MINISTRY OF TRANSPORT

RAILWAY ACCIDENT

REPORT ON THE COLLISION

which occurred on

2nd September 1960

at

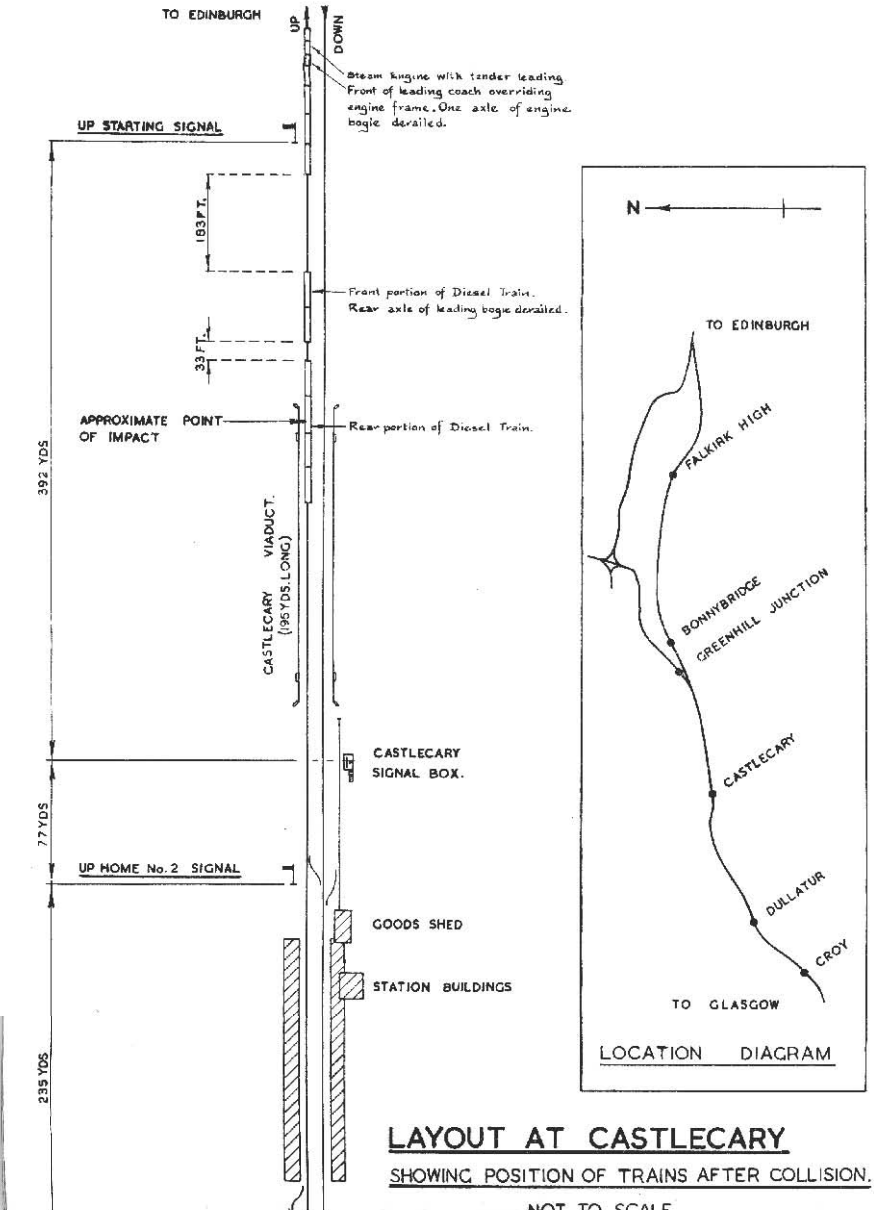
CASTLECARY

in the

SCOTTISH REGION
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE
1961
TWO SHILLINGS NET

COLLISION AT CASTLECARY
2ND. SEPTEMBER 1960



LAYOUT AT CASTLECARY

SHOWING POSITION OF TRAINS AFTER COLLISION.

NOT TO SCALE

MINISTRY OF TRANSPORT,
ST. CHRISTOPHER HOUSE,
SOUTHWARK STREET,
LONDON, S.E.1.

21*st February* 1961.

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order dated Friday, 2nd September 1960, the result of my Inquiry into the collision that occurred at about 7.58 a.m. that day on the Up Main line at Castlecary, between Glasgow and Edinburgh, in the Scottish Region, British Railways.

In patchy fog the 7.30 a.m. Class A Glasgow to Edinburgh six-coach diesel multiple unit passenger train, which had been irregularly admitted into the Dullatur-Castlecary block section before the previous train had cleared it, collided at a speed of 25-30 m.p.h. with the rear of the slowly moving steam-hauled 7-12 a.m. Cowlairs to Greenhill four coach empty coaching stock (ECS) train between the Up Home No.2 and the Up Starting signals at Castlecary.

The Castlecary Up Distant signal had been at Clear when the diesel train passed it and this train was travelling at speed when its driver saw at short range the Castlecary Up Home No.1 signal unexpectedly at Danger; his reaction was slow and he braked too late to stop short of the train ahead. The ECS train had been stopped at Up Home No.1 signal and, after Up Home Nos.1 and 2 and the Up Starting signals had been cleared, was approaching the Starting signal when this was put back to Danger in the driver's face: fortunately he had no time to apply the brakes before the collision occurred and this mitigated its results. The relative speed of the collision was between 10 and 15 m.p.h.

The buffers on the leading diesel coach were broken off, its headstock was torn away, and the front end flanges of its solebars were bent, but the driver's cab was not stove in and the driver was not hurt. The rest of the train, which was well loaded, was very little damaged, there was no flying glass, and only 9 out of 123 passengers were injured sufficiently to need hospital treatment: only one of these was injured seriously and he was discharged from hospital on 10th December. The buckeye coupling between the third and fourth coaches was forced apart during the collision and the divided train came to a stand with its two portions 33 feet apart, but the couplings had kept the train in line and only one pair of wheels, on the leading bogie of the front portion, was derailed.

Damage to the ECS train was greater but was largely confined to the coach next to the engine which was running tender first. The shock of the collision, transmitted through the other coaches, forced the leading end of this coach up off its bogie, which continued forward till it struck the engine's bogie derailing one pair of wheels, and thrust it forward over the front of the engine's frame till it hit the smokebox, which stove it in. The other coaches were little damaged. With its brakes off the train was propelled forward and the two trains came to rest 183 feet apart.

