

REPORT

BY

MAJOR J. W. PRINGLE, R.E., ON THE FATAL COLLISION
THAT OCCURRED ON THE 2ND SEPTEMBER, 1913,
BETWEEN TWO PASSENGER TRAINS NEAR AIS
GILL, ON THE MIDLAND RAILWAY.

Presented to both Houses of Parliament by Command of His Majesty.



LONDON:

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By DARLING AND SON, LTD., BACON STREET, E.

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1913.

[Cd. 7153.] *Price 1s. 2d.*

MIDLAND RAILWAY.

Board of Trade (Railway Department),
8, Richmond Terrace, Whitehall, London, S. W.

SIR,

10th October, 1913.

I HAVE the honour to report for the information of the Board of Trade, in compliance with the instructions contained in your Order of the 2nd September, the result of my inquiry into the causes of the collision which occurred on the same date, about 3.4 a.m., near Ais Gill, on the Midland Railway.

Two south-bound express passenger trains were concerned in this case. The first comprised vehicles from Strauraer and Glasgow; the second from Aberdeen, Inverness and Edinburgh. They were due to leave Carlisle at 1.35 a.m. and 1.49 a.m. respectively. The second train overtook the first, which was at a standstill on the up road, and a collision, with disastrous effects, ensued.

The engine of the second express crashed through the last vehicle—a bogie brake van—of the standing train, and buried itself midway in the passenger coach in front of the van. The roof of the wrecked van, under which the engine passed, cut through the three passenger compartments of the composite carriage which travelled behind the engine of the second train. Fire broke out very shortly, if not immediately, after the collision, and the last three vehicles of the first train were burnt.

I report, with deep regret, that fourteen passengers lost their lives in the collision, and their bodies were wholly or largely destroyed by fire. Two more passengers subsequently died from the effects. Thirty-eight others suffered more or less serious injuries, or have complained of the effects of shock or exposure. All the fatalities occurred to passengers travelling in the last passenger vehicle of the leading express, and those at all seriously injured were occupants either of this coach, or of the front vehicle of the second express.

The first (Glasgow) express was drawn by engine No. 993, of the 4th or most powerful class—4-4-0 type, with 6-wheeled tender—and comprised the following stock:—

M. & G.S.W., 8-wheeled composite brake	...	No.	254	
Midland, 8-wheeled sleeping car	...	..	2770	
	...	..	2777	
M. & G.S.W., 8-wheeled 3rd class coach	...	..	237	
.. 6-wheeled brake van	...	..	204	
.. 8-wheeled composite brake	...	..	250	
Midland, 8-wheeled 3rd class coach	...	..	79	
.. sleeping car	...	..	2785	} These were burnt.
M. & G.S.W., 8-wheeled 3rd class coach	...	..	227	
.. " " brake van	...	..	208	

The second (Edinburgh) express was drawn by engine No. 446 (second class) of similar type, with 6-wheeled tender, and had the following vehicles in rear:—

M. & N.B., 8-wheeled 3rd class brake	...	...	No.	123
.. " composite sleeping car	...	...	..	155
.. " " brake	...	...	..	143
.. " sleeping car	...	...	..	171
.. " composite brake	...	...	..	142
.. " " coach	...	...	..	122

Both engines were fitted with the steam brake working blocks upon the four coupled wheels, and upon all the wheels of the tender. The trains were equipped throughout with the continuous automatic vacuum brake, working blocks upon all coaching wheels. Both steam and vacuum brakes could be applied and released by one handle on the locomotive; also by the opening or closing of the brake valve in any of the vans or brake compartments. Valves of the Westinghouse quick-acting (vacuum) type were fitted in each of the three brake compartments in the second express. The brake equipment was in good order, and no question is raised as to its adequacy or efficiency.

The first express was driven forward 13 or 14 yards by the collision, but only the last three bogies of the train were derailed. Vehicles Nos. 227 and 208 were destroyed and burnt, and the body of No. 2785 was also burnt to floor level. A number of headstocks and buffer castings were broken. Nos. 2785 and 227 were buffer-locked, which accounts for the destruction of the former vehicle by fire. The screw coupling between Nos. 250 and 79 broke.

The engine bogie of the second express was derailed, and considerable damage was done to the locomotive, which suffered severely in the fire. But the engine was subsequently removed on its own wheels. No. 123 was the only coaching vehicle on this train which was badly damaged.

A detail of damage to rolling stock and to permanent way is attached (Appendix I.).

Description.

Ais Gill Moor, the scene of this collision, lies immediately north of the water-parting, which forms the County Boundary of Westmorland and the North Riding of Yorkshire. The actual spot is about half a mile from the railway summit at Ais Gill (altitude 1,166 feet), and is but two miles distant from the scene of the disaster which took place in December, 1910, near Hawes Junction.

Appleby and Carlisle are 17 and 47 $\frac{3}{4}$ miles distant to the north, and Leeds 65 miles south by rail. The nearest stations north and south are Kirkby Stephen (6 $\frac{1}{4}$ miles) and Hawes Junction (3 $\frac{3}{4}$ miles). Mallerstang and Ais Gill signal-boxes are the neighbouring block posts.

I attach a diagram (Pl. I.) showing the railway lines in the vicinity, and a plan (Pl. II.) on a larger scale, showing the two trains after the collision, together with the gradients.

Mallerstang block post is placed on the east of the railway, and the distances to the undermentioned places, signals, &c., mentioned in the report are approximately as follows:—

Kirkby Stephen Station	...	...	3 m.	572 yds.	N.
Birkett Tunnel—north end	...	...	1 "	468 "	N.
" " south end	...	...	1 "	44 "	N.
Mallerstang up distant signal	...	...		744 "	N.
" " home signal	...	...		47 "	N.
" " starting signal	...	...		291 "	S.
Left-hand curve commences	...	...	2 "	462 "	S.
Ais Gill Viaduct	...	...	2 "	1,034 "	S.
Point of collision	...	...	2 "	1,611 "	S.
Left-hand curve ceases	...	...	3 "	100 "	S.
Ais Gill up distant signal	...	...	3 "	135 "	S.
Ais Gill Signal-box	...	...	3 "	968 "	S.

The railway from Carlisle, southward, rises at an average rate of about 30 feet per mile in the first 8 miles; the next 25 miles show a rise of only about 8 feet per mile. From Ormside Viaduct (33 miles) to Ais Gill, the climb is long and severe. The actual rise in level is over 661 feet in a distance of 15 $\frac{1}{4}$ miles, or 43 feet per mile. The average gradient on this long bank is, therefore, about 1 in 125. In the vicinity of Mallerstang the gradient eases for a distance of 7 furlongs to 1 in 330.

From the signal box at Mallerstang the road runs on a tangent for a little over a mile. There follows an easy curve (radius 120 chains) to the right, extending for three-quarters of a mile, which is succeeded by a tangent with a length of somewhat less than half a mile. Preceding the spot where the collision took place, the railway is aligned on a left-hand curve for a distance of 1,148 yards, the radius varying from 54 chains to 65 chains.

The first express, at the moment of collision, rested partly on embankment and partly in shallow cutting. The seventh and eighth vehicles stood under a road bridge over the railway. The tail light was about 80 yards from the northern end of the cutting, and, with one side light, was visible for a distance of at least 200 yards to an approaching train. The formation north of the cutting as far as Ais Gill Viaduct is on sidelong ground, with low cutting slopes on the west and embankment on the east side.

The length and weight of the stock forming the two trains were as follows:—

Ist train.	Length over		Weight.
	ft.	in.		tons. cwt.
Engine No. 993 and tender, loaded	57	9	106 4
Coach No. 254, unloaded	53	2	24 0
" 2770	53	2	24 0
" 2777	57	2	29 0
" 237	57	2	27 0

1st train— <i>continued</i> .					Length over buffers.		Weight.	
Coach No.					ft.	in.	tons. cwt.	
204	unloaded	...	...	...	34	2	13	0
250	"	...	...	...	53	2	24	0
79	"	...	...	...	57	2	26	0
2785	"	...	...	...	57	2	28	0
227	"	...	...	...	57	2	26	0
208	"	...	...	...	53	2	22	0
Total length of train ...					590	5		
Total weight (coaching) ...					...		243	0

2nd train.					Length over buffers.		Weight.		
Engine No.					ft.	in.	t.	c.	qr.
446	and tender, loaded	...	...	...	53	2½	88	8	3
123	unloaded	...	...	...	57	2	26	0	0
155	"	...	...	...	57	2	28	0	0
143	"	...	...	...	53	2	25	0	0
171	"	...	...	...	57	2	28	0	0
142	"	...	...	...	53	2	25	0	0
122	"	...	...	...	53	2	25	0	0
Total length of train ...					384	2½			
Total weight (coaching) ...					...		157	0	0

The approximate lengths and weights of the two trains (including engines) were, therefore :—

First train—length, 197 yards; weight, 349 tons.
 Second ,, ,, 128 ,, ,, 245 ,,

The trains were composed of corridor stock, with continuous communication provided by means of centre gangways. On the corridor side of each coach there were three doorways, with an outside doorway on the opposite (non-corridor) side into each compartment. No. 227 had seven compartments; No. 123 had three compartments, the back half providing luggage accommodation.

The first train contained accommodation as follows :—

Sleeping berths	...	...	...	...	...	26
1st class seats	...	...	...	...	...	16
3rd class seats	...	...	...	...	...	150
Total	...	...	...	...	...	192

The accommodation on the second train was :—

Sleeping berths	...	...	...	...	...	14
1st class seats	...	...	...	...	...	32
3rd class seats	...	...	...	...	...	84
Total	...	...	...	...	...	130

The sleeping cars in the two trains were lighted electrically, so was No. 123, the leading vehicle in the second train. The remaining ten vehicles were lighted by compressed oil gas on Pintsch's system. The gas is stored in cylinders, carried under the floor, which are charged to 105 lbs. pressure. Of the two wrecked vehicles, No. 208 had two cylinders, each 5 feet 6 inches in length by 20 inches diameter. The total cubic capacity was 23·98 feet. No. 227 had three cylinders, all 6 feet 4 inches in length, two of them having a diameter of 20 inches, and the third of 24 inches. The total cubic capacity was 47·94 feet.

The following vehicles each contained tools and lamps, four fire buckets, and two fire extinguishers :—

In the first train, composite brakes Nos. 254, 250, and van No. 208.

In the second train, 3rd class brake No. 123, and composite brakes Nos. 143 and 142 (except extinguishers).

Each sleeping car also carried one extinguisher.

The total number of tools, &c., carried was :—

Fire extinguishers	...	...	...	...	15
Fire buckets	...	...	...	...	24
Safety hand lamps	...	...	...	...	12
Hand saws	...	...	...	...	12
Hatchets and axes	...	...	...	...	12
Hammers	...	...	...	...	12
Pinch bars (6 feet 8 inches and 3 feet)	...	...	...	...	12
Chisels	...	...	...	...	6
Drifts	...	...	...	...	6
Tin bafflers, for extinguishing gas jets	...	...	...	...	12

In addition, each engine carried 1 crowbar, 1 hand and 1 sledge hammer, 2 hand lamps, and other appliances.

I attach (Appendix II.) extracts from the General Rules and Regulations, which bear upon the conduct of the men concerned in this case.

Conclusion.

The inquiry in this case was opened at Kirkby Stephen Station in private. This has been the usual procedure in cases where there is a likelihood of criminal proceedings being taken against any of the men concerned. Subsequently it appeared that there was some misconception on the part of the general public with regard to the bona fides of the inquiry, or some idea was prevalent that various matters would not be thoroughly investigated. I decided, therefore, that there was justification for departing from precedent, and the second and subsequent sittings, which were held in Leeds and London, were conducted in public. In the circumstances the straightforward manner in which the men concerned made their statements is certainly praiseworthy.

Great interest has been shown in all the circumstances attending this lamentable disaster. This has made it necessary to deal with a large variety of subjects, some of which have little real bearing upon the causes of this collision.

I.—1. *Account of events leading up to the collision.*—The two expresses left Carlisle at 1.38 a.m. and 1.54 a.m.—three and five minutes late respectively. In each case one engine was attached, and the loads behind the engines were 243 tons and 157 tons. The trains were about half full. In the first, 13 sleeping berths and 91 seats were occupied, out of a total accommodation for 192 persons. In the second nine sleeping berths and 53 seats were filled, out of 130.

The railway servants on the trains were as follows :—

1st Express.

Driver Nicholson	}	Enginemen.
Fireman Metcalf		
Sleeping-car attendant Fisher, rode in the second vehicle.		
Front guard Donnelly, rode in the fifth vehicle.		
Sleeping-car attendant Wakelin, rode in the eighth vehicle.		
Rear guard Whitley, rode in the last vehicle.		

2nd Express.

Driver Caudle	}	Enginemen.
Fireman Follows		
Sleeping-car attendant Westbrook, rode in the second vehicle.		
Sleeping-car attendant Tweeda, rode in the fourth vehicle.		
Guard Walker, occupied various positions during the journey.		

The booking of these trains between Carlisle and Ais Gill summit ($48\frac{1}{4}$ miles) is similar. The scheduled speed averages $44\frac{1}{2}$ miles per hour. As far as Ormside signal-box ($33\frac{1}{2}$ miles) the journey was accomplished by both trains without unusual occurrence. The first express passed this block post at 2.20 a.m., and the second at 2.39 a.m. The time allowed is 41 minutes, the actual times occupied were 42 and 45 minutes. It will be noted that whereas 16 minutes separated the trains on departure from Carlisle, there was an interval of 19 minutes between them at Ormside. The first express had so far only lost one minute, the second had lost four.

After passing Ormside, the enginemen on the first express began to experience difficulty in keeping the pressure of steam necessary to maintain the booked speed. Despite the fact that Nicholson acted as fireman between Ormside and Kirkby Stephen, the train did not pass the latter block post until 2.37 a.m., and had an average speed—over this section of $8\frac{1}{4}$ miles—of only 29 miles per hour instead of 40. At Mallerstang, 3 miles further south, the first express was booked past at 2.46 a.m. This short section was traversed at an average speed of only 20 miles per hour. The express had therefore lost eight minutes after passing Ormside, and, allowing for late departure, was about 10 minutes behind scheduled time at Mallerstang.

The second express did well enough as far as Crosby Garrett, indeed better than driver Caudle appears to have thought. It passed Kirkby Stephen at 2.51 a.m., 14 minutes behind the first express, and Mallerstang at 2.57. It maintained an average speed, therefore, from Ormside of $37\frac{1}{2}$ miles an hour, and was only 11 minutes behind the first express at Mallerstang. The average booked speed between Ormside and Ais Gill summit is $37\frac{1}{2}$ miles, so that Caudle must have been travelling, as far as Mallerstang, very little slower than was necessary to keep scheduled time. The train had lost four minutes running as far as Ormside, but certainly had not lost more than another minute when it passed Mallerstang.

Nicholson estimates that he passed Mallerstang with clear signals at a speed of from 15 to 20 miles an hour. He declares that all the Mallerstang signal lights were burning properly when he passed them, and that there was no difficulty in observing them. Other witnesses prove that the night was clear, and lights could be readily sighted. Thereafter, he describes that with the regulator wide open, he had difficulty in keeping the brake blocks off the wheels. The vacuum had dropped to 15 inches, and he had to use the large ejector to prevent the blocks rubbing. At last, when steam pressure had fallen to about 80 or 90 pounds, the train came to a standstill, after travelling about 3 miles from Mallerstang. The engine was then about 185 yards north of Ais Gill down distant signal, and not much more than half a mile from the level road on the summit. The time as booked by Nicholson was 2.55 a.m., but, as vouched for by guard Whitley, it was 2.57 a.m. The latter I accept as likely to be the more correct, because the average speed of the train over the last three miles was probably not greater than 15 miles an hour.

About this same moment of time the second express was passing Mallerstang block post. Signalman Sutherland states that he replaced all his up line signals in the normal danger position after the first express had passed. He is very clear on this point. No clearance for the first express was forwarded to or received by Sutherland. About 2.56 a.m. he saw the second train approaching, and telephoned to Ais Gill to enquire of the whereabouts of the first express. Signalman Clemmet, from Ais Gill, replied that he had no information—he had not seen or heard the train. Sutherland turned to watch the approaching train and saw, as he thought, that it was not steaming. He concluded that, in obedience to the warning given by his distant signal, the train had slowed. He therefore lowered the home signal as the train came out of a cutting, with the intention of allowing it to run up to the starting signal. A moment later, when the engine was close upon the home signal, he realized that she was steaming hard and travelling fast. He therefore threw the home signal to danger, and tried to warn the driver by showing him a red light, but without success. He watched the train go past the up starting signal, which was at danger, and immediately warned the signalman at Ais Gill, by sounding the special bell signal for a train running away on the right road, that the second express had entered the section without permission. This signal was immediately acknowledged by Clemmet. Sutherland estimates the speed of the second express at from 25 to 30 miles an hour.

Driver Caudle gives the following account of his journey after passing Kirkby Stephen. He left the footplate when approaching Birkett Tunnel, on the near side, to oil the left driving auxiliary box, and was on the framing of the locomotive whilst the train passed through the tunnel. He then went round

the smoke-box on to the off side, oiled the corresponding box, and got back to his place at the "front." Mallerstang up distant signal is situated on the near side of the railway, about 1,060 yards from the south end of Birkett Tunnel. A good view can be obtained of this signal as soon as the cutting at the south end of the tunnel is cleared—say for 500 yards. Caudle states that he got the impression, when he was outside the engine, that the distant signal was in the clear position. The wind also was stronger than he had expected to find it. He was consequently a longer time than usual going round the framing, and was outside when the engine passed the distant signal. On his return to the cab he found the water low in the glass, and his fireman (Follows) engaged in trying to get the right-hand injector to work. He immediately applied himself to the refractory injector, and forgot he had not assured himself of the position of the distant signal. He was pre-occupied with his work on the water-feed, and, when he had succeeded in getting it to work satisfactorily, found that he had run past the home and starting signals at Mallerstang without observing their position. He kept the regulator and reversing lever in the same position and continued to run forward, being engaged in watching Follows put some coal on the fire. Suddenly he heard the engine whistle sounded, and shortly afterwards heard Follows say, "Look out, Sam, there's a red light in front of us." At once he pulled over the brake handle and closed the regulator. He had time to do no more before the collision occurred. There was just time for the continuous brake to bring the blocks up to the wheels, before the engine struck the train in front. He estimates his speed when he applied his brake as possibly 30 miles an hour, and thinks the brake acted wonderfully.

From an experiment made by the Company with an engine similar in type to No. 446, and a train composed of six bogie vehicles (four of which formed part of the second express) it was found that the time taken, from the application of the driver's brake valve, until the brake blocks were applied on the rear vehicle, was $1\frac{3}{4}$ seconds. At 30 miles an hour a train will travel about 20 yards in this time.

Follows, whilst Caudle was outside on the framing, was busy with the water-gauge and injector, and in relighting the gauge lamp, which had been blown out in the tunnel. After Caudle's return he was attending to the fire, and was some distance beyond Mallerstang before he was able to look up. When his eyes had recovered from the blinding effect of the furnace, he saw two red lights. At first he thought they were the Ais Gill distant and home signal lights, and opened the engine-whistle to draw the signalman's attention to their approach. He then saw a moving third red light, and called Caudle's attention. He estimates that only 50 yards separated the two trains when he realised that the red lights in front of him were those of a train, and puts the speed of the train at the moment at 30 miles per hour. He acknowledges he was not watching for the Mallerstang signals and did not observe them.

2. *Principles of Block Working.*—At this point it seems necessary, in view of much that has been said, and written, to outline roughly what is the method of working passenger traffic upon double lines of railways, and the principle adopted for obtaining security. There is no time interval in normal conditions. It would be impossible nowadays to conduct traffic with such a system. Safety does not depend upon an interval of time between the dispatch of following trains. The principle which has been universally adopted, since 1889, is the preservation of an adequate interval of space between trains following each other on the same line. The railway is divided into a number of sections by signal-boxes, in each of which there are signalling instruments enabling the men to communicate electrically with the signal-box on each side. The sections are of equal or unequal length as may be convenient for working the traffic. No train is permitted to pass away from a signal-box **A** towards another **B** until the signalman **A** has, firstly, received telegraphic information from signalman **B** that the previous train has passed, and that the section between **A** and **B** is clear; nor, secondly, until permission has been asked by **A** from **B** for a train to proceed, and has been definitely granted. The most advanced outdoor signal-post, home, starting, or advanced starting, as the case may be, defines the boundary between any two adjacent sections. A signalman, when he has received permission to allow a train to enter the section in advance, gives authority to an engineman to leave his section and enter the next by lowering the outdoor signals. No driver is authorised to pass any home, starting, or advanced starting signal until he receives authority to do so, either by the lowered position of the semaphore by day, or the display of a green light on the signal post by night. It makes no difference, therefore, whether a train is travelling or standing still in a section.

The principle holds good, and the security provided in both cases is similar, provided that the regulations are fully observed, firstly, by signalmen, and secondly, by enginemen.

From this rough outline of general principles, the evidence to which reference has been made is sufficient in itself to show that the primary cause of this collision was the failure of the enginemen to obey the danger position of the starting signal. I propose to criticise their conduct at greater length at a later moment.

3. *Circumstances of secondary consideration.*—The main issue which I have so far dealt with has been to some extent obscured by allusions to quite secondary matters—secondary so far at least that they do not affect general principles; though in a survey of such matters there may be found grounds for regarding in a somewhat different light a breach of the general rules and regulations for the safe conduct of traffic. These matters are: (a) The non-provision of a pilot, or assisting engine, to the first express; (b) the quality of coal used on the engines; and (c) the practice of oiling whilst trains are in motion.

(a) The first express had a load behind the engine of 243 tons, 13 in excess of the load specified for a second limit train on this section of the road, with a locomotive similar in type to No. 993. Driver Nicholson applied, in accordance with the notice issued in July, 1910 (*vide* Appendix II.), for the assistance of a pilot before leaving Carlisle. The platform inspector told him that one was not available, meaning that a pilot would not be provided. Mr. Paget explains in his evidence that the loads set forth in the notice are intended to be rigidly adhered to, if it is desired that the scheduled time shall be maintained; that if assistance is not given, when the load is greater than that laid down, drivers are not expected to keep to scheduled time, nor are they found fault with if time is lost. He adds that on the night in question, although there was an engine available, more time would have been occupied in fetching and attaching the pilot, than might be expected would be lost on the journey by an engine of this class drawing 13 tons beyond the tabulated amount. An engine of this type can with safety, in normal weather conditions, haul a load considerably in excess of that laid down to Ais Gill summit. Driver Nicholson in his statement admits the correctness of all these contentions. The Company have been blamed and the locomotive inspector has been censured for not supplying Nicholson with a pilot. If a pilot had been given the first express would not, in all probability, have been stopped in section by shortness of steam. It is correct, therefore, to say that the accident would not have occurred. But it is incorrect to declare that this refusal was the primary cause of the collision. Stoppages in section recur from a variety of reasons, *e.g.*, the use of the communication cord by passengers, the failure of a connecting rod, the heating of a bearing, the breaking of an axle, straying cattle, &c. None of these incidents could be reasonably adduced as the cause of a collision. The safety of a train, as has been shown, does not depend primarily upon its ability to maintain a scheduled speed, or even to keep moving. The refusal of a pilot I do not, therefore, regard as anything more than a circumstance—an unfortunate circumstance no doubt, but one which the existing regulations, had they been obeyed, would have safeguarded.

(b) Much has been said with regard to the coal used on these two engines. The opinion expressed by the enginemen is unanimous that it was too small for locomotive purposes. This view is fully accepted by the officials of the Company, as a sufficient explanation of the stoppage of the first express. They do not attach responsibility to the enginemen for stopping, or failing to keep time. But suggestions have been made that the coal was of poor quality, and was purchased by the Company from motives of parsimony, and that they were indifferent to complaints, which had been made regarding the coal. The statement made by Sir Guy Granet, and the analyses of the two classes of coal referred to, dispose of these ideas. In the case of the Blakett coal, the analysis (*vide* Appendix III.) shows that it has a high calorific value, higher than the average from a large number of collieries in the south of Yorkshire. It has the disadvantage, however, of forming clinkers too readily. The Naworth coal has a very high calorific value, equal to the best Welsh coal used by the Company. It is low in sulphur and ash and does not adhere to the firebars. It is, however, a small coal. It was specially tested in April, 1913, on express and slow passenger trains, both with Nos. 2 and 4 class engines. The report of the Company's inspector states that it is "splendid fuel for the Carlisle road, and can be used without being mixed with South Yorkshire coal. I can without the least hesitation recommend it for use by itself at Carlisle." It was in consequence of this recommendation that the Naworth coal was brought into use in July last on

passenger trains. Complaints were made at the end of July of the small size of the coal. I have copies of correspondence, furnished by the Company, showing the action taken in consequence of the formal complaint lodged by the District Locomotive Superintendent at Carlisle. The complaint reached the Stores Department at Head Quarters on August 1st. On August 5th the coal contained in a number of waggons was examined at Carlisle by a Stores Inspector. He reported by telegram that it contained large quantities of fine slack or dust, and had the general appearance of not having been screened. The contract specified that the coal should conform to sample, and be screened over a $\frac{3}{4}$ -inch mesh. The colliery was informed on August 6th, and subsequently admitted that the coal was not well screened, and promised to put the matter right. A guarantee was called for by the Company that the coal would be better screened in future, and on August 23rd the Colliery informed the Company that they had taken action to improve the screening arrangements. On August 21st and 25th, the Company's Coal Inspector again examined the coal which was being received at Carlisle from the Naworth Colliery, and reported that the supplies were then quite equal to contract, and that the screening and loading were satisfactory.

There can be no doubt that the improvement in screening was not maintained, and that the failure of the enginemen on No. 993 to keep the required pressure of steam on the night of September 1st was due to the small size of the coal, but not to its inferior heating qualities or to bad firing. There have been undoubtedly other instances of trains stopping between Carlisle and Ais Gill recently for the same reason. Caudle, however, states that he had never been stopped by shortness of steam during his 40 years' service, and Nicholson can only recite one such occasion many years ago, when he was fireman on a goods train. At the same time enginemen on all railways occasionally experience difficulty on account of the small size of their coal, and even with the best intentions on the part of the responsible officers, I do not think this can always be avoided.

In the case of the second express the trouble with the injector is also attributed to shortness of steam caused by fine coal. But having regard to the light load behind engine No. 446, and to the fact that the engine hauled her load between Ormside and Mallerstang practically in the scheduled time, it appears probable that the contrariness of the right-hand injector was not likely to have been caused altogether by low steam pressure. Injectors are sometimes peculiar in action and require humouring. It must also be noted that the fireman (Follows) was new to this engine, though not to the class. In any case, the size of the coal cannot, I think, be regarded in any other light than one of a somewhat extraordinary sequence of incidents, which should not in itself have led to danger.

(c) By the Company's regulations oiling an engine is the duty of the driver and not the fireman. Before the recent improvements in lubrication were adopted, it was necessary for a driver, more than once on a long journey, to feed additional oil on to the bearings. A receptacle is now filled with oil before a journey is commenced, and the lubricant is syphoned, drop by drop, from wicks on to the bearings. Provided that the receptacle is large enough to supply all the oil likely to be syphoned, there is no actual necessity for the driver to renew the supply during the journey. But drivers of long service have generally acquired the habit of going round their engines, and prefer to continue the practice, even though it may not actually be necessary. It affords the men an opportunity also of observing the movement of the engine, which cannot be seen from the cab. Caudle and Nicholson say that they are in the habit of going round with a feeder once during the journey between Carlisle and Leeds.

The practice must be regarded from two points of view, viz., danger to the men themselves, and loss of security to the train. When the train is travelling steadily, there does not appear to be much risk to an experienced man in thus exposing himself on the framing. The men, in this case, say that they select a portion of the road where it is straight, and there is shelter from the wind. But it cannot be denied that there is some risk in stormy weather of falling from the engine, also on all occasions of coming into contact with outside objects. The attitude of the Board of Trade has been that the practice is inadvisable on account of this personal risk. A notice (*vide* Appendix II.) has been issued by the Company warning the men that accidents have occurred, and cautioning them against leaving the footplate unnecessarily when the engine is in motion. The enginemen were aware of this notice, and state that they did not consider the practice to be dangerous.

The second aspect is important from the point of public safety. A man is certainly at a disadvantage for observing signals, when he is engaged outside an engine in securing his footing and using a feeder. But the men, again, reply that there would not ordinarily be any danger to public safety, because the work only occupies the short period of two or three minutes, and that they are careful to choose a section of line between block posts, where, from their knowledge of the road, there will be no signals to observe. Provided their judgment can always be relied upon in this respect, the danger of non-observance of signals should be small. Moreover, firemen are also fully competent to observe signals, if required to do so, during the temporary absence of the driver from the footplate. If a driver chooses to go round the framing, there should be a distinct obligation upon him, in my opinion, to arrange with his mate that the latter shall be at liberty from his own work to devote himself to the more important work of observation.

On this particular occasion it appears that Caudle was away from the "front" longer than he had calculated to be, and consequently passed the distant signal before he had returned to his proper position. His action was therefore ill-judged, and possibly the reason why the distant signal was not properly observed, or at all events obeyed. But there was no necessity for Caudle to go round at the time he did, and he did not take the precaution to see that the fireman, who was strange to him, was disengaged, nor did he give him any instructions. The conclusion may be drawn that he felt himself competent to carry out his duty of observation, having done the same thing on many other occasions without ill results.

4. *The bearing of General Rules 40 (a) and 217 (a).*—The first of these rules (*vide* Appendix II.) defines the use of the home signal, when the starting signal is at danger. "It must not be lowered for an approaching train until the train is close to the home signal, and has been brought quite, or nearly, to a stand at it." Signalman Sutherland states that he watched the second express approach, and saw that it was not steaming, and took it for granted that it had slowed on account of the danger position of the distant signal. He therefore dropped the home signal when the train was between two bridges (Nos. 163 and 161). These bridges are situated 175 and 310 yards north of the signal-box. It may be taken that the train was at the moment—say, 200 yards distant. This distance is too far, especially at night time, to comply either with the spirit, or with the letter, of the rule. To a driver who has missed, or is not properly on the look-out for a distant signal, the dropping of a home signal at such a distance might prove misleading. For this reason I take exception to Sutherland's conduct as being incautious and inconsistent with the intention of Rule 40 (a). The train was clearly too far away for him to be absolutely certain that it was prepared to stop at the home signal. On other occasions fault has been found with the manner in which signalmen carry out this rule, the most recent illustration is the accident at Yeovil. Traffic officers do not, I think, sufficiently insist upon its proper observance. Sutherland's action in throwing the home signal to danger at a later moment, when he saw the train was approaching at a high speed, was quite correct. Having regard to Caudle's own statement, it does not appear that the lowering of the home signal had any influence upon the passage of the second express, and the incident therefore has no bearing upon this particular accident.

