INTERSTATE COMMERCE COMMISSION

REPORT NO. 3392

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

FLORIDA EAST COAST RAILWAY

May 9, 1951

Accident (boiler explosion) at Lake Worth, Fla., on April 4, 1951, caused by overheating of the crown sheet due to low water.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On April 4, 1951, about 9:40 a.m., at Lake Worth, Fla., the boiler of Florida East Coast Railway locomotive 815 exploded while the locomotive was hauling a freight train at an estimated speed of 45 miles per hour. The engineer, fireman and three nonemployees were seriously injured.

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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.

DESCRIPTION OF ACCIDENT

Florida East Coast Railway locomotive 815, hauling southbound freight train Extra 815 South departed from Fort Pierce, Fla., at 7:25 a.m., April 4, 1951, en route to Miami, Fla., and proceeded without any known unusual incident to a point 4664 feet north of the station at Lake Worth, Fla., approximately 63 miles from Fort Pierce, where, at about 9:40 a.m., the boiler of the locomotive exploded while the train was moving at an estimated speed of 45 miles per hour. Cars were picked up and set out at several points en route and the tender water tank was filled at West Palm Beach, Fla., 6 miles from the point of the accident.

The train, which departed from West Palm Beach, at 9:15 a.m., consisted of 13 loaded and 24 empty cars, 1550 tons, which was about one-third of the maximum tonnage handled in this district. At the time of the accident, the engineer and fireman were seated in their usual positions in the cab and the brakeman and conductor were in the brakeman's cab on top of the tender water tank. The northbound and southbound tracks were parallel, with centers of the tracks 13 feet 6 inches apart. The tracks were tangent and approximately level for a distance of 8 miles approaching the point of the accident and for 7 miles beyond.

The force of the explosion raised the rear of the locomotive and front of the tender from the track, allowing both trailing truck centering device rockers to fall out of position and to the ground, and moved the front of tender 6 inches off the truck center. The front smoke box door with headlight attached was blown from the locomotive; the door was found 220 feet south and 285 feet east, and the headlight 220 feet south and 225 feet east of the point of the explosion. One half of the fire door with door latch attached was found at the side of the track at the point of explosion. The carbon box of the fire pan was found in the center of the track about 40 feet south of the point of explosion. Both rails of the rear frame extension of the locomotive and the drawbar and safety bar were bent. The lower portion of the draw casting on the locomotive, the lower portion of the buffer casting on the front of the tender frame, and the truck bolster hanger at left side of front tender truck were broken. All of the brick work was blown from the firebox and bricks struck and damaged a total of 19 buildings at the sides of the track. An automobile standing on the east side of the track was overturned; it and three other automobiles were considerably damaged. Both rails of the track beneath the locomotive were kinked downward and 2690 feet of the track was damaged by the explosion and the derailment which

followed. The train came to a stop 2694 feet beyond the point of the explosion with the second, third, and fourth pairs of driving wheels derailed. The tires on these wheels were badly damaged by sliding on the track rails in the derailment.

The engineer and fireman were seriously injured. The engineer was given first aid treatment at Lake Worth and later sent to his home, and the fireman was taken to a hospital in West Palm Beach. A man and woman in one of the damaged buildings and a woman near the track suffered shock that required medical attention.

DESCRIPTION OF LOCOMOTIVE

Locomotive 815 was an oil burning, 4-8-2 type, built by the American Locomotive Company in June 1926; cylinders 28 by 30 inches; diameter of driving wheels over new tires 69 inches; weight in working order 356,000 pounds; weight on driving wheels 244,500 pounds; tractive effort 60,800 pounds; working steam pressure 210 pounds per square inch; it was equipped with Baker valve gear; type "A" superheater; front end throttle; Alco power reversing gear; and a Clarke fuel oil burner. The locomotive had made 6,511 miles since last classified repairs. The rectangular tender had a capacity of 12,000 gallons of water and 5,000 gallons of fuel oil; weight in working order 255,900 pounds. A brakeman's cabin was located on top of the tank back of the fuel space.

The boiler, builder's number 66,825, was a three-course conical type, radial stayed, with a sloping back head; inside diameter of the first course 84½ inches and the third course 94½ inches. The thickness of the first course sheet was 13/16 inch, the second and third courses 7/8 inch. The wrapper sheet was 1/2 inch, back head 9/16 inch, and throat sheet 3/4 inch thick. The boiler was equipped with 226 2¼-inch and 54 5½-inch superheater flues, 22 feet in length.

