

# LONDON AND NORTH EASTERN RAILWAY.

Ministry of Transport,

4, Whitehall Gardens,

London, S.W.1.

23rd March, 1936.

SIR,

I have the honour to report, for the information of the Minister of Transport, in accordance with the Order of 24th December, 1935, the result of my Inquiry into the accident which occurred at about 7.45 p.m. on 19th December, 1935, near Woodford and Hinton, on the main line of the London and North Eastern Railway (former Great Central Section) from London to Leicester.

A through carriage to Stratford-on-Avon, attached at the rear of the 6.20 p.m. express from Marylebone to Bradford, was slipped at Woodford and Hinton. Shortly after this carriage had been detached, the main portion of the train stopped unexpectedly, and the slip carriage, travelling at a speed which was probably about 20 m.p.h., collided with it. The underframe of the slip carriage overrode that of the rear coach of the train, and the two vehicles were telescoped for a distance of about 4 ft. Eleven passengers sustained shock or injuries, fortunately not of a severe nature; two guards, travelling respectively at the rear end of the train and at the leading end of the slip carriage, were more seriously injured.

It was fine at the time; there had been fog in the neighbourhood earlier in the afternoon, but this had cleared away shortly before the accident took place.

### *Description.*

2. The line runs approximately north and south through Woodford and Hinton, the former being the down direction; south of the station it is on a gentle curve, right-handed for down trains, and passes through a deep cutting, about half-a-mile in length. The down line falls on a gradient of 1 in 176 to Culworth Junction signal box, about  $1\frac{3}{4}$  miles south of Woodford and Hinton. North of Culworth Junction the line is level for about 3 furlongs, and then rises for nearly a mile, first at 1 in 176 (3 furlongs), then at 1 in 475 ( $\frac{1}{4}$ -mile), and finally at 1 in 176 (3 furlongs), to a level stretch on which Woodford and Hinton station lies. The down distant signal for Woodford Central box is situated about midway along the 1 in 475 rising gradient, and is close to the south end of the cutting. Relevant distances, measured from Woodford Central signal box, are approximately as follows:—

	<i>Miles.</i>	<i>Yards.</i>
Centre of station platform ... ..	0	170 north.
Down home signals ... ..	0	305 south.
Up starting signal ... ..	0	430 "
Point of collision ... ..	0	576 "
Down distant signal ... ..	0	1,322 "
Culworth Junction signal box ... ..	1	1,166 "

3. The train was drawn by Atlantic type engine No. 6086, with 6-wheeled tender, driven from the right-hand side of the footplate, and consisted of seven corridor bogie coaches, its total length being about 506 ft.; including the engine, its total weight was about 370 tons. The vacuum brake was in operation on all wheels of the train, working in conjunction with the steam brake on all wheels of the engine and tender, except those of the leading bogie. The ratio of brake block pressure to tare weight on the coaches varied between  $72\frac{1}{2}$  per cent. and 81 per cent., while the similar ratio for the train as a whole, inclusive of the engine and tender, was 65 per cent.

The slip carriage was a non-corridor bogie composite, with a brake compartment and slipping gear at both ends, having an overall length of 63 ft. 7 ins. and a tare weight of 37 tons 1 cwt. It was fitted with the vacuum brake, the ratio of brake block pressure to tare weight being 71 per cent., and also with a hand brake in each brake compartment.

The damage to the bodies of the rear coach of the train and of the slip coach was practically confined to the brake compartments at the rear end of the former vehicle and at the leading end of the latter, but these compartments were badly smashed. Due to the telescoping, the leading bogie of the slip coach was forced back about 3 ft., and in consequence of this the brake reservoirs and train lighting batteries were damaged.

4. The equipment used for slipping on this section of the line comprises a special pattern of screw coupling, and special connections for the steam heating pipe and for the train pipe of the vacuum brake. The slip coach itself has a drawhook of the usual pattern, but is provided with a screw coupling having an outer shackle with a hinged end, secured by a spring latch; this shackle is placed on the drawhook at the rear of the main portion of the train. The guard in charge of the slip coach travels in the brake compartment at its leading end, which has end windows; when he desires to slip, he can operate the latch by means of a cord, so allowing the shackle to open and releasing the drawhook. The coupling used for the steam heating pipe is in two parts, inserted between the standard hose couplings, to each of which one half of the special coupling is secured; when the slip coach is detached the special coupling is drawn asunder, the escape of steam being prevented by self-closing ball valves contained in each half of it. There was no irregularity in the operation of either of the above components in the case now under consideration.

