INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT NO. 3483

CENTRAL OF GEORGIA RAILWAY COMPANY

IN RE ACCIDENT

AT MCINTYRE, GA., ON

AUGUST 29, 1952

Report No. 3483

SUMMARY

Date:	August 29, 1952
Railroad:	Central of Georgia
Location:	McIntyre, Ga.
Kind of accident:	Boiler explosion
Train Number:	Gordon switch local
Locomotive number:	629
Consist:	Light, at time of accident
Speed:	Standing
Operation:	Local switching
Track:	On house track
Time:	1:20 p. m.
Casualties:	2 injured
Cause:	Overheated crown sheet resulting from low water

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3483

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

CENTRAL OF GEORGIA RAILWAY

November 10, 1952

Accident (boiler explosion) at McIntyre, Ga., on August 29, 1952, caused by overheated crown sheet due to low water.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On August 29, 1952, about 1:10 p.m., at McIntyre, Ga., the boiler of Central of Georgia Railway locomotive 629 exploded while the locomotive was standing on the house track. The engineer and fireman were seriously injured.

---

[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.

DESCRIPTION OF ACCIDENT

Central of Georgia Railway locomotive 629 was placed in service at Gordon, Ga., at 7:30 a.m., August 29, 1952, on the Gordon switch local which regularly performs switching service at four kaolin mines at and between Gordon and McIntyre, Ga., a station 8.9 miles east of Gordon. After switching at two mines the train proceeded, without any known unusual incident, one mile to McIntyre where the train, consisting of 3 loaded and 4 empty cars, was placed on a siding and the locomotive moved to the house track. Shortly afterward, at about 1:20 p.m., the boiler of the locomotive exploded while the locomotive was standing on the house track.

The firebox crown sheet and the top parts of flue sheet and door sheet had been overheated and the front end of the crown sheet with top knuckle of flue sheet attached was pocketed downward to a maximum depth of 7 inches. Four arch brick were blown down into the fire and the front bearing center support was sprung downward from its bearing on the back section, allowing the right and left sections of grates to slant. There were no tears in the firebox sheets or seams.

The engineer and fireman who were in their usual positions in the cab jumped from their respective windows; both were seriously injured. The engineer was taken to his home in Gordon and the fireman was taken to a hospital in Milledgeville, Ga., and three days later to the carrier's hospital at Savannah, Ga.

DESCRIPTION OF LOCOMOTIVE

Locomotive 629, 2-8-2 type, was built by the Lima Locomotive Works in August 1916; cylinders 27 x 30 inches; driving wheels 63 inches in diameter over new tires; weight 282,700 pounds; working steam pressure 200 pounds per square inch; tractive effort 59,000 pounds. It was equipped with Walschaert valve gear, Dickert power reverse gear, type A superheater, Standard HT type stoker, and a Franklin No. 8 butterfly type fire door. The rectangular feed water tank had a capacity of 8,500 gallons of water and tender had capacity for 18 tons of coal. The locomotive had made 24,709 miles in freight and switching service since receiving class 5 repairs.

The boiler, builder's number 5174, was a three-course straight top type, radial stayed, with sloping back head; inside diameter of first course 80-1/2 inches, and of third course 83-1/2 inches. All three courses were 3/4 inch in thickness.

The steam dome and the inspection manhole back of the dome were located on the third course. The boiler was equipped with 262 2-inch and 36 5-3/8 inch flues, 20 feet and 6 inches in length.

The firebox was originally of three-piece construction consisting of one-piece crown and side sheets, flue sheet, and door sheet, with all seams riveted. The flue sheet was 1/2 inch thick and all other sheets 3/8 inch thick. The right and left one-half side sheets, door sheet, and top knuckle of flue sheet had been renewed with seams welded. The firebox was 120-5/8 inches in length and 84 inches in width at the mud ring. It was equipped with four 3-inch arch tubes supporting a brick arch.

