

Inv-2425

INTERSTATE COMMERCE COMMISSION
WASHINGTON

REPORT OF THE DIRECTOR
BUREAU OF SAFETY

ACCIDENT ON THE
SOUTHERN RAILWAY

LEADVALE, TENN.

MAY 5, 1940

INVESTIGATION NO. 2425

SUMMARY

Inv-2425

Railroad: Southern

Date: May 5, 1940

Location: Leadvale, Tenn.

Kind of accident: Side collision

Trains involved: Freight : Freight

Train numbers: Extra 5210 East : Extra 5249 West

Engine numbers: 5210 : 5249

Consist: 35 cars and cabooses : 35 cars and cabooses

Speed: 2-4 m.p.h. : 15-20 m.p.h.

Operation: Timetable and train orders on branch. Timetable, train orders and automatic block-signal and automatic train-stop system on main line.

Track: Branch: 1° curve; 1 percent grade descending eastward.
Main line: tangent; grade practically level.

Weather: Clear

Time: 2:15 p.m.

Casualties: 2 killed

Cause: Failure to control speed of both trains properly while moving in yard limits and approaching a junction.

July 29, 1940.

To the Commission:

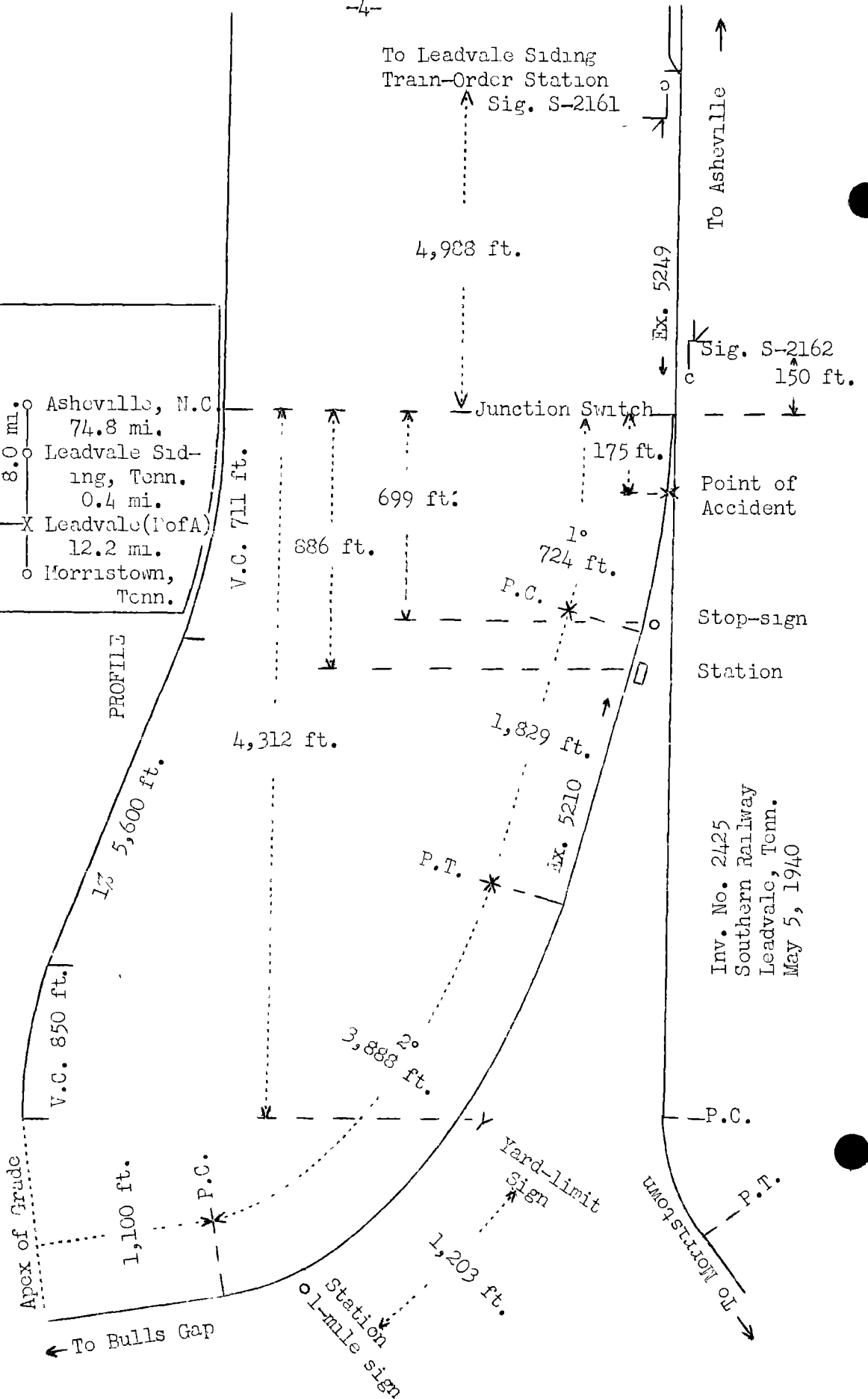
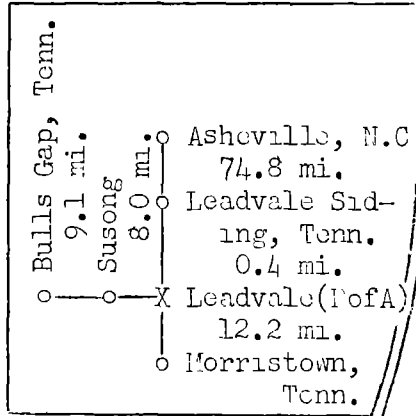
On May 5, 1940, there was a side collision between two freight trains on the Southern Railway at Leadvale, Tenn., which resulted in the death of two employees.

