

Inv-2369

INTERSTATE COMMERCE COMMISSION
WASHINGTON

REPORT OF THE DIRECTOR
BUREAU OF SAFETY

ACCIDENT ON THE
NORFOLK AND WESTERN RAILWAY

DIX BRANCH, VA.

JULY 5, 1959

INVESTIGATION NO. 2369

SUMMARY

Inv-2369

Railroad: Norfolk and Western

Date: July 5, 1939

Location: Dry Branch, Va.

Kind of accident: Derailment; Wreckage striking
opposing train on adjacent track

Trains involved: Freight: Freight

Train numbers: Extra 2030: Extra 2037

Engine numbers: 2030: 2037

Consist: 101 cars and 108 cars and
caboose caboose

Speed: 20-35 m.p.h. 18-25 m.p.h.

Operation: Timetable, train orders, and
automatic block-signal system

Track: Double; 5° 15' right curve;
grade level

Weather: Clear

Time: 1:05 p.m.

Casualties: 3 killed, 5 injured

Cause: Failure to lubricate properly the
main boiler-bearing sliding-plate
of a locomotive

September 18, 1939.

To the Commission:

On July 5, 1939, there was a derailment of a freight train on the Norfolk and Western Railway near Dry Branch, Va., the wreckage of which struck a freight train moving in the opposite direction on an adjacent track, resulting in the death of three employees, and the injury of three trespassers and two employees.

