

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3410

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

PENNSYLVANIA-READING SEASHORE LINES

August 27, 1951

Accident near Delair, N. J., on July 20, 1951, caused by the
failure of a main rod.

REPORT OF THE COMMISSION¹

PATTERSON, Commissioner:

On July 20, 1951, about 8:29 p.m., near Delair, N. J., a main rod on Reading Company locomotive 120 broke while the locomotive was hauling a Pennsylvania-Reading Seashore Lines passenger train at a recorded speed of 50 miles per hour. The fireman was killed and the engineer was fatally injured and died the following day.

¹Under 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

Reading Company locomotive 130, hauling northbound Pennsylvania-Reading Seashore Lines passenger train No. 1034, departed from Atlantic City, N. J., July 20, 1951, at 7:30 p.m. en route to Philadelphia, Pa., and proceeded without any known unusual incident to a point near Delair, N. J., 58 miles from Atlantic City, where, about 8:29 p.m., the left main rod broke while the train was moving at a recorded speed of 50 miles per hour. The end of the box section at crosshead wrist pin was broken out and the front end of the rod dropped to the track; was then thrown upward and back and struck the boiler, tearing large holes in the outside and inside throat sheets.

The train consisted of 8 cars, a passenger-baggage car, 6 coaches, and a parlor car. The accident occurred near Delair, N. J., a point on the Pennsylvania Railroad 6 miles from point of junction with the tracks of the Pennsylvania-Reading Seashore Lines. The track approaching the point of accident was tangent and slightly ascending for a distance of 2000 feet.

Marks on the road bed at point of failure showed that front end of the main rod dropped, struck and broke two ties; apparently flew up and came down again in approximately 20 feet where the ends of five ties were sheared off and the road bed was torn up. There was no derailment and no track damage or marks on the right of way other than at the point of the accident. The principal damage to the locomotive consisted of the broken main rod; badly torn throat sheets; damage to a number of flexible staybolt sleeves and caps at approximately the horizontal center line, and damage to the running board, main reservoir, and air radiating pipes. The engineer remained on the locomotive and brought the train to a stop with the front end of the locomotive on the south end of the Delaware River bridge, 2379 feet from the point of the accident.

The fireman's body was found lying against the outside of the right track rail at a point about 750 feet beyond the point of the accident. The engineer, declining assistance from members of the train crew, got off the locomotive and walked to the first car where first aid treatment was given. About 30 minutes later he was taken in an ambulance to a hospital in Camden, N. J., where he died at 8:50 p.m. the following day.

DESCRIPTION OF LOCOMOTIVE

Locomotive 130 was a 4-6-2 type, Reading Company's classification G1-Sa, built by the Baldwin Locomotive Works, Eddystone, Pa., in June 1924; cylinders 25 x 28 inches; 12-inch piston valves; driving wheels 80 inches in diameter with full tires; weight in working order 273,600 pounds; tractive effort 40,900 pounds. It was equipped with Walschaert valve gear, power operated reverse gear, and a standard stoker. The conical radial-stayed type boiler, having a wide firebox and combustion chamber, was equipped with a Schmidt type superheater and six 3½-inch diameter arch tubes supporting a brick arch. The boiler carried a working steam pressure of 220 pounds per square inch. The back head had two fire-door holes, each equipped with a Franklin vertical type fire door. The locomotive was also equipped with two Sellers 6500-gallon capacity non-lifting injectors, two 11-inch Westinghouse air compressors, No. 6-ET brake equipment, and a Chicago Pneumatic Company speed recorder, graduated from 10 to 120 miles per hour. The tender was rectangular type, capacity 9,000 gallons of water and 15 tons of coal.

DESCRIPTION OF PARTS INVOLVED

The front end of the broken main rod was found lodged in the throat sheet after the locomotive stopped, apparently held in this position from the point of the accident by a lubricating oil pipe on which it rested. The separated portion of the rod, weighing about 10 pounds, front end key, key block, and front end brasses were found near the point of the failure.

There were no identification marks on the failed rod and its source could not be determined. The rod was of "I" section, medium nickel carbon steel, polished all over. It was fitted with a two-piece front end brass to receive a 5-inch crosshead wrist pin and a two-piece brass at the back end to receive a 7-inch main crank pin. The distance between pin centers of the rod was 125 inches. The outside face of front end of the rod had been built up with babbitt metal to compensate for lateral wear; this built-up portion of babbitt metal was approximately 1/8 inch thick. The bore of the front end brasses was 1/32 inch larger than the wrist pin. The bore of the back end brasses was 3/64 inch larger than the main pin.

