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INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT OF THE DIRECTOR

BUREAU OF SAFETY

ACCIDENT ON THE

BALTIMORE & OHIO RAILROAD

CLAY CITY, ILL.

JULY 28, 1936

INVESTIGATION NO. 2088

SUMMARY

Railroad: Baltimore and Ohio
Date: July 28, 1936
Location: Clay City, Ill.
Kind of accident: Derailment
Train involved: Freight
Train number: No. 91
Engine number: 4573
Consist: 44 cars and caboose
Speed: 40-45 miles per hour
Track: Tangent and slightly ascending
grade
Weather: Clear
Time: 10:35 a.m.
Casualties: 5 killed and 4 injured
Cause: Partly open switch, due to two
rivets breaking off in switch-
stand mechanism.

September 16, 1936

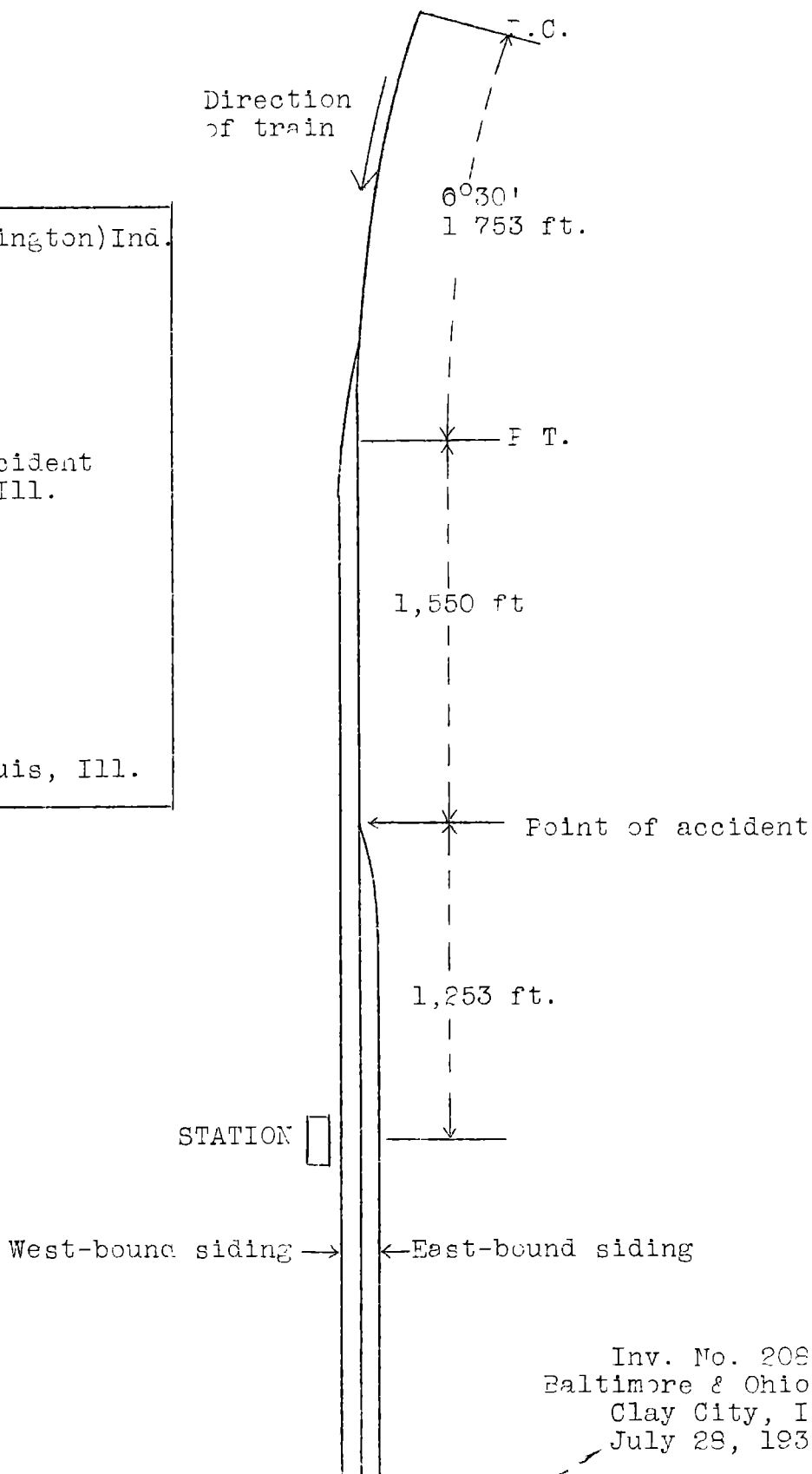
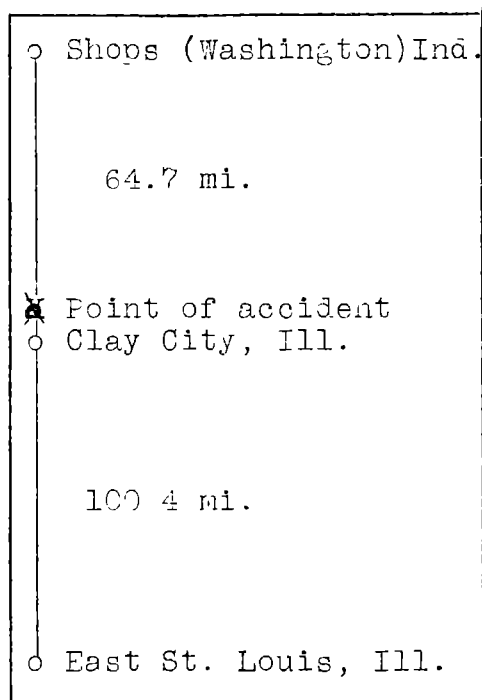
To the Commission:

On July 28, 1936, there was a derailment of a freight train on the Baltimore & Ohio Railroad at Clay City, Ill., which resulted in the death of 1 employee, 1 student fireman, and 3 trespassers, and the injury of 4 employees.

Location and method of operation

This accident occurred on the Illinois Sub-division of the St. Louis Division, which extends between Shops, near Washington, Ind., and K Tower, near East St. Louis, Ill., a distance of 165.1 miles; in the vicinity of the point of accident this is a single-track line over which trains are operated by timetable, train orders, and a manual block-signal system. The accident occurred at the east switch of the east-bound siding at Clay City, a facing-point switch for west-bound trains, located 1,253 feet east of the station; approaching this point from the east, the track is tangent for more than 1 mile, followed by a $0^{\circ}30'$ curve to the left 1,753 feet in length and then tangent track for a distance of 1,550 feet to the point of accident. The grade is 0.28 percent ascending for west-bound trains, and the maximum authorized speed for freight trains is 45 miles per hour. The track is laid with 100-pound rails, 39 feet in length, with 22 treated hardwood ties to the rail length, single-spiked, fully tieplated, and is ballasted with washed gravel to a depth of about 18 inches; it is well maintained.

There is a siding on each side of the main track, the east-bound siding parallelling the main track on the south, with the switch stand on the same side; this stand is an Anderson Economy stand equipped with targets located 6 feet above the switch ties. A green diagonal target with pointed ends is displayed when the switch is closed and a red horizontal target with rounded ends is displayed when it is open; a lamp with corresponding green and red indications is located above the targets. This switch stand is equipped with a $1/2$ -inch rivet which passes through the target shaft and the hub of the segmental gear, and holds the crank clutch in engagement with the segmental gear clutch and also holds the segmental gear in a fixed position with relation to the target shaft, so that the target and switch lamp will display the indication which corresponds to the position of the switch points. A safety rivet, $1/4$ inch in diameter, also is provided; it passes through the target shaft just about the hub of the segmental gear and the protruding ends of this rivet would prevent the target shaft from falling from normal position if the $1/2$ -inch rivet should fail. In the case of the failure



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of both of the rivets, as occurred in this case, the target shaft can drop down a sufficient distance to permit the disengagement of the crank clutch with the clutch of the segmental gear and thus leave the switch points free to move in either direction without changing the indication displayed by the target.

The weather was clear at the time of the accident, which occurred about 10:35 a.m.

