INTERSTATE COMMERCE COMMISSION

WASHINGTON

INVESTIGATION NO. 2489

THE PENNSYLVANIA RAILROAD COMPANY

REPORT IN RE ACCIDENT

NEAR BADEN, PA., ON

MARCH 16, 1941

SUMMARY

Railroad:	Pennsylvania
Date:	March 16, 1941
Location:	Baden, Pa.
Kind of accident:	Derailment
Train involved:	Passenger
Train number:	316
Engine number:	3773
Consist:	5 cars
Speed:	60-70 m. p. h.
Operation:	Automatic block-signal system
Track:	Four; tangent; level
Weather:	Snow and strong wind
Time:	9:03 p. m.
Casualties:	5 killed; 121 injured
Cause:	Accident caused by malicious tampering with track.

INTERSTATE COMMERCE COMMISSION

INVESTIGATION NO. 2489

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS
UNDER THE ACCIDENT REPORTS ACT OF MAY 6, 1910.

THE PENNSYLVANIA RAILROAD COMPANY

May 1, 1941

Accident near Baden, Pa., on March 16, 1941, caused by malicious tampering with track.

REPORT OF THE COMMISSION[1]

PATTERSON, Commissioner:

On March 16, 1941, there was a derailment of a passenger train on the Pennsylvania Railroad near Baden, Pa., which resulted in the death of 2 passengers, 2 employees off duty and 1 train-service employee on duty, and the injury of 102 passengers, 3 dining-car employees, 1 Pullman porter, 10 employees off duty and 5 train-service employees on duty. This accident was investigated in conjunction with the Pennsylvania State Public Utility Commission.

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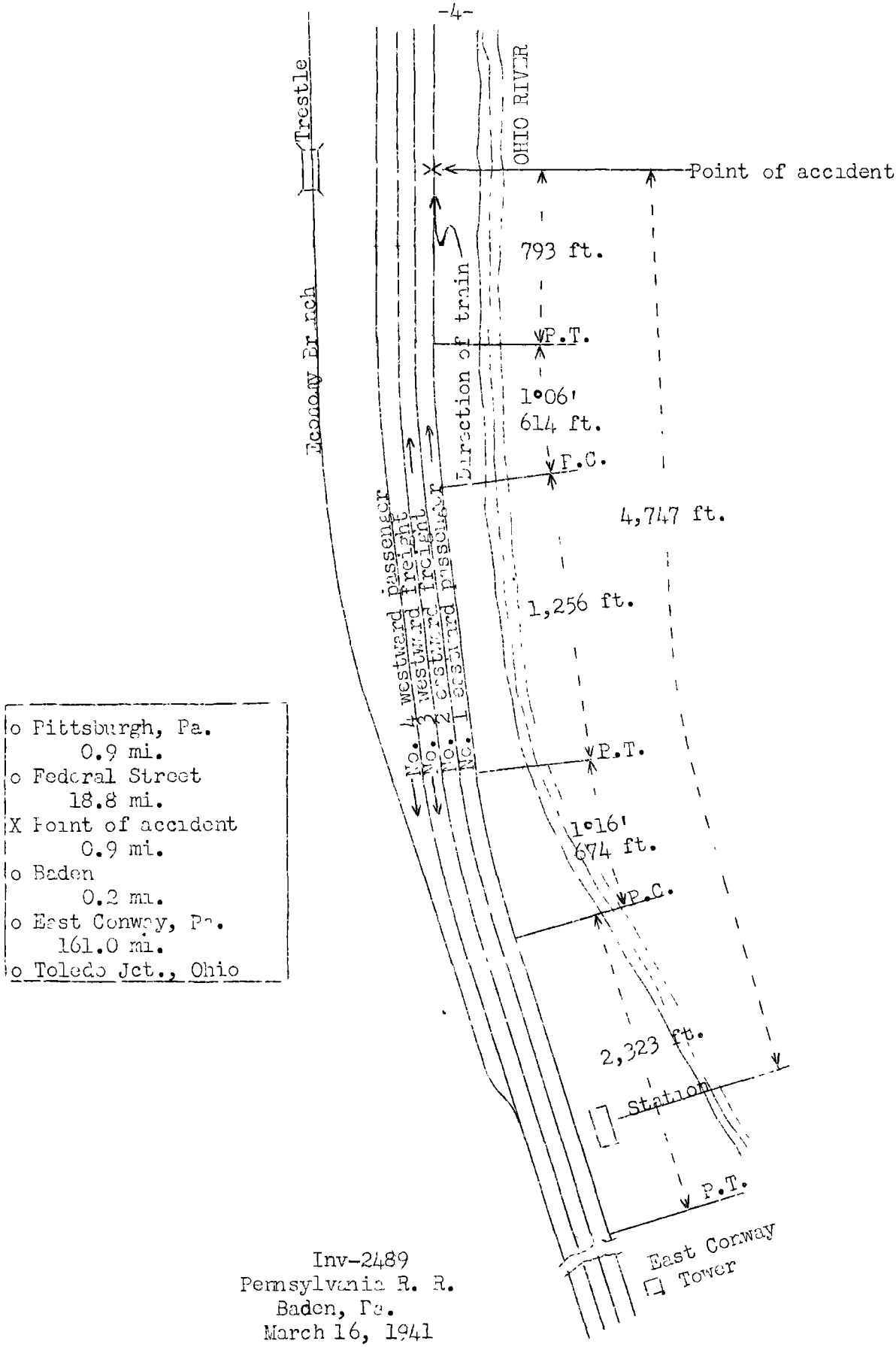
[1] Under authority of section 17(2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Patterson for consideration and disposition.