The failure of the rod occurred at the front end of the bottom section of front brass fit, 2-3/8 inches ahead of the center line of wrist pin, through a progressive fracture which started at a gall mark under the rabbitt-metal liner on the outside face of the rod and progressed inward. Approximately 50 percent of the progressive fracture appeared to be long standing, 48 percent of more recent origin and the remaining 2 percent of cross-sectional area was a new break. The top section of the rod also broke at the front end of the brass fit, 2-3/8 inches ahead of the center line of the wrist pin, and was a 100 percent new shock break. The top and bottom sections of the rod at points of the breaks were 1-5/8 inches thick and 3-7/8 inches wide. The main rod was bent 12 inches out of alignment. Sketch of failed rod appears on page 8.

Irregular holes were torn in the outside and inside throat sheets by the end of the broken rod. The opening in outside sheet, approximately 31 inches long, consisted of three connecting holes, located between the 2nd and 4th vertical rows of staybolts from the left side and points 4 inches to 35 inches above the mud ring. The bottom hole was approximately 4 inches wide and 8 inches long, the middle hole approximately 5 inches wide and 8 inches long, and the top hole approximately 5 inches wide and 10 inches long, with sheet torn between the holes. Two holes were punched in the inside throat sheet directly in line with the holes in outside sheet. The bottom hole, 4 inches above the mud ring, extended vertically approximately 3-1/2 inches and was 5-1/2 inches wide. The second hole, 4 inches above the bottom hole, extended vertically approximately 12 inches and had a maximum width of 7-1/4 inches. The holes were adjacent and to the left of an arch tube and the sheet was torn between the holes and the arch tube hole.

A number of flexible staybolt sleeves and caps, running board, main reservoir, and air radiating pipes were damaged when the broken rod struck the left side of the boiler.

The front end key, key block, and front end brasses which were found at the scene of the accident were in good condition. The left crosshead pin was found intact in crosshead and in good condition. The crosshead, piston, guides, guide yoke, all side rods, right main rod, and valve motion on both sides were not damaged and were in good condition.

There was no evidence that the engine had been working water and the walls of cylinders were adequately lubricated.

There were no markings on the piston head or cylinder heads to show there had been any foreign object in the cylinder. The driving boxes, shoes, and wedges were examined and found in good condition. The cylinder cocks which were hand operated were tested and found working satisfactorily. Fire doors were tested and found operating properly.

The boiler had been entirely drained and about all the fire and ashes had been blown from the firebox by pressure from the escaping water and steam from the holes in throat sheet.

INSPECTION AND REPAIR REPORTS

Company records indicate that this rod was last inspected by magnaflux method on April 27, 1951, at Camden, N. J.

The locomotive received class 4 repairs at Reading Shops, Reading, Pa., April 3, 1950; mileage since class repairs 31,715 miles. Last annual inspection was made at Camden, N. J., April 1, 1951. Last quarterly inspection was made at Camden, N. J., on April 27, 1951. Last monthly inspection was made at Camden, N. J., on June 26, 1951. Last daily inspection was made at Atlantic City, N. J., on July 20, 1951.

Daily inspection reports from June 1st to time of accident filed at Wildwood, Atlantic City and Camden, N. J., the only points from which this locomotive was dispatched, were examined and these reports did not show any items which might have had a bearing on the accident.

SUMMARY OF EVIDENCE

Investigation with train crew developed that the conductor conversed with engineer prior to departure of Train 1034 from Atlantic City and the engineer made no statement regarding locomotive 130. The train proceeded from Atlantic City to point of accident without stops, trouble, or unusual conditions. Just prior to the point of failure, the train crew noted that the speed of train was being reduced which at first was thought to be a slow down for the Delaware River bridge. About this time the baggageman, who was in first car in train, heard a muffled explosion and debris strike the car. Other members of train crew, who were farther back in train, observed steaming of windows and steam along train. The

members of the train crew were unable to state where the steam and water stopped blowing from the locomotive, but all concurred that there was no steam or water coming from locomotive when train came to rest. None of the train crew made an inspection of the locomotive following accident.

The road foreman of engines stated that when he got on the locomotive, following accident, he found the reverse lever in forward motion at about 50 percent cut off, throttle in closed position, automatic brake valve in emergency position, and both fire doors closed. He noted there was no steam pressure on the locomotive and no water in the water glass. He then opened left fire door and observed that there was no fire in the firebox and that there was a hole in the firebox sheet at the left front corner.

DISCUSSION

The failure in the main rod which caused this accident occurred through a progressive fracture at the juncture of the bottom rail and curved end of the box section that housed crosshead wrist pin brasses. The point of origin of the primary progressive fatigue fracture appeared to be in a gall or tool mark at the corner of the outer face of the rod and the top surface of the lower rail and was hidden beneath the face babbitt that had been applied because of excess lateral wear.

Mechanical conditions were particularly favorable to development of fatigue fractures at the point of failure and included the following factors:

- A. Heavy tensile stresses in the top and bottom rails which varied from zero to a maximum on each forward piston stroke.
- B. Development of sharp corners of the box section resulting from wear of the outer and inner faces of the rod and which, because of stress concentration, were subject to cracking.
- C. Presence of gall or tool marks at or adjacent to stress concentrations in which the notch effect would promote cracking.

