

REPORT OF THE CHIEF OF THE BUREAU OF SAFETY
COVERING THE INVESTIGATION OF AN ACCIDENT
WHICH OCCURRED ON THE PHILADELPHIA & READ-
ING RAILROAD NEAR FORT WASHINGTON, PA., ON
JANUARY 13, 1919.

APRIL 10, 1919.

TO THE COMMISSION :

On January 13, 1919, there was a rear-end collision between two passenger trains on the Philadelphia & Reading Railroad near Fort Washington, Pa., which resulted in the death of 13 passengers and 1 employee off duty and the injury of 22 passengers.

As a result of the investigation of this accident, I respectfully submit the following report :

This accident occurred on the Bethlehem Branch of the New York Division of the Philadelphia & Reading Railroad, approximately one-half mile south of Fort Washington station and about 15 miles north of Philadelphia. In this vicinity the Bethlehem Branch is a double-track line, over which the movement of trains is governed by time-table, train orders, and an automatic block signal system.

The block signals are of the inclosed disk type, controlled and operated by the normal danger system. Two disks—a home and a distant—are located on each mast; the stop indication consists of a red risk above a green disk; caution, a white disk above a green disk; and clear, two white disks. At night similar indications are displayed by means of lights. On this line the distant signal is not controlled by the position of the home signal, but it is controlled directly by the track circuits of the two block sections in advance.

The signals in this vicinity governing northbound traffic are numbered 309, located at Oreland, 311 located just south of Camp Hill station, and 313 located approximately 2,000 feet south of Fort Washington. The distance between signals 309 and 311 is 5,718 feet, while signal 313 is located 3,756 feet north of signal 311.

Approaching the point of accident from the south, beginning at Edge Hill station, there is over a mile of straight track to automatic signal No. 311; then there is a 2-degree curve to the right, 1,650 feet long, followed by a tangent 750 feet long extending from a point just north of an overhead road crossing bridge to a point just south of the Pennsylvania Railroad overhead bridge, known as the Trenton cut-off bridge; then a 2-degree curve to the left to signal 313, a dis-

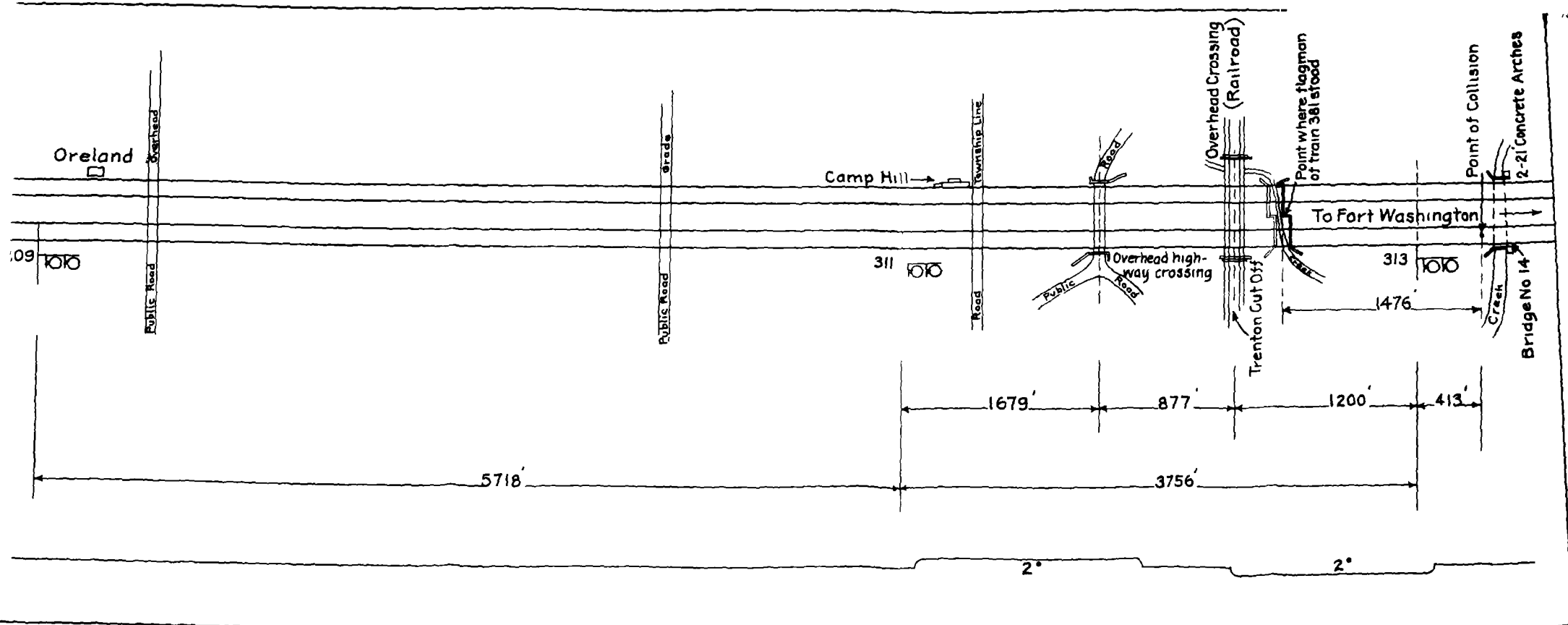
tance of 1,250 feet; then tangent to the point of accident 413 feet north of signal 313. From a point just south of Edge Hill station the grade is descending northward, graduating from 1 per cent to 0.77 per cent to 0.3 per cent, to a point just south of signal No. 313, where the grade changes to 0.25 per cent ascending to the point of collision. From signal No. 311 toward the point of accident the view is considerably obstructed by curves, trees, and the overhead road crossing bridge. At the time of the accident it was dark and the weather clear.