o Pittsburgh, Pa.
0.9 mi.
o Federal Street
18.8 mi.
X Point of accident
0.9 mi.
o Baden
0.2 mi.
o East Conway, Pa.
161.0 mi.
o Toledo Jct., Ohio

Inv-2489
Pennsylvania R. R.
Baden, Pa.
March 16, 1941

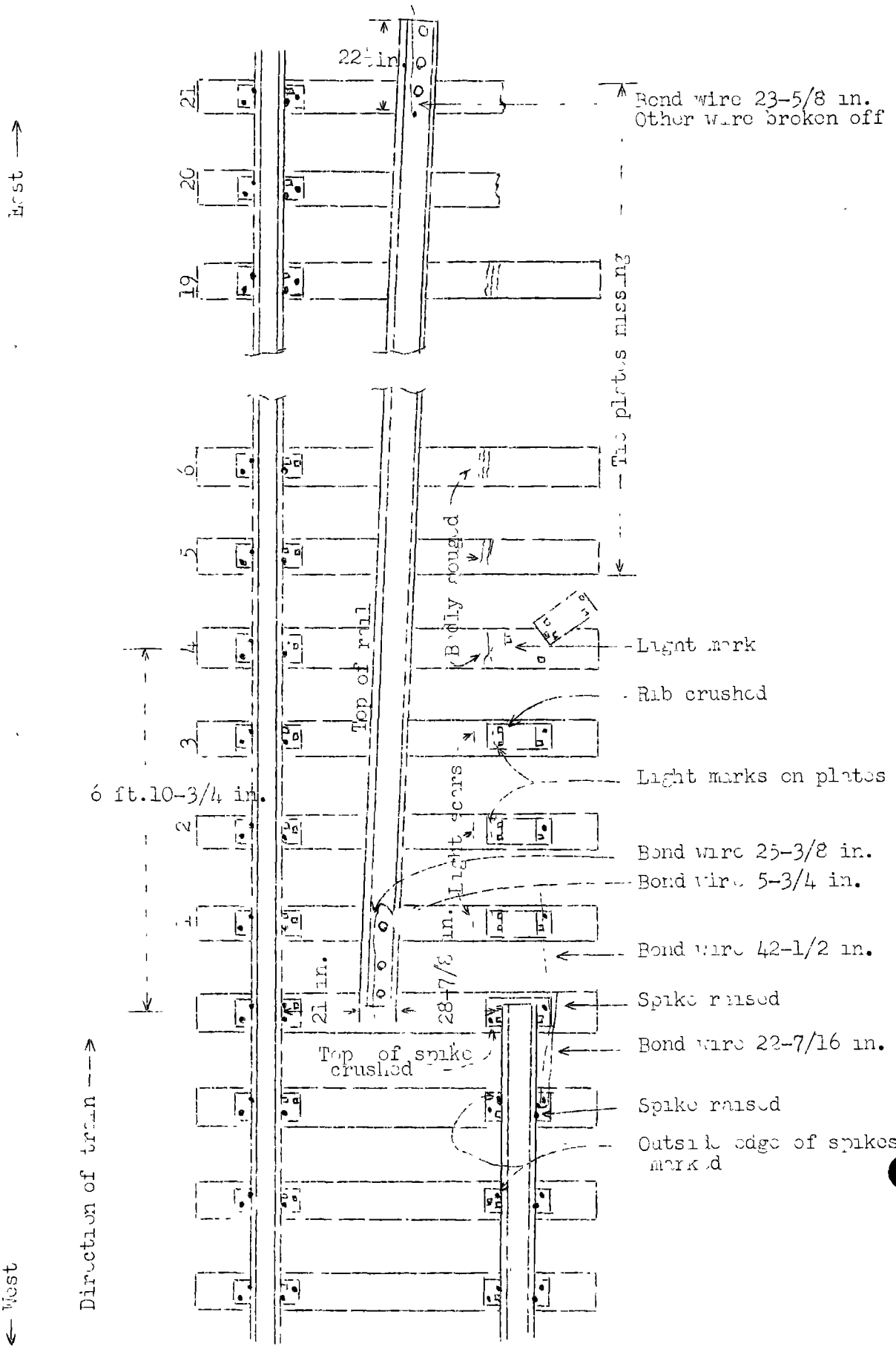
Location and Method of Operation

This accident occurred on that part of the Eastern Division which extends between Toledo Junction, Ohio, and Federal Street, Pittsburgh, Pa., a distance of 180.9 miles. In the immediate vicinity of the point of accident this is a four-track line over which trains moving with the current of traffic are operated by an automatic block-signal system, the indications of which supersede time-table superiority. The tracks from south to north are: No. 1, eastward passenger; No. 2, eastward freight; No. 3, westward freight; and No. 4, westward passenger. The accident occurred on track No. 1 at a point 4,747 feet east of the station at Baden. As the point of accident is approached from the west there are, in succession, a tangent 2,323 feet in length, a 1°16' curve to the right 674 feet, a tangent 1,256 feet, a 1°06' curve to the right 614 feet, and a tangent 793 feet to the point of accident and approximately 900 feet beyond. The grade for east-bound trains is, successively, 0.05 percent descending a distance of 3,531 feet, 0.27 percent ascending 1,964 feet and level 1,232 feet to the point of accident.

In the vicinity of the point of accident the tracks are laid on a hillside cut and parallel generally the north shore of the Ohio River. At 6 a.m., March 17, 1941, track No. 1 was 32.5 feet above the level of the water and the center-line of the track was 58.75 feet horizontally distant from the north shore. The embankment slopes toward the river at a ratio of 1 to 1-1/2 and its top is 12 feet horizontally distant from the center-line of track No. 1. At the north the ground rises in a gradual slope until, at a distance of 112.5 feet north of the center-line of track No. 4, it is 30 feet above the top of the rail.

The track structure consists of 130-pound P. S. rail, 39 feet in length, laid new in 1929 on 22 treated oak and gum ties to the rail length; it is fully tieplated with double-shoulder tieplates, spiked with one rail-holding spike and one plate-holding spike on the outside of the rail and one rail-holding spike on the inside of the rail; also, on about 30 percent of the ties there is one plate-holding spike on the inside of the rail. An average of 6 rail anchors per rail length are provided. Angle bars are 38-1/2 inches in length and have 6 holes. The angle-bar bolts are secured by nuts and lock washers. The track is laid on 28 inches of limestone and is well maintained. The gage varied between 4 feet 8-1/2 inches and 4 feet 8-3/4 inches.