Rule 217 (a).—This rule has been adopted as an additional precaution to the Block Regulations to safeguard trains standing in Block sections. It lays down that the rear guard, in the event of the stoppage of a train by failure, &c., must "immediately" go back to protect his train in the manner described (*vide* Appendix II.). It is to be regretted that, when asked by guard Donnelly how long the first express would be kept standing, Nicholson was not more accurate in his reply. He acknowledges in his evidence that he knew it would take 10 minutes or more to obtain the necessary pressure of steam to start the train on such a gradient. Yet he answered "only a few minutes." From Donnelly's version, Nicholson added, "Go back to your van." If he used these words he was clearly trying to minimise the probable length of the stoppage, and must have known that his reply would influence the guards in their behaviour with regard to this rule.

Donnelly allows that he knew the cause of the stoppage was shortness of steam when he went back to his van. He shouted to rear guard Whitley that the driver had said he would be "about a minute." Whitley states that three minutes had elapsed when he heard Donnelly shout to him that they would be away "in a

minute or so," and immediately afterwards he heard the second express approaching. He was aware that under this rule it was his duty to go back, but understood from Donnelly that the stoppage would be so short, that he did not think there was good enough reason to carry out the rule. He would certainly have carried out the rule if he had known that the train would be at a standstill for 10 minutes, or even that the cause of the stoppage was shortness of steam. He had provided himself with detonators before getting out of his van. He estimates that the train stood for about four minutes before the collision took place. Other estimates of railwaymen vary from four to six minutes. These estimates are, I think, a little under the mark. The second express, as has been shown, was 11 minutes behind the first, passing Mallerstang block post, and travelled 3 miles at an average speed of between 25 and 30 miles an hour before the collision took place. It is probable, therefore, that at least seven minutes elapsed. This accords with the estimate given by Miss Clarke and Mr. Thomas, and with the time at which signalman Sutherland heard what he took to be the noise of the collision, viz., 3.3 to 3.4 a.m.

Railway Companies have not always rigidly enforced obedience to this important rule. It is difficult, sometimes impossible, to obey the rule as it stands literally. For example, in the case of a train, with only one guard, stopped by the unexpected action of the continuous brake, the guard must first discover the cause of the stoppage. General practice therefore justified Whitley's delaying action until he had heard the result of Donnelly's interrogation of the driver.

On the other hand, I do not credit Whitley's statement that he was unaware that the engine was short of steam. Any experienced man must have known it, and must also have known that the delay would be considerable. Notwithstanding therefore that action under the rule might have caused additional delay to the train, it was his duty, in default of any other explanation from Donnelly, to take action. I cannot therefore free him from all blame in the matter. I hold also that both Nicholson and Donnelly must share the blame in this respect because, though both were fully aware of the fact, they endeavoured to minimize the probable length of the delay.

5. *Conduct of enginemen of second express.*—I pass now to the consideration of the conduct of the two enginemen of the second express. Every railwayman will allow that his first duty is to the travelling public. Rule 6 enunciates:—"The safety of the public must under all circumstances be the chief care of the servants of the Company." Safety of working upon railways depends entirely upon obedience to signals, and every driver will admit this. Every driver will also admit that if he does not see signals, it is his duty to act as if they were at danger, and proceed, if he does proceed at all, with caution. Caudle states that on emerging from Birkett Tunnel, when he was outside on the framing, he looked ahead and could see the Mallerstang up distant signal, and "formed the impression" that it was at "safety." He gives two explanations as to why he did not, in accordance with his custom, take a second look at this signal. Firstly, because on his return to the "front" his attention was distracted by the low state of the water in the boiler, on seeing which he immediately applied himself to getting the right-hand injector to work. Secondly, because he was round on the framing when he passed the signal, and therefore had no second chance of observing it. I think the latter is probably the correct explanation, although Follows, the fireman, thinks that Caudle was back on the footplate before they actually passed the signal. Caudle's subsequent complete absorption in connection with the working of the injector accounts for the fact, which he admits, that he did not observe the home and starting signals at Mallerstang at all. It must be noted here that he does not appear even to have asked his fireman whether he had observed the signals. When he had finished his work with the injector and looked up, he recognised that he had run past all these signals without observing their position. Here, in my opinion, was the critical point in the journey. Asked what was his duty in the circumstances, Caudle replied that he should have gone ahead cautiously enough to stop clear of any obstruction. Instead of acting in this spirit, he explains that he never expected to find a train standing in the section so close to the summit. Clearly he "took chances." Instead of immediately reducing speed, and devoting his whole attention to observing the road, from whichever side of the footplate presented the best opportunity, he watched the fireman doing his work. It was possible, on a clear night as this was, to have seen the tail and near side lights of the standing train at a distance of 200 yards, at all events from the fireman's side. Caudle was not on the look out, and did not

see them. With so much warning he could have prevented the collision, even without any previous reduction of speed, by the prompt application of the continuous brake.

Allowances may be made for Caudle's non-observation of the distant signal, as possibly due to misjudgment on his part of the time required for going round the engine. Sympathy will be felt in his anxiety regarding the low state of the water in the boiler, and the difficulty with the injector. But I can see no excuse, after he had overcome these difficulties, for his carelessness when he recognised that he had passed all these signals without noticing their position, and his inattention to his duty of observation.

I find, therefore, after giving the fullest consideration to all the circumstances, and making every allowance possible for the difficulties on the journey, that the main responsibility for this deplorable accident rests upon driver Caudle.

With regard to fireman Follows, it is evident that, owing to difficulties on account of small coal, and his lack of acquaintance with engine No. 446, which, I think to some extent may have accounted for his difficulty with the right-hand injector, his time was more entirely occupied with his own immediate duties than is usually the case. He had therefore less opportunity than usual for observing signals. His responsibility for this duty is quite secondary to that of driver Caudle. He was employed immediately before he sighted the red lights in firing, and the glare of the fire must have temporarily impaired his powers of vision. Taking all these things into consideration, his responsibility for the collision is comparatively small.

Driver Caudle is 59 years old. He has served the Company 40 years, and has been a driver nearly 29 years. He had been two hours on duty at the time of the accident, after an interval of rest of 16 hours. His service record shows seven occasions upon which he has been rewarded for vigilance in noting obstructions on the line, &c., and there are no serious offences during the past seven years.

Fireman Follows has 13 years' service. He passed as a fireman in May, 1905, and has been a regular fireman since May last. Both men have an excellent character for general sobriety. They were tested as regards sight and colour vision on the 29th and 27th August, 1913, respectively, and were found to be perfectly normal.

6. *Conduct of men with the first express, after they became aware of the approach of the second train.*—Only six or seven persons on the first express appear to have been aware of the impending collision. These were the enginemen, guards and a few passengers. Driver Nicholson was, I believe, the first to see in the distance the glare from the smoke-box of the approaching express. He stopped his fireman (Metcalf), who was on the point of going to Ais Gill, and sent him back to try and stop the train. He also sounded his engine whistle several times before the collision occurred. Nicholson further attempted to get the first express into motion, but failed for want of sufficient steam. Metcalf states that the approaching light appeared a long way off, possibly a mile and a half, but he had not reached the end of his own train before the collision took place. Guard Donnelly also heard the sound of the approaching train, but only managed to get as far towards the rear of his train as Metcalf. From the account of fireman Follows, it must have been one of the moving red lights carried by either Donnelly or Metcalf, which made him recognise the danger of the position, as these men were on the rear (fireman's) side of the train.

Whitley was still standing on the ballast when he heard the second express approaching. He rushed back to stop it, using his red lamp and whistle. He did not succeed in getting back more than 100 yards, having run along the six-foot way, on the off side of the track. I do not think that he had time to lay detonators, with which he had provided himself before he first left his van. He saw neither of the enginemen as the train passed him, at a speed, in his view, of 40 miles an hour, but had an idea that the brakes were applied to the train before the collision took place.

From the various accounts, it does not seem as if these men had more than two minutes' warning at the outside of the approach of the second express, and I do not think that they could have taken any other action than they did.

It has been suggested that the guards should have aroused the passengers in the carriages in the rear of the first express, and made them get out. It was certainly not Whitley's duty to do this, and Donnelly and Metcalf do not appear to have got back as far as the last passenger vehicle before the collision occurred. The evidence

of Miss Clarke, that time did not allow of any such action, is conclusive. On a dark night, with no platform available, I think it is fortunate, having regard to all the circumstances, that no attempt was made to arouse the passengers, who were probably either asleep or in a somnolent condition. I believe that the number of severely injured would have been largely increased if the attempt had been made.

It is worth recording that fireman Metcalf after the collision had occurred arrived at Ais Gill signal-box at 3.10 a.m. (Clemmet), in time to stop the despatch of a down goods train.

Stationmaster Bunce arrived on the scene from Hawes Junction at 3.40 a.m., by which time the front part of the first express had been uncoupled and drawn ahead. The rear portion (five vehicles) of the second express appears not to have been moved back until later, ten minutes after the arrival of the platelayers, about 3.55 a.m.

II. *Recommendations for increasing safety conditions of working.*—There is now to consider what action is advisable to increase the safety conditions of passenger train working. The Hawes Junction accident was due to the forgetfulness of a signalman, and the general circumstances proved the inadequacy of Rule 55 as a safeguard against any such lapse of mindfulness. In the present case the collision was caused by the failure of enginemen to obey the instructions given by a signalman to stop, as indicated by the outdoor signals, and Rule 217 (a) proved an ineffective additional safeguard.

1. *Passing signals at danger.*—The suggestions received have been very numerous, but none of them is novel in principle. I am not in favour of the addition of a third man on the footplate, purely for purposes of observation. Reasons against the suggestion have been entered into fully in other reports. Cab signalling in a variety of forms and devices is the most radical change recommended. This method, whereby outdoor signals are altogether replaced, or merely repeated, by miniature signals on the engine, is well known. Trials have been made of a number of such systems from time to time during the past ten years. The mechanism in most is very ingenious and highly complicated. The principle of cab signalling, in conjunction with audible signalling, has, so far as distant signals are concerned, been adopted by the Great Western Railway at a number of important centres. The object was, primarily, to meet the difficulties in connection with fog signalling at distant signals. But it cannot be said that the method has as yet been proved to be efficient, to the extent of meeting adequately the very complicated requirements of traffic on English railways. It will have to be experimented with much more thoroughly, and subjected to further prolonged tests under ordinary working conditions, before it will be possible to recommend it as a panacea for all difficulties. One of the objections which would have to be met is the risk of the non-observance by enginemen, not of outdoor signals, but of obstructions on the railway, such as cattle, level crossings, irregularities of permanent way, &c.

Another method, which is still quite in its infancy, is the wireless control of trains.

The present excellent system of outdoor mechanical signalling is the result of many years of trial and error. At the present moment it remains to be seen whether this existing method cannot be supplemented in some way to provide additional safety. Some form of automatic train stop is necessary.

On the Underground tube railways of London an arrangement has been in use since the initiation of electrical working in 1906. It consists of a "train stop" fixed on the ground alongside each signal. The "stop" is brought into an upright position when danger is indicated, and comes into contact with a stop cock carried on the train, thereby causing a valve on the train pipe to be opened, and the train to be automatically brought to a stand by the operation of the continuous brake. The arrangement is very suitable for an omnibus service at moderate speeds, especially where all the trains are fitted with the continuous brake, but there are difficulties when other conditions prevail, as on steam-worked railways. It involves special fittings to all locomotives, as well as to outdoor signals. I do not think the device has been adequately tried by steam railways. Great accuracy in regard to gauge is necessary with these train stops. Whether such accuracy can be obtained when train stops are worked mechanically at considerable distances remains to be determined. Where electrical or other power is available, the maintenance of gauge should not be a difficult matter. It is certainly a device which Railway Companies should unite in experimenting with more fully, and should adopt, if found to be

reliable and practical at high speeds. It would certainly very adequately meet the demand for additional safety. In the first instance, "stops" would be necessary, I think, only at signal posts which define the boundary of block sections.

In the meantime, and pending the acceptance of some satisfactory automatic control, I think it would be possible to introduce at all signal-boxes, at all events on main line and express routes, an arrangement whereby one or more detonators can be placed upon the rail by the operation of a lever in the signal-box. This arrangement is now largely in use upon English railways, especially at busy centres, mainly as an interim method of fog-signalling—in the event of the sudden appearance of fog—until the arrival upon the scene of fog-men. The explosion of a detonator is, moreover, a sound which cannot well be missed on an engine, or mistaken, and is thoroughly recognized by enginemen as an indication of danger. An audible warning could thereby be given to enginemen when necessary, before the despatch of the special bell signal for a train running away in the right direction. The position selected for the detonators would require special consideration in each case.

2. *Protection of a train standing in section.*—A large number of suggestions have been received with regard to the protection of a train standing in a block section. Some simpler, more speedy, and less laborious method of protecting a train than that provided by Rule 217 (a) is clearly necessary. I recommend that each guard's van should be furnished with coloured flare lights, such as are in use upon American railways. These burn for a considerable period and light up a large tract of country. Immediately upon a train coming to a standstill in a section, the rear guard should be instructed to place one of these lights on the ballast, or in some suitable position, and set fire to it. I think that an illumination of this description could hardly fail at night time to attract the attention of enginemen on an approaching train. Moreover, in case of accident, the flare lights would be useful to provide illumination for salvage purposes. The use of flare lights has been recommended in reports upon other accidents by the Inspecting Officers of the Board of Trade. The question of providing a warning suitable for use in daylight is more difficult. An audible warning would appear to be preferable. A suggestion has been made for the use of a signal bomb, such as is generally employed by coast-guards for summoning lifeboat and life-saving rocket companies. In country districts it is possible that the explosion of a number of bombs of this description might serve the purpose, but I do not think the sound would always be recognisable as a warning signal in manufacturing and mining districts. Where the number of tracks is numerous, or other railways are adjacent, there would be risk of confusion, and unnecessary delay. I am not prepared, therefore, definitely to recommend this suggestion. The use of a flare light would not obviate the necessity for Rule 217 (a). But it would limit the use of the rule, at all events at night time, to cases where it was known that the stoppage would be of considerable duration.

III. *Recommendations for mitigating the results of accidents.*

1. *The construction of carriage stock.*—It should be noted that in this case no real "telescoping" of coaching stock took place as a result of the collision. The word "telescoping" technically implies that the underframe of one vehicle mounts that of another, and thereby shears its way bodily inside the second. The two wrecked vehicles of the first express, Nos. 227 and 208, had timber underframes with steel channels outside the sole bars, and were built in the year 1900. Frames of this description offer comparatively little resistance, and it is evident that the colliding engine smashed in the headstocks and split open the frames of both the vehicles. The practice of the Company during the past ten years has been to construct all underframes of coaching stock of steel. It is probable that, as the speed of the second express at the moment of the collision does not appear to have been greater than 25 miles an hour, coach No. 227 would not have been so much crushed had the underframes of the last two vehicles been constructed of steel, and possibly no fatalities would have occurred. On the other hand, vehicles with steel underframes, because of their greater resistance, are more liable to telescope. Shock absorbing buffers, with large faces, steel castings and double cases, such as are described in Mr. Bain's evidence, ought to reduce this liability to telescope. The conclusion may therefore, I think, be drawn that, at all events for express services, the old type of coach, with wooden underframes, should be withdrawn as speedily as possible, and be replaced by other stock of a stronger type, with improved buffering.

A feature of this accident, and indeed of most collisions, was the difficulty in obtaining entrance to the two wrecked coaches, Nos. 227 and 123. It is the old story of doors jamming. This point is one which calls for more attention in designing passenger stock. It has been suggested to me by one correspondent that the jambs of doors and the doors themselves, instead of being cut square, should be cut at an angle of 45 degrees. Another proposes the use of an instrument, like a screw vice, with a clamp at one end to bear against the inside of a window, and a screw at the other to act upon the door frame. I suggested in my report upon the accident at Hawes Junction that sockets should be provided on the outside, by which, with the aid of a crowbar, doors which had jammed could be more easily prised open. Experiments might be made in these directions.

With regard to windows, it is the practice of the Company to fix bars across them on the corridor side of passenger stock. I understand that the bars are considered necessary to protect passengers whilst traversing the corridors from being thrown against the windows. If so necessary, they should be made easily removable, by hinging them, or otherwise, at one end.

The recent practice of some companies of building long corridor stock, with two doors only on each side, of using thick plate glass, and of constructing windows that will only open about eight inches at the top, is not in the best interests of safety. Nor, if I am to judge from correspondence, do the general public regard with favour such arrangements.

The use of fire-proof material in the construction of coaching stock has not so far received the consideration it deserves by Railway Companies generally. These very deplorable cases of fire following upon accidents emphasize the necessity for utilizing, so far as possible, material that is non-inflammable. The contention that material so treated is not durable is met by Sir Bradford Leslie in a letter he has addressed to me. He instances the old timber viaducts in Cornwall, constructed by Brunel of "Burnettized" (chloride of zinc) material. These have proved immune from fire since their erection, 50 to 60 years ago. Some are still standing, and the process of fire-proofing cannot therefore have had any ill effect upon the life of the timber, or upon the iron bolts used as fastenings.

2. *The provision of tools and appliances for rescue work.*—In the descriptive part of this report, and in Mr. Bain's evidence, there will be found information regarding the tools and appliances carried by these two trains. The Company's practice, since the Hawes Junction accident, has been to fit all brake vans, or composite brake vehicles, used upon main line services with a cupboard containing tools and fire appliances. Out of a total of 353 such vehicles, 328 had been so equipped at the date of this accident. There were three compartments or vans so fitted on each of the trains concerned in this accident. The tools stored in No. 208 bogie van were not available for use, as the van was completely demolished in the collision. Extinguishers also were not stored in the cupboard in the brake compartment of coach No. 142. The total available appliances for service after the collision were, therefore, as follows:—

Extinguishers	...	...	...	...	13
Fire buckets	...	...	...	...	20
Safety lamps	...	...	...	...	10
Hand saws	...	...	...	...	10
Hatchets and felling axes	...	...	...	...	10
Pinch bars	...	...	...	...	10
Hammers (two sizes)	...	...	...	...	10
Chisels	...	...	...	...	5
Drifts	...	...	...	...	5
Tin bafflers	...	...	...	...	10

In addition to the above, a certain number of tools and appliances are kept on each engine, of which details will be found elsewhere.

The number of tools seems to have been amply sufficient, considering the limited space available for working in.

Passengers generally agree in their statements that there was a delay in the issue of tools and appliances, that no one knew where the tools were stored, and that if this information had been available, precious time would have been saved. On this point the evidence of the railwaymen, Donnelly and Tweeda, is contradictory.

These men do not allow that there was any time wasted in opening the cupboards, and handing the tools to the passengers. Donnelly affirms that all the tools were issued to passengers calling for them on the off side before 10 minutes had elapsed. I am afraid that, in deplorable circumstances such as these, there will always be some delay in commencing rescue work, whatever arrangements may be made for distributing tools, and notwithstanding that everyone may know where they are kept. But I think, on the whole, that it will be advisable for Railway Companies to notify in some manner where tools for rescue purposes are stored. This could be readily done by placing a notice at each end of the corridors of coaching stock. The fact that some at least of the platelayers (*vide* Rudd's evidence) were ignorant of the fact that tools were stored in the train, points to the advisability of the Company's disseminating the information regarding the storage of such tools more widely. As regards the position for storing tools and appliances, I do not think that any better arrangement could be made than was made on these two trains. Out of a total of six receptacles, five were available after the collision.

All the extinguishers were probably made use of. The evidence of Captain Hill and others is that they had a wonderful effect in quenching the fire at the outbreak. But there is evidence to show that these appliances were not used to the best advantage. They appear to have been too lavishly used at the outset. Additional charges for extinguishers could be easily stored with them. Water in sufficient quantity is always available on corridor trains, and the instruments can very quickly be recharged. The circumstances in connection with this case again emphasize the conclusion that extinguishers cannot well be relied upon except at the first outbreak of fire, when it is small and can be easily approached and localised. There is, therefore, great necessity for a careful watch to be maintained so that any appearance or sign of fire may be dealt with immediately.

I observe that but little use was made of the fire buckets. Drivers Nicholson and Caudle used the buckets from their engines, and Caudle and Follows state that a number of buckets were utilised, water being obtained from the tender of engine No. 446. But it appears to me that these men are referring to quite a late period in the proceedings (*vide* evidence of platelayer Rudd and painter Lancaster). A curious fact, illustrating what difficulties darkness introduces, is that the first express was actually standing over a small stream (Far Cote Gill), and no one was aware of the proximity of water.

The accounts given by passengers are unanimous on the point that artificial light was badly needed at the scene of operations when the work of rescue commenced. As a matter of fact, it does not appear to have been recognised by railwaymen, or passengers, that lamps were required before tools could be utilised. It seems to me that it would be desirable to increase the number of safety hand lamps carried, at the expense, if necessary, of the number of fire buckets. Flare-lights, if carried, could be utilized to provide artificial light.

Pinch or crowbars are in all probability the most generally useful tools for rescue work in these circumstances. The general opinion expressed with regard to those carried on these trains is that they were too short and too light for the work. I think one reason for this opinion may be found in another of the difficulties experienced on this occasion, *viz.*, the height of the floor of the carriage above the ground. This difference of level (3 feet 6 inches) is shown to have severely hampered the efforts of the rescuers, who were forced to support the workers on the collapsible tables carried in the train. Mr. Bain in his evidence explains that the length of the pinch bars was decided upon having regard to their possible use inside a corridor. But the evidence of attendant Tweeda clearly shows that some longer instrument, to serve as a lever for lifting timbers off imprisoned passengers, is very necessary. To meet the difficulty of the difference of level, I can suggest no better appliance than that recommended by the jury at the coroner's inquest at Kirkby Stephen. The provision of short ladders fitted with hooks at one end, which could be fastened to the foot board or underframing of coaches, would place men in a more commanding position for forcing open carriage doors, &c.

I think also that small screw jacks, such as can be used in a confined space, might prove particularly useful in raising baulks or timbers sufficiently to extricate passengers.

As regards tin bafflers, which the Company have provided for the purpose of

extinguishing jets of gas burning at high pressure, I think the number provided is amply sufficient.

The suggestion of Mr. Drake that a box of surgical dressings be carried with the appliances should be adopted.

It is necessary again to draw attention to the immense difficulty of salvage work in such circumstances as these, and to possible danger from the inexperienced use of powerful tools. One at least of the witnesses bore evidence on his person of this danger.

The feeling is expressed by some of the witnesses that more could have been accomplished if someone in authority had directed the operations. There appears to have been no great confusion, but no one knew how best to address the efforts made to open the doors, and obtain entry into the wrecked carriage, and no one recognized the importance of watching and guarding against a second outbreak of fire. I do not think it is possible for a railway company to arrange that some one of their staff shall be trained especially to take charge of the operations in such a case. The man appointed might be injured or killed. But they can instruct their guards and attendants more thoroughly in general principles, and, at all events, impress upon them that, in a case of this description, it is of first importance to arrange for some one to watch for any outbreak of fire and make preparations to fight it.

IV. *Fire, its origin.*—One of the most difficult points to determine in this case, is the origin of the outbreak of fire. The evidence bearing on the point is, as might be expected in such distressing circumstances, conflicting. But after studying the statements made both by passengers and railway men, and allowing for their different points of view—some on the east side of the track and others on the west—and for apparent discrepancies due to varying estimates of the lapse of time, certain facts emerge, which appear to me to be reliable.

The collision was followed by a big flash—"a huge flare." I gather this from the accounts given by guard Donnelly and Captain Hill. Of the five persons on the ground at the moment of collision, the first-named, with fireman Metcalf, were nearest to the actual point. Captain Hill was an occupant of the front compartment of the wrecked coach. The gas lamps in this coach were extinguished simultaneously with the collision, and an illumination in the immediate vicinity of the vehicle would be certainly more noticeable to one in darkness than it would be to other passengers who occupied places in carriages further away, where the lights were not extinguished by the collision. It was only in the two rear vehicles, Nos. 208 and 227, that the lights were put out by the collision. Other witnesses (Miss Clarke and Metcalf) saw red ash and burning cinders fly from engine No. 446 when it struck the first express. Caudle agrees that it is probable that there was a discharge from the ashpan, as the damper was up when the collision took place.

Subsequently, as other persons arrived at the immediate scene of the wreckage, from two to ten minutes after the shock, fires were observed. Caudle speaks of splintered woodwork smouldering in several places, and a small flame like gas burning in front of where his engine stood buried in the wreckage. Captain Hill speaks of a gas jet, the flame of which was striking the floor of the carriage; Nicholson of a fire on the level of the floor of the carriage amongst the mass of crushed baggage and contents of the van, which were piled in confusion in front of the buffers of the engine. Attendant Fisher speaks in the same terms. Mr. Drake saw dress material or cloth burning under the floor, and further signs of fire amongst the broken timber above the floor level, as well as in the roof.

During this first period of eight to ten minutes, these evidences of fire were seen by observers on the off side, but not by those who were on the near side of the carriage. Extinguishers were brought forward and used against these small fires, in the first instance on the off side, and with wonderful effect. All are agreed that the fires or flames observable, were apparently entirely quenched, and nothing but blackness and smoke remained. So much so that no further thought appears to have been paid to the possibility of further danger from fire, and all efforts were bent upon rescuing the unfortunate passengers who were imprisoned in the débris and seen to be alive. Possibly another 15 minutes then elapsed.

A growing illumination then seems to have warned the workers that the fire, thought to be dead, was alive; and was gaining strength with alarming rapidity. Extinguishers were again brought into play from both sides, but the fire caught the roof, and, fanned by the wind, which now made itself felt, soon became an unconquerable furnace. About 3.40 efforts were mainly directed on the off side to checking the flames at the particular point where the rescuers were engaged. Five minutes

later it was no longer possible to approach the wrecked carriage, and the flames were sweeping along the roof of sleeping car No. 2785. It had not been found possible to uncouple this car, though but little damaged, when the first seven vehicles were drawn away.

Witnesses are clearly divided in their views upon the origin of the fire. The railwaymen are practically unanimous that no gas jets were seen or heard—driver Caudle alone amongst them states that the small flame observed was like gas. They feel certain that the fire was caused by live ash thrown from the engine amongst the baggage and wreckage, which broke into flame at various points. This opinion is supported by two passengers, Miss Clarke and Mr. Thomas, who alone were on the ground when the collision took place, but viewed the scene from the near side.

Captains Hill and Jotham, Messrs. Drake, Brander, and Maley are equally positive that gas was the cause. The two first, I think, ascribe the outbreak of the first fire or fires on or about the floor level to burning gas—whilst the last three, who saw no flames or jets of gas at the outset, attribute the later fire in the roof of the carriage to the same cause.

On this point of origin it is necessary to consider the bearing which the evidence given by Mr. Bain has upon the question. The five cylinders carried under the floor of the two wrecked vehicles were subjected to experiment, after they had been removed from the wreck. The experiments go far towards proving that, if the perforations and apertures described by Mr. Bain, were all the immediate result of the collision, in less than three minutes after engine No. 446 had finally come to rest in the wreckage, all the gas remaining in the cylinders must have escaped. All these cylinders must have been knocked away from their fastenings and the pipe connections severed in the actual collision. The position of the engine after the collision and of three out of the four bogies, allows no other conclusion to be drawn. But it does not follow that the severance of the pipes between the cylinders and the reducing chambers, must have all occurred at that moment. Further breakages of the piping may have resulted whilst the débris was being removed by the breakdown gang. If this were the case, gas might have been issuing at low pressure for a much longer period than three minutes.

With regard to an incident described by Captain Hill, that he saw a person whom he took to be an engineman, trying to close a gas pipe with a hammer or coal pick, all the enginemen have been further questioned, and they deny all knowledge of having done anything of the sort. I think it is possible that Captain Hill may have mistaken the movements of either Mr. Drake or Mr. Maley, who at different times were at work under the coach (*vide* evidence).

There was, from all accounts, a distinct and considerable interval of time between the quenching of the first flames observed and the second outbreak. A continuous escape of gas would, therefore, it appears to me, have been noticeable to the sense of smell, and not one of the witnesses remembers to have smelt gas. Moreover, gas could never at any time have been burning above floor level, for all the gas-pipe connections above floor level were severed at the moment of collision.

The opinion I have formed on this point of origin is that a quantity of gas escaping from the cylinders did ignite immediately after the collision. It is, I think, quite possible that this flash of gas, which possibly lasted some seconds, set fire to some of the surrounding inflammable material, such as cloth and so forth, which Mr. Drake describes as having seen burning, and as having pulled away from under the flooring. It is possible also that gas jets may have been set alight under the floor, but if this gas issued direct from the cylinders, the supply must have been exhausted long before ten minutes had elapsed, and before any of the passengers could have observed it burning.

The fires ignited by gas flashing or burning were extinguished in the manner described by witnesses. A more serious, but less noticeable source of fire existed, I think, in the live ash thrown from the engine amongst the baggage and splinters of wood which were piled and massed in confusion in front of the engine as it drove into the passenger coach. This live fire, I think, smouldered, perhaps hidden from sight, and gradually attained strength amongst the wreckage round and below the smoke-box of the engine, where the temperature must have been very considerable, until, reaching the roof, it burst into violent flames. The wooden roof, which rested on the chimney of the engine, must have been ready to take fire with small provocation.

I conclude that the more serious outbreak of fire arose, not so much from the ignition of gas, which I think caused the first visible appearance of fire, but from

the contents of the ashpan and the heat radiated from the engine, which was buried, practically, in the wreckage

V. Gas and electricity as illuminants for railway carriages.

1. The case for gas as a standard illuminant is not bettered by the circumstances attending this accident. Gas escaped from the cylinders under two of the wrecked carriages, and ignited.

In Appendix IV. will be found a statement of all the accidents inquired into by the Board of Trade, during the past 15 years, in which the wreckage caught fire. There have been altogether 13 cases, including Ais Gill. It will be noted that five have occurred since the accident at Hawes Junction.

As danger only from electric lighting circuits upon steam railways is being considered, two of these cases, which occurred upon an electrical railway, owing to arcing of high-pressure conductors, need not be taken into account. In one instance (Cudworth) the origin of the fire was doubtful. These must, I think, be the three cases of electrical disturbance referred to in Sir Guy Granet's statement. Of the 10 remaining, fire was attributed solely to the engine in two instances; to gas in six cases; and in two to both gas and engine causes. It will be difficult to deny from this evidence that, so far as danger from fire is concerned, gas is less desirable as an illuminant than electricity.

2. In February, 1911, the Board of Trade wrote to the railway companies severally on the subject of the illumination of railway carriages, pointing out that from the point of view of safety electricity was materially preferable to gas. The replies received showed that most of the large companies did not contemplate the adoption of electricity as the standard illuminant, but that attention was being given to the suggestions made in the report upon the Hawes Junction accident, for minimizing the risk of danger from the use of gas.

