

INTERSTATE COMMERCE COMMISSION
WASHINGTON

INVESTIGATION NO. 2472
THE UNION PACIFIC RAILROAD COMPANY
REPORT IN RE ACCIDENT
AT WEIR, COLO., ON
DECEMBER 22, 1940

SUMMARY

Railroad: Union Pacific
Date: December 22, 1940
Location: Weir, Colo.
Kind of accident: Derailment
Train involved: Passenger
Train number: 104
Engine number: Diesel power units L. A. 1, 2 and 3
Consist: 15 car units
Speed: 60-35 m. p. h.
Operation: Timetable, train orders and automatic
block and cab-signal system
Track: Double; tangent; 0.3 percent
descending grade eastward
Weather: Clear
Time: About 10:16 p. m.
Casualties: 5 injured
Cause: Accident caused by broken rail

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2472

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

THE UNION PACIFIC RAILROAD COMPANY

February 19, 1941

Accident at Weir, Colo., on December 22, 1940, caused
by broken rail.

REPORT OF THE COMMISSION¹

PATTERSON, Commissioner:

On December 22, 1940, there was a derailment of a passenger train on the Union Pacific Railroad at Weir Colo., which resulted in the injury of five passengers.

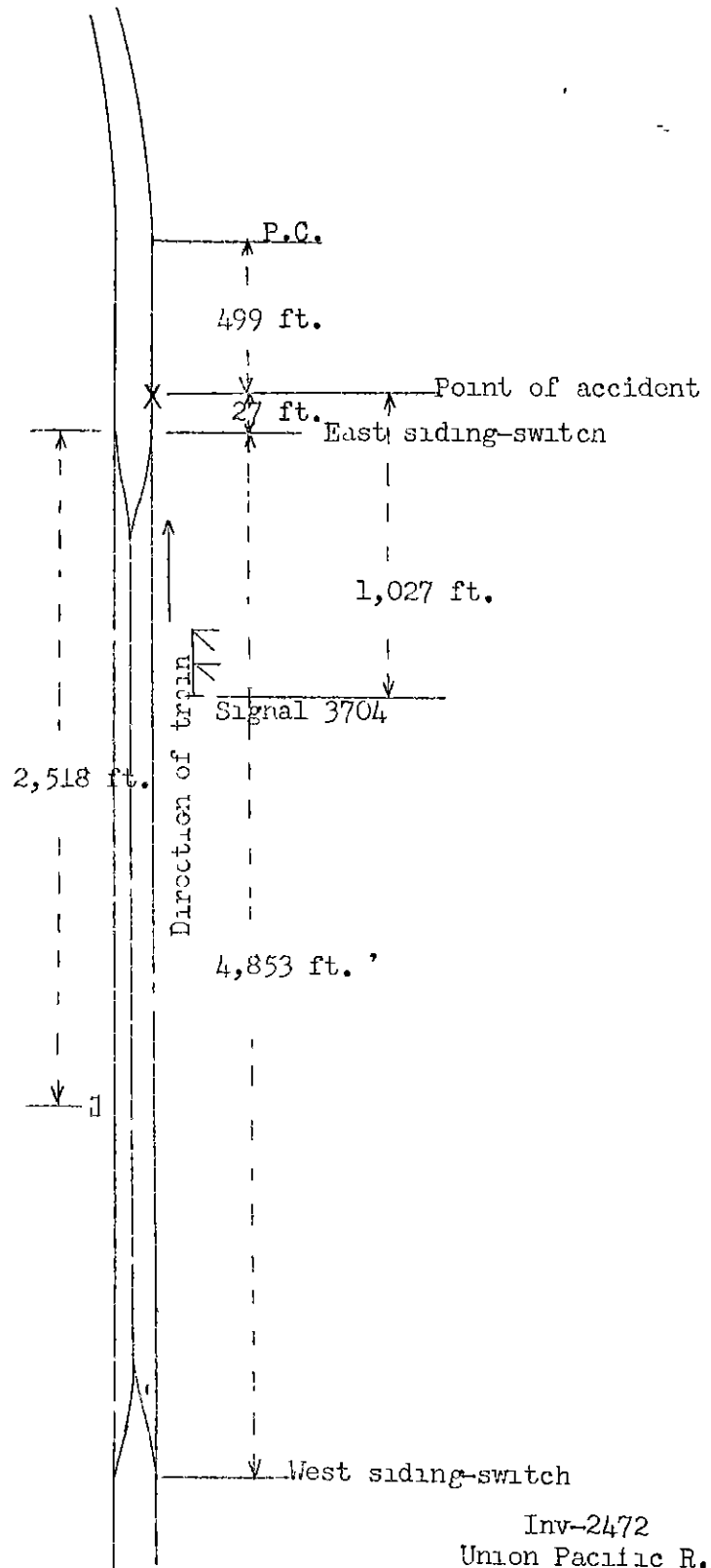
¹Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.

o	North Platte, Nebr.
	86.5 mi.
X	Point of accident
o	Weir, Colo.
	36.9 mi.
o	Sidney, Nebr.



