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IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE DENVER & RIO GRANDE RAILROAD, NEAR DEEN, COLO., SEPTEMBER 8, 1915.

On September 8, 1915, there was a head-end collision on the Denver & Rio Grande Railroad between a passenger train and a light engine near Deen, Colo., which resulted in the death of 1 employee and the injury of 34 passengers and 6 dining car employees. After investigation the Chief of the Division of Safety reports as follows:

The first district of the second division of the Denver & Rio Grande Railroad, on which this accident occurred, is a single-track, standard gauge, line from Salida, Colo., to Deen, Colo., a distance of 71.68 miles; double-track from Deen to Watts, Colo., a distance of 16.75 miles, and single-track from Watts to New Castle, Colo., a distance of 69.10 miles. At the point of collision it is single-track. Trains are operated by time-table and train orders. The Telegraphic train-order system is used at telegraph offices, supplemented by the use of telegraphones at points where no operator is employed.

The track in this vicinity runs through a mountainous country, around sharp curves and over heavy grades. This accident occurred on the west side of the Continental Divide, known as Tennessee Pass, at an altitude of about 10,200 feet, and on a one-degree curve, 919.8 feet long, with a 3% grade descending for westbound trains. At this point the views of the approaching enginemen were obstructed on account of being on the curve and by high embankments beside the track.

Approaching Tennessee Pass station from the east the maximum grade is 1.45% ascending, and full trains usually have one or more helper engines. About 529 feet west of Tennessee Pass station is the east portal of Tennessee Pass tunnel, which is 2,577 feet in length, and the summit of this ascending grade is about the center of the tunnel. After passing the summit, the grade descends about 1% westward through the tunnel, and then increases rather abruptly to 3%. Train movements through Tennessee Pass tunnel are governed by an electric track circuit and two automatic block signals of the banjo type. One of these signals is located 389 feet from the west portal of the tunnel and the other 502 feet from the east portal.

Westbound trains leaving Tennessee Pass require the assistance of a helper or pusher engine to get started through Tennessee Pass tunnel, and the helper engines which help westbound trains from Salida to Tennessee Pass, if necessary, are cut off from the head end, run around the train, and push the train out. Movements between Minturn and Tennessee Pass station, a distance of 21 miles with a maximum grade of 3%, entail the operation of a heavy helper service for which a number of Mallet compound locomotives are used. At Tennessee Pass station these helper engines are cut off, turned around, and run light back to Minturn. When eastbound movements are heavy and close together, a number of these Mallet locomotives will arrive and group at Tennessee Pass station in a short space of time. In order to expedite the return of these helper engines to Minturn, to avoid

the delay incident to blocking each engine ten minutes apart, and likewise the delay that would result in allowing them to occupy the automatic block circuit through the tunnel in succession, these engines are coupled together in groups of two or three, or more, given their running orders and a clearance on the block and allowed to depart. When clear of the west portal of the tunnel, they are uncoupled and allowed to proceed to Minturn, running on whatever orders the crews may hold, subject to the time-table rules.

The only block requirement at Tennessee Pass is that provided by time-table rule E-11, reading as follows:

> "All passenger trains in the same direction must keep ten (10) minutes apart. All westward trains between Tennessee Pass and Minturn must keep(10) ten minutes apart."
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> "Operators at open telegraph offices will block trains accordingly, holding train order signals at 'stop' the required time for this purpose."

Eastbound passenger train No. 20 consisted of 1 baggage car, 1 coach, 6 Pullman sleeping cars, 1 tourist car and 1 dining car, hauled by locomotives 1063 and 732, and was in charge of Conductor Evans and Engineman Rush and Downing. This train was en route from Salt Lake City to Denver, and left Minturn, Colo., at 6:46 a. m., passed Pando, Colo., the last open telegraph office before reaching the point of accident, at 7:40 a.m., passed Deen, Colo., at 7:51 a.m., and at about 8:00 a.m. collided with extra 1140, a light engine, about one and one-half miles east of Deen, while running at a speed of about 17 miles an hour.

Locomotive 1140, in charge of Engineman King and Fireman John, left Salida, Colo., at 12:15 a.m. as a helper to west

bound freight train No. 65, arrived atTennessee Pass station, a point about four miles east of the point of accident, at 7:00 a.m., and locomotive 1140 was then cut off from the head of that train and taken to the rear. At Tennessee Pass station Engineman King received a copy of train order No. 16 reading as follows:

"To Eng. 1140 at Tenn. Pass. 6:38 a.m. Engs. 1140 - 1062 & 1064 run extra Tenn. Pass to Minturn."

Locomotives 1140, 1062 and 1064 helped start train No. 65 at Tennessee Pass station and that train left there at 7:30 a.m., followed by the locomotives just named, all three locomotives being coupled together. When these locomotives cleared the west portal of Tennessee Pass tunnel, which is about 3,100 feet west of Tennessee Pass station, they were uncoupled and proceeded toward Pando.

When train No. 65 reached Mitchell, 2.7 miles west of Tennessee Pass station, it went in on the passing track there for the purpose of meeting train No. 30. When locomotive 1140 reached Mitchell, it continued on and collided with train No. 30 about one and one-half miles west of Mitchell, or one and one-half miles east of Deen, while running at a speed of about 15 miles per hour.

