In re Investigation of accident which occurred on the Atchison, Topeka & Santa Fe Railway, near Haynes, Calif., on June 14, 1917.

July 23, 1917.

On June 14, 1917, there was a derailment of a passenger train on the Atchison, Topeka & Santa Fe Railway, near Haynes, Calif., resulting in the death of one employee and the injury of one employee, one expressman, five postal clerks and one trespasser. As a result of the investigation of this accident, the Chief of the Division of Safety submits the following report:

The train involved in this accident was eastbound passenger train No. 22, known as "The Missionary," en route from San Francisco and Los Angeles to Chicago; it consisted of locomotive No. 3600, one postal car, one baggage car, one smoking car, one chair car, two tourist sleeping cars, and two standard sleeping cars, and Conductor Ray and Engineman Bispham were in charge of this train. The sections of this train which originate at San Francisco and at Los Angeles are consolidated at Barstow.

The second district of the Arizona Division of the Atchison, Topeka & Santa Fe Railway, on which this accident occurred, extends from Barstow to Needles, a distance of 169 miles. The derailment occurred approximately 76 miles east of Barstow, 1.65 miles east of Haynes, which was the last station passed by this train prior to the accident, and approximately two miles west of Bagdad. At both ends of this district the line is double tracked, between Barstow and Daggett, a distance of 9.4 miles, and between Goffs and Needles, a distance of 31.2 miles; on these double track portions trains are operated by the automatic block signal system. For the distance of 128.4 miles between Daggett and Goffs, which includes the point of accident, the line is single track, and trains are operated by the timetable and train order system.

Approaching the scene of the accident from Haynes, there are three curves, Nos. 238, 237 and 236, each approximately 1,000 feet long, and the maximum curvature is 32 minutes, 1 degree 56 minutes, and 3 degrees 32 minutes, respectively. Proceeding eastward from the eastern end of curve No. 236, the track is tangent for a distance of approximately 650 feet, to the beginning of curve No. 235. This is a spiraled curve 1,114 feet in length, the degree of curvature for a distance of 112 feet from each end being 4 degrees 40 minutes, and for the intervening distance of 890 feet it is 6 degrees 2 minutes. The point of derailment was 38 feet

from the eastern end of curve No. 235. From a point some distance west of Haynes to point of derailment there is a descending grade for eastbound trains; the gradient varies from 1.55 per cent. at Haynes to 1.2 per cent. at the western end of curve No. 235, and for the greater part of this curve the grade is more than 1 per cent., although at the actual point of derailment it decreases to 0.35 per cent.

On the night of this accident train No. 22 was late throughout the run from Barstow to the point of accident. The regular meeting point for trains 22 and 17 is Bagdad, they being due at that station at 1.05 a. m., and on this night order No. 3 was issued giving train No. 17 right over train No. 22 from Cadiz to Ludlow but requiring train No. 17 to wait at Bagdad for train No. 22 until 1.12 a. m. The schedule running time between Siberia and Bagdad, a distance of 7.4 miles is fifteen minutes. According to the train sheet record, train No. 22 passed Siberia at 12.57, seven minutes late, which was the amount of time given train No. 22 on train No. 17 by order No. 3. Train No. 22 left Barstow at 11.23 p. m., June 13, a thirteen minutes late, and passed Siberia, which was the last open telegraph office west of the point of accident, 5.8 miles west of Haynes, at 12.57 a. m., June 14, whistled for Haynes Siding at about 1.02 a. m., and was derailed at 1.04 a. m. At the time of this accident the weather was clear.

In the vicinity of the scene of this derailment the track is laid with 90-pound rails, 33 feet in length, tie-plated, with staggered spiking, there being 22 pine ties to the rail length; six anti-creepers were also used to each rail length. Dirt ballast was used, the surface being oiled. New rails had been laid in March, 1916, at which time a maximum superelevation of 3-1/4 inches was provided on curve No. 235, this superelevation providing for a maximum rate of speed of 35 miles per hour on an eight-degree curve. One month after this work had been completed, curve No. 235 was checked up and was found to have settled about one inch.

Following this accident, the track on this curve was checked up with respect to gauge and superelevation. The maximum gauge on the curve was found to be 4 feet 8-7/8 inches, the minimum gauge being 4 feet 8-3/8 inches, while at the point of derailment the gauge was standard, 4 feet 8-1/2 inches. On the 8 degree 2 minute portion of the curve the maximum superelevation was 4-3/8 inches, and the minimum superelevation was 3 inches, this point of minimum superelevation being 226 feet west of the point of derailment. The superelevation on the 4 degree 40 minute curve at the point of derailment was 2-3/8 inches.

