INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE ATLANTIC COAST LINE RAILROAD NEAR MAITLAND, FLA., ON DECEMBER 16, 1925.

January 30, 1926.

To the Commission:

On December 16, 1925, there was a derailment of a passenger train on the Atlantic Coast Line Railroad near Maitland, Fla., resulting in the death of one employee, and the injury of one passenger, six persons carried under contract, and three employees.

Location and Method of Operation

This accident occurred on the Tampa District of the Third Division, extending between Sanford and Port Tampa, Fla., a distance of 123.7 miles; in the vicinity of the point of accident this is a single-track line over which trains are operated by time-table and train orders, no block-signal system being in use. The accident occurred about 1.1 miles north of Maitland; approaching this point from the north the track is tangent for a considerable distance, followed by a 6° curve to the right 875 feet in length, the accident occurring on this curve at a point about 517 feet from its northern end. The grade is descending for southbound trains to the northern end of the curve, varying from 0.05 to 0.57 per cent, and is nearly level around the curve, which is on a small fill for practically its entire length. The track is laid with 85-pound rails, 33 feet in length, with about 17 to 18 ties to the rail-length, tie-plated, about 75 per cent of the tie plates being slotted for 4 spikes and the remaining 25 per cent slotted for 3 spikes, the 3 spike tie plates being designed to accomodate 2 spikes on the gauge side of the rail and 1 on the outside. The track is ballasted with rock to a depth of about 12 inches. The speed of passenger trains is limited to 40 miles an hour on curves of 4° and over.

The weather was clear at the time of the accident, which occurred at about 4.30 p.m.

Description

Southbound passenger train No. 89 consisted of four express cars, one combination mail and baggage car, one mail car, one baggage car, two coaches, two Pullman parlor cars, and one official car, hauled by engine 472, and was in charge of Conductor Johnson and Engineman Dandy. The first, fifth, and ninth to twelfth cars, inclusive, were of all-steel construction, while the remainder were of steel-underframe construction. This train left Altamonte Springs, 2.6 miles north of Maitland, at 4.28 p.m., 40 minutes late, and on reaching a point about 1.5 miles beyond was derailed while traveling at a speed estimated to have been about 35 miles an hour.

Engine 472, the first seven cars and the forward truck of the eight car, were derailed to the east, the engine and tender coming to rest on their left sides, about 310 feet from the initial point of derailment, parallel with the track; the first four cars were piled up in a space of about 90 feet, and came to rest at right angles to and east of the track, the first car being bottom up, while the next car was demolished. The other four derailed cars remained practically upright. The employee killed was the fireman.

Summary of evidence

Engineman Dandy stated that the first he knew of anything wrong was on feeling the engine suddenly go down and at the same time he saw a rail fly up, near the right cylinder of the engine; he then was thrown from his seat box without having had time to shut off steam or apply the air brakes. He said he had felt no unusual rocking or swaying of the engine prior to the accident, which occurred while the train was traveling at a speed of about 35 miles an hour, and that the engine turned over immediately after he felt it drop.

None of the other members of the crew noticed anything unusual prior to the accident; their estimates as to the speed at the time of the accident were from 30 to 35 miles an hour. Conductor Johnson was of the opinion that the track was knocked out of alinement on the high side of the curve by several heavy trains which had passed over it previously, and that when his train encountered the curve the engine dropped between the rails. The rail on the high

side of the curve was turned over for some distance, and for about two rail-lengths this rail was lying almost in its place except that it was turned over. He said it was about 15 rail-lengths from where the engine first dropped between the rails to where it came to rest, and that the low rail of the curve was completely torn up. Baggagemaster Powell said the rail was turned over at the point where the last derailed car came to rest, with its forward truck off the rails.

Trainmaster Howser stated that he was riding in the eighthcar of the train at the time of the accident. Shortly afterwards he examined the track and he said there were about 15 rail-lengths involved in the derailment. Some of the rails were badly broken and twisted; most of these had been thrown to the east side of the track and were covered up by the wreckage. A short piece of rail was found protruding through the engine tender, which is his opinion was the rail that Engineman Dandy mentioned as having seen fly up in front of him. The rails did not show excessive wear, while the ties were good, and he considered the track to be in good condition as a whole. Trainmaster Howser examined the track for ¼ mile north of the point of derailment for indications of anything dragging or other marks of derailment but found nothing in this connection. The derailed equipment was so badly torn up that it was impossible to tell the condition of the brake rigging, trucks, etc., as they existed prior to the accident. On the day following the accident, in company with an inspector of the Commission, he saw a number of spike heads broken off on the gauge side of the high rail between mile post 110, located 792 feet north of the point of accident, and the point where the derailment occurred, although nearly every tie had at least one spike in it. He thought the first rail involved in the accident was the 24th rail south of mile post 110, while the broken rail that was later found and mentioned as having been the probable cause of the accident was the 30th rail south of this mile post; a portion of this rail was found in an orange grove opposite where the engine came to rest, the other portion, as stated before, having penetrated the tender, Trainmaster Howser estimated the speed of the train at the time of the accident to have been between 35 and 40 miles an hour, and said that the accident occurred at 4.30 p.m.

