

INTERSTATE COMMERCE COMMISSION

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THIRTY-NINTH ANNUAL REPORT  
OF THE  
DIRECTOR  
BUREAU OF LOCOMOTIVE INSPECTION  
TO THE  
INTERSTATE COMMERCE COMMISSION

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FISCAL YEAR ENDED  
JUNE 30, 1950



UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON : 1950

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, 1950.

*To the Interstate Commerce Commission:*

In compliance with section 7 of the act of February 17, 1911, as amended, the Thirty-ninth Annual Report of the Director of the Bureau of Locomotive Inspection, covering the work of the Bureau during the fiscal year ended June 30, 1950, 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. 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—					
	1950	1949	1948	1947	1946	1945
Number of locomotives for which reports were filed.....	29,743	33,866	37,073	39,578	41,851	43,019
Number inspected.....	66,809	85,353	93,917	94,034	101,869	115,979
Number found defective.....	6,740	7,035	9,417	10,248	11,337	11,975
Percentage inspected found defective.....	10.1	8.2	10.0	10.9	11.1	10.3
Number ordered out of service.....	399	436	654	708	690	506
Number of defects found.....	28,504	28,642	38,855	41,250	56,541	53,367

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

	Year ended June 30—					
	1950	1949	1948	1947	1946	1945
Number of accidents.....	169	228	341	360	419	410
Percent increase or decrease from previous year.....	25.9	33.1	5.3	14.1	12.2	11.7
Number of persons killed.....	7	10	15	16	10	20
Percent increase or decrease from previous year.....	30.0	33.3	6.3	60.0	50.0	20.0
Number of persons injured.....	184	243	361	464	439	429
Percent increase or decrease from previous year.....	24.3	32.7	22.2	5.7	12.3	7.9

<sup>1</sup> Increase.

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

	Year ended June 30—							
	1950	1949	1948	1947	1946	1945	1915	1912
Number of accidents.....	59	81	104	116	156	141	424	856
Number of persons killed.....	4	9	14	12	10	13	13	91
Number of persons injured.....	70	94	108	124	165	154	467	1,005

<sup>1</sup> 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—									
	1950		1949		1948		1947		1946	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	2	64	3	75	3	109	6	126	4	142
Firemen.....	2	64	3	92	6	155	6	159	4	184
Brakemen.....	2	29	1	30	3	43	1	37		46
Conductors.....		4		7		5		10		7
Switchmen.....		5		6		10		9		10
Roundhouse and shop employees:										
Boilermakers.....		2		2		4		3		1
Machinists.....		1		4		1		1		6
Foremen.....		1				1				3
Inspectors.....		2						1		1
Watchmen.....	1	4		1		2		2	2	4
Boiler washers.....										1
Hostlers.....		1		1		8		6		10
Other roundhouse and shop employees.....		2		1		4		5		8
Other employees.....		4		6		12		2		21
Nonemployees.....		1		9		6		82		8
Total.....	7	184	10	243	15	361	16	464	10	439

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

	Year ended June 30—					
	1950	1949	1948	1947	1946	1945
Number of locomotive units for which reports were filed.....	15,719	12,692	9,803	7,805	6,616	6,094
Number inspected.....	42,503	30,684	20,798	13,115	10,908	9,888
Number found defective.....	2,748	1,238	853	633	499	447
Percentage of inspected found defective.....	6.5	4.0	4.1	4.8	4.6	4.5
Number ordered out of service.....	42	20	21	19	17	16
Number of defects found.....	6,325	2,804	1,745	1,442	1,385	1,212

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

	Year ended June 30—					
	1950	1949	1948	1947	1946	1945
Number of accidents.....	51	49	41	40	38	29
Number of persons killed.....	3			2		1
Number of persons injured.....	50	67	50	41	56	40

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

	Year ended June 30—									
	1950		1949		1948		1947		1946	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....		15		12		7	1	9		8
Firemen.....		21		14		24		21		14
Brakemen.....		3		6		1		5		3
Conductors.....		4				2		1		2
Switchmen.....		1		4		2		1		2
Maintenance employees:										
Other employees.....		3		8			1	2		4
Nonemployees.....	1	2		13		2		2		5
Total.....	2	1		10		12				18
Total.....	3	50		67		50	2	41		56

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—														
	1950			1949			1948			1947			1946		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs							1		2	1		1		1	
Aprons	2		2	3		3	5		5	4		4	2		2
Arch tubes	1		1												
Ashpan blowers			1			1									
Axles							3		3	1	2	1	1		1
Blow-off cocks	2		2	5	1	4	5	5	5	8	8	15			16
Boiler checks	3		3	4		5	7	1	6	7		7	8		8
Boiler explosions:															
A. Shell explosions															
B. Crown sheet; low water; no contributory causes found	8	4	12	4	6	13	10	12	8	11	7	16	15	7	20
C. Crown sheet; low water; contributory causes or defects found	1		2	1	1	1	3		7	2	4	3	3	3	2
D. Miscellaneous firebox failures															
Brakes and brake rigging	2		2	3		4	11		24	8		4	1		12
Couplers	4	1	4	3		4	4		4	6		6	5		5
Crank pins, collars, etc.	1		1				2		2	3		3	5		5
Crossheads and guides	1	1	2	1		1	1		1	2		2	3		5
Cylinder cocks and rigging							3		3	3		3	1		1
Cylinder heads and steam chests							1		1	2		2	1		1
Dome caps															
Draft appliances				3		3						2			2
Draw gear	1		1						1			1			1
Fire doors, levers, etc.	2		2	3		3	10		10	2		2	2		2
Flues	6		9	3		3	8		9	4		4	10		12
Flue pockets															
Footboards	8		8	10		10	15		15	15		15	12		12
Gage cocks				1		1									
Grease cups	1		1							1		1			1
Grate shakers	6		6	11		11	15		15	20		20	25		25
Handholds	11		11	13		13	12		12	18		18	20		20
Headlights and brackets	1		1	1		1	3		3	2		2	2		2
Injectors and connections (not including injector steam pipes)	7		7	12		12	10		10	14		14	14		14
Injector steam pipes							4		4	4		4	2		2
Lubricators and connections	2		2	4		4	2		2	4		4	5		5
Lubricator glasses	1		1	1		1						2			2
Patch bolts															
Pistons and piston rods							2		2	1		1			
Plugs, arch tube and washout	1		1				3		3	1		1			1
Plugs in firebox sheets															
Reversing gear	9	1	8	6		6	12		12	13		13	11		11
Rivets	1		1												
Rods, main and side	1		2	2		2	5		5	3		3	7		7
Safety valves															
Sanders	4		4	4		4	4		4	5		5	4		4
Side bearings							1		1						
Springs and spring rigging	3		3	1		1	4		4	4		4	6		7
Squirt hose	9		9	14		14	5		5	19		19	14		15
Staybolts	1		1	1		1	4		4	2		2	1		1
Steam piping and blowers	3		3	4		4	13		13	4		4	15		15
Steam valves	3		3	3		3	6		6	8		8	13		13
Studs	1		1	1		1				2		2	1		1
Superheater tubes	3		3	3		3	2		2	2		2	2		2
Throttle glands	2		2	3		3	4		4	1		1			1
Throttle leaking	2		2	1		1	1		1	2		2	1		1
Throttle rigging	7		7	11		11	10		10	16		17	15		16
Trucks, leading, trailing, or tender				3		3	3		3	4		4	7		7
Valve gear, eccentrics, and rods				1		1	4		4	8		8	12		13
Water glasses	3		3	3		3	5		5	4		4	2		2
Water-glass fittings				3		3	3		3	3		3	2		2
Wheels							1		1	2		2	1		1
Miscellaneous	46		40	74		75	121		122	117		117	124		127
Total	169	7	184	228	10	243	341	15	361	360	16	464	419	10	439

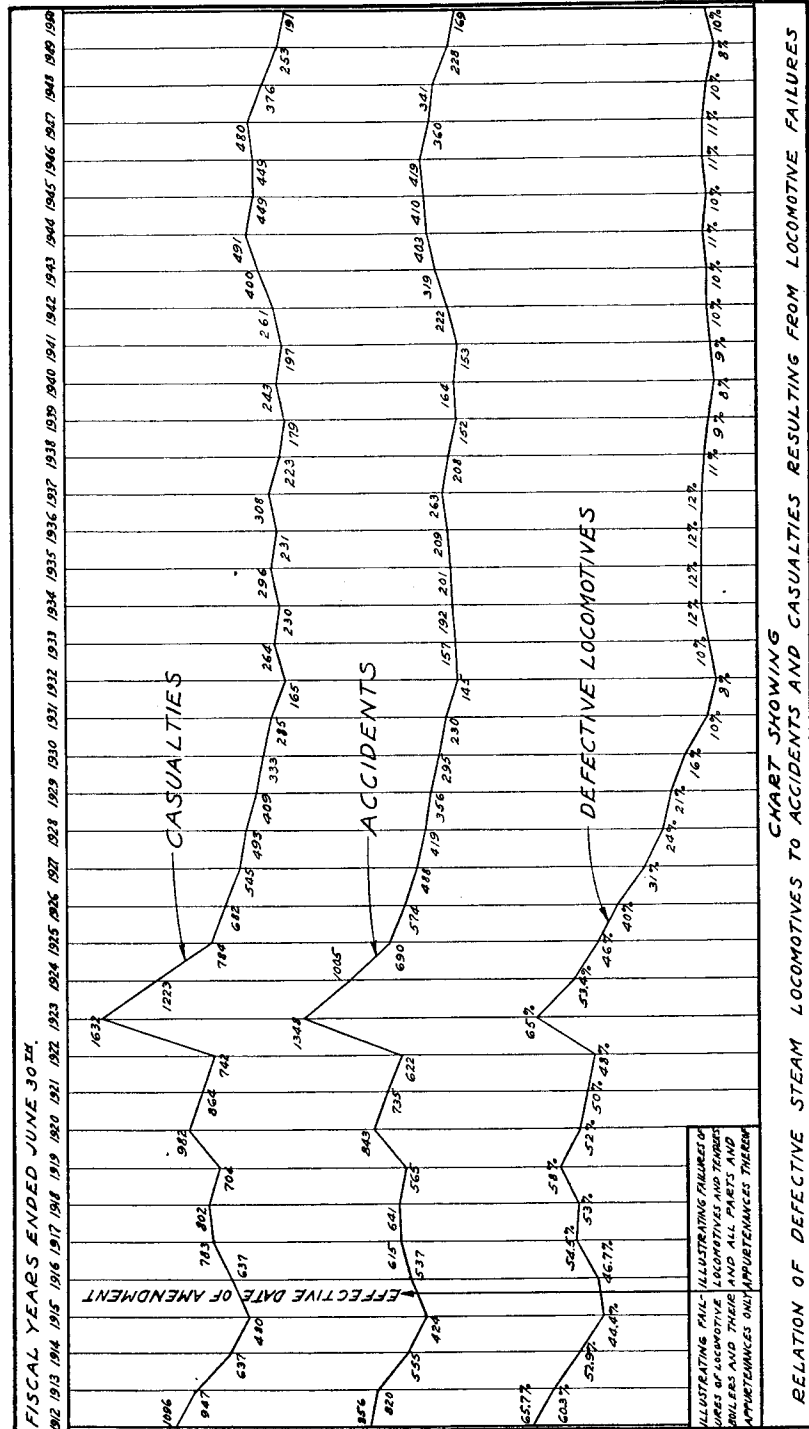


TABLE IX.—Accidents and casualties resulting from failures of locomotive units other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—																	
	1950			1949			1948			1947			1946			1945		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging.....	4	---	4	4	---	5	3	---	6	2	---	2	2	---	2	---	3	---
Carburetors.....	1	---	1	1	---	1	---	---	2	---	2	---	---	---	---	---	---	---
Couplers.....	4	---	4	8	---	9	3	---	3	7	---	8	4	---	4	---	5	---
Crank pins and connecting rods.....	1	---	1	1	---	1	---	---	1	---	---	1	---	---	1	---	1	---
Fires due to overflowing or leakage of fuel, crankcase explosions, back firing, etc.....	1	---	1	1	---	1	---	---	1	---	---	1	---	---	1	---	1	---
Generators and starting devices.....	2	---	2	6	---	6	7	---	7	---	7	2	---	2	---	2	---	2
Insulation.....	38	---	38	27	---	43	27	---	33	22	---	22	27	---	27	---	43	---
Pantographs and trolleys.....	1	---	1	1	---	1	---	---	1	---	---	1	---	---	1	---	1	---
Short circuits.....	2	---	2	6	---	6	7	---	7	---	7	2	---	2	---	2	---	2
Miscellaneous.....	38	---	38	27	---	43	27	---	33	22	---	22	27	---	27	---	43	---
Total.....	51	3	50	49	---	67	41	---	50	40	---	41	38	---	38	---	56	---

