



MINISTRY OF TRANSPORT

RAILWAY ACCIDENTS

REPORT ON THE FIRE
which occurred in
an Express Passenger Train
on 14th July 1951 near
HUNTINGDON
in the
EASTERN REGION
BRITISH RAILWAYS

LONDON : HER MAJESTY'S STATIONERY OFFICE

1952

PRICE 1s. 6d. NET

10th March, 1952.

SIR,

I have the honour to report for the information of the Minister of Transport, in accordance with the Order dated 16th July 1951, the result of my Inquiry into the fire which occurred in an express passenger train at about 5 p.m. on Saturday, 14th July 1951, one mile north of Huntingdon on the Eastern Region main line to the North.

The train was the 3.45 p.m. "West Riding" from King's Cross to Leeds, and consisted of 14 coaches, drawn by Class A. 3, 4-6-2, locomotive No. 60058. It weighed, with the engine, 619 tons, and its brake power was 479 tons, or 77% of its total weight.

The fire occurred in the second coach and spread very rapidly, but the train, travelling at about 55 m.p.h., was stopped in a short distance by an emergency application of the brakes. Twenty-two passengers and the guard received burns and other injuries in escaping, and were taken to the Huntingdon County Hospital, where nine were detained.

The bodies of the four leading coaches were completely destroyed, and the tracks alongside them were also damaged by the fire.

The position where the train stopped was over 300 yards from a road, but the fire was seen by several people in the vicinity, and the Huntingdon Police and Fire Brigade were informed between 5.3 and 5.7 p.m. The first fire fighting appliance reached the scene at 5.8 p.m., followed by others at frequent intervals; the first ambulance arrived at 5.12 p.m., and two more came at 5.21 p.m. First-aid was given to the injured on the spot before they were taken to the hospital.

Soon after the train stopped, a signalman at Huntingdon saw that it was on fire and took immediate steps to protect both Up and Down lines; in addition, the driver and the fireman of the train acted promptly by placing detonators.

The weather was fine and warm, and a slight North-East wind was blowing.

DESCRIPTION

The Line

1. The Eastern Region main line to York is a fast running line, with few gradients or curves of any severity. The track is level for two miles before reaching Huntingdon (North) station, but immediately afterwards it commences to rise at a gradient of 1 in 200. This continues past the place, north of the station, where the train stopped. Between 4 and 5 miles south of Huntingdon there was, on the day of the accident, a permanent way restriction of 20 m.p.h.

Distances from the place where the train stopped to points relative to this Report are :—

	Miles	Yards	
Peterborough	16½		North
Point where train stopped	—	—	
Huntingdon (North)			
Advance signal		1,067	South
No. 2 Signal box		1,709	"
No. 2 Home signal	1	141	"
No. 1 Signal box	1	496	"
No. 1 Home signal	1	689	"
No. 1 Distant signal	2	305	"
Permanent Way Restriction ended	5	198	"
" " " commenced	6	374	"
Paxton signal box	6	376	"

The Train

2. The length of the train was 919 feet, and it was composed as follows :—

Engine
Twin open brake third, Coaches Nos. 1738 and 1737
Twin open first
Twin restaurant open third
Corridor composite
Corridor third
Corridor brake third
Corridor composite brake
Corridor composite
Corridor third
Corridor third
Corridor brake third

The seating capacity, excluding the restaurant car, was 96 first class and 316 third class, and the recorded number of passengers on the train was 10 first and 337 third class.

The leading six coaches formed three twin sets, each of which was articulated in the centre over one bogie, so that it was inseparable at this point.

A plan of the leading set, including the second coach, No. 1737, in which the fire started, is given under:—

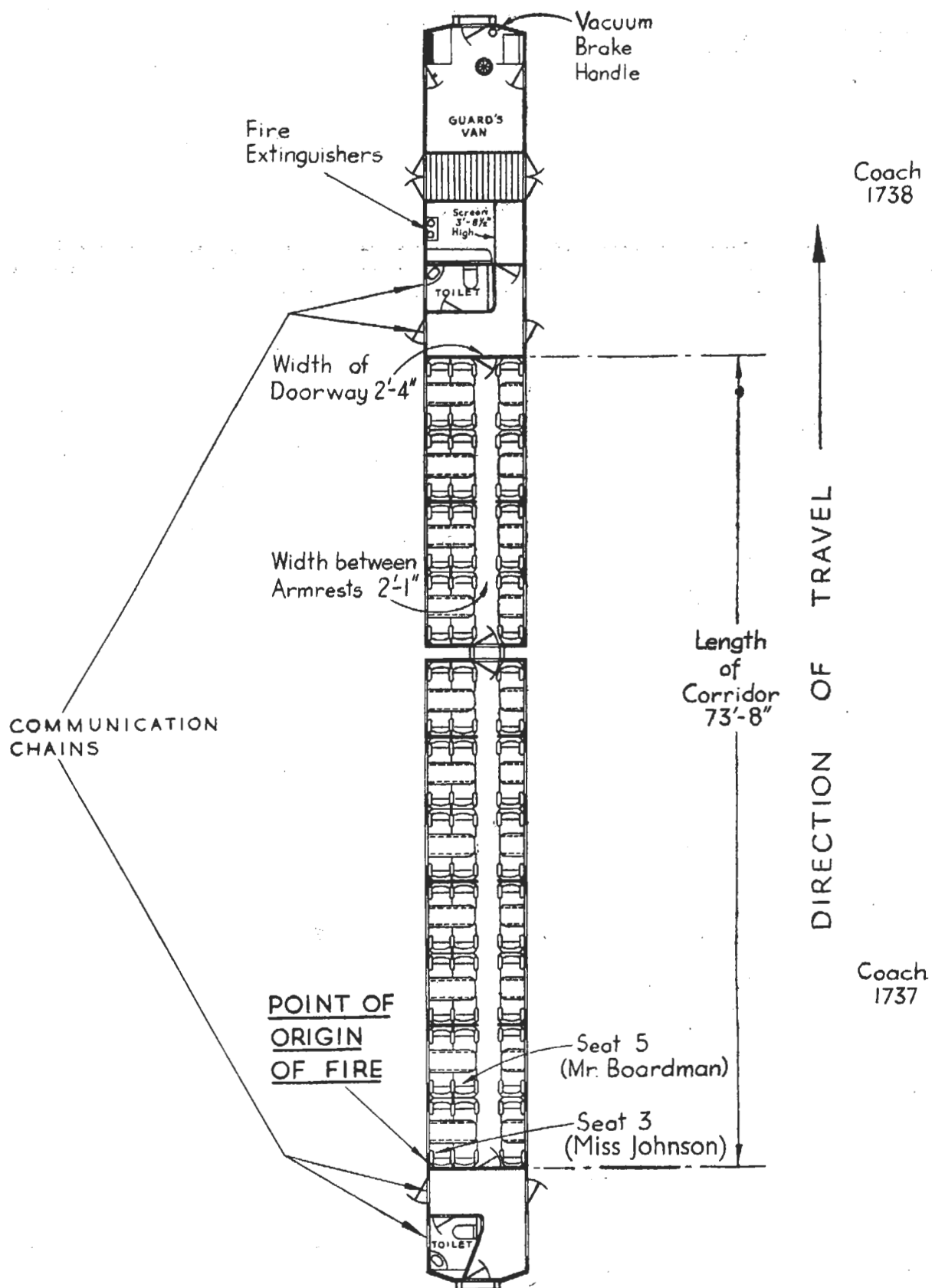
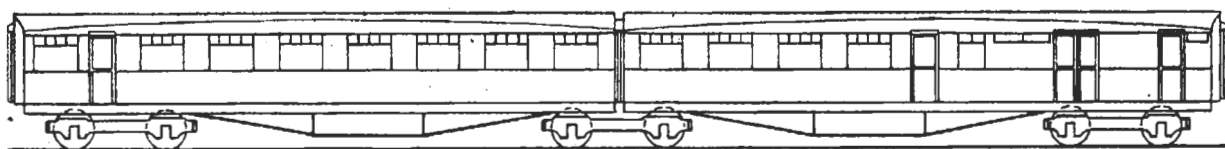
TWIN OPEN THIRD BRAKE SET

COACHES N^o.