Location and Method of Operation

This accident occurred at the junction of that part of the Knoxville Division which extends between Asheville, N.C., and Morristown, Tenn., a distance of 87.4 miles, hereinafter referred to as the main line, and that part which extends between Bulls Gap and Leadvale, a distance of 17 miles, hereinafter referred to as the branch. In the vicinity of the point of accident both are single-track lines. Trains are operated on the main line by timetable, train orders and an automatic block-signal and automatic train-stop system. Trains are operated on the branch by timetable and train orders; there is no block system in use. The accident occurred within yard limits at a point 175 feet west of the junction switch of the main line and the branch, and 711 feet east of the station at Leadvale.

As the point of accident is approached from the east the main line is tangent and practically level a distance of about 2 miles to the junction switch and 3,442 feet beyond. As the point of accident is approached from the west on the branch there are, in succession, a tangent more than 1,100 feet in length, a 2° curve to the left 3,238 feet in length, a tangent 1,829 feet in length, and a 1° curve to the left 724 feet in length to the junction switch. The grade is 1 percent descending eastward a distance of 5,600 feet, which is followed by a vertical curve 711 feet to the junction switch.

The automatic block system is of the absolute-permissive type. Signal S-2162, which governs east-bound movements on the main line, is located 150 feet east of the junction switch and can be seen a distance of approximately 3,700 feet by the engine crew of an east-bound train approaching on the branch. Signal S-2161, which governs west-bound movements on the main line, is located 1,050 feet east of the junction switch; both signals are 3-indication, color-light signals and are continuously lighted. East-bound trains on the branch are required to stop at a stop sign, located 699 feet west of the junction switch, and to obtain permission from the operator at Leadvale Siding, 0.4 mile east of Leadvale, to occupy the main line and to move eastward, under the provisions of the yard-limit rule, to Leadvale Siding where train orders are delivered for further movement.



Leadvale Siding train-order station is located 4,988 feet east of the junction switch.

Rules of the operating department read in whole or in part as follows:

93. Within yard limits the main track may be used without protecting against second and inferior class trains. Second and inferior class and extra trains or engines must move within yard limits prepared to stop unless the main track is seen or known to be clear. When the view is obstructed additional precautions must be taken. In case of accident the responsibility will rest with the approaching train.

Note.- Yard limits are indicated by sign boards reading "YARD LIMIT," and the locations are also shown for each division in the current time table.

98. Trains must approach * * * junctions, * * * with caution, and unless otherwise provided must stop and not proceed until it is known the switches are right and the way clear.

* * *

1227. (Conductors in freight service.) Before starting they * * * must be assured by the car inspector that the air brakes have been tested and are working throughout the train and is ready for movement.

1653. (Enginemen.) They must test the air brakes before reaching * * * junctions, * * * yard limits and other places where necessary and in case the brakes do not work, must at once make every effort to stop the train.

1664. (Inspectors.) After the air brakes have been applied they will inspect each brake in the train, noting the piston travel and other conditions and as soon as inspection is completed, they will then go forward making necessary changes and repairs, after which they may authorize the train to proceed.

Rules of the Association of American Railroads for Maintenance of Brake and Train Air Signal Equipment, which have been adopted by the carrier involved, read in whole or in part as follows:

25. (a) After the brake system on a freight train is charged to not less than 5 lbs. below the standard pressure for that train, and on a passenger train when charged to at least 70 lbs., a fifteen pound service reduction must be made upon request or proper signal, then note the number of pounds of brake pipe leakage per minute as indicated by the brake pipe gauge, after which the reduction must be increased to a total of twenty pounds. Then an examination of the train brakes must be made to determine if brakes are applied in service application on each car; that the piston travel is correct, and that brake rigging does not bind or foul.

(b) When the examination has been completed in accordance with rule 25(a) proper release signal must be given and each brake examined to see that it releases properly.

27. Piston travel less than seven inches or more than nine inches, must be adjusted to nominally eight inches.

28. When the test is completed the inspector or trainman who made the test will personally inform the engineman and conductor, and advise them the number of cars in train and the number having inoperative brakes.

41. On a freight train, before an engine is detached or an angle cock closed on an engine or a car, the brake must be fully applied. After recoupling and opening the angle cock and before proceeding, it must be known that the brake pipe pressure is being restored as indicated by the caboose gauge and that the rear brakes are released. * * *

42. At point where motive power or engine crew or train crew is changed, tests of the train brake system must be made as follows:

After the brake system on a freight train is charged to not less than 5 lbs. below the standard pressure for that train, as indicated by the locomotive gage, and on a passenger train to at least 70 lbs., a fifteen pound service reduction must be made upon proper request or signal, brake pipe leakage noted as indicated by the brake pipe gage (which must not exceed 7 lbs. per minute), after which the reduction must be increased to 20 lbs. Then an examination of the train brakes must be made to determine if brakes are applied in service application on each car. When this examination has been completed, proper release signal

must be given and each brake examined to see that it releases properly.

43. When one or more cars are added to a train at any point subsequent to a terminal test the cars added, when in the position where they are to be hauled in the train, must be tested as prescribed in rule 42. Before proceeding, it must be known that the brake pipe pressure is being restored as indicated by the caboose gauge and that the rear brakes are released. * * *

Yard-limit signs are located on the main line 10,354 and 2,248 feet, respectively, east and west of the junction switch. A yard-limit sign is located on the branch 4,312 feet west of the junction switch.

