SIR,

I have the honour to report, in accordance with the Order of 17th January last, the result of my inquiry into the causes of the accident which occurred at about 7.30 a.m. on 10th January, 1945, between Victoria Halt and Ballymacarrett Halt on the Bangor Branch of the Belfast and County Down Railway.

The 7.10 a.m. passenger train, Bangor to Belfast, had been brought to a stand at the Outer Home Signal of Ballymacarrett Junction and was run into from the rear by the 7.40 a.m. rail motor set, Holywood to Belfast. The latter train, which was being propelled by an engine at the rear, had previously been stopped at the Sydenham Automatic Stop Signal which was at the danger position, and had moved forward in accordance with the “Stop and Proceed” rule which applied. The accident occurred during the hours of darkness, and visibility was further decreased by reason of local ground fog.

I regret to report that thirteen passengers in the Bangor train were killed instantaneously, while nine others received such serious injuries that they have since died. Twenty-three other passengers in the Bangor train, and one in the Holywood train, were also injured, and of these, two are still in hospital.

Three members of the train crews, the guard of the Bangor train and the conductor and porter of the rail motor train also received minor injuries. They have now resumed duty.

At the outset, the darkness and fog presented serious difficulties to the rescue work, but these were overcome to some extent by the lighting of bonfires from the wreckage and by the action of drivers of motor buses in drawing their vehicles up on the adjoining East Road so that the headlights illuminated the scene. Assistance in extricating the dead and injured was readily forthcoming from passengers in the two trains, from workmen making their way along the East Road, and from residents in the neighbourhood. With the arrival of police, railway employees, rescue and ambulance services, rescue work was promptly carried out, injuries were dealt with by doctors and first-aid personnel and the casualties were removed to hospital without delay. The proximity of East Road to the scene of the collision did much to facilitate the rescue work. There was no damage to permanent way. Single-line working was instituted by 11 a.m. and normal conditions were resumed by 5 p.m.

**Particulars of Trains Involved**

The 7.10 a.m. train ex Bangor consisted of thirteen six-wheeled coaches drawn by a 4-6-4 tank locomotive No. 25. It had a length of some 550 feet and a total weight of 268 tons. The seating capacity was 724, and on this occasion the train carried some 600 persons. The guard’s compartment was located in the ninth coach, four additional coaches having been attached—an arrangement which is not unusual. The red tail-light was exhibited in the normal position on the rear of the last coach, while the two side-lights on the guard’s compartment each showed a white light to the front and a red light to the rear. With the exception of the conductor and porter of the rail motor and the guard of the Bangor train, all the casualties were located in the last two coaches of the Bangor train—the penultimate, No. 72, Second Class, 16
tons, 38 years old, and the last, No. 9, Second and Third composite, 13 tons 12 cwt., 40 years old.

The rail motor set was made up of a motor coach 38 years old, weighing 27 tons, with steel sole-bars and steel cross-members on two four-wheeled bogies, and two six-wheeled coaches (similar to those of the Bangor train) propelled by a 2-4-2 tank locomotive, No. 5, running bunk first. The length of this train was 176 feet and its weight totalled 104 tons. Its seating capacity was 186, and on the journey in question there was a number of standing passengers, the number travelling being in excess of the seating capacity.

When the engine is leading, this train is controlled by the driver from the footplate in the normal manner, but when it is propelled by the engine from the rear, as on this occasion, the method of control is unusual. The driver takes up his position in a compartment situated at the front of the motor coach and fitted with a remote-control regulator, a brake-valve, a hand-brake and a whistle-cord. The regulator gear comprises a shaft running lengthwise under each coach with a "sword and scabbard" feature providing the connection between coaches, and on the propelling journey is attached to the normal regulator on the engine. The whistle-cord in the driver's compartment is attached to the whistle on the engine by an overhead cord and provides the means of communication between the driver and the fireman on the footplate. The train set can be brought to a stand more quickly with the engine brake valve than with the valve in the driver's compartment. This is due to the fact that the engine is sometimes used on heavier trains and its valve has a larger orifice.