The permanent way was only slightly damaged and the signalling equipment was unaffected. The Down Line was not obstructed but it was closed to traffic to facilitate clearance of the damaged trains.

Immediate medical aid was given by two doctors who had been passengers on the train and by a local doctor who had been summoned promptly, but, owing to an error of judgment by the Castlecary Station Master, ambulances were not summoned until 9.15 a.m. and the three passengers whose condition necessitated their removal by ambulance did not leave for hospital until 9.55 a.m. The remaining passengers walked back along the line for about ½ mile to Castlecary station whence they were taken forward by bus or taxi. Other emergency arrangements were prompt and the line was cleared by 1.22 p.m. when working at restricted speed was introduced: normal working was resumed at 4.50 p.m. some nine hours after the accident.

Although the morning mist had begun to thicken in patches into fog, weather conditions until very shortly before the collision had not been such as to warrant fogsignalmen being called out. It was not raining.

DESCRIPTION

Layout and Signals

1. Castlecary is a wayside station on the main line route, classified as "very important", between Glasgow (Queen Street) and Edinburgh (Waverley). In the Up direction the signal box in rear is Dullatur East (2 miles away) and that in advance is Greenhill Junction (1¾ miles away). The maximum permitted speed is 75 m.p.h. (70 m.p.h. for diesel trains).

2. The diagram shows the general layout at Castlecary, the distances between the signals, the approximate point of impact, and the positions of the trains after the accident. The Up Distant signal, which is not shown, is 1389 yards in rear of Up Home No.1 signal. All the signals are

upper quadrant semaphores with oil-lit lamps. The arm and light of the Up Distant signal are both repeated in Castlecary signal box; the two Home signals are not repeated. Up Home No.1 signal is the Castlecary fogmark: it is 312 yards from the box and shows its back to the signalman but from his viewpoint its arm is against the sky. The Up line falls at 1 in 1200 from Dullatur to the east end of Castlecary Viaduct, whence it continues level for some miles.

3. In normal weather drivers on the Up line get a reasonably early view of the Castlecary signals, but on this occasion the view of all the relevant signals was limited by the patchy fog. Automatic Warning System equipment is installed on this line and the inductor for the Castlecary Up Distant signal is 185 yards on the approach side of it.

4. There is an intermediate block section on the Down line between Dullatur East and the box ahead (Croy). This somewhat increases the work of the Dullatur East signalman.

Signal Controls

5. The main line through Castlecary is worked on the Absolute Block system, in accordance with the former London and North Eastern Railway Absolute Block Regulations, and with three-position block instruments. The instruments at Dullatur East are of Scottish Region pattern with the indicators for both lines mounted, one above the other and above the commutator handle, in one instrument case. In the Scottish Region pattern instrument the indicator controlled by the instrument's own commutator is always the lower of the two, with the indicator controlled by the commutator in the box ahead above it. The instruments at Castlecary are of ex-L. & N.E.R. pattern with the needle-type indicators for the Up and Down lines mounted in separate instrument cases. The receiving block instrument for the Up line from Dullatur East, which controls the Up line indicators there, is of the "pegger" type: a positive movement of the commutator handle to left or right, while the top catch is held off with the thumb, is needed for deflecting the indicator needle from the vertical or "Line Blocked" position to "Line Clear" or "Train on Line", and vice versa. The block bell from Dullatur East rings with a note quite distinct from that of the bell from Greenhill Junction. Similarly at Dullatur East the block bell from Castlecary is quite distinct from that from the next box in the other direction.

6. The Up Starting signal at Dullatur East is controlled by the condition of the block and cannot be cleared until the Castlecary signalman has accepted the train and has released the signal lever by pegging the Up line indicator to "Line Clear": such a release is for one clearance only and the signal lever once put back cannot be cleared again until another acceptance and consequently another release have been given. If, after it has been pegged to "Line Clear", the indicator is pegged to "Train on Line" by the signalman at Castlecary without the Starting signal at Dullatur East having been cleared, the release is cancelled and the signal then cannot be cleared until a further release has been obtained.

7. Controls on the Up line signals at Castlecary ensure that "Line Clear" cannot be pegged, and consequently the Starting signal at Dullatur East cannot be released, unless the Castlecary Up Home No.1 signal lever is normal and the Up Distant signal arm is at Caution. There are, however, no track circuits in the Up line at Castlecary, and thus there is no "Welwyn" control (with this control "Line Clear" cannot be pegged for a train until the previous train has occupied and cleared a track circuit at the far end of the section or a special emergency release has been operated). The Up Starting signal at Castlecary cannot be cleared until the signalman at Greenhill Junction has accepted the train and turned his Up line indicator to "Line Clear". There is sequential locking between the stop signals.

The trains

8. The diesel train was of the Inter Cities type with four motor and two trailer coaches, one of which was a buffet coach. Its overall length was 399 feet and it weighed 219 tons unladen. It was buckeye-coupled throughout and fitted with standard vacuum brakes: all wheels were braked and the available brake power was 186 tons or 85% of the unladen weight. Automatic Warning System equipment was installed in the leading coach and was operative at the time of the collision. The leading coach was a Type X Motor Second Brake and had two front windows giving the driver, who sat on the left, a good view ahead. As with all Inter Cities type diesel coaches, its buffers had been added to the original bufferless design, for shunting purposes, and were not very strongly supported.

9. The ECS train comprised one semi-corridor and three non-corridor coaches hauled by a Class 5 M.T. 4-6-0 steam engine travelling tender first. Its overall length was 275 feet and it weighed 238 tons. All the coaches had steel underframes but the coach next to the engine had a timber and not a steel body frame with timber panels. This latter coach, a semi-corridor compo, was built in 1927: the other coaches were all built after 1950.

Effects of the Collision

10. The buffers of the leading diesel coach did not transmit the full shock of impact back along the solebars which were thus very little distorted, their end flanges only being bent. The headstock

was torn away and the buffers broken off, but there was no serious crumpling of the front end of the underframe and very little real damage above it: so little was the driver's cab distorted that the toughened glass in one of the two front windows was only starred. The trailing wheels of the leading bogie only were derailed. The buckeye couplings throughout the train were damaged and that between the second and third coaches parted: the buckeye on the rear of the second coach was bent upwards by the punch of its counterpart on the front of the third coach which was itself then bent downwards when, in forcing itself free, it struck and distorted the gangway frame above it. Other damage throughout the train was superficial.

