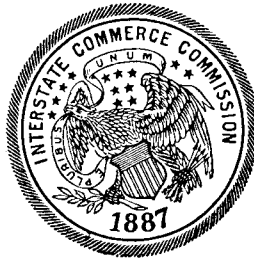


INTERSTATE COMMERCE COMMISSION

THIRTY-FIFTH ANNUAL REPORT
OF THE
DIRECTOR
BUREAU OF LOCOMOTIVE INSPECTION
TO THE
INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED
JUNE 30, 1946



UNITED STATES
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**ANNUAL REPORT OF THE DIRECTOR
BUREAU OF LOCOMOTIVE INSPECTION**

OCTOBER 1, 1946.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Thirty-fifth Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1946, is respectfully submitted.

Summaries are given, by railroads, of all accidents, showing the number of persons killed and injured due to the failure of parts and appurtenances of locomotives, as reported and investigated under section 8 of the Locomotive Inspection Act and those reported to the Bureau of Transport Economics and Statistics under the Accident Reports Act of May 1910 and not reported to this Bureau in accordance with the requirements.

The tables showing the number of accidents, the number of persons killed, and the number of persons injured have been arranged to permit comparison with previous years as far as consistent. These tables also show the number of locomotives inspected, the number and percentage of those inspected found defective, the number for which written notices for repairs were issued in accordance with section 6 of the law, and the total number of defects found and reported. The data contained therein cover all defects on all parts and appurtenances of locomotives found and reported by our inspectors, arranged by railroads.

Summaries and tables show separately accidents and other data in connection with steam locomotives and tenders and their appurtenances, and accidents and other data in connection with locomotives other than steam.

TABLE I.—*Reports and inspections—Steam locomotives*

	Year ended June 30—					
	1946	1945	1944	1943	1942	1941
Number of locomotives for which reports were filed.....	41,851	43,019	43,297	43,064	42,951	43,236
Number inspected.....	101,869	115,979	117,334	116,647	113,451	105,675
Number found defective.....	11,337	11,975	12,710	11,901	10,970	9,570
Percentage inspected found defective.....	11	10	11	10	10	9
Number ordered out of service.....	690	506	630	487	474	560
Number of defects found.....	56,541	53,367	56,617	51,350	44,928	37,691

TABLE II.—Accidents and casualties caused by failure of some part of the steam locomotive, including boiler, or tender

	Year ended June 30--					
	1946	1945	1944	1943	1942	1941
Number of accidents.....	419	410	403	319	222	153
Percent increase or decrease from previous year.....	12.2	11.7	126.3	143.7	145.1	6.7
Number of persons killed.....	10	20	25	27	34	15
Percent increase or decrease from previous year.....	50.0	20.0	7.4	20.6	126.7	16.7
Number of persons injured.....	439	429	406	373	227	182
Percent increase or decrease from previous year.....	12.3	7.9	124.9	164.3	124.7	19.1

¹ Increase.

TABLE III.—Accidents and casualties caused by failure of some part or appurtenance of the steam locomotive boiler ¹

	Year ended June 30--							
	1946	1945	1944	1943	1942	1941	1915	1912
Number of accidents.....	156	141	141	129	81	43	424	856
Number of persons killed.....	10	13	17	25	30	12	13	91
Number of persons injured.....	165	154	194	173	83	64	467	1,005

¹ The original act applied only to the locomotive boiler.

TABLE IV.—Number of casualties classified according to occupation—Steam locomotive accidents

	Year ended June 30--									
	1946		1945		1944		1943		1942	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	4	142	5	117	7	128	11	109	10	79
Firemen.....	4	184	9	183	11	181	10	143	12	73
Brakemen.....		46	2	61	2	67	4	47	4	32
Conductors.....		7	1	11		11		8		7
Switchmen.....		10	1	10		5		12		5
Roundhouse and shop employees:										
Boilermakers.....		1	1	10	2	5		4	2	4
Machinists.....		6		6		2		3		5
Foremen.....		3		6		0				1
Inspectors.....		1		1		2				1
Watchmen.....		1	1	1	1	2			1	2
Boiler washers.....		4		1		1	1	3		
Hostlers.....		10		5		12		1		4
Other roundhouse and shop employees.....		3		4	1	4		4	3	3
Other employees.....		13		5		6		11	2	3
Nonemployees.....		8		10	1	40	1	28		9
Total.....	10	439	20	429	25	466	27	373	34	227

TABLE V.—Reports and inspections—Locomotives other than steam

	Year ended June 30--					
	1946	1945	1944	1943	1942	1941
Number of locomotive units for which reports were filed.....	6,616	6,094	5,139	4,351	3,957	3,389
Number inspected.....	10,908	9,888	7,711	6,847	6,728	5,558
Number found defective.....	499	447	378	298	358	319
Percentage of inspected found defective.....	4.6	4.5	4.9	4.4	5	6
Number ordered out of service.....	17	16	9	6	12	21
Number of defects found.....	1,385	1,212	1,026	849	928	905

TABLE VI.—Accidents and casualties caused by failure of some part or appurtenance of locomotives other than steam

	Year ended June 30--					
	1946	1945	1944	1943	1942	1941
Number of accidents.....	38	29	17	15	9	11
Number of persons killed.....		1				
Number of persons injured.....	56	40	23	18	9	11

TABLE VII.—Number of casualties classified according to occupation—Locomotives other than steam

	Year ended June 30--									
	1946		1945		1944		1943		1942	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		8		4		4		3		5
Firemen.....		14		14		4		9		2
Brakemen.....		3		1		1		1		1
Conductors.....		2		1		1		1		
Switchmen.....		2		2				1		1
Maintenance employees.....		4	1	3		4		2		
Other employees.....		5		8		1		1		
Nonemployees.....		18		7		8				
Total.....		56	1	40		23		18		9

TABLE VIII.—Accidents and casualties resulting from failures of steam locomotives and tenders and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1946			1945			1944			1943			1942		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs	1		1	1		1	3		4		1	1		1	1
Aprons	2		2	2		2	7		1		1	1			
Arch tubes				2		2	1		2		2	1			
Ashpan blowers				1		1	1		1		1	1			1
Axles	1		1	2		2	5		1		1	1			1
Blow-off cocks	15		16	7		7	8		1		1	1			1
Boiler checks	8		6	6		6	9		7		7	3			3
Boiler explosions:															
A. Shell explosions															
B. Crown sheet; low water; no contributory causes found	15	7	20	7	9	11	12	7	19	10	22	48	8	18	11
C. Crown sheet; low water; contributory causes or defects found	3	3	2	1	1	1	7	5	43	4	6	5	5	5	
D. Miscellaneous firebox failures	1		1	1		1				2	2	2	2		2
Brakes and brake rigging	10		12	10		10	12		12	11	13	4		1	3
Couplers	5		5	5		5	6		6	3	3	3			3
Crank pins, collars, et cetera	5		5	5		5	7		9	6	9	1			1
Crossheads and guides	3		3	2		2	8		2	1	2	2			2
Cylinder cocks and rigging	1		1	1		1	3		3	4	4	4			4
Cylinder heads and steam chests	1		1	2		2	3		1	5	5	1			1
Dome caps	2		2	2		2	3		3	1	1	1			1
Draft appliances	1		1	2		2	1		1	1	1	1			1
Draw gear	1		1	2		2	1		1	1	1	1			1
Fire doors, levers, et cetera	2		2	8		8	6		6	5	6	6			6
Flues	10		12	5		6	8		9	5	10	3		1	2
Flue pockets															
Footboards	12		12	13		12	6		6	4	4	5			5
Gage cocks				1		1	1		1	1	1	1			1
Grease cups	1		1	1		1	1		1	2	3	3			3
Grate shakers	25		25	17		17	10		10	18	18	12			12
Handholds	20		20	26		25	14		14	18	18	10			10
Headlights and brackets	2		2	7		7	4		4	4	4	1			1
Injectors and connections (not including injector steam pipes)	14		14	12		12	8		8	7	7	4			4
Injector steam pipes	2		2	1		1	1		1	2	2	2			2
Lubricators and connections	5		5	4		4	5		5	7	7	5			5
Lubricator glasses	2		2	1		1	1		1	1	1	1			1
Patch bolts				2		1	3		3	1	1	1			1
Pistons and piston rods	1		1	5		2	6		3	7	2	3		1	5
Plugs, arch tube and washout	1		1	1		1	1		1	1	1	1			1
Plugs in firebox sheets	1		1	13		13	16		16	14	14	19			19
Reversing gear	11		11	13		13	16		16	14	14	19			19
Rivets	7		7	7		7	11		7	2	9	7			7
Rods, main and side	4		4	8		8	12		12	2	2	2			2
Safety valves															
Sanders	4		4	8		8	12		12	2	2	2			2
Side bearings															
Springs and spring rigging	6		7	5		4	6		2	8	7	8			2
Squirt hose	14		15	23		25	21		22	16	16	7			6
Staybolts	1		1	4		4	4		1	4	4	2			2
Steam piping and blowers	15		15	12		14	11		14	9	15	6			5
Steam valves	13		13	7		7	7		7	9	10	5			4
Studs	1		1	1		1	1		1	1	1	1			1
Superheater tubes	2		2	4		6	2		2	4	5	2			2
Throttle glands	1		1	2		2	2		2	1	1	1			1
Throttle leaking	1		1	2		3	1		1	1	1	1			1
Throttle rigging	15		16	6		6	9		9	4	4	4			4
Trucks, leading, trailing, or tender	10		12	5		5	5		1	5	3	3		3	11
Valve gear, eccentrics, and rods	7		7	7		7	10		1	9	3	3			4
Water glasses	12		13	10		10	14		1	13	11	11			7
Water-glass fittings	2		2	1		1	2		3	1	2	1			1
Wheels	1		1	1		1	1		1	2	2	1			1
Miscellaneous	124		127	124		126	103		1	106	70	1		69	48
Total	419	10	439	410	20	429	403	25	466	319	27	373	222	34	227

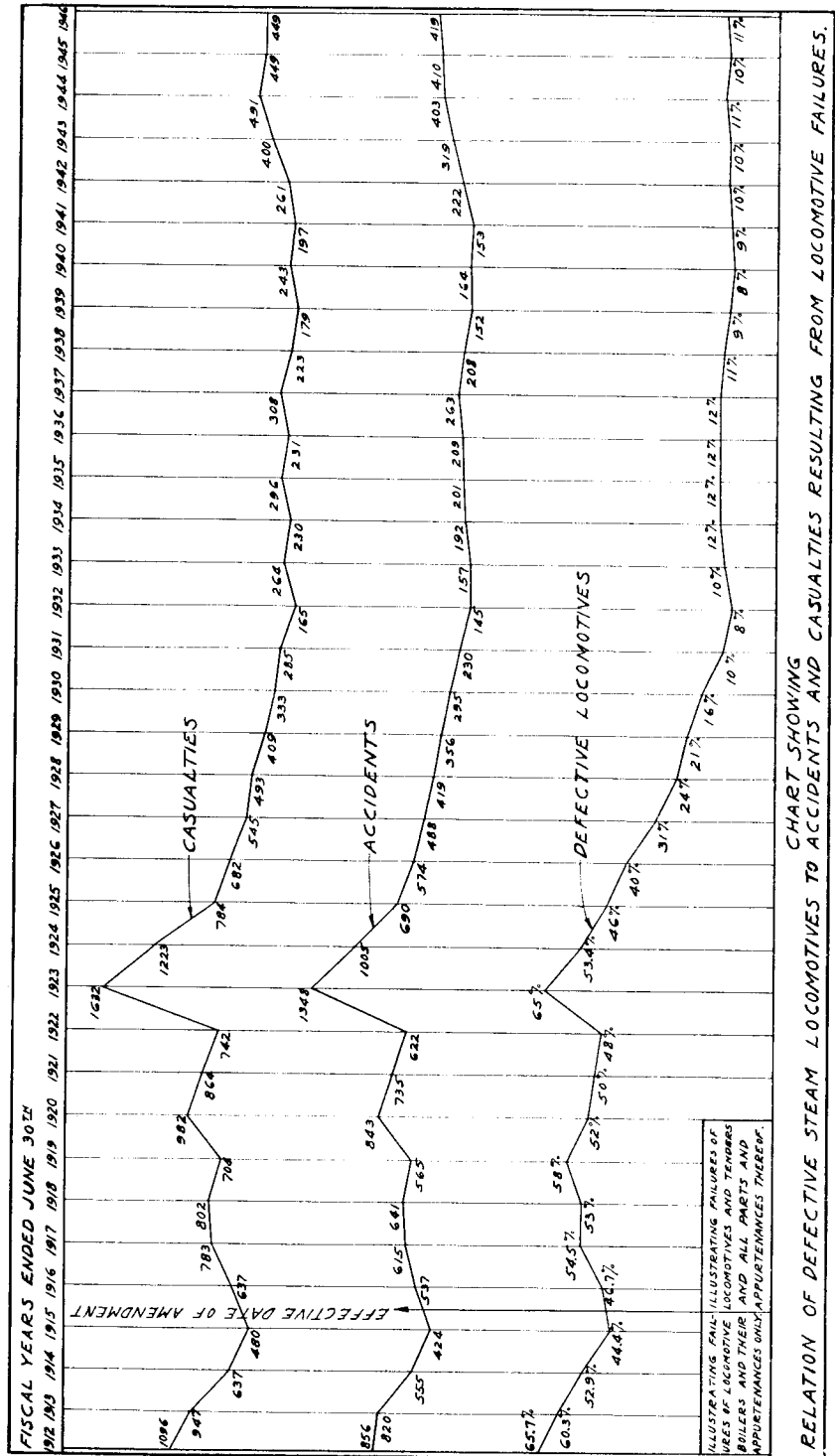


TABLE IX.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1946			1945			1944			1943			1942		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging	2	3	3	6	1	3	1	1	1						
Carburetors				1	4	3	3	1	1	1					1
Couplers				2	2										
Crack pins and connecting rods															
Fires: due to overflowing or leakage of fuel, crank case explosions, back firing, et cetera	4	5	6	6	4	5	3	5	3	3					3
Generators and starting devices															
Insulation	1	1	1	1				1	1						1
Pantographs and trolleys	2	2	2	1	1			1	1	1					1
Short circuits	2	2	2	2	1		1	3	4	3					3
Miscellaneous	27	43	12	16	8	11	5	5	5	3					3
Total	38	56	29	40	17	23	15	18	9						9

TABLE X.—Number of steam locomotives reported, inspected, found defective, and ordered out of service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1946	1945	1944	1943	1942	1941
1. Air compressors	1,044	1,054	1,146	968	829	684
2. Arch tubes	27	17	45	50	27	31
3. Ashpans and mechanism	93	81	93	71	80	67
4. Axles	7	11	15	15	2	5
5. Blow-off cocks	388	361	289	291	238	205
6. Boiler checks	526	511	533	503	393	313
7. Boiler shell	462	416	406	377	290	271
8. Brake equipment	2,992	2,755	2,914	2,661	2,382	1,945
9. Cabs, cab windows, and curtains	1,501	1,057	1,169	1,102	1,163	1,087
10. Cab aprons and decks	469	426	381	390	335	307
11. Cab cards	120	91	104	142	131	97
12. Coupling and uncoupling devices	46	57	65	66	70	74
13. Crossheads, guides, pistons, and piston rods	1,941	2,079	2,149	1,961	1,273	858
14. Crown bolts	88	90	105	66	75	97
15. Cylinders, saddles, and steam chests	2,217	1,801	2,133	1,395	1,514	1,332
16. Cylinder cocks and rigging	679	454	624	430	521	438
17. Domes and dome caps	164	187	189	196	112	94
18. Draft gear	536	486	576	599	651	620
19. Draw gear	462	447	515	469	369	347
20. Driving boxes, shoes, wedges, pedestals, and braces	1,922	1,803	2,026	2,053	1,743	1,348
21. Firebox sheets	333	319	347	303	255	224
22. Flues	253	260	274	215	178	150
23. Frames, tail pieces, and braces, locomotive	1,003	852	1,019	894	869	863
24. Frames, tender	88	97	126	86	86	83
25. Gages and gage fittings, air	185	151	158	191	193	183
26. Gages and gage fittings, steam	370	353	328	316	263	236
27. Gage cocks	495	449	532	584	497	373
28. Grate shakers and fire doors	555	558	539	492	491	430
29. Handholds	540	527	464	483	378	433
30. Injectors, inoperative	50	41	46	66	47	39
31. Injectors and connections	2,750	2,553	2,867	2,637	2,220	1,882
32. Inspections and tests not made as required	8,885	9,067	9,565	9,037	8,186	7,215
33. Lateral motion	862	977	898	700	498	357
34. Lights, cab and classification	161	167	243	184	131	50
35. Lights, headlight	168	222	268	184	218	190
36. Lubricators and shields	351	306	257	292	234	196
37. Mud rings	238	257	301	256	244	187
38. Packing nuts	691	654	746	669	689	508
39. Packing, piston rod and valve stem	776	845	879	724	738	675
40. Pilots and pilot beams	153	171	193	194	188	142

TABLE X.—Number of steam locomotives reported, inspected, found defective, and ordered out of service—Continued

