

INTERSTATE COMMERCE COMMISSION

THIRTY-THIRD ANNUAL REPORT

OF THE

DIRECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED

JUNE 30, 1944



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ANNUAL REPORT OF THE DIRECTOR BUREAU OF LOCOMOTIVE INSPECTION

OCTOBER 1, 1944.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Thirty-third Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1944, is respectfully submitted.

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

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

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

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

	Year ended June 30—					
	1944	1943	1942	1941	1940	1939
Number of locomotives for which reports were filed.....	43,297	43,064	42,951	43,236	44,274	45,965
Number inspected.....	117,334	116,647	113,451	105,675	102,164	105,606
Number found defective.....	12,710	11,901	10,970	9,570	8,565	9,099
Percentage inspected found defective.....	11	10	10	9	8	9
Number ordered out of service.....	630	487	474	560	487	468
Number of defects found.....	56,617	51,350	44,928	37,691	32,677	33,490

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

	Year ended June 30—					
	1944	1943	1942	1941	1940	1939
Number of accidents.....	403	319	222	153	164	152
Percent increase or decrease from previous year.....	1 26.3	1 43.7	1 45.1	6.7	17.9	25.9
Number of persons killed.....	25	27	34	15	18	15
Percent increase or decrease from previous year.....	7.4	20.6	1 126.7	16.7	1 20.0	1 114.3
Number of persons injured.....	466	373	227	182	225	164
Percent increase or decrease from previous year.....	1 24.9	1 64.3	1 24.7	19.1	1 37.2	24.1

1 Increase.

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

	Year ended June 30—							
	1944	1943	1942	1941	1940	1939	1915	1912
Number of accidents.....	141	129	81	43	67	52	424	856
Number of persons killed.....	17	25	30	12	16	15	13	91
Number of persons injured.....	194	173	83	64	110	55	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—									
	1944		1943		1942		1941		1940	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	7	128	11	109	10	79	5	41	5	70
Firemen.....	11	181	10	143	12	73	68	6	49	49
Brakemen.....	2	67	4	47	4	32	3	21	4	24
Conductors.....		11		8		7		8	1	4
Switchmen.....		5		12		5		6		4
Roundhouse and shop employees:										
Boilermakers.....	2	5		4	2	4			1	3
Machinists.....		2		3		5	1	3		3
Foremen.....		2				1		2		
Inspectors.....	1	2			1	2				
Watchmen.....		1	1	3			1	2		1
Boiler washers.....								3		
Hostlers.....		12		1		4				2
Other roundhouse and shop employees.....	1	4		4	3	3		1		1
Other employees.....		6		11	2	3		9		20
Nonemployees.....	1	40	1	28		9		18		44
Total.....	25	466	27	373	34	227	15	182	18	225

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

	Year ended June 30—					
	1944	1943	1942	1941	1940	1939
Number of locomotive units for which reports were filed.....	5,139	4,351	3,957	3,389	2,987	2,716
Number inspected.....	7,711	6,847	6,728	5,558	4,974	4,581
Number found defective.....	378	298	358	319	298	260
Percentage inspected found defective.....	4.9	4.4	5	6	6	6
Number ordered out of service.....	9	6	12	21	16	14
Number of defects found.....	1,026	849	928	905	766	696

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

	Year ended June 30—				
	1944	1943	1942	1941	1940
Number of accidents.....	17	15	9	11	7
Number of persons killed.....					
Number of persons injured.....	23	18	9	11	7

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

	Year ended June 30—									
	1944		1943		1942		1941		1940	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		4		3		5		1		2
Firemen.....		4		9		2		5		2
Brakemen.....		1		1		1		1		
Conductors.....		1		1				1		1
Switchmen.....				1		1				1
Maintenance employees.....		4		2				2		1
Other employees.....		1		1						
Nonemployees.....		8						1		
Total.....		23		18		9		11		7

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—														
	1944			1943			1942			1941			1940		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs	3														
Aprons	1														
Arch tubes	2														
Ashpan blowers	5	1		5	1		5	1		5	1		5	1	
Axles	8			8			8			8			8		
Blow-off cocks	9			8			3			3			5		
Boiler checks															
Boiler explosions:															
A. Shell explosions															
B. Crown sheet; low water; no contributory causes found	12	7	19	19	22	48	8	18	11	7	6	27	7	12	13
C. Crown sheet; low water; contributory causes or defects found	7	5	43	4		6	5	5	7	4	5	2	1		2
D. Miscellaneous firebox failures															
Brakes and brake rigging	12			12			13			3		5			1
Couplers	6			9			3			3		1			10
Crank pins, collars, etc.	7			9			6			1		2			6
Crossheads and guides	3			2			2			2		2			2
Cylinder cocks and rigging	3			3			4			1		1			1
Cylinder heads and steam chests	1			1			5			1		1			1
Dome caps															33
Draft appliances	2			3			1			1		1			1
Draw gear	1			1			1			1		1			2
Fire doors, levers, etc.	6			6			5			6		9			11
Flues	8			9			10			3		2			5
Flue pockets				6			4			4		5			2
Footboards	6			6			4			4		5			1
Gage cocks	1			1			2			3		3			2
Grease cups	19			19			18			12		4			1
Grate shakers	14			14			18			10		11			8
Handholds				18			18			10		11			8
Headlights and brackets				4			4			1		3			3
Injectors and connections (not including injector steam pipes)	8			8			7			4		3			6
Injector steam pipes				7			2			2		1			1
Lubricators and connections	5			5			7			5		3			2
Lubricator glasses	1			1			1			1		3			1
Patch bolts															1
Pistons and piston rods	3			3			1			1		1			1
Plugs, arch tube and washout	6	3		7	2		3	3	1	5	1	2	2		2
Plugs in firebox sheets	1			1			1			1		1			1
Reversing gear	16			16			14			19		11			12
Rivets															1
Rods, main and side	7	2		9	7		10	4		5	3	2	2	1	1
Safety valves															4
Sanders	12			12			2			2		2			4
Side bearings															4
Springs and spring rigging	6	2		8	7		8	2		2	6	6	2		4
Squirt hose	21			22			16			7		3			3
Staybolts	4	1		4	4		4	2		2		1			4
Steam piping and blowers	11			14			15			6		4			8
Steam valves	7			7			10			5		1			2
Studs															1
Superheater tubes	2			2			1			2		2			4
Throttle glands	2			2											1
Throttle leaking	1			1			1			1		1			1
Throttle rigging	9			9			4			4		4			5
Trucks, leading, trailing, or tender	5	1		5	3		3	3		4	4	4			2
Valve gear, eccentrics, and rods	10	1		9	3		11	7		7		4			16
Water glasses	14	1		13	11		3	1		7		4			1
Water-glass fittings	2			3			2			1		2			6
Wheels															1
Miscellaneous	103	1	106	70	1	69	48		50	42		43	40	1	40
Total	403	25	406	319	27	373	222	34	227	153	15	182	164	18	225

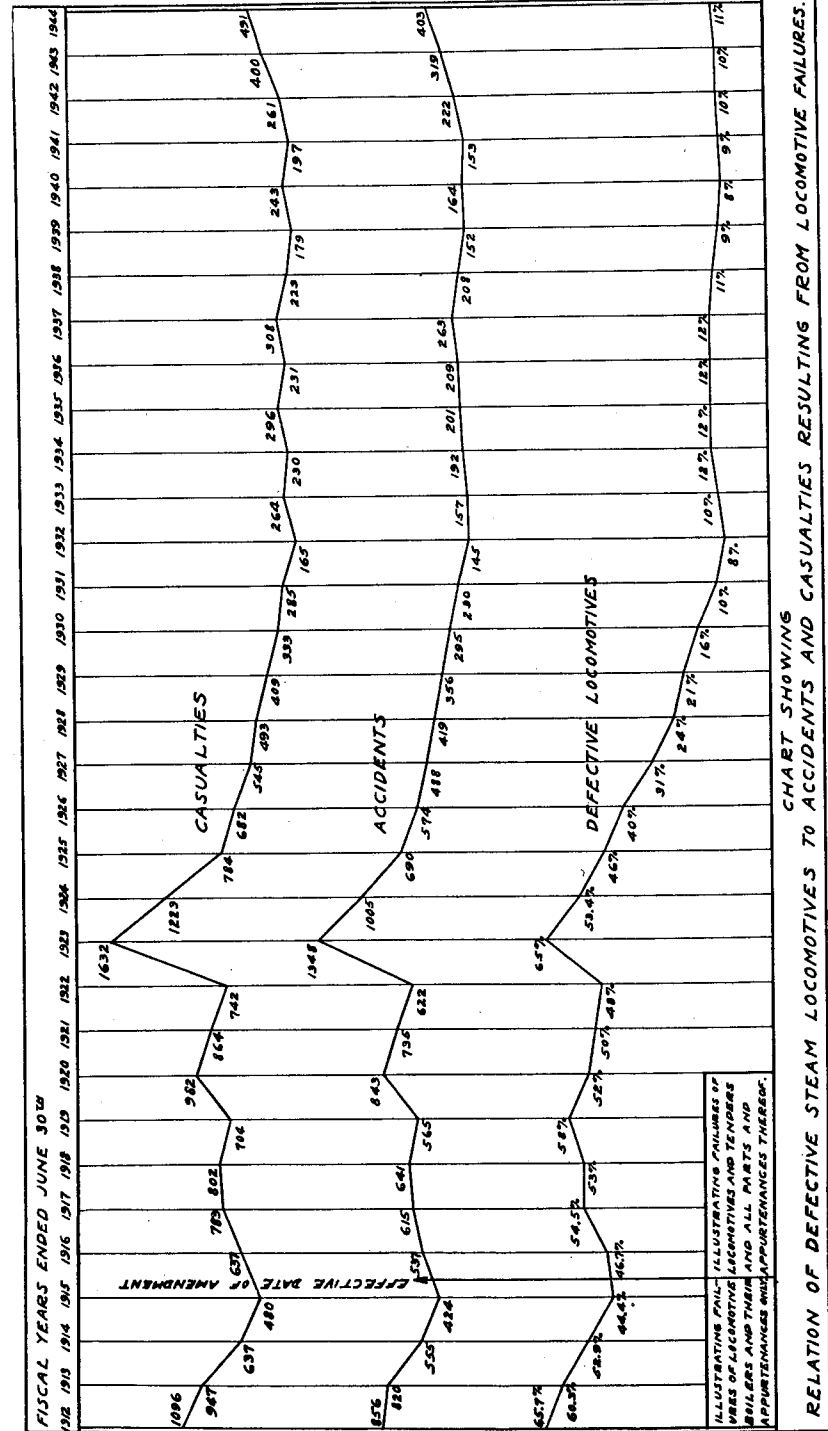


TABLE IX.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1944			1943			1942			1941			1940		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
	Brakes and brake rigging.....	1	3	1	1	1	1	1	1	1	1	1	1	1	1
Carburetors.....	3	3	1	1	1	1	1	1	1	1	1	1	1	1	
Couplers.....	4	5	3	5	3	3	4	4	2	2	2	2	2	2	
Crack pins and connecting rods.....	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
Fires: due to overflowing or leakage of fuel, crank case explosions, back firing, etc.....	4	5	3	5	3	3	4	4	2	2	2	2	2	2	
Generators and starting devices.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Insulation.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Pantographs and trolleys.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Short circuits.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Miscellaneous.....	8	11	5	5	3	3	5	5	1	1	1	1	1	1	
Total.....	17	23	15	18	9	9	11	11	7	7	7	7	7	7	

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—					
	1944	1943	1942	1941	1940	1939
1 Air compressors.....	1,146	968	829	684	567	518
2 Arch tubes.....	45	50	27	31	20	28
3 Ashpans and mechanism.....	93	71	80	67	37	67
4 Axles.....	15	15	2	5	3	2
5 Blow-off cocks.....	289	291	238	205	191	204
6 Boiler checks.....	533	503	393	313	288	279
7 Boiler shell.....	406	377	290	271	266	272
8 Brake equipment.....	2,914	2,661	2,382	1,945	1,506	1,377
9 Cabs, cab windows, and curtains.....	1,169	1,102	1,163	1,087	1,078	943
10 Cab aprons and decks.....	381	390	335	307	277	260
11 Cab cards.....	104	142	131	97	101	92
12 Coupling and uncoupling devices.....	65	66	70	74	53	60
13 Crossheads, guides, pistons, and piston rods.....	2,149	1,961	1,273	858	815	739
14 Crown bolts.....	105	66	75	97	54	47
15 Cylinders, saddles, and steam chests.....	2,133	1,395	1,514	1,332	1,320	1,232
16 Cylinder cocks and rigging.....	624	430	521	438	447	418
17 Domes and dome caps.....	189	196	112	94	78	90
18 Draft gear.....	576	599	651	620	508	450
19 Draw gear.....	515	469	369	347	306	360
20 Driving boxes, shoes, wedges, pedestals, and braces.....	2,026	2,053	1,743	1,348	1,243	1,330
21 Firebox sheets.....	347	303	255	224	191	238
22 Flues.....	274	215	178	150	147	165
23 Frames, tall pieces, and braces, locomotive.....	1,019	894	869	863	665	708
24 Frames, tender.....	126	86	86	83	78	71
25 Gages and gage fittings, air.....	158	191	193	183	132	155
26 Gages and gage fittings, steam.....	328	316	263	236	211	226
27 Gage cocks.....	532	584	497	373	400	361
28 Grate shakers and fire doors.....	539	492	491	430	273	252
29 Handholds.....	464	483	378	433	333	349
30 Injectors, inoperative.....	46	66	47	39	30	26
31 Injectors and connections.....	2,867	2,637	2,220	1,882	1,330	1,457
32 Inspections and tests not made as required.....	9,565	9,037	8,198	7,215	6,218	6,645
33 Lateral motion.....	898	700	498	357	313	243
34 Lights, cab and classification.....	243	184	131	50	49	50
35 Lights, headlight.....	268	292	234	196	185	200
36 Lubricators and shields.....	257	256	244	187	213	248
37 Mud rings.....	301	669	689	508	418	408
38 Packing nuts.....	746	724	738	675	660	739
39 Packing, piston rod and valve stem.....	193	194	188	142	140	104
40 Pilots and pilot beams.....	281	259	173	156	166	179
41 Plugs and studs.....	454	452	411	387	320	317
42 Reversing gear.....	454	452	411	387	320	317

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—					
	1944	1943	1942	1941	1940	1939
43 Rods, main and side, crank pins, and collars.....	3,230	2,798	1,986	1,565	1,199	1,293
44 Safety valves.....	77	74	67	68	61	97
45 Sanders.....	609	642	738	490	415	432
46 Springs and spring rigging.....	4,625	3,583	3,349	2,597	2,174	2,340
47 Squirt hose.....	94	92	67	62	50	75
48 Stay bolts.....	400	367	272	239	227	181
49 Stay bolts, broken.....	232	247	274	198	271	258
50 Steam pipes.....	435	414	290	385	255	285
51 Steam valves.....	161	159	150	110	106	115
52 Steps.....	872	729	594	555	449	490
53 Tanks and tank valves.....	1,400	1,321	1,150	952	768	837
54 Telltale holes.....	69	78	79	59	95	58
55 Throttle and throttle rigging.....	948	887	786	688	647	638
56 Trucks, engine and trailing.....	1,155	1,020	833	636	598	628
57 Trucks, tender.....	928	900	786	773	705	665
58 Valve motion.....	1,021	998	779	580	506	554
59 Wash-out plugs.....	845	685	569	445	478	487
60 Train-control equipment.....	5	9	7	1	2	5
61 Water glasses, fittings, and shields.....	1,323	1,454	1,133	788	753	690
62 Wheels.....	759	728	664	536	554	466
63 Miscellaneous—Signal appliances, badge plates, brakes.(hand).....	1,167	1,142	970	785	564	610
Total number of defects.....	56,617	51,350	44,928	37,601	32,677	33,490
Locomotives reported.....	43,297	43,064	42,951	43,236	44,274	45,965
Locomotives inspected.....	117,334	116,647	113,451	105,675	102,164	105,606
Locomotives defective.....	12,710	11,901	10,970	9,570	8,565	9,099
Percentage of inspected found defective.....	11	10	10	9	8	9
Locomotives ordered out of service.....	630	487	474	560	487	468

