INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 2504

THE CLINCHFIELD RAILROAD COMPANY

REPORT IN RE ACCIDENT

NEAR POPLAR, N. C., ON

MAY 22, 1941

SUMMARY

Railroad:	Clinchfield
Date:	May 22, 1941
Location:	Poplar, N. C.
Kind of accident:	Derailment
Train involved:	Freight
Train number:	Extra 726 North
Engine number:	726
Consist:	77 cars, caboose
Speed:	30-35 m. p. h.
Operation:	Timetable and train orders
Track:	Single; 9° left curve; 1.17 percent descending grade northward
Weather:	Clear
Time:	11:59 a. m.
Casualties:	1 killed; 2 injured
Cause:	Accident caused by train being operated on sharp curve at excessive speed for the type of engine involved

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2504

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

THE CLINCHFIELD RAILROAD COMPANY

July 21, 1941

Accident near Poplar, N. C., on May 22, 1941, caused by train being operated on sharp curve at excessive speed for the type of engine involved.

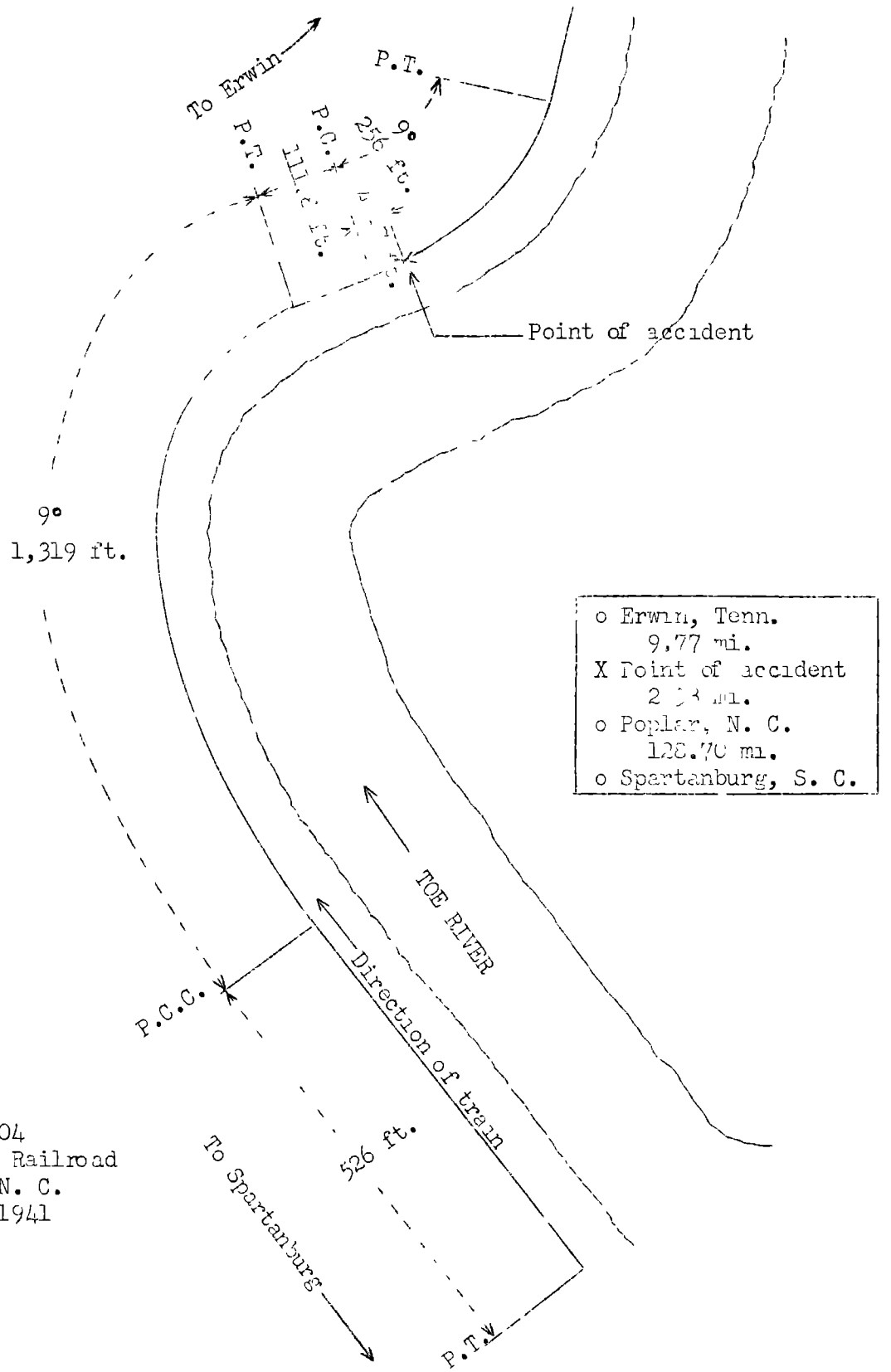
REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On May 22, 1941, there was a derailment of a freight train on the Clinchfield Railroad near Poplar, N. C., which resulted in the death of one employee and the injury of two employees.