The firebox, which was 121 inches long and 90½ inches wide, was equipped with a combustion chamber, 51 inches in length, and two thermic syphons which extended from between the 15th and 16th transverse rows of crown stays back to between the 36th and 37th transverse rows. The firebox originally was of four-piece construction, consisting of crown and right and left side sheets in one piece, flue sheet, door sheet, and inside throat sheet. The flue sheet and inside throat sheet were 1/2 inch thick and the other sheets 3/8 inch thick. The crown sheet was 6½ inches

higher at the flue sheet than at the door sheet. All seams were riveted with the exception of the syphon seams which were butt welded. In August 1947, the right and left side sheets and the necks of both syphons had been renewed. A small patch had been applied to each of the four mud ring corners and a patch, 40 inches in length, to the top knuckle of the flue sheet. All patch seams were butt welded with exception of the knuckle patch crown sheet seam which was riveted.

The crown sheet was supported by 20 longitudinal and 38 transverse rows of stays. The first four transverse rows of crown stays extending to and including the 5th longitudinal row each side of center line were hollow expansion stays, 1¼ inches diameter at the bottom and 1-1/8 inches at top end with reduced body section one inch in diameter. The 5th to 38th transverse rows of crown stays, inclusive, in the first five longitudinal rows on each side of center, with exception of the stays in the syphon flanges, were tapered, driven head stays, 1¼ inches in diameter at bottom and 1-1/8 inches at top end; the stays through the syphon flanges had driven heads, 1¼ inches in diameter at both ends and 1-1/16 inch body section. The 6th to and including the 10th longitudinal rows on both sides of center line from the 1st to the 38th transverse rows, inclusive, were straight stays 1-1/8 inches in diameter at both ends and 15/16-inch body section. The remaining stays on both sides of center and in the combustion chamber, door sheet, and throat sheet were straight 1-inch hollow, flexible type. The crown stays were spaced 4.25 by 4.11 inches, the combustion chamber stays 4.5 by 4 inches, and all other staybolts 4.12 by 4.28 inches.

EXAMINATION OF BOILER AND APPURTENANCES

BOILER

The initial failure appeared to have occurred at the front of the combustion chamber crown sheet where the sheet had been overheated. Apparently the crown sheet bagged causing the top knuckle of the flue sheet to fold down until rupture occurred. Starting at the center line, on the right side the flue sheet tore through the welding of the knuckle patch one inch above the top row of superheater flue holes for a distance of 14 inches, then diagonally between the 3rd and 4th longitudinal rows to a point 2 inches from the center of the rivet holes of flue sheet seam, into the crown sheet, and straight across the sheet to the 7th longitudinal row at the 1st transverse row and diagonally downward to the 16th longitudinal row between the 3rd and 4th transverse rows. From between the 14th and 15th

longitudinal rows at the 16th transverse row, the sheet tore through the 16th transverse to the 4th longitudinal row and diagonally backward through the flange of the right syphon to the 19th transverse row at the 2nd longitudinal row on right side of center line and across to the 2nd longitudinal row on left side of center line, then diagonally forward on an irregular line through the flange of the left syphon to the 16th transverse row and 4th longitudinal row and downward through the 16th transverse row to the 10th longitudinal row, and from between the 15th and 16th transverse rows to between the 14th and 15th longidutinal rows. From the 17th longitudinal row between the 2nd and 3rd transverse rows, the sheet tore diagonally upward to the 11th longidutinal row to a point 2 inches from the center of the rivet holes in the flue sheet seam and straight across to the 4th longitudinal row of stays and downward to the knuckle of the flue sheet, into the weld of the knuckle patch, and through this weld for a distance of 14 inches to the center line. The upper portion of the combustion chamber and 16 inches of the front upper portion of the firebox from the 15th longitudinal row of stays on each side of the center line folded down into the lower portion of the combustion chamber, onto the necks of the right and left syphons, the inside throat sheet, and the front part of the fire pan.

