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INTERSTATE COMMERCE COMMISSION.

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE PENNSYLVANIA RAILROAD NEAR COLUMBUS, OHIO, ON DECEMBER 7, 1923.

February 8, 1924.

To the Commission:

On December 7, 1923, there was a derailment of a freight train on the Pennsylvania Railroad near Columbus, Ohio, which resulted in the death of one employee and the injury of three employees.

Location and method of operation.

This accident occurred on the Cincinnati Division, which extends between Cincinnati and Columbus, Ohio, a distance of 119.6 miles; in the vicinity of the point of accident this is a double-track line over which trains are operated by time-table, train orders, and a manual block-signal system. The accident occurred within interlocking limits at Miami Crossing, 3.3 miles west of Columbus, at a split-rail derail located on the south rail of the eastbound main track, at a point approximately 500 feet west of MI interlocking tower, which governs crossing movements of Pennsylvania and Cleveland, Cincinnati, Chicago & St. Louis trains at this point. Approaching the point of derailment from the west there are 3.75 miles of tangent, followed by a compound curve to the right, varying in curvature from 31° 27" to 1°, this curve being 2,984 feet in length, followed by 555 feet of tangent to the point of derailment. The grade for more than 4 miles is generally descending for eastbound trains, being 0.74 per cent descending for 4,000 feet west of the point of accident.

All switches and signals at this crossing are operated from MI interlocking tower, located in the northeast angle of the intersection, this tower is equipped with a 40-lever electric-mechanical interlocking machine, and is maintained by the Cleveland, Cincinnati, Chicago & St. Louis Railroad.

Movements of eastbound Pennsylvania Railroad trains over this crossing are governed by a pipe-connected home signal located 555 feet west of the crossing, and a power-operated distant signal located 4,222 feet west of the home signal. Eastbound distant signal No. 2, the signal directly involved in this accident, is a one-arm, three-

position, upper-quadrant semaphore, but is blocked so as to operate only in the caution and clear positions, its normal indication is caution, and it is controlled by track circuits, the home signal and an electric lock on No. 3 lever of the interlocking machine. When the track is clear and the home signal is cleared by the operator, the distant signal automatically goes to clear position, the operator having no direct control of this signal. There is no indicator in the tower showing the indication of this signal and it is out of sight from the tower. The night indications are yellow and green, for caution and clear, respectively. An oil burning yellow marker light is also displayed on the signal mast, about 7 feet below the semaphore arm.

Approach lighting is used in connection with the distant signal, effective when a train reaches a point about 2,500 feet west of the signal. If the home signal has been previously operated to proceed or clear position by the towerman, an approaching train receives a green indication in addition to the yellow marker light. If the home signal has not been operated to clear position before the train reaches the approach-lighting circuit, a yellow indication is displayed in addition to the yellow marker light, and this indication remains displayed until the home signal has been moved to a position between  $85^{\circ}$  and  $90^{\circ}$  above the horizontal, at which time the indication of the distant signal changes from yellow to green, provided the track circuit is not occupied. The electrically lighted yellow signal indication can readily be distinguished from that of the oil lamp light of the marker.

Owing to the long tangent there is a clear view during the day of the distant signal, and at night of the yellow marker light, for a considerable distance, but on account of shrubbery and a high oak on the inside of the curve, the view of the home signal is obscured until a train is within a distance of about 1,600 feet.

The weather was clear at the time of the accident, which occurred at about 7.37 a. m.

#### Description.

Eastbound freight train extra 8899 consisted of 32 cars and a caboose, hauled by engine 8899, and was in charge of Conductor Gray and Engineman Whitacre. This train left Cincinnati at 2.42 a. m., passed M block station, 4.9 miles west of the point of accident, at 7.31 a. m., and was derailed at II tower at about 7.37 a. m. while running at a speed estimated to have been approximately 30 miles an hour.

The engine, tender, and first 10 cars were derailed to the right, the engine and tender coming to rest at a point about 200 feet east of the derail, the engine lying on its right side, parallel with the roadbed, the first five cars were thrown in a broken mass on top of the engine and tender. The employee killed was the head brakeman, who was killed in jumping from the engine.

#### Summary of evidence.

Engineman Whitacre, of extra 8899, stated that as his train approached MI tower he saw the distant signal when he was a considerable distance away, it was clear, he called its clear indication, and both the fireman and head brakeman answered. After passing this signal he said he made a brake-pipe reduction of about 10 pounds; while passing around the curve saw the home signal in stop position and immediately placed the brake valve in emergency position and opened the sand valve, also sounding the whistle several times, calling for the signal. He estimated the speed of his train at the time of passing the distant signal to have been between 28 and 35 miles an hour, as the signal was not cleared and as he saw the train would not be stopped before reaching the derail, he and the fireman and head brakeman got off near the home signal, the speed at that time being between 18 and 22 miles an hour. Engineman Whitacre's statements were practically corroborated by those of Fireman Gleason who said he also saw and called the clear indication of the distant signal.