1737

and

1738



The Incident

3. The train left King's Cross at 3.48 p.m. three minutes late. At about 4.30 p.m., a passenger who was sitting in the rearmost seat on the left hand side of the second coach, No. 1737, noticed a wisp of smoke rising between the arm rest of the seat and the side of the coach. She called the attention of a passing pantry boy, who returned to the fifth coach and informed the restaurant car conductor. This man went forward and, having looked at the smoke, leant out of a nearby vestibule window to discover if there were any signs of fire outside, but there was none, so he returned through the train to the guard's van in the ninth coach and reported to him.

The guard then went forward and, lifting the seat, saw that the smoke was coming from the corner of the floor, between the edge of the carpet and the side of the coach. He assumed at once that it was due to a hot axle box underneath, and decided to write a note, which he could throw out of the window as the train passed through Huntingdon in about another 10 minutes, asking for the train to be stopped for examination at Peterborough, half-an-hour further on. He told the passengers what he proposed to do, and then returned through the train to his compartment in the ninth coach to write the note.

4. During the next few minutes, however, the smoke in the second coach grew increasingly thick and the passengers became more uneasy. One of them examined under the seat, and found that the carpet was hot to touch, and that the sponge rubber floor covering underneath, where it protruded beyond the edge of the carpet, was partially melted. He decided at once to pull the communication chain, but was unable to find it in the main body of the coach, so he went into the rear vestibule, hoping to see one there or in the next coach. Discovering it over one of the external doors in the vestibule, he pulled it, and then asked one of a group of soldiers who were standing there to go back quickly to the guard's van and call the guard again. The passenger then went back into the main body of the coach and advised the other passengers to move forward with their belongings into the coach ahead, No. 1738. He noticed that a few sparks were by now coming from the corner, and that the fumes and smoke had become much worse; almost at the same time a small flame appeared under the seat.

5. While this was happening, the guard wrote his note in the ninth coach and went to the restaurant car, in order to search for a potato to attach as a weight, but he was unable to find one. He was still looking when the soldier arrived from the second coach and told him that something should be done about the fire quickly. The train was approaching Huntingdon by this time, and, as it passed No. 1 signalbox, the guard threw his message out of the window, without anything attached to it. (This message was found on the following day under one of the platform copings). He then went forward to the second coach again, and reached it at about the moment when the small flame, mentioned above, appeared. On this occasion he realized the seriousness of the situation, and at once made his way through the passengers who were already standing in the corridor, and going forward to the guard's van at the leading end of the first coach, applied the brake fully; the driver, however, had already made a full brake application, having noticed the loss of vacuum due to the communication chain, and the train stopped in about another 700 yards. By this time, the guard had unstrapped a fire extinguisher from its bracket on the side of the van and was returning with it to the rear of the second coach.

In the meantime, the flames from the floor in the corner had increased and, as the train came to a stand, they suddenly spread with great rapidity up the sides and into the roof. The guard, who reached the place a few moments later, tried to use the extinguisher, but it would not work, and in the matter of a few seconds, the flames were spreading quickly forwards along the sides and roof of the coach.

6. Immediately the flames broke out, all the passengers at once tried to escape, some taking their baggage with them. As will have been seen in the diagram, the only available exit was through a single door into the vestibule at the leading end of the first coach. Both coaches were full and, in addition, some soldiers and sailors were standing in the leading vestibule; five passengers, however, had moved to the rear of the train before the flames appeared, so that there were probably about 65 people in the twin set. The outbreak of flame was accompanied by dense and choking fumes and smoke, which filled the coaches very quickly and made it impossible to see; in the excitement, alarm and haste caused by these, the long narrow centre corridor of both first and second coaches of the set at once became blocked with passengers: others were unable to leave their seats to get into the corridor at all because of the rush. Those in the rear of the second coach were trapped between the block in front of them and the rapidly approaching fire behind, so that they had no other alternative than to try and escape by breaking the windows of the coach and jumping out. Most of the injuries, consisting of burns and cuts, were incurred in this way, although the flames spread so rapidly that other passengers who were seated in the first coach also received burns before they could make their way out. Fortunately, all managed to escape, for in a very short time from the first outbreak of flame both coaches were blazing.

The train crew were prompt in appreciating the situation, and divided the train behind the second twin set; the leading four coaches were then drawn away from the rest of the train, and the engine was detached and run clear. It was impossible to uncouple behind the second coach because the heat was too intense to approach, and the only course was to uncouple behind the next twin set. The fire soon spread and four coaches were thus destroyed down to their underframes.

EVIDENCE

7. Engine No. 60058 was inspected at Peterborough after the accident and found to be in good order, except that one double fire bar was missing from the front drop grate. Apart from this, the grate and firebox were in normal condition, such as might be expected after a run from King's Cross, and there were no particular signs that the engine had thrown out an unusual amount of the fire.

It has not been possible to determine when the fire bar was lost, but the interior of the firebox was inspected by a boilermith in the shed at King's Cross before the departure of the train on the morning of July 14th, and, so far as could be seen, everything was then in good condition. The engine, however, had arrived earlier in the day from Newcastle, and some fire had been left in the firebox in preparation for its next trip, so the firebar would be difficult to see in any case. It may, therefore, have been missing for some days.

8. The train was examined by the Chargeman and an electrician at Holloway Carriage Sidings on the afternoon of July 14th, shortly before it left the yard for King's Cross. It appeared to be in good order and nothing unusual was noticed by either examiner.

9. Signalman S. L. Luff was on duty at Paxton, which is about 5 miles from Huntingdon and on the Down side of the line. He said that the train passed at 4.49 p.m., at a speed of about 20 m.p.h., and he examined it in the usual way as it went by, but saw nothing unusual.

10. Signalman W. G. Pateman was on duty in Huntingdon No. 1 Box which is on the Up side of the line. Everything appeared to be normal when the train passed him at 4.56 p.m., and he did not see the guard nor notice anything being thrown out of the window. He thought the speed was then between 50 and 55 m.p.h.

11. Signalman D. L. Munro was on duty in Huntingdon No. 2 Box, which is also on the Up side of the line. The train passed at a speed which he thought was about 40 m.p.h. He did not notice anything of remark about the train, nor the passengers in it, whom he could see quite clearly. About two or three minutes later, he saw that the train had stopped about 1 mile away, and that smoke was coming from it. He at once telephoned to Stukeley, the next signalbox to the north, and told the signalman to stop the Up line; then he telephoned to Huntingdon No. 1 Box, calling for Fire Brigade and Ambulances.

12. Guard J. W. Nunns was 56 years old, and had been a guard for 14 months. He said that he knew the main line well, having been a train attendant, but he was now mostly employed as a guard on local trains. He did a main line trip, however, about once every six months, and had been on this particular trip once before. He then gave evidence generally in accord with the description of the fire in paragraph 6 above, with the exception that he thought that he first heard of it from the restaurant car conductor when they were passing Offord, only about 3 minutes before reaching Huntingdon. (As will be explained later, he must have been mistaken in this, and have been told of it considerably earlier). When asked why he did not stop the train at once, or as it passed through Huntingdon, he replied that it did not occur to him to do so, and that he thought his first duty was to get a message out of the train to stop and examine at Peterborough.

13. Driver A. Cartwright was 62 years of age; he joined the railway in 1907 and had been a driver since 1925. He said that the train had passed Huntingdon No. 2 Box at about 55 m.p.h. when he noticed that the vacuum had dropped 5 inches, so he made a full brake application. When the train stopped, he got down from the left hand side of the engine, and as he did so, passengers and suitcases seemed to pour out of doors and windows on both sides throughout the length of the two leading coaches. Cartwright gained the impression that he first saw smoke, and that it was not until the windows were broken that the flames burst out. He described the smoke as very black.

He also said that his engine was steaming very well, and that he saw no signs of sparks or fire being thrown out during the whole journey from King's Cross.