Triangular piece broken off
at leaving, or eastern, end.

Weir



Inv-2472
Union Pacific R.R.
Weir, Colo.
December 22, 1940

Location and Method of Operation

This accident occurred on that part of the Nebraska Division designated as the Third Subdivision which extends between North Platte and Sidney, Nebr., a distance of 123.4 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 and cab-signal system. At Weir a siding 4,853 feet long lies between the main tracks; the east siding-switch is 2,518 feet east of the station. The derailment occurred on the eastward track at a point 27 feet east of the east siding-switch. As the point of accident is approached from the west there is a 1°00' curve to the left 2,870 feet in length, which is followed by a tangent 4,915 feet in length to the point of accident and 499 feet beyond. The grade for east-bound trains is 0.3 percent descending a distance of 4,090 feet to the point of accident.

The track structure consists of 131-pound rail, 39 feet in length, laid new in September, 1939, on 22 treated ties to the rail length; it is fully tieplated with double-shoulder tieplates, secured with two rail spikes and two lag spikes per plate, and is provided with eight rail anchors to the rail length; it is equipped with 4-hole angle bars 24 inches in length, is ballasted with gravel to a depth of 8 inches, and is well maintained. The rail joints are bonded with rail-head bonds for signal circuits. At the point of accident a distance of 26 feet is maintained between track-centers.

Automatic signals 3716 and 3704, which govern movements on the eastward track, are located 7,317 feet and 1,027 feet, respectively, west of the point of accident.

In the vicinity of the point of accident the maximum authorized speed for streamline trains is 90 miles per hour; however, speed is restricted to 75 miles per hour on the eastward track on curves east and west of Weir.

It was dark and the weather was clear at the time of the accident, which occurred about 10:16 p. m.

Description

No. 104, an east-bound streamline passenger train, known as "The City of Los Angeles," with Conductor Vernon and Engineer Voseipka in charge, consisted of three power units, an auxiliary baggage and dormitory unit, two chair units, one chair-lounge unit, one kitchen-diner unit, one diner unit, one dormitory-club unit, seven Pullman sleeping units, and one

lounge unit, in the order named. The three power units were of steel-frame construction; the bodies were of 3/8-inch plywood covered with 27-gage galvanized iron. The remainder of the units were of aluminum alloy with steel end-sills, body bolsters, and cross bearers. This train departed from Sidney, 36.9 miles west of Weir and the last open office, at 9:44 p. m., according to the train sheet, on time, and at a point 27 feet east of the east siding-switch at Weir it became derailed while moving at a speed estimated to have been between 60 and 65 miles per hour.

The three power units and the baggage-dormitory unit, remaining coupled, stopped with the front end of the first unit 1,821 feet beyond the point of derailment. Power units Nos. 1 and 2 were slightly damaged but were not derailed. The truck frames and the brake rigging on power unit No. 3 were badly damaged; the rear truck was derailed to the north. Unit No. 4 was derailed to the north but remained upright on the roadbed and in line with the track; the truck frames were broken and the underframe was damaged slightly. Units Nos. 4 and 5 became separated; the front end of unit No. 5 stopped 671 feet to the rear of unit No. 4. Units Nos. 5 and 6, which were articulated, were derailed and stopped north of the eastward track and parallel to it with the rear of the sixth unit about 8 feet north of the track; the trucks and the underframe of both units were slightly damaged. Unit No. 7 was derailed; it stopped with its front end just north of the north rail of the eastward track and its rear end on the westward track, and leaned at a 10-degree angle to the south; the trucks, underframe and diaphragms were damaged. Unit No. 8 was derailed and stopped, practically upright, with its front end on the westward track and its rear end on the eastward track; the trucks, underframe and side sheets were damaged. Unit No. 9, which was articulated with unit No. 8, was derailed and stopped with the front end on the eastward track and its rear end on the westward track; the trucks, underframe and side sheets were damaged. Unit No. 10 was derailed and stopped practically upright with the front end on the westward track and the rear end on the eastward track; the trucks, underframe and side sheets were damaged, and the diaphragms were bent. Unit No. 11 was derailed and stopped with the front end on the eastward track and its rear end on the westward track; the trucks were damaged, the side sheets and the diaphragms were bent, and the end sheets were torn. Unit No. 12 was derailed and became separated from unit No. 11, with which it was articulated, and stopped on its right side on the eastward track practically at right angles to it; the center-sills and end sheets were torn, the side sheets were bent and the trucks were

