

INTERSTATE COMMERCE COMMISSION

FORTY-FIRST ANNUAL REPORT
OF THE
DIRECTOR
BUREAU OF LOCOMOTIVE INSPECTION
TO THE
INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED
JUNE 30, 1952



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1952

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**

SEPTEMBER 30, 1952

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Forty-first Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1952, 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.

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. Tables are also given showing 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 locomotive units other than steam.

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

	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Number of locomotives for which reports were filed.....	20,490	26,595	29,743	33,866	37,073	39,578
Number inspected.....	45,220	62,113	66,809	85,353	93,917	94,034
Number found defective.....	6,234	7,995	6,740	7,035	9,417	10,248
Percentage of inspected found defective.....	13.8	12.9	10.1	8.2	10.0	10.9
Number ordered out of service.....	370	508	399	436	654	708
Number of defects found.....	24,738	34,657	28,504	28,642	38,855	41,250

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

	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Number of accidents.....	122	167	169	228	341	360
Percent increase or decrease from previous year.....	26.9	1.2	25.9	33.1	5.3	14.1
Number of persons killed.....	3	14	7	10	15	16
Percent increase or decrease from previous year.....	78.6	100	30.0	33.3	6.3	160.0
Number of persons injured.....	126	170	184	243	361	464
Percent increase or decrease from previous year.....	25.9	7.6	24.3	32.7	22.2	15.7

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—							
	1952	1951	1950	1949	1948	1947	1915	1912
Number of accidents.....	35	51	59	81	104	116	424	856
Number of persons killed.....	2	3	4	9	14	12	13	91
Number of persons injured.....	36	59	70	94	108	124	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—									
	1952		1951		1950		1949		1948	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	1	36	2	51	2	64	3	75	3	109
Firemen.....	2	45	3	62	2	64	3	92	6	155
Brakemen.....		19	1	20	2	29	1	30	3	43
Conductors.....		3		6		4		7		5
Switchmen.....		2	1	8		5		6		10
Roundhouse and shop employees:										
Boilermakers.....		2		2		2		2		4
Machinists.....		2	1	2		1		4	1	2
Foremen.....		2		2		1				1
Inspectors.....				2		2				
Watchmen.....		2	1		1	4	1			2
Boiler washers.....										1
Hostlers.....		8	1	4		1	1	8		8
Other roundhouse and shop employees.....		2		2		2	1	4		5
Other employees.....		1		3		4		6		12
Nonemployees.....		2	4	6		1		9		6
Total.....	3	126	14	170	7	184	10	243	15	361

TABLE V.—Reports and inspections—Locomotive units other than steam

	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Number of locomotive units for which reports were filed.....	22,716	19,320	15,719	12,692	9,803	7,805
Number inspected.....	65,263	52,948	42,503	30,684	20,798	13,115
Number found defective.....	6,087	4,375	2,748	1,238	853	633
Percentage of inspected found defective.....	9.3	8.3	6.5	4.0	4.1	4.8
Number ordered out of service.....	135	106	42	20	21	19
Number of defects found.....	16,613	11,935	6,325	2,804	1,745	1,442

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

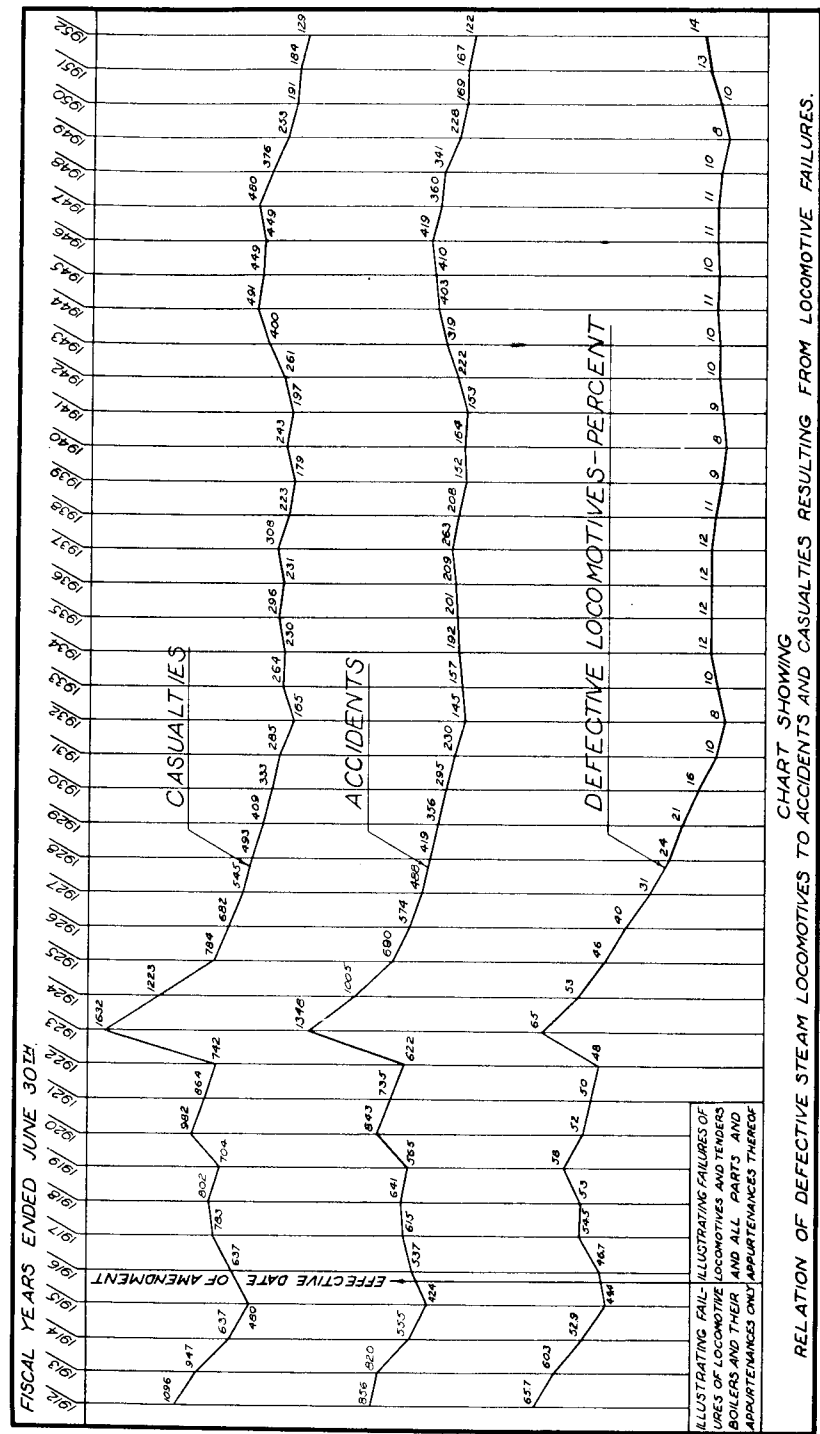
	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Number of accidents.....	74	54	51	49	41	40
Number of persons killed.....	1	2	3			2
Number of persons injured.....	77	129	50	67	50	41

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

	Year ended June 30—									
	1952		1951		1950		1949		1948	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		15		11		15		12		7
Firemen.....		31	1	30		21		14		24
Brakemen.....	1	12		4		3		6		1
Conductors.....		4				4				2
Switchmen.....		8		5		1		4		2
Maintenance employees.....		6	1	3		3		8		
Other employees.....		1		13	1	2		13		2
Nonemployees.....				63	2	1		10		12
Total.....	1	77	2	129	3	50		67		50

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—														
	1952			1951			1950			1949			1948		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs.....	1		1												5
Aprons.....				1		1	2		2	3		3	5		
Arch tubes.....				1		1	1		1						
Ashpan blowers.....										1		1			
Axles.....	1		1									3			5
Blow-off cocks.....				2		2	2		2	5	1	4			
Boiler cheeks.....	3		3	3		3	3		3	4		5			6
Boiler explosions:															
A. Shell explosions.....															
B. Crown sheet; low water; no contributory causes found.....	3	1	5	5	3	8	8	4	12	4	6	13	10	12	8
C. Crown sheet; low water; contributory causes or defects found.....	1		1	1		5	1		2	1	1	1	3		7
D. Miscellaneous firebox failures.....															
Brakes and brake rigging.....	2		2	3		3	2		2	3		4	11		24
Couplers.....				2		2	4		1	4		3	4		4
Crank pins, collars, etc.....				2		1	1		1	1		1	4		2
Crossheads and guides.....	1		1	1		1	1		1	2		1	1		1
Cylinder cocks and rigging.....													3		3
Cylinder heads and steam chests.....													1		1
Dome caps.....															
Draft appliances.....										3		3			
Draw gear.....				1		1	1		1	3		3			
Fire doors, levers, etc.....	3		4	2		2	2		2	3		3	10		10
Flues.....	1		1	3		3	6		9	3		3	8		9
Flue pockets.....															
Footboards.....	9		9	8		8	8		8	10		10	15		15
Gage cocks.....										1		1			
Grease cups.....										1		1			
Grate shakers.....	3		3	7		7	6		6	11		11	15		15
Handholds.....	8		8	14		14	11		11	13		1	12		12
Headlights and brackets.....	1		1	1		1	1		1	1		1	3		3
Injectors and connections (not including injector steam pipes).....	9	1	8	3		3	7		7	12		12	10		10
Injector steam pipes.....				1		1							4		5
Lubricators and connections.....	1		1	4		4	2		2	4		4	2		2
Lubricator glasses.....							1		1	1		1			
Patch bolts.....													2		2
Pistons and piston rods.....													3		3
Plugs, arch tube and washout.....				2		2	1		1						
Plugs in firebox sheets.....															
Reversing gear.....	5		7	5		5	9		1	8		6	12		12
Rivets.....										1		1			
Rods, main and side.....	3	1	3				1		2	2		2	5		7
Safety valves.....															
Sanders.....	3		3	1		1	4		4	4		4	4		4
Side bearings.....															
Springs and spring rigging.....	1		1	2		2	3		3	3		3	4		4
Squirt hose.....	4		4	6		6	9		9	14		14	5		5
Stay bolts.....										1		1	4		4
Steam piping and blowers.....	1		1	3		3	3		3	6		4	1		13
Steam valves.....	2		2	3		3	3		3	3		3	6		6
Studs.....															
Superheater tubes.....				1		1	3		3	3		6	2		3
Throttle glands.....	1		1												
Throttle leaking.....				5		5	2		2	1		1	1		1
Throttle rigging.....	5		5	5		5	7		7	11		11	10		10
Trucks, leading, trailing, or tender.....	1		1	2		2	2		2	3		3			3
Valve gear, eccentrics, and rods.....				3		3	3		3	3		3	1		3
Water glasses.....	2		2	1		1	3		3	5		5	4		4
Water-glass fittings.....													3		3
Wheels.....				1		1							1		1
Miscellaneous.....	45		45	61		61	59		59	46		49	74		122
Total.....	122	3	126	167	14	170	169	7	184	228	10	243	341	15	361