Conductor Gray stated that he was riding in the caboose and did not observe the indication of the distant signal, but that after the usual brake application was made rounding the curve there was a heavier brake application followed shortly afterwards by the jar of the derailment.

Flagman Howard went back to flag immediately after the accident, and then he got around the curve where he could see the distant signal it was showing a clear indication. At about the time he arrived at the distant signal the signal maintainer also arrived there and as the maintainer opened the door at the bottom of the signal mast the semaphore arm dropped to the caution position.

Operator Gardner, who was on duty at MI tower from 11 p. m. to 7 a. m., stated that at 12.40 a.m. he attempted to clear the route over the crossing for a Big Four yard engine but although he tried the time release three or four times the lever would not release, after several unsuccessful attempts he disconnected the lever, under order from the dispatcher, and notified the signal maintainer, who arrived at the tower at about 1.25 a.m. After making several tests the maintainer said the trouble was not in

the office out outside, and he did not think he could locate it that night; he advised that the distant signal be put out of service. Operator Gardner said he wrote out a note, asked for the Pennsylvania dispatcher and gave the following message: "Maintainer has disconnected eastbound distant signal. Notify all eastbound to that effect that this signal is out of service." He received an O.K. to the message, the operator at Cedarville and not the dispatcher received the message.

Two eastbound trains passed MI tower at about 2:20 and 3:30 a.m. respectively. Operator Gardner said they went by at moderate rates of speed and there was nothing to suggest the possibility that they had not received, or were not observing, the order which he assured had been issued in response to his message.

Operator Grigole, on duty at Cedarville on the night of the accident, stated that Dispatcher Kirby asked him to take O's for him for a few minutes. During the dispatcher's absence the operator at MI tower reported that the eastbound distant signal at that point was out of service and that the maintainer would not be able to repair it that night and asked that the dispatcher notify all eastbound trains to that effect. He said it was not in message form and he did not give his O.K., but answered "all right". Upon the dispatcher's return he told him of the message and, as he remembered it, the dispatcher said something to the effect that he would not put out any notice.

Dispatcher Kirby of the Pennsylvania Railroad, said that at about 1 a.m. he talked with the operator at MI tower in reference to the interlocking plant not working properly, the operator asking to be protected against a train scheduled to arrive in about 35 minutes. Later the operator called and advised that the protection previously requested was not then needed, and that he had called for the signal maintainer. Still later he was advised by some one whom he took to be the operator at MI tower that the maintainer had put the distant signal out of service, and as he understood it, that would take care of Pennsylvania trains, as the rules require that signals put out of service be secured in normal position, which in this case would be the caution position. Dispatcher Kirby did not recall that any one had asked him to put out a notice to the effect that the distant signal at MI tower was out of service or that he replied that he would not put out such a notice, although he said it is possible that he might have done so. He assumed that as required by the rules this signal would be at caution, its most restrictive indication, and it would not make it any safer to notify trains, had he been notified that this signal was not displaying a caution indication he said he would

certainly have notified all trains concerned.

Operator Rice said he relieved Operator Gardner at MI tower at 7 a.m. on the day of the accident. There was nothing on the train sheet or any other record to indicate that the distant signal was out of order and he was unaware of the fact until so advised by Signal Maintainer Graham, who arrived at the tower at about 7.05 or 7.10 a.m. However, had he known when he went on duty that this signal was out of service it would not have prevented the derailment as he had no direct control over the signal and he would not have had time to go around the curve and see what position it was in. The last train to use the crossing was a Big Four local which cleared the crossing at 7.36 a.m. He heard Engineman Whitacre sound the whistle for the signal and he tried to clear the route for his train but he was unable to do so as the plant was still locked for the Big Four movement.

Signal Maintainer Graham said he was called to MI tower at about 1 a.m. on the day of the accident, on account of the electric lock on No.2 lever failing to release and preventing the lever from being restored to its normal position, thereby fouling the normal operation of the mechanical locking and preventing Big Four movements over the crossing. After several tests he found the trouble was outside the tower and as he did not think he would be able to locate it until daylight he verbally instructed the operator to put the signal out of service; he saw the operator write a message and heard him telephone it to the dispatcher. He removed the connecting rod of the electric lock, opened the control circuit of the clearing relay and locked the case cover over the lock so as to prevent any tampering with it in his absence. He said a voltmeter reading on the lock indicated that the distant signal was in the caution position, and to further assure himself that this signal was in caution position on his way home he passed the distant signal and saw that it displayed a yellow indication.

