INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 2519

THE DELAWARE, LACKAWANNA & WESTERN RAILROAD COMPANY

REPORT IN RE ACCIDENT

AT MILLBURN, N. J., ON

AUGUST 17, 1941

SUMMARY

Railroad:	Delaware, Lackawanna & Western
Date:	August 17, 1941
Location:	Millburn, N.J.
Kind of accident:	Derailment
Train involved:	Passenger-milk
Train number:	Extra 1140 East
Engine number:	1140
Consist:	6 cars
Speed:	Not less than 65 m.p.h.
Operation:	Timetable, train orders and an automatic block-signal system
Track:	Double, $4^{\circ}00'$ curve to right; grade practically level
Weather:	Clear
Time:	About 5:56 p.m.
Casualties:	1 killed; 3 injured
Cause:	Accident caused by excessive speed on curve

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2519

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

THE DELAWARE, LACKAWANNA & WESTERN RAILROAD COMPANY

October 13, 1941

Accident at Millburn, N.J., on August 17, 1941, caused by excessive speed on curve.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On August 17, 1941, there was a derailment of a passenger-milk train on the Delaware, Lackawanna & Western Railroad at Millburn, N.J., which resulted in the death of one employee and the injury of three employees. This accident was investigated in conjunction with the New Jersey Board of Public Utility Commissioners.

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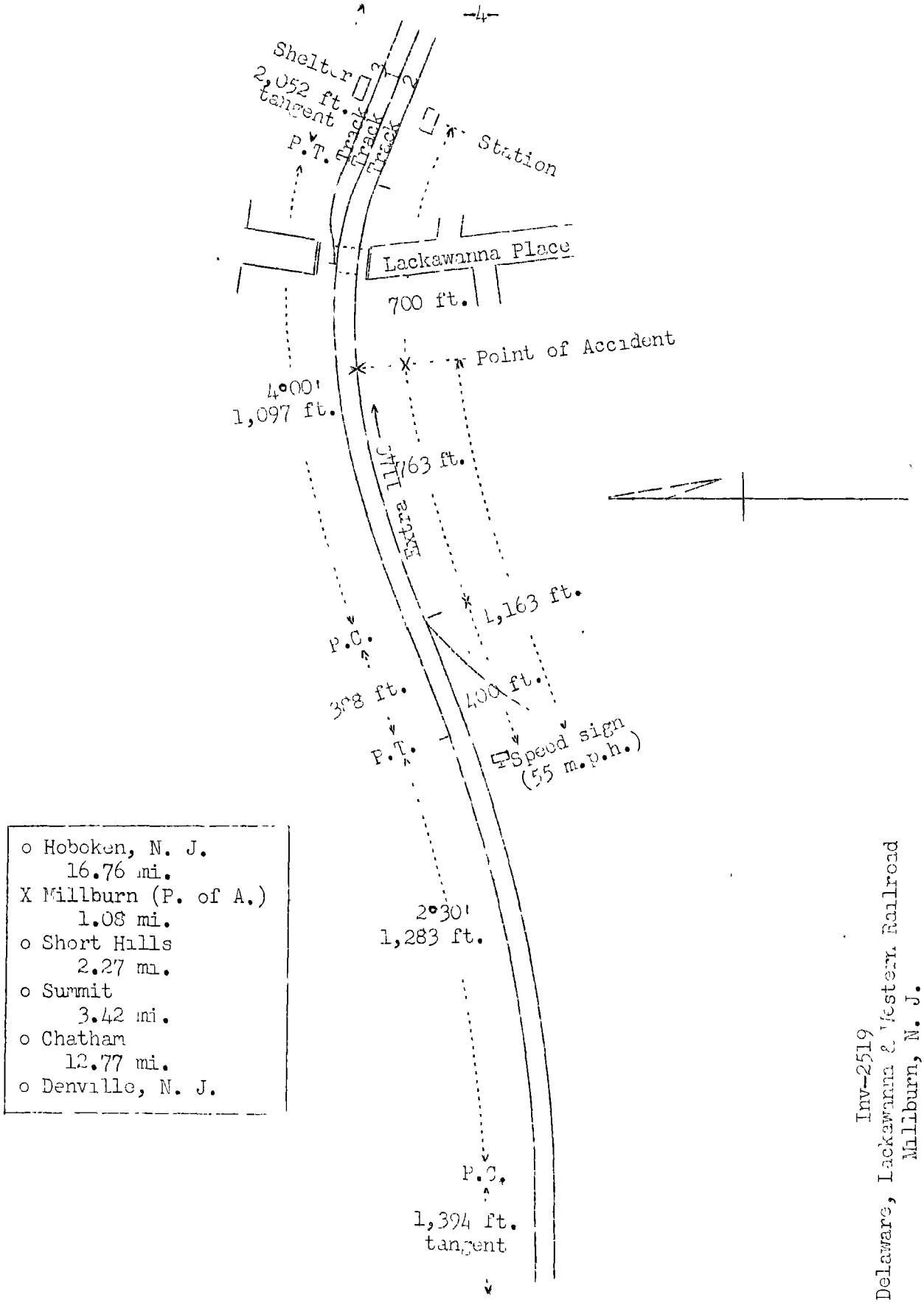
[1] Under authority of section 17(2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.



