MINISTRY OF TRANSPORT

RAILWAY ACCIDENT

REPORT ON THE COLLISION

which occurred on

11th April 1961

at

WATERLOO

in the

SOUTHERN REGION

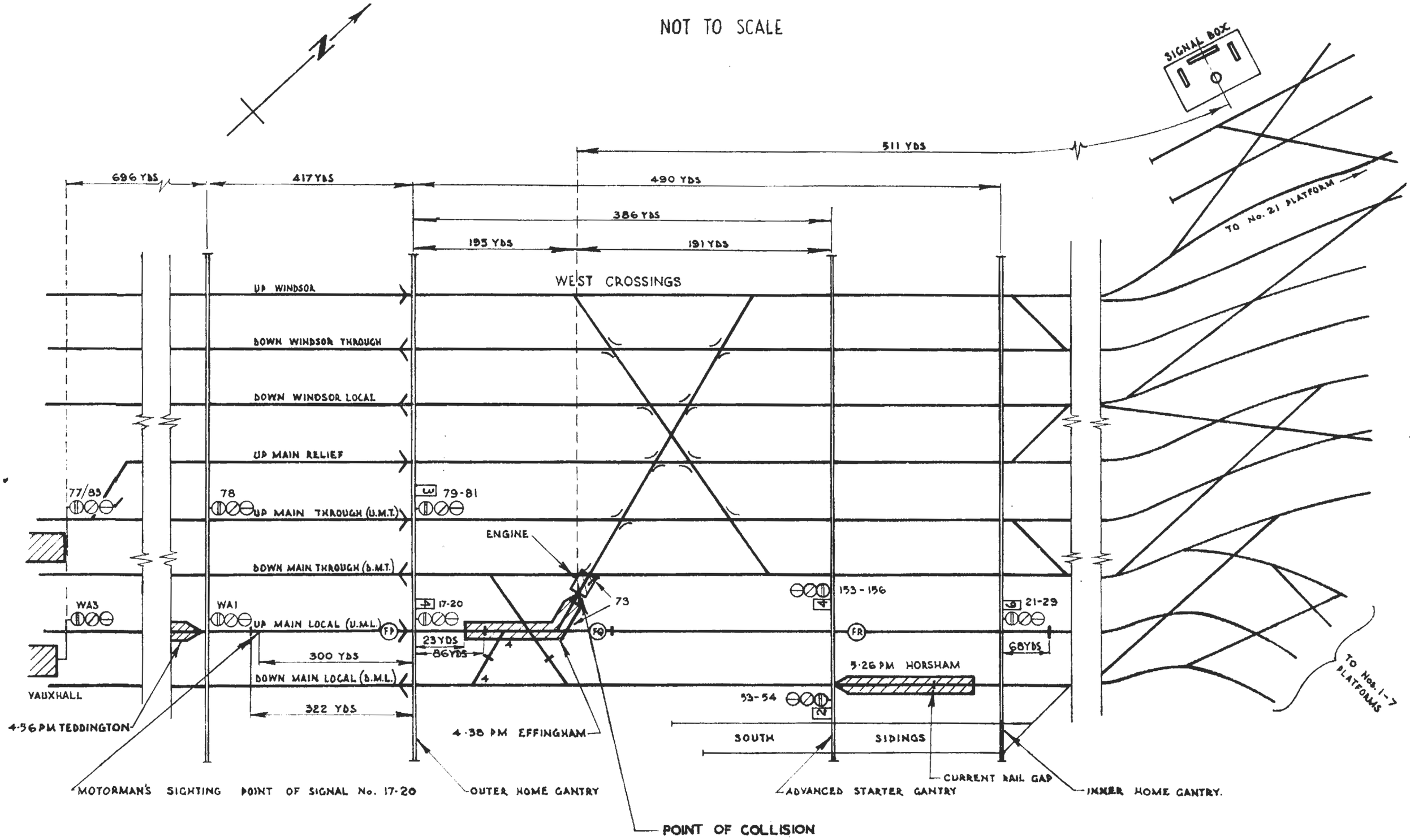
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE : 1961

PRICE 1*s.* 3*d.* NET

SKETCH SHOWING PART OF THE LAYOUT AT WATERLOO

NOT TO SCALE



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

31*st October*, 1961.

SIR,

I have the honour to report, for the information of the Minister of Transport, in accordance with the Order dated 13th April, 1961, the result of my Inquiry into the collision between an electric passenger train and an engine, which occurred at 5.26 p.m., on 11th April, 1961, at Waterloo, in the Southern Region, British Railways.

The 4.38 p.m. 8-coach multiple unit electric passenger train from Effingham Junction to Waterloo (via Epsom) was approaching Waterloo on the Up Main Local line. It was to be stopped at the outer home signal (a colour light), which was at Red, for the engine to pass in the Down direction from the Down Main Through line across the Up Main Local line to the Down Main Local line, en route to the Motive Power Depot. The electric train, however, failed to stop at the signal and collided head on with the engine on the crossover which had been reversed for the latter, at a point about 195 yards beyond the signal. At the time of the collision the electric train was travelling at 20-25 miles per hour and the engine at abont 12 m.p.h. The engine was running tender leading and its driver only became aware of the electric train at the last moment, and was unable to slacken speed.

As a result of the collision the motorman's cab of the electric train was wrecked and the rear end of the leading coach was telescoped into the front end of the second coach for a distance of about six feet. Five other coaches sustained relatively minor damage. The tender of the engine was derailed and severely damaged. I regret to report that the motorman of the electric train, R. E. Charles, of Effingham Junction, was killed. There were about 100 passengers in the train and 14 of them, including two railwaymen, received slight injuries. Twelve were taken to St. Thomas' Hospital and were discharged after treatment, and two were given first aid at the Medical Centre at the station.