The coupling used for the train pipe of the vacuum brake is of more elaborate construction, in order that there may be no interference with the automatic action of the brake in case the train parts prematurely immediately in front of the slip coach; its general arrangement can be seen by reference to the drawings accompanying this Report. Like the steam pipe coupling, it consists of two parts, the outer faces of which are shaped similarly to the ordinary vacuum hose couplings, between which it is inserted. Normally the assembly is held together by the vacuum in the train pipe, but to prevent any separation of the couplings when the vacuum is destroyed, its weight is taken by straps suitably secured to the swan neck of the vacuum pipe at the rear of the train, and to a bracket on the slip coach; snap hooks on these straps pass through holes in the upper lugs as shown, so securing each half of the coupling to the corresponding standard vacuum coupling. The inner faces of the two portions of the coupling, which separate when the slip coach is detached, are of similar design to the ordinary vacuum hose coupling, but smaller in diameter.

As will be seen from the drawing, there is a plug cock in each half of the coupling, by which the train pipe on the train and that on the slip coach can be sealed before the coach is detached. The cock in the half nearer the slip coach can be closed by the guard for this purpose by a cord attached to its lever, and when so turned also closes the cock in the other half, as the levers of the two cocks are in contact when the coupling is assembled. There is a spring-loaded locking sleeve on the spindle of the plug of each cock, having two projections which enter recesses in the body of the coupling when the cock is in its closed position—the purpose of these locking sleeves is to prevent accidental opening of the cocks, and consequent application of the brake, after the slip coach has been detached. The springs by which the locking sleeves are actuated also serve to hold the plugs of the cocks home in the body of the coupling.

The coupling described was designed for use between vehicles having their vacuum brake pipes above the headstock, in the position which is standard on non-corridor coaching stock. The last vehicle of the main portion of the 6.20 p.m. train from Marylebone is, however, a through corridor coach for Barnsley, having at each end the Company's standard (Pullman type) gangway connection, with the flexible hose of the vacuum brake below it. To enable the brake pipe to be coupled to that of the slip coach a second vacuum hose connection has been provided above the headstock at the usual height, between the gangway and the corner of the body, and consequently well to one side of the centre line, on the coaches used for this through service to Barnsley.

5. At one time the slip coaches were controlled, after slipping, by means of the hand brake only; the vacuum brake on them could be applied, but could not be released, as there was no means of re-creating the vacuum in the train pipe, so was reserved for use in case of emergency. To give the guard better control over the slip portion, especially if it consisted of more than one vehicle, the slip

coaches on this section of the line were fitted some 22 years ago with apparatus to enable the vacuum brake to be used to control their speed. For this purpose each slip coach has a number of vacuum reservoirs, of considerable capacity, and a special form of guard's application valve. When the handle of the last-named is depressed air is admitted to the train pipe, so applying the brake, and when it is raised above its normal position, communication is established between the vacuum reservoirs and the train pipe, so re-creating the vacuum in it and releasing the brake.

*Report and Evidence.*

6. The 6.20 p.m. train had no booked stop between Marylebone and Leicester, and left London conveying two slip coaches, one of which had already been slipped at Finmere, about 14 miles south of Woodford and Hinton; though this had no immediate bearing on the accident now under consideration, incidents which occurred when slipping the Finmere coach on previous occasions were mentioned by some of the witnesses. The timing of the train is such that it is usually running at high speed when approaching Woodford and Hinton, and it is customary to slip the Stratford-on-Avon coach there at speeds as high as 70 m.p.h.

7. The Company's Regulations regarding the procedure to be followed if slipping would be rendered risky by local fog are clearly worded, and provide for written instructions being given to both the driver and the guard of the slip portion to the effect that the train is to stop at the station concerned, instead of slipping there. If these instructions cannot be given at the last booked stopping place, the Regulations lay down that the train is to be stopped specially for the purpose at the station (or if this is impracticable, at the signal box) next in rear of the station at which the slip would normally be made.

No such action had been taken on the night of the accident. Mr. H. Gardner, the Woodford and Hinton stationmaster, said that the weather was not such as to render it unsafe to slip, and added that during the 4½ years that he has held that post he had only found it necessary to prevent the slip taking place, on account of fog, on two occasions, once by warning Marylebone before the train started, and once by stopping it specially at Culworth Junction.

