

INTERSTATE COMMERCE COMMISSION

TWENTY-NINTH ANNUAL REPORT

OF THE

DIRECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED

JUNE 30, 1940



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1940

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

OCTOBER 1, 1940.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Twenty-ninth Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1940, 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 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.

In addition to the accidents shown in the tables and otherwise referred to in this report two accidents resulting in injuries to four employees were reported to the Bureau, by widely separated railroads, which were caused by explosions of torpedoes carried in metal containers attached to the backboards inside of the locomotive cabs. These accidents and two other explosions from the same cause on one of the railroads involved, in which no injuries occurred, do not come within the scope of the locomotive inspection law but are mentioned here to emphasize the necessity of smooth surface containers and keeping them thoroughly clean and having the explosives properly

placed therein and packaged in such a manner that the contents will not leak out. Deterioration of the explosive material due to exposure accompanied by the excessive heat that is often present in cabs creates a condition such that ignition is liable to take place by friction due to vibration of the locomotive while in motion. Explosions of this character jeopardize the safety of employees in the cab and indirectly other employees and travelers upon railroads and the general public. All practicable precautions should be taken to reduce the hazard to the minimum.

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

	Year ended June 30—					
	1940	1939	1938	1937	1936	1935
Number of locomotives for which reports were filed.....	44,274	45,965	47,397	48,025	49,322	51,283
Number inspected.....	102,164	105,606	105,186	100,033	97,329	94,151
Number found defective.....	8,565	9,099	11,050	12,402	11,526	11,071
Percentage inspected found defective.....	8	9	11	12	12	12
Number ordered out of service.....	487	468	679	934	852	921
Number of defects found.....	32,677	33,490	42,214	49,746	47,453	44,491

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

	Year ended June 30—					
	1940	1939	1938	1937	1936	1935
Number of accidents.....	164	152	208	263	209	201
Percent increase or decrease from previous year.....	17.9	26.9	20.9	125.8	14.0	14.7
Number of persons killed.....	18	15	7	25	16	29
Percent increase or decrease from previous year.....	120.0	114.3	72.0	152.2	44.8	1314.3
Number of persons injured.....	225	164	216	283	215	267
Percent increase or decrease from previous year.....	137.2	24.1	23.7	131.6	19.5	119.7

¹Increase.

TABLE III.—*Accidents and casualties caused by failure of some part or appurtenance of the steam locomotive boiler¹*

	Year ended June 30—							
	1940	1939	1938	1937	1936	1935	1915	1912
Number of accidents.....	67	52	59	63	75	68	424	856
Number of persons killed.....	16	15	5	19	10	24	13	91
Number of persons injured.....	110	55	59	73	80	119	467	1,005

¹The original act applied only to the locomotive boiler.

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

	Year ended June 30—									
	1940		1939		1938		1937		1936	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	5	70	4	46	3	70	8	106	4	75
Firemen.....	6	49	6	66	2	80	5	78	6	72
Brakemen.....	4	24	2	18		31	3	30	3	28
Conductors.....	1	4		5		6	1	18		13
Switchmen.....		4		6		7		10		2
Roundhouse and shop employees:										
Boilermakers.....	1	3	1	1		2	2	2		
Machinists.....		3		2			2			4
Foremen.....						1				3
Inspectors.....						1				2
Watchmen.....		1		1	2		1	1	1	1
Boiler washers.....						1				
Hostlers.....		2		1		6		9		3
Other roundhouse and shop employees.....		1		2		1		3		3
Other employees.....	1	20	2	2		3	1	14		5
Nonemployees.....	44		2	14		7	4	10	2	4
Total.....	18	225	15	164	7	216	25	283	16	215

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

	Year ended June 30—					
	1940	1939	1938	1937	1936	1935
Number of locomotive units for which reports were filed.....	2,987	2,716	2,555	2,416	2,361	1,911
Number inspected.....	4,974	4,581	4,024	3,615	3,118	1,620
Number found defective.....	298	260	274	328	252	146
Percentage inspected found defective.....	6	6	7	9	8	9
Number ordered out of service.....	16	14	9	24	11	5
Total number of defects found.....	766	696	769	991	674	449

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

	Year ended June 30—				
	1940	1939	1938	1937	1936
Number of accidents.....	7	5	4	12	9
Number of persons killed.....					
Number of persons injured.....	7	5	4	14	9

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

	Year ended June 30—									
	1940		1939		1938		1937		1936	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		2		3		3		7		7
Firemen.....		2		1				2		1
Brakemen.....				1				2		
Conductors.....	1					1				
Switchmen.....	1									
Roundhouse and shop employees:										
Inspectors.....										
Other roundhouse and shop employees.....		1								1
Other employees.....							3			
Nonemployees.....										
Total.....	7		5		4		14			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—														
	1940			1939			1938			1937			1936		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs.....	1			1			1	3		3			3	1	
Aprons.....															
Arch tubes.....															
Ashpan blowers.....															
Axles.....	5			5			6	2		5	2		2	4	
Blow-off cocks.....	2			2			3	5		5	1		1	3	
Boiler checks.....															
Boiler explosions:															
A. Shell explosions.....										1	4		2		
B. Crown sheet; low water; no contributory causes found.....	7	12	13	4	5	7	5	5	3	5	9	2	6	8	5
C. Crown sheet; low water; contributory causes or defects found.....	1		2	2	7	4				3	4	6	2		3
D. Miscellaneous firebox failures.....										1		3	1		2
Brakes and brake rigging.....	1		1	5		5	6		7	14		17	13		13
Couplers.....	10		12	1		1	4		1	4		10	11		8
Crank pins, collars, etc.....	6	2	5	1		1	5		1	4		3	2		1
Crossheads and guides.....	2		2	2		2	2		2	2		2	2		1
Cylinder cocks and rigging.....	2		2												
Cylinder heads and steam chests.....	1		1												
Dome caps.....															
Draft appliances.....	1		33	2		1	1		1	1		1			
Draw gear.....							1		1	4		4	4		1
Fire doors, levers, etc.....	2		2	2		2	4		4	4		4	5		7
Flues.....	9		11	8		9	3		3	3		4	4		1
Flue pockets.....															
Footboards.....	1		1	3		3	6		7	2		2	3		1
Gage cocks.....															
Grease cups.....	2		2	1		1			1			1	1		1
Grate shakers.....	1		1	5		5	7		7	10		10	8		7
Handholds.....	8		8	8		8	7		7	10		10	8		8
Headlights and brackets.....	3		3	1		1	1		1	5		5	3		3

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

Part or appurtenance which caused accident	Year ended June 30—														
	1940			1939			1938			1937			1936		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Injectors and connections (not including injector steam pipes).....	6		6	2		2	2		2	2		2	5		4
Injector steam pipes.....	1		1							3		3	4		2
Lubricators and connections.....	2		2	1		1				3		3	4		4
Lubricator glasses.....	1		1												
Patch bolts.....															
Pistons and piston rods.....	1		1	2		2	3		3	3		3	3		1
Plugs, arch tube and washout.....							1		1	1		1	2		1
Plugs in firebox sheets.....															
Reversing gear.....	12		12	13		13	12		12	34		33	19		19
Rivets.....															
Rods, main and side.....	1		1	4		4	5		5	5		5	4		1
Safety valves.....															
Sanders.....	4		4	3		3	9		9	6		6	2		2
Side bearings.....															
Springs and spring rigging.....	2		2	4		4	4		4	4		4	12		6
Squirt hose.....	3		3	6		6	7		7	5		5	4		4
Stay bolts.....	3		3	4		4	2		2	1		1	1		1
Steam piping and blowers.....	7	1	8	6	1	7	6	7	13	7	6	13	10	7	17
Steam valves.....	2		2	2		2	1		1	4		4	4		3
Studs.....	1		1										1		1
Superheater tubes.....	3		3	4		4	1		1	1		1	1		1
Throttle glands.....															
Throttle leaking.....							1		1	1		1	1		1
Throttle rigging.....							1		1	2		2	5		5
Trucks, leading, trailing, or tender.....	2		2	2		2	5		5	5		5	6		6
Valve gear, eccentrics and rods.....	1		1	4		4	4		4	5		5	5		5
Water glasses.....	6		6	3		3	8		8	5		5	6		17
Water-glass fittings.....															
Wheels.....	1		1							3		3	2		2
Miscellaneous.....	40	1	40	35		35	66		68	65	1	65	16	46	45
Total.....	164	18	225	152	15	164	208	7	216	263	25	283	209	16	215

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—														
	1940			1939			1938			1937			1936		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Carburetors.....															
Couplers.....										1		1	3		1
Crank pins and connecting rods.....										1		1	1		1
Fires: due to overflowing or leakage of fuel, or back firing.....	2		2	1		1				1		1	4		4
Generators.....															
Insulation.....	2		2												
Pantographs and trolleys.....															
Short circuits.....	1		1												
Miscellaneous.....	2		2	3		3	4		4	4		4	3		4
Total.....	7		7	5		5	4		4	12		14	9		9

