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IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE CHICAGO, ROCK ISLAND & PACIFIC RAILWAY NEAR WINSTON, MO., JANUARY 20, 1916.

On January 20, 1916, there was a derailment of a passenger train on the Chicago, Rock Island & Pacific Railway near Winston, Mo., which resulted in the death of one employee and the injury of 6 passengers, 5 employees and 3 mail clerks. After an investigation as to the nature and cause of this accident the Chief of the Division of Safety submits the following report:

The train involved in this accident was eastbound passenger train No. 2, known as the "Californian," en route from Kansas City, Mo., to Chicago, Ill. It left Kansas City, Mo., at 11:37 p.m., January 19, 1916, 37 minutes late, in charge of Conductor Burnett and Enginemen McDonald and Collier, and consisted of locomotives 887 and 879, one mail car, one baggage car, three chair cars, two sleeping cars, and one dining car.

Leaving Kansas City, Mo., this train used the tracks of the Kansas City Terminal Railway to Sheffield, a distance of 4.9 miles; the tracks of the Chicago, Milwaukee and St. Paul Railway to Birmingham, a distance of 8.3 miles; the tracks of the Chicago, Burlington & Quincy Railroad to Cameron Junction, Mo., a distance of 44.6 miles, where it reached its own line.

This division of the Chicago, Rock Island & Pacific Railway is a single track line extending from Cameron Junction, Mo., to Trenton, Mo., and is a part of the Missouri Division of the first district, known as Sub-Division No. 32. Trains are operated by telegraphic train order and time table rights and spaced by

automatic block signals. The signals are three-position single-arm upper-quadrant, the normal position being clear.

On the morning of the accident this train left Cameron Junction, the last open telegraph office, at 1:30 a.m., and was derailed 427 feet from the receiving end of a 3-degree curve with a maximum superelevation of 4-1/4 inches on a descending grade of .69%, at a point about 2.3 miles west of Winston, Mo., and 9 miles distant from Cameron Junction, at 1:45 a.m.

The entire train with the exception of the leading engine and tender and the last car was derailed to the north side of the track. The leading locomotive, No. 887, was not derailed, but became disconnected from the following derailed portion of the train and was not brought to a stop until it had run more than 1,000 feet beyond the point of derailment. Engine No. 879 came to rest on its right side about 340 feet east of where the first mark on the ties was found. The front trucks were detached from and lay about 35 feet beyond the engine. The mail car, which was the first car in the train, came to rest on its left side about 80 feet from the center line of the track and 70 feet beyond the front end of the derailed engine. The baggage car next following remained in an upright position with the tender frame and cistern between it and the engine with head end 80 feet and rear end 40 feet from the center line of track. The remaining derailed cars remained in an upright position at diminishing distances from the center line of the track, the rear sleeper remaining on the track.

Approaching the point of derailment there is a tangent 9,392 feet in length, followed by an easement and spiral of 240 feet to the curve. Starting 3,000 feet west of the point of de-

railment the grade is descending for a distance of 2,000 feet, the maximum being 1.1 per cent; from this point the grade is alternately slightly ascending and descending to the point of derailment.

The track in the vicinity of the derailment is laid with 85-pound steel rails, 33 feet in length, and had been in service about ten years. Four-hole angle bars are used. There is a six-foot earth fill at this point, on top of which are nine inches of burnt gumbo ballast. About 20 ties are used under each rail and eighty per cent of them are treated and untreated oak and other hard wood, the remaining 20% being of soft wood. A little more than half of the ties were tie-plated, tie plates being used only on treated ties, the single spike method being used to hold the rails in place. There were only three rail braces on the outside of the curve on which this derailment occurred, a number so few as to be almost negligible in considering the strength of the track structure.

An examination of the track for a distance of one-half mile east of the point of derailment showed that there were from two to six cedar ties to the rail, which were rail-cut from 3/8 to 3/4 of an inch. In this distance the track was not found to be over 3/8 of an inch out of surface, nor over 3/16 of an inch out of alignment, and at no place on straight track was the gauge found to be over 1/4 of an inch wide nor was it found to be over 5/8 of an inch wide on curve, except where the track had been disturbed by the derailment. There were two broken ties found in the track on the curve. After the derailment, beginning about 150 feet from the point of spiral, the north or outside rail on the curve was

spread for a distance of about 33 feet, the tie plates being pushed out with the rail a maximum distance of 1-5/8 inches. About 35 feet beyond this point, the south rail was spread for a distance of about 26 feet, the maximum being one inch; about 20 feet from this point the track was again spread on the north side for a distance of about 34 feet to a point where the first driving wheel of the second engine left the ball of the south rail. This derailed wheel continued inside the ball of the south rail a distance of 128 feet before making the first mark on th ties. From this point it continued to crowd the north rail outward for a distance of about 93 feet, at which place the outside rail broke and allowed the engine and cars to pass through the opening made in the track.

