

INTERSTATE COMMERCE COMMISSION

TWENTY-SIXTH ANNUAL REPORT

OF THE

CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED

JUNE 30, 1937



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

OCTOBER 1, 1937.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Twenty-sixth Annual Report of the Chief Inspector, covering the work of the Bureau during the fiscal year ended June 30, 1937, 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.

In addition to the accidents shown in the tables and otherwise referred to in this report there was reported to the Bureau a total of 87 accidents in which 4 employees were killed and 83 employees injured in falls while in the performance of their duties on locomotives. None of these falls could be attributed to any features encountered in connection with the condition of locomotives, it being apparent in each instance that the falls were caused by inattention or sudden illness on the part of those killed and injured. These accidents do not come within the scope of the locomotive inspection law but are mentioned here in order to emphasize the necessity of alertness on the part of all persons employed on or about locomotives.

TABLE I.—Reports and inspections—Steam locomotives

	Year ended June 30—					
	1937	1936	1935	1934	1933	1932
Number of locomotives for which reports were filed.....	48,025	49,322	51,283	54,283	56,971	59,110
Number inspected.....	100,033	97,329	94,151	89,716	87,658	96,924
Number found defective.....	12,402	11,526	11,071	10,713	8,388	7,724
Percentage inspected found defective.....	12	12	12	12	10	8
Number ordered out of service.....	934	852	921	754	544	527
Total number of defects found.....	49,746	47,453	44,491	43,271	32,733	27,832

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

	Year ended June 30—					
	1937	1936	1935	1934	1933	1932
Number of accidents.....	263	209	201	192	157	145
Percent increase or decrease from previous year.....	125.8	14.0	14.7	122.3	18.3	36.9
Number of persons killed.....	25	16	29	7	8	9
Percent increase or decrease from previous year.....	152.2	44.8	314.3	12.5	11.1	43.7
Number of persons injured.....	283	215	267	223	256	156
Percent increase or decrease from previous year.....	131.6	19.5	19.7	12.9	64.1	42

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—							
	1937	1936	1935	1934	1933	1932	1915	1912
Number of accidents.....	63	75	68	63	53	43	424	856
Number of persons killed.....	19	10	24	4	3	8	13	91
Number of persons injured.....	73	80	119	77	55	46	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—									
	1937		1936		1935		1934		1933	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	3	106	4	75	7	65	1	57	2	58
Firemen.....	5	78	6	72	4	70	1	73	1	48
Brakemen.....	3	30	3	28	2	26	1	32		17
Conductors.....	1	18		13		10	1	17		10
Switchmen.....		10		2		3		6		8
Roundhouse and shop employees:										
Boiler makers.....	2	2				6				1
Machinists.....		2		4		3		5		2
Foremen.....				3		2				
Inspectors.....				2		1				
Watchmen.....				1		1		3		1
Boiler washers.....	1	1	1	1	1	1	1	4	2	3
Hostlers.....										
Other roundhouse and shop employees.....		9		3		3	1	5		1
Other employees.....	1	3		3		6		1		3
Nonemployees.....	4	14	2	5		14		4		2
Total.....	25	283	16	215	29	267	7	223	8	256

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

	Year ended June 30—				
	1937	1936	1935	1934	1933
Number of locomotive units for which reports were filed.....	2,416	2,361	1,911	1,288	1,349
Number inspected.....	3,615	3,118	1,620	1,436	1,368
Number found defective.....	328	252	146	69	74
Percentage inspected found defective.....	9	8	9	5	5
Number ordered out of service.....	24	11	5	4	4
Total number of defects found.....	991	674	447	158	176

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

	Year ended June 30—				
	1937	1936	1935	1934	1933
Number of accidents.....	12	9	8	1	2
Number of persons killed.....	14	9	8	1	2
Number of persons injured.....					

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

	Year ended June 30—									
	1937		1936		1935		1934		1933	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		7		7		3				2
Firemen.....						1				
Conductors.....		2				1				
Brakemen.....		2		1						
Roundhouse and shop employees:										
Inspectors.....										
Other roundhouse and shop employees.....						2		1		
Other employees.....				1						
Nonemployees.....		3				1				
Total.....		14		9		8		1		2

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—														
	1937			1936			1935			1934			1933		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs.....	3														
Aprons.....		3		1		1	1	1	1	1	1	1	1	1	1
Arch tubes.....				1		1	2	3	6						
Ashpan blowers.....				1		1									
Axles.....				1		1									
Blow-off cocks.....	2	2	1							2	2	2			
Boiler checks.....	2	2	2	4		3	3	20	1	1	1	1	1	1	1
Boiler explosions:	1	1	1	3		3	3	6	5	5	5	8	5	3	16
A. Shell explosions.....	1	4	2												
B. Crown sheet; low water; no contributory causes found.....	5	9	2	6	8	5	6	17	52	6	4	18	5	2	6
C. Crown sheet; low water; contributory causes or defects found.....															
D. Miscellaneous firebox failures.....	3	4	6	2		3	5	4	8	1		3			
Brakes and brake rigging.....	1		3	1		2	1	1	1						
Couplers.....	14		17	13		13	3	1	8	1		1			
Crank pins, collars, etc.....	6		11	8		11	6	7	7			10	5		5
Crossheads and guides.....	3	2	7	4		4	6	6	2	2	2	2	2	2	2
Cylinder cocks and rigging.....	3		2	1		2				2	2	2	3	3	3
Cylinder heads and steam chests.....	3		3							2	2	2	2	1	2
Dome caps.....	2		2				2	2	3	3	3	3	4		8
Draft appliances.....															
Draw gear.....	1		1			1		1	1	1	1	1	1	1	1
Fire doors, levers, etc.....	1		1			1		1	1	1	1	1	1	1	1
Flues.....	4		4	1		1	1	1	1	1	1	1	1	1	1
Flue pockets.....	4		4	5		7	1	1	1	1	1	1	1	1	1
Footboards.....			1	1		1	3	3	4	4	4	4	5	5	5
Gage cocks.....	2		2	3		3	6	6	3	3	3	2	2	2	2
Grease cups.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Grate shakers.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Handholds.....	6		6	7		7	4	4	4	4	4	1	1	1	1
Headlights and brackets.....	10		10	8		7	7	7	5	7	5	4	4	4	4
Injectors and connections (not including injector steam pipes).....	5		5	3		3	7	7	7	7	7	6	2	2	2
Injector steam pipes.....	4		5	4		4	1	2	1	1	1	1	4	4	4
Lubricators and connections.....	4		4	2		4	6	6	3	3	3	1	1	1	1
Lubricator glasses.....	4		4			1	1	1	1	1	1	1	1	1	1
Patch bolts.....															
Pistons and piston rods.....	3		3	1		1									
Plugs, arch tube and washout.....	1	2	1	1		2	1	2	2	2	2	2	2	2	2
Plugs in firebox sheets.....															
Reversing gear.....	34	1	33	19		19	17	2	2	2	2	2	2	2	2
Rivets.....															
Rods, main and side.....	5		5	4		4	1	1	1	1	1	1	1	1	1
Safety valves.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Sanders.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Side bearings.....	6		6	2		2	1	1	1	1	1	1	1	1	1
Springs and spring rigging.....	4		4	6		6	4	2	2	2	2	2	2	2	2
Squirt hose.....	5		5	4		4	12	12	9	10	10	4	1	1	1
Stay bolts.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Steam piping and blowers.....	6		6	7		7	1	1	1	1	1	1	1	1	1
Steam valves.....	4		4	3		3	1	1	1	1	1	1	1	1	1
Studs.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Superheater tubes.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Throttle glands.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Throttle leaking.....	1		1	1		1	1	1	1	1	1	1	1	1	1
Throttle rigging.....	5		5	1		1	1	1	1	1	1	1	1	1	1
Trucks, leading, trailing or tender.....	5		5	6		6	1	1	2	2	2	2	1	1	1
Valve gear, eccentrics and rods.....	5		5	5		5	5	2	2	2	2	2	4	4	4
Water glasses.....	5		5	17		17	8	8	11	11	11	11	11	11	11
Water-glass fittings.....	2		2	2		2	1	1	1	1	1	1	1	1	1
Wheels.....	2		2	5		5	4	4	4	4	4	4	4	4	4
Miscellaneous.....	65	1	65	46		46	2	2	2	2	2	2	1	1	1
Total.....	263	25	283	209	16	215	201	29	267	192	7	223	157	8	256

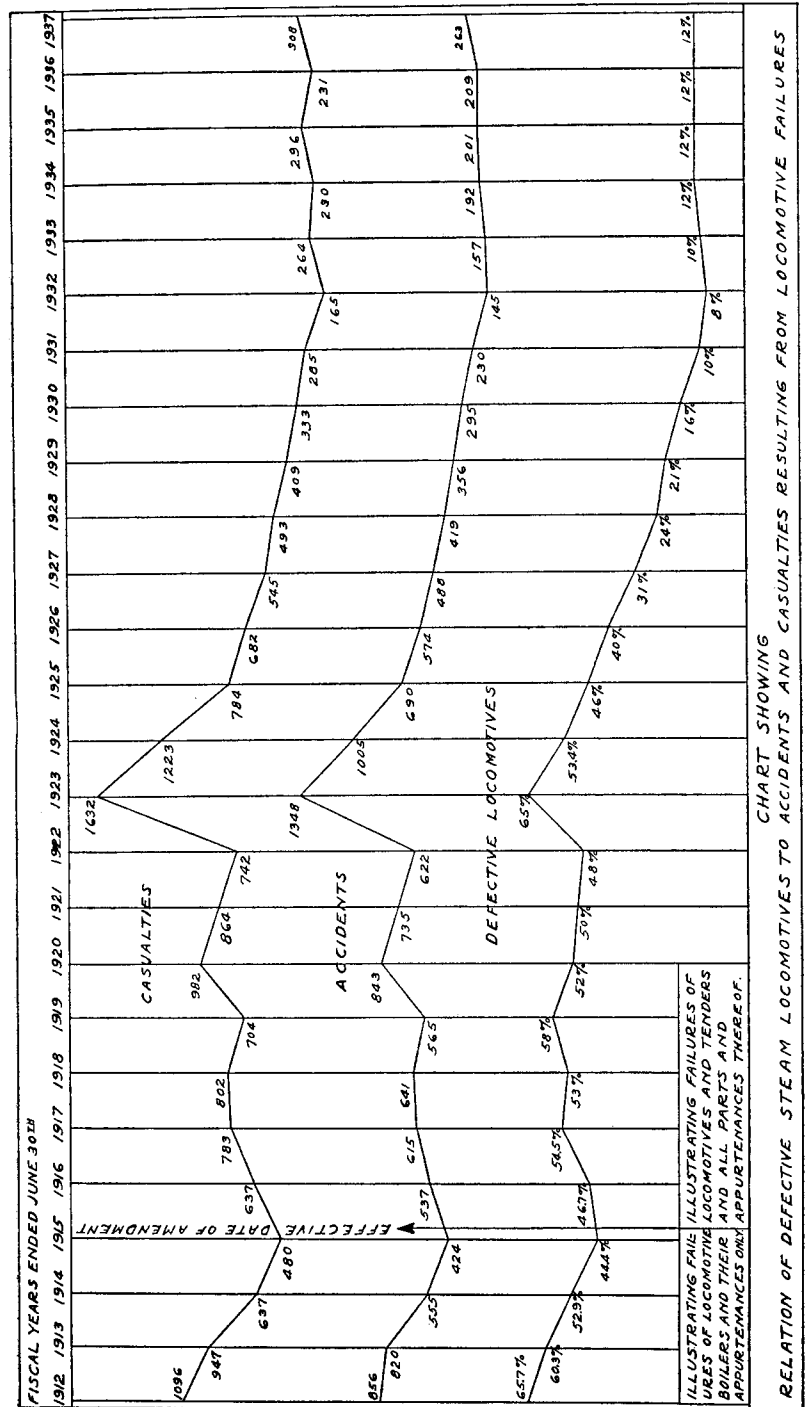


TABLE IX.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1937			1936			1935			1934			1933		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Carburetors.....	1		1												
Couplers.....	3		3	1		1	2		2						
Crank pins and connecting rods.....	1		1												
Fires, due to overflowing or leakage of fuel.....	1		1	4		4									1
Generators.....	1		1												
Insulation.....	2		2				1		1	1		1			
Pantagraphs and trolleys.....	2		2												
Short circuits.....	1		3	4		4	4		4						1
Miscellaneous.....	1		3	4		4	4		4						1
Total.....	12		14	9		9	8		8	1		1	2		2