The emergeney services responded to urgent calls for assistance with commendable promptitude and the first fire appliance arrived within 5 minutes of the accident and the first ambulance 11 minutes later. All the passengers requiring hospital treatment had left the site by 6.10 p.m. A doctor, nurse and priest also arrived promptly. A local firm provided a mobile erane which was used to transfer them from the road to the railway which, at the site of the accident, is on a viaduct. The remainder of the passengers, together with those from a train on the Down Main Local line, which had just left Waterloo and a train on the Up Main Local line which was following the 4.38 p.m. from Effingham Junction, both of which had been stopped at signals, were detrained and conducted along the lines to Waterloo South Sidings and Vauxhall respectively. The current had not however been removed from the Down Main Local line at that time.

The accident blocked three of the eight lines on the approach to Waterloo and it necessitated the removal of the traction current from platforms No. 1-7. This resulted in heavy delays and a widespread disruption of the evening peak services. Passengers were diverted to alternative services on the Windsor lines which remained in operation, and they were also advised to travel on trains from London Bridge or Victoria, or by London Transport Executive routes.

A breakdown crane was ordered without delay and the wreckage was removed and the lines were restored for normal traffic working by 5.45 a.m. on the following morning.

The weather was fine and clear.

The accident was similar in some respects to one which occurred at Waterloo on 3rd June, 1960. I held an Inquiry into that accident and presented a report dated 30th September, 1960.

DESCRIPTION

The Passenger Train

1. The electric train comprised two 4-coach units, each of which had two motor coaches with two trailers between them. The coaches in each unit were "tight coupled" with centre buffers and the units were screw-coupled together, the headstocks of the motor coaches having side buffers. The weight of the train was 274 tons and its length was 172 yards. It was equipped with the standard Westinghouse air brake. The coaches in the leading and rear unit were built in 1949 and 1946 respectively, and were of "all steel" construction.

The Engine

2. The engine was of the modified West Country Class, with 4-6-2 wheel arrangement and a six-wheeled tender. It weighed 133 tons in working order and was driven from the left hand side.

The Site

3. Waterloo is the London Terminus of the Western Section of the Southern Region and it has 21 platforms. Between Waterloo and Vauxhall Station, approximately one mile to the South, there are four Up and four Down lines. From West to East they are the Up Windsor, Down Windsor Through, Down Windsor Local, Up Main Relief, Up Main Through(U.M.T.), Down Main Through (D.M.T.), Up Main Local (U.M.L.), and Down Main Local (D.M.L.). For the sake of simplicity the above initials will be used in this report. Leaving Vauxhall the Up lines take a slight curve to the right, followed by a long curve to the right, which in turn is followed by a long left handed compound curve of easy radii which extends to the outer home signals. Details of the layout and of the position of the signals concerned are given in the sketch opposite page 3. The gradients are of no account.

The Signalling Equipment

4. The lines between Waterloo and Vauxhall are fully track circuited and the signals are 3-aspect multiple-lens colour lights. The signals and the electrically operated points are controlled from an electrically interlocked frame with 309 miniature levers, 272 of which are working levers, situated on the upper floor of the two-storey signal box at Waterloo; the relay room, battery room, transformers, rectifiers, etc., and the linemen's rooms are on the ground floor. The signalling installation was brought into use in 1936. The position of the box is shown on the sketch.

5. The frame in the signal box is arranged to form three sides of a rectangle. There are four illuminated diagrams each covering all the tracks between Vauxhall (inclusive) and Waterloo; one diagram is above each short side section and two are above the long central section of the frame. The occupation of a track circuit is indicated by the illumination of two red lights on the diagrams. All the aspects of signals are repeated above the levers in the frame except that, when a signal is controlled by more than two levers, the repeater lights are provided only above the two end levers. There is an indicator light with the letter "F" above each signal lever; when illuminated it indicates that the route is correctly set and locked and that all the detection circuits are made, and that, consequently, the lever is free to be reversed. When the lever has been reversed and the aspect of the signal has cleared, another light above the lever becomes illuminated and indicates the route which has been set up. There are also two indicator lights above each lever controlling points in a running line, with the letter "N" (normal) in one and "R" (reverse) in the other. When illuminated they indicate the position of the points and also that the detection circuit is made.

6. There are no block instruments and trains are described between Waterloo signal box and Loco Junction signal box, which is just under 2 miles distant. The frame is operated normally by four signalmen per shift and in addition there is a Yard Inspector, who is in charge; there are also two booking lads. Signal linemen are on duty throughout the 24 hours.

7. Except for signal No. 77/83 on the U.M.T., which has a position light junction route indicator, all the running signals that lead to more than one route are equipped with multiple lamp theatre type route indicators. Each is worked by more than one lever, the number of levers depending on the number of routes to which the signal leads. For instance, signal No. 17-20, the outer home on the U.M.L. which the electric train passed at Danger, leads to all four Up lines and it is worked by either lever No. 17, 18, 19 or 20; for a movement along the U.M.L. it is worked by lever 17. The signals on the U.M.L. between Vauxhall and the outer home are Nos. WA3 and WA1, and they are worked automatically by the track circuits. They also have 3 aspects but the aspect of No. WA3 is normally green and that of No. WA1, which is in effect the distant signal, is yellow when signal No. 17-20 is at Red.

8. The other signals referred to in this report are:—

No. 21-29, the inner home signal on the U.M.L.