When the train is standing at a platform, one of the two means of access and egress for passengers to and from the motor coach is through the driver's compartment which can be closed off from the remainder of the coach by means of sliding doors to which a latch is fitted on the driver's side. The following notice is displayed above the sliding doors in the driving compartment: "Passengers are not permitted to remain in this compartment."

**Damage to Rolling Stock**

In the collision, the main frame of the motor coach mounted the deck of the last coach of the stationary train, left its leading bogie, swept away completely the superstructure of the last coach and penetrated the next coach for a length of about ten feet before coming to rest. These two coaches included steel sole-bars with oak cross-members in their construction and, apart from minor damage to headstocks, buffers and couplings on four other coaches, they were the only items of the rolling stock making up the Bangor train to sustain extensive damage.

The leading bogie of the motor coach was badly twisted in the impact, became detached from the frame and lodged against the rear wheels of the last coach, while the trailing bogie remained attached to the frame and finished up close to the leading one. The front of the driver's compartment was pushed in as a result of the impact with the stationary train, but generally superficial damage only was suffered by the superstructure of this coach. Damage to this train was confined to the motor coach apart from the fracture of two headstocks in the next coach and one in the coach adjoining the engine.

**Locality and Distances**

The accident occurred on the Bangor up-line between the Connswater and Dee Street bridges at a point 823 yards on the Belfast side of Victoria Park.
Halt. This section consists of a double line on a 45 chain curve with practically no gradient, and at the site of the accident is flanked on the up side by the Oval Football Grounds and on the down side by the East Road from which it is separated by a sleeper fence. There are no connections to this section between Sydenham Station and Ballymacarrett Junction.

Sydenham Up Stop Signal to west end of Victoria Park Halt 675 yds.
West end of Victoria Park Halt to point of Collision 523 yds.
West end of Victoria Park Halt to Ballymacarrett Junction Outer-Home Signal 814 yds.

**Signalling System**

The Bangor Branch is provided with continuous track-circuits which operate approach-lighted, banner-type, two-position, Syke’s patent signals, except in the Ballymacarrett-Tillysburn section which was the first portion to be converted to automatic signalling in 1926 and where the signals are of the upper quadrant, semaphore type. Normal automatic distant signals are provided at stations and halts at adequate braking distance in rear of the respective stop signals, repeating their aspects. All automatic signals are marked “A” to indicate that they are fully automatic, and the Sydenham Up Stop Signal is the last of this type, being maintained at danger by the Sydenham Station to Ballymacarrett Inner Home Signal track circuits when occupied. The Ballymacarrett Junction Distant and Outer Home are controlled signals, manually operated from the Junction signal box.

The overlapping track circuits lock the Outer Home Signal at danger in addition to the normal mechanical locking in the signal box.

The Distant Signal is located about midway along Victoria Park Halt platform and the Outer Home Signal at the west end of Ballymacarrett Halt. The latter bears a diamond-shaped plate to indicate to the driver of a train held up at the signal that he is not required to send his fireman forward to the signal box (Rule 55). It is also provided with a strain-type reverser which returns the signal to danger when the train has passed. Two track circuits are repeated visually and aurally in the signal box, one extending from a point about midway between Tillysburn Station and Sydenham Station to Victoria Park Halt, and the other from the Halt to the Outer Home Signal.

Telephones are not provided at the signals, but there is a telephone communication between the Junction box, Sydenham and Holywood Stations.

**The Rules**

The Railway Company’s Rule Book, dated 1905, contains the usual rule governing detention at home and starting signals—

"Rule 55 (a)—In case of detention at an Outer Home, Home, Starting, or Advanced Starting Signal, the Engine-driver must immediately sound his whistle, and if detained more than two minutes, again sound his whistle, and if further detained, the Guard, Shunter or Fireman must go to the signal-box, etc., etc."

The appendix to the Working Time-Table of 30th May, 1943, includes a section on the Automatic Signalling between Ballymacarrett Junction and Bangor. Under “Description of Signals” are to be found the following paragraphs—
"When a train has stood at an automatic stop signal at 'Danger' for two minutes, the Driver must give one long whistle and may then pass the signal at 'Danger,' proceeding with great care to the next automatic stop signal at which he must also stop two minutes if it is against him and repeat this at each automatic stop signal found at 'Danger,' and

"The train must be run at such speed that it can be stopped short of any obstruction and full particulars reported at next stopping station."

