

INTERSTATE COMMERCE COMMISSION

REPORT OF THE DIRECTOR OF THE BUREAU OF SAFETY IN RE
INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE
NORFOLK & WESTERN RAILWAY AT LICK BRANCH, W. VA.,
ON NOVEMBER 1, 1929.

November 30, 1929.

To the Commission

On November 1, 1929, there was a rear end collision between two freight trains on the Norfolk and Western Railway at Lick Branch, W. Va., which resulted in the injury of two employees.

Location and method of operation

This accident occurred on that part of the Pocahontas Division extending between Bluefield, W. Va., and Williamson, W. Va., a distance of 105 miles, this is a double track line over which trains are operated by timetable, train orders, and an automatic block signal system. On that portion of the division extending between Bluefield and Iaeger, a distance of 57.2 miles, electric locomotives as well as steam locomotives are used, the trains involved in this accident being hauled by electric locomotives.

The accident occurred on the westbound track 1,303 feet west of automatic block signal 3807, located at Lick Branch. Approaching this point from the east there is a series of short curves and tangents, a compound curve to the right, 3° for 812 feet and $1^{\circ} 15'$ for 678 feet, is followed by a tangent 612 feet in length on which the accident occurred, the point of accident being 305 feet from the eastern end of this tangent. Beginning at Ruth, approximately 3.6 miles east of the point of accident, there is a descending grade for westward trains, the gradient varying from a maximum of 2.40 per cent to 1.475 per cent at the point where the collision occurred.

The track in the vicinity of the point of accident is laid with 130 pound rail, about 43 feet in length, with an average of 20 hardwood ties to the rail, is rock-ballasted and well maintained, it extends through an open cut and along the north bank of a creek. Just east of the point of collision a precipitous rock cut rises about 50 feet at the north side of the track, restricting the vision of engineers of westbound trains approaching the point of accident to about 660 feet.

Day was just breaking, and it was cloudy at the time of the accident, which occurred at 6.20 a.m.

Description

Westbound extra 2513 consisted of 34 cars of coal and a caboose, hauled by electric locomotive 2513, and was in charge of Conductor Snider and Engineman Edwards. This train was assembled at Flat Top Yard and was en route to Eckman, it had been flagged at Lick Branch at about 6.10 a.m. on account of a train ahead making a crossover movement, and it was just preparing to proceed when struck by extra west 2504.

Westbound extra 2514, consisting of 28 loaded cars and a caboose, hauled by electric locomotive 2514, in charge of Conductor Allen and Engineman Lyons, left Bluefield at 4 58 a.m., and proceeded to Flat Top Yard where 12 cars loaded with coal were picked up, making a total train weight of 2403 tons leaving Flat Top. After picking up these cars at Flat Top this train proceeded to Bluestone, where electric locomotive 2514 was exchanged for electric locomotive 2504. Extra 2504 left Bluestone at 5.54 a.m., and while descending the grade west of Ruth the speed of this train was being controlled at a rate of about 14 miles per hour by means of electric or regenerative braking. Block signal 3801 indicated "caution", and block signal 3807 indicated "stop". When the block signal in stop position was seen by the engineman he attempted to apply the air brakes on the train and he then shut off the motor, but the brakes failed to operate and the speed of the train began to increase. Extra 2504 passed block signal 3807 in stop position, and the flagman of extra west 2513, and collided with the rear end of train extra west 2513, while running at an estimated speed of 20 miles per hour.

At the time of the accident the engineman of extra 2513 had just released the air brakes, this train was driven ahead a distance of about 15 feet. The caboose and three rear cars of extra 2513, and the motor and three head cars of extra 2504 were derailed and together with the fourth car were badly damaged. The employees injured were the engineman and head brakeman of extra 2504.