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1946	1945	1944	1943	1942	1941
41. Plugs and studs	262	245	281	259	173	156
42. Reversing gear	482	439	454	452	411	387
43. Rods, main and side, crank pins, and collars	2,581	2,569	3,230	2,798	1,986	1,565
44. Safety valves	72	84	77	74	67	68
45. Sanders	784	658	609	642	738	490
46. Springs and spring rigging	5,195	4,734	4,625	3,583	3,349	2,597
47. Squirt hose	120	98	94	92	67	62
48. Stay bolts	360	351	400	367	272	239
49. Stay bolts broken	268	308	232	247	274	198
50. Steam pipes	551	416	435	414	290	385
51. Steam valves	203	157	161	159	150	110
52. Steps	914	681	872	729	594	555
53. Tanks and tank valves	1,570	1,215	1,400	1,321	1,150	952
54. Telltale holes	60	78	69	78	79	59
55. Throttle and throttle rigging	979	948	948	887	786	688
56. Trucks, engine and trailing	1,261	1,151	1,155	1,020	833	636
57. Trucks, tender	1,101	974	928	900	786	773
58. Valve motion	1,080	991	1,021	998	779	580
59. Washout plugs	740	820	845	685	569	445
60. Train-control equipment	5	2	5	9	7	1
61. Water glasses, fittings, and shields	1,190	1,328	1,323	1,454	1,133	788
62. Wheels	840	899	759	728	664	536
63. Miscellaneous—Signal appliances, badge plates, brakes (hand)	1,332	1,211	1,167	1,142	970	785
Total number of defects	56,541	53,367	56,617	51,350	44,928	37,691
Locomotives reported	41,851	43,019	43,297	43,064	42,951	43,236
Locomotives inspected	101,869	115,979	117,334	116,647	113,451	105,675
Locomotives defective	11,337	11,975	12,710	11,901	10,970	9,570
Percentage of inspected found defective	11	10	11	10	10	9
Locomotives ordered out of service	690	506	630	487	474	560

TABLE XI.—Number of locomotives other than steam reported, inspected, found defective, and ordered from service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1946	1945	1944	1943	1942	1941
Air compressors	15	14	7	7	13	22
Axles, truck and driving				6		5
Batteries	2		1	2	1	6
Boilers	11	8		1	5	4
Brake equipment	102	114	85	62	86	69
Cabs and cab windows	46	59	40	33	27	45
Cab cards	24	25	21	17	20	24
Cab floors, aprons, and deck plates	72	60	54	31	10	14
Clutches	2	2	1	2	1	
Controllers, relays, circuit breakers, magnet valves, and switch groups	16	18	14	9	12	7
Coupling and uncoupling devices	6	6	3	1	5	2
Current collecting apparatus	9	10		1	1	3
Draft gear	18	14	14	15	19	15
Draw gear	3	8		2	3	3
Driving boxes, shoes, and wedges	44	29	12	25	16	36
Frames or frame braces	10	12	12	7	5	1
Fuel system	57	45	33	32	81	62
Gages or fittings, air	7	7	6	3	8	3
Gages or fittings, steam			2	1		
Gears and pinions			1	4	4	2
Handholds	18	13	6	19	14	12
Inspections and tests not made as required	357	297	278	223	274	243
Insulation and safety devices	12	17	8	4	3	4
Internal-combustion engine defects, parts and appurtenances	145	133	86	50	62	54
Jack shafts	4	6	8	2	1	3
Jumpers and cable connectors	8	9	2	3	1	
Lateral motion, wheels	18	20	9	10		4
Lights, cab and classification	2		1	1	5	2
Lights, headlight		1	2	2	1	1

TABLE XI.—Number of locomotives other than steam reported, inspected, found defective, and ordered from service—Continued

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1946	1945	1944	1943	1942	1941
Meters, volt and ampere.....	4	2	2	3	2	16
Motors and generators.....	15	12	14	14	16	12
Pilots and pilot beams.....	8	1	2	4	10	1
Plugs and studs.....	1	1	1	1	1	1
Quills.....	52	29	18	9	6	4
Rods, main, side, and drive shafts.....	11	3	10	3	2	56
Banders.....	57	50	59	41	57	58
Springs and spring rigging, driving and truck.....	42	38	44	18	35	1
Steam pipes.....	1	6	3	1	1	35
Steps, footboards, et cetera.....	29	28	25	25	21	2
Switches, hand-operated, and fuses.....	3	7	2	2	2	3
Transformers, resistors, and rheostats.....	3	7	2	3	3	3
Trucks.....	52	42	47	22	28	30
Water tanks.....	1	2	1	4	1	1
Water glasses, fittings, and shields.....	15	2	4	2	5	1
Warning signal appliances.....	2	2	2	3	3	4
Wheels.....	54	46	74	107	43	28
Miscellaneous.....	31	16	13	16	14	8
Total number of defects.....	1,385	1,212	1,026	849	926	905
Locomotive units reported.....	6,616	6,094	5,139	4,351	3,957	3,389
Locomotive units inspected.....	10,908	9,888	7,711	6,847	6,728	5,558
Locomotive units defective.....	499	447	378	298	358	319
Percentage inspected found defective.....	4.6	4.5	4.9	4.4	5	6
Locomotive units ordered out of service.....	17	16	9	6	12	21

INVESTIGATION OF ACCIDENTS AND GENERAL CONDITION OF LOCOMOTIVES

All accidents reported to the Bureau as required by the law and rules were carefully investigated and appropriate action taken to prevent recurrence as far as possible. Copies of reports of accident investigations were furnished to interested parties when requested and otherwise used in our effort to bring about a diminution in the number of such accidents.

The fiscal year covered by this report is the first year in the 35 years' history of the Bureau in which no deaths occurred in any accident other than boiler explosions caused by overheating of crown sheets.

STEAM LOCOMOTIVES

Four hundred and nineteen accidents occurred in connection with steam locomotives resulting in 10 deaths and 439 injuries. This represents an increase of 9 accidents, a decrease of 10 in the number of persons killed, and an increase of 10 in the number of persons injured compared with the preceding year.

The chart on page 5 shows the relation between the percentage of defective steam locomotives and the number of accidents and casualties resulting from failures thereof, and illustrates the effect of operating locomotives in defective condition.

Table VIII shows the various parts and appurtenances of steam

locomotives and tenders which through failure have caused serious and fatal accidents in the past 5 years. If the information contained in this table is taken advantage of and proper inspections and repairs made in accordance with the requirements of the law and rules, many accidents will be avoided.

During the year 11 percent of the steam locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this represents an increase of 1 percent compared with the preceding year. Six hundred and ninety locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this is an increase of 184 locomotives compared with the preceding year.

Detailed results of our inspections of steam locomotives of each railroad are shown in table XII.

EXPLOSIONS AND OTHER BOILER ACCIDENTS

Eighteen boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. Ten employees were killed in these accidents and 22 employees were injured. There was an increase of 10 in the number of boiler explosions, an increase of 1 in the number of employees killed, and an increase of 10 in the number of employees injured compared with the preceding year.

Two of the explosions occurred on locomotives hauling hospital trains, 2 occurred on locomotives in passenger-train service, 11 occurred on locomotives engaged in freight-train service, and 3 occurred while the locomotives were in charge of engine watchmen.

One of these accidents, in which two employees were killed, occurred on the leading locomotive of a double-header which was hauling a hospital train at an estimated speed of 20 miles per hour. The boiler was torn from the running gear, struck the adjacent track, then bounded and came to rest about 350 feet from the point of explosion and 90 feet forward of the point where the train stopped. Parts of the wreckage were scattered over an area extending to a radius of 751 feet. In the other accident in which the locomotive was hauling a hospital train at an estimated speed of 45 to 50 miles per hour, the force of the explosion broke the front end door hinges; the door was found 437 feet ahead and 186 feet to the left of the point of explosion, and parts of the headlight were found from 300 to 400 feet ahead and from 166 to 190 feet to the left. The train was brought to a stop in 2,090 feet by the conductor who applied the brakes from the caboose upon seeing a cloud of black smoke around the locomotive. One employee was killed and one injured in this accident.

One employee was killed and one injured in one of the two explosions that occurred while the locomotives were hauling passenger trains. The locomotive involved in this accident was the second locomotive of a double-header, and the explosion occurred while the train was running at an estimated speed of 65 miles per hour. The train was stopped by the engineer of the leading locomotive about 2,000 feet from the point of the explosion. Two employees were injured in the other explosion which occurred while the train was running at an estimated speed of 15 to 18 miles per hour. In this instance the two employees were blown from the cab by the force of the explosion, and the train was stopped in a distance of about 1,000 feet by the conductor by means of the conductor's brake valve.

Four employees were killed and 17 injured in the 11 explosions that occurred on locomotives in freight-train service. One of these accidents caused derailment of the locomotive and tender and derailment of 13 cars, 8 of which were destroyed. The locomotive, tender, and cars were massed within a space of 150 feet on and adjacent to the track about 250 feet forward from the point of explosion.

Two employees were killed and one injured in the three explosions that occurred while the locomotives were in charge of engine watchmen. In two instances, in each of which the watchman was killed, the force of the explosions tore the boilers from the running gears. One of these boilers was blown upward and forward and alighted, on a rail of the track upon which the locomotive was standing, 193 feet from the point of explosion; the rail was broken by the impact, and a depression was made in the roadbed approximately 8 feet deep. Parts of the wreckage were scattered in various directions over an area extending to a radius of 900 feet. Electric power service of the city in which the explosion occurred and that of a nearby Army camp was disrupted by falling parts which severed the power lines. The other boiler that was torn from the running gear apparently ascended practically vertically, and in falling the boiler back head struck the right main rod and the boiler came to rest in approximately upright position, 12 feet ahead and 12 feet to the right of the point of explosion and parallel to the running gear. Parts of the wreckage were scattered in various directions over an area extending to a radius of 272 feet.

Our investigations developed that the absence of normally safe water level was known by one or more employees on one of the locomotives in passenger-train service and on six of the locomotives in freight-train service in advance of occurrence of the explosions, and actions had apparently been taken to increase the rate of water supply to the boilers. One employee was killed and 12 employees were injured in this group of 7 accidents.

In all the foregoing seven instances, working of the locomotives was

continued with various throttle openings described as part to full open, which use of steam results in further retardation of restoration of the water level, or depletion of the quantity of water in the boiler, depending upon the extent of working of the locomotive and the rate of water supply. In one case the fuel-oil fire was extinguished by closing the emergency valve in the oil supply line shortly before the accident occurred, but there was no evidence in any other instance that any steps had been taken looking toward extinguishing or dumping the fire or of easing off or closing the throttle to conserve the known inadequate quantity of water in the boiler. One of this group of locomotives, in freight-train service, was equipped with a low-water alarm. The alarm sounded about 4½ miles before the point of accident was reached and continued to sound steadily, for a time estimated as 6 to 8 minutes, until the accident occurred; during this time two applications and releases of the brakes were made in attempts to slush water over the crown sheet and the throttle remained practically full open. It is apparent that in all these instances the innate urge to keep trains moving to avoid delays on the line of road, which is a characteristic of all employees whose duties involve the movement of trains, was permitted under the exigencies prevailing to take precedence over the universal safety rule of all railroad companies, applicable to any condition of train or locomotive operation that may arise, to the effect that in case of doubt the safe course shall be taken.

Attention has repeatedly been called in the annual reports of this Bureau and in reports on boiler explosions caused by overheating of crown sheets, to the futility of attempting to keep trains moving in the absence of definite knowledge of the presence of safe water level in the boiler and to the necessity of constant vigilance on the part of all whose duties in any way concern the safety of locomotives, whether moving or standing, to maintain the water level at a known height that will protect the crown sheet from overheating. This requires maintenance of the water level so that the height is readily visible in the water glass, reducing the rate of working of the locomotive if, from any cause, water is being used at a rate in excess of that at which it can be supplied to the boiler. Water glasses should be blown out sufficiently often, and the movement of the water therein carefully noted, to insure that the water moves freely. The gage cocks should be tried frequently to check the level in the water glass, but a safe water level should not be assumed if the bottom gage cock seemingly indicates the presence of water if none is visible in the water glass. The lowest indication of any of the water level indicating devices when observed in the normal manner should be controlling, in other words, the least favorable should be considered as the correct indication.

Trick means, such as closing the top water-glass cock in attempts to cause the water to ascend in the glass, attempts to slush water over the crown sheet by abruptly varying the speed of the locomotive, or, if the locomotive is standing, attempts to raise the water or slush it over the crown sheet by opening the throttle and repeatedly reversing the locomotive, or assuming that the discharge from the water-glass drain pipe or the discharge from the bottom gage cock indicate sufficient water in the boiler if water cannot be readily observed in the water glass, serve only to raise false hopes that the crown sheet may not become overheated.

If observation of the water level has been inadvertently overlooked until the level has receded below the lowest reading of the water glass, or proportionately higher if the locomotive is headed upward on an ascending grade, the fire should be dumped or extinguished at once.

One hundred and thirty-eight boiler and appurtenance accidents other than explosions, in which no fatalities occurred, resulted in injuries to 143 employees. This is an increase of five accidents, a decrease of four deaths, and an increase of one injury compared with the preceding year.

EXTENSION OF TIME FOR REMOVAL OF FLUES

One thousand seven hundred and twenty-seven applications were filed for extension of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 240 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Fifty-two were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Fifty-eight extensions were granted after defects disclosed by our investigations were required to be repaired. Sixty-nine applications were canceled for various reasons. One thousand three hundred and eight applications were granted for the full period requested.

The purpose of periodic removal of flues as required by rule 10 is to make possible the removal of scale and thorough cleaning and inspection of the interior surfaces of boilers and inspection of the braces and their attachments. Provision is made in this rule for extension of time for removal of flues from individual boilers, if conditions warrant, upon formal application to the Director. Requested extensions are granted where this can be done without liability of adverse effect on the safety provisions of the Locomotive Inspection Act. Granting extensions on boilers of considerable age is not considered to be in keeping with these safety provisions, and extensions of time for removal of flues have been declined for boilers 30 years of age and upward.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

Thirty-eight accidents, resulting in injuries to 56 employees, occurred in connection with locomotives propelled by power other than steam; no fatalities were caused by these accidents. This represents an increase of 9 in the number of accidents, a decrease of 1 in the number of persons killed, and an increase of 16 in the number of persons injured compared with the preceding year.

During the year 4.6 percent of the locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this represents an increase of 0.1 percent compared with the results obtained in the preceding year. Seventeen locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this represents an increase of one locomotive compared with the preceding year.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 170 specification cards and 5,080 alteration reports were filed, checked, and analyzed. These reports are necessary in order to determine whether or not the boilers represented were so constructed or repaired as to render safe and proper service and whether the stresses were within the allowed limits. Corrective measures were taken with respect to numerous discrepancies found.

Under rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 627 specifications and 112 alteration reports were filed for locomotive units, and 162 specifications and 149 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

AMENDED RULES

As a result of numerous accidents and in accordance with the provisions of section 7 of the Locomotive Inspection Act, recommendations were made in my thirty-third annual report, with reasons therefor, for changes in certain rules which would result in increased safety of operation. After consideration and consultation with representatives of affected interests the Commission, in an order dated January 16, 1946, amended the rules shown below to conform to these recommendations which will accomplish the purposes set out therein.

106. *Safe condition.*—(a) It must be known before each trip that the brakes on locomotive and tender are in safe and suitable conditions for service; that the air compressor or compressors are in condition to provide an ample supply of air for the service in which the locomotive is put; that the devices for regulating all pressures are properly performing their functions; that the brake valves work properly in all positions; and that the water has been drained from the air-brake system.

(b) Each steam road locomotive built on or after March 1, 1946, shall be equipped with a brake pipe valve attached to the front of the tender or on the rear of the back cab wall to enable the brakes to be applied in the event the occupants of the cab are, from any cause, prevented from applying the brakes in the usual manner. On locomotives having vestibule cabs the brake pipe valve shall be located adjacent to an exit.

The words "EMERGENCY BRAKE VALVE" shall be legibly stenciled on the cab near the brake pipe valve or shall be shown on a badge plate adjacent thereto. That each steam road locomotive built before March 1, 1946, shall be so equipped the first time said locomotive receives class 3¹ or heavier repairs after June 1, 1946, but not later than June 1, 1948.

153. *Feed water tanks.*—(a) Tanks shall be maintained free from leaks, and in safe and suitable condition for service. Suitable screens must be provided for tank wells or tank hose. Feed water tanks on road locomotives that take water en route, built on or after March 1, 1946, shall be equipped with a device whereby the height or quantity of water in the tender feed water tank may be ascertained from the cab or tender deck of the locomotive, which shall be properly maintained. That each steam road locomotive that takes water en route, built before March 1, 1946, shall be so equipped the first time said locomotive receives class 3¹ or heavier repairs after June 1, 1946, but not later than June 1, 1948.

157. *Reverse gear.*—* * * (c) Each steam locomotive used in road service, built on or after March 1, 1946, that has an air operated power reverse gear shall be equipped with a connection whereby such gear may be operated by steam or by an auxiliary supply of air in case of failure of the main reservoir air pressure. Each steam locomotive used in road service, built on or before March 1, 1946, that has an air operated power reverse gear shall be so equipped the first time said locomotive receives class 3¹ or heavier repairs after June 1, 1946, but not later than June 1, 1948. If an independent air reservoir is used as the source of auxiliary supply for the reverse gear, it shall be provided with means to automatically prevent loss of pressure in event of failure of the main reservoir air pressure.