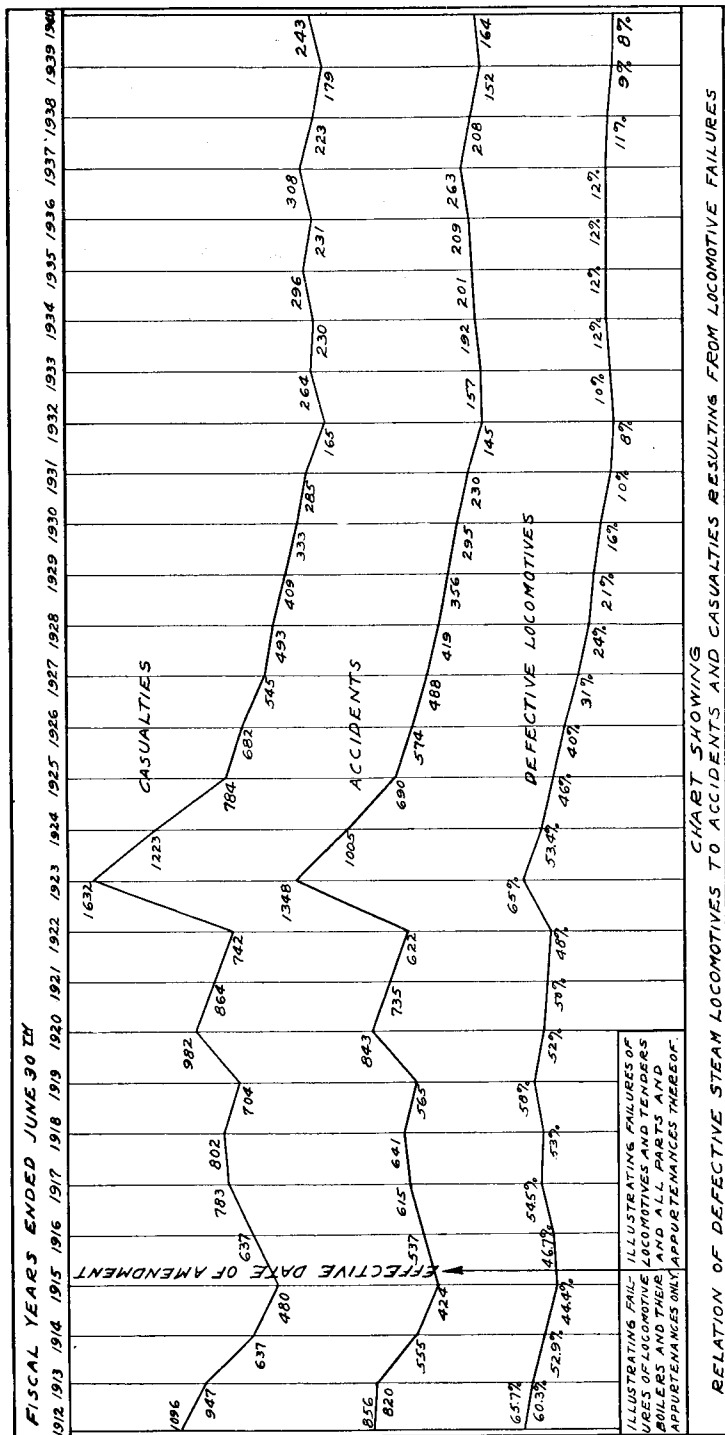


TABLE X.—Number of steam locomotives reported, inspected, found defective, and ordered from service

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30 —					
	1940	1939	1938	1937	1936	1935
1. Air compressors	567	518	689	765	740	733
2. Arch tubes	20	28	66	105	74	74
3. Ashpans and mechanism	37	67	72	80	79	94
4. Axles	3	2	13	10	13	10
5. Blow-off cocks	191	204	226	199	236	283
6. Boiler checks	288	279	301	382	356	413
7. Boiler shell	266	272	331	347	383	396
8. Brake equipment	1,506	1,577	2,044	2,322	2,480	2,449
9. Cabs, cab windows, and curtains	1,078	943	1,226	1,807	1,638	1,273
10. Cab aprons and decks	277	260	326	466	450	368
11. Cab cards	101	92	109	145	166	142
12. Coupling and uncoupling devices	53	60	73	74	65	73
13. Crossheads, guides, pistons, and piston rods	815	739	905	1,160	1,056	1,086
14. Crown bolts	54	47	59	76	63	75
15. Cylinders, saddles, and steam chests	1,320	1,232	1,645	2,206	1,717	1,547
16. Cylinder cocks and rigging	447	418	585	729	605	627
17. Domes and dome caps	78	90	109	101	114	94
18. Draft gear	508	450	740	522	513	423
19. Draw gear	306	360	479	590	451	414
20. Driving boxes, shoes, wedges, pedestals, and braces	1,243	1,330	1,688	1,637	1,712	1,573
21. Firebox sheets	191	238	244	371	295	343
22. Flues	117	165	159	225	178	173
23. Frames, tail pieces, and braces, locomotive	665	708	1,001	1,053	997	1,006
24. Frames, tender	78	71	131	129	113	124
25. Gages and gage fittings, air	132	155	230	261	257	275
26. Gages and gage fittings, steam	211	226	279	324	350	320
27. Gage cocks	400	361	451	538	579	480
28. Grate shakers and fire doors	273	252	403	470	400	394
29. Handholds	333	349	405	510	502	464
30. Injectors, inoperative	30	26	26	38	40	39
31. Injectors and connections	1,330	1,457	1,784	2,020	2,085	2,035
32. Inspections and tests not made as required	6,218	6,645	8,204	9,638	9,005	8,344
33. Lateral motion	313	243	325	446	404	389
34. Lights, cab and classification	49	50	48	90	78	81
35. Lights, headlight	180	177	257	313	251	257
36. Lubricators and shields	185	200	212	254	255	191
37. Mud rings	213	248	203	272	237	241
38. Packing nuts	418	408	448	487	508	527
39. Packing, piston rod and valve stem	660	739	913	1,393	1,133	906
40. Pilots and pilot beams	140	104	154	133	178	152
41. Plugs and studs	156	179	238	238	236	167
42. Reversing gear	320	317	404	492	463	414
43. Rods, main and side, crank pins, and collars	1,199	1,293	1,669	2,348	2,093	1,826
44. Safety valves	61	97	125	132	125	100
45. Sanders	415	432	536	655	678	779
46. Springs and spring rigging	2,174	2,340	2,901	3,172	3,008	2,765
47. Squirt hose	50	75	94	133	134	113
48. Stay bolts	227	181	211	276	279	240
49. Stay bolts, broken	271	258	380	542	520	512
50. Steam pipes	255	285	410	446	526	463
51. Steam valves	106	115	141	165	227	212
52. Steps	449	490	631	678	615	640
53. Tanks and tank valves	768	837	955	1,009	877	913
54. Telltale holes	95	58	67	79	127	102
55. Throttle and throttle rigging	647	638	685	909	760	733
56. Trucks, engine and trailing	598	628	762	785	861	811
57. Trucks, tender	705	665	907	1,018	1,109	1,120
58. Valve motion	506	554	722	798	824	799
59. Washout plugs	478	487	626	598	714	679
60. Train-control equipment	2	5	11	12	6	4
61. Water glasses, fittings, and shields	753	690	915	1,049	1,118	951
62. Wheels	554	466	577	803	790	697
63. Miscellaneous—Signal appliances, badge plates, brakes (hand)	564	610	684	759	608	563
Total number of defects	32,677	33,490	42,214	49,746	47,453	44,491
Locomotives reported	44,274	45,965	47,307	48,025	49,322	51,283
Locomotives inspected	102,164	105,606	105,186	100,033	97,329	94,151
Locomotives defective	8,565	9,099	11,050	12,402	11,526	11,071
Percentage of inspected found defective	8	9	11	12	12	12
Locomotives ordered out of service	487	468	679	934	852	921