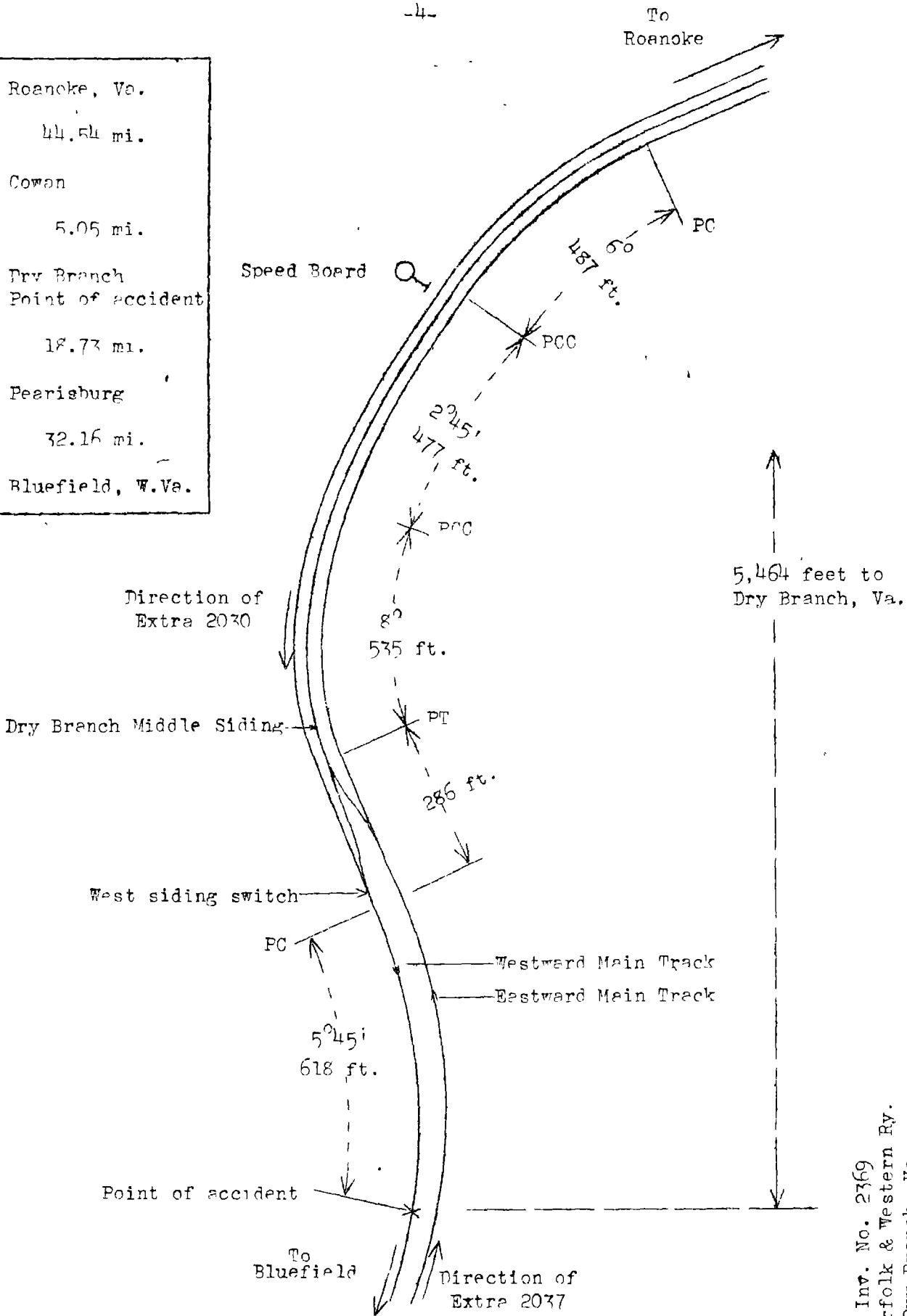
Location and Method of Operation

This accident occurred on that part of the Radford Division which extends between Bluefield, W. Va., and Roanoke, Va., a distance of 100.93 miles. In the 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 derailment occurred on the westward track at a point approximately 3,454 feet west of the station at Dry Branch, and 367 feet west of the west switch of the middle siding which lies between the eastward and westward main tracks. In the vicinity of the point of accident the tracks are laid on a side-hill cut paralleling the south bank of New River; a 25-foot embankment slopes from the westward track toward the river. Approaching from the east on the westward track there is a series of curves and tangents followed by a compound curve to the left 1,499 feet in length. This compound curve, composed of 487 feet of 6° curvature, 477 feet of $2^{\circ} 45'$ curvature, and 535 feet of 8° curvature, is followed by a tangent 365 feet in length and a $5^{\circ} 15'$ curve to the right 836 feet in length. The derailment occurred on this latter curve at a point 342 feet west of its eastern end. The superelevation on this curve is 6 inches and the gage varies between 4 feet $8\frac{1}{4}$ inches and 4 feet $8\frac{1}{2}$ inches. The grade on the westward track is 0.27 percent descending a distance of 1,300 feet, then level a distance of 398 feet to the point of accident and some distance beyond.

Approaching from the west on the eastward track there is a tangent 1,253 feet long followed by a $5^{\circ} 15'$ curve to the left 836 feet in length. The accident occurred on this curve, which has a superelevation of 5 inches. The grade is 0.21 percent ascending a distance of 1,900 feet, then level 302 feet to the point of accident and some distance beyond.

The track structure of the westward track consists of 130-pound rail, 39 feet in length, laid on 24 treated oak ties to the rail length; it is fully tie-plated, spiked with two plate-holding and two rail-holding spikes per plate, provided with six rail anchors per rail length, is equipped with continuous angle bars 24 inches in length, laid on 30 inches of crushed stone, and is

o	Roanoke, Va.	
		44.54 mi.
o	Cowan	
		5.05 mi.
o	Dry Branch	
x	Point of accident	
		18.73 mi.
o	Fearisburg	
		32.16 mi.
o	Bluefield, W.Va.	



Inv. No. 2369
 Norfolk & Western Ry.
 Dry Branch, Va.
 July 5, 1939

well maintained. The rail was laid in 1923. The track structure of the eastward track consists of 131-pound rail, 39 feet in length, laid on 24 treated oak ties to the rail length; it is fully tie-plated, spiked with two rail-holding and two plate-holding spikes per plate, provided with twelve rail anchors per rail length, is equipped with 6-hole straight angle bars 38 inches in length, laid on 30 inches of crushed stone, and is well maintained. The rail was laid in 1930. A minimum distance of 15 feet is maintained between track centers.

A speed board located 1,818 feet east of the point of accident limits the speed of passenger and freight trains to 50 and 40 miles per hour, respectively.

