

INTERSTATE COMMERCE COMMISSION

TWENTY-EIGHTH ANNUAL REPORT

OF THE

CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED

JUNE 30, 1939



UNITED STATES
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**ANNUAL REPORT OF THE CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION**

OCTOBER 1, 1939.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Twenty-eighth Annual Report of the Chief Inspector, covering the work of the Bureau during the fiscal year ended June 30, 1939, 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 law, and those reported to the Bureau of Statistics under the accident report 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 number 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 and found defective, the number for which written notices for repairs were issued in accordance with section 6 of the law, and the total 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—					
	1939	1938	1937	1936	1935	1934
Number of locomotives for which reports were filed	45,965	47,397	48,025	49,322	51,283	54,283
Number inspected	105,606	105,186	100,033	97,329	94,151	89,716
Number found defective	9,099	11,050	12,402	11,526	11,071	10,713
Percentage inspected found defective	9	11	12	12	12	12
Number ordered out of service	468	679	834	852	921	754
Number of defects found	33,490	42,214	49,746	47,453	44,491	43,271

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

	Year ended June 30—					
	1939	1938	1937	1936	1935	1934
Number of accidents.....	152	208	293	209	201	192
Percent increase or decrease from previous year.....	26.9	20.9	125.8	14.0	14.7	22.3
Number of persons killed.....	15	7	25	16	29	7
Percent increase or decrease from previous year.....	114.3	72.0	152.2	44.8	1314.3	12.5
Number of persons injured.....	164	216	283	215	267	223
Percent increase or decrease from previous year.....	24.1	23.7	131.6	19.5	119.7	12.9

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—							
	1939	1938	1937	1936	1935	1934	1915	1912
Number of accidents.....	52	59	63	75	68	63	424	856
Number of persons killed.....	15	5	19	10	24	4	13	91
Number of persons injured.....	55	59	73	80	119	77	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—									
	1939		1938		1937		1936		1935	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	4	46	3	70	8	106	4	75	7	65
Firemen.....	6	66	2	80	5	78	6	72	4	70
Brakemen.....	2	18		31	3	30	3	28	2	26
Conductors.....		5		6	1	18		13		10
Switchmen.....		6		7		10		2		3
Roundhouse and shop employees:										
Boilermakers.....	1	1		2	2	2				6
Machinists.....		2				2		4		3
Foremen.....				1				3		2
Inspectors.....				1				2		1
Watchmen.....		1		2		1		1		1
Boiler washers.....				1						
Hostlers.....		1		6		9		3		3
Other roundhouse and shop employees.....		2		1		3		3		6
Other employees.....		2		3		14		5		14
Nonemployees.....	2	14		7		4		10		22
Total.....	15	164	7	216	25	283	16	215	29	267

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

	Year ended June 30—					
	1939	1938	1937	1936	1935	1934
Number of locomotive units for which reports were filed.....	2,716	2,555	2,416	2,361	1,911	1,288
Number inspected.....	4,581	4,024	3,615	3,118	1,620	1,436
Number found defective.....	260	274	328	252	146	69
Percentage inspected found defective.....	6	7	9	8	9	5
Number ordered out of service.....	14	9	24	11	5	4
Total number of defects found.....	696	789	991	674	447	158

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

	Year ended June 30—				
	1939	1938	1937	1936	1935
Number of accidents.....	5	4	12	9	8
Number of persons killed.....					
Number of persons injured.....	5	4	14	9	8

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

	Year ended June 30—									
	1939		1938		1937		1936		1935	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		3		3		7		7		3
Firemen.....		1				2		1		1
Brakemen.....		1				2				1
Conductors.....						2				
Switchmen.....				1						
Roundhouse and shop employees:										
Inspectors.....										
Other roundhouse and shop employees.....								1		2
Other employees.....						3				1
Nonemployees.....										
Total.....		5		4		14		9		8

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—														
	1939			1938			1937			1936			1935		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs	1														
Aprons		1		3		3	3		3	1		1	1		1
Arch tubes															
Ashpan blowers	6		13	2		6	2	2	1			3		20	
Axles	2		2	5		5	2	2	4			3		3	
Blow-off cocks	3		3	5		5	2	1	3			3		3	
Boiler checks															
Boiler explosions:															
A. Shell explosions							1	4	2						
B. Crown sheet; low water; no contributory causes found	4	5	7	5	5	3	5	9	2	6	8	5	6	17	52
C. Crown sheet; low water; contributory causes or defects found	2	7	4				3	4	6	2	3	5	4	4	8
D. Miscellaneous, firebox & failures							1		3	1		2	1	3	1
Brakes and brake rigging	5		5	6		7	14		17	13		13	8	1	7
Couplers	1		1	4		4	10		11	8		11	6		6
Crank pins, collars, etc	1		1	5		1	4		7	4		4			
Crossheads and guides	2		2	2		2	3	2	2	1	2	4			
Cylinder cocks and rigging							3		3			2		2	
Cylinder heads and steam chests							2		2			2		2	
Dome caps															
Draft appliances	2	1	1				1		1			1		1	
Draw gear				1		1	1		1			1		1	
Fire doors, levers, etc.	2		2	4		4	4		4	1		1		1	
Flues	8		9	3		3	4		4	5		7		3	
Flue pockets							1		1			1		1	
Footboards	3		3	6		7	2		2	3		3		6	
Gage cocks							1		1			1		1	
Grease cups	1		1				1		1			1		1	
Grate shakers	5		5				6		6	7		7		7	
Handholds	8		8	7		7	10		10	8		8		7	
Headlights and brackets	1		1	1		1	5		5	3		3		1	
Injectors and connections (not including injector steam pipes)	2		2	2		2	5		5	4		4		2	
Injector steam pipes				2		2	3		3	4		4		6	
Lubricators and connections	1	1	1	3		3	4		4			1		1	
Lubricator glasses	1		1												
Patch bolts	2		2	3		3	3		3	1		1		2	
Pistons and piston rods				1		1	1		1			2		1	
Plugs, arch tube and washout							1		1			1		1	
Plugs in firebox sheets							2		2			2		2	
Reversing gear	13		13	12		12	34		1	33	19		19	17	17
Rivets	4		5	5		5	5		5	4		5		5	
Rods, main and side							1		1	1		1		1	
Safety valves	3		3	9		9	6		6	2		2		1	
Sanders															
Side bearings				4		4	4		4	6		6		2	
Springs and spring rigging	3		3	6		6	7		7	5		5		4	
Squirt hose	3		3	2		2	1		1	1		1		1	
Stay bolts	6	1	7	6		6	7		7	7		7		7	
Steam piping and blowers	1		1	4		4	4		4	3		3		2	
Steam valves							1		1	1		1		1	
Studs	1		1	1		1	1		1	1		1		1	
Superheater tubes	1		1	1		1	1		1	1		1		1	
Throttle glands							1		1			1		1	
Throttle leaking	1		1	2		2	5		5	1		1		1	
Throttle rigging							5		5	1		1		1	
Trucks, leading, trailing, or tender	2		2	5		5	5		5	6		6		1	
Valve gear, eccentrics and rods	4		4	4		4	5		5	5		5		5	
Water glasses	3		3	8		8	5		5	6		6		17	
Water-glass fittings	2		2				2		2	2		2		2	
Wheels	1		1				3		3	2		2		4	
Miscellaneous	35		35	66		66	65		65	46		46		47	
Total	152	15	164	208	7	216	263	25	283	209	16	215	201	29	267

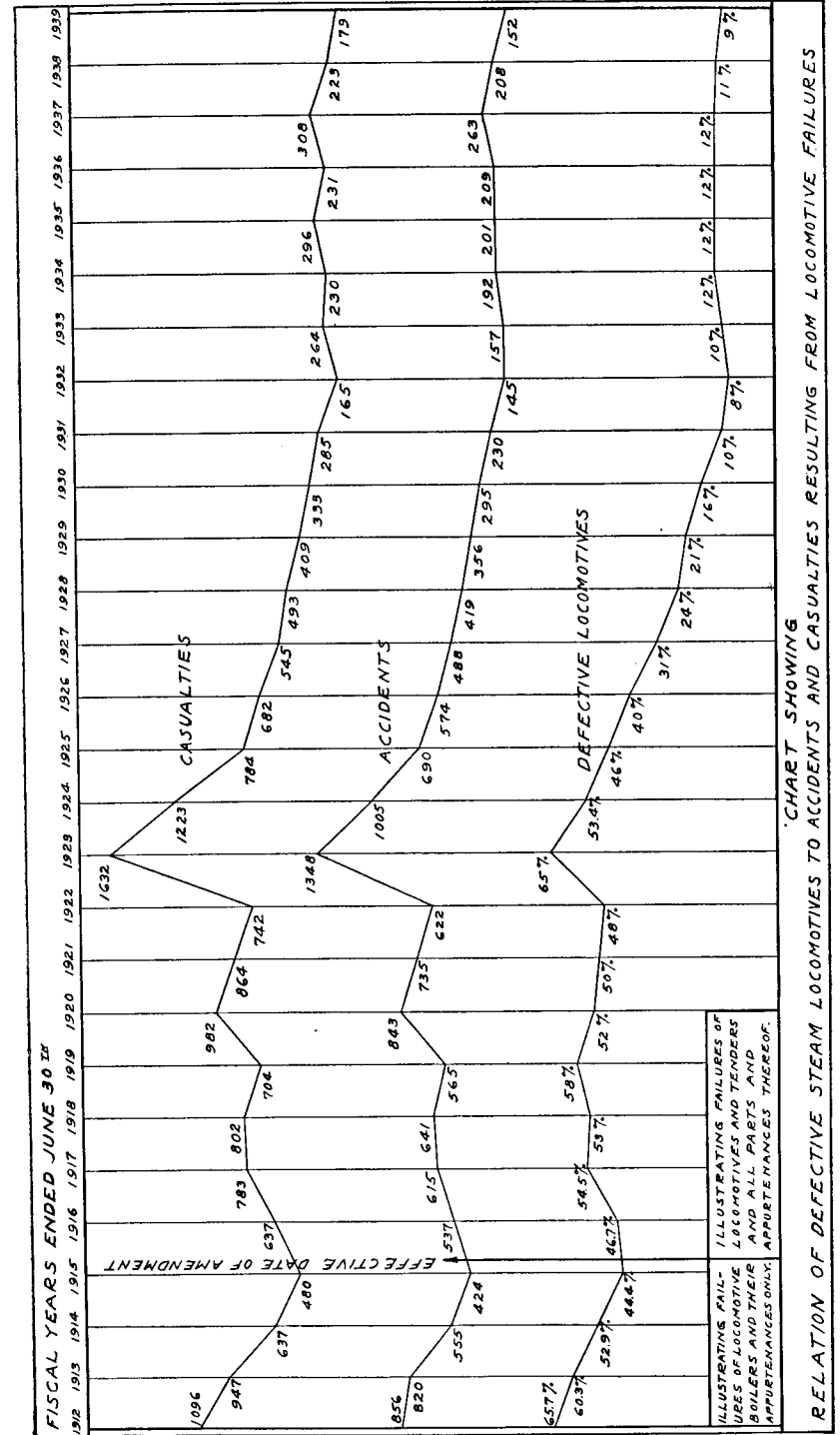


TABLE IX.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1939			1938			1937			1936			1935		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Carburetors.....															
Couplers.....															
Crank pins and connecting rods.....															
Fires: due to overflowing or leakage of fuel, or back firing.....	1		1				1		1	4		4			
Generators.....															
Insulation.....													1		1
Pantagraphs and trolleys.....							2		2				1		1
Short circuits.....	1		1				2		2						
Miscellaneous.....	3		3	4		4	1		3	4		4	4		4
Total.....	5		5	4		4	12		14	9		9	8		8

