INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 3248

THE PENNSYLVANIA RAILROAD COMPANY

REPORT IN RE ACCIDENT

NEAR CONEMAUGH, PA., ON

APRIL 17, 1949

SUMMARY

Date:	April 17, 1949
Railroad:	Pennsylvania
Location:	Conemaugh, Pa.
Kind of accident:	Derailment
Train involved:	Freight
Train number:	Extra 6407 West
Engine number:	6407
Consist:	82 cars, caboose
Estimated speed:	25 m. p. h.
Operation:	Automatic block and cab-signal systems
Tracks:	Four; 5°30' curve; 0.97 percent descending grade westward
Weather:	Clear
Time:	11:08 a. m.
Casualties:	1 killed; 2 injured
Cause:	Broken rail

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 3248

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

THE PENNSYLVANIA RAILROAD COMPANY

June 10, 1949

Accident near Conemaugh, Pa., on April 17, 1949, caused by a broken rail.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On April 17, 1949, there was a derailment of a freight train on the Pennsylvania Railroad near Conemaugh, Pa., which resulted in the death of one employee, and the injury of two employees. This accident was investigated in conjunction with a representative of the Pennsylvania Public Utility Commission.

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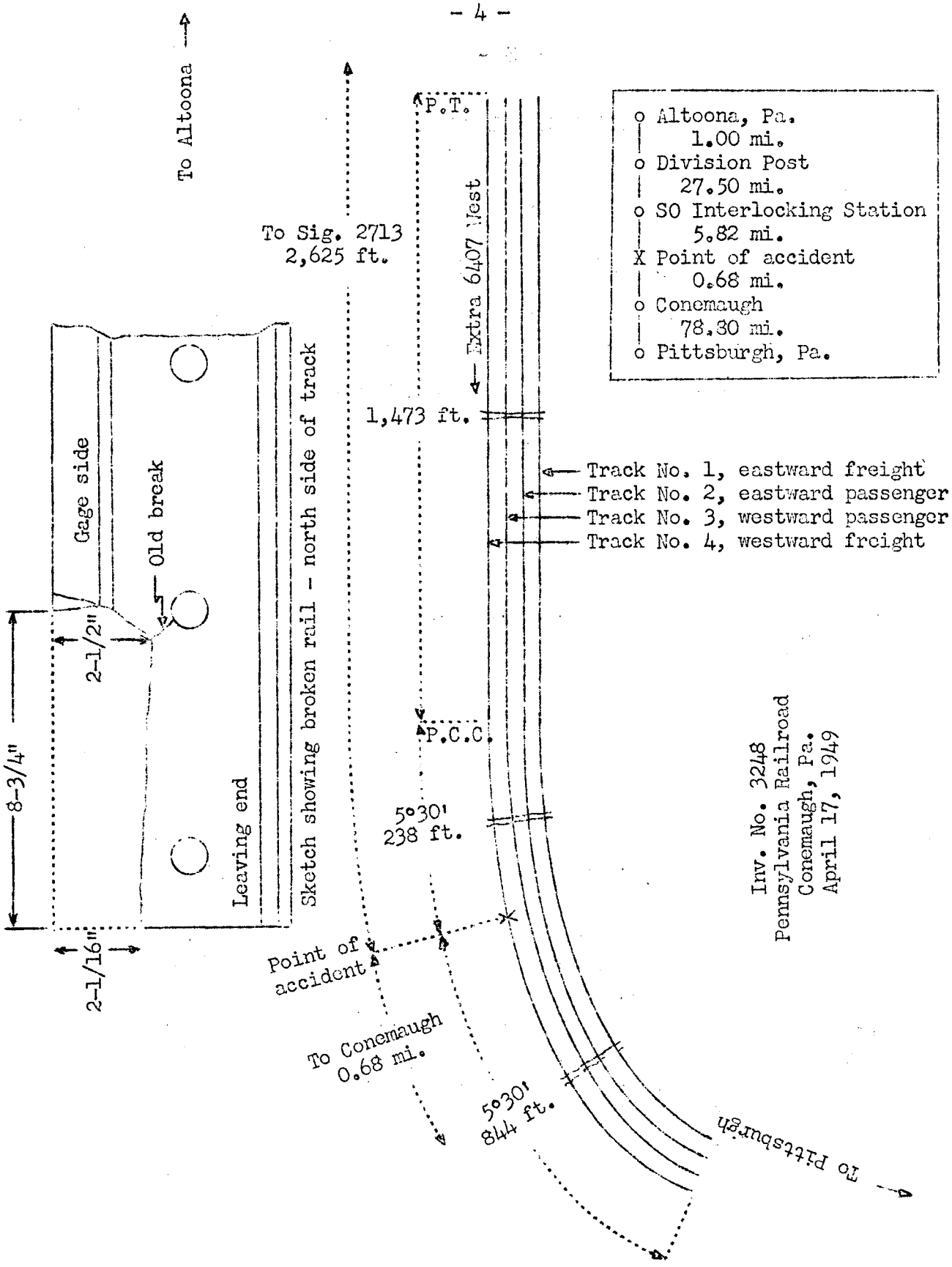
[1] Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.


