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Report of the Interstate Commerce Commission  
on the accident of the Pennsylvania Railroad  
train near Warrior Ridge, Pa., on May 1, 1947.

INTERSTATE COMMERCE COMMISSION,  
WASHINGTON

INVESTIGATION NO. 3101

THE PENNSYLVANIA RAILROAD COMPANY

REPORT IN RE ACCIDENT

NEAR WARRIOR RIDGE, PA., ON

MAY 1, 1947

SUMMARY

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Railroad: Pennsylvania  
Date: May 1, 1947  
Location: Warrior Ridge, Pa.  
Kind of accident: Collision  
Trains involved: Freight : Passenger  
Train numbers: Extra 6744 West : 67  
Engine numbers: 6744 : 5512  
Consists: 65 cars, cabooses : 15 cars  
Estimated speeds: 5 m. p. h. : 57 m. p. h.  
Operation: Signal indications  
Tracks: Four; 3° curve; 0.17 percent  
descending grade westward  
Weather: Misting  
Time: 1:41 a. m.  
Casualties: 5 killed; 53 injured  
Cause: Operating a freight train in which  
the lading on one of the cars was  
not adequately secured

INTERSTATE COMMERCE COMMISSION

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INVESTIGATION NO. 3101

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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June 9, 1947

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Accident near Warrior Ridge, Pa., on May 1, 1947, caused  
by operating a freight train in which the lading on  
one of the cars was not adequately secured.

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1  
REPORT OF THE COMMISSION