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—					
	1939	1938	1937	1936	1935	1934
1. Air compressors.....	518	689	766	740	733	660
2. Arch tubes.....	28	66	105	74	74	127
3. Ashpans and mechanism.....	67	72	80	79	94	87
4. Axles.....	2	13	10	13	10	6
5. Blow-off cocks.....	204	226	199	236	283	289
6. Boiler checks.....	279	301	382	356	413	407
7. Boiler shell.....	272	331	347	383	396	372
8. Brake equipment.....	1,577	2,044	2,322	2,480	2,449	2,326
9. Cabs, cab windows, and curtains.....	943	1,226	1,807	1,638	1,273	1,342
10. Cab aprons and decks.....	260	326	466	450	368	343
11. Cab cards.....	92	109	145	166	142	129
12. Coupling and uncoupling devices.....	60	73	74	65	73	54
13. Crossheads, guides, pistons, and piston rods.....	739	905	1,160	1,056	1,086	1,100
14. Crown bolts.....	47	59	76	63	75	77
15. Cylinders, saddles, and steam chests.....	1,232	1,645	2,206	1,717	1,547	1,491
16. Cylinder cocks and rigging.....	418	585	729	605	627	654
17. Domes and dome caps.....	90	109	101	114	94	105
18. Draft gear.....	450	740	522	513	423	401
19. Draw gear.....	360	479	560	451	414	480
20. Driving boxes, shoes, wedges, pedestals, and braces.....	1,330	1,688	1,637	1,712	1,573	1,472
21. Firebox sheets.....	238	244	371	295	343	356
22. Flues.....	165	159	225	178	173	203
23. Frames, tail pieces, and braces, locomotive.....	708	1,001	1,053	997	1,006	951
24. Frames, tender.....	71	131	120	113	124	128
25. Gages and gage fittings, air.....	155	230	261	257	275	212
26. Gages and gage fittings, steam.....	226	279	324	350	320	289
27. Gage cocks.....	361	451	538	579	480	384
28. Grate shakers and fire doors.....	252	403	470	400	394	404
29. Handholds.....	349	405	510	502	464	377
30. Injectors, inoperative.....	26	26	38	40	39	33
31. Injectors and connections.....	1,457	1,784	2,020	2,085	2,035	1,909
32. Inspections and tests not made as required.....	6,645	8,204	9,638	9,005	8,344	8,173
33. Lateral motion.....	243	325	446	404	389	351
34. Lights, cab and classification.....	50	48	90	78	81	79
35. Lights, headlight.....	177	257	313	251	257	218
36. Lubricators and shields.....	200	212	254	255	191	215
37. Mud rings.....	248	203	272	237	241	247
38. Packing nuts.....	408	448	487	508	527	491
39. Packing, piston rod and valve stem.....	739	913	1,393	1,133	906	833
40. Pilots and pilot beams.....	104	154	133	178	152	174
41. Plugs and studs.....	179	238	238	236	167	242
42. Reversing gear.....	317	404	492	463	414	390
43. Rods, main and side, crank pins, and collars.....	1,293	1,669	2,348	2,093	1,826	1,670
44. Safety valves.....	97	125	132	125	100	108
45. Sanders.....	432	536	655	678	779	697
46. Springs and spring rigging.....	2,340	2,901	3,172	3,008	2,765	2,854

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1939	1938	1937	1936	1935	1934
47. Squirt hose.....	75	94	133	134	113	107
48. Stay bolts.....	181	211	276	279	240	235
49. Stay bolts, broken.....	258	380	542	520	512	455
50. Steam pipes.....	285	410	446	526	463	489
51. Steam valves.....	115	141	165	227	212	267
52. Steps.....	490	631	678	615	640	567
53. Tanks and tank valves.....	837	955	1,009	877	913	862
54. Telltale holes.....	58	67	79	127	102	93
55. Throttle and throttle rigging.....	638	685	909	760	733	639
56. Trucks, engine and trailing.....	628	762	785	861	811	898
57. Trucks, tender.....	665	907	1,018	1,108	1,120	918
58. Valve motion.....	554	722	798	824	799	784
59. Washout plugs.....	487	626	598	714	679	776
60. Train-control equipment.....	5	11	12	6	4	8
61. Water glasses, fittings, and shields.....	690	915	1,049	1,118	951	907
62. Wheels.....	466	577	803	790	697	734
63. Miscellaneous—Signal appliances, badge plates, brakes (hand).....	610	684	759	608	563	572
Total number of defects.....	33,490	42,214	49,746	47,453	44,491	43,271
Locomotives reported.....	45,965	47,397	48,625	49,322	51,283	54,283
Locomotives inspected.....	105,606	105,186	100,033	97,329	94,151	89,716
Locomotives defective.....	9,099	11,050	12,402	11,526	11,071	10,713
Percentage of inspected found defective.....	9	11	12	12	12	12
Locomotives ordered out of service.....	468	679	934	852	921	754

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—					
	1939	1938	1937	1936	1935	1934
Air compressors.....	14	6	6	2	5	3
Axles, truck and driving.....	1	5	4	6	1	
Batteries.....	1	1	4		7	
Boilers.....	6	6	5	5	3	1
Brake equipment.....	50	74	97	66	46	16
Cabs and cab windows.....	36	25	51	30	33	9
Cab cards.....	18	11	25			
Cab floors, aprons, and deck plates.....	13	8	17	10	6	1
Controllers, relays, circuit breakers, magnet valves, and switch groups.....	13	7	8			5
Coupling and uncoupling devices.....	4	4	3		3	
Current-collecting apparatus.....	5	8	4	16	3	3
Draft gear.....	17	23	28	24	21	8
Draw gear.....	4	3	1	1		
Driving boxes, shoes, and wedges.....	52	16	14	5	5	7
Frames or frame braces.....	9	37	5	15	4	6
Fuel system.....	35	47	152	44	15	4
Gages or fittings, air.....	6	11	1	6	4	
Gears and pinions.....	2	2	2			1
Handholds.....	8	13	11	8	3	
Inspections or tests not made as required.....	185	204	237	186	124	52
Insulation and safety devices.....	4	13	13	20	15	2
Internal-combustion engine defects, parts and appliances.....	32	26	50	23	4	4
Jack shafts.....	6	1		1		
Jumpers and cable connectors.....	1	1	2			
Lateral motion, wheels.....	1		1	2		3
Lights, cab and classification.....	3	2	5	6	1	
Lights, headlight.....	4	4	11	4	2	
Meters, volt and ampere.....	2	2	1	2		
Motors and generators.....	19	18	10	14	5	4
Pilots and pilot beams.....	6	1	7	6	5	
Plugs and studs.....	1		1			
Quills.....	7	6	3			
Rods, main, side, and drive shafts.....	2	2	23	2	10	4
Sanders.....	28	37	52	25	21	2
Springs and spring rigging, driving and truck.....	16	43	36	29	20	4
Steam pipes.....	5	1	1	2		
Steps, footboards, etc.....	18	23	13			

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—					
	1939	1938	1937	1936	1935	1934
Switches, hand-operated, and fuses	5	7	2	2	2	1
Transformers, resistors, and rheostats	1	3	—	—	1	1
Trucks	33	40	41	42	46	3
Water tanks	1	—	1	—	—	—
Water glasses, fittings, and shields	1	3	—	4	6	—
Warning signal appliances	1	3	2	1	—	—
Wheels	16	11	21	26	6	8
Miscellaneous	10	7	20	39	25	7
Total defects	696	769	991	674	449	158
Locomotive units reported	2,716	2,555	2,416	2,361	1,911	1,288
Locomotive units inspected	4,581	4,024	3,615	3,118	1,620	1,436
Locomotive units defective	260	274	328	252	146	69
Percentage inspected found defective	6	7	9	8	9	5
Locomotive units ordered out of service	14	9	24	11	5	4

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.

STEAM LOCOMOTIVES

One hundred and fifty-two accidents occurred in connection with steam locomotives resulting in 15 deaths and 164 injuries. This represents a decrease of 56 accidents, an increase of 8 in the number of persons killed, and a decrease of 52 in the number of persons injured compared with the previous 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. 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 9 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 2 percent compared with the results obtained

in the previous year. There was a decrease of 31 percent 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 6 explosions that occurred in the past fiscal year, in which 12 persons were killed and 11 injured, were caused by overheating of the crown sheets due to low water.

Three of these explosions were particularly violent; in one of these accidents, which caused the death of three employees and two transients and the injury of four transients, the force of the explosion hurled the entire locomotive, which was of the articulated type, 150 feet forward and to the right of the track and parts of the wreckage were scattered in various directions up to approximately 450 feet from the point of the explosion. Investigation disclosed that the capacity of the feed water pump was reduced due to a defective drifting control valve; the feed water pump was reported twice on the day before the locomotive was taken out of service for monthly inspection, 17 days before the accident occurred, and was reported repeatedly after the locomotive was returned to service. An accumulation of foreign matter was found in the tender water tank though the monthly inspection and repair report showed the condition of the tender was good. Many appurtenances were so badly damaged that their condition prior to the accident could not be determined. In the second accident, in which three employees were killed and one injured, the boiler was torn from the frame and forced upward and forward; it turned over while in flight, the back head struck the eastward track and the boiler then bounded upward and forward and finally alighted to the south of and fouling the eastward track approximately 260 feet from the point of explosion; parts of the wreckage were scattered various distances up to approximately 445 feet from the point of explosion. In the third accident, in which two employees were killed, the locomotive involved was the second locomotive of a double-header train; the boiler was torn from the frame leaving the running gear and tender on the track, coupled to the train and to the leading locomotive; the boiler was forced upward and forward a distance of 318 feet and in descending it grazed the left side of the leading locomotive and broke off some of the exposed parts. Parts of the wreckage were scattered various distances up to 2,165 feet from the point of explosion.

