INTERSTATE COMMERCE COMMISSION

REPORT NO. 3364

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

LONG ISLAND RAILROAD

November 9, 1950

Accident at Central Islip, N. Y., on September 26, 1950, caused by an explosion in crankcase of the engine which propelled a Diesel-electric locomotive unit.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On September 26, 1950, about 4:48 p.m., at Central Islip, N. Y., an explosion occurred in the crankcase of the engine of Long Island Railroad Diesel-electric locomotive unit 1503 soon after the unit, which was hauling a passenger train, was stopped because smoke appeared at the front of the engine. The engineer and fireman 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

Long Island Railroad Diesel-electric locomotive unit 1503 hauling 11-car westbound passenger train No. 211 departed from Greenport, N. Y., at 3:00 p.m., September 26, 1950, and proceeded without any known unusual incident until it was approaching the station at Central Islip, N. Y., 51 miles from Greenport, at an estimated speed of 58 miles per hour, at which time smoke was noticed around the front end of the engine and the train was brought to a stop with unit 1503 standing about 100 feet west of the station which was not a scheduled station stop. Shortly thereafter, at about 4:48 p.m., an explosion occurred in the crankcase.

At the time of the explosion, the engineer and fireman were endeavoring to determine the cause of the smoke coming from the engine. The fireman had opened two hood doors and was standing on the left running board; the engineer had opened two hood doors on the right side and was on the right running board. In this vicinity the line is single track and tangent for approximately 4 miles; there are two sidings, one on north side and the other on south side of the main line.

The cars of a freight train were standing on the south siding and locomotive unit 450 of this train was on the north siding. When the engineer and fireman on unit 450 saw train 211 come to a stop and noticed smoke coming from unit 1503 they moved unit 450 alongside of unit 1503 to render assistance. The force of the explosion blew 17 of the 18 crankcase handhole covers from the engine of unit 1503 and displaced the remaining cover. The lubricating oil sump filler cover was also blown from the engine. Some of the covers were blown for a distance of 40 feet from the unit.

The engineer and fireman of unit 1503 were seriously injured; were treated by a physician at the scene of the accident and then returned to their homes where they received further treatment. The engineer of unit 450 who was standing on the rear platform of unit 450 when the explosion occurred was struck by a crankcase cover and burned by hot oil thrown from unit 1503. He was not seriously injured.

DESCRIPTION OF LOCOMOTIVE UNIT

Unit 1503, type B-B, was built by Fairbanks, Morse & Company in March 1949. It was equipped with a type 38D8-1/8, 8-cylinder,

opposed piston, 2-cycle, 1500 HP Diesel engine, with bore and stroke of 8-1/8 x 10 inches respectively, which was direct connected to a generator which furnished electric power to four traction motors mounted on two 4-wheel swivel type trucks, all axles of which were motor driven; wheel diameters 42 inches; weight on driving wheels 248,140 pounds; tractive effort 62,010 pounds. It was also equipped with a PG pneumatic-hydraulic Woodward governor; lubricating oil temperature, water temperature, lubricating oil and fuel oil pressure gages; low lubricating oil, ground relay, hot engine and wheel slip lights. The unit was operated as a demonstrator on various railroads from March to August 1949, during which time the accumulated mileage was 18,564; it was placed in the builder's shop, August 1949, for general repairs, was returned to demonstrator service in February 1950, on the Long Island Railroad and operated for 25,093 miles; in June 1950 it was placed in the Morris Park shop for change of all 42-inch wheels and general inspection; from June 26, 1950 to the date of the accident it made 22,855 miles; total mileage since built 66,512 miles.

The Diesel engine was equipped with an upper and a lower crankshaft. Two opposed pistons worked vertically in each cylinder and the upper and the lower pistons drove the upper and lower crankshafts respectively. The crankshafts were interconnected by a vertical gear drive. The cast iron pistons had crowns and skirts chromium and tin plated, respectively, and were fastened to cast iron piston inserts which supported the piston pins. Aluminum cooling-oil retainers with helical retaining springs at upper ends of the connecting rods acted as seals for the cooling oil in the piston crowns.

Lubricating oil was forced to each main bearing, thence through the crankshaft passages to each crankpin bearing; from each crankpin bearing it passed through the oil passages in the connecting rods to the piston pin bearings and to the piston cooling oil pockets and was discharged through the cooling oil outlet in the piston insert.

Scavenging air was supplied to the cylinders at a pressure of 3½ to 5½ pounds per square inch by a positive displacement impeller type blower.

An oil separator was located inside the crankcase, near the vertical drive inspection cover, and was connected to the upper suction side of the blower by a copper crankcase vent suction pipe 1½ inches I.D. and 73 inches in length.

EXAMINATION OF LOCOMOTIVE UNIT AND PARTS INVOLVED

Examination of the unit disclosed that fire had blistered the paint on the No. 3 hood doors, right side of unit, and on the louvers over these doors; that 17 of the 18 crankcase handhole covers had been blown from the engine. The remaining crankcase handhole cover had been displaced from its anchorage on the engine and all yokes that had secured the crankcase handhole covers, including the yoke on the displaced cover, were badly distorted.

The lubricating oil sump filler opening cover had been blown off the engine and its chain was broken. The appearance of this cover and its yoke indicated the cover had not been properly applied prior to the explosion.

The upper horizontal portion of the crankcase vent suction pipe was badly flattened for a distance of 4 inches and a hole approximately 3/4 inch by 1-1/4 inches was worn through the pipe where it fouled the underside of the rear stiffening member of the rear hatch cover; discoloration on the hatch cover indicated smoke had issued from the opening in the pipe.