Summary of evidence

Conductor Snider of extra 2513 stated that his train was stopped at Lick Branch at about 6.10 a.m., after the stop was made Flagman Davidson went back to flag and he opened an angle cock on the rear end for the purpose of holding the brakes applied and then made an inspection of his train. He said that he had completed the inspection and was in his caboose when he heard a train whistling for brakes about three minutes after the angle cock was closed, he saw the headlight of extra 2504 approaching and he jumped off when that train was within 5 or 6 car lengths of his caboose. He thought its speed at the time was about 20

miles per hour. It was ~~just~~ breaking day at the time of collision and he fixed the time of the accident at about 6.20 a.m. He also said that the marker lights were burning on his caboose at the time and that Flagman Davidson was back a sufficient distance to protect the train.

Engineman Edwards of extra 2513 stated that he was flagged just east of Innis by extra 2503 east which was crossing over from the westbound to the eastbound main track. When he tried to start the train he found that the brakes were applied, shortly afterwards his conductor came up and told him that he had an angle cock open on the rear and that he should proceed when it was closed. He had just gotten brake pipe pressure pumped up and the brakes released when there was a jar in his train which knocked it ahead about 15 feet, and at the same time the brakes went into emergency. He said that he had heard a motor blowing for brakes. He went to the scene of the accident where he met Engineman Lyons of 2504 who told him that he had no air on extra 2504, and he just got a "soit" at the brake valve. It was cloudy but not raining and just breaking daylight when the accident occurred. He stated that when coming west from the tunnel near Coaldale he did not make an application of the air to test the brakes when starting down the grade, that he knows this running test is required by the rules but it is not made on trains hauled by electric locomotives on the Pocahontas division.

Flagman Davidson of extra 2513 stated that his train stopped at Lick Branch about 6.10 a.m., he went back to protect his train and stationed himself at the point of curve just west of block signal 3807 which was in stop position. At this point he could see an approaching train a distance of about 30 car lengths, and he was about 20 or 25 car lengths from the rear of his train. At the time extra 2504 came in sight it appeared to be running at about 14 miles per hour, when it passed him it was making about 16 or 17 miles per hour and increasing speed until the time of collision when he estimates the speed at about 20 miles an hour. He flagged extra 2504 from the time it came into sight but did not remember that his signals were acknowledged. He saw no fire flying from the wheels or other indication of braking on the train. Immediately after the collision he walked to the head end of extra 2504, and as he went he noticed that the brakes were then applied. He came back along the train some 40 minutes later and the brakes were still applied on some of the cars. When the train passed him he saw Brakemen Jackson and Lusk setting hand brakes on the first and second cars. He stated that the engineman of extra 2504 whistled for brakes 5 or 6 times from the time he came into sight of the signal in stop position until he was 3 or 4 car lengths from the rear end of extra 2513. He also stated that he was back far enough to afford ample

protection to his train, that it was the distance from which he had flagged trains before at this point and that they had always before stopped at a safe distance behind his train.

Engineman Lyons of extra 2504 stated that he left Bluefield with 28 loads and a caboose, brake pipe leakage on this train leaving Bluefield was 3 pounds per minute and the air brakes were working properly. At Flat Top 12 more cars were picked up, the brakes on these cars were inspected, tested and reported to be operating properly. He then proceeded to Bluestone where he stopped for the purpose of changing engines. In making the stop at Bluestone he stated that he used the automatic brake, making one reduction when approaching Bluestone and making a second brake pipe reduction in order to stop at the proper point. He said he did not notice the amount of brake pipe reduction for this stop but thought it must have been between 15 and 20 pounds. Engine 2514 was cut off and engine 2504 coupled to his train, he handled both locomotives in making this change which he thought consumed a period of about seven minutes. After engine 2504 was coupled to the train, he said that he gave the brakes time to release, with the large capacity feed valve now in use no reduction of brake pipe pressure is indicated on the gauge if the angle cocks are turned slowly when the air is cut through after an operation of this character. As engine 2504 was coupled to the train and the air was cut through, or he thought it was cut through, the brakes did not apply on the engine, he thought he moved the brake valve to release position once or twice for not more than 2 seconds each time, but with the large capacity feed valve used it is not necessary to go to release position in order to release the brakes. No test of the brakes was made at that point after coupling on engine 2504 but he thought it would have been impossible for him to have left there without air or with the brakes applied on the train. He stated he had no difficulty in starting, and the ampere readings of the meters were just about normal for a train of that character while ascending the grade between Bluestone and Ruth. He did not make any running test of the brakes after leaving Bluestone and before starting down the grade west of Ruth as it has not been the practice to make such tests on trains hauled by electric motors. He stated that he changed over to regenerating position just as his train entered the tunnel at the summit of the grade at Ruth for the purpose of controlling the speed of the train on the descending grade westward. Approaching Lick Branch they received a yellow signal or caution indication and the next signal was red, indicating "stop". As soon as Helper Clark could see the stop signal from his side of the motor, he called "Red board". Engineman Lyons said he immediately made an application of the brakes but the brake valve exhaust seemed to be too short for a