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—					
	1940	1939	1938	1937	1936	1935
Air compressors.....	8	14	6	6	2	5
Axles, truck and driving.....	1	1	5	4	6	1
Batteries.....	10	6	1	4	5	7
Boilers.....	50	50	6	5	5	3
Brake equipment.....	22	36	74	97	66	46
Cabs and cab windows.....	13	18	25	51	30	33
Cab cards.....	17	13	11	25	10	6
Cab floors, aprons, and deck plates.....	16	13	8	17	10	6
Controllers, relays, circuit breakers, magnet valves, and switch groups.....	6	4	7	8	3	3
Coupling and uncoupling devices.....	1	5	4	3	16	3
Current-collecting apparatus.....	31	17	8	28	24	21
Draft gear.....	2	4	3	1	1	1
Draw gear.....	29	52	16	14	5	5
Driving boxes, shoes, and wedges.....	12	9	37	5	15	4
Frames or frame braces.....	51	35	47	152	44	15
Fuel system.....	1	6	11	1	6	4
Gages or fittings, air.....	2	2	2	2	2	2
Gages or fittings, steam.....	1	2	2	2	8	3
Gears and pinions.....	6	8	13	11	8	3
Handholds.....	207	185	204	237	186	124
Inspections or tests not made as required.....	2	4	13	13	20	15
Insulation and safety devices.....	35	32	26	50	23	4
Internal-combustion engine defects, parts and appliances.....	7	6	1	2	1	1
Jack shafts.....	5	1	1	2	2	1
Jumpers and cable connectors.....	1	3	2	5	6	1
Lateral motion, wheels.....	3	4	4	11	4	2
Lights, cab and classification.....	4	2	2	1	2	2
Lights, headlight.....	12	19	18	10	14	5
Meters, volt and ampere.....	10	6	1	7	6	5
Motors and generators.....	4	7	6	3	2	10
Pilots and pilot beams.....	2	2	2	23	2	21
Plugs and studs.....	34	28	37	52	25	20
Quills.....	2	2	2	3	2	2
Rods, main, side, and drive shafts.....	34	28	37	52	25	21
Sanders.....	50	16	43	36	29	20
Springs and spring rigging, driving and truck.....	4	18	5	1	2	2
Steam pipes.....	22	5	23	13	2	2
Steps, footboards, etc.....	3	1	7	2	2	1
Switches, hand-operated, and fuses.....	1	1	3	4	4	1
Transformers, resistors, and rheostats.....	43	33	40	41	42	46
Trucks.....	1	1	3	1	4	6
Water tanks.....	1	1	3	2	1	1
Water glasses, fittings, and shields.....	22	16	11	21	26	6
Warning signal appliances.....	15	10	7	20	39	25
Wheels.....	15	10	7	20	39	25
Miscellaneous.....	766	696	769	991	674	449
Total number of defects.....	766	696	769	991	674	449
Locomotive units reported.....	2,987	2,716	2,555	2,416	2,361	1,911
Locomotive units inspected.....	4,974	4,581	4,024	3,615	3,118	1,620
Locomotive units defective.....	298	260	274	328	252	146
Percentage inspected found defective.....	6	6	7	9	8	9
Locomotive units ordered out of service.....	16	14	9	24	11	5

STEAM LOCOMOTIVES

One hundred and sixty-four accidents occurred in connection with steam locomotives, resulting in 18 deaths and 225 injuries. This represents an increase of 12 accidents, an increase of 3 in the number of persons killed, and an increase of 61 in the number of persons injured, compared with the previous year.

The chart on page 6 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. 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 8 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 a reduction of 1 percent compared with the results obtained in the previous year. There was an increase of 19 in the number of locomotives ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe.

Detailed results of our inspections of steam locomotives of each railroad are shown in table XII, and a comparison of the condition of locomotives of each railroad over a period of years is shown in table XIII.

EXPLOSIONS AND OTHER BOILER ACCIDENTS

All of the 8 explosions that occurred in the fiscal year, in which 12 persons were killed and 15 injured, were caused by overheating of the crown sheets due to low water.

Five of the explosions were particularly violent; in one of these accidents, which caused the death of three employees, the boiler was torn from the running gear and hurled forward; the smoke-box end of the boiler struck the track 286 feet ahead of the point of explosion, the boiler bounded ahead 60 feet and landed on the track on its back head, then bounded forward 115 feet and rolled forward 34 feet, and came to rest 495 feet from the point of the explosion. In another accident, in which two employees were killed and four employees and four passengers were injured, the force of the explosion lifted the boiler from the running gear, after which it fell back on the running gear and was carried about 500 feet from the point of explosion, where

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 our 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 running gear overturned. Two employees were killed and one employee was injured in another explosion in which the boiler was torn from the running gear and hurled forward 265 feet, where it struck on the front end, then bounded 75 feet forward and came to rest 340 feet from the point of explosion. Two employees were killed and one employee was fatally injured in an accident in which the boiler was torn from the running gear and alighted 125 feet forward and then bounded forward and alighted and came to rest 237 feet ahead of the point of explosion. In another instance, in which two employees were killed, the boiler was torn from the running gear and first struck the ground on its back head 104 feet forward from the point of explosion, then bounded 296 feet further, again struck on the back head and bounded and struck on the smoke-box end 122 feet forward and again bounded and struck on the back head 30 feet further, where it fell across the rails and was struck by the moving running gear and moved ahead and to the south of the track, 668 feet from the point of explosion. The running gear and train continued onward and came to a stop 1,133 feet from the point of explosion with the engine truck wheels derailed.

The explosions in the three remaining accidents were less violent than those described in the foregoing. In one of these accidents, in which two employees were injured, the crown sheet and parts of the door and side sheets were blown down, but the boiler did not leave the frame. Difficulty had been experienced in supplying the boiler with water over a distance of approximately 30 miles, and the steam pressure was down to between 80 and 100 pounds at the time of the explosion. Investigation disclosed that defects in connection with the injectors had been reported nine times in the 2 months next previous to the date of accident, the left boiler check was found to be leaking, the stem was broken off the blow-back check valve in the feed line to left injector, the common outlet used from the tender tank to the feed pipes of right and left injectors resulted in the breaking and blowing back of either injector when the other injector was shut off or broken, the telltale or alarm pipe of the left injector was flattened and closed making it difficult to determine whether the left injector was operating or blowing steam back into the tender tank, and the water in the tank was found to have been heated to a higher temperature than the injectors would handle. In another accident, in which one employee was killed and one employee injured, the crown sheet pulled from 72 stays and pocketed $5\frac{7}{8}$ inches; in another instance, in which two employees were injured, the crown sheet pulled from 32 stays and pocketed $2\frac{7}{8}$ inches.

Boiler and appurtenance accidents other than explosions resulted in the death of 4 persons and injuries to 95 persons.

EXTENSION OF TIME FOR REMOVAL OF FLUES

One thousand one hundred and twenty-seven applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 85 of these cases the condition of the locomotives was such that extensions could not properly be granted. Thirty-five were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Forty-seven extensions were granted after defects disclosed by our investigations were required to be repaired. Twenty-seven applications were canceled for various reasons. Nine hundred and thirty-three applications were granted for the full periods requested.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

There was an increase of 2 in the number of accidents occurring in connection with locomotives other than steam and an increase of 2 in the number of persons injured as compared with the previous year. No deaths occurred in either year.

During the year 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 percentage is the same as in the previous year. There was an increase of 2 in the number of locomotives ordered withheld from service by our inspectors, because of the presence of defects that rendered the locomotives immediately unsafe.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 187 specification cards and 4,449 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, 335 specifications and 103 alteration reports were filed for locomotive units and 87 specifications and 35 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.

SPECIAL WORK

At the direction of the Chairman of the Commission, in response to a request from the National Resources Planning Board, a survey was made to ascertain the condition and usefulness of the locomotives reported stored serviceable by the Car Service Division of the Association of American Railroads, and what proportion of the number of locomotives reported by that source as in or awaiting shop would be repaired in the usual course of events and what proportion would be repaired only in an emergency. This work involved examination of each locomotive by our inspectors and required 652 man days.

AMENDMENT TO THE LAW

The act approved April 22, 1940, further amending the locomotive inspection law, changed the title of the Chief Inspector to Director, and the title of each of the two Assistant Chief Inspectors to Assistant Director.

APPEALS

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

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, 1940, BY ROADS

[A star (*) indicates accidents taken from records of the Bureau of Statistics of the Interstate Commerce Commission. A double star (**) indicates accidents not properly reported, as required by rules 65 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 18, 1939, locomotive 4362, Mazonia, Ill. Water crane hook slipped from water spout; hook was not company's standard; one injured.
One accident; one injured.

ALTON & SOUTHERN RAILROAD:

**March 25, 1940, locomotive 13, East St. Louis, Ill. Blow-off cock stuck open, due to valve stem having been fouled by blow-off pipe; nut on union in blow-off cock pipe worked loose, permitting this loose section of pipe to swing around and strike stem of blow-off cock valve, bending it and holding the valve open; blow-off cock pipe not properly clamped; one injured.
One accident; one injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

July 1, 1939, locomotive 2130, San Diego, Calif. Employee's clothing caught on rear end handhold, which extended beyond the supporting bracket, causing him to fall; one injured.

