INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT NO. 3649

ST. LOUIS-SAN FRANCISCO RAILWAY COMPANY

IN RE ACCIDENT

AT MARKED TREE, ARK., ON

AUGUST 19, 1955

SUMMARY

Date:	August 19, 1955
Railroad:	St. Louis-San Francisco
Location:	Marked Tree, Ark.
Kind of accident:	Derailment
Train involved:	Passenger
Train number:	105
Locomotive number:	Diesel-electric units 2018 and 2015
Consist:	13 cars
Speed:	50 m. p. h.
Operation:	Timetable, train orders, and automatic block-signal system
Track:	Single; spiral; level
Weather:	Clear
Time:	9:10 a. m.
Casualties:	5 killed; 21 injured
Cause:	Defective switch stand

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3349

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

ST. LOUIS-SAN FRANCISCO RAILWAY COMPANY

September 29, 1955

Accident at Marked Tree, Ark., on August 19, 1955, caused by a defective switch stand.

REPORT OF THE COMMISSION[1]

CLARKE, Commissioner:

On August 19, 1955, there was a derailment of a passenger train on the St. Louis-San Francisco Railway at Marked Tree, Ark., which resulted in the death of 4 passengers and 1 dining-car employee, and the injury of 16 passengers and 5 dining-car employees.

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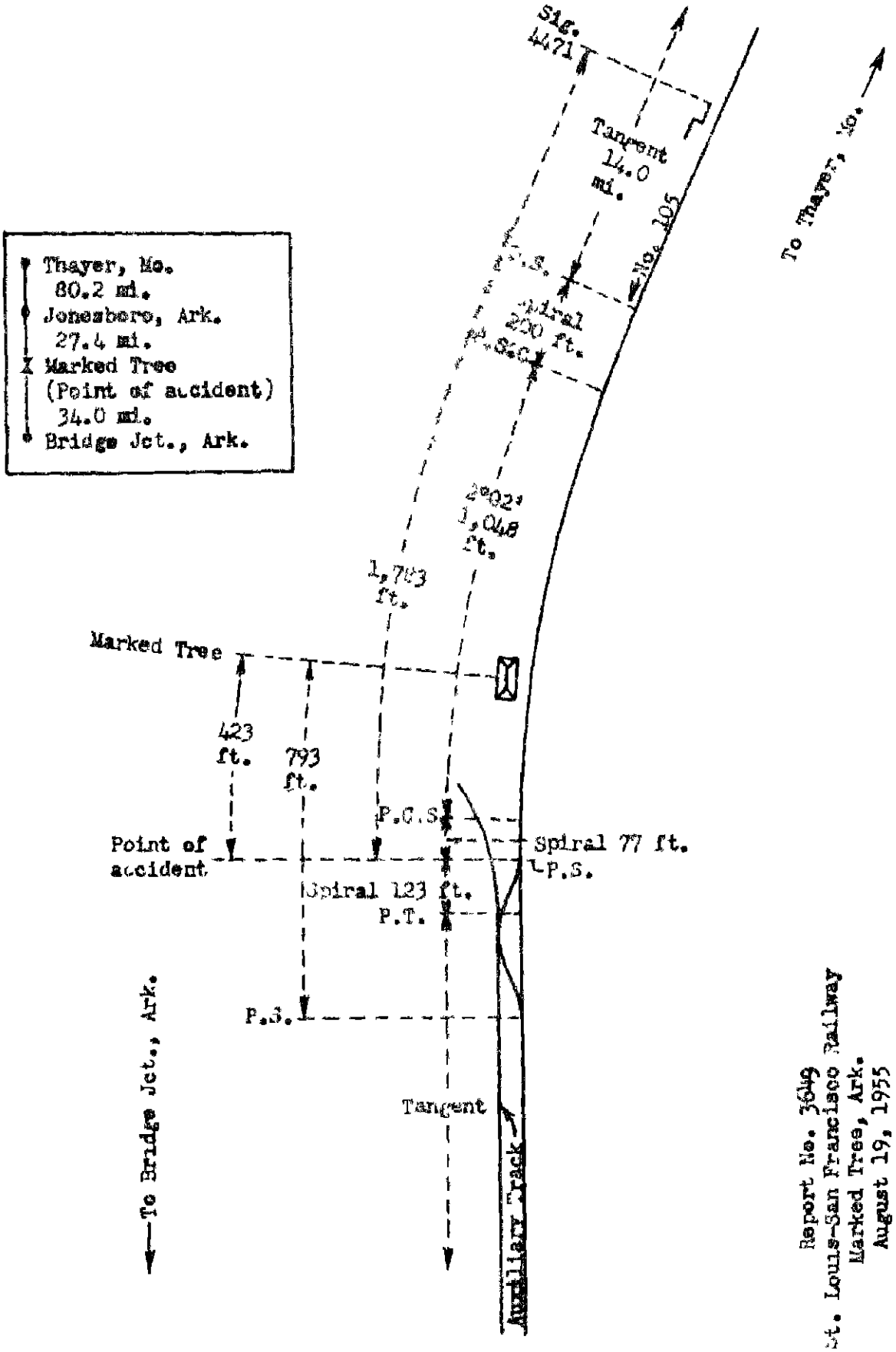
[1] Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Clarke for consideration and disposition.