In January, 1913, consequent upon Sir Arthur Yorke's report upon the Ditton Junction accident, the Board brought his recommendation, that electricity should be substituted for gas on all main line trains, to the notice of the railway companies, and asked what action they proposed to take in the matter. The replies showed some change of attitude in the desired direction. Five of the large companies stated that they did not propose to adopt electricity for new stock, except for particular classes such as restaurant and sleeping cars; five others stated that they had decided to use electricity in all or nearly all new stock for main line service; two had no decided policy; and two others, besides fitting all new stock for electricity, were refitting old gas-lighted stock with electrical arrangements. A number of the smaller companies replied that all stock was lighted by electricity.

I attach (Appendix V) two tables giving statistics regarding the number and relative percentages of gas and electrically lighted stock on sixteen of the principal railways in the United Kingdom on the 31st December, 1910, and the 31st August, 1913. These include restaurant and sleeping cars. It will be seen that the number of gas lighted vehicles has decreased from 41,474 to 40,536; whilst those electrically lighted have increased from 10,808 to 11,906. The relative percentages are from 76·0 to 74·7, and from 19·8 to 21·9.

On grounds of safety gas is being steadily replaced by electricity on Indian railways. This is illustrated by the following comparative statement:—

Year.	Vehicles fitted for gas.	Vehicles fitted for electricity.	Total number of vehicles.	Percentage fitted for gas.	Percentage fitted for electricity.
1902 ...	8,076...	4...	8,080...	99·95...	·05
1907 ...	10,677...	2,172...	12,849...	83·10...	16·90
1912 ...	13,343...	5,012...	18,355...	72·69...	27·31

Time has not allowed of obtaining figures illustrative of the practice upon foreign railways so as to include them in this report. But it will, I think, be admitted that for express services, such as trains *de luxe*, the tendency is to light the stock electrically. Experience from the past shows that, what is considered to-day the most desirable illuminant for high class express trains, will be demanded in the future as the standard.

3. The above-mentioned correspondence referred also to the desirability of providing one set at least of salvage tools on all passenger trains. The replies on

this point showed that some of the larger companies provided tools in the brake vans of some express trains, and that others considered the provision unnecessary. I have dealt specifically with the manner in which the Midland Railway Company have carried out the recommendation in this respect.

VI. *Summary*.—It may be of service, having regard to the length of this report, to summarize the conclusions arrived at, and the recommendations made.

1. The cause of the collision was the neglect of driver Caudle to observe and obey the fixed signals at Mallerstang block-post, and subsequently his carelessness and incaution, after recognizing that he had run past those signals without seeing them. The refusal of a pilot to the first train and the smallness of the coal on the tenders were features of the case. They account for the stoppage in section of Nicholson's train—an occurrence which obedience to signals on Caudle's part would have safeguarded. The size of the coal rendered the fireman's work on the second train more arduous than usual. For this reason, but little responsibility for non-observance of signals falls upon Follows. I regret I cannot accept Caudle's voluntary action in oiling the engine, or his trouble with the right-hand injector, as sufficient reasons for his neglect of the far more important duties of observation and caution.

Signalman Sutherland was wrong, having regard to Rule 40 (a), in lowering the up home signal at Mallerstang when the second express was so far from it. His action, however, had no influence upon Caudle's behaviour.

Guard Whitley ought, in compliance with Rule 217 (a), to have gone back to protect the first train, as I believe he knew the real cause of the stoppage. If he had placed detonators only 150 yards in rear of his train, the collision would probably have been averted. Responsibility to a small extent rests upon him for not obeying the rule; also upon driver Nicholson and guard Donnelly, for abetting his disregard of the rule. It must at the same time be admitted that the rule in question is always difficult, and sometimes impossible, to carry out literally.

I find no fault with the behaviour of any of the railwaymen of the first train, after they realised that the second express was approaching.

There were two sources of fire—burning gas and live cinders. The first outbreak was successfully coped with. If the danger of a further outburst had been recognized, it is possible that the second might also have been controlled.

The supply of tools and fire appliances was generally adequate in quantity. Time was, perhaps, lost owing to ignorance on the part of passengers as to where these were stored.

2. As additional safeguards, to meet the case of enginemen failing to observe and obey signals, and as a speedier method than that furnished by Rule 217 (a) of protecting trains standing in section, I recommend:—

(a) That all signal-boxes on main line or express routes be provided with means, either automatic, or such as can be readily employed by signalmen, for laying one or more detonators upon the rails in front of any approaching train when the section in advance of the signal-box is occupied.

(b) That all guards' vans upon main line or express routes be furnished with a sufficiency of coloured flare lights, which can be readily ignited on every occasion that a train is stopped in section. Experiment will show whether any type of flare light will be suitable as a warning by day as well as by night.

(c) Having regard to the risk which recent accidents have proved to exist, in too lax an observation of Rule 40 (a), it is advisable that the words "is close to the home signal and . . . quite, or nearly," be deleted, except where recommendation (a) has been adopted, or on steep rising gradients in the case of heavy goods trains, and the necessary corrections made in other rules.

The adoption of the recommendation (b) above will necessitate some addition to, or alteration in, Rule 217 (a), which, as it stands at present, is not always practicable.

The notice regarding the practice of oiling an engine in motion should be supplemented by an instruction that enginemen, before leaving the footplate, must first assure themselves that the fireman is at liberty to observe signals during their absence from the "front."

(d) All coaching stock on main line or express services should have steel under-frames with shock absorbing buffers, and the timber or other material utilised in

the bodies should be rendered non-inflammable. The construction of the doorways requires special attention. They should either be so situated that "jamming" will not result from an accident, or attachments outside the doors should be provided by means of which they may be more readily forced open. Bars across windows, if necessary, should be easily removable. Windows should be capable of being opened to their fullest extent.

Suggestions regarding the provision of tools and appliances are offered on pages 16-17 of this report. Notices informing passengers of the position of such tools and appliances in trains should be fixed at every gangway, or possibly outside in some conspicuous position on the vans holding the tools.

(e) As regards illumination, I wish again strongly to urge upon railway companies the desirability of employing electricity as their standard illumination. It cannot be expected that all the gas-lighted vehicles can be replaced at once. The expense would be too considerable. But the policy of constructing all new stock with electric lighting, and of replacing as early as possible the existing gas-lighted stock on main line and express services, is in consonance with the trend of general practice all over the world, and one which is not impracticable from the point of view of expense.

VII. In conclusion I wish to refer to the action taken by the Midland Railway, subsequent to the accident at Hawes Junction, as set forth in Sir Guy Granet's statement. I have personal experience of the thorough manner in which they have dealt, and are dealing, with the two main points brought to light by that accident, namely, the introduction of safeguards to prevent mistakes by signalmen, and of devices to remind them of trains standing out of sight of, or at a distance from, their posts. They have also met very adequately the recommendations in that report, which may be described as of secondary importance, regarding tools and fire appliances, &c. It is true that, after full consideration, they have not accepted electric light as their standard illuminant upon trains, but, on the other hand, they have fully adopted the alternative procedure suggested to safeguard the use of gas. The design of the cylinders has been altered, the ends strengthened, they are better housed and protected, and an automatic valve has been devised to cut off the issue of gas under high pressure. These improvements have been applied to new coaching stock, 125 having been so equipped; and 62 old stock have been fitted with the new automatic valve and other improvements.

The Assistant Secretary,
Railway Department,
Board of Trade.

I have, &c.,
J. W. PRINGLE,
Major.

Evidence.

Taken on the 4th September.

George Sutherland, signalman, stationed at Kirkby Stephen, states: I have 38 years' service with the Company, and have been 24 years a signalman, all the time at Mallerstang signal-box. I came on duty on September 1st at 8 p.m., and was due off at 6 a.m. I came off duty previously at 10 p.m. on Saturday, August 30th. The night in question, September 1st, was clear, there was an occasional drizzle of rain. Wind was blowing at times strongly from the north-east, but there was no fog. I could see the back light of the up distant signal all the night. The rain was not sufficient to obscure my view of signal lights. The 1.15 a.m. express from Carlisle to Manchester passed my box at 2.13 a.m. The

boxes on each side of me are Kirkby Stephen, about $3\frac{1}{2}$ miles distant to the north, and Ais Gill, about $3\frac{1}{2}$ miles to the south. Both of these boxes were open on the night in question. The 1.35 a.m. from Carlisle was offered to me from Kirkby Stephen at 2.31 a.m., and the 1.49 a.m. was offered at 2.46 a.m. I got "Train entering section" for the 1.35 at 2.38 a.m., and for the 1.49 at 2.51 a.m. The 1.35 passed at 2.46 a.m., and the second train at 2.57 a.m. It is evident from these times in my book that the second train travelled faster than the first, at all events between Kirkby Stephen and Mallerstang. The first train was offered to Ais Gill at 2.38 a.m., and it was accepted at the same time. It usually

takes about 6 minutes to obtain clearance from Ais Gill after passing Mallerstang, and I should have expected to receive clearance for the first train at about 2.52. I did not receive any clearance for the train. I noticed, when the first train passed my box, that it was not travelling quite as fast as most of the expresses do. About 2.55 or 2.56 I got on the telephone to Ais Gill and asked the signalman what had become of the first train. He said that he had no information about it, and had not seen it. At the time I was telephoning all my signals were at danger—distant, home, and starting. I put the up distant signal at danger before the first train passed my box, and I put the home and starting signals back to danger as the rear of the train cleared them. The usual time occupied by an up train running between Kirkby Stephen and Mallerstang is 5 to 6 minutes. The second train, which was signalled to me as entering the section at 2.51, I should therefore expect to arrive at 2.56 or 2.57; this train actually passed my box at 2.57, though the signals were at danger. It was when I saw this train approaching that I telephoned to Ais Gill to ask for information about the first train. I watched the second train approach from the cutting. I saw that it was not steaming, and took it for granted from that fact that the train was slowing, and had slowed, on account of the distant signal being at danger. When the train was between the two bridges Nos. 163 and 161, I therefore dropped the home signal. I did not watch the train any further until it was close upon the home signal. I then observed that it was steaming hard and travelling at a high rate of speed. I therefore put the home signal to danger, but I cannot say whether the engine had passed the home signal before I put it to danger or not. I rushed to get my hand lamp to show the engine driver a red light, but could not get it before the engine passed the signal-box. I am quite satisfied that I did not attract the enginemen's attention by the red light. I did not notice the guard's head out of the window, so that I could not have attracted his attention either. I was not certain whether the driver would be able or intended to actually come to a stand at the up starter, but when I had seen him go past the up starting signal I sent the bell signal 4—5—5 to Ais Gill, to indicate that a train was running away on the right road. I entered the time in my book of this bell signal as 2.57 a.m., and it was immediately acknowledged by the signalman at Ais Gill. Neither of these trains on this morning was travelling as fast as 40 miles an hour; I should judge the speed of the second train at between 25 and 30 miles an hour as it passed my box; the speed of the first was lower still; in my opinion he was going somewhat slower. The second train was steaming, as far as I could tell, as hard as she could, and she was gathering speed also as she passed the box. There is a piece of flatter gradient in front of my box of 1 in 330 rising, where the driver of a train would not unnaturally increase speed. Passenger expresses very infrequently have to stop, either at my signal-box or in the section between Mallerstang and Ais Gill, for want of steam or other reasons. I have known occasions of this occurring, but I do not suppose that they average more than one a month, possibly less. I can't speak accurately on this point. It is much more uncommon for them to stop in the section on the steep gradient between Mallerstang and Ais Gill than on the level gradient at Mallerstang

itself. After sending the bell signal 4—5—5, I telephoned to the signalman at Ais Gill and told him by word of mouth that the express had passed my signals at danger, and asked him whether he had seen the first train, and he said "No," and asked me whether there was any way of stopping the second train, and I said "No," as it had already passed my down distant signal. About 3.3 or 3.4 I heard the sound of engine whistling from the direction of Ais Gill, and shortly afterwards a rumbling sound which I took to be that of a collision. I immediately got on the telephone to Kirkby Stephen signal-box and told them that I thought a collision had occurred. I had previously told Kirkby Stephen that the second express had passed my signals when they were at danger, and on this occasion, about 3.3 or 3.4, I told him that I thought a collision had occurred and advised him to tell the station master. The signalman at Kirkby Stephen told me that he went to call the station master at 3.5 a.m. I was not requested by Ais Gill or Kirkby Stephen to take any further action in connection with the accident. The first relief train from Appleby passed Mallerstang at 6.1 a.m. When the second express passed me it was still a clear night with an occasional slight drizzle of rain, but there was no obscuration of signal lights or back lights so far as I was concerned.

Thomas Clemmet, signalman at Ais Gill, states: I have about 12 years' service with the Company, and have been a signalman for about 10 years. Altogether I have been about 6 years at Ais Gill. On September 1st I came on duty at 8 p.m., and would ordinarily book off at 6 a.m. I was off duty on August 31st. The 1.15 a.m. up express from Carlisle is shown as entering section from Mallerstang at 2.12 a.m., and it passed me at 2.18 a.m. The usual time for expresses on the up road between these points is from 5 to 6 minutes. The 1.35 a.m. was offered to me by Mallerstang at 2.38 a.m. I got "Entering section" signal for the 1.35 a.m. express at 2.46 a.m. About 2.55 I was called up by the Mallerstang signalman, who asked me if I knew where the 1.35 express was. It should have passed my box at 2.52, but I had not seen any sign of it. The wind was blowing on this particular night from the north-east somewhat across the direction of the railway, and I could hear no sound on this account of the approach of the 1.35. If the wind had been in the direction of the railway, I should have heard the noise the train made. I have no note in my book as to the actual time of the collision. I did not actually hear the sound of the collision. I saw a light rising and falling like a red mist away beyond the distant signal, and to the best of my memory I should say this light appeared for the first time about 3 a.m. It was possibly after 3 a.m., perhaps a minute or two after. The light that I saw I should describe as a column of steam with a red glow on it. It appeared only momentarily, and then I lost sight of it for some considerable time. The first person to arrive at my signal-box was the fireman of the front train; this was at 3.10 a.m. I have not this time booked, but I am perfectly satisfied in my mind that it was 3.10. He told me that a collision had occurred between the two expresses, but he did not say anything about the train having caught fire. I think he came away immediately after the accident had happened. The man had evidently been hurrying, and was, as far as memory serves me, out of breath. At that moment there was a

goods train standing at the down home signal. I called up Hawes Junction signal-box and told them to call Mr. Bunce, the station master. I backed the down goods into the siding to clear the road for Mr. Bunce. The light engine bringing Mr. Bunce was given in section from Hawes Junction at 3.26, and arrived at Ais Gill at 3.35 a.m. I got the 4—5—5 bell signal for a train running away on the right road from Mallerstang at 2.57 a.m. and acknowledged it at once. At this moment, 2.57, the distant, home, and starting signals for the up road were all clear for the first express. At this moment, 2.57, as it appears now, the first express must have been standing, but prior to this time I had heard no sound of an engine steaming up the bank from the direction of Mallerstang and had no sort of idea where the first train was. There, therefore, appeared to me to be no reason to put any of my signals to danger. I cannot say what is the usual speed of expresses on the up road past my box. During the last year I cannot remember whilst I have been on duty a case of an engine having to stop in section south of Mallerstang on account of shortness of steam, or for any other reason, but I can remember during the period of my former service at Ais Gill, more than 5 years ago, there were cases of engines having to stop in section for shortness of steam. The occasions that I can remember trains having to stop were infrequent. I cannot say how frequent. I can see the distant signal posts from my box during daylight, and the back light by night-time. There was no difficulty on this night, the 1st of September, in seeing the back light. There was no fog, it was a comparatively clear night for seeing signals. I do not think it was raining when the fireman arrived, I cannot say for certain, but I can recollect that there was no difficulty in seeing lights. There was no difficulty in seeing tail lamps, *e.g.*, of a train standing at my up starting signal. During the past 12 months, whilst I have been at Ais Gill, this is the first instance that I know of a passenger express being stopped in the section for shortness of steam. The guard from one of the two expresses concerned came to my signal-box about the same time that the engine bringing the station master from Hawes Junction arrived. When Mr. Bunce arrived with the light engine at 3.35 he took control of the matter and sent the necessary telegraphic messages. The first relief train arrived from Hellifield at 6.34 a.m.

Thomas Horatio Gibson, M.D., Edin., states: I arrived on the scene of the collision about 5 a.m. The carriages were still burning. It was the third carriage that was burning when I arrived, the one under the bridge. So far as I know I was the first doctor to arrive on the scene. I understand a doctor had been there. He may have been one of the passengers. I was informed when I arrived that the injured people had been removed, some in the direction of Hawes Junction and some to Carlisle. The more seriously injured had been sent towards Kirkby Stephen, and I therefore found that there was nothing for me to do on the scene of the accident. None of the bodies had been removed from the wreckage at that moment, but I am quite certain that no one was alive amongst the ruins of the train. I confirm the opinion I have given that, from what I saw of the remains, the unfortunate people were either dead or unconscious before they were attacked by the fire. My reasons for

this are, that the bones were very severely injured, being crushed and fractured. The injuries were so severe that in my opinion there was very little probability of the people being conscious, even if they were alive, at the time the flames reached them. If the train or engine that was leaving Kirkby Stephen at the moment of my arrival in my motor car at that station had been delayed a few moments, I should have been able to reach the scene of the accident earlier. I came to the station at Kirkby Stephen expecting that there would be an engine or train to convey me to the scene of the accident, as the railway people had called me for assistance, and I understood that they wished me to come to the station. I do not make this statement with a view to making a complaint, for the Midland Company may have had good reasons for starting the train when it did start, but I could have been earlier on the scene of the accident if the train had been delayed a minute or two, and I understand the signalman at Kirkby Stephen tried to stop the train when he saw me approaching the station and knew of my arrival. It appears to me that in an accident of this description there would be an advantage if someone could take charge of the proceedings, so that doctors, on arrival, could obtain immediate information as to the number and position of injured persons. I mention this having regard not only to this particular accident, when I found the injured had been removed on my arrival, but also in connection with Hawes Junction and other similar accidents, for we found considerable difficulty in discovering what had happened to the injured, and where they were on our first arrival at the scene. So far as I am able to speak from the remains that I have seen, I have confirmed the opinion that there were 13 people killed in the accident.

Hugh Hight, College of Surgeons and Physicians of Edinboro' and Glasgow, states: I was called later than Doctor Gibson. The messenger who came for me asked me to come at once to the Midland station as there had been an accident. I got up immediately and came to Kirkby Stephen station and found the messenger and the signalman in the signal-box. I, of course, thought that there would be something to take me on to the scene of the accident from the man's message, but finding nothing I immediately turned and went back by road to the scene of the accident, where I met Doctor Gibson coming away from it. He informed me that the injured were being taken to Kirkby Stephen, so I turned round with him and we both came as hard as we could, and boarded the train at Kirkby Stephen. The first person I passed was a man lying in the guard's van burnt. He had been already dressed with bandages out of the cupboard in the guard's van. As he had received medical attendance I left him and attended three or four others along the train. A passenger, who was a medical man, had been giving attention to the wounded. I cannot give his name. I do not think that with the injuries manifest in the remains which were examined, injuries from fracture and crushing, that any human being could have existed, and I am therefore of the same opinion as Doctor Gibson that none of the persons whose remains we examined were conscious at the time the fire reached them. I have one suggestion to make with regard to First Aid Boxes, that they should be stored not only in guards' vans but in other parts of the train.

Thomas William Guy, farmer of Intake Farm, near Ais Gill, states: I was in bed, awake, about 3 a.m. on September 2nd, when I heard the sound of trains approaching from Kirkby Stephen. I remarked that one of them was travelling very slowly. I heard the other one travelling much faster, and then I heard the crash of the collision. My house is on the east side of the railway, and is separated by a gill from the railway. The house may be 300 yards, measured horizontally, from the railway. When the crash came I was out of bed looking out of the window. I was attracted by the noise of the two trains coming so close one after the other. I could see the ends of the two trains after the collision, but not the middle part or the engine of the second train. I noticed a flash from sparks. I woke my wife and told her that there had been a collision on the railway. She was frightened at first and did not like my going for a few minutes, but I afterwards went. I suppose half-an-hour elapsed, possibly three-quarters, before I arrived at the scene of the accident. I must have stayed with my wife for a quarter-of-an-hour before I left the house. I arrived at the train about mid-way between the leading engine and the second engine, and there I found an injured man lying on the bank. Someone was attending to this injured man, bandaging him, and he told me to take some pillows and blankets and follow him, and I went towards the road bridge. I saw then that two of the vehicles were in flames. I was following the doctor down, and did not stop to see the extent of the fire in the train, and I went up to the top of the bank to attend to an injured man. When I arrived at the scene the front portion of the train had been pulled on, and we crossed the line just before reaching the bridge, for the injured man was on the west slope of the cutting. I did not notice anyone trying to put out flames at that time, they had evidently given up trying. The rear portion of the second train also had been taken away when I arrived. There were men working with axes trying to cut into the first coach of the second train. No one was working with axes or cutting at the coaches that were on fire. I cannot be certain of the time at which I arrived at the scene of the collision, it may have been an hour, three-quarters, or half-an-hour afterwards. There were some men with buckets carrying water trying to extinguish the fire on the roof of the first carriage on the second train. The fire in the roof of this coach was really in the roof that was thrown on to it from the front train, and I assisted other men afterwards in cutting some of this roof off. I also assisted them in looking for luggage. At that time there appeared to be plenty of tools for all purposes. After the collision occurred, the sparks or flashes of light which I saw at the moment of the collision disappeared, and all was darkness for a period of about 10 minutes. I then noticed that the light began to grow again over the place, which gave me the idea the wreckage had caught fire and was burning, otherwise I should not have gone at all. I could see from my window that nothing had happened to the carriages at either end of the two trains, it was only those in the middle that were out of sight, and it was because I saw indications that these carriages out of sight had caught fire that I left my house to give assistance. There was nothing to indicate for a short time, about 10 minutes I should say, that there was anything on fire on the trains.

Robert Watson, ganger, states: I am in charge of two miles of double road between 258½ and 260½ mileage. This includes Ais Gill signal-box. I have four men working with me. I live in the railway cottages on the Ais Gill Moor on the west side of Ais Gill signal-box, about 150 yards from the railway. The signalman at Ais Gill knocked up one of my men who lives in the room under mine, and this was about 3.25 a.m. My man started off in front of me, and I followed with a hand lamp. I got down to the scene of the collision about 3.40, as near as I can tell. The front part of the first train had been uncoupled and drawn forward before I arrived. I helped some of the passengers who had been in the rear part of the train to get into the front part of the train. I then went further northward. I had to get over the wall to get past the bridge where the sleeping car stood, as the fire was very strong under the bridge. When I passed the fire on this occasion, about 3.50, they had given up trying to put it out, it was burning so fiercely. Soon after I got there they uncoupled the rear portion of the second train, some of my men helped to do it.

Adam Rudd, platelayer, living at Ais Gill Cottages, states: I work in ganger Watson's gang. The signalman woke me at 3.23 a.m. and told me that the first express had failed in steam, and that the second express had run into it. I woke up the ganger and also the other men. I then went to the signal-box to get my ambulance box and hand lamp, and arrived at the scene of the accident about 3.35, before ganger Watson arrived. Just then they had drawn forward the front part of the first train, which had been uncoupled in front of the third vehicle from the end. A number of passengers were then still engaged in trying to put out the fire with buckets—they were carrying buckets of water. I do not know where they got the water from. There is water obtainable from Far Cote Gill, which runs under the railway (Culvert 135). This is about 4 chains from the road bridge over the railway where the fire was going on. I saw that axes and tools were wanted, and I went into the rear brake compartment in the front vehicle of the second train and broke open the locker in which these tools are stored. I took out two hand saws, two felling axes, and two short crowbars. A signal porter—Leaf by name—was with me at the time. The tools were required to cut away timbers, &c., which had been thrown in the collision over the mail bags in that same compartment. At the time I took these tools out, I did not notice anyone else working with tools on the scene. They had evidently been working, but the tools had been put down or mislaid or burnt; some of them were found burnt afterwards. No one I think was actually trying to rescue passengers when I arrived. All of them that could be got out had been removed by that time. I asked the guard of the second train whether it would not be possible to let down the second train 40 or 50 yards so that it should not catch fire. He said it was impossible, because there was so much debris between the wheels. He took off his brake, but he could not stir them. So I and our second man, Coates, got our permanent-way bars, 5 or 6 feet in length, and pinched the wheels until we got the coaches to move, and we got them about 40 or 50 yards away. I handed the ambulance box that I brought from the signal-box to some passengers that were standing alongside the front portion

of the first train, who said that there were injured passengers in it. When I arrived it was quite dark, and it was still necessary to have a lantern. In addition to the one I took, I do not remember seeing more than three or four on the scene, my ganger had one of them. I was not aware that there were tools in this particular locker I speak of until signal-porter Leaf told me about them, and asked me to open it because he could not reach the button. Station-master Bunce arrived on the scene before I did.

William Henry Bunce, station-master at Hawes Junction, states: I have been 28 years station-master at Hawes Junction. I received information through signalman Simpson of Hawes Junction at 3.5 a.m. to go as quickly as possible as an accident had occurred between Ais Gill and Mallerstang, so I got up and went to the signal-box, arriving there about 3.10 a.m. I asked Simpson for information, and he told me two trains had come into collision on the up road. I asked him how I could get forward and he said he had the 9.30 p.m. from London just coming in. I spoke to the signalman at Ais Gill on the telephone about the same time, and he confirmed the fact that an accident had occurred, and I thought it was better to call out the breakdown vans, and I told Simpson to telephone to Carlisle for the breakdown vans. I then took the pilot engine from the 9.30 express and went forward to Ais Gill. When I arrived at Ais Gill I at once went into the signal-box and spoke to the signalman. I met guard Whitley in the signal-box, and he told me that it was very serious, and that the train was on fire. I left the Hawes Junction signal-box at 3.26, arrived at Ais Gill signal-box about 3.35, and at the scene of the accident about 3.40. I told the signalman at Ais Gill to telephone to Hawes Junction signal-box to call out the platelayers. I found that the front part of the first train had been drawn forward. The engine that took me down stopped at the head of the first train and I got down and walked along. Just after passing under the bridge I saw them trying to drag out a passenger, a gentleman, from the bogie third carriage, which was the last but one on the train; they succeeded in getting the man out of the carriage. This was about 3.45. At that time the sleeping car in front of this carriage was burning, in fact all three of the vehicles were burning that had been left behind. I noticed that the passengers who were trying to rescue this passenger could not stand alongside the carriage for more than a few seconds at a time owing to the intense heat, they had to run forward, drag a short time, and then run back out of the heat. I saw one of the sleeping-car attendants at the same point who was trying to sprinkle the windows of the coach, from which the gentleman was being drawn, from a Rex extinguisher. I did not go on the north side of the road bridge over the railway until after despatching the front portion of the first train and injured people to Hawes Junction. After arriving at the scene of the accident I got down off the engine and sent the engine back to Hawes Junction with orders to go straight to Hawes to get medical assistance, and I hoped this assistance would arrive at Hawes Junction by the time the first portion of the first train arrived there with the injured passengers. I took down my own hand lamp with me to the scene of the accident. In Ais Gill signal-box there were five hand lamps, one belonging to the signalman, two fogman's

lamps, and two spare. No mention was made to me whatever as to the want of lamps, but when I arrived the fire was burning so fiercely that the whole country side was lit up. I arrived possibly 40 minutes after the collision occurred. The fire was then burning so furiously that it was hopeless to try to put it out, even if large quantities of water had been available. I can remember no instances where it has been reported that a train has come actually to a stand for want of steam before reaching the summit. Reports have been made of delays caused by shortness of steam. I received no complaints from passengers on any particular point, and the Midland Railway Company have authorised a station-master or person in charge, in the event of an accident, to despatch telegrams without prepayment. I personally did despatch several telegrams without prepayment. I have examined the signalman's book at Ais Gill and find that the engine that went to Hawes left Ais Gill at 4.9 a.m., and that the train which I despatched with passengers being part of the first express left Ais Gill at 4.20 a.m. I telephoned to the station-master at Kirkby Stephen from Ais Gill to run an engine in the right direction to the scene of the accident, and go back on the wrong road with the portion of the second train which was despatched to Kirkby Stephen. I have examined the signalman's book at Mallerstang and find that this engine entered the section at Mallerstang at 4.36 and drew the rear portion of the train away and passed Mallerstang towards Kirkby Stephen at 4.59. I had no conversation with the enginemen concerned in this case.

Thomas Moss, station-master at Kirkby Stephen, states: I have been 21 years station-master at Kirkby Stephen. Signalman Davis came down and called me out about 3.10 a.m. on the 2nd September, and gave me information that there had been a collision between the second and first expresses, so I got up immediately and went to the signal-box. We tried to get into communication with Ais Gill, but there was some trouble with the telephone apparatus, and we neither of us could hear each other, although we could hear the bells. We then called up Mallerstang, but he could not tell us anything more than what we had already heard. I then went and called out all the platelayers, and the first man who arrived I sent off to call the doctors in Kirkby Stephen. I told him to call doctors Gibson and Highet and tell them to come to the station at Kirkby Stephen as there was an accident. A Carlisle to Manchester express had entered the station, and I put the train into the siding and utilized the engine for despatching doctors to the scene. There was a doctor on the Manchester express, and so, without waiting for the doctors from Kirkby Stephen, whose arrival I thought would be delayed, I started off the engine with the doctor, who had agreed to go forward from the Manchester express, intending to bring the engine back for further medical assistance if required. I went forward with the engine and the doctor, and told the signalman that we would return for the other doctors. In the meantime the telephone communication had been put right between ourselves and Ais Gill, and Mr. Bunce from Hawes Junction told me he wished us to go on and relieve the rear portion of the second express, so I started. I have examined the signalman's train book and find I left on the engine at 4.26 a.m. and passed Mallerstang at 4.35 a.m. I can

remember no instance where a passenger express has been reported as having stopped between Mallerstang and Ais Gill—this portion of the road is under the control of the station-master of Hawes Junction—or elsewhere under my particular jurisdiction for want of steam during the last six months. The night was clear at 3.10 a.m. when I got out, and there was not any difficulty in seeing signals. We passed the distant, home, and starting signals for Mallerstang, and there was nothing to draw my attention in any way to the inadequacy of the signal lights, nor was the view of the signals obscured by the atmosphere in any way.

James Gilliland, locomotive foreman's assistant at Carlisle, states: I have 34 years' service in the Company, and have been assistant foreman 11 years. Previous to that I acted as caller-up and storekeeper. I know personally all the drivers and firemen in the Midland Railway Depôt at Carlisle, and the four men Nicholson, Metcalf, Caudle, and Follows are known to me intimately. All these men have been 10 or more years, in Caudle's case 30 years, in the depôt. All these enginemen signed on duty on Tuesday morning, September 2nd, between midnight and 1 a.m. I saw them all, but the only one I actually spoke to was Caudle. He came for a spare oil bottle. Caudle was perfectly sober, and to the best of my knowledge is practically a teetotaler. I have never seen him have any drink. He was in good health, and I could see nothing whatever in his appearance to show he was in trouble or anxiety. I can say the same for the other three men so far as their appearance or behaviour went, although I did not speak to them.