In another accident, in which two employees were killed, the locomotive was hauling a passenger train at an estimated speed of 70 miles per hour at the time of the explosion. None of the parts of the air-brake system were damaged in the accident and the train continued for a distance of 5.62 miles until stopped by loss of momentum and the creeping on of the air brakes. Investigation disclosed that the steam valve operating mechanisms of both injectors were so applied that the valves could not be fully opened by the operating handles; the latches of both injector operating valve handles were inoperative; the injectors, both of which were of the nonlifting type, were not equipped with telltale or warning devices, and the water in the tender tank was found to be heated to an estimated temperature of 125° to 135° F. about 2 hours after the accident.

Six employees were injured in the remaining two accidents in which no fatalities occurred.

Boiler and appurtenance accidents other than explosions resulted in the death of 3 persons and injuries to 44 persons.

A number of accidents have been investigated in the past when either the engineer or fireman or both were seriously scalded while in the act of shutting off the water-glass valves following failures of the gage glasses; no doubt the seriousness of these injuries was contributed to by the fact that the valve stems had fine threads which required several turns of the valve handles to close the valves. Inasmuch as water-glass valves are now available that can be closed with less than one turn of the handle consideration should be given to use of such quick-closing valves, especially on high-pressure locomotive boilers.

EXTENSION OF TIME FOR REMOVAL OF FLUES

One thousand and nine applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 64 of these cases the condition of the locomotives was such that extensions could not properly be granted. Thirty-one were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Fifty-six extensions were granted after defects disclosed by our investigations were required to be repaired. Fifteen applications were canceled for various reasons. Eight hundred and forty-three applications were granted for the full periods requested.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

There was an increase of one in the number of accidents occurring in connection with locomotives other than steam and an increase of one 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 as compared with 7 percent in the previous year. There was an increase of 5 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, 131 specification cards and 4,493 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, 252 specifications and 90 alteration reports were filed for locomotive units and 60 specifications and 36 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.

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, *Chief Inspector.*

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1939, 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 55 and 162. A complete investigation, 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.]

ALQUIPPA & SOUTHERN RAILROAD:

*May 8, 1939, locomotive 210, Aliquippa, Pa. Insufficient clearance between handhold on locomotive and tank casting supporting cab apron; one injured.
One accident; one injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

September 18, 1938, locomotive 590, Los Angeles, Calif. Lubricator glass blew out; nut for securing glass in place was loose in fit in lubricator; one injured.

September 29, 1938, locomotive 1344, Los Nietos, Calif. Tender truck axle broke due to having been overheated; two injured.

December 16, 1938, locomotive 1210, near Alfalfa, Kans. Brakeman's drop-type cab seat fell from position, due to the loop hinge of the drop leg bracket working loose; one injured.

May 2, 1939, locomotive 5008, Summit, Calif. Squirt hose valve worked open; packing nut not securely tightened on valve; one injured.

May 18, 1939, locomotive 3211, Arkansas City, Kans. Tender truck brake head pin worked out about 1½ inches, due to loss of cotter key; one injured.

June 17, 1939, locomotive 3880, Victorville, Calif. Employee's foot slipped when he stepped on metal step on rear of tender oil tank, due to having oil on his shoes; a large quantity of crude oil was on top of oil tank; one injured.
Six accidents; seven injured.

ATLANTA, BIRMINGHAM & COAST RAILROAD:

**January 14, 1939, locomotive 210, near Bradshaw, Ala. Right trailer hub liner broke and a piece weighing about 5 pounds was thrown outward and struck a track employee; one injured.
One accident; one injured.

ATLANTA JOINT TERMINALS:

*February 6, 1939, locomotive (A. & W. P.) 210, Atlanta, Ga. Power reversing gear did not operate properly due to nut having worked off of link bolt which allowed bolt to work out sufficiently to foul on the link saddle; one injured.
One accident; one injured.

ATLANTIC COAST LINE RAILROAD:

**September 6, 1938, locomotive 1687, Jacksonville, Fla. Broken radial stay blew out of wrapper sheet; attempted to calk leaky stay while under pressure; no threads on stay or in stay hole in wrapper sheet; one injured.

September 9, 1938, locomotive 971, Aurora, N. C. Insufficient clearance between overhang of cab running board and cab apron; one injured.

November 3, 1938, locomotive 1108, Florence, S. C. Bull's-eye water-glass packing nut and glass blew out of frame, due to defective threads in frame opening for the nut. No service had been performed since water gage had been overhauled, and the new packing nut could be inserted into the frame for three of its six threads without turning and the cleaning tap could be inserted into the hole five threads without turning; one injured.
Three accidents; three injured.

BALTIMORE & OHIO RAILROAD:

July 6, 1938, locomotive 7149, Hardman, W. Va. Injured while attempting to adjust stoker which fed heavily on one side; nut for securing divider had become loose; one injured.

**October 25, 1938, locomotive 7129, Rodemer, W. Va. Caboose derailed and turned over, resulting in injury to an employee; front coupler pocket casting on pusher locomotive permitted excessive swing of coupler due to absence of filler pieces which are required by the carrier's standard practice; one injured.

December 30, 1938, locomotive 6108, French, W. Va. Crown sheet failure caused by overheating due to low water; two killed.

January 9, 1939, locomotive 4274, between Nappanee and East Chicago, Ind. Reverse lever very difficult to operate; reversing shaft bent and shaft bearings

out of alignment; reversing gear reported on December 10, 11, 12, 13, 19, 20, 21, 28, January 7, 8, 9 (two times), and 10; one injured.

January 10, 1939, locomotive 4424, Ravenna, Ohio. Injured while attempting to move manually operated screw reversing gear to forward position; reach rod splice bolts loose and fouling boiler jacket due to nuts having worked off; splice bolt nuts not applied according to carrier's standard practice; one injured.

April 6, 1939, locomotive 5304, Elizabeth, N. J. Driver brake rod safety hanger broke at bend where secured to bottom frame rail and hanger was hurled from the moving locomotive; metal at point of failure was laminated and apparently overheated when the bend was made; one injured.
Six accidents; two killed, five injured.

BOSTON & MAINE RAILROAD:

**August 11, 1938, locomotive 2734, near Meredith, N. H. Ashpan clean-out door came down; one injured.

August 13, 1938, locomotive 4013, Lowell, Mass. Precision type reversing gear hand wheel spun when unlatched and struck employee's hand; one injured.

**January 9, 1939, locomotive (M. C.) 465, Salmon Falls, N. H. Guide yoke broke in fillet under top guide bracket at old fracture which extended through approximately 70 percent of cross-sectional area of guide yoke; one injured.

February 8, 1939, locomotive 1490, Tilton, N. H. Reverse lever stuck due to slides around lever to cover opening in cab deck being dirty and gummy; one injured.

February 17, 1939, locomotive 3687, Dover, N. H. Reverse lever difficult to operate; slides dirty and full of waste; one injured.

April 3-4, 1939, locomotive 3708, between Boston, Mass. and White River Junction, Vt. Superheater unit failed in front end due to old fracture; unit had been leaking throughout the trip and fireman was burned by the excessive heat which radiated from fire door opening; one injured.

May 25, 1939, locomotive 3670, Eagle Bridge, N. Y. Employee injured due to swaying of locomotive; trailing truck not properly leveled; locomotive reported swaying four times since May 1; one injured.
Seven accidents; seven injured.

CENTRAL OF GEORGIA RAILWAY:

*November 25, 1938, locomotive 701, Alexandria City, Ala. Locomotive and five cars derailed, caused by broken cross-equalizer hanger; two injured.
One accident; two injured.

CENTRAL RAILROAD OF NEW JERSEY:

June 30, 1939, locomotive 780, Red Bank, N. J. Whistle valve stuck open due to a chip of metal lodging between valve and its seat; one injured.
One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

*December 16, 1938, locomotive 2341, St. Albans, W. Va. Blow-off cock difficult to operate; one injured.

**June 17, 1939, locomotive 1243, near Eagle Mountain, Va. Knuckle pin lost out of right back side rod; threads on knuckle pin were stripped; knuckle pin was not properly fitted to rod and proper repairs not made when the defect was reported. "Tighten right back knuckle pin" was reported on June 2, 9, and 12, and engine was reported riding rough and knocking bad on June 1, 4, and 15; two injured.
Two accidents; three injured.

CHICAGO & EASTERN ILLINOIS RAILWAY:

*September 1, 1938, locomotive 1935, Mount Vernon, Ill. Pin came out of reversing gear; one injured.

December 21, 1938, locomotive 879, Chicago, Ill. Water glass burst. Employee was burned while attempting to close water-glass valves; lower valve not easily operated account of insufficient clearance between the valve handle and drain valve handle; one injured.
Two accidents; two injured.

CHICAGO & NORTH WESTERN RAILWAY:

*September 16, 1938, locomotive (C. St. P. M. & O.) 601, near South Beaver Dam, Wis. Eccentric rod pin broke; one injured.

June 7, 1939, locomotive 2901, Mayfair, Ill. Right No. 2 tender truck journal failed, due to overheating, resulting in derailment of the tender and seven cars

of passenger train; journal bearings ran hot throughout the trip from Elroy, Wis. "Pack all tank trucks and put a brass in right No. 1" was reported at end of previous trip; five injured.

Two accidents; six injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

November 29, 1938, locomotive 6100, Gilson, Ill. Whistle valve stuck open due to shoulder that was worn on valve stem sticking in the packing nut; end of valve stem was spread due to being contacted by operating lever. Employee fell from running board when he went to make repairs to bell ringer which failed; bell ringer reported on November 1 and 17; one injured.

One accident; one injured.

CHICAGO GREAT WESTERN RAILROAD:

July 20, 1938, locomotive 738, Virgil, Ill. Coal retaining plate, below coal gates on tender, fell from its vertical position and struck employee's foot; accumulation of coal packed at hinged end of plate at bulkhead prevented plate from standing securely in vertical position and top bolt for guiding plate in curved slot while being raised or lowered was missing; one injured.

August 22, 1938, locomotive 874, Sumner, Iowa. Side rod bearings of locomotive tender booster ran hot; one injured.