Report No. 3649
St. Louis-San Francisco Railway
Marked Tree, Ark.
August 19, 1955

Location of Accident and Method of Operation

This accident occurred on that part of the Eastern Division extending between Thayer, Mo., and Bridge Jct., Ark., 141.6 miles. In the vicinity of the point of accident this is a single-track line, over which trains are operated by timetable, train orders, and an automatic block-signal system. At Marked Tree, Ark., 107.6 miles south of Thayer, an auxiliary track parallels the main track on the west throughout a distance of about 1,900 feet. The north switch of a crossover which connects the main track and the auxiliary track is located 423 feet south of the station. This switch is facing-point for south-bound movements on the main track. The south switch of another crossover between the main track and the auxiliary track is located 793 feet south of the station. This switch is trailing-point for south-bound movements on the main track. At the time of the accident there were six freight cars on the auxiliary track. The north end of the north car was 565 feet south of the north switch of the north crossover. The accident occurred at the north switch of the north crossover. From the north on the main track there are, in succession, a tangent 14.0 miles in length, a spiral to the left 200 feet, a 2°02' curve to the left 1,048 feet, and a spiral 77 feet to the point of accident and 123 feet southward. The grade is practically level. In the vicinity of the point of accident the tracks are laid on a fill approximately 12 feet in height.

In the vicinity of the point of accident the track structure consists of 112-pound rail, 39 feet in length, laid new in 1942 on an average of 24 treated ties to the rail length. It is fully tieplated, spiked with two rail-holding spikes and two plate-holding spikes per tie plate, and is provided with 4-hole 24-inch joint bars and an average of 24 rail anchors per rail. It is ballasted with chats to a depth of 12 inches below the bottoms of the ties. The turnout at the north switch of the north crossover is constructed with switch rails 16 feet 6 inches in length and with a No. 10 spring-rail frog. The switch points are arranged for a throw of 4-1/2 inches.

The switch stand in service at this switch was of the low-stand ground-throw type and was located 7 feet 1 inch west of the center-line of the main track. The target is parallel with the track when the switch is lined for main-track movement. This type of switch operates through a pinion gear operated by the throwing lever, and a segment gear on the spindle. The gears are enclosed in a metal housing. A square section of the spindle measuring 1-1/2 inches by 1-1/2 inches is fitted into a square hole in the hub of the segment gear. It is secured by a rivet having a nominal diameter of 3/8 inch and a length of 2-7/8 inches. The rivet passes through the spindle and both sides of the hub of the segment gear, and supports the weight of the spindle and its attachments. A crank underneath the base of the stand is attached to the lower end of the spindle. A cylindrical lug on top of one end of the crank is fitted into a hole in the end of the connecting rod. This lug is 1-1/2 inches in diameter and 1-1/2 inches in height. Lugs are provided on the underside of the base of the stand to prevent the end of the connecting rod from rising above the top of the lug on the crank and becoming disengaged. The switch stand involved was installed new in 1942.

Automatic signal 4471, governing south-bound movements, is located 1,783 feet north of the point of accident.

Rules for the maintenance of way and structures read in part as follows:

Frogs and Switches.

* * *

561. Inspection of Main Track Switches and Turnouts. Section foreman shall make such inspection of main track switches as designated by roadmaster, and each week * * * examine switch stand for lost motion and possible defects, * * *

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563. Inspection of Switch Stands. Yearly, frog repairer, assisted by section forces, shall make a complete examination of all main track switch stands over ten years of age.

On ground throw type switch stands careful inspection shall be made of fan gear and bevel pinion gear, foot crank, and all other parts to detect cracks or defects.

To insure against failure to detect the slightest fracture or flaw, each part of the mechanism shall be thoroughly cleaned, using a light hammer in making the inspection. * * *

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The maximum authorized speed for passenger trains is 65 miles per hour.

Description of Accident

No. 105, a south-bound first-class passenger train, consisted of Diesel-electric units 2018 and 2015, coupled in multiple-unit control, one express-refrigerator car, three baggage cars, one baggage-mail car, one baggage car, one coach-dormitory car, three chair cars, one cafe-lounge car, and two sleeping cars, in the order named. The first car was of steel underframe construction, the tenth and the thirteenth cars were of lightweight steel construction, and the other cars were of conventional all-steel construction. The ninth, tenth, and thirteenth cars were equipped with tightlock couplers. This train departed from Thayer at 6:45 a. m., on time, passed signal 4471, which indicated Proceed, passed the station at Marked Tree at 9:10 a. m., 6 minutes late, and while moving at a speed of 50 miles per hour the rear truck of the ninth car, the tenth and the eleventh cars, and the front truck of the twelfth car were derailed at the north switch of the north crossover at Marked Tree.

