

Inv-2433

INTERSTATE COMMERCE COMMISSION  
WASHINGTON

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REPORT OF THE DIRECTOR  
BUREAU OF SAFETY

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ACCIDENT ON THE  
ATCHISON, TOPEKA AND SANTA FE RAILWAY

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BARNES, OKLA.

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JUNE 24, 1940

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INVESTIGATION NO. 2433

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SUMMARY

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Inv-2433

Railroad: Atchison, Topeka and Santa Fe  
Date: June 24, 1940  
Location: Barnes, Okla.  
Kind of accident: Derailment  
Train involved: Freight  
Train number: Extra 3167 West  
Engine number: 3167  
Consist: 55 cars, caboose  
Speed: 30-40 m. p. h.  
Operation: Timetable, train orders and  
automatic block system  
Track: Single; 3°02' curve; descending  
grade westward  
Time: 12:40 a. m.  
Weather: Cloudy  
Casualties: 3 killed  
Cause: Irregularity in alinement and  
surface of track which rendered  
it unsafe for authorized speed

September 14, 1940.

To the Commission:

On June 24, 1940, there was a derailment of a freight train on the Atchison, Topeka and Santa Fe Railway near Barnes, Okla., which resulted in the death of three employees.

#### Location and Method of Operation

This accident occurred on that part of the Oklahoma Division designated as the First District which extends between Arkansas City, Kans., and Purcell, Okla., a distance of 153.9 miles. In the vicinity of the point of accident this is a single-track line over which trains are operated by timetable, train orders and an automatic block system. Time-table directions are used in this report. The accident occurred at a point about 2 miles west of Barnes. As the point of accident is approached from the east there are, in succession, a tangent, 2,730 feet in length and a  $3^{\circ}02'$  curve to the left, 478 feet in length; the derailment occurred on this curve, designated as Curve 75, at a point 388.2 feet west of its eastern end. The grade for west-bound trains is 0.903 percent descending, 3,500 feet, then 0.222 percent descending a distance of 900 feet to the point of accident, at which point the gradient changes to 0.583 percent descending.

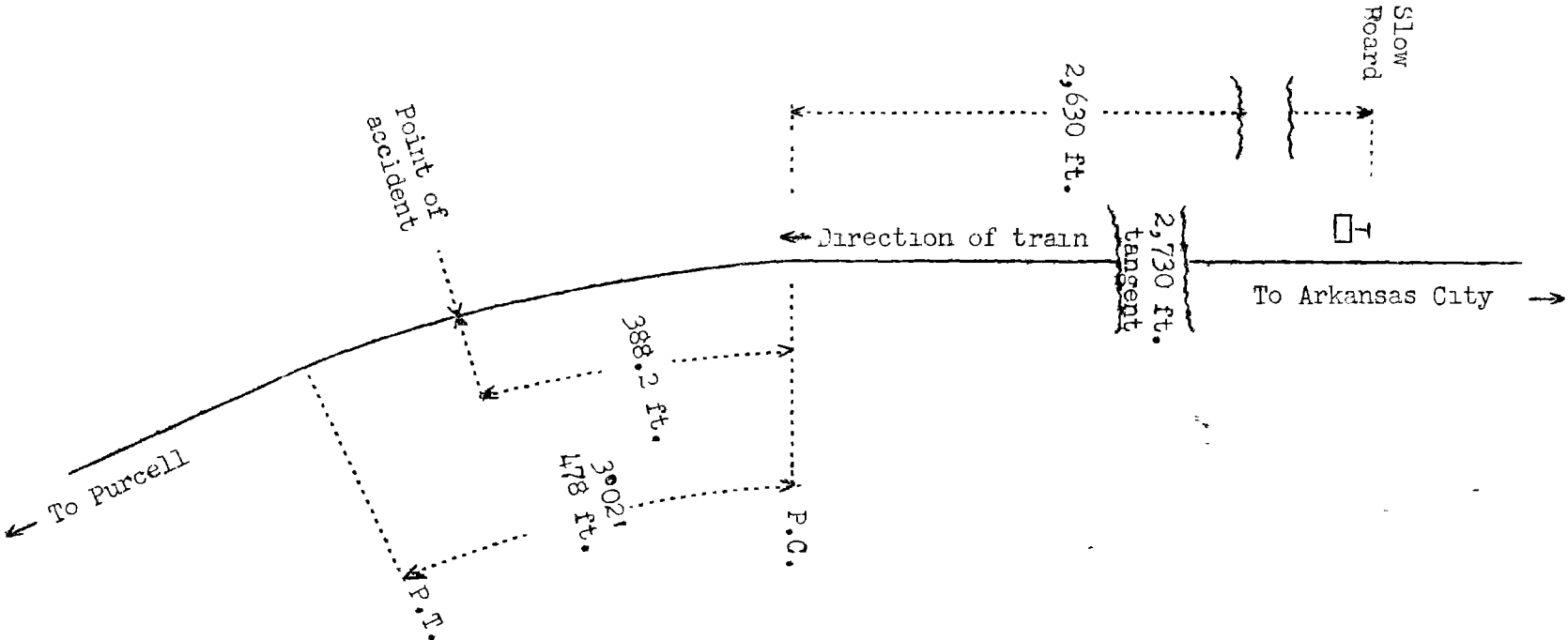
The west portion of Curve 75 is in a cut about 8 feet deep; the derailment occurred in this cut.

