

INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD NEAR WOODFORD, VA , ON APRIL 2, 1924

APRIL 28, 1924

To the Commission

On April 2, 1924, there was a derailment of a passenger train on the Richmond, Fredericksburg & Potomac Railroad near Woodford, Va., resulting in the death of one employee, and the injury of one passenger, two employees, a Pullman conductor, and a Pullman porter.

LOCATION AND METHOD OF OPERATION

This accident occurred on that part of the main line extending between Fredericksburg and Richmond, Va., a distance of 59.4 miles, in the vicinity of the point of accident this is a double-track line over which trains are operated by time-table, train orders, and an automatic block-signal system. The accident occurred on a small fill at a point about $1\frac{1}{2}$ miles south of Woodford, approaching this point from the north the track is tangent for more than 2 miles, while the grade is level for a considerable distance. The track in this vicinity is laid with 100-pound rails, 33 feet in length, with an average of 18 white-oak ties to the rail length, single-spiked and ballasted with washed gravel from 12 to 16 inches in depth. Four-hole angle bars are used. The weather was clear at the time of the accident, which occurred at about 2:32 a. m. Figure 1 shows the location of the accident looking north.

DESCRIPTION

Southbound passenger train No. 87 consisted of one baggage car, four Pullman sleeping cars, one dining car, three Pullman sleeping cars, and one observation car. In the order named of all-steel construction, hauled by engine 90, and was in charge of Conductor Allen and Engineman Snelson. This train passed MA block station 11.7 miles north of Woodford, at 2:16 a. m., four minutes late and on reaching a point about $1\frac{1}{2}$ miles south of Woodford was derailed.

while traveling at a speed estimated to have been between 60 and 65 miles an hour.

Engine 90 and eight cars were derailed. The engine came to rest down the fill on its right side, parallel with and about 20 feet west of the track, the tender was between the track and the engine, reversed. The cars remained upright, the first car coming to rest about 165 feet south of the engine, fouling the northbound track. The employee killed was the engineman.

SUMMARY OF EVIDENCE

None of the members of the crew was aware of anything wrong until the accident occurred. Fireman Gravatt stated he noticed



FIG. 1.—Location of the accident. View of the derailed engine and tender. Tender turned half way around.

nothing unusual in the movement or handling of the engine en route. He was sitting on his seat box at the time of the accident, and said that after the engine was derailed it traveled a few engine lengths before turning over. Conductor Allen stated that immediately after the accident he took a lantern and started south on the northbound track to flag, continuing to RX block station where he reported the accident. Flagman Downer immediately went northward to flag. Baggage-master Franck stated he was riding in the car next to the baggage car at the time of the accident, and that just before this car was derailed he looked out of the window on the west side of the car and saw fire flying. These employees estimated the speed to have been between 60 and 65 miles an hour at the time of the accident.

At the point of derailment a rail on the east side of the track was broken, the break beginning at the receiving end of the rail, immediately under the head, at a splice bar. Several other rails were broken as a result of the derailment, two pieces of rail, about 7 feet in length, and evidently middle portions, penetrated the tender, one piece puncturing the front truck bolster and the other piercing the under frame, near the rear of the tender.

The southbound track was torn up for a distance of 561 feet. A flange mark was found on the ties on the gauge side of the east rail, at a point about 12 feet north of where the southbound track was torn up.

New rail was being laid in the southbound track north of, and approaching the point of derailment. This work was started on March 19, 1924, and up to and including March 28, 1924, more than $2\frac{1}{2}$ miles were laid, extending to a point 703 feet north of the point of derailment on the west rail, and to a point 373 feet north of the point of derailment on the east rail.

Supervisor Donahoe passed over the track at the point of derailment on southbound passenger train No. 5 on the day prior to the accident, but noticed nothing unusual on this occasion. He arrived at the scene of the accident shortly after its occurrence and, on examining the track, found no indications of derailment north of where the track was torn up.

Section Foreman Mitchell stated that about one-half mile of track is laid in a day, and that had it not been for weather conditions work of laying new rail would have been continued on the day prior to the accident. It is customary to pull the spikes from every other tie on both sides of the rail on one side of the track, curves excepted, for the next day's work, and at the time of this accident this had been done on the west rail for about a half mile south of where work of laying the new rail had stopped.

This accident was caused by a broken rail. An investigation into the reason for the failure of this rail was conducted by Mr. James E. Howard, engineer-physicist, whose report immediately follows.

REPORT OF THE ENGINEER-PHYSICIST

The accident to southbound train No. 87, on the morning of April 2, 1924, which occurred at a point south of Woodford, Va., in the immediate vicinity of mile post 43, was apparently due to a broken rail. The rail involved was an A S C E section, 100 pounds weight per yard, rolled by the Maryland Steel Co. in May, 1909, branded as follows: 247 Maryland IIII 09 heat number 16042. It is understood to be a Bessemer rail, which came from the middle part of the ingot. It was laid in the year in which it was rolled.

