INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 3154

MISSOURI PACIFIC RAILROAD COMPANY

REPORT IN RE ACCIDENT

NEAR SYRACUSE, MO., ON

JANUARY 1, 1948

SUMMARY

Railroad:	Missouri Pacific	
Date:	January 1, 1948	
Location:	Syracuse, Mo.	
Kind of accident:	Rear-end collision	
Trains involved:	Passenger	: Mail-express
Train numbers:	First 9	: Second 9
Engine numbers:	5326	: 2213
Consists:	12 cars	: 8 cars
Estimated speeds:	15 m. p. h.	: 40 m. p. h.
Operation:	Timetable, train orders and automatic block-signal system	
Track:	Single; tangent; 0.14 percent ascending grade westward	
Weather:	Snowing; daylight	
Time:	7:48 a. m.	
Casualties:	14 killed; 37 injured	
Cause:	Failure to operate following train in accordance with signal indications	

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 3154

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

MISSOURI PACIFIC RAILROAD COMPANY

February 26, 1948

Accident near Syracuse, Mo., on January 1, 1948, caused by failure to operate the following train in accordance with signal indications.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On January 1, 1948, there was a rear-end collision between a passenger train and a mail-express train on the Missouri Pacific Railroad near Syracuse, Mo., which resulted in the death of 12 passengers and 2 Pullman employees, and the injury of 32 passengers, 1 dining-car employee, 1 train porter and 3 train-service employees. This accident was investigated in conjunction with representatives of the Missouri Public Service Commission.

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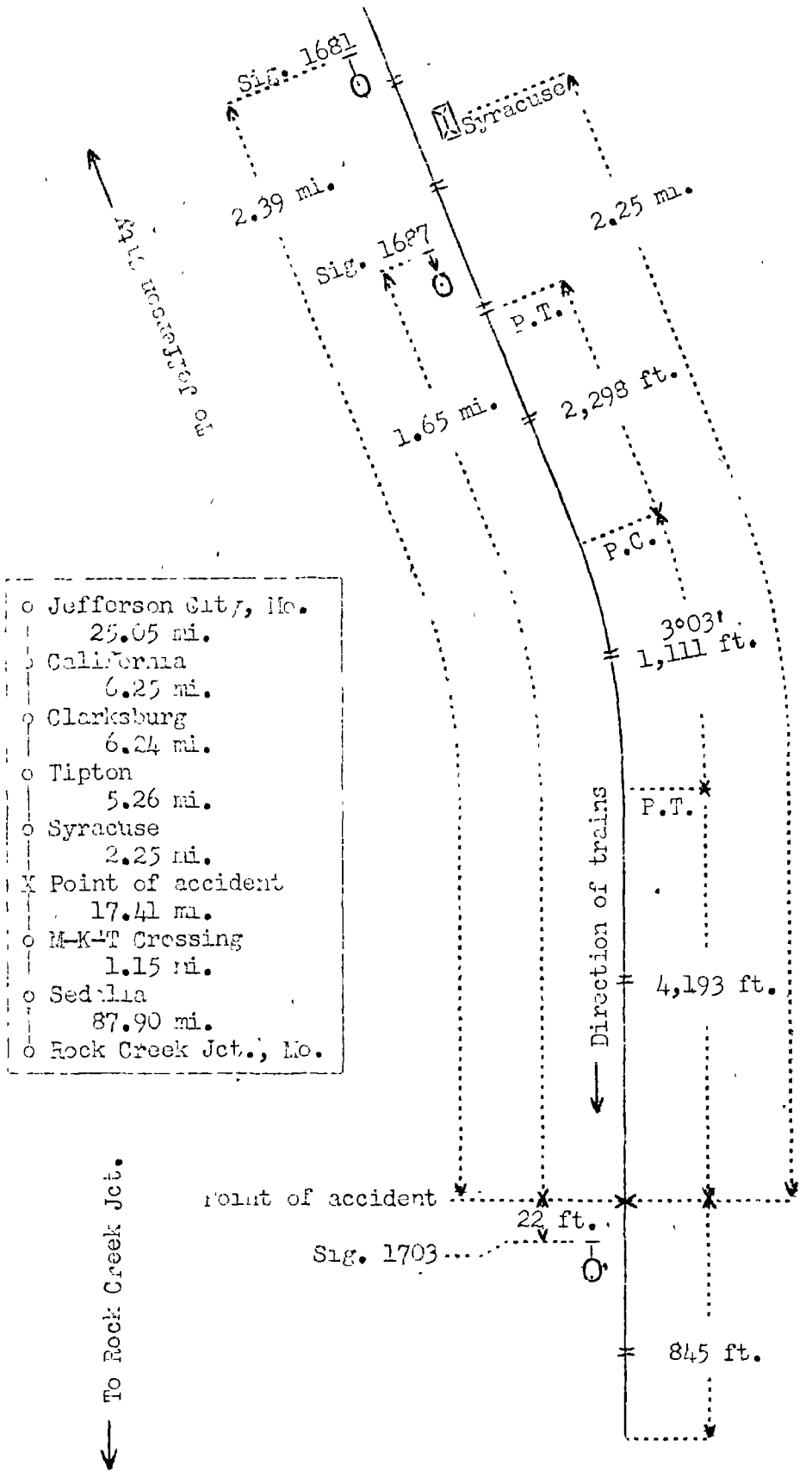
[1] Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.



