



MINISTRY OF TRANSPORT

Report of the Public Inquiry
into the Accident at
Hixon Level Crossing
on January 6th, 1968

*Presented to Parliament by the Minister of Transport
by Command of Her Majesty
July 1968*

LONDON

HER MAJESTY'S STATIONERY OFFICE

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Crossing on January 6th 1968**

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CORRECTION

Page 115, Finding 2 *for* para. 211 *read* para. 212
Page 115, Finding 3 *for* para. 214 *read* para. 215
Page 115, Finding 4 *for* para. 213 *read* para. 214
Page 115, Finding 5 *for* paras. 215–217 *read* paras. 216–218
Page 115, Finding 6 *for* para. 218 *read* para. 219
Page 116, Finding 7 *for* para. 218 *read* para. 220
Page 116, Finding 8 *for* para. 223 *read* para. 222
Page 116, Finding 10 *for* para. 224 *read* para. 226
Page 116, Finding 11 *for* paras. 216 & 224 *read* paras. 217 & 226
Page 116, Finding 12 *for* para. 225 *read* para. 228
Page 116, Finding 13 *for* para. 226 *read* para. 230
Page 117 Recommendation 9
for para. 351 *read* 352

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ORDER under Section 7 of the Regulation of Railways Act, 1871 for constituting, and of the terms of reference for, a formal inquiry into the accident at Hixon Level-Crossing, Staffordshire, on the 6th January 1968

WHEREAS it appears to the Minister of Transport that it is expedient that there should be such a formal investigation of the accident which occurred at Hixon Level Crossing, Staffordshire, on the 6th January 1968, and of the causes thereof and of the circumstances attending the same as is mentioned in Section 7 of the Regulation of Railways Act, 1871, the MINISTER HEREBY ORDERS and directs that such an investigation shall be held and appoints Mr. Edward Brian Gibbens, Q.C., with the assistance as assessors of Mr. Granville Berry, M.I.C.E., M.I.Mun.E., F.I.E.S., A.M.I.W.E. and Brigadier Richard Gardiner, C.B., C.B.E., M.Inst.T., to hold the said investigation and to make a report to the Minister in accordance with the said Section 7, and to inquire generally into the safety of the system of protection of railway level crossings by automatic half-barriers and to make recommendations.

Dated 16th January 1968.

C. P. SCOTT-MALDEN

An Under Secretary
Ministry of Transport

To: The Rt. Hon. RICHARD MARSH, M.P., Minister of Transport.

SIR,

INTRODUCTION AND TERMS OF REFERENCE

1. I was appointed by your predecessor, the Rt. Hon. Barbara Castle, M.P., on 16th January 1968, to hold a formal investigation under Section 7 of the Regulation of Railways Act, 1871, into the accident which occurred at Hixon level-crossing, Staffordshire on the 6th January 1968.

2. The Order constituting the Inquiry (reproduced at p. 6) required me to report to you on the causes and circumstances of the accident, and also to inquire generally into the safety of the system of protection of railway level-crossings by automatic half-barriers, and to make recommendations.

3. The Order appointed as assessors Mr. Granville Berry, C.Eng., M.I.C.E., M.I.Mun.E., F.I.E.S., A.M.I.W.E., and Brigadier Richard Gardiner, C.B., C.B.E., M.Inst.T.. Their function was to assist me with their advice on all technical matters within their expert knowledge. I gratefully acknowledge their invaluable help, and though I must accept responsibility for the decisions and defects of this Report, I have invited them to subscribe their signatures to indicate their collaboration in formulating the recommendations.

4. The Inquiry was opened in Stafford on 29th January 1968, when applications for representation were heard. I also inspected the scene of the accident on that day, accompanied by the assessors. During the course of the preliminary hearing I made it clear that the Inquiry would not be concerned with the apportionment of financial responsibility, and I therefore refused representation to the insurers of the transformer damaged in the accident. I also suggested that the victims of the accident or their families might wish to consider shared representation: in the event, however, only one family was represented at the hearings.

5. The hearings were resumed in London on 26th February, and continued until 20th March and from 29th April until 29th May, a total of 41 days. The hearings were held in public, and the 63 witnesses (listed at Appendix II) gave evidence on oath, under the powers contained in Section 7 of the Regulation of Railways Act, 1871.

6. After the opening statement by the Attorney General I afforded Counsel for each of the other parties (listed at Appendix I) the opportunity of addressing the Court in accordance with the procedure recommended by the Royal Commission under the Rt. Hon. Lord Justice Salmon (Cmnd. 3121). Thereafter one of the Counsel appearing for the Court called the witnesses, and they were examined in chief either by their own Counsel or, if they were not represented, by Counsel for the Court. Counsel for the Court, and Counsel appearing for other parties, were then in turn given the opportunity of cross-examining them: if a witness was examined in chief by Counsel appearing for the Court he was then available for cross-examination by another Counsel representing the Court.

7. Two interesting features of the Inquiry were the fact that this was only the second formal investigation to be held under the provisions of Section 7 of the Regulation of Railways Act 1871, the first having been the investigation into the Tay Bridge disaster of 1879; and the fact that the Ministry of Transport was separately represented at the hearings.

8. I am grateful to the very many members of the public who wrote either to me or to the Ministry of Transport making suggestions about protection at level crossings. These suggestions were all very carefully considered in the course of the investigation. Among them were papers from groups of ratepayers and other local associations (see Appendix III) and from one or two local authorities, including Camborne and Redruth Urban District Council, who had originally petitioned against the British Transport Commission Act of 1957 authorising the installation of automatic half-barriers at level crossings. The debate of the House of Commons Committee which considered this Private Bill was a most valuable source of information about the formative stage of policy, and I wish respectfully to express my appreciation and thanks to the Speaker for allowing the Court to consider the record of the Committee's deliberations.

9. On 22nd-24th April I visited level-crossings in France and Holland with the assessors, as the guests of French and Dutch railways, whose help and courtesy I gratefully acknowledge. Further, on the 11th May, we travelled in the driver's cab of a multiple unit train from London to Eastbourne and back, so that we might appreciate the problem from the point of view of railwaymen.

10. The general public has been understandably anxious about the safety of level crossings protected only by automatically operated half-barriers already in use in this country, and that anxiety was greatly increased when the disaster at Hixon was followed by a distressing accident at Trent Road, Beckingham, Lincolnshire, on the 16th of April 1968. But " 'tis held that sorrow makes us wise " and these disasters have produced, I believe, the most profound and intensive examination of the whole problem of the safe operation of such level crossings which has been made in any country in the world.

PART ONE

I. THE HISTORICAL BACKGROUND

11. From the time when railways were first built in Britain it was recognised that at places where the railway crossed public highways on the same level trains must be given the right of way because of their inability to stop in a short distance, owing to their weight and the low coefficient of friction between the steel wheels and the steel rails. Consequently, by the Railway Clauses Consolidation Act, 1845, Parliament imposed rigorous rules to ensure the safety of the public on the highways, and required that all public level crossings should be both manned and gated, with "good and sufficient" gates kept normally closed against the road, so as to fence the railways in. But the Act allowed directions to be given by the President of the Board of Trade, whose powers in this respect were transferred to the Ministry of Transport in 1919, that the gates should normally be open to the road and closed across the railway; and, over many years (as the volume of road traffic increased, so that the crossings were used more frequently by road than rail traffic) such directions were issued for nearly every busy level crossing where the gates were interlocked with protecting railway signals in such a way that the signals could only be set at clear for trains after the gates had been shut against the road.

12. As time went on people grew to believe that every public level crossing was protected in the way described, but such was not always the case. The directions I have mentioned have, from time to time, been given by the Ministry even where there was no interlocking mechanism, but this was generally at crossings which were not very busy. Indeed, in 1966, when there were 2,500 public level crossings in Britain, no less than 514 gated crossings (at some of which the gates were normally open to the road) were not interlocked with protecting signals.

13. These old gated crossings required, of course, to be operated by a crossing-keeper (or signaller if there was a signal box near by) who had first to close the gates to exclude road traffic and then, returning to his signal apparatus, set the signals in favour of the approaching train. All this had to be completed before the train had reached a point from which it could be brought to a halt before passing the last stop signal. Bearing in mind the considerable distance required in which to halt a fast train, this procedure meant that road traffic was kept at a standstill for a comparatively long time. At the crossings where there was no interlocking mechanism, the crossing-keeper would close the gates after he received a bell-signal that the train had entered his section, but the time spent was not much less. According to the evidence, a passenger train would cause the gates to be closed for an average of three or four minutes at least, and a slower freight train five or six minutes; and, if another train should be coming in the opposite direction when the first was clearing the crossing, the time the gates were closed might be doubled.

14. The statutory rules for level crossings remained substantially unchanged for 112 years, except that in 1954 the British Transport Commission Act empowered the Minister of Transport to permit the use of lifting barriers instead of gates at manned crossings. But the changing conditions of modern life brought demands for relaxation of the rigorous Victorian rules for the protection of road and rail traffic at level crossings, if it could be done without prejudice

to the high standard of safety which the railways had achieved. In the presence of modern technology the old gates were a creaking anachronism.

15. The enormous growth of road traffic since the last war meant that the delays imposed by the traditional gated crossings were seriously impeding the flow of traffic, especially on the busier roads, and the Ministry of Transport felt that the delays were no longer to be accepted. At the same time, the British Transport Commission (the predecessors of the British Railways Board) found that the manned crossings were uneconomic owing to increases in wages together with reduction in hours of work; and the extra work occasioned by the greater number of road vehicles using crossings necessitated a shift system of manning at many places: the busiest were on a three-shift basis. At some crossings the cost of manning came to more than £3,000 per year. Moreover, by the early 1950's it was found to be more and more difficult to find people to man level crossings, a job which is unattractive and tedious but which requires a responsible and reliable person to perform it. (I was told by Mr. J. F. H. Tyler, Chief Signal and Telecommunications Engineer of British Railways that contrary to the contention that had been maintained for the greater part of the Inquiry, this difficulty disappeared with the closure of a number of railway lines under the "Beeching plan" and that finding staff to operate the gates is no longer a problem, though, of course, it may become one again.)

16. Consequently, in the hope of solving these problems, the Ministry of Transport and British Railways jointly decided to make a close study of continental methods of level crossing protection, and a joint working party, led by Colonel D. McMullen, of the Ministry of Transport Railway Inspectorate, visited France, Holland and Belgium in 1956. The Chief Inspecting Officer of Railways, Colonel G. R. S. Wilson, wrote to Colonel McMullen on the 25th September 1956:—

"Before you leave for the Continent I feel that it may be helpful to the party and their work for me to recapitulate very briefly the considerations which have led to the arrangement of this visit to study problems in connection with the design and working of lifting barriers at public road level crossings.

First of all I should say that there is no doubt in anyone's mind of the very high standard of safety to road and rail traffic which has been maintained over the years at our public level crossings with their alternatively closing swinging gates worked by gatekeepers or signalmen on the spot. The wisdom of Parliament in insisting on this form of protection by legislation in the early days has thus been well proved in practice, and if it were only a question of safety we should be content to leave things as they are. The cost of providing attendants has, however, risen very greatly in recent years, in some cases as much as tenfold, and furthermore there are growing difficulties in finding reliable men to act as gatekeepers, particularly at relief periods, as some recent accidents have shown. The only solution to these present day problems is to take full advantage of modern technical developments, as is so often done in other spheres.

Some years ago the railways began to consider the simple substitution of lifting barriers for the conventional swinging gates as a better engineering proposition . . . and an experimental installation has now been in use for

some time at Warthill in the North Eastern region, with the barriers worked from an adjacent signal box and interlocked with the railways signals. . . .

Only minor economies can result from the mere substitution of lifting barriers for swinging gates, but with lifting barriers, remote or automatic control without attendants at the barriers becomes practicable technically, and the latter type of working has been developed extensively on the Continent and in the U.S.A. The British Transport Commission are therefore anxious to experiment on these lines for British Railways in order to save considerable expenditure, particularly at rural level crossings where the wages which have to be paid are altogether disproportionate to the amount of work a man has to do. It is the Minister's wish that the Commission should be encouraged in this direction."

17. The chief object of the working party's investigation on the Continent was the level crossing protected by automatically operated half-barriers (which, for the sake of brevity I shall hereinafter call automatic crossings).

18. At the time of their visit to the Continental countries there were 700 automatic crossings in France and 39 in Holland, in addition to which in Holland, Belgium and France there were a considerable number of crossings controlled by automatically operated flashing lights only, without barriers. The background situation on the Continent was very different from that in Great Britain because, generally speaking, there was no statutory obligation on the railway administrations to fence in the line and no binding legislation to man public level crossings. None of the countries visited used gates closing alternately across the road and rail as in Great Britain. Consequently, the public in those countries had grown up accustomed to forms of level crossing protection different from those which were instinctive to the British people. Nevertheless, each of the Continental administrations had to consider the same traffic problem as that in Britain, and the urgent need for economy was causing them to find ways and means of reducing the expenditure in connection with level crossings.

19. In France automatic half-barriers at unmanned crossings had been introduced in 1955 on lines with no more than two tracks, and at sites where there was a traffic moment of not more than 20,000* and where approaching trains were in view for not less than 12 seconds. They were never interlocked with railway signals. The visiting party was told that up to the time of their visit there had been only eight accidents at such crossings, in which 11 occupants of road vehicles and 7 railway passengers had been killed, though there had been a large number of road vehicles running into crossing barriers without causing collisions with trains.

20. The time sequence for the operation of automatic crossings in France allowed a total of 20-25 seconds after the apparatus had been activated by an approaching train before its arrival upon the crossing.

21. In Holland, where automatic crossings had been introduced experimentally in 1951, the party were told that the Netherlands Railway authorities considered them to be the most economical and the safest form of level crossing

* "Traffic moment" is used on the Continent as a standard of measurement of the interaction of road and rail traffic and is arrived at by multiplying the number of trains per day by the average number of road vehicles per day which use the crossing.

protection, even on busy roads, where pedestrian or bicycle traffic is not exceptionally heavy. The time sequence there allowed the lapse of 25 seconds before the fastest train on the section would reach the crossing after initiating the operation of the mechanism. Though it was not possible to obtain accident statistics comparable with those in Great Britain the number of accidents in which both trains and road vehicles were involved at attended crossings was not large, but there had been only two train accidents at automatic crossings since they were first installed in 1951. The number of cases of motor vehicles colliding with barriers was said to be high.

22. On their return home, Colonel McMullen and his colleagues submitted a report (which was published by Her Majesty's Stationery Office in March 1957) in which they concluded that automatic and remote operation systems of control might be adopted at selected crossings after satisfactory trials. Their report continued:—

“We recognise the necessity for a fundamental change in outlook as to the purpose of protection at level crossings. The type of heavy wooden gate which has been in use for over 100 years was intended to be, and in fact was, a completely effective obstacle to the horse-drawn road vehicle. The situation has changed with the advent of the modern powered road vehicle which can easily break through such a gate, and its value, therefore, as an obstacle to vehicle movement when closed against the road lies primarily in its conspicuousness. This characteristic can be fully achieved with a barrier of suitable construction, especially when it is equipped with modern reflecting material. . . . The barrier can be of light construction, and as it is mechanically more efficient than the gate it can be operated more easily and more quickly. . . .

We have not overlooked the safety of pedestrians, although we feel that their attitude to the level crossing requires to be changed. The belief that pedestrians and particularly children must be afforded full protection against the dangers of the line is nowadays illogical. There are many level crossings where adults and children already have free access to the railway, viz. public level crossings with controlled gates but uncontrolled wickets, footpaths and accommodation and occupation crossings with wicket gates or stiles. Crossings of these types exist on the most important main lines and also on lines electrified with the third rail system. Furthermore, the dangers to which pedestrians are exposed on the roads are at least as great and certainly more frequent than those at level crossings.

With the introduction of lifting barriers at level crossings, and in particular if automatic half-barriers are to be adopted, the principle must be recognised that it is the responsibility of the individual to protect himself from the hazards of the railway in the same way as from the hazards of the road. . . .

The automatic half-barrier equipment which has been developed in recent years on the Continent has undoubtedly been successful. . . . We believe that this type of protection, which has also been in use in the U.S.A. for some years, will prove to be safe in this country.”

23. Having come to that conclusion, the British Transport Commission, with the support of the Minister of Transport, promoted a clause in the British

Transport Commission Bill in 1957 to permit the installation of automatic crossings instead of gated crossings. Giving evidence before a Committee of the House of Commons, Colonel McMullen referred to his Report mentioned in the preceding paragraph, and said that he considered that such crossings would be no less safe than the protected gated crossing. Both he and Mr. J. H. Fraser, then Chief Signal Engineering Officer of the British Transport Commission, explained that the intention of the Commission was, at the outset, to experiment on a limited number of crossings "to make sure of our ground as we go along". Four particular points were made in the evidence to the Committee:—

- (i) Mr. Fraser stated the principle underlying the "brisk operation" of the automatic crossing was not only to save time for road users, but "the object of the short time is that very quickly the public know that there is no chance of beating the thing. When the barrier comes down, it means a train is there, and there is no temptation to beat it. If we attempt to link up with the signals, we almost certainly lose the discipline of the public, I think";
- (ii) that the operation of the half-barriers was not connected with the signals;
- (iii) that if, when an emergency arose, the train had passed the last signal at which it could be arrested, nothing could be done to stop the train before it reached the crossing;
- (iv) that, according to Colonel McMullen, the safeguards proposed for British automatic crossings were more than had been seen on any of the Continental systems.

24. The Bill was passed and Section 66 of the resultant British Transport Commission Act, 1957, provided:—

Power for
Minister to
authorise
special safety
arrangements
at public
level
crossings.

66.—(1) The Minister may on the application of the Commission by order provide that so long as the order continues in force the provisions of the Highway (Railways Crossings) Act 1839 of section 47 of the Act of 1845 and of section 6 of the Act of 1863 and any other provisions to the same or similar effect incorporated with or contained in any enactment relating to any level crossing at which a public carriage road is crossed on the level by any railway of the Commission or such of those provisions as may be specified in the order shall cease to apply to that level crossing or shall apply thereto with such modifications as may be specified in the order.

(2) An order made under this section may require the Commission to provide at or near to any level crossing to which the order relates and to maintain and operate so long as the order continues in force such barriers lights traffic signs and automatic or other devices and appliances and may lay down such other conditions and requirements to be observed by the Commission in relation to such level crossing and the use and operation thereof as shall in the opinion of the Minister be necessary or desirable for the protection safety and convenience of the public.

(3) Any traffic sign provided in pursuance of an order made under this section shall be deemed to be a traffic sign lawfully placed on or near a road in accordance with the provisions of section 48 of the Road Traffic Act 1930 and the order may provide that the provisions of section 49 of the said Act of 1930 shall apply to that traffic sign.

...

(6) Before applying to the Minister for an order under this section the Commission shall give notice in writing to the highway authority and if the local authority . . . is not the highway authority to the local authority of their intention to do so and such notice shall be accompanied by a copy of the draft order which the Commission intend to submit to the Minister and the said highway authority and local authority shall be entitled to make representations to the Minister in respect of the said application within such period not being less than two months as may be specified in the notice.

(7) An order made under this section may be made in accordance with the draft submitted to the Minister by the Commission or with such alterations as the Minister may think fit and the Minister may by order amend or revoke any order so made.

25. With the supervision and guidance of the Railway Inspectorate of the Ministry of Transport and Civil Aviation, the British Transport Commission proceeded to introduce automatic crossings cautiously and, in the first instance, at little-used crossings. A document entitled "The Provisional Requirements of the Minister of Transport and Civil Aviation in Regard to Automatically Operated Half-Barriers at Public Level Crossings" was published on the 1st of May 1958 as a tentative guide to the Commission on the principles to be regarded as governing the installation of automatic crossings. The document laid down the principle that the installations would be permitted only at crossings where the daily motor traffic (excluding motor-bicycles) did not exceed 1,000 vehicles and where the maximum speed of trains did not exceed 60 miles per hour. These Requirements were in fact more cautious and restrictive than those in force on the Continent of Europe and, consequently, by the end of 1961 only two automatic crossings were in use.

26. In 1961 Colonel McMullen visited the railways of the United States of America and Canada and, on his return, he reported:—

"Crossings with automatic half barrier equipment (in U.S.A. and Canada) are undoubtedly safe, and this equipment saves a lot of delay to road traffic. I think that we might consider relaxing some of our requirements for these, as a result of which the circuits could be simplified and the cost of the equipment reduced. . . . On the other hand, I am convinced that before this equipment can be used on fast running lines, we must adopt some system of measuring the speed of trains so that the falling of the barriers can be delayed to avoid an unduly long period of time elapsing after they have fallen and before the arrival of a slow train."

27. After consideration of Colonel McMullen's report, revised Provisional Requirements (similar in form to Appendix V) were published in which it was

laid down that "initially, this system is to be applied only to crossings with road traffic not exceeding an unidirectional peak flow of 150 vehicles per hour . . . the railway to have not more than two running tracks and the maximum speed of trains preferably not to exceed 60 miles per hour. A higher maximum speed of say 70 miles per hour may be acceptable if the difference in time between the fastest and slowest train reaching the crossing after the warning is initiated is not more than say 40 seconds." Additional safety precautions were also included to ensure that the barriers would always descend in the event of a failure of the equipment and that the barriers would remain in the lowered position, against the road, if all the red flashing light signals failed on one approach to the crossing.

28. Those amended Requirements were found still to be too restrictive and so, when Colonel McMullen took over as Chief Inspecting Officer of Railways in 1963, he arranged for another joint working party from the Ministry and the British Railways Board to visit the Continent again, under the leadership of Colonel Reed of the Railway Inspectorate, in order to make recommendations on how the Requirements might be reconsidered in the light of the further experience of automatic crossings that had been gained in Holland and France.

29. Colonel Reed found that the S.N.C.F. had now installed over 1,300 automatic crossings at sites in France where the total traffic moment was under 20,000 and where visibility was good; between four and five thousand more crossings were noted as suitable for conversion. All these crossings were in rural areas, and no serious consideration had yet been given in France to their use at busy urban sites or on fast and busy main roads in rural areas. The variation in timings, both between the lights starting to flash and the arrival of the train, and after the passing of the train before the barriers began to rise, was wider than required in Britain and speed discrimination equipment had not been adopted.

30. Colonel Reed reported that the Dutch had installed over 200 automatic crossings, many at busy sites, and that new installations were being brought into use at the rate of one per week. The general opinion there was that half-barriers could be used at almost any level crossing. He reported: "The numerous examples which we saw in Holland of the manner in which delays to road traffic were reduced to a minimum by auto-half-barrier equipment at busy crossings in built-up areas, adjacent to railway stations, and with road junctions on either side of the crossing, as well as at busy crossings on high speed important roads, some also with heavy rail traffic, showed how well the Dutch outlook is justified in practice."

31. In Holland it was considered that there had been insufficient time to establish clearly the trend of accidents, but the record showed only one case of a road vehicle dodging round the barrier since the first installation of automatic equipment in 1953, and comparatively few cases of motor cyclists or cyclists doing so. There were four fatal accidents in 1962 which were all said to be due to negligence by the road users rather than to any misunderstanding or deliberate disobedience of the barrier warnings.

32. After the return of the working party Colonel Reed's recommendations for further revision of the Requirements were considered, and it was consequently laid down in September 1963 that automatic crossings should now be accepted

in rural areas where there was road traffic not exceeding 150 vehicles per hour in each direction, and that neither the speed nor the frequency of trains should be a limiting factor, provided (i) that the difference in time between the fastest and slowest train reaching the crossing after the warning should not be more than 40 seconds and (ii) that road traffic could clear readily between train movements. In built-up areas there was to be no limit on road traffic volumes, unless there was any risk of traffic blocking back over the crossing from an adjacent junction or unless, for some reason, traffic could not clear readily between train movements.

33. The latest amendment of the Requirements was issued in July 1966 with an Explanatory Note (see Appendix V) and remained in force at the time of the accident in January 1968.

34. The first automatic crossing was installed at Spath, Staffordshire (not far from Hixon) in February 1961, and by the end of 1963 there were only six; but after the revisions of the Requirements mentioned above British Railways arranged to instal 12 crossings in July 1964. Since that date installation of such equipment has progressed steadily, as will be seen from the following numbers of automatic crossings in use (not counting those which have at some time ceased to be used owing to closure of the line):—

1964	...	...	15
1965	...	...	56
1966	...	...	124
1967	...	...	205*

The installations are mainly in rural areas, and the greatest number (89) are in the Eastern Region.

35. Thus was introduced into Britain what the Ministry has described as “the most revolutionary of the new types of level crossing protection”. It is interesting to note, particularly in view of the important feature of automatic crossings that they are not protected by interlocking railway signals, that at present there are 2,425 public level crossings on British Railways, made up as follows:—

Crossings with signal protection

Crossings operated from a signal box	954
Crossings operated by a keeper with interlocked signals	...	...	...	453
				<hr/> 1,407 <hr/>

Crossings not protected by signals

Crossings operated by a keeper, no interlocked signals	514
Automatic crossings	...	...	...	...	...	207
Other crossings	...	...	...	...	...	297
						<hr/> 1,018 <hr/>

Thus it will be seen that 42 per cent of the level crossings on British railways today are not protected by signals: of the 207 automatic crossings, 54 replaced old ones which had not thereto been protected by railway signals.

* Two further crossings were converted to automatic working at the beginning of 1968, before the moratorium imposed pending this Inquiry.

36. British Railways wish to convert another 1,500 level crossings to automatic half-barrier protection. At the time of the Hixon accident their intention was to convert about 150 crossings per year, but since that date their plans have been suspended to await this Report.

II. AUTOMATIC HALF-BARRIER LEVEL CROSSINGS

37. It is necessary to understand the nature and principal features of level crossings protected by automatically operated half-barriers. In place of the heavy wooden gates by which most of the old familiar level crossings were protected, half-barriers have been substituted which operate to bar half the carriageway to road traffic but which (unlike the gates) are never closed against the railway. They are lightly constructed, being little more of a physical obstruction to motor vehicles than a policeman's outstretched arm, and so should be regarded chiefly as a signal of the approach of a train. Each is covered with red and white stripes of a reflecting material and carries two small red electric lamps (shining in both directions) to make them plainly visible at a distance along the road.

38. The arrangement of the crossings is as follows. On the left hand side of the road at each side of the crossing a half-barrier is mounted on a pivot post containing part of the operating mechanism. The barriers are normally at rest in a nearly vertical position but, when a train approaches, they descend to the horizontal so as to occupy the nearside half of the carriageway, thus excluding road traffic from the crossing until the train has passed. Each pivot post also carries a pair of red lights (similar to the traffic lights with which one is familiar at road intersections) and a bell or gong mounted beside them: there is also a similar pair of red lights mounted on a post at the crossing on the right-hand side of the road. To make those lights easily discernible at all times each pair is backed with a rectangular black board.

39. The descent of the half-barriers is initiated by the approaching train when, at a distance from which the fastest train permitted on that particular stretch of line would take 24 seconds to reach the crossing, it strikes a treadle and also (lest the treadle fail) completes an electric circuit through the rails, whereupon the two sets of twin red lights at each side of the crossing flash alternately, and the alarm bells ring, for a period of 8 seconds before the half-barriers begin to descend. The barriers reach the horizontal in the next 8 seconds, and then another 8 seconds later (in the case of a train travelling at the maximum permitted speed) the train arrives upon the crossing. Thus, the system of automatic protection at automatic crossings allows road traffic no more than 24 seconds warning before the fastest train will be upon it.

40. A few yards short of the crossing is another treadle which is allowed to rise after the last vehicle of the train has passed over it (when it has, so to speak, "struck out"): this allows the red flashing lights to be extinguished and the half-barriers to rise immediately the last of the train has gone over the crossing.

41. This "brisk operation" of automatic crossings is designed, firstly, to encourage good traffic discipline (see paragraph 23 (i) above) and, secondly, to reduce the delays to road traffic as far as possible. The Ministry insists upon a minimum total time sequence for the fastest train of 24 seconds (except in the case of a second train: see below) but that minimum is increased where the passage of the vehicle over the crossing is lengthened because the road crosses the railway on a skew, or where there are more than two railway tracks to be traversed. However, in order to maintain the two objects of "brisk operation", it is necessary to provide against the longer time which will be taken by slower trains. A margin of a further 40 seconds is allowed for the latter (making a total of 64 seconds for the longest sequence of operation) and, if the difference in the

speeds of railway traffic normally using any particular part of the system is likely to produce a greater disparity in times, speed discriminators are used to ensure that the difference between the timing of the barriers on the passage of the fastest and of the slowest trains is no more than 40 seconds.

42. If a second train "strikes in" before a previous train has "struck out", the half-barriers remain down and the lights continue to flash. If, however, the second train strikes in during the 6 seconds while the half-barriers are rising after the passage of the first train, the barriers will continue to rise, with the lights extinguished, and there will then (when they have reached the vertical) be an abbreviated warning phase of about 6 seconds during which the lights will flash and the bells ring, followed by the normal 6 to 8 seconds descent of the barriers and a final 5 to 6 seconds before the second train reaches the crossing. Thus, assuming the worst or "critical" situation, where the second train is travelling at the maximum speed for the line, and has struck in the instant after a previous train has struck out, there could be a total warning period to the road user of as little as 18 seconds.

43. The most important feature of automatic crossings is that the half-barrier protection is not in any way related to the railway signals, as was the case at most, but not all, of the familiar gated crossings. This is because, in order to produce the time sequence for the brisk operation desired, it is necessary for the apparatus to be so arranged that, when it "strikes in", the fastest train will be no further from the crossing than the distance it will be able to cover in 24 seconds. In that time, no train running at a high speed can be stopped, and consequently the initiating treadles and commencement of the electric circuit are of necessity nearer to the crossing than would be any signal which could be used to arrest the train. Moreover, the train driver can have no notice of any obstruction upon the crossing, nor, if he did, would it avail him since he would be unable to stop before reaching it.

44. Consequently, as will be appreciated, at automatic crossings the entire responsibility for preventing collisions between trains and road vehicles, and for the safety of trains, is thrown upon the road user. And, to quote from a paper presented to the Court by the Ministry of Transport,

"the formidable onset of the train so soon after the falling of the barriers reinforces the traffic signals"

and thereby promotes good discipline among road users.

45. The operation of an automatic crossing is monitored at, but cannot be controlled from, the nearest signal box for that section of the railway. There the signalman is able by an electric device to check, at the beginning of his shift, that the apparatus is working correctly and, if the barriers should remain in any position except fully raised for more than 3 minutes, an alarm sounds in the monitoring signal box. The signalman's instructions, in that event, are that he must immediately caution all trains proceeding towards the crossing, call out an attendant to man it, send for repair technicians, and inform the police.

46. The apparatus of an automatic crossing is designed so that, should any fault develop, it will "fail safe". This means that, in the case of any breakdown, such as the failure of electric current or of any part of the mechanism, the barriers are designed to descend and to remain at the horizontal until the fault

is corrected. At the same time the red lights will continue flashing. If all the lamps on the flashing light fail on one approach to the crossing (an unlikely occurrence) the barriers will stay down after a train has passed. Moreover, a failure in the electric power supply also sounds an alarm in the signal-box, and there are stand-by batteries incorporated in each barrier post which will keep the half-barrier apparatus, including the lights and bells, working for twelve hours.

47. Incorporated in the pivot post of each half-barrier erected since 1965 is a telephone connected directly to the monitoring signal box, and intended for use by the public. By the time I began this Inquiry telephones had been added to all the older automatic crossings. Nearby is erected a notice (which I shall call the "Emergency Notice") in black lettering on a white background which reads:—

" IN EMERGENCY or before crossing with exceptional or heavy loads or cattle PHONE SIGNALMAN ".

And on the offside of the road is another notice:—

" Another train is coming if lights continue to flash ".

Both these Notices can be seen in Plate 4 of Appendix X. The Emergency Notice measures $14\frac{1}{2}$ in. by $30\frac{1}{2}$ in.

48. Written instructions in the monitoring signal box relating to the telephone procedure at the automatic crossing read as follows:—

" A telephone is provided between this box and the crossing to enable members of the public to communicate with you before taking exceptional or heavy loads, or cattle, over the crossing. You must ask the person requiring to use the crossing how long he requires.

Permission must not be given for the crossing to be used when you have taken off your signals for, or have allowed the train to proceed towards, the crossing until you are satisfied that such train(s) has/have passed the crossing. When giving permission, you must request the user to again telephone from the other side of the crossing when he is safely across.

After permission has been given, if the person using the crossing does not inform you, by telephone, that he has passed safely over the crossing, you must inform the signalman at [Meaford] crossing box, and you must stop the first train proceeding towards the crossing on each line, inform the driver of the circumstances, and instruct him to proceed cautiously and be prepared to stop short of any obstruction. The driver must also be instructed to stop at the next signal in advance of the crossing and inform you in case of an up train, or the signalman at [Meaford] crossing box in the case of a down train, whether the crossing is clear of the exceptional or heavy load or cattle. If the driver reports the crossing is clear, normal working may be resumed and the signalman at the other end of the section informed accordingly."

However, if a motorist telephones because the half-barriers have remained horizontal owing to some failure of the apparatus the signalman is permitted to do no more than tell him how long it will be before the next train arrives; he is forbidden to tell the motorist to cross or to give any advice as to what he should do.

49. On the road approaches to an automatic crossing the highway authority erects the authorised traffic signs. The advance road-sign used to indicate the presence of an automatic crossing is depicted in "The New Traffic Signs" pamphlet, published by H.M. Stationery Office, 1967, and is shown in Fig. 1 in Appendix XV. It purports to show a representation of the half-barriers in black on white within a red triangle, but those symbols do not easily bring to mind the image of half-barriers: the Attorney-General thought they looked like two hammers, and some may imagine they are T-squares. Beneath the sign itself is a large plate bearing two large red spots and the words "STOP when lights flash". This sign is not prescribed by the Road Traffic Regulations Act, 1967, and has to be authorised individually by the Minister for each crossing. It is not used on the Continent where the "gated" crossing sign is used for automatic as well as manned crossings (so tourists will not have encountered it). This "gated" sign (Fig. 4 of Appendix XV) is included in the draft convention on road signs and signals which is to be considered shortly at an international conference in Vienna and, if the United Kingdom Government agrees to abide by the decision of that conference, it may be that the "hammer sign" will have to be discontinued in favour of the "gated" sign. (But see paragraph 364 in Part Two of this Report.)

50. A white stop line is painted across the near side of the road and double white lines mark the centre. Count-down markers are also sometimes used and, in a few instances, yellow box markings have been tried experimentally, especially in situations where traffic might block back over the crossing owing to a road intersection ahead.

51. The two notices mentioned in paragraph 47 above are railway notices erected by the British Railways Board as they were required to do by the Minister's Order authorising the installation of an automatic crossing. They are not prescribed by the Traffic Signs Regulations and they have no mandatory force. However, the twin red flashing lights, although also required by the Order, are mandatory signs prescribed under Regulation 31(3) of the Traffic Signs Regulations and General Directions, 1964, and it is an offence for a motorist to pass them unless his vehicle is so close to the line or signals that it cannot safely be stopped.

III. PROCEDURES

(i) The Authorisation of Automatic Crossings

52. The normal procedure leading to the authorisation of an automatic crossing is as follows. British Railways, having examined the site and having come to the conclusion that it would be suitable for conversion to automatic working, prepare case papers, setting out in detail the various data such as the volume of road and rail traffic, the speed limits of each, the actual speeds of the fastest and slowest trains, the distance from which train drivers and motorists respectively can see the crossing on approach and the nature of the site. These case papers are then submitted to the Railway Inspectorate of the Ministry of Transport who consider whether the site is acceptable in principle. If they conclude that it is, British Railways arrange a site meeting and this is always attended by the representatives of the railways, of the highway authority, and of the local authority, and by the Ministry's Divisional Road Engineer (D.R.E.) and the police; the National Farmers Union always attend if they are interested in a particular site.

53. The meeting (which is not part of the statutory procedure) takes place at the site under the chairmanship of an officer from the Inspectorate, or, more frequently in recent years, an official of British Railways. The object of the site meeting is "for the convenience of British Railways" to allow an exchange of views between those attending, and to "ventilate the issues involved in the automatic half-barrier proposal and to obtain guidance on what additional road works may be involved and what requirements additional to the normal ones may have to be included in the Order or . . . whether the proposal is in fact acceptable" (per Colonel Reed). (On occasions when an official of British Railways holds the meeting the last matter would not have an independent judge though, of course, the ultimate decision rests with the Minister).

54. If, at the site meeting, it is decided to proceed with the proposal, British Railways then submit a draft Order under Section 66 of the British Transport Commission Act 1957, together with a detailed site plan, to the Railway Inspectorate, also sending copies to the Divisional Road Engineer and to the highway and local authorities. Under the Act, the latter have a period of two months in which to make representations to the Minister should they wish to object to the Order, after which time British Railways confirm to the Railway Inspectorate the date on which they propose to bring the half-barriers into operation and that the highway authority is prepared to carry out, or to allow the railway to carry out, all necessary road works.

55. In the absence of any objections from the highway or local authority to the Minister, and if the Inspectorate decide that the proposals should be accepted (which is not always the case), the Order is then made by the Minister. Thereupon, work on the installation of the half-barriers may begin, and they are brought into operation on the date laid down in the Order or as soon as possible thereafter. The D.R.E. arranges for the highway authority to erect the advance warning signs on the road, and he inspects the traffic signals at the crossing as soon as possible after installation.

56. After the crossing has been installed, a site inspection is held for the purposes of ensuring that the Order has been complied with and considering

whether any further modification of the arrangements is necessary to improve safety. This inspection is carried out by an officer of the Railway Inspectorate and a representative of the D.R.E. and is attended, again, by representatives of the railways, the highway authority, the local authority and the police. The inspecting officer makes a report in which he specifies any changes which are necessary, and which the British Railways Board are obliged to carry out, informing the Inspectorate when they have done so. The British Railways are not allowed to withdraw their attendant from the crossing until after it has been approved at the site inspection.

(b) The Authorisation and Movement of Abnormal Vehicles

57. The powers and practice of the Ministry in controlling the movement of special types of vehicles on the roads of England and Wales may be briefly described as follows. The specifications of vehicles not exceeding 32 tons laden weight which may normally use the roads without special permission are laid down in the Motor Vehicles (Construction and Use) Regulations 1955; vehicles which do not conform to those specifications, but which do not exceed an overall length of 90 feet, a width of 20 feet* and a total weight of 150 tons, must comply with the requirements of the Motor Vehicles (Authorisation of Special Types) General Order 1966, including the obligation to give advance notice to all police, bridge and highway authorities of the proposed movement of the load on a defined route. The latter movement is commonly called a "general order" movement. Vehicles which exceed the maximum weight and dimensions for a general order movement and which cannot, without undue expense or risk of damage, be divided into two or more loads for the purpose of carriage on the highway (defined in the Authorisation of Special Types General Order as "an abnormal indivisible load") may not be driven upon the highway without the authority of a "special order" from the Ministry under Section 64(4) of the Road Traffic Act, 1960. These special orders, which are required for each journey undertaken, are issued subject to conditions, the principal stipulations usually being as to the number of the crew, the speed and braking efficiency of the vehicle, the route to be followed, the giving of six days' advance notice by the hauliers to all highway and bridge authorities and chief officers of police, and the requirement that the directions of the chief officer of police should be obeyed. Moreover, the haulier must give an indemnity to the highway and bridge authorities against damage to bridges and roads. Though the route is notionally an "agreed" route, it is in fact imposed on the haulier by the Ministry and the vehicle is not allowed to depart from it.

58. Originally, the fundamental object of prescribing the route to be followed was the protection of bridge structures, and so it was that the special orders are dealt with by the Bridges Engineering Design Standards Division of the Highways 2 Group of the Ministry of Transport. Mr. A. D. Holland, who is a Deputy Chief Engineer in charge of that group, explained that, though such was the fundamental and primary purpose of this service, the Ministry has, at the same time, always regarded it as a service which they have provided for hauliers because of the Ministry's expertise and peculiar knowledge of the

* Vehicles exceeding 14 ft. and less than 20 ft. in width, whatever their length, require a "V.R.1 authorisation" for every movement under Article 27 of the General Order, 1966.

strength of bridge structures, since hauliers could not easily ascertain the strength or dimensions of bridges, yet were liable on their contracts of indemnity for all damage caused by the passage of a special order load over them. It has always been the policy of the Ministry, before finally laying down a route in a special order, to consult all highway and bridge authorities, chief officers of police and divisional road engineers so as to obtain their comments on the proposed itinerary. The standard form of letters sent to those authorities makes it plain that bridge structures were, and remain, the chief concern of the Ministry; for instance, if British Rail had no bridges on a proposed route, no approach would be made to them. But police and highway authorities are consulted lest there might be particular, perhaps temporary, traffic difficulties such as road repairs, market crowds and the like.

59. The authorities consulted about a proposed route frequently make comments or reservations, or give warnings about the route or about the movement of a particular vehicle at various places; and it has for long been the custom of the Ministry to incorporate those comments or warnings in the prescribed route in the form of "Cautions", though they may not relate to bridges at all but refer to such things as speed, awkward turnings, roundabouts, and lateral clearances.

60. Mr. Holland explained that, though his department of the Ministry accepted responsibility for including in the prescribed route "cautions" which may have been indicated by the various authorities consulted, he accepted no responsibility for checking the accuracy of such warnings nor of ensuring that all matters which might properly have been included as cautions had been included. That has been well understood by hauliers in general, especially since all special order routes include an express standard condition that "this information is to be taken in the nature of advice . . . and it must be clearly understood that the Minister, in suggesting the above, assumes no responsibility of any kind in connection with this journey" and that neither the owner nor the operator of the vehicles is relieved of any of his obligations or liabilities either under the Motor Vehicles (Authorisation of Special Types) General Order, 1966, or otherwise". The firmly held view of the Ministry, and the guiding rule upon which the routes are prepared, is that it is wholly unnecessary to issue cautions in respect of hazards which are visible and capable of being appreciated by the driver of the vehicle.

61. For that reason it has not been the practice to include in a prescribed route any cautions relating to a level crossing, but occasional exceptions have been found where cautions were included at the instance of British Railways where there was too little clearance under overhead electric cables, where the crossing would have to be plated to carry the load and, on one route, where there were so many level crossings that British Railways declined to give *carte blanche* for all. In each of those instances the driver was required to telephone British Railways to make arrangements for crossing. In most instances level crossings are mentioned in a prescribed route only for specific reasons, such as problems of lateral clearance, dimensions, awkwardness of approach, or merely as landmarks.

62. Each route issued is recorded in a special filing system and the accumulated information is used as a basis for devising routes whenever a general or

special order movement is planned. On each occasion the various authorities mentioned above are again consulted, and the result is that the routes are thereby kept up to date and that the cautions in earlier orders are repeated or revised.

63. In this way the service has expanded, but the obligation has always remained with the haulier to reconnoitre a route with which he is not familiar. Road haulage drivers have come to expect that the stipulated route will contain all the cautions which a driver should be given, but that assumption is wrong, save in so far as, having reconnoitred the route, the employers may have added their own warnings. Hauliers and drivers must have been aware that they never received a caution in respect of a normal road hazard.

64. It has never been the practice of British Rail to inform the Bridges Engineering Design Standards Division of the Ministry of the installation of any automatic crossing, nor was such information transmitted to them by the Ministry's own Railway Inspectorate.