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—					
	1950	1949	1948	1947	1946	1945
Air compressors.....	719	693	1,007	944	1,044	1,054
Arch tubes.....	9	11	15	10	27	17
Ashpans and mechanism.....	59	52	72	87	93	81
Axles.....	1	4	8	6	7	11
Blow-off cocks.....	220	220	274	308	388	361
Boiler checks.....	386	337	424	428	526	511
Boiler shell.....	211	208	298	342	462	416
Brake equipment.....	1,845	1,806	2,617	2,512	2,992	2,755
Cabs, cab windows, and curtains.....	862	781	1,049	1,347	1,501	1,057
Cab aprons and decks.....	364	355	414	428	469	426
Cab cards.....	97	95	109	91	120	91
Coupling and uncoupling devices.....	41	42	55	58	46	57
Crossheads, guides, pistons, and piston rods.....	1,100	1,147	1,611	1,683	1,941	2,079
Crown bolts.....	53	46	78	98	88	90
Cylinders, saddles, and steam chests.....	1,160	1,155	1,617	2,004	2,217	1,801
Cylinder cocks and rigging.....	376	356	494	650	679	454
Domes and dome caps.....	90	82	142	130	164	187
Draft gear.....	368	370	461	449	536	486
Draw gear.....	280	300	413	453	462	447
Driving boxes, shoes, wedges, pedestals, and braces.....	1,037	1,070	1,582	1,580	1,922	1,803
Firebox sheets.....	181	191	302	257	333	319
Flues.....	152	156	201	197	253	260
Frames, tail pieces, and braces, locomotive.....	451	451	576	820	1,003	852
Frames, tender.....	34	39	72	63	88	97
Gages and gage fittings, air.....	116	118	185	135	185	151
Gages and gage fittings, steam.....	272	268	354	358	370	353
Gage cocks.....	386	375	474	404	495	449
Grate shakers and fire doors.....	326	286	455	444	555	558
Handholds.....	439	421	513	469	540	527
Injectors, inoperative.....	45	39	68	39	50	41
Injectors and connections.....	1,767	1,795	2,329	2,369	2,750	2,553
Inspections and tests not made as required.....	122	104	148	350	8,885	9,067
Lateral motion.....	389	507	821	791	862	977
Lights, cab and classification.....	60	58	132	155	161	167
Lights, headlight.....	131	118	183	143	168	222
Lubricators and shields.....	157	157	236	228	351	306
Mud rings.....	145	147	186	217	238	257
Packing nuts.....	558	474	456	575	691	654
Packing, piston rod and valve stem.....	510	511	658	691	776	845
Pilots and pilot beams.....	126	73	132	156	153	171
Plugs and studs.....	104	99	169	236	262	245

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—					
	1950	1949	1948	1947	1946	1945
Reversing gear.....	404	405	649	528	482	439
Rods, main and side, crank pins, and collars.....	1,213	1,408	1,998	2,136	2,581	2,569
Safety valves.....	34	45	45	70	72	84
Sanders.....	641	608	597	569	784	658
Springs and spring rigging.....	2,845	3,177	4,124	4,622	5,195	4,734
Squirt hose.....	74	63	93	79	120	98
Stay bolts.....	229	227	292	318	360	351
Stay bolts, broken.....	193	196	258	283	268	308
Steam pipes.....	302	256	435	356	551	416
Steam valves.....	131	133	150	146	203	157
Steps.....	680	652	767	778	914	681
Tanks and tank valves.....	1,205	1,228	1,757	1,558	1,570	1,215
Telltale holes.....	28	33	60	69	60	78
Throttle and throttle rigging.....	664	709	923	1,026	979	948
Trucks, engine and trailing.....	580	545	812	1,005	1,261	1,151
Trucks, tender.....	540	471	652	795	1,101	974
Valve motion.....	486	484	676	778	1,080	991
Washout plugs.....	289	268	384	441	740	820
Stokers.....	261	216	270	208	---	---
Water glasses, fittings, and shields.....	907	920	1,039	1,318	1,190	1,328
Wheels.....	394	455	779	583	840	899
Miscellaneous—signal appliances, badge plates, brakes (hand).....	652	626	707	870	1,337	1,213
Total number of defects.....	28,504	28,642	38,855	41,250	56,541	53,367
Locomotives reported.....	29,743	33,866	37,073	39,578	41,851	43,019
Locomotives inspected.....	66,809	85,353	93,917	94,034	101,869	115,979
Locomotives defective.....	6,740	7,035	9,417	10,248	11,337	11,975
Percentage of inspected found defective.....	10.1	8.2	10.0	10.9	11.1	10.3
Locomotives ordered out of service.....	399	436	654	708	690	506

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—					
	1950	1949	1948	1947	1946	1945
Air compressors.....	99	26	32	9	15	14
Axles, truck and driving.....	2	1	3	2	---	---
Batteries.....	20	13	8	1	2	---
Boilers.....	46	9	30	5	11	8
Brake equipment.....	673	299	204	178	102	114
Cabs and cab windows.....	377	159	90	97	46	59
Cab cards.....	75	46	37	29	24	25
Cab floors, aprons, and deck plates.....	726	234	134	130	72	60
Clutches.....	1	2	---	---	2	2
Controllers, relays, circuit breakers, magnet valves, and switch groups.....	61	35	24	14	16	18
Coupling and uncoupling devices.....	32	15	12	13	6	6
Current collecting apparatus.....	18	20	11	3	9	10
Draft gear.....	91	66	36	30	18	14
Draw gear.....	27	13	8	4	3	8
Driving boxes, shoes, and wedges.....	51	33	16	38	44	29
Frames or frame braces.....	9	5	2	7	10	12
Fuel system.....	483	191	136	66	57	45
Gages or fittings, air.....	29	11	11	10	7	7
Gages or fittings, steam.....	14	2	2	5	---	---
Gears and pinions.....	15	6	9	1	---	---
Handholds.....	70	53	32	22	18	13
Inspections and tests not made as required.....	116	90	59	78	357	297
Insulation and safety devices.....	48	36	10	11	12	17
Internal-combustion engine defects, parts and appurtenances.....	1,456	602	241	254	145	133
Jack shafts.....	8	11	5	3	4	6
Jumpers and cable connectors.....	86	8	7	1	8	9
Lateral motion, wheels.....	2	7	18	7	18	20
Lights, cab and classification.....	7	5	5	1	2	---

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—					
	1950	1949	1948	1947	1946	1945
37 Lights, headlight.....	9	3	3	2		1
39 Meters, volt and ampere.....	7		3	3		2
40 Motors and generators.....			26	16	4	12
42 Pilots and pilot beams.....	106	46	26	16	15	1
43 Plugs and studs.....	29	16	23	15	8	1
44 Quills.....						1
46 Rods, main, side, and drive shafts.....	10	9	16	18	52	29
48 Sanders.....	6	1	5	6	11	3
49 Springs and spring rigging, driving and truck.....	356	151	106	82	57	50
51 Stay bolts, broken or defective.....	103	43	44	63	42	38
53 Steam pipes.....	1					
54 Steps, footboards, etc.....	32	17	10	4	1	6
55 Switches, hand-operated, and fuses.....	284	213	116	68	29	28
56 Transformers, resistors, and rheostats.....	9	1	3	1		7
57 Trucks.....	9	2	6	2	3	
59 Water tanks.....	182	84	65	45	52	42
60 Water glasses, fittings, and shields.....	20	2	1	2	1	2
61 Warning signal appliances.....	27	2	18		15	2
62 Wheels.....	21	9	7	8	2	
63 Miscellaneous.....	95	98	72	48	54	46
	377	109	39	40	31	16
Total number of defects.....	6,325	2,804	1,745	1,442	1,385	1,212
Locomotive units reported.....	15,719	12,692	9,803	7,805	6,616	6,094
Locomotive units inspected.....	42,503	30,684	20,798	13,115	10,908	9,888
Locomotive units defective.....	2,748	1,238	853	633	499	447
Percentage of inspected found defective.....	6.5	4.0	4.1	4.8	4.6	4.5
Locomotive units ordered out of service.....	42	20	21	19	17	16

#### 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 was 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 sixty-nine accidents occurred in connection with steam locomotives resulting in 7 deaths and 184 injuries. This represents a decrease of 59 accidents, a decrease of 3 in the number of persons killed, and a decrease of 59 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, 10 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 2 percent from the results obtained in the preceding year. Three hundred and ninety-nine 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 37 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

Nine boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. Four employees were killed in these accidents and 14 were injured. There was an increase of four in the number of boiler explosions and a decrease of three in the number of employees killed compared with the preceding year.

One of the explosions occurred on a locomotive in passenger-train service, three on locomotives in freight-train service; two on locomotives in charge of watchmen; and one each on locomotives in switching, mixed, and work train service. The boilers involved in the explosions were not equipped with either fusible plugs or low-water alarms.

Absence of a safe water level was known to employees on two of the locomotives prior to the explosions. On one of these the low water level resulted from undetected loss of water through an inadvertently opened blow-off cock which discharged through a muffler located under the locomotive deck. Action to restore water to the boiler had been initiated, but the explosion occurred before a sufficient quantity of water had been fed to the boiler. Subsequently, blow-off mechanisms on all locomotives owned by the railroad on which the explosion occurred were examined, redesigned, and reconstructed where necessary to prevent repetition of conditions responsible for the explosion.

Fifty boiler and appurtenance accidents other than explosions resulted in injuries to 56 employees. This is a decrease of 26 accidents and a decrease of 24 injuries compared with the preceding year.

#### EXTENSION OF TIME FOR REMOVAL OF FLUES

Four hundred and seventy applications were filed for extension of time for removal of flues, as provided in rule 10. Our investigations

disclosed that in 33 of these cases the condition of the locomotives or other circumstances were such that extensions could not properly be granted. Nine were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Twenty-four extensions were granted after defects disclosed by our investigations were required to be repaired. Eighteen applications were canceled for various reasons. Three hundred and eighty-six applications were granted for the full period requested.

#### LOCOMOTIVE UNITS PROPELLED BY POWER OTHER THAN STEAM

Fifty-one accidents, resulting in 3 deaths and injuries to 50 persons occurred in connection with locomotive units propelled by power other than steam. This represents an increase of 2 in the number of accidents, occurrence of 3 fatalities, and a decrease of 17 in the number of injured compared with the preceding year.

During the year 6.5 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 2.5 percent compared with the results obtained in the preceding year. Forty-two 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 22 units compared with the preceding year.

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, 114 specification cards and 2,748 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, 3,287 specifications and 1,165 alteration reports were filed for locomotive units and 564 specifications and 257 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.

#### 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.

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, 1950, 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.]

##### ATCHISON, TOPEKA & SANTA FE RAILWAY:

October 30, 1949, locomotive 570, Calwa, Calif. Right front footboard was too low; height from top of rail to top of tread was 2 inches less than minimum prescribed height; one injured.

December 17, 1949, locomotive 9442, Entro, Ariz. Crown-sheet failure caused by overheating due to low water; one injured.

December 18, 1949, locomotive 1661, Shattuck, Okla. Leakage from steam blow-back valve into fuel-oil pipe leading to firing valve prevented ready ignition and resulted in gas explosion in firebox; blow-back valve and seat were steam cut; one injured.

December 19, 1949, locomotive 5023, Canadian, Tex. Oil on step on front end of tender fuel-oil tank; one injured.

May 30, 1950, locomotive 4115, near Littlefield, Tex. Main throttle unexpectedly moved violently from about one-half to fully open position; throttle lever quadrant bracket was loose on boiler back head and back end of quadrant was sprung toward center so that throttle lever latch teeth did not properly engage teeth on back sector of quadrant; "Main throttle will not stay latched" was reported on May 29; one injured.

June 5, 1950, locomotive 1968, Cadiz, Calif. Oil on top of tender oil tank; employee's foot slipped from step on water leg of tender and lodged in unprotected space between water leg and fuel-oil tank; one injured.

Six accidents; six injured.

##### ATLANTIC COAST LINE RAILROAD:

\*\*September 23, 1949, locomotive 1032, Chadbourn, N. C. Grate shaker bar slipped off post; shaker-bar safety pin was too large for fit in hole in shaker post; one injured.