Inv-2519
Delaware, Lackawanna & Western Railroad
Millburn, N. J.
August 17, 1941

Location of Accident and Method of Operation

This accident occurred on that part of the Morris and Essex Division which extends between Denville and Hoboken, N.J., a distance of 36.3 miles. In the immediate vicinity of the point of accident this is a double-track line over which trains are operated by timetable, train orders and an automatic block-signal system. The tracks from north to south are No. 1, westward main, and No. 2, eastward main. The line changes from double track to three tracks at a point 300 feet east of the point of derailment. The three-track line extends eastward from Millburn to Hoboken. These tracks from north to south are No. 3, westward main, No. 1, eastward and westward main, and No. 2, eastward main. The accident occurred on track No. 2 at a point 700 feet west of the station at Millburn, at which point the tracks are laid on a slight fill. As the point of accident is approached from the west there are, in succession, a tangent 1,394 feet in length, a 2°30' curve to the left 1,283 feet, a tangent 388 feet, and a 4°00' curve to the right 1,097 feet in length. The accident occurred on the latter curve at a point 763 feet from its western end where the curvature is 4°03'45". The grade for east-bound trains varies from 0.988 percent to 1.644 percent descending a distance of 5,766 feet, then there is a vertical curve 600 feet long, beyond which the track is practically level a distance of 1,202 feet to the point of derailment.

On the curve involved the track structure consists of 105-pound rail, rolled in 1926, 39 feet in length and laid on an average of 24 treated hardwood ties to the rail length; it is fully tieplated, double-spiked on the inside of the rail and single-spiked on the outside, provided with six rail anchors per rail length, and is ballasted with stone to a depth of 10 inches. The maximum superelevation was 6-1/8 inches. At the point of accident the superelevation was 5-15/16 inches and the gage was 4 feet 8-1/2 inches.

A speed-limit sign bearing the numerals "55" is located 400 feet west of the west end of the curve involved and 1,163 feet west of the point where the derailment occurred. This sign indicates that the maximum authorized speed on the curve involved is 55 miles per hour. The maximum authorized speed at other points in this vicinity for the train involved is 70 miles per hour.

Description of Accident

Extra 1140, an east-bound passenger-milk train, consisted of engine 1140, of the 4-6-2 type, two coaches, three box-type milk cars and one tank-type milk car. The first, second and sixth cars were of all-steel construction, and the third, fourth

and fifth cars were of steel underframe and wooden superstructure construction. This train departed from Denville, 19.54 miles west of Millburn, at 5:37 p.m., according to the dispatcher's record of movement of trains, and passed Summit, the last open office, 3.35 miles west of Millburn, at 5:53 p.m. While this train was moving on a curve to the right at a speed of not less than 65 miles per hour the engine was derailed to the left.

The engine was in good mechanical condition and there was no indication of dragging equipment or of any obstruction having been on the track. The equipment and the air brakes had been inspected prior to the time Extra 1140 left Denville and no defective condition was disclosed. The air brakes functioned properly at all points where used en route. The specified curvature was 4°00' and the specified superelevation was 6 inches; at the point of derailment the curvature was 4°03'45" and the superelevation was 5-13/16 inches. The first mark on the track structure was a tread mark on the outside edge of the head of the high rail. This mark extended a distance of 237 feet and appeared to have been made by wheels leaning outward at an angle of 20 degrees. Throughout this distance the rail-head bonds were depressed. Near the eastern end of this mark the angle increased to 40 degrees. Immediately beyond the eastern end of the tread mark and 17 inches outside the gage side of the high rail, flange marks appeared on the ties. At a point 23 feet 2 inches east of the first mark on the ties there was a flange mark on a spike outside the high rail. This mark extended diagonally outward on the ties a distance of 12 feet, beyond which point track No. 2 was torn up a distance of 375 feet, track No. 1, a distance of 650 feet, and track No. 3, a distance of 575 feet. There was no mark between the rails west of the point where the tracks were torn up.