damaged. Unit No. 13, which was articulated with unit No. 14, was derailed and stopped upright and parallel to unit No. 12; the trucks were damaged, the diaphragms were bent, the center-sills and end sheets torn, and the side sheets bent; the front coupler-head was broken off. Units Nos. 14 and 15 were derailed and stopped upright about 38 feet back of unit No. 13; the front coupler of unit No. 14 was broken, the diaphragms were bent and the trucks and underframe damaged. The underframe of unit No. 15 sustained slight damage and one truck was damaged. Unit No. 15 was articulated with unit No. 16. The front truck of unit No. 16 was derailed to the north of the eastward track. Unit No. 18 was slightly damaged.

Summary of Evidence

Engineman Voseipka stated that at Sidney an air-brake test was made and the brakes functioned properly en route. As the train was approaching the point where the accident occurred, the headlight was burning brightly, he was maintaining a look-out ahead, and power unit No. 1 was riding smoothly. The automatic block signals and the cab signal displayed proceed for his train. About 1/2 mile west of Weir the engineman made a brake application which reduced the speed to about 60 miles per hour, then released the brakes. When the first unit was passing over the east siding-switch at Weir he heard a noise and felt a slight jar. The fireman, who was in the cab, remarked that the sound was similar to that made by a broken rail. Before the engineman could apply the air brakes, they became applied in emergency. In his opinion the rail involved had been broken previously and was held in place until his train struck it. After the accident occurred he inspected the power units and found the fuel tanks punctured and slid-flat spots on the No. 3 pair of wheels of the front truck of unit No. 1. The weather was clear at the time of the accident, which occurred about 10:16 p. m.

Fireman Rose corroborated the statement of his engineman, and added that he heard a sound as though something had struck the bottom of the power unit. Later he found that the fuel tank had been punctured just behind the No. 3 pair of wheels of the front truck of unit No. 1. After the accident occurred he inspected the track and found a 6 or 8-inch piece broken off the end of a rail; the angle bars were missing and the angle-bar bolts were broken.

Conductor Vernon stated that as his train approached the point where the accident occurred he was in the fourth unit and the speed was about 65 miles per hour. The train was riding

smoothly and the first intimation of anything wrong was the derailment of unit No. 4 soon after it passed over the east siding-switch. Afterwards he inspected the track and found a piece about 6 inches long broken off the end of a rail on the north side of the eastward track. The accident occurred at 10:15 p. m.

The statement of Front Brakeman Gutherless added nothing of importance.

Flagman Macomber stated that as his train was approaching the point where the accident occurred he was in the vestibule at the rear of the train, maintaining a lookout around the curve west of Weir. There was no indication of defective equipment. By means of an air gauge located in the vestibule he observed that the brakes were applied and released on the curve. Soon afterward the train was derailed. As he proceeded back to provide flag protection he found no indication of dragging equipment. Later he returned to the point of derailment and observed that at a rail joint a short piece was broken out of a rail; the outside angle bar was lying near the westward track but the inside angle bar was missing. He observed three broken angle-bar bolts with the nuts remaining on them.

Section Foreman Dodd stated that on December 19 he last inspected the track on which the accident occurred, and at that time it was in good condition. About three weeks prior to the accident he had snimmed the track, but he had not performed any work recently at that point.

Roadmaster Ferguson stated that he arrived at the scene of accident about 1.30 a. m., December 23, and inspected the track and equipment. Under unit No. 17, at a point 27 feet east of the east siding-switch, the north rail was broken about 7 or 8 inches from its leaving or eastern end; the broken piece was lying nearby. The break extended diagonally through the head, the web, the first angle-bar bolt-hole, and to the end of the rail about 2 inches above the base. The rail involved was 19 feet 6 inches long and had been cut by a chisel to the length necessary for placing in the track east of the switch stock-rail; the chisel marks were visible. Both angle bars were displaced; one was lying about 8 or 10 feet north of the track and about 15 to 20 feet east of the broken rail; another angle bar was lying between the rails of the eastward track about one-half rail length east of the broken rail. The roadmaster could not identify these bars as being from the joint involved. The adjacent rail remained in upright position but the receiving

