INTERSTATE COMMERCE COMMISSION

REPORT OF THE CHIEF OF THE BUREAU OF SAFETY UPON INVESTIGATION OF AN ACCIDENT WHICH OCCURRED ON THE SOUTHERN PACIFIC RAILROAD NEAR VINCENT, CALIF., OCTOBER 29, 1919

DECEMBER 5, 1919.

To the Commission:

On October 29, 1919, there was a derailment of a passenger train on the Southern Pacific Railroad near Vincent, Calif., which resulted in the death of two employees, two trespassers and one passenger, and the injury of three employees, one trespasser and 158 passengers. This accident was investigated jointly with the California State Railway Commission, and as a result of this investigation I respectfully submit the following report:

This accident occurred on the Mojave and Saugus subdivision of the San Joaquin division, a single-track line extending between Mojave and Saugus, a distance of 69.9 miles. Trains are operated by time table, train orders and an automatic block signal system. Proceeding eastward from Vincent the grade is descending to the point of accident, a distance of almost exactly three miles, the grade varying from 1.96 to 2.2 per cent. Approaching the point of accident from the west the track is tangent for about 2,200 feet, followed by a 3° curve to the right about 1,000 feet in length, 1,300 feet of tangent, and a curve to the left of 8° 10′ about 800 feet in length. The derailment occurred on this latter curve at a point about 500 feet from its western end. The track is laid with 90-pound rails, 33 feet in length, double spiked with an average of 18 ties to the rail, fully tie-plated. The ballast is of gravel. The alinement, gauge and surface were in excellent condition. The speed of passenger trains is restricted by time-table rule to 30 miles an hour from Vincent to mile post No. 422, a distance of approximately 1½ miles, while from mile post No. 422 to mile post No. 427, within which territory this accident occurred, the speed limit of passenger trains is restricted by time-table rule to 40 miles an hour. The weather at the time of the accident was clear.

The train involved was eastbound passenger train No. 50, consisting of two wooden baggage cars, five steel coaches, one tourist car, one dining car, and three Pullman sleeping cars, in the order named.

hauled by Mikado-type engine 3265 and was in charge of Conductor Cameron and Engineman Fiedler This train held an order to run 7 hours and 40 minutes late, and according to the train sheet it arrived at Vincent at 2 47 p m and departed at 2 49 p m, 9 minutes late on its run-late order It was derailed on the 8° 10′ curve while traveling at a speed estimated by the train crew to have been about 35 miles an hour, the derailment occurring at 2 57 or 2 58 p m

The engine came to rest in an upright position on the right side of the track, 274 feet east of the point of derailment and about 40 feet from the track The first baggage car stopped at the rear of the engine, partly across the tender cistern, and was practically demolished Illustration No 1 shows the baggage car resting partly over the cistern, which was torn from its frame In the foreground is the tender frame resting partly under the rear of the engine Illustration No 2 is a view taken from the opposite side, showing the wreckage of the baggage car in the center The second baggage car and the first coach passed along the ground on the left side of the engine, coming to a stop with the head end of the baggage car about 115 feet beyond the engine as shown by Illustration No 3 The next three cars came to rest partly across the track and partly down the bank on the right side of the track The head end of the seventh car was derailed to the left its rear end remaining on the track coupled to the tourist car the forward trucks of which were also derailed Illustration No 4 is a view looking eastward showing this portion of the train after the tourist car had been derailed and the other cars had been moved sufficiently to clear the track This view also shows the point where the train was derailed Illustration No 5 is a view of the same portion of the train looking westward, while Illustration No 6 is a general view of the wreckage taken from the opposite side Diagram No 1 shows the relative position of the engine and first eight cars before any of the equipment had been moved The balance of the train consisting of the dining car and three sleeping cars, remained on the rails and was not damaged in any way The employees killed were the engineman and fireman

Examination of the track disclosed that the first mark of derailment was on the outside rail where a wheel apparently one of the wheels of the engine had mounted the rail This mark extended diagonally across the rail a distance of 4 feet The first mark on the roadbed outside of this rail was 6 feet beyond the point where the wheel left the ball of the rail and 12 inches from the gauge side of the rail This mark continued to lead off to the right and down the 10-foot embankment on which the track was laid at this point The first mark on the ties between the rails was 35 feet east of the point where the first mark appeared on the opposite rail, indicating that the wheels on the left side of the engine had been raised

from the track and did not come down within that distance Beginning 70 feet beyond the first marks the track was torn up for a distance of about 200 feet

