

IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED
ON THE SOUTHERN RAILWAY, NEAR FROST STATION,
S. C., ON FEBRUARY 25th, 1918.

March 21, 1918.

On February 25, 1918, there was a rear-end collision between two passenger trains on the Southern Railway, near Frost Station, S. C., about 7 miles from Columbia, S. C., resulting in the death of 12 passengers, one person hauled under contract, and injury of 108 passengers and 4 employees on duty. After investigation the Chief of the Bureau of Safety reports as follows:

The Spartanburg Division of the Southern Railway, upon which this accident occurred, is a single-track line, extending from Columbia, S. C., to Spartanburg, S. C. At Alston, 25 miles from Columbia, a line branches off to Greenville, and between Alston and Columbia trains to and from both Spartanburg and Greenville operate over the same track. Trains are operated by time table and train orders, no block system being used, but passenger trains in the same direction are spaced ten minutes apart at open telegraph offices by rule.

Frost Station, 7.5 miles from Columbia, consists only of an earth platform for the use of passengers. There are no station buildings, but a special form of semaphore is provided to flag trains. There is a siding on the south side of the main track 1,277 feet long, the west switch being around a curve, and the east switch is on a tangent, near the earth platform.

From near the west switch at Frost Station, about three quarters of a mile west of the point of collision, and proceeding eastward, there is a 1° curve to the left 360 feet long, followed by a tangent 2,400 feet long, connecting to a $2^{\circ}30'$ curve to the left, which is 740 feet long. It was at the farther or east end of this curve that the collision occurred. From the west end of Frost siding and proceeding east, the grade is level, followed by a descending grade 1,300 feet long varying from .29% to .10%, when the grade ascends for a distance of 500 feet at the rate of .20%, after which it again descends at a rate varying from .12% to .45% for a distance of 600 feet to a piece of level track, on which the accident occurred. On the inside of the $2^{\circ}30'$ curve there is a bluff which so obstructs the view that the rear of a train standing at the point of collision can only be seen from the fire-

man's position on an approaching eastbound train, for a distance of about 600 feet.

The trains involved in this accident were east-bound train No. 18, consisting of engine 942 and 4 cars, in charge of Conductor Meridith and Engineman Nicely, en route from Greenville, S. C., to Columbia, S. C., and eastbound train No. 42, consisting of engine 1200 and 5 cars, in charge of Conductor Gelston and Engineman Long, en route from Ashville, N. C., via Spartanburg, to Columbia, S. C.

Train No. 18, a local train from Greenville, passed Alston, which is about 19 miles west of the point of accident, at 1.20 p.m., 15 minutes late, and passed Bookman, the last open telegraph station west of and 8 miles distant from Frost, at 1.47 p. m. It stopped at Frost, leaving there at 1.59 p. m., but was stopped about 1/2 mile east of Frost by an application of the air brakes, due to a break in a branch of the train pipe leading to the conductor's valve on the head car. After a stop of about 6 or 7 minutes to make necessary repairs, the train started and after having proceeded about fifty feet, stopped again to wait for the flagman, who was seen returning to his train. The train again started, and after having moved forward about 300 feet, and while running at a speed of about 10 miles per hour, the rear end was struck by train No. 42.

Train No. 42 left Alston at 1.20 p.m., three minutes late, passed Bookman at 2.03 p.m., ten minutes late, passed Frost at about 2.12 p.m., 3 minutes late and, while running at a speed estimated to have been 45 miles per hour, collided with the rear end of No. 18 at about 2.13 p.m. At the time of the accident, the weather was clear.

As a result of the collision, the rear end of the rear coach of train No. 18 was telescoped by the front end of engine 1200 for about 6 feet and both vestibules and platforms were destroyed. The forward end of this car raised up over the wooden underframe of coach 1281, which was immediately ahead of it, and sheared away most of the superstructure for about 2/3 of its length. Both trucks of the rear car were bunched together in front of the pilot of engine 1200, but the trucks of coach 1281 remained about in position under the car, only one wheel being derailed. Combination car 810, which was just ahead of car 1281 was not derailed and was but slightly damaged. The front end and cylinders of engine 1200 of train No. 42 were badly damaged, the headlight and stack were knocked off and the engine trucks derailed, but only minor damage was done to the remainder of the train. All the cars in

both trains were of wooden construction except the head car in train No. 42, which was steel. All cars in train No. 42 had steel platforms, and one had a steel underframe.

