

INTERSTATE COMMERCE COMMISSION  
WASHINGTON

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INVESTIGATION NO. 3004  
THE PENNSYLVANIA RAILROAD COMPANY  
REPORT IN RE ACCIDENT  
NEAR WALL, PA., ON  
JULY 13, 1943

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SUMMARY

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Railroad: Pennsylvania  
Date: July 13, 1946  
Location: Wall, Pa.  
Kind of accident: Collision  
Trains involved: Freight : Passenger  
Train numbers: Extra 6760 East : 29  
Engine numbers: 6760 : 669-3670  
Consists: 123 cars, cabooses : 16 cars  
Estimated speeds: Standing : 20 m. p. h.  
Operation: Automatic block and cab-  
signal systems  
Tracks: Four; tangent; 0.12 percent  
ascending grade westward  
Weather: Clear  
Time: 9 p. m.  
Casualties: 95 injured  
Cause: Derailed freight cars obstructing  
adjacent main track in front of  
approaching passenger train

INTERSTATE COMMERCE COMMISSION

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INVESTIGATION NO. 3004

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

THE PENNSYLVANIA RAILROAD COMPANY

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September 10, 1946.

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Accident near Wall, Pa., on July 13, 1946, caused by  
derailed freight cars obstructing an adjacent main  
track in front of an approaching passenger train.

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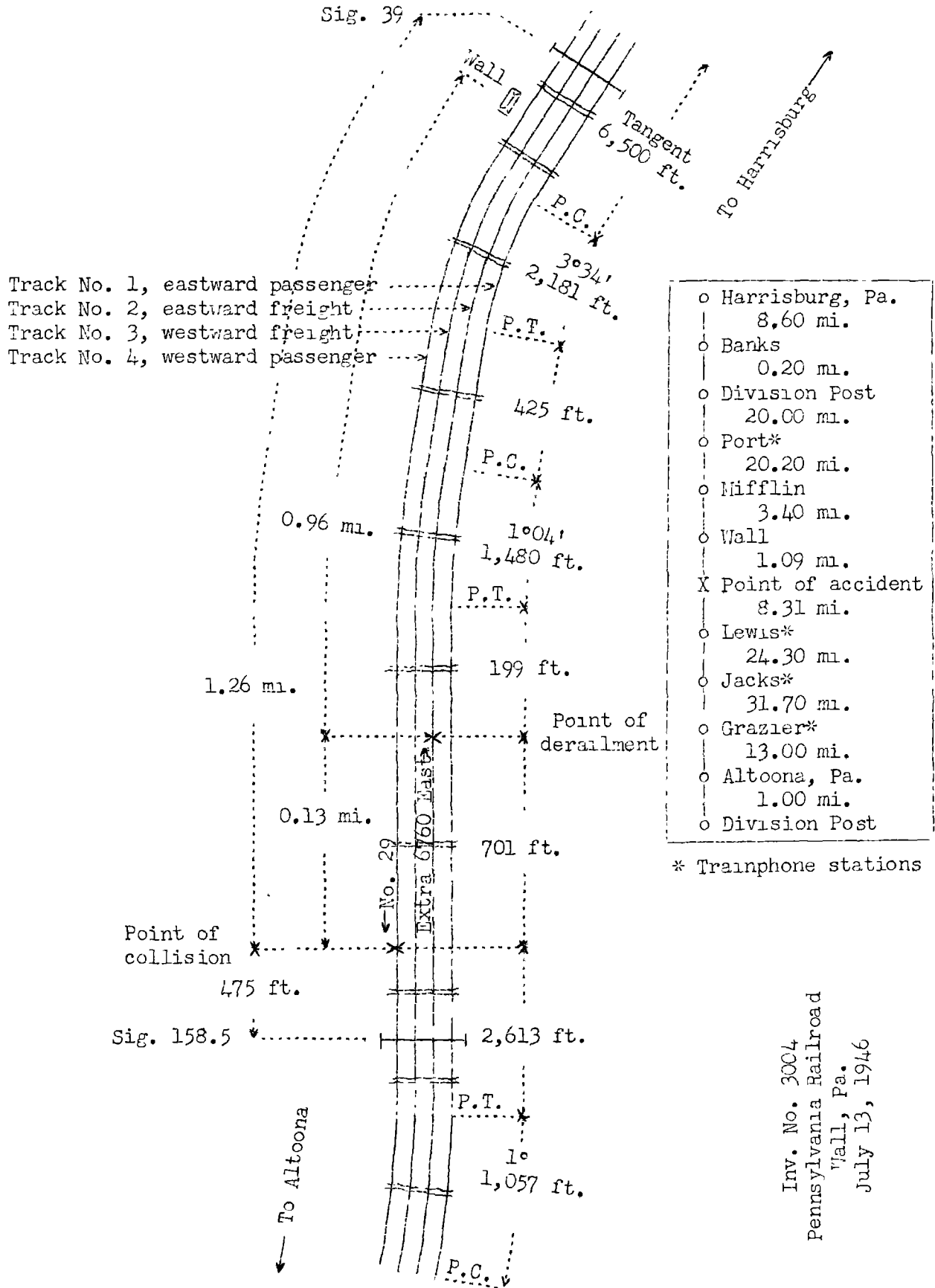
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REPORT OF THE COMMISSION

