

INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT OF THE DIRECTOR

BUREAU OF SAFETY

ACCIDENT ON THE

DENVER & SALT LAKE RY.

WEST PORTAL, COLO.

FEBRUARY 13, 1937

INVESTIGATION NO. 2146

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SUMMARY

Inv-2146

Railroad:	Denver & Salt Lake
Date:	February 13, 1937
Location:	West Portal, Colo.
Kind of accident:	Derailment
Train involved:	Light engine
Engine number:	404
Speed:	Undetermined
Track:	Tangent, descending westward through Moffat Tunnel
Weather:	Smoke in tunnel materially restricts visibility
Time:	2:15 p. m.
Casualties:	2 killed
Cause:	Unknown

April 14, 1937

To the Commission:

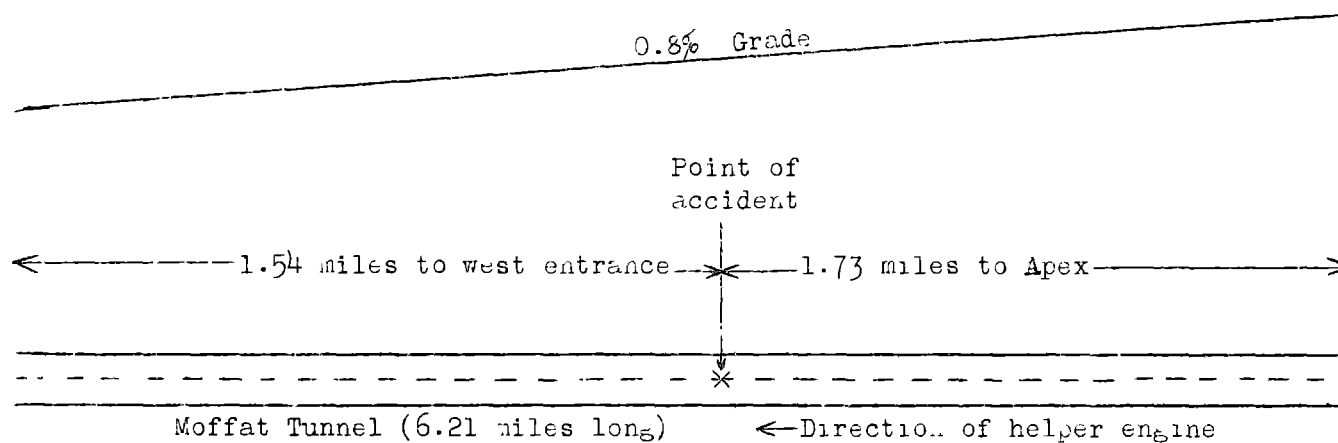
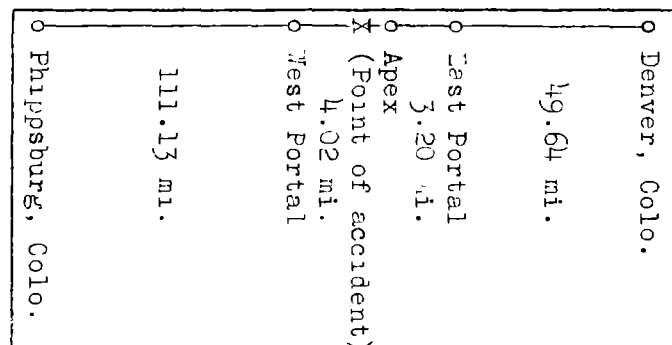
On February 13, 1937, there was a derailment of a light engine on the Denver & Salt Lake Railway in Moffat Tunnel, near West Portal, Colo., which resulted in the death of 2 employees.