Engine 1140 stopped on its left side, diagonally across tracks Nos. 1 and 3, and the pilot fouled track No. 2 at a point 770 feet east of the point of derailment. The cab stopped against a shelter building opposite the station and was crushed inward. The tender, remaining coupled to the engine, was derailed and stopped on its left side diagonally across track No. 3 and its front end was against the shelter building. The first car stopped on its left side diagonally across track No. 3, with its front end near the tender and its rear end on the shelter-building platform. The seats in this car were badly disarranged, all windows were broken, the left rear corner of the car was tc considerably, and there were several deep dents in the body of the car. The second car stopped diagonally across track No. 2, 150 feet west of the first car, and leaned at an angle of about 20 degrees. The seats in the second car were disarranged, windows were broken and several side sheets were scarred. The third, fourth, fifth and sixth cars stopped behind the second

car on tracks Nos. 1 and 3 and in general alinement with these tracks. The sixth car remained upright but the other three cars leaned at an angle of about 60 degrees.

The weather was clear at the time of the accident, which occurred about 5:56 p.m.

The employee killed was the fireman, and the employees injured were the engineman, the front trainman and the flagman.

Mechanical Data

After the accident an inspection of the engine disclosed that all flanges were of good contour. The engine-truck castings conformed to the prescribed requirements. All driving-box wedges were lubricated and moved freely. The radial buffer was well lubricated and it functioned properly. The top and the bottom clearances of all driving boxes conformed to the specifications. The baffle plates in the tender cistern were in place and securely fastened.

Measurements of the tread wear and lateral motion of the wheels of engine 1140 were as follows:

Wheel	Lateral	Tread wear Left	Tread wear Right
Engine truck			
Front pair	3/8"		
Rear pair	5/8"		
No. 1 driving	3/8"	5/32"	5/32"
No. 2 driving	3/8"	5/32"	5/32"
No. 3 driving	7/16"	5/32"	4/32"
Trailer truck	1/2"		

The total weight of engine 1140 in working order is 301,000 pounds, distributed as follows: Engine truck, 52,500 pounds; driving wheels, 191,000 pounds; and trailer truck, 57,500 pounds. The diameters of the engine-truck wheels, the driving wheels, and the trailer-truck wheels are, respectively, 33, 79, and 51 inches. The tender is rectangular in shape and is equipped with two 4-wheel trucks. The weight of the tender loaded is 209,500 pounds. The rigid wheel-base of the engine is 14 feet and the total length of the wheel base is 36 feet. The total length of the engine and tender is 83 feet 6-3/8 inches. The last class 3 repairs were made at Scranton Shops, Pa., February 6, 1941. The accumulated mileage since the last class repairs was 34,351 miles.

Track Data

Measurements of the track taken from the western end of the curve involved to the point of derailment, a distance of 763 feet, were as follows:

Distance west of point of derailment	Superelevation	Gage	Curvature
763 feet	0	4 feet 8-1/2 in.	0
732 feet	2-1/16 in.	4 feet 8-1/2 in.	0°45'00"
701 feet	2-5/16 in.	4 feet 8-5/8 in.	1°07'30"
670 feet	2-3/4 in.	4 feet 8-1/2 in.	1°45'00"
639 feet	3-3/4 in.	4 feet 8-1/2 in.	2°03'45"
608 feet	4-1/4 in.	4 feet 8-1/2 in.	2°52'30"
577 feet	4-1/2 in.	4 feet 8-5/8 in.	3°30'00"
546 feet	5-1/8 in.	4 feet 8-1/2 in.	3°26'15"
515 feet	5-3/4 in.	4 feet 8-1/2 in.	3°33'45"
484 feet	5-15/16 in.	4 feet 8-5/8 in.	3°48'45"
453 feet	6-1/8 in.	4 feet 8-1/2 in.	4°07'30"
422 feet	5-15/16 in.	4 feet 8-1/2 in.	3°41'15"
391 feet	6-1/16 in.	4 feet 8-1/2 in.	3°52'30"
360 feet	5-7/8 in.	4 feet 8-5/8 in.	4°22'30"
329 feet	6 in.	4 feet 8-1/2 in.	3°37'30"
298 feet	6-1/8 in.	4 feet 8-1/2 in.	4°22'30"
267 feet	5-3/4 in.	4 feet 8-5/8 in.	4°00'00"
236 feet	5-7/8 in.	4 feet 8-1/2 in.	4°11'15"
205 feet	5-7/8 in.	4 feet 8-1/2 in.	3°41'15"
174 feet	5-15/16 in.	4 feet 8-1/2 in.	3°48'45"
143 feet	6 in.	4 feet 8-1/2 in.	4°07'30"
112 feet	6 in.	4 feet 8-1/2 in.	3°41'15"
81 feet	5-15/16 in.	4 feet 8-1/2 in.	3°37'30"
50 feet	6 in.	4 feet 8-5/8 in.	4°03'45"
19 feet	6 in.	4 feet 8-1/2 in.	4°03'45"
Pt. of derailment	5-15/16 in.	4 feet 8-1/2 in.	4°03'45"

Discussion

The engine became derailed to the left when the train was moving at a speed not less than 65 miles per hour on a curve to the right, on which the maximum authorized speed was 55 miles per hour. The specified curvature for this curve was 4°00' and the specified superelevation was 6 inches. At the point of derailment the curvature was 4°03'45" and the superelevation was 5-15/16 inches. According to A.R.E.A. superelevation tables, on a 4°03'45" curve having a superelevation of 5-15/16 inches the absolute overturning speed is about 95 miles per hour and the maximum safe speed is about 64 miles per hour. There was no defective condition of the engine, no dragging equipment and no obstruction on the track.

The engine overturned to the outside of the curve as tread marks on the outer edge of the head of the high rail indicate that wheels were leaning outward from 20 to 40 degrees throughout a distance of 237 feet immediately west of the first mark of derailment, and beyond the point of derailment the engine slid on its left side a distance of 700 feet. There was no mark between the rails. The first mark of derailment, which was 17 inches outside the gage side of the high rail, indicates that it was made by the flange of the left trailer-truck wheel, and a flange mark on a spike about 24 feet east of the first flange mark indicates that it was made by the flange of the left front driving wheel. The relative positions of these two marks indicate that the rear end of the engine became derailed an instant before the front end.

According to the statement of the engineman, the speed of the train was about 65 miles per hour when the engine was near the west end of the curve involved, then he made a brake-pipe reduction of 12 or 15 pounds. The train passed Summit, 3.35 miles west of Millburn, at a speed of about 35 miles per hour and 2-3/4 minutes later the derailment occurred. This indicated an average speed between these points of 70 miles per hour. Since the brakes were not applied on the heavy descending grade between these stations until the engine was near the west end of the curve, it therefore appears that the speed of the train was in excess of 70 miles per hour when the engine entered the curve. This is supported by the result of a test made between Summit and Millburn a few days after the accident occurred, with a train similar to the one involved. After the test train reached a point 500 feet east of Summit, steam was not used and a speed of 72 miles per hour was attained at a point 1 mile west of the curve involved, then a brake-pipe reduction was made and the train stopped at Millburn station. The elapsed time was 4 minutes 10 seconds.

Undoubtedly, the speed of the train involved was in excess of the maximum safe speed but less than the absolute overturning speed. Apparently some other factor or factors were combined with the excessive speed to cause the engine to overturn to the outside of the curve. Two factors were the irregularity in the alinement of the track, which probably caused the engine to pivot laterally, and the brake-pipe reduction of 12 or 15 pounds, made at the entrance of the curve, which would cause the wheel base of the engine to become rigid and the spring-borne weight to incline forward and downward and the rear end of the engine to be lifted upward and thrust outward.

The maximum authorized speed for this train in the territory immediately west of the curve involved was 70 miles per hour. The sign limiting the maximum authorized speed to 55

miles per hour on this curve was located only 400 feet west of the west end of the curve, and action to reduce speed from 70 miles per hour to 55 miles per hour before the engine entered the curve would be required at some point west of this sign.

Cause

It is found that this accident was caused by excessive speed on a curve.

Dated at Washington, D.C., this thirteenth day of October, 1941.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.