IV. THE ACCIDENT AT HIXON

(i) The Level Crossing

65. The accident happened at the level crossing where the main railway line from London to Manchester crosses Station Road, Hixon, between the A.51 road and the former airfield. That railway line is electrified, using 25 Kv. overhead conductor wires, and carries high-speed express trains. A plan of the locality and the relevant parts of the railway is to be found in Appendix VIII. An aerial view of the site may be seen in Plate 2 of Appendix X.

66. By the British Railways Board (North Staffordshire Railway) (Hixon Level Crossing) Order 1967 (hereinafter called "the Hixon Crossing Order"), made on the 19th January, 1967 (see Appendix IV), the Minister of Transport authorised the conversion of the existing level crossing to automatic half-barrier protection, and it has been in operation as such since April 1967. The railway crossing attendant was withdrawn in July of the same year. The lay-out of the crossing and the design and functioning of the half-barriers were generally in accord with the conditions laid down in the Hixon Crossing Order and as described in paragraphs 37-51 above. The crossing itself is on a long straight road, in flat country, with good visibility for both road and rail, and it has been described as an ideal site for this kind of installation. A census taken over a period of six days in February, 1968, in snowy weather, showed that an average of about 870 road vehicles (not including bicycles) and 26 trains used the crossing in each 24 hours.

67. The automatic operation of the half-barriers was, in this instance, initiated by a triplicated arrangement: not only was it set in motion by the track circuit, but also by two treadles each duplicating the other. The treadles were set 1,000 yards from the crossing but there was a long gentle bend so that the driver of the locomotive on the up line could not see the crossing more than about 400 yards away. The maximum speed on that stretch of line was 85 miles per hour and, going South, there was a down-gradient of about 1 in 600 so that, at the maximum speed, a train weighing 400 tons would require 1,520 yards in which to stop.

68. In parenthesis, I would remark that the provisions of paragraph (3) of the Third Schedule of the Hixon Crossing Order (Appendix IV) make it possible for only 20 seconds to elapse between the "strike in" of the fastest train and its arrival on the crossing, but in fact the time is regulated by the distance from the crossing of the initiating treadle and, in accordance with established practice, that is so situated as to allow a minimum of 24 seconds.

69. As will be seen from Plate 3 of Appendix X, drivers of motor vehicles approaching the crossing from the A.51 road would meet first the traffic sign indicating an automatic crossing (which has been described in paragraph 49 above) situated on the road side 173 yards before the railway. Then, a little way ahead, was the standard sign indicating the danger of overhead electric cables and stating that the headroom was 16 feet 6 inches. Finally, at the crossing itself were the two railway notices which I have already mentioned, the "Emergency Notice" being on the nearside of the road behind a white paling fence on property belonging to the British Railways Board. This notice has been much criticised by the witnesses who appeared before me both for its

format* and for its position on the 6th January, 1968, and I shall deal with these matters later in paragraphs 148 *et seq.*, and paragraph 188.

(ii) The Immediate Circumstances of the Accident

70. The basic facts of the tragic accident are not in dispute. At approximately 12.26 p.m. on Saturday the 6th January, 1968, in clear visibility, the 11.30 a.m. Manchester to Euston express, a 12-coach train carrying some 300 passengers and weighing (with its locomotive) 491 tons, running at about 75 miles per hour collided with a heavy road transporter carrying a 120-ton transformer over the automatic crossing. As a result of that collision the train driver, the second man, and a spare driver in the locomotive were killed, and so also were eight passengers in the train. Forty-four passengers and a restaurant car attendant were injured, six of them seriously.

71. The evidence has established that at the time of the accident the automatic half-barrier apparatus operated without fault.

72. The transporter, owned by Robert Wynn and Sons Limited, consisted of a specially strengthened 32-wheel trailer with its own steering cabin and impelled by a tractor at each end. (See Plates 5 and 6 of Appendix X). With its load this monstrous and complex equipage (which was frequently referred to during the hearings as a juggernaut) was 148 feet long, its maximum width was 16 feet 9 inches, and its maximum height was 16 feet 9 inches, though it was capable of being lowered to 16 feet 3 inches. Its laden weight was 162 tons. Manned by a crew of five, all of whom escaped injury in the accident, the transporter was carrying the transformer on the seven-mile journey from the English Electric Company's works at Stafford to that Company's depot on the disused airfield, which lay just beyond the automatic crossing at Hixon. The journey had been authorised by a special order† issued by the Ministry of Transport under the provisions of Section 64(4) of the Road Traffic Act 1960, and the Ministry had laid down the route. It was escorted by two police constables in a police patrol car.

73. The immediate cause of the accident is plain. The level crossing was thirty feet long from the nearest half-barrier to the furthest rail and no vehicle of the length of the transporter could traverse it within the 24 seconds' warning period before the arrival of an express train unless it moved at more than six miles per hour: but this transporter was going at only two miles per hour. Neither the crew of the transporter nor the police escort knew the time sequence of operation of automatic crossings, and so did not realise that they would have such short warning of the onset of a train. Consequently, no one paused to consider whether a train might be imminent. Nor had any of them observed the Emergency Notice, or become aware of the provision of a telephone in the half-barrier apparatus, so no one telephoned the signalman to enquire whether it was safe to cross.

74. The use of the telephone by the driver of any large slowly moving vehicle to ascertain from the signalman whether he will have time to cross safely is vital to the safe use of automatic crossings. If that had been done on this occasion the disaster would not have happened.

* See paragraph 329.

† Appendix VI.

75. The police escort car led the way over the level crossing from the direction of the A.51 and the transporter followed at a distance of about fifty to seventy-five yards, moving at about four miles per hour. When it reached the crossing the barriers were in the raised position, the lights were not flashing and the bells were silent. The driver reduced speed to about two miles per hour so that three of the crew could walk alongside and check the clearances between the transporter and the overhead wires and the ground respectively. I am satisfied that the transporter neither stopped nor fouled the overhead cables.

76. The leading tractor had traversed the two railway tracks and the main bulk of the transporter with its load was astride them (indeed, the rear bogie of the trailer was still about six feet short of the nearest barrier) when the express, approaching on the up line, activated the automatic apparatus by "striking in" on the treadles 1,000 yards away. The lights began to flash, and the bells to ring, and then to the consternation of the crew, the barrier descended upon the forward part of the transformer. At about the same time the leading driver, Mr. B. H. Groves, (who had not heard the bells and could not see the lights) saw the train approaching from his left and, realising that it would not stop, shouted a warning to his crew. He then accelerated and so did the driver of the tractor at the rear, Mr. A. L. Illsley, though this meant that the latter was deliberately bringing himself into the direct path of the train. One witness who was a passenger in the train was aware of the sharp application of the brakes at a point which must have been about 200-300 yards from the crossing, that is to say at about the point where it would have been sensed if the brakes had been applied as soon as the crossing came into the view of the train driver. As a result of these emergency actions, the train hit only the rear seven or eight feet of the transformer and sheared through the "swan neck" by which the trailer was attached to its rear bogie, and the transformer was thrown forward off the trailer and to the left of the up line. The locomotive and the first five coaches of the train were demolished, and the following three coaches were derailed. The up and down lines were destroyed for a length of 120 yards and the overhead cables were brought down.

77. Tribute must be paid to both Mr. Groves and Mr. Illsley, perhaps the latter especially, for their brave and resolute behaviour in trying to get the enormous vehicle out of the way of the train. If the train had met the transformer more squarely in its centre the impact might have been very much more severe and many more casualties might have been caused. One must also be grateful for the fact that the train was relatively uncrowded.

78. The guard on the express, Mr. W. C. Final, carried out his duties in a most commendable manner: after the collision, he ran northwards along the line for a distance of one mile, setting detonators at the proper intervals as he went. A mile behind his train he found an electrification post telephone in working order from which he informed the Electric Traction Control Room at Crewe. Having set out detonators and flags at that point, Mr. Final ran back to one mile south of the train (skirting the wreckage by running through fields) again setting more detonators and flags to protect his damaged train. Mr. Final has been in railway service since 1934 and is now 49 years of age: he ran a total distance of more than four miles over rough and difficult ground (as he said: "I never stopped running"), which was a considerable physical feat.

79. Mr. Hockenhull, a railway fireman travelling as a passenger so as to bring back the train from London with the spare driver (who was killed on the footplate) was unable to use the telephone incorporated in the barrier equipment, so he got a lift in a van in Station Road and went to a house on the main road from which he was able to make an emergency telephone call.

80. Three signalmen on duty at the time of the accident appeared before the Court. Mr. B. S. Regester and Mr. J. H. Holdcroft were in the signal box at Colwich, from which Hixon level-crossing was monitored, while Mr. M. J. Woodcock was on duty at Meaford, some 12 miles to the north. Mr. Woodcock described how the ill-fated train passed him on time, but when the electric track-circuit panel in his signal box (which shows what parts of the lines are occupied) showed it had not cleared Colwich he did what he could to find out what was wrong. He was unable to get through to Colwich signal box on the telephone, so he rang the Power Box at Stoke, and set his signals to danger to block all lines.

81. At Colwich signal box Mr. Regester was alerted to the accident by the lighting up of eight track-circuits on his panel, followed by indications of power failure and a barrier failure at the crossing. He set his covering signals to danger and rang Control Office at Stoke-on-Trent and the lineman's office at Stafford. As a result of the latter message, a technician, Mr. E. Bickley, went to the scene of the accident. He was able to remove the fuses from the signals near the crossing, thus setting the more distant signals to danger, and he also rang Mr. Regester to tell him exactly what had happened.

82. Immediately the accident had happened, one of the constables in the police escort car informed Police Headquarters at Stone by radio telephone. This enabled the rescue services to reach the scene of the accident in a remarkably short time. The first ambulance and sitting-case car arrived at 12.45 p.m., less than 20 minutes after the crash, the first casualties reached Stafford General Infirmary at 1.05 p.m., and all the "easily available" injured were in hospital by 1.35 p.m. Two Police/Army trial helicopters proved valuable in transporting doctors quickly to the scene.

83. If the Police had not been on the spot when the crash occurred it would inevitably have taken longer to bring the rescue services into action. Mr. Hockenhull, as mentioned above, had to get a lift in a van in Station Road and drive to a house from which he was able to dial 999. I understand that a signalman who suspects from indications on his track-circuit panel that an accident may have occurred has no means of direct communication with the police and can only telephone the Railway Control Room. I would suggest for consideration the desirability of enabling every signalman to get in touch with police and emergency services in case of need. There seems on this occasion to have been no communication from anyone employed by British Railways to the police, who, as it happened, knew about the crash, but might not, on other occasions, be aware that an accident had taken place.

84. It is right that a warm tribute should be paid to all those members of the police, Fire Brigade and emergency services, and to the many unofficial helpers, who did such a magnificent job of helping the injured. Their efforts are clearly deserving of the highest praise.

85. A letter to me from one of the survivors of the crash paid tribute to the efforts of the rescue services but criticised the equipment available to them. In particular he made the point that, with much longer supply pipes, the oxy-acetylene cutters would have been more useful in enabling the rescuers to free those trapped under the coaches. This is a thoughtful suggestion which I have carefully considered, but I am happy to say that I have had a categorical assurance from the Fire Brigade, the police and railway officials concerned, that there was no lack of rescue equipment. The difficulty of rescue was due rather to problems of access to parts of the wreckage, and not to lack of oxy-acetylene apparatus at any point. Every casualty who was alive when the rescue services reached the scene was rescued alive.

86. The disaster at Hixon demonstrated one exceptional hazard in the use of automatic crossings, namely the hazard of an abnormal vehicle which cannot clear the crossing within 24 seconds. This hazard has been conveniently called "the slow vehicle hazard" or the "slow-moving vehicle problem", and it must be the central point of this part of my Inquiry.

87. I now propose in the next five sections of this part of my Report to examine in greater detail the part played by various bodies and individuals in, and their contribution to, the events leading up to the disaster. In assessing their conduct I shall try to keep well in mind the precept neatly stated by counsel for the Ministry of Transport, Mr. Nigel Bridge (now the Hon. Mr Justice Bridge) in his opening statement: "The wisdom to which we can all aspire after the event is by no means necessarily a proper measure of the foresight to be expected of us before the event". Then, in the sixth section, I shall correlate the facts, and state my conclusions on the causes and circumstances of the accident.

(iii) The role of Robert Wynn and Sons Limited

(a) *The Crew of the Transporter*

88. Whatever the degree of responsibility which belongs to the Ministry of Transport in authorising and prescribing the route for the load, and which was assumed by the police in agreeing to escort it, the immediate responsibility for the safe movement of the equipage lay with the five members of the transporter crew, under the leadership of Mr. B. H. Groves, the driver of the front tractor. It is therefore important to consider both the actions of the crew during the journey and also the adequacy of the training and supervision provided by the management of Robert Wynn and Sons Limited. Two questions demand an answer:

(i) Why did not the leading driver, Mr. Groves, telephone the signalman at Colwich before going on to the crossing, as required by the Emergency Notice? and

(ii) Why was the equipage going so slowly over the crossing?

89. Mr. Groves had been in Wynn's employ for 20 years. His experience and skill were rightly respected by the rest of the crew and by his employers. He had supervised the lengthening of the trailer in Manchester, and subsequently the widening of the trailer and the loading of the transformer at Stafford, the day before the journey: he knew his vehicle and his job.

90. The route prescribed by the Ministry (and notified in a modified form by Wynn's to Mr. Groves at Stafford) contained three "cautions"*: two were related to the need to travel at crawling speed in the centre of the carriageway while passing over bridges, and the third mentioned a 16 feet 3 inches (or 16 feet 6 inches in Wynn's version) headroom under a railway bridge on the A.51. Mr. Groves told the police escort about the need to lower the load for this bridge; and he also lowered the load, even though there was no caution in the route, in order to pass under the bridges on the M.6, raising it again on the slip-road when leaving the motorway.

91. In that way Mr. Groves managed his vehicle and load, but he expected and received police assistance in controlling traffic, especially at road junctions so that he could negotiate turnings, as happened when driving from the A.34 into the A.51 and again when he turned from the A.51 into Station Road, Hixon. However, his view of the responsibilities and duties of the police in regard to the safety of his vehicle was rather ambiguous and uncertain. Naturally, he, like any other citizen, felt a sense of assurance in being shepherd by the police who, he was confident, would look after him; but I do not believe that he really thought that the police escort were able to assure his safe passage over the automatic crossing (see paragraph 99 below).

92. Neither Mr. Groves nor any of his crew had been to Hixon before, and the route prescribed in the Ministry's special order did not mention a level crossing; but he knew that it was there because Mr. Preston of the English Electric Company had told him of it before he left Stafford. Moreover, at the beginning of Station Road P.c. Nicholls, who had gone ahead to ascertain the exact location of the depot, told Mr. Groves that there was a 16 feet 6 inches headroom sign in front, and a level-crossing with a slight hump. Mr. Groves later saw the road traffic warning sign indicating an automatic crossing with its attached plate "Stop when lights flash", and he at once realised that he was approaching an automatic crossing though (he said) he had never met one before. But he did not observe the headroom sign or the Emergency Notice.

93. Mr. Groves's attitude and conduct on approaching the crossing were remarkable. The following are material extracts from his evidence on this aspect of the case:

Mr. Philip Owen, Q.C.: What I want to try and establish is how far before you got to the crossing did you realise that this was one of the new type of automatic uncontrolled [*sic*] crossings?

A. When I saw the sign saying "stop".

Q. As far back as that?

A. Yes, sir.

Q. And if I understand your evidence correctly, you say the reason you did not stop at all was two-fold: firstly, because the police had gone over it—is that right?

A. That is correct.

* For explanation of "Cautions" in special orders see paragraph 59. For the Notification of Movement see Appendix VII.

Q. And secondly, because you thought that if the crossing was obstructed somehow the engine driver would be notified or informed or told by some device?

A. That is correct.

Q. Did it occur to you that if you actually went on to this crossing without stopping and the train was very close at hand, it would not matter whether the engine driver knew or not, because he could not do a thing about it?

A. No Sir; I am afraid it did not.

Later, in cross-examination by Mr. Stephen Brown, Q.C., the witness was asked:

Q. You have never supposed the civil police officers could have had control over rail traffic as distinct from road traffic?

A. Not control over them, no, sir.

Q. You have told us you assumed they were in charge, but you did not assume, I suggest, that they could have any control over the railway tracks; that is right, isn't it?

A. Not control over the railway, no, sir.

Chairman: Is this how you put it, that when you got to the crossing the police car went over, and waited for you 50 yards ahead, you thought he was inviting you to follow him?

A. Yes, sir.

Q. And although he would have no control over the railway traffic, you thought he had knowledge about the movements of the rail traffic?

A. Yes, sir.

Q. Which entitled him to invite you over?

A. Yes, sir.

Mr. Brown: I must challenge that at once. Did the police officer give you any signal to follow him over the railway crossing?

A. No signal, no, sir.

Q. All that happened was that he continued on his journey ahead in order to warn oncoming traffic, is that right?

A. Yes, sir.

. . .

Q. What knowledge did you think the police would have of the trains at this particular point?

A. I did not really know what knowledge they had of the trains.

. . .

Q. Did you stop to think for one moment "Oh, the police will have enquired whether the railroad is clear", or did you not think of it at all?

A. I am afraid I did not think of it.

Chairman: I suppose you were just confident that the police were looking after you and you did not think any more about it?

A. Yes, sir.

94. Later, I recalled Mr. Groves to the witness box and the following questions and answers were exchanged:—

Q. How did you know it was an automatic crossing if you had never heard of them and never met one before?

A. Well, I did not know of any other. I had heard of automatic crossings in the country, but I had never experienced going over an automatic crossing before.

Q. That is why I wanted to ask you this question. You say you had heard of automatic crossings?

A. I had heard of automatic crossings, yes sir.

Q. What had you heard about them?

A. Only the fact that they were half-barrier: that is all I have ever heard—and that the lights flashed when the barriers came down.

Q. But you are reading a little more into it perhaps that you told us about before. You had heard of automatic level crossings introduced into this country and that they had half-barriers?

A. I had heard, yes.

Q. So as soon as you saw that sign you knew you were coming to such a crossing?

A. Well, I realised that it was a different type of crossing.

Q. You deduced that it would be the train that would set it working?

A. Yes, sir.

Q. And if the train set it working when you were on the crossing, did you pause to think how would it be stopped then, or what would happen if you were on the crossing when the train started the automatic apparatus working?

A. Well, as I say, sir, I never realised that there was so short a margin of when the gates operated, the barriers operated, and, as I say, it went through my mind, while on the crossing, that while the load is on the crossing there must be something in the mechanism to put the signal at stop to the train, giving him sufficient time to stop the train, to avert disaster.

Q. You are a heavy transport driver, Mr. Groves, and a very intelligent man, and know your job well. Did you ever think “Well, how long does a train take to stop?”

A. That thought has crossed my mind, yes sir . . . I have thought about that at various times.

Q. Have you ever thought “Now, if this barrier is set working by the train while I am on the crossing, I wonder how long it takes for the train to be stopped?”

A. Whilst on the crossing I did not think the barrier could be set in operation.

95. Having been told by P.c. Nicholls, when leaving the A.51, that there was a headroom sign for 16 feet 6 inches before the crossing, and knowing that the height of his load was three inches higher than that, Mr. Groves nevertheless decided not to lower it immediately but to “leave it until we were approaching

the crossing". According to the trailer steersman, Mr. T. C. Wilkins, this was the normal attitude of the crew, as they often find that there is more room than the headroom signs indicate. Indeed, it seems to have been common knowledge among men employed on the movement of heavy haulage vehicles that electric cables are usually more than two feet higher than the stated headroom (as, indeed, was the case at Hixon). But Mr. Groves was not willing to rely entirely on such knowledge, and so he reduced his speed to about two miles per hour in order that the steersman could judge by eye alone whether the load would pass safely under the electric cables: if it had proved that there was not enough clearance, or if the electricity had arced across to the load, the transporter would have been lodged across the tracks for a substantial time.

96. The following is an extract from the evidence, when I questioned Mr. Groves, on this aspect of the matter:—

Mr. Groves: The steersman was checking the height from the back cabin, sir.

Q. But only by seeing how the middle part would fit under the wires?

A. At the front end, sir.

Q. So that, as far as I can see it, it means that your vehicle must have been well on to the crossing, the front tractor at any rate, before he could make any judgment as to whether the clearance was sufficient or not?

A. Yes, sir.

Q. If it had turned out not to be sufficient, what on earth was going to happen then?

A. I should have had to reduce the height.

Q. While you were reducing the height there would be several expresses going to and from London, would there not, while your vehicle was immobilised on the middle of the crossing? That seems to be the difficulty that you have if you ignore the notice.

A. Yes, sir.

Q. Did you think of that?

A. I assumed that everything was all in order, sir.

97. Mr. Groves's conduct was different from that of a fellow-employee, Mr. T. W. Cromwell, who drove a transformer from the Hixon airfield depot to the Pomona Dock, Manchester, on the 7th of December, 1967: he telephoned to his employers' head office on the previous day for an assurance that the height of the wires was adequate, and, again, before venturing over the crossing on the day of his journey, he asked the escorting police constable (P.c. Richards) to telephone to the signalman to ask whether he could safely pass under the wires.

98. Even had there been no worry about the headroom, Mr. Groves would have driven across the railway very slowly, for the width of the carriageway was only 20 feet, giving only a little clearance on either side, and also it was his custom (as well as the common practice) when driving such an exceptional load over any kind of level-crossing, to reduce speed to about 3 miles per hour. He knew, therefore, that it would take an appreciable time for his transporter to clear the crossing.

99. I have been very troubled about Mr. Groves's responsibility for producing a huge vehicle in the path of an express train, and his general attitude to the unfamiliar type of level-crossing which he knew was unattended and was operated by an approaching train. He impressed me as an honest witness, doing his best to tell me the truth out of a confusion of mind due, at least partly, to a natural desire to justify his actions both to himself and to the Court. I am not sure that he has told me all that he ever knew about the working of automatic crossings, and I do not accept that he really believed that the police escort had assured him of a safe passage. As a long-experienced driver of heavy haulage, he knew that the police were concerned principally with clearing oncoming road traffic (escorts sometimes go much further ahead than 70 yards), and that they had no reason to expect, nor any control over, his decision to reduce speed to a crawl while traversing the railway instead of reducing height.

100. Mr. Groves did not reflect whether, like the traditional crossing, this new one was protected by railway signals, but if he had thought carefully he might have realised that his assumption that the half-barriers could not be set in operation while his vehicle was on the crossing could not be right, otherwise a line of road traffic would completely disorganise the running of trains.

101. None of the other members of the crew of the transporter seem to have been aware in advance of the existence of the level-crossing; none saw any of the road signs or railway notices before or at the level-crossing itself; and none had ever previously seen a level-crossing equipped with automatic half-barriers. None had received any instructions from their employers about this hazard.

102. Mr. R. C. Parsons, Mr. Groves's mate in the front tractor, was unaware of the nature of his duties as statutory attendant, under Article 25 of the Motor Vehicles (Authorisation of Special Types) General Order 1966, "to give warning to the driver and to any other person of any danger likely to be caused . . . by reason of the presence of the vehicle on the road." Under cross-examination on the subject of road signs he said that: "If I see a notice I would point it out to Mr. Groves, but personally I do not think it is part of my duty." Consequently, he did not observe the Emergency Notice, as he should have done. He considered his job was to do as he was told by the leading driver.

103. The trailer steersman, Mr. T. C. Wilkins, was clearly a responsible and intelligent man, who considered it to be part of his job when necessary to climb on to the roof of his cab, as he did on this occasion, to check the headroom clearance. However, he had not been shown the route notice before the journey, and although Mr. Groves gave evidence that he had told Mr. Parsons to warn Mr. Wilkins about the headroom over the crossing, after the police escort had drawn attention to it, this message had not in fact reached Mr. Wilkins, with the result that he did not know there was a level-crossing ahead until he actually saw the overhead cables immediately in front of the transformer itself. He then climbed up on to the top of his cab to check that there was adequate clearance, before descending from the vehicle to walk over the crossing together with his mate, Mr. Sutcliffe.

104. Mr. Wilkins's assessment of safe headroom under the wires was based upon guesswork rather than any exact knowledge of the clearance necessary to avoid arcing. With no advance knowledge that the crossing was ahead, either from Mr. Groves or from his own observation of the road signs, there

would have been only a few seconds in which to stop the load before it fouled the wires if the clearance had in fact been inadequate. Similarly with the question of ground clearance, if the hump over the crossing had in fact caused difficulty, it would have been necessary to stop and raise the load, with the transporter straddling the track.

(b) *The Management*

105. Robert Wynn and Sons Limited has been long established in the road haulage business especially for the movement of abnormal loads, even of far greater weight than the English Electric Company's transformer. The Company owns 170 vehicles of all sizes. Several of the directors, like Mr. Henry Percy Wynn, have had many years' practical experience as fully qualified drivers of all vehicles which the Company owned, from the lightest to the heaviest.

106. I think one must ask what responsibility the management of the Company had for the conduct of Mr. Groves on the day of the accident, particularly in making the dreadful trial of whether he could safely pass over the crossing under the electric wires without thought as to whether a train might approach. What training, supervision and instructions were given to the drivers of abnormal vehicles? If none, why not?

107. The supervision of drivers employed by the Company was minimal: drivers were recruited and tested for their driving skills; then, after probation with an experienced driver, would be put in charge of one of the smaller vehicles and thereafter gradually work their way up until they became drivers of the heaviest transporters. Apart from the routes and any cautions contained therein it has not been the practice of the Company to give any written instructions to the drivers: indeed, Mr. H. P. Wynn felt that to give a written instruction would be "positively dangerous in that our loads vary so much that it would be impossible to cater for everything and the driver might be misled into mis-applying written rules."

108. At the opening of the Inquiry Mr. Morris Finer, Q.C., on behalf of the Company, emphasised that no one had any knowledge of the operation of automatic crossings, nor of the necessity to telephone the signalman before entering upon a crossing, nor even of the existence of the telephone itself; and that the load was moving under the escort of police upon whom the driver was accustomed to rely. In such circumstances, he said, the Board of Directors felt that they were "entrapped in this situation". However, on the 8th November 1966 (more than a year before the accident at Hixon), an alarming incident had happened at Leominster which ought to have brought the problems of automatic crossings to the forefront of the mind of every director of the Company.

109. On that date Mr. James Howard Horton, who is employed by Robert Wynn and Sons Limited as a driver, drove a Scammell low-loader lorry, carrying a crane weighing more than 15 tons, over the recently installed automatic crossing at Leominster. At that time the road surface had not been finally made up, and there was a small ramp of about 4 inches' drop on the further side of the crossing. Mr. Horton drove over at about 5 miles per hour but, as the front of his tractor went down the ramp, the low-loader grounded and he could not move. A railwayman (believed to be a signalman) from the station nearby called out "You can't park there", to which Mr. Horton replied

" Park, indeed! I am grounded on the crossing ". The signalman then informed him that there was a train due and that, once the lights began to flash, it would mean that the train was only a matter of seconds up the line. On that stretch of line the maximum speed was 90 miles per hour and, obviously, this was a grave emergency. Mr. Horton told the signalman " You had better get on the 'phone and stop the train as I am going to be here for perhaps an hour jacking this lot up to get it off the crossing ", but, apparently, the signalman was unable to do so because the train was already too close. Mr. Horton then, with great courage, got into his driving seat and, by violently accelerating the engine and letting the clutch in, caused the front end of the vehicle to leap into the air, and thus to drag it clear from the rail, just as the express whizzed behind him.

110. After the train had gone, a telecommunication and signals officer of the Railways came over and, in the course of conversation, told Mr. Horton that this was a new automatic crossing and that the time element was about 30 seconds before the approach of a train. Mr. Horton thought this was a ridiculously short time to expect a vehicle such as his to clear the line; he thought one would not even have time to push a stalled car off. So he reported the matter to his employers, Robert Wynn and Sons Limited.

111. Consequently, on the 19th November 1966, the Company wrote to the Chief Civil Engineer of the British Railways Western Region the following letter:—

" For the personal attention of Mr. Barnwell

Dear Sir,

We are concerned with a report which we have received from the driver of one of our Scammell 25 ton low-loaders relating to an incident which occurred at Leominster level-crossing at approximately 5.30 p.m. on the 8th November last.

Our driver reports that when he approached the crossing from the direction of Ludlow the barriers were in the raised position and there was no indication of a train approaching. He proceeded to pass over the crossing, but for some reason of which we are not aware his vehicle grounded and the vehicle which was carrying a heavy crane became immobilised across your permanent way. Our driver alighted to ascertain the cause and to see what could be done to remove the vehicle from the crossing. He was then informed by some workmen nearby that an express train was due shortly. Almost immediately the warning lights started to flash, your workmen cleared away from the crossing and your signalman said that he could not stop the express.

With considerable presence of mind, our driver got back into the cab of his vehicle and by excessive revving of the engine and use of the clutch he succeeded in removing from the crossing just as an express train passed across.

We believe that the express stopped at some half mile beyond the crossing.

Our driver reported the incident to railway officials at Leominster, also to the civil police.

If our information is correct—and it is this that causes us concern—the trains themselves actuate the warning lights and barriers and, with regard to express trains, it is only a matter of 7 to 10 seconds before they are on the crossing. In addition there is no means of warning the train driver or stopping the train.

There is no need for us to enlarge on the disaster which could have occurred at Leominster on the 8th November, had not our driver, with what we consider considerable bravery, succeeded in removing his vehicle.

We shall be glad to have your comments in due course."

112. That letter clearly indicated the state of the Company's knowledge of the danger of these crossings as far back as November 1966. It is plain that they knew that the lights and barriers were actuated by the train and that thereafter there was no means of warning the train driver, or of stopping the train, and that the train itself arrived on the crossing only a few seconds after actuating the mechanism. They also knew that a transporter such as passed along Station Road, Hixon, could not clear the crossing safely in such a short space of time, should a train approach, for they knew the practice was to decrease speed at a level-crossing to a slow walking pace which would mean that the transporter would require one minute to cross. A director of the Company, Mr. Noel Wynn, told me that, after the Leominster incident, he realised the risks involved by reason of a vehicle becoming immobile on a crossing either through stalling or through coming into contact with overhead wires or the like. But, he said, the only hazard which he and his fellow directors did not appreciate was the hazard of a vehicle which keeps moving but moves slowly across an automatic crossing. The two hazards are not very different in kind.

113. To that letter, British Railways, by Mr. Lattimer, the Assistant General Manager of the Western Region, replied by a letter dated the 29th November, addressed to Mr. H. P. Wynn:—

"Mr. Barnwell has passed forward your letter of the 19th November for my attention. I am naturally as much concerned as you are about this incident, which might have had much more serious consequences.

Automatic level-crossing barriers have been installed at a number of points on British Railways and are, of course, widespread in other countries. There is no difference in the circumstances at Leominster from any other barrier crossing. The design is approved by the Ministry of Transport, both on the railway and on the road side, and the contingency of a road vehicle stalling on the level-crossing and becoming immovable was one that was considered and found too remote to be taken as a serious consequence.

Apart from barrier operated crossings, we have several hundred occupation and accommodation crossings out on the above line, mainly for agricultural use and similar conditions apply there should the occupier attempt to use the crossing for a complicated or heavy machine.

In brief, road vehicles must not become immobile on these crossings. If they do, they not only become a hazard to themselves, but they have become a hazard to trains and to whomever are travelling in them.

I think I am quoting correctly what would be the view of the Ministry Inspecting Officer of Railways. Had there been a serious accident, it would have been subject to a Ministry Inquiry and the principal point of the Inquiry would not have been the safety of the crossing, which is an approved one, but why the vehicle was on the line when the train approached, and the barriers were about to close to road traffic.

The time interval between the warning lights and the closing of the barriers has been especially laid down by the Minister and, once again, there is no difference at Leominster than at other crossings. If the warning is too long, the public become accustomed to the length of time and start taking unjustifiable risks to beat the lights.

A train travelling at high speed with no warning of anything amiss ahead takes something like three-quarters of a mile to stop, and this would explain why there was no means of stopping the express in question before it reached the crossing. It had evidently already passed any warning signal that could have been given to it.

Nothing which has been said above in any way detracts from the action of your driver, which appears to have been in every way commendable. We are obviously grateful that he removed the hazard to safety at a risk to himself. I must emphasise, however, that the hazard was of your firm's making and it is fortunate that it was not more than a hazard.

Once the flashing lights start, then road vehicles are in a position of having to stop because of 'major road ahead'. I would ask you to consider whether the same sort of hazard might have been created if your vehicle had been coming out of a difficult side road on to a main trunk road with high speed vehicles on it and had stalled across the main road. However, I am passing on this correspondence to the local Divisional Manager so that he can satisfy himself that there was no fault on the railway side that in any way contributed to the incident and that our staff did all that could be expected of them in the circumstances."

114. That letter was remarkable for its arrogance and lack of insight (on a par with the statement "You can't park there") at a high executive level in British Railways, and it is most unfortunate that the writer did not point out the hazard to slowly moving vehicles and the requirement that the driver of any heavy or exceptional load must telephone the signalman before crossing, which was a precaution vital to the safety of automatic crossings. Had he done so, we can only speculate as to whether the accident at Hixon a year later would have happened: in all probability it would not.

115. On the eighth day of the hearing, Mr. Morris Finer, Q.C., made a statement in which he maintained his clients' submission that they had been entrapped by the circumstances preceding the 6th January, but added: "However, there are some traps which greater foresight can avoid, and I would therefore like to make it clear at this stage, and to do so without reservation, that Wynn's do fully recognise that on receipt from their driver Horton of his report of the incident at Leominster on the 8th November 1966 they ought to have realised, although in fact they did not do so, the serious implications for their operations in general, and their special order operations in particular, to have taken steps to have put all their employees on warning, and, despite

the remarkable response . . . of British Railways to the approach that was made to them, to have done more to pursue the matter." With that very proper statement I entirely agree. Unfortunately, the directors of Robert Wynn Limited were annoyed by the tone of the letter, which seemed to them to preclude further discussion, and they let the matter rest.

116. Mr. Percy Wynn said that the hazard they were concerned about after the Leominster incident was the hazard of a comparatively small vehicle (i.e. within the limits of the Construction and Use Regulations) stalling or grounding on an automatic crossing; the main risk never occurred to them. "The penny did not drop". Mr. Wynn thought that if they had received specific information with regard to the use of the telephone in the letter from British Railways that might have produced a different result.

117. There were other sources of information which Messrs. Wynn might have noted, namely the national and trade Press and paragraph 58 of the *Highway Code*, but they did not. In April 1966, an automatic crossing was installed at Pontsarn, 20 miles from their headquarters at Newport, Monmouthshire, but Mr. Noel Wynn said they had seen none of the British Railways pamphlets about it nor remembered the news item about it in the local newspaper, *The South Wales Echo*. It is surprising that some talk of this new device on the local roads did not reach his company, but they did not even know of its existence.

118. Mr. Edward Clark, a director and manager of the Manchester depot of Robert Wynn and Sons Limited, was in a position to know all about the automatic crossing at Hixon, because he had visited the site in October 1965, and discussed with Mr. Preston of English Electric Company Limited the problems relating to the conveying of large transformers along Station Road to the airfield depot created by the forthcoming electrification of the railway. Thereafter, he did not inspect the crossing again, being content to leave the surveillance of that route to Mr. Preston, and so knew nothing of the conversion of the crossing to half-barrier protection. He went on to say that even if Mr. Preston had told him of the new crossing and of the Emergency Notice, he would have taken no action, leaving it to the driver to deal with the matter as he thought fit.

119. However, Messrs. Wynn were clearly aware that there was an extremely short time for any heavy vehicle to traverse any automatic crossing ("7-10 seconds" was stated in their letter) for in the second paragraph of the above-quoted reply from British Railways it was stated that "there is no difference in the circumstances at Leominster from any other barrier crossing". Mr. Noel Wynn agreed that that ought to have put him on his guard but, he said, "in a sense it allayed my concern". I do not know why. Both he and Mr. Percy Wynn said that "it would be usual to take the outfit over at a walking pace of two or three miles per hour . . . and at the kind of speed mentioned this would take about one minute". The simple putting together of that fact and the timing they themselves had mentioned in their letter to British Railways on the 19th November, would have revealed to them the problem of the slowly moving abnormal load.

120. In this state of ignorance, and failure to draw the glaring inferences from the events which had taken place in their own business, the management

failed to give any instructions or warning to any of their drivers as to the hazards of automatic crossings, even about the hazard (stalling) which they did appreciate.

121. However, since the accident at Hixon Robert Wynn and Sons Limited have taken the action which, in my opinion, they ought to and would have taken previously had they appreciated the hazard of the slow moving vehicle, that is to say three days after the accident they began the practice of endorsing a special note on the routes given to all drivers as follows:—

“DRIVER TO NOTE. BEFORE CROSSING ANY AUTOMATIC CONTROLLED RAILWAY CROSSING, HE MUST ENSURE THAT THE POLICE ESCORT OR HIMSELF CONTACT THE SIGNALBOX TO OBTAIN PERMISSION TO CROSS.”

(iv) The role of the English Electric Company

122. Evidence was given by Mr. J. H. Preston, who has been for 12 years Chief of Heavy Transport with the English Electric Company at Stafford. It was he who wrote to the Ministry of Transport on the 18th December 1967 to ask urgently for a special order authorising the movement of the transformer to Hixon, and to whom the Ministry telephoned on the 22nd the information that the movement was authorised.

123. Mr. Preston was familiar with the Hixon crossing and with the fact that it was an automatic crossing; he used to pass it almost once per week, and he was aware that, apart from the load-carrying vehicles with which he was concerned, a 'bus provided for his Company's work people used to travel along that road every day. But, he said, he had never seen the crossing in operation, nor did he know about the “brisk operation” of the half-barriers; he had never given any thought to this question at all.

124. Before the accident on the 6th January 1968, six other abnormal loads belonging to the English Electric Company had passed over the automatic crossing. The first five, on the 3rd, 5th, 6th and 7th November respectively, weighed less than 150 tons and therefore did not require special orders from the Ministry of Transport: the sixth, on the 7th December, was the load directed to Pomona Dock, Manchester, which did require a special order and which has been referred to in paragraph 97 above. Apparently none of these loads worried Mr. Preston.

125. Before the movement of the transporter on the 7th December, Mr. J. W. Ruston, a clerical officer of the Route Section of the Ministry's Bridges Engineering Design Standards Division, spoke to Mr. Preston on the telephone and asked him to confirm that there was adequate clearance beneath the overhead wires. Mr. Preston investigated the position and gave the confirmation sought, as he had done similarly on previous occasions. Mr. Ruston said that he and other officers of the Ministry relied on Mr. Preston to give information when required about the passage of loads along roads in his area. He said that he would have expected Mr. Preston to have brought to the attention of the Ministry the presence of the sign limiting headroom to 16 feet 6 inches; if he had done so, that would have been inserted in the route as a caution.

126. Before setting out with his load on the 6th January Mr. Groves told Mr. Preston that he had never been to the Hixon Depot and asked the way. He was told that after turning off the A.51 he should go over the level-crossing and into the depot. Mr. Preston in evidence agreed that he merely mentioned the level-crossing as a landmark and did not warn Mr. Groves that it was an automatic crossing, nor that there were overhead electric wires. Mr. Preston had taken it upon himself to investigate the situation at the crossing to see whether his Company's goods should be driven along Station Road to the airfield depot, and I think he knew that Mr. Edward Clark (manager of Wynn's Manchester Depot) relied on him to attend to any problems that might arise in that direction. So also did the Ministry, as he knew, and Mr. Groves too was confident that he would mention any difficulty he knew of.

127. But Mr. Preston, having satisfied himself that there was enough head-room and width of carriageway, took no step to see how the automatic crossing worked nor to inform Mr. Clark that the crossing had been converted. Of course, he was under no obligation to instruct drivers employed by independent hauliers how to deal with hazards on the route, but in view of his interest in the safe conveyance of his Company's goods, I think it is surprising and disappointing that he never paused to consider (as he had done when the line was electrified) how this new apparatus on his Company's doorstep would affect the movement of transporters. If he had done so, he would probably have observed the Emergency Notice and would probably have told Mr. Groves about the necessity to telephone before crossing.

(v) The role of the Police

128. The transporter was escorted by the police the whole way from Stafford to Hixon. For the last part of the journey, along the A.34 and A.51 and Station Road, Hixon, the escort was provided by two constables, Ephraim Prince and Anthony Nicholls, who gave evidence before me. One must enquire what were their responsibilities as escorting police? Why did they allow the transporter to cross the railway without first telephoning the signalman to ascertain that it was safe to do so?

129. Wynn's had sent to the Staffordshire Police on the 29th December 1967 a copy of their notice relating to the journey, as they are required to do under Article 28 of the Motor Vehicles (Authorisation of Special Types) General Order, 1966, but it was only on the actual morning of the 6th January that a telephone call was received by Police Headquarters to say that the load was then ready to leave Stafford. Thus, none of the policemen concerned was in any way prepared in advance for the duty of escorting the load, and in fact (like the crew of the transporter), neither P.c. Prince nor P.c. Nicholls had ever previously been to Hixon. Both had been posted to motor patrol duties in the Stone Division only five days before.

130. During the journey, the police, of course, controlled traffic to allow the load to negotiate turns, and to clear the way ahead. When the transporter moved into Station Road, Mr. Groves, the driver, was told to stop while one constable went ahead over the crossing to make sure where the depot was. On his return, P.c. Nicholls told Mr. Groves that "this is the place", and told him about the hump on the level crossing as well as of the headroom

restriction. Mr. Groves seemed quite confident about negotiating the crossing and the constable (who was not, of course, conversant with driving such huge vehicles) was content—indeed obliged—to leave Mr. Groves to do his own job.

131. The police car slowly led the way over the crossing and was some 70 yards on the other side when the warning lights began to flash and the train crashed into the transporter.

132. Although the hauliers agreed that in practice the co-operation between heavy vehicle drivers and police escorts is on the basis of team-work, they have shown a misunderstanding of the duties of the police; they regard them as pilots assuming control of a ship rather than as shepherds. Police forces are under no statutory duty to provide escorts for abnormal vehicles, but do so as part of their task of controlling traffic in their districts. In my opinion, the functions of the police in this connection are properly described by the Home Office as follows:—

“As part of their general duty to preserve law and order and to protect life and property, constables have for a long time undertaken traffic duties, in particular the regulation of road traffic for the benefit and safety of all road users and not for individuals. An important aspect of this is securing the free circulation of traffic and preventing obstruction. . . . Where such arrangements include providing a police escort, the latter's duties are regarded as extending to the regulation of traffic as a whole. The police force is not responsible for routeing, but for ensuring that the escorted load and other traffic using the route authorised by the Ministry of Transport can do so with a minimum risk to each other and without undue hindrance.”

And in paragraph 110 of the Standing Orders for the Staffordshire Police (relating to the escorting of abnormal loads) it is laid down that “it should be the endeavour of all concerned to facilitate the passage of abnormal loads so as to cause as little inconvenience, danger or delay as possible to other road users”. But, of course, in performing their duty, if the escorting constables saw that the vehicle was running into danger, particularly through ignoring a safety precaution (and if they happened to be near enough), it would be their duty to halt it and not allow it to proceed until the safety precaution had been taken.

133. Both constables were slightly acquainted with two other automatic crossings in the County, although they had never before been to Hixon. They also knew the reference to automatic crossings in the *Highway Code**; they had seen at least one of the leaflets produced by British Railways when another automatic crossing had been installed†; and they had also seen the 1966 edition of the Requirements of the Ministry of Transport. The Chief Constable of Staffordshire, Mr. A. M. Rees, said that P.c. Prince had attended a police driving course in 1964 and “one of the questions he was asked was, what does it say about these crossings in the *Highway Code*, and he got 5 out of 5 . . . but even he has forgotten it by 1968”.

