

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3278

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION  
REPORTS UNDER THE LOCOMOTIVE INSPECTION ACT  
OF FEBRUARY 17, 1911, AS AMENDED

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD

November 10, 1949

Accident at St. Paul, Minn., on August 18, 1949, caused by  
separation of locomotive and tender due to failure of  
the locomotive frame tail piece.

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

PATTERSON, Commissioner:

On August 18, 1949, about 10:15 p.m., at St. Paul, Minn.,  
the cast steel frame tail piece of Chicago, Milwaukee, St. Paul  
and Pacific Railroad locomotive 373 broke off while the loco-  
motive was assisting in hauling a freight train at an estimated  
speed of 5 miles per hour. The engineer and fireman were serious-  
ly injured.

---

<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.

## DESCRIPTION OF ACCIDENT

On August 18, 1949, three helper locomotives were attached to Chicago, Milwaukee, St. Paul and Pacific Railroad eastbound freight train No. 626 at St. Paul Yard, St. Paul, Minn., to assist the train up the hill to Gloster, Minn., 6-1/2 miles from St. Paul Yard. Two helpers were coupled to the front end and one to the rear end of the train. The train departed from St. Paul Yard at 9:55 p.m. and had proceeded about 3-1/2 miles, to Payne Avenue and Reaney Street, St. Paul, where, at about 10:15 p.m., while it was moving at an estimated speed of 5 miles per hour, the stoker engine on locomotive 373, the second helper at front end, stopped with result that it became necessary to fire the locomotive by hand. The engineer and fireman were on the deck for that purpose when the cast steel frame tail piece failed just ahead of the cradle casting under the deck. The rear part of the tail piece with cradle casting, deck, and other parts remained attached to the tender by the drawbars while the locomotive moved forward. When the train line brake pipe parted the brakes were applied and the train stopped immediately. The engineer and fireman fell to the track between the rails and were seriously injured.

The train consisted of 43 loads and 29 empties, 3565 tons. The tonnage rating for the four locomotives involved over this territory was 3300 tons. The accident occurred while the train was ascending Gloster Hill, a 1.29 percent grade on a 9 degree curve to the left.

## DESCRIPTION OF LOCOMOTIVE

Chicago, Milwaukee, St. Paul and Pacific Railroad locomotive 373 was a 2-8-2 type; carrier's class L-3; built by the American Locomotive Company in July 1919; cylinders 27 x 32 inches; driving wheels 63 inches over new tires; steam pressure 200 pounds per square inch; weight on driving wheels 243,000 pounds; weight on trailing truck 53,000 pounds; weight in working order 320,000 pounds. Tractive effort was 62,949 pounds. The frame tail piece was of cast steel construction, with the cradle, or deck casting, cast integral and attached to the tender with two drawbars.

The trailing truck was two-wheel radial type, pivoted at the front end at the center line of the locomotive and attached by radius bars. The centering device spring housing was cast integral with the tail piece.

Locomotive was equipped with double drawbars. A Duplex stoker was mounted on the frame just forward of the cradle, or deck casting. A Wilson feed water pump was mounted on a bracket which was suspended below the frame on the left side below the stoker engine.

The cab and deck plates were constructed from sheet iron. The deck plates carried a wooden floor and were supported at the front end by 2 x 2-inch angle irons, which were secured to the rear boiler support by  $\frac{1}{2}$ -inch rivets, on the sides by 2 x 2-inch angle irons secured to the wind sheets by  $\frac{1}{2}$ -inch rivets, and at the rear by 2 x 2-inch angle irons secured by  $\frac{1}{2}$ -inch rivets to the tail sheet.