Upon examination of the engine after the derailment the brake valve was found in full release position The air-brake cut-out cock had been broken off and was found under the débris of the cab when it was cleared up two days after the accident occurred when found the cut-out cock was in closed position The examination of this engine failed to disclose any defects which could have contributed to the derailment

Train No 50 had been assisted up the grade into Vincent by a helper which was operated as the leading engine Engineman Calhoun who was in charge of this helper, and who operated the brakes on the train from Lancaster to Vincent, a distance of 15 miles stated that he made three stops as well as a running test of the air brakes and that no difficulty of any kind was experienced with the brakes The brake-pipe pressure was 90 pounds In making the stop at Vincent he made about an 18-pound reduction and did not release the brakes, leaving his brake valve in the lap position until his engine had been cut off At this time his engine was standing just clear of the switch leading to the east leg of the wye Just as his engine was cut off from the train he heard Engineman Fiedler whistle for a plug test from the rear end As soon as his engine had been cut off he moved it ahead a few feet and then backed into clear after which train No 50 started Engineman Calhoun stated that Engineman Fiedler worked steam fairly hard until he had made a running test of the air brakes which was done while the train was traveling at a speed of about 8 miles an hour and then the train moved off easily Engineman Calhoun further stated that if the air-brake cut-out cock on engine 3265 had been closed at Vincent it would have been impossible for Engineman Fiedler to have released the brakes and if he had not released the brakes he would not have been able to start the train for if the brake pipe had leaked at all this would have resulted in the brakes being applied harder considering the short space of time in which the train remained at the station He said that in his judgment if the brakes had not been applied on train No 50 after leaving Vincent, it would have been derailed within a mile on account of excessive speed, also that several hours would be required for the brakes to leak off entirely, in view of the condition of brake apparatus on that train After the accident he went to the scene and examined the engine and track He thought that the marks on the ties were not as heavy as would have been made by an empty box car he was unable to account for these light marks and had formed no opinion as to the cause of the accident

Conductor Cameron stated that he did not know whether or not the engineman whistled for the plug test at Vincent, but that Rear Brakeman Shaver made the test while he himself was standing on the platform of the second car from the rear and felt the brakes apply, after which they were released This could not have been done if the cut-out cock had been closed The train remained at Vincent three or four minutes and left there at 2 50 p m , a running test of the brakes being made as the train started out At the time of the derailment he was working in the second car from the rear, and while he had not been paying any attention to the speed he did not think it could have been more than 35 miles an hour or he would have noticed it, although he said it was entirely possible that this rate of speed might have been exceeded He based his estimate on the way in which the cars rode He said that if the engineman had released the brakes just before reaching the tangent approaching the 8-degree curve, the speed would have increased rapidly before reaching the curve and would not have caused any excessive motion on account of the cars then being on the tangent track His first knowledge of the derailment was when he felt a sudden shock, which felt like an emergency application of the air brakes This was followed by two other shocks each of increasing force He got out of the car in which he had been riding and started ahead and while he was running forward it occurred to him to look at his watch He did so when he was about opposite the engine, and it was then nearly 3 p m , he estimated that the derailment actually occurred at about 2 58 p m Conductor Cameron further stated that nothing had happened during the trip to indicate any defects in the equipment and that so far as he knew Engineman Fiedler was in good health The engineman was considered to be one of the best qualified men in the service and a man who strictly observed the rules

Rear Brakeman Shaver stated that the air brakes were used in making the stop at Vincent, and that they were not released immediately after the train stopped The engineman whistled for a plug test and he made the test from the rear end raising the safety chain uncoupling the hose from its hanger and turning the valve The brakes had not been released at the time of this test, so that its only effect was to set the brakes more firmly against the wheels The train remained at Vincent two or three minutes A running test was made leaving Vincent, at which time he was standing in the vestibule waiting to hear the exhaust through the retainer He then signaled to the engineman that the brakes had applied, and they were then released He remembered this particularly because a passenger had inquired what he was doing and he explained the matter to him After this he felt the brakes applied and released

on one of the curves He had not been paying particular attention to the speed, but thought it was about 35 miles an hour His first knowledge of anything wrong was when he felt the brakes being applied in emergency, followed by a severe jar As he got off the train after the accident he looked at his watch and it was then between 2 57 and 2 58 p m

