

## INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE  
INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE  
GREAT NORTHERN RAILWAY NEAR INDEX, WASH., ON  
SEPTEMBER 4, 1930.

October 17, 1930.

To the Commission:

On September 4, 1930, there was a derailment of a mail train on the Great Northern Railway near Index, Wash., resulting in the death of one employee and the injury of one employee, who subsequently died. This accident was investigated in conjunction with representatives of the State of Washington Department of Public Works.

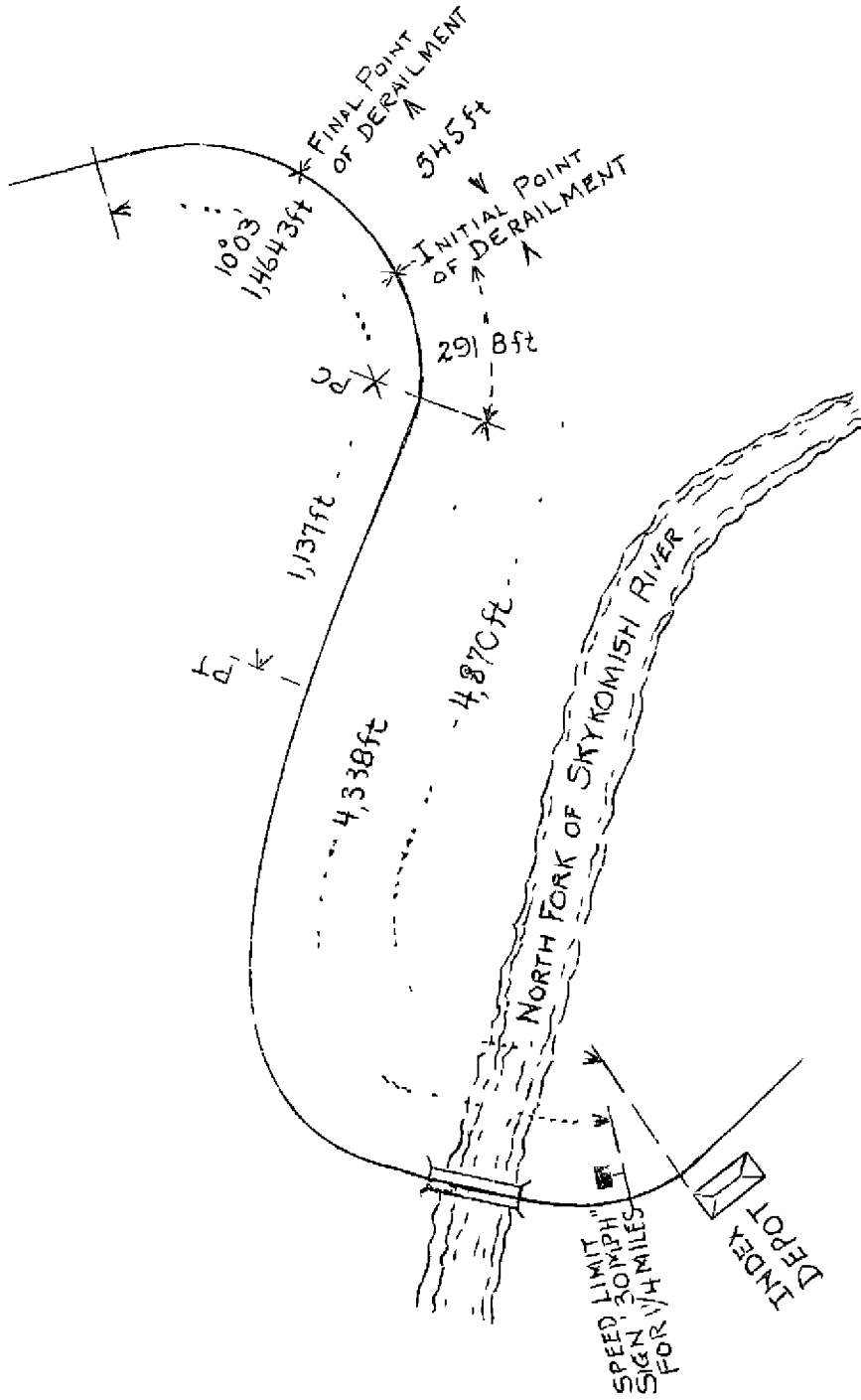
#### Location and method of operation

This accident occurred on the First Subdivision of the Cascade Division, extending between Wenatchee and Seattle, Wash., a distance of 155.7 miles; in the vicinity of the point of accident this is a single-track line over which trains are operated by time-table, train orders, and an automatic block-signal system. The initial point of derailment occurred at a point 4,370 feet east of the depot at Index, the final derailment being 545 feet beyond that point; approaching the initial point of derailment from the west, there are several short tangents and sharp curves, followed by 1,137 feet of tangent and then a  $10^{\circ} 03'$  curve to the left 1,464.3 feet in length, including spirals, each spiral being 300 feet in length; the initial point of derailment occurred on the curve proper at a point 291.8 feet from the extreme western end of the curve. The grade for eastbound trains is generally ascending, being 0.479 per cent around the curve.

The track in the vicinity of the point of accident is laid on a side cut, the major part of the derailment occurring in a cut with walls ranging from 40 to 100 feet in height. The track is laid with 130-pound rails, the first rail of the spiral being 33 feet in length and the others being 39 feet in length, with an average of 23 ties to the rail-length, double shoulder tie plates are used, and the track is double-spiked inside and out, and is ballasted with washed gravel to a depth of about 12 inches. The gage on the curve was maintained at 4 feet 9 inches, and the elevation at  $3\frac{1}{2}$  inches. There is a speed-limit sign located on the engineer's side of the track at a point 4,338 feet west of the curve involved, restricting the speed of eastbound trains to 30 miles per hour for  $1\frac{1}{4}$  miles.

INV. No. 1662

GREAT NORTHERN RAILWAY  
INTEX, WASH.  
Sept. 4, 1930.



The weather was foggy at the time of the accident, which occurred about 12.39 a.m.

#### Description

Eastbound first-class mail train No. 28 consisted of one mail car, three baggage cars, one Pullman sleeping car, one deadhead rail car, and one dining car, in the order named, hauled by engines 1371 and 1453, both of the 4-6-2 type, and was in charge of Conductor Brokaw and Engineer Noble and Applegate, respectively. The first, third, fifth and sixth cars were of steel-underframe construction, the second and seventh cars were of all-steel construction, while the fourth car was of wooden construction. This train left Gold Bar, the last open office, 9.20 miles west of Index, at 12.24 a.m., 20 minutes late, and was derailed east of Index while traveling at a speed shown by the speed-recorder tape on engine 1453, the second engine, to have been approximately 44 miles per hour.