No. 79-81, the outer home signal on the U.M.T.

No. 153-156, the advanced starter on the D.M.T: it leads to all four Down lines: for a movement to the D.M.L. it is worked by lever No. 153.

No. 53-54, the advanced starter on the D.M.L.

No. 174-175, the starter from No. 10 platform: it leads to signal 153-156 on the D.M.T. (lever No. 174) and to the Down Windsor Local line (lever No. 175): this signal is not shown on the sketch.

9. Each signal is sited just to the left of the line to which it refers and the route indicator, where provided, is to the left of the signal. On account of the curvature, the siting of some of the signals is difficult and the view of them is restricted. From the cab of an electric train on the U.M.L. signal No. WA1 comes into view at a distance of about 320 yards and signal No. 17-20 can first be seen at a distance of about 300 yards under a gantry carrying Down signals. Signal No. 17-20 can be seen by the guard through the rear brake van periscope at a distance of about 250 yards.

10. On account of the comparatively slow speed of trains approaching and leaving Waterloo, the overlaps beyond signals are short. The overlap track circuit (FP) extends for 86 yards beyond signal No. 17-20. The same track circuit starts 322 yards on the approach side of the signal as an approach locking track circuit. Track circuit FR approach locks signal No. 21-29 and extends for 68 yards beyond it as an overlap.

The Signal Controls

11. As with mechanical interlocking, the electrical interlocking prevents the levers of signals controlling conflicting routes from being reversed at the same time. The electrical locks and contacts are on shafts which are connected physically to the levers; they are located behind the frame and are enclosed by steel panels which are kept locked.

12. The track circuits exercise the usual controls on the signals and points. They ensure that the aspect of a signal is held at Red by the occupation of any track circuit in the route which the signal controls up to and including the overlap track circuit beyond the next signal ahead. The track circuits also approach lock and back-lock signals, and lock points in the route of a train. When a route is set up and the signal for that route is cleared, and when the approach locking track circuit is occupied by the train, the signal lever is back-locked. As mentioned in paragraph 10 the approach locking track circuit for signal No. 17-20 is FP. The back-locking of lever No. 17 is released when the train passes off that track circuit, but the occupation of the track circuit ahead (FQ) then directly locks all facing and trailing points which lie on it in either the normal or reverse positions, according to the way in which they are set, and it therefore locks crossovers No. 4 and 73.

13. There are no releases for the track circuit locks. A lineman must be called and he must unlock the back of the frame and remove a panel to get access to the electric locks. He can then free a track circuit lock on a lever by the simple motion of lifting the lock. In order, however, to release the lever interlocking he must first break a seal; this is an extremely infrequent occurrence and needs to be done only during alterations to the interlocking or in the event of a fracture of a lock. All releases given by linemen are required to be noted in a special register and the entry must be signed by the lineman concerned and by the person at the time in charge in the box.

Report and Evidence

14. The engine that was involved in the collision had worked the 1.25 p.m. train from Weymouth into No. 14 platform at Waterloo. It was then shunted into No. 10 platform from where it was to be sent to the Motive Power Depot at Nine Elms. Signal No. 174-175 was cleared for it to proceed to signal No. 153-156 on the Down Main Through (D.M.T.) line, from where it was to be crossed over the Up Main Local (U.M.L.) to the Down Main Local (D.M.L.) line through crossovers No. 73 and 4. (These crossovers and the other connections in that area are known as the West Crossings). The route had been set and signal No. 153-156 had been cleared for the engine.

15. The passenger train arrived at and left Wimbledon (7 m. South of Waterloo) on time, but after starting from there it was again brought to a stand by an emergency brake application by the guard because of a suspected open door. It left again about 3 minutes late. Because it was running late, the signalman at Loco Junction allowed an engine to go ahead of it on the U.M.L. line to Waterloo. The train passed signal No. 17-20 which was at Red, burst open points No. 4 and, turning left handed on to crossover No. 73, collided head on with the engine about half way along the lead of the crossover.

Evidence of Trainmen of Electric Train and Engine

16. Guard C. L. Bolton was in charge of the electric passenger train. He had worked as a guard for nearly seven years and knew the line well. He said that there had been nothing unusual about the running of the train and that Motorman Charles had had no difficulty in stopping it at stations. When Bolton had made the emergency brake application at Wimbledon, the train had stopped at once. From Wimbledon the signals were green and Charles made up a little of the lost time but as the train approached Vauxhall he reduced the speed and the train passed through that station fairly slowly. He then increased the speed of the train which remained constant at, Bolton estimated, 20-25 m.p.h. up to the time of the collision. He said that it was the speed at which motormen usually ran when aspect after aspect was yellow. He was definite that there had been no rapid acceleration such as was normal when, after running on yellow aspects, a motorman saw a signal at Green. Bolton said that he assumed that signal No. WA3 was at Yellow for the train, but that he did not see it until the front of the train had passed the signal and had replaced it to Red. He observed neither signal No. WA1 nor No. 17-20 and he excused himself for not doing so by saying that he was making entries in his journal. Bolton said that he had not felt any brake application immediately before the collision neither had he heard the motorman sound the train whistle.

17. After the accident Bolton got down on the nearside and walked up to the front of the train. After passing round the engine he met the fireman who had just returned from telephoning to the signal box. Bolton then returned along the offside of the train reassuring the passengers that they were in no danger and he met another guard, W. S. Buchan, who was travelling as a passenger and who went back to protect the train. Bolton said that when the train stopped its rear end was just beyond signal No. 17-20.