(d) When steam connections to air operated power reverse gear are used, the operating valve handle shall be conveniently located in the cab of the locomotive and so arranged and maintained that in case of air failure steam may be quickly used to operate the reverse gear. The operating rod or lever shall be plainly marked and equipped with a handle or wheel of a distinctive design.

APPEALS

No formal appeal by any carrier was taken from the decisions of any inspector during the year.

¹ Flues all new or reset. (Superheater flues may be excepted.) Necessary repairs to firebox and boiler. Tires turned or new. General repairs to machinery and tender.

ACKNOWLEDGMENT

I wish to acknowledge and express my sincere appreciation for the fine spirit of cooperation of the entire personnel of the Bureau and to our inspectors for the energy and good judgment exercised in the performance of their duties.

JOHN M. HALL,
Director.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1946, BY ROADS

[A star (*) indicates accidents taken from records of the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission. A double star (**) indicates accidents not properly reported, as required by rules 55 and 162. Complete investigations, therefore, could not be made, inasmuch as the Bureau was not apprised of the accidents in sufficient time after they occurred to permit them to be properly investigated.]

ALTON RAILROAD:

**August 30, 1945, locomotive 4365, Glenn, Ill. Employee was burned by discharge from boiler blow-off cock; handle of three-way cock in blow-off discharge pipe line was not applied in accordance with the carrier's standard practice; one injured.

**November 9, 1945, locomotive 5291, near Corder, Mo. Blow-off cock stuck open; one injured.

*December 4, 1945, locomotive 4351, Slater, Mo. Throttle was hard to operate; one injured.

March 26, 1946, locomotive 5299, near Rinaker, Ill. Injector steam pipe top collar broke circumferentially near spanner nut seat; collar was not properly applied; and steam pipe had excessive vibration, due to locomotive riding rough and clamps on the pipe being defective; one injured.

**May 3, 1946, locomotive 4376, Stanford, Ill. Headlight generator failed; one injured.

Five accidents; five injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

**July 15, 1945, locomotive 797, Barstow, Calif. Center board, 10 inches wide, was missing from cab deck; board, which was about 2 inches too short, loosened and worked off deck support; one injured.

July 22, 1945, locomotive 857, Kansas City, Kans. Oil boiled out of hydrostatic lubricator, burning employee; defective air compressor starting and lubricating valves allowed steam to enter lubricator with main steam supply valve closed, causing oil to become so hot that it boiled out of the filling hole; one injured.

**July 24, 1945, locomotive 964, Rice, Calif. Top of tender fuel tank covered with fuel oil; one injured.

August 1, 1945, locomotive 4110, Marceline, Mo. Power grate shaker operated with steam shut off; apparently the intermediate valve leaked due to defective seat; one injured.

August 16, 1945, locomotive 4004, Winslow, Ariz. Oil on step between cab and top of tender; one injured.

**August 19, 1945, locomotive 3834, Holbrook, Ariz. Feed water pump delivery pipe became disconnected at boiler check; delivery pipe was too short for the spanner nut to properly engage threads on boiler check; one injured.

**August 23, 1945, locomotive 3524, Oleander, Calif. Squirt-hose valve worked open; one injured.

August 23, 1945, locomotive 1798, near Minneola, Calif. Bonnet nut of fuel-oil heater valve blew off and struck employee; nut had been fractured due to the use of improper tools in attempts to tighten it; the close arrangement of valve among the connecting pipes to the firing valve manifold prevented the use of a regular wrench in tightening the bonnet nut; "Union on tank heater leaks very close to heater valve" was reported on August 20; one injured.

September 1, 1945, locomotive 793, Chambers, Ariz. Driving box ran hot; one injured.

September 4, 1945, locomotive 3746, Houck, Ariz. Oil on top of tender water tank; tender fuel-oil tank had a leak at back manhole, permitting oil to run down on top of water tank; one injured.

**September 20, 1945, locomotive 3436, Shopton, Iowa. Water valve extension to injector was disconnected under the deck; one injured.

September 21, 1945, locomotive 3859, Woodford, Calif. Oil on top of tender fuel tank, caused by oil in tank having boiled over; one injured.

September 23, 1945, locomotive 2506, Amarillo, Tex. Water crane hook slipped from water spout; handle of crane hook was bent, preventing the hook from having secure hold on water spout; one injured.

**September 25, 1945, locomotive 1236, Tuttle, Calif. Oil on top of tender fuel oil tank; one injured.

**September 25, 1945, locomotive 1345, Muir, Calif. Smoke deflector on locomotive did not operate properly, due to clamp on deflector piston rod being loose on the cable; four injured.

September 30, 1945, locomotive 3150, Kingman, Ariz. Crown-sheet failure caused by overheating due to low water; one killed.

October 11, 1945, locomotive 3119, Kingman, Ariz. Oil on locomotive steps; one injured.

October 23, 1945, locomotive 3722, Gallup, N. Mex. Employee slipped on oil on top of tender water tank and fell on some spare parts which were being carried on top of the tank; one injured.

October 26, 1945, locomotive 2130, San Diego, Calif. Footboard contacted highway pavement and was bent back under the pilot beam; footboard was less than the standard minimum prescribed height above the rail; one injured.

November 5, 1945, locomotive 1630, Angell, Ariz. Oil on top of tender; one injured.

**November 6, 1945, locomotive 4109, near Elmer, Mo. Engine-truck journal ran hot; one injured.

**November 17, 1945, locomotive 3899, Bakersfield, Calif. Kerosene spilled on cab apron and deck caused employee to slip and fall to the ground; one injured.

**November 29, 1945, locomotive 3753, De Soto, Kans. Employee's vision was obscured by steam and smoke trailing the cab; left front cylinder cock was missing and there was a steam leak around feed water heater; one injured.

December 3, 1945, locomotive 828, Kansas City, Kans. Employee's foot was crushed between cab overhang and deck apron; no means provided to prevent employee's feet from being placed between the overhang and apron; one injured.

**December 14, 1945, locomotive 1821, Calwa, Calif. Improper adjustment of the blower and atomizer valves; one injured.

**December 22, 1945, locomotive 3110, Skedee, Okla. Ice on top of tender feed water tank; one injured.

**December 23, 1945, locomotive 3868, Bakersfield, Calif. Boiler check was leaking, causing feed water pump to become overheated and lose its prime; one injured.

December 25, 1945, locomotive 3888, near Havre, Ariz. Pane of glass fell from rear cab window; window sash was worn and very loose; one injured.

**December 25, 1945, locomotive 3251, Shopton, Iowa. Collision, caused by ineffective emergency brakes; emergency position stop on the automatic brake valve was broken off and missing, preventing the proper functioning of the brakes; emergency position stop was reported broken off on August 14, November 30, and December 6 and 15; two injured.

*December 30, 1945, locomotive 3878, Audley, Ariz. Nut came off main pin; one injured.

January 19, 1946, locomotive 3419, Appleton, Ill. Employee was struck by some object which was thrown through the glass cab door of locomotive 3464 while meeting locomotive 3419; left link trunnion bolt was found missing from locomotive 3419; one injured.

**January 23, 1946, locomotive 5016, near La Lande, N. Mex. Steam pipe for mixing boiler compound broke off through threads at firing manifold on boiler back head and escaping steam filled the cab; employee attempted to close the header valve to auxiliary steam pipe but the valve was corroded and could not be closed; one injured.

January 28, 1946, locomotive 3741, Gallup, N. Mex. Leakage on side of locomotive permitted ice to form on the gangway steps and handholds, causing employee to slip and fall; one injured.

February 2, 1946, locomotive 1885, Corwith, Ill. Water glass burst; excessive openings at top and bottom of water-glass guard permitted broken glass to be blown out; one injured.

February 6, 1946, locomotive 1866, Lakin, Kans. Employee slipped and fell from gangway, due to oil and water on deck; one injured.

**February 7, 1946, locomotive 9011, Los Angeles, Calif. Rear tender truck collapsed; both side members of truck transom were fractured, resulting in the rear end of tender being lowered so that the rear footboard contacted the track surface and was dragged back under the tender; one injured.

**February 9, 1946, locomotive 1370, Needles, Calif. Lubricator drain valve and nipple were clogged with foreign matter; one injured.

February 11, 1946, locomotive (C. B. & Q.) 6301, Colorado Springs, Colo. Driving spring hanger broke through fracture which started at bottom edge of gib; one injured.

*February 20, 1946, locomotive 1648, Newberry, Calif. Water glass blew out; one injured.

*February 25, 1946, locomotive 1315, Syracuse, Kans. Clamp on air pipe was loose, due to bolts having lost out; one injured.

March 7, 1946, locomotive 3940, Pica, Ariz. Oil on top of tender between fuel-oil and water tank manholes; one injured.

March 16, 1946, locomotive 2921, Los Angeles, Calif. Insufficient clearance between the blow-off cock extension handle and the front cab wall; one injured.

**April 12, 1946, locomotive 3737, Mojave, Calif. Top of tender fuel-oil tank was oily and slippery; one injured.

June 1, 1946, locomotive 946, Keenbrook, Calif. Oil on top of tender feed water tank; one injured.

**June 10, 1946, locomotive 2923, Needles, Calif. Welding at neck of combustion chamber thermic syphon connection failed; one injured.

June 21, 1946, locomotive 3934, Gallup, N. Mex. Oil on top of tender fuel oil tank; one injured.

**June 26, 1946, locomotive 4077, Ponemah, Ill. Lug for holding grate-shaker post in central position would not stay clear of the moving shaker post while grates were being shaken with the steam-operated shaker, due to the lug fouling on side of the metal box which enclosed the shaker posts and power levers; one injured.

Forty-seven accidents; 1 killed, 50 injured.

ATLANTIC COAST LINE RAILROAD:

**September 1, 1945, locomotive 1511, Waycross, Ga. Employee was burned by hot water which was emitted from train steam-heat line while it was being connected; hot water had accumulated in heat line due to leaking control valves; one injured.

**September 27, 1945, locomotive 416, Eastover, S. C. Grate-shaker bar came off post; one injured.

March 9, 1946, locomotive 1506, Marion, Fla. Pin came out of grate-shaker post while grates were being shaken; one injured.

April 18, 1946, locomotive 1031, Smithfield, N. C. Front end of main rod key was loose; nut on end of key was thread-bound; one injured.

June 26, 1946, locomotive 7230, Haralson, Ga. Main rod broke through fracture which extended through approximately 95 percent of cross-sectional area of the top section of the eye in rod; "Check both ends of both main rods for pounds" was reported on June 24 and 26 (prior to the trip on which the failure occurred); one injured.

Five accidents; five injured.

BALTIMORE & OHIO RAILROAD:

August 4, 1945, locomotive 4226, near M. & K. Junction, W. Va. Crown-sheet failure caused by overheating due to low water; two killed.

September 15, 1945, locomotive 2695, Tilden, Ind. Brakeman's drop seat in cab collapsed, due to wood screws which secured strap hinge of supporting arm to bottom of the seat pulling out of seat; apparently the screws had been loose and working; one injured.

September 19, 1945, locomotive 5316, Pennington, N. J. Trailing truck spring hanger broke through old fracture at gib slot and part of the hanger was thrown from the rapidly moving locomotive and struck a track employee; one injured.

September 19, 1945, locomotive 1065, Cleveland, Ohio. Reversing gear stuck in forward motion; reversing gear was reported on September 5, 11, 15, 16, and 18; one injured.

**December 19, 1945, locomotive 2689, Botzum, Ohio. Lubricator sight feed glass blew out, due to the retaining nut blowing off; retaining nut had not been properly tightened and threads in lubricator body were badly worn; one injured.

December 29, 1945, locomotive 4562, Chillicothe, Ohio. Handrail above cab windows failed through old fracture at bend which extended through 75 percent of cross-sectional area; one injured.

January 10, 1946, locomotive 4529, Parkersburg, W. Va. Flue failed at safe end weld; overheated in welding; one injured.

January 18, 1946, locomotive 5117, Louisville, Ky. Air compressor was groaning immediately after the locomotive was dispatched; when employee attempted to remove filling plug of air compressor auxiliary lubricator, the two-way cock broke off at the steam pipe fitting; compressor reported to be oiled on January 1, 7, 8, 11, 12 (two times), and 14; one injured.

January 19, 1946, locomotive 4864, Owings Mine, W. Va. Horizontal handhold at rear of tender broke through old crack at bolt hole at bottom end; bolt hole was $\frac{1}{4}$ inch out of center; bottom end of handhold was badly rusted and pitted; one injured.

January 31, 1946, locomotive 2759, Valier, Pa. Power reverse gear and throttle lever were hard to operate; reverse gear piston rod packing was leaking and reverse cylinder did not have sufficient lubrication; one injured.

February 7, 1946, locomotive 5090, Dawson, Pa. Cast-iron main steam pipe in front end broke through flanges at top and bottom ends, caused by cylinder working badly; cylinder was loose account of bolts being broken or having nuts missing; "Right and left cylinders working" was reported on February 6; numerous other defects reported indicate that the locomotive was not properly maintained; one injured.

February 11, 1946, locomotive 4465, Massillon, Ohio. Steam whistle valve stuck open; whistle-valve spring coils were broken and crushed together and a piece of the broken coil was lodged on the valve seat; steel spring was badly pitted; one injured.

April 2, 1946, locomotive 4485, Arden, Del. Crown-sheet failure caused by overheating due to low water; two injured.

*May 16, 1946, locomotive 6155, Miamisburg, Ohio. Insufficient clearance between cab gangway handhold and ladder at front of tender when on curve; clearance did not conform to company's standard; one injured.

**June 17, 1946, locomotive 2537, between Glenwood and West Mosgrove, Pa. Locomotive rode rough, due to the weight not being properly distributed on driving spring rigging, the equalizers over left No. 4 driving box being displaced, and the spring-loaded radial buffer between locomotive and tender not being properly maintained; reports for 30 days preceding the accident show these conditions had been reported repeatedly; one injured.

*June 19, 1946, locomotive 4459, Reedsville, W. Va. Insufficient clearance between gangway handhold and ladder when on curve; one injured.

June 24, 1946, locomotive 4428, Leslie, Md. Employee's foot caught in defective rack over radiator in cab floor; two wood strips in rack were broken and one strip was fractured and bent downward; one injured.

Seventeen accidents; 2 killed, 17 injured.

BANGOR & AROOSTOOK RAILROAD:

January 23, 1946, locomotive 193, Lille, Maine. Superheater flue broke at back flue sheet; flue had been excessively rolled and thickness was further reduced by erosion resulting from longitudinal cracks at flue end; one injured.

One accident; one injured.

BELT RAILWAY OF CHICAGO:

*February 19, 1946, locomotive 123, South Chicago, Ill. Insufficient clearance between gangway handhold and tender step when on curve; one injured.

One accident; one injured.

BOSTON & MAINE RAILROAD:

August 6, 1945, locomotive 1415, Cambridge, Mass. Injector steam pipe spanner nut blew off; threads on nut were defective and nut could be applied to injector more than four threads before thread engagement; nut was badly mutilated, indicating frequent attempts to tighten; "Collar on steam pipe to injector leaks" was reported on August 4 and "Steam in cab, due to steam leaks" was reported on August 6, prior to departure of the locomotive on the trip on which the failure occurred; one injured.

December 25, 1945, locomotive 3712, Troy, N. Y. Precision reverse gear suddenly spun out of control and the handle on the handwheel struck employee's arm; one injured.

Two accidents; two injured.

CANADIAN NATIONAL RAILWAYS:

*November 23, 1945, locomotive 713, Danville Junction, Maine. Straight air pipe joint between locomotive and tender became disconnected; two injured.

One accident; two injured.

CENTRAL OF GEORGIA RAILWAY:

January 15, 1946, locomotive 479, near Smarr, Ga. Crown-sheet failure caused by overheating due to low water; one injured.

April 1, 1946, locomotive 205, Brumby, Ga. Crown-sheet failure caused by overheating due to low water; two injured.

Two accidents; three injured.

CENTRAL RAILROAD OF NEW JERSEY:

August 20, 1945, locomotive 104, Jersey City, N. J. Throttle lever latch spring broke; one injured.

August 20, 1945, locomotive 774, Dunellen, N. J. Employee slipped on a piece of pin grease which was lying on locomotive running board; one injured.

November 29, 1945, locomotive 778, Spring Lake, N. J. Throttle flew open; one injured.

March 27, 1946, locomotive 102, Jersey City, N. J. Coal-gate door lock bar fell to the deck, striking employee's foot; door plate which held the bolt supporting the bottom lock bar was badly deteriorated and metal surrounding the bolt hole was broken, permitting the bolt head and washer to pull through; one injured.

April 28, 1946, locomotive 863, Jersey City, N. J. Broken stay blew out of crown sheet; attempted to calk while under steam pressure; stay head had been excessively hammered and threads on stay and in stay hole were badly deteriorated; one injured.

Five accidents; five injured.

CHICAGO & EASTERN ILLINOIS RAILROAD:

*January 20, 1946, locomotive 1951, Danville, Ill. Locomotive derailed at switch, due to chafing iron being dry and holding engine too rigid to take curve; one injured.

