

LONDON AND NORTH-WESTERN RAILWAY.

*Board of Trade,
(Railway Department),
Whitehall, 9th August 1871.*

Sir, In compliance with the instructions contained in your minute of the 28th ultimo, I have the honour to report, for the information of the Board of Trade, the result of my inquiry into the circumstances which attended the accident that occurred to the limited mail train on the Lancaster and Carlisle section of the London and North-western Railway on the morning of the 24th July, and into the alleged failure of the cord-communication on the same railway between Blisworth and Rugby on the 17th July.

The limited mail, 8.40 p.m. from Euston station, travelled in due course to Carnforth on the night in question (Sunday July 23rd), and left Carnforth punctually at 2.50 a.m. on the Monday morning, consisting, in the following order, of an engine and tender, a break-van, a Glasgow composite-carriage, a post-office, a post-office tender, a composite-carriage for Inverness, the Duke of Sutherland's saloon, a saloon for Inverness occupied by Mr. Forbes and party, a composite-carriage for Aberdeen, and a break-van for Aberdeen; altogether 9 vehicles besides the engine and tender. This train passed Penrith at the usual speed, and at the usual time, about 4 a.m. After it had proceeded about three miles beyond Penrith, and while it was travelling at a speed of from 40 to 45 miles an hour, the engine-driver perceived something on the line "in the four-foot space," about 50 yards in front of him. He at first thought it was a platelayer lying down; and he opened his whistle, and shut off his steam, whilst the fireman ran to the tender break. On coming close to this object, it occurred to him that it might be a rug dropped by some cattle-drover from a previous train. The engine ran over it without any shock of any description being felt by either the driver or the fireman; but the driver took the precaution to look back at the carriages of his train, to see whether they were affected by it. He could not detect any unusual motion in any of them, and he ran forward for about three miles before he noticed that anything was wrong. The engine was losing steam at the end of that distance in a way which he could not account for; and he supposed that what he had taken for a rug might have been sucked up into the ash-pan, and stopped the draught. He opened his damper "two or three nicks wider;" the engine recovered her steam; and the train ran forward to Carlisle, reaching that station at 4.27 a.m., one minute before its proper time.

The guard in the leading van, next behind the tender, heard the whistle from the engine as above described, about three miles north of Penrith, and 14½ miles south of Carlisle, whilst sitting in his van. He got up, and looked out of the windows, first towards the engine, and then back along the train; but he was unable to ascertain the cause for which the engine-driver had whistled. Perceiving no unusual motion in his own van, or in any of the vehicles behind it, he sat down again in his van; and he was not aware of anything being wrong until he arrived at Carlisle.

The guard in the van at the tail of the train heard no whistle, felt no unusual motion, and was not aware that there was anything wrong in any way with the train until he heard complaints after arriving at Carlisle.

The cord-communication was complete through the train in the way in which it is usually arranged with that train. It was coupled up from van to van, and from the front van to the lever of the steam-jet on the engine; so that a strong pull from the post-office, or from any of the carriages, ought to have caused the bells to ring in both of the vans.

The two men who were on duty on that particular Sunday evening, and whose duty it was to attach the cord-communication throughout the train, state that they duly attached it, coupled it up, and tested it, and that it was in perfect working order when the train left Euston station.

It was thus tested before the train left Euston, from the front van to the hind van, and in reply from the hind van to the front van, and it was then found to be working perfectly well. It was also made use of as the train was leaving Tamworth, between the front van and the engine. A passenger had left the train at Tamworth for a minute or so, and had not rejoined it before it started. The inspector on duty was not aware of the passenger being left behind, and gave the signal for the train to start without him. The head guard, from the tail of the train, seeing that the passenger was being left behind, showed a red light from his hand-lamp to the leading guard; the leading guard, receiving thus a signal to stop the train, pulled his cord-communication, opened the steam-jet on the engine, and held a red light out of his van window to the engine-driver; and the train was thus stopped to enable the passenger to rejoin it. As soon as the passenger had got into his carriage, the train started again, and proceeded in due course towards the North. Neither of the guards were aware of any action upon the cord from any one pulling at it during any part of the journey. Not only did their bells not ring in their vans, but they did not perceive even that there was any motion of the cord. They received complaints on arrival at Carlisle from the occupants of both the post-office and the Duke of Sutherland's saloon, of the cord having been pulled ineffectually somewhere south of Plumpton station; but they were unable to test it or to ascertain the cause of its failure, in consequence of the cord having been already loosened on some of the vehicles before they had time to examine it.

On an examination of the train, it was found, however, that something which had been on the line had struck and damaged certain vehicles. The engine-driver found that his damper was not so far open as he expected and intended it to be, and observed that some substance must have struck the edge of the damper, and strained one of the rods by which he worked it from his foot-plate. There was no mark on the damper itself to show where it had been struck; and the only indication of its having received a blow was from the bending of the rod above referred to, by which it was worked. He did not find anything, as he expected, in the ash-pan; and the only damage done to the carriages of the train was confined to the post-office and the Duke of Sutherland's saloon.