Location and method of operation

The accident occurred on Subdivision 1, extending between Denver and Phippsburg, Colo., a distance of 167.99 miles; this is a single-track line over which trains are operated by timetable and train orders, a manual block system being used through Moffat Tunnel which is 6.21 miles in length. The west portal of the tunnel is located about 0.75 mile east of the passenger station at West Portal; the accident occurred in the tunnel at a point approximately 1.54 miles east of the west portal. The grade is ascending approaching the tunnel from both directions and breaks at a point within the tunnel, called Apex, 4.02 miles east of West Portal. Westward from Apex the grade is descending, being 0.8 percent at the point of accident; the track is tangent through the tunnel.

A series of 21 refuges, numbered consecutively commencing at the east portal and spaced from 1,200 to 2,000 feet apart, are located in the tunnel; telephones connecting with the operators at West Portal, East Portal and the chief dispatcher in Denver, are located in most of the refuges. The tunnel, in places, is lined with reinforced concrete; at other places the natural rock wall is covered with a coating of Gunitite. The tunnel is equipped with a ventilating system and it is the practice to blow the smoke westward for eastbound trains and eastward for west-bound trains; the tunnel is well drained with concrete drains.

The track in the vicinity of the point of accident was laid in 1928 and consists of 110-pound rail, 60 feet in length, with an average of 37 treated oak ties to the rail length, double-spiked at rail joints, fully tieplated, with 10 rail anchors to the rail length and ballasted with crushed rock laid on the natural rock of the tunnel floor, to an average depth of 2½ feet. The track structure is fairly well maintained. The authorized maximum speed for light engines running in backward motion is 25 miles per hour; however, there was a temporary slow order in effect, restricting speed to 20 miles per hour between Refuge 18 and the west portal; the accident occurred in a Gunitite section of the tunnel at a point 65 feet west of Refuge 18.



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Inv. No. 2146
Denver & Salt Lake Ry.
West Portal, Colorado
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A train having a helper engine coupled to the rear of the caboos stops when over the grade at Apex, waits 2 minutes for the helper engine to be uncoupled, and then proceeds. When the engineman of the helper engine is satisfied that the train has proceeded, the helper engine is backed out of the tunnel. Under block rules in effect through the tunnel no other train is permitted to enter until both the train and the helper engine using the tunnel have reported clear at West Portal and East Portal.

Smoke materially restricts visibility in the tunnel; the accident occurred about 2:15 p.m.

Description

Helper engine 404, in charge of Engineman Callahan and Fireman Root, assisted east-bound freight Train First No. 72 from Tabernash, 9.12 miles west of West Portal; the train stopped at Apex about 1:59 p. m., and waited 2 minutes while helper engine 404 was uncoupled from the caboos and then proceeded eastward and arrived at East Portal at 2:11 p. m., according to the train sheet. After cutting off Train First No. 72, helper engine 404 backed westward and on reaching a point approximately 1.73 miles from Apex it was derailed in the tunnel while traveling at an undetermined rate of speed.

The rear end of the tender was derailed toward the north and the rear end of the engine was derailed toward the south, striking the walls of the tunnel; they remained upright and coupled, with the left front driving wheel and pony truck wheel on the rail. The tender damaged the engine cab and stopped with its rear end 220 feet west of the initial mark of derailment. The employees killed were the engineman and fireman, the fireman dying three days after the accident.

Summary of evidence

The first indication of derailment was a wheel mark on track bolts on the gauge side of the south rail. As shown by measurements taken by the engineering department of the railroad at this point the track gauged $1/8$ inch wide and the north rail was $3/4$ inch low; at a point 1 foot west of the mark on the track bolts there was a wheel mark on a tie 8 inches from the base of the gauge side of the south rail and there was a corresponding mark on the outside of the north rail; these marks led diagonally toward the northwest, the north wheel leaving the ties 15 feet beyond, while 14 feet farther on two parallel wheel-marks made by south wheels appeared on the ties at points 17 inches and 27 inches from the gauge side of the base of the north rail. These latter

marks continued in an approximately straight line for a distance of 82 feet, from which point westward the track was badly torn up to the point where the tender and engine stopped. The rear end of the derailed tender struck the north wall of the tunnel at a point 58 feet west of where the double wheel marks first appeared on the gauge side of the north rail. Commencing at a point 30 feet east of the initial wheel mark on the track bolts, the track was thrown from $\frac{1}{2}$ inch to 12 inches northward out of line for a distance of 142 feet. A rail was broken on the south side of the track opposite the point where engine 404 stopped, the break occurring 43 feet from the receiving end of the rail and 54 feet west of the torn up track.