One accident; one injured.

CHICAGO & NORTH WESTERN RAILWAY:

*August 16, 1945, locomotive 2561, Winfield, Ill. Defective squirt-hose valve worked open; one injured.

October 5, 1945, locomotive 1519, Barrington, Ill. Bonnet was accidentally turned out of the top water-glass cock; evidently the bonnet had not been properly tightened after removal for the monthly inspection of October 4; one injured.

*February 1, 1946, locomotive 2336, between Butler and Clyman Junction, Wis. Grate-shaker bar fouled on jet valve on boiler; one injured.

February 14, 1946, locomotive 941, Beresford, S. Dak. Flue failed at front flue sheet due to being badly pitted; one injured.

February 26, 1946, locomotive 1758, Antigo, Wis. Water glass burst; one injured.

**June 13, 1946, locomotive 2639, Proviso, Ill. Cab seat box collapsed, due to failure of the boards of which it was made; one injured.

Six accidents; six injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

July 31, 1945, locomotive 5104, Zearing, Ill. Grate-shaker lever latch fell into locking position while grates were being shaken, suddenly stopping the shaker

bar; grate-shaker lever latch fouled on cab floor and could not be thrown far enough away from locking position that it would not fall back to locking position; one injured.

August 2, 1945, locomotive 5606, Lisle, Ill. Tube of feed water pump gage broke, blowing out dial and gage glass; gage pipe was not equipped with reducing choke fitting; one injured.

August 17, 1945, locomotive 6166, Crawford, Nebr. Manhole cover bracket on tender water tank broke in weld and bent under the weight of the cover, allowing the manhole cover to drop on employee's foot; bracket was not of company's standard design and weight; one injured.

August 19, 1945, locomotive 6318, Rome, Iowa. Eccentric rods broke; one injured.

April 2, 1946, locomotive 5248, Elsberry, Mo. Main crank pin broke through old fracture which extended through approximately 70 percent of cross-sectional area; main rod or main driving box reported pounding on February 3, 7, and 19, and March 14, 20, 22, and 24; one injured.

Five accidents; five injured.

CHICAGO GREAT WESTERN RAILWAY:

**December 9, 1945, locomotive 858, Thorpe, Iowa. Throttle worked very hard; throttle rod guides were dry and front throttle rod was binding on sand dome tubing; one injured.

**December 28, 1945, locomotive 856, Hayfield, Minn. Bell was inoperative; bell ringer was improperly adjusted, causing the bell to turn completely over and wind the bell rope around bell crank; "Repair bell rope" was reported on December 27; one injured.

December 31, 1945, locomotive 505, near Racine, Minn. Brake beam on tender truck became disconnected at one end and fell, caused by excessive vibration of truck account of a shelled out spot on truck wheel; one injured.

January 15, 1946, locomotive 758, Mason City, Iowa. Employee was injured while attempting to clean the fire en route; bad fire account of inferior grade of coal; clinker hook was bent and the handle was sprung; one injured.

January 25, 1946, locomotive 729, Hayfield, Minn. Power reverse gear was hard to operate, due to reverse reach rod rubbing on injector delivery pipe ahead of the cab; reverse gear reported hard to operate on January 26, 27, and 28, and February 10; one injured.

May 8, 1946, locomotive 507, Harlan, Iowa. Crown sheet failure caused by overheating due to low water; two injured.

June 17, 1946, locomotive 851, Inver Grove, Minn. Engine truck journal bearing overheated; engine truck was reported running warm or hot 17 times from May 30 to June 24; one injured.

Seven accidents; eight injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

July 22, 1945, locomotive 1144, Wabasha, Minn. Right front cylinder head ruptured and central portion with cylinder head casing attached was blown out; old fracture in cylinder head which originated at bottom of the boss had progressed through approximately 60 percent of the thickness of the head for a distance of 10 inches around outside circumference of the boss; one injured.

*August 20, 1945, locomotive 129, Minneapolis, Minn. Coupler knuckle pin fell out, due to cotter key missing; one injured.

August 29, 1945, locomotive 453, Collins, Iowa. Air compressor was inoperative; slight cuts on face of reversing valve slide valve and valve seat; one injured.

October 28, 1945, locomotive 1004, near Kimball, S. Dak. Side rod broke through old fracture at main pin fit; fracture extended through approximately 20 percent of cross-sectional area; one injured.

**November 17, 1945, locomotive 1275, Fayette, Iowa. Driving brake cylinder pipe union was loose; employee went to tighten the union and his foot slipped off the guide yoke step, due to oil on the step tread; one injured.

February 10, 1946, locomotive 1263, Clyde, Iowa. Right boiler check valve stuck open; right delivery pipe intermediate check valve seats were badly cut; boiler checks were reported on January 24, January 31, and February 6; one injured.

February 17, 1946, locomotive 669, Milwaukee, Wis. Air compressor stopped; one injured.

February 20, 1946, locomotive 889, Seattle, Wash. Steam heat pipe collar flange failed through an old circumferential crack and steam pipe separated from

reducing valve; wall of collar was of reduced thickness and the bronze metal was porous; brazing at lower end of the joint had broken loose from the pipe, allowing the pressure to be carried entirely on the flange; steam pipe was not flared or belled over at the joint; one injured.

**April 8, 1946, locomotive 130, Milwaukee, Wis. Bell rope became tangled around bell and whistle; one injured.

**May 7, 1946, locomotive 4, Chicago, Ill. Bolt missing from adjusting rod to front cab door; one injured.

Ten accidents; 10 injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

August 12, 1945, locomotive 2628, Marseilles, Ill. Stoker was inoperative, due to stoker elevator screw being obstructed by a wooden wedge; one injured.

September 10, 1945, locomotive 284, Herington, Kans. Excessive carbon on oil burner and in pan; apparently the locomotive had not been properly prepared before being dispatched; one injured.

November 9, 1945, locomotive 2689, near De Soto, Iowa. Cab heater drain pipe was disconnected at union under the cab, and the escaping steam obscured the vision of an employee who stepped from the locomotive while it was standing on a bridge; one injured.

*February 4, 1946, locomotive 5025, Enid, Okla. Main rod broke through keeper bolt hole; one injured.

Four accidents; four injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

June 18, 1946, locomotive 338, Blue Earth, Minn. Manually operated reverse lever unexpectedly moved to extreme forward position; insufficient clearance between the front support of reverse lever quadrant and reverse lever latch teeth which overlapped the quadrant; one injured.

One accident; one injured.

COLORADO & SOUTHERN RAILWAY:

March 8, 1946, locomotive 350, Boulder, Colo. Bell ringer did not operate properly; employee went to make adjustment to bell ringer and fell due to losing hold on handrail over cab window; insufficient clearance around handrail; "Adjust bell ringer" was reported on March 7; one injured.

One accident; one injured.

DELAWARE & HUDSON RAILROAD:

September 9, 1945, locomotive 1601, Forest City, Pa. Cab seat box tipped, causing employee to fall; nuts worked off bolts which held seat box to cab floor, permitting the bolts to work out; one injured.

November 17, 1945, locomotive 915, Carbondale, Pa. Grip handle and locking pin for securing the marker lamp in position in the socket were missing, permitting the lamp to be turned unexpectedly; one injured.

March 9, 1946, locomotive 1205, near Forest City, Pa. Tubular water glass burst; two injured.

**May 16, 1946, locomotive 1517, Oneonta, N. Y. Forked end of fire rake broke off at defective weld; one injured.

**June 14, 1946, locomotive 1528, Oneonta, N. Y. Exhaust steam injector did not function properly due to a delivery nozzle of improper size having been applied in injector; one injured.

Five accidents; six injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

July 17, 1945, locomotive 1257, Richfield Junction, N. Y. Roughened surface of step on side of cab was worn smooth; one injured.

September 6, 1945, locomotive 1627, Sloan, N. Y. Stud in arch tube washout plate in back head blew out, due to improper application; threads on nut were badly stripped and corroded, nut on outside of washout plate was cross-threaded, and threads on nut and in sheets were badly distorted; one injured.

**March 5, 1946, locomotive 1255, Norwich, N. Y. Insufficient clearance between cab seat box and shaker bar when used on outside shaker staff; one injured.

Three accidents; three injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

November 19, 1945, locomotive 1507, Coal Creek, Colo. Metal rod became wedged in stoker elevator; one injured.

March 10, 1946, locomotive 3604, Sommers, Colo. Sand pipe became loose and fouled driving wheel tire; one injured.

Two accidents; two injured.

ELGIN, JOLIET & EASTERN RAILWAY:

*September 27, 1945, locomotive 704, Normantown, Ill. Engine truck ran hot; one injured.

One accident; one injured.

ERIE RAILROAD:

**September 11, 1945, locomotive (N. Y. C. & St. L.) 200, Buffalo, N. Y. Injector overflow valve stuck shut; one injured.

November 5, 1945, locomotive 220, Cleveland, Ohio. Cab gangway handhold fouled tender deck when on curve; one injured.

November 25, 1945, locomotive 3125, Deposit, N. Y. Water crane hook slipped from crane spout; hook was mutilated and badly bent; one injured.

December 2, 1945, locomotive 3374, Highland Mills, N. Y. Coal saver plate fell, striking employee's foot; apparently the coal saver plate was not fastened when raised before the locomotive was dispatched; one injured.

**December 24, 1945, locomotive 3335, Belfast, N. Y. Stoker slide hook slipped out of hole in stoker slide plate; slide hook was of obsolete type; one injured.

December 28, 1945, locomotive 1752, near Millers, Pa. Bonnet in water-glass top shut-off valve blew out; one injured.

February 8, 1946, locomotive 2557, Paterson, N. J. Cab apron was badly worn; one injured.

March 6, 1946, locomotive 2912, Saegertown, Pa. Fire hook which was hanging on hooks provided on tender for that purpose moved to the left and struck the fireman of an opposing locomotive; no means provided to prevent lateral movement of the fire hook; one injured.

March 17, 1946, locomotive 3306, Marion, Ohio. Bell ringer was inoperative; while employee was attempting repairs, his foot slipped on grease on smokebox front step and he fell to the track; "The bell does not operate" was reported on March 16; one injured.

April 18, 1946, locomotive 2935, Mansfield, Ohio. Handrail on rear of tender gave way, due to the rivet which secured one end breaking through old fracture; one injured.

**June 18, 1946, locomotive 3077, Port Jervis, N. Y. Fire hose burst; hose badly worn; one injured.

Eleven accidents; 11 injured.

FLORIDA EAST COAST RAILWAY:

December 11, 1945, locomotive 301, Lake Harbor, Fla. Fire from oil-fired firebox discharged into cab; one injured.

One accident; one injured.

GRAND TRUNK WESTERN RAILROAD:

August 7, 1945, locomotive 6040, Battle Creek, Mich. Coal on tender running board; one injured.

One accident; one injured.

GREAT NORTHERN RAILWAY:

**August 11, 1945, locomotive 763, Eastham Junction, Mont. Safety guard on grate-shaker lever broke, causing shaker lever to lift off grate-shaker post; one injured.

November 28, 1945, locomotive 834, Grand Forks, N. Dak. Tubular water glass burst, breaking glass panels in water-glass shield; one injured.

January 1, 1946, locomotive 1193, Superior, Wis. Water glass burst, breaking two glass panels in water-glass shield; one injured.

January 19, 1946, locomotive 2508, Wenatchee, Wash. Steam-heat valve at main turret could not be operated by means of the extension rod and handle in the cab; "Fix steam heat valve at fountain so it can be opened from the cab" was reported on January 14; one injured.

May 25, 1946, locomotive 1719, Lewistown, Mont. Crown-sheet failure caused by overheating due to low water; one injured.

*May 28, 1946, locomotive 3225, Hillyard, Wash. Oil on rung of ladder; one injured.

Six accidents; six injured.

GULF COAST LINES:

November 7, 1945, locomotive (N. O. T. & M.) 1033, Eunice, La. Main throttle rod packing leaking due to insufficient packing in stuffing box; defective packing ring and worn stuffing box joint ring permitted packing to be forced through stuffing box into the boiler by compression; one injured.

**November 20, 1945, locomotive (St. L. B. & M.) 1018, Vanderbilt, Tex. Blow-off cock stuck open; one injured.

Two accidents; two injured.

GULF, COLORADO & SANTA FE RAILWAY:

August 6, 1945, locomotive (A. T. & S. F.) 4047, Cresson, Tex. Wooden tread of tender sill step was slippery, due to being worn and having oil on it; one injured.

April 8, 1946, locomotive (A. T. & S. F.) 918, Oakdale, La. Feed valve and condenser valve stem packing nuts to flange oiler were leaking; while attempting to tighten the packing nuts, employee accidentally struck squirt-hose valve, opening it; insufficient packing in squirt-hose valve to prevent valve from opening too easily; one injured.

Two accidents; two injured.

HOUSTON BELT & TERMINAL RAILWAY:

*July 11, 1945, locomotive 5, Houston, Tex. Headlight turbine exhaust pipe was missing, permitting steam to blow back into the cab; one injured.

One accident; one injured.

ILLINOIS CENTRAL RAILROAD:

February 16, 1946, locomotive 2351, Olympia Fields, Ill. Crown-sheet failure caused by overheating due to low water; due to a manufacturing defect, a bridge of metal extended across the illumination slot in left water-glass lamp cavity wall which caused a dark shadow about midheight on the water-glass tube when the electric light was burning, this shadow could easily be mistaken for an indication of the boiler-water level; one killed, one injured.

*February 20, 1946, locomotive 261, Jackson, Miss. Insufficient clearance between gangway handhold and apron when on curve; one injured.

Two accidents; one killed, two injured.

ILLINOIS NORTHERN RAILWAY:

*January 16, 1946, locomotive 16, McCormick, Ill. Channel tender frame broke, permitting tender to separate from locomotive; one injured.

One accident; one injured.

INDIANA HARBOR BELT RAILROAD:

**July 6, 1945, locomotive 328, Hammond, Ind. Cab drop seat lower frame bracing worked out at cab wall, permitting undesired drop of cab seat; one injured.

**October 11, 1945, locomotive 251, Argo, Ill. Grate shaker rod was bent and fouling on furnace bearing plate; one injured.

**March 16, 1946, locomotive 319, Franklin Park, Ill. Injector overflow valve was hard to open; injector steam ram was leaking, permitting pressure to build up against the overflow valve; one injured.

Three accidents; three injured.

INDIANAPOLIS UNION RAILWAY:

April 3, 1946, locomotive 31, Indianapolis, Ind. Main throttle valve stem packing was leaking; one injured.

One accident; one injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

December 12, 1945, locomotive 359, Valley Junction, Tex. Improper blow-off cock rigging prevented blow-off cock from being closed from the cab; employee was burned while attempting to close the emergency shut-off sleeve, due to discharge pipe drain valve leaking and drain pipe missing from drain valve; one injured.

February 15, 1946, locomotive 383, near Thrall, Tex. Crown-sheet failure caused by overheating due to low water; one killed, one injured.

Two accidents; one killed, two injured.

KANSAS CITY SOUTHERN RAILWAY:

November 20, 1945, locomotive 903, near Page, Okla. Smokebox petticoat pipe swung down and partially obstructed the exhaust nozzle, causing back draft; three of the six bolts for securing the petticoat pipe were missing and nuts were missing from two of the other bolts; one injured.

January 22, 1946, locomotive 903, DeQueen, Ark. Stop lug was missing from fuel oil firing valve quadrant which permitted the firing valve handle to travel beyond the closed position on the quadrant, allowing the oil regulating valve to admit oil to the burner unexpectedly; one injured.

Two accidents; two injured.

LEHIGH & HUDSON RIVER RAILWAY:

*June 7, 1946, locomotive 10, Maybrook, N. Y. Extension rod and handle to main steam valve to injector became disconnected at joint, due to bolt being worn; one injured.

One accident; one injured.

LEHIGH VALLEY RAILROAD:

October 11, 1945, locomotive 2058, near Wende, N. Y. Engine truck hub liner failed, due to old flaw in half section, and part of the liner flew off, striking a track employee; hub liner retaining band was poorly spot-welded to the liner; one injured.

June 23, 1946, locomotive 2092, Buffalo, N. Y. Grate-shaker bar slipped off lever; lever was worn, causing improper fit; one injured.

Two accidents; two injured.

LITCHFIELD & MADISON RAILWAY:

*May 31, 1946, locomotive 161, on the line. Throttle was hard to operate; one injured.

One accident; one injured.

LOUISIANA & ARKANSAS RAILWAY:

**March 21, 1946, locomotive (K. C. S.) 1023, Shreveport, La. Fire in firebox became extinguished, due to an accumulation of water in the fuel oil, then ignited unexpectedly; inadequate means provided for draining water from fuel oil cistern; one injured.

*May 1, 1946, locomotive 509, New Orleans, La. Squirt hose valve did not close properly account of a small piece of casting having lodged under valve stem; one injured.

Two accidents; two injured.

LOUISVILLE & NASHVILLE RAILROAD:

**August 1, 1945, locomotive 1841, Elmore, Ala. Union in heater pipe to auxiliary water feed pipe became disconnected under the cab deck; one injured.

December 8, 1945, locomotive 86, Evelyn, Ky. Union in steam pipe to automatic blow-down system became disconnected, due to union nut working off; one injured.

