

INTERSTATE COMMERCE COMMISSION  
WASHINGTON

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INVESTIGATION NO. 2833  
THE CHICAGO & NORTH WESTERN RAILWAY COMPANY  
REPORT IN RE ACCIDENT  
AT MISSOURI VALLEY, IOWA, ON  
SEPTEMBER 28, 1944

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SUMMARY

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Railroad: Chicago & North Western  
Date: September 28, 1944  
Location: Missouri Valley, Iowa  
Kind of accident: Side collision  
Trains involved: Passenger : Freight  
Train numbers: 203 : 256  
Engine numbers: 509 : 3020  
Consist: 9 cars : 28 cars, caboose  
Speed: 10 m. p. h. : 15 m. p. h.  
Operation: Timetable, train orders and  
automatic train-control  
system; yard limits  
Track: Double; 2°59' curve;  
practically level  
Weather: Clear  
Time: About 7:32 p. m.  
Casualties: 9 killed; 95 injured  
Cause: Failure to provide adequate pro-  
tection for crossover movement  
Recommendation: That the Chicago & North Western  
Railway Company install electric  
switch-locking at all main track  
hand-operated switches in auto-  
matic train-control territory

INTERSTATE COMMERCE COMMISSION

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INVESTIGATION NO. 2833

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS  
UNDER THE ACCIDENT REPORTS ACT OF MAY 6, 1910.

THE CHICAGO & NORTH WESTERN RAILWAY COMPANY

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November 28, 1944.

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Accident at Missouri Valley, Iowa, on September 28, 1944,  
caused by failure to provide adequate protection for  
a crossover movement.

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REPORT OF THE COMMISSION<sup>1</sup>

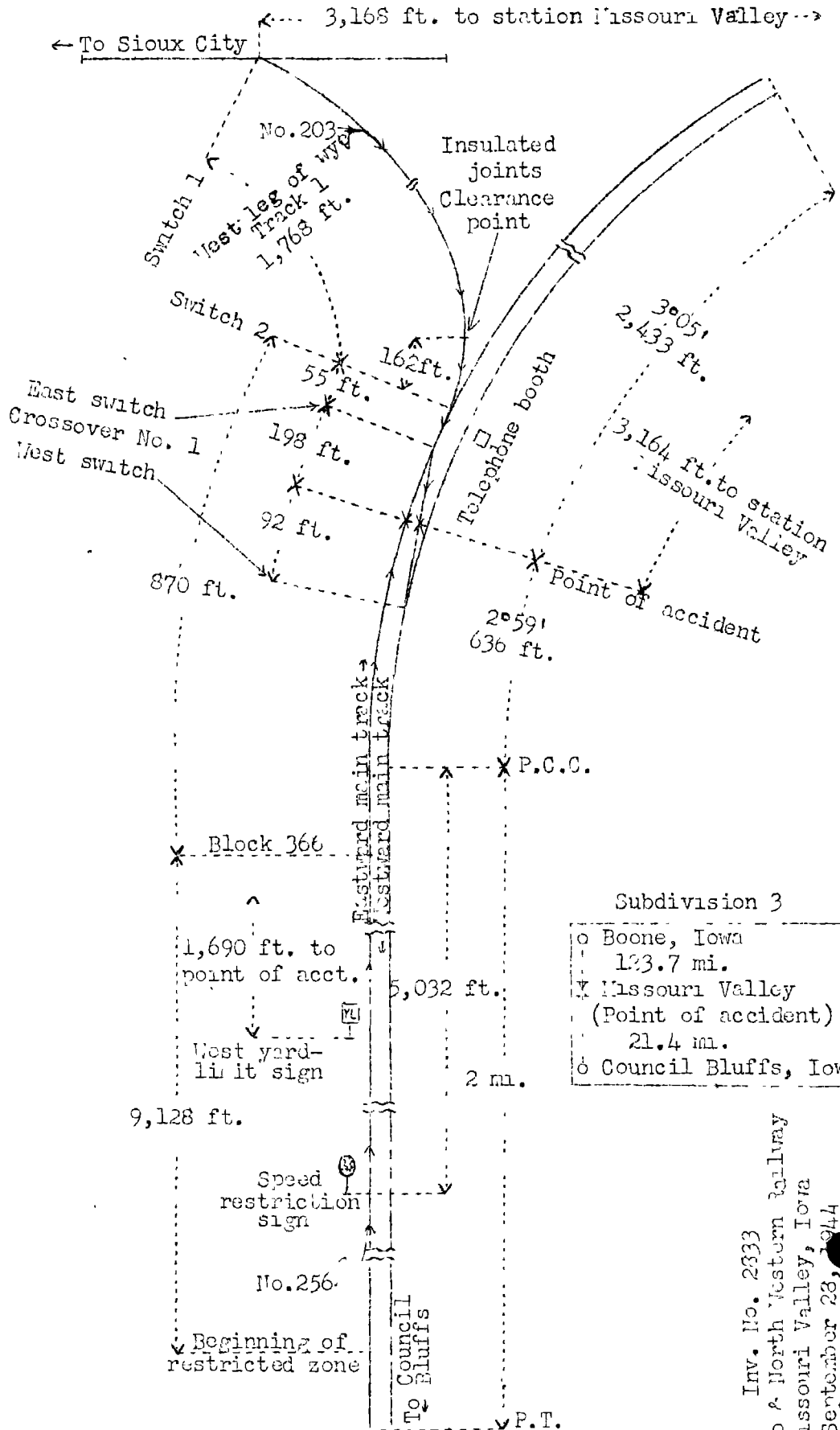
PATTERSON, Chairman:

On September 28, 1944, there was a side collision between a passenger train and a freight train on the Chicago & North Western Railway at Missouri Valley, Iowa, which resulted in the death of 9 passengers, and the injury of 95 passengers. This accident was investigated in conjunction with a representative of the Iowa State Commerce Commission.

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<sup>1</sup>Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Chairman Patterson for consideration and disposition.

Subdivision 4  
 o Sioux City, Iowa  
 69.4 mi.  
 o California Jct.  
 5.9 mi.  
 \* Missouri Valley, Iowa  
 (Point of accident)



Subdivision 3  
 o Boone, Iowa  
 123.7 mi.  
 \* Missouri Valley  
 (Point of accident)  
 21.4 mi.  
 o Council Bluffs, Iowa

Inv. No. 2333  
 Chicago & North Western Railway  
 Missouri Valley, Iowa  
 September 28, 1944

Location of Accident and Method of Operation

This accident occurred on that part of the Iowa Division designated as Subdivision 3 and extending northward from Council Bluffs to Missouri Valley, Iowa, 21.4 miles, and thence eastward to Boone, Iowa, 123.7 miles. This was a double-track line over which trains moving with the current of traffic were operated by timetable, train orders and an automatic train-control system. The current of traffic was to the left. At Missouri Valley this line converged with a single-track line of the Iowa Division designated as Subdivision 4 and extending westward to California Jct., 5.9 miles, and thence northward to Sioux City, Iowa, 69.4 miles. Time-table directions were eastward and westward for both subdivisions. Hereinafter, time-table directions will be used in this report. The accident occurred within yard limits at a point 1,690 feet east of the west yard-limit sign. The west leg of a wye, 1,768 feet long and hereinafter referred to as track 1, connected the single-track line of Subdivision 4 and the eastward main track of Subdivision 3. The switch of track 1 on Subdivision 4, hereinafter referred to as switch 1, was 3,168 feet west of the station. The switch of track 1 on Subdivision 3, hereinafter referred to as switch 2, was 2,911 feet west of the station. A trailing-point crossover 290 feet long, hereinafter referred to as crossover No. 1, connected the eastward and the westward main tracks. The east switch of crossover No. 1 was 55 feet west of switch 2. The accident occurred 3,164 feet west of the station, at the fouling point of the eastward main track and crossover No. 1. From the west on the eastward main track there was a tangent about 2 miles in length, which was followed by a compound curve to the right 3,069 feet, the maximum curvature of which was  $3^{\circ}05'$ . The accident occurred on this curve 636 feet east of its western end where the curvature was  $2^{\circ}59'$ . The grade was practically level.