General Foreman Denson stated that when he arrived at the scene of the accident it was dark, but that he examined the engine by the light of a lantern; he examined it again on the following morning and also when it was picked up and rerailed two days afterwards, but found nothing about it that would have caused the accident and

said he had received no adverse report in regard to its riding qualities. He saw the piece of broken rail in the orange grove, about 27 feet in length, while the piece which matched it was in the tender, there was also a full 33-foot rail in the coal space of the tender. There was another piece of broken rail about three or four rail-lengths north of where the engine rested; this rail, however, layed near where it came out of the track and showed a new break. General Foreman Benson was unable to say what caused the derailment.

Roadmaster Chandler stated that after the derailed cars had been moved back he examined the track from the first wheel marks appearing on the ties back to mile post 110. Track conditions were good, and in his opinion safe for scheduled speed; the outside rail had a superelevation of 4½ inches, while the gauge around the curve was maintained at ½ inch over standard, and he said there was no more than ¼ inch variation either in the cross levels or in the gauge. Some of the heads were broken off the spikes, and the high rail of the curve was slightly curve-worn, approximately ¼ inch on the gauge side. No indications were found of anything dragging. There was a broken rail at a point six rails south of the first wheel mark on the track, one portion of this rail being found in the orange grove and the other piece in the tender. Roadmaster Chandler said that he did not know what caused the accident.

Section Foreman Ingram stated that on December 12 he had performed work on this curve, raising low joints and centers, and noticed that on an average the heads were missing from about three spikes to each rail-length, the stubs being left in the tie plates. On the morning of December 15, the day prior to the accident, he gauged the curve, at rail joints and rail centers, but nothing wrong was found in this connection; he also passed this curve on his motor car on the evening of that day, and again on the morning of the accident, but noticed nothing wrong with the gauge, alinement, superelevation, or surface. He was following train No. 89 on his motor car, reaching the scene of the accident about 10 minutes after its occurrence, and he said that immediately north of the point of accident he observed from 10 to 12 missing spikes to the rail-length. He had noticed this condition prior to the accident, but he did not replace the missing spikes as he did not find anything to indicate that the track was spreading, and also because there were other points on his section which were more in need of attention.

At the time the Commission's inspector arrived at the scene of the accident the track had been opened to traffic. It appeared that the first rail to be renewed was

the 23rd rail south of mile post 110, on the east or high side of the curve. This rail, the first one involved in the derailment, had been twisted for about 15 feet on the leaving end. The 24th rail on the same side of the track was somewhat bent and flange marks appeared on the web, on the gauge side, in about the center of the rail, these flange marks continuing along the web to the angle bar at the leaving end. This angle bar showed very deep impressions where wheel flanges had struck it. Deep flange marks appeared about 8 inches inside the gauge of the west rail on 6 ties about opposite the center of the 24th rail. These flange marks veered abruptly to the east or left and were the first flange marks on the ties. All the ties south of these six ties had been renewed, and most of the ties taken out of the track had been badly broken. It appeared that the engine had turned over the 24th rail, the flanges of the wheels running along the web of the rail to the angle bar, at which point they went off the rail. The location of all the rails was accounted for up to the 30th rail, and it was concluded that this was the broken rail one portion of which was found in the orange grove and the other portion in the engine tender. The portion taken from the tender measured 10 feet 8 inches in length and was the receiving end of the rail, the broken end showing no defect. The broken end of the longer piece showed a slight abrasion or scar in the web, extending down into the base, but apparently this abrasion was caused by that end having struck some object after having been torn from the track. The rail undoubtedly broke as a result of the accident, and was not its cause.

A careful inspection of the track from mile post 110 to the point of accident disclosed that the ties and rails were in good condition, and the elevation, alinement, gauge, and surface was practically uniform. Starting at the north end of the curve, however, this point being about eight rail-lengths south of mile post 110, and proceeding southward, there was observed a large number of spikes with heads broken off, apparently having been in this condition for some time, and the broken ends of the stubs which remained in the tie plates were corroded. A check of the unbroken spikes on the east or high rail of the curve, beginning with the eighth rail south of mile post 110, was as follows:

RAIL NUMBER	TIES TO RAIL LENGTH	SPIKES ON GAUGE SIDE	SPIKES ON OUTSIDE
8	17	15	16
9	18	17	18
10	18	16	22
11	18	17	35
12	18	18	21
13	18	19	25
14	18	17	28
15	18	19	20
16	18	14	20
17	17	12	17
18	18	17	26
19	18	18	26
20	18	17	24
21	18	18	24
22	18	16	18

The track had been renewed south of the 22nd rail. While Roadmaster Chandler said the instructions were that curves of more than 3° should be double spiked, it is to be noted that on the gauge side of the outside rail only five of the rails enumerated had as many as one unbroken spike to each tie, in one case there were only 12 unbroken spikes on the gauge side.