Illustration No. 1 is a diagram showing the existing physical conditions approaching the point of collision. Illustration No. 2 is a view approaching signal No. 311, while illustration No. 3 shows signal No. 313, just beyond which the collision occurred.

Northbound freight extra, consisting of locomotive 1508 and 24 cars, in charge of Conductor Russell and Engineman Love, arrived at Fort Washington at 5.50 p. m. A car for that station was set off and the train was ready to proceed at 5.55 p. m., but in attempting to start a coupler was pulled out of the fourth car from the head end of the train. This damaged car was then taken to Ambler, the next station, 1.4 miles beyond, where it was set off and the locomotive with front portion of the train returned to Fort Washington for the rest of the train. During this delay train 381 arrived at Fort Washington, and while standing behind extra 1508 at that point the collision occurred.

Northbound passenger train No. 381, running from Philadelphia, Pa., to Doylestown, Pa., and known as the Doylestown local, was drawn by locomotive 587. It consisted of eight wooden coaches and was in charge of Conductor Barndt and Engineman Rouland. This train left Reading terminal station, Philadelphia, at 5.30 p. m. on time; passed Oreland, the last telegraph office south of, and about 1.6 miles from the point of accident, at 6.11 p. m., one minute late. It received a caution indication at signal No. 311, after which it made a station stop at Camp Hill. This train also stopped at signal No. 313, which displayed a stop indication, then pulled up north of signal 313 and stopped behind freight extra 1508 just south of Fort Washington at about 6.17 p. m. While standing at that point, with the rear end of the train 413 feet north of signal No. 313, it was struck by train No. 319 about 6.33 p. m.

Northbound passenger train No. 319, known as the Scranton express, running from Philadelphia to Scranton Pa., was drawn by locomotive 339 of the 4-4-2 type, weighing 196,500 pounds. This locomotive has two cabs, the engineman's cab being located ahead of the fire box at about the center of the locomotive and the fireman's cab being located at the rear of the fire box. This train was in



116795 (To face page 2)

No. 1 - Diagram showing physical conditions approaching point of collision

charge of Conductor Fawthorp and Engineman Githens, and consisted of the following cars in the order named:

Cars	Construction	Year built	Weight (pounds)	Length
Central Railroad Co of New Jersey, 272, combination	All steel	1917	111,000	72 feet 5½ inches
Central Railroad Co of New Jersey, 880, coach	do	1915	116,360	72 feet 5½ inches
Pullman Co, "Brant Beach" parlor car	do		146,100	
Philadelphia & Reading Railway Co, 1523, coach	do	1916	116,800	63 feet