It had, however, been foggy earlier in the day at Culworth Junction, about 1½ miles south of the point of collision. The signalman there, J. Merry, had called out the fogmen at 4.30 p.m., and dismissed them shortly before 7.30 p.m., as the weather had cleared. He stated that he could clearly see his fog object, the down main line home signal, 150 yards from the box, when the train passed, at 7.43 p.m., and said that its tail lights were visible for 60 yds. or more.

The signalman at Woodford Central, H. S. Dale, had not found it necessary to call out the fogmen during the afternoon, and was able to see his up starting signal, 430 yards from the box, at the time of the accident. He had all his signals "off" for the train, for which he received "Train-Entering-Section" from Culworth Junction at 7.43 p.m. At about 7.47 p.m., realising that it had been an unusually long time in the section, he telephoned to Culworth Junction, and on learning that it had passed that box some four minutes previously he kept an up train, which was ready to start and had been accepted by Culworth Junction, waiting at the platform.

8. The driver of the train, E. V. Cawkwell, had been working it, in rotation, for about seven years. He estimated that his speed when passing Woodford Central distant signal was about 70 miles an hour, and added that the schedule timing of the train necessitated an average speed of about 60 miles an hour from Princes Risborough to Woodford. He said that shortly after he passed the distant signal the vacuum brake was applied with full force, and that though he kept the large ejector working he was unable to create more than 7 ins. of vacuum in the train pipe, just as if the vacuum hose had been left off the plug at the rear end of the train, and the train consequently came to a stand. The instructions for working slip coaches lay down that a hand signal is to be given by the guard to the driver after slipping, to indicate when the coach has been detached, but Cawkwell said that he had not seen this hand signal and remarked that there is usually some difficulty in seeing it at Woodford and Hinton, unless there is a fairly strong cross wind blowing, on account of steam

and smoke enshrouding the train while it is in the cutting; he added that often he was not aware whether the slip had been made until he saw the coach, or its headlight, following the train, when rounding the curve near the down home signals, and said that the slipping of a single coach was not perceptible on the footplate. As he did not consider it too foggy to slip, he came to the conclusion, when he felt the brake application, that something was amiss with the slipping apparatus and that the brake had been applied by the guard to indicate to him that it would be necessary to stop at the station. He said that he had never known the train to be stopped for this reason, but that he had once been so stopped because the guard considered it too foggy to slip with safety.

The slip coach instructions direct the driver to whistle for the brakes of the slip coach to be applied if he finds it necessary to reduce speed or to stop, before reaching the station concerned, after the coach has been detached, but Cawkwell admitted that he did not do this, as he was fully under the impression that it was still coupled to the train. He said that he did not feel the shock of the collision on the footplate, but that he heard it almost immediately after the train had stopped.

Cawkwell also stated that on two occasions during the previous six months, when driving the same train, he had been compelled to stop at Finmere after the slip coach had been detached there owing to an unexpected, though less violent, brake application, which he understood to have been due to incomplete closing of the cock on the "train" half of the brake coupling. On each of these occasions, however, the vacuum was reduced by 6 or 7 ins. only and use of the large ejector had enabled him to keep the train in motion, without substantial reduction of speed, until it was clear of the station, a stop being made at the advance starting signal to enable the cock to be adjusted; these occurrences, he said, had been duly reported. He added that since the accident other drivers working in the same link as himself had told him that they had had similar experiences.

The fireman, R. W. Elliott, gave evidence supporting that of the driver, and stated that when the brake application was felt Cawkwell said to him, referring to the guard, "Why is he keeping his hand on the handle so long?" or words to that effect. Elliott had been firing for Cawkwell on the two recent occasions mentioned by the latter when the train was unexpectedly brought to a stand after slipping at Finmere, and said that on each of these he had learnt from the guard on arrival of Leicester that the cock on the "train" part of the vacuum coupling had remained slightly open.

9. On account of the injuries which they sustained, the two guards concerned were not able to give evidence until 19th February. The guard travelling at the rear of the main portion of the train, R. Bonnett, was still apparently suffering from shock and was not a very satisfactory witness on that account. He said that after seeing that the Woodford Central down distant signal was "off" from the left-hand window of the brake compartment, he crossed to the other window and, in accordance with his usual custom, showed a green light towards the driver as soon as the slip coach left the train. He stated that he then looked round and saw the headlight of the slip coach approaching at, he thought, a distance of not more than 10 yds., and showed a red light towards it with his hand lamp, as a warning to the slip guard.

