MINISTRY OF TRANSPORT

RAILWAY ACCIDENTS

REPORT ON THE COLLISIONS

which occurred on the

10th February, 1946, at

POTTERS BAR

on the

London and North Eastern Railway

LONDON: HIS MAJESTY'S STATIONERY OFFICE

1946

PRICE 1s. 3d. NET

LONDON AND NORTH EASTERN RAILWAY

MINISTRY OF TRANSPORT,
BERKELEY SQUARE HOUSE,
LONDON, W.1.
31*st May*, 1946.

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order of 11th February, the result of my Inquiry into the circumstances of three passenger train collisions which occurred at about 10.8½ p.m., 10.9½ p.m., and 10.9¾ p.m. respectively on Sunday, 10th February, at the North end of Potters Bar Station on the main line of the London and North Eastern Railway.

The 9.32 p.m. Hatfield to King's Cross local Passenger train, travelling on the Up Slow, due to stop at the station on the Up Main, became derailed, as the result of the signalman reversing the facing crossover, Slow to Main, between the bogies of the first coach. The engine collided at considerable speed with the buffer stop of the short dead-end siding extension of the Up Slow; but, as the train followed the line of the crossover, the impact forced the first two coaches out of alignment to such an extent that the Down Main was fouled as well as the Up Main.

Soon after that the 9.45 p.m. Down Express, King's Cross to Edinburgh, travelling under clear signals at about 45 m.p.h., collided with these two coaches and carried the underframe of the second in front of it, while dragging along that of the first, for a distance of about 115 yards, where both main lines were again obstructed. The engine was derailed and considerably damaged; the rear of its tender was lifted and the six leading coaches were derailed.

Thereafter, and perhaps even at the same time as the Down Express came to a stand, the 5.0 p.m. Up Express, Bradford to King's Cross, collided at slow speed with the wreckage; the engine and tender fell over on their sides to the left, adjacent to and alongside the engine of the Down Express, with the underframe of the first coach jammed between them. The leading vehicle of the Up Express was derailed. The positions in which the three trains came to rest are shown on the attached plan.

I regret to report that two passengers in the local Hatfield train were killed, and eleven others, with six of the Company's servants, were either injured or suffered from shock, of whom three were detained in hospital for more than a week. It was estimated that this train carried only 30 passengers; there were 595 in the Down Express and probably 450 in the Up Express. The small casualty list was providential and due to the light loading of the Local train; the Buckeye coupling may also have contributed to the immunity in the Down Express.

Medical aid was available within five minutes, while local ambulances and the Metropolitan Police rendered immediate assistance. The King's Cross and Peterborough breakdown trains with steam cranes arrived at 1.50 a.m. and 2.25 a.m. respectively on 11th February. The Down Main and Down Slow lines were re-opened at 6.55 p.m. that day, while the Up Main and Up Slow were re-opened at 12.5 a.m. and 2.0 a.m. respectively on 12th February.

Some 300 yards of track were badly damaged, including two sets of points and crossings. The down starting signals on a bracketted post were carried away and three ground disc signals were destroyed; rodding, cranks, etc., were badly damaged, and debris in contact with wires caused certain signals to remain in, or to be pulled to, the clear position (see later).

During the time the lines were blocked, traffic was diverted via Hertford, and connecting shuttle services were put into operation between Hitchin, Stevenage and Hatfield; also between King's Cross and New Barnet. A Push and Pull service was introduced between New Barnet, Hadley Wood and Potters Bar, and a bus service between New Barnet and Hatfield.

It was a clear night.

COMPOSITION OF TRAINS AND CIRCUMSTANCES OF ACCIDENT

The Hatfield train comprised two quadruple sets of inner suburban articulated stock weighing 168 tons 3 cwts. Each set was carried on five bogies; the inner wheels of the two bogies under the first vehicle were 22 ft. apart. The train was hauled by tank engine No. 2679, type 0–6–2, running bunker first, length 38 ft., weight in working order 71 tons 9 cwts., fitted with the vacuum brake operating blocks on the coupled wheels and on all wheels of the train. Overall length was 375 ft. The first three coaches were wrecked; the fourth was considerably damaged, but came to rest on the crossover and was not derailed. The second quadruple set was undamaged except for the rear end of the last coach, which came in contact with the leading vehicle of the Down Express.

The Down Express was hauled by engine No. 4876, type 2–6–2, weighing in working order with tender 145 tons 2 cwts.; it comprised 12 bogie vehicles, Buckeye coupled with a 6-wheeled van in rear, weighing 383 tons 13 cwts. The train was fitted throughout with the vacuum brake operating blocks on all wheels, except the centre pair of the 6-wheeled van and the pony and carrying wheels of the engine. There was a screw coupling between tender and train; the buffer of the first coach penetrated the tender, and both were raised up and tilted to the right. The tender axle boxes (right-hand side) were broken and the main frames bent. The engine also came to rest leaning to the right, its buffer beam and the right-hand leading buffer having been badly damaged, presumably by collision with the articulated end of the leading coach of the local train or subsequently by contact with the engine of the Up Express. Although the first coach was considerably damaged, the other derailed vehicles were little affected.

The Up Express comprised ten coaches, Buckeye coupled, weighing 307 tons 3 cwts., hauled by engine No. 4833, type 2–6–2, weighing in working order with tender 145 tons 2 cwts. The vacuum brake operated on all wheels, except tbe pony and carriers of the engine. Its buffer beam and right-hand buffer were badly buckled in a similar manner to the engine of the Down Express, and this damage may also have resulted from collision with the wreckage or from actual contact between the two engines. The air photographs appeared to confirm the latter, and it is conceivable that the engines came to a stand simultaneously after making glancing contact buffer to buffer. Speed when the Up Express engine and tender overturned (to the left) had fortunately been reduced to five to ten m.p.h.

Mr. F. J. Flint, of Messrs. Westinghouse Brake & Signal Company, an independent witness, was residing at the time in a camping coach adjacent to the station signal box. He did not actually hear the buffer stop collision, as he was listening to his wireless ; but his fitter immediately advised him about it, and they noticed at once that the bracketted post carrying the Down starters, Nos. 54 and 56, had been hit by a coach (presumably tbe second) and was leaning over 10° ; also that *both* signals, Down Main and Main to Slow, were displaying green lights, the latter no doubt the result of debris lying on the wire. He was about to take action to release them when the Down Express arrived ; he witnessed this collision, and judged that the interval after the Hatfield train had collided with the buffer stops was not more than a minute.

Mr. Flint did not realise at the time that an Up Express was also involved ; but Lineman E. Cornell (who was off duty) was walking along a footpath (on the Down side of the line) towards Brookman's Park, and had reached a point about 150 yards North of the signal box (nearly opposite to where the engines came to a stand) when he heard the buffer stop collision. He thereupon observed the tail light of the local train, and noted that the Up Main and Up Slow home signals were at Danger (by viewing the back lights). His account was that he immediately observed the lights of the Up Express and watched it approach until it came to a stand a few yards short of the local train :—

" I also noticed that the doors of several compartments opened very quickly after the train had come to a stand, and some passengers jumped out and ran across the Down Main line on to the bank near where I was standing. Within a matter of seconds I heard a grinding sort of noise in the direction of the station, and the next thing I saw was a black object near the engine of the Up Express. It appeared to me that there was a collision, and I then saw the engine of the Up train fall on its side."

Thus it would appear, as was Cornell's impression, that the Down Express engine, carrying forward the wreckage of the Hatfield train coaches, collided with the already stationary Up Express, overturning the engine and tender of the latter and derailing its leading coach ; but further evidence by the Driver concerned disproves this suggestion, and it can reasonably be assumed that passengers did not jump hurriedly from the Up Express as the result merely of brake application to a stand. The account, however, of an eye-witness in darkness is mentioned here to illustrate one of the uncertain and contradictory features of the evidence in this case, even about the sequence of events.