PATTERSON, Commissioner:

On July 13, 1946, derailed cars of a freight train were struck by a passenger train on the Pennsylvania Railroad near Wall, Pa. This accident resulted in the injury of 57 passengers, 7 railway-mail clerks, 2 Pullman employees, 23 dining-car employees and 6 train-service employees. It was investigated in conjunction with a representative of the Pennsylvania Public Utility 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 Commissioner Patterson for consideration and disposition.



Location of Accident and Method of Cooperation

This accident occurred on that part of the Middle Division extending between Division Post, near Harrisburg, and Division Post, near Altoona, Pa., 123 miles, a four-track line in the vicinity of the point of accident, over which trains moving with the current of traffic are operated by automatic block-signal and cab-signal systems. The main tracks from south to north are designated as No. 1, eastward passenger, No. 2, eastward freight, No. 3, westward freight, and No. 4, westward passenger. The freight train was being operated on track No. 2, and the passenger train was on track No. 4. The derailment occurred 53.36 miles west of Harrisburg and 0.96 mile west of the tower at Wall, and the collision occurred 701 feet westward. From the west on track No. 2 there is a 1° curve to the left 1,057 feet in length, which is followed by a tangent 3,314 feet to the point of derailment and 129 feet eastward. From the east on track No. 4 there are, in succession, a tangent 6,500 feet in length, a 3°34' curve to the left 2,161 feet, a tangent 425 feet, a 1°04' curve to the left 1,480 feet, and a tangent 900 feet to the point of collision and 2,613 feet westward. The grade is 0.12 percent ascending westward.

In this vicinity the tracks are laid on a hillside cut immediately south of the south bank of the Juniata River. At mean water level the south bank of the river extends 39 feet below the level of the tops of the rails of track No. 4 and 65 feet horizontally distant from the centerline of that track. The distance between the centerlines of tracks Nos. 2 and 4 is 25 feet 1 inch. Track No. 2 is laid with 152-pound rails and track No. 4 with 131-pound rails. The structure of these tracks consists of 39-foot rails laid on an average of 22 ties per rail length. It is fully tieplated with double-shoulder tie plates, spiked with four spikes per tie plate, provided with 6-hole angle bars and an average of 3 rail anchors per rail length, and is ballasted with crushed stone to a depth of 18 inches.

Home signal 39 and automatic signal 158.5, governing west-bound movements on track No. 4, are, respectively, 1.26 miles east and 475 feet west of the point of collision. These signals are of the position-light type. Signal 39 is controlled from the interlocking machine at Wall. The cab signals are of the four-indication position-light type. The involved aspects and corresponding indications displayed by signal 39 and the cab signals of the passenger train immediately prior to the accident were as follows:

<u>Signal</u>	<u>Aspect</u>	<u>Indication</u>
39 and cab signal	Three white lights in vertical position	Proceed.
Cab signal	Two white lights in diagonal position to the left	Proceed at Restricted speed.