The rail joints are bonded for signal circuits with two seven-strand conductor cables, each of which is 42 inches in length; six strands are of steel, the center strand is of



Sketch of track as found after accident occurred.

copper, and each strand is 77 millimeters in diameter. The two cables are secured to terminal pins that are driven into 3/8-inch holes in the center of the web of the rail 2-1/2 to 3 inches outside the ends of the angle bars. The cables are supported by a standard clip secured on one of the two bolts nearest to the rail ends.

Approach signal No. 220 and an interlocking home signal at East Conway, which govern eastward movements on track No. 1, are mounted on signal bridges located 12,714 and 6,939 feet, respectively, west of the point of accident; both signals are of the 2-unit, position-light type. Signal 220 is automatic and its normal indication is approach; the home signal is semi-automatic and its normal indication is stop. The home signal operates in conjunction with the next signal in advance, which is an automatic signal located 10,332 feet east of the home signal.

In the vicinity of the point of accident the maximum authorized speed for passenger trains is 70 miles per hour.

It was snowing and there was a strong wind at the time of the accident, which occurred at 9:03 p.m.

Description

No. 316, an east-bound passenger train, with Conductor White and Engineman Wiegel in charge, consisted of engine 3773, of the 4-6-2 type, one baggage car, two coaches, one cafe-coach and one Pullman sleeping car, in the order named; all cars were of steel construction. This train departed from Cleveland, Ohio, 117.2 miles west of Baden, at 6:17 p.m., according to the train sheet, 2 minutes late, entered the Eastern Division at Homewood Jct., Pa., 14.2 miles west of Baden, at 8:46 p.m., 2 minutes late, stopped at Rochester, 5.3 miles west of Baden, and departed from that point at 8:56 p.m., on time, passed approach signal No. 220 and the interlocking home signal at East Conway, which displayed proceed indications, passed the interlocking tower at East Conway, 0.2 mile west of Baden, at 9:02 p.m., on time, and, while moving at a speed estimated to have been between 60 and 70 miles per hour, became derailed 0.9 mile east of Baden.