*January 13, 1939, locomotive 906, McIntire, Iowa. Piston rod broke through an old fracture which extended approximately 90 percent through cross-sectional area, located inside crosshead fit; fracture started in a tool mark, about one-eighth inch wide and one thirty-second inch deep, which extended around the piston rod; one injured.

January 28, 1939, locomotive 906, McIntire, Iowa. Grate shaker bar slipped off dump grate lever, due to improper fit; one injured.

May 24, 1939, locomotive 483, South Des Moines, Iowa. Water glass burst; one injured.

June 25, 1939, locomotive 859, St. Joseph, Mo. Insufficient clearance between cab hood curtain housing brace on tender and cab overhang; one injured.

Six accidents; six injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

October 13, 1938, locomotive 336, Almora, Ill. Crown sheet failure caused by overheating due to low water; three killed, one injured.

December 16, 1938, locomotive 586, Park Siding, Mich. Generator did not furnish proper light, account of brushes sticking and not making proper contact with commutator; brushes were badly worn; one injured.

*January 18, 1939, locomotive 1137, near Deerfield, Ill. Reverse lever broke at pin hole for reach rod connection; old fracture extended through approximately 30 percent of cross-sectional area of lever; one injured.

Three accidents; three killed, three injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

*February 9, 1939, locomotive 4029, Meade, Kans. Employee was struck by water crane while leaning out cab window to observe hot box on tender; one injured.

June 10, 1939, locomotive 2602, Des Moines, Iowa. Coupling nut at boiler check blew off while being tightened under pressure; nut stretched and threads partly stripped and threaded portion of check body was tapered, permitting the nut to be placed to within two threads of closed position without being turned; one injured.

*June 19, 1939, locomotive 4038, West Davenport, Iowa. Glass in cab storm window broke; employee cut by flying glass; one injured.

Three accidents; three injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

December 30, 1938, locomotive 515, near Knapp, Wis. Steam pipe in front end of locomotive burst due to being of insufficient thickness; thickness at point of failure varied from one-eighth inch to three-eighths inch; one injured.

One accident; one injured.

DELAWARE & HUDSON RAILROAD:

May 17, 1939, locomotive 1119, Schenectady, N. Y. One side of butterfly type fire door dropped from position and caught employee's hand; excessive lost motion caused by badly worn link bolt and bolt hole in connection link permitted link to become disconnected from air cylinder and allow the door to drop.

"Fire door won't open by air" was reported 8 hours prior to the accident; the door was found disconnected by the shop employee who reconnected the defective parts and the locomotive was dispatched without further attempt to apply repairs; one injured.

One accident; one injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

October 26, 1938, locomotive 1504, Scranton, Pa. Oil and grease on tender deck plate caused employee to slip and fall from the deck to the ground; one injured.

One accident; one injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

July 2, 1938, locomotive 801, near Pueblo, Colo. Water-glass steam pipe broke off at collar; one injured.

October 5, 1938, locomotive 1712, Soldier Summit, Utah. Gangway handhold fouled tender deck; one injured.

*October 24, 1938, locomotive 3403, Crescent, Colo. Struck by flying glass when clear vision window was broken; one injured.

December 2, 1938, locomotive 3605, Minturn, Colo. Employee fell from top of car and was fatally injured when the cut of cars was hit very hard by locomotive in coupling; several sand pipes were not depositing sand on the rails account of being stopped up; sand pipes were reported 22 times in the 30 days preceding the accident; one injured.

**March 2, 1939, locomotive 1183, Pueblo, Colo. Reverse lever jerked forward suddenly when unlatched; reversing gear reported difficult to operate on February 16, 19, 24, 26, 27, and March 1; one injured.

Five accidents; five injured.

ERIE RAILROAD:

September 6, 1938, locomotive 219, Marion, Ohio. Employee's feet slipped off platform under cab seat box when he attempted to leave the seat box; platform was insufficient in width and worn around outer edge; one injured.

One accident; one injured.

FLORIDA EAST COAST RAILWAY:

September 1, 1938, locomotive 448, near New Smyrna Beach, Fla. Main driving axle broke causing derailment of entire passenger train; old fracture extended through about 80 percent of cross-sectional area at point of failure; driving boxes reported on August 22, 25, and 27, and engine riding very rough was reported on August 26 and 30; one injured.

*March 8, 1939, locomotive 714, Miami, Fla. Sliver of steel punctured employee's hand while he was filling rod grease cup; one injured.

April 2, 1939, locomotive 445, Jacksonville, Fla. Handhold on top of cab gave way due to nut having worked off bolt securing front end of handhold; one injured.

June 8, 1939, locomotive 452, St. Augustine, Fla. Crank pin ran hot due to lack of lubrication; bushing keeper in back end of main rod was worn, permitting bushing to turn in rod and partially close the grease passageway to the pin; one injured.

Four accidents; four injured.

FORT WORTH & DENVER CITY RAILWAY:

*September 15, 1938, locomotive 302, near Carey, Tex. Eccentric strap broke; one injured.

One accident; one injured.

GREAT NORTHERN RAILWAY:

September 3, 1938, locomotive 2525, Breckenridge, Minn. Air bell ringer was inoperative and bell rope became entangled on bell stand so that bell could not be rung manually. Employee was knocked from cab running board by a coal shed when returning to cab after freeing the bell. Snap rings on bell ringer piston had been replaced by asbestos rope packing and operating crank of ringer was not properly aligned. Bell rope lever and bell ringer crank were applied to the same trunnion, so that if bell should turn over the rope would become entangled. The bell fell from yoke when locomotive had proceeded 115 miles after the accident; one injured.

February 6, 1939, locomotive 3328, Aylmer, N. Dak. Main rod broke through old fracture which extended through approximately 20 percent of its cross-

sectional area; main rods reported to be keyed up on January 18, 23, 25, and February 1 and 2; one injured.

February 20, 1939, locomotive 2048, near Grizzly, Mont. Brake pipe connection to distributing valve broke, resulting in emergency application of the brakes; distributing valve bracket vibrated greatly; bracket was not braced as on other locomotives of this class; one injured.

Three accidents; three injured.

GULF, COLORADO & SANTA FE RAILWAY:

August 19, 1938, locomotive (A. T. & S. F.) 3930, near Belton, Tex. Mechanical lubricator did not feed properly account of ball check valves being worn and leaking; "Mechanical lubricator is not feeding enough oil to properly lubricate engine" was reported on August 18. While employee was returning to the cab after having poured oil into relief valves for the fourth time since leaving Brownwood terminal, he was knocked from running board by a bridge superstructure; one killed.

November 1, 1938, locomotive (A. T. & S. F.) 1353, Thackerville, Okla. Injector overflow body became disconnected from injector, due to union nut working off at the injector connection. When employee leaned out cab window to observe the injector his head was struck by the arm of a mail crane; one injured.

Two accidents; one killed, one injured.

GULF, MOBILE & NORTHERN RAILROAD:

*March 19, 1939, locomotive 107, Falkner, Miss. Employee's eye was struck by flying glass when cab storm window broke; one injured.

One accident; one injured.

ILLINOIS CENTRAL SYSTEM:

**August 10, 1938, locomotive 335, Memphis, Tenn. Insufficient clearance between vertical handhold on cab and tender deck; one injured.

**August 11, 1938, locomotive 1664, West Frankfort, Ill. Squirt hose burst; defective lining in hose collapsed and closed the opening in hose; one injured.

**October 27, 1938, locomotive 2015, Mattoon, Ill. Engineman injured while attempting to remove a gasket from air hose at rear of tender; one injured.

*December 14, 1938, locomotive 7044, Sitka, Tenn. Brakeman's drop seat in cab fell down and struck employee's foot; vibration of the moving locomotive caused seat support to slip on wet cab deck; one injured.

December 15, 1938, locomotive 1774, Hart, Ill. Ashpan operating lever fouled on lever lock bracket, preventing door from opening fully. When door was released the operating lever went forward rapidly, catching employee's thumb between lever and trailer spring and hanger; insufficient clearance between operating lever and trailer spring; one injured.

**December 17, 1938, locomotive 2444, Hart, Ill. Blower cap missing from smokebox fitting; one injured.

**January 28, 1939, locomotive 1191, near Love, Miss. Side rod adapter at middle connection broke in two places, resulting in the side of locomotive being stripped; first break occurred through an old fracture which started at inside edge of bushing anchor bolt hole at or near a flaw in the metal, seven-eighths inch long by three-eighths inch wide; one injured.

**February 5, 1939, locomotive 3528, Markham, Ill. Insufficient clearance between grate shaker bar and oil can tray apron; one injured.

**February 15, 1939, locomotive 2402, near Medina, Tenn. Boiler check leaking; apparently caused by some foreign substance under seat; one injured.

February 19, 1939, locomotive 3520, Bluford, Ill. Piston rod packing leaking; packing defective; one injured.

March 18, 1939, locomotive 3533, Champaign, Ill. Insufficient clearance between vertical side handhold and tender sill step when on a curve; one injured.

June 22, 1939, locomotive 1957, Munger, Ill. Sand in sand box was caked and did not flow freely to the rail. Employee's head struck overhead bridge while he was giving attention to the sand; one injured.

Twelve accidents; twelve injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

*October 14, 1938, locomotive 1107, Bryan, Tex. Spring hanger broke; one injured.

One accident; one injured.

JACKSONVILLE TERMINAL COMPANY:

December 19, 1938, locomotive 16, Jacksonville, Fla. Crown sheet failure caused by overheating due to low water; two injured.

One accident; two injured.

LOUISVILLE & NASHVILLE RAILROAD:

August 4, 1938, locomotive 1207, Anniston, Ala. Reverse lever counterbalance spring broken; one injured.

January 3, 1939, locomotive 1483, Blackmont, Ky. Crown sheet failure caused by overheating due to low water; four injured.

**January 8, 1939, locomotive 1236, Highland Park, Ky. Fire door piston became disconnected from operating mechanism; key in pin in the operating mechanism was broken off which permitted pin to work out of clevis on end of piston, disconnecting the piston; one injured.

Three accidents; six injured.

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

August 13, 1938, locomotive 4013, Ladysmith, Wis. Burned by hot water from air compressor low pressure steam cylinder drain cock; nipple and bushing not tightly screwed into cylinder head; one injured.

**September 15, 1938, locomotive 4020, Aburdale, Wis. Burned by hot water from hole in squirt hose; one injured.

**February 2, 1939, locomotive 2434, Gladstone, Mich. Employee fell from gangway step; outer end of wooden front tender end sill which formed the step was worn and sloped toward the outside edge; one injured.

Three accidents; three injured.