11. The rear three coaches of the ECS train also escaped serious damage and remained on the rails, though bogies in two of them were displaced. The shock of the impact was transmitted through their frames, which were not distorted, to the frame of the coach next to the engine which buckled sideways near its mid point and was bent upwards at its front end. The sideways buckling, though severe, did not seriously damage the compartments above it but the leading compartment was concertinaed when the leading end of the coach was forced upwards off its bogie and on to the front of the engine; the next two compartments also were extensively damaged and the outer corridor wall was torn away. It was the distortion and damage in this coach that absorbed most of the energy of the collision and it was fortunate that the coach was empty. The engine's bogie was derailed, probably when the coach's displaced bogie struck it, but apart from its buffers, which were *broken off, the engine was very little damaged.*

12. The distribution of the debris alongside the track showed that, at the moment of impact, the rear of the ECS train was some 65 feet short of the far end of the viaduct.

Evidence

Visibility

13. Witnesses were generally agreed that what at 7.0 a.m. had been patchy mist at Castlecary, with visibility varying from 100 to 300 yards, deteriorated rapidly after 7.45 a.m. At about that time it thickened quite suddenly and visibility became much reduced, though it continued to vary from place to place.

14. Signalman E. Murray, on duty in Castlecary signal box, said that he could still see the back of Up Home No.1 signal, at a range of 312 yards, as late as 7.45 a.m.: his view of it was then intermittent and he lost sight of it altogether a little later.

15. Passed Fireman W. Innes, the driver of the ECS train said that, when he was approaching the Up Home No.1 signal very slowly at about 7.55 a.m., he first saw its arm at a range of about 25 yards, and the driver of a freight train that passed through Castlecary on the Down line under clear signals at this time said that he saw his signals at about the same range. Innes' estimate of the range at which he saw the Up Starting signal was "about the same distance, 25 yards" but at the moment of collision he must still have been some 75 yards short of that signal and he had had time, between his first sight of it and the collision, to see the signal put *back to danger and to close* the regulator. That Innes under-estimated the visibility was confirmed by the evidence of his guard, Passenger Guard G. Hunter, who said that when he looked along the train after it had stopped at Up Home No.1 signal he could see the signal arm and he must then have been about 100 yards from it.

16. Neither of the drivers expected fogsignalmen to be on duty.

The Signalling of the Trains

17. The signalmen at Dullatur East and Castlecary were respectively Rest Day Relief Signalman A. Wilson and Signalman E. Murray. They agreed closely in their evidence on the signalling of the Up trains previous to the ECS train, on the acceptance of the ECS train by Murray, and on the signalling of all Down trains, but their evidence on the signalling of the ECS train after its acceptance, and on the signalling of the diesel train, was flatly contradictory.

18. Wilson said that he offered the ECS train to Murray at 7.47 a.m. and that Murray accepted it at once and pegged the Up line indicator to "Line Clear". At this time the Down line indicator was also showing "Line Clear" for a Class C freight train which he had accepted from Castlecary at 7.43 a.m. This evidence Murray confirmed. On the acceptance of the ECS train by Murray, Wilson cleared his Up line signals for it.

19. Wilson's version of the signalling thereafter was that at 7.50 a.m., as the ECS train was passing his box, he sent the "Train Entering Section" signal (two beats on the block bell not preceded by a single "Call Attention" beat) for it to Castlecary, received the two beat acknowledgment, and saw the Up line indicator change to "Train on Line" (a change that could only have been effected by a manipulation of the Castlecary Up line commutator by Murray). Immediately afterwards he received the "Train Entering Section" signal (two beats) for the Class C freight train on the Down line from Castlecary, acknowledged it, and turned his own commutator handle for the Down line indicator to "Train on Line". He was in a position to pull off his Down line signals up to the Intermediate Block Home and did so. He restored his Up line signals behind the ECS train and

then sent the "Train Out of Section" signal (2 pause 1) to the box in rear (Croy) for it, and was at once offered and accepted the diesel train on the Up line. Wilson went on to say that at 7.52 a.m. he heard the "Call Attention" signal from Castlecary, acknowledged it, heard the "Train Out of Section" signal, acknowledged it, and saw the Up line indicator change to "Line Blocked". He said that he at once offered the diesel train to Castlecary: his signal, four consecutive beats on the bell preceded by a "Call Attention" beat, was acknowledged and he saw the Up line indicator change to "Line Clear". At about this time he heard and acknowledged the "Train Out of Section" signal from Croy for a previous Down freight train, and sought and was given acceptance from Croy for the Class C train on the same line. He also received and acknowledged the "Train Entering Section" signal on the Up line from Croy for the diesel train. He cleared his Down Intermediate Block signals for the Class C train and sent the "Train Entering Section" signal for it to Croy at 7.53 a.m., the time at which it passed his box, and then restored his Down line signals and sent the "Train Out of Section" signal for it to Castlecary, heard the acknowledgment, changed his Down line indicator to "Line Blocked", and was then at once offered and accepted a Class D freight train (five consecutive beats) on the Down line from Castlecary and changed his Down line indicator to "Line Clear". He then went to pull off his Up line signals for the diesel train, after looking at the Up line indicator and seeing it at "Line Clear". He was able to pull off Up Home No.1 and No.2 signals but found the Up Starting signal locked: he claimed that he then looked again at his Up line indicator and saw that it had been changed to "Train on Line". Wilson said that his first thought was that there had been a block failure, and that he had then assumed that Murray at Castlecary had mistakenly thought that the "Train Entering Section" signal had been given for the diesel train and that he had manipulated his block indicator accordingly: in Wilson's words Murray "must have assumed he (Wilson) had given him the 'Train Entering Section' signal". He did not however claim that Murray acknowledged this assumed "Train Entering Section" signal on the block bell. Wilson said that he then called Murray to the telephone and told him "you are too quick for me. I have not got my Starting signal off for the 7.30 a.m. yet": he said that he did not actually ask for a second release but expected Murray to know what he meant, and that Murray just said "Right" and manipulated the Up line indicator through "Line Blocked" to "Line Clear" again, and thus gave a second release, without asking any questions. He agreed that he should have used the proper cancelling procedure, but claimed that he acted as he did to avoid delaying the diesel train. Wilson was emphatic that he made it quite clear over the telephone that the train concerned was the 7.30 a.m. (the diesel) and that Murray understood this. Wilson then pulled off his Up Starting signal in time for the diesel train to enter the section ahead without any more delay than that imposed by its having passed the Distant signal at Caution. As the diesel train passed his box he sent the "Train Entering Section" signal for it to Castlecary and heard it acknowledged: the Dullatur East train register showed this signal as having been sent at 7.55 a.m. Wilson said that when he received the six-beat "Obstruction Danger" signal from Castlecary at 7.58 a.m. he at once called Murray to the telephone and asked him what was wrong: Murray replied that the diesel train had run through his signals and Wilson assumed that Murray "was not ready for the train".

