

INTERSTATE COMMERCE COMMISSION

THIRTY-SIXTH ANNUAL REPORT

OF THE

DIRECTOR

BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED
JUNE 30, 1947



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1947

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 15 cents

ANNUAL REPORT OF THE DIRECTOR BUREAU OF LOCOMOTIVE INSPECTION

OCTOBER 1, 1947.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Thirty-sixth Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1947, 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—					
	1947	1946	1945	1944	1943	1942
Number of locomotives for which reports were filed.....	39,578	41,851	43,019	43,297	43,064	42,951
Number inspected.....	94,034	101,869	115,979	117,334	116,647	113,451
Number found defective.....	10,248	11,337	11,975	12,710	11,901	10,970
Percentage inspected found defective.....	11	11	10	11	10	10
Number ordered out of service.....	708	690	506	630	487	474
Number of defects found.....	41,250	56,541	53,367	56,617	51,350	44,928

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

	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
Number of accidents.....	360	419	410	403	319	222
Percent increase or decrease from previous year.....	14.1	12.2	11.7	126.3	143.7	145.1
Number of persons killed.....	16	10	20	25	27	34
Percent increase or decrease from previous year.....	160.0	50.0	20.0	7.4	20.6	126.7
Number of persons injured.....	464	439	429	466	373	227
Percent increase or decrease from previous year.....	15.7	12.3	7.9	124.9	164.3	124.7

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—							
	1947	1946	1945	1944	1943	1942	1915	1912
Number of accidents.....	116	156	141	141	129	81	424	856
Number of persons killed.....	12	10	13	17	25	30	13	91
Number of persons injured.....	124	165	154	194	173	83	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—									
	1947		1946		1945		1944		1943	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	6	126	4	142	5	117	7	128	11	100
Firemen.....	6	159	4	184	9	183	11	181	10	143
Brakemen.....	1	37		46	2	61	2	67	4	47
Conductors.....		10		7	1	11		11		8
Switchmen.....		9		10	1	10		5		12
Roundhouse and shop employees:										
Boilermakers.....		3		1	1	10	2	5		4
Machinists.....	1			6		6		2		3
Foremen.....				3		6		2		
Inspectors.....		1		1		1		2		
Watchmen.....		2	2	4		1		1	1	3
Boiler washers.....				1						
Hostlers.....		6		10		5		12		1
Other roundhouse and shop employees.....		8		3		4	1	4		4
Other employees.....	2	21		13		5		6		11
Nonemployees.....		82		8		10	1	40	1	28
Total.....	18	464	10	439	20	429	25	466	27	373

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

	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
Number of locomotive units for which reports were filed.....	7,805	6,616	6,094	5,139	4,351	3,957
Number inspected.....	13,115	10,908	9,888	7,711	6,847	6,728
Number found defective.....	633	499	447	378	298	358
Percentage of inspected found defective.....	4.8	4.6	4.5	4.9	4.4	5
Number ordered out of service.....	19	17	16	9	6	12
Number of defects found.....	1,442	1,385	1,212	1,026	849	928

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

	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
Number of accidents.....	40	38	29	17	15	9
Number of persons killed.....	2	1	1	23	18	9
Number of persons injured.....	41	56	40			

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

	Year ended June 30—									
	1947		1946		1945		1944		1943	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	1	9		8		4		4		3
Firemen.....		21		14		14		4		9
Brakemen.....		5		3		1		1		1
Conductors.....		1		2		1		1		1
Switchmen.....		1		2		2		2		1
Maintenance employees.....	1	2		4	1	3		4		2
Other employees.....		2		5		8		1		1
Nonemployees.....				18		7		8		
Total.....	2	41		56	1	40		23		18

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--														
	1947			1946			1945			1944			1943		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs.....	1		1	1		1	1		1	3		4			
Aprons.....	4		4	2		2	8		8	7		7		1	1
Arch tubes.....															
Ashpan blowers.....															
Axles.....	1	2	1	1	1	1	1	2	1	5	1	5	1	1	1
Blow-off cocks.....	8		8	15		16	7		7	8		8		8	8
Boiler checks.....	7		7	8		8	6		6	9		9		8	7
Boiler explosions:															
A. Shell explosions.....															
B. Crown sheet; low water; no contributory causes found.....	11	7	16	15	7	20	7	9	11	12	7	19	19	22	48
C. Crown sheet; low water; contributory causes or defects found.....	2	4	3	3	3	2	1		1	7	5	43	4		6
D. Miscellaneous firebox failures.....	2		4	1		1	1		1	2	2	2	2	2	2
Brakes and brake rigging.....	8		12	10		12	10		10	12		12	11	13	13
Couplers.....	6		6	5		5	5		5	6		6	9	3	3
Crankpins, collars, et cetera.....	3		3	5		5	5	1	4	7		9	6	1	9
Crossheads and guides.....	2		2	3		3	5		5	2		8	2	2	2
Cylinder cocks and rigging.....	3		3	1		1	1		1	3		3	4	4	4
Cylinder heads and steam chests.....	2		2	1		1	2		2	3		3	1	5	5
Dome caps.....															
Draft appliances.....			2			2	2		2	3		3	1	1	1
Draw gear.....	1		1	1		1	2		2	1		1	1	1	1
Fire doors, levers, et cetera.....	2		2	2		2	8		8	6		6	5	5	5
Flues.....	4		4	10		12	5		6	8		9	5	5	10
Flue pockets.....															
Footboards.....	15		15	12		12	13	1	12	6		6	4	4	4
Gage cocks.....	1		1	1		1	1		1	1		1	2	3	3
Grease cups.....	1		1	1		1	1		1	1		1	2	2	2
Grate shakers.....	20		20	25		25	17		17	19		19	18	18	18
Handholds.....	18		18	20		20	26	1	25	14		14	18	18	18
Headlights and brackets.....	2		2	2		2	7		7	4		4	4	4	4
Injectors and connections (not including injector steam pipes).....	14		14	14		14	12		12	8		8	7	7	7
Injector steam pipes.....	4	1	4	2		2	1		1	1		1	2	2	2
Lubricators and connections.....	4		4	5		5	4		4	5		5	7	7	7
Lubricator glasses.....				2		2	2		2	1		1	1	1	1
Patch bolts.....	1		1				2	1	1	3		3	1	1	1
Pistons and piston rods.....	1		1	1		1	5	2	6	6		6	7	2	3
Plugs, arch tube and washout.....	1		1	1		1	1		1	1		1	1	1	1
Plugs in firebox sheets.....	1		1	1		1	1		1	1		1	1	1	1
Reversing gear.....	13		13	11		11	13		13	16		16	14	14	14
Rivets.....							1		1	1		1	1	1	1
Rods, main and side.....	3	1	2	7		7	7		7	11	7	2	9	7	10
Safety valves.....															
Sanders.....	5		5	4		4	8		8	12		12	2	2	2
Side bearings.....															
Springs and spring rigging.....	3		3	6		6	7	5	1	4	6	2	8	7	8
Squirt hose.....	19		19	14		14	15	23	4	25	21	4	22	16	16
Stay bolts.....	2		2	1		1	1		1	1		1	4	4	4
Steam piping and blowers.....	8		8	15		15	12		12	14		14	9	9	15
Steam valves.....	8		8	13		13	7		7	7		7	7	9	10
Studs.....	2		2	1		1	1		1	1		1	1	1	1
Superheater tubes.....	2		2	2		2	2		2	2		2	4	4	5
Throttle glands.....															
Throttle leaking.....	2		2	1		1	3		3	3		3	1	1	1
Throttle rigging.....	16		17	15		16	6		6	9		9	4	4	4
Trucks, leading, trailing, or tender.....	2		2	10		12	7		7	5		5	1	1	3
Valve gear, eccentrics, and rods.....	4		4	7		7	10		10	14		14	13	11	11
Water glasses.....	8		8	12		12	1		1	2		2	3	3	3
Water-glass fittings.....	3		3	2		2	1		1	1		1	2	2	2
Wheels.....															
Miscellaneous.....	117	1	117	124		127	124	3	126	103	1	106	70	1	69
Total.....	360	16	464	419	10	439	410	20	429	403	25	466	319	27	373

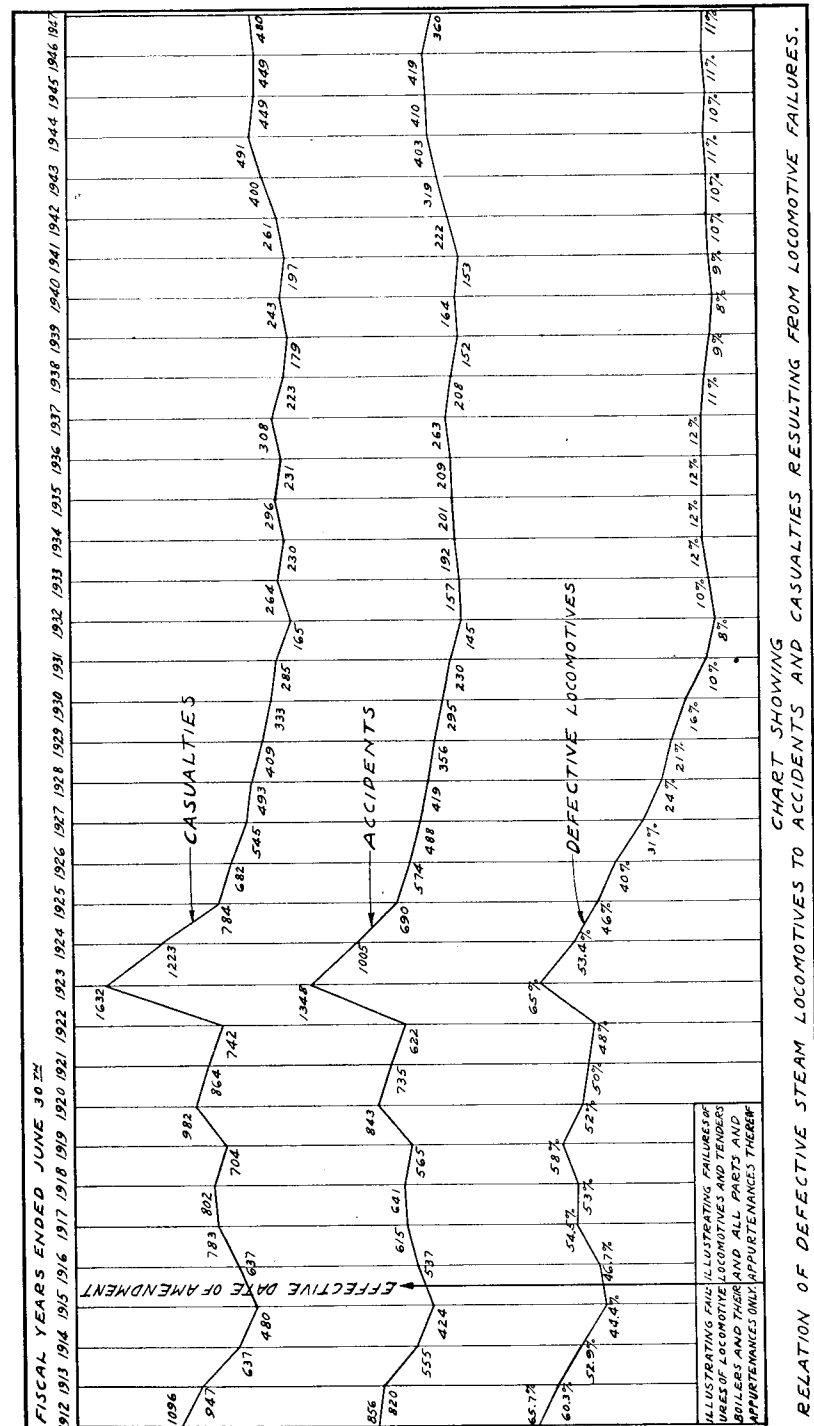


TABLE IX.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1947			1946			1945			1944			1943		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging	2	2	2	2	3	3	8	1	3	1	1	1	1	1	1
Carburetors	2	2	2	2	2	2	4	3	3	1	1	1	1	1	1
Couplers	2	2	2	2	2	2	4	3	3	1	1	1	1	1	1
Crank pins and connecting rods	2	2	2	2	2	2	4	3	3	1	1	1	1	1	1
Fires: Due to overflowing or leakage of fuel, crank-case explosions, back firing, et cetera	7	8	4	5	6	6	4	5	5	3	3	5	5	5	5
Generators and starting devices	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Insulation	4	1	5	1	1	1	1	1	1	1	1	1	1	1	1
Photographs and trolleys	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Short circuits	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Miscellaneous	22	22	27	43	42	42	16	8	11	5	3	5	5	5	5
Total	40	2	41	38	56	29	1	40	17	23	15	18	18	18	18

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
Air compressors	944	1,044	1,054	1,146	968	829
Arch tubes	19	27	17	45	50	27
Ashpans and mechanism	87	93	81	93	71	80
Axles	6	7	11	15	15	2
Blow-off cocks	308	388	361	289	291	238
Boiler checks	428	526	511	533	503	393
Boiler shell	342	462	416	406	377	290
Brake equipment	2,512	2,992	2,755	2,914	2,061	2,382
Cabs, cab windows, and curtains	1,347	1,501	1,057	1,169	1,102	1,163
Cab aprons and decks	428	469	426	381	390	335
Cab cards	91	120	91	104	142	131
Coupling and uncoupling devices	58	46	57	65	66	70
Crossheads, guides, pistons, and piston rods	1,683	1,941	2,079	2,149	1,961	1,273
Crown bolts	98	88	90	105	66	75
Cylinders, saddles, and steam chests	2,004	2,217	1,801	2,133	1,395	1,514
Cylinder cocks and rigging	650	679	454	624	430	521
Domes and dome caps	130	164	187	189	196	112
Draft gear	449	536	486	576	599	651
Draw gear	453	462	447	515	469	369
Driving boxes, shoes, wedges, pedestals, and braces	1,580	1,922	1,803	2,026	2,053	1,743
Firebox sheets	257	333	319	347	303	278
Flues	197	253	260	274	215	178
Frames, tail pieces, and braces, locomotive	820	1,003	852	1,019	894	869
Frames, tender	63	88	97	126	86	86
Gages and gage fittings, air	135	185	151	158	191	193
Gages and gage fittings, steam	358	370	353	328	316	263
Gage cocks	404	495	449	532	584	497
Grate shakers and fire doors	444	555	558	539	492	491
Handholds	469	540	527	464	483	378
Injectors, inoperative	39	50	41	46	66	47
Injectors and connections	2,369	2,750	2,553	2,867	2,637	2,220
Inspections and tests not made as required	350	8,885	9,067	9,565	9,037	8,186
Lateral motion	791	862	977	898	700	498
Lights, cab and classification	155	161	167	243	184	131
Lights, headlight	143	168	222	268	184	218
Lubricators and shields	228	351	306	257	292	234
Mud rings	217	238	257	301	256	244
Packing nuts	575	691	654	746	669	689
Packing, piston rod and valve stem	691	776	845	879	724	738
Pilots and pilot beams	156	153	171	193	194	188

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
41 Plugs and studs	236	262	245	281	259	173
42 Reversing gear	528	482	439	454	452	411
43 Rods, main and side, crank pins, and collars	2,136	2,581	2,569	3,230	2,798	1,986
44 Safety valves	70	72	84	77	74	67
45 Sanders	569	784	658	609	642	738
46 Springs and spring rigging	4,622	5,195	4,734	4,625	3,583	3,349
47 Squirt hose	79	120	98	94	92	67
48 Stay bolts	318	360	351	400	367	272
49 Stay bolts, broken	283	268	308	232	247	274
50 Steam pipes	356	551	416	435	414	290
51 Steam valves	146	203	157	161	159	150
52 Steps	778	914	681	872	729	594
53 Tanks and tank valves	1,558	1,570	1,215	1,400	1,321	1,150
54 Telltale holes	69	60	78	69	78	79
55 Throttle and throttle rigging	1,026	979	948	948	887	786
56 Trucks, engine and trailing	1,005	1,261	1,151	1,155	1,020	833
57 Trucks, tender	795	1,101	974	928	900	786
58 Valve motion	778	1,080	991	1,021	998	779
59 Washout plugs	441	740	820	845	685	569
60 Stokers	208	208	208	208	208	208
61 Water glasses, fittings, and shields	1,318	1,190	1,328	1,323	1,454	1,133
62 Wheels	583	840	899	759	728	664
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)	870	1,337	1,213	1,172	1,151	977
Total number of defects	41,250	56,541	53,367	56,617	51,350	44,928
Locomotives reported	39,578	41,851	43,019	43,297	43,064	42,951
Locomotives inspected	94,034	101,869	115,979	117,334	116,647	113,451
Locomotives defective	10,248	11,337	11,975	12,710	11,901	10,970
Percentage of inspected found defective	11	11	10	11	10	10
Locomotives ordered out of service	708	690	506	630	487	474