Thomas Lancaster, signal painter, states: I am engaged in painting Ais Gill signal-box,

and am lodging for the time being in the Ais Gill cottages with signalman Bellas. Mrs. Bellas woke me about 3.30 a.m. on the 2nd September. Two signal painters, mates of mine, and signal-porter Leaf all went out together and signalman Bellas also. I got to the bridge where the accident took place as near as I can calculate about 3.50 a.m. There were no passengers or railwaymen calling for tools of any description at that time. The fire was burning so fiercely in the last three carriages of the front train that it was impossible to go near it. I assisted, at the request of some passengers, in carrying an injured passenger on rugs to the first portion of the front train. This was the last of the injured passengers that I saw removed. By about 4 a.m. all the injured passengers that were taken away in the first train had been removed into that train. I got round the road bridge by climbing up the abutment, the fire was very hot under the bridge so that no one could pass under the railway span. I found in the second train that all the injured people had been by that time removed from the first carriage. We tried to move the first coach of the second train, which had been cut into by the roof of the van at the rear of the first train, and by the use of crowbars we managed to move it a few inches. At that time and from the moment I arrived there was no complaint of shortness of tools. After the two portions of the train had gone off to Hawes Junction and Kirkby Stephen respectively, we were working trying to put out the flames in the carriages that were left, and utilised the water that was still available in the tender of engine 446. Caudle, the driver, told some of us that there was a quantity of water still in his tender. Signal-porter Leaf followed me as I went out of the house down to the scene of the collision and arrived shortly after me.

Evidence.

Taken on the 5th September.

William Nicholson, engine-driver, stationed at Carlisle, states: I have had 26 years' service with the Company, and have been an engine-driver 12 years. On August 31st I came on duty at 11.9 p.m. and signed off duty at 9.53 a.m. on September 1st. I next signed on duty at 12.5 a.m. on September 2nd to work the 1.35 a.m. express from Carlisle to London as far as Leeds, and the 6.35 a.m. Leeds to Carlisle, and should ordinarily have finished work about 11.45 a.m. I have been stationed at Carlisle for 26 years, and have a thorough acquaintance with the line between Carlisle and Leeds. I have been driving expresses between the two named places for two years. I was driving engine No. 993, No. 4 class, the most powerful class of passenger engine, a four-wheels-coupled locomotive with leading bogie and six-wheeled tender. This engine and tender (loaded) weigh, I understand, 106 tons 4 cwt. 1 qr. It is fitted with the steam brake working blocks on the four coupled engine wheels and six tender wheels. The whole of the vehicles on the train were fitted with the automatic vacuum brake, both brakes being applied by one lever from the footplate. We had no difficulty in maintaining the required vacuum of 20 inches until just very shortly before we came to a standstill. We were short of steam just before we stopped, and the result of this was that there was a difficulty in maintaining a vacuum of 20 inches; I think it dropped to about 15 inches before we

stopped, and the blocks were beginning to bind on the wheels. A platform inspector informed me before leaving Carlisle that the total loading behind the engine was 243 tons. The usual load for the train with an engine of No. 4 class is 230 tons, but there is no definite limit fixed, and I have frequently travelled with more than 230 tons behind the engine. The heaviest load I can remember drawing from Carlisle without the assistance of a pilot has been 258 tons with a No. 4 class engine. We were 3 minutes late leaving Carlisle and started at 1.38 a.m. We had full pressure of steam at that time—180 lbs., she was just blowing off. Everything was in order so far as I could tell when we left Carlisle. We had a clear road the whole way from Carlisle to Mallerstang; all the signals at Mallerstang were clear and also the up distant signal at Ais Gill. I should judge that our speed passing Mallerstang signal-box was from 15 to 20 miles an hour. This is considerably lower than what our usual speed would be. I should estimate the usual speed at Mallerstang for an express passenger train at about 40 miles an hour. When we passed Appleby, 30 miles from Carlisle, we had lost about 2 minutes on our booked time. I did not look at my watch as we passed Mallerstang and cannot say how much we had lost at that point of the journey, but when we came to a stand outside Ais Gill distant signal, the time by my watch was 2.55. We were losing time all the way up the steep gradient south of Appleby,

as the engine was making steam badly. I attribute this to the smallness of the size of the coal. The coal we have been having this last fortnight has varied in size considerably, sometimes it is good for making steam, at other times it has been smaller in size, and it has been difficult to keep a sufficient head of steam with it. My experience has always been that there is greater difficulty in keeping a good head of steam with coal small in size; with a lighter train we should have been able to manage that night without stopping. The train was heavy, and I attribute the fact that we had to come to a stand before reaching the summit to the difficulty in maintaining a sufficient head of steam, due to the size of the coal. I had the regulator wide open after passing Mallerstang, and I came to a standstill with the regulator in that position, and the reversing screw in forward gear. I had had, previous to coming to a standstill, to take the vacuum brake blocks off the wheels by using the large ejector. The engine stopped some little distance north of the distant signal for Ais Gill; at that moment the pressure of steam was between 80 and 90 lbs. The coal we have been using lately comes from Blakett Colliery, South Tyne, and from the Naworth Coal Company, Cumberland. The complaint that I have against the coal is not on account of its quality, but that it is too small for locomotive purposes. I have complained to the Company's representatives at Carlisle on this subject. I have heard of an engine-driver with an express on Monday night, September 1st, who was stopped twice for lack of steam on the bank. My fireman's name is Metcalf. He has been a registered fireman for a number of years. I do not think that the shortness of steam was due to the way he did his work. I acted as fireman on the bank between Ormside and Kirkby Stephen. I drive ordinarily from the right-hand side of the footplate. Whilst I was acting for the fireman—doing the fireman's work, I was on the left of the footplate, and whilst I was working for him he was on the look-out for signals, but in addition to his being on the look-out, I saw all the signals myself. I cannot remember for certain whether I went round the engine whilst running, but, as far as my recollection serves me, I think I did go round between Kirkby Stephen and Mallerstang. This is my usual practice running from Carlisle to Leeds without a stop. I have seen a notice issued at Carlisle from headquarters wherein drivers and firemen are cautioned against leaving the footplate whilst the engine is in motion. I have not been actually forbidden never to leave the cab whilst the engine is in motion. When I have considered it necessary to go round the engine I have chosen a long section where the observation of signals was not called for—that is, there was time available to go round, which only takes a matter of a couple of minutes, the most important duty of a driver is to observe his road and signals. A driver can still observe signals when he is round his engine oiling. I was brought to a stand on account of shortness of steam with a pressure of 80 to 90 lbs. I should have wanted a pressure of at least 160 to start on that gradient with the load behind me. Of course I should have tried to start the engine with a lower pressure than that, but I do not think she would have started with less than 160 lbs. I intended to stop there until I could get the pressure necessary. I should not have stopped if I could have got on to Ais Gill. The reason I did not stop at Mallerstang was that I thought there was just enough steam to get up to Ais Gill.

In this case there was no alternative for me other than to stop, and there were the usual block signals to protect me from a train in the rear, so I did not anticipate any danger from stopping. The front guard came to me after we had come to a stand and asked how long we were going to be, and I told him only a few minutes. I told him we were stopping for shortness of steam. I knew it would be 10 minutes at least and possibly more. I was aware of Rule 217, but it never occurred to me to say anything about it; I did not say anything more than that we should be a few minutes, though I knew that we might be possibly as much as 10 minutes. The fire was raked through as soon as we stopped. The fireman, after raking over the fire, got down on to the ballast and was going to Ais Gill to tell the signalman our position in accordance with Rule 55, but at the very moment he got down I turned round and saw a light in the distance. I thought it was a train coming and that the light was from the engine chimney and fire. I took it to be an express train following us, and I told my fireman to run back to the rear of the train and try to stop the train. I sounded the whistle several times before the collision actually occurred. I thought the sound of the whistle would attract the notice of the engine-driver behind. I tried to get my engine to start so as to get away, but the engine would not move. I did not look at my watch at the moment of the collision. When we stopped it was 2.55 a.m., and I think that about 5 minutes must have elapsed, I do not think much more, before the collision occurred. The pressure of steam had increased to not much over 100 lbs. when the collision occurred. The night was very dark, but no rain was falling and there was no mist or fog. There was no difficulty in seeing signal lights. I had no difficulty in seeing Mallerstang distant signal that night; you can see it after passing under the overbridge some distance to the north, and it remains in view the whole way until it is reached. It was burning well and showed a good green light as I passed it. The light of the up home signal from Mallerstang is somewhat obscured whilst approaching it by two timber overbridges, but can be seen however at intervals before these are passed, and after passing the second of these bridges there is no obstruction to the view. There was no difficulty about seeing the signal light when I passed it; it was burning all right. There is nothing to prevent the Mallerstang up starting signal being seen, it was in full view from the signal-box at Mallerstang, and remains in full view until it is passed, and the signal light was burning all right when I passed it. My train was driven forward a distance of about 13 or 14 yards I estimate by the force of the collision. I was not knocked down by the shock, I fell back against the tender, but was not in any way hurt. When we stopped there was about an inch or 1½ inches of water in the glass, and I had not used either of the injectors before the collision occurred, so that before leaving the footplate I thought it necessary to get some water into the boiler and I used the left-hand injector. I estimate about 5 minutes elapsed before I actually left the cab and got down and went to the rear of the train. I went down the 6-foot way right up to where the second engine was. When I arrived at the scene of the collision I noticed at once that a fire had started and was burning just in front of the engine of the express about on a level with the floor of the carriage, which I think was a third-class bogie. It appeared to be burning amongst a lot of baggage, broken boxes, &c. I

think these boxes and baggage must have been driven out of the van in front of the engine of the second express. The fire seemed to be burning a little distance in front of the buffer beams of the engine, and the roof of the carriage which was partly over the engine was also covering that part of the carriage that the fire was burning in. I also think at the same time there was a fire in the roof of that carriage. The size of both these fires was quite small at that time. I cannot say anything as to whether there was any gas jet burning at this time at the rear of the first train amongst the wreckage. No one at that moment had begun to try and extinguish these fires, at least I did not see anybody. There were five or six gentlemen at the time on the 6-foot side of the train; the gentlemen were trying to force the doors open of this particular carriage. At that moment I do not think any of them had tools in their hands. I went back immediately to the engine to get the bucket off the engine. I filled the bucket from the tender of my engine, and took it down to the scene of the fire with the intention of trying to put it out. By the time I got back three or four people were using extinguishers against the fire in the roof and the fire on the floor level of the carriage; at that time there was no difficulty in approaching close to the carriage and touching it. I took down a gauge lamp in my hand on the first occasion, but the light of the fire in the roof at that time was sufficient to enable me to distinguish the fire that was also burning at the floor level. These extinguishers were being utilised and were obviously in working order, and the men using them appeared to have been able to keep these two fires within limits for some time. There was no difficulty in my actually approaching the carriage and throwing the water on the top of the fire that was burning. There was a good deal of smoke at the time, therefore it was not so easy to distinguish what was actually aflame, it seemed to be cloth. Burning cloth I think was responsible for a good deal of the smoke, but the wreckage consisted of all sorts of broken up baggage, boxes, splinters of wood, &c. The pile of debris that was burning rested on the ground and came up to about the level of the floor of the carriage. You could approach the fire from the side of the carriage without difficulty. I then put down the bucket in the 6-foot way and got a hammer from the engine-driver of the second express, who was standing close to me, and tried to force open one of the carriage doors in the same carriage in front of where the fire was burning. There were noises being made by people who were inside tapping against the window. There were five or six gentlemen with axes at the same time cutting into the panels just beyond the doorway that I was attacking. I also saw a gentleman using a crowbar. I did not hear anybody calling for tools, there seemed to be a considerable supply of them available. Just after I had managed to break in the door with the hammer the front guard of my train called me away to draw away the front portion of the train. The drawbar hook between two of the carriages had broken as a result of the collision, and we were able to couple these two carriages together again, and eventually we drew a number of the carriages away from the scene, as far back as we could uncouple them. I stood on the footplate of the engine after that and waited until it was time for me to draw the train up to Ais Gill. When I left the scene to go and couple up and draw the carriages away the fire we were working against seemed to have got more hold, there

was a greater illumination coming from it. The wind was blowing from the north approximately, right along the direction of the train from the rear to the front. There was a moderate wind blowing, and I think the wind assisted the fire. I asked Caudle after he gave me the hammer to go and have a look at my engine, which had been standing for some time with nobody on her, as I thought she might be short of water so he went and used the injector. The front guard of the train whom I saw several times during the morning was carrying his lamp. I did not hear any passengers asking for lamps. Caudle also had his lamp in his hand whilst I spoke to him. I did not see Caudle's fireman anywhere at the time. Of course there was considerable confusion amongst all the people working. I noticed the front guard of my train distributing tools amongst the passengers. I do not think they knew which was the best point of the carriage to attack with axes; there was no one to take charge of the operations. There was nothing in any way wrong with my engine as far as I know. I am perfectly satisfied that the engine was in perfect running condition when it left Carlisle, and the only breakage on the engine as the result of the collision was the steam brake-pipe. I can only remember one previous occasion on which I have had to stop on account of steam, and this was many years ago, when I first became fireman, and was on a goods train. I am 49 years old. If the night is fine there is no trouble under ordinary circumstances in dealing with a load of 243 tons behind the engine. If the night is rough difficulty is experienced even with a load of 230 tons. I found no difficulty on the occasion when I took 258 tons behind me to Ais Gill. I am permitted to ask for the assistance of a pilot when the load exceeds 230 tons. When I backed up to the train at Carlisle and heard the load of the train I asked the platform inspector for a pilot, and he told me that there was not a pilot available. When I say there are difficulties sometimes with a load of 230 tons or more, my meaning is that it is difficult to keep to the timing allowed. The engine can get up the bank. I did not mean that the engine could not get up the bank with 230 tons. In case we lose time we have to make a report and mention the cause of the delay; if the cause is entered as bad coal we are not found fault with. I should not be found fault with either if I lost 5 or 10 minutes on account of being short of steam and entered it as being short of steam in my report. We are not afraid of reporting to our officers when we lose time. I understand that the notice which I signed at Carlisle is not a direct order forbidding me going outside my cab whilst the engine is in motion; its object is to call my attention to the personal danger or risk there is in doing this. I do not think there would be any risk to a driver going round his engine after passing Kirkby Stephen, on the straight and open section of the line between there and Birkett Tunnel, from the point of view of his not being able to observe signals whilst so employed. I should not think of going round the engine on a busy piece of line where the signals are close together. I have been round the engine in Birkett Tunnel; it is best to go round where there is some shelter from the wind on a rough night. I did not think there was any danger in stopping the train as I did on account of shortness of steam; I was protected by block signals behind me, and I presumed that these signals would be sufficient to stop any train that was following me. It did not occur to

me that there was any risk, neither had I any other alternative. I have no idea as to the lapse of time, but it may have been half an hour, possibly more, after the accident when I was called away by the guard to draw away the front portion of the train. I observed no signs of hot ash or fire, burning coals, or cinders from the fire-box of the second engine; if there had been ashes lying about it is almost certain I should have noticed them. I got on to the footplate of the engine of the second express to shut off the right-hand injector. Steam was blowing through the injector. There were no hot coals or burning ash about on the footplate. I found some difficulty in climbing on to the front of the engine. The footplate was heaped up with timber wreckage from the carriages. A carriage roof, I think it was that of the second vehicle from the end of my train, was resting on the weather board of the cab. It is possible that ashes were thrown out of the ashpan under the engine and in front of it, but I did not see any hot ashes or cinders of any sort in proximity to the fire that I have described as burning on the level of the floor of the carriage.

James Metcalf, fireman, stationed at Carlisle, states: I have about 18 years' service with the Company, and have been acting as a fireman about 13 years. I was fireman on August 31st and on September 1st and 2nd with driver Nicholson, and did the same hours of duty. We left Carlisle three minutes late. Considering the coal we were using I managed to keep a head of steam nearly up to the maximum as far as Appleby. The reason the coal was bad was its size; there was no body in it. With larger-sized coal I should have been able to get a bigger body in the fire and maintain the steam pressure better. I have had as small coal previously when I was firing with a No. 2 class engine. It is easier to keep a good fire with this class of engine than with a No. 4 class engine, and we got up the bank all right, but there was difficulty in doing it. I do not remember ever having to stop on any other occasion short of Ais Gill, or at any other place on the Midland Railway. I was at the coal stage when the coal was tipped into the tender, and it was the only sort of coal available at the time. I did not find it difficult to get up the required head of steam before starting. I think our speed at Mallerstang would be about 25 miles an hour; this is about 10 miles an hour less than our usual speed. There is a bit of flat gradient at Mallerstang where it is possible to increase the speed a little, but it is possible our speed was not much more than 20 miles an hour. It is a rising gradient of 1 in 100 the whole way between Mallerstang and Ais Gill, a distance of about $3\frac{1}{2}$ miles. We began immediately to lose speed after passing Mallerstang. I had no doubt at the time we were at Mallerstang that we should get up to Ais Gill all right. After passing Mallerstang I closed the injector. We had about $1\frac{1}{2}$ inches in the glass. After we had run some little distance the water began to run low in the glass, and I had to maintain it. This meant putting on the injector. We had used one injector, the exhaust injector, on the left side on which I rode. I had to leave the injector on to keep the level of the water up. When we were passing Ais Gill viaduct, I felt certain that we should not be able to get to the summit. The pressure at the viaduct was somewhere about 120 lbs., and it had dropped to about 80 or 90 when we came to a stand. The engine came to a stand with the regulator wide open. The driver managed to maintain

the vacuum by using the large ejector at times. I was on the point of leaving the engine to go up to Ais Gill, and was going to do this of my own accord. I was prevented from going by my driver, who noticed a light coming up on the railway behind us. It was not a head light I understood from him, but it was the glare of fire coming out of the smoke box of an engine. I saw the light myself, and it appeared a long distance off, possibly a mile-and-a-half. It was south of Mallerstang box when I saw it. My driver ordered me to go to the rear of the train and try to stop the train if possible. I had got up on to the footplate again to see the light, and I took my lamp showing a red light and got down at once and went down along the east side of the train. I got as far along the train as the overbridge No. 136. I had not passed the end of our train when the collision took place. I was under the bridge when the collision occurred. I saw the engine hit the rear vehicle, it seemed to lift it up. There was no great flash of light that I am aware of, but I noticed many sparks about as if the bogie wheels of the engine were off the road. I saw no appearance of ashes or fire thrown out of the fire-box or ash-pan of the engine; the sparks seemed to come from under the van, and to be caused by the bogie wheels of the engine running over the ballast or against the rails. I did not wait at that part of the train any longer, but ran back to the engine and told the driver what had happened. I then ran on to Ais Gill signal-box to tell the signalman what had happened. I had made up my mind that the down road was fouled from what I had seen, and I thought that it was necessary to warn him in case there were down trains. I noticed a little time after I had been in the signal-box that the signalman's clock showed 3.15. I had probably arrived at the box a few minutes earlier. There was a goods train stopped at the down home signal at the time I noticed the clock—3.15. I was able to tell the signalman what had happened in time to stop the train leaving. I waited at Ais Gill signal-box until a light engine with the station-master from Hawes Junction arrived, and went back with the station-master to the scene of the accident. I got off the engine when we arrived at our engine, and walked down the train with the object of uncoupling where it was found possible to do so. There was a couple of carriages had to be coupled. I helped to do this. I gave my mate a signal to draw the vehicles ahead, and when this was done I rejoined the engine. The flames from the burning carriages were then being blown under the arch of the bridge, and I did not go through the bridge to find out whether anyone was still trying to extinguish the flames. I complained about a fortnight previously about the small size of the coal that we were being given on engines to locomotive inspector Watson, who was in charge of the depot at Carlisle at that time while the superintendent was away. I complained verbally. He admitted that the coal was small, but said that some wagons seemed to contain much larger-sized coal. I told him that the coal was very bad indeed and not good enough for passenger service. With small coal when you leave Carlisle the fire has to be fed with the shovel the whole time, and it means very much harder work. I should not be afraid of reporting when I had lost time through bad quality coal. I do not see any danger in ordinary circumstances in a train stopping in section or losing time. We expect to be protected by the

signals in the rear of us. It is possible that the driver might think it necessary to help his fireman with the fire-box door, and also to reach particular lumps of coal. As a matter of fact it is very uncommon to get signals against us on that section of the road between Carlisle and Ais Gill, but of course we do get them sometimes, though very rarely. In a general way we get a clear run. The driver of a second express train would know that there was an express in front of him, but nothing would justify a driver in neglecting to properly observe his signals.

Arthur Fisher, sleeping-car attendant, states: I have been 10 years in the Company's service. I have been a spare attendant for about seven years. My hours on the night of September 1st were from about 9 p.m. to about 8.30 a.m. I had signed off duty at 8 a.m. on September 1st. I was in charge of sleeping cars Nos. 2770 and 2777, which formed the second and third vehicles from the front of the first train, on leaving Carlisle. They both came from Stranraer. There were about 22 passengers in bogie third 237, 6 in the bogie compo. No. 254, and there were also 3 ordinary firsts in the bogie composite. There were 11 passengers in the two sleeping cars. I am also in charge of the collection of tickets between Carlisle and London so far as these vehicles go. There was nothing of any consequence to speak of on the journey until we came to a stand below Ais Gill, except that the train was losing time after passing Appleby. I should say we came to a stand about 3 a.m. I cannot speak accurately as to the moment of the collision. I estimate that about four or five minutes elapsed after the time we came to a stand until the moment of the collision, but I did not look at my watch at either of these times. I was standing in the first of the two sleeping cars at the time of the collision. The shock of the collision threw me about violently from side to side, but did not throw me down. It broke a lot of the crockery in the cupboard. I saw that all the passengers had been awakened by the shock, but none of my sleeping-car passengers were injured. About six or seven minutes after the collision I opened a window on the off side and noticed that there was a fire blazing at the rear of the train. Each sleeping car contains one fire extinguisher of the Rex pattern, and I took the two extinguishers down on to the ballast on the six-foot side and went back along the train with them. I handed one of the extinguishers to a passenger and used the other myself. The third-class bogie coach, the second vehicle from the end, was tilted upward at the rear end. The fire that I noticed was a few yards in front of the buffer beam of the engine and a little higher than the level of the floor. I believe that the seat of this fire was in the midst of a large quantity of broken-up baggage and boxes which had been driven out of the luggage van by the engine. I did not observe any other fire burning at the time. I did not notice any red-hot ash or cinder or burning coals lying about such as one might have expected if they had been thrown out of the ash pan of the engine. I remember working the extinguisher on this fire that I have referred to, and I thought that I had succeeded in putting it out, because the illumination made by the fire appeared to disappear. After a time there appeared to be nothing but smoke from the seat of the fire. There was no light at all.

I did not even exhaust all the contents of the extinguisher that I was using, for I thought we had put this particular fire out, and I left the work to go and assist in getting passengers out of the compartments in front of the fire where they were entangled in the wreckage. Guard Donnelly fetched and distributed the tools. I was using a crowbar, and tried to force open the doors. I do not know where the crowbar came from, it might have been one of the tools Donnelly distributed. A considerable time elapsed, to my mind it may have been half an hour or 40 minutes from the time the collision took place, and during the whole of this period we were working in darkness assisted by the light from lamps. There were two or three hand lamps burning in the neighbourhood of where I was working, and these I presume came out of the tool boxes. About 30 or 40 minutes after the collision occurred I noticed that we were working by a stronger light, and that the fire had begun to grow in size, so I and some passenger went forward again to get more extinguishers. We got them from the guard's van. We got two more, and I and this other person, I am not certain that it was a passenger, again used these extinguishers in trying to put out the fire, which was now in a much higher position, as high as the roof, but still in front of where the engine stood. I think this second fire arose from the engine or live cinders in some way ignited by the wind. I did not see any gas jet burning so far as I can recollect. I imagine that the gas from the cylinders had escaped and ignited in one flash. The fire grew in size and violence so rapidly that we had to stop and give up our efforts to put it out. I then went and assisted to get the passengers back into the Stranraer portion of the train, including the injured people. I did not hear any of the passengers asking for tools, there appeared enough available for all who wanted to use them. I saw crowbars, axes, and saws used. The electric light in my sleeping cars was not extinguished when the collision occurred. The electric lights in the third sleeping car at the rear of my train were also burning after the collision. I have no recollection as to whether the gas in the other carriages was burning after the collision or not.

Charles Wakelin, sleeping-car attendant, states: I have 13 years' service with the Company, and have been an attendant about 10 years. I was in charge of sleeping car No. 2785 from Glasgow on the night of this accident. I cannot say exactly what time the train was stopped north of Ais Gill, but five or six minutes elapsed after we came to a standstill before the collision occurred. I was standing in the pantry at the time, and the shock of the collision knocked me down, but I was not hurt. There were two passengers in the car; they were not injured. I looked out of the window and saw there had been a collision, and I got my passengers out of the car. I suppose it must have occupied 15 minutes or so to do this and help to get the passengers out of the third-class bogie in front of my car. I then got out on the near side of the train close to the bridge. I then saw that there was a fire in the rear of the train, and I got back into the sleeping car and fetched out the extinguisher. I got out on the near side, and a passenger took the extinguisher from me. I went back to the fire with this extinguisher. I then assisted in extricating certain passengers from the third-

class carriage from behind my car. I heard a gentleman calling out for a saw, and so I went into the brake compartment of No. 250 coach and took out the saw which was left there, all the other tools had been already taken out. I handed this saw to the gentleman. Passengers were also calling for lights. Guard Donnelly was handing out some lamps, and I went and got one of these from him. There were also applications for water for injured passengers, and I got it out of my pantry.

David Charles Donnelly, passenger guard, stationed at St. Pancras, states: I have had 35 years' service with the Company, have been a passenger guard 27 years, and am used to working over the Settle and Carlisle line about 15 years. I signed on duty at St. Pancras at 7.30 a.m., on August 31st and off duty at Carlisle at 3.30 a.m. on September 1st. I was off duty until 1 a.m. on September 2nd, when I signed on to work as assistant guard with the 1.35 a.m. Carlisle to London, and expected to sign off duty at 8.15 a.m. at London. I rode in the fifth vehicle from the engine, a six-wheeled van No. 204. Our train, on leaving Carlisle, consisted of 10 vehicles all fitted with the automatic vacuum brake. I noticed in the neighbourhood of Crosby Garrett that the train was losing time. I estimate that the speed of the train passing Mallerstang was about 15 miles an hour. We came to a stand short of the up distant signal for Ais Gill, and I noticed that the signal light was showing clear. When the train stopped I immediately got out of the van on the near side and went to the engine. I asked the driver what he was stopping for, and he said he was short of steam. I then asked him how long he would be. The driver got down on to the ballast and said "We shall be all right in about a minute, so you had better get back to your van." Of course he would have to get a signal from one of us two guards before he started again. I got back to my van and spoke to guard Whitley, who was standing on the ballast opposite his van at the end of the train, and told him that the driver said he would be about a minute. He said "All right." Immediately after this conversation with Whitley I heard a train approaching. I ran towards the rear of the train showing a red light. I did not get as far as the rear van of the train before the collision occurred. I should think that four or five minutes elapsed between the time we came to a stand and the collision. I did not make a note of the time we came to a standstill, it would be the duty of the rear guard. I went down towards the end of the train, still on its near side. I went under the bridge through the opening up the bank, and had scarcely got through it when the collision occurred. Immediately the collision occurred there was a big flash of light. It occurred to me that the gas cylinder under the van had been struck by the engine and had burst, and that the gas had ignited instantaneously. It was nothing more than a flash, but a very distinct flash and the whole place was immediately in darkness after it. I did not hear any loud report like an explosion of gas. The crash of the collision was a loud noise in itself. The engine appeared to have run through the van, and had demolished it, and the rear part of the bogie carriage in front of the van was also smashed in to the extent of two or three compartments at least. I went down the train towards the engine as far as the front part

of the bogie third, and did not notice from that position any fire in that carriage or amongst the debris. I immediately called upon all the passengers to alight, and called for volunteers to help the injured passengers; a number of ladies and gentlemen volunteered. I should imagine that a large number of the passengers able to move were out of the carriages within 1½ minutes of the time I called on them to alight. I called to some of them to follow me to the front of the train for appliances. I first of all went to bogie compo. brake No. 250, the seventh vehicle on the train. I got into the brake compartment and opened the cupboard, which is near the door at a high level, and took out the tools. The following tools are contained in each of these cupboards:—Two hand saws, two felling axes, two bars, two lamps, steel chisel, and two smith's hammers. There are also in the brake compartment four buckets and two fire extinguishers. A similar assortment of tools and utensils were stored in four brakes or brake compartments of my train. I then went to six-wheeled van No. 204 and issued the tools from the cupboard in that van. There was no application for extinguishers in the first instance, therefore I did not issue them until they were asked for. The tools in two cupboards met with all the wants that were first expressed for tools. I then proceeded to assist the passengers, all the people who wanted tools at that time having got them. I went to assist in extricating the passengers from the third-class bogie in the rear of the train. I then noticed when I got back to this carriage that a fire had started. It was in a higher part of the carriage about the level of the top of the smoke-box or bottom of the chimney of the locomotive and quite close to it. I thought this small fire that I saw, it was not larger than the inkstand on the table, was caused by fragments of broken woodwork that had been resting on the smokebox of the engine and had gradually been charred, and the wind had blown it into flame. I noticed that some of the timber work was painted. I did not know at the time that a fire had previously been noticed and had been thought to have been extinguished in this same carriage shortly before. Some passengers were already trying to extinguish this second fire with extinguishers that I had issued after the tools were taken away. I tried to impress upon the passengers who were working that it was very important to put this fire out; I dare say I was excited about it because I could see that it was of importance. I directed the hose of one of these extinguishers that was being worked by a passenger, and when this was exhausted another was brought into use. I issued the tools and extinguishers on the six-foot side of the train, and I also assisted in using the extinguishers on the six-foot side of the train. I should say a number of passengers were trying to put the fire out; others were trying to extricate the passengers. There was some difficulty in directing the contents of the extinguishers on the fire, but there was no great heat from it at first; we could get right alongside and close to the carriage. The fire grew so rapidly in violence that it is my impression that we were not able to approach the carriage on account of the flames and the heat after five minutes had elapsed. The rear brake van contained a tool-cupboard, but this was rendered useless by the collision, as the engine destroyed the van. To get at the tools you have to cut a cord and draw two bolts and

the flap over the cupboard falls forward, so that it only took a very few seconds of time to hand the tools out to the passengers waiting for them. I therefore do not think that much more than 10 minutes could have elapsed from the moment the collision occurred until that moment when I went back and found the fire burning as I have described. There was no panic in any of the proceedings that I have described—calling the passengers out, distributing the tools and so forth—and I have a very strong impression that not more than 10 minutes were occupied in this duty, and that therefore the fire that I have described appeared not much more than 10 minutes after the collision. I had not seen nor heard anything of the fire which I am told another witness has described as having been extinguished in another part of the same carriage. After I had given up all hope of putting out the fire I then saw it was time to uncouple the train and draw away that portion of it that could be saved. I should estimate half-an-hour elapsed before the coaches in front of sleeping car No. 2785 were uncoupled and worked forward. At this time the heat was so great and the injured people on the cutting slopes felt it so severely that they had to be shifted. I had no complaints at the time from passengers regarding want of tools or appliances. In addition to the two tool cupboards that I opened, there was another in the leading vehicle of the train that was available. I did not open this and do not know whether the tools were used, but all that came to me for tools I supplied as described. The lamps, buckets, extinguishers, and tools were some of them thrown on the floor of the vans near the doors, which were thrown open, and within reach of any passengers who wished to take them. I did not personally give them into the hands of the passengers. A number of passengers who were standing on the ballast took away the tools. I heard a child crying from the wreckage. This was the only sound that I heard that led me to suppose that there was anyone conscious among the debris. There was no rain falling during the half-hour I have described, nor do I remember rain falling before we left in the train for Hawes Junction. I do not think there was any confusion amongst the workers; they were all very willing. I do not think that this was a case calling for action under Rule 217 on these grounds, viz., I had been to the driver and had asked him what was the cause of the delay. He had replied that it was loss of steam and told me to return to my van as the train would only be delayed about a minute. I thought by his telling me to go back to my van that the time we should have to wait would be very short, and I did not think under the circumstances that this rule would be applicable. I do not think that the interval between our train stopping and the collision was more than five minutes.

