

**RAILROAD ACCIDENT INVESTIGATION**

**Report No 3870**

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THE BALTIMORE AND OHIO RAILROAD COMPANY

WEST END, W VA

DECEMBER 27, 1959

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**INTERSTATE COMMERCE COMMISSION**

**Washington**

## SUMMARY

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DATE	December 27, 1959
RAILROAD	Baltimore and Ohio
LOCATION	West End, W Va
KIND OF ACCIDENT	Deraiment
TRAIN INVOLVED	Passenger
TRAIN NUMBER	2
LOCOMOTIVE NUMBERS	Diesel electric units 4534, 5470, 5457, 1433, 1408
CONSIST	13 cars
SPEED	30 m p h
OPERATION	Signal indications
TRACKS	Three, 8°20' curve, 1 93 percent ascending grade eastward
WEATHER	Cloudy
TIME	2 05 a m
CASUALTIES	8 injured
CAUSE	Combination of wide gage and excessively worn rail conditions on a curve, which resulted in the breaking of a rail
RECOMMENDATION	That the carrier review its policy as to permissible limits of rail wear and immediately remove from main track service all rails which are excessively worn

PLATE 1

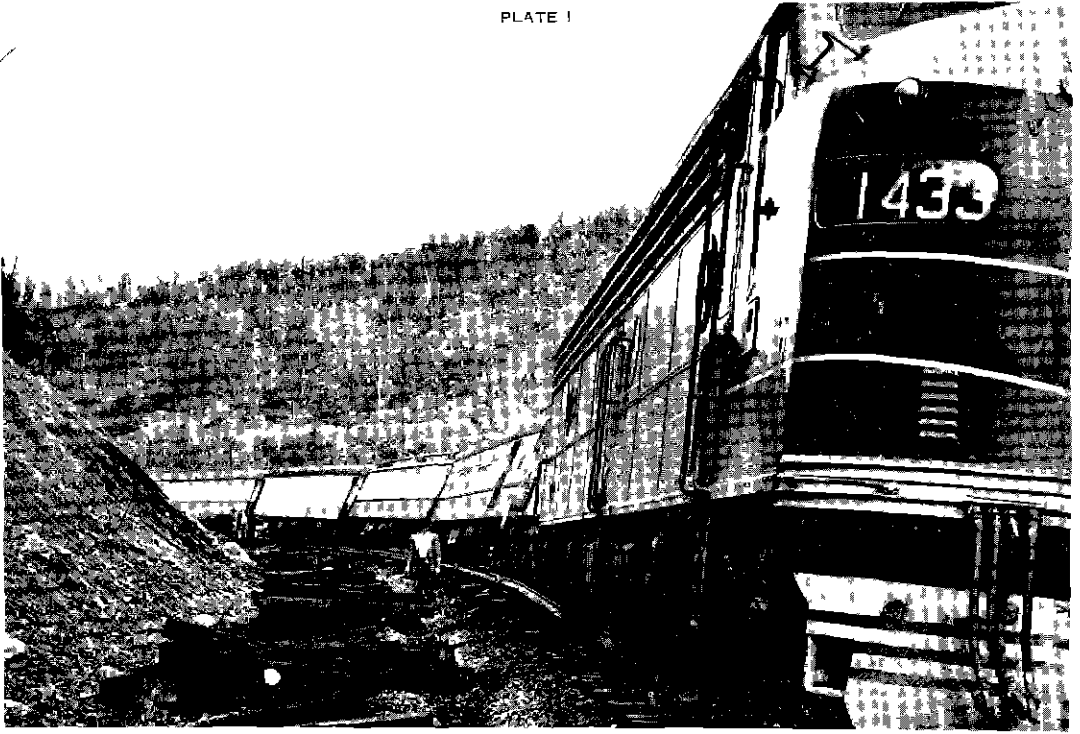
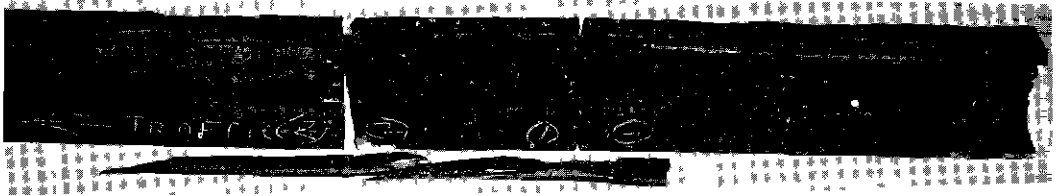
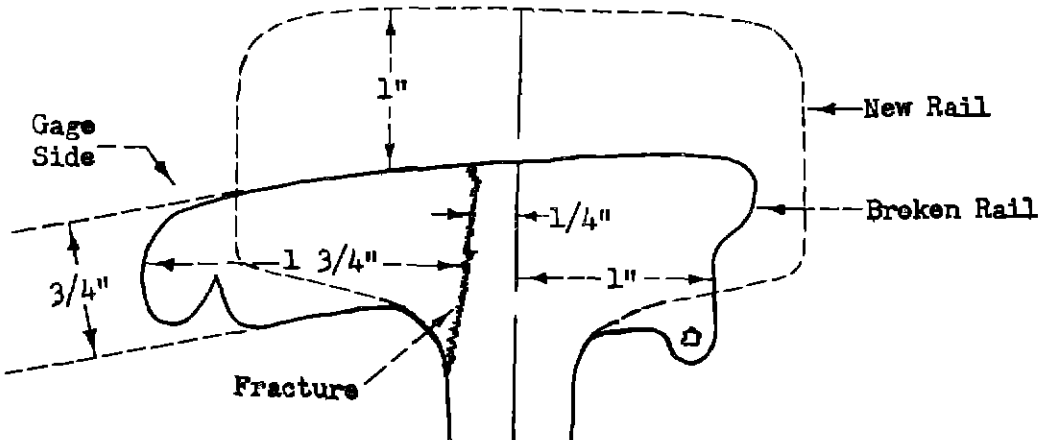


