In re investigation of an accident which occurred on the Louisville & Nashville R. R., at Nashville, Tenn., July 16, 1917.

August 20, 1917.

On July 16, 1917, there was a rear-end collision between two freight trains on the Louisville & Nashville Railroad, at Nashville, Tenn., which resulted in the death of one employee.

As a result of an investigation of this accident the Chief of the Division of Safety submits the following report:

This accident occurred on the Nashville Division of the Louisville & Nashville Railroad, at a point approximately 2.6 miles north of Nashville station and 3266 feet south of the northern limit of Nashville terminals, the railroad at this point being double tracked and trains being operated by a telephone block signal system.

At Maplewood, a point 5.5 miles north of Nashville, there is an interlocking plant located where the Lewisburg & Northern R. R. diverges from the main line of the Louisville & Nashville; the operators at this interlocking tower, in conjunction with block operators at Foster Street, which is a block station 2.4 miles north of Nashville, operate the manual block system. At Maplewood the home interlocking signal governing southbound movements is located 781 feet north of the tower; this signal has three semaphore arms, the top signal governing movements on the main line, the middle arm governing movements on the diverging route, and the bottom arm being calling-on signal and governing movements over all routes. When the southbound main line route is lined up and the block between Maplewood and Foster Street is clear, a clear indication of the home interlocking signal authorizes a train to proceed; if the block is occupied or if a form 19 order is to be delivered to a train at the tower, a yellow flag or lantern is displayed at the tower; and a red flag or lantern displayed at the tower is used both as a stop signal indication as well as to stop a train for the delivery of a form 31 train order.

Approaching the scene of the accident from the north, there is a descending grade for southbound trains nearly four miles long, the gradient varying from 1.13 per cent to 1.36 per cent, extending to a point 1,430 feet north of the scene of the accident; from there the track is level to a point

more than 3,000 feet south of the point of accident. The track in this vicinity was laid with 90-lb. rail, with 18 ties to the rail length and ballasted with crushed stone, being maintained in good condition.

The trains involved in this collision were the first and second sections of second-class train No. 75, both of which were en route from Louisville, Ky. to Nashville, Tenn., and were received by the Nashville Division at Bowling Green, Ky. First No. 75 consisted of locomotive 1258, 29 cars and a caboose, with Conductor Gallagher and Enginemen Burkhart in charge; 2nd No. 75 consisted of locomotives 1048 and 1133, 18 cars and caboose, with Conductors Ogle and Bloodworth and Engineman Rice and Whitehead in charge.

Train 1st No. 75 arrived at Bowling Green at 1.38 p. m., 2 hrs. and 28 min. late, passed Maplewood at 5.46 p. m., 3 hrs. and 25 min. late, and at 5.53 p. m. was stopped by the block signal at Foster Street on account of congestion of traffic south of that point.

Train 2nd No. 75 left Bowling Green at 2.14 p. m., 3 hrs. and 4 min. late, locomotive No. 1048 being coupled on as leading engine at Avondale, 17.6 miles north of Foster Street, passed Maplewood at 6.15 p. m., 3 hours and 54 min. late, and at 6.21 p. m., collided with the rear end of 1st No. 75 which was standing at Foster Street block station.

At the time of the accident a light rain was falling and smoke from two engines of a passing northbound freight train hung over the tracks. A concrete viaduct over the tracks at Cleveland Street, 1565 feet north of the point of accident, obstructed the view to some extent.

The speed of train 2nd No. 75 at the time of the collision was estimated by different railroad employees at from 4 to 15 miles per hour. The caboose and rear car of 1st No. 75 were demolished, and Conductor Gallagher who was in the caboose was killed in the collision. The shock of the collision was not felt by the employees on the front end of train 1st No. 75.

Signalman Cole, who was on duty at Foster Street Tower, stated that when 1st No. 75 arrived the signal was in the stop position as there were three trains between his station and Cumberland River bridge. Previous to the arrival of 2nd No. 75 at Maplewood he called Operator Franklin located at that point, told him of the congestion and directed him to hold everything until he heard further; when the situation had

cleared up somewhat, there being only train 1st No. 73 between Maplewood and Foster Street, he told Operator Franklin to display a yellow signal for 2nd No. 73. Northbound train No. 84, a double header, went by shortly before the collision and he noted that smoke was lying low; he saw the smoke of 2nd No. 73 also as it approached, but he assumed that train would come up behind the first section and stop, as there was nothing out of the ordinary in the circumstances. He stated that he had heard Engineman Burkhart sound the whistle signal for the flagman to go out to protect his train, and that was before 2nd 73 received the block at Maplewood.