The post-office attached to the above train travelled to near Plumpton without anything unusual occurring. Six clerks and sorters were riding in the post-office, and one in the post-office tender, when they heard the engine-driver whistle, and shortly after felt a severe shock, as if something had struck the post-office from below. Four of them, who were sitting on the desk, were thrown to the floor in different positions, and one of them has complained of injury, so that he has been obliged to give up work for the time. A cloud of dust rose from the floor, and the post-office travelled for a short distance very uneasily; but afterwards it appeared to go on as usual; and one of the clerks looked out of the window, but he could not see anything wrong. Three of the sorters, Messrs. Morton, McMicken, and Quimby, went to the post-office tender, opened the trap-door, and caught hold of the rope which descends from the cornice of the post-office tender to the upper edge of the trap-door; and they pulled, all of them, as hard as they could at the rope. They continued to pull in this way from three to five minutes; until, finding that the train appeared to be travelling all right, and that they could gain no attention, they relinquished the attempt, and closed the door, while the train travelled forward to Carlisle.

Before the train had come to a stand in the Carlisle station, Mr. McMicken and Mr. Quimby got out of the trap-door on to the platform (which is at Carlisle on the off side of a train from the south), caught hold of the rope, and pulled it from the cornice of the post-office van, without being able to hear that it produced

any effect. Mr. McMicken then went forward to the engine, and asked one of the men on it whether he had felt any shock, and heard from him that it had affected the ash-pan of the engine, but he did not notice whether the rope was attached to the engine or not.

A sole-bar and the axle-box bolts at the leading end on the near side of this post-office were found at Carlisle to have been fractured.

In the Duke of Sutherland's saloon, the axle-box of the right leading wheel was broken at the back and split down in the front, the clips which secured the springs to the right leading and middle axle-boxes were both broken across their centres, and two pipes coming down from the lavatory compartment were bent. There were marks on the axle-guards and other parts, indicative of a violent blow, by which the leading and middle axle-boxes on the off side had been forced upwards—the one for two, and the other other for four inches beyond their ordinary play in the axle-guards; and the middle wheel had been forced against, and had indented, the bottom of the saloon. The centre panel on the same side had been split longitudinally, and there was a general shake to the panel and framing. The blind rollers were shaken out, the cupboard was burst open, and its contents were scattered about. The plates over the spring-plates appear also to have been strained. This saloon was constructed at the London and North-western Railway Company's works at Wolverton, and weighs about 12 tons, on six wheels. It is provided with iron rings along the cornice for the communication-cord.

The Duke of Sutherland, Lord Stafford, Lord Tarbat, Colonel Marshall, of the 2nd Life Guards, with his son, and Mr. Mitford, were asleep in the saloon when they felt the violent shock which occasioned the above damage,—a shock which would, no doubt, have caused a lighter carriage to leave the rails, and thus have been productive of more serious effects to the train. Colonel Marshall was slightly injured, receiving a blow behind his shoulder. On being thus rudely awakened, and after a glance at the condition of affairs, they did their best to attract the attention of the servants of the company by means of the communication-cord on the off side of the train. The Duke and Colonel Marshall both tugged at the communication-cord, each of them several times as hard as they could, and then both together, but without any useful effect, as will be seen by the statements above quoted of the guards of the train; those men not having either heard their bells ring, or noticed any motion of the cord. It appears that one of them was riding in the same compartment of his van with the wheel and bell of the cord-communication; and the other was riding in a compartment of his van, next to that in which were his wheel and bell. The rope was pulled on the off side, and with greater force in the direction of the engine, with the intention of attracting, if possible, the attention of the guard in the leading van. If all had been in order, as stated, a comparatively slight effort ought, over only seven vehicles between the two vans, to have rung the bells in both vans; and as neither of them rang, by the joint efforts of the post-office clerks and of two powerful men pulling from the Duke of Sutherland's saloon, the conclusion cannot be avoided, either that some part of the apparatus was out of adjustment, in spite of its having been properly adjusted and tested at the commencement of the journey, or that the apparatus is not, even when in proper adjustment, to be depended on in practice.

It would appear, then, that whatever the substance which the engine-driver saw in front of the train south of Plumpton, it took the following course as the train passed over it;—it first slightly touched the damper of the engine; the tender, a van, and one carriage passed over it without touching it; it was struck by the leading end of the near side of the post-office; the post-office tender and the Inverness composite-carriage passed over it without touching it; it was struck by the leading and middle axles of the Duke of

Sutherland's saloon on the off side; and the other vehicles in the train passed over it without touching it.

The object over which the limited mail thus passed proved to be a bale of stair-carpet, somewhat out of shape and enlarged by the rough usage which it had received; and the holland wrapper by which it had been covered was, when it was found, much torn. The bale appears to have measured, as originally packed, rather less than two feet high, and less than two feet in diameter.