MISSOURI-KANSAS-TEXAS LINES:

July 19, 1938, locomotive 46, Smithville, Tex. Water glass burst; one injured.

One accident; one injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

July 26, 1938, locomotive 658, Chattanooga, Tenn. Boiler check valve stuck open, caused by foreign matter under valve seat; one injured.

August 5, 1938, locomotive 670, Wartrace, Tenn. Feed water heater pump stopped, caused by failure of oil pipe from oil cup to a T in the steam pipe to pump which permitted the steam to escape; oil cup vibrated badly, due to being improperly applied, causing the pipe to break off at connection to the steam pipe. Employee fell from running board while attempting to make repairs; running board was obstructed by flue blower spindle and operating shaft, its width being reduced to 6½ inches for a distance of 82 inches; one injured.

Two accidents; two injured.

NEW YORK CENTRAL SYSTEM:

August 13, 1938, locomotive (P. & E.) 37, Urbana, Ill. Throttle rod packing blew out of stuffing box when adjustment was being made account of hard working throttle; one injured.

August 19, 1938, locomotive 828, New York, N. Y. Clamp fell from right No. 1 tender brake beam head, due to nuts working off clamp bolt, and clamp was thrown through a window of a passenger car in the train and struck a passenger; "Right head working off No. 1 tender brake beam" was reported on August 18 while locomotive was receiving monthly inspection; one injured.

January 15, 1939, locomotive 4631, Denmark Junction, Mich. Steam heat line nipple under cab deck blew out; threads on nipple and in manifold were badly worn; one injured.

*February 14, 1939, locomotive 7533, Jackson, Mich. Insufficient clearance between handhold on side of cab and step or angle iron on tender when on a sharp curve; one injured.

*May 11, 1939, locomotive 7921, Cleveland, Ohio. Insufficient clearance between handhold at gangway and engine deck; one injured.

May 24, 1939, locomotive 2787, Minoa, N. Y. Fire tube failed due to being badly cinder cut; tube collapsed and tore through pocket where reduced to paper thickness; adjacent fire tube was also pocketed and thin and three other tubes were found to be thin; two injured.

June 14, 1939, locomotive 4861, Ashley, Ohio. Coal pusher operating lever stopped in backward movement, then suddenly released and continued backward causing employee's elbow to strike coping on top of water tank; coal pusher operating valve stuck due to lack of lubrication; one injured.

June 28, 1939, locomotive 2936, Bellefontaine, Ohio. Blow-off cock leaking due to scale on valve disc; one injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**September 10, 1938, locomotive 3211, Milford, Conn. Cab windshield broke; one injured.

December 2, 1938, locomotive 814, South Boston, Mass. Chain on tender coal bunker door pulled off due to failure of the weld which secured it to door; one injured.

*December 20, 1938, locomotive 3013, New Britain, Conn. Bell rope became entangled; bell ringer valve was open too wide, causing the bell to turn over; one injured.

January 12, 1939, locomotive 3552, Groton, Conn. Squirt hose blew off nipple, due to not being properly secured; one injured.

*March 21, 1939, locomotive 3416, Cedar Hill, Conn. Throttle stuck in open position; one injured.

*March 22, 1939, locomotive 381, Willimantic, Conn. Reverse lever caught in center; one injured.

April 12, 1939, locomotive 3327, South Boston, Mass. Fire tube broke off at safe end weld; safe end was badly deteriorated and reduced in thickness near the weld; one injured.

June 19, 1939, locomotive 11, Cedar Hill, Conn. Bell rope broke; rope had been scorched at the point of failure; one injured.

Eight accidents; eight injured.

NEW YORK, ONTARIO & WESTERN RAILWAY:

December 30, 1938, locomotive 273, Spring Glen, N. Y. Steam heat pipe coupling nut in front cab of double-cab locomotive blew off of steam heat throttle valve, due to loose fit; threads on nut were in poor condition and badly stripped; one injured.

*January 24, 1939, locomotive 453, Livingston Manor, N. Y. Fire tube failure; one injured.

Two accidents; two injured.

NORTHERN PACIFIC RAILWAY:

July 7, 1938, locomotive 5105, Willis, Mont. Crown sheet failure caused by overheating due to low water; capacity of feed water pump was reduced due to defective drifting control valve; feed water pump was reported twice on the day before the locomotive was taken out of service for monthly inspection and was reported repeatedly after locomotive was returned to service on June 30. An accumulation of 56 quarts of cinders and other foreign matter was found in tender water tank, though the monthly report showed the condition of tender was good. Many appurtenances were so badly damaged that their condition prior to the accident could not be determined; five killed, four injured.

**August 16, 1938, locomotive 5007, Sweet Briar, N. Dak. Driving box bearing ran hot; one injured.

October 5, 1938, locomotive 2626, Kountze, Wash. Eccentric crank arm broke off at eccentric end; old fracture extended through 50 percent of cross-sectional area at point of failure; one injured.

January 12, 1939, locomotive 2180, Billings, Mont. Air bell ringer inoperative, due to lack of lubrication; locomotive not properly oiled at roundhouse prior to this trip; one injured.

Four accidents; five killed, seven injured.

PENNSYLVANIA RAILROAD:

**July 2, 1938, locomotive 3882, Milton, Pa. Fire tube failed at back flue sheet due to being thin; one injured.

**July 4, 1938, locomotive 1787, Pittsburgh, Pa. Air compressor did not operate properly account of defective governor; condition of governor reported and shown renewed on June 17, July 1 and 3; one injured.

August 13, 1938, locomotive 3445, Kittanning Point, Pa. Fire tube broke off at defective safe end weld; one injured.

August 25, 1938, locomotive 5343, Selma, Ohio. Crown sheet failure caused by overheating due to low water; steam valve operating mechanisms of both injectors were so applied that the valves could not be fully opened by the operating handles; latches of both injector operating valve handles were inoperative; the injectors, both of which were of the nonlifting type, were not equipped with telltale or warning devices; water in tender tank was hot; two killed.

*September 8, 1938, locomotive 5403, Dublin, Ind. Struck by broken glass when cab windshield broke; one injured.

October 23, 1938, locomotive 6738, Ryde, Pa. Front end netting was stopped up due to moisture in smoke box, and when employee opened smoke box door for the purpose of cleaning the netting, while locomotive was running about 20 miles per hour, a back draft through open firebox door ignited the interior of the cab and severely burned the fireman who then jumped from the locomotive; some of the flues were stopped up and leaking, superheater unit return bend was leaking badly, main steam pipe T joint and superheater unit joints were leaking, and cold water pipe of feed water heater was leaking in smoke box; one killed.

December 27, 1938, locomotive 2955, near Floreffe, Pa. Eccentric crank arm broke at keyway; one injured.

**January 30, 1939, locomotive 1963, Valparaiso, Ind. Blower valve operating handle overtraveled its normal closed position and caught employee's finger between the handle and a stud on boiler head; set screw which held operating lever on blower valve stem loosened and allowed lever to turn on valve stem which permitted the operating handle to overtravel; one injured.

February 26, 1939, locomotive 4420, Brink Haven, Ohio. Fire tube broke off at front flue sheet due to being badly corroded and reduced in thickness. Excessive openings in right cab floor and insufficient clearance around right seat box contributed to the seriousness of the employee's injuries; one injured.

March 25, 1939, locomotive 6746, Enola, Pa. Precision type power reversing gear did not operate properly, and when attempt was made to force the hand wheel it suddenly spun rapidly and the handle of wheel struck employee's hand; link block pin had run hot and was galled in block, causing taper pins to shear off and allow link block pin to work out and foul link saddle, preventing link block from passing to back position; one injured.

May 18, 1939, locomotive 8240, Newton Falls, Ohio. Cab deck apron badly worn; one injured.

**May 26, 1939, locomotive 2833, Landisville, Pa. Fireman's hand injured by splinter from defective handle of firing shovel; one injured.

May 27, 1939, locomotive 6950, Newcomerstown, Ohio. Packing nut became disengaged from squirt hose valve, due to not being securely tightened; one injured.

Thirteen accidents; 3 killed, 11 injured.

PERE MARQUETTE RAILWAY:

**March 20, 1939, locomotive 906, Chicago, Ill. Piece of wood which was fastened to upper side of metal step at gangway broke off, causing employee to slip and fall to the ground; one injured.

One accident; one injured.

PITTSBURGH & LAKE ERIE RAILROAD:

**June 12, 1939, locomotive 8001, McKeesport, Pa. Insufficient clearance between cab vertical handhold and corner of tender deck while on a sharp curve; one injured.

One accident; one injured.

PITTSBURGH & WEST VIRGINIA RAILWAY:

*July 29, 1938, locomotive 1103, Bowest, Pa. Grate shaker bar slipped off post, due to being cracked; one injured.

**August 11, 1938, locomotive 1002, Pittsburgh Junction, Ohio. Squirt hose valve worked open; one injured.

Two accidents; two injured.

READING COMPANY:

November 26, 1938, locomotive 1078, Boyertown, Pa. Steam spindle stuffing box blew out of injector body, due to bonnet threads being a very poor fit in threads of injector body; one injured.

One accident; one injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

August 5, 1938, locomotive 182, Tenile, Fla. Main driving axle broke, due to old fracture which extended through practically the entire cross-sectional area; one injured.

November 4, 1938, locomotive 4026, Harvard, Ark. Stoker inoperative account of a piece of metal in coal supply having lodged in stoker elevator; one injured.

Two accidents; two injured.

SEABOARD AIR LINE RAILWAY:

*December 2, 1938, locomotive 827, West Frostproof, Fla. Locomotive failed while on the road, necessitating the removal of the rods and placing the locomotive on one side before it could be moved; one injured.

One accident; one injured.

SOUTHERN RAILWAY:

August 26, 1938, locomotive 340, New Bridge, N. C. Radial stay broke at wrapper sheet and blew out of firebox crown sheet; no thread engagement in stay hole in crown sheet; one injured.

December 6, 1938, locomotive 5214, Bull's Gap, Tenn. Fire tube broke off at back flue sheet; thickness of tube reduced to one-thirty-second inch at point of failure due to the excessive use of expander and to corrosion between tube and the copper ferrule; one injured.

**January 5, 1939, locomotive 5023, Asheville, N. C. Sanders inoperative, account of wet sand in sand traps; "Clean out sand traps" was reported 15 times in the 21 days preceding the accident; one injured.

January 17, 1939, locomotive 8339, Worth, Ga. Crosshead arm failed due to old fracture which extended approximately 70 percent of its cross-sectional area; arm improperly machined where reduced in thickness, leaving a square corner from which point the fracture started; one injured.