long train and he remarked that he did not believe they had much air, he made a second reduction and the pressures equalized so quickly that he knew he did not have a large amount of air but thought he had enough to hold the train. He then moved the brake valve to emergency position, and he cut off the regenerative braking as he thought he would be able to stop with the emergency application. However, the speed of the train immediately began to increase and he then tried to get back into regenerating position, and he also sounded the whistle signal for brakes several times. In the short distance remaining he was unable to regain control of his train by means of regenerative braking. The speed continued to increase and he jumped off just before the collision occurred, when he thought the speed was about 20 miles per hour. He said he did not think it necessary to make a test of the air brakes at Bluestone as required by the rules, and he regarded it as impractical to make the running test just before starting over the summit of the grade at Ruth, as to the practicability of making a running test after starting over the summit he expressed no opinion. He further stated that in descending grades with electric locomotives the regenerating feature holds the speed of the train to 14 miles per hour while descending, but cannot be used to bring the train to a stop, and he considered it just as essential to have the air brakes on a train handled by an electric locomotive in good condition as on a train handled by a steam locomotive. While he could not state the cause of the brakes failing to operate on his train, he thought somebody had closed an angle cock about three or four cars behind the locomotive immediately before he undertook to use the brakes, or that it worked closed due to vibration or the slack action of the train.

The statement of Fireman Clark of extra 2504 was substantially the same as that of Engineman Lyons regarding the trip to Bluestone, where he said that not over five minutes were consumed in changing engine 2514 for engine 2504. He did not know whether the brakes were left applied on his train or not when engine 2514 was detached to exchange engines, from the time the stop was made until after engine 2504 had been coupled on and started to leave Bluestone he was performing other duties and knew nothing of the manipulation or condition of the air brakes at that point during the change of engines. He also said that while the rules require an air brake test be made after changing engines, sometimes it is done and sometimes it is not done at Bluestone, and he did not think it necessary to comply with this rule at all times. He further stated that after leaving Bluestone there was no occasion to apply the brakes at any time until they were near Lick Branch store where they saw a red block signal and a flagman, at that time they were descending the grade at a speed of about 14 miles per hour, in regeneration, Engine-

man Lyons placed the brake valve in emergency position, shut off the electric motor, whistled for hand brakes, and then tried to get back into regeneration, calling to him that he had no air. He further stated that he did not notice any indications of the air brakes taking hold on the motor or the cars, and that after the motor was shut off the speed of extra 2504 increased until the rear end of extra 2513 was struck, at which time he estimated it at about 20 miles per hour. He also said that it is not customary, when starting to descend the grade at Ruth, to make a running test of the air brakes in compliance with rule 387; he did not know if it would be practical but said that it could be done, the rule requires it and if the rule had been complied with in this case the condition of the train brakes would have been known.

