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IN RE INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE  
PENNSYLVANIA RAILROAD, AT WEST PHILADELPHIA, PA.,  
JANUARY 18, 1919.

April 2, 1919.

On January 18, 1919, there was a rear-end collision between a freight train and a passenger train on the Pennsylvania Railroad, at West Philadelphia, Pa., which resulted in the death of one employee and the injury of ten employees and six passengers. After investigation, the Chief of the Bureau of Safety makes the following report:

This accident occurred in West Philadelphia on the Philadelphia Terminal Division. The line in the vicinity of the accident is double track, extending east and west by time table direction, and trains are operated over it by time table train orders, an automatic block signal system and semi-automatic signals operated from interlocking plants. JO and NR signal stations on this line are located a mile apart, west and east, respectively, of the New York & Pittsburgh subway. The western approach to the subway is called the New York & Pittsburgh tunnel, and the point of accident was in the subway about 200 feet east of the eastern portal of the tunnel.

The trains involved were freight extra 928, consisting of locomotive, 46 loaded cars and 2 helper engines, in charge of Conductor Heeper and Engineman Reward, and passenger train No. 20, known as the Keystone Express, consisting of locomotive, coach, three Pullman cars and a dining car, in charge of Conductor Divinney and Engineman Makibben.

Freight extra 928 left Enola, Pa., for Camden, N.J., at 9 p.m., January 17, passed JO signal station at 10.40 a.m., January 18, with helper engine 1965 coupled to rear of caboose, and while moving through the New York & Pittsburgh subway parted at the eighth car from the rear. With the aid of the helper engine several unsuccessful attempts were made to re-couple the train; the train dispatcher and the signalman at NR signal station were notified, and engine 327 was ordered forward to help. Engine 327, in charge of Conductor Whitelock and Engineman Hemphill, running with tender ahead, passed JO signal station at 11.15 a.m., stopped for the signal west of the tunnel, and after the calling-on signal was cleared this engine proceeded through the tunnel and coupled to extra 928. While waiting for a signal to start, the collision occurred.

Passenger train No. 20, en route from Chicago to New York, passed JO signal station at 11.29½ a.m., and at about 11.31 or 11.32 it collided with extra 928. The collision resulted in the death of a flagman of extra 928, the injury of six passengers and nine Pullman and dining car employees of passenger train No. 20, and the engineman of helper engine 327. The engine of train No. 20 and helper engines 327 and 1965 were considerably damaged, and the wooden caboose of extra 928 was practically destroyed. At the time of the accident the weather was cloudy.

While the statements of employees indicate that the speed of train No. 20 was not more than ten miles per hour when it emerged from the tunnel, the damage which resulted from the

collision indicated that at the time of the accident the speed of train No. 20 was probably in excess of that rate.

The track is tangent for nearly the whole distance from a point west of JO signal station to the western portal of the tunnel. The track then curves to the left, reaching its maximum curvature of six degrees about 1000 feet east of the eastern portal of the tunnel, east of point of collision. On this track there is a descending grade of .42 per cent to a point east of JO signal station, followed by a descending grade of 1.51 per cent, decreasing to 1.25 per cent as the western portal is approached. Leaving this point the gradient becomes .9 per cent, then .56 per cent descending to a point inside the tunnel near the eastern portal, where the grade changes to 1.72 per cent ascending, upon which grade extra 928 parted and was located when the collision occurred.

The signals on this line are of the 3-position, upper quadrant, semaphore type, and are controlled by A.C. circuits. RR signal station is a modern plant, well installed and maintained. The interlocking machine is of the electric type, having 43 working levers and 12 spare spaces. All functions are straight electric except signal 8-R, which is electro-pneumatic. Dwarf signals govern to all routes. All-electric signals are of the top post type, operated by 110-volt, direct current; electro-pneumatic signals are also of the top-post type. Signal 8-R is located at the west end of the subway about 3070 feet west of RR signal station and out of sight of