RELATION OF DEFECTIVE STEAM LOCOMOTIVES TO ACCIDENTS AND CASUALTIES RESULTING FROM LOCOMOTIVE FAILURES. CHART SHOWING

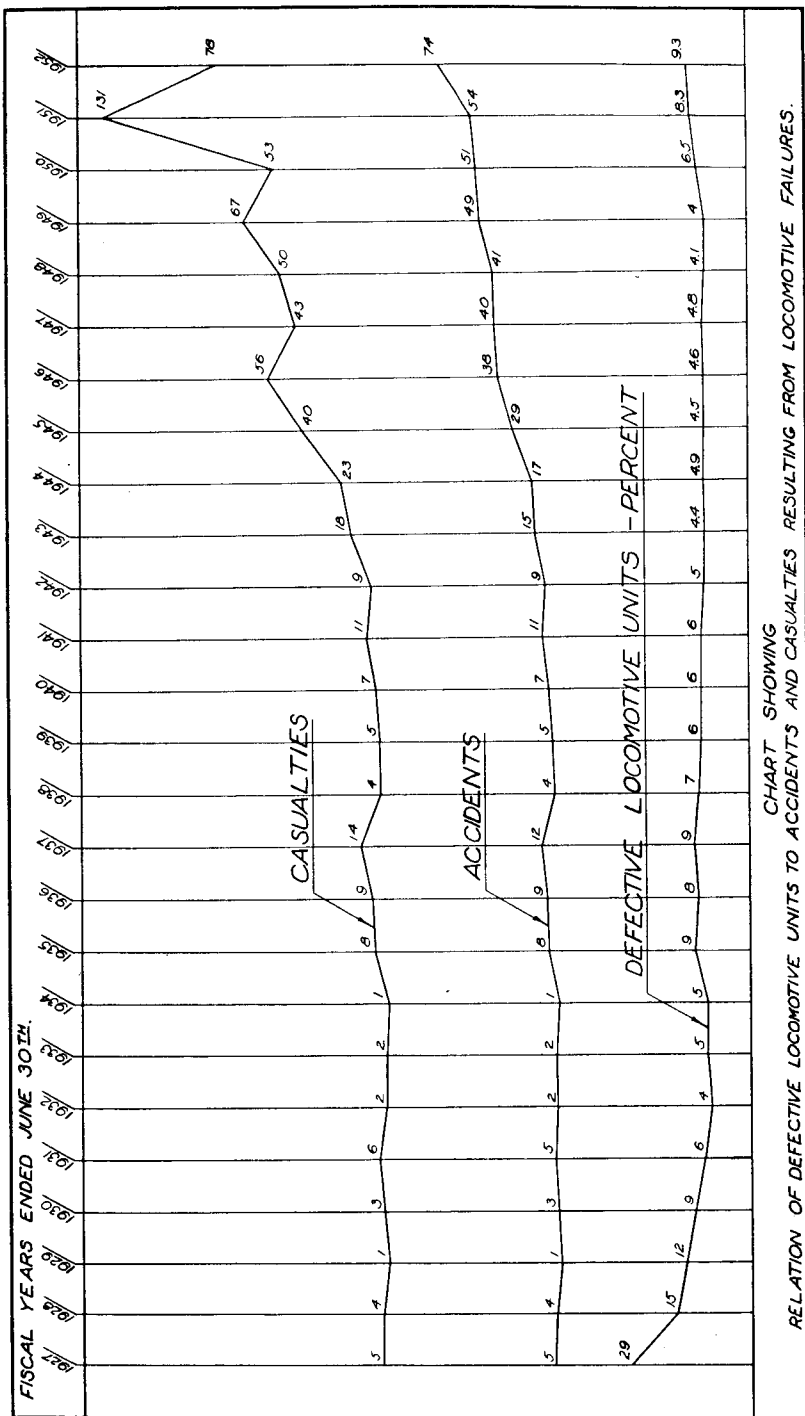


CHART SHOWING RELATION OF DEFECTIVE LOCOMOTIVE UNITS TO ACCIDENTS AND CASUALTIES RESULTING FROM LOCOMOTIVE FAILURES.

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

Part or appurtenance which caused accident	Year ended June 30—														
	1952			1951			1950			1949			1948		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging.....	5	---	6	2	---	3	4	---	4	4	---	5	3	---	6
Carburetors.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Couplers.....	2	---	2	1	---	1	1	---	1	1	---	1	---	---	---
Crank pins and connecting rods.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fires due to overflowing or leakage of fuel, crankcase explosions, back firing, etc.....	7	---	8	9	---	10	4	---	4	8	---	9	3	---	3
Generators and starting devices.....	---	---	---	2	---	2	1	---	1	1	---	1	1	---	1
Insulation.....	---	---	---	1	---	1	1	---	1	1	---	1	---	---	---
Pantographs and trolleys.....	---	---	---	1	---	1	1	---	1	1	---	1	---	---	---
Short circuits.....	9	---	11	9	---	9	2	---	2	6	---	6	7	---	7
Miscellaneous.....	51	1	50	29	1	103	38	2	38	27	---	43	27	---	33
Total.....	74	1	77	54	2	129	51	3	50	49	---	67	41	---	50

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

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
1 Air compressors.....	671	897	719	693	1,007	944
2 Arch tubes.....	12	17	9	11	15	19
3 Ashpans and mechanism.....	59	64	59	52	72	87
4 Axles.....	1	4	1	4	5	6
5 Blow-off cocks.....	299	262	220	220	274	308
6 Boiler checks.....	356	477	386	337	424	428
7 Boiler shell.....	174	226	211	208	298	342
8 Brake equipment.....	1,955	2,453	1,845	1,806	2,617	2,512
9 Cabs, cab windows, and curtains.....	694	1,173	862	781	1,049	1,347
10 Cab aprons and decks.....	295	395	364	355	414	428
11 Cab cards.....	53	83	97	95	109	91
12 Coupling and uncoupling devices.....	42	54	41	42	55	58
13 Crossheads, guides, pistons, and piston rods.....	1,035	1,363	1,100	1,147	1,611	1,683
14 Crown bolts.....	38	52	53	46	78	98
15 Cylinders, saddles, and steam chests.....	908	1,437	1,160	1,155	1,617	2,004
16 Cylinder cocks and rigging.....	328	474	376	356	494	650
17 Domes and dome caps.....	85	131	90	82	142	130
18 Draft gear.....	313	441	368	370	461	449
19 Draw gear.....	189	297	280	300	413	453
20 Driving boxes, shoes, wedges, pedestals, and braces.....	681	1,145	1,037	1,070	1,582	1,580
21 Firebox sheets.....	141	203	181	191	302	257
22 Flues.....	121	184	152	156	201	197
23 Frames, tail pieces, and braces, locomotive.....	368	486	451	451	576	820
24 Frames, tender.....	26	47	34	39	72	63
25 Gages and gage fittings, air.....	136	173	116	118	185	135
26 Gages and gage fittings, steam.....	228	325	272	268	354	358
27 Gage cocks.....	337	495	386	375	474	404
28 Grate shakers and fire doors.....	282	339	326	286	455	444
29 Handholds.....	353	420	439	421	513	469
30 Injectors, inoperative.....	34	60	45	39	66	39
31 Injectors and connections.....	1,615	2,190	1,767	1,795	2,329	2,309
32 Inspections and tests not made as required.....	68	121	122	104	148	350
33 Lateral motion.....	274	465	389	507	821	791
34 Lights, cab and classification.....	44	118	60	58	132	155
35 Lights, headlight.....	100	108	131	118	183	143
36 Lubricators and shields.....	160	222	157	157	236	228
37 Mud rings.....	149	153	145	147	186	217
38 Packing nuts.....	552	638	558	474	456	575
39 Packing, piston rod and valve stem.....	494	765	510	511	658	691
40 Pilots and pilot beams.....	102	124	126	73	132	156
41 Plugs and studs.....	91	117	104	99	169	236

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 the rules	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Reversing gear.....	429	631	404	405	649	528
Rods, main and side, crankpins, and collars.....	990	1,511	1,213	1,408	1,998	2,136
Safety valves.....	39	45	34	45	45	70
Sanders.....	552	806	641	608	597	569
Springs and spring rigging.....	2,424	3,340	2,848	3,177	4,124	4,622
Squirt hose.....	69	90	74	63	93	79
Stay bolts.....	254	280	229	227	292	318
Stay bolts, broken.....	159	282	193	196	258	283
Steam pipes.....	232	342	302	256	435	356
Steam valves.....	146	181	131	133	150	146
Steps.....	561	805	680	652	767	778
Tanks and tank valves.....	980	1,304	1,205	1,228	1,757	1,558
Telltale holes.....	15	33	28	33	60	69
Throttle and throttle rigging.....	608	927	664	709	923	1,026
Trucks, engine and trailing.....	427	700	580	545	812	1,005
Trucks, tender.....	474	710	540	471	652	795
Valve motion.....	437	673	486	484	676	778
Washout plugs.....	266	325	289	268	384	441
Stokers.....	253	306	261	216	270	208
Water glasses, fittings, and shields.....	651	858	907	920	1,039	1,318
Wheels.....	340	536	394	455	779	583
Miscellaneous—signal appliances, badge plates, brakes (hand).....	569	774	652	626	707	870
Number of defects.....	24,738	34,657	28,504	28,642	38,855	41,250
Locomotives reported.....	20,490	26,595	29,743	33,866	37,073	39,578
Locomotives inspected.....	45,220	62,113	66,809	85,353	93,917	94,034
Locomotives defective.....	6,234	7,995	6,740	7,035	9,417	10,248
Percentage of inspected found defective.....	13.8	12.9	10.1	8.2	10.0	10.9
Locomotives ordered out of service.....	370	508	399	436	654	708

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

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
42 Pilots and pilot beams.....	53	36	29	16	23	15
43 Plugs and studs.....	3	3	1	1	1	1
44 Quills.....	15	26	10	9	16	18
46 Rods, main, side, and drive shafts.....	15	2	6	1	5	6
48 Sanders.....	1,202	902	356	151	106	82
49 Springs and spring rigging, driving and truck.....	153	108	103	43	44	63
51 Stay bolts, broken or defective.....	1	1	1	1	1	1
53 Steam pipes.....	89	24	32	17	10	4
54 Steps, footboards, et cetera.....	480	377	284	213	116	68
55 Switches, hand-operated, and fuses.....	18	15	9	1	3	1
56 Transformers, resistors, and rheostats.....	2	9	9	2	6	2
57 Trucks.....	390	234	182	84	65	45
59 Water tanks.....	47	33	20	2	1	2
60 Water glasses, fittings, and shields.....	38	11	27	2	18	8
61 Warning signal appliances.....	117	83	21	9	7	7
62 Wheels.....	230	215	95	98	72	48
63 Miscellaneous.....	638	574	377	109	39	40
Number of defects.....	16,613	11,935	6,325	2,804	1,745	1,442
Locomotive units reported.....	22,716	19,320	15,719	12,692	9,803	7,805
Locomotive units inspected.....	65,263	82,948	42,503	30,684	20,798	13,115
Locomotive units defective.....	6,087	4,375	2,748	1,238	853	633
Percentage of inspected found defective.....	9.3	8.3	6.5	4.0	4.1	4.8
Locomotive units ordered out of service.....	135	106	42	20	21	19

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 published reports of accident investigations were distributed to interested parties and otherwise used in our effort to bring about a diminution in the number of such accidents.