A stop board is located on the branch 699 feet west of the junction switch.

The weather was clear at the time of the accident, which occurred about 2:15 p.m.

Description

Extra 5210, an east-bound freight train, with Conductor Blanchard and Engineman Giles in charge, consisted of engine 5210, 33 loaded and 2 empty cars, and a caboose. The weight of the train was 2,312 tons. This train departed from Bulls Gap at 1:50 p. m., according to the train sheet. At a point about 2 miles east of Bulls Gap the conductor applied the air brakes from the rear end and stopped the train because of a car brake sticking. This brake was released and the train proceeded; it passed the stop sign at Leadvale, passed the clearance point of the junction switch, and, while moving at a speed estimated at 2 to 4 miles per hour, collided with Extra 5249 West.

Extra 5249, a west-bound freight train, with Conductor Beeler and Engineman Smith in charge, consisted of engine 5249, 9 loaded and 26 empty cars, and a caboose. This train departed from Asheville, 75.2 miles east of Leadvale, at 10:30 a. m., according to the train sheet, stopped at Leadvale Siding train-order station at 2:10 p. m., departed at 2:13 p. m., and, while moving at a speed estimated at 15 to 20 miles per hour, collided with Extra 5210 East.

Engine 5210 was derailed to the north and stopped on its left side 115 feet west of the junction switch; the smoke-box, the right cylinder, the right cross-head, and the right end of

the pilot beam were badly damaged; the tender, remaining coupled to the engine, was derailed and stopped diagonally across the branch, and leaned to the north. The first car and the front truck of the second car were derailed. Engine 5249 and the tender, remaining coupled, were derailed and stopped upright, down the embankment, south of the main line and at an angle of 45 degrees to it; the smoke-box, the right cylinder, the right cross-head, and the right end of the pilot-beam were badly damaged. The first and the second cars of this train were derailed and stopped down the embankment; the third car was derailed but remained in line with the track; these three cars were badly damaged.

The employees killed were the engineman and the fireman of Extra 5249 West.

Summary of Evidence

Engineman Giles, of Extra 5210, stated that before his train departed from Bulls Gap the train brakes were tested. A car inspector examined the train brakes from the engine to the caboose; however, he did not examine them to see whether each brake released and he did not inform the engineman of the number of operative brakes. The engineman said that it is customary for the car inspector to inform the conductor of the condition of the brakes and then for the conductor to give a proceed signal, which is accepted by the engineman as information that the brakes are operative. Brake-pipe pressure of 70 pounds and main-reservoir pressure of 110 pounds were being maintained. About 2 miles east of Bulls Gap the brakes were applied from the rear end of the train because the brake on a car did not release. After this brake was released the train proceeded, and no other stop was made en route. When the engine passed over the apex of the grade west of Leadvale, at which point the speed was 10 or 12 miles per hour, he closed the throttle. Approximately 4,500 feet west of the point of accident he made about a 10-pound brake-pipe reduction and moved the brake valve to lap position. As a result of this reduction the speed was reduced to 8 or 10 miles per hour; however, after the train moved about 1,500 feet farther he found that the speed had not been reduced to the extent expected, and he made a further brake-pipe reduction of 10 or 15 pounds; the two reductions totaled 20 or 25 pounds. The total application reduced the speed to 6 or 8 miles per hour. When his engine was just west of the station he realized that the train would not stop at the stop sign, so he moved the brake valve to emergency position, reversed the engine, and opened the throttle and the sander valve. At this time the fireman called a warning of an approaching train and the engineman sounded one long blast of the engine whistle as a warning. The engine passed the stop sign at a speed of 4 or

5 miles per hour, and fouled the main track. He said that, except for the sticking brake, he had no reason to think that anything was wrong with the air brakes of his train; the air gauges indicated proper pressures en route. A running air-brake test of a freight train is not required and it is not the practice to make one; it is not the practice to use retainers on this grade. He understood that the rules require that an air-brake test be made before reaching yard limits and junctions; however, he thought that an application made at the top of the grade approaching Leadvale complied with the rules. This is the first instance wherein he had experienced any difficulty in stopping a train at Leadvale. Under normal conditions a train can be stopped short of the stop sign involved by making a 10-pound brake-pipe reduction near the yard-limit sign, and it was his intention to follow this practice. He said that when a train contains a large percentage of Interstate Railroad cars it is difficult to control the speed and extra precaution is necessary. He did not know that his 35-car train contained 29 loaded Interstate Railroad cars; conductors usually give enginemen such information but in this case his conductor did not do so. He said that he knew of other instances wherein trains had failed to stop before fouling the junction switch at Leadvale. After the accident he and the conductor inspected that portion of the train which was not derailed. They did not find any defective brake, and all angle cocks were in proper position. He had operated trains over this branch about 5 years and was thoroughly familiar with its physical characteristics. He was last instructed on the operating rules in 1939. He understood that Rule 93 requires second, inferior class and extra trains or engines to move within yard limits, both on the main line and on the branch, prepared to stop unless the way is seen or known to be clear. Rule 98 requires trains moving on the branch to stop at the stop sign, and trains moving on the main line to approach the junction switch with caution and not to proceed until it is known that the switch is properly lined and the way is clear. He understood that signal indications do not supersede or affect Rules 93 and 98.