The firebox crown sheet between the two syphons with parts of the flange and inside body wall of each syphon pulled from the stays and pocketed downward 34 inches between the 19th and 20th transverse rows of stays; the pocket sloped upward to the crown sheet level between the 29th and 30th transverse rows of stays. The inside wall of the right syphon pulled from the 1st to 8th staybolts, inclusive, in the top row of the syphon wall, from the 1st to the 6th staybolts, inclusive, in the second row, and from the 1st, 2nd and 3rd staybolts in the 3rd row. The inside wall of the left syphon pulled from the 1st to 11th staybolts, inclusive, in the top row, from the 1st to 9th staybolts, inclusive, in the 2nd row, and from the 5th, 6th and 7th staybolts in the 3rd row.

The crown sheet also tore between the 4th and 5th longitudinal rows at the 15th and 16th transverse rows, forward to the 10th transverse row of stays at right and left sides of the center line. The welding at the top of right and left inside throat sheet ears failed for a distance of 16 inches on each ear. The lower portion of the right and left firebox sheets and mud ring were sprung outward to a maximum, at the longitudinal center of the mud ring, of 3½ inches on right side and 2-5/8 inches on the left.

The sheets pulled from 408 crown stays, 190 staybolts, and 10 2¼-inch flues, and partly pulled from 9 5½-inch flues, 18 crown stays, and 12 staybolts. One broken crown stay pulled away with the sheet; 60 inches of welding in firebox failed.

Nine 5½-inch flues in the top row were sprung upward approximately one inch near the back end of flues. A superheater unit in the center superheater flue in the bottom row was blown forward 26 inches from its original position. The petticoat pipe was blown forward at an angle of 45 degrees from vertical; the fire pan was blown from its fastenings to the mud ring and folded down over the right and left back frame extensions and right and left sides of the trailing truck frame.

Approximately 24.5 square feet of the crown sheet and 2.5 square feet of the flue sheet had been overheated. The overheated area as indicated by discoloration of the sheets extended downward from the top of the flue sheet to the center of the top row of superheater flues and across the combustion chamber to the 8th longitudinal row of stays at the first transverse row of stays from the flue sheet on right side of center line, diagonally backward to between the 13th and 14th transverse rows at the 6th longitudinal row at right side of center line, across to the 6th longitudinal row at left side of center line, and diagonally forward and upward to the 8th longidutinal row at the 1st transverse row from the flue sheet. The line of demarcation on the flue sheet indicated that the water had been 8 inches below the highest part of the crown sheet. The ends of a large number of crown stays in the overheated area were a distinct blue in color and some were cupped downward approximately 3/8 inch. All stay holes in the sheets from which the stays pulled were stretched and a number of them were elongated to a maximum of one-half inch. At the point of rupture part of the crown sheet was reduced to 3/16 inch in thickness. The firebox sheets as far as could be seen were free of scale. The sheets, the threads in the stay holes in the sheets, and those remaining on the stays appeared to have been in good condition prior to the accident.

APPURTENANCES AS FOUND

The top and bottom water glass valves and the feed water pump throttle were opened and closed by the carrier's air brake superintendent, in the presence of the road foreman of engines and general foreman of shops, Miami, Fla., 4 hours 35 minutes after the accident occurred. The air brake superintendent stated that after operating the valves he placed them in the

same position as they were found at the time of his arrival at the point of accident. The following descriptions apply to the appurtenances when later examined by the Commission's representatives.

Safety valves: The boiler was equipped with three 4-inch Ashton safety valves set to open at 210 pounds, 213 pounds, and 216 pounds, respectively. When tested on locomotive 801, which was the same class as locomotive 815, the first valve opened at 210 pounds and seated at 208 pounds; the second valve opened at 213 pounds and seated at 210 pounds; the third valve opened at 215 pounds and seated at 212 pounds. The fire was forced and the steam pressure in the boiler could not be raised above the setting of the second valve.

Steam gage: The boiler was equipped with one Ashton steam gage, graduated to 400 pounds; when tested on a dead weight tester, it registered correctly from 0 to 270 pounds. The siphon valve was found in open position and the openings into the boiler and siphon pipe were clean and unobstructed.

Water lever indicating devices: The boiler was equipped with a water column on which a water glass and three gage cocks were mounted. The column was a Nathan type WOA; inside diameter 3 inches and length 21 inches. The top connection entered the wrapper sheet 14 inches from the boiler back head and 7 inches to right of center line. The lower connection entered the boiler back head at a point 15 inches to right of center line and 6 inches below the highest part of the crown sheet. The steam pipe to the column was a 1½-inch O.D. copper pipe, 50 inches in length. The top nipple had an opening of 1¼ inches into the boiler; the lower nipple extended into the boiler 2-3/4 inches with an opening of 3/4 inch. The interior of the column, the steam pipe, and openings into the boiler were clean.