14. Mr. Boardman is an officer in the Salvation Army. He said that, when he entered the train at King's Cross, all the seats in the leading twin set were occupied and, in addition, some soldiers were standing in the vestibules at either end, as well as in the corridor of the first coach. Mr. Boardman himself was in seat No. 5, facing the engine. About half-an-hour before the train stopped, smoke started to come through the space between the arm rest of seat No. 3 and the side of the coach. The guard was sent for and, when he arrived a few minutes later, he lifted off the seat cushion and looked underneath. He said he thought the smoke was caused by a hot axle box, that there was nothing to worry about, and that he would have the train stopped at Peterborough for examination; he then returned to his own compartment of the train. Within about 5 minutes of this the smoke got increasingly worse, and began to annoy the passengers who were sitting nearby with its rather acrid fumes. They became uneasy and mentioned among themselves that Peterborough was over half-an-hour ahead and that they did not think the guard's action was sufficient.

The two occupants of the corner seats, from which the smoke was coming, then left the carriage to find other accommodation, and Mr. Boardman went to investigate underneath the seat himself. By this time, the smoke was noticeably more intense, and the rear end of the coach was becoming filled with it. He put his hand on the carpet in the corner and found it was distinctly hot, and the sponge rubber, which was protruding between the edge and the side of the coach, was half melted. Mr. Boardman then decided that the communication chain should be pulled and, as he was unable to find it in the passenger part of the coach, he went into the vestibule at the rear, thinking that there would be one there or, if not, in the next coach. He eventually found a chain over one of the external doors in the vestibule, and he pulled it; then, after a slight pause, he asked one of the soldiers to go and tell the guard to come back to the fire.

Having re-entered the passenger accommodation he advised the passengers to move forward into the next coach and after a few moments they started to do so. Mr. Boardman then tried unsuccessfully to stamp out the fire, and returned once again into the vestibule to make sure that the communication chain had really been pulled to its full extent. He did this because the train did not seem to be slowing down. Mr. Boardman's purpose in asking the passengers to move forward was to close the communicating door between the two coaches after the passengers had left, and so prevent the fumes, which were becoming bad, from entering into the first coach. At about this time he saw a few sparks in the corner; smoke and fumes also grew much worse, and a small flame started. The guard came in at this moment and, seeing the flame, gave an exclamation and made his way as quickly as he could to the guard's van in front. He was somewhat hampered by the excited people standing in the passage way, and had to push his way through them. The train eventually began to slow down and, at the moment when it came to a stop, flames suddenly spread with great rapidity up the sides and into the roof of the coach. Mr. Boardman said that, once they started they moved extremely quickly, and it was only a matter of a few seconds before they were in the roof and travelling rapidly forwards along it. Very shortly after this happened, the guard returned with the fire extinguisher, but it failed to work.

By this time the passengers were crowding into the corridor, which immediately became blocked, so that it was obviously going to be impossible, with the speed at which the heat and the flames were increasing, for all to get out of the coach in time through the single entrance at the far end. The immediate effect of the outburst of the flames was that some particularly acrid and choking fumes quickly filled the inside of the coach and it soon became very difficult to see anything at all. This, while not causing a panic, increased the alarm; there was then nothing left but for everyone to look after himself and make his way out of the coach if he could. Mr. Boardman felt at this moment that he was being overcome by the fumes and would not be able to get out. He heard people shouting that they could not break the windows, and he saw one man trying with a heavy suitcase for some time before succeeding. Mr. Boardman managed to reach this window with difficulty and to throw himself onto the track. He then helped other passengers to get out. Some women, who were frightened of the drop to the track, had to be dragged out of the windows.

Mr. Boardman had no doubt at all about the speed with which the fumes and the flames spread forward along the coach. They were very rapid indeed and soon enveloped both vehicles. The fumes were so bad that, after the last passenger had escaped from the coach, and a few of the injured had been put by the lineside, they blew across the track and began to choke the passengers again, to the extent that they had to be helped to a safer place.

15. Mr. J. L. Golding and Miss G. Johnson were the passengers who were sitting in the seats where the smoke arose. Neither had been smoking during the journey. When they returned to their seats from the restaurant car at about 4.30 p.m., they first noticed the trickle of smoke in the corner. Mr. Golding felt under the seat and in the corner, but it was quite cool at that time. A few minutes later, having drawn the pantry boy's attention to the smoke, they moved down the train to a different carriage.

16. A number of other passengers made statements, but there is little more to be gained by describing them in detail. It may be of advantage, however, to give the consensus of their opinion on the following points:—

- (a) the time which elapsed from the first observation of the smoke to the stopping of the train was between 20 minutes and half-an-hour;
- (b) several passengers tried to find the communication chain, but only Mr. Boardman succeeded;
- (c) a few described the situation as a panic, but most said that this was not so, although there was a great deal of excitement and rushing about;
- (d) many of the passengers commented on the good work done by the soldiers and sailors who were travelling in the coaches. They said that if it had not been for their help, given at personal risk, some passengers would have been suffocated or burnt to death.

CONSTRUCTION OF COACH

17. Coaches Nos. 1737 and 1738 formed one of 16 generally similar twin sets which were specially built by the former London & North Eastern Railway Company in 1937 for their high speed trains, the "Coronation" and the "West Riding".

As previously described, the pairs of coaches were articulated in the centre over one bogie. In addition, they were sound and heat insulated to an unusual degree, and an electrically operated pressure ventilation system, combined with thermostatically controlled steam heating was installed. Internal design and decoration were elaborate, and the seating arrangements differed from the normal type of coach. Transverse partitions divided No. 1737 into four cubicles, three of which seated 12, and the fourth 6, passengers; No. 1738, which was a brake third coach, was similarly divided into two compartments, each seating 12 persons; the total seating capacity of the set was thus 66. A centre corridor, 2 feet 1 inch wide between the arm rests of seats, ran through the two coaches, and the openings in the transverse partitions were 2 feet 4 inches wide; there were no doors in the partitions, but swing doors, also 2 feet 4 inches wide, were provided at each end of the corridor of each coach, the one leading to a vestibule, and the other serving to close off the gangway between the vehicles. The length of the corridor, measured from the vestibule door of one coach to that of the other was 73 feet 7 inches. External doors, one on each side, were in the vestibules at either end of the twin set. The windows were of the usual type, except that they were originally

double glass, consisting of two sheets of $\frac{1}{4}$ inch plate glass with a $\frac{1}{4}$ inch gap between ; some, however, were doubtless single glass at the time, as when they had needed replacement, only single sheets were used. These windows were 4 feet long and 2 feet $1\frac{1}{2}$ inches deep. They could not be opened, but, set above them in the normal way, there were sliding ventilators, which gave a maximum opening of 1 foot 10 inches by $9\frac{1}{2}$ inches.

No paint, cellulose lacquer, french polish, or varnish was used in the interior of the passenger part of the coaches, but the whole, including the roof, was covered with a nitrocellulose coated fabric. This is a type of leathercloth, and is commonly known as "rexine", the trade name of one of its manufacturers. Seats were upholstered in moquette, and the floor was covered with an Axminster carpet, laid on top of a sponge rubber sheet $\frac{1}{2}$ inch thick. Woodwork in the vestibules was finished in french polish.

The underframes of the coaches were steel, and bodywork consisted of steel exterior panels with teak framing and soft wood interior linings ; partitions and roofs were also of soft wood.

18. Electricity for both the pressure ventilation and the lighting systems was provided by a 24 volt 65 ampere generator and two 180 amp./hr. batteries, placed underneath the frame. The maximum load for lighting was 19.3 amps., and for pressure ventilation, 13.5 amps. The batteries were protected on both positive and negative sides by fuses which were designed to blow at 165 amps., and to carry a continuous current of about 80 amps. Leads consisted of V.I.R. cables, which were carried on the underframes in corrosion proof conduits ; they were then taken to switch and control panels in a cupboard in the vestibule, whence the lighting circuits were distributed through three 10 amp. and one 5 amp. fuse to the various lighting points. A 24 volt 6 amp. immersion heater in a small boiler provided hot water for the toilet and was separately fused.

19. The pressure ventilation panel contained the control gear, switches, and fuses for the system. The fuses for the blower fan motor circuit were designed to carry a load of 10 amps., and to fuse at 20 amps.