end was badly battered. There was a crack in the web through the second bolt hole and it appeared to be a new break. Only three angle-bar bolts were found and these had been sheared; however, the nuts remained on the bolts. The first mark of derailment was a flange mark on the ties outside the north rail about 3 feet east of the broken rail; the marks continued diagonally toward the ends of the ties. He inspected the switch and the frog and found no indication of dragging equipment or of any condition which could have contributed to the cause of the derailment. A check of the gage and cross levels a distance of 28 rail lengths west of the point of accident disclosed that the cross-levels were regular and the gage varied between 4 feet 8-1/4 inches and 4 feet 8-1/2 inches. When he passed over the track involved on a motor-car on the day prior to the day of the accident he observed nothing wrong. In his opinion the broken rail was the cause of the derailment.

General Roadmaster Hart arrived at the scene of accident about 9:30 a. m., December 23. The first indication of derailment consisted of two flange marks on the fourth tie east of the joint involved. At the next joint eastward on the south rail there was a mark on the inside nut of the west angle-bar bolt. Examination of the track throughout a distance of 1/2 to 3/4 mile west of the point where the derailment occurred disclosed no indication of dragging equipment; the switch, frog and guard rail of the east siding-switch were in good condition. At the joint involved a triangular piece, measuring 7 inches on the running surface of the rail, was broken from the leaving end of the rail. The break extended diagonally through the web to the center of the No. 1 bolt hole and down to the fillet where the web joins the base of the rail. A triangular-shape piece was broken from the inner corner of the receiving end of the rail immediately east of the broken rail; the break extended to the middle of the head. An area of about 4 inches on the outside face of the outside angle bar was abraded. The ties under the joint were in place. On December 19, he rode over the track involved on a motor-car and found nothing wrong.

Division Engineer Jolley stated that at a point 5 feet east of the broken rail light wheel marks appeared on the ties about 8 inches north of the rails and continued eastward a distance of 65 feet; from that point eastward the track was destroyed by the derailed equipment. As the rail apparently broke under the No. 1 unit, the signals in the rear would not display restrictive indications before the passage of No. 104. No detector car had been operated over the track involved since this rail had been laid in 1939.

Track Patrolman Wise stated that on the morning of the day of the accident he patrolled the track and found nothing wrong.

Engineman Connelly, Fireman Genau and Conductor Lambert, of Second 6, the last train prior to the train involved to pass over the point where the accident occurred, stated that they neither felt nor heard anything that indicated something wrong with the track when their train passed over it about 7:05 p. m., December 22.

According to a report of the Research and Mechanical Standard Department of this railroad, the rail involved was a 131-pound, Carnegie-Illinois, controlled cooled, RE rail, rolled at Gary, Ind., May, 1939, laid in September, 1939, and bore the marking CC-63189-A-24. The rail was 19 feet 6 inches in length; it was cut from the top end of a 39-foot rail by use of a chisel. The chemical analysis of the broken rail was as follows:

Carbon	.79 percent
Manganese	.82 percent
Phosphorus	.021 percent
Sulphur	.033 percent
Silicon	.19 percent

Note: This conforms to specification and compares favorably with mill analysis. The inspection report at the mill indicated that it was an X-Ray1 because of segregation found in the first cut of an A rail.

The break occurred through the web 2-1/8 inches above the base, extended diagonally through the No. 1 angle-bar bolt hole to a point on the head 7 to 7-1/2 inches back of the leaving end. A small triangular section was broken from the field side of the rail head about 1-1/2 inches back of the major fracture. The faces of the fracture disclosed all new break. Etchings of cross-sectional, horizontal head-section and vertical head-section of the rail back of the fracture disclosed sound dense steel of normal structure. An etching of the face of the leaving end of the rail disclosed a group of hairline cracks about 1/2 inch above the major fracture; the cracks resulted from the tearing of the crystalline structure by stresses caused by blows when the rail was cut to the required length. The etching showed very light hardening of the running surface about 1/16 inch deep at the end of the rail, and it extended 1-1/2 inches back from the end of the rail. Maximum Brinell hardness on the running surface was 313, tapering to 245 at 3-3/4 inches from the end of the rail. The flame hardening bore no relation

to the failure of the rail. Although the inspection report at the mill indicates the rail was an X-Ray1, examination disclosed it to be of first quality. The hairline cracks may have been a factor contributing to the failure, and the report states this is sufficient to justify giving consideration to the method of breaking rail to length in the field. The angle-bar bolt holes, which were drilled in the field, were 1-1/8 inches in diameter, were slightly elongated and had light metal lipping on the gage side.