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—					
	1944	1943	1942	1941	1940	1939
Air compressors.....	7	7	13	22	8	14
Axles, truck and driving.....	6	6	1	5	1	1
Batteries.....	1	1	1	6	1	1
Boilers.....	1	5	4	10	6	6
Brake equipment.....	85	62	86	69	50	50
Cabs and cab windows.....	40	33	27	45	22	36
Cab cards.....	21	17	20	24	13	19
Cab floors, aprons, and deck plates.....	54	31	10	14	17	13
Clutches.....	1	2	1	1	1	1
Controllers, relays, circuit breakers, magnet valves, and switch groups.....	14	9	12	7	16	13
Coupling and uncoupling devices.....	3	1	5	2	6	4
Current collecting apparatus.....	1	1	1	3	1	5
Draft gear.....	14	15	19	15	31	17
Draw gear.....	12	2	3	3	2	4
Driving boxes, shoes, and wedges.....	12	25	16	36	29	52
Frames or frame braces.....	12	7	5	1	12	9
Fuel system.....	33	32	81	62	51	35
Gages or fittings, air.....	6	3	8	3	1	6
Gages or fittings, steam.....	2	1	1	2	2	2
Gears and pinions.....	1	4	4	2	1	2
Handholds.....	6	19	14	12	6	8
Inspections and tests not made as required.....	278	223	274	243	207	185
Insulation and safety devices.....	8	4	3	4	2	4
Internal-combustion engine defects, parts and appurtenances.....	86	50	62	54	35	32
Jack shafts.....	8	2	1	3	7	6
Jumpers and cable connectors.....	2	3	1	1	1	1
Lateral motion, wheels.....	9	10	1	4	5	1
Lights, cab and classification.....	1	1	5	2	1	3
Lights, headlight.....	2	2	1	1	3	4
Meters, volt and ampere.....	2	3	2	2	4	2
Motors and generators.....	14	14	16	16	12	19
Pilots and pilot beams.....	2	4	10	12	10	5

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—					
	1944	1943	1942	1941	1940	1939
Quills.....	18	9	6	4	4	7
Rods, main, side, and drive shafts.....	10	2	2	4	2	2
Sanders.....	59	41	57	56	34	28
Springs and spring rigging, driving and truck.....	44	18	35	58	50	16
Steam pipes.....	3	1	1	1	4	4
Steps, footboards, etc.....	25	25	21	35	22	18
Switches, hand-operated, and fuses.....	2	2	2	2	3	5
Transformers, resistors, and rheostats.....	47	3	3	3	1	1
Trucks.....	47	22	28	30	43	33
Water tanks.....	1	4	1	1	1	1
Water glasses, fittings, and shields.....	4	2	5	1	1	1
Warning signal appliances.....	2	3	3	4	4	1
Wheels.....	74	107	43	28	22	16
Miscellaneous.....	13	16	14	8	15	10
Total number of defects.....	1,026	849	926	905	766	696
Locomotive units reported.....	5,139	4,351	3,957	3,389	2,987	2,716
Locomotive units inspected.....	7,711	6,847	6,728	5,558	4,974	4,581
Locomotive units defective.....	378	298	358	319	298	280
Percentage inspected found defective.....	4.9	4.4	5	6	6	6
Locomotive units ordered out of service.....	9	6	12	21	16	14

INVESTIGATION OF ACCIDENTS AND GENERAL CONDITION OF LOCOMOTIVES

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

STEAM LOCOMOTIVES

Four hundred and three accidents occurred in connection with steam locomotives, resulting in 25 deaths and 466 injuries. This represents an increase of 84 accidents, a decrease of 2 in the number of persons killed, and an increase of 93 in the number of persons injured compared with the preceding year.

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

Table VIII shows the various parts and appurtenances of steam locomotives and tenders which, through failure, have caused serious and fatal accidents. If the information contained in this table is taken advantage of and proper inspections and repairs made in accordance with the requirements of the law and rules, many accidents will be avoided.

During the year 11 percent of the steam locomotives inspected by our inspectors were found with defects or errors in inspection that

should have been corrected before the locomotives were put into use; this represents an increase of one percent compared with the next preceding year. Six hundred and thirty locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this is an increase of 143 locomotives as compared with the next preceding year.

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

EXPLOSIONS AND OTHER BOILER ACCIDENTS

All of the 19 explosions that occurred in the fiscal year, in which 12 persons were killed and 62 injured, were caused by overheating of the crown sheets, due to low water. There was a reduction of 6 in the number of boiler explosions, a reduction of 12 in the number of persons killed, and an increase of 6 in the number of persons injured as compared with the preceding year.

Five of these explosions, in which, with one exception, the boilers were torn from the running gears or frames, were particularly violent.

One of these accidents occurred while the locomotive was hauling a passenger train at an estimated speed of 70 miles per hour. The boiler was hurled about 700 feet forward from the point of explosion, it turned over in flight and alighted on the track ahead of the train, then bounded and came to rest 900 feet from the point of explosion and 35 feet south of the track. All wheels of the locomotive and tender, the first 10 cars, and the front truck of the eleventh car were derailed. The fifth and sixth cars came to rest in V-shape across the tracks, and the running gear and tender came to rest 1,300 feet from the point of explosion. The firebox crown sheet with upper part of door sheet and parts of both side sheets attached alighted, turned inside out, 400 feet forward and 100 feet to the right of the point of explosion. Three employees were killed, and 9 mail clerks, 5 Pullman porters, and 15 dining-car employees were seriously injured.

In another explosion, which occurred while the locomotive was hauling a troop train at an estimated speed of 50 miles per hour, one employee was fatally injured and died approximately 36 hours after the accident, and two employees were seriously injured. The boiler was torn from the frame fastenings but remained attached to the cylinders; the main frames were broken off at the rear of the cylinders, all wheels were derailed, and the boiler and running gear came to rest at the base of an embankment approximately 249 feet west of the point of explosion. The first eight cars of the train were derailed. The first car of the train, an express car, was derailed to the right at a 45° angle to the track, the second car, a standard Pullman, was

derailed to the left and stopped, practically parallel to the track ahead of all other wreckage. The third car, a tourist Pullman, came to rest on top of the express car which was demolished. The fourth car was derailed to the right at a 45° angle, the fifth car leaned on the track fill parallel to the track, and the three following cars remained in upright positions.

Three employees were killed in another explosion which occurred while the locomotive was hauling a freight train at an estimated speed of 30 miles per hour; the boiler alighted 340 feet forward of the point of explosion with the rear end fouling the track; it was struck by the running gear which was then derailed.

In another accident where the boiler was torn from the running gear, in which one employee was killed and two employees injured, the locomotive, which had been hauling a freight train, was standing at a water tank. In its flight, the boiler destroyed the approach span of an overhead concrete highway bridge and came to rest on the slope of an embankment, 116 feet from the point of explosion.

Two employees were seriously injured in another accident caused by explosion of the boiler of a locomotive which was hauling a freight train at an estimated speed of 15 miles per hour. This boiler was not torn from the running gear or frame but the force of the explosion lifted the back end of the locomotive and caused the locomotive to derail and overturn on its left side crosswise of the north-bound and south-bound tracks. Parts of the wreckage were found scattered over a radius of 500 feet.

Five employees were killed and 26 seriously injured in the remaining 14 accidents.

Occurrence of explosions caused by overheating of crown sheets due to low water, with consequent loss of life and serious injuries and damage to locomotives, clearly points to the hazard brought about by any relaxation of the vigilance normally exercised in the maintenance of safe water level or in the promptness with which the fire is extinguished in the event a safe water level cannot be maintained. All employees whose duties include responsibility for the maintenance of safe water level should see that water glasses, including water-glass cocks and all connections, are properly blown out and gage cocks tested, and that all are known to be in good working order before each trip. The water level shown in the water glasses should be closely observed at all times, and the glasses should be blown out sufficiently often during each trip and movement of the water in the glasses carefully noted at that time and thereafter to insure that the level in the glass moves up and down freely with the water level in the boiler which is subject to practically constant motion over a narrow range when the locomotive is working. It should be specially stressed that those observing the water level should always be guided

by the lowest indication of any of the water-level indicating devices if there is any variation in the indications, in other words, the least favorable indication should be considered as the correct indication. Gage cocks should be tried frequently to check the level shown in the water glasses. If the water is below the line of sight in the water glass, emergency measures to protect the crown sheet from overheating should be taken at once; interpretation of a "flutter" of water from the bottom gage cock as indicating safe water level in the boiler will in all probability result in disaster.

Boiler and appurtenance accidents other than explosions resulted in the death of 5 persons and injuries to 132 persons; this is an increase of 4 deaths and an increase of 15 injuries as compared with the preceding year.

EXTENSION OF TIME FOR REMOVAL OF FLUES

One thousand four hundred and four applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 46 of these cases the condition of the locomotives was such that extensions could not properly be granted. Sixteen were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Fifty-nine extensions were granted after defects disclosed by our investigations were required to be repaired. Forty applications were canceled for various reasons. One thousand two hundred and forty-three applications were granted for the full period requested.

MECHANICAL STOKERS

The Commission's Order No. 24049, dated March 18, 1939, established rule 118 (c), the first paragraph of which requires that all coal-burning steam locomotives which weigh on driving wheels 160,000 pounds or more to be used in fast or heavy passenger service and all coal-burning steam locomotives which weigh on driving wheels 175,000 pounds or more to be used in fast or heavy freight service, built on or after April 15, 1939, be equipped with a suitable type of mechanical stoker and that such stokers be properly maintained.

The second paragraph of the rule required the filing by each railroad which operated coal-burning locomotives of the above weights, with the Director of the Bureau of Locomotive Inspection, lists as of April 15, 1939, of all hand-fired locomotives of the specified weights built prior to April 15, 1939, which would in the future be used in fast or heavy service, that mechanical stokers be applied in each 12-month period to not less than 20 percent of the total number so listed, that all locomotives included in the lists be so equipped before April 15, 1944, and that such stokers be properly maintained.

The number of hand-fired locomotives built prior to April 15, 1939, reported by the railroads as of that date to be used in the future in services requiring the use of stoker-equipped locomotives was 2,171. The lists filed by the railroads were revised from time to time as traffic increased due to our preparedness efforts and our participation in the war, it being necessary to use in fast or heavy service all locomotives that could be made capable of such use because of inability to obtain a sufficient number of new and more modern locomotives to satisfactorily handle the greatly increased traffic. These revisions in the lists, after adjustments due to conversion of some of the locomotives to oil burners, replacements with new stoker-equipped locomotives, assignments to other than fast or heavy service, and retirements, resulted in the application of stokers to 3,648 locomotives before expiration of the time limit on April 15, 1944. This number of locomotives upon which stokers were applied is 1,477 in excess of the number originally reported by the railroads required to be so equipped. Various extensions of time for equipment of 245 locomotives with stokers, all of which expire on or before December 31, 1944, were granted by the Commission pending shopping of the locomotives involved for classified repairs. Stoker applications to these locomotives are proceeding currently.

The equipment of these locomotives with mechanical stokers contributed materially to the ability of the railroads to successfully handle wartime traffic. The boilers of these locomotives are, in general, of such capacity that maximum power of the locomotives cannot be maintained over any considerable period of time by hand firing without hazard of physical exhaustion of the firemen. The installations of mechanical stokers resulted in making available the maximum power of the locomotives when needed and for long sustained periods of time, thus increasing their usefulness and ability in the movement of present-day traffic which is heavier, and for the most part, is moved with greater expedition than was ever heretofore thought possible.

A further assistance in our war effort brought about by the application of mechanical stokers to these locomotives is the saving in manpower and labor turn-over, and reduction in lost working time, or absenteeism, of the firemen. The hand firing of these locomotives was an arduous task before present-day traffic conditions obtained and often resulted in the necessity for longer rest periods than are generally considered normal for persons engaged in that service; this condition would have been greatly accentuated, and many employees now regularly employed in the firing of stoker-equipped locomotives would have been compelled, for reasons of health, to leave that occupation if mechanical stokers had not been substituted for hand firing.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

There was an increase of two 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 preceding year. No deaths occurred in either year.

During the year 4.9 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; this represents an increase of 0.5 percent compared with the results obtained in the preceding year. Nine locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this represents an increase of three locomotives compared with the next preceding year.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 583 specification cards and 5,996 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, 793 specifications and 28 alteration reports were filed for locomotive units and 117 specifications and 100 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

SPECIAL WORK

In response to requests from military and naval authorities and other Government agencies engaged in the war effort, inspections of various locomotives were made to determine the condition and suitability for use, and cooperative assistance was rendered in other respects. These locomotives are being generally maintained to the standards prescribed by the locomotive inspection law and rules governing the condition of locomotives used on the lines of common carriers and inspections are currently made by our inspectors.

APPEALS

One formal appeal from a decision of an inspector, as provided in section 6 of the law, was made during the year. Subsequent investi-

gation resulted in the decision of the inspector being sustained. This appeal was based on an order to withhold a locomotive from service which our inspector found in use with a crack in the hub of a main driving wheel. An earlier transverse crack had developed in the outer circumference of the hub between an intermediate and a short-length spoke, and fusion welding had been applied in an attempt to repair this crack. Our inspector found a crack at the edge of this welding which crack had extended to the outer face of the hub and into the hub 4 inches toward the axle fit. When reexamined following the appeal, the presence of the crack was clearly evident without visual aid. It was stated in the appeal that a magnaflux test of the wheel center had been made and that no crack was indicated by that test; after our reexamination the railroad officer who made the appeal advised that he had been misinformed as to the application of the magnaflux test.

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 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 enginemen 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 a train can be stopped in instances of this kind is for the engineer or fireman to climb out of or over the cab and make way to the front end and open the front end brake pipe angle cock if it is accessible.

2. All road steam locomotives should be equipped with means whereby the height or quantity of water in the tender feed water tank may be ascertained from the cab or tender deck of the locomotive.

In the interest of expeditious movement of trains it often becomes necessary while proceeding on the line of road for the locomotive crew to have knowledge of the height or quantity of water remaining in the tender tank. The common practice in these instances is for the fireman to make his way back over the tender coal space, or fuel oil tank, to the filling hole on the rear of tender, open the cover of the filling hole, and measure the water height by whatever means that may be available. While performing this service, many slips and falls resulting in serious injuries have occurred due to the swaying

of the tender while the train is in rapid motion, and weather conditions which render it difficult to maintain safe footing. The results of accidents of the nature herein described are not recorded in the accident statistics of the Bureau of Locomotive Inspection unless due primarily to some defective condition of the locomotive; however, the unnecessary hazard in proceeding over the tender to the filling hole to measure the water in the tender while the train is in motion at normal speeds is apparent.

The first recommendation was made in a previous annual report. Some of the railroads have recognized the value of the additional air brake valve and have applied such a valve to a limited number of their locomotives. Likewise, some of the railroads have recognized the value of means to ascertain the quantity of water in the feed water tank from the cab or tender deck. However, compliance with recommendations 1 and 2 is by no means generally widespread, and installations are not progressing to the extent that could be desired to obtain the maximum degree of safety.

ACKNOWLEDGMENT

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

JOHN M. HALL,
Director.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1944, BY ROADS

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

ALABAMA, TENNESSEE & NORTHERN RAILROAD:

*May 15, 1944, locomotive 402, Chestang, Ala. Steam pipe failed; two injured.
One accident; two injured.

ALTON RAILROAD:

**December 3, 1943, locomotive 4357, near Vera, Mo. Main crank pin broke through old fractures which extended through approximately 65 percent of cross-sectional area; one injured.

**January 26, 1944, locomotive 5299, Lockport, Ill. Whistle lever stuck due to being bent; lever had been fouled by the cover on top of the fountain casing which came open account of the wing nut which held it in closed position having loosened; one injured.

January 29, 1944, locomotive 146, Venice, Ill. Water-crane hook slipped off water spout; hook was not the company's standard; one injured.

Three accidents; three injured.

ALTON & SOUTHERN RAILROAD:

*August 30, 1943, locomotive 10, East St. Louis, Ill. Glass in air gage shattered due to pressure built up in gage from a hole in the main reservoir tube in the gage; one injured.

December 15, 1943, locomotive 13, Washington Park, Ill. Tender truck axle broke due to old fracture which extended through approximately 40 percent of cross-sectional area; two injured.

Two accidents; three injured.

ANN ARBOR RAILROAD:

**January 25, 1944, locomotive 1612, Lake George, Mich. Guide yoke broke; one injured.

One accident; one injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

July 21, 1943, locomotive 1236, Port Chicago, Calif. Bullseye glass blew out of oil reservoir of lubricator; outer rim of the glass was defective; one injured.

July 23, 1943, locomotive 3823, near Bond, N. Mex. Main rod failed due to progressive fracture; "Back end of right main rod hot" was reported on July 20; one injured.

August 5, 1943, locomotive 3704, Los Angeles, Calif. Employee was injured while lubricating the bell ringer, due to his hand being caught between the stop cross bar attached to top of the bell and an unused bracket at the top of the bell frame arm; bracket, which was a part of a previously used bell ringing device, was not removed when the ringing device was changed; one injured.

**August 23, 1943, locomotive 3529, Goffs, Calif. Sanders inoperative; one injured.

August 30, 1943, locomotive 3413, Clucas, Colo. Boiler check stuck open; one injured.