Elsewhere in the Appendix is an instruction amplifying Rule 55 and covering the provision of diamond-shaped boards on certain signals, of which the Ballymacarrett Outer Home is one, where it is not necessary on prolonged detention to send anyone to the signal-box, but to sound the engine whistle only.

**Report and Evidence**

The driver of the 7.10 a.m. train ex Bangor, J. McGraw, stated that he left Bangor one minute late, lost a few more en route and was four or five minutes behind time when he stopped at Ballymacarrett Halt. He was standing there from 7.47 a.m. and the crash took place about four minutes later. He had been detained at the Outer Home Signal many times.

He had observed the Distant Signal, situated at Victoria Park Halt, at Caution, and his speed was about 10 or 12 miles per hour. The rail was slippery and it was very foggy, but he could see about 150 yards and was able easily to bring his train to a stand at the white disc at the near end of the platform 41 yards from the Outer Home Signal. He had not expected to see fogmen out so early. He had heard no whistle before the crash.

His brakes were off, and the impact moved his train forward and broke it into two portions, thus releasing the vacuum and applying the brakes.

Isaac McQuillan, the driver of the rail motor train, said that he left Holywood on time, passed the Tillyburn Distant Signal at Caution, and "got" the Tillyburn Stop Signal just as he was preparing to stop in accordance with its red aspect. This is consistent with the evidence that the Bangor train was running late.

When he was ready to leave Sydenham, the Stop Signal there was at danger, so he waited two minutes and then proceeded at Caution, as permitted by the "Stop and Proceed" Rule.

As he approached Victoria Park Halt he observed that the Ballymacarrett Distant Signal was at Caution. After some passengers had alighted and others had joined the train, he proceeded again still under caution.

The weather had been clear at Sydenham, but the fog was increasing in the vicinity of the Halt. After he had gone about fifty yards, the fog became very thick and he had his front window fully open. McQuillan said that it was near this place that he always shut his regulator, but being under caution already, he did not apply his brakes as he did not consider it necessary further to reduce speed. Soon afterwards he saw a red light thirty yards ahead, and snapped on his brake, but crashed into the rear of the Bangor train.

William Lamont, the fireman on the engine at rear of the Holywood train, said that the fog had thickened at Victoria Park Halt so much that he could not see the length of his train (fifty-nine yards). He confirmed that steam was shut off in this particular case, before the train had reached half-way, but was positive that brakes were not applied before the crash. James McMillan, the porter on the train, said he felt a slight jar just before the impact.
McQuillan's evidence as to signals was not in doubt, and it was established that all lights were burning and that the aspects of the signals were consistent with the situation ahead of the train. Further he stated that every morning he was particularly careful as he knew that the Bangor train was not far ahead, and he was quite satisfied that he was driving safely under caution, at a speed of eight to ten miles per hour. Although he had no experience of an emergency stop, he felt sure he could draw up in the length of his train (fifty-nine yards). He had never before found the Bangor train held up at the Outer Home Signal.

Both McQuillan and Lamont were somewhat inconsistent in their opinions as to where the fog became such as to cause anxiety; Lamont's opinion of the speed was valueless.

Conductor C. Smith said the speed was about 10 miles per hour, while James McMullan said that when he joined the train visibility was about eight coach lengths (say 110 yards).

Driver W. Mulholl of the 7.0 a.m. train ex Bangor confirmed the general opinion that the fog was heaviest near Ballymacarrett junction. He remarked on it to his fireman, W. J. Miskelly, the Ballymacarrett Signalman, said the weather was clear when he went on duty, but by 7.30 a.m. it was becoming very thick. He was of the opinion that fogmen should have been out, but he knew that as they would report automatically at 7.45 a.m. no advantage would be gained by sending for them specially.

Questioned on the possibility of passengers being in the driver's compartment, McQuillan was aware of the notice prohibiting such a situation, but said it was not his custom to close the sliding doors. He admitted having driven with passengers beside him on other occasions. Pressed for a definite answer as to whether there were passengers in his compartment between Sydenham and Victoria Park Halt, he answered "No"; and when it was suggested that someone might have been standing behind him from Victoria Park Halt, his reply was "It could happen."