signalmen. The bottom arm of this signal, S-R(b), is known as a hanger or "calling on" signal; normally it is operated as a semi-automatic signal, being controlled by track, line and local circuits. A push-button arrangement is provided whereby the track-circuit control feature may be eliminated; when the block is occupied, signal S-R(b) can be placed in the 45° or caution position by the signalman by moving lever S to the right and pressing a push-button which is then uncovered. Signal S-R(b) remains in the 45° position, irrespective of the condition of the block, until lever S is restored to normal position. A train approaching signal S-R and finding it in stop position is required under the rule to ascertain the cause by telephone and fill out a clearance card by direction of the signalman if necessary. In order to avoid making out these cards, it has been customary for the signalman, when notified of a train west of or at signal S-R, to place signal S-R(b) in the 45° or caution position by means of the push-button device referred to. This action has the effect of nullifying the track circuit control over the signal and authorizes a train to proceed at low speed and enter the block though already occupied. Operating in connection with signal S-R(b) are several light indicators; one of these, located in front of the director, is extinguished when an approaching train reaches the home signal at JO; a red light on the machine is displayed when signal S-R(b) has moved from the horizontal position; and when a train enters the block controlled by signal S-R(b) a white light on the machine is

extinguished; when a train has passed or cleared signal S-R, the indicator in front of the director is illuminated.

Engineman Hemphill stated that on arriving at the west end of the tunnel the signals were against him; the conductor went to the telephone and was told he would get the "calling on" signal. On getting this signal he rang bell, called in the flagman, and proceeded cautiously to find the rear of 928. When the rear of engine 1965 was seen and a coupling was made, the flagman went back into the tunnel with a red flag and red light. The engineman stated he then began watching for a signal to proceed, when he heard the exhaust of the engine of train No. 20, and before he could give any warning that engine came out of the tunnel and ran into his engine.

Conductor Whitelock of engine 327 stated that he had orders to assist helper engine 1965 in pushing a train out of the subway. He arrived at the west end of the tunnel with engine headed west and found the signal against him. The operator at JO was called; she in turn called ER, and the latter in about five minutes gave the "calling on" or permissive signal. He then moved cautiously through the tunnel and when near the east end was warned by caps and flag of standing train. He went ahead to get signal to push out, while the flagman went back with flag and red light. After calling up and being told what was to be done, he saw the brakeman run out and flag against a passing train on the westbound track; he looked back and discovered that No. 20 had run into them.

Rear Brakeman Whittaker, acting as flagman for engine

327, stated that after coupling was made with extra 928 he had gone back for a distance of about 75 feet. The tunnel was so full of smoke and steam that he could not see. He intended to go through to the west end, when he heard a train coming from that direction. He ran toward it, signalling and yelling, and threw his lamp at the engine, but failing to attract any notice he ran toward the east end in an effort to stop the train in the open. He did not have torpedoes or fuses with him, and stated that there were none on the engine. He was familiar with General Order No. 598 relative to the use of flagman's signals in cases where a train stops or is moving under circumstances in which it may be overtaken by another train, and considered conditions preceding the accident such as to require the use of torpedoes and fuses, but as his engine was not supplied he was not in a position to comply with the order. He knew that No. 20 was following them and thought he was far enough in the tunnel to have flagged it but for the steam and smoke which obscured the view.

Engineman Makibben of passenger train No. 20 stated that when he passed JO tower the signal indication on the automatic signal east of that tower was in the caution position, and shortly afterward he also found the same indication on the low speed or "calling on" signal at the west portal of the tunnel. He released the brakes near the latter signal and he was running at about ten miles an hour when he passed it. When he entered the tunnel it was filled with smoke, and the first intimation he had of anything ahead was when he heard a shout. He was

then out of the tunnel, and immediately applied the brakes in emergency. He had no idea of his speed when he struck although his train was running very slowly when it passed the signal and he stated that he did not use steam between the low speed signal and the point of collision.

Fireman Sheep corroborated the statements of Engineman Makibben concerning the position of the signals referred to. He also stated that the rate of speed was not over five miles an hour when they passed the west portal of the tunnel, and thought it was about the same when they ran into engine 327. The tunnel was so full of smoke he could not see the front end of his engine. He first caught sight of engine 327 just as they emerged from the tunnel; he shouted to the engineman and he immediately applied the brakes. He thought No. 327 was only about an engine length away when he first saw it.