\*\*November 18, 1949, locomotive 1810, Sellers, S. C. Employee was injured while removing grate shaker bar from storage in left front corner of cab; loop attached to tender coal-gate frame for insertion of shaker-bar handle when bar was not in use was located too low for the bar to pass through it; one injured.

\*\*January 5, 1950, locomotive 1031, Fairmont, N. C. Bell ringer was inoperative; one injured.

February 24, 1950, locomotive 411, near Tarboro, N. C. Crown-sheet failure caused by overheating due to low water; three killed.

March 14, 1950, locomotive 1621, Seville, Fla. Crown-sheet failure caused by overheating due to low water; three injured.

Five accidents; three killed, six injured.

## BALTIMORE &amp; OHIO RAILROAD:

January 1, 1950, locomotive 7513, Springville, N. Y. Incompletely fused bronze weld in top rail over driving box of low pressure engine frame failed, resulting in derailment of the locomotive, second locomotive, and several cars of train; less than 1 square inch of the 27 square-inch cross-sectional area of frame at weld was fused; three injured.

January 9, 1950, locomotive 696, Cumberland, Md. Throttle stem packing blew out; loosened stud nuts permitted gland to back out of packing box; one injured.

\*\*May 30, 1950, locomotive 6167, Hamilton, Ohio. Side rod knuckle pin worked out; pin was improper fit in side rod pin hole and threads on pin and in combined nut and washer had been pounded flat and worn smooth; cotter pin for securing the nut and washer was not found; driving-box journals were loose, and driving boxes, wedges, crown brasses, and knuckle pins were repeatedly reported pounding in the 30 days preceding the accident; two injured.

June 5, 1950, locomotive 7167, Chiefton, W. Va. Superheater flue which was badly cinder cut and reduced in thickness burst near back flue sheet. Because of crack at header bolt slot 3 units had been removed and openings blanked; this condition resulted in excessive flow of gases and cinders through these unobstructed flues; one injured.

Four accidents; seven injured.

## BIRMINGHAM BELT RAILROAD:

January 13, 1950, locomotive (St. L.-S. F.) 3743, Birmingham, Ala. Left No. 1 driving spring hanger pin broke through old fracture and end of pin worked out which released the end of spring and permitted left front end of locomotive to lower, resulting in front footboard being bent back under locomotive. Employee was thrown from footboard and his leg severed by wheels of the moving locomotive. Left section of front footboard was reported sloping downward before movement of the locomotive was ordered; one injured.

One accident; one injured.

## BOSTON &amp; MAINE RAILROAD:

\*\*July 11, 1949, locomotive 649, Boston, Mass. Water glass burst; one injured.

December 16, 1949, locomotive 3670, between Boston, Mass. and Dover, N. H. Hard working throttle; one injured.

May 15, 1950, locomotive 2685, Somerville, Mass. Flexible staybolt cap blew off while being tightened under pressure; staybolt was broken and cap threads badly deteriorated; one injured.

Three accidents; three injured.

## CAMBRIA AND INDIANA RAILROAD:

February 2, 1950, locomotive 21, Nantyglo, Pa. Arch tube failed; tube had been excessively rolled in flue sheet; one injured.

One accident; one injured.

## CHICAGO, ROCK ISLAND &amp; PACIFIC RAILROAD:

November 25, 1949, locomotive 302, Fort Worth, Tex. Throttle stem packing blew out; loosened stud nuts permitted gland to back out of packing box; one injured.

January 29, 1950, locomotive 2694, Lima, Okla. A large piece broke out of team pipe in locomotive front end; steam pipe was made of cast iron and pipe wall thickness at edges of the break varied from  $\frac{3}{8}$  inch to  $1\frac{1}{2}$  inches, while carrier's print showed the pipe to be of cast steel and wall thickness to be  $\frac{1}{2}$  inch; two injured.

April 18, 1950, locomotive 2003, Sunray, Tex. Oil on top of tender fuel-oil tank; "Clean oil off top of tank" was reported on April 16; one injured.

June 7, 1950, locomotive 2059, Donovan, Mo. Right boiler check stuck open; when right injector is used and shut off boiler check sticks" was reported on June 5; one injured.

June 7, 1950, locomotive 2603, Clearing, Ill. Grate shaker bar slipped from alcrum lever; shaker bar was bent and did not conform to carrier's standard; one injured.

June 18, 1950, locomotive 1738, Parker, Okla. Squirt hose parted at defective splice; hose had been spliced 8 days previously, apparently due to having been badly chafed between rear cab wall and cab apron while hanging free in gangway;

nipple of the recently applied discharge end of hose was inserted into the chafed end of squirt hose only approximately  $\frac{1}{4}$  inch and hose was not properly clamped on it; no means provided for securing the hose when not in use; one injured.

Six accidents; seven injured.

## DELAWARE &amp; HUDSON RAILROAD:

\*\*January 9, 1950, locomotive 603, Rouses Point, N. Y. Union at delivery pipe connection to boiler check was leaking; one injured.

April 24, 1950, locomotive 95, Oneonta, N. Y. Flue broke at front flue sheet; bottom of flue was deteriorated and reduced to approximately  $\frac{1}{16}$  inch in thickness; one injured.

Two accidents; two injured.

## CHESAPEAKE &amp; OHIO RAILWAY:

\*\*September 24, 1949, locomotive 271, Handley, W. Va. Handle came off extension rod to injector overflow valve stem when attempt was made to open overflow valve; one injured.

May 23, 1950, locomotive 201, Russell, Ky. Tank hose blew off; tank valve had been closed account of boiler check leaking badly; boiler check was reported leaking on April 24, May 5, 17, and 18; one injured.

Two accidents; two injured.

## CHICAGO &amp; NORTH WESTERN RAILWAY:

November 3, 1949, locomotive 2572, Lake Bluff, Ill. Main steam pipe burst in smokebox, due to insufficient thickness of pipe wall; pipe wall was of uneven thickness at point of failure, due to manufacturing defect, the minimum thickness being  $\frac{1}{2}$  inch less than carrier's standard; three injured.

March 8, 1950, locomotive 1560, Medary Junction, Wis. Crown-sheet failure caused by overheating due to low water; two injured.

May 12, 1950, locomotive 2497, Sanborn, Minn. Boiler check and branch pipe drain valve worked open en route and employee fell while attempting to make repair; bottom supporting column of the semicircular handhold pulled from bolt which secured it to front end door ring because of missing nut; handhold then slipped through eyes of the other two columns; no means provided to prevent movement of handhold through supporting columns; one injured.

Three accidents; six injured.

## CHICAGO, MILWAUKEE, ST. PAUL &amp; PACIFIC RAILROAD:

\*\*July 28, 1949, locomotive 128, Sturtevant, Wis. Front end of engine truck spring disengaged from spring hanger pocket and spring safety hanger broke, permitting spring to fall to the roadbed and scatter track ballast, some of which struck a track employee; one injured.

August 18, 1949, locomotive 373, St. Paul, Minn. Locomotive separated from tender, due to cracks in cast-steel locomotive frame tailpiece which progressed until complete failure of tailpiece occurred; two injured.

Two accidents; three injured.

## DELAWARE, LACKAWANNA &amp; WESTERN RAILROAD:

\*\*December 27, 1949, locomotive 1232, Branchville, N. J. Sand trap clogged; one injured.

One accident; one injured.

## DENVER &amp; RIO GRANDE WESTERN RAILROAD:

September 11, 1949, locomotive 3603, Tabernash, Colo. Insufficient clearance between cab handhold at gangway and gangway ladder on tender when on curve; one injured.

September 20, 1949, locomotive 1159, New Castle, Colo. Generator steam valve broke off at turret in cab when attempt was made to tighten air compressor turret valve packing nut; one injured.

January 24, 1950, locomotive 3616, Adel, Colo. Grate shaker bar broke through fatigue cracks at junction to socket; radius of junction was  $\frac{1}{8}$  inch while carrier's print showed a  $\frac{3}{4}$ -inch radius; handle was battered near the break; one injured.

April 19, 1950, locomotive 454, Montrose, Colo. Locomotive moved unexpectedly due to leaky throttle; both valve seats were shouldered and lower seat was steam cut; slots in throttle valve lifting stem were not standard and rigging did not hold valve on seat when in closed position; one injured.

Four accidents; four injured.



## ERIE RAILROAD:

July 14, 1949, locomotive 3341, near Jeddoo, Ohio. Crosshead wrist pin worked out because pin nut and lock nut had not been properly tightened after rods were removed at time of monthly inspection; one killed, two injured.

August 6, 1949, locomotive 134, Newark, N. J. Fire hose burst; hose was defective; one injured.

Two accidents; one killed, three injured.

## FLORIDA EAST COAST RAILWAY:

March 5, 1950, locomotive 811, North Miami, Fla. Window glass in front cab door broke due to excessive vibration of the door; employee was cut by flying glass; one injured.

April 21, 1950, locomotive 818, Elkton, Fla. Handle of feed water pump drain cock was so located that hand of operator was in line with the discharge; one injured.

Two accidents; two injured.

## FORT WORTH &amp; DENVER CITY RAILWAY:

August 25, 1949, locomotive (C. B. & Q.) 5231, Elna, Tex. Sand box on tender tilted backward, catching employee's hand between it and fuel oil tank; bolt for securing sand box, near the top, to tender water leg was missing and welding which secured sand-box stand to deck plate was broken on one side; "Tighten sand box" was reported on July 31; one injured.

September 27, 1949, locomotive 458, Elna, Tex. Oil on top of tender fuel-oil tank; one injured.

February 13, 1950, locomotive (C. & S.) 911, Henrietta, Tex. Coupler pocket casting pulled from locomotive due to breakage of the bolts used to secure it to cast steel plate which was attached to pilot beam; 1¼-inch bolts used in place of standard 1½-inch bolts; one of four 1½-inch bolts securing the steel plate failed through old fracture at root of thread and the other three bolts were stretched; two injured.

Three accidents; four injured.

## GEORGIA &amp; FLORIDA RAILROAD:

\*July 16, 1949, locomotive 506. Draw bar broke; one injured.

One accident; one injured.

## GREAT NORTHERN RAILWAY:

\*\*January 31, 1950, locomotive 1177, Westhope, N. Dak. Tension adjusting bolt in chafing iron broke and was thrown from the moving locomotive; one injured.

One accident; one injured.

## GULF COAST LINES:

April 24, 1950, locomotive (St. L. B. & M.) 1201, en route Vanderbilt to Houston, Tex. Rough riding locomotive; excessive slack between locomotive and tender due to drawbar pin bushing working out of top hole in tender draw casting; right and left main and left back driving box wedges were improperly adjusted; one injured.

May 19, 1950, locomotive (St. L. B. & M.) 358, Hoskins Junction, Tex. Squirt hose was badly worn; hose was not carrier's standard; one injured.

Two accidents; two injured.

## GULF, COLORADO &amp; SANTA FE RAILWAY:

December 18, 1949, locomotive (A. T. & S. F.) 3930, Nicholls, Tex. Coupler knuckle broke through flaw at knuckle pin hole; one killed.

January 24, 1950, locomotive (A. T. & S. F.) 942, Easton, Tex. Vertical hand-rod at rear corner of tender gave way, due to supporting rivet at top end pulling through hole in tender sheet and rivet at bottom end breaking; rivets were cut too short to provide proper heads inside the tender sheet; one injured.

Two accidents; one killed, one injured.

## ILLINOIS CENTRAL RAILROAD:

September 27, 1949, locomotive 2514, near Champaign, Ill. Crown-sheet failure caused by overheating due to low water; three injured.

January 22, 1950, locomotive 2453, Goodman, Miss. Main crank pin broke through fractures originating at the fillet inside hub of driving wheel; rods, driving boxes, and wedges were reported pounding numerous times in the 60 days preceding the accident; one injured.

Two accidents; four injured.

## LEHIGH VALLEY RAILROAD:

August 30, 1949, locomotive 305, Jersey City, N. J. Fire hose burst; hose was worn and chafed; one injured.

One accident; one injured.

## LONG ISLAND RAILROAD:

February 26, 1950, locomotive (P. R. R.) 3655, Hicksville, N. Y. Flue broke off at prosser groove adjacent to water side of front flue sheet; flue had been excessively worked and was wasted away and reduced to approximately ¼ inch in thickness at the point of failure; one injured.

One accident; one injured.