The engine and the tender, remaining coupled, were derailed to the right and stopped on their right sides with the front end of the engine 610 feet beyond the point of derailment and on track No. 1, and the rear end of the tender down the embankment, 30 feet south of the track. The engine truck was detached but the safety chains held intact. Both engine-truck side-frames were broken near the pedestals of the No. 2

pair of wheels. The cab was crushed and the independent brake valve, the automatic brake valve, the distributing valve, and the reverse gear were broken off. Both tender trucks were detached. All the cars of the train were derailed to the right and became separated; however, no couplers were broken or twisted. The baggage car stopped practically upright, in the river, with its front end 70 feet and its rear end 95 feet south of track No. 1. About one-third of its superstructure was submerged, the side sheets were badly dented, both ends were crushed inward and the upper deck of the roof was caved in a distance of 20 feet at the rear end and about 10 feet at the front end, and both trucks were detached. The second car stopped on its right side behind the first car, in the river, with its front end in 7 feet of water and 105 feet south of track No. 1; the rear end was in 18 inches of water and 60 feet south of track No. 1. Two rails, remaining connected, protruded through the floor of this car at the front end and extended diagonally toward the roof at the rear end. The right side-sheets were dented; the bulkheads, the end sheets and the roof were crushed at both ends, and the center-sill was bent at both ends. The third car stopped down the embankment, badly damaged, with its front and rear ends, respectively, 60 feet and 40 feet south of track No. 1, and leaned toward the south at an angle of 20 degrees. The fourth car stopped down the embankment on its right side, parallel to the track and 55 feet from it, with the front end in about 6 inches of water; the center-sill was bent at both ends, the roof was crushed inward at eight places, and the right side-sheets were crushed inward between 2 and 4 inches at various points; 18 windows on the right side and 12 windows on the left were broken; partitions between the kitchen and the dining room and between the dining room and the passenger compartment were torn loose. The fifth car stopped with its front end 15 feet south of track No. 1 and its rear end on the roadbed; it leaned toward the south at an angle of 45 degrees and was but slightly damaged.

The train-service employee killed was the engineman and the train-service employees injured were the fireman, the conductor, the baggageman, the brakeman and the flagman.

Summary of Evidence

Fireman Milburn stated that at Cleveland a terminal air-brake test was made, a running test was made 2 miles east of the station, 9 stops were made en route, and the brakes functioned properly. As his train was approaching the point where the accident occurred, the headlight was burning brightly and both he and the engineman were maintaining a lookout from their respective sides of the cab. At East Conway, approach

signal 220 and the home signal displayed proceed indications for his train. After the train passed East Conway the engineman sounded the whistle signal for a road crossing, then increased the speed to between 65 and 70 miles per hour. It was snowing and a strong wind prevailed, which blew the smoke down first on one side of the engine and then on the other. The storm restricted visibility to a distance of 600 feet at times, then would break so that visibility was better. Throughout the trip the engine rode smoothly. At a point about 4,700 feet east of Baden station, just after the fireman called the indication of the next signal in advance and before the engineman could reply, the engine started to rock, thrust hard toward the right, then toward the left, and then overturned down the embankment to the right. When the engine made the first thrust the engineman applied the air brakes in emergency. Prior to the accident the fireman did not see anything wrong with the track ahead nor any person standing nearby. When he was extricating himself from the overturned engine he saw two men standing on the bank above track No. 4. The reflection from the blast furnaces across the river made it possible to see objects plainly. The fireman expressed the opinion that the engineman did not see any defective condition of the track. The throttle remained open to some extent, as the driving wheels continued to revolve for several minutes after the derailment.

Conductor White stated that at Cleveland his train was inspected, a terminal air-brake test was made before the train departed and the brakes functioned properly en route. As his train was approaching the point where the accident occurred, it was riding smoothly and the speed was about 60 miles per hour when the air brakes became applied in emergency, and immediately afterward the cars became derailed. The accident occurred at 9:03 p.m., at which time the blast furnaces across the river illuminated the surroundings so that objects could be seen plainly. There was a strong wind, and snow was falling at intervals. Soon after the accident occurred he observed that a rail had been displaced from the right side of the track and was lying in the center of the track at the point of derailment. The angle bars, angle-bar bolts and spikes were missing. In his opinion the rail had been displaced prior to the passage of his train, as there was no indication that his engine thrust it out of place.

Brakeman Simms estimated that the speed was 60 to 65 miles per hour when the accident occurred.

Flagman Bigley stated that he felt the air brakes being applied in emergency just before the train was derailed. Immediately after the accident occurred, he proceeded westward

to provide flag protection and saw no indication of equipment having been dragged or of any obstruction on the track. He did not examine the track at the scene of accident.

