

## INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE CENTRAL VERMONT RAILWAY NEAR BOLTON, VT., ON MARCH 11, 1924

April 17, 1924

To the Commission:-

On March 11, 1924, there was a derailment of a passenger train on the Central Vermont Railway near Bolton, Vt., resulting in the death of 3 passengers and the injury of 69 passengers and 2 employees

Location and method of operation

This accident occurred on that part of the Third District of the Northern Division, extending between White River Junction and St. Albans, Vt., a distance of 117.23 miles. In the vicinity of the point of accident this is a single-track line over which trains are operated by timetable, train orders and a manual block signal system. This accident occurred about 1.48 miles south of Bolton. Approaching the point of accident from the south the track is tangent for nearly two miles. The grade for northbound trains from bridge 74, located 6,830 feet south of the point of accident, is descending, varying from 0.72 per cent to 0.37 per cent to within 230 feet of the point of accident, from which point it is level for a considerable distance beyond the point of accident. The track in this vicinity is laid on a fill averaging 16 feet in height, with 80-pound rails, 33 feet in length, with an average of 19 chestnut, oak and pine ties to the rail length, single-spiked and ballasted with gravel, tie plates are used on curves. The weather was cloudy at the time of the accident which occurred about 4.25 a.m.

Description.

Northbound passenger train No. 1 consisted of one mail car, two baggage cars, two coaches, one Pullman sleeping car, one coach and one Pullman sleeping car, in the order named, hauled by engine 233, and was in charge of Conductor Fitzgerald and Engineman Palmer. The cars were of steel underframe construction with the exception of the

first, seventh and eighth cars which were of all-steel construction. This train left White River Junction at 2 07 a. m., 37 minutes late, passed Waterbury, the last open office at 4 17 a. m., 18 minutes late, and on reaching a point about  $1\frac{1}{2}$  miles south of Bolton was derailed while traveling at a speed estimated to have been about 35 miles an hour.

Engine 232 with the exception of its front pair of engine truck wheels, together with its tender, was derailed to the right and came to rest in an upright position about 750 feet beyond the initial point of derailment. All of the cars of the train were derailed to the right and with the exception of the first and last cars, came to rest down the embankment on their sides, the seventh car being bottom up, in the water and ice of the Winooski River.

#### Summary of evidence

The testimony of the crew was to the effect that prior to the accident nothing unusual occurred on this run, the brakes were working properly and no trouble was experienced in making the various stops en route. Engineman Palmer said he shut off steam and permitted the train to drift through bridge 74, about  $1\frac{1}{2}$  miles south of the point of accident, at a speed of about 25 miles an hour and then opened the throttle lightly and was running at a speed of about 35 miles an hour when the derailment occurred. He noticed the engine strike something and then began to toss around and he made an emergency application of the air brakes. While the train had made up approximately 19 minutes of the lost time since leaving its terminal, White River Junction, in a distance of 71.12 miles, according to the statements of the employees, the speed was not excessive.

A rail which was on the west side of the track was found broken, 7 feet 1 inch of the receiving end of this rail remained intact, a portion 7 inches long was broken into small pieces, and the remaining 25 feet 4 inches of the leaving end was intact. The rail was twisted outward for a portion of its length and the gauge side of the head of the rail abraded.

Division Engineer O'Donnell was of the opinion that the accident was caused by a broken rail and thought the fractures were fresh breaks. He examined the track at the point of accident after the derailment and considered it to be good as to line and surface and the ties to be in fair condition.

Track Supervisor Austin examined the track upon his arrival at the scene of the accident and gauged the track north and south of the point of derailment and found it to be true to gauge. He said the ties which were rail cut from one to two inches and in a few instances in excess of that, had not been in the track over four years. He further said that the rails were braced on each tie and one-half inch shims used. He considered the track was properly maintained and safe for the maximum speed permitted of 55 miles an hour and ascribed the broken rail as the cause of the accident.