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—					
	1937	1936	1935	1934	1933	1932
1. Air compressors.....	766	740	733	660	474	417
2. Arch tubes.....	105	74	74	127	51	54
3. Ashpans and mechanism.....	80	79	94	87	40	69
4. Axles.....	10	13	10	6	21	13
5. Blow-off cocks.....	201	236	283	289	210	144
6. Boiler checks.....	382	356	413	407	293	214
7. Boiler shell.....	347	383	396	372	296	220
8. Brake equipment.....	2,322	2,480	2,449	2,326	1,696	1,645
9. Cabs, cab windows, and curtains.....	1,807	1,638	1,273	1,342	1,183	851
10. Cab aprons and decks.....	466	450	368	343	309	262
11. Cab cards.....	145	166	142	129	121	162
12. Coupling and uncoupling devices.....	74	65	73	54	67	85
13. Crossheads, guides, pistons, and piston rods.....	1,180	1,056	1,086	1,100	773	763
14. Crown bolts.....	76	63	75	77	67	50
15. Cylinders, saddles, and steam chests.....	2,206	1,717	1,547	1,491	1,084	841
16. Cylinder cocks and rigging.....	729	605	627	654	374	376
17. Domes and dome caps.....	101	114	94	105	76	45
18. Draft gear.....	522	513	423	401	318	325
19. Draw gear.....	500	451	414	480	357	371
20. Driving boxes, shoes, wedges, pedestals, and braces.....	1,637	1,712	1,573	1,472	1,080	821
21. Firebox sheets.....	371	295	343	356	246	235
22. Flues.....	225	178	173	203	150	120
23. Frames, tail pieces, and braces, locomotive.....	1,053	997	1,006	951	669	611
24. Frames, tender.....	120	113	124	128	80	86
25. Gages and gage fittings, air.....	261	257	275	212	145	156
26. Gages and gage fittings, steam.....	324	350	320	289	258	214
27. Gage cocks.....	538	579	480	384	388	330
28. Grate shakers and fire doors.....	470	400	394	404	245	288
29. Handholds.....	510	502	464	377	363	382
30. Injectors, inoperative.....	38	40	39	33	20	31
31. Injectors and connections.....	2,020	2,085	2,035	1,909	1,357	1,168
32. Inspections and tests not made as required.....	9,638	9,005	8,344	8,173	6,358	3,801
33. Lateral motion.....	446	404	389	351	269	237
34. Lights, cab and classification.....	90	78	81	79	76	55
35. Lights, headlight.....	315	251	257	218	169	119
36. Lubricators and shields.....	254	235	191	215	157	119
37. Mud rings.....	272	237	241	247	232	166
38. Packing nuts.....	487	508	527	491	419	402
39. Packing, piston rod and valve stem.....	1,393	1,133	906	833	592	444
40. Pilots and pilot beams.....	133	178	152	174	123	145
41. Plugs and studs.....	238	236	167	242	151	176
42. Reversing gear.....	492	483	414	390	254	202
43. Rods, main and side, crank pins, and collars.....	2,348	2,093	1,826	1,670	1,327	1,256
44. Safety valves.....	132	125	100	108	53	63
45. Sanders.....	653	678	779	697	376	289

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—					
	1937	1936	1935	1934	1933	1932
46. Springs and spring rigging.....	3,172	3,008	2,765	2,854	2,122	1,851
47. Squirt hose.....	133	134	113	107	93	96
48. Stay bolts.....	276	279	240	285	219	181
49. Stay bolts, broken.....	542	520	512	455	368	552
50. Steam pipes.....	446	526	463	489	338	285
51. Steam valves.....	165	227	212	267	193	143
52. Steps.....	678	615	640	567	498	622
53. Tanks and tank valves.....	1,009	877	913	862	600	587
54. Telltale holes.....	79	127	102	93	90	108
55. Throttle and throttle rigging.....	909	760	733	639	448	434
56. Trucks, engine and trailing.....	785	861	811	898	664	648
57. Trucks, tender.....	1,018	1,108	1,120	918	747	766
58. Valve motion.....	798	824	799	784	640	520
59. Washout plugs.....	598	714	679	776	623	599
60. Train-control equipment.....	12	6	4	8	4	13
61. Water glasses, fittings, and shields.....	1,049	1,118	951	907	716	676
62. Wheels.....	803	790	697	734	580	603
63. Miscellaneous—Signal appliances, badge plates, brakes (hand).....	759	608	563	572	423	325
Total number of defects.....	49,746	47,453	44,491	43,271	32,733	27,832
Locomotives reported.....	48,025	49,322	51,283	54,283	56,971	59,110
Locomotives inspected.....	100,033	97,329	94,151	89,716	87,658	96,924
Locomotives defective.....	12,402	11,526	11,071	10,713	8,388	7,724
Percentage of inspected found defective.....	12	12	12	12	10	8
Locomotives ordered out of service.....	934	852	921	754	544	527

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—					
	1937	1936	1935	1934	1933	1932
Air compressors.....	6	2	5	3	2	3
Axles, truck or driving.....	4	6	1			
Batteries.....	4		7			
Boilers.....	5	5	3	1		
Brake equipment.....	97	66	46	15	16	13
Cabs or cab windows.....	51	30	33	9	14	6
Cab cards.....	25					
Cab floors, aprons, and deck plates.....	17	10	6	1	1	2
Controllers, relays, circuit breakers, magnet valves and switch groups.....	8			5		
Coupling and uncoupling devices.....	3					
Current-collecting apparatus.....	4	16	3	3	2	7
Draft gear.....	28	24	21	8	8	13
Draw gear.....	1	1				2
Driving boxes, shoes, and wedges.....	14	5	5	7		4
Frames or frame braces.....	5	15	4	6	2	
Fuel system.....	152	44	15	4	1	3
Gages or fittings, air.....	1	6	4		2	3
Gears and pinions.....	2			1		
Handholds.....	11	8	3			
Inspections or tests not made as required.....	237	186	124	52	58	23
Insulation and safety devices.....	13	20	15	2	2	2
Internal-combustion engine defects, parts and appliances.....	50	23	4	4	18	
Jack shafts.....		1			1	
Jumpers and cable connectors.....	2					
Lateral motion, wheels.....	1	2		3	1	2
Lights, cab and classification.....	5	6	1			4
Lights, headlight.....	11	4	2		3	1
Meters, volt and ampere.....	1	2				
Motors and generators.....	10	14	5	4	8	1
Pilots and pilot beams.....	7	6	5		4	
Plugs and studs.....	1					
Quills.....	3					
Rods, main, side, and drive shafts.....	23	2	10	4	2	
Sanders.....	52	25	21	2		
Springs and spring rigging, driving and truck.....	36	29	20	4	8	9

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—					
	1937	1936	1935	1934	1933	1932
Steam pipes.....	1	2				
Steps, footboards, etc.....	13					
Switches, hand-operated, and fuses.....	2	2				
Transformers, resistors, and rheostats.....			2	1	4	
Trucks.....			1	1		2
Water tanks.....	41	42	46	3	7	5
Water glasses, fittings, and shields.....	1					
Warning signal appliances.....		4	6			1
Wheels.....	2	1				
Miscellaneous.....	21	26	6	8	5	11
	20	39	25	7	7	9
Total defects.....	991	674	440	158	176	126
Locomotive units reported.....	2,416	2,361	1,911	1,288	1,349	1,274
Locomotive units inspected.....	3,615	3,118	1,620	1,436	1,368	1,411
Locomotive units defective.....	328	252	146	69	74	57
Percentage inspected found defective.....	9	8	9	5	5	4
Locomotive units ordered out of service.....	24	11	5	4	4	6

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. In our effort to bring about a diminution in the number of accidents copies of reports of our investigations were supplied to interested parties when requested and, because of circumstances involved in certain other accidents, reports were issued to all railroads and others concerned in connection with the following accidents resulting from failures of parts or appurtenances:

Front-end steam pipe. New York Central Railroad. Locomotive 5322, November 16, 1936.

Short circuit in starting contactor. Chicago & North Western Railway. Union Pacific Railroad unit M-10001, December 28, 1936.

Main crank pin. Grand Trunk Western Railway. Locomotive 6039, December 31, 1936.

Auxiliary dome. New York, New Haven & Hartford Railroad. Locomotive 438, January 11, 1937.

Shelled tender wheel tread. Chicago, Burlington & Quincy Railroad. Locomotive 7002, February 1, 1937.

Water-column steam pipe. Southern Pacific Co. Locomotive 4322, April 11, 1937.

STEAM LOCOMOTIVES

There was an increase of 54 in the number of accidents occurring in connection with steam locomotives, an increase of 9 in the number of persons killed, and an increase of 68 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 casu-

alties 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 12 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 percentage has remained the same during the past 4 years. There was an increase of 9.6 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

There was an increase of one in the number of accidents, an increase of nine in the number of persons killed, and an increase of three in the number of persons injured as a result of boiler explosions or crown-sheet accidents as compared with the previous year.

The foregoing includes four deaths and two injuries that occurred as a result of a derailment followed by an explosion when the locomotive fell from a trestle and alighted on a highway 96 feet below the level of the rails. The boiler was torn apart at the back-end connection seam and the cylindrical part of the boiler was hurled upward and forward; it struck the track 400 feet ahead of the point of explosion and rebounded and came to rest 350 feet further on, or a distance of 750 feet from the point where the explosion occurred. The back end of the boiler was blown backward 50 feet and parts of the locomotive and boiler were scattered over a radius of 1,000 feet.

In another explosion, caused by overheating of the crown sheet due to low water, the boiler was blown 323 feet forward and parts of the wreckage were scattered over a radius of 800 feet. This boiler was equipped with only one water glass, the top cock of which was found closed and the valve stem bent in such a manner as to indicate that it must have been closed prior to the explosion. Upon test on another locomotive one of the four safety valves did not open and when it was disassembled it was found that a piece of steel tubing had been substituted for the spring. A sworn report had been made at the last

quarterly inspection 38 days before the accident that showed all four safety valves had been properly set at that time.

Boiler and appurtenance accidents other than explosions resulted in the death of 2 persons and the injury of 60 persons.

