

INTERSTATE COMMERCE COMMISSION.

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE
INVESTIGATION OF AN ACCIDENT WHICH OCCURRED
ON THE TEXAS & PACIFIC RAILWAY AT COLORADO,
TEXAS, ON APRIL 10, 1923.

June 19, 1923.

To the Commission:

On April 10, 1923, there was a derailment of a passenger train on the Texas & Pacific Railway at Colorado, Tex., resulting in the death of one employee, and the injury of two passengers.

Location and method of operation.

This accident occurred on the Baird Sub-Division of the Rio Grande Division, extending between Baird and Big Springs, Tex., a distance of 127.5 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 on the main line, on a fill about 15 feet in height, at a point 1,430 feet west of the station at Colorado, between the switch frog and switch points of the west switch of the passing track, a trailing-point switch for westbound trains which leads gradually off the main track to the south; approaching this point from the east the track is tangent and the grade practically level. The track is laid with 75-pound rails, 30 feet in length, with an average of 18 oak ties to the rail-length, single-spiked, tie-plated, and ballasted with cinders. The gauge, elevation and alignment were in good condition. It was raining at the time of the accident, which occurred at about 7.55 a. m.

Description.

Westbound passenger train No. 15 en route from Dallas to El Paso, Tex., consisted of two baggage cars, one mail car, two coaches, and one Pullman Sleeping car, in the order named, hauled by engine 701, and was in charge of Conductor Durnell and Engineer Price. The cars were of all steel construction, with the exception of the first and last cars. This train left Colorado, the last open office, at 7.54 a. m. 29 minutes late, and after having proceeded a short distance was derailed while traveling at a speed shown by a speed recorder tape to have been 11 miles an hour.

Engine 701, together with its tender, was derailed to the right, and came to rest bottom side up, down the embankment, badly damaged, the head end of the engine being approximately 125 feet west of the initial point of derailment, the first car was partly derailed but remained upright. The employee killed was the engineman.

Summary of evidence.

Just after leaving Colorado, Fireman Orr was standing on the deck of the engine holding the firing valve and the first knowledge he had of anything wrong was when the engine started bouncing on the ties. The first intimation other members of the crew had of anything wrong was when the air brakes were applied in emergency. Immediately after the accident, Conductor Durnell examined the track and found that there was a broken rail on the north side of the track, the north wheels of the rear truck of the first car standing on the web of the gauge side of the overturned portion of this piece of the broken rail, while Fireman Orr noticed that a piece of the broken rail was wedged between the brake shoe and right front driving wheel. Section Foreman Logan, who has jurisdiction over the section of track on which the accident occurred, was only a short distance from the point of accident at the time of its occurrence, and on arrival at this point immediately afterwards made an examination of the derailed equipment; however, nothing was found that would have contributed to the accident. He thought the rail broke under the weight of engine 701, as the break was fresh. Conductor Durnell stated that no trouble was experienced with the air brakes in making the various stops en route on this trip, and Fireman Orr stated that there was nothing wrong with the engine of any consequence.

The rail which broke was made in November, 1902, and laid in the track at the point of accident either late in that year or early in the year of 1903. The receiving end was intact and fully bolted to the adjacent rail, and the rail was broken apparently into eight pieces, the lengths of which, beginning with the rail joint at the east or receiving end, were as follows: 8 feet 6 inches; 3 feet 9 inches; 3 feet 9 inches; 4 feet; 4 feet 5 inches (missing); 1 foot 11 inches; 1 foot 9 inches; and 1 foot 11 inches. Although diligent search was made for the missing section, it was not located.

Inspection disclosed the first mark of derailment to be a wheel-flange mark on the gauge side of the base of the south rail, this mark then appeared on the ties and extended gradually toward the right, followed by numerous other flange marks which led off the ties to the right at a point about 78 feet distant. About 5 feet from where

the first mark appeared on the base of the south rail there was a flange mark on the gauge side of the web of the broken north rail, extending for a distance of 5 feet, starting at a point 40 inches west of the rail joint at the receiving end of this rail; the western end of this largest section of broken rail was partly turned over and twisted outward. Leaving this piece of rail the flange marks were not clearly defined for some distance, then they appeared again and finally led off the ties to the north at a point 36 feet from where the mark appeared on the web of the broken rail.