Inv. No. 3154
Missouri Pacific Railroad
Syracuse, Mo.
January 1, 1948

Location of Accident and Method of Operation

This accident occurred on that part of the Eastern Division extending between Jefferson City and Rock Creek Jct., Mo., 151.51 miles, a single-track line in the vicinity of the point of accident, over which trains are operated by timetable, train orders and an automatic block-signal system. The accident occurred on the main track 45.05 miles west of Jefferson City and 2.25 miles west of the station at Syracuse. From the east there are, in succession, a tangent 2,298 feet in length, a 3°03' curve to the right 1,111 feet and a tangent 4,193 feet to the point of accident and 845 feet westward. Throughout a distance of 2.42 miles the grade varies between 0.02 percent and 1.30 percent descending westward, then it is, successively, level 300 feet and 0.14 percent ascending 295 feet to the point of accident and 205 feet westward.

The automatic block-signal system is arranged on the absolute-permissive principle, with absolute signals near the ends of sidings and intermediate signals between stations. Signals 1681, 1687, and 1703, governing westbound movements, are, respectively, 2.39 and 1.65 miles east, and 22 feet west of the point of accident. Signal 1687 is provided with a marker displaying the letter "A". These signals are of the color-light type, and are continuously lighted. When the signal system is functioning normally, the aspects and corresponding indications and names of these signals are as follows:

Aspect	Indication	Name
Green	PROCEED	CLEAR SIGNAL
Yellow	Proceed, immediately reducing to Medium Speed, or slower if necessary, prepared to stop before leading wheels pass the next signal.	APPROACH SIGNAL
Red	STOP, THEN PROCEED AT LOW SPEED THROUGH THE ENTIRE BLOCK (SEE RULE 509(a))	STOP AND PROCEED SIGNAL
Red over "A" marker	STOP (SEE RULE 509)	STOP SIGNAL

The controlling circuits of the signal system are so arranged that, when a train enters the territory extending from one siding to another, all signals governing opposing movements between such sidings display red aspects. Normally, when the block extending between signals 1687 and 1703 is occupied by a west-bound train, signal 1681 displays proceed-prepared-to-stop-at-next-signal, and signal 1687 displays stop. The signal power supply lines consist of two wires for the transmission of electrical energy at 4,400 volts. In addition, there are two wires for the transmission of electrical energy at 110 volts to charge batteries at points where the use of transformers is not practicable. Between sidings a minimum of three signal control wires are provided. If the power-line wires become broken, the operation of the signal system is not immediately affected, as the storage batteries have sufficient capacity to supply energy during a minimum period of about 18 hours. If the control wires become broken, the signals affected will display their most restrictive indications. During a period of about 8 hours immediately prior to the time the accident occurred the signals in the territory involved were displaying restrictive indications, because the control wires were broken as the result of a sleet storm. In addition, the power-transmission lines and the communication-system lines were broken.

This carrier's operating rules read in part as follows:

DEFINITIONS.

* * *

Low Speed.--A speed that will permit stopping short of another train or an obstruction, but not exceeding 15 miles per hour.

Medium Speed.--A speed not exceeding one-half authorized speed, but not exceeding 30 miles per hour.