Signalman Mattis of RR block station stated that extra 928 was making a preferred move through the tunnel with engine 1965 as pusher. He told the leverman to put it over the switch under a clear signal. When it emerged from the tunnel it broke loose eight or nine cars from the rear, and as the pusher engine was unable to bring the train together, the train dispatcher was notified and engine 327 was sent to assist. On arriving at No. 8-R signal, the engineman of 327 asked for a clearance card and was told that would not be necessary as he would be given the "calling on" signal. Later he said he talked with the dispatcher about train 20, but he did not recall what

the dispatcher said, and about that time JO reported No. 20. He asked the operator where No. 20 was and being told "down there" which indicated that it was near the west portal of the tunnel, he jumped up and put lever No. 8 back so as to restore signal 8-R(b) to the stop position; but No. 20 had already passed that signal. He stated that at the time neither he nor the leverman knew that engine 327 was past No. 8 signal, the indicator not being operative at that time as extra 938 had not cleared the track circuit.

Signalwoman Wardwell of JO tower stated that engine 327 passed JO at 11.15 a.m. on its way to the subway, and passenger train No. 20 passed at 11.29½ a.m. She reported No. 20 to NR and received the response "all right." She knew that a freight extra was stalled in the tunnel but raised no question about letting No. 20 in behind it, for when No. 20 passed under her home signal she saw that the automatic signal east of JO governing movements through the subway was in caution position.

Asst. Trainmaster Wright stated that signal 8-R at the western portal of the tunnel is a permissive home signal and indicated to No. 20 at the time of its approach that it should proceed at low speed prepared to stop; that track may be occupied or next signal at stop. He said that the train dispatcher knew what the conditions were in the subway but did not think it incumbent upon him to hold No. 20 at JO for the reason that there is a home interlocking signal at the west portal and an automatic signal just east of JO which stood at 45 degrees



or caution. Furthermore, it was not expected that extra 926 would consume much time in getting started. He said that no serious harm could have resulted if the operator had restored signal 8-R(b), even though engine 327 had not passed it, for in the latter event the engine would merely have been compelled to stop and await an order to proceed.

It is apparent from the investigation of this accident that several factors were involved, and that it might have been averted by any one of several employees. In the following statement of cause and discussion, those features are considered in sequence and not necessarily in the order of relative importance.

This accident was caused by a calling-on signal which had been displayed at caution for the helper engine, being left in caution position, thereby being unintentionally displayed for the passenger train involved in this accident; also failure of the engineman of the passenger train sufficiently to reduce speed and operate his train under absolute control as required by the rules and dictated by good judgment under the exceptional circumstances which existed at that time; and failure of the crew of the preceding train to provide adequate flag protection.

The investigation disclosed that the calling-on signal was left in the caution position for about ten minutes after engine 327 passed it. This engine passed JO tower at 11.15 a.m., was delayed about five minutes at signal 8-R, and had passed

through the tunnel and stood coupled to the rear of extra 928 some seven or eight minutes before the collision occurred. Train No. 20 did not pass JO tower until 11.29 $\frac{1}{2}$ , and this must have been approximately ten minutes after engine 327 had passed signal 8-R. Signalman Mattis was familiar with the schedule of train No. 20 and means were available for him to ascertain whether that train was on time. Under the circumstances no indication could be received that engine 327 had passed signal 8-R, but it was the duty of Signalman Mattis under the rules to restore signal 8-R(b) to normal or stop position after allowing a reasonable time for the movement of the light engine which had been authorized, and in any event it was imperative that he should do so before the arrival of train No. 20. His failure to restore that signal to normal position before train No. 20 passed it resulted in that train accepting a signal which was not intended to be displayed for it. Had Signalman Mattis properly performed his duty in this instance the accident would undoubtedly have been averted.