August 31, 1943, locomotive 4086, Kiowa, Kans. Cab awning rod bracket broke when awning rod was accidentally used instead of the cab side handrail; insufficient clearance between handrail and awning rod; one injured.

September 17, 1943, locomotive 4054, Kansas City, Kans. Pilot buffer beam handhold broke, due to old fracture which extended through approximately 75 percent of its cross-sectional area; one injured.

September 19, 1943, locomotive 2019, Los Angeles, Calif. Squirt-hose valve worked open; valve stem was loose, due to packing nut not being properly tightened; one injured.

**September 21, 1943, locomotive 1333, Cadiz, Calif. Oil on top of tender fuel-oil tank caused employee to slip and fall against rear headlight; one injured.

October 4, 1943, locomotive 3887, near Cable, Calif. Injured while attempting to operate lubricator flange oiler, due to filler plug being missing; apparently the plug was not in place when the locomotive was dispatched; one injured.

October 9, 1943, locomotive 3257, South Chaves, N. Mex. Coal on top of tender back of fuel space; one injured.

**October 10, 1943, locomotive 3869, Seligman, Ariz. Grease on step at front end of locomotive; one injured.

October 12, 1943, locomotive 1619, Alto, Ariz. Employee's foot was caught between cab apron and edge of cab floor or running board which extended beyond the cab back wall when apron buckled due to fouling of edge of tender deck on apron hinge; one injured.

**October 25, 1943, locomotive 1799, Wickenburg, Ariz. Tender rear handrail broke through progressive fracture; one injured.

*November 8, 1943, locomotive 3761, Needles, Calif. Air hose at rear end of locomotive failed, resulting in emergency application of the brakes; hose deteriorated; one injured.

November 16, 1943, locomotive 4081, Adamana, Ariz. Ashpan slide fouled on rear hopper and was difficult to operate. When forced the slide released suddenly and employee's hand was caught between ashpan dump lever and the injector overflow pipe, due to insufficient clearance; one injured.

**November 19, 1943, locomotive 3782, Ash Fork, Ariz. Oil on top of tender fuel tank; one injured.

*November 22, 1943, locomotives 2320 and 3835, Barstow, Calif. Air hose parted between locomotives, resulting in emergency application of the brakes; one injured.

December 3, 1943, locomotive 1689, Victorville, Calif. Blower was inoperative due to broken nipple at nozzle connection; one injured.

**December 12, 1943, locomotive 3237, between Winslow, Ariz., and Gallup, N. Mex. Stoker engine operating steam valve was leaking; valve was reported on November 4 and December 11, 14, and 22; one injured.

*December 12, 1943, locomotive 3425, Baring, Mo. Main lubricator steam pipe broke off through old defect in pipe; one injured.

December 22, 1943, locomotive 4065, Summit, Calif. Oil around manhole of tender fuel oil tank; one injured.

January 2, 1944, locomotive 3252, Dalies, N. Mex. Coal on top of tender behind fuel space; one injured.

*January 4, 1944, locomotive 3935, Seligman, Ariz. Oil on top of tender fuel tank; one injured.

January 17, 1944, locomotive 3239, Houck, Ariz. Condensation dripping from cab heater trap scalded employee who was dumping ashpan; heater trap was located too close to ashpan dump lever and the vent was directed toward the usual position of a person while operating the dump lever; one injured.

January 31, 1944, locomotive 3257, Holbrook, Ariz. One section of tender water tank manhole cover was missing; one injured.

*February 4, 1944, locomotive 3525, Gale, Calif. Fitting blew off of air hose, causing emergency application of the brakes; one injured.

February 11, 1944, locomotive 3248, Armijo, N. Mex. Power grate shaker cylinder head gasket blew out, causing a bad steam leak; one injured.

February 17, 1944, locomotive 3238, Cheto, Ariz. Link block pin worked out and fouled other parts of valve gear; dowel for securing the pin was missing; valve gear was reported on February 2, 5, 6, 10, 18, and 19; one injured.

*February 17, 1944, locomotive 1963, Santa Ana, Calif. Cylinder cock rod became disconnected; one injured.

**February 23, 1944, locomotive 3936, Pisgah, Calif. Engine truck journal became overheated; one injured.

*February 27, 1944, locomotive 3855, Boron, Calif. Brake valve failed to operate brakes in service position, resulting in emergency application of the brakes; one injured.

March 23, 1944, locomotive 3427, Bosworth, Mo. Head of pilot knee brace bolt broke off through old fracture and the bolt dropped out of brace and was thrown through cab window, striking an employee; one injured.

April 21, 1944, locomotive 4083, near Mendon, Mo. Lubricator steam pipe separated from lubricator connection, due to flange joint sleeve breaking off; sleeve had not been properly brazed to steam pipe and steam pipe was not belled or flared at the joint end of sleeve; sleeve was porous and brittle and had the appearance of having been overheated; one injured.

*April 30, 1944, locomotive 3814, near Mindeman, N. Mex. Hook slipped out of hole in stoker conveyor slide; slide was bent down 1¼ inches at the hole; one injured.

*May 29, 1944, locomotive 3711, Mojave, Calif. Sand pipe leaking; one injured.

June 9, 1944, locomotive 3784, Los Angeles, Calif. Burned by hot water which discharged from train line steam heat conduit coupler at rear of tender; steam heat stop valve had not been properly closed; one injured.

June 12, 1944, locomotive 820, Belen, N. Mex. Insufficient clearance between cab apron and the angle iron on bottom of the back end of the cab which overhangs the gangway; one injured.

June 15, 1944, locomotive 3937, Mojave, Calif. Oil on top of tender fuel oil tank; one injured.

June 30, 1944, locomotive 3149, Cliff, Calif. Cylinder cock broke off and cylinder cock rigging struck the track ties and caused the cylinder cock operating lever in cab to fly back, striking employee; cylinder cock had thin wall due to the casting core being off center; one injured.

Forty accidents; forty injured.

ATLANTA & WEST POINT RAILROAD:

*March 19, 1944, locomotive 376, Opelika, Ala. Sand pipe was stopped up; one injured.

One accident; one injured.

ATLANTIC COAST LINE RAILROAD

August 6, 1943, locomotive 1726, Watha, N. C. Main reservoir radiator pipe clamp was thrown from rapidly moving locomotive and struck the brakeman of a train which was on a siding; bolt for securing clamp was missing; one injured.

October 5, 1943, locomotive (C. & O.) 2310, Godwin, N. C. Grate-shaker bar slipped off post, due to improper fit; shaker bar was not designed for use on locomotives of this type; one injured.

October 28, 1943, locomotive 1744, Yemassee, S. C. Coal pusher was inoperative and middle sliding cover of stoker conveyor was stuck in closed position, due to accumulation of coal dust and dirt packed in the grooves; coal pusher was reported inoperative on October 26 and 28 (at end of the previous trip); one injured.

November 27, 1943, locomotive (C. & N. W.) 2354, Morven, N. C. Feed valve failed to control the brake-pipe pressure; one injured.

*January 2, 1944, locomotive 1515, Climax, Ga. Tender truck spring hanger broke; two injured.

March 10, 1944, locomotive 2019, Collier, Va. Grate-shaker bar slipped off post, due to improper fit; shaker post had improper taper and shaker-bar socket had oil on it; one injured.

**March 30, 1944, locomotive 1213, Richmond, Va. Injector failed to operate and discharged hot water and steam through telltale which overflowed the drain pipe and burned employee; injector was reported on March 21, 23, 27, 28, 29, and 30 (two times), and April 1; one injured.

June 30, 1944, locomotive 1206, Petersburg, Va. Nozzle of fire hose blew off; hose was defective at point of failure, apparently caused by being kinked due to the nipple hanging free when hose was on the rack; one injured.

Eight accidents; nine injured.

BALTIMORE & OHIO RAILROAD:

**July 1, 1943, locomotive 666, Cincinnati, Ohio. Boiler check stop valve bonnet blew out; bonnet threads were too small in diameter for threaded section of stop valve body; one injured.

August 12, 1943, locomotive 4162, Toledo, Ohio. Reflex water glass burst and blew out of frame; one injured.

August 20, 1943, locomotive 99, Philadelphia, Pa. Spark arrester became disconnected from smokestack due to the bolts in hinge being defective and loose; arrester was reported loose on August 11 and 13; one injured.

**December 24, 1943, locomotive 783, Rochester, N. Y. Both heads of main air reservoir were blown out, due to explosion caused by oil in reservoir; oil had

been introduced through air compressor inlet in effort to make compressor operate properly; compressor was reported on December 15, 18, 19, 21, and 22; one injured.

**December 30, 1943, locomotive (B. & O. C. T.) 901, Chicago, Ill. Grate-shaker bar slipped off post due to improper fit; one injured.

February 21, 1944, locomotive 356, Hamilton, Ohio. Vertical cab handhold at gangway contacted the tender gangway step when on a sharp curve; one injured.

**February 27, 1944, locomotive 4317, near Cochran, Ind. Main driving axle broke; one killed.

**March 30, 1944, locomotive 4218, LaPaz Junction, Ind. Grate-shaker bar slipped off post, due to improper fit; shaker bar was battered, shaker post was worn, and pin for securing shaker bar on post was missing; shaker bar was not company's standard; one injured.

May 5, 1944, locomotive 5310, Stepney, Md. Nut worked off tender truck box bolt and was thrown from rapidly moving locomotive, striking a nonemployee; one injured.

**June 6, 1944, locomotive 5501, Newport, Pa. Undesired application of the brakes by train-control equipment, caused by voltage fluctuations of the turbo-generator due to scale having lodged under the generator governor; one injured.

June 13, 1944, locomotive 4703, Leroy, N. Y. Superheater flue failed at safe end weld; one injured.

June 18, 1944, locomotive 2565, Fairmount, Ohio. Squirt-hose valve was inoperative; valve stem was bent; one injured.

**June 19, 1944, locomotive 4537, Olney, Ill. Flag container fell from position in cab; nuts worked off one of the two bolts which fastened the container to back wall of cab and the other bolt broke under the additional load; flag container was not the company's standard, and was improperly located and insecurely applied; one injured.

Thirteen accidents; one killed, twelve injured.

BESSEMER & LAKE ERIE RAILROAD:

*April 27, 1944, locomotive 346, Butler, Pa. Cab apron dropped off front angle support while on curve; one injured.

One accident; one injured.

BOSTON & MAINE RAILROAD:

October 10, 1943, locomotive 3021, near West Boylston, Mass. Crown-sheet failure caused by overheating due to low water; the assemblage and location of the discharge end of the injector-indicating or annunciator pipe were such that it did not provide adequate warning in case of the failure of injector to operate as intended; four injured.

*December 16, 1943, locomotive 2394, North Wilmington, Mass. Valve stem broke; one injured.

February 9, 1944, locomotive 644, Lynn, Mass. Water glass broke, breaking glass panel in water-glass shield; one injured.

Three accidents; six injured.

CANADIAN NATIONAL RAILWAYS:

**July 15, 1943, locomotive (G. T.) 5584, North Stratford, N. H. Main driving wheel axle broke due to a progressive fracture which covered approximately 70 percent of cross-sectional area; one injured.

One accident; one injured.

CAROLINA & NORTHWESTERN RAILWAY:

*February 22, 1944, locomotive 533, Newton, N. C. Sand pipe stopped up; one injured.

One accident; one injured.

CENTRAL OF GEORGIA RAILWAY:

November 1, 1943, locomotive 485, Fort Valley, Ga. Crown-sheet failure caused by overheating due to low water; one killed, two injured.

January 21, 1944, locomotive 59, Columbus, Ga. Grate-shaker bar slipped off lever due to improper fit and oil on lever at shaker-bar fit; one injured.

Two accidents; one killed, three injured.

CENTRAL RAILROAD OF NEW JERSEY:

June 5, 1944, locomotive 866, Phillipsburg, N. J. Guard was missing from right side of cab apron which permitted employee's foot to be placed under cab

ear wall extension where it was crushed when the locomotive passed over uneven track; right side of cab apron was bent upward; one injured.

One accident; one injured.

CENTRAL VERMONT RAILWAY:

July 24, 1943, locomotive 388, Brattleboro, Vt. Explosion of both main air reservoirs due to excessive pressure; apparently the compressor governor was temporarily inoperative due to an accumulation of loose foreign matter in the cavity under the diaphragm and around pin valve of governor top; two injured. One accident; two injured.

CHESAPEAKE & OHIO RAILWAY:

January 22, 1944, locomotive 2311, near Lowell, W. Va. Blow-off discharge pipe became disconnected at Barco joint; threads of joint spanner nut and fitting were defective; one injured.

June 1, 1944, locomotive 1468, Elk Run Junction, W. Va. Crown-sheet failure caused by overheating due to low water; one killed.

Two accidents; one killed, one injured.

CHICAGO & EASTERN ILLINOIS RAILROAD:

July 11, 1943, locomotive 2000, Johnston City, Ill. Cast-iron steam pipe in front end failed; apparently the primary cause of the failure was the movement of the valve chest and cylinder due to a crack in the cylinder saddle, caused by water being carried over into cylinders; minimum thickness of pipe wall was $\frac{1}{4}$ inch less than company's standard; two injured.

One accident; two injured.

CHICAGO & NORTH WESTERN RAILWAY:

August 9, 1943, locomotive 2122, Janesville, Wis. Water glass burst; one injured.

November 9, 1943, locomotive 2474, near Scranton, Iowa. Main crank pin broke, due to a progressive fracture which extended through approximately 55 percent of cross-sectional area; one injured.

April 17, 1944, locomotive 2438, Marshalltown, Iowa. Water glass broke; one injured.

*June 18, 1944, locomotive 4002, Belle Plaine, Iowa. Spring clip thrown from moving locomotive struck person who was on station platform; one injured.

**June 23, 1944, locomotive 343, Wankegan, Ill. Throttle was hard to close, due to improper alignment of throttle lever; excessive slack in rigging at connection to throttle valve; one injured.

Five accidents; five injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

**August 12, 1943, locomotive 7012, Fairfield, Iowa. Injector steam valve connecting rod was too short, permitting lever handle to strike on guide bracket on boiler back head; one injured.

August 20, 1943, locomotive 4953, Prospect Hill, Mo. Insufficient clearance between tender deck and vertical handhold at right back corner of cab when on curve; one injured.

October 17, 1943, locomotive 5627, near Otis, Colo. Both eccentric rods broke, due to the erratic action of the valve motion caused by broken needle bearing in the forward end of the right eccentric rod, resulting in emergency application of the brakes and parting of the train between passenger cars; one killed.

**November 14, 1943, locomotive 5295, Bartlett, Iowa. Stoker was inoperative due to an iron bolt having lodged between the elevator screw and elevator casing; one injured.

February 16, 1944, locomotive 2062, Kent, Iowa. Locomotive separated from tender due to the locomotive frame tail piece breaking through defects in the cast steel tail piece and to failure of a fusion weld in a slab that had been applied on top of the tail piece to reinforce the casting; one injured.

March 27, 1944, locomotive 4986, Zearing, Ill. Nuts came off guide-bar bolts, allowing undue vertical movement of the bars; guide-bolt nuts were reported loose on February 29 and March 9; one injured.

**May 15, 1944, locomotive 1729, St. Joseph, Mo. Water glass burst, breaking glass panel in water-glass shield; one injured.

May 20, 1944, locomotive 6128, Birmingham, Mo. Stoker was inoperative, account of elevator being obstructed by foreign matter; one injured.

**June 17, 1944, locomotive (C. & S.) 372, Glenrock, Wyo. Main driving box running hot; driving boxes were reported for repacking or examination on May 24, 28, and 30 and June 1, 3, 7, 9, 11, 13, 15, and 16; one injured.

Nine accidents; one killed, eight injured.

CHICAGO GREAT WESTERN RAILWAY:

**April 4, 1944, locomotive 719, Hayfield, Minn. Steam leak at blower check valve; one injured.

One accident; one injured.

CHICAGO, INDIANAPOLIS & LOUISVILLE RAILWAY:

April 27, 1944, locomotive 573, Spring Cave, Ind. Joint sleeve at top of water column steam pipe broke at collar, permitting the pipe to become disconnected; collar was not properly brazed to steam pipe and was not belled or expanded at joint end of sleeve. "Spanner nut leaking steam pipe to water column" was reported on April 3, at which time the nut was tightened but the joint was not disconnected for inspection; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

**August 28, 1943, locomotive 1329, La Crosse, Wis. Sander was stopped up; sanders were reported on August 17, 23, and 26; one injured.

February 17, 1944, locomotive 588, near Dimock, S. Dak. Crown-sheet failure caused by overheating due to low water; three killed.

March 13, 1944, locomotive 163, Freeport, Ill. Bell ringer was inoperative; bell ringer was reported on February 1 and March 8 and 11; one injured.

May 10, 1944, locomotive 304, Stickney, Ill. Wrist pin broke and worked out of crosshead, apparently due to nuts and cotter key missing; wrist-pin nuts were reported loose on April 18 and May 4; one injured.