Train 319 left Reading terminal station, Philadelphia, at 6 p. m., on time; made station stops at Columbia Avenue and Wayne Junction and passed Oreland, the last reporting station south of the point

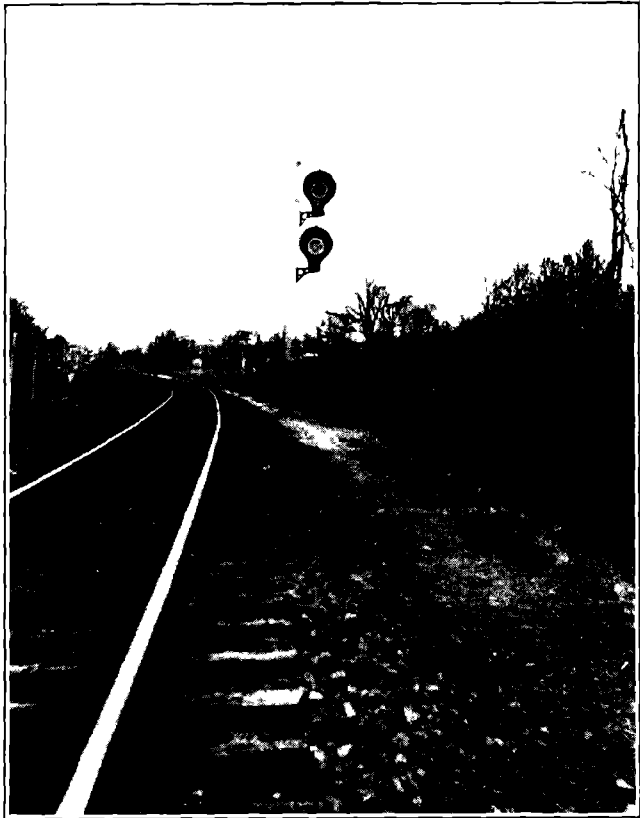


No 2 —View approaching signal No 311

of accident, at 6 31 p. m., 3 minutes late. It passed a flagman stationed about 1,000 feet south of signal 313; also passed signal 313, which displayed a stop indication, and at about 6 33 p. m. collided with the rear of train 381.

The locomotive telescoped the rear coach of train 381 about 45 feet, demolishing the coach and slightly damaging the locomotive. The next coach forward had the rear platform steps broken and one corner of the roof slightly damaged. Both trucks of the rear coach were jammed up against the rear truck of the next coach forward. None of the cars in either train was derailed and there was no damage to the track or roadbed.

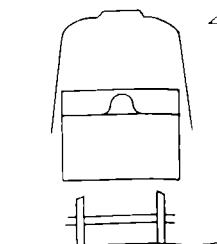
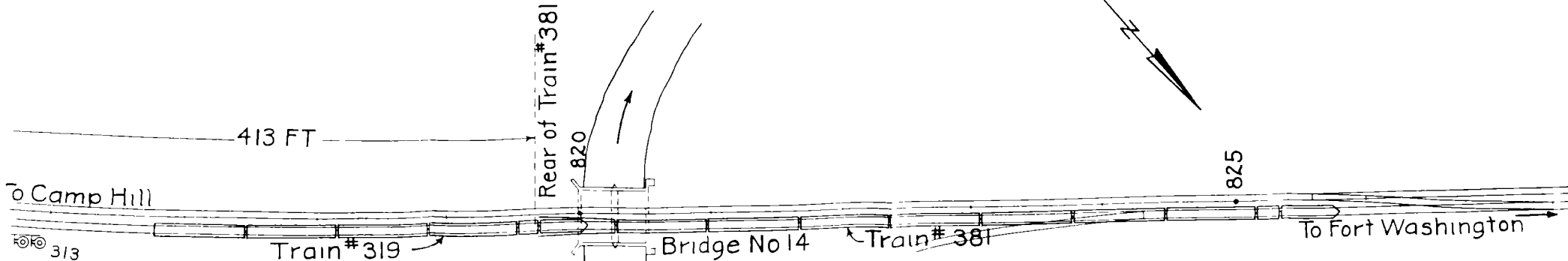
Information disclosing accurately the speed of train 319 at the time of the collision could not be obtained. Based on the results, and considering the fact that the combined weight of engine 339 and the cars comprising train 319 was 686,760 pounds, and that the cars of the train with which it collided were all of wooden construction, it is apparent that the speed at the time of collision was not high, otherwise far greater damage to the wooden cars would have resulted.