He was certain that he heard the van valve in the compartment open as soon as the slip coach was detached, but his recollection of subsequent events was clearly at fault, for he first said that the train stopped immediately when the van valve lifted, and later stated that it had been stationary for some seconds when he saw the slip coach approaching.

With regard to previous irregularities, Bonnett said that he had been working on the 6.20 pm. train, about one week in 14, for the past 13 years, and that he had known it to stop unexpectedly at Woodford and Hinton, after slipping there, on one occasion during that period owing to the cock of the brake coupling not closing properly; this, he said, was a long time ago.

10. The guard who was travelling in the slip coach, C. Robertson, was able to give a clearer account, though he admitted that he had not fully recovered from the effects of the accident. He said that he had worked as a slip guard two weeks out of every five for the past 30 years (except during the War, when the running of slip coaches was suspended) and that he had had charge of the

Finmere and of the Woodford and Hinton slip coaches alternately during that period. He remembered the train being pulled up at Finmere on two occasions during the past two years, owing to incomplete closing of the slip cock, and had heard of other occurrences of this nature.

He explained that it was his practice to detach the Woodford slip coach from the train at some point in the cutting between an overbridge and the site formerly occupied by a signal box, respectively 60 yds. and 220 yds. north of the down distant signal, depending on the speed at which the train was running. He also said that, on a still day, it was quite usual for his view of the train to be impeded by steam from the engine, after slipping at Woodford and Hinton, and mentioned that on one occasion he had refrained from slipping there, thinking that it was too foggy to do so with safety, only to find that it was quite clear nearer the station and that what he had taken to be fog was really the train's own steam; he added that quite a gentle breeze made all the difference to visibility in the cutting.

Robertson said that on the night of the accident the steam limited visibility in the cutting to about 20 yds. He could not see the distant signal until he was close to it, on that account, and on finding it "off", closed the cocks of the brake pipe coupling. Since he could not see if they had closed properly, he gave the cord a second pull to make certain of this, in accordance with his regular practice when slipping after dark; he noticed nothing unusual in the "feel" of the cord when closing the cocks, and did not think that he pulled it more forcibly than on other occasions. He stated that after detaching the coach from the train, somewhere between the overbridge and the signal box site already mentioned, he checked it by a full application of the brake, again in accordance with his usual practice, reducing the train pipe vacuum to zero momentarily in order to keep well clear of the rear of the train, and then restoring it. He was standing by the vacuum brake valve, looking out of the left-hand end window of the coach, all the time after slipping, but said that on account of the steam which was hanging about in the cutting he saw nothing of the rear of the train, or of its tail light, which was on the right-hand side, until the collision occurred. He thought that this might have been as much as a minute and a half after slipping, and was unable to say how fast the slip coach was travelling at the time, but he did not think its speed was as high as 20 miles an hour.

11. With regard to the possibility of the brake pipe couplings separating when the cord is pulled to close the cocks, Robertson said that he had never known this to happen at Finmere, but that it was quite a usual occurrence at Woodford and Hinton. His explanation of this was that as the two slip coaches are both non-corridor vehicles, the vacuum pipe at the rear end of the Woodford and Hinton coach is central, and thus directly opposite that at the front end of the Finmere coach. At the front end of the Woodford and Hinton coach the conditions are different, for, as described earlier, the last coach of the train (the through corridor coach for Barnsley) has a special vacuum standpipe and hose fitted well to one side of its centre. He pointed out that in consequence of this the vacuum hose pipes between the Barnsley coach and the Woodford and Hinton slip coach do not hang quite so low as those between the two non-corridor slip coaches, and said that the guard of the Woodford slip could generally separate the couplings by a jerk on the cord, when closing the cocks, but that this was hardly possible in the case of the Finmere slip "because the pipes are slacker, and there is nothing to jerk against".

12. The procedure for testing the brake couplings before leaving Marylebone was also described by Robertson, who said that both sets are tested by the guard of the Finmere slip coach, who books on duty earlier than the Woodford slip guard, with the assistance of a shunter. The guard closes the cocks by means of the cord in the usual way, and destroys the vacuum in rear of them by opening the van valve on the slip coach, then ascertaining whether this has affected the vacuum on the train ahead of the cocks, which are subsequently re-opened by the shunter. Guard Bonnett said he saw this test being made on the night of the accident.