To Altoona
To Sig. 2713
2,625 ft.
P.T.
Extra 6407 West
1,473 ft.
P.C.C.
5°30'
238 ft.
5°30'
844 ft.
Point of accident
To Conemaugh
0.68 mi.
To Pittsburgh
Track No. 1, eastward freight
Track No. 2, eastward passenger
Track No. 3, westward passenger
Track No. 4, westward freight
o Altoona, Pa.
1.00 mi.
o Division Post
27.50 mi.
o SO Interlocking Station
5.82 mi.
X Point of accident
0.68 mi.
o Conemaugh
78.30 mi.
o Pittsburgh, Pa.
Gage side
Old break
Leaving end
2-1/2"
8-3/4"
2-1/16"
Sketch showing broken rail - north side of track
Inv. No. 3248
Pennsylvania Railroad
Conemaugh, Pa.
April 17, 1949

Location of Accident and Method of Operation

This accident occurred on that part of the Pittsburgh Division extending between Division Post, near Altoona, and Pittsburgh, Pa., 112.8 miles. In the vicinity of the point of accident this is a four-track line, and the main tracks from south to north are designated as No. 1, eastward freight; No. 2, eastward passenger; No. 3, westward passenger; and No. 4, westward freight. Trains moving with the current of traffic on tracks Nos. 1, 2 and 4, and in either direction on track No. 3, are operated by automatic block-signal and cab-signal indications. The accident occurred on track No. 4 at a point 34.32 miles west of Altoona and 0.68 mile east of the station at Conemaugh. From the east, track No. 4 is tangent 1,473 feet, then there is a compound curve to the left, having a maximum curvature of 5°30', 238 feet to the point of accident and 844 feet beyond. Between points 22.52 miles and 1.18 miles east of the point of accident, the grade for west-bound trains is generally descending, then throughout a distance of 1.18 miles immediately east of the point of accident the grade varies between 0.59 percent and 1.20 percent descending to the point of accident, where it is 0.97 percent.

At the point of accident, the tracks are laid on a hillside cut paralleling the north bank of the Conemaugh River. A drainage ditch about 2.5 feet deep is about 10 feet north of the center-line of track No. 4. The structure of track No. 4 consists of 131-pound controlled-cooled rail, 39 feet in length, laid new during 1942, on an average of 24 treated ties to the rail length. It is fully tieplated with double-shoulder tieplates, spiked with a maximum of 3 rail-holding and 2 anchor spikes per tieplate, provided with 6-hole joint bars fully bolted, and 8 rail anchors per rail length. It is ballasted with crushed stone to a depth of 18 inches below the ties. The specified curvature was 5°30', the specified superelevation was 4 inches, and the specified gage was 4 feet 8-1/2 inches.

Automatic signal 2713, governing west-bound movements on track No. 4 through the block in which the accident occurred, is located 2,625 feet east of the point of accident.

Timetable special instructions prescribe the maximum authorized speed for all trains on any track on the curve involved as 40 miles per hour.

Description of Accident

Extra 6407 West, a west-bound freight train, consisting of engine 6407, a 2-10-4 type, 82 cars and a caboose, passed SO interlocking, the last open office, 5.82 miles east of the point of accident, at 10:58 a. m., passed signal 2713, which indicated Clear, and while it was moving on track No. 4 at an estimated speed of 25 miles per hour the engine, the tender, and the first thirty-six cars were derailed.

The engine overturned to the right and stopped on its right side in the drainage ditch about 5 feet north of track No. 4 and parallel to it, with the front of the engine 571 feet west of the point of derailment. The tender remained coupled to the engine and stopped on its right side at the rear of the engine, and in line with it. The engine and the tender were considerably damaged. The brakeman's booth on top of the tender was demolished. The first thirty-six cars stopped in various positions across the main tracks or north of them. Of these cars, twenty-six were ordered by the carrier to be destroyed, and the other ten cars were considerably damaged.