The controlling circuits on track No. 4 are so arranged that when the block extending between the western limits of the interlocking at Wall, 1,692 feet west of signal 39, and signal 158.5 is occupied, or if the track circuit is shunted by an obstruction within the block, signal 39 will display stop-then-proceed-at-restricted-speed and the cab signals of an approaching west-bound train will display proceed-at-restricted-speed.

Operating rules read in part as follows:

DEFINITIONS

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Cab Signal--A signal located in engineman's compartment or cab indicating a condition affecting the movement of a train or engine.

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Reduced Speed--Prepared to stop short of train or obstruction.

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Restricted Speed--Not exceeding 15 miles per hour prepared to stop short of train, obstruction or switch not properly lined and to look out for broken rail.

11. A train finding a fusee burning red on or near its track must stop and extinguish the fusee and then proceed at Reduced speed.

76a. Engine and train crews as frequently as opportunity permits must observe engines and cars in their train, moving and standing, to detect any conditions that might interfere with the safe movement of trains.

99. When a train stops under circumstances in which it may be overtaken by another train, the flagman must go back immediately with flagman's signals a sufficient distance to insure full protection, placing two torpedoes, and when necessary, in addition, displaying lighted fusees.

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The front of the train must be protected in the same way when necessary by the fireman.

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102. When a train is disabled or stopped suddenly by an emergency application of the air brakes or other causes, adjacent tracks as well as tracks of other railroads that are liable to be obstructed must be protected at once in both directions until it is ascertained they are safe and clear for the movement of trains.

514. When cab signal indication changes to Restricting, a train or engine must reduce speed at once to not exceeding Restricted speed.

A system of train communication known as a trainphone system was placed in service on this division on April 28. This system is operated on the inductive two-channel principle, and equipment is provided for communication between employees at four wayside block stations and employees on trains, between employees at the front end and the rear end of freight trains, and between trains. At the time of the accident, 294 engines and 90 cabooses, or about 70 percent of the engines and cabooses used in this territory, were provided with trainphone equipment. The three engines of the two trains involved in this accident were equipped with the trainphone apparatus. Where train equipment is provided, it is installed in the cabs of passenger-train engines, in the cabooses and in the cabs of freight-train engines. The equipment consists of hand-set telephones, loud speakers, control panels and associated apparatus installed in such manner that communication can be had between any two units so equipped. The four trainphone-equipped block stations are Port, Lewis, Jacks and Grazier. These stations are, respectively, 24.69 miles east, and 8.31, 32.61 and 64.31 miles west of the point of collision. Special instructions governing the use of the trainphone system are provided in the timetable.

The maximum authorized speed for the freight train was 50 miles per hour and for the passenger train, 70 miles per hour.

#### Description of Accident

Extra 6760 East, an east-bound freight train, consisting of engine 6760, 123 loaded cars and a caboose, passed Lewis, the last open office, 9.4 miles west of Wall, at 8:45 p. m. and was moving on track No. 2 at an estimated speed of 35 miles per hour when the rear coupler of the sixteenth car dropped to the track. The seventeenth to the forty-eighth cars, inclusive, which were loaded with coal, were derailed about 0.96 mile west of Wall. These derailed cars obstructed the four main tracks, and were considerably damaged. The engine and the first sixteen cars were not derailed. This equipment, remaining coupled, stopped with the front of the engine standing 659 feet east of the point of derailment. Less than one minute after the derailment occurred, the forty-first car, which obstructed track No. 4, was struck by No. 29.