DESCRIPTION OF SIGNALLING, ETC.

The Company's main line through Potters Bar runs roughly North and South, and the attached diagrams include the lines and signals concerned. The approximate distances from London of the signal boxes and stations referred to in the evidence are as follows :—

New Barnet North Box	9¼ miles
Greenwood Box	10 ,,
Hadley Wood Station	10½ ,,
Potters Bar Box	12¾ ,,
Brookman's Park Station	14½ ,,
Marshmoor Box	16 ,,
Hatfield No. 3 Box	17¾ ,,

Until August 1942, the additional Up running line between Hatfield and Potters Bar was used for slow passenger traffic throughout its length ; but in that month the crossover, Slow to Main, was provided at Brookman's Park, and until 6th January, 1946, the section between there and Potters Bar was operated as an Up Goods line under tbe Permissive Block system. With the cessation of hostilities, it was considered desirable again to use this section for passenger traffic under Absolute Block conditions, while continuing Permissive Block for freight trains, and after its use in this manner had been approved and the former signalling arrangements had been restored, the section was again made available for passenger working from the latter date.

The movement under the first coach of facing crossover No. 7, Up Slow to Up Main, brought about the derailment of the Up local train from Hatfield, and signals Nos. 10, 11, and 12 applied to it. Signal No. 11 requires the bar No. 4 to be drawn with crossover No. 7 set either way ; but signal No. 12 requires he crossover set for the movement Slow to Main, in which case Signals 13, 14, and 15, applicable to he Up Express, are locked normal.

The spacing is 6 ft. between the Up Slow and Up Main, and between the Up and Down Mains. The lines were track circuited throughout, except on the Up Slow and Up Main between Signals Nos. 12 and 15, through crossover No. 7 to the Up Starter, No. 16. Since the accident this gap in the track circuiting has been closed. Potters Bar signal box is provided with an illuminated (spot light) track circuit diagram, and has 53 working levers and 7 spare. Operation to Marshmoor and Greenwood boxes on either side is by train-describing bell.

The approximate distances from the centre of the signal box to relevant points and signals are as follows :—

Buffer stops of Up Slow	1 yard North
Facing points of No. 7 crossover in Up Slow	75 yards ,,
Front of engine of Down Express and tender of Up Express with debris between them.	130 ,, ,,
Up Main (No. 15) and Up Slow to Main (No. 12) Home Signals...	340 ,, ,,
Up Main (No. 14) and Up Slow (No. 11) Outer Home Signals ...	882 ,, ,,
Up Main (No. 13) and Up Slow (No. 10) Distant Signals ...	1,682 ,, ,,
Up Main (outer Distant) and Slow colour light intermediate Signals	1 mile 622 yards north
Up Main and Slow colour light Auto Distants	2 miles 292 ,, ,,

The Up Distant and Outer Homes for the slow line are carried on posts in the cess and are some 25 ft. high ; each post supports a 15 ft. bracket which carries the main line signals, 28 ft. high and well sited over the main line. These signals can be seen at ranges of 560 yards and 740 yards respectively.

The Up Inner Homes, with a sighting distance of 1,000 yards, are not so well sited ; the post is 19' 8" from the centre of the Up Slow, outside the Up siding, and supports a bracket of only 9' 0" carrying the main line signal, 21' 10" from the centre of the Up Main, but only 10' 8" from the centre of the Up Slow. The two signals are 29' 3" and 32' 0" respectively above rail level.

The other signals concerned are the colour light intermediate Stop and Distant signals on either side of Brookman's Park, worked from Marshmoor, both approach lighted by occupation of the relevant track circuits. The Up Slow Intermediate Home is of multi-unit 2-aspect type, and carries a junction indicator for the crossover, Slow to Main ; also a calling-on banner type signal for use with permissive working over the section to Potters Bar, as previously mentioned. The lamps are 6-volt 12/16 watt, double filament type ; indications are Red and Green, the latter with lever reversed and track circuits clear as far as Potters Bar Up Inner Homes.

The corresponding main line signal is of searchlight type, controlled by lever which stands normally reversed in Marshmoor ; the signal thus works automatically and displays R, YY, and G. It is also approach lighted, the searchlight mechanism operating at 6-volts, the lamp being of 6/9 watt double filament type. This signal acts as an Outer Distant for Potters Bar and caters for high speed running ; YY is displayed normally with the lever reversed and track circuits UM, UN, and UO clear ; it also proves that Potters Bar Up Main Distant and Outer Home arms and the Inner Home lever have been replaced behind the previous train. Green is displayed only when Potters Bar Up Main Distant is clear.

The Auto Distants display G. and Y, and can be seen at a range of 840 yards. A good view of the Stop signals can also be obtained from the North side of Brookman's Park.

As already mentioned, in addition to signals Nos. 54 and 56, debris in contact with wires caused the following signals to remain in the clear position, and their electrical repeaters were showing " off " after the accident, although the respective levers were normal :—

No. 55 Down Slow Advance Starter
No. 53 Down Main Advance Starter
No. 58 Down Main Outer Home
No. 10 Up Slow Distant
No. 11 Up Slow Outer Home
No. 14 Up Main Outer Home

REPORT AND EVIDENCE

1. The preceding and following passenger trains which will be mentioned, and those involved in this series of collisions, were as follows :—

No. 92 Up Express, 5.50 p.m. Grimsby to King's Cross, running on the Main line, 22 minutes late, passed Potters Bar at 10.0 p.m.

No. 90 Up ordinary, 7.15 p.m. Peterborough to King's Cross, running on the Slow line, 30 minutes late, passed Potters Bar at 10.3 p.m.

No. 95 Up ordinary, 9.32 p.m. Hatfield to King's Cross, running on the Slow line, which left Hatfield 25 minutes late and collided with buffer stops, fouling both main lines at about 10.8½ p.m.

No. 255 Down Express, 9.45 p.m. King's Cross to Edinburgh, running on the Main line, 3 minutes late, collided with the wreckage at about 10.9½ p.m.

No. 94 Up Express, 5.0 p.m. Bradford to King's Cross, running on the Main line, 20 minutes late, collided with the wreckage at about 10.9¾ p.m.

No. 257 Down Express, 9.55 p.m. King's Cross to Edinburgh, was stopped at Greenwood.

2. The first collision took place when the tank engine of No. 95 hit the buffer stops at a speed of at least 15 m.p.h. and carried them forward some 26 feet. Driver Trigg appeared to be a reliable witness and has a very good record. He estimated that maximum speed after making a stop at Brookman's Park reached 35 to 40 m.p.h. on passing the Distant signal, and he was preparing to come to a stand at the platform at Potters Bar on the assumption that he was going to traverse crossover No. 7 before doing so. He thought the speed restriction over the crossing was 15 m.p.h., whereas it was 10 m.p.h.