20. Murray's version of these events was very different. He flatly denied hearing or acknowledging any "Train Entering Section" signal on the Up line at 7.50 a.m., and was emphatic that he did not alter the Up line indicator: it remained at "Line Clear", to which he had moved it at 7.47 a.m. when he accepted the ECS train. He confirmed that he sent the "Train Entering Section" signal for the Class C train to Dullatur East on the Down line at 7.50 a.m. and said that, after he had restored his Down line signals and sent the "Train Out of Section" signal to Greenhill, he was immediately offered and accepted the Class D train and heard and acknowledged the "Train Entering Section" signal for it. He also flatly denied sending the "Train Out of Section" signal for the ECS train on the Up line to Dullatur East at 7.52 a.m.; no train passed his box in either direction at this time and the last "Train Out of Section" signal that he sent was to Greenhill at 7.50 a.m. for the Class C train on the Down line. He also denied hearing or acknowledging the "Is Line Clear" signal on the Up line for the diesel train at any time, and was emphatic that he did not manipulate the Up line indicator at 7.52 a.m. as Wilson said he did. He did not receive any "Train Entering Section" signal on the Down line after that for the Class D train at 7.50 a.m. Murray's version of the request for a second release on the Up line block instruments to free the Dullatur Up Starting signal was also very different from Wilson's. Murray said that, shortly after he had offered the Class D freight train to Dullatur East and it had been accepted, Wilson called him to the telephone and "asked for a re-set on the Up line". Murray said that he took this to mean that the Dullatur East Up Starting signal was stuck and that Wilson wanted a second release. He was emphatic that Wilson made no mention of any particular train and that he had assumed that Wilson wanted to clear the signal for the ECS train; no mention was made of the diesel. He denied that Wilson said anything about his having been "too quick" but confirmed that he gave the second release without demur: he turned the indicator from "Line Clear", at which it had stood since 7.47 a.m. for the ECS train, through "Train on Line" and "Line Blocked" to "Line Clear" again only after he had been asked for the re-set. He said that he knew the proper cancelling procedure and agreed that it should have been used.

21. Murray confirmed that he received the "Train Entering Section" signal from Dullatur East at 7.55 a.m. but emphasized that he naturally thought that it was for the ECS train. He said that he at once got acceptance for the train from Greenhill Junction, and the signalman on duty in the

box there, Signalman D. Smith, confirmed that Murray did so at 7.55 a.m. and with the 2-2-1 signal that is used for an ECS train. Murray said that he then cleared his Up line signals: when questioned he emphasized that he cleared them as soon as the ECS train was accepted by Greenhill and not in response to a whistle. He said that he did not hear any whistle at this time: the door of his signal box was shut but the front window was open. Murray went on to say that shortly afterwards Signalman Smith called him to the telephone and questioned whether in fact the ECS train, which was running late, was to run ahead of the diesel. Murray said that he called Wilson to the omnibus telephone to confirm his reply to Smith that it was: although Wilson denied taking part in this conversation Smith confirmed Murray's evidence that he did so, and said that he recognised Wilson's voice and that Wilson confirmed that the ECS train was running ahead. When questioned on this point Wilson said that he had overheard Murray and Smith talking about the regulation of the two trains but that this was during his re-set conversation with Murray and that he himself had said nothing. Murray continued that about two minutes after he had cleared his Up line signals the ECS train passed his box at slow speed and that he restored the Distant and the two Home signals behind it: its driver made a signal to him which he thought was meant to convey a question about the aspect of the Starting signal and he laughingly made a gesture to convey that it was "off". He said that he had just turned to his train register to book the train when he saw the diesel train approaching at speed on the Up line. He waited a moment, to allow the ECS train to get past the Starting signal, and then put that signal back to Danger. He sent the "Obstruction Danger" signal in both directions at 7.58 a.m.

22. Entries in the train registers at Croy, Dullatur East, Castlecary and Greenhill Junction all agreed as regards the bell signals not in dispute, i.e., bell signals on the Up line up to and including acceptance of the ECS train by Castlecary and all bell signals on the Down line.

23. All entries in the train registers at Dullatur East and Castlecary supported the versions of events given by Signalmen Wilson and Murray respectively. There was nothing obviously unusual about the critical entries in the Dullatur East register, but two critical entries in the Castlecary register had clearly been altered: the timing of the receipt of the "Train Entering Section" signal for the ECS train from Dullatur East and the timing of its acceptance by Greenhill had both been altered, by over-writing in ink, from 7.50 to 7.55. Murray admitted that he had so altered these entries, and his explanation was that he had entered 7.50 in error and had then been told indirectly, in the course of his train regulation conversation with Signalman Smith at Greenhill that the correct time for it was 7.55. He said that after Wilson had confirmed to Smith that the ECS train was running first he overheard Smith repeating to himself what he must have been writing in the train register: in his own words, Smith "must have been holding the 'phone and writing in the book, at the same time. He wrote in '2-2-1 at 7.55' and I said '50' and he said 'No, 55'. I looked up at the clock and said '55, you are quite correct'." This explanation was not confirmed by Smith, who said that he had written this timing in the train register before the conversation took place, but Smith was vague about what had been said. Smith was however emphatic that Murray only once sought acceptance for the ECS train and that that was at 7.55 a.m.

24. Signalmen Wilson and Murray both gave their evidence firmly and without hesitation, and remained calm under questioning. They maintained their attitudes and stood firm on their contradictory versions of the events leading up to the re-set, and of the re-set itself, when questioned separately, and then together, and then separately again. When questioning them separately the second time I put to each of them various possible ways in which they might have made mistakes that could have led to what happened: in particular I stressed the possibility of confusion between bell signals exchanged for the Down line and those exchanged, on the same bells, for the Up line. They were emphatic that they did not make any of these mistakes: Wilson indeed was emphatic that he could not conceivably have done so.