* July 29, 1939, locomotive 3429, Rothville, Mo. Draft hopper dropped off draft pan of oil-burning locomotive, due to the failure of the rivets and bolts securing it, and fell to the track, resulting in derailment of 4 cars of the passenger train; draft hopper was not adequately secured to the draft pan; 33 injured.

September 17, 1939, locomotive 4000, Frontenac, Kans. Fuel oil supply to burner failed, caused by intake screen on oil tank heater being obstructed by sludge; two injured.

**March 8, 1940, locomotive 4081, Ethel, Mo. Locomotive booster was inoperative from the cab; one injured.

March 11, 1940, locomotive 1246, Fresno, Calif. Burned by hot water when squirt hose valve was accidentally opened; valve located near right front corner of fireman's seat box where likely to be struck by employee's feet; one injured.

May 6, 1940, locomotive 4083, Marceline, Mo. Half section of pawl casing wearing plate flew out of left stoker elevator, striking employee; one of the cap screws which held wearing plate retaining ring was broken, permitting the ring to drop and section of wearing plate to fly out; wearing plate ring inadequately secured; one injured.

Six accidents; 39 injured.

ATLANTIC COAST LINE RAILROAD:

April 17, 1940, locomotive 1515, Burroughs, Ga. Steam pipe in front end of locomotive broke off near the flange for top joint which connects to superheater header; walls of steam pipe at point of failure varied from $\frac{3}{16}$ inch to $\frac{1}{16}$ inch in thickness; one injured.

One accident; one injured.

BALTIMORE & OHIO RAILROAD:

July 4, 1939, locomotive 4442, Baltimore, Md. Crown sheet failure caused by overheating due to low water; stem broken off blow-back check valve in feed line to left injector allowing check valve to drop out of place; left boiler check leaking; common outlet used from the tender tank to the feed pipes of right and left injectors resulted in the breaking and blowing back of either injector when the other injector was shut off or broken; left annunciator or alarm pipe flattened and closed near discharge end made it difficult to determine whether or not the

left injector was operating or blowing steam back into the tender tank; water in tank was heated to a higher temperature than the injectors would handle; two injured.

September 14, 1939, locomotive 2918, Old Portage, Ohio. Two leading locomotives broke away from locomotive 2918, resulting in emergency application of the brakes; pivoted pilot coupler pocket pin on locomotive 2918 was broken, permitting coupler to work out of line; pin was of insufficient strength for the service in which it was used; elongation of holes in pivoted coupler shank and coupler pocket and loose bushing in coupler pocket hole allowed excessive lost motion of coupler shank in coupling pocket; one injured.

January 26, 1940, locomotive 7305, Mountain Lake Park, Md. Flue broke off at defective safe end weld; overheated in welding and reduced to $\frac{1}{8}$ inch in thickness; two injured.

March 3, 1940, locomotive 7311, near Swanton, Md. Drain valve blew out of centrifugal dirt collector, causing emergency application of the brakes; drain valve engaged only two threads in fitting in dirt collector, the remaining threads in fitting being entirely wasted away; one injured.

**March 15, 1940, locomotive 3107, Foxburg, Pa. Driving wheel tire became dislocated, due to improper fit on wheel center; wheel center was out of round, the bore of the tire was tapered, eccentric to the tread, out of round, and too large for the wheel center; one injured.

**March 17, 1940, locomotive #25, Cumberland, Md. Employee was burned while attempting to close lubricator drain valve; handle of drain valve was missing, necessitating the use of a wrench to close the valve, and employee was using wrench with one hand and holding a torch in the other hand when escaping oil became ignited, setting cab curtains and interior of the cab on fire; one injured.

*May 22, 1940, locomotive 7133, Tunnelton, W. Va. Locomotive stalled due to wheels slipping; sand pipe stopped up; one injured.

Seven accidents; nine injured.

BOSTON & MAINE RAILROAD:

September 26, 1939, locomotive 4024, Mascoma, N. H. Precision type power reversing gear hand wheel spun out of control when unlocked; counterbalance spring had been adjusted and new bushing applied to valve gear prior to federal examination; one injured.

September 29, 1939, locomotive 1391, Cambridge, Mass. Reverse lever latch stuck and did not hold lever in position on quadrant; reverse lever latch bolt loose and turned in lever, preventing free movement of the latch; one injured.

November 9, 1939, locomotive 290, Boston, Mass. Sliding iron plate, used in place of a front cab window, fell from its position; plate not applied in accordance with the company's standard practice; one injured.

**January 9, 1940, locomotive (B. M.) 10, Berlin, N. H. Steam valve bonnet blew out of injector; threads on bonnet badly worn; a leak at the joint was reported about five hours before the accident; one injured.

March 26, 1940, locomotive 4006, Mascoma, N. H. Insufficient clearance between cab seat box and extension handle of feed water heater drain valve; one injured.

March 30, 1940, locomotive 1444, Forbes, Mass. Insufficient clearance between reverse lever and air pipe at front end of quadrant; one injured.

Six accidents; six injured.

BURLINGTON-ROCK ISLAND RAILROAD:

**September 3, 1939, locomotive (C. R. I. & P.) 2313, Seabrook, Tex. Left trailer wheel journal and bearing became overheated and hose used to cool the trailer box, and which was connected into the injector delivery pipe, blew off trailer-box connection, due to not being properly applied; one injured.

April 30, 1940, locomotive (F. W. & D. C.) 410, near Dobbin, Tex. Boiler jacket inside of cab was loose and excessive openings in the jacket around reverse lever bracket, main throttle bracket, and main fountain permitted asbestos lagging to sift and fly about in the cab when the locomotive was in motion; one injured.

Two accidents; two injured.

CENTRAL RAILROAD OF NEW JERSEY:

November 13, 1939, locomotive 934, Franklin Junction, Pa. Grate shaker bar slipped off lever due to improper fit; shaker bar had a long socket while

shaker lever had a short end for engaging the bar; shaker lever was worn excessively and shouldered; one injured.

One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

September 3, 1939, locomotive 2302, Crane, Va. Stoker hook became disconnected from sliding plate, causing employee to fall; hook slightly worn and bent; one injured.

September 14, 1939, locomotive 3036, Fostoria, Ohio. Hook slipped out of opening in stoker slide, causing employee to fall backward; hook openings in stoker slides too large; one injured.

*March 11, 1940, locomotive 2348, Toledo, Ohio. Handhold on locomotive fouled tender step when on curve; one injured.

**May 28, 1940, locomotive 1125, Nelsonville, Ohio. Blow-off cock discharge pipe pulled out of Barco flexible joint between blow-off cock and muffler; threads on piping and in the joint were deteriorated; one injured.

Four accidents; four injured.

CHICAGO & EASTERN ILLINOIS RAILWAY:

January 4, 1940, locomotive 1930, Whittington, Ill. Crown sheet failure caused by overheating due to low water; three killed.

One accident; three killed.

CHICAGO & NORTH WESTERN RAILWAY:

October 12, 1939, locomotive 2123, Chicago, Ill. Free end of emergency whistle rope which was attached to the back wall of cab near the roof broke while being used as an aid in getting off left cab seat, causing employee to fall to the deck; rope was deteriorated; one injured.

June 28, 1940, locomotive 1627, Rockfield, Wis. Handrail attached to bottom of headlight bracket broke off, causing employee to fall to the ground; handrail had been broken at one end for some time prior to the accident and the other end had an old fracture which extended approximately 33 percent through cross-sectional area; one injured.

Two accidents; two injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

*December 26, 1939, locomotive 5607, East Winona, Wis. Tender coal slide hook straightened out while being used, causing employee to fall backward against the firebox door; one injured.

February 8, 1940, locomotive 4956, near Diamond Bluff, Wis. Main crank pin broke through old fracture which extended through approximately 80 percent of cross-sectional area; one injured.

March 29, 1940, locomotive 6311, Liberty, Mo. Whistle bell worked loose; one injured.

April 20, 1940, locomotive 4990, Galesburg, Ill. Burned by hot water which gushed from steam heat pipe; intermediate steam heat valve leaking due to valve disc and seat being badly cut; this valve was located in cab and was not "extra heavy"; one injured.

Four accidents; four injured.

CHICAGO GREAT WESTERN RAILROAD:

September 15, 1939, locomotive 881, Valeria, Iowa. Employee was injured when he attempted to close injector delivery pipe drain valve while en route; one injured.

One accident; one injured.

CHICAGO, INDIANAPOLIS & LOUISVILLE RAILWAY:

*February 20, 1940, locomotive 227, Monon, Ind. Sand pipe not in proper alignment with the rail; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

**December 4, 1939, locomotive 230, Sturtevant, Wis. Loop handle, which had been fusion welded on arm of locking pin of retractible coupler at front end of locomotive, broke off through the welds; one weld showed complete old fracture and the other about 50 percent old fracture through the points of failure; one injured.