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—					
	1947	1946	1945	1944	1943	1942
Air compressors	9	15	14	7	7	13
Axles, truck and driving	2	2	2	2	2	2
Batteries	1	2	1	1	1	1
Boilers	5	11	8	1	1	5
Brake equipment	178	102	114	85	62	86
Cabs and cab windows	97	46	59	40	33	27
Cab cards	29	24	25	21	17	20
Cab floors, aprons, and deck plates	130	72	60	54	31	10
Clutches	2	2	2	1	2	1
Controllers, relays, circuit breakers, magnet valves, and switch groups	14	16	18	14	9	12
Coupling and uncoupling devices	13	6	6	3	1	5
Current collecting apparatus	3	9	10	1	1	1
Draft gear	30	18	14	14	15	19
Draw gear	4	3	8	2	2	3
Driving boxes, shoes, and wedges	38	44	29	12	25	16
Frames or frame braces	7	10	12	12	7	5
Fuel system	66	57	45	33	32	81
Gages or fittings, air	10	7	7	6	3	8
Gages or fittings, steam	5	7	7	2	1	1
Gears and pinions	1	1	1	1	1	4
Handholds	22	18	13	6	19	14
Inspections and tests not made as required	78	357	297	278	223	274
Insulation and safety devices	11	12	17	8	4	3
Internal-combustion engine defects, parts and appurtenances	254	145	133	86	50	62
Jack shafts	3	4	6	8	2	1
Jumpers and cable connectors	1	8	9	2	3	1
Lateral motion, wheels	7	18	20	9	10	1
Lights, cab and classification	1	2	2	1	1	5
Lights, headlight	2	1	2	2	2	1

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1947	1946	1945	1944	1943	1942
Meters, volt and ampere.....	3	4	2	2	3	2
Motors and generators.....	16	15	12	14	14	16
Pilots and pilot beams.....	15	8	1	2	4	10
Plugs and studs.....	18	52	29	18	9	6
Quills.....	6	11	3	10	3	2
Rods, main, side, and drive shafts.....	82	57	50	59	41	57
Sanders.....	63	42	38	44	18	35
Springs and spring rigging, driving and truck.....	4	1	6	3	1	1
Steam pipes.....	68	29	28	25	25	21
Steps, footboards, et cetera.....	1	3	7	2	2	2
Switches, hand-operated, and fuses.....	2	3	3	3	3	3
Transformers, resistors, and rheostats.....	45	52	42	47	22	28
Trucks.....	2	1	2	1	4	1
Water tanks.....	2	15	2	4	2	5
Water glasses, fittings, and shields.....	8	2	2	2	3	3
Warning signal appliances.....	48	54	46	74	107	43
Wheels.....	40	31	16	13	16	14
Miscellaneous.....	40	31	16	13	16	14
Total number of defects.....	1,442	1,385	1,212	1,026	849	926
Locomotive units reported.....	7,805	6,616	6,094	5,139	4,351	3,957
Locomotive units inspected.....	13,115	10,908	9,888	7,711	6,847	6,728
Locomotive units defective.....	633	499	447	378	298	358
Percentage inspected found defective.....	4.8	4.6	4.5	4.9	4.4	5
Locomotive units ordered out of service.....	19	17	16	9	6	12

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

Three hundred and sixty accidents occurred in connection with steam locomotives resulting in 16 deaths and 464 injuries. This represents a decrease of 59 accidents, an increase of 6 in the number of persons killed, and an increase of 25 in the number of persons injured compared with the preceding year.

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

Table VIII shows the various parts and appurtenances of steam locomotives and tenders which through failure have caused serious and fatal accidents in the past 5 years. If the information contained in this table is taken advantage of and proper inspections and repairs

made in accordance with the requirements of the law and rules many accidents will be avoided.

During the year 11 percent of the steam locomotives inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this percentage is the same as in the preceding year. Seven hundred and eight 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 18 locomotives compared with the preceding year.

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

EXPLOSIONS AND OTHER BOILER ACCIDENTS

Fourteen boiler explosions occurred in the fiscal year. Eleven employees were killed in these accidents and 22 were injured. There was a reduction of 4 in the number of boiler explosions, an increase of 1 in number of employees killed, and the same number of employees injured as in the preceding year.

Two explosions caused by overheating of the crown sheets occurred on locomotives in passenger-train service, nine on locomotives in freight-train service, and two on locomotives in charge of engine watchmen. One explosion on a locomotive in freight-train service was caused by overheating of the bottom sheet of the combustion chamber.

Three employees were killed in one of the two explosions that occurred while locomotives were hauling passenger trains. In this instance the train was running at an estimated speed of 55 miles per hour. The boiler was torn from the running gear, struck the track 407 feet from the point of explosion, bounded and struck the track 170 feet beyond, then rebounded and came to rest close to the track and 709 feet from the point of explosion. Parts of the wreckage were scattered over an area extending to a radius of about 700 feet. The running gear, tender, and first four cars of the train were derailed and stopped close to the boiler. Two employees were injured in the other explosion which occurred while the train was running at an estimated speed of 65 miles per hour; they were forced by escaping steam to leave the cab, but the engineer returned and applied the brakes.

Eight employees were killed and two injured in three of the nine explosions caused by overheated crown sheets that occurred while the locomotives were in freight-train service and the boilers were torn from the running gears. Four employees were killed and one was injured in one of these explosions in which the locomotive, assisted by a Diesel-electric locomotive coupled ahead, was hauling a freight train

at an estimated speed of 15 to 20 miles per hour. The boiler was hurled upward and forward over the helper locomotive, it alighted on the track 265 feet from the point of explosion, broke out a section of rail and made a deep impression in the road bed, bounded, and came to rest 390 feet from the point of explosion. The engineer and fireman of the steam locomotive were killed and the brakeman was injured. The Diesel-electric helper locomotive derailed at the broken rail and depression in the track, was otherwise damaged, and the engineer and fireman were killed. The engineer and fireman were killed in the second of these explosions which occurred while the locomotive was hauling a freight train at an estimated speed of 40 miles per hour. The boiler was hurled upward and forward 302 feet, it then bounded 77 feet, and rebounded and came to rest clear of the track 420 feet from the point of explosion. The running gear and tender remained attached to the train and stopped about 1,700 feet beyond the point of the explosion. In the third instance in which the boilers were torn from the running gears, the explosion occurred while the locomotive was hauling a freight train at an estimated speed of 45 miles per hour. The engineer and fireman were killed and the brakeman was fatally injured. The boiler was hurled upward and forward, the back head struck the track and the boiler turned over and alighted upside down and headed in the opposite direction at the base of the track embankment 293 feet forward of the point of explosion. The running gear and 13 cars were in wreckage at the foot of the embankment. In each of these explosions parts were scattered in various directions over areas extending to a radius up to 900 feet.

Fifteen employees were injured in the eight remaining explosions caused by overheated crown sheets. Six of these locomotives were in freight-train service and two were in charge of engine watchmen.

The overheating of the combustion chamber which resulted in one explosion in which three employees were injured was caused by accumulation of sludge in the water space between the bottom sheet of the combustion chamber and the boiler shell. This accident occurred about 20 minutes after the locomotive departed from the terminal where the boiler had been washed and thereafter, in the process of making tests for leakage, water that contained a high content of sludge had twice been pumped into the boiler from the blow back tank of the boiler washing plant.

One of the boilers involved in the foregoing described explosions was equipped with a low-water alarm. This alarm was so damaged in the explosion that it could not be tested without application of extensive repairs. However, a record of test made before departure of the locomotive on its trip showed that the alarm functioned properly at that time.

Our investigations developed that absence of safe water level was known by employees on two of the locomotives in advance of the occurrence of the explosions. One of the locomotives had been stopped after passing the apex of a grade to regain steam pressure and replenish the water supply in the boiler. While the locomotive was standing absence of water in the water glass was noted by five employees who were in the locomotive cab. In the other instance difficulty in movement had been encountered because of heavy snow, and snow had been shoveled into the tank to supplement the dwindling water supply. When the locomotive arrived at a water crane, water was not visible in the water glass and attempts were made to raise the steam pressure and put water into the boiler for a period of time estimated at about 20 minutes before the explosion occurred.

It was further developed in our investigations of three explosions that dependence had been placed on gage cocks rather than on the water glasses for indicating the boiler water level, without any reason being given or found for the following of this procedure. All three gage cocks on another exploded boiler were found open after the explosion, none survived this accident and no conditions were found that would interfere with proper operation and correct indications of the water glass.

Investigation of another explosion developed that during or following an attempt to blow out the water glass, the bottom valve of the water glass may have been closed to such extent as to trap water in the glass and thus give a false reading; the gage cocks were not tested before starting on the trip and were not used thereafter, although they were found in good working order following the explosion.

Anxiety to avoid stalling or to keep trains moving at the desired speed is one of various factors that lead to occurrence of accidents of the character described. Shutting off the boiler feeding appliance (injector or feed water pump) commonly termed "trading water for steam" in efforts to maintain the steam pressure should not be indulged in to the extent that normal safe water level is not readily visible in the water glass. If the water level is being reduced at a rate in excess of that at which water can be supplied to the boiler, the rate of working of the locomotive should be adjusted accordingly.

Another contributing factor to these accidents is the equipment of locomotives with boiler feeding devices of inadequate capacity to supply the maximum quantity of water the boiler is capable of evaporating. The Locomotive Inspection Act and the rules issued thereunder contemplate that each locomotive shall be equipped with two such devices, each capable of full stand-by service in the event of failure of the other. These devices can be and are often used to supplement each other, but few if any are susceptible of sufficiently fine

regulation as to permit simultaneous use without adverse effect on the steam pressure. Under many circumstances where maximum performance of the locomotive is required to maintain schedules, reluctance to use the two devices simultaneously occurs and the boiler water is consumed at a rate in excess of that at which it is supplied.

Reliance on the indications of gage cocks without taking into full consideration the height of water, or absence of water, in the water glass is another contributing factor. Many errors are made in interpretation of the indications from gage cocks. Water glasses should be blown out sufficiently often, and the movement of the water therein carefully noted, to insure that the water moves freely. Gage cocks should be tried frequently to check the level in the water glass, but a safe water level should not be assumed if the bottom gage cock seemingly indicates the presence of water if none is visible in the water glass.

One hundred and two boiler and appurtenance accidents other than explosions resulted in the death of 1 employee and injuries to 102 employees. This is a decrease of 36 accidents and a decrease of 41 injuries compared with the preceding year in which no fatalities occurred from causes other than boiler explosions.

EXTENSION OF TIME FOR REMOVAL OF FLUES

Six hundred and fifty-six applications were filed for extension of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 160 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Twenty-four were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Twenty-two extensions were granted after defects disclosed by our investigations were required to be repaired. Twenty-four applications were canceled for various reasons. Four hundred and twenty-six applications were granted for the full period requested.

LOCOMOTIVES PROPELLED BY POWER OTHER THAN STEAM

Forty accidents, resulting in 2 deaths and 41 injuries, occurred in connection with locomotives propelled by power other than steam. This represents an increase of 2 in the number of accidents, and a decrease of 15 in the number of persons injured compared with the preceding year; no fatalities occurred in the preceding year.

During the year 4.8 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 0.2 percent compared with the results obtained in the preceding year. Nineteen 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 two locomotives compared with the preceding year.

One employee was killed and two were injured as a result of a short circuit between bus bars and a flashover to a cab bulkhead on an electric locomotive, and one employee was killed on another electric locomotive by contact with an energized pantograph when attempt was made to pass through a roof hatch, the door of which was found open due to interference of an improperly assembled safety attachment to the grounding switch.

Six explosions occurred in crankcases of engines of Diesel-electric locomotives, resulting in injuries to seven employees. Five of these explosions were caused by overheated bearings, and one was caused by an overheated cylinder liner and piston due to inoperative water-cooling system shutters.

Two of the explosions caused by overheating of bearings occurred when attempts were made to restart the engines after having been shut down because of emission of smoke from the valve covers and other indications of overheating; one occurred after the engine was taken off the line and speed reduced because of unusual noise and low oil pressure; one occurred following shut down of the engine as a crankcase inspection cover was being removed to determine the source of pounding noise; and one occurred following shut down of the engine because of smoke and a light explosion which forced off a valve cover, the second explosion forced off all valve covers and eight inspection covers and ignited the oil in the crankcase. The explosion caused by an overheated cylinder liner and piston occurred after the engine speed had been reduced to about one-half of normal because of excessive temperature of cooling water due to closed cooling system shutters.

The rapidly expanding and widespread intensive use of Diesel-electric locomotives and repetition of accidents caused by crankcase explosions accentuates the need for higher degree of maintenance of Diesel engines and the necessity of operators of these engines being fully informed of the hazards involved in continuing the engines in use when undue heating occurs. In instances of low lubricating oil pressure or abnormal heating, engines should be shut down promptly and restarting of an overheated engine should not be attempted unless it is known that the engine has cooled to normal temperature and the cause of overheating has been found and remedied.

It is not uncommon for crankcase explosions to occur after overheated engines have been shut down and before the overheated parts

have cooled sufficiently to avoid ignition of the vapor in the crankcase. Entry of air into the crankcase or other conditions may affect the vapor mixture to such extent as to change the explosive characteristics, and explosion may occur before the overheated parts have cooled to below the flash point of the vapor which is variable in composition and necessarily unknown under the circumstances. It is therefore advisable for attendants or others present to depart promptly from close proximity to any engine that has been shut down because of smoke coming from the valve covers, incipient crankcase explosions or any excessive overheating, until cooling has occurred. The crankcase handhole covers or inspection covers or doors should not be loosened or removed until it is known that a sufficient interval of time has elapsed for cooling of any heat-affected parts below the flash or fire point of the contents of the crankcase.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 207 specification cards and 4,512 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, 1,274 specifications and 116 alteration reports were filed for locomotive units and 415 specifications and 192 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

AMENDED RULES

The appliances required by amended rules 106 (b), 153 (a), and 157 (c) and (d) to be installed on steam road locomotives the first time class 3 repairs are applied but not later than June 1, 1948, consist of an emergency brake valve located on the front of the tender, on the rear of the back wall of the cab, or adjacent to a cab exit if the cab is of the vestibule type; a device whereby the height or quantity of water in the tender feed water tank may be ascertained from the cab or tender deck; and steam or auxiliary air supply to air operated reverse gears.

Installation of these safety aids was started at or shortly after the time the order amending the rules was issued; some delays, spotty

rather than general, were early encountered because of shortage of materials and parts but considerable progress is now being made. However, the following irregularities have been found in some of the installations and suitable action taken toward correction:

Emergency brake valve.—Mounted on the rear of the back wall of the cab at such height as to be liable to catch the clothing of a person passing through the gangway.

Tender feed water height indicator.—Devices of the general type that consist of a vertical pipe, either inside or outside the tank, with a valve at the bottom manually operable from the top of the tank bulkhead by means of which water from the tank is admitted into the bottom of the pipe and the level indicated by water discharging from a series of holes, nipples, or street ells in the pipe, or nipples connecting the pipe to holes in the side plate of the tank: Water valve subject to seizure and at times cannot be opened, water valve leaks, provision not made for indicating the lower levels of water in water bottom tanks, discharge openings closed by corrosion or foreign material, some plugged with wood or pin grease and in some instances welded closed, device subject to becoming inoperative in cold weather due to freezing, discharge of water so near the tender vertical handhold and gangway steps that ice forms on these parts in cold weather, in some instances discharge of water is so located that it can be seen only by looking back through the side cab window when open or by extending the head out of the gangway.