Oliver Whitley, passenger guard, stationed at St. Pancras, states: I have 41 years' service with the Company and have been a passenger guard 37 years. I have been accustomed to work trains over the Settle and Carlisle line for 20 years. I signed on duty at St. Pancras at 11.30 p.m. on Sunday, August 31st, and off duty at Glasgow at 9.50 a.m. on Monday, September 1st. I again signed on duty at Glasgow at 10.30 p.m. on Monday to work the 11 p.m. express from Glasgow to London. On leaving Carlisle my train consisted of engine

No. 993 and 10 vehicles in the following order from the engine:—

Eight-wheeled bogie compo. brake	No. 254.
„ „ sleeping car	No. 2770.
„ „ „ „	No. 2777.
„ „ bogie third	No. 237.
Six-wheeled van	No. 204.
Eight-wheeled bogie compo. brake	No. 250.
„ „ „ third	No. 79.
„ „ sleeping car	No. 2785.
„ „ bogie third	No. 227.
„ „ „ van	No. 208.

The total weight of these vehicles was 244 tons, and I travelled in the last vehicle, the bogie van No. 208. All the wheels on these vehicles were blocked. We coupled up to the Stranraer portion at Carlisle, and I tested the continuous brake from the rear vehicle. We left Carlisle at 1.38 a.m., three minutes late. The van I rode in, besides containing certain passenger baggage, also contained parcel post, mail bags, and other parcels. There was only one wooden packing case so far as I can remember, but a certain amount of the passengers' baggage consisted of deal boxes. There was nothing particular to call my attention on the journey south of Carlisle until we reached Crosby Garrett. The train was then travelling slowly; we were losing time. The vacuum gauge showed no signs of lowness before reaching Appleby, but I afterwards noticed at one time that it had dropped to 16 inches. I should not expect the reading in the gauge to be lower than 18 inches in a train of this length under ordinary circumstances. We came to a standstill before reaching the Ais Gill up distant signal at 2.57 a.m. After the train came to a stand I got down from the van on the near side and waited there until I heard from my front guard Donnelly, who was riding in the 5th vehicle from the engine, and had got out of his van to go to the engine. He came back and shouted to me, also from the near side of the train, that the driver had told him we should be away in a minute or so. I suppose 3 minutes may have elapsed after we came to a stand before I heard this shout. Immediately after I got the information from Donnelly I heard an up train approaching and immediately rushed back to try to stop the train. I had with me a hand-lamp and some detonators in my pocket; these I had taken before I had left the van. I did not stop to put the detonators down as I wanted to get back as far as I could to warn the enginemmen. I got back, I think, about 100 yards. I was sounding my whistle and I waved my red light to the driver as he passed, and I was standing in the 6-foot way when the engine passed me. I did not see either the driver or fireman on the footplate as the engine passed, and I cannot say whether the whistle and the red light drew their attention. I estimate the speed of the train when passing me at about 40 miles an hour. The whole of the train just passed me before it came to rest. I cannot say whether the brakes were applied upon the train before the collision took place; I had an idea that they were. I heard the crash of the collision, but I did not see any big flash of light. I went back some distance along the Edinboro' train until I met the guard of that train who had got out of his compartment, and told him that his train had run into mine, and I arranged with him to go back and protect the train. I then came back to the rear of my own train and found that the van and the bogie third next to it were prac-

tically broken up and the sleeping car, the third vehicle from the rear, was badly damaged. I found that there was a fire burning in the bogie third in front of the engine. It appeared to me to be up in the roof of the carriage. Some men were using extinguishers on the fire when I arrived at the scene. I went forward and got an extinguisher from the front part of my train, and carried it back again to where the fire was and used it myself from the 6-foot side. At the time I got back I found that the passengers were in possession of tools. None of the passengers asked me for any of these appliances. I assisted guard Donnelly in uncoupling the vehicles in front of the sleeping car, and, as soon as the front portion was drawn away, I went forward to Ais Gill signal-box to give them information with regard to the accident. Guard Donnelly told me the fireman of our train had gone to protect the down line and I found him at Ais Gill signal-box. I got to the signal-box before the station-master from Hawes Junction arrived. I waited till the station-master arrived and told him that both lines were blocked and that the accident was of a very serious nature. I told him I thought there were a number of fatalities. I then came back with the station-master on the engine. At that time they had given up trying to put the fire out. I was under the impression that one more passenger was got out of the bogie third after I returned, but I cannot be certain on this point. I cannot recollect whether anyone was engaged in trying to extricate passengers from this bogie third carriage when I returned, and I heard no cries and saw no signs of passengers being alive in the debris. I assisted in loading the injured passengers in the front portion of the first train and travelled with them when the train started for Hawes Junction. At Hawes Junction the injured passengers were transferred to the 9.30 p.m. express from London which was standing in the station. This train was taken back to Hellifield and my passengers were there transferred to the boat train from Heysham to London, in which the injured passengers were taken to Leeds Hospital. I noticed some time before I left for Hawes Junction that the sleeping-car attendants of the Edinboro' train, two in number, were working to extricate the passengers from the first vehicle of the Edinboro' train. They told me that they had got the passengers out of the sleeping cars. I am aware of Rule 217 and that it is the duty of the rear guard, in case of a train stopping in section by failure or other reason, to go back with detonators and protect his train. In this instance I understood from what Donnelly told me that the delay to the train would be so short a time that I did not think there was any reason to carry the rule out. My train-book was in van No. 208 and has been lost. I recollect recording the time we stopped as 2.57, but I have no record of the moment of the collision. I should say that not more than about 4 minutes elapsed, which would make the time of the collision about 3.1. I am quite certain that as much as 8 minutes could not have elapsed between our stopping and the collision occurring. If I had known that the driver would take 10 minutes to blow up steam, I should certainly have gone back at once in accordance with Rule 217. I got out of the van with the detonators in my pocket in case of necessity. I did not hear from Donnelly what was the cause of the stoppage; I did not know it was want of steam. If I had known

that the driver had stopped for lack of steam, even though he had said he would be away in a minute or two, I should have gone back in accordance with Rule 217. I can remember only one previous occasion when the train on which I was guard was brought to a standstill in this section; it was about 20 years ago so far as I can tell. I have heard that there have been other instances, but I have no accurate knowledge of them.

Samuel Caudle, engine driver, stationed at Carlisle, states: I have about 40 years' service with the Company, have been an engine driver about 29 years, and have worked over the Settle and Carlisle line for 37 years. I am thoroughly acquainted with all the details of the road and of working in connection with the driving of passenger express engines on this section. I am 59 years old. On September 1st I signed on duty at 12.39 a.m., and booked off at 8.20 a.m., and I remained off duty until 12.39 a.m. on Tuesday, September 2nd. I then signed on to work the 1.49 a.m. express Carlisle to London as far as Leeds, expecting to finish duty at Leeds at 9.15 a.m. My engine was No. 446, a No. 2 class passenger engine. It is a four-wheels-coupled engine with leading bogie and six-wheeled tender. The engine and tender loaded weigh, I understand, about 88½ tons. I am well acquainted with the engine and have driven it on other occasions. It was in thorough working condition in every respect when I left Carlisle. The engine is fitted with the steam brake on the driving and tender wheels, and works the automatic vacuum brake on the train, both brakes being applied by one lever from the footplate. George Follows was my fireman. My train consisted of six vehicles weighing 157 tons. On this train and with a No. 2 class engine my ordinary full load without assistance is 180 tons; sometimes I take more than 180 tons. If the weight is only a few tons over 180 tons we do not think it necessary to ask for a pilot, but if it amounts to 10 or 15 tons more, we ask for a pilot as a rule. If they do not give us a pilot they tell us to do the best we can, which means that they do not expect us to keep the booked time for the train. There is no danger in taking a load over the fixed amount, but it may involve a loss of time. In such cases we are never found fault with for losing time. We had 30 cwts. of Blaxett, South Tyne, coal, and 20 cwts. of Naworth coal on the tender, both coals come off the North-Eastern Line, one of them from Cumberland. We have been using the South Tyne coal for four or five years and the Naworth coal for six months, or possibly more. Both classes of coal are very small. Blaxett coal seems to form clinkers which stick to the firebars. The Naworth coal is more porous and does not do this. Previous to the last month or so we were supplied with a certain amount of Yorkshire coal to mix with the other two classes, and this helped us in the matter of keeping up a better fire. I have not complained about the Naworth coal to Mr. Carey, who is the district locomotive superintendent, but have several times complained of the clinkery nature of the South Tyne coal. I have never made a written and special report about this, I have mentioned it in conversation only. I know that locomotive inspectors have been sent on the footplates of engines at times, but I cannot say with what purpose they were sent. I saw the coal tipped myself into the tender at the coal stage. It struck me then that the coal was worse than

usual as regards its size; it was very small. In a general way it is the case that there is greater difficulty in maintaining a head of steam with very small coal. We prefer much larger coal, even if we have to break it ourselves. We then feed it on the fire in lumps the size of a man's fist. Engine No. 446 is a good steamer, and it struck me when I saw the coal that if she would steam with this description of coal she would do well with anything. I found the engine did perfectly well as far as Appleby, and even as far as Crosby Garrett, but beyond that steam began to go down, and there was difficulty with water in the boiler. We were five minutes late leaving Carlisle, 1.54 p.m., and we got a clear road between Carlisle and Kirkby Stephen. As far as Kirkby Stephen I saw all the signals, and they were all clear. I asked the fireman regarding the starting signal, which was on his side of the cab, and he said that it was all right. I drove from the right-hand side of the footplate. When approaching Birkett Tunnel, which lies about two miles south of Kirkby Stephen, I left the footplate on the left side to oil the left driving auxiliary box, and I stood on that side of the engine outside the cab until we passed through the tunnel. I then went round the front of the smoke-box on to the right-hand side to oil the box on that side, and then came back to the footplate. When I got back to the engine footplate my first impulse was to look at the glass. I had left about an inch of water in it before I went outside, but I saw on my return that there was none showing. I agree that the most important duty of drivers is observation of signals. I remember when we came out of Birkett Tunnel I looked ahead and could see the Mallerstang distant signal, and got the impression that it was in the clear position. I always take two looks at a signal—the second time when I am close to it—but my attention, as I have described, was attracted on my return to the cab by the low state of the water in the boiler, and I suppose I must have forgotten the necessity of observing the distant signal again. I applied myself immediately to the right-hand injector. The fireman had had the left-hand injector working, but it was not working well on account of the low pressure of steam; I think the steam pressure was about 140 lbs. He had not been able to get the right-hand injector to work, so that was why I applied myself to it. You cannot see the home signal at Mallerstang for any long period, for the view is obstructed by a couple of timber overbridges. It remains in sight only after you have passed under the overbridges. I did not observe the position of this signal, I was so busy with the injector. I was still working at the injector and did not look out whilst I was passing the signal-box. I am sorry to say I did not see the position of the up-starting signal either, though there is a good view of it. When I looked up after I had got the injector to work, I recognised that I had run past all these signals without noticing their position. I had finished working with the injector just after we had passed the starting signal, but it was then too dark for me to see what its position was. The duty of a driver if he does not observe signals is to go sufficiently cautiously to stop clear of any obstruction in the road. I estimate that our speed at that moment after passing the starting signal would be about 30 miles an hour. I kept the regulator and the reversing lever in the same position—I did not alter them—but

owing to the gradient and the fact that we were continuously losing steam the speed of the engine was decreasing. There was no fog or rain falling, and there was no difficulty in seeing signal lights. I had been helping the fireman a little with his fire, and thought we had got as far as the stone bridge near the scene of the accident at the moment when we passed under the last wooden overbridge, and I remember saying to myself that we had not got so far as I thought, and so I told the fireman to put a bit more coal on, and watched him whilst he was doing it to see that it was put to the best advantage. He had just finished doing this when he sounded the engine whistle without saying anything; he afterwards said "Look out, Sam, there is a red light in front of us." The first thing I did was to pull over the brake handle and then close the regulator. I had carried out both of these operations before we actually struck the train. A very short time must have elapsed after I had closed the regulator and screwed up the reversing gear and applied the brake before we struck. The speed at the moment that I applied the brake would be between 20 and 30 miles an hour, perhaps 30 miles, much the same as when we passed through Mallerstang. I think the brake was acting before we struck the van. The continuous brake acted wonderfully. I think if I had had 50 yards clear after the brake was applied, I should have brought the train to a standstill. The road in the vicinity of the accident is on a curve to the left-hand side, and the fireman, on such a curve, has a better opportunity of seeing than the driver, as he, the driver, stands on the right-hand side. I did not see the red lights at all myself; I was occupied in trying to stop the train and shutting off steam. I have never been stopped owing to shortness of steam with any train. I had been losing time on the journey to Ais Gill and think it amounted to as much as six minutes, but I cannot be certain. If I had arrived at Ais Gill without mishap it would have been my duty to report that I was so many minutes late, and I should have attributed it to bad coal. The result of this report would have been that an inspector would have examined the coal that I was using. I am satisfied that I should not have been punished or fined in this case. I remember signing a notice with regard to going round the engine whilst in motion. It was a caution notice reminding us of the possible danger to ourselves and not of danger to the working of the train. I make it a practice to go round the engine to oil the auxiliary boxes. They start with a certain amount of oil, and this may be enough to take us through to Skipton or Leeds but sometimes is not. If it is very low in the cup there is not so much syphoned as if the cup is full, and I prefer to go round for my own sake and the Company's, so as to ensure that there shall be plenty of oil in the cup. I do not oil anything else but the auxiliary boxes. If I thought it was dangerous to myself at any moment to go round I certainly would not do it. Of course, whilst I am engaged in actually putting in oil my attention is diverted from the road and signals for half a minute or so. I went round with the intention of being back in the cab of the engine before we reached the Mallerstang signals, but when I got outside the cab I found the wind was stronger than what I expected, and it delayed me in getting round the engine, and that caused me to be outside on the framing

when I passed the distant signal at Mallerstang. I do not think that there would ordinarily be any danger in a driver going round an engine from the point of view of the safety of the train. I know it is the general practice of drivers to go round their engines once between Carlisle and Leeds, and they do it before they reach Ais Gill box; we are going at a steadier speed before we reach Ais Gill. South of Ais Gill the speed is very much higher. I never thought there was any danger either to myself or the train in this practice, because I always choose the place that seems to be most suitable. One of the points which we would consider was whether the place was sheltered from the wind; a cutting would be more suitable than a bank. I am satisfied that my fireman, Follows, was sufficiently acquainted with his duties. It was the first time he had been booked with me, but I know that he has been a spare fireman for at least 12 months, and has constantly been over the road with passenger and goods trains, and I am satisfied that he was acquainted with the road and signals. By the Company's instructions the driver is responsible for oiling, and it therefore devolves upon him to go round the engine. In any case I should not have sent the fireman, as he was not accustomed to the work as I was, and there would be some risk in his doing it—risk to the man himself I mean. When the engine came to rest, the roof of one vehicle of the first train had gone right over the engine, and the rear part of this roof was resting on the tender of my train. The roof of another vehicle was resting on part of my engine. The engine was surrounded with wood and fragments of debris. The left-hand injector was open at the moment of the collision and it was knocked off by the collision, so I shut off the steam-cock of this injector and opened the right-hand injector before leaving the engine. I was not badly knocked about in the collision, except for a knock on my hip, which seems to have passed off. I do not think more than a minute, perhaps two, elapsed after the collision before I left the footplate; the engine was surrounded on all sides by splinters of wood, it was difficult getting down. I noticed that there were signs of burning amongst the splintered wood lying between the level of the footplate and the ground. The damper was up when the collision occurred, and there may have been something thrown out of the ashpan. I closed it as soon as possible after the collision. The blast was closed with the regulator, and I do not think the blower would send much ash out of the smoke-box. The fire-box is on a slope to the front, and in the case of a violent jar of this description the fire would be thrown forward and the arch would prevent it rising to the level of the ends of the tubes. There was no fire thrown out on to the footplate. There were a lot of broken timbers and splinters piled up on each side of the engine as high as the top of the boiler and the smoke-box and also in front of the engine up to the chimney. On the six-foot side and alongside the engine I am quite certain there were several places where the woodwork was smouldering, it may have been from ash thrown out from the engine. There was also a very small fire just like a gas light burning amongst some fragments or debris that was lying a few yards in front of the right-hand corner of the engine framing. I had the idea that it was a gas fire, but I did not take a very accurate observation of it, as I was so anxious to go and assist

the passengers. I thought the passengers were of more importance than dealing with the small flames that I saw. I went forward and tried to assist in getting passengers out of the vehicle in front of the engine. I got the pick off the engine. A number of passengers were working there, and all of them seemed to have plenty of tools. I do not think I ever saw anyone work harder than those passengers did. A number of fire-extinguishers were used and exhausted; I used one myself. I remember seeing a sleeping-car attendant also using one. I thought that we could easily have seen to the fire after liberating the passengers, but as a matter of fact it grew to such a size and so rapidly that we were not able to cope with it. After the extinguishers were used I used my own bucket off the engine, and got buckets from those which are carried in the brake van, and these buckets were filled with water from my tender. I was on the engine working the valve for the purpose. As long as it was possible to work at the fire and get water on it we went on with the work, but after a time the heat got so powerful that we could not approach it; I believe in my recollection there must have been as many as 10 or 15 buckets of water used on this occasion. As we were unable to master the fire I arranged with guard Whitley of the Glasgow train (the guard of my own train had gone back to protect the rear of the train) to uncouple behind the first vehicle and let the train run back of its own accord down the gradient about 100 yards. We had to use a bar to get the carriages to stir. We got them to start, and they then ran back all right. We were unable to detach the vehicle next to the tender, but we got all the passengers out of the vehicle. There were plenty of men working to extricate the passengers in the carriage behind my engine. I remember a gentleman asking me if I had a lamp. I told him that the one I had was the only one I had available. There were a number of lamps in use at the time. Both the lamps on my engine were available, the collision only extinguished the light in one of them. I did not hear any whistle sounded from the engine of the front express. The wind was blowing at my back on this occasion. It was not a very strong wind at the time of the collision, but it increased in force after the collision. I expect the wind blowing from me to him would partly prevent us hearing, and the fact that the engine was running and we had a large weather board over our heads would also prevent the sound being heard. I never expected that any train would be standing in the block section, and I also had a sort of idea that I had seen the Mallerstang distant signal "off," and for this reason I did not slow or stop after passing the Mallerstang signals without seeing their position.

George Herbert Follows, fireman, stationed at Carlisle, states: I have 12 years' service with the Company. I have been a registered fireman since last July, and have acted as fireman when required for about 8 years. During this time I have worked between Carlisle and Leeds. I know the position of the signals and where to look for them on the road. On Saturday, August 30th, I signed on duty at 7.25 a.m. and was off duty at 5.40 p.m. I remained off duty until I signed on at 12.39 a.m. on Tuesday, September 2nd, to work as fireman with driver Cudde with the 1.49 a.m. up express to London. I have often acted as fireman with

an express engine. I was on the engine when they tipped the coal into the tender. The coal that we had come from the same collieries which supplied the coal we have been using for some time, but it was much smaller in size. It was smaller than I have been accustomed to. You cannot build up your fire with such small coal as you can with harder coal or coal of larger size. I did not experience any difficulty until we were approaching Crosby Garrett. I saw all the signals between Carlisle and Crosby Garrett and they were all standing clear. We always have to be on the look-out for them in any case, but the likelihood of their being against us on this occasion was small. By this I mean that if two expresses are following each other closely they would shunt any train clear ahead of the first train, and they would keep the road clear until the second express had gone through also. I have not often fired with driver Caudle, and cannot speak to his usual practice, but on this occasion I remember he began to go round the engine before reaching Birkett tunnel to attend to the oiling of the auxiliary boxes. It is always the engine-driver's duty to do this work. I was busy at the time with the fire and was attending to the water in the boiler. I looked at the gauge and thought the injector was not taking up the water properly, so I got hold of the gauge lamp to look at it properly, and the lamp was blown out. This was in the tunnel itself. I relighted the lamp, and saw that there was very little water in the gauge glass. The left-hand injector had been open since we left Carlisle, but by this time it was not working so efficiently on account of the head of steam getting lower, so I stepped across and tried to apply the right-hand injector, but I could not get it to work. Sometimes the steam does not catch behind the water properly for the first time or two, and you have to go through the operation again. We had just come out of the tunnel and I was engaged in working at the right-hand injector when the driver came in off the outside of the engine to the footplate. He took the injector in hand and I started firing. It is part of my duty also to observe the signals. I think the driver was on the footplate of the engine again before we actually passed the distant signal for Mallerstang, and I did not look to see what the position of the signal was. I should not tell the driver I had omitted to see the position of the signal unless he asked me. I had recommenced firing immediately the driver came back. I was engaged with the fire the whole time while we were passing the home and starting signals at Mallerstang, and did not look to see what their position was. Even if I had stopped in my firing to look up at the signals I should have found some difficulty in seeing them on account of the glare of the fire momentarily preventing me from using my sight. My work was more continuous that night on account of the quality of the coal. I had to dribble it into the fire-box in small quantities at a time. It was some distance from Mallerstang before I was able to leave my work of firing, but when I did look ahead I saw two red lights on the road in front. On first sighting them I thought they were the Ais Gill home and distant signals at danger, and I opened the whistle to draw the signalman's attention that we were approaching the distant signal, and wished it lowered. Almost immediately after sounding the whistle, I saw another red light nearer the ground, which looked to me as if someone was stepping down from a carriage with a red light in his hand.

I called my mate's attention to it immediately. I cannot say what my mate was doing at the time. He had finished with the injector, and was standing on the footplate. He immediately closed the regulator and applied the brake. I cannot say whether the brake began to act before the collision occurred. The collision took place immediately after the driver had taken this action. I do not think there can have been more than 50 yards between us when I realised that the lights were those of a train. I suppose the speed of our train might have been 30 miles an hour when I recognised what the lights were. I hardly think there was any reduction made in the speed before the collision took place. I lost my balance at the moment of collision, and fell between the hand rails to the ground. I was winded by the fall, and I climbed through the woodwork of the broken vehicles alongside the engine out on to the cutting slope. I saw subsequently that the debris I had climbed through was the side of the rear van of the first train. There was a quantity of steam blowing round me as I struggled through, but I do not recollect any signs of fire at the time amongst the debris. I went along the cutting slope to see my guard: I think he must have gone back to protect the train. I was thrown out of the engine on the left-hand side, and after getting round to the end of the train I came along by the 6-foot side and found passengers were in difficulties in the carriages behind our tender. I held a light to see what could be done. I got the lamp from one of the gentlemen. I found that there were four passengers in the carriage, but they were not injured, they were only imprisoned in the debris. The guard of my train came and told me that he was going back to protect the train. I cannot say from where the tools were got, but I suppose it was out of the tool cupboards in my train. I should say there was an ample quantity of tools for the space there was to work in. I heard them asking for tools before they were given out, but after that I heard no application made. I did not notice the fire in the carriage in front of my engine for some considerable time after the collision. I saw them using fire extinguishers and endeavouring to put it out. I remember seeing water being got from the tender, and buckets being filled at it. I helped some passengers in removing baggage and mail bags out of the third-class compo. brake behind the engine, and I was then told by my driver to go forward to Ais Gill signal-box, and tell them to wire for the break-down vans, but I found, when I arrived, that they already had the information. The fire was burning before I left for Ais Gill, but it was not very large in size, and they were using extinguishers then. A driver has certainly more opportunities for observing signals and his eyes are not tried by the glare of the fire in the way that a fireman's are. I had to use the rake once between Crosby Garrett and Kirkby Stephen to find out the condition of the fire. I could not say there was anything wrong with it. With this class of coal the engine always throws the fire badly, even if it is not using much steam. In ordinary circumstances our duties of observation of signals are not interfered with by adjustments of injectors. I had exceptional trouble that night in attending to the fire and the boiler, owing to the condition of the coal. It is the very small size that is so objectionable.

Cecil Paget, General Superintendent of the Midland Railway, states: I think first I ought

to make quite clear if I can the purpose for which pilot engines are employed. Every train has a scheduled timing, and according to the timing certain loads are regulated for the engine. To state that in another way, it means that with a certain load an engine may be expected to keep a certain scheduled time. If it is thought necessary, and we are very particular about punctuality, to rigidly maintain our scheduled timing a pilot engine becomes necessary in order to do that, but only in order to do that. So far as the power of the engines are concerned, perhaps I may take this particular engine, No. 993. The hauling capacity of that engine is greater than that of our largest mineral engine, and it is one of the class of the most powerful passenger engines that we have. This class, together with our large compound engines, are grouped together and designated class 4. It is considered that the 990 class have a margin of power, *i.e.*, a capability of maintaining the scheduled time with a greater load than the compound engines which are included in the same class. As driver Nicholson pointed out in his evidence, there is no question of the ability of that class of engine to take the load that was put on it that night with perfect safety. It is merely a question of departing from the scheduled time if the load exceeds the load of 230 tons, and both drivers have made it quite clear that they are not expected to keep to the scheduled time with greater loads than are laid down. There was a pilot available at Carlisle station when the first train started, but owing to the shortness of time available to get the pilot engine on to the train the inspector decided that, in view of the fact that the engine on the train was of the 990 class, more time would have been lost in fetching and attaching the pilot than the big engine might be expected to lose on the scheduled time with the additional load of 13 tons. If an engine of the 4th class is employed to haul an express freight train, its load over the line in question would be 300 tons or more. I think men like to go round the engine to see how things are running. From the position a driver is in he cannot see his engine, and I think this makes them go round; as they go they might just as well take a feeder with them, and so it becomes a practice. I think there is nothing dangerous in the practice of enginemmen in going round their engine once on this section between Leeds and Carlisle. There is nothing to prevent them from adequately performing their duty to the public, namely, the proper observation of signals. I think they are careful to do it at places which are suitable—at places where their attention is not required for looking after signals. I do not think that the fact of the driver going round his engine, taken by itself, is accountable for the fact that he did not observe his signals. We have stopped the supply of coal to Carlisle from these two collieries, so that this particular coal will not be used in future at this depot for locomotive purposes.

Edward Kiely Carey, district locomotive Superintendent, Midland Railway, Carlisle, states: I have been two years at Carlisle. I know all these men concerned personally; they are all four very steady men. There is no record against any of the men of insobriety. I am positive that there is no question of soberness concerned in this case. In the case of men losing time a driver is instructed to make

a report as to the time lost and the reason to which he attributes the loss. This report is sent forward to headquarters for investigation and dealt with by them. Men are not punished in any way if they give a reasonable explanation for their lateness. It would be decided at headquarters whether it would be necessary to inspect the coal or send an inspector on the footplate to test the fireman's work. There was a case of delay attributed in a man's report to badness of coal on the same night, September 1st. There have been other reports prior to September 1st; these complaints have been verbal complaints, made to me as regards the size of the coal. The complaints have not touched upon the quality. The size is, generally speaking, small. It moreover fluctuates considerably in size from time to time, some waggon loads have been sizeable enough, others very small. I have reported to the Company that the size of the coal is too small. I have no knowledge as to the actual specification for the coal supplied. Both of the collieries named by the men in the evidence, the Blackett, South Tyne, and Naworth are on the borders of Cumberland, and the coal is brought on the North Eastern Railway into Carlisle. The men appear to approve of the coal if it is mixed with a certain amount of Yorkshire coal, not otherwise. I think it was at the end of July I made the complaint to the Company, and since then I have been away on leave. Headquarters sent an inspector down from the Stores Department, who met a representative of Naworth Colliery, and he gave an undertaking that the coal would be improved in size. This would be about three or four days after I had sent in the report. There was afterwards an improvement, because the inspector who relieved me told me there was an improvement, but the improvement has not been maintained. There is a good deal of clinkers with this Blackett coal. There is not so much clinker with the Naworth. It runs into the bars of the fire; this would stop the draught to some extent and make it more difficult to obtain a head of steam. Drivers also complain that the smallness of the size of the coal blocks up the tubes in the boiler. I arrived at the scene of the accident about 7 a.m. on September 2nd. I found what was remaining of the woodwork of the two coaches in front of engine 446 still burning. The bogie wheels of engine 446 were derailed, but the driving wheels were on the rails and also the tender wheels. The engine had evidently, after striking the rear van, run through it, and the roof of the van appeared to have passed over the engine, or the engine to have passed under it, and then to have cut through half the carriage behind the engine. The rear part of this roof projected about 10 or 12 feet over the engine tender, and I cut the projecting portion off. One of the bogies of either the van or the carriage in front of it was found over the buffer beam of engine 446. The other two bogies had been pushed in front of the engine and were all mixed up together. From the quantity of broken material on the framing of engine 446 the engine must have penetrated about half-way into the third-class bogie in front of the van. The remaining part of the woodwork was burning, and after using the hand pump for a while the work of moving the wreckage was begun. There was a quantity of stuff which was burning in front of the engine. The pile of red-hot stuff which was left when I came on the scene occupied about the position the rear bogie of the carriage

would occupy. I cannot speak as to the condition of the gas cylinders.