The weather was clear at the time of accident, which occurred at 1:05 p.m.

Description

Extra 2030, a west-bound freight train, consisted of 101 empty hopper cars and a caboose, hauled by engine 2030, of the 2-8-3-2 type, and was in charge of Conductor Meyers and Engineman Brooks. This train departed from West Roanoke, 48.2 miles east of Dry Branch, at 10:30 a.m., according to the train sheet, passed Cowan, 5.05 miles east of Dry Branch, at 12:53 p.m., and, while rounding the curve west of the west end of Dry Branch middle siding, was derailed while moving at a speed variously estimated to have been between 20 and 35 miles per hour. Engine 2030 became derailed to the right and stopped on its right side down the embankment at an angle of 45 degrees to the track with its front end touching the westward track and its rear end farther down the bank. The tender, remaining coupled to the engine, was derailed and stopped down the embankment with its rear end nearer to the track. The first 17 cars, 8 of which were demolished, were derailed and stopped at various angles on the track and down the embankment.

Extra 2037, an east-bound freight train, consisted of 19 loaded and 89 empty cars and a caboose, hauled by engine 2037, and was in charge of Conductor Coalson and Engineman Spangler. This train passed Pearisburg, the last open office, 18.7 miles west of Dry Branch, at 12:10 p.m., according to the train sheet, and, while moving at a speed variously estimated to have been between 18 and 25 miles per hour, was struck by the derailed wreckage of Extra 2030. The north sides of the ninth and the tenth cars were damaged by being scraped; the fourteenth to twenty-third cars, inclusive, were derailed and stopped at various angles on both tracks, eight being demolished. The twenty-

ninth and twenty-fifth cars were derailed but remained upright and in line with the track. The wrecked equipment of Extra 2030 was confined within a distance of 393 feet and that of Extra 2037 within a distance of 315 feet. The westward track was out of line throughout a distance of 367 feet, and a section 272 feet in length was destroyed. A section of the eastward track 63 feet in length was destroyed. The employees killed were the engineer, the fireman, and the front brakeman of Extra 2030 West; the employees injured were the conductor and the flagman of Extra 2037 East.

Summary of Evidence

Conductor Myers, of Extra 2030, stated that an air-brake test was made at West Roanoke; the brakes functioned properly en route. Approaching the point where the accident occurred he was seated in the caboose, at which time the speed was between 25 and 28 miles per hour, when an emergency application of the brakes occurred and the train stopped abruptly at 1:05 p.m. He went forward and found engine 2030 and 17 cars derailed. At West Roanoke he had ridden on engine 2030 a distance of three-fourths mile and had noticed nothing wrong with the engine.

Flagman Witt, of Extra 2030, stated that he was in the caboose approaching the point of accident; the speed was about 20 or 25 miles per hour. The accident occurred at 1:05 p.m., at which time the weather was clear and hot.

Conductor Coalson, of Extra 2037, stated that approaching the point of accident he was in the caboose, at which time the speed was between 20 and 22 miles per hour. He observed Extra 2030 at the west end of Dry Branch siding, but saw nothing unusual in its motion. At 1:05 p.m. the train stopped suddenly. He then went forward and found that both trains were wrecked. He could advance no opinion as to the cause of accident.

Flagman Shelton, of Extra 2037, stated that after the accident occurred he examined the track but found nothing which he thought might have caused the derailment. The speed of Extra 2037 was between 20 and 25 miles per hour.

Front Brakeman Kegley, of Extra 2037, stated that approaching the point of accident he was in the brakeman's booth on top of the tender. He first was aware of the approach of Extra 2030 as the engines passed each other. He saw engine 2030 swing to the left and scrape two cars, the ninth and tenth cars in his own train, then swing to the right, overturn and slide on its right side down the embankment. He examined these cars afterward

and found that they had been scraped and badly dented. He examined the track but could not determine the cause of the accident.