- D. Application of face babbitt could adversely affect the results of a magnaflux test.

RECOMMENDATION

It is recommended that application of face babbitt to crosshead ends of main rods be prohibited; that tool marks or surface defects be eliminated from highly stressed rod sections and that filleted corners be properly maintained.

CAUSE OF ACCIDENT

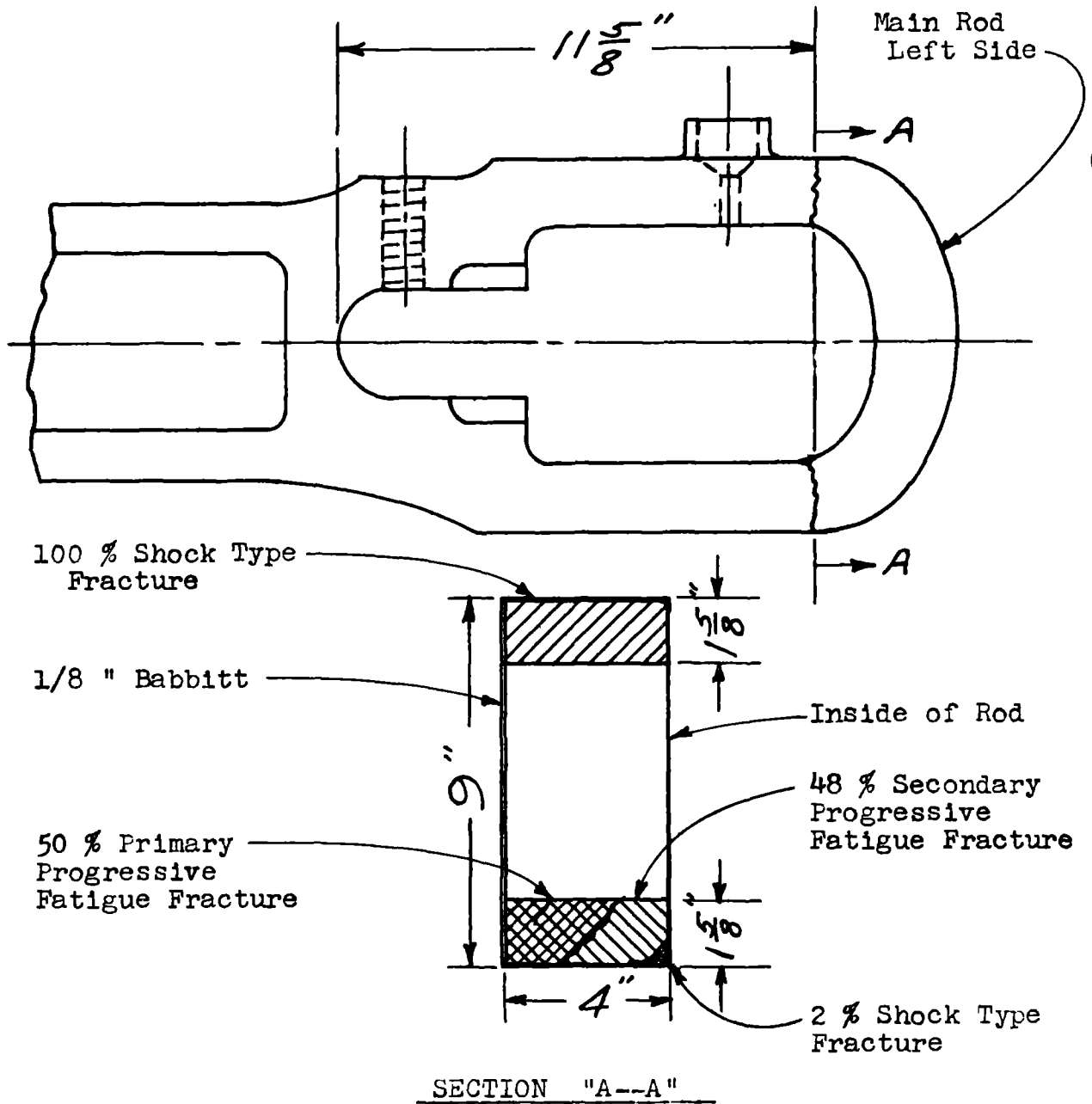
It is found that this accident was caused by the failure of a main rod through progressive fracture at gall mark under babbitt-metal liner at front end of the bottom section of brass fit in outside face of the rod.

Dated at Washington, D. C., this 27th day
of August, 1951.

By the Commission, Commissioner Patterson.

SEAL

W. P. BARTEL,
Secretary.



SKETCH OF FAILED FRONT END OF MAIN ROD
 READING COMPANY LOCOMOTIVE 130