Conductor Allen of extra 2504 stated that he was not informed of the condition of the air brakes on his train before leaving Bluefield. He did not know whether an air test was made at Flat Top Yard where 12 loads were picked up, as he was getting car numbers, but he noticed when leaving Flat Top that the pressure on the caboose gauge registered somewhere near 70 pounds, they then proceeded to Bluestone where engine 2514 was exchanged for engine 2504. He did not know how the train was stopped at Bluestone, and he did not look at the caboose gauge when stopping or during the interval they were there. He thought not more than 5 or 6 minutes were consumed in changing engines, during this time he was in the caboose writing, and he thought no air brake test was made, but he did not look at the air gauge until extra 2504 was leaving Bluestone, when he noticed that it registered about 70 pounds. He further stated that a running test of the brakes was not made when over the summit of the grade at Coaldale tunnel, that after leaving Bluestone the brakes were not applied at any time until after the collision occurred. He stated that if a reduction had been made with the automatic brake valve at the summit of the grade near Ruth to test the condition of the brakes and they did not respond there would have been plenty of time to have stopped the train by other means when their attention was called to it. The first information he had of the collision was after the train came to a stop at which time the caboose gauge showed 40 pounds brake pipe pressure and was going down as if an air hose had burst, he went forward along the train looking for a burst hose and when within about 10 or 12 car lengths of the head end he saw the wreckage. He said that the speed of his train while coming down the grade from Coaldale tunnel was about 14 miles per hour until the engineman shut off the motor at the red board (signal 3807), and that it had increased to about 20 miles per hour when the accident occurred. He thought nothing of this since enginemen often shut off regeneration at this point to increase the speed. He thought that the emergency application of the brakes was

not made until after the train collided with the rear of extra 2513 and was the result of the broken brake pipe.

Head Brakeman Lusk of extra 2504 stated that the middle brakeman tested the air brakes on the 12 loads picked up at Flat Top. When the stop was made at Bluestone to change engines he thought a heavy application of the automatic brake was made because he noticed coal and sand dust flying about cars in train. He stated that when engine 2514 was detached he closed one angle cock and the middle brakeman closed the other and that when engine 2504 was coupled to the train and the air hose coupled Brakeman Jackson turned the angle cock on one side and he turned it on the engine. He stated that he heard no release of the train brakes at this time or afterwards, and that the train started without any trouble. On leaving Bluestone he rode the rear end of motor 2504 to a point just west of Lick Branch store where the engineman called for brakes and he climbed back on the cars and he and Middle Brakeman Jackson doubled on the first two brakes after which he set the brakes on the third car and rode the middle of the fourth car into the wreck. When he came out of the rear of the motor to set hand brakes he did not notice the position of the angle cocks, and he saw no one on the train but the middle brakeman.

Middle Brakeman Jackson of extra 2504 stated that he tested the brakes on the 12 cars picked up at Flat Top and the brakes were working on all these cars. When the stop was made at Bluestone for the purpose of changing engines he did not know whether the automatic brake was used or not, or whether the train brakes were set or released before detaching engine 2514 from or after coupling extra 2504 to the train. He stated that when engine 2504 was coupled to the train he turned the angle cock handle on the right side and that Brakeman Lusk was on the left side of the motor, but he heard no release of the brakes at that time, and no air brake test was made before leaving that point. After leaving Bluestone he and Brakeman Lusk rode in the back of the motor until the whistle was sounded for hand brakes a short distance west of Lick Branch store when he and Brakeman Lusk ran out on the train and doubled on the hand brakes on the two head cars which were together, he did not look for a closed angle cock when he went out of the motor. He further said that when setting the two brakes he had to take up some of the slack in the brake rigging by hand which would indicate to him that the air brake was not applied at that time. He climbed down and got off as the collision occurred and afterward proceeded along the entire remaining portion of the train looking for a closed angle cock, but found none, during this trip to the rear all the pistons he saw were out, indicating that the brakes were then applied. He thought the speed of the train had increased to about 18 or 20 miles per hour at the time of the collision.