18. Bolton said that he lived in the same village as Motorman Charles and knew him well. He thought that Charles was a fit man and said that he appeared to be quite normal when he saw him at Effingham before the train started. He was not aware that Charles had any worries or troubles at home.

19. Guard Buchan, who was travelling as a passenger, had joined the train at a station called Ewell West on the country side of Wimbledon and he said that as the train ran into his station he saw that the motorman was alone in the driving cab. Buchan sat towards the rear end of the leading coach in which

there were 10 or 11 other passengers. He was reading and did not notice anything about the run until the collision occurred. Nor did he remember having felt any severe braking immediately before the impact or having heard the sound of the train whistle. Afterwards, he went back and protected the train and he assisted in detraining the passengers from another train that was standing at signal No. WA1. He did not notice the aspects of any signals.

20. Driver F. C. Strickland was in charge of the engine. He said that it was standing at the starting signal (No. 174-175) of platform No. 10 when the signal cleared to Yellow with a route indication M.T. (Main Through). He started the engine and drove it to the D.M.T. and stopped at signal No. 153-156 which was at Red. The signal almost immediately cleared to Green with a route indication M.L. (Main Local) and he re-started the engine; it was running tender leading and Strickland was therefore on the right-hand side in the direction of travel. He opened the regulator, "notched up" to about 30 degrees cut off and then closed the regulator, and he was coasting at about 12 m.p.h. through the crossover to the U.M.L. when he saw the electric train ahead and, almost simultaneously, heard his fireman shout and also heard a whistle which he took to come from the electric train. The collision followed immediately and before the brakes which he had applied fully had had time to take effect.

21. Fireman R. White generally confirmed Driver Strickland's statement. He said that after starting from signal No. 153-156 he was keeping a good lookout through the back spectacle glass on the tender but, on account of the restricted view through that glass, he did not see the electric train until it and the engine, which was then travelling at about 15 m.p.h., had turned towards each other on the crossover to the U.M.L. He shouted to the driver who applied the brakes at once but the collision occurred almost immediately. He said that he heard the whistle of an electric train just before the impact.

22. After the collision White turned on the injector of the engine and then went to a telephone some 70 yards away and spoke to someone in the signal box. He told him that the engine was "off the road" and that the D.M.L., U.M.L. and D.M.T. lines were blocked, but he did not think that he had mentioned that the engine had collided with an electric train.

Evidence of Signalmen and Station Staff, Waterloo

23. The signalmen and the other persons on duty in the Waterloo and Loco Junction signal boxes and at Waterloo station, who were concerned in the accident, were: —

J. R. Edwards	Signalman, Waterloo Signal Box.
F. Jerrum	Signalman, Waterloo Signal Box.
F. C. Cammell	Yard Inspector, Waterloo Signal Box.
A. J. M. Hudson	Porter, Acting Signal Lad, Waterloo Signal Box.
Mr. R. A. Bridger	Senior Assistant Station Master, Waterloo.
R. T. Duckett	Signalman, Loco Junction Signal Box.

24. The times of the movements of the train and the engine involved in this accident and of certain other movements which were relevant to the case, as recorded in the Waterloo Train Register Sheets, were as follows: —

Line	*Train*	*Described from Loco Junction*	*Arrived at or passed outer home signal No. 17-20*	*Due*	*Arrived*	*Platform No.*	*Remarks*
Up Main Local	Engine	5.19	5.23	—	5.26	9	(for the 5.39 p.m. Down Salisbury)
,,	4.38 p.m. Effingham	5.22	5.26	5.22	—	—	Obstruction Danger sent at 5.29
,,	4.56 p.m. Teddington	5.25	—	5.29	—	—	(Stopped at WA1)
Up Main Through	4.29 p.m. Guildford	5.20	5.21*	5.24	5.23	5	—
,,	5.15 p.m. E.C.S.	5.22	5.23*	5.26	5.27	7	—
,,	5.20 p.m. E.C.S.	5.25	5.27*	5.29	5.30	10	—

** Passing time at Vauxhall*

Line	*Train*	*Platform No.*	*Rung out ready*	*Departure and described to Loco Junction*	*Advance starter overlap track circuit cleared*	*Remarks*
Down Main Local	5.20 p.m. Teddington	3	5.21	5.22	5.23	—
,,	5.26 p.m. Horsham	1	5.25	5.26	—	(Stopped at signal No. 53-54)
,,	5.30 p.m. Shepperton	3	Error			
,,	Engine	10		Through to Local at 5.25 p.m.		
Down Main Through	5.21 p.m. Portsmouth	7	5.20	5.21	5.22	—

The entries in the Train Register at Loco Junction generally corresponded with the above entries but the entry for the 4.38 p.m. Effingham train had been omitted. The engine on the D.M.L. was recorded as having been described at 5.24 p.m. and there was no record of the 5.26 p.m. Horsham train having been described at all.

25. Signalman Edwards had worked in Waterloo signal box for six years; he had come on duty at 2.0 p.m. on the day of the accident and was controlling movements into and out of the platforms on the Through and Relief lines. He explained that after the 1.25 p.m. Weymouth train had arrived, its engine had been shunted from No. 14 to No. 10 platform because a boat train was to be taken in to the former platform line. The normal arrangement was for the engine to be sent to the Motive Power Depot following the 5.21 p.m. Waterloo to Portsmouth train. Sometimes the engine was sent via the D.M.T. and the D.M.L. lines and sometimes via the Down Windsor Local line. On that particular occasion it was to be sent via the D.M.T. and the D.M.L. in order to avoid detaining the boat train. After the 5.21 p.m. Portsmouth train had left and the 4.29 p.m. Guildford train had arrived at 5.23 p.m., Edwards reversed lever No. 174 for the engine to proceed to signal No. 153-156 on the D.M.T. line, and he saw that the aspect of the signal had changed from Red to Yellow. He told Jerrum about the engine and the latter said that he would cross it over to the D.M.L. line between the Up engine and the 4.38 p.m. Effingham train on the U.M.L. The outgoing engine stopped at signal No. 153-156 for, he thought, about 2 minutes. After the incoming engine had passed signal No. 17-20 and the West Crossings, and after Jerrum had set crossovers No. 73 and 4 for the outgoing engine, Edwards saw the F light above lever No. 153 and cleared that signal for the engine to proceed to the D.M.L.; he could not remember whether the aspect of the signal changed to yellow or green.