The brake pipe couplings, when not in use, were in charge of Carriage and Wagon Foreman A. Tissington, who unfortunately died shortly before the resumed Inquiry. He had, however, prepared a written report to the effect that he had examined those concerned before they were fixed on the train, and that

they were in good condition. They were examined at Woodford and Hinton shortly after the accident by Carriage and Wagon Foreman T. W. Shaw. He stated that he found the cock of the "slip" portion of the coupling properly closed, and locked, but that the "train" portion had been damaged, the locking sleeve and part of the plug of its cock being missing; he found the locking sleeve in the ballast at the site of the accident a couple of days later, indicating that the cock was complete when the collision occurred.

13. During the Inquiry I had an opportunity, on 2nd January, of observing the behaviour of the slipping apparatus at high speed, by travelling in the brake compartment of a coach which was slipped from a special train at Woodford and Hinton; the slip coach and the one next ahead of it were similar in all respects to those damaged in the accident.

The weather was cold and showery, but no rain was falling at the time; there was scarcely any wind. The speed of the train was between 60 and 70 m.p.h. when the slip coach was detached, immediately after passing the Woodford Central down distant signal. I had not heard Guard Robertson's evidence at the time, and anticipated that the vacuum hose pipes would remain coupled until dragged asunder at the moment of slipping, also that they might swing rather violently when so parted. But, contrary to my expectation, the vacuum couplings separated when the cocks were closed, although the guard did not pull the cord with undue force; the hose at the rear of the train fell away gently, and the coupling at its end struck nothing which might have knocked the cock open—I examined this portion of the coupling later and found the cock properly shut and locked. As the train drew away from me, I noticed that its rear end was quickly hidden by steam from the engine swirling round it, becoming invisible when the gap between it and the slip coach had widened to 30 yds. or thereabouts. The guard controlled the slip coach by the vacuum brake, reducing the vacuum from 20 ins. to 14 or 15 ins. for perhaps 10 seconds, and then releasing the brake; the slip coach entered the station at about 20 m.p.h., and a reduction of the vacuum to about 10 ins. brought it to a stand smoothly after traversing about two-thirds of the length of the platform.

I subsequently examined the rear coach of the train to ascertain whether the cock of the brake coupling could be knocked open by contact with any projection, if not previously locked shut. Considered in relation to the length of the vacuum hose and of the strap supporting its free end, there were three fittings on the coach which might have been struck by the lever of the cock in the "train" portion of the coupling, when falling into position after parting from the "slip" portion, in such a way as to tend to open the cock. These were the faceplate of the Pullman vestibule, a tail lamp bracket, and a step forming part of the buffer guide casting; it did not appear that a particularly violent swing of the vacuum hose, at the moment of slipping, would be needed to bring about contact between the lever of the cock and any one of these three objects.

14. On a later date I saw, at Liverpool Street Station, the process of testing the vacuum brake coupling used at the leading end of the coaches which are slipped at Marks Tey from a Clacton express. The coupling was of the pattern already described, and I found that it was not possible to separate its two portions by pulling or jerking the cord by which the cocks are closed. As the last coach of the train had no corridor, its vacuum pipe was central, and thus immediately opposite that on the slip coach; in consequence of this there was sufficient slack in the vacuum hose pipes and their supporting straps to allow the hose on the slip coach to be pressed against the end of the body by the pull of the cord, without imposing sufficient tension on the coupling to separate its two halves.

#### *Conclusion.*

15. Since the brake application occurred at the moment of slipping, it was evidently due to the cock in the brake coupling at the rear of the train being incompletely closed, and therefore not locked; its locking sleeve was not missing at the time, for it was subsequently found among the debris. Moreover, as Driver Cawkwell was unable to maintain sufficient vacuum to keep the train moving, and as Guard Bonnett heard his van valve lift, the cock was evidently fairly wide open. I am therefore of opinion that the primary cause of the accident was the faulty action of the brake pipe coupling.