Trigg said he was fully aware that he was travelling on the Slow line, and was acquainted with the Main line between Hatfield and Potters Bar; but he had not been over either for three months, and it was his first trip over this section of the Slow line since its conversion from Permissive into Absolute Block working, though he knew that the change had come about on 6th January and had seen the relevant Notices. His evidence was to the effect that "*I should not have gone over the road if I had not known it.*"

He stated that he passed the intermediate signals at Brookman's Park at Green, but he suggested that those for the Main line did not light up, as he did not see them. He observed and passed both Potters Bar (semaphore) Distants at caution. He submitted a Shed Report on the morning after the accident as follows:—

"*The Outer Home was in the off position, and I am sure the Inner Home was also off. I had the brake partly applied, being prepared to take the lead turning me Slow to Main line to stop at platform, but ran into buffer stops.*"

Trigg's fuller account at the Company's Inquiry regarding his approach to these signals was:—

"*Potters Bar Up Slow line Outer Home signal (No. 11) was in the 'off' position, and I also noticed that the Up main Outer Home signal was in the 'on' position. I should estimate that I was travelling at between 35 and 40 m.p.h. when I passed the Distant signal, and I shut off steam prior to passing the Outer Home signal. I saw the Inner Home signals, one of which was red and the other green. I was almost* (the underlining is mine) *certain that the signal in the 'off' position was the one applicable to the Up Slow line. I had a good view of the signals as I approached them. As I passed the Inner Home signals I applied the brake ready to take the lead from the Slow line to the Main line, and to stop in the Potters Bar Up Platform. The next thing I knew was the engine had hit the buffer stops, and I should estimate that at the time we were travelling at about 15 m.p.h. I was still applying the brakes at the time when the engine hit the stops.*"

At my Inquiry, Trigg was more emphatic as regards the Inner Home No. 11, and on reflection desired to withdraw the word "almost" which he had used when asked at the Company's Inquiry if he was "*absolutely certain*" that this signal was clear for his train. He explained that "*the word has got in the Report by the way I spoke. If I had not been certain it was my signal I would not have passed it.*" That, in fact, was the gist of his evidence, on which he could not be shaken, nor was there any doubt in his mind that he was running on the Slow line and that he knew the road. Fireman L. J. Dungate, a man with 10 years' service, also supported him, using a similar expression, "*We should not have passed the board otherwise.*" Dungate had worked on the main line for six years, as recently as the previous week, but had not been over the Slow line for a year and then with a freight train.

3. On the other hand, Signalman G. T. Baines, a man of 27 years' experience, the last four at Potters Bar, emphatically contradicted Trigg. His evidence was that he lowered the Outer Home, No. 11, only when he saw UG track circuit indicator light up, as well as UD, UE, UF, and UG which are combined on one indicator; this was in order to allow the train to draw up to Inner Home No. 12. He anticipated that the train would stop at the Inner Home which was at danger, but it ran past, and his account was as follows:—

"*When I saw that the train had passed the Up Slow line Inner Home signal at danger I immediately sent the obstruction danger bell signal to Marshmoor and to Greenwood signal boxes. I then immediately placed the Up Main Line signals to danger, these having been pulled off at 10.7 p.m. for the 5.0 p.m. Express Passenger train Bradford to King's Cross. I then placed the Down Main Line signals to danger, these having been pulled off at 10.5 p.m. for the 9.45 p.m. Express Passenger train King's Cross to Edinburgh. My next thought was that as the 9.32 p.m. from Hatfield had run past the Inner Home signals, the engine would collide with the buffer stops, and it was with this in mind that I decided to try to reverse No. 7 points with the object of diverting the train on to the Up Main and into the station. When I attempted to do this I was not clear as to the actual position of the Hatfield train, but I thought I had a reasonable chance of making the lever movement and effecting the diversion. I should estimate that the Up Slow train was running towards the buffer stops at approximately the normal speed of a train running into the station to stop. I pulled No. 7 lever right over, there was nothing really abnormal in the pull of the points. The next thing that I saw was that the engine had run into the buffer stops. It was then 10.8 p.m. I did not know at that moment what had happened to the train itself. I looked for the Down Express which I knew would be approaching and saw that it was just on the London side of the Inner Home signal, so far as I could judge. I should estimate the speed of the Down Express Passenger train at about 40 miles per hour when it came through the station. I did not actually see the engine of the Down Express hit the coaches of the Slow Passenger train, but I heard a crunching noise. I then made an immediate report to Control on the telephone. I did not see or hear anything of the Up Express Passenger train.*"

Signalman Baines had corrected his clock at 7.50 p.m., and comparison of his register with those at Marshmoor and Greenwood on either side showed that bookings were fairly consistent, with Marshmoor about a minute behind and Greenwood about a minute ahead. He held that his Obstruction Danger signal was transmitted at 10.7 p.m., even a minute *before* the collision with the buffer stops, namely, when "*casting my eye back, I saw that the train had overrun his signal.*"

According, however, to his evidence, he lowered the signals for the Up Express at the same time, 10.7 p.m., when it "*would have passed my Outer Distant, and he would not be far away from my Distant signals*". He suggested, therefore, that the train had entered the section at 10.6½ p.m., his booking for this being 10.7 p.m. also, as compared with that of 10.6 p.m. by Marshmoor. To make the times

tally with the assumed facts of the situation and his account of what happened, he suggested that, instead of 10.7 p.m. (his booking), the clearing of signals for the Express and the transmission of the Obstruction Danger bell signal might have been 10.6½ p.m. and 10.7½ p.m. respectively; he adhered to the statement that the collision with the buffer stops occurred at 10.8 p.m.

As regards his statement "*I did not know at that moment* (10.8 *p.m.*) *what had happened to the train itself*", Baines did not go to the window to see whether he had succeeded in his object of diverting the train on to the Main line; nor did he watch the collision with the buffer stops. He said that the approaching Down Express was on his mind, and that he could not altogether see the results of the derailment in the dark, on the north side of the box.

He further stated that he observed the Down Express engine hit the wreckage "*only a matter of seconds*" after the collision with the buffer stops. According to his booking, it had entered the section at Greenwood at 10.5 p.m. (Greenwood's booking 10.7 p.m.), and he recorded arrival (and the second collision) at 10.8 p.m.; but he had *previously* entered 10.10 p.m., which he said must have been a mistake as the right figure, 10.8 p.m., was subsequently written above it. His usual custom in the event of error was to "*put a pen through the entry and write above*", but on this occasion the first entry, 10.10 p.m., was not so deleted.

Another example of the uncertain features of the case was the fact that the clock in the box was subsequently noted to have stopped at 10.10½ p.m. Baines explained that it was "*because a piece of wood was knocked off which covers the wiring, and it knocked the clock on one side and stopped it, for the pendulum was not going equally.*" He did not see the wood fall, nor the time at which the clock moved, but he agreed that the fall must have been due to the shake of the Down Express collision; also that the time of stopping of the clock "*could not have been far off*" that of this collision. On the other hand, he accounted for the difference of 2½ minutes (between 10.8 p.m. and 10.10½ p.m.) from his evidence that the collision of the Down Express was "*almost simultaneous*" with that of the local train and the buffer stops, by suggesting that "*the piece of wood may not have dropped directly the collision occurred . . . it might just have been shaken and then have dropped.*"

Again, there is room for considerable uncertainty as regards Baines' account that he made an "*immediate report*" to the Controller after the Down Express collision. According to his evidence, this occurred within a few seconds of the buffer stop collision at 10.8 p.m., but the Controller recorded Baines' message and noted the time as being 10.12 p.m. Allowing for the number of important emergency instructions and messages which the Controller had to transmit before his log was entered up, it was not considered that Baines could have reported before 10.11 p.m.

4. Nor does the evidence of Signalman H. S. Colbert of Greenwood make it any easier to assess the sequence of events; it also casts serious doubt upon the accuracy of Signalman Baines' account as regards the running of the Down Express and the transmission of the Obstruction Danger signal. Colbert has had 14 years' experience as a signalman and had been at Greenwood since July 1945. He said he received the Train Entering Section signal at 10.5 p.m. (compared with the entry of 10.6 p.m. at New Barnet North, three-quarters of a mile in rear), and the train passed at 45 to 50 m.p.h. at 10.7 p.m.—"*perhaps not so fast as normal*"—the time at which he described it to Baines. He expected it to reach Potters Bar, 2¾ miles ahead, in about three minutes, say, at 10.10 p.m. It was thus running five minutes behind time, although it had left King's Cross at 9.48 p.m., three minutes late. Colbert's entry of 10.7 p.m. was made at the time, and within half a minute he had reported its passage to Control. He said that timing of trains passing his box varied from 17 to 23 minutes after leaving King's Cross.

