

IN RE INVESTIGATION OF AN ACCIDENT WHICH
OCCURRED ON THE GREAT NORTHERN RAILWAY
NEAR BASIN, MONT., ON SEPTEMBER 14, 1917

November 26, 1917.

On September 14, 1917, there was a derailment of a passenger train on the Great Northern Railway near Basin, Mont., which resulted in the death of two employees, serious injury of one employee and slight injury of twenty-one passengers and four employees. This accident was investigated by the Railroad Commission of Montana, as well as by this Bureau, and the Chief of the Bureau of Safety submits the following report:

The second district of the Butte division on which this accident occurred is a single-track line extending from Butte to Glancy, Mont., a distance of 56.9 miles, over which train movements are governed by time-table and train orders transmitted by telephone. No block system is in use on this district except a staff system between Butte tower and Woodville and between Amazon and Portal through Tunnel No. 6. Time card rules provide that trains descending grades will not follow each other out of stations less than fifteen minutes apart.

Westbound passenger train No. 238 consisted of 1 combination mail and baggage car, 1 smoking car, 1 day coach, 1 dining car, 1 observation car, and 1 dead-head coach, in the order named and all of wooden construction, hauled by locomotive 1433, and was in charge of Conductor McPherson and Engineman Carter. This train left Butte at 9 a. m., left Basin, 29.5 miles east of Butte, at 9:21 a. m., and was derailed at bridge No. 120, about 2-5/8 miles east of Basin, at 9:28 a. m., while running at a speed of about 40 miles an hour.

The accident occurred on a 9-degree curve at bridge No. 120 which spans the Boulder river. The bridge is a through girder type of steel construction, 130 feet long, the west girder being 61 feet long, and the east girder 70 feet long. Inside guard rails extend 94 feet west of the west end of the bridge and approximately the same distance from the east end.

Approaching the point of accident from the west there is an 8-degree curve to the right 570 feet in length, the western end of this curve being 4,298 feet west of the point of accident; then there is a tangent 1,040 feet long; then a 6-degree curve to the left 850 feet long; then a tangent 860 feet long; then a 2-degree curve to the right 335 feet long; then a tangent 340 feet long; and then a 6-degree curve to the left 1,110 feet long. The accident occurred on this latter curve, 395 feet from its western end. The weather at the time was clear.

There is a tunnel, 821 feet in length, the western portal of which is 4,175 feet west of the point of accident and 219 feet in on the 8-degree curve. From the west portal of this tunnel there is a descending grade eastward of from 1.0% to 2%, it being 1.6% for the last 395 feet before reaching point of accident. The track consists of 20-pound steel rails, 33 feet in length, laid on about 20 fir and tamarack ties under each rail, and ballasted with decomposed granite. In this vicinity it is laid on fills and in cuts, and at the point of accident it is on a 15-foot fill. The rails are laid with broken joints, tie-plated, double-siked at joints, and equipped with rail anchors. The rails and ties were in good condition and the alignment and gauge good. The superelevation on the 8-degree curve was 3-1/4 to 3-1/2 inches.

Both the engineman and fireman were killed. From marks found on the boiler of locomotive No. 1433 it is evident that the throat sheet struck the end of the top girder plate squarely and a hole was torn through the throat and 1 side sheets, causing the mud ring to be sheared off between the top row of bolts and the lower row of stay bolts, and resulting in an explosion of the boiler. The boiler was torn from the engine frame and thrown from the track, and stopped with its front end about 67 feet from the track and pointing westward, and its rear end about 25 feet from the track. The flue sheet was torn loose from fifteen flues in the lower right hand corner and bent backward; the cab was found about fifty feet from the track and practically demolished. The engine frame was lying upside down near the south abutment of the east abutment of the bridge with the rear end in the river; the tank frame was lying upside down in the middle of the river, while the cylinder of the tank was lying upside down near the east bank of the river and near the tank frame; the combination rail and baggage car was lying on its right side with its rear end in the middle of the river and front end on the bank; the smoking car came to a stop with one end on the west abutment of the bridge and the other end in the river, its front end having been telescoped by the combination car. The day coach remained upright on the roadbed and stopped 2.1 feet east of the bridge; the dining car stopped about 65 feet east of the bridge with its front end against a bank and about 60 feet south of the track; the observation car stopped on the east end of the bridge. The day coach, dining car, observation car and passenger coach were not badly damaged.