February 4, 1940, locomotive 1036, near New Lisbon, Wis. Crown sheet failure caused by overheating due to low water; two killed, one injured.

April 18, 1940, locomotive 712, Milwaukee, Wis. Steam gage light bulb burned out due to excessive voltage; generator governor stuck, permitting generator to run too fast; one injured.

**May 23, 1940, locomotive 566, Council Bluffs, Iowa. Bell ringer did not operate properly due to being out of adjustment; one injured.

Four accidents; two killed, four injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

July 7, 1939, locomotive 903, near Fruitland, Kans. Reverse lever jerked from employee's control and moved rapidly to extreme forward position; various pins and bushings of valve gear were worn; one injured.

October 17, 1939, locomotive 1994, Howe, Okla. Employee was burned when squirt pipe drain valve was accidentally opened; when drain valve was in closed position, the handle was so located that it was likely to be moved by the engine-men in the performance of their regular duties; valve was easily opened due to valve stem packing not being properly drawn up with packing nut; one injured.

December 16, 1939, locomotive 2101, Council Bluffs, Iowa. Operating lever links of left injector steam valve broke; one injured.

December 25, 1939, locomotive 841, near Choctaw, Okla. Crown sheet failure caused by overheating due to low water; two killed.

**February 1, 1940, locomotive 956, Eldon, Iowa. Employee mistook a bent washout tag on front of pilot for a step and fell heavily; jacket iron tag was bent into shape of a step and so located as to be easily mistaken for a step; one injured.

February 6, 1940, locomotive 4012, Neola, Iowa. Cross-compound air compressor would not maintain sufficient pressure to operate the brakes on a three-car train; locomotive was equipped with an additional 9½-inch compressor which was ineffective due to a stuck open discharge valve; one injured.

February 19, 1940, locomotive 2643, Herington, Kans. Improperly applied throat brace staybolt blew out of inside throat sheet when attempt was made to stop leakage at the staybolt while the boiler was under steam pressure; threads on staybolt covered with rust and scale and had appearance of never having been threaded into the sheet or sleeve of the brace; threads in staybolt hole in throat sheet were very poor and bottom inside of brace sleeve had a deposit of mud; two injured.

**April 23, 1940, locomotive 2709, Garber, Okla. Oil leaking from around stem of oil tank valve; one injured.

**June 28, 1940, locomotive 5020, Optima, Okla. Blow-off cock was leaking and when employee attempted to close blow-off cock valve with operating lever his hand was caught between the lever and booster idling valve handle; blow-off cock operating lever fulcrum casting was not properly secured to cab floor, permitting operating lever to have excessive play; one injured.

Nine accidents; two killed, nine injured.

COLUMBUS & GREENVILLE RAILWAY:

November 11, 1939, locomotive 215, Columbus, Miss. Indicator glass of lubricator oil reservoir blew out; threads worn in body of lubricator, permitting follower nut, gasket, and indicator glass to blow out; one injured.

**June 19, 1940, locomotive 55, Columbus, Miss. Air-operated bell ringer was inoperative; one injured.

Two accidents; two injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

June 19, 1940, locomotive 222, Jersey City, N. J. Vertical handhold on locomotive at gangway came in contact with the step casting supporting front end of tender deck while locomotive was on a curve; one injured.

One accident; one injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

*September 14, 1939, locomotive 781, Delta, Colo. Tender and three cars of passenger train derailed, caused by defective tender spring; back outside top section of left front tender spring was broken and two leaves in middle section of the three-section semi-elliptical spring were broken; three injured.

September 15, 1939, locomotive 3601, Gypsum, Colo. Superheater flue broke off at defective safe end weld; one injured.

April 30, 1940, locomotive 3409, near Crescent, Colo. Mechanically operated smoke stack cover became inoperative due to the operating air cylinder being insufficiently lubricated; one injured.

Three accidents; five injured.

ELGIN, JOLIET & EASTERN RAILWAY:

April 17, 1940, locomotive 120, Gary, Ind. Blow-off cock leaking at valve seat; blow-off cock had excessive lost motion due to valve yoke and operating stem being worn; one injured.

One accident; one injured.

ERIE RAILROAD:

November 24, 1939, locomotive 2945, Kennedy, N. Y. A piece of babbitt was thrown from crosshead shoe and struck a track employee; slots in face of crosshead shoe were ¼ inch deep while carrier's print provided they should be ⅜ inch deep; crosshead not properly tinned and babbitt failed to adhere to the shoe; one injured.

February 4, 1940, locomotive 3311, Wadsworth, Ohio. Main crank pin broke through old fracture damaging reversing gear which caused reverse gear wheel to spin and injure engineer's wrist; one injured.

March 31, 1940, locomotive 3324, Narrowsburg, N. Y. Piston rod nut and piston head worked off piston rod due to threads in nut being badly stripped. Nut, piston head and front cylinder head, which was knocked off, were thrown from the moving locomotive and rolled down the embankment where the piston head crashed into a dwelling and resulted in injury to an occupant; one injured.

June 14, 1940, locomotive 2937, near Youngstown, Ohio. Stoker elevator pawl shifter would not hold securely in neutral position; catch pins too short and recesses badly worn; one injured.

Four accidents; four injured.

FLORIDA EAST COAST RAILWAY:

*June 21, 1940, locomotive 812, Lake Worth, Fla. Bell cord became tangled on line; one injured.

One accident; one injured.

FORT WORTH & DENVER CITY RAILWAY:

September 7, 1939, locomotive 313, Childress, Tex. Boiler check stuck open; one injured.

One accident; one injured.

GRAND TRUNK WESTERN RAILROAD:

*November 19, 1939, locomotive 3708, Holly, Mich. Blow-off valve stuck open; one injured.

One accident; one injured.

GULF, COLORADO & SANTA FE RAILWAY:

July 20, 1939, locomotive (A. T. & S. F.) 2068, Beaumont, Tex. Air compressor oil cup bracket was loose on pump; one injured.

One accident; one injured.

ILLINOIS CENTRAL RAILROAD:

**February 16, 1940, locomotive 778, Freeport, Ill. Water glass broke; water-glass guard did not provide adequate protection to permit water-glass cocks to be closed safely; one injured.

February 26, 1940, locomotive 738, Champaign, Ill. Water glass burst, breaking glass panel in water-glass shield; bottom water-glass cock not in proper alignment permitting bottom water-glass packing nut to foul on water glass; one injured.

February 28, 1940, locomotive 3739, New Orleans, La. Insufficient clearance between cab apron and cab running board, permitting employee's foot to be caught when locomotive dropped in low place in the track; one injured.

**March 12, 1940, locomotive 3511, East St. Louis, Ill. Insufficient clearance between cab gangway handhold and corner of tender sill when on sharp curve; one injured.

**March 18, 1940, locomotive 328, Council Bluffs, Iowa. Left rear sander was stopped up; sanders reported on March 15, 16 (two times), 21, and 23; one injured.

**April 26, 1940, locomotive 3547, Clinton, Ill. Cylinder cocks inoperative from the cab; stop bolt missing from cylinder cock slide rod and slide rod badly bent; one injured.

**May 5, 1940, locomotive 1177, Chicago, Ill. Employee was burned by steam which was escaping from around the packing nut and stem of fountain valve

while attempting to operate the air compressor throttle which was difficult to open due to stem packing being dry and hard; one injured.

**May 6, 1940, locomotive 1244, Russum, Miss. Spring hanger became disconnected; bottom spring hanger pin missing; one injured.

Eight accidents; eight injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

October 15, 1939, locomotive 1104, near Aldine, Tex. Sand sifted from defective sand box on tender deck; bolt holes for securing sand box were worn $\frac{3}{8}$ inch larger than the bolts and sand box was corroded and badly worn under the brace, having a crack 4 inches long at this place; one injured.

One accident; one injured.

LOUISVILLE & NASHVILLE RAILROAD:

**July 15, 1939, locomotive 1287, Buck Lodge, Tenn. Reverse lever very hard to operate; one injured.

**August 28, 1939, locomotive 228, Rockfield, Ky. Bolt lost out of reverse lever latch handle, permitting the lever to unlatch and move forward with great force; bolt was undersize and nut on bolt not properly tightened; one injured.

December 13, 1939, locomotive 1255, near Marvel, Ala. Guide yoke broke through old fracture which extended through approximately 77 percent of cross-sectional area; one injured.

✓ January 6, 1940, locomotive 1421, near Pryse, Ky. Crown sheet failure caused by overheating due to low water; two injured.

**February 6, 1940, locomotive 1775, Coplay, Ky. Coupler knuckle at front of locomotive 1775 broke and the locomotive separated from leading locomotive, resulting in emergency application of the brakes; one injured.

**May 3, 1940, locomotive 2403, Cincinnati, Ohio. Tender deck $2\frac{3}{8}$ inches higher than deck on locomotive; one injured.

