

IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE
MINNEAPOLIS & ST. LOUIS RAILROAD NEAR LIVERMORE, IOWA
JULY 3, 1920.

On July 3, 1920, there was a derailment of a passenger train on the Minneapolis & St. Louis Railroad, near Livermore, Iowa, resulting in the death of 8 passengers and the injury of 39 passengers and 5 employees.

This accident was investigated jointly with the Iowa State Railroad Commission, and as a result of this investigation the Chief of the Bureau of Safety submits the following report:

This accident occurred on the First District, Central Division, the line in the vicinity of the point of accident being single track, over which trains are operated by time-table and train orders, no block system being in use. The speed limit for passenger trains on this line is 40 miles per hour, according to time-table rule. There were no slow orders in effect at this point.

The line extends approximately north and south, but the corresponding time-table directions of trains are west and east. Arnold station is located approximately 4 miles south of Livermore. Approaching the point of accident from Arnold, the track is tangent and there is a descending grade of .41 per cent for a distance of approximately 3,700 feet, extending to bridge No. 131 where the derailment occurred. The track is laid with 70-lb rail, 33 feet in length, with 19 or 20 cedar, oak and tamarack ties to each rail section, an average of about 17 ties to the rail being in serviceable condition, no tie-plates are used in this vicinity, the ballast consists of gravel and cinders and varies from 6 to 12 inches in depth and at the point of accident was about 8 inches deep. The rails had been in service about 20 years; they are laid with seven joints. The alignment of the track was fair but the surface was poor. The weather was clear at the time of the accident.

The train involved in this accident was westbound passenger train No. 1, en route from Des Moines, Iowa, to St. Paul, Minn. It consisted of engine No. 157, 1 combination mail and baggage car, 1 baggage car, 1 smoking car and 2 day coaches in the order named, these cars all being of wooden construction except one day coach, the second car from the rear end, which was of steel underframe construction. The combination and baggage cars had no platforms, the smoking car and the rear day coach were open-end platform cars and the second coach from the rear end was a vestibule car. Conductor Conklin and Engineman Murphy were in charge of this

train. It left Fort Dodge, Iowa, at 11.10 a.m., 15 minutes late, left Humboldt at 11.51 a.m., 14 minutes late, passed Arnold without stopping and was derailed at bridge No. 131, about 7 miles distant from Humboldt, at about 12.05 p.m.

The speed of the train at the time of derailment was approximately 30 miles per hour. The entire train was derailed on the left side of the track, the engine coming to rest on its left side, at an angle of about 45 degrees to the track, at the west end of the bridge. The tender was in line with the engine but separated from it and turned upside down. The combination mail and baggage car came to rest on its left side with its forward end against the west bridge bulkhead, the sides and roof of this car being crushed. The baggage car also came to rest on its left side at the bottom of the bridge nearly in line with the first car, the sides and roof of this car also being crushed. These two cars were approximately parallel to the line of track. The third car in the train, the smoking car, was lying at the bottom of the bridge and diagonal to it, its front end resting partly on the crushed baggage car, this car was practically destroyed. The first coach came to rest with its front end resting in the water at the bottom of the bridge and the rear end at the top of the bridge, standing at an angle of approximately 45 degrees, the front end being badly crushed. The rear car remained upright on the bridge after the accident, but fell to the bottom of the bridge when the wreckage was being cleared away. Nearly all of the persons killed and injured were riding in the smoking car and the first coach.

Bridge No. 131 was practically destroyed as a result of this accident. It had been rebuilt about 7 years ago and prior to the accident was considered to be in good condition. The bridge was constructed with outside guard timbers and metal covering, there were no inside guard rails on this bridge. It was a wooden pile bridge 260 feet long and 27 feet high, with 21 bents. Only 7 of the bents on this bridge remained standing after the accident. The ties on the bridge for a distance covering the first two bents or about 30 feet were not damaged, except for wheel marks.

Examination of the track after the accident indicated that a wheel had mounted the north or right-hand rail, beginning at a point 25 feet from the bridge, and had traveled diagonally across the ball of the rail for a distance of 15 feet, striking a tie on the right-hand side of the track at a point 52 inches from the place where it left the rail. The opposite wheel struck a tie between the rails at a point 15 inches from the place where the north wheel left the rail. There being no inside guard rail on this bridge, one of the derailed wheels struck the outside guard timber. The next marks of derailment consisted of an

abrasion on the gauge side of the north rail on the bridge 17 feet 6 inches from the end, and extending for a distance of 5 feet 7 inches, there were then marks showing that another wheel had crossed the north rail diagonally for a distance of 1 foot, the south wheel striking the ties 6 inches from this point and the north wheel striking the ties 32 inches from this point. The bridge then began to break down due to ties and timbers being displaced by the derailed track. The engine and tender passed entirely across the bridge before turning over, while the cars in the train were derailed on the bridge, falling into the positions described as the bridge broke down.

