

## SOUTHERN RAILWAY.

Ministry of Transport,  
7, Whitehall Gardens,  
London, S.W.1.  
25th July, 1928.

SIR,

I have the honour to report, for the information of the Minister of Transport, in accordance with the Order of the 10th July, the result of my Inquiry into the cause of the accident which occurred at about 7.25 p.m. on Monday, the 9th July, at London Bridge Station, on the Southern Railway.

In this case, light engine No. B.210, which had been authorised to move out of No. 1 engine siding for shunting purposes, passed a shunt signal at danger, with the result that it came into sidelong collision with the 7.22 p.m. down electric train, London Bridge to Epsom Downs, which, travelling in the same direction, was departing from No. 12 platform for the down local line under clear signals.

The collision occurred on the near side of the train at the fouling point of a diamond crossing, towards which the two movements converged. The engine, running tender leading, at about 10 m.p.h., made first contact with the side of the leading coach just in rear of the motorman's compartment, and came to a stand in about 30 yards, derailed all wheels.

The train was travelling at probably 15 to 20 miles an hour, and also came to a stand in about the same distance, with its rear end some 35 yards from the platform. The wheels of the leading bogie of the first coach were presumably the first to leave the road, and became buried in the ballast, so that the rear end of the coach was thrown to the right and simultaneously tilted up. Its frame thus overrode that of the second coach, its three rear compartments and the five leading compartments of the second coach becoming telescoped as the result, the roof of the latter penetrating below that of the former. The trailing bogie of the first, and the leading bogie of the second, were also derailed, and overridden by the frames of these coaches when the telescoping took place.

There were some 300 people in the train, and I regret to report that one was killed, another died in Guy's Hospital on the 11th July, and five others were seriously injured, necessitating detention in hospital. In addition, four received minor injuries, while five others, and the driver and the fireman of the light engine, suffered from shock effects; the driver did not, however, have to leave duty. Considerable difficulty was experienced in extricating some of these passengers, but to show the rapidity with which the work was carried out, it may be mentioned that the first stretcher case left the scene of the accident at 7.31 p.m. and the last at 8.5 p.m.

The train comprised two 3-coach sets with two intermediate trailers, viz. eight bogie vehicles weighing 258 tons, 503 feet long overall, fitted with the Westinghouse brake operating blocks on all wheels. The light engine was of the express passenger type, 4-4-0, with a 6-wheeled tender, weighing in working order 83½ tons, 53 feet 7 inches in overall length, fitted with the Westinghouse brake on the coupled and tender wheels, and with the hand brake operating the same blocks on the latter wheels.

The details of damage to stock and permanent way are given in the Appendix. Five of the approach lines to the station were blocked, viz. those known as H, G, F, E and D from East to West, thus preventing access to or exit from 10 out of the 21 platforms, viz. lines Nos. 8 to 17. No untoward result followed the damage to, and contact by wheels with, the conductor rail, current being at once cut off from all lines concerned; and the necessary repairs were completed and power restored by 9 a.m. next morning.

At the time of the accident another electric 8-coach train was approaching the station at about 30 m.p.h. under clear signals over the up local line, bound for the adjacent platform No. 13 via D line. Fortunately motorman A. Church observed the collision, realised that his road was fouled by the derailed coaches and was able to bring his train to a stand within 100 yards of the site. I take this opportunity of recording appreciation of his vigilance and promptitude on this occasion.

The weather was fine.

*Description.*

The station lies in a general north and south direction, and since 17th June, when the new colour light signalling was brought into use, the one running and 21 platform lines have been numbered consecutively from east to west. Nos. 1 to 7, comprise the through, high level, Eastern section lines; Nos. 8 to 11, the terminal, low level, Eastern section lines; and Nos. 12 to 22, the terminal, Central section lines.

Immediately to the west of No. 11 line, there is No. 1 engine siding, the latter being the most westerly track in the low level, Eastern section, of the station, which is divided by a wall from the Central section, No. 12 platform line being located immediately beyond the wall. Before the two movements commenced, the light engine was standing in the siding at the shunt exit signal No. 212 on one side of the wall, while the electric train was standing on the platform line on the other side of the wall, the head of the train being about level with the engine, and 30 feet away from it.

The engine moved out of the siding on to G departure line, which on the straight ahead becomes the down through, and the train moved out of the platform on to F departure line, which crosses G by a diamond crossing (point of collision) before reaching the junction trailing points, No. 148, in the down local, which is located on the east side of the down through.

Southwards, from the point where the train and light engine were standing, the intervening space (maximum width about 50 feet) between G and F lines, up to the point of their intersection—a distance of some 600 feet—is taken up by a long high water tank, the new signal box, and a stores building, the view from either line, as applicable to this case, being thus entirely obstructed, except over a short length of perhaps not more than 60 feet between the water tank and the box. The motorman did not therefore see the light engine until a second or two before the collision took place, and the driver of the light engine was in fact unaware of the presence of the train until it crossed his path.