EXTENSION OF TIME FOR REMOVAL OF FLUES

Six hundred and seventy-nine applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 50 of these cases the condition of the locomotives was such that extensions could not properly be granted. Forty-one were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Thirty-five extensions were granted after defects disclosed by our investigations were required to be repaired. Ten applications were canceled for various reasons. Five hundred and forty-three applications were granted for the full periods requested.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

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

During the year 9 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 8 percent in the previous year. There was an increase of 13 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, 295 specification cards and 6,746 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, 127 specifications and 184 alteration reports were filed for locomotive units and 181 specifications and 32 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

One appeal from a decision of an inspector, as provided in section 6 of the law, was made during the year. Subsequent investigation resulted in the decision of the inspector being sustained.

RECOMMENDATIONS

In accordance with the provisions of section 7 of the locomotive inspection act the following recommendations, with reasons therefor, are made for the betterment of the service:

1. All road steam locomotives should be equipped with a suitable water column to which shall be attached three gage cocks and one water glass with not less than 6 inches, preferably 8 inches, clear reading, and one additional water glass with not less than 6 inches, preferably 8 inches, clear reading, located on the left side or back head of the boiler. The water glasses to be so located, constructed, and maintained that they will register the approximate general water level in the boiler under all conditions of service and show a corresponding level within 1 inch and be so located, constructed, and maintained that the engineer and fireman may under all conditions of service have an easy and clear view of the water in the glass from their respective and proper positions in the cab. The gage cocks to be so located that they will be in easy reach of the engineer from his proper position in the cab while running the locomotive, extension handles to be applied if necessary to accomplish this.

All gage cocks to be supplied with suitable nipples that will direct their discharge into a properly located and constructed drain or dripper that will convey the discharging water to near the cab deck; nipples to be not less than $\frac{1}{2}$ inch nor more than 1 inch above the top of the dripper or drain and kept in correct alinement.

Gage cocks and water glasses are the only means of gaging the water level in the boiler and, since the two devices attached directly to a boiler do not show a corresponding level under operating conditions, it is clear that one or the other must be incorrect, therefore misleading.

Investigations made by this bureau clearly established the fact that gage cocks when applied directly in the boiler give incorrect indications of the water level under operating conditions. It is very important that at least two devices, attached separately to the boiler, be employed for the purpose of providing visual indications of the water level at all times so as to form a double check and so as to have one appliance in case of failure of the other while on the road and away from points where repairs can be made.

2. Cabs of all steam locomotives not equipped with front doors or windows of such size as to permit of easy exit should have a suitable stirrup or other step and a horizontal handhold on each side,

approximately the full length of the cab, which will enable the engine-men to go from the cab to the running board in front of it—handholds and steps or stirrups to be securely attached with bolts or rivets; the distance between the step and handhold to be not less than 60 inches nor more than 72 inches.

This recommendation is based on the results of investigations of accidents of a character which make it impossible for engine-men to remain in the cab and which compel them to make exit through the cab window to the ground or running board. While locomotives are operating at high speeds, to be compelled to jump from the cab window is exceedingly dangerous and almost invariably results in serious if not fatal injury.

The front doors or windows on modern locomotives are so small that they will not permit the engine-men to pass out through them, thus making it necessary to climb over the roof of the cab or out through the side window.

Recommendations 1 and 2 were made in previous annual reports. The larger railroads have generally recognized the value of these appliances but there are still many locomotives not equipped and installations are not progressing as fast as could be desired to obtain the maximum degree of safety; therefore the recommendations are respectfully renewed.

3. All steam locomotives should be equipped with a brake pipe valve, similar to the conductor's valve used in passenger train cars and caboose cars, at the rear of the cab or the front end of the tender to enable the brakes to be applied in the event the engine-men are, from any cause, prevented from applying the brakes in the usual manner.

Numerous accidents have occurred where, due to sudden failure of steam pipes or other causes, the cabs were immediately filled with steam and the occupants were forced out of the cabs without opportunity to close the throttle or to apply the brakes in the usual manner. Practically the only way that engine-men can stop a train in instances of this kind is to climb out of or over the cab and make their way to the front end and open the front end brake pipe angle cock if it is accessible. A recent instance is the failure of a water column steam pipe while the locomotive was hauling a passenger train at a speed of approximately 60 miles per hour. The engineer, despite serious scalds, made his way to the front end of the locomotive and stopped the train by opening the angle cock. The railroad involved operates a number of locomotives with "streamline" shrouding around the entire locomotive and had this accident occurred on one of these locomotives where the front end angle cock is not readily accessible the train would have continued on probably until a collision or a derailment occurred.

4. The condemning limit for slid flat spots on wheels 36 inches or less in diameter on road locomotives should be reduced to 1 inch and such wheels should not be continued in service if out of round $\frac{1}{16}$ inch or more in an arc having a length of 12 inches.

Pounds and vibrations set up by flat spots and wheels out of round cause loosening of and failure of truck parts and are destructive to other parts of equipment and track, especially under present day operating conditions when the speed of practically all trains has been greatly increased.

5. Safety glass should be used in all front cab doors and windows and in all cab storm windows.

Practically all regulatory authorities having to do with motor vehicles require the use of safety glass, especially in the windshields, and the reasons that underlie this requirement apply equally to front cab doors and windows and to cab storm windows on locomotives. Safety glass is now used throughout in a small number of locomotives propelled by power other than steam and in some few other instances it is used in the front cab doors and windows and in cab storm windows, but ordinary glass is used throughout on the vast majority of locomotives, both steam and those propelled by other forms of power. The use of ordinary glass in the front windows and in storm windows constitutes an unnecessary hazard to engine-men and others who may be riding in the cab as is evidenced by an increasing number of injuries caused by the breaking and shattering of glass from these windows. It is therefore recommended that installation of safety glass be made mandatory in all front cab doors and windows and in all cab storm windows.

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, 1937, 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.]

ALTON RAILROAD:

May 16, 1937, locomotive 4387, near Kansas City, Mo. Blow-off cock handle was held in open position due to becoming lodged behind end of stoker operating rod bracket; one injured.

June 24, 1937, locomotive 5286, St. Louis, Mo. Cross arm over bell worked out of position and prevented bell from ringing when bell ringer was operated, and bell cord broke when used in an attempt to start the bell; clapper bolt for securing cross arm was loose; one injured.

Two accidents; two injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

July 29, 1936, locomotive 1327, Marmon, N. Mex. Lubricator light with enclosing wire cage which was inadequately secured on oil pipe by a hook became disengaged and swung on its extension cord, striking employee in the eye; one injured.

August 14, 1936, locomotive 3534, near Needles, Calif. Injured while attempting to release tender brakes by disconnecting brake levers under tender; air hose between locomotive and tender improperly coupled up and brakes could not be

released with brake valves in cab; brakes not properly tested before locomotive was placed in service; one injured.

**September 19, 1936, locomotive 920, Lamy, N. Mex. Burned by steam and hot water which were escaping from valve rocker shaft of power grate shaker, due to the use of improper packing; one injured.

November 17, 1936, locomotive 834, Albuquerque, N. Mex. Spark arrester blew from stack and struck employee who was on running board; fusion weld securing hinge of spark arrester to frame attached to stack failed; one injured.

**November 19, 1936, locomotive 1222, LeGrand, Calif. Employee's eye burned by hot sand; sand did not enter firebox properly due to hole in fire door being obstructed by a split and sand scoop being too large to extend into hole in fire door liner; one injured.

March 18, 1937, locomotive 3718, Joseph City, Ariz. Cylinder lubricator steam valve connection fitting to boiler blew out of wrapper sheet due to improper application; hole in wrapper sheet was threaded only two-thirds of thickness of sheet, leaving a shoulder at bottom of hole on which the threads of fitting were forced and damaged; threads on fitting were also deteriorated due to leakage; one injured.

*March 27, 1937, locomotive 3849, Barstow, Calif. Derailment; left front tender wheel flange badly worn; one injured.

May 19, 1937, locomotive 587, Los Angeles, Calif. Rectangular type tank leaned to the right, making it difficult for enginemen to see the signals; tank reported on April 18, 20, and 23, and though locomotive was in shop from April 27 to May 8 the condition was not corrected; one injured.

Eight accidents; eight injured.

ATLANTIC COAST LINE RAILROAD:

October 2, 1936, locomotive 1726, near North Charleston, S. C. Grate shaker bar slipped off post due to improper fit; one injured.

*February 9, 1937, locomotive 1548, Wade, N. C. Struck by oil step which was thrown from passing locomotive; one injured.

**March 27, 1937, locomotive 2011, Ozark, Ala. Tank hose strainers stopped up, due to scale and rust dropping from inside of tender cistern; one injured.

April 15, 1937, locomotive 421, near Wilmington, N. C. Bottom hole in front tender-truck brake-beam dead lever pulled out, causing bottom rod to drop and damage brake beams and brake rigging; one injured.

April 17, 1937, locomotive 1515, near Dunn, N. C. Glass in cab storm window broke; one injured.

Five accidents; five injured.

BALTIMORE & OHIO RAILROAD:

August 10, 1936, locomotive (P. & L. E.) 9234, Crescentdale, Pa. Fire tube broke off at safe end weld; overheated in welding; adjacent tube found thinned and cracked at safe end weld; one injured.

August 19, 1936, locomotive 4567, Rock Run, W. Va. Squirt hose defective; one injured.

October 5, 1936, locomotive 1486, Westfield, Pa. Throttle unexpectedly went into wide open position, causing reverse lever which was being moved to slam to back corner; teeth on throttle latch and quadrant worn so that latch would not hold properly; one injured.

November 20, 1936, locomotive 5236, near Albion, Ind. Strap hangers of left no. 1 driving spring broke and spring dropped and became wedged between leading tender truck spring plank and angle bar of rail, breaking tender truck frame and resulting in derailment of tender and all cars of passenger train; nine injured.

**November 24, 1936, locomotive 1632, Wildwood, Pa. Engine truck box ran hot account of loss of oil cellar; one injured.

**November 25, 1936, locomotive 433, Jackson, Ohio. Cylinder saddle exhaust cavity drain pipe came out; one injured.

December 29, 1936, locomotive 1170, Rochester, N. Y. Turbo-generator exhaust pipe broke off at pipe bushing; one injured.

January 15, 1937, locomotive (B. & O. C. T.) 908, Chicago, Ill. Cab apron worn; one injured.

February 9, 1937, locomotive 615, Cumberland, Md. Air-compressor governor did not function properly; a deposit of a substance resembling shellac, apparently a residue from the oil used to lubricate the compressor, was found in the bowl or diaphragm body, and the air port leading to the top of the steam valve piston was obstructed by this substance; one killed.

**March 10, 1937, locomotive 3057, Riverside Junction, N. Y. Reverse lever unlatched and went rapidly to front corner, catching employee's hand between lever and bell ringer valve handle; valves dry and excessive lost motion

in right valve gear; teeth on reverse lever dog and quadrant worn, and grease and oil on both; insufficient clearance between reverse lever and bell ringer valve handle; cylinder packing or valve blows reported on January 28, 29, February 1, 3, 6, March 10, 11, 16, and 18; one injured.