### EXAMINATION OF PARTS INVOLVED

The cast steel frame tail piece was broken at the front end of the cradle or deck casting, which was 14 inches ahead of the front drawbar pin hole, through old and progressive fractures which extended through 95 percent of the cross-sectional area. The original or old fracture evidently started at the top of the frame and progressed downward through the bolt holes on each side back of the stoker support bracket to the bottom. This fracture appeared to be very old. On the right side the fracture progressed through the bottom web toward the center and appeared to be of more recent origin than the upper part of the fracture. At the left side the fracture progressed through the bottom web and inward toward the center, a distance of 6 inches from the left vertical member of the frame. This fracture also appeared to be more recent than the top part of the fracture. The fracture then progressed outward on each side of the center member of the frame, joining the progressive fracture from the right side. It progressed from the center member toward the left side and ended 3 inches from the fracture from the left side. This portion of the fracture was also more recent. The remaining 3 inches of the bottom member showed a new break and was the only part of the frame which was intact immediately prior to the accident.

The rear part of the tail piece with the deck, stoker engine and elevators, water pump, and injector remained attached to the tender by the drawbars.

The steel cab was pulled to the rear on each side a distance of 5 inches at the running boards but remained attached to the bottom cab brackets and to the angle irons at the top. The nuts were pulled from the studs securing the cab brackets on each side

and the brackets were pulled to the rear  $1\frac{1}{2}$  inches. The reverse lever and quadrant, the brake valves and related piping, cab floors, and seat boxes remained intact in the cab.

The stoker elevators were broken at the top when pulled from the back head. The rivets which secured the deck plates to the rear boiler support and to the wind sheets on the sides were pulled off. On the right side, the tail sheet was pulled from the frame and remained attached to the bottom of the cab. On the left side, the top angle iron, by which the tail piece was secured to the rear of the cab and cab floor support or the running board, was broken off through the center. The 6-inch inside diameter exhaust steam condensate pipe, which extended back to the water pump hot well located in the left side of the tender, was broken off just back of the rear mud ring and in line with the break in the frame.

The stoker engine steam pipes and reversing valve extension handle were broken off at the stoker engine. All pipes to the water pump were broken or pulled from the water pump. The copper steam pipe, extension handles, and delivery pipe were pulled from the injector on the right side. The train line air pipe was parted below the mud ring on the right side.

The driving wheel tires had  $1/8$ -inch tread wear and Nos. 3 and 4 tires on each side had a false flange which extended out from the throat of the flange  $1/2$  inch on the left tires,  $3/8$  inch on the right tires, and were  $7/16$  inch high. The marks on the edges of these false flanges indicated that they had been on top of the rails at times.

The driving box lateral was  $5/8$  inch for No. 1 driving wheels,  $1/2$  inch for No. 2,  $5/8$  inch for No. 3 or main wheels, and  $3/8$  inch for No. 4. The lateral in the trailing wheels and engine truck wheels was  $3/8$  inch. The driving box wedges were not loose and were apparently set up properly. The crown brass of the right No. 4 driving box was loose and the shim had worked outward 2 inches.

The crosshead shoes were in good condition.

The main and side rods were removed from the pins and the wear of the bushings on the pins was found as follows: Front end of right main rod  $1/16$  inch and back end  $1/8$  inch. Right No. 1 side rod  $1/32$  inch, right No. 2 side rod  $1/8$  inch, right No. 3 side rod  $5/32$  inch, and right No. 4 side rod  $1/32$  inch. Right front knuckle pin  $1/16$  inch and right back knuckle pin

1/32 inch. Front end of left main rod 1/32 inch and back end 1/16 inch. Left No. 1 side rod 3/32 inch, left No. 2 side rod 1/2 inch, left No. 3 side rod 3/16 inch, and left No. 4 side rod 1/32 inch. Left front knuckle pin 1/16 inch, and left back knuckle pin 3/16 inch.

### INSPECTION AND REPAIR REPORTS

Last annual inspection was made on September 1, 1948, last quarterly inspection on June 15, 1949, and last monthly inspection on August 15, 1949, all at St. Paul, Minn.

Daily inspection and repair reports from Milwaukee, Portage, Sparta, and La Crosse, Wis., and Duluth and St. Paul, Minn., for 30 days previous to the accident were examined and the following items which may have a bearing on the accident were found reported:

July 19, 5:30 a.m., at Milwaukee, reported by engineer: "Engine rides very hard."  
Repairs shown: "Leveled spring rigging."  
Report signed by foreman.