The lines concerned fall slightly to the site of the collision, and the following are the approximate distances from the centre of the box to relevant points, signals, etc.:—

Position of light engine in No. 1 siding, and out-going shunt signal No. 212; also front end of electric train in No. 12 platform ...	400 feet north.
Points No. 214 in G line, leading to Nos. 10 or 11 platforms ...	210 „ „
Points No. 213 of No. 1 siding in G line ...	180 „ „
Trailing points No. 217 in G line of crossover between G and H lines, and shunt signal No. 218 controlling in-going movement via this crossover to No. 9 platform, or via points No. 213 into No. 1 siding ...	100 „ „
Out-going shunt signal No. 141 on the left of G line ...	100 feet south.
Out-going shunt signal No. 147 on the left of F line ...	120 „ „
Out-going fouling point between G and F lines, and site of collision ...	220 „ „
Centre of diamond crossing between G and F lines ...	310 „ „
Points No. 148, the junction of F and H lines, in the down local ...	430 „ „
First advanced starting signals Nos. 158 and 156 for down local and through lines ...	760 „ „

*Report.*

(1) The reorganisation of the signalling at London Bridge involved, as from the 17th June, the suppression of all semaphore signalling, and the introduction of colour light indications between Borough Market Junction on the north side of the station and Bricklayers Arms Junction on the south side, in continuation

of the same system, which was brought into use two years ago, from Charing Cross and Cannon Street to Borough Market.

Operation at London Bridge in respect of all the terminal lines, and the southern end of the through, high level, lines, is concentrated in the new box, mentioned above, containing an all-electric type power frame of 284 working and 21 spare miniature levers with 6 spaces. Track circuiting has been installed throughout, imposing the usual locking on point and signal levers in the normal and reverse positions, two large spot light diagrams (duplicates) in the box indicating in conjunction therewith the occupation of all sections of lines concerned.

(2) Running and shunt signals are provided as necessary to control every movement, the former being of the three and four aspect type, and the latter of the two aspect type. No hand signals are therefore displayed from the box, the signalmen, of whom there were eight on duty at the time of this accident, watching operations by means of the illuminated diagrams. For the same reason, shunters do not accompany light engine shunt movements, as they did previously from No. 1 siding to G line, their work being now confined to the supervision of stock movements, coupling, uncoupling, etc. However, so far as it is practicable, drivers, who are performing such shunts, are advised by the shunters of what is required, with a view to expediting and facilitating the working generally. The shunters' lobby applicable to this case, in which there was also a telephone attendant in direct communication with the box, is situated on Nos. 10/11 platform, some 75 yards north of where the light engine was standing in the adjacent siding alongside the south end of the platform.

Signal Instruction No. 20 (1928), illustrated by a diagrammatic plan of all lines, and showing the location of all signals, describes fully the meaning of both types of signal and their different aspects, and gives in detail the individual function and application of each. The extracts of the notice relevant to this case are as follows:—

#### *Two-Aspect Shunt Signals.*

<i>Aspect.</i>	<i>Meaning.</i>
<i>Red Light ...</i>	<i>Danger—stop.</i>
<i>Green Light...</i>	<i>Proceed as far as the line is clear, or to the next signal only.</i>

#### *Shunt Signals preceding Running Signals.*

*It will be observed from the tabulated pages of this instruction that certain shunt signals (indicated by an italic note) will precede the running signals, i.e., they will be worked for all running movements. The object of this arrangement (which also exists in the case of certain shunt signals at Charing Cross, Cannon Street, Blackfriars Junction and Holborn Viaduct) is to avoid the red aspect being passed by the driver of a running train.*

*Drivers of trains whose movement has been authorised by a running signal are not required to observe shunt signals. It may, however, happen in an emergency that a shunt signal applicable to the direction and line on which the train is travelling has been placed at "danger" by the signalman, and in such circumstances, if this signal is noticed by a driver, he should bring his train to a stand. During shunting operations on lines to which these shunt signals apply, the aspects shown in the shunt signals must be strictly observed.*

#### *Shunt Signals worked from London Bridge Signal Box.*

<i>No of Signal.</i>	<i>Aspect.</i>	<i>Name and application of signal.</i>	<i>Remarks.</i>
<i>E.141</i>	<i>2-aspect</i>	<i>"G" section to down local or down through line.</i>	<i>This signal will be worked for all running movements in addition to shunting movements.</i>
<i>E.212</i>	<i>2-aspect</i>	<i>No. 1 siding to No. 2 down line, No. 3 line, "H" section as far as No. E.149 shunt signal, or "G" section as far as No. E.141 shunt signal.</i>	

Each shunt signal aspect consists of a cluster of 4 separate lights, each of 8 watts covered with coloured cup-shaped stepped glasses, the cluster being enclosed behind a hemi-spherical frosted white glass. The primary object of the arrangement is to provide a good close-up view. Each aspect is repeated in the box.