Neither engine 1371, the lead engine, nor its tender, was derailed; it became detached from the second engine, the knuckle remaining closed, and came to a stop about 650 feet east of engine 1453. Engine 1453 came to rest on its right side, parallel with the track end on the outside of the curve, at a point 545 feet east of the initial point of derailment, the tender was behind the engine. The first car came to rest up the embankment to the right of engine 1453, the second car was opposite the engine and on the inside of the curve, and the third car had its forward truck derailed and stopped right behind the second car. The employee killed was the engineer of engine 1453, while the employee injured was the fireman of that engine.

#### Summary of evidence

Engineer Noble, of lead engine 1371, stated that on reaching a point just east of Reiter, located 4.89 miles west of Index, the speed was reduced to about 30 miles per hour, he having determined the rate of speed by looking at the speedometer gauge, and this rate of speed was maintained until just before entering upon the curve involved, when he made a light air-brake application, about a 4-pound reduction, in order to steady the train around the curve, and the first he knew of anything wrong was when his own engine broke away from the second engine. He said that the light air-brake application had not been released, nor had the speed of the train been retarded by it prior to the derailment; he did not notice anything peculiar about the riding qualities of his engine just before the derailment occurred. He was endeavoring to make up lost time, but said he was

not running any faster on this occasion than he usually did, estimating the speed to have been not more than 30 miles per hour around the curve. He did not pay particular attention to the exact speed, not having looked at the speedometer gauge at this time, but said that he maintained about a uniform rate of speed from Reiter to Index. He placed the time of the derailment at 12.41 a.m., saying that he looked at his watch just after his own engine came to a stop, not more than 30 or 40 seconds after the derailment occurred. The air brakes had been tested and worked properly. Engineman Noble further stated that recently the railroad officials had inquired as to the reason for delay in his operation of train No. 28, which inquiry he considered to be criticism, in a way, but that no question had been raised as to operating too fast. In this connection, however, General Superintendent Smith stated that this inquiry was not made in the nature of criticism, but merely asking for information as to the cause of the delay, saying that according to instructions, engineers are not expected to make up time under conditions where it is not safe to do so. Statements of Fireman Allen were similar to those of Engineman Noble; he also said that shortly after the accident, he talked to Fireman LaVigne, of the second engine, who was injured and subsequently died, and according to his statements that fireman said he thought they were going too fast.