At no point in his evidence did either man give me any grounds for thinking that he was deliberately lying.

25. Wilson is an experienced and confident signalman, aged 47 and a signalman for 12 years. He had been giving rest day relief in a total of 11 boxes, in which the block instruments were of different types including some other Scottish Region pattern instruments with combined indicators. He regarded himself as thoroughly conversant with the working of Dullatur East box. Castlecary was one of the boxes in which he had been giving relief and the Station Master, Mr. W. Ferguson, who had known him for some six years spoke very highly of his ability and said that he took a keen interest in teaching the younger signalmen and passing on his knowledge to them: Mr. Ferguson had found him forthright and ready to admit a mistake. Murray is aged 20 and had been a trained signalman for only four months. Mr. Ferguson spoke highly of him also, describing him as "a very keen railwayman and a very tidy worker in the box". It was clear from the records in the train register at Castlecary that Mr. Ferguson had exercised close supervision over Murray.

26. Both Wilson and Murray had come on duty at 7.0 a.m. after sufficient rest. Both were emphatic that they had had nothing on their minds and had been paying full attention to their duties. As it was Murray's first experience of fog and I felt that he might have left the box for a minute or two at one of the critical times to see if the Station Master was yet at hand and to seek his advice on calling out fogsignalmen, I asked him whether he might possibly have done so, but he

was certain that he had remained in the box. His view of his fog mark is better from inside the box than it is from the top of the steps outside.

27. Inspector A. Wilson, Signal Engineer's Department, said that he reached the scene of the accident at about 9.15 a.m. He tested the Up line signal equipment at Dullatur East and Castlecary and satisfied himself beyond any doubt that the line clear release control, for one pull only, on the Up Starting signal could not be pulled until the indicator had been pegged to "Line Clear" and this pegging could only be done by the signalman at Castlecary. He also satisfied himself that the block controls on the Up Distant and Up Home No.1 signals at Castlecary were working properly and that the Up line indicators at Dullatur East and Castlecary were in correspondence. I also tested the "Line Clear" release on the Up Starting signal at Dullatur East, and satisfied myself that it was for one pull only.

The Handling of the Trains

28. The ECS train had been late leaving Cowlairs and was running behind its usual time when approaching Castlecary. Passed Fireman Innes, its driver, said that he had seen the Castlecary Up Distant signal at Caution and was travelling at only walking pace when he saw the Up Home No.1 signal at Danger. He stopped an engine length short of it and, because of the weather and because he realized that the diesel must be fairly close behind, he at once despatched his fireman to the signal box to comply with Rule 55. He said that he gave a single long blast on his whistle, which was of the standard type fitted to ex-L.M.S. Class 5 M.T. engines, and that the signal was then cleared almost at once, before the fireman had reached it on his way forward to the signal box. The sounding of the whistle was confirmed by Leading (DR) Porter G. Batchelor who was working at the end of the Down platform nearer to the signal box: he clearly heard an engine whistle from the direction of Up Home No. 1 signal shortly before the ECS train passed slowly through the station.

29. Fireman Innes said that he drew slowly forward towards Up Home No.2 signal expecting it to be at Danger, but began to accelerate when he saw that it was "off". He crossed to the other side of the engine to exchange signs with the signalman that the Starting signal was also "off" and then returned to his own side to observe it. He did not gain any impression of urgency or impending emergency from his exchange of signs with the signalman. The Starting signal was "off" when he first saw it but it was then put back to Danger in his face. He said that he had time only to close the regulator and not to apply the brake before there was a violent lurch and he was thrown against the faceplate. He estimated his speed when approaching the Starting signal at 15-20 m.p.h. and said he did not think that his closing of the regulator had had time to affect it before the collision occurred.

30. Passenger Guard G. Hunter confirmed his driver's evidence about the running of the train. He had checked his watch against the clock at Queen Street that morning and he said that he looked at it when the train stopped at Up Home No. 1 signal: the time was then 7.54½ a.m. He heard the engine's whistle and saw the signal cleared shortly afterwards. He was standing at the door of his compartment in the last coach when the diesel struck it and he was thrown against the coach's side.

31. Driver A. Milne, alone in the cab of the diesel train, had left Queen Street on time; he is 63 years old and has been a driver for 31 years with 2 years on diesel trains. He said that he had had no troubles with his brakes and had made his two booked stops, at Lenzie and Croy, without any difficulty. His A.W.S. apparatus was in working order and he received the sound indications appropriate to the aspects at all Distant signals. It was not raining and there was no tendency for his windows to get misted over. The Dullatur Up Distant signal was at Caution and when he heard the A.W.S. horn he slowed down, after pressing his acknowledgment button and thus changing his A.W.S. indicator to yellow. The first Home signal was "off" when he reached it but he could not see the second Home and Starting signals until he was close to them, so he continued forward in second gear and at about 15 m.p.h. until he saw the Starting signal "off", when he accelerated and resumed free running. Approaching the Castlecary Up Distant signal, in fourth gear and at about 40 m.p.h., he heard the A.W.S. bell ring, telling him that the signal was "off", before he saw it: he continued to accelerate and was, he thought, travelling at about 55 m.p.h. when he first saw, at a range of about 25 yards, the Up Home No.1 signal unexpectedly at Danger.

32. Driver Milne said that as soon as he saw the Home No.1 signal at Danger he closed the throttle and began to apply the brakes. His evidence about this brake application was somewhat confused: at first he said that he did not apply the brakes fully until he saw Home No.2 signal also at Danger, but later he became emphatic that when he first saw that signal the brakes had already been fully applied and he could take no further action to stop the train. He did not see the ECS train ahead until his own train was on the viaduct. He remained in his seat until after the collision and thought that the speed of the diesel train at impact was 10 to 15 m.p.h.

33. Of the rest of the diesel train's crew only Travelling Ticket Collector S. McKenzie said that the braking at Castlecary seemed to be anything more than a normal service application. When asked if it had seemed to be an emergency application, he replied that it was "very severe" but he had been on his feet at the time, chatting to the conductor in the buffet car, and it did not un-

balance him. Passenger Guard J. Bell who had been standing in the rear van described the brake application as "just a normal application"; it had been enough to make him open his window to look out but the collision took him completely by surprise. The assistant guard also, Passenger Guard T. Redden, was taken completely by surprise when the shock of the collision threw him across his van: he said that he had felt the brakes applied but thought it to be an ordinary check and that he had "had no impression of any emergency".

