January 25, 1915.

In re investigation of accident which occurred on the St. Louis & San Francisco Railroad near Joplin, Mo., on December 10, 1914. Inv-237

On December 10, 1914, there was a derailment of a passenger train on the St. Louis & San Francisco Railroad near Joplin, Mo., which resulted in the injury of 12 passengers, 3 mail clerks and 1 employee. After investigation of this accident, the Chief of the Division of Safety reports as follows:

Westbound train No. 309 consisted of one combination car, one baggage car, one coach, one chair car and one Pullman sleeping car, hauled by locomotive No. 718, and was in charge of Conductor Woodruff and Engineman Dwyer. It left its terminal at Monett, Mo., at 11.00 p.m. 10 minutes late, and at 12.32 a.m. was derailed at a point about 2.2 miles east of Joplin, while running at a speed estimated to have been between 35 and 40 miles per hour. At the time of the accident the train was on schedule time.

The engine came to a stop at a point about 400 feet beyond the point of derailment, with the main and back driving wheels derailed on the north side of the track. The tender frame remained connected with the engine by one safety chain, the cistern having become detached from the frame and landing bottom-side up at the bottom of the fill. The trucks also came out from under the tender frame and went down the embankment on the north side. All of the cars were derailed on this side of the track, the first three turning over and resting on their sides at the bottom of the fill. These cars were all of wooden construction and apparently did not overturn until they had nearly stopped.

The division on which this accident occurred is a single-track line. No block signal system is in use, trains being operated

by train orders and time-card rights. The derailment occurred at a point about 250 feet west of the eastern end of a curve of 5 degrees 19 minutes leading to the right, 1,800 feet in length, on a fill of about 15 feet. The grade approaching the point of derailment is about 1% descending for westbound trains for a distance of about one mile. The track is laid with 65-pound rails, 30 feet in length, with about 18 or 19 hardwood ties under each rail. The track is single-spiked, with about 18 inches of chatt ballast. No tie plates or rail braces are used on curves. At the time of the accident it was snowing slightly.

Examination of the track showed that the first evidence of derailment was the spreading of a rail on the inside of the curve for a distance of 15 feet, permitting the wheels to drop inside of the rail, marking the ties for some distance beyond. The outside rail on the curve then turned over, as evidenced by flange marks on the angle bars on the inside of the same and also on the inside webs of those rails for a distance of about 67 feet, at which point the wheels crossed to the right beyond the outside rail, the three forward cars going down the fill and carrying the outside rails with them.

Engineman Dwyer stated that his first knowledge of anything wrong was when heard a crashing noise and on looking around he saw the tender go down. He at once applied the air brakes in emergency. In his opinion the forward tender truck was the first to be derailed. He further stated that there was no unusual movement of the engine until after the tender had been derailed, when he felt the engine jerk as if it also had been derailed. Engineman Dwyer further stated that the tender rode unusually well but that the engine did not ride

well at high speed, due to the counter-balance. At a speed of about 40 miles per hour the counter-balance would cause the engine to jump up and down, while at about 50 miles per hour or more this motion was too severe to allow a man to remain on his seat box very long. On account of this counter-balance, Engineman Dwyer stated that he would not run at high speed at any time, the engine being powerful enough to run on ascending grades at a speed sufficient to make up any time which might be lost through not running at high speed on level track or descending grades. He thought the speed at the time of derailment was between 35 and 40 miles per hour, stating that it had not reached the point at which the counter-balance would cause the engine to begin its up-and-down motion. Engineman Dwyer further stated that he had not noticed any bad spots or any unevenness on the track, either on this trip or on previous trips.

Fireman Adell stated that he first noticed the derailment of the tender. He thought the engine rode fairly well for a freight engine in passenger service, although when it attained a speed of about 40 miles per hour or more it began to jump up and down, due to the counter-balance. He estimated the speed at the time of the derailment was about 35 miles per hour, the engine riding smoothly until after the tender had been derailed.

Train Porter Harris, who was riding on the engine at the time of the derailment, stated that he heard a noise and on looking out of the window on the fireman's side, saw a streak of fire under the tender. He at once got up and was about to jump off when the engineman told him not to do so. At about that time the cistern broke loose and went down the embankment, the engine apparently

being derailed at about that time.

This track was rebuilt in September, 1914, having been aligned, surfaced and practically re-tied. The rails in use were rolled in March, 1900, and had been laid on straight track at another point until about 3 years ago, when they were taken up and relaid on this district. These rails were in fair condition and not curve-worn to any extent. Inspection of the track found it to be well ballasted, ties in good condition and well spiked. The track was not in good condition, however, with respect to the gauge, alignment and surface. The gauge and alignment on the tangent preceding the curve seemed to be in good condition, but there were some irregularities in surfacing. On the curve, however, the track was not in good condition, the surfacing being irregular, while the gauge and alignment approaching the point of derailment were bad. At a distance of 60 feet east of the point of derailment, and extending westerly a distance of 20 feet, the alignment of the outside rail, measured from the theoretical center line of the track, ranged from 2 ft. 4.56 inches to 2 ft. 6.24 inches, a variation of 1.68 inches in a distance of 20 feet. In surfacing there was a depression at this point of 3/8 of an inch, while the gauge showed a variation of 7/10 of an inch.

If the train was travelling at the minimum estimated speed of 35 miles per hour, a wheel would pass over this distance of 20 feet in about 4/10 of a second. The forced lateral divergence of a pair of wheels and an axle a distance of 1.68 inches, or a considerable part thereof, and their return to the alignment proper for the curve, within less than half a second, would involve greatly

augmented strains over static conditions of loading. At a distance of 60 feet east of the point of derailment, the gauge was 4 ft. 9.72 inches, diminishing to 4 ft. 9.00 inches at the point of derailment, a difference of 0.72 inch. The difference between the maximum and minimum distances which the outer rail departed from the theoretical center line of the track, in a distance of 130 feet on this curve, was 3.34 inches, and this distance of 130 feet would have been covered by the train in about 2½ seconds. A ricochet movement of the engine could hardly fail to take place on track which was in such a condition.

The statements of the engineman and fireman indicate that when the engine was travelling at a speed of 40 miles per hour or more, it began to jump up and down in proportion to the speed at which it was running, these oscillations being attributed to the counter-balance. The weight of the engine, ordinarily an important factor in holding a rail down upon the ties, would be appreciably diminished when the counter-balance was up, relieving the rail of a considerable part of the static weight of the engine.

Notwithstanding the light rails in use, heavy motive power was used on this division, and it is believed that the weight of this motive power was in part responsible for the irregularities in the track, or for causing irregularities which maintenance had not properly cared for or corrected.

Locomotive No. 718 is of the 4-6-0 type and has a total weight, engine and tender, ready for service, of 330,700 lbs. The tender has a coal capacity of 14 tons and holds 6,000 gallons of water. All the wheels on the tender were in good condition. The forward wheel on the right side of the rear tender truck was slightly worn.

This accident was caused by the derailment of the forward tender truck wheels while rounding the curve, due to the uneven and irregular condition of the track. On account of the constantly increasing weight of engines and cars this accident calls further attention to the necessity of having adequate inspection and maintenance of track in order that it may be able to support this heavy equipment.