26. Edwards said that the Up engine which was running ahead of the 4.38 p.m. Effingham train was taken along the U.M.L. to the inner home signal (No. 21-29) from where it was signalled into No. 9 platform. He went on to say that there had been no discussion as to whether the outgoing engine should cross from the D.M.T. to the D.M.L before or after the 4.38 p.m. Effingham train had passed the West Crossings, and that it was Jerrum's decision that it should go before that train. He added that if the engine had been detained further at signal No. 153-156 to enable the Effingham train to proceed along the U.M.L. line without being stopped, the 5.27 p.m. Down train to Portsmouth and other trains would have been delayed. He stated that it was not his duty to describe the outgoing engine to Loco Junction and that it was to be described by Jerrum when the engine was crossed to the D.M.L. line.

27. Signalman Jerrum had worked in Waterloo signal box for 25 years; he had come on duty at 5.0 p.m. on the day of the accident and was controlling movements on the U.M.L. and D.M.L. lines. He said that he knew that Edwards would start the Down engine from No. 10 platform after the 4.29 p.m. Guildford train had arrived at 5.23 p.m., and he saw from the track circuit diagram that the engine had arrived at signal No. 153-156. He said that it was usually crossed to the D.M.L. after the 4.38 p.m. Effingham had passed on the U.M.L. That train was however a few minutes late that day and he saw that it was approaching signal No. WA1, and so he decided to give preference to the engine and to cross it to the D.M.L. after the Up engine on the U.M.L. had cleared the West Crossings. Consequently when he saw that the Up engine had placed signal No. 17-20 to Red and had cleared track circuit FQ, he replaced lever No. 17 to normal and pulled the levers No. 73 and 4 for the crossovers. Edwards then cleared signal No. 153-156 by pulling lever No. 153 and Jerrum described the engine to Loco Junction, at 5.24 p.m. He realized that the 4.38 p.m. Effingham train would probably be detained momentarily at signal No. 17-20 and that the 5.26 p.m. Down Horsham train might suffer a slight delay, but he explained that if he had given preference to the Effingham train, the Horsham train and the 5.27 Down train to Portsmouth would certainly have been delayed. I questioned Jerrum closely as to whether he might have cleared signal No. 17-20 for the Up Effingham train and then changed his mind and put it back to Danger in order to give preference to the engine, and I pointed out to him that only one lever movement by him was necessary to clear the signal for the Up train. Jerrum was definite however that he had replaced the lever of

signal No. 17-20 after the Up engine had passed it and that he had not pulled it again for the Effingham train either intentionally or inadvertently. He was quite adamant on that point.

28. Jerrum stated that, from the track circuit diagram, it seemed that the Down engine was taking a long time in crossing the U.M.L. and then he saw that the indication light above No. 4 lever had become extinguished. He realized that something must be wrong, and he called Yard Inspector Cammell.

29. Mr. Cammell had worked in Waterloo signal box as a signalman for 9 years and as a Yard Inspector since December, 1952. He confirmed the sequence of events given by Edwards and Jerrum, and he said that he was able to do so because he always kept a close watch on the track circuit diagrams and was thus able to follow all the train movements. He explained that there were in general three periods each of about six minutes duration in each hour in which paths were available for engines to be sent to the Motive Power Depot and that one of these was after the departure of the 5.20 p.m. Teddington train. He said that the despatch of the engine from No. 10 platform via the D.M.T. and D.M.L. lines was a perfectly normal move and that, if the 4.38 p.m. train from Effingham had been on time, it would have been allowed to run into the station without being stopped and the engine would have been crossed to the D.M.L. behind it. As however the Effingham train was a few minutes late it was quite in order for Jerrum to cross the engine in front of it. By doing so he would have detained the Effingham train for only about 1 minute, but he would have saved delays to several other trains. Mr. Cammell said that there had been no discussion as to whether the Down engine should be crossed over the U.M.L. ahead of the Effingham train or behind it, and that it was a normal practice for the signalman concerned to make such a decision himself. He was absolutely definite that Jerrum had not cleared signal No. 17-20, the repeater of which he had seen at Red, for the Effingham train, and then changed his mind and replaced it to danger. He had never known that to be done.

30. Mr. Cammell said that after Jerrum had drawn his attention to the fact that something was wrong, he saw that the track circuits on the crossover from the D.M.T. to the U.M.L. remained occupied and that the indicator light above lever No. 4 had gone out. He therefore decided to go to the site and find out what had happened, but before leaving he telephoned to Mr. Bridger, told him the situation, and asked him to come to the box. As Mr. Cammell was leaving the box the fireman of the Down engine telephoned and said that the engine was "off the road" but did not say anything about a collision. Mr. Cammell therefore proceeded to the site and found that the fire brigade had already arrived. Having assessed the situation he went to a nearby telephone and spoke to Mr. Bridger in the signal box, asked for the current to be taken off the Up and Down Main Local lines, and for assistance to be sent to deal with the passengers of the Effingham train and the 5.26 p.m. Horsham train which had stopped at signal No. 53-54. Soon after that a shunter told him that the current was still on the D.M.L. line so he went to the telephone again and asked for it to be cut off from platforms Nos. 1 to 7. Mr. Cammell said that ambulances and medical assistance arrived very soon after the fire brigade.