34. Independent and informed evidence on the brake application at Castlecary was provided by a passenger, District Foreman (C.M. & E.E., C. & W.) H. Allan. He was sitting with a friend in the third coach at the time of the collision and he felt only what he described as a "service application" of the brakes: he said that this was insufficient to disturb the balance of another friend who was standing chatting in the doorway of the compartment.

35. That the Castlecary Distant was "off" when the diesel train passed it was confirmed by the evidence of HQ Locomotive Inspector (Footplate) J. Cunningham who inspected the diesel's cab shortly after the collision. He said that the A.W.S. indicator was showing an all black aspect, that the driver's brake handle was fully on, and that the gear lever was in neutral.

36. I was shown a certificate signed by Foreman J. G. Train that the brakes on all the coaches of the diesel train had been tested on 1st September and that certain of the brakes and brake shoes had been adjusted on the same day.

Medical Relief Arrangements

37. Mr. Ferguson, the Castlecary Station Master, said that he had been preparing to go on duty when Leading Porter Batchelor came to his house and told him of the collision. He had not himself heard any crash and he underestimated the gravity of what had happened. Instead of calling for ambulances at once, as is laid down in the Standing Instructions, he went to the scene of the collision to see for himself and, once there, misinterpreted a gesture by one of two doctors, who had been passengers and were giving first-aid, to mean that ambulances were not necessary. Ambulances were eventually ordered at 9.15 a.m. and arrived at 9.50 a.m.

Tests

Maintenance of Train Registers

38. As it was clear that one of the two train registers was an incorrect or incomplete record of the signalling of the two trains, I asked the Railway Officers to have a comparison made between a selection of previous registers kept by Signalmen Wilson and Murray and those kept at the same time by the signalmen in the boxes on either side. A random check of registers kept by Wilson at various boxes disclosed a number of errors in his bookings: some of these were gross, such as the complete omission of a train, with a confusion of its timings with those of the train ahead, and the record of the acceptance of another train at a time previous to that recorded for the despatch of "Train Out of Section" for the preceding train. In contrast a check of Murray's registers at Castlecary, covering one shift per week since he took charge there in May 1960, showed that his booking had been very good, with clean and clear figures: he had altered figures on nine occasions but there was no evidence of his ever having made bookings in anticipation of, or much after, the signals booked.

39. I questioned Signalman Wilson on the errors disclosed in his booking. He was very surprised that he had made them but did not dispute that he had. His errors are no proof whatsoever of irregular block working but they do undoubtedly suggest a slackness in his attitude to one aspect of a signalman's duties. Irregular booking is also in itself a danger to block working. If a signalman makes an entry in anticipation of an action he may later assume that he has in fact done what he has recorded. Similarly, if he records an action a long time after he has done it he may record more or less than he actually did. Either way he can easily deceive himself as to what he has or has not done.

Braking of the Diesel Train

40. Various braking tests were carried out with trains similar to the diesel train, one with a train handled from Dullatur East onwards through Castlecary in accordance with my interpretation of Driver Milne's evidence. This train was running at 56 m.p.h. at a point just short of Castlecary Home No.1 signal, and the brake was slightly applied when the cab was halfway down the platform and fully applied at a point 25 yards short of Up Home No.2 signal: the train was still running at 25 m.p.h. when it reached the point of impact and it stopped 40 yards beyond it. In a rather similar test, in which the train when approaching Up Home No.1 signal was running at 55 m.p.h. but in which there was no braking until an emergency application was made at a point 70 yards short of Up Home No.2 signal, the train stopped 43 yards beyond the point of impact.

41. In two other tests, in the first of which the train was running at full power and at 51 m.p.h. when a partial application was made 70 yards short of Up Home No. 1 signal, followed by an emergency application 70 yards short of Up Home No. 2 signal, and in the second of which the

train was running at full power at 52 m.p.h. when an emergency application was made 70 yards short of Up Home No. 1 signal, the trains stopped 175 yards and 237 yards respectively short of the point of impact. Even with a speed of 67½ m.p.h. approaching Up Home No. 1 signal an emergency application 70 yards short of the signal stopped the train 86 yards short of the point of impact, and with an approaching speed of 54 m.p.h. an ordinary service application (vacuum reduced from 21 to 7 inches) stopped the train 90 yards short of it.

Reliability of the Block Indications at Dullatur East

42. When I visited Dullatur East signal box after the accident I removed the back of the combined block indicator that is controlled by and controls the indicators for the Down and Up lines respectively at Castlecary. I examined the condition and layout of the wiring and arranged for its insulation to be tested: I am satisfied that *a false indication could not have been shown on the* Dullatur East Up line indicator as a result of any current leakage.

43. After experimenting with the pegger type commutators at Castlecary I discounted the possibility of the Up line commutator having been turned inadvertently.

Discussion

44. That the manner in which the release of the Up Starting signal at Dullatur East was requested and given was irregular is not in dispute. Whether the request *itself, however, was irregular, and* the extent to which the irregularity in manner contributed to the collision, depend on which of the two versions of events leading up to the request is correct.

45. According to Wilson the second release was necessary because Murray, after having accepted the diesel train at 7.52 a.m. and having pegged the Up line indicator to "Line Clear" for it, had prematurely pegged to "Train on Line" a moment or two before Wilson had tried to pull the lever. In these circumstances Wilson would have been entitled to ask for an emergency release but he should have adopted the correct cancelling procedure. If Wilson's version of events is substantially correct the collision would probably have occurred even if, when he found the signal locked through Murray's mistake, he had cancelled correctly and had then belled for a second "Line Clear": having irregularly accepted the diesel train once, Murray would probably have accepted it again. If, however, Murray's version of events is substantially correct and the Starting signal was locked at 7.52 a.m. because the one pull for which he had released it at 7.47 a.m. had already been used, unknown to him, in clearing it for the ECS train at 7.50 a.m., the request itself was irregular, and use of the correct cancelling procedure or, if the telephone had been used, *a proper verbal understanding* between the two men would probably have prevented the collision: the 4-beat "Is Line Clear" signal for a diesel in place of the expected "1-2-2" signal for the ECS train should have warned Murray that something was amiss.