Conclusions

This accident was caused by the high or outside rail of the curve overturning due to inadequate spiking.

Section Foreman Ingram had been in charge of this section only two months, but he was aware that prior to the derailment there were spikes with heads broken off, the stubs being left in the tie-plates and also a large number of missing spikes, however, he did not replace them at that time as he found no indication of the track spreading and also because at other points on his section there were places which in his opinion needed attention more than on the curve on which the accident occurred. For his failure to see that the curve involved was properly spiked, especially when being fully aware of the weakened condition of the track prior to the derailment, he cannot escape his share of the responsibility for this accident.

The maintenance of way officials were of the opinion that the broken rail, a piece of which was found in the orange grove and the other piece in the tender, was the cause of the accident, having broken under the engine due to a flaw, or at the time the previous train, northbound train No. 184,

passed this point, about 30 minutes prior to the accident, and they expressed the further opinion that the rails north of this point were thrown out by the buckling of train No. 89 at the time of the derailment. Engine 472, however, came to rest less than 150 feet from the original location of the broken rail in question, and it appeared that if it were traveling at the speed estimated by members of the crew and others, it would have traveled a much greater distance before coming to rest had this broken rail marked the point of derailment. Nevertheless, a further investigation into this phase of the situation was undertaken by Mr. James E. Howard, engineer-physicist, whose report immediately follows:

REPORT OF THE ENGINEER-PHYSICIST

The derailment of southbound train No. 89, on December 16, 1925, at Woodbridge Curve, a 6° curve leading to the right for southbound trains, and located near Maitland, Fla., was caused apparently by the overturning of some of the rails on the high side of the curve. Evidence upon which this belief rests follows:

Train No. 89, consisting of locomotive No. 472 and 12 cars, traveling southbound at a speed of 35 or 40 miles per hour, was in part derailed at Woodbridge Curve. The engine, tender, and seven cars were completely derailed, and the forward truck of the eighth car. The rear four cars remained on the rails. The engine, tender and forward cars took outward courses, tangent to their points of derailment.

An examination was made of the rails which were removed from the portion of the track destroyed by the derailment. The low rails of the curve were found intact, with little distortion in shape. Eight of the high rails were decidedly bent, broken or twisted.

The train passed over the northerly half of the curve without disturbance to the track. A little beyond the middle of the length of the curve the rails on the high side were twisted in an outward direction, and abreast these rails there were marks on the ties, inside the low rails. Derailment began in this vicinity.

The engine took a tangent course, and after traveling a few rail-lengths nearly cleared the high rail. The engineman, sitting on the right side of the cab, saw a high rail, one of the left hand rails of the track, appear before him.

A fragment, 10 feet 8 inches long, believed to have been a part of this rail, lodged itself in the tender, while the leaving and longer end of the rail was thrown into an orange grove outside the right of way. This rail is designated as the 30th rail south of mile post 110.

The next rail beyond, namely, the 31st, was broken. Other rails, believed to have occupied places in the track immediately following were slightly buckled.

Preceding rail No. 30, as to location, the receiving end of which lodged in the tender, and representing the place where the engine had practically cleared the track, there were several twisted and bent rails. Four of these rails were twisted outward, in amounts ranging from 14° to 26° each. On one rail the result of overturning was shown by a slight mark along the inside face of the web, culminating in the shearing of a fin from the lower corner of the head, gauge side.

Three of the rails, including the one the engineman saw in the air and two preceding ones, were sharply bent into curved shapes the aggregate curvature of which was nearly 180°. The fragment found in the orange grove displayed a bend having a middle ordinate of about 3 feet on a chord of 21 feet 4 inches.

Rail No. 30 appeared to have turned half over, and was apparently bottom side up when the engine reached it. The outside flange of the base was bent upward 5/8 inch at the leaving end of the fragment taken from the tender. There was a corresponding bend in the flange of the fragment which was thrown into the orange grove. Pieces of the outside flange of the 31st rail were stripped off, sheared and bent upward.

There is reason for believing the high rails were not adequately secured by spikes, at their inside flanges, against overturning forces. There were rails in the vicinity after the derailment, which were not involved in the accident, resting upon ties in which the heads of the spikes were broken off. Headless spikes recovered from the burnt ties indicated that conditions in adjacent parts of the curve were not unlike but representative of those which probably prevailed in the parts destroyed by the derailment. Headless spikes driven through tie plates aid in keeping the track in gauge but lose in efficiency in preventing the overturning of the rails.

The fractured surface of the broken rails exhibited metal which was sound prior to its rupture at the time of the accident, the fractures representing a consequence and not

the cause of the accident.

The cause of the derailment attaches to insecure spiking of the high rails of the curve.

Summary

The conclusion is concurred in that the immediate, proximate, cause of the derailment of train No. 39 was due to the overturning of the high rails of the curve, and that such overturning was facilitated by reason of inadequate spiking of the inside flanges of the high rails.

None of the employees involved had been on duty in violation of any of the provisions of the hours of service law.

Resectfully submitted,

W. P. BORLAND,
Director.