Four accidents; three killed, three injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

*July 10, 1943, locomotive 1720, Libertyville, Iowa. Relief valve stuck open; one injured.

October 2, 1943, locomotive 5012, Joliet, Ill. Excessive steam coming from under the cab obscured the engineer's vision and caused him to fall from the gangway steps; stoker had excessive leaks at supply steam pipe drain plugs and at exhaust steam drain pipes; blow-off cock, which discharged into a muffler located between the frames, was leaking; one injured.

**October 4, 1943, locomotive 2103, Burr Oak, Ill. Wash-out plug blew out when attempt was made to tighten it while under steam pressure; threads on the outer end of plug were corroded and wasted away and the remaining threads were defective due to the plug having been applied cross-threaded; one injured.

November 25, 1943, locomotive 2707, Inver Grove, Minn. Oil on cab deck caused insecure footing; one injured.

**November 25, 1943, locomotive 2677, Grantville, Kans. Steam emitted from drain pipe of fuel oil heating system obscured employee's vision, causing him to fall; one injured.

**November 27, 1943, locomotive 2314, Goodland, Kans. Oil on top of tender fuel oil tank; one injured.

**December 1, 1943, locomotive 961, Herington, Kans. Oil on top of tender fuel oil tank; one injured.

December 13, 1943, locomotive 939, Chicago, Ill. Grate-shaker bar slipped off fulcrum lever; shaker bar was bent and did not conform to company's standard; one injured.

December 15, 1943, locomotive 236, Burr Oak, Ill. Undesired closing of mechanically operated fire door from set-open position; fire door pet-cock handle and push rod were missing; one injured.

January 19, 1944, locomotive 2707, Sheffield, Iowa. Squirt hose parted at spliced joint; ends of hose were not clamped or properly secured to nipple; one injured.

**February 17, 1944, locomotive 5040, Tucumcari, N. Mex. Oil on top of tender fuel tank; one injured.

**February 29, 1944, locomotive 2315, Little Rock, Ark. Extension rod to air compressor steam valve became disconnected; one injured.

June 14, 1944, locomotive 2625, Marengo, Iowa. Front cylinder head blew out; 25 of the 30 cylinder-head studs were pulled out of cylinder at threads;

4 studs apparently were broken at time of the accident, and apparently the nut was missing from the 1 stud which remained intact in the cylinder; many of the stud holes contained little or no threads to hold the studs; one injured.
Thirteen accidents; thirteen injured.

CLINCHFIELD RAILROAD:

July 30, 1943, locomotive 651, Erwin, Tenn. Wash-out plug blew out; plug had not been properly tightened after boiler wash; one injured.
One accident; one injured.

DELAWARE & HUDSON RAILROAD:

August 13, 1943, locomotive 1601, Forest City, Pa. Locomotive derailed due to loose driving-wheel tire caused by loss of tire shims; one injured.
One accident; one injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

*July 8, 1943, locomotive 1244, Scranton, Pa. Bell clapper fell from bell and struck employee who was on footboard; one injured.
One accident; one injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

**July 27, 1943, locomotive 1198, Grand Junction, Colo. Main throttle was difficult to operate when locomotive was using steam; lost motion inside the boiler allowed the lever to traverse nearly two-thirds of quadrant before the main valve was lifted; one injured.

August 4, 1943, locomotive 803, Cliff, Colo. Coal on top of tender behind coal space; one injured.

**September 9, 1943, locomotive 3555, Sulphur, Colo. Top of tender water cistern back of fuel space was obstructed by water-spout hook, causing employee to trip; no proper means provided for securing the hook when not in use; one injured.

January 31, 1944, locomotive 3556, Cliff, Colo. Steam blowing from locomotive obscured the view of employees; high pressure valve stem packing had blown out, making a very bad steam leak, and locomotive had various other excessive steam leaks; steam leaks had been reported repeatedly during the 30 days preceding the accident; "Can't see front of engine for steam leaks" was reported at end of the previous trip; two injured.

**February 3, 1944, locomotive 3705, Green River, Utah. End of grate-shaker bar struck back wall of cab; shaker bar was 4 inches longer than company's standard for locomotives of this class; one injured.

March 6, 1944, locomotive 485, Chama, N. Mex. Sand-dome cover fell on employee's foot; safety chain was broken; one injured.

April 26, 1944, locomotive 3714, Detour, Utah. Steam pipe to left front cylinder failed; initial failure occurred in an old crack in pipe which had been repaired by welding; carrier's rules prohibit welding on cylinder steam pipes; one injured.

Seven accidents; eight injured.

DONORA SOUTHERN RAILROAD:

**November 3, 1943, locomotive 18, Donora, Pa. Plug blew out of crown sheet; threads on plug and in sheet were badly eroded; firebox end of plug showed it had been heavily calked to stop leakage; one injured.

One accident; one injured.

ELGIN, JOLIET & EASTERN RAILWAY:

*March 9, 1944, locomotive 745, East Joliet, Ill. Insufficient clearance between handhold and cab apron when on curve; one injured.

One accident; one injured.

ERIE RAILROAD:

**July 8, 1943, locomotive 93, Farrell, Pa. Driving-brake hanger broke, causing derailment of the locomotive; failure occurred through an old break in hanger which had been repaired by fusion welding; one injured.

July 21, 1943, locomotive 3343, Polk, Ohio. Valve spindle in multiple type main throttle valve broke off and lodged under cam, holding main throttle open; metal in spindle was damaged in the application of hard facing by fusion welding; one injured.

September 7, 1943, locomotive 2915, near Graham, N. Y. Crown-sheet failure caused by overheating due to low water; two injured.

October 5, 1943, locomotive 2913, Chicago, Ill. Steam leak at packing nut of boiler check shut-off valve; one injured.

**February 2, 1944, locomotive 4214, Meadville, Pa. Injector overflow valve stuck in closed position; one injured.

May 29, 1944, locomotive 3300, Hornell, N. Y. Handwheel of Precision reverse gear spun rapidly out of control and handle on the handwheel struck employee's wrist; bolt which secured inside radius bar to reverse yoke on right side had worked out, due to cotter key and castle nut being missing and the second nut having worked partially off, allowing the bolt to foul on gear connecting rod which caused the reverse gear wheel to spin when forced; one injured.

June 11, 1944, locomotive 1752, Meadville, Pa. Throttle was difficult to operate; throttle-stem packing was too tight; locations of seat box, throttle lever, and reverse lever were such as to cause employee to assume an awkward position for operation of the throttle; one injured.

**June 24, 1944, locomotive 132, Port Jervis, N. Y. Mechanically operated fire door did not open properly; one injured.

**June 30, 1944, locomotive 80, Brier Hill, Ohio. Cab drop seat became disconnected from cab wall, causing employee to fall to the floor; cab-wall lining was badly deteriorated and too soft to hold the seat hinge screws; one injured.

Nine accidents; ten injured.

FLORIDA EAST COAST RAILWAY:

January 16, 1944, locomotive 426, Cocoa-Rockledge, Fla. Side rod bushing keeper pin worked out, allowing the bushing to turn and close the grease passage; one injured.

One accident; one injured.

FORT WORTH & DENVER CITY RAILWAY:

**July 30, 1943, locomotive 452, Vernon, Tex. Oil on top of tender fuel oil tank caused employee to fall; one injured.

One accident; one injured.

GREAT NORTHERN RAILWAY:

October 6, 1943, locomotive 2109, Minot, N. Dak. Main crank pin pulled out of wheel center; two injured.

October 29, 1943, locomotive 2041, Snohomish, Wash. Employee struck a bridge girder while giving attention to a hot trailer truck journal on line of road; one killed.

**November 11, 1943, locomotive 2022, Yarnell, Mont. Driving box ran hot; one injured.

**November 20, 1943, locomotive 2057, Kremlin, Mont. Grease gun fell out of holder in cab; gun was not the company's standard and was too large for fit in the holder; one injured.

November 23, 1943, locomotive 3338, Melby, Minn. Flue failed in prosser groove at back flue sheet; flue reduced to 1/2 inch in thickness in prosser groove; one injured.

**December 23, 1943, locomotive 3080, Rustad, N. Dak. Tank hose blew off connection to injector feed pipe; one injured.

January 23, 1944, locomotive 2125, near Fort Wright, Wash. Tender separated from car; coupler knuckle on tender was below the minimum prescribed standard height; one injured.

April 27, 1944, locomotive 843, Superior, Wis. Engineer fell from running board while cleaning cab window; locomotive placed in service with dirty windows; one injured.

June 5, 1944, locomotive 2044, Minot, N. Dak. Malleable cast-iron arch tube wash-out plug cap, located inside of cab, broke off; one killed, two injured.

Nine accidents; two killed, ten injured.

GULF COAST LINES:

September 25, 1943, locomotive (St. L. B. & M.) 1014, near Huffman, Tex. Driving-spring hanger broke through old fractures on each side of gib slot; old fractures involved approximately 65 percent of cross-sectional area of hanger; one injured.

March 4, 1944, locomotive (St. L. B. & M.) 1013, Pleasanton, Tex. Engineer's tool box worked out of its proper position in cab; tool box was too large to fit into the angle iron retainer provided on locomotive deck; one injured.

Two accidents; two injured.

GULF, COLORADO & SANTA FE RAILWAY:

July 24, 1943, locomotive (A. T. & S. F.) 1917, Conroe, Tex. Left front sand pipe was stopped up; "Clean out L. front sand pipe" was reported on July 22; one injured.

August 21, 1943, locomotive (A. T. & S. F.) 1083, Ricker, Tex. Union in sand pipe became disconnected, allowing sand to blow back into cab; one injured.

**November 5, 1943, locomotive (A. T. & S. F.) 1098, Bay City, Tex. Bell cord chafed asbestos wrapping of injector steam pipe and loosened particles of the wrapping blew into employee's eye; one injured.

December 4, 1943, locomotive (A. T. & S. F.) 3178, Fair Plains, Tex. Lubricator oil pipe to cylinder pulled from the collar at the choke union connection; one injured.

Four accidents; four injured.

GULF, MOBILE & OHIO RAILROAD:

January 15, 1944, locomotive 472, Carroll, Tenn. Arch tube pulled out of inside throat sheet; tube was entered in hole in throat sheet at an improper angle and tube was not beaded or flared on the water side of the sheet; two injured.

One accident; two injured.

ILLINOIS CENTRAL RAILROAD:

**July 6, 1943, locomotive 2541, Champaign, Ill. Manhole-cover hinges were broken; one injured.

**August 7, 1943, locomotive 1439, Sidon, Miss. Squirt hose burst; one injured.

August 13, 1943, locomotive 1155, near Coulterville, Ill. Crown-sheet failure caused by overheating due to low water; two pieces of glass, broken from bottom end of water glass, were found in the opening of bottom water-glass cock; one killed, one injured.

**August 21, 1943, locomotive 1279, Dyersburg, Tenn. Whistle cord broke; one injured.

August 24, 1943, locomotive 2032, Vicksburg, Miss. Arch tube plug blew out; hole in plug bushing was for a 3/8-inch plug, but was out of round and a 3/8-inch plug was being used; attempted to tighten the plug while under pressure; one killed, one injured.

**November 28, 1943, locomotive 1286, near Perryville, Ill. Sand pipe was stopped up or restricted; one injured.

January 14, 1944, locomotive 3773, Markham, Ill. Throttle stem spanner packing nut turned off threads of stuffing box; one injured.

**May 4, 1944, locomotive 8048, Nonconnah, Tenn. Water glass burst; excessive openings around water-glass packing nuts at top and bottom of water-glass shield; one injured.

**June 8, 1944, locomotive 2410, Otto, Ill. Crosshead shoe broke through sections between the bolt holes and came off crosshead; bolt holes were worn and elongated and bolts were sheared and badly bent; one injured.

June 22, 1944, locomotive 1470, near Canton, Miss. Crown-sheet failure caused by overheating due to low water; one injured.

Ten accidents; two killed, ten injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

**May 11, 1944, locomotive (M. P.) 1485, Valley Junction, Tex. Boiler check stuck open; check was defective; one injured.

One accident; one injured.

KANSAS CITY SOUTHERN RAILWAY:

September 15, 1943, locomotive (L. & A.) 806, near Mooringsport, La. Side rod knuckle pin worked out, due to the loss of the draw key, and resulted in the breakage of the side rod, the swinging end of which punctured the outside and inside throat sheets; one killed, one injured.

October 2, 1943, locomotive 802, near De Queen, Ark. Exhaust steam convey pipe in smoke box came loose from its rear fastenings on stack saddle extension and pipe moved out of line with exhaust nozzle, causing back draft through firebox; one of the six bolts supporting the pipe was broken and nuts were missing from two other supporting bolts; one injured.

**February 24, 1944, locomotive 532, Leesville, La. Broken radial stay blew out of wrapper sheet (inside of cab) while being calked with an air hammer while the boiler was under 155 pounds steam pressure; stay broke through an old fracture near firebox crown sheet; stay was improperly applied and threads on stay

did not enter wrapper sheet sufficiently for proper thread engagement; threads on stay and in wrapper sheet were badly deteriorated; one killed, one injured.

Three accidents; two killed, three injured.

LEHIGH & HUDSON RIVER RAILWAY:

January 19, 1944, locomotive 82, Belvidere, N. J. Cast-iron main steam pipe in front end burst due to insufficient thickness of part of the pipe wall, caused by the core having shifted or been misplaced; wall thickness at the point of failure varied from 3/32 to 1/16 inch, while company's print provided that the pipe wall be 1/8-inch thick; one injured.

One accident; one injured.

LEHIGH VALLEY RAILROAD:

December 31, 1943, locomotive 3210, Coxton, Pa. Steam-heat gage burst; fitting on end of one of the tubes in gage came off, due to failure of the soldered joint, permitting steam and hot water to escape into the cage; one injured.

June 24, 1944, locomotive 2119, Spencer, N. Y. Boiler-jacket band broke at riveted connection on top of boiler; band was badly rusted at point of failure; one injured.

Two accidents; two injured.

LONG ISLAND RAILROAD:

August 6, 1943, locomotive (P. R. R.) 5409, Hicksville, N. Y. Flue ruptured at back flue sheet; flue reduced to approximately 1/4 inch in thickness at point of failure due to having been excessively worked; one injured.

August 15, 1943, locomotive (P. R. R.) 732, Mineola, N. Y. Flue failed at back flue sheet; flue wasted away on water side and reduced to 1/2 inch in thickness at the point of failure; one injured.

January 11, 1944, locomotive 101, Long Island City, N. Y. Bell ringer was inoperative; bell-ringer piston was gummy and dirty and there was some dirt in air cylinder; one injured.

Three accidents; three injured.

LOUISIANA & ARKANSAS RAILWAY:

May 23, 1944, locomotive 502, McElroy, La. Piston head failed; one injured.

One accident; one injured.

LOUISVILLE & NASHVILLE RAILROAD:

**July 7, 1943, locomotive 2091, Birmingham, Ala. Injured while attempting to close ashpan slide; stop bolt in slide was loose and badly worn, permitting slide to overtravel and bind on guide; one injured.

*July 21, 1943, locomotive 1753, Tyson, Ala. Injector steam valve rod broke through pinhole at swivel joint; one injured.

**August 9, 1943, locomotive 1240, Thompson, Tenn. Supporting bracket of extension handle to injector broke through bolt hole; one injured.

September 5, 1943, locomotive 1426, Latonia, Ky. Edge of cab-floor board broke off due to being deteriorated; one injured.

October 25, 1943, locomotive 1279, Atmore, Ala. Employee's foot slipped partly into safety chain pinhole in tender deck when locomotive was on a sharp curve and was caught by cab apron when locomotive approached straight track; safety chain pinholes were exposed when the locomotive was on a sharp curve; one injured.

October 28, 1943, locomotive 219, South Union, Ky. Manually operated reverse lever moved suddenly to front end of quadrant, catching employee's foot between lever and foot brace; one injured.

January 3, 1944, locomotive 1751, Letohatchie, Ala. Crown-sheet failure caused by overheating due to low water; one killed, two injured.

January 22, 1944, locomotive 1955, De Coursey, Ky. Headlight step bracket broke due to old fracture in bend; one injured.

**January 22, 1944, locomotive 253, New Orleans, La. Pipe nipple blew out of blow-off cock, due to improper application; hole in blow-off cock was undersize and did not permit a standard nipple to enter a sufficient distance to provide a proper joint; one injured.

January 31, 1944, locomotive 1824, Louisville, Ky. Employee stepped into opening between the back section of running board and the feed water pump; running board was not of proper width and was obstructed by other appurtenances; one injured.

February 25, 1944, locomotive 1302, Athens, Tenn. Bell ringer was not properly adjusted; one injured.