---

[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-2504
Clinchfield Railroad
Poplar, N. C.
May 22, 1941

Location and Method of Operation

This accident occurred on that part of the railroad which extends between Spartanburg, S. C., and Erwin, Tenn., a distance of 141 miles. In the vicinity of the point of accident this is a single-track line over which trains are operated by timetable and train orders; there is no block system in use. The accident occurred at a point 2.53 miles north of the north siding-switch at Poplar. As the point of accident is approached from the south there is a series of curves and tangents followed, in succession, by a tangent 526 feet, a compound curve to the right 1,319 feet, the maximum curvature of which is 9°, a tangent 111.8 feet, and a 9° curve to the left 256 feet in length. The accident occurred on this latter curve, at a point 46.7 feet from its southern end, where the curvature is approximately 3°. The grade for north-bound trains is 1.17 percent descending at the point of accident.

In the vicinity of the point of accident the track parallels the west bank of the Toe River. The track is laid on a hillside cut and is 22 feet above the level of the shore line of the river and 50 feet horizontally distant. On the west side of the track there is a rock bluff about 30 feet high, the toe of which is about 11 feet from the center-line of the track.

The track structure consists of 100-pound rail, 39 feet in length, laid new in August, 1940, on an average of 22 treated oak ties to the rail length; it is fully tie-plated, double-spiked on the outside of the rail and single-spiked on the inside, and ballasted with stone to a depth of 10 inches. Rail anchors are not provided. The superelevation at the point of derailment is approximately 3 inches.

The maximum authorized speed for the train involved was 35 miles per hour.

The weather was clear at the time of the accident, which occurred at 11:59 a.m.

Description

Extra 726, a north-bound freight train, with Conductor Beckelhimer and Engineman Hale in charge, consisted of engine 726, of the 2-8-8-2 type, 3 loaded and 74 empty cars, and a caboose. This train departed from Spartanburg, 128.7 miles south of Poplar, at 3:25 a.m., according to the train sheet, performed work en route and arrived at Poplar at 11:45 a.m., where it entered the siding and met First 26, a south-bound freight train. Extra 726 departed from Poplar at 11:55 a.m.,

according to statements of the members of the crew, and, when it reached a point 2.53 miles beyond and was moving at a speed estimated as between 30 and 35 miles per hour, it became derailed.

The engine stopped on its right side down the embankment, with the front end 54 feet north of the point of derailment and 21 feet east of the center of the track and the rear end 24 feet east of the center of the track; the cab was torn loose and the steam pipe to the water column was broken. The tender stopped on its right side to the rear of the engine with its rear end 50 feet east of the center of the track. The right side was crushed inward. The first ten cars were derailed and stopped in various positions; four were across the track and the others were down the embankment. The first, second, third and fifth cars were destroyed. All the derailed cars were contained in a space of 160 feet. The track structure was displaced a distance of five rail lengths.

The employee killed was the engineman and the employees injured were the fireman and the front brakeman.

Summary of Evidence

Fireman Pippin stated that the brakes functioned properly en route. The train departed from Poplar at 11:55 a.m. As the train approached the point where the accident occurred the engineman and he were maintaining a lookout ahead. The fireman did not think the air brakes were used in this immediate vicinity. A drifting throttle was being used and the speed of the train down the hill was about 30 or 35 miles per hour. The first the fireman knew of anything being wrong was when the front end of the engine thrust to the right just as it entered the curve to the left, then it thrust to the left and again to the right and then the engine turned over on its right side. He did not feel any unusual motion at the rear of the engine. He thought the engine moved a distance of about 100 feet during the three thrusts. Prior to the occurrence of the accident the engine rode smoothly. He did not observe any track irregularity before the engine swerved, and he was not alarmed about the speed. The engineman appeared normal. The fireman thought that the accident was caused by misalined track.