Engineman Spangler, of Extra 2037, stated that an air-brake test was made at Bluefield and the brakes functioned properly en route. Approaching the point of accident, at which time the speed was between 18 and 20 miles per hour, he observed Extra 2030 at a distance of about 15 car lengths; there was nothing unusual in the motion of its engine at that time. Shortly after the two trains passed each other the brakes on his train became applied in emergency and he heard slack action on the other train. Subsequently he examined the track but could not determine the cause of the accident.

Fireman Munsey, of Extra 2037, stated that approaching the point of accident he saw Extra 2030 at a distance of 25 car lengths and there was nothing unusual in its motion. The two engines passed each other at the west siding-switch, at which time engine 2030 was moving at a speed between 25 and 30 miles per hour. At the time when the brakes on his train were applied in emergency he noticed that Extra 2030 was stopping.

William Scott and John Howell, two boys living in Dry Branch, were walking eastward along the track near the point of accident and saw the accident occur. They stated that an east-bound train moving about 20 miles per hour passed them; then a west-bound train, which was moving about 35 miles per hour, approached. The engine of the west-bound train started to shake and then wobbled to the left, struck the side of the east-bound train, and then turned over.

Assistant to the General Manager Derrick stated that he arrived at the point of accident about 1-1/2 hours after its occurrence and examined the westward track. Beginning at the heel of the west siding-switch the track was shifted to the right gradually, and at a point 367 feet west of the switch it was 4-1/2 inches out of line. From this point the track was destroyed for some distance. At the point where the track was first broken the rails were spread apart; the left rail was lying close to the edge of the ties of the eastward track and a portion of the right rail was on the extreme outer edge of the roadbed, and a portion of it was down the embankment. The track being knocked out of line to the right indicated to him that engine 2030 was fouled in such manner that the driving units could not curve with the track. It had just rounded an 8° left curve and apparently did not straighten up, or right itself, on the tangent track between the two curves. It was his opinion that the

first pair of drivers of the rear unit became derailed first as there were four or five ties marked by what appeared to have been the flanges of the first pair of drivers of the rear unit; these marks progressed outward to the right about two inches in each foot. The two driving units forced the rails apart; the rear unit being rigid with the boiler and carrying more weight had more force in its direction than the forward unit. The front of the boiler being in an abnormal position and the weight of the train adding impetus caused the engine to be thrown at an angle of 45 degrees to the track and to be turned over on its right side and to skid down the embankment. This is confirmed by the spikes being sheared off on the outside and pulled loose on the inside of the low rail; the spikes and plates of the high rail had been pushed outward to the left. The following morning he examined the track for gage, alinement, and superelevation on the curve immediately east of the derailment and on all curves to a point 3.4 miles east of the point of derailment; all were in good condition except three right curves of approximately 6 degrees each, located 8.4 miles, 6.8 miles, and 5.9 miles east of the point of the accident, respectively, which were moved to the right a maximum of 1/2 inch. He was over this track at 11:30 a.m. on a motor-car the day of the accident and noticed nothing wrong at that time.

Chief Chemical and Test Engineer Coddington stated that he had arrived at the point of accident about three hours after its occurrence. Engine 2030 had stopped on its right side down the embankment with its front end near the westward track and its rear end down the slope. The drivers, rods, and running gear were in good condition; the springs and equalizers were in proper position and could not have contributed to the accident. After the engine had been rerailed a further inspection was made and no defects were found except that the main boiler-bearing sliding-plate of the forward unit was lubricated on its left surface but was dry on its right surface; the intermediate boiler-bearing sliding-plate was well lubricated. The only marks on the wheels were abrasions on the counterbalances of the left No. 2 and the left No. 3 drivers, which he believed were caused in the process of overturning as a corresponding mark was found on an angle bar approximately at the point of derailment. He examined the track and found that it was shifted to the right progressively as the engine entered the right curve on which the derailment occurred. The track was shifted to the right as follows:

44 inches west of the heel of the west Dry Branch siding-switch	1/4"
33 feet 4 inches farther west	1/2"
123 feet 11 inches west of switch point	2-1/2"
173 feet 4 inches west of switch point	4 "
216 feet west of switch point	4-1/4"
233 feet 8 inches west of switch point	4-1/4"

He made a further examination and found that the track had been moved out of alinement on three right curves, however, there was one right curve on which no track disturbance was found. He said that the track watchman at Cowan reported the track at that point had been in good condition until engine 2030 passed. These track disturbances indicated to him that a resistance was developed which prevented a change in relationship between the forward driving unit and the boiler on right curves. He was not certain that lack of lubrication on the main boiler-bearing sliding-plate was sufficient to prevent the engine curving properly but thought it might be significant.