Absolute Signal.--A home signal designated by an "A" marker, * * *

* * *

9. * * * when day signals cannot be plainly seen, night signals must be used in addition.

* * *

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

15. The explosion of two torpedoes is a signal to proceed at low speed. The explosion of one torpedo will indicate the same as two, but the use of two is required.

* * *

19. The following signals will be displayed to the rear of every train, as markers, to indicate the rear of the train: * * * by night * * * Lights * * * as markers, showing green to the front and side and red to the rear. * * *

34. All members of engine and train crews must, when practicable, communicate to each other by its name the indication of each signal affecting the movement of their train or engine.

35. The following signals will be used by flagmen:

Day signals	(A red flag, (Torpedoes and (Fusees.
Night signals	(A red light, (Torpedoes and (Fusees.

99. * * *

* * *

When a train is moving under circumstances in which it may be overtaken by another train, the flagman must take such action as may be necessary to insure full protection. By night, or by day when the view is obscured, lighted fusees must be thrown off at proper intervals.

When day signals cannot be plainly seen, owing to weather or other conditions, night signals must also be used. * * *

508 (c). Absolute signals are designated by "A" markers, or the absence of number plates.

509. When a train or engine is stopped by a Stop-indication, it must stay until authorized to proceed. Upon information from the train dispatcher (or signalman on instructions of train dispatcher) that there is no opposing train in the block, it may, after filling out clearance, when required, proceed at low speed, expecting to find a train in the block, broken rail, obstruction or switch not properly set, to the next signal displaying a Proceed indication. Dispatcher or signalman, or both, will make record of information given.

If the means of communication fails, or if the train dispatcher or signalman does not know that there is no opposing train movement involved, the train or engine may proceed when preceded by a flagman to the next signal displaying a Proceed or Proceed at Low Speed indication.

The requirements of this rule must be repeated at each Stop-indication.

509 (a). When a train or engine is stopped by a Stop, then Proceed at Low Speed indication it may proceed:

A.--On any track signaled for traffic in both directions, at low speed through the entire block, expecting to find a train in the block, broken rail, obstruction or switch not properly set, except that when a train is proceeding under protection of a flagman from the last Stop-indication, it must continue under protection of a flagman to the next signal displaying a Proceed or Proceed at Low Speed indication.

* * *

In the vicinity of the point of accident the maximum authorized speeds were 75 miles per hour for the preceding train and 55 miles per hour for the following train.

Description of Accident

First 9, a west-bound first-class passenger train, consisted of engine 5326, three mail cars, one baggage car, one passenger-baggage car, two coaches, one dining-lounge car, and four sleeping cars, in the order named. The rear

car was of lightweight high-tensile steel construction, and the remainder of the cars were of conventional all-steel construction. At Tipton, 5.26 miles east of Syracuse, the crew of this train received copies of a message reading in part as follows:

> * * * there is no opposing trains in block between Tipton and MKT Crossing.

M-K-T Crossing is 19.66 miles west of Syracuse. First 9 departed from Tipton at 7:20 a. m., 3 hours 45 minutes late. Because restrictive indications were displayed by five successive signals east of signal 1703, this train stopped at each of these signals. According to the testimony, signal 1703 displayed proceed-prepared-to-stop-at-next-signal and while the train was moving at an estimated speed of 15 miles per hour, in compliance with the indication displayed by this signal, the rear end was struck by Second 9 at a point 22 feet east of signal 1703.

Second 9, a west-bound first-class mail-express train, consisted of engine 2213, two box-express cars, two express-refrigerator cars, three box-express cars and one coach, in the order named. The third and fourth cars were constructed with steel underframe and wooden superstructures, and the remainder of the cars were of all-steel construction. At California, 17.75 miles east of Syracuse, the crew of this train received copies of a message reading in part as follows:

> * * * there is no opposing trains in block between Clarksburg and MKT Crossing.

Clarksburg is 12.5 miles east of Syracuse. This train departed from California, the last station where communication was available, at 6:43 a. m., 3 hours 23 minutes late, and, without stopping, passed 23 successive signals, of which 9 displayed stop and the remainder displayed stop-then-proceed-at-low-speed, passed signal 1687, which displayed stop-then-proceed-at-low-speed, and while moving at an estimated speed of 40 miles per hour it struck First 9 at a point 1.65 miles west of signal 1687.