Conductor Brokaw stated that the speed was the highest on passing Index, but from that point eastward, he was writing and was not paying particular attention to the speed, although he "felt we were making top speed all the way." When the car in which he was riding, the third car, came to a stop following the derailment, he gathered himself together, lighted a match, found his lantern, and immediately looked at his watch; it was then 12.41 a.m., and he placed the time of the derailment at 12.40 a.m. Conductor Brokaw estimated the speed of the train to have been between 40 and 45 miles per hour, saying that the coaches lurched on account of the speed and that milk cans fell over on rounding the curve at Index, although that happened not infrequently. Head Brakeman Enyart was also riding in the third car, while Flagman Schlegel was riding in the next to the last car, both of these employees looked at their watches after the derailment and at that time it was 12.40 a.m.

Division Engineer Hastie was riding in the sleeping car at the time of the accident; after its occurrence he examined the track and found there was a wheel mark on the gage side of the outside rail of the curve, extending eastward about 390 feet, from which point on there were wheel marks on both sides of the

outside rail for an additional distance of about 155 feet, or to where the final derailment occurred. He also had the section crew check the superelevation of the outside rail, and it was almost exactly  $3\frac{1}{2}$  inches at the first mark of derailment, the gauge was perfect. He said that the track at that point is on a solid, well-ballasted roadbed; at the point where the first marks of derailment showed on the ties, the track was not damaged, the only damage thereto between the initial and final points of derailment consisting of the shearing off the heads of a few bolts and the breaking of one spring on a nut lock where the final derailment occurred. There were four rails that were badly bent, two on each side of the track, which had to be replaced, and also a few ties, but generally speaking, there was very little damage done to the track. He considered the curve safe for a speed of 30 miles per hour.

Dispatcher Moo placed the time of the accident at 12 39 a. m., saying that there was a noise on the loud speaker, and the wires failed. He looked at his watch, which he had directly in front of him, and it was then a few seconds after 12.39 a.m., nearer 12.39 than 12.40.

Machinist Weststein stated that he read the tape that was removed from the speed recorder on engine 1453 and that it showed the highest speed attained by train No. 23 after departing from Gold Bar to have been 40 miles per hour, when in the vicinity of Index, and the speed at the time of the derailment to have been approximately 41 miles per hour. No reading was made of the tape from engine 1371, the pencil having cut the paper at the starting point.

Machinist Eagen stated that he inspected engine 1453 at Interbay roundhouse prior to its departure on the trip in question, but found no defect of any consequence.

Division Roadmaster Riley and District Roadmaster Larson gave testimony to the effect that the superelevation of the outside rail of the curve was  $3\frac{1}{2}$  inches and that the gauge was uniform, being from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch wide around the curve. The track was in first-class condition and they considered the curve safe for a speed of 30 miles per hour.

The first marks of derailment appeared on spike heads on the gage side of the high rail of the curve, starting at a point 291.8 feet from the extreme western end of the curve; at a point 143 feet beyond this point, marks also appeared on angle-bars, bolts, and nuts,

on the outside of the high rail, while at a point 347 feet farther to the east, there were marks on the ties outside of the high rail. No mark of derailment was discernible on or near the inside rail of the curve throughout the distance of 545 feet from the initial to the final point of derailment. A steel pin was placed in the center of the track near the beginning of the main 10° curve, as a base point, and measurements were taken from this pin. Starting at a point 76 feet east of the pin, or 13 feet east of an insulated rail joint on the high rail of the curve, one of two rail joints that lacked tie plates, the other joint being the next joint east thereof and on the inside rail of the curve, the tops of the heads of the spikes on the gage side of the high rail bore heavy cut marks. These spikes were in the eighth to the thirteenth ties, inclusive, east of the first insulated rail joint, 10 spikes in all. The backs of the spikes appeared to have been sheared upward in some instances and bent upwards in others, indicating that wheel pressure had forced them downward by the edge of the base of the rail, these marks appeared to have been made by a tire, and later, after removal, these spikes were found to fit the worn chamfered edge of the rim of the right front engine-truck wheel of engine 1453. On top of the thirteenth tie there was a distinct flange mark across the full width of the tie, and approximately 6 inches from the gage side of the base of the high rail, this flange mark continuing eastward around the curve at an almost uniform distance, 6 to 7½ inches, from the base of the rail, to where the final derailment occurred. After engine 1453 had been derailed, the engine truck of that engine followed the lead engine for a considerable distance, and on 42 ties east of where engine 1453 came to rest, flange marks appeared on the ties from 3 to 8 inches from the gage side of the inside rail of the curve, indicating that the engine truck was still off the track at that point.