The pressure ventilation was introduced by air ducts which ran under the seats at floor level along each side of the coach, with louvres at intervals throughout their length. Close by the last seat at the vestibule end, a branch from the main duct on the left hand side of the coach was taken down through the floor, along its underside, and up into the toilet compartment, thus completing the ventilation of the coach.

20. The floor and covering were elaborate and unusual, and were of particular interest in connection with this fire. They consisted, working from the bottom upwards, of the following layers :—

corrugated steel sheeting
 $\frac{3}{4}$ inch sprayed asbestos
 $1\frac{1}{2}$ inch air space
 $\frac{3}{4}$ inch deal boards
 $\frac{1}{2}$ inch hair felt
 $1\frac{1}{2}$ inch deal boards
 $\frac{1}{2}$ inch sponge rubber
carpet.

21. When the coaches were examined after the fire, nothing remained above floor level except the twisted steel panelling and the hoops which had supported the roofs ; it could be seen, however, that the communication chain of the second coach had been pulled and that the valve was open. The floors were covered with the remains, either completely or partially burnt, of a large number of personal belongings, such as suitcases, bags and spectacles, which gave evidence of the haste with which their owners had been forced to escape. There were no signs of burning through the floor itself, except in the corner under the seat where the smoke was first seen. In the original construction, two holes had been made through the floor at this place, one to take the branch air duct for the toilet, and the other to take three electric leads from a thermostat which was fixed to the side of the coach. The fire had evidently been concentrated in the first place in the neighbourhood of the air duct hole, which had been cut in an irregular shape, about 6 inches in length by $4\frac{1}{2}$ inches in width. The duct itself was rectangular, 2 inches by $1\frac{1}{2}$ inches, and the intention had been that the space between its sides and the edges of the hole should be packed with asbestos ; there were, however, no signs of this packing, and the duct simply went through the middle of the hole, leaving a gap round the sides. On the inside of the coach, this gap was covered by the sponge rubber and carpet, which fitted closely round the duct, so that it could not be seen from above.

As a result of the fire, a considerably larger hole was burned in the lower layer of boarding than in the upper ; in the former, it was about 20 inches by 20 inches in size, and in the latter about 14 inches by 13 inches. Although it was to be expected that the lower layer would burn more rapidly than the upper, because more air could reach it, the general appearance of the burning and the shape of the hole gave the impression that the lower layer of wood had been smouldering for an appreciably longer time than the upper.

CONCLUSION

22. There can be little doubt that the fire started in the hole in the floor through which the air duct to the toilet was taken. In all probability, it was caused by a piece of live coal from the engine which entered from the underside and lodged in the air space between the asbestos and the lower wood layer of the floor. I think it likely that this occurred soon after the train left King's Cross, and that the wood smouldered for some time before the fire spread through the hair felt to the upper layer of wood ;

then, fanned by the air flow underneath the coach, it gradually spread upwards through the hole, and caused the thin trickle of smoke which was noticed by the passengers. Eventually, the smouldering fire reached the sponge rubber floor covering and, as this was itself covered by a carpet, it did not ignite, but partially melted and gave off the heavier fumes (isoprene) which were noticed by the passengers about 10 minutes before Huntingdon was reached. Finally, when the train stopped (and perhaps, because it stopped), the rubber burst into a small flame. This, in turn, came in contact with the leather cloth covering on the side of the coach, and in a very few seconds the end of the coach was fully ablaze, and the fire was out of control.

23. Other possible causes which required to be examined were, a lighted match or cigarette dropped on to the carpet under the seat, or a short circuit in the electrical system. I think that both of these causes are extremely unlikely. The passengers occupying the seats were not smoking and, if they had dropped a match, it would be improbable that it could have started a fire which would have smouldered for such a long time. Even if the match had slipped between the side of the coach and the carpet, I do not think there would have been sufficient air for the rubber underneath to ignite; the match would, in this case, have been far more likely to ignite the leather cloth covering, and to start an immediate blaze.

The possibility of an electrical fault may also be dismissed. Although three wires passed through the floor in the vicinity of the fire, they were all positive leads and were not live at the time.

On the other hand, the entrance and lodgement in the hole in the floor of a piece of live coal are by no means improbable; it is, in fact, a common occurrence for quite large pieces of ballast from the track, or cinders from the engine to be thrown up and remain in various parts of the undercarriage of a fast running train. In this particular case, the probability is the greater because the hole was over the centre of a bogie, and immediately behind one wheel, so that a piece of coal striking the wheel would be the more likely to be thrown up; furthermore, the $1\frac{3}{4}$ inches air space in the floor provided a suitable lodging place for it. In addition, the missing double firebar in the engine left a gap in its drop grate of nearly 3 inches in width and 1 foot 4 inches in length, so that a larger piece of coal than usual could drop onto the track.

It is for these reasons that I am satisfied, beyond reasonable doubt, that this was the cause of the fire.

REMARKS

24. The fire at Huntingdon was the third serious fire in a passenger train to occur within the space of little more than two years. The others were at Penmanshiel in June 1949, where seven passengers were injured, and at Beattock, in June 1950, where five passengers lost their lives. In addition, there was again a similar type of fire at Westborough in 1941, in which six schoolboys were killed and seven injured.

The two main points which have characterized all four fires have been the extremely rapid spread of flame inside the coaches, and the difficulties encountered by the passengers in escaping. Descriptions of these fires are given in the published Reports of the Inquiries which were held into them; in particular, the Beattock Report reviews the whole question of fire and fire protection in trains, and makes a number of recommendations in connection with the problem. The following remarks, therefore, are not confined solely to the fire at Huntingdon, but are also intended as a continuation of the previous Reports.

In general, the Huntingdon fire raises no points which have not already been indicated by the earlier incidents. It serves, however, once again to emphasize the need for proper and careful consideration of fire hazard in the detailed design of coaches, and the great importance of providing adequate means of escape in case of emergency. It also draws attention to the need for giving some elementary training in fire fighting procedure to train crews.

25. The following facts about the fire stand out clearly:—

- (1) It would have been prevented altogether if the asbestos packing between the edges of the holes in the floor and the sides of the air duct had been in place.
- (2) The dangerous and extremely rapid spread of flame inside the coaches would not have occurred if their interiors had not been covered with highly combustible materials.
- (3) The injuries which the passengers received, and the much graver dangers to which they were subjected, would have been avoided—possibly if,
 - (a) the fire extinguisher had worked.
 - (b) the communication chain had been readily available in the coach.and certainly if,
 - (c) the train crew had stopped the train promptly when first told of the fire.
 - (d) there had been a sufficient number of doors or opening windows in the coaches to permit of reasonably rapid evacuation.

These points are discussed below.

Asbestos Packing

26. There were no signs of the packing to be found after the fire, and it is probable that it had been missing for some time. The importance of avoiding as much as possible places where cinders or burning coal can remain is obvious but, in view of this occurrence, it may be advisable to remind the appropriate staff about the point.

The rapid spread of flame

27. There is a striking similarity between the Huntingdon and the Penmanshiel fires, both in their behaviour and in the materials which caused them. In each case, the behaviour followed the same pattern. Having broken out, the flames spread upwards and along the roof of the coach, enveloping the whole in a very short time ; furthermore, the intensity of the heat increased remarkably quickly, and a number of passengers in both fires, although some distance from the original point of outbreak, received burns before they could escape.

Perhaps the most dangerous feature, prominent in all three fires, was the rapidity, even greater than that of the flames, with which thick black smoke and fumes filled the coach in which the fire started, and spread along the corridors of others, blinding and choking the occupants. These fumes were overpowering ; many passengers described them as particularly acrid, and felt that they were going to be overcome by them in a few seconds. This sensation of choking and collapse, coupled with the inability to see, considerably increased the feeling of alarm among the passengers at Huntingdon, and hampered their efforts to make an orderly escape.

It is known that fumes, and not flames, are very often the cause of deaths in fires. This is a point which needs special consideration in trains which, with their confined spaces, long narrow corridors, and draughts, present a greater danger in this respect than buildings. Both Penmanshiel and Beattock have already clearly indicated the danger.