**March 14, 1937, locomotive 3057, Cascade Park, N. Y. Reverse lever unlatched and went rapidly to front corner, catching employee's hand between lever and straight air brake valve; valves dry and excessive lost motion in right valve gear; teeth on reverse lever dog and quadrant worn, and grease and oil on both; insufficient clearance between reverse lever and brake valve; cylinder packing or valve blows reported on January 28, 29, February 1, 3, 6, March 10, 11, 16, and 18; a similar accident occurred on this locomotive on March 10, 1937, in which one person was injured; one injured.

**April 9, 1937, locomotive 7154, Benwood Junction, W. Va. Cab arm rest bracket gave way; rivets for securing bracket badly corroded; one injured.

May 3, 1937, locomotive 6161, Cumberland, Md. Discharge pipe nipple on rear air compressor pulled out of union ell due to improper fit, permitting brakes to apply in emergency; threads in union ell badly worn and first four threads partly stripped due to having been cross-threaded; threads on nipple badly wasted away; one injured.

May 3, 1937, locomotive 5135, Mineral Siding, Ohio. Cab seat fell due to supporting rod becoming disengaged from seat frame; one injured.

May 23, 1937, locomotive 6223, Broad Ford, Pa. Employee fell from running board; apparently tripped on defective cover plate over an unused slot in running board; free use of handrail above running board was obstructed by a junction box and two brackets located almost directly over the cover plate; one injured.

May 28, 1937, locomotive 4288, Myoma, Pa. Stoker failed due to teeth in gear wheel breaking; one injured.

June 22, 1937, locomotive 4575, near Osgood, Ind. Crown sheet failure caused by overheating due to low water; three killed.

June 24, 1937, locomotive (Alton) 2406, Chicago, Ill. Reverse lever moved forward unexpectedly; one injured.

Eighteen accidents; 4 killed, 24 injured.

BANGOR & AROOSTOOK RAILROAD:

**December 12, 1936, locomotive 100, Millinocket, Maine. Locomotive separated from train, causing brakes to apply in emergency; tender coupler below minimum prescribed height; fusion welding that held shim on top of coupler carry iron broke away, permitting shim to work out; one injured.

One accident; one injured.

BESSEMER & LAKE ERIE RAILROAD:

December 23, 1936, locomotive 518, Curtisville, Pa. Injector steam pipe collar pulled off, permitting steam pipe to pull out of coupling nut to turret valve; collar not properly brazed to steam pipe and not chamfered to permit end of steam pipe to be flared; two injured.

One accident; two injured.

BOSTON & MAINE RAILROAD:

July 8, 1936, locomotive 3682, Springfield, Mass. Upright board behind engineers' cab seat split when used as a handhold; bolt which secured the part of board which broke off was missing; one injured.

**July 20, 1936, locomotive 3681, North Adams, Mass. Locomotive pounding badly; injured while attempting to tighten right main rod brasses; right back end key bolt reported loose on July 12, 14, and 15; one injured.

Two accidents; two injured.

CENTRAL OF GEORGIA RAILWAY:

*August 5, 1936, locomotive 631, Wadley, Ga. Crank pin broke; metal defective; one injured.

*May 23, 1937, locomotive 777, Americus, Ga. Coupler pulled out of rear end of tender; one injured.

Two accidents; two injured.

CENTRAL RAILROAD OF NEW JERSEY:

January 10, 1937, locomotive 174, Port Monmouth, N. J. Collar of injector steam pipe sleeve broke off, permitting steam pipe to pull out of coupling nut; sleeve was not chamfered to permit end of pipe to be flared, and only the upper part of sleeve was brazed to the pipe; one injured.

One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

August 20, 1936, locomotive 1512, White Stick, W. Va. Crown sheet failure caused by overheating due to low water; three killed.
One accident; three killed.

CHICAGO & EASTERN ILLINOIS RAILWAY:

July 11, 1936, locomotive 950, Evansville, Ind. Squirt hose burst; hose worn; one injured.

August 15, 1936, locomotive 1949, Pimento, Ind. Crown sheet failure caused by overheating due to low water; two killed, one injured.

Two accidents; two killed, two injured.

CHICAGO & NORTH WESTERN RAILWAY:

**November 22, 1936, locomotive 1458, Proviso, Ill. Sliver of wood from cab window frame punctured employee's finger; one injured.

December 7, 1936, locomotive 2536, State Center, Iowa. Undesired emergency application of brakes, caused by defective vent valve on locomotive; one injured.

January 26, 1937, locomotive 2910, Lake Forest, Ill. Engine truck lateral plate was thrown off and struck an employee who was on station platform; lateral plate was too short and dovetail groove in truck box was excessively worn, preventing plate from being securely attached; engine truck frame had been riding on back engine truck boxes; lateral plates reported missing or clamp bolts reported loose on January 1, 5, 20, 21, and 25; one injured.

April 9, 1937, locomotive 1473, Boone, Iowa. Arch tube plug in backhead blew out due to not being properly applied after boiler wash; threaded portion of plug excessively tapered; attempted to tighten the leaking plug under boiler pressure; two killed.

April 30, 1937, locomotive 2210, Highwood, Ill. Pin which secured front end of trailing truck yoke to locomotive frame was thrown from locomotive and struck track employee; key for securing pin failed or worked out; one injured.

Five accidents; two killed, four injured.

CHICAGO & WESTERN INDIANA RAILROAD:

March 1, 1937, locomotive 220, Chicago, Ill. Reverse lever jerked back and struck employee's arm when he attempted to move the lever forward; one injured.
One accident; one injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

July 22, 1936, locomotive 6318, Smithboro, Ill. Valve gear pin lost out; one injured.

August 25, 1936, locomotive 5062, Tamalco, Ill. Main rod broke due to old fracture; fracture covered entire top section of rod and should have been detected by proper inspection; one injured.

December 12, 1936, locomotive 1681, Denver, Colo. Vertical lifting bar at front end of air cylinder operating lever, which controlled the position of combination standard and narrow gauge coupler, was improperly applied; one injured.

January 10, 1937, locomotive 6168, near Burdock, S. Dak. Adapter at back end of main rod broke due to old fracture which started at grease hole; one injured.

January 13, 1937, locomotive 2202, Rochelle, Ill. Boiler check stuck up; check valve and body covered with thin hard scale; one injured.

February 1, 1937, locomotive 7002, Garryowen, Mont. Pedestal tie bar and jaw lost off tender truck, resulting in a damaged switch which caused derailment of the next train passing over the switch; tie bar became detached from tender truck due to vibrations set up by a shelled out tread on tender wheel; looseness of tender truck tie bars had been reported repeatedly; tie bar fastenings in generally deteriorated condition; the defective conditions causing or contributing to the loss of tie bar could have been found by ordinary inspection; two injured.

March 2, 1937, locomotive 6127, Cameron Junction, Mo. Stoker was inoperative due to conveyor trough being out of its proper position and binding conveyor screw in trough; bolts missing from left side of conveyor trough and track and the additional strain on bolts and trough supports on right side caused trough supports to bend, allowing conveyor and screw to move backward a distance of 5 inches; one injured.

June 21, 1937, locomotive 1716, Lincoln, Nebr. Water glass burst, breaking water-glass shield; one injured.

Eight accidents; nine injured.

CHICAGO, INDIANAPOLIS & LOUISVILLE RAILWAY:

February 3, 1937, locomotive 286, Carmel, Ind. Reverse lever unlatched and moved forward violently catching employee's foot between it and boiler back head; one injured.

*February 6, 1937, locomotive 577, Greencastle, Ind. Air compressor failure; one injured.

June 30, 1937, locomotive 251, Francesville, Ind. Cast iron cylinder head burst through old fractures. Cylinder head had not previously shown any leakage; one injured.

Three accidents; three injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

October 5, 1936, locomotive 7216, Milwaukee, Wis. Board forming edge of elevated portion of cab floor was badly worn, causing employee who was using squirt hose to slip and lose control of the hose; one injured.

December 9, 1936, locomotive 8352, Bensenville, Ill. Smoke consumer throttle valve stuck open due to cotter key in universal connection to extension handle becoming caught on seam of boiler jacket; one injured.

*December 10, 1936, locomotive 8640, Winona, Minn. Sand pipe stopped up; one injured.

Three accidents; three injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

**August 15, 1936, locomotive 252, Topeka, Kans. Main throttle valve rigging difficult to operate account of bracket pin stuck in throttle lever; hole in lever was rusted, galled and very dry with no sign of lubrication; one injured.

September 12, 1936, locomotive 1525, Malvern, Ark. Cylinder cock lever was loose on shaft, due to loose and worn set screw, which prevented operation of left cylinder cocks from the cab; one injured.

**February 2, 1937, locomotive 952, Rockdale, Ill. Right side of driver brake adjusting rod safety hanger became disengaged and dropped to track where it was broken off and thrown from the locomotive, striking employee; one injured.

**March 5, 1937, locomotive 255, Topeka, Kans. Insufficient clearance between locomotive gangway handhold and tender deck when on sharp curve; one injured.

**March 18, 1937, locomotive 499, Liberal, Kans. Cab seat support leg strap became detached from bottom of seat, due to not being properly secured, permitting cab seat to drop; strap not applied according to company's standard; one injured.

**April 5, 1937, locomotive 5055, Groveland, Kans. Blow-off cock main operating rod broke at splice; rod had been spliced near middle by application of pipe couplings and a pipe nipple; one injured.

**April 6, 1937, locomotive 227, Morris, Ill. Insufficient clearance between vertical cab handhold and tender deck; one injured.

April 13, 1937, locomotive 2557, Bureau, Ill. Locomotive moved unexpectedly due to main steam throttle not closing properly; throttle operating shaft stuffing box spring broken in six pieces; one injured.

April 24, 1937, locomotive 880, Vona, Colo. Headlight generator failed; generator not properly lubricated and ball bearing seized generator shaft, preventing its operation; one injured.

**June 2, 1937, locomotive 1932, Garner, Iowa. Employee fell while descending from coal on tender to top of tender cistern; suitable handhold or step not provided at top of high back wall of tender coal space; one injured.

Ten accidents; 10 injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

April 12, 1937, locomotive 423, Altoona, Wis. Mechanically operated fire door closed suddenly catching employee's hand; upper rollers in lower section of door were inoperative due to accumulation of dirt and carbon, and pins were missing from upper left and lower right rollers of upper section, permitting upper section of door to become tipped and stick in open position; one injured.

One accident; one injured.

DELAWARE & HUDSON RAILROAD CORPORATION:

June 21, 1937, locomotive 47, Oneonta, N. Y. Push pole fell from brackets; push pole improperly located near tender sill steps; one injured.

One accident; one injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

June 8, 1937, locomotive 2141, Hallstead, Pa. Valve rings broken; one injured. One accident; one injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

August 17, 1936, locomotive 1703, Midvale, Utah. Radius rod broke; old fracture covered approximately 50 percent of cross-sectional area; one injured.

**December 7, 1936, locomotive 1503, Agate, Utah. Squirt hose valve accidentally opened; valve improperly located; one injured.

December 12, 1936, locomotive 3415, Sierra, Colo. Top board and supporting brackets at rear of tender coal space out of proper alignment; one injured.

**December 22, 1936, locomotive 1190, Grand Junction, Colo. Throttle difficult to operate; throttle reported on December 21, 22, 23 (two times), 25, and 27; one injured.