The crown sheet was supported by 20 longitudinal and 36 transverse rows of stays. The first 4 transverse rows of stays at front end extending to and including the 6th longitudinal row on each side of the center line were 1-1/8 inch straight driven head expansion stays; back of the first 4 transverse rows, the first 6 longitudinal rows of stays on each side of the center line were button head stays, 1-3/16 inches in diameter at the bottom, 1-1/8 inches at the top, with body section reduced to 1 inch. The 7th and 8th longitudinal rows of stays on each side of the center line were 1-1/8 inch driven head stays. The 9th to and including the 14th longitudinal rows on each side of the center line and the stays in the throat sheet were 1-inch flexible stays. All other stays in the firebox were 1-inch rigid stays with the exception of the 1-inch flexible stays located in the breakage zones. The stays in the firebox were spaced 4 x 4 inches. The crown sheet was 4 inches higher at the flue sheet than at the door sheet.

EXAMINATION OF BOILER AND APPURTENANCES

BOILER

Approximately 60 square feet of the crown sheet, 6 square feet at top of flue sheet, including the ends of 16 large and 33 small flues, and 3.7 square feet at top of door sheet had been overheated. The overheated area, as indicated by discoloration of the sheets, extended downward from the top of the sheets to between the 10th and 11th longitudinal rows of stays on each side of the center line of crown sheet at its front end and to between the 9th and 10th longitudinal rows of stays on each side of crown sheet at back end. The line of demarcation on the flue sheet indicated that the water had been 13-1/2 inches below the highest part of the crown sheet.

The pocketed area of the crown sheet extended from the 5th longitudinal row of stays on the right side of center to the 7th longitudinal row on left side at front end, a distance of 48 inches, and backward 26 inches to the 6th transverse row of stays. The sheets pulled from 49 crown stays and partially pulled from 2 crown stays and 6 large and 4 small flues. Approximately 315 crown stays were found loose in stay holes by hammer test. All stay holes from which the stays were pulled were stretched and some were elongated to a maximum of 1/4 inch. The ends of the stays from which the sheets pulled were a distinct blue in color and some were cupped downward to a maximum of 3/8 inch. The stay holes appeared to have been in good condition before the accident. The sheets did not rupture and the welded seams did not fail.

APPURTENANCES AS FOUND

Safety valves: The boiler was equipped with three 3-1/2 inch Ashton safety valves, one muffled and two open type, which were located on the manhole inspection cover back of the steam dome. These valves were tested on a compressed air safety valve testing device; the muffled valve lifted at 198 pounds, one of the open type valves lifted at 202 pounds and the other at 206 pounds per square inch.

Steam gages: The boiler was equipped with two Ashcroft steam gages, graduated to 400 pounds, located on the boiler back head. When tested under hydraulic pressure both gages registered correctly from 0 to 250 pounds. The two siphon pipes and their spud connections to the boiler were found in good condition, clean, and unobstructed. No siphon valves were used in the gage connection to the boiler.

Water level indicating devices: The boiler was equipped with a No. 5 Nathan twin-pattern reflex type water gage with a clear vision reading of 7-1/2 inches, located on the left side of the boiler back head and with three Edna gage cocks located on the right side of the boiler back head. The reading faces of the water glass were so directed that the engineer and fireman would have unobstructed view of the water level in the glasses from their usual positions in the cab. The top and bottom water-gage valves were found in full open position and the drain valve in closed position. A wiping rag was found wired to the water gage; this rag covered the area between the two adjacent edges of each water-glass cover plate and lapped over and under the body of water gage. The appearance of the rag and the body of the gage indicated a leak existed. The bottom water-gage valve entered the boiler back head and extended into the water space 2-3/8

inches at a point 19 inches to the left of the vertical center line; the opening was 9/32 inch in diameter. This valve entered the boiler back head 1-1/2 inches above the highest part of the crown sheet. The top water-gage valve entered the boiler 8 inches from the boiler back head and 9 inches to the left of the center line; the opening was 9/32 inch in diameter. The upper end of the water gage was connected to the top water-gage valve by a 5/8-inch O. D. copper pipe, 39 inches in length. The passages through these devices were found open and unobstructed. The boiler was leveled from frame position and it was found that the lowest reading of the water in the gage was 4-3/8 inches above the highest part of the crown sheet.