This bale was loaded in a Lancashire and Yorkshire waggon, No. 1,116, at Heckmondwike, on the 22nd July. James Hepworth, a goods-inspector in the service of the Lancashire and Yorkshire Company, superintended the loading, and saw the waggon leave the station, containing 17 bales of blankets and carpets from various manufactories, all destined for Glasgow. Hepworth asserts that these bales were all well secured by means of the tarpaulin sheet which was over them, and was tied by 14 cords to the waggon; but they were, many of them, more or less above the top of the sides of the waggon; and it appears that one of them, No. 9243, fell off the waggon at Eastwood, about 20 miles from Heckmondwike, and was there run over by the engine of a Lancashire and Yorkshire goods train. The bale which fell off on the Lancaster and Carlisle line was No. 1522, and all the other bales were found to be in the waggon when it arrived at Glasgow. The two bales which thus fell from the waggon slipped down, no doubt, between the tarpaulin cover and the end of the waggon. Such bales cannot be considered to be safely loaded when packed in low-sided waggons, and, as in this case, in two tiers, so that the upper tier is partly or wholly above the sides of the waggon; and it is not right that they should be allowed to depend for security upon the tarpaulin sheet, which is placed over them to protect them from the weather. The bale which fell off at Eastwood was larger than that which fell from the waggon near Plumpton; and such bales being most dangerous things to get into the way of passenger or other trains, they ought, either—which is the safer arrangement—to be loaded in high sided waggons, from which they could not fall, or else, at least, to be carefully secured by ropes independently of the tarpaulin cover.

On inspection of the permanent way, and examination of the platelayers by whom the bale was found, I observed that it was first struck by the engine at a point rather more than 14½ miles south of Carlisle, and that it was then dragged forward, no doubt under the ash-pan of the engine, for a considerable distance, the ballast having been scraped and slightly disturbed between the rails of the down line in the process. The holland wrapper was then torn off the bale by degrees, and the bale was found, a few inches clear of the rails, on the near side, 130 yards forward from the point at which the first marks were observable in the ballast.

No carriage is attached to or detached from the limited mail train between the Euston station and Carlisle, with the exception of a post-office tender for the Midland system which is detached at Rugby, and a post-office tender for Liverpool which is detached at Newton Bridge; and as both are placed behind the last van, neither of them interfere, in any way, with the cord-communication as completed at Euston before the starting of the train.

It is not the practice to test the cord-communication between the Euston station and Carlisle with a train so running complete between those stations; but in the cases of all trains which are altered in their composition, and in which, therefore, the cord-communication is uncoupled and recoupled on the journey, it is the practice to re-test the communication on each occasion on which changes are made, and on which the cord-communication is for that reason interfered with, either between the two vans or between the leading van and the engine. The foreman of the carriage-department is the person responsible at any station at which such changes are made, for seeing that the cord-communication is properly re-attached and duly tested before the train again starts on its journey.

The other case in which the cord-communication has been alleged to be useless when actually required, was that of Mr. Galloway, an Inspector of the Marine Department of the Board of Trade, while travelling by the 12 o'clock (noon) train from the Euston Station for Manchester and Birmingham on the 17th July. That train started from Euston at 12.5, five minutes late, consisting of an engine and tender and 19 vehicles. Of these, nine were composite-carriages, one was a third-class carriage, four were break-vans, three were horse-boxes, and two were carriage-trucks; and the three horse-boxes and two carriage-trucks were all behind the rear van. There was a dummy-van next behind the tender, and there were next three composite-carriages and a break-van behind them; and these composite-carriages and van were connected by cord-communication with the engine;—so that the guard of this (the Birmingham) van and the passengers in the three composite-carriages in front of it would, on pulling the cord of communication, open the steam-jet on the engine; while the passengers in the carriages would be able, if the apparatus were in order, to open the steam-jet and ring the bell in the van at the same time.

Between the two break-vans, the Manchester portion of the train was composed of three composite-carriages and a third-class carriage. The passengers in those carriages, on pulling the cord-communication, would, if it was working properly, ring the bells in the two vans.

It would appear that the cord-communication was not completely coupled up until just as the train was starting from Euston, and that the man who was employed (assisted by two other men) in coupling it up was engaged in this work for the first time as "responsible coupler," though he had previously assisted other men in that duty. In coupling up the last two vehicles on which the cord was connected, he rang the bell in the front break-van. Hearing it ring, he went to the van, but he had scarcely time to stop the ringing of the bell, to place the cam in its proper position on the wheel, and to adjust the balance-weight, before the train started; and the guard told him that if he did not get out quickly he would be taken forward with the train. He jumped out of the van on the platform side, while the train was, he thought, going too fast for him to jump out safely on the off side, after the train had proceeded about 25 yards.

The foreman on duty in the service of the carriage-department states that he saw the cord-communication properly coupled up, but had not time to see it tested, the train having been marshalled for so short a time before it started.

The train ran in due course to Blisworth, reaching that station at 1.46, 14 minutes late. Five minutes of this time were lost in starting late from Euston, as already described; and nine minutes in slackening speed while travelling over portions of the line that were being relayed, or where slips had taken place.

There was a stoppage of four minutes at Blisworth station, and during that time the three horse-boxes and two carriage-trucks behind the rear van were detached from the train; but the cord-communication was not interfered with, nor was it tested, and the guards did not notice it at all after leaving Euston. The train was not due to stop between Blisworth and Rugby, and neither of the guards noticed any movement whatever in the cord-communication between those places; nor did the engine-driver observe any movement of the cord, which was properly attached, when he reached Rugby, to the lever of his steam-jet.