STEAM LOCOMOTIVES

One hundred and twenty-two accidents occurred in connection with steam locomotives resulting in 3 deaths and 126 injuries. This represents a decrease of 45 accidents; 11 in the number of persons killed, and 44 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.

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

Parts defective, inoperative or missing, or in violation of the rules	Year ended June 30—					
	1952	1951	1950	1949	1948	1947
Air compressors.....	206	146	99	26	32	9
Axles, truck and driving.....	3	2	2	1	3	2
Batteries.....	39	85	20	13	8	1
Boilers.....	69	43	46	9	30	5
Brake equipment.....	1,450	1,166	673	299	204	178
Cabs and cab windows.....	813	672	377	159	90	97
Cab cards.....	139	100	75	46	37	29
Cab floors, aprons, and deck plates.....	1,694	1,281	726	234	134	130
Clutches.....	5	4	1	2	2	1
Controllers, relays, circuit breakers, magnet valves, and switch groups.....	222	166	61	35	24	14
Coupling and uncoupling devices.....	76	35	32	15	12	13
Current collecting apparatus.....	5	9	18	20	11	3
Draft gear.....	202	141	91	66	36	30
Draw gear.....	28	46	27	13	8	4
Driving boxes, shoes, and wedges.....	98	38	51	33	16	38
Frames or frame braces.....	33	27	9	5	2	7
Fuel system.....	1,751	1,082	483	191	136	66
Gages or fittings, air.....	110	70	29	11	11	10
Gages or fittings, steam.....	11	14	14	2	2	5
Gears and pinions.....	26	9	15	6	9	1
Handholds.....	127	97	70	53	32	22
Inspections and tests not made as required.....	159	143	116	90	59	78
Insulation and safety devices.....	102	64	48	36	10	11
Internal-combustion engine defects, parts and appurtenances.....	4,768	3,270	1,456	602	241	254
Jack shafts.....	1	5	8	11	5	3
Jumpers and cable connectors.....	191	190	86	8	7	1
Lateral motion, wheels.....	8	11	2	7	18	7
Lights, cab and classification.....	49	23	7	5	5	1
Lights, headlight.....	22	16	9	3	3	2
Meters, volt and ampere.....	41	14	7	3	3	3
Motors and generators.....	674	314	106	46	26	16

During the year 14 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 is an increase of 1 percent from the results of the preceding year. Three hundred and seventy locomotives were ordered withheld from service by our inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this is a decrease of 138 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

Four boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. One person was killed in these accidents and six were injured. There was a decrease of two in the number of boiler explosions; a decrease of two in the number of persons killed and a decrease of seven in the number of persons injured compared with the preceding year.

Three of the explosions occurred on locomotives in freight-train service and one on a locomotive in charge of a watchman. All explosions were caused by overheated crown sheets due to low water. One of the locomotives used in freight service was equipped with a low water alarm which apparently had functioned but no testimony was developed to indicate that the low water alarm warning whistle sounded or was heard by members of the engine crew. In this instance the water level at time of the explosion, as shown by discoloration of crown sheet, had been approximately $7\frac{1}{4}$ inches below the highest part of the crown sheet. In a second explosion involving a locomotive in freight-train service, evidence indicated that absence of a safe water level was known to employees on the locomotive prior to the accident. No defects were found on this and the third freight locomotive which would have contributed to the accidents.

Examination of the boiler that was damaged by explosion while in charge of a watchman disclosed that the left water-gage glass steam pipe was bent downward. The sagged section formed a water trap 17 inches long and $2\frac{1}{2}$ inches deep, which could have resulted in a false water level indication. Discoloration of the crown sheet indicated that the water level had been approximately 4 inches below the highest part of the crown sheet.

Thirty-one boiler and appurtenance accidents other than explosions resulted in 1 fatality and injuries to 30 persons. This is a decrease of 14 accidents, an increase of 1 in number of persons killed and a decrease of 16 in number of persons injured as compared with the preceding year.

EXTENSION OF TIME FOR REMOVAL OF FLUES

Eight hundred and forty-five applications were filed for extension of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 93 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Eight were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Thirty-five extensions were granted after defects disclosed by our investigations were required to be repaired. Forty-four applications were canceled for various reasons. Six hundred and sixty-five applications were granted for the full period requested.

LOCOMOTIVE UNITS PROPELLED BY POWER OTHER THAN STEAM

Seventy-four accidents, resulting in 1 death and injuries to 77 persons occurred in connection with locomotive units propelled by power other than steam. This represents an increase of 20 in the number of accidents, a decrease of 1 in number of persons killed and a decrease of 52 in the number of persons injured compared with the preceding year.

During the year 9.3 percent of the locomotive units inspected by our inspectors were found with defects or errors in inspection that should have been corrected before the units were put into use; this represents an increase of 1 percent compared with the results obtained in the preceding year. One hundred and thirty-five locomotive units were ordered withheld from service by our inspectors because of the presence of defects that rendered the units immediately unsafe; this represents an increase of 29 units compared with the preceding year.

The chart on page 6 shows the relation between percentage of defective locomotive units and the number of accidents and casualties resulting from failures thereof, and illustrates the effect of operating locomotives other than steam in defective condition.

Detailed results of our inspections of locomotive units other than steam are shown in table XIII.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 61 specification cards and 2,277 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, 3,781 specifications and 636 alteration reports were filed for locomotive units and 839 specifications and 267 alteration reports were filed for boilers mounted on locomotive units other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

RECOMMENDATION

In recent years there has been a revolutionary change in railroad motive power from steam locomotives to Diesel-electric locomotives. This transition will probably continue. Present general use of the two types of locomotives has increased the responsibility placed upon our inspectors and requires that incumbents and candidates for position of inspector of locomotives be men of wider experience and training than was formerly required. Increase in salaries and improvement in working conditions of men employed in positions on railroads, duties of which provide qualifying experience required of applicants for position of inspector of locomotives, have caused difficulty in obtaining replacements for inspectors who retire or leave the service. Our inspectors must be men of good moral character and habits; active, intelligent, and discreet; of good speech and manner and qualified to address and confer with railroad officers as occasion may require. They must have extensive background of experience and training and a wide general and technical knowledge of construction, repair, and operation of steam and Diesel-electric locomotives as well as electric locomotives and locomotives propelled by other types of self-contained power and appurtenances thereto. They are clothed with wide authority and therefore must be men of mature experience and capable of exercising sound administrative judgment under greatly varied circumstances. They must be capable of discharging the duties of their position after a short period of orientation. In order to obtain and retain men of the caliber required, the salary of the position of inspector of locomotives should be commensurate with the required qualifications and the responsibilities imposed and should be comparable with salaries paid in the positions from which we necessarily recruit personnel.

I therefore recommend that the position of inspector of locomotives be allocated to the next salary grade above that presently designated.

APPEALS

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

ACKNOWLEDGMENT

The Bureau personnel is commended for cooperation and effective discharge of the duties of their respective positions under adverse circumstances resulting from an increased work load.

EDWARD H. DAVIDSON,
Director.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1952, BY ROADS

[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.]

ATCHISON, TOPEKA & SANTA FE RAILWAY:

August 16, 1951, locomotive 802, Calwa, Calif. Loose boards under cab seat shifted, causing employee to fall from cab seat; one injured.

September 6, 1951, locomotive 3122, Winslow, Ariz. Top of tender behind fuel space was obstructed by a plank; one injured.

November 24, 1951, locomotive 3776, Emporia, Kans. No. 2 tender truck brake cylinders were slow in releasing; brake cylinder cut-out cocks were not equipped with side vents in accordance with carrier's standard; one injured.

January 14, 1952, locomotive 3176, Wellington, Kans. Sand dome cover fell from locomotive; safety chain was disconnected at split link which had opened; one injured.

April 21, 1952, locomotive 976, Albuquerque, N. Mex. Rung of ladder on rear end of tender broke through old fractures in fillets at both reduced ends where inserted in side rails of ladder; one injured.

Five accidents; five injured.

BALTIMORE & OHIO RAILROAD:

**November 20, 1951, locomotive 4442, near Newark, Del. Tender water-level gage was inoperative. Employee was struck by an overhead bridge while going to top of tender to check the amount of water in the tank; one injured.

December 7, 1951, locomotive 4596, Sandusky, Ohio. Insufficient clearance between cab gangway handhold and tender step when on sharp curve; one injured.

December 9, 1951, locomotive 7157, near Paint Creek, Pa. Inspirator water regulating valve bonnet blew out of threaded connection to inspirator operating valve body; apparently valve had not been properly reapplied after recent classified repairs; one injured.

January 4, 1952, locomotive 7609, near Rawlings, Md. Injector starting valve extension rod became disconnected due to bolt at connection to starting valve handle being missing; use of feed water pump was discontinued at start of trip because of its unsatisfactory operation; feed water pump had been reported on December 4, 12, 19, and 22; one killed.

January 15, 1952, locomotive 4876, near Shober, Pa. Cab gangway handhold fouled tender deck when on sharp curve; one injured.

February 22, 1952, locomotive 4521, Glenwood, Ind. Crown-sheet failure caused by overheating due to low water; three injured.

Six accidents; one killed, seven injured.