Operator Franklin, who was on duty at Maplewood, stated that before train 2nd No. 73 appeared, Operator Cole at Foster Street called him and told him to hold all trains at Maplewood; later on he called and asked for the block for 2nd 73 and Operator Cole told him to display a yellow signal. He stated that he put the yellow flag on the arm at the tower window and left it there until the train passed, the distant and home signals being in the clear position. At the time 2nd 73 passed the weather was misty and it was raining; but he said there was no reason why the enginemen could not have seen the flag. He was standing at the tower window and the engineman of the second engine was looking up at him as the train passed. He stated that the engineman of 2nd 73 did not answer the caution signal indication as required by the rules, but as it frequently happens that enginemen do not answer caution signal indications and it has not been customary to report same, he did not make a report in this particular case.

Engineman Burkhart of train 1st No. 73 stated that he received a caution signal indication at Maplewood and at Foster Street the signal was red. He brought his train to a stop with the locomotive standing approximately a hundred feet north of Foster Street crossing at 5.55 p. m. He then released his brakes, and a minute or two after stopping he sounded the whistle signal for the flagman to go back and protect the rear end of the train; he saw the flagman come out of the caboose, wave a red flag at him and then disappear from view behind the caboose. Engineman Burkhart then went to the block office to ascertain the reason for the delay to his train, and while there he learned from the operator that 2nd No. 73 had passed Maplewood under a caution signal. After he returned to his locomotive, northbound train No. 84 passed and he stated that smoke from the two locomotives of that train blew over upon the southbound track; shortly afterwards while waiting for the block signal to clear, the head brakeman suddenly called his attention to the rear of the train and looking back he saw dust flying, that being the first intimation he had of the collision.

Fireman Simpson, of train 1st No. 73, stated that about two minutes after the train stopped at Foster Street the engineman signalled the flagman to go back. He lighted the headlight and cab lamps and then watched the northbound freight train pass. He stated that the smoke from the two engines of that train was very dense and it hung low over the southbound track; it was some time before he could see the rear end of his train, and while looking back he saw a black cloud of smoke at the rear end of the train, as if from an explosion, but he felt no shock of collision.

Flagman Angland, of train 1st No. 73, stated that when his train came to a stop at Foster Street he lighted his lanterns and the caboose markers, put up the markers and then, without receiving any instructions from the conductor, he went out to flag. He thought he went back about eight car lengths from the rear end of his train; he put down two torpedoes, and when he saw 2nd 73 approaching he lighted a fusee, picked up the torpedoes and walked back toward the approaching train waving the lighted fusee. He did not think there was any danger until the train passed the Cleveland Street viaduct and he saw the engine crews jumping off. Flagman Angland stated that he was familiar with the flagging rule, but he considered that within yard limits it was sufficient for a flagman to go out only a short distance in order to be seen from an approaching train. He also supposed that the following train would receive a caution signal at Maplewood and that the crew in charge of that train would be looking out for a preceding train. He thought it was about five minutes after the train came to a stop before he started out to flag, and that he stood at a point about eight car lengths from the caboose for a period of twenty minutes before 2nd 73 appeared. He said there was not sufficient smoke from the northbound train to obstruct the view, and that he could plainly see the approaching train for a long distance.

Engineman Rice, of the leading engine of train 2nd No. 73, stated that his locomotive was coupled on to the train at Avondale, and the brakes were tested and found to be working properly. He stated that the train passed Maplewood at about 6.12 p. m., the signals were in proceed position, and there was no yellow flag displayed from the tower. The train coasted down the grade, and as it approached the terminal limits, at a speed of approximately 30 miles per hour, he applied the brakes, slowing down to about 12 miles per hour; he then released, and when the speed had again picked up to about 15 miles per hour, approaching Cleveland Street bridge, he made another brake application. He stated that it was raining at the time and smoke from the northbound train obscured the view to such an extent that he did not see the flagman

and the rear end of 1st 73 until after passing under the Cleveland Street bridge. He thought the flagman was at that time about four car lengths from the caboose. He made an emergency application, reversed the engine and sounded the whistle signal calling for brakes, and just before the collision, he jumped off. He said the brakes did not seem to take hold very well when he made the emergency application, and he thought the speed of his train at the time of the collision was about four miles per hour. He stated that he was familiar with the rule requiring trains to approach yard limits under control and run carefully through yards expecting to fin the main track occupied, and he considered that he complied with that rule. He stated that he saw the red lights on the rear of the caboose as well as the flagman's fusee; but the fusee was only three or four car lengths from the caboose and he had passed under Cleveland Street bridge when he saw it; there was not then sufficient time to stop.

