

INTERSTATE COMMERCE COMMISSION
WASHINGTON

INVESTIGATION NO. 2726
THE PENNSYLVANIA RAILROAD COMPANY
REPORT IN RE ACCIDENT
AT SHORE, PA., ON
SEPTEMBER 6, 1943

SUMMARY

Railroad:	Pennsylvania
Date:	September 6, 1943
Location:	Shore, Pa.
Kind of accident:	Derailment
Train involved:	Passenger
Train number:	Passenger Extra 4930 East
Engine number:	4930
Consist:	16 cars
Speed:	56 m. p. h.
Operation:	Interlocking
Track:	Four; tangent; 0.61 percent descending grade eastward
Weather:	Clear
Time:	6:06 p. m.
Casualties:	79 killed; 129 injured
Cause:	Broken journal

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2726

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

THE PENNSYLVANIA RAILROAD COMPANY

October 1, 1943.

Accident at Shore, Pa., on September 6, 1943, caused by a
broken journal.

REPORT OF THE COMMISSION¹

PATTERSON, Commissioner:

On September 6, 1943, there was a derailment of a passenger train on the Pennsylvania Railroad at Shore, Pa., which resulted in the death of 78 passengers and 1 dining-car employee, and the injury of 102 passengers, 5 Pullman employees and 22 dining-car employees. This accident was investigated in conjunction with representatives of the Pennsylvania Public Utility Commission.

¹Under 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.

Philadelphia Terminal Div.	o Holmesburg Junction, Pa.	4.9 mi.
	X Shore (Point of accident)	2.9 mi.
	o North Philadelphia	4.4 mi.
	o 30th Street, Philadelphia	5.0 mi.
	o Darby, Pa.	20.6 mi.
	o Wilmington, Del.	68.4 mi.
	o Baltimore, Md.	40.1 mi.
	o Washington, D. C.	

To Holmesburg Junction →

P.C.

0.27 mi.

Position of signal
bridge after accident

Foundation of westward
home-signal bridge

468 ft.

Cross-
over 17

Point of
accident

150.0 ft.

Shore

1,582
ft.

Passenger Extra
4930 East

1.06 mi.

Eastward
home-signal
bridge

Track No. 5
Track No. 4
Track No. 3
Track No. 2
Track No. 1
Track No. 0

P.T.

← To Darby

Broken journal
5-1/2" by 10"

Inv. No. 2726

Pennsylvania Railroad

Shore, Pa.

September 6, 1913

Location of Accident and Method of Operation

This accident occurred on that part of the Philadelphia Terminal Division extending between Darby and Holmesburg Junction, Pa., 17.2 miles. This line was equipped with an overhead catenary system for the electric propulsion of trains. In the vicinity of the point of accident this was a four-track line over which trains were operated with the current of traffic by an automatic block and cab-signal system, the indications of which superseded time-table superiority. The main tracks from south to north were No. 1, eastward passenger, No. 2, eastward freight, No. 3, westward freight, and No. 4, westward passenger. Secondary track No. 0 paralleled track No. 1 on the south, and secondary track No. 5 paralleled track No. 4 on the north. Within interlocking limits at Shore, crossover No. 17 connected track No. 2 with track No. 0. This crossover intersected track No. 1 by a No. 15 movable-point crossing at an angle of $3^{\circ}49'05.9''$. The accident occurred on track No. 1 at the west frog of the crossing, 150.9 feet east of the tower. The main tracks were tangent throughout a distance of 1.06 miles west of the point of accident and 0.27 mile east of it. The grade for east-bound trains was 0.61 percent descending 4,822 feet to the point of accident and 675 feet beyond.