Section Foreman Walker said a track walker had patrolled the track on the afternoon of the day prior to the accident and that he himself had inspected the track at the point of accident on the day prior to the accident but had noticed nothing unusual. He examined the track upon his arrival at the scene of the accident and noticed the broken rail. Foreman Walker also said that the ties were deeply rail cut north and south of the point of accident, in some instances extending half way through the ties. He further said he used 30 rails and about 500 ties to make the necessary repairs to the track after the derailment.

Southbound freight train 465 passed the point of accident less than 1½ hours prior to the occurrence of the derailment and Dispatcher Lyons said the crew of that train did not report to him any unusual track condition.

Engine 232 is of the 4-6-2 type, having a total loaded weight, engine and tender, of 362,800 pounds. An inspection of the engine and equipment failed to disclose anything that could have contributed to the accident.

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 broken rail involved in the accident which occurred March 11, 1934, about a mile and a half south of Bolton Station, was branded "L.S. Co Buffalo 800 7 1908". It is reported to have been laid in 1908. It showed little wear, presenting a good appearance, excepting its fractured state.

The fracture of this rail attended and led to the general derailment of train No. 1. The cause of the fracture of the rail is attributable, apparently, to track conditions.

Seven feet, one inch of the receiving end of the rail was intact. Seven inches of length was fragmented. Twenty-five feet, four inches of the leaving end was intact. The fragmented portion showed the rail was partially, or completely, overturned outwardly at the time it broke. It further appeared that this rail was twisted along an intermediate portion of its length. With reference to the ends of the rail the outward torsional permanent set of the head attained a maximum in the vicinity of the fragmented portion and immediately beyond.

The gauge side of the head was flattened or abraded. With the rail in vertical position this flattened edge made an under cut angle, hence the flattening occurred when the rail was not upright but when canted more or less outwardly.

A rail, believed to have been the one next beyond, showed similar effects on the gauge side of the head, extending over a length of about five feet. Then six small scalloped fragments were detached from the inside edge of the flange of the base. Light marks were displayed on the upper surface of the inside flange preceding the scalloped edge on this and similarly on the broken rail.

The directions in which the fractures traversed the cross section of the rail at the fragmented portion, the torsional permanent set, progressive and reaching a maximum in the vicinity of the ruptured zone, thence diminishing in amount constitute the evidence upon which the conclusion is reached that the accident was due to the overturning and fracture of this rail.

The fractured surfaces showed no evidence of structural defects in the steel, nor effects of preceding train movements contributory to final rupture.

The query why this rail overturned will be considered in connection with track conditions in the vicinity of the place of derailment and in other portions of the railroad, and which are regarded as indexical of those which prevailed at the immediate point of derailment. Quite generally, the ties were cut by the bases of the rails. Rails had sunk into the ties varying depths, reaching a maximum of nearly three inches. The outer ends of the ties were adzed off to the level of the bases of the rails.

Wooden braces were used in places in different parts of the track generally in groups. They were used on curves and also on tangent track, and for the most part on

the outside of the rail. A few braces were employed on the gauge side of the rail. The intermittent use of braces seemed to indicate a realization that local strengthening of the track was needed and braces were put on accordingly.

Ties at the scene of the accident, replaced by others in repairs to the track following the derailment exhibited the same rail cut conditions witnessed in ties in other portions of the road.

In conclusion, it is believed the derailment of train No. 1 was due to a weakened track structure, specifically in which there was impaired strength in ties which were deeply rail cut.

#### Summary

Investigation of the circumstances attending the derailment of train No. 1 did not reveal any condition pertaining to the motive power or equipment of the train, nor as to speed of running which would be taken as a cause for the accident. A broken rail apparently was the immediate cause of the derailment. The explanation of the cause of the fracture of this rail, the result of examination of the fractured surfaces, the torsional permanent set of the rail, and inspection of track conditions in the vicinity of the point of derailment has led the engineer-physicist to attribute the cause of the fracture to insecure track structure in which rail-cut weakened ties constitute the chief factor. The findings thus set forth are concurred in.

Respectfully submitted,

W P BORLAND

Director