Colbert considered that he received the Obstruction Danger signal at 10.11 p.m., no less than three minutes (corrected) later than Baines suggested, and he had booked it accordingly. It was an estimated time; on receipt of this bell signal, he had replaced all his signals to Danger, hurried from the box (a low structure), fallen over some wires, put three detonators on the line, and returned, which he did not think occupied much more than a minute. He thus stopped the following Express No. 257 at his Home signal. Perhaps ten minutes later, Baines rang him up to ask:—

"*What time he gave me six bells . . . I said* 10.11 *p.m. He said it was before that. I said it might have been a minute before that, but he said it was* 10.8 *p.m. I altered my figure while I was talking to him on the telephone into* 10.8 *p.m., and afterwards I was thinking that my original figure was correct, so I altered it back to* 10.11 *p.m. . . .*"

Baines made no suggestion that Colbert should alter his figure, and Colbert did not tell him that he would adhere to his original entry. The conversation lasted only a few moments for purposes of comparison, and they did not think of checking their clocks. Later that evening, Baines simply informed Colbert with no explanation that a "*train on the Up road had hit the buffer stops and the Down train had run into it.*"

5. Thus Baines' account that his Obstruction Danger signal was transmitted at about 10.7 p.m., a minute *before* the buffer stop collision at 10.8 p.m., met with no sort of confirmation by Colbert's suggestion that he received the signal at, say, 10.11 p.m. (10.10 p.m. corrected) *after* the collision of the Down Express with the wreckage of the local train at 10.10 p.m.

Colbert's account, however, was supported by the evidence of the train crew. Driver G. C. Inmonger of Grantham (58 years of age, with 37 years' service) was taken by surprise, as he was running at about 45 m.p.h. under clear signals. The only signals he could not recollect seeing were the Down Main Starters, but they were certainly displaying two green lights according to Mr. Flint. Inmonger considered that he was "*just about keeping time*", namely, 22 minutes to Potters Bar and 27 to Hatfield. He therefore estimated that, with the three minutes late start, 9.48 p.m. from King's Cross, the time of the collision was about 10.10 p.m. He could not have made up two minutes on the heavy gradient and, indeed, Colbert suggested that time had been lost.

Inmonger said the regulator was open when the engine hit the wreckage ; he was unable to apply the brake at once as he was thrown off his seat. The engine evidently rocked very badly and came to a stand (in less than ten seconds) leaning over considerably to the right. He did not realise at the time that the Up Express engine had also collided with the wreckage ; he climbed down on the lefthand side with the aid of a bicycle lamp, and went back to see if anyone was injured in the second and third coaches. He did not look into the first, which was upended and leaning over against the tender, as already described. Thereafter, he went round and found the engine of the Up Express lying on its side. His answers on this point were as follows :—

" Q. *What is your impression about this other train ? Did it come into you after you got off the engine or before ?*

A. *It arrived just as I was on the point of stopping.*

Q. *Were you on the engine when the other train collided with you ?*

A. *I think I was. I must have been on the point of stopping. I did not see it until afterwards.*"

Fireman R. E. Harsley was firing at the time, and was thrown on to the footplate. He had also observed the Outer and Inner Homes at clear, and generally confirmed Inmonger's evidence ; but he could not speak regarding the Up Express collision.

Guard W. J. Pelling, aged 62, with 47 years' service, estimated that speed was normal, just over 45 m.p.h. As regards the time of the collision, he entered 10.9 p.m. in his own Journal and 10.10 p.m. in his Statement for Driver Inmonger. His account of what happened is interesting :—

" *Just as we got out of the tunnel I went out to shut my vestibule door and just came back when I went right on my back when we struck the obstruction. I picked myself up and I went on my back again. I picked myself up and went on my back again—three times. I looked at his brake and he still had 20, and I looked at the steam heater and he still had 20 on. It appears that owing to the driver hitting the obstruction he could not get at his brake, and, of course, it gave my train a good jerking . . .*"

The brake appears to have been applied when the division took place between the first coach and the tender, as the train came to a stand ; presumably this was caused, or accentuated, by the collision of the Up Express. Pelling said the gauge fell " *straight down* " after he had picked himself up for the third time.

6. In addition to the Controller's record (10.12 p.m.) already referred to, further light was thrown on the time of the Down Express collision by the evidence of Driver Trigg. He and his fireman fell on to the footplate when their engine, bunker leading, collided with the buffer stop at not less than 15 m.p.h. The stops were of ordinary heavy rail-built type, and they were pushed back bodily for 26 ft., so that the engine came to rest on the ground in the intervening space clear of rails and sleepers. Trigg did not note the time, but he estimated that the Down Express collision occurred " *a minute or two* " after he and his fireman had recovered and were on the ground. The collisions certainly did not follow immediately. Trigg was not aware of the Up Express collision until he walked round the rear of his train.

7. Guard Florence Haden said that the Up Local train No. 95 left Hatfield at 9.55 p.m. according to her watch " *which is not too reliable* " ; the train registers, however, corresponded fairly well, namely, 9.57 p.m. Entering Section forwarded by Hatfield and 9.56 p.m. received by Marshmoor. Her watch might have been a minute or two slow. The train was delayed by signals leaving Hatfield, as it was closely following No. 90 from Peterborough on the Up Slow. It was nearly brought to a stand at Marshmoor for the same reason, and then proceeded to Brookman's Park where a normal stop was made.

The train left Brookman's Park at 10.6 p.m. by Mrs. Haden's watch, and she said that thereafter it ran quite normally ; it was allowed 4½ minutes for the journey to a stop at Potters Bar, which she therefore expected to reach at 10.10 p.m. or 10.11 p.m., allowing for the correction of her watch. Approaching Potters Bar, she was engaged in making up her journal and saw no signals. As the brake was being applied, preparatory as she thought to stopping at the platform, she picked up her lamp and walked to the door of her brake compartment ; but a jolt threw her off her balance. On recovering, she first looked out on the left-hand side, but realised that the station had not been reached ; she then looked out on the right-hand side, and saw that the line was obstructed near the box. Her account was :—

" *I got out of the brake and could hear an Up train approaching, although I could not then see it. I ran towards the approaching up train shouting as I did so, and showed a red light with my hand lamp. I noticed that the brakes were being applied on the Up train, and I should say it was a full application of the brake when the train actually passed me on the Up Main line. I was very upset, and cannot remember clearly what happened afterwards.*"

8. Driver S. T. Churchill was in charge of the Up Express. He is 50 years of age with 27 years' service, the last 5 in his present capacity. He has a good record, was an excellent witness, and knew the road well. The train was 20 minutes late, but he judged that the schedule was being maintained and speed was not more than 60 m.p.h. His account was that he observed the intermediate colour-light signal at Green at the usual sighting distance before reaching Brookman's Park ; he then observed the Potters Bar Inner Distant at Clear. When level with the Outer Home, which was also clear, he " *saw someone waving a red light and at the same time saw the Inner Home signal go to danger* ".

He immediately closed the regulator and fully applied the brake. The brake acted well, but he realised that he could not stop at the Inner Home, and was in the act of reversing as he " *felt the engine strike something* " at slow speed, not exceeding 5 to 10 m.p.h. ; it fell over to the left, throwing his

fireman, G. Sims, on top of him. The latter got out and went back to advise Guard J. W. Chappell; Churchill followed and also went back to assist, but another driver, travelling as passenger took him to receive First Aid, and on the way he visited the box to ascertain the cause of the collision, when Signalman Baines replied "*It is not your fault; the man on the Up local ran by my boards*".

Churchill could not say whether the right-hand buffer of the Down Express engine actually made contact with that of his engine, as the damage appeared to indicate, and his own opinion was that his engine struck "*something that was between us.*" As regards the time of this collision, he saw Chappell's statement when subsequently travelling home that night to Peterborough and it recorded 10.10 p.m.

Questioned as regards the waving red light and its relation to Mrs. Haden's action *after* the first collision with the buffer stops had happened and to the fact that the interlocking prevented him from seeing the Inner Home signal move to danger at one and the same time, Churchill was "*positively sure*" that this signal went to danger *after* he saw the red light. He said that Fireman Sims had called out to him "*'There is someone waving a red light', and I saw the signals go to Danger and I saw the red light. After I had seen this red light, I lost it; it got out of my view, and I wasn't thinking of anything in front of me at all when it crossed my mind that I had maybe knocked someone down. Then I heard afterwards that the Guard of the local train had fallen and cut her leg. I never saw the Guard of the local train that Sunday night*".