PLATE 2



Portion of broken rail cut in three pieces. Receiving end is toward the right. The three broken pieces of the head are shown in the foreground.

PLATE 3



Cross section of broken 131-pound rail with cross section of new 131-pound rail superimposed

## INTERSTATE COMMERCE COMMISSION

REPORT NO 3870

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS UNDER  
THE ACCIDENT REPORTS ACT OF MAY 6, 1910

THE BALTIMORE AND OHIO RAILROAD COMPANY

April 29, 1960

Accident near West End, W Va , on December 27, 1959, caused by a combination of wide gage and excessively worn rail conditions in a curve, which resulted in the breaking of a rail

REPORT OF THE COMMISSION<sup>1</sup>

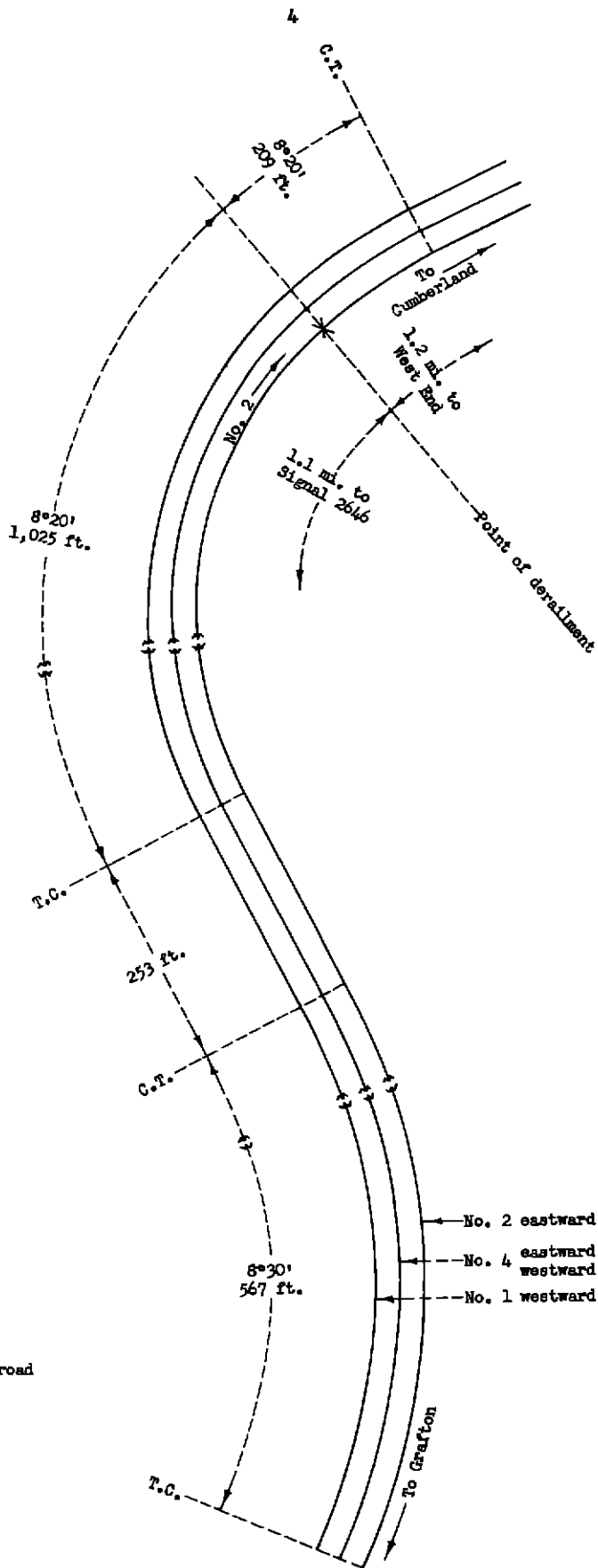
*HUTCHINSON, Commissioner*

On December 27, 1959, near West End, W Va , there was a derailment of a passenger train on the Baltimore and Ohio Railroad, which resulted in the injury of 6 passengers, 1 train-service employee, and 1 train attendant

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<sup>1</sup>Under authority of section 17 (2) of the *Interstate Commerce Act* the above-entitled proceeding was referred by the Commission to Commissioner Hutchinson for consideration and disposition

- Cumberland, Md.  
83.7 mi.
- West End, W. Va.  
1.2 mi.
- ✕ Point of derailment  
6.6 mi.
- Hardman  
9.9 mi.
- Grafton, W. Va.



The Baltimore and Ohio Railroad  
 West End, W Va.  
 December 27, 1959