134. Neither of the constables knew of the extremely short warning time before the onset of an express train (indeed P.c. Nicholls, who was clearly very

* See paragraph 203.

† See paragraphs 143, 169, 170.

shocked, said that when the accident happened "I was absolutely astounded by the speed of the whole process") nor of the existence of a telephone, and neither of them had observed the Emergency Notice (which was not a traffic sign that they are trained to observe) on either side of the crossing, though they had passed up and down Station Road three times immediately before the accident. Both were ignorant of the fact that the railway was a main line for express traffic. It is plain that neither constable gave any thought to the question whether a train might arrive while the transporter was crossing the line: this was due partly to their concentration on the task of warning opposing traffic of the wide load, and partly because they did not think the transporter would take so long to cross. (It could have crossed safely if it had moved at six miles per hour.) Knowledge of the 24 second timing, and the lack of signal protection would probably have caused them to study the situation more closely and discover the telephone. Both constables asserted, and I accept, that if they had known those essential facts, they would have insisted on the driver using the telephone before going on to the crossing.

135. In November 1963 (when there was only one automatic crossing in the County) the Home Office had sent to the then Chief Constable of Staffordshire a copy of the edition of the Requirements which had just been issued, together with the Explanatory Note. In August 1966 the revised Requirements and Explanatory Note* were sent to the Chief Constable, Mr. A. M. Rees, and again sent forward to all divisions "for the information of all ranks". Those documents, though containing a mass of technical detail of no interest to the police, contained all the information necessary to enable them to appreciate the nature of the traffic hazard created by automatic crossings.

136. Neither the Chief Constable nor the Assistant Chief Constable, Mr. S. E. Bailey, read more than the covering letter from the Home Office and the Explanatory Note; a glance was enough to satisfy Mr. Rees that the Requirements themselves were of no interest to him, though in fact paragraph 18, dealing with the use of the telephone by abnormal loads was of first importance for police escorts. The five lines of block capitals at the head of the Requirements did not excite his curiosity. I think neither officer read the Explanatory Note with more than cursory attention, for neither was arrested by the description of the new crossings as "most revolutionary", nor was either particularly concerned with the description in the second paragraph of the rapid time cycle or the statement that the half-barriers were not associated with the signals. Mr. Rees's attention was mainly attracted by the last sub-paragraph which indicated that police would be invited to assist in inculcating road discipline at the crossings. He said he expected to receive a letter at the appropriate time from "somebody" inviting him to do this, but no letter ever came.

137. Mr. Rees adopted the attitude that nothing at all was expected of the police at that time because "they are telling us all this, not asking for our opinion". That curious answer seems irrelevant to his duty to see that the police officers serving under him were properly instructed in the duties they had to perform. In his opening speech the Attorney-General had posed the question for the Court to consider: "When a potential hazard is created by the crossing of road and rail traffic at an automatic crossing, what is the duty of the police then in relation to escorting duties they have undertaken? Is it to

* Appendix V

appraise the hazards in their districts and to instruct constables about those hazards and how to deal with them . . . ? ” In my opinion, the answer must be Yes, and Mr. Rees agreed that he so understood his duty. That duty belongs primarily to the Chief Constable and, below him, to the Superintendents of Divisions: the police constable cannot be expected to do more than act on instructions and intelligently observe what he sees as he goes about his duty. In fact, the Chief Constable, and senior officers under him, did nothing. Mr. Rees’s explanation was that he did not appreciate there was a hazard, which is hardly surprising for, unless he studied the information sent to him and appraised the situation, he could not know whether there was a hazard or not.

138. On the other hand, the first concern of policemen is to see that traffic signs (e.g. the red flashing lights) are obeyed, and it is not for them to cross-examine British Railways or experienced lorry drivers to discover whether they are aware of all potential dangers. The Explanatory Note stated that “ in no way do they (the Requirements) infringe the principles for safety on which this type of protection is based ”, and nowhere was it suggested that the onus of ensuring safety at level-crossings was regarded as having been transferred from the Railways to the road user, for whom the police are responsible.

139. Mr. Rees and Mr. Bailey claimed to have no more knowledge of the working of automatic crossings than the two police constables, “ which was very little ”. The Chief Constable complained that this was because the Home Office had not extracted from the Requirements the points relevant to police work as, he said, they usually did. Mr. P. L. Taylor, assistant secretary in the police department at the Home Office, gave evidence that he thought there was justification for that complaint if directed against the Ministry from which the document emanated, though he still expected the police to pick out from any document sent to them what was relevant to their functions and to disseminate it in a suitable way, in other words to do their own “ staff work ”. The Home Office, for its part, was asked by the Ministry of Transport merely to send the Requirements to all police forces, which Mr. Taylor understood to mean that the document should be sent on without any “ staff work ” by him, as if he was a mere forwarding agent, because it is not the practice in the Civil Service to interfere with what another department of government has produced for circulation.

140. The police had other means of knowledge of the working of these crossings. There were already in North Staffordshire six other automatic crossings; namely at Spath, near Uttoxeter, installed on the 5th February 1961; Brook Hay, Alrewas, installed in May 1966; Loxley Lane, in June 1966; Burton Old Road, Uttoxeter, December 1966; Bramshall in May 1967; and Aston-by-Stone; installed on the 30th July 1967. At all except the first a telephone had been provided. Moreover, counsel for the police submitted to the Court a document entitled “ Crossing failures in Staffordshire as known to the Police ”, setting out a considerable number of failures of the automatic apparatus at those crossings between April and December 1967 which had been brought to the attention of the police and at most of which a police constable had attended in order to assist in controlling traffic.

141. At the site meeting on the 12th January 1966, preparatory to the authorisation of the Hixon automatic crossing, the police authority was

represented by Inspector R. C. Wilkes, who submitted a full report of that meeting to the Chief Constable. That report contained an intelligent appreciation of the situation, including the traffic which was normally to be expected there, particularly between the English Electric Company's works at Stafford and the disused airfield. He reported that the half-barrier crossing would be operated by trains in the manner laid down in the 1963 edition of the Requirements and Explanatory Note, which were then current. Major Olver, who held the site meeting, testified that, to the best of his belief, he explained the time cycle to all present, and probably Inspector Wilkes thought it was sufficient in his report merely to refer to the Requirements where the details were set out. On the 2nd June 1967, Police constable (now Sergeant) P. J. Calladine attended on behalf of the police authority at the site inspection at Hixon and saw officials of the Ministry of Transport timing the operation of the barriers, but paid little attention to the test and Colonel Reed did not think fit to explain it to him. P.c. Calladine had seen the operation of the crossing at Hixon on several occasions when driving in his car and it caused him no sense of danger.

142. The Requirements, together with the Explanatory Note, were sent, as I have said, to all divisional headquarters and were placed on a file kept at each police station. Although every officer was required to read every document in that file, I would be surprised to find that any constable had paused to study the detailed Requirements which neither his Chief Constable nor the Assistant Chief Constable had thought it necessary to do. Certainly none of the constables who gave evidence before me had read it with sufficient care to find paragraph 18, about the provision of telephones.

143. Further, leaflets relating to each new automatic crossing were sent to the County Police Headquarters by British Railways and sent to local police stations, but there was no suggestion that the police officers should study them. They were, like other publicity leaflets, put in the public part of the local police station for any member of the public to take, and a police officer would read one only if, in an idle moment, he glanced at the loose literature lying around. The British Railways local publicity pamphlets had taken effect in the schools of the district for whom it was primarily intended but, in the police stations, it was mere flotsam.

144. Since the disaster a memorandum has been issued by the Chief Constable which, while confirming paragraph 110 of the Force Standing Orders, informs all police officers in the area of the location of existing automatic crossings and lays down that whenever an abnormal load is being escorted, the police officers and attendants must always stop the load on the approach to the crossing and inform the driver of the requirement for him to telephone the signalman before attempting to go over.

145. As I have said above, after the accident had happened, the police forces, under the Chief Constable, organised and took part in the rescue and relief operations with great speed and efficiency.

(vi) The role of British Railways

146. British Railways are responsible for the installation (in collaboration with the Ministry), operation and maintenance of the automatic crossing at

Hixon as elsewhere. They are also responsible for protecting the safety of their employees and the passengers on trains, and, in my opinion, they have a duty also to provide road users with the means of safely using the crossings.

147. The standard of installation and maintenance of the automatic equipment at Hixon seems to have been adequate. Thirteen failures of the half-barriers were reported to the police between April and September 1967, but they were all "failures to safety". I also heard evidence (which I accept) from P.c. R. J. Richards that on the 7th December 1967, when he was escorting Wynn's transporter, driven by Mr. T. W. Cromwell, with the load destined for the Pomona Docks, the barriers remained raised while the bells rang and the red lights flashed until the signalman sent a light engine along which, by its approach, corrected the fault. This is called a "partial danger-side failure". However, tests carried out after the accident, as well as eye-witness accounts, established that the equipment was in normal working order on 6th January.

148. In accordance with the provisions of the Hixon Order, the Emergency Notice had been erected on either side of the crossing, but there has been a considerable conflict of evidence as to its position on the 6th January: it has been said that the reason why neither Mr. Groves nor any of his crew nor Mr. Preston nor either of the police constables saw the Notice on the down side was that it was parallel with the road (in which position it was certainly found immediately after the accident) so that no approaching driver would either see or read it.

149. On the down side (i.e. the side which Mr. Groves approached) the Notice had first been erected 8 feet from the road inside the fence on British Railway's property at an angle of about 30 degrees to the road. At the site inspection on the 2nd June 1967, Colonel Reed, of the Railway Inspectorate, and Mr. F. S. Alexander, of the Divisional Road Engineer's office (Ministry of Transport), considered that the Notice was obscured from the view of approaching traffic, and the latter instructed Mr. Frank Shaw, Assistant Divisional Signals Engineer of British Railways, to have it moved to a new position nearer the road so that it should be seen by approaching traffic, though he did not specify in terms any precise angle at which it should be placed. Mr. Shaw, on the other hand, gave instructions to his subordinates to erect the Notice "more facing the road", which, apparently, they interpreted as being more nearly parallel to the road, so that drivers by the stop line could see it. Soon after this had been done, Mr. F. B. Gubbins, an Inspector in the Signals and Telecommunications Department of British Railways at Stafford, visited the crossing and observed the new position of the Notice. He testified that he found the Notice was almost parallel with the road, in a position where it could be read by someone at the stop line but not so easily by someone approaching from the direction of the A.51. He said that its position, as far as the motoring public was concerned, was "not exactly hopeless but getting that way". He considered that a mistake had obviously been made by Mr. Alexander, but having discussed the matter with a colleague, Mr. Burkill, he decided not to question the orders given by the Ministry of Transport official. An independent witness, Mr. T. W. Cromwell, a fellow employee of Mr. Groves, said he observed on the 7th December that the notice was parallel to the road.

150. On the other hand, Mr. D. C. R. Mackmurdie, the Divisional Operating Superintendent at Stoke-on-Trent, had paid a routine visit to the Hixon crossing

in September 1967 and he found that the notice was about 7 feet off the road at an angle of 20 to 30 degrees. This witness was obviously worried by the position of the Emergency Notice immediately after the accident because on the evening of the 6th of January he tried by hand whether it could be turned; but it did not move.

151. Fortunately, having seen a report of the disputed evidence in the newspapers, Mr. Iain Campbell, of Creswell, Staffordshire, a keen young amateur photographer, communicated with the Court and enclosed two photographs which he had taken in pursuit of his hobby on the 8th and 16th December 1967. These photographs were examined by Flight Lieutenant Moreau, R.A.F., a photographic interpreter at the Joint Air Reconnaissance Intelligence Centre at Brampton, Huntingdonshire, who testified that the Emergency Notice was shown to be at an angle of approximately 26 degrees to the road. These photographs enabled me, with some certainty, to resolve the dispute by holding that such was the angle at which the Emergency Notice faced the road. (There was no evidence to suggest that its situation had been altered before the accident, but it had very probably been displaced by rescuers pushing past it after the crash.)

152. I am satisfied from the evidence of Mr. Shaw that the notice could have been read by the driver of a vehicle from a distance of about 60 feet before reaching it. At such an angle, seven feet from the kerb and overtopping a white fence, it was not in a good position to be read by drivers of cars or fast vehicles; *that is why it had not caught the attention of either Mr. Preston or the two police constables, Nicholls and Prince.*

153. I have thought fit to examine this matter with great care owing to the importance which was attached to it in the newspapers and in public discussion, as well as by all those who failed to observe the Emergency Notice; but, in my opinion, it really plays no great part in the events leading up to the accident, because I believe that Mr. Groves would not have obeyed its message even if he had seen it. Whether it was at an angle of 26 degrees or absolutely parallel to the road did not matter to Mr. Groves for he was not anxious about the level-crossing: otherwise, being the driver of a vehicle moving at only crawling speed, he could easily have seen and read it as he passed the stop line, and so too could Mr. Parsons if he had been given instructions to observe signs at the crossing.

154. Basically the confusion as to the desired position of the Notice arose from the dual character of the notice itself: it was intended to convey two messages, one applying to those in emergency on the crossing, and the other to drivers approaching the crossing. Consequently, Mr. Gubbins came to the conclusion that the angle at which he believed it had been ordered to be placed, nearly parallel to the road, was an intentional compromise so that not only approaching drivers but also those who had already reached the crossing could see it.

155. It may be remarked that, notwithstanding the provisions of paragraph 18 of the Requirements of 1966, the telephone niche on the pivot post at this crossing was not marked with reflectorised material, *but neither the Railways officials nor the Inspector of the Railway Inspectorate at the site inspection noted that fact.*

156. The Chairman of the British Railways Board, Sir Henry Johnson, in his evidence made an explicit admission that members of their staff did know, before the accident at Hixon, that the slow-moving vehicle was a "special problem" at automatic crossings and that they appreciated the danger involved.

157. The problem was by no means a new one to British Railways. Rule 107, which had been in their Rule books for many years, read as follows:—

- "(a) Unless special authority be given to the contrary, traction or other heavy engines, heavy vehicles or heavily loaded vehicles, whether mechanically propelled or otherwise, or droves of animals, must not be allowed to cross the line when any train can be seen, or is known to be approaching the crossing.
- (b) Stationmasters must, as far as practicable, request users of traction or other heavy engines in their neighbourhood to give reasonable notice to the nearest stationmaster on each occasion of their intention to pass such engines over the line at a public level-crossing not provided with fixed signals. . . .
- (d) Where telephonic communication is provided between the level-crossing and the signal-box . . . the crossing keeper must communicate with the signaller and obtain his permission for the traction or other heavy engine, etc., to cross the line."

Though sub-paragraph (b) could be interpreted as applying to automatic crossings, I think that the rule was really drafted in contemplation of more primitive vehicles than the modern diesel traction transporters, and British Railways did not regard it as applicable. Nevertheless, both Mr. J. Bonham-Carter, the Chief Operating Officer of British Railways (now Chairman of the Western Region), and Mr. E. Merrill, Chief Public Relations Officer of British Railways since 1959, said that having that rule in mind they had been conscious since 1964 of the problem presented by heavy, slow-moving vehicles. Mr. Merrill said "the exceptional load was clearly in our minds when this [the Emergency Notice] was drafted but I think the intention was that anybody driving an exceptional load, which I am sure includes a slow-moving load, should be alerted to telephone the signaller when he approached one of these crossings. . . . The sort of thing they had in mind were those slow-moving vehicles such as Pickfords have on the road, the things that we sometimes use to carry our own dead steam locomotives."

158. This evidence is, of course, corroborated by the fact that not only did British Railways take part in devising and erecting the Emergency Notice, but they had given written instructions to all signallers as to their duties when the driver of such a vehicle telephoned in accordance with the notice (see paragraph 48). Mr. Bonham-Carter assured me that, this being known by some officials of British Railways, it would also be known by those in the Chief Engineers' Department of the Railway Regions who were concerned with giving information to the Ministry of Transport Bridges Engineering Design Standards Division in response to enquiries about routes for special order movements. They did not, however, inform the Ministry of Transport of the advisability of including a caution regarding automatic crossings in the special order routes.

159. Notwithstanding the admissions to which I have referred above, which were not entirely consonant with other answers by the same witnesses, I think

the true position was that British Railways officials looked at the problem from the point of view of assisting large slow vehicles in a difficulty or emergency but somehow it did not dawn on them that there was danger of a serious accident every time such a vehicle crossed the railway.

160. What did British Railways know of the kind of traffic likely to use the automatic crossing at Hixon? Mr. Preston, on behalf of the English Electric Company, had written to them in August 1963 to ask them to widen the carriageway on the crossing (which was then only 12 feet 6 inches) to 20 feet so as to allow the conveyance of a large transformer to the airfield depot for a special test, and the parties met at the crossing in March 1964 to discuss the project. This particular scheme was abandoned, but in 1966 the British Railways did widen the carriageway to 20 feet preparatory to converting the crossing to half-barrier protection. They would have known then that that widening made possible the use of the road by English Electric for larger loads than formerly.

161. Mr. Edward Clark, manager of Robert Wynn and Sons' depot at Manchester, who was responsible for the Stafford area, testified that in October 1965, when electrification of the line was in contemplation, he met Mr. Preston and two officials of British Railways at the Hixon crossing and there discussed the problems of moving large transformers to the airfield under the overhead cables. British Railways were, therefore, he said, aware that from time to time such loads would be carried over the railway line. Mr. Preston does not recall that meeting, and Mr. Clark's recollection was directly challenged by British Railways who can find no record of such a meeting in their files. After careful thought, I am satisfied that the meeting did take place with Mr. Preston, but that Mr. Clark is mistaken in believing that the Railways' officials were present.

162. Of course, British Railways were consulted in January and February 1967 about the proposed route for the "special order" movement of *two* abnormal indivisible loads on separate occasions from the Hixon depot, where they were being built, to the Pomona Docks at Manchester. The crossing was not mentioned in the route and, although the reply from the Chief Civil Engineer, London Midland Region, raised no objections it is evident that he was concerned mainly with the risk of damage to railway bridges.

163. British Railways not only knew that the English Electric Company (which is well-known locally to produce enormous loads from their works at Stafford) had a depot on the airfield which they might use for storing such things as transformers, but, if they had enquired (their crossing-keeper was in attendance at the crossing until July 1967) they would have known that in the latter half of 1967 another company, Turriff Construction Limited, also used the airfield for heavy transport, including low-loaders carrying long and heavy steel pipes for North Sea gas. But neither at the preliminary site meeting in January 1966, nor at the site inspection on the 2nd of June 1967, nor on any other occasion did they mention to the Ministry of Transport the possibility of such heavy transport using the road, nor did they enquire of the police or highway authority at those meetings for information on the topic. They paid no attention to it themselves.

164. The only steps taken by British Railways to deal with the problem of the abnormal slow-moving load at Hixon or elsewhere was to provide the telephone and the Emergency Notice. However, though the problem had been

recognised as early as 1964, at the time of the accident on the 6th January 1968, there were still 18 automatic crossings in the country which had not been provided with telephones. They made no approach to the Ministry to discuss the problem, or to get them to mention the telephone procedure in the Explanatory Notes, or to emphasise it in the *Highway Code*; and the Notice itself was wholly inadequate to convey to a driver of such vehicles the imperative necessity to obtain permission before crossing the railway.

165. To give some national publicity to the new crossings, British Railways arranged a demonstration for the Press at Marylebone Station on the 22nd June 1964, as a result of which short news items appeared in most national newspapers, and on the television and radio, but nowhere (except in a trade journal *Modern Transport*) was the provision of a telephone mentioned, because the demonstrators had not spoken of it. Clearly, though the problem of the slowly moving abnormal vehicle which could not clear the line in 24 seconds had been seen, British Railways did not think to give the telephone procedure the importance it deserved, probably because they believed that the entire responsibility for safe use of the crossings had been passed to the road user* who, being provided with a telephone, should be left to use it.

166. In all these circumstances, it is not surprising that the telephone was very little used by the public except to report faults at the half-barriers. The signalmen at the Colwich and Meaford signalboxes said no one had telephoned in respect of a heavy or exceptional load before the disaster, and a rough national survey has shown very infrequent use elsewhere. (It is remarkable that at Leominster where a great volume of heavy industrial traffic uses the automatic crossing, there have been no such telephone calls even since the 6th January.) British Railways did not try to assess the effectiveness of the Emergency Notice and their publicity by enquiring of their signalmen how often the telephone was used.

167. It was agreed between the Ministry of Transport and British Railways that the best method of educating the public in the use of automatic crossings was by local publicity after the installation of half-barriers, which should be carried out by the Railways. Mr. Ronald Owen, British Railways Public Relations Officer at Stoke-on-Trent, who had not previously undertaken this task, distributed 1,000 leaflets describing the Hixon crossing and 45 posters, to such people as the Education Officer, the County Librarian, the Staffordshire County Council offices, the Central Library at Stafford, and police headquarters at Stafford. There is no record of the 150 leaflets and 5 posters he sent having reached police headquarters or any police station, and I am not satisfied that they ever did reach that destination. Lectures and special film-shows were arranged at local schools and it seems clear that the schoolchildren of the district were well instructed, for no complaints have been received as to their being endangered. But the publicity does not seem effectively to have reached the adult population, for neither Mr. Preston nor Mr. Holbrook (a local butcher, who gave evidence), nor any of the police officers who appeared before me had seen the leaflets or the posters.

* See the Report by Col. McMullen in 1957 (paragraph 22 above): "If automatic half-barriers are to be adopted, the principle must be recognised that it is the responsibility of the individual to protect himself from the hazards of the railway in the same way as from the hazards of the road".

168. Though British Railways' local officials must surely have known that enormous loads for transport issued from the English Electric Company works at Stafford only six miles from Hixon, and though they knew that Robert Wynn and Sons Limited (whose name, like that of Pickfords Limited, is synonymous with abnormal slow-moving loads) were employed to convey those loads, they did not think to send a copy of the leaflet, nor any other information about an automatic crossing to Wynns or to any heavy haulage company. No one responsible for these matters in the British Railways organisation sufficiently appreciated the situation as to direct the information to the heart of the target. Moreover, as I have pointed out in paragraph 114, on the occasion of the incident at Leominster in November 1966 when a particularly blatant opportunity arose to inform heavy haulage contractors of the vital importance of the telephone procedure prior to crossing, it was not taken.

169. The publicity material itself, i.e. the leaflets and the posters, has been criticised on two grounds: (i) it did not clearly explain that it was necessary for drivers of exceptional vehicles to use the telephone for permission to cross the railway, and (ii) it emphasised the safety of the new devices rather than their inherent dangers. As regards the first, though British Railways have acknowledged that the risk of a vehicle which moved so slowly that it could not traverse the crossing within the time of 24 seconds was known to them since 1964, and that the telephone was provided to deal *inter alia* with that problem, all leaflets regarding automatic crossings published up till the end of 1966 read:—

“Phones are located on either side of this crossing for use in emergency . . .

Drivers in charge of heavy vehicles or exceptional loads *which might stall* on or near the railway *should* also phone . . .”

(The italics are mine.)

170. That injunction would not, it is contended, have been clearly understood to apply to exceptional or heavy loads which were not likely to stall, as very few would be. In the pamphlet issued for the Hixon Crossing in 1967 (see Appendix VIII), the wording and format of that part has been changed. The equivocal “*should phone*”, which lacks the mandatory tone, is retained and no guidance is given as to the meaning of “exceptional or heavy loads”. (No one has doubted that the transporter involved in the accident of 6th January 1968, was well within any definition of that term.) But the words “which might stall” have been omitted.

(vii) The role of the Ministry of Transport

(a) *The Installation of the Crossing*

171. The initial site meeting was held at the level crossing in Station Road, Hixon, on the 12th January 1966, and was conducted by Major P. M. Olver of the Ministry of Transport Railway Inspectorate. Also present were Mr. F. S. Alexander, the electrical engineer from the office of the Divisional Road Engineer (to deal with traffic signals and road signs), and representatives of the Parish Council, the County Council as highway authority, the police and British Railways. No objection was made at that stage, nor during the statutory two months under section 66 of the Act of 1957, to the proposal that automatic half-barriers should be installed: indeed, the parish council were eager for it in order to reduce delays to road traffic. Just over a year later, on the 19th

January 1967, the Minister of Transport, on the application of the British Railways Board, made the Hixon Order. The Order came into effect on the 2nd April 1967.

172. Neither at the site meeting, nor at the site inspection in June 1967, did any of those attending inform the officers of the Railway Inspectorate of any unusual local traffic conditions, actual or prospective. Criticism has been made of the conduct of those meetings in this regard.

173. In 1965 Colonel Reed prepared a model opening speech to be made by presiding officers at site meetings and this was used regularly thereafter *mutatis mutandis* at every site. It forms a valuable guide to what was said and also to what was in Colonel Reed's contemplation at the material time.

174. The site meeting at Hixon was opened by Major Olver addressing those present on the lines of the model speech. Major Olver accordingly explained fully the brisk operation of the barriers and arrival of the train, and that that was the chief importance and value of such crossings. The model speech, after mentioning accidents due to human fallibility at manned crossings, points out that "it should not be thought that the manned crossing is dangerous and the automatic half-barrier utterly safe", and I have little doubt Major Olver said something of that kind at the meeting; but the British Railways minute of the meeting records that he "concluded by emphasising that experience had shown a high standard of safety had been obtained from existing half-barriers throughout the country". The evidence has given me the clear impression that the emphasis of his talk (as it was at other sites by his colleagues) was to allay any misgivings entertained by local people and to impress upon them that these new crossings had been legalised and accepted by the Ministry as proved safe.

175. There followed much discussion but no mention was made by Major Olver (nor in the model speech) of any question of refusal to sanction the conversion of the crossing to automatic half-barriers (though it was sometimes refused) nor of any risk to any particular type of traffic (though the risk of "blocking-back" was always in mind) nor of the provision of a telephone for use by drivers of heavy or exceptional loads (for, at that stage, it had not yet been decided to instal a telephone at all crossings and none was intended for Hixon). The safety of pedestrians and children was discussed (and likened to their safety on other parts of the highway) and details of the projected publicity, in local schools and generally, were outlined.

176. Major Olver, following the usual practice of the Inspectorate, was not concerned to study the surrounding countryside to see what information he could gain of factors which might affect the desirability and safe working of the automatic crossing: his interest was confined to the immediate geography of the site, and so it did not happen that he observed and enquired about the depots on the airfield which could be seen from where he stood. Colonel Reed explained his own attitude:—

"If we are going to think on those lines, then any level crossing in relation to any built-up area would have to be specially considered in regard to the industrial use generally throughout the area. . . . If we are going to say that at Hixon we ought to have thought about the airfield, then I would say that at Hensall we ought to have thought of the long distance traffic

which we knew used it regularly . . . and at Nantwich, Cheshire, on a busy road, we ought to have thought of all the traffic that might use it, and there is a limit to this."

I do not agree with that attitude; the traffic conditions ought to have been considered in detail, and I was sorry to hear Colonel Reed trying to justify that attitude on the 23rd day of this Inquiry.

177. Similarly, at the site inspection on 2nd June, conducted by Colonel Reed and attended by the same local representatives, no questions were put to the latter to elicit information though, the carriageway having been widened, it was likely that a hitherto suppressed use of the road by different forms of traffic might have shown itself. Up to that time no abnormal vehicle had gone to Hixon airfield but in January and February 1967 the route had been submitted to British Railways, the police, the highway authority and the Divisional Road Engineer for two special order movements later in the year, so at least some of those bodies would have been able, if properly briefed, to bring to the attention of Colonel Reed the new traffic development.

178. Colonel McMullen, Colonel Reed and Major Olver all expressed the view of the Inspectorate that it was best not to send a preliminary questionnaire seeking particular information from the local representatives lest, by asking particular questions, it distracted attention from other information which might have been volunteered. I do not entirely accept that view, for an inspecting officer, if competent and knowing what it is important to discover, can make it plain at the same time that all other relevant information is required.

(b) The Authorisation of the Journey

179. Since the transporter and its load exceeded the limits of 90 feet length and 150 tons weight laid down in the Motor Vehicles (Authorisation of Special Types) General Order, 1966, the journey required a special order from the Ministry of Transport. This was requested urgently by letter from the English Electric Company dated the 18th December 1967, followed by a telephone call on the 21st. The part of the route from the A.51 to the English Electric Company's depot on the former airfield at Hixon which was copied from the special order relating to the movement on the 7th December to Pomona Dock, Manchester, had been cleared with the police, county council and British Railways in January and February 1967. In view of the Company's wish to move the transformer as soon as possible, the necessary consultations with the County Council, the police and British Railways were carried out by telephone.

180. English Electric were told by telephone on the 22nd December that the order had been signed and, a week later, Robert Wynn and Sons Limited sent out a notification of the movement to the County Council, the police and British Railways, incorporating the prescribed Ministry route.

181. The prescribed route contained no mention of the automatic crossing in Station Road, Hixon, nor had it done so on the occasion when it was prescribed for the journey to Pomona Dock. This omission was consistent with the policy of the Ministry of Transport, above mentioned, for British Railways had not, on either occasion, indicated that a caution should be given in respect of it.

(c) *The hazard of the slow-moving Vehicle*

182. At the opening of the Inquiry, Mr. Nigel Bridge, counsel for the Ministry of Transport, defining the attitude of the Ministry on this aspect of the matter, said:—

“ . . . Before this accident the Ministry, as such, had never specifically focused its attention upon the slow vehicle hazard. . . . Although it may well have been present to the mind of individual people in the Ministry, there is nothing to show it was present in the minds of individuals that half-barrier automatic crossings presented a hazard to slow-moving vehicles. Over the period of years during which these crossings have been developed, it does not appear, from the extensive researches undertaken by those instructing me, that this specific problem was ever raised in any Minute, in any Report or Memorandum, or in discussions between the various divisions of the Ministry which might have been concerned. If it had been, then it might have led, and very probably would have led, to the taking, before this accident, of the additional steps which, as I am going to tell you shortly, have been taken since the accident.”

183. The additional precautionary steps to which Mr. Nigel Bridge referred, and which were taken immediately after the disaster at Hixon, are:—

- (1) Special Orders made under section 64 of the Road Traffic Act now include a requirement that the driver or one of the crew of the vehicle must use the telephone at an automatic crossing so as to obtain the signalman's permission before attempting to negotiate it;
- (2) Circulars have been sent to all haulage contractors known to the Ministry to own vehicles of over 10 tons unladen weight, drawing their attention to the necessity of instructing their drivers about the importance of the telephone procedure prior to crossing;
- (3) At the request of the Ministry the Home Office has written to all Chief Constables drawing their attention to the necessity of ensuring that drivers of vehicles escorted by the police use the telephone before negotiating automatic crossings.

184. It is important to examine this failure to appreciate and foresee such a crucial danger. There were two departments of the Ministry which principally were concerned with this matter, namely the Railway Inspectorate, who were actively concerned in the adoption of the automatic half-barrier system and in laying down the conditions for their installation; and the Bridges Engineering Design Standards Division, which dealt with the authorisation of abnormal indivisible loads by special order. Those two departments possessed, before January 1968, all the knowledge that was necessary to anticipate or to foresee such an accident as has happened, but, though their officers were competent and intelligent men, no one foresaw precisely the nature of the problem. Mr. C. P. Scott-Malden, who was then Under-Secretary in charge of the Railways Group at the Ministry, described it as “an omission resulting from lack of imagination” and said:—

“ I think the two pieces of knowledge, the knowledge of the half-barrier working and the knowledge of the exceptional loads, had to come together in one person's mind and he would have to see the connection between them. That is what could have happened really anywhere in the Ministry,

or indeed in quite a lot of other places. But that linking and that, as it were, flash of imagination did not happen."

185. The working parties of 1956 and 1963 had returned from the Continent fully satisfied that the automatic half-barrier crossings in France and Holland had been proved successful and they therefore started with the disadvantage that they did not feel it necessary to think things out intensively from the very beginning, though they did introduce a number of safety measures which improved upon what they had seen in Europe. They had noticed that there were differences in continental conditions, e.g. that driven cattle were uncommon on the roads there, but they did not observe that there were not so many abnormal and slow vehicles as are to be found in this country, nor did they enquire whether the S.N.C.F. or the Netherlands Railways experienced any difficulties with any particular type of traffic, except bicycles.

186. The development of official thinking on this problem can be traced, firstly, in the development of the use of the telephone at automatic crossings. No such provision has ever been made at the crossings in Holland, but in the provisional Requirements dated the 1st May 1958, it was laid down that a "telephone [was] to be provided and connected to the nearest signalbox in circuit". In April 1962 the Requirements provided (as at some crossings in France) for a telephone adjacent to each pivot post, with a notice displayed "Use telephone if there is undue delay"; and in the revised Requirements of 1963 this had been expanded to the provision of "plug-in" connections to be provided for an emergency telephone for use by railway staff, and also "if cattle are driven over the crossing frequently a telephone available to the public may be necessary", with a suitably worded notice. It was apparent, therefore, that up to this time the telephone was intended simply for use in emergencies, and it was not until the publication of the Requirements of July 1966 that, in paragraph 18, it is provided that "if abnormal loads or cattle pass over the crossing frequently, a telephone available to the public may be necessary". Even now, the qualification "frequently" and the indecisive "may be necessary" indicated that the vital importance of the telephone procedure to obviate the slow vehicle hazard had not been clearly appreciated.

187. Mr. Scott-Malden himself considered the possible classes of user, such as hazardous loads (like petrol tankers and buses) and cattle, and was satisfied that all were catered for; the exceptional slow-moving load did not occur to his mind. Colonel McMullen, of the Railway Inspectorate, did not think of it either, perhaps partly because (he said) he had never seen or contemplated a load of the size of the transporter involved in the accident. (Judging from my personal experience, I am surprised that any motorist who has driven any substantial distance on the roads of England and Wales is not aware of huge loads crawling along the highway from time to time.) He explained that a great many people in the Ministry, together with British Railways, considered various aspects of the use of automatic crossings, but they did not analyse the great spectrum of vehicles from the mini-car to the largest vehicle: "what was considered was normal moving traffic . . . traffic was considered as road traffic . . . One type of vehicle we never did consider, I am afraid, is the very slow and the very long vehicle, which was not appropriate for the time cycle". They did not look at the various kinds of vehicle which might be involved in the ordinary traffic stream.

188. Since the 1963 Requirements referred to the provision of a telephone where cattle were driven over the crossing frequently and that, in such case, "a suitably worded notice" would be required, the British Railways Board wrote to Colonel Reed on the 29th November 1963 enclosing a suggested draft for the notice, which has since become the Emergency Notice. The draft was copied from a notice used at "On-Call" crossings, where one presses a push button for the gates to be opened for a brief time by a signalman by remote control. The signalman requires to be informed when any movement over the line will require him to keep the gates open longer than usual. These crossings, now obsolete, were found at very little used places and had no similarity to automatic crossings. The draft read:—

"In emergency or before driving cattle or exceptional loads over railway, telephone signalman."

Colonel Reed submitted it for consideration by the Traffic Engineering Division, and they advised that it should be amended to refer to "exceptional or heavy loads". I was not offered evidence from anyone of that Division to explain that amendment. The Traffic Engineering Division also recast the form of the notice (as can be seen in plate 4 of Appendix X) so that the first two and the last two words were given special prominence because, they wrote, "the most important part of the notice would then *read very rapidly* 'In Emergency . . . Phone Signalman' and the most important and urgent part of the message would be imparted to the driver very quickly". (The italics are mine.) Colonel Reed and British Railways accepted that advice; they regarded the notice as principally for information of drivers caught in emergency on a crossing, and the slow-vehicle hazard had not yet been truly appreciated.

189. The notice at "on-call" crossings was expected to be used by people wishing to take clumsy agricultural machinery over the tracks, and Colonel McMullen and Colonel Reed both explained that when, in 1963, it began to be appreciated that there were certain vehicles which, being awkward and slow, might find it difficult to traverse a crossing within 24 seconds, their minds remained fixed on heavy agricultural machinery such as combine harvesters. They had, therefore, considered the provision of a telephone at automatic crossings for such vehicles, as well as for use in emergency, and had, naturally, taken the notice at "on-call" crossings as their model.

190. Colonel McMullen insists that all he, and the officers in his Inspectorate, had in mind, even after the installation of telephones and the Emergency Notice at automatic crossings, was that agricultural vehicles might be in difficulty. Colonel McMullen is an eminently truthful man and I accept his evidence about himself without reservation; but one must remark that such a limited view is strange when one considers that the 1963 Requirements provided that automatic crossings could be installed in both rural and built-up areas and that the volume of traffic was not to be a restrictive factor. The Notice applied to all "exceptional and heavy" loads and it must have been common knowledge in the Railway Inspectorate, as well as other divisions of the Ministry, that Pickfords Limited (who are closely associated with British Railways) were in the habit of conveying very large loads very slowly along the highways. It is difficult to find an explanation for the failure of these competent and experienced officers to appreciate that there were other vehicles, besides the agricultural, which deserved consideration in this respect. Colonel Reed was unable to

explain why the adjective "abnormal" was imported into paragraph 18 of the 1966 Requirements; it seems to indicate that someone had seen, at least dimly, the problem of the "abnormal indivisible load"* for which special orders are required.

191. It will be remembered that Mr. Bonham-Carter, on behalf of British Railways, admitted that the problem of the slow-moving vehicle was appreciated in his organisation from 1964 when the Emergency Notice was drafted and agreed with the Railway Inspectorate. Major Olver, on the other hand, said that it was in the middle of 1966, when British Railways informed them that they proposed putting telephones at all automatic crossings, that the Inspectorate realised that the problem of slow traverse could apply to other than agricultural vehicles; but that they then thought that the provision of the telephone with the Emergency Notice was a sufficient safeguard for all large slowly moving vehicles. In other words, the Inspectorate adopted the same view as British Railways, and, like the Railways, they did not understand that here was an *accident* hazard. I find that from early in 1964 the minds of the officers of the Railway Inspectorate were hovering around the vital point but never saw with clarity what it was.

192. In 1964 British Railways had, at the same time as providing the telephone, posted written instructions in all signalboxes monitoring automatic crossings relating to the telephone procedure (see paragraph 48). That was known to the Railway Inspectorate, who also knew the Railway Rules including rule 107 referring to the passage of heavy vehicles over level-crossings, but that rule did not bring the crucial problem to their minds, as it had to officials of the Railways.

193. The risk was not hidden from the Bridges Engineering Design Standards Division, which of course was familiar with the movement of exceptional loads under special orders, and knew how large and slow such vehicles were. They knew of the probable use of the Hixon depot for outsize loads, for Mr. A. D. Holland, who is in charge of the Division, told me that the English Electric Company had "specifically informed the Ministry that they could not use the crossing until it was widened . . . and then they wrote and said it was going to be automatic", therefore widened. The following passage occurred when Mr. Holland was cross-examined by Mr. E. Fay, Q.C.:—

"Q. I suppose anyone with a pencil and paper and an elementary knowledge of mathematics can work out at what speed a vehicle of 150 feet long will get into danger on these crossings, if one knows the time factor between entering on a clear crossing and the earliest arrival of a train. Did no one in your Division ever work that out or bring it to your notice as a danger factor?

A. No.

Q. Was it ever brought to your notice from outside?

A. No.

Q. Did you notice it yourself?

A. Certainly from my general knowledge of the situation and from my acquaintance with the Explanatory Notes to the Requirements where

* See paragraph 57.

there was this reference to a half minute, I appreciated that there was a time factor involved in this, a time factor in regard to this sort of load.

Q. Well, it is not a very difficult matter to appreciate, is it?

A. No, it is not, no."

And in cross-examination by Mr. Blennerhassett, Q.C.:—

“Q. The Ministry knew, did they not, that this was a level-crossing with automatic half-barriers?

A. The Ministry knew it was an automatic crossing.

Q. They knew the timing that was operative in relation to automatic half-barrier crossings?

A. Yes.

Q. Ought not a reference to have been made [in the special order route] to that?

A. This takes us back to the point of time, to 1966, when the 1966 Requirements were issued, and the question was considered in the routing section of the Ministry as to exactly what category of information this particular feature came into; . . .

Q. So the Routing Section directed its mind to the problem of whether to make special reference in routes to automatic half-barrier crossings?

A. This was considered.

Chairman: Considered, and rejected?

A. I would like to make it quite clear that this was not what one might call a decision in great depth. The question was posed, was there anything particular about these that needed differentiation from any other kind of level crossing, or indeed any other type of traffic feature."

Mr. Holland declared that when the question was considered by the Route Section as to what problems were posed by automatic level-crossings it was decided that they were a self-evident hazard, marked by signs and signals, and that, therefore, no different attitude should be adopted towards them from the attitude in regard to ordinary traffic lights at crossroads. But he agreed that the analogy was not an exact one, and that, perhaps, the problem ought to have been studied in greater depth. At a later stage in his evidence, Mr. Holland was asked:—

“Within your Division was there ever any conscious consideration of the specific risk arising from the relationship between the time a heavy load would take to get over the crossing and the time of the operation of the automatic crossing as such, that specific risk; did anybody turn their mind to it?

A. I do not think so, no."

In my view, the problem was seen in the Route Section of the Ministry but no more clearly than elsewhere; and, the policy decision having been taken that automatic crossings being an evident hazard they need not be mentioned as cautions in special order routes, no mention was made of the level crossing in the route followed by Mr. Groves on the 6th January. This was most unfortunate

because it is plain that, though the presence of half-barriers was evident, the danger was latent. Nevertheless, according to Mr. Holland and in my judgment, one would have expected any caution requiring the telephone procedure to be used by abnormal loads at automatic crossings to come from British Railways, when consulted both for the load that was involved in the accident and the earlier routes submitted to it.

194. Of course, under the present practice, one disadvantage of British Railways notifying the presence of automatic crossings on a proposed route would be that, since they were consulted only if their bridges were involved, the general accumulation of routes in the Ministry of Transport would prove to be inaccurate, for there would be no mention of automatic crossings on routes which did not involve railway bridges.

(d) *Publicity*

195. Needless to say, when a new and revolutionary method of traffic control is introduced, the public requires, and is entitled to, education by adequate and effective publicity. The Ministry recognised the fact from the outset, and had noted the excellent methods of propaganda employed in France and Holland. In his report of May 1963, after his return from the Continent, Colonel Reed said: "We are of the opinion that when each installation is brought into use, the measures taken by the Dutch to promote publicity . . . should still be used". In Holland there was in the beginning a massive national campaign, and the local publicity included (and still includes) the delivery to every household in the district where a new automatic crossing is installed of a pamphlet describing the workings of automatic crossings and the dangers of indiscipline in their use. Such thorough measures have not been adopted in Britain.

196. Throughout, the Ministry's guiding principles have been to educate the public in the right use of automatic crossings; to allay their fears, because the crossings "do not give the appearance of being safe", and to "create a climate of acceptance" of the new devices. They have preferred the matter-of-fact approach rather than an emphasis on danger, and they took the view that "too much national publicity would invite general emotional reaction and a possible feeling of danger attached to the crossings".