Brakeman Phelps stated his train remained at Vincent three or four minutes, he was standing opposite the engine when Engineman Fiedler whistled for the plug test When the train started to leave Vincent he was on the ground opposite the first car, and boarded the forward end of the smoking car, riding there until the derailment occurred The left vestibule door was open and he looked out of this door before and after passing the first curve east of Vincent At these times he did not notice anything wrong or any unusual amount of dust under the train He estimated the speed to have been between 30 and 35 miles an hour and said he was sitting on the top step when he felt the first shock followed closely by a second shock Brakeman Phelps further stated that he was positive the brakes were applied and released at least twice between Vincent and the point of derailment the last time being after rounding the first curve west of the point of derailment This was an ordinary service application after which the brakes were again released He thought the time which elapsed between this application and the application made at the time of the derailment was sufficient to allow the train line to be charged, he estimated this period of time to have been a minute or a minute and a half

Division Engineer Bordwell stated that measurements of the track showed it to be in good condition The elevation was uniform with a maximum variation of one-eighth inch in 290 feet varying from 4 inches to 4⅛ inches Beginning 200 feet west of the point of derailment, the gauge was 4 feet 8¾ inches increasing gradually in 125 feet to 4 feet 9⅛ inches From this point to the point of derailment a distance of 165 feet it varied from 4 feet 8⅞ inches to 4 feet 9⅛ inches Diagram No 2 shows the measurements as to gauge and elevation in detail These measurements were taken every 25 feet for a distance of 200 feet, and then every 15 feet for a distance of 90 feet to the point of derailment This diagram also shows the amount of wear on the particular rail on which the first marks of derailment appeared Diagram No 3 shows the track layout at Vincent and the alinement and grade of the track from that point to the point of derailment

Trainmaster Wilson stated that the cut-out cock was found on the morning of October 31 when they started to move the débris of the engine cab It had been broken off, together with a section of brake pipe about 7 feet long When found the valve was closed and

while there were no marks to indicate that it had been struck it was worn bright for an inch or two and looked as though it might have been dragging The normal position of the valve when the air is cut in is at right angles with the pipe, and when in that position would have been broken off if struck from above The fact that the valve was not broken off was considered as tending to indicate that it was not in the open position at the time of the accident, but Trainmaster Wilson stated that the valve moved freely and might easily have been moved by some one taking hold of it, or even by stepping on it

Master Mechanic Shelaberger stated that engine 3265 was sent to the shops on July 31 for a general overhauling the engine being released from the shops on September 8 He carefully examined the engine after the accident and found all wheels and flanges to be in perfect condition in fact he was unable to find anything wrong with the engine Superintendent of Motive Power Sheedy and Road Foreman of Engines Jones added nothing to Mr Shelaberger's statements

Section Foreman Freeze stated that he reached the scene of the accident at 4 45 p m He said he was unable to find that anything had been wrong with the track, and from the marks on the outside of the outer rail with no corresponding marks on the inside of the inner rail he concluded that high speed was the cause of the derailment, and that the wheels on the inside of the curve had been raised up from the rails and ties He had been in charge of this section 14 years, during which time he had won six prizes on account of the good condition of the section

Roadmaster Markley stated that the track where the accident occurred was in first-class condition, and that he considered it to be the best track in his district

J B Threlkeld employed in the commissary department of the Southern Pacific Railroad, was a passenger on train No 50, riding in the fifth coach He was positive that when leaving Vincent a running test of the brakes was made Two or three applications of the air were made after that time, but when the train reached the 3° curve west of the curve on which the derailment occurred he noticed that the speed was high probably 40 or 45 miles an hour and he began to get frightened He was expecting an application of the brakes to be made, but the speed increased from that point to the point of derailment the first indication of which was a sudden jar like an emergency application of the brakes He was unable to estimate the speed at the time of the derailment