The first indication of the derailment, which was found

on the track, was a well-defined flange mark the oiled surface of the roadbed, thirty-three inches from the rail on the north side of the track. This flange mark was more than two feet in length, and from its width and depth it appeared to have been made by a driving-wheel flange, although this could not be definitely determined. For a space of about twenty-five feet east of this flange mark the surface of the roadbed on the north side of the track was unbroken, but from that point onward the marks made by the engine were continuous to the place where it finally came to a stop, on its left side, several feet from the track, on the north side and approximately 800 feet from the point of initial derailment. The locomotive tender was also derailed on the north side of the track and came to rest between the locomotive and the track, one corner fouling the track.

The postal car, which was the first car in the train, was derailed 54 feet east of the point where the locomotive first left the track, and this car ran along on the ties for a distance of 345 feet before it came to a stop. The corner of the tender fouling the track raked the side of this car and cut it at about the floor line; the car almost completely reversed its direction and when it settled upon the right-of-way on the south side of the track it became detached from its trucks and nearly the entire body of the car fell away from the underframe, turning bottom side up. The baggage car followed the same path as the mail car and suffered similar raking and cutting damage, the entire body of the car falling away from the steel underframe. The next two cars remained upright but were considerably damaged by striking the corner of the tender, the front trucks of the fourth car being derailed opposite the point where the tender was doubled back against the locomotive. All the cars which were damaged were of steel-underframe construction. The remaining three cars in the train were not derailed and being clear of all wreckage were not damaged.

A thorough examination of locomotive No. 3600 failed to disclose any defect of equipment which might have caused or contributed to this derailment. The tires, flanges and treads of engine truck wheels, drivers and tender wheels were found to be in good condition; flange and tire wear on both sides of the locomotive was quite uniform, and no tendency to drift to either side was apparent. No part of the brake rigging was missing.

Conductor Ray stated that on the night of the accident the train was stopped near Gale upon a signal by the head brakeman to the enginemen on account of a noise under the car in which the head brakeman was riding, which he believed was due to the train having hit some obstruction on the track. An inspection of the train equipment, as well as of the track

in that vicinity, was made, but no defect or cause of trouble was found. The conductor secured orders at Ludlow, and when he delivered them to Engineman Bispham he asked the engineman about the cause of the trouble near Gale and the engineman said he had not found anything. Conductor Ray stated that the brakes were working properly when the train stopped at Ludlow, and that the engineman handled the train properly between Ludlow and the point of accident, there being several sharp curves in that distance; he was riding in the forward end of the smoking car at the time of the derailment, and as the train struck the curve it gave a lurch and leaned toward the north. He grabbed the seat arm and braced himself, and then it was only a few seconds before the derailment occurred. He said the brakes were not applied at that time and he did not think they had been set between Haynes and the point of accident; he did not have time to set the brkes himself by pulling the conductor's cord and said that on account of the motion of the car it would have been impossible to hold his feet to get to the cord. He thought the brakes were applied by the air hose separating before the car came to a stop. Conductor Ray said he did not notice the speed until the train struck the curve; he thought then the speed was at least thirty miles an hour, which he considered too fast for that curve, and he stated it was possible that they were going much faster.

Head Brakeman Moon stated that near Gale he heard something hitting the bottom of the baggage or smoking car and signaled the engineman to stop. An examination of train equipment was made, but failed to disclose any defect or cause of trouble. Brakeman Moon also was riding in the forward end of the smoking car at the time of the accident, and he estimated that the rate of speed was 35 or 38 miles per hour. He said he thought the engineman released the brakes while going over the east switch at Haynes and he did not think the brakes were set after that until just about the time the accident occurred.

Flagman Jackson said he noticed a brake application near Siberia but did not notice when the last application was made prior to the accident. He stated that the rear car in which he was riding lurched badly on a curve before reaching Haynes; at the time the accident occurred he was sitting next to a window on the right hand side, and the lurching of the car caused him to slide over in the seat toward the middle of the car. He was knocked down twice and his lanterns were extinguished by the shocks.