## LOUISIANA &amp; ARKANSAS RAILWAY:

March 7, 1950, locomotive (K. C. S.) 480, Bijou, La. Gas explosion in firebox; water in fuel oil supplied to burner extinguished the fire which caused oil vapor to accumulate in firebox where it became ignited; fuel oil cistern water drain pipe was clogged with foreign matter; excessive lost motion in firing valve extension rod fit on the firing valve made regulation of oil flow difficult; one injured.

One accident; one injured.

## LOUISVILLE &amp; NASHVILLE RAILROAD:

\*\*September 1, 1949, locomotive 1889, Bay Minette, Ala. Squirt hose split in worn place resulting from contact with edge of deck apron when not in use; no means provided for storing the squirt hose when not in use; one injured.

November 1, 1949, locomotive 410, near Camden, Ky. Injector starting valve stuck open; lift washers were missing from starting valve which allowed valve to overtravel and hang in open position; one injured.

November 5, 1949, locomotive 273, near Georgiana, Ala. Restricting disc valves were missing from air ports of air operating mechanism of fire door, permitting fire door to open or close with excessive speed; one injured.

\*\*December 13, 1949, locomotive 1554, Graceville, Fla. Sander was inoperative; one injured.

Four accidents; four injured.

## MINNEAPOLIS, ST. PAUL &amp; SAULT STE. MARIE RAILROAD:

April 4, 1950, locomotive 463, Riverdale Junction, N. Dak. Employee injured while attempting to adjust slack in power reverse cylinder mechanism; one injured.

One accident; one injured.

## MISSISSIPPI CENTRAL RAILROAD:

\*August 10, 1949, locomotive 150. Injector overflow valve stuck and released suddenly when forced; one injured.

One accident; one injured.

## MISSOURI-KANSAS-TEXAS RAILROAD:

July 7, 1949, locomotive 656, Altus, Okla. Oil on top of tender fuel-oil tank; one injured.

September 2, 1949, locomotive 35, San Antonio, Tex. Bell ringer was defective; bell ringer was reported on August 24, 25, and 26, and September 2, at end of the period of duty following the shift on which the accident occurred; one injured.

December 7, 1949, locomotive 51, Kansas City, Kans. Tin timetable case in cab was badly torn and mutilated; employee was severely cut by jagged sharp edge of protruding front of case; one injured.

Three accidents; three injured.

## NASHVILLE, CHATTANOOGA &amp; ST. LOUIS RAILWAY:

\*July 1, 1949, locomotive 582. Insufficient clearance between grab iron and step when on curve; one injured.

December 24, 1949, locomotive 408, Bruceton, Tenn. Lubricator steam pipe collar broke at collar flange and the pipe separated from lubricator connection; collar was not properly brazed to steam pipe and end of pipe was not flared; one injured.

Two accidents; two injured.

## NEW YORK CENTRAL SYSTEM:

July 6, 1949, locomotive 2337, Wyandotte, Mich. Precision power reverse gear was hard to operate, due to reverse gear adjusting screw being missing and main slide valve and its seat leaking; one injured.

\*\*July 11, 1949, locomotive (B. & A.) 64, Allston, Mass. Firebox door pedal became disconnected due to fulcrum bolt coming out account of nut missing; one injured.

\*July 21, 1949, locomotive 7833. Bell chain was stuck; one injured.

August 8, 1949, locomotive 4679, Pittsford, N. Y. Precision power reverse gear was hard to operate; gear adjusting screw shaft and threads were worn and hole in indicator block was worn oversize, permitting indicator block to work on the shaft and bind the handwheel; reverse gear was reported handling hard on July 25, 30, and 31, and August 2, 5 (two times), 6, 7, and 8; one injured.

August 10, 1949, locomotive (B. & A.) 310, West Newton, Mass. Injector steam ram packing nut was leaking; one injured.

September 2, 1949, locomotive 4907, Midland, Ill. Handle on handwheel of precision reverse gear jerked from employee's grasp and the handwheel spun out of control; universal joint at forward end of reverse gear reach rod was worn and had considerable lost motion; left link and link block were dry and link showed evidence of having been galled; one injured.

September 15, 1949, locomotive 5201, Syracuse, N. Y. Blow-off cock stuck open, due to a piece of a burned-off staybolt fouling valve seat; sludge pipe was missing from mud ring, permitting foreign matter to enter the blow-off cock; one injured.

September 19, 1949, locomotive 2914, Mitchell, Ill. Handwheel of Precision reverse gear spun out of control and handle on handwheel struck employee's hand, caused by defective condition of bolt which secured a radius bar connection reverse yoke of valve gear and defective condition of self-locking clutch designed to prevent free spinning of the handwheel; one injured.

September 29, 1949, locomotive 2869, South Anderson, Ind. Handwheel of precision reverse gear spun violently out of control and handle on handwheel struck employee's hand; bolt which secured the upper end of left inside radius bar reversing yoke worked out, due to cotter key, nut, and collar of bolt being missing, and fouled the upper inside rear clevis section of gear connecting rod which caused the valve gear to stick, and when the handwheel was forced the valve gear freed suddenly and permitted the handwheel to spin; reverse gear was reported working hard on September 1, 6, 9, 14, 21, and 24; one injured.

October 16, 1949, locomotive 2511, en route Williamsport, Pa. to Corning, N. Y. Precision power reverse gear was hard to operate; sleeve of gear adjusting screw, gland, and packing at back end of reverse gear cylinder were worn and packing was distorted, permitting it to seize on the sleeve; one injured.

\*\*October 21, 1949, locomotive 4552, Canajoharie, N. Y. Flash ignition light commercial type fuel oil in firebox of oil-burning locomotive expelled flame and hot gases into cab through an uncovered sanding hole in firebox door; one injured.

November 6, 1949, locomotive 7408, Syracuse, N. Y. Crown-sheet failure used by overheating due to low water; two injured.

November 24, 1949, locomotive (I. H. B.) 258, near St. John, Ind. Superheater flue bead weld and bead separated from bottom half of flue at rear flue sheet producing an opening  $\frac{1}{2}$  inch in maximum width; flue had been thinned by excessive rolling; stoker peephole slide cover plate was stuck and the four  $\frac{1}{2}$ -inch peepholes were approximately three-fourths open; one injured.

November 25, 1949, locomotive 1921, Geneva, N. Y. Flue ruptured through 10 percent of its circumference at front flue sheet, due to being badly pitted and very thin; one injured.

December 3, 1949, locomotive 7874, River Rouge, Mich. Lost motion in throttle rigging resulted in improper operation of main steam-throttle lever; one injured.

December 10, 1949, locomotive 5272, Wayneport, N. Y. Sand box cover fell from locomotive; safety chain was disconnected from cover; one injured.

December 15, 1949, locomotive 2122, Lake Orion, Mich. Throttle was difficult to open fully; one injured.

\*\*January 7, 1950, locomotive 2365, near Dearborn, Mich. Air valve in EP valve which operates the acknowledging switch stuck at times and would not

seat properly; dirt under air valve seat permitted acknowledging whistle to continue blowing after receiver had passed to inductor; one injured.

February 9, 1950, locomotive 263, Guilford, Ind. Packing on overflow valve stem was loose; overflow valve worked to closed position causing injector to break; interruption to water supply lowered water level in boiler to danger point; one injured.

February 14, 1950, locomotive 2994, Utica, N. Y. Precision reverse gear handwheel spun rapidly out of control and handle on handwheel struck employee; reverse gear was kicking due to operating slide valve leaking badly; self-locking clutch, designed to prevent free spinning of the handwheel, was oily; one injured.

February 15, 1950, locomotive 5234, La Porte, Ind. Location of train control relay box on top of tender water tank prevented insertion of water spout in tank filling hole; one injured.

March 2, 1950, locomotive 7336, Toledo, Ohio. Footboard at rear of tender was out of position due to footboard hangers being bent back under tender end sill; one injured.

April 8, 1950, locomotive 2583, Stoneboro, Pa. Leaking throttle valve caused unexpected movement of locomotive; one injured.

\*\*May 24, 1950, locomotive 2799, Verona, N. Y. Metal equipment box broke from fastening to cab roof and fell, striking employee; box was not properly secured and excessive vibration caused by bad condition of driving boxes and rods caused additional strain on fastening; driving boxes or rods were reported pounding or pounding bad 41 times and locomotive reported riding hard 15 times since April 1; one injured.

May 30, 1950, locomotive 1542, Indianapolis, Ind. Flue broke at front flue sheet; flue had been excessively grooved and rolled and was badly pitted; three injured.

June 27, 1950, locomotive 7608, Indianapolis, Ind. Employee fell while descending from cab seat after checking lubricator feeds; two bull's-eye feed sights of hydrostatic lubricator were approximately 72 inches above level of the cab seat deck, obscured by steam pipe to water column and difficult to observe; one injured.

Twenty-six accidents; 29 injured.

## NORFOLK &amp; WESTERN RAILWAY:

November 24, 1949, locomotive 1216, North Kenova, Ohio. Reflex type water glass burst; lower part of water glass was eroded and thickness at point of failure was reduced to  $\frac{1}{16}$  inch at bottom of serrations; one injured.

One accident; one injured.

## NORTHERN PACIFIC RAILWAY:

\*\*September 1, 1949, locomotive 5114, Washtucna, Wash. Oil on vertical handhold on rear of tender; one injured.

September 5, 1949, locomotive 1669, near Goodrich, N. Dak. Crown-sheet failure caused by overheating due to low water; no means provided whereby blow-off cock operating mechanism could be secured or locked in closed position; two injured.

October 18, 1949, locomotive 2242, Dickinson, N. Dak. Ashpan slide stuck; one injured.

February 26, 1950, locomotive 1193, Laurel, Mont. Cab-seat box was loose; one injured.

February 27, 1950, locomotive 2609, near Woodland, Wash. Left No. 2 flange oiler pot became disengaged and was thrown from moving locomotive, due to failure of defective weld connecting oiler-pot bracket to brake hanger bracket; "Left #2 driver flange oiler loose" was reported on February 26; one injured.

March 25, 1950, locomotive 2652, Mossmain, Mont. Superheater flue failed near safe end weld; metal overheated when welded; one injured.

May 6, 1950, locomotive 2455, Mandan, N. Dak. Two bolts extended  $\frac{3}{8}$  inch above surface of running board; one injured.

May 17, 1950, locomotive 1792, Yardley, Wash. Headlight did not comply with illumination requirements; "Speed up dynamo-lites very poor" was reported on May 14; one injured.

Eight accidents; nine injured.

## NORTHWESTERN PACIFIC RAILROAD:

July 7, 1949, locomotive (S. P.) 2708, Willits, Calif. Employee slipped on the top of tender fuel-oil tank which was not level; tank was sprung upward around manhole to a maximum of  $1\frac{1}{16}$  inches; one injured.

One accident; one injured.

## PECOS VALLEY SOUTHERN RAILWAY:

July 23, 1949, locomotive 5, Pecos, Tex. Crown-sheet failure caused by overheating due to low water; one killed.

One accident; one killed.

## PENNSYLVANIA RAILROAD:

July 12, 1949, locomotive 9984, New Brighton, Pa. Driving spring hanger broke through progressive fractures in front and back portions of hanger at gib slot; one injured.

\*August 7, 1949, locomotive 8277. Grate shaker bar was burred; one injured.

August 11, 1949, locomotive 9432, Dennison, Ohio. Injector starting valve separated from valve stem, due to worn valve assembly; one injured.

August 13, 1949, locomotive 6159, near Johnstown, Pa. Grate shaker bar became dislodged from storage bracket and fell, striking employee's foot; storage bracket was not suitable for the type of shaker bar being used; one injured.

August 14, 1949, locomotive 4616, Leolyn, Pa. Undesired application of brakes, due to feed valve failing to supply the proper train line pressure; feed valve, distributing valve, and air compressor were defective; one injured.

September 3, 1949, locomotive 1634, Enola, Pa. Flue failed in prosser groove at back flue sheet; flue wasted away on water side adjacent to back flue sheet and thinned to knife edge at the point of failure; two injured.

\*\*September 22, 1949, locomotive 127, Enola, Pa. Hard working throttle; throttle balancing piston packing ring was poor fit in throttle chamber; throttle was reported working hard on September 7, 13, 17, 20, and 22; one injured.

November 12, 1949, locomotive 4292, Dennison, Ohio. Cab handhold at gangway broke through old fracture in top bend; one injured.