The track structure on the curve involved consists of 90-pound rail, 33 feet in length, laid on 20 to 21 treated hardwood ties to the rail length; it is fully tieplated, single-spiked on the low rail and double-spiked on the high rail, and is provided with 12 rail anchors per rail length; it is equipped with 90-pound, 100-percent angle bars, and is laid on 10 inches of crushed rock ballast. The superelevation is approximately 6 inches. The gage varied from standard to 4 feet 8-3/4 inches. No. 1 re-lay rail was laid on the curve in January, 1938, and within 6 months prior to the accident 15 No. 1 re-lay rails were laid.

The following rules of the operating department read in whole or in part as follows:

S. It is the duty of employees to report by wire to the superintendent,  
\* \* \* defects discovered in track,  
\* \* \*. When necessary, proper signals must be used to stop trains, \* \* \*.

○	Arkansas City, Kans.
○	25.5 mi.
○	Ponce City, Okla.
○	17.9 mi.
○	Red Rock
○	14.8 mi.
○	Perry
○	17.2 mi.
○	Mulhall
○	3.7 mi.
○	Barnes
○	2.0 mi.
X	Point of accident
○	2.7 mi.
○	Lawrie
○	3.2 mi.
○	E. O. Jct.
○	2.2 mi.
○	Guthrie
○	31.4 mi.
○	Oklahoma City
○	33.3 mi.
○	Purcell, Okla.



Inv. No. 2433  
 Atchison, Topcka and Santa Fe Ry.  
 Barnes, Okla.  
 June 24, 1940

103(B). Messages or orders respecting the movement of trains or the condition of track or bridges must be in writing.

Train and enginemen must observe operators, section and bridge men, and other trainmen when passing and look out for signals.

The maximum authorized speed for freight trains is 40 miles per hour on the curve involved. A slow-board for west-bound trains is located 2,630 feet east of Curve 75.

Automatic signals 3423 and 3441, governing westward movements, are located 10,340 feet and 475 feet, respectively, east of the point of accident.

The weather was cloudy at the time of the accident, which occurred at 12:40 a. m.

#### Description

Extra 3167, a west-bound freight train, with Conductor Humphrey and Engineman Taylor in charge, consisted of engine 3167, of the 2-8-2 type, 10 loaded and 45 empty cars, and a caboose. At Red Rock, 35.7 miles east of Barnes, the crew received a clearance card and, in addition, a copy of train order No. 94, which read as follows:

Between Lawrie and E O Jct On First  
Curve West of Lawrie speed Limit 30  
miles per hour

Lawrie and E. O. Jct. are located, respectively, 4.7 and 7.9 miles west of Barnes. This train departed from Red Rock at 11:45 p. m., June 23, according to the train sheet, passed Perry, the last open office and 20.9 miles east of Barnes, at 12:09 a. m., and, while moving at a speed estimated to have been between 30 and 40 miles per hour, became derailed on Curve 75.

Engine 3167 stopped on its left side practically parallel to the track, about 24 feet south of it, and about 420 feet west of the initial point of derailment. The engine truck and the air compressor were torn loose, the cab was bent and broken, and the water column was broken off at the boiler connections. The tender, remaining coupled, stopped upright and at an angle of 15 degrees to the track; both trucks were torn loose. The first 30 cars in the train stopped at various angles to the track and were badly damaged. All the derailed equipment stopped within a distance of 410 feet.

The employees killed were the engineman, the fireman and the front brakeman.