### Location of Accident and Method of Operation

This accident occurred on that part of the Cumberland Division extending between Grafton, W Va , and Cumberland, Md , 101 4 miles . In the vicinity of the point of accident this is a three-track line over which trains moving with the current of traffic on tracks Nos 1 and 2, and in either direction on track No 4, are operated by signal indications . From the south the main tracks are designated as No 2, eastward, No 4, eastward and westward, and No 1, westward .

The derailment occurred on track No 2 at a point 16 5 miles east of Grafton and 1 2 miles west of West End, W Va . From the west there are, in succession, an 8°30' curve to the left 567 feet in length, a tangent 253 feet, and an 8°20' curve to the right 1,025 feet to the point of derailment and 209 feet eastward . In this vicinity the grade is 1 93 percent ascending eastward .

In the vicinity of the point of derailment the structure of track No 2 consists of 131-pound rail, 39 feet in length, with the south and north rails relaid with secondhand rails in 1956 and 1954, respectively, on an average of 22 treated ties to the rail length . It is fully tie-plated with double-shoulder tie plates, spiked with 2 rail-holding spikes and 1 plate-holding spike per tie plate, and it is provided with 6-hole, 36-inch joint bars and an average of 8 rail anchors per rail . It is ballasted with crushed stone to a depth of 10 inches below the bottoms of the ties and has a ballast section in accordance with specifications of the carrier .

Automatic signal 2646, governing eastbound movements on track No 2, is located 1 1 miles west of the point of derailment .