Six accidents; seven injured.

MAINE CENTRAL RAILROAD:

*November 9, 1939, locomotive (B. & M.) 3716, Burnham Junction, Maine. Ashpan levers dropped to the track; one injured.

One accident; one injured.

MARINETTE, TOMAHAWK & WESTERN RAILROAD:

**December 23, 1939, locomotive 250, Bradley, Wis. Insufficient clearance between reverse lever and a foot brace which had been applied to cab floor; one injured.

One accident; one injured.

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

January 23, 1940, locomotive 328, Manitowoc, Wis. Smokebox handhole cover not properly secured; both locking lugs on the cover for engaging in lugs in handhole casting had been broken off; one injured.

One accident; one injured.

MISSOURI & ARKANSAS RAILWAY:

*August 3, 1939, locomotive 49, Harrison, Ark. Struck switch lamp while looking for source of water leak which was found to be due to undesired opening of a valve in injector delivery pipe; one injured.

One accident; one injured.

MISSOURI PACIFIC RAILROAD:

*December 16, 1939, locomotive 6409, Almont, Ark. Main pin broke at wheel center, due to old fracture; one injured.

*March 1, 1940, locomotive 9782, St. Louis, Mo. Boiler check stuck open, due to foreign substance having lodged in it; one injured.

*March 31, 1940, locomotive 6607, Washington, Mo. Generator of locomotive lighting system did not generate current due to scale or other sediment having settled on it; one injured.

Three accidents; three injured.

NEW YORK CENTRAL SYSTEM:

July 6, 1939, locomotive 5316, Dayton, Ohio. Flue failed at defective safe end weld; excessive openings at bottom of fire door frame permitted the escaping hot water and steam to enter the cab freely; one injured.

September 4, 1939, locomotive 2777, Hudson, N. Y. Handwheel of Precision type reversing gear spun around out of control, due to end of counterbalance spring rod catching on edge of frame cross-tie casting when the locomotive was reversed; counterbalance spring rod bent, counterbalance spring case loose on waist sheet, and adjusting nut loose and backed away from rear counterbalance spring; one injured.

September 30, 1939, locomotive 6624, Rochester, N. Y. Flue failed at back flue sheet; flue overworked and reduced to paper thickness; one injured.

October 22, 1939, locomotive 2718, South Bend, Ind. Cast-iron steam pipe burst, due to insufficient thickness of one side of pipe wall; excessive openings between the stoker distributor sleeves and draft plates on boiler back head permitted fire and steam to enter the cab freely; one killed, three injured.

November 6, 1939, locomotive (B. & A.) 618, Westfield, Mass. Rear tender truck inside equalizer broke, due to old fracture, and struck the heel of a track frog, resulting in truck frame being broken and the tender truck and all cars of a passenger train being derailed; 15 injured.

February 15, 1940, locomotive 2187, Kenton, Ohio. Locomotive separated from the train due to coupler of car passing over the top of tender coupler; coil springs in friction draft gear on tender were broken, permitting excessive coupler slack; two injured.

February 22, 1940, locomotive 2847, Toledo, Ohio. Flue broke off at defective safe end weld; one injured.

**March 3, 1940, locomotive 2892, South Schenectady, N. Y. Coupler knuckle at rear of locomotive worked open and the locomotive separated from the train, resulting in emergency application of the brakes; one injured.

March 14, 1940, locomotive 7603, Columbus, Ohio. Insufficient clearance between grate shaker bar and oil can shelf; oil can shelf not company's standard; one injured.

March 23, 1940, locomotive 1872, Ritchie, Pa. Superheater flue broke off at back flue sheet due to having been excessively thinned by working in attempts to prevent leakage; two injured.

April 11, 1940, locomotive 2333, Columbus, Ohio. Blower valve difficult to operate from the cab due to valve extension rod fouling on water pump steam pipe; "Blower valve works too hard and will not shut off" was reported on April 10; one injured.

April 13, 1940, locomotive 1360, Alsen, N. Y. Knuckle of coupler at front end of locomotive broke; one injured.

**May 26, 1940, locomotive 2185, Rockton, Pa. Injector steam ram was difficult to operate; steam ram packing nut was screwed too tight, causing packing nut to grip valve stem; one injured.

Thirteen accidents; 1 killed, 31 injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

July 27, 1939, locomotive 3506, Danielson, Conn. Stoker conveyor cover slide stuck and then suddenly moved freely while attempt was being made to operate it; one injured.

December 9, 1939, locomotive 3500, Carolina, R. I. Whistle steam pipe joint in front end failed; boss in steam pipe was originally drilled off center and had been improperly repaired; "Fix steam leaks around front end. Cannot see" was reported on December 5; one injured.

January 20, 1940, locomotive 3341, Cedar Hill, Conn. Injector delivery pipe stopped up with ice; one injured.

March 27, 1940, locomotive 3004, Hyannis, Mass. Flue broke off at back flue sheet, due to having been thinned by excessive working on account of leakage; one injured.

June 26, 1940, locomotive 3331, Putnam, Conn. Feed water pump drain cock leaking due to valve being loose; "Water pump pounds too much" was reported on June 25, and "Drip cock to water pump leaking" was reported on June 26, prior to the accident; one injured.

Five accidents; five injured.

NEW YORK, ONTARIO & WESTERN RAILWAY:

March 1, 1940, locomotive 213, Providence, Pa. Water glass burst and glass panels in water-glass shield broke; shield frame was broken in two places; one injured.

One accident; one injured.

NORFOLK & WESTERN RAILWAY:

**November 7, 1939, locomotive 1206, Portsmouth, Ohio. Headlight failed, resulting in collision of a freight locomotive with a yard locomotive. Headlight failed when the freight train was about 24 miles from Portsmouth and bulb was renewed. The newly applied bulb also failed en route and the locomotive was continued in service without headlight until the collision occurred as the train entered Portsmouth Yard. Headlight was so damaged in the collision that previous condition could not be determined; headlight burned out and/or generator running too fast were reported on October 15, 16, 20, 21, 22, and 24; one injured.

One accident; one injured.

NORFOLK SOUTHERN RAILROAD:

**August 5, 1939, locomotive 538, Wilson, N. C. Step to sand box became disconnected from bracket, causing employee to fall; bolt for securing step to bracket was missing; one injured.

One accident; one injured.

NORTHERN PACIFIC RAILWAY:

**January 16, 1940, locomotive 23, Helena, Mont. Water glass burst; one injured.

**June 12, 1940, locomotive 1840, Avon, Mont. Main driving box ran hot; one injured.

Two accidents; two injured.

PENNSYLVANIA RAILROAD:

**July 10, 1939, locomotive 3838, near Port Washington, Ohio. Employee in the cab of second locomotive of double-header was struck by foreign object which came through right front cab window glass. Apparently the object was part of grease plug which broke off at end of right crosshead wrist pin on locomotive 3838, the leading locomotive; four inches of the grease plug and the nut were missing; old fracture extended through 95 percent of cross-sectional area of plug at the point of failure; one injured.

July 24, 1939, locomotive 4234, South Charleston, Ohio. Locomotive 4234 became uncoupled from the second locomotive while double-heading and was subsequently struck by the second locomotive; anticreeping device of coupler at rear of the leading locomotive was worn and defective; one injured.

July 30, 1939, locomotive 6832, Latrobe, Pa. Flue broke off at safe end weld; flue overheated and excessively rolled when safe end was applied; two injured.

**August 21, 1939, locomotive 6934, Millerstown, Pa. Pipe connecting main air reservoirs pulled out of union elbow in front of the right reservoir, causing emergency application of the brakes; threads on pipe and in elbow were stripped and pipe fit in elbow was oversize. "Main reservoir pipe leaks at front end of right main reservoir" was reported on August 9; one injured.

September 29, 1939, locomotive 7628, North Jackson, Ohio. Whistle valve did not seat properly; one injured.

October 4, 1939, locomotive 6712, Millbrook, Ohio. Precision type reversing gear hand wheel spun rapidly when latch was released and the handle on hand wheel struck employee's wrist; extension broke off valve operating arm due to use of material of doubtful quality which was weakened by machining and reduction of the diameter of the arm in the process of applying a bushing to restore wear; one injured.

October 19, 1939, locomotive 4252, Cleveland, Ohio. Boiler feed water pump was inoperative, due to reversing at half stroke; a defective gasket in feed pump between the right auxiliary valve head and valve gear cylinder permitted leakage between steam ports and reversing gear; the small end of reversing valve had little bearing in valve chamber; feed pump was reported on October 1, 2, 3, 4, 7, 10, 13, 14, 17 (two times), 18, and 19. Employee fell from the side of cab while going to give attention to the pump; one killed.

**November 5, 1939, locomotive 6623, Pittsburgh, Pa. Mechanically operated fire door failed to open wide, due to lack of lubrication; one injured.