Churchill's evidence was also to the effect that he noted that the Up Slow Distant was at Caution when the Up Main Distant was clear; that when he reached the Outer Home location, *both* Main and Slow signals were clear, but that the Slow Inner Home was at danger while that for his train was clear. He did not know at the time that there was a train on the Slow line. The explanation for the position of the Slow Outer Home was that its wire had been dragged along by the movement of the buffer stops and this "*wrongly*" pulled the signal off. As regards the Up Main Outer Home, it was suggested that the wire broke as the result of the collision with the buffer stops, but its indicator, like that of the Slow line signal, was showing "off" at 10.38 p.m., and it was considered that, although the levers may have been replaced to normal whilst the train was running between the Distant and the Outer Home, the latter was also *wrongly* cleared by the debris of the first collision.

Fireman Sims is 18 years of age, with 4 years' service. His evidence (after correction and some prompting, as he was not sure of the designations of the signals concerned) generally confirmed Driver Churchill's account; it was to the effect that, when the engine reached a point between the semaphore Distant and Outer Home Signals, he observed someone waving a red lamp and then immediately saw the Inner Home signal go to danger. Churchill made a full brake application, having seen the red light at the same moment.

Guard Chappell's account was that, after a good run, the train passed through Hatfield and Marshmoor at normal speed, after which there was a "*very sharp*" application of the brake, "*something unusual*". He went to the window, looked out on the left-hand side, and was thrown hard up against it when the train came to an abrupt stop. He saw no signals. A driver and fireman who were with him, travelling as passengers, were thrown onto the floor; he sent them forward to investigate and he himself went back to protect his train. It had been maintaining schedule, though 20 minutes late; the booking is 19 minutes to pass Hatfield and stop at Finsbury Park, namely, 48 m.p.h. There was no doubt in Chappell's mind that the train was still moving when the collision occurred at approximately 10.12 p.m. according to his watch (a good timekeeper, which had been checked that morning) which he looked at "*just after it happened*".

9. Signalman C. C. Willis was on duty at Marshmoor. His age is 23; he has been a signalman for nearly 4 years and had been at Marshmoor for 3 months. His clock had been checked at 10.0 a.m. the day before and was reliable. His bookings were about 1 minute behind those of Hatfield and Potters Bar, and this difference was fairly consistent. For instance, No. 92, the Up Grimsby Express, was recorded at Hatfield as passing Marshmoor on the main line at 9.57 p.m.; Willis booked 9.56 p.m., at which time he belled it to Baines, who recorded receipt at 9.57 p.m., while Colbert at Greenwood entered 9.58 p.m. Similarly, for the next train, No. 90, on the Up Slow, Hatfield recorded it as passing Marshmoor at 9.57 p.m., while Willis also booked this as 9.56 p.m., at which time he belled it to Baines, who recorded receipt at 9.57 p.m. and stated that it passed Potters Bar at 10.3 p.m.

Willis had certain conversations with Baines, and his evidence was inclined to be evasive about this; he had also, like Colbert at Greenwood, altered the time of receipt of Baines' "Obstruction Danger" signal. But generally his register appeared reliable and consistent, and I think his statements were substantially truthful, so far as his memory served him. His account of the first conversation was as follows:—

"*At about 9.55 p.m. Signalman Baines rang me up as he often does to ascertain the running of trains and he asked me where the Grimsby express No. 92 was. I told him I had just got 'On Line' from Hatfield, namely, at 9.54 p.m., and I asked him if he was running the passenger train, namely, No. 90, on the Slow Line. He told me that he would hold the passenger train and run it after No. 92. That is all the conversation I had with him as regards the running of the trains.*"

When Willis was asked if there was no more conversation relating to trains Nos. 95 and 94, he replied "*There was no conversation as regards No. 95*", for which he received the "Train Entering Section" signal at 9.56 p.m. and transmitted "Out of Section" for it at 10.1 p.m., at which time it passed his box. But the Up Bradford Express No. 94 entered the section at 10.4 p.m. and passed his box at 10.6 p.m., the time at which he described it by bell signal to Baines, and he agreed that he then telephoned to Baines. According to Baines, Willis said "*By gum, Tom, he is going*". According to Willis, however, speed was normal and did not exceed 60 m.p.h.

Questioned as to his object in making the call, other than to tell Baines that the express was running well, Willis was indefinite, but said that, although the local train No. 95 was not referred to, he thought it may have been to suggest that the Up Express No. 94 should precede it. When asked whether *" it was to stop Baines moving No. 95 on to the Main line "*, he replied *" I expect that was the object of it "*. He had *" probably thought "* that No. 95 would precede *" until I got ' On Line ' for the Express* (10.4 *p.m.*) *and he had passed me* (10.6 *p.m.*) . . . 95 *would be nearly at Potters Bar Home signal by the time* 94 *passed me "*.

On the other hand, Signalman Baines emphatically asserted that there was no question in his mind of No. 95 preceding No. 94, as the latter would have been delayed. The decision was left entirely to him, and questioning made it clear that Willis was proceeding on supposition and had received no information from Baines that his intention was to turn No. 95, following No. 90, on to the Main line in front of No. 94. Willis pointed out that he merely telephoned to co-operate with and warn Baines in the absence of previous advice from Hitchin as to the running of expresses. On this point, Baines said that, according to his memory, he received advice direct from Hitchin at about 9.45 p.m. which he *" jotted down "* on a piece of paper. *" These express trains have running times between Hitchin and Potters Bar, and that is what we go by, unless we telephone Hatfield or Marshmoor."*

As regards the running of the Up Local train, No. 95, Willis said he received the " Entering Section" signal at 9.56 p.m. and gave " Out of Section " at 10.1 p.m. ; when No. 90 had cleared the relevant track circuits, he was able to clear his signals for No. 95 to proceed to the intermediate colour lights on either side of Brookman's Park, namely, *" up to the autos at Hawkshead "*, which were cleared at 10.4 p.m. when he described the train to Baines. (This was in accordance with custom, unless the Slow line is unoccupied throughout its length, which it was not in this case due to the presence of No. 90 ahead).

In other words, No. 95 had to be nearly stopped by Willis at Marshmoor, and the Intermediate Home (Hawkshead) could not be cleared until track circuits UD, UE, UF, and UG were cleared and the Potters Bar signals returned to normal. Driver Trigg's confirmatory evidence as regards his approach to Marshmoor was as follows :—

" After leaving Hatfield (9.52 *p.m. as compared with* 9.55 *p.m. according to Guard Florence Haden, see para. 7) on the Slow line, we were stopped at the Hatfield Advance Starting signal for approximately 2 minutes. The Red Hall signals were in the ' Off ' position, but the Marshmoor Up Slow Distant signal was at caution. I checked the train approaching the Marshmoor Home signal, and came almost to a stand when I noticed both the Starting and Home signals come off. The distant repeater for the Marshmoor Intermediate Block Home was showing a green light. We made the booked stop in normal time at Brookman's Park."*

At the same time as Willis thus described No. 95 forward to Baines at 10.4 p.m., he received from Hatfield the Entering Section signal for the Up Express ; it passed him at 10.6 p.m., at which time he described it to Baines, whose entry was 10.7 p.m. The Local train appears to have started from rest at Brookman's Park between 10.4 p.m. and 10.5 p.m., 1¾ miles from Potters Bar, while the Express, travelling at 55 to 60 m.p.h., passed Marshmoor at 10.6 p.m., 3¼ miles from Potters Bar.