May 19, 1944, locomotive 176, near Evergreen, Ala. Reverse lever latch became disengaged from quadrant and lever flew forward and crushed employee's hand against independent brake valve; handle of reverse lever fouled independent brake valve, due to lack of a proper stop on quadrant; one injured.

**June 7, 1944, locomotive 250, South Louisville, Ky. Ashpans were difficult to dump; ashpan dumping mechanism was binding due to improper adjustment; one injured.

June 17, 1944, locomotive 2087, Birmingham, Ala. Employee's leg struck end of valve stem of fire-door air regulating valve; retaining nut and handwheel were missing from the valve stem and the stem protruded rearward, restricting the passageway to the engineer's cab seat; one injured.

Fourteen accidents; one killed, fifteen injured.

MAINE CENTRAL RAILROAD:

January 13, 1944, locomotive 387, Goodwins, Maine. Crown-sheet failure caused by overheating due to low water; three injured.

One accident; three injured.

MINNEAPOLIS & ST. LOUIS RAILWAY:

*May 20, 1944, locomotive 406, Packwood, Iowa. End of fire-door pedal was broken off and sharp corner of the pedal cut employee's foot; one injured.

One accident; one injured.

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

July 16, 1943, locomotive 800, Ryder, N. Dak. Insufficient clearance between reverse lever and sliding back cab curtain; one injured.

**July 27, 1943, locomotive 467, near Kief, N. Dak. Insufficient clearance around injector starting valve handle; one injured.

January 3, 1944, locomotive 1001, Woodboro, Wis. Sanders inoperative; one injured.

**March 6, 1944, locomotive 469, Stevens Point, Wis. Oil on engine deck; one injured.

March 14, 1944, locomotive 703, near Wendell, Minn. Tumbling shaft arm broke off and right back-up eccentric blade broke; failures occurred through old defects; one injured.

Five accidents; five injured.

MISSOURI & ARKANSAS RAILWAY:

December 9, 1943, locomotive 50, Marshall, Ark. Crown-sheet failure caused by overheating due to low water; bottom water-glass cock was completely clogged with boiler sediment, causing water glass to have incorrect reading; water in boiler was very dirty and water glass had not been properly blown out; "Wash out boiler" was reported on December 2 and 6, though this was not done; locomotive was due for monthly inspection and boiler wash before departure on this trip; two injured.

One accident; two injured.

MISSOURI-KANSAS-TEXAS LINES:

**August 19, 1943, locomotive 888, Savonburg, Kans. Fuel oil on top of tender fuel tank; one injured.

**September 16, 1943, locomotive 39, Harrisburg, Tex. Throttle lever latch spring broke; one injured.

**September 23, 1943, locomotive 483, Augusta, Mo. Manually operated reverse lever jerked to full forward position when unlatched, caused by insufficient lubrication of the valves; lubricator was empty; one injured.

October 12, 1943, locomotive 101, Denison, Tex. Water glass burst; injured while attempting to close water-glass cocks; one injured.

*December 20, 1943, locomotive 897, Mingo, Tex. Injector did not operate properly; one injured.

February 11, 1944, locomotive 101, Denison, Tex. Water glass burst; one injured.

**April 5, 1944, locomotive 109, Fort Worth, Tex. Water glass burst; one injured.

**June 22, 1944, locomotive 726, Addicks, Tex. Crosshead broke; one injured.

Eight accidents; eight injured.

MISSOURI PACIFIC RAILROAD:

**July 29, 1943, locomotive 1503, Hpxie, Ark. Driving-wheel journal overheated; one injured.

*July 31, 1943, locomotive 2514, Bradford, Ark. Insufficient clearance between reverse lever when in forward motion and handle of injector water valve; one injured.

*August 3, 1943, locomotive 1435, Canado, Kans. Main rod broke; one injured.

**December 18, 1943, locomotive 1501, near Kingsville, Mo. Stoker distributor became displaced; one injured.

*December 19, 1943, locomotive 2120, Grants, Mo. Train broke apart due to low coupler; carrier iron on tender was bent; one injured.

February 7, 1944, locomotive (T. & P.) 372, Clayton, La. Crown-sheet failure caused by overheating due to low water; three injured.

*March 26, 1944, locomotive 6520, Lamonte, Mo. Boiler check stuck open; one injured.

**April 30, 1944, locomotive (C. & N. W.) 2402, Poplar Bluff, Mo. Oil on engine steps; one injured.

**May 29, 1944, locomotive 437, Pine Bluff, Ark. Employee's foot slipped into a hole in cab floor, approximately 4 x 18 inches, which had rotted away; "Repair deck" was reported on March 6 and April 27; one injured.

Nine accidents; eleven injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

July 10, 1943, locomotive 410, Hickman, Ky. Squirt hose burst, due to being badly worn; one injured.

September 17, 1943, locomotive 554, Chattanooga, Tenn. Handwheel of Precision-type reversing gear spun rapidly when employee attempted to move valve gear from backward to forward motion and handle on the handwheel struck employee's wrist; one injured.

September 18, 1943, locomotive 572, Bell Buckle, Tenn. Flue failed at back flue sheet, due to being cinder cut; many other flues and the staybolt heads near top of syphons were also cinder cut; one injured.

**September 21, 1943, locomotive 251, Union City, Tenn. Squirt hose burst, due to being badly worn; one injured.

September 26, 1943, locomotive 614, near Shellmound, Tenn. Water-glass steam pipe pulled out of collar at connection to water-glass valve in boiler; collar was improperly brazed to steam pipe; "Steam pipe leaking at water glass left side" was reported on September 13; two injured.

*October 11, 1943, locomotive 506, Eads, Tenn. Locomotive frame broke; one injured.

April 21, 1944, locomotive 671, White Bluff, Tenn. Superheater flue failed at defective safe end weld; one injured.

Seven accidents; eight injured.

NEW YORK CENTRAL RAILROAD:

**July 28, 1943, locomotive 7438, Elkhart, Ind. Bolt which connected front coupler pin lifting lever to coupler block chain broke, resulting in uncontrolled movement of the lever; bolt was smaller than carrier's standard and was badly worn; one injured.

**August 26, 1943, locomotive 2886, Clinton Point, N. Y. Handwheel of Precision-type reversing gear spun violently out of control and handle struck employee's hand. Right valve was found disconnected from valve stem and packing rings broken and valve was otherwise damaged; one injured.

September 7, 1943, locomotive 5450, Canastota, N. Y. Crown sheet failure caused by overheating due to low water; extension handle to feed water pump operating valve became disconnected while en route; three killed, twenty-nine injured.

**October 5, 1943, locomotive 2896, Indianapolis, Ind. Ashpan bottom slide door would not close properly account of the pin in forward end of the rod connecting the arm of ashpan dump shaft to the door having worked partly out, due to the loss of the retaining split key; one killed.

October 24, 1943, locomotive 2903, Indianapolis, Ind. Boiler check stuck open; one injured.

November 8, 1943, locomotive 7225, Indianapolis, Ind. Throttle was difficult to operate; "Examine throttle—works very hard" was reported on October 24; one injured.

**November 24, 1943, locomotive 2116, Marysville, Ohio. Grate-shaker lever lock dropped from semivertical or open position to closed position and locked the lever, causing shaker bar to stop suddenly; latch for securing the lever was missing; one injured.

December 6, 1943, locomotive 5434, Oneida, N. Y. Handwheel of Precision-type reversing gear spun rapidly when gear was released after having been stuck;

bolt which secured the inside radius bar to reverse yoke worked out, due to cotter, nut, and collar of bolt being missing, and the bolt fouled on the gear connecting rod and on bell crank, causing valve gear to bind; one injured.

December 24, 1943, locomotive (B. & A.) 1432, North Adams Junction, Mass. Superheater header joint ring at connection to front-end throttle broke, due to being badly deteriorated; two injured.

December 28, 1943, locomotive 7075, South Columbus, Ohio. Throttle unexpectedly moved to open position, due to defective throttle-operating mechanism; one injured.

**January 6, 1944, locomotive 1016, Albion, Mich. Bell ringer was inoperative; one injured.

January 24, 1944, locomotive 1885, Gouverneur, N. Y. Stoker failed due to elevator being obstructed by foreign matter; one injured.

January 25, 1944, locomotive 2700, La Porte, Ind. Handwheel of Precision reverse gear spun rapidly out of control and the handle on the wheel struck employee's wrist; reverse shaft counterbalance spring rod broke, apparently permitting the rod fork to foul on the frame cross tie and cause the reverse gear to bind and when it freed suddenly the handwheel spun out of control; one injured.

*February 8, 1944, locomotive 2874, Memphis, N. Y. Reverse gear wheel handle struck employee's hand; one injured.

February 12, 1944, locomotive 5232, Elkhart, Ind. Handwheel of Precision reverse gear spun rapidly out of control and handle on the handwheel struck employee's hand; nut lost off rear splice bolt in left radius bar, permitting the bolt to work out and foul link support frame, retarding the movement of the gear, then the bolt broke, releasing the gear and permitting it to spin; one injured.

*February 20, 1944, locomotive 5261, Brimfield, Ind. Alemite fitting, weighing 2 1/4 pounds, was thrown from eccentric arm; one injured.

March 13, 1944, locomotive (P. & L. E.) 9252, Ashtabula, Ohio. Handwheel of Precision reverse gear spun rapidly out of control and handle on the wheel struck employee's wrist. Nut worked off bolt in left lug of counterbalance spring casting, putting excessive stress on right lug which caused it to break. This permitted the entire weight of casting and spring to rest on spring rod which caused the reverse gear to bind, and when the gear freed suddenly the handwheel spun; one injured.

April 1, 1944, locomotive 2380, near New Buffalo, Mich. Side rod broke due to a progressive fracture which extended through approximately 90 percent of cross-sectional area; fracture started from an internal flaw; one killed, two injured.

*April 19, 1944, locomotive 5422, Gary, Ind. Employee was struck by a piece of engine-truck spring which was thrown from rapidly moving locomotive; one injured.

April 22, 1944, locomotive 2290, Kenton, Ohio. Grate-shaker lever lock dropped, blocking the shaker lever and causing sudden stop of shaker bar; insufficient clearance between shaker lever and safety latch and between shaker-lever lock and deck; "Left back grate shaker latch won't stay up" was reported on April 1; one injured.

**May 25, 1944, locomotive 7913, Selkirk, N. Y. Squirt-hose valve was inadvertently opened; squirt-hose arrangement was not company's standard; boiler check valve was leaking, causing squirt hose to thresh around when valve was opened; one injured.

**June 9, 1944, locomotive 2785, Rome, N. Y. Trailing truck tire came off due to insufficient shrinkage; two injured.

*June 25, 1944, locomotive 7902, East Syracuse, N. Y. Insufficient clearance between tender handhold and gangway step when on curve; one injured.

Twenty-three accidents; five killed, fifty-three injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

July 5, 1943, locomotive 1345, Pomfret, Conn. Flue broke at back flue sheet; flue had been excessively prossered and reduced in thickness at point of failure; flues reported leaking on June 1, 8, 9, 10, 11, 12, 13, 14, and 17, and July 4; one injured.

**July 21, 1943, locomotive 3432, Worcester, Mass. Fire hose burst; one injured.

**September 4, 1943, locomotive 837, Baychester, N. Y. Manually operated reversing gear was difficult to move from forward to backward motion; reversing gear was reported on September 1 and 5; one injured.

September 23, 1943, locomotive 387, New Haven, Conn. Boiler check leaking; check valve not in proper condition due to excessive grinding and reseating; one injured.

*February 20, 1944, locomotive 1345, Boston, Mass. Cil cup fell from cross-head guide; one injured.

Five accidents; five injured.

NORFOLK & WESTERN RAILWAY:

**November 17, 1943, locomotive 2110, Eckman, W. Va. Throttle was hard to operate, due to worn cams and improperly adjusted cam shaft bearing plug and throttle rigging; one injured.

November 23, 1943, locomotive 1158, near Gennett, Ohio. Crown-sheet failure caused by overheating due to low water; one killed.

**January 24, 1944, locomotive 1221, Renick, Ohio. Air pipe between locomotive and tender disconnected, resulting in emergency application of the brakes; ball member of the Barco flexible joint in air line worked off nipple; one injured.

Three accidents; one killed, two injured.

NORTHERN PACIFIC RAILWAY:

*December 13, 1943, locomotive 1854, Cheney, Wash. Nut on blow-off cock was loose; one injured.

*April 27, 1944, locomotive 1717, Billings, Mont. Turbo-generator steam pipe broke off at turret; one injured.

June 3, 1944, locomotive 1265, Auburn, Wash. Water-gage glass burst, breaking the rear and right glass panels in water-glass shield; one killed.

Three accidents; one killed, two injured.

PENNSYLVANIA RAILROAD:

July 14, 1943, locomotive 4398, Canton, Ohio. Arch tube plug blew out; plug was not properly applied and blew out when attempt was made to tighten it while under pressure; one killed, one injured.

**July 19, 1943, locomotive 1226, Philadelphia, Pa. Defective buffer spring between locomotive and tender caused derailment of the locomotive, tender, and one car; one of the buffer coil springs was broken and apparently a part of this spring lodged between the buffer spring-box casting and the back of the chamber casting which prevented the tender from maintaining proper alignment; two injured.

July 26, 1943, locomotive 6312, Loudenville, Ohio. Eccentric crank arm broke; arm had 70 percent old fracture between drawbolt hole and crankpin fit; valves out of square and driving rods and boxes pounding had been reported repeatedly since July 1; one injured.

July 30, 1943, locomotive 4445, Ravenna, Ohio. Squirt-hose valve leaking; valve disk did not have proper bearing on valve seat; one injured.

**August 13, 1943, locomotive 3872, Wilmington, Del. Part of a brake head was thrown from locomotive; one injured.

August 17, 1943, locomotive 6868, River View, Pa. Crosshead wrist pin worked out, permitting main rod to drop and break air pipes; wrist pin was improper fit and had been working in crosshead which caused the retainer studs to shear, releasing the retainer and allowing wrist pin to work out; one injured.

September 12, 1943, locomotive 8070, near Howard City, Mich. Driving spring hanger broke through old fracture, resulting in derailment of the locomotive, tender, and several cars in the train; two killed, one injured.

**September 15, 1943, locomotive 1603, East Altoona, Pa. Brakes leaked off, caused by air compressor stopping due to lack of lubrication; one injured.

September 16, 1943, locomotive 4368, Acre, Ohio. Chain to whistle valve caught on a pipe-cover bolt, preventing full steam opening to whistle valve; one injured.

September 16, 1943, locomotive 6756, Philadelphia, Pa. Stoker conveyor drive shaft became disconnected at end of sleeve between stoker engine and tender; center bolt in front half of universal joint clip had broken and part of the bolt was missing; one injured.

September 16, 1943, locomotive 6890, near Saltzburg, Pa. Stoker conveyor trough angle ring was broken off at the front end and angle iron at top of the front end of conveyor was bent inward; one injured.

September 27, 1943, locomotive 9391, Ashtabula, Ohio. Tender bottom coal gate swung open, due to the absence of safety chain; safety chains on both bottom coal gates were reported missing on September 13, 15, and 27 (after the accident); one injured.

October 8, 1943, locomotive 304, Altoona, Pa. Bonnet of blower valve screwed out of body when attempt was made to open the valve; threads on bonnet were worn and bonnet was loose in body; stem was bent and galled in the packing in

stuffing box and was inoperative by hand; packing was very dry; blower valve was reported leaking on September 15, 17, 25, 29, and October 2; one injured.

*October 9, 1943, locomotive 6778, Chicago, Ill. Hood over stoker jets was missing; one injured.

October 12, 1943, locomotive 8166, Canton, Ohio. Sliding door at back of cab was out of bottom guide; one injured.

October 14, 1943, locomotive 4530, near Portage, Pa. Front tender truck brake rigging bottom rod, live truck lever, and a part of brake cylinder truck-lever connecting rod became disengaged and were thrown from moving locomotive; one injured.

November 11, 1943, locomotive 7344, Girard, Ohio. Throttle quadrant bracket was loose on boiler head; this defect was reported by engineer prior to departure from enginehouse and repairs were made by inserting, but not fastening, a wooden wedge between the top of quadrant and cab roof and the wedge worked out en route and fell to cab floor, striking employee's foot; throttle bracket was reported loose several times before and after the accident; one injured.

November 20, 1943, locomotive 4311, East Liverpool, Ohio. Flue failed at front flue sheet, due to reduction in thickness caused by corrosion; the left peep-hole cover was in open position and the cover of right stoker distributor peep-hole was missing which permitted steam, smoke, and gas from firebox to enter the cab freely; one injured.

November 22, 1943, locomotive 187, Altoona, Pa. Broken flexible staybolt blew out of side sheet while being calked under pressure; staybolt was not proper fit in stayhole in side sheet and threads on bolt did not engage threads in sheet; staybolt was cut too short and firebox end was flattened and very thin, due to having been frequently hammered in attempts to make it tight in the sheet; one injured.