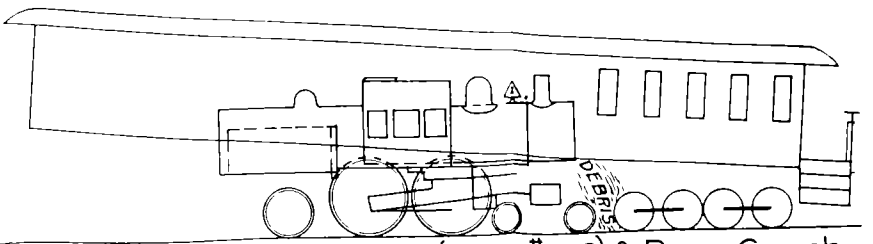
No. 3—View showing signal No. 313 and tangent on which collision occurred.

Illustration No. 4 is a diagram showing the relative position of the equipment of the two trains after the accident.

Engineman Love of extra 1508 stated that signals 311 and 313 both showed clear, which were the proper indications, when he passed them. He stopped at Fort Washington at 5:50 p. m. and after setting off a car was ready to leave at 5:55 p. m. In attempting to start his train a coupler was pulled out of the fourth car from the engine, causing delay, and while standing at that point train 381 came up and stopped behind his train.



End View
Engine & Car



Side View of Engine (Train # 319) & Rear Coach
of Train # 381 Immediately after crash

Conductor Russell of extra 1508 stated that after passing Oreland he was riding on the car that was to be set off at Fort Washington and personally observed signals 311 and 313, at each of which two white lights were displayed, which were the proper indications at that time.

Flagman Jessop of extra 1508 stated that on arrival at Fort Washington he went back with flagging equipment about 600 feet to protect his train. After the car was set off he was called in and when attempting to start the train at about 5.55 p. m. a coupler was pulled out of a car, causing delay to the train. He then went back again about 800 feet and flagged No. 381 at about 6.16½ p. m.

Engineman Rouland, of train 381, stated that he received a white over green, or a caution indication, at signal 311 just south of Camp Hill station, and red over green, or a stop indication, at signal 313. After passing signal 311 he made a passenger stop at Camp Hill station and also stopped at signal 313; he then pulled up north of signal 313, where he stopped behind extra 1508 about 6.17 p. m.

Conductor Barndt, of train 381, stated that when his train stopped behind extra 1508 its rear was standing near the creek, north of signal 313. He was on the platform of the third car from the engine when the stop was made, after which he went to the head end, where he made inquiry as to the cause of the delay. He then returned to the rear of his train and was standing about two car lengths back from the rear when train 319 approached. He waved a stop signal with his white lantern. He stated that he could not estimate the speed of the approaching train at the time of the collision. He also stated that his flagman was back near the Trenton cut-off bridge.

Flagman Powers, of train 381, stated that his train stopped at signal 313, then pulled up north of the signal and stopped behind a freight train. He was standing between the seventh and eighth cars in his train when it made the last stop, and he immediately started back with flagging equipment to protect his train. He did not know at what time his train stopped, but stated that he started back immediately. While on his way back he looked at his watch as southbound train No. 318 passed him, and it was then 6.28 p. m. He had been standing on the concrete bridge north of the Trenton cut-off from 3 to 5 minutes before train No. 319 approached, and during this time could see the markers on the rear of his train and saw signal 313 displaying red and green, or the stop indication. He flagged train No. 319 as it came around the curve under the overhead highway bridge, apparently at a speed of 30 or 35 miles an hour, but his signal was not answered by the engineman until the engine had passed him. When about half the train had passed him he observed fire flying from the wheels, indicating that the brakes were applied.