January 1, 1946, locomotive 242, Oakland, Ky. Guide yoke broke at old fracture which extended through approximately 55 percent of cross-sectional area; causing the locomotive to be stripped on one side; three injured.

**February 1, 1946, locomotive 1370, Leewood, Tenn. Pilot beam handrail broke in bend at right end; handrail vibrated badly due to being supported by end posts only; one injured.

April 12, 1946, locomotive 2107, Montgomery, Ala. Air gage burst; gage had previously been overheated due to a fire in the cab; one injured.

April 29, 1946, locomotive 1829, near Rowletts, Ky. Cab ceiling board was badly deteriorated, permitting cab front door slide rod bracket screws to pull out; one injured.

May 27, 1946, locomotive 1240, Carters Creek, Tenn. Main rod broke through weld; old fracture extended through 90 percent of cross-sectional area; one injured.

Seven accidents; nine injured.

MAINE CENTRAL RAILROAD:

December 13, 1945, locomotive 653, Bangor, Maine. Flue broke off at safe end weld; flue improperly rolled when safe end was applied, leaving a ridge on

the inside which resulted in the flue being cinder-cut and reduced in thickness at the point of failure; one injured.

December 18, 1945, locomotive 525, near Pittsfield, Maine. Crown-sheet failure caused by overheating due to low water; one killed, one injured.

Two accidents; one killed, two injured.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE RAILROAD:

September 22, 1945, locomotive 1031, Superior, Wis. Oil on front uncoupling lever caused employee to slip; air compressor lubricators so located that oil spillage fell on uncoupling lever and pilot beam and steps; one injured.

February 6, 1946, locomotive 4001, Hankinson, N. Dak. Injector delivery pipe was frozen; pipe was not drained when locomotive was placed on storage track; one injured.

Two accidents; two injured.

MISSOURI & ARKANSAS RAILWAY:

July 31, 1945, locomotive (I. C.) 2071, Helena, Ark. Water glass burst; one injured.

One accident; one injured.

MISSOURI-KANSAS-TEXAS RAILROAD:

July 26, 1945, locomotive 887, near Erie, Kans. Flue-cleaning sand blew back into the cab through circumferential openings around fire door sander hole which existed when sander funnel was oscillated in hole; one injured.

September 23, 1945, locomotive 35, Houston, Tex. Injured while attempting to replace the electric light wire plug to lubricator and right steam gage lights in receptacle in cab ceiling; locomotive had been dispatched from enginehouse with the plug out of receptacle; one injured.

December 4, 1945, locomotive 881, Denison, Tex. Insufficient clearance between blow-off cock operating handle and the booster latch on reverse lever; "Fix handle on right blow-off cock so it will clear booster handle on reverse lever" was reported on November 23; one injured.

December 7, 1945, locomotive 861, Franklin, Mo. Oil on top of tender fuel oil tank; one injured.

December 10, 1945, locomotive 18, Dallas, Tex. A piece of steel blew off pipe when blow-off cock was opened and struck employee's eye; one injured.

Five accidents; five injured.

MISSOURI PACIFIC RAILROAD:

**August 27, 1945, locomotive 1817, El Dorado, Ark. Handrail on tender broke off through threaded connections near each end soon after being struck by water crane; handrail was of very light construction and internal corrosion had reduced the thickness to approximately $\frac{1}{32}$ inch at the roots of the threads where the breaks occurred; one injured.

**August 31, 1945, locomotive 1273, Collinston, La. Oil on top of tender; one injured.

December 13, 1945, locomotive 487, Haswell, Colo. Crown-sheet failure caused by overheating due to low water; leakage at a fractured nipple under left water-glass frame; serrations or reflex surfaces worn off of lower portion of left water glass; left bottom water-glass cock passage practically stopped up with soft mud; right water glass applied in the frame with reflex surfaces or serrations, on the outside; bottom gage cock extension or fitting did not extend into the water space far enough to clear all obstructions; the boiler opening for the bottom gage cock was in a pocket formed by a gusset brace assembly and the back head top knuckle; one leg of the gusset brace angle iron was directly below and flush with the bottom gage cock extension hole, forming a shelf on which scale accumulated; steam leakage in the smokebox at nozzle stand bottom joint and at one superheater unit joint; part of left delivery pipe had opening reduced more than 50 percent due to scale adhering to the walls; water in boiler foaming, necessitating frequent blow downs; one killed.

January 15, 1946, locomotive 1712, near Everest, Kans. Crown-sheet failure caused by overheating due to low water; feed water pump was erratic in operation, apparently due to the feed water being heated by the exhaust steam from stoker which was discharged into the leg of the water tank about 30 inches from the tank outlet and by steam discharged into the feed pipe from the antifreeze pipe which interfered with the prime of the pump; feed water pump was reported not operating properly 26 times since November 1, 1945; one killed, one injured.

*March 27, 1946, locomotive 1547, Kensett, Ark. Driving box ran hot; one injured.

**April 5, 1946, locomotive 114, Pacific, Mo. Driving spring hanger broke; one injured.

*April 29, 1946, locomotive 9315, Kansas City, Mo. Throttle stuck open; one injured.

**May 29, 1946, locomotive 1506, Malden Mo. Grate-shaker bar slipped off lever; outer end of shaker bar was so badly battered that shaker bar could not be properly placed on the lever; one injured.

**June 1, 1946, locomotive 6437, Nevada, Mo. Bonnet of steam turret valve blew out; threads in turret and on bonnet were defective; one injured.

**June 26, 1946, locomotive 53, Bastrop, La. Boiler check stuck in open position; one injured.

Ten accidents; two killed, nine injured.

MONONGAHELA RAILWAY:

**July 8, 1945, locomotive 177, near Maidsville, W. Va. Stoker slide plate hook slipped out of hole in conveyor trough cover plate; cover plate was badly mutilated by poundings with coal pick or similar tools, making the hole of improper size; one injured.

One accident; one injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

March 16, 1946, locomotive 666, Mercer, Tenn. Feed water pump indicator pipe broke off; one injured.

One accident; one injured.

NEW YORK CENTRAL SYSTEM:

*July 13, 1945, locomotive 841, Williamson, N. Y. Main pin ran hot; one injured.

*July 13, 1945, locomotive (B. & A.) 31, Framingham, Mass. Projecting edge of wooden tread on step casting at side of cab broke off; entire tread was deteriorated; one injured.

**September 16, 1945, locomotive (C. R. & I.) 182, Chicago, Ill. Blow-off cock held open by a piece of a broken staybolt; one injured.

**October 13, 1945, locomotive 7435, Cleveland, Ohio. Insufficient clearance between gangway handhold and cab apron while on curve; one injured.

**January 10, 1946, locomotive 5379, Donovan, Ill. Handwheel of power reverse gear became unlatched and spun out of control; one injured.

January 27, 1946, locomotive 2876, Jordan, N. Y. Lever of manually operated ashpan blower became inoperative, preventing blower valve from being closed, and steam and hot water entered the cab through hole in deck; blower operating lever was too short and was bent upward and binding on slot opening in cab; cross-over pipe under deck was deteriorated and permitted escape of steam; one injured.

January 28, 1946, locomotive 811, Rensselaer, N. Y. Lubricator sight feed glass burst; glass damaged due to lubricator having been frozen; one injured.

**March 5, 1946, locomotive 6674, Oneida, N. Y. Boiler check valve stuck open; one injured.

**March 7, 1946, locomotive 1979, Sharonville, Ohio. Stoker elevator was inoperative due to a piece of metal, 14 inches in length, being lodged between elevator screw and casing; one injured.

March 21, 1946, locomotive 2821, Campbell, Ohio. Engine truck spring dropped and lodged between the rails, causing front footboard to be bent; three leaves of engine truck spring were broken; one injured.

April 14, 1946, locomotive (B. & A.) 1437, Jordan, N. Y. Bolt in blow-off cock handle fouled on a flexible staybolt cap, holding blow-off cock in open position; one injured.

May 30, 1946, locomotive 6898, Battle Creek, Mich. Fire hose burst; one injured.

June 4, 1946, locomotive (B. & A.) 62, West Springfield, Mass. Steam-whistle valve was leaking; one injured.

June 14, 1946, locomotive 2035, Otter Lake, Mich. Handwheel of Precision reverse gear became unlatched due to excessive vibration caused by worn latch pivot pin and notches in locking wheel; "Reversing gear will not stay latched" was reported on June 11; one injured.

June 15, 1946, locomotive 3022, Depew, N. Y. Flue failed at front flue sheet through old fracture; flue had been improperly rolled; one injured.

June 24, 1946, locomotive 2130, Ridgeway, Ohio. Insufficient clearance between grate-shaker bar and feed valve; wear of shaker bar, lever, and connecting rod permitted excessive forward and rearward movement of the shaker bar; one injured.

Sixteen accidents; 16 injured.

NEW YORK, CHICAGO & ST. LOUIS RAILROAD:

*July 4, 1945, locomotive 745, Willoughby, Ohio. Engine truck wheel plate broke through old defect, causing derailment; three injured.

One accident; three injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**August 9, 1945, locomotive 3603, Providence, R. I. Boiler check and delivery pipe were stopped up with scale; injector and/or boiler check were reported on July 31, August 1, 3, 4, 6, 7, and 9 (after accident); one injured.

September 13, 1945, locomotive 1406, Worcester, Mass. Sloping section of handrail near front end of locomotive became disconnected due to poor threads in union; one injured.

**December 12, 1945, locomotive 3022, between South Boston and Braintree, Mass. Shovel struck hole in shoveling sheet; shoveling sheet was badly worn and had a hole 3¼ x 6 inches; one injured.

**December 17, 1945, locomotive 1396, Cedar Hill, Conn. Squirt hose burst; hose damaged at the point of failure; one injured.

*January 10, 1946, locomotive 3609, Maybrook, N. Y. Coupler pocket pin broke; one injured.

**January 12, 1946, locomotive 1303, Cohasset, Mass. Injector annunciator pipe became disconnected at union, due to threads being badly worn; one injured.

**February 28, 1946, locomotive 3011, Middlefield, Conn. Throttle hard to operate due to throttle shaft covering pipe being loose in throttle box; "Throttle works too hard to handle engine safely" was reported on February 14; one injured.

**April 20, 1946, locomotive 3001, Brockton, Mass. Grate-shaker bar slipped off lever; lubricator was leaking, permitting oil to run down on shaker levers and shaker bar; one injured.

Eight accidents; eight injured.

NEW YORK, ONTARIO & WESTERN RAILWAY:

*April 25, 1946, locomotive 310, Earlville, N. Y. Packing nut on injector was leaking; threads on nut were worn; one injured.

One accident; one injured.

NORFOLK & PORTSMOUTH BELT LINE RAILROAD:

*December 18, 1945, locomotive 17, Money Point, Va. Handhold on side of cab fouled tender end sill while on curve; one injured.

One accident; one injured.

NORFOLK & WESTERN RAILWAY:

**July 2, 1945, locomotive (A. C. L.) 1650, Abilene, Va. Steel retaining ring of engine truck floating hub liner failed at both welded joints and permitted the two-piece hub liner to drop from the axle, one section of which was thrown from under the locomotive and struck a track employee; one injured.

**September 5, 1945, locomotive 2106, Carlos, W. Va. Air compressor failed, causing the brakes to apply and stop the train; intermediate air valves had too much lift; discharge valves and seats were burned and pitted; lower discharge ports and one upper discharge port in high pressure air cylinder wall, leading to discharge valve cage, were completely stopped up and the other upper discharge port was partially stopped up with carbonized oil; the mechanical lubricator was improperly adjusted, permitting an excessive amount of oil to be fed to the air end of the compressor; one injured.

**May 21, 1946, locomotive 2136, Saltville, Va. Tender brake beam connecting rod jaw broke; one injured.

Three accidents; three injured.

NORTHERN PACIFIC RAILWAY:

July 14, 1945, locomotive 5142, Lamont, Wash. Grates difficult to operate, due to shaker slide bent and binding; one injured.

**August 17, 1945, locomotive 2677, Detroit Lakes, Minn. Air operated steam whistle valve stuck open; whistle valve piston movement was obstructed by pieces of a previously broken pipe nipple in the cylinder; one injured.

September 6, 1945, locomotive 1269, Pasco, Wash. Ashpan slides were stuck; one injured.

**September 6, 1945, locomotive 1383, Pullman, Wash. Ashpan slide stuck; ashpan wrench and lever on lower end of vertical shaft were longer than standard; one injured.

**September 18, 1945, locomotive 2249, Talmadge, Wash. Grates were difficult to operate; grate-shaker reach rods for three of the four grate sections fouled on bottom of slots at rear of ashpan when the grates were tipped forward; one injured.

September 22, 1945, locomotive 2143, Pasco, Wash. Blow-off cock was leaking; one injured.

September 24, 1945, locomotive 1358, near Eltopia, Wash. Defects and lost motion in valve gear resulted in reverse lever jerking out of employee's control and moving suddenly to full forward position; valve gear defects reported on September 5, 7, 9, 10, 11, and 25; one injured.

September 29, 1945, locomotive 1757, Glenullen, N. Dak. Crown-sheet failure caused by overheating due to low water; one killed, one injured.

**November 7, 1945, locomotive 18, Jamestown, N. Dak. Water glass burst, breaking glass panels in water-glass shield; one injured.

November 9, 1945, locomotive 1252, Spokane, Wash. Crosshead key broke into three pieces, piston rod separated from the crosshead, and piston rod and piston were blown from the cylinder, knocking out front cylinder head; one injured.

**November 21, 1945, locomotive 1763, between Hatton and Connell, Wash. Grates were difficult to operate; one injured.

December 11, 1945, locomotive 2234, Livingston, Mont. Blow-off cock stuck open; one injured.

February 24, 1946, locomotive 2677, Perham, Minn. Flue failed at safe end weld; one injured.

**March 5, 1946, locomotive 2604, Austin, Mont. Ashpan was stuck in closed position, causing ashpan operating mechanism to be hard to operate; one injured.

**March 11, 1946, locomotive 2653, Kamm, Mont. Water glass broke; one injured.

Fifteen accidents; 1 killed, 15 injured.

OGDEN UNION RAILWAY AND DEPOT COMPANY:

*October 29, 1945, locomotive (S. P.) 2922, Ogden, Utah. Oil on step at end of tender tank caused employee to slip and fall; oil on top of tender fuel tank and on other parts of the locomotive; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

*July 8, 1945, locomotive 4256, Cadiz Junction, Ohio. Squirt hose union stud broke through threads in check box, due to old defect; one injured.

**August 2, 1945, locomotive 3679, Columbus, Ohio. Main side rod broke through the tongue of the knuckle joint section at the back end of the rod; old fractures extended through the entire lower cross-sectional area and through approximately 18 percent of the upper cross-sectional area of the tongue; adjust wedges, engine too low on boxes, and engine pounding had been reported repeatedly since July 1; one injured.

**August 3, 1945, locomotive 5400, Columbus, Ohio. Handle of angle cock on brake pipe at rear of tender broke; one injured.

August 13, 1945, locomotive 7004, Bellevue, Pa. Injector starting lever moved violently from priming to full open position when starting valve was unseated; one injured.

August 16, 1945, locomotive 4683, Bowerston, Ohio. Eccentric rod broke through old fracture which extended through 40 percent of cross-sectional area; one injured.

August 17, 1945, locomotive 8306, Jeffersonville, Ind. Reflex water glass broke, due to being badly worn; one injured.

**August 20, 1945, locomotive 289, Brocton, N. Y. Patch on baffle plate in smokebox blew out of stack; patch was not properly applied; two sections of front end netting were loose and out of position; apparently the application of the patch was not completed before the locomotive was returned to service; one injured.

August 24, 1945, locomotive 8650, Pittsburgh, Pa. Squirt hose burst; hose had been burned; one injured.

September 2, 1945, locomotive 8170, Mingo Junction, Ohio. Steam blower valve body nut worked off, permitting the parts of valve to separate and steam to be blown into the cab; nut was battered and chisel-marked and did not have secure thread engagement on the valve body; one injured.

September 17, 1945, locomotive 292, Lewistown, Pa. One section of tender water tank manhole cover was missing; one injured.

October 8, 1945, locomotive 1732, between Dennison, Ohio, and Laurel Hill, Pa. Locomotive rode rough; defective spring rigging caused improper weight distribution on the wheels; left back trailer coil spring was reported missing on October 4 and 8, and engine riding rough and/or pounds in rods or boxes were reported on September 24, and October 4, 7, 8, and 10; one injured.

October 19, 1945, locomotive 1395, Port Washington, Ohio. Main crank pin outside lateral liner broke through two drilled grease holes, and the segments were thrown from the rapidly moving locomotive; old fracture extended through entire cross-sectional area at one of the breaks; one injured.

November 8, 1945, locomotive 6971, Conway, Pa. Stoker slide hook slipped from hole in stoker slide; stoker slide plate was badly battered and distorted, preventing the hook from properly entering the hole; one injured.