According to Willis' account, he received the " Obstruction Danger " signal a minute later, at 10.7 p.m., and a minute after that, at about 10.8 p.m., Signalman Baines rang him up and said the Down Express had run into No. 95. While this more or less confirms Baines' evidence, it conflicts with that of Signalman Colbert, Drivers Trigg and Inmonger, and Guard Pelling, whose accounts all appear to show that this collision did not take place till about 10.10 p.m. The Controller's record of 10.12 p.m. suggests that it may even have occurred still later, although, as already mentioned, Baines himself altered his entry for it from 10.10 p.m. to 10.8 p.m.

But Willis, like Baines, had also changed the time in his register of an important entry. Willis had recorded the receipt of the Obstruction Danger signal as 10.9 p.m., and altered it to 10.7 p.m. after Baines had telephoned and informed him at 10.8 p.m. about the collision of the Down Express. Questioned about this alteration, Willis stated that *" all he (Baines) told me was that the Down Express had run into the local . . ."*. Willis explained that the entry of the later time *" was put down in mistake "* on his own initiative ; *" it probably wasn't booked at the time it was sent and it must have been booked afterwards . . . I received the six bells at* 10.7 *p.m. That was the time on the clock, and when I got to the book to put it in, I must have looked at the clock again and saw it was* 10.9 *p.m. and then thought again and altered it."*

CONCLUSION

10. In an extraordinary series of collisions such as this, at night, it is unlikely that the various witnesses would agree on all material points. But certain incidents in this case stand out, and the evidence in connection with the times at which it was alleged they took place left room for doubt as to the facts of the situation.

For instance, it was disconcerting to find that Signalmen Baines and Willis had altered their records, even by as much as 2 minutes *earlier*, for the times of the Down Express collision (10.10 p.m. to 10.8 p.m.). and of the Obstruction Danger signal (10.9 p.m. to 10.7 p.m.) respectively, the latter *after* Baines had told Willis of the collision, said to have taken place at 10.8 p.m. And it was this time about which Baines questioned the other signalman concerned, Colbert at Greenwood, as regards the Obstruction Danger signal, with the result that Colbert also changed his entry during the course of the conversation, but subsequently adhered to his original booking of 10.11 p.m.

Although Baines emphasised that he transmitted this bell signal in both directions at the same time, not later than, say, 10.7½ p.m. (booked 10.7 p.m.), *before* the first collision with the buffer stops at 10.8 p.m., *and* contended that the second collision of the Down Express took place immediately

afterwards, there was no confirmation of this except from Signalman Willis, whose booking was open to doubt in this respect ; moreover, it was contradicted by Colbert's adherence to 10.11 p.m., namely, a difference of at least 2½ minutes, making allowance for the Greenwood clock having been a minute ahead of Potters Bar.

I think, too, that it is reasonable to assume that the stopping of the signal box clock at 10.10½ p.m. (again a difference of 2½ minutes from 10.8 p.m.) indicated fairly closely the time when the structure must have suffered severe vibration from the Down Express collision. Having regard also to the Controller's account of Baines' "*immediate report*", it seems more likely that this collision took place nearer 10.11 p.m. than 10.8 p.m. as suggested by Baines.

In order, therefore, to test the reliability of his account, I asked the Company's Officers, Messrs. H. C. Johnson and A. Moss, to make as accurate an assessment as possible of the actual running of the trains concerned. I have to acknowledge their assistance and advice in the thorough investigation which was carried out by means of stop watch tests with trains similar to those in question.

11. As regards the first collision with the buffer stops, Driver Trigg of the Hatfield train, No. 95, stated that he observed and passed *both* the Potters Bar (semaphore) Distants at caution. He explained that the Slow Line Outer Home (No. 11) was in the clear position when he first saw it and remained in that position until he passed it ; also that the main line signal (No. 14) was at danger. He claimed further that he was sighting the Inner Home (No. 12) all the time that he was running up to it from the Outer Home, that it remained in the off position until he passed it, and that No. 15 was at danger. He was preparing, in fact, to traverse crossover No. 7 and come to a stand at the station platform.

On the other hand, Signalman Baines directly contradicted this and said, in effect, that the main line signals were off for the Up Express when the Hatfield train was approaching on the Up Slow line ; he noticed that Trigg had passed the Inner Home at danger, and, fearing the effect of a collision with the buffer stops, he first transmitted the Obstruction Danger signal ; secondly, placed the Up Main, and then the Down Main, signals to danger ; and, thirdly, attempted to divert the Hatfield train on to the Up Main by setting crossover No. 7.

Baines strongly denied the suggestion that (following the Up Peterborough train, No. 90, which approached on the Up Slow Line and passed at 10.3 p.m.) he lowered the Inner Home No. 12 as well as the Outer Home No. 11 for the Hatfield train, and that thereafter he decided to give the Up Express precedence, but found he had misled Trigg and thereupon attempted the diversion by setting crossover No. 7 again. Indeed, he affirmed definitely that he had *not* left this crossover set after the passage of No. 90.

12. The following facts require to be borne in mind in considering the approach of the two Up trains :—

1. The Up Main signals must have been at danger *before* point lever No. 7 was pulled.
2. The derailment took place immediately after it was pulled and as the train was passing over the points.
3. It follows that these points were normal as the train approached them, which in turn means that the Up Slow Inner Home, 265 yards away, was at danger at that time.
4. The driver of the Up Express could not have seen, at one and the same time, the red light which was waved *after* the collision with the buffer stops by the guard of the Hatfield train *and* the Up Main Inner Home signal go to danger.

13. To plot the running of these trains, Marshmoor has been taken as the datum point as the clock was known to be reliable and the bookings were reasonably consistent (about 1 minute behind Hatfield and Potters Bar), namely, 10.1 p.m. "Out of Section" transmitted to Hatfield for the 9.32 p.m. ex Hatfield and 10.6 p.m. for the Up Express, at which time the trains passed Willis. On this basis, and assuming that the Hatfield train was delayed at Marshmoor for ¾-minute due to signals as already mentioned, and that the express was travelling at 55 m.p.h., the running appears to have been approximately as follows :—

	9.32 *p.m. ex Hatfield*	5 *p.m. ex Bradford*
Marshmoor	10.1 p.m.	10.6 p.m.
Marshmoor I.B. Distants	10.3 p.m.	10.7 p.m.
Brookman's Park	10.4 to 10.4½ p.m.	10.7¼ p.m.
Marshmoor I.B. Home Signal (and Potters Bar Up Main Outer Distant)	10.5¾ p.m.	10.7¾ p.m.
Potters Bar Semaphore Distants	10.6½ p.m.	10.8½ p.m.
,, ,, Outer Homes	10.7¼ p.m.	10.8¾ p.m.
,, ,, Inner Homes	10.8 p.m.	To a stand at 10.9¾ p.m.
No. 7 Points	10.8¼ p.m.	
Buffer Stops	10.8½ p.m.	

14. As regards the Down Express, Signalman Colbert's bookings at Greenwood were a minute behind those at New Barnet where the "Entering Section" signal was recorded as 10.6 p.m compared with Colbert's booking of 10.5 p.m. His entry of 10.7 p.m. for the "Out of Section" signal (at which time he described the train to Baines) correspondingly compared with 10.8 p.m. at New Barnet, but Baines' booking was 10.5 p.m.

I think the New Barnet and Greenwood records are the more reliable, and assuming that, at 50 m.p.h., the train passed the former post at 10.5 p.m. and the latter just before 10.6 p.m. (¾ mile),

it is not unreasonable to conclude that Potters Bar was reached in 3¼ minutes (2¾ miles), say, at 10.9¼ p.m. instead of 10.8 p.m. as suggested by Baines' corrected booking (from 10.10 p.m.) ; the train might thus have come to a stand at about 10.9½ p.m. if 10 seconds are allowed for traversing the distance of 130 yards North of the box. This is not inconsistent with the time which it might have taken Driver Trigg to recover himself following the collision with the buffer stops, and it may also be assumed that had nothing occurred the train would have reached Hatfield (5 miles) on the falling gradient in 5 to 6 minutes, namely, at 10.15 p.m., or 3 minutes late, it having been due to pass Hatfield at 10.12 p.m.