Front Brakeman Nidiffer stated that as the train approached the point where the accident occurred he was in the booth on the left side of the tender and was maintaining a lookout ahead. The tender rode smoothly and the speed of the train was about 30 or 35 miles per hour. The first he knew of anything being wrong was when the engine swayed to the right and then the engine and the tender turned over to the right. He said it was possible that the heavy engine entered

the curve so fast that the track was knocked out of alinement. Soon after the accident he remarked to the roadmaster that the accident could have been caused by speed.

Conductor Beckelhimer stated that at Spartanburg a terminal air-brake test was made and the brakes functioned properly en route. The caboose gauge indicated that brake-pipe pressure of between 65 and 70 pounds was being maintained. His train entered the siding at Poplar to meet First 26 and when Extra 726 was departing a member of the crew of a pusher engine, which was a short distance behind his train on the siding, closed the north siding-switch. When his caboose passed this switch the speed of the train was about 25 or 30 miles per hour. It was 11:55 a.m. when the caboose was at a point about 100 feet north of the switch. He thought there was ample time to operate Extra 726 from Poplar to Erwin, a distance of 12.3 miles, and to clear at Erwin by 12:25 p.m. for No. 38, a south-bound first-class train. As his train approached the point where the accident occurred he was in the cupola of the caboose and the speed of the train was 30 to 35 miles per hour. The first he knew of anything being wrong was when the air brakes became applied in emergency, then the train surged two or three times. The caboose moved a distance of about 15 car lengths and stopped at 11:59:30 a.m. About 1-1/2 hours after the accident occurred he examined the track a distance of about 2 or 3 rail lengths on each side of the displaced track and found the rail ends open at joints. The track appeared to be fully ballasted. In his opinion the track was either buckled before the engine encountered it or was in condition to buckle under the engine. He did not think that excessive speed caused the accident. Ordinarily, with a train similar to Extra 726, enginemen of north-bound trains make a brake-pipe reduction when the engine is about 1.5 miles south of the point where the accident occurred, and the brakes are kept applied until the train reaches a point north of the point where the accident occurred. He said that in this instance no brake-pipe reduction was made until the engine was about 1,500 feet south of the point where the accident occurred; at this time the speed of the train was about 30 or 35 miles per hour. This brake-pipe reduction was a light service reduction, which was made to steady the train and not to reduce speed.

Flagman Callahan substantially corroborated the statement of Conductor Beckelhimer.

Engineman Wheeler, of First 26, a south-bound freight train, which was the last train to pass the point involved before the accident occurred, stated that when his train passed that point about 11:40 or 11:45 a.m. he did not observe any

indication of rough or irregular track. He did not think a speed greater than 20 or 25 miles per hour was safe for a mallet engine in the vicinity of the point where the accident occurred.

Conductor Webb, of First 26, stated that he was in the caboose when his train passed the point where the accident later occurred. He did not observe any rough or irregular track condition.

Engineman Slagle, in pusher-engine service on the day of the accident, stated that 35 to 40 minutes should be used in hauling a train similar to Extra 726 with a mallet engine from Poplar to Erwin. He said that when a mallet engine moves from a curve to a tangent the front end of the boiler surges laterally and if the speed is high the engine may overturn. He thought a speed greater than 20 or 25 miles per hour is unsafe for a mallet engine in the territory involved.

Section Foreman Davis, in charge of the section involved, stated that on May 14, because of a tight track condition, a section of rail 7 inches long was cut from each side of the track 5 rail lengths north of the point where the accident later occurred. The rails were then loosened within the joints to a point 1,000 feet south of the point where the accident occurred. He was then satisfied that there was no danger of the track buckling. He surfaced the track from 30 feet north to 500 feet south of the point where the accident occurred. The track was fully ballasted and there was a full shoulder at the point involved. When this work was completed he checked the gage and cross levels. On May 17 he walked over this track and there was no indication of the track being out of alinement. On May 20 he passed over this track on a track motor car during the morning and again during that afternoon and he did not observe anything unusual about the track. He arrived at the scene about 1 hour after the accident occurred and examined the track. At joints on either side of the point of accident the ends of rails were open from 1/4 to 1/2 inch. At this time the temperature was about 90 degrees. He did not think the track buckled. The inside spikes of both rails being bent inward throughout the entire distance the track was damaged indicated that both rails had turned outward. The outside spikes were not disturbed. He thought the track involved was safe for the maximum authorized speed. He did not think track conditions contributed to the cause of the accident.