Rear Brakeman Brown stated that the train brakes were applied at Bluestone because the stop was slightly rough and he and the conductor mentioned it, the pressure on the air gauge went back about 10 pounds. He also stated that the train brakes were released during this time, but he could not say which engine released the brakes as he remained in the caboose while the train was standing at Bluestone. He further stated that after leaving Bluestone and while proceeding westward he looked at the air gauge in the caboose several times and that it showed about 70 pounds pressure until the final stop was made when it showed 40 pounds and was still going down when he went back to flag.

The statements of other members of the crew of extra 2513 and members of the train crew of extra 2503 who saw the collision or were familiar with events leading up to it corroborated some of the statements of employees who were directly involved. A number of them heard the whistle-signals for brakes which were sounded by Engineer Lyons of extra 2504 and stated that the speed of that train was increasing as it approached the point of accident. The consensus of opinion was that the speed of that train was about 20 miles per hour at the time of collision. None of them saw any indication of the brakes being applied on that train prior to the accident, but several persons noticed that they were applied after the accident.

According to the statements of Air Brake Inspector Farmer and Air Brake Repairer Catron, the 28 cars which left Bluefield in extra 2514 on the morning of the accident were inspected and the brakes found to be in good condition, brake pipe leakage was 3 pounds per minute. A test was made by charging the brake pipe from an air line and making an application by breaking the hose connection. After the engine was coupled on, an application and release test was made.

Engineer of Tests Coddington stated that on the day following the accident all of the cars which were in extra 2504 at the time of the accident except the motor and the first four cars were assembled at Eckman yard and arranged in the same order as they were at the time of the accident. The brake pipe was charged to a pressure of 71 pounds and a 15 pound reduction was made. All cars were inspected and it was found that all brakes applied and piston travel ranged from $5\frac{1}{2}$ to 9 inches. The brake pipe leakage was 4 pounds in 1 minute and 22 pounds in 12 minutes, the time required for the inspection. A release was then made and all brakes released properly. The engine was then shifted from the head end to the rear end of the cars and the tests were repeated, with similar results. After this test the brake pipe was again charged to 71 pounds pressure, the angle cock was closed and the brake pipe was disconnected from the engine. Observations were made to determine

whether or not any of the brakes would apply as a result of brake pipe leakage. After a period of 5 minutes, one brake applied. No additional brakes applied during a total period of 40 minutes. An emergency application was then made by opening the angle cock on the head end of the cars, as a result of which all brakes applied. The period of 40 minutes was selected as corresponding to the period from the time extra 2504 stopped at Bluestone to change locomotives to the time of the accident. An inspection of the running gear and drivers of locomotive 2504 disclosed evidence of heavy braking on all drivers of both units. This was disclosed not only by the appearance of the driver tires but also by the surfaces of the brake shoes.

General Air Brake Inspector Looney stated that the rules in effect covering operation and maintenance of air brakes on the Norfolk and Western Railway were contained in rule books M. P. 239, M. P. 294 and the rules adopted as standard by the American Railway Association in 1923 and by the N & W Ry. on October 14, 1924. He stated that he is familiar with the A. R. A. rules for operation and maintenance of air brakes adopted in 1925, and understands that they are the minimum requirements accepted by the Interstate Commerce Commission. He said that the 1925 rules had been put in effect on his line as far as the maintenance of air brakes is concerned but not with respect to train or engine crews. Engine and train crews are governed by the rules adopted October 14, 1924, which he thinks are sufficient.

He stated that if the conductor of extra 2504 was not notified as to condition of brakes on the train as it left Bluefield, rule 28 was not fully observed. He approves of making air tests by breaking the hose, but said that practice does not comply with existing rules.