The water gage was tested by slowly filling it with water, and the water level in both glasses, from top to bottom, was clear and distinct. It was then tested on locomotive 610 of the same type and with both water-gage valves fully open, 175 pounds boiler pressure, and two gages of water in boiler, the right glass leaked badly along the edge of the left glass cover plate. Numerous tests were made by draining the water from the glass and when the drain valve was closed the water would immediately rise to the top of the glass.

The water gage was dismantled and the following conditions were found: The left glass and gasket were in good condition; the right glass was eroded badly around the rounded top; the bearing on the body gasket at the right top corner, with reference to the locomotive, was reduced to the extent that steam and water escaped from the body of the gage and was deflected by the glass cover plate to the edge of the plate adjacent to the left glass cover plate where it escaped to the atmosphere. Approximately 75 particles of the eroded glass were found between the body and cover plate at the top section of the glass.

The three Edna gage cocks entered the right side of the boiler back head at the lower edge of the knuckle, were spaced spirally on 3-inch vertical centers, and were found in closed position. The dripper and dripper pipe were in position, open, and unobstructed. The top gage cock extended into the water space 2-3/8 inches, the middle gage 1-7/8 inches, and bottom gage 2-3/8 inches. The openings through the gage cocks were 9/32 inch in diameter and were found clean and unobstructed. The bottom gage cock was located 4-1/8 inches above the highest part of the crown sheet and all three gage cocks could be easily opened and closed by hand.

Injectors and fittings: The boiler was equipped with two lifting type, Edna No. 11 injectors, having a rated capacity of

5200 gallons per hour, one of which was located on each side of the boiler in front of the cab with operating handles extending back into the cab. The steam ram of the right injector was found in closed position and the water valve in open position; the steam ram and water valve of the left injector were found in open position. The injectors were tested on locomotive 617, of the same class as locomotive 629, with the following results: All of these tests were made for a duration of 2 minutes with the injector water valves in full open position. At 90 pounds boiler pressure, the right injector raised the water in the glass from 1 inch to 2 inches; at 150 pounds pressure, the water was raised in the glass from 1 inch to 2-1/4 inches, and at 190 pounds pressure, the water in the glass was raised from 1 inch to 2-3/4 inches. The left injector at 90 pounds boiler pressure raised the water in the glass from 1 inch to 2 inches; at 150 pounds pressure, the water in the glass was raised from 1 inch to 2-1/4 inches, and at 190 pounds pressure it raised the water in the glass from 1 inch to 2-5/8 inches. During these tests both injectors primed easily, worked properly, did not spill water through the overflow, and delivered normal quantity of water to the boiler.

Boiler and line checks: The boiler was equipped with two 2-inch Nathan check and stop valves, located on opposite sides of boiler near the front of first boiler course and two 2-inch Hancock line checks, each of which was located near the back end of each injector delivery pipe. The valves and the valve seats of all four checks were found in good condition; the right boiler check valve had 1-inch lift, which was excessive, the left boiler check valve had 1/2-inch lift, and the two line checks each had 3/8-inch lift. All four check valves were clean and both boiler checks were unobstructed at the boiler entrance. The two boiler check stop valves were in good condition with the valves securely attached to the valve spindles.

Steam turret valves: The steam turret was located on top of the boiler in the cab; the steam turret valve and the right and left injector valves in the turret were found in fully open position with the valves securely attached to the valve spindles.

Blow-off cocks: The boiler was equipped with four 2-inch Okadee blow-off cocks, one located in each side of wrapper sheet near front mud ring corners, one near the bottom center of throat sheet, and one in the bottom of first boiler course; the blow-off cocks located in the mud ring corners discharged through a muffler located between the frames beneath the deck casting and were operated from the cab; the one in throat sheet discharged to the atmosphere and was operated from the left running board, and the

one located in the first boiler course discharged to the atmosphere and was operated from the ground.