Conductor Bloodworth, who was in charge of engine 1048, stated that he rode on the leading engine from Avondale to the scene of the collision. He noted that the signals at Maplewood were in proceed position but he did not see any flag or signal displayed from the tower. When he saw the fusee ahead, he called to the engineman who apparently saw it at abut the same time and made an emergency application of the brakes. He thought the speed at that time was 25 or 30 miles an hour, and that it had been reduced to 10 or 15 miles an hour when he got off 4 or 5 car lengths from the rear end of 1st 73.

Fireman Harrison, of engine 1048, stated that train 2nd 73 passed Maplewood running at about 25 miles an hour and had clear signals there. Approaching the terminal limits, the brakes were applied and speed reduced to about 12 miles per hour, the brakes being released at the yard limits. The brakes were again applied near Cleveland Street, and when they had passed south of the bridge he saw the flagman's fusee; he thought the flagman was about four and half car lengths from his caboose. The engineman made an emergency application, reversed his engine, used sand, and called for brakes. He thought the speed of his train was about 12 miles an hour at Cleveland Street, and about four miles an hour at the time of collision.

Engineman Whitehead of engine 1153, the second locomotive of train 2nd No. 73, stated that at Maplewood the signals were in clear position and he did not see any flag displayed at the office although he was looking up at the tower as the train passed. He stated the brkes were operated from the leading engine and that the speed had been reduced to about fifteen miles an hour at the yard limits. When he heard

the engineman of the loading engine acknowledge the flag and call for brakes he reversed his engine, used sand and opened the throttle. He said it was raining and the rail was damp, but they did all they could to stop. He saw the flagman's fusee in the smoke ahead, but stated it was not far from the rear end of 1st 73.

Fireman Barker of engine 1133, train 2nd 73, stated that at Maplewood the signals were in clear position and he did not see any flag displayed from the tower. He got off when the engineman called his attention to the fusee ahead, after passing Cleveland Street bridge, and he thought the speed at that time was about 15 miles per hour.

Conductor Ogle, of train 2nd No. 73, stated that the train passed Maplewood at a speed of 30 or 35 miles per hour, and that they received a clear block signal at that point. The train slowed down to about 15 miles per hour at the yard-limit board, and north of Foster Street an emergency application was made; the speed had been reduced to four or five miles an hour when the collision occurred. He walked forward and found a fusee burning about 200 feet north of the rear end of 1st 73. He said there was no yellow flag displayed at the tower at Maplewood.

Head Brakeman Russell, of 2nd No. 73, stated that he was on the head car and was looking at the tower at Maplewood; he did not see any yellow flag. He thought they were about thirty car lengths from the rear end of 1st 73 when the engineman called for brakes.

Master Mechanic Enoch stated that his home is one block north of Cleveland Street viaduct and about three blocks from the point of accident. He heard the noise of the collision and arrived at the scene about fifteen or twenty minutes after the accident occurred. He went back over train 2nd 73 with Engineman Rice, noted that all the angle cocks were cut in and that on about twelve cars the brakes were still applied. He then had the engineman release the brakes and recharge; the brakes were then tested and it was found that the brakes on all cars in the train were in good working condition. He found the remains of Flagman Angland's fusee at about the middle of the first car behind the two engines. He also stated that he did not hear any whistle signals from train 2nd 73 before the collision occurred.

Conductor Edwards of northbound train No. 84 stated that he was riding on the rear end of the caboose which was about opposite the second engine of 2nd 73 when the collision occurred. He was not in position to form any opinion as to the rate of speed of 2nd 73 at the time of the collision and

he did not see the flagman of that train.

Flagman Allen on train 84 stated that shortly before the collision he was riding on top of the caboose. He saw 2nd 93 approaching and thought that train was under control and would stop before reaching the preceding train. He did not see the flagman. He stated that the smoke from his train was blowing to the right of the train and there did not seem to be much smoke around the viaduct.

Rule No. 99 of the Louisville & Nashville R. R. establishes definite and specific requirements for flagging protection. It provides in part as follows:

> When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals to stop any train moving in the same direction. At a point 30 rail lengths, or 1,500 feet, from the rear of his train, he must place one torpedo on the rail; he must then continue to go back at least 100 rail lengths, or 5,000 feet, from the rear of his train, and place two torpedoes on the rail, 30 feet, or one rail length apart, when he may return to a point 70 rail lengths, or 3,100 feet, from the rear of his train; and he must remain there until recalled by the whistle of his engine.....
> If the view is obstructed, or if on descending grade, he must go as much farther as may be necessary to reach a point where he is absolutely sure that he can be seen by the expected train at a sufficient distance in which to stop.
> .....

A time table rule contained in special instructions for the Nashville Terminals provides that "when a train or yard engine is stopped, or delayed, trainmen must not depend on block or interlocking signals as a protection, but flagman must immediately go back a sufficient distance to protect against following movements."