31. Porter Hudson had acted as "signal lad" in Waterloo box for some eleven years and on the day of the accident he was responsible for the Up and Down main and local lines and the Up relief line. He said that he recorded the majority of the times in the Train Register Sheets by watching the track circuit diagrams and from the describers but he made the entries under the "Arrive" column by actual observations of the arrival of the trains. Hudson said that the Down engine was described to Loco Junction box at 5.24 p.m. and that he recorded it as having moved from the D.M.T. to the D.M.L. line at 5.25 p.m.; he said that he made that entry in the Register Sheets after he had made the entries for the 5.26 p.m. Horsham and 5.30 p.m. Shepperton trains. As far as he could remember, the latter train went by a different route and consequently he wrote the word "error" against it. He was certain that the 5.26 p.m. Horsham train had been described to Loco Junction when it started from the platform at 5.26 p.m.

32. Mr. Bridger, Senior Assistant Station Master, Waterloo, said that Mr. Cammell rang him at 5.28 p.m. and said that there was some trouble at the West Crossings and that he was going to the site, and he asked Mr. Bridger to go to the signal box. Mr. Bridger said that he reached the box at 5.35 p.m.; he had a look round and saw that lever No. 4 was reversed and that the indication light above it was not illuminated. Mr. Cammell then came on the telephone and told him the situation. Mr. Bridger immediately asked what emergency services were required and Mr. Cammell replied that they had already arrived. Mr. Bridger went on to say that by that time there must have been about 4,000—6,000 people at the station and that his main concern was to arrange the running of the trains over the Windsor lines, which had not been obstructed by the accident. He did not raise the question of the removal of the current when he spoke to Mr. Cammell because he knew that Mr. Cammell had already spoken to a signalman about it.

33. Signalman Duckett had worked at Loco Junction signal box for two years. He said that normally the Up engine for the 5.39 p.m. Salisbury train (see Para. 24) usually followed the 5.38 p.m. Effingham train, but that on the day of the accident the latter was a few minutes late, so he allowed the engine to go ahead of it. He was certain that the 4.38 p.m. train had been described to his box and that he described it to Waterloo, and he said that his booking lad, who was responsible for booking trains on all the lines and was consequently very busy, must have omitted to make the entry in the Train Register. Duckett said that Down engines are frequently despatched from Waterloo in the six-minute gap after the 5.20 p.m. Teddington train and that they usually run on the D.M.L. line ahead of the 5.26 p.m. Horsham train. He agreed that the engine involved in the collision would have checked the latter train that day. Duckett confirmed that he had received the description of the Down engine on the D.M.L. line at 5.24 p.m., but he said that he received no description of the 5.26 p.m. Horsham train.

Technical Evidence

34. Technician A. Hallett, who had come on duty at 2.30 p.m., was the senior representative of the Signal and Telecommunication Department in the Waterloo box. He said he was in the messroom when he heard, at 5.28 p.m., that something was wrong at the West Crossings. He and his assistant took tools and went to the site, arriving there at 5.35 p.m. He stated that he examined the points and found cross-overs No. 73 and 4 were reversed, but the points of crossover No. 4, which were trailing for Up movements on the U.M.L., had been run through and burst open by the electric train. He saw that at that time he could do nothing so he returned to the box and went on to the operating floor. He said that he found levers No. 73 and 4 reversed and locked with no indication light above lever No. 4, levers No. 17-20 normal and locked and the signal repeater lights at Red. He then went to the site of the accident again and examined signal No. 17-20, and saw that its aspect was red.

35. Hallett stated that before the accident neither he nor any of the other technicians had been on the operating floor of the box since they came on duty. He could not recollect when he had last given a back-lock release. He said that during the afternoon he and his mates had cleaned the relay room but they had not touched any of the relays. No maintenance had been done on the circuits controlling signals No. 153-156 and 17-20 since the previous week and then no disconnections had been made.

36. Inspector A. Hunt, Signal and Telecommunication Department, arrived at Waterloo at 7.15 p.m., and went to the site of the accident. He confirmed the statement made by Hallett about crossovers No. 73 and 4. He then returned to the box and inspected the frame, and he again confirmed Hallett's statement as to the position of the levers. After that he tested various circuits under the supervision of Mr. D. W. Perry, the Divisional Signal Engineer (Central), Wimbledon. Mr. Hunt stated that Hallett had told him that during the day of the accident no requests had been made for any attention or maintenance to be given to the frame or to the controlling circuits.

37. Mr. Perry arrived at Waterloo signal box at 6.40 p.m. and went to the site of the accident. He also confirmed Hallett's statement about crossovers No. 73 and 4. Then he returned to the box and made arrangements for a series of tests to be made. I was present when some of the tests were made and I asked for details of the tests and of the results thereof to be recorded. They showed that the insulation of all individual circuits had a resistance to earth of not less than 100 megohms and that the equivalent figure for groups of circuits was not less than 50 megohms.

38. Mr. Perry went on to say that no major re-wiring had been done at Waterloo for the past four years. The insulation of the cables was tested regularly at six-monthly intervals, and if it was found to be deteriorating the cables concerned were renewed. Some outside cables had been renewed, but no re-wiring inside the relay room had been done. He stated that, as a result of the accident in 1960, tell-tale relays had been placed on certain signal circuits to indicate whether the signals had at any time shown a clear aspect when the aspect should have been red, and that a bell had been fitted on the operating floor of the box, which would ring if such an incorrect aspect was given. He said, however, that there had been no such failures.