#### Summary of Evidence

Conductor Humphrey, of Extra 3167, stated that a terminal air-brake test was made at Arkansas City, 79.1 miles east of Barnes. At Ponca City, 53.6 miles east of Barnes, cars were set out and others were added to the train; the brakes were tested again, and they functioned properly en route. At Red Rock he received a copy of train order No. 94 and understood that speed must be restricted to 30 miles per hour on the first curve west of Lawrie; however, as he did not receive any information about a bad track condition on Curve 75 he did not anticipate encountering any such condition east of Lawrie. When his train approached Barnes he was maintaining a lookout from the left side of the cupola and the flagman was on the right side. He and the flagman observed the train as it rounded curves en route and saw no indication of dragging or defective equipment. The train attained a speed of about 50 miles per hour after it passed Barnes and an air-brake application, which reduced the speed to about 35 or 40 miles per hour, was made at a point about 1/2 or 3/4 mile east of Curve 75; the brakes were released just before the engine entered this curve. When the engine was rounding Curve 75 and before the speed had increased again, he saw fire flying near the front end of the train. He felt an emergency application of the brakes; the train stopped at 12:40 a. m. After the accident he proceeded from the caboose to the front end and inspected the track under the rear cars that were not derailed; there was no mark on the rail. At Arkansas City he had conversed with Engineman Taylor and at that point the engineman appeared normal.

Flagman Moore, of Extra 3167, stated that when his train approached Barnes he was maintaining a lookout from the cupola of the caboose. On curves he could see that the engine headlight was burning brightly. At several points west of Barnes he observed that automatic signals displayed green aspects until the engine reached them, then the aspects changed to red. Just before the engine reached the curve involved a brake application reduced the speed to 30 or 40 miles per hour. After the accident he inspected the track from the caboose to the initial point of derailment and he found no indication of dragging equipment.

Division Engineer Claybaugh stated that he arrived at the scene of the accident at 5 a. m., June 24, and examined the track before the equipment was removed. At a point 388.2 feet west of the east end of the curve involved there was a broken angle bar on the inside of the low or south rail of the curve.

The outside angle bar at this joint was not broken but was bent and cracked. West of the broken rail-joint the inside rail was pushed off the ties; it was lying on the ballast and was canted at an angle of 45 degrees; there were flange marks on the inside surface of the web. The first flange mark was on the head of the outside rail at a point about 4 feet east of the broken angle bar; it started near the center of the head of the rail, extended a distance of 1 foot 5 inches, and disappeared at the gage side of the rail. The second flange mark was 6 feet 9-1/2 inches farther west; it started near the center of the head, extended a distance of 1 foot 10 inches, and disappeared at the gage side of the rail. There was a diagonal flange mark on the head of the receiving end of the inside rail at the broken angle bar; this mark started at the inside corner, where it showed a battered condition 1-1/2 inches in length, crossed the head of the rail and dropped off the outside within a distance of 1-1/2 feet. The inside rails east of the broken angle bar were upright and in proper position; the inside spikes were raised increasingly westward 1/4 to 2-1/2 inches on 30 ties throughout a distance of 47 feet immediately east of the broken angle bar. There were wheel marks on the ties inside the high rail and outside the low rail commencing on the first tie east of the broken angle bar and progressing westward as follows:

<u>Tie No.</u>	<u>Left of gage of low rail</u>	<u>Left of gage of high rail</u>
1	Badly splintered near angle bar.	8"
2	9-1/2"	7", 10"
3	9"	7", 9", 10"
4	8-1/2", 1'3"	3-1/2", 1'2"
5	10", 1'7"	9", 1'7"
6	Splintered	9", 1'2", 2'9"
7	Splintered	10", 1'11"
8	Splintered	2'10", Badly broken and splintered.
9	Splintered	1'2", 1'9", 3'9"

West of tie No. 9 the track was destroyed a considerable distance. Throughout the entire area of the derailment the north or high rail was neither disconnected nor broken but it was pushed out beyond the ends of the ties from 2 to 3 feet. There was no broken rail that might have contributed to the derailment. He said that the track was in good condition and well maintained, and that the surface and alinement were good, but at the point of accident the track had been knocked out of alinement a maximum of 5 inches either by Extra 3167 West or by some preceding train. After the accident he gaged the track eastward from the broken angle bar; the gage and superlevation at stations 16.5 feet apart were as follows:

Joint No.	Established super-elevation	Variations from established super-elevation		Gage at joint	Remarks
		Left rail	Right rail		
0	6"	1/8" Low		Standard	Actual point of derailment PSC 3°02' curve
1	6"		Normal	1/8" Wide	
2	6"	3/8" High		Standard	Actual point of derailment PSC 3°02' curve
3	6"		1/2" Low	1/8" Wide	
4	6"	3/8" High		1/8" Wide	Actual point of derailment PSC 3°02' curve
5	6"		3/8" Low	1/4" Wide	
6	6"	3/8" Low		1/8" Wide	Actual point of derailment PSC 3°02' curve
7	6"		1/2" High	Standard	
8	6"	1/4" Low		1/4" Wide	Actual point of derailment PSC 3°02' curve
9	6"		1/4" Low	Standard	
10	6"	1" High		1/16" Wide	Actual point of derailment PSC 3°02' curve
11	6"		5/8" Low	1/8" Wide	
12	6"	5/8" High		Standard	Actual point of derailment PSC 3°02' curve
13	6"		1/3" High	1/4" Wide	
14	6"	1/2" Low		3/16" Wide	Actual point of derailment PSC 3°02' curve
15	6"		5/8" High	1/8" Wide	
16	6"	1/8" Low		1/4" Wide	Actual point of derailment PSC 3°02' curve
17	6"		Normal	1/4" Wide	
18	6"	3/8" High		1/4" Wide	Actual point of derailment PSC 3°02' curve
19	5-5/8"		7/16" Low	1/4" Wide	
20	5-1/4"	7/16" High		3/16" Wide	Actual point of derailment PSC 3°02' curve
21	4-7/8"		11/16" Low	1/8" Wide	
22	4-1/2"	11/16" High		1/4" Wide	Actual point of derailment PSC 3°02' curve
23	4-1/8"		7/16" Low	1/4" Wide	
24	3-3/4"	1/16" High		1/8" Wide	Actual point of derailment PSC 3°02' curve
25	3-3/8"		3/8" Low	1/8" Wide	
26	3"	3/8" Low		1/8" Wide	Actual point of derailment PSC 3°02' curve
27	2-5/8"		7/16" Low	1/4" Wide	
28	2-1/4"	5/16" High		1/8" Wide	Actual point of derailment PSC 3°02' curve
29	1-7/8"		11/16" Low	1/8" Wide	
30	1-1/2"	1/16" High		1/4" Wide	Actual point of derailment PSC 3°02' curve
31	1-1/8"		1-1/16" High	1/8" Wide	
32	3/4"	Normal		3/16" Wide	Actual point of derailment PSC 3°02' curve
33	3/8"		1/4" Low	1/16" Wide	
34	0	1/8" High		1/3" Wide	Actual point of derailment PSC 3°02' curve
35			1/8" High	1/8" Wide	
36		1/4" High		1/8" Wide	Actual point of derailment PSC 3°02' curve
37			3/8" High	1/4" Wide	
38		3/8" High		1/4" Wide	Actual point of derailment PSC 3°02' curve
39			1/2" High	1/4" Wide	
40		3/8" Low		Standard	



Beginning at a point 278.5 feet east of the point of derailment and progressing westward the alinement of the curve involved was as follows:

<u>Distance east of point of derailment</u>	<u>Alinement</u>
278.5 feet .....	1/2" in
238.5 feet .....	1/4" out
188.5 feet .....	1" in
149.5 feet .....	1/2" out
110.5 feet .....	1-1/2" out
60.5 feet .....	5" out
20.5 feet .....	Normal
0.0 feet .....	Point of derailment

He said that there was no indication of a sun kink. The rail joint involved was not directly supported by a tie. The maximum allowable speed on this curve is 65 miles per hour on the basis of a 3-inch unbalanced superelevation as recommended by the A. R. E. A. Based on this calculation and the center of gravity being 84 inches above the top of the rail, the safe speed is 76 miles per hour and the overturning speed 113 miles per hour. The center of gravity of engine 3167 in working order is 75-3/4 inches above the top of the rails. After the derailment the curvature was approximately 6° for a short distance east of the first marks on the rails and the ties. Based on the A. R. E. A. calculations, a safe speed on a 6° curve with a superelevation of 6 inches is 54 miles per hour and the overturning speed is 80 miles per hour. Curve 75 was last re-staked as a 3°02' curve with 200-foot spirals for alinement and 275-foot spirals for a superelevation of 6 inches.

District Engineer Starkie stated that he arrived at the scene of the accident at 6:55 p. m., June 24. He remained in this locality until the night of June 27, and during this period he made several detailed examinations of the derailed equipment, the track and the roadbed in the vicinity of the point of derailment. On the curve involved the rail was not curve-worn. Track fastenings, except those disturbed as a result of the accident, were intact and in good condition. The gage varied from 4 feet 8-3/8 inches to 4 feet 8-13/16 inches. Marks on the head of the low rail located immediately west of the broken angle bar, the battered and broken inside angle bar, the marks on the receiving end of the rail, the bent condition of the outside angle bar, and the wheel marks on the next eight ties indicated that the initial point of derailment was at this rail joint. He thought that marks on the head and the web and under the head on the gage side of the high rail were made as a result of the derailment. In

his opinion the accident was caused by irregularities in track alinement, which were the result of trains rounding Curve 75 at excessive rates of speed.