The first insulated rail joint previously referred to, on the outside rail of the curve, showed indications of working, and it had cut into the tie on one end. The second unsupported insulated joint, located on the inside rail of the curve about 14 feet east of the first insulated joint, about opposite the center of the 10 marked spikes, showed an angle bar movement outward of about ½ inch, and downward about 5/8 inch, and was in a decidedly loose condition. The next joint east was tie-plated and showed no indication of looseness.

Engine 1371, the lead engine, is of the 4-6-2 type, H-5, having a total weight, engine and tender, of 518,100 pounds; the engine wheel base is 36 feet 1 inch

and the overall length is 86 feet  $\frac{3}{4}$  inch. The tender is of the Vanderbilt type, having six-wheel trucks; the weight of the tender, loaded, is 252,300 pounds.

Engine 1453, the second engine, is of the 4-6-2 type, H-4, having a total weight, engine and tender, of 387,950 pounds, the engine wheel base is 33 feet 9 inches and the overall length is 77 feet  $5\frac{1}{2}$  inches. The weight is distributed as follows: engine truck, 30,900 pounds, driving wheels, 132,000 pounds; trailer truck, 43,850 pounds. The tender is of the square type, having four-wheel trucks, the weight of the tender, loaded, is 152,200 pounds. Several careful inspections of engine 1453 failed to disclose any indication of dragging equipment, and the shoes, flanges, wedges and axles were in good shape. No excessive lateral was found in any of the wheels, and the engine generally was in good condition. It had last been overhauled in December, 1923.

Careful check of the speed-recorder tapes in use on train No. 23 from August 1, a total of 33 trips, showed that out of 24 tapes which were in good condition, there were 14 violations of the 30-mile speed limit on the 10° 03' curve involved in this accident, 9 of which showed a speed of from 35 to 38 miles per hour, and of these 9 violations, 6 were made by Engineman Noble.

The superelevation of the 10° 03' curve was  $3\frac{1}{2}$  inches, this being  $\frac{1}{2}$  inch lower than that called for in the manual of this railway for the guidance of roadmasters, while according to the formula of the American Railway Engineering Association, the superelevation of the high rail of a 10° curve, for a speed of 30 miles per hour, should be  $5\frac{7}{8}$  inches; for a speed of 44 miles per hour, an elevation of nearly 13 inches would be required.

#### Conclusions

This accident is believed to have been caused by speed on a curve in excess of the rate for which superelevation was provided, possibly combined with two loose rail joints.

Apparently, the speed alone was not the cause of the accident, as the lead engine was not derailed, although speed undoubtedly was the principal cause. The speed-recorder tape on the second engine, 1453, showed a speed of approximately 44 miles per hour at the time of the derailment, whereas the maximum permissible speed was 30 miles per hour. The track was in good surface,

alignment and gage, but the superelevation was insufficient for the rate of speed at which the train was being operated. The lead engine was much the heavier of the two engines, and the indications are that as a result of the excessive speed and existing track conditions, an extreme lateral thrust was communicated to the engine truck of engine 1453, against the outside rail, at a point near the loose insulated rail joint on that rail, at which time the rear wheels of the tender of the lead engine were approximately over the other loose insulated rail joint on the inside rail, and that this resulted in the giving of an opposite list or jerk to the front end of the second engine, increasing the nosing motion of that engine sufficiently to cause the left front engine truck wheel of engine 1453 to be forced up above the inside rail of the curve and resulting in the opposite wheel dropping down on the gage side of the outside rail, precipitating the derailment.

The marks on the outside of the high rail of the curve possibly were made by the equalizer bar on the rear truck of the first car, which had both equalizer bars torn off at the time of the accident. The right rear equalizer bar showed scars and battered marks on the bottom of its front end, indicating that it could have made the marks in question.

All of the employees involved were experienced men and at the time of the accident none of them had been on duty in violation of any of the provisions of the hours of service law.

Respectfully submitted,

W. P. BORLAND,

Director.