On the night of the accident two Santa Fe conductors were deadheading as passengers on train No. 22. Conductor Majors was riding at about the middle of the chair car. He stated that just before the accident the car was listing badly

toward the north and he heard heavy grinding of wheel flanges against the rail. He braced himself just before a series of shocks, and he heard something scraping along the side of the car, which came to a stop just opposite the locomotive. He stated that he noticed a little grinding of the wheel flanges on one other curve, but not at all like the grinding on the curve on which the derailment occurred. It seemed to him that when they came around that curve the whole train was riding on one side, and he was certain the train was running at a very high rate of speed. Conductor Survant was in a berth in one of the sleeping cars but was awake at the time of and before the accident. He stated that he had noted the high rate of speed, and he thought the train was running at very high speed at the time of the derailment. He thought the brakes were not set for some time prior to the accident.

Postal Clerk Sherman stated that the train was running at a very high rate of speed just prior to the accident; he estimated that it was more than fifty miles per hour. He said he was thrown nearly half the length of the car when the first shock came, and that letters were thrown out of pigeon-holes before the car left the track.

Postal Clerk Putnam stated that he realized the train was running pretty fast; just before the accident occurred he stepped to the door and looked out to see where they were, and he thought then that the train was running about 45 miles per hour. When the first lurch came it startled him and he moved away from the door; the car failed to right itself and immediately following a second lurch the postal car was derailed.

Postal Clerk Morrison thought the train was running unusually fast, and as the train rounded the curve the mail began to fall out of the boxes; the car kept leaning more and more toward the north until the time of the crash of derailment and collision with the tender.

Express Messenger Lingenfelter was lying on a large box in the baggage car; he stated that express packages began to fall and the baggage began to shift before the derailment occurred.

Engineman Bispham stated that the air brakes were tested before leaving Barstow and the brakes were working properly on this trip. When he stopped the train near Cale, both he and the fireman examined the engine but found nothing wrong. He made a further examination at Ludlow. He said that approaching the scene of the accident the train was five or six minutes late, and he intended to go to Bagdad to meet train No. 17, under the order holding that train there until

1.12; but as they had lots of time he was not hurrying to get to Bagdad for train No. 19. He stated that he applied the brakes when entering upon the curve and then released them as the train started around the curve. He thought the speed of the train increased somewhat after he released the brakes, and thought it was running at about thirty miles per hour at the time of derailment. Engineman Bispham stated that just as the engine got around the curve it dropped a little on the left side and turned right over; he did not have time to set the brakes. He thought the derailment was due to a low joint or some similar track defect; he said the low spot had been there for some time but it was not very bad and he had not made a report regarding it. He stated that he was thoroughly awake, saw the curve ahead, had not lost his bearings in any way, and did not think he had anything on his mind at that time which would be likely to take his thoughts away from his work. He said that several times he had gone around that curve faster than on the night of the accident, and he did not think that the rate of speed of his train was excessive. He considered that it would be safe to run at a rate of 24 or 25 miles per hour on this curve; he stated that he started around it at about that speed with throttle in drifting position; and as that engine picks up pretty fast the speed probably increased five or six miles an hour before the derailment occurred.

Fireman Woods died as the result of injuries received in the derailment.

Road Foreman of Engines Ledger stated that he inspected engine 3600 after the derailment and found the reverse lever in drifting position, or about five or six notches ahead of center, and the throttle open as if in drifting position. The firing valve was bent, but in position as if working a drifting throttle. Both the automatic brake valve and the independent brake valve were in running position.

Both Conductor Ray and Flagman Jackson looked at their watches at 1.05, and shortly after the accident occurred. And Dispatcher Duncan stated that at 1.04 he was receiving a report when the telephone wire began to roar as if a button were sticking, and after that he was unable to communicate west of Bagdad.

The following tabulation includes the train sheet record of the time train No. 22 passed each of the station listed, the schedule time shown by the timetable, the number of minutes late at each of these stations, the distance between stations, the schedule running time according to the timetable, and the actual running time according to the train sheet record and evidence, between Barstow and the point of accident:

		Train sheet record	Time-table schedule	Time late	Miles	Schedule running time	Actual running time.
Kenston	(left:)	11.23	11.10	13 mins.			
———	———	———	———	———	9.4	15 mins.	12 mins.
Baggett	(passed:)	11.35	11.25	10 *			
———	———	———	———	———	11.9	15 mins.	*21 *
Newberry	(*)	11.56	11.40	16 *			
———	———	———	———	———	13.0	16 mins.	12 *
Hector	(*)	12.08	11.56	12 *			
———	———	———	———	———	10.2	15 mins.	12 *
Levis	(*)	12.20	12.11	9 *			
———	———	———	———	———	9.1	12 mins.	10 *
Ludlow	(arrived)	12.30					
	(departed)	12.35	12.23	12 *			
———	———	———	———	———	11.4	16 mins.	15 *
Klondike	(passed:)	12.50	12.41	9 *			
———	———	———	———	———	5.3	9 mins.	7 *
Siberia	(*)	12.57	12.50	7 *			
———	———	———	———	———	5.45	———	7 *

(Point of accident) (Time of accident established by evidence: 1.04 a. m.)

* Train stopped for a period of five minutes near Dale while inspection of equipment was made.

An analysis of this record shows that the average rate of speed between Klondike and the point of accident, a distance of 10.8 miles, was 46.9 miles per hour, and the average rate of speed between Barstow and point of accident, a distance of 76 miles, was, deducting ten minutes for stops near Gale and Ludlow, 50.1 miles per hour; that with the exception of the run between Daggett and Newberry, where a stop was made for the purpose of inspecting the train, the actual running time as shown by the train sheet record was from fifteen to twenty-five per cent. less than the schedule running time provided by the time-table. While the average rates of speed, based upon this tabulation, are not excessive as compared with passenger-train speeds commonly maintained in present day service, the tabulation indicates a more or less uniform rate of speed throughout the run and particularly for the last ten miles traversed prior to the derailment; in connection with the evidence furnished by the investigation, this is a significance in establishing the cause of the accident.

With the exception of Engineman Bispham, the evidence of all the employees who were on train No. 22 is positive and conclusive that the speed of their train was excessively high while rounding the curve on which the derailment occurred; and the condition of the train equipment following the derailment demonstrates beyond peradventure that such was the case. Engineman Bispham therefore is undoubtedly in error in his statements relative to the speed of his train while rounding the curve on which the derailment occurred. Furthermore, there is nothing to support, and much to contradict, his statement that he made a brake application just before entering upon this curve; in fact, the weight of evidence leads to the conclusion that the speed of the train was not checked or reduced while rounding the curve, and that Engineman Bispham did not, as claimed, make an application of the brakes when entering upon this curve. In view of the sharpness of this curve and the comperatively low superelevation, it is believed that if the average speed for the last ten miles, of approximately 47 miles per hour, was maintained, the derailment was inevitable.

The direct cause of this accident was the excessively high rate of speed of the train on the sharp curve where the derailment occurred, for which Engineman Bispham was responsible.

Engineman Bispham had been employed by the Santa Fe as engineman since 1901, and he had been regularly assigned to train No. 22 out of Barstow ever since that train had been put on over two years previously. At the time of the accident he had been on duty 2 hours and 25 minutes, after a period off duty of 13 hours and 45 minutes. Whether his failure properly to reduce and control the speed of his train on this curve was due to a mental lapse, temporary distraction from his work and duties, or some other cause, could not be definitely determined.

Timetable rule No. 20 provides in part as follows:

> "The speed of passenger trains will ordinarily be that prescribed in the schedule, but in cases of delay, requiring greater speed in order to enable trains to make meeting points or to secure connections, the speed may be so moderately increased above that prescribed in the schedule, as in the judgment of the conductor and enginemen in charge of the train, may be safe and prudent, due consideration being always given to the condition of track and all the circumstances."

Also, a table showing the maximum speed for trains in minutes and seconds per mile, in certain locations, restricts the speed of passenger trains on 10-degree curves between Ash Hill and Bagdad to one mile in 2 minutes and 30 seconds, or 24 miles per hour. But there was no other speed restriction in effect in the vicinity of the scene of the accident, and although the superelevation provided on the curve of 8 degrees 2 minutes, on which this accident occurred, was intended for a maximum speed of only 25 miles per hour, no rule or instructions had been issued restricting speed on the curve to that limit. While the absence of such rule or instructions had no bearing upon this accident, in view of Engineman Bispham's experience and his admitted knowl-edge of the maximum speed permissible on this curve, nevertheless at this point the track was manifestly unsafe for ordinary passenger train speeds authorized by timetable rule No. 20, and there was no rule specifically limiting speed of trains to the maximum rate for which the track construction provided the requisite factor of safety.