Section Foreman Edwards stated that he assisted Section Foreman Davis to perform the track work on May 14. After the rails were cut and respaced the joints were left sufficiently open to allow for expansion.

Roadmaster Brown stated that during August, 1940, the entire track structure involved was replaced because of a washout. This work extended from a point 1,442 feet south of the point of accident to a point 198 feet north of it. After track repair work was completed by the section foreman on May 14, he inspected the track and was satisfied with its condition. He was last over the track involved on May 20, at which time he passed on the caboose of a freight train; there was no indication of any track irregularity. He arrived at the scene about 1 hour after the accident occurred and observed that the track throughout a distance of 172 feet southward from the point where the engine stopped was down the embankment. Bolts were broken from the east rail joint between the second and third displaced rails south of the engine and from the west rail joint between the third and fourth displaced rails; the rails at these joints were separated. The fourth and fifth displaced west rails extended westward to the cliff. All other displaced rails were east of the track. At the point of accident the cribs were full of ballast. He found scars on two rails but he could not determine whether they were made by wheels of the engine or of cars. He thought that the ballast shoulder was sufficient to prevent the track from being kicked out of alinement provided a train did not exceed the maximum authorized speed, and that the curve involved was safe for a speed of 35 to 40 miles per hour. There was no indication of either sun-kinked rail or a tight track condition and the rails were spaced properly in the joints. In repairing the track after the accident occurred the same amount of rail that was damaged in the accident was used to restore the track to its original location. Because of the absence of heavy marks on the ties such as would be made by driving-wheel flanges, he thought the engine turned over when it entered the curve to the left. The roadmaster was of the opinion that the accident was caused by high speed.

Chief Engineer Elliott stated that he arrived at the scene about 2 hours after the accident occurred and examined the track. Starting at a point 289 feet south of the point of accident and proceeding northward the gage and cross levels were taken at alternate stations 16 and 23 feet apart; the gage was uniformly 4 feet 8-1/2 inches and the superelevation was as follows:

Distance south of point of derailment		Superelevation
West rail	East rail	
	289 ft	3-1/2"
273 ft.		3-1/4"
	250 ft.	3-1/2"
234 ft.		3-1/4"
	211 ft.	3-1/2"
195 ft.		3"
	172 ft.	2"
156 ft.		1"
	133 ft.	1/2"
117 ft.		0
	94 ft.	0
78 ft.		0
	55 ft.	1/2"
39 ft.		1"
	16 ft.	2"
West joint at P. of A.		3"

The chief engineer was of the opinion that the accident was caused by excessive speed.

Erecting Shop Foreman Rimel stated that he examined engine 726 at the scene of the accident and again after it was moved to the shop. The brake-valve handle was in running position; however, the brake valve was torn loose from the bracket and related piping. The throttle was two-thirds open. The engine-truck springs and equalizers, the driving-box springs, spring saddles, spring hangers and equalizers were in place and in good condition. All driving-box shoes and wedges, the boiler-bearing sliding saddle, the articulated casting and the chafing castings between the engine and the tender were well lubricated; there was no indication of sticking or binding of any of those parts. The engine-truck and the trailer-truck centering devices were in good condition. The pilot was intact and was not scarred. The frame-connection radius bar between the front and the rear driving units was cracked as a result of the derailment. The bolts which secured the right-hand stop on the boiler-bearing sliding saddle were found at the point where the engine overturned. The brake-pipe feed valve, the reducing valve, both brake valves and the distributing valve were tested and found to be functioning properly. All flanges were of good contour and their height and thickness were within the prescribed limits. The driving-wheel tires averaged 3-1/2 inches in thickness and 5-5/8 inches in width. Measurements of the engine wheels and lateral motion were as follows:

Wheel	Lateral	Tread wear Left	Tread wear Right	Wheel spacing Back to back
Engine truck		3/64"	5/64"	53- 5/16"
No. 1 driving	1/4"	1/16"	1/16"	52-15/16"
No. 2 driving	3/8"	1/16"	5/64"	53- 9/64"
No. 3 driving	3/8"	1/16"	1/16"	53- 3/32"
No. 4 driving	1/2"	1/16"	1/16"	52- 7/8 "
No. 5 driving	1/4"	1/16"	1/16"	52-63/64"
No. 6 driving	1/8"	1/16"	1/16"	53- 1/8 "
No. 7 driving	1/4"	1/16"	1/16"	53- 1/16"
No. 8 driving	1/4"	3/64"	1/16"	52-31/32"
Trailer truck		1/16"	1/16"	53-13/32"

Derrick Car Master Jones stated that he arrived at the scene of the accident about 2:15 p.m. There was no mark of derailment to indicate that the engine ran upright after being derailed. In his opinion the engine entered the curve at excessive speed and overturned. The blow-off cock from the right side of the engine was buried in loose rock about 6 feet east of the original location of the ends of the ties; apparently it had been knocked off when the engine overturned and struck the ground, then the engine slid northward on its right side a distance of 6 or 8 feet. Except for damage sustained in the accident, the track in this vicinity was in good condition.