On reaching Rugby, the engine-driver uncoupled his communication-cord from the tender end, detached the engine from the train, and went to the platform siding; and another engine was attached, as usual, to take the train forward. The head guard in the rear van heard no complaint of the communication-cord having been pulled unsuccessfully, was not aware of anything being ill in the train, and did not know of anything unusual having occurred. The guard of the Birmingham portion of the train, who rode, as already stated, in the front van, with three composite-carriages and a dummy-van between his van and the engine, was informed before leaving Rugby that a gentleman

had been in a fit in the composite-carriage immediately in front of his van; and on going to that carriage he found a gentleman in a first-class compartment, under the care of another guard who had been riding as a passenger in the train. This latter guard had been put into the compartment with the invalid by the inspector at Rugby. This guard was not aware, until he was summoned to appear before me on 31st July, that there had been any question of any one having attempted to use the cord-communication.

The inspector at Rugby station was standing at the south end of the down platform when the train arrived. He was called forward by a guard belonging to another train, who happened to be standing near the other end of the platform; and his attention was directed to a gentleman standing outside a carriage near the front of the train, who complained that his fellow passenger had had a fit, and said that he declined riding any further in the same compartment with him. The gentleman complaining added—he states—either that he "could not pull or could not get at the confounded cord;" and the inspector provided another compartment for the gentleman who complained, and directed a guard who was riding as a passenger by the same train (to bring back his own train from Birmingham) to ride in the compartment with the gentleman who appeared to be ill, and to take care of him on the journey. The inspector did not test the cord-communication; and while he was engaged on this matter the train was divided, the one part going to Birmingham and the other part proceeding along the Trent Valley line to Stafford.

Mr. Galloway states in writing, that on leaving Blisworth station a gentleman who rode with him in the train "apparently went mad;" and he adds "I had to struggle with him until we got to Rugby. I tried the cord to stop the train, but to no purpose, so it was, who was the strongest. I overpowered the man and got him down in the seat, but when I got to Rugby I thought he was dead . . . It was something frightful. So much for the cord signal!" He says in another note, "The one fact cannot be disputed: I pulled the cord about 20 times, and when the train arrived at Rugby, I stood at the carriage door some time before anyone came to me, showing that the signal did not act. Otherwise, directly the train stopped, the guard would have run along the train to ascertain the cause of the signal being made."

The whole of the rolling stock of the London and North-western company used in passenger trains, is fitted up with apparatus for cord-communication on the system, differing in details from, but known generally as the North Eastern system, from its having first been adopted on the North Eastern Railway. There are, on the sides of the carriages, vans, horse-boxes, post-offices, fish-vans, carriage-trucks, bullion-boxes, and other such vehicles, pulleys, made of brass to avoid rust, which are placed at an average distance of about three feet apart. These pulleys are placed for the most part along the cornices of the carriages or other high-sided vehicles; but on the low-sided carriage trucks there is, as the more convenient arrangement, only one pulley; and on the post-offices the pulleys are placed above, and the cord is brought down to, the low side-door.

Each vehicle carries one cord on each side of it, and the cords on the off-side of the train, when coupled up for the whole length of the train, are intended to form a means of communication accessible to passengers, for attracting the attention of the engine-drivers, or of the guards riding in vans, either before or behind them, or both. The accompanying card (Appendix 3) is posted in every compartment of every carriage, to explain to the passengers the mode in which this communication is to be used. In cases in which there is no van between a passenger carriage and the engine the passengers are in direct communication with the engine-driver. The cord along the sides of the carriages is then attached to a lever on the engine connected with an opening in the boiler. When this lever lies in a forward position no steam escapes from the boiler, but when it is by the action of the cord pulled over into a backward position, the steam then escap-

ing from the boiler is expected to attract the attention of the engine-driver and fireman. When there is a van containing a guard at the back of the tender, the rope from the passenger carriages passes at right angles to its line along the carriages into this van, running over two extra pulleys; and it is connected with a balance-weight, in a covered slide about six feet high, which compensates, in rising and falling, for the action of the buffers in the train. The balance-weight, in fact, takes up the slack which it would be otherwise necessary to leave; and in this way the rope is kept always taut, and is less liable to get entangled with lamp-irons, footsteps, or other projecting parts of the carriages. At the same time, rather more power is required, and especially in long trains, to ring the bells in the vans, on account of this rope being brought in, and being connected with the balance-weight, in a transverse position in the van. When the guard riding in the front van hears his bell rung by a passenger, it is his duty, whether he be behind the tender or in the middle of the train, to pull the rope leading from his van direct to the engine, or from his van and along the sides of any other carriages which may be interposed between him and the engine, also to the engine. It will thus be seen that the guard at the tail of a train, and the passengers in all vehicles between the van at the tail of a train and the front van, communicate with the guard in the front van; while the guard in the front van, and any passengers between the front van and the engine, communicate directly with the engine-driver; and, by pulling the cord, open the steam-jet, and cause an escape of steam from the engine-boiler. These cords for communication, though supplied on each side of every vehicle, are coupled up in all cases, as already stated, on the off-side only, that is to say, on the right-hand side of the direction in which the train is travelling; and it will be seen by the accompanying card, above referred to, that passengers are thereon directed to seek for the cord in cases of emergency on that side of the train. All the apparatus for the cord-communication is under the charge of the workmen of the carriage-department of the company.