December 3, 1949, locomotive 6945, near Creasy, Pa. Fire scraper fell from support brackets on tender; rear bracket was missing when locomotive was dispatched; one injured.

December 27, 1949, locomotive 5101, Camden, N. J. Boiler washout cap blew off while being examined or tightened under pressure because of leakage; threads on cap were badly deteriorated; one injured.

March 9, 1950, locomotive 7284, Roxanna, Ohio. Front coupler pivot pin on second locomotive of double header broke and locomotives parted, resulting in emergency application of the brakes and collision with leading locomotive; excessive lost motion between coupler shank and coupler pocket bushings and coupler pivot pin; coupler pivot pin was not heat-treated as required by carrier's specifications; one injured.

April 10, 1950, locomotive 8306, Indianapolis, Ind. Reflex type water glass burst; one injured.

May 5, 1950, locomotive 7225, Chicago, Ill. Flue broke off at front flue sheet; flue deeply grooved and reduced in thickness by corrosion; excessive openings between fire doors and frame and peephole cover was stuck in two-thirds open position; one injured.

May 21, 1950, locomotive 3805, Sebring, Ohio. Bracket supporting duplex air gage and gage light bracket broke off boiler back head due to failure of the two supporting studs which broke through roots of first threads outside back head; top stud had 100 percent old fracture and the other stud was fractured through 85 percent of cross-sectional area; defects found and reported indicated that locomotive had been pounding for some time; one injured.

May 23, 1950, locomotive 5490, Midway, Pa. Squirt-hose valve worked open; valve-stem packing was loose; one injured.

June 15, 1950, locomotive 6447, Mansfield, Ohio. Supply pipe to steam-operated booster cylinder cocks was broken at connection to main booster steam pipe; one injured.

June 22, 1950, locomotive 4393, Pittsburgh, Pa. Throttle was hard to operate due to worn balancing piston ring and chamber; throttle reported 15 times in the 30 days preceding the accident; one injured.

Seventeen accidents; 18 injured.

## SEABOARD AIR LINE RAILROAD:

November 12, 1949, locomotive (F. E. C.) 436, Ocala, Fla. Tender water tank manhole cover fell from open (practically vertical) position; latch provided to hold the cover in open position was inadequate; one injured.

January 28, 1950, locomotive 235, Aberdeen, N. C. Insufficient clearance between blow-off cock operating lever and a hinge which was used as a cab window stop; one injured.

March 11, 1950, locomotive 308, Madison, Fla. Oil on gangway step; tender fuel oil drain hole was located just above the step; no means provided to direct drainage from oil tank beneath the tank; one injured.

April 4, 1950, locomotive 337, near Laurel Hill, N. C. Employee struck by swinging coal gate; hook to secure the hinged gate in open position was missing; one injured.

May 26, 1950, locomotive 245, Otis, Fla. Squirt-hose valve worked open due to packing nut being too loose; one injured.

Five accidents; five injured.

## SOUTHERN RAILWAY:

July 9, 1949, locomotive 670, Centralia, Ill. Pilot beam handrail pulled loose at right end, due to bolts for securing it to pilot beam being missing; "Bolts loose on right side of grab iron on pilot" was reported on July 8; one injured.

\*\*December 17, 1949, locomotive 1872, Knoxville, Tenn. Coal and ice on gangway step; one injured.

February 2, 1950, locomotive 4852, Lula, Ga. Nail protruded  $3\frac{1}{2}$  inches from back of extension board attached to bottom coal board; one injured.

April 9, 1950, locomotive 6270, Cincinnati, Ohio. Employee fell against the protruding base or stub end of a fusee which had been driven into the rear inside wall of cab as a means of securing sliding back curtain latch in open position; carrier had no standard application for this purpose; one injured.

\*\*April 10, 1950, locomotive 627, Hendersonville, N. C. Coupler was inoperative; coupler knuckle was cracked near inside end, permitting tip of knuckle to stretch out of position; one injured.

June 5, 1950, locomotive 842, Commerce, Ga. Cab apron was approximately  $1\frac{1}{2}$  inches above tender deck account of coal packed under apron; one injured.

Six accidents; six injured.

## SOUTHERN PACIFIC—LINES WEST:

\*\*July 13, 1949, locomotive 4175, Wicopee, Oreg. Lugs for securing cab-seat box in position were worn; seat box moved back and back rest fouled squirt-hose valve handwheel, which caused the valve to open unexpectedly; one injured.

July 15, 1949, locomotive 4413, Ben Ali, Calif. Employee in cab was injured by flying glass from broken cab storm window; single thickness nonsafety glass was used in window; one injured.

August 13, 1949, locomotive 3248, Tracy, Calif. Particles of asbestos blew into employee's eyes; one injured.

August 15, 1949, locomotive 3213, Toy, Nev. Pilot beam handrail broke in right-angle bend at one end; old fracture at point of failure; one injured.

August 18, 1949, locomotive 2609, Black Butte, Calif. Employee fell from running board; handrail on the side of cab was  $1\frac{1}{2}$  inches higher above the running board than the maximum prescribed height; one injured.

October 9, 1949, locomotive 5019, Red Rock, Ariz. Locomotive steamed poorly due to imperfect combustion which caused an excessive accumulation of carbon in the firebox; splice joint between left and middle cylinders was leaking and discharging exhaust steam into the smokebox front end; burner in firebox was cracked along the left side and the steam jet was worn, causing uneven distribution of flames in the firebox; clean carbon from firebox and/or engine not steaming properly were reported on September 8, 10, 14, 16, 22, and 27, and October 9, 11, 15, 18, and 22; one injured.

November 4, 1949, locomotive 2463, Davis, Calif. High reaction pressure caused squirt hose to break from employee's grasp and whip about in cab; diameter of squirt hose choke fitting was  $\frac{1}{8}$  inch greater than carrier's standard; one injured.

November 6, 1949, locomotive 2589, Hillsboro, Oreg. Main steam turret valve bonnet blew out; threads on bonnet and in turret badly corroded and

rounded; wrench fit on bonnet badly deformed at corners where chisel had been used to tighten bonnet in attempt to stop leakage; one injured.

December 6, 1949, locomotive 1782, Los Angeles, Calif. Air compressor stopped, due to lack of proper lubrication. In attempting to start compressor employee lost grasp because of oil on handrail and fell from running board; one injured.

December 11, 1949, locomotive 4153, Dunsmuir, Calif. Oil on top of tender fuel-oil tank around measuring rod; one injured.

December 27, 1949, locomotive 3123, Pulp, Oreg. Insufficient clearance between cab vertical handhold and gangway ladder stile when on sharp curve; one injured.

\*\*December 29, 1949, locomotive 3226, Suisun, Calif. Drinking water container fell from bracket on front end of tender, due to pin used to fasten ends of bracket around container working out; pin and wire fastening used was not the carrier's standard; one injured.

February 1, 1950, locomotive 2703, Newton, Oreg. Ice and snow in gangway and on gangway handholds and steps; one injured.

February 4, 1950, locomotive 3241, near Modoc Point, Oreg. Explosion in firebox of oil-burning locomotive caused by ignition of undesired flow of oil to firebox; firing valve lever stop pin in quadrant was too short and stop pin and lever were worn, permitting lever to pass over stop pin and open oil feed cock when attempt was made to close the firing valve; one injured.

February 7, 1950, locomotive 2858, Timber, Oreg. Oil on top of tender fuel oil tank; one injured.

February 22, 1950, locomotive 4443, Blaisdell, Ariz. Grease on deck of engine; one injured.

\*\*March 9, 1950, locomotive 3215, Los Angeles, Calif. Insufficient clearance between cab gangway handhold and tender deck when on a sharp curve; one injured.

April 5, 1950, locomotive 2382, Tracy, Calif. Leak at stem of lubricator water valve; one injured.

April 13, 1950, locomotive 4390, Roseville, Calif. Employee's foot was crushed between cab apron and a piece of pipe welded on tender deck for holding cab side curtain rod; cab apron was too wide for the space between locomotive and tender; one injured.

April 22, 1950, locomotive 4410, San Jose, Calif. Explosion and flash back from firebox of oil-burning locomotive when attempt was made to relight the fire; oil burner was not properly lined up; one superheater unit was fractured; one injured.

May 18, 1950, locomotive 5008, Watsonville Junction, Calif. Excessive space between boards of running board on top of tender; one injured.

June 27, 1950, locomotive 2312, Grapit, Calif. Hot water which had accumulated in turbo-generator blew out of exhaust pipe when steam was turned on and entered cab through open ventilator in cab roof; drain pipe was stopped up with dirt and scale at a union in pipe and ventilator cover was fastened in open position; exhaust pipe was curved so that discharge was directed to cab roof at ventilator; apparently drain pipe was not given proper attention when generator was changed on June 17; one injured.

June 30, 1950, locomotive 4157, Norden, Calif. Undesired emergency application of brakes caused locomotive to stop in tunnel; lame engine and numerous steam leaks had been reported on a number of previous occasions; one injured.

Twenty-three accidents; 23 injured.

#### SPokane, Portland & Seattle Railway:

September 24, 1949, locomotive 700, Pasco, Wash. Particles of hot carbon or sand blew into cab through fire-door peephole, injuring employee's eye; brick flash wall in firebox was low and in poor condition; "Clean firebox" or similar items were reported repeatedly in the 30 days preceding the accident; one injured.

February 1, 1950, locomotive 626, Pasco, Wash. Bell was inoperative; one injured.

February 28, 1950, locomotive 700, near South Cheney, Wash. Grease-cup bushing was thrown from right side rod middle connection and crashed through cab window; threads on bushing and in connection were badly worn and no means provided to lock the bushing in the side rod; cab window was not equipped with

safety glass; "Renew grease cup bushing to right middle connection bushing" was reported at time of monthly inspection on February 27 and was signed off, indicating the work was done; one injured.

March 6, 1950, locomotive 911, Vancouver, Wash. Backfire from firebox of oil-burning locomotive; firebox brick work was in poor condition; firebox reported to be cleaned out numerous times in the 30 days preceding accident, including a report on March 6; one injured.

Four accidents; four injured.

#### TEXAS & PACIFIC RAILWAY:

December 18, 1949, locomotive 277, Addis, La. Crown-sheet failure caused by overheating due to low water; one injured.

One accident; one injured.

#### UNION PACIFIC RAILROAD:

September 18, 1949, locomotive (O. W. R. & N.) 2159, Nampa, Idaho. Blow-off valve stem packing was leaking; gasket seat in stem bushing was cut and gasket was reduced from original ¼-inch thickness to ⅛ inch and was broken into three pieces; one injured.

February 28, 1950, locomotive 3836, near Georgetown, Idaho. Explosion occurred in firebox of oil-burning locomotive; fire extinguished when trip pin worked out of tender oil-tank valve stem; ignition and explosion occurred when fuel supply was restored; carrier's standard stop on firing valve lever quadrant, to indicate closed position of lever, was missing; one injured.

March 15, 1950, locomotive (O. W. R. & N.) 2159, Nampa, Idaho. Three-eighths inch tapered vertical opening between footboard and back stop; one injured.

April 19, 1950, locomotive 2497, Frederick, Colo. Power reverse lever latch block stuck in raised position and failed to engage the quadrant which permitted reverse gear to make undesired movement to position for forward movement while locomotive was backing with five cars, resulting in severe slack action; reverse gear latching mechanism was defective; one killed.

Four accidents; one killed, three injured.

#### WABASH RAILROAD:

\*\*July 10, 1949, locomotive 2823, Brooklyn, Ill. Squirt hose burst; one injured.

#### WESTERN PACIFIC RAILROAD:

July 27, 1949, locomotive 251, Berry Creek, Calif. Employee fell from top of tender to the ground, due to tripping on clinker bar or water spout hook, both of which were lying on top of tender cistern just behind the fuel-oil tank; one injured.

\*\*May 14, 1950, locomotive 257, near Belden, Calif. Throttle was hard to operate; threads were stripped from lower end of left valve in multiple throttle and rollers in front guide to throttle valve rod were stuck and inoperative; one injured.

Two accidents; two injured.

#### ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF LOCOMOTIVE UNITS OTHER THAN STEAM AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1950, BY ROUTES

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

#### ATCHISON, TOPEKA & SANTA FE RAILWAY:

July 4, 1949, unit 55-A, Amarillo, Tex. Detonation occurred in steam generator combustion chamber when generator was restarted after having been shut down by automatic safety control; one injured.

\*August 31, 1949, unit 2601. Grease on running board; one injured.