This carrier's maintenance-of-way rules and instructions read in part as follows .

#### Defective, Broken and Failed Rails

900 Frequent and careful inspection must be given to all rail in track, particularly on curves, \* \* \*

901 Defective, broken and failed rails must be promptly replaced . Until replaced, protection must be provided .

The maximum authorized speed for passenger trains in the vicinity of the point of derailment is 35 miles per hour .

### Description of Accident

No 2, an eastbound first-class passenger train, consisted of diesel-electric units 4534, 5470, 5457, 1433, and 1408, coupled in multiple-unit control, 1 passenger-baggage car, 6 coaches, 1 slumbercoach, 1 sleeping car, 1 dining car, 2 sleeping cars and 1 observation car, in the order named . The cars were of all-steel construction, and the 8th, 9th, 11th, 12th, and 13th cars were equipped with tightlock couplers . This train departed from Grafton at 1 41 a m , 19 minutes late, passed Hardman, W Va , the last open office 9 9 miles east of Grafton, at 1 56 a m , 19 minutes late, and while moving at a speed of about 30 miles per hour, as indicated by the tape of the speed-recording device, the rear trucks of the 1st diesel-electric unit, both trucks of the other 4 units and the 1st to 7th cars, inclusive, and the front truck of the 8th car, were derailed at a point 1 2 miles west of West End .

No 2 stopped with the front end 508 feet east of the point of derailment . There were no

separations between units of the train. The diesel-electric units stopped upright on the structure of track No. 2 and in line with the rails. All the derailed cars stopped upright on the track structure in positions similar to those of the cars shown in PLATE 1. All the diesel-electric units, and the 2nd, 6th and 7th cars were slightly damaged. The 1st, 3rd, 4th, and 5th cars were somewhat damaged.

The train-baggage-man was injured.

The weather was cloudy at the time of the accident, which occurred about 2:05 a. m.

During the 30-day period immediately preceding the date of the accident the average daily movement over track No. 2 in the vicinity of the point of accident was 18.9 trains, having an average weight of 4,434 tons.

### Discussion

As No. 2 was approaching the point where the derailment occurred, its speed was about 30 miles per hour. The enginemen were in the control compartment at the front of the locomotive, the train-baggage-man was in the first car, the conductor was in the 6th car, and the flagman was in the last car. The brakes of the train had been tested and had functioned properly when used en route. The headlight was lighted brightly. All the members of the crew said that before the accident occurred, the train was riding smoothly and there was no indication of defective track or equipment. The engineer said that after the train passed signal 2646, which indicated proceed, and entered the curve on which the accident occurred, he felt the locomotive lurch as it moved over the point of derailment. He said he then realized that a derailment had occurred, and that he immediately initiated an emergency application of the brakes.

Examination of the equipment of No. 2 disclosed no condition which could have caused or contributed to the cause of the accident.

After the accident occurred a broken rail was found on the south side of track No. 2 at the point of derailment. A portion of the head on the gage side of the rail 29 inches in length had broken off and was separated into three pieces, all of which were recovered. From a point 17 feet 10 inches east of the receiving end of the rail, a vertical fracture extended approximately 37 inches diagonally eastward from the web to the gage side of the head. This joined a vertical break which extended from the head on the gage side to the web, at a point 18 feet 6 inches from the receiving end of the rail. The initial break apparently occurred at the latter point as No. 2 was moving over the curve and, as a result of wide gage at this point and failure of a portion of the head section of the rail, wheels of the rear truck of the first diesel-electric unit were permitted to drop inside the web of the south rail and the trailing units of the locomotive and following equipment then became derailed. Both rails were displaced and the track was destroyed throughout a distance of more than 290 feet east, and 300 feet west, of the point of derailment.