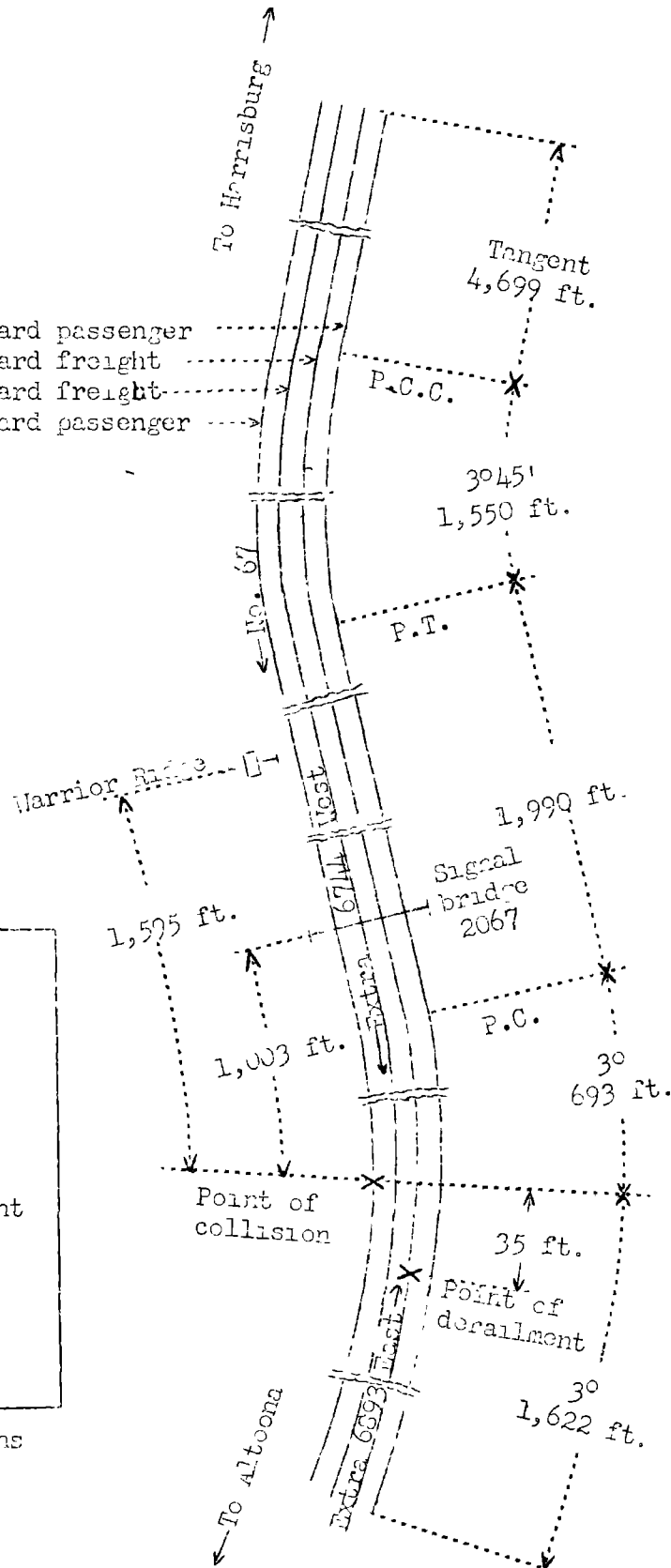
PATTERSON, Commissioner

On May 1, 1947, there was a collision between a  
passenger train and projecting lading of a car moving in  
a freight train on an adjacent main track on the Pennsylvania  
Railroad near Warrior Ridge, Pa., which resulted in the  
death of 5 passengers and the injury of 53 passengers. This  
accident was investigated in conjunction with a representative  
of the Pennsylvania Public Utility Commission.

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

- Track No. 1, eastward passenger
- Track No. 2, eastward freight
- Track No. 3, westward freight
- Track No. 4, westward passenger



- Harrisburg, Pa. 3.8 mi.
- Division Post 88.2 mi.
- Hunt\* 4.2 mi.
- Warrior Ridge 0.3 mi.
- X Point of accident 7.3 mi.
- Spruce\* 22.0 mi.
- Altoona, Pa. 1.0 mi.
- Division Post

\* Trainphone stations

Inv. No. 3101  
 Pennsylvania Railroad  
 Warrior Ridge, Pa.  
 May 1, 1947

Location of Accident and Method of Operation

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. 3 and the passenger train on track No. 4. The accident occurred 101.5 miles west of Harrisburg and 1,595 feet west of Warrior Ridge station. From the east on tracks Nos. 3 and 4 there are, in succession, a tangent 4,699 feet in length, a compound curve to the left, the maximum curvature of which is 3°45', 1,550 feet, a tangent 1,990 feet and a 3° curve to the right 693 feet to the point of accident and 1,622 feet westward. The grade is 0.11 per cent descending westward.

At the point of accident the distance between the center-lines of tracks Nos. 3 and 4 is 12 feet 1-1/4 inches. The super-elevation on the 3° curve at the point of accident is 5-7/8 inches on track No. 4 and 4-5/8 inches on track No. 3.

Automatic signals governing west-bound movements on tracks Nos. 3 and 4 are mounted on signal bridge 2067, located 1,003 feet east of the point of accident. These signals are of the position-light type and are approach lighted. The cab signals are of the four-indication position-light type. The involved aspects and corresponding indications displayed by the wayside signals and by the cab signals of the freight train and the passenger train immediately prior to the accident were as follows:

<u>Signal</u>	<u>Track</u>	<u>Aspect</u>	<u>Indication</u>
2067	3	Three white lights in horizontal position over white marker	Stop; then proceed at Restricted speed.
Cab signal	3	Two white lights in diagonal position to the left	Proceed at Restricted speed.

2067 and cab signal	4	Three white lights in vertical position	Proceed.
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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.

\* \* \*

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.

16. Communicating Signals

Note--The signals prescribed are illustrated by "o" for short sounds; "\_\_\_" for longer sounds.

Sound	Indication
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\* \* \*

(b) o o	When running--stop at once.
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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.

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 train-communication system known as a trainphone system, which is in use on the division on which this accident occurred, is provided for communication between employees at wayside block stations and employees on trains, between employees at the front end and the rear end of freight trains, and between trains. Where train equipment is provided, it is installed in the cabs of passenger-train engines, in cabooses and in the cabs of freight-train engines. The block stations at Hunt and Spruce, located, respectively, 4.5 miles east and 7.3 miles west of the point of accident, are trainphone-equipped stations. Special instructions governing the use of the trainphone system are provided in the timetable.

The maximum authorized speed was 50 miles per hour for the freight train moving on track No. 3, and 65 miles per hour for the passenger train moving on track No. 4.

#### Description of Accident

Extra 6744 West, a west-bound freight train, consisting of engine 6744, 65 cars and a caboose, passed Hunt, the last open office, 4.2 miles east of Warrior Ridge, at 1:20 a. m., stopped at signal 2067, which displayed stop-then-proceed, and while it was moving on track No. 3 at an estimated speed of 5 miles per hour a steel plate, which projected from the seventeenth car and fouled track No. 4, was struck by No. 67.

No. 67, a west-bound passenger-train, consisted of engine 5512, a 4-4-4-4 type, one mail car, one baggage car, one passenger-baggage car, two coaches, two sleeping cars, one dining car, one lounge car and six sleeping cars, in the order named. All cars were of steel construction. This train passed Hunt at 1:36 a. m., 35 minutes late, passed signal 2067, which displayed proceed, and while moving on track No. 4 at a speed of 57 miles per hour it struck the steel plate.