39. Mr. M. R. Pierson, Maintenance Engineer (Rolling-stock), Chief Mechanical and Electrical Engineer's Department, Southern Region, was questioned about the testing of the brakes of the electric train and he stated:

> "After the accident a preliminary examination was carried out at the site on the seven coaches to enable the train to be returned to Wimbledon, i.e., on the rear four coaches and the rear three coaches of the leading unit.
>
> A full brake test was carried out at Durnsford Road, Wimbledon, on the following day.
>
> In all cases there was a brake stroke of 4½". All brake blocks were well within their limits. The minimum thickness was about 1⅛", which is well within the correct size.
>
> Tests were carried out in connection with the Westinghouse Brake and the dead man's application (from the centre and rear cars) and the application from the guards van, and in all cases the brake test was satisfactory".

Mr. Pierson said that, on account of the very extensive damage to the front of the leading coach of the train, it was not possible to test the brakes of that coach. He said also that for the same reason no reliable evidence was available as to the position of the controls at the time of the accident.

Other Evidence

40. At my request the motorman of the 5.15 p.m. and the driver of the 5.20 p.m. empty coaching stock trains on the U.M.T. line (see Table at Para. 24) were questioned, but neither of them could give any information about signal No. 17-20 on the U.M.L. line. The motorman of another Up train stated that he had spoken to Motorman Charles across the platform at Wimbledon on the afternoon of the accident and that Charles seemed quite normal.

41. I mentioned in paragraph 29 that Mr. Cammell, the yard inspector in charge of Waterloo Signal Box, had stated that once a signal had been cleared it was never replaced to Danger while a train was approaching it, to enable the route ahead to be changed. However, a driver in charge of a train on the U.M.T. line reported that on 19th April he had seen signal No. 17-20 on the U.M.L. line at Clear and had seen it replaced to Red. At my request an investigation was made into the circumstances of that case

and it was found that the signal had in fact been cleared for a train and had been replaced to Red to enable an engine movement, similar to the movement of the engine involved in the collision, to be made ahead of the train instead of behind it. There was no doubt, however, that signal No. 17-20 had been replaced to Red before the train for which it had been cleared had passed signal No. WA3. Signal No. WA1 must therefore have assumed its more restrictive aspect, and changed from green to yellow, well before it came into the view of the motorman of the approaching train.

Conclusions, Remarks and Recommendations

42. I am satisfied that the brakes of the electric train were working correctly. I am also satisfied that the signalling equipment at Waterloo was in good order, and that consequently the levers of signal No. 17-20 (the outer home) could not have been reversed when crossover No. 4 was reversed, and the aspect of the signal could not have been at Clear when its levers were normal. There is ample evidence that the crossover was in the reverse position and that its points in the Up Main Local line, which were trailing for movements on that line, had been "run through" and burst open by the electric train. As will be seen later the signal must also have been at Red when it first came into Motorman Charles' view, and he must therefore bear the main responsibility for this accident, for driving the electric train past it.

43. Motorman Charles was 63 years of age. He had had 46 years' service, including five years as a passed fireman, two years as a driver and thirteen years as a motorman. He had been stationed at Effingham Junction and had worked trains regularly into Waterloo. He had served in H.M. Forces during both the world wars. His sight was good and, according to Guard Bolton, he was in good health and had no worries and no troubles at home. His duty that day started at 4.5 p.m., and was to end at midnight. He had worked the same duty during the previous day and in fact since 3rd April, when he had returned from two weeks annual leave. He had a clear record.

44. It is improbable that Motorman Charles collapsed in the driving cab of the electric train before passing signal No. 17-20 because, unless he had fallen on to the dead man's handle, it would have applied the brake and stopped the train rapidly. Furthermore, both the driver and fireman of the Down engine heard the whistle of an electric train just before the accident and as there was no other train nearby, it must, as they thought, have come from Motorman Charles' train. Again, the post-mortem examination indicated that Charles had died from the injuries he sustained in the accident and from no other cause.

45. As I have said, signal No. 17-20 must have been at Red when the 4.38 p.m. Effingham train passed it. There can also be no doubt that it was at Red when it first came into Motorman Charles' view at a distance of 300 yards because the approach locking track circuit extends for 22 yards on the approach side of the sighting point. Once that track circuit has been occupied, the signal lever is back-locked and, although the aspect can be replaced to Red, the points ahead of the signal could not have been reversed for the engine. However, time-distance calculations show that it would have been possible for Charles to have seen signal No. WA1 (the distant) at Green and for it to have remained at Green until he passed it, if Signalman Jerrum had pulled lever No. 17 after the Up engine ahead of the 4.38 p.m. Effingham train had passed signal No. 21-29 and cleared track circuit F.R., and had then replaced it before the 4.38 p.m. train had occupied the approach locking track circuit (F.P.). Jerrum was, however, most emphatic that he had not intended to pass the electric train over the West Crossings ahead of the engine and that he had not pulled lever No. 17 intentionally or even inadvertently having regard to the fact that, as mentioned in paragraph 27, no other preceding lever movement would have had to be made. Yard Inspector Cammell had been watching train movements on the track circuit diagrams and he also was definite that signal No. 17-20 had not been cleared for the electric train. Mr. Cammell and both the signalmen explained that if the Down engine had been held at signal No. 153-156 for the electric train to be given preference over the West Crossings, it would have detained several other trains. This certainly would have been the case, but by giving preference to the engine, the 4.38 p.m. Effingham train and the 5.26 p.m. Horsham train would have been delayed. As things were however, slight delays had to occur to some trains and I think that, on balance, the least delay would have been caused by moving the Down engine over the West Crossings ahead of the 4.38 p.m. Effingham train, as the signalman had intended. Furthermore, the delay to departing trains would have been reduced to a minimum, which is desirable.