BOSTON & MAINE RAILROAD:

**March 21, 1952, locomotive 444, Somerville, Mass. Hot water discharged from sprinkler hose account of leaky boiler check and hose shut-off valve; one injured.

One accident; one injured.

CENTRAL RAILROAD OF NEW JERSEY:

February 16, 1952, locomotive 22, Elizabethport, N. J. Fire tool bracket broke at electric weld which joined U-shaped section to supporting member; weld was defective; one injured.

One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

**August 3, 1951, locomotive 2707, Russell, Ky. Pin in handle of reverse wheel broke; one injured.

One accident; one injured.

CHICAGO & ILLINOIS MIDLAND RAILWAY:

April 13, 1952, locomotive 752, Hill Top, Ill. Grate shaker bar slipped off shaker lever; shaker bar safety pin was useless because it had been left hanging below cab floor when floor had been repaired and could not be lifted to usual position; one injured.

One accident; one injured.

CHICAGO & NORTH WESTERN RAILWAY:

January 15, 1952, locomotive 1822, Vesper, Wis. Crown-sheet failure caused by overheating due to low water; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

July 30, 1951, locomotive 322, Harlowton, Mont. Dynamo valve packing nut was leaking; one injured.

One accident; one injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD:

January 24, 1952, locomotive 1722, South Chicago, Ill. Employee slipped on ice on top of tender feed water tank while attempting to take water; no water crane hook was provided; one injured.

One accident; one injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

January 24, 1952, locomotive 1196, Salt Lake City, Utah. Running board below sand dome was not roughened; one injured.

One accident; one injured.

EL DORADO & WESSON RAILWAY:

February 7, 1952, locomotive 16, Wesson, Ark. Crown-sheet failure caused by overheating due to low water; sag in left water-glass steam pipe, 17 inches long and 2½ inches deep, formed a water trap near top connection; left tank hose strainer was partially stopped up with waste and scale; one injured.

One accident; one injured.

ERIE RAILROAD:

July 15, 1951, locomotive 244, Youngstown, Ohio. Fire hose burst; hose badly worn and deteriorated; one injured.

One accident; one injured.

GULF COAST LINES:

**September 14, 1951, locomotive (St. L. B. & M.) 1154, DeQuincy, La. Fire door fouled firebox combustion air conduit; fire door hinge pin holes were worn, permitting door to sag when in open position; conduit was applied ¾ inch high on one side; one injured.

One accident; one injured.

GULF, COLORADO & SANTA FE RAILWAY:

October 16, 1951, locomotive (A. T. & S. F.) 3528, Coleman, Tex. Oil on top of tender fuel oil tank; one injured.

April 6, 1952, locomotive (A. T. & S. F.) 1910, Sweetwater, Tex. Water glass burst; one injured.

Two accidents; two injured.

ILLINOIS CENTRAL RAILROAD:

July 4, 1951, locomotive 2514, near Mattoon, Ill. Hot water squirt hose pipe line blew from fitting in cab adjacent to boiler backhead; nipple of squirt hose pipe line had been applied cross-threaded and entered elbow fitting less than two full threads; one injured.

**October 5, 1951, locomotive 2540, near Thawville, Ill. Blow-off cock operating rod unexpectedly dropped to closed position and stop pin in rod struck employee's foot; notch provided on operating rod to hook on floor plate and secure rod in open position was badly worn; stop pin extended ¾ inch outside fit in rod; one injured.

October 10, 1951, locomotive 2449, Perryville, Ill. Flue failed at back flue sheet; flue had been excessively worked and wall thickness at point of failure was reduced to ¼ inch; opening in cab floor around stoker steam jet pipes was excessive; one injured.

May 13, 1952, locomotive 2619, Effingham, Ill. Boiler check stuck open; stem of injector delivery pipe check valve was broken off and in branch pipe below boiler check; injector overflow muffler and pipe connecting muffler to injector were missing, resulting in violent discharge from overflow which created a large hole beside the track, filled with hot water and steam, into which employee fell when leaving the locomotive to obtain assistance; one injured.

Four accidents; four injured.

KANSAS CITY SOUTHERN RAILWAY:

December 22, 1951, locomotive 762, Stotesbury, Mo. Classification light bulb burned out; employee fell from front end of locomotive after making repairs, due to section of handrail which extended down in front of smokebox door ring becoming disconnected at union to handrail on side of locomotive; one injured.

One accident; one injured.

LOUISVILLE & NASHVILLE RAILROAD:

October 22, 1951, locomotive 1309, Dorchester Junction, Va. Cab ventilator hinges were broken; one injured.

One accident; one injured.

MISSOURI PACIFIC RAILROAD:

May 4, 1952, locomotive 9765, El Dorado, Ark. Hinge on tender water tank manhole cover was broken; one injured.

May 4, 1952, locomotive 1485, Alexandria, La. Oil on top of flue cleaning sand box; one injured.

May 9, 1952, locomotive 1570, North Little Rock, Ark. Water column steam pipe threaded flange connection separated from water column due to stripped threads on water column; appearance of torn-off brass water-column threads remaining in flange threads indicated they had been stripped for some time; one injured.

Three accidents; three injured.

NEW YORK CENTRAL SYSTEM:

**July 30, 1951, locomotive 1358, Rensselaer, N. Y. Injector steam ram packing nut was leaking due to packing being hard and worn; steam rams reported to be packed on July 30 (before accident) and 31; one injured.

October 20, 1951, locomotive 1305, Pana, Ill. Excessive lost motion in throttle rigging; one injured.

**November 3, 1951, locomotive 2843, Indianapolis, Ind. Handrail failed at coupling near front end of locomotive and vertical section swung outward, pulling handrail column from smokebox front ring; brass fitting in conduit union in handrail had broken and was missing; nut was missing from bolt connecting handrail column to smokebox ring; one injured.

December 10, 1951, locomotive 7701, East Toledo, Ohio. Main throttle stem packing blew out; nuts for securing packing gland were partially backed off studs, allowing packing rings to work out between stuffing box and end of packing gland; no lock nuts on the studs though print shows lock nuts used in original application; one injured.

December 18, 1951, locomotive 5278, Harmon, N. Y. Part of cab deck wooden flooring was badly deteriorated; one injured.

December 18, 1951, locomotive 2914, Indianapolis, Ind. Bottom gangway step was missing; step had been broken off en route; one injured.

December 25, 1951, locomotive 4930, Indianapolis, Ind. Handwheel of Precision reverse gear suddenly spun out of control and struck employee's arm; valve gear was fouled; one of three bolts connecting two sections of radius bar was missing and radius bar was bent; one injured.

January 15, 1952, locomotive 5308, near New London, Ohio. Rear end collision involving a passenger train which was stopped on a main track because of reverse gear failure on its leading locomotive; Precision power reverse gear broke off through the four bracket lugs; one rear lug showed old fracture and bolts in both rear lugs were loose; crank arm bolts were worn and crank arm was loose on main pin; left main piston valve was dry; left terminal check was leaking; three injured.

March 15, 1952, locomotive 2972, Adrian, Mich. Mechanically operated fire door was inoperative and fire door handle for manual operation was missing; "Fire door not working" was reported on March 14; one injured.

Nine accidents; 11 injured.

NEW YORK, CHICAGO & ST. LOUIS RAILROAD:

September 27, 1951, locomotive 906, Toledo, Ohio. Inoperative water-column drain line on locomotive on outbound track; "Drain to water column plugged at valve" was reported at end of previous trip; one injured.

November 23, 1951, locomotive 278, Canton, Ohio. Loosened brake beam safety hanger fell to roadbed, buckled and struck employee who was riding on engine footboard; one injured.

Two accidents; two injured.

NORFOLK & PORTSMOUTH BELT LINE RAILROAD:

March 17, 1952, locomotive 61, Belt Junction, Va. Insufficient clearance between vertical handhold on rear of cab and tender deck while on a sharp curve; one injured.

One accident; one injured.

NORFOLK & WESTERN RAILWAY:

March 21, 1952, locomotive (Southern) 791, Bristol, Va. Throttle flew open; balancing chamber was worn where ring on balancing portion of valve had been working; "Throttle is bad about jumping wide open when engineer tries to open it" was reported on March 14; one injured.

One accident; one injured.

NORTHERN PACIFIC RAILWAY:

September 6, 1951, locomotive 1174, Pasco, Wash. Air compressor did not operate properly; compressor final discharge valve guide was leaking; steam gage was 7 pounds high, and steam pressure 12 pounds low; compressor was reported on August 13, 14, 15, 18, and 19, and September 4, 5, 7, 13, 14, 15, 29, and 30; one injured.

September 10, 1951, locomotive 1819, Superior, Wis. Cab ventilator adjusting rod broke through old fracture; one injured.

February 26, 1952, locomotive 1570, Maple, Wis. Crown-sheet failure caused by overheating due to low water; one killed, one injured.

March 25, 1952, locomotive 2435, Glenwood, Minn. Right Nos. 1 and 2 driving wheel springs broke and spring hangers worked off both ends of left No. 2 driving spring; one injured.

Four accidents; one killed, four injured.

NORTHWESTERN PACIFIC RAILROAD:

August 22, 1951, locomotive (S. P.) 2513, Willits, Calif. Cab gangway handhold was broken at lower end; failure occurred through old fracture at bolt hole; one injured.

One accident; one injured.

PENNSYLVANIA RAILROAD:

July 16, 1951, locomotive 4625, en route Southport, N. Y., to Troy, Pa. Rough riding tender; intermediate wheels of rear truck were 1 inch greater in diameter than front and rear wheels, with no means provided to compensate for the difference, and rear truck side frame equalizer seats were worn; "Brakeman's cab on tank rides very rough, impossible for brakeman to ride in it" was reported at end of the trip and similar reports were made on July 22 and 23; one injured.

July 22, 1951, locomotive 6469, near Worthington, Ohio. Blower operating rod was bent; bolts missing from clamp on pipe line to main reservoir; clamp twisted on pipe and fouled blower valve arm; one injured.

July 23, 1951, locomotive 6436, Blairsville, Pa. Grates did not operate properly; "Examine front shaker grates, too much fire going through" was reported 13 hours prior to accident; one injured.

July 24, 1951, locomotive 431, Toledo, Ohio. Main steam heat valve at steam dome and union in steam heat pipe under tender were leaking, resulting in unexpected discharge of hot water and steam at steam heat connection at rear of tender; leaks in steam heat pipe were reported on July 11 and 12; one injured.

July 26, 1951, locomotive 587, Pavonia, N. J. Welding applied to hold hinges of door on brakeman's cabin broke from door post, permitting door to fall; door was not applied in accordance with the carrier's specifications; one injured.