28. At Penmanshiel and at Huntingdon, the materials which caused the initial rapid spread of flame contained nitrocellulose ; in the one case, it was clear cellulose lacquer containing 68 % of the substance and, in the other, it was a nitrocellulose coated cloth containing about 28 %. Both materials when submitted to the "Surface Spread of Flame Test", as specified in British Standard Definitions No. 476-1932 (Amendment No. 2 1945), fell into the lowest category as "Class 4—Surfaces of Rapid Flame Spread".

At Huntingdon, a further contributory cause of the intensity of the fire was the sponge rubber floor covering. This could be ignited easily at exposed edges, and it also had a very high calorific value. A sample was tested after the fire and its value was found to be 14,100 B.T.U's. per lb., comparing with the figure of about 8,000 B.T.U's. per lb. for wood, or 14,000 for good coal. It will thus be seen that, given conditions under which it could burn freely, the sponge rubber was capable of generating a considerable quantity of heat very quickly.

I do not think, however, that it had an immediate spreading effect at Huntingdon, because it was covered by a carpet, but it undoubtedly increased the quantity and aggravated the effect of the fumes, as well as adding to the heat.

29. The experiences of these two fires have demonstrated that the materials, nitrocellulose paint and nitrocellulose covered cloth, are not suitable for the interiors of railway coaches. After the Penmanshiel Fire in 1949, the Railway Executive undertook to remedy the cellulose lacquer situation. The extent of the problem, however, proved to be greater than was at first thought, because it was not then known which coaches were affected, or how many there were ; all, therefore, had to be tested.

There is a total of 24,900 corridor coaches on British Railways. Of these, 23,800 have now been examined ; 15,275 were found to be in order, and 8,525 to contain an inflammable surface. Of this last figure, 6,831 have already been dealt with, and 1,694 are receiving or awaiting attention. 1,100 thus remain to be tested and, provided every effort continues to be made to deal with them as quickly as reasonably possible, the task may be regarded as almost completed.

30. The nitrocellulose coated cloth situation is different. In 1949, the material was abandoned for use in all future passenger stock, but it had already been extensively used for decorative purposes for a number of years in certain types of coaches, as well as for blinds, arm rests, and the undersides of removable cushions. Many coaches thus still remain affected. Although the cloth falls into the same spread of flame category as the lacquer, its distribution is limited, and I do not think that the risk is so acute. Few, if any, remaining coaches contain the cloth in such large unbroken areas as those on which the lacquer was sprayed. I understand that, apart from arm rests, blinds and cushions, there are approximately 7,000 coaches in which this cloth is used on the sides or roofs, and of these, 3,320 are affected only from waist level upwards. Among the remainder, the cloth extends down to floor level in 1,220, and 2,460 have a metal or other skirting fitted between floor level and the bottom of the finish.

This detail of design is of great importance, because the danger spot for starting a fire is on the floor, among discarded bits of paper or other rubbish, or in the corner beside an inflammable vertical surface. It is worth noting that if there had been skirtings in the corridor at Penmanshiel or underneath the seat in the compartment at Beattock, or along the coach side at Huntingdon, it is probable that none of these fires would have broken out. Steps have now been taken to fit skirtings to the 1,220 coaches, and a number have already been completed.

So far as the blinds, arm rests, and undersides of removable cushions are concerned, I think the risk of starting an uncontrollable fire is negligible, although they would undoubtedly add to the subsequent conflagration. Blinds are unlikely to be ignited unless they are pulled down and a flame held against them, when the fire would be at once obvious and easily extinguished ; the undersides of cushions are horizontal surfaces from which free air is largely excluded, so that they would only burn with difficulty in most cases, and arm rests are small and isolated.

Nevertheless, nitrocellulose coated cloth is an undesirable material from the point of view of fire, and the sooner it is removed from all coaches the better.

The thirty two coaches of the type involved in the Huntingdon fire presented a special case, because their interiors were almost entirely covered with the leather cloth, and it was, moreover, left unprotected at floor level. After the fire, the Railway Executive removed from the twenty-eight remaining coaches, the cloth from waist level downwards, and also the sponge rubber. This work has already been completed.

Nitrocellulose coated leather cloth has been extensively used for a wide variety of purposes for many years past, but I understand that its place is now being taken by a superior type of leather cloth, coated with polyvinyl chloride. This, if used with the proper adhesive, falls into "Class 2—Surfaces of Low Flame Spread" in the British Standard Test. It is, at present, more expensive than the nitrocellulose type.

Fire Extinguishers.

31. The failure of two of the six extinguishers used in this fire is a most disturbing feature, and should receive the urgent attention of the Railway Executive and the manufacturers.

If the extinguisher which the guard tried to use had worked properly, the passengers would possibly have been given time to escape without burns or other injuries, and the fire might indeed have been held in check altogether. A total of six fire extinguishers from the train's equipment was used in the fire ; of these, two failed and four worked. Of the six extinguishers, five, including the two failures, were of the soda acid type, and one was of the carbon tetrachloride type from the kitchen car. In the case of the two extinguishers which failed, the dates when they were last inspected and the cause of their failure cannot be determined as both were practically destroyed in the fire, but the evidence has shown that the guard knew how to operate them, and that he did so correctly.

It has recently been decided to adopt the water (gas expelled) type of extinguisher as standard, and the existing stock of soda-acid containers is now being replaced gradually. The Railway Executive had previously accepted the recommendation in the Beattock Report that there should be one extinguisher placed in every passenger coach, and the work of provision was already in hand, but the particular coaches involved in the fire had not yet been equipped. It should be noted in this connection that if there had been an extinguisher readily available in the coach at Huntingdon, the passengers might have been encouraged to take more positive action themselves, in which case the fire would probably have been restricted to the hole in the floor.

The Communication Chain

32. A particularly unsatisfactory feature of this accident was the lack of communication chains. There were only two at each end of the twin set, the one over an external door in the vestibule, and the other in the toilet compartment. Throughout the entire length of the main body of the two coaches, where the passengers were seated, there was none ; neither was there any notice to inform passengers where it was to be found. In these circumstances, it is not surprising that they were unable to find the chain quickly when the need arose. Mr. Boardman eventually found it, but not until he had first searched the rear end of the coach ; other passengers were also looking for some time, but failed to discover it.

Immediately after the fire, the Railway Executive placed notices inside all similar coaches, stating where the chains were ; at the same time, arrangements were made for the chains themselves to be available in the main body of each set, and this work is now completed.

The provision of some means of communication between passengers and train crew is a statutory obligation expressed in the Regulation of Railways Act, 1868. This requires that, in all passenger trains travelling more than 20 miles without stopping, there shall be "such efficient means of communication between the passengers and the servants of the company in charge of the train as the board of trade may approve". (The responsibilities of the Board of Trade for railways have since passed to the Ministry of Transport).

When the Act was passed, there was no vestibule or corridor stock, and all carriages were divided into compartments. A communication cord was, in those days, taken along the length of the outside of a train, above the doors, so that a passenger requiring to pull it had to lean out of the window to do so. When the more modern stock was introduced, communication chains were provided in each compartment and at intervals throughout the lengths of corridor and open coaches. Gradually, however, it seems that the practice has grown of reducing the number of chains in certain types, such as dining cars. The two particular trains, for which the twin sets at Huntingdon were specially designed, were planned to carry an unusually large staff of attendants, and it can only be presumed that it was for this reason that the provision of passenger communication facilities was so inadequate.

I recommend that the whole question of passenger communication in coaches be reviewed to ensure that it is adequate in all types of passenger stock and that it has the approval of the Minister of Transport, in accordance with the Act.

33. It will have been observed from Mr. Boardman's evidence that he returned a second time to the communication chain because he thought that the train was showing no signs of slowing down. In his original evidence to me, he said that this would be nearly 10 minutes after he first pulled the chain. I have examined this matter very carefully and, without describing here the details of calculations and reasons, which concern the relative times of the movements and actions of the driver, the guard, Mr. Boardman, and others concerned, I think it was almost impossible for Mr. Boardman to have pulled the chain more than 4 minutes before the train stopped, and it was more likely to have been about 2½ to 3 minutes.

Further tests which were carried out subsequently at Huntingdon by pulling the communication chain in an identical train, drawn by the same engine and driven by the same driver, confirmed my own calculations. Moreover, they showed that it would have been impossible for the driver to have carried on for anything like 10 minutes without using the large ejector. This he did not do.