Devices consisting of a gage or liquid in a U tube actuated by air pressure sufficient to balance a column of water equal in height to the level of the water in the tank: Various irregularities of these devices have been found to be due to lack of proper maintenance, such as air screen or pipes plugged by foreign matter and leakage in air or water connections.

Various kinds or types of devices for ascertaining the height or quantity of water in the tender tank have been applied by various carriers apparently in some instances without giving thorough consideration as to the suitability of the designs or constructions to effect the purpose of the Commission's order establishing the amendment of the rule. Some of these devices have been supplanted with other devices and others will be modified as a result of experience under the particular services and locations where the locomotives are used; those found to comply with the intent and purpose of the rule will be continued in use.

As with other rules requiring the installation of locomotive devices or accessories the choice of make, type, details of design, and method of application rests, for obvious reasons, with each carrier involved.

This Bureau does not undertake recommendation or approval of any particular design or any particular device but it is required that the purpose sought be reasonably accomplished.

Power reverse gear.—The valve handle of steam connection to air operated power reverse gear where such supplementary means of operation is used is required to be plainly marked and equipped with a handle or wheel of distinctive design. Suitable marking has generally been applied, but in some instances the handle is of the same size and design as used on other steam valves in cabs. It is the intent of the rule that the handle be of different design than that of other valves on the locomotive and that all such handles used on locomotives of any particular carrier be alike.

APPEALS

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

ACKNOWLEDGMENT

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

JOHN M. HALL,
Director.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1947, BY ROADS

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

ALTON RAILROAD:

**December 8, 1946, locomotive 4399, Dwight, Ill. Sanders were inoperative; one injured.

**January 30, 1947, locomotive 4378, San Jose, Ill. Piston rod packing in feed water pump was leaking; one injured.

**March 1, 1947, locomotive 5285, near Mazonia, Ill. Parts of crosshead and valve gear were thrown from locomotive; union link and crosshead shoe bolts were broken and crosshead cracked; crosshead, crosshead shoe bolts and bolt holes were defective; one injured.

Three accidents; three injured.

APACHE RAILWAY:

**February 3, 1947, locomotive 300, near Snowflake, Ariz. Tender truck axle broke due to failure of a journal that had been built up with fusion welding; two killed, one injured.

One accident; two killed, one injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

July 1, 1946, locomotive 1655, Hurley, N. Mex. Blow-off cock in back head was leaking; horizontal blow-off discharge pipe was applied with outer end higher than blow-off cock, causing the leakage to accumulate in the pipe until pressure forced it out; one injured.

**July 14, 1946, locomotive 3770, Yampai, Ariz. Insufficient clearance between the throttle lever grip and the independent air gage; one injured.

July 23, 1946, locomotive 584, Los Angeles, Calif. Squirt hose burst; inner lining had collapsed, restricting the opening and causing increased pressure; one injured.

*July 24, 1946, locomotive 2546, Ponca City, Okla. Oil on deck of engine; one injured.

July 25, 1946, locomotive 3873, near Husted, Colo. Stoker conveyor trough slide was difficult to move; slide guides were badly battered and slides were longer than company's standard; one injured.

August 8, 1946, locomotive 1877, Mendon, Mo. Hard coupling, caused by defective locomotive throttle and independent brakes; throttle was reported on August 5 and brakes reported on August 7; one injured.

August 11, 1946, locomotive 3854, near Casa Blanca, Calif. Side plate of spark arrester became detached and was thrown out of smokestack, striking employee who was on top of the tender; bolt for securing the side plate to spark arrester had worked loose; one injured.

**August 16, 1946, locomotive 3746, Barstow, Calif. Gangway handhold broke through bolt hole at cab bracket connection; one injured.

*August 16, 1946, locomotive 846, Gallup, N. Mex. Cab handhold broke loose at bottom end, due to defective rivet; one injured.

*August 22, 1946, locomotive 853, Chicago, Ill. Pin lifter lever at front of locomotive broke; one injured.

*August 24, 1946, locomotive 3927, Black, Tex. Cab handhold at gangway broke; one injured.

**September 6, 1946, locomotive 946, San Bernardino, Calif. Oil on top of tender fuel oil tank; one injured.

October 15, 1946, locomotive 1831, Holbrook, Ariz. Guide oiling step and ladder were missing; oiling step was reported missing on October 14, 15, 16, 17, and 18; one injured.

October 22, 1946, locomotive 4010, Santa Ana, Calif. Oil and dirt on tender water leg step; one injured.

November 2, 1946, locomotive 567, Los Angeles, Calif. Kerosene on gangway floor; one injured.

*November 6, 1946, locomotive 824, Los Angeles, Calif. Side rod broke; one injured.

**November 14, 1946, locomotive 3109, Independence, Kans. Oil on top of tender fuel oil tank; one injured.

November 26, 1946, locomotive 3826, Castle Rock, Colo. Superheater flue collapsed and ruptured; flue excessively thinned due to cinder cutting; one injured.

**December 2, 1946, locomotive 1701, Trinidad, Colo. Employee's jacket caught on marker lamp bracket that projected outward from end of pilot beam, causing him to fall; one injured.

**December 6, 1946, locomotive 2927, Mulvane, Kans. Oil on top of tender tank; one injured.

January 17, 1947, locomotive 729, San Bernardino, Calif. Oil on cab apron and tender deck; one injured.

February 2, 1947, locomotive 800, Bartlesville, Okla. Water crane hook slipped off water spout; hook improperly bent; one injured.

February 17, 1947, locomotive 570, Los Angeles, Calif. Throttle was difficult to operate account of throttle lever stem being worn to the extent that it bound in packing box; throttle was reported working hard on February 4, 7, 10, 11, 14, 15, and 16; one injured.

**February 28, 1947, locomotive 1798, Hector, Calif. Angle iron at outer edge of gangway tender end sill step was loose due to bolt for securing it being missing; one injured.

March 16, 1947, locomotive 9042, San Diego, Calif. Boiler check stuck open; one injured.

March 30, 1947, locomotive 9109, Richmond, Calif. Employee slipped while going to top of tender water tank while locomotive was in motion and his head was caught between cab roof overhang and top of fuel oil tank; one injured.

May 3, 1947, locomotive 1818, Lockport, Ill. Flue failed at safe end weld; one injured.

**May 22, 1947, locomotive 3728, Port Chicago, Calif. Employee stepped on a wooden block which was nailed to cab floor, spraining his ankle; eyebolt provided to support brakeman's cab seat in raised position was too short to raise the seat to level position and the block had been applied directly under the eyebolt; one injured.

May 28, 1947, locomotive 3243, Phoenix, Ariz. Feed water pump was inoperative due to being steambound; boiler check seat and valve were cut and leaking, causing the pump to become overheated; one injured.

June 17, 1947, locomotive 2924, Emporia, Kans. Oil on top of tender fuel tank; one injured.

June 24, 1947, locomotive 3100, Chicago, Ill. Locomotive failed account of low steam pressure; oil burner was not set properly, causing an accumulation of carbon about 5 inches thick around the burner. Employee was burned by blow back from the firebox when he attempted to blow out the oil line to burner; firing valve had excessive lost motion, permitting the valve to be partly open when the handle was in closed position; lining of fire door was burned off; "Clean out carbon. Firing valve has too much play" was reported on June 22; one injured.

June 26, 1947, locomotive 4197, near Marceline, Mo. Throttle was hard to handle; throttle was badly unbalanced due to snap ring on lower end being stuck in groove and not making a tight joint; "Throttle works too hard, can hardly open it" was reported on June 20; one injured.

June 27, 1947, locomotive 4106, near Baring, Mo. Leak at connection in lubricator pipe to right cylinder prevented the cylinder from being properly lubricated; one injured.

June 27, 1947, locomotive 3718, Marceline, Mo. Lid of metal box covering grate-shaker posts tilted when employee stepped on it; bolts which secured the box to cab deck had worked out, permitting the box to shift so that the lid did not rest on it properly; one injured.

**June 27, 1947, locomotive 3129, Bakersfield, Calif. Water glass burst; one injured.

Thirty-five accidents; 35 injured.

ATLANTIC COAST LINE RAILROAD:

August 5, 1946, locomotive 7225, Cordele, Ga. Pin worked out of grate-shaker rod at shaker-lever connection, permitting the shaker rigging to become disconnected; one injured.

August 7, 1946, locomotive 1528, Fitzgerald, Ga. Wash-out plug blew out of boiler back head when attempt was made to tighten it while boiler was under steam pressure of 190 pounds per square inch; one injured.

August 8, 1946, locomotive 1042, Dunbarton, S. C. Metal locomotive decks were worn smooth near the left cab seat; one injured.

September 6, 1946, locomotive 7118, Birmingham, Ala. Fire-rake handle was too short, permitting employee's finger to be caught between it and the fire-door wing; rake handle was 20½ inches shorter than the company's standard; one injured.

September 12, 1946, locomotive 1503, St. Petersburg, Fla. Oil on gangway handhold; one injured.

January 13, 1947, locomotive 417, Oglethorpe, Ga. Employee's hand was caught between handle of fire rake and front wall of tender coal space while attempting to put the rake into firebox, due to the short distance between the wall and fire-door hole; the sloping front wall of coal space was 71¾ inches from the center of fire-door hole, measured horizontally, and the height of the wall was 82 inches; the fire rake, which was the carrier's standard, had an over-all length of 136½ inches; one injured.

March 18, 1947, locomotive 1404, Cross City, Fla. Reversing gear was inoperative, due to defective valve gear reverse lift arm box; steel bushing on lug of lift arm box had loosened and worked out over the end, causing the arm to hang on the valve gear frame; one injured.

**June 19, 1947, locomotive 1158, Jacksonville, Fla. Injured while attempting to tighten driving brake adjusting screw; one injured.

Eight accidents; eight injured.

BALTIMORE & OHIO RAILROAD:

September 3, 1946, locomotive 2810, West Mosgrove, Pa. Wooden tread on cab gangway step broke; tread was worn; one injured.

**November 8, 1946, locomotive 2550, Winton Place, Ohio. Insufficient clearance between cab handhold at gangway and corner of tender deck when on curve; one injured.

December 30, 1946, locomotive 596, Sidney, Ohio. Boiler check cap joint was leaking and cap blew out when attempt was made to tighten it with boiler check stop valve open; cap was too small for proper fit in threads of boiler check body section; one injured.

**December 31, 1946, locomotive 4103, Brydon, W. Va. Overheated main crankpin and brass; both halves of main rod brass were broken; main rod brass was reported broken at two points and as running hot twice at one point on December 30; one injured.

January 21, 1947, locomotive 2850, Grafton, W. Va. Power reverse gear piston packing was leaking; "Power reverse piston packing leaking" was reported on January 10, 12, 18, and 21; one injured.

March 5, 1947, locomotive 2901, Grafton, W. Va. Approximately 3 inches of the back of wooden footboard on rear of tender broke off; one injured.

Six accidents; six injured.

BOSTON & MAINE RAILROAD:

October 12, 1946, locomotive 650, Everett, Mass. Whistle wire broke; wire deteriorated; one injured.

**November 23, 1946, locomotive 3234, Woburn, Mass. Manually operated reverse lever was hard to operate; one injured.

**January 25, 1947, locomotive 1443, Woodmere, N. H. Eccentric strap broke, causing reverse lever to unlatch and move violently into forward gear; one injured.

January 27, 1947, locomotive 3682, East Somerville, Mass. Ashpan operating lever came off shaft, due to nut being missing; one injured.

Four accidents; four injured.

BURLINGTON-ISLAND RAILROAD:

September 13, 1946, locomotive (F. W. & D. C.) 503, near Grimes, Tex. Cylinder head casing stud broke through old fractures, permitting the casing to be thrown from the rapidly moving locomotive and strike a track employee; one injured.

October 19, 1946, locomotive (C. R. I. & P.) 835, Houston, Tex. Cab saddle-bracket stud blew out of boiler; stud had been applied cross-threaded and threads were badly stripped; two of the four cab saddle-bracket studs were broken and nuts on the remaining stud were loose; cab saddle bracket was very loose on boiler and front cab sheet; right side of cab had been reported loose on bracket numerous times in the 30 days preceding the accident; one injured.

Two accidents; two injured.

CENTRAL OF GEORGIA RAILWAY:

June 1, 1947, locomotive 773, Bolingbroke, Ga. Crown-sheet failure caused by overheating due to low water; two killed.

One accident; two killed.

CENTRAL RAILROAD OF NEW JERSEY:

February 14, 1947, locomotive 872, Jersey City, N. J. Broken radial stay blew out of firebox sheet when attempt was made to stop leak at the stay while boiler was under pressure; threads on stay and in firebox sheet were badly deteriorated; one injured.

One accident; one injured.

CHARLESTON & WESTERN CAROLINA RAILWAY:

January 27, 1947, locomotive 818, near Beldoc, S. C. Injector steam pipe broke off through sleeve of collar at turret valve connection; right injector was found to have been loose on bracket; one injured.

One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

February 6, 1947, locomotive 3014, Harpster, Ohio. Main crankpin broke through old fracture at fillet between main and side rod bearings; one injured.

One accident; one injured.

CHICAGO & EASTERN ILLINOIS RAILROAD:

**July 4, 1946, locomotive 1957, Villa Grove, Ill. Rail of ladder on tender between top of tank and coal space slope sheet broke; rail had previously been bent and fractured; one injured.

One accident; one injured.

CHICAGO & NORTH WESTERN RAILWAY:

July 19, 1946, locomotive 383, Omaha, Nebr. Grease fitting in boss of eccentric rod was loose; bushing had not been properly tightened in the rod boss and had further loosened en route; one injured.

July 23, 1946, locomotive 2502, Dunlap, Iowa. Employee was burned while attempting to close steam valve to stoker jet manifold; steam pipes to blower, stoker engine, and stoker jet manifold were exposed in the vicinity of the left main steam fountain in the cab; "Master valve to firing jets will not shut off tight" was reported on July 19 and 22; one injured.

August 24, 1946, locomotive 1705, South Omaha, Nebr. Oil on top of tender fuel oil tank; one injured.

October 26, 1946, locomotive 1098, Chicago, Ill. Reverse lever was hard to operate, due to valve gear not being properly balanced; one injured.

December 23, 1946, locomotive 1098, Barrington, Ill. Reverse lever was hard to operate, due to valve gear not being properly balanced; one injured.

June 17, 1947, locomotive 2534, near Blencoe, Iowa. Crown-sheet failure caused by overheating due to low water; two killed, one injured.

June 29, 1947, locomotive 1140, near Quinn, S. Dak. Squirt hose valve stuck open; one injured.

Seven accidents; two killed, seven injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

November 20, 1946, locomotive 6152, Arvada, Wyo. Water spout hook broke through old fracture at a weld near the middle of the rod; one injured.

**February 6, 1947, locomotive 5622, New London, Iowa. Union in feed water pump exhaust steam pipe was loose and leaking; one injured.

Two accidents; two injured.

CHICAGO GREAT WESTERN RAILWAY:

October 14, 1946, locomotive 474, Minneapolis, Minn. Lost motion in grate-shaker rigging permitted loop of shaker-bar handle to contact oil plug in fire-door cylinder; one injured.

January 1, 1947, locomotive 857, St. Joseph, Mo. Employee stepped into manhole of tender water tank; locomotive placed in service with the central section of manhole cover in open position; one injured.

January 18, 1947, locomotive 450, Sycamore, Ill. Asbestos wrapping on injector steam pipe loosened, leaving the pipe exposed; one injured.

Three accidents; three injured.

CHICAGO, INDIANAPOLIS & LOUISVILLE RAILWAY:

October 27, 1946, locomotive 443, Lafayette, Ind. Piston rod pulled from crosshead and knocked out front cylinder head; piston rod key was missing; piston rod did not have proper fit in crosshead when applied; one injured.