Thus the first collision with the buffer stops and the derailment of the Hatfield train took place at about 10.8½ p.m., and the second collision of the Down Express, followed by the third, of the Up Express, occurred a little before 10.10 p.m., namely, at about 10.9½ p.m. and 10.9¾ p.m. respectively. In fact, the Down Express may itself be considered to have been involved in two collisions, first with the debris of the Hatfield train, and secondly with the Up Express ; it is even possible that the engines actually made contact and came to a stand simultaneously, the one glancing off the other and rolling over. It is evident, however, that the sequence of events was *not* such that the Up Express had become stationary *before* the Down Express collided with it.

15. No responsibility attaches to the enginemen of the Down Express, and I accept their statements, namely, that they did not see any Down signals at danger. Indeed, from Mr. Flint's account, there was no doubt about the positions of both the Starters which were held at clear by the debris. Nor is there any doubt in respect of the Distant and Outer Home, and even as regards the Inner Home it appears that Inmonger and Fireman Harsley were not necessarily wrong in stating that they did not pass it at Danger.

The times already suggested for the running of this express can only be approximate, and Signalman Baines' evidence led to uncertainty as regards the sequence and times at which the various incidents took place. His account, however, of what he did was to the effect that he took no steps of an emergency nature until *after* the Hatfield train passed the Up Slow Inner Home No. 12, namely, until about 10.8 p.m. (according to the statement in paragraph 13) instead of 10.7 p.m. according to his evidence.

Moreover, it seems very doubtful whether he would at that time (before the collision with the buffer stops occurred) have expected the Down line to be fouled as well as the Up. It appeared, too, as the result of questioning, and as was natural, that he dealt with the Up line signals first and transmitted the " Obstruction Danger " signal to Greenwood as he "*was passing*" from the other end of the frame, before replacing the Down line signals. Although he suggested that the two collisions occurred nearly simultaneously—"*only a matter of seconds*" between them—there is little doubt that the interval was a good deal longer.

But even if it be assumed that Baines acted in respect of the Down line as rapidly as he said he did for the Up line, he might have been occupied for at least 20 seconds in making the necessary movements :—transmission of " Obstruction Danger " signal in the Up direction (which was "*very deliberate*") ; replace 5 Up main signal levers, 13, 14, 15, 16 and 17 ; replace No. 11 (if it had not already been done) ; replace bolt 4 (if it had not already been done after the previous return of No. 11 to danger) ; send " Obstruction Danger " signal to Greenwood ; and replace the 5 Down main signal levers 59, 58, 57, 54 and 53.

Baines stated that he pulled points No. 7 after all these movements had been completed, but I feel very doubtful about it. I think it more probable that, having released the interlocking on these points, he pulled this lever in an attempt to divert the Hatfield train, and it was not until he had realised that the attempt was abortive that he dealt with the Down line signals. If that was, in fact, what happened, it was not until, say, 10.8¾ p.m., and perhaps 10.9 p.m., that his lever movements were completed, and it should be noted that the reversal of the Down main Inner Home would be almost the final action.

The Down Express appears to have passed Potters Bar at about 10.9¼ p.m., and the engine would have passed the Inner Home just after 10.9 p.m. It is reasonable to assume that Inmonger and Harsley may not have seen this signal reversed so close in advance of them, even if the train did not in fact arrive a little later, as it might well have done, according to some of the evidence and if speed was less than the assumed 50 m.p.h.

16. Driver Churchill—a reliable and straightforward witness, who had a very fortunate escape—is to be commended for vigilance and for bringing the Up Express nearly to a stand short of the obstruction formed by the Down Express. Guard Florence Haden's alertness and action were also praiseworthy, though I do not think, as it at first appeared, that her hand signal can have been instrumental in initiating the former's action.

Churchill's evidence disclosed an obvious and marked discrepancy as compared with that of Driver Trigg. The latter claimed, as already stated, that the Slow Inner Home No. 12 was clear all the time he was running up to it from the Outer Home No. 11 and that he passed it at clear, namely, from 10.7¼ p.m. to 10.7¾ p.m. On the other hand, Churchill stated that he saw the Marshmoor Intermediate Block Home (Potters Bar Up Main Outer Distant) showing a green light when he passed the Repeater Distant. On the assessment of running quoted above, Churchill passed the latter at 10.7 p.m., and he claimed that all the Up main line signals continued to be clear until he saw the Up Main Inner Home go to danger.

The two Outer Home signals, both of which were clear when Churchill passed this location and commenced to apply the brake, were found to have been pulled off by the weight of debris on the wires. If the collision with the buffer stops took place at 10.8½ p.m., it is conceivable that the main

line signal was put to danger by Baines shortly after 10.8 p.m., and that it was again pulled off by the debris at 10.8½ p.m. Though Churchill's evidence was to the effect that he was sighting it throughout, there is the possibility that it was returned to danger and came off again during his run from the Semaphore Distant.

Apart, however, from this signal, it is apparent from Churchill's evidence that the Marshmoor Intermediate Block Home (Potters Bar Outer Distant) and the Semaphore Distant were at clear from about 10.7 p.m. to 10.8¼ p.m. These signals could not have been in this position if the Up Slow Inner Home was off, and thus Trigg's evidence must be open to question in relation to this signal.

17. Finally, there are Baines' actions to consider, in view of Willis' anticipation that he was going to let the Up Hatfield train No. 95 precede the Up Express. Assuming that the former's evidence is uncertain, having regard to the various contradictions, there is the obvious possibility to consider, namely, that after having cleared signals 11, 12 (and possibly 16 and 17), he decided, on hearing from Willis how well the express was running, to give it precedence, but found that he had misled Trigg, and attempted the diversion at the last moment.

If it be assumed, therefore, that Trigg's evidence is valid, Baines must have attempted to carry out the reversal *after* 10.8 p.m. His lever movements would have been to replace signals 12, and possibly 16 and 17 ; lock bar 4 ; points 7 ; and pull signals 14, 15, 16, 17 and 13. On test, these movements took 14 seconds, which directly contradicts Churchill's evidence that the main line signals were off at 10.7 p.m. But to take it a stage further, and to effect derailment at No. 7 points, Baines would have had to replace the main line signals to danger and again pull point lever No. 7, which takes 8 seconds ; this would have left no time at all for the main line signals to have been in the off position, apart from the probability that the derailment would have taken place at the rear end of the Hatfield train, if at all, due to inability to pull point lever No. 7 earlier.

Again, even assuming that Trigg had his last look at the Up Slow Inner Home at 10.7¼ p.m., when he passed the Outer Home, there is still Churchill's evidence to the effect that the main line signals were off at 10.7 p.m. and remained off until at least 10.8¼ p.m., which would have made it impossible for Baines to have acted in the manner suggested.

18. In spite, therefore, of the unreliability of Baines' evidence as regards times, there appears to be little doubt that this series of accidents in their initial stage was due to Driver Trigg mistaking the clear indication of the Up Main Inner Home No. 15 as applying to the Slow line. I do not think he can have known the road as well as he assumed he did. It is possible, however, that he was misled, and I feel his evidence should be accepted that No. 12 was clear when it came into his view. Baines, in spite of denial, probably pulled it off earlier than he intended, namely, *before* Track Circuit UG was occupied. The bad siting of the Inner Homes may also have contributed, No. 15 being located over the Up Slow instead of over the Up Main.

19. As regards Signalman Baines' responsibility, apart from this possible error, I think the fairest comment is that his attempt to divert the Hatfield train must have been the result of mistaken zeal. While there was no reason, in respect of time, why the train should not have been delayed by being brought even to a stand at the Outer Home signal No. 11, Baines had, in the circumstances, to make up his mind very quickly before taking the action he did in moving facing points No. 7 when he realised that signal No. 12 was being passed. In March 1945, there had been a collision of some wagons with these buffer stops which had resulted in the Up Main being fouled.