September 17, 1951, locomotive 3599, Phillipston, Pa. Pin worked out of grate shaker reach rod at grate connecting rod; pin was not standard and no means provided to secure pin in place; one injured.

November 13, 1951, locomotive 1451, near Trotwood, Ohio. Left lower guide broke through old fracture at a stud hole which had been plugged and ends welded over; failed guide had previously been used as a top guide and fitted with two studs to hold valve crosshead stand; one injured.

February 1, 1952, locomotive 8041, Frankford, Pa. Backfire from firebox of oil-burning locomotive; oil burner was not properly adjusted and alined, and opening of steam automatization port was less than carrier's standard; engine not steaming properly and/or making excessive black smoke were reported 16 times since January 1; firebox door did not operate properly due to excessive wear; one injured.

February 9, 1952, locomotive 9985, Chicago, Ill. Injector steam packing nut blew off; injector steam bonnet threads were worn and crossed and packing nut was worn and poor fit on steam bonnet; packing nuts reported leaking on February 2, 4, 5, 7, and 9; one injured.

March 31, 1952, locomotive 6425, Etna, Pa. Bottom coal gate extension slide plate stuck in guide; slide plate was bent and its edge mushroomed; handhold for positioning slide plate was missing from plate; one injured.

Ten accidents; 10 injured.

PENNSYLVANIA-READING SEASHORE LINES:

July 20, 1951, locomotive (Reading) 130, near Delair, N. J. Main rod broke through progressive fracture at gall mark under habbitt-metal liner at front end of bottom section of brass fit in outside face of rod and end of rod dropped to roadbed and was thrown upward and back, striking the boiler and punching holes in outside and inside throat sheets; one killed, one injured.

One accident; one killed, one injured.

PITTSBURGH & LAKE ERIE RAILROAD:

July 14, 1951, locomotive 202, McKees Rocks, Pa. Whistle did not function properly; a wooden wedge had been inserted between whistle operating lever and bowl which prevented whistle valve from opening sufficiently; one injured.

November 30, 1951, locomotive 9518, McKees Rocks, Pa. Auxiliary cab seat collapsed due to failure of fusion welding which secured seat hinge pin; one injured.

January 11, 1952, locomotive 8014, Dickerson Run, Pa. Air compressor governor air pipe broke off at connection to main reservoir; old fracture extended through more than 75 percent of cross-sectional area at point of failure; one injured.

May 13, 1952, locomotive 8059, Youngstown, Ohio. Throttle lever stuck in quadrant in wide-open position, due to an improperly repaired lever latch and quadrant assembly; one injured.

Four accidents; four injured.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

**February 19, 1952, locomotive 615, Washington, D. C. Gasket of reflex type water glass blew out; one injured.

One accident; one injured.

SANTA MARIA VALLEY RAILROAD:

November 16, 1951, locomotive 100, Battles, Calif. Tender truck axle broke through old fracture; one injured.

One accident; one injured.

SEABOARD AIR LINE RAILROAD:

March 13, 1952, locomotive 421, Greenwood, S. C. Tender water tank man-hole cover fell from raised position and struck employee's foot; one of two hinge bolts was broken; both hinge bolts and the rivets securing one hinge and the handle on cover were badly deteriorated; one injured.

June 20, 1952, locomotive 417, Apex, N. C. Steam whistle inoperative because whistle lever was disconnected from operating rod; oil on running board and cab footrail; employee slipped from footrail and fell to ground after making emergency repairs to whistle; one injured.

Two accidents; two injured.

SOUTHERN RAILWAY:

July 16, 1951, locomotive 6323, near Alpine, Ky. Lid on tender supply box was not secured; equipment fell from box and struck employee; no means provided to fasten supply box lid in closed position; one injured.

September 15, 1951, locomotive 1880, Charlotte, N. C. Locomotive was slipping; sander was inoperative; one injured.

May 26, 1952, locomotive 6315, Ludlow, Ky. Oil on deck of engine; one injured.

Three accidents; three injured.

SOUTHERN PACIFIC—LINES WEST:

**July 13, 1951, locomotive 3657, Alviso, Calif. Engine deck was wet and slippery account overflowed drinking water container; one injured.

July 19, 1951, locomotive 4202, Anapra, N. Mex. Squirt hose valve worked open; packing nut and packing were loose; one injured.

**July 20, 1951, locomotive 1236, Oakland, Calif. Cushion fell from cab seat while employee was attempting to open throttle; cushion was not secured to seat and throttle lever worked hard; "Fasten Engr. cushion to seat box" was reported on July 16; one injured.

July 22, 1951, locomotive 3627, Antelope, Calif. Brakeman's seat in cab unexpectedly dropped from partially lowered position; pipe supporting seat was bent near lower end, causing seat sliding tube to bind and stop downward movement of seat approximately 7 inches above the lowered position until vibration of seat and weight of employee caused it to fall; metal seat frame projected above the seat cushion; one injured.

July 30, 1951, locomotive 2518, Redding, Calif. Employee slipped and fell from main rod while oiling valve gear; oil, grease, and dirt on rods; one injured.

August 7, 1951, locomotive 1217, Oakland, Calif. Side rod was bent inward and was contacting driving wheels; one injured.

August 14, 1951, locomotive 1287, San Francisco, Calif. Injector broke while employee was under back end of firebox removing carbon from damper hopper; one injured.

August 28, 1951, locomotive 4320, Niles, Calif. Part of running board beneath train number indicator box was covered with accumulation of oil, grease, and dirt and was obstructed by a pipe clamp and numerous square-headed bolts which protruded above the surface of running board; one injured.

September 5, 1951, locomotive 2551, Suisun, Calif. Boiler check valve was leaking; "Grind in left boiler check" was reported on September 2 and 3 and similar reports were made 24 times in the 30 days following the accident; one injured.

September 13, 1951, locomotive 4178, Likely, Calif. Oil and dirt on tender fuel-oil tank, gangway steps and handholds, and deck between locomotive and tender; fuel tank and/or deck reported to be cleaned on August 18 and 19 and September 4, 6, 11, and 13; one injured.

**September 25, 1951, locomotive 2481, Tracy, Calif. Oil on gangway handholds; one injured.

October 7, 1951, locomotive 3708, Lodi, Calif. Roughening near outer edge of gangway step was worn smooth; one injured.

**November 16, 1951, locomotive 4316, Turlock, Calif. Case for holding inspection reports and other records fell from position at top of cab; five of six wood screws provided to fasten case to cab ceiling boards were missing and the one remaining screw was loose; one injured.

November 27, 1951, locomotive 3201, Garlock, Calif. Employee fell from tender running board while going to check the amount of water in tender tank; steel cover over opening between tender fuel-oil tank and water tank extended over part of running board, reducing the usable width of running board to 8 inches, or 2 inches less than the prescribed standard width, at the point of the fall; one injured.

**December 11-12, 1951, locomotive 3687, en route Ben Ali to Lathrop, Calif. Boiler feed pump gage pipe connection under boiler jacket in cab was leaking and leakage fell on boiler sheet, resulting in steam being blown into cab; bad steam leak under boiler jacket was reported on November 23 and 25 and December 1, 4, 9, and 11; one injured.

December 16, 1951, locomotive 3694, El Paso, Tex. Peep-hole swing type fire door was defective and did not prevent excessive flames from escaping into cab when explosion occurred in firebox of oil-burning locomotive; fire-door latch

would not go down in its slot properly; lock for securing latch in closed position and stud for securing the lock were missing; fire did not burn properly account of oil in tank not heated sufficiently to flow freely; two injured.

December 21, 1951, locomotive 3318, Westley, Calif. Roughening on cab windsheet step was worn smooth; one injured.

January 17, 1952, locomotive 2449, Merced, Calif. Air compressor was inoperative; one injured.

January 22, 1952, locomotive 5023, near Grape, Calif. Cushion fell from brakeman's cab seat while seat was in elevated storage position; cushion was not fastened to seat; one injured.

January 22, 1952, locomotive 5026, Loma Linda, Calif. Main steam throttle stuck in partly open position; valve rings in throttle were burred and sticking in grooves; preliminary admission valve had 1/16-inch lift instead of standard 3/16-inch lift; one injured.

February 9, 1952, locomotive 4188, Burbank Junction, Calif. Loose particles of asbestos lagging in cab blew into employee's eyes; cab had not been properly cleaned after lagging had been applied to boiler; one injured.

February 23, 1952, locomotive 1623, Yuma, Ariz. Insufficient clearance between steam valve to power reverse gear and reverse gear lever when in extreme forward motion; one injured.

March 12, 1952, locomotive 4227, Cantil, Calif. Oil and dirt on locomotive deck, top of tender fuel-oil tank, and tank steps and handholds; drain valve in emergency fuel-oil shut-off valve housing was partially open; one injured.

March 15, 1952, locomotive 5043, Kino, Ariz. Sand did not feed to front sand pipes; one injured.

March 21, 1952, locomotive 4173, Norden, Calif. Employee slipped and fell from locomotive which was covered with ice and snow; one injured.

March 22, 1952, locomotive 3216, West Oakland, Calif. Oil on cab deck; one injured.

March 30, 1952, locomotive 4338, Bayshore, Calif. Drain plug in hydrostatic lubricator was loose, permitting hot oil to blow out with force and splatter about in the cab; threads on drain plug and the head of plug were badly worn; one injured.

March 30, 1952, locomotive 3313, Tracy, Calif. Pilot beam handhold broke through old fracture at bend; one injured.

May 20, 1952, locomotive (F. C. P.) 3446, Tucson, Ariz. Bonnet blew out of injector steam pipe turret valve; bonnet was threaded with 12 V-type threads per inch and valve body with 14 threads per inch and threads on bonnet and valve were badly worn; one injured.

May 20, 1952, locomotive 4374, Portland, Oreg. Oil on tender deck; one injured.

May 22, 1952, locomotive 1814, Sacramento, Calif. Employee's foot slipped from combination footboard and pilot and was caught under footboard of locomotive which was moving forward in switching service; locomotive, which was designed for road service, did not afford proper vision from the cab of employees on front and rear footboards; one injured.

May 27, 1952, locomotive 3257, Prospero, Calif. Reverse motor lever sprang back when released and struck employee's hand; one injured.

June 1, 1952, locomotive 4149, Loma Linda, Calif. Throttle lever fulcrum pin broke; 90 percent old break in fulcrum pin; one injured.

June 4, 1952, locomotive 4420, Sacramento, Calif. Pilot step was worn smooth; one injured.