The indication of signal 8-R(b) which was displayed at the time train No. 20 passed it is interpreted by the rules as "proceed at low speed, prepared to stop; track may be occupied or next signal at stop." In view of the signal indication received, as well as the fact that the view in the tunnel was totally obscured by steam and smoke, Engineman Makibben should have reduced the speed of his train to a very low rate and should have proceeded only when he was certain that his train was absolutely under control. It is believed that the rate of speed of train No. 20 was considerably higher than is indicated by the

statements of employees involved, for the reason that it covered the distance from JO tower to the point of accident, approximately 3300 feet, in from 1½ to 2½ minutes, running under caution signals practically the entire distance and 1014 feet being through the smoke-filled subway; furthermore, had the speed been as low as was claimed upon emerging from the tunnel the distance of 150 or 200 feet to the point of collision would probably have been sufficient to enable the engineman to bring his train to a stop without colliding with the standing train. It is therefore conclusive that the speed of train No. 20 exceeded that authorized by the signal and rules as well as that permitted by good judgment of an experienced engineman, and it is believed for that reason that the direct responsibility for this accident rests primarily upon Engineman Makibben. Had he fully complied with the signal and rule and exercised good judgment under the circumstances, the accident would not have occurred, notwithstanding failure of the signalman promptly to restore the signal to normal position.

Conductor Whitelock and Engineman Remphill of engine 327 are at fault for failing to comply with General Order No. 592, which comprises a modification of Rule 99 of the book of rules, and in part reads as follows:

When a train stops under circumstances in which it may be overtaken by another train, the flagman must go back immediately with flagman's signals a sufficient distance to insure full protection, placing two torpedoes, and when necessary, in addition, displaying lighted fuses.

Conductors and enginemen are responsible for the protection of their trains.

The flagman was not instructed to comply with this rule, and if

he had been, he was not in position to do so fully because of the absence of necessary flagging material. The engine was at the end of a tunnel where the range of vision was extremely limited and it could be seen from an approaching train for only a few hundred feet; it was therefore all the more incumbent upon the conductor and engineman to see that the rule was strictly complied with. Under the circumstances Conductor Whitelock should have instructed his flagman to remain at the western portal of the tunnel and hold all trains until recalled. The rules also require that the engineman and conductor must know that their locomotive is supplied with all signals necessary. The investigation developed that engine 327 was not supplied with all signals required to provide necessary flag protection.

Flagman Whittaker, having had many years of experience as a flagman, should have remained at the western portal of the tunnel without instructions; and he is also at fault for not complying with Rule 7 of the book of rules, which reads as follows:

Employees whose duties may require them to give signals must provide themselves with the proper appliances, keep them in good order, and ready for immediate use.

Had this rule been obeyed the flagman would have been supplied with torpedoes and fuses and would have been in position to avert the accident.

The automatic block signal rules include the following:

88. In automatic territory, when a train is to be admitted to an occupied block between the interlocking home signal and the next automatic signal in advance, it must be stopped before being admitted to the block. It

must also be stopped before being admitted to an occupied track between the interlocking home signal and the advance signal in its usual location.

97. When a train is stopped by a block signal, the conductor or engineer will ascertain the cause by telephone if this can be done more promptly than by going to the office, and may fill out clearance cards by direction of the signalman, if necessary.

The push-button arrangement described in connection with signal 8-R(b) enabled the signalman to cut out the track-circuit control feature and to operate that signal as a calling-on signal; this in effect rendered Rule 88 inapplicable to signal 8-R, the caution indication of the calling-on arm being substituted for the clearance card provided for by Rule 97. But as is evidenced by the occurrence of this accident, this feature introduced a source of possible danger, and any convenience or saving of time effected is at a sacrifice of safety. The direct lever control of a signal in that location is considered by no means good practice, and this was one of the controlling conditions which rendered this accident possible. Had the practice prescribed by Rules 88 and 97 been followed when train No. 20 approached, that train would have been held west of the tunnel and the accident would not have occurred. It is noted that since the accident measures have been taken to eliminate the unsafe condition disclosed; the push-button arrangement for cutting out the track-circuit control of signal 8-R(b) has been discontinued, thereby eliminating the "calling on" feature of signal 8-R(b).

All of the employees involved were experienced men. The signalman at NR tower and the crews of passenger train No.

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20 and engine No. 327 had been on duty less than five hours at time of accident and had had ample rest prior thereto.

H.P.