Superintendent Rex stated that he arrived at the scene of accident at 9:59 p.m. He inspected the engine and the cars but found no indication of defective equipment which could have contributed to the cause of the derailment. He inspected the track westward from the point of derailment and found no indication of defective track or dragging equipment. At a point about 100 feet west of the last derailed car, and 4,747 feet east of the station at Baden, a rail on the south side had been displaced from its normal alinement and was lying on its side in the center of the track, with the head of the rail turned to the north. Starting at the first tie east of the receiving end of the misplaced rail, hereinafter referred to as tie No. 1, all rail-holding spikes had been removed. The angle bars had been removed from both ends of the rail and could not be found at the time the first examination was made. The angle-bar bolts, nuts and lock-nut washers were missing. The tieplates on the south ends of the first three ties east of the receiving end of the misplaced rail remained in place and the tieplate on the fourth tie was torn loose and lying near the end of the tie. The remainder of the tieplates that had been under the rail involved were torn loose by derailed equipment. Examination disclosed that, of the tieplates remaining on the ties, the holes in the tieplates were in line with the holes in the ties and that the points of the rail-holding spikes had been pulled through the tieplates; this condition would not have existed had the rail been displaced by the derailed equipment. The conductor cables were broken at each end of the misplaced rail and appeared to have been severed by force and not by cutting, or by having been run over by wheels. At the receiving end of the misplaced rail a batter mark 3/32 inch in depth and chamfered upward to the top of the head in a distance of 5/16 inch indicated that the rail in its original position had been struck by wheels. He said that because of the angularity of the batter mark, apparently the angle bars and a considerable number of spikes had been removed prior to the passage of No. 22, which preceded No. 516, and the loosened end rose and fell as wheels passed over the joint. When No. 22 passed, the rail apparently was held in alinement by the double-shoulder tieplates and some spikes, but was free to move vertically. Marks on the base of the rail indicated that after the rail was overturned it was struck heavy blows by either brake beams, safety rods, or steam-heat connections, which thrust the rail inward to the position in which it was found after the accident. During the process of moving inward, the conductor cables were severed. Measurements

disclosed that the west and east ends of the rail were, respectively, 28-7/8 inches and 22 inches inward from the gage side at their original locations. Starting on tie No. 4, there were deep flange marks on the top of the south ends of the remaining ties of the panel from which the rail had been removed. These marks progressively increased toward the east until the more easterly ties were badly splintered. The south ends of the ninth, twelfth, thirteenth, twentieth, and twenty-first ties were broken off. The two rails immediately east of the rail involved, remaining connected, were found in the second car. The receiving end of the rail adjacent to the east end of the misplaced rail was formed into a blunt wedge-shaped, because of having been struck heavy blows by wheels. There were light marks on the heads of the rail-holding spikes on the gage side of the leaving end of the rail west of the misplaced rail. The inside plate-holding spike at the joint was crushed. There also were light marks on the tieplates that remained on the ties and that were spiked on the outside; the rib on the third tieplate was crushed. The north rail just west of the point of derailment remained secure on its ties but was shifted to the north slightly as a result of wedging action as various units of equipment became derailed. East of the misplaced rail the engine apparently straddled the south rail, which acted as a guard rail, and the engine proceeded on the roadbed to the point where it overturned. Later, 26 track spikes, 3 six-hole angle bars, 3 tieplates, 3 bolts, 1 nut, 2 lock-nut washers, 2 wrenches and 1 claw bar were found scattered down the bank opposite the misplaced rail within an area of 47.5 feet along track No. 1 and 55 feet to the edge of the river. One wrench, which was provided with a pipe-extension handle, was found opposite the west end of the rail at the edge of the water, but the jaws were too small to fit the nuts of the angle-bar bolts in use. The other wrench was found in the water opposite the east end of the rail, and was of the proper size to fit a 1-7/8-inch nut; it was a standard P. R. R. tool bearing the inspection mark of the P. R. R. A nut, a bolt and a spike also were found in the water. The claw bar, which had a distinctive Pennsylvania Railroad feature, a crinkle in the handle, was found opposite the east end of the rail at the edge of the water; however, it did not have the Pennsylvania Railroad inspection mark and the chisel end was not of standard dimensions. The claw end had been reforged some time after it was manufactured but a die had not been used in accordance with the company's requirement, as the jaws were irregularly spaced. Examination of two angle bars found opposite the west end of the rail disclosed that the bolts had been removed by means of a wrench. There were gouges on the sides of the bars cut by lock-nut washers when they were forced backward as the nuts were being removed. No broken or sheared nuts and bolts were found. It was his opinion that the bolts had been unscrewed by one inexperienced in track work. The spikes indicated that

they had been pulled by someone who was experienced in the use of a claw bar. It was his opinion that, after the angle bars and the spikes had been removed, the rail was turned over on its side and moved inward, as far as the bond wires would permit, by the use of the claw bar at the east end and the small track wrench at the west end. He thought the work of disconnecting the rail had started at the west end and progressed to the east end, and that the standard track-bolt wrench and the claw bar were thrown toward the river opposite the east end of the misplaced rail. It was his opinion that the rail was removed by a person, or persons, with malicious intent.

Division Engineer Meintel stated that he arrived at the scene of the accident at 11:30 p.m. He inspected the track and found the conditions as described by Superintendent Rex. The division engineer was convinced that the rail had been moved with intent to cause a derailment. The first mark was on the inside rib of the third tieplate east of the west end of the misplaced rail. The marks on the outside edges of the spikes on the gage side of the south rail just west of the misplaced rail indicated that, after the engine truck became derailed, some following wheel was derailed and struck these spikes. Throughout a distance of 663 feet west of the point of derailment, the gage varied between 4 feet 8-1/2 inches and 4 feet 8-3/4 inches and the greatest variation in cross levels was 1/4 inch. Throughout this distance there was no indication of defective track or of dragging equipment which could have contributed to the cause of the accident. The track was destroyed a distance of 635 feet east of the point of derailment.