This rail displayed a web fracture which had its origin at its receiving end. It began immediately under the head, thence extending obliquely downward to the second bolt hole. It resumed its course from the opposite side of the bolt hole extending downward to the junction of the web and the base. It then changed direction and developed along the length of the web gradually upward to the middle of its depth, terminating 27 inches from the receiving end of the rail. This line of rupture apparently antedated the time of the accident.

Thirteen inches of the length of rupture was covered by the splice bars of the joint, the remaining part of its length being uncovered. This rail was on the east side of the track.

The events which transpired at the time of the derailment and their order of sequence are believed to have been as follows. The receiving end of the east rail of the track was broken under the driving wheels of the engine, the leading truck having passed over that part of the rail without injury.

Fragmentation began when the driving wheels reached the rail. Several short fragments, ranging from one to two feet in length, were broken from the receiving end, portions of the head and web being detached from the base. These short pieces entangled with the tender trucks were carried along toward the place where the engine and tender came to rest.

The long end of the rail evidently rebounded when relieved of the weight of the drivers, canted upward and punched its way through the bolster of the forward truck of the tender. It passed on obliquely upward punching its way through a cross beam of the tender floor frame. The tender was turned end for end. The rail was bent and broken at a point between the forward truck bolster and the rear portion of the tender floor frame.

While this was going on the engine dropped inside the west rails. They were ploughed off the side of the roadbed. The east rails, next beyond the rail initially broken, were bent into various shapes. One was bent through 90 degrees of curvature concave on the gauge side. Another was bent convex on the gauge side. These were secondary events.

The above conjectural explanation of what happened is in harmony with all that has been learned concerning the derailment.

Figures 2 and 3 illustrate the appearance of the fragment from the receiving end of the rail. The origin of the fracture was under the head, at the hot sawed end of the rail, indicated by a star on each of the cuts. Arrows on Figure 2 indicate the direction the line of rupture traveled.

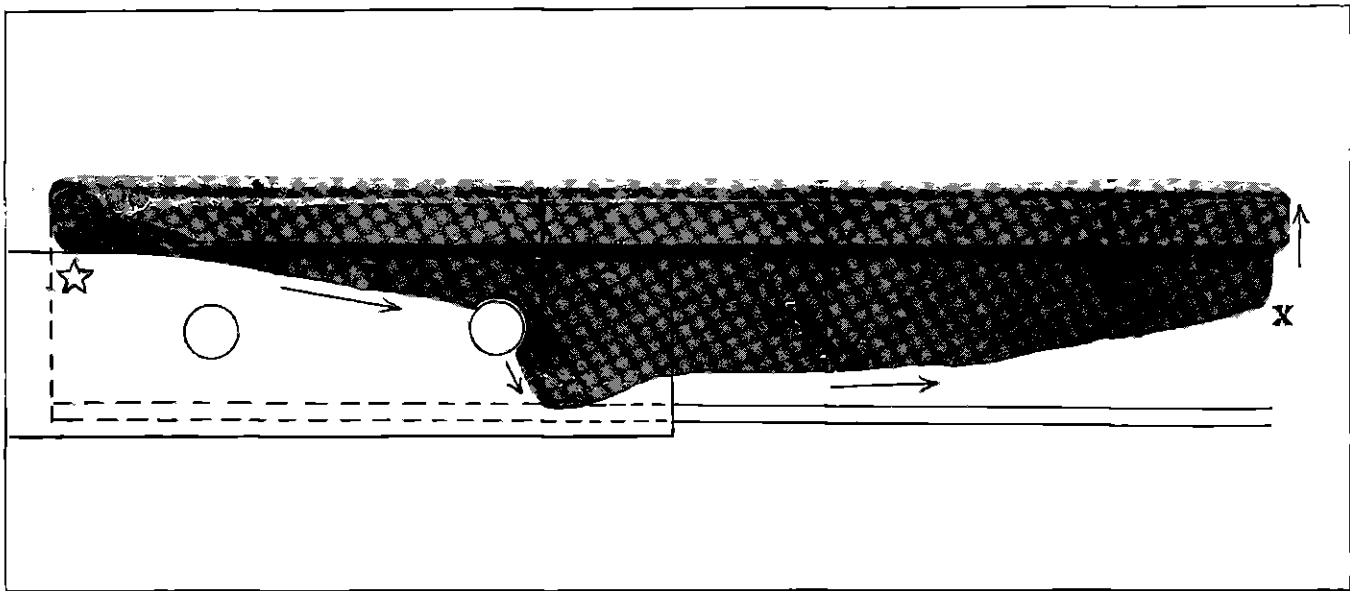


FIG. 2—Gauge side of fragment from receiving end of the rail. Origin of fracture at end of rail under the head at place indicated by star on the cut. Arrows indicate the direction the line of fracture traveled. Position of splice bar shown in outline.

