CIRCULATED

IN RE INVESTIGATION OF ACCIDENT WHICH OCCURRED ON THE PIEDMONT AND NORTHERN RAILROAD NEAR CHICK SPRINGS, SOUTH CAROLINA, ON FEBRUARY 8, 1919.

March 15, 1919.

On February 8, 1919, there was a derailment of an electric passenger train on the Piedmont & Northern Railroad near Chick Springs, S. C., which resulted in the death of 4 passengers and injury of 1 employee and 23 passengers. After investigation of this accident, the Chief of the Bureau of Safety submits the following report.

Northbound passenger train No. 6 consisted of two motor cars, Nos. 2022 and 2009, in charge of Motorman Maudlin and Conductor Wilson, and was en route from Greenville to Spartanburg. It left Taylor, 10 miles from Greenville, at 10.49 a.m. according to the train sheet, and about 1 minute later was derailed at a point 60 feet south of Enoree River bridge, which is about 3200 feet north of Taylor. The speed at the time of derailment is estimated to have been about 25 miles an hour. The train continued onto the bridge and the rear car, No. 2009, finally fell to the ground below, a distance of about 90 feet.

Car No. 2009 landed on its rear end and came to rest bottom up, inclined at an angle of about 45 degrees. This car was practically demolished, while considerable damage was sustained by the bridge and track. The rear end of the first car was pulled from its trucks.

This part of the Piedmont & Northern Railroad is a single-track line extending between Greenville and Spartanburg,

a distance of 33.5 miles. Train movements are handled by time table and train orders, protected by a manual block signal system. Enoree River bridge is a steel structure about 900 feet long and 90 feet above the ground at the highest point. Approaching this bridge from the south, the track is tangent for about 1100 feet, followed by a curve to the left of 6 degrees, this curve being about 460 feet in length. It is about 400 feet from the northern end of this curve to the south abutment of the bridge, and the track is tangent from the curve to a point about 200 feet the other side of the bridge. Beginning at the first mentioned curve, there is a descending grade of .82% about 700 feet in length; 700 feet of level track, 600 feet of a .7% ascending grade, and then 1% ascending grade to a point just north of the bridge. The track is laid with 80-pound rails, 33 feet in length, with about 18 untreated oak ties under each rail, double-spiked and tie-plated on curves. The guard rails in use on the bridge were 56-pound rails, 30 feet in length. The trolley wires on the bridge were supported by steel frame arches. The first one is 100 feet north of the southern end of the bridge, while the others are spaced 120 feet apart. The weather was clear.

Careful examination of the trucks, wheels and brake rigging of the two cars involved failed to disclose anything wrong with the exception of the tie bar on the forward truck of the rear car. This was disconnected on the right side, the bolt having been broken off. The break was a fresh one, how-

ever, and had evidently resulted from the tie-bar encountering some obstruction on the track. There were also marks on the tie-bar itself, indicating this to be the case, and other marks on the motor casing of this truck where some heavy object had been encountered, a piece of the metal being gouged out. These tie-bars hold the brake shoes in position and have a clearance of from 3 inches to 4-3/4 inches above the top of the rails, the distance depending chiefly upon the amount of wear on the wheels. These bars are 2-1/2 inches wide and 1/2 inch thick.

Examination of the track showed the first marks on the track to be at a point 83 feet south of the bridge. At this point the tie-bar had come in contact with the receiving end of the right guard rail and apparently this rail had in this manner been raised up enough to allow it to strike the motor casing of the truck. This bent the rail and caused the angle bars joining it to the next rail to be broken off. This detached guard rail section, about 15 feet in length, was carried a distance of about 115 feet along the track before it fell from the bridge. The first wheel marks on the ties were about 30 feet north of the receiving end of the guard rail, these marks being on the outside of the left stock rail, about 12 inches from the base of the rail, and were made by the rear truck of the rear car. These marks continued in this approximate position a distance of about 60 feet or until the first cross-tie on the bridge was encountered. The wheel marks were then diverted toward the rail and followed it a distance

of about 30 feet when they began to work outward toward the ends of the ties, these marks continuing an additional distance of about 33 feet. Beginning at this point, the wheels traversed the 8"x8" wooden guard timbers a distance of about 35 feet before dropping off on the outside. They then ran on the ends of the ties a distance of about 100 feet before the left wheels went off. The truck was then dragged in this position an additional distance of about 135 feet before becoming detached from the car and falling from the bridge. The body of the car, resting only on the forward truck, continued to a point 31 feet beyond, where the coupling broke between it and the first car, allowing it to fall from the bridge on the left side. The forward truck of this car was not derailed until within 60 feet of where the body of the car finally fell from the bridge. This truck continued on the ties a total distance of 130 feet and did not fall from the bridge. Motor car 2022 stopped at a point about 75 feet farther north with the body of the car projecting over the side of the bridge. None of the wheels under this car was derailed. The right guard rail was overturned for a distance of about 90 feet beyond the point where the 15-foot section was torn out. At this point, the wheels crossed to the inside or left of the rail, continuing to work to the left until the truck fell from the bridge.