**November 27, 1946, locomotive 576, Yokey, Ind. Handle pulled from extension rod to right blow-off cock, due to badly worn threads; "Put handle on blow-off cock rod, right side" was reported on November 25; one injured.

**February 4, 1947, locomotive 229, Michigan City, Ind. Classification lamp cage was stuck in closed position, due to a thick coating of paint between the base of lamp and hinged cage; one injured.

Three accidents; three injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

November 12, 1946, locomotive 468, Hartford, Wis. Grate-shaker bar broke through forge weld; one injured.

January 13, 1947, locomotive 251, Spokane, Wash. Insufficient clearance between gangway handhold and tender step when on curve; one injured.

**January 24, 1947, locomotive 577, Hartland, Wis. Nut worked off bolt which secured injector telltale pipe; one injured.

Three accidents; three injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

*July 25, 1946, locomotive 4045, Scott, Mo. Derailment caused by failure of tender truck spring; two injured.

**August 2, 1946, locomotive 276, Englewood, Ill. Squirt hose valve opened unexpectedly; one injured.

August 13, 1946, locomotive 281, Kansas City, Kans. Employee stepped on carbon slicing bar which was carried on runway on top of tender water leg; one injured.

**October 5, 1946, locomotive 1741, Des Moines, Iowa. Hole worn in squirt hose; one injured.

November 15, 1946, locomotive 5106, Optima, Okla. Blow-off cock stuck open, then released suddenly when forced; blow-off cock operating lever, which was loose on fulcrum, fouled on union in cab radiator steam supply, preventing the cock from closing properly; close clearance around the grip of blow-off cock operating lever; one injured.

**December 18, 1946, locomotive 255, North Little Rock, Ark. Air bell ringer was inoperative; intake port was partially stopped up with scale; bell yoke holes were out of alignment and yoke pins and bushings were cut, due to insufficient lubrication; "Adjust bell ringer" was reported on November 19, 22, 26, 29, and 30, and December 1, 6, 9, and 18; one injured.

**January 25, 1947, locomotive 1715, Hartshorne, Okla. Rear uncoupling lever shaft broke through weld at lock lifter arm connection; one injured.

February 19, 1947, locomotive 2613, Enid, Okla. Bell was inoperative, due to bell cord being wound around bell crank; one injured.

**March 11, 1947, locomotive 1981, Cedar Rapids, Iowa. Employee stumbled on a board which was lying on running board and fell to the ground; one injured.

May 30, 1947, locomotive 2314, Bridgeport, Tex. Tender sill step was broken; one injured.

Ten accidents; 11 injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

*December 30, 1946, locomotive 386, Spooner, Wis. Steam leak in steam-heat pipe to reducing valve; one injured.

One accident; one injured.

CLINCHFIELD RAILROAD:

**March 3, 1947, locomotive 651, Spartanburg, S. C. Superheater flue failed at safe end weld; one injured.

One accident; one injured.

COLUMBUS & GREENVILLE RAILWAY:

**December 15, 1946, locomotive 405, Eupora, Miss. Rail washer pipe was bent and not in line with the rail; one injured.

One accident; one injured.

CRAIG MOUNTAIN LUMBER COMPANY:

July 24, 1946, locomotive 2, near Winchester, Idaho. Crown-sheet failure caused by overheating due to low water; water glass was dark at lower end, due to worn reflexes, giving the appearance of water in the glass at all times; water glass was so turned that normal vision of it was to be had from the left side of the cab only and the mirror provided to allow vision from the right side was cracked and scuffed and part of it was missing; fusible plug in crown sheet did not function fully, due to having been filled with lead instead of tin; right feed water pipe was obstructed by fine coal; lowest reading of water glass was only approximately 1.56 inches above the highest part of crown sheet; two injured.

One accident; two injured.

DELAWARE & HUDSON RAILROAD:

**July 1, 1946, locomotive 923, Wilkes-Barre, Pa. Inspirator overflow valve was hard to open; threads on valve stem and in bonnet were worn, causing valve to stick when closed; one injured.

March 18, 1947, locomotive 1530, Ararat, Pa. Reflex type water glass burst; one injured.

June 18, 1947, locomotive 164, Carbondale, Pa. Hinged cab drop seat fell from upright position; no provision made for holding bottom end of seat supporting rod in proper place while seat was raised; one injured.

Three accidents; three injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

**July 18, 1946, locomotive 1618, Scranton, Pa. Cab deck plate was worn smooth over an area of approximately one square foot; one injured.

**December 28, 1946, locomotive 1253, Marathon, N. Y. Tender deck was 2 inches lower than locomotive deck; one injured.
Two accidents; two injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

November 6, 1946, locomotive 1016, Garfield, Utah. Injector was inoperative from the cab, due to the universal joint in extension handle to injector water valve fouling on its own parts; one injured.

November 24, 1946, locomotive 1550, Helper, Utah. Eccentric rod broke; one injured.

November 29, 1946, locomotive 3713, Spring Glen, Utah. Coal pusher operating valve head blew out; cap screws for securing the valve head were of insufficient length and threads were worn and stripped; one injured.
Three accidents; three injured.

DETROIT, CARO & SANDUSKY RAILWAY:

March 3, 1947, locomotive 31, Snover, Mich. Crown sheet failure caused by overheating due to low water; one injured.
One accident; one injured.

ERIE RAILROAD:

January 4, 1947, locomotive 2914, Cuba, N. Y. Grate-shaker bar slipped off post, apparently due to oil on the post; oil on the deck, under shaker post covers, and on top of shaker post castings; one injured.

January 20, 1947, locomotive 237, Calumet City, Ill. Rear headlight failed; one injured.

February 7, 1947, locomotive 2922, Huntington, Ind. Ice on tender sill steps and gangway handhold caused by discharge from cab heater drain; one injured.

February 17, 1947, locomotive 2724, Secaucus, N. J. Water crane hook slipped off handle of water spout; hook did not conform to company's standard; one injured.

Four accidents; four injured.

FLORIDA EAST COAST RAILWAY:

January 27, 1947, locomotive 431, Miami, Fla. Eccentric rod broke through old fracture which extended through approximately 50 percent of cross-sectional area; one injured.

March 7, 1947, locomotive 439, Jacksonville, Fla. Cap blew off train steam heat pressure regulating valve; cap was loose due to badly worn threads; one injured.

**March 30, 1947, locomotive 435, near Miami, Fla. Defective sand pipe; one injured.

**April 26, 1947, locomotive 269, Buena Vista, Fla. Engineer injured while making repairs to air pipe from main reservoir pump governor; one injured.

Four accidents; four injured.

GEORGIA & FLORIDA RAILROAD:

November 18, 1946, locomotive 503, Willacoochee, Ga. Bonnet of injector steam ram blew out, due to badly worn threads in injector body; one injured.

One accident; one injured.

GRAND TRUNK WESTERN RAILROAD:

**August 19, 1946, locomotive 8375, Detroit, Mich. Water glass burst and glass panel of water-glass shield shattered; one injured.

**April 9, 1947, locomotive 3515, Detroit, Mich. Part of nonskid surface of cab apron was worn smooth; one injured.

Two accidents; two injured.

GREAT NORTHERN RAILWAY:

*July 5, 1946, locomotive 1202, Allouez, Wis. Employee's hand was cut on broken glass in water-jug container on tender; pieces of a broken glass water jug had not been removed from the container; one injured.

*July 19, 1946, locomotive 1361, Stanwood, Wash. Valve stem broke; one injured.

*September 21, 1946, locomotive 2021, Allouez, Wis. Blow-off cock stuck open; one injured.

November 8, 1946, locomotive 2049, Seattle, Wash. Sander did not operate properly; "Clean out sanders" was reported on November 6 and 9; one injured.

January 9, 1947, locomotive 2581, near Crary, N. Dak. Crown-sheet failure caused by overheating due to low water; three killed.

**March 2, 1947, locomotive 849, Superior, Wis. Boiler check stuck open; one injured.

Six accidents; three killed, five injured.

GULF COAST LINES:

**January 8, 1947, locomotive (S. B. & R. G. V.) 953, Bishop, Tex. Reverse lever stop on front end of quadrant was not in proper position, allowing handle of reverse lever to strike bottom gage cock handle; one injured.

February 15, 1947, locomotive (I.-G. N.) 231, Weslaco, Tex. Crown-sheet failure caused by overheating due to low water; one injured.

May 16, 1947, locomotive (N. O. T. & M.) 1036, Houston, Tex. Grease on locomotive deck; one injured.

June 11, 1947, locomotive (H. & B. V.) 310, Edinburg, Tex. Horizontal hand-rail on rear of tender broke through old fracture in the bend at left end; one injured.

Four accidents; four injured.

GULF, COLORADO & SANTA FE RAILWAY:

July 29, 1946, locomotive (A. T. & S. F.) 1352, near Brownwood, Tex. Squirt-hose valve worked open, due to insufficient packing; one injured.

September 9, 1946, locomotive (A. T. & S. F.) 1291, Lometa, Tex. Oil on top of tender fuel oil tank; one injured.

May 19, 1947, locomotive (A. T. & S. F.) 1917, San Augustine, Tex. Cylinder cock stuck open; one injured.

Three accidents; three injured.

HARBOR BELT LINE RAILROAD:

**August 10, 1946, locomotive (A. T. & S. F.) 9066, Wilmington, Calif. Water gage bottom cock could not be closed fully, due to being fouled by a piece of broken water glass; one injured.

One accident; one injured.

HOUSTON BELT & TERMINAL RAILWAY:

February 2, 1947, locomotive 1, Houston, Tex. Deck sand box cover fell from open position, due to the cover and latch being defective; one injured.

One accident; one injured.

ILLINOIS CENTRAL RAILROAD:

**October 26, 1946, locomotive 2810, near Eleroy, Ill. Handle of coal shovel broke while being used to loosen a metal obstruction in the crushing zone of stoker conveyor and a splinter of wood from the broken handle struck and deeply cut employee's eyeball; handle was of defective material and had been burned at the point of failure; one injured.

December 7, 1946, locomotive 1273, Chicago, Ill. Plug blew out of blow-off cock muffler line; threads in tee in muffler line were badly worn; one injured.

Two accidents; two injured.

INDIANA HARBOR BELT RAILROAD:

**December 23, 1946, locomotive (N. Y. C.) 1456, Argo, Ill. Grates dropped into ashpans while being shaken; grates were badly damaged by fire; one injured.

**May 20, 1947, locomotive 338, Gibson, Ind. Injector overflow valve stuck in closed position; one injured.

Two accidents; two injured.

INDIANAPOLIS UNION RAILWAY:

March 13, 1947, locomotive 8, Indianapolis, Ind. Bolt broke or lost out of cylinder cock slide rod and union link connection; one injured.

One accident; one injured.

KANSAS CITY SOUTHERN RAILWAY:

**August 19, 1946, locomotive 553, Neosho, Mo. Squirt hose burst; one injured.

*October 15, 1946, locomotive 766, Anderson, Mo. Lid fell from water cooler; one injured.

*October 18, 1946, locomotive 751, Poteau, Okla. Lubricator oil pipe union was leaking; one injured.

Three accidents; three injured.

LEHIGH & HUDSON RIVER RAILWAY:

**July 8, 1946, locomotive 93, Great Meadows, N. J. Blow-off cock valve stuck open, due to a steel chip being wedged between valve and seat; one injured.

June 25, 1947, locomotive 10, Phillipsburg, N. J. Bell ringer was inoperative; one injured.

Two accidents; two injured.

LEHIGH VALLEY RAILROAD:

August 5, 1946, locomotive 3205, South Plainfield, N. J. Fire hose burst; hose deteriorated; one injured.

*December 16, 1946, locomotive 289, Ashmore, Pa. Injector extension handle became disconnected; one injured.

June 6, 1947, locomotive 323, Manchester, N. Y. Throttle lever became disengaged from quadrant; quadrant teeth were worn and slots clogged with dirt; throttle reported not latching properly on May 6, 10, 13, 22, and 24; one injured.

June 17, 1947, locomotive 317, Suspension Bridge, N. Y. Cab seat fell while being lowered due to hinge bolt working out of joint where seat was attached to cab wall; "Put nut on bolt in back of seat left side" was reported on June 16; one injured.

Four accidents; four injured.

LOUISIANA & ARKANSAS RAILWAY:

May 8, 1947, locomotive 490, Spring Hill, La. Cab seat hanger bracket had to be lifted to pass the heads of slide rail supporting bolts and in adjusting seat the hanger bracket disengaged from slide rail and seat fell; one injured.

One accident; one injured.

LOUISVILLE & NASHVILLE RAILROAD:

November 13, 1946, locomotive 1233, Fort Deposit, Ala. Automatic blow-off system was inoperative, due to pipe nipple being broken off; one injured.

November 18, 1946, locomotive 1333, Cartersville, Ga. Handrail became disconnected from cab; bolt for securing handrail to cab was not properly tightened after repairs to handrail; one injured.

December 12, 1946, locomotive 2068, Howell, Ind. Throttle lever was difficult to operate; throttle lever quadrant was improperly located with regard to radius from fulcrum pin hole; throttle reported hard to handle on October 13, 20, and 24, and November 1, 5, and 30; one injured.

December 18, 1946, locomotive 1300, Bowling Green, Ky. Drop seat in cab fell, due to seat support being fouled by screen over cab radiator; screen had been battered and distorted in attempt to provide clearance between screen and cab wall to permit the seat to be moved forward; one injured.

January 27, 1947, locomotive 932, near Cowan, Ky. Crown sheet failure caused by overheating due to low water; one injured.

January 30, 1947, locomotive 32, near Calvary, Ky. Crown sheet failure caused by overheating due to low water; five injured.

April 10, 1947, locomotive 87, Kona, Ky. Defective glass pane in cab window; one injured.

Seven accidents; 11 injured.

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

August 10, 1946, locomotive 487, Lake Emily, Wis. Air compressor stopped; one injured.

**August 27, 1946, locomotive 2711, New Richmond, Wis. Grate-shaker fulcrum lever lock fell into locked position while the grates were being shaken; fire door pedal arm was so located that it interfered with the movement of the fulcrum lever lock when in unlocked position and caused it to fall into locked position; one injured.

Two accidents; two injured.

MISSOURI-KANSAS-TEXAS RAILROAD:

December 2, 1946, locomotive 766, Gainesville, Tex. Carbon deposit on floor of fire pan; one injured.

January 1, 1947, locomotive 559, Mangum, Okla. Carbon deposit on floor of fire pan; one injured.

February 15, 1947, locomotive 70, Denison, Tex. Water glass burst; one injured.

February 24, 1947, locomotive 399, Clinton, Mo. Throttle lever moved unexpectedly to back end of quadrant; throttle-lever latch did not properly hold the lever when throttle was partially open; one injured.

March 15, 1947, locomotive 399, near Boonville, Mo. Shattered glass from broken clear vision window struck and injured employee's eye; one injured.

March 16, 1947, locomotive 917, Choteau, Okla. Crown-sheet failure caused by overheating due to low water; two injured.

Six accidents; seven injured.

MISSOURI-PACIFIC RAILROAD:

**July 29, 1946, locomotive 2638, near Spencer, La. Cab drop seat hinge broke through two unused bolt holes; area of this section of the hinge was reduced by five bolt holes, only two of which were being used; one injured.

**August 31, 1946, locomotive 1434, Pueblo, Colo. Handhold pulled out of platform around manhole of auxiliary water car; wooden platform was badly deteriorated at handhold connection; one injured.

**October 18, 1946, locomotive 458, Malvern, Ark. Top strap of hinge used for cab window stop was broken and the portion attached to the hinge was bent and projected 1/4 inches from the window guide; one injured.

**December 29, 1946, locomotive 1502, Carthage, Mo. Coal on top of tender behind fuel space; "Shovel coal off back of tender" was reported at end of the previous trip; one injured.