Fireman Mink, of Extra 5210, stated that when the first brake-pipe reduction was made and when the engine was at a point 3,537 feet west of the point of accident the speed was 15 or 18 miles per hour. The brake-pipe exhaust sounded as though an ordinary reduction had been made. The brakes seemed to take effect slowly, and after the train moved 20 or 25 car lengths farther, in which distance the speed was reduced to 8 or 10 miles per hour, the engineman made a second brake-pipe reduction. When the speed was 5 or 6 miles per hour and the engine was about 15 car lengths from the stop sign the fireman

observed that signal S-2162 was displaying a red aspect and that a west-bound train was approaching; he called a warning and the engineman moved the brake valve to emergency position. At a point 5 or 6 car lengths west of the clearance point the engineman reversed the engine, opened the throttle and the sander valve, and sounded the whistle. The fireman estimated that the speed was 2 or 3 miles per hour when the accident occurred. He said that enginemen take extra precaution when there is a large percentage of Interstate Railroad cars in their trains because the brakes of these cars are not so effective as those of other cars. He is familiar with conditions at Leadvale. Most enginemen with whom he has worked make an air-brake application soon after passing over the top of the hill, release the brakes and permit the train to drift, then make another application and stop the train short of the stop sign. He said that on this occasion the engineman began to brake near the point where other enginemen begin to brake. On several previous occasions his train passed the stop sign involved but did not pass the clearance point. When the terminal train-brake test is made it is customary for the air-brake inspector to examine each brake to determine whether it is applied; however, in most instances the air-brake inspector does not examine each brake to see whether it releases properly, nor does he inform the engineman of the number of cars in the train and the number of inoperative brakes. He was last instructed on the operating rules on May 22. He understood that Rule 93 requires second and inferior class and extra trains to move within yard limits prepared to stop. Rule 98 requires trains moving on the branch to stop at the stop sign, and trains moving on the main line to approach the junction with caution until the junction switch is passed. He said a signal indication does not confer any right to disregard Rules 93 and 98.

Front Brakeman Tiller, of Extra 5210, corroborated the statement of his engineman, and added that about 10 days prior to the accident he was on a branch-line train that did not stop short of the clearance point at Leadvale. He was last instructed on operating rules on July 1, and understood that inferior class and extra trains must move prepared to stop in yard limits. Trains approaching a junction switch must proceed with caution until the junction is passed. While moving in yard limits or while approaching a junction, a signal indication cannot be accepted as information that the way is clear. He said that it is not customary, when cars are added to a train at any point subsequent to a terminal test, to examine each brake to see whether it applies and releases; however, it is customary to observe on the caboose gauge whether the pressure has been restored.

Conductor Blanchard, of Extra 5210, stated that at Bulls Gap he received a hand signal from the car inspector, indicating to him that the train brakes had been inspected. The conductor gave a proceed signal to the engineman. Because of a sticking brake on a car, he applied the air brakes by opening the caboose emergency valve and the train stopped 2 miles east of Bulls Gap. After the brake was released the train proceeded. The caboose air gauge indicated 70 pounds brake-pipe pressure. When the engine passed over the hill west of Leadvale the speed was about 15 miles per hour. The first brake-pipe reduction was made 70 or 75 car lengths west of the junction switch, at which point the speed was about 15 miles per hour and the caboose gauge indicated 50 pounds brake-pipe pressure; the brakes were effective and the speed was reduced to 6 or 8 miles per hour. After the first reduction was made the brakes were not released. The train was being handled in the usual manner and he thought the stop at Leadvale would be made satisfactorily. Soon afterward the air gauge indicated that the brake-pipe pressure was depleted; at this time the speed was about 3 miles per hour. He saw Extra 5249 near the junction switch and almost immediately afterward the collision occurred. Two hours after the accident occurred he and the engineman inspected the brakes throughout the train and they found that some of the brake-cylinder pistons remained out; all angle cocks were in proper position. There were three cars in the train with AB brake equipment. The conductor said that Interstate Railroad cars are more difficult to stop than others. He did not inform his engineman of the number of Interstate Railroad cars in the train. He said that at Bulls Gap it is not customary for a car inspector either to examine each brake to determine if it releases or to inform a conductor of the number of cars in the train and the number having operative brakes. He had never had an engineman request him to set retaining valves for use on the grade approaching Leadvale Junction. After the accident when 33 cars of this train were again moved down the grade approaching Leadvale, being hauled by engine 5201, the train was stopped 3 or 4 car lengths west of the stop sign. He was last instructed on operating rules on July 1. He understood that Rule 93 requires second and inferior class and extra trains to move in yard limits prepared to stop unless the way is clear. Rule 98 requires trains moving on the main line to approach junction points with caution and not to proceed until it is known that the way is clear, and trains moving on the branch line to stop at Leadvale. Under Rules 93 and 98 signal indications cannot be accepted as information that the way is clear. After cars are added to a train subsequent to a terminal test it is not the custom to examine each of the cars added to see whether the brake applies and releases; however, it is customary to observe on the caboose gauge whether the brake-pipe pressure is restored.

Flagman Eason, of Extra 5210, corroborated the statement of his conductor.

Front Brakeman Miller, of Extra 5249, stated that the train air-brakes were tested before leaving Asheville and they functioned properly en route. When his train was approaching the point of accident he was in the booth on top of the tender. After the train left Leadvale Siding he observed that signal S-2161 was displaying a clear indication. His train was moving 15 or 20 miles per hour when he felt an emergency brake application at a point 4 or 5 car lengths east of the junction switch at Leadvale, and this was the first warning he had of Extra 5210 approaching. He had been instructed on operating rules recently. He understood that Rule 93 requires inferior class and extra trains to move within yard limits prepared to stop unless the main track is clear. Rule 98 requires trains to approach junctions with caution until after the engine passes the junction switch. He stated that a signal indication cannot be accepted as information that the way is clear. He said that the speed at which his train approached the junction switch at Leadvale did not comply with the requirements of moving with caution. When terminal air-brake tests are made it is not customary to examine each brake to see whether it releases after the application test is completed.