Engineman Githens of train 319 stated that he made a running test of the brakes leaving Reading Terminal and that they were holding all right. He also made regular stops at Columbia Avenue and Wayne Junction where the brakes held properly. He further stated that signal 311 south of Camp Hill showed two white lights or a clear indication. He first observed it when about $\frac{1}{4}$ mile distant. He let his train drift until near Camp Hill where he began to work steam and was sure the signal was right when he passed it. He was running about 50 or 60 miles an hour approaching Trenton cut-off and was almost to the bridge when he saw the flagman waving a stop signal. He applied the brakes in emergency, but they did not appear to take hold properly. After he passed the flagman he saw signal 313 in the stop position and at the same time saw the rear of train 381, but he could not stop before striking it. He also stated that with the same train on a previous occasion about five or six weeks before this accident occurred, he received a clear indication at signal 311 and found signal 313 in the stop position with the block unoccupied, and that he told some one about it on his arrival at Bethlehem, but did not know whether it had been reported to the proper official or not.

Fireman Coulton of train 319 was injured, and at the time of this investigation his physical condition was such that an interview was not permitted. However, he had previously stated to the railroad officials that he was shoveling coal when his train passed Camp Hill station and did not see signal 311. He thought the speed passing Camp Hill was about 40 or 45 miles an hour. The first thing that attracted his attention after passing Camp Hill was when the engine-man blew two short blasts of the whistle in answer to the flagman and applied the brakes. He thought the brakes were applied and the flagman's signals answered after they passed Trenton cut-off bridge, as he immediately looked ahead and saw signal 313 and the passenger train.

Conductor Fawthorp of train 319 stated that his train left Reading Terminal about 2 minutes late. They made a passenger flag stop at Columbia Avenue and one at Wayne Junction. The air brakes were suddenly applied near the overhead highway bridge south of the Trenton cut-off. The application of the brakes appeared to be in emergency. He thought his train was running about 40 miles an hour when the brakes were applied and probably 20 miles an hour when the collision occurred. He stated that as near as he could tell the collision occurred about 6.32 p. m. or 6.33 p. m. He looked at his watch about 2 minutes after the accident occurred and it was then 6.34 p. m. He did not see the indications at either signal 311 or 313.

Engineman Yeakel and Fireman Knapp of train 387, which was the first northbound train following train 319, stated that they passed signal 311 about 25 or 30 minutes after the accident occurred and that at that time it was displaying white over green, or caution indication, and that signal 313 was displaying red over green, or stop indication, both of which were the proper indications in view of the track conditions existing at that time.

Car Inspector Lunney stated that the engineman of train 319 applied the brakes on the train while standing in the Reading terminal station at Philadelphia prior to its departure, and that he went back over the train and saw that it was O. K.; the piston travel on the cars was about 6 inches, which is the length at which they endeavor to keep it adjusted.

The investigation shows that locomotive 339 on train 319 was braked on the driving wheels and the tender. The brake equipment consisted of a Westinghouse 11-inch air pump and G-6 brake valve with plain F-46 type triple for the driving wheels, and a quick-action triple, F-29 type, for the tender. The maximum brake-pipe pressure was 110 pounds, main reservoir pressure 130 pounds. The combination car and two coaches of train 319 were equipped with Westinghouse 16-inch brake cylinders, having the old-style high-speed type of brake equipment with P-2 quick-acting passenger triple. Pullman car, Brant Beach, of the same train was similarly equipped except that two cylinders and two triples were applied to this car, each truck being braked separately. The foundation apparatus consisted of the clasp brake with divided shoe pressure.

The testimony developed some difference of opinion on the distance within which train 319 should have been brought to a stop. In order to determine definitely that feature, four running tests were made January 18, with a train made up of equipment as nearly identical with that of train 319 as it was possible to obtain. The train used in making these tests consisted of locomotive 304, of the 4-4-2 type (Atlantic), weighing 4,100 pounds less than engine 339, Philadelphia & Reading coach 1523 and Pullman car, Brant Beach, both of which were on train 319 on the date of the accident, and Central Railroad of New Jersey cars 255 and 923, identical in every particular with cars 272 and 880 which were in train 319 on the night of the accident but were not available for use on the test train. The air-brake piston travel on the test train was as follows:

	Inches
Locomotive 304, drivers.....	4½
Locomotive 304, engine truck.....	6½
Locomotive 304, tender.....	10½
Central Railroad of New Jersey, combination, 255.....	5½
Central Railroad of New Jersey, coach, 923.....	6½
Philadelphia & Reading, coach, 1523.....	4½
Pullman, "Brant Beach," one cylinder.....	5
Pullman, "Brant Beach," other cylinder.....	6½

