The Chairman

CIRCULATED 10/16/19

IN RE INVESTIGATION OF AN ACCIDENT ON THE KANSAS CITY SOUTHERN RAILWAY NEAR LYONS, OKLA., ON AUGUST 2, 1919.

September 23, 1919.

On August 2, 1919, there was a derailment of a passenger train on the Kansas City Southern Railway near Lyons, Okla., which resulted in the death of 2 employees and injury of 1 employee, 13 passengers and 2 mail clerks. After investigation of this accident, the Chief of the Bureau of Safety reports as follows:

The Third District of the Northern Division of the Kansas City Southern Railway, on which district this accident occurred, extends between Watts, Okla., and DeQueen, Ark., a distance of 197.4 miles. It is a single-track line, over which train movements are governed by time-table and train orders, no block signal system being in use. Approaching the point of derailment from the north the track is straight for a distance of 2,251 feet followed by a 3-degree 36-minute curve to the right 634.5 feet in length. The accident occurred on this curve approximately 440 feet from its northern end. Beginning at a point 3,000 feet north of the point of accident and proceeding southward, the grade is .8 per cent. descending for 2,000 feet and then .45 per cent. descending for the remaining 1,000 feet.

The track in the vicinity of the point of accident is laid with 85-pound rails, 33 feet in length, on about 20 ties to the rail, the ties being 97 per cent. white oak and 3 per cent. walnut and pine. The rails are single spiked and tie

plates are used on curves. Four-hole, 24-inch angle bars are used and are fully bolted, the bolts being in good condition and tight. The ballast consists of 2 to 6 inches of gravel on top of 8 inches of chat on a sub-grade of rock formation with 8 to 12 inches of ballast to shoulder outside ends of ties. The surface, gauge and alignment of the track was good. At the point of accident the outside rail on the curve was laid in 1916, on account of the old rail being curve-worn, and the curve-worn rail was re-laid on the inside of the curve to give an anti-friction effect. On the mile of track where the accident occurred, 296 white oak ties have been applied during the year 1919. The super-elevation on the curve was uniform and averaged 4 inches.

The train involved in this accident was southbound passenger train No. 3, a through mail and express train running between Kansas City, Mo., and Port Arthur, Texas. At the time of the accident it consisted of locomotive 804, 1 combination mail and express car, 1 baggage car, 1 coach, 2 chair cars and 2 Pullman sleeping cars, and was in charge of Engineman Esterday and Conductor Curtin. This train departed from Watts at 9.20 a.m., 12 minutes late, departed from Stilwell at 10.15 a.m., 18 minutes late, and at 10.35 a.m., while running at a speed of between 35 and 45 miles an hour was derailed about 2 miles south of Lyons.

The engine trucks of locomotive 804 remained on the roadbed, straddling the west rail about 50 feet south of where

the engine proper came to rest; the engine turned over one and one-half times and came to rest on the west side of the track about 40 feet from the roadbed; the tender trucks came out from underneath the tender and came to a stop north of the tender. The mail and baggage cars turned over on the east side of the track, the northern end of each car fouling the main line; the mail car was badly damaged, and the baggage car practically destroyed. The coach remained upright and across the track. This car, the two chair cars and the first sleeping car were more or less damaged. The track was torn up a distance of about 400 feet. The engineman and fireman were killed as a result of the derailment. The weather at the time was clear.

Conductor Curtin stated that at the time of the accident he was riding in the rear end of the third car in the train and he thought the speed was about 35 miles an hour. The first intimation he had of anything wrong was a crash and then the car gave a lurch. He stated that he did not feel any application of the brakes. Conductor Curtin further stated that after the derailment he looked the track over and noticed a low spot in the east rail just behind the rear truck of the last car in the train, this low spot being 6 or 8 feet in length. The right front truck wheels of the last car in the train were standing in the channel of an overturned rail on the west side of the track, and it was the conductor's opinion that the low spot caused the locomotive to swing to

such an extent that the thrust overturned this rail, which in turn caused the train to become derailed. He said the crew held no slow order for this part of the road.

Brakeman Hudson stated that he was riding in the rear Pullman car at the time of the accident. The first intimation he had of the accident was an application of the brakes in emergency and a sudden stopping of the train. He stated further that while he noticed no particularly low spots in the track when he went back to flag, Conductor Curtin told him of the low spot he noticed just behind the train where it came to a stop and he agreed with the conductor as to the cause of the derailment.