Examination of the lower No. 5 piston disclosed that the four compression rings, the two oil drain rings and the oil scraper ring were all frozen in the grooves. The outside cylindrical portion of the skirt was badly galled and a hole approximately 5/8 inch by 1 inch was blown through the crown in the right front quadrant. A crack extended from each outer corner of this hole; the crack that extended toward the rear was 1 inch in length and the one toward the front center of the crown was 3-1/2 inches long. These cracks and hole were located where the crown joins the inside surface of the cylindrical portion of the piston. The piston walls were uniform in thickness.

Practically all of the aluminum piston-cooling-oil retainer was missing; the part that remained adhered to the top of the connecting rod, and the retainer spring was badly distorted.

The piston pin showed evidence of overheating and both outer bushings were frozen on the pin. The piston cooling oil outlet, in the insert, was open. The remaining upper and lower pistons were in good condition.

The lower portion of the No. 5 cylinder liner was badly galled; the upper portion and other liners were in good condition.

Examination of the lower crankshaft main bearings disclosed that approximately 95 percent of the bearing metal in the bottom shell of No. 5 bearing had flaked and was missing; the journal had worn slightly into the bronze back and approximately 35 percent of the bearing metal in the upper shell had flaked and was missing. Both shells of Nos. 4 and 6 bearings were badly flaked. There was some flaking in the No. 8 bearing shells. The remainder of the bearings were in fair condition.

Examination of the upper crankshaft main bearings disclosed that the bearing metal on both shells of the No. 5 bearing was badly flaked over nearly the entire surface; that there was some flaking of the bearing metal in both shells of No. 1 bearing and the upper shells of Nos. 2 and 4 bearings; and that both shells of No. 8 bearing were flaked at one point.

The upper crankshaft connecting rod bearings appeared to be in fair condition.

All lower crankshaft connecting rod bearings except the No. 5 bearing were in fair condition. In No. 5 bearing the bearing metal in the cap half of the shell was slightly wiped, otherwise it was in good condition. The rod half of the shell was in fair condition except for some bearing metal that was missing from a circular area approximately 1 inch in diameter. This circular area embraced both sides of the circular oil groove and was directly beneath the connecting rod oil passage.

The low lubricating oil warning light circuit was tested and functioned properly.

The lubricating oil temperature, water temperature and lubricating oil pressure gages were tested and found accurate.

When examined the fuel tanks were approximately 3/4 full and the oil level gage dip stick showed that the lubricating oil level was at the "Full Engine" mark.

Samples of lubricating oil taken from the unit on September 22, 1950, and September 26, 1950, after the accident, were analyzed and the oil was found in good condition.

INSPECTION AND REPAIR REPORTS

The last monthly inspection was made at Morris Park, N. Y., on September 7, 1950. The last main air reservoir hydrostatic

and hammer tests were made July 7, 1950; and the last insulation tests were made February 16, 1950.

The daily inspection and repair reports from September 16 to 26, 1950, on file at Morris Park Enginehouse, were examined and nothing was found reported having any bearing on the accident.

SUMMARY OF EVIDENCE

The engineer (unit 1503) stated that as train No. 211 was approaching Central Islip he was operating the unit at full throttle and the train speed was 58 miles per hour; that when he saw smoke issuing from the engine he examined the panel instruments and immediately closed the throttle to "idle" and made an automatic service brake application; that the lubricating oil temperature gage registered 160 degrees, the water temperature gage registered 165 degrees, and the lubricating oil pressure gage registered 40 pounds; that subsequently the fireman was standing on the left running board and had two hood doors open; that he (the engineer) was standing on the right running board and had opened two hood doors when the crankcase explosion occurred. He further stated that the locomotive had been operating properly and that after the explosion occurred the Diesel engine continued to operate and that a flame was burning over the oil in the crankcase and continued to burn until the engine was stopped.

The fireman (unit 1503) corroborated the engineer's statement and further stated that prior to seeing smoke issue from the engine he did not notice or hear anything unusual; that the locomotive did not lose power or lag; that all gages, pressure and heat indicators were normal; and that there was no indication of a hot engine or low oil.

The engineer of unit 450 stated that when unit 1503, which was smoking badly, stopped it was near his locomotive and he moved the 450 alongside unit 1503; that the engineer of unit 1503 had the hood doors open and was examining the engine when the crankcase explosion occurred; that a blast of flame issued from the engine and the engine continued to run; that he (engineer of unit 450) was struck in the stomach by a crankcase handhole cover blown from locomotive 1503; and that the back of his left hand was burned by hot oil thrown from locomotive 1503. He further stated that one cover was blown approximately 40 feet from the locomotive; that he instructed his fireman to shut down

the engine on locomotive 1503; and that the flame in the crankcase was extinguished when the engine stopped.

The fireman of unit 450 corroborated the engineer's statement and stated that he stopped the engine on locomotive 1503 by pressing the engine "Stop" button on the panel board.

DISCUSSION

The defective condition of the crankcase vent pipe and the improperly secured cover to the lubricating oil sump filler opening undoubtedly were contributing factors to the accident. The primary cause of the explosion was an overheated and broken piston which permitted entry of the fuel oil vapor and products of combustion into the lower crankcase and also interrupted supply of lubricating oil to the piston pin and associated main bearing. The combination of these conditions caused the formation of a combustible vapor in the lower crankcase which was ignited and exploded when the temperature of the overheated piston or the bearing reached the flash point of the oil vapor mixture.

CAUSE OF ACCIDENT

It is found that this accident was caused by a crankcase explosion, resulting from an overheated and broken piston and an overheated bearing.

Dated at Washington, D. C., this 9th day of November, 1950.

By the Commission, Commissioner Patterson.

SEAL

W. P. BARTEL,

Secretary.