At all the terminal stations, and all the principal junctions at which the trains are liable to be broken up, or to have vehicles attached to them, there are men specially charged with the care of this apparatus, and having no other duties to attend to during the stoppages of the trains. The rope is of hemp, which has been found to be upon the whole the most satisfactory material. In the first instance wire was used, but it was found to kink. It is hardly an economical system, though cheap in first cost; the ropes wear out rapidly; and too much attention is constantly required. The total cost since it has been in operation has been estimated at 6,287*l.* 7*s.* 6*d.* As the ropes chafe and wear out at particular points, there are no means of repairing them, and the guards habitually carry spare lengths in their vans, to replace portions of rope that may fail on the journey. Stocks of rope are also kept at the principal stations and junctions, with which to replace broken or worn-out pieces upon the vehicles.

The bells in the vans ring, when started by the action of the rope or otherwise, for about seven minutes without stopping; and they are wound up by turning small discs attached in front of them, which act on the principle of the handle of a key-loss watch. The wheel, when turned by the cord, on its being pulled, strikes the lever projecting from the bell by means of a cam screwed on to its circumference. When the cam encounters the striking lever, it pushes it over, and the bell then rings on continuously as above described, for about seven minutes, unless purposely stopped and put out of action by the guard. The wheel has a diameter of about 15 inches, and is furnished with a groove round its circumference. The cam, with a disc about two inches in diameter, is affixed to the wheel by a screw, and may be transferred from any one part to any other part of the wheel, working round the groove on the circumference. It is considered to be the duty of the cord-communication men, and of the guards, to see that the whole of the com-

munication-apparatus is in proper working order, and to test it, before the starting of a train. The latter are directed, also, to record and to report any failure in the action of the cord-communication on the journey.

It is the practice, as already stated, to couple up the cords on the off sides only, in each train in which the cord-communication is employed; and it is thus always possible for passengers, especially when they are in a state of alarm, to make a mistake, and to pull the cord which is not coupled up to the vans or the engine, in place of the one which is so coupled up. The unused cord is a fixture, its ends being fastened down to the ends of the carriage with hooks and eyes; and a passenger making such a mistake, would, therefore, find that he was pulling an unyielding cord in place of one which would yield more or less to his efforts. It is clearly desirable, however, as long as the cord communication is employed, that the passengers should find it always on one particular side of a train; and as the carriages may run either end first, it has for that reason been considered necessary to provide cords on both sides of them.

When the present plan of cord-communication was originally adopted, it was applied, apparently without much discussion, on the off sides of the trains; but the London and North-western Company, as long as 18 months ago, called the attention of the other companies to the fact that in practical working it would be better to use the cord on the near sides of the trains, and expressed their willingness at once to carry out that arrangement; and it was only in consequence of the objection of certain other companies exchanging stock with the London and North-western Company that the idea of such an alteration was abandoned. There was a feeling that it was safer for passengers to put their heads and arms out of the carriage-windows, when they required to use the cord-communication, on the off rather than on the near sides of the trains; and there was also an idea, on the part of some companies, that the cords might on the near sides be in the way of the engine-drivers looking out as the trains started from the stations. On the other hand, the side of the train next to the platform is more convenient for the servants employed by the carriage-department to couple or uncouple the cord at the stations, and to examine it from time to time, to see that it is in working order. As it is now used on the off side, those men are unable in walking along the train so well to observe whether the cord is running freely through all the brackets or pulleys, or whether it is knotted, kinked, or entangled, so as to prevent it from freely running through those brackets or pulleys. It is more easily and rapidly coupled and uncoupled from the platforms than from the level of the rails on the off side, where the men also incur more risk in the performance of their duties. It frequently happens, further, that on the off side the men are, after dark, unable to see whether the cord is in proper order, the light of their hand-lamps not being sufficient to enable them to do so satisfactorily and they cannot use both hands in coupling up and uncoupling the cord, and at the same time hold their hand-lamps with which to light themselves in doing it; while on the platform side the ordinary lamps on the station-platforms afford them in many cases the necessary light for inspecting as well as for coupling up or uncoupling the apparatus.

The above remarks, however, only apply to the cases of stations at which the platforms are on the near sides of the trains. In other cases, where the platforms are on the off or wrong sides of the trains, it becomes exceptionally more convenient to have the cord on the off sides also.

In commencing my investigations into these cases, it occurred to me to test the apparatus in the first two trains with which I happened to meet. I therefore travelled, as an experiment, on the 31st July, by the 12 o'clock (noon) train from Euston to Manchester and the north, and tested the cord-communication 10 or 12 times between Euston and Willesden, five and a half miles. I pulled the rope, sometimes with a bias towards the front van, and sometimes towards the rear van, sometimes with a harder pull, and sometimes with a less hard

The bell was rung at least three times in the front van, but at other times, during some of which the rope was pulled down to the bottom of the window, it was not rung. The apparatus acted well about five times in the rear van, but it was several times prevented from acting in that van, by the cam on the wheel having passed the striking gear of the bell, and by this cam not having been replaced as at other times in its original position. On all occasions after the employment of the rope, the readjustment of the cam would be expected, under ordinary circumstances, to be done by the guard. These experiments, were, however, made rapidly, and not altogether in the way in which the apparatus would be worked in actual practice. The guards and others in the van were aware of their being made, and were on the look out. The front van was the seventh vehicle, and the carriage from which the rope was pulled the eleventh vehicle in the train, in which there were 16 carriages, besides two-horse boxes in the rear. On reaching Willesden, the cord in the front van was pulled to open the steam-jet on the engine. The steam-jet in the first instance did not appear to be open, but it was afterwards opened, on the apparatus being worked by the guard. Signals were made from the front and rear vans to the carriage from which the rope was pulled, by a white flag when the bells were rung, and by the hand and arm held out from the carriage when the rope appeared to be pulled without the bell being rung.