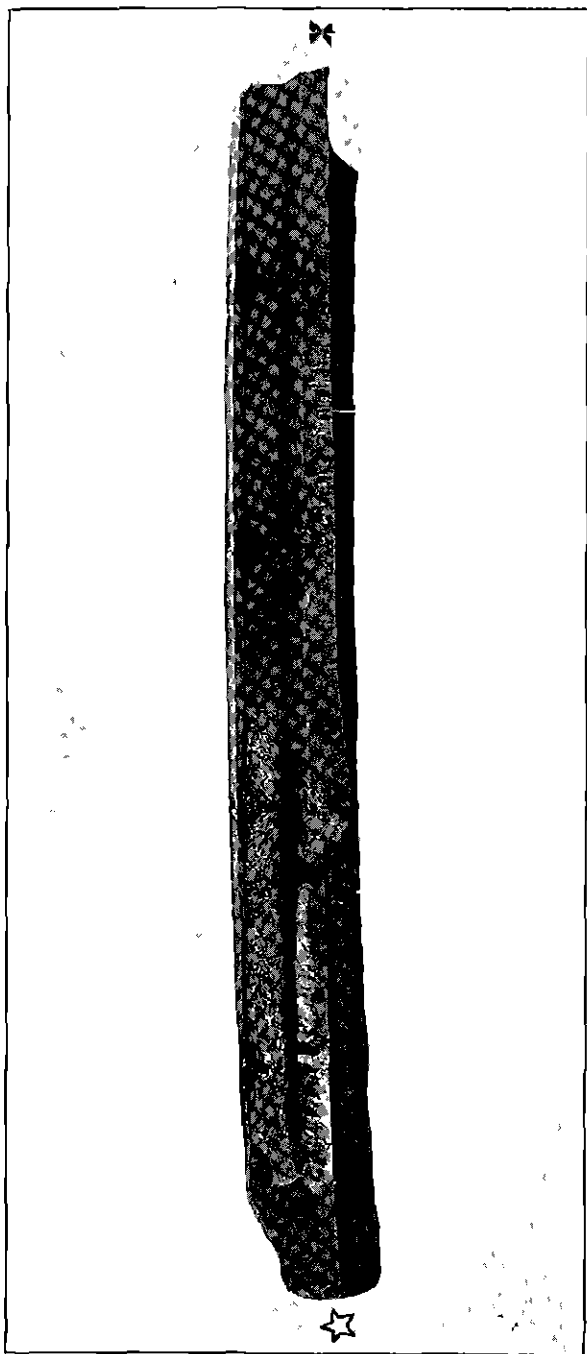


FIG. 3—View of under side of fragment from receiving end of rail, showing fractured surface of web. Origin of fracture at star on cut.

That portion of the line of rupture between the star on the cut and the letter x represents the portion believed to have been formed prior to the time of the accident. When finally broken the short line of rupture above the letter x detached this fragment from the remainder of the rail.

This fragment received a severe blow endwise battering its receiving end, shearing off the inside corner and bending the head convex on the gauge side. The fragmentation of this end of the rail necessarily occurred within a small fraction of a second of time. The results witnessed could hardly have taken place except within a very brief interval of time, in which the acceleration of the mass of the metal in the rails together with the strength of the track structure constituted the resisting forces.

The above explanation of the proximate cause of the derailment and description of the manner of rupture of the rail involved is based upon the indications presented by the fractured surfaces, the character of the fractures and the directions they traveled, together with those circumstances attending the derailment which are definitely known.

Chemical analysis showed the carbon content to be 0.55 at the outside of the head and 0.53 in the web. Segregation played no part in the fracture of the rail.

SUMMARY

The result of the investigation of this derailment fixes the responsibility for its occurrence on a broken rail. It was a web fracture in its origin. The beginning of the fracture was at the end of the rail under the head, where it was covered by the splice bars. The fracture was progressive in its character, appearing later in the web beyond the section obscured by the splice bars. It eventually reached a length of 27 inches. This, apparently, was the condition of the rail when the engine of train No. 87 completed the fracture and broke other portions of the rail. Other features of the accident which followed were of a secondary order.

This accident points to the necessity for the most careful scrutiny in track inspection of rails for the detection of incipient lines of rupture of those types which admit of discovery before complete failure is reached.

Respectfully

W. P. BORLAND,
Director Bureau of Safety