In regard to the operation at Bluestone, he said that according to the statements made at the hearing rule 31 of their rules was not observed at that point. After listening to all evidence, and with his general knowledge of air brakes, it was his opinion that an angle cock was left closed next to the engine at Bluestone, which caused the accident. He said that because of the slow leakage he did not think the brakes would creep on. This was further indicated by the test made of the train of extra 2504 at Eckman on the next day. He was present when Engineer Lyons' statement was taken in the hospital, Engineer Lyons had made a positive statement that he stopped the train at Bluestone with the automatic brake and left the brake applied when engine was detached; he did not know whether Engineer Lyons' statement might be influenced on account of his responsibility and he did not know whether Engineer Lyons was sufficiently in possession of his

faculties to make a proper statement. However, if this were true he could not have gotten away from Bluestone. He further stated that engineers are taught to stop long trains on level track with the independent brake. The air brake inspector at Bluestone had examined the air brake equipment on motor 2504 prior to the trip when accident occurred and did not find anything wrong at that time, after the accident the equipment was damaged to such an extent that it was impossible to make an examination. He examined the driving-wheel tires and brake shoes after the accident, and they showed evidence of having been subjected to severe braking. On November 6 he and Division Car Inspector East made an examination of the brake pipe, air hose and angle cocks on the wrecked motor and cars, that they located all air hose and angle cocks on both units of motor 2504, angle cocks and air hose on the third car in train and the air hose and angle cocks from A end of second car in train, which were all found in good condition with the angle cocks open, they were unable to locate the angle cock or air hose from B end of second car in train. They located the angle cock and air hose from A end of the car which had been next to the motor and the hose was in good condition except that the outer surface was cut as the result of collision, however, the angle cock was closed and it evidently had been struck by something which broke the lug off the safety lock and forced the handle slightly beyond closed position as was indicated by an impression on angle cock handle.

Conclusions

This accident was caused by a runaway freight train due to a closed angle cock in the brake pipe at the head end of the first car behind the locomotive, and failure to make proper air brake tests which would have disclosed this condition after the locomotives were changed at Bluestone or before starting down the grade on which the accident occurred.

The rules in effect required that an application and release test be made when a locomotive is changed and that a running test be made before a train starts from the summit of a grade such as is here involved. Neither of these tests was made, had either of these tests been made the fact that an angle cock was closed would have been discovered in time to avert the accident.

The fact that an angle cock was left closed when extra 2504 departed from Bluestone was clearly established by the investigation. When locomotive 2514 was changed for locomotive 2504, the air hose were coupled and uncoupled and angle cocks manipulated by Brakeman Lusk on one side and Brakeman Jackson on the other. However, according to their statements each of them claimed that he

opened the angle cock on motor 2504 when it was attached to the train and it does not appear that either of them opened the angle cock ~~on the~~ head end of the first car. As a result of the emergency application made by Engineman Lyons just before the accident occurred the brakes on cars of the train did not apply, as there was no fire flying from the car wheels and brake shoes, the conductor who was in the caboose said there was no brake application after leaving Bluestone until after the collision occurred, and when the brakeman set the hand brakes on the first two cars the slack in the brake rigging had to be taken up, however, there was unmistakable evidence of severe braking on the rotors. These facts definitely located the stoppage in the brake pipe between the motor and first car. When the angle cock from the forward end of the first car was later recovered it was found closed, and its condition, together with riks which were found upon it, indicated that it was in closed position when it was struck by the motor end sill at the time of the collision, it was so damaged that it could not be manipulated by hand and consequently its position could not have been inadvertently changed after the accident occurred. That the run from Bluestone to the point of accident could have been made with the angle cock closed and without the brakes creeping on was fully established by the tests the following day when, even with increased brake pipe leakage, the brake on only one car applied in a period of forty minutes after the angle cock was closed.

