INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 2754

THE UNION PACIFIC RAILROAD COMPANY

REPORT IN RE ACCIDENT

AT WILLARD, UTAH, ON

DECEMBER 21, 1943

SUMMARY

Railroad:	Union Pacific	
Date:	December 21, 1943	
Location:	Willard, Utah	
Kind of accident:	Head-end collision	
Trains involved:	Freight	: Motor-car
Train numbers:	Extra 2531 East	: Extra B-28 West
Engine numbers:	2531	: Motor-car B-28
Consist:	47 cars, caboose	:
Estimated speed:	About 35 m. p. h.	: Standing
Operation:	Timetable, train orders and an automatic block-signal system	
Track:	Single; $2^{\circ}04'$ compound curve; 0.266 percent descending grade eastward	
Weather:	Dense fog	
Time:	About 9:16 a. m.	
Casualties:	2 killed; 2 injured	
Cause:	Inferior train occupying main track on time of opposing superior train, and an inadequate block-signal system	

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2754

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

THE UNION PACIFIC RAILROAD COMPANY

February 21, 1944.

Accident at Willard, Utah, on December 21, 1943, caused by an inferior train occupying the main track on the time of an opposing superior train, and by an inadequate block-signal system.

REPORT OF THE COMMISSION[1]

PATTERSON, Chairman:

On December 21, 1943, there was a head-end collision between a freight train and a motor-car on the line of the Union Pacific Railroad at Willard, Utah, which resulted in the death of two employees, and the injury of two train-service employees. This accident was investigated in conjunction with a representative of the Public Service Commission of Utah.

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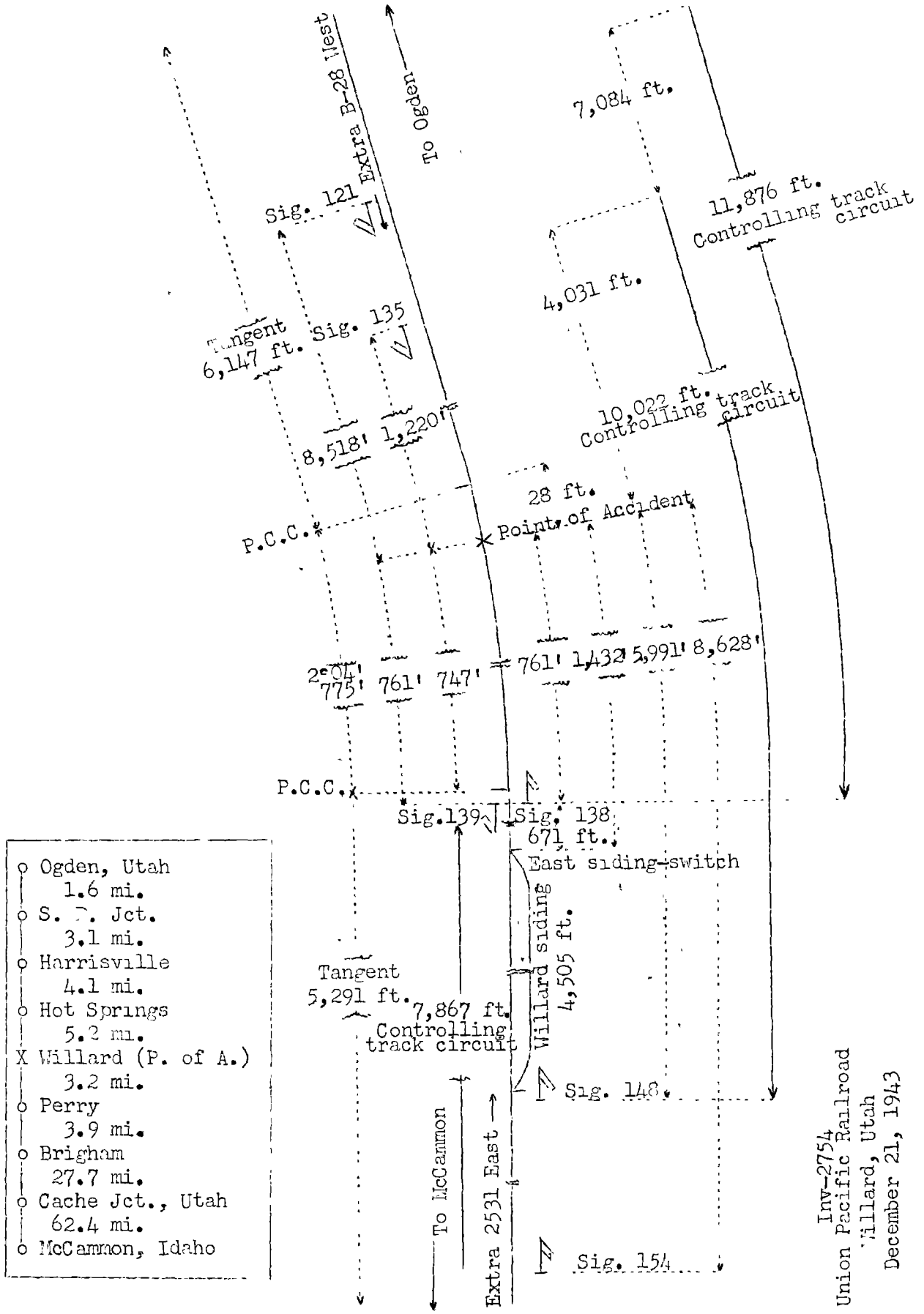
[1]Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Chairman Patterson for consideration and disposition.