Motorman Maudlin testified that after leaving River Junction, the first stop out of Greenville, his train made 5 stops en route to Taylor, no trouble with the air brakes being experienced. His train left Taylor at 10.47 a.m. and just be-

fore passing a circuit breaker located about 1700 feet south of the bridge, he shut off the current. He thought the speed was about 20 miles an hour at this time and said that he did not again apply the power between there and the point of derailment. After the train had started across the bridge, there was a motion which felt as if an air hose had burst and he applied the emergency air brakes and reversed the power. He thought the car stopped within 30 feet, but afterwards changed his estimate to 60 feet. He did not know that the rear car had been derailed until he saw it on the ground. He did not notice any unevenness in the track or unusual motion of the car, though he afterwards stated that the track was pretty rough, needing ballast and new ties.

Conductor Wilson stated that his train arrived at Taylor at 10.47 a.m. and left almost immediately. Leaving Taylor, he boarded the train at the front end of the first car, riding there for a short distance. He had just started back through the car when he felt a motion as if it had struck something on the bridge. The car began to swing and he thought it was derailed and called to the motorman to hold it. He did not know the rear car had fallen from the bridge until he reached the door after the train had stopped. He thought the speed of the train was about 25 miles an hour and that this rate had not been exceeded at any point between Taylor and the point of derailment. He did not know of his own personal knowledge whether or not the motorman had shut off the current approaching the bridge.

Bridge Foreman Hunt, a passenger on train No. 6, was riding in the front end of the car with the motorman. He thought the speed of the train approaching the bridge was about 25 miles an hour. When the head end of the train had passed onto the bridge a distance of about 150 or 200 feet, he felt an unusual motion of the train, due to the rear car being derailed. He did not think the motorman was using current at this time, but was not positive. The conductor called to the motorman, and he felt the brakes being applied and saw the motorman reverse the power. He did not think the brakes took hold as well as usual, as the train did not stop as quickly, but said he was not positive as to his observations in this particular.

O. K. Jackson, employed as a lineman, stated that he was riding in the front end of the first car with the motorman and that the motorman shut off the current before passing the circuit breaker. He did not see him turn on the current again although he thought he did so. The speed approaching the bridge was about 25 miles an hour. When about opposite the first arch, he felt a jerk and after traveling 75 or 100 feet looked back and saw the rear car starting to go off the trestle. The conductor called to the motorman to hold it and he said that he saw the motorman shut off the controller and place the brake handle in the emergency position. He thought the brakes took hold well and that the train stopped very suddenly. He did not know whether or not the motorman was using current.

W. T. Pryor, employed as a lineman helper, was riding with the motorman in the front end of the first car. He noticed

nothing wrong until after passing the first arch. The car then began to jerk and the conductor called to the motorman to hold it, the motorman doing everything he could to stop.

Colored Train Porter Lee stated that he was riding in the forward end of the rear car when he felt a jar, and by the way it jumped he knew that the car had been derailed. He did not know whether or not the air brakes were applied before this car fell from the trestle. He thought the speed was about 25 miles an hour.

A. D. Frye, Superintendent of Motive Power, stated that he examined the tie-bar and truck upon his arrival at the scene of accident. He thought the spring of the truck would have been sufficient to let the tie-bar swing low enough to strike the guard rail. His opinion regarding the accident, however, was that the tie-bar did not strike and pull up the receiving end of the guard rail, but that the spring in the track, due to churning of joints, caused the receiving end to be forced high enough to encounter the motor casing. The height of this particular tie-bar above the level of the rails was about 3-3/8 inches. He further stated that there were no spikes in the end of the guard rail; there were spikes in the second tie, but the tie was old and badly decayed. In all, he found one spike and three spike holes in the 15 feet covered by the first guard rail section. The clearance of the motors above the level of the rails was 4 inches, and of tie-bars with new wheels 4-3/4 inches. Mr. Frye further stated that he had made

a test of a train of two cars of this type and had found that with the train traveling at a speed of 55 miles an hour, it could be stopped in a distance of 487 feet with an emergency application of the air brakes.

D. C. Smith, Supervisor of Tracks, stated that he reached the scene of the accident shortly after its occurrence and found the track to be in good condition and the gauge correct. He saw the section of guard rail which had been torn out and also saw a mark on the left guard rail a few feet from its receiving end, and he concluded as a result of his investigation that the accident was due to something catching in the guard rail, loosening it enough to cause it to catch on the truck, resulting in the derailment. Mr. Smith said that he also found abrasions upon the lead rail at the end of the passing track at Taylor, these abrasions causing him to think that something had been dragging. These marks were near the center of the track, and he said that whatever had been dragging would not have been caught by the planks at a highway crossing nearby, if the object had been bent downward in the middle and supported at each end, this being due to the fact that the planks at the crossing were laid parallel to the rails and were not placed in the center. He stated, however, that he did not think anything had been actually dragging, but said that he thought the accident was due to the tie-bar not having sufficient clearance. He had last examined the track in the vicinity of the accident on January 27th. He found general conditions to be good, and

noticed nothing wrong with the guard rail at the southern end of the bridge. Generally speaking, he considered the track to be as good as the average during the winter months. The section in which this accident occurred is 8 miles in length and the section crew consisted of a foreman and 4 men.