197. It was decided as a matter of policy that British Railways should carry out all the necessary local publicity, and that national publicity should be entrusted to the Ministry, but there has always been close liaison between the two bodies. Between 1961 and 1964 there were very few automatic crossings in the country, and these were in rural districts, so that a national publicity campaign was felt to be inappropriate. When, in March 1964, Mr. F. D. Bickerton, then the Ministry's Chief Information Officer, learned that it was intended to introduce twelve more crossings by the end of July, he called a meeting of representatives of various departments of the Ministry and British Railways to study publicity arrangements. It was decided that, not only should British Railways give the demonstration to the Press at Marylebone Station, which I have already mentioned (paragraph 165), but the Ministry would provide wall charts for schools, enlist the aid of the motoring organisations and RoSPA, and that they would ask the television networks to show "fillers", i.e. short films in cartoon form which are shown (free of charge) between

programmes from time to time on B.B.C. and the commercial networks. That was done: a 60-seconds "filler" was shown on television from time to time until January 1967, mention was made of automatic crossings on sound radio, and up to the present date 12,450 copies of the wall chart have been sent to schools in the locality of new automatic crossings.

198. On 24th June 1966, Mr. Bickerton called another meeting to review the publicity arrangements and, having learned that modifications were likely to be made to the equipment, the meeting decided to issue revised versions of the posters and television "fillers". Colonel McMullen was pressing for a new burst of activity in this field. Unfortunately, the "filler" was withdrawn in January 1967 and the revised version was not available to the television networks until October of the same year. Thus, for the greater part of the year in which conversion to automatic crossings was proceeding apace, there was no national publicity directed to the adult population.

199. On the 26th April 1967 Colonel W. P. Reed reported to the Ministry, after attending a Coroner's Inquest on a fatal accident that had occurred at the automatic crossing at Star Lane, Wokingham, on the 9th March 1967, that "in the course of the evidence it became clear that many of the witnesses had no clear idea of the meaning and significance of the twin flashing light road signal" and that the Coroner had expressed the opinion that more publicity would be helpful to road safety. That confirmed the opinion of those responsible for publicity that the new "fillers" were necessary, but it did not induce them to keep the old "filler" for further showing on the nation's television screens until the new ones were ready.

200. Further meetings were held by Mr. Bickerton on the 11th October and the 11th November 1966, to discuss publicity campaigns, but at none of the meetings I have mentioned was any mention made of slow-moving vehicles or the telephone procedure. Mr. Bickerton had understood that the telephone was merely for use in an emergency.

201. I have studied the publicity material and television "fillers" put out by the Ministry and by British Railways but I find that, though they seem very good and convey a simple message adequately, they do not state explicitly how soon the train may arrive at the crossing after the lights begin to flash. I think a more emphatic definition of the imminent arrival of the train is necessary if, as the Ministry maintain, "the formidable onset of the train so soon after the falling of the barriers reinforces the traffic signals". I appreciate that it is difficult to specify an exact time because of the difference in the time of arrival of the fastest and the more frequent slower trains, but I feel that a tinge of urgency and danger ought to have been injected into the publicity material. The message ought to have been to the effect that "this is the safe way of using these new automatic crossings, but, if you do not take care to do as directed, the train cannot stop and the result will be fatal". The Dutch entitled their publicity film "One Minute—or Eternity". The "fillers" are also misleading in that they lead the public to believe that if the barriers rise there will *not* be a second train coming whereas, of course, in the "critical second train situation" (see paragraph 42) that is not true.

202. The Ministry's criteria governing publicity are (i) there should be a need to know; (ii) the publicity must affect the audience at the time of

publication: that is, there must be a close relationship between the moment of publicity and the moment of action by the persons addressed; and (iii) the cost must be related to the benefit to be gained. The gradual introduction of automatic crossings made national publicity irrelevant on the basis of the first two of those criteria, and, as to the third, those who organised a national publicity campaign had, of course, to budget for it out of a limited allocation of money. General road safety was, obviously, of first importance: in 1966 there had been 291,000 road accidents in which nearly 8,000 people had been killed and more than 380,000 injured, whereas at automatic crossings between 1961 and 1967 there had been three casualties. So automatic crossings were very low in the list of priorities for a share in the available funds for publicity; and in fact, apart from the cost of printing wall charts for schools, the Ministry has spent nothing on publicising these revolutionary new crossings, for publicity on radio and television was not charged for.

203. The Ministry proposed to reach the special class of people most likely to be frequent users of the new devices, namely the long-distance drivers, the drivers of heavy slow-moving vehicles, and the police who are concerned for the safety of traffic in two ways: (i) by a paragraph in the *Highway Code*, and (ii) by circulating the Requirements. The reference to automatic crossings in the *Highway Code* was not an ideal presentation of the matter, especially in so far as it concerned heavy transport drivers: the latest edition of the Code was published in 1959 (before there were any automatic crossings in Britain) and the illustration at the back of the pamphlet was not very like the real appearance of such crossings. Moreover, the text of the paragraph read:—

“ 58. Some level-crossings are being equipped with the Continental type of short barrier, which covers only half the width of the road and is worked automatically by approaching trains. The barriers are timed to fall *just before a train reaches the crossing*. Red flashing signals and gongs will be provided, and they will operate before the barriers begin to fall, in order to warn traffic. Do not pass the signals when they are flashing, and do not zig-zag round the barriers.

Never cross before the barriers are lifted; there may be a second train coming.

BE PATIENT—NEVER ZIG-ZAG.”

204. It will be observed that that paragraph does not contain what I have called a “tinge of urgency and danger”, which would have made motorists realise that automatic crossings are a very special kind of traffic hazard, and there is no reference to the telephone procedure. Though the problem of the slow-moving load was seen in 1966 and the provision of telephones was made universal in July 1966, there has yet been no amendment of the *Highway Code*.

205. Mr. J. R. Madge, Under-Secretary of the Road Safety Group of the Ministry of Transport since August 1966, gave evidence that his group had received the Requirements of 1966 from the Inspectorate, requiring drivers of heavy or exceptional loads to telephone the signalman before crossing, and he thought that “anyone discussing and hearing of a change of this nature [i.e. as contrasted with the mention of the telephone in the 1963 Requirements] must realise that the change is made because of the concern for a load of a certain size or slowness needing to 'phone before moving across. I think by the

nature of it anyone who knows of this amendment knows of the reason for it, and the reason is self-evident in the amendment."

206. In so far as the Requirements were directed to bringing the knowledge of working of automatic crossings directly to those who needed it, particularly to those such as the police who were responsible for enforcing discipline on highways and to road hauliers whose vehicles might be in, and might cause, danger, the Requirements were inept and wholly ineffective. They contained a great deal of technical detail which could be of no interest whatsoever except to the railway technicians who were concerned with the installation or maintenance of the crossings or those manufacturers who might hope to tender for the supply of the equipment. Yet the Ministry thought fit to send them to a number of lay people such as the Magistrates' Association, RoSPA, the Road Haulage Association and the Police. It was not reasonable for anyone to expect that those Requirements, apart from the words in block capitals at the head, would be of interest to, or likely to be sifted by, those lay bodies, and indeed no one did read through the otiose paragraphs. It is not surprising that the Chief Constable of Staffordshire, Mr. A. M. Rees, Mr. P. L. Taylor, Assistant Secretary at the Home Office, and the secretary of the Road Haulage Association all regarded it as a document intended for the railways, especially as the fifth paragraph of the accompanying Explanatory Note, which purported to put into simple language the leaden mass of the Requirements, read:—

"These Requirements are not statutory but serve as an *essential guide to the railways* when selecting sites and in preparing each automatic half-barrier proposal for submission to the Ministry for approval."

207. The Explanatory Note, which was the only document likely to attract the attention of a layman, did not at any time mention the provision of a telephone, not even in July 1966 when it had become universal after the realisation of the slow-vehicle hazard had dawned on those at the Railway Inspectorate.

208. The Road Haulage Association adopted the same attitude as the Chief Constable of Staffordshire, namely that as the Requirements had been sent for information, and not to invite consultation or comments, nothing need be done except to circulate the Explanatory Note to the Highways and Vehicles Committee of the Association. This attitude, which seems not to serve the interests of their members, is greatly to be regretted: if the Association had paid any intelligent attention to the information in the Note they, as experts directly engaged in heavy haulage, would surely have seen the inherent danger for their members' vehicles. No one read the Requirements, because they were difficult to understand and seemed obviously not intended for the Association.

(viii) Conclusions on the Causes and Circumstances of the Hixon Accident

209. Hitherto I have stated the facts as I find them, but I must now try to inter-relate the contribution of, and the part played by, each of the persons and bodies involved. Many of the facts I have recounted were not immediately causative of the disaster and form only the background against which it took place, but they may serve to point the way to improvements in the future. It is safe to say that the vast majority of the adult population of this country

is entirely ignorant of the details of the "brisk operation" of automatic crossings, but I am dealing solely with people who were in a special position to know, and had a duty to search out, these things.

210. The real cause of the disaster was ignorance, born of lack of imagination and foresight at the sources where one would expect to find them. It is an odious task to criticise anyone unfavourably for having failed to foresee a danger, when many intelligent minds and experienced and talented people have conscientiously considered the same problem before the danger manifested itself, yet failed to appreciate it. The civil law of England tests negligence objectively upon the basis of the foresight of the "reasonable man" (who in theory never suffers from an inexplicable oversight) but I think it is appropriate in this instance to adopt a more subjective approach lest able men of integrity be unfairly blamed for incompetence. A subjective judgment is, however, the more difficult to make, for it requires one to put oneself imaginatively in the place of the person to be judged at the time of the events.

211. The actors on the scene of the accident in Station Road, Hixon, were mainly victims of shortcomings at more responsible levels. The essential fact which Mr. Groves and the police officers ought to have known was the need for the driver of an abnormal load always to use the telephone before attempting to cross the line. Without a telephone at Hixon, there would have been only the alternatives of asking the police to radio to police headquarters for advice, or of taking the vehicle across in the hope that British Railways had attended to the safety measures.

212. Mr. Groves did not know, and never had the means of knowing, that he might have only 24 seconds to get his enormous equipage over the railway; but he knew that half-barrier crossings were automatically operated by approaching trains, and he probably had read that they worked more rapidly than the traditional kind. His task required a great deal more thought and perception than driving a car. I have come to the conclusion that Mr. Groves did not think what he was doing when he negotiated the crossing. If he had thought about the matter when he realised that he was approaching a new automatic level-crossing, instead of basking in the shadow of the police escort, he might have recalled that its operation was rapid and he would at least have paused to seek advice before launching his huge vehicle across the railway. A driver of such experience as he had of heavy haulage ought not to have risked, as he did, becoming immobilised across the railway for an indefinite time. Moreover, he ought to have instructed his statutory attendant, Mr. Parsons, to look out for signs and notices, and either he himself or Mr. Parsons ought to have observed and obeyed the Emergency Notice. On the other hand, he had not the foreknowledge that there might be a notice, other than a traffic sign, which governed his behaviour at the crossing.

213. It was a lack of awareness which led Mr. Groves not to concern himself about the level-crossing problem except as regards clearances. However, I have formed the opinion that he is the kind of man who, though a most experienced driver, requires to be told things specifically and who does not draw more than the superficial inferences from what he sees. In this instance, he had not the advantage, which he ought to have been given, of guidance from his employers as to the inherent risks and the proper procedure to be adopted.

214. Police constables Prince and Nicholls, likewise, were almost totally ignorant of the important but latent features of the working of automatic crossings. I do not think they can be blamed for failing to observe the Emergency Notice at the crossing for it was not a traffic sign and was not readily observed from a car moving at a normal speed. (They did notice the regular traffic signs.) Even if they had noticed its presence, read rapidly* when passing it would have seemed to apply only to the case of an emergency. They had forgotten the paragraph in the *Highway Code* referring to automatic crossings, perhaps because its bare statement that the half-barriers would descend "just before a train reaches the crossing" (without indicating how very quickly that would happen) had not made the necessary impact on their understanding and there was no mention there of the telephone procedure. Nevertheless, if they had thought intelligently about the significance of an unmanned level-crossing, they might well have become as apprehensive of the safety of the venture as Mr. Groves ought to have been, though his was the prime responsibility. (It is a strange fact that neither the police officers nor Mr. Groves seem to have felt that sense of danger that so many people experience when traversing an automatic half-barrier crossing.)

215. The principal responsibility for Mr. Groves' failure to use the telephone to obtain permission to cross the railway immediately before the accident lies upon his employers, Robert Wynn and Sons Limited. The directors of that Company were aware of the introduction of automatic crossings into Britain, and ought to have been inquisitive to discover how the new automation affected their business. It is true that others, such as Pickfords Limited, appear to have been no more inquisitive or perceptive than they, but Robert Wynn and Sons had an advantage that no others, in the trade or even in the Ministry, had: in November 1966 the near-catastrophe at the level-crossing at Leominster had brought home to them the exceedingly short time which their large vehicles would have for traversing an automatic crossing and yet, though this had occurred in their own business, they gave no real thought to the problem because they were annoyed by the tone of the letter received from British Railways. They gave no warning or information at all to their drivers, even of the foreseen risk of stalling, and continued to rely on their principle that their experienced drivers should be left to deal with all hazards of the road themselves, even though this was an invisible hazard which had taken the directors (themselves with long experience of the highways) by surprise. They ought to have made immediate enquiries, discovered the object of the telephone, and put a caution on all their special order and general order movement routes. In my opinion, the default of the directors of Robert Wynn and Sons Limited was the principal factor contributing to the disaster.

216. The Chief Constable of Staffordshire cannot escape criticism both personally and vicariously on behalf of all the officers of his force responsible for the instruction of constables. I am not ready to assume that the ignorance which he and the Assistant Chief Constable professed about automatic crossings was universal throughout the Force though, perhaps unintentionally, that was the impression conveyed by his evidence. It is sufficient to say that neither P.c. Prince nor P.c. Nicholls knew anything at all about automatic crossings, and the Chief Constable said his knowledge was about the same. I have been

* As intended by the designers of the Emergency Notice: see paragraph 188, *supra*.

told that at site inspections generally police officers show a keen interest in the planned publicity, especially for schools, yet, according to the evidence, police officers in Staffordshire knew less about the brisk operation of these crossings than the local schoolchildren. This deplorable situation had arisen because the senior officers of police had not appraised the hazard (in the sense that any traffic intersection is a traffic hazard), although there were seven automatic crossings in North Staffordshire by the end of July 1967, and because the relevant information had not been extracted from the Requirements and Explanatory Note. Having extracted such information from the existing crossings and from the documents, they could have applied it to the type of vehicles which they frequently escorted in Staffordshire and thus would have recognised the slow vehicle hazard. I am satisfied that, with that information, the two constables escorting the load on the 6th January would have realised its significance and caused Mr. Groves to telephone for permission to cross.

217. Having said that, I must point out that the Chief Constable and his officers have cause for complaint as to the manner in which the information was presented to them. Not only he but Mr. P. L. Taylor, of the Home Office, too, thought that the Requirements were intended for the railways, for the reason already indicated. The reference in the Note to the police falls outside the stated purpose of the Requirements, and I think it is understandable that the Chief Constable and Mr. Bailey thought that perhaps the only reason why the document had been sent to them at all was the last sentence, *viz.* that the assistance of the police in inculcating road discipline at these crossings would be invited. Of course, they would have had to read all the significant parts of the Explanatory Note before reaching the statement that the Requirements were a guide for the railways, and more careful thought would have led them to realise that here was information which was most useful for them to have. But I agree with, and adopt, what Mr. Taylor said in evidence:—

“... it was for the people who decide to set up a new system, whether it is a new system of dealing with drunken drivers . . . or with noisy cars, or with gaming . . . or whatever it is, to have a clear idea of what they are expecting to happen, and they should then let this be known to the people who have to carry out the actual work. . . . If you give a Chief Constable on the one hand the law, and on the second hand as clear and comprehensive an explanation as you can of the policy objective of the law, then he is in a better position to make the actual instruction which will be sent to the constable on the beat. But in order to do that it is really, in my view, only fair to brief him properly first, and ultimately the responsibility for the central government briefing must come from the [department of] central government that has been involved in creating the situation.”

218. The Chief Constable got no such briefing from the Ministry who issued the Requirements, and, indeed, the Explanatory Note was to some extent misleading. The information which is so important in the context of the subsequent accident at Hixon was tucked away on the sixth page of a great deal of technical detail. Without proper briefing the police were to be expected to realise the hazard of the slow-moving vehicle less readily than the hauliers, or British Railways, or the Ministry!

219. As for British Railways, since 1964 they appreciated the hazard of the slowly-moving vehicle for which the time cycle of the automatic crossing was

not sufficient. This hazard is not restricted to vehicles of the length of the Wynn's transporter involved in the accident, for a vehicle of less than half its length would not be able to cross safely at 3 miles per hour. British Railways imagined that the Emergency Notice and the provision of the telephone were sufficient to deal with this hazard and, as the Ministry, upon whom they relied to deal with problems of road traffic, seemed to think so too, they were satisfied. It is to be regretted that, having realised the problem, British Railways did not discuss it explicitly with the Ministry or instruct the Regional Civil Engineers' departments to notify as a caution on special order routes the presence of an automatic crossing and the condition that the driver must telephone before crossing. However, they were entitled to rely on the Ministry for advice and directions as to problems of road traffic, and I do not blame them for accepting the Emergency Notice.

220. I think that British Railways' principal contributions to the accident and their most serious faults were: (i) their failure to inform Robert Wynn and Sons Limited in their letter of the 29th November 1966, of the imperative necessity for them to ensure that drivers of their heavy vehicles used the telephone procedure, and (ii) their failure to inform heavy haulage contractors of the necessary safety precautions. They ought to have realised the grave importance of the risk to trains presented by the slow-moving vehicles ("like Pickfords'")* and, for that reason as well as because they had undertaken the local publicity, they ought to have ensured that full information, especially about the telephone procedure, was sent direct to heavy haulage contractors and such manufacturers as the English Electric Company. Messrs. Wynn and Pickfords Limited are the two largest heavy hauliers, yet British Railways did not send information even to the latter. The Railways' officials did not ponder to whom the information might most profitably be sent. Rule 107 had reminded them of the slow-moving vehicle problem; though the Rule was not apt for modern vehicles, the same problem remained and they surely should have thought what measures are now appropriate instead of the former rule that the stationmaster should request users of traction engines to give reasonable notice.

221. Mr. Lionel Read, counsel for the Ministry of Transport, said that "such responsibility as the Ministry should properly bear, it accepts collectively". The Ministry's posture in the whole of this Inquiry has been impeccable, and I agree that it is proper to deal with it collectively because the slow-vehicle hazard with its risk of catastrophe has been present ever since the first automatic crossing was installed in 1961, but the number of officers within the Ministry who have been concerned with these matters over the years have been far more numerous than those who are now available as witnesses. Moreover, the Ministry consists of a number of large departments, each of whom may gain a piece of knowledge which, added to what another department knows, might produce realisation of a particular fact but it is sometimes inevitable, to use the words of one witness, that "with the best of intentions on the part of the individuals concerned, something is likely to fall between the interstices of the administrative net". Unless the amount of paper in the Government service is infinitely increased, it is not practicable to prevent such a mishap absolutely.

* See paragraph 157, *supra*.

222. I am satisfied that within the Ministry it was known from early in 1964 that there was a problem in regard to the use of automatic crossings by slow-moving vehicles, and that some time later it was appreciated that abnormal special-order vehicles were the kind of vehicles which could cause such a problem. I do not accept that all officers of the Ministry were thinking only of agricultural vehicles; but, having thought of the problem, they did not clearly realise that it presented a grave danger. It was never discussed between the various departments nor with British Railways and never as a special problem in the Railway Inspectorate. Mr. Holland, in charge of the Route Section, got nearest to the point when considering whether automatic crossings should be notified as cautions on special order routes, but established precedent dimmed the vision.

223. It seems astonishing that, though so many talented and thoughtful men had the full facts in their minds, the essence of the matter did not occur to any of them. For that reason, it is most important to keep the problem in its proper perspective. There are 13,000,000 registered road vehicles in Britain but only a few abnormal indivisible loads: in 1967 there were 850 special order journeys, representing a vehicle mileage of 30,000 miles, whereas the total vehicle mileage of all road traffic is estimated at 100,000 million vehicle miles. Moreover, most special order vehicles, even of the length and weight of the transporter involved in the accident at Hixon, have a normal travelling speed of about 10 miles per hour, which would allow ample time for it to traverse the crossing before the arrival of a train. Most commercial vehicles nowadays travel at almost the speed of private motor cars; but assuming, for example, that a vehicle is traversing a crossing at only 14 miles per hour, and the lights begin to flash as it is crossing the stop line, it will not only have cleared the crossing but will be 150 yards away on the further side before the train arrives. Such were the considerations which the officers of the Ministry had in mind: no one directed his mind to the possibility of a vehicle moving at walking speed.

224. Despite such considerations, I think the failure to appreciate the problem was due to a wrong approach in two ways. Firstly, the officers of the Ministry relied too much on statistics. For instance, the risk of a vehicle stalling on a crossing, rather than anywhere else on the 200,000 miles of roads in Britain, was accepted as very remote because it is statistically minute. But, of course, there are many reasons why vehicles may stall on crossings and not elsewhere, such as panic on the part of the driver when the bells suddenly ring, grounding, starting from the stop line in the wrong gear, etc. Likewise, most drivers slow down over level-crossings, especially if there are problems of clearance or where (unlike at Hixon) a heavy vehicle is going up hill.

225. Secondly, and perhaps more importantly, both the Ministry and the Railways' officials, in adopting the Dutch system, calculated the time cycle by considering how long a warning by flashing red lights was necessary to bring to a halt a vehicle approaching at 60 miles per hour; then how long was needed for the barriers to descend; and finally what was the minimum safety margin to be allowed before the arrival of the train. In this last detail, the officers of the Ministry were obsessed with the possible, or, as they thought, the probable, zig-zagging motorist, to defeat whom the time must be kept to the minimum. But if the last detail had been thought of in terms of how long it would take the longest and slowest vehicle to clear the crossing, the slow vehicle hazard

would probably have been appreciated from the beginning. It was fallacious to regard road traffic as a homogeneous entity.*

226. As the telephone procedure was essential to the safety of half-barrier crossings, it was singularly inept to hide mention of it away in the Requirements and I refer to the passage I have quoted from the evidence of Mr. P. L. Taylor† which is applicable as much in the case of laymen as of Chief Constables. It is not clear to me what purpose the Ministry imagined was to be served, or object achieved, by sending to lay bodies, even such as the Road Haulage Association, a document described as “an essential guide to the Railways when selecting sites”, and which contained so much of a technical nature as might induce a layman not to read it. I believe that the responsible officers of the Ministry had no clear reason for sending the Requirements, but they expected the Explanatory Note to be read and understood by all addressees. In that case, it was obvious that the importance of the telephone procedure should have been emphasised in the Note.

227. I agree with the general principles behind the Ministry's decision not to embark on a national publicity campaign, but I think that they, perhaps even more than British Railways (since the Ministry was looking after the interests of road traffic) were at fault in failing to appreciate the desirability of sending information direct to the main road haulage contractors.

228. Moreover, the Ministry's lack of understanding and foresight led to the unhappy format of the Emergency Notice. I find no other explanation for their failure in 1965 or 1966, when they realised that the telephone was intended for use by drivers of slow-moving loads, to realise that the Notice which they had until then regarded as needed primarily for emergencies required revision. They thought it was enough, but it is now admitted that it was wholly inadequate.

229. In my judgment, the Ministry knew the problem and ought to have recognised the inherent danger of the slow-moving loads of all kinds, at least from the date (July 1964) when automatic crossings were being installed in busier places than previously. They ought then to have taken the steps they have now taken and which I have enumerated in paragraph 183 above. The decision which most directly affected the accident at Hixon, namely the decision in 1966 that no caution relating to automatic crossings should be included in special order routes, was wrong; and I think it ought to have been plain to those who made the decision that it was wrong, because these “revolutionary” crossings were not normal traffic hazards—their dangers were invisible and, like the strength of bridges, could not be detected without special knowledge.

230. When the Ministry and British Railways decided that the responsibility for safety at level-crossings should be transferred from the Railways to the public on the road, it behoved them to make sure that the public knew of that change and knew what they had to do. There can be no doubt that, in collaboration with the Railways, Mr. Scott-Malden and the officers of the Railway Inspectorate gave the most conscientious and careful thought to all questions of safety at these new level-crossings and it is, therefore, tragic that the proper way of dealing with and eliminating the comparatively infrequent hazard of the slow-moving abnormal vehicle escaped them. Such oversights may be inexplicable, but they are not unknown. Therein lay the origin of an accident which was both foreseeable and avoidable.

* *Supra* paragraph 187.

† *Supra* paragraph 217.

PART TWO

Out of this nettle, danger, we pluck this flower, safety.

I. GENERAL CONSIDERATIONS

231. The second part of the terms of reference contained in the Order constituting this Court of Inquiry requires the Court "to inquire generally into the safety of the system of protection of railway level crossings by automatic half-barriers, and to make recommendations". Much of what I have said in the first part of this Report is relevant to this general aspect of the matter, pointing out what lessons may be learned and what needs amendment. At the outset, I wish to say that, under the direction of Mr. C. P. Scott-Malden, who is now a deputy secretary, the Ministry of Transport presented to the Court a most valuable and helpful paper, prepared by experts in the Ministry after many weeks of intensive study, reviewing the whole area of this part of the Inquiry. The assessors and I are indebted to them for their assistance.

232. Nobody, least of all railwaymen, likes a level-crossing of any kind: a former President of the Netherlands Railways described it as "Public Enemy No. 1" and Sir Henry Johnson wished he could see them disappear, but conceded "we have got to live with them". It is interesting to recall that in the Report of the Royal Commission on Transport published in 1929 the following passage occurs:—

"In view, however, of the serious nature of the accidents which have taken place at railway level crossings and of the obstruction which these crossings constitute, we cannot refrain from expressing our opinion that the time has arrived when these should be abolished altogether . . . We consider that the Department should, without delay, formulate and give effect to a programme on a very much wider scale for the speedy elimination of these crossings on all classified roads and the substitution therefor of bridges and tunnels. The only difficulty is that of cost . . ."

Of course, the Commission was dealing with the accidents and obstructions occasioned by the traditional heavily-gated crossings, to which there was no alternative in 1929, and though the quantity of road traffic has since multiplied six-fold, I am not confident that they would express the same opinion today.

233. It is beyond argument that the safest and most convenient form of crossing of road and rail is a bridge or tunnel, but I am not required by the terms of reference to resolve conflicting claims between bridges and level-crossings: if I were, this part of my Report would be much abbreviated. It has not been suggested that if I, with the concurrence of the assessors, were to find that automatic crossings were not acceptable for continued use in Britain, Government policy might be, not to return to the *status quo ante*, but to embark on a nation-wide conversion of level-crossings to bridges. It may, however, be useful to record that there are now 2,425 public level crossings on British Railways, and the average cost of building a bridge over a railway at a simple rural site such as Hixon is estimated to be not less than £100,000. Of course, at complicated urban sites the costs and other problems would be much greater. The most costly instance which was cited was the replacement of a level crossing by a bridge on the A.56 Edenfield-Rawtenstal by-pass, involving dual 24 feet carriageways for over three miles, which cost £3,620,000. Obviously, even if it fell within the terms of reference, the cost of building rules

out bridges as a practical alternative to the immediate object of this Inquiry and, indeed, at places like Hixon, would be rather ludicrous. But, taking a long view, the increasing quantity, speed and weight of road vehicles, and the possible increase in the speed of trains to 125 miles per hour or more, will make it ever more necessary to consider bridging instead of level crossings.

234. The railway trade unions, like many other bodies, have always been anxious and vigilant about the safety both of the trains, with their crews and passengers, and of children straying onto the line, at automatic crossings. We have had the advantage of hearing the evidence of two train drivers of many years' experience, Mr. George Bridges and Mr. Reginald James Stuart, who claimed to be echoing the opinions of their fellows. One can readily understand the feelings of an engine driver who sees, as Mr. Stuart described, a large lorry or petrol tanker going over the tracks little more than a quarter of a mile ahead of his train as it bears down on the crossing at 90 miles per hour: such a sight violates all that drivers have learned over long years of experience about the safety of their path. It is difficult to convince them that, if the vehicle crosses while the barriers are still upright, the train will take at least 18 seconds to reach the crossing, by which time the lorry will probably be more than 100 yards clear of the railway. Of course, what mainly worries Mr. Stuart and Mr. Bridges and their fellow drivers is the possibility that the lorry will stall across the rails. In *The Guardian* of the 30th April 1968, the editorial opinion was expressed that "there is something fundamentally wrong with a system which means that the train cannot be stopped before it reaches the crossing", and that view corresponds with the feelings of many railwaymen and others. I confess that when this Inquiry began I held the same opinion.

235. Other organisations have also expressed great anxiety, particularly in regard to children and pedestrians. Before the accident at Hixon little, if anything, was heard about apprehensions as to the safety of motor traffic.

236. It is my task, with the assistance of the assessors, to inquire into the safety of the automatic half-barrier protection of level crossings. That task may be defined by the three questions:

- (i) Is it necessary or desirable to replace the traditional gated level crossings with automatic crossings?;
- (ii) If so, is it justified in terms of safety?; and
- (iii) If the answer to those two questions is in the affirmative, can anything more be done to make automatic crossings as safe as humanly possible?

237. Safety is a relative concept varying in proportion to its opposite, danger. It is almost impossible to remove absolutely the risk of accident from any form of human activity, and it is a truism that many forms of progress, though producing greater safety than of old, bring with them possibilities of greater catastrophe: the jet aeroplane, the motor car, motorways, and express trains, all are liable to produce serious loss of life but they have been accepted by the public because the advantages they bring outweigh the inescapable risks. Safety can, in a sense, be bought like any tangible commodity—the higher the price paid, the better the safety; and, in assessing the degree of safety to be acquired, one must put into the balance, on the one side, the magnitude of the danger to be eliminated and, on the other, the sacrifice in money, time,

convenience, material resources (and the neglect of other pressing safety needs elsewhere) involved in eliminating that danger. Every road casualty costs the nation £1,450, and one must strive mightily to avoid the loss of even one life, but it would be a misguided action to spend £100,000 to build a bridge in order to save one life at a level-crossing if doing so would leave no funds or other resources to eliminate a narrow road bottle-neck or blind bend, where ten lives are lost every year. There is no such thing as unbounded resources for every desirable reform.

238. Are automatic half-barrier crossings really necessary? As I have said, when reciting the history of their introduction into this country, there were two principal reasons for wanting them:

- (i) the saving in costs and manpower as compared with the manned crossing;
- (ii) the avoidance of delays to road traffic.

The cost of manning a busy level crossing of the old type on a three-shift basis can be as much as £3,500 per year, and it is estimated that the conversion of each old crossing to automatic half-barrier operation saves British Railways between £900 and £3,500 each year. Sir Henry Johnson, Chairman of British Railways, in his evidence, estimated that the annual saving to his organisation by the total abolition of gated level crossings would be "in the order of £2,000,000", and others have given a higher estimate.

239. Economic gains also flow to the nation from the easement of road traffic, though these are not so precisely quantifiable. The old manned crossings were usually interlocked with the railways signal system, and that fact caused long periods of closure against the road because of the long braking distance* required by trains, the average time of closure for fast trains being three or four minutes, and for slower trains five or six minutes. On occasions when two trains, travelling in opposite directions, passed over the level-crossing too close in time to allow the keeper to open the crossing in the interval between them, the road traffic might well be delayed for eight minutes or more.

240. The modern railway signalling system must be understood. Using electric circuits, it involves two signals, namely the distant (amber and green) and the home (red and green). As a driver of a train approaches the distant signal it informs him of the probable aspect of the home signal: if it shows its green light the driver may rely upon the home signal being at green and clear for him to proceed, without reducing his speed. But if the distant signal is at amber, the train driver is warned that he may find the home signal at red and, consequently, he must immediately begin reducing speed so that he may be able to stop at the home. A train driver requires a "sighting distance" of about 600 yards before reaching the distant signal, which at a speed of 85 miles per hour, means a running time of about 15 seconds. From the distant to the home signal there must be sufficient time for the train to stop, which, again at a speed of 85 miles per hour, would be 1,500 yards on the level*, or 36 seconds in time. Therefore, the train needs 51 seconds' warning before it reaches the home signal, which is usually placed about 250 yards from the level-crossing lest, in inclement weather or for various technical reasons affecting the braking distance, the train cannot be halted at the signal. (In the calculations of timings which are

* See Appendix XIV.

given in paragraphs 295 *et seq.* and in Appendix XIII, it is assumed for the purpose of arriving at the minimum timings that the stop signal can be put only 50 yards from the crossing.) To all those calculations must be added the time taken by the signalman or crossing keeper to close the gates before setting the signals at clear for the train; and, of course, there is a tendency on the part of railway staff to "play for safety" and close the heavy gates too soon rather than just in time.

241. By eliminating interlocking with railway signals, and relying only on the initiating treadle to give a signal to road traffic (but not to the train driver), automatic crossings are enabled to function in a "brisk operation", which has been proved to diminish very considerably the traffic blocks that used to occur at level-crossings and to provide a free and easy flow of traffic. On my visit to the Continent with the assessors I saw the improved situation clearly: it is illustrated by the two photographs, plates 7 and 8 of Appendix X, which show the experience of the Netherlands Railways, before and after conversion of a busy crossing to automatic half-barriers.

242. Not only does the automatic barrier provide a shorter time of closure, but because of its rapid operation it may be opened and closed far more frequently than the old type of crossing, with the result that the impediment to road traffic is for, say, three short periods, whereas previously it would have been for one long closure extending over twice the total time of those three brisk operations, as can be seen in diagram 7 of Appendix XIII. The Netherlands Railways have established that, at a busy level-crossing where there are frequent trains, automatic operation reduces the loss of time for road traffic by 75 per cent and, furthermore, 75 per cent of the traffic which would previously have had to wait is not now interrupted at all.

243. The benefit to road traffic in Britain is similar but, as our experience has been much shorter than in France or Holland, and since we have no automatic crossings yet at busy and complex urban locations, as have the Netherlands Railways, the benefit to road traffic in our own country has to be demonstrated theoretically. The following calculations submitted to the Court by the Ministry are based on data provided by a census taken at specified level-crossings before their conversion to automatic working:—

Location	Vehicle hours lost with manned gates	Vehicle hours likely	
		to be lost with automatic half-barriers	Saving in vehicle hours per day
Hensall ...	78	$3\frac{3}{4}$	$74\frac{1}{4}=95\%$
Beckingham ...	43	$3\frac{1}{4}$	$39\frac{3}{4}=92\%$
Ferring ...	36	$2\frac{1}{4}$	$33\frac{3}{4}=93\%$
Whyke Road ...	26	$2\frac{3}{4}$	$23\frac{1}{4}=90\%$

244. It is, therefore, in my opinion, well established that automatic crossings result in considerable benefits to road traffic and to the economics of British Railways. For the first of those reasons, according to the evidence, many local authorities, particularly in East Anglia, have actively urged the Ministry and British Railways to introduce automatic crossings into their districts, subject, of course, to the proper standards of safety being maintained, and the Road Haulage Association and the motoring organisations, who warmly welcomed the introduction of the new devices, advocate their continued use. Mr. Lloyd-

Eley, counsel for the A.A. and R.A.C., while maintaining the ideal of bridging, put his clients' attitude as follows:—

“One is concerned with the safety of automatic half-barriers, and the motoring organisations put forward the view that safety in that context means not ‘absolutely safe’, but ‘reasonably safe’, having regard to all the circumstances. Their submission is initially that the automatic half-barrier crossings are an efficient and inexpensive tool for certain classes of crossing. . . . And my submission on behalf of these motoring organisations is that this system of automatic half-barriers, without the protection of interlocked signals, can be reasonably safe, and brings advantages to both road and rail.”

The Chief Electrical and Signals Engineer of the Netherlands Railways told us: “In Holland, we can't make them quick enough because everybody is asking for them”.

II. REVIEW OF SAFETY AND HAZARDS AT AUTOMATIC LEVEL-CROSSINGS

(i) General

245. In assessing the safety of automatic crossings, it is useful and instructive to begin with a comparison of the safety record of the old manned level-crossings, most of which were protected by signals interlocked with the gates, and of the automatic crossings, none of which have any protection from railways signals. Since our experience of automatic crossings in Britain has been shorter than that of other countries, I propose also to include a comparison with the accident statistics in six other countries of Europe.

246. Between 1961 and 1967 the number of level-crossings with manned gates or barriers was reduced, mainly by branch-line closures, from approximately 4,386 to 2,093. The number of accidents at these manned crossings did not however show a proportional decline, the figure for 1967 being 106, compared with 124 in 1961. The full figures are as follows:—

	<i>Manned Crossings</i>	<i>Total Accidents</i>	<i>Accidents Involving Casualties</i>	<i>No. Killed</i>	<i>No. Injured</i>
1967	... 2,093	106	18	7	17
1966	... 2,572	104	18	6	12
1965	... 2,712	128	17	10	21
1964	... 3,243	146	17	8	21
1963	... 4,386 (approx.)	138	25	11	26
1962	... 4,386 (approx.)	165	15	6	17
1961	... 4,386 (approx.)	124	16	11	9
Average per year	... 3,398	130	18	8	18

247. During the four years 1964/65/66/67 the accidents statistics for automatic half-barrier level-crossings were as follows:—

	<i>Britain</i>	<i>Belgium</i>	<i>France</i>
Number of automatic crossings	15/56/124/205	247/296/363/434	1,746/1,905/ 2,057/2,215
Number of collisions with trains	0/1/0/3	3/5/8/2	19/17/16/27
Number of persons killed	0/0/0/1	1/4/5/2	9/2/7/6
<i>Germany</i>	<i>Italy</i>	<i>Sweden</i>	<i>Holland</i>
241/292/345/410	79/88/99/129	151/161/168/174	262/294/329/345
7/17/7/21	3/3/0/5	2/3/2/5	16/18/20/26
0/10/0/6	5/2/0/2	0/4/0/3	3/7/5/8

248. To complete the statistical picture I must mention unguarded level-crossings. Between 1961 and 1967 the number of private occupation and accommodation crossings was reduced from approximately 19,701 to 12,481, the latter including six crossings fitted with automatic half-barriers. The number of public level-crossings without gates or barriers was reduced from approximately 281 to 126, the latter including 39 crossings equipped with miniature red/green lights operated by the train. The total accident figures at these two types of crossing, added together for convenience, were:—

	<i>Unguarded Crossings (Public and Private)</i>	<i>Total Accidents</i>	<i>Accidents Involving Casualties</i>	<i>No. Killed</i>	<i>No. Injured</i>
1967 ...	12,607	55	29	8	31
1966 ...	13,236	49	23	13	16
1965 ...	14,474	70	33	12	35
1964 ...	15,997	69	38	17	42
1963 ...	19,982 (approx.)	73	33	14	28
1962 ...	19,982 (approx.)	68	26	13	30
1961 ...	19,982 (approx.)	69	42	20	55
Average per year ...	16,609	65	32	14	34

249. To summarise the above, during the years since 1961 in this country an average of 8 people have been killed each year at manned crossings, and another 14 people at unguarded crossings. It is probably too early to make any valid statistical comparison with the casualty figures at automatic crossings in Britain, but if one totals the figures for the seven European countries, including Britain, listed in paragraph 247, one sees that on average 23 people a year were killed during the period 1964/7. During this period an average of 3,300 automatic crossings were in use in the seven countries.

250. Apart from the accident at Hixon there have been seven accidents involving collisions between motor vehicles and trains at automatic crossings in this country. Eight people were killed in these accidents, five of them at Trent Road, Beckingham, on 16th April 1968*. The first accident in this country,

* See paragraph 266 below.

at Cleghorn on 11th December 1965, in which two people were injured, also resulted from a car stalling, in this case as a result of confusion on the driver's part on seeing the flashing of the secondary red lights (which were at that time situated facing him on the far side of the crossing). As a result the duplicate lights at all automatic crossings are now sited on the off side of the road on the approach side. The remaining five accidents* all resulted from drivers zig-zagging around the barriers after they had descended. In no case was there any fault in the barrier equipment.

251. The statistics relating to automatic crossings in Holland are very interesting when it is realised that the "traffic moment"† is exceptionally high, and in not a few instances amounts to as much as $3\frac{1}{2}$ million. This is to be compared with the fact that the S.N.C.F. in France regards a traffic moment of 500,000 as a practical maximum for automatic crossings. The Netherlands Railway officials have given those calculations in a different form, that is to say relating the number of accidents and casualties with the number of automatic half-barrier crossings in operation between 1960 and 1963 (5,000 "automatic half-barrier months") and these show that at every automatic crossing there would be a collision with a train once in 18 years, and a fatality once in 70 years. Nevertheless, in 1964, 1965 and 1966 accidents involving collisions with trains have been 6.1 per 100 automatic crossings but less than 2 per 100 manned full barrier crossings: the difference is explained by the much lower "traffic moment" at the latter.

252. I have studied a description supplied by Mr. Hendrik de Vos tot Nederveen Cappel, the Chief Electrical and Signal Engineer of the Netherlands Railways, of the 20 accidents in 1966 involving collisions with trains at automatic crossings in Holland. Three such accidents occurred owing to a vehicle stalling on the crossing because of a mechanical defect; two occurred when the driver (of a lorry on each occasion) was unable to stop owing to weather conditions, in one case because the road was slippery with frost and in the second because of thick fog; two were due to drivers negligently running through the lowered half-barrier; and three were cases of drivers zig-zagging through the open sides of the crossing. One nine-year-old child, who strayed on to the line while playing with friends, was fatally injured.

253. A curious feature of the accident statistics in Holland is the number of collisions with moving or closed half-barriers. In 1966 there were 82 (25.5 per hundred crossings) such collisions at automatic crossings, and in the same year at manned crossings with full barriers there were 23.5 collisions with moving or closed barriers per hundred crossings. Mr. de Vos was unable to explain the continued incidence of these accidents, which are on occasions so severe that people are killed or injured, but they may reflect a certain standard of indiscipline among motorists and cyclists.

Reliability of Equipment

254. One of the possible causes of danger at automatic crossings is, of course, failure of the equipment. As I have said before, it is designed to "fail to safety" so that road traffic is given the danger signal until a railway employee arrives to attend to the breakdown, and the police come to control the traffic. Nevertheless, there have been occasions when there have been "danger-side" failures.

* Three in 1967 and two in January 1968.

† See paragraph 19.

A fault may be such that no indication of danger is given (referred to as a "danger-side failure") or it may affect only part of the equipment, leaving other parts working properly, e.g. the lights may flash but the half-barriers fail to descend or *vice versa*, which is known as a "partial danger-side failure". The following tables show the details of all such failures since 1964.