Signalman W. J. Miskelly said that the Bangor train was held at the Outer Home Signal due to a defect in the apparatus—a failure of the signal to reset, which prevented it from coming off when the lever was again pulled. It was possible always to pull the lever, but the signalman does not know whether the signal has come off until he glances at the repeater. On this occasion the signal failed at the first attempt, so Miskelly took on a Mainline train from Newcastle, and after clearing the junction he again attempted to pull off the signal, without result. At 7.50 a.m. exactly, he took a lamp and proceeded down the line to bring in the Bangor train. At this time both track-circuits were occupied according to his indicators. Before he reached the signal, he heard the crash. This particular signal had been giving trouble for some time past, especially in wet or frosty weather, and other evidence confirmed this unfortunate fact.

Meantime Guard J. E. Hewitt, of the Bangor train, who had heard no whistling from the train behind, after having been standing at the Outer Home Signal for three minutes proceeded to take protective action, but too late. After the crash, his action in going back to the vicinity of Victoria Park Halt and there placing detonators is commendable. Fireman Lamont also carried out the regulations as he had already reached Sydenham Station and there warned the 7.35 a.m. train ex Bangor not to proceed.

It transpired during the Inquiry that the remote control regulator gear had considerable backlash and that the regulator could not be fully opened. It also appeared in Lamont's evidence that the pin connecting the rod with the regulator had to be watched to prevent it falling out.
Conclusion

Driver McQuillan knew that the Bangor train was close ahead. Not only was he running at caution imposed by the Sydenham Stop Signal, under the "Stop and Proceed" Rule, but he had received an additional caution from the Ballymacarrett Distant Signal at Victoria Park Halt and further he had run into fog. He was timed to stop at Ballymacarrett Halt.

The amount of damage sustained by the Bangor train was very considerable, and not, in my opinion, such as might be expected as a result of a collision in which the colliding train, weighing only 104 tons, was moving at a speed of 8 to 10 miles per hour. It is also very doubtful whether the brakes were applied even at 30 yards distance; Fireman Lamont was emphatic that no application was made. The normal clear weather speed was stated to be around 20 miles per hour. Tests on a similar train, starting from Victoria Park Halt, indicated that 21 miles per hour was the maximum speed attained over a distance of 440 yards, and of 27 miles per hour over the "collision" distance of 322 yards.

McQuillan's replies to questions as to the closing of the door of his compartment, and as to the presence of passengers within that compartment, were evasive. Although no actual evidence was obtained, it seems certain that the door between the driver's compartment and the passenger space was not closed. It was, therefore, highly probable that one or more passengers of the crowded car were beside, or close behind, the driver, providing conditions favouring lack of concentration on his part.

I am of the opinion, therefore, that the direct cause of this accident was the failure of Driver McQuillan to proceed at such a speed as would enable him to draw up before any obstruction. Considering all circumstances, I am forced to the conclusion that Driver McQuillan had completely failed to realise his responsibility as driver of a passenger train. I cannot accept his statement that he was unaware of the distance in which he could bring his train to a stand when running at the speed he stated.

Remarks

It may be appropriate at this stage to define the generally accepted distinction between " Controlled " and " Automatic " signals.

Controlled signals are those which are controlled to their " Danger " or " Clear " position by the signalman; they may, however, be restored to " Danger " by the passage of the train, by track circuit or other device, while the lever in the signal box is still in the reversed position. In these circumstances, the lever has to be worked again to clear the signal.

Automatic signals are those which are not worked in any way from a signal box and whose indication is governed solely by the track conditions ahead. Continuous track circuiting is necessary with a series of automatic signals.