April 27, 1939, locomotive 70, Glendon, Ala. Main driving axle broke through old fracture which started at keyway and extended over approximately 65 percent of cross-sectional area; three injured.

June 9, 1939, locomotive 1106, near Camden, S. C. Main driving axle broke just inside right wheel fit, due to old fracture which extended about 75 percent of cross-sectional area; one injured.

Six accidents; eight injured.

SOUTHERN PACIFIC—LINES EAST:

August 31, 1938, locomotive (T. & N. O.) 626, Valentine, Tex. Fire tube broke off at safe end weld near back flue sheet; overheated in welding. Large opening in adjustable baffle type fire door permitted steam and hot water to escape into the cab freely; one injured.

One accident; one injured.

SOUTHERN PACIFIC—LINES WEST:

**July 10, 1938, locomotive 3208, San Jose, Calif. Injured while attempting to adjust damper; damper had broken completely off its hinges and was hanging on the adjusting chain; one injured.

November 1, 1938, locomotive 4319, between Douglas, Ariz. and El Paso, Tex. Anchor bolts for securing sand box to tender tank were rusted and worn, permitting sand to leak out of sand box around the worn bolts; one injured.

December 20, 1938, locomotive 1409, Roseville, Calif. Left front driving spring hangers broke, due to old fracture in each hanger; one injured.

January 11, 1939, locomotive 4345, Sacramento, Calif. Broken rigid crown stay blew out of firebox sheet when attempt was made to calk the stay while boiler was under pressure; threads on stay badly deteriorated; one killed.

June 15, 1939, locomotive 3705, Alamogordo, N. Mex. Ashpan hopper stuck in closed position; injured while attempting to force it open; one injured.

Five accidents; one killed, four injured.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS:

**July 26, 1938, locomotive 129, St. Louis, Mo. Shaker bar slipped off grate shaker post, due to improper fit; one injured.

**April 18, 1939, locomotive 309, St. Louis, Mo. Bell stuck in inverted position; one injured.

Two accidents; two injured.

UNION PACIFIC RAILROAD:

February 15, 1939, locomotive (O. S. L.) 2521, Hood River, Oreg. Explosion in firebox burned employee who was removing carbon from firebox wall; explosion resulted from an accumulation of oil in firebox becoming ignited by hot brick in fire pan; stop pin missing from firing-valve quadrant, permitting firing valve to be accidentally opened; burner out of line, causing carbon deposit to form on firebox wall; burner reported on January 6, 14, 16, 27, and February 2 and 5, and firebox reported for cleaning 32 times since January 1; one injured.

February 22, 1939, locomotive (O. W. R. & N.) 5405, near Lund, Utah. Water column steam pipe collar at boiler connection broke; metal at point of failure was very porous and collar was not properly brazed to steam pipe; collar was not company's standard; steam pipe was so designed that its contraction and expansion exerted unnecessary strain on its collars; one injured.

April 20, 1939, locomotive 3925, Hanna, Wyo. Shaker bar slipped off grate lever; shaker bar badly battered on end, preventing proper fit on lever; one injured.

June 28, 1939, locomotive (L. A. & S. L.) 2727, Caliente, Nev. Air compressor drain valve broke off at pump cylinder; drain pipe improperly applied; one injured.

Four accidents; four injured.

WESTERN PACIFIC RAILROAD:

*November 29, 1938, locomotive 45, Blinzig, Calif. Reverse lever difficult to operate account of mechanical lubricator not providing thorough lubrication; one injured.

One accident; one injured.

WHEELING & LAKE ERIE RAILWAY:

*September 24, 1938, locomotive 4309, Clarkson, Ohio. Broken flange on right front tender wheel caused derailment of tender; 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, 1939, 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. A complete investigation, 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.]

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

December 29, 1938, unit 5801, Chicago, Ill. Stem of intake valve of engine of gas-electric unit broke; back flow of gas ignited the gasoline in the carburetor; one injured.

One accident; one injured.

GREAT NORTHERN RAILWAY:

*November 9, 1938, unit 5016, Skykomish, Wash. Air hose burst; one injured.

One accident; one injured.

ILLINOIS TERMINAL RAILROAD:

February 11, 1939, unit 1586, Decatur, Ill. Air compressor circuit contactor grounded to lightning arrester cabinet bracket and cap blew off auxiliary circuit fuse; crimping which held cap to body of auxiliary fuse was too weak to hold cap on when the fusible material melted; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

March 25, 1939, unit 4819, Perryville, Md. Cab door fouled on improperly applied stud for securing cover plate which enclosed the tap switch compartment; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

**September 6, 1938, unit (L. A. & S. L.) E-100, Glendale, Calif. Fuse to air compressor governor blew out; 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 River & Indiana	Chicago, Rock Island & Pacific	Chicago, St. Paul, Minneapolis & Omaha	Chicago, West Pullman & Southern	Cincinnati Union Terminal	Clinchfield	Colorado & Southern	Colorado & Wyoming	Columbus & Greenville	Conemaugh & Black Lick	Copper Range	Cumberland & Pennsylvania	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western
1 Air compressors	2	54	13			1	2							17	2
2 Arch tubes															
3 Ashpans and mechanism		7													
4 Axles															
5 Blow-off cocks		28	3											4	
6 Boiler checks		20													
7 Boiler shell		9	2				1	1						6	5
8 Brake equipment		131	11				1	1	1	1				18	5
9 Cabs, cab windows, and curtains		84	63			2	1	1	1				3	27	5
10 Cab aprons and decks	1	18	2			1								2	
11 Cab cards		5													
12 Coupling and uncoupling devices							1								
13 Crossheads, guides, pistons, and piston rods	1	55	1			9	1	2						18	8
14 Crown bolts		2		1											
15 Cylinders, saddles, and steam chests		96	13			2	1					8		47	8
16 Cylinder cocks and rigging		32	21			5								8	8
17 Domes and dome caps		3				1								5	
18 Draft gear	2	34	5	2		1	1	1				2		6	
19 Draw gear		23	3			2	1	2				1		6	1
20 Driving boxes, shoes, wedges, pedestals, and braces		96		1		7	7	5				1		23	8
21 Firebox sheets		22	2	1		1	1							1	
22 Flues		5				1								1	
23 Frames, tail pieces, and braces, locomotive		52	5			2	5					2		21	3
24 Frames, tender		1				2								2	
25 Gages and gage fittings, air		9	1			1								3	
26 Gages and gage fittings, steam		17				1	10							1	
27 Gage cocks		22	7			1	1	1						1	
28 Grate shakers and fire doors		21	4			1								4	1
29 Handholds		26	8			1				1				4	
30 Injectors, inoperative		2													
31 Injectors and connections	1	99	13	1		3	5	5				2		33	5
32 Inspections and tests not made as required		381	106			11	16	2		2		3	19	120	29
33 Lateral motion		19	1											4	2
34 Lights, cab and classification		3				1	1								
35 Lights, headlight		10	2											7	3
36 Lubricators and shields		30	2			1								1	2
37 Mud rings		14	4			1								3	
38 Packing nuts		25	6			6	3							6	2
39 Packing, piston rod and valve stem		32	39			6	1	2				4		34	
40 Pilots and pilot beams		10													1
41 Plugs and studs		7				2								1	
42 Reversing gear		27	8												
43 Rods, main and side, crank pins, and collars		61	4			12	3	2				4		18	12
44 Safety valves		12													3
45 Sanders		44	1			1	3	1						25	5
46 Springs and spring rigging		142	26			17	5	3	1			10		52	3
47 Squirt hose		11	1			1								4	
48 Stay bolts		8	1											6	
49 Stay bolts, broken		2												2	
50 Steam pipes		15												10	1
51 Steam valves		9	3			1								1	
52 Steps		30	11			2		2						11	1
53 Tanks and tank valves		84	14			2	1	1				3		21	1
54 Telltale holes		1	1												
55 Throttle and throttle rigging	1	53	14			7	1	1				1		22	1
56 Trucks, engine and trailing		51	5			7		3						13	1
57 Trucks, tender		32	15			3	6	2						16	17
58 Valve motion		42				14	2					2		1	3
59 Washout plugs		18	12											24	6
60 Train-control equipment														1	
61 Water glasses, fittings, and shields		58	8			2		1	1					5	2
62 Wheels		24	2			2								11	
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)		65	9			2	4							10	6
Number of defects	8	2,293	472	5		119	98	21	26	6		17	52	686	156
Locomotives reported	43	983	266	12	12	85	102	21	26	27	11	11	366	436	349
Locomotives inspected	51	3,108	771	22	18	183	366	47	40	25	23	14	821	1,079	989
Locomotives defective	4	501	124	3		29	26	5	17	4		4	20	170	36
Percentage of inspected found defective	8	16	16	14		16	7	11	42	16		29	2.4	16	3.6
Locomotives ordered out of service	40	6				2	1	1						11	3

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

Denver & Salt Lake	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 Smith & Western	Fort Worth & Denver City	Georgia & Florida	Georgia	Grand Trunk Western	Great Northern	Green Bay & Western	Gulf Coast Lines	Gulf, Colorado & Santa Fe	Gulf, Mobile & Northern	High Point, Thomasville & Denton	Houston Belt & Terminal	Huntingdon & Broad Top Mountain		
1					3	1			7			1	1			17	1		4					1	
2									1																2
3									2																6
4									7																7
5									4																6
6									1																7
7									4																6
8									1																7
9									1																6
10									40																8
11									11																9
12									3																8
13									7																9
14									3																10
15									1																11
16									9																10
17									3																11
18									6																11
19									4																10
20									1																11
21									6																11
22									4																20
23									1																21
24									11																22
25									3																23
26									1																24
27									5																25
28									6																26
29									7																27
30									1																28
31									19																29
32									24																30
33									93																32
34									3																33
35									1																33
36									4																34
37									1																35
38									12																36
39									1																37
40									12																38
41									7																39
42									3																40
43									3																41
44									15																42
45									1																43
46									4</																