Machinist Harris, at Spartanburg, stated that he made an inspection of engine 726 before it was dispatched on the trip involved. In his opinion the engine was in safe and suitable condition for service.

Road Foreman of Engines Meredith stated that the curve involved was safe for the type of engine involved moving at a speed of 40 miles per hour. About 8 a.m. on the day of the accident he rode over the track involved on an engine of the same type as engine 726; at that time the track was in good condition. He thought the accident was a result of excessive speed. In his opinion, as the engine was moving on the curve to the right the front end of the boiler was displaced laterally to the left side of the track; when the short tangent was reached the boiler swung to the right, and, since the rear driving unit is rigid with the boiler, a lateral thrust of great force resulted at the rear of the locomotive and the rear driving unit shifted the track to the right and off the solid roadbed; the engine became over-balanced and turned over to the right.

Superintendent of Motive Power Shull stated that the center of gravity of engine 726 is 73-1/4 inches above the top of the rails.

Train Dispatcher Coward, on duty at the time of the accident, stated that the wires failed at 11:59 a.m.

Superintendent Moss stated that, in his opinion, the derailment was caused by the train moving at excessive speed on the curve involved. He said that the boiler of an articulated engine is rigid with the rear driving unit but slides laterally on the front driving unit. When the engine left the curve to the right the boiler moved to adjust itself for the short tangent and a lateral thrust of sufficient force was created to start an overturning movement of the boiler and the rear driving unit; this condition was augmented by the front driving unit entering upon the curve to the left, thereby preventing the necessary adjustment to negotiate the curve properly. Apparently the engine overturned before it was derailed, and it probably slewed the track eastward to the edge of the bank before the engine overturned. He did not think track conditions contributed to the cause of the accident. The superintendent said that the enginemen on this railroad are employees of long experience and they are expected to reduce speed below the maximum authorized speed at points where they think it is necessary for safe movement of their trains.

According to data furnished by the carrier, engine 726 is of the compound, articulated, mallet, 2-8-8-2 type, having a total weight of 531,000 pounds distributed as follows: Engine truck, 28,000 pounds; first pair of driving wheels, 59,600 pounds; second pair of driving wheels, 59,300 pounds; third pair of driving wheels, 59,700 pounds; fourth pair of driving wheels, 58,400 pounds; fifth pair of driving wheels, 60,100 pounds; sixth pair of driving wheels, 60,000 pounds; seventh pair of driving wheels, 60,700 pounds; eighth pair of driving wheels, 60,200 pounds; and the trailer truck, 25,000 pounds. The diameters of the engine-truck wheels, the driving wheels and the trailer-truck wheels are, respectively, 30 inches, 57 inches and 30 inches. The tender is rectangular in shape and has two four-wheel trucks. The weight of the tender loaded is 214,000 pounds. The total weight of the engine and tender is 745,000 pounds. The rigid wheel-base of each driving unit is 15 feet 9 inches and the distance between the front driving unit and the rear driving unit is 10 feet 10 inches; the total length of the engine wheel-base is 42 feet 4 inches, and the total length of the engine and tender is 105 feet 1-1/8 inches. The last Class 3 repairs were completed in October, 1940. The engine was returned to service February 1, 1941. The accumulated mileage was 13,580 miles.

During the 30-day period prior to the occurrence of the accident, the average daily movement over the track involved was 14.36 trains, among which was an average daily movement of 7.36 mallet type engines.

