INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 3123

THE PENNSYLVANIA RAILROAD COMPANY

REPORT IN RE ACCIDENT

AT PHILADELPHIA, PA., ON

AUGUST 15, 1947

SUMMARY

Railroad:	Pennsylvania
Date:	August 15, 1947
Location:	Philadelphia, Pa.
Kind of accident:	Derailment
Train involved:	Passenger
Train number:	1054
Engine number:	127
Consist:	6 cars
Estimated speed:	15 m. p. h.
Operation:	Interlocking
Tracks:	Four; crossover; 0.84 percent descending grade eastward
Weather:	Clear
Time:	7:25 a. m.
Casualties:	1 killed
Cause:	Defective engine truck

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 3123

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

THE PENNSYLVANIA RAILROAD COMPANY

October 10, 1947

Accident at Philadelphia, Pa., on August 15, 1947, caused by a defective engine truck.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On August 15, 1947, there was a derailment of a passenger train on the Pennsylvania Railroad at Philadelphia, Pa., which resulted in the death of one employee. This accident was investigated in conjunction with a representative of Pennsylvania Public Utility Commission.

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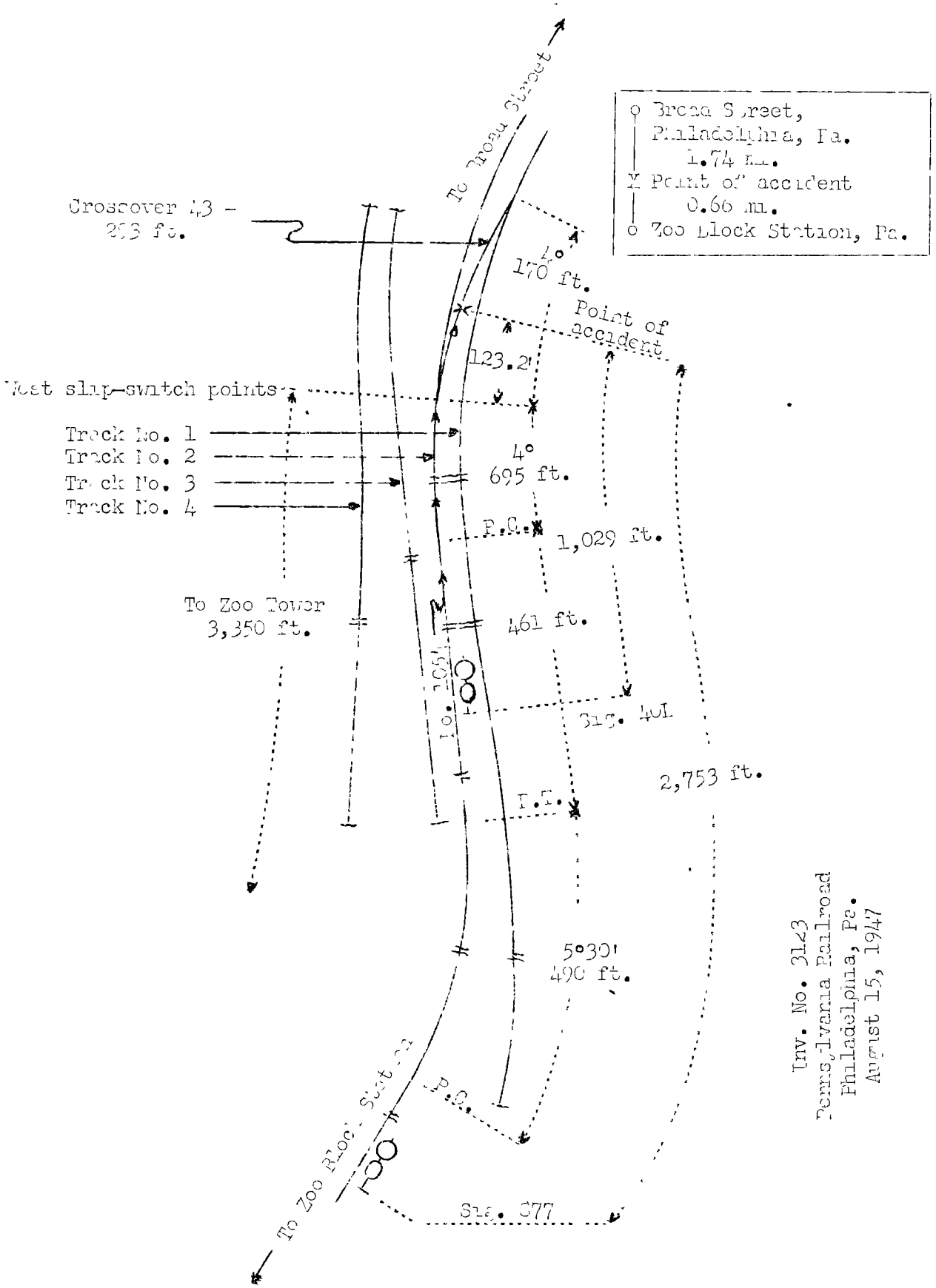
[1] Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.