Engineer of Maintenance of Way Crew stated that he arrived at the scene of accident about 10:15 p.m. and found the misplaced rail lying in the position described by the superintendent; its receiving end was 3/4 inch west of its normal longitudinal position in the south rail. The rail apparently first lay somewhat nearer its normal alinement and was then thrust inward to its final position by being struck by the derailed equipment. There was a slight depression on the top of the head of the receiving end but no corresponding mark on the leaving end of the adjacent rail to the west. This indicated that after the angle bars had been removed and before the rail itself had been misplaced there was a vertical movement of the rail under the impact of passing wheels of a train preceding No. 316; however, he did not think this slight depression was sufficient to be noticeable to trainmen on moving trains. On the leaving end of the first rail west of the misplaced rail, broken portions of two conductor cables remained attached; one was 42-1/2 inches long and the other was 22-7/16 inches. On the receiving end of the misplaced rail the portions of conductor cable were 5-3/4 inches and 25-3/8 inches

in length and on the leaving end a portion 23-5/8 inches long of one cable remained attached. The conductor cables were severed by force as the strands, being reduced in section, indicated tensile strain. He searched along the bank for parts of the track structure and found track spikes, tie-plates, angle bars and the smaller wrench, and later another six-hole angle bar, which probably had been in the joint at the east end of the rail, was found. The sharp ends of the spikes were shiny and pieces of wood fibre adhered to some of them. There were marks on the underside of the heads where a claw bar had been in contact with them. The spike-holes in the ties were straight, and the wood not being mashed or torn indicated that the spikes were pulled by someone experienced in track work. He observed broken limbs on a willow bush just above the place where the claw bar was found, and concluded that the bar had been thrown from the track through the willow bush to the bottom of the bank. The jaws of the bar were bright and apparently had been used recently. Because of the position in which the rail was found, the facts that the spikes remained practically straight after being pulled, that the angle bars and angle-bar bolts were not broken, and that there were no hammered or crushed marks in the bolt holes of the leaving end of the adjacent rail westward, indicated to him that the misplaced rail was maliciously removed from its normal position before the passage of No. 316. On March 18, a test was conducted on the ninth rail westward from the misplaced rail to determine the time necessary for one man, using a standard track wrench and a claw bar, to remove the angle bars from each end, to draw all rail-holding spikes, and to move the rail inward. The nuts of 12 bolts were removed, the bolts withdrawn and the angle bars removed from both ends of the rail in 15 minutes 40 seconds and 44 spikes were pulled in 7 minutes 50 seconds. The rail was moved inward 18-1/4 inches, the limit permitted by the conductor cables, in 3 minutes 5 seconds. The total time consumed was 26 minutes 35 seconds.

Supervisor of Track Sipe stated that he arrived at the scene of the accident at 11:15 p.m. He inspected the track on his arrival at the scene of accident and found conditions as described by the superintendent. The track is patrolled by the track foreman once weekly and by one of the trackmen twice weekly. The track had last been patrolled on the afternoon of March 15. After the accident occurred a check was made of each tool-house and tool-box on his subdivision. No tools were missing or unaccounted for and none of the tool-houses or boxes was found unlocked nor was any lock forced open.

Section Foreman Liposcack stated that he had been in charge of the section involved since 1907. He had had no

occasion to discharge any trackman for several years. The last spot surfacing that was done on track No. 1 was in 1940. On March 8 he gaged track No. 1 and checked the cross levels in the vicinity of the point of accident. It was his opinion that the rail was deliberately removed prior to the passage of No. 316.

Trackman Graham stated that he patrolled the tracks during the afternoon of March 15. He walked westward on track No. 1 and about 1:30 p.m. passed the point where the accident later occurred; at that time track No. 1 was in good condition.

Supervisor of Telegraph and Signals Hendricks stated that the conductor cables at each end of the misplaced rail had been severed by a pulling force as companion strands were broken in different lengths. A rail could be moved toward the center of the track a distance of 18-1/4 inches from its normal position without disconnecting or breaking the bond wires. About 11 p.m., March 16, checks of the signal circuits and relays were made, and again after the track was restored to service; the signals functioned normally.

Signal Maintainer Graham stated that if the conductor cables had been severed prior to the passage of No. 316, the most favorable indication that train could have received at the home signal at East Conway would be a stop-and-proceed indication.

Assistant to Chief Engineer Maintenance of Way Code, Chief Car Inspector Moir, and Trainmaster Wisegarver, members of the general manager's investigation committee, stated that they arrived at the scene of accident between 11:40 p.m. and midnight, and found the track conditions as previously described. Examination of the engine, the tender and the cars disclosed no condition that could have contributed to the cause of the accident. Since the misplaced rail was undamaged, since it was disconnected at each end and there were no broken angle bars or broken angle-bar bolts, since all track spikes were neither bent nor twisted, and since the track and the equipment were in good condition, it was their opinion that some person, or persons, maliciously removed the rail with the intention of causing a derailment.