**November 9, 1945, locomotive 6556, Chicago, Ill. Pin fell out of grate rigging under the deck; one injured.

**November 11, 1945, locomotive 6942, South Fork, Pa. Combination link and reverse shaft bracket broke off the locomotive, due to the failure of radius rod, and the broken parts lodged on an adjacent track and caused derailment of two locomotives and six cars of a passenger train which was moving on that track; failure of the radius rod was due to an overheated and stuck valve, caused by lack of lubrication; the feeds of the mechanical lubricator which supplied oil to the cylinders and valves were closed with sediment; one injured.

*November 18, 1945, locomotive 3842, Conemaugh, Pa. Brake pipe became disconnected between locomotive and tender account of nipple pulling out of Barco fitting on tender due to not having been properly tightened when applied; one injured.

November 24, 1945, locomotive 4355, Wampum Junction, Pa. Flue failed circumferentially near front flue sheet, due to wall thickness being reduced to approximately $\frac{1}{2}$ inch; flue had been excessively grooved; one injured.

November 28, 1945, locomotive 4463, Pittsburgh, Pa. Throttle was hard to operate; main throttle valve had been assembled with the balancing piston ring missing; throttle was reported hard to operate on November 7, 9, 12, and 19; one injured.

**December 15, 1945, locomotive 6718, Newark, N. J. Throttle lever latch spring rod broke at threaded end near the latch and caused delay in getting the throttle closed when the driving wheels slipped, resulting in the slack running in hard and the train making an unexpected and hard stop; two injured.

December 21, 1945, locomotive 5349, near Altoona, Pa. Main crank pin failed through a fracture at fillet at hub of driving wheel which extended through approximately 85 percent of cross-sectional area; rods and boxes pounding due to loose main crown brasses and wedges; one injured.

December 29, 1945, locomotive 8808, Suffern, Ill. Metal fused from three fusible plugs in crown sheet, apparently caused by bad boiler water; "Blow down boiler, water bad" and "Automatic blow down not working" were reported approximately 10 hours previous to accident; one injured.

December 31, 1945, locomotive 3483, near Tyrone, Pa. Extension rod from main steam valve to cab turret became disconnected at the valve, due to cotter keys for securing it to the valve handwheel losing out; one injured.

January 5, 1946, locomotive 4259, Gregg, Pa. Flue failed circumferentially near front sheet due to grooving; one injured.

January 11, 1946, locomotive 2963, Glencoe, Md. Locomotive rode rough; two driving boxes were stuck, two were tight, and none of the faces were lubricated; the right Nos. 1 and 2 driving springs were not approximately level and the main frame was striking on right Nos. 1, 2, and 3 driving boxes; buffer springs between locomotive and tender had insufficient tension; locomotive was reported riding rough on January 4, 6, and 8; one injured.

January 11, 1946, locomotive 67, near Muncy, Pa. Knob was missing from door of brakeman's cab on tender; one injured.

*January 15, 1946, locomotive 6773, Pittsburgh, Pa. Right No. 2 driving wheel tire came off, due to being loose on wheel center; this tire was reported loose on January 2, and the left No. 4 driving wheel tire was reported loose 9 times since January 1; one injured.

January 20, 1946, locomotive 3419, Jersey City, N. J. Sheet between coal and water compartments of tender was deteriorated and water leaking through small holes in the sheet passed through the coal space and over the shoveling sheet and cab apron where it became ice, causing employee to slip and fall; one injured.

January 23, 1946, locomotive 4263, near Gallitzin, Pa. Superheater flue failed near back flue sheet, due to being badly cirder cut and reduced to $\frac{3}{4}$ inch in thickness at point of failure; cover missing from stoker elevator peep hole and distributor casting at top of elevator was improperly fitted to opening in boiler back head, allowing flames, cinders, et cetera to be discharged into the cab; one injured.

*January 23, 1946, locomotive 3661, Hubbard, N. Y. Driving wheel brake hanger broke; one injured.

January 24, 1946, locomotive 6981, Altoona, Pa. Section of tender cistern manhole cover was missing; one injured.

January 27, 1946, locomotive 4555, Weirton Junction, W. Va. Throttle rigging was worn; one injured.

January 27, 1946, locomotive 4359, Bowerston, Ohio. Driving spring hangers came off and the resulting debris struck and broke the train line pipe on tender, causing emergency application of the brakes; one injured.

January 28, 1946, locomotive 4495, Altoona, Pa. Flue burst; excessive openings around stoker elevator castings and elevator peep hole permitted steam to enter the cab freely; an adjacent flue failed at front flue sheet on February 7, 1946, due to being cracked and badly eroded; one injured.

February 2, 1946, locomotive 175, Avalon, Pa. Fusion-welded crack in boiler back head near the stoker elevator ruptured; one injured.

*February 4, 1946, locomotive 5346, New Waynesville, Ohio. Split key for securing engine-truck center plate swing hanger pin broke through old fracture and a portion of the broken key struck and broke the cab storm window of the second locomotive of the train; one injured.

February 5, 1946, locomotive 8624, Dennison, Ohio. Throttle worked hard; no guide provided to support throttle lever, allowing operator's weight and force to pull the throttle stem downward in the packing gland; one injured.

February 5, 1946, locomotive 8261, Taylor, Ohio. Loose grease fitting and adapter were thrown from crosshead wrist pin, striking and breaking cab storm window; engine riding rough and rods and boxes pounding had been reported numerous times in the 30 days preceding the accident; one injured.

*February 19, 1946, locomotive 4304, near Gallitzin, Pa. Employee injured while giving attention to the delivery of coal to the stoker conveyor trough; conveyor trough cover plates were not in proper position, leaving opening in trough at rear end; cover plate at front end was stuck; a section of tender shoveling sheet was missing and front cover plate was used to cover the space over the conveyor trough; cab drop curtain was too long, permitting the bottom end of curtain and bottom stiffening rod to lie on cab apron; stiffening rod, which was made of iron tubing, worked out of one side of curtain, due to the washer and cotter for securing it being missing, and turned when employee stepped on it, causing him to lose his balance and fall from the moving locomotive; one injured.

February 26, 1946, locomotive 900, Williamsport, Pa. Throttle rigging was difficult to operate; throttle rod was $\frac{5}{8}$ inches longer than standard and was bent and fouling on throttle stem packing stuffing box and on a boiler cross-brace; throttle lever fulcrum post was $4\frac{1}{2}$ inches longer than standard and was bent; throttle stem was tapered and pitted; throttle-valve lift rod was bent; throttle was leaking; lost motion in throttle rigging, due to improper adjustment and worn pin holes of throttle lift rod and bell crank lever; throttle reported on February 6, 9, 15, 16, 22, and 24; one injured.

*March 2-3, 1946, locomotives 4641 and 1175, Columbus, Ohio. Rough riding locomotives; one injured.

*March 6, 1946, locomotive 2461, Altoona, Pa. Handrail over running board gave way account of bolt missing; one injured.

*April 11, 1946, locomotive 1426, Enola, Pa. Sand did not flow freely; one injured.

April 17, 1946, locomotive 3680, Salem, Ohio. Side rod broke through old fracture which extended across the bottom flange and into the web for $2\frac{1}{8}$ inches; one injured.

*April 20, 1946, locomotive 6440, Conesville, Ohio. Grate-shaker bar came off shaker lever due to reach rod pin working out; shaker bar improper fit on lever due to fine coal packed in upper end of the shaker-bar lever opening; one injured.

April 25, 1946, locomotive 7128, Transfer, Pa. Steam leaks around stoker driving rack housing, due to leaks from stoker engine cylinder into the housing; stoker operating throttle and booster valves were leaking, due to valve seats being defective and badly steam cut; false cylinder head was loose and working, cylinder head gasket was leaking, and head was cracked for a distance of $1\frac{1}{4}$ inches; drain port in stoker rack housing was stopped up by an accumulation of hard grease and fine coal, trapping water in recess at outer end of the housing; one injured.

April 30, 1946, locomotive 4561, Donohoe, Pa. Main driving axle broke through old fracture which extended through approximately 90 percent of cross-sectional area of the journal; one injured.

April 30, 1946, locomotive 3845, Beaver Falls, Pa. Employee on station platform was struck by some object thrown from the passing locomotive; pin from right No. 2 driving brake head was missing; one injured.

*June 6, 1946, locomotive 4420, near Xenia, Ohio. Squirt hose burst; hose was badly worn and fabric deteriorated; one injured.

*June 14, 1946, locomotive 6385, Verona, Pa. Insufficient clearance between gangway handhold and tender shoveling plate when on curve; one injured.

*June 18, 1946, locomotive 7550, Sandusky, Ohio. Throttle difficult to operate; throttle reported on June 18, 19, 20 (two times), 21 (two times), 27, 28, and 30; one injured.

*June 30, 1946, locomotive 7276, Louisville, Ky. Bonnet of throttle valve to air pump screwed out of valve body when employee attempted to open the valve with a wrench; one injured.

Fifty-one accidents; 52 injured.

READING COMPANY:

September 26, 1945, locomotive 609, Roelofs, Pa. Pilot beam step bracket became disengaged and was thrown from moving locomotive, due to the two bolts that secured it having broken or worked out; one injured.

November 6, 1945, locomotive 590, Philadelphia, Pa. Employee slipped while shoveling coal into firebox; coal saver deck plate had a smooth spot, approximately 6 x 10 inches, between the fire door pedals; one injured.

Two accidents; two injured.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

*January 10, 1946, locomotive 504, Leeland, Va. Grate-shaker lever latch broke in weld; one injured.

One accident; one injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

September 8, 1945, locomotive 1216, Memphis, Tenn. Squirt hose burst; hose had been squeezed and damaged, restricting the opening in hose approximately 30 percent; one injured.

November 30, 1945, locomotive 4204, Lenexa, Kans. Crown-sheet failure caused by overheating due to low water; two injured.

January 13, 1946, locomotive 965, Memphis, Tenn. Water glass burst; one injured.

March 30, 1946, locomotive 1276, West Greene, Ala. Coupler key was forced down from the top section of tender draft gear yoke and the bottom section of the yoke was bent downward at an angle of approximately 45 degrees; coupler key had been tapered at top end fit and the pull on the tapered key forced it downward, the yoke ties were broken and the yoke spread after the key slipped out of the top fit; one injured.

Four accidents; five injured.

ST. LOUIS SOUTHWESTERN RAILWAY:

August 12, 1945, locomotive 255, Paragould, Ark. Crown sheet failure caused by overheating due to low water; one killed.

October 2, 1945, locomotive 581, near Wabbaseka, Ark. Driving spring hanger broke through progressive fractures in both portions of the reduced sections of

the hanger, permitting the spring to fall between the rails, resulting in the derailment of the second car in the train; two injured.

December 21, 1945, locomotive 764, near Weiner, Ark. Crown sheet failure caused by overheating due to low water; three injured.

Three accidents; one killed, five injured.

SEABOARD AIR LINE RAILWAY:

**July 16, 1945, locomotive 545, Richland, Ga. Squirt hose burst; one injured.

*August 15, 1945, locomotive 503, Vidalia, Ga. Guide bolt broke; one injured.

September 19, 1945, locomotive 855, Red Banks, N. C. Boiler blow-off pipe nipple became disconnected from muffler; blow-off pipe clamp was broken and threads in pipe nipple were deteriorated; two injured.

*October 6, 1945, locomotive 365, Dillon, S. C. Knuckle in front coupler was defective; one injured.

October 26, 1945, locomotive 815, Bay Lake, Fla. Reverse lever suddenly moved to full backward motion, caused by valve crosshead pin being improperly applied; reverse lever was reported very hard to handle on October 22, 23, 24, and 25; one injured.

November 2, 1945, locomotive 382, near Marshville, N. C. Throttle was difficult to operate, due to worn operating shaft bearing bushings; one injured.

November 3, 1945, locomotive 2500, near Gumberry, N. C. A 3½-inch open flue collapsed and ruptured due to being reduced in thickness by cinder cutting; three injured.

November 18, 1945, locomotive 540, Cordele, Ga. Grate-shaker bar slipped off post; fulcrum bearing of shaker lever was worn, and taper of shaker bar socket did not correspond with taper of lever; one injured.

**December 11, 1945, locomotive 252, Schofield, S. C. Reach rod to stoker became disconnected; one injured.

**December 12, 1945, locomotive 375, near Middendorf, S. C. Stoker coal crusher did not function properly due to teeth being worn; teeth on coal crusher were reported worn on December 11, 12 (before accident), 13, and 15; one injured.

**January 15, 1946, locomotive 249, Sanford, N. C. Handwheel of Precision reverse gear spun violently out of control, due to a broken pin through lower end of radius bar and gear connecting rod, and the handle on the handwheel struck employee's hand; inside jaw of upper end of gear connecting rod showed evidence of having fouled the pin through reversing yoke and upper end of inside radius bar; "Reverse lever entirely too hard to turn" was reported on January 14; one injured.

January 29, 1946, locomotive 448, Charlotte, N. C. Part of the outside edge of floor boarding over the raised portion of cab deck was broken off; one injured.

February 13, 1946, locomotive 873, Winter Haven, Fla. Reverse counter-balance spring broke into three pieces, permitting manually operated reverse lever to move unexpectedly to full forward position when unlatched; one injured.

**February 15, 1946, locomotive 837, Wildwood, Fla. Fire-door pedal was out of alinement; one injured.

**March 23, 1946, locomotive 244, Cheraw, S. C. Steam supply pipe to stoker engine became disconnected at flexible ball joint connection between locomotive and tender; one injured.

April 3, 1946, locomotive 482, Thalman, Ga. Boiler check stuck open; one injured.

April 24, 1946, locomotive 364, Wildwood, Fla. Extension handles to operate steam valves in turret ahead of cab improperly marked; handle to headlight turbo-generator valve was marked "Booster" and handle to booster valve was marked "Dynamo"; one injured.

May 9, 1946, locomotive 423, Seals, Ga. Water hose between locomotive and tender became disconnected; one injured.

Eighteen accidents; 21 injured.

SOUTHERN RAILWAY:

**July 3, 1945, locomotive 5232, Whitesburg, Tenn. Board fell out of tender coal gate; one injured.

**July 28, 1945, locomotive 4026, Copper, Va. Steam pipe to cylinder cocks parted between the high and low pressure engines where loose on worn threads and the short vertical section of the pipe came out of elbow at the lower Barco joint; one injured.

**July 30, 1945, locomotive 4879, Gretna, Va. Grates were stuck; one injured.

**August 10, 1945, locomotive 1487, Barber, N. C. Throttle valve in steam-heat line was leaking; one injured.

**August 30, 1945, locomotive 605, John Sevier, Tenn. Oil or grease on gang-way handhold; one injured.

**October 22, 1945, locomotive 1669, Charleston, S. C. Squirt hose burst; hose deteriorated; one injured.

**November 11, 1945, locomotive 5242, Knoxville, Tenn. Squirt pipe was disconnected at union at injector, permitting steam and hot water to be discharged when injector was in operation. Injectors did not supply the boiler properly, due to trash in the feed water; strainers were missing from both tank valve wells; one injured.

**November 13, 1945, locomotive 6537, Birmingham, Ala. Lid of water cooler on locomotive fell off, due to hinges being loose; one injured.

November 21, 1945, locomotive 4553, Bremen, Ga. Crown-sheet failure caused by overheating due to low water; three injured.

**December 6, 1945, locomotive 651, Pisgah Forest, N. C. Drawbar and safety bars broke, permitting locomotive to separate from tender; one injured.

December 22, 1945, locomotive 575, South Hill, Va. Injector delivery pipe connection to combined boiler check and stop valve case was leaking; attempted to tighten the spanner nut with hammer and chisel, and spanner nut slipped over the threads on the casing due to threads on the nut and casing being badly worn; one injured.

**March 12, 1946, locomotive 1690, Atlanta, Ga. Grate-shaker bar slipped from shaker lever socket, due to improper fit; taper of shaker bar did not correspond with taper of shaker lever sockets; one injured.

March 12, 1946, locomotive 4772, Villa Rica, Ga. Stoker slide hook slipped out of hole in slide; slide was binding and hard to move; one injured.

**March 18, 1946, locomotive 1452, Barton, Ala. Oil on tender deck and apron; tender deck was 3¾ inches lower than locomotive deck, or 1¼ inches in excess of the prescribed maximum difference; one injured.

**March 21, 1946, locomotive 5200, Hot Springs, N. C. Stoker conveyor trough slide hook slipped out of hole in slide due to being bent; one injured.

**March 26, 1946, locomotive 4841, Reidsville, N. C. Blower valve extension handle rod became disconnected at coupling to blower valve stem, due to cotter key which held the rod in the universal joint breaking; one injured.

April 18, 1946, locomotive 70, Kimbrough, Ala. Eccentric blade broke due to old fracture; one injured.

**May 5, 1946, locomotive 4595, Talmage, Ky. Handrail column on the side of boiler broke at eye for the handrail and, the handrail extension on which employee was standing pulled from the coupling in the column; handrail column had old fractures on both sides of the eye, indicating previous use of the handrail as a step; insufficient steps provided on the boiler shell to enable employees to reach various appurtenances on the boiler without stepping on the handrails or pipes; handrail extension entered the coupling only three threads; handrail extension was 39 inches in length, providing unusual leverage and strain on the column and coupling when extension was used as a step; one injured.

June 20, 1946, locomotive 6605, near Collbran, Ala. Crown-sheet failure caused by overheating due to low water; one injured.

Nineteen accidents; 21 injured.