46. The two versions of events leading up to the request for a second release are in direct contradiction on four points:

(a) *The alleged "Train Entering Section" signal for the ECS train*

Wilson claimed that he sent this signal to Castlecary at 7.50 a.m., that it was acknowledged, and that he saw the Up line indicator change to "Train on Line". Murray denies that he heard the signal at this time and that he changed the indicator. The fact that Murray originally booked the signal as having been received at 7.50 a.m. seems to favour Wilson's claim, but if Murray in fact acknowledged and booked the signal at this time why did he not seek acceptance of the train from Greenhill at once: I am quite satisfied that he first sought this acceptance at 7.55 a.m. although he booked it originally as at 7.50 a.m. It is possible that the 7.50 a.m. booking of the acceptance was made in anticipation of the signal being sent at that time, the signal itself then being forgotten, but irregular booking would have been contrary to Murray's good booking habits. In my opinion Murray's explanation of when and why he altered these entries from 7.50 a.m. to 7.55 a.m., although confused and not supported by Smith's evidence, rang true, and, although Smith said that he had made his booking before the telephone conversation took place, it seems more likely that he would have made it after and not before he had checked, by that conversation, that it was the ECS train and not the diesel that was to be booked. (At 7.55 a.m. when the telephone conversation took place, as at 7.52 a.m. when the second release was requested, nothing had yet happened to make the exact details of what was said stick in the minds of the men concerned: it was still just an ordinary morning and none of the men knew they would later be cross-questioned about its details.) At 7.50 a.m. Wilson was fairly busy and there is no doubt that he received and acknowledged at this time a "Train Entering Section" signal on the Down line and that for part of this minute his Down line indicator stood at "Train on Line".

(b) *The alleged "Train Out of Section" signal for the ECS train*

Wilson claimed that he heard and acknowledged this signal from Castlecary at 7.52 a.m. and that he saw the Up line indicator change to "Line Blocked". Murray denies that

he sent the signal or changed the indicator. No train passed Castlecary signal box in either direction at 7.52 a.m. and the fog was never so thick that Murray can have imagined that one had passed unseen. He has a good view up and down the lines from his box and there was no shunting going on to distract him. I can see no reason at all why Murray should have sent this signal deliberately and no possibility of his having sent it by mistake. If for some reason he did send the signal he seems to have acted out of character in not booking it: and why did he not send the "Train Entering Section" signal forward. It is not in dispute that Wilson received a "Train Out of Section" signal at Dullatur East at the time but it was on the Down line from Croy for a previous freight train: for the whole of the minute his Down line indicator from Castlecary stood at "Train on Line".

(c) *Alleged acceptance of the diesel train by Murray*

Wilson claimed that he sent the 4-beat "Is Line Clear" signal for the diesel train on the Up line bell to Castlecary at 7.52 a.m., heard it acknowledged and saw the Up line indicator change to "Line Clear". Murray denies all this: again, if he accepted the train, his failure to book the acceptance seems out of character. There was no dispute that, from 7.52 a.m. until 7.55 a.m. the Up line indicator at Castlecary and consequently at Dullatur East stood at "Line Clear": according to Murray, however, it had stood thus since he accepted the ECS train at 7.47 a.m. while Wilson claimed that it had been changed to "Train on Line" at 7.50 a.m. and to "Line Blocked" at 7.52 a.m. and then to "Line Clear" again when the diesel was accepted by Murray.

(d) *Position of the Up line indicator at Dullatur East when Wilson tried to pull the Starting signal for the diesel train*

Wilson claimed that between his looking at the Up line indicator before going to the frame to pull his Up line signals and his actually trying to pull the Up Starting signal, Murray had changed the indicator from "Line Clear", at which both men agree it had been standing, to "Train on Line". The only reason he could suggest for Murray's having done so was that Murray must have assumed that the "Train Entering Section" signal had been sent. Murray denies that he changed the indicator at this time and there seems to have been no reason why he should have done so: he received no "Train Entering Section" signal from Greenhill on the other line, which might have confused him, and if he did assume he had received the signal from Dullatur East why did he not acknowledge it before pegging to "Train on Line"? I can see no reason why Murray should suddenly peg to "Train on Line" two minutes after receiving his last "Train Entering Section" signal, on which he had pegged correctly at the time. Whichever version is correct the Starting signal would be locked: in one case by the premature peg to "Train on Line" and in the other because the release given had already been used. At this time the Down line indicator at Dullatur East was showing "Line Clear".

47. If Wilson's version is substantially correct, Murray took a series of positive but irrational actions which he did not record and which he denies taking: Murray can hardly have forgotten all these actions and two of them, the alleged despatch of the "Train Out of Section" signal for the ECS train and his peg to "Line Clear" at 7.52 a.m. and his alleged peg to "Train on Line" just as Wilson was preparing to pull the Starting signal about a minute later, cannot in my view be reasonably explained. If, however, Murray's version is correct, Wilson's actions are at least explicable, partly in the light of his previous slack booking habits and the self-deception to which such habits can lead (see paras. 38 and 39) and partly in the light of his self-confidence. For example, his assumption that the Starting signal was locked through some mistake by Murray might well have stemmed from his certainty that it could not possibly have been locked through his own mistake: having made the assumption he might well have convinced himself later that, as a good signalman, he had checked its correctness at the time by observing the indicator at "Train on Line". Similarly, Wilson might have booked the despatch of the "Train Entering Section" signal for the ECS train at 7.50 a.m. in anticipation of his despatching it at that time, and might then have been led by the entry in the book to assume that he had really done so and had, of course, checked the acknowledgment by the indicator. That Wilson may not have had his mind fully on his job between 7.45 a.m. and 7.58 a.m. is suggested by his failure to realize that something was seriously amiss when Murray asked him to confirm to Smith at Greenhill that the ECS train was running ahead of the diesel: I am satisfied that Murray's and Smith's evidence that Wilson took part in this conversation was correct and that the conversation must have taken place at 7.55 a.m. about 1½ minutes after Wilson had seen the diesel train pass his box.

48. Neither of the two versions of events can be proved or disproved. But in my view the balance of probability is strongly in favour of Murray's version being substantially correct.