Engineman Murphy, of train No. 1, had been on this run continuously for the past 6 years. On the day of the accident he noticed no unusual conditions until he reached bridge No. 131. He stated that his train was running at its usual rate of speed which was about 30 miles an hour. About the time he reached the bridge he heard a noise either under him or immediately back of him and when the engine reached a point about 20 feet beyond east end of the bridge he felt a sudden jerk, he thought the engine was derailed at that point. He immediately closed the throttle and applied the brakes, he remained on the engine until it turned over at the opposite end of the bridge. He had started out with a full tank of water and coal, and said the water in the tank had been lowered about sixteen inches.

Examination of the track after the accident indicated that the first wheels derailed were the wheels of the tender. Locomotive 157 is of the 4-4-0 type having a total weight of 144,500 pounds. The length of the tender frame over end sills is 25 feet 5 inches, height of tender frame deck, loaded, 47-5/8 inches, height of water space in tank, 18 inches, height of space in coal pit, 6 feet 2 inches, width of tank 9 feet 10 1/2 inches, capacity, 12 tons coal, 5,500 gallons of water, baffle plates are used in the cistern. This tender was equipped with Wood tip roller side bearings on both tender trucks, spaced 50 inches apart, the standard clearance on both trucks being 3/16 inch.

Engine No. 157 had been turned out of the shops after a general overhauling in April and was considered in excellent condition. No repairs had been made recently except that about a week before one pair of wheels under the tender had been replaced on account of sharp flanges.

According to Engine Inspector Vlieg and Master Mechanic Brown, inspection of this engine before it departed on train No. 1 on July 3 indicated that it was in good condition, and examination after the accident disclosed that the tender wheel flanges, roller side bearings, and

splash plates and braces were in good condition, there was proper clearance between bolster and top arch bars, drawbar and tail plates, and drawbar and front tank sill, the center plates were also properly lubricated, and the engine was in good trim. Prior to the accident Enginemen Murphy noticed nothing whatever wrong with the engine which might have contributed to the derailment.

Examination of the track approaching the point of accident in the direction train No. 1 was running disclosed considerable variation in the elevation of the rails. Measurements were taken for a distance of 1630 feet east of the point of derailment, using the east rail as a base, elevation the west rail varied between 1-1/8 inches high and 1 inch low. The maximum variation between 1-1/8 inches high and 1 inch low was found within a distance of approximately 200 feet and within about 800 feet of the south end of the bridge. Within a distance of 200 feet from the end of the bridge the variation in elevation of the west rail was from level to 5/8 inch high.

Section Foreman Fine stated he had done no work on this track this year except to raise low joints. He had inspected it the preceding day and considered the line and surface fair, he thought the track was safe for the maximum speed of 40 miles per hour permitted by time-table rules.

The track supervisor had inspected this track on June 30, going over it in a gasoline motor car, and found nothing out of the ordinary in the condition of the track or of the bridge. At the time of the accident he was riding on the rear car of the derailed train and stated that the track at the initial point of derailment was not disturbed by the derailment, at the time of this investigation no work had been done on this track subsequent to the derailment.

Chief Engineer Kenly thought the front tender truck was derailed first, and that on account of the irregularities of the track the tender rolled more or less, at the second joint in the track south of the bridge, which was high, the weight was lifted off from the right wheels of the front truck, allowing them to climb the rail.

This accident was caused by irregularity of the surface of the track and variation in the elevation of the rails.

It was found after the accident that the elevation of the rails alternated within short distances at several points and approaching the scene of accident the variation found in elevation of the rails was excessive. It is believed this irregularity in the surface of the track caused the tender to roll to such an extent as to result in derail-

ment of the tender wheels approaching the bridge. On account of the excessive variation in the elevation of the rails, the rolling of the tender probably not only removed the weight from the right wheels of the front tender truck, but also lifted them partially clear of the rail, the truck while in that position being held practically rigid, thus allowed the flange to climb the rail. The marks on the rails and ties at the point of derailment support this view.

The records of the Minneapolis & St. Louis Railroad indicate that there have been twenty-four tender derailments on that road from July 1, 1919, to July 3, 1920, fourteen of these derailments occurred since March 1, 1920. A derailment which occurred on this line a short distance west of Livermore, on August 29, 1917, and which was investigated by this Bureau, was also caused by uneven and insecure condition of the track.

As a result of this investigation it is believed the track in the vicinity of the point of accident was not in proper condition to permit the safe operation of trains at a maximum speed of 40 miles per hour as authorized by time-table rule. Such speed restrictions as are necessary to provide a proper factor of safety should immediately be placed in effect on this line and maintained until the track has been placed in proper condition.

Had bridge No. 131 been equipped with inside guard rails, the first truck to be derailed might have been held more nearly in alignment with the track, and the loss of life, personal injuries and damage would then probably have been materially reduced.

The conductor and engineman in charge of this train were experienced men, they had been on duty about two hours and a half after a period of duty of about seventeen hours.