April 13, 1947, locomotive 9531, Lake Charles, La. Employee slipped when stepping from the bottom step on sloping sheet of tender to the rear-end handrail and fell into inspection pit; carrier's prescribed step was missing from the rear face of tender between the bottom step on sloping sheet and the rear-end handrail; one injured.

Five accidents; five injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

October 22, 1946, locomotive 405, Bruceton, Tenn. Live brake lever on tender truck broke through fulcrum-pin hole; old fracture extended through approximately 50 percent of cross-sectional area at the point of failure; one injured.

February 19, 1947, locomotive 424, Nashville, Tenn. Throttle was very hard to open and latch would not hold it in open position; pin holes in throttle valve stem gave throttle rigging incorrect leverage; one injured.

Two accidents; two injured.

NEW YORK CENTRAL SYSTEM:

July 5, 1946, locomotive 1339, Palmyra, N. Y. Electric cable between locomotive and tender was pulled from socket and there was no light on the rear of tender; one injured.

**August 12, 1946, locomotive 4856, La Porte, Ind. Throttle was difficult to operate; throttle was reported working hard on August 12, 13, 14, and 15; one injured.

August 27, 1946, locomotive 4634, Grand Rapids, Mich. Handwheel of Precision reverse gear spun rapidly out of control and the handle on the wheel struck and broke employee's wrist; counterbalance spring was approximately 4 inches out of adjustment, permitting the counterbalance spring washer or spacer to fall out of position in the case, resulting in excessive wear on the counterbalance spring rod which finally broke and fouled the reverse gear and when pressure within the reverse gear cylinder built up so as to bend the remaining part of the rod, the gear freed itself permitting the handwheel to spin; one injured.

August 30, 1946, locomotive 5406, Elkhart, Ind. Flue failed at defective safe end weld; one injured.

**September 24, 1946, locomotive (B. & A.) 1201, Middlefield, Mass. Blow-back from firebox when firebox door was opened; one injured.

**October 8, 1946, locomotives 7588 and 7865, Jackson, Mich. Excessive steam leaks in cab of locomotive 7588 and throttle of locomotive 7865 worked

hard account of boiler foaming and carrying sludge into throttle valve and rigging; one injured.

November 6, 1946, locomotive 3062, Dewitt, N. Y. Left blower valve was difficult to close; "Left blower doesn't shut off tight" was reported on October 23; one injured.

December 25, 1946, locomotive 2916, near Shelbyville, Ill. Cast-iron front-end steam pipe burst; steam pipe wall at point of failure was less than the carrier's minimum prescribed thickness, apparently due to shifted or misplaced core when cast; there were 10 plugged test holes in the pipe wall, 5 were in the broken-out section and 3 of which were in the area of minimum thickness; one injured.

**January 7, 1947, locomotive 7811, Toledo, Ohio. Throttle opened unexpectedly, due to failure of throttle lever to latch properly; throttle lever latch handle pin and fulcrum pin were worn excessively and latch spring was weak; one injured.

January 18, 1947, locomotive 2081, River Rouge, Mich. Throttle lever was fouled by the actuating lever of automatic boiler-water blow-down device, preventing proper operation of the throttle; one injured.

February 1, 1947, locomotive 2039, Mackinaw City, Mich. Handwheel of Precision reverse gear spun violently, jerking the handle on the handwheel from employee's grasp, and the handle on the revolving wheel struck employee's hand and arm; one injured.

February 3, 1947, locomotive 2394, North Toledo Yards, Ohio. Defective squirt hose; one injured.

February 12, 1947, locomotive 2142, East St. Louis, Ill. Feed water pump became steambound, due to leaky boiler check; one injured.

**February 26, 1947, locomotive 2290, Columbus, Ohio. Sand pipe was stopped up; one injured.

**March 3, 1947, locomotive 2770, Allison, Ind. Packing nut of main stoker jet valve was leaking; edges of hexagonal packing nut were badly worn, causing wrench to slip off the nut when attempt was made to tighten it; one injured.

April 24, 1947, locomotive 2795, Schenectady, N. Y. Grate-shaker bar slipped off shaker post; shaker-bar socket was worn; one injured.

**May 6, 1947, locomotive 5282, Boston, Mass. Safety chain was 5/8 inches longer than carrier's standard; one injured.

May 8, 1947, locomotive 2084, Augusta, Mich. Throttle valve stuck open; one injured.

May 9, 1947, locomotive 3115, near Savannah, N. Y. Defective filling hole cover on tender cistern permitted cistern to overflow with force while locomotive was scooping water from track pan; rectangular cover was bent upward 2 inches at center and locking bar had 1-inch lost motion at foot latch; cover was not company's standard; one injured.

June 20, 1947, locomotive 7843, Detroit, Mich. Insufficient clearance between tender deck and gangway handhold when on sharp curve; one injured.

June 20, 1947, locomotive 4730, Poughkeepsie, N. Y. A wooden plug having jagged edges projected from hole in front corner of tender water tank near handhold; the hole in tank and plug were not the carrier's standard; one injured.

Twenty-one accidents; 21 injured.

NEW YORK, CHICAGO & ST. LOUIS RAILROAD:

**July 4, 1946, locomotive 64, Cleveland, Ohio. Cab window glass was broken; one injured.

June 4, 1947, locomotive 152, Frankfort, Ind. Collision, caused by failure of locomotive brakes; application cylinder pipe was broken at connection to distributing valve; one injured.

Two accidents; two injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

*July 12, 1946, locomotive (B. & M.) 643, South Worcester, Mass. Extension handle to top steam valve to inspirator was disconnected; one injured.

*November 28, 1946, locomotive 3000, Canaan, Conn. Insufficient clearance between cab handhold and tender deck when on sharp curve; one injured.

December 28, 1946, locomotive 393, Waterbury, Conn. Back head knuckle cracked for a distance of approximately 10 inches; one staybolt in wrapper sheet near the crack was broken; one injured.

February 8, 1947, locomotive 2353, East Hartford, Conn. Drop seat in cab fell, due to the supporting rod connection to bottom of the seat being loose; two

screws were missing from the supporting rod hinge connection and the other two screws were very loose; one injured.

April 2, 1947, locomotive 3327, Medfield Junction, Mass. Stoker was inoperative due to movement of conveyor being obstructed by a hardwood board which was in the conveyor trough; while attempting to reverse the stoker engine, the operating rod to reversing valve broke, then the conveyor reverse lever was used and it broke, resulting in injury to an employee; old flaw in stoker reverse lever casting; one injured.

June 11, 1947, locomotive 3604, Hartford, Conn. Roughened tread of tender step was badly worn; one injured.

Six accidents; six injured.

NORFOLK & PORTSMOUTH BELT LINE RAILROAD:

**May 7, 1947, locomotive 26, Norfolk, Va. Glass in front cab door was broken; door which was binding in the frame was sprung when opened, causing the glass to break; one injured.

One accident; one injured.

NORFOLK & WESTERN RAILWAY:

June 29, 1947, locomotive 2132, Riverside, Va. Grate shaker lever broke through fusion weld; one injured.

One accident; one injured.

NORFOLK SOUTHERN RAILWAY:

January 28, 1947, locomotive 217, Boushell, N. C. Injector steam pipe collar broke at turret valve connection; collar was not properly brazed to steam pipe; two injured.

One accident; two injured.

NORTHERN PACIFIC RAILWAY:

July 11, 1946, locomotive 5138, Parkwater, Wash. Squirt hose burst; hose had previously been damaged; one injured.

August 24, 1946, locomotive 1264, Pasco, Wash. Ashpan slides hard to open when under load; one injured.

**December 14, 1946, locomotive 1902, Hanson, Wash. Bottom end of squirt-hose storage pipe was stopped up with coal, causing hot water to be forced out of the pipe when inspirator was applied while squirt-hose valve was open; one injured.

February 6, 1947, locomotive 1265, Auburn, Wash. Water glass broke and glass panel blew out of water-glass shield; one injured.

**May 2, 1947, locomotive 1120, Brainerd, Minn. Water glass burst; one injured.

Five accidents; five injured.

NORTHWESTERN PACIFIC RAILROAD:

September 24, 1946, locomotive 182, Willits, Calif. Blow-off cock stuck open; blow-off cock operating lever not provided with a stop to prevent it from going past center and fouling; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

July 3, 1946, locomotive 6563, Baltimore, Md. Throttle lever was hard to operate; lever was not properly lined up in fulcrum arm clevis and throttle stem clevis; fulcrum pin at back head connection was binding; fulcrum block was loose on back head; throttle reported on June 7, 11, 18, 19, 21, 22, and 30, and July 1; one injured.

**July 13, 1946, locomotive 2033, Port Allegany, Pa. Fire door was defective; one injured.

**July 13, 1946, locomotive 5360, Plymouth, Ind. Clamp of air hose at rear of tender broke, permitting the coupling to pull from the hose and cause emergency application of the train brakes; four injured.

July 21, 1946, locomotive 7133, Philadelphia, Pa. Train line air hose burst at rear of tender, causing emergency application of the brakes; two injured.

**August 6, 1946, locomotive 5370, Wanatah, Ind. Air hose at rear of tender failed, resulting in undesired emergency application of the train brakes; one injured.

August 19, 1946, locomotive 247, Sergeant, Pa. Cab bracket stud blew out of firebox sheet; threads on stud were stripped; the other stud in this bracket was broken and bore evidence of leakage; one injured.

**August 25, 1946, locomotive 3645, Kiskiminetas Junction, Pa. Grate shaker reach rod became disconnected from shaker post due to the pin which secured it to post having worked out; one injured.

**August 28, 1946, locomotive 3879, Chicago, Ill. Employee's leg struck guide for fire-door pedal while he was putting in a fire; guide was too long and was bent rearward from vertical position, the top of guide extending rearward beyond the pedal tread; one injured.

September 9, 1946, locomotive 3227, Pittsburgh, Pa. Air compressor failed; one compressor reversing valve piston ring was broken and stuck in the groove and other rings were worn and weak; one injured.

**September 10, 1946, locomotive 1746, Burgettstown, Pa. Main throttle valve was hard to operate, due to excessive wear and lost motion in the preliminary valve stem; throttle was reported on August 31 (two times), and September 4, 11 (two times), and 14; one injured.

September 20, 1946, locomotive 3021, Benwood, W. Va. Ledge of wooden platform on side of cab broke off when employee stepped on it, due to the floor board being decayed; one injured.

October 8, 1946, locomotive 4260, Etna, Pa. Stoker steam gage front tube burst, blowing the gage case ring, dial, hands, and glass assembly off; tube and cap were badly eroded; one injured.

**November 1, 1946, locomotive 3710, Derry, Pa. Double-heading cock was hard to operate due to being dirty and dry; one injured.

November 15, 1946, locomotive 3899, Canton, Ohio. Air compressor receiving valve cap worked loose and cap and receiving valve fell off; one injured.

*November 16, 1946, locomotive 3445, Spangler, Pa. Safety chain on top of tender coal gate broke, permitting safety bar to fall and strike employee; one injured.

November 19, 1946, locomotive 677, Philadelphia, Pa. Wing nut to the eye bolt for securing smoke box spark arrester cap in position was missing, and the wire used as a substitute for this nut broke and released the arrester; arrangement provided for securing the spark arrester required the removal and restoration of the nut each time the position of the arrester was changed; one injured.

November 26, 1946, locomotive 4241, Canton, Ohio. Coal divider plate was missing from stoker transfer hopper; one injured.

November 29, 1946, locomotive 6971, Pittsburgh, Pa. Throttle was hard to operate due to excessive compression of throttle stem packing and lack of lubrication; excessive packing had been applied in attempt to stop leakage around throttle stem; throttle packing was reported leaking 11 times since November 1; one injured.

**November 29, 1946, locomotive 4397, East Pittsburgh, Pa. Throttle was hard to operate; a worn ring on throttle balancing piston caused the throttle to be out of balance; one injured.

*December 4, 1946, locomotive 6447, Hagenbaugh, Ohio. Tender brake shoe was binding; one injured.

**December 13, 1946, locomotive 4483, North Bend, Pa. Grate-shaker bar slipped off post; shaker-bar fit was partially stopped up with coal and other foreign substances; one injured.

*December 16, 1946, locomotive 6920, Wellsville, Ohio. Coupler pulled from front end of locomotive; one injured.

**December 23, 1946, locomotive 113, Pittsburgh, Pa. Drop seat in cab collapsed; wing nut used to secure the seat to supporting rod was badly rusted and could not be properly tightened; rod supporting back edge of seat was bent; one injured.

December 26, 1946, locomotive 4376, Burgettstown, Pa. Chain missing from coal gate; coal gate chains reported missing on December 8, 10, 23, 26, and 27; one injured.

**January 3, 1947, locomotive 3858, near Bailey, Pa. Main crankpin broke through old fractures which extended through approximately 80 percent of cross-sectional area; fractures appeared to have started from tool marks in fillet and were aggravated by the continued pounding of driving boxes and rods and other defects which caused the locomotive to ride rough; these defects had been reported many times in the 60 days preceding the accident; one injured.

January 5, 1947, locomotive 6925, Akron, Ohio. Grate-shaker reach rod became disconnected from grate connecting rod due to connection pin coming out; cotter pin missing from connection pin; one injured.

**January 6, 1947, locomotive 4280, Red Bank, Pa. Insufficient clearance between grate-shaker bar and fire-door operating lever, caused by shaker bar being bent and having excessive lateral motion due to shaker post fulcrum pin hole being worn; one injured.

January 8, 1947, locomotive 9018, Wheatland, Pa. Employee slipped on cab apron and fell to the ground; cab apron was badly worn and oil had been spilled on cab deck and apron; one injured.

January 9, 1947, locomotive 5349, Johnstown, Pa. Grate-shaker bar slipped off post; shaker-bar socket was badly burred; one injured.

January 14, 1947, locomotive 7030, Cleveland, Ohio. Shaker bar slipped off dump grate fulcrum lever; shaker bar was worn, resulting in poor fit on lever; one injured.

February 3, 1947, locomotive 6939, near Blairsville, Pa. Insufficient clearance between handwheels of injector regulating and overflow valves; handwheels were not spaced in accordance with the carrier's specifications; one injured.

February 6, 1947, locomotive 6151, Cresson, Pa. Pin lost out of front end of ashpan door connector, permitting end of connector to drop to roadbed; one injured.

February 19, 1947, locomotive 6737, near Mingo Junction, Ohio. Pin lost out of rear end of reach rod to ashpan doors, allowing rod to drop and drag on roadbed; one injured.

**March 8, 1947, locomotive 6997, near Schererville, Ind. Side rod broke through progressive fracture which extended through approximately 50 percent of cross-sectional area of rod; rods and/or boxes reported pounding 13 times since February 1; one killed.

March 15, 1947, locomotive 6424, between Scio and Cadiz, Ohio. Locomotive slipping due to sanders being inoperative; employee's wrist was injured due to continuous operation of the throttle account of locomotive slipping; throttle was hard to operate; sanders reported repeatedly during the 30 days preceding accident; one injured.

March 16, 1947, locomotive 4319, near Conemaugh, Pa. Flue failed at front flue sheet, due to thickness having been reduced by grooving; one injured.

March 19, 1947, locomotive 4638, Shire Oaks, Pa. Flue broke off at front flue sheet due to having been excessively grooved; flue was badly pitted its entire length; one injured.

**March 24, 1947, locomotive 5392, near Massillon, Ohio. Crosshead wrist pin lost out; crosshead pin nuts loose and crosshead pin grease plunger loose or missing had been reported numerous times in the 30 days preceding the accident; one injured.

April 21, 1947, locomotive 474, Phillipsburg, N. J. Reflex type water glass burst; one injured.

April 21, 1947, locomotive 1733, Williamsport, Pa. Defective cab seat cushion; one injured.

April 28, 1947, locomotive 5533, Warsaw, Ind. Engine truck spring hanger broke and the spring dropped to the track and became wedged at a crossover rail, resulting in derailment of the tender and all cars of the passenger train; 74 injured.

**May 2, 1947, locomotive 6438, Conesville, Ohio. A protruding arm rest hinge in cab caused injury to employee; arm rest hinges were not applied in conformity with carrier's standard; one injured.