I made a second experiment with the 7-15 a.m. train from Liverpool, and 9-40 a.m. train from Birmingham, due at London at 12-45 noon. I met this train at Willesden, and rode in a third-class carriage with it to Euston. I first tried the rope, before starting, from the front van, along about five carriages, to the engine, when the steam-jet was at once opened. On visiting the front van, I found the cord was not in working order. It had not been passed through the pulley between the bell and the side of the van, and, though threaded through the pulley at the top of the balance-weight, it had got off the top of that pulley. This having been set right, and the apparatus at the rear having been found to be in order, the train started. I pulled the rope frequently from the third-class carriage (intermediate between the two vans), and found it to work well in every case. I observed, however, after the train stopped, that the rope from the front van to the engine had caught under a label-socket for receiving the moveable board which showed the destination of the vehicle. At the further end of the carriage from which I pulled the rope the cord was not threaded through the pulley; and the cord required on this account to be pulled much harder; but when the cord was taken over to the outside of the pulley it worked freely without being threaded through the pulley.

In the above two cases, then, of the 12 o'clock (noon) train from Euston between Blisworth and Rugby on the 17th July, and of the limited mail train between Penrith and Carlisle on the 24th July, the cord was found, when required in practice, to be quite useless as a means of communication between the passengers and the servants of the company. It was tried in both cases under circumstances favourable in all respects for success; on the 17th July with only four vehicles between the tender and the leading break van; on the 24th July with only seven carriages between the two break-vans. The passengers who vainly essayed to use it, from real risk and necessity, were strong, cool-headed men, exceptionally accustomed to railway travelling, and unusually well qualified to make it succeed. The apparatus was, according to the evidence of the servants of the company, in perfect order; and had been coupled up, adjusted, and tested, in each case before the starting of the train. No cause is apparent, assigned, or even suggested, for its failure.

Besides the experiments above recorded on the London and North-Western Railway, I tested the cord-communication in the 5.25 p.m. express train from London to York, by the Great Northern Railway, on the 4th August 1871. In approaching

Retford in that train I pulled the cord into the carriage for a length of about 18 feet, until it reached the opposite window, and then down (doubled) to below the bottom from the top of the window. I then pulled with some violence in both directions,—towards the rear van and towards the engine; and I wound the cord round and round the arm on the seat of the carriage (No. 135, 1st class). There were 12 vehicles in the train. I rode in the third vehicle from the engine, one carriage only having been between that in which I rode and the front van. When the train stopped at Retford I called both guards to see what I had done, and inspected the wheel in the van behind the train. The guards were quite unaware of any one having touched the cord; and the driver uncoupled his engine, and went away before I could speak to him. There was a bell on the tender, and a bell above the wheel in each guard's van.

As the result of these cases, and of these and other experiments and observations on different railways on which the cord system is in force, I have come to the conclusion that although that system may, under careful management, and with special watchfulness, be made to succeed, and although it would be found to succeed, when tested without notice, in many instances; yet it cannot, and especially as applied on the London and North-Western Railway, be expected always to succeed when tried in practice; and it ought not to be relied upon for giving warning in those cases of real necessity which occur, fortunately, on rare occasions and at long intervals, but, unfortunately, just when they are least expected.

The cord may appear, at first sight, to be the most simple, the most practical, and the most easily applicable of the various means of communication in trains; and it has, under that impression, been adopted on the railways north of the Thames, and, indeed, on most of the principal railways in the kingdom. But it is by no means so simple in the actual practice of working as might be anticipated. There are too many adjustments to be attended to whenever a train is made up, and before it is started. Taking, as examples, the two London and North-Western trains, of the 17th and 23rd July, now under special notice, not only must the couplings be complete between the carriages and the vans, and between the leading van and the engine, but also the bells in the two vans must be wound up, the cord must be properly threaded through the pulleys into each van, and wound one or more times round each wheel, the slack must be taken up in the requisite degree, the cam must be adjusted to its proper position on each wheel, and the balance-weight, which compensates for the working of the buffers, must in each van be adjusted in its casing. This very simple system thus depends for success upon a complication of adjustments which it must always be difficult invariably to enforce; and which are the more liable to be neglected by railway servants, after a long period during which the system has been proved to be not required. Simplicity in principle or construction and simplicity in working are too frequently confounded together; and they have been so in this instance. The simplest working apparatus for communication in trains must clearly be that which will require no adjustments as the trains are being made up, but which, as soon as the couplings are completed, is at once in perfect order throughout the trains; and the simplest and most effectual mode of testing it would be by requiring that every time a train starts from a station, the signal to start should be given by means of the apparatus from the guard in the hind-van through all the vehicles of the train to the engine-driver, and should be repeated back from the engine-driver to the guard. There would be no difficulty in applying such apparatus; and the principle being admitted that there ought to be the means of communication in trains, it must also be admitted that such means should be a reality and not a pretence, as must be too much the case with the cord-system, or with any system depending upon the constant adjustment of numerous parts. If the cord cannot be made to succeed in the simple cases and under the favourable

circumstances above quoted, how can it possibly be expected to succeed in the case of less experienced and more nervous passengers, or of longer trains, containing vehicles of a more heterogeneous character, or in which many changes are made on the journey? The cord system is, no doubt, capable of some improvement. It is used with differences of details on other lines. The London and North-Western Company are now, I understand, making some alterations in their

apparatus with a view to its improvement. But I do not myself think that the cord-system will ever be a satisfactory system.