(3) In regard to the training of the locomotive running personnel, I understand that a chart showing the different signal aspects was posted up in all depots at the end of April, and Inspectors attended to explain the system. On the 3rd May the diagram, referred to above, was also posted; and on the 5th June the notice, with a copy of this diagram, was sent to all drivers concerned.

The Secretaries of the Mutual Improvement Classes were relieved of ordinary duties, and conducted over the installation while the alterations were in progress, and visits were made to the other sections of line where colour light signalling was already in operation. These Secretaries then held classes at their respective depots to instruct the men, and, in addition, Inspectors paid visits to the depots and terminal station to explain the system to, and answer the questions of, drivers who required assistance. On the 17th June these Secretaries and Inspectors were available at London Bridge and the various depots, for the same purpose, and this was continued for some days afterwards.

Driver J. Beale, of the light engine, whose headquarters are at New Cross Gate, had signed as having received his copy of the notice and diagram on the 8th or 9th June, and I understand that he had attended, with other drivers, on three occasions, both in and out of his own time, to obtain advice from certain of the Inspectors, with a view to having the signalling and lay-out explained to him.

He is 60 years of age with 42 years' service, for the last 30 of which he has acted in his present capacity on the Central section of the system. During the last two years he had worked into the low level (Eastern section) part of the station on half a dozen occasions, but neither into or out of it since the new signalling had been in operation. However, since the 17th June he had worked daily to and from the terminal, Central section. His fireman, J. A. Axton, is 32 years of age, and has acted as such for 13 years. He was unacquainted with the signals, and it was the first time he had been in the low level (Eastern section) part of the station. Although not supplied with the notice referred to, he had had an opportunity of studying his driver's copy, and also the plan posted up at New Cross Gate depot.

#### *Evidence.*

(4) The evidence of motorman A. Farr of the electric train shows that he observed the green aspect in the platform starter, No. 113, in the shunt signal No. 147 which precedes it in the locking, and in the first advanced starter, No. 158, applicable to the down local line. He saw the last-named signal from his position as the train passed the box. The two signalmen, E. Nicholson and H. G. Bray, who dealt with this movement, also noted the corresponding repetition of these aspects in the indicator lights behind the levers, as each lever was operated in the frame. Except that the train left nearly three minutes late, the movement was in order, and further reference to it is unnecessary, the circumstances leading up to the accident being concerned solely with the handling of the light engine.

(5) This engine had arrived in No. 11 platform at 5.13 p.m., 16 minutes late, with the 2.50 p.m. passenger train ex Brighton, and, as hooked, the crew were at once relieved by driver Beale and fireman Axton, who had joined for duty at New Cross Gate at 4 p.m. and had travelled as passengers to London Bridge. Following its arrival, the next rostered working of the engine was to run light, but at no definite timing, to New Cross Gate.

The stock of this train formed the 5.20 p.m. to Tunbridge Wells West, and it left two minutes late. The engine, owing to occupation of No. 1 siding, remained standing at the buffer stops of the platform for an hour, until about 6.30 p.m., when it was shunted into the siding, Beale having been previously advised by shunter Asbury that the movement was required, and that the engine would thereafter, in Asbury's words, "*when convenient, go light to New Cross Gate.*"

Beale performed the outward shunt (tender leading, and in obedience to a shunt signal at the buffer stops and another at the end of the platform) on to G line, and came to a stand, opposite the box, and outside No. 218 shunt signal. Thereafter, when this signal was cleared, he moved back into the siding. Owing to heavy track occupation at this time in the afternoon, preventing its despatch to New Cross Gate, the engine remained in the siding for another hour, until the shunt in question took place, the sequence of events preceding the shunt being as follows:—

(6) The 2.35 p.m. train ex Margate via Redhill, due at 6.44 p.m., arrived in No. 11 platform at 6.52 p.m. Its empty stock was due to leave again for Rotherhithe Road at 8.5 p.m., and its engine had to be prepared on No. 1 siding for subsequent working ex Cannon Street at 8.36 p.m.