In making the tests the train was started each time from a point south of Oreland and the brakes were applied south of the Trenton cut-off bridge at the point, as nearly as could be determined, where Engineman Githens stated he applied his brakes on train 319 on the night of the accident

The nature and result of each test were as shown in the following table

Test No	Kind of brake application	Speed of train, miles per hour	Seconds from time of application of brakes to time the stop was made	Distance run after application of brakes	Distance test train stopped from point occupied by rear of train 381 on date of accident
1	Emergency with sand	47 4	24	<i>Feet</i> 858	1,137 south
2	Service, 15 pounds reduction followed by 20 pounds reduction	60	36	1,995	15 north
3	Emergency without sand	59	28	1,462	533 south
4	Service, 12 pounds reduction followed by emergency when in sight of signal 313	61	32	1,640	355 south

From the records in the office of the master mechanic at Philadelphia it was found that inspection and test of the brakes on engine 339 were made on January 16, by connecting the main reservoir of engine 339 to engine 319 to see how the brake would function with the brake valve on engine 339, with the following results

In one test, with an emergency application made from a brake pipe pressure of 110 pounds, the driver brake piston travel was found to be 9 inches for the right cylinder and 4½ inches for the left cylinder; the tender brake piston travel was 11½ inches. After a period of 3 minutes there was 44 pounds pressure in the driver brake cylinder, and after the lapse of two additional minutes there was 29 pounds pressure, with the right piston showing 8 inches travel and the left piston 3¼ inches travel, the tender brake piston remaining at 11½ inches travel.

In another test, on a service reduction made from a brake pipe pressure of 112 pounds, there developed practically the same condition as in the first test, with 41 pounds pressure in the driver brake cylinder, which reduced to 23 pounds in five minutes.

From comparison it is quite apparent that the test train could be brought to a stop in a shorter distance than could be expected from the equipment used on train 319 on the date of the accident, for the following reasons. Locomotive 339 of train 319, although of the same type, was 4,100 pounds heavier than engine 304 used on the test train, and was braked only on the driving wheels and tender, while locomotive 304 was braked on the engine truck in addition to the drivers and the tender. The difference in the piston travel would

also result in a higher brake cylinder pressure being obtained on engine 304 than could be developed on engine 339. The fact that the piston travel on the tender of engine 339 was $11\frac{1}{2}$ inches on a standing test would indicate that on application of the brake while the train was running the piston would cushion on the cylinder head and to a great extent destroy the factor of retardation. On account of excessive piston travel on engine 339, low cylinder pressure would be obtained with the result that the train brakes would be, to a large extent, responsible for producing a retarding effect, not alone for the control of each individual car, but to provide a factor of retardation to assist the weak brake apparatus on the engine to overcome its weight and momentum.

It is therefore believed that with the brake equipment on engine 339 in the condition developed by the inspection and test referred to in this report, and the same condition of brake apparatus on the cars used on the test train, the distance in which the various stops could be made would be materially greater.

It was conclusively determined by the running tests that if an engineman knew a flagman was located on the concrete bridge north of the Trenton cut-off, and the flagman's stop signals were seen by the engineman instantly on emerging from under the overhead highway bridge at the south end of the tangent south of the Trenton cut-off, and an emergency application of the brakes were made immediately, the train could be stopped before reaching the point where the collision occurred. The test also demonstrated that from a service application, with 35 pounds brake-pipe reduction, made at the same point under the same conditions and circumstances, the train could not be stopped short of the point of collision. These facts indicate that train 381 was not afforded the maximum or full flag protection required by rule 99.

Illustration No 5 is a view taken from a point two telegraph poles south of the highway bridge, showing that from this point the engineman could not have seen the flagman. Illustration No. 6, is a view from a point one telegraph pole south of this bridge, midway between the rails, and shows that from this point the flagman would be visible, standing beyond the second overhead bridge. Illustration No. 7 is a view from the track under the highway bridge, showing the Trenton cut-off bridge, with the curve beyond on which the flagman was stationed.