After leaving Bluestone no stops were made and no effort was made to use the air brakes until Engineman Lyons undertook to stop the train when he saw signal 3807 in stop position. From Bluestone to the point where the engineman whistled for brakes, Brakeman Jackson and Lusk both rode in the rear end of the motor, practically at the location of the angle cock which it later developed was closed, they saw nobody else on the train and were in position to have seen anyone in that location, it is wholly improbable that the angle cock was closed between Bluestone and the point of accident, it undoubtedly was closed at the time the train departed from Bluestone. After engine 2504 was coupled to the train at Bluestone there is no evidence that a release of the brakes occurred. No one heard their release, Engineman Lyons merely said that he gave them time enough to release. That the brakes were not applied when the train departed from that point is evident from the fact that no difficulty was experienced in starting, and current consumption on the ascending grade to Ruth was not excessive. It is therefore believed either that Engineman Lyons made the stop at Bluestone by means of the independent brake, or if he used the automatic brakes he must have released them before engine 2514 was cut off.

Some of the rules in effect which required specified tests to be made of the brakes of extra 2504 prior to the occurrence of this accident are as follows:

Rule 26. "When brakes are to be tested from yard plants, after blowing out yard line, train must be charged to the required pressure.

"While brake system is being charged, a visual inspection of retaining valves and retaining valve pipes must be made, and position of angle cocks and hose ascertained. Close examination must be made for leaks and necessary repairs made to reduce leakage to a minimum.

"When brake system is charged to standard pressure, a 15 pounds service reduction must be made, after which a second examination of the train must be made to determine

- (A) Brake pipe leakage
- (B) If brakes will apply in service application.
- (C) Piston travel
- (D) That brake rigging does not bind or foul.

"Release tests must be then made to determine if brakes release properly.

"If, during these tests, the brake pipe leakage as indicated by the brake pipe gauge exceeds 8 pounds per minute, it should be reduced to 8 pounds (preferably 5 pounds) and if piston travel is less than 6 inches or more than 8 inches, it should be adjusted to nominally 7 inches.

"After road engine is coupled to train, brakes must be tested as prescribed in Rule 31."

Rule 27. "Before a train leaves an originating point, where brakes have not been tested from yard plant, test must be made as follows:

"After air gauge on engine indicates within 5 pounds of standard brake pipe pressure, enginemen must, on request or signal, make a service brake pipe reduction of 15 pounds, and determine by length and force of brake pipe discharge if there is open communication throughout the brake pipe. After the brake pipe discharge ceases and having noted brake pipe leakage, he must increase reduction to a total of 25 pounds. Inspectors, or train crew, must then make certain that brakes have applied, that piston travel is not less than 6 nor more than 8 inches, and that brake rigging does not bind or foul, inspectors or member of train crew must then give enginemen proper signal for releasing brakes and see that all release."

Rule 30. "When cars are added to a train, the brakes on such cars must be tested as prescribed in Rule 27, and where practicable they should be charged before coupling them to the train."

Rule 31. "When engines are changed, or an angle cock has been closed, except for cutting off car or cars from the rear of train, an application and release test must be made from the engine. Inspector or trainmen will note that rear brakes of train apply and then signal for a release, noting that rear brakes release."

Rule 387 "When handling freight trains on mountain grades, the engineman must pull the train over the summit, and as soon as the danger of train parting has passed, he must apply the brakes with a reduction of from 7 to 10 pounds to check the speed of the train. It must be borne in mind that it is a great deal easier to hold the train at a slow speed than it is to bring it down from a high to a low speed. The speed should be kept low until the efficiency of the brakes is determined, which should govern the speed to be maintained afterwards."

The requirements of rule 26 were not fully complied with at Bluefield prior to the departure of extra 2514, brakes on the cars which were picked up at Flat Top were not tested in accordance with rules 30 and 27, when locomotives were changed at Bluestone no test was made as required by rule 31, and when the train reached the summit of the grade at Ruth no running test of the brakes was made as required by rule 387.

During this investigation it appeared that both division officials and employees undertook to justify the practices which were followed, as being safe and sufficient, at the same time, however, it was freely admitted that the rules requiring the tests had not been rescinded or modified. It was brought out during the investigation that on trains hauled by electric motors, it has not been the practice to make running tests of the brakes before starting the descent of grades on this division. This is probably due to the fact that the speed of trains on these descending grades is controlled by electric or regenerative braking, while this is an effective and efficient method of controlling speed at a relatively uniform rate, the fact remains that in case a stop is required to be made the brakes must be depended upon for that purpose, and it is therefore fully as essential for electric trains as for steam trains that all the required tests be made to insure that the air brakes are in effective operating condition.