Maintenance of Way Engineer Gaines was of the opinion the accident was caused by a broken rail, due to a defect in its general structure, stating that examination disclosed the head of the rail to be of a coarse, granular, structure, somewhat different from the general structure of the web and base, while microscopic examination disclosed dark lines or streaks running through the head.

District Roadmaster Johnson walked over the track at the point of derailment on the day prior to its occurrence, and a thorough inspection made at that time disclosed nothing unusual; the gauge, alinement, and elevation were in good condition.

General Roadmaster Bettie inspected this section of track from the rear end of a passenger train, four of five days prior to the accident, and noticed nothing unusual at that time.

Master Mechanic Blue made an inspection of engine 701 subsequent to the derailment and found no defect that would have contributed to the accident. There was lateral motion of $3/16$ inch in the driving wheels, $17/32$ inch in the front wheel of the leading truck, and $1/2$ inch in the rear wheels of this truck, while the lateral in the trailer truck wheels was about $1/2$ inch. No material indication of wear was found on the wheel flanges, this engine having received general repairs at Marshall on March 8, 1923, at which time all the tires were turned.

Engine 701 is of the 4-6-2 type, having an engine wheel base of 34 feet 7 inches, and a total wheel base, engine and tender combined, of 71 feet 6 $3/4$ inches. The weight of the engine loaded is 275,080 pounds, and the total loaded weight, engine and tender, is 450,080 pounds. Careful examination of the engine failed to disclose anything which could have contributed to the accident.

Eastbound passenger train No. 2, the last train to pass the point of derailment prior to the accident, passed that point less than 1 hour and 15 minutes before the ac-

cident occurred, and at that time nothing unusual was noticed by members of the crew.

The broken rail was branded "National Steel Co. 7502 IIIIIIIIIII." The first fracture, nearest the receiving end of the rail, started in the head at the upper corner, on the outside. The second fracture occurred at the same corner and side of the rail; the third fracture at the upper corner of the gauge side; the fourth fracture was in the same place as described for the first and second.

A shallow zone of metal next the running surface broke with an oblique shearing fracture, common in appearance to the fracture of rails which have been in service and subjected to the cold rolling action of the wheels. The balance of the fractured surfaces showed fine granular metal; sound steel.

The running surface of the head showed flow of the steel, with the formation of fins along both the gauge side and the outside corners of the head. Conditions of service had exhausted the toughness of the metal next the running surface.

Four bending tests were made on the second and third fragments from the receiving end of the rail. The rail was placed on supports 2 feet apart and loaded at the middle. The results were as follows:

Loaded on the base,	Ultimate strength, 144,200 lbs.
Loaded on the head,	" " 174,800 lbs.
Loaded on the outside of the head	" " 65,200 lbs.
Loaded on the gauge side of the head	" " 60,600 lbs.

When tested in sidewise direction, its strength was far below its ability to sustain direct downward loads. Under the downward bending test the rail deflected 250 before rupture. In each of the other tests the rail displayed great brittleness, the deflection being negligible in each case.

Conclusions.

This accident was caused by a broken rail.

The tests showed that the strength of the rail in a lateral direction was very much less than its strength when tested in a downward direction, this lack of strength being coupled with great brittleness, and the indications are that the nosing of the engine was the proximate cause of the rupture of the rail, causing lateral strains in the head, and resulting in the fracture of the rail, the fracture beginning at the upper outside corner of the head.

The employees involved were experienced men, at the time of the accident none of them had been on duty in violation of any of the provisions of the hours of service law.

Respectfully submitted,

W. P. BORLAND,

Director.