Description

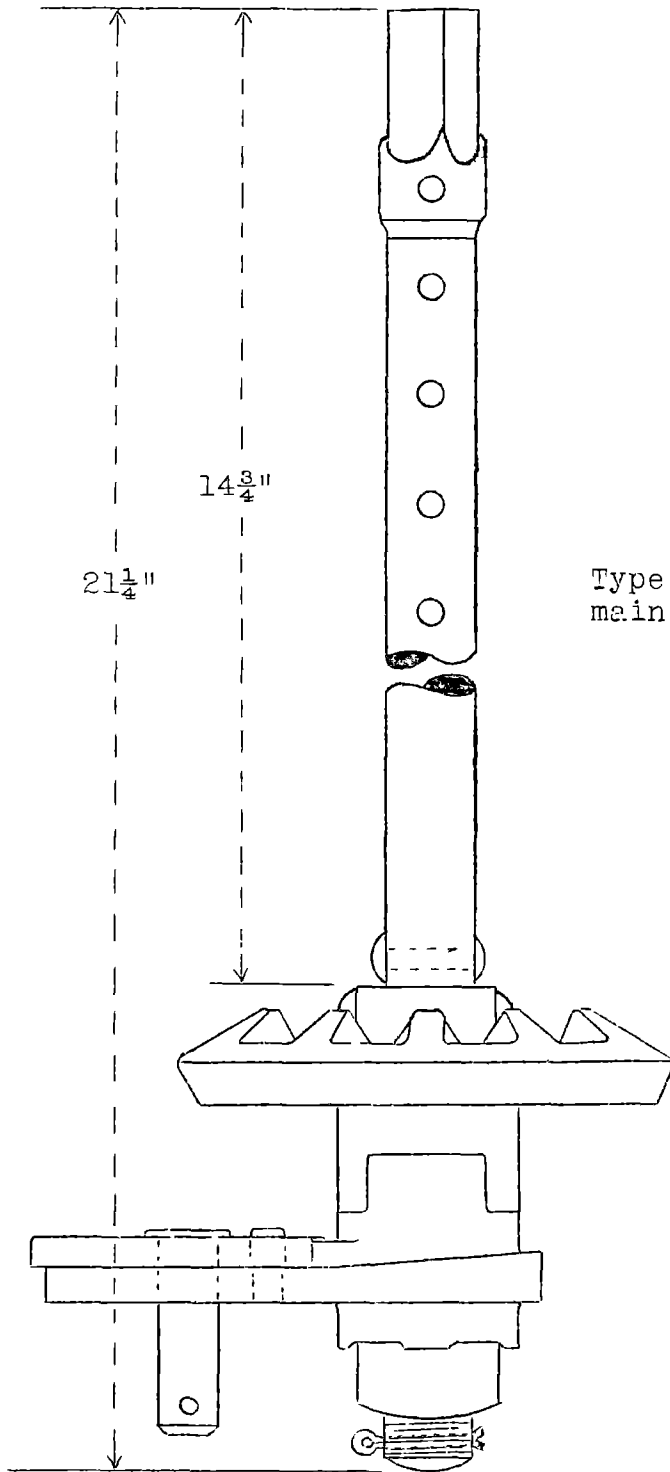
Train No. 91, a west-bound second-class freight train, consisted of 44 cars and a caboose, hauled by engine 4573, and was in charge of Conductor Wright and Engineman McCool. This train departed from Noble, 7.1 miles from Clay City, at 10:24 a.m., 1 hour 29 minutes late, and was derailed at the east switch of the east-bound siding at Clay City while traveling at a speed estimated to have been between 40 and 45 miles per hour.

The engine stopped on its right side with its front end 338 feet beyond the switch, at a slight angle across the main track. The tender and first 12 cars stopped in various positions on all three tracks between the engine and the thirteenth car, which was derailed but remained upright on the east-bound siding. The fourteenth car stopped with its front truck on the east-bound siding and the rear truck on the main track just east of the switch points. None of the remaining equipment was derailed with the exception of the caboose which was derailed but remained upright. The employees killed were the head brakeman and a student fireman; those injured were the engineman, fireman, conductor and flagman.

Summary of evidence

Engineman McCool stated that he was operating his train at a speed of about 45 miles per hour, that he did not notice anything wrong with the switch, and that as he started to sound the whistle for a crossing the engine made a sudden leap and he at once placed the brake valve in emergency position. After the accident he walked back to the switch and found the stand lined and locked for the main track, but the points were lined for the passing track and a small piece had been broken off of each point, with indications that they were new breaks. The connecting rod was disconnected from the stand and the pin was lying between the ties, and the tie rod nearest the switch points was bent.

Fireman Potts stated that on rounding the curve just east of the station he saw that the train-order signal was clear and



Type of mechanism for
main line switches

ECONOMY SWITCH STAND MECHANISM

called its indication; the student fireman was on the fireman's seat handling the stoker and Fireman Potts was on the brakeman's seat looking out through the cab doorway. He saw the green banner of the switch stand and when about 100 feet from the switch he caught a glimpse of the switch points and they appeared to be open from $1/3$ to $3/4$ inch, but the engine reached the switch and the accident occurred before he could call a warning. Subsequently he examined the switch, and he stated that in addition to the connecting rod being disconnected and the pin lying between the switch ties, as mentioned by the engineman, he also saw that the adjusting lug was lying on the ground. Conductor Wright stated that when he examined the switch the points were open from 1 to $1\frac{1}{2}$ inches.

Section Foreman McGain, in charge of the section on which the accident occurred, stated that on the morning of the accident, accompanied by the four men in his gang, he made an inspection of the switch in question between 7:45 and 8:15 a.m. He first spiked the switch, and then took off the No. 1 switch rod, examined it for defects, examined the switch stand connecting rod, and removed the housing from the switch stand to examine the cranks, and also examined the switch points. He found nothing wrong, and after completing his examination and replacing all parts he operated the switch to see that it was in proper working order, and then lined and locked it for the main track and noted that the points fitted properly. In making this inspection he noticed that the rivet through the segment was in place, also that the rivet through the shaft above the segment was in place, but he did not make any test of the rivets with a hammer. He was at the west end of the east-bound siding at the time of the accident, and again examined the east switch about 15 minutes afterwards, noting its condition as described by the engine crew of Train No. 91. Later, when the switch stand housing was removed, he observed that the rivet which had secured the segment to the shaft was broken off and the safety rivet sheared off, and in his opinion this condition caused the shaft to drop down, thus causing the connecting rod to become disconnected and allowing the switch points to open. This switch had never been run through, nor had he ever had occasion to make any repairs to it.