Data furnished by Assistant Superintendent Altizer shows the elevation of the left rail of the westward track to have been 1 inch at a point 50 feet west of the west siding-switch; 2 inches, 100 feet westward; 3-1/2 inches, 150 feet westward; 5 inches, 200 feet westward; 6 inches, 250 feet westward; 6 inches, 300 feet westward; and 4 inches, 750 feet westward.

Engine 2030 is a compound articulated mallet engine of the 2-8-8-2 type. Its weight in working order is 531,000 pounds, distributed as follows: Engine truck, 28,000 pounds; first pair of drivers, 59,600 pounds; second pair of drivers, 59,300 pounds; third pair of drivers, 59,700 pounds, fourth pair of drivers, 58,400 pounds; fifth pair of drivers, 60,100 pounds; sixth pair of drivers, 60,000 pounds; seventh pair drivers, 60,700 pounds; eighth pair of drivers, 60,200 pounds; and trailer truck, 25,000 pounds. The engine-truck wheels are 30 inches, the drivers 57 inches, and the trailer wheels 30 inches in diameter. The tender is rectangular in shape and has two 6-wheel trucks; the diameter of these wheels is 33 inches; its capacity is 18,000 gallons of water and 26 tons of coal; its loaded weight is 314,340 pounds. The wheel-base of each driving unit is 15 feet 9 inches; the distance between the engine-truck wheel-center and the first driver-center is 9 feet 6 inches; the distance between the two driving units is 10 feet 10 inches; the total engine wheel-base is 53 feet and the overall length of engine and tender is 107 feet 9-1/2 inches. The boiler is supported upon the forward unit of driving wheels by two boiler-bearing sliding-

plates, the intermediate, which is located ahead of the fourth pair of drivers, and the main, which is located between the second and third pairs of drivers. The main boiler-bearing support consists of a bronze sliding-plate attached to a saddle, which, in turn, is attached to the boiler; a fiber waste-filled cavity is provided in this saddle to retain oil and permit its feeding to the sliding-plate where it is distributed over the bearing surface by motion of the engine. A lower plate of boiler steel is attached to a transverse frame tie-brace; the two plates run in contact. The weight on the main boiler-bearing sliding-plate is approximately 141,000 pounds or 138.2 pounds per square inch. The two driver units are connected by an articulated hinged casting secured by a pivot pin.

According to data furnished by the railroad, engine 2030 was given class 4 repairs in October 1938. This engine then made 1,656 miles and was taken out of service and stored, unsheltered, on November 1, 1938. It was restored to service July 3, 1939, and at the time of the accident was on its first trip after being taken out of storage. After the accident all drivers were gaged back-to-back in three positions; none were out of gage, which varied between 53-3/32 and 53-1/4 inches. The lateral motion on all engine wheels was well within the prescribed limits, varying between 5/16 and 3/8 inch. Other data furnished by the railroad shows that the displacement of the track to the right by this engine approaching the point of accident occurred at points where a left curve of about 6 degrees was closely followed by a right curve of approximately the same degree of curvature.

Observations of the Commission's Inspectors.

The Commission's inspectors observed that there were no flange marks or marks of dragging equipment on the westward track approaching the point where the track was destroyed. The track was forced out of alignment on the inside of the curve involved, varying between 1/2 inch and 4-1/2 inches. This distortion of track extended westward from the west siding-switch a distance of 367 feet, beyond which the track was destroyed a distance of 272 feet. The track was gaged at 23 points in the distance of 367 feet above mentioned and the gage varied between 4 feet 8-1/4 inches and 4 feet 8-1/2 inches.