I am also satisfied that there is no question that the apparatus failed to operate, because the indication disc on the outside of the coach was found to be turned after the fire, and I am almost certain that it was the communication chain, and not the guard's brake application, which caused the driver to stop the train, and that he did so as soon as could reasonably be expected.

Time is always difficult to judge in an emergency, and I think that Mr. Boardman was misled by the stress of the moment. It must be stated, however, that not only did he display considerable cool-headedness and courage at the time of the fire, but in his evidence he proved a good and clear witness; when my own calculations and reasons were explained to him in detail, he agreed that he must have been mistaken about the time, but I think he still remained a little doubtful.

Action of the Train Staff

34. If the restaurant car conductor and the guard had taken reasonable precautions as soon as the fire was brought to their notice, some twenty minutes before it broke out seriously, it would probably have been easily quelled, and the passengers would certainly have been able to evacuate the coach quietly, and without injury or alarm. As it was, the conductor looked at the smoke, but made no attempt to investigate under the seat where it was coming from, nor to put the fire out; instead he walked through nearly seven coaches to tell the guard. The guard's actions, though well intended, were particularly ill-judged. Having seen the smoke coming from the floor, he did not lift the carpet and look underneath, but immediately jumped to the conclusion that the cause was a hot axle box, and that it would be sufficient if the train was stopped for examination at Peterborough, more than half-an-hour ahead.

In both assumptions he was wrong; it was not a hot box, and if it had been, he should certainly not have waited until the train reached Peterborough before dealing with it. After he had looked at the smoke, instead of stopping the train at once, he returned through half its length to write his note, leaving no one of the train staff to watch the progress of the fire or the supposed hot box. All these actions wasted valuable time and allowed the fire to develop. On the second occasion when he was called, he acted rightly and promptly by taking steps to stop the train and by bringing a fire extinguisher, which, however, failed to work. This was not his fault. The fire then gained too strong a hold, and Guard Nunns made a determined and commendable attempt to deal with it, in the course of which he received burns on his hands and face, and suffered severe shock. Finally, after managing to escape through a window, he continued to assist passengers and carry out his other duties with regard to the train.

Tests which have since been carried out in a similar train show that the actions of the guard, conductor and pantry boy in walking up and down the train occupied about 15 minutes. Allowing 5 minutes for the interval after the guard left the coach the first time, until the passengers sent for him on the second occasion, the total time, from the first intimation of the fire, given to the pantry boy, to the arrival of the guard at the fire with an extinguisher, was between 17 and 20 minutes.

It should be noted that no standing instructions were issued by the Railway Authorities to train crews about the action they should take in case of fire or suspected fire; furthermore, if a guard stops an express train for reasons which subsequently are found to be trivial or unnecessary, it is possible that he will be called to account for it. I have little doubt that Guard Nunns, who was not a regular main line guard, was influenced by this consideration; also, he was not experienced or trained in fire and consequently did not realise its latent dangers, so he thought the wisp of smoke of insufficient importance to stop the train.

35. In the Beattock Report, the Railway Executive were asked to consider the institution of a standard fire fighting procedure to be adopted in the event of a train catching fire, so that each member of the train crew and dining car staff would know what he should do. The Executive, however, thought this to be impracticable, owing to the responsibilities of the train staff for protecting the train.

In the suggested standard procedure, the first rule would certainly have been that, if signs of fire are seen or suspected, and the source cannot quickly be found, or having been found, cannot obviously and easily be extinguished, then the train must be stopped at once. If this simple rule had been impressed on the minds of the train staffs at the time, neither the deaths at Beattock nor the injuries at Huntingdon would have occurred.

The Railway Executive, on being asked to reconsider, eventually agreed to the introduction of this particular rule, but they are still unwilling to adopt the suggestion as a whole.

It seems to me that the protection of the passengers of a train against the actual dangers of a fire should rank at least as high in importance as protecting the train against the potential dangers caused by stopping in section, very important though the latter safeguard is. Moreover, main line trains frequently carry a staff of a second guard, restaurant car attendants, ticket collector, and cleaner as well as the driver, fireman and guard who are primarily responsible for protecting the train in the customary meaning of the term. This additional staff could surely be made available for such purposes as closing vestibule and corridor doors to isolate fumes and stop draughts, bringing fire extinguishers to the scene of the fire (particularly now that there is to be one in every coach), controlling and helping passengers, and any other similar actions which experience has shown to be helpful.

It is understandable that, with the variation in the circumstances of different trains and the number of staff that they carry, it may well be impossible to devise a rigid drill ; nevertheless, the institution of some form of fire fighting procedure, and the education of staff in the danger of fire and its behaviour in trains, would go a long way to reducing its effects. This should not be difficult to arrange.

Means of exit from the coaches

36. The situation which arose inside the twin set when the fire broke out was alarming and extremely dangerous. As soon as the flames appeared at the rear end, all the passengers, numbering between 65 and 70, tried at the same time to escape through the one remaining door at the other end. As might be expected, the corridor immediately became blocked with people and suitcases, particularly in the neighbourhood of the doors leading from the second to the first coach, and from the first coach into the vestibule. The congestion was such that some passengers were unable to get into the corridor at all, but were knocked back into their seats by the press of others who were trying to reach the door. In addition, fumes and smoke rapidly filled the two coaches, greatly increasing the difficulties. The fire approached quickly and the heat grew intense, so that it very soon became obvious that only a few of the passengers could pass through the door before the flames reached them, and the only course left for the remainder was to try and escape through the windows. These were fixed and difficult to break ; furthermore, the act of climbing over the jagged edges of the broken glass and dropping over 7 feet on to the trackside was in itself dangerous and forbidding. In these circumstances, there was no question of an orderly evacuation ; all that each person could hope to do was to make his own escape if he could.

I do not think that this state of affairs amounted to a panic, although some of the passengers described it as such ; nevertheless, the acute danger of the approaching flames, the feeling of being trapped and unable to escape, coupled with the heat, choking, darkness and confusion, naturally created a situation which, in itself, retarded the evacuation of the coaches. It is fortunate that there were no young children among the passengers, particularly in the second coach ; if there had been, the results can hardly have failed to be more serious.

37. This situation was avoidable, for it was caused almost entirely by the general design of the coaches, and by the lack of adequate means of exit. As will be seen in the diagram on page 2, the only two doors by which the designed number of 66 passengers could leave the set were separated by a long narrow corridor, measuring 73 feet 8 inches in length and 2 feet 1 inch in width between armrests of seats. In the centre of the set, where the two coaches were joined, there was another door in each which served only to divide the corridor into two, and to shut off the gangway between coaches. All four doors in the corridor opened inwards, so that a press of people trying to get out might make them impossible to open, as has been known to happen with disastrous results in other fires. The series of openings along the centre of the coaches, through the transverse partitions, greatly increased the impression of length in the corridor, and a passenger sitting in one of the cubicles formed by the partitions, might well feel cut off in an emergency.

It will have been noted from Mr. Boardman's evidence that, on his advice, some of the passengers were already preparing to leave the second coach before the fire burst out seriously ; some, indeed, may already have moved into the first coach. Nevertheless, when the flames appeared, although the doors between the two coaches were open, only about half of the 42 passengers in the second coach were able to move into the first ; the remainder were forced to break the windows and jump out. The same thing occurred in the first coach, where the 24 passengers already seated in it were joined by those who managed to escape from the second ; the fire from the second coach must have taken a little longer time to reach the first but, even so, some of these passengers were unable to avoid burns and other injuries.

38. In the Report on the Beattock Fire in 1950, the need for more adequate means of escape in case of fire was urged, and suggestions were made where, in various types of coach, it was thought that improvements should be made. In particular, after a statement of opinion that a centre door in the corridor of sleeping cars was desirable, the Report continues :—

"I also think that consideration on similar lines should be given to the new open (centre corridor) coach. This is designed to carry as many as 64 passengers, and is provided with two doors at each end. As in the case of sleeping cars, if one end is blocked, there is the possibility, in an emergency, of an uncontrolled rush to escape from the other end. This did, in fact, happen in the same type of coach at Westborough in 1941, and the serious results of that train fire were undoubtedly aggravated by it".

