

INTERSTATE COMMERCE COMMISSION

EIGHTEENTH ANNUAL REPORT

OF THE

CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FISCAL YEAR ENDED
JUNE 30, 1929



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ANNUAL REPORT OF THE CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION

OCTOBER 1, 1929.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended, the Eighteenth Annual Report of the Chief Inspector covering the work of the bureau during the fiscal year ended June 30, 1929, is respectfully submitted.

Summaries are given, by railroads, of all accidents, showing the number of persons killed and injured due to the failure of parts and appurtenances of locomotives, as reported and investigated under section 8 of the locomotive inspection law, and those reported to the Bureau of Statistics under the accident report act of May, 1910, and not reported to this bureau in accordance with the requirements.

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

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

REPORT OF CHIEF INSPECTOR OF LOCOMOTIVES

TABLE I.—Reports and inspections—Steam locomotives

	Year ended June 30—					
	1929	1928	1927	1926	1925	1924
Number of locomotives for which reports were filed.....	63,562	65,940	67,835	69,173	70,361	70,683
Number inspected.....	96,465	100,415	97,227	90,475	72,279	67,507
Number found defective.....	20,185	24,051	29,995	36,354	32,989	36,098
Percentage inspected found defective.....	21	24	31	40	46	53
Number ordered out of service.....	1,490	1,725	2,539	3,281	3,637	5,764
Total number of defects found.....	53,998	85,530	112,008	136,973	129,239	146,121

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

	Year ended June 30—					
	1929	1928	1927	1926	1925	1924
Number of accidents.....	356	419	488	574	690	1,005
Per cent increase or decrease from previous year.....	15	14.1	14.9	16.8	31.3	25.5
Number of persons killed.....	19	30	28	22	20	66
Per cent increase or decrease from previous year.....	36.6	17.1	127.3	110	69.7	8.3
Number of persons injured.....	390	463	517	600	764	1,157
Per cent increase or decrease from previous year.....	15.8	10.4	21.6	13.6	33.9	25

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

	Year ended June 30—							
	1929	1928	1927	1926	1925	1924	1915	1912
Number of accidents.....	119	150	185	247	274	393	424	856
Number of persons killed.....	14	26	20	18	13	54	13	91
Number of persons injured.....	133	174	205	287	315	447	467	1,005

¹ The original act applied only to the locomotive boiler.

TABLE IV.—Derailments and casualties caused by defects in or failure of some part of the steam locomotive or tender

	Year ended June 30—				
	1929	1928	1927	1926	1925
Number of derailments ¹	9	14	15	23	22
Number of persons killed.....	1	1	1	2	2
Number of persons injured.....	25	27	23	49	52

¹ Only derailments reported by carriers as being caused by defect in or failure of parts of the locomotive or tender were investigated or counted.

REPORT OF CHIEF INSPECTOR OF LOCOMOTIVES

TABLE V.—Number of casualties classified according to occupation—Steam locomotive accidents

	Year ended June 30—									
	1929		1928		1927		1926		1925	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers.....	7	128	8	151	8	181	5	210	8	230
Firemen.....	7	128	11	181	9	179	6	230	6	300
Brakemen.....	1	45	4	54	4	51	3	77	2	84
Conductors.....		24		16		25	2	28		25
Switchmen.....	1	11		15	1	13		19		23
Roundhouse and shop employees:										
Boiler makers.....		5	3	5		11		5		6
Machinists.....		2	2	4	1	5		5		13
Foremen.....		1		1		1		3		
Inspectors.....		1		1						2
Watchmen.....		3	1	2	2	4	1	5	1	3
Boiler washers.....		1		1	1	2		2		5
Hostlers.....		5		10	1	7		9		16
Other roundhouse and shop employees.....	1	3		8		10	1	15		10
Other employees.....	2	10		12	1	9	3	10	1	13
Nonemployees.....		23	1	23		19	1	42	2	34
Total.....	19	390	30	463	28	517	22	660	20	764

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

	Year ended June 30—		
	1929	1928	1927
Number of locomotive units for which reports were filed.....	1,071	1,034	951
Number inspected.....	1,099	1,119	604
Number found defective.....	131	169	174
Percentage inspected found defective.....	12	15	29
Number ordered out of service.....	4	9	9
Total number of defects found.....	329	411	423