Rule No. 93 provides that "trains must approach yard limits under control, and run carefully through the limits, expecting to find the main track occupied."..... "Within terminal and switching limits, trains occupying the main track must protect themselves against following move-

ments. . . . . .*

From the statement of the flagman himself it is evident that he relied to some extent upon the block signals and upon yard limit rules for the protection of his train, and that although he had ample time, he did not go back a sufficient distance to provide proper and adequate protection.

The direct cause of this accident was the failure of the flagman of train 1st No. 73 properly to protect his train as required by the rules.

A contributing cause was the failure of the conductor of that train to see that it was properly protected by flag.

The crew in charge of train 2nd No. 73 were also at fault because their train was not operated under control within terminal limits; had the speed of their train been reduced sufficiently for the train to be under proper control, the accident could no doubt have been averted, notwithstanding the lack of proper flag protection for the preceding train.

Also, either the crew in charge of train 2nd No. 73 failed to observe and obey the caution block signal indication at Maplewood, or the operator at that point failed to display the proper caution indication; had a caution signal been received at that point, the crew in charge of train 2nd No. 73 would no doubt have exercised greater care in the operation of their train and the accident would probably have been averted.

Flagman Anglad stated that while he could read, he could not write, and when he was examined on the rules two or three years ago he took the form home with him and answers to the questions were written in at his dictation by his son-in-law. When he presented this form to the examiner he was questioned further and some of the answers were corrected. When questioned during the investigation of this accident, his knowledge of the flagging rule appeared to be extremely vague and inaccurate. He was a man 58 years of age and had had 24 years' experience, 14 of which were as brakeman and flagman; he had been working between Louisville and Nashville for about two years, and had been working with Conductor Gallagher for several months.

It is apparent that in this instance the benefit of periodical examinations on operating rules was nullified by the method of conducting the examination. Being required to pass a written examination, the flagman who was unable to write, had the form filled out by another person. Although this examination was evidently accepted as satisfactory by the railroad company, the investigation developed that while the flagman had had many years of practical experience, he

not only did not have a proper working knowledge of the flagging rules, but failed entirely to comprehend the essential principles of train protection.

While the enginemen of Smd No. 73 considered that he complied with the rule requiring trains to be operated under full control within yard limits, the occurrence of this accident, with attending circumstances, particularly the fact that he had 1,500 feet in which to bring his train to a stop after passing under Cleveland Street Bridge, demonstrates absolutely that the train was not under proper control, and if this instance can be taken as a criterion, it is apparent that the rule referred to is not being observed.

The rules of the Louisville & Nashville Railroad governing the use of the manual block system provide in part as follows:

> 306. Unless otherwise provided, a yellow flag by day and a yellow light by night will be used as a permissive signal in addition to caution card.
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> 318. A permissive indication "yellow" (caution) will be used to permit a freight train to follow a freight train into a block after ten minutes, although the preceding train has not cleared the block . . . . .
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> 352. When a train receives a caution indication, the enginemen will immediately sound caution whistle signal and proceed under control to the next block station, expecting to find a preceding train in the block.

There were no special rules or instructions governing the operation of the manual block system at this point and the investigation disclosed that in certain respects the rules quoted above were not observed. It was not the practice to issue a caution card in addition to the yellow or permissive signal, as required by Rule No. 306, and it is therefore apparent that a train crew receiving a yellow signal would have no means of knowing that the indication was intended as a caution or permissive signal except by reason of the fact that they did not receive a form 19 order. Furthermore, from the statement of the operator who was on duty at Maplewood in this instance, it appears to be a common practice for enginemen to fail to acknowledge a caution signal as required by Rule No. 352, quoted above, which is similar to Rule No. 286 of the operating rules.

The Louisville & Nashville Railroad Company is open to criticism on account of failure to utilize the signals installed at Maplewood in the operation of the block between that point and Foster Street. Practically speaking, the block was operated entirely by flag or lantern signals displayed from the tower window, the absence of any such signal being a clear indication, and yellow and red flags or lights being caution and stop signals, respectively. There is no reason apparent why the top arm and the calling-on arm of the interlocking signal at that point, together with caution cards as provided by the rules, could not be used to govern train movements through the block.

A proper regard for the safety of train operation on this line would seem to require not only that proper methods of instructing and examining employees be inaugurated and operating rules be rigidly enforced, but also, signaling rules and operating methods should be revised to insure that train crews receive the intended block signal indications.

All of the employees involved in this accident were experienced men. The crew in charge of train 1st No. 73 had been on dut about 14 hours and 30 minutes; the engine crew of engine 1046 had been on duty 6 hours and 40 minutes, and the engine crew of engine 1135 had been on duty 12 hours and 50 minutes.