SOUTHERN PACIFIC—LINES EAST:

February 18, 1946, locomotive (T. & N. O.) 818, New Orleans, La. Insufficient clearance between vertical handhold on tender and cab overhang when locomotive was moving on sharp curve; one injured.

May 19, 1946, locomotive (T. & N. O.) 960, El Paso, Tex. Nail protruding above cab floor caused employee to trip and fall to the deck; one injured.

**June 16, 1946, locomotive (T. & N. O.) 629, Valentine, Tex. Tank hose blew off at tank valve connection; heater valve to injector was partly open which permitted steam to flow into tank hose and pressure to build up in the hose when tank valve was closed; one injured.

Three accidents; three injured.

SOUTHERN PACIFIC—LINES WEST:

July 13, 1945, locomotive 2709, Burma, Oreg. Fire hose nozzle coupling blew from fire hose; expansion ring in nozzle coupling not properly applied; two injured.

July 28, 1945, locomotive 4012, Mojave, Calif. Employee tripped on wire

over rung of tender ladder and fell to the ground; wire fastened to operating lever of automatic cut-out valve on tender fuel oil tank was fastened to top of tender ladder and extended diagonally across the top rung of ladder, fouling the clearance above the rung; one injured.

September 1, 1945, locomotive 1268, Emeryville, Calif. Locomotive moved from relief point, apparently while unattended, and collided with another locomotive which was in service in the yard; one injured.

September 3, 1945, locomotive 1738, Sugarfield, Calif. Flashback occurred while attempting to light a fire in firebox; three flues were leaking in firebox which probably contributed to the accumulation of gas in the firebox; flues reported leaking on August 4, 5, 13, and 28 and September 1; one injured.

September 4, 1945, locomotive 1402, Roseville, Calif. Bell did not ring properly due to air bell ringer being inoperative and bell cord being defective; employee slipped and fell from running board while attempting repairs, due to oil on the running board; one injured.

**September 5, 1945, locomotive 3690, Hornbrook, Calif. Tender gangway handhold came loose at lower end; two bolts for securing the handhold were missing; one injured.

September 7, 1945, locomotive 5022, Palm Springs, Calif. Feed-water pump water-chamber drain cock blew off, due to defective nipple thread fit in the pump; one injured.

**September 8, 1945, locomotive 3256, Massie, Nev. Water cooler fell from bracket on front of tender, due to not being properly secured; iron band provided to secure the cooler to tender had broken and the temporary repairs made after this failure were ineffective; one injured.

September 8, 1945, locomotive 1291, Oakland, Calif. Air compressor did not operate properly; when steam valve chamber head was removed to permit examination of the parts, the compressor reversing valve blew out of valve chamber, due to leaking compressor throttle, and struck employee; one injured.

**September 12, 1945, locomotive 3809, Vaughn, N. Mex. Grates were very hard to shake; grates reported on September 3, 6, and 12 (before accident); one injured.

September 16, 1945, locomotive 4310, Bassett, Calif. Locomotive lights went out account of turbine steam pipe having broken at throttle valve located under fountain hood; employee was injured while assisting in opening the fountain hood cover which was fouled by improperly located whistle rod; one injured.

**September 17, 1945, locomotive 2846, Marana, Ariz. Locomotive failed due to insufficient steam pressure, caused by leaking flues and stays; leaks in firebox were reported on September 1, 2, 5, 14, and 15, and the crew protested the use of the locomotive prior to departure on the trip on which the accident occurred due to the leaks; one injured.

**September 28, 1945, locomotive 3504, near Deming, N. Mex. Precision reverse gear spun violently out of control when attempt was made to move it forward and the handle on the gear operating handwheel struck employee's hand and wrist; the counterbalance spring was not properly adjusted, causing the gear to bind; the air pipe to reversing cylinder was broken off at nipple, necessitating the manual operation of the reverse gear; one injured.

September 28, 1945, locomotive 5024, Maricopa, Ariz. Water column hook broke through old fracture at rivet hole where hook was riveted to handle; one injured.

September 30, 1945, locomotive 2803, San Jose, Calif. Fire-door baffle plate fouled on door frame, due to distortion caused by heat; one injured.

**October 6, 1945, locomotive 4186, Troy, Calif. Oil on top of tender and on deck at front of tender; oil reported on these parts on September 27, 29, and 30 and on October 4, 6, 7, 8, 12, and 13; one injured.

October 10, 1945, locomotive 3505, Afton, N. Mex. Prong end of clinker hook was warped and bent; one injured.

October 14, 1945, locomotive 5037, Niland, Calif. Injector was inoperative; injector overflow valve extension handle became disconnected due to broken universal connection at overflow valve stem swivel pin; one injured.

October 18, 1945, locomotive 3758, Tonka, Nev. Oil on top of tender fuel oil tank, caused by oil in tank having boiled over; one injured.

October 27, 1945, locomotive 3721, Santa Margarita, Calif. Squirt hose valve worked open; one injured.

October 28, 1945, locomotive 4108, Palm Springs, Calif. Feed water pump was inoperative; boiler check was leaking, causing pump to become overheated; one injured.

**November 13, 1945, locomotive 1205, Oakland, Calif. Fire from oil-fired firebox discharged into cab; one injured.

November 28, 1945, locomotive 2491, Sacramento, Calif. Flames entered the cab when firebox door was opened; "Adjust burner in firebox—too high and engine smokes" and "Examine front end as blower is very weak, acts as though it was disconnected" were reported on November 11 and similar items were reported following the accident; one injured.

January 7, 1946, locomotive 5038, Miriam, N. Mex. Accumulated fuel oil in firebox became ignited and caused flash-back through open fire door; stop was missing from firing valve quadrant and when valve was moved past center, which was closed position, it opened in reverse position and allowed fuel oil to accumulate in the firebox; one injured.

**January 9, 1946, locomotive 3247, Hazen, Nev. Board in cab floor turned when employee stepped on it and caused him to step backward upon the squirt hose which was lying on cab deck; floor board was loose account of cross-member or nailing strip being split; hole in deck for the squirt hose was stopped up with dirt and pieces of brick; one injured.

January 19, 1946, locomotive 3306, Livermore, Calif. Oil on top of tender feed water tank; one injured.

**February 8, 1946, locomotive 4338, Yuma, Ariz. Train steam heat operating valve was hard to open; one injured.

**March 16, 1946, locomotive 1195, Sacramento, Calif. Injector water valve was stuck in closed position; one injured.

March 25, 1946, locomotive 3508, Deming, N. Mex. Ashpan was very hard to open, due to an accumulation of ashes and other matter which obstructed the sliding hopper door; ashpans were reported hard to open on January 1, 10, 11, and 28, February 2, 6, 8, and 14, March 8, 22, 23, 25, 26, 30, and 31, and April 1, 2, and 5; one injured.

April 17, 1946, locomotive 2478, Delta, Calif. Air compressor stopped; one injured.

*May 8, 1946, locomotive 2664, Tucson, Ariz. Water car connection hose fell from handhold on rear of tender, striking employee; hose not properly secured; one injured.

May 10, 1946, locomotive 1409, Roseville, Calif. Driver brake hanger broke through crack which extended through approximately 50 percent of cross-sectional area; one injured.

May 26, 1946, locomotive 1252, Emeryville, Calif. Employee's hand was injured by a piece of wire which was attached to the handwheel of extension handle to the injector water valve; one injured.

May 30, 1946, locomotive 3682, Carlin, Nev. Employee fell from running board account of reduced width; clear width of running board was reduced to 6 inches due to booster steam pipe passing through it; one injured.

**June 1, 1946, locomotive 3502, Afton, N. Mex. Ashpan slide stuck in the grooves, then suddenly released; one injured.

June 2, 1946, locomotive 2782, Roseville, Calif. Bell ringer was inoperative; bell ringer was reported on May 30 and 31; one injured.

June 4, 1946, locomotive 5018, Tucson, Ariz. Cushion fell from brakeman's cab seat while the seat was in elevated storage position; one injured.

June 8, 1946, locomotive 4176, Colfax, Calif. Top of tender fuel oil tank and deck were covered with oil and sand; "Clean top of oil tank" was reported on May 11, 13, 17, 20, 21, and 31, and June 6, 7, and 8; one injured.

June 14, 1946, locomotive 4175, Emigrant Gap, Calif. Top of tender fuel oil tank was covered with oil and sand; "Clean oil off top of tank and monkey deck" was reported on May 22 and similar reports made on May 28 and June 8; one injured.

June 15, 1946, locomotive 2736, Polk, Calif. Blower valve worked shut; packing nut was loose on blower valve stem and locomotive was riding rough; one injured.

**June 28, 1946, locomotive 4168, Heather, Oreg. Employee fell from running board; no stop provided on end of handrail above the running board; one injured.

June 30, 1946, locomotive 1284, Sacramento, Calif. Employee slipped on deck apron which was slippery due to a combination of fuel oil and water on it; fuel oil

leaking around studs on front of the tank ran down on tender deck and drain from drinking water container fell on the deck; one injured.

Forty-two accidents; 43 injured.

SPOKANE, PORTLAND & SEATTLE RAILWAY:

**December 28, 1945, locomotive 504, Goodnoe, Wash. Steam leak at house blower valve connection; the squared upper part of the plug-type valve was so badly worn that it did not provide proper wrench engagement; one injured.

One accident; one injured.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS:

**July 24, 1945, locomotive 331, Madison, Ill. Water glass burst; one injured. One accident; one injured.

TEXAS & PACIFIC RAILWAY:

July 23, 1945, locomotive 662, near Graco, Tex. Centrifugal cold water feed pump did not operate properly, apparently caused by being steam-bound due to hot water leaking back through the boiler and line checks and into the pump and feed line; boiler check and feed water pump were reported on July 12 (two times), 16, and 23 (after accident); one injured.

June 11, 1946, locomotive 801, Ranger, Tex. Left boiler check was leaking, causing feed water pump to become steam-bound; "Left boiler check leaking" was reported on May 27 and June 9; one injured.

Two accidents; two injured.

UNION PACIFIC RAILROAD:

July 14, 1945, locomotive 2852, near Alda, Nebr. Water column steam pipe collar flange broke and steam pipe separated from coupling nut; fitting did not have sufficient inside diameter for penetration of the spelter to effect a proper bond between sleeve and steam pipe, and end of pipe was not flared at joint end of the sleeve; one injured.

**July 21, 1945, locomotive (L. A. & S. L.) 6031, Caliente, Nev. Main air reservoir exploded caused by engine oil having been fed through the open strainers of the air compressor; one injured.

**September 17, 1945, locomotive 2255, Duncan, Oreg. Filler slot in walkway on top of tender water tank projected approximately $\frac{3}{8}$ inch above the boards of walkway; one injured.

**October 14, 1945, locomotive 3932, Pocatello, Idaho. Handrail on top of cab was obstructed; one injured.

**November 8, 1945, locomotive 3931, Montpelier, Idaho. Grate-shaker bar slipped off post, due to improper fit; shaker-bar socket was burred; one injured.

December 9, 1945, locomotive 3119, Nampa, Idaho. Cast-iron cab steam heat radiator burst; metal at point of failure not of sufficient thickness due to manufacturing defect; defective pressure control valve permitted excessive pressure to build up in radiator; one injured.

**January 25, 1946, locomotive 3824, Yermo, Calif. Oil on top of tender fuel oil tank caused employee to slip and lose his balance, and his foot went into the boiler compound supply box, the cover of which was broken and a part of it missing; one injured.

**April 3, 1946, locomotive 241, Idaho Falls, Idaho. Cab awning rod and bracket were bent, fouling cab windshield and preventing windshield from opening properly; one injured.

**June 21, 1946, locomotive 7023, Los Angeles, Calif. Washout plug blew out of boiler back head; threads on end of plug were deteriorated by corrosion, and plug did not have proper thread engagement in the sheet; attempted to tighten plug while under pressure; one injured.

Nine accidents; nine injured.

VIRGINIAN RAILWAY:

**July 13, 1945, locomotive 610, Oak Hill Junction, W. Va. Headlight generator failed; one of the brush holders was loose which permitted the brush to work out of place. Employee slipped on step to generator, due to an accumulation of fine cinders on the tread, and fell to the ground; one injured.

January 13, 1946, locomotive 462, Norfolk, Va. Grate-shaker bar slipped off grate lever, due to improper fit; one injured.

**February 24, 1946, locomotive 727, Lester, W. Va. Stoker throttle valve packing nut was leaking; one injured.

March 16, 1946, locomotive 907, Abilene, Va. Engine slipping due to insufficient sand being delivered to the rails; sand-box construction was such that sand did not properly feed to the opening leading to the sand traps; one injured.

Four accidents; four injured.

WABASH RAILROAD:

**July 7, 1945, locomotive 2908, Peru, Ind. Blow-off cock discharge pipe and muffler were missing; one injured.

October 26, 1945, locomotive 2908, Huntington, Ind. Left link block pin worked inward and fouled the link bracket, stopping forward movement of the valve gear; one tapered pin for securing link block to radius rod was missing and the other was sheared off; excessive wear in all parts of valve gear on left side of the locomotive; one injured.

**November 8, 1945, locomotive 2918, Forrest, Ill. Employee injured while shaking the grates; locomotive carrying heavy fire account of not steaming properly; "Examine front end & clean out flues. Engine failed for steam" was reported on November 8 (before accident) and similar reports were made on November 9 and 12; one injured.

**December 5-6, 1945, locomotive 692, en route Hannibal, Mo. to Decatur, Ill. Firebox was very hot near fire door; clean flues, engine failing for steam, and/or engine very hot at fire door were reported on November 4, 15, 16, 17, 18, 22, 24, and 27, and December 1 (two times), 3 (two times), and 6; one injured.

**December 10, 1945, locomotive 2318, Decatur, Ill. Main throttle worked hard; one injured.

**December 21, 1945, locomotive 2155, Pontiac, Ill. Lumps of coal were frozen to the tender gangway floor; water had spilled from the top of the pipe containing the tender water level measuring rod and run down on gangway floor where it became frozen; one injured.

Six accidents; six injured.

WASHINGTON TERMINAL COMPANY:

July 30, 1945, locomotive 26, Washington, D. C. Grate-shaker rigging became disconnected, due to reach rod pin working out; split key in reach rod pin had been burned off; one injured.

One accident; one injured.

WESTERN PACIFIC RAILROAD:

August 15, 1945, locomotive 405, Arinosa, Utah. Feed water pump failed due to broken trip valve springs; cross-sectional area of the springs had been reduced about 50 percent by corrosion at the points of failure; one injured.

September 10, 1945, locomotive 328, Winnemucca, Nev. Plug in blow-off line blew out, due to badly worn threads on the plug and boss in the pipe; one injured.

November 22, 1945, locomotive 160, South Sacramento, Calif. Blow-off cock stuck open; packing nut on the emergency valve in blow-off line was leaking; handwheel on emergency valve was broken and did not have sufficient clearance to permit easy operation of the valve; one injured.

*January 27, 1946, locomotive 165, Portola, Calif. Blow down valve worked open; one injured.

Four accidents; four injured.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF LOCOMOTIVES OTHER THAN STEAM AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1946, BY ROADS

[A star (*) indicates accidents taken from records of the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission. A double star (**) indicates accidents not properly reported, as required by rule 335. Complete investigations, therefore, could not be made, inasmuch as the Bureau was not apprised of the accidents in sufficient time after they occurred to permit them to be properly investigated.]

ALTON RAILROAD:

**July 26, 1945, unit 6021, Drake, Ill. Employee was burned by an electric flash from air compressor and fan motor fuse box when he attempted to close the lid of fuse box; apparently the flash was caused by the cover of fuse box contacting a fuse plug which was not in proper position; spring latch on fuse box was too weak to hold the cover in closed position and bottom fuse clip in the box was badly burned and did not hold the fuse plug securely; one injured.

One accident; one injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

August 5, 1945, unit 137-C, Ash Fork, Ariz. Floor of Diesel engine room between traction motor blower and side wall was not sufficiently covered with safety tread to provide secure footing; one injured.

*August 27, 1945, unit 148, Houck, Ariz. Defective dead man feature made it impossible to control the air, resulting in slack action; two injured.

August 28, 1945, unit 105-B, near Dennison, Ariz. Connections at front end of engine leaked lubricating oil on engine room floor; one injured.

September 1, 1945, unit 107-A, near Navajo, Ariz. Oil on engine room floor; one injured.

*September 30, 1945, unit 139, near Cliffs, Ariz. Improperly placed engine cranking bar fell, striking employee; one injured.

**October 8, 1945, unit 2409, McCook, Ill. Glass in cab door broke; cut by flying glass; safety glass not used in cab door; one injured.

**October 13, 1945, unit 113, near Penzance, Ariz. An unused fuel oil suction filter which had been left on top of the Diesel engine or the scavenger chamber blower housing at the generator end of the engine fell off, due to vibration of the engine, and struck an employee; one injured.

*November 22, 1945, unit 143, Beal, Calif. Air cleaner vibrated loose and fell, striking employee; one injured.

January 13, 1946, unit 2203, Kansas City, Kans. Handwheels missing from top and bottom cocks to water glass for registering the amount of water in the cooling system expansion tank; one injured.

April 18, 1946, unit 140, near Argos, Calif. Oil line connection at accessory end of engine was leaking, permitting oil to accumulate on passageway and engine room floor; one injured.