Conductor Beeler, of Extra 5249, stated that the train air-brakes were tested before leaving Asheville and they functioned properly en route. As his train was approaching the point of accident, at a speed of 15 or 20 miles per hour, he was stationed on the rear platform of the caboose. He saw Extra 5210 and thought it was in the clear on the branch. After his train moved 4 or 5 car lengths farther the brakes were applied in emergency and his train stopped abruptly; the accident occurred at 2:15 p. m. He had been instructed on the operating rules recently. He understood that Rule 93 requires second and inferior class and extra trains to move within yard limits prepared to stop unless the main track is seen or known to be clear. He thought that his engineman complied with Rule 93 as the weather was clear and the track was tangent; however, an opposing train had the right to occupy the main track at any time. He said that main-line trains are required by Rule 98 to move with caution when approaching junctions until the engine passes the junction switch. He thought his train was moving with caution as branch-line trains are required to stop in the clear and to obtain authority to use the main line; however, branch-line trains then could enter the main track under the yard-limit rule. Under the requirements of Rules 93 and 98 signal indications cannot be accepted as information that the way is clear; this must be determined by vision. He said that it is customary

to accept hand signals from the air-brake inspector as an indication that the train brakes are operative. It is not customary for an air-brake inspector to examine brakes throughout a train to see whether each brake releases. He said that he understood Rule 1653; however, in most instances crews did not comply with its provisions.

Flagman Wright, of Extra 5249, corroborated in substance the testimony of Conductor Beeler.

Engineman Needham, of Extra 5201, stated that subsequent to the accident his engine hauled 35 cars of the train of Extra 5210, which had been hauled back to Susong, 8 miles west of Leadvale, from Susong to Asheville. The master mechanic and the general road foreman of engines were on the engine. The speed of his train when approaching Leadvale was 15 or 18 miles per hour. As his train approached the yard-limit board he made a brake-pipe reduction of about 10 pounds, which reduced the speed to 5 or 6 miles per hour. He then released the brakes, and after the train drifted about 50 car lengths farther he made a 10-pound brake-pipe reduction. After the train moved an additional distance of 10 or 15 car lengths he made a further reduction of about 5 pounds, and the engine stopped 5 or 6 car lengths west of the stop sign. He said that the brakes of Interstate Railroad cars are not so effective as the brakes of cars of other lines. On two previous occasions he had failed to stop his train clear of the main track at Leadvale.

Master Mechanic Tipton stated that he inspected engine 5210 at the scene of the accident. He found the automatic brake valve in emergency position, the reverse lever in position for backward motion, and the sanders open. There was no indication of excessive heating of the brake shoes of the engine; three brake shoes showing an accumulation of old grease indicated that these shoes had not been overheated. Of the 35 cars of Extra 5210 which were pulled back to Susong, 29 were Interstate Railroad cars. No adjustment was made to the brake equipment, and all retaining valves were open. Engine 5201 was coupled to these cars and an air-brake test was made in the presence of himself, the general road foreman of engines, the general car foreman, and a car inspector. All brakes were operative except the brake of Interstate car 2119, which was the seventeenth car ahead of the caboose; however, this brake became applied later. When the train departed from Susong he rode on the engine and observed that the brakes controlled the speed properly when the train stopped at Leadvale. He said that the brakes of Interstate Railroad cars meet standard requirements. The second, fifth, and twenty-eighth cars of Extra 5210, which were Interstate Railroad cars, were equipped with AB valves.

General Road Foreman of Engines Sinks corroborated in substance the statements of Master Mechanic Tipton and Engineman Needham. His opinion, based on observation, was that the air brakes of Interstate Railroad cars were as effective as the brakes of other cars of the same class and type.

Car Inspector Ryden stated that at Bulls Gap he made an air-brake test of Extra 5210 East. He observed that all brakes were applied; however, he did not observe whether the brakes released. When he reached the caboose he gave the conductor a signal that the brakes were operative. As the train departed he observed that the brakes on the last six cars were released; one brake was sticking slightly but finally it released. In some instances he examines the brakes to see whether they release properly but this procedure is not customary. When it is difficult to transmit a hand signal to the engineman because of track curvature he instructs the engineman to apply the brakes, wait a fixed period of time and then release the brakes. Car Inspector Ryden was at Susong when the brakes on the last 33 cars of Extra 5210 were tested after the accident. He corroborated the statement of Master Mechanic Tipton concerning the result of this test. He had heard complaints that the air-brake equipment on Interstate Railroad cars was not so effective as the air-brake equipment on Southern Railway cars, but he had not observed any difference.

General Foreman Garrett, at Bulls Gap, stated that about 8 a. m., May 5, he inspected engine 5210 and did not find any defect; the air-brake equipment functioned properly.