I need not, however, say more at present, as it will be my duty later to report further on the general subject.

*The Secretary,
(Railway Department),
Board of Trade.*

I have, &c.,
H. W. TYLER.

APPENDIX (1).

LONDON AND NORTH-WESTERN RAILWAY.

PASSENGERS' CORD COMMUNICATION.

(Circular No. 789.)

Instructions to Guards, Enginemen, and others.

The Coaching Stock having been fitted with the Cord Communication, the following regulations will take effect from the 2nd August.

1. Guards will be held responsible for seeing, before their Trains are due to start, that the Trains are provided with the means of communication, and that all the bells and cords are in proper working order before the Train is ready to start. This regulation will apply to all Stations at which vehicles are attached to, or detached from, their Train. A testing signal (one pull) to be given by the Guard to the Driver, and one pull by the Driver as an acknowledgement.
2. The cords will be fixed on both sides of the Coaches, but the communication to the Guard and Driver will only be joined together so as to be available for signalling on the off or six foot side of the Train while travelling.
3. So soon as the Train is started, the Guard must see that the cam of the communication wheel fixed in his van is carefully adjusted to a distance of about eight inches from the tongue of the bell, which will be struck by the cam when the cord is pulled, so as to enable Passengers to ring the bell with ease, and avoid any ringing or whistling which might otherwise be caused by the lengthening or contraction of the buffers, either when the Train is leaving a Station, after being brought to a stand, or is passing round a curve.
4. Each Guard must carry with him six spare cords fitted at both ends with cord-couplings complete, to replace any cords which may be damaged on the journey, or may be required for vehicles unprovided with cords, which may have to be attached.
5. When any vehicles are attached or detached at road Stations, or in the event of the Train being re-marshalled during the journey, care must be taken that all the cords are properly adjusted, so that the communication may be complete throughout the Train, before the Train starts again; and in the case of vehicles which are detached the cord couplings of these vehicles must always be secured at both ends, on the hooks provided for the purpose, to prevent the cords being lost or damaged.
6. When the Guard hears the bell ring, and the Engine Driver hears the gong or whistle on his Engine sound, they must at once look carefully along each side of the Train; and in case any oscillation be noticed, or a Carriage be on fire, or other occurrence of a serious character be observed, the Train must be stopped as speedily as possible, and when stopped must be protected by Signals, as prescribed in the Company's regulations. Should, however, the Guard and Engine Driver fail to observe any-

thing which really necessitates an immediate stoppage of the Train, the Train must be stopped at the first Station or Junction, where it can be properly protected by fixed signals.

7. When the Train is stopped, the Passenger who gave the Signal may be expected to communicate with the Guard; but should he fail to do so, the Guard must endeavour to ascertain from which compartment the signal was given, and obtain information as to the cause, and the name and address of the Passenger who pulled the Cord. Should the alarm have been mischievously given, or for an insufficient cause, the names and addresses of all the Passengers in that compartment must be taken, in order that the offending Passenger may be properly dealt with.
8. On arrival at the end of the journey, or where the Train is transferred to another Company, a testing signal is to be given by the Guard and acknowledged by the Driver before the Engine is uncoupled from the Train. The fact to be recorded by the Head Guard on his journal, and he must likewise specially report any use that may have been made of the communication on the journey, and any failure in its action.

Euston Station,
30th July 1869.

W. CAWKWELL,
General Manager.

APPENDIX (2).

LONDON AND NORTH-WESTERN RAILWAY.

(No. 792.)

PASSENGERS' CORD COMMUNICATION.

Circular to Station Masters, Foremen, and others.

Commencing on Monday the 2nd August, the Express Trains, and all Passengers Trains, running more than 20 miles without stopping, are to be provided with the means of communication between the Passengers and the Company's Servants in charge of the Train.

The communication is effected by a Cord fixed along the Carriages above the doors, and each Carriage is furnished on both sides with its own portion of cord; but when the Trains are travelling the communication will only be coupled and in operation on the "off-side," that is, the right-hand side of the Train looking towards the Engine.

Station Masters are instructed to take care that the Cord is suitably provided throughout the length of the Train. The Foremen and Shunting and Marshalling Porters must observe that the cord coupling is properly attached and detached when vehicles are added or removed, and that the ends of the cord on the Carriages when they are detached are secured to the hooks supplied for the purpose.

It will be the duty of the Locomotive Department to couple the communication to the Engine before starting, and to uncouple it when leaving a Train.

A Copy of the instructions issued to the Guards and Engine Drivers is attached for your information.

General Manager's Office,
Euston Station,
30th July 1869.

W. CAWKWELL,
General Manager.

APPENDIX (3).

LONDON AND NORTH-WESTERN RAILWAY.

The Express and Fast Trains are now provided with the means of communicating between the Passengers and the Servants of the Company in charge of such Trains.