**November 28, 1943, locomotive 1059, Conemaugh, Pa. Bolt came out of connecting rod due to nut losing off, permitting grate-shaker lever to move forward and catch employee's finger between shaker lever and grab iron on boiler; one injured.

December 7, 1943, locomotive 4136, Altoona, Pa. Operating chain of steam whistle caught on bell yoke and whistle valve would not close; operating chain had excessive slack; whistle stop valve was practically closed and whistle valve and seat were badly scored. Employee fell from toeboard when returning to cab after making emergency repairs; rear end of toeboard was covered with oil; one injured.

December 12, 1943, locomotive 1478, near Seward, Pa. Tender coal gate safety chain pulled from eye bolt in tender side sheet; one injured.

December 19, 1943, locomotive 1975, near Dewart, Pa. Grate-shaker bar broke through old fracture; shaker bar had been overheated and contained numerous fractures; grates were difficult to shake account of connector bar and grate-operating rod fouling parts of the ashpan; one injured.

December 20, 1943, locomotive 1279, Ischua, N. Y. Side rod broke and part of the broken rod swung around and punched a hole in inside throat sheet; main driving box wedge was down and box was pounding; two injured.

January 5, 1944, locomotive 6844, Huntingdon, Pa. Sanders were inoperative; sanders were reported before the locomotive departed on this trip and proper repairs were not made; "Remove wet sand from sand box" was reported at end of the previous trip; one injured.

January 19, 1944, locomotive 6810, Royalton, Pa. Reflex water glass burst; one injured.

January 30, 1944, locomotive 6380, Philadelphia, Pa. Smokestack spark arrester became disconnected. In dismantling from smoke box after making repairs to the arrester, employee's hand contacted the flyballs of the turbo-generator, due to the end door of turbo-generator being open; thumb screw for securing the door was missing; one injured.

**February 1, 1944, locomotive 6818, near Altoona, Pa. Main crank pin broke through an old fracture at fillet which extended through approximately 60 percent of cross-sectional area; fracture started from tool marks in the fillet and was aggravated by the persistent pounding of the driving boxes and rods and other defects which caused the locomotive to ride rough; two injured.

**February 7, 1944, locomotive 4430, Columbus, Ohio. Cab vertical handhold at gangway broke through old fracture which extended through approximately 50 percent of cross-sectional area; one injured.

February 21, 1944, locomotive 6786, Delphos, Ohio. Reflex-type water glass burst; one injured.

**February 21, 1944, locomotive 5444, Burgettstown, Pa. Throttle valve was difficult to operate; one injured.

*March 3, 1944, locomotive 8154, Richmond, Ind. Insufficient clearance between handhold and tender step casting when on curve; one injured.

March 20, 1944, locomotive 3522, Kearny, N. J. Flue ruptured in prosser groove near back flue sheet; flue had been excessively worked and was reduced to approximately $\frac{1}{2}$ inch in thickness at the point of failure; one injured.

*April 16, 1944, locomotive 6845, Elma, N. Y. Crank pin worked out of main driving wheel due to improper fit; one injured.

April 28, 1944, locomotive 6154, Rochester, Pa. Extension handle to water-pump throttle valve became disconnected due to pump operating valve stem nut working off; one injured.

May 5, 1944, locomotive 3745, Winona Lake, Ind. Grate-shaker bar slipped off post due to improper fit; post was battered and distorted; shaker rigging was improperly adjusted; one injured.

**June 1, 1944, locomotive 5377, Columbus, Ohio. Main driving-wheel axle broke; progressive fracture extended through approximately 80 percent of cross-sectional area; driving boxes pounding or engine riding rough were reported on May 19, 22, 29, 30, and 31; one injured.

*June 11, 1944, locomotive 3234, Pittsburgh, Pa. Coal gate on tender closed unexpectedly; no chain or other provision for holding the gate in open position; one injured.

June 12, 1944, locomotive 6964, near Longfellow, Pa. Door of brakeman's cab on tender suddenly closed, injuring employee's hand; door lock was broken and door stop was bent and ineffective; one injured.

June 14, 1944, locomotive 1387, Renova, Pa. Steam-heat line starting valve broke through old fracture which extended through approximately 80 percent of cross-sectional area of valve body; walls of valve body were not uniform in thickness, due to the core being out of center when valve was cast, and the fracture started from a point where the metal was only $\frac{1}{8}$ inch thick; one injured.

June 15, 1944, locomotive 200, Latrobe, Pa. Handwheel on extension rod to steam valve to lubricator fell from position and struck employee; dowel pin for securing the handwheel was missing and dowel-pin hole was badly worn; one injured.

Forty-one accidents; three killed, forty-four injured.

PERE MARQUETTE RAILWAY:

January 18, 1944, locomotive 375, Detroit, Mich. Radial crown stay broke through old fracture at wrapper sheet and stay head blew out of wrapper sheet; stay hole in wrapper sheet was elongated $\frac{3}{2}$ inch and threads in hole were badly deteriorated; one injured.

One accident; one injured.

PITTSBURGH & LAKE ERIE RAILROAD:

August 15, 1943, locomotive 7296, Campbell, Ohio. Uncoupling lever lifting arm broke through fusion weld connecting the arm to main shaft; weld was of poor quality and an old fracture extended through approximately 96 percent of its cross-sectional area; indications were that the fracture had existed for some time and repairs had been attempted; the carrier's instructions prohibit welding on the parts involved; one injured.

January 13, 1944, locomotive 7295, Youngstown, Ohio. Mechanically operated fire door stuck in open position, due to excessively worn parts; fire door was reported sticking open on January 1 and 6; one injured.

Two accidents; two injured.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

*December 12, 1943, locomotive 2, Potomac Yard, Va. Water-glass gasket blew out; one injured.

*February 2, 1944, locomotive 571, Richmond, Va. Open ring on cab storm curtain caught in employee's ear; one injured.

May 12, 1944, locomotive 601, Alexandria, Va. Flames flashed back through fire door; two injured.

Three accidents; four injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

August 22, 1943, locomotive 4138, near Macomb, Mo. Crown-sheet failure caused by overheating due to low water; drain cock in barrel cap of left injector had lost out, preventing the injector from functioning properly; three injured.

September 24, 1943, locomotive 4503, Crocker, Mo. Radius bar became disconnected from link block due to loss of link block pin; one injured.

**October 30, 1943, locomotive 4128, Dora, Ala. Insufficient clearance between handle of blow-off cock and reverse lever; handle of blow-off cock rod was improperly applied; one injured.

*November 14, 1943, locomotive 1528, Alma, Ala. Main pin broke due to progressive fracture; one injured.

*March 9, 1944, locomotive 963, Springfield, Mo. Waterspout hook was bent; one injured.

Five accidents; seven injured.

ST. LOUIS SOUTHWESTERN RAILWAY:

*July 11, 1943, locomotive 569, Waldenburg, Ark. Handrail at front of locomotive was loose due to bolt which connected handrail to pilot beam being broken; one injured.

April 1, 1944, locomotive 533, Jonesboro, Ark. Tubular water glass burst; steam and hot water discharged from vent pipe in water-glass shield struck oil tray in cab and deflected upward toward employee's face; one injured.

Two accidents; two injured.

SAN DIEGO & ARIZONA EASTERN RAILWAY:

**May 29, 1944, locomotive (S. P.) 2711, Calexico, Calif. Employee's foot was caught between cab apron and bottom edge of cab when locomotive moved on a curve; one injured.

One accident; one injured.

SEABOARD AIR LINE RAILWAY:

September 2, 1943, locomotive 516, Richland, Ga. Sprinkler pipe broke off through bushing at connection to injector; emergency repairs were made by plugging the hole in injector with a flagstaff which later blew out, resulting in injury of an employee; another employee was later injured when he attempted to operate the injector before repairs had been made; sprinkler pipe was not properly clamped, permitting excessive vibration; two injured.

*November 15, 1943, locomotive 207, Emory, Ga. Tender journal overheated; one injured.

*December 10, 1943, locomotive 397, Cochran, Va. Stoker drive shaft fell on brake rigging and journal; one injured.

**January 1, 1944, locomotive 374, Gainesville, Fla. Injector overflow annunciator was improperly located; one injured.

January 26, 1944, locomotive 929, Cottman, Fla. Crown-sheet failure caused by overheating due to low water; left injector was inoperative due to compound forcer steam valve being disconnected; openings into gage cock nipples were flush with the inside surface of the sloping back head; two superheater units were leaking; exhaust nozzle bridge was displaced; two injured.

April 27, 1944, locomotive 820, Catawba, S. C. Crown-sheet failure caused by overheating due to low water; water passage through bottom water-glass valve was reduced to approximately one-half of its original diameter by hard scale adhering to its walls and was further reduced by a flake of hard scale; flow of water through left tank-hose strainer was reduced by an accumulation of grass and weeds; numerous work reports concerning cleaning the tank hose and strainers indicate that considerable trouble had been experienced due to foreign matter in the feed water; one killed, two injured.

May 9, 1944, locomotive 657, near Abbeville, Ga. Rocker box broke; old cracks in rocker-box casting and from weld in rocker-box cap; one injured.

June 5, 1944, locomotive 425, Woodbine, Ga. Grate-shaker bar slipped off post; shaker bar and post were worn; one injured.

June 13, 1944, locomotive 2504, near Mountville, S. C. Grate-shaker bar slipped off post due to improper fit; shaker-bar socket was badly burred; one injured.

Nine accidents; one killed, twelve injured.

SOUTHERN RAILWAY:

August 10, 1943, locomotive 4553, Tuscaloosa, Ala. Cab vertical handhold at gangway broke through old fracture in the bend near the top end, causing employee to fall from the moving locomotive; one injured.

**September 19, 1943, locomotive 6337, Helenwood, Tenn. Grate-shaker bar slipped off post; shaker bar and posts were worn; one injured.

October 23, 1943, locomotive 4873, near Ayersville, Ga. Crown-sheet failure caused by overheating due to low water; two injured.

**October 27, 1943, locomotive 1212, near Summitt, Tenn. Nuts securing left piston rod to crosshead became loose; one injured.

**December 8, 1943, locomotive 5202, near Nocona, N. C. Coal board fell from rack, due to rack being spread; one injured.

**February 18, 1944, locomotive 1648, Atlanta, Ga. Link hanger broke through old fracture; lower bearing of hanger had seized the link saddle pin, caused by bearing being cut due to lack of lubrication; one injured.

*February 27, 1944, locomotive 6475, Sloan's Valley, Ky. Loose nut on slack edge between locomotive and tender; one injured.

**March 4, 1944, locomotive 1741, Birmingham, Ala. Sheet-metal cover over draw bar pinhole in firing deck was bent upward at one corner, causing injury to employee's foot; one injured.

*March 13, 1944, locomotive 390, Hamburg, S. C. Flagstaff broke while being placed in holder; one injured.

April 2, 1944, locomotive 6329, near Burnside, Ky. Throttle rod became disconnected, permitting the throttle to close, and the locomotive came to a stop in tunnel; cotter key in pin which connected throttle rod to throttle lifting arm had sheared off; one injured.

**April 16, 1944, locomotive 823, Oakdale, Tenn. Boiler check stuck open; one injured.

May 6, 1944, locomotive 6352, Greenwood, Ky. Smokestack hood did not operate properly and engineer was overcome by smoke while train was in tunnel; packing nut had worked off gland on hood operating piston and the leak prevented sufficient pressure from being built up in cylinder to move the hood forward; one injured.

May 12, 1944, locomotive 1889, John Sevier, Tenn. Squirt hose burst; one injured.

**May 29, 1944, locomotive 2507, Harriman, Tenn. Bell cord caught under housing over sand trap. Automatic bell ringer did not function properly due to lack of lubrication; one injured.

**June 2, 1944, locomotive 1607, Spencer, N. C. Squirt hose burst; hose defective; one injured.

June 7, 1944, locomotive 4622, Chandler, Ind. Cab drop seat supporting rod slipped on wet cab floor, causing the seat to fall; no provision made to hold the supporting rod in proper position; one injured.

Sixteen accidents; seventeen injured.

SOUTHERN PACIFIC—LINES EAST:

*August 29, 1943, locomotive (T. & N. O.) 994, Hondo, Tex. Feed water pump was inoperative, due to broken steam ring in valve gear; one injured.

May 3, 1944, locomotive (T. & N. O.) 800, Waller, Tex. Bracket which held brakeman's cab seat in elevated storage position broke through bolt hole, permitting the seat to fall; one injured.

May 11, 1944, locomotive (T. & N. O.) 550, Boutte, La. Right top guide ran hot; insufficient vertical clearance between crosshead and guides; one injured.

Three accidents; three injured.

SOUTHERN PACIFIC—LINES WEST:

*August 6, 1943, locomotive 1214, Yuma, Ariz. Blow-off cock pipe broke loose from nipple at muffler; failure occurred through welding which joined pipe to nipple; one injured.

**August 12, 1943, locomotive 2443, Hasson, Calif. Injured while adjusting manually operated reverse lever; reversing gear was difficult to operate; one injured.

August 19, 1943, locomotive 4317, near Gillispie, Ariz. Hot water squirt-hose valve worked open; valve stem turned freely in packing nut due to insufficient packing; evidently the threaded end of valve stem had broken off and the stem had been dressed down to receive the handwheel, the end of stem being riveted over to hold the wheel in place, which left the stem too short to permit proper packing; one injured.

**August 23, 1943, locomotive 4419, North Battle Mountain, Nev. Door in side skirting of streamlined locomotive swung open and struck a mail sack which was hanging on a mail crane and the mail sack then struck and shattered the cab windows; one injured.

October 21, 1943, locomotive 4162, near Moorpark, Calif. Cab vertical handhold broke at bend at top connection, due to progressive fracture which extended through approximately 90 percent of cross-sectional area; one injured.

October 23, 1943, locomotive 4168, Troy, Calif. Gas explosion in oil-fired firebox; excessive play between contact faces of fire-door latch and latch pin permitted flames to enter the cab freely; one injured.

October 29, 1943, locomotive 2373, Soledad, Calif. Uneven place in cab deck; one injured.

October 30, 1943, locomotive 4411, Elmira, Calif. Squirt-hose valve worked open; valve stem packing follower was missing from squirt-hose valve; one injured.

*November 3, 1943, locomotive 3668, Mill City, Nev. Blow-off cock stuck open; packing nut on blow-off cock was too tight; one injured.

**November 28, 1943, locomotive 4154, Fernley, Nev. Handle of blow-off cock operating lever fouled arm rest; one injured.

*December 1, 1943, locomotive 1231, Los Angeles, Calif. One prong of tender water-spout hook was broken off; one injured.

**December 14, 1943, locomotive 4250, Beaumont, Calif. Oil on top of tender fuel oil tank; one injured.

December 23, 1943, locomotive 3707, near Coyote, Calif. Brakeman's cab seat fell from elevated storage position, due to failure of the fusion welding which secured the pin, used for holding the seat in elevated position, to the cab seat; welding was defective; one injured.

*December 25, 1943, locomotive 2408, Topaz, Ariz. Cylinder cocks were leaking and piston packing was blowing; one injured.

December 27, 1943, locomotive 4302, Northridge, Calif. Wedge-block bolt in back end of main rod broke and block lost out, resulting in front cylinder head being knocked out and other damage to the locomotive; wedge block and bolt were previously found loose while en route and repairs were made by keying up wedge block and tightening the bolt; pounds in rods, boxes, crossheads, et cetera, were reported on November 19, 22, 27, 28, 30, and December 2, 8, 14, 21, and 25; one injured.

January 21, 1944, locomotive 2564, Los Angeles, Calif. Injector was difficult to prime; boiler check or injector reported on January 15, 19, 20, 21, 22, and 23; one injured.

**January 26, 1944, locomotive 1245, Los Angeles, Calif. Throttle lever worked hard account of throttle stem packing gland being too tight; one injured.

January 28, 1944, locomotive 3803, near Montoya, N. Mex. Grate shaker bar had insufficient clearance in forward or open position; one injured.

**January 29, 1944, locomotive (N. P.) 1799, Santa Rosa, N. Mex. Grates difficult to shake with short shaker bar provided; one injured.

February 3, 1944, locomotive 2350, Saco, Calif. Squirt-hose valve worked open; one injured.

February 4, 1944, locomotive 4114, Mojave, Calif. Tender sill steps were covered with fuel oil; one injured.

March 8, 1944, locomotive (N. P.) 1799, Pastura, N. Mex. Grates difficult to shake with short shaker bar provided; one injured.

March 17, 1944, locomotive 4032, Dunsmuir, Calif. Gas explosion in firebox; defective oil valve allowed leakage of fuel and subsequent formation of gas in the firebox; one injured.