Arthur Bancroft, clerk in charge of the Coal Office, General Stores Department, Derby, states: All the coal bought by the Company is subject to approval. The specification states that all coal shall be of the best quality and suitable for the purposes required and shall be subject to the approval of the Company. I hand in an analysis of the two classes used from Blackett and Naworth respectively. The Naworth coal has by the specification to be screened over a $\frac{3}{4}$ -inch screen. There is no size of screen specified in the case of the Blackett coal. The screen in use at this colliery, however, is somewhat larger— $1\frac{1}{2}$ to 2 inches. I have been up to the Blackett Colliery and seen this screen. Both collieries concerned are small, and the arrangements are not up to date as regards the screening; the screens do not move. I am afraid we have received some coal which has not been as large as it ought to have been. The report from Mr. Carey reached the Stores Department on August 1st. On August 5th we sent our inspector to Carlisle Loco' Yard. Between the 1st and 5th it will be recollected that there was a Bank Holiday and a Sunday. Our inspector wired from Carlisle the same day to say that the coal was not properly screened, and the next morning, that of the 6th, we wired to the colliery people and told them that we were getting into trouble owing to the

smallness of their coal, did they wish to inspect it. They sent the colliery manager and the secretary to Carlisle to see it, and they admitted that the waggons inspected were not as well screened as they should have been, and they promised to put it right immediately. We heard no more of it until August 21st, when we sent our inspector to Carlisle to see that the coal was right then, and he reported that he found it well loaded and fully equal to the sample.

James Briggs, assistant engineer for maintenance, to the Midland Railway Company, states: I hand in a drawing No. 284/13, being a plan and section on a large scale of the line between Mallerstang and Ais Gill with an intermediate section of 2 miles left out. Also a plan on the scale of 40 feet to an inch showing the immediate scene of the accident. I will also forward a copy of the longitudinal section of the line from Appleby to Ais Gill. I also hand in sheet 3 of the Midland Railway Distance Diagram on a scale of 1 inch to a mile showing the line between Kirkby Stephen and Ribbleshead; this shows the altitude of the line at various points. I also hand in a return showing the damage to the permanent way and works in the collision. I also hand in a statement showing the respective lengths of straight and curved line between Mallerstang and Ais Gill signal-boxes, a total distance of 3 miles 44 chains.

Evidence.

Taken on the 15th September.

Captain Walter Hill, Royal Fusiliers, states: I was a passenger from Glasgow by the first express. I rode in the front compartment in the third-class carriage which was the last but one vehicle on the train. I was lying down on a seat of the carriage dozing when the train came to a stand before reaching Ais Gill. I was conscious that it had stopped. I heard a noise and then I felt the carriage rocking; it was rocking sideways; and I heard the cries of people in the other compartments. I was not thrown down, and directly I felt the shock I jumped up and caught the luggage rack. I heard a cry from a man as if he had been rudely awakened. A gentleman was riding with me in the compartment, I believe his name was Smallwood, but cannot be certain. He was thrown by the collision on to the floor or in some way—I cannot speak certainly—as the lights went out. I believe the seat at the north end of the train in my compartment was crushed forward and some of the floor of the compartment fell out. As the train was rocking from the shock I noticed a huge flare outside. I did not realise what had happened, but first I thought the flash was the lights of a station. My companion tried to open the door on the six-foot—the off side—and I tried to open the door of the carriage on the near side, but neither of us managed to open them, they were jammed. I then put my foot through the window and we both got out on the off side of the train. About two minutes would have elapsed perhaps. I turned round and looked at the coach we had come out of, it was telescoped up to the first compartment. The last three compartments were non-existent,

the three in front of them were crushed together, and mine was the only compartment which had not been crushed in. The carriage was already on fire. I got on to the cutting slope, from where I could see better. At that time I had no idea there was an engine in the middle of the wreckage; it was not until three-quarters of an hour later, after the fire had burned away some of the wreckage, that I saw the engine. There was a fire in the roof, which was a small fire; it was not a large fire and was not burning fiercely. A lot of splintered wood was burning. Previous to my seeing this fire I heard the roar of a gas jet burning. I could see the jet burning, the flame was striking the floor of the coach over it about the position of the third compartment from the front. I cannot say very much as to any fire that may have been burning on the floor level behind this fire that I have spoken of in the roof. After seeing a drawing of the coach with the position of the gas cylinders, I give it as my opinion that the gas jet was issuing from the pipe connecting the first and middle cylinders. The front guard came down the train on the six-foot side and I spoke to him and pointed out that the carriage was badly telescoped and that there was a fire burning. He said he had to go away to the second train; before I saw the guard no one else had got out, on that side of the train at all events, and there was no noise at all except the roar of the gas jet I have mentioned. I walked with the guard a little way and then came back towards the compartment I had occupied. I was joined shortly by a number of railway officials, I think they were

enginemmen as they wore blue overalls. One of these men got under the train and he tried to hammer down the pipe from which this flame of gas was playing on the bottom of the compartment. He used a wedged-shaped hammer with a sharp point at one end, which I understand was a coal pick. We then tried to open the door of the compartment, which would be the second from the front of this carriage, with a key, but we could not open it, and we then started smashing in the door with a hammer; there was also a pick there. I do not remember seeing the enginemmen after this, I believe they were otherwise occupied with their engines. We then tried to break open the door with a section of the stiffening rods of the carriage frame, which I see from the drawing are shown under the gas cylinder. It was a broken piece of round iron bar. I had broken the windows before this to let the smoke out, the compartments were getting full of it. I heard someone ask for fire extinguishers and these were forthcoming and a number were brought. I think I can recollect four of the painted red pattern and three of the brass kind. I do not remember having seen anybody trying to extinguish the fire in the roof, at all events from my side—the off side of the train—up to this moment. It was growing in strength whilst we had been working. I think all these extinguishers, except one, were turned on the flames at the same time and had a wonderful effect. The flames were practically extinguished, at all events there was nothing but blackness there. The fire started again not long afterwards whilst we were working at the door and I asked for more extinguishers, but not seeing or getting any I went off to see if I could find some. I did not find any, but I found an axe in the guard's van among the luggage. It was a hatchet judging from the drawings I now see. I went back with the hatchet and started splintering the door. Other tools were then brought, and I remember seeing two crowbars being used and another axe. The crowbars were not heavy enough, and eventually we managed to force the door open with the piece of round iron above mentioned by forcing the end under the door and heaving it. The fire then was much stronger, and I went and picked up the fire extinguishers that had been put on the ground and found one which had not been emptied. I handed it to a passenger, who did not seem to be applying the jet to the right spot, so I took it away from him and gave it to a clergyman, who was doing good work there, and showed him where we wanted the liquid applied as the fire was getting very hot. The wind increased in force, somewhat suddenly I think, and the violence of the fire in consequence rapidly increased and drove us from our work. The rapidity with which the fire gained ground at this particular moment was remarkable. With regard to the actual passage of time I remember speaking to another passenger, Mr. Knox by name, after we had been obliged to withdraw from our work on the carriage, owing to the strength of the fire, and we came to an agreement that 1 hour 20 minutes had elapsed. I cannot be certain when we had this conversation, but it was before we got into the front portion of the Glasgow train which was taken forward to Hawes Junction. One of the greatest difficulties that we had to contend with was the height of the door above the ground level. It was very difficult to reach, a table was brought out and was used continuously afterwards, on which some of us stood to get at our work on

the door. I was on the off side of the train the whole time. I think it is possible that to persons upon the near side of the train, the fire to which I referred as having commenced immediately after the collision was not visible. I did not hear a guard or railway official calling to passengers to accompany him to obtain tools. There was some delay in our obtaining tools, but once they were given out there were as many as we could utilise in the space available for working. Amongst other things that I have thought about since the accident is the question of gas. We did not recognise perhaps at the time how important it was to extinguish this gas jet that was burning. It might have been done if we had known how to do it. I was not aware that there were any appliances for the purpose carried with the tools on the train. I have already spoken as to the difficulty there was in working owing to the high level of the door above the ground. It appears to me that the best use was not made of the fire extinguishers. If they had been under some person's control who understood how to apply them they might have had better effect. If passengers had been aware where the tools, the extinguishers, and other appliances were stored on the train, it would have been a distinct advantage to us. We could have started to work with them sooner.

Mr. Rowland Brander states: I joined the first express at Glasgow. I rode, so far as my recollection serves me, in the third-class carriage which was the fourth vehicle from the rear of the train. I was lying on the seat of one of the compartments asleep when the collision took place, and I did not know that the train had previously come to a stop. I was thrown off the seat on to the floor of the carriage. Neither myself nor the other people in the compartment, of whom there were three, had any idea that anything of so serious a nature had occurred. No damage was done to the carriage, and there was no difficulty in getting out of it. We got out on the near side of the train on to the cutting slope. Immediately after the accident one of the attendants came along the corridor shouting to us to get out of the carriages, and so far as I know all the passengers got out on the near side of the train. The baggage also was being taken out of the train on that side. After we had got out, the lights in the carriage were still burning, and there was nothing to show us how serious the condition of affairs was, so I thought we might at all events try to get out our baggage, and I went back into the corridor and began throwing out articles of luggage, mostly to ladies who were standing on the bank, many of them only partially clad. I stood on the bank for some little time wondering what had happened, when I heard shouting from the rear of the train, "Men wanted. No women." I should think not more than 4 or 5 minutes could have elapsed when we heard the shouting. We naturally obeyed the call. As soon as we had got under and through the bridge under which the train was standing, we could see the engine in the midst of the wreckage. I cannot recollect whether I immediately saw any signs of fire, but very shortly afterwards it made its appearance, slightly at first. When I arrived it was still perfectly dark. I noticed three or four men climbing up the side of the carriage, which the engine had crashed into, endeavouring to tear away the wreckage and rescue the inmates of the carriage, and I assisted them. It was hopeless work, and no tools were available, and

the cry was for light the whole time. Several of the passengers, who were on the cutting slope, struck matches, and realising that nothing much could be done, I jumped down and ran along to the front of the train to see if I could get a lamp from the guard's van. The guard was in the van when I arrived there, and there were also others who were asking for tools, lights, &c. The guard told me that some lights were coming along, and either he or someone else climbed into the van, and handed me down a crowbar, sledge hammer, saw, and an axe. This was on the near side of the train. I thought that lamps would be following me closely. When I got back to the wrecked carriage the men were doing their best in the pitch dark up on the top of the vehicle. Possibly about 10 or 15 minutes might have elapsed from the collision until the moment I returned to the scene a second time. Even on this second occasion, though I can remember hearing some crackling and seeing smoke, there was still no alarm in connection with fire, and I saw no one attempting to extinguish it. I climbed up on to the carriage and handed tools to the men who were working, passengers I think they were. I was met with a cry for light, and immediately went back to the front of the train, and when I got to one of the vans I was able to secure one lamp and went back. I was under the impression that there was another lamp in the van when I left it. I ran back with the lamp and handed it to the men who were working. Very shortly afterwards they pulled out a man from among the wreckage, and whilst so engaged dropped the lamp and it went out. I climbed down, picked the lamp up and relighted it, and after returning it I saw the first passenger, who was taken out on the near side of the train, rescued from the debris. At that time, possibly 20 minutes had elapsed, the fire was still quite small in size, and the illuminating effect was quite insignificant, otherwise I should not have relighted the lamp which was extinguished when it fell down. I assisted to get this passenger down to the ground, and four or five of us carried him along through the bridge towards the front of the train where the women had got pillows and rugs laid out. After depositing the injured passenger with the women, who were attending to him, I went back, and when I arrived at the scene again they were just getting a boy out of the same place, and I got him on my shoulders and ran back with him to the women. He did not appear to be burnt much, and was not much hurt. When I returned on this third occasion, I could distinctly see the wreckage immediately in front of the engine, and recognised that the fire was burning up and crackling amongst all the debris that was stacked in front of the locomotive, and that the fire was being fanned by the wind. I have no recollection of any particular strong breeze, but after the carriages commenced to burn I noticed it sprang up very strongly. I did not notice anyone on the near side of the train trying to extinguish the fire up to that moment, in fact I did not notice anyone on the near side trying to do this at any time. I only saw one extinguisher, and that was on the off side of the train. I agree with other witnesses, who I understand have stated that in about 40 minutes after the collision the fire was burning too furiously to admit of approach. So far as my experience goes there were not sufficient tools for the willing hands to use. I was not aware that there were other places in the train where tools were

stored. On several occasions whilst I was working, but after the fire had increased and was very clearly strengthening, I heard the sound of gas burning in a flare as if escaping under pressure. The impression made upon my mind was that a number of gas cylinders were bursting one by one and gas escaping from them successively. One particular sound of flaring would only last for a quarter of a minute, and it would be succeeded in a few minutes' time by another. I distinctly remember three. I did not notice any smell at all of escaping gas on the first two occasions when I was at the scene. I think possibly that heavier bars than there were available might have proved useful. I am certain there were no people utilising extinguishers or other appliances for checking or putting out the fire from the near side of the train. The only thing I can possibly suggest is the provision of an adequate supply of tools, and especially of lamps for use in cases of this sort, and also some means of informing passengers and others where the supply of tools is stored. I subsequently, after what I have mentioned, went round the Edinburgh train and tried to assist in extricating and helping passengers out of the first vehicle of that train from the off side. When I heard the sound of burning gas there was also the crackling roar of the fire, but above that there was another bursting roar dominating that altogether, and that was most distinctly the roar of burning gas. The whole time that the fire was burning there was a hissing of steam escaping from the engine, but this was a continuous sound.

Mr. Leslie Alexander Drake, Bachelor of Medicine and Master of Surgery, Edinburgh, states: I travelled in the Glasgow train, the first express, on the night of this accident, in the third-class compartment in the fifth carriage from the rear of the train (No. 250). I was sitting on the left-hand side, the near side, of the train a few minutes after the train had come to a stand, when I saw one of the railway men running along the bank alongside the carriage and heard him say, "My God, they are into us." I immediately leaned out and looked back. I saw another train coming round the curve, it was then about 150 to 200 yards away. I could see the carriages as well as the lights of the train. When the train was within a very short distance of us I saw the wheels take on an appearance as if ringed with flame. I concluded the brakes had been put on, but it seemed to me that, with very little difference in speed, she crashed into the rear part of our train. As soon as the crash came I threw myself back on to the seat, and held on to the hat rack to steady myself. My wife was in the carriage, and she was thrown on to the floor. I picked her up, and my little child who was with us, and put them on the seat, and we were then ordered to get out. We got out of the carriage on the left hand, near side, and I helped all my family out and told them to stay there, and immediately went to the rear of the train to see if I could render any assistance. The lights were still burning in our carriage, and I do not think that more than two or three minutes could have elapsed before I got to where the engine was. I tried the doors of the coach that was broken up by the engine; there were only three or four of these doors left, all the others had been knocked to pieces by the collision. I found I could not get in through any of these doors, and I climbed under the couplings of the coach in front of this carriage to the other side of

the train. I found that the doors upon the off side of the train were also jammed and could not be opened. At this time there was one gentleman on the off side and two on the near side when I was there. I do not recollect having seen any fire burning on my first arrival, either on the near or off side of the carriage in question. There was one passenger jammed down under the carriage, and it appeared to be a woman, and I realised from the position that she was in that there was no hope of her being alive. It was whilst trying to see if there was any chance of moving this person that I saw the first sign of fire. This was some burning dress material underneath the level of the floor of the carriage and in front of where I knew the engine buffers were situated, though I could not actually distinguish the buffers on account of the wreckage. Above the floor there was also some of the woodwork burning, and there was also fire in the roof of the carriage. I noticed all of these fires, and so far as I can remember all at the same time. It did not appear to me that 10 minutes could have elapsed, but it is very difficult to estimate the passage of time in such circumstances. I am quite certain I was not attracted by any appearance of fire when I first arrived. We put out all these fires with the help of extinguishers, and pulled away some of the burning material from underneath, and so far as I can tell we put them out completely. One of the train attendants brought the extinguishers along. I was engaged in dragging out the burning material from under the floor. Then we began opening the doors with some axes and crowbars brought along by, I understand, the guard of the train, and whilst doing this the fire again started, but in the roof only. It grew in strength very quickly and became absolutely uncontrollable. At that time we had about four extinguishers, and these were used in the endeavour to put out the fire, but it was useless, it got so violent that they had no effect on it at all. The wind was fairly strong, and it seemed to grow stronger, fanning the fire along from one compartment to another. I see no reason to doubt the statement which I hear has been made by a railway witness, that after 3.45 a.m. we were unable to do any more rescue work. We were calling for tools before we could get them, no one seemed to know where they were kept, and the greatest difficulty that we experienced was that we were standing on the track and had to work high above our heads owing to the height of the coach. In this position the crowbars were too short for use, and we had to hold men on a table out of one of the first-class compartments while they worked with the crowbars on the doors. Speaking as a medical man, I think it would be a great advantage if on all these long-distance trains such a thing as a box of dressings could be carried, and also trestles. If there is not a medical man on the train, a man skilled in ambulance work could have used them, and they would have been of very great assistance to those who had been injured. The ambulance box that was brought from Ais Gill signal-box was taken to the Glasgow (?) portion of the train. After we had done all we could and the fire had stopped us working, I turned my attention to those people who had been injured. They were all badly injured, and I attended to them in a medical way as far as I could, and I went back with them to Kirkby Stephen and then to Carlisle. In talking the thing over afterwards, all the

passengers came to one conclusion, that if it had not been for the gas we should not have had the horrors to deal with that we had on that night. When the flame lit up in the roof the second time, in our opinion we felt that it was being fed by gas. Steam was roaring off from the engine, and it was making such a noise that I cannot say that I heard any escape of gas. I heard passengers calling out for tools, but did not hear the guard shouting to people to fetch tools.

Captain Eustace Jotham, 51st Sikhs, Frontier Force, states: I travelled in the first train from Glasgow in a third-class compartment in a carriage near the end of the train. I think from the drawing now shown to me, it must have been No. 79. I believe I was asleep when the collision actually took place. I knew that something serious had happened, but the blow did not appear to me to be very violent. Somebody came along the corridor and called out, "All passengers get out," so I got out of the carriage on the near side of the train, and walked back immediately to where the collision had taken place. I do not suppose that more than two minutes could have elapsed, after the collision, before I was actually on the scene of the broken-up carriage. I noticed that there was a considerable illumination as soon as I got out of the carriage, and then it seemed to die away. I did not see any jets of gas burning. I think the illumination that I saw was caused by gas catching fire, because it went out again. If it had been wreckage burning it would not have gone out so quickly or made such an illumination. I was occupied for some time on the near side of the train trying to extricate passengers who were amongst the debris of the carriage that was wrecked, but after a time the smoke grew so thick that I went on to the off side, by climbing between couplings. I used an axe part of the time and also a crowbar. At first there were no tools or appliances available, but after a time there were enough for all who could work. I was not very long employed upon the near side of the train, but during that period I saw no extinguishers used. There were a number used on the off side. The wind was blowing from the rear of the train towards the front, and I believe also somewhat from the off to the near side. There was certainly a good deal more smoke on the near side than on the off side. Possibly 10 minutes might have elapsed before the fire started again. The principal difficulties were:—firstly, want of lights—there were only one or two lamps available on the near side; secondly, tools were not available very quickly—because the ordinary passenger has no knowledge as to where the tools on a train are kept in a case of this description; thirdly, it was so very difficult to work right down below the carriages. If you stood on the carriages you had only one hand to work with. Passengers were ignorant of the construction of a carriage, and did not know where to apply their tools. I do not think there was any sort of confusion—I was aware of none. I should think the time that I hear has been given by a railway witness—3.45—is possibly correct with regard to the violence of the fire and the heat of the flames preventing us working.

Miss Nan Clarke states: I travelled in the first train. I travelled in one of the third-class carriages in front of the last sleeping car. I was reading when the train came to a standstill. The train came to a stand, and I wanted

to know what was the matter. I asked a fellow traveller, Mr. Thomas, to look out of the window, and then I heard the guard run along, and he asked the guard what was the matter. The guard said "It is loss of steam, we shall be away in a few minutes." After that we sat down again for a few minutes, and then we heard our train whistling. I then asked Mr. Thomas to look out again and he said that he saw another train coming from the north. Then I looked out and saw it was coming upon the same line as ours, so he opened the carriage door and said "jump then," and I jumped out first—he followed. We climbed up the slope of the cutting, and stood against the stone dyke at the top, and had just time to turn round and look at the rear of the train when the collision took place. I should think that possibly seven minutes elapsed between the time the train came to a stand and the moment of collision. I saw the glare from the smoke-box chimney of the engine behind us before I got out of the carriage. I heard no guards calling to passengers to jump out. As far as I can remember, referring to the plan now shown me, I was riding in coach No. 250. No other passengers got out on that side before the collision occurred. I think that very few people could have been got out of the train, even if the guard had shouted to them to get down, because it took me some time to arouse and get passengers out of the carriages in the front part of the train after the collision. After seeing the collision I and my companion went back to the rear of the train, and I met someone whom I took to be a guard of the train. I asked him if I could help in any way, and he asked me to go forward and arouse all the men as they wanted help, so I went along the train and called into every carriage that men were wanted. Some passengers, by that time, in the rear part of our train had already got out, but very few from the front portion. Then I heard them calling for lights, and I went up to the engine of our train and climbed on to the cab. No one was there, and I tried to find a lamp, but I could not find any. I suppose they had been taken. The whole time that I have described I was on the near side of the train. I then went round to the off side and called out to the people on that side and warned the passengers upon that side of the train. I then came back round the front of the train and heard a call for fire-extinguishers, and I saw in the van next to the engine two fire-extinguishers. Two men behind me got them out of the van. There were also buckets in the van. The extinguishers were on a ledge and the buckets were hanging against the side. The men did not bring away the buckets. I then went forward to where there was a small hut alongside the railway thinking it was a signal-box. I thought there might be a shelter there for the passengers who were injured. I then went back along the near side under the bridge to the end of the train to see if I could be of further help, and found they wanted cushions and rugs. So I went through the various compartments and threw them out, and carried them away afterwards. I also succeeded in getting some brandy from various passengers for the injured people. When I went back on the second occasion the fire was burning furiously. I remember seeing red hot ash or coal flying from the engine, that struck us, from under the level of the footplate, and when I was on the off side of the train I saw red-hot cinders lying in the ballast between the

rails of the down road. There was nothing to see when I first arrived on the scene but steam coming from the engine. The fires, I think, started very soon afterwards. I noticed no jet of gas flaring. My impression is that the fires were started by the red-hot ash or coals that were thrown out. There was a considerable quantity of red-hot ash or coal thrown out into the air immediately the collision occurred, and I rather think it was these burning embers that started the fires. I stood there alongside the fire as long as it was possible trying to give assistance.

Mr. Ivor Akers Thomas states: I was a passenger by the Stranraer portion of the first express and travelled in what I think was the sixth vehicle from the front. I was awake when the train came to a stand and asked one of the guards as he passed the carriage what was the matter. He said: "It is all right, Sir, we have not enough steam." We heard the whistle sounded by our own engine, and I looked out of the window and saw the guard running to the rear of our train waving his lamp. Then I could see the glare of the engine fire and the smoke from the chimney of a train coming behind us. At first I thought the train could not be on the same line that we were on, but Miss Clarke insisted that it was. After a minute I was convinced that she was right, so opened the door and told her to jump out, and followed her. We scrambled up the slope as far as the wall on the top just in time to see the collision take place. I should think 8 minutes possibly elapsed between the moment the train came to a standstill and the collision, because I did not look out of the train immediately it came to a stop, but waited until the guard had gone up to the engine and come back again before I asked him what was the matter. So considering altogether what happened, I think that 8 minutes at least must have elapsed after the train came to a stand before the collision occurred. I find, on looking at the plan, that I and Miss Clarke occupied the fourth vehicle from the front, third-class bogie 237. I ran down to the rear of the train, and I heard Miss Clarke ask a guard what we could do. He told her to wake up the people in our train, and then I went on to the rear where the engine of the second express was in the midst of the wreckage. The guard, I think, we met before passing the overbridge. I climbed up on the cab of the engine and there was a great deal of steam about, but it was not issuing strongly from any one pipe or aperture. I climbed from the engine on to the wreckage, which I suppose was the remains of the roof of a vehicle, towards the front of the train. Eventually I found my way on to the footboard of a carriage. I was joined by another passenger, and after breaking some windows he managed to go inside and passed out quantities of wreckage which I threw away. There was a fire smouldering I remember at this time amongst some of the wreckage. It was not, at all events, in the roof, as I crawled along it; it may have been splinters of wood charring from the quantities of red-hot coal or ash which was thrown out from the engine on colliding. After some people had been extricated from the side where I was—two I think it was—I got through under the couplings on to the off side of the train. The fire at that time was not strong at all. There were no tools available to start with, but someone after a little time handed me a hammer, and later I saw an axe and two crowbars. I remember

holding a fire-extinguisher which was working to start with, and either something went wrong with it or all the liquid was used. There were no lights available at first. The tools were all right when they appeared, but there was a delay in obtaining them.

Mr. Thomas Edward Maley states: I travelled in the first train on this occasion. I joined the train at Glasgow, and travelled in a third-class compartment in a carriage one end of which was standing under the bridge. I was dozing and I suppose awoke by the unaccustomed stoppage at this place. The violent shock of the collision and the reaction threw me on the floor of the carriage, and after surveying the compartment I got out as quickly as I could and took out my belongings. I got out on the near side of the train. It must have taken a very short time to do this as I went to the rear of the train and through the arch opposite to where the colliding engine stood without seeing anyone about. I tried to see what had happened, but the smoke and darkness prevented me from recognising what had happened. I saw someone come through the gloom, the fireman or engineman I thought he was, and he said that a train had run into ours. My next question was, are all the people out, and he said, I believe so; and whilst still looking I heard smothered cries, and moaning, and particularly a child's voice from the carriage in front of me. I saw fire start, as I thought, where the roof and side of the carriage meet on the near side of the train in front of the engine. Possibly this might have been 10 minutes after the collision. I do not remember hearing any particular sound like a gas jet burning under pressure. There was a hissing going on, but it might easily have been an escape of steam. There was a great want of light at the time on that side. I crawled under the coach from where the sound was coming but without success. I then went on the top of the cutting to see if I could find anything that I could use to smash in the doors or side of the carriage with. After a time there were hatchets, crowbars, and extinguishers brought along. I know that there were extinguishers worked from the near side of the train as I actually directed two or three, and they worked very well. They checked the flames very considerably I thought, so I left some men who were working with them from the top of the cutting slope to get hold of the guard, in order to uncouple the front portion of the train with a view to taking it away before the flames could get to it. I remember I got between the two coaches and uncoupled, perhaps I was clumsy, but the lamp the guard was showing me a light with fell and went out. The flame that I have described as burning at the top side of the coach under the roof was that of a gas flame. My reason for this is that the flame showed no flickering—it was a steady continuous light. When I came back from uncoupling the coaches, I was on the off side of the train and noticed that the fire was stronger and was burning along the floor level. I believe there were two sources of fire, the one I have described in the roof and the other at possibly the floor level. I do not think that the source of the fire on the low level was gas, the flames were so intermittent, first flame and then smoke. I do not recollect having seen red-hot cinders or ash lying outside the engine when I first came to the scene. The difficulty of access to the carriage was manifest. We could not possibly get up to it, but we made

the best use we could of collapsible tables, and once on these tables the crowbars were plenty long enough. I was unaware that tools were kept in the guard's van. As regards the extinguishers I think they worked very well; but lights were badly wanted. Of course, even if tools had been immediately available and in larger quantities, unless the tools had been properly directed, injury might have been done to passengers who were fortunately saved. I think, therefore, that if someone had been present to have taken authority and actually directed the actions of passengers, the results would have been better. After the unfortunate and lamentable accident nothing could have been kinder than the way in which passengers of all sorts were treated by the Railway Company. For instance, instead of making the passengers change at Hawes Junction, they transferred a coach to the 9.30 down express and sent it back to Hellifield and there it was connected to the Heysham Boat Express train. There was no difficulty in despatching telegrams. When I crawled under the carriage which was so badly smashed up, the first cylinder that I came across was intact and undamaged. I could not get any further than the first cylinder. I did not smell gas at any time, neither at the outset, nor when I was crawling under the carriage.

David Charles Donnelly, front guard of the first express, was recalled and stated: I was partially in my van, and had one foot on the step and one out of the van, when my attention was first drawn to the second train. The beating of the engine drew my attention at first. I heard the whistle of the approaching train some time afterwards, and then heard the whistle from my own engine. I saw the fireman of my engine at the rear—we were running practically together; I was in front and he came running just behind me. I am almost sure I started to go back before our engine whistled. I heard the sound of the approaching train and had arrived at the bridge before I saw the train. My meaning is that my attention was first drawn to the approaching train by the beat of the engine, and that then I made a rush for the rear and was at the bridge before the engine came in sight. I could see the approaching train after it came round the curve, but it was only a second before it struck us. It did not occur to me to call upon passengers to get out of the train as I went back along it. I do not think I could have had time to warn them: many of them would be asleep. Even if it had occurred to me there would not have been time. I do not think that any passenger could have travelled faster than I did from the bridge to where my van was, and therefore I do not think the tools could have been obtained more quickly. I did not tell guard Whitley what the driver told me, that the engine of the first express was stopped for want of steam, because he must have known it himself already. The train had been travelling so slowly for such a distance. I thought, when the driver told me that he would only be stopped a minute or two, that I should act in accordance with that information. He also said that I was to get back to my van, which I took to mean that unless I was quick in returning he might go before I could get in. The driver would not have been justified in starting unless he had got a signal from me, nor I, in giving him a signal to start, until I had got one from guard Whitley. I also noticed that the vacuum gauge reading in my van was

12 inches when I left it, and 18 inches when I returned, and I thought that the pressure of steam was being quickly increased.

Sir Guy Granet, General Manager, Midland Railway, states: With your permission I desire to make a statement on behalf of the Company. *First*.—As to the steps taken by the Company after the previous accident at Hawes Junction to minimise the probability of accidents, and to carry out the recommendations which you then made. *Secondly*.—As to the circumstances attending the present accident. Now, dealing with the first subject, I shall state in detail what we have done in following your recommendations, but, before dealing with that, I wish to point out in what respects the Company have gone beyond what you recommended. You will remember, Sir, that most of the recommendations made in your report had reference to suggestions for minimising the effects of accidents after they had taken place, and very important suggestions they were, but my Board, after very carefully considering your report, came to the conclusion that, beyond what you had recommended, it was very desirable to see whether it was not possible to take further steps to prevent the occurrence of accidents, or at any rate to make it more improbable that they should occur. You will remember that in the first accident it was admitted that it had occurred through two causes, both failures of the human element, namely: first, the momentary forgetfulness of a signalman, a man of the highest character and record, who forgot that he had left two light engines on the road and subsequently admitted the express into that section; and, secondly, owing to the failure of engine drivers, also men of the highest record, to observe the provisions of Rule 55, under which they ought to have reminded the signalman of the presence of these light engines in the section. That source of weakness having been revealed, it was recognised that there were places on the line where it was possible, either through physical causes or possibly through density of traffic, for a signalman to forget the existence of a train standing at signals in his section, and so admit another one into it. Accordingly a survey of the line was made, and it was decided that in over 2,000 places the circumstances were such that it would be desirable to instal apparatus for correcting that tendency towards human error, and thereupon my Board made an

Your recommendations were.

1. That in view of the turntable work at Hawes Junction, and the number of engine movements, the up and down lines between the advance starting signals and cross-over road should be track circuited, and the levers working these signals thereby controlled.