Engineman Nicely of train No. 18 stated that his train stopped at Frost for a passenger, leaving there at 1.59 p.m., and about two minutes later was stopped by the air brakes applying. He thought at first that an air hose had burst, but upon investigation, discovered a bad leak in the brake pipe under about the middle of the head car. He immediately returned to his engine, whistled out the flagman, and then assisted in repairing the leak, which was done by plugging the broken pipe. He said that about six or seven minutes were consumed in making the necessary repairs, and before he got on the engine the conductor signaled him to call in the flagman, which he did, and immediately got a signal to go. He started his train without waiting for the flagman, but before he had moved forward over an engine length he received another whistle signal to stop, which he obeyed. About two minutes later he again received a whistle signal to proceed, and after having moved forward about two train lengths and while moving at a speed of about 9 or 10 miles an hour, the rear of his train was struck by train No. 42. He stated that he knew that train No. 42 was overdue at Frost when he called in the flagman, but he did not know whether or not that train was on time when he left Alston. He stated further that he was familiar with that part of Rule 99 which instructed the flagman to remain out if a passenger train were due in 10 minutes, but he waited for the flagman because he got a signal from his conductor to do so.

Conductor Meredith of train No. 18 stated that when his train stopped on account of the broken air pipe, he got off the train, and saw his flagman starting back; but that he also motioned him back by waving his hand, knowing that No. 42 would be close. After the repairs to the air pipe had been made he told Engineman Nicely to call in the flagman, and as the train started saw the flagman coming in near the rear of his train. As the flagman was so close, and supposing that he had left torpedoes, he called to Trainmaster Bishop, who was in the baggage car door, to "pull him down", and the flagman got on just after the train started the second time. He stated that he understood the rule that a flagman should not come in under such conditions. He did not think from the time that elapsed between the time the flagman was called in, and the time he appeared at the rear of the train, that he could have been back far, but that he was right around the curve.

Flagman Locklier, of train No. 18 stated that after leaving Frost he walked to the rear of the train. When he noticed that the train had stopped, he looked out the window, saw the baggage-master jump out, and he immediately started back on a run to protect his train, before the engineman signaled him to go back. He did not count the telegraph poles, but said he went back the regular distance and put down two torpedoes east of Frost Station at a distance from the train that he estimated was more than a half a mile. He then came back a distance of 8 or 9 telegraph poles east of Frost and stood there where he could see west beyond Frost, waiting for train No. 42, remaining there until called in. When he started back to his train he had not seen nor heard train No. 42 approaching, and had not put down a torpedo at this point, although he stated that he intended to do so if he heard the train coming. His train had started when he reached it, and he said he closed the vestibule doors after getting on, and put his flag away in the box on the rear platform. As he turned to go into the car, he saw train No. 42 approaching. When they struck, he said he had opened the door and was about to jump off. He stated he did not look at his watch after leaving Bookman, nor did he look at his time table to see what time train No. 42 was due at any point between Alston and Frost, but he knew they left Alston on train No. 42's time at 1.25 p.m. He further stated that train No. 42 was supposed to run 10 minutes behind his train, and he was figuring on the operator spacing the train. He said he realized that he violated the flagging rule in coming in, with a passenger train due within 10 minutes.

Colored Fireman Robinson of train No. 18 stated that he could see about a car length beyond the rear of the train, and saw the flagman jump off and go back out of sight as soon as they were stopped by the broken air pipe. He saw the flagman coming back when he first got up on the engine after the pipe had been plugged. He further said that Engineman Nicely called in the flagman before the train started, but said, "We ought to go ahead and leave the flagman." He did not hear any whistle from train No. 42 nor hear any torpedoes explode.