Cross levels and gauge measurements taken every 30 feet between refuges Nos. 17 and 19 showed the gauge to be $\frac{1}{4}$ inch wide at 4 different points, while the elevation was $\frac{3}{4}$ inch low at 12 different points. There was nothing found about the condition of the track which it was believed would have caused the accident.

Thorough examination was made of engine 404 and tender, including lateral, tread wear, flanges, crossheads and guides, side and main rods, spring rigging, driving box wedges, all safety appliances, etc. The side bearing clearance of the tender could not be obtained; all side bearings were in place and undamaged. The rear tender truck did not show indications of having left the center pin and there were no marks around the female casting. The brake rigging on the engine and tender was intact prior to rerailling but was damaged during wrecking operations; there was no indication of dragging equipment. There was no condition found about the engine which would have caused or contributed to the accident.

Chief Dispatcher Culbertson stated that the movement through the tunnel was handled in accordance with the usual method of operation. A close check is made of all movements in the tunnel, such movements being governed by manual block-signal indications displayed at East Portal and West Portal on authorization of the train dispatcher. Engineer Callahan had been engaged in this class of helper service for a considerable length of time and had operated engine 404 and other engines in this service. No previous derailment had occurred in the tunnel. Crews of helper engines are furnished copies of train orders issued to the road crews and in this instance the 20 mile slow order effective between Refuge 18 and the west portal of the tunnel was addressed to all trains. Chief Dispatcher Culbertson placed the time of the accident as between 2:15 and 2:20 p.m. He was informed by the section foreman that there was no danger of falling walls in the tunnel at the point where the engine became derailed.

Statements of Engineman Fallon, Fireman Paddock, Conductor Hall and Brakenen Karney and Hollenon, of train first No. 72, were to the effect that the air was cut through to the helper engine and was under the control of the engineman of the road engine; no heavy air brake application was made prior to the accident, visibility and track conditions in the tunnel were normal, no low spots or uneven surface of the track were noticed and the speed of the train was between 15 and 20 miles per hour. The conductor delivered a copy of all orders involved to the helper engineman, and the crew of that engine appeared to be normal in every respect. After the freight train stopped at Apex and waited 2 minutes for the helper to cut off, the train proceeded eastward and the helper engine started westward. The tender of engine 404 had a coal capacity of 17 tons and a water capacity of 8,736 gallons; the indications were that the tender had a full capacity of both coal and water before leaving Tabernash where it was coupled to the caboose of their train and it was estimated that not more than about one-half tank of water and 3 or 4 tons of coal would be used en route.

Engineer Maintenance of Way Turner, Section Foreman O'Halloran and Relief Section Foreman Terry described marks of derailment and the position of the derailed engine and tender substantially the same as employees of the engineering department. The first indication of derailment was a mark on a bolt at a rail joint on the gauge side of the south rail; however, there was no mark on the north rail or any marks on top of either rail to indicate where wheels had become derailed or had climbed the rails east of the mark. There was a $\frac{3}{4}$ inch low spot at a point 15 feet east of the first mark of derailment; however, the track had been thrown about $\frac{1}{2}$ inch out of line at this point which might have affected the level to some extent. The broken rail on the south side of the track was caused by the derailment. There was no indication of dragging equipment. The track involved is well drained and normally dry and there is no seepage or soft track at this location. Measurements were made to determine to what extent the track sagged under a train and the maximum settlement was $\frac{1}{8}$ inch. A low spot of $1\frac{1}{2}$ inch or more would be considered dangerous; $\frac{3}{4}$ inch low would not indicate any dangerous condition provided the gauge was proper. No rock fell from the tunnel, but some concrete was knocked off as a result of the accident. The track was installed in Moffat Tunnel in 1928, new rail and new treated ties were used throughout, and rock from the excavation was crushed for ballast. Operations through the tunnel were begun on February 26, 1928. The rails in the tunnel were tested by a rail detector car during the latter part of August, 1936, and four defective rails were replaced, but none of them was located west of Refuge 17. The 20-mile-per-hour slow order, in effect