2. That having regard to the work at Hawes Junction as a whole, and its situation on an express road, the signalmen's hours of duty should be limited to 8 instead of 10.

3. That in view of the apparent disregard by enginemen of Rule 55, special action appeared to be necessary to impress upon them the importance of obeying the Rule at other centres where detentions are of frequent occurrence, and that to prevent any possible misunderstanding some further elaboration of the Rule was advisable.

order that apparatus should be provided at these places, and for the work to be put in hand at once. The apparatus decided upon was of a two-fold character. First of all there was the provision of track circuiting and electric locks which has a two-fold effect. It has the effect of giving the signalman in his cabin a visible signal that there is a train in his section, and it also has the effect of preventing him, by means of electric locking, from improperly lowering his signals to admit a train into his section. Then, in addition to that, it was decided to put in what is known as the "Rotary Interlocking Block." This is a device which protects the other end of the section, or rather the section in the rear—it prevents the signalman in the rear from pulling off his signals and admitting a train into the section in advance until any train in that section has passed out of it. Well, in order to do that work, my Board immediately set aside, as a first instalment, the sum of £100,000 over and above the ordinary expenditure for maintenance, renewal, and improvements, and ordered the work to be taken in hand at once, and that work has been proceeded with ever since as fast as possible. It cannot all be done at once; one obvious reason being the rate at which the locking of the signal lever frames can be altered, or added to, because the alterations in the locking cannot be done when traffic is about. Therefore, the whole of the work practically has to be done on Sundays; but special gangs have been put on, and have been continually at work at this since the order of the Board was given, with the result that we have to-day completed 374 track circuits and 379 Rotary Interlocking Block installations. That leaves still to be done 500 track circuits and 900 Rotary Interlocking Block installations. I think, Sir, you have seen some of the work. I believe it is thoroughly satisfactory, and I believe that we have gone considerably beyond what any other Railway Company has done in the use of these devices. Now that is what we have done over and above what you recommended in your report. At any rate I can say that we acted fully up to the spirit of your report. I will go through the specific recommendations made one by one and show what we have done. You made a specific recommendation as to track circuiting at one place. I have taken out your recommendations, and if you will allow me, I will read the recommendations and state what we have done.

What we have done.

This has been done.

We did not do that as we thought that having track circuited and taken off a considerable responsibility from the signalman it was not desirable.

As to that, this track circuiting and interlocking block is for the purpose of doing away with Rule 55, but the attention of the staff has been called specifically to the importance of observing it at all other places where it does apply and the Rule has been considered by all Railway Companies and has been amended.

You then say that the following suggestions had been made and deserved consideration:—

Your recommendations were.

What we have done.

1. That to minimise the risk of fire where gas lighting is used:—

(a) A valve to automatically close when the rush of gas exceeds a certain pressure should be fixed in the gas cylinder.

This has been done on all our new stock, and is being gradually done to the old stock. This has not been done as quickly as I should like, because we had considerable difficulty in finding a valve. We found that there was a tendency to a deposit of carbon, which prevented its working, but we have now got a satisfactory valve, and that has been applied to all our new stock and to a gradually increasing number of the old stock, and with reference to this it is rather interesting to state that we have had an opportunity of noting whether the valve is efficacious or not, because we had an accident at Wanstead Park last March in which a train of new empty carriages, the gas cylinders of which were fitted with this valve, was run into by a light engine, and a very complete smash occurred. Mr. Bain can give the actual details of the damage done, but it was a considerable smash. In the case of two of the carriages the pressure pipes underneath the carriages were broken, but in each case the safety valve closed, and the gas in the cylinder did not escape. So one may say that we had a very early proof of the efficacy of the suggestion you had made.

(b) That the ends of the cylinders should be strengthened.

This is being done in all new cylinders.

(c) That the size of the diameter of the cylinders should be decreased and improvements made in housing and protection of cylinders and gas mains.

This was immediately put in hand, and is being done.

(d) That the cylinders should be placed above the roof instead of under the framing.

That we did not do because we came to the conclusion that on the whole the danger attending that situation was greater than that underneath the framing, and we were fortified in that opinion by foreign practice. Moreover, one or two Companies who had been in the habit of placing the cylinders on the roof decided to change the position and place them underneath. In one case since then another Company has made the change in the other direction. At the time the experience was entirely the other way.

(e) That incombustible materials should be provided above or below cylinders according to the position adopted.

We have agreed to this and gone beyond it, because we are covering the whole of the under side of the floor of all new stock with asbestos. I might mention that to some extent we are minimising the liability of fire occurring by this fact, that in all our new stock for the last 10 years we have employed a steel under-frame. It is only our older stock which has a timber under-frame. I do not think we have built a vehicle for 10 years which has anything but a steel under-frame.

2. That in order to reduce the liability of telescoping of passenger vehicles—

(a) Uniformity of weight of coaching stock forming the trains should be arrived at.

This has been very carefully gone into and given effect to as far as possible.

(b) A modification in the shape of buffers of passenger vehicles should be made.

We have introduced an improved buffer to carry out this recommendation.

(c) That headstocks should be deepened.

This we did not do. I say this deliberately. The Company decided that the disadvantages that would result from the adoption of this suggestion would outweigh any benefits that might be derived therefrom.

3. That tools and appliances for rescue work should be carried on the trains, such as axes, saws, and additional hand lamps.

4. That fire-extinguishing apparatus and fire-buckets should be carried on the trains.

5. That a third door should be provided in the middle of each sleeping car.

6. That sockets should be provided outside carriage doors for prizing the doors open.

7. That windows should be large enough for exit purposes.

8. That railway servants, particularly guards and conductors, should be further instructed how to act in case of serious accident.

Now comes the question of gas lighting versus electric light. I will read what you said:—

“ It cannot be denied that there is a greater liability to fire in a railway accident of this description when gas is used as an illuminant than with electric light. For it is a simple matter to prevent danger from short circuiting of electric wires, by the proper provision and arrangement of fuses. But this elimination of gas as a source of light would not preclude all danger from fire. There remains the risk from the contents of an engine firebox and from the employment of coal, coke, or gas in cooking ranges and stoves on restaurant cars. Instances of fires so originated can readily be quoted, *e.g.*, at Grantham and possibly at Cudworth. In fact, this is actually the first occasion when it can be proved beyond question of doubt that fire was occasioned by burning gas. It has to be remembered also that gas has been in use for lighting purposes for a very long period, and that during the whole of that time, in fact since the year 1868, there is no case of fire destroying either the lives or bodies of passengers in a railway accident. Gas with the latest improvements in the way of incandescent mantles, &c., has also many practical advantages over electricity as a source of illumination. It requires no expert staff, is nearly as easily controlled, is more economical to instal and maintain, and is less liable to failure as an illuminant. It is only reasonable, therefore, first to consider before entirely condemning it whether it is possible to safeguard the use of gas as an illuminant by the adoption of any improvement in appliances which may minimise the risk of fire. On grounds of safety I hold that electricity is the more desirable means of illumination for pas-

This we have done.

This is a list of articles carried in the guards' vans of express trains:—

Two liquid extinguishers.

Four buckets.

Two tin bafflers with long iron handles.

Two safety hand lamps.

Two hand saws.

Two hatchets.

Two hammers.

Two pinch-bars.

One chisel.

One drift, and a supply of cotton waste.

We have put two fire extinguishers and four fire-buckets into the guards' vans, and tin bafflers, which are for extinguishing gas flame from a broken pipe, are also carried, and instructions have been issued to the staff as to how to use this apparatus, and further, the guard of every express train has been shown the apparatus, and received personal instruction as to the manner in which both the tools and fire appliances are to be used.

That we did not think desirable, because cases have occurred of passengers in sleeping cars falling out by mistaking the door. We thought it would create another danger, so we did not do it, but we have provided an extra window in the sleeping cars.

This we did not think necessary.

That we say is so in all the express stock.

New rules have been issued to the staff dealing with that matter in great particularity.

senger trains, and as such should be adopted wherever possible, and that in the case of long-distance and express trains it is more particularly to be recommended.” Well, Sir, the position the Company took up as to this was as follows:—First of all, looking at the statistics of accidents over the whole country for the last 30 years, and taking the recorded accidents for the last 32 years up to December 31st, 1912, *i.e.*, the period during which gas may be practically said to have been the standard illuminant of the country, we find that there have been 1,602 cases of accidents to passenger trains. In 23 of these cases fire occurred as the result of the accident, and in those 23 cases the fire was attributable to the following circumstances:—

Two to oil lamps;

Three to electrical causes;

Three causes not stated;

Seven to fire from locomotives; and

Eight to gas;

and when I say eight to gas I have taken eight cases in which it could be said that gas was the cause, although you said in the case of the Hawes accident this was actually the first case in which it could be proved that gas was the source of fire; but I am taking it against myself that in eight cases gas was the cause of the fire. Well, then, as you yourself have pointed out in your report, there are many advantages from the railway working point of view of gas over electricity, but the advantages are well known, and I think you are well aware of them. We also investigated what was going on abroad, and we found, generally speaking, that the consensus of opinion was in

favour of gas rather than electricity. There were exceptions, but the trend of railway experience abroad was in favour of gas, with its improvements, against electric light, and I was yesterday informed, but I have not had an opportunity of verifying this, that on the German and Austrian railways, which are to a very large extent under the management of the State, they have got nearly 60,000 passenger vehicles, and there is not one which is lit by electricity. Therefore, looking at the situation as a whole, and having regard to all these circumstances, viz., the small percentage of cases in which fire broke out, the fact that these fires occurred before these protective devices had been installed, and in view of the further precautions that we were taking, and the money that we were spending to prevent the accidents occurring at all, in view of the fact that in our opinion gas was a better light and has considerable railway advantages, and in view of the fact that we were corroborated in our opinion by the practice of many foreign and English Railway Companies, my Board came to the conclusion that it would be premature to make a complete revolution in their policy as to the illumination of railway vehicles, and therefore in that respect they did not carry out your recommendation. But I wish to emphasise the fact that that decision was come to on reasoned grounds, after very careful consideration and investigation as to how to prevent accidents occurring. Unless you have anything to ask me, that is all I have to say as to what the Company has done with reference to the lessons of the last accident, and I should like now to say a word or two about the circumstances attending the present accident. Certain accusations or allegations have been made against the Company, some of which are based on misconception as to what the Block System is—there have been criticisms as to trains following in the section at intervals of 14 or 15 minutes in the same direction, and that has been seriously suggested as an act of criminal negligence on my part, but I do not think you will expect me to labour that point. But there are one or two matters as to which I should like to say a word. It has been stated that the coal used on that night in question was bad. Well, Sir, I will admit that so far as the size of the coal is concerned, it was too small on the night of the accident, and that in that respect it was a bad coal, and that undoubtedly it was difficult for driver Caudle to keep up a proper head of steam with that coal, and that—I do not know I have a right to say so—if I have I should like to say it—that whatever blame he may have incurred that circumstance is one which should be taken into full account in weighing the amount of blame which should be given to him. But the suggestions about the coal, which I resent very much, is that the coal was of a very inferior quality, that the contract was made negligently or carelessly or without proper tests as to whether the coal was a proper sort of coal for use on the railway, and that it was bought for reasons of economy. This is absolutely without foundation, and perhaps you will allow me to deal with that. Now first of all dealing with the price. The price that we paid for that coal was 13s., and that price was 6d. higher than any other coal that we were purchasing, except Welsh coal. It was 6d. higher than the coal that we have always regarded as the best English coal, viz., the South Yorkshire, and 1s. 6d. more than the best Nottinghamshire and Derbyshire coal, so

that as regards price it cannot be suggested that it was a cheap coal. This was the first contract that we had made with this particular colliery, and before making the contract we first of all had the coal analysed. The analysis of the coal gave this result:—

Moisture	...	...	...	2.20
Ash	...	...	...	1.92
Volatile matter	...	...	...	22.42
Fixed carbon	...	...	...	73.46
				100.00

Sulphur, per cent. of coal	...	0.57
Iron, per cent. of ash	...	19.6

Calorific value:—

British thermal units per	per
pound of coal (to the nearest	50 units)
...	...
...	15,150

The analysis from 15 of the best South Yorkshire collieries I will hand to you. It shows that the analysis of this Naworth coal comes out better than the South Yorkshire coal. May I read the report of the chemist on the analysis:—"This is a coal of very high calorific value, equal in this respect to the best of the Welsh coal supplied to us. It is low in sulphur, very low in ash and moisture, and better than any of the coals I have examined from Northumberland (Plainmeller) Coalfield." We took some of the coal and tried it for some days over the section of line between Carlisle and Leeds, and here I have the inspector's report. He first of all gives the amount of coal taken on, &c., and I will hand you the report in. I will read what he says:—"In accordance with your instructions I have tested this coal with passenger trains (both express and slow) between Carlisle and Leeds with No. 2 and 4 class engines," and then, after giving the particulars of the runs on the various days, he says: "The Naworth coal forms a splendid fuel for use on the Carlisle road. It is rather small and there is not much smoke from it. Forms very little clinker, which is very porous and not in any way adhesive. There is very little char deposited in the smokebox. It is far more durable than either Blackett or South Tyne coal, and can be used without being mixed with South Yorkshire coal. I found, when using this mixture, that the engines did not steam any more freely than when using Naworth coal alone. From my experience with this coal and the results of the tests, I can, without the least hesitation, recommend it for use by itself at Carlisle in place of either Blackett or South Tyne coal. It is one of the cleanest coals I have used with locomotives, and burns in the firebox very similarly to the Welsh coal." Thereupon a contract was made with the colliery to supply 300 tons of the coal per week at the price of 13s., and it was stipulated in correspondence attached to the contract that the coal should be screened over 3/4-inch screens so as to prevent any slack being delivered with it. The deliveries of this coal began on July 1st, and on August 1st a complaint was received at Derby that the coal was giving trouble. I will hand in the whole of the documents. Thereupon, on August 5th (a Sunday and Bank Holiday intervenes), an inspector was sent down to Carlisle to look at the coal. Here is his report which I will hand in. On August 6th the matter was taken up with the colliery people, and they came and inspected the coal, admitted that it was not right and agreed to put it right by increasing the space between the bars of the screens, and

so making the size larger, and thereupon deliveries commenced again, and these deliveries were again inspected by our inspector on August 21st, who had the trucks opened up, and he reported that the coal was fully in accordance with the contract and contained no slack, and thereafter we had no complaint at all. We have never received a complaint as to the quality of the coal, and we assumed, especially as the contract was a new one and the colliery company's attention having been called to the amount of slack and the matter put right, that the deliveries would be kept right, and we had no complaint on the subject. But undoubtedly from inspection which I have caused to be made of the coal which was left on the tenders of the engines on the day in question, I have come to the conclusion quite clearly that on that day out of that particular waggon which was sent in by the colliery there was an undue amount of small coal and slack. That particular waggon had not been properly screened. I want to guard myself against suggesting that there was any intentional change by the colliery in the character of the coal. I do not make that suggestion for a moment. I think it really had to do with their screens. They are not movable screens, they are fixed screens of an old-fashioned type. One can understand that when a screen is fixed the bars tend to become clogged up, and the slack, instead of going through on to the floor, gets into the waggon. This might well happen, and having regard to the character of the screen used, I think this is what did happen. I feel bound to say this in justice to the colliery company. I have dealt with this matter at some little length because I wanted to show that there was no foundation for the suggestion that we had bought this coal from motives of economy, or carelessly or without proper tests and safeguards. The question of the pilot engine has been explained by Mr. Paget. The load for the engine is fixed by the Company

solely from the point of view of estimating the load of the train which, when pulling it, a driver had to keep time with, so that if the load is exceeded he is entitled to ask for a pilot. If he does not get one he will probably lose time. It is purely an internal calculation made by the Company for the purpose of deciding what is a fair load to take with an engine upon which it is expected that a driver shall keep time. As regards mere pulling, this particular engine could have pulled 400 tons. There is no question of safety at all. There has been criticism of the interval of time between the first and second train. That is made without a true conception of what the Block System is. It has been suggested that the eyesight tests were not properly carried out. As to that I should just like to say what is the practice of the Company. Men suitable for employment as engine-cleaners are examined medically and as to eyesight, both for distance and colour, before they are appointed. Tests are again made before a cleaner is made a fireman, and again before a fireman is made a driver. The eyesight of all drivers, firemen, and passed cleaners is periodically tested both as to distance and colour; in the case of men under 40 years of age every 2 years, and in the case of men over 40 every 12 months. Any cleaner, fireman, or driver who is absent from duty through illness is required to produce a medical certificate of fitness before being allowed to resume work, and if it extends over three months, they are examined as though they were new entrants into the service. If any man whilst continuing at work shows any signs of weakness he is required to undergo an examination, and as a matter of fact these two men were examined and passed for eyesight as late as August 27th and 29th of this year. I think that is all that I desire to bring forward. If there is anything that you would like me to answer I would try to do so.

Evidence.

Taken on the 16th September.

William Tweeda, sleeping-car attendant, stationed at St. Pancras, states: I have 6 years' service with the Company and have been acting as sleeping-car attendant and collector during the summer months the whole time. I came on duty on September 1st at 4.30 p.m. and would ordinarily book off duty at 8.45 a.m. I was off duty on the Sunday previous. I was in charge of sleeping car No. 171, and started with the train from Inverness to work to London. This car was the fourth vehicle from the engine on the 1.49 a.m. express, Carlisle to London. There were five passengers in my car. I was in charge of the ticket collecting on the train. There were 11 first-class passengers and 32 third-class passengers in the last four coaches of the train of which I was in charge. The two front coaches were in charge of another sleeping-car attendant. I was sitting on the end bench in the sleeping car when the collision occurred. I did not notice that the train had been running slowly previous to this, and did not observe that the brake had been applied violently previous to the moment of collision. I was thrown on the floor in the gangway and my shoulder was injured. I did not make a note of the time, but believe

the collision occurred about 3 a.m. or very shortly afterwards. The only damage in my sleeping car was crockery broken, and an urn for heating water was thrown down on the floor. The car is lighted electrically, and the lights were not put out by the collision. There is a gas ring for heating purposes in the pantry supplied from a cylinder carried under the coach. The first thing I did was to turn the gas off. Two of the sleeping-car passengers, ladies, were thrown out on to the floor, but they were not injured. The shock of the collision was not a very violent one. One of the gentlemen in the car told me that he woke up, and turned over and went to sleep again, thinking it was only a rough shunt. I then got out on to the 6-foot side of the train and went up towards the engine. I met guard Walker on my way, he was going back to the rear of the train to protect it. He had been riding in the front vehicle, a compo. brake behind the engine. He had passed along the corridor about 10 minutes before the collision, and had gone to the front van to sort parcels. When he had completed this work he would have gone back to the rear brake. I asked the guard what was wrong, and he said he did not

know exactly. He said: "You get some detonators and go forward and protect the down line. He gave me detonators for the purpose. I went forward, but someone told me that the down line was being protected, so I only went as far as the engine of my train. I found the engine was covered with wreckage and the front of the engine was inside a bogie third-class carriage. I cannot say to what extent the third-class carriage was actually smashed up. I saw a small fire had started, it was under the engine, I cannot be certain how far back from the buffer beams. I took it to be luggage of some kind that was on fire. It was not blazing—a smouldering fire—as if it was coming from cinders. There was certainly no gas jet burning amongst the wreckage. I should have noticed it if there had been. I smelt no gas, and heard no sound of the escape of gas. I took it to be that the baggage had been fired by live ashes thrown from the engine. I cannot say where the ashes came from; the fire was under the framing. The actual fire was amongst these ashes and cinders which were lying amongst the broken-up baggage. I do not think that more than 5 or 6 minutes could have elapsed after the collision when I saw this fire. So I ran back then to my car to get the "Rex" fire extinguisher. I also called to sleeping-car attendant Westbrook to get his extinguisher from his car. He was then going towards the engine. We went forward with these extinguishers and I gave mine to one of the passengers and showed him how to use it. There may have been one or two people alongside the engine when I first arrived and saw this fire, but certainly not a great number. After getting the extinguisher I called upon the passengers in my train to come out and give assistance. It was to one of these that I handed the extinguisher. I then went back to the front brake van behind the engine and got out two more extinguishers. They are kept on the shelf in the corner of the compartment. There was a difficulty in reaching the extinguishers. I had to crawl over the luggage and mail bags which were piled up to get them out. Westbrook was helping me. They were in serviceable order. One of them went off as I was getting it out of the van, so I bent the tube up and stopped the contents from being wasted. I handed the extinguishers to Westbrook. I believe he gave them to passengers who were waiting at the door. These extinguishers I got out after I had got out the first lot of tools from the cupboard in the second van (compo. brake 143). I took out all the tools there were in the cupboard and also the two lamps. I handed out the tools to the passengers and they carried them up to the engine. I lit the two lamps that were in the tool cupboard in this brake (No. 143) and took them forward after the tools had gone. I saw then that the fire was still burning there. It seemed to have increased in size, and it was then that I went back to get the other two extinguishers from the van behind the engine. I gave these two extinguishers to someone, and then went back again and got the tools out of the third brake compartment in the train, the one behind the sleeping car, and handed them out. There was only one passenger waiting at the van then, and he could not carry them all, so I carried some forward myself. We thought we had extinguished the fire on the first occasion when the extinguishers were used. On the last occasion that I have mentioned, when I

carried tools by myself to the engine, the second fire had started, and seemed to be located in the roof of the carriage that the engine had run into. It seemed to be round about the smoke stack of the engine. As far as I can recollect there were flames visible in this fire. Fully a quarter of an hour must have elapsed when I saw this second fire. There were a number of people in the coach, behind the engine of my train, which was badly damaged by the roof of the van at the rear of the first train, which had cut through the partitions of the carriage. The gentlemen in the compartments in this carriage were most of them able to get out without help. We heard the voices of two women who were crying, but we could not locate actually where they were. So I went into the brake compartment which formed the rear part of this carriage, climbed over the baggage and got in through the door which leads into the corridor which was on the near side of the train. I could not, however, get near where I thought they were, so I came back. I then called some passengers to go round on the near side of the train where I thought it would be easier to work, and got one of the doors open on that side into the corridor, and I crawled inside until I could touch them, and found out exactly where they were. It was so dark, however, that I could not do anything. I went under the couplings of the coaches and got a lamp from one of the people on the off side, came back with it, and got into the coach again with the lamp. I then got hold of a long piece of iron tubing, about 6 feet in length, and tried to use it as a lever to lift the timbers off the women, but was unable to do so. So I returned to the off side of the train—any wreckage that there was from this coach was on the off side of the train—and got two long pieces of wood 12 feet in length, and a passenger went into the coach. I stood outside and directed the movements of these timbers, and we managed at last, by using them as levers, to raise the timbers that were holding down the women and drew them out. One of them was badly injured. The other people in the carriage had been previously extricated. I should think about 40 minutes or three-quarters of an hour had elapsed before we could get these women out. The fire, when I saw it after doing this, was blazing violently. I saw no water being thrown on the fire. I do not recollect seeing buckets about. I do not remember whether I took them from the cupboards in which they are stored. I then assisted in lifting the injured passengers into the undamaged part of the train. I had to go into the vans to clear spaces for them. I met one of the passengers the second time I went back from the head of the train; he said to me: "I am a doctor. Can I be of any use?" so I told him his services would be wanted as soon as we could get out the injured passengers. The doctor had no bandages of any sort with him. We tore up the sheets obtained from the sleeping cars and they were used for the purpose. I went back when the train was taken to Kirkby Stephen. There was one doctor came up with an engine from Kirkby Stephen before the train was moved back. He had no appliances, but on arrival at Kirkby Stephen other doctors were present. One of the doctors, who had done most of the work, was a passenger on my train, and left it at Appleby. The train was taken back to Carlisle, and the uninjured passengers got out at that station, and the injured pas-

sengers were taken on in a railway carriage over the canal branch close to the infirmary, and were transferred to that institution. I furnished the doctors with hot water from the apparatus in the sleeping car. It never occurred to me that it was advisable to leave someone in charge at the scene of the fire, after we thought we had put it out, to watch it in case of a further outbreak. There were only two railway employees available in my train, myself and the other sleeping-car attendant, and we were fully occupied in trying to extricate the injured passengers. I thought that the fire had been finally extinguished. I do not think that, if the passengers had known where the tools were stored, they could have got them out more quickly than I did. There was bound to be some delay before the tools could reach the point where they were required. The "Rex" extinguishers seemed to work very well when I saw them used. The other extinguishers, which I got out from the brake compartment behind the engine, were also effective. The only fault we have to find with them is that they are too heavy for one man to work. It is quite easy for two men—one to carry the extinguisher and the other to direct the hose. We did not have to use any tools to extricate the women I have spoken of. I had a hatchet in my hand at one time, but I found it was not of any use. A screw jack would have been of service in lifting the timbers which were imprisoning the women. There would have been space to utilise a jack for this purpose, but an ordinary crowbar, even 6 feet in length, would not have been long enough. I did not see anyone using a hammer at any time under the coach that was burnt to close up a gas pipe, nor have I heard any talk that this was done. I only saw the fire from the off side of the train, and I certainly did not notice any jet of gas burning at any time.

George Westbrook, sleeping-car conductor, stationed at St. Pancras, states: I have had 17 years' service with the Company, 15 years as attendant on dining cars, afterwards as porter, and have acted as sleeping-car attendant since July last. I was in charge of sleeping car No. 155, which left Aberdeen at 7.35 p.m. on September 1st. This car was the second vehicle from the engine of the 1.49 a.m. express—Carlisle to London—on September 2nd. I came on duty on September 1st at 7 p.m., and would ordinarily go off duty at 8.45 a.m. I booked off duty at Aberdeen on September 1st at noon. I had charge of the first two carriages on the train leaving Carlisle, a bogie brake third No. 123 and sleeping car No. 155. There were nine passengers in the bogie brake and four passengers in the sleeping car, and six third-class passengers in the compartments at the end of the car—total altogether in the two coaches, 19. Nothing out of the common occurred on the journey until the moment of the collision. I did not notice any violent application of the continuous brake before the collision occurred. There was a big crash when the collision took place, and a lot of crockery fell from the shelves on my head. I looked out of the window on the six-foot side after the train had come to a standstill. I jumped out into the six-foot way without further delay, and told the passengers to wait until I found out what had happened. I then went forward to the engine and found a lot of debris round it. About four or five minutes might have elapsed after the collision. I saw the fireman of our engine walking along before I got to the engine. I got as close to the

carriage in which the engine was embedded as the wreckage would allow me, and saw there was a small fire amongst the broken woodwork under the floor of the carriage, or about the floor level. I cannot say whether it was in front of the engine buffer-beam or not. I ran back immediately to the train, and summoned the men passengers to come and give assistance. A number of them got out. I then jumped up into my sleeping car, got out the fire extinguisher, returned to the fire, and turned the extinguisher on it. I used it myself. I could see the spray falling upon the fire and quenching it. I did not stop to empty the extinguisher, but handed it to a passenger and went to fetch more. Tweeda was with me when I went back, and I assisted him in getting them out of the brake compartment in the first carriage of the train. We got two out of my car, and two out of the bogie brake which Tweeda handed to me. I cannot say for certain how many were got out of the other part of the train, but I remember getting some out of the back part of the train. I also assisted in getting out the tools. There was one set of tools in the bogie brake next to the engine and two other sets besides. It was Tweeda who actually opened all the tool cupboards in the train. I assisted in handing the tools out of the train. I cannot say for certain whether all the three tool cupboards were opened. I do not think that the cupboard in the bogie brake behind the engine was utilised at the time. I did not actually see the first fire extinguished, but it was making no way when I left it. After issuing the tools I got hold of a hatchet or felling axe, and tried to break into the second compartment from the front of the coach behind our engine. There were people in this compartment, but I did not succeed in forcing a way in. I was working on the six-foot side of the carriage. I remember that someone called my attention to the necessity for uncoupling the sleeping car from the bogie brake. I had a lantern in my hand and gave a light to the man who was uncoupling. I cannot say who it was that uncoupled. This was on the near side. I then got through the sleeping car again on to the off side, the six-foot side, and undid the gangway connections between the sleeping car and the bogie brake. I assisted in lifting injured passengers into my car. A doctor followed me into the sleeping car, and I assisted him by providing water, and I also provided linen sheets from the sleeping car for surgical purposes, and made the injured passengers comfortable with rugs and pillows. I subsequently went back with the train to Carlisle. The second time I saw the fire, it had gained in strength and was burning the sleeping car in front of the broken carriage like a furnace. I noticed no jet of gas burning when I first found the fire in the coach as I have described. If there had been such a jet burning I should certainly have seen it. I thought that this fire that I noticed was caused by burning coal or hot ash from the engine, and I remember seeing that some smouldering ash was lying about.

William Walker, passenger guard, states: I have been in the service of the North British Railway Company 15 years, and have been a passenger guard 12 years. I am a spare passenger guard, and know the road thoroughly between Edinburgh and Carlisle, and elsewhere on the North British system, also the Midland road between Carlisle and St. Pancras. I came on duty at Edinburgh on

September 1st at 11 p.m., and would ordinarily have booked off duty at 8.35 or 8.40 a.m. at St. Pancras. I booked off duty previously on August 31st at 7.25 a.m. The train was made up at Edinburgh, portions of it had come from Aberdeen and Inverness. On leaving Carlisle the train was made up of six coaches in the following order:—Brake third next to engine; composite sleeping car; compo. brake; sleeping car; compo. brake; bogie compo.; all these carriages were eight-wheeled bogie stock, and were all fitted throughout with the vacuum continuous brake with all wheels blocked. Three coaches were taken off the train at Carlisle. I was riding in the third-class brake next to the engine on leaving Edinburgh. I occupied all of the brake compartments of the train at one time or other during the journey. I tested the continuous brake in the third-brake compartment at the front of the train before leaving Carlisle. I do not remember whether I tested the brake at the rear of the train, by lifting the brake coupling off the plug. I was riding in the compo. brake compartment in the last but one vehicle of the train between Edinburgh and Carlisle. There was another guard riding in the three vehicles of the train that came off at Carlisle from the rear of the train. I remember seeing the vacuum-brake gauge in the last brake compartment on the train on the journey after leaving Carlisle, and the vacuum reading in the gauge was 20 inches then. I am perfectly satisfied that the brake connection through the train was complete. I am aware of the rule laid down that guards should test the brake at the rear of the train when vehicles are detached or attached. There was nothing unusual in the way the train travelled between Carlisle and Mallerstang. I believe there are distant, home, and advanced starting signals at Mallerstang. I did not see any of them as we passed them. I was engaged in the front brake. I was looking at my time-table. There was a deal of work in connection with the preparation of waybills and parcels. I was engaged in this work, and was not at liberty to observe signals. There is nothing to differentiate Mallerstang signal-box from other similar signal-boxes on the line. There is no junction, and it is not one of the places where it would be necessary for the guard, in accordance with the general rules, to be observing signals. The first thing that drew my attention was two short whistles. I did not know what the two short whistles could be for. I was in the act of rising to look out of the window when the crash of the collision came. I was struck over the eye by the boarding alongside the guard's seat in the van, and it knocked me back into the seat, and I did not recover my senses for a little while. When I recovered my senses I opened the door and got out on the six-foot side. I went back along the train towards the end and met guard Whitley with his lamp. He was on the six-foot side. I asked him what was wrong. I do not remember the exact words, but the meaning was that our train had run into his train. He then went on, and I concluded from what he said that it was my duty to go back and protect the rear of my train, so I returned to the brake compartment and got out my detonators and flags. My lamp had gone out with the crash of the collision together with all the lights in the coach, so I got down with the detonators and at once put down two a quarter of a mile in the rear of the train, and then returned for my lamp. Previous to this,

just after I had met guard Whitley, I saw car attendant Tweeda, and he enquired what was wrong. I said I could not be sure, but I thought it was serious from what Whitley had told me. He asked me for detonators to protect the down road. I told him I had seen guard Whitley and thought he would be protecting the road. The reason I did not take my lamp with me with the detonators was that everything was in darkness, and I could not find it, and I thought it was important to get the detonators down. After getting my lamp, as I was going back again to fulfil the rule of three-quarters of a mile protection, I met two passengers on the six-foot side. They asked what was wrong—I said that I could not be certain, that it was serious, and would they go and give assistance, so they went. I then went back three-quarters of a mile and put down detonators at quarter-mile intervals and stayed there. The engine from Kirkby Stephen, when it arrived, stopped at my detonators, and I told them where the trains were. I told them that I was short of detonators, and seeing that I was unfit to stay out longer I was taken back to Kirkby Stephen. I knew that there were two cupboards in the front and rear brake compartments with tools in them, but I was not certain about the centre brake compartment. My duty clearly was to go to the rear of my train in accordance with the rule and protect it. It was my first duty, and I had not time for anything else. I never was close to the fire, and can give no information about it.