The first girder on the right side of the bridge was bent outward at the top and showed evidences of having been struck, the inside wing braces were bent eastward, and the inside edge of the top girder plate showed marks its full length where something had scraped against it. The girder on the opposite side of the track was bent slightly toward the center of the track for about 10 feet at its east end, and was pulled loose from the girder east of it. The second girder on the right side was pulled

loose from the first girder and bent outward, forming a bow, the center part being nearly horizontal where the engine had evidently gone over the side. The engine trucks were found standing on edge and wedged between this girder and the ends of the ties about 25 feet from the east end of the bridge.

The outside guard rail on the south side of the bridge was broken for a distance of 5 feet at the west end of the bridge, the next 5 feet remained in good condition, and the remainder of the guard rail to the middle of the second girder was practically demolished. The four 1-3/4 inch anchor bolts which held the west end of the bridge to the abutment were snapped off and that end of the bridge shifted about 11 inches to the south. One rail joint on the south side and 10 feet from the west end of the bridge was broken, probably on account of the west end of the bridge shifting, and three rails on the north side of the bridge were so badly bent that they had to be replaced. There were flange marks on the east end of the bridge which were caused by the wheels of the coaches, but there were no marks to indicate where the engine left the rails.

Commencing 121 feet west of the bridge, there were 41 ties on the outside of the south rail which were considerably damaged, evidently, by the wheels of the smoking car when it was derailed. There were no wheel marks between the rails on the ties at this point.

Conductor McPherson stated that his train left Basin at 11:11 a. m., ten minutes late, and as Engineer Carter was a new man on that run he cautioned him before leaving Basin about trying to make up time around curves and told him to take it easy, even though he would be late in reaching Great Falls, and he sure and set the air brakes when going around the curves. This warning, however, was not given on account of the way the engineer had been handling the train, but merely as a precaution. He said that the engineer applied the air brakes as the train was coming out of the tunnel west of the point of accident, and again as it reached the curve upon which the accident occurred, and in his judgment the speed of the train was 30 or 35 miles an hour when this curve was reached. Conductor McPherson said that he had ridden trains around this curve ten miles an hour faster than train no. 208 was running on the day of the accident and in his opinion the locomotive was not derailed on account of excessive speed. He said that the scheduled speed of his train at this point was 31 miles an hour and on account of the great amount of station work it was necessary for them to "keep going."

Assistant Roadmaster Kemp was riding in the rear car of the train and thought its speed at the time of the accident was about 40 miles an hour. He stated that the standard superelevation for a 9-degree curve on the Great Northern is from 3-1/2 to 4 inches. Resident Engineer Harvin stated that 3-1/2 inches was sufficient superelevation for this curve.

Louis Watson, an eye witness of this accident, stated that he was driving an automobile toward the track along the public road which runs under the west end of Bridge 120, and stopped about 120 feet from the track as the train came around the curve. As the locomotive came onto the bridge fire and steam began to shoot out from the rear of the locomotive, followed by a great crash. The smoke and steam then obscured his view of the wreckage for a few moments.

The wheel flanges of the locomotive were carefully examined and nothing was found that should have caused the ~~xxx~~ derailment.

While the direct cause of this accident could not be definitely ascertained, it is believed to have been due to excessive speed on a 2-degree curve. The speed of the train at the time of the accident was between 40 and 42 miles an hour, this conclusion having been reached after an inspection of the speed recorder tape, on which, while broken and saturated with oil, the markings were fairly easy to distinguish. The only speed restrictions for this district are contained in a rule in the time-table reading as follows:

"Passenger trains will not exceed 45 miles and other trains 35 miles per hour, and on descending grades, passenger trains will not exceed 35 miles and other trains 15 miles per hour."

As this accident occurred on a descending grade, the maximum speed allowed by this rule was 35 miles an hour, and the speed of 40 or 42 miles an hour attained by train No. 236 was a violation of the rule, for which Engineer Carter and Conductor Matherson were responsible.

Locomotive 1403 was carefully examined after the accident and it was clearly established that the explosion of its boiler was the result of the derailment and not its cause.

This accident occurred on a 2-degree curve, having a super-elevation of 3-1/2 inches. It is believed that in order to preserve a sufficient margin of safety that on track having this curvature and super-elevation, trains should not exceed a speed of 35 miles an hour if they are to be operated safely.

J. J. T.