A. G. Bullock, extra gang foreman, stated that on reaching the scene of the accident he saw where something had struck the guard rail. He then went back to the highway crossing about 1/4 mile south of the bridge, and found marks indicating that something had dragged on a tie and also on the crossing. In company with Supervisor Smith, he then went back as far as Taylor and found where the same object had dragged on a lead rail at the passing track switch. Mr. Bullock said the guard rail was 1 inch lower than the main rail, and that in his opinion the tie-bar had been too low and had jerked up the end of the guard rail, causing it to strike the motor casing and derail the trucks.

Car Inspector Tramell, stationed at Anderson, stated that he had inspected both of these cars, examining the running gear and brake rigging, including tie-bars, and found everything to be in good condition. The air brakes were tested and he also examined the flanges, finding them to be in good condition.

General Roadmaster Richburg stated that on the day following the accident he made an examination of the track between Taylor and the point of derailment and found it to be in fair condition. He found many places where there was churning

at the joints, the worst places being near the bridge. He said this was a condition which resulted in an up and down motion of the car, as well as a swinging motion. He did not think the guard rail was spiked as securely as it should have been, but said that there was only one decayed tie under it. There were 9 ties under the 15-foot section of the rail which was torn from the track, and there were spikes only in the second and eighth ties. In his opinion, about 50% of the ties between Taylor and the bridge should be removed on account of decay, and within 200 feet of the bridge there were 50 which should be removed. Although orders had been placed, he had been unable to obtain the necessary ties, and it was on account of the track conditions known to exist that an order was issued in December restricting the speed of passenger trains to 30 miles an hour. Roadmaster Richburg thought the churning of the joints, resulting in an excessive motion of the car, allowed the tie-bar to catch the end of the guard rail.

On February 12th, a test was made to ascertain how far a train would drift after having shut off the power at the circuit breaker, while traveling at a speed estimated to have been 30 miles an hour, and it was found that it reached the bridge at a speed of about 10 or 12 miles an hour and that it was necessary to apply the current in about the middle of the bridge in order to keep the train from coming to a stop. In view of this test and in view of the statements of the various employees riding on the train, it is believed that Motorman Maudlin actually used the power approaching the bridge, and that the speed

of his train was about 25 miles an hour; that on account of track conditions, this resulted in an excessive motion of the car, resulting in the tie-bar, which was low, coming in contact with the receiving end of the guard rail. The track had considerable spring in it, and it is probable that this resulted in the end of the rail being raised a little. The first section of this guard rail was insecurely spiked and was raised by the tie-bar sufficiently to allow it to strike the motor casing of the truck, the guard rail being torn out and the train derailed. The first marks of derailment were approximately 50 feet south of the bridge, and at this time therefore the head end of the train had started across the bridge. With the exception of the colored porter, all of the train crew, together with the other employees who were riding on the train, were in the forward end of the first car with the motorman, and apparently none of them noticed the derailment of the rear car until just before it started to fall from the bridge. All of them felt something unusual in the motion of the train at about the same time, the conductor calling to the motorman to stop the train. The motorman at once applied the emergency air brakes and reversed the current. The evidence indicates that when this was done the train was brought quickly to a stop. There was no evidence that the train did not stop within a reasonable distance after the brakes were applied; neither was there any evidence that the brakes had not worked satisfactorily in making previous stops. While it is not believed that Motorman Maudlin is correct in his statements as to the speed of the car or as to his use of

the power after passing the circuit breaker, yet there is nothing to indicate that he exceeded the speed limit allowed or that he violated any of the rules of the company in the handling of his train. The track conditions, however, were faulty and the tie-bar on the forward truck of the rear car was too low, having a clearance of about 3-3/8 inches, whereas with new wheels it would have had a clearance of 4-3/4 inches. There is nothing in the record to indicate exactly how much clearance these tie-bars should have, but the fact that marks were found on the track at two or three points between Taylor and the point of derailment would seem to indicate that this tie-bar did not have sufficient clearance to permit of the safe operation of the car.

This accident was caused by the tie-bar on the forward truck of the rear car of train No. 6 coming in contact with the receiving end of the guard rail, due to the tie-bar being too low and also due to track conditions so rough as to result in excessive motion of the car.

All of the employees involved in this accident were experienced men, and none had been on duty in violation of any of the provisions of the hours of service law.

Both of the cars involved in this accident were wooden cars with semi-steel underframes, built in 1911. Their length was 62 feet with a weight of 96,000 pounds. They were equipped with trucks built for high speed service and had a speed capacity of 60 miles an hour.

G.V.L.