Air Brake Instructor Bradbury stated that the braking ratio of Interstate Railroad cars is from 63 to 67 percent of their light weight; this conforms to the A. A. R. requirement of 60 percent or more. On some cars of other railroads the light-weight braking ratio is adjusted as high as 85 percent, but the average is about 75 percent. Because of the lower braking ratio, Interstate Railroad cars are more difficult to control; however, they can be handled successfully either by heavier brake-pipe reductions or by starting the reductions sooner. He did not think it necessary to notify enginemen at Bulls Gap of the number of Interstate Railroad cars in a train because he did not consider the grades on the branch particularly hazardous. It is necessary to notify enginemen of trains moving between Asheville and Spartanburg of the number of Interstate Railroad cars in a train because of a 4.8 percent descending grade on Saluda Mountain. Instructions have been issued to assemble trains in the Saluda Mountain territory so that at least fifty percent of the cars will be other than

Interstate Railroad cars. No running air-brake test is required in freight service. It was his opinion that trains would be stopped in the clear at Leadvale if enginemen made an air-brake test approaching the junction point as required by Rule 1653. He said that employees are instructed to comply with Rules 25(a), 25(b), 28, 40, 42, and 43, of the A. A. R. for maintenance and operation of train air-brakes; however, employees do not always comply with the provisions of these rules.

Engineman Shumaker stated that on May 5 he left Bulls Gap with 39 loaded cars, 23 of which were Interstate Railroad cars, and 3 empty cars. His engine stopped about 258 feet east of the stop sign at Leadvale. In his opinion the brakes did not hold properly.

Three enginemen, who were not involved in the accident, made statements regarding their understanding of Rules 93, 98, and 1653 of the operating rules. The common understanding was that inferior class and extra trains must move within yard limits prepared to stop unless the way is seen or known to be clear; to know that the way is clear is entirely dependent on vision. When a train is moving in yard limits or approaching a junction, a signal indication cannot be accepted as information that the way is clear. In case of accident the responsibility rests with the approaching train. If two trains approaching from opposite directions collide, both are responsible. Trains moving on either a main line or a branch line must approach junctions with caution and be prepared to stop until the engine has passed the junction switch. Where stop signs are provided trains must stop. One engineman said that the banner on the junction switch at Leadvale could be seen from the right side of a west-bound engine a distance of 6 car lengths; another engineman said it could be seen a distance of about 510 feet. All three said that it is usual practice to comply with Rule 1653 when a train is approaching yard limits and junctions. All were agreed that it is not customary for an air-brake inspector to observe that each brake in a train releases after the application test is completed, nor does the inspector inform the engineman of the number of cars in the train and the number having inoperative brakes. Two enginemen said that when cars are added to a train subsequent to a terminal brake-test a trainman observes each brake to see whether it applies, but it is not customary to see whether each brake releases; one engineman said that no test was made, but that he made a running test after he started the train.

Trainmaster Good stated that he conducts classes annually wherein employees are instructed orally upon the application of operating rules. These instructions on rules are given by

lecture, and then those present are questioned about their understanding of the rules. Employees are instructed to comply with the provisions of Rule 93 which require second and inferior class and extra trains to move within yard limits prepared to stop unless the main track is seen or known to be clear; the main track can be known to be clear by vision only. Should some emergency arise at a switch leading from the main track, the train moving on the main track is required to stop short of any obstruction. Should two trains, neither of which is first class, approach from opposite directions, the responsibility of averting an accident rests with both trains. To comply with the provisions of Rule 98, all trains when approaching junctions must move with caution prepared to stop, and, unless otherwise provided by time-table instructions, must not proceed until it is known that the switches are properly lined and the way is clear. The way is known to be clear by vision only. A train must move with caution until after the junction has been passed. To comply with Rules 93 and 98, signal indications cannot be accepted as information that the main track is clear. In compliance with Rule 1227 conductors may accept hand or lantern signals from the inspector that the terminal air-brake test has been completed. Employees are instructed to make air-brake tests when their trains approach junctions and yard limits. He said that he has observed that this rule is complied with in most instances.

Superintendent Hair stated that he has ridden on east-bound freight trains from Bulls Gap to Leadvale and has not observed any particular difficulty in stopping branch-line trains at the stop sign at Leadvale. No employee had ever reported to him that difficulty had been experienced in stopping trains on the branch at Leadvale. He said that the instructions as given by Trainmaster Good conformed generally to the management's interpretation of the rules.

General Car Foreman Harris said that the air-brake equipment on cars of the Interstate Railroad conformed to A. A. R. specifications. He did not know of any accident having been caused by ineffective brakes on Interstate Railroad cars. After the accident he inspected the cars of Extra 5210; the results were as follows:

<u>Car Initial and Number</u>	<u>Brake Cleaned</u>	<u>Piston Travel</u>	<u>Car Initial and Number</u>	<u>Brake Cleaned</u>	<u>Piston Travel</u>
Sou. 285333	5- 3-40	6"	Int. 2119	10- 3-39	6"
" 285914	Built 11-37	7" AB	" 2380	7-12-39	5"
" 194108	10-25-39	8"	" 6534	2-19-40	6"
" 282596	8- 1-39	7½"	" 10198	1- 3-40	6"
" 320177	Built 10-37	6" AB	" 10155	6- 6-39	6"
" 158729	3-11-40	9"	" 10010	5-26-39	6½"
Int. 2535	11-29-39	7"	" 5420	12- 4-39	6"
" 10068	1- 1-40	6"	" 10025	12-20-39	8"
" 6421	1-24-40	6½"	" 10003	6- -39	7"
" 2671	1-26-40	6½"	" 6335	5- 8-39	7" AB
" 2753	11-27-39	6"	" 2693	11- -39	5"
" 5485	8-23-39	7"	" 3425	5- 3-39	6"
" 5078	8- 3-39	5½"	" 5195	10-13-39	6"
" 6430	1-10-40	5"	" 2247	4-17-39	7"
" 5111	11-23-39	6"	" 5589	8- 3-39	5"
" 2460	4-25-40	5"	" 5216	4-11-40	6"
" 5076	6- 5-39	6"	" 2643	6-14-39	5"
" 2571	7-26-39	6"			

All retaining-valve handles were turned down. All cars except Sou. 285333 and Sou. 158729 were under load.