No. 29, a west-bound first-class passenger train, consisted of engines 639 and 3670, one mail car, one passenger-baggage car, six Pullman sleeping cars, one lounge car, two dining cars, four Pullman sleeping cars and one observation car, in the order named. This train passed Wall, the last open office, at 8:59 p. m. and was moving on track No. 4 at an estimated speed of 20 miles per hour when it collided with the derailed equipment which obstructed track No. 4. Both engines, the first car, and the seventh to tenth cars, inclusive, were derailed. The first engine stopped on its right side, down the south bank of the river, with the front end 90 feet west of the point of collision, 75 feet north of track No. 4 and at an angle of 50 degrees to it. The tender of this engine was torn loose from the engine, and stopped on its right side at the rear of the engine. The second engine and its tender, remaining coupled, stopped on their right sides down the bank of the river, with the front end of the engine 60 feet west of the point of collision, 48 feet north of track No. 4 and at an angle of 45 degrees to it. The first car, remaining coupled to the tender of the second engine and to the second car, and the other derailed cars stopped upright and practically in line with track No. 4. The engines and tenders were badly damaged, and the derailed cars were slightly damaged.

The weather was clear at the time of the accident, which occurred about 9 p. m.

The engineers, the firemen, the conductor and the flagman of No. 29 were injured.

The sixteenth car of Extra 6760 East, Pennsylvania 162046, a steel double-hopper car, was built in September, 1909, and was rebuilt in April, 1945. It is 52 feet 3 inches long over end sills, 10 feet 1-1/4 inches wide and 10 feet high. Its light-weight, capacity, and load-limit are, respectively, 37,300, 100,000 and 131,700 pounds. At the time of the accident it was loaded with 98,400 pounds of coal. This car was equipped at the B, or west, end with an E-type, top-lift, cast-steel coupler having an 11-inch knuckle, a 5-inch by 7-inch shank and a butt 9-1/8 inches wide. The coupler was provided with a yoke secured to the coupler butt by two rivets 1-1/4 inches in diameter by 11-5/8 inches long and applied vertically through the butt, which was provided with two 1-5/16 inch holes. The yoke, which contains the draft gear and stops, was a forged-steel bar 5-1/4 inches wide and 1-1/4 inches thick and bent into U-shape, the legs of which were 31-1/8 inches long. The legs of the yoke were shaped at the front ends into overlapping gibs 1-inch long, which were clamped over right-angled edges of the coupler butt.



### Discussion

Extra 6760 East was moving on track No. 2 at a speed of about 35 miles per hour, in territory where the maximum authorized speed was 50 miles per hour, when the seventeenth to forty-eighth cars, inclusive, were derailed at a point 0.96 mile west of the tower at Wall. The first the members of the crew knew of anything being wrong was when the brakes became applied in emergency as a result of the derailment. Less than one minute after the derailment occurred, the forty-first car, which obstructed track No. 4, was struck by No. 29.

As No. 29 was approaching the point where the accident occurred the headlight of the first engine was lighted brightly, the throttles of both engines were open, the speed was about 60 miles per hour, in territory where the maximum authorized speed was 70 miles per hour, and the engineers of both engines were maintaining a lookout ahead. The brakes of this train, which were in the charge of the engineer of the first engine, had been tested and had functioned properly en route. The fireman of each engine was standing on the deck back of the boilerhead, because there was a west-bound freight train passing on track No. 3. When No. 29 passed signal 39, that signal and the cab signals on each side of the cab of the first engine displayed proceed. When the first engine was about 4,000 feet east of the point where the accident occurred, the cab signals of the first engine changed to display proceed-at-restricted-speed, and the engineer immediately closed the throttle and made a 20-pound brake-pipe reduction, which soon reduced the speed to about 40 miles per hour. About the time the brake-pipe exhaust ceased, and as his engine was passing the engine of Extra 6760 East, the fireman of the first engine resumed his seat on the left side. Immediately afterward he observed that Extra 6760 East had become separated, and he called a warning to the engineer. The engineer immediately moved the brake valve to emergency position. The speed of No. 29 was about 20 miles per hour when the collision occurred. Because of dense coal dust from the derailed cars of the freight train, none of the employees on the engines of No. 29 saw the car which obstructed track No. 4. When the engineer of the second engine observed that a heavy service brake-pipe reduction had been made at an unexpected point he closed the throttle of his engine, and, when he saw fire flying in the vicinity of the front end of the first engine, he moved the automatic brake valve to emergency position.