The engine crew of southbound local freight train extra 474, which passed over the point of derailment about 30 minutes before the derailment of train No. 3, stated that they noticed a slight rough spot at this point and while they remarked about it at the time, they did not consider it at all dangerous and not sufficiently serious to report.

Traveling Engineer McCutcheon stated that he arrived at the scene of the accident at about 5.00 p.m. and made an investigation of the track. At that time a new rail had been laid in the place of the rail which turned over on the inside of the curve. The other rails were in good condition and he was unable to form any opinion of the condition of the track prior to the derailment. He examined the locomotive and found nothing that would cause or contribute to this derailment. He

did not, however, examine the lateral of the locomotive. In the opinion of Traveling Engineer McCutcheon, a rough spot in the track started a swinging motion of the locomotive, forcing the locomotive so hard against the outside rail on the curve as to cause the top of that rail to spring outward sufficiently to allow the right back engine truck wheel to drop inside the opposite rail, causing the adjoining inside rail to turn over when the wheels of the locomotive came in contact with it.

Trainmaster Weir stated that he arrived at the scene of the accident at 5.00 p.m. and after a thorough examination of the track was unable to find anything either as to the condition of the surface, alignment and gauge, the condition of the ties and rails or the condition of the ballast which could have contributed to the cause of the derailment in any way. Neither did an inspection of the engine and train equipment disclose any condition to which he could assign the cause of the derailment. He stated that he had given careful thought and consideration to the matter, but it had failed to lead him to any conclusion as to the cause of the accident.

Superintendent Cornelisen stated that the Chief Engineer, Division Engineer, Superintendent of Machinery, other divisional officials and himself conferred almost the entire day of August 3d in an effort to arrive and agree as to the cause of the accident. He stated that they all agreed that the west rail at the north end of the scene was turned over, but that there was a division of opinion as to whether its turning over was the cause or the result of the derailment. His

opinion was that the turning over of the rail caused the derailment and he gave the two following statements as his reasons:

> (1) "The rail in question was north of all the disorder caused by the derailment. It shows where the flange rode on the side of the ball of the rail and where it dropped off onto the web.
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> (2) "The rear wheel on the right hand side of the pony truck shows where the rivets on the wheel rim have been worn off, and which I believe occurred when the rail turned, and brought that side of the wheel in contact with the ball of the rail."

Superintendent Cornelisen further expressed his opinion that the train was running probably 45 miles an hour, and on entering the curve, the engine rolled from one side to the other. The side thrust found a weak place in the track which gave way sufficiently to permit the pony truck wheels to drop into the web of the west rail, where it traveled for several rail lengths before the general disorder followed.

Mechanical Superintendent Hess stated that he arrived at the scene of the derailment at 9.30 p.m., at which time the engine trucks had been removed from the rails. He said that while the section forces were repairing the main line, he in the company of Superintendent Cornelisen, Trainmaster Weir, Traveling Engineer McCutcheon, General Car Foreman Gutteridge, Division Engineer Reece, section foremen and roadmasters, made numerous examinations of the track and equipment. He stated that they were unable to locate any defects in the locomotive or cars that would cause or contribute to a derailment. It is his opinion that the turned over rail was the beginning of the de-

railment and he attributes the cause of the rail overturning to weak ties.

Roadmaster Anderson stated that he considered the condition of the ties and rails good, and after making a close inspection of the truck, he reached no conclusion as to the cause of the derailment. However, he is very positive that the track conditions can not be assigned as the cause and declared that the track was good for a speed of 50 or 60 miles an hour without any likelihood of derailment.

O. H. Bruhn, night roundhouse foreman at Pittsburgh, Kansas, stated that on July 28th or 29th he applied a three-fourth inch shim between the male and female front truck center castings of locomotive 804 for the purpose of raising the engine up in front and securing clearance between the pedestal bolt and the main frame, but that he had to remove the shim again on account of insufficient penetration of the male casting into the female casting, to keep it from working up and riding the top of the female casting. After removing this three-fourth inch shim, the engine truck frame was in the same relative position to the main frame as it was before the shim was applied. He stated that he took out the front pair of engine truck wheels and applied smaller ones about July 24th, and made a like change of the rear engine truck wheels about July 28th. He stated that he thought the back wheels he put in were 5 inches smaller than the ones removed. He also stated that he applied two new engine truck boxes and two new brasses with the rear pair of wheels.