June 5, 1952, locomotive 3251, Maricopa, Ariz. Water spout hook slipped from water spout, causing employee to lose balance and fall on top of tender; fuel oil on top of tender fuel-oil tank and on water spout hook; one injured.

June 7, 1952, locomotive 4155, near East Applegate, Calif. Excessive smoke, gas, and steam surrounded locomotive while moving in tunnel; piston rod packings were blowing, steam pipe joints blowing, and valve rings worn and valves blowing; one injured.

June 29, 1952, locomotive 4344, San Jose, Calif. Ashpan damper was stuck shut by an accumulation of heavy fuel-oil residue; one injured.

Thirty-seven accidents; 38 injured.

TEXAS & PACIFIC RAILWAY:

July 6, 1951, locomotive 662, Quincy, Tex. Boiler check stuck in open position, resulting in tank hose being blown from connections; delivery pipe line check stem was badly bent; boiler check was defective and leaking; "Grind in left boiler check" was reported on July 3; one injured.

August 26, 1951, locomotive 807, Natchitoches, La. Insufficient clearance between train steam heat rear shut-off valve handle and auxiliary water tank pipe connection union under rear of tender prevented steam heat valve from being opened fully; steam heat shut-off valve extension rod latch bracket was bent; one injured.

Two accidents; two injured.

UNION PACIFIC RAILROAD:

November 16, 1951, locomotive (L. A. & S. L.) 5526, Wyuta, Wyo. Employee started to attend defective injector, slipped on accumulation of ice and snow and fell from running board. Handholds were iced and slippery. Injector, feed water pump, and boiler checks had been reported numerous times since October 1. Feed water pump gage defective and indicated incorrect pressures; one injured.

February 9, 1952, locomotive 9056, Onaga, Kans. Front headlight failed; one injured.

Two accidents; two injured.

VIRGINIAN RAILWAY:

July 30, 1951, locomotive 716, near Harper, W. Va. Driving box ran hot; locomotive reported riding rough on July 16, 18, 19 (two times), 20, 24, 25 (two times), 27, 28 (two times), 29 (two times), and 30 (after accident); one injured.

August 31, 1951, locomotive 460, Norfolk, Va. Extension handle to injector priming valve separated from universal joint attached to priming valve stem; cotter key was missing; badly worn universal joint and extension handle fittings caused excessive strain on cotter key when priming valve was operated; one injured.

**September 30, 1951, locomotive 469, en route Roanoke, Va. to Charleston, W. Va. Rough riding locomotive; "Engine riding rough, something striking frogs" was reported on September 22; one injured.

October 8, 1951, locomotive 506, Victoria, Va. Blow-off cock was leaking; one injured.

October 18, 1951, locomotive 212, Victoria, Va. Ashpan hoppers were difficult to open; one injured.

**December 27, 1951, locomotive 716, Jenny Gap, W. Va. Injector starting valve stuck in open position. Employee was injured while attempting to close injector throttle valve at turret; throttle valve stem nut was distorted and loose; one injured.

June 5, 1952, locomotive 508, Seneca, Va. Coal on top of tender back of fuel space; one injured.

Seven accidents; seven injured.

WHEELING SEEL CORPORATION:

December 21, 1951, locomotive 116, Steubenville, Ohio. Head blew from main air reservoir due to excessive pressure; air compressor did not operate properly; section of air cylinder block on compressor containing discharge valves and connection for discharge pipe had been hot; discharge valves and seats were worn and pitted; no cooling coil between compressor and reservoir; packing leather in tender brake cylinder was leaking badly; air-brake system had been reported defective 17 times since November 11; 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, 1952, BY ROADS

[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:

July 17, 1951, unit 2318, Los Angeles, Calif. Oil and water on running board; drinking-water cooler was on running board; one injured.

September 6, 1951, unit 2670, Rheem, Calif. Foreign particle entered employee's eye when exhaust from automatic brake valve blew across the cab; preliminary and service exhaust ports of brake valve opened toward left side of cab and no protection was provided from the exhaust; one injured.

September 11, 1951, unit 2335, Los Angeles, Calif. Train line air pipe was too long, causing train line angle cock to foul rear coupler when coupler was in extreme right position; one injured.

October 29, 1951, unit 2319, Los Angeles, Calif. Employee fell while attempting to sit down on a loose wooden packing case in cab of switching unit; proper seats not provided in the cab for the yard crew; one injured.

December 16, 1951, unit 177-C, Chicago, Ill. Cab step at gangway had insecure footing; tread plate was worn at and near outside edge and depth of tread plate was restricted to 3¼ inches by kick plate; one injured.

December 26, 1951, unit 2267, near Amarillo, Tex. Engine cooling water pump packing gland was leaking; leak was reported before locomotive left engine-house and the repairs made were inadequate; one injured.

January 6, 1952, unit 90, near Mojave, Calif. Bolt dropped from lug at bottom of cab seat cushion plate and fell into swivel in seat frame, restricting movement of seat; one injured.

June 2, 1952, unit 2417, Barstow, Calif. Safety guard for cab heater circulating fan was missing, permitting employee's hand to be struck by moving fan blade; one injured.

June 3, 1952, unit 2343, Los Angeles, Calif. Rear platform of Diesel-electric switching unit was obstructed by train line air hose extension; one injured.

Nine accidents; nine injured.

ATLANTIC COAST LINE RAILROAD:

January 5, 1952, unit 242, Sebring, Fla. Cab door was obstructed by a fire extinguisher which was fastened to cab wall and seated on cab floor near the door; one injured.

**February 5, 1952, unit 699, Jacksonville, Fla. Employee stumbled on a car replacer which was on running board and fell to the ground; car replacer was last used 6 hours prior to the accident; car replacer bracket was not readily accessible; one injured.

Two accidents; two injured.

BOSTON & MAINE RAILROAD:

February 9, 1952, unit 1168, East Deerfield, Mass. Oil on rear platform and gangway steps and handholds; oil sprayed from end of fuel tank filling pipe which extended above platform; "Fuel oil tank gets pressure when engine is setting still and throws oil out spout, covering steps and hand rails and end of cab" was reported on February 10; one injured.

One accident; one injured.

CHESAPEAKE & OHIO RAILWAY:

April 1, 1952, unit 7014, Muncie, Ind. An air box hand hole cover blew off; hand hole cover cross bar locator was broken and about one-half of it was missing, permitting cross bar which secured the cover to shift from position and become disengaged; one injured.

One accident; one injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

February 1, 1952, unit 1622, Milwaukee, Wis. Front headlight did not operate properly due to intermittent short circuit. Employee slipped on grease on running board directly below ladder rungs and fell from running board; "Headlight switch B. O. lights go on and off" was reported on January 29 and 31, and "Clean grease off left running board" was reported on January 31; one injured.

One accident; one injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD:

**May 2, 1952, unit 648, Topeka, Kans. Oil on engine room floor; engine room reported to be cleaned numerous times in the 30 days preceding the accident; one injured.

June 4, 1952, unit 102-B, County, Iowa. Crankcase explosion, resulting from an overheated main bearing; exhaust valves of 11 cylinders were leaking freely; two fuel-oil injectors were defective and not properly atomizing the oil; lubricating oil relief valve stem was galled and valve was held off its seat; lubricating oil cooling radiator core was solidly plugged, resulting in excessively hot oil; No. 4 main bearing shell was turned until it blocked the oil passage from lubricating oil header; one injured.

June 20, 1952, unit 635, near Union City, Okla. Crankcase explosion resulting from overheated main bearings; low oil pressure; hot engine alarm, lubricating oil suction gage, lubricating oil strainers, oil pressure relief valve, and filters were defective; one injured.

Three accidents; three injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

February 14, 1952, unit 954, Glenburn, Pa. Air valve stuck in magnet valve of electrical governor for air compressor; one injured.

One accident; one injured.

ERIE RAILROAD:

December 18, 1951, unit 602, Middletown, N. Y. Wet and packed snow accumulated on steps and footboards; handholds of unit were wet and slippery; one killed.

February 11, 1952, unit 860, Rutherford, N. J. Unit separated from car due to coupler knuckles on unit and car opening; one injured.

June 21, 1952, unit 706-A, Binghamton, N. Y. Cab seat fell over backward; two front bolts for fastening swivel plate to base were missing and one bolt was loose; inside back rest bracket iron at fastening to seat base was ground down at bolt hole and broken; bolt holes in hinges on back rest were worn, permitting back rest to tip back excessively; one injured.

Three accidents; one killed, two injured.

GREAT NORTHERN RAILWAY:

May 25, 1952, unit 5006-A, Leavenworth, Wash. Motoring line contactor would not close or stay closed. Electric flash occurred when high voltage cabinet was opened to examine contactors; cover plate guarding high tension contactors was not securely fastened in place and not kept marked with the word "Danger" and the normal voltage carried, as required by rule 245; two injured.

One accident; two injured.

GULF, MOBILE & OHIO RAILROAD:

April 24, 1952, unit 2503, Fruitland, Tenn. High voltage air compressor switch flashed, resulting in switch cabinet explosion; switch contactors had poor contact; one injured.

One accident; one injured.

HOUSTON BELT & TERMINAL RAILWAY:

December 19, 1951, unit (St. L. B. & M.) 4113, Houston, Tex. Oil on running board; one injured.

May 30, 1952, unit (St. L. B. & M.) 9165, Houston, Tex. Uncoupling lever on unit became disengaged from bridle while attempt was being made to uncouple unit from car, resulting in sudden release and jerk of lever; outside brackets on uncoupling levers were improperly located, allowing excessive end play; one injured.

Two accidents; two injured.

ILLINOIS TERMINAL RAILROAD:

January 4, 1952, unit 1597, near Girard, Ill. Trolley pole hook bracket insulator failed, resulting in electric flash and fire in cab roof and ceiling; one injured.

One accident; one injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

October 22, 1951, unit (M. P.) 8003, Overton, Tex. Oil and water on floor of cab passageway; steam generator feed water pump packing was leaking; oil leaks and/or oil on engine room floor were reported on October 8, 10, 12, 16, 18 (three times), and 22; one injured.

One accident; one injured.

MISSOURI PACIFIC RAILROAD:

January 17, 1952, unit 4109, Rantoul, Kans. Explosion occurred in transition meter, shattering dial glass and blowing it out; one injured.

One accident; one injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

December 21, 1951, unit 715, Pond, Tenn. Engine of Diesel-electric unit failed to make transition because of a defective power contactor magnet valve;

engine not making transition was reported on December 15, 19, and 20; one injured.

One accident; one injured.