Private Greenwald, of the Pennsylvania State Motor Police, stated that he arrived at the scene of the accident at 9:30 p.m. Since there were no foot-prints in the snow, it was his opinion that he was the first to walk along the embankment after the accident. At a point opposite the leaving end of the misplaced rail he found a track claw bar partially in the

water and about three-fourths of it covered with snow; the points were shiny as though it had been used recently. On the bank above the claw bar there was a willow bush with freshly broken limbs. Apparently the bar had been thrown from the track, passed through the bush and landed at the edge of the river. About 40 feet west of the bar he found a pair of angle bars. His statement concerning the track conditions at the point of derailment corroborated the statements of other witnesses.

Detective Winlow, of Beaver County, Pa., stated that he arrived at the scene of accident about 10 p.m. He assisted in searching for the various parts of the track structure. The angle bars were unbroken but were scratched where lock-nut washers revolved when the nuts were loosened. The spikes being practically straight indicated that they had been pulled by a bar and not torn out by the rail overturning during the derailment. The spike-holes in the ties were clean and straight and the rail was practically undamaged. The bond wires were broken as a result of tensile strain. These conditions indicated to him that there had been malicious tampering with the track prior to the passage of No. 316. He said that State highway patrolmen guarded the various parts of the track structure at the point of derailment so that nothing was disturbed until the investigation was completed.

Earl Denton, identification expert of the Pennsylvania State Motor Police, stated that at 3 a.m., March 17, he took numerous photographs of the misplaced rail, derailed equipment, and the recovered claw bar, angle bars, nuts, bolts, washers and spikes. These photographs portrayed conditions to be as described by other witnesses.

R. H. Gregory, an employee of the U. S. Department of Engineers, at Shields, Pa., stated that on March 20 he found a wrench opposite the point of derailment about 10 or 12 feet from the shore in water 3 feet deep. It was about 4 feet in length and the jaws were spaced about 2 inches apart; it was not rusty and did not appear to have been in the water very long.

Captain of Police Gauvey, of the Pennsylvania Railroad, stated that he arrived at the scene of accident at 11:10 p.m., and found the track structure in the condition as previously described. It was his opinion that the conditions found indicated sabotage.

Master Mechanic Chaffin stated that he arrived at the scene of accident at 1 a.m., March 17, and inspected engine 3773 as it lay on its side and again after it was removed to Conway Shop. It was his opinion that prior to the derailment

the engine was in suitable condition for service. Because of the damage in the cab it was impossible to determine the position of the brake valves, the throttle and the reverse lever at the time of the accident. Both sides of the engine-truck frame were broken back of the center casting. He observed the misplaced rail and was of the opinion that it had been removed from the track prior to the accident.

Road Foreman of Engines Hanna stated that he arrived at the scene of the accident about 12:01 a.m., March 17. He inspected engine 3773 and found the engine-truck springs and equalizers, the driving-box springs, spring saddles, spring hangers, equalizers, pins and clips in good condition. The driving-box shoes and wedges and the chafing castings between the engine and the tender were well lubricated. His examination failed to disclose any condition that could have contributed to the cause of the accident.

Enginehouse Foreman Bonhoff stated that, in the presence of the Commission's inspectors, he inspected engine 3773 at Conway enginehouse on March 18. The back-to-back measurements of all pairs of wheels of the engine disclosed the spacing to be within the prescribed limits. All flanges were of good contour, over 1 inch in thickness, and their heights were within the tolerances permitted. Diameters of companion wheels did not vary more than 2/32 inch. All lateral motion was within the prescribed limits and the maximum tread wear was 2/32 inch. The trailer-truck frame was in good condition except that one side-bearing was lost during the process of rerailing the engine. The buffer castings between the tender and the engine were in good condition and the buffer springs were under proper compression. The splash partitions in the tender were in place and securely fastened. In his opinion the engine was in safe and suitable condition for service prior to the derailment.

Machinist-Inspector Baker stated that he inspected engine 3773 before its departure from Cleveland and it was in safe and suitable condition for service.

Car Inspectors Kozlik and Nupp, at Cleveland, stated that they inspected the equipment of No. 316 before its departure and made a terminal air-brake test. The equipment was in good condition and all brakes functioned properly.

Engineman Bruce and Fireman Phillips, of the first engine of No. 22, the last train to pass over the point involved prior to No. 316, stated that about 8:45 p.m., March 16, their train, moving on track No. 1 at a speed of about 65 miles per hour, passed over the point where the accident later occurred. Both

were maintaining a lookout ahead from their respective sides of the cab. There was no unusual condition of the track. Snow restricted visibility so that it would have been difficult to observe any person in the vicinity of the tracks.

Engineman Smith, of the second engine of No. 22, corroborated the statements of the crew of the first engine.