The eastward and the westward home signals of the interlocking at Shore were mounted on signal bridges located, respectively, 1,582 feet west and 68 feet east of the point of accident. A dragging-equipment detector was located 2.11 miles west of the eastward home signal. The westward home-signal bridge was a substantial steel structure, which also supported the catenary line and an overhead high-voltage electric-power line. It consisted of a lattice truss, which spanned tracks Nos. 1 to 5, inclusive, and was supported by A-frame bents, on concrete pedestal foundations, on the north side of track No. 5 and on the south side of track No. 1. The pedestal foundation on the south side was 10 feet $8\frac{5}{8}$ inches south of track No. 1.

The track structure consisted of 130-pound rail, 39 feet in length, on 22 treated ties to the rail length. It was fully tieolated, single-spiked and was ballasted with stone to a depth of 18 inches.

Operating rules read in part as follows:

76a. Engine and train crews as frequently as opportunity permits must observe engines and cars in their train, moving and standing, to detect any conditions that might interfere with the safe movement of trains.

77. So far as practicable and other duties permit, employees will observe passing trains for defects and should there be any indication of conditions endangering the train they must take necessary measures for its protection.

Train and engine crews on moving trains will be on the lookout for signals when passing other trains and while passing stations, highway crossings where watchmen are on duty and points where trackmen and other employees are working and when practicable exchange hand signals with them.

The maximum authorized speed for passenger trains was 80 miles per hour on certain sections of the line between Washington and North Philadelphia, and between North Philadelphia and the point of accident it was 70 miles per hour.

Description of Accident

Passenger Extra 4930 East, an east-bound passenger train, designated as an advance section of the Congressional Limited, consisted of electric engine 4930, 8 coaches, 2 dining cars and 6 Pullman parlor cars, in the order named. The cars were of steel construction. After a terminal air-brake test was made this train departed from Washington, D. C., 141.4 miles west of Shore, at 4 p. m., and made no stop en route. It passed North Philadelphia, Pa., 2.9 miles west of Shore and the last open office west of Shore, at 6:03 p. m., passed the eastward home signal at Shore, which displayed proceed, and while moving on track No. 1 at a speed of 56 miles per hour it was derailed 150.9 feet east of the tower at Shore.

The engine and the first six cars, remaining coupled, stopped with the front end of the engine 2,193 feet east of the point of accident. The rear truck of the sixth car became detached and stopped adjacent to track No. 1, on the roadbed, 740 feet east of the point of accident. The seventh to the fourteenth cars, inclusive, and the front truck of the fifteenth car were derailed. The seventh car struck the south A-frame support of the westward home-signal bridge, and the frame was sheared from the concrete foundation and moved 22 feet eastward. This car was sheared practically its entire length diagonally from the floor on the right side to the juncture of the roof and side sheets on the left side, and the rear end stopped against the A-frame. The front truck became detached and stopped on the roadbed, 39 feet west of the rear end of the car. The eighth car stopped on its right side, on top of the rear end of the seventh car, with the center of the roof against the A-frame. The superstructure was crushed inward and the center sills were bent. Practically all the fatalities occurred in the seventh and eighth cars. The ninth to twelfth cars, inclusive, stopped

in various positions, practically upright, and across the main tracks. These cars were considerably damaged. The thirteenth and fourteenth cars stopped upright and in line with the track. These cars were slightly damaged.

It was clear at the time of the accident, which occurred at 6:06 p. m.

Discussion

Passenger Extra 4930 East was moving at a speed of 56 miles per hour in territory where the maximum authorized speed was 70 miles per hour when the train became derailed. Prior to the time of the accident the engine and the cars were riding smoothly and there was no indication of defective track. The first the crew knew of anything being wrong was soon after the front portion of the train passed the tower at Shore, when the air brakes became applied in emergency, and the train stopped abruptly.

After the accident it was found that the left front journal of the front truck of P. R. R. 1860, the seventh car, was broken off. Beginning at the heel of the west frog of the movable-point crossing and extending eastward 23 feet 4-1/4 inches, an angular flange-mark appeared on top of the head of the north rail. Extending from the east end of this mark a distance of 48 feet 8-1/4 inches to the heel block of the east movable point of the crossing, the ties bore wheel marks outside the north rail and inside the south rail. Immediately east of the heel block the track was torn up a distance of 480 feet, and from this point eastward it was damaged 1,056 feet.