The force of the impact broke the brake-pipe at the front end of the first car of First 9 and caused separations between the third and fourth cars, between the fifth and sixth cars and between the eleventh and twelfth cars. The

first two separations were caused by broken couplers. The rear car only was equipped with tightlock couplers. The sixth car was off center at the front truck. The rear truck of the eleventh car was torn loose at the time of the collision, and this car, remaining coupled to the tenth car, stopped upright on the roadbed, with the rear end about 10 feet north of the centerline of the main track, 387 feet west of the point of collision and 164 feet west of the front end of the twelfth car. The right side of the rear vestibule was damaged. The twelfth car was telescoped at the front end a distance of about 12.5 feet by the eleventh car and at the rear end a distance of 53 feet 3 inches by the engine of Second 9. The engine of Second 9 sheared the rear end of the twelfth car from the underframe, sides and roof, and pushed it forward through the car, and tore out partitions and fixtures. The center sills were broken off at the rear-end bolster and were badly broken and twisted throughout practically their entire length. All cross members were torn loose from the side sills and pushed ahead of the engine. The fatalities occurred in this car. The engine and the tender of Second 9 were derailed, but remained on the roadbed and leaned to the north at an angle of 30 degrees, with the front end of the engine 12 feet north of the centerline of the main track and 191 feet west of the point of collision. The boiler was covered by the roof and the sides of the rear car of First 9. The pilot was broken off and it was dragged under the engine-truck, which was pushed backward from its normal position about 1.5 feet. The air-compressor-frame castings and the smokebox were bent. The first to sixth cars, inclusive, and the front truck of the seventh car were derailed. Separations occurred at each end of the second to fifth cars, inclusive. The first car remained upright and in line with the track. The second car stopped upright, at the rear of the first car and at an angle of 40 degrees to it, with the rear end 40 feet north of the track, and was demolished. The third car stopped against the second car and practically parallel to it. The fourth car stopped on its side and at an angle of 30 degrees to the track, with the front and the rear ends, respectively, 38 feet and 20 feet south of the main track. The fifth car stopped at the rear of the fourth car and in line with it, and leaned to the south at an angle of 60 degrees, with the front end 20 feet south of the track and the rear end on the roadbed. The sixth and seventh cars remained upright on the roadbed. The first car and the third to sixth cars, inclusive, were badly damaged, and the eighth car was slightly damaged. These cars were not equipped with tightlock couplers.

The engineer, the fireman and the conductor of Second 9 were injured.

It was daylight and snow was falling at the time of the accident, which occurred about 7:48 a. m.

In tests of the air-brake equipment of Second 9 after the accident the automatic brake valve and all control valves of the units involved functioned properly. The travel of the brake-cylinder pistons of the engine, the tender and the cars was within the requirements. The engine and the tender were provided with No. 8-ET brake equipment. The feed-valve was adjusted for brake-pipe pressure of 91 pounds. Of the cars of Second 9, five were equipped with AB-1-B valves, two with LN valves and one with UC valve. One car was provided with clasp brakes, and the remainder with a single brake shoe per wheel.

The twelfth car of First 9, Pullman Golden Cloud, a sleeping car of lightweight low-alloy high-tensile steel-construction, was one of a lot of 119 cars built during 1941-1942. It was 84 feet 9 inches long between the pulling faces of the couplers, contained 4 bedrooms, 6 roomettes and 6 standard sections, and was equipped with a vestibule at one end only. Its lightweight was 139,000 pounds. At the time of the accident, the non-vestibule end was at the rear end of the train.

Discussion

The investigation disclosed that during a period of about 8 hours immediately prior to the occurrence of the accident the automatic block system at various locations between Jefferson City and M-K-T Crossing, a distance of 62.46 miles, was disrupted as a result of a sleet storm, which damaged the power-transmission lines and the circuit-control wires at many locations. The communication-system between Tipton and M-K-T Crossing also was out of service. This condition caused all absolute signals to display stop and all intermediate and approach signals to display stop-then-proceed-at-low-speed throughout a distance of 25.28 miles immediately east of the point of accident. These signals are of the color-light type, and they remained illuminated by power supplied by storage batteries.