**December 27, 1936, locomotive 1151, Helper, Utah. Reversing gear difficult to operate account of valves being dry; dry pipe and/or throttle reported leaking 13 times since December 1; one injured.

March 1, 1937, locomotive 1705, Brendel, Utah. Left main pin failed due to old fractures; left main rod reported pounding on February 9, 11, 25, and 27; one injured.

June 26, 1937, locomotive 1148, Kaysville, Utah. Lost footing due to rough riding locomotive; one injured.

Seven accidents; seven injured.

ERIE RAILROAD:

August 10, 1936, locomotive 3323, Cameron, N. Y. Main steam pipe in front end burst; thickness of steam pipe walls varied from $\frac{3}{8}$ inch to $1\frac{1}{8}$ inches, due to defective casting, and side wall contained an air pocket approximately $7\frac{1}{2}$ inches long and metal on sides of this pocket was about $\frac{1}{16}$ inch thick; three injured.

*August 10, 1936, locomotive 1767, Monterey, Ind. Reverse lever jerked from employee's grasp and went to corner, striking his leg; valves dry; one injured.

*November 20, 1936, locomotive 2707, Osborn, Ohio. Air hose on tender burst; one injured.

December 21, 1936, locomotive (N. Y. S. & W.) 34, Avon, N. Y. Handrail broke off at both ends due to being fractured at both fittings and wasted away to about $\frac{1}{2}$ inch in thickness at root of threads; one injured.

January 27, 1937, locomotive 3338, Akron, Ohio. Insufficient clearance between fire door pedal and hinge on door over stoker transfer hopper; one injured.

February 18, 1937, locomotive 2027, Buffalo, N. Y. Reverse lever jerked while being moved; right valve was dry and binding due to rings too tight account of excessive carbon in valve chest and valve body; link blocks worn; reverse lever latch handle was badly bent, due to connecting straps between handle and dog being too short, preventing proper hold on lever; one injured.

March 4, 1937, locomotive 3333, Shongo, N. Y. Stoker elevator pawl shifter would not latch in neutral position account of catch pin missing; one injured.

June 30, 1937, locomotive 4017, Marion, Ohio. Bell ringer inoperative; one injured.

Eight accidents; 10 injured.

FLORIDA EAST COAST RAILWAY:

January 15, 1937, locomotive 702, Fort Pierce, Fla. Handrail broke due to old fracture; one injured.

One accident; one injured.

FORT WORTH & DENVER CITY RAILWAY:

January 24, 1937, locomotive 456, near Wichita Falls, Tex. Squirt hose valve worked open; insufficient means for holding squirt hose in position when not in use; valve insufficiently packed and packing dry, permitting valve handle to work open; one injured.

One accident; one injured.

GRAND TRUNK WESTERN RAILWAY:

*August 15, 1936, locomotive 3741, Stillwell, Ind. Piston rod broke through flaw at keyway in crosshead fit; 1 injured.

November 11, 1936, locomotive 3737, Port Huron, Mich. Oil feed pipe to air compressor failed near lubricator connection; one injured.

December 31, 1936, locomotive 6039, Perry, Mich. Main crank pin broke just inside wheel fit; old fracture covered 75 percent of the area of the crank pin; two injured.

Three accidents; four injured.

GREAT NORTHERN RAILWAY:

**November 19, 1936, locomotive 1702, Northtown Junction, Minn. Reverse lever jerked violently forward, shearing stop bolt in quadrant and going to extreme forward end of quadrant where it stuck; one injured.

**December 12, 1936, locomotive 3048, Howard Lake, Minn. Mechanical stoker failed to function due to bucket chain becoming stuck in elevator housing; one injured.

March 27, 1937, locomotive 1458, Stanwood, Wash. Driving spring hanger broke at gib hole; approximately 40 percent of break was old fracture; one injured.

June 12, 1937, locomotive 2124, near Blaisdell, N. Dak. A piece of cast iron steam pipe in smoke arch, approximately 13 by 25 inches, blew out; failure originated at a vertical crack that started from the inside of pipe; thickness of steam pipe walls varied from $\frac{3}{4}$ inch to $1\frac{1}{8}$ inches, due to core being improperly placed in casting. A 12-inch crack in pipe wall opposite the failure had been repaired by fusion welding; one injured.

Four accidents; four injured.

GULF, COLORADO & SANTA FE RAILWAY:

January 19, 1937, locomotive (A. T. & S. F.) 1385, Berwyn, Okla. Headlight burned out; headlight step not conveniently located; one injured.

February 5, 1937, locomotive (A. T. & S. F.) 1266, near Arlington, Tex. Main crank pin broke off due to old fracture covering approximately 80 percent of cross-sectional area; one injured.

June 23, 1937, locomotive (A. T. & S. F.) 3923, Cozart, Tex. Main pin broke at inside of main rod bearing; 80 percent old fracture; one injured.

Three accidents; three injured.

ILLINOIS CENTRAL RAILROAD:

November 17, 1936, locomotive 1853, Pinckneyville, Ill. Defective wire covering on air hose for cleaning cab caught on nail head projecting from deck and pulled the nail out. The nail flew up and struck engineer's eye, resulting in probable permanent disability; one injured.

December 5, 1936, locomotive 1085, Sitka, Tenn. Fire door frame stud blew out; not more than one-half thread had been tapped in stud hole in boiler back head and stud had been screwed into sheet only about three and one-half threads with threads mutilated; one injured.

December 14, 1936, locomotive 265, New Orleans, La. Insufficient clearance between cab handhold at gangway and tender deck; one injured.

February 13, 1937, locomotive 2013, Gordon, Ill. Fire door pedal improperly located; one injured.

February 17, 1937, locomotive 1895, Cruse, Ill. Locomotive uncoupled from train due to low coupler on rear of tender; one injured.

May 1, 1937, locomotive 558, Bossier City, La. Pipe from main reservoir to high pressure head of air-compressor governor broke off at collar of union to governor; one injured.

May 17, 1937, locomotive 3562, Memphis, Tenn. Water glass burst; one injured.

June 29, 1937, locomotive 1531, Fonda, Iowa. Fire-door pedal moved out of position when adjustable latch became disengaged, causing employee to fall; fire-door hanger bolt cotter key missing; one injured.

Eight accidents; eight injured.

INDIANA HARBOR BELT RAILROAD:

*April 2, 1937, locomotive 408, Hammond, Ind. Glass in cab storm window broke; one injured.

One accident; one injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

October 21, 1936, locomotive 342, Palestine, Tex. Axle broke inside the hub of left main driving wheel; old fractures covered approximately 36 percent of cross-sectional area at point of failure; wheel improper fit and had been working on axle. Locomotive was returned to service on date of accident after having been removed account of left main wheel loose on axle; one injured.

One accident; one injured.

KANSAS CITY SOUTHERN RAILWAY:

August 21, 1936, locomotive 497, Baxter Springs, Kans. Fire tubes leaking at fusion welded beads to back flue sheet, caused by overheating due to accumulation of mud about 3 inches thick on back flue sheet. "Bad leaks in firebox"

was reported on August 20, after which 14 fire tubes were worked and beads rewelded, however, serious leakage was noted when locomotive had made 11 miles after these repairs; one injured.

One accident; one injured.

LAKE TERMINAL RAILROAD:

*April 15, 1937, locomotive 38, Lorain, Ohio. Sand did not flow freely from sand pipe; one injured.

One accident; one injured.

LEHIGH VALLEY RAILROAD:

January 7, 1937, locomotive 445, Nescopeck, Pa. Broken pivot pin in front coupler of second locomotive worked out, permitting the locomotives to separate and resulting in emergency application of the brakes; old fracture covered approximately 40 percent of cross-sectional area of pivot pin; one injured.

June 12, 1937, locomotive 749, Newark, N. J. Injector steam pipe spanner nut failed due to having been mutilated by use of improper tools; one injured.

Two accidents; two injured.

LOUISVILLE & NASHVILLE RAILROAD:

**July 11, 1936, locomotive 1350, Blue Ridge, Ga. Burned by hot water and steam from squirt hose which was jerked out of his hand when injector kicked off; injector reported on July 3, 5, 6, 7, 9, and 10; one injured.

*October 13, 1936, locomotive 1336, Dunley, Ky. Reverse lever difficult to operate; one injured.

*October 20, 1936, locomotive 152, Ocean Springs, Miss. Reverse lever difficult to operate; one injured.

November 4, 1936, locomotive 1420, Chenowee, Ky. Locomotives separated, causing emergency application of the brakes; carrier iron on tender not properly adjusted, permitting tender coupler to be below the prescribed standard height; two injured.

**November 25, 1936, locomotive 1210, near Florala, Ala. Driving box wedge stuck, resulting in derailment; wedge reported on October 19 and November 18; one injured.

December 3, 1936, locomotive 228, Holt, Ky. Reverse lever unexpectedly went to full forward position, catching employee's leg between lever and feed valve; one injured.

**January 3, 1937, locomotive 1786, Boyles, Ala. Bell ringer inoperative; one injured.

January 6, 1937, locomotive 1889, near North Cabin, Ky. Superheater flue broke off at safe end weld; overheated in welding; two injured.

**March 2, 1937, locomotive 1263, Howell, Ind. Reversing gear counterbalance spring broke, causing reverse lever to jerk back unexpectedly when unlatched; one injured.

March 23, 1937, locomotive 1782, Boyles, Ala. Bell ringer inoperative and bell cord broke when employee attempted to use it to ring the bell; one injured.

April 25, 1937, locomotive 1200, South Louisville, Ky. Reverse lever very difficult to operate, due to reversing gear and valve motion being badly fitted up after being overhauled; one injured.

**May 31, 1937, locomotive 1510, Cotula, Tenn. Piston rod broke in cross-head fit; old defect covered approximately 65 percent of cross-sectional area; "Right crosshead pounding bad" was reported on May 30; one injured.

Twelve accidents; 14 injured.

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

**August 3, 1936, locomotive 1010, Pike Lake, Mich. Squirt hose burst; hose worn; one injured.

September 17, 1936, locomotive 720, Bergen, N. Dak. Reverse lever unlatched and moved forward rapidly, striking employee's arm; reverse lever quadrant not firmly supported; bolt holes in cab wind sheet for securing quadrant were badly worn; reverse lever was reported on August 14, 18, and 24; one injured.

October 13, 1936, locomotive 1011, Wendell, Minn. Main pin broke off due to old fractures covering approximately 71 percent of cross-sectional area; main pin running hot, rod keyed, or brasses working or broken reported 14 times in the first 3 months following application of the pin; one injured.

*February 5, 1937, locomotive 2723, Hamel, Minn. Reverse lever jerked to corner of quadrant, catching employee's foot; lever difficult to handle; one injured.

*February 12, 1937, locomotive 801, Hankinson, N. Dak. Reversing gear difficult to operate; links dry; one injured.

Five accidents; five injured.

MISSOURI & ARKANSAS RAILWAY:

*January 21, 1937, locomotive 21, Harrison, Ark. Reverse lever difficult to operate; one injured.

One accident; one injured.

MISSOURI-KANSAS-TEXAS LINES:

**September 3, 1936, locomotive 846, near Bernheimer, Mo. Injured while adjusting manually operated reverse lever; lever difficult to handle; one injured.

June 17, 1937, locomotive 62, Parsons, Kans. Water glass burst; one injured.

Two accidents; two injured.