Inv. No. 3143
Pennsylvania Railroad
Philadelphia, Pa.
August 15, 1947

Location of Accident and Method of Operation

This accident occurred on that part of the Philadelphia Terminal Division extending between Zoo Block Station and Broad Street, Philadelphia, Pa., 2.4 miles. In the immediate vicinity of the point of accident this is a four-track line, over which trains are operated by signal indications. The main tracks from south to north are designated as tracks No. 1, No. 2, No. 3 and No. 4. Within interlocking limits at Zoo Block Station a crossover, 293 feet long and designated as crossover 43, connects tracks No. 2 and No. 1, and it is facing-point for eastbound movements from track No. 2 to track No. 1. The west end of this crossover consists of a double-slip crossing, and the west slip-switch points are 3,350 feet east of the tower. The train involved was being operated from track No. 2 through crossover 43 to track No. 1, and the derailment occurred 123.2 feet east of the west slip-switch points at the east frog of the double-slip switch crossing. From the west on track No. 2 there is a 5°30' curve to the left 490 feet in length, a tangent 461 feet and a 4° curve to the right 695 feet to the west slip-switch points of the double-slip crossing and 170 feet eastward. The grade is 0.84 percent descending eastward.

The structure of the double-slip crossing consists of No. 15 rigid-type frogs 25.3 feet in length, 130-pound switch-points, movable-points and rail sections, and 9-foot guard rails. The angle of each frog is 3°49'05.9". The maximum curvature of the south outer slip-rail is approximately 7°. The distance between the gage line of the east frog to the face of the crossover guard rail is 4 feet 6.6 inches. The crossing is laid on 109 switch ties. The distance between the centerlines of track No. 2 and track No. 1 is 12 feet 2 inches. The track is ballasted with crushed stone to a depth of 24 inches.

Approach signal 877 and home signal 40L, governing the movement involved, are, respectively, 2,753 and 1,029 feet west of the point of accident. These signals are of the position-light type, and the involved aspects and corresponding indications and names are as follows:

Signal	Aspect	Indication	Name
877	Three white lights in diagonal position to the right over three white lights in vertical position	Proceed approaching next signal at Medium speed.	Approach-medium.

40L	Three white lights in horizontal position over three white lights in vertical position	Proceed; Medium speed within interlocking limits.	Medium-clear.

The interlocking at Zoo Block Station consists of an electro-pneumatic machine having 145 working levers. Approach, time and detector locking are provided.

This carrier's operating rules read in part as follows:

DEFINITIONS

* * *

Medium Speed--Not exceeding one-half the speed authorized for passenger trains but not exceeding 30 miles per hour.

* * *

The maximum authorized speed for the train involved was 30 miles per hour. The maximum authorized speed for all trains through the crossover involved was 15 miles per hour.

Description of Accident

No. 1054, an east-bound first-class passenger train, consisted of engine 127, a 4-6-2 type, and six coaches. All cars were of steel construction. This train passed Zoo Block Station at 7:22 a. m., 5 minutes late, passed signal 877, which displayed proceed-approaching-next-signal-at-medium-speed, passed signal 40L, which displayed proceed-medium-speed-within-interlocking-limits, and while moving on track No. 2 at an estimated speed of 15 miles per hour it entered crossover 43, which was lined for movement from track No. 2 to track No. 1, and the engine and the front trucks of the tender and the first car were derailed.

The engine stopped on its right side on track No. 1 and in line with it, with the front end 279.5 feet east of the point of derailment. The cab of the engine was practically demolished, and the engine and the tender were otherwise considerably damaged. The first car was slightly damaged.

The engineer was killed.

The weather was clear and it was daylight at the time of the accident, which occurred at 7:25 a. m.

The total weight of engine 127 in working order is 273,600 pounds, distributed as follows: Engine truck, 38,000 pounds; driving wheels, 176,925 pounds; and trailer truck, 58,675 pounds. The specified diameters of the engine-truck wheels, the driving wheels, and the trailer-truck wheels are, respectively, 36, 80 and 54 inches. The driving wheelbase is 13 feet 10 inches long, the total length of the engine wheelbase is 35 feet 7 inches, and the total length of the engine and tender is 80 feet 9-3/4 inches.