Locomotive 1140 was considerably damaged, the tank broke loose from the tender frame, and both the locomotive and tender were derailed. Locomotive 1063, the leading locomotive on train No. 30, was seriously damaged, and with its tender, was derailed. Locomotive 732 and its tender were also damaged but

were not derailed. The fireman of locomotive 1140 was seriously injured and diged within a few hours after the accident. At the time of the accident it was cloudy and a light rain was falling.

Engineman King of extra 1140 stated that when he arrived at Malta with train No. 65 he received a message directing him to report at Pando for the purpose of loading a train of stock. After assisting train No. 65 to get started at Tennessee Pass station, the three locomotives were coupled together, run through Tennessee Pass tunnel, and then uncoupled. His engine being the head engine, he proceeded toward Pando with locomotive 1140, followed by locomotives 1062 and 1064. He stated that upon his arrival at Mitchell he saw train No. 65 on the passing track but thought it stopped there for train No. 15 instead of going to Pando because there was not sufficient room on the passing track at Pando for that train. Engineman King started that he told his fireman that they would run down to Pando, head in, take a tank of water there, and be ready to load the stock. He said that when he had reached a point about a mile and a half east of Deen, and on a sharp curve, the fireman called to him and made an attempt to jump. Engineman King stated that he raised himself off the seat and saw the pilot of the approaching train but did not have time to shut off steam, apply the brakes or jump. He thought the speed of locomotive 1140 was 15 or 16 miles an hour. He stated that he had a copy of the time card showing train No. 20 as a regular schedule train, and when asked why he did not go in on the passing track at Mitchell, replied that he had overlooked that train entirely. He further stated that his fireman

had a copy of the time card but did not mention train No. 20 to him. After leaving Mitchell he did not look back to ascertain whether or not locomotives 1062 and 1064 were following him. He stated that his view of the approaching train at the point of accident was obstructed on account of the curve.

Engineman Rush of train No. 20 stated that he was on locomotive 1063, the leading locomotive of that train, and that he did not see locomotive 1140 until it collided with his train. He stated that the speed of his train was about 15 miles an hour at the time of the collision and that he did not have time to shut off steam or apply the brakes. He further stated that he could not see approaching trains at this point on account of the curve, high embankment and brush.

Fireman Lumley of locomotive 1062 stated that when locomotives 1062 and 1064 reached Mitchell, he opened the switch and those locomotives were backed in on the passing track for train No. 20. After waiting some time for locomotive 1140 to back in on this passing track it became apparent that it had departed, whereupon engineman Dearing sounded the whistle for it to back up.

This accident was caused by extra 1140 occupying the main track on the time of train No. 20, a superior train, for which Engineman King and Fireman John are responsible.

Rule 210 of the Denver & Rio Grande Railroad book of rules reads in part as follows:

> "Engineers must show their train orders to their firemen and head brakemen, and conductors to their rear brakemen or flagmen, who are required to read and understand them. Passenger conductors will show all train orders to head brakemen and train porters. Brake-

men, firemen, flagmen and train porters will call the attention of conductors and engineers should orders be disregarded."

Rule 337 reads in part as follows:

"They (firemen) must familiarize themselves with all rules for engineers, and note how they are carried out, and must observe rules for other employees insofar as they relate in any way to the proper performance of their duties."

Engineman King was employed as a fireman in December, 1890, promoted to engineman in July, 1899, and taken out of service in December, 1909, for an excessive accumulation of demerits. In April, 1910, he was reinstated, and since that time has received demerit marks for violating speed restrictions, leaving a station with orders improperly made out, and for not knowing that his train was properly protected by flag.

Fireman John had been employed by the Denver & Rio Grand Railroad as a fireman for three years and had a good record.

No reason can be assigned why train No. 20, a regular schedule train, was entirely overlooked by both the engineman and fireman of extra 1140. Especially is this true when it is considered that Mitchell is the scheduled meeting point for trains Nos. 15 and 20, and Engineman King had been running over this territory for several years. Furthermore, when the crew of extra 1140 passed Mitchell and saw train No. 65, which they had been following, was on the passing track, this should have indicated to them that they were overlooking train No. 20.

As previously stated, there are no block signals on this part of the Denver & Rio Grande Railroad, except about a half-mile of track through Tennessee Pass tunnel, which is

protected by automatic signals. It is also to be noted that following the prevailing practice in handling helper engines through this tunnel, the three locomotives were coupled together and run through this tunnel as one unit and then uncoupled and allowed to proceed as three units or trains, thus materially increasing the density of traffic on the 20 miles of heavy grades with its many sharp curves. Traffic of such density would seem to require, in the interest of safety, the installation of some form of block signals on this portion of the road. Had such a system been in operation, it is probable that Engineman King would have been reminded by singal indications that train No. 20 was in the block and would have brought his train to a stop at Mitchell and the collision would not have occurred.

At the time of the accident Engineman King had been on duty nine hours and five minutes after a period off duty of thirty-one hours and ten minutes. Fireman John had been on duty nine hours and five minutes after a period off duty of thirteen hours and twenty minutes.