The testimony of members of the crews of eastbound extra freight trains 9890 and 9738, which passed MI tower at 2.26 and 3.41 a.m., respectively, with the exception of but one employee was to the effect the distant signal was in the clear position when passed by their trains. Fireman Montague, of extra 9890, stated that he saw this signal change from yellow to green as they approached it, although he did not recall having seen the yellow marker light at the time he saw the yellow signal light. Brake-man Degenhart, who sat ahead of him on the seatbox, stated that he saw the green signal light and also saw the yellow marker light. Engineman Durfey, of extra 9890, was positive in his statement that this signal was displaying a green or clear indication when his engine entered the

approach-lighting circuit, and at no time did this indication change as his train approached the signal.

On October 11, 1923, this distant signal was reported as having been operating improperly, at which time the operator-towerman disconnected the rod between the No. 2 lever and the electric lock so as to restore this lever to normal, and free the mechanical locking. The maintainer was not called in this instance and the matter was not reported to him until about October 26, at which time he spent an entire day looking for the trouble but was unable to locate the cause.

Careful examination and numerous tests were made subsequent to the accident to ascertain the cause of the false clear failure of the distant signal. These tests failed to reveal any ground or combination of grounds that would appear to have any bearing on the matter. Various crosses and grounds were created for test purposes and nothing was developed that would indicate an unsafe or improper action of the clearing relay. It was noted that the armature of the slot coils had considerable lost motion, the residual pins were battered or worn so that there was but 0.005 inch air gap between armature and face of the lower coil pole, and considerable residual magnetism was also present. An inspection for mechanical friction and lost motion of moving parts failed to disclose any defective condition that would alone account for this failure. Maintainer Graham, in reply to a question as to whether or not he complied with previous instructions to remove a certain guide on the rod connection between the semaphore and the mechanism, said, "There was no guide on it." On December 12, the guide referred to was discovered and removed together with two pieces of iron that had fallen into the interior of the pole. It is not believed, however, that these pieces entered into a combination that would create a condition affecting the downward movement of the connecting rod. On December 10, when the slot coils were completely disconnected from the local battery, the armature of the slot coils on two occasions remained in the latching position and the semaphore arm remained in clear position for periods of several minutes before the armature released and the semaphore returned to caution position, in the first instance the period of time was more than eight minutes and in the second instance it returned to normal position in four or five minutes. While these false clear conditions existed, examination showed that the armature was attracted to the slot coil pole faces by residual magnetism, but tests failed to determine to what extent, if any, mechanical friction or obstruction of moving parts contributed to this condition.

### Conclusion.

This accident was caused by a false clear indication of eastbound distant signal No. 2.

The testimony of the employees involved, together with the results of careful examination and tests of the circuits and apparatus, indicates that the distant signal failed to assume the caution position after it was cleared for train No. 23 at 12.40 a.m., on the morning of the accident, believed to have been due to defective signal mechanism, and that this signal remained in clear position until after the time of the accident.

The operating rules of both railroads require that when a signal is placed out of service it must be secured so as to display its most restrictive indication. Maintainer Granar was apparently under the impression that when he removed the connecting rod of the electric lock and rotated the commutator so as to open the control circuit of the clearing relay, reported the signal out of service and observed its position as stated, he had secured the signal in its most restrictive indication. This, however, was not the case, for upon his arrival at the signal shortly after the accident he found it in the clear position with a train in the block. At the time of the earlier trouble with this signal there was some discussion as to the possibility of a false clear failure of this signal. In view of this fact it would appear that Maintainer Granar, in the present instance, should have exercised particular care to take steps which would insure that this signal was in the caution position and that it would, beyond any question of doubt, remain in that position until the cause of the failure was removed.

He should have realized that the most dangerous cause of a failure of the electric lock to release the lever is the possibility of the distant signal not having returned to caution position. Instead of merely opening the normal circuit to the control relay, he should have disconnected the signal operating battery at the signal mechanism and by proper inspection at the signal he should have made certain that it was secured in its most restrictive position. It appears, however, that he depended in a measure upon Dispatcher Kirby to notify eastbound Pennsylvania trains that this signal was out of service, to afford necessary protection, but this did not relieve him from the responsibility of properly performing his duty as required by the rules. Had this signal been secured in caution position until the trouble was located and corrected this accident would undoubtedly have been averted.

Inasmuch as Dispatcher Kirby was in communication with MI tower at about 7 a.m. in regard to the distant signal and the plant not working properly and that he was asked for protection against an eastbound train on this account, was later advised by the operator at MI tower that the protection would not be necessary, and then still later was given a verbal message, relayed by the operator at Cedarville, that the eastbound distant signal at MI tower was out of service and asked to put out a notice to this effect, it is believed that he should have communicated with the operator at MI tower at once and made certain that the signal was in proper position to furnish adequate protection.

Had an adequate automatic train control device been in use at this point, this accident would probably have been prevented.

None of the employees involved in this accident had been on duty in violation of any of the provisions of the hours of service law.

Respectfully submitted,

W. F. BORLAND,

Director.