TABLE A
DANGER-SIDE FAILURES

			1964	1965	1966	1967	Total
Number of Crossings	...	...	15	56	124	205	
Type of Fault:							
1. Faulty track relays	...	—	—	1	2	—	3
2. Faulty local button	...	—	—	1	1	—	2
3. Failure of both flashing lights	...	—	—	—	1	1	2
4. Equipment under repair	...	1	—	—	—	—	1
5. Error in Controls	...	—	—	—	—	1	1
6. Earth fault	...	—	—	—	1	—	1
7. Rusty rails	...	1	3	2	1	—	7
8. Ballast on rails	...	—	—	1	—	—	1
9. Malicious interference	...	—	1	—	—	—	1
Totals	...	...	2	6	8	3	19

TABLE B
"PARTIAL DANGER-SIDE" FAILURES

			1964	1965	1966	1967	Total
Type of fault:							
1. Faulty track relay	...	13	5	3	—	—	21
2. Faulty local button	...	—	—	1	2	—	3
3. Failure of one flashing light...	...	—	3	2	—	—	5
4. Faulty hydraulic posts	...	2	2	2	1	—	7
5. Faulty bells	...	2	9	5	24	—	40
6. Faulty Contactor	...	—	3	14	2	—	19
7. Faulty boom lights	...	—	—	—	7	—	7
8. Track Circuit fault	...	—	1	—	—	—	1
9. Flat battery	...	—	—	7	2	—	9
10. Miscellaneous	...	—	2	3	12	—	17
11. Alleged by motorists	...	5	5	3	2	—	15
12. Wind delayed fall of barrier	...	—	3	2	3	—	8
Total	...	...	22	33	42	55	152

255. Of the 19 "danger-side" failures reported in the years 1964 to 1967, only the first three appear to be attributable to faulty equipment. Initially faulty components were replaced by components of improved design and efficiency, which seems to be borne out by the fact that in 1967 only one failure (of lights) appeared in the list of faults. Items 4, 5 and 6 of Table A are faults concerned more with maintenance than with mechanical defect, and again the figures for 1967 show improvement with only one such fault. Items 7 and 8 are of physical origin and emphasise the importance of the provision of two or more "strike-in" treadles or systems, e.g. as at Hixon where there were duplicated strike-in treadles as well as

electric track circuit. This fault is found not to occur on the very busy routes of the Southern Railway third rail electrification system because the rails are always bright and conductivity is good.

256. Of the "partial danger-side" failures, items 1 to 7 of Table B are attributable to faulty equipment though some may have an element of faulty maintenance. The faulty bells and faulty lights on the boom are perhaps only technically within the category of a "danger-side" failure, since the rest of the equipment functions satisfactorily and, therefore, an accident would be unlikely.

257. In the early stages certain components proved defective, but they were re-designed and replaced by more efficient mechanisms so now the whole equipment is working more reliably, though of course one can never eliminate the risk of a defective batch of components being produced by a manufacturer. Eternal vigilance by the maintenance staff is required, as in many other fields where the lives of men depend upon the functioning of machinery.

(ii) The Safety of the User of Automatic Crossings

258. The time sequence of operation of automatic half-barriers has been worked out with the object of achieving safety. In paragraph 39 of Part One of this Report, I indicated the phases of the time cycle for the operation of the automatic half-barriers, namely:—

- (i) flashing red lights after train strikes-in ... 6 to 8 seconds;
- (ii) descent of half-barriers ... 6 to 8 seconds;
- (iii) interval before arrival of fastest train on crossings 12 to 8 seconds.

It will be remembered that the minimum time of a total of 24 seconds is determined by the distance of the strike-in treadles from the crossing, and so item (iii) above would in fact be the balance between the total of the first two phases and 24 seconds. The factors leading to the fixing of the time in each of the above phases were as follows:—

- (a) The *initial warning period* must be long enough to enable the driver approaching the crossing at high speed to take action in time to allow him an adequate stopping distance before reaching the crossing. Assuming, as the Ministry did, an approach speed of 60 miles per hour, the stopping distance shown in the table on the back of the *Highway Code* is 60 feet "thinking time" plus 180 feet for stopping. Since that calculation is based on ideal conditions, for safety's sake the Ministry decided to double the stopping distance of 180 feet and, adding to it the 60 feet reaction time, arrived at a total stopping distance to be allowed of 420 feet. At a speed of 60 miles per hour it would take driver of a car 5 seconds to travel that distance. Moreover, observations made by the Road Research Laboratory show that, at 65 miles per hour, 90 per cent of drivers will elect to stop at a stop signal if given 5½ seconds' warning. Using those data, Mr. B. M. Cobbe, Superintending Engineer in the Ministry of Transport, and his colleagues, took a period of 7 seconds as ample for the warning period, particularly as this would indeed provide for approach speeds of up to 70 miles per hour, and thus the Requirements provide for a warning period of 6 to 8 seconds, allowing for mechanical variations. A driver approaching at 60 miles per hour (which equals 29½ yards per second) who was unable

to stop before reaching the half-barriers because the lights began to flash when he was nearer than 420 feet, would be able easily and safely to clear the crossing before the barriers descended.

- (b) The *period of descent* of the half-barrier is merely a function of practical design of the equipment. It is a good thing to have the barrier descend fairly rapidly since that gives the affair a decisive appearance, and a too leisurely descent would perhaps encourage people to think that they had a good chance of dodging under the barrier while it was descending.
- (c) The *final phase* before the arrival of the train has been calculated, partly, to allow a vehicle which has already reached the crossing before the barriers started to descend to clear the railway lines. But the principal objects of keeping it to the minimum were to save delays to road users and, by its brevity, to deter impatient motorists from the temptation to zig-zag round the open side of the crossing. That consideration for the ill-disciplined driver has been very much to the fore in the minds of the Ministry, as it was in the minds of officials of continental railway systems, from the outset. The time phases are adequate for 95 per cent of all traffic on the roads of Britain, since it moves at more than 20 miles per hour.

(a) *Pedestrians and Children*

259. When considering the safety of automatic crossings it is necessary to review the interests of all those different kinds of people who must be expected to use them. Firstly, pedestrians, especially children. Quite naturally, since the first automatic crossing was installed in this country a good deal of apprehension has been expressed by the public as to the safety of children, and these fears were put into words by Professor Colin Buchanan, Professor of Transport at the Imperial College of Science and Technology, after he watched the film which is used in schools for the instruction of children:

“As I watched the film, which was shown on the first day of the Inquiry, I could not suppress a shudder at the sight of little children standing within 6 feet of an express train with no other protection than a white line. I had the same feeling when I recently watched unaccompanied children on horseback making their way over one of these crossings.”

Those fears are entertained by all responsible people. In his Report published in 1957 after his return from leading the working party on the first visit to continental railway systems (see paragraph 22 of Part I of this Report) Colonel McMullen (who is, of course, no less responsible and humane) expressed a different view:—

“We have not overlooked the safety of pedestrians, although we feel that their attitude to the level crossing requires to be changed. The belief that pedestrians and particularly children must be afforded full protection against the dangers of the line is nowadays illogical. There are many level crossings where adults and children already have free access to the railway, viz. public level crossings with controlled gates but uncontrolled wickets, footpaths and accommodation and occupation crossings with wicket gates or stiles. Crossings of these types exist on the most important main lines and also on lines electrified on the third rail system. Furthermore, the dangers to which pedestrians are exposed on the roads are at least as great and certainly more frequent than those at level crossings.”

260. When giving evidence before the Committee of the House of Commons on the British Transport Commission Bill in 1957, Mr. J. H. Fraser, who was then the Chief Signal Engineering Officer of the British Transport Commission, was asked about the safety of children and expressed confidence that children would behave "in the same way as children observe safety rules on a street. If they walk along a pavement, they know what happens if they step off the kerb. In the same way, they would know how they should go over crossings; and I think it is probably fair to say that one of the modernised railway crossings would be as safe if not safer than a street crossing." (The analogy of a cross-roads is not exact because, of course, cars can swerve or stop in a way that trains cannot; and on a level-crossing it is conceivably possible that a child could get its foot trapped in the gap between the rail and the road surface.)

261. There is, of course, no physical obstruction to prevent children straying on to a railway line under the present half-barrier system, whereas at the old gated crossings, though there were, as Colonel McMullen wrote, wickets through which children could gain access to the line, those wickets did constitute an apparent barrier and some discouragement to their going on the line when the main gates were shut. There is now nothing but a white stop line to mark the limit of a child's progress. However, though I still feel anxious, reason persuades me that Colonel McMullen's approach is right, and is in accordance with the universally accepted policy of modern times that fast traffic should not be banned because there is some risk to pedestrians and children: a child can be taught to be as safe at a level crossing as on the pavement beside a fast motor road or crossing a busy London street.

262. The children's safety depends, of course, on their education in the proper use of automatic crossings, and the instilling of a strict sense of discipline in the matter is of vital importance, at least as much as on the fast roads of a busy city. Fortunately, experience hitherto suggests that the education of children in the schools by the local publicity material distributed by British Railways and by lectures given on behalf of the Railways has had good effect, because there has yet been no accident in Britain involving a child straying on a railway line at an automatic crossing. I was told by senior officials of the Netherlands Railways that there have been few accidents in Holland involving children, but more involving old people: they felt that old people found it very difficult to learn how to use these crossings, and that children were the best behaved section of the entire public. Mrs. Cynthia Russell, who lives in the house adjacent to the level crossing at Hixon, has a seven-year-old son; but she told me she is not worried about his safety because both his parents, and even more his school, have taught the boy about the crossing and she is sure he would never go on to the line.

263. Pedestrians should normally experience no difficulty and be at no risk. An ordinary person, with no physical handicap, can at ordinary walking speed traverse a crossing in less than 10 seconds and so, if he obeys the message of the flashing red lights and the ringing bells, and does not venture over the crossing after the train has initiated the operation of the automatic system, he will have more than ample time to reach safety if it should happen that he had already passed the half-barrier at the moment of strike-in by a train. Some may be aged, or infirm, but it seems to me that even they will have adequate time to reach the other side, even if they find themselves on the

crossing after the bells have begun to ring. Here again, adequate publicity should help to prevent their feeling panic at that moment.

(b) *Stalled Vehicles*

264. Of the ordinary stream of road traffic only the following require special consideration: the stalled vehicle, especially the hazardous vehicle, and long and slow-moving vehicles. I shall deal with the latter class in paragraphs 301 *et seq.* below.

265. The risk of vehicles stalling on a crossing existed before the introduction of automatic crossings, at manned level crossings which were not interlocked with the railway signals. In those cases the crossing keeper is informed by a bell signal that the train is about to enter his section and he must then close the gates against the road. If he fails to do so in time, or if a vehicle stalls on the crossing as he is about to close the gates, there is no fixed signal available by which he can stop the train, although he might be able to show a hand-signal and so reduce the extent of, or even prevent, an accident. When automatic crossings were introduced into England, it was realised that accidents involving a train colliding with a stalled vehicle on the crossing were not avoidable if brisk operation was to be retained as an essential feature. The problem was studied carefully, but the risk was accepted on the basis that the statistical chance of a vehicle stalling across the rails rather than anywhere else on the 200,000 miles of roads in Britain was very remote. It was thought that a light vehicle, such as a car or a light van, even if it did stall, could be pushed off the crossing without much difficulty (in my opinion, an over-optimistic assumption), or, if a train was not too close, the driver could inform the signalman of his predicament by the telephone. Unfortunately, experience has proved that vehicles have occasionally stalled on a crossing when a train is already imminent.

266. There are many reasons for that to happen, the most important of which is, perhaps, the human element. A timid driver may be startled on hearing the bells suddenly begin to ring and seeing the lights flash as he is about to reach the railway line; the shock may cause him to mismanage his vehicle so that it stalls. A classic example of this was the tragic accident which happened at the Trent Road automatic crossing, Beckingham, Nottinghamshire, on the 16th April 1968. Colonel J. R. H. Robertson, of the Ministry's Railway Inspectorate, held the official inquiry into that accident and I have had the benefit of studying his report. It appears that an Austin A40 private saloon motor car, with a driver and five passengers, halted clear of the down side half-barrier when the warning lights began to flash and became the leading vehicle of a short queue of motor vehicles that formed up behind it. A similar queue, headed by a lorry, formed up behind the half-barrier on the opposite up side of the crossing. A goods train, which had set in operation the automatic working of the half-barriers, passed, the warning lights ceased to flash, and the half-barriers rose automatically to the vertical. Thereupon, the leading vehicles of each queue of traffic, including the Austin car, were driven forward on to the crossing, but the lights and bells immediately began to operate again because of the approach of an express train on the up line which had struck in only a moment after the goods train had struck out, that is to say it presented the "critical second train situation". This sudden reversal of the message given by the extinguishment of the lights and the rising of the half-barriers caused confusion

and, no doubt, panic in the mind of the driver of the car and his engine thereupon stalled. Unfortunately, the car was in a defective state of repair and the self-starter was not working. The driver scrambled out of the car and tried to push it off the crossing, in vain. Within a matter of seconds, the train swept the car and its occupants and the driver away and they were all killed. That most tragic accident was occasioned by a natural human reaction, in a situation which must not be repeated.

267. Two other examples have been quoted to us. Mr. B. F. Larkinson, of Holbeach, Lincolnshire, wrote to his Member of Parliament describing an incident on the evening of the 20th March of this year when he was driving his car, with his wife and two friends as passengers. As he approached the automatic crossing at Algarkirk, the warning lights began flashing and the half-barriers descended, so he stopped, switched off his engine, and waited for a train to pass. That train having gone the lights stopped flashing and the half-barrier lifted, so Mr. Larkinson started his engine, engaged first gear and began to move. Suddenly, to his dismay, the lights began flashing again and the barrier *once more* descended. He had time to cross safely, but he panicked and tried to reverse to get back behind the barrier but was unable to do so. The barrier descended on the boot of his car and he remained beside the railway line while a fast train passed. Another alarming incident happened on the 15th April of this year at the Yapton automatic crossing, when a Ford Anglia two-door saloon, with driver and three passengers, came up to the crossing behind a car which was towing a boat on a trailer. The leading car, with its trailer, stopped on the crossing in front of the driver of the Ford car causing him to brake; his engine then stalled and he was unable to restart it. Unfortunately, at that time there were two trains approaching the crossing from opposite directions and they had passed the last signals which could arrest them. Therefore, although a retired railwayman living near by used the telephone in the pivot post of the half-barrier to telephone the signalman and inform him of the obstruction, the alteration of the signals was too late. Nevertheless, by the greatest good fortune, the driver of each of the approaching trains observed an object on the crossing from some distance and each applied his brakes in case the object did not clear their path. As a result each train was brought to a halt, one 40 yards from the car and the other only 5 yards from it.

268. It is plain that there are many situations, not all of which can be precisely foreseen, which will react upon the different temperaments of different drivers and may produce stalling at a dangerous moment.

269. There are, of course, other reasons why vehicles become immobilised, including mechanical breakdown. A particular and unusual instance of this occurred on the 25th January 1968 at the Leominster automatic crossing. At about 1.20 a.m. Mr. K. A. McLoughlin, a truck driver employed by Silver Roadways Limited, drove an articulated lorry, which was 42 feet long and 8 feet wide, along the A.49 road over the crossing. His vehicle was carrying a load of 30 tons of steel plates. In accordance with the general custom of heavy haulage drivers, he reduced speed, when he reached the level crossing, to 5 miles per hour and as soon as his front wheels had passed over the first railway track the flexible connection to the air brakes of his trailer became disconnected owing to its oscillation over the uneven surface of the crossing. The brake system on his vehicle corresponded with the Code of Practice for Vehicle Brakes prepared

and accepted by the Ministry of Transport and the manufacturers and operators of commercial vehicles, and, consequently, the accidental disconnection of the braking system automatically caused the trailer brakes to be applied immediately and to remain locked, so that Mr. McLoughlin was unable to move. As he was attending to the repair of this piece of apparatus, an approaching train initiated the automatic operation of the crossing; Mr. McLoughlin seized his torch and ran up the railway track towards the train to warn it. By emergency application of his brakes, the driver of the train, which happened to be a slow goods approaching on an up-gradient, was able to stop before a collision occurred. The disconnection of the brake mechanism on Mr. McLoughlin's vehicle was a quite extraordinary mishap because it was due to a manufacturing defect which only manifested itself at that moment, notwithstanding that the vehicle had completed 85,000 miles since manufacture. Further, it will be remembered that very low vehicles also may ground themselves as they pass over an unlevel surface on a crossing, as happened to Mr. Horton on the occasion of the incident at the same level crossing on the 8th November 1966 which I have described in paragraph 109 of the first part of this Report.

270. Hazardous vehicles are those which, irrespective of their dimensions, would, in collision with a train, cause exceptional damage or loss of life, e.g. a large petrol tanker or tanker containing corrosive liquids, which might envelop the train in flames or acid causing dreadful casualties, and vehicles carrying radioactive material or explosives. I would also include in this category buses and coaches from which emergency escape would not be easy and which, if in collision with a train, might produce many casualties. There are 5,000 petrol tankers and 78,500 buses and coaches registered in Britain. The view was expressed to the Court, however, that vehicles in this category are among the best maintained of all, and are the least likely to stall because of a mechanical defect.

271. Finally, one must consider vehicles which, if they become immobile on an automatic crossing, may cause the derailment of the train. I think there is a wide range of vehicles of this class, from the clumsy and slow-moving agricultural load, like combine harvesters, timber drays carrying the trunks of felled trees, fairground vehicles, military tank transporters, and all other vehicles which by reason of their height, width, or low ground clearance must be expected both to go slowly over a crossing and to be an accident hazard in respect of other vehicles which might be crossing in the opposite direction at the same time. The risk of a vehicle of such dimensions as are permitted under a "general order" movement stalling on a level crossing is comparable with the risks of special order movements which have been demonstrated by the accident at Hixon.

272. A great deal of thought has been given to the problem of the stalled vehicle by a great many people and by this Court but it is plain that there is no way of eliminating the risk completely except by full signal-integrated protection for the crossing, as described in paragraphs 291 *et seq.* below.

(c) "*Blocking-back*"

273. A hazard related to, and sometimes the cause of, stalling is that of vehicles "*blocking-back*", that is to say when a line of traffic is traversing a crossing and those in front are stopped by a sudden obstruction, such as cattle coming out of a farmyard, traffic coming out of a side road, cross-roads ahead,

roadworks and the like. When the leading vehicle halts those behind may be forced to halt on the crossing and cannot reverse off it, either because of cars immediately behind or because the half-barrier has descended. The risk of blocking-back is always considered at site meetings, and several applications for approval of conversion to automatic working have been refused on the ground that local conditions make it probable, but it may also happen because of temporary conditions such as I have indicated. It is, therefore, important that traffic should not go over a crossing in a line "nose to tail". In Holland accidents have happened in this way, and the Netherlands Railways have recently erected notices advising motorists to keep a distance from the car ahead. In this country "yellow box" markings are used on some automatic crossings for the same purpose.

(d) *The Zig-Zagging Driver*

274. It is not always the stalled vehicle which is the cause of obstruction on an automatic crossing; it may be the vehicle which is unlawfully driven onto the crossing after the half-barrier has descended. The driver of such a vehicle has been referred to as a "zig-zagger". Both on the Continent of Europe and at home in the Ministry of Transport and British Railways, those responsible for the arrangement and operation of automatic crossings have shown a concern for the zig-zagger amounting almost to an obsession; it is to defeat him that they have put such insistence on keeping the final phase of the time sequence as short as possible and it is for his sake that some possible modifications of the crossings have been rejected. Five out of the eight accidents which have occurred on British automatic crossings since 1964 have been caused by zig-zaggers. Though ones immediate reaction to the zig-zagger is that he is a reckless lawbreaker for whom one can have no sympathy, one must remember that he may involve innocent passengers in his car in a fatal accident, and that there is, according to the evidence, a possibility of his derailing the train. This possibility is remote, since it is unlikely that anyone with a vehicle larger than the private car or light van would be able to zig-zag through the open halves of the level-crossing.

275. It may be that this species of motorist may not be as numerous as feared, for a witness from Holland told the Court that the problem has decreased in his country with the growing intimacy with automatic crossings. He said the offence is usually found to be committed when the motorist is unobserved at a lonely place or when the crossing is close to his home so that familiarity has bred contempt. I take the view that the problem will diminish with the spread of knowledge that the waiting time will be very short, no more than at some road crossings; but, in any case, I consider that the interests of this reckless type of driver should not be given the highest priority.

(iii) **Conclusion**

276. Senior officials of British Railways and of the Ministry (like their counterparts abroad) are convinced that automatic crossings are as safe as, if not indeed safer than, the old manned and gated level crossing. The above statistics from Europe, as well as for the short time of our own experience, seem to corroborate this, though Professor Buchanan rightly observed that if one could relate numbers of accidents to numbers of people using the crossings it might be found that the fully manned crossing, integrated with railway signals, "has got the edge as far as safety is concerned". Nevertheless, Professor

Buchanan regards the automatic crossing, though with an instinctive personal apprehension, as an advance in accordance with the trend towards automation in modern times, and believes that, with some modifications, they may be regarded as acceptably safe. Indeed, the short experience in Britain of the use of automatic crossings, though at relatively quiet locations, shows that the accidents that have hitherto happened have been caused almost entirely by ill discipline.

277. Having studied the evidence with great care, and having watched automatic crossings in operation both in England and in Europe, the assessors and I have no hesitation in finding that they are reasonably safe and that their continued use is justified, with some further safeguards. The standard of safety in Britain, both for the old gated crossings and the new automatic half-barriers, has always been, and remains, outstandingly high.

III. POSSIBLE METHODS OF IMPROVING SAFETY AT AUTOMATIC CROSSINGS

278. I now propose to review the various suggestions for eliminating danger at automatic crossings. When considering the possible modifications of automatic crossings to improve safety one must keep in mind the costs involved in relation to the benefit gained, as, of course, both the Ministry and British Railways have to do. Mr. J. F. H. Tyler, Chief Signal and Telecommunications Engineer of British Railways, testified that the average cost of the installation of half-barrier equipment (with telephones) is not less than £7,850 each, and there have been some crossings which have cost as much as £28,000. The cost varies, of course, according to the difficulty of the site, e.g. whether the road requires to be widened, whether private property adjacent to the crossing has to be acquired, or the profile of the crossing has to be levelled for any distance. Alterations to the existing signalling apparatus, which will be more and more complicated as automatic crossings are introduced at busier locations, can add as much as 10 per cent to the total cost quoted. We have been given figures of the estimated costs of various additional items and amenities, which I quote here so that reference may be made to them when considering the proposals that are reviewed below:—

Provision of four lay-bys—£8,000.

Road widening and re-grading—£750.

Provision of dual two-lane carriage-ways on busy trunk road—£12,500
(£16,000 or more in urban areas)

Night lighting on trunk road—£1,000.

Presence detectors and associated signals, approximately £12,000.

(i) The Time Cycle

279. As the accident at Hixon demonstrated, there are abnormal and slow-moving vehicles for which the time cycle of automatic crossings is not appropriate. This applies not only to vehicles of the extraordinary length of Messrs. Wynn's transporter (148 feet) but to vehicles of much less size. A vehicle of the maximum measurements allowed under the Construction and Use Regulations to move on the roads without prior information to the police may be 55 feet long, and, in first gear, cannot move at more than 2 miles per

hour, so it will take 30 seconds to cross over two railway tracks. Consequently, it is evident that if any such vehicle passes the stop line at less than the speed mentioned, at the moment when the automatic operation of the barriers is begun, it will be unable to clear the crossing before a collision takes place. These vehicles are infrequent, and are probably not to be found in 95 per cent of the general stream of road traffic, but an increase of 8 seconds in the time cycle would accommodate them. In the case of the 55 feet long vehicle which requires 30 seconds to cross at a slow moving speed, an extension of 8 seconds would give it bare clearance, namely 32 seconds for its passage. However, in my view the increase of time is not necessary for these vehicles since they will be required to adopt the telephone procedure mentioned below; but it will be an advantage for pedestrians and for anyone who stalls on the crossing, or where traffic has "blocked back".

280. The inevitable objection has been raised that the longer operating cycle will act as a temptation to motorists to zig-zag; and the Ministry of Transport in their written evidence urge that, if the time is to be extended it should be by lengthening the final phase of the time sequence, i.e. when the barrier is down, because they say that if anything more than 1 or 2 seconds should be added to the flashing light warning period "it is virtually certain" that it would lead to widespread disregard of the lights. On the other hand, Mr. Scott-Malden believes that the 8 seconds added to the final phase would be of minor importance in this connection, although the Ministry wishes to have further time to study the effect on road traffic behaviour of any extension of the time cycle.

(ii) Second Train Sequence

281. In paragraph 42 I have described the arrangements for dealing with the approach of a second train while a first train is passing over the crossing. It will be remembered that in the "critical second train situation", where it has struck in the instant after the first train has struck out, the lights are extinguished and the barrier rises as soon as the first train has passed; but as soon as it attains the vertical, the barrier will fall again and the second train may arrive in as little as 18 seconds. This has two clear disadvantages, namely (a) that it gives the lie to the assurance implicit in the notice on the offside of the road which reads "Another train is coming if lights continue to flash" since the lights are extinguished as soon as the barriers begin to rise; and (b) for the heavy and cumbersome vehicle which is waiting at the crossing for the passage of the first train, and which will make a slow start, the time allowed is wholly inadequate. The first aspect of this matter was exemplified, as I have already recounted in paragraph 266, by the tragic accident at Beckingham in April. Secondly, I adopt as an example the articulated vehicle with an overhanging load making a total length of 55 feet, to which I have referred in paragraph 279 above. A typical vehicle of that type has a maximum speed in first gear of 2 miles per hour, though in any other gear it can travel at more than 3 miles per hour. If such a vehicle starts from the stop line after the first train has passed, it is likely to be in first gear and moving at 3 feet per second (2 miles per hour); it must travel 87 feet between the half-barriers before it passes the last point at which a train could strike it. That would occupy 30 seconds at that speed. Assuming a second train strikes in shortly after the barriers had started to rise, and the lorry driver had made a leisurely start occupying, say, 8 seconds, it follows that the vehicle

would not be clear to safety for 38 seconds but the train would have collided with it in 24 seconds (6 seconds while the barrier rises, plus 18 seconds before the second train arrives). (For crossings over more than two tracks or skew crossing where the length is more than 30 feet, of course the time will be extended.) If our recommendations are adopted, such a driver should use the telephone to obtain the signalman's permission before he crosses, but there may be a temptation for a driver, who has already been halted and who sees the train which has apparently necessitated the closing of the crossing pass by, to go forward. But more important, it is imperative to avoid the startled confusion which caused the harrowing accident at Beckingham in April, and for that reason alone the second train sequence should be amended.

282. It is possible so to arrange the apparatus as to hold down the barriers if another train is within 20 seconds of the normal strike-in treadle when the first strikes out, i.e. about 44 seconds before reaching the crossing. Thus, if the barriers rise (6 seconds) they will remain erect for at least 14 seconds before descending again and a driver will have 44 seconds to pass over the crossing. The result would be that road traffic would be held up, in the case of the second train being a fast train, for a total of 68 seconds, and, very occasionally, the delay may bring about a "third train coming" situation.

283. British Railways acknowledge the necessity for an alteration of the second train sequence, although Mr. J. F. H. Tyler emphasised the cost and complexity of this proposal. To increase the cycle by 20 seconds involves extending the controlling mechanisms 786 yards for a line with a maximum speed of 80 miles per hour or 980 yards for 100 miles per hour, and at 71 places the additional strike-in treadle will overlap one or more signals. Mr. Tyler explained that such alterations, if decided upon, would require to be brought into effect at the same time as other modifications in the system and would take about a year to bring about, but, at my request, discussions leading to the implementation of the improvement have already begun between the Ministry and British Railways.

(iii) Double Half-Barriers

284. There are two ways of defeating the zig-zagger, other than by the menace of the instant arrival of the train: first, by introducing double half-barriers, that is to say arranging for a complementary half-barrier on the further side of the crossing to close the offside of the road, or, secondly, by making a dual carriageway with a central reservation extending for some distance on either side of the crossing so that a motorist cannot swerve to the offside of the road and round the open sides of the crossing.

285. Double half-barriers at automatic crossings have been extensively used in France where they are obligatory at busy crossings, and the S.N.C.F. are, indeed, intending to increase their use in place of half-barriers. They are not used in Holland where they are regarded with absolute disapproval. The system of operation would require that the nearside half-barriers should come down, and be proved to be down, before the offside half-barrier descended, because, if, for any reason, the nearside barrier did not come down properly before its counterpart began to descend, a vehicle might lawfully enter on the crossing only to be confronted suddenly with a half-barrier barring its exit. It is necessary,

therefore, for the barrier on the offside of the road to descend 8 seconds after the first has reached the horizontal. This allows any vehicle which happens to be on the crossing when the automatic operation has been initiated by an approaching train to clear the crossing with ease before the second half-barrier descends. Unfortunately, experience has shown, according to the evidence, that the extended time, when known to the type of motorist who is willing to zig-zag, is a positive invitation to him to try to dodge through and defeat the barriers. Consequently, there is some risk of vehicles being trapped on the crossing, their attempt to zig-zag having failed. On two occasions in the last two years that has happened in France.

286. The installation of double half-barriers, costing £2,000 extra to the normal costs, would not be difficult but would involve an extension of the signal arrangements, because the time cycle must of necessity be extended by 8 seconds. If installed on a line carrying trains in the speed range of 85 to 30 miles per hour, road traffic would be held up (a) on the existing 24 seconds time cycle for 43 seconds for the fastest single train or, where two trains pass at 30 miles per hour, 261 seconds, or (b) if the time cycle is extended to 32 seconds, as recommended below, for 51 or 307 seconds respectively.

287. The opinion of the Ministry is that double half-barriers would not, on balance, add appreciably to safety, but the British Railways tend to support the suggestion as they feel that it would reduce zig-zagging to a minimum. It does not, however, eliminate the zig-zagger or the stalled vehicle: indeed, it might to some extent be a cause of stalling if, for instance, a timid driver, going slowly across, suddenly saw a half-barrier coming down across his exit space. It may also aggravate the predicament of the vehicle which has been blocked-back.

(iv) Dual Carriageways

288. The second method of effectively closing a crossing is by dual carriageways separated by a central reservation of 2 to 4 feet in width. This would allow the half-barrier completely to occupy the nearside carriageway and would effectively prevent zig-zagging. Naturally, the central reservation would have to be extended a substantial distance along the road on either side of the crossing lest drivers at the back of a queue of traffic waiting at the crossing might be tempted to pull out of line and try to go over the railway.

289. I am satisfied that this method would be unsuitable and, indeed, dangerous on a two-lane road for several reasons:—

- (a) On a road less than 40 feet wide, the carriageway in either direction would be too narrow to allow overtaking, so that, if it should happen that a leading vehicle stopped just after traversing the crossing*, the vehicles immediately behind would be held up on the railway and would have no opportunity of reaching safety by overtaking the stationary one in front;
- (b) Wide vehicles, which have to be accommodated on the roads from time to time, would not be able to use the road without straddling the centre reservation: that would often be impossible because on large multi-wheeled vehicles the wheels are often too close together. Further, in

* See, for example, paragraph 267 above.

order to cater for the situation when a large special order load is stationary at the crossing while its driver telephones to the signalman in accordance with the procedure outlined in paragraph 302 below, it would be necessary always to provide two lay-bys on each side of the crossing in order to allow other traffic to pass it: four lay-bys at any location are estimated to cost £8,000.

290. Dual two-lane carriageways would, however, be acceptable where the overall width of the road is not less than 40 feet, but the cost of providing such an arrangement at a rural site is expected to be about £12,500, or £16,000 or more in built-up areas where there are the obvious problems of acquiring adjacent land or buildings which may be of considerable value. Mr. Scott-Malden informed me that it is the intention to install dual carriageways if the road is a busy one and the amount of traffic demands it but that, of course, it would be impracticable to convert every existing automatic crossing to dual carriageway. To convert the present 207 crossings on the British Railways system would cost £2,500,000; that is, I was told, equal to the cost of five miles of motorway which, on present statistics, would save between 50 and 100 accidents every year. In view of the fact that until the date of the Hixon disaster there had only been five accidents involving zig-zagging the expenditure would be inordinate.

(v) Full Protection

291. The proposal for full protection of automatic crossings means that provision is made to ensure that a train shall never be able to come on to the crossing unless it has previously been proved clear of obstruction. That is done, not by interlocking the half-barriers with the signals, but by use of presence detectors associated with the railway signalling. This requires some device or instrument to be added to the present equipment which would be able to detect the presence of an obstruction on the crossing after the half-barriers had descended and traffic should have cleared the tracks; if an obstruction were then present the device would either turn the signals to danger or prevent the signals clearing to allow the train to come forward. The detector would need to be able to detect road vehicles but not a passing train (lest a train running on one line were to work the detector and thereby stop a train coming in the other direction), and it should be as free as possible from mischievous or malicious application. Of course, it must also operate effectively on electrified lines with either overhead wire or third rail.

292. Having these desiderata in mind, the choice of a particular form of presence detector would lie between the following:—

- (a) Closed circuit television with the screen in the monitoring signal box. We studied an installation of this kind at the level crossing at Champigny near Paris, a trial installation which has been used since 1958, but re-equipped in 1965 with a transistorised camera. The equipment works satisfactorily, even in fog, and there are now four similar installations on the S.N.C.F. However, it is used at a very quiet urban crossing (carrying 50 road vehicles a day only) and the barriers, fitted with full skirts, are kept closed to the road until a motorist presses a bell to signal to the crossing keeper, nearly a quarter of a mile away, that he wants the barriers opened. At this crossing there has been no problem

of illumination at night for there are no trains on that line in hours of darkness. But, of course, apart from technical difficulties of ensuring it is always reliable, this system could only be effective with a fully closed crossing interrelated with full signal protection controlled by the signalman: otherwise it would merely enable the signalman to have a clear view of a vehicle obstructing a crossing and of an accident which he would be quite unable to prevent. Moreover, there would be considerable complications in a signalbox monitoring several automatic crossings and the risks of human fallibility would be multiplied. If one provides full protection for the crossing by mechanical devices associated with the signal system then there is no need for television, because it would be of no further advantage for the signalman to be able to see the crossing.

- (b) Electro-mechanical methods, including axle counters, pressure pads, sweeping arms or similar devices have all been carefully considered. Many of the suggestions put forward to us by members of the public who wrote to convey their own ideas involved the use of these methods, and their suggestions were all examined by the assessors and many of them were carefully studied by Professor F. T. Barwell, Professor of Mechanical Engineering of the University College of Swansea in the University of Wales. We are greatly indebted to him and to Mr. Trevor Davies, a lecturer in his department, for having produced an excellent working model of a sweeping arm or gate method of level crossing protection, which epitomised so many of the suggestions that have been communicated to us.

The difficulty of designing such a device is, firstly, that it must sweep a square or rhombic area so as to prove it clear of any obstruction and yet, at the end of its motion, it must act as a gate or obstruction to prevent any further traffic from entering upon the railway. In the case of a main road crossing a double railway line, four co-operating sweeping mechanisms would be necessary, one at each corner of the crossing. The rotating axis of each sweeping arm or gate is fitted with a slipping clutch so that, if the arm meets an obstruction in its 90 degrees arc (from closed against the railway to closed against the road) it will be halted and the railway signals will not clear to admit the train on to the crossing. An objection is raised that if the arm meets an obstruction such as a pedestrian, or a mischievous schoolboy trying to hold it back, it would either have to sweep them aside or would be held back by their presence; consequently, either rail services would be disorganised by mischievous intervention, or it would be so powerful as to be likely to cause injury to pedestrians on the crossing. Similarly, the sweeping arm would be very vulnerable to interference by strong winds, a factor which does not so much affect the falling half-barrier, though it has been known to do so in East Anglia; if it was strong enough to overcome the restraint of a force 9 gale it would be liable to cause injury to people lawfully on the crossing, but if it was not so strong, a gale would hold it open to the road, causing a dangerous situation.

Other objections are, that the quadruple mechanisms, bearing comparatively heavy gates or barriers, are bound to be complicated and cumbrous, very susceptible to mechanical failure or failure because

of snow, ice, water, mud, etc., and the maintenance costs are likely to be high. Clearly, there is risk of trouble if the arm or gate catches a slow vehicle on the centre of the crossing. The difficulties of arranging "failure to safety" in the event of electric power failure will be enormous, since the drain on the reserve batteries will be very high and it will be impossible to have stand-by batteries working such heavy equipment at automatic half-barrier crossings. (Half-barriers, of course, fail to safety merely by falling to the horizontal under the forces of gravity when the electric power which is used to hold them upright fails.) There are, moreover, electronic devices which are simpler, cheaper and more reliable than these cumbrous mechanisms.

- (c) Infra-red, photo-electric, ultra-sonic or radar systems to define the presence of an obstruction are feasible, and may be devised so that they will not recognise an obstruction which remains for less than a given period, say 6 seconds. It would thereby be possible to avoid the detection of vehicles or people passing over the crossing lawfully as the half-barrier falls, but the devices are very vulnerable to malicious interference and, in our opinion, would not be satisfactory for that reason. According to the evidence, vandalism is rife in certain areas on railway property, and the possibility of interference to equipment must always be borne seriously in mind. In 1967 there were 72 cases of interference by trespassers or damage done by unknown persons to the existing automatic crossings which caused "failures to safety". Such failures, as will be understood, result in the stopping and disorganisation of the rail services.
- (d) Electro-magnetic methods of presence detection seem to us to afford the most promising possibilities. Inductive wire loops beneath the roadway can be made to distinguish between stationary or very slow-moving vehicles and those passing over the crossing at a normal safe speed, and thus can be arranged to be active at all times. Fortunately, an experiment with this type of inductive wire loop has been evaluated for nearly 12 months past in the West London Computer Traffic Control experiment, and the evidence of experts from the Ministry of Transport is that the experiment is proving very successful. This device is not liable to interference by the malicious or mischievous but further development would be needed to apply it to the level crossing environment, especially on electrified tracks where the rail can be carrying heavy return currents. It is expected to prove satisfactory for use.

293. I do not think it is necessary for me to recommend any particular method of presence detection, though if full protection were to be adopted, I would be in favour of the inductive wire loop unless it is proved inefficient under further tests: I am more concerned to say what degree of protection there should be.

294. Whichever means is employed, the detector instrument would have to be appropriately linked with the signalling system, but unfortunately, signals are not at present always placed in a suitable position for the protection of a level-crossing. In such instances, it would be necessary to provide extra signalling, which of itself might disorganise the existing spacing of signals arranged with a

view to other aspects of safety, and at some places this might make an automatic crossing impracticable.

295. It is important to understand the effect of full protection associated with the railway signalling system on the time for which road traffic would be held up at the crossing. Assuming the use of half-barriers operated on the present time cycle, the detector would have to prove the crossing clear after allowing traffic time to leave after the fall of the barrier, namely 4 seconds after the half-barriers had descended; and, therefore, the beginning of the operating cycle must be 20 seconds before the moment of proof. That proof must be given when the train is still at least 15 seconds' travelling time (about 600 yards at 80 miles per hour) short of the distant signal, i.e. about 1,950 yards (or about 50 seconds' running time) from the crossing, assuming that the stop or home signal is no more than 50 yards away (instead of the normal 250 yards). The half-barrier cycle must therefore be initiated not less than 70 seconds before the fastest train will reach the crossing. The train will then take between 4 and 5 seconds to clear the crossing and the barriers will take another 6 seconds to become upright. Consequently, for a train at 80 miles per hour the total waiting time for road traffic, assuming that no second train is coming in the opposite direction, would be 81 seconds. The time involved in the case of a slow train, travelling at about 30 miles per hour would be a great deal more, approximately 237 seconds, and in the case of two opposing trains using the crossing under the "second train situation" the times would be between 182 and 525 seconds. These timings are clearly shown in the diagrams in Appendix XIII and in the table under paragraph 312 below.

296. Single half-barriers would not, of course, preclude an obstruction occurring after the detectors have given the "all clear": to keep the crossing clear until the train has gone by requires something to prevent anything entering after the moment of proof, and it would be necessary to adopt double half-barriers or a dual carriageway, as described above. Double half-barriers would add at least 6 to 8 seconds to the time cycle to allow for the delayed fall of the exit barriers. The times of road closure in the case of full protection using double half-barriers are shown in diagram 2 of Appendix XIII.

297. On the parts of the railway where the electric colour light signal system is in use, the signal is normally at clear (green) until a train occupies the section past it (or unless the current fails): it then turns to danger (red). With that system, or if the signals of the older system on other parts of the railway were altered and set normally at clear, a matter of 5 or 10 seconds of the times cited could be saved by arranging that when the detector sensed an obstruction it would turn the signals to danger. Under this arrangement the train driver would require only about 250 yards' sighting distance.

298. The wide difference in times for full protection cannot be mitigated by speed discrimination. Under the present system, speed discrimination is employed to keep the difference in time of arrival of slow and fast trains to a maximum of 40 seconds. It acts by timing the train over a short length of track immediately on the approach side of the initiating treadle: if the train is travelling slowly, the initiating treadle is excluded from the operating circuit and the cycle does not begin until the train has reached another point nearer the crossing. However, though that device maintains the timing of approach within limits by reducing the long distance of strike-in for a fast train to a shorter one for a

slow train, the basic fact remains that the strike-in point for the slow train must, nevertheless, be at a point which allows the driver at least 15 seconds' travelling time short of the distant signal; and, therefore, the problem is not one of the timing of the approach, but of the distance which the slow train must have, after using the same signal as an express, to be assured that the crossing is clear. Speed discrimination is therefore not a practical solution to the problem of delay at a fully protected crossing.

299. Mr. Tyler estimated that the provision of full protection of this kind would increase the cost of installing an automatic crossing to about £30,000. Therefore, for this expensive installation one gains the advantage of eliminating the danger of a collision with an immobilised vehicle on the crossing, but at the cost of losing all the benefits of brisk operation for road traffic. And a would-be zig-zagger who was trapped on the crossing would disorganise the running of not only the approaching train but, on a busy line, those behind it. Both the Ministry of Transport and British Railways have expressed their opposition to this development and the latter have said that, if it is to be imposed upon them, the capital costs may make the conversion of the old type level crossings not a worthwhile proposition unless they receive a subvention from outside. The Road Haulage Association, the motoring organisations, and, I dare say, some local authorities would equally oppose this further obstruction to the free movement of road traffic.

(vi) Partial Protection

300. An alternative system put forward by the Ministry of Transport, which we have examined, affords partial protection to the crossing by interrelation with the railway signals. A detecting device, such as the coil mentioned above, would be used. On detecting a stalled vehicle or other obstruction, the device would set the normal rail signals at danger so that, if the train had not yet passed the signal, it would be halted. But the crossing would not be completely closed as in the case of full protection, and an unprotected gap would remain between the last moment at which the train can be stopped and the time when it reaches the crossing. For a train travelling at 85 miles per hour that gap will be about 2,125 yards or 51 seconds (see Appendix XIII, diagram 2) and for a slow train it will amount to 3 or 4 minutes. During that time the barriers would be open and vehicles could *lawfully* enter the crossing for 27 seconds (that is to say 51 seconds minus the 24 seconds of the time cycle for the fastest train to reach the crossing). Therefore, though this would give a certain measure of protection in warning the train driver of an obstruction which had occurred on the crossing at a time when the driver of a road vehicle might not have been able to use the telephone to get the signalman to change the signals against the train, it would not give any protection for a vital period, namely the 27 seconds immediately before the barriers descend, when it is, some think, most likely that vehicles may enter the crossing and stall, nor will it give protection against the zig-zagger. British Railways are opposed to this system, which they feel might lead to a sense of false security in the public mind, yet lead to a feeling of anxiety among railwaymen. It is, moreover, just as expensive as full protection save for the cost of full barriers or dual carriageways. It is not feasible at every crossing and its only advantage is that it does not increase the time of delay for road traffic. It does not seem to us that the protection offered by this system

fully meets the point and purpose of any system co-ordinated with the railway signals, namely to give complete safety to the passage of the train, but it is a tempting compromise.