The switch-stand for switch 2 was on the north side of the eastward main track, and was of the hand-throw intermediate-stand type. The switch-stands for the switches of crossover No. 1 were between the main tracks, and were of the hand-throw low-stand type. Each switch-stand was provided with an oil lamp and a red target. When the switches were lined normally, green lights were displayed. When the switches were lined for movement from track 1 through crossover No. 1 to the westward main track, the targets and red lights were displayed. Switch 2 was provided with a bolt lock.

The automatic train-control system was of the continuous-inductive type. Each engine was equipped with an audible indicator. Visual indicators were provided on each side of the engine cab. There were no wayside signals except at interlockings. The track was divided into blocks, in the same manner as where wayside automatic signals are used. The system was so arranged that when a main-track switch was open or a block was occupied there was a restricted zone extending from a point at least stopping distance in approach of the entrance to that block. When an engine entered this restricted zone the visual indicators would

change from green to red-over-yellow, the speed-control mechanism would start to function, then an audible speed-indicator and an acknowledging indicator would sound, and, regardless of the speed at which the train was operating, an automatic brake application would occur unless the engineer operated an acknowledging lever. If the speed was above the maximum low-speed limit of 23 miles per hour, the engineer, in addition to acknowledging properly, was required to reduce the speed to the low-speed limit within a predetermined distance. The speed-control mechanism functioned in such manner that if the speed was not reduced by the engineer in accordance with a gradually reducing or tapered speed-control limit, the brakes would become applied automatically and could not be released until the speed at that particular point had been reduced below the limit fixed by the mechanism. Failure to acknowledge would result in an automatic brake application, which could not be released until the speed of the train had been reduced below the low-speed limit. When the train was being operated under the low-speed restriction of 23 miles per hour, the acknowledging indicator would sound and recurrent acknowledgment was required at intervals of approximately 3,600 feet to prevent an automatic-brake application. If the low-speed limit was exceeded in a restricted zone, an automatic-brake application would be initiated and the brakes could not be released until the speed was reduced to 23 miles per hour. When the restriction was removed the visual indicators would change from red-over-yellow to green, and a single stroke on a gong located in the cab would be sounded. Then the train could be operated at maximum authorized speed.

The speed-control mechanism comprised a centrifugal governor for measuring speed, cams for measuring distance and electrical contacts jointly operated by both. The governor and cams were driven from a vertical shaft, which extended through the cistern of the engine tender. The vertical shaft was connected to a horizontal telescoping drive shaft through a bevel-gear unit and the horizontal shaft terminated in an axle transmission mounted on one of the tender axles. At each end of the horizontal drive member, a flexible disc-type universal joint was provided. The functioning of the speed-control mechanism which actuated the audible speed and acknowledging indicators and established the various speed restrictions depended upon the operation of the governor and its associated gears, cams and electrical contacts.

A train-control automatic-brake application would be effected by means of a brake-valve actuator, which was superimposed upon the brake-valve housing. The actuator had a cut-out cock, the handle of which normally was locked in the cut-in position and sealed. The key for the lock of the cut-out cock could not be removed unless the automatic train control was cut in. This key was required to be in the possession of the conductor, and a duplicate key was provided in a sealed box located in the engine cab. The actuator could not be cut out after the lock was unlocked or the seal was broken.