TABLE XII.—Number of steam locomotives inspected

Parts defective, inoperative or missing, or in violation of the rules	South Buffalo	Southern Pacific, lines east	Southern Pacific, lines west	Southern Pacific of Mexico	Southern	Spokane International	Spokane, Portland & Seattle	Steelton & Highspire	Tennessee, Alabama & Georgia	Tennessee Central	Tennessee Coal, Iron & R. R.
	1 Air compressors			15		5		1			2
2 Arch tubes					1					2	
3 Ashpans and mechanism											
4 Axles											
5 Blow-off cocks			2		1					1	
6 Boiler checks	2	6			5					1	
7 Boiler shell	1	15			1						
8 Brake equipment	4	27	4		38		3			7	
9 Cabs, cab windows, and curtains		11			8		1	1		1	
10 Cab aprons and decks		7	2		2						
11 Cab cards		2	2		2						
12 Coupling and uncoupling devices		3			1						
13 Crossheads, guides, pistons, and piston rods	1	20			21					5	
14 Crown bolts		6	1		1						
15 Cylinders, saddles, and steam chests		28	1		44		1			6	
16 Cylinder cocks and rigging	2	2			9					2	
17 Domes and dome caps		1								1	
18 Draft gear		20			3					3	
19 Draw gear		10	3		6		1			3	
20 Driving boxes, shoes, wedges, pedestals, and braces	3	59	1		42		2			5	
21 Firebox sheets	1	14	3		7		1			2	
22 Flues		5	1		9					2	
23 Frames, tail pieces, and braces, locomotives	2	14			23		4		1	5	
24 Frames, tender		2			3						
25 Gages and gage fittings, air		2			2						
26 Gages and gage fittings, steam	3	5			5					1	
27 Gage cocks		15			3					1	
28 Grate shakers and fire doors		2								1	
29 Handholds	1	7	1		4		2			1	
30 Injectors, inoperative		3								3	
31 Injectors and connections	6	68			17					7	
32 Inspections and tests not made as required	16	242	3		62	1	15	8	1	7	
33 Lateral motion	1	10			5					9	
34 Lights, cab and classification											
35 Lights, headlight		6			2						
36 Lubricators and shields	1	4			1		1			2	
37 Mud rings		9			4					2	
38 Packing nuts		18			2					2	
39 Packing, piston rod and valve stem		4			24					3	
40 Pilots and pilot beams		1			1						
41 Plugs and studs		2			3						
42 Reversing gear		4			4						
43 Rods, main and side, crank pins, and collars		35			29					10	
44 Safety valves		1			4						
45 Sanders		2									
46 Springs and spring rigging	3	49	1		47	1	6			8	1
47 Squirt hose		2			1						
48 Stay bolts		6			4		1			1	
49 Stay bolts, broken		6	5								
50 Steam pipes		2			5					2	
51 Steam valves		2			6						
52 Steps		4			8					2	
53 Tanks and tank valves		11	5		15					5	
54 Telltale holes	2	1	1		1					2	
55 Throttle and throttling rigging	2	3			10			1		3	
56 Trucks, engine and trailing		2	1		20					2	
57 Trucks, tender		17			2		3			1	6
58 Valve motion	3	3			21				1	7	
59 Washout plugs		12			10					6	
60 Train-control equipment											
61 Water glasses, fittings, and shields	1	3	16		14		2			3	
62 Wheels		1	37		1					1	
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)		1	9	2	5		1			1	
Number of defects	1	65	900	40	579	2	44	6	3	136	7
Locomotives reported	33	479	1,385	26	1,602	10	100	13	10	33	52
Locomotives inspected	25	984	3,056	8	3,645	20	237	28	23	135	11
Locomotives defective	1	18	302	7	187	1	17	3	2	35	1
Percentage of inspected found defective	4	1.8	10	87	5	5	7	11	9	26	9
Locomotives ordered out of service		2	10	4	9					5	

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

Terminal R. R. Association of St. Louis	Texas & Pacific	Texas-Mexican	Texas Pacific-Missouri Pacific Terminal of New Orleans	Toledo, Peoria & Western	Toledo Terminal	Toronto, Hamilton & Buffalo	Union Pacific	Union	Upper Merion & Flymouth	Utah	Virginian	Wabash	Washington Terminal	Western Maryland	Western Pacific	Wheeling & Lake Erie	Wrightsville & Tennille	Roads with less than 10, and industrial locomotives	Total defects								
							19		1		2		2					44	518								
							1												28								
							3												6								
							4												16								
							13		2										279								
							11		1										15								
							53		1		10	2	1						150								
							34		3		3								105								
							9		1		3		1						25								
							1												30								
							1												60								
							3	2			1								18								
							1				6		1		2				59								
							78				51		3						4								
							9		1		1								89								
							4												3								
							19				3								73								
							13		1		5				1	2			46								
							82				21								64								
							5					1							21								
							5												43								
							65				4								42								
							3												6								
							11				1								23								
							15				1								18								
							12		1				1						41								
							8		3				4						16								
							16				2		1						61								
							1												2								
							66		6		9	1	3	3		1	7	2	136								
							43	5	3		57	2	8	15	11	20			520								
							12				9								28								
							5												5								
							11				2		1						29								
							10												7								
							10												20								
							48		2				3						110								
							8												15								
							8												4								
							8												16								
							8												16								
							5	3			16		2	5					163								
							13				1								2								
							24				1		1						23								
							101		1		32	1		3	1	4	4		170								
							4												7								
							6				3								15								
							6												144								
							6				4								11								
							21		2		3								5								
							38				5								80								
							1												65								
							20												48								
							30		5				3						51								
							20												11								
							28		2										38								
							15				9								67								
							7												4								
							1												33								
							22												2								
							1												33								
							20												75								
							9												67								
							1												4								
							22												24								
							1,457				324	9	39	47	30	70	11	3,200	33,490								
							113	315	17		12	20	20	14	1,454	125	10	16	103	447	21	225	168	180	10	1,834	45,965

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

Road	Percentage inspected defective							Ordered out of service						
	1939	1938	1931	1929	1927	1925	1923	1939	1938	1931	1929	1927	1925	1923
Akron, Canton & Youngstown	1.6	3.2	14	47	42	56	38	0	0	1	12	1	5	0
Aliquippa & Southern	4.8	9	0	31	26	69	0	0	0	0	0	0	0	0
Alton & Southern	20	28						1	1					
Alton	6	4.9	0	3	14	35	75	2	2	0	3	5	9	29
Ann Arbor	1	1.6	0	9	25	71	97	0	0	0	0	2	15	24
Atchison, Topeka & Santa Fe	12	10	8	14	24	32	49	2	11	9	14	40	30	84
Atlanta & St. Andrews Bay	2.9	17						0	0					
Atlanta & West Point	0	3.8	4	6	9	23	27	0	0	0	0	1	4	1
Atlanta, Birmingham & Coast ¹	4.1	2.7	4.3	27	40	54	78	0	1	0	2	8	12	6
Atlantic & North Carolina	20	10						0	0					
Atlantic & Yadkin	0	8	6	10	16	100		0	1	0	1	0	0	
Atlantic Coast Line	10	17	14	10	30	35	58	8	42	7	2	4	15	45
Baltimore & Ohio, lines east ²	9	11	4.1	15	30	52	62	13	19	3	10	32	113	153
Baltimore & Ohio, lines west ³	7	9	4.7	17	49			13	7	8	17	72		
Bangor & Aroostook	4.5	9	5	31	43	28	50	0	1	1	1	3	1	6
Belt Railway of Chicago	19	28	4	35	54	51	66	0	2	0	4	5	4	6
Bessemer & Lako Erie	10	11	12	22	21	63	43	2	1	1	6	1	1	2
Boston & Maine	10	8	13	16	23	36	67	2	2	6	3	13	23	191
Buffalo Creek	15	36	0	0	18	0	0	0	0	0	0	0	0	0
Camas Prairie	5	17	47	16				0	0	0	0	0	0	0
Canadian National ⁴	13	18	37	34	50	50	84	2	4	5	7	30	24	4
Canadian Pacific	9	12	25	32	44	56	76	0	0	2	1	4	0	5
Carolina & Northwestern	0	0						0	0					
Central of Georgia	10	13	20	19	30	37	33	2	5	10	5	10	8	10
Central Railroad of New Jersey	9	10	13	42	38	47	77	2	0	2	14	20	46	139
Central Vermont	8	5	11	12	11	27	47	1	1	1	1	1	2	4
Charlotte & Western Carolina	12	22	16	28	58	63	68	0	1	1	2	2	2	1
Chesapeake & Ohio ⁵	3.4	5	9	17	28	49	68	3	5	5	5	26	29	58
Chicago & Eastern Illinois	6	5	12	28	38	64	75	1	1	3	3	25	31	77
Chicago & Illinois Midland	0	11	0	14	83			0	0	0	0	29		
Chicago & North Western	13	14	7	12	19	35	67	13	16	5	8	18	29	193
Chicago & Western Indiana	28	4	6	25	43	22	86	67	0	0	3	0	2	0
Chicago, Burlington & Quincy	4.7	6	6	14	21	46	60	4	7	4	18	39	185	176
Chicago Great Western	22	33	26	11	20	40	52	4	20	23	2	0	10	20
Chicago, Indianapolis & Louisville	6	3.8	11	26	29	45	57	2	0	1	2	14	7	13
Chicago, Milwaukee, St. Paul & Pacific	6	8	4	5	9	13	27	48	3	5	2	5	9	12
Chicago River & Indiana	8	19	0	5	0	70	62	0	0	0	0	0	0	5
Chicago, Rock Island & Pacific	16	20	11	17	29	55	76	40	48	17	13	49	124	367
Chicago, St. Paul, Minneapolis & Omaha	16	14	9	17	30	46	70	6	9	2	6	12	20	54
Chicago, West Pullman & Southern	14	14	7	47	53	100	58	0	1	0	5	1	7	0
Cincinnati Union Terminal	0	0						0	0					
Clinchfield	16	22	9	38	25	76	63	2	6	1	5	0	1	10
Colorado & Southern	7	8	8	43	40	76	81	1	2	2	10	4	52	71
Colorado & Wyoming	11	0	0	21	27	15	14	0	0	0	1	3	2	0
Columbus & Greenville	42	32	17	25	21	26	44	1	0	1	0	0	0	0
Conemaugh & Black Lick	16	12	16	58	0	0	0	0	0	0	2	0	0	0
Copper Range	0	7	18	28	84	59	75	0	0	1	1	7	7	0
Cumberland & Pennsylvania	29	20	12	29	13	20	25	0	0	0	1	0	0	0
Delaware & Hudson	2.4	2.3	2.7	2.6	9	24	62	0	0	0	0	1	2	52
Delaware, Lackawanna & Western	16	19	11	21	22	36	62	11	8	3	17	4	3	47
Denver & Rio Grande Western	3.6	8	10	36	54	58	92	3	6	7	32	88	72	174
Denver & Salt Lake	3.5	0	0	19	44	68	93	0	0	0	2	7	39	8
Detroit & Mackinac	39	19	41	33	36	82	26	0	0	0	0	0	2	0
Detroit & Toledo Shore Line	2.1	0	0	8	33	51	78	0	0	0	0	1	5	3
Detroit Terminal	21	3	18	31	46	72	76	2	0	0	1	0	7	0
Detroit, Toledo & Ironton	4.6	3	3.8	5	15	28	29	0	0	0	0	3	4	7
Donora Southern	28	22	5	0	0	0	0	0	0	0	0	0	0	0
Duluth, Missabe & Iron Range	4.4	2.7	4.2	1	12	37	74	0	0	0	0	0	1	2
Duluth, South Shore & Atlantic	9	9	10	24	29	35	69	0	0	1	4	2	5	3
Elgin, Joliet & Eastern	8	4.3	7	4.7	13	68	50	1	0	0	0	1	58	1
Erie	6	8	13	45	30	39	70	6	15	17	137	41	26	100
Florida East Coast	11	17	1.4	7	21	22	22	0	1	0	0	0	0	0
Fort Smith & Western	19	26	71	49	60	62	87	1	0	29	5	5	2	2
Fort Worth & Denver City	9	11	5	13	23	36	27	1	3	2	2	3	8	4
Georgia & Florida	14	23	57	47	55	62	46	3	5	5	2	2	3	1
Georgia	1.3	2.2	1.1	1.1	12	34	28	0	0	0	3	0	2	5
Grand Trunk Western ⁶	15	22	8	31	33	46	76	17	26	5	42	27	31	262
Great Northern	3.8	3.3	7	28				0	0	0	0	0	0	0
Green Bay & Western	10	7	13	45	47	67	59	0	0	2	1	1	9	0