46. If Charles had seen signal No. WA1 at Green, he would quite correctly have expected signal No. 17-20 to be at Yellow or even at Green. He had however driven the train slowly through Vauxhall, and signal No. WA3 must have been at Yellow. He accelerated slightly, but only up to 20-25 m.p.h., which, Guard Bolton said and the railway officers have confirmed, is a normal speed for a train running on yellow aspects. If Charles had seen signal No. WA1 at Green, he would undoubtedly have accelerated considerably, which Bolton was certain that he had not done. Taking all the evidence into consideration, I am satisfied that Signalman Jerrum did not clear signal No. 17-20 for the electric train and then replace it to Red, and that consequently Charles did not see signal No. WA1 at Green. I refer to this matter again in Paragraph 50.

47. In an endeavour to find some reason for Motorman Charles' failure, I asked Dr. D. Russell Davis, a member of the Committee of the Medical Research Council that is investigating cases of drivers passing signals at danger, to accompany me over the route in the driving cab of a train similar to the 4.38 p.m. Effingham train, but we could find nothing to explain his failure. It is possible that, when signal No. 17-20 first came into view, he had seen the signal No. 79-81 on the Up Main Through line, which would have been at Clear for the 5.20 p.m. empty coaching stock train, and had mistaken it for the signal applicable to the Up Main Local line on which he was travelling. But I think that this is

unlikely because the signals are some 20 feet apart (the Down Main Through line lies between these two Up lines), the curvature of the lines at that point is easy and, as mentioned above, the viewing distance of signal No. 17-20 is 300 yards. I am therefore unable to offer any explanation for Motorman Charles having failed to obey signal No. 17-20, but it is quite clear that he could not have been concentrating sufficiently on his work and that he did not carry out the most important duty of a motorman, which is to watch and obey the signals.

48. Guard Bolton also must bear a measure of responsibility for this accident for failing to watch the running of the train as it approached the terminal station, as required by Rule 148 (a). This Rule reads as follows:

> "When passenger trains are approaching important junctions, terminal stations, and stations at which they are booked to stop, the Guards must carefully watch the running of the trains and take any action that may be necessary. They must also keep a good look-out when leaving stations, and, as far as practicable, on other parts of the journey".

The viewing of signals on the approach to Waterloo through the brake van periscope is not easy on account of the curvature, but if Bolton had been looking out he could have seen that signal No. 17-20 was at Red before the train reached it and he could have stopped the train short of the West Crossings.

49. I do not think that Driver Strickland, who was in charge of the engine, or his fireman could have avoided the accident. It was running tender leading and the view of the line ahead through the rear foot-plate spectacle glass on that type of engine is limited.

50. No objection can be taken to what was done in the case mentioned in paragraph 41 because signal No. 17-20 was replaced to Red and signal No. WA1 therefore changed from Green to Yellow before the latter had come into the view of the driver of the approaching train. It is, however, fundamental that once a signal has been seen at Clear by a driver or, where the Automatic Warning System of Train Control is provided, once a driver has received an indication on the apparatus that a signal is Clear, the signal should not be made to assume a more restrictive aspect solely in order to enable a route ahead of it to be changed. I mentioned in paragraph 65 of my Report on the previous accident which occurred on 3rd June, 1960, that in modern installations the approach locking ensures that this cannot be done and, although I was certain that it had no bearing on that accident, I said that I considered that it would be advisable for the approach locking at Waterloo to be extended so as to prevent it. I am equally certain that the lack of this control in modern form also had no bearing on the present accident, but I still consider that this work should be undertaken or that some other type of control should be applied which would achieve the same result.

51. I have mentioned on page 3 that the current remained on the Down Main Local line while the passengers were being detrained. This came about because, although instructions for the removal of the current from that line had been given and the Waterloo and Queen's Road Substation circuit breakers controlling the feed to that line had been opened, the 5.26 p.m. Down Horsham train, which had been stopped at the advance starting signal, was bridging the current rail gap between the lines serving platforms No. 1-7, which were energized, and the Down Main Local line. The current was not removed from the latter line until some time later when the circuit breaker controlling the feed to the platform lines was opened. The Up Main Local line, from which the current had correctly been removed, was again inadvertently energized when the 4.56 p.m. Up Teddington train was drawn by a steam engine backwards into Vauxhall, and bridged a hook switch which had been opened. The Southern Region "Instructions Applicable to the Electrified Lines" lay down that when it is necessary for passengers to be detrained from a train which is not at a platform, the current must first be removed from the line on which the train is standing and from other lines alongside it or over which the passengers may have to walk. They also cover the use of short-circuiting bars which should have been, but were not placed on the lines in this case. In addition, they lay down that before an electric train is moved from an isolated section to a live section of the line, or vice versa, the shoe fuses (or links if fitted) must be removed. Fortunately, the failure of certain members of the staff to comply with these Instructions had no adverse effects in this case, but I consider that it would be advisable for the attention of all the staff to be drawn to the importance of the Instructions dealing with the removal of current in an emergency.

I have the honour to be.

Sir,

Your obedient Servant,

D. McMULLEN,

Colonel.

The Secretary,

Ministry of Transport.

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