But I have watched the working in this box in darkness and clear weather, and find it difficult to understand Baines' action, as an experienced signalman, having regard to the uncertain view of engine headlights and the difficulty of locating a train even by its illumination when approaching this junction. I can appreciate that Baines "*was not clear as to the actual position of the Hatfield train*", and even if he had thought he had "*a reasonable chance of making the lever movement and effecting the diversion*" he was taking, in my opinion, unjustifiable risk in respect of the approaching Up Express.

Indeed, he ought to have left the Hatfield train to collide with the buffer stops because the Up Express was unduly close. Baines could not have been expected to do more than replace the signals to danger and transmit the necessary bell signals. On the other hand, the position was such that he can rightly claim, after the event, that had he pulled lever No. 7 a few seconds earlier the Hatfield train would have been successfully diverted, *and* the Up Express would have been stopped before colliding with it, *and* the Down Express would not have been involved in any risk at all. His age is 64 and he has a good record.

REMARKS AND RECOMMENDATIONS

(a) *Advice of Running of Up Trains.*—The signalman at Marshmoor (who operates the facing crossover at Brookman's Park) does not receive the same information from Hitchin as does the signalman at Potters Bar. The latter is, of course, in control, and the additional information at Marshmoor (which mainly acts as a block post) has hitherto not been thought to be necessary ; but I suggest that it should be considered whether this might not facilitate co-operation and efficiency, and perhaps avoid uncertainty or last minute change of mind as regards sequence, particularly when trains are running late and out of course, as on this occasion. In view of the tunnels ahead, the sequence accorded here has an important bearing on time of arrival at King's Cross.

(b) *Track Circuiting.*—The position of the Inner Home signal No. 12, which is 265 yards in rear of facing points No. 7, clearly had a bearing on the fact that Signalman Baines brought about the derailment of the Hatfield train by pulling the latter lever ; but before doing this, he had to operate

lever No. 4 which unbolts this facing connection and at the same time actuates the 40 ft. locking bar. Even if two or three intermediate bars had existed as a preventive against the movement of these points under a train, they would have been of no avail if the signal was passed at danger and if the bolt had been withdrawn before the train reached the first bar.

Indeed, even track circuiting, which has since been provided between the Inner Homes, Nos. 12 and 15, and the Starter, No. 16, on both the Up Slow and Main lines, would not have had the desired effect in the circumstances which apparently prevailed, namely, the passing of No. 12 at danger. Conditions, however, have been improved, in that this track circuiting, when occupied, locks levers Nos. 12 and 15 normal, and approach back-locks them when the signals are clear; the latter function ensures (subject to the usual time release) that points No. 7 cannot be moved while the train occupies this track circuiting. But no lock is thereby applied on the points, either normal or reverse, if the signal levers have not been pulled. The Company should be asked to consider, in view of the exceptional circumstances (which include shunting movements), whether it would not be justifiable to arrange that occupation of the track circuit, or a portion of it, should make it impossible for these facing points to be shifted while any movement, authorised or otherwise, is traversing them.

As regards track circuit UG which extended in rear of the Inner Home No. 12 to a point 200 yards in rear of the Outer Home No. 11 (and existed when the accident occurred), I also suggest, in view of the special circumstances of this layout, that consideration should be given to ensuring by approach control that the signalman does what I think Baines inadvertently failed to do; the premature pulling of No. 11 lever should be positively prevented until the track circuit is occupied, *if* No. 12 is at danger. This may involve the splitting of this track circuit at No. 11, but in any case it appears that the occupation of the circuit between Nos. 11 and 12 should back-lock the latter lever once that signal has been cleared, thus ensuring (subject to the usual time release) that facing points No. 7 are held while the train approaches No. 12, even if the signal is reversed to danger in emergency.

(c) *Re-siting of Inner Homes.*—These signals, Nos. 12 and 15, have been in their present position for many years, but the circumstances of this accident merit consideration of their location, first, in respect of the connections which they protect and, secondly, in relation to the running lines and sidings, the spacing of which is only 6 ft. At present, the Main line signal No. 15, may well be read to apply to the Slow line. I do not suggest relocation as an alternative to the additional track circuit controls referred to above, because the latter can be simply applied and without delay.

(d) *Reconstruction of Station.*—What is chiefly wanted, however, is the reconstruction of this old station by the provision of two island platforms serving four running lines. This has been under consideration for some years, and, but for the war, the works, which include the rebuilding of the bridge to provide for a wider road, might by now have been carried out. Irrespective, therefore, of further railway widenings which may be necessitated by the Greater London Plan, and having regard to the nature and speed of the traffic, Main Line and Suburban, at present concentrated on two tracks only through the station, I recommend that early steps be taken to carry out this reconstruction. As a commencement, the Up Slow should be extended towards the tunnel mouth, and, if only for convenience in working, the provision by this means of an Up island platform appears to be a matter of considerable urgency.

I have the honour to be,

Sir,

Your obedient Servant,

A. H. L. MOUNT,

Lt.-Colonel.

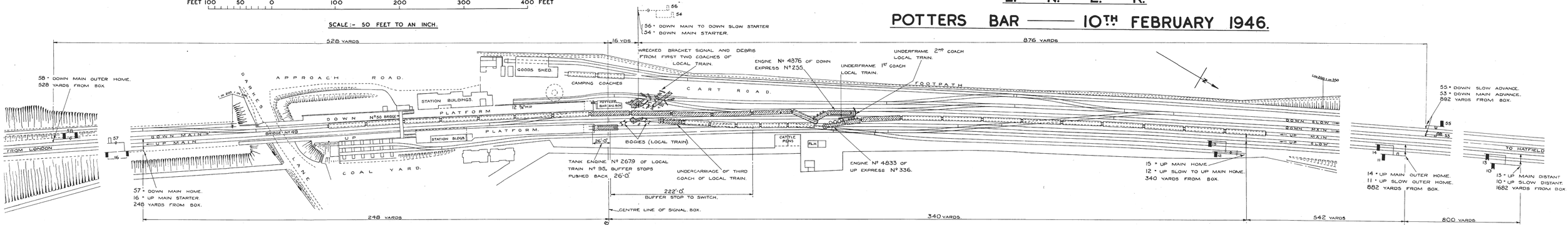
The Secretary,

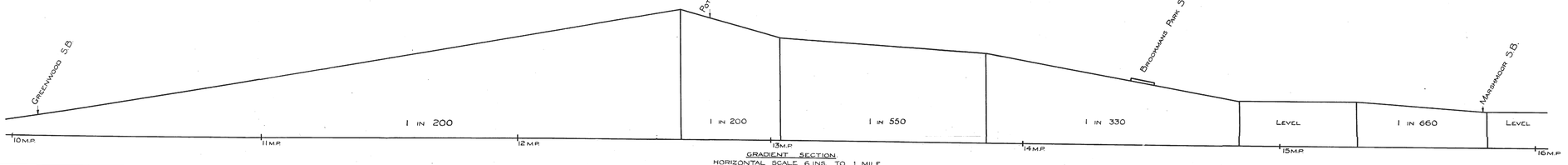
Ministry of Transport.

(31069) Wt. 2931—1115 7/46 D.L. G.379

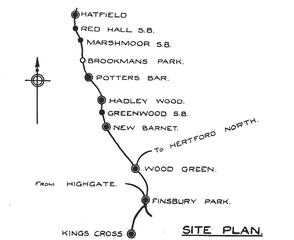
L. N. E. R.

POTTERS BAR —— 10TH FEBRUARY 1946.





GRADIENT SECTION.
HORIZONTAL SCALE 6 INS. TO 1 MILE.



SITE PLAN.

L.N.E.R.
POTTERS BAR — 10·2·46
DIAGRAM OF SIGNALS