MISSOURI PACIFIC RAILROAD:

*April 23, 1937, locomotive 1201, Barretts Tunnel, Mo. Glass in cab storm window broke; one injured.

One accident; one injured.

MONONGAHELA CONNECTING RAILROAD:

*March 2, 1937, locomotive 60, Pittsburgh, Pa. Piece of timber used for holding cab ventilator open fell, striking employee; one injured.

One accident; one injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

October 28, 1936, locomotive 655, Chattanooga, Tenn. Radial-buffer adjusting wedge between locomotive and tender sheared its pin and flew out when hard coupling was made; wedge insecurely fastened; one injured.

**March 21, 1937, locomotive 670, Cowan, Tenn. Right main driving-box wedge not properly adjusted; one injured.

Two accidents; two injured.

NATALBANY LUMBER COMPANY:

June 4, 1937, locomotive 201, near Yawn, La. Crown sheet failure caused by overheating due to low water; left injector was wasting water at overflow and not supplying the boiler; left injector throttle-valve opening was restricted by removable valve disk which had become unscrewed from stem and jammed against valve seat; five injured.

One accident; five injured.

NEW YORK CENTRAL SYSTEM:

July 18, 1936, locomotive (P. & L. E.) 9253, Ashtabula, Ohio. Reversing gear hand wheel spun; a broken counterbalance spring casing interfered with the reversing of valve motion; one injured.

*August 24, 1936, locomotive 7512, Ecorse, Mich. Insufficient clearance between locomotive grab iron and tank beam; one injured.

**September 18, 1936, locomotive 2769, Corning, N. Y. Top of classification lamp came off, due to broken hinge; lugs of hinge badly worn and one lug broken prior to accident; one injured.

September 23, 1936, locomotive 2710, near Syracuse, N. Y. Fire tube broke off at front flue sheet due to having been rolled very thin; one injured.

October 15, 1936, locomotive 2236, Fowler, Ind. Drop seat in cab collapsed; bracket bolts loose in cab wall; one injured.

November 16, 1936, locomotive 5274, Cleveland, Ohio. Precision reversing-gear hand wheel kicked when gear was forced over center, breaking employee's wrist; nut missing from bolt in radius-bar splice, permitting bolt to work outward and foul on valve-gear frame; one injured.

November 16, 1936, locomotive 5322, Hudson, N. Y. Steam pipe in front end of locomotive burst due to being of insufficient thickness; thickness at point of fracture varied from $\frac{3}{8}$ inch to $1\frac{1}{2}$ inch while the wall opposite the fracture was $1\frac{1}{4}$ inches thick; two injured.

December 17, 1936, locomotive 2703, near Syracuse, N. Y. Locomotive separated from train; locomotive rear coupler below the minimum prescribed height; one injured.

January 22, 1937, locomotive (B. & A.) 619, Boston, Mass. Valve-chamber inspection cap broke and blew off and the escaping steam broke eight windows in a passenger coach on adjacent track; cap casting was defective. A feed-water heater tube had broken previously and the locomotive had been working water; one injured.

**February 14, 1937, locomotive 6694, Buffalo, N. Y. Air hose parted between locomotive and car; stop pin missing from coupling head; one injured.

**February 26, 1937, locomotive 5244, Bergen, N. Y. Driver brake shoe head came off and the pin for securing it to hanger struck track employee; cotter key for holding pin in place was missing; one injured.

*March 20, 1937, locomotive 4535, Dune Park, Ind. Foot caught between reverse lever and boiler back head; one injured.
Twelve accidents; 13 injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

September 4, 1936, locomotive 3322, Waterford, Conn. Throttle stuck open due to throttle lever binding in quadrant; throttle rod too long and improper throttle lever fulcrum used; throttle lever quadrant bent and radius of quadrant did not coincide with radius of throttle lever; one injured.

November 18, 1936, locomotive 2393, New Britain, Conn. Headlight failure, caused by insulation worn from wire in conduit; one injured.

December 2, 1936, locomotive 3003, New Haven, Conn. Uncoupling lever became disconnected, causing employee to fall; pin securing coupler lock lift clevis to uncoupling lever arm came out; one injured.

January 11, 1937, locomotive 438, South Boston, Mass. Auxiliary dome blew off due to failure of rivets securing dome to roof sheet; heads of all rivets broke off inside the boiler, apparently caused by being overheated when applied; leaks around auxiliary dome were reported on October 8 and 31, November 14, December 8, and January 11; two injured.
Four accidents; five injured.

NORFOLK & WESTERN RAILROAD:

September 5, 1936, locomotive 392, Kenova, W. Va. Insufficient clearance between cab apron and leg of tender water tank; one injured.

**September 9, 1936, locomotive 2025, Portsmouth, Ohio. Reversing gear kicked, causing hand wheel to spin violently and strike employee's hand; reversing gear trunk packing defective and fouling trunk; one injured.

October 8, 1936, locomotive 1453, War Eagle, W. Va. Insufficient clearance between cab apron and cab floor; no provision to guard against the use of that part of the apron extending under the cab floor; one injured.

**October 31, 1936, locomotive 101, Crewe, Va. Burned by discharge from steam heat hose at rear of tender; valve in heat line leaking and hose bent up sharply with end caught between coupler and train line forming a trap for the accumulated leakage which was discharged when hose was released from the kinked position; one injured.

**February 8, 1937, locomotive 1362, Clare, Ohio. Sand pipe stopped up; one injured.

March 19, 1937, locomotive 2090, Roanoke, Va. Precision reversing gear hand wheel spun, due to excessive strain on valve gear caused by low pressure valves being dry; one injured.

**April 2, 1937, locomotive 2055, Waverly, Ohio. Brake pipe broke at distributing valve due to vibration, causing emergency application of the brakes; two similar breaks had occurred in this pipe due to the same cause, one on March 26 and one on March 27; one injured.

April 10, 1937, locomotive 2049, Roanoke, Va. Precision reversing gear caught in central position, then suddenly released, causing hand wheel to spin rapidly; insufficient clearance between reverse shaft arm and emergency exhaust pipe flange joint; one injured.

June 30, 1937, locomotive 2092, Maybeury, W. Va. Boiler explosion caused by derailment and impact with highway when locomotive fell from a trestle; four killed, two injured.
Nine accidents; four killed, 10 injured.

NORTHERN PACIFIC RAILWAY:

September 1, 1936, locomotive 1624, Garrison, Mont. Ashpan slides difficult to operate due to improperly designed linkage which would assume a straight line position and prevent manual movement of the operating lever; one injured.

September 4, 1936, locomotive 2248, Kountze, Wash. Water glass burst; one injured.

September 29, 1936, locomotive 1553, Mesa, Wash. Insufficient clearance between reverse lever and boiler head; one injured.

October 7, 1936, locomotive 2605, Dickinson, N. Dak. Grates became cocked due to part of brick arch falling down; one injured.

January 6, 1937, locomotive 2157, Drayton, N. Dak. Locomotive lighting system failed, caused by snow in generator; one injured.

January 10, 1937, locomotive 1759, Beatrice, Wash. Exhaust steam and water from drain valves of stoker engine formed ice on bottom gangway steps, causing employee to fall; one injured.

January 11, 1937, locomotive 1367, Connell, Wash. Fell from running board while cleaning out sander; one injured.

February 14, 1937, locomotive 5101, Jens, Mont. Stoker slide hook swung out and struck employee; hook bent near top of handle causing rebound against tender; hook not company's standard; one injured.

February 17, 1937, locomotive 1760, Willow River, Minn. Defective low water alarm permitted steam to escape through alarm whistle. Whistle bell lock nut cracked and threads badly worn, and a piece of sheet copper had been crudely soldered over an opening made in whistle bell. The sheet copper blew out and struck employee's eye when attempt was made to stop the escape of steam; one injured.

Nine accidents; nine injured.

PARIS AND Mt. PLEASANT RAILROAD:

*June 22, 1937, locomotive 302, Paris, Tex. While operating blow-off cock lever, employee's hand struck on a nail which projected from back wall of cab; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

July 13, 1936, locomotive 6769, Altoona, Pa. Injector operating rod became disconnected; connecting bolt lost out account of nut working off; one injured.

August 31, 1936, locomotive 6908, Harrisburg, Pa. Stoker conveyor slide hook straightened out sufficiently to cause hook to slip out of hole in slide; one injured.

November 19, 1936, locomotive 6756, Menlo Park, N. J. Eccentric rod bushing set screw worked out and was thrown through cab storm window, striking engineer's eye; threads on screw and in rod were stripped; one injured.

December 11, 1936, locomotive 640, Watsontown, Pa. Main rod strap failed due to old fracture which started in one of several scores on inside of strap near fillet, caused by loose liners working in the strap; improperly fitted piston rod and wrist pin resulted in bad pounds in driving gear; bad pounds reported on November 13 and 20 and December 1, 2, and 4; one injured.

**December 30, 1936, locomotive 8281, Sturgeon, Pa. Engine truck frame brace came down, due to bolts losing out, and struck train line, resulting in emergency application of the brakes; bolts in frame brace not securely applied; one injured.

January 27, 1937, locomotive 9876, Erie, Pa. Crown sheet failure caused by overheating due to low water; top water-glass cock was completely closed and bottom water-glass cock was almost closed; one killed, one injured.

February 8, 1937, locomotive 5210, Georgetown, Del. Drain valve to steam cylinder of air compressor fell out; one injured.

February 20, 1937, locomotive 3864, Leaman Place, Pa. Reversing gear stuck and could not be operated to forward position; link block pin was galled fast to part of link block bearing surface and the pin, oscillating in tapered fits of radius rod, had sheared the pins securing it and worked out sufficiently to foul inside link trunnion and prevent the block from passing through neutral to forward gear; link block and pin were renewed just prior to this trip and apparently improper assemblage permitted some hard or gritty substance to work its way to the bearing; one killed.

March 9, 1937, locomotive 7280, Legionville, Pa. Side rod broke; old fracture covered about 30 percent of top web; locomotive reported riding rough 11 times in the 30 days preceding the accident; driving boxes, wedges, and rods were also repeatedly reported; one injured.

March 11, 1937, locomotive 2871, Onoville, N. Y. Crown sheet failure caused by overheating due to low water; one injured.

March 28, 1937, locomotive 5058, Bird-in-Hand, Pa. Piston rod disengaged from piston; rod had been working due to improper crosshead fit; piston rod nut not properly applied; pounds in rods or driving boxes, or both, reported repeatedly; one injured.

April 16, 1937, locomotive 7104, Logansport, Ind. Hinge for securing lid covering hole in manhole cover broken; one injured.

April 25, 1937, locomotive 1522, Altoona, Pa. Reverse lever stuck; reversing gear or valve gear reported 10 times since April 1; 1 injured.

Thirteen accidents; 2 killed, 12 injured.

PENNSYLVANIA-READING SEASHORE LINES:

July 13, 1936, locomotive (P. R. R.) 389, Reed Crossing, N. J. Brake head failed permitting tender truck brake beam to come down; one injured.
One accident; one injured.

PERE MARQUETTE RAILWAY:

*October 12, 1936, locomotive 711, Fowlerville, Mich. Bell inoperative, due to bell rope being caught on jacket bolt; one injured.

*January 26, 1937, locomotive 726, Stark, Mich. Insufficient clearance between reverse lever and boiler back head; one injured.