Under ordinary rules a driver is not permitted to pass a controlled stop signal at " Danger " except with the indication of some subsidiary signal or under some other special authority, and when a driver is detained at such a signal he has to send his fireman to the box unless exempted by a fixed " diamond " (track circuit) or " D " (telephone) sign on its post (Rule 55). Thus with controlled signals, the signalman is usually in possession of the necessary information to decide whether he is justified in instructing a driver to proceed against a danger indication, e.g., in the case of a mechanical or electrical failure.
But if traffic is to be kept moving in the case of failure of an automatic signal, there is no alternative except to allow the driver to move forward, under prescribed precautions, on every occasion when he encounters such a signal at danger, unless there is a telephone from the signal to the signal box, and the track conditions ahead are indicated therein. In this installation, as in the earlier installations in England, there was no such feature, and the "Stop and Proceed" arrangement applied at the automatic signals at all times without distinction, whether they were properly at "Danger" owing to occupation of the section ahead, or wrongly so owing to failure of apparatus with the section ahead clear. The application of "Stop and Proceed" in the former circumstances, i.e., in the ordinary course of traffic, will obviously occur more often than in the latter, and in the substance amounts to the abandonment of the principle of a space interval between trains, which is fundamental to the Block System.

This was appreciated in England following accidents in 1933 and 1934, when the position was reviewed, and steps were taken to ensure that such signals should only be passed at "Danger" when it was legitimate and necessary to do so, i.e., in the case of failure or other emergency. On main lines in England, there is now communication by telephone from every automatic signal to a signal box, and the relevant track circuits are indicated in the box to which the telephone is connected. On receipt of a telephone call from the driver of a train detained at a specified signal, the signalman first satisfies himself as to the identity of the train, and that the signal is not properly at danger owing to the occupation of the section ahead of it. If so satisfied, he then switches on an illuminated "P" sign at the signal concerned to minimise any chance of misunderstanding of a verbal message; this authorises the driver to proceed at the cautionary speed prescribed.

When considering whether such measures might have been introduced at the time by the Belfast and Co. Down Railway Company, regard must be had to the lighter traffic, the shorter distances, the lower speed, and the lesser incidence of fog as compared with English main line operation. But whatever the circumstances in which the "Stop and Proceed" arrangement is applied, it remains essential that the driver should proceed at a speed consistent with visibility, so that he can stop short of any obstruction within his range of view. The precise rule may vary as to the time the driver must wait before proceeding, and whether the speed is fixed at, say, 5 M.P.H. or left to his judgment.

Recommendations

On the primary matter of signalling, in view of the general desire for greater safety and because of the expected demand for improved services, I am of the opinion that it would be a mistake to confine any improvement in the apparatus to the section of line concerned in this particular case. The whole branch, and not only the Ballymacarrett-Holywood section, is equally in need of modernisation. While Banner and Semaphore signals have given place to Colourlight systems where high speed working is prevalent, it would hardly seem necessary in this case, to suggest the conversion of the signals themselves. It would, however, seem appropriate to increase their candle power, now that it is not so necessary to rely on battery operation. Whatever type of signal the Company may ultimately choose, the essentials do not vary. These are the proving or indication of all track circuits and the provision of telephones and "P" signs at top signals throughout, the whole being operated under the latest Railway Clearing House Rules. It is for the Company to decide, but it would seem not only more economical, but also easier in operation if one or more control points
were set up, rather than to bring all circuits to the terminal boxes. It would
be necessary to ensure adequate control of movements partly within the ambit
of the terminal manual boxes and of the part-time manual box at Holywood
which covers two remote-controlled industrial sidings. It is also recommended
that the opportunity be taken to provide suitable means of communication
with Sydenham Airport Control to offset as far as possible the obvious danger of
aircraft crashes on the line.

Apart from the major issue of improvement of the Signalling System, this
Inquiry has disclosed several other matters to which the attention of the
Railway Company must also be directed.

Only a degree less important than the signals, in my opinion, is the need for
a complete modernisation of the remote control gear on the rail motor. The
gear should be more positive and should preclude operation by the fireman,
except to stop in an emergency. I understand that a very suitable device is
in use elsewhere and has been found satisfactory.

The partition between passenger space and driver's compartment should be
solid, and coaches should be provided with the necessary side-doors for the use
of passengers.

It is also recommended that the arrangements for fog operation be over-
hauled, and that the routine of reports and records of defects and repairs to
signals and like matters be tightened up.

I have the honour to be,

Sir,

Your obedient Servant,

R. DUNDAS DUNCAN.

Note—I am informed that the Railway Company has already instituted,
as a first step, a control system under which the "Stop and Proceed" Rule will
no longer be applied as the result of traffic delay.

The Secretary,
Ministry of Commerce,
31 Linenhall Street,
Belfast.