Examination of three angle-bar bolts involved disclosed that they were bent and sheared before breaking. Each bolt measured 1-1/8 inches in diameter at the threaded end and 1-1/16 inches through the body; each was worn at the point where it had been in contact with the rail bolt-hole seat.

According to data furnished by the railroad, the train involved is owned jointly by the Union Pacific Railroad and the Chicago and North Western Railway.

Observations of the Commission's Inspectors

The Commission's inspectors examined the track a distance of 3/4 mile west of the point of derailment and found no indication of defective or dragging equipment or any obstruction in the frogs or the flangeways of the guard rails; the switch points at the east siding-switch fitted properly. The inside corner of the head of the receiving end of the rail immediately east of the broken rail was broken off and battered, and bore tread and flange marks. The spike heads outside this rail were sheared off. Two of the angle-bar bolts were broken at the thread end. The head of the other bolt was broken off but the nut remained in place. These bolts had been slightly bent and the fractured ends showed evidence of having broken under stress. The only mark on the piece broken from the rail involved was circular in shape, about 1/2 inch in diameter, and 1/16 inch deep. Eastward from the broken rail the two succeeding rails bore flange marks on the gage side of the web; these marks were about 1 inch long, 3/4 inch wide and 1/4 inch deep.

The left No. 3 wheel of the front truck of unit No. 1 bore an abraded scar, 5/8-inch wide and 1/16-inch deep, extending diagonally across the outside face of the rim of the wheel. There was a 10-inch slid-flat spot on this wheel and on its companion wheel. The left No. 1 wheel of the rear truck of unit No. 1 bore marks, spaced at intervals of about 1 foot, on the outer edge of the tread. The left No. 2 wheel of the rear truck of unit No. 2 bore one mark 1/8 inch deep, 1/2 inch wide,

and 1 inch long on the outside edge of the tread. All wheels of the rear trucks of unit No. 1 and unit No. 3 were badly marked as a result of the derailment. The wheels of power unit Nos. 1, 2 and 3 were within the prescribed limits of diameters and back-to-back measurements of companion wheels. The flange thickness and height were within the prescribed limits.

The fuel tank and the water tank of unit No. 1 each had two holes punctured in the lower horizontal surfaces; the tanks were mounted below the body in the longitudinal center of the unit. There was no general distortion or telescoping of the superstructure of the cars. All couplers were of the tight-lock type; two were broken during the process of derailment.

Discussion

According to the evidence, No. 104 was moving at a speed of 60 or 65 miles per hour when it became derailed near the leaving end of a tangent, on which the maximum authorized speed for this train was 90 miles per hour, but on the curves immediately west and east of the tangent the speed was restricted to 75 miles per hour. The train had been riding smoothly. Prior to the time of the accident, there was no indication of defective equipment or track, nor of any obstruction on the track. The automatic wayside signals and the cab signal displayed proceed. The enginemen and the fireman heard a clicking sound, similar to that made by a broken rail, beneath unit No. 1 as this unit was passing over the east switch, and they felt an abnormal movement.

Subsequent to the accident, examination disclosed that a triangular-shape piece about 7-1/2 inches long was broken from the leaving end of a rail on the north side of the track at a joint 27 feet east of the east switch. This fracture extended diagonally through the web and first bolt hole to the end of the rail at a point about 2 inches above the base. The battered condition of the receiving end of the rail immediately east indicated that wheels had struck the end of this rail after the piece of rail had been displaced; in addition, there were wheel marks both outside and inside the receiving rail. Apparently the first two pairs of wheels of the front truck were not derailed at any time during the process of derailment, but marks on the third pair of wheels indicated that this pair at some time had been derailed; however, it was on the rails when the train stopped. Marks on the north wheels of the rear truck of unit No. 1 indicated that they had struck the receiving end of the rail located immediately beyond the fracture. The condition

of the angle-bar bolts disclosed that they had been in their proper places before the derailment but were bent and sheared during the derailment. The evidence is not definite whether the rail broke under No. 104 or under another train.

In September, 1939, when the rail involved was laid, it was cut by use of a chisel to a length of 19 feet 6 inches to fit with the switch stock-rail. According to a report of the Research and Mechanical Standard Department of this railroad, concerning the results of tests made of the broken rail, the metal was of good quality. Examination disclosed a group of hairline cracks, which resulted from the tearing of the crystalline structure by stresses caused by blows delivered when the rail was cut, and the bolt holes were slightly elongated.

Cause

It is found that this accident was caused by a broken rail.

Dated at Washington, D. C., this nineteenth day of February, 1941.

By the Commission, Commissioner Patterson.

SEAL

W. P. BARTEL,
Secretary.