Inv-2754
Union Pacific Railroad
Willard, Utah
December 21, 1943

Location of Accident and Method of Operation

This accident occurred on that part of the Utah Division designated as the Fifth Subdivision and extending between McCammon, Idaho, and Ogden, Utah, 111.2 miles. This was a single-track line over which trains were operated by timetable, train orders and an automatic block-signal system. At Willard a siding 4,505 feet in length paralleled the main track on the south. The accident occurred 1,432 feet east of the east siding-switch. From the west there was a tangent 5,291 feet in length, which was followed by a compound curve to the left 775 feet in length, the maximum curvature of which was 2°04'. The accident occurred on this curve 28 feet west of its eastern end. From the east there was a tangent 6,147 feet in length, which was followed by the curve on which the accident occurred. The grade for east-bound trains was 0.266 percent descending.

The automatic block-signal system was arranged on the overlap principle and consisted of double-location home signals near the ends of sidings, intermediate home signals between stations, and approach signals in the approach of the home signals near the ends of sidings. The signals were of the one-arm, two-position, lower-quadrant, semaphore type, and were approach-lighted. Home signals displayed either red or green, and approach signals either yellow or green. The aspects and corresponding indications and names of these signals were as follows:

Aspect	Indication	Name
Green, 60 degrees	Proceed	Clear Signal
Yellow, horizontal	Proceed preparing to stop at next signal. Train exceeding medium speed must at once reduce to that speed	Approach Signal
Red, horizontal	Stop	Stop Signal

Approach signal 154, and home signals 148 and 138, governing east-bound movements, were located, respectively, 8,628, 5,991 and 761 feet west of the point of accident. Intermediate home signal 121, approach signal 135 and home signal 139, governing west-bound movements, were located, respectively, 8,518 and 1,220 feet east and 761 feet west of the point of accident. The controlling track circuits of these signals were so arranged that when an east-bound train reached a point 7,867 feet west of signal 139, that signal would display stop, signal 135 would display approach, and signal 121 would display proceed, and when it passed signal 138, signal 121 would display stop. When a west-bound train reached a point 11,876 feet east of signal

138, this signal would display stop, and signals 148 and 154 would display proceed, and when it reached a point 4,792 feet east of signal 138, signals 138 and 148 would display stop, and signal 154 would display approach.

DEFINITIONS.