May 3, 1947, locomotive 1478, Scottsville, N. Y. Injector overflow valve stuck in closed position, due to having been overheated; starting valve leaking and threads on overflow valve stem and bonnet were worn; one injured.

May 3, 1947, locomotive 3653, Wilkes-Barre, Pa. Main air reservoir exploded due to thickness of plate having been reduced by pitting and corrosion; one injured.

May 7, 1947, locomotive 7927, near Star City, Ind. Crown sheet failure caused by overheating due to low water; two injured.

May 15, 1947, locomotive 8803, Columbus, Ohio. Rear of cab apron raised violently; right side of tender deck was 2 $\frac{3}{8}$ inches higher than the left side and the height of tender deck exceeded the height of locomotive deck more than the maximum prescribed limit; one injured.

May 24, 1947, locomotive 6419, Gallitzin, Pa. Main throttle lever latch link top bolt worked out; two injured.

May 24, 1947, locomotive 5535, Chicago, Ill. Injector was hard to operate; starting and water valve stem packing nuts were too tight; one injured.

May 24, 1947, locomotive 9894, Fairmont, Ill. Lubricator filling hole bushing broke while plug was being tightened; bushing was not of carrier's standard material; one injured.

**June 1, 1947, locomotive 8608, place not shown. Drawbar pin cover plate was missing; one injured.

June 9, 1947, locomotive 6496, Straughn, Ind. Blower valve operating arm was loose on valve stem; one injured.

June 17, 1947, locomotive 3853, Gallitzin, Pa. Grate-shaker bar slipped off post; shaker-bar socket was filled with packed fine coal to a depth of 3 inches, preventing the socket from having proper fit on post; one injured.

June 17, 1947, locomotive 6177, Lucas, Ohio. Squirt-hose valve worked open; one injured.

**June 27, 1947, locomotive 6866, Howard, Pa. Throttle lever suddenly jerked to closed position while being moved; "Throttle leaking" was reported on June 14 and 22; one injured.

Fifty-four accidents; 1 killed, 132 injured.

PENNSYLVANIA-READING SEASHORE LINES:

September 2, 1946, locomotive (P. R. R.) 2445, Ancora, N. J. Defective air compressor stopped; while employee was attempting emergency repairs from the ground, he was struck by the locomotive of a passing train; air compressor was reported 20 times in the 30 days immediately preceding the accident; one killed. One accident; one killed.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

**September 2, 1946, locomotive 606, near WH Tower, Va. Brazing which secured collar to water-glass steam pipe broke, permitting steam and hot water to escape; one injured.

**December 18, 1946, locomotive 261, Milford, Va. Coal on top of tender water tank; one injured.

**January 23, 1947, locomotive 613, Long Bridge, Va.-D. C. Employee slipped on deck of locomotive; one injured.

Three accidents; three injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

October 28, 1946, locomotive 4122, Catoosa, Okla. Employee was burned by hot water discharged from train steam-heat pipe at rear of tender; valve in heat pipe was leaking, due to being steam cut, and a bend in the steam pipe under tender formed a trap in which the condensation accumulated until forced out by the pressure caused by the leaking valve; one injured.

**November 22, 1946, locomotive 1508, Monett, Mo. Main train steam-heat valve did not close properly, account of defective valve seat; one injured.

November 28, 1946, locomotive 4408, Cuba, Mo. Whistle was inoperative, due to nut working off the stud which held whistle bowl to the base and permitting whistle bowl to move away from the base; whistle was reported on October 29 and November 3, 5, 6, 17, 25, and 27; one injured.

December 19, 1946, locomotive 987, Tulsa, Okla. Pilot coupler pocket bolts broke, permitting the pocket and coupler to drop to the footboard on which employee was riding; excessive lost motion between coupler pivot pin and bushings in coupler pocket and shank; one injured.

February 6, 1947, locomotive 1331, near Avoca, Ark. Front cab door swung open, due to bolt losing out of door fastening rod account of nut working off; bolt was not applied in accordance with the carrier's standard; one injured.

June 9, 1947, locomotive 183, Bolivar, Mo. Whistle sound deflector was loose; "Fix shield on whistle so it won't work around and hold whistle open" was reported on April 12 and 13; one injured.

Six accidents; six injured.

SEABOARD AIR LINE RAILROAD:

July 9, 1946, locomotive 842, Tallahassee, Fla. Employee's wrist was burned when it contacted hot blower pipe near the valve on boiler back head; one injured.

**September 10, 1946, locomotive 438, Raleigh, N. C. Bolt for securing ashpan operating arm to operating rod was missing; one injured.

September 16, 1946, locomotive 341, near Dixiana, S. C. Bottom sheet of combustion chamber failed caused by overheating due to the water space below the combustion chamber being filled with mud; three injured.

November 21, 1946, locomotive 256, near Hawthorne, Fla. Crown-sheet failure caused by overheating due to low water; two injured.

November 29, 1946, locomotive 330, Lake Wales, Fla. Toe board of front footboard was broken and part of it was missing, leaving 16 inches at outer end of footboard without toe guard; one injured.

January 13, 1947, locomotive 1059, Wildwood, Fla. Injectors did not operate properly; injectors reported on January 11 and 12; one injured.

February 3, 1947, locomotive 825, Okeetee, S. C. Manually operated reverse lever moved with force to forward end of quadrant when unlatched, apparently caused by the valves being dry; one injured.

February 11, 1947, locomotive 496, Colon, N. C. Front section of handrail turned, causing employee to fall from step at side of smokebox; handrail was loose in union connecting front and middle sections; one injured.

March 7, 1947, locomotive 842, West Palm Beach, Fla. Manually operated reverse lever was too close to cab wall when in back position; one injured.

April 15, 1947, locomotive 840, Dale, S. C. Grate-shaker bar slipped from shaker post; shaker bar and post were not equipped with carrier's standard safety pin; shaker bar was 8 inches longer than standard; one injured.

April 17, 1947, locomotive 421, Savannah, Ga. Boiler check stuck open; one injured.

April 26, 1947, locomotive 320, Shelby, N. C. Gangway handhold broke through old fracture; one injured.

Twelve accidents; 15 injured.

SOUTHERN RAILWAY:

**August 5, 1946, locomotive 572, Bulls Gap, Tenn. Squirt hose burst, due to being badly worn; one injured.

*August 7, 1946, locomotive 4817, Oyama, N. C. Derailment, caused by broken truck side on trailing truck of tender; 19 injured.

**August 9, 1946, locomotive 678, Cordele, Ga. Squirt hose burst; one injured.

**August 22, 1946, locomotive 1849, Atlanta, Ga. Squirt hose burst; one injured.

August 24, 1946, locomotive 4811, Weyburn, Va. Boiler feed water pump was inoperative, due to a crack in the wall of hot water pump between return valve chamber and cold water intake valve chamber; feed water pump was reported on July 31 and August 2, 10, 11, 13 (two times), 17, 20, and 25; one injured.

September 29, 1946, locomotive 5078, Greenlee, N. C. Extension handle to cylinder cock operating valve became disconnected from operating valve; pin through operating valve stem for securing the extension handle was missing; one injured.

**October 26, 1946, locomotive 1881, Spartanburg, S. C. Three of the four long leaves in driving spring were broken, permitting the locomotive to be low on one side, and bolt through footboard struck a derailer which was on rail of a cross-over track; one injured.

**November 3, 1946, locomotive 719, Enka, N. C. Squirt hose burst; boiler check had stuck open and steam was being drained out of injector delivery pipe through squirt hose at the time of the failure; one injured.

November 9, 1946, locomotive 802, Royston, Ga. Part of a defective coal board fell from storage rack and struck employee's foot; coal board was approximately 2 inches too short and was split lengthwise near center; one injured.

November 14, 1946, locomotive 6278, near Clark, Ky. Employee slipped or lost balance on gangway step and fell to the ground when he went to observe a main pin which was thought to be heating; "Clean oil off left step" and "Left main pin running warm" were reported at the end of the trip; one injured.

**December 2, 1946, locomotive 581, Selma, N. C. Anti-slip tread plate on tender sill step fouled handhold on side of cab; tread plate was too wide and extended over the front edge of step 1½ inches; one injured.

**December 16, 1946, locomotive 5204, Jonesboro, Tenn. Insufficient clearance between cab gangway handhold and tender deck when on curve; one injured.

January 12, 1947, locomotive 6626, near Keener, Ala. Stoker was inoperative, due to a bolt being wedged between elevator screw and casing; one injured.

January 28, 1947, locomotive 6627, Birmingham, Ala. Drain valve on steam end of feed water pump worked open; one injured.

**February 13, 1947, locomotive 831, Atlanta, Ga. Grate shaker bar slipped off lever due to improper fit; one injured.

February 24, 1947, locomotive 1881, Spartanburg, S. C. Injector steam pipe coupling flange pulled from angle valve at steam turret when attempt was made to repair a leak while under pressure; threads in flange were badly deteriorated; one killed.

**March 4, 1947, locomotive 6291, Georgetown, Ky. Employee stepped on some object on top of tender behind fuel space, causing loss of balance; one injured.

**May 6, 1947, locomotive 1862, John Sevier, Tenn. Insufficient clearance between grate-shaker bar handle and a shield which projected downward from oil tray shelf located on boiler back head; one injured.

**June 6, 1947, locomotive 4755, Columbia, S. C. Whistle rod was disconnected; one injured.

Nineteen accidents; 1 killed, 36 injured.

SOUTHERN PACIFIC—LINES EAST:

September 28, 1946, locomotive (T. & N. O.) 762, Raywood, Tex. Elbow of steam whistle broke through old fracture; one injured.

One accident; one injured.

SOUTHERN PACIFIC—LINES WEST:

July 13, 1946, locomotive 4147, Hooker, Calif. Bonnet blew out of fire hose valve; one injured.

July 16, 1946, locomotive 3308, Tucson, Ariz. Oil on top of tender fuel oil tank and on handhold and steps at front end of the tank; one injured.

July 28, 1946, locomotive 3818, Tucson, Ariz. Gas explosion in firebox; water in tender fuel oil tank caused an irregular flow of oil to the burner, causing the fire to go out and oil to accumulate in the firebox where the resulting gas became ignited and caused the explosion; two injured.

August 2, 1946, locomotive 1725, Oxnard, Calif. Injector ram packing nut was leaking; one injured.

August 4, 1946, locomotive 2646, Bayshore, Calif. Oil on gangway step; one injured.

August 6, 1946, locomotive 5019, Bowie, Ariz. Oil on top of tender feed water tank; "Clean top fuel oil tank" was reported on August 5; one injured.

August 14, 1946, locomotive 4137, Hewitt, Calif. Feed water pump was inoperative account of gasket blown out; pump was reported on August 13; an unused bolt and water and oil on the rear deck caused employee to slip and fall when he went to examine the pump; one injured.

**August 29, 1946, locomotive (S. D. & A. E.) 27, Walnut, Calif. Reverse lever became unlatched and moved to full forward position; reverse lever latch was worn, causing excessive lost motion; one injured.

September 2, 1946, locomotive 2845, Colton, Calif. Main rod broke through old fracture; one injured.

September 6, 1946, locomotive 1783, Bakersfield, Calif. Feed water hose obstructing rear handrail; one injured.

September 13, 1946, locomotive 4016, Sage Hen, Calif. Squirt-hose valve worked open; valve packing nut was loose; one injured.

September 27, 1946, locomotive 4254, Cholla, Ariz. Feed water pump operating valve was difficult to open; threads of valve stem had an excessive accumulation of hardened graphite; one injured.

September 30, 1946, locomotive 1762, Knights Landing, Calif. Excessive opening between planks of tender running board; one injured.

October 14, 1946, locomotive 5028, between Tucson, Ariz. and Lordsburg, N. Mex. Staybolts leaking under boiler jacket on right side of firebox; leaks on right side of boiler were reported on October 2 and 14 (before the accident) and 15 times from time of the accident to November 17; one injured.

October 22, 1946, locomotive 3234, Eliot, Calif. Insufficient clearance between cab handhold and tender deck when on curve; one injured.

November 5, 1946, locomotive 4039, Sparks, Nev. Cover of train signal box in cab fell account of defective hinges; one injured.

November 9, 1946, locomotive 2427, Dunsmuir, Calif. Manually operated reverse lever moved violently to extreme backward motion, striking employee;

reverse lever latch was stuck in its guide and did not engage in the teeth of reverse lever quadrant; one injured.

November 11, 1946, locomotive 5037, near Bosque, Ariz. Crown-sheet failure caused by overheating due to low water; reflexes at bottom of the water glass located on water column were worn and glass was dark for a distance of 3½ inches from the bottom; four killed, one injured.

December 8, 1946, locomotive 4434, El Paso, Tex. Cushion fell from cab seat box; cushion not fastened; one injured.

December 9, 1946, locomotive 1406, Tucson, Ariz. Oil on cab apron; one injured.

December 30, 1946, locomotive 4134, Crescent Lake, Ore. Injector water regulating valve stuck in closed position and was very hard to open; one injured.

January 14, 1947, locomotive 3262, Alturas, Calif. Oil on top of tender fuel tank; tank had been filled to capacity (without allowance for expansion) and when the oil became heated it overflowed through measuring-rod hole and covered the top of the tank; one injured.

February 1, 1947, locomotive 3643, Ontario, Calif. Coupler defective; one injured.

March 1, 1947, locomotive 4301, Rodeo, N. Mex. Water-spout hook slipped off handle of water spout; one injured.

March 8, 1947, locomotive 2803, Oxnard, Calif. Employee's foot broke through decayed plank in running board on top of tender; one injured.

March 11, 1947, locomotive 1230, Los Angeles, Calif. Uncoupling lever lifting arm fulcrum bracket broke at point of a previous break which had been repaired by fusion welding; one injured.

March 14, 1947, locomotive 3713, Hadley, Calif. Employee's foot caught in 2-inch opening between planks of platform on top of tender feed water tank; one injured.

April 12, 1947, locomotive 3308, Separ, N. Mex. Water-crane spout was in bad order and difficult to operate; one injured.

April 26, 1947, locomotive 3742, Pengra, Ore. Relief valves worked open; one injured.

April 28, 1947, locomotive 3671, Red House, Nev. Oil on top of tender, caused by fuel oil in tender tank having boiled over; one injured.

April 28, 1947, locomotive 3213, Tucson, Ariz. Bell ringer was inoperative; bell ringer was loose on bell frame and the bushing in right side of bell frame had turned, preventing oil from flowing through oil hole to the shaft in bell hanger; one injured.

May 1, 1947, locomotive 2751, Inyokern, Calif. Handrail across front of locomotive broke at old fracture which extended through approximately 85 percent of cross-sectional area; one injured.

May 3, 1947, locomotive 3226, Estrella, Ariz. Oil on top of tender fuel oil tank; one injured.

May 14, 1947, locomotive 3715, Hornbrook, Calif. Employee fell from top of tender; top of tender fuel oil tank was covered with oil and the light on fuel oil column adjacent to the water column was inoperative; one injured.

May 16, 1947, locomotive 3245, Ben Ali, Calif. Bell cord became wrapped around bell; one injured.

June 18, 1947, locomotive 2329, Sparks, Nev. Grease on gangway step; one injured.

June 19, 1947, locomotive 4124, Beaumont, Calif. Oil on cab handhold at gangway; one injured.

June 25, 1947, locomotive 3509, near Afton, N. Mex. Handwheel of Precision reverse gear spun violently when unlatched; air cylinder to reverse gear was slow in filling with air and gear unlatched before the pressure in cylinder was balanced; "Air leak in nipple at air valve to reverse gear in cab" was reported on June 13; one injured.

Thirty-eight accidents; 4 killed, 39 injured.

TEXAS & PACIFIC RAILWAY:

September 18, 1946, locomotive 472, Fort Worth, Tex. Water-glass top steam pipe connection was leaking, due to union nut having worked loose; nut was not properly tightened after removal during monthly inspection on the previous day; one injured.