During a period of 82 days prior to the date of this accident, P. R. R. coach 1860 had been regularly used in passenger-train service between Washington and New York and other points, and the accumulated mileage during this period was approximately 30,000 miles. During the last 10 days it had been in regular service between Washington and New York, and on the date of the accident it arrived at Washington in train No. 109 about 11:20 a. m. En route from New York to Washington the members of the crew of that train observed no defective condition. This car remained at Washington approximately 4-1/2 hours. The journal boxes were supplied with lubricating oil, and were inspected by the mechanical forces, and no defective condition was found. Passenger Extra 4930 made no stop between Washington and Shore. During the trip the members of the crew made frequent observations of the equipment and no condition indicating the presence of an overheated journal was detected. The members of the crews

of four east-bound and two west-bound freight trains, the operators at fifteen stations, and mechanical forces at Baltimore, Wilmington, Philadelphia and North Philadelphia, respectively, 101.3 miles, 32.9 miles, 7.3 miles and 2.9 miles west of Shore, observed the equipment of Passenger Extra 4930 as it passed them and no defective condition was seen. The enginemmen of a yard engine standing on track No. 5 at a point about 1 mile west of Shore observed fire and smoke from the left side of Passenger Extra 4930 as that train was passing, about 1 minute before the accident occurred. The operator at Shore was notified by telephone immediately, but the front end of the train had just passed the tower at Shore, and the accident occurred before action could be taken to stop the train.

Coach 1860 was built in 1909 and modernized in 1935. It was 80 feet 3-3/4 inches in length, and had seating capacity for 80 persons. Class 2B repairs were made during June, 1941. It was of conventional all-steel, plate, girder, post and sill construction, equipped with four-wheel trucks, 5-1/2 by 10-inch journals, bolster-locking center-pins, type D couplers, and clasp brakes. The truck side-frames were of one-piece cast-steel construction. The front wheels of the front truck were mounted on the axle in 1937. The wheels and the axle were applied to the car and the journals were repacked June 16, 1943. The break in the journal was irregular and measured from 7-1/4 to 7-7/8 inches inward from the collar. There was no evidence of cutting on the outer portion, but the end of the journal remaining attached to the wheel assembly was ground down to an oval shape by contact with the journal wedge. The journal box was demolished as a result of the accident. A portion of the outer end of the journal-box bearing, approximately 3-1/8 inches wide and 3-1/2 inches long, was recovered. There was no lining metal remaining on the bearing surface. A foreman of car inspectors and other officials examined the broken journal about 1-1/2 hours after the accident and found that it was then heated considerably above normal running heat. According to a report of the Engineer of Tests of the Pennsylvania Railroad, tests and analyses of the metal of the broken journal and the bearing indicated that they were within the requirements of A. A. R. specifications for car axles and bearings. The report, which was accompanied by photomicrographs of the broken parts of the journal, stated that the broken-off journal end had been heated sufficiently to cause discoloration to a brown color, which indicated a temperature of at least 900 degrees F. The original coarse ferrite of the structure adjacent to the surface of the broken-off journal end was finely broken up, which condition indicated that the surface of the journal had reached a temperature of approximately 1,400 degrees F. The band of changed structure was about 3/16-inch thick, from which

point the structure abruptly diverted back approximately to the original. The shallowness of the transformed zone signified that the heating to high temperature occurred very rapidly. In conclusion, the report stated that the immediate cause of the failure of the journal was overheating, but examination and analysis of the axle, wedge and portion of the journal bearing failed to develop anything which would cause overheating.

Cause

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

Dated at Washington, D. C., this first day of October, 1943.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,
Secretary.