[Note 1.—*In the Westborough fire, a number of schoolboys were travelling in an open (centre corridor) coach, having, as at Huntingdon, one door at each end leading to a vestibule with two external doors. Fire broke out and spread quickly, blocking one end of the coach, and the boys rushed to escape through the door at the other end. Very largely as a result of the congestion round this door, and the confusion which it caused, six boys lost their lives and seven were injured before they could escape.*]

[Note 2.—*In the quotation given above, the two doors, stated as being at each end of the new open coach, are the two external doors situated in each vestibule ; as in the Westborough and Huntingdon coaches, the vestibule and these external doors could only be reached by one single internal door, leading from the main body of the vehicle.*]

39. The fire at Huntingdon has thus demonstrated and repeated, almost to an exaggerated degree, the precise dangers which arose at Westborough, and which the recommendation in the Beattock Report was designed to prevent.

Unfortunately, as in the case of the fire fighting procedure, this recommendation was also declined by the Railway Executive.

It should be noted, at this point, that the situation at Huntingdon did not arise because the two coaches formed a twin set with only one available exit ; on the contrary, the congestion round the door occurred in a similar way in each individual coach. It is also to be observed that, in this case, the single door was found to be inadequate even for a coach seating only 42 passengers ; the new coach, to which the recommendation refers, seats 64.

40. The three recommendations of the Beattock Report which were not accepted were thus :—

- (a) some form of organisation among the staff for dealing with fires in trains,
- (b) additional doors in open (centre corridor) coaches, and
- (c) an extra door in the corridor of sleeping cars.

After the fire at Huntingdon had once more so clearly confirmed their need, and in view of the importance which was attached to them, they were twice again referred to the Executive, with the request that they should be considered, but they were still found to be unacceptable. This cannot be regarded as satisfactory.

41. The reasons given by the Railway Executive were as follows :—

In relation to the general question, they stated that there is no limit to the number of safeguards which can be applied in the search for greater safety, but a reasonable balance must be held between the incidence of fire and the expenditure which is needed to remove the risk of it.

They also thought that, by the acceptance of the following recommendations in the Penmanshiel and Beattock Reports, the risk will be so greatly reduced as to make the centre door unnecessary either in open (centre corridor) coaches or in the corridors of sleeping cars :—

- (a) nitrocellulose lacquer to be removed from all coaches which contain it.
- (b) surfaces under seats around heaters to be protected by asbestos millboards.
- (c) wire mesh grilles to be fixed under seats, in conjunction with making all seats removable, to reduce the ingress of rubbish and to render it easier to clean underneath.
- (d) gap between seat back and partition to be closed.
- (e) lower portion of compartment partition to be of steel.
- (f) a fire extinguisher to be provided in every corridor coach, and in all dining, sleeping, and kitchen cars.
- (g) in the electrical wiring of coaches, additional fuses to be provided in the main circuits.
- (h) in sleeping cars, compartment windows to be made to lower sufficiently for passengers to be able to escape through them.

Of the above, (a) is nearly completed, (b), (c), (e) and (h) are for new coaches only, and (d), (f), and (g) are being applied to all coaches as soon as it is found possible to do so.

42. In open coaches, their objections to centre doors were that this would mean a loss of seating capacity, and also a loss of amenity. In addition they thought that the risk of fire starting and remaining unobserved in an open coach, where many passengers might be seated, was very small.

In the case of sleeping cars, the new type is to be of "all steel" construction, the only combustible material in the berths will be bedding and carpets, and the windows of berths have now been arranged to open enough for passengers to escape through them if necessary. The Executive considered, moreover, that a centre door in the corridor would render difficult the control of passengers at stations, increase the risk of theft, and increase the risk of passengers mistaking the door in the night and falling out of the train. They also felt that the incidence of fires in sleeping cars has not shown the recommendation to be necessary.

43. As the Railway Executive rightly say, and I think it is the important point of their reasons, the whole question of acceptable accident risk is one of proportion, in balancing the degree of risk against the cost, in one form or another, of removing it. In my view, however, where fires in passenger trains are concerned, there is no room for nice calculation on this point ; unless the cost is really prohibitive, and if removal or reduction of the risk can reasonably be effected, then I think it should be.

In assessing the degree of risk in train fires, the factor of incidence, though it is obviously important, can be given too much weight, if considered by itself alone. An equally valid consideration, and one which appears sometimes to be overlooked, is the intensity of the peril in each incident. In other words, an accident probably involving only minor injury can be tolerated much more readily than one which is likely to have fatal consequences, although the incidence of both may be the same.

44. Few will deny that there is in most people's minds a latent and instinctive dread of fire. This alone is sufficient to require special consideration in assessing fire risk ; much more important, however, is its frequent and very dangerous consequence, panic. It is common knowledge how quickly this can be aroused by fire, and how, by itself, it is sometimes the cause of deaths and injuries which would otherwise have been avoided. There can surely be few situations more likely to give rise to panic than that of people trapped in the small confines of a burning railway carriage on a moving train. Moreover, there can be few structures in which, by their nature, fire is more likely to be encouraged than a train, with its long narrow shape, numerous windows, and draughts.

In addition, from the standpoint of practical experience, the three recent fires have shown that it was only by good fortune that there were not more fatalities or injuries. At Penmanshiel and at Huntingdon particularly, they might well, by the smallest change in circumstances, have been very much more serious.

I therefore think that, in the question of acceptable risk, fires in trains present a special problem which is different from most other types of accident. Because of the nature of fire, partial measures resulting from careful calculations of cost and risk are not good enough ; the aim should be no less than to prevent fire happening at all, and, where this is not entirely possible, to ensure that every reasonable step has been taken to mitigate its consequences.

This is largely a matter of organization and design, and need not cost much, particularly if it is taken into consideration and given full weight at the outset. Naturally, if mistakes are discovered afterwards and have to be remedied, the cost may then be great.

45. The recommendations of the Penmanshiel and Beattock Reports, which the Executive have already accepted, go a long way towards reducing fire risk in trains. It must be recognised, however, that the danger is not entirely removed, and so long as coaches have inflammable materials inside them, either placed there in the course of design or brought in by passengers, there will be the possibility of fire. There will also remain the possibility of fire being started by external sources, as has happened before.

46. Moreover, so far as incidence is concerned, there have now been three serious fires in the space of two years, causing five deaths, including two small children, and injuries to 29 other passengers. Some years earlier, another fire killed six schoolboys and injured seven others. In addition, the number of fires in passenger trains reported to the Ministry of Transport during the past three years has averaged 87 a year. This figure excludes a yearly average of 34 gangway fires also reported during the same period. Most of these were small and caused little damage, but each one was potentially a serious fire.

I do not think that this record can be regarded with complacency, nor do I consider that the incidence of fires can be looked upon as small. Fires in passenger trains represent, in fact, about 10% of all train accidents reported.

47. Finally, there remains the question of cost. The Railway Executive have already incurred considerable expenditure in meeting the recommendations of the Penmanshiel and Beattock Reports, most of which has been for the testing of coaches and the removal of inflammable surfaces from their interiors, as described in paragraph 29 ; the remainder is on account of the provision of fire extinguishers and the improvements in design.

It was with a view to the present difficult financial situation that the recommendations for additional doors were confined to future stock, and excluded existing stock. The cost in this case is, I understand, in the nature of £5 to £10 for each additional door, which is an almost negligible figure in relation to the cost of the coach or to the important gain in safety which the door would provide. The overall cost would thus be very small, and it would, moreover, be spread over a number of years as new coaches were built. I do not consider, therefore, in assessing the Railway Executive's main point, cost against risk, that the cost can reasonably be regarded as prohibitive. To provide new doors in the 4,700 existing centre corridor coaches and 383 sleeping cars clearly presents a different problem, involving structural alteration and the expenditure of a considerable amount of effort as well as money. It was thought that this, although desirable from the safety aspect, would be unreasonable to expect, and so these coaches were excluded from the recommendation.