* * *

Medium Speed.--A speed not exceeding thirty (30) miles per hour.

* * *

Approach Signal.--A fixed signal used in connection with one or more home signals to govern the approach thereto.

* * *

Operating rules read in part as follows:

S-71. A train is superior to another train by right, class or direction.

Right is conferred by train order; * * *

* * *

S-87. An inferior train must keep out of the way of opposing superior trains and failing to clear the main track by the time required by rule, must be protected as prescribed by Rule 99.

* * *

FORMS OF TRAIN ORDERS.

* * *

S-C

Giving Right Over Anotner Train

* * *

(5) Extra 38 East has right over Extra 37 West (or all trains) X to G and wait at
H until nine fifty nine 9 59 A M
L " ten thirty 10 30 A M
K " ten fifty five 10 55 A M (etc.)

* * *

Trains over which the first-named train has been given right must clear it five minutes when moving in the opposite direction, * * *

* * *

406. In foggy or stormy weather enginemen must approach all signals with great care, prepared to respect the indication given, stopping if necessary to determine the indication.

The maximum authorized speed for both trains was 40 miles per hour.

Description of Accident

Extra 2531 East, an east-bound freight train, consisted of engine 2531, 26 loaded and 21 empty cars and a caboose. At Cache Jct., 34.8 miles west of Willard, the crew received, among others, copies of train order No. 246, Form 19, reading as follows:

Engine 2531 run extra Cache Jct to SP Jct
and has right over No. 255 and all westward
extra trains Cache Jct to SP Jct and wait at
Brigham until nine one 9:01 A. M.
Perry " nine six 9:06 A. M.
Willard " nine twelve 9:12 A. M.
Hot Springs " nine twenty 9:20 A. M.
Harrisville " nine twenty five 9:25 A. M.

This train departed from Cache Jct. at 8:15 a. m., passed Brigham, 7.1 miles west of Willard and the last open office, at 9:05 a. m., passed the east siding-switch at Willard at 9:15 a. m., passed signal 138, and while moving at an estimated speed of 35 miles per hour it collided with Extra B-28 West on the main track, 1,432 feet east of the east siding-switch at Willard, and 781 feet east of signal 138. The brakes of Extra 2531 East had been tested and had functioned properly en route.

Extra B-28 West, a west-bound train, consisted of motor-car B-28 in the charge of a conductor-pilot, and was being operated by a motor-car operator. At Ogden, 14 miles east of Willard, the conductor-pilot received, among others, a copy of train order No. 246, Form 19, previously quoted. This train departed from Ogden at 8:20 a. m., departed from Hot Springs, 5.2 miles east of Willard, about 8:55 a. m., passed signal 135, which displayed approach, and was stopped when it was struck by Extra 2531 East.

Extra 2531 East stopped with the front end of the engine 1,465 feet beyond the point of collision. The force of the impact demolished motor-car B-28.

From the right side of engine 2531, the view of signal 138 was unobstructed, but it could not be seen from the left side throughout a distance of 115.5 feet immediately west of the signal, because of the engine boiler.

There was a dense fog at the time of the accident, which occurred about 9:16 a. m.

A signal maintainer and a signal helper were killed. The conductor of Extra B-28 and the front brakeman of Extra 2531 were injured.

According to data furnished by the railroad, motor-car B-28 was 21 feet in length and weighed 16,000 pounds. It was provided with an enclosed cab, and equipped with an air-operated brake, which had functioned properly en route. At the time of the accident it was loaded with batteries and the total weight was 24,000 pounds. It was a 4-wheel car with a 12-foot wheel-base, and was being used by a signal-maintaining force engaged in changing signal batteries.

Discussion

The rules governing operation on this line provide that an extra train may be made superior to other trains by a right-of-track order. When a right-of-track order requires the superior train to wait until a specified time at a designated point, opposing inferior trains must keep out of the way of the superior train and must clear the time named in the order not less than 5 minutes. If the inferior train fails to comply with these requirements, it must furnish flag protection.