John Korb, General Roundhouse Foreman at Pittsburgh, stated that subsequent to the derailment, he found the large (lower) cradle pins of the front engine truck center casting badly bent. These pins were bent so that there was a deflection midway of their length of one-half inch, which would allow center casting to drop down approximately three-sixteenths of an inch at the point of suspension.

Inspections of engine 804 made by representatives of the Commission at Pittsburgh, Kansas, on August 8th, 9th and 12th developed conditions that evidently were overlooked at the time the inspections were made by the railroad officials at the scene of the wreck. The engine truck frame of locomotive 804 is similar in design to those in general use throughout the country. The female center casting is a cradle which is suspended to/two twin section cross bars by four 3-point suspension hangers. Each engine truck box pedestal is secured to the frame by two 1¼-inch bolts. The inspection at Pittsburgh showed that the metal pilot beam of this engine truck had been cut away at the lower back corner on both sides by the front engine truck wheels. The engine truck female center casting had a semi-circular worn place on top of its rim showing that at some time, the male casting had been out of place and was riding off center. The center hole in the male casting was partly filled with grease and dirt, showing that the pin had not been in place for some time. The upper end of the back bolt, which holds the back jaw or pedestal of the right back engine truck to the engine frame, which had protruded sufficiently to take

two full size nuts and on which only one nut was found, was worn off on end by chafing under the main frame of the engine, on a taper so that the front side of the bolt extended three-fourths of an inch through the nut, and the back side of the bolt extended 3/32 inch through the nut. There were also marks in the metal on the outer side of the bolt and on the outer edges of its nut, which indicated that they had been engaged with the inner side of the main engine frame. The other bolt holding same pedestal to the frame had two nuts and these nuts also had marks on the outside edges indicating that they had been engaged by the inner side of the main frame. There were marks on the inner side of the main frame indicating contact with these bolts. There were marks on top of the right back corner of the engine truck frame showing that they had been made by the main frame. At the time of this inspection, the engine was standing on straight, level track, and in the worn down condition of the right back engine truck pedestal bolt, it cleared the main frame 3/16 inch. The left back engine truck pedestal bolt had one nut only and the bolt did not protrude through this nut. Clearance between this bolt and the main frame was 3/4 inch. The front wheels of the engine truck cleared the back pilot beam 3 inches. Prior to this inspection all the shims that were claimed to have been used between the male and the female center castings of this engine truck at the time of the derailment were replaced, which gave the male casting 1-5/8 inch penetration into the female casting. The clear depth of the female casting,

without shims, is 3½ inches. The outside edges of the male center casting had been turned off and a band one inch thick had been shrunk on around its outer circumference to compensate for wear. This ring was found broken at one point but was replaced inside of the female casting, and the male casting was let down inside of it. The cab, piping, jacket and practically all the fixtures on the boiler were stripped off in the accident. The valve motion was also damaged but the trailer and driving wheels were in place and not visibly damaged. The engine trucks were separated from the engine in the accident, but were not visibly damaged except that two lower center casting cradle pins were bent. An inspection of the back wheels claimed to have been removed from the truck on July 24th showed that the removed wheels measured 36 inches over the tires, while the wheels that were applied measured 34 inches over the tires; this indicates that the night roundhouse foreman was mistaken in his statement that he thought the wheels he applied were 5 inches smaller than the ones removed. The change he made would not materially alter the distance from the pedestal bolt to the main frame and the new boxes and brasses which he applied would partially offset what little change there was.

Engine 802, an engine of the same class and construction as the one involved in this accident, is in service now running with the lower cradle pins bent so that there is 9/16 inch deflection from a straight line. On engine 802 there is no clearance between the shoulder on the cradle of the female

center casting and the cross bars of the engine truck, and the shoulder is chafing the cross bars.

While the cause of this accident was not definitely ascertained, it is believed that as the locomotive was rounding the sharpest part of the curve, the right back engine truck pedestal bolts became engaged with the inside of the main frame and as the locomotive proceeded to where the curvature of the track began to straighten out, the engine trucks were locked and could not adjust themselves to the alignment of the track. This made the engine trucks and driving wheels rigid, forming a wedge which continued until the strain became so great that the inside rail on the curve was forced to give way and permitted the wheels to drop into the channel formed by the web and ball of the rail, which in turn pulled the opposite wheels off the outside rail.

None of the employees involved in this accident had been on duty in violation of the provisions of the Hours of Service Law.

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