The front brakeman was killed, and the engineer and the fireman were injured.

The weather was clear at the time of the accident, which occurred about 11:08 a. m.

Engine 6407 is equipped with a booster engine mounted on the trailer truck. The total weight of engine 6407 in working order is 574,730 pounds, distributed as follows: Engine truck, 64,110 pounds; driving wheels, 379,300 pounds; and trailer truck, 131,320 pounds. The specified diameters of the engine-truck wheels, driving wheels, and the Nos. 1 and 2 pairs of trailer-truck wheels, are, respectively, 33, 70, 36 and 44 inches. The driving wheelbase is 24 feet 4 inches long, the total length of the engine wheelbase is 49 feet 3 inches, and the total length of the engine and its tender is 117 feet 8 inches. The spring-borne weight of the engine is supported by an equalized spring system, which is divided into two parts. The front part consists of the engine truck and the Nos. 1, 2, and 3 pairs of driving wheels, and the rear part includes the Nos. 4 and 5 pairs of driving wheels and the trailer truck. Lateral motion between the engine-truck bolster and the truck frame is restrained by two heart-shape constant-resistance rockers. The trailer truck is provided with a heart-shape rocker-type centering device. An adjusted radial buffer assembly with floating block is arranged between the engine and the tender. All the journals of the engine-truck and trailer-truck axles are arranged with out-board journal boxes. The engine is not equipped with a speedometer.

The tender is rectangular in shape, provided with a cast-steel one-piece water bottom, and has capacity for 29.4 tons of coal and 21,000 gallons of water. The weight of the tender loaded is 411,500 pounds. It has two 8-wheel trucks, which are constructed with integrally cast sideframes, pedestals, non-swing bolsters, female centerplates, and friction-type side bearings. The male centerplates are cast integrally with the water-bottom, and are provided with wear plates. The wheelbase of each truck is 13 feet 9 inches long, and the distance between truck centers is 25 feet 3 inches. A brakeman's booth is mounted on top of the tender cistern. It is 11.5 feet above the tops of the rails and 18 inches inward from the rear end-sheet.

The last class 3 repairs of engine 6407 were completed November 19, 1947. The last general overhaul repairs were completed January 6, 1949. The last monthly inspection and repairs were completed April 14, 1949. The last trip inspection and repairs were completed at Altoona on April 16, 1949. The accumulated mileage since the last class repairs was 53,953 miles, and the mileage since the last monthly certificate was 459 miles.

The theoretical equilibrium, safe and overturning speeds of engine 6407 moving on a 5°30' curve having a superelevation of 4 inches are, respectively, 33.3, 53.2 and 82.1 miles per hour.

Discussion

As Extra 6407 West was approaching the curve on which the accident occurred, the enginemen were in the cab of the engine, the front brakeman was in the brakeman's booth on the tender, and the assigned conductor, the flagman, and a pilot-conductor were in the caboose. Signal 2713 and both cab signals indicated Clear, and the enginemen called the indication. The engineer said that the throttle was closed and the train was drifting on the descending grade at a speed of about 25 miles per hour. The train brake-system had been released during a period of several minutes prior to the time the accident occurred, and the engine, the tender and the cars were moving freely. Soon after the engine entered the 5°30' curve to the left, the front of the engine dropped, then the engineer noticed that the right wheels of the engine were moving on the ties. He immediately moved the brake valve to emergency position, but the engine overturned after moving about 150 feet and before the brakes became effective. When the front of the engine dropped, the engineer moved

the brake valve to emergency position before the fireman could call a warning. Prior to that time the engine had been moving smoothly, there was no thrusting or rolling, and there was no indication of anything binding or fouling on either the engine or the tender. The brakes of this train had been tested and had functioned properly en route. The members of the crew estimated that the train was moving at a speed of about 25 miles per hour when the accident occurred.