Examination of track No. 2 after the accident occurred disclosed that there were variations in the gage on the curve to a maximum gage of 4 feet 9-1/2 inches. Variations also were found in the alignment and superelevation. The rails on the south side of this track were excessively worn and rails on the north side of this track were curve worn to a considerable extent. A rail-defect detector car was operated over this track in the vicinity of the point of accident on December 1, 1959, and one defective rail was found in the curve. The track in this section was surfaced in August 1958, at which time old and defective ties were replaced. On December 17, 1959, the track

on the curve was spot surfaced at some points to correct variations from the specified superelevation. On the same day the gage was checked as being 4 feet 9¼ inches due to worn condition of rails in the curve, and the rails were mirror-checked. No exceptions were taken to the gage or to the condition of the rails.

The broken rail was manufactured by the Bethlehem Steel Company at Steelton, Pa., in May 1940, and bore heat number 84152. Laboratory tests made after the accident occurred disclosed that the fractures of this rail resulted from service stresses of the head after the head section had been worn from an original depth of 1¾ inches to a remaining thickness of ¾-inch. An analysis disclosed that the chemical composition of the rail met the specifications of the carrier.

The investigation disclosed that the failed rail had been curve-worn before it was laid on the south side of track No. 2 at the point where the accident occurred. In the normal contour of a new 131-pound rail section the width of the head is 3 inches and the depth of the head is 1¾ inches. The head of the rail involved had been reduced from its normal contour by wear, and distortion resulting from metal flow, to a thickness of ¾-inch on the gage side in the cross-sectional area of the head at the point where the failure occurred, and at this point the field side of the rail also was considerably worn and distorted. In addition to the worn condition of the rails, the gage was wide throughout the curve. It is apparent that as the locomotive of No. 2 was moving on this curve at a speed of about 30 miles per hour with the wheels on the north side of the locomotive crowding the high rail, only the outer portion of the treads of the wheels on the south side of the locomotive were bearing on the rails in the south side of the curve. It is evident, under these circumstances, that at the point of accident the gage was sufficiently wide so that the outer portion of the treads of the wheels were in contact with only that portion of the head of the rail projecting inward on the gage side which was worn and distorted and which was not supported by the girder strength of the web section of the rail. As a result, a portion of the head broke off on the gage side of this rail, permitting wheels on the south side of the rear truck of the first diesel-electric unit to drop inside the south rail and the general derailment then occurred. The pieces which broke off the head of this rail were 1¾ inches wide and ¾-inch thick at the point of initial failure and their combined length was 29 inches. Laboratory analysis of the failed rail disclosed that the fracture, which was 29 inches long, showed all new break and resulted from service stresses after being worn to a ¾-inch head thickness.

According to the statement of an official of the engineering department of the carrier, it is the practice for a track foreman to make a detailed inspection of all rails in his territory every 6 to 8 weeks. The foreman in his report to the track supervisor indicates any rails which he considers to be in defective condition and the track supervisor then inspects such rails and if necessary schedules their replacement. If a supply of rails is not available in the track supervisor's territory, replacement is delayed until rails are obtained from another territory. It is the policy of the carrier to replace rail when it becomes curve-worn to the extent of 1 inch, and to change out rail for head-wear only when such wear reaches the point that the rail indicates strain and cracks in the fillet under the head. This official stated that after completion early in December of a detailed inspection of all rails in this territory, it was determined that rails on the curve where the accident occurred should be programmed for replacement during the first quarter of 1960. After the accident occurred the speed of trains moving over track No. 2 on this curve was restricted until all rails in this portion of the track were replaced.

No defective condition was found in the equipment of the train. Considering the wide gage throughout the curve and the worn condition of the rails on both the high and the low sides of the curve, it is apparent from the manner in which the derailment occurred that the failed rail was broken



as a result of a combination of wide gage and the excessively worn condition of the head of the low rail, a portion of which broke off under the stresses which were then imposed on it

#### **Cause**

This accident was caused by a combination of wide gage and excessively worn rail conditions in a curve, which resulted in the breaking of a rail

#### **Recommendation**

It is recommended that the carrier review its policy as to permissible limits of rail wear and immediately remove from main track service all rails which are excessively worn

Dated at Washington, D C , this twenty-ninth  
day of April, 1960

By the Commission, Commissioner Hutchinson

(SEAL)

HAROLD D McCOY,

Secretary