October 2, 1946, locomotive 664, Baird, Tex. Centrifugal boiler feed-water

pump burst, apparently caused by a mechanical failure inside the steam turbine case; one injured.

Two accidents; two injured.

UNION RAILROAD:

*October 4, 1946, locomotive 133, Bessemer, Pa. Brake rigging on tender came down; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

**July 1, 1946, locomotive 3514, Lynndyl, Utah. Extension hose which had been applied to squirt hose became disconnected; one injured.

*December 15, 1946, locomotive 3831, Collins, Calif. Oil on top of tender water tank; one injured.

**January 14, 1947, locomotive 2908, Brighton, Colo. Boiler check stuck open; one injured.

January 16, 1947, locomotive 2163, North Platte, Nebr. Crown-sheet failure caused by overheating due to low water; one injured.

Four accidents; four injured.

VIRGINIAN RAILWAY:

**March 27, 1947, locomotive 481, McCoy, Va. Grate-shaker bar slipped off lever; one injured.

June 13, 1947, locomotive 421, Norfolk, Va. Engine truck journal bearing ran hot; one injured.

Two accidents; two injured.

WABASH RAILROAD:

*August 27, 1946, locomotive 2074, Neoga, Iowa. Water glass burst, breaking glass panel in water-glass shield; one injured.

September 24, 1946, locomotive 2727, Tolono, Ill. Headlight and cab lights went out due to failure of the generator; generator governor piston valve was stuck and drain pipe from generator was stopped up, preventing the condensate from draining from turbine; one injured.

**January 10, 1947, locomotive 2719, near Decatur, Ill. Locomotive not lubricating properly; employee fell from running board while attempting to pour oil into left cylinder relief valve; "Engine not getting any oil on left side" was reported on January 5; one injured.

**February 5, 1947, locomotive 543, Decatur, Ill. Dump-grate lever was bent, permitting shaker bar handle to foul on back wall of cab; one injured.

Four accidents; four injured.

WESTERN MARYLAND RAILWAY:

*July 7, 1946, locomotive 958, Hagerstown, Md. Squirt hose burst; one injured.

One accident; one injured.

WESTERN PACIFIC RAILROAD:

**July 26, 1946, locomotive 323, Portola, Calif. Gas in firebox ignited and blew the firebox draft chute down, permitting flames from the firebox to enter the cab; chute was bent and did not fit at fire door properly to be secured by the means provided; one injured.

August 28, 1946, locomotive 320, Winnemucca, Nev. Hole in squirt hose; one injured.

September 23, 1946, locomotive 176, Oroville, Calif. Oil and sand on top of tender fuel oil tank; one injured.

October 12, 1946, locomotive 46, Fitz, Calif. Hot water overflowed from injector, due to leaks at injector steam spindle seat and at joint of steam nozzle in injector body; one injured.

*December 26, 1946, locomotive 256, Del Paso, Calif. Glass in cab window was broken; one injured.

Five accidents; five injured.

WHEELING & LAKE ERIE RAILWAY:

December 17, 1946, locomotive 6017, Jewett, Ohio. Right rear grate shaker fulcrum rod fouled the right front shaker rod, due to the rear rod having excessive wear and lateral motion; 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, 1947, BY ROADS

IA 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:

August 11, 1946, unit 135-B, near Maine, Ariz. Oil on engine-room floor; one injured.

September 7, 1946, unit 169-A, near Fields, Ariz. Oil on engine room floor; one injured.

**September 7, 1946, unit 123, Needles, Calif. Oil on engine-room floor; one injured.

**December 23, 1946, unit 135, near Keenbrook, Calif. Battery box door became dislocated and fell from the box, due to not having been properly latched in position; one injured.

February 12, 1947, unit 101-C, South Guam, N. Mex. Oil on engine room floor; one injured.

**March 5, 1947, unit 118-A, Winslow, Ariz. Engine-room floor was not sufficiently covered with safety tread to provide secure footing; one injured.

Six accidents; six injured.

ATLANTIC COAST LINE RAILROAD:

*November 12, 1946, units 511 and 721, Jacksonville, Fla. Units separated, apparently due to train line and signal hose becoming fouled on safety hanger provided for holding steam heat connectors when units were uncoupled; one injured.

April 23, 1947, unit 309-B, Harpersville, Ala. Crankcase explosion caused by overheated Nos. 9 and 10 crankshaft main bearings which were badly worn; one injured.

**June 2, 1947, unit 623, Lakeland, Fla. Mudguard plate for footboard at rear end of unit was bent and the top of the plate, which had a jagged edge, protruded about 1 inch from the sill; one injured.

Three accidents; three injured.

BALTIMORE & OHIO RAILROAD:

October 16, 1946, unit 68, Sparksville, Ind. Crankcase explosion occurred when crankcase cover was removed while bearings were overheated; tangs on No. 4 main bearing were depressed permitting the bearing to revolve in its housing and cut off the supply of lubricating oil to the No. 4-10 connecting-rod bearing; one injured.

One accident; one injured.

BIRMINGHAM SOUTHERN RAILROAD:

*July 13, 1946, unit 75, Fairfield, Ala. Rocker arm adjusting screw lock nut on No. 11 cylinder worked off and dropped down through cavity in cylinder head casting and lodged underneath the control rod clevis, holding the entire governor lay-shaft in load position; one injured.

One accident; one injured.

BOSTON & MAINE RAILROAD:

*July 14, 1946, unit 3805, Exeter, N. H. Gasket blew out of brake pedestal, resulting in loss of brake-pipe air; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

**October 30, 1946, unit 14, St. Paul, Minn. Oil on floor of engine room due to leak in air compressor seal on end of crankshaft of the B-2 engine; one injured.

**October 30, 1946, unit 5931, Yankton, S. Dak. Engine of gas-electric motor-car backfired, fouling the air in enginemen's compartment; throttle rod between Nos. 1 and 2 carburetors was too long, due to improper adjustment, which allowed No. 1 carburetor to admit gas mixture to cylinders with the throttle in closed position; Nos. 3 and 4 exhaust valves were defective; one injured.

Two accidents; two injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

**July 29, 1946, unit 97-B, West Davenport, Iowa. Cylinder air box cover worked loose; one injured.

September 8, 1946, unit 9007, Cedar Rapids, Iowa. Engine-room floor was slippery, due to being oil-soaked in the vicinity of the lubricating oil receptacle of No. 1 engine; one injured.

Two accidents; two injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

**August 16, 1946, unit 407, Hoboken, N. J. Oil on running board; one injured. One accident; one injured.

GREAT NORTHERN RAILWAY:

**December 19, 1946, unit MC-2300, Kalispell, Mont. Exhaust pipe flange connection on gas-electric motorcar was leaking at manifold; one injured.

One accident; one injured.

GULF, MOBILE & OHIO RAILROAD:

November 21, 1946, unit 704, Rutherford, Tenn. Crankcase explosion caused by overheated cylinder liner and piston; water-cooling system shutters would not operate properly; one injured.

One accident; one injured.

MISSOURI PACIFIC RAILROAD:

**January 2, 1947, unit 503-A, near Holland, Ark. Crankcase explosion due to overheated connecting-rod bearings caused by defective condition of crankshaft bearings which resulted in interference with proper lubrication; Nos. 1 and 3 main bearing shells were worn and broken and No. 2 shells had been turning on crankshaft; a similar explosion occurred on January 1; one injured.

March 13, 1947, unit 502, Avert, Mo. Crankcase explosion caused by an overheated connecting-rod bearing; a main bearing had broken and turned and blocked the oil passage to the crank bearing; two injured.

Two accidents; three injured.

NEW YORK CENTRAL SYSTEM:

December 13, 1946, unit 337, New York, N. Y. Traction motor rheostat cover plate became displaced, apparently due to not having been properly fastened in place; cover plate did not fit properly and was difficult to apply due to horizontal stiffening member at upper inside of cover plate fouling on bulkhead member; one injured.

April 6, 1947, unit 1603, near Utica, N. Y. Crankcase explosion due to an overheated connecting-rod bearing caused by improper lubrication; one injured.

April 26, 1947, units 8533 and 451, Selkirk, N. Y. Employee was burned by electric flash when attempt was made to replace trailer blower motor fuse; one injured.

Three accidents; three injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

*July 15, 1946, unit 0355, Cos Cob, Conn. Motor grounded causing heating and igniting of insulation on transformer coils; one injured.

**March 16, 1947, unit 0756, Kingston, R. I. Fire occurred under the floor of Diesel-electric unit near No. 2 traction motor, apparently caused by a short circuit or grounded coil in traction motor; one injured.

April 14, 1947, unit 0715, Springfield, Mass. Oil on engine-room floor; one injured.

Three accidents; three injured.

NIAGARA JUNCTION RAILWAY:

July 10, 1946, unit 12, Niagara Falls, N. Y. Short circuit in electric wiring in cab, caused by tape covering wire tip ends of cable being chafed off; one injured. One accident; one injured.

PENNSYLVANIA RAILROAD:

July 3, 1946, unit 4730, Lancaster, Pa. Transformer blower fuses blew out, caused by starting contactor not opening properly due to leaking air relay; one injured.

October 17, 1946, unit 4898, Wilmington, Del. Employee went through open hatch door and contacted an energized down pantograph, the opposite pantograph being in contact with energized trolley wire; door hatch could not be closed or grounding switch put in in-position, due to ground switch connecting rod being improperly connected to paddle on operating rod and fouling on center nut; one killed.

*November 10, 1946, unit 3919, New York, N. Y. Knob came off cab door, due to set screw having worked loose; one injured.

November 28, 1946, unit 4763, Malvern, Pa. Coupler pin broke through old fracture; one injured.

December 17, 1946, unit 4881, Long Island City, N. Y. Leaking decarbonizing valve discharged steam into oil burner of oil-fired steam heat boiler and extinguished the fire; gas in firebox exploded when attempt was made to relight the fire; "Atomization gasket leaking bad" and "Steam atomization packing leaking" were reported on December 15; one injured.

**January 7, 1947, unit 4818, Baltimore, Md. Knuckle of coupler at rear end of unit broke; one injured.

May 9, 1947, unit 4788, near Ardmore, Pa. Deterioration of the insulation on bus bars leading to the traction motors resulted in a short circuit between the bus bars and a flash over to the cab bulkhead; one killed, two injured.

May 29, 1947, unit 5940, New York, N. Y. Cab drop window fell from raised position due to not being properly secured; edge of cab side sheet for engaging groove of window frame was bent and out of alinement with the groove; one injured.

Eight accidents; two killed, eight injured.

TONOPAH & GOLDFIELD RAILROAD:

*October 3, 1946, unit 1, Millers, Nev. Axle broke, causing unit to derail and turn over; one injured.

One accident; one injured.

VIRGINIAN RAILWAY:

January 25, 1947, unit 10, Rich Creek, Va. Insulation of traction motor stator coils failed causing a ground; flash occurred when ground detector connection burned off at transformer; one injured.

One accident; one injured.

WESTERN PACIFIC RAILROAD:

**August 15, 1946, unit 905, Reno Junction, Calif. Oil on floor of passageway of unit; one injured.

September 28, 1946, unit 908, near Boaz, Nev. Oil on floor of engine room; one injured.

Two accidents; two injured.

TABLE XII.—Number of steam locomotives inspected,

found defective, and ordered from service, et cetera

Parts defective, inoperative or missing, or in violation of the rules	Akron, Canton & Youngstown	Alquippa & Southern	Alton & Southern	Alton	Ann Arbor	Atchison, Topeka & Santa Fe	Atlanta & West Point	Atlantic & Yadkin	Atlantic Coast Line
1 Air compressors	1			3		38			3
2 Arch tubes									
3 Ashpans and mechanism				1		1			1
4 Axles									
5 Blow-off cocks						33			4
6 Boiler checks				1		16			3
7 Boiler shell				1		15			2
8 Brake equipment				4		130			39
9 Cabs, cab windows, and curtains				16		64			5
10 Cab aprons and decks				1		30			9
11 Cab cards				1		2			2
12 Coupling and uncoupling devices				1		1			
13 Crossheads, guides, pistons, and piston rods				6		57			25
14 Crown bolts				11		11			
15 Cylinders, saddles, and steam chests	1			2		61			11
16 Cylinder cocks and rigging				1		12			3
17 Domes and dome caps						3			1
18 Draft gear				2		11			7
19 Draw gear				3		19			4
20 Driving boxes, shoes, wedges, pedestals, and braces				4	2	89			3
21 Firebox sheets				6		15			1
22 Flues				4		20			3
23 Frames, tail pieces, and braces, locomotive				6	2	45		1	8
24 Frames, tender				4		4			
25 Gages and gage fittings, air						9			2
26 Gages and gage fittings, steam						26		1	4
27 Gage cocks						14			2
28 Grate shakers and fire doors						9			3
29 Handholds				2		9			1
30 Injectors, inoperative						144			22
31 Injectors and connections	2			3		5			
32 Inspections and tests not made as required	1			1		22			7
33 Lateral motion	2			3		3			2
34 Lights, cab and classification						8			2
35 Lights, headlight					1	8			2
36 Lubricators and shields						26			2
37 Mud rings						7			2
38 Packing nuts				11		37			5
39 Packing, piston rod and valve stem				1		1			3
40 Pilots and pilot beams				1		5			4
41 Plugs and studs						12			2
42 Reversing gear						30			9
43 Rods, main and side, crankpins, and collars				11		62			21
44 Safety valves						1			1
45 Sanders				3		46			1
46 Springs and spring rigging	3			19	1	158			61
47 Squirt hose						7			1
48 Stay bolts						38			6
49 Stay bolts, broken						7			3
50 Steam pipes						41			2
51 Steam valves				1		17			7
52 Steps				3		35			7
53 Tanks and tank valves						126			13
54 Telltale holes						2			1
55 Throttle and throttle rigging						48		1	6
56 Trucks, engine and trailing				5		62			18
57 Trucks, tender				3		43			10
58 Valve motion					1	20			7
59 Washout plugs						24			1
60 Stokers					1	4			
61 Water glasses, fittings, and shields				2	1	38			12
62 Wheels						10			3
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).				1	1	110		1	6
Number of defects	10			123	10	1,935	1	3	391
Locomotives reported	22	25	20	96	34	1,564	43	12	667
Locomotives inspected	115	25	8	156	58	3,979	62	38	1,606
Locomotives defective	6			29	5	538	1	1	133
Percentage of inspected found defective	5			19	9	14	1.6	2.6	8
Locomotives ordered out of service				2		9			7