NEW YORK CENTRAL SYSTEM:

October 8, 1951, unit 1601, near Millersburg, Ind. Flash explosion in camshaft drive housing caused by overheated idler gear bearing; one injured.

February 28, 1952, unit 1688, Ashtabula, Ohio. Rough train movement caused by an undesired automatic train stop application; open circuit in secondary coil of automatic train stop receiver; "Received automatic train stop operation at * * *". Train control light not burning. Seal broken on train control cutout cock" was reported on February 25; one injured.

Two accidents; two injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**September 23, 1951, unit 0739, New Haven, Conn. Oil on engine-room floor; oil radiators leaking; engine-room floor to be cleaned or radiators leaking were reported 24 times in the 16 days preceding accident; one injured.

**December 11, 1951, unit 0777, Boston, Mass. Crankcase explosion caused by overheating and disintegration of a piston and scoring of cylinder liner which permitted products of combustion to pass rings and ignite gases in crankcase; one injured.

February 6, 1952, unit 0767, Providence, R. I. Oil on boiler room floor; oil leaks and related defects had been reported repeatedly; walkway in boiler room was not properly lighted; one injured.

Three accidents; three injured.

NORTHWESTERN PACIFIC RAILROAD:

March 17, 1952, unit (S. P.) 1900, Petaluma, Calif. Brakes did not hold properly; "Adjust brake piston travel—brakes not holding good" was reported on March 11; one injured.

June 11, 1952, unit (S. P.) 5249, Ukiah, Calif. Grease on step; one injured.

Two accidents; two injured.

PENNSYLVANIA RAILROAD:

August 30, 1951, unit 4837, near Howellville, Pa. Short circuit occurred in main transformer which resulted in explosion and fire in transformer compartment and short circuit and heavy electrical flash in tap switch compartment; two injured.

August 31, 1951, unit 9587-A, Taylor, Ohio. Sliding window in cab door was stuck in partially open position and when employee attempted to lower window it came down suddenly and caught his finger; latch to secure window in raised position was missing and window was stuck due to accumulation of foreign matter in slides; insufficient clearance between horizontal top member of window frame and bottom of door frame when window was in lowered position; cab window was reported on August 18, 25, and 28; one injured.

October 4, 1951, unit 9599-A, Brink Haven, Ohio. Oil on engine room floor; one injured.

October 4, 1951, unit 9536-A, Dennison, Ohio. Fire at top of Diesel engine caused explosion under cylinder head covers; oil leaking at defective cylinder head cover support frame fell on top of engine around exhaust pipes; two of four valves in No. 8 cylinder head did not seat; one injured.

October 30, 1951, unit 9330, Cleveland, Ohio. Nipple in supply pipe to main air reservoir broke through old fracture; one injured.

November 12, 1951, unit 5759-A, Lima, Ohio. Employee tripped and fell over guard plate which had been installed between high voltage cabinet and main generator; bolts which secured guard plate in upright position came out, permitting the plate to fall approximately flat on the floor; one injured.

January 8, 1952, unit 4917, Secaucus, N. J. Pipe union at connection of main steam heat pipe to pressure regulating valve in cab passageway failed while under pressure; interior threads of pipe union coupling nut were badly deteriorated; one injured.

February 6, 1952, unit 4906, Washington, D. C. Explosion and back fire from oil-fired firebox of steam heating boiler; improper adjustment of atomizer or oil pressure caused fire to be extinguished when change was made from low to high flame; "Boiler smokes in high or low flame" was reported on January 20; one injured.

March 5, 1952, unit 4898, Monmouth Junction, N. J. A 1½-inch nut from bolt in foot of motor casting which housed Nos. 9 and 10 traction motors was thrown from moving locomotive unit and struck an employee; nut and bolt were not carrier's standard; one injured.

May 20, 1952, unit 4751, Hamilton Township, N. J. Electric flash caused by failure of insulation on high voltage lead-in cable; considerable dust and moisture in boxlike shield which housed 7 inches of the cable provided a creepage path for current from the lead-in bar and the brass terminal on primary cable; cable had been rubbing on shield; one injured.

Ten accidents; 11 injured.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

**December 4, 1951, unit 1157, Richmond, Va. Steam generator discharge line parted at connection to steam separator, permitting steam to be discharged in engine room; union ell at top of separator turned downward when blow-off valve was opened, pulling rubber-hose splice from upper section of discharge pipe and swinging the hose with steam discharge toward passageway; one injured. One accident; one injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

December 3, 1951, unit 2000, Monett, Mo. Section of metal flooring in passageway in engine room was loose; two of the three screws for securing the section were missing and the remaining screw was loose; one injured.

January 26, 1952, unit 5212, Stroud, Okla. An air filter fell from rack near top of engine-room body, striking employee's head; bracket of one of the two springs provided to hold air filter in rack broke through defective weld; one injured.

Two accidents; two injured.

SEABOARD AIR LINE RAILROAD:

September 19, 1951, unit 1714, Raleigh, N. C. Diesel-electric locomotive unit collided with rear end of a work train, caused by inoperative air brakes and defective hand brake on the unit; "Engine brakes slow going on and slow releasing" was reported at end of previous shift; two injured.

April 19, 1952, unit 3054, Coleman, Fla. Steps from cab to engine compartment were not properly secured; one injured.

Two accidents; three injured.

SOUTHERN RAILWAY:

July 4, 1951, unit 2108, Atlanta, Ga. Welds which joined engine cooling fan screen to frame failed when screen was stepped on, permitting employee's foot and leg to pass through the opening and enter fan well where they were badly mangled by the revolving fan; one injured.

September 7, 1951, unit 2201, New Orleans, La. Vertical handhold at right rear steps of unit became detached at lower end; bolt for securing lower end of handhold was missing; one injured.

December 26, 1951, unit 6880, O'Neal, Ga. Sheet-iron panel in a front cab window frame became dislodged and fell to cab floor, striking employee's foot; improperly applied weather stripping failed to hold the panel in place; one injured.

**March 17, 1952, unit 2278, Knoxville, Tenn. Fire extinguisher and supporting bracket fell from position at back of cab; bracket was not properly secured; one injured.

**April 16, 1952, unit 2265, New Orleans, La. Bolt and nut in stanchion of guard rail of rear platform projected into step passageway at side of platform 1/2 inch, resulting in injury to employee using the passageway; one injured.

May 6, 1952, unit 4338, Pilot Mountain, Tenn. Crankcase explosion caused by overheated main bearing; main bearing shell was improperly applied; hot engine alarm system and hot lubricating oil alarm system were inoperative; oil temperature gage and lubricating oil pressure gage registered incorrectly; one injured.

May 27, 1952, unit 2043, Springfield, S. C. Employee was burned by flash from fuse panel of steam generator control circuit while removing a fuse; fuse panel covers were not stenciled with danger warnings and instructions for use of the electrical equipment were not displayed in the generator compartment; one injured.

June 14, 1952, unit 6215, Columbia, S. C. Train brake pipe hose flew back violently when disconnected from dummy coupling, due to release of built-up

brake pipe pressure within the hose; brake pipe cut-out cock handles were applied in positions opposite to original application; one injured.

Eight accidents; eight injured.

SOUTHERN PACIFIC—LINES WEST:

December 3, 1951, unit 5115, Patagonia, Ariz. Employee slipped while descending from hood over Diesel engine after work at indicator boxes; handrail provided for use when mounting or descending from hood did not afford adequate protection; one injured.

**February 19, 1952, unit 6353, Los Angeles, Calif. Ladder leading from cab to nose of unit was missing; one injured.

February 23, 1952, unit 1467, Casa Grande, Ariz. Oil on footboard; fuel-oil tank cleanout plug was defective and leaking; one injured.

**March 24, 1952, unit 1392, San Jose, Calif. Welded roughening bobs on right front steps were worn smooth; one injured.

April 6, 1952, unit 6005, Sparks, Nev. Oil and water on floor of unit; oil on floor was reported on April 2 and 3; one injured.

April 20, 1952, unit 6324, Santa Barbara, Calif. Employee slipped on a flag on cab floor and fell against electrical cabinet; one injured.

May 15, 1952, unit 8065, Indio, Calif. Oil on walkway in unit; "Clean oil off floor" was reported on May 3, 7, 10, 11, 12, 14, and 15; one injured.

Seven accidents; seven injured.

SPOKANE, PORTLAND & SEATTLE RAILWAY:

August 18, 1951, unit 852 A-2, near Burlington, Oreg. Measuring rod was blown from crankcase of overheated air compressor; oil sprayed from crankcase to overheated high pressure cylinder filled engine room and cab with excessive smoke and oil fumes; cylinder and pistons were badly scored; piston rings were stuck; springs in final exhaust valve were weak and apparently did not keep the valve seated; air compressor was reported on August 16 (two times) and 18; two injured.

One accident; two injured.

TEXAS & PACIFIC RAILWAY:

June 3, 1952, unit 1577-A, Fort Worth, Tex. Sand box door did not latch in closed position account of sand in latch mechanism; one injured.

One accident; one injured.

UNION PACIFIC RAILROAD:

January 10, 1952, unit 1604, Mills, Utah. Oil on floor of engine room of Diesel-electric unit and passageway at rear end of engine room restricted by an equipment box and by marker lamps which were carried loose on engine room floor when not in use; metal section in engine room floor which was part of passageway was not properly roughened; no provision for proper storage of marker lamps; one injured.

March 20, 1952, unit 1408-C, Ute, Nev. Oil on engine room floor; oil leaking from Diesel engine; one injured.

June 5, 1952, unit 987, Morgan, Utah. Engine in Diesel-electric trailing unit did not load properly due to failure of reverser coil; winding of reverser coil had broken near terminal and arced because of the inactivated reverser which did not synchronize with other reversers; employee was burned by electric flash from P-1 contactor while attempting repairs; one injured.

Three accidents; three injured.

WABASH RAILROAD:

**November 2, 1951, unit 1021, Logansport, Ind. Leak at train steam heat line coupling between trailing unit and first car; employee slipped from cab step while going to make repairs account of oil on steps and/or shoe soles; oil reported on floor of engine compartment; one injured.

One accident; one injured.

WESTERN PACIFIC RAILROAD:

September 25, 1951, unit 908-A, near Twain, Calif. Oil on engine room deck plate and nonskid points on deck plate worn; engine room floors reported to be cleaned on September 21, 22, and 28 and October 3, 8, and 11; one injured.

December 27, 1951, unit 923-C, Niles, Calif. Oil on engine room floor; "Clean oil off engine room floors" was reported on December 26; one injured.

Two accidents; two injured.