July 19, time not shown, at Portage, reported by engineer: "Engine rides hard." Repairs not shown.  
Signed off by foreman as "Engine went thru."

July 23, 3:50 p.m., at Portage, reported by engineer: "Stoker loose on frame." Shown: "Tightened."  
"Cab loose." Shown inspected by general road foreman of engines. Report signed by foreman.

July 26, 3:55 a.m., at Sparta, reported by engineer: "Boxes badly worn, engine rides very hard."  
No repairs shown. Item checked as having been examined and found serviceable by foreman.  
Report signed by foreman.

July 26, 6:15 a.m., at Sparta, reported by engineer: "Steam pipe to water pump gauge leaking at union connection to gauge." Repairs shown: "Renewed sleeve and nut at La Crosse on 7-27-49."  
"Steam pipe connection to jets leaking at main connection." No repairs shown. Item checked as having been examined and found serviceable by foreman. Report signed by foreman.

July 26, 6:20 p.m., at Portage, reported by engineer: "Engine rides very hard and pounds bad." Repairs shown: "Adjusted wedges." Report signed by foreman.

July 27, 7:05 p.m., at La Crosse, reported by engineer: "Engine rides very hard." Item checked as having been examined and found serviceable by foreman. Report signed by foreman.

July 29, 7:20 p.m., at La Crosse, reported by engineer: "Stoker barrels loose on frame." "Engine very lame square up." "Engine very hard." Items checked as having been examined and found serviceable by foreman. Report signed by foreman.

August 1, 9:25 p.m., at La Crosse, reported by engineer: "Take up lost motion between engine and tank." Item checked as having been examined and found serviceable by foreman. Report signed by foreman.

August 4, 4:00 a.m., at La Crosse, reported by engineer: "Engine rides hard." Item checked as having been examined and found serviceable by foreman. Report signed by foreman.

August 15, at St. Paul, reported by inspector: "Frame broke where drawbar connects." Item marked as having been examined and "considered serviceable. Eng. due for hydro 9-1" by foreman. Report signed by foreman.

August 16, 12:30 a.m., at St. Paul, reported by engineer: "Bad steam leaks top of boiler head and in turret box. Engine lame. R. F. cyl. cock blows when eng. is working hard. Air pump stops at time." Repairs shown made to last item: "Oiled." Cause shown for work not done: "Items #1, #2, #3 examined. Leaking not excessive, considered serviceable for service." Report signed by foreman.

August 17, 2:00 a.m., at St. Paul, reported by engineer: "Eng lame - Rods pounding - Bushings worn. Hot water control valve leaking badly, leaks in cab top of boiler head and in turret box. Reverse creeps, can't hook up." Last item shown repaired as follows: "Piston gland leaking tightened."

August 17 (Continued) -

Cause shown for work not done: "Engine turned on pit - considered serviceable for helper service." Report signed by foreman.

August 18, 1:00 a.m., at St. Paul, reported by engineer: (1) Eng. lame - rods pounding. (2) Pack water pump valve. Shown: "Exam. O.K." (3) Bell ringer broken. Shown: "Repaired." (4) Clean out R F sand pipe. Shown: "Cleaned." (5) Steam leaks top of boiler and in turret box. (6) Exhaust steam pipe under tank leaking. (7) Pack top nut left water glass. Shown: "Exam. O.K." (8) Top R front of tank leaking water. (9) Cyl. cock steam pipe leaking near R.B. cyl cock near Tee. (10) Eng. throttle latch don't shut off. Shown: "Repaired."

Cause shown for work not done: "Items #1, #5, #6, #8, #9, examined, leakage not excessive considered serviceable for yard service, Eng turned on pit." Report signed by foreman.

August 18, 12:15 p.m., at St. Paul, reported by engineer: (1) Left front cylinder cock leaks. Shown: "Pipe repaired." (2) Left front cylinder head leaks. Shown: "Leak was from cyl. cock." (3) Water conditioner leaking around pipe joint. Shown: "Examined considered serviceable." Report signed by foreman.