Some dislocation and delay in working (averaging five or six minutes) had been occurring as the result of current failure in the morning at Forest Hill, and of two point failures early in the afternoon at London Bridge. District Inspector Pellow had in consequence been in the box since 4.50 p.m. supervising the work, and Mr. Day, the Assistant Stationmaster, also went to the box shortly before 7.0 p.m. to ascertain how the up traffic was running. When Mr. Day arrived, Inspector Pellow informed him that the 2.35 p.m. train had extra stock on it, which made it too long for No. 11, with the result that the entrance to No. 10 was being fouled, thus preventing the arrival, according to booking, of an up Tattenham electric train, due at 6.50 p.m.

According to Inspector Pellow's account, certain communications by telephone with the shunters' lobby on Nos. 10/11 platform had taken place, and there was a discussion in the box, as the result of which Mr. Day agreed with Inspector Pellow's suggestion that the Tattenham train should be run into No. 9 platform instead of into No. 10. Soon after 7.0 p.m. Mr. Day therefore gave the necessary instructions (for advising the staff concerned) to Attendant Bastin, who was on duty in the lobby. The train arrived in No. 9 at 7.7 p.m., 17 minutes late, and left again for Tattenham at 7.14 p.m., losing another minute.

It may be mentioned here that Bastin is a man of 60, with 47 years' service, of which he has acted as a signalman for 39 years. He is therefore a man of experience, and while this was the first occasion on which he had performed the duty of telephone attendant in this particular lobby, he had, for the previous three weeks, acted in the same capacity on the Central side of the station. His duty was merely to deal with telephone messages between the lobby and the box, thus acting as the channel of communication between the box and shunter Asbury on the ground (whose post was also this lobby), and the station foreman, etc. His duty in fact was to remain in attendance upon the telephone, only leaving it to take messages, none of which are recorded. Asbury, whose duties have already been referred to in general terms, was also a man of experience with nine years' service, and he had acted as a shunter at London Bridge for six years.

At the time, soon after 7 p.m., when the above-mentioned decision was taken, Mr. Day and Inspector Pellow also decided to shunt the 2.35 p.m. Margate empty stock from No. 11 platform to No. 10, in order to release its engine for the working already referred to. After satisfying himself that the passengers had been detrained, Mr. Day, according to his account, had a further conversation, at about 7.10 p.m., with the lobby, speaking on this occasion to shunter Asbury, advising him that this shunt was to be made.

After this, there is conflict of evidence between Mr. Day and Inspector Pellow as to what transpired. According to the latter, he overheard the former giving instructions to the lobby during the latter conversation that in addition to the movement from No. 11 to No. 10, light engine No. B210 was to make a shunt from No. 1 siding to No. 9 platform, to pick up certain vans from the 6.45 p.m. van train ex Rotherhithe Road, which was shortly to arrive in that platform, following the despatch of the Tattenham train. This was an arrangement of working with this particular engine, which had previously operated on the 4th, 5th, and 6th July, the movement being a transference of vehicles from the Eastern to the Central Section of the station.

Inspector Pellow could not, of course, say who Mr. Day communicated with at the lobby, but if his impression is correct, the inference is that either Asbury



or Bastin was advised in respect of the proposed movement perhaps 15 minutes before the engine left the siding. When both men were confronted on the point, Pellow confirmed the evidence he had previously given, but Mr. Day stated that he had no recollection of having transmitted any instructions of the kind over the telephone to the lobby.

There is, however, general agreement between the accounts of these two men, and of those of signalman Dickinson in the box, shunter Asbury, and attendant Bastin, that the question of this shunt was the subject of conversation between the lobby and the box between 7.15 p.m. and 7.20 p.m. But here again there is conflict in respect of what in fact happened, Dickinson stating that at about 7.15 p.m. he received instructions from Mr. Day to ring up the lobby to give the necessary advice; Bastin saying that he initiated the conversation on instructions from Asbury to the effect that the engine was "*all ready for New Cross Gate when he (Dickinson) was ready*"; Mr. Day confirming this by saying that he was referred to on the subject by Dickinson; and Pellow saying that he also overheard this conversation, which he regarded as the second occasion on which the lobby had thus been advised that the shunt was to be made.

On the other hand, there is no disagreement in the evidence of Bastin and Asbury, each man satisfactorily accounting for his actions, and relating what happened following the arrival of the Margate train on No. 11 platform at 6.52 p.m., though neither of them knew to whom he spoke in the box. They both stated emphatically that the question of the movement of the light engine was not raised with the box until Asbury was commencing (at as nearly as it can be estimated 7.20½ p.m.) the shunt of the empty coaches of this train, when Asbury told Bastin to ring up the box, as related above, Bastin then for the first time receiving the information as to the shunt the engine was to make.

By that time Asbury was riding on the coaches on their outward movement from No. 11 platform, and Bastin therefore had to wait for a couple of minutes until (as was estimated, about 7.23 p.m.) Asbury returned, and got off the coaches at a point near the lobby during the progress of the propelling movement into No. 10. Bastin then gave Asbury the message; but before the latter could advise driver Beale, he had to complete his superintendence of the movement of the coaches to the buffer stops. Having done that, he turned round to walk the short distance southwards, perhaps 100 yards, down the platform to the light engine, when he noticed that it had already left the siding, and in fact that the accident had occurred.