at the time of the accident was placed because of rail joint nut-locks breaking in this vicinity, but it was not known what caused them to break; none of the track bolts was broken. There was no indication of any defect in the track or equipment and no opinion could be advanced as to what caused or contributed to the derailment; the comparatively light wheel marks indicated that the tender wheels were the first to become derailed.

Master Mechanic Peterson, Road Foreman of Engines and Equipment Arco and Trainmaster Daly made substantially the same statements relative to the condition of the engine and tender as those previously made. The tender was equipped with a rear headlight and there were spring buffers between the tender and engine; a safe speed while running in backward motion on straight track would be from 20 to 30 miles per hour. A side bearing clearance of from $\frac{3}{8}$ to $\frac{1}{2}$ inch is maintained on the tender which is equipped with splash plates and had new steel wheels on the four-wheel rear truck. There was nothing to indicate that excessive speed was involved in the accident, the engine was in good mechanical condition, there was no unusual track condition, nothing was found to indicate that the engine struck anything and there was no evidence that the reduced amount of coal and water after the trip up the grade would cause an unusual rocking motion of the tender during the back-up movement. Apparently the lead pair of tank wheels were the first to become derailed, as the engine was backing out of the tunnel. The engineer had a good reputation for obedience to the rules and attention to duty. No explanation could be advanced as to what caused the accident.

Inspection by the Commission's inspectors of the track, equipment and the tunnel, disclosed conditions to be practically as cited by railroad employees. Nothing was found about the condition of the track equipment or tunnel that would have caused or contributed to the accident.

Engine 404 is of the 2-8-2 Mikado type, built in August, 1915; it has a 15 foot 9 inch rigid wheel base and a loaded weight of 295,000 pounds when conditioned for service. The tender has a capacity of 17 tons of coal and 8,736 gallons of water and is equipped with 2 four-wheel trucks; the weight of the tender when loaded is 178,000 pounds. The total wheel base, engine and tender, is 67 foot 8 inches, and total weight 473,000 pounds. Engine 404 received class 5 repairs, this work being completed November 24, 1936, and since that time it had traveled 5,091 miles.

Discussion

Apparently the lead pair of tender wheels were the first to become derailed as the engine was backing out of the tunnel. The engineman had a good reputation for obeying the rules and attending his duties, and he had been engaged in helper service on this grade for a considerable length of time; prior to the trip involved, both he and the fireman appeared normal in every respect. The authorized maximum speed for light engines in backward motion is 25 miles per hour; however, due to track nutlocks breaking at this point permitting the nuts to become slightly loosened, a slow order of 20 miles per hour was placed about 30 days prior to the accident. No track bolts were broken and there were no pronounced low spots or uneven track or unusual track condition, nor was there any indication of dragging equipment. Excessive speed apparently was not a factor, nor was there any known indication of unusual rocking or swaying of the tender. The tender was equipped with splash plates and a rear headlight, and the rear truck had four new wheels. There was nothing found in the condition of the tunnel that appeared to be hazardous and nothing to indicate that the engine had struck an obstruction. Thorough examination of the track, engine, tender and tunnel, failed to disclose any condition that would have caused or contributed to the derailment.

Conclusions

The cause of this accident was not definitely determined.

Respectfully submitted,

W. J. PATTERSON,

Director.