The entrance to block 366, the block involved in the accident, was located 870 feet west of switch 2. With switch 2 lined for movement to the eastward main track, there was an approach section extending 9,128 feet west of the entrance to block 366, in which train-control restriction was imposed. As a result, a restricted zone extending 9,998 feet west of switch 2 was provided.

A switch indicator at switch 2 was of the semaphore type, and its control circuit extended to a point 9,998 feet westward.

Operating rules read in part as follows:

93. All second and third class and extra trains must approach and pass all stations, yards, sidings, fuel and water stations, expecting to find trains or yard engines occupying the main track within the switches or yard limits, or taking fuel or water and will be prepared to stop unless the main track is seen or known to be clear. Trains and yard engines may use the main track at such points, protecting against first class trains in all cases and will protect against all trains where the view is obscured by fog, storms or track curvature, or other causes requiring additional safeguards.

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511. Both switches of a cross-over must be open before a train or engine starts to make a cross-over movement, and the movement must be completed before either switch is restored to normal position.

512. Where switch indicators are used, the indications displayed do not relieve enginemen and trainmen from protecting their train as required by the rules.

512a. A switch must not be opened to permit a movement to a main track when the semaphore arm is horizontal or the disc is visible in the indicator box at the switch, except under protection as per Rule 99.

The maximum authorized speed for freight trains was 60 miles per hour, and on the curve on which the accident occurred, 35 miles per hour. A speed-restriction sign was located 5,032 feet west of the western end of the curve.

### Description of Accident

No. 10, an east-bound first-class passenger train en route from Sioux City to switch 1 at Missouri Valley, its terminal station, consisted of engine 509, one baggage-mail car, two baggage-express cars, one passenger-baggage car, three coaches, one cafe-parlor car and one coach, in the order named. All cars were of steel construction. This train stopped at switch 1 at 7:23 p. m. Then the equipment, which was to be operated as No. 203, a first-class westward schedule, from the west switch of crossover No. 1 to Council Bluffs, entered track 1 and stopped about 7:28 p. m., with the engine standing clear of the insulated joints at the clearance point on track 1, about 162 feet west of switch 2. About 2 minutes later, while this equipment, hereinafter referred to as No. 203, was moving at an estimated speed of 10 miles per hour, en route from track 1 to the eastward main track thence through crossover No. 1 to the westward main track, the fourth car was struck by No. 256 at the fouling point of the eastward main track and crossover No. 1.

No. 256, an east-bound second-class freight train, consisting of engine 3020, 28 cars and a caboose, departed from Council Bluffs, the last open office, at 7 p. m., entered the approach section of block 366, passed the west yard-limit sign at Missouri Valley, entered block 366, and while moving at an estimated speed of 15 miles per hour it struck No. 203.

The third to the eighth cars, inclusive, of No. 203 and the engine and the first four cars of No. 256 were derailed. The third and fourth cars of No. 203 were slightly damaged, and the fifth to the seventh cars, inclusive, were badly damaged. The engine of No. 256 was considerably damaged, and the first four cars were slightly damaged.

It was clear and daylight at the time of the accident, which occurred about 7:32 p. m.

In tests after the accident the automatic train-control circuits and equipment and the switch indicator of switch 2 functioned properly.

### Discussion

No. 203 was en route from track 1 to the eastward main track, and thence through crossover No. 1 to the westward main track, when the fourth car was struck by No. 256 at the fouling point of the eastward main track and crossover No. 1. The accident occurred in automatic train-control territory and within yard limits.

As No. 256 was approaching the point where the accident occurred the speed was about 50 miles per hour. The enginemen and the front brakeman were maintaining a lookout ahead. The visual indicators on the engine displayed green aspects until



the engine reached a point about 2,800 feet west of switch 2, then the audible indicator sounded and the aspects of the visual indicators changed to red-over-yellow. The engineer immediately made a 20-pound brake-pipe reduction and moved the throttle lever to closed position. From this point to a point about 1,000 feet eastward the view of the track ahead was obscured by trailing smoke. Then the engineer saw No. 203 moving on the eastward main track and crossover No. 1, and he immediately moved the brake valve to emergency position. The speed of No. 256 was about 15 miles per hour when the collision occurred.