Observations of the Commission's Inspectors

The Commission's inspectors examined the track throughout a distance of 1 mile south of the point where the accident occurred. There was no indication of dragging equipment or defective track. The engine was examined and found to be as previously described. Marks on the outside faces of the flanges and on the flange throats of the right Nos. 2, 3 and 4 driving wheels indicated that these flanges had been subjected to great pressure. Starting at a point 46 feet north of the southern end of the curve involved the high rail bore numerous scars, indentations and flange marks its entire length. The heaviest flange mark began on the gage side of the rail at a point 11 feet 5 inches south of the leaving end of the rail. At a point 21 inches farther north there was evidence of increased pressure outward; a heavy mark appeared on top of the rail and continued diagonally throughout a distance of 4 feet 3 inches and ended in a heavy indentation 3-1/8 inches long and 15/32 inch wide on the outside edge of the head of the rail. A second heavy flange mark was parallel to the first mark across the top of the rail and was 1-1/2 inches farther north; this flange mark ended in a heavy indentation 4 inches long and 1/2 inch wide on the outside of the rail. At points 19 inches and 5 inches from the leaving end of the rail two other flange marks appeared on the gage side and continued to the receiving end of the succeeding rail, then extended diagonally across the top of this rail to the outer edge and ended in heavy indentations at points 15 and 28 inches north of the receiving end of the rail. At a point 3-1/2 inches from the leaving end of the first rail there was another heavy mark that extended diagonally a distance of 8-1/2 inches across the top to the receiving end of the succeeding rail and ended in a deep indentation on the outer edge. At a point 9 feet 3 inches from the leaving end of the second rail there was a beveled mark that extended to the end of the rail. At this point the outside angle bar and one bolt head were marked.

Discussion

According to the evidence, Extra 726 North was moving at an estimated speed of 30 to 35 miles per hour when the engine was derailed to the right at a point on the south spiral of a 9° curve to the left where the curvature was about 3° and the superelevation about 3 inches. The maximum authorized speed for the train involved was 35 miles per hour, and there is no evidence that the train was exceeding that speed. The derailment occurred on a 1.17 percent descending grade for northbound trains. The track immediately south of the point of accident was in proper gage and alinement and in good surface. There was no indication of dragging equipment. After the accident occurred, inspection of the engine and cars failed to

disclose any defective condition that might have existed prior to the accident and contributed to the cause of the derailment.

The engine had rounded a 9° curve to the right, moved over a tangent 112 feet long and had just entered a 9° curve to the left when the fireman observed the front end of the engine thrust to the right, then to the left, and again to the right, and the engine overturned immediately to the right. The front brakeman, who was on the tender, observed the engine sway to the right and then overturn.

Some witnesses expressed the opinion that the track was misalined as a result of high temperature but the fireman did not observe any track irregularity. The ends of the rails at undisturbed rail joints both north and south of the point of accident were not tight. The temperature was about 90 degrees. Since the descending grade continued a considerable distance north of the point of derailment and the center of the curve involved was about 80 feet north of the point of accident, it is improbable that a sun kink would occur at the point where the derailment occurred.

The track at the point of derailment was fully ballasted and full shoulders were provided. The absence of flange marks on the ties, the nature of marks on the head of the high rail and on the flanges of the right Nos. 2, 3 and 4 driving wheels indicated that the front end of the engine was the first part to leave the track; this agrees with the statements of the fireman and the front brakeman. To provide superelevation on the curve to the right and the curve to the left, which were separated by a short tangent, throughout a distance of 200 feet immediately south of the point of derailment the east rail varied from 3-1/2 inches lower than the west rail to 3 inches higher than the west rail. This condition would cause the engine to roll laterally if the speed were high. The engine was of the 2-8-8-2 type. Since the rear end of the boiler of this type is rigid on the rear driving unit and the front end moves laterally on the front driving unit, it follows that when the engine entered the curve to the right the front end of the boiler moved to the left of the center; then, when the engine entered the short tangent the front end probably moved momentarily to the right and then to the left, and when the engine entered the curve to the left the front end again moved to the right. If the engine were moving at high speed the movement of the front end of the boiler from side to side would cause the engine to rock laterally and the front end to thrust laterally. Some witnesses were of the opinion that the track was safe for the maximum authorized speed; however, two engine-men thought a speed of more than 20 or 25 miles per hour at the

point involved was unsafe for a mallet engine, and the evidence developed in the investigation indicates that the maximum authorized speed was too high for this type of engine in the territory involved. According to the statement of the superintendent, enginemen are expected to reduce speed below the maximum authorized speed at points where it is necessary for the safe movement of their trains. If lower speed limit for safe movement is required for engines of certain types or at specified locations, operating officials should establish such speed restrictions in a definite manner instead of placing the responsibility on enginemen to determine the safe speed under all conditions.

Cause

It is found that this accident was caused by the train being operated on a sharp curve at excessive rate of speed for the type of engine involved.

Dated at Washington, D. C., this twenty-first day of July, 1941.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.