(vii) The Telephone Procedure for Exceptional Vehicles

301. Very slow and abnormally large vehicles require special provision. The first difficulty is trying to define such vehicles precisely, so that regulations may be made binding upon them. There are really three classes:

- (i) Vehicles of dimensions exceeding the limits laid down in the Motor Vehicles (Authorisation of Special Types) General Order 1966, (among which I include the vehicles allowed to travel under "VR 1 authorisations") which have been referred to as "special order loads" (see paragraph 57);
- (ii) Vehicles within the specification of "General Order loads" (i.e. over 55 feet long, or 9 feet 6 inches wide, or 32 tons gross weight); and
- (iii) Vehicles of other kinds which for reasons of their construction or for other temporary reasons, such as mechanical defect, cannot travel at more than the speed required for safe clearance of the crossing.

These latter vehicles include those with the maximum length of 55 feet allowed under the Construction and Use Regulations mentioned above, lorries in a defective state of maintenance struggling up-hill, or smaller vehicles which have temporary defects that slow them down considerably. It would be wholly impracticable to lay down different minimum speeds affecting different types of vehicle. In France it is provided that any vehicle over 18 metres in length, or which cannot clear the crossing in 10 seconds, may only cross the line after making special arrangements with the S.N.C.F. In Holland there was a similar general practice adopted by haulage contractors of their own initiative (unlike Pickfords Limited or Robert Wynn and Sons Limited), and the authorities are now considering making it a statutory obligation. But the Ministry has suggested, and I agree, that for ease of control, it would be best to fix a minimum speed for crossing an automatic crossing at an ample and round figure, namely 10 miles per hour. All these exceptional vehicles will, therefore, have the same problem and need the same basic discipline.

302. Two forms of discipline are suggested: firstly, that the driver of the vehicle should be obliged to telephone to the signalman by using the telephone installed at the half-barrier and, on completing his crossing, telephone again to inform the signalman that the line is now clear; and secondly, as a possible alternative, that there should be an early warning road signal to inform such vehicles of the approach of a train some short time (20 seconds) before the red lights flash so that they will be able to stop before reaching the stop line. Under this latter proposal, a driver need not telephone because the early warning signal would tell him what he would learn from the signalman.

303. Dealing first with the special order and VR 1 vehicles, I think the early warning signal would be quite inadequate. The Ministry have already, after the Hixon accident, inserted in all prescribed routes under special orders a requirement that the driver or one of the crew of the vehicle must use the telephone procedure at every automatic crossing (see paragraph 183 of the first

part of this Report). This procedure will adequately cater for the safety of the railways in respect of these abnormal vehicles, but it should be realised that there may be dislocation of the running of the railways if the driver of the vehicle, after having crossed, neglects to telephone so as to assure the signalman that the crossing is clear, or, of course, if a hooligan should use the telephone to put through a false message of obstruction on the crossing. Such complications cannot be avoided as, of necessity, the telephone must be readily available to any member of the public.

304. At present, special order vehicles are escorted at the discretion of the police authorities through whose areas they are travelling. We have examined the question of introducing a compulsory escort by police and transferring to the police the responsibility for telephoning. This would mean a complete change from the present role of the police (see paragraph 132) and there seems to be no reason why the police, who are not familiar with all the details of the vehicle and its management, should be required to carry on a vicarious conversation with the signalman on behalf of the man who should really know his own problem. The police should not be distracted from their general duties, and on escort duty they have to attend to other traffic besides the special order vehicle. The police escort may have to go ahead some distance, or may be called away for some urgent task, and there should never be any doubt as to whose duty it is to telephone the signalman. But this is not to say that the police should not be responsible, as now, for seeing to it that the requirements for safety are observed by those who are responsible for driving the vehicles, particularly if the telephone procedure were to be made mandatory.

305. It has also been suggested by the Ministry that the haulage contractors should be under an obligation to give notice to British Railways, perhaps at Regional level, a week in advance, that a special order load would require to use an automatic crossing and, thereupon, the British Railways would arrange for special manning of the crossing at the time notified. The railway employee who was sent to the crossing would then be responsible for telephoning to the signalman to make the necessary arrangements. It is objected that haulage contractors very rarely know the exact time when they will be ready to begin their journey and certainly not the exact time of their arrival at a crossing, and to meet this objection it is suggested that it would be possible for them to give a final notice to British Railways eight hours before the load is expected to reach the crossing. Though these objections are raised on behalf of hauliers in England, it is remarkable that in France and Holland similar arrangements have to be made with the railway authorities, and, as far as I know, no difficulties have been experienced on either side. If, owing to the uncertain time of arrival of the transport at a particular point, the railway attendant was not there to meet it the question would arise whether the driver himself should use the telephone and proceed without waiting for the railwayman to arrive, or whether he must wait until the railway servant comes and telephones to the signalman. It seems to me that, at first sight, either it is necessary for safety to have the railway employee present or it is not, and if the first suggestion is adopted then it seems that the arrangement itself need not be pursued.

306. There is a small class of extraordinary vehicles which do not meet the requirements of the Construction and Use Regulations: they are not all particularly large or slow but are specialist vehicles, such as excavators, not normally

used on the highway. Some may be very large and slow-moving. It would not be necessary to have a crossing specially manned for such vehicles but the Ministry could insert a provision in their special order route on each occasion requiring the driver to observe the telephone procedure.

307. The second class of vehicles are those exceeding the specified limits of the Construction and Use Regulations. They frequently travel without police escort and there is no external control over them, not even by their having been given a prescribed route by the Ministry. As they are likely often to cross the railway at a very slow speed, we think reliance on an early warning signal alone would be unsafe and sometimes confusing. Drivers of these vehicles, as well as those in the third category, should be obliged to use the telephone procedure.

308. *Anxiety must naturally be felt about the occasional irresponsible driver* who may decide to cross the line without using the telephone; one can imagine an occasion, like that at Hixon, when the driver of such a vehicle approaches the crossing and, being able to see about 500 yards to either side that no train is in sight, may cast care to the winds and decide to go over, but just as he is committed to the crossing the 24-second time phase begins. He would, of course, be committing an offence if the telephone procedure were made mandatory and the question is whether one has to accept that in every walk of life the lawbreaker can cause immense harm.

309. It can be foreseen that the telephones may be destroyed or put out of action by vandals, as has happened so often in public telephone kiosks, so that the driver who is required by law to telephone the signalman before crossing the line will be put in a difficult predicament, especially in a rural area where no other telephone is available. It is important, therefore, to ensure that the breakdown of the telephone should be detected in the monitor signal box, like the failure of the half-barriers, and dealt with with equal urgency.

310. One matter that, of course, requires consideration arising out of the telephone procedure is that of the danger created by a large vehicle halted immediately before a crossing, which at some places in urban areas might be a considerable traffic inconvenience as well as a hazard. On roads which are not in built-up areas, lay-bys could be provided on each side of the crossing to accommodate the vehicles while the driver was using the telephone, but in built-up areas this might not always be possible and arrangements would have to be made for the vehicle to stop at a convenient point some distance before reaching the crossing. On such an occasion as last mentioned, the presence of the British Railways' employee to use the telephone on behalf of the lorry driver might be a convenience. However, it is not right to suppose that lay-bys would be necessary on all country roads, for at many places the traffic density is so small that it would not justify the expense of such installations.

311. In order to allow the telephone to be used conveniently the Ministry has suggested that it ought to be placed 20 or 30 yards before the crossing so that when the driver uses it both before and after going over the railway, his vehicle is likely to be in a position which does not cause danger by obstructing the view of other traffic. These telephones at a distance from the crossing are to be in addition to the telephone for emergency use.

(viii) Summary of the Road Delays Involved

312. The periods during which road traffic may be held up in consequence of any of the proposals examined above may be easily calculated by reference to the diagrams in Appendix XIII, but for the sake of convenience I set out below a table showing those times (in seconds) related to a line where the maximum and minimum speeds of trains are 85 miles per hour and 30 miles per hour respectively.

	<i>One train passing</i>	<i>Two trains passing</i>
Single half-barriers, single carriageway (<i>present 24 secs. cycle</i>)... ..	35-101	84-253
*Single half-barriers, single carriageway (<i>with proposed 32 secs. cycle</i>)	43-124	100-299
*Single half-barriers, single carriageway, with partial protection	43-124	100-299
*Single half-barriers, dual carriageway (with or without partial protection)	43-124	100-299
Single half-barriers, full protection	84-237	182-525
*Double half-barriers	51-132	108-307
*Double half-barriers, partial protection	51-132	108-307
Double half-barriers, full protection	92-245	190-533
Swinging gate or barrier, full protection	89-200	

N.B. In addition to the three phases of the time cycle the above figures include 5 seconds for the passing of the train and 6 seconds for the rising of the barriers. Items marked with an asterisk are calculated on the basis of extension of the basic time from 24 seconds to 32 seconds.

Speed discrimination

313. The above times are also calculated on the assumption that speed discrimination may be used. Speed discrimination maintains the timing of approach within a limit of 40 seconds by reducing the long strike-in distance necessary for a fast train to a shorter one for a slow train by providing that if the train is travelling slowly the first initiation treadle is excluded from the operating circuit and the cycle does not begin until the train reaches another treadle nearer the crossing. If, when the train reaches the first treadle, its speed is less than the calculated speed for the slowest train, it is assumed to be accelerating and the position of the second strike-in treadle is determined in accordance with the minimum possible travelling time for the accelerating train. In written evidence submitted on behalf of British Railways, however, it was pointed out that the acceleration rates which have been used for this purpose have been found to be considerably less than can be attained with the locomotive running light. Therefore, the Railways Board believe that speed discrimination must be abandoned in future for this reason. The Board's evidence obviously came as a surprise to Mr. Scott-Malden, on behalf of the Ministry, who recognised the danger of a light engine possibly arriving at the crossing before the barriers had come down, but wished to give further thought to overcoming the difficulty. Mr. J. F. H. Tyler, giving evidence for British Railways, doubted whether speed discrimination was worthwhile merely to reduce the total time occupied by the slowest

train to reach the crossing by a mere 5 or 10 seconds at the small minority of places where there is such a variation in speed. No doubt the Ministry and the British Railways Board will discuss this problem in the hope of retaining speed discrimination where it could be useful.

IV. PUBLICITY

(i) National Campaigns

314. Perhaps the most important safeguard in respect of the use of automatic crossings is the education of the public who use them. At present the crossings do not feel safe to people used to massive gates, and it is the frightened driver who is most likely to stall his car halfway across; but knowledge of how to use them, and of how they will operate and affect the motorist, will bring assurance and safety to all concerned. Publicity must be looked at on two levels, firstly national and secondly local publicity. National publicity involves campaigns by newspaper advertisements, posters on hoardings, television advertisements and the like. Local publicity is carried out in the area where the immediate users of new automatic level crossings may be found.

315. The principles governing the effectiveness of propaganda material are as follows. The object to be achieved is to teach the public the proper working of the automatic crossings and how they can be used safely. A choice must first be made of the desired kinds of emphasis to be given to the message: either emphasis on safety, allaying public anxiety and not rousing unreasonable emotional fears of the innovation; or an emphasis on the dangers so as to make people fear to misbehave. Publicity, if it is to be effective, must give positive advice instead of merely warning and prohibiting; it must relate to the things people need to know at the time the information is published, that is to say it must affect them in their immediate lives; and it must be repeated from time to time to refresh their recollection. When few automatic crossings exist in Britain, most people are not concerned about them. Professor Buchanan observed:—

“ I do not really know how one drives this into the minds of 50,000,000 people. Why, I think, I am doubtful about national publicity is that you undertake national publicity, and at the end of it you find that you really have not achieved anything with the people you meet . . . ; they are still just as ignorant about it as they were before. They may grasp it for a time, and then it goes out of their minds, with the pressure of life, and when they come to a crossing they forget it. . . . You could spend a lot of money on a national campaign and not get very much for it.”

316. It may be interesting to compare the policy pursued in Holland. When automatic half-barriers were first introduced there a massive national publicity campaign, by press conferences, cinema films and the like was carried out. But the main effort was concentrated on local publicity, timed close to the opening of any new automatic crossing in the surrounding district. The publicity material used, besides showing how safe the crossings could be, emphasised the dangers of disobeying the rules: for example, one pamphlet which bore on its face the word “ DANGER ” and a bloody palm print, began in its early pages to convey the messages that “ Red is the colour for traffic danger: Red is also the colour of blood: when the red danger sign is ignored, it can mean blood too:

so stop at every red traffic light. Your own life and that of others depends on it". And later the following passage is found:—

"The best advice is *timely advice*. The flashing light shows danger even before the half-barriers begin to come down. So stop as soon as it begins to flash, even if the barriers are still open. They will be coming down any second now! Only the suicide squad drives through red flashing lights!"

That "horror pamphlet" has now been discontinued and a leaflet coloured yellow and green, entitled "Safety at Level-Crossings", contains the following:—

Page 1

"A flashing red light at a level-crossing means STOP: do not proceed further. A train is approaching (and may very soon be upon you)."

Page 2

"Red/White half-barriers at crossings. They only close half the roadway. Do not in any circumstances venture on to the crossing!

About 27 seconds before the train reaches the crossing, all red lights come on and a bell begins to ring. 5 seconds later the barriers begin to fall and each one cuts off the right-hand half of the carriageway. The lowering takes 12 seconds. 10 seconds after that, the train goes through. When the train is clear of the crossing, the barriers begin to lift, but . . . *the lights are still on, and so no one must traverse the crossing*. There could easily be another train coming! Only when the barriers have come to rest in the fully vertical position, *and all lights are out, is the crossing safe!*"

That pamphlet is put through the letter box of every household in the area where a new automatic crossing is set up and is also compulsory reading for every candidate for a driving licence. The message it contains is in accordance with the French view recorded by Colonel McMullen in his report after his return from the visit to the Continent in 1956*, viz., "the S.N.C.F. consider that once the public understand *the timing* of the automatic half-barrier, the risk to road users will be considerably less than at attended crossings".

317. It has always been the opinion of the officers of the Ministry of Transport responsible for publicity that the "horror" technique is the wrong one because people tend to close their minds to that kind of publicity and, according to the evidence, their opinion was supported by the advice of the Road Research Laboratory and by advertising agents who had consulted the Tavistock Institute for Human Relations. Nevertheless, I think, there is force in the submissions that were made to the Court that, though the Ministry's opinion was generally correct, it is advisable that the public should not only be educated in how to use the crossing safely but also be given a clear (though not over-emphasised) indication of the penalty that awaits disobedience.

318. Publicity campaigns must of course not only be conducted in such a way and in such directions as to achieve the greatest benefit, but also be related to the funds available. Hitherto, there have been relatively few automatic crossings, affecting a very small proportion of the population, and any kind of national campaign requiring the expenditure of large sums of money would have been quite unjustified: but if automatic level crossings are to be retained and developed in Britain there will be stronger reasons for a publicity campaign

* Part I, paragraph 22.

on a wider or different scale. However, the funds available are not unlimited: in the financial year 1963/1964 the Ministry's publicity budget was £46,200 and in 1967/1968 £120,100, for all subjects within their responsibility, including particularly road safety. For 1968/1969 £1,096,000 has been granted for road safety alone. The expensive nature of national publicity can be gauged from one recent example, namely the official campaign on tyre safety which cost, excluding the part of the campaign that was matched by publicity from the trade, about £100,000.

319. The choice of priorities for the allocation of funds is an extremely difficult one, for the Ministry have to bear in mind the overall picture of road accidents:—

<i>Date</i>	<i>Total Casualties</i>	<i>Killed</i>	<i>Injured</i>
1962	341,696	6,709	334,987
1963	356,179	6,922	349,257
1964	385,499	7,820	377,679
1965	397,937	7,952	389,985
1966	392,497	7,985	384,472
1967	369,978	7,319	362,659

The tragic and soaring destruction of human life on the roads may be contrasted with the record of accidents at automatic crossings, albeit they are still few in number, where between 1962 and April 1968 (including the accidents at Hixon and Beckingham) 16 people were killed (two of whom were illegally zig-zagging round the barriers and on to the lines) and 45 injured.

320. Mr. J. R. Madge, Under-Secretary of the Road Safety Group of the Ministry of Transport, expressed his difficulties thus:—

“... Priorities are always agonising when it comes to a question of deciding what weight to give to each of many items, each involving potential loss of lives and personal injuries... What we have said is that we do not think this is a case for expenditure of the very large sums of money involved in a *mass media campaign* such as the one we are launching on safety belts. This is agonising, I assure you, from my chair. But one is in the situation that one quite literally can save so many lives and injuries for a given sum of money, and one is forced into the agonising situation of investing that money where you get the biggest return: and your return is in people's lives. It is not a very nice situation to be in, but this is what we face... There is a potential saving of 15,000 fatal and serious casualties a year if we can persuade all people to wear safety belts.”

And Professor Buchanan expressed the same view:—

“This is a very difficult subject to be dogmatic about, but I have looked at it in this way, that we have got 54,000,000 people in the country, compared with the 12,000,000 in Holland, we have got more vehicles than they have people in Holland, and it seems to me it would have to be a very powerful publicity effort indeed to reach right through the road-using public and I haven't been able to convince myself that this would be worth the expenditure that would be involved. I keep reminding myself of the general road accident context in this country where we are running at something under 8,000 fatal accidents a year and some 400,000 injuries

a year, and in that context what happens on level-crossings is a drop in the ocean and when it comes to publicity I just wonder whether, if I were in charge of dispensing funds, I wouldn't get much better value from, say, real publicity on how to use a motorway in fog than how to use one of these crossings."

(ii) The Highway Code

321. A better form of national publicity would be that which was directed in a concentrated beam at the people most likely to be affected and who are the most important to educate, such as motorists and long-distance lorry drivers.

322. One medium for this kind of information is the *Highway Code* which, though one is tempted to be sceptical about the thoroughness with which people read it, must be learned by everyone who goes in for driving test and which, according to Mr. Madge, is one of the best selling documents in the country. The existing reference in the *Code* to automatic crossings*, is in a quite unsatisfactory form: it does not mention the telephone procedure, nor does it give the ordinary road user a real indication of the timing of the automatic half-barriers and of exactly how imminent the train may be. A revised version of that paragraph was circulated to a large number of bodies and organisations for their comments on the 19th January 1968 and it reads thus:—

"Many level-crossings have automatic half-barriers that go across the left side of the road. The barriers are worked by the train so that they fall just before the train arrives at the crossing. Twin flashing red stop lights and bells warn you when the barriers are about to come down. Do not cross the railway lines once the warning signals have started. Wait at the STOP line or if you are walking on the right-hand side of the road, wait at the broken white line. Do not zig-zag round the barriers. Do not cross until the barriers rise, even when a train goes by—there may be another one coming."
"If you are driving a very large or heavy load, or are herding animals, you should first 'phone the signalman to make sure you have time to cross."

323. I have not heard the comments of the bodies who have been consulted but I think that the proposed revision does not yet meet the case. In my view, it should be re-drafted so as to include the essential elements which I have quoted above (paragraph 316) from the Dutch leaflet "Safety at Level-Crossings", namely a more precise indication of the actual time within which a train may arrive: I think it does not matter a great deal that the train may not arrive for a few seconds longer than the time stated, for no motorist is likely to wait with a stop watch to see whether it is accurate and the time itself is the indication of danger which is necessary. To that should be added the prohibition against zig-zagging, and the essence of the new notice which is proposed obliging drivers of vehicles of certain dimensions or which are travelling at less than 10 miles per hour to telephone the signalman before crossing.

(iii) Direct Information to Drivers

324. I am very glad also to be able to record that Mr. Edgar Fay, Q.C., on behalf of British Railways, made the following offer:—

"British Railways on their own account are prepared to devise and print a leaflet, not a special leaflet for each crossing, but a general leaflet,

* Part I, paragraph 203.

somewhat on the Dutch pattern, which is intended to be put into the hands of every driver of the country, whether it be a driver of a bus, a coach, a juggernaut or a private car, or any road vehicle. That will be a very big printing job; it will be a costly job, and British Railways, I am instructed, are fully prepared to take upon themselves that part of the national publicity. We think . . . that the Ministry is the proper channel for distribution, because it is the Ministry who have the outlets to the licensing of those drivers who require to be licensed specially, to the licensing of other drivers; they have their channels of communication with the A.A., R.A.C., R.H.A., and the other bodies We suggest that it is through the Ministry that this brochure or pamphlet should be distributed. We envisage it as something which is factual We do not think it should be alarmist, by stressing danger; nor do we think it should be soothing, by emphasising safety. We think it ought to be factual, and leave it in no doubt that two cardinal facts are that the train comes very smartly and that the train cannot stop."

(iv) Local Publicity

325. Apart from that kind of national publicity, it is important that intensive publicity by films, lectures, written matter and practical demonstration on the site should be continued to be given to schoolchildren who are anywhere in the locality of an automatic crossing. I think that this local publicity should not be restricted to the children of the generation who are at school in the year when their nearest automatic crossing is opened, but that it should be repeated from time to time as an important part of the road safety instruction given to each succeeding generation. The general public may be informed by television "fillers", brief films in cinemas, and by posters on hoardings. The definition of a locality is not easy in a highly populated country such as ours: for instance, the local publicity relating to the Hixon crossing was sent to Stafford and to the schools, libraries and institutions in the rural areas around Hixon, but the large population of Newcastle-under-Lyme and Stoke-on-Trent, many of whom must travel by car or lorry in the same district, got nothing. One can appreciate the enormous difficulty, and partial waste, of sending a pamphlet to every household in those places on the introduction of a single automatic crossing.

(v) Information at the Site

Design

326. Notwithstanding all the efforts of national and local publicity there are bound to be a number of people who forget, or do not wholly digest, the information that is communicated to them; there may even be a substantial number who throw away the leaflets which are sent to them. It is, therefore, essential that, as a last line of defence, the information necessary for the safe use of level crossings be communicated to each motorist as he approaches each crossing so that he may know what to do without an effort of memory to recall what he has read in the Highway Code, or has seen on television. Professor Buchanan has recommended the employment of a skilled industrial designer, with knowledge of the psychology of the road user (a mysterious science), to design a crossing as "a coherent installation over the whole length between the advance warning signs, using simple items and material such as signs, lights, fencing, paint, kerbing and reflecting surfaces . . . in such a manner that an approaching road user is fully instructed in the methods of the crossing during

his approach to the barrier, and that no reliance is placed on the hopes that the driver has read and remembered the Highway Code or any other document." At present the automatic crossings, which are mainly in rural areas, are remarkably insignificant, and we agree with Professor Buchanan that the motorist or the driver of a large vehicle should be made to realise that he is approaching a traffic intersection of exceptional importance. To use an analogy which is not altogether accurate, the motorist should feel the same difference between a crossroads and a level crossing as between a bus stop and a railway station.

Road Signs and Signals

327. Naturally, the most direct way of advising a driver what hazard he is approaching, and what to do, at the moment when he most immediately needs the information, is by means of the road signs and signals, and we have considered the various suggested signs illustrated in Appendix XVI. In Chapter 5 of the Ministry of Transport's "Traffic Signs Manual" (paragraphs 1.27 and 1.30) the following principles are stated:—

"In order to perform the function for which it is intended a sign must be capable of transmitting its message clearly and at the right time to road users travelling at the normal speed for the road. To achieve this a sign must have correct legibility distance, appropriate target value, simplicity of content and layout . . . for simplicity of content and layout, ideographic representation of the message is most effective but where lettering has to be used the message needs to be condensed into as few immediately comprehensible words as possible. Abstract symbolism is less satisfactory since its meaning must be learnt and remembered."

328. The existing sign indicating the presence of an automatic crossing ahead, which the Attorney-General called "the hammer sign", and which is peculiar to Britain, is defended by no one; Professor Buchanan characterised it as "ridiculous". Unless a motorist happens to have studied the "New Traffic Signs" leaflet or a similar document, and remembers the significance of the sign, he will not know that it is meant to indicate that there is a railway ahead, nor when he reads the plate beneath "Stop when lights flash" will he know that the flashing of the lights means that a train is imminent. Moreover, the sign is easily confused with the sign which means "Two-way traffic crosses one-way road". The advance road warning sign used in European countries is the red triangle containing, on a white background, a representation of a gate, which under the "New Traffic Signs" manual means "level crossing with either barrier or gate ahead". This "gated" sign does not indicate visually that the motorist is approaching a railway and, though it would be possible in Britain to add a plate with the words "automatic barriers" (as in France the words "*Signal Automatique*" are added) nevertheless, if the ideograph is to mean anything, it should convey the presence of a railway. The picture of a gate is in fact a falsehood. With the undistinctive shapes of modern railway locomotives it is difficult to imagine a suitable pictorial representation to equal the old locomotive sign, but, though this may now be an anachronism, it will for the next generation or more be recognised instantly as the sign that a railway is ahead. It is true that, at present, that sign is intended to indicate "level crossing without gate or barrier ahead" but that meaning is not so ingrained in the British motorist's mind as to cause any misunderstanding. There is in this some reflection of national environmental upbringing: in continental countries where there never has been

a statutory obligation to fence the railway in and where, accordingly, the majority of crossings were without gates or barrier protection, the introduction of even a half-barrier is in advance towards the idea of gated protection, whereas, in Britain, where one has been reared in the environment of massive gated protection for the railway, the removal of all physical obstacles other than a slender half-barrier, seems to approximate to having no protection at all, and consequently the locomotive sign would be readily accepted and understood in our country. Greater accuracy would be achieved by superimposing on the silhouette of the locomotive a descending half-barrier, as shown in figure 4 of Appendix XVI. We feel that this sign is much more accurate and urgent in the message it conveys than the gate sign.

329. The Emergency Notice has already been criticised and is plainly unsatisfactory; as Mr. Raymond Kidwell, Q.C. said "As a piece of the sign producer's theory, there is hardly a rule in the book that it does not break. It is a dual notice, containing two messages which have nothing to do with each other save that they have the common factor of the telephone; it is directed to two different classes of people in two different situations; each of these classes of people is liable to be in different topographical conditions, one perhaps on the crossing in an emergency, and the other approaching along the road but not yet having reached the crossing; one of the messages is made more prominent than the other by a larger case for the letters which overshadows the message in the lower case; it completely lacks the dignity and importance of a true road sign, but is not very different from a trivial railway notice such as "Trespassers will be Prosecuted"; and it is not possible to place it in any position where it will be seen satisfactorily by both the persons for whom it is intended at the same time." It is obviously essential that the two messages be separated and placed where they are required: one, relating to the emergency, should be placed where the person who is on emergency on the railway lines can see it facing him, on the further side of the crossing beside the telephone, which will not, therefore, be affixed to the pivot post. The message requiring the drivers of extraordinary vehicles to telephone before crossing should be placed before the vehicles reach the crossing and that telephone should be adjacent to it.

330. There is some doubt whether, in law, the existing Emergency Notice constitutes a traffic sign by virtue of sub-section (2) of Section 66 of the British Transport Commission Act, 1957, I incline to the view that it does not, but that the matter requires to be put beyond doubt, especially if our recommendation of the telephone procedure is adopted.

331. The twin red flashing lights as signals of danger have been criticised and it has been suggested that it would be better if the ordinary three-colour traffic lights used at road intersections, and familiar to motorists, were substituted. We have carefully considered this suggestion but there are several objections. Firstly, they do not convey, as the flashing red lights are intended to do, the message of a different danger; and secondly, the maintenance of the green light, which would have to be illuminated all the time except when a train was passing, would cause considerable practical difficulties because the batteries, if the electric current should fail, would not be able to support it for twelve hours. Moreover, the flashing red lights are internationally recognised signals for automatic crossings. Mr. H. N. Ginns, Deputy Chief Engineer of the Highways Division

of the Ministry, and a Fellow and Vice-President of the Institute of Highway Engineers, summed up the Ministry's attitude thus:—

“ The more you look into it in detail, and particularly after the evidence we have heard at this Inquiry, when we are being asked to look at individual and minority type vehicles, the more you have to come to the conclusion that the standard sequence of signals is not usable at level-crossings.”

However, there is a case for the red and amber phase to be used: under Regulation 34(4) of the Traffic Signs Regulations and General Directions, 1964, the significance of the red flashing signals is that traffic must not proceed beyond the stop line except in the case when a vehicle, at the moment the lights begin to flash, “ is so close to the line or signals that it cannot safely be stopped before passing the line or signal ”. If, therefore, there were to be an amber light which came on, say, 5 seconds before the red flashing lights were initiated by the approaching train, the law could be amended to make it an absolute offence to pass the red lights when they began to flash. Moreover, since many people feel startled when the lights and the bells simultaneously begin to operate as they are drawing alongside it may be that the timid driver will be so startled as to stall on the crossing, and the advantage of having a preliminary warning of an amber light would therefore be some improvement of safety.

V. SITE MEETINGS AND SITE INSPECTIONS

332. The account which I have given of the circumstances of the accident at Hixon reveals that not all, at any rate, of those who were present at site meetings were alive to the purpose for which they had been summoned. It may very well be, as Colonel Reed said, that his general experience at site meetings throughout the country was that the police and highway authorities were alive to the purposes of the inquiry at the time, but that may not be so in every case. Probably the more familiar the general public and their representatives are about automatic crossings the more will those who attend site meetings be conversant with the types of information that the presiding officer needs to have; but, until that day comes, it would be advisable for a full questionnaire to be sent to the various bodies consulted on those occasions asking them for all the information that may reasonably be considered necessary and asking them to send to the meeting a representative of superior rank who will be able to deal with the matter on even broader lines.

333. The site inspections take place after the automatic crossings have been installed.* Apparently, it has often be found impracticable to achieve the ideal of an inspection on the day the crossing is brought into commission, and sometimes the inspection does not take place for a month or even two months after the automatic operation of the crossing has begun. This has meant that imperfect conditions have been allowed to continue for far too long, for any imperfect condition is one which creates danger and should not be allowed to continue for a moment longer than possible. To give two instances: as one of the important measures to prevent stalling of vehicles, particularly large low-loaders, on the crossing, the Requirements provide that a good surface on the crossing and its immediate approaches is to be maintained, and the Minister's Order authorising the conversion of a level crossing to automatic operation stipulates that the

* See Part I, paragraph 56.

surface of the carriageway over the crossing shall be maintained in a good and even condition. The automatic crossing at Loxley Lane, Uttoxeter, Staffs, was brought into operation on the 5th June, 1966, but not inspected until the 27th July of the same year. On the inspection report appears the criticism "road needs improving". And, more seriously, the Kington Junction level-crossing was authorised by Order made on the 5th September 1966 to be converted to automatic operation and it was commissioned, and began to work as such, on the 16th October 1966. The roadwork between the barriers required by the Order, which is the responsibility of the British Railways, had been completed before the crossing was commissioned, but the roadworks beyond the crossing which was the responsibility of the Hereford County Council had not been completed by that date. Moreover, the British Railways had not altered the profile of the crossing which was governed by the super-elevation of one side of the rail levels because the line is on a slight curve, resulting in the outer rail of the up line being $2\frac{3}{4}$ inches above the inner rail. The crossing was not inspected on behalf of the Railway Inspectorate until Colonel Reed carried out the site inspection on the 23rd February 1967, when he made, *inter alia*, this criticism:—

"The road work has not yet been completed, though at the time of the inspection there was comparatively little left to be done. The obstruction is however distracting to road traffic on this busy trunk road and the county authority which is responsible for carrying it out is being pressed to complete it."

This crossing lies on a road which is used by an abnormally large volume of heavy industrial traffic, and it is not only surprising but, indeed, very alarming, that two incidents have happened there which might have produced disaster, namely, (1) the incident on the 8th November 1966 when Mr. J. H. Horton's low-loader grounded on the uneven surface of the crossing* and (2) the incident on the 25th January 1968 when Mr. K. A. McLoughlin, driving an articulated vehicle carrying steel plates over the crossing, was suddenly halted because, owing to the oscillation of the movement over the super-elevated rail, a defective brake connection severed and brought his vehicle to a halt across the railway.†

334. Surprising to relate, notwithstanding those two incidents, when Brigadier Gardiner went to study the Kington crossing at Leominster in the course of this Inquiry, he found this state of affairs:—

"The only real criticism I have relates to the road levels over the crossing. Quite a lot has been made about the slight hump at Hixon, but this is nothing compared with the conditions at Kington. Horton's statement that the road is now as flat as a table is just not so. This is clear from the photographs. From the plan it appears that the low-loader trailer involved in the Hixon accident could not have negotiated this crossing at the time of the Leominster incident, since a ground clearance of about 1 foot 2 inches is necessary."

Moreover, although the Order authorising the installation of an automatic crossing at Kington, Leominster, was based on a maximum railway speed of 80 miles per hour, we heard evidence from Mr. R. J. Stuart, an engine driver on express trains, that he had not been informed until about December 1967

* See Part I, paragraph 109.

† Paragraph 259.

or January 1968 that the former maximum limit of 90 miles per hour had been reduced to 80 miles per hour.

VI. RECOMMENDATIONS

335. The assessors and I have come to the conclusion that level crossings protected by automatic half-barriers are a valuable answer to the needs of modern transport and that they are reasonably safe, but we believe that their safety can be much improved by certain modifications. We have to recommend how they can be made as safe as practicable, weighing all the advantages and disadvantages in the balance. In putting before us many of the possible precautions which they have so carefully studied, the Ministry has been cautious and suggested that the precautions require further field trials and experience before being definitely adopted. However, I feel, and the assessors agree, that a definite decision is necessary now in respect of many of the matters we regard as essential for safety. These recommendations will, no doubt, be improved upon after further experience has been gained.

336. One must assess the risks dispassionately, and recognise that some dangers may involve the possible derailment of a high speed train, with the consequent loss of many lives, while other dangers do not. The more substantial dangers to be eliminated are those created by crawling and stalling vehicles, by the negligent and the criminal. Of those only the stalled vehicle cannot be provided against except at the highest cost.

337. There is a clear choice to be made between full protection for the automatic crossings by means of presence detectors allied with railway signals, and a lesser degree of protection which will minimise, but not eliminate, all risks. It is not possible now to recommend the immediate adoption of full, or even partial, protection by employment of presence detectors or the mechanisms such as that demonstrated by Professor Barwell because further experiments and tests would be necessary *before the feasibility of any such apparatus could be established*. Mr. Granville Berry has pressed upon me his opinion that I should nevertheless recommend that methods of full protection with presence detection should be actively examined and adopted as soon as a satisfactory method has been proved, and that meanwhile no level crossing should be converted to automatic half-barrier operation except at those places where the existing manned crossings with gates are not interlocked with the railway signals.

338. I would not lightly differ from Mr. Berry's opinion, but it seems to me that this is not a matter which depends on expert engineering knowledge, and I have come to a different conclusion, with which Brigadier Gardiner agrees. Though full protection with complete closure of the crossing would eliminate all risks so far as humanly possible, it would do so at such great cost in money and in the complexity of the alterations to the signal system that, for the most part, conversion of level crossings to automatic operation would cease. Almost all benefits to road traffic would also be lost, for there are more slow trains than fast, and the average times of closure of the road would be much the same as in the case of manned crossings.

339. Since the risks attendant on the abnormal slow-moving vehicle, and the negligent or the criminal driver (the "zig-zagger") can be satisfactorily dealt

with and, indeed, almost erased by other methods, the only reason for demanding full protection would be in case a vehicle (especially a hazardous load or a vehicle which would derail a train) should stall on the crossing. The magnitude of that risk may be assessed like this: some provision is already made against it by the provision of an emergency telephone which can be used to get the signalman to stop the train at any moment before it reaches the distant signal. One may suppose that a driver whose car has stalled would be able to use that telephone within two minutes of finding himself immobilised on the tracks, so that, where the distant signal is within a mile or two of the crossing (not, of course, always the case) the telephone would afford full protection up to about three or four minutes before the arrival of a fast train. The risk of a mechanical breakdown so soon before the arrival of the train must be regarded as small. I have not overlooked the near-accident at Yapton described in paragraph 267, but the more likely cause of stalling after that point of time is the timid driver who panics when he suddenly hears the bells begin to ring, 24 seconds before the arrival of the train, and it is hoped that alterations in the time cycles and better education will reduce that risk to a very low degree. Professional transport drivers are not likely to panic and the risk of their stalling through mechanical defect or grounding at the critical time is fairly remote.

340. In parenthesis, I would observe that of the three accidents mentioned in paragraph 252 above where vehicles stalled due to mechanical defect two could probably have been avoided if a telephone has been provided for use in emergency. None of the other accidents, except those occasioned by wilful zig-zagging, would have been prevented by full protection.

341. Apart from the elimination of the risk of collision with a stalled vehicle, the principal benefit which would remain with full protection would be the saving in manpower for British Railways, at the expense of great capital outlay. But, with the additional precautions enumerated below, automatic crossings in Britain will have a far greater degree of safety than are to be found in any of the other nine countries of the world who use them, and it seems to me that to adopt full protection would be indeed a backward movement. Of course, even if tests prove that detector devices such as the inductive coil are feasible and reliable, the disadvantages of a system of full protection will remain.

342. A provision of partial protection as described in paragraph 300 would retain the advantage of free flow of road traffic, and would diminish (but not eliminate) the risk of collision with a stalled vehicle. But the cost would be nearly as great as for full protection and, since its value would be no more than to warn the train driver of a vehicle which has stalled at a time when his train is so close to the distant signal that the driver of the vehicle has not sufficient time to use the emergency telephone, yet leaves an unprotected gap thereafter, I do not think that such a small advantage is worth the price. It would probably have been useless to prevent the near-accident at Yapton and it does not give any confidence to railwaymen.

343. For the reasons I have stated, I do not recommend a full or partial protection of automatic crossings by presence detectors.

344. Where the road crosses three or more railway tracks the complex interaction of road and rail traffic might necessitate special safety precautions, and I recommend that automatic crossings should not be brought into use where there

are more than two railway tracks until further experience of automatic operation has been gained.

345. Certain basic changes in the operation of all automatic crossings are necessary and should be put into effect as soon as possible. They are:—

- (i) that the time cycle should be extended to a total of 32 seconds before the arrival of the fastest train on a crossing, i.e.

warning period	8 seconds
barriers descend	8 seconds
final phase	16 seconds.
- (ii) that the second train sequence should be altered so that, if a second train would reach the normal strike-in point within 20 seconds (for the fastest train) after the first train strikes-out, the half-barriers will remain down and the lights continue to flash. If it strikes in later, the barriers will rise, but there will be at least 14 seconds before the standard operating cycle starts again. This alteration should be treated as a matter of urgency:
- (iii) that, if the second train situation is amended in that way, the "second train coming" notice on the offside of the road should be illuminated from within.

Objection will probably be made that the recommended enlargement of the time phases will increase the frequency of zig-zagging offences, and no doubt research will be carried out to see whether that is so. I venture to think it will be found that the fear of the zig-zagger has been exaggerated: motorists are accustomed to waiting at traffic lights at junctions with high speed roads for as much as 100 seconds, and they will recognise that automatic crossings are a very special type of road hazard. But, however that may be, as the recommendations we have made are necessary for the safety of law-abiding motorists, their interests should be given priority.

346. Efforts should, nevertheless, be made to close the crossings to the zig-zagger as far as practicable, and we recommend:—

- (i) that wherever the width of the carriageway is 40 feet or more a dual carriageway should be created, with a central strip extending 40 yards along the road on either side of the crossing;
- (ii) that elsewhere, if the amount of road traffic is substantial the road should be widened and dual carriageways constructed so far as practicable. The Ministry should study the question of what volume of traffic and what conditions would make this course necessary, and should publish their findings;
- (iii) that, where a dual carriageway is not practicable, a double white line with "cats' eyes" should be marked along the centre of the road for a distance of 40 yards along the road on each side of the crossing, with deflecting arrows directing traffic to its nearside.

347. Mr. Granville Berry is in favour of a recommendation that the standard three-colour traffic signals should be substituted for the present twin red flashing lights, on the ground that the former are universally understood and well respected whereas the latter are unknown to the majority of motorists. He envisages that they would have an additional function as an early warning

signal, and so proposes that the signal sequence should be: green → flashing amber (as early warning) → steady amber (as at present) → red.

348. I regret that, once more, I feel obliged to take a different view, with the support of Brigadier Gardiner, for the reasons set out in paragraph 331 above. We all feel sure that a preliminary warning is desirable to avoid motorists being surprised by the sudden flashing of the red lights and also, even more important, so that the red lights may be made by law an absolute signal to stop. The red flashing lights, apart from being the internationally recognised sign, give the public an unmistakable indication that the crossing is not an ordinary road intersection: the flashing conveys a message of urgency. So we recommend (a) the addition of an amber aspect which should give a warning to traffic five seconds before the beginning of the time cycle for the automatic operation of the half-barriers; (b) that the twin red flashing lights be retained; and (c) that regulation 34(4) of the Traffic Signs Regulations and General Directions, 1964, be amended so that the provisions of regulation 34(1)(a) and (d) shall apply to these signals.

349. "Yellow box" markings should be more extensively employed on automatic crossings to discourage traffic "blocking back" over the railway.

350. The risk of stalling can, and should, be further diminished by strict attention being given to a level profile not only on the crossing but for a distance on either side. We accept the Ministry's proposal that the longitudinal profile of the centre line of the carriageway across the rail tracks and for a distance of 100 feet on each side shall conform to a vertical curvature of not less than 1,250 feet radius, and that the cant of the railway tracks on a curve should generally not exceed three inches. If it is not possible to eliminate a greater cant or hump on a crossing, the crossing should be classified and a list giving the locations and measurements of each classified crossing should be circulated to all haulage contractors, and appropriate road warning signs erected.

351. Where special, but occasional, traffic problems are foreseen, e.g. crowds coming from football matches or children coming out of school, special arrangements should be made to control them. This would normally be the duty of the police, but the British Railways should give any expert assistance necessary, such as arranging communication with the signal box.

352. For slow-moving vehicles the following provisions are recommended:—

- (i) all special orders should include the location of every automatic crossing on the prescribed route and a caution or direction that the driver must telephone to the signalman before crossing for permission to cross, and that, after crossing, he must again telephone to inform the signalman that the crossing is clear. VR1 movement orders should contain a similar direction. These precautions should be the responsibility of the Ministry.

It does not seem necessary at present to lay down a rule that special order loads should be met at every automatic crossing by a railway employee, because the loads will usually be escorted by police, and because it is important that there should be no doubt who is the person responsible for using the telephone procedure. But British Railways and the Ministry should keep this possibility under review, and the hauliers must be reminded that it is their duty to reconnoitre

a route and make provision for telephoning if the vehicle cannot conveniently halt adjacent to the crossing:

- (ii) that all other vehicles which are unable for any reason to negotiate the crossing at 10 miles per hour must adopt the telephone procedure;
- (iii) that a large notice should be erected on the approach to the crossing requiring large and slow vehicles to telephone. Two suggested forms of notice appear in figures 6 and 8 of Appendix XVI, but we prefer the imperative tone of figure 8 to that suggested by the Ministry (figure 6):
- (iv) that notice should be made an authorised traffic sign and should be mandatory.

353. Consideration should be given to the question whether or not it is necessary to make it a specific criminal offence to use the telephone for the purpose of sending false information to the signalman in the monitoring signal box.

354. The proposed wording of the new paragraph in the *Highway Code* about automatic crossings is not, in our view, satisfactory. The *Highway Code* is issued by authority of Parliament and can be amended only by resolution of both Houses in accordance with section 74 of the Road Traffic Act, 1960. I would respectfully submit that the amended paragraph should make plain:—

- (a) that the train cannot stop before it reaches the crossing;
- (b) that the train may be upon the crossing only 24 (or 32 seconds, see paragraph 345) after the lights begin to flash, with some words of emphasis such as “almost as quickly as you can read this paragraph”;
- (c) that no one must in any circumstances venture on the crossing while the lights are flashing—“you may be killed”;
- (d) that drivers of any vehicle which cannot cross at 10 miles per hour at least must use the telephone to obtain the signalman’s permission before crossing;
- (e) that drivers must not drive “nose to tail” and must not enter upon a crossing unless they can see their exit is clear;
- (f) that it is a serious offence to disobey these rules;
- (g) that “if a vehicle stalls on the crossing, telephone the signalman immediately to stop the trains, but if the red lights have begun flashing there is no time to waste—get everyone out of the car and get clear of the railway”.