Section Foreman Scheer stated that he experiences more difficulty in maintaining curves on which there is a change in the gradient than on curves where the track is level. During May he replaced 12 rails on Curve 75. Each week day he inspects the curves on his section. On June 22 he performed work of spotting a rail on each side of the track midway on this curve, and also lined the track inward about 1 inch for a distance of 2 rail lengths. He then checked the entire curve with the level board, and found the gage, surface, and alinement proper and the track firm.

Mechanical Superintendent Nicholson stated that after the accident he made a thorough inspection of engine 3167, including all engine and tender wheels, brake rigging, shoes, wedges, pedestals, and spring rigging, and nothing was found about the engine, tender or cars that might have contributed to the accident. After inspection of the derailed equipment he concluded that the accident was caused by a severe lurch of the locomotive to the inside of the curve, which partially pulled the spikes on the gage side of the low rail and permitted the left Nos. 3 and 4 tender wheels to drop inside the rail and spread the track.

Superintendent Wagner stated that in his opinion the accident was caused by irregularity in the track alinement, which was developed by trains rounding Curve 75 at excessive rates of speed, and this track irregularity caused engine 3167 to make a severe lurch to the left, forcing the low rail of the curve outward and off the ties.

According to the record, six trains were operated over Curve 75 within a period of less than 4 hours prior to the accident; these six trains consisted of one west-bound and two east-bound freight trains, and one east-bound and two west-bound passenger trains. Of these six trains, members of three crews filed messages pertaining to track conditions prior to the accident, members of two crews did not notice any rough track condition, and members of one crew did not file a report until their train reached Oklahoma City, located 41.5 miles west of Barnes, at 12:44 a. m., or 4 minutes after the occurrence of the accident. The first message was filed by the conductor of a west-bound freight train at Guthrie, at 10:03 p. m., and read as follows:

CFK, Ark City  
First curve east of overhead bridge between  
Barnes and Lawrie getting out of line rides  
rough.

Soules Exa 4068 West,  
1003 PM

The second message was dictated to the operator at Mulhall about 11:15 p. m. by the engineman of an east-bound freight train, and was addressed to the engineman of a west-bound passenger train; it read as follows:

Engr No 15  
Bad place in track near this end first  
curve west of Lawrie  
Engr ex 3207 east

When No. 15 passed Mulhall the engineman did not receive this message, but it was delivered by hoop to a member of the train crew. Afterward the conductor changed the address and the signature of this message, addressed it to the trainmaster, and included additional information. This third message, filed at Guthrie at 11:43 p. m., read as follows:

CFK, Ark City.  
Bad place in track near this end first curve  
west of Lawrie also on Skeleton curve. Should  
place 30 mile per hour.  
Pyer and Burns No. 15.

In the meantime, at 10:27 p. m., the night chief dispatcher sent to the roadmaster at Guthrie a preferred message, which read as follows:

Ark City, June 23-40

PX L Sears, Guthrie  
First curve east of overhead bridge between  
Barnes and Lawrie getting out of line, riding  
rough. Advise if should be covered by slow  
order and condition of track. Joint HOW KWC LS.  
M 7.

CFK 1027PM

cc - HOW  
KWC

No answer to this message was received.

Operator Alsup, at Guthrie, stated that about 10 p. m. Conductor Soules, of Extra 4068 West, handed him a message, addressed to the trainmaster at Arkansas City, about a bad track condition between Barnes and Lawrie; he transmitted this message immediately. About 11:20 p. m. he copied the message, previously quoted, addressed to Roadmaster Sears. The operator said that he did not receive any special request to telephone this message to the roadmaster, and he did not give the message preferred handling; however, he thought that he called the roadmaster's residence-telephone but received no answer. In regard to the message filed at 11:43 p. m. by No. 15, previously quoted, he said that after attending to No. 15 he was off duty; however, he gave the relieving operator this message to transmit.