In the signal system in use on this line direct current supplied by primary batteries is used for all circuits. Line wires are carried by a separate pole line which is used for signal circuits only. Copper line wires with weatherproof insulation are used. Track circuits are divided into "cut sections," as required by local conditions.

In addition to the usual 4-ohm track relay at the entering end of the block section, there is also a normally deenergized relay of low resistance in series with the track battery at the leaving end of the block, which picks up to clear the signal for an approaching train. Similar special relays are employed at the leaving ends of long track-circuit sections or where protection against foreign current is required.

With the track ahead clear, the home and distant signals at signal 311 clear after an approaching train has passed signal 309, the circuit for the home signal being completed as follows



No. 5—View taken at a distance of two telegraph poles from highway bridge. flagman could not be seen from this point

Starting at common wire at signal 309, through back point of track relay at that location to line wire, through coils of line relay at signal 311 and home signal instrument 311, thence through front points of track relays at entrance and cut section of the block north of signal 311 to positive side of battery at signal location 311. This completes the circuit for home signal 311, and it therefore clears after a train passes signal 309, provided the block governed by home signal 311 is not occupied.

The circuit for distant signal 311 is completed as follows: From common at signal 311, through front point of line relay, resistance coil, distant signal instrument 311, to line wire, thence through front point of track relay at entrance to block at signal 313, coils of indi-

cator relay at that location, to line wire; thence through front points of track relays and back points of special relays for the block section north of signal 313, to positive side of battery at signal location 315. The distant signal 311, therefore, clears after the circuit for clearing home signal 311 has been completed, provided the block sections between signals 311 and 313 and signals 313 and 315 are not occupied. As previously stated, the distant signal is not controlled directly by the position of the home signal, but the circuit for the home signal, including the line relay mentioned in the foregoing description, must be completed before the distant signal clears. In connection with the control circuit for distant signal 311 it should be noted that when



No. 6—View taken at a distance of one telegraph pole from highway bridge, flagman visible from this point

the track relay at that location is open the control circuit for the distant signal is shunted to common through a back point, protection to a certain degree thereby being provided against dangerous failures due to crosses between wires.

The investigation of this accident brought out the fact that both of the trains involved in this accident, as well as the next northbound train, passed signal No. 311 under identical track conditions—namely, that the block between signals 311 and 313 was clear, while the block between signals 313 and 315 was occupied by a preceding train. Under these conditions the caution indication, or white and green, should have been displayed at signal 311, and the danger indi-

cation, or red and green, should have been displayed at signal 313. That the proper danger indication was displayed by signal 313 for each of these trains is not questioned; and the proper caution indication was displayed by signal 311 for train 381, and about 20 minutes before train 319 passed it, and for train 387 about 30 minutes after train 319 passed it; nevertheless, the statement of Engineman Githens of train 319 is positive that a clear indication was displayed by signal 311 for his train, and in any event he accepted a clear signal indication at that point and proceeded accordingly.

The signal supervisor and four signal maintainers stated that during the evening within a few hours after the accident occurred



No 7 —View from a point under highway bridge, showing Trenton cut-off bridge and curve on which flagman was standing

an inspection of the signals was made, but disclosed no condition which could have caused an improper indication of signal No 311; and, further, that tests were made which demonstrated that signal 311 was operating properly and giving proper indications

On January 18 representatives of the Bureau of Safety made a thorough examination and conducted tests of the signals involved. At that time there was no indication of the presence of foreign current, residual magnetism, mechanical trouble, or any other abnormal condition which could have caused a false clear indication of distant signal 311. Careful inspection of the wiring was made, as well as tests of the track circuits involved, but nothing was discovered which

could possibly have led to the display of a false clear distant indication at signal 311 for train 319. The signal installation was found to be well maintained, and the possibility that any abnormal condition existed which could produce a false clear failure of distant signal 311 after the passage of train 381 and then cleared up after the passage of train 319 and before the passage of train 387 is exceedingly remote.

Particular attention is called to the fact that the lower disk at signal 311 was clear on the approach of extra 1508; and that it returned to green, the normal position, after the passage of extra 1508, as proven by the testimony of the crew of train 381, the next train passing it. There was no change in the track conditions after the passage of extra 1508 and train 381 which would cause or permit the movement of the lower disk to the clear position, and thus afford an opportunity for any foreign substance to lodge in the mechanism and hold the disk improperly in the clear position. Therefore, when the disk went to the caution position after the passage of extra 1508, with the same track condition prevailing, it undoubtedly remained in that position for following trains until the block in advance was cleared.