What was intended and what should have happened during these last few minutes was this:—It having been decided to utilise engine No. B.210 for the shunt to No. 9 platform upon the arrival of the van train, which was then (at 7.24 p.m.) approaching this platform, and having regard to the fact that the engine of the 2.35 p.m. Margate train required to go to No. 1 siding for watering, etc., purposes, Inspector Pellow gave signalman Hulbert instructions to move the former engine out of the siding, with a view to its standing at signal No. 141 (preparatory to setting back through No. 217 crossover to No. 9 platform, after the arrival of the van train), and to enable the latter engine to follow it from No. 11 platform on to G line, and return to No. 1 siding thus vacated. Signalman Hulbert accordingly operated points No. 213 and shunt signal No. 212 directly the holding track circuit, which controlled the former, had cleared, after the passage of the empty coaches into No. 10 platform. There is little doubt that actually engine No. B.210 quite correctly commenced to move out of the siding some seconds before these coaches had come to a stand, and therefore before Asbury could have disengaged himself from the superintendence of the movement.

I have considered very carefully this phase of the events preceding the accident, and was impressed by Inspector Pellow's straightforwardness and definite grasp of what transpired. On the other hand, Bastin seemed an entirely reliable witness, as was Asbury; and I think that the only conclusion to be formed from the various communications which took place is that Bastin would not have been likely to ring up the box at 7.20 p.m. to say that the engine was ready to leave for New Cross Gate, nor would Asbury have been likely to tell him to do so, if either man had already been told, or had understood, in conversation only ten minutes previously, that the engine was destined to make the

shunt first. It may, therefore, be accepted that, though it had been realised in the box since perhaps 7.0 p.m. that the engine would probably be available to make this particular movement, the instructions in this respect did not reach the ground till perhaps five minutes before the movement commenced, when no avoidable delay occurred in acting upon the advice received, Bastin not of course being expected to take the initiative in Asbury's absence in a matter of this kind, while the latter certainly lost no time after the completion of his previous duty.

(7) As the engine moved, signalman Hulbert was watching the diagram, but he did not actually notice the occupation of the track circuit ahead of shunt signal No. 141, his attention at the moment having been diverted to another movement. The noise of the collision was therefore the first intimation to those in the box that anything untoward had occurred.

Chief lineman Powell was passing through the relay room at ground level under the box at the time, and, within as short an interval as 15 seconds, he observed shunt signal No. 147, applying to the train, and No. 141, applying to the engine, displaying respectively green and red indications. He went up to the frame immediately, and also satisfied himself that the lever of No. 141 was normal, the repeater indicator behind it showing red. At about 10 p.m., after releasing the track circuit locking on the junction points No. 148, which had not been reached by the vehicles, he tried the mechanical locking of this signal, and found it correct.

(8) As indicating what both the enginemen had in their minds before leaving the siding, fireman Axton said he had spoken to shunter Asbury at about 7.0 p.m. to enquire when the engine would get away, and Asbury had repeated what he had said 1½ hours previously, that "*When it is convenient you will be light to New Cross Gate*". After that, at about 7.15 p.m., Beale sent Axton to the Locomotive Foreman, whose office is nearby under the water tank, "*to tell him that we wanted to get to New Cross Gate for the 8.28 empties, New Cross Gate to London Bridge*," Axton returning in a few minutes with the message that the foreman "*would advise the signalman, but he did not know how long we should be before we got away*".

Both men subsequently observed the clear aspect of shunt signal No. 212, Beale crossing the footplate for the purpose. Beale started away "*thinking I was all right as far as the first set of running signals on the girder*," viz., Nos. 158 and 156. His account is that, on passing out of the siding, he observed, over the coal in the tender, signal No. 141 showing red, "*but I was under the impression that it did not apply to me*," and when he saw (from a position apparently near the box, and after losing sight of No. 141) that No. 158, some 250 yards ahead, was displaying a green indication (for the electric train) he accepted it, and applied steam, the accident taking place immediately afterwards.

Examination from the footplate of one of these engines, similarly coaled, showed that Beale had an excellent view of No. 141 over the top of the tender, from points between the North end of the tank and the box, viz., over a distance of about 80 yards. Axton was similarly under the impression that the next applicable signals were those on the gantry ahead, and he was not aware of the existence of No. 141, nor did he in fact observe it.