Mr. David Bain, Carriage and Waggon Superintendent of the Midland Railway, states: I hand in particulars of:—(1) Damage sustained by the coaches of the two trains; (2) a list of tools and fire extinguishers carried on the trains; also a sketch of the tools; (3) lithograph drawing showing carriages Nos. 227 and 208; (4) photographs of gas cylinders fitted to carriages 227 and 208 as recovered from the wreckage; and (5) sketch showing details of steel channels outside timber solebars. The following vehicles contained tools and lamps:—

Nos. 254, 250, and 208 in the first express.

Nos. 123, 143, and 142 in the second express.

The total number of tools and appliances available in the two trains was as follows:—

Fire extinguishers:—

In brake vans and brake compartments	...	...	...	10
In sleeping cars	...	...	...	5
			Total	15

Fire buckets	...	...	...	24
Safety hand lamps	...	...	...	12
Hand saws	...	...	...	12
Hatchets and felling axes	...	...	...	12
Hammers (two sizes)	...	...	...	12
Pinch bars	...	...	...	12
Chisels	...	...	...	6
Drifts	...	...	...	6
Tin bafflers	...	...	...	12

In addition to these there are certain tools which would be available from the two engines, and a certain number of lamps would also be available from the engineer and guards. There are 353 passenger brake-vans which work in connection with main-line express traffic, including vehicles which contain accommodation for passengers as well as brake accommodation for guards. These comprise

stock owned jointly by the Midland and North British and the Midland and Glasgow and South Western Railways. 328 of these vehicles have been equipped with tools and fire appliances. The evidence with regard to taking out tools from six-wheeled van No. 204 is incorrect—it is one of those which have not been fitted so far. There were only three brake compartments fitted in the first train. The tin baffle shown on the sketch is used for extinguishing gas escaping from a broken pipe. We found, in experimenting with the escape of burning gas, that we were unable to put it out with water or extinguishers if it had a very strong pressure behind it, and I thought, and some of my staff agreed with me, that it could be put out if we put soil into a can and drove the soil into the pipe. We discovered that the pressure blew the soil out, but found that the can when used by itself readily put the flame out, and the tin bafflers are for that purpose, and they were supplied as part of the equipment. As soon as we had a fair number of vehicles fitted with cupboards containing the tools we sent out special vehicles to various depots—London, Leeds, Bradford, Bristol, &c., and men who had been specially trained, accompanied these vehicles as instructors, and instructed batches of the guards how to best use these tools, and showed them exactly how to take them out of the cupboards and put them in position again, and also instructed them as fully as possible as to the use of the whole equipment. There are a certain number of men always going out of the Company's service and fresh ones coming in, and these latter are trained from time to time as can be arranged. At present the senior guard is in charge of the train, and we have not recognised that in a case of this sort a particular man should be detailed to be continually on watch for a fire or for the chance of one occurring. (Mr. Loveday states: That the Company has not definitely laid it down as to which of the guards' duty it is to concern themselves with the issue of tools and appliances. So far it has always been left with the men to do the best they can. Personally, I think this is the best thing to do, to leave it to the men who are on the spot.) I may explain that with regard to the tools one or two of the witnesses have stated that the tools are too small; some were made small intentionally so that they would be available for use in the corridor. It was considered that the short hatchet and the short hammer would be useful in certain positions where there would not be much room to work. We experimented with the crowbar and came to the conclusion that it was about the right length for a man to readily and freely use. I do not think that guards have actually been instructed how to force open doors with these bars. We have tried these bars upon old carriage doors and considered that they were the handiest form we could suggest. If after enquiry we find a heavier crowbar will be useful we will readily supply it. Of course a large proportion of the men are always on duty, and you can only get small batches of them at a certain place at one time for instruction, and the same thing has to go on time after time. With regard to the complaint of a witness that the fire extinguishers were too large, we came to the conclusion that the extinguisher was of a size that could be readily handled by one man, and we were anxious to get these extinguishers as large and efficient as possible. Once an extinguisher is used there

is no means of shutting it off before it is exhausted. The contents of the extinguisher is a chemical mixture which forms gas under pressure. On the two vehicles that were broken up in the collision the last van, No. 208, had two gas cylinders, and the other, No. 227, had three. The dimensions of the two cylinders 208 (D) and 208 (E) on bogie van No. 208 are 5 feet 6 inches long by 20 inches diameter. In both these cases the only outlet of gas was where the pipe connection was broken off, one outlet in each case. These two cylinders were fully charged at Glasgow to a pressure of 105 lbs., and the pressure would be about 80 lbs. at the time of the collision. Since the accident careful tests have been made with these cylinders—the apertures were sealed up and they were charged with gas at a pressure of 80 lbs. The outlet was then freed, and in the case of 208 (D) it took 85 seconds for the pressure gauge to fall to zero; all the gas had practically then escaped. As regards cylinder 208 (E) it took 30 seconds for the gauge to fall to zero. The cylinders A, B, and C on the third-class bogie No. 227 were larger, they were 6 feet 4 inches in length. Cylinder (A) was crushed in at both ends, and the pipe connections broken off at the cylinder. (B) had a very small crack at one end and the connections were broken off. In the case of (C) the cylinder was rather badly dented at both ends, and the connections and plug on the underside of the cylinder were broken off leaving two holes for the gas to escape through. These plugs are for the purpose of taking out the deposit of hydro-carbon. At the tests with these cylinders the gas escaped in the case of:—(A) in 80 seconds, (B) in 90 seconds, and (C) in 30 seconds. After the pressure gauge fell to zero there was still a very slight trace of gas coming from the cylinders, which continued for about one minute for the smaller size cylinders to about two minutes for the larger ones. There was no breakage in the gas pipe connections of any other coaches on the trains and none of the cylinders were damaged. In the first train the three sleeping cars were electrically lighted; all the remainder of the vehicles were lighted by gas. The result of the tests with the cylinders show that when the damage was done there would have been no gas left in any of these cylinders in from 2 to 2½ minutes after the collision. I do not understand how it could have been possible to have seen gas burning from a broken pipe or aperture unless it was within the time stated after the collision. I do not see how one of the cylinders could have been driven along with the pile of luggage which was described as being the seat of the fire. I think that if any of the staff had remained at the fire and made intelligent use of the fire extinguishers, the fire would never have got hold of the vehicles. It was a slow fire to start with, and I feel certain that if there had been any pressure of gas the flame would have been very strong and very noticeable. I am satisfied that on the second occasion on which the fire was noticed, if there had been any gas escaping from any of the cylinders it would have flashed up immediately. I am satisfied that gas did not contribute to the fire in any way. I think Miss Clarke was the most observant of any of the witnesses, and what she stated would be the natural thing to happen, because the driver had said that the ashpan damper was open, and the fire must have got out of the ashpan and Miss Clarke said she saw it come out. I think the fire came from

the debris being ignited by the small cinders from the ashpan which would be shot out just underneath the level of the engine platform, about 2 feet 6 inches above rail level. (Mr. Loveday here stated that the fact that the bogie wheels of the engine were off the rails and raised would cause the cinders to be thrown out at a higher angle.) I do not think the red-hot ash thrown from the ashpan lighted the gas which would have escaped from the cylinders within two minutes of the accident. I do not think the first fire was thoroughly extinguished as has been the idea of many of the witnesses. My impression is the fire crept up very slowly, and unnoticed, inside the vehicle, and when it got to the roof the wind got hold of it and made it burn very quickly. If there had been a safety valve fitted to the cylinders under van No. 208 I think it would have prevented the gas escaping after the pipe was broken away. In the case of the cylinders under the third-class coach a safety valve would not have prevented the gas escaping. After your recommendation regarding gas cylinders, in connection with the mishap at Hawes Junction in 1910, we devised a different gas cylinder. We now use a cylinder smaller in diameter but very much longer, and it is housed inside the main framing, which is built up of steel. The cylinders are housed between the main members of the underframe, so they are practically iron clad, and at the end of each cylinder we have a valve, a very strong substantial fitting, which closes automatically when the pipe connections get broken. This does not prevent an escape of gas if the cylinder gets perforated. We think the cylinders are so strongly made and so well protected by the steel under-framing that there is practically no chance of them getting perforated. All the new vehicles that we have built since we got the apparatus satisfactorily designed have had these valves fitted. We have 125 vehicles with the new fittings, and in addition we have altered 62 of the main-line vehicles so far as the pipe connections are concerned, and put these valves on. It took us some considerable time before we got a satisfactory valve. Both the coaches destroyed by this collision, Nos. 227 and 208, had underframes of the old type, and were constructed of timber about 1900 or prior to that time. The resist-

ance offered by such frames in a collision of this description would be comparatively small, and accounts for the damage done to the vehicles—they were split open. This would not have happened if they had been steel frames. I think if they had been the new type of underframe with the new buffers, the passengers in the vehicle so badly damaged would have got off with a very bad shaking. The main underframe of new stock is constructed of steel channels—it is strongly braced together, and is a structure that will take the maximum end thrust. From mishaps during recent years we found that these frames stand a very severe shock indeed before they collapse. We have very carefully considered the design of the new buffer, and so long as vehicles remain approximately in their right position on the road this buffer, in combination with the new steel frame, will prevent telescoping up to a speed of 30 to 40 miles an hour. In addition to the ordinary buffer spring we have inserted at the base of the buffer casting a large pad of rubber. The buffer castings which have to take the blows in case of collision used to be made of cast iron, but are now made of steel, and to get the maximum strength we make a double case—really two buffers, one inside the other. The blow is taken up first by the inside case and afterwards the second (outside) case is brought into play if the blow is violent enough. If you take a rigid vehicle, in the case of a collision at, say, 60 miles an hour, the vehicles would, in my opinion, probably get thrown on to their sides, since the force of the train must be spent in some direction. We think that the danger would be greater in this contingency than with telescoping, because if thus thrown whilst travelling through tunnels, or under over-bridges, or along viaducts, the vehicles would get absolutely crushed against the structures of bridges, tunnels, and so forth. We have been seriously considering the question of fire-proof material. Sleeping cars recently constructed have had all the roofs and other portions made of deal wood fire-proofed, but it is very expensive, and it is not known if it will prevent fire after a term of years. We also find that the acids used have a bad effect on the nails and screws and other attachments.

APPENDIX I.

(1) DETAIL OF DAMAGE TO ENGINES.

Engine No. 446.—Chimney broken; dome and manhole copper covers damaged; signal whistle broken; large ejector casting and vacuum and drip pipes broken off; both engine hand rails bent; brass beading on splashers broken; smoke-box door damaged; number plate broken off and front hand rail damaged; both leading buffers, castings, and bolts broken off; front screw coupling broken off and drawbar hook damaged; Spencer buffer spring burnt; engine fall plate

damaged; all lamp irons and front vacuum pipe broken off; engine foot plate bent and damaged; all weatherboard glasses, steam pressure and vacuum gauges broken; gauge stand burnt off; engine life guards broken; dust shields broken off; both sand pipes, steam pipes, and stays broken; foot board burnt; lead out of back lead plug fused and fire-box top damaged; metal knocked off the inside, right leading bogie box.

Engine No. 993.—Steam brake-pipe broken.

(2) PARTICULARS OF DAMAGE TO COACHING STOCK.

1.35 a.m. Train:—

Brake No. 254.—One headstock damaged.

Sleeping Car No. 2770.—One headstock damaged.

Sleeping Car No. 2777.—Two buffer castings broken.

Bogie Third No. 237.—One mirror and one photo-frame glass broken.

Van No. 204.—Rear end of van and gangway damaged; one drawbar hook broken off.

Composite Brake No. 250.—Both headstocks broken; one brake hosepipe damaged; gangway frame bent and canvas torn.

PARTICULARS OF DAMAGE TO COACHING STOCK—*continued.*

- Bogie Third No. 79.—One headstock broken; two diagonal plates bent and bolts broken; one buffer spring badly strained.
- Sleeping Car No. 2785.—Buffer castings at rear end broken, and body burnt down to floor level.
- Bogie Third No. 227.—Demolished; wreckage destroyed by fire.
- Van No. 208.—Demolished; wreckage destroyed by fire.
- 1.49 a.m. Train:—
- Bogie Third Brake No. 123.—Three passenger compartments and lavatory badly damaged, having portion of roof of No. 208 driven through the compartments.
- Sleeping Car No. 155.—One headstock broken; one top bogie centre casting broken.
- Bogie Composite Brake No. 143.—One headstock broken.
- Composite Sleeping Car No. 171.—Both headstocks broken.
- Bogie Composite Brake No. 142.—Both headstocks broken.
- Bogie Composite No. 122.—Not damaged.

LIST OF DAMAGED PERMANENT WAY MATERIALS.

<i>Down Line.</i>	<i>Up Line.</i>
2 100 lb. 36 ft. Rails, 24 Chairs, 6 Fish Plates, 48 Trenails, 24 Keys, 24 10 in. by 5 in. Sleepers.	4 85 lb. 30 ft. Rails, 36 50 lb. Chairs, 6 Fish Plates, 100 Trenails, 29 10 in. by 5 in. Sleepers, 50 Keys.

The masonry in centre arch of Bridge No. 136 slightly damaged by fire.

APPENDIX II.

EXTRACTS FROM THE COMPANY'S BOOK OF RULES AND REGULATIONS REVISED 1st JULY, 1912.

6. The safety of the public must, under all circumstances, be the chief care of the servants of the Company.
36. When an engine driver finds a distant signal at danger he must reduce speed and proceed cautiously towards the home signal, being prepared to stop if necessary.
- 40 (a). When the starting signal is at danger, the home signal must not be lowered for an approaching train until the train is close to the home signal, and has been brought quite, or nearly, to a stand at it.
- (b) The engine driver of any train which has been thus stopped, or brought nearly to a stand, at a home signal, must, after that signal has been lowered, go slowly forward towards the starting signal, but must only proceed as far as is necessary to leave the last vehicle well clear of the points and crossings, and within sight of the signalman. The starting signal must not be passed until it is lowered, except as provided in Rule 44.
- (c) If the signal-box is between the home and starting signals, the engine driver must be prepared to stop at the box, if necessary.
44. Starting signals (where advanced starting signals are not provided) control the entrance of trains into the section ahead, and must not be passed when at danger
74. The absence of a signal at a place where a signal is ordinarily shown must be considered a danger signal and treated accordingly.
- 76 (a). Detonating signals must be used for the purpose of attracting the attention of engine drivers
139. The engine driver must keep a good look-out all the time the engine is in motion, and the fireman must also keep a good look-out when he is not necessarily otherwise engaged.
143. The engine driver and fireman must carefully observe all signals, and when, from fog or falling snow, or from any other cause, the fixed signals are not visible as soon as usual, the speed must be reduced, and every possible precaution used, so that they may be able to stop the train short of any obstruction, should the signals be against them.
- 147 (a). 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.
- 217 (a). When a train is stopped by accident, failure, obstruction, or other exceptional cause (unless it has arrived at or passed the home signal), the guard, if there be only one, or the rear guard, if there be more than one, must immediately go back three-quarters of a mile, unless he arrive at a signal-box within that distance, plainly exhibiting his hand danger signal, to stop any following train, and he must take detonators which must be placed upon the line on which the stoppage has happened as follows, viz. :—
- One detonator a quarter of a mile from his train,
One detonator half a mile from his train, and
Three detonators, 10 yards apart, not less than three-quarters of a mile from his train,
- and must also continue to exhibit his hand danger signal to stop any coming train.
- (j) the guard must not return to his train until recalled by the engine driver sounding the whistle of his engine, and, when recalled he must leave the three most distant detonators, and return to his train taking up the other detonators on his way. Should he be recalled before reaching the prescribed distance, he must then place on the rails three detonators, 10 yards apart, and return to his train taking up the other detonators on his way.

LOAD FOR MAIN LINE PASSENGER ENGINES.

Derby, July, 1910.

The following table of loads for passenger engines supersedes all other, and with them drivers should, in normal weather, be able to keep time, without the assistance of pilot engines. It may happen, however, that it is necessary to make up the trains heavier than shown in this list, or that the weather conditions are not normal, and in such cases it will be left to the discretion of drivers whether they call for the help of a pilot engine; but they must not ask for assistance unless absolutely necessary. Whether working trains alone or with an assistant engine, the speed limitations on various parts of the line must be rigidly observed, and there must be no excessive running down falling gradients.

Both up and down between	Loads in tons.		No. 2.	No. 4.	
	No. 2.	No. 4.			
Carlisle and Hellfield	180	230	...	...	With 2nd limit trains.
	190	240	...	...	With full load trains.

NOTICE TO DRIVERS AND FIREMEN.

PRECAUTIONS TO BE TAKEN TO PREVENT INJURY.

Accidents have occurred to drivers and firemen through their failure to take proper precautions when they have gone out on to the engine framing, or on to the top of the tender while the engine was moving.

Drivers and firemen are hereby cautioned against leaving the footplate unnecessarily when the engine is in motion.

Rule 24A of the Company's Rule Book warns all servants of the Company not to expose themselves to danger, and drivers and firemen are hereby requested to take such precautions at all times as will ensure them from risk of injury.

BY ORDER.

General Superintendent's Office,
Derby, May 1st, 1911.

APPENDIX III.

30th July, 1908.

Report on a sample of *Blackett Steam Coal*, supplied by the *Blackett & South Tyne Collieries, Ltd.* Sample taken from three waggons re-labelled from Carlisle to Derby for trial.

Result of Analysis:—

Moisture	...	...	...	...	...	...	...	...	2.38
Ash	...	...	...	...	...	...	...	...	4.99
Volatile Matter	...	...	...	...	...	...	...	...	33.50
Fixed Carbon	...	...	...	...	...	...	...	...	59.13
									<u>100.00</u>

Sulphur, per cent. of coal	...	...	...	...	...	...	...	...	2.82
Iron, per cent. of ash	37.4

Calorific Value:—

British Thermal Units per pound of coal	14.326
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This coal is very similar to that supplied to us from *Byron and Roachburn Collieries*. It has a high calorific value, but contains an excessive proportion of sulphur, and a large amount of iron in the ash. It is, therefore, *likely to form a fusible and dense clinker*.

(Signed) L. ARCHBUTT.

15th May, 1913.

Report on a sample of *Steam Coal* from *Naworth Colliery, Cumberland*, taken from three waggons sent to Carlisle for trial.

J. FENWICK,
Newcastle-on-Tyne.

Result of Analysis:—

Moisture	...	...	...	...	...	...	...	...	2.20
Ash	...	...	...	...	...	...	...	...	1.92
Volatile matter	...	...	...	...	...	...	...	...	22.42
Fixed carbon	...	...	...	...	...	...	...	...	73.46
									<u>100.00</u>

Sulphur, per cent. of coal	...	...	...	...	...	...	...	...	0.57
Iron, per cent. of ash	...	...	...	...	...	...	...	...	19.6

Calorific Value:—

British Thermal Units per pound of coal (to the nearest 50 units)	15,150
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This is a coal of very high calorific value, equal in this respect to the best of the *Welsh* coals supplied to us. It is low in sulphur, very low in ash and moisture, and better than any of the coals I have examined from the *Northumberland (Plainmeller) Coalfield*.

(Signed) L. ARCHBUTT.

APPENDIX IV.

Statement of Accidents to Trains in which the wreckage caught fire, showing how the passenger vehicles were illuminated in Years 1898-1913, inclusive.

Date.	Railway.	Place where Accident occurred.	Description of Accident.	How passenger vehicles were illuminated.	Remarks.
1898. September 2nd...	Midland ...	Wellingboro' ...	Derailment through collision with a luggage barrow.	Gas... ..	Fire caused by escape of gas.
1900. June 16th ...	Great Western	Slough	Collision ...	Not stated	A portion of wrecked carriage, which overhung broken chimney of engine, caught fire.
1905. January 17th ...	Midland ...	Cudworth ...	Collision ...	Electricity... ..	Cause of fire, whether electric light, gas, or engine, could not be stated.
July 27th ...	Lancashire and Yorkshire.	Hall Road ...	Collision ...	Electricity... ..	Slight charring, due to short-circuiting between broken traction conductors and iron-work under car.
September 1st ...	Great Eastern..	Witham	Derailment ...	Gas	Fire due apparently to escape of gas.
1906. September 19th	Great Northern	Grantham ...	Derailment ...	All vehicles but two lighted by gas.	Two separate fires. One apparently originated from engine. The other appeared to be due to escape of gas.
1909. January 21st ...	Lancashire and Yorkshire.	Marsh Lane Junction.	Collision ...	Electricity... ..	Fire due to arcing of high pressure traction cables.
1910. December 24th...	Midland ...	Hawes Junction	Collision ...	Gas, with the exception of two sleeping cars which were electrically lit.	Fire caused by escape of gas.
1911. July 28th ...	London and North Western.	Crewe	Collision ...	Gas	Carriage roof set on fire by engine.
1912. January 29th ...	Midland ...	Washwood Heath Sidings, near Saltley.	Collision ...	Gas	Fire caused by escape of gas.
April 5th ...	North Eastern	Eaglescliffe North Junction.	Derailment ...	Gas	Fire caused by escape of gas.
September 17th	London and North Western.	Ditton Junction	Derailment ...	Five vehicles lit by gas, and two by electricity.	Fire attributed to escaping gas.
1913. September 2nd...	Midland ...	Ais Gill	Collision ...	Gas, with the exception of sleeping cars and one other vehicle which were electrically lit.	Dual cause of fire—gas and live ash from engine.

NOTE.—In two cases, (1), of the derailment of a passenger train in Catesby Tunnel (Great Central Railway) in January, 1906, and (2), the derailment of a passenger train near Chevington (North Eastern Railway), in September, 1913, gas was found escaping, but in both cases precautions were taken to prevent it catching fire, which were successful.

APPENDIX V (1).

Statistics regarding Illumination of Coaching Vehicles on 16 Railways in the United Kingdom.

Name of Railway.	Number Gas Lighted on		Number Electrically Lighted on		Lighted otherwise.		Total Coaching Vehicles.	
	31 Dec., 1910.	31 Aug., 1913.	31 Dec., 1910.	31 Aug., 1913.	31 Dec., 1910.	31 Aug., 1913.	31 Dec., 1910.	31 Aug., 1913.
Great Central	1,242	1,138	432	553	27	103	1,701	1,794
Great Eastern	4,341	4,245	341	341	—	—	4,682	4,586
Great Northern	2,902	2,890	286	297	11	2	3,199	3,189
Great Western	5,721	5,634	336	624	59	44	6,116	6,302
Lancashire and Yorkshire... ..	4,004	3,927	382	384	—	—	4,386	4,311
London and North Western	4,917	4,603	2,459	2,657	4	2	7,380	7,262
London and South Western	2,152	2,084	1,456	1,583	99	68	3,707	3,735
London, Brighton and South Coast	1,628	1,549	724	939	175	105	2,527	2,593
Midland	4,729	4,559	756	816	197	162	5,682	5,537
North Eastern	3,724	3,716	473	510	—	—	4,197	4,226
South Eastern and Chatham	910	823	2,174	2,176	563	529	3,647	3,528
Caledonian	1,717	1,705	260	308	284	254	2,261	2,267
Glasgow and South Western	1,058	1,060	49	59	20	18	1,127	1,137
North British	1,818	1,970	243	249	779	516	2,840	2,735
Great Northern (Ireland)... ..	—	—	418	409	15	15	433	424
Great Southern and Western	611	633	19	1	22	22	652	656
Totals	41,474	40,536	10,808	11,906	2,255	1,840	54,537	54,282

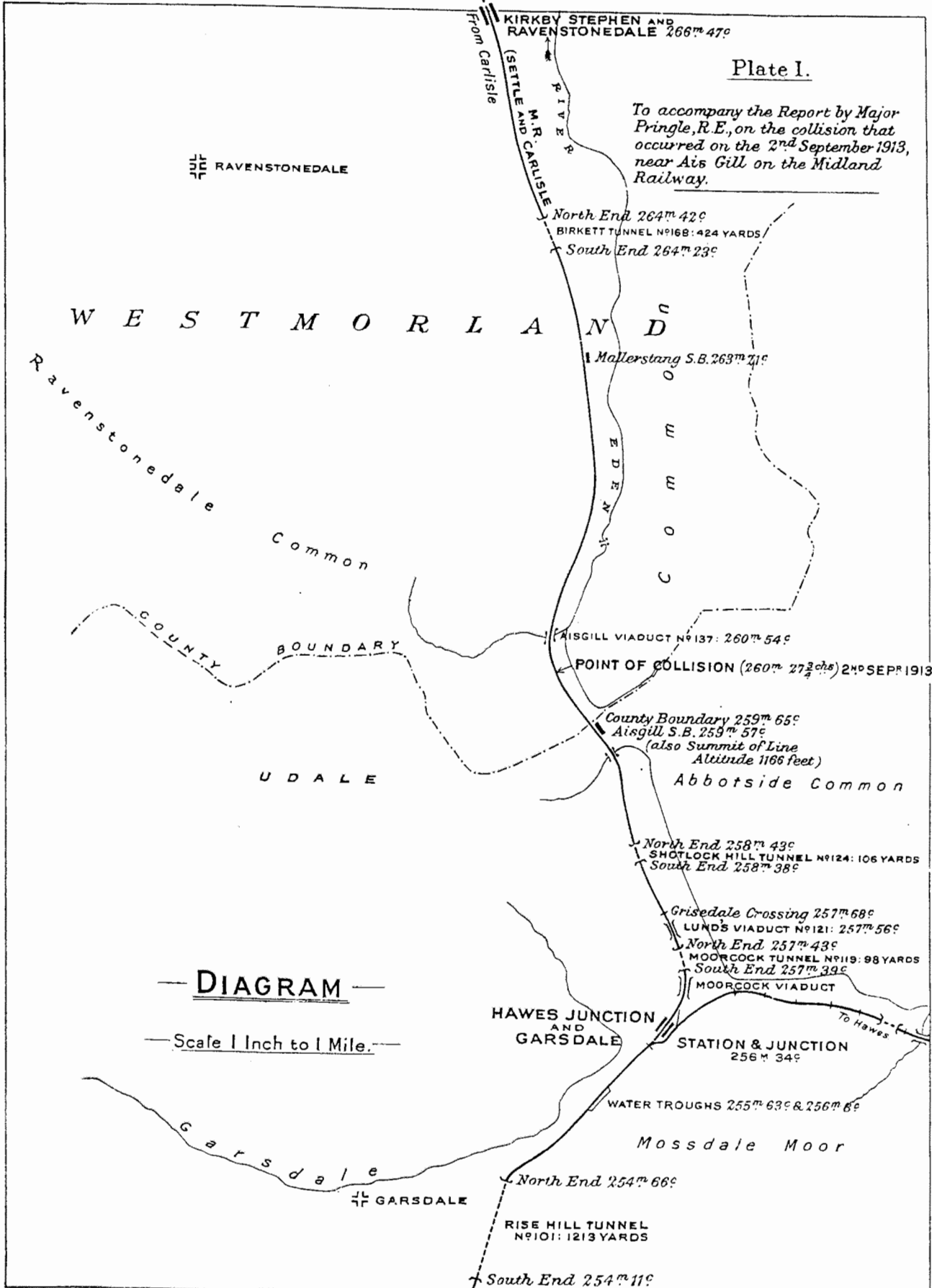
APPENDIX V (2).

PERCENTAGES.

Railway.	Percentage of Coaching Vehicles lit by Gas.		Percentage of Coaching Vehicles lit by Electricity.		Percentage of Coaching Vehicles lit by Oil or otherwise than by Gas or Electricity.	
	31 December, 1910.	31 August, 1913.	31 December, 1910.	31 August, 1913.	31 December, 1910.	31 August, 1913.
Great Central	73·0	63·4	25·4	30·8	1·6	5·7
Great Eastern	92·7	92·5	7·3	7·5	—	—
Great Northern	90·7	90·6	8·9	9·3	·3	·1
Great Western	93·5	89·4	5·5	9·9	1·0	·7
Lancashire and Yorkshire	91·3	91·1	8·7	8·9	—	—
London and North Western... ..	66·6	63·4	33·3	36·6	·1	·0
London and South Western... ..	58·0	55·8	39·3	42·4	2·7	1·8
London, Brighton and S.C.	64·4	59·7	28·7	36·2	6·9	4·0
Midland	83·2	82·3	13·3	14·7	3·5	2·9
North Eastern... ..	88·7	87·9	11·3	12·1	—	—
South Eastern and Chatham	25·0	23·3	59·6	61·7	15·4	15·0
Caledonian	75·9	75·2	11·5	13·6	12·6	11·2
Glasgow and South Western	93·9	93·2	4·3	5·2	1·8	1·6
North British	64·0	72·0	8·6	9·1	27·4	18·9
Great Northern (Ireland)	—	—	96·5	96·5	3·5	3·5
Great Southern and Western	93·7	96·5	2·9	·2	3·4	3·4
General Percentage	76·0	74·7	19·8	21·9	4·1	3·4

Plate I.

To accompany the Report by Major Pringle, R.E., on the collision that occurred on the 2nd September 1913, near Ais Gill on the Midland Railway.



DIAGRAM

Scale 1 Inch to 1 Mile.

Plate II.
 To accompany the Report by Major Pringle, R.E., on the collision that occurred on the 2nd September 1913, near Ais Gill on the Midland Railway