The equipment of Extra 6744 West and No. 67 was not derailed. The first mark on the equipment of No. 67 was a scraping mark on the left side of the cab of the engine immediately below the cab window. The handholds at the left gangway on the engine and tender were bent eastwardly, and the left side of the tender was slightly scraped. The left side-sheets of the first, third and fifth cars were dented inward and cut near the tops of the cars. The left top corner of the vestibule at the east end of the third car

was torn loose and bent outward about 2 feet. The left side of the fourth car was sheared at the window line throughout the length of the car, and the interior fixtures on the left side of this car were demolished. The casualties occurred in this car. During its contact with the equipment of No. 67, the steel plate from the seventeenth car of Extra 6744 West was rotated forward and dislodged from the car at the end gate at the west end. Then this plate came in contact with steel plates loaded on the sixteenth car of Extra 6744 West, crossed over the top of the fifteenth car, struck the east end of the fourteenth car, and became embedded in the ballast about 26 inches below the rails of track No. 1. The top plate in the middle section of the lading of the sixteenth car was forced to the south when it was struck by the plate from the seventeenth car, and one end of this plate became wedged between the ties and the base of the south rail of track No. 2 and the other end extended over the top of the north rail. Immediately afterward, the engine of Extra 6893 East, an east-bound freight train moving on track No. 2 at a speed of about 5 miles per hour, struck the steel plate which obstructed this track at a point about 35 feet west of the point of collision, and the Nos. 2, 3 and 4 pairs of driving wheels and the trailer truck of the engine were derailed. The engine stopped upright and in line with track No. 2 at a point 48 feet east of the point of derailment.

It was misting and visibility was restricted to a distance of about 150 feet at the time of the accident, which occurred about 1:41 a. m.

The fifteenth, sixteenth and seventeenth cars of Extra 6744 West are gondolas, and were loaded with steel plates of various dimensions. Reading 20575, the seventeenth car, is of steel construction of the fish-belly underframe type, equipped with drop-end gates and wooden flooring, and was built in March, 1923. Its lightweight, capacity and load limit are, respectively, 49,500, 140,000 and 160,500 pounds. The height above the tops of the rails is 6 feet 7-1/2 inches, the outside width is 10 feet 3-1/4 inches over the top angles, and the length over the striking castings is 48 feet 7 inches. The inside length, width and height are, respectively, 46 feet, 9 feet 6 inches and 3 feet. The trucks are of the 4-wheel type, having 33-inch multiple-wear wrought steel wheels, A.A.R. axles with 6 inch by 11 inch journals, and a cluster of five double-coil helical springs at each side of each truck. The truck centers are spaced 37 feet 7 inches apart. The body bolsters are equipped with rocker-type side bearings spaced 50 inches apart. The truck bolsters are equipped with steel plate side-bearings, 1/2 inch by 4 inches by 12 inches. The



Lading of this car consisted of 14 steel plates, and the total weight of the car and the lading was 135,395 pounds. These plates varied from 119 inches to 125 inches in width, from 200 inches to 235 inches in length, and from 1/2 inch to 1 inch in thickness. The plates were loaded at an angle of about 30 degrees to the flooring and in three piles. The piles at the west end and at the center consisted of five plates each, and the pile at the east end consisted of four plates. The end piles extended to within distances of 1 inch and 2-1/2 inches from the ends of the car, and the center pile overlapped the end piles about 25 inches. The lading of the fifteenth and sixteenth cars of Extra 6744 West also consisted of steel plates of various dimensions, similarly loaded in the cars.

#### Discussion

The investigation disclosed that on April 29, 1947, a shipment of steel plates had been loaded on three gondola cars, B&M 92428, Reading 7045 and Reading 20575, at the plant of the Lukens Steel Company, Coatesville, Pa. This shipment was destined to East Pittsburgh, Pa., via the Reading Company and the Pennsylvania Railroad. These cars were moved from the plant of the L.S.Co. by the Reading Company, and were delivered in a cut of 47 cars in interchange to the P.R.R., and were accepted by the latter-mentioned carrier at its west-bound receiving yard at Enola, near Harrisburg, Pa., 92.6 miles east of Warrior Ridge, at 11:32 a. m., April 30, 1947. After various switching movements, these cars were assembled in the train of Extra 6744 West, which departed from Enola Yard about 10:15 p. m., April 30.