November 15, 1939, locomotive 4249, near Oleopolis, Pa. Crown sheet failure caused by overheating due to low water; one killed, one injured.

December 21, 1939, locomotive 6854, Denholm, Pa. Side rod bushing became overheated; one injured.

**December 27, 1939, locomotive 8235, Cincinnati, Ohio. Headlight generator stopped due to governor being out of adjustment; one injured.

January 3, 1940, locomotive 2404, Youngstown, Ohio. Power reversing gear difficult to operate; reversing gear reported on December 28 and January 1 and 3; one injured.

January 6, 1940, locomotive 6586, Youngstown, Ohio. Cab sliding door stop bracket was broken, permitting door to overtravel and catch employee's finger between door handle and cab wall; old fracture extended through approximately 50 percent of cross-sectional area of bracket at point of failure; one injured.

January 18, 1940, locomotive 4569, Weirton Junction, W. Va. Flue failed at defective safe end weld; one injured.

January 22, 1940, locomotive 6994, Valparaiso, Ind. Main crank pin broke through old fracture which extended through approximately 60 percent of cross-sectional area; one injured.

February 23, 1940, locomotive 3874, near Maples, Ind. Main crank pin broke, due to old fracture which extended through approximately 70 percent of cross-sectional area; one killed.

April 22, 1940, locomotive 5476, Fort Wayne, Ind. Side member of ladder at rear of tender broke through defective weld; one injured.

April 27, 1940, locomotive 6752, Avonmore, Pa. Injured while attempting to operate uncoupling lever on tender; coupler lock lifter top clevis, pin and cotter key were missing; one injured.

**May 24, 1940, locomotive 7286, Bridgeport, Ind. Engine truck cellar dropped on track, rebounded, and broke a crossover pipe on a car in the train, causing emergency application of the brakes; one injured.

June 6, 1940, locomotive 6726, Trinway, Ohio. Ashpan blower pipe broke off through old fracture in threaded portion where it screwed into the operating valve, and the operating valve, blower hose, and nozzle were thrown from the locomotive; hangers for blower hose and nozzle were loose on ashpan wings; one injured.

*June 12, 1940, locomotive 8670, Dolton, Ill. Insufficient clearance between vertical handhold at gangway and tender sill step when on curve; one injured.

Twenty-one accidents; 3 killed, 20 injured.

PERE MARQUETTE RAILWAY:

August 15, 1939, locomotive 915, Midland, Mich. Right front cylinder head failed by blowing off the studs; one injured.

One accident; one injured.

RUTLAND RAILROAD:

March 22, 1940, locomotive 74, Burlington, Vt. Double-heading locomotives broke apart, causing emergency application of the brakes; knuckle of front coupler of second locomotive opened due to rectangular hole in coupler operating lever just above coupler being too wide, permitting link to turn out of line and assume a position that prevented the lock and lock lifter from dropping into fully closed position; one injured.

One accident; one injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

January 19, 1940, locomotive 629, Rogers, Ark. Employee fell from tender footboard; steam from steam heat line was directed toward the footboard, resulting in an accumulation of ice on footboard; one killed.

One accident; one killed.

ST. LOUIS SOUTHWESTERN RAILWAY:

July 20, 1939, locomotive 509, Pine Bluff, Ark. Water glass burst; one injured.

One accident; one injured.

SAN DIEGO & ARIZONA EASTERN RAILWAY:

June 29, 1940, locomotive 27, San Diego, Calif. Eccentric blade broke through old fracture at bolt hole in strap connection; "Right link block cheek strikes link saddle" was reported on June 25, and reversing gear was reported inoperative in back motion on June 23 and 25; one injured.

One accident; one injured.

SEABOARD AIR LINE RAILWAY:

August 31, 1939, locomotive 542, Taylorsville, Ga. Air compressor inoperative, due to broken ring in reversing valve of compressor. "Packing rings broken on reversing piston in air pump" was reported on August 30; one injured.

February 22, 1940, locomotive 419, Tallahassee, Fla. Hand wheel of Precision type reversing gear spun rapidly when the gear was being moved into reverse and handle on wheel struck employee's wrist; bolts for securing spring balance box to waist sheet brace had worked out; one injured.

March 30, 1940, locomotive 380, Hoyt, Fla. Crown sheet failure caused by overheating due to low water; two killed, one injured.

Three accidents; two killed, three injured.

SOUTHERN RAILWAY:

**August 26, 1939, locomotive 6336, near Norwood, Ky. Locomotive not steaming properly; combustion chamber filled with cinders up to and including the fourth row of flues and most of the flues below the superheater flues were stopped up; one large flue and one small flue were leaking and calking edge of flue-sheet combustion-chamber seam was leaking; three of the four bolts missing from diaphragm plate over superheater header, allowing plate to swing out of place; "Clean out flues" was reported on August 3, 6, 7, 9, 12, 24, and 26 (after accident); one injured.

*October 10, 1939, locomotive 4815, Weyburn, Va. Left intermediate driving box ran hot; one injured.

**November 17, 1939, locomotive 4026, Glenita, Va. Feed pipe from mechanical lubricator to cylinder broke off under cylinder jacket; one injured.

January 8, 1940, locomotive 447, New Bridge, N. C. Sanders inoperative; one injured.

January 16, 1940, locomotive 4824, Tye River, Va. Superheater flue failed at safe end weld; overheated in welding; one injured.

March 15, 1940, locomotive 5237, Rollins, N. C. Flue broke off at back flue sheet; flue reduced in thickness at the point of failure by corrosion; one injured.

May 17, 1940, locomotive 6594, Gadsden, Ala. Squirt hose valve leaking; one injured.

Seven accidents; seven injured.

SOUTHERN PACIFIC—LINES EAST

July 6, 1939, locomotive (T. & N. O.) 967, Millican, Tex. Broken radial stay blew out of crown sheet; stay improperly applied in crown sheet and had no holding power; one injured.

August 21, 1939, locomotive (T. & N. O.) 913, Dorso, Tex. Crank pin broke inside hub fit; old fracture extended through approximately 85 percent of cross-sectional area of pin; one killed, one injured.

January 23, 1940, locomotive (T. & N. O.) 913, Sanderson, Tex. Flames from firebox burst into cab through baffle type fire door when fuel oil line blow back valve was opened; fire door was not equipped with an extension hood or conduit through cab floor, permitting flames to have free access to cab through fire door which had damper adjusted at about a 45 degree angle; one injured.

Three accidents; one killed, three injured.

SOUTHERN PACIFIC—LINES WEST:

*November 8, 1939, locomotive 3690, Hathaway, Calif. Coupler on tender slipped under coupler of car, causing train to part and brakes to go into emergency; tender coupler below the prescribed minimum standard height; two injured.

November 29, 1939, locomotive 3691, El Paso, Tex. Gangway handhold fouled on tender deck when locomotive was backed on a sharp curve; one injured.

*January 29, 1940, locomotive 4167, Dorris, Calif. Water cooler fell from its position in cab; pin in hasp which fastened strap holding the cooler to cab wall worked out; pin badly worn; one injured.

February 10, 1940, locomotive 4356, Lordsburg, N. Mex. Studs at flange joint securing auxiliary steam pipe to superheater header broke, permitting the steam pipe to pull away from header, and the escaping steam blew back through the flues and open firebox door into the cab; studs broke off through old fractures; one injured.

*April 26, 1940, locomotive 2449, Tracy, Calif. Employee's foot was caught between an alemite fitting located on reverse lever and the deck of engine; guard for the fitting did not afford proper protection; one injured.

Five accidents; six injured.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS:

**December 28, 1939, locomotive 328, East St. Louis, Ill. Cab curtain roller rope broke; rope badly worn; one injured.

**January 3, 1940, locomotive 319, East St. Louis, Ill. Fireman's hand injured by a splinter on handle of firing shovel; one injured.

Two accidents; two injured.

TEXAS & PACIFIC RAILWAY:

September 26, 1939, locomotive 712, Preble, Tex. Crown sheet failure caused by overheating due to low water; two killed, eight injured.

November 15, 1939, locomotive 658, near Fort Worth, Tex. Water glass burst; one injured.

Two accidents; two killed, nine injured.

UNION PACIFIC RAILROAD:

September 21, 1939, locomotive 3644, Laramie, Wyo. Radial stay blew out of crown sheet while being calked under pressure; leakage of firebox stays had been repeatedly reported during the previous month and effective measures were not taken to relieve the condition; one killed, one injured.

February 25, 1940, locomotive (O. W. R. & N.) 732, Spokane, Wash. Flue broke off near safe end weld; one injured.

April 25, 1940, locomotive 2835, Hiawatha, Kans. Injector steam pipe blew off injector connection due to a defective spanner nut; improper repairs were made the day previous to the accident, and an attempt made to tighten the joint by hammering the nut while the pipe was under pressure; one injured.