The Nathan type water glass was mounted on the back of the water column; the bottom water-glass valve entered the water column 1½ inches above the highest part of the crown sheet. The glass had a clear reading of 8 inches with indications visible from deck and right and left sides of cab. The top water glass valve was found in closed position, the bottom valve fully open, and the drain valve closed. Statement on file made by officials mentioned in the 4th preceding paragraph pertaining to these valves is:

"The water glass drain valve was closed. Bottom connection fully open and the top connection two complete

turns open and required one and one-half turn to open fully."

The upper end of the water glass was connected to the top water-glass valve at the water column by a 5/8-inch O.D. copper pipe 18 inches in length. This pipe was cracked above the collar at the connection to the top water-glass valve. The crack extended through the pipe and spirally above the collar for a distance approximately 35 percent of the circumference of the pipe. The water-glass valves were closed and a hydrostatic pressure of 160 pounds was applied through the water-glass drain pipe before the connections to this pipe were disturbed. The pipe leaked badly through the crack and the water squirted with force to the top of the cab. This pipe was then removed and tested on locomotive 817 under 175 pounds steam pressure. The pipe leaked badly through the crack and spurted steam and water to the top of the cab. The water was lowered in the boiler to a point immediately below the bottom gage cock and four or five tests were made by draining the water from the glass by opening the water-glass drain valve; when the drain valve was closed and both water glass valves in open normal position the water would immediately rise to the top of the water glass. The water glass valves had openings into the column of 5/16 inch. The water glass drain valve and pipe were in good condition; the passages through both water glass valves, water glass, and drain valve were clean and unobstructed.

The three Lee type gage cocks entered the right side of the water column; were spaced spirally on 3-inch vertical centers and were in good condition with passages clean and unobstructed. The gage-cock dripper and its drain pipe were in position and unobstructed.

The locomotive was leveled and the lowest reading of the water glass and bottom gage cock was found to be 5½ inches above the highest part of the crown sheet.

Feedwater heater and pump: The locomotive was equipped with a Worthington 4-B-L feedwater heater type pump with a rated capacity of 7200 gallons per hour. All of the related piping to this pump was found in good condition and unobstructed. The operating valve was located in front of the cab on the left side with an extension handle leading back into the cab and was operated from the left side of the cab; this valve was found closed. The statement of officials previously referred to shows operating valve was open one complete turn when examined immediately after the accident.

The feedwater pump was tested on locomotive 801 with the following results: With 100 pounds boiler steam pressure and the operating valve three-fourths turn open, it raised the water level in the water glass from 1/2 inch to 1-3/8 inches in a test of one minute. At 150 pounds pressure, it raised the water level in the glass from 1/2 inch to 1-3/4 inches in a one-minute test; at 200 pounds pressure it raised the water level in the glass from 1/2 inch to 1-7/8 inches in a one-minute test while the operating valve was 3/4 turn open; with the operating valve fully open at 200 pounds boiler steam pressure it raised the water level in the glass from 1/2 inch to 2 inches in a one-minute test.

Injector: The locomotive was equipped with a Nathan 1918 Special B non-lifting type injector, a rated capacity of 6500 gallons per hour at 200 pounds steam pressure, located under the right side of the cab with the starting valve located in front of the cab. The related piping to this injector was found in good condition and unobstructed. The injector was tested on locomotive 801 with the following results: With 100 pounds boiler steam pressure and the water valve fully open, the injector took up all the water and raised the water level in the water glass from 1/2 inch to 1-1/8 inches in one minute; at 150 pounds boiler steam pressure with water valve fully open, the injector took up all the water and raised the water level in the glass from 1/2 inch to 1-3/4 inches in one minute; and at 200 pounds boiler steam pressure with water valve fully open the injector took up all the water and raised the water level in the glass from 1/2 inch to 1-1/4 inches in one minute. The annunciator on the injector was found in good condition and unobstructed. The tubes, which were stamped 6500 gallons, were removed from the injector after these tests were made and were found in good condition. The feedwater pump and the injector worked properly and delivered normal quantities of water to the boiler.