In regard to Beale's explanation in respect of the function of this signal, I gathered that he felt at the time that the signal did not apply to a movement of a running nature, which (while standing in the siding) he had formed the impression that his was. On the other hand the explanation which he had previously given to the Company's officers was that he did not obey the signal because he thought it applied to the adjacent road H, for which, however, there is also the corresponding signal, No. 149, in its proper position on the left, at the corresponding location, and on a level with No. 141.

I think, perhaps, that the measure of Beale's knowledge of the new signalling—acquired as the result of scrutiny of Notice No. 20 and the instructions he had received thereon—may best be summed up in his own words:—"I concentrated on the Central section mostly, but it was a job to keep it all in my head." He could not, of course, point to any example in the installation where an isolated signal of the kind was permitted to be passed at danger, whether

the movement concerned was of a running or shunt character. He was also admittedly fully alive to the fact that the services of a pilotman would have been available, had he thought one necessary, or, alternatively, that his duty would have been changed, had he felt himself incompetent to handle an engine in the low level station.

#### *Conclusion.*

This is really a very simple case, and no question arises in connection with it which throws any doubt upon the proper operation of points, signals, track circuits, locking, etc. The last-named is such that the road may be made for an out-going movement from No. 12 platform, via F line and the junction points No. 148, on to the down local line, while points No. 213 may be set and signal No. 212 cleared for a simultaneous movement out of No. 1 siding up to signal No. 141, the lever of which remains mechanically held normal.

It is also quite clear that all reasonable endeavours had been made—both before and for that matter after the 17th June—to inform drivers as to the working under the new conditions, and the instructional notice could not have been drawn up in a better or more detailed form. The fact, however, that this notice is a printed foolscap document of 24 pages in itself illustrates the magnitude of the undertaking involved in the reorganisation of this station, as affecting the operation of over 2,100 loaded passenger trains in the 24 hours (apart from the numerous light engine, empty stock and goods workings). Between the hours of 4 p.m. and 7 p.m. alone, there are no less than 428 of these trains, an intensive service of over 140 per hour.

Naturally some men absorb such instructions, and understand plans and new methods more readily than others. It must also be recognised that however carefully the programme of education was carried out, no preliminary rehearsal was practicable on this vast stage, and the production had to be brought into effect as a whole and not piecemeal. It can hardly be expected that everyone would be word-perfect; but as showing the measure of success attained, it is noteworthy that this is the first case of accident which has occurred since the new works were brought into use. Time, patience and experience are of course required before every part can be played as all concerned are endeavouring it should be played.

The case in fact is illustrative—as driver Beale so frankly and regretfully admitted—of what may result from misunderstanding and imperfect knowledge of the true meaning of signal indications in these circumstances. It has been necessary, however, to refer in some detail to what may be inferred from his evidence led to this misconception, or more precisely how it came about that advice did not reach him, and thus possibly safeguard him from such misconception.

There is the fact that he had acted in accordance with the advice he had received an hour previously when he approached the same signal, on the same road, and with undoubtedly the same impression in his mind (*viz.*, that his engine was booked to return to New Cross Gate), and it might not seem unreasonable to assume that he would have acted properly again, an hour later, had he been similarly warned. On the other hand, it might have transpired that, by advice from the shunter, Beale's impression was confirmed; but, by subsequent decision in the box, it was intended that the engine should draw up to signal No. 141 preparatory to proceeding to New Cross Gate, following the passage of the train in question across its path, a combination of movements which have frequently to occur.

So far therefore as it affects this case, it is to be regretted that the warning, which was about to be given to Beale, failed to reach him; but, having regard to the pressure under which operations were necessarily being conducted, I am satisfied that no responsibility can reasonably be attached to the traffic staff concerned. Indeed, as already explained, provided that drivers obey signal indications, the system installed ensures the safety of every movement, without intervention, direct supervision or instruction by the traffic staff, as represented by the shunter on the ground. The latter's function under this system is to give, to the best of his ability, informative advice to drivers, if such advice be available, with the important object of facilitating the expeditious handling of



traffic; but not with the object of protecting drivers against misunderstanding, misreading, or disobedience of signal indications, for which they alone must, as always, remain entirely responsible.

Whether the engine left the siding en route for New Cross Gate or for shunting work, it should of course have been brought to a stand at signal No. 141. In spite of the instructions, clear as they are, and in spite of the fact that he had been successfully working for three weeks, into and out of the Central section of the station, under the new arrangements, Beale appears to have deceived himself in regard particularly to his knowledge of the shunt signal system, the result of failure to appreciate its two main principles:—(a) that in the case of movements authorised by shunt signal, which this was, the clear aspect (green) gives permission to proceed only as far as the line is clear, and in any event no further than the next signal, be it a shunt or running signal; and (b) that shunt signals, if isolated, as was No. 141, are invariably worked for all movements authorised by running signal, which this movement was not.

