In re Investigation of an accident which occurred on the Missouri, Kansas & Texas Railway of Texas, near Lancaster, Texas, on August 1, 1916.

On August 1, 1916, there was a derailment of a passenger train on the Missouri, Kansas & Texas Railway of Texas, near Lancaster, Texas, which resulted in the death of the engineman, fireman and 1 passenger, and the injury of 48 passengers and 2 Pullman employees. After investigation of this accident the Chief of the Division of Safety submits the following report:

The division on which this accident occurred is a single track line. No block signal system is in use, trains being operated by time-table and train orders. Approaching the point of derailment from the north the track is tangent for 2,800 feet, followed by a curve of 4 degrees to the left. Beginning just north of the curve, and extending a distance of about three miles in a southerly direction, the grade is about 1 percent ascending for southbound trains. The accident occurred 69 feet south of the point of the curve. The superelevation at the point of derailment was 4-15/16 inches. The track is laid with 66-pound rails, 30 feet in length, single spiked to about 18 oak and treated pine ties under each rail, ballasted with about 20 inches of burnt gumbo ballast, and tie-plated on curves. The curve on which the derailment occurred is on a fill of abut 15 feet. The weather at the time was clear and very warm.

Southbound passenger train No. 7 was en route from St. Louis, Mo., to San Antonio, Texas, and consisted of one combination baggage and coach, one chair car, one dining car and two Pullman sleeping cars, all of all-steel construction, hauled by locomotive 368, and was in charge of Conductor Murphy and Engineman Hollis. It left Dallas at 12.58 p. m., 18 minutes late, stopped for water at Hone, 5.7 miles south of Dallas, and at about 1.15 p. m. was derailed at a point about 5 miles north of Lancaster, or 10 miles south of Dallas, while running at a speed estimated to have been about 45 miles an hour.

The train derailed to the right, the locomotive coming to rest on its right side at a point about 30 feet from the track. The cistern of the tender was torn from its frame and badly damaged. The combination car went to the right of the locomotive, landing on its right side with its front end about 70 feet from the track and the rear end about 35 feet from the track. The chair car stopped about 20 feet from the track with its front end jammed against the combination car. The dining car came to rest in a partially overturned position on the side of the fill. The first sleeping car was entirely derailed with the exception of the rear pair of wheels of the rear truck; the left back wheel remained on the ball of the left rail, while the right wheel was on the web of the first overturned rail. The last car was not derailed or damaged in any way. The passenger killed was in the combination car, and apparently was killed by

the car turning over as he was getting out of a window.

Examination of the track showed that the first marks of derailment were flange marks on the west side of the track on the inside web of a rail at a point about five feet south of its receiving end, where the rail had begun to turn over. From this point south the rail had twisted to the right and turned over, together with the following rail, the derailed wheels running on the webs of both rails. The joint at the southern end of these two rails was broken, the right driving wheels apparently having dropped off on the outside of the rail. The next four rails were carried down the fill with the wreckage and were bent and twisted. The seventh rail on this side was found to have turned over on the ties and the inside angle bar on the southern end was cut practically in two, the joint being broken; the end showed signs of chafing. Apparently it was at this point that the wheels on the left side of the locomotive had crossed the outside rail of the curve. The first mark on the left or east side of the track was found at a point about 15 feet south of the first mark on the opposite side, and was a flange mark located about 10 inches from the rail. From this point there were flange marks leading gradually to the right for a distance of about 60 feet, the track being damaged considerably. There was then found a rail which had been broken about 6 feet 5 inches from its receiving end. The south portion, together with the two following rails, were pushed outward off the roadbed. These two rails, together

with the broken portion which was about 20 feet long, were bent outward in about a half circle. Beyond this point the track was demolished for a distance of about 90 feet.

Flagman Luck stated that at the time of the accident he was riding on the rear of the train, and did not notice whether or not any application of the air brakes was made on approaching the curve. He thought the speed at the time was about 40 or 45 miles an hour, and said that the first he knew of the accident was when he was thrown against the car. He stated that he thought the train had been handled much better than usual, and that no excessive speed was maintained around any curves; that the enginsman exercised very good judgment in the handling of the train, and that the highest speed made at any point was about 70 miles an hour. He did not know at what time the train arrived at or departed from Hone, but stated that the accident occurred at 1.20 p. m. He thought the speed from Hone to the point of derailment was maintained at about 40 or 45 miles an hour. Flagman Luck further stated that after the accident he went back to flag and did not have an opportunity to examine the wreckage until some time afterward, at which time new track had been laid. He thought, however, that the accident was due to the buckling of the track, due to the heat, saying that all of the joints were as tight as if they had been wedged.

Conductor Murphy stated that he thought the highest speed attained at any point between Denison and the point

of derailment was about 45 miles an hour, and he thought the speed at the time of the derailment, which occurred at about 1.15 p. m., was about 40 or 45 miles an hour. He did not know at what time the train arrived at or left Hone, but stated that Engineman Hollis handled the train satisfactorily and to the best of his judgment observed all speed restrictions. He stated that no application of the air brakes was made approaching the curve on which the accident occurred, on account of it being on the heavy ascending grade. On examining the track after the accident he stated that it was in good condition, but the joints of the rails were as tight as if welded together, and he reached the conclusion that the accident was due to a sun kink.

Roadmaster Raleigh stated that upon reaching the scene of the accident he made an examination of the track for a distance of about 500 feet back from the point of derailment, but did not discover anything which might have caused it. About 95 percent of the ties were in good condition, there being only 12 ties which needed renewing. He did not notice any missing spikes, and there were only a few which were not well driven. He also stated that the alignment and surface were good. Roadmaster Raleigh said that he had traveled in trains around this curve at a speed of 50 miles an hour and had never noticed anything unusual in the riding of the cars. He stated, however, that the curve should have an elevation of 6 inches for that speed, and that if the

elevation was less than 6 inches the curve was not properly elevated, according to the standard of this road.