Engineman Long of train No. 42 stated that while checking the register at Alston against opposing trains, he did not notice whether or not No. 18 had left there ahead of him, and that he passed Frost about 2.12 p. m. He did not see any flagman nor did his train explode any torpedoes, and the first intimation he had that he was close on to No. 18 was when his fireman called to him to stop, at which time he was running about 45 miles per hour. When he first saw train No. 18 it was about 50 or 75 yards

ahead of his engine, and he immediately applied the air brakes in emergency. He stated that the air brakes had been properly tested before leaving Spartanburg and that they had been working satisfactorily on the entire trip.

Fireman Stricklan of train No. 42 stated that just before reaching Frost he put in a fire, getting back up on his seat box before reaching the station. He first saw the section men at work, and then the rear of train No. 18 about 150 yards ahead. He stated that they did not explode any torpedoes and that they were not flagged, but that he saw the flagman on the rear step of train No. 18. He stated that Engineman Long applied the brakes in emergency just as soon as he called to him.

Conductor Gelston of train No. 42 stated he left Alston at 1.29 or 1.30 p.m. and that at the time Engineman Long sounded the whistle for Frost Station it was 2.09 p.m. At the time of the collision he was riding in the front end of the rear compartment of the third car in his train. He did not hear any torpedoes explode. Before leaving Alston he said he checked the register for opposing trains, but did not notice whether or not train No. 18 had gone.

Baggage-master Lawson, Trainman Harris and colored Porter Thompson of train No. 42 corroborated Conductor Gelston's testimony as to hearing no torpedoes explode, and both stated that they would undoubtedly have heard them had any been struck.

Section Foreman Derick stated that he was working on the curve right where train No. 18 stopped, so that the break in the air pipe was opposite him. As he was on the right hand side of the track, he could not see the flagman go back. After the pipe was repaired, he said the flagman was called in, but the train remained standing an appreciable time before starting. He was watching train No. 18 depart, and so did not notice train No. 42 until it was so close that the engineman had shut off steam. He heard no torpedoes explode, and was of the opinion that he could not have heard them if they were any distance away, with train No. 18 pulling out and the wind not blowing in a favorable direction.

Trainmaster Bishop, who was riding in the baggage car of train No. 18 at the time of the accident, stated that after the broken pipe had been repaired he heard the conductor, who was on the opposite side of the train, tell the engineman to call in the flagman, and that he immediately jumped in the baggage car, pulling the signal whistle for the train to proceed. He said he then looked out the baggage car door and Conductor Meredith called to him to "pull him down," and as he had seen several

passengers on the ground while repairs were being made to the broken train pipe; but not knowing just why Conductor Meredith wanted the train stopped, he immediately signaled the engineman. He again looked out the door, and Conductor Meredith called to him, "That boy is right here; we will get him," so he immediately turned around and pulled the proceed signal again. He judged that by the time that elapsed between the time the flagman was called in and the second start was made, the flagman could not have been back more than 100 yards beyond the curve, and that he did not consider that he had been out a sufficient distance to insure full protection to his train. He further stated that he did not hear any torpedoes explode and that he did not hear No. 42's whistle.

A series of tests to determine the time that would be consumed by a flagman to cover the distance Flagman Locklier claimed to have gone back were made. Locklier himself, having been injured, was unable to make the demonstration, but was present and explained the manner in which he had flagged. He indicated the different locations at which he claimed he had placed torpedoes, and the point at which he was standing when he was recalled. The time consumed in making the test are as follows: From point where rear of No. 18 stopped to where the flagman claimed he had placed the two torpedoes, just east of Frost and 2,200 feet from the rear of his train required by running 3 minutes and 15 seconds. Walking back from this point to where the flagman claimed he was standing when called in, 900 feet from point where rear of train stood when first stopped, required 3 minutes and 30 seconds, and to run from this point to where he said he got on the train required 1 minute and 45 seconds. The total time consumed, including 3 or 4 minutes which he said he had remained standing, amounts to about 12-1/2 minutes, which was about the length of time elapsing between the time the train first stopped and the time it was struck.