**March 24, 1944, locomotive 5037, Tucson, Ariz. Rigid radial crown stay broke and blew out of firebox wrapper sheet; attempted to calk while under pressure; stay showed 90 percent old fracture; stay improperly applied and did not have proper thread engagement in wrapper sheet; one injured.

**March 29, 1944, locomotive 4430, Myoma, Calif. Squirt-hose valve worked open; valve packing nut had worked off valve bonnet and packing was missing; one injured.

May 16, 1944, locomotive 4264, near Vail, Ariz. Relief valve in steam pipe to cylinder would not stay closed, due to valve spindle being worn and unduly free in the packing nut. While attempting to close the relief valve, employee slipped and fell from the deck of the rear bumper platform between locomotive and tender, apparently caused by oil which had accumulated on the deck over the cylinder; one injured.

June 3, 1944, locomotive 3675, Imlay, Nev. Oil on tread of tender gangway ladder; one injured.

June 13, 1944, locomotive 2364, McKay, Calif. Handhold on pilot buffer beam broke; one injured.

June 25, 1944, locomotive 2367, Redwood Junction, Calif. Insufficient clearance between cab apron and cab running board; one injured.

**June 28, 1944, locomotive 3121, El Monte, Calif. Insufficient clearance; between cab vertical handhold and tender when on curve; one injured.

Thirty accidents; thirty injured.

SPOKANE, PORTLAND & SEATTLE RAILWAY:

August 31, 1943, locomotive (G. N.) 2036, Madras, Oreg. Guide yoke broke guide was reported loose on August 22, 27, 29, and 30; one injured.

September 26, 1943, locomotive 364, Evansville, Oreg. Coupler pivot pin at rear of tender broke and tender separated from car, resulting in emergency application of the brakes; three injured.

October 9, 1943, locomotive 530, Vancouver, Wash. Broken water glass; one injured.

February 10, 1944, locomotive (G. N.) 2033, Bend, Oreg. Oil-heater line between locomotive and tender was frozen; one injured.

Four accidents; six injured.

TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS:

July 21, 1943, locomotive 309, St. Louis, Mo. Squirt hose blew off; hose not securely clamped to fitting; one injured.

**January 15, 1944, locomotive 121, St. Louis, Mo. Deck apron was worn smooth; one injured.

Two accidents; two injured.

TEXAS & PACIFIC RAILWAY:

July 26, 1943, locomotive 664, Fort Worth, Tex. Sand pipe union was loose; "Stop sand pipe leak near dome when sander is on" was reported on July 25; one injured.

January 8, 1944, locomotive 656, Mingo, Tex. Steam turbine end of centrifugal boiler feed water pump exploded due to excessive speed; choke was not applied in steam heater line to pump suction pipe to reduce the opening in this pipe from $\frac{1}{2}$ inch to $\frac{1}{16}$ inch as provided in the builder's print; automatic trip valve did not function properly; one injured.

January 31, 1944, locomotive 393, near Forney, Tex. Crown-sheet failure caused by overheating due to low water; three injured.

Three accidents; five injured.

TOLEDO, PEORIA & WESTERN RAILROAD:

June 29, 1944, locomotive 80, near Secor, Ill. Boiler check stuck open; scale in boiler check valve; one injured.

One accident; one injured.

TRONA RAILWAY:

*July 23, 1943, locomotive 1, Trona, Calif. Wash-out plug fell out due to not having been properly applied; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

August 30, 1943, locomotive (L. A. & S. L.) 4230, Los Angeles, Calif. A piece of the left branch of blow-off cock discharge pipe blew out, striking an employee; threads on discharge-pipe connection were deteriorated to such extent that the coupling failed to hold; one injured.

September 23, 1943, locomotive 5516, Tintic, Utah. Handwheel of Precision-type reversing gear spun violently out of control, due to the failure of the operating valve lug, one injured.

**November 6, 1943, locomotive 3500, Borie, Wyo. Stoker elevator pawl shifter would not stay in neutral position; shifter pin slots in both fingers of pawl shifter were so worn and battered as to form ribs of metal along outer edges of slots which prevented catch pins from seating sufficiently to hold shifter in neutral position; one injured.

March 19, 1944, locomotive 4744, Salt Lake City, Utah. Crown-sheet failure caused by overheating due to low water; one injured.

May 24, 1944, locomotive 4009, Aspen, Wyo. Flue failed at defective safe end weld; two injured.

**June 16, 1944, locomotive 5009, Victorville, Calif. Nut on handrail column bolt loosened, permitting handrail extension to swing outward when used; one injured.

Six accidents; seven injured.

VIRGINIAN RAILWAY:

*August 24, 1943, locomotive 482, Kenyon, Va. Nut on valve stem worked loose; one injured.

January 26, 1944, locomotive 446, near Boaz, Va. Piston center and bull ring broke; one injured.

June 1, 1944, locomotive 733, Roanoke, Va. Stoker was inoperative, account of elevator being obstructed by foreign matter; one injured.

*June 17, 1944, locomotive 726, South Branch, Va. Low pilot struck on crossing material, resulting in derailment of the locomotive; three injured.

Four accidents; six injured.

WABASH RAILROAD:

**July 19, 1943, locomotive 2741, Mitchell, Ill. Nipple in dead engine feature pipe broke at connection to main air-reservoir pipe; one injured.

**August 24, 1943, locomotive 2519, Decatur, Ill. Packing nut worked off squirt-hose valve; one injured.

**September 1, 1943, locomotive 2520, Boody, Ill. Bell ringer was inoperative, due to lack of lubrication; one injured.

**January 30, 1944, locomotive 2431, Valley City, Ill. Locomotive was dispatched with ashpan door open and without proper tools for closing it; one injured.

**February 14, 1944, locomotive 2918, La Fayette, Ind. Locomotive separated from train, causing emergency application of the brakes; coupler at rear of tender was below the minimum standard prescribed height; two injured.

**April 19, 1944, locomotive 2725, Campus, Ill. Engine truck journal ran hot; one injured.

Six accidents; seven injured.

WESTERN MARYLAND RAILWAY:

September 1, 1943, locomotive 734, Jack's Mountain, Pa. Cast-iron steam pipe in front end burst; failure occurred through a manufacturing defect which extended through about 55 percent of the cross-sectional area of pipe wall; two injured.

One accident; two injured.

WESTERN PACIFIC RAILROAD:

**July 28, 1943, locomotive 311, Garfield, Utah. Feed water pump became vapor-locked; one injured.

**September 19, 1943, locomotive 330, Smoke Creek, Nev. Flames from firebox entered the cab when the main throttle was closed, due to insufficient action of the steam blower; apparently the feed water pump was accidentally operated instead of the blower, as the handwheels of these appurtenances were adjacent and identical and neither was marked for identification; one injured.

**November 13, 1943, locomotive 55, Sunol, Calif. Squirt-hose valve worked open; one injured.

March 13, 1944, locomotive 49, Oroville, Calif. Air duct fell from fire door and struck employee's foot; apparently the air duct had not been fastened in position on the fire door; one injured.

March 17, 1944, locomotive 60, South Sacramento, Calif. Oil on top of tender feed water tank; one injured.

**May 13, 1944, locomotive 322, near Cluro, Nev. Crank pin failed through old defect which included approximately 90 percent of cross-sectional area; one injured.

Six accidents; six injured.

WHEELING & LAKE ERIE RAILWAY:

*January 28, 1944, locomotive 3957, Brewster, Ohio. Bell cord became tangled; 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, 1944, BY ROADS

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

ATCHISON, TOPEKA & SANTA FE RAILWAY:

**November 10, 1943, unit 102-C, near Ibis, Calif. Explosion and fire occurred in crankcase of Diesel engine, caused by the No. 2 idle gear bearing seizing on stub shaft and creating sufficient heat to cause the explosion and fire; one injured.

**February 21, 1944, unit 118, Hartoun, Calif. Air-box cover blew off of Diesel engine, due to the tightening screw having broken, permitting gases from the engine to fill the engine room; one injured.

March 6, 1944, unit 107, Daze, Ariz. Oil on engine room floor; lubricating oil was leaking from connections at front end of engine; one injured.

*May 16, 1944, unit 103, Cadiz, Calif. While knuckle on front end of Diesel unit was being opened, the pin lifter lever came up flush with the bottom of motor

frame and caught employee's finger; broken rivet permitted pin lifter to raise too high; one injured.

May 21, 1944, unit 135, near Piute, Calif. Crank case explosion and fire occurred in engine of Diesel-electric unit, caused by a connecting rod bearing running hot; one injured.

June 19, 1944, unit 122-A, Powell, Ariz. Oil on engine-room floor; one injured. Six accidents; six injured.

ATLANTIC COAST LINE RAILROAD:

*April 11, 1944, unit 753, South Tower, Ga. Defective control valve on Diesel unit caused emergency application of the brakes; three injured.

One accident; three injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

**March 5, 1944, unit 430, East Buffalo, N. Y. Hose in engine cooling system return line was split and leaking; one injured.

One accident; one injured.

FLORIDA EAST COAST RAILWAY:

February 29, 1944, unit (A. C. L.) 751, Hobe Sound, Fla. Knuckle of coupler at rear of unit opened, permitting the train to separate; uncoupling mechanism was defective; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

September 12, 1943, unit 4766, Enola, Pa. Aisle door in electric unit was difficult to open; one of the hinge screws had worked partially out and was bent which wedged the door against the latch on the other side, preventing the latch from functioning properly; latch pivots and pins were dry and rusty; one injured.

September 21, 1943, unit 4927, Baltimore, Md. Locomotive lost power to traction motors, due to defective interlock fingers on transformer tap switch making poor contact; fingers were burned and pitted on account of insufficient tension; four injured.

January 1, 1944, unit 4771, Baltimore, Md. Screen of equipment compartment came in contact with switch bus bars, causing a ground and short circuit with resulting heavy arc; top and bottom frames of screen were broken and cap bolt for securing one bottom corner of screen was broken and bolt at the other bottom corner was stripped in frame, permitting screen to move inward; one injured.

March 11, 1944, unit 4883, Baltimore, Md. Magnet-valve cap broke off; metal at point of failure was porous; one injured.

Four accidents; seven injured.

SEABOARD AIR LINE RAILWAY:

October 19, 1943, unit 3004, Henderson, N. C. Burned by flash from crankcase of Diesel engine; flash resulted from an overheated connecting rod bearing on which the lubrication had been destroyed by water which leaked from a cracked cylinder liner; crack in liner resulted from overheating due to failure of the cap screws which secured the piston cooling pipe to the liner; cap screws had been overstressed in application; one injured.

One accident; one injured.

SOUTHERN RAILWAY:

**December 30, 1943, unit 2902-B, Coveseville, Va. Steam-heat line disconnected between unit and first car in train while employees were attempting to stop a steam leak; train had previously parted, due to defective coupler at rear of the unit, resulting in damage to the steam-heat line connections; part of flange on connector-locking device segment was broken off, old defect; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

October 2, 1943, unit M-39, Plainville, Kans. Explosion of butane gas in engine room of gas-electric unit; two injured.

One accident; two injured.

VIRGINIAN RAILWAY:

*March 7, 1944, unit 100, King, W. Va. Switch failed to function when change from brake to running position was made, resulting in all fuses on auxiliary motors being blown out; magnet valve to switch was inoperative, due to magnet coil plate having loosened, preventing magnet-valve piston from moving far enough to operate the air valve which would have caused the switch to function; one injured.

One accident; one injured.

TABLE XII.—Number of steam locomotives inspected,

found defective, and ordered from service, etc.

Parts defective, inoperative or missing, or in violation of the rules	Akron, Canton & Youngstown	Alabama, Tennessee & Northern	Alliquippa & Southern	Alton & Southern	Alton	Ann Arbor	Atchison, Topeka & Santa Fe	Atlanta & St. Andrews Bay	Atlanta & West Point	Atlanta, Birmingham & Coast	Atlantic & East Carolina	Atlantic & Yadkin	Atlantic Coast Line
Air compressors							38	1	3				27
Arch tubes							4						9
Ashpans and mechanism							4						8
Axles							25						9
Blow-off cocks							27						1
Boiler checks							30						1
Boiler shell							41	2	1				43
Brake equipment							17						26
Cabs, cab windows, and curtains							4						3
Cab aprons and decks							1						3
Cab cards							1						1
Coupling and uncoupling devices							2						30
Crossheads, guides, pistons, and piston rods							132	1	2				26
Crown bolts							8						19
Cylinders, saddles, and steam chests							142						4
Cylinder cocks and rigging							48						17
Domes and dome caps							7						14
Draft gear							13	1	2				23
Draw gear							9						1
Driving boxes, shoes, wedges, pedestals, and braces							231			1			18
Firebox sheets							18						16
Flues							16						33
Frames, tail pieces, and braces, locomotive							76						2
Frames, tender							3						5
Gages and gage fittings, air							15						4
Gages and gage fittings, steam							31						13
Gage cocks							25						8
Grate shakers and fire doors							12	2					2
Handholds							1						78
Injectors, inoperative							158	3	3				199
Injectors and connections							389	2	7	4	8		15
Inspections and tests not made as required							61						1
Lateral motion							2						4
Lights, cab and classification							12						7
Lights, headlight							27						3
Lubricators and shields							21						22
Mud rings							46						5
Packing nuts							33						8
Packing, piston rod and valve stem							6						2
Pilots and pilot beams							44						2
Plugs and studs							30						11
Reversing gear							4						35
Rods, main and side, crank pins, and collars							203						11
Safety valves							45						137
Sanders							1						2
Springs and spring rigging							136	1	2				1
Squirt hose							12						1
Stay bolts							32						30
Stay bolts, broken							19						5
Steam pipes							4						13
Steam valves							28						16
Steps							94	1		1	1		3
Tanks and tank valves							1						13
Telltale bores							2						29
Throttle and throttle rigging							2						4
Trucks, engine and trailing							48						5
Trucks, tender							51						36
Valve motion							18						83
Washout plugs							61	1					21
Train-control equipment							58						2
Water glasses, fittings, and shields							47						7
Wheels							34	1		5	3		9
Miscellaneous—Signal appliances, badge plates, brakes (hand)							77		2	1			23
Number of defects	117	7	21	99	10	2,956	18	31	13	39			1,171
Locomotives reported	22	12	25	182	38	1,542	10	48	61	14	11		655
Locomotives inspected	83	27	35	433	147	4,745	20	62	217	46	38		1,572
Locomotives defective	18	1	5	25	5	766	3	7	7	9			242
Percentage of inspected found defective	67	2.8	20	6.3	4	16	15	11	3.2	20			15
Locomotives ordered out of service	1					9	1						13

	Baltimore & Ohio	Bangor & Aroostook	Belt Ry. of Chicago	Bessemer & Lake Erie	Boston & Maine	Camas Prairie	Cambria & Indiana	Canadian National	Canadian Pacific	Canadian & Northwestern	Carolina & Georgia	Central R. R. of New Jersey	Central Vermont	Charleston & Western Carolina	Chesapeake & Ohio	Chicago & Eastern Illinois	Chicago & Illinois Midland	Chicago & North Western	Chicago & Western Indiana	Chicago, Burlington & Quincy	Chicago Great Western	Chicago, Indianapolis & Louisville	Chicago, Milwaukee, St. Paul & Pacific	Chicago River & Indiana
	33				9			2		1		2	6	8	2			53	1	22		12	1	2
	2												1	3	2			5		2		3		3
	5							1											1					4
	4				2			1	1									13	5	1			15	5
	17				6			2	2									4					8	1
	18				1			2	2									12					29	7
	17				1			2	2									10	1			1	49	8
	57				8			2	3									16					26	9
	27				9			7	7									40					26	10
	21				10			1	2									24					6	11
	4				2													7					4	12
	3				3													2					6	11
	54				17			7	7									92					69	2
	4				21			1	5									53					6	13
	127				2			2	4									8					52	15
	23				2			3	2									13					6	16
	5				2			3	3									6					1	17
	7				4			2	4									3					11	18
	24				10			1	1									9					7	19
	36				24			1	4									18					91	20
	4				7			1	1									2					5	22
	5				2			1	1									1					8	21
	36				1			1	1									3					5	22
	1				2			1	1									2					56	23
	6				1			3	3									7					1	24
	7				1			1	1									1					1	25
	6				7			1	1									2					5	26
	7				4			3	3									3					6	27
	5				3			1	1									1					3	26
	3				4			1	1									4					4	27
	12				5			1	3									8					6	28
	18				5			3	1									9					3	28
	1				1			1	3									1					4	29
	53				20			3	8									6					64	1
	352	1	1	2	128			21	35	5	5	30	19	21	11	4		44	39	55	67	41	3	2
	31				12			4	3	3	2	2	17	2	5			2	17	2	5	43	5	31
	8				2			2	2									2					1	34
	4				4			4	4									1					4	35
	16				6			1	2									2					1	36
	15				3			1	2									1					8	37
	26				2			2	2									5					11	38
	4				4			2	1									4					10	40
	9				2			2	1									1					7	41
	10				2			3	3									2					12	42
	92				26			1	1									9	17	24	10	1	114	18
	13				1			1	1									1					4	24
	7				5			1	1									4					1	11
	13				7			1	1									8					32	1
	191				51			14	5	1	17	17	25	52	18	10	1	344					53	3
	1				1			1	1									6					3	5
	13				4			2	2									10					11	1
	16				1			1	1									4					4	4