\*\*September 18, 1949, unit 101, Marceline, Mo. Engineer's foot slipped from safety control (dead man) pedal. Full service brake application, operation of pneumatic control switch and rough stop of train resulted. Adequate means not provided to prevent foot slippage; one injured.

\*\*October 17, 1949, unit 2405, Barstow, Calif. Air-reducing valve became inoperative; one injured.

October 22, 1949, unit 2350, San Bernardino, Calif. Employee fell due to stepping on a brake club which was lying on end platform; no storage place provided for brake clubs when not in use; one injured.

November 3, 1949, unit 2405, Barstow, Calif. Crankcase explosion caused by an overheated bearing; connecting rod of rear assembly was broken, bearing shells were broken, and crankshaft was badly scored; blade type connecting rod broke through flaw near lower end which extended through 20 percent of cross-sectional area; one injured.

January 27, 1950, unit 216, Clovis, N. Mex. Grease on step of control cab ladder; one injured.

February 2, 1950, unit 213, Lenwood, Calif. Engine of Diesel-electric unit would not respond to throttle movement; plunger on "D" magnet valve on governor was sticking and did not contact the solenoid plate pressure point; heavy flash occurred in high voltage electrical control cabinet while employee was checking connections in cabinet while unit was under load; one injured.

\*\*February 13, 1950, unit 18-B, Winslow, Ariz. Oil on engine room floor; one injured.

Nine accidents; nine injured.

#### ATLANTIC COAST LINE RAILROAD:

March 30, 1950, unit 346-A, Bessemer, Ala. Oil leaking on floor of engine room; one injured.

One accident; one injured.

#### BALTIMORE & OHIO RAILROAD:

July 10, 1949, unit 59-B, near Childs, Md. Crankcase explosion caused by overheated bearings; one injured.

One accident; one injured.

#### CENTRAL RAILROAD OF NEW JERSEY:

October 12, 1949, unit (C. R. P.) 2-B, near Treichler, Pa. Unit became uncoupled from freight train; bottom portion of coupler which housed rotary lock lift assembly was bent inward which prevented lock lift assembly and coupler lock from dropping into locked position; one injured.

One accident; one injured.

#### CHICAGO, BURLINGTON & QUINCY RAILROAD:

December 31, 1949, unit 136-A, Bonneville, Wyo. Cab-door handle was improperly applied; one injured.

One accident; one injured.

#### CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

December 22, 1949, unit E35-A, Two Dot, Mont. Locomotive unit collided with a standing car; headlight on operating end of unit was inoperative and a 60-watt light bulb on an extension cord was being used for headlight; headlight was inoperative when locomotive was dispatched to haul freight train; "#69 relay kicks out on A unit" was reported on December 12 and 20 and "The capacitor which is on #68 relay caused 69 relay to kick out at least 20 times between Deer Lodge and Butte on A unit" was reported on December 20; one injured.

One accident; one injured.

#### CHICAGO, ROCK ISLAND & PACIFIC RAILROAD:

\*August 3, 1949, unit 639. Steam-heat valve on unit was leaking badly; one injured.

August 21, 1949, unit 92, near Grinnell, Iowa. Crankcase explosion; water leak in oil cooler core caused excessive dilution of the lube oil and all main crankshaft bearings became overheated, resulting in ignition of the combustible vapors in the crankcase; one injured.

October 14, 1949, unit 98, Oklahoma City, Okla. Crankcase explosion caused by overheated main bearing; main bearing cap was closed in from 0.036 inch to 0.040 inch; all lube oil filter elements were dirty; one injured.

Three accidents; three injured.

#### ERIE RAILROAD:

March 3, 1950, unit 732-A, Marion, Ohio. Hand-brake wheel slipped off operating shaft; nut which secured wheel on shaft was missing; one injured.

June 24, 1950, unit 5010, Midvale, N. J. Inadequate means provided for handling cab-window sash; one injured.

Two accidents; two injured.

#### MISSOURI PACIFIC RAILROAD:

\*July 29, 1949, unit 501-A. Oil on cab floor; one injured.

One accident; one injured.

#### NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

March 18, 1950, unit 5, Chattanooga, Tenn. Brake pipe on rear end of unit was too short, causing air hose to uncouple when on curve; one injured.

April 18, 1950, unit 33, Atlanta, Ga. Back rest of engineman's cab seat failed in upright spring steel section; old fracture at point of failure; one injured.

Two accidents; two injured.

#### NEW YORK CENTRAL SYSTEM:

\*July 4, 1949, units 4004 and 4100. Grease on floor of unit; one injured.

October 3, 1949, unit 276, Tarrytown, N. Y. Steam chest gasket blew out of feed water pump; one injured.

November 7, 1949, unit 1638, New Scotland, N. Y. Cab heater fan in control unit was not fully guarded; one injured.

December 2, 1949, unit 110, New York, N. Y. Treadle on air valve which operated overhead collector was worn smooth and tapered to a sharp edge; one injured.

May 23, 1950, unit (B. & A.) 808, Framingham, Mass. Front of tread board of right front footboard broke off through old crack; one injured.

Five accidents; five injured.

#### NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

\*\*February 3, 1950, unit 0760, New Haven, Conn. Water from leaking ice box and oil on floor of nose compartment; one injured.

\*\*May 20, 1950, unit 0701, Midway, Conn. Fire occurred at No. 3 traction motor; one traction motor field lead was loose or disconnected, causing arcing; one injured.

May 26, 1950, unit 0752, New Haven, Conn. Oil and grease on engine-room floor; fuel pump to No. 2 engine was leaking; oil radiators, lube oil line, and engine fuel pumps were reported leaking numerous times in the 10 days preceding the accident; one injured.

\*\*June 30, 1950, unit 906, New Haven, Conn. Oil on running board and cab deck; one injured.

Four accidents; four injured.

#### NORTHERN PACIFIC RAILWAY:

January 23, 1950, unit 6005-C, near Marshall, Wash. Drain pipe to after cooler filter broke; loose braces permitted excessive vibration; welding at one end of right brace was broken and nut was loose and bolt hole elongated at other end; left brace had never been attached to bracket; one injured.

One accident; one injured.

#### PENNSYLVANIA RAILROAD:

August 27, 1949, unit 4706, North East, Md. Trailing pantograph on second locomotive unit failed to lower when pantograph on the leading unit was lowered; one killed.

September 4, 1949, unit 4848, Elizabeth, N. J. Explosion in transformer tap switch compartment occurred when attempt was made to start the unit because contacts of one of the tap switches were fused together and arc chutes were missing from other nearby tap switches; two injured.

January 7, 1950, unit 4748, near Columbia, Pa. Spring rigging bolt worked out of position; nut for securing bolt was missing; employee was fatally injured when

his head struck a catenary pole as he leaned out of cab door to determine the cause of the smoke and fumes coming from around driving wheels; one injured.

March 1, 1950, unit 5850-B, near Hanlin, Pa. Oil on engine-room floor; one injured.

March 13, 1950, unit 4879, Elizabeth, N. J. Cap of rubber drive assembly (quill cups) worked off and parts of the assembly were thrown from the locomotive unit; one cap screw worked outward and contacted main frame, resulting in breakage of the other three cap screws; one injured.

Five accidents; one killed, five injured.

#### READING COMPANY:

November 30, 1949, unit 40, Philadelphia, Pa. Oil on right running board caused by engine governor leaking; leather cup washers on trip rod in governor were worn to extent that air leaked past them and forced oil from vent on top of sight gage of governor; "Bad oil leak on right side of engine" and "Examine engine governor for leaking oil. Clean oil from running board, right side. Clean oil from engine room floor" were reported on November 30, prior to the unit being placed in service; one injured.

One accident; one injured.

#### SEABOARD AIR LINE RAILROAD:

September 7, 1949, unit 4202, near Hanlin, Ga. Brakeman's cab seat fell, due to failure of spot welding between plate at bottom of seat and top of column supporting the seat; seat plate and column were not properly welded; one injured.

June 23, 1950, unit 4005, Aberdeen, N. C. Oil on engine room floor caused by leak in main bearing lubricating oil discharge line at flanged connection to gear housing; oil leak was reported and repairs attempted approximately 1 hour prior to the accident; one injured.

Two accidents; two injured.

#### SOUTHERN RAILWAY:

\*\*March 24, 1950, unit 6060, Cox, Ala. Speed recorder friction drive wheel arm broke in welded joint; weld was defective; one injured.

One accident; one injured.

#### SOUTHERN PACIFIC—LINES WEST:

September 18, 1949, unit 6004-C, Los Angeles, Calif. Cast-iron filter pot in main reservoir air system exploded; wall thickness not symmetrical because of shifted core. Failure resulted from excessive air pressure caused by air compressor running out of control when valve to air operated compressor control relay was closed during renewal of an air pressure gage; one injured.

December 14, 1949, unit 8060, Molus, Calif. Oil on engine-room floor; one injured.

\*\*February 15, 1950, unit 5208, Glendale, Calif. Front door of cab was difficult to disengage from spring-operated stop which held it in open position; one injured.

\*\*April 23, 1950, unit 6140, Pope, Calif. Temporary drinking water cooler was not properly secured in position in the cab; one injured.

Four accidents; four injured.

#### UNION PACIFIC RAILROAD:

April 20, 1950, unit 1614-C, Fallon Spur, near Walnut, Calif. Wheel under Diesel-electric unit broke into six pieces while train was running at speed of 59 miles per hour and the broken wheel damaged a track switch, resulting in derailment of the unit and 41 cars of the train; failure of the class B wheel occurred through cracks originating in hot stenciled indentations in the rim; two killed.

\*\*June 8, 1950, unit 1187, Tekoa, Wash. Employee slipped on running board, fell through open door of engine room, and his hand was caught between the belt and small upper sheave of front traction motor blower; running board was slippery due to oil and water, and traction motor blower belt guard did not adequately protect the pulley; one injured.

Two accidents; two killed, one injured.

#### WABASH RAILROAD:

March 1, 1950, unit 1201, Riverside, Ind. Nut worked off high pressure air compressor connecting rod cap bolt and the bearing became disconnected, resulting in breakage of the air compressor crankcase; nut was not secured on bolt with a cotter pin; one injured.

One accident; one injured.

#### WESTERN PACIFIC RAILROAD:

\*\*August 26, 1949, unit 901, Doyle, Calif. Oil on floor of unit; one injured.

November 16, 1949, unit 802-C, Sloat, Calif. Control valve application cap gasket was leaking which caused brakes on unit to stick; one injured.

November 28, 1949, unit 553, Portola, Calif. Arm rest fell from cab window; arm-rest board was worn and did not properly engage window frame; one injured.