The investigation developed nothing which would support the statement of Engineman Githens that signal 311 displayed a clear indication instead of caution; on the contrary, all the circumstances point to the conclusion that this signal was in the caution position, and it is believed that Engineman Githens must have been mistaken or have misinterpreted the indication of signal 311 when he accepted it as being clear.

In regard to the statement of Engineman Githens relative to finding signal 313 displaying a stop indication with the block unoccupied after having passed signal 311 in the clear position some five or six weeks previous to the time of this accident, he was unable to fix the date of the incident; but Signal Supervisor Steele presented the record of one instance which occurred on November 25, 1918, when signals 311 and 313 were reported out of order. An investigation by the signal maintainer at the time of the reported failure disclosed that the blocks governed by signals 311 and 313 were clear, but on account of local circuit trouble the clearing relay for signal 313 failed to pick up on the approach of a train, and signal 313 therefore remained in the stop position. In this instance signal 311 gave the proper clear indication, as the block sections controlling this signal were not occupied, but signal 313 improperly displayed a stop indication. This is probably the instance referred to by Engineman Githens in his statement.

The primary cause of this accident is believed to have been the failure of Engineman Githens to observe and obey the caution indication

displayed by signal 311 and bring his train under control prepared to stop at signal 313. A contributing cause was the failure of Flagman Powers to go back far enough to insure full flag protection to his train.

Any attempt to explain the cause of the failure of Engineman Githens to observe and properly obey signal 311 would be futile. Owing to the physical characteristics of the railroad in the vicinity of this accident and under the condition that train 319 was running, at high speed with Engineman Githens believing that he had clear signals, it could not be expected that the engineman would observe the flagman, located north of the Trenton cut-off bridge, until after the engine passed out from under the overhead road crossing bridge at the south end of the tangent south of the flagman. Therefore it is believed that he observed the flagman and applied the brakes about as promptly as could be expected under the circumstances. Engineman Githens is 39 years old. He was employed by the Philadelphia & Reading Railroad Co as fireman in 1907 and promoted to engineman in 1913. A number of items of discipline are charged against him. The records also show that he was demoted to fireman on February 7, 1918, on account of unsatisfactory service as engineman, and was restored to the position of engineman 12 days later, since which time two other items of discipline appear against him.

Rule 99 of the operating department of this railroad provides that—

When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals a sufficient distance to insure full protection. When recalled, he may return to his train, first placing two (2) torpedoes on the rail when the conditions require it.

Flagman Powers was thoroughly familiar with this rule and understood that operation of the automatic signals did not relieve him in any measure from its requirements. According to the evidence, however, at least 15 minutes elapsed between the time train 381 stopped and the approach of train 319, and in this time Flagman Powers went back approximately only 1,500 feet, which could be walked easily in 5 minutes, and according to his own statement he stood at that location from 3 to 5 minutes before train 319 approached. He, therefore, had ample time to have continued back far enough to have given full and maximum protection instead of providing only a minimum protection on the theory that the engineman of the following train would be governed by the signal indication and be approaching with his train under control. He was derelict in his duty as a flagman and must bear his share of responsibility for the accident.

Flagman Powers is 35 years old. He was employed by the Philadelphia & Reading Railroad Co. as passenger trainman in 1905 and promoted to freight and coal conductor in 1917. His record since 1909 is clear.

Engineman Githens had been on duty 1 hour and 18 minutes when the accident occurred after having been off duty 40 hours. Flagman Powers had been on duty an aggregate of 5 hours and 20 minutes, from 6 a. m. January 13 to the time of the accident, after having been off duty 15 consecutive hours.

As has been pointed out in the foregoing, all the cars in train 381 were of wooden construction, and the rear car was telescoped approximately three-quarters of its length, being practically destroyed. Had steel cars been used in this train the number of fatalities and injuries would undoubtedly have been materially reduced.

Respectfully submitted

W. P. BORLAND,
Chief, Bureau of Safety.