The rules of this carrier requires that, when a stop indication is displayed by an absolute signal, a train must stop short of the signal and must not proceed until authorized to do so by receiving proper information that no opposing train has departed from the last station in advance, and by

the issuance of a clearance form from the train dispatcher. A train so authorized to proceed may then proceed at low speed to the next signal. If means of communication fails, a train may, after stopping short of an absolute signal displaying stop, proceed to the next signal under protection of a flagman preceding the train. The requirements of this rule must be repeated at each absolute signal displaying stop. When an intermediate signal or an approach signal displays a stop-then-proceed-at-low-speed indication, a train must stop short of the signal, then it may proceed, but must be prepared to stop short of a train or an obstruction. However, if the train has been preceded by a flagman from an absolute signal displaying stop, the train must continue under flag protection until it reaches a signal displaying an indication more favorable than stop-then-proceed-at-low-speed. All the employees concerned so understood.

After receiving a message containing information that there was no opposing train in the territory extending between Tipton and M-K-T Crossing, First 9 departed from Tipton at 7:20 a. m., stopped at two absolute signals, which displayed stop, and stopped at three other signals, which displayed stop-then-proceed-at-low-speed. As First 9 was approaching the point where the accident occurred the speed was about 15 miles per hour. The enginemen were in the engine cab, the conductor was in the fifth car, and the flagman was seated near the rear end of the eleventh car. The enginemen said that signal 1703 displayed proceed-prepared-to-stop-at-next-signal and this train was proceeding at a speed of about 15 miles per hour, in compliance with the indication displayed by this signal, when the rear end was struck by Second 9 at a point 22 feet east of signal 1703 and 1.65 miles west of signal 1687. Because the rear end of the rear car of First 9 was not equipped with a vestibule and platform steps, the flagman was in the eleventh car. His flagging equipment was in the vestibule at the front end of the rear car. The flagman understood that, in accordance with the rules, lighted fusees were required to be dropped at proper intervals when his train was moving under circumstances in which it might be overtaken by another train, as in this case. The flagman said that he had left lighted 10-minute red fusees at the rear of his train at points where stops were made in compliance with signals displaying stop indications. He had a supply of 18 fusees when he left St. Louis and, at the time of the accident, all but 4 of this supply had been used. He had expected to

renew the supply at Sedalia, 18.56 miles west of the point of accident. He said that about 12 minutes prior to the time of the accident he last lighted a fusee and placed it on the main track at a point about 2.56 miles east of the point where the accident occurred. He did not place torpedoes when his train stopped momentarily as the time was insufficient to place them to the rear of his train during such stops. The first that any member of the crew of First 9 knew of anything being wrong was when the collision occurred.

The crew of Second 9 held copies of a message containing information that there was no opposing train in the territory extending between Clarksburg and M-K-T Crossing. Second 9 departed from Clarksburg, 13.75 miles east of the point of accident, about 7:30 a. m. and, without stopping, passed all the signals in the territory between Clarksburg and the point of accident, including signal 1687, the last signal which Second 9 passed. As this train was approaching the point of accident, the throttle was in heavy drifting position, and the enginemen were maintaining a lookout ahead from their respective sides of the cab. The conductor, the flagman and the train porter were in the rear car. Falling snow materially restricted visibility. No burning fusee was seen and no exploding torpedo was heard throughout this territory. The first the enginemen knew of anything being wrong was when the fireman saw the rear of First 9 a short distance ahead, and he warned the engineer, who immediately closed the throttle, moved the brake valve to emergency position and the independent brake valve to application position, opened the sander valve, and placed the reverse lever in position for backward movement. However, the collision occurred before the action of the brakes became effective and before the engineer saw the preceding train. The engine of Second 9 was not equipped with a speedometer. The crew of Second 9 estimated the speed of their train as about 40 miles per hour at the time of the collision, but from the resultant damage, it apparently was somewhat greater. The average speed between Clarksburg and the point of accident, based on the elapsed time and distance, was 44.5 miles per hour. The brakes of this train had been tested and had functioned properly en route. In tests after the accident, the brakes functioned properly in both service and emergency applications, and the travel of the brake-cylinder pistons was in conformity with the requirements.