Fireman Eidson, of the second engine of No. 22, stated that, as his train was approaching the point where the accident later occurred, he was leaning out the side cab-window and maintaining a lookout ahead. The storm ceased momentarily and the moon shone through a rift in the clouds. By its light and the light from the blast furnaces across the river, he saw two men standing along track No. 4 opposite the point where No. 316 later was derailed. Because of the storm he wondered why these men were standing and not walking to keep warm. He noticed no unusual condition of the track nor did he hear any unusual click as his engine passed over the place where the rail was later removed.

According to data furnished by the railroad, the total weight of engine 3773 was 320,000 pounds, distributed as follows: Engine truck, 53,200 pounds; driving wheels, 210,300 pounds; trailer truck, 57,500 pounds. The tender was rectangular in shape and had two four-wheel trucks. The weight of the tender loaded was 221,500 pounds. The diameters of the engine-truck wheels, the driving wheels and the trailer wheels were, respectively, 36 inches, 79-26/32 inches, and 50 inches. The rigid wheel-base was 13 feet 10 inches in length and the total length of the engine and tender was 82 feet 11-3/4 inches. The last Class 3 repairs were made at Altoona Works, Pa., on August 3, 1940. The last monthly certificate was received at Crestline, Ohio, March 14, 1941. The accumulated mileage since the last class repairs was 47,515 miles. After its last monthly inspection this engine was placed in service on March 15.

Observations of the Commission's Inspectors

Inspection by the Commission's inspectors of track No. 1 throughout a distance of 1 mile west of the point of accident disclosed that it was well maintained. There were no indications of dragging equipment or of wheel marks. They found the track at the point of derailment to be as previously described. The conductor cables, the recovered claw bar, wrenches, spikes, angle bars and angle-bar bolts were found to be as previously described. The engine truck of engine 3773 was examined at the scene of the accident, and engine 3773 was examined at Conway Enginehouse. Apparently there was no condition of the engine existing prior to the derailment which could have contributed to its cause.

Discussion

According to the evidence, No. 316 was moving at an estimated speed of 60 to 70 miles per hour when it became derailed. The maximum authorized speed for this train in this territory was 70 miles per hour. The engine and cars were riding smoothly and there was no condition about them that would cause the derailment. There was no indication of equipment having been dragged and the track immediately west of the point of derailment was structurally sound. The last signal, which was an interlocking signal that operated in conjunction with an automatic signal located about 1 mile east of the point of accident, displayed proceed for No. 316. Because of blowing snow, visibility was restricted to a distance of about 600 feet; however, the first the fireman knew of an abnormal track condition was when he felt the engine suddenly roll and then thrust toward each side. Apparently the engineman, who was killed in the accident, did not see any abnormal condition as he did not apply the brakes in emergency until after the first thrust occurred.

Soon after the accident occurred, several railroad officials and employees and some officers of the State of Pennsylvania found one of the south rails lying near the center of the track. The first mark of derailment, a flange mark on a rib of the third tieplate east of the west end of the misplaced rail, indicated that this rail had been removed before No. 316 was derailed. All rail-holding spikes, the two pairs of angle bars, the angle-bar bolts and the nuts were missing, but later most of these were found scattered on the embankment between track No. 1 and the river. The angle bars were undamaged; however, they bore marks which were apparently made by the lock-nut washers turning when the nuts were being removed from the bolts. The condition of the bolts indicated that the nuts had been removed by a wrench. The spikes were practically straight. The spike-holes and marks on the lower surfaces of the heads of the spikes indicated that the spikes had been removed by means of a claw bar. Two track wrenches and a claw bar were found near the edge of the river. One of the wrenches would fit the nuts of the bolts, and the claw bar bore indications of recent use. This evidence is conclusive that some time before No. 316 was derailed the rail involved was loosened and shifted inward from its normal position. The exact time the rail was shifted is not known. When the track was last patrolled, about 30 hours prior to the time of the derailment, no abnormal condition was observed. The last train prior to No. 316 passed the point involved about 18 minutes before the accident occurred and the crew did not observe any abnormal condition; however, a fireman on this train saw two men standing nearby and a batter mark on the receiving end of the misplaced rail indicated that part of the

work of loosening the rail had been done before this train passed the point involved. In a test conducted two days after the accident occurred, one man loosened and removed a rail from its normal position in 26 minutes 35 seconds. After the accident the fireman of No. 316 saw two men on the bank above track No. 4.

The evidence indicates that the conductor cables at the ends of the displaced rail were not broken when the rail was moved toward the center of the track. The investigation disclosed that the conductor cables used as rail bonds on this line permit a rail to be moved laterally as much as 18 inches without interference with the electrical connections. Rail-bond connections can be arranged so as to restrict to a considerable extent the possible lateral displacement of a rail without interference with the normal operation of the signal system, and such an arrangement would render it somewhat more difficult to set up a defective condition in the track without causing the display of restrictive signal indications.

Cause

It is found that this accident was caused by malicious tampering with the track.

Dated at Washington, D. C., this first day of May, 1941.

By the Commission, Commissioner Patterson.

(SEAL)

W. P. BARTEL,

Secretary.