355. A satisfactory knowledge of that new paragraph of the *Highway Code* should be made a condition precedent to passing the driving test.

356. The motorist who disregards the red flashing lights and who persists in going across the railway, whether by zig-zagging or by trying to get under the barriers before they fall, not only commits the offences of disobeying the lights and, probably, of crossing over the double white lines, but is guilty of dangerous driving of a kind which may produce a great disaster. It is true that the risk of a car, motorcycle, or other small vehicle (for no very large vehicle would be able to indulge in this kind of offence) doing damage to anything but itself, or derailing a train, is small indeed. Nevertheless it is not unknown for a solid piece of metal from the vehicle, by gross misfortune, to come between the rails

and the flange of the locomotive wheels and thus derail it. A motorcycle has been known to derail a train. Consequently, it would seem that the offender is already liable to the penalties of the law for dangerous driving; but, lest there be occasions when a court might consider the evidence did not disclose any danger, it seems desirable to make it a special offence punishable with the same penalties as for dangerous driving, including most particularly a compulsory disqualification for not less than 12 months.

357. Of course, the offence is difficult to detect and discipline is difficult to enforce; zig-zagging is likely more often to be committed when the offender believes he is unobserved. It cannot easily happen at places where a central reservation in a dual carriageway has been provided to exclude the possibility of zig-zagging and, therefore, the question will arise as to how it can be prevented at places where there is no such central reservation. I submit for consideration a method that is, I understand, used in Germany and Belgium, namely to fit a camera to the pivot post on each side of the automatic crossing which is operated only by the passage of any vehicle over the line of the barriers after the red lights have begun to flash. By means of the photograph the registered owner of the car can be traced and, under section 232 of the Road Traffic Act, 1960, can be obliged to supply information to the police as to the identity of the driver of the vehicle at the relevant time. It would be necessary in order to provide for effective enforcement of this discipline, for

- (a) the photograph to be *prima facie* evidence of the committing of the offence, and
- (b) that, if the owner refuses to give information as to the identity of the driver at the relevant time, he should not be able to escape by paying the penalty of £50 under section 232 of the Road Traffic Act, 1960, but should be presumed to be himself the driver at the relevant time, the onus of disproving that fact being upon him.

Mr. J. F. H. Tyler, giving evidence on behalf of British Railways, indicated their willingness to adopt this device.

358. In what are the more serious cases of *infringement*, namely the neglect by the driver of a load who is required to do so to observe the telephone procedure, the same penalty as for zig-zagging should be imposed but, for the further enforcement of discipline, a penalty should also fall on his employers, unless they could establish that they had given all necessary instructions to their employee to comply with that procedure. For example, consideration might be given to the withdrawal of the licence of the transport manager proposed under clause 61 of the Transport Bill, 1968.

359. The most effective means of eradicating the dangers of automatic crossings is by sound education. For the reasons given in paragraphs 318-320 above, a nation-wide publicity campaign would be too expensive and, more important, would be likely not to have the desired result. One of the things disclosed by our examination of the circumstances of the accident at Hixon was that the publicity given to automatic crossings was inadequate because there were too few crossings to justify a concentrated national campaign and such publicity as there had been had left no impression on the minds of those, like Mr. Groves, who had noticed it. Merely local publicity is not enough unless it covers large towns within a substantial radius from the site, because a mobile

motoring population is likely to encounter crossings outside its home district. National publicity by television "fillers", radio announcements, and publicity with the aid of the motoring organisations should be pursued to the extent thought most effective. We have, however, come to the conclusion that the proper approach, which we recommend, is that the conversion to automatic crossings should be pressed forward at greater speed and, so far as possible, on a programme concentrating on one line or in one region of the country, so that an intensive publicity campaign covering a wide area may have the best effect.

360. In addition, the leaflet which British Railways have offered to publish should be sent to householders in the locality of a new installation. The Ministry should send it to all motoring organisations, heavy haulage contractors, omnibus companies, and motor coach operators.

361. Local publicity by posters and press conferences should be continued, and special attention paid to lectures and practical demonstrations at schools, particularly for children under 13, and these lessons should be repeated periodically.

362. The cost of the intensive publicity mentioned in paragraphs 359-361 above should not be met by drawing on the funds allotted to the Ministry for road safety propaganda, but should be regarded as an item in the cost of installing automatic crossings.

363. It is recommended that the design and presentation of automatic crossings should be reconsidered by an industrial designer with knowledge of the psychology of road users as suggested by Professor Buchanan or by the Traffic Engineering Division of the Ministry, in association with British Railways. We are strongly of opinion that, any new design should include a double St. Andrew's cross at each corner of the crossing (see Appendix XV, figure 5 and Appendix X, plate 8).

364. The road signs at automatic crossings should be informative as well as regulatory. The "hammer sign" should be withdrawn as soon as a decision is reached as to a suitable alternative. We favour the new sign shown in figure 4 of Appendix XVI and respectfully suggest that this sign should be contended for at the United Nations Economic and Social Council Conference on Road Traffic in Vienna in October. If other delegates to that conference object to it, the existing locomotive sign, (Appendix XVI, figure 2) would be a suitable alternative. What is most desirable is that the road sign should indicate the presence of a railway.

365. We recommend that experiments should be carried out at selected crossings to test the value of an early warning signal erected on the roadside on the approach to the crossing which would operate for 20 seconds before the initiation of the automatic operation of the half-barriers, with a view to seeing whether, for vehicles other than special order loads, this signal could be substituted for the obligatory telephone procedure. Great caution would be necessary to ensure that if a vehicle 55 feet long, travelling (for some reason) in first gear should have passed the signal before it began to operate, it would not be entrapped on the crossing.

366. The procedure at site meetings should be improved. We recommend that site meetings should be conducted by officers of the Railway Inspectorate and that steps should be taken to ensure that officers of senior rank from each of the consulted authorities appear and are fully aware of the contribution they can make to the deliberations of the British Railways and the Ministry. A document setting out the general headings or aspects of the matters to be considered, particularly present and foreseeable changes of traffic conditions of all types (from pedestrian to juggernaut) should be circulated to them before the meeting.

367. The delays which have occurred hitherto between the time when a level-crossing has begun automatic working and the time of the site inspection have often been excessive. It may not be practicable for an inspection to take place at every site before automatic working begins, but the Ministry should take steps to ensure that the site inspection takes place as soon as possible thereafter. The crossing-keeper should not be allowed to be withdrawn until all the requirements of the Minister's order authorising the conversion are certified by the officer of the Railway Inspectorate to have been complied with.

368. At many automatic crossings on the Southern Region the strike-in is done by means of the electric track circuit, relying on the fact that by much use the rails are kept bright and so make good electric contact. It seems, however, clear that it would be safer to install a strike-in mechanism to duplicate the track circuit (and we have been told that is being done). Indeed, all the mechanisms upon which the safe working of the automatic crossings depend should be duplicated so far as possible.

369. The recommendations made in this Report are based on present conditions. It is obviously impossible for the Court to consider, or to decide upon, what may happen when, for instance, the speed of trains is increased above 100 miles per hour. Higher speeds may be accompanied by improved braking systems or other technological advances of which we cannot know.

PART THREE

SUMMARY

Findings:

1. The immediate cause of the accident at the automatic crossing at Hixon on 6th January, 1968, was that the driver of a huge transporter vehicle, 148 feet long, carrying a load of 120 tons, failed to comply with a notice erected near the stop line on the approach road directing him to telephone the signalman before attempting to cross, and drove the vehicle across the railway at two miles per hour when the arrival of an express train at 75 miles per hour was imminent. (*Paragraphs 73 and 74*)

2. The driver of the transporter, Mr. B. H. Groves, did not know of the existence of such a notice nor of the need to telephone for permission to cross the line, but he or his statutory attendant, Mr. R. C. Parsons, ought to have seen it and complied with it. (*Paragraph 211*)

3. Mr. Groves knew the crossing was automatically operated by trains but he did not pause to think before venturing upon the crossing about the possibility of the arrival of a train. The responsibility for his neglect and ignorance belongs principally to his employers, Robert Wynn and Sons Limited. Those employers were gravely at fault for failing to discover the proper procedure for their heavy vehicles when using automatic crossings and to instruct their drivers accordingly. That failure by the directors of Robert Wynn and Sons Limited was the principal factor contributing to the disaster. (*Paragraph 214*)

4. The two police constables escorting the transporter, P.c. Prince and P.c. Nicholls, were almost wholly ignorant of automatic crossings and the way they worked. They had not observed the Emergency Notice, and were not responsible for Mr. Grove's failure to comply with the telephone procedure, but they were at fault for failing to consider intelligently whether such a vehicle could safely cross the railway, and to make inquiries. (*Paragraph 213*)

5. The Chief Constable and senior officers of the Staffordshire Police failed to instruct their constables about the working of automatic crossings, and especially of the need for drivers of heavy vehicles to use the telephone procedure, because they themselves were ignorant of those matters. They had failed to consider the possible hazards presented by automatic crossings already working in North Staffordshire, and had not read with care the explanation contained in the Requirements and Explanatory Note which were sent to them. They were less to be expected readily to relate those hazards to slow abnormal vehicles than Robert Wynn and Sons Limited or British Railways or the Ministry of Transport but nonetheless were at fault in failing to do so. (*Paragraphs 215-217*)

6. Since early 1964 officials of British Railways knew of the hazard of large vehicles which would be unable to clear an automatic crossing within 24 seconds but assumed that the Emergency Notice, which had been drafted and approved by the Ministry, was sufficient warning to drivers of such vehicles. (*Paragraph 218*)

7. The principal faults of British Railways contributing to the accident were:

- (a) their failure when replying to a letter of the 19th November 1966, relating to an alarming incident at an automatic crossing at Leominster, to inform Robert Wynn and Sons Limited of the imperative necessity for drivers of heavy transport to comply with the telephone procedure, and
- (b) having undertaken to conduct the necessary local publicity campaigns, they failed to send any information direct to heavy haulage contractors. (*Paragraph 218*)

8. The Ministry of Transport failed to consider the individual types of traffic which must be catered for, and so failed to consider the need for special precautions for the abnormal slow-moving vehicle. (*Paragraph 223*)

9. In July 1966 the Ministry took a policy decision which was wrong, and which directly contributed to the accident at Hixon, namely that cautions relating to automatic crossings should not be inserted in Special Order routes. (*Paragraph 193*)

10. The Ministry of Transport's attempt to convey information about the working of automatic crossings to a number of lay bodies, including the police, by circulating the technical Requirements, though accompanied by an Explanatory Note, was inept, and should have been recognised as such. The Explanatory Note, which was expected to be understood by lay addressees, made no mention of the obligation on drivers of abnormal heavy vehicles to telephone the signalman. (*Paragraph 224*)

11. The Ministry is responsible for the fact that the Chief Constable of Staffordshire was not properly briefed by the Home Office about the significant matters which would concern constables escorting heavy loads. (*Paragraphs 216 and 224*)

12. The Ministry drafted the Emergency Notice in such a form that it was likely not to attract the attention of drivers who ought to have complied with the telephone procedure. (*Paragraph 225*)

13. The origin of the accident was in the failure of officers of both the Ministry and British Railways in collaboration to appreciate the measures necessary to deal with a hazard of which they were aware. (*Paragraph 226*)

Recommendations:

1. Automatic half-barriers are a valuable answer to the needs of modern transport, and can be made acceptably safe without the introduction of obstruction detection devices, linked with either full or partial signal protection. These devices, even if technically feasible, would be costly; and full protection would involve the loss of most of the benefits for road-traffic achieved by automatic half-barriers. (*Paragraphs 335-343*)

2. The conversion of crossings to automatic working should be pressed forward at greater speed, concentrating on particular areas, so that the public become familiar with the new equipment. (*Paragraph 359*)

3. Automatic half-barriers should not be introduced at crossings with three or more railway tracks until further experience of automatic operation has been gained. (*Paragraph 344*)

4. Certain basic changes in the operation of all automatic crossings are necessary, and should be put into effect as soon as possible:—

- (i) Extension from 24 to 32 seconds of time before arrival of fastest train on the crossing;
- (ii) Alteration of equipment so that if a second train would reach normal strike-in point within 20 seconds after the first train strikes out, the half-barriers will remain down and the lights continue to flash;
- (iii) "Second train coming" notice to be illuminated from within. (*Paragraph 345*)

5. Zig-zagging to be discouraged by:—

- (i) Installation of dual carriageways, where road is wide enough or where road traffic is sufficiently heavy to justify the expense;
- (ii) Extended use of double white lines. (*Paragraph 346*)

6. Flashing red lights to be retained, with addition of preliminary amber warning light. (*Paragraph 348*)

7. Extension of use of yellow box markings. (*Paragraph 349*)

8. More stringent standards of road profile, to diminish risk of grounding. (*Paragraph 350*)

9. Extra precautions for slow-moving vehicles:—

- (i) Special Order and V.R.1 movement orders to include a caution or direction that the driver must telephone the signalman for permission to cross and where there is a prescribed route the location of every automatic crossing to be indicated on it;
- (ii) Mandatory traffic signs at crossing, requiring drivers of large vehicles (over 55 feet long, or 9 feet 6 inches wide, or 32 tons gross weight) or vehicles unable to cross at over 10 miles per hour, to telephone the signalman. (*Paragraph 351*)

10. Revised paragraph about automatic crossings for *Highway Code*. (Paragraphs 354-355)

11. More severe penalties for drivers who zig-zag or fail to use the telephone procedure. (Paragraphs 356-358)

12. Need for more intensive local publicity. (Paragraphs 359-362)

13. Reconsideration of design of automatic crossings and associated road signs. (Paragraphs 363-364)

14. Need for experiments with early warning road signal. (Paragraph 365)

15. Suggestions for improved procedure in relation to site meetings and inspections. (Paragraphs 366-367)

I wish to repeat the gratitude I expressed in the Introduction to this Report to Mr. Granville Berry and Brigadier Gardiner for their most helpful advice and collaboration, and unflagging patience, throughout this Inquiry. I am also sincerely grateful to Mr. W. P. Jackson for the highly efficient and industrious way in which he has punctually discharged his onerous duties as Secretary, and for his guidance on many matters. I am indebted to Mr. R. E. Leake, Clerk of the Court, for his most competent and cheerful management of the Court. I must also acknowledge with thanks the invaluable help given by the Treasury Solicitor and his officers in the preparation of the evidence with meticulous care. And, not least, I warmly thank the Treasury team of shorthand writers who provided the Court with an accurate record of the proceedings every day.

E. BRIAN GIBBENS

Assessors { GRANVILLE BERRY
R. GARDINER

W. PATRICK JACKSON, *Secretary*

1st July 1968.

APPENDIX I

Party	Counsel	Solicitors
The Court	The Rt. Hon. Sir Elwyn Jones, Q.C., M.P. (H.M. Attorney General) Mr. F. Blennerhassett, Q.C. Mr. R. Kidwell, Q.C.	H.M. Treasury Solicitor
British Railways Board	Mr. Edgar S. Fay, Q.C. Mr. J. H. Ellison	Solicitor British Railways Board
Messrs. Robert Wynn & Sons Ltd. Mr. Brindley Harold Groves	Mr. Morris Finer, Q.C. Mr. Patrick Bennett	Messrs. A. E. Wyeth & Co.
Ministry of Transport	Mr. Nigel Bridge (until March 20th) Mr. L. F. Read Mr. D. Woolley	H.M. Treasury Solicitor
Staffordshire County Council Chief Constable of the Police Authority for the Staffordshire and Stoke on Trent combined Police Force	Mr. Stephen Brown, Q.C. Mr. Michael Pratt	Clerk of Staffordshire County Council
National Union of Railwaymen	Mr. Douglas Lowe, Q.C. Mr. Frank J. White	Messrs. Pattinson & Brewer
Associated Society of Locomotive Engineers and Firemen	Mr. Ronald E. Hopkins	Messrs. Kenneth Brown, Baker, Baker
Relatives of Mr. Roger Keith Blake, decd., Jill Blake, decd. and other members of that family involved in the accident	Mr. Philip L. W. Owen, Q.C. Mr. N. W. Lyell	Messrs. Swepstone, Walsh & Son
Royal Automobile Club Automobile Association	Mr. J. Lloyd-Eley	Mr. J. B. Izod
English Electric Co.	Mr. Desmond J. Ackner, Q.C. Mr. David Paterson	Messrs. Linklaters & Paines
Road Haulage Association	Mr. R. M. Yorke (until 29th April) Mr. D. W. Keene	Messrs. Mawby Barrie & Letts

APPENDIX II

Witnesses

ALEXANDER, Francis Spencer	MACKMURDIE, Douglas Craghill Robert
BAILEY, Stanley Ernest	MADGE, James Richard
BARWELL, Professor Frederick Thomas	MCLOUGHLIN, Kenneth Anthony
BICKERTON, Frank Donald	MCMULLEN, Colonel Denis
BICKLEY, Eric	MERRILL, Eric
BONHAM-CARTER, John	MITCHELL, George Henry
BRIDGES, George Arthur	MOREAU, Flt. Lieut. Roger Dennis
BUCHANAN, Professor Colin Douglas	NICHOLLS, Anthony James
CLARK, Edward	OLVER, Major Peter Michael
CLARKE, Harry Leslie	OWEN, Peter John
COBBE, Brian Morton	OWEN, Ronald
CROMWELL, Thomas William	PARNALL, Keith Phillip
DE VOS, Hendrik Adriaan Ewoud	PARSONS, Richard Collingwood
FINAL, William Cyril	PARTINGTON, William
FRENCH, Gilbert James	PRESTON, John Henry
GINNS, Harry Norwood	PRINCE, Ephraim
GROVES, Brindley Harold	REED, Colonel William Power
GUBBINS, Francis Bernard	REES, Arthur Morgan
HALE, Frank Maurice	REGISTER, Brian Spencer
HIGGINS, William Nelson	RICHARDS, Robert John
HOCKENHULL, Leslie	ROSS, Malcolm
HOLBROOK, John Phillip	RUSSELL, Mrs. Cynthia Ann
HOLDCROFT, John Joseph Harry	RUSTON, John William
HOLLAND, Arthur David	SCHOUTEN, Professor Jacobus Pieter
HORTON, James Howard	SCOTT-MALDEN, Charles Peter
HOUGHTON, Albert Morley	SHAW, Frank
ILLSLEY, Alan Leslie	STUART, Reginald James
JOHNSON, Sir Henry Cecil	SUTCLIFFE, Bryan
LEWIS, Peter Timothy James	TAYLOR, Paul Langdon
	TYLER, John Francis Henry
	WILKINS, Terence Charles
	WOODCOCK, Malcolm John
	WYNN, Henry Percy
	WYNN, Noel Robert

APPENDIX III

SUMMARY OF WRITTEN SUGGESTIONS RECEIVED

During the period of the Inquiry over 700 letters were received by the Court or by the Ministry of Transport. Some were from local authorities, from other public bodies and from companies (listed below), but many of the letters were from members of the public who were sufficiently concerned about the situation to wish to put their views. This correspondence was of the greatest possible assistance to the Court, and was considered in great detail by the two assessors.

Apart from a number of expressions of general concern about different features of automatic crossing operation, the great majority of the letters suggested, not a return to manned crossings, but a retention of automatic crossings, with suitable safeguards. In particular a large majority of the letters received suggested different ways in which obstruction detection might be provided which would enable a train to be stopped if a crossing was not clear. A number of ingenious systems were devised and sent to the Court, in some cases with detailed plans and even working models, to provide increased protection at crossings, and the feasibility of all these systems was most carefully considered:

Association of Luton and District Driving Schools
Associated Society of Locomotive Engineers and Firemen. Nottingham Branch
Camborne and Redruth Urban District Council
Dorrridge Ratepayers Association
East Sussex County Council
Faringdon Rural District Council
Harwich Constituency Labour Party
Kent County Council
Lancaster and District Road Safety Committee
National Council on Inland Transport
National Farmers Union
Royal Society for the Prevention of Accidents. North Midland Region
Sandheys Ratepayers Association
Stowe Parish Council
Transport and General Workers' Union
Willington Parish Council
The Wokingham Society
Yapton Parish Council

Beulah Electronics
Electronic and Automation Engineers Ltd.

P. J. Greenfield. Electronic Photo Controls
Hepplewhite Marine
Edwin Higginbottom. Milling Engineers
Laslett Design Services Ltd.
D. A. Leadbeater
Mayday Alarms Ltd.
Micro Consultants Ltd.
Motivated Flooring & Storage Ltd.
Nachshen, Crofts and Leggatt
Tyersal Combing Company (Bradford) Ltd.
Unicost Autodoors Ltd.
Van de Geer Ltd.
E. W. Williams. Industrial Safety Consultants

APPENDIX IV

BRITISH TRANSPORT COMMISSION ACT 1957

THE BRITISH RAILWAYS BOARD (NORTH STAFFORDSHIRE RAILWAY) HIXON LEVEL CROSSING ORDER 1967

Made - - - - - 19th January 1967

Coming into Operation 2nd April 1967

The Minister of Transport in exercise of her powers under section 66 of the British Transport Commission Act 1957(a) and of all other powers enabling her in that behalf hereby makes the following Order:—

1.—(1) This Order shall come into operation on the 2nd April 1967 and may be cited as the British Railways Board (North Staffordshire Railway) (Hixon Level Crossing) Order 1967.

(2) In this Order—

“ the Board ” means “ the British Railways Board ”;

“ the Minister ” means “ the Minister of Transport ”;

“ nearside ” means “ on the left-hand side of the road or carriageway in relation to a person approaching the crossing along the road or carriage-way ”, “ offside ” means on the right-hand side of the road in relation to any such person ” and the expressions “ the nearside ” and “ the offside ” shall be construed accordingly.

(3) The Interpretation Act 1889(b) shall apply for the interpretation of this Order as it applies for the interpretation of an Act of Parliament.

2. So long as this Order continues in force the provisions of Section 47 of the Railways Clauses Consolidation Act 1845(c) as incorporated with the North Staffordshire Railway Act 1847(d) and Section 39 (Company to erect a Station or Lodge at the Points of crossing, and to abide by the Regulations of the Commissioners of Railways) of the said Act of 1847 shall cease to apply to the level crossing referred to in the First Schedule hereto being a level crossing at which a public carriage road is crossed on the level by a railway of the Board.

3. The following provisions, being provisions which in the opinion of the Minister are necessary or desirable for the protection, safety and convenience of the public, shall apply with respect to the said level crossing—

(1) The Board shall provide at the said level crossing, and shall maintain and operate so long as this Order continues in force, the barriers, lights, traffic signs and other devices and appliances specified in the Second Schedule hereto.

(2) The Board shall observe the conditions and requirements specified in the Third Schedule hereto in relation to the said level crossing and the use and operation thereof.

(a) 5 & 6 Eliz. 2. c. xxxiii.
(c) 8 & 9 Vict. c. 20,

(b) 52 & 53 Vict. c. 63.
(d) 10 & 11 Vict. c. cviii.

4. The Board shall give notice in writing to the Minister as soon as the works referred to in Article 3 of this Order have been completed to enable an Inspecting Officer of Railways to make an inspection thereof.

FIRST SCHEDULE

In the County of Stafford—

In the parish of Stowe in the rural district of Stafford—

The level crossing known as Hixon crossing whereby Station Road is crossed by the railway at the former Hixon station.

SECOND SCHEDULE

Particulars of barriers, lights and traffic signs

(1) Only one half-barrier shall be constructed on each side of the railway.

(2) Each half-barrier shall be capable of being raised and lowered across the nearside of the carriageway and when lowered shall be as nearly as is reasonably practicable at right angles to the centre line of the carriageway. The half-barriers shall be as close to the railway as practicable but no part of a half-barrier shall be nearer than 5 ft. 3 $\frac{3}{4}$ ins. to the running edge of the nearest rail and some part shall be within 11 ft. 4 ins. of the running edge of the nearest rail.

(3) Each half-barrier shall be of light construction, shall be provided with a fracture segment near the pivot and shall be so counter-weighted that it will descend in the event of any failure.

(4) When lowered the tip of each half-barrier shall extend to a point within 1 ft. from the centre of the carriageway and shall be not less than 10 ft. from the further edge of the carriageway both distances measured horizontally. The half-barriers shall when lowered be as near as is reasonably practicable to the horizontal and their undersides shall be not less than 2 ft. 9 ins. and not more than 3 ft. 3 ins. above the road at the centre of the carriageway.

(5) The half-barriers shall display on both the front and back face red and white stripes of reflecting material 2 ft. wide commencing with red at the tip.

(6) When raised, the half-barriers shall be inclined towards the carriageway at an angle of between 5 and 10 degrees from the vertical. No part of any half-barrier or of its attachments which is less than 16 ft. 6 ins. above the level of the carriageway shall be horizontally displaced from the carriageway by less than 1 ft. 6 ins.

(7) Each half-barrier shall be positioned so that, if the half-barrier is capsized towards it, no part of the half-barrier can come closer than 6 ins. to any part of the overhead system which is electrified.

(8) A cover shall be provided where necessary at each pivot post for the purpose of guarding against danger to the public from the operating mechanism and the moving parts of each barrier.

(9) Two electric lamps of not less than 6 watts each and showing a red light in both directions along the carriageway shall be fitted to each half-barrier, one within 6 ins. of the tip and the other near the centre.

(10) A red flashing light signal consisting of a pair of lamps prescribed as traffic signs by Regulations made under the Road Traffic Act 1960 shall be provided on the nearside of the carriageway on or adjacent to each pivot post with an additional traffic sign of the same type on the offside of the carriageway on a separate post on each side of the crossing. The flashing light signals shall be so arranged as to face along the carriageway in the direction of traffic approaching the crossing and the lamps shall be capable of adjustment. Single tone bells mounted on or adjacent to each pivot post shall also be provided. A single rectangular black backboard shall be provided for each pair of lamps such that the sides of the board are not less than 1 ft. from the centre of the signal lens of of each lamp. The centre of the lamp nearest the carriageway shall be not less than 2 ft. 6 ins. and not more than 5 ft. from the edge of the carriageway both distances measured horizontally. The centre of the lamps shall be not less than 7 ft. 6 ins. and not more than 10 ft. above the carriageway.

(11) The carriageway at the crossing shall be 20 ft. wide and shall be marked on the crossing with a double continuous line of the size, colour and type prescribed as a traffic sign by Regulations made under the Road Traffic Act 1960, and for a distance of 100 ft. on each side of the crossing with a continuous line and a dotted line of the size colour and type so prescribed, so placed that the continuous line is on the nearside of the dotted line.

(12) The surface of the carriageway over the crossing shall be maintained in a good and even condition.

(13) The two edges of the carriageway where it passes over the crossing shall be made up to the level of the carriageway for a further distance of 3 ft. beyond each edge. Immediately adjacent to the ground so made up cattle grids of standard railway design shall be provided on both sides of the crossing. The cattle grids shall extend to the full width between the protecting fences on both sides of the railway.

(14) Two whistle boards shall be provided on the railway in each direction on the approaches to the crossing at distances equivalent to 7 seconds and 4 seconds travelling time for the fastest train.

(15) A notice board shall be provided displaying the words " Another train is coming if lights continue to flash ".

(16) A telephone shall be provided adjacent to each pivot post and shall be connected to Colwich signal box. A notice board displaying the words " In Emergency or before crossing with exceptional or heavy loads or cattle, telephone signalman " shall be provided near the telephone.

THIRD SCHEDULE

Conditions and requirements to be observed by the Board

(1) The half-barriers shall be operated and controlled automatically by the approach of a train as described in the following paragraphs, but means shall also be provided for controlling them from a position near the crossing.

(2) The half-barriers shall be kept in the raised position except during the time when engines, carriages or other vehicles passing along the railway line have occasion to cross the road.

(3) The arrangements shall be such that when the train actuates a treadle the traffic signs mentioned in paragraph (10) of the Second Schedule to this Order shall be immediately illuminated and the bells mentioned in that paragraph shall begin to sound. The traffic signs shall operate and the bells sound for a warning period of from 6 to 8 seconds before the half-barriers begin to descend and during the descent of the half-barriers which shall occupy a further period of from 6 to 8 seconds. The bells shall thereupon cease to sound. A further period of approximately 8 seconds shall elapse between the time when the half-barriers are fully lowered, and the time when a train travelling at its maximum permissible speed (80 m.p.h. in the Up direction and 80 m.p.h. in the Down direction) can reach the crossing. The traffic signs shall remain illuminated until the half-barriers have begun to rise and shall be extinguished before the half-barriers have risen to an angle of 10° above the horizontal.

(4) The half-barriers shall be raised as soon as a train has passed the crossing. Provided that if another train is approaching the crossing, the half-barriers, shall only be raised if, before they start to descend again, they can remain fully raised for a shortened warning period of 4 to 6 seconds, and be fully lowered not less than 4 seconds before the other train arrives at the crossing.

(5) The relay controlling the half-barriers shall be capable of moving from the position for lowering the barriers to the position for raising the barriers only when both the barriers are in the lowered position.

(6) A visual repeater with two positions shall be provided in Colwich signal box. In one position the repeater shall show that the relay controlling the half-barriers is in the position for raising the half-barriers and that they are raised; and in the other position the repeater shall show that either the half-barriers or the controlling relay, or both, are in some other position. If the repeater remains in the latter position for more than 3 minutes, an audible alarm shall be given in Colwich signal box.

(7) The two red lamps on each half-barrier referred to in paragraph (9) of the Second Schedule to this Order shall be lighted at all times except when both the half-barriers are in the raised position.

(8) A single power supply with standby batteries with sufficient capacity to operate the whole installation for 12 hours shall be provided. A "Power-off" indicator to be provided in the Colwich signalbox.

(9) In the event of any failure in the equipment other than electric bulbs, the half-barriers shall descend. In such a case the traffic signs shall be illuminated as soon as the barriers start to fall and shall remain illuminated until the failure has been rectified and the half-barriers have begun to rise. In the event of a failure of all the red flashing lights facing in any one direction during the warning period, or when the half-barriers are descending or are lowered both the half-barriers shall descend or remain lowered as the case may be.

(10) Each half-barrier shall be capable of being moved by hand.

Given under the official Seal of the Minister of Transport the 19th January 1967.

(Signed) D. McMULLEN,
Chief Inspecting Officer of Railways.

BRITISH TRANSPORT COMMISSION ACT 1957

THE BRITISH RAILWAYS BOARD (NORTH STAFFORDSHIRE RAILWAY) (HIXON LEVEL CROSSING) (AMENDMENT) ORDER 1967

Made - - - 12th April 1967

Coming into Operation 16th April 1967

The Minister of Transport in exercise of her powers under section 66 of the British Transport Commission Act 1957(a) and of all other powers enabling her in that behalf hereby makes the following Order:—

1.—(1) This Order shall come into operation on the 16th April 1967 and may be cited as the British Railways Board (North Staffordshire Railway) (Hixon Level Crossing) (Amendment) Order 1967.

(2) The Interpretation Act 1889(b) shall apply for this interpretation as it applies for the interpretation of an Act of Parliament.

2. The British Railways Board (North Staffordshire Railway) (Hixon Level Crossing) Order 1967 shall be amended by substituting the following for the penultimate sentence in paragraph (3) of the Third Schedule “ A further period of approximately 8 seconds shall elapse between the time when the half-barriers are fully lowered, and the time when a train travelling at its maximum permissible speed (85 m.p.h. in the Up direction and 85 m.p.h. in the Down direction) can reach the crossing ”.

Given under the official Seal of the Minister of Transport the 12th April 1967.

(Signed) D. McMULLEN,
Chief Inspecting Officer of Railways.

(a) 5 & 6 Eliz. 2. c. xxxiii.

(b) 52 & 53 Vict. c. 63.

APPENDIX V

EXPLANATORY NOTE ON THE REQUIREMENTS (JULY 1966) FOR AUTOMATIC HALF-BARRIER PROTECTION AT LEVEL CROSSINGS

The most revolutionary of the new types of level crossing protection, and the most valuable to road users, is the half-barrier worked automatically by the approaching train, which reduces delays to road traffic very considerably.

The saving of delays at busy level crossings by installing automatic half-barriers can be very great. At a crossing worked by an attendant, the level crossing is protected by railway signals and the attendant must close the gates in time to lower the distant signal which may be $\frac{3}{4}$ mile or more away, so that the approaching train can pass it without checking. The majority of attended crossings must therefore be closed about 3–4 minutes before even a fast train passes and, if a train in the opposite direction should approach just as the first one passes, the gates may remain closed for 6–7 minutes or more at a time. With the automatic half-barrier, which is not associated with railway signals, the timing is such that the red flashing light stop signal is given to road traffic, and the barriers come down just before the fastest train reaches the crossing. The delay to road traffic for each train to pass may thus be of the order of only half a minute for a fast train increasing to about $1\frac{1}{2}$ minutes for a slow-speed freight train. The chance of a prolonged closure of the crossing when another train in the opposite direction is also approaching is thus diminished and the delay when it arises very much less. The reduction in delays at level crossings where both rail and road traffic is heavy may well be sufficient to obviate or postpone the need for bridge construction in certain cases.

The principle of using automatic half-barriers in Great Britain has already been accepted and legalised. The original conditions under which they might be installed proved too restrictive and a fresh examination, which included a further study of this equipment on the Continent, was made to decide what could be done to enable automatic half-barriers to be used more widely.

The recommendations arising from this examination have been approved by the Ministry of Transport, the Scottish Development Department and also the Welsh Office, and are incorporated in the attached Requirements. These Requirements now make it possible to use automatic half-barriers at far busier crossings than previously permitted. In no way do they infringe the principles for safety on which this type of protection is based.

These Requirements are not statutory but serve as an essential guide to the Railways when selecting sites and in preparing each automatic half-barrier proposal for submission to the Ministry for approval. They also serve as a guide to highway and/or local authorities, who must be consulted by the Railways about each individual case.

For further automatic half-barrier installations, particularly those at busy crossings, precautions will be taken to make road users acquainted with their working as has been done for the few existing installations. These include:—

- (a) national publicity at the appropriate time;

- (b) local publicity, with special attention being given to children from schools in the vicinity of the crossing;
- (c) attendance of a railway worker at the crossing for some weeks after the installation has been introduced;
- (d) an invitation to the police to assist in inculcating road discipline at the crossings.

Ministry of Transport,
St. Christopher House,
Southwark Street,
London, S.E.1.

RI 1/0010

July 1966

REQUIREMENTS OF THE MINISTER OF TRANSPORT IN REGARD TO AUTOMATICALLY OPERATED HALF-BARRIERS AT PUBLIC LEVEL CROSSINGS (JULY 1966)

THE GUIDING PRINCIPLE FOR THIS SYSTEM, WITH THE BARRIERS COVERING THE NEARSIDE HALF OF THE ROAD ONLY, IS THAT ROAD TRAFFIC MUST BE STOPPED FOR THE SHORTEST POSSIBLE TIME. THE HALF-BARRIERS SHOULD BE FULLY LOWERED ONLY JUST BEFORE THE ARRIVAL OF A TRAIN AT THE CROSSING, AND BE RAISED IMMEDIATELY AFTER IT HAS PASSED UNLESS ANOTHER TRAIN ON ANOTHER TRACK IS ABOUT TO ARRIVE.

I. CONDITIONS

1. Road and rail traffic

- (a) *Road Traffic.* There is no limit on road traffic volumes in either built-up or rural areas, providing there is no risk of traffic blocking back over the crossing from an adjacent junction and that traffic can clear readily between train movements. Traffic signals at the adjacent junction linked with the level crossing signals may be necessary to ensure these needs. Traffic in opposite directions may be required to be separated by a physical barrier on the approaches and over the crossing if the road traffic is very heavy.
- (b) *Pedestrian traffic.* This is not a limiting factor, but where there are footpaths, subsidiary barriers, or self closing wicket gates, pedestrian guard rails and additional signals may be required.
- (c) *Movement of cattle.* This may affect the suitability of a level crossing for half-barrier protection, and each case will have to be considered on its merits. Special arrangements for cattle may exceptionally be necessary.
- (d) *Speed of trains.* This is not a limiting factor provided that the difference in time between the fastest and slowest train reaching the crossing

after the warning is initiated is not more than 40 seconds. Speed discrimination controls may be necessary on high speed routes.

(e) *Frequency of trains.* This is not a limiting factor provided that road traffic can clear readily between train movements (see para. 1(a)).

(f) *Number of running tracks.* This is not of itself a limiting factor, but more clearance time may be necessary before the train passes after the barriers are down if the crossing is a long one on account of the number of tracks. Where there are three or more running tracks separation of road traffic in opposite directions by a physical barrier on the approaches may be necessary; alternatively "Another Train Coming" secret illuminated sign may be required (see para. 16).

2. Carriageway

Preferably the carriageway at the crossing and the approaches for a distance of at least 50 ft. on each side shall be not less than 20 ft. wide; but a minimum width of 18 ft. at the crossing and for a distance of at least 20 ft. on each side will be acceptable if this is more in keeping with the character and average width of the road.

3. Intervisibility

Intervisibility between approaching trains and approaching road vehicles is not necessary, though a good approach view of the crossing itself from each is desirable.

II. ROAD AND RAIL ARRANGEMENTS

4. Traffic Signs

The Traffic Signs Regulations and General Directions 1964 (S.I. 1964 No. 1857, herein referred to as T.S.R. 1964) and the Traffic Signs Manual shall be observed where applicable.

5. Surface of Crossing

A good surface on the crossing and its immediate approaches to be maintained. The ground on the crossing to be made up to carriageway level for a further distance of not less than 3 ft. beyond each edge of the carriageway.

6. Cattle-cum-Trespass Guards

Cattle-cum-trespass guards of standard railway design to be provided, if required, on both sides of the crossing and immediately adjacent to the ground so made up, and to extend to the full width between the protecting fences on both sides of the railway.

7. Carriageway Markings

(a) The two edges of the carriageway where it passes over the crossing to be clearly marked with a reflectorised continuous longitudinal line in accordance with Diagram 1011 (T.S.R. 1964).

(b) Where the width of the carriageway over the crossing is 18 ft. or over but less than 20 ft., the centre of the carriageway to be marked with the appropriate reflectorised longitudinal warning line, in accordance

with Diagram 1004 (T.S.R. 1964), over the crossing for a distance of 50 ft. on each side of the crossing, or alternatively, for at least 20 ft. on each side of the crossing if beyond this distance the road is less than 18 ft. in width.

- (c) Where the width of the carriageway at the crossing and on the immediate approaches is, or will be, more than 20 ft. the centre of the carriageway over the level crossing should be marked with a double reflectorised continuous line which should be continued beyond the limits of the crossing and its approaches where justified by the visibility requirements. On the approaches the centre of the carriageway should have a reflectorised continuous line with a broken line on its offside. The length of lines required on the approaches will depend (1) on the general width of the carriageway (i.e. excluding any part on the crossing or approaches which may have been specially widened) and (2) on the speed value of the road. Recommended lengths are shown below:

Speed restriction of road on carriageway widths of over 18 ft. but not more than 24 ft.	Length of carriageway marking on each approach (ft.)
30 m.p.h.	50-100
40 m.p.h.	75-150
50 m.p.h. and over or unrestricted	100-200 depending on speed value of road

For roads having carriageways over 24 ft. in width add 50% to above figures.

- (d) Transverse Stop lines (Diagram 1001 T.S.R. 1964) to be provided across the nearside half of the carriageway 6 ft. in advance of the barrier or 3 ft. in advance of the flashing light signals whichever is further from the crossing.

8. Central Reserves

Where dual carriageways are provided, the central reserves leading up to the barriers shall not be less than 4 ft. wide with kerbs, and not less than 20 ft. long.

9. Road Warning Signs

Directly illuminated or reflectorised road warning signs and supplementary plates (M.O.T. drawings WB 108 and WB 109) for an automatic half-barrier crossing shall be provided; it may sometimes be desirable for the location of the crossing also to be made conspicuous by the use of prescribed countdown marker posts (Diagram 539-541 T.S.R. 1964). The road warning signs and road markings on the approaches are the responsibility of the Highway Authority; signs including road markings and signals at the crossings are to be provided and fixed by the Railway Administration.

10. Location of Barriers

- (a) The barriers to be pivoted on posts located behind the nearside edge of the carriageway and when lowered to be as nearly at right angles to the road as is feasible and to extend as close as possible to the central reserve where provided, or to the centre of the road. The tip of the barrier to be not more than 1 ft. from the centre and not less than 10 ft. from the far edge of the carriageway.
- (b) Alternatively, where there is a two lane dual carriageway, two short barriers may be provided in line with each other across the carriageway on the approach side of the crossing, one mounted on the near side of the road and one on the central reserve. The mechanism to be such that both barriers come down together.
- (c) The crossing to be as short as possible but no part of the barrier equipment to be within 5 ft. 4 in. of the running edge of the nearest rail.
- (d) On skew crossings where the acute angle is between the offside of the road and the railway the barrier post to be so placed that when lowered the prolongation of the line of the barrier cuts the far edge of the carriageway, or of the footpath beyond it if provided, at a distance of not less than 3 ft. from the running edge of the nearest rail.
- (e) The underside of the barriers when lowered to be not less than 2 ft. 9 in. and not more than 3 ft. 3 in. above the road at the centre of the carriageway. The barriers not to have skirts.
- (f) When raised the barriers to be inclined towards the carriageway at an angle of between 5° and 10° from the vertical and no part of the structure which is less than 16 ft. 6 in. above the carriageway to be nearer than 1 ft. 6 in. to its edge. If the barriers cover a footpath, no part of the structure which is less than 8 ft. above the footpath should preferably be nearer than 6 in. to its outer edge.

11. Illumination of Crossing

It may be necessary for certain crossings, when pedestrian usage is high, to be illuminated.

12. Whistle Boards

Two whistle boards to be provided on the railway in each direction on the approaches to the crossing at distances equivalent to 7 seconds and 4 seconds travelling time for the fastest trains. Train drivers to be instructed to sound a short whistle at each board between the hours of 7.00 a.m. and 11.30 p.m. only.

III. BARRIER EQUIPMENT

13. Construction of Barriers

- (a) The barriers to be of light construction and a "fracture segment" to be incorporated near the pivot; the barriers to be so counter-weighted that they will descend in the event of a total power failure and to be capable of being lifted by hand. If the crossing is on a line electrified

on the overhead system the position of each barrier to be such that it cannot come closer than 6 in. to the overhead wire if capsized towards it. If, however, this is not possible the barrier either to be made of metal or to be provided with a continuous metallic strip of adequate section along its whole length, and the metal barrier or the metal strip to be earthed. In order to achieve the necessary clearance so as to avoid the need for earthing, the barriers may be positioned at distances up to 11 ft. 4 in. between any part of the barrier and the nearest running edge of rail.

- (b) The barriers when lowered to display alternate red and white vertical bands 2 ft. wide on both front and back faces, and to be provided with red and white reflectors at intervals of not more than 12 in., or with red and white reflecting material. Two red electric lights with lenses of not less than 2 in. diameter and of not less than 6 watts each, shining both ways along the road to be fitted to each barrier, one within 6 in. of the tip and the other near the centre. These lights will be required at all installations on lighted roads and on all installations on Trunk, Class I and Class II roads. They may also be required at Class III roads.