Three accidents; three 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	Albion & Southern	Ann Arbor	Atchison, Topeka & Santa Fe	Atlanta & West Point	Atlantic Coast Line	Baltimore & Ohio	Bangor & Aroostook	Belt Ry. Co. Chicago	Bessemer & Lake Erie	Boston & Maine
1 Air compressors	2		1	21		1	25				2
2 Arch tubes											1
3 Ashpans and mechanism							4				
4 Axles											
5 Blow-off cocks				17	1	4	1				
6 Boiler checks				15	1	4	12	1			1
7 Boiler shell				6			3	2			
8 Brake equipment	1		1	27	4	22	97				5
9 Cabs, cab windows, and curtains				2			20				5
10 Cab aprons and decks			1	13	1	5	34				2
11 Cab cards				2			4				
12 Coupling and uncoupling devices											
13 Crossheads, guides, pistons, and piston rods			2	20	1	6	62			1	7
14 Crown bolts				8			3				
15 Cylinders, saddles, and steam chests				35		3	91	1			9
16 Cylinder cocks and rigging				12			15				3
17 Domes and dome caps			1	1			1				2
18 Draft gear				6	1	6	12				
19 Draw gear				6	6	6	15				4
20 Driving boxes, shoes, wedges, pedestals, and braces				26	5	2	64		1		2
21 Firebox sheets				4			1				
22 Flues				14	1		5				1
23 Frames, tail pieces, and braces, locomotive				11	1	2	35				2
24 Frames, tender							2				
25 Gages and gage fittings, air			1	19		2	2				
26 Gages and gage fittings, steam				4			8				1
27 Gage cocks			1	21	2	10	12				2
28 Grate shakers and fire doors				9			14				
29 Handholds			1	7		2	15				1
30 Injectors, inoperative				1			1				
31 Injectors and connections			3	91	5	24	79				10
32 Inspections and tests not made as required			2	2		2	4				
33 Lateral motion				9			25			2	1
34 Lights, cab and classification				1			3				
35 Lights, headlight				7		1	7				1
36 Lubricators and shields				6	1	1	4				1
37 Mud rings				4			5		1		2
38 Packing nuts				35	2		25	5			4
39 Packing, piston rod and valve stem				10			17				
40 Pilots and pilot beams				3		2	6				1
41 Plugs and studs				13			3				
42 Reversing gear				9	1	4	12				1
43 Rods, main and side, crankpins, and collars				23		4	69		1		10
44 Safety valves				1			1				
45 Sanders				31	2	3	23			1	
46 Springs and spring rigging			4	62	1	24	165	2			8
47 Squirt hose				2		3					
48 Stay bolts				14			6		1		2
49 Stay bolts, broken				5			4				
50 Steam pipes				21		7	9				1
51 Steam valves				7		2	5				1
52 Steps				33	1	2	31				3
53 Tanks and tank valves				35	2	9	49				9
54 Telltale holes			1	35			2				2
55 Throttle and throttle rigging				18	4		33				4
56 Trucks, engine and trailing				20	5	4	47				5
57 Trucks, tender				37	1	18	41				3
58 Valve motion				3			37		1		3
59 Washout plugs			2	19			16				2
60 Stokers				1		2	25		1		
61 Water glasses, fittings, and shields	1		2	33	1	3	59	1			8
62 Wheels				6		5	21		1		1
63 Miscellaneous—Signal appliances, badge plates, brakes (hand)			2	46		2	29				3
Number of defects	5		26	994	42	212	1,417	13	7	4	135
Locomotives reported	14	24	33	1,209	40	514	1,629	61	25	93	261
Locomotives inspected	39	33	74	2,500	66	934	3,915	46	207	666	
Locomotives defective	2		12	236	7	55	354	5	3	1	84
Percentage of inspected found defective	5.1		16.2	9.4	10.6	5.9	9.0	23.8	6.5	0.5	12.6
Locomotives ordered out of service				4		2	8				

Camas Prairie	Canadian National	Canadian Pacific	Central of Georgia	Central Railroad of New Jersey	Central Vermont	Charleston & Western Carolina	Chesapeake & Ohio	Chicago & Illinois Midland	Chicago & North Western	Chicago, Burlington & Quincy	Chicago, Milwaukee, St. Paul & Pacific	Chicago River & Indiana	Chicago, Rock Island & Pacific	Chicago, St. Paul, Minneapolis & Omaha	Chicago, West Fullman & Southern	Cincinnati Union Terminal	Clinchfield
1			3	1			6		22	12	18		53	15			4
2	1						1										1
3							1			2							3
4							1										
5							1										
6							1										
7							1										
8							1										
9							1										
10							1										
11	2						27		51	31	22		48	21			2
12							10		6	7	12		23	6			1
13							1		1	1	4		4	6			2
14							1				3		3	3			1
15							7		8		5		5	10			10
16							2		13		2		2	2			13
17							9		1		45		2	1			14
18							34				14		37	8			15
19							8				11		6	3			16
20							2				5		7	1			17
21							2				1		7	5			18
22	1						2				4		4	1			19
23							5				38		130	6			20
24							3				1		15	1			21
25							3				4		37	8			22
26							8				23		39	3			23
27							1				1		6	3			24
28							10				1		1	3			25
29							7				6		2	3			26
30							4				2		2	6			27
31							3				3		8	2			28
32							3				9		30	5			29
33							2				30		1	1			30
34							8				24		7	5			31
35							2				3		1	5			32
36							6				26		4	4			33
37							1				3		7	1			34
38							2				2		4	3			35
39							1				3		2	3			36
40							2				12		3	7			37
41							6				18		24	4			38
42							1				3		12	6			39
43							1				3		3	6			40
44							4				1		2	1			41
45							15				2		5	1	2		42
46							2				17		10	25			43
47							1				3		3	3			44
48	4	3	1				39				27		4	17			45
49							5				40		14	93			46
50							4				2		5	1			47
51							1				3		1	5			48
52							1				8		12	1			49
53							1				4		3	4			50
54							5				1		4	9			51
55							14				2		6	25			52
56	4	3					11				6		49	7			53
57		2					2				9		38	9			54
58	1						2				10		29	3			55
59		3					10				5		19	3			56
60		1					6				4		15	7			57
61		3					2				2		2	5			58
62							4				4		7	33			59
63	1						4				12		4	4			60
							5				8		4	58			61
							1				2		7	1			62
							2				10		6	88			63
	14	33	18	229	92	29	62	347	10	821	228	862	6	2,147	232	28	76
	10	258	98	178	235	47	34	1,022	32	807	733	880	24	461	170	12	82
	42	110	71	323	646	134	71	1,923	68	2,129	1,580	2,286	54	1,478	394	60	167
	7	15	14	42	88	8	12	93	3	190	82	228	5	387	64	12	25
	16.7	13.6	19.7	13.0	5.9	6.0	16.9	4.8	4.4	8.9	5.2	10.0	4	26.2	16.2	20.0	15.0

TABLE XII.—Number of steam locomotives inspected, found

Parts defective, inoperative or missing, or in violation of the rules		Colorado & Southern	Colorado & Wyoming	Conemaugh & Black Lick	Ouyahoga Valley	Davenport, Rock Island & North Western	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western	Detroit & Toledo Shore Line	Detroit, Toledo & Ironton	Donora Southern
1	Air compressors	4					5		6			2
2	Arch tubes											
3	Ashpans and mechanism											
4	Axles											
5	Blow-off cocks					1		3				1
6	Boiler checks					4		4				
7	Boiler shell	3				4		5				
8	Brake equipment	10				1	5	32				4
9	Cabs, cab windows, and curtains	3				4		13				
10	Cab aprons and decks	6				1		4				2
11	Cab cards							3				
12	Coupling and uncoupling devices							1				4
13	Crossheads, guides, pistons, and piston rods	7				5	2	9				4
14	Crown bolts							1				
15	Cylinders, saddles, and steam chests	2				5	1	35				2
16	Cylinder cocks and rigging	1						3				
17	Domes and dome caps	1						3				
18	Draft gear	3				2	1	15				1
19	Draw gear					2	1	5				
20	Driving boxes, shoes, wedges, pedestals, and braces	3				9	5	31				
21	Firebox sheets					7		7				
22	Flues					1		9				
23	Frames, tail pieces, and braces, locomotive	7						1				
24	Frames, tender	1					1	2				
25	Gages and gage fittings, air							1				
26	Gages and gage fittings, steam					1		2				
27	Gage cocks	1						1			3	
28	Grate shakers and fire doors	3					2	10				
29	Handholds	2					1	7			2	2
30	Injectors, inoperative						1	1				
31	Injectors and connections	14				3	5	13			2	3
32	Inspections and tests not made as required					1		1				
33	Lateral motion					2		11				
34	Lights, cab and classification						1	1				
35	Lights, headlight											
36	Lubricators and shields					9		5				
37	Mud rings	1				6						2
38	Packing nuts	3				1		1				1
39	Packing, piston rod and valve stem							8				
40	Pilots and pilot beams					1		2				
41	Plugs and studs					1		1				1
42	Reversing gear	4				1		6				
43	Rods, main and side, crankpins, and collars	4				4	4	24				10
44	Safety valves											
45	Sanders	1				2		26				
46	Springs and spring rigging	11				21	9	35		1	1	1
47	Squirt hose					1						1
48	Stay bolts	1				14						
49	Stay bolts, broken	2										
50	Steam pipes	3					2	12				5
51	Steam valves	1				1	2	8				
52	Steps	2				1	1	6				2
53	Tanks and tank valves	5				3	6	6				
54	Telltale holes	1				1		1				
55	Throttle and throttle rigging	2				2		8				1
56	Trucks, engine and trailing	5					4	9				
57	Trucks, tender	3					3	6				
58	Valve motion	1					3	7				3
59	Washout plugs					7	1	3				
60	Stokers	1				1		3				
61	Water glasses, fittings, and shields	2					4	8				
62	Wheels	1				1		8				
63	Miscellaneous—Signal appliances, badge plates, brakes (hand)	3				7	1	10				
Number of defects		128				145	66	428			8	49
Locomotives reported		67	20	26	15	10	235	188	235	25	50	15
Locomotives inspected		224	53	29		44	832	603	806	54	127	34
Locomotives defective		28					42	24	80		1	7
Percentage of inspected found defective		12.5					5.0	4.0	9.9		0.8	20.6
Locomotives ordered out of service		1							3			

defective, and ordered from service, et cetera—Continued

Duluth, Missabe & Iron Range	Duluth, South Shore & Atlantic	Erie	Florida East Coast	Fort Worth & Denver City	Georgia & Florida	Georgia	Grand Trunk Western	Great Northern	Gulf Coast Lines	Gulf, Colorado & Santa Fe	Gulf, Mobile & Ohio	Illinois Central	Indiana Harbor Belt	International-Great Northern	Interstate	Jacksonville Terminal	Kansas City Southern	Kansas, Oklahoma & Gulf	Lake Superior & Ishpeming		
1						1	1	4	1	2		1			3		2				
2																					
3																					
4																					
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63																					
Number of defects		18	6	63	5	140	17	19	68	126	43	57	5	195	14	37	84	54	10		
Locomotives reported		154	25	325	75	61	28	42	137	574	66	(*)	40	1,173	39	86	16	12	85	12	30
Locomotives inspected		92	26	1,201	122	177	52	59	238	926	181	289	38	2,769	53	109	63	7	229	36	38
Locomotives defective		7	2	22	4	30	7	6	26	59	8	12	2	58	5	7	13		11	3	
Percentage of inspected found defective		7.6	7.7	1.8	3.3	16.9	13.5	10.2	10.9	6.4	4.4	4.2	5.3	2.1	9.4	6.4	20.6	4.8	8.3		
Locomotives ordered out of service		1		1		2		1						3		2	2	1			

\*Atchison, Topeka & Santa Fe.



TABLE XII.—Number of steam locomotives inspected,

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

	Parts defective, inoperative or missing, or in violation of the rules										
	Lehigh & Hudson River	Lehigh Valley	Long Island	Louisiana & Arkansas	Louisville & Nashville	McCloud River	Maine Central	Midland Valley	Minneapolis & St. Louis	Minneapolis, St. Paul & S. S. Marie	Minnesota Transfer
1 Air compressors.....		2	1	4	33						
2 Arch tubes.....					1						
3 Ashpans and mechanism.....					7						
4 Axles.....											
5 Blow-off cocks.....			1	1	1						
6 Boiler checks.....				2	4						
7 Boiler shell.....		3			2						
8 Brake equipment.....		2	1	9	68		2	3			1
9 Cabs, cab windows, and curtains.....		7		7	26				1		1
10 Cab aprons and decks.....		7			21						
11 Cab cards.....		2									
12 Coupling and uncoupling devices.....											
13 Crossheads, guides, pistons, and piston rods.....		5		5	46		2			2	1
14 Crown bolts.....											
15 Cylinders, saddles, and steam chests.....		1		7	38		1			1	
16 Cylinder cocks and rigging.....					22						
17 Domes and dome caps.....					1				4		
18 Draft gear.....		2			22		1				
19 Draw gear.....					4		2				
20 Driving boxes, shoes, wedges, pedestals, and braces.....					15		2				
21 Firebox sheets.....		1			54		3				
22 Flues.....			1	3	2						2
23 Frames, tail pieces, and braces, locomotive.....		2		6	28					1	
24 Frames, tender.....			1								
25 Gages and gage fittings, air.....		1		1	4						
26 Gages and gage fittings, steam.....		2		4	17						1
27 Gage cocks.....		2			8						
28 Grate shakers and fire doors.....				3	2						
29 Handholds.....		1		1	6			1	1		
30 Injectors, inoperative.....					1						1
31 Injectors and connections.....		6	2	5	56		2				3
32 Inspections and tests not made as required.....		1		4	4				3		
33 Lateral motion.....		2	3	7	8						
34 Lights, cab, and classification.....				2	1						
35 Lights, headlight.....					1						
36 Lubricators and shields.....		1		2	3		1				
37 Mud rings.....											
38 Packing nuts.....		11			33						
39 Packing, piston rod and valve stem.....		1		3	21						
40 Pilots and pilot beams.....		1			4						
41 Plugs and studs.....				1	6						
42 Reversing gear.....		4	2	1	1						
43 Rods, main and side, crankpins, and collars.....		3	1	14	61		3				
44 Safety valves.....											
45 Sanders.....		2		1	27						
46 Springs and spring rigging.....		3	1	7	106		6			1	
47 Squirt hose.....					7						
48 Stay bolts.....				3	6		1				
49 Stay bolts, broken.....					11						33
50 Steam pipes.....					9		1				
51 Steam valves.....					2				1		
52 Steps.....		2		2	23						
53 Tanks and tank valves.....		11	2	13	31		3				2
54 Telltale holes.....					1						
55 Throttle and throttle rigging.....		2		7	23						
56 Trucks, engine and trailing.....		1	2	2	28		1				
57 Trucks, tender.....		3	2	1	3		4				
58 Valve motion.....		3			9						
59 Washout plugs.....					1					3	
60 Stokers.....					12		2				
61 Water glasses, fittings, and shields.....		17		3	14		1	2			1
62 Wheels.....		7	2		6						
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).....		5	4	4	13						
Number of defects.....		132	27	157	960		37	5	2	20	50
Locomotives reported.....	18	151	60	38	731	12	87	13	14	217	12
Locomotives inspected.....	71	462	58	103	1,619	18	253	17	41	369	31
Locomotives defective.....		38	8	30	175		22	1	1	7	15
Percentage of inspected found defective.....		8.2	13.8	29.1	10.8		8.7	5.9	2.4	1.9	48.4
Locomotives ordered out of service.....				6	24						6