48. With regard to the other objections of the Railway Executive, I feel that they are not very important in relation to the scale of the problem, and need not all be discussed in detail. It must be remarked, however, in regard to the open (centre corridor) coaches, that the type recommended, having centre doors as well as end doors, does in fact exist and is in service today. Built in 1948 as a main line coach, it represented the latest design of the Southern Railway, and seats 64 passengers. There is therefore no loss of seating capacity when compared with the British standard coach without centre doors ; and in the question of amenity, the designers apparently saw no difficulty in the way, nor does any seem to have arisen since the coaches have been in service. The objections of the Executive are therefore difficult to understand.

49. In sleeping cars, the dangers were discussed in the Beattock Report, and certain recommendations were made. Since then an improvement has been achieved by making the compartment windows open sufficiently for the occupants to climb through. This improvement, however, is only partial. Escape through the window may be difficult in any case, or even impossible with elderly or large people, and there are obviously considerable risks in using it. Furthermore, it seems likely that the first reaction of most passengers on hearing an alarm would be to try and escape through the door.

50. So far as incidence is concerned, it may be true that there have been few fires in sleeping cars of recent years (there are only 383 sleeping cars on British Railways), but this does not mean that the risk is less than in other coaches ; in fact, whatever their construction may be, with their bedding, water heating systems and passengers' baggage, sleeping cars can never be considered immune from fire risk.

Moreover, there have actually been five fires in sleeping cars reported to the Ministry of Transport during the past year. In addition, there was a serious fire on the Continent some months ago which is described below because it shows what may happen when a fire occurs, and how dangerous it can be.

51. The fire followed in all essentials the style of the Penmanshiel and Huntingdon fires, both in rapidity of spread and in danger to the passengers. It apparently broke out and advanced along the corridor so quickly that the attendant, who was at one end, was cut off and unable to warn the sleeping passengers. These were soon awakened by the heat and noise of the flames, and all tried, in the first place, to escape through the corridor. In the rear half of the coach this was impossible on account of the flames, and some of the passengers were forced to escape by the windows of their compartments.

Although these windows had wide openings, and had worked properly when the train started, at least three of the passengers were unable to open them when the crisis arose, presumably because the heat had caused them to stick. One passenger, after being seriously burned on the hand in trying unsuccessfully to open his window, managed with difficulty to break it and climb out, receiving severe cuts in the process. Another passenger in the same predicament was unable to break the window, and remained trapped in his compartment until the glass was broken by others throwing stones at it from the outside. A third passenger, having also failed with his window, just managed to escape through the corridor, with bare feet and in his pyjamas, leaving everything else in his compartment.

This fire was a most dangerous and unpleasant experience for those involved. If it had occurred in a third class sleeping car with 28 passengers, it needs little imagination to realise that the results would certainly have been much graver.

52. For the reasons already discussed in this and the Beattock Reports, and in the light of the example given above, I consider that every effort should be made to improve the situation for the future. A more ready means of escape in the corridor, provided by the additional door in the centre, is undoubtedly one of the most effective ways of achieving this improvement.

SUMMARY

52. To sum up, I do not consider that the reasons put forward by the Railway Executive, either in regard to risk, incidence, cost or other disadvantages, are sufficient to justify their reluctance to carry out the few remaining improvements. Their unwillingness seems the more strange in view of the relatively small cost involved, particularly when the importance of the improvements has been confirmed so strongly by the experience at Huntingdon. I must therefore say that I do not think that the present position is satisfactory, or that the matter should be allowed to stand where it is.

53. It is not in the nature of things that fire can be absolutely prevented, but it can be very largely so, and its effects reduced, by the adoption of suitable measures. The wide extent of the precautions which are taken in public buildings, however fire resisting their main structures may be, is well known. The incidence of fire in such buildings is probably very small indeed, yet experience has shown the necessity of the protection, and much of it is obligatory by law. A railway train, carrying six or seven hundred people at high speeds is, also in the nature of things, a considerably greater hazard than a solidly constructed building; it surely demands, therefore, at least as high a standard of protection in so far as it is possible to provide it.

The first object in any fire is to save life, and the first and obvious way to do this is by providing adequate means of getting away from the fire. This is as vital in trains as it is anywhere else; certainly the lack of means of escape should not be allowed to be the direct cause of deaths or injuries, as it was at Westborough and Huntingdon.

54. I do not wish to give the impression, and it would be entirely wrong to suggest, that the Railway authorities do not give constant thought and care to safety; indeed, it is their vigilance in this respect over many years which has resulted in the very high general standard which exists today. Nevertheless, consideration of the details of the recent series of fires, the design and equipment of the coaches concerned, and the lack of staff training, all seem to indicate that of late years the awareness of fire risk has become less acute than, perhaps, it should be.

Neither the Penmanshiel nor the Huntingdon fires should have been allowed to occur for, if it was not already known, a simple test when the coaches were designed would have shown how highly combustible the offending materials were. Furthermore, after the Penmanshiel and Beattock fires had so clearly pointed out the dangers, it is difficult to understand why the particular coaches at Huntingdon were allowed to remain in service without modification; with their inflammable interiors, inadequacy of communication chains, lack of fire extinguishers and, above all, lack of sufficient exits, they were a very poor fire risk indeed.

55. I therefore think that, even more important than the detailed improvements which remain to be done, there is need for a new outlook on the subject of fire in passenger trains. It seems to me that the problem should now be unreservedly recognised and squarely faced, and that it should be tackled with the object of deciding how much can be done in all directions to improve the situation and to remove unnecessary risk.

I have the honour to be,

Sir,

Your obedient Servant,

R. J. WALKER,
Colonel.

The Secretary,
Ministry of Transport.

POSTSCRIPT

Since this Report was concluded, yet another fire has occurred in an express passenger train, resulting in the destruction of one more coach. The circumstances, which give rise to new doubts and are disturbing, call for the most thorough investigation. Details are given in the attached Appendix.

APPENDIX

FIRE IN PASSENGER TRAIN AT FORDHOUSES, LONDON MIDLAND REGION—14th MARCH, 1952.

The coach concerned was a corridor brake third, and the fire started underneath the seat and behind the heater in a non-smoking compartment, next to the brakevan where the guard was sitting. Several men occupied the compartment, and as soon as they noticed the smoke coming up the back of their seat, they told the guard, who was only a few paces away. He immediately came, bringing a fire extinguisher. Together with a train cleaner who accompanied him, he tried to lift the seat, but could not do so because it was fixed. He then played the extinguisher as best he could on the back and top of the seat, closed the compartment door to keep the smoke in, and made an emergency application of his brake.

The train stopped about 400 yards from a station, and the guard and fireman examined under the coach, but saw no signs of fire. They decided to continue into the station, where the staff had already seen that the train was stopped, and had realised that something was wrong. As the train stopped in the station, the compartment burst into flames. All available fire extinguishers were brought into action; in addition, the Fire Brigade of a Supply Depot, which was by the lineside, saw that the train was on fire and came at once to its assistance. As a result, hoses from a fire hydrant with a good pressure of water were brought to bear in an unusually short time. Despite all this, the fire spread quickly and, except for the lavatory compartment, the coach was completely burnt out. Fortunately, no one was injured as all the passengers were able to move into other coaches or on to the platform.

The compartments of this coach were similar to those in the Beattock fire, and the fire started in the same inaccessible place, amongst some rubbish underneath the seat behind the heater. There is little doubt that a match or cigarette end started it. Apart from the match, the secondary cause was that the seat was not removable; this allowed the rubbish to collect in a place which could not be cleaned, and also prevented the guard from reaching the seat of the fire with the extinguisher.

The salient points of this fire are that the circumstances in which it was detected and fought could hardly have been more speedy or favourable; even so, it was impossible to control it and the coach was burnt out.

The coach, moreover, was built as recently as September 1950, 15 months after the Penmanshiel and 3 months after the Beattock fires; nevertheless, the compartments were found to be decorated with material containing nitrocellulose. When tested by the Department of Scientific and Industrial Research and Fire Offices Committee, Joint Fire Research Organisation, they fell into the lowest category "Class 4—Surfaces of Rapid Flame Spread".

A further point is that the coach had previously been tested by the Railway authorities, as described in paragraph 29 of this Report, and had been passed as safe.