Operator Brickley, at Guthrie, stated that he went on duty at 11:45 p. m., and at 11:46 p. m. he telephoned to the dispatcher the message left by No. 15. The dispatcher asked whether the message gave the location of Skeleton Curve and was informed that it did not. About 12:15 a. m. the relieving dispatcher instructed him to telephone the roadmaster about the bad track conditions and to ascertain the location of Skeleton Curve. He communicated with the roadmaster and transmitted to the dispatcher the information that Skeleton Curve was between mileposts 344 and 345. The dispatcher told the operator to ascertain whether the agent at Mulhall, 3.7 miles east of Barnes, could reach his office within the next 10 minutes to handle train orders. The agent said it would require about 15 minutes for him to reach Mulhall station, and the dispatcher told the operator to disregard the call. Soon afterward the dispatcher asked him if Extra 3167 had entered the circuit and he informed the dispatcher that it had not. The operator received several more inquiries about Extra 3167 from the dispatcher and the night chief dispatcher. He was not certain whether it was before or after receiving the instructions to telephone the agent at Mulhall that the dispatcher instructed him to telephone the roadmaster, but thought that it was before.

Operator Woods, at Mulhall, stated that his tour of duty expired at midnight and soon after that time he left the office.

Dispatcher Russell stated that he was on duty from 4 p. m. to 11:59 p. m. He did not receive information about track conditions between Barnes and Lawrie as reported by Conductor Soules of Extra 4068 West from Guthrie at 10:03 p. m. and which was transmitted to the night chief dispatcher. The first information he received relative to track conditions was about 11:20 p. m., when the operator at Mulhall informed him that the engineman of Extra 3207 East had reported a bad track condition west of Lawrie. Therefore, at 11:24 p. m. the dispatcher issued

to Extra 3167 West at Red Rock train order No. 94, which restricted speed to 30 miles per hour on the first curve west of Lawrie. During the course of the transfer with the relieving dispatcher the operator at Guthrie reported a bad track condition on Skeleton Curve, whereupon the relieving dispatcher inquired as to the location of that curve. Since the relieving dispatcher knew of the existence of Extra 3167 West and of the track condition reported, Dispatcher Russell thought it best to let him make necessary arrangements to protect the situation. About 11:50 to 11:52 p. m. the relieving dispatcher started to check the transfer, and at 12:01 a. m. Dispatcher Russell left the office. In his opinion the proper method for handling the situation in the first instance would have been to instruct the operator at Mulhall immediately to display the train-order board in stop position for all west-bound trains and then to deliver either a message or a train order concerning track conditions to the crew of each train involved; however, the principal thought in his mind was to avoid unnecessary delay to trains.

Dispatcher Kincheloe stated that he was on duty from 11:59 p. m. to 8 a. m. He arrived at the office about 11:50 p. m. and was preparing to assume duty when he heard the operator at Guthrie advise Dispatcher Russell that the crew of No. 15 had filed a message relative to bad track conditions west of Lawrie and on Skeleton Curve. This was the only information he received about track conditions between Barnes and Lawrie. Dispatcher Kincheloe suggested that Dispatcher Russell ascertain the location of Skeleton Curve. Dispatcher Kincheloe assumed duty soon afterward, and about midnight he instructed the operator at Guthrie to ascertain from the roadmaster the location of Skeleton Curve. The operator advised him that the curve was located between mileposts 344 and 345; then the dispatcher asked the operator to ascertain from the roadmaster if this was the only curve between those mileposts, but evidently the operator had left the telephone when this second question was asked. About 12:07 a. m. the dispatcher called the operator at Perry to issue a slow order on the curve between mileposts 344 and 345, but the operator did not answer until shortly after 12:09 a. m., at which time the operator reported Extra 3167 West as having passed that point at 12:09 a. m., which was 2 or 3 minutes earlier than the dispatcher thought it would pass Perry. The dispatcher immediately called the operator at Mulhall, which office closes at midnight, but did not receive a response. Therefore, about 12:15 a. m. he instructed the operator at Guthrie to telephone the agent at Mulhall and ascertain whether the agent could reach Mulhall in 12 minutes, which probably would be before Extra 3167 would pass that point. About 12:17 or 12:18 a. m. the operator advised the dispatcher that the agent could not reach Mulhall within that time. About 12:20 a. m. the night chief dispatcher returned from lunch and the dispatcher

informed him that Extra 3167 West had passed Perry at 12:09 a. m. and was not in possession of a slow order relative to track conditions on Skeleton Curve. Dispatcher Kincheloe was relying on being able to deliver a slow order to Extra 3167 West at Perry. He knew that Skeleton Curve was between Barnes and Lawrie, and thought that there was sufficient time to issue an order to that train at Perry; he desired to ascertain the exact location so that it could be included in the order. It did not occur to him that any unsafe condition existed that required immediate action. He considered that he was giving necessary attention to the handling of the message involved.