The crews of both trains held copies of train order No. 246, which conferred upon Extra 2531 East right over all west-bound extra trains between Cache Jct. and S. P. Jct., a distance of 47.2 miles, and which directed this train not to pass five designated points before the times specified in the order. Willard and Hot Springs were two of the waiting points. Hot Springs was 5.2 miles east of Willard. Under the provisions of this order Extra 2531 could leave Willard at 9:12 a. m., and Hot Springs at 9:20 a. m. No other order restricting the movement of Extra 2531 East had been addressed to Extra B-28 West. The inferior train was required to enter the east siding-switch and to be into clear at Willard not later than 9:07 a. m., if it proceeded to that station for Extra 2531, and it was not authorized to occupy the main track between the east siding-switch at Hot Springs and the east siding-switch at Willard after 9:07 a. m. Willard was the first point west of Hot Springs where Extra B-28 could get into clear. Extra B-28 departed from Hot Springs at 8:55 a. m., and, about 9:16 a. m., was 1,432 feet east of the east siding-switch at Willard when it was struck by Extra 2531. Extra 2531 passed the east siding-switch at Willard at 9:15 a. m., the speed was about 35

miles per hour, the headlight was lighted brightly and the members of the crew on the engine were maintaining a lookout ahead. A dense fog restricted visibility to about 400 feet. Because of the curvature to the left, the first that the engineer was aware of anything being wrong was when both the fireman and the front brakeman called a warning. The engineer immediately moved the brake valve to emergency position, but the collision occurred before the brakes became effective.

Extra B-28 consisted of a motor-car used by a signal-maintaining force engaged in changing batteries at signals, and was being operated by a motor-car operator. The train-service crew consisted of a conductor-pilot only. As this train was approaching the point where the accident occurred, the speed was about 10 miles per hour, the headlights were lighted, and the conductor and the motor-car operator were maintaining a lookout ahead. Both observed the headlight of Extra 2531 about 400 feet distant. The operator applied the air brake, and Extra B-28 stopped just before the collision occurred. The conductor-pilot understood that train order No. 246 conferred superiority upon Extra 2531, and that Extra B-28 was required to clear the times specified at the points designated. When his train departed from Hot Springs, 12 minutes remained in which to traverse the 5.2 miles between Hot Springs and Willard, and to clear for Extra 2531. Based on the maximum authorized speed of 40 miles per hour, Extra B-28 could have traversed this distance in 7 minutes 48 seconds; however, it was necessary to stop at three locations to change batteries. Each stop consumed at least 1 minute. The conductor was confident that his train would be into clear at Willard about 9:07 a. m. Furthermore, at Hot Springs he received information from the train dispatcher that Extra 2531 was about 5 minutes later than the times specified by the order. The dispatcher said that he expected Extra B-28 to clear Extra 2531 in accordance with the rules, and that his reason for telling the conductor about Extra 2531 being later than the times specified was for information only. He instructed the conductor to remain at Hot Springs if work was to be performed en route to Willard, but received no reply. Dense fog was encountered soon after Extra B-28 departed from Hot Springs, and the motor-car was operated at reduced speed. Three stops were made at signal locations before it entered the limits of the controlling circuits for signal 138. At 9:07 a. m. it was about 1-1/2 miles east of Willard, and continued without stopping until at 9:15 a. m. it was 1,432 feet east of the east siding-switch. The conductor was required to furnish flag protection after 9:07 a. m. However, since he was the only train-service employee on the motor-car and his train was proceeding ahead of an overdue second-class train, he did not think it advisable to stop the motor-car to provide flag protection against Extra 2531 when the rear end would be unprotected; furthermore, he was depending upon signal 138 to hold Extra 2531 at Willard, although this signal was 671 feet east of the east siding-switch. The motor-car operator and one of the signalmen were qualified on the operating rules, and could have been used to provide rear-end flag protection. If flag protection had been provided

after it was learned that Extra B-28 could not clear for Extra 2531 at Willard in the manner provided by the rules, this accident could have been averted. The conductor had not shown train order No. 246 to any employee on the car, but had informed them that there was sufficient time for Extra B-28 to proceed to Willard against an east-bound train.