	Mississippi Central	Missouri-Illinois	Missouri-Kansas-Texas	Missouri Pacific	Monongahela	Montour	Nashville, Chattanooga & St. Louis	New York Central	New York, Chicago & St. Louis	New York, New Haven & Hartford	Norfolk & Portsmouth Belt Line	Norfolk & Western	Norfolk Southern	Northern Pacific	Northwestern Pacific	Pennsylvania	Pennsylvania-Reading Seashore Lines	Pittsburgh & Lake Erie	Pittsburgh & Shawmut
	1				7			4	83	3			20		10	3	138		4
2								1				1				2			
3				2			1	4				2		1	2	12			
4																			
5				2			10	38				1		4		25			
6				1			1	93				1		3		31		1	
7				2			19	16		2		3		2	1	62			
8	1			48			19	197	4	2		19		19	5	302		2	
9				13			13	133	5	1		10		15	5	130			
10				5			13	49	2			1		4	1	40			
11				1			1	15							1	4			
12								5											
13	1			18			12	124	2			1		2	7	193		1	
14								12						7	6	7			
15				20			18	60	1			1				3			
16				1			1	38				40		15	1	140			
17	1			1			8	34				10		2	5	74			
18	2			6			4	23				2		2		11			
19				6			4	25				1		4	5	47			
20				14			40	59	3			18		3	1	48			
21				3			3	10		1		2				237			
22	1			2			3	7								53			21
23	2			3			1	37				27		1	3	6			
24				1			2	1						2		33			
25	1			1			2	6						1	2	2			
26	2			2			12	36				3		1	1	17			
27	2			3			3	22	3			2		2	2	29			
28				3			8	54	3			2		10	2	56		1	
29	1			1			3	91	2	1		15		4	2	74		1	
30				6			2	8				3		1	8	55		2	
31				1			30	1				1		1		3			
32	6			5			1	220	7			29		17	9	281		2	
33	1			4			3	9								8			
34	2			7			4	51				9		2		81			
35				1			1	4	1			2		2		22			
36				1			1	3				1		1	2	24			
37	1			2			6	10				14		3	4	24			
38	11			3			1	12				1				11			
39	1			3			6	108	1			13		5	2	34			
40	1			3			13	40				13		3		41		3	
41				1			3	19						6		19		1	
42	4			1			2	13				15		2	3	14			
43	3			14			5	86	1			2		3	80				
44							17	101	2			26		5	2	245			
45								10				1				1			
46	3			7			27	7				10				51			
47	3			3			26	360	2			72		14	6	657		6	
48							1	9								11			
49							1	31	1	1				2		40			
50							8	8								54			
51							8	17				1		3	3	51			
52	2			2			4	10				3		1		21			
53	2			2			5	124				2		4	3	84			
54							17	103				14		5	9	121			1
55							1									5			
56							3	5								99			
57							5	86				1		9	4	82			
58							10	149				16		5		99			
59							3	70				7		11	4	60			
60							7	3				25		4	5	49			
61							10	1						7		59			
62							4	29						3		69			
63							17	9				4		4		59			
							2	163				5		11	4	123			1
							1	34				5		2		87			
							5	121				4		10	1	51		2	

TABLE XII.—Number of steam locomotives inspected, found

defective, and ordered from service, et cetera—Continued

	Pittsburgh & West Virginia	Quebec Central	Reading	Richmond, Fredericksburg & Potomac	River Terminal	Rutland	St. Louis-San Francisco	St. Louis Southwestern	San Diego & Arizona Eastern	Seaboard Air Line
1 Air compressors.....	2	1				8	12	2	3	6
2 Arch tubes.....										
3 Ashpans and mechanism.....						1				
4 Axles.....										
5 Blow-off cocks.....							2	1	3	
6 Boiler checks.....						2	1			1
7 Boiler shell.....	1					2	2		2	
8 Brake equipment.....	3	1	2			13	20	2	1	26
9 Cabs, cab windows, and curtains.....	4					4	12	1	1	7
10 Cab aprons and decks.....	1					3	2	1		3
11 Cab cards.....						1			2	
12 Coupling and uncoupling devices.....										
13 Crossheads, guides, pistons, and piston rods.....	2	1				12	3		3	4
14 Crown bolts.....										
15 Cylinders, saddles, and steam chests.....	6					9	9	1	4	5
16 Cylinder cocks and rigging.....	3					1	7		1	
17 Domes and dome caps.....						1	1			
18 Draft gear.....	2					3	3		1	4
19 Draw gear.....		1				5	1		2	
20 Driving boxes, shoes, wedges, pedestals, and braces.....	1					8	12	3	2	
21 Firebox sheets.....		1				12	1	1		
22 Flues.....						4			1	1
23 Frames, tail pieces, and braces, locomotive.....	2					1	8			
24 Frames, tender.....						1			2	
25 Gages and gage fittings, air.....							4	2	1	3
26 Gages and gage fittings, steam.....						1	6	1		3
27 Gage cocks.....						4	3		1	4
28 Grate shakers and fire doors.....	3	1				4	3		1	1
29 Handholds.....						2	3		1	4
30 Injectors, inoperative.....						1			1	
31 Injectors and connections.....			3	3		9	14	6	1	13
32 Inspections and tests not made as required.....									3	3
33 Lateral motion.....			1			2	2	1		2
34 Lights, cab and classification.....	1								1	
35 Lights, headlight.....						2	3	1	1	2
36 Lubricators and shields.....	1					1	2	1		1
37 Mud rings.....						8	1			
38 Packing nuts.....	3					10	1	1	1	3
39 Packing, piston rod and valve stem.....						5	1	1		
40 Pilots and pilot beams.....						1			1	
41 Plugs and studs.....						1				5
42 Reversing gear.....	2					1	1			5
43 Rods, main and side, crankpins, and collars.....						8	9	1	1	14
44 Safety valves.....	1					1				
45 Sanders.....	4					4	2	2		5
46 Springs and spring rigging.....	2	1	3			27	19	3	5	10
47 Squirt hose.....						5				
48 Stay bolts.....	2					3				
49 Stay bolts, broken.....						7				
50 Steam pipes.....						4			3	2
51 Steam valves.....						2	2		6	1
52 Steps.....	2	1	1			19	14	1	1	2
53 Tanks and tank valves.....						1	1	2	11	5
54 Telltale holes.....						1				
55 Throttle and throttle rigging.....	1					6	1			2
56 Trucks, engine and trailing.....	2	1				3	3		1	1
57 Trucks, tender.....						3	2			1
58 Valve motion.....						4	3		2	2
59 Washout plugs.....						3	1	1		
60 Stokers.....	2					7	2			1
61 Water glasses, fittings, and shields.....	1		5	1		2		2	7	14
62 Wheels.....						7				3
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).....			1			7	1			3
Number of defects.....	46	21	10			241	228	44	73	160
Locomotives reported.....	24	18	283	50	12	53	425	102	11	355
Locomotives inspected.....	45		803	81	7	190	891	288	32	604
Locomotives defective.....	8		9	3		58	66	13	12	42
Percentage of inspected found defective.....	17.8		1.1	3.7		30.5	7.4	4.5	37.5	7.0
Locomotives ordered out of service.....	1					5		1		3

	Southern Pacific, lines east	Southern Pacific, lines west	Southern	Spokane, Portland & Seattle	Tennessee Central	Tennessee Coal, Iron & R. R.	Terminal R. R. Association of St. Louis	Texas & Pacific	Toronto, Hamilton & Buffalo	Union Pacific	Union Railroad	Utah	Virginian	Wabash	Western Maryland	Western Pacific	Roads with less than 10, and industrial locomotives	Total defects		
		55	17		8	1				25			10	3		1	32	719		
		9	1		1								1				2	9		
	2	44			1					8							3	59		
	2	45	5		5					16							18	220		
	4	11	2					1		4			2			3	18	386		
	10	94	37	3	7					81			6	13		4	11	211		
		62	5		6					54			9			5	96	1,845		
	1	27	3	2	4					15			3			5	33	862		
		20								5						1	16	364		
	3	120	4		7					79			10			5	15	97		
	1	10								4						1	5	41		
	2	163	8	3	8	2				71			13			2	51	1,100		
		28	3		2					23			5	1		19	33	1,160		
		4								4						4	4	17	376	
	1	21	8	1		1				17			3			1	3	90	17	
	6	14			1					12			3			1	40	368		
	7	34	8		1					30			4			24	24	280	19	
	2	11	1		1					4			5			1	11	1,037	20	
	3	20	5	2						4						1	16	181	21	
	2	20	3		4					2			3			15	15	152	22	
	1	10	1							30			3			4	10	451	23	
	2	2								2		1				2	7	34	24	
	1	31	7	1	2					3			3			1	6	116	25	
	1	48	10							11			2			12	272	26		
	3	9	1	1						10			3	1		2	46	386	27	
		48	4	3	1					9			2	3		1	16	326	28	
		8								17			1	1		1	43	439	29	
	4	218	44	4	7	1				3						5	5	45	30	
	1	6	2	1	1	1				90			5	8		11	65	1,767	31	
	1	6	3							12						2	1	28	122	32
	2	5	2							14			8	8		1	7	389	33	
	2	20	2							2			1					60	34	
	1	28	1							5							6	131	35	
	3	9	2							8						2	6	157	36	
	1	50	7		5					10						2	4	145	37	
	3	34	4		2					28				7		2	46	558	38	
	3	5								12			1	2		33	510	39		
	1	27								11						2	7	126	40	
	1	28	4		3					13			1	1		1	6	104	41	
	3	47	31		15					45			6	2		3	21	404	42	
	4	92	12							1			9	9		1	86	1,213	43	
	7	129	33	4	18					38			1	5		6	17	641	45	
		6	6							143			17	14		2	80	2,848	46	
	3	29	1	1	2					1						5	7	74	47	
		7								10				1		5	5	229	48	
	1	56	9		1					13			1			33	193	49		
	2	20								17						8	302	50		
	2	59			1					3			2			1	7	131	51	
	9	164	23	4	6					22			2	4		2	63	680	52	
	5	24								63			8			4	53	1,205	53	
	2	24	8	1	1					3							4	28	54	
	1	29	12	1	1					15			2	4		3	41	664	55	
	1	36	9							8			3	2		1	15	580	56	
	2	47	2	1	6					13				3		1	21	540	57	
	1	7	3		7					22			1	2		42	486	58		
		6	6							13						1	15	289	59	
	6	91	25	5	3					25			2	3		1	1	261	60	
		42	8	2	1					31			5	4		1	73	907	61	
	2	82	10	2	2					17				3		2	42	394	62	
	112	2,406	407	43	143	10				82			180	143		108	1,446	28,504	63	
	378	1,200	935	53	27	24	61	156	14	984	45	13	108	304	194	92	1,233	29,743		
	677	2,935	1,590	108	50	15	90	353		2,410	15	71	225	922	359	237	2,167	66,809		
	28	578	94	23	2	2		16		292	1	1	41	47		22	309	6,740		
	4.1	10.7	5.9	21.3	46.0	13.3		4.5		12.1	6.7	1.4	18.2	5.1		9.3	14.3	10.1		