Enginemen McDonald, on locomotive 667, stated that leaving Cameron Junction his train ran about three-quarters of a mile through the city limits at a speed of from eight to ten miles per hour. After leaving the city limits the speed was increased, and his train passed the west switch at Mabel, a station 2-1/4 miles from the point of accident, at 1:40 a.m. He stated further that when about 300 yards from the curve, he made an air brake application of from 8 to 10 pounds to reduce speed and that at the time of derailment his train was running at a speed of from 40 to 45 miles per hour. He stated that the derailment occurred at 1:45 a.m., and that he had noted nothing wrong until the train parted and that he did not hear the enginemen of the second engine call for brakes. He stated that after the train had parted his engine ran from 150 to 300 yards before coming to a stop. Enginemen McDonald stated further that he had run engine 679, the second engine in the train, on December 21, 22, 25 and 26, and that the

engine did not ride well and that he had reported it at the roundhouse at Trenton, and also made a statement to the claim department that there was a general complaint in regard to the engine riding hard; that it "hit" curves hard and "snaked" badly. He stated that he attributed this condition to a lack of sufficient weight on the forward end of the engine and that it should be corrected. He stated that when he was running engine 879, he maintained schedule time on train No. 2, but that it was not necessary to run fast to do so.

Fireman Ellis, of engine 867, stated that a preaching the place of derailment his train was running about 45 miles per hour and at the point of the curve the engine began to roll badly and that Engineman MacDonald applied the air brakes. He stated that he heard a grinding noise on the outside rail, and his attention was attracted to it by a stream of fire coming from the driving wheel, and while he was looking at it he heard the second engine whistle for brakes. He stated that he immediately looked to the rear; at about that time the engines parted and he called to his engineman: "They are going into the fence." He thought engine 879 was derailed at the time the engineman whistled for brakes.

Fireman McReynolds, of the derailed locomotive 879, stated this engine did not ride good and that it, both on this trip and on previous trips, had "rolled" or "moved," and that this rolling had been commented upon by Engineman Collier, who was killed in the accident. He stated further that this locomotive was worse in this respect than other engines he had been on, but that it was better on this trip than when he had been on it on a previous trip, some two weeks before. He stated that in his opinion the maximum speed at any place on this tri was not in excess

of 50 miles per hour. When leaving Cameron Junction, while in the city limits, the speed of the train was about 12 to 15 miles per hour; and, at the time of derailment the speed was 45 miles per hour, but that it all happened so quickly he could not say what may have caused it.

Conductor Burnett stated that the first indication he had of the derailment was when he felt a jar and the derailment immediately followed. He stated that he did not know how fast the train was running, but it was riding smoothly, no jolt or jar having been felt prior to the derailment. He stated that the train was not running faster than the normal rate of speed for that schedule.

Roadmaster Stanley stated that after the accident, in company with Trainmaster Scoffern, he made an examination of the track and no indication of anything dragging was found. He stated that the tie plates were moved outward on the ties as far back as six rails distant from where the broken rail was found, and it was his opinion that the track spread first and that a broken rail found after the accident was caused by the engine striking the curve at a high rate of speed and the weight was so great on the outside rail that it broke the rail.

Section Foreman Waldron stated that the ties on the curve were fairly good, but that there were some bad ties. Tie plates were not used on the cedar ties, but about two-thirds of the ties were oak or treated ties, and these ties had tie plates. In his inspection of the track, at no place in the curve had he found the gauge to be over one inch wide. He stated that after

the accident, four or five rails or possibly more west of the broken rail were found spread outward. He stated further that his force consisted of a foreman with three laborers, which force of four men was at times reduced to two, owing to illness, etc. He had 6.46 miles of main track and .7 miles of side track under his charge.

Track Walker Jefferies stated that on the afternoon prior to the accident he had been over the track and on his inspection found about five rail lengths west of the place of accident what he termed a "long quarter," and noticed that the track was spread a little, and drove a couple of spikes in it and drew it in. He did not find any other point where the track was spread in the vicinity of the accident. He stated work had been done on this curve two days prior to the accident and that two rails had been gauged in and the ties were in fair condition, and spikes were holding "pretty fair."

Master Mechanic Harris stated that after the accident he made an examination of engine 879. He measured the lateral motion and found that the fore engine truck wheels had 5/16 of an inch, back engine truck wheels 7/8 to 15/16 of an inch, back drivers 1/2 of an inch, front drivers 7/16 of an inch, main driver 1/4 of an inch. The driving wheel flanges on the left side were good and on right side slightly worn. In his opinion the condition of the engine was good, and while the tires were worn some they were no where near the limit; while the lateral motion indicated some wear, in no instance was it greater than was permissible. He stated he made an examination of the track, and it was his opinion that the first engine, when entering the curve, struck the rail

a severe blow, causing the rail to spread, the second engine hitting the rail the same kind of a blow, causing the rail to overturn, and completed what the first engine merely started.