Extra 6744 West was moving on track No. 3 at an estimated speed of 5 miles per hour, in territory where the maximum authorized speed for this train was 50 miles per hour, in compliance with the stop-then-proceed indication displayed by signal 2067. The headlight was lighted brightly, and the enginemen were maintaining a lookout ahead. The front brakeman was in the gangway of the engine, and the conductor and the flagman were in the caboose. The members of the crew of this train were not aware of anything being wrong until after the accident occurred, when the engineer heard a warning to stop all trains being broadcast on the trainphone by an employee on the engine of No. 67. Extra 6744 West was stopped with the front end and the rear end, respectively, 3,800 feet and 700 feet west of the point of accident. Immediately afterward examination disclosed that a steel plate projecting from the seventeenth car of Extra 6744 West had fouled track No. 4 and had been struck by No. 67.

As No. 67 was approaching the point where the accident occurred the speed was 57 miles per hour, as indicated by the speedometer with which the engine is equipped. The maximum authorized speed for this train moving on track No. 4 is 65 miles per hour. The brakes of this train had been tested and had functioned properly en route. The headlight was lighted brightly, and the engineer was maintaining a lookout ahead. The fireman was standing on the deck back of the boilerhead, because the west-bound freight train was moving on track No. 3. A road foreman of engines was in the tender of the engine. The members of the train crew were stationed in various cars throughout the train. Signal 2067 and the cab signals on the engine displayed proceed. The first the employees on the engine knew of anything being wrong was when they heard an unusual noise at the left side of the engine, and the engineer made a 10-pound brake-pipe reduction. Immediately afterward a stop signal was sounded on the communicating signal, and the engineer moved the brake valve to emergency position. No. 67 stopped with the front of the engine about 6,000 feet west of the point of accident. The first any member of the train crew was aware of anything being wrong was when a brakeman, who was in the rear end of the third car, heard a sudden impact against the left side of the car, and he immediately gave a stop signal on the train communicating system.

Under the rules, the members of the crew of No. 67 were required to protect adjacent tracks in both directions when the train was stopped as a result of the emergency application of the brakes. However, the engine of Extra 6893 East moving on track No. 2 had passed the rear ends of No. 67 and Extra 6741 West before these trains were stopped. When the engine of Extra 6893 East was derailed, this train was moving at a speed of about 5 miles per hour in compliance with restrictive indications displayed by the cab signals of the engine. The cab signals were actuated to display restrictive indications when a steel plate shunted the controlling circuit as it fell on track No. 2.

Examination after the accident disclosed that the steel plate which fouled track No. 4 and was struck by No. 67 was the bottom plate of the pile at the west end of Reading 20575. This plate had moved upward from its original position in the car, and the top east corner projected a sufficient distance outward from the north side of the car to foul track No. 4. When the plate came in contact with the engine and the first three cars of No. 67, it was pulled forward in a rotary motion, then the projecting corner became wedged against the front corner of the fourth car of No. 67.

When this occurred, the plate was moved westward and it bent the end gate of its car outward, and the bottom west corner of the plate was forced outward through the south side of the car just above the floor line. Then the plate was rotated so that it extended into the interior of the fourth car of No. 37.

The crew of Extra 6744 West said that, prior to the accident, the engine and the cars of the train had been riding smoothly and there was no indication of irregularity in the surface or alinement of the track. The train had been handled smoothly and there was no abnormal stretching or closure of slack between the cars. Investigation disclosed that the wheels of the seventeenth car were properly mounted and had proper flange and tread contour, and measurements indicated that they were not out of round. The car was level and plumb with the track. The truck springs of this car were removed and examination disclosed that two outer coils and one inner coil on the north side of the front truck and one outer coil on the south side of the rear truck were broken. However, the broken pieces were in normal alinement. Tests to determine the effect of the broken springs under load indicated that the deflection at the location of the spring assemblies with the broken coils was only 0.16 inch in excess of the deflection at the location of the spring assemblies with no broken coils. The surfaces of the top and bottom center plates indicated proper bearing of these members, but there was no clearance between the top and bottom side bearings at either side of the car. The top surface of the bottom side bearing on the north, or right, side at the west end of the car was worn and indented 7/16 inch. This condition indicated that shocks and resulting wear had progressed on this side bearing during a considerable period. The lack of any side-bearing clearance resulted in a solid 3-point bearing between the trucks and the car body, and such rigid condition would transmit road shocks from the trucks directly to the body of the car at the side-bearing locations. The rules of the Association of American Railroads governing maintenance of freight cars prescribe that side-bearing clearance shall be adjusted within the limits of 1/8 inch to 1/4 inch at each side bearing.