Boiler check: The locomotive was equipped with duplex Nathan, 300-pound, 2½-inch, feedwater pump type check and stop valve located on top of the boiler near the front flue sheet. The right check valve had 5/16-inch lift and the left check valve, which was spring loaded, had ¼-inch lift; the valves and valve seats were in good condition. Both stop cocks were fully open with the valves securely attached to the valve spindles. The body of this valve was free of mud and scale and its opening into the boiler unobstructed.

Steam turret valves: The main steam turret was located on top of the boiler in front of the cab; the main steam valve, injector, and feedwater pump throttles in the turret were found fully open with the valves securely attached to the spindles.

Blow-off cocks: The boiler was equipped with two Okadee blow-off cocks. One, a 2-inch cock, was located in the bottom of the first boiler course 15 inches from the front flue sheet and discharged to right side of the locomotive. It was found in closed position. The other blow-off cock, a 3/4-inch Okadee continuous blow down located in the boiler back head near the right corner of mud ring, discharged through a 5/32-inch orifice to the atmosphere below the locomotive deck. It was found in open position and the orifice was unobstructed. Both blow-off cocks were operated by extension rods leading into the right side of cab.

Tank, tank valves, and tank hose: Only 5 inches of water had been used from the tank since it was last filled before the accident. The interior of the tank was clean and the swash plates were in good condition. The tank valves in both water legs were found in good condition and attached to their operating rods which extended to the top of the tank. The right tank valve was found closed and the left tank valve in full open position. No strainers were used in the tank wells or tank hose. A wall extended from the outer wall of the left water leg of the tank to the outer wall of the right water leg, approximately 6 feet from front of the tank. A 14½ by 47 inch section of netting on a frame was keyed to an opening in the bottom of this wall to prevent foreign matter from entering the feedwater lines; right and left tank hose were found in good condition and free of leakage.

INSPECTION AND REPAIR REPORTS

The locomotive received annual inspection October 10, 1948, at which time class 3 repairs were made. The last annual inspection was made October 26, 1950. The last monthly inspection was made March 23, 1951, at which time the boiler was last washed.

Daily inspection and repair reports from Bowden, New Smyrna Beach, Fort Pierce, and Miami, Fla., covering the period from March 1, 1951 to the date of accident were examined. The following items which might have a bearing on the accident were reported:

March 21, at Miami, Fla., engineer reported: "Engine raises water very bad." The T.D.S. reading indicated 105 grains; the boiler was blown out by hostler and report approved by foreman.

March 31, at Fort Pierce, Fla., engineer reported: "Water feed pump pounds." Item signed for by machinist and report approved by foreman.

March 31, at Miami, Fla., engineer reported: "Engine foams." The T.D.S. reading indicated 135 grains. One-half glass of water was blown out; report approved by foreman.

April 4, at West Palm Beach, Fla., engineer reported: "Top water glass connection in very bad condition." This report was made while the feed water tank was being filled shortly before the accident occurred and the report was found in the cab of the locomotive after the accident.

BOILER FEEDWATER CONDITION

Boiler water tests are made only on arrival of locomotives at main terminals; the company's rules are not to dispatch a locomotive with dissolved solids above 150 grains and to reduce the dissolved solids the boiler is blown out immediately before the locomotive is dispatched. When this locomotive arrived at New Smyrna Beach on April 3rd, the water in the boiler was tested and found to have 130 grains of dissolved solids. One-half glass of water was blown from the boiler before the locomotive was dispatched at 11:20 p.m. on April 3rd. The engineer in charge of movement of the locomotive from New Smyrna Beach to Fort Pierce, 117 miles, with the caboose only stated that he had no trouble with the boiler foaming. No test was made of the boiler water at Fort Pierce, the point from which the locomotive was last dispatched before the accident.

SUMMARY OF EVIDENCE

The engineer stated that locomotive 815 performed satisfactorily and the boiler did not foam during the trip; that

the fireman was carrying the water with the feed water pump and the injector was not used during the trip; he noticed a leak in the steam pipe to the water glass at its connection to the water glass valve and tried to stop the leak by tightening the nut on the pipe with a wrench but was unable to do so; he did not consider the leak bad enough to have any effect on the indication of the water level; shortly before the accident he noticed the water level in the water glass indicated a little more than one-half full; that while water was being taken at West Palm Beach, approximately 35 minutes before the accident occurred, he made out his daily work report; the only item on this report was: "Top water glass connection in very bad condition."