Road Foreman Penney stated that he had ridden on engine 879 on Sunday, four days prior to the accident, and at that time the condition of the engine was good. He also stated that the engine had been reported by him several times and in each instance the work had been taken care of at the Trenton shops. He stated that the engine appeared to have most of its weight centered on the drivers, and he believed this caused the engine to "nose" and for this reason the back equalizers were shortened. About a week before the accident, part of the weight had been taken off the drivers and put on the engine trucks and he had heard no further complaint about the engine, and thought the trouble had been corrected.

Train Master Zeerfaa stated that when he arrived at the scene of the accident, he made an inspection of the track and found the gauge to be from 1/2 inch to 1-5/8 inches wide for at least six rail lengths back from the broken rail. He stated that 96 feet back from the first wheel mark on the ties, there was unmistakable evidence that the wheel had dropped down on the inside of the north rail, scraping the joints over which it passed. At first he thought that the derailment had been caused by something coming down on the engine, spreading the rail, but since the investigation he had concluded, "that probably high rate of speed and possibly engine 879 may have had something to do with it, together with high speed."

Locomotives Nos. 887 and 879, running double-headed on train No. 5, were superheater engines of the 4-6-2 type, built in 1909, and received general repairs in November, 1915; both were

equipped with electric head lights. When in working condition, each weighed 377,590 pounds. A lateral motion of 15/16 of an inch was found in the back engine truck wheels of the derailed locomotive 379, and while this is not considered to be beyond the limits of safety, still it is more than it is the usual practice to permit. The investigation showed further that, while engine 379 was in good condition, it rolled slightly more than other engines of its class in use on this road. An attempt to overcome this tendency to "roll" or "nose" was made in January of the present year, by shifting the weight so as to place more of the load on the truck and trailer, taking the corresponding weight off the drivers. However, this had not proved to be entirely corrective and therefore any abnormal motion of the locomotive would subject the track structure to tremendous strains in addition to those strains produced by the forward movement of the train, this being particularly true in a train handled by two engines, as in this instance.

The accident occurred at a point about 9 miles from Cameron Junction. The train register at that point shows this train as leaving at 1:30 a.m., and as the evidence indicates that an average speed of 12 miles per hour was observed to the city limits, three-quarters of a mile from the water tank at which both engines stopped for water, at least 3-3/4 minutes were consumed in covering that part of the trip. The distance from the city limits of Cameron Junction to the point of derailment is about 8 miles, and as 11-1/4 minutes were consumed in covering this distance, the average speed must have been but slightly in excess of 45 miles per hour. However, Engineman McDonald stated that he passed the west switch at Mabel, 2-1/4 miles west of the point of derailment at

1:43 a.m., and as the accident happened at 1:48 a.m. the speed of the train after leaving Mabel, must have been more than 60 miles per hour.

The speed restrictions in force over the portion of the track where the derailment occurred, read as follows:

> "Maximum speed limit as shown below must not be exceeded. Engineers must use good judgment, and handle trains at a speed as much slower than herein prescribed as is necessary to insure absolute safety. While it is important to make schedule, safety must ~~mus~~ be given first consideration."

The speed limit as given in Chicago, Rock Island & Pacific Railway Time Table No. 40, in connection with the above rule, called for a maximum speed for passenger trains of 50 miles per hour on tangents and 45 miles per hour on curves.

The statements of all of the members of the train crew tended to show that their train was not running at higher speed on any of the tracks traversed than was usual in making the trip on previous runs. As neither engine was equipped with a speed recorder, it was impossible to ascertain definitely at what speed they were traveling at any particular point on the run.

On account of the conflict of testimony, the direct cause of the accident cannot be stated with certainty; but it is believed to have been due to the speed of the train in view of existing insecure track conditions, which allowed the first driving wheel of the second engine to leave the rail on the south side, causing the outside rail on the curve to spread. This fact is clearly established by the marks made on the tire of the wheel, as well as by the markings made by that wheel on the rail joints as it moved forward before leaving the roadbed.

Section Foreman Saldron had been working on track in section and extra gang work for about sixteen years and had been employed as section foreman on this section for about one year.

Engineman McDonald had been employed as an engine wiper in 1897, as a fireman in 1899, and was promoted to engineman in 1899; in 1900 he was disciplined for failure to observe and obey signals, and in July, 1901, he was given 30 demerits for running past a flagman; and three days afterwards was dismissed for an accumulation of demerits. He was re-employed in December, 1902, since which time he had been twice disciplined for exceeding speed limits over bridges, and on another occasion was given twenty demerits for running against an opposing passenger train without sufficient time; and at the time of the accident he had been on duty about 3 hours.

The small loss of life and few injuries sustained are attributed to the fact that with the exception of the dining car and one sleeping car, which were of wood, all cars were of steel construction.