TABLE XII.—Number of steam locomotives inspected,

Parts defective, inoperative or missing, or in violation of the rules	Chicago, Rock Island & Pacific	Chicago, St. Paul, Minneapolis & Omaha	Chicago, West Pullman & Southern	Cincinnati Union Terminal	Cincinnati	Colorado & Southern	Colorado & Wyoming	Columbus & Greenville	Conemaugh & Black Lick	Copper Range	Davenport, Rock Island & North Western	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western	Denver & Salt Lake
1 Air compressors	71	4			18	2	1					18	12		
2 Arch tubes															
3 Ashpans and mechanism	5				1										
4 Axles															
5 Blow-off cocks	40				1	1									
6 Boiler checks	35				1	1						4	5	2	
7 Boiler shell	10				1	1						5	5		
8 Brake equipment	161	10			18	10	1	1	1			1	26	31	
9 Cabs, cab windows, and curtains	61	1			7	2		2	1			1	10	10	
10 Cab aprons and decks	26	1			1	1						2	1	2	
11 Cab cards	2				1										
12 Coupling and uncoupling devices	1											1			
13 Crossheads, guides, pistons, and piston rods	108	5			18	1						2	25	25	1
14 Crown bolts	3														
15 Cylinders, saddles, and steam chests	145	2			19	6	8					4	55	17	
16 Cylinder cocks and rigging	36				20		4						16	9	
17 Domes and dome caps	5				1								6		
18 Draft gear	16	2			1	1						5	5	7	
19 Draw gear	25				1							1	5	4	
20 Driving boxes, shoes, wedges, pedestals, and braces	103	1			3	9	2					3	17	38	1
21 Firebox sheets	28											2	3		
22 Flues	12				1										
23 Frames, tail pieces, and braces, locomotive	44	2			3	3		1				1	13	3	
24 Frames, tender	3	2													
25 Gages and gage fittings, air	11	1													
26 Gages and gage fittings, steam	26				2							2	4		
27 Gage cocks	36	1			1	2						3	2	2	
28 Grate shakers and fire doors	45		1		4	1						2	4	1	
29 Handholds	15				7		2					2	3	2	
30 Injectors, inoperative	4														
31 Injectors and connections	155	4	2		18	5	2					5	32	19	
32 Inspections and tests not made as required	335	12	2		47	18	2	6	3			38	114	68	1
33 Lateral motion	42				6	3		2				6	7	42	
34 Lights, cab and classification	5											1	2		
35 Lights, headlight	9				1							1	10	1	
36 Lubricators and shields	36				6	1		1				2	1	3	
37 Mud rings	25											2		2	
38 Packing nuts	44	2			2	1	5					1	10		
39 Packing, piston rod and valve stem	24	1			2	3							39	14	
40 Pilots and pilot beams	11	1			2							2	1	6	
41 Plugs and studs	23				2		1					2			
42 Reversing gear	30				2		2						4		
43 Rods, main and side, crank pins, and collars	99	5			30	10		3	4			3	53	32	1
44 Safety valves	1											1			
45 Sanders	41	2										1	2	4	
46 Springs and spring rigging	228	12	2		23	12		1	1			2	53	34	2
47 Squirt hose	3	1													
48 Stay bolts	11				1							1	3		
49 Stay bolts, broken						2							3		
50 Steam pipes	21				3								2	3	
51 Steam valves	10	1			2								2		
52 Steps	29	2			4	3		1				4	6	1	
53 Tanks and tank valves	106	2			2	2						3	15	5	
54 Telltale holes	2	1													
55 Throttle and throttle rigging	52	1	1		2							4	15	7	
56 Trucks, engine and trailing	94	4			12	1		1					9	8	
57 Trucks, tender	24	6			1							1	3	2	
58 Valve motion	51	1			7	2						1	7	7	
59 Washout plugs	41				1							8	30	9	
60 Train-control equipment															
61 Water glasses, fittings, and shields	107				5		1	2				6	13	7	
62 Wheels	25	2			4		1	2				1	27	10	1
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)	64				12	4						5	15	5	
Number of defects	2,825	92	8		322	111	7	48	12			133	705	459	7
Locomotives reported	785	236	13	18	77	87	27	32	11			10	357	371	328
Locomotives inspected	2,867	766	36	4	217	323	39	33	50	12		53	1,219	1,302	1,225
Locomotives defective	588	17	3		53	21	2	7	3			46	166	90	2
Percentage of inspected found defective	21	2.2	8		24	7	5	21	6			3.8	13	7.3	6
Locomotives ordered out of service	31				7			2					4	3	

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

Detroit & Mackinac	Detroit & Toledo Shore Line	Detroit Terminal	Detroit, Toledo & Ironton	Donora Southern	Duluth, Missabe & Iron Range	Duluth, South Shore & Atlantic	Elgin, Joliet & Eastern	Erte	Florida East Coast	Fort Worth & Denver City	Georgia & Florida	Georgia	Grand Trunk Western	Great Northern	Green Bay & Western	Gulf Coast Lines	Gulf, Colorado & Santa Fe	Gulf, Mobile & Ohio	Harbor Belt Line	Houston Belt & Terminal	Illinois Central	Illinois Terminal	Indiana Harbor Belt Line	Indianapolis Union	International—Great North-	Interstate	
							1	26	8	3	5	2	1	11				12		1		2		1	1	1	
							2	3														1					2
								8	2	3		1		2				4				1				3	
							1	1						12				7				2				6	
	3						6	42	8	13	10	2	6	35		3	21	31		5	18				3	8	
							4	16	6	1	1	1	1	13			6		1	4					10	9	
							6	5			2		1	1			3				4				3	7	
							4	1	1		1	1	1	2			1				1				3	8	
							2	2			1	1	1	1			3				1				3	8	
							2	7			1	1	1	1			2				4				3	8	
							4	4			1	1	1	2			1				1				3	8	
							15	27	3	5	6	2	3	16			8	20		3	16		1		1	13	
	1		3				27	3	5	6	2	3	16				20		3	16		1			1	14	
							67	1	3	2			12			1	12		2	11		1			1	7	
	1						9	1	2	6	1		1	1		1	2		2	2		2			1	16	
							4						1			2				1		1				17	
							7						4			1				1		1				18	
							2	14					2			8				5		7				19	
							20	3	5	10	4		33				5			7						20	
							7	5	5				2			2				4						21	
							1	2	2				2			2				1						22	
							1	2	2				2			2				1						22	
							3	15	1	1	2	4	10			4	6			11		1			2	5	
							4	2												3						24	
							3	3						3			1	2		1						25	
							7	1	1	2			6			1	4			1						26	
							1	1	2				2			6				1						27	
							2	5	5	6			2			2		5		3						27	
							1	5	3	1	3		5			1				1						28	
							2	5	2		1	1	6							6						29	
							9	34	7	9	2	3	30			1	4	26		7						30	
							1	1	1	1	1	1	1	1		1	1	1		1						31	
							27	133	21	29	24	7	18	177		3	23	90		11					6	5	
	11	3	17				35	4	3	7	4	3	7	7		3	23	90		11					2	3	
							1	1												92						2	
							1	1												3						2	
							1	1												3						2	
							1	1												3						2	
							1	1												3						2	
							1	1																			

TABLE XII.—Number of steam locomotives inspected,

	Southern Pacific of Mexico	Southern	Spokane International	Spokane, Portland & Seattle	Steelton & Highspire	Tennessee Central	Tennessee Coal, Iron & R. R.
Parts defective, inoperative or missing, or in violation of the rules							
1 Air compressors		15	1	3		7	
2 Arch tubes		1					
3 Ashpans and mechanism						1	
4 Axles							
5 Blow-off cocks		3				1	
6 Boiler checks		9		2		1	
7 Boiler shell		2		1			
8 Brake equipment		61	2	9		9	
9 Cabs, cab windows, and curtains		23		4		2	
0 Cabs aprons and decks		4		1			
1 Cab cards		1					
2 Coupling and uncoupling devices		1		1			
3 Crossheads, guides, pistons, and piston rods		14	1	11		6	
4 Crown bolts		2					
5 Cylinders, saddles, and steam chests		60		8		19	
6 Cylinder cocks and rigging		15			1	2	
7 Domes and dome caps		1	1				
8 Draft gear		14		9			
9 Draw gear		1		2		2	
0 Driving boxes, shoes, wedges, pedestals, and braces		27		8		9	
1 Firebox sheets		6		1		1	
2 Flues		6		15			
3 Frames, tail pieces, and braces, locomotive		23		13		3	
4 Frames, tender		3				3	
5 Gages and gage fittings, air		4				1	
6 Gages and gage fittings, steam		6		6		1	
7 Gage cocks		11		3		3	
8 Grate shakers and fire doors		10				11	
9 Handholds		5		1		1	
0 Injectors, inoperative		1		1			
1 Injectors and connections		34	6	22		5	
2 Inspections and tests not made as required		152	8	101		33	1
3 Lateral motion		14		5		5	
4 Lights, cab and classification		11		1			
5 Lights, headlight		5	1	1		1	
6 Lubricators and shields		1				1	
7 Mud rings		2		1		1	
8 Packing nuts		19		1		3	
9 Packing, piston rod and valve stem		20		1		3	
0 Pilots and pilot beams		2				1	2
1 Plugs and studs		3				1	
2 Reversing gear		2				4	
3 Rods, main and side, crank pins, and collars		22	2	12		13	
4 Safety valves		8		1		1	
5 Sanders		1					
6 Springs and spring rigging		76	2	38		5	
7 Squirt hose		1					
8 Stay bolts		9		6			
9 Stay bolts, broken		2		7		1	
0 Steam pipes		8		1		1	
1 Steam valves		4				2	
2 Steps		11		1		6	
3 Tanks and tank valves		19		2		4	
4 Telltale holes		1		2			
5 Throttle and throttle rigging		14		1	3		
6 Trucks, engine and trailing		14		23		8	
7 Trucks, tender		13		6		2	
8 Valve motion		1	1	9		4	
9 Washout plugs		9				3	
0 Water-control equipment		1					
1 Water glasses, fittings, and shields		26		4		8	
2 Wheels		5		10		1	
3 Miscellaneous—Signal appliances, badge plates, brakes (hand)		19		7		3	
Number of defects		851	28	361		195	5
Locomotives reported	16	1,536	14	108	13	34	49
Locomotives inspected		3,284	21	288	19	133	14
Locomotives defective		180	8	103	5	43	1
Percentage of inspected found defective		5	38	36	26	32	7
Locomotives ordered out of service		14		3		4	

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

	Terminal R. R. Assn. of St. Louis	Texas & Pacific	Texas Pacific-Missouri Pacific Terminal of New Orleans	Toledo, Peoria & Western	Toledo Terminal	Toronto, Hamilton & Buffalo	Union Pacific	Union	Upper Merion & Plymouth	Utah	Virginian	Wabash	Washington Terminal	Western Maryland	Western Pacific	Wheeling & Lake Erie	Roads with less than 10, and industrial locomotives	Total defects						
							40	3			14	3	4		7		60	1,146						
													1				9	45						
																	4	93						
																	3	15						
							16										3	289						
							46		2		1		2				21	533						
							20				3						18	406						
							51	5	4		21		13				159	2,914						
							28	1	13		11		11		1		70	1,169						
							18				1		3				20	381						
							4										21	104						
							9		1								4	65						
							34	3	7		13		10				15	2,149						
							5										1	8						
							48		5		17		3				3	105						
							18		1		2		1				4	74						
							4						3				1	59						
							16		8		2		6				14	189						
							8		1		2		4				5	515						
							69				16		30				16	2,026						
							4	5	2		1						2	18						
							3	3	5		1						1	274						
							32		1		4		5				1	1,019						
							5				1						1	8						
							3				4						1	17						
							20				3						1	11						
							24		4				1				7	328						
							23		5		2						5	532						
							19		2		3						12	539						
							2										2	464						
							87	4			12		7				8	5						
							353	12	56		57		70		8		140	124						
							11	2			29		20		5		13	464						
							2				2						7	33						
							8		4								1	4						
							14				4						1	20						
							6	3									1	2						
							31		3		7		4				4	10						
							27	8	15		6		4				4	58						
							11				4		2				3	85						
							5		1								1	17						
							11										6	7						
							57	8	23		7		42				3	19						
							11				20		3				3	157						
							15	1	4		1		3				1	3						
							150	2	11		81		32				28	28						
							1						1				1	152						
							8	3	1		1						1	6						
							16				1						6	13						
							4				1		4				4	66						
							3				1		2				2	3						
							35	1	7		6		3				4	6						
							54	4			1		5				1	3						
							3										1	131						
							23		2		4		1				4	40						
							20				7		10				3	15						
							18		1		13		1				4	39						
							22		1		12		5				7	44						
							29		3		1		6				7	74						
							65	5	12		5		1				18	1,021						
							14	1			1		5				2	58						
							73				7		3				15	33						
							21	14	2				84	22	505	45	2,824	56,617						
							100	264	10	16	20	13	1,475	132	10	13	104	378	23	234	174	162	1,629	43,297
							119	524	10</															

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 (1944-1923), Ordered out of service (1944-1923). Rows include various railroad lines 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 (1944-1923), Ordered out of service (1944-1923). Rows include various railroad lines like Houston Belt & Terminal, Illinois Central, Indiana Harbor Belt, 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

Road	Percentage inspected defective ¹							Ordered out of service						
	1944	1943	1931	1929	1927	1925	1923	1944	1943	1931	1929	1927	1925	1923
St. Johnsbury & Lake Champlain	0							0						
St. Louis-San Francisco	3.9	3.1	3.9	14	22	49	88	1	2	1	7	12	65	346
St. Louis Southwestern	11	10	8	4.3	22	47	86	2	4	4	2	22	14	54
San Diego & Arizona Eastern	14	7						0	0					
Savannah & Atlanta	16	24	19	80	67	73	68	0	2	0	0	0	2	3
Seaboard Air Line	8	7	9	37	56	51	55	7	4	2	24	43	33	23
South Buffalo	10	10	39	23	29	75	0	0	0	8	0	1	0	0
Southern Pacific, lines east	3.3	2.4	3.3	5	13	30	47	0	1	1	3	10	37	28
Southern Pacific, lines west	17	15	11	24	27	33	38	9	11	13	47	50	51	24
Southern	5	6	9	12	24	36	59	14	6	15	13	38	56	177
Spokane International	38	26	9	13	28	0	37	0	0	0	0	0	0	2
Spokane, Portland & Seattle	36	40	22	22	33	32	60	3	3	1	1	2	4	13
Steelton & Highspire	26	26	19	24	48			0	0	1	0	2		
Tennessee Central	32	23	14	47	65	74	89	4	5	0	14	40	23	63
Tennessee Coal, Iron & Railroad	7	24	7	38	67	40	50	0	2	0	0	0	0	0
Terminal R. R. Assn. of St. Louis	8	18	32	41	44	62	76	2	2	4	0	3	1	6
Texas & Pacific	1.1	0	0	1	12	16	62	0	0	0	1	3	1	91
Texas Pacific-Missouri Pac. of N. O.	10	14	0	4	10	57	83	0	0	0	0	0	2	0
Toledo, Peoria & Western	0	4.3	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	0	0	0	0			0	0	0	0	0		
Union Pacific	10	10	9	17	20	30	41	4	6	2	8	17	19	26
Union	20	12	11	9	29	80	10	1	4	1	2	0	0	2
Upper Merion & Plymouth	56	43	28	60	62			6	4	0	7	8		
Utah	0	0	0	11	4	26	19	0	0	0	0	0	0	0
Virginian	19	24	17	22	50	58	75	10	5	1	0	2	5	45
Wabash	7	5	0	1.5	6	47	82	6	1	0	1	2	21	89
Washington Terminal	27	46	0	10	43	40	89	1	0	0	0	1	1	2
Western Maryland	.9	1.7	13	26	42	54	76	0	0	1	3	13	22	90
Western Pacific	21	12	16	25	19	36	37	4	0	5	9	1	13	9
Wheeling & Lake Erie	3.9	4.5	8	42	55	67	74	0	0	1	7	10	20	31
Less than 10, discontinued roads, and industrial locomotives	19	22	32	40	51	56	56	53	45	279	417	762	827	639
All roads	11	10	10	21	31	46	65	630	487	688	1,487	2,535	3,637	7,075

¹ 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.