Under the rules, the crew of Extra 6760 East was required to protect adjacent tracks in both directions when their train was stopped as a result of the emergency application of the brakes. In this case, when the engineer of Extra 6760 East observed that the brakes of his train had become applied in

emergency he instructed the fireman to protect all tracks, and the front brakeman, who was on the engine, to inspect the train. Then the engineer assisted the fireman in collecting the flagging equipment, which was in a compartment at the front of the tender. The fireman alighted from the left side of his engine before it stopped. However, before he could give a stop signal, the engines of No. 29 had passed his engine. The operator at Wall said that soon after No. 29 had passed out of his sight immediately west of the tower the track diagram indicated that track No. 1 was occupied. The engineer of Extra 6724 West, a west-bound freight train moving on track No. 3, said that No. 29 passed his engine and was rounding the curve immediately west of Wall when the indications of the cab signals of his engine changed from proceed to proceed-at-restricted-speed. He reduced speed in accordance with the indication, and soon afterward stopped his train short of the derailed cars of Extra 6760 East in response to the flagging signals given by the fireman of that train.

After the accident, examination disclosed that the rear coupler of the sixteenth car of Extra 6760 East, P.R.R. 162046, had dropped to the track and that the guard arm was struck by the wheels of the seventeenth car, which was the first car to become derailed. As shown by the records, this car had arrived in the receiving yard at Altoona on July 13, and was inspected by the mechanical forces at that time. Later, this car was assembled into a cut of 39 cars in the dispatching yard. One of these cars was found off center and was switched out, then the cut of 38 cars was doubled over to a cut of 85 cars on another track, the train was inspected and then departed about 6:06 p. m. as Extra 6760 East. During these inspections no defective condition of the sixteenth car was found. Extra 6760 East stopped at points, respectively, 74.4 miles and 54.2 miles west of Wall. Members of the crew said there was no unusual slack action or rough handling at these points, and the train had been operated smoothly throughout the trip. None of these employees saw any condition to indicate that any coupler in the train was defective prior to the time the derailment occurred. The investigation disclosed that both rivets of the coupler yoke at the B, or west, end of P.R.R. 162046 had been sheared off about 1-1/2 inches below the tops of the rivets. The lower portions of these rivets had not been found at the time this investigation was completed, but the top portions were found adjacent to the yoke. These rivets were of sound metal and had sheared squarely as the result of severe shock. The rivet holes in both legs of the yoke were slightly worn and somewhat elongated, but the dimensions were within the required limits. The upper bend of the yoke was broken throughout its width. There were small progressive detail fractures near each outer edge of this break, but about 85 percent of the break was new.

The overlapping ends of the yoke had spread to a distance of 10-5/8 inches, or 4-1/8 inches greater than the normal spread. The draft gear had remained in place within the yoke. Both rivets of the coupler carry-iron were broken. Marks on the carry-iron and on the front draft-gear stop indicated that after the coupler had separated from the yoke it continued to provide coupling strength until it became free of the draft-stop and the carry-iron. The conditions surrounding the failure of the coupler yoke indicate severe shock, which apparently was buffing snock resulting from coupling impact of a degree greater than the maximum safe impact at 2 miles per hour. This car was assembled in a cut and placed in the front portion of the train of Extra 6730 East. These cars had passed over an inspection pit during switching movements, and no defective condition was observed by the inspector. After the front portion was assembled other inspectors found that the sixth car to the rear of the car involved was off center as the result of severe impact. Probably the coupler-yoke rivets of the car involved became sheared at that time. After the yoke rivets were sheared the yoke continued to function in pulling draft as long as the overlapping members remained in place over the butt of the coupler. Because of vibration and repeated change between pull and buff during movement, the legs of the yoke finally spread sufficiently for the coupler butt to pull free from the overlap members of the yoke. The spreading of the legs of the yoke resulted in the fracture of the upper bend at the rear of the yoke, and the coupler fell to the track near a rail where it was struck by a wheel of the seventeenth car.