In addition to the fact that the rules in effect on this line relating to the operation and testing of air brakes were not rigidly observed and strictly enforced, the investigation disclosed that the requirements of the Norfolk & Western in respect to maintaining and testing brakes have not been revised to conform to the current standard practice. The rules for engine and train crews which were in effect at the time of this accident conformed to the standards adopted by the American Railway Association in 1923, revised rules

were adopted as standard by the American Railway Association in 1925, superseding the 1923 code, but these revised rules so far as they apply to engine and train crews had not been accepted or adopted by the Norfolk & Western Railway. The 1925 code of rules was one of the results of a proceeding of inquiry and investigation entered upon in 1922 by the Interstate Commerce Commission in respect to power brakes and appliances for operating power brake systems

"to determine whether, and to that extent, power brakes and appliances for operating power brake systems, now generally in use upon the locomotives and cars of carriers by railroad subject to the interstate commerce act, are adequate and in accordance with requirements of safety, what improved appliances or devices are available for use, and what improvements in power brakes and appliances may or should be made, to the end that increased safety in train operation may be obtained."

The Norfolk & Western Railway Company was one of the respondents in this proceeding. In its report of July 18, 1924, the Commission said (p. 516):

"Throughout this proceeding the necessity for better maintenance of present power brake equipment in order to secure proper operation and safety to control trains was repeatedly stressed, and this necessity was recognized by both carriers and employees. It is beyond question or argument that piston travel should be maintained within proper limits, triple valves should be kept properly cleaned, brake pipe and brake cylinder leakage should be kept below certain prescribed amounts, and retaining valves with their pipe connections should be kept in good condition; furthermore, rules should provide and proper tests should be made to insure that trains will not leave terminals with defective, inoperative, or cut-out brakes on any cars."

One of the conclusions of the Commission which was stated in this report was that:

"Improvements in the operation of power brakes for both passenger and freight trains are essential and must be effected."

Following the issuance of that report the American Railway Association, with the cooperation and assistance of the Bureau of Safety, revised its rules for maintenance of air brake and train air signal equipment which had been adopted as standard in 1925. The purpose of this revision

was to bring about improvements in the maintenance and operation of power brakes, the necessity for which had been pointed out in the Commission's report of July 18, 1924. These revised rules were approved by the Commission and adopted as standard by the American Railway Association in 1925, when issued, the following statement was made.

"These rules were formulated jointly by the Bureau of Safety of the Interstate Commerce Commission and the Safety Appliance Committee of the Mechanical Division of the American Railway Association. They represent minimum requirements, and shall govern the maintenance of air brake and air brake signal equipment on locomotives and cars, provided that nothing herein contained shall be construed as prohibiting the carriers from enforcing additional rules and instructions not inconsistent with these rules."

The revised rules specified in detail certain tests of air brakes under different operating conditions which were considered essential to insure that air brakes on trains would be maintained in efficient operating condition, and these revised rules marked a distinct advance in safety requirements as compared with the rules of 1923 which they superseded.

The responsibility for this accident rests not only upon Engineer Lyons and Conductor Allen for their neglect to make air brake tests as required by the rules, but also upon the entire staff of division operating officers for permitting and encouraging violation of definite rules with respect to air brake tests until it had become common practice to disregard the requirements of these rules on the division.

The management of the Norfolk & Western Railway should promptly give consideration to the matter of revising their rules and adjusting their practices to make fully effective the provisions of the current standard rules of the American Railway Association covering maintenance and tests of air brake equipment.

All of the employees involved in this accident were experienced men, and none of them was on duty contrary to the provisions of the hours of service law.

Respectfully submitted,

W. P. BORLAND,

Director.