According to data furnished by the carrier, the consist of Extra 5210 East, and the weight and the braking power of each unit were as follows:

<u>Car</u>	<u>Number</u>	<u>Light weight</u>	<u>Gross weight</u>	<u>Total braking power</u>	<u>Braking power light weight</u>	<u>Braking power gross weight</u>
		<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Percent</u>	<u>Percent</u>
Engine	5210		275,000	137,500	50.0	50.0
Tender	5210	72,350	188,300	61,600	84.5	32.7
Int.	2648	37,700	135,300	24,444	64.6	18.0
"	5216	39,600	151,200	24,444	61.7	16.1
"	5589	39,400	149,500	24,444	62.0	16.3
"	2247	39,000	124,000	24,444	62.7	19.7
"	5195	39,600	145,000	24,444	61.7	16.9
"	6425	38,400	150,200	24,444	63.6	16.3
"	2693	37,800	131,600	24,444	64.7	18.6
"	6335	38,600	149,400	24,444	63.3	16.4
"	10003	38,200	144,800	25,764	67.4	17.8
"	10025	36,300	124,400	25,764	70.0	20.7
"	5420	38,200	132,000	24,444	64.0	18.5
"	10010	37,500	124,700	25,764	68.7	20.6
"	10155	37,300	123,600	25,764	68.5	20.8
"	10198	38,600	124,200	25,764	66.7	20.7
"	6534	38,600	133,400	24,444	63.3	18.3

<u>Car</u>	<u>Number</u>	<u>Light weight</u> <u>Pounds</u>	<u>Gross weight</u> <u>Pounds</u>	<u>Total braking power</u> <u>Pounds</u>	<u>Braking power light weight</u> <u>Percent</u>	<u>Braking power gross weight</u> <u>Percent</u>
Int.	2380	36,800	122,000	24,444	66.4	20.0
"	2119	37,200	125,000	24,444	65.7	19.5
"	2571	36,900	122,800	24,444	66.2	19.9
"	5076	38,100	147,600	24,444	64.1	16.5
"	2460	37,800	134,900	24,444	64.6	18.1
"	5111	38,900	149,500	24,444	62.8	16.3
"	6460	39,500	145,500	24,444	61.8	16.8
"	5078	38,800	143,200	24,444	63.0	17.0
"	5485	40,000	136,000	24,444	61.1	18.0
"	2758	36,800	131,500	24,444	66.4	18.6
"	2671	36,200	132,500	24,444	67.5	18.4
"	6421	38,800	134,800	24,444	63.0	18.1
"	10068	38,400	124,600	25,764	67.0	20.7
"	2535	37,300	123,600	24,444	65.5	19.9
Sou.	158729	41,300	41,300	26,532	64.2	64.2
"	320177	42,700	155,500	30,042	70.3	19.3
"	282596	33,200	129,300	36,708	96.0	28.4
"	194108	42,200	142,800	36,000	85.3	25.2
"	285914	42,600	155,700	30,042	70.5	19.3
"	285333	40,100	40,100	31,452	78.4	78.4
"	X-2401	43,500	43,500	24,000	55.1	55.1

Note - All calculations were based on 70 pounds brake-pipe pressure. All brake cylinders except those on the engine, the tender, and the caboose were 10 inches in diameter. The engine and the tender were provided with No. 6-ET equipment; the caboose with a K-1 triple valve; the second, fifth, and twenty-eighth cars with AB valves; and the remainder of the cars with K-2 triple valves.

The engine and tender weighed 218 tons; the train weighed 2,312.25 tons; the total weight was 2,530.25 tons. The average number of tons per brake was 66.58. The average percentage of braking power for the gross weight of the entire train was 22.2; the average percentage of braking power of the gross weight of the cars was 20.1; the average percentage of the braking power of the loaded cars was 18.8; and the average percentage of the loaded Interstate Railroad cars was 18.3.

Observations of the Commission's Inspectors

The Commission's inspectors observed the results of two air-brake tests conducted in the vicinity of the point of accident. In the first test the train consisted of 35 Interstate Railroad cars loaded with coal. Brake-pipe pressure of 70 pounds and main-reservoir pressure of 110 pounds were being maintained. When this train was approaching Leadvale on the branch and while moving at a speed of about 15 miles per hour, the engineman applied the independent brake and the speed was reduced to about 12 miles per hour. When the engine was at a point 528 feet west of the yard-limit sign a 5-pound brake-pipe reduction was made, the engine and the tender brakes were released, and the automatic brake-valve was moved to lap position and was held there 1 minute 17 seconds; because of leakage the brake-pipe reduction totalled 15 pounds. When the speed was reduced to 5 or 6 miles per hour the brakes were released at a point 2,763 feet west of the junction switch. Forty seconds after the release a brake-pipe reduction of 10 pounds was made, and the brake valve was moved momentarily to lap position, then to service position, where it remained until a total reduction of 42 pounds had been made, after which the brake valve was again moved to lap position; immediately afterward the engine stopped about 35 feet east of the stop sign. The total elapsed time of the second brake application was 1 minute; the engine and the tender brakes remained applied during the second brake application.