TABLE XIII.—Number of locomotive units other than steam

Table with 11 columns representing different locomotive regions and 63 rows of defect categories. Includes a summary row for 'Number of defects' and a final section for 'Locomotive units reported', 'inspected', 'defective', and 'ordered out of service'.

inspected, found defective, and ordered from service, et cetera

Table with 20 columns representing different locomotive regions and 63 rows of defect categories. Includes a summary row for 'Number of defects' and a final section for 'Locomotive units reported', 'inspected', 'defective', and 'ordered out of service'.

TABLE XIII.—Number of locomotive units other than steam inspected,

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

	Newburgh & South Shore	New Orleans Public Belt	New York Central	New York, Chicago & St. Louis	New York, New Haven & Hartford	New York, Ontario & Western	New York, Susquehanna & Western	Niagara Junction	Norfolk Southern
1 Air compressors.....			12		1				
2 Axles, truck and driving.....			1						
4 Batteries.....			2						
5 Boilers.....			11		11				
6 Brake equipment.....			57	3	85	1		2	
8 Cabs and cab windows.....			88	1	22				
9 Cab cards.....			12	1	9				
10 Cab floors, aprons and deck plates.....			140	7	48		2		
11 Clutches.....									
12 Controllers, relays, circuit breakers, magnet valves and switch groups.....			7		11				1
13 Coupling and uncoupling devices.....			3						
14 Current collecting apparatus.....			2		2			1	
16 Draft gear.....			11		8				
17 Draw gear.....			1						
18 Driving boxes, shoes and wedges.....			5		17				
20 Frames or frame braces.....			1		10				
22 Fuel system.....			168	5	57	1	2		1
23 Gages or fittings, air.....			15		15			4	
24 Gages or fittings, steam.....			1		3				
25 Gears and pinions.....					4				
26 Handholds.....			3	1	2				
28 Inspections and tests not made as required.....			7		2			5	
29 Insulation and safety devices.....			21		4				
30 Internal-combustion engine defects, parts and appurtenances.....			351	11	168	2	11		1
32 Jack shafts.....									
33 Jumpers and cable connectors.....			19						
35 Lateral motion, wheels.....					5				
36 Lights, cab and classification.....			5						
37 Lights, headlight.....					1				
39 Meters, volt and ampere.....			10		2				
40 Motors and generators.....			27		17			1	
42 Pilots and pilot beams.....			1		4				
43 Plugs and studs.....					3				
44 Quills.....					5				
46 Rods, main, side, and drive shafts.....									
48 Sanders.....			31		40				1
49 Springs and spring rigging, driving and truck.....			15		11				
51 Stay bolts, broken or defective.....			1						
53 Steam pipes.....			8		22				
54 Steps, footboards, et cetera.....			63		10				1
55 Switches, hand-operated, and fuses.....			3		1				
56 Transformers, resistors and rheostats.....									
57 Trucks.....			16		2				1
59 Water tanks.....			17		6		2		
60 Water glasses, fittings and shields.....			3		1		1		
61 Warning signal appliances.....			9						
62 Wheels.....			5		2	5			
63 Miscellaneous.....			54		26		1		
Number of defects.....			1,206	29	637	9	19	13	7
Locomotive units reported.....	17	14	1,650	142	494	47	26	10	23
Locomotive units inspected.....	10	12	3,808	317	1,001	251	80	66	42
Locomotive units defective.....			438	8	204	4	9	8	2
Percentage of inspected found defective.....			11.5	2.5	20.4	1.6	11.2	12.1	4.8
Locomotive units ordered out of service.....			13		6				

Northern Pacific	Northern Pacific Terminal	Northwestern Pacific	Pacific Electric	Patapsco & Back Rivers	Pennsylvania	Pennsylvania-Reading Seashore Lines	Peoria & Pekin Union	Philadelphia, Bethlehem & New England	Piedmont & Northern	Pittsburgh & Lake Erie	Pittsburgh & West Virginia	Portland Traction	Reading	Richmond, Fredericksburg & Potomac
6		1	3		30				1				1	1
					1									2
					3									6
					4									8
3					26								3	8
					12				3				3	6
					27				1				5	8
					7				1				1	9
21					113								5	10
					3									11
4					31									12
					2									13
					12				1					14
					5									16
														17
														18
														20
18					184				1				2	22
4					1								3	23
														24
														25
														26
														28
														29
1					27									30
					3				3					32
														33
														35
														36
														37
														39
														40
														42
														43
														44
														46
														48
9					35									49
1					6				2				1	51
														53
														54
														55
														56
														57
														59
														60
														61
														62
														63
2														5
9														8
														2
														5
														1
														1
194					1,471				1				45	13
271	14	26	52	36	2,009	19	17	48	29	75	18	11	271	62
633	10	69	45	52	3,736	9	29	130	55	49	36	12	567	112
93		10	11		453		1		10		1		14	7
14.7		14.5	24.4		12.1		3.4		18.2		2.8		2.5	6.2
1		1			4				1					

TABLE XIII.—Number of locomotive units other than steam inspected,

Parts defective, inoperative or missing, or in violation of the rules	Rutland	Sacramento	Northern Fran- cisco	St. Louis Southwestern	Seaboard Air Line	South Buffalo	Southern Pacific, lines east	Southern Pacific, lines west	Southern	Spokane, Portland & Seattle	Steelton & Highspire
1 Air compressors.....	1		7	2	2			4	22		
2 Axles, truck and driving.....											
4 Batteries.....			2					5	3		
5 Boilers.....	1							1	4		
6 Brake equipment.....		2	33	12	47			54	102	6	
8 Cabs and cab windows.....	1	1	11	9	13			41	23		
9 Cab cards.....			1		2			7	2		
10 Cab floors, aprons and deck plates.....	1		30	9	59			66	48		
11 Clutches.....											
12 Controllers, relays, circuit breakers, magnet valves and switch groups.....	2		1		5			13	12		
13 Coupling and uncoupling devices.....			3		7			24	1		
14 Current collecting apparatus.....								8	16		
16 Draft gear.....			5		6			7	1		
17 Draw gear.....								7	1		
18 Driving boxes, shoes and wedges.....				12				2	2		
20 Frames or frame braces.....								1	1		
22 Fuel system.....	6		31	13	30	2		80	60		
23 Gages or fittings, air.....			4	1	1			3	12		
24 Gages or fittings, steam.....			1	1	1			2	2		
25 Gears and pinions.....											
26 Handholds.....			1	1	4				3		
28 Inspections and tests not made as required.....			4		2			19			
29 Insulation and safety devices.....			1		2			3	3		
30 Internal-combustion engine defects, parts and appurtenances.....	8		159	22	92	3		200	219	2	
32 Jack shafts.....											
33 Jumpers and cable connectors.....			10			3		4	3		
35 Lateral motion, wheels.....				3							
36 Lights, cab and classification.....			2			1		5			
37 Lights, headlight.....			1					3	1		
39 Meters, volt and ampere.....					4				1		
40 Motors and generators.....			5	2	19	3		19	19	3	
42 Pilots and pilot beams.....			2	2	6				3		
43 Plugs and studs.....											
44 Quills.....											
46 Rods, main, side, and drive shafts.....											
48 Sanders.....			62	19	52	6		21	65		
49 Springs and spring rigging, driving and truck stay bolts, broken or defective.....			3		13			1	7		
51 Steam pipes.....			1						2		
54 Steps, footboards, et cetera.....	1		5	1	5			15	9		
55 Switches, hand-operated, and fuses.....								2			
56 Transformers, resistors and rheostats.....											
57 Trucks.....			10	4	7	3			6		
59 Water tanks.....			4								
60 Water glasses, fittings and shields.....					4			10	7		
61 Warning signal appliances.....			2		6			13	2	3	
62 Wheels.....			1					13	2		
63 Miscellaneous.....	2		11	3	16			45	14		
Number of defects.....	21	5	412	116	404	21	668	681	14		
Locomotive units reported.....	12	24	411	116	432	54	201	809	811	83	23
Locomotive units inspected.....	98	43	1,348	418	1,215	13	438	3,556	2,718	208	21
Locomotive units defective.....	12	4	128	44	152	14	333	176	13		
Percentage of inspected found defective.....	12.2	9.3	9.5	10.5	12.5	3.2	9.4	6.5	6.2		
Locomotive units ordered out of service.....			3	1	7		6	4	1		

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

Tennessee Central	Tennessee Coal & Iron Div.	Terminal R. R. Association of St. Louis	Texas & Pacific	Texas Mexican	Toledo, Peoria & Western	Toledo Terminal	Union Pacific	Union Railroad	Virginian	Wabash	Washington Terminal	Waterloo, Cedar Falls & Northern	Western Maryland	Western Pacific	Youngstown & Northern	Roads with less than 10, and industrial locomotive units	Total defects		
1	1						6							1		206	1		
							5									3	2		
														2		4	4		
																69	5		
2	12	3	6	1			73			11				12		60	1,450		
	23						17			4				10		44	813		
							2							1		15	139		
2	10	3	1				43	1		12				5		29	1,604		
									2							5	11		
	1						22							3		19	222		
																	76	13	
														2			5	14	
3	3						16							1		25	202		
							2									1	28	17	
							5									1	98	18	
																1	1	33	20
							98	1		2				7		38	1,751	22	
							5		1					3		6	110	23	
							1										11	24	24
1	2						1							6		1	26	25	
							4		2					2		10	127	26	
							3							6		15	159	28	
							3							2		2	102	29	
6	51	3	2				451	8		19				22		95	4,768	30	
																		1	32
							11							3			191	33	
																	8	35	
							4			1							49	36	
							4										1	22	37
																	1	41	39
							24	1								11	674	40	
							1										1	53	42
																	3	43	43
																	15	44	44
																	15	46	46
1	2	2					56			3				3		52	1,202	48	
							1									3	153	49	
																	1	51	51
																	89	53	53
							11	1						4		51	480	54	
							3							1			18	55	55
														1			2	56	56
							7			2						15	390	57	
																1	47	59	59
							1										38	60	60
							36							8			117	61	61
1							4								9	25	230	62	62
	1	1					60			3				12		24	638	63	63
17	114	12	10	1	3		978	12	9	58				120	9	566	16,613		
19	45	82	205	18	15	10	658	144	44	236	26	15	67	148	14	1,167	22,716		
61	41	87	560	28	19	25	3,145	51	73	1,117	8	7	147	535	23	1,751	65,263		
7	14	6	4	1	1		355	2	5	31				43	2	196	6,087		
11.5	34.1	6.9	0.7	3.6	5.3		11.3	3.9	6.8	2.8				8.0	8.7	11.2	9.3		
1							7									16	135		