¹ Atlanta, Birmingham & Atlantic prior to 1927.
² Includes Buffalo & Susquehanna and Buffalo, Rochester & Pittsburgh, 1933-39.
³ Statistics prior to 1927 included in Baltimore & Ohio, lines east.
⁴ Includes Grand Trunk Western, 1925-27.
⁵ Includes former Hocking Valley, 1931-39.
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

Road	Percentage inspected defective							Ordered out of service						
	1939	1938	1931	1929	1927	1925	1923	1939	1938	1931	1929	1927	1925	1923
Gulf Coast Lines	2.3	2.4	1	7	58	59	70	0	1	0	0	15	26	7
Gulf, Colorado & Santa Fe ⁷	10	14	7	19	47	45		2	3	3	6	31	32	
Gulf, Mobile & Northern ⁸	8	18	18	22	23	38	62	0	1	0	1	2	7	6
High Point, Thomasville & Denton	0							0	0					
Houston Belt & Terminal	1.3	0	1.4	8				0	0	0	0			
Huntingdon & Broad Top Mountain	14	4.5	0	36	44	78	67	0	0	0	3	4	0	0
Illinois Central ⁹	5	8	12	10	14	30	43	7	10	22	14	35	30	48
Illinois Terminal	2.9	0	32	29	40	12		0	0	4	1	0	0	
Indiana Harbor Belt	9	8	0	1	14	52	68	1	0	0	0	0	18	4
Indianapolis Union	0	0	14	13	30	26	36	0	0	1	0	4	0	2
International-Great Northern	2.4	6	7	5	27	29	66	1	3	1	0	11	9	16
Interstate	33	26	42	60	83	94	78	2	2	1	4	6	6	3
Jacksonville Terminal	0	0	0	50	0	0	0	0	0	0	0	0	0	0
Kansas City Southern	9	7	1.9	8	26	52	92	3	3	0	1	12	11	121
Kansas City Terminal	25	24	0	24	24	80	88	1	0	0	0	0	2	3
Kansas, Oklahoma & Gulf	0	4.9	1.3	1	43	50		0	0	0	1	1	0	0
Kentucky & Indiana Terminal	0	14	3.7	8	6	0	79	0	0	0	0	1	0	10
Lake Superior & Ishpeming	5	3.6	17	52	39	46	59	0	0	1	7	1	2	3
Lake Superior Terminal & Transfer	10	7	0	10	21	44	67	0	0	0	0	0	1	2
Lake Terminal	9	9	10	56	20	50	0	0	0	1	1	0	0	0
Lehigh & Hudson River	15	35	14	25	20	14	60	0	0	0	1	0	1	0
Lehigh & New England	13	10	12	21	26	65	70	1	0	0	4	2	5	10
Lehigh Valley	8	8	10	39	26	36	71	4	2	8	42	14	26	219
Long Island	4.7	3.7	10	59	48	35	66	0	0	0	2	3	1	10
Louisiana & Arkansas	2.3	3.3	15	55				0	0	1	3			
Louisiana & North West	0	0	17	50				36	75	0	0	0	2	8
Louisiana, Arkansas & Texas	10	11	26					0	0	2				
Louisville & Nashville	5	7	9	33	41	57	68	6	9	6	32	54	94	136
McCloud River	0	0	0	29	25	63	46	0	0	0	0	0	0	0
McKeesport Connecting	0	0	0					0	0					
Macon, Dublin & Savannah	29	43	9	24	56	64	60	1	4	0	0	10	0	0
Maine Central ¹⁰	9	9	12	27	42	41	68	1	1	4	1	6	14	15
Manufacturers Railway	17	14						0	1					
Maryland & Pennsylvania	7	11	24	42	50	85	58	0	0	0	3	3	4	4
Midland Terminal	4.3							0	0					
Midland Valley	7	0	0	1	42	40	72	0	0	0	0	1	2	0
Minneapolis & St. Louis	12	17	7	9	17	35	57	5	3	2	1	7	6	49
Minneapolis, Northfield & Southern	23	19	12	25				0	0	0	0	0	0	0
Minneapolis, St. Paul & S. S. Marie	5	5	6	14	13	25	60	2	1	0	5	2	4	14
Minnesota Transfer	14	1.5	31	32	7	67	97	0	0	1	0	8	1	35
Mississippi Central	3	0												

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						
	1939	1938	1931	1929	1927	1925	1923	1939	1938	1931	1929	1927	1925	1923
Peoria & Pekin Union	0	11	40	14	23	31	54	0	0	0	0	0	1	1
Pere Marquette	4.5	3.2	12	21	38	57	83	0	0	3	8	14	21	68
Philadelphia, Bethlehem & New England	35	29	21	65	74	76	67	0	4	1	16	14	2	2
Pittsburgh & Lake Erie	7	12	1.9	6	12	10	27	0	2	0	0	0	0	10
Pittsburg & Shawmut	6	4	4	4	0	47	52	1	0	0	0	0	0	2
Pittsburgh & West Virginia	10	17	32	57	39	0	33	1	2	4	30	8	0	0
Pittsburg, Shawmut & Northern	0	6	3.6	8	25	53	86	0	1	0	1	2	0	0
Quebec Central	37	50	0	100				0	0	0	0			
Reading	8	7	13	33	42	48	59	3	2	5	31	22	26	12
Richmond, Fredericksburg & Potomac	18	19	14	18	30	43	58	2	1	0	1	1	2	3
River Terminal	68	50	0	71	43	70	0	4	2	0	5	1	0	0
Rutland	10	8	6	6	12	44	54	0	0	0	0	1	3	1
St. Louis-San Francisco	2.8	3.4	3.9	14	22	49	88	0	3	1	7	12	65	346
St. Louis Southwestern	10	9	8	4.3	22	47	86	3	3	4	2	22	14	54
San Diego & Arizona Eastern	11	13	13	38	30	55	44	0	0	2	4	3	0	1
Savannah & Atlanta	5	19	19	80	67	73	68	0	0	0	0	0	2	3
Seaboard Air Line	2.4	6	9	37	56	51	55	1	11	2	24	43	33	23
South Buffalo	4	27	39	23	29	75	0	0	1	8	0	1	0	0
Southern Pacific, lines east	1.8	1.7	3.3	5	13	30	47	2	1	1	3	10	37	28
Southern Pacific, lines west	10	15	11	24	27	33	38	10	10	13	47	50	51	24
Southern Pacific of Mexico	87	100	0	30	100	100		4	11	0	2	3	1	
Southern	5	9	9	12	24	36	59	9	20	15	13	38	56	177
Spokane International	5	8	9	13	28	0	37	0	0	0	0	0	0	2
Spokane, Portland & Seattle	7	17	22	22	33	32	60	0	1	1	1	2	4	13
Steeleton & Highspire	11	23	19	24	48			0	0	1	0	2		
Tennessee, Alabama & Georgia	9							0						
Tennessee Central	26	25	14	47	65	74	89	5	7	0	14	40	23	63
Tennessee Coal, Iron & R. R.	9	15	7	38	67	40	50	0	0	0	0	0	0	0
Terminal Railroad Association of St. Louis	21	19	32	41	44	62	76	1	2	4	0	3	1	6
Texas & Pacific	1.4	1	0	1	12	16	62	1	0	0	1	3	1	91
Texas-Mexican	14	12	27	43	50	33	50	1	0	0	0	1	0	1
Texas Pacific-Missouri Pacific of New Orleans	4.5	14	0	4	10	57	83	0	0	0	0	0	2	0
Toledo, Peoria & Western	6	6	25	65	88	87	93	0	0	2	4	7	2	4
Toledo Terminal	0	0	5	45	35	3	41	0	0	0	0	0	0	3
Toronto, Hamilton & Buffalo	20	0	0	0	0			0	0	0	0	0		
Union Pacific ¹²	10	12	9	17	20	30	41	18	14	2	8	17	19	26
Union	0	9	11	9	29	80	10	0	0	1	2	0	0	2
Upper Merion & Plymouth	26	30	28	60	62			0	9	0	7	8		
Utah	0	0	0	11	4	26	19	0	0	0	0	0	0	0
Virginian	38	35	17	22	50	58	75	3	10	1	0	2	5	45
Wabash	4	.8	0	1.5	6	47	82	1	1	0	1	2	21	89
Washington Terminal	26	20	0	10	43	40	89	0	0	0	0	1	1	2
Western Maryland	2.7	3.9	13	26	42	54	76	0	0	1	3	13	22	90
Western Pacific	2.4	6	16	25	19	36	37	0	0	5	9	1	13	9
Wheeling & Lake Erie	6	13	8	42	55	67	74	1	4	1	7	10	20	31
Wrightsville & Tennessee	17	13						0	0					
Less than 10, discontinued roads, and industrial locomotives	23	23	32	40	51	56	86	98	244	395	719	804	615	
All roads	9	11	10	21	31	46	65	468	679	688	1,490	2,539	3,637	7,075

¹² Includes Los Angeles & Salt Lake, Oregon Short Line, Oregon-Washington Railroad & Navigation, and St. Joseph & Grand Island, last 6 months 1936-39.

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

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.

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