Night Chief Dispatcher Watson stated that the message sent by the conductor of Extra 4068 West from Guthrie at 10:03 p. m., in regard to the track being out of line and riding roughly on the first curve east of the overhead bridge between Barnes and Lawrie, was received by him about 10:25 p. m. He made a copy of this message at 10:27 p. m., addressed it to the roadmaster at Guthrie, and added instructions for the roadmaster to advise whether the track involved should be covered by a slow order. He marked the message as preferred and placed it in the chute leading to the telegraph office; this constituted his entire handling of the matter. The only explanation he could offer for the preferred message having been stamped as received in the Arkansas City telegraph office at 11:16 p. m., or 49 minutes after he prepared it, was that it must not have been removed promptly from the chute. He said that usually preferred messages were telephoned. No reply to the message was received but he did not follow up the matter to ascertain whether the message received proper attention. At 11:30 p. m. he went to lunch and on his return at 12:20 a. m. Dispatcher Kincheloe told him what had transpired. The night chief dispatcher said that it did not occur to him that it was desired to have a slow order placed at this point, and he thought the message had been sent merely as information that it would be necessary to examine the track and for that reason he sent the message to the roadmaster. Previously slow orders had been in effect in the locality involved; however, occasionally they were canceled almost immediately after being issued.

Roadmaster Sears stated that at 12:02 or 12:03 a. m. the operator at Guthrie telephoned to inquire as to the location of the first curve east of the overhead bridge between Barnes and Guthrie, and he replied that it was between mileposts 344 and 345; the operator did not mention Skeleton Curve. Nothing was said about the condition of the track; however, the operator said that a slow order would be issued to cover the curve. The operator did not advise him that there was a message in the station addressed to him calling attention to the track being out of line and riding roughly on the first curve east of the

overhead bridge between Barnes and Lawrie. He did not receive this message until about 1:20 a. m., or 40 minutes after the accident occurred; it was marked as having been received at Guthrie at 11:20 p. m. He arrived at the scene of the accident at 2:10 a. m. and found track conditions to be as previously described. There was no indication of equipment having been dragging. There were no water pockets or soft spots on this curve. Ordinarily he inspects the main line of his territory every week, in each direction, from a motor-car; his last inspection was on June 10. He did not know what caused the accident.

According to the train sheet, Extra 3167 passed Perry at 12:09 a. m., and the accident occurred at 12:40 a. m. The distance between Perry and the point of derailment is approximately 22.9 miles. Using these figures the average speed of Extra 3167 between these points was 44.32 miles per hour. According to the timetable, the maximum authorized speed for freight trains east of Barnes is 50 miles per hour and from Barnes to Guthrie, 45 miles per hour.

Engine 3167 is a C-2 Mikado type locomotive. Its total weight is 340,800 pounds, distributed as follows: Engine truck, 28,100 pounds; first pair of drivers, 64,000 pounds; second pair of drivers, 63,900 pounds; third pair of drivers, 64,000 pounds; fourth pair of drivers, 63,900 pounds; and the trailer truck, 53,900 pounds. The engine-truck wheels are 31 inches in diameter, the driving wheels 63 inches and the trailer truck wheels 40 inches. The tender, which is rectangular, has two six-wheel trucks with 33-inch wheels. The tender has a capacity of 5,000 gallons of oil and 15,000 gallons of water. The weight of the tender loaded is 298,600 pounds. The rigid wheel-base of the engine is 16 feet 6 inches, and the total engine wheel-base is 35 feet 1 inch. The total wheel-base of the engine and the tender is 78 feet 1-1/16 inches, and the overall length is 88 feet 8-7/16 inches. The normal center of gravity is 75-3/4 inches above the top of the rails.

#### Observations of the Commission's Inspectors

The Commission's inspectors observed that the condition of the track, the engine, the tender and the cars was practically as previously described.

#### Discussion

According to the evidence, Extra 3167 West was moving at a speed of 35 or 40 miles per hour on a 3°02' curve to the left when the engine became derailed to the low side of the curve. There was no defect in the engine that might have caused