*February 7, 1937, locomotive 1334, Dearborn, Mich. Governor to headlight generator stuck; one injured.

*February 10, 1937, locomotive 1025, Reed City, Mich. Air pump inoperative; one injured.

*March 16, 1937, locomotive 1042, En route Detroit, Mich. Injured while handling injector lever; lever worked hard and would not hold in latch; one injured.

Five accidents; five injured.

PITTSBURG, SHAWMUT & NORTHERN RAILROAD:

*November 16, 1936, locomotive 72, Angelica, N. Y. Coupler pocket pin broke; one injured.

One accident; one injured.

PORT ISABEL & RIO GRANDE VALLEY RAILWAY:

December 16, 1936, locomotive 6, Brownsville, Tex. Crown sheet failure caused by overheating due to low water; one killed.

One accident; one killed.

QUINCY RAILROAD:

*June 7, 1937, locomotive 1, Quincy, Calif. Packing blew out of throttle valve, due to packing nut having worked loose; one injured.

One accident; one injured.

READING COMPANY:

August 6, 1936, locomotive 1716, Penllyn, Pa. Both bolts at front end of left bottom guide failed due to old fractures and bottom guide was forced down, breaking guide yoke and resulting in much damage to the locomotive and track; one injured.

September 25, 1936, locomotive 125, Jersey City, N. J. Grate shaker bar slipped off lever, due to improper fit; shaker bar socket did not conform to company's standard; one injured.

February 19, 1937, locomotive 1355, Philadelphia, Pa. Right steam spindle stuffing box blew out of duplex injector due to loose fit; bonnet threads and threads in injector body so badly worn that bonnet could be inserted to one-sixteenth inch of shoulder without engaging the threads; left steam spindle stuffing box was also a loose fit due to worn threads; steam rams reported leaking 15 times since February 1; one injured.

Three accidents; three injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

December 27, 1936, locomotive 1287, St. Louis, Mo. Mechanically operated fire door closed unexpectedly, caused by worn pin in fire door mechanism; one injured.

June 2, 1937, locomotive 1052, Hoxie, Ark. Engine truck box ran very hot; one injured.

Two accidents; two injured.

SEABOARD AIR LINE RAILWAY:

October 5, 1936, locomotive 2501, Raleigh, N. C. Grate shaker bar slipped off post; shaker bar slot was worn causing improper fit on posts; one injured.

**October 12, 1936, locomotive 223, Jacksonville, Fla. Lubricator terminal checks leaking at steam pipe connections; brass connection to right oil pipe was cross-threaded, causing threads to strip, and left connection was poor fit in steam pipe due to having improper taper; one injured.

October 28, 1936, locomotive 443, Franklin, Va. Grate shaker bar slipped off post; shaker bar slot had been mutilated, causing improper fit on posts; one injured.

November 7, 1936, locomotive 827, Starke, Fla. Whistle valve stuck open; evidently a foreign substance caught between valve and valve seat; one injured.

*December 1, 1936, locomotives 425 and 1093, Savannah, Ga. Air hose parted between locomotives, resulting in rough stop; three injured.

*January 16, 1937, locomotive 338, Belleview, Fla. Struck by ashpan hook which apparently had been shaken from position by vibration; one injured.

February 15, 1937, locomotive 734, Lincolnton, N. C. Outer muffler shell of safety valve blew off; thread fit of muffler shell on casing of safety valve very loose and threads distorted; lock bolt for locking shell on valve casing was missing; one injured.

February 23, 1937, locomotive 384, Baldwin, Fla. Handrail gave way due to old fracture; one injured.

February 25, 1937, locomotive 223, Carmen, Fla. Broken radial stay blew out of crown sheet; old fracture covered approximately 95 percent of cross-sectional area of stay and threads were stripped; one injured.

**March 5, 1937, locomotive 830, Marietta, Fla. Reverse lever broke due to old fracture at latch guide fastening and broken lever went forward, catching employee's foot between lever and boiler backhead; stop at front end of quadrant missing; one injured.

May 22, 1937, locomotive 371, near Richmond, Va. Fusion welded seam joining crown sheet to top of door sheet failed for a distance of 20 inches. Crown sheet lapped over top of door sheet flange and welded on fire side only; edge of door sheet flange to which one side of the fillet weld was applied had been thinned or scarfed to two-thirds of its original thickness prior to application of the welding; three injured.

Eleven accidents; 15 injured.

SOUTHERN RAILWAY:

**August 3, 1936, locomotive 4508, Melrose, N. C. Fell from defective ladder after making repairs to air compressor; one injured.

**August 4, 1936, locomotive 1341, Charlotte, N. C. Burned by hot water which spurting from steam heat conduit on rear of tender when conduit was taken from hook provided to hold it when not in use; hook held end of conduit too high, forming a pocket which prevented condensation from draining off; main steam heat valve in cab leaking slightly; one injured.

**September 21, 1936, locomotive 600, Jellico, Tenn. Grate shaker bar slipped off post; shaker bar burred; one injured.

**October 17, 1936, locomotive 5026, Saluda, N. C. Driving brake shoe worn; one injured.

**October 19, 1936, locomotive 5054, Asheville, N. C. Drop seat in cab fell; cab running board deck on which the seat supporting rod rested was worn; one injured.

**November 9, 1936, locomotive 627, Knoxville, Tenn. Vertical handhold at left back corner of cab was bent in close to cab wall, causing employee to miss handhold when leaving gangway; one injured.

**November 30, 1936, locomotive 4836, Ridgecrest, N. C. Ashpan scraper, lodged under lip of ashpan blower nozzle, deflected the flow of steam and water from nozzle and caused fire to be blown out over side of ashpan, burning employee; handle of scraper had been burned off, indicating that scraper had become fastened at some previous time and the handle cut off rather than work with scraper until it was dislodged; one injured.

**December 9, 1936, locomotive 1382, Greensboro, N. C. Heater pipe to mechanical lubricator broke off near lubricator connection; one injured.

**April 27, 1937, locomotive 6628, Boligee, Ala. Bell cord broke; one injured.

**May 13, 1937, locomotive 1381, Lake, N. C. Right cab seat box tilted, due to not being securely fastened; one injured.

June 2, 1937, locomotive 4626, Otes, Tenn. Sand did not flow from sand pipes due to wet sand in traps; one injured.

Eleven accidents; 11 injured.

SOUTHERN PACIFIC—LINES EAST:

December 19, 1936, locomotive (T. & N. O.) 618, Lissie, Tex. Glass in cab window broke and a piece of glass fell and struck employee; practically all of the molding securing the glass was loose or missing; one injured.

One accident; one injured.

SOUTHERN PACIFIC—LINES WEST:

July 10, 1936, locomotive 3718, Cosgrave, Nev. Main reservoir pipe broke, resulting in emergency application of the brakes; two injured.

July 27, 1936, locomotive 4405, Mazama, Oreg. Guide yoke broke due to old fracture in bottom bend covering approximately 90 percent of cross-sectional area; one injured.

**September 26, 1936, locomotive 4014, near Cascade Summit, Oreg. Undesired emergency application of the brakes, caused by defective vent valve on tender; one injured.

*October 18, 1936, locomotive 2806, Surf, Calif. Insufficient clearance between throttle lever and valve on boiler head; one injured.

October 18, 1936, locomotive 3243, Gridley, Calif. Eccentric rod broke; old fracture covered approximately 50 percent of cross-sectional area; one injured.

*November 17, 1936, locomotive 2350, Volta, Calif. Insufficient clearance between reverse lever and feed valve bracket; one injured.

January 4, 1937, locomotive 1787, Berenda, Calif. Injector throttle valve bonnet blew out due to poor fit in valve body; one injured.

*January 23, 1937, locomotive 4401, Suisun-Fairfield, Calif. Glass in cab storm window broke; one injured.

**April 8, 1937, locomotive 1273, Oakland, Calif. Lubricator plug bushing broke off at seat on lubricator; old cracks in bushing; one injured.

April 11, 1937, locomotive 4322, Randolph, Ariz. Steam pipe sleeve at water column connection failed at fillet between sleeve and flange; steam pipe not belled or flanged over end in accordance with company's standard practice and brazing between pipe and sleeve extended only about three-fourths inch from top of sleeve, permitting pipe to pull out of coupling nut when sleeve failed; defective installation of steam pipe resulted in strain on pipe and sleeve. A heavy deposit of bronze had been applied by fusion welding just above sleeve in an attempt to repair a circumferential crack in steam pipe; two injured.

*April 16, 1937, locomotive 4367, Argo, Nev. Driving wheel tire broke due to thermal crack; one injured.

*April 29, 1937, locomotive 4324, Curvo, Ariz. Feed water pump did not operate properly; one injured.

May 9, 1937, locomotive 3265, Malaga, Calif. Water glass burst; water-glass frame not true and water glass had been filed in attempt to fit it to frame. In attempting to escape from the steam and water, the firing valve was inadvertently opened wider and fire suddenly backed through firebox door of oil burning locomotive in such volume that it spread over oil tank and badly damaged first car; two injured.

*June 3, 1937, locomotive 3762, Massie, Nev. Rear axle of tender broke at old fracture, causing derailment of 15 cars; two killed.

June 16, 1937, locomotive 1209, East Portland, Oreg. Explosion of accumulated gases in firebox while cleaning carbon from firebox; "Clean carbon out of firebox" was reported 22 times since June 1; one injured.

Fifteen accidents; 2 killed, 17 injured.

TENNESSEE, ALABAMA & GEORGIA RAILWAY:

December 3, 1936, locomotive 301, Pigeon Mountain, Ga. Sand pipes clogged account of sand being wet; one injured.

One accident; one injured.

TENNESSEE CENTRAL RAILWAY:

*June 7, 1937, locomotive 505, Stone River, Tenn. Brake hanger broke; one injured.

One accident; one injured.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS:

**March 16, 1937, locomotive 330, St. Louis, Mo. Coal board split, causing employee to fall; one injured.

One accident; one injured.

TEXAS & PACIFIC RAILWAY:

**February 23, 1937, locomotive 909, Mineola, Tex. Employee scalded by discharge from blow-off cock which was apparently accidentally opened and by steam from cylinder cock which was held open by pieces of broken cylinder packing ring; one injured.

April 21, 1937, locomotive 458, Shreveport, La. Insufficient clearance between cab handhold and tender deck; one injured.

May 21, 1937, locomotive 603, Edgewood, Tex. Steam pipe in front end burst; upper wall of 90° angle in the cast iron steam pipe was reduced from ¼ inch to about ½ inch in thickness; steam pipe not company's standard; one injured.

June 15, 1937, locomotive 397, Grand Bayou, La. Reverse lever unlatched and went to full forward position, catching employee's leg between lever and foot brace; valves dry and teeth in quadrant worn; one injured.

Four accidents; four injured.

UNION PACIFIC RAILROAD:

July 24, 1936, locomotive 9080, Baxter, Wyo. Left guide rail of middle cylinder crosshead fell from locomotive and became wedged on track, resulting in derailment of 26 cars of a mixed train; right guide rail had previously fallen off en route; all guide bar bolts were missing; bolt holes in guide bars and rails were enlarged and elongated; bolts reported repeatedly since July 1; two killed.

**August 3, 1936, locomotive 7008, near Seymour, Nebr. Wooden block (provided to be used to relieve the weight from driving boxes when journals heat) fell from locomotive and struck track employee; one injured.