The fact that the signal in question, which Beale admittedly observed, was at danger, should have immediately warned him that the impression under which he left the siding was a mistaken one. He had neither authority for supposing his movement was of a running character, it having been initiated by a shunt signal, nor any reason for thinking that No. 141, which is in its correct position, did not apply to the road upon which he was travelling. There could be no clearer justification than this case for the adoption of the latter principle.

Moreover, Beale was admittedly aware that a pilot would have been promptly available, had he considered, before leaving New Cross Gate, that his knowledge of the low level yard did not justify him in working there. I understand also that his tour of duty would have been changed entirely if he had not felt confident of himself. Even when he got to London Bridge, he was in touch with the locomotive foreman there, and had plenty of time to obtain assistance; and apart from taking that course, if he had not been sure of the location or application of any particular signal, shunter Asbury was available to render advice.

His long experience, good record, and the fact that this was the first occasion upon which he had worked in the low level yard under the new arrangements, make his momentary lapse from caution all the more difficult to explain. The only excuse which I can find for his regrettable mistake, for which he is solely responsible, is that he was really over-confident of his own ability to grasp the fundamental principles of the system of signalling to which he was working.

#### *Remarks.*

Signal No. 141 is in effect an isolated right-road limit-of-shunt, and its position on outgoing line G is such that the over-run beyond it to the nearest fouling point of the crossing of line F amounts to 120 feet, a distance which—in view of the number of times during the day when shunt movements approach the signal at danger while converging or crossing running movements simultaneously take place in close proximity ahead—might appear to be somewhat short for the rectification of any error of judgment on the part of a driver.

The conditions in respect of the corresponding signal No. 147 on line F are similar, the over-run in that case to the fouling point of the crossing of line G being 112 feet; and there are three other signals here of the same category, viz., No. 149 on line H where the distance is 75 feet, No. 138 on line E and No. 49 on line B, where the distances are 130 feet and 122 feet respectively.

In the case of a system embracing automatic train control, it would I think probably be deemed advisable, as part of such an installation, to provide a train-stop at each of these locations, and I have discussed with the Company's officers the question of what steps, if any, can reasonably be taken, in respect of these particular signals, to safeguard a recurrence of the error which occurred on this occasion.

In addition to that mentioned, there are various ways of improving security, viz., (a) by the introduction of trap points with or without a sand drag ahead

of these signals; (b) by the provision of motor-worked detonator placers operating in conjunction with the signals; and (c) by providing locking which would not permit the combination of shunt and running movements simultaneously to converge so closely.

In regard to (a), four of the signals could be so treated, but the fifth, No. 138, could not. I understand, however, that this equipment—besides forming an additional obstruction to men moving or working on electrified track, and possessing other objectionable features—would involve such extensive alterations in the existing locking frame that it would become necessary entirely to close down the installation for long periods while the work was being carried out. Clearly such a proposition could not be contemplated, if indeed it would be right in principle to provide apparatus such as trap points or derailleurs on passenger roads for a purpose of this kind.

In regard to (b), the detonator provides a less costly alternative, and its installation is commendable as being a comparatively simple matter. But its efficacy would be very doubtful under conditions of such limited over-run and again, in principle, its introduction, in connection with shunt movements, even in an uncommon situation of this kind, has other disadvantages.

Alternative (c) has also been considered very carefully with the aid of statistics of movement prepared by the Company's officers, based upon observed operations. It has been ascertained that the daily booked short outward light engine and other shunt movements from the various platform and siding roads up to the above-mentioned signals at danger are 24, 16, 7, 6, and 17 respectively, a total of 70 movements, which number is probably a minimum. The overall time taken to effect the outward movement (which is the one in question), and the inward movement, varies from one to two minutes in each case, the total shunt covering two to four minutes.

If restrictive locking were imposed—as it would have to be upon no less than 17 shunt signals in rear of, and leading up to, those concerned—to render it impossible to make such shunts, while all conflicting or converging running movements were in progress, I am informed by the Company's responsible traffic representatives that operation would be so detrimentally affected that an appreciable reduction of train services would inevitably result. And even if less restrictive locking were provided, with a view to preserving a somewhat longer over-run distance, in cases merely of converging shunt and running outgoing movements, it would appear that, particularly in the evening rush period, serious and cumulative delay might be anticipated as the result of loss of essential flexibility.

In connection with this point, it is of interest to note that the equivalent of such locking was not imposed under the old semaphore signalling, which operated so successfully for many years; while under the new and safer system, in spite of increased train services, conditions are more restrictive. An example in this respect may be quoted in regard to the present location of No. 147, where the over-run was previously only a few feet. It is also noteworthy that at other junction locations, under the new system of signalling, traffic conditions to-day have made it necessary to operate, in respect even of running movements, with over-runs much less than those relating to the shunt movements in question.