#### SUMMARY OF EVIDENCE

The engineer stated that he had used locomotive 373 in helper service on five consecutive days and that it was pounding all the time. He made reports about its condition, but did not see that anything had been done to it. He had objected to taking the locomotive out, but was told that was the only locomotive available for them.

They had made a previous trip up the hill with the locomotive as front helper on the day of the accident. On this trip the locomotive made so much noise that they warned the head brakeman not to get on the deck or gangway as they did not know what might happen. For the trip on which the accident occurred, locomotive 373 was coupled to the train and another helper was coupled ahead and he and the fireman were the only persons on the locomotive when the accident occurred. When the stoker

stopped, he used the reversing valve on the stoker but that did not work and the fireman started to shovel the coal. He started to assist the fireman and just as he got on the deck, the deck parted or disintegrated under them and they fell to the track between the rails. The locomotive pulled away from the tank and the train stopped. If the train had not stopped promptly, both he and the fireman would have been run over. He stated he had heard that it was the drawbar casting that broke, that they had no knowledge of a weakness there, and that he had never seen an engine and tank pull apart like this one did. The fireman heard and approved the engineer's statement, adding nothing of importance.

A machinist inspector stated that on August 15, 1949, which was three days before the accident and at the time of the last monthly inspection, he found the frame broken where the drawbar connects to the casting; that he showed the break to the foreman as far as possible from the outside, and that he reported the defect on the work report. (The fracture was 14 inches forward of the center line of the front drawbar pin hole.)

The foreman to whom the broken frame was reported stated that he personally investigated the break and found it was cracked on the outside as far as could be seen and that it was impossible for him to determine exactly how far the break extended without removing the entire assembly.

The assistant roundhouse foreman, who signed the inspection report of August 15 and dispatched the locomotive, stated that when he examined the report he found the drawbar connection castings reported as broken, and that he personally entered the pit and examined the drawbar casting at the pin and found it good. He made further examination and saw a crack in the trailer stabilizing barrel which appeared to have been stopped by welding. (The stoker supports which were fabricated brackets 1 inch thick and 6 inches wide covered the old fracture which extended down through the casting on each side.) He was unable to determine the extent of the crack without dismantling the stoker and stoker rack housing. As the locomotive was due for classified repairs on September 1, 1949, and was being held in helper service only, he considered it serviceable.

#### DISCUSSION

Locomotive 373 was originally equipped with a Standard stoker. This was replaced with a Duplex stoker in 1921. When the Duplex stoker was applied new holes were drilled in the cast steel frame for the bolts which secured the fabricated supports for the stoker to each side of the frame at the front



end of the cradle frame. The three upper bolts in each bracket were 1-1/4 inches in diameter and the two bottom bolts were 1 inch in diameter. The bracket was welded to the frame at the front end. The original fracture was at the top of the frame at the front end.

On locomotives of this type, having cast steel tail frames and equipped with Duplex stokers, it is very difficult to inspect the portion of the frame which failed and caused this accident. The inspector who reported "Frame broke where drawbar connects" on August 15, evidently saw the fracture extending from the stabilizing cylinders up through the two bottom corners of the casting below the fabricated brackets, which were secured to the frame with five bolts in each bracket, and covered the fracture which extended up through each side of the casting. It was practically impossible to see the old fracture from the top of the casting.

If the coal, dirt, and debris had been cleaned from the top of the stabilizing cylinders, the bottom portion of the casting could have been seen and the extent of the fracture determined at that time. Had proper action been taken when the defective condition was first discovered, this accident could have been avoided.

#### CAUSE OF ACCIDENT

It is found that this accident was caused by separation of the locomotive and tender because of cracks in the frame tail piece which progressed until complete failure occurred.

Dated at Washington, D. C., this 10th day  
of November, 1949.

By the Commission, Commissioner Patterson.

SEAL

W. P. BARTEL,  
Secretary.