Ten accidents; 11 injured.

ATLANTIC COAST LINE RAILROAD:

**February 2, 1946, unit 508, Winokur, Ga. Ring gear on driving-wheel axle broke, due to old fractures; two injured.

One accident; two injured.

BALTIMORE & OHIO RAILROAD:

June 27, 1946, unit 158, Baltimore, Md. Bolt for securing the channel iron portion of the current collecting equipment to driving-wheel box bracket was missing; one injured.

One accident; one injured.

BOSTON & MAINE RAILROAD:

**December 22, 1945, unit 4220-B, Mechanicville, N. Y. Broken piston allowed hot oil to be discharged through exhaust stack; one injured.

One accident; one injured.

CHICAGO & NORTH WESTERN RAILWAY:

*October 29, 1945, unit 5006, Evanston, Ill. Ring gear on traction motor dropped down and broke air reservoir and air and steam connections, resulting in emergency stop; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

October 15, 1945, unit 14, Elm Grove, Wis. Derailment caused by a failed traction motor armature bearing which seized the shaft and caused a pair of wheels of the Diesel-electric locomotive to slide, damaging the wheels and the track; 16 injured.

One accident; 16 injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

*August 24, 1945, unit 9056, Eldon, Iowa. Broken spark plug; one injured.

**September 15, 1945, unit 629, near Lineville, Iowa. Loss of water in engine cooling system; leaks in cooling system were reported repeatedly during the period, August 1 to September 30; one injured.

January 21, 1946, unit 95, Northfield, Minn. Fire broke out in the nose and cab of Diesel-electric unit; when frozen drain of air reservoir in the nose of the unit was thawed with a fusee, the liquid, which contained alcohol as an antifreeze,

blew out and was ignited by the fusee; no means provided to drain condensates from this reservoir outside of the unit; one injured.

Three accidents; three injured.

FLORIDA EAST COAST RAILWAY:

February 21, 1946, unit 1051, Jacksonville, Fla. Defective stack switch of steam generator; one injured.

One accident; one injured.

GREAT NORTHERN RAILWAY:

January 11, 1946, unit MC-2318, Geyser, Mont. Right No. 2 traction motor suspension bearing ran hot, due to having been fitted too tight; "Right No. 1 box runs hot" and "Repack motor suspension bearing, it runs hot" were reported approximately 6 hours prior to the accident; one injured.

One accident; one injured.

KANSAS CITY SOUTHERN RAILWAY:

February 10, 1946, unit 25, Hatfield, Ark. No. 1 engine used excessive oil and was taken off the line and No. 2 engine was stopped by overspeed trip; No. 1 engine had been reported running hot or knocking numerous times since January 28; one injured.

One accident; one injured.

LOUISVILLE & NASHVILLE RAILROAD:

*January 12, 1946, unit 453, Ashley, Ill. Oil on engine room floor; one injured.

One accident; one injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**July 11, 1945, unit 0943, Hartford, Conn. Air-brake hose uncoupled unexpectedly; coupling was badly worn; one injured.

**October 16, 1945, unit 0749, Clinton, Conn. Lubricating-oil radiator was leaking; one injured.

Two accidents; two injured.

NEW YORK, SUSQUEHANNA & WESTERN RAILROAD:

January 20, 1946, unit 1001, Passaic Junction, N. J. Connecting rod in cylinder of oil engine of passenger rail motorcar broke, resulting in holes being punched in crank case, a fuel oil supply pipe being pulled off at filter connection, and engine inspection cover being displaced which permitted flames to be blown into the car; connecting rod failed through old fracture which comprised 50 percent of cross-sectional area on bottom of the rod foot; no safety cut-out valve was provided in the fuel-oil line; two injured.

One accident; two injured.

NORTHERN PACIFIC RAILWAY:

August 28, 1945, unit 6001, Kiona, Wash. Clearance around steps in nose compartment of unit was obstructed by loose spare parts; no provision for securing the spare equipment carried in these compartments in place; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

October 27, 1945, unit 4884, Baltimore, Md. Employee came in contact with energized down pantograph; one injured.

November 27, 1945, unit 4783, Parkesburg, Pa. Derailment caused by a pinion gear on a traction motor shaft becoming loose and causing part of a quill gear case to drop and lodge in a cross-over switch; one injured.

December 16, 1945, unit 4845, Bowie, Md. Cab door worked open; one injured.

April 21, 1946, unit 4816, Daylesford, Pa. Fire in switch group compartment caused by failure of insulation on a preventive coil; one injured.

Four accidents; four injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

March 19, 1946, unit 2128, Ardmore, Okla. Leakage of exhaust gas into engine room of gas-electric motorcar through defective joints at manifold and exhaust stacks; one injured.

One accident; one injured.

SEABOARD AIR LINE RAILWAY:

April 11, 1946, unit 3008, Miami, Fla. Crank case explosion caused by a main bearing overheating due to misalignment; one injured.

April 13, 1946, unit 3010, Hagood, Va. Crank case explosion caused by overheated connecting rod and pin; "Check oil No. 2 engine as it is very dirty" was reported by Diesel attendant on April 10; one injured.

June 29, 1946, unit 4015, Wildwood, Fla. Oil on floor of B-unit; one injured. Three accidents; three injured.

SOUTHERN RAILWAY:

March 4, 1946, unit 2208, Greensboro, N. C. A piece of timber used as a push pole slipped from push pole socket and partly crushed the top step leading to front platform and left running board; employee lost his footing on the damaged step and fell to the ground; one injured.

One accident; one injured.

SOUTHERN PACIFIC—LINES WEST:

**March 13, 1946, unit 1308, Oakland, Calif. Fuel tank intake cap came off, permitting oil to splash on employee; cap had not been properly secured; one injured.

One accident; one injured.

VIRGINIAN RAILWAY:

December 15, 1945, unit 101-5, Matoaka, W. Va. Traction motor overheated and caused the insulation to break down, resulting in short circuit and ground and flash which set fire to the bearing lubrication and insulation; one injured.

One accident; one injured.

TABLE XII.—Number of steam locomotives inspected,

Parts defective, inoperative or missing, or in violation of the rules	Chicago, West Pullman & Southern	Cincinnati Union Terminal	Clinchfield	Colorado & Southern	Colorado & Wyoming	Columbus & Greenville	Conemaugh & Black Lick	Copper Range	Cuyahoga Valley	Davenport, Rock Island & North Western	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western	Denver & Salt Lake
1 Air compressors.....			3	4		2					1	7	7	2
2 Arch tubes.....											1			
3 Ashpans and mechanism														
4 Axles.....														
5 Blow-off cocks.....			1								3		1	
6 Boiler checks.....			4			2					1	3	3	
7 Boiler shell.....											2	1	4	
8 Brake equipment.....			26	16	1	6					7	19	22	
9 Cabs, cab windows, and curtains			4	4		3					2	20	12	
10 Cab aprons and decks.....				1		1					2	2	2	
11 Cab cards.....			1								2	2	1	
12 Coupling and uncoupling devices												1		
13 Crossheads, guides, pistons, and piston rods			21	2	1	12					4	25	19	1
14 Crown bolts.....											1	1		
15 Cylinders, saddles and steam chests			10	7		8					2	45	18	
16 Cylinder cocks and rigging			4	4		1					10	6	1	
17 Domes and dome caps.....						1					5	1		
18 Draft gear.....			4	3	1	5					3	1	7	
19 Draw gear.....				2						1	8	2	7	1
20 Driving boxes, shoes, wedges, pedestals, and braces			3	6	3	6					4	17	7	
21 Firebox sheets.....			1								3	6		
22 Flues.....											2	2	22	
23 Frames, tail pieces, and braces, locomotive			6	3		4						13		
24 Frames, tender.....					1									
25 Gages and gage fittings, air						1					2			
26 Gages and gage fittings, steam						1					2	1		
27 Gage cocks.....			3	1		2					1	1	1	
28 Grate shakers and fire doors													5	
29 Handholds.....			1		5						4			
30 Injectors, inoperative.....			1								3			
31 Injectors and connections			9	7		1					3	26	13	
32 Inspections and tests not made as required			49	16	3	22				1	25	92	58	1
33 Lateral motion.....			27	5		3					8	5	17	
34 Lights, cab and classification											1			
35 Lights, headlight.....											1	5		
36 Lubricators and shields			3	1							2	1	2	
37 Mud rings.....			1								3			
38 Packing nuts.....			3	8							3	2		
39 Packing, piston rod and valve stem			6	3		1						27	9	1
40 Pilots and pilot beams.....			1											
41 Plugs and studs.....						1					4	1		
42 Reversing gear.....			3	3		1					1	1	5	
43 Rods, main and side, crank pins and collars			46	7	2	24					5	25	9	2
44 Safety valves.....														
45 Sanders.....			1								4	4	7	
46 Springs and spring rigging			20	4		4					12	37	34	
47 Squirt hose.....			1									3		
48 Stay bolts.....											4	2	2	
49 Stay bolts, broken.....													3	
50 Steam pipes.....			2		1	4						2	4	
51 Steam valves.....											1	3	1	
52 Steps.....			7	5		4					2	2	2	
53 Tanks and tank valves.....			5	2		3					4	28	2	
54 Telltale holes.....														
55 Throttle and throttle rigging			1	2		11					4	13	9	
56 Trucks, engine and trailing.....			12	2		12					2	13	7	
57 Trucks, tender.....						2	11				6	6	6	
58 Valve motion.....			15	3	2	7					2	10	12	
59 Washout plugs.....											11	20	2	
60 Train-control equipment														
61 Water glasses, fittings, and shields			1		1	4					3	4	15	
62 Wheels.....			1			1					6	23	9	1
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)			5	3		3					3	5	8	
Number of defects.....			310	126	18	178					146	565	379	10
Locomotives reported.....	13	19	77	95	20	23	36	11	10	10	327	294	312	39
Locomotives inspected.....	24	21	234	218	37	65	65	11	15	48	1,157	1,155	1,100	49
Locomotives defective.....			58	21	4	27	65	33	7	1	33	109	75	1
Percentage of inspected found defective			25	10	11	42			1	2.9	9	7	7	2
Locomotives ordered out of service	12	1		2							3		3	

Aitchison, Topeka & Santa Fe.

Found defective, and ordered from service, etc.—Continued

Detroit & Mackinac	Detroit & Toledo Shore Line	Detroit Terminal	Detroit, Toledo & Ironton	Donora Southern	Duluth, Missabe & Iron Range	Duluth, South Shore & Atlantic	Elgin, Joliet & Eastern	Erie	Florida East Coast	Fort Worth & Denver City	Georgia & Florida	Georgia	Grand Trunk Western	Great Northern	Green Bay & Western	Gulf Coast Lines	Gulf, Colorado & Santa Fe	Gulf, Mobile & Ohio	Harbor Belt Line	Houston Belt & Terminal	Illinois Central	Illinois Terminal	
		2			1		1	22		1	1			6		2	6	15		1	6	1	
							4														1		2
																							3
																							4
																							5
								4		1				12		2	1				1		6
								11						9			7				1		7
								1		1				21		1	2				1		8
								3		3				13		1	23				6		9
								1		3				13		1	10				19		10
								5		4				7		1	1				2		11
														1			1				2		12
																					1		13
														7			10				3		14
								13													16		15
								26													10		16
								1															17
								6															18
								12						10							1		19
								1						3									20
								10						1							1		21
								3						2									22
								1															23
								3						4									24
								2															25
								1						3									26
								9						10									27
								1						3									28
								6						3									29
								5						2									30
								1						2									31
								6															32
								27						17									33
								105						37									34
								6						10									35
								12						24									36
								14						2									37
								2															38
								4						3									39
								9						10									40
								1						3									41
								6						3									42
								1						2									43
								3						2									44
								5						9									45
								1						2									46
								6						4									47
								2						4									48
								14						2									49
								12						3									50
								4						4									51
								2						2									52

TABLE XII.—Number of steam locomotives inspected,

found defective, and ordered from service, et cetera—Continued

Table with 12 columns for railroad regions (Montour, Chattanooga & St. Louis, etc.) and 63 rows of defect categories (Air compressors, Arch tubes, etc.), including summary rows for total defects and locomotives.

Table with 12 columns for railroad regions (Pacific Electric, Patapsco & Back Rivers, etc.) and 63 rows of defect categories, including summary rows for total defects and locomotives.

TABLE XII.—Number of steam locomotives inspected,

	Southern Pacific, lines east	Southern Pacific, lines west	Southern	Spokane International	Spokane, Portland & Seattle	Steelton & Highspire	Tennessee Central	Tennessee Coal, Iron & R. R.	Terminal R. R. Assn. of St. Louis	Texas & Pacific
1		2	65	10	2	2	6	1		1
2				4						
3		9								
4		1								
5		57	1		4		5			
6	2	47	2		2		5			
7	4	27	3		2					
8	10	102	50		8		11	14		
9		98	9		16		3	4		
10		21	5		2		3	3		
11		29			1		1			
12			2		1					
13	4	162	10		6		15			
14		18								
15	15	267	23		3		14	3		
16	6	74	2			1	1			
17	1	2	1							
18	3	36	18		1		3			
19	17				1		2			
20										
21	5	140	18		9		4		1	
22	1	35	1		2		1			
23		36	1		4					
24	2	64	18		6		13	1		1
25		13	1	2						
26	2	16	1	1	1			1		
27	2	18	2					2		
28	1	43	1				1			
29	3	33	5				1			
30	1	67	1					3	6	
31	8		2							
32	5	282	16	2	15		7	6		
33	30	701	127	4	54	3	29	9	11	3
34	2	39	10				12	2		1
35	18		5				1			
36	1	35						2		
37	24	1								
38	12	1							1	
39	1	91	6			2			1	
40	2	80	7		3		3			
41		14	3				1			
42		10	2		1					
43	2	32	3				1			
44	1	102	32		7		18	8	1	1
45	2									
46	7	75	4						1	
47	7	202	61	2	15		13	2	3	1
48	1	9								
49	2	30	1				2		1	
50		19	12		3					
51		68	7		2		1		1	
52	1	15	3							
53		89	11				15	2		
54	7	154	12		3		3	4		
55	4	26	11		3		1			
56	3	43	17		3	2		2		2
57	6	44	9	1			6			
58	7	63	7		2		5	2		
59		38	2				3			
60										
61	9	142	21	1	4	1	1	5	1	1
62	1	57	2		3		2		1	
63	2	97	11		5	1	7	5		
Number of defects										
Locomotives reported										
Locomotives inspected										
Locomotives defective										
Percentage of inspected found defective										
Locomotives ordered out of service										

found defective, and ordered from service, et cetera—Continued

	Toledo, Peoria & Western	Toledo Terminal	Toronto, Hamilton & Buffalo	Union Pacific	Union	Utah	Virginian	Wabash	Washington Terminal	Western Maryland	Western Pacific	Wheeling & Lake Erie	Roads with less than 10, and industrial locomotives	Total defects
				28	2		7	3	1		5	1	40	1,044
				1				1			1		1	27
				8	1			1					11	388
			1	16	3		2	1			2		19	526
				15			2	1					15	462
				55	2		26	13	3		3	1	210	2,992
				33			5	12				2	79	1,501
				19	1		1				2		36	469
				4									16	120
				1								1	12	46
				53	4		10	7	2				73	1,941
				6									1	88
				45			7	7	2		5	3	98	2,217
				19			2	6	1		1		38	679
				2									3	164
				14			1	2			2	1	93	536
				7			4	2	2		1		32	462
				35	1		4	11			7		44	1,922
				4	5								25	333
				1									17	253
				29			2	10			7		42	1,003
				2									7	88
				5	2		5				1		11	185
				14	2		2	1	1				14	370
				16			8	3			4		42	495
				19			3	2					21	555
				15	6		2	3			6	1	66	540
				1	1			1					4	50
				71	1		10	7			17	1	109	2,750
				52	11		52	60	7		51	22	353	8,885
				10	4		7	9			1		30	862
				2			3				4		4	161
				1			2	1					14	168
				10			1	2			3		5	351
				5							2		13	238
				18	1		6	1			10	3	48	691
				14	1		3	2			1		66	776
				2	1		1						14	153
				1			9						6	262
				9	1		3	2	1		5	3	12	482
				28	3		8	32	2		3	5	198	2,581
				2			1						7	72
				13				4	2				31	784
				102	1		36	43			20	4	190	5,195
				1									7	120
				10							3		14	360
				8				23					102	268
				4			1	2			2		14	551
				24	1		9	1					1	203
				52				4					99	914
				1							1		61	1,570
				24	2		2	1			3	6	15	60
				11			13	4			6	1	40	1,261
				23			15	4	1		9		98	1,101
				22			6	10			6		60	1,080
				25				13			4	6	22	740
				28	8		6		2				82	1,190
				8	1		1	6			11	2	79	840
				45	1			7			2	1	20	1,332
				1,297	69		285	329	28		234	70	2,943	56,541
	16	20	12	1,507	113	13	114	363	21	202	176	150	1,613	41,851
	10	35	5	4,053	86	21	256	1,005	52	575	462	305	2,411	101,869
		5	1	297	11		53	76	7		51	23	440	11,337
		14	20	7	13		21	8	13		11	8	18	11
				5	1		1						68	690