14. Red Flashing Light Signals

(a) *Siting*

A two lamp red flashing light signal, as prescribed by Regulations 31 (3) of T.S.R. 1964 and with adjustable beams, to be provided on or adjacent to each pivot post. A second signal shall normally be provided on the offside of the road on each approach, mounted on a separate supporting post. In exceptional circumstances, further signals may be required. Where there are dual carriageways, a signal will normally be necessary on the central reserve. In exceptional cases, where the central reserve is of narrow width and horizontal twin flashing light signals would be likely to encroach on the overhang clearance above the carriageway, they may be arranged vertically. This requires special authorisation.

(b) *Specification*

The specification for the optical performance of red flashing lights is as B.S. 505, paras. 25 and 26, in regard to colorimetric properties and transmittance, and as B.S. 505 para. 21, modified as shown below, in regard to distribution:—

Horizontal distribution: not less than 1,000 candelas at $1\frac{1}{2}^\circ$ from centre;

not less than 200 candelas at 10° from centre;

and not less than 70 candelas at 25° from centre.

Vertical distribution: not less than 1,000 candelas at $1\frac{1}{2}^\circ$ from centre;

and not less than 200 candelas at 10° below centre.

(c) *Visibility*

The desirable minimum distance for visibility of the red flashing light signals will vary according to the speed value of the road. The recommended distances are shown below, but if these cannot be achieved consideration should be given at the planning stage to any further measures which may be justified, including the use exceptionally of a special advance warning sign to be authorised by this Ministry. Suitable distances for visibility of the primary signals are:—

<i>Type of Road</i>	<i>Distance</i>
Restricted to 30 m.p.h.	200 ft.
„ „ 40 m.p.h.	300 ft.
„ „ 50 m.p.h.	425 ft.
Over 50 m.p.h. or unrestricted	650 ft. upwards according to speed value of road.

(d) *Flashing Rate*

Each light signal to have a flashing rate of 54–66 flashes per minute with overlap and the word “STOP” in black letters on each lens.

(e) *Arrangements of Lights*

The lights to be arranged horizontally so that there is a distance of between 1 ft. 9 in. and 2 ft. 3 in. between the centres of the lenses of the lamps, and a single rectangular black backboard with white border if required to be provided for each signal of a size that the sides of the board are not less than 1 ft. from the centre of each lamp lens. The red flashing light signals to be placed so that the height of the centre of each lens is between 7 ft. and 11 ft. 6 in. from the carriageway and the centre of the light nearest the carriageway is not less than 2 ft. 6 in. and not more than 5 ft. from the edge of the carriageway. Where the signals overhang a footpath a minimum headroom of 7 ft. to be maintained.

Note: The present limits of adjustment for signals on the B.R. standard barrier post are 7 ft. 6 in. and 10 ft. and these will normally be observed.

15. Bells

Single tone bells of modest sound output to be provided to warn pedestrians.

16. “Another Train Coming” Sign

Where there are three or more running tracks and where a physical barrier to separate road traffic in opposite directions cannot be provided, a “secret”, internally illuminated, “Another Train Coming” sign (Diagram 828 T.S.R. 1964) may be required. The sign shall be illuminated on the approach of another train and shall be clearly visible to traffic on the carriageway approaching the crossing.

Where no illuminated sign is required, a reflectorised notice to be provided to warn road users that if the red lights continue to flash after a train has passed another train is approaching.

17. Standby Batteries

A standby battery of sufficient capacity to operate the whole installation for

12 hours, to be provided, and to take over the electrical load automatically in the event of a failure of the main power supply.

18. Telephones

- (a) If abnormal loads or cattle pass over the crossing frequently a telephone available to the public may be necessary. A notice displaying the words "In Emergency or before crossing with exceptional or heavy loads or cattle, telephone signalman" will also be required. The notice boards to be reflectorised. The door of the cabinet containing the telephone to be marked in reflectorised material with either the word "Telephone" or the appropriate symbol.
- (b) If a telephone is not required, "Plug-in" connections to be provided for an emergency telephone to be connected at site by railway staff when required for emergency working or maintenance.
- (c) A suitable notice to tell road users how to contact the Railway in an emergency should be provided at all crossings where a special telephone is not required.

19. "Power-off" Indicator and Visual Repeater

A "Power-off" indicator and a visual repeater with audible warning to be provided in the signalbox or alternative surveillance point.

IV. METHOD OF WORKING

20. Operation of Barriers

The barriers normally to be operated automatically by the approach of trains, but provision to be made for manual operation at the site. Additional controls may be superimposed on the automatic operation provided that the cycle of operation outlined in para. 21 is achieved. The relay controlling the barriers to be capable of moving from the position for lowering the barriers to the position for raising the barriers only when both the barriers are in the lowered position. The repeater to show in one position that the relay controlling the barriers is in the position for raising the barriers and that they are raised; and in the other position the repeater to show that either the barriers or the controlling relay, or both, are in some other position. In addition, an audible warning to be given in the signalbox or at the control point if the repeater remains in the latter position for more than 3 minutes (a tolerance of ± 15 seconds is acceptable).

21. Timing of Operating Cycle

(a) Normal Crossings

The timing of the barrier movement to be such that on the approach of a train the road signals start to flash and the bells begin to ring 6-8 seconds before the barriers start to fall ("warning period"); the lowering of the barriers to occupy 6-8 seconds and to switch on the barrier lights; the barriers to be fully lowered approximately 8 seconds before the arrival at the crossing of a train travelling at the maximum speed but not more than 48 seconds before one travelling at the slowest speed in normal conditions. The bells to stop ringing when the barriers

are fully lowered. The road signals to continue to flash and the barrier lights to remain illuminated while the barriers are down. As soon as the train has passed the crossing, the barriers to rise, the flashing lights to be extinguished before the barriers have risen to an angle of 10° above the horizontal and the barrier lights to be extinguished when both the barriers have returned to the raised position.

(b) Second Train

On a double line, the arrangements to be such that if a second train approaching the crossing from the opposite direction "strikes in" (i.e. operates the control equipment) before the first train has passed, the barriers remain down. If a second train "strikes in" after the first train has passed, the barriers to be raised only if they can remain raised for a minimum "warning period" of 4-6 seconds before the normal lowering period of 6-8 seconds followed by an interval of not less than 4 seconds before the arrival of a train travelling at the maximum speed. In these circumstances the road signals to start to flash and the bells to ring as soon as the barriers are raised after the first train has passed. Where there are three or more tracks equivalent arrangements to be made.

(c) Skew Crossings

At long skew crossings where there is an appreciable pedestrian user it may be necessary exceptionally to arrange the timing of the barriers so that the period between the barriers being down and the fastest train reaching the crossing is more than 8 seconds in normal operation and more than 4 seconds if the second train "strikes in" just after the first train has passed. These periods may be extended by up to 4 seconds if conditions require. They may also be extended at long crossings resulting from more than two tracks (see para. (1)(f)).

22. Failure of Barrier Equipment

Arrangements to be such that any failure in the equipment other than electric bulbs will result in the lowering of the barriers. In such a case the flashing lights to be illuminated as soon as the barriers start to fall and to remain illuminated until the failure has been rectified and the barriers have begun to rise. In the event of a failure of all the red flashing lights facing in one direction during the warning period or when the barriers are descending or are lowered both the barriers to descend or remain lowered as the case may be.

Ministry of Transport,
St. Christopher House,
Southwark Street,
London, S.E.1.

RI 1/0010

July 1966

APPENDIX VI

ROAD TRAFFIC ACT 1960

Order of the Minister of Transport under section 64(4)

The Minister of Transport (hereinafter referred to as "the Minister") in exercise of her powers under section 64(4) of the Road Traffic Act 1960 hereby authorises the use on roads of a trailer which is so constructed as to be capable of carrying an abnormal indivisible load (within the meaning of Article 20 of the Motor Vehicles (Authorisation of Special Types) General Order 1966) being a transformer which by reason of its weight and width cannot be carried on roads under that Order, notwithstanding that such trailer does not comply in all respects with the requirements of the Motor Vehicles (Construction and Use) Regulations 1966 subject to the following conditions and restrictions:—

- (1) such a trailer as aforesaid shall be used under this Order only—
 - (a) being a trailer which has eight or more axles;
 - (b) being one of nine trailers set out in Schedule 1;
 - (c) by or on behalf of Pickfords Limited or Robert Wynn and Sons Limited, Albany Street, Newport, Monmouthshire;
 - (d) for the purpose of one journey only, which shall take place before the 24th December 1968; and
 - (e) for the carriage of such a transformer as aforesaid from the works of The English Electric Company Limited, Stafford, Staffordshire to the works of The English Electric Company Limited, Hixon, Staffordshire and return to the works of The English Electric Company Limited, Stafford, Staffordshire, by such route as may be previously agreed by or on behalf of the Minister;
- (2) the provisions of—
 - (i) paragraphs (a), (d), (e), (g), (h), (i), (j), (l), (m), (n), (o) (other than sub-paragraph (i) of paragraph (o)) and (p) of Article 21 of the Motor Vehicles (Authorisation of Special Types) General Order 1966; and
 - (ii) Articles 24, 25 and 30 of the said Order of 1966

shall apply to the said trailer as they apply to trailers the use of which upon roads is authorised by the said Article 21;

(3) the sum of the weights transmitted to the road surface by all the wheels of the said trailer shall not exceed that as set out in Schedule 1;

(4) the overall width of the said trailer and its load shall not exceed 16 feet 9 inches;

(5) the said trailer shall not be used under this Order during any of the following periods:—

from 12 noon on Friday 22nd December 1967 to 12 noon on Wednesday 27th December 1967;

from 12 noon on Thursday 11th April 1968 to 12 noon on Tuesday 16th April 1968;

from 12 noon on Friday 31st May 1968 to 12 noon on Tuesday 4th June 1968; and

from 12 noon on Friday 30th August 1968 to 12 noon on Tuesday 3rd September 1968;

(6) as from Friday 7th June 1968 and until Friday 27th September 1968, unless specifically directed in writing by or on behalf of the chief officer of police of every police area through which the journey is to be made, the said trailer shall not be used under this Order during the period from 6 p.m. on Friday in any week to 11.59 p.m. on the next following Sunday;

(7) before the said trailer is used under the terms of this Order, an indemnity in the form set out in Schedule 2 hereto shall be given by or on behalf of Pickfords Limited or Robert Wynn and Sons Limited to every highway authority and every bridge authority responsible for the maintenance and repair of any road or bridge over which it is proposed that the said trailer shall pass and every such authority and the chief officer of police of every police area through which the journey is to be made shall be given six clear days' notice of the date on which it is proposed that the journey will commence and of the index mark and registration number of every motor vehicle by which the said trailer will be drawn on the said journey;

(8) any directions given by the chief officer of police of any police area through which the journey is to be made shall be complied with, provided that if any such direction involves the making of a deviation from the route for the journey previously agreed with the Minister pursuant to paragraph (1) of this Order the deviation shall not be made without the prior approval of the Minister.

Signed by authority of the Minister of Transport the 22nd December 1967.

P. Elliott,
A Superintending Engineer of the
Ministry of Transport

SCHEDULE 1

- (i) Pickfords Limited trailer No. 1104 with a gross weight not exceeding 166 tons.
- (ii) Pickfords Limited trailer No. 909 with a gross weight not exceeding 177 tons.
- (iii) Pickfords Limited trailer No. 1120 with a gross weight not exceeding 189 tons.
- (iv) Pickfords Limited trailer No. 1277 with a gross weight not exceeding 210 tons.
- (v) Robert Wynn and Sons Limited trailer No. 567 with a gross weight not exceeding 162 tons.
- (vi) Robert Wynn and Sons Limited trailer No. 456 with a gross weight not exceeding 162 tons.
- (vii) Robert Wynn and Sons Limited trailer No. 789 with a gross weight not exceeding 176 tons.

- (viii) Robert Wynn and Sons Limited trailer No. 999 with a gross weight not exceeding 210 tons.
- (ix) Robert Wynn and Sons Limited trailer No. 654 with a gross weight not exceeding 162 tons.

SCHEDULE 2

To (Name of Highway/Bridge Authority)

In pursuance of paragraph (7) of Order No. P.336/67 made by the Minister of Transport on the 22nd December 1967 we hereby agree to indemnify you in respect of any damage which may be caused to any road or bridge in respect of which you are the highway or bridge authority by the trailer to which the said Order applies, or its load, or any motor vehicle used in combination with the said trailer, or by any other vehicle by reason of the use of any of the said vehicles, except to the extent that the damage was caused or contributed to by the negligence of the driver of the other vehicle, whilst such trailer is on a journey to which the said Order relates, provided that any claim in respect of damage so caused shall be made in writing within twelve months from the date on which the vehicle is last used on that journey, stating the occasion and place of the damage.

Signed.....

APPENDIX VII

ROBERT WYNN & SONS LTD. NEWPORT, MON.

Telegrams:
" WYNN'S,
NEWPORT "

Telephone:
NEWPORT 59741/6

Job No.: 4003

Date: 29th December, 1967

ROAD TRAFFIC ACT 1960

Order No. P.336/67 dated the 22nd December, 1967 made by the Minister of Transport under Section 64(4) of the above Act.

We **ROBERT WYNN and SONS LTD.**, of 50, Shaftesbury Street, Newport, Mon. being the owners of the undermentioned vehicles to which the above Order applies, hereby give notice that it is our intention to use the said vehicles on the roads specified in the attached itinerary:—

FROM: The English Electric Co. Ltd., STAFFORD.

TO: The English Electric Co. Ltd., HIXON, Staffs.

Commencing the journey on the: 2nd January, 1968

Completing the journey by the: 5th January, 1968 (Approx)

1. VEHICLES TO WHICH THE ORDER APPLIES.

Carriers Licence No. G.855/A.

Type: Trailer No. 456 Description of load: Transformer.

Overall dimensions of vehicle (inclusive of load)

Max. Height 17' 0" (Can be reduced to 16' 3")

Max. Width 16' 9" Max. Length 148' 0" overall of train.

Weight of vehicles (inclusive of load): 162-tons.

2. OTHER VEHICLES DRAWING THE ABOVE MENTIONED VEHICLE.

Index Mark and Registration No. HDW 122. ADW 228B.

Type: Tractor(s) Laden Weight 22. 22 (Tons approx.)

Type: Tractor(s)

Laden Weight:

Tons (approx)

INDEMNITY as per Article 29

To: Highway and Bridge Authorities concerned

We hereby agree to indemnify you and each and every highway or bridge authority responsible for the maintenance and repair of any road or bridge on the journey to which the above notice relates in respect of any damage which may be caused to any such road or bridge:—

(a) by (any of) the above-mentioned vehicle(s):—

(i) by reason of the construction of or weight transmitted to the road surface by (any of) the said vehicle(s), or

(ii) by reason of the dimensions, distribution or adjustment of the load carried by (any of) the said vehicle(s), or

(b) by any other vehicle by reason of the use of (any of) the above-mentioned vehicle(s) on the road or, as the case may be, the bridge, except to the extent that the damage was caused or contributed to by the negligence of the driver of the other vehicle.

Provided that any claim in respect of damage so caused by any vehicle shall be made in writing within twelve months from the date, which the vehicle is last used on the journey to which the above notice relates, stating the occasion and place of the damage.

For and on behalf of
ROBERT WYNN & SONS LTD.
S. T. RALPH

INDEMNITY

In pursuance of Order No. P.336/67 made by the Minister of Transport on the 22nd December, 1967 we hereby agree to indemnify you in respect of any damage which may be caused to any road or bridge in respect of which you are the highway or bridge authority by the trailer to which the said Order applies, or its load, or any motor vehicle used in combination with the said trailer, or by any other vehicle by the reason of the use of any of the said vehicles, whilst such trailer is on a journey to which the said Order relates, provided that any claim in respect of damage so caused shall be made in writing within twelve months from the date on which the vehicle is last used on a journey to which the above Order relates, stating the occasion and place of damage.

For and on behalf of
ROBERT WYNN & SONS LTD.
K. G. LEONARD

Leave English Electric Works via A.34 Lichfield Rd, turn left A.449 Wolverhampton Rd to junc M.6 Motorway turn right join northbound carriageway of M.6 turn right join north bound carriageway of A.34 to junc A.51 turn right A.51 Stone By Pass, (CAUTION: vehicles must proceed at crawl speed, keeping to the centre of the carriageway, with no other vehicles to be on the structure at the same time when crossing the bridge carrying the A.51 over the River Trent and the Trent and Mersey Canal) (CAUTION: headroom restriction 16' 6") Sandon, A.51 (CAUTION: when crossing the bridges carrying the A.51 over Gayton Brook and the L.M.R.R. at Weston, vehicles to proceed at crawl speed, keeping to the centre of the carriageway, with no other vehicles to be on the structure at the same time) Weston to junc class III road approx 2 miles past Hixon turn left class III road turn left access road to English Electric Works and destination.

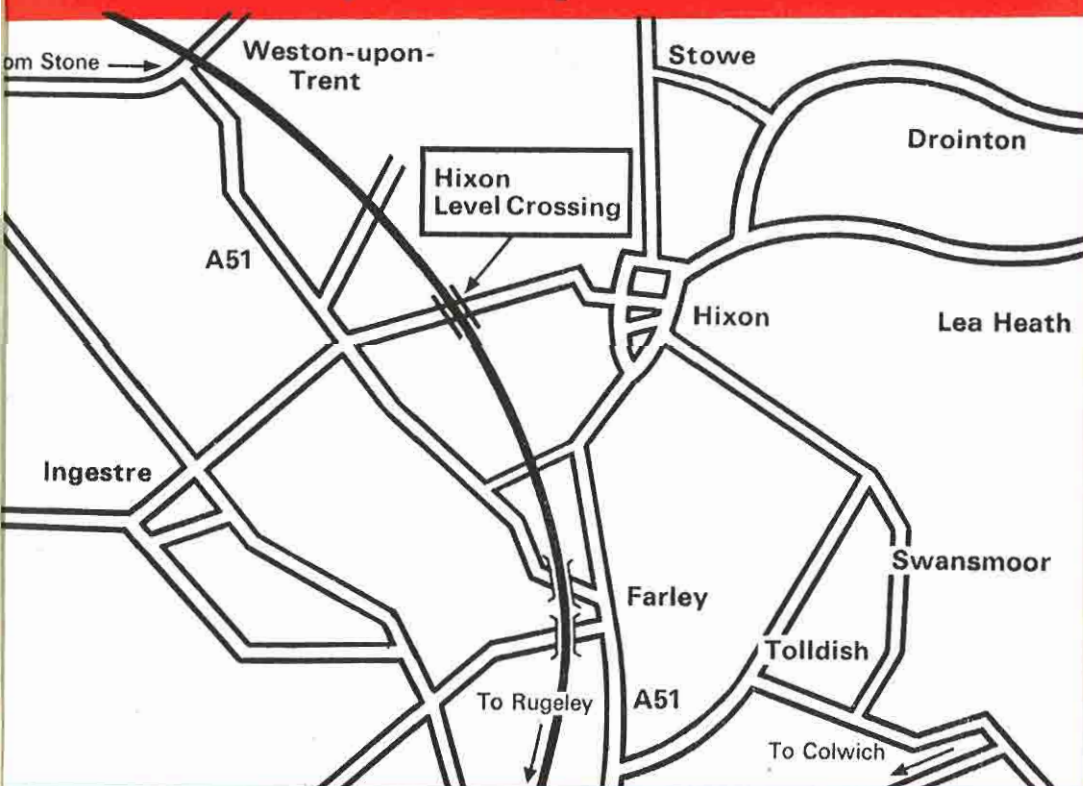
AUTOMATIC LEVEL CROSSING HALF BARRIERS

WILL OPERATE AT

Hixon

near Colwich, Staffs. on

Sunday 2 April 1967



British Rail

Automatic lifting half barriers

are not yet familiar in Britain although commonplace in the United States and on the Continent where they have proved to be safe and very satisfactory in saving the time of road users.

HOW THEY WORK

A train approaching the crossing automatically sets warnings in motion to stop road traffic and pedestrians. These are unmistakable. A bell gives audible warning and twin red lights flash at both sides of the road. Two red and white striped barriers, carrying fixed red lights, finally descend to seal off the half of the road to oncoming traffic. Within a few seconds the train will pass and, if no other train is approaching, the half-barriers lift automatically to clear the road.

REMEMBER If the barriers do not lift immediately it means another train is approaching. **Obey the red stop lights, your wait will be brief.**

The red stop lights apply to all road users. Pedestrians will have time to cross even if the warnings start as soon as they have stepped on to the crossing. Because each barrier closes only half the road it is impossible to be shut in on the crossing.

PHONES are provided at each barrier post in case of emergency.

BUT – if you intend to herd animals over the crossing you should first use the phone to find out if you have time to cross before the next train.

– drivers with exceptional or heavy loads should also phone the signalman before crossing.



These diagrams will help you to recognise at once the new level crossing.

1 Half-barriers down, red lights flashing, indicating the imminent approach of a train.

2 Half-barriers in the all-clear position allowing the crossing to be used fully by motor traffic, cyclists and pedestrians.

Safety first

The sounding of bells, the flashing red stop lights and the half-barriers are all for your safety.

ALWAYS REMEMBER

that after the red stop lights have started to flash and the warning bell to sound, the half-barriers will descend because

A TRAIN IS APPROACHING

For safety's sake

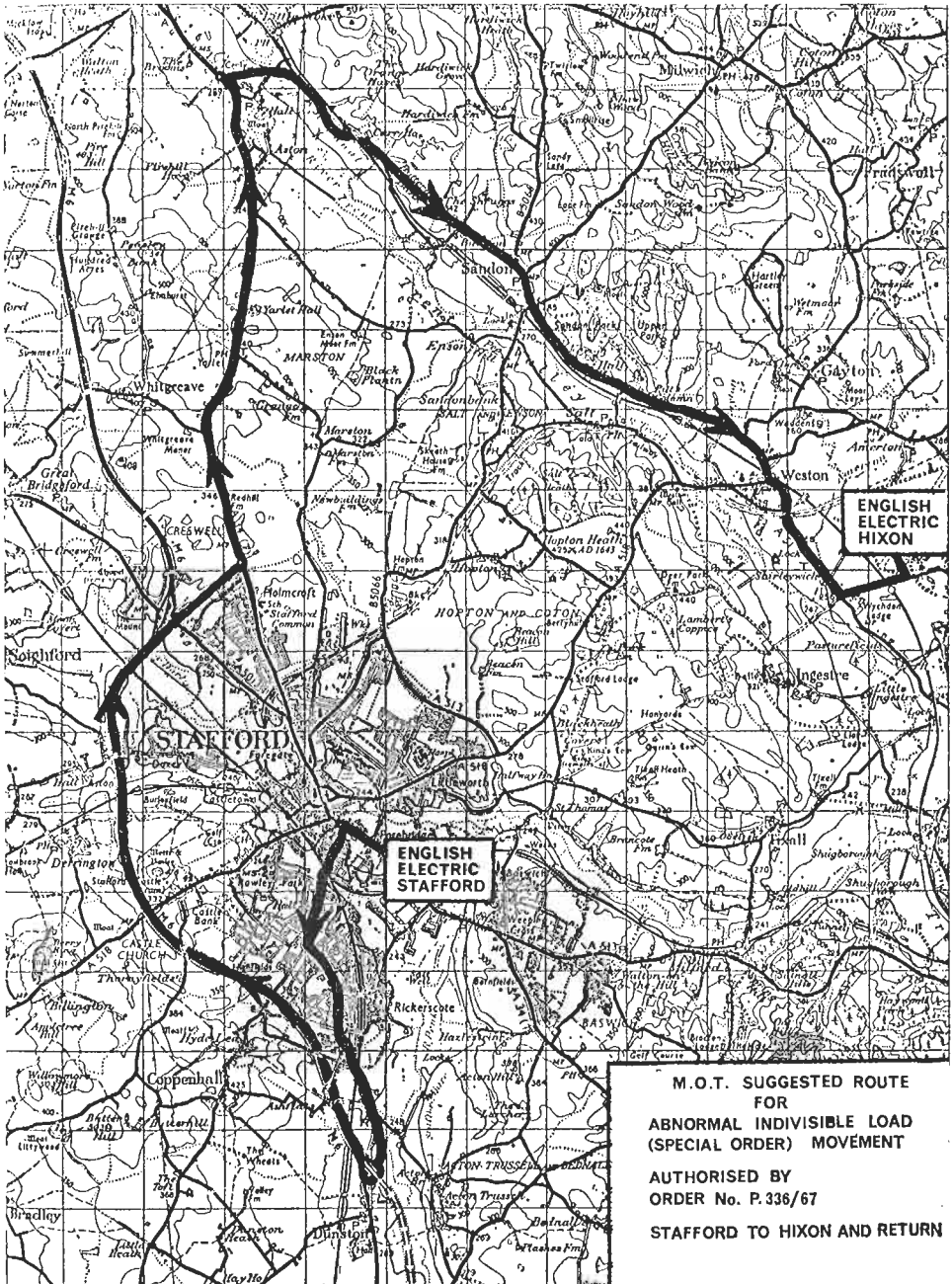
NEVER get impatient — a train reaches the crossing within seconds of the barriers being lowered.

NEVER try to 'beat the barrier' and get across the railway.

NEVER pass the line of the lowered barrier even when the train has gone by — there might be another train coming immediately.

NEVER zig-zag !

APPENDIX IX



APPENDIX X

PLATE 1

Aerial view of wrecked train (by courtesy of Daily Mirror Newspapers Ltd.).

PLATE 2

Aerial view of Hixon Level Crossing (by courtesy of Staffordshire County Police).

PLATE 3

Approach to Hixon Level Crossing showing road signs (by courtesy of Staffordshire County Police).

PLATE 4

Closer view of approach to level crossing showing railway notices and barriers (as reconstructed after accident) (by courtesy of Staffordshire County Police).

PLATE 5

Model of Wynn's transporter involved in Hixon accident.

PLATE 6

Photograph of similar transporter with different transformer load (rear tractor only just visible on extreme right) (by courtesy of Associated Electrical Industries Ltd.).

PLATE 7

Dutch level crossing with manned barriers (by courtesy of Netherlands Railways).

PLATE 8

Dutch level crossing after conversion to automatic working (by courtesy of Netherlands Railways).

PLATE 1

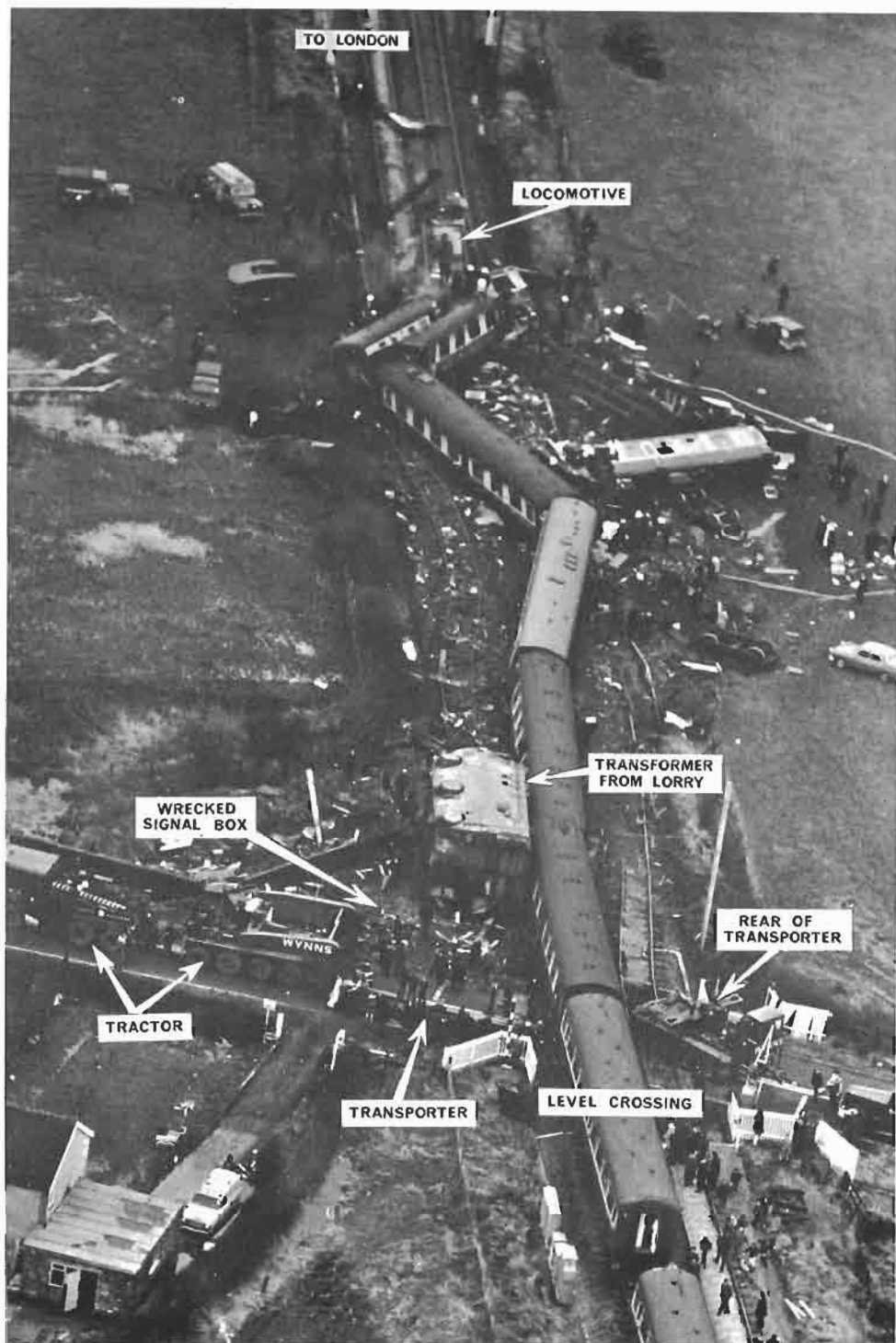




PLATE 3





PLATE 5

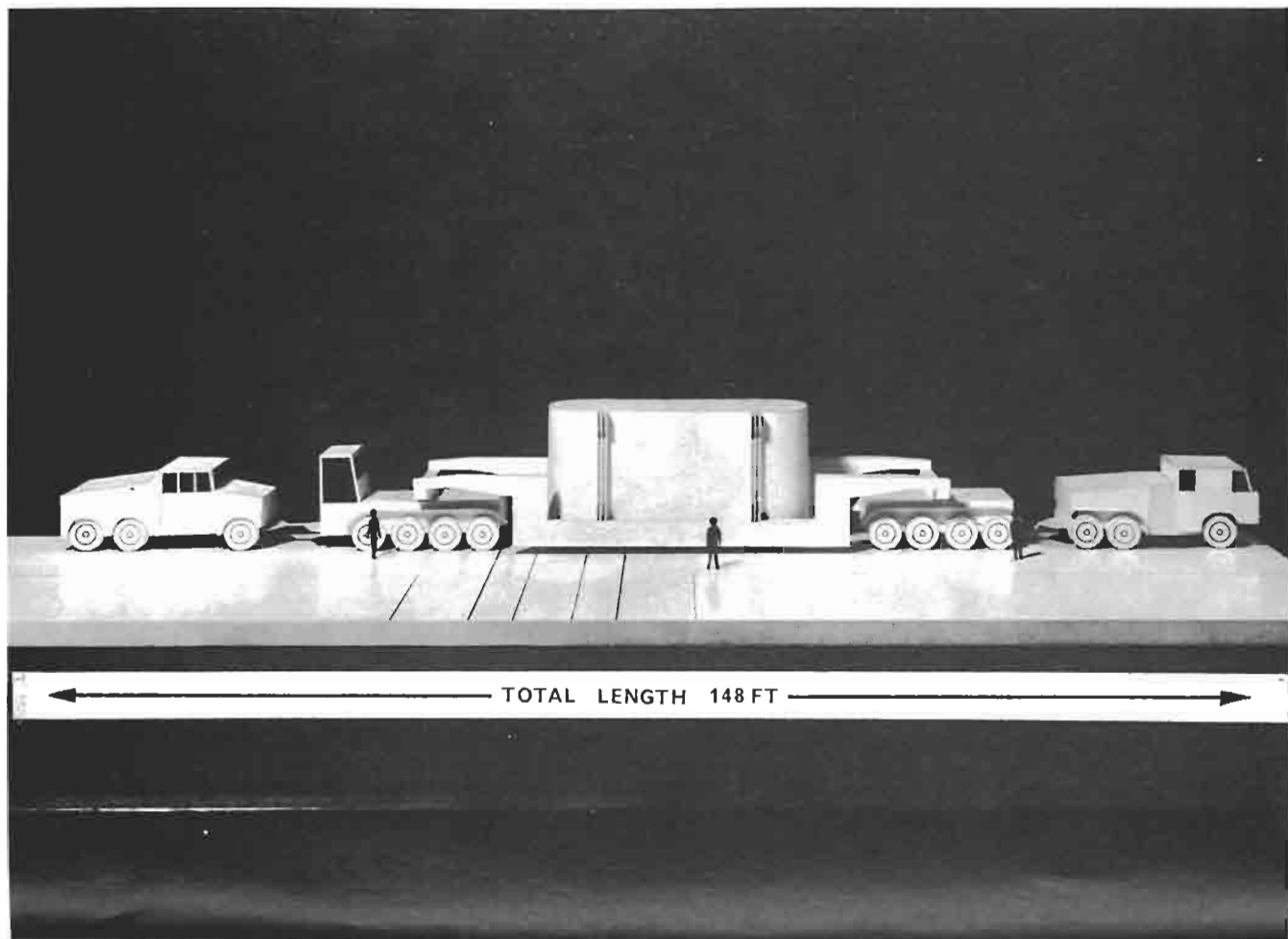




PLATE 7

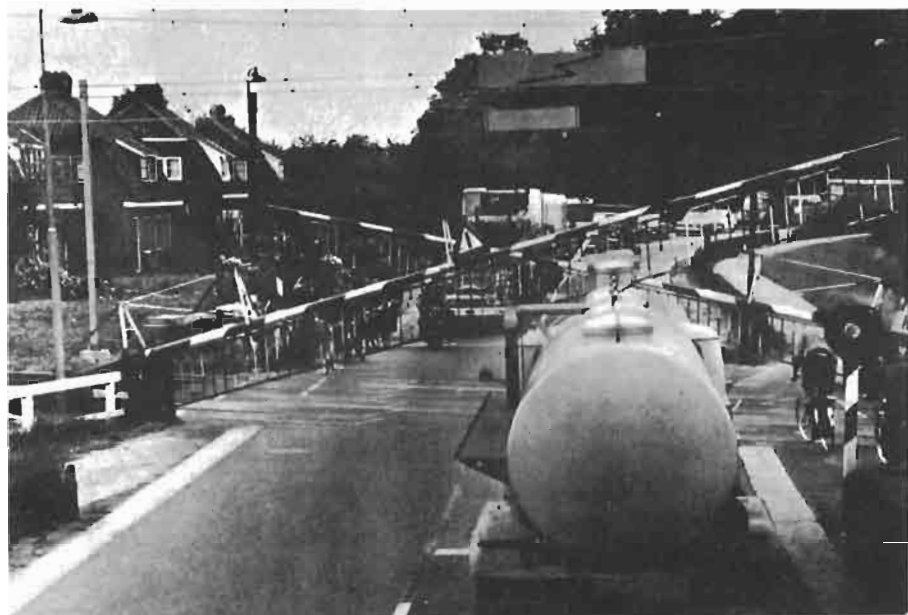
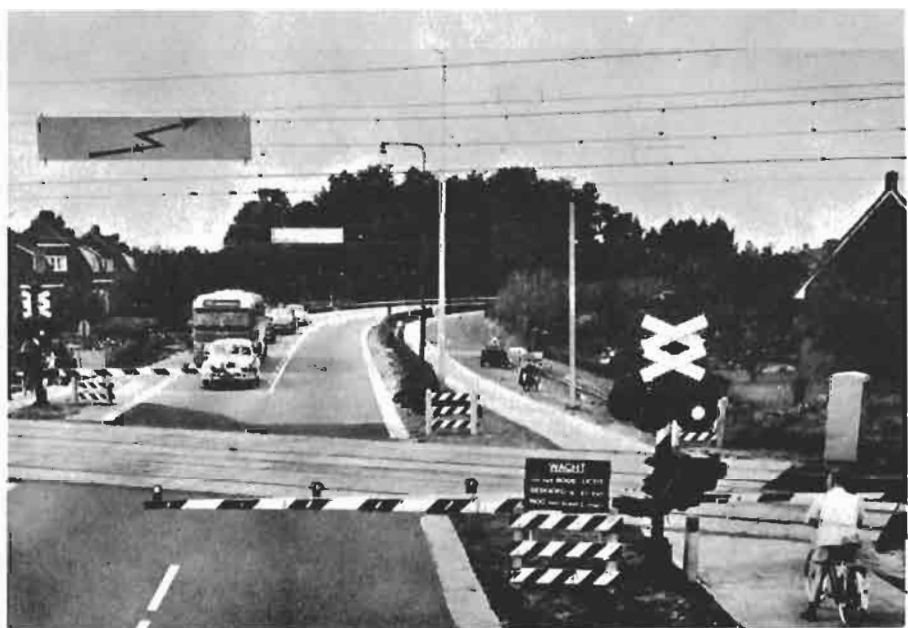
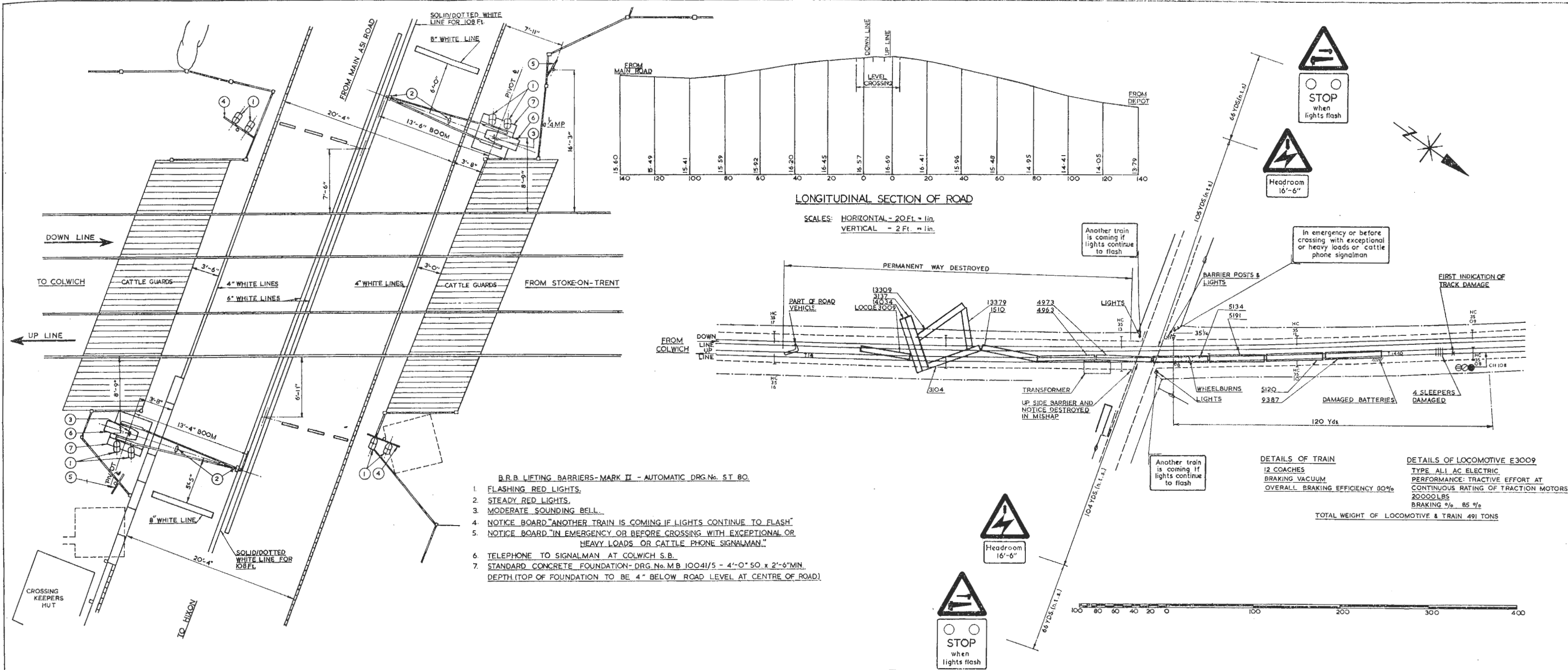


PLATE 8





APPENDIX XII

CHRONOLOGICAL SUMMARY

6th January 1968

- Approx. 08.15 Police told load ready for escort.
- Approx. 09.30 Wynn's transporter left English Electric Works, Stafford, under Police escort.
- 11.30 1A41 express left Manchester Picadilly for Euston.
- 12.10 Previous train on line (goods train 8G04) saw transporter crossing A.51 bridge. Hixon barriers seen to be working normally.
- 12.13 1A41 left Stoke (on time).
- Approx. 12.23 1A41 passed Meaford signalbox.
- 12.26 Collision at Hixon. Recorded at 12.27, on clock fifty seconds fast, in Electric Control Room, Crewe; oil circuit-breakers for overhead wires tripped on earth fault. Circuit-breakers closed to de-energise North Staffordshire line Colwich-Stone.
- 12.27 Meaford signalman noticed 1A41 had not cleared track-circuit towards Colwich. Unable to contact Colwich signalbox. Notified Stoke Power Box.
- 12.27 Police escort-car sent radio message to Police Headquarters for assistance.
- 12.29 Failure of barriers indicated in Colwich signalbox.
- 12.29-12.32 Police Headquarters notified Fire Brigade and Ambulance service.
- Approx. 12.32 Colwich signalman rang Stafford Signal and Telecommunications Department to report power failure and lighting up of track circuits. Technician Bickley thereafter sent to Hixon.
- 12.32 Message to Colwich signalbox from crossing-keeping at Pasturefields: "explosion" at Hixon crossing. Colwich signalman not able until 13.00 hours to send "obstruction danger" signal to Meaford Crossing Signalbox. Notified Stoke Traffic Control.
- 12.41 Guard Final spoke to Electric Traction Control Room, Crewe, and Stoke Traffic Control, from electrification phone one mile in rear of crashed train. Placed detonators.
- 12.42 Arrival of Fire Brigade with cutting and jacking equipment.
- 12.45 Arrival of first ambulance and first of two Police helicopters.
- Approx. 12.45 Arrival of Technician Bickley and assistant, who removed fuses to put signals to danger, and phoned Colwich signalbox.
- 12.55 Arrival of Chief Constable.
- 13.05 Arrival of Assistant Station Manager Stone (warned by Meaford signalbox).

- 13.05 First victims reached hospital.
- 13.06 Guard Final rang Colwich signalbox from Pasturefields Crossing. *Placed detonators ahead of crash.*
- 13.10 Arrival of Divisional Movements Inspector from Stoke.
- 13.35 Last "easily accessible" victims reached hospital.
- 15.35 Last injured reached hospital.
- 16.50 Last bodies of passengers removed.
- 23.10 Body of driver recovered.

APPENDIX XIII DIAGRAM 1

B.R. AUTOMATIC HALF BARRIERS FIRST TRAIN CYCLE.