The investigation disclosed that as a result of the change of cab-signal indications from proceed to proceed-at-restricted-speed at the time when the track ahead became obstructed, the speed of No. 29 was reduced from about 60 to about 20 miles per hour before the collision occurred, and the disastrous consequences which otherwise would have resulted from this accident were thereby greatly reduced. In recent years train-communication systems have been developed which may be used to provide additional protection in a case of emergency such as was involved here. An installation of such a system was partially in service on the line where this accident occurred. In this system the trainphone is intended to be used as a means of communication in the same manner that a wayside telephone is used. It may be used to supplement existing emergency warning methods such as flagging. The engine of Extra 6760 East was equipped with a trainphone in operating condition. The caboose of this train was not equipped. Both engines of No. 29 were equipped with trainphone, but the equipment was inoperative. The trainphone on engine 3670 had been reported inoperative by the engineer when the engine arrived at Harrisburg from its last previous trip at 9:15 a. m., July 13, but repairs had been deferred. Examination of inspection reports for engine 669 indicated that the trainphone was reported inoperative on

July 4, at which time it was adjusted. There was no further report of defects of this equipment prior to the day of the accident. The engineer of the first engine of No. 29 said that during several attempts to call the operator at Port he received no response, and he did not hear any conversation on his loudspeaker at any point between Harrisburg and the point where the accident occurred. The engineers on engines 669 and 3670 were unable to effect communication between their engines. There is no means provided by which an engineman can test the trainphone equipment before his engine leaves the enginehouse to determine if it is operating. The first point where a communicating test can be made after a west-bound train enters the Middle Division at Banks, 8.6 miles west of Harrisburg, is when the train is within the range of the trainphone equipment located at Port, 20.2 miles west of Banks.

The time-table instructions governing the operation of the trainphone system provide that an emergency calling signal of four successive tone signals be sounded. This signal notifies all trainphone stations within range that an emergency message is about to be sent. It is then necessary to state the nature of the emergency and the location. There is no immediate action required by employees receiving an emergency signal on the trainphone other than to listen for the emergency message. In this instance it appears that almost immediate advantage was taken of the trainphone to communicate with the wayside stations. As soon as the engineer of Extra 6760 East made certain his fireman had started out to flag he made an attempt to call Port on the trainphone. When he started to use the trainphone the engineer of Extra 6724 West was just completing a call to Port in which he had told Port that he had been flagged, and that a freight train on track No. 2 appeared to be derailed. The engineer of Extra 6760 East tried to break in on Port, but received no answer. Then he called Lewis and made contact almost at once. Port was the first trainphone equipped block station to the east, but not the nearest block station to the point of accident, as Mifflin and Wall were between Port and the point of accident. Lewis was the first block station to the west and the nearest trainphone equipped block station. The engineer of Extra 6760 East then informed the operator at Lewis of the emergency brake application of his train, and that the front brakeman was making an inspection of the train. At this time No. 29 had passed the engine of Extra 6760 East, and the collision occurred immediately afterward. The engineer of Extra 6724 West, who had first made a brake application when the cab signals in his engine displayed a restrictive indication just before the engine cleared the interlocking limits at Wall and then made an emergency application when his fireman saw stop signals being given by the fireman of Extra 6760 East, called Port immediately after his train was stopped.

From the statements of the crews of Extra 6760 East and Extra 6724 West as to any part that the trainphone system might have played toward preventing the collision of No. 29 with the derailed cars of Extra 6760 East, it is apparent that No. 29 was so close to the point of accident when the derailment occurred that there was not sufficient time in which to use the trainphone to warn the engineers of No. 29, had the equipment on the engines of that train been in operative condition. The investigation disclosed that the use of the trainphone system to send a warning does not necessarily result in instantaneous response, and also that there is no way to be sure that approaching trains for which warnings are intended have heard those warnings, unless a reply is received.

Cause

It is found that this accident was caused by derailed freight cars obstructing an adjacent main track in front of an approaching passenger train.

Dated at Washington, D. C., this tenth  
day of September, 1946.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,  
Secretary.