Separations occurred between the eighth and the ninth cars and between the tenth and the eleventh cars. The forward portion of the train stopped with the eighth car about 1,700 feet south of the point of derailment. The rear truck of the ninth car became derailed at the south switch of the south crossover. This car stopped with the front end 914 feet south of the point of derailment. None of the derailed cars overturned. The side of the tenth car struck the freight cars on the auxiliary track, and the west side of the car was torn off between a point near the center and the rear end. This car stopped approximately in line with the main track. The eleventh car stopped with the front end near the rear end of the tenth car, and the rear end on the track structure of the auxiliary track. The front end of the car was badly damaged. The twelfth car stopped in line with the auxiliary track. The front truck and the appurtenances below the floor level at the front end of the car were considerably damaged. The thirteenth car stopped on the auxiliary track. The two most northerly freight cars on the auxiliary track were demolished.

The weather was clear at the time of the accident, which occurred at 9:10 a. m.

Discussion

As No. 105 was approaching the point where the accident occurred the speed was approximately 50 miles per hour, as indicated by the tape of the speed-recording device. The enginemen were maintaining a lookout ahead from the control compartment at the front of the locomotive, the conductor and the train porter were in the vestibule at the front of the ninth car, and the flagman was in the rear car. The conductor and the train porter said that they felt the ninth car become derailed in the vicinity of the north switch of the north crossover at Marked Tree. The conductor immediately stepped to the rear end of the eighth car and made an emergency application of the brakes by use of the conductor's valve. He said that the knuckle at the rear of the eighth car broke when the brakes became applied. The enginemen were not aware that anything was wrong until the brakes became applied.

After the accident occurred it was found that the connecting rod was disengaged from the crank on the switch stand at the north switch of the north crossover. The throwing lever was locked in position for main-track movement and the target indicated that the switch was in this position, but the switch points were lined for entry to the crossover. The switch points were undamaged. Marks on the ties indicated that wheels had dropped inside the east rail of the main track and inside the west rail of the crossover at a point about 24 feet south of the switch points. After becoming derailed several wheels had veered to the west, and the east wheels had crossed the west rail of the main track at a point about 40 feet south of the frog. From the position of the equipment after the accident occurred it appears that these marks were made by the rear truck of the tenth car and the front truck of the eleventh car. The tenth car apparently moved southward with the front end on the track structure of the main track and the rear end on the track structure of the auxiliary track to the point at which it struck the freight cars. The fact that signal 4471 indicated Proceed indicates that the switch points were in normal position when No. 105 passed the signal. From the position of the equipment and the marks on the track structure it appears that the switch points remained in normal position until after the front truck of the ninth car passed over them. The switch points then moved sufficiently to permit flanges to pass between the west switch rail and the stock rail. After the front truck of the twelfth car passed, the east switch point was moved against the stock rail. The following wheels were then diverted to the crossover.

When the housing of the switch stand was removed it was found that the rivet through the spindle and the hub of the segment gear had broken and worked out. The spindle had worked downward through the hub of the segment gear, and the crank at the lower end of the spindle had been lowered to the extent that the lugs underneath the base of the stand were no longer effective in preventing the end of the connecting rod from rising above the top of the lug on the crank. The end of the connecting rod had become disengaged from the lug on the crank, and the switch points were then free to move.

After the accident occurred the switch stand involved was sent to the testing department of the carrier for examination. According to the report of the engineer of tests of the carrier no exception was taken to the grade of steel of which the rivet was made. One end of the rivet was slightly cupped, and it appeared that a button head had broken off of this end. The head was not found. A button head at the other end was badly battered. It appeared that the head at one end may have broken off due to some cause such as cracking resulting from overdriving the rivet when it was applied. The rivet then worked partly out of the hole and fouled parts of the pinion gear assembly. Play between the spindle and the hub of the segment gear wore the rivet to a slight taper at the center. The fouling of the rivet head on the pinion gear assembly whenever the switch was thrown wore and distorted the head and set up bending stresses in the rivet. These stresses eventually caused a fatigue failure, and the rivet broke through the center. The headless portion of the rivet was then free to work out of the hole, and after the head of the other portion became worn to the extent that it cleared the pinion gear assembly this portion also worked out.

The switches in the vicinity of the point of accident are inspected weekly and also semi-annually. During the latter inspections all bolts in the switches are removed and the bolts and other parts are inspected for defects. The roadmaster said that it is not customary to disassemble the switch stands or to remove the housings of the switch stands during either of these inspections. The maintenance-of-way foreman made a semi-annual inspection of the switch involved approximately 7 months before the accident occurred, and the assistant foreman made a weekly inspection 7 days before the accident occurred. Neither of these employees removed the housing of the switch stand. The foreman passed the switch a few minutes before the accident occurred. He observed no defective condition of the switch or switch stand.

Cause

This accident was caused by a defective switch stand.

Dated at Washington, D. C., this twenty-ninth day of September, 1955.

By the Commission, Commissioner Clarke

(SEAL)

HAROLD D. McCOY,

Secretary.