Feedwater tank, tank valves, hose, and strainers: Forty-seven inches of water remained in the tank after the accident. The interior of the tank and the right and left tank wells were clean; the swash plates were in good condition and in position; the tank valves in both tank wells were in good condition and were found in fully open position and securely attached to their operating rods; both tank hose, strainer boxes, and tank hose strainers were found in good condition. A small amount of scale was found in the bottom of right and left strainer boxes at back side of strainer but not enough to restrict the free flow of water. Both injector water supply pipes were in good condition.

Fire door: The Franklin No. 8 butterfly type fire door was found in good condition and operated properly when tested with air pressure from the shop air line.

INSPECTION AND REPAIR REPORTS

Locomotive 629 received class 3 repairs, including the removal of jacket and lagging and the caps from the flexible staybolts, on April 3, 1950. The last annual inspection was made April 12, 1951, and the last monthly inspection was made August 4, 1952, at Macon, Ga., at which time the boiler was last washed.

Daily inspection and repair reports from Gordon and Savannah, Ga., covering the period from July 14, 1952, to the date of the accident were examined. The following items which might have had a bearing on the accident were reported:

July 14, at Savannah, Ga., reported by engineer:
"Clean out strainers to both injectors both are hard to prime."
"Grind both boiler checks."
"Condition of injectors bad."
Items were signed for, indicating the defects were repaired, and the report was approved by foreman.

August 29, at Gordon, Ga., reported by engineer:
(This report was made at 10:30 p.m., subsequent to the accident at 1:20 p.m.)
"Water glass leaking."
"Left injector very hard to prime."

SUMMARY OF EVIDENCE

The engineer stated that the fireman was carrying the water; the locomotive performed satisfactorily and the boiler did not foam. Shortly before the accident he glanced at the water glass and noted 1-1/2 inches to 2 inches of water in the glass. He tried the gage cocks several times during the day; they opened and closed freely, and the water level in the gage cocks checked with the water level in the water glass. The left injector was hard to prime, but after starting worked normally except it did not pick up all of the water. The right injector worked better than the left injector. The water glass was leaking badly and he wired a rag on the glass to prevent the water and steam from striking the fireman. On August 28th, he was advised that the locomotive would be moved in tow under steam with a messenger to Macon, Ga., 22.6 miles west of Gordon; he made out a work report and placed it on the throttle lever and on the 29th when he found the locomotive was still at Gordon he tore up the work report and put the pieces in the right seat box. After the accident he made another report and sent it to Macon.

The fireman stated that he was carrying the water and immediately before the accident occurred there was 1-1/2 to 2 inches of water in the glass; the steam pressure in boiler was between 192 and 195 pounds and that the left injector had been working for 10 minutes at that time. The water glass leaked badly at top when full of water. The left injector was not as hard as usual to prime and wasted very little water through the overflow.

DISCUSSION

The leak at the top of the right glass of the water gage caused a reduction in pressure on the surface of the water in the water gage which resulted in maintenance of a water level indication materially above that existing in the boiler. Tests made by our inspector subsequent to the accident showed that a safe water level would be indicated by the gage glass when the level of water in the boiler had receded to a danger point. It thus appears that the boiler was being operated with a falsely indicated and apparently safe water level while the quantity of water in the boiler decreased until the crown sheet became exposed and overheated with disastrous consequences. Had the boiler been equipped with a second water glass the difference in water level shown by the two gage glasses would have indicated necessity for immediate action to remedy a defective and potentially dangerous situation and this accident could have

been avoided. The installation of a second gage glass to improve safety of locomotive operation has been emphasized and recommended in numerous annual reports of the Bureau of Locomotive Inspection, accident reports, and on various other occasions.

CAUSE OF ACCIDENT

It is found that this accident was caused by an overheated crown sheet due to low water. The water glass, which was defective and did not correctly indicate the water level in the boiler, was a contributory cause of the accident.

Dated at Washington, D. C., this 10th day of November, 1952.

By the Commission, Commissioner Patterson.

SEAL

GEORGE W. LAIRD,

Acting Secretary.