Engineer of Roadway and Track Myers stated that the switch stand involved in this accident is of practically the same type that has been in use on this railroad for the past 31 years and is used on main tracks by many class 1 railroads. His observations for the past 17 years and inquiry of the superintendents and mechanics of the reclamation shops indicated that rivets in these switch stands never had been found sheared, although some had been found which were loose, probably due to vibration after long periods of service, and to the best of his knowledge this

was the first accident due to the breaking of the rivets in this type of stand.

Division Engineer Gabriel stated that on arriving at the scene of the accident from the east he found the caboose derailed and some marks on the ball of the rail which no doubt were made by the derailment of the caboose. He then walked down the track toward the head end of the train and did not see any indications of anything dragging or any condition of the track which might have contributed to the accident. He later had the housing removed from the switch stand and his examination revealed that the shaft of the stand had dropped down, burying the large nut at the bottom of the shaft in the ground. The large $\frac{1}{2}$ -inch rivet that secures the segment to the shaft had been sheared into three pieces, the middle portion remaining in the shaft and the two ends remaining in place in the hub of the segment, while the $\frac{1}{4}$ -inch rivet above this segment also had been sheared off, the middle portion remaining in the shaft and the two ends lying inside of the housing at the base of the stand. The adjusting segment was found below the stand between the headblocks, and the bolt that goes through this segment and fastens the switch connecting rod to the crank was found about 18 inches toward the main track and between the headblocks. On raising the shaft, the large nut at the bottom was found to be in place. The division engineer stated that the shearing of the two rivets had permitted the shaft to drop down and disconnect the crank from the switch connecting rod. It also appeared from his statements that the bolt that came out of the switch stand end of the connecting rod was threaded and also had a hole for a cotter key, but neither a nut nor a cotter key was used, as the top of the bolt engages the bottom of the switch stand and there is no way for the bolt to get out provided the shaft is held in its normal position. It was his opinion that the broken rivet in the segment could not have been discovered by a visual examination.

Division Foreman Geinberger stated that he inspected engine 4573 as to lateral, flanges and treads of engine truck and driving wheels, and found nothing that could have contributed to the cause of the derailment.

Inspection by the Commission's inspectors of the switch stand revealed it to be in the condition as previously described. The first marks of derailment were found on the north side of the north switch point, 14 feet 9 inches from the point, and on the south side of the south switch point 10 feet 9 inches from the point; flange marks then continued to and beyond the frog, where the track was torn out. A small piece was broken off the top of each switch point, and also at the base of the north switch point

a piece measuring $3\frac{1}{2}$ by $2\frac{1}{8}$ inches was broken off; the switch points showed no evidence of having been bent or straightened. At the time of this inspection the right or north point was in use in the track, while the left point had been replaced but was still at the scene of the accident. The large rivet appeared to have been broken at each end, and the middle portion, which occupied the hole in the shaft, showed considerable wear and could be moved into and out of place by hand. The ends of the safety rivet appeared to have been sheared off and probably were the last to fail; the middle portion of this rivet was held firmly in its hole in the shaft.

An east-bound passenger train and two east-bound freight trains had passed over this switch in a trailing-point direction between the time of the section foreman's inspection and the time of the accident, and reports from the car and engine inspectors of these trains at their Cincinnati and Washington Terminals failed to develop that any parts of the running gear which might have become wedged in the switch, such as brake beam supports, safety chains, or brake shoes, were dragging or missing.

Discussion

After the accident the switch stand was found lined and locked for a main-track movement but the switch points were open. The large rivet which passes through the shaft and segment gear hub, and also the safety rivet located in the shaft just above, were broken or sheared off, thus permitting the shaft of the switch stand to drop down, which in turn allowed the clutch of the crank to become disconnected from the clutch in the segment gear and caused the switch points to be free to move.

This switch had been inspected about 2 hours prior to the occurrence of the accident. This inspection, required monthly, included the inspection of the No. 1 switch rod, the connecting rod, switch clips, and switch stand cranks, but did not include the inspection of the rivets; the section foreman stated, however, that during his inspection he noticed that the rivets were in place.

Conclusion

This accident was caused by a cocked or partly-opened switch, due to the breaking off of the rivet which holds the crank clutch in engagement with the segmental gear clutch, and also the safety rivet which passes through the target shaft just above the head of the segmental gear.

Respectfully submitted,

W. J. PATTERSON,
Director.