The fireman stated that when he arrived at the locomotive in Fort Pierce at 6:55 a.m. on date of accident, he blew out the water glass and noted the top water glass connection was leaking and after departure from Fort Pierce this leak increased, the water and steam spurting to the top of the cab; that he experienced no trouble in maintaining the proper water level with the feed water pump, and that shortly before the accident he noted the water glass was more than half full.

The brakeman stated that he was in the cab of the locomotive from the time the train left West Palm Beach; that he did not observe the water level in the glass or any leakage about the water glass; the engineer and fireman were in normal condition and did not appear to be worried about the locomotive, and that he left the cab of the locomotive and entered the cabin on top of tank about 6 minutes before the accident.

The conductor stated that he was in the cab of the locomotive from the time the train left West Palm Beach until he went back to the brakeman's cabin several minutes before the accident; the engineer and fireman were in normal condition and did not appear to be worried about anything unusual in the operation of the locomotive; that shortly before he left the cab he observed the water glass was three-fourths full of water, and he did not note any leakage about the water glass.

A machinist stated that he made an inspection of locomotive 815 after its arrival at Fort Pierce at 2:25 a.m. on April 4th. The feedwater pump was tested and it worked properly; the water glass and three gage cocks were tested; the water glass was blown out several times and the water circulated freely in the glass; that the indication of the gage cocks corresponded with the water level in the water glass; that no leakage was noted about

the water glass and its connections, and that he did not test the injector.

DISCUSSION

The crack in the copper pipe which extended from the top of the gage glass to the valve at the water column and was located at the valve union caused a differential in pressure which resulted in maintenance of a water level indication materially higher than that existing in the boiler. Tests made by our inspectors subsequent to the accident, described on page 8, showed that a safe water level would be indicated by the gage glass when the level of the water in the boiler had receded below the danger point. The leak at the top gage glass valve could also affect the column-mounted gage cock indication of water level. 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 overheated with disastrous consequences. Had the boiler been equipped with a second water glass the difference in readings of 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 might have been avoided.

Such installations have been recommended in numerous annual reports of the Bureau of Locomotive Inspection dating back to 1920 and on various other occasions and again emphasized in that part of the 26th Annual Report of the Bureau of Locomotive Inspection for the fiscal year ended June 30, 1937, which reads as follows:

> "All road steam locomotives should be equipped with a suitable water column to which shall be attached three gage cocks and one water glass with not less than 6 inches, preferably 8 inches, clear reading, and one additional water glass with not less than 6 inches, preferably 8 inches, clear reading, located on the left side or back head of the boiler. The water glasses to be so located, constructed, and maintained that they will register the approximate general water level in the boiler under all conditions of service and show a corresponding level within 1 inch and be so located, constructed, and maintained that the engineer and fireman may under all conditions of service have an easy and clear view of the water in the glass from their respective and proper positions in the cab. The gage cocks to be so located

that they will be in easy reach of the engineer from his proper position in the cab while running the locomotive, extension handles to be applied if necessary to accomplish this."

"***It is very important that at least two devices, attached separately to the boiler, be employed for the purpose of providing visual indications of the water level at all times so as to form a double check and so as to have one appliance in case of failure of the other while on the road and away from points where repairs can be made."

A signed statement dated April 6, 1951, covering joint inspection made by the superintendent of air brakes, road foreman of engines and general foreman at 2:15 p.m., April 4, 1951, or 4 hours 35 minutes after the accident, shows that automatic brake valve was not in the position in which it had been observed about 30 minutes prior to the inspection; that position of various valves was determined by movement and that these valves were left exactly as they were found. The positions of the top water-glass valve, feedwater-pump valve and left tank valve as described in the statement did not correspond to the positions of these valves as found by our inspectors during their examination of the locomotive. The admitted movement of various boiler appurtenance controls by railroad employees during their examination of the damaged locomotive and evident subsequent meddling by unknown persons discloses that action to prevent disturbance of all parts and appurtenances and to preserve them in the condition found after the accident, which is general railroad practice, and is required by Section 8 of the Boiler Inspection Act, was not effected by the carrier.

CAUSE OF ACCIDENT

It is found that this accident was caused by overheating of the crown sheet due to low water. The defective condition of the top gage glass connection, which caused a false indication of the water level in the boiler, was a contributory cause of the accident.

Dated at Washington, D. C., this 9th day of May, 1951.

By the Commission, Commissioner Patterson.

W. P. BARTEL,

SEAL

Secretary.