Baltimore & Ohio	Bangor & Aroostook	Belt Railway of Chicago	Bessemer & Lake Erie	Boston & Maine	Camas Prairie	Cambria & Indiana	Canadian National	Canadian Pacific	Carolina & North-western	Central of Georgia	Central R. R. of New Jersey	Central Vermont	Charleston & Western Carolina	Chesapeake & Ohio	Chicago & Eastern Illinois	Chicago & Illinois Mid-land	Chicago & North West-ern	Chicago & Western In-diana	Chicago, Burlington & Quincy	Chicago Great Western
20				1				2			1	6		5	1		24	1	12	1
2				3										1			7		1	2
4																				3
7																				4
5				4				3			1	1		1			4		2	5
7		2		1				1			1	3		3			4		5	6
7				1							3	3					6		8	7
66				5				3	5		9	8	2	7	4		56		36	8
27		2		7				2			9	3		11	18		19		13	9
13				3				1			3	1					17		8	10
6														1			4		2	11
52		2		10				9			5	8		1	27	4	38		22	12
6				1										3			4		5	14
145				13				3	1	4	2		4	5	4	2	45		35	15
9				4										5	2	4	22		8	16
7		1		1										2			2		2	17
8				4				4	1	3		4	1	1			16		5	18
14				3				2			2	2	1	4	2		16		7	19
64				12				6	3		2	1	12	7			61		18	20
4		2		5				1			1		1	4	1		31		3	21
6		2		1				1			2		1	1			3		1	22
41				1				2	2	1	4	1	3	8	2		18		12	23
3																	2		3	24
4																	1		2	25
12								3			1			1			2		2	26
7								1				5	1	3	3		8		4	27
7				3							4			4			6		5	28
17		1		2				1	1	1	2			11			22	1	9	29
49				14				7	9	2	4		12	17	3		31		36	30
6				4				2	2	1	4		3	5	1		4		1	31
31				3				1	2		2		16	6	5		9		13	33
4				1									1	2			2		3	34
6				1									1	2			2		3	35
6				1									1	2			6		2	36
25				6							1		2	5	1		10		17	38
17				3							1			6	8		21		19	39
2				1							1			6	8		6		2	40
20		1						2			3			4	4		6		1	41
11								1	1		1			3	1		4		8	42
81		1		7				5	3		17	1	4	3	25	4	42		25	43
2				1							4		1	1	1		4		7	44
222		2		22	1			6	4	7	40	8	23	4	15	3	156		27	46
1																	5		1	47
7														5			5		10	48
7														2			4		1	49
7														2			4		1	50
1														1			6		2	51
27				1				1	3	1	2	1	4	1	8		14		7	52
43		2		2				3	11		1	9	7	3	7		43		20	53
24				5				1	2	5	3	1	3	6	2		55	1	10	54
45				5				1	1	1	1	2	1	4	10		54		7	56
35				6				2		1	1	3	6	6			10		8	57
28				7				4		1	3	1	9	2			24		20	58
19				1				1		2	4	2	1	3			12		15	59
13				1				1		1	2	2	6	1			13	2	6	60
32				5				1	2	2	3	2	3	7	2		19		7	61
14		1		6				1		4	3	3	3	4			15		11	62
9				1							3	2		4	1					63
1,373	23	3		196	3		64	76	30	108	103	148	23	255	137	8	1,002	7	522	23
1,944	70	52	118	365	10	10	270	161	15	198	305	52	46	931	129	28	911	19	783	156
4,573	88	13	135	957	38	26	102	158	35	551	975	194	74	1,932	250	55	2,572	11	2,414	395
356	14	2		100	2		20	26	6	43	46	40	10	76	31	1	243	3	145	8
8	16	15		10	5		20	16	17	8	4.7	21	14	3.9	12	1.8	9	27	6	2
18				3						4		4	1	3			6		7	

TABLE XII.—Number of steam locomotives inspected,

	Chicago, Indianapolis & Louisville	Chicago, Milwaukee, St. Paul & Pacific	Chicago River & Indiana	Chicago, Rock Island & Pacific	Chicago, St. Paul, Minneapolis & Omaha	Chicago, West Pullman & Southern	Cincinnati Union Terminal	Clinchfield	Colorado & Southern	Colorado & Wyoming
1	2	14		25	7				3	
2				4						
3	2	2		1	1					
4										
5		9		10						
6		10		34	3				2	
7		16		3						
8		41	1	104	11			11	9	
9	7	17		48	2			1	3	
10		14		23	1			3	2	
11	3	2		1	1					
12		5		3						
13		53	1	40	6			19	11	
14		1		4				1		
15	6	48	1	114	2			6	7	1
16	4	22	1	33	3			3	1	
17		1		1	2			1		
18		10		18	3			3	4	
19		7	1	26	1			1		
20		29	1	58	4			5	15	
21	6	17		17				1		
22		4		10	1			2	1	
23	1	26		44	1			5	8	1
24				9				1		
25		4		29				1	1	
26	1	8		11	4			3	2	
27		6		18				3	1	
28		16		13				3		
29	1			123	6			6	5	
30				8	1			6	2	
31	1	38		22				34		
32		18		3						
33		2		7	1					
34	3			30						
35		10		10				3	7	
36	6	24		15	4			7	7	
37		3		3				1		
38	6	24	4	20				7	7	
39	5	34		1	3			1		
40		1		9				1		
41		16		44	1			1		
42	3	2		9	2			43	13	
43	3	29		55	1					
44		6		33	2			1	1	
45		84		144	8			24	3	
46	3			3						
47		9		10				2	1	
48		5		4				2	2	2
49		4		13				1	3	
50	1			3						
51	3	12		31				3	1	1
52		20		93	10			8	2	
53	5			2						
54	1	34		57	3			1		
55	1	33		35	1			4		
56		5		15	1			1	5	
57		17	1	33	2			6	8	
58		12		13				1		
59	1	5		1				5		
60		13		88						
61	1	13		10	1			1		
62	1	13		10	1			1		
63	4	14		38	4			2	1	
Miscellaneous—Signal appliances, badge plates, brakes (hand).										
Number of defects.....										
77 837 11 1,673 100 213 137 5										
Locomotives reported.....										
185 2,631 24 2,169 519 11 21 187 215 36 1										
Locomotives inspected.....										
25 225 2 412 23 2 2 42 25 1										
Locomotives defective.....										
14 9 8 19 4.4 22 12 2.8										
Percentage of inspected found defective.....										
2 7 14 2										
Locomotives ordered out of service.....										

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

Columbus & Greenville	Conemaugh & Black Lick	Cuyaboga Valley	Davenport, Rock Island & No. Western	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western	Detroit & Toledo Shore Line	Detroit Terminal	Detroit, Toledo & Ironton	Donora Southern	Duluth, Missabe & Iron Range	Duluth, South Shore & Atlantic	Elgin, Joliet & Eastern	Erie	Florida East Coast	Ft. Worth & Denver City	Georgia & Florida	Georgia	Grand Trunk Western	Great Northern	
	1			1	2	6							1	14		1	1			1	1
					1	1							1								2
					3	5							1	11		1				7	5
					1	2							1	5		1			5	6	6
					1	1							1	6		1			12	7	7
					4	6							3	34	3	4	15		4	4	8
					3	3							2	25		5			1	10	9
	5				1	1							1	2					6	10	10
					1	3							1	2					3	11	12
					11	9							1	6					10	9	13
	7				8	11							1	15	1				14	13	14
					1	1							1	1		1			16	15	15
	7	5			1	10	20						3	86		5			3	16	16
					1	1	8						1	29					1	17	17
					2	2							2	2					1	17	18
					3	4							1	5					6	18	19
					3	1							1	5			1		2	19	20
					2	4							1	6		1			17	20	21
					3	1							2	2		1			1	22	22
	4				2	6							3	22		7			6	23	23
					1	1							4	4		1			1	24	24
					1	1							2	2		1	2		1	25	25
					1	1							4	4		1	1		3	26	26
	2				1	1							2	7		3			6	27	27
					4	6							1	6		1			2	28	28
					2	4							1	6					2	29	29
					8	10	27						2	36		15	4		1	30	30
	2				2	8							3	6		5			17	31	31
	2				5	1							2	14		3			2	32	32
					1	9							1	2		5	9		3	33	33
					2	2							1	1		2			1	34	34
					8	1							1	8		1			1	35	35
	1				2	5							1	8		1			1	36	36
	2	1			1	6							2	8					1	37	37
					4	6							2	13		4			4	38	38
					1	4							2	23		7			1	39	39
						1							1	6		1				40	40
					1	1							1	1						41	41
	2				5	1	8						1	16		2	1		4	42	42
	8				5	17	14						4	35		2	9		4	43	43
					3	1	7						2	8		1			13	44	44
					3	1	7						2	8		1			5	45	45
	5				9	15	36						4	59		2	4	14	3	30	46
					1	1							1	1		1				1	47
					5	2							1	3		2				4	48
					2	2							3	3						4	49
					1	1							1	3						1	50
	3				2	1	5						4	10		2				7	51
	3				4	6							1	20		1	6		33	52	52
					5	5	4						2	18		2			2	54	53
					5	3							4	14		2			4	55	55
	2				4	4							2	14		2			1	56	56
	5				3	4							3	16		5			15	57	57
	1				6	8							10	2		1			6	58	58
					7	9							8			4			5	59	59
	2				1	1							3	3					3	60	60
	4				2	6	15						2	21		3			6	36	61
					7	1	3						1	18		2			1	7	62
					1	2	9						13			4				5	63
75 9 2 99 170 363 12 13 20 5 71 690 17 120 67 6 17 351																					
Locomotives reported.....																					
48 37 10 10 293 291 331 25 15 48 17 139 29 123 726 87 57 28 51 153 703																					
Locomotives inspected.....																					
10 56 18 55 1,090 959 1,189 72 34 93 6 141 70 171 2,080 224 134 95 147 367 1,531																					
Locomotives defective.....																					
13 2 2 34 51 71 6 6 6 2 2 5 3 15 187 10 20 25 5 10 132																					
Percentage of inspected found defective.....																					
32 3.6 11 3.1 5 6 18 33 3.5 4.3 9 9 4.5 15 26 3.4 2.7 9																					
Locomotives ordered out of service.....																					

TABLE XII.—Number of steam locomotives inspected,

Parts defective, inoperative or missing, or in violation of the rules	River Terminal	Rutland	St. Louis-San Francisco	St. Louis Southwestern	San Diego & Arizona Eastern	Savannah & Atlanta	Seaboard Air Line	South Buffalo	Southern Pacific, lines east	Southern Pacific, lines west	Southern
1 Air compressors.....	7	2					7	3	62	17	
2 Arch tubes.....	1										
3 Ashpans and mechanism.....	3								13	2	
4 Axles.....		4					1	2	32	2	
5 Blow-off cocks.....		4	1				4	2	45	8	
6 Boiler checks.....	10						1	3	22	2	
7 Boiler shell.....	14	23	5				31	16	123	61	
8 Brake equipment.....	5	9	3				5	5	116		
9 Cabs, cab windows, and curtains.....	3	2					5	3	26	3	
10 Cab aprons and decks.....	1						2		24		
11 Cab cards.....						1			11		
12 Coupling and uncoupling devices.....	9	5	2				9	9	122	10	
13 Crossheads, guides, pistons, and piston rods.....	1		1				1	1	24	1	
14 Crown bolts.....	10	10	5				2	13	246	11	
15 Cylinders, saddles, and steam chests.....	2	5					1	8	97	1	
16 Cylinder cocks and rigging.....	2						1		3		
17 Domes and dome caps.....	5	1				2	11	2	28	18	
18 Draft gear.....	7						1	5	18		
19 Draw gear.....	10						3	1	135	9	
20 Driving boxes, shoes, wedges, pedestals, and braces.....	10	1					7	7	35	2	
21 Firebox sheets.....	5	2					1	2	35	2	
22 Flues.....	3	6	3				5	5	52	17	
23 Frames, tail pieces, and braces, locomotive.....	1						1		5	1	
24 Frames, tender.....	2	4	3				3	6	17	5	
25 Gages and gage fittings, air.....	1	1					1		43	4	
26 Gages and gage fittings, steam.....	1	1					1		41	1	
27 Gage cocks.....	1						1		59	3	
28 Grate shakers and fire doors.....	3	2					7	11	221	21	
29 Handholds.....	9	11	11			2	5	1	27	6	
30 Injectors, inoperative.....	1						5	1	19	7	
31 Injectors and connections.....	10						8	5	16		
32 Inspections and tests not made as required.....	1						1		17	4	
33 Lateral motion.....	5	1					3		15	2	
34 Lights, cab and classification.....	3						9		9		
35 Lights, headlight.....	9	2					4		59	4	
36 Lubricators and shields.....	4						6		57	7	
37 Mud rings.....	1						1		9	3	
38 Packing nuts.....	3	1					3	5	9	6	
39 Packing, piston rod and valve stem.....	1						1		9	3	
40 Pilots and pilot beams.....	3	1					5	6	44	3	
41 Plugs and studs.....	3	5	5			2	14	8	86	31	
42 Reversing gear.....	13	5					2	1	21	5	
43 Rods, main and side, crankpins, and collars.....	1						1	1	2		
44 Safety valves.....	22	10	23				52	2	275	67	
45 Sanders.....	1	2					2	15	4	5	
46 Springs and spring rigging.....	6	1					1	1	8		
47 Squirt hose.....	2						1		40	3	
48 Stay bolts.....	4	5					13	4	33	9	
49 Stay bolts, broken.....	4	2					6	3	64	9	
50 Steam pipes.....	7	3					16	1	62	16	
51 Steam valves.....	6						4	2	71	5	
52 Steps.....	24	7	5			1	8	8	165	10	
53 Tanks and tank valves.....	1						1		9		
54 Telltale holes.....	4	5					13	4	33	12	
55 Throttle and throttle rigging.....	4	2					6	3	64	9	
56 Trucks, engine and trailing.....	3						16	1	62	16	
57 Trucks, tender.....	16	2					4	3	71	5	
58 Valve motion.....	3						1		20	1	
59 Washout plugs.....	4						1		6	2	
60 Stokers.....	2	1	10			1	14	6	132	17	
61 Water glasses, fittings, and shields.....	4	1	3				4	7	22	4	
62 Wheels.....	14	5	1				7	2	86	15	
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).....											
Number of defects.....	305	164	109	2	16	281	3	201	3,233	465	
Locomotives reported.....	14	60	553	141	13	16	503	28	419	1,474	1,415
Locomotives inspected.....	20	276	1,421	558	65	36	1,219	23	859	4,019	2,896
Locomotives defective.....	65	57	35	1	9	19	2	54	917	129	
Percentage of inspected found defective.....	24	4	6	1.5	25	8	9	6	23	4.4	4
Locomotives ordered out of service.....	3	1	2			5		4	60	6	

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

Spokane International	Spokane, Portland & Seattle	Tennessee Central	Tennessee Coal, Iron & R. R.	Terminal R. R. Assn. of St. Louis	Texas & Pacific	Toledo, Peoria & Western	Toledo Terminal	Toronto, Hamilton & Buffalo	Union Pacific	Union	Utah	Virginian	Wabash	Washington Terminal	Western Maryland	Western Pacific	Wheeling & Lake Erie	Roads with less than 10, and industrial locomotives	Total defects	
1	1	16							33	1		20	2			4	2	51	944	
2									3	1								1	19	
3									13	1		2		1			1	8	308	
4									23			1					1	19	428	
5									12	1		1	2				3	8	342	
6									75	1	10	9	2	2			6	176	2,512	
7									46	3	9	1	9	2			3	70	1,347	
8									25	2		1	5				3	25	424	
9									4								1	8	91	
10									2								1	8	58	
11									39	1		7					2	70	1,683	
12									7								1	2	98	
13									45	2		13	1				1	68	2,004	
14									24	2		4	8				4	33	650	
15									8			2	1				1	1	130	
16									7			1	2				1	54	449	
17									12			6	6				1	27	453	
18									6	25			11				1	35	1,580	
19									5	1								4	257	
20									3	3							3	24	197	
21									1	6	23						1	23	820	
22									1	1	3							6	63	
23									1	1								4	24	
24									6									11	135	
25									1	1								19	358	
26									1	6	1	1	1					40	404	
27									1	1								26	444	
28									1	2								4	26	
29									1	2								64	469	
30									1	1								5	39	
31									4	10	4	1	1	3			119	2,369		
32									1	1							1	41	350	
33									1	8	4						7	35	791	
34									2	1								7	155	
35									5	3		9						10	143	
36									15			2	1	1				4	228	
37									6			1						12	217	
38									2	1	1	1	1				4	18	575	
39									1	1	1	1						52	691	
40									1	4	1	1						14	156	
41									1	1								4	236	
42									1	1	1	1	2					17	528	
43									1	8	4		2					147	2,136	
44									9	5		12	6				7	70	44	
45									9			1						4	569	
46									1	2		3	1				3	1	45	
47									21	38	1	2	1				6	8	165	
48									2	1								1	79	
49									5	1								9	318	
50									5									62	283	
51									1	1							1	1	9	
52									1	1								4	146	
53									2	7	2	1					3	1	123	
54									4	6	2						4	1	61	
55									1			4						17	558	
56									6									5	68	
57									11	15	3	2						4	1,026	
58									7	3		2	5	1				4	68	
59									3	8	1		3					2	44	
60									45			2	3					65	795	
61									16			6	3	1			1	3	778	
62									16			1	3				4	8	441	
63									29			1	3						208	
64									9	10	2	9							1,318	
65									1	4	22		2					5	2	59
66									1	6	4							2	16	870</