16. Guard Robertson's statement with regard to the behaviour of these couplings when used behind corridor and non-corridor stock respectively was confirmed by my own observation of their action on the two occasions which I have mentioned. As a result of this, and of my examination of the coupling after slipping at Woodford and Hinton on 2nd January, I feel that there are two possible explanations of the failure which caused the accident; either the cock in the "train" portion, though closed by the cord, was not turned sufficiently for the lock to spring into place, and was then knocked open when the couplings separated, or else the pull of the cord separated the couplings with the cock on the "train" portion partly open, that on the "slip" portion closing when rearward movement of the vacuum hose was checked by contact with the end of the body. It is not possible to say which of these explanations is the correct one, but I incline to the latter, for with a vacuum of 20 ins. in the train pipe, the two halves of the coupling would be held together by atmospheric pressure with a force of barely 40 lbs., since the outside diameter of the washer sealing the joint between them is only  $2\frac{1}{2}$  ins. It is not unlikely that a smart jerk on the cord, in the act of closing the cocks, may have exerted a separating force in excess of 40 lbs. on the coupling, and if the cock in the "train" portion was at all stiff there would have been some leverage tending to prise the two halves apart. It should be noted in this connection that separation of the standard vacuum couplings, of which the faces are of larger diameter (about  $3\frac{5}{8}$  ins.) is resisted by an atmospheric pressure of about 100 lbs. when there is a vacuum of 20 ins. in the train pipe.

17. Though it cannot be said with certainty that if Driver Cawkwell had sounded the whistle in the prescribed manner when he found that he could not keep the train moving, the warning would have been heard by Guard Robertson above the noise of the train, and interpreted correctly, and though I accept Cawkwell's statement that he thought that the slip coach had not been detached, I nevertheless regard his omission as an unfortunate one, and am of opinion that he cannot be entirely relieved of responsibility for the accident.

18. There is nothing to indicate that Guard Robertson was not keeping a good look-out, and I think that his failure to notice that the train was being overtaken by the slip coach may fairly be ascribed to its tail light being obscured by steam, for though the regulator of the engine was closed before the train stopped, the large ejector was in use. Atmospheric conditions were evidently such as to prevent steam dispersing quickly, for the fog had only cleared a short time previously; I noticed during my trip on 2nd January how completely the rear of the train was concealed in this way, under rather similar weather conditions. In the circumstances I do not consider that Robertson can be blamed for not realising the situation in time to prevent the collision.

#### *Remarks and Recommendations.*

19. This accident was of an unusual nature, for while the practice of slipping coaches is of long standing in this country, incidents similar to that now under consideration have been very rare. This method of operation was in force on the majority of the larger systems prior to the War, the number of slip portions (sometimes consisting of several coaches) detached per day then totalling over 150. In recent years, however, the number of such services has diminished considerably, and the practice is at present confined to the Great Western Railway, which now has about 20 slip services per day, and to the London and North Eastern Railway.

The latter Company still work two slip portions daily, on trains from Liverpool Street, but elsewhere on their system the practice has ceased, for the working of both of the slip coaches formerly attached to the 6.20 p.m. train from Marylebone, with which this Report is concerned, has now been discontinued. Booked stops at Finnere and at Woodford and Hinton were substituted for the slip coach services at the beginning of February, and since the evidence in this case suggests that local conditions at the latter place are apt to be such that slipping there is attended with some risk, it is satisfactory to record this alteration.

20. Though the pattern of brake pipe coupling which has been described is understood to have given satisfactory service, its failure to operate properly on this occasion, and the similar failures in the past which were mentioned in the evidence, indicate that the cord-operated cocks cannot always be relied on to seal the train pipe. As considerably greater use of slip coach services has always been made by the Great Western Railway than by other Companies, I have examined the special brake pipe coupling forming part of the slipping apparatus used on that system. This coupling was adopted many years ago in place of that already described, and is of simpler construction, as it has no cocks; also, the inner faces of its two halves are of the same diameter as the standard hose coupling, and so are held together by atmospheric pressure with a force of 100 lbs. or thereabouts.

With this pattern of coupling, the vacuum pipe at the rear of the train is sealed by a spring-loaded flap valve, forming part of the "train" portion of the coupling, when the slip coach is detached; when the two portions are assembled, the flap valve is held open, a projection on it engaging with a thin bar forming part of the "slip" portion, thus maintaining continuity of the vacuum brake throughout the train until the moment of slipping. A special screw coupling is not used, but the slip coach is equipped with a hinged drawhook, controlled by a lever in the brake compartment. Application of the brakes on the slip portion when the couplings part is prevented by a valve in the train pipe on the coach, operated by this lever, which is also used to apply and release the brakes to control the speed subsequent to slipping.

It is true that accidental division of the train, immediately in front of the slip coach, would not cause a brake application on the vehicles ahead of that point, but as there would be no interference with the automatic action of the brake on the vehicles which had broken loose, there would be no risk of collision between the two portions of the train, and hence exception cannot be taken to this form of brake pipe coupling on grounds of safety. As its simpler construction renders it less liable to failure, I suggest that its adoption should be considered by the other Companies in the event of a re-introduction of slip coach services on their systems.