Three accidents; one killed, three injured.

WESTERN PACIFIC RAILROAD:

October 15, 1939, locomotive 179, between Oroville and Stockton, Calif. Steam operated cylinder cocks could not be closed by means of the steam valve as designed and the continuous noise of escaping steam from the open cylinder cocks resulted in injury of employee's ear; one injured.

One accident; one injured.

WHEELING & LAKE ERIE RAILWAY:

*June 4, 1940, locomotive 5107, Canton, Ohio. Insufficient clearance between vertical handhold at gangway and tender deck when on curve; one injured.

One accident; one injured.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF LOCOMOTIVES OTHER THAN STEAM AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1940, BY ROADS

[A star (*) indicates accident taken from records of the Bureau of Statistics of the Interstate Commerce Commission. A double star (**) indicates accident 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.]

ATCHISON, TOPEKA & SANTA FE RAILWAY:

January 11, 1940, unit (E-M Corp.) 103, Barstow, Calif. Steam heat pipe leaking; one injured.

One accident; one injured.

NEW YORK CENTRAL SYSTEM:

**November 15, 1939, unit 505, New York, N. Y. Handwheel of locomotive hand brake fell off and struck employee's foot; lock nut washer was missing, permitting nut to unscrew; one injured.

One accident; one injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

*November 6, 1939, unit 9114, Monument Beach, Mass. Fire occurred in gas-electric unit, caused by nut in gasoline line at bottom of carburetor breaking which permitted gasoline to flow down the side of engine and sparking of switches located on the side wall of cab near the carburetor caused ignition of the gasoline fumes; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

August 4, 1939, units 4753 and 4785, Edge Moor, Del. Flash occurred at transformer tap switch on unit 4753 while examination was being made, caused by defective control circuits on both units; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

May 6, 1940, unit M-35, Leona, Kans. Priming nozzle was fractured and priming valve was open, permitting leakage of gasoline which became ignited; one injured.

One accident; one injured.

VIRGINIAN RAILWAY:

September 24, 1939, unit 31, Price, Va. Lug connecting lead from bus line to circuit breaker burned off; one injured.

**October 31, 1939, unit 26, Tralee, W. Va. Traction motor field winding burned out causing short circuit; one injured.

Two accidents; two injured.

TABLE XIII.—Summary of comparison of the percentage of steam locomotives inspected and found defective, with the number ordered out of service for the years ended June 30, on roads reporting on 10 or more locomotives

Table with columns: Road, Percentage inspected defective (1940-1923), Ordered out of service (1940-1923). Lists various railroads and their corresponding percentages and counts.

1 Atlanta, Birmingham & Atlantic prior to 1927.
2 Includes Buffalo & Susquehanna and Buffalo, Rochester & Pittsburgh, 1933-40.
3 Statistics prior to 1927 included in Baltimore & Ohio, lines east.
4 Includes Grand Trunk Western, 1925-27.
5 Includes former Hocking Valley, 1931-40.
6 Included in Canadian National, 1925-27.

TABLE XIII.—Summary of comparison of the percentage of steam locomotives inspected and found defective, with the number ordered out of service for the years ended June 30, on roads reporting on 10 or more locomotives—Continued

Table with columns: Road, Percentage inspected defective (1940-1923), Ordered out of service (1940-1923). Continuation of Table XIII from page 34.

7 Included in Atchison, Topeka & Santa Fe, 1923.
8 Includes New Orleans Great Northern, 1935-40.
9 Includes Alabama & Vicksburg, Gulf & Ship Island, Vicksburg, Shreveport & Pacific, and Yazoo & Mississippi Valley, 1927-40.
10 Includes Portland Terminal, 1932-40.
11 Includes Boston & Albany, Cleveland, Cincinnati, Chicago & St. Louis, Michigan Central, New York Central, lines west, and Peoria & Eastern, 1937-40.

TABLE XIII.—Summary of comparison of the percentage of steam locomotives inspected and found defective, with the number ordered out of service for the years ended June 30, on roads reporting on 10 or more locomotives—Continued

Road	Percentage inspected defective							Ordered out of service						
	1940	1939	1931	1929	1927	1925	1923	1940	1939	1931	1929	1927	1925	1923
Pittsburg, Shawmut & Northern	20	0	3.6	8	25	53	86	1	0	0	1	2	0	0
Quebec Central	25	37	0	100				0	0	0	0			
Reading	6	8	13	33	42	48	59	1	3	5	31	22	26	12
Richmond, Fredericksburg & Potomac	13	18	14	18	30	43	58	0	2	0	1	1	2	3
River Terminal	65	68	0	71	43	70	0	8	4	0	5	1	0	0
Rutland	4.8	10	6	6	12	44	54	1	0	0	0	1	3	1
St. Louis-San Francisco	2	2.8	3.9	14	22	49	88	0	0	1	7	12	65	346
St. Louis Southwestern	10	10	8	4.3	22	47	86	1	3	4	2	22	14	54
San Diego & Arizona Eastern	4.2	11	13	38	30	55	44	0	0	2	4	3	0	1
Savannah & Atlanta	25	5	19	80	67	73	68	4	0	0	0	0	2	3
Seaboard Air Line	3.5	2.4	9	37	56	51	55	2	1	2	24	43	33	23
South Buffalo	9	4	39	23	29	75	0	0	8	0	0	10	37	28
Southern Pacific, lines east	1.1	1.8	3.3	5	13	30	47	0	2	1	3	3	0	0
Southern Pacific, lines west	7	10	11	24	27	33	38	4	10	13	47	50	51	24
Southern Pacific of Mexico	51	87	0	30	100	100		5	4	0	2	3	1	
Southern	6	5	9	12	24	36	59	15	9	15	13	38	56	177
Spokane International	12	5	9	13	28	0	37	0	0	0	0	0	0	2
Spokane, Portland & Seattle	6	7	22	22	33	32	60	0	0	1	1	2	4	13
Steelton & Highspire	14	11	19	24	48			0	0	1	0	2		
Tennessee, Alabama & Georgia	7	9						1	0					
Tennessee Central	23	26	14	47	65	74	89	3	5	0	14	40	23	63
Tennessee Coal, Iron & Railroad	50	9	7	38	67	40	50	1	0	0	0	0	0	0
Terminal R. R. Assn. of St. Louis	15	21	32	41	44	62	76	6	1	4	0	3	1	6
Texas & Pacific	2	1.4	0	1	12	16	62	1	1	0	1	3	1	91
Texas-Mexican	29	14	27	43	50	33	50	0	1	0	0	1	0	1
Texas Pacific-Missouri Pacific of New Orleans	23	4.5	0	4	10	57	83	0	0	0	0	0	2	0
Toledo, Peoria & Western	0	6	25	65	88	87	93	0	0	2	4	7	2	4
Toledo Terminal	4.6	0	5	45	33	3	41	0	0	0	0	0	0	3
Toronto, Hamilton & Buffalo	0	20	0	0	0			0	0	0	0	0		
Union Pacific ¹²	9	10	9	17	20	30	41	16	18	2	8	17	19	26
Union	16	0	11	9	29	80	10	1	0	1	2	0	0	2
Upper Merion & Plymouth	33	26	28	60	62			4	0	0	7	8		
Utah	0	0	0	11	4	26	19	0	0	0	0	0	0	0
Virginian	38	36	17	22	57	58	75	8	3	1	0	2	5	45
Wabash	2.2	4	0	1.5	6	47	82	2	1	0	1	2	21	89
Washington Terminal	12	26	0	10	43	40	89	1	0	0	0	1	1	2
Western Maryland	2.3	2.7	13	26	42	54	76	1	0	1	3	13	22	90
Western Pacific	3.6	2.4	16	25	19	36	37	2	0	5	9	1	13	9
Wheeling & Lake Erie	12	6	8	42	55	67	74	1	1	1	7	10	20	31
Less than 10, discontinued roads, and industrial locomotives	22	23	32	40	51	56	56	90	88	275	404	734	808	625
All roads	8	9	10	21	31	46	65	487	468	688	1,490	2,539	3,637	7,075

¹² Includes Los Angeles & Salt Lake, Oregon Short Line, Oregon-Washington R. R. & Navigation, and St. Joseph & Grand Island, last 6 months 1936-1940.

NOTE.—Omitted statistics not comparable, due to consolidations, separations, changes in corporate identity, carrier not in existence in year shown, less than 10 locomotives, etc.

Fractional percentages not shown unless percent defective is less than 5, otherwise nearest whole number is given.

ILLUSTRATIONS OF LOCOMOTIVE BOILER EXPLOSIONS
OR CROWN SHEET FAILURES AND
LOCOMOTIVE DEFECTS