Engine 2030 was inspected at the scene of accident and later at Roanoke shops. The water-pump-exhaust-receiver-pipe bracket near the front end on the left side of the boiler was broken, the left running board bent, and the pilot-beam scarred; there were marks on the left low-pressure cylinder. These scars bore very pronounced traces of red car-paint. The right side of the locomotive was damaged in the process of overturning. The springs were in good condition and the brake rigging was normal; the

throttle was closed, the reverse lever in forward position, and the automatic brake-valve handle was broken off. The main boiler-bearing sliding-plate was slightly lubricated on its left side but was dry on the right side. The oil cavity contained fiber waste but this contained neither sufficient oil to be visible nor sufficient oil to lubricate the surface of the sliding-plate. The ninth and tenth cars of Extra 2037, both of which were box cars, were found to have sustained damage on their north sides corresponding in height and extent to the scars on the left side of the locomotive. Imbedded in the sheathing on the north side of the tenth car at a height of 9 feet 10 inches above the top of the rail was a portion of a stud to which was attached a washer and a nut which were identified as having been broken from the water-pump-exhaust-receiver-pipe bracket on the left side of engine 2030.

Discussion

According to the evidence, after the accident the westward track was found to be spread at the point of derailment, which was on a $5^{\circ} 15'$ curve to the right. The high rail and the spikes and plates on the high side of the curve were shifted to the left and stopped near the ends of the ties of the eastward track. Some of the low rail was shifted to the right to the outer edge of the road-bed, and some was shifted down the embankment. On the low side the outer spikes were sheared off and the inner spikes were pulled out. The gage of the track was not in excess of 4 feet 8-1/2 inches. The superlevation was sufficient for the maximum authorized speed and the speed of the west-bound train was less than the maximum authorized speed. An official of the railroad had been over the track involved about 1 hour 35 minutes before the accident occurred, at which time the track was in good condition. Over a distance of 8.4 miles approaching the point of accident the westward track had been moved out of alinement to the right a maximum of 1/2 inch on three curves to the right of approximately the same degree of curvature as the one involved in the accident; in these instances curves to the left immediately preceded the curves to the right. The track watchman at Cowan, approximately 5 miles east of the point of accident, reported that he found the track shifted after the passage of Extra 2030 West. When this train left an 8° curve to the left, it started to shift the track to the right on a short tangent which immediately preceded the curve to the right upon which the accident occurred. The shift on the tangent was 1/4 inch, but as the engine entered the curve to the right this shift increased progressively until it reached a distance of 4-1/4 inches out of alinement.

After the accident an examination of engine 2030 disclosed that the running gear was in good condition, the wheels were not out of gage, and there was no excessive lateral motion. The main boiler-bearing sliding-plate was slightly lubricated on its left side but was dry on its right side. The fiber-waste packing in the cavity of the upper sliding-plate saddle was moist but did not contain sufficient oil to provide adequate lubrication. As this main sliding-plate supports a weight of 141,000 pounds, or 138.2 pounds per square inch, a lack of lubrication would create on curves a high fractional resistance to a change in relationship between the boiler and the forward driving unit. Apparently, when the engine entered the short tangent the forward driving unit was inclined to the left and on account of lack of lubrication remained in this position when entering the curve to the right. Normally, the inclination of the rear driving unit would be to tram in a tangent with the engine truck. Apparently this condition resulted in the left front driver of the forward driving unit bearing heavily against the high rail and the right rear driver of the forward driving unit bearing heavily against the low rail, thereby creating a wedging effect which resulted in the rails being spread and the rear unit of the engine being derailed first. Because of the manner in which the engine became derailed at an angle to the track, it is apparent that the engine pivoted on the forward portion of the rear unit, which resulted in the front end swinging to the left and the rear end to the right.

Why the condition of engine 2030 was not observed prior to the derailment is not known as all members of the crew on the engine were killed in the accident.

Conclusion

This accident was caused by failure to lubricate properly the main boiler-bearing sliding-plate of an articulated locomotive.

Respectfully submitted,

S. R. WHITE

Assistant Director.