Division Engineer Sharp stated that after a careful examination of the conditions existing, he was unable to reach a definite conclusions as to the cause of the accident. At first he followed the theory that the train approached the point of derailment at high speed and that on reaching the curve and the heavy grade the engineman opened the throttle, using from a half to a full head of steam, throwing the right hand wheels against the outside rail with sufficient force to turn the rail over. But in view of the broken rail on the inside of the curve 70 feet beyond the initial marks of derailment, and in view of the fact that the receiving end of this broken rail was in practically normal position, he thought the theory of the locomotive turning over the outside rail was not well founded, for the derailed wheels would have followed down the web of the overturned rail on the outside of the curve and away from the broken rail, and this rail would not have been broken, as the derailed wheels would have been clear of it. From the position and condition of the equipment he considered it possible, and even probable, that this rail broke under the engine, derailing it, and that the engine curled and broke the rail next ahead on the other side of the track, this rail going over the axle of the rear tender truck through the frame, turning the frame around. This, with the force of the equipment on the curve,

could have turned over the outer rail under the equipment back of the broken rail.

Superintendent Johnson stated that he made a careful examination of the track for a distance of 500 feet back from the last car of the derailed train, and the only irregularity of alignment he found was a variation of about one inch at a point about three rail lengths behind the last car. Between the point of the curve and the derailed train the gauge measured from 1/4 inch to 1/2 inch more than the standard, while for a distance of about 300 feet back from the point of the curve the gauge measured from 1/8 inch to 1/4 open. He found the ties and spiking good, while the bolts in some of the joints were a little loose, but not enough to cause any trouble. He also stated that the first rail on the right side to overturn was under the rear truck of the fourth car, the leaving end of the rail being twisted over. The next rail beyond this was off the ends of the ties, while the next rail was missing, and in his opinion was the rail found in the frame of the tender. When work was started on removing the wreckage, the broken rail was discovered. This rail bore evidence of a concealed defect in the ball, together with evidence of a crack in the web. When this broken rail was found he was of the opinion that possibly it was the cause of the accident, saying that while the first marks of derailment were perhaps 60 feet in advance of the broken rail, yet in his opinion this could have been caused by the engine leaving the track at the broken

rail, he saying that the centrifugal force or reaction in striking the opposite rail and driving it through the tank frame could and in fact would have been of sufficient force to have caused the rail to turn under the remaining cars. He further stated that he had passed over this part of the road only a few hours previous to the accident, and although he was maintaining a careful lookout he did not notice any defects which were worthy of note. Superintendent Johnson stated that he thought the accident was caused by the breaking of the rail, saying that the weather was very hot and should the track have buckled at this particular point the buckling from the sun kink would have broken the rail. While the evidence shows that wheels passed over the west or outside rail at a joint, he stated that this would naturally have occurred had the rail broken, permitting the inside driving wheels to drop between the rail, the effect of which would have forced the outside rail over, the right hand driving wheels naturally going over it at the point where they came in contact with the joint. He stated further that he considered the straight track between Denison and the point of derailment to be safe for a speed of 60 miles an hour, and he said that he hardly felt that that speed had been exceeded on this particular date.

In view of the conflicting evidence, and the fact that the track was badly torn up from a point a few feet from the initial point of derailment, it was impossible definitely to determine the cause of this accident, but

it is believed to have been due either to the overturning of the outside rail under the weight of the train, moving at a high rate of speed, or to the buckling of the track on account of the heat. The broken rail found when picking up the wreckage is believed to have been a result of the accident.

In connection with the speed of the train, it is to be noted that the distance between Denison and Dallas is 106.1 miles, and the time-table schedule of this train is 2 hours and 30 minutes, including one scheduled stop, the average speed between the two stations being 42.4 miles an hour. On this date, however, train No. 7 was late leaving Denison, and covered the distance in about 2 hours and 13 minutes, or at an average speed of 47.86 miles an hour, and this included station work at the scheduled stop, the taking of coal, the consumption of eight minutes in traveling one mile between Greenville and Hunt, and the observing of three slow orders, one of which limited the speed to 30 miles an hour, one to 15 miles an hour, and the other to 5 miles an hour. From these facts it is apparent that the running time must have averaged at least 50 miles an hour over the entire distance. The maximum speed permitted, according to the time table, is 50 miles an hour except on curves, where it is limited to 45 miles an hour. This investigation disclosed the fact that the speed limit was not observed, and in several instances was greatly exceeded as noted below:

Bells to Whitewright,	7 miles,	60	miles an hour
Trenton to Celeste,	13 "	55.7	" " "
Hunt to Caddo Mills,	7.6 "	65.1	" " "
Caddo Mills to Royse City,	8.7 "	52.2	" " "
Fate to Rockwall,	4.6 "	55.2	" " "
Rockwall to Rowlett,	7.8 "	58.5	" " "
Rowlett to Garland,	4.4 "	66	" " "

From Fate to Garland is 16.8 miles, and the time consumed was only 17 minutes, an average speed of practically 60 miles an hour. These facts, together with statements of the employees on this train that it was not operated at a rate of speed which appeared to be excessive, would indicate that the speed limit of 50 miles an hour is not strictly observed nor enforced on this division.

It is also to be noted that while this track was laid with 66-pound rails, the locomotive hauling this train of all-steel equipment at such a high rate of speed was of the Pacific type, having a total weight, in working order, of 402,500 pounds. In view of the fact that it was considered wise to limit speed on this division to 50 miles an hour, immediate steps should be taken to insure strict compliance with this time-table rule before other serious accidents occur.