the derailment. The maximum authorized speed on this curve, which had a superelevation of about 6 inches, was 40 miles per hour. At a point 60.5 feet east of the point of derailment the track was found after the accident to be shifted 5 inches toward the outside of the curve; this resulted in the curvature being about  $6^{\circ}$  at the point where the maximum shift existed and also resulted in an inward shift of 1 inch at a point 188.5 feet east of the point of derailment. According to A. R. E. A. superelevation tables, the maximum safe speed on a  $6^{\circ}$  curve with a 6-inch superelevation, based on a center of gravity of 84 inches, is 54 miles per hour; since the center of gravity of the locomotive involved is  $75\frac{3}{4}$  inches the maximum safe speed would be somewhat higher than 54 miles per hour. There was considerable irregularity in the surface of that portion of the curve east of the point of derailment. On the high rail between stations 16.5 feet and 49.5 feet east of the point of accident the variation was  $\frac{1}{2}$  inch, between stations 82.5 feet and 115.5 feet it was  $\frac{7}{8}$  inch, and between stations 115.5 feet and 148.5 feet it was  $\frac{3}{4}$  inch; on the low rail between stations at the point of derailment and 33 feet east thereof the variation was  $\frac{1}{2}$  inch, between stations 66 feet and 99 feet it was  $\frac{3}{4}$  inch, and between stations 152 feet and 165 feet it was  $1\frac{1}{4}$  inches. This variation would cause the locomotive to swing laterally; this action combined with a sudden lurch toward the outside of the curve at the point where the track was 5 inches out of line undoubtedly caused the engine to rebound toward the low rail with sufficient force to lift a wheel high enough to pass over the head of the low rail, as a diagonal flange mark 18 inches in length extending from the gage side to the outside was found on the head of the low rail at the point of derailment.

According to the section foreman, the track involved was in proper alinement on June 22. Within a period of 4 hours prior to the accident, six trains passed over Curve 75. The crew of one of these trains filed a message at Guthrie at 10:03 p. m., reporting a track irregularity between Barnes and Lawrie, and the crew of another train filed a message at Guthrie at 11:43 p. m., reporting a track irregularity on Curve 75 and also on a curve west of Lawrie. The night chief dispatcher received the first-mentioned message at 10:25 p. m., made a copy of it, addressed it to the roadmaster at Guthrie, added a request for the roadmaster to advise whether the curve involved should be covered by a slow order, and marked it as a preferred telegram at 10:27 p. m. He did not give the matter further attention as he thought the message received by him was sent merely as information. The message sent by the night chief dispatcher was stamped as being received in the telegraph office, which was nearby, at 11:16 p. m., and the operator at Guthrie received this message at 11:20 p. m. but the roadmaster did not receive it until 1:20 a. m., or 40 minutes after the accident occurred.



The operator at Guthrie did not give the message preferred handling but thought that he had telephoned it to the roadmaster but had not received a reply to it. At 11:47 p. m. the third-trick dispatcher was in the office, preparing to relieve the second-trick dispatcher at midnight, when the operator at Guthrie read to the dispatcher the message concerning a track irregularity on Skeleton Curve and on a curve west of Lawrie. The latter curve had already been covered by train order No. 94, but this was the first information concerning Skeleton Curve the dispatchers had received. At this time a train order could have been sent to Perry for Extra 3167, which did not pass that station until 12:09 a. m., but the dispatchers did not know the location of Skeleton Curve. The third-trick dispatcher then assumed duty and instructed the operator at Guthrie to ask the roadmaster the location of Skeleton Curve. There was considerable discrepancy in the statements of the operator at Guthrie and the roadmaster regarding their conversation over the telephone about the curve involved. The operator said that he talked with the roadmaster about 12:15 a. m.; the roadmaster said that the conversation took place at 12:02 or 12:03 a. m.; the operator said that he asked the location of Skeleton Curve but the roadmaster said the operator asked the location of the first curve east of the overhead bridge between Barnes and Lawrie; however, both were agreed the roadmaster's reply was that the curve referred to was between mileposts 344 and 345. Apparently the operator was mistaken as to the time of his conversation with the roadmaster as the dispatcher stated that he received the information concerning the location of the curve at 12:07 a. m. The dispatcher attempted to issue a slow order to Perry for Extra 3167 but when the operator at that point responded, this train had passed that station. The dispatcher then had only one station, Mulhall, at which it was possible to issue an order to the train involved before it would reach Curve 75. The regular closing hour for this station was midnight; nevertheless the dispatcher called the operator immediately after 12:09 a. m., and, not receiving a response, about 12:15 a. m. he instructed the operator at Guthrie to ask the agent at Mulhall if he could report to his station within 12 minutes to receive an order for Extra 3167. Being informed within 2 or 3 minutes that the agent could not reach the station in the time designated the dispatcher canceled the request.

As the matter was handled, the crew of the train involved did not have information concerning the bad track condition on Curve 75. If the employees whose duties required them to issue train orders or to supervise the issuance of train orders and instructions to train crews and other employees, and the employees whose duties required them to transmit, receive, and deliver messages had been more alert and had realized that the condition of the track was dangerous, it is probable this accident could have been averted.

Conclusion

This accident was caused by irregularity in alinement and surface of the track which rendered it unsafe for authorized speed.

Respectfully submitted,

S. N. MILLS,

Director.