In the second test the train consisted of 35 Southern Railway cars loaded with coal. Brake-pipe pressure of 70 pounds and main-reservoir pressure of 110 pounds were being maintained. When this train was approaching Leadvale and moving at a speed of about 15 miles per hour, the engineman applied the independent brake and the speed was reduced to 10 or 12 miles per hour. When the engine was at a point 660 feet west of the yard-limit sign, a 5-pound brake-pipe reduction was made and the automatic brake valve was moved to lap position; this was followed by a 3-pound reduction and the speed was reduced to about 6 miles per hour; then the brakes were released. After an interval of 45 seconds a 7-pound brake-pipe reduction was made; it was held applied for 36 seconds and then released. After an interval of 49 seconds a 10-pound brake-pipe reduction was made and then it was increased to 15 pounds; the train stopped in an elapsed time of 35 seconds with the engine standing about 80 feet west of the stop sign. From the time of the initial brake-pipe reduction until the train stopped the speed did not exceed 8 miles per hour. During the periods that the train brakes were released the engine and the tender brakes were held applied by the independent brake valve. There was no noticeable brake-pipe leakage.

Discussion

According to the evidence, Extra 5249 West was moving within yard limits on the main line and was approaching a junction at a speed of 15 or 20 miles per hour when it collided with Extra 5210 East which had overrun a stop sign and fouled the main line. At a point 3 or 4 car lengths east of the junction switch the engineman of Extra 5249 made an emergency application of the brakes, but too late to avert the accident. The last automatic signal passed by this train was displaying a clear indication; however, because of this signal being within yard limits, under the yard-limit rule the engineman of Extra 5249 was not authorized to operate his train according to the indication displayed by this signal, but was required to operate prepared to stop unless the way was seen or known to be clear. Because this train was approaching a junction the engineman was required to operate with caution and not to proceed unless the way was known to be clear. The weather was clear; however, the banner on the junction switch-stand could be seen from a west-bound engine a distance of only about 500 feet. Extra 5249 was being operated at a speed of 15 or 20 miles per hour when the brakes were applied in emergency a short distance from the junction switch and the speed had not been materially reduced when the accident occurred. Why the engineman failed to operate his train under proper control within yard limits and when approaching this junction is not known as he was killed in the accident.

Extra 5210 also was moving within yard limits but on the branch, and was approaching a junction. In addition to being required to comply with the yard-limit rule and the rule governing the approach to a junction, the engineman of this train was required to stop at a stop sign located 699 feet west of the junction switch. The engineman said that he was endeavoring to comply with these rules but was unable to control the speed of his train properly on the descending grade and to stop before overrunning the stop sign and fouling the main line.

The engineman of Extra 5210 thought the brakes on his train did not hold so well as the brakes on other trains he had handled. He attributed this to the fact that there were 29 Interstate Railroad cars in his train of 35 cars and said that the brakes of cars of this railroad are not so effective as the brakes of cars of other railroads. Prior to the accident he had not been informed concerning the number of Interstate Railroad cars in his train. He stated that had he known a large percentage of the cars of his train were cars of this railroad he would have taken extra precaution. Other employees stated that they knew of instances wherein trains moving eastward on the branch overran the clearance point involved; they attributed

this to the brakes of Interstate Railroad cars not being so effective as those of cars of other railroads, and this opinion was supported by the results of tests made subsequent to the accident.

The engineman of Extra 5210 did not apply the train brakes until his engine was moving on the 1-percent descending grade just west of the junction switch. The rules required the engineman to test the air brakes before his train entered the yard limits, but no test was made prior to the first application on the descending grade. There was some discrepancy in the testimony with regard to the point where the first brake-pipe reduction was made; the engineman, the fireman, and the conductor, respectively, said it was made at points 4,500 feet, 3,537 feet, and 3,000 feet west of the junction switch. These three employees said that the brakes were not released following the first application. After the accident, an air-brake inspection disclosed that the brakes of 33 undamaged cars of Extra 5210 were operative and that the brake-cylinder piston-travel was not excessive. Subsequent to the accident these 33 cars again were moved down the 1-percent descending grade and the brakes controlled the speed of the train properly. In a test conducted subsequent to the accident a train of 35 loaded Interstate Railroad cars was operated down the grade but in making the stop for the junction this train overran the stop sign a distance of 85 feet. The air-brake instructor said that Interstate Railroad cars can be controlled properly either by braking sooner or by making a heavier brake-pipe reduction than when other cars are used. From the foregoing it appears that the engineman of Extra 5210 did not begin to brake soon enough to control the speed of this train properly.

The rules of both the carrier and the Association of American Railroads prescribe that an examination of the air brakes must be made at terminals to determine whether each brake applies and releases properly; the employee who makes the test is required to inform the engineman and the conductor regarding the condition of the brakes. Extra 5210 departed from Bulls Gap without this information being given either to the engineman or to the conductor; however, the evidence indicated that there was no inoperative brake in the train.

The braking ratio of the Interstate Railroad cars involved was from 63 to 67 percent of their light weight, and from 16.1 to 20.3 percent of their loaded weight; the average percentage of braking power for the gross weight was 18.3. The light-weight percentage conforms to the A.A.R. requirement of 60 percent or more; however, on nine cars the braking ratio based upon loaded weight was less than 18 percent. After the accident, examination of the 20 Interstate Railroad

cars of Extra 5210 disclosed that the brake-cylinder piston-travel varied from 5 to 8 inches; on 24 of these cars the piston-travel was less than 7 inches. According to A.A.R. rules the prescribed minimum piston-travel is 7 inches.

Conclusion

This accident was caused by failure to control the speed of both trains properly while moving within yard limits and approaching a junction.

Respectfully submitted,

S. N. MILLS,

Director.