The engine truck is of the 4-wheel type, its wheelbase is 6 feet 8 inches, and the distance between the center of the engine truck and the No. 1 driving axle is 8 feet 4 inches. The journal boxes are mounted inside the wheels. Two equalizing bars extend between the journal boxes on each side of the truck. They curve upward at each end and are seated upon the tops of the journal boxes. Semi-elliptic springs, which are cambered downward, are arranged longitudinally and suspended by hangers between the sets of equalizer bars on each side of the truck. These springs are seated against the lower surfaces of the truck side-frames. The equalizer bars are 7-1/4 inches wide, 1-1/4 inches thick and 7 feet 5-1/2 inches long. Holes 1-13/16 inches in diameter are provided for the insertion of 1-3/4-inch spring-hanger pins, and are spaced 3 feet 6-1/4 inches apart. The spring-hanger pins are of case-hardened steel. The engine truck is provided with a swing bolster having a female center-plate cast integrally on the top surface. The lateral motion between the swing bolster and the truck frame is restrained by swing links. When the engine truck is mounted in working order, the male center plate, which is bolted to the cylinder-saddle, engages the female center plate of the truck bolster. The arrangement of the center plates, the swing links and the bolster permits the engine truck to pivot and to move to either side of the centerline of the engine proportionately to the curvature of the track. The bolster assembly is arranged to resist lateral movement with respect to the center plate proportionate to the force required to deflect the engine from a tangential line.

The tender is rectangular in shape and is equipped with two 4-wheel trucks. Its capacity is 9,000 gallons of water and 15 tons of coal. The weight of the tender loaded is 183,700 pounds.

The last class 4 repairs were completed during April, 1947, the last monthly inspection and repairs were completed on July 22, 1947, and the last trip repairs were completed on August 14, 1947. The accumulated mileage since the last class repairs was 9,560 miles.

Discussion

The route was lined for No. 1054 to proceed within interlocking limits at Zoo Block Station from track No. 2 through crossover 43 to track No. 1, and the controlling signals were displaying proper indications for this movement. The maximum authorized speed for movement through the crossover is 15 miles per hour. No. 1054 was moving through the crossover at an estimated speed of 15 miles per hour when the engine and the front trucks of the tender and the first car were derailed.

The first that any member of the train crew knew of anything being wrong was when the derailment occurred. The fireman said that immediately after the engine entered the crossover he felt an unusual movement of the front end of the engine, then the engineer moved the brake valve to emergency position, but the engine overturned to the right before the train could be stopped. The engineer was killed. The brakes of this train had been tested and had functioned properly en route.

Examination of the track throughout a considerable distance westward from the point of derailment disclosed that the surface, alinement and gage were well maintained for the maximum authorized speed. There was no indication of dragging equipment, or of any obstruction having been on the track.

The first mark on the track structure was an abrasion on the inner face of the right guard rail at a point 18 inches immediately west of the point of the east frog of the double-slip crossing of crossover 43. This mark continued eastward along the inner face of the guard rail to a point opposite the frog point, then it appeared on the top surface of the guard rail a distance of 3 feet to the eastern end. At the frog point a flange mark appeared on the top surface and extended diagonally outward to the heel of the frog. Eastward from this point a distance of about 36 feet flange marks appeared on the ties inside the right rail of the crossover and outside the left rail. From this point eastward the track structure was displaced or torn up to the point where the engine stopped.

Examination of the engine disclosed that the engine-truck wheels were of good contour. Both axles were bent and the pedestals were broken as a result of the derailment. The spring and the equalizers on the right side were displaced and the heads of the right spring-hanger pins were broken off, but the hangers were intact. The fracture through the No. 1 pin was new, but the fracture through the No. 2 pin consisted

of a progressive detail fracture, which covered about 25 percent of the cross-sectional area. The No. 1 pin had broken near its outer end in such a manner so as to free the right outside equalizer bar, but the pin remained in place in the front end of the inside equalizer bar. The pin was 9-3/4 inches long and 1-3/4 inches thick, and was fitted at its outer end with a head 2-3/4 inches wide and 1/4 inch thick. The inner end was reduced by threading to 1-1/2 inches, and was provided with a hole for the insertion of a 5/8-inch cotter pin. Normally, the pin was secured at its inner end by a nut 1 inch thick and by a cotter key. Under normal conditions the pin rotates freely in its bearings. Examination disclosed that the pin involved had been secured by a nut 1-1/4 inches thick and counterbored to a depth of 5/16 inch. The counterbore extended over the body of the pin so that the bearing surface of the pin was shortened 5/16 inch. After the nut was tightened, the equalizers fouled the spring hanger, and this resulted in an unusual stress being exerted on the head of the bolt. This stress resulted in the head becoming chipped to the extent that the outside equalizer was unsecured at its front end. Apparently, this condition had not existed over any long period of time as there was no indication of the journal boxes having been overheated. This defective condition resulted in an unequal distribution of the springborne weight on the engine truck sufficiently for the right front journal box to rise in its pedestal jaw, and then the outer edge became wedged in that position. As a result of this condition, the engine truck became practically rigid, and when the engine entered the crossover the right front wheel of the engine truck mounted the guard rail and the left front wheel struck the frog point, then the general derailment followed.

Cause

It is found that this accident was caused by a defective engine truck.

Dated at Washington, D. C., this tenth day of October, 1947.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.