Apart, however, from such considerations, this case is clearly one in which the length of over-run beyond signal No. 141 did not in any way contribute to the accident; and on its merits, therefore, there is no justification for expecting that any steps should in consequence be taken in the form of additional apparatus on the ground or locking in the box. Indeed, I am not satisfied that it would be entirely reasonable to suggest the introduction of such safeguards, which amount in effect to the provision of protection against mistakes, which it is the primary duty of drivers to avoid. It cannot, in fact, be impressed too strongly upon all enginemen that in no circumstances may an isolated signal of any kind be passed when displaying the red aspect.

The points, therefore, to which I think attention should be mainly directed as the result of this accident are:—(a) the necessity for intensive educational training and examination of enginemen in the new system, and (b) the advisability of keeping them informed, as early as it is practicable to do so,

of what is expected of them, particularly when employed in connection with light engine and shunt movements.

I understand that steps are being taken, by removal of a wall and the stores building, to improve the view between the outgoing G and F lines. Having regard also to the possibility that there was misunderstanding in this case as to the road to which the signal in question applied, it would not be inappropriate to consider the question of fixing indicative pointers to such signals, similar to those, for instance, at Waterloo.

I have the honour to be,

Sir,

Your obedient Servant,

A. H. L. MOUNT,

*Lieut.-Col.*

The Secretary,

Ministry of Transport.

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## APPENDIX.

## DAMAGE TO STOCK OF ELECTRIC TRAIN.

*Motor Third No. 8671—Leading vehicle.*

Last three compartments wrecked and trailing end smashed.	4 short bogie stepboards broken.
2 quarter panels.	1 motor axle box broken.
1 door panel.	2 spring hangers broken.
1 door.	2 bogie guard irons bent.
2 long stepboards.	2 body trusses bent.
7 step iron brackets.	Steel underframe distorted.
4 axle boxes.	Brakework and pipe work bent.
Brake work distorted.	Westinghouse reservoir and cylinder broken.
1 bogie frame distorted.	Compressor carrier broken.
1 side spring broken.	Both centre pins bent.
8 spring hangers bent.	1 top and 1 bottom pivot casting broken (motor end).
3 brake blocks broken.	1 buffer face plate bent.
2 conductor shoe beams broken.	1 drawbar broken.
2 fuse brackets broken.	1 Westinghouse hose pipe broken.
2 side springs crippled.	4 pairs of wheels derailed.

*Composite Trailer No. 9702—Second vehicle.*

Leading five compartments smashed.	Steel underframe distorted.
2 bottom sides broken.	2 trusses bent.
2 cant rails broken.	Brakework and pipe work bent.
1 end smashed.	Brake cylinder broken.
3 quarter panels broken.	1 bogie truck distorted.
2 door panels broken.	1 buffer face plate bent.
1 body quarter broken.	1 body friction block broken.
2 long stepboards broken.	1 axle box broken.
27 feet roof boarding gone (including smashed compartments).	3 side spring hangers bent.
12 stepboard brackets bent.	1 bogie stepboard broken.
	2 pairs of wheels derailed.

## DAMAGE TO ENGINE No. B.210.

Trailing engine axle bent.	Left trailing tender spring broken and hanger bent.
Whole of cab shifted and damaged.	Foot-plate around tender bent.
Intermediate engine buffer beam bent.	Left tender door bent.
All steps bent and broken.	Left leading tender axle box cover broken.
Both sides of foot-plate buckled, and foot-plate angle iron bent.	Left bogie splashers damaged.
Left middle and trailing tender axle boxes broken.	Vacuum intermediate train and injector over-flow pipes broken.
Left middle tender horn block broken.	Whistle stem broken.
Left middle tender journal damaged.	

## DAMAGE TO PERMANENT WAY, ETC.

17 crossing timbers, 10 to 14 feet long, damaged and broken.	100-feet L.T. cable troughing.
2 45 feet rails, and 1 angle bond broken.	20 L.T. cable bolts.
22 middle, 8 check and 5 M.I. chairs broken.	60 4-inch brass screws.
59 yards 100 lb. section conductor rail.	200-feet protection boarding.
3 pairs conductor rail fish plates.	50 double supports.
8 conductor rail fish bolts.	100 4-inch coach screws.
50 insulators.	100 pairs protection board clips.
30 insulator clips.	6 1½-inch iron wood screws.
50 3-inch coach screws.	92 conductor rail bonds.
3 hook switches.	4 9½-inch P.T. track bonds.
	4 23-inch flexible bonds and bullets.

## DAMAGE TO SIGNAL APPARATUS.

20 copper bonds.	2 sets block joint insulations.
40 channel pins.	