21. I also recommend that consideration should be given to its adoption for the Liverpool Street slip coach services, if these are continued. The slip coupling on the vehicles concerned is of the hinged drawhook type, released by a lever, and the addition of a valve in the train pipe, actuated by the same lever, would not appear to be a difficult matter.

I have the honour to be,

Sir,

Your obedient Servant,

E. WOODHOUSE,

*Lieut.-Colonel.*

The Secretary,

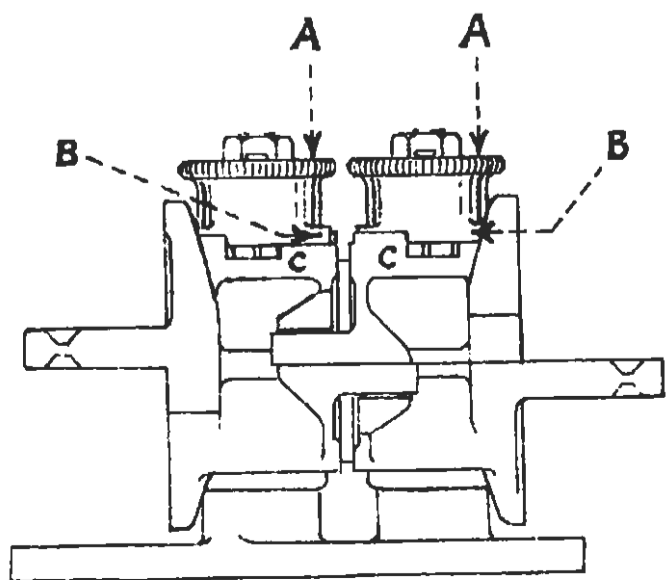
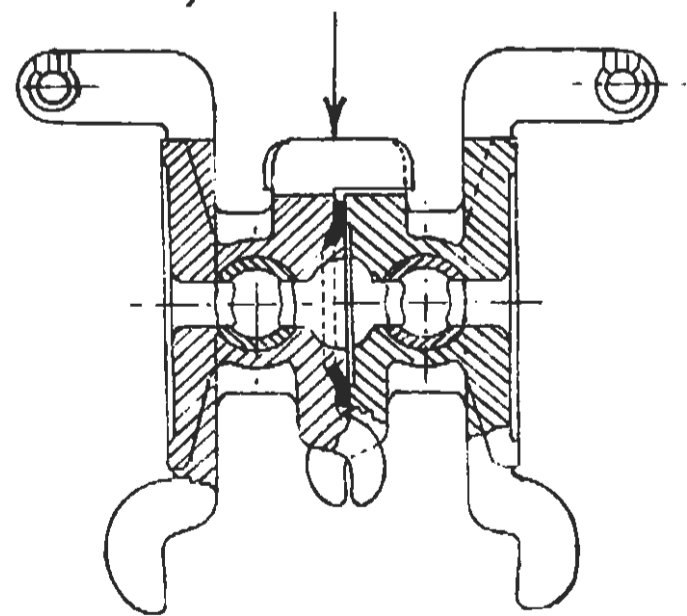
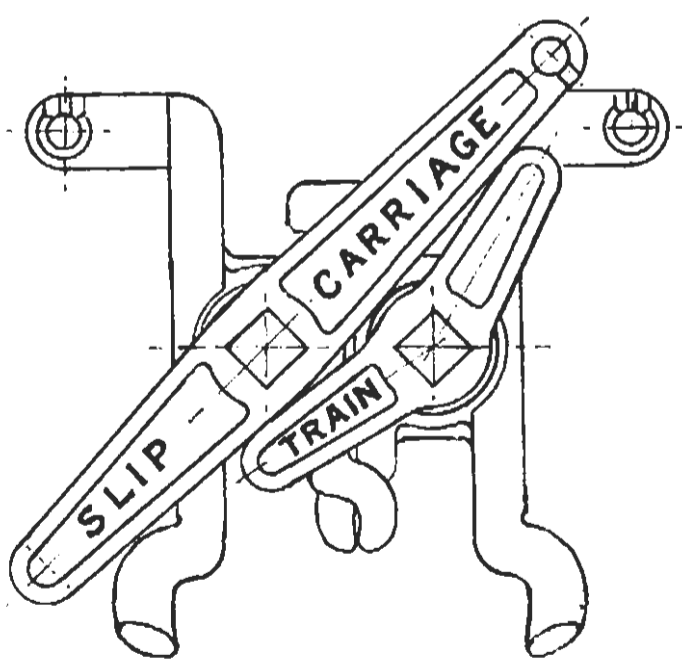
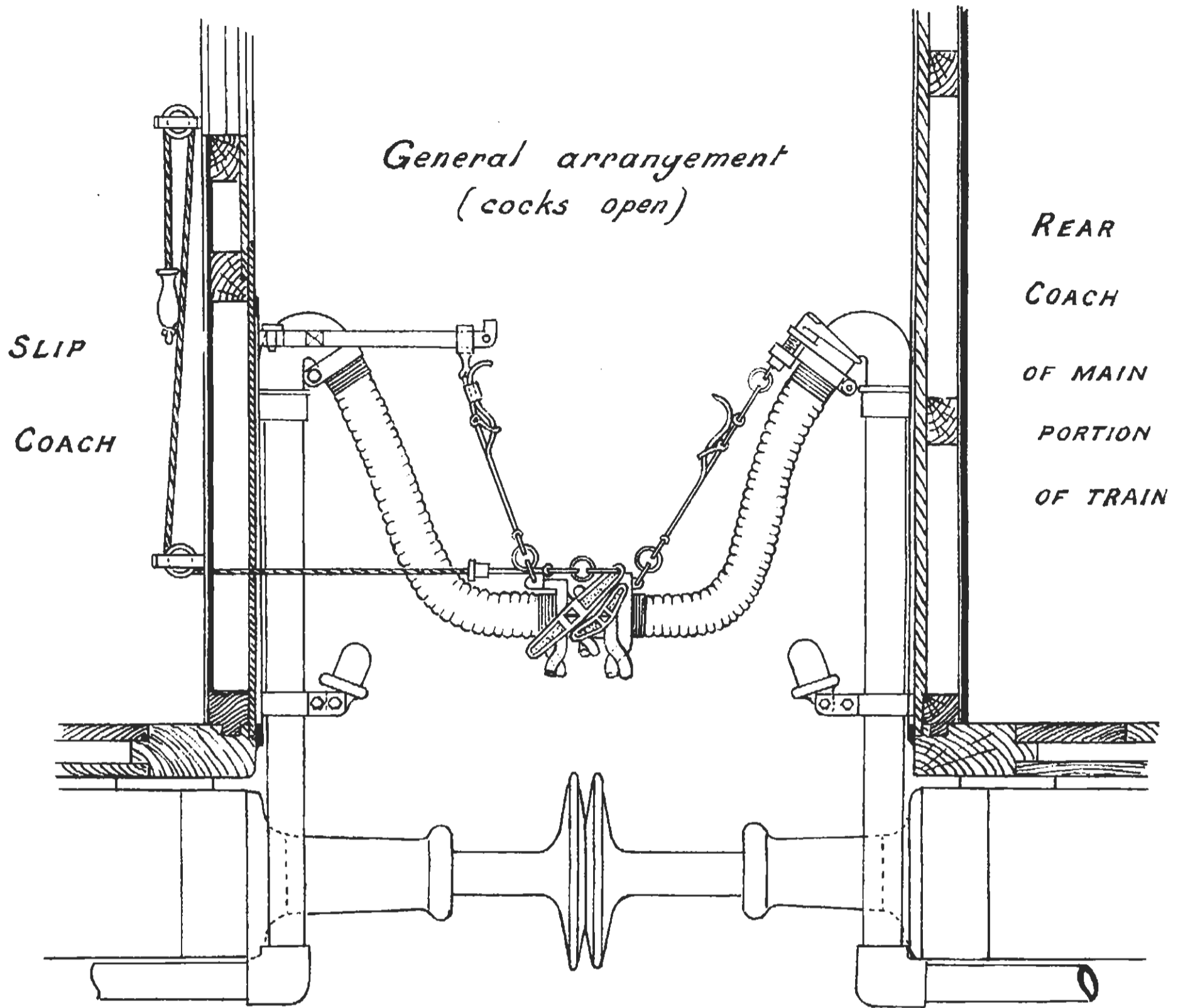
Ministry of Transport.



# SLIP COACH ACCIDENT AT WOODFORD & HINTON L.N.E.R.

ON 19.12.35.

## BRAKE PIPE COUPLING



*Cocks are shown "OPEN."  
When they are fully closed, locking sleeves A. are pressed inwards by internal springs, projections B. entering recesses C thus locking the cocks "Shut."*