When No. 203 stopped at switch 2 the front brakeman, who had been on the engine, crossed to the south side of the main tracks and reported by telephone to the train dispatcher the arrival of No. 10 at switch 1. The conductor was in the eighth car and the other members of the train crew were located in other cars of the train. The front brakeman said that soon after he communicated with the train dispatcher he observed that the semaphore arm of the switch indicator at switch 2 was in vertical position. He then operated switch 2 and the switches of crossover No. 1, and gave signals to the engineer for the train to proceed through the crossover. The fireman and the front brakeman said that before their train entered the eastward main track they saw a train approaching from the west on the eastward main track at a distance which they thought was about 1-1/2 miles. The enginemen and the front brakeman were not aware that No. 256 was closely approaching until their engine entered crossover No. 1. Then these employees observed that the approaching train was about 1,200 feet west of the west switch of crossover No. 1. The engineer immediately increased the speed of his train in an unsuccessful attempt to clear the crossover before No. 256 reached it.

Under the rules of this carrier governing operation within yard limits at Missouri Valley, No. 256 was authorized to proceed at the maximum authorized speed of 60 miles per hour to the point where the speed was required to be reduced in compliance with the time-table speed restriction of 35 miles per hour on the curve on which the accident occurred, if the main track was seen or known to be clear. The enginemen of No. 256 understood that, within yard limits, a green aspect displayed by the visual cab indicator was adequate information that the way was clear, and this was in conformity with common practice on this railroad. The accident occurred 636 feet east of the western end of the curve and 1,690 feet east of the west yard-limit sign.

The control circuit of the switch indicator at switch 2, which connected track No. 1 and the eastward main track, was so arranged that if a train was occupying the eastward main track within a distance of 9,998 feet immediately west of switch 2 the semaphore arm of the switch indicator would be displayed in horizontal position, indicating track occupancy. The control circuits of the automatic train-control system were so arranged that when switch 2 was opened to permit a movement to be made from track No. 1 to the eastward main track a train-control restricted zone extending westward 9,993 feet was imposed. Since

no restrictive indication was received on the engine of No. 256 until it reached a point about 2,800 feet west of switch 2, it is evident that this switch was not operated to permit the movement of No. 203 from track 1 to the eastward main track until No. 256 had reached that point. If the switch indicator was functioning properly when the front brakeman observed it just prior to the opening of switch 2, the semaphore arm would have been in horizontal position and, under the rules, flag protection was required before the switch was opened to permit the movement of No. 203 from track 1 to the eastward main track. In tests after the accident the switch indicator at switch 2 functioned as intended. However, the front brakeman of No. 203 stated he was positive that the semaphore arm of the switch indicator was in vertical position when he observed it just before he operated switch 2, and No. 203 was permitted to proceed as though a clear indication was displayed by the switch indicator.

In view of the high speeds at which trains are authorized to proceed through Missouri Valley and the fact that the only protection provided for the crossover movement of No. 203 was the aspects displayed by switch indicators, additional protection for these movements is required. If the switch connecting the west leg of the wye and the eastward main track had been equipped with electric switch-locking, it would not have been possible to operate the switch to permit a movement to the eastward main track when a train was closely approaching, as in this case, and the accident would not have occurred.

#### Cause

It is found that this accident was caused by failure to provide adequate protection for a crossover movement.

#### Recommendation

It is recommended that the Chicago & North Western Railway Company install electric switch-locking at all main track hand-operated switches in automatic train-control territory.

Dated at Washington, D. C., this twenty-eighth day of November, 1944.

By the Commission, Chairman Patterson.

(SEAL)

W. P. BARTEL,  
Secretary.