Conclusions

49. The main immediate cause of this collision was the irregular release of the block controls on the Up Starting signal at Dullatur East, as a result of which the diesel train was irregularly admitted into the Dullatur East/Castlecary block section before the ECS train had cleared it. In asking

verbally for this release, instead of adopting the correct cancelling procedure and belling for a second "Line Clear", Signalman Wilson acted irregularly. Signalman Murray also acted irregularly in not insisting that the correct procedure was adopted; far worse, he failed in his elementary duty to find out for what train he was giving the second release. Wilson was the older and much the more experienced signalman and it was he who took the lead in the adoption of the irregular procedure. I think that Wilson did not bother to explain to Murray why he wanted the release but just asked for it, and that Murray, relying on the other's wider experience, gave it to him without question.

50. As regards the block irregularities that must previously have taken place, I incline to the view that Murray's version of the signalling was correct in essentials, and that the Up Starting signal at Dullatur East was locked at 7.53 a.m. because the one pull for which it had been released by Murray at 7.47 a.m. had been used for the despatch of the ECS train for which it had been given. Whether Wilson sent some or all of the disputed signals and Murray missed them, or Wilson wrongly assumed that he had done so, must be a matter for speculation, but I do not think that any of the disputed signals were in fact exchanged. In my view the root cause of this collision was irregular block working by Wilson, which culminated in his asking for the irregular release, thereby defeating a control that has been designed to stop a signalman admitting a train into the section ahead until it has been properly accepted. Why Wilson acted as he must have done if Murray's version is correct must also be a matter for speculation: inattention, the routine of the movements, early or late booking, false assumptions, confusion between bell signals, misreading of one indicator for another, and over-confidence, may each have played its part. If my view is correct, Murray thought that when he gave the irregular release it was for the ECS train. His contribution to the causes of this accident is therefore, in my view, limited to his failure to find out for what exactly the release was required, either by insisting on the proper procedure being adopted or by questioning Wilson until he was satisfied. The fact that a repeat of the release was being asked for some six minutes after the original release had been given should, I think, have made him suspicious. His compliance with Wilson's request seems to have been quite uncritical. His failure was a serious one.

51. In my opinion the main responsibility for this collision must be shared by Signalman Wilson and Signalman Murray, but by far the bigger share must be borne by Signalman Wilson.

52. A secondary cause of the collision was Driver Milne's failure to stop his train as quickly as he should have done. As he had heard the AWS bell at the Castlecary Up Distant signal and had seen that signal "off" he had a right to expect the stop signals through Castlecary to be "off" also and he was not going too fast. When, however, he saw the Up Home No.1 signal at Danger he should at once have realized that it had been put back in his face for some urgent reason, and that this must be because there was an obstruction ahead: the fact that he saw the first stop signal at short range made the need for emergency action all the greater. But instead of braking hard and fast he only checked his train until he saw the Up Home No.2 signal also at Danger, and when he then made an emergency brake application it was too late. The braking tests showed clearly that the diesel train could have been stopped short of the ECS train. Driver Milne did not, in my view, act as fast as he should have done in this emergency but his share of the blame for the collision is less than that borne by the signalmen, and is of a very different kind.

Remarks and Recommendations

53. The purpose of block controls is to assist the signalman and to prevent certain kinds of mistake that may cause accidents. No matter how comprehensive the controls may be they do not relieve him of any of his responsibility for correct block working. Controls have sometimes necessarily to be overcome and emergency releases have therefore to be provided. The use of such a release at once exposes the signalman to the particular danger from which the control was designed to shield him. Before resorting to a release, therefore, a signalman must take particular care to ensure that all is in order and that he is not trying to do what the control is specifically designed to prevent: only after careful consideration of all the possibilities should he conclude that it is the control and not himself that is at fault. Once he has decided to seek a release he must seek it correctly. Any kind of misuse of an emergency release is a very serious irregularity. Signalman Wilson's excuse for not following the correct procedure when seeking the release was a very bad one: a signalman should certainly try to avoid delaying a train but disobedience of the regulations is not the way to do it.

54. At only 20 years of age Signalman Murray was young to be in charge of a signal box on a "very important" line. Both the District and the Area Signalling Inspectors, however, who were keeping a careful eye on him because of his youth, were quite satisfied that he was fit for the task. A signalman's fitness depends much more on his maturity than on his age in years and I do not think that too much was being asked of Murray at Castlecary. Nevertheless Murray's youth was, I think, a significant factor in this case in that it made him much more likely to agree, without demur and without finding out exactly what was wanted and why, with Wilson's demand for a release. Wilson's one deliberate irregularity was thus all the more reprehensible: he should have been particularly careful to set a good example to so young and inexperienced a colleague as Murray.

55. No controls are proof against deliberate irregularity and this collision would not necessarily have been prevented by a "Welwyn Control". The importance of this main line, however, warrants the provision, throughout its length, of block controls more comprehensive than a simple line clear release with Home and Distant proving. "Welwyn Control", which prevents the acceptance of a train unless the previous train has passed through the block section and has occupied and cleared a track circuit at its forward end, would be appropriate here and the Regional Officers have agreed to its provision, with associated berth track circuits, on both lines at Castlecary. I recommend its early provision also at other boxes on this line at which it has not yet been provided.

56. The fact that the Automatic Warning System (A.W.S.) had been installed on this line had no bearing on the accident. The system's function is to warn a driver when a Distant signal is at Caution and to take the appropriate braking action if he fails to respond, but in this case the Castlecary Up Distant signal was "off" for the diesel train. I derived much satisfaction, however, from Driver Milne's evidence of how much the A.W.S. horn and bell signals had helped him generally during his journey from Glasgow to Castlecary.

57. The block irregularities that were the basic cause of this accident were of the unthinking sort that suggests a habit of bad block discipline. Sooner or later such bad discipline is bound to lead to trouble, no matter how comprehensive the block controls may be, because the signalman will have fallen into the habit of getting round them when it suits him to do so. Indiscipline is usually a sign of slack supervision but I do not suggest that this was the case here: Wilson was a relief signalman and his previous booking irregularities were spread over a number of different boxes. This case, however, emphasizes the danger from bad booking habits and the importance of the regular and comparative checking of block registers, not least those kept by experienced relief signalmen.

58. Fortunately there were no serious casualties. If there had been, the delay in calling for ambulances might have had very serious consequences. The Station Master should have called for ambulances at once, as his instructions laid down, without waiting to assess the exact need. In making medical arrangements after an accident it is wiser to assume at once that ambulances will be needed rather than wait until the need for them has been established.

I have the honour to be,

Sir,

Your obedient Servant,

J. R. H. ROBERTSON,

Colonel.

The Secretary,

Ministry of Transport.

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