The absolute and the intermediate signals between Clarksburg and the point of accident displayed their most restrictive indications for Second 9. Under the rules, this train was required to stop short of each signal, and,

where absolute signals were involved, not to proceed unless authorized by the train dispatcher to do so, or under flag protection. After stopping for each signal, Second 9 was required not to exceed 15 miles per hour and to be prepared to stop short of another train or an obstruction. The crews of both trains understood the messages received from the train dispatcher to mean that no opposing train was moving in the territory involved and that they were not required further to call for instructions at each absolute block signal. With this understanding and because of the icy conditions prevalent, First 9 was not preceded by a flagman. However, this train stopped at each signal displaying its most restrictive indication and then proceeded at low speed in accordance with the requirements. The engineer of Second 9 was confused as to the meaning of the message addressed to Second 9 and asked the conductor for instructions. The conductor said he told the engineer to proceed at low speed. However, the engineer said that the conductor would not give him definite instructions but merely replied that the message meant just what it said. The train dispatcher said that, since the lines of communication were rapidly failing over an increasingly larger territory, he had sent the messages to First and Second 9 as information only, but expected the crews of these trains to comply with the rules at points where block signals displayed restrictive indications. The engineer of Second 9 understood the message to mean that his train was not required to stop at any signal that displayed its most restrictive indication, and that his train could proceed at medium speed and without providing flag protection ahead. Furthermore, he thought the message indicated that First 9 had arrived at some point beyond the territory involved, although the message mentioned opposing trains only. Under the rules of the carrier, the only provision for taking the automatic block-signal system out of service is by the issuance of a train order specifically stating that the system is out of service. The engineer said that he could have stopped his train within sighting range of a lighted fusee. The fireman of Second 9 had made no previous trip over the territory west of Jefferson City and was not sufficiently informed concerning the operating rules to warn the engineer to take action to control the movement of his train. The conductor and the flagman depended upon the engineer to proceed in compliance with the rules, and these employees said they thought the signals passed by their train were displaying indications more favorable than their most restrictive indications.

The means of protection for the trains involved in this accident consisted of the provisions of the rules requiring that flag protection be provided by First 9, and an automatic block-signal system. Notwithstanding the adverse weather conditions which existed at the time of the accident, and interference with the normal operation of the block-signal system which resulted therefrom, the accident would not have occurred if the rules had been complied with. Flag protection for First 9 was not provided, and the block-signal indications were not complied with by Second 9. As a result, when the enginemen of Second 9 saw the preceding train only a short distance ahead, it was impossible to stop in time to avert the accident.

The twelfth or rear car of First 9 was constructed of lightweight low-alloy high-tensile steel, and the underframe was fabricated by welding. It is apparent that, when the collision occurred, the deflecting-type pilot of the engine of Second 9, because of its rounded contour and retracted coupler with coverplate, forced the rear coupler of First 9 to the left and the buffer plate to the right. This action split the draft sills and broke the entire draft and buffer assembly free from the rear body bolster. The front end of the engine sheared away all partitions, the rear body bolster, and cross framing, and pushed this debris ahead. The center sills buckled badly. The draft and buffer assembly on the front end apparently was forced downward under the rear coupler and draft assembly of the eleventh car. Damage to the eleventh car was comparatively light. Most of it resulted after the rear truck was torn loose, and the car dropped to the track after the rear two cars separated just prior to stopping. Damage to the rear car of First 9 directs attention to the capacity of lightweight cars to withstand heavy buffing stresses. The specifications for cars used in trains of more than 600,000 pounds lightweight, made standard by the Association of American Railroads in 1945, require that the structure of passenger-train cars resist a static end-load of 800,000 pounds applied on the centerline of draft without developing permanent deformation and not more than 1-inch vertical deflection at the center of the car. The car structure must withstand horizontal end load of 500,000 pounds on the buffer at a point 12 inches above centerline of draft. The buffer beam, anti-climbing arrangement and coupler carry-iron assembly must withstand a vertical load of 100,000 pounds. The main vertical end

members must have an ultimate shear value of 300,000 pounds at the top of underframe to which they are attached. The car involved was one of a lot of 119 cars. One of these cars had withstood a squeeze-test load of 800,000 pounds without permanent deformation and with only 1/2-inch deflection at the center. Apparently, the construction of the Golden Cloud met the specifications of the A.A.R.

Cause

It is found that this accident was caused by failure to operate the following train in accordance with signal indications.

Dated at Washington, D. C., this twenty-sixth day of February, 1948.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.