The rules of the Association of American Railroads governing the movement in trains of steel plates loaded diagonally on gondola cars provide that, to prevent displacement, the centerline of the plates must be directly above the longitudinal centerline of the car, the bottom edges of the top plates must be in contact with the side of the car and rest on the floor, or on bearing pieces attached to the floor. To support the upper portion of steel plates of the dimensions and weights of the plates involved, seven hardwood posts 6 inches

by 8 inches by 63 inches must be secured to the side of the car by two 7/8 inch bolts per post. The top surface of each post must be beveled to an angle corresponding with the angle of the lading. Each post must be braced longitudinally with two 2 inch by 6 inch timbers bolted to the side of the car and extending diagonally from the surface of the car floor to a point not less than 60 percent of the length measured from the lower end of each post, and one 2 inch by 4 inch bearing block must be nailed to each post immediately above the top of each brace. Each post must be braced laterally with one 7/8 inch rod extending diagonally through the post at a point about 8 inches below its top and downward through the car flooring at a point immediately adjacent to the bottom edges of the plates. A bearing support consisting of one 4 inch by 4 inch by 18 inch hardwood block, or one 1/2 inch by 4 inch by 12 inch metal plate, must be provided between the bottom surface of the flooring and the securing washer and nut. That part of the specifications intended to prevent upward movement of the steel plates provides that a metal anchor bracket 1/2 inch thick by 3 inches wide and of unspecified length, with a bolt hole near one end, must be attached with the bolt-hole end of the bracket against the outer face of a supporting post and secured to the post either by a 5/8-inch bolt or by the diagonal brace rod, and the other end of the bracket to extend over and downward on the top surfaces of the plates. One anchor bracket is required to be provided at the end of each tier of plates. No requirement was specified to provide for securing the overlapping end of the anchor bracket.

The loading foreman employed by the Lukens Steel Company said that he had inspected the car involved after it had been loaded and before it left the plant. He was certain that it was loaded in conformity with the specifications. A foreman of car inspectors and a car inspector employed by the Reading in its yard at Coatesville said they had inspected the car in that yard, and they were positive that the lading was in proper position and secured in accordance with the specifications. Two inspectors employed by the P.R.R. to inspect cars received in interchange at the yard of this carrier at Enola said they had inspected the car involved after its arrival at Enola, and at that time there was no indication that the lading was not properly secured. Other inspectors employed by the P.R.R. at Enola inspected this car after switching movements were made, and the engine and train crews of Extra 6744 West made inspections of the train while it was moving and during an interval of a 20-minute stop at Denholm, about 50 miles east of the point of accident. At the time these employees made these inspections they found no indication that any of the plates had shifted.

After the accident examination disclosed that the blocking, the supporting posts and braces, and the diagonal brace rods used to secure the lading of the car involved were in accordance with the specified requirements, except that at the point where the anchor brackets were attached to the supporting posts there was a 7/8-inch nut and washer placed between each post and bracket, and the bottom edges of the top plates were in contact with the side of the car but were not in contact with the bearing pieces on the car flooring. The centerline of the plates remaining in the car was directly above the longitudinal centerline of the car. The plate that became displaced from this car was the bottom plate from the tier at the west end of the car. The two anchor brackets at this end of the car were attached at the bolt-hole ends to the first and third supporting posts, but the overlapping ends of the brackets were bent upward and outward, and they hung loosely. The posts were split at the diagonal brace-rod hole locations, and the upper ends of the diagonal brace rods were bent downward at practically right angles to the rod.

A foreman of the P.R.R. car repair shop at Altoona, who inspected this car after it had been moved to that point about 8 hours after the accident occurred, said that in his opinion the bottom edges of the top plates were not placed in contact with the bearing pieces on the car flooring when the car was loaded at the point of origin. He thought that since the bottom edge of the top plate was not in contact with the bearing pieces on the car flooring, the weight of the top plates at the west end of the car was sufficient during movement of the car to force the bottom plate upward and that, since the overlapping ends of the anchor brackets were not secured, the two anchor brackets at the west end were displaced by the upward movement of the plate.

Since the investigation of this accident the Association of American Railroads issued additional instructions pertaining to the diagonal loading of flat, dished or flange plates. These instructions now require a 3/4-inch rod extending diagonally across the top of the lading and secured to each anchor bracket and to the opposite side of the car near the car flooring.

Cause

It is found that this accident was caused by operating a freight train in which the lading on one of the cars was not adequately secured.

Dated at Washington, D. C., this ninth day of June, 1947.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,  
Secretary.