In the vicinity of the point of accident the signal system was arranged on the overlap principle. The controlling circuits were so arranged that, after a west-bound train reached a point 11,876 feet east of signal 138, signals 154 and 148 would display proceed and signal 138 would display stop, and after it reached a point 4,792 feet east of signal 138, signal 148 would display stop. When an east-bound train reached a point 7,867 feet west of signal 139, signal 139 would display stop, signal 135 would display approach, and signal 121 would display proceed. Signal 121 would not display stop until the train reached signal 138.

Extra B-28 received an approach indication at signal 135, which was its most restrictive indication, but the collision occurred before that train reached the next signal, 1,981 feet beyond. The engineer of Extra 2531 East said that signals 154, 148 and 138 displayed proceed for his train, and he communicated these indications to the fireman and the front brakeman. Because of fog, the view of these signals was restricted to about 400 feet. He was not certain as to the color of the light displayed by signal 138, but was positive that the semaphore displayed proceed. The fireman was tending the fire and did not observe the signal. The railroad experience of the front brakeman was about 2 months, and he was somewhat confused about locations, but was certain that shortly before he observed the headlights of the approaching motor-car he momentarily saw a signal, apparently signal 138, to the right of the engine, displaying red. Since Extra B-28 West was occupying the track within the limits of the controlling circuits of signal 138 as early as 9:07 a. m., and since Extra 2531 East passed signal 138 about 9:15 a. m., this signal should have displayed stop for Extra 2531. The investigation disclosed that the motor-car shunted the track circuits after it left Hot Springs, as the proper restrictive signal indications were observed by the engineer of No. 255, a following train which entered the siding at Hot Springs to meet Extra 2531 East. Unless the motor-car failed to shunt a track circuit as it approached Willard, signal 138 should have displayed stop for Extra 2531 East. After the accident, signal 138 functioned as intended, and in tests simulating the operation of the motor-car the controlling track circuits between Hot Springs and Willard were shunted in the manner intended. However, the tests disclosed that it was possible to spot motor-car B-28 between the staggered insulated joints at ends of track circuits in such position that neither of the two adjoining track circuits would be shunted. Because of this condition and also

because of the liability of loss of shunt at times when a small light-weight car of this type is operated over the line, it is not safe to depend upon automatic block signals for protection of such movements, and absolute manual block protection should be provided.

The rules of this railroad require a train to be operated in foggy or stormy weather prepared to stop short of any home signal, regardless of the indication displayed by the last signal to the rear. Nevertheless, the proceed indication displayed by signal 148 authorized Extra 2531 East to move at the maximum authorized speed of 40 miles per hour to signal 138, which under the circumstances in this case should have displayed stop. If signal 138 displayed stop, in order to obey this indication it would have been necessary for the engineer to take action a considerable distance west of the signal. Since the signal could be seen a distance of only 400 feet and the accident occurred only 761 feet east of the signal, the train could not have been stopped short of the point of accident on the 0.266 percent descending grade. Neither train in this instance received both an approach and a stop indication.

Section 207 of the rules, standards and instructions for the installation, inspection, maintenance and repair of automatic block-signal systems prescribed by the Commission's order of April 13, 1939, which became effective September 1, 1939, provides as follows:

> 207. On track signaled for movements in both directions, signals shall be so arranged and controlled that proper restrictive indications will be provided to protect both following and opposing movements.

The automatic block-signal system at this location was in violation of section 207 of the Commission's order of April 13, 1939.

Cause

It is found that this accident was caused by an inferior train occupying the main track on the time of an opposing superior train, and by an inadequate block-signal system.

Dated at Washington, D. C., this twenty-first day of February, 1944.

By the Commission, Chairman Patterson.

W. P. BARTEL,
Secretary.

(SEAL)