To call the attention of the Guard and Driver, Passengers must

PULL DOWN THE CORD,

which will be found outside the Carriage, close to the Cornice, over the Window of the Carriage Door. There are Cords on both sides of the Train, but that

on the RIGHT-HAND SIDE in the direction in which the Train is travelling IS THE ONE BY WHICH ALONE THE COMMUNICATION CAN BE MADE.

Passengers are earnestly requested to protect the communication from improper and mischievous use, as it is very important that it should not be used without real and urgent necessity.

Under the provisions of the Regulation of Railways Act, 31 and 32 Victoria, cap 119, any Passenger who makes use of the means of communication without reasonable and sufficient cause will be liable for each offence to a PENALTY NOT EXCEEDING FIVE POUNDS.

Euston Station,
August 1869.

W. CAWKWELL,
General Manager.

METROPOLITAN RAILWAY.

1, *Whitchall*, 14th August 1871.

Sir,
With reference to my report of the 3rd instant, on the subject of the collision which occurred at the South Kensington station of the Metropolitan and Metropolitan District Railways on the evening of the 2nd instant, I have now the honour, in compliance with your instructions, further to report the result of my inquiry into the circumstances under which a second accident took place later on the same evening at the Gower Street station on the Metropolitan Railway.

In this latter case the Metropolitan District train, while running forward, after the collision, from South Kensington to Moorgate Street, with another set of passengers, became divided near the Gower Street station, and the hind portion of it came into collision with the leading portion of it at that station.

It appears that immediately after the collision at South Kensington the signalman blocked both lines of rails to prevent the chance of further accident, by telegraph, and by his signals, while the inspector on duty sent men out also, as a further security, to stop the trains in both directions. The inspector next assisted the passengers out of the trains which had been concerned in the collision, got them up upon the platform, and caused them to be attended to. On examining the trains he found that none of the vehicles in either of them had been thrown off the rails. The Metropolitan engine and train were backed; to clear the woodwork of the buffer-plank from the engine-bogie; and the District engine, which had become disconnected from its own train (as a result of the collision), was backed in the opposite direction, and re-attached to its own train.

The Metropolitan train having next been taken forward on to the dock line, and thus got out of the way, the inspector went with the guard round the District train, to see whether any of the couplings of that train had been broken, and especially whether, as he had no siding into which to place it, it was generally in a fit state to proceed forward.

After this inspection he directed it to be taken forward to the High Street, Kensington, station, with a view to its being shunted out of the way there, and further examined as to any damage which it might have sustained. The District train thus left the South Kensington station at about 8.40 p.m., 20 minutes after the collision, accompanied by its own engine-driver, fireman, guard, and breaksman. It went through the Gloucester Road station without stopping, and reached the High Street, Kensington, station a little before 9 o'clock.

The out-door superintendent of the line (Mr. Crapp) was at the High Street station when the train arrived, and the inspector at that station was also on the platform. The engine-driver told the inspector on his arrival that he had been ordered by the inspector at South Kensington to put his train away into the siding on the District road, at the High Street station, as soon as he reached that station; but the inspector replied

that he had Mr. Crapp's orders to send the train forward to Moorgate Street, and said that the train could not be put away, as proposed, at the High Street station. Mr. Crapp was, unfortunately, taken seriously ill after these accidents, and he is not even now in a fit state to be examined, or to give his account of what happened. But the guard further states that he informed the inspector that he did not believe the train was in a fit state to go forward. The inspector went towards the engine, and consulted with the driver, and he (the driver) corroborating the guard's opinion, informed the inspector that the train was not even fit to run forward empty, and was much less fit to go forward with passengers to Moorgate Street.

The inspector does not remember hearing these exact words, but states that he understood the engine-driver to say that "he did not think he should be able to take the train to Moorgate;" and he says further that he told the guard, after the train had started, and as it was passing him, "If you find you can't get on, you had better try and get another engine at Edgware Road."

The question was, in any case, warmly discussed for ten minutes or a quarter of an hour, between the inspector on the one side and the guard and driver on the other; the engine-driver even refusing to go forward without special orders from his own foreman. The driver was, on this refusal, taken across the line by the inspector to see Mr. Crapp, who had previously been, and was supposed to be still, in the signal box; but it was found that Mr. Crapp had left the station and gone to South Kensington.

The passengers were at length put into the train, and the guard, under the direct orders of the inspector, gave the engine-driver the signal to start, and the train accordingly left the High Street station for Moorgate Street at five or ten minutes past nine. The guard and engine-driver were, it appears, unwilling to proceed to Moorgate Street, partly because the breaks of the train were out of order, and partly because the driver had noticed several pieces of metal, which had fallen from the train during the collision, lying by the side of it. He thought, therefore, that it was probably damaged, and that it must be unfit to travel; and he knew that as the buffer beam of his engine was broken, it would not be available for returning with another train from Moorgate Street, as, in that case, the broken buffer beam would have been between the engine and the carriages.

It appears that the inspector at High Street had not heard that the breaks were out of order, or that anything was the matter with the train; and he did not know for certain, though he suspected, that it had been concerned in the accident which had, he heard, occurred at South Kensington; and it further appears that Mr. Crapp, when he ordered the inspector to send the train forward, was not aware of its having been in the collision.

When ordered to proceed, the engine driver went