The statements of the various employees indicate that a test of the air brakes was made, as required by time-table rule after the helper

had cut off at Vincent that a running test of the brakes was made when leaving Vincent, and that the brakes were used at one or two points to control the speed of the train on the grade. While the air-brake cut-out cock on engine 3265 was in the closed position when it was found after the accident, it is believed that this was not its position when the train left Vincent. If it had been closed at that time, unless the train brakes had been released by the helper engine before it was cut off, it would have been impossible for Engineman Fiedler to have started the train as it had not stood at Vincent for a sufficient period to allow the brakes to leak off. The evidence is positive and definite that the train brakes were not released until after the helper engine had been cut off and the plug test had been made. Furthermore, if the cut-out cock had been closed, it would have been impossible to have released after the plug test to have made the running test or to have controlled the speed by means of the train brakes between Vincent and the point of derailment. Had the train departed from Vincent without the plug and running tests being made, and with the cut-out cock closed, it would either have been traveling at a dangerous rate of speed long before reaching the point of derailment or the brakes would have been applied due to brake-pipe leakage, in which case the engineman would have been unable to release them, and the train would have been brought to a stop. That the speed of this train could have been properly controlled and regulated on a 2 per cent grade for a distance of 3 miles, the line consisting of both tangents and sharp curves, by means of a single brake application resulting from brake-pipe leakage, is entirely beyond belief. The evidence also is clear that the train brakes were applied and released in the customary manner between Vincent and the point of derailment. The conclusion is therefore firmly established that the air-brake system was in operating condition on this train after leaving Vincent, and also it is believed at the time of the derailment.

Careful examination of the equipment failed to disclose anything which could have contributed to the derailment. The marks on the ties, however, indicate that when the wheels of the engine first mounted the rail the engine was raised clear of the track on the left side and did not settle back until it reached a point 35 feet beyond the first marks. This indicates that the speed of the train was excessive at the time of the derailment. While there was no speed recorder on the engine, and while the average speed from Vincent, based on the conductor's figures, was only 22 or 23 miles an hour, the employees stated that it was about 35 miles an hour at the time of the derailment, and the statements of one of them indicated that it was in excess of that amount. These facts, especially when taken

in conjunction with the marks on the ties and the condition of the equipment after the accident, indicate that the speed at the time of derailment could not in any event have been materially less than the maximum of 40 miles an hour allowed by rule.

It is believed that the track conditions existing at this point did not afford an adequate margin of safety for a speed of 40 miles an hour. As previously stated the track was in good alinement surface and gauge, the variations in gauge and elevation being slight. The elevation, however, was insufficient for the maximum rate of speed permitted. According to the measurements of the division engineer the elevation varied from 4 to 4½ inches. According to the recommended practice of the American Railway Engineering Association, the theoretical elevation of the outer rail on an 8° 10′ curve if trains are to be operated over it at a speed of 40 miles an hour should be slightly over 8½ inches, with an elevation of 4 inches the maximum speed allowed should be only slightly over 27 miles an hour. While it is true that the overturning speed of a train on a curve of the degree and elevation here under consideration is much greater than 27 miles an hour, nevertheless overturning speeds are entirely matters of calculation and theory, whereas the speeds shown as safe speeds are more or less matters of common knowledge based on practical experience. The speed of a train seldom reaches the point where it actually overturns. Long before such a speed is reached the speed is sufficient to cause the equipment to rock back and forth until finally a wheel climbs the rail and results in derailing the train. This was evidently the result in this instance as none of the equipment overturned even after derailment. A very large margin must necessarily be maintained between theoretical overturning speeds and the speeds authorized for common practice in order that proper allowance may be made for errors in estimating speed, worn rails and slight imperfections in track or equipment which may not be serious enough to warrant repair or replacement but which combined materially reduce the factor of safety. The elevation recommended for common practice is designed to provide the necessary margin of safety and no speed should be permitted which is greater than that recommended for the existing elevation and curvature. If it is not desired to increase the elevation on account of heavy grades or for other reasons or if the required elevation is beyond the dictates of good practice then the obvious remedy is to reduce the maximum permissible speed accordingly.

This accident was caused by excessive speed, the rate of speed permitted over that part of the road being too great for the existing elevation on the curve where derailment occurred. While there was no means of definitely determining whether or not the maximum

speed limit was actually exceeded it is believed that had the speed of trains on this curve been restricted in accordance with the recommended practice of the American Railway Engineering Association for the existing elevation this accident would not have occurred

All of the employees involved were experienced men with clear records and none had been on duty in violation of any of the provisions of the hours of service law

Respectfully submitted

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