Examination of engine 6407 after the accident disclosed that the throttle was closed and the automatic brake valve was in emergency position. The engine-truck assembly was badly twisted as a result of the derailment. There were severe scoring marks on the engine-truck frame inside the right wheel and on the journal-box pedestal cap outside the left wheel. At this latter location, there were smooth rubbing marks on the inside of the frame and outside the left wheel. All parts of the engine-truck were in place and intact. The counterbalances on all of the driving wheels on the left side bore batter marks on their forward corners. There was considerable damage to the rods on the right side as a result of the derailment. The driving-wheel assembly was in serviceable condition. There was some variation of back-to-back spacing of companion tires, but all measurements were in compliance with the standards of the carrier. The height and thickness of the flanges were within the limits prescribed by the carrier. The lateral motion of all pairs of wheels was in accordance with the requirements of the carrier. All wheel centers were tight on their axles, and all tires were tight on their wheel centers. The spring arrangements were maintained in good alinement, and there was no indication of binding or fouling. The trailer-truck assembly was somewhat damaged during the derailment, but all parts were intact and in place, except the centering-device rockers, which had fallen to the ballast when weight was removed as the engine overturned. The drawbar and the safety-bar were intact, but they were twisted about 10 degrees to the right. The radial-buffer assembly was intact and well lubricated. Both tender trucks were intact, and measurements of the wheels disclosed no defective condition. The friction-type side bearings and side-bearing plates bore no indication of improper clearance, or of having run in continuous contact. The splash plates in the cistern were in good condition. Examination of the centerplates of the front truck disclosed lack of good lubrication, and the wear plate was disconnected from the male casting. Also, there were loose globules of welding material on the bottom of the female centerplate. However,

there was good clearance in the fit of the male centerplate within the female centerplate, and there was no indication of binding, or of any appreciable restriction to freedom of movement. There was no mark on the throat of any wheel flange to indicate restraint to proper slueing in accordance with track curvature. The rear truck was intact and in good condition.

Examination of track No. 4 throughout a distance of 445 feet immediately east of the point of derailment disclosed that the surface, gage and alinement were adequately maintained for the maximum authorized speed. There was no indication of any obstruction having been on the track, or of any dragging equipment. The first indication of disturbed track structure was a mark on the receiving end of a joint bar inside the high rail at a point 185 feet east of the point of derailment. At a point 4 feet westward from the first mark the high rail was turned outward, and there were numerous wheel marks in the web of the rail. Between points 185 feet east of the point of derailment and 515 feet west thereof, track No. 4 was destroyed, the rails were torn loose from the ties, the joint bars were separated, and numerous wheel marks appeared on rails, joint bars, and on joint-bar bolts and nuts. All of these conditions were a result of the derailment.

The derailment occurred at a joint between two rails on the high side of the curve, at a point 238 feet west of the east end of the curve, where the specified curvature was 5°30' and the specified superelevation was 4 inches. At this point a piece was broken from the leaving end of a rail, and the break occurred within the limits of the joint bars. An old fracture 1 inch in length extended upward and westward from the No. 2 bolt hole. A new fracture extended upward and slightly eastward from the end of the old fracture to the head of the rail, then it extended through the head in a square break above the No. 2 bolt hole at a point 8-3/4 inches from the leaving end of the rail. Another new fracture extended horizontally from the end of the old fracture to the leaving end of the rail. This latter fracture was practically straight and was 2-1/2 inches below the top of the rail at its east end and 2-1/16 inches below the top at its west end. This piece of rail was not recovered. The top of the receiving end of the adjacent rail was battered at the gage side, then a light flange mark extending diagonally outward appeared on the top surface of the rail. Because of subsequent damage, it could not be determined where this wheel dropped outside the rail.

The broken rail involved was manufactured and laid in the track during 1942. At the point of break the rail was curve-worn. The curve-wear extended upward and outward at an angle of 18 degrees from perpendicular, and it was worn 1/4 inch outward from the original contour at the top of the rail. The head-wear was 1/16-inch. This rail was last tested with a rail-defect detector car on September 14, 1948, and no defective condition was indicated at that time. The track was last surfaced during February, 1949, was last inspected for surface, gage and alinement on March 30, 1949, and was inspected daily except Sunday by a track patrolman. The accident occurred on Sunday. The crack in the web of the rail in question was concealed from detection by the joint bars. The origin of the fracture was in the web. It is probable that the break occurred under a preceding train, and that the piece of rail remained in normal position until it was displaced by the right engine-truck wheel of engine 6407. Although the engine was moving on a 5°30' curve to the left at a speed somewhat less than equilibrium speed, a force would be exerted at the point of contact between the flange of the right engine-truck wheel and the high rail sufficient to deflect the engine from a tangential line. Considering the broken rail and the flange mark on the next rail westward, together with the wear marks on the engine-truck frame and journal boxes, it is apparent that the piece of rail was thrown outward as a result of flange pressure. Then the right engine-truck wheel mounted the top surface of the head of the adjoining rail, moved diagonally outward and dropped outside the rail. Lateral pressure exerted by the engine-truck frame caused the track to separate and the rails on the high side of the curve to overturn, then the general derailment occurred.

Cause

It is found that this accident was caused by a broken rail.

Dated at Washington, D. C., this tenth day of June, 1949.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.