January 14, 1937, locomotive 2301, Ault, Colo. Fire tube failed at safe end weld; one injured.

March 30, 1937, locomotive (O. W. R. & N.) 2152, Dodson, Oreg. Injector steam pipe sleeve at connection to cab turret steam valve failed in an irregular break for its full circumference; sleeve greatly overheated at time of application and brazing between steam pipe and sleeve did not extend full length of sleeve; one injured.

**April 19, 1937, locomotive 1931, Frankfort, Kans. Governor pipe to air compressor broke off at connection to governor; pipe not properly clamped; one injured.

June 6, 1937, locomotives (O. S. L.) 9509 and (U. P.) 3601, Manson, Idaho. Locomotives uncoupled, causing emergency application of the brakes; one injured.

June 9, 1937, locomotive (O. W. R. & N.) 4913, Albina, Oreg. Tender derailed at crossover, caused by spring buffer slipping by corner of wearing plate in chafing block while rounding curve; shoulder on wearing plate did not permit spring buffer to return to normal position after coming out of curve; one injured.

Seven accidents; two killed, six injured.

WABASH RAILWAY:

January 3, 1937, locomotive 2917, Adrian, Mich. Crown sheet failure caused by overheating due to low water; top water-glass cock was closed at time of accident; three killed.

**February 27, 1937, locomotive 1562, St. Louis, Mo. Insufficient clearance between vertical handhold at back of cab and tender deck when on sharp curve; one injured.

April 1, 1937, locomotive 603, near Sturgeon, Mo. Reverse lever unlatched and went forward rapidly, striking employee's foot; one injured.

**April 11, 1937, locomotive 2919, Peru, Ind. Dump grate plate broken and part of plate missing; one injured.

Four accidents; three killed, three injured.

WESTERN MARYLAND RAILWAY:

August 8, 1936, locomotive 1126, near Confluence, Pa. Driving spring hanger gib broke or lost out, throwing excessive weight on one side of locomotive which resulted in derailment of locomotive and tender; one injured.

April 11, 1937, locomotive 921, George's Creek Junction, Md. Air bell ringer inoperative; cotter key for attaching plunger to piston sheared off; one injured.

Two accidents; two injured.

WESTERN PACIFIC RAILROAD:

*February 28, 1937, locomotive 4, Keddie, Calif. Reverse lever latch broke; 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, 1937, 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 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.]

AROOSTOOK VALLEY RAILROAD:

**March 26, 1937, unit 54, Caribou, Maine. Employee received electric shock while adjusting trolley pole which had become turned so that trolley wheel was not running true on trolley wire; one injured.

One accident; one injured.

CHICAGO & NORTH WESTERN RAILWAY:

December 28, 1936, unit (U. P.) M-10,001, DeWitt, Iowa. Short circuit due to failure of main generator starting contactor to open and controller stand light socket not sufficiently insulated; one injured.

One accident; one injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

January 19, 1937, unit 9843, Valier, Ill. Explosion in motor crank case; carburetors which could not be properly regulated, fed too much gasoline to the engine, and crank case vent was located too close to exhaust pipe; one injured.

May 17, 1937, unit 9765, Edwards, Ill. Fire occurred when gasoline tank under unit was punctured by a piece of broken rail; gasoline was sprayed out due to air pressure maintained in tank to raise the fuel to carburetors; one injured.

Two accidents; two injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

**January 7, 1937, unit 10206, Henderson, Mont. Pantagraph failed to lower; one injured.

One accident; one injured.

NEW YORK CENTRAL SYSTEM:

**May 31, 1937, unit 111, New York, N. Y. Pin connecting uncoupling chain to lock lifter lever at front end of unit lost out; one injured.

June 13, 1937, unit 548, New York, N. Y. Burned by electric flash when short circuit occurred in auxiliary cab; short circuit caused by hand lantern coming in contact with high speed circuit breaker; one injured.

Two accidents; two injured.

NORTHERN PACIFIC RAILWAY:

*March 8, 1937, unit B-12, Odair, Wash. Generator on gas-electric unit failed; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

October 30, 1936, units 4713 and 4733, New Brunswick, N. J. Couplers between units broke following undesired emergency application of the brakes; one injured.

November 1, 1936, unit 4728, Stelton, N. J. Coupler knuckle broke through knuckle pin hole following release of the brakes while train was in motion; one injured.

Two accidents; two injured.

READING COMPANY:

*August 20, 1936, unit 78, Skillman, N. J. Connecting rod failed due to old flaw; one injured.

One accident; one injured.

SEABOARD AIR LINE RAILWAY:

May 16, 1937, unit 2025, Sanderson, Fla. Heater hose blew off at heater connection; defective gate valve permitted pressure to build up in hose; three injured.

One accident; three injured.

TABLE XII.—Number of steam locomotives inspected,

Table with 10 columns for locomotive categories and 63 rows for defect types. Includes a summary row for 'Number of defects' and a final section for 'Locomotives reported' and 'found defective'.

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

Table with 14 columns for locomotive categories and 63 rows for defect types. Includes a summary row for 'Number of defects' and a final section for 'Locomotives reported' and 'found defective'.

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 (1937-1923), Ordered out of service (1937-1923). Rows list various railroads like Akron, Canton & Youngstown, Alabama, Tennessee & Northern, etc.

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 (1937-1923), Ordered out of service (1937-1923). Rows list various railroads like Great Northern, Green Bay & Western, Gulf Coast Lines, etc.

1 Atlanta, Birmingham & Atlantic prior to 1927.
2 Includes Buffalo & Susquehanna and Buffalo, Rochester & Pittsburgh, 1933-37.
3 Statistics prior to 1927 included in Baltimore & Ohio, lines east.
4 Trinity & Brazos Valley prior to 1931.
5 Includes Grand Trunk Western, 1925-27.
6 Includes former Hocking Valley, 1931-37.
7 Included in Canadian National, 1925-27.

8 Included in Atchison, Topeka & Santa Fe, 1923.
9 Includes New Orleans Great Northern, 1935-37.
10 Includes Alabama & Vicksburg, Gulf & Ship Island, Vicksburg, Shreveport & Pacific, and Yazoo & Mississippi Valley, 1927-37.
11 Includes Portland Terminal, 1932-37.
12 Includes Boston & Albany, Cleveland, Cincinnati, Chicago & St. Louis, Michigan Central, New York-Central, lines west, and Peoria & Eastern, 1937.

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							
	1937	1936	1931	1929	1927	1925	1923	1937	1936	1931	1929	1927	1925	1923
Pennsylvania - Reading Seashore Lines	12	13						0	0					
Peoria & Pekin Union	18	0	40	14	23	31	54	0	0	0	0	0	1	1
Pere Marquette	9	4.7	12	21	38	57	83	2	0	3	8	14	21	68
Philadelphia, Bethlehem & New England	24	11	21	65	74	76	67	3	1	1	16	14	2	2
Pittsburgh & Lake Erie	24	10	1.9	6	12	10	27	0	1	0	0	0	0	10
Pittsburg & Shawmut	2.8	3.7	4	4	0	47	52	0	0	0	0	0	0	2
Pittsburg & West Virginia	27	33	32	57	39	0	33	21	10	4	30	8	0	0
Pittsburg, Shawmut & Northern	0	14	3.6	8	25	53	86	0	0	0	1	2	0	0
Quebec Central	67	67	0	100				0	0	0	0			
Reading	8	11	13	33	42	48	59	5	7	5	31	22	26	12
Richmond, Fredericksburg & Potomac	17	21	14	18	30	43	58	2	3	0	1	1	2	3
Rio Grande Southern	84	73	0	0	70	62	100	2	1	0	0	8	8	2
River Terminal	77	29	0	0	43	70	0	7	0	0	5	1	0	0
Rutland	8	4.7	6	6	12	44	54	0	0	0	0	1	3	1
St. Louis-San Francisco	4.8	3.8	3.9	14	22	49	88	1	2	1	7	12	65	346
St. Louis Southwestern	12	12	8	4.3	22	47	86	6	3	4	2	22	14	54
San Diego & Arizona Eastern	15	14	13	38	30	55	44	0	1	2	4	3	0	1
Savannah & Atlanta	7	44	19	80	67	73	68	0	5	0	0	0	2	3
Seaboard Air Line	7	8	9	37	56	51	55	5	10	2	24	43	33	23
Sierra Railway of California	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Buffalo	18	9	39	23	29	75	0	1	0	8	0	1	0	0
Southern Pacific, lines east	2.8	4.6	3.3	5	13	30	47	2	4	1	3	10	37	28
Southern Pacific, lines west	21	13	11	24	27	33	38	71	14	13	47	50	51	24
Southern Pacific of Mexico	57	60	0	30	100	100		1	3	0	2	3	1	
Southern	12	14	9	12	24	36	59	44	75	15	13	38	56	177
Spokane International	0	7	9	13	28	0	37	0	0	0	0	0	0	2
Spokane, Portland & Seattle	16	17	22	22	33	32	60	2	0	1	1	2	4	13
Steelton & Highspire	15	26	19	24	48			0	0	1	0	2		
Tennessee, Alabama & Georgia	17	0						0	0	0				
Tennessee Central	24	31	14	47	65	74	89	5	3	0	14	40	23	63
Tennessee Coal, Iron & R. R.	20	33	7	38	67	40	50	0	0	0	0	0	0	0
Terminal R. R. Assn. of St. L.	32	36	32	41	44	62	76	10	11	4	0	3	1	6
Texas & Pacific	5	4.8	0	1	12	16	62	1	1	0	1	3	1	91
Texas-Mexican	13	7	27	43	50	33	50	0	0	0	0	1	0	1
Texas Pacific-Missouri Pacific of New Orleans	12	20	0	4	10	57	83	0	0	0	0	0	2	0
Toledo, Peoria & Western	0	0	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	0	67	0	0				0	0	0	0	0		
Utah	0	0	0	0	0	75		0	0	0	0	0	0	0
Union Pacific ¹³	14	13	9	17	20	30	41	24	14	2	8	17	19	26
Union	3.2	7	11	9	29	80	10	0	2	1	2	0	0	2
Upper Merion & Plymouth	22	36	28	60	62			6	10	0	7	8		
Utah	0	0	0	11	4	26	19	0	0	0	0	0	0	0
Virginian	37	47	17	22	50	58	75	4	12	1	0	2	5	45
Wabash	1.4	1.6	0	1.5	6	47	82	1	1	0	1	2	21	89
Washington Terminal	0	33	0	10	43	40	89	0	1	0	0	1	1	2
Western Maryland	6	7	13	26	42	54	76	3	0	1	3	13	22	90
Western Pacific	9	8	16	25	19	36	37	2	5	5	9	1	13	9
Wheeling & Lake Erie	16	4.1	8	42	55	67	74	6	2	1	7	10	20	31
Wichita Falls & Southern	50	40	18	4	0	87	100	2	2	1	1	0	6	1
Less than 10 discontinued roads, and industrial locomotives	27	32	32	40	51	56	56	134	190	240	393	707	785	609
All roads	12	12	10	21	31	46	65	934	852	688	1,490	2,539	3,637	7,075

¹³ Includes Los Angeles & Salt Lake, Oregon Short Line, Oregon-Washington R. R. & Navigation and St. Joseph & Grand Island, 1937, and last 6 months 1936.

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