As the theory was advanced that possibly the torpedoes had not exploded, several tests were made of various kinds of torpedoes in use or previously in use on the Southern Railway, some of which were made over ten years ago. These tests developed no failures on the part of the torpedoes to explode.

Tests were also made to determine how far a person riding on the fireman's seat of an engine similar to the one which was hauling No. 42 could see a train on the curve in the position of train No. 18 when struck, and it was found that a train could be seen about 800 feet. The weather at the time the tests were made was about the same as at the time of the collision.

Rule 99 of the Southern Railway reads in part as follows:

"When a train is stopped at an unusual point or is delayed at a regular stop over three minutes, or when it fails to make its schedule time, the flagman must immediately to back with danger signals to stop any train moving in the same direction. At a point ONE-HALF OF A MILE (or 18 telegraph poles) from the rear of his train he must place ONE torpedo on the rail, on engineman's side; he must then continue to go back at least THREE-FOURTHS OF A MILE (or 27 telegraph poles) from the rear of his train and place TWO torpedoes on the rail, ten yards apart (one rail length), when he may return to a point ONE-HALF OF A MILE (or 18 telegraph poles) from the rear of his train, and he must remain there until recalled; but if a passenger train is due within TEN minutes, he must remain until it arrives. When he comes in, he will remove the torpedo nearest to the train, but the TWO torpedoes must be left on the rail as a caution signal to any following train."

Rule 91 reads as follows:

"Passenger trains in the same direction must keep at least ten (10) minutes apart, freight trains fifteen (15) minutes apart except when closing up at stations or at meeting and passing points except where block signals are used."

The direct cause of this accident was the failure of Flagman Locklier to properly protect his train, as required by Rule 99. From his own statement, and designation of the point where he claims to have placed the two torpedoes, he went back only 2,200 feet, instead of the 3/4 mile required. He was not even back the 1/2 mile at which he should have put down 1 torpedo, and at which point he should have remained, instead of at a distance of only 900 feet from the point where the rear of his train first stopped. Further, he did not comply with the provision of Rule 99 that requires him to remain out when a passenger train is due within 10 minutes. While the flagman claims he placed two torpedoes near Frost, it is not believed that he did so, as the crew of train No. 42 failed to hear any explosions, no one on train No. 18 heard any, nor did the track foreman notice any explosion. A careful search at the point indicated by Flagman Locklier as that at which he placed the torpedoes failed to show any evidence of any having exploded.

Conductor Meredith is at fault in instructing Engineman Nicely to call in the flagman and in requiring him to stop again and wait after Trainmaster Bishop had signaled the train to proceed. Had train No. 18 not made this second stop, it is probable that the accident would not have occurred.

This accident once more called attention to the inadequacy of the time interval system of spacing trains. Between Columbia and Alston, a distance of 25 miles, there are 14 scheduled trains and an average of 4 extra trains each 24 hours. Twice daily, in each direction, passenger trains follow each other approximately 10 minutes apart, with no other means provided for spacing other than Rule 91, which requires passenger trains to keep at least 10 minutes apart. Traffic under such conditions can not be safely handled under the time-interval system, even less than could a denser traffic, more evenly spaced over the 24 hour period.

Under such a system the movements of trains are restricted only at open offices, at which points trains going in the same direction may be spaced 10 minutes apart. While this system of operation may afford protection in the vicinity of open offices, the long distances between such offices make it possible for a train traveling at a high rate of speed to overtake a train traveling at a low rate of speed, and make advisable the adoption of some form of adequate block signals that will provide a space interval rather than a time interval between trains. For the prevention of similar accidents, immediate steps to provide an adequate block system on this section of the road should be taken.

All the employees involved in this accident were experienced men. The crew of train No. 18 had been on duty about 6 hours at the time of the accident. The engine crew of train No. 42 had been on duty about 5 hours and the train crew about 8 hours.

G.E.E.