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

	Year ended June 30—		
	1929	1928	1927
Number of accidents.....	1	4	5
Number of persons killed.....		1	
Number of persons injured.....	1	3	5

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

	Year ended June 30—					
	1929		1928		1927	
	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:						
Engineers.....					2	
Firemen.....		1				
Roundhouse and shop employees:						
Inspectors.....			1	1		
Other roundhouse and shop employees.....						
Total.....		1	1	3		

TABLE IX.—Accidents and casualties resulting from failures of steam locomotives and tenders and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—														
	1929			1928			1927			1926			1925		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs															
Aprons	2			5			3			3			5		
Arch tubes	1	2		1	1		6			11			4		
Ash-pan blowers		1		1	1		2			5			3		
Axles	7	8		5			6			7	1		12		
Blow-off cocks		10		7			10	1		9			10		
Boiler checks	1	1		3			4	2		2			8		
Boiler explosions:															
A. Shell explosions															
B. Crown sheet; low water; no contributory causes found	11	11	12	15	16	25	14	14	14	22	11	33	9	5	18
C. Crown sheet; low water; contributory causes or defects found	6	2	8	7	4	12	5	3	12	15	6	30	13	5	22
D. Fire box; defective stay bolts, crown stays, or sheets	1	3											6	2	9
Brakes and brake rigging	16	17	14							13			21	31	33
Couplers	5	6	13	1	14	15				16	15		19	21	20
Crank pins, collars, etc	2	2	8							8			10	8	10
Crossheads and guides	3	10	3							3	7		5	7	3
Cylinder cocks and rigging	1	1	6							3	3		3	3	3
Cylinder heads and steam chests	4	4	1							4			9	11	2
Dome caps			1										2	2	2
Draft appliances	3	3	1							2	1		1	4	8
Draw gear	6	6	2							2	2		2	6	6
Fire doors, levers, etc	4	4	8							8	6		11	12	12
Flues	7	1	7	17						26	26		31	36	42
Flue pockets	7														
Footboards	1	1	7	11						10	9	1	8	11	11
Gauge cocks	1	1												2	2
Grease cups	5	6	1											7	7
Grate shakers	16	16	25							1	3		3	7	7
Handholds	10	1	9	12	12	12	1	11	14	29	38	57	38	57	57
Headlights and brackets	2	1	1	3	1	2	6	1	5	2	2		2	5	13
Injectors and connections (not including injector steam pipes)	6	6	7							12	19		22	20	20
Injector steam pipes	2	2	3							2	4		5	12	15
Lubricators and connections	5	5	8							3	7		8	12	16
Lubricator glasses	2	2	1							8	12	1	11	16	16
Patch bolts	2	2	1							3	3		3	6	6
Pistons and piston rods	4	4	2							4	1	3	3	4	4
Plugs, arch tube and washout	2	2	1	2	1	6	1	8	4	1	3	4	5	5	6
Plugs in fire box sheets	1	1								2	2		5	5	6
Reversing gear	23	23	35							30	37		37	49	49
Rivets	3	3	1							30	37		37	49	49
Rods, main and side	14	17	11	1	13	16	1	18	20	2	3		3	1	1
Safety valves	3	3	2							1	1		24	23	25
Sanders	3	3	1							2	5		5		3
Side bearings	1	1												3	3
Springs and spring rigging	10	10	10	1	11	14				18	16		16	25	26
Squirt hose	23	23	32							33	51		51	53	53
Stay bolts	4	4	5	2	4	8				8	4		4	5	6
Steam piping and blowers	4	6	7	1	10	11				11	7		7	5	6
Steam valves			2		2	6				6	4		4	7	8
Studs			5		1	3				3	7		9	1	1
Superheater tubes	2	1	1							3	7		7	3	3
Throttle glands			1							2	2		10	3	3
Throttle leaking			1							2			1	1	1
Throttle rigging	2	2	3							3	3		3	2	2
Trucks, leading, trailing or tender	4	4	3							6	12		12	10	10
Valve gear, eccentrics and rods	14	16	8							1	4		7	23	14
Water glasses	18	18	13							23	13		13	16	16
Water-glass fittings	1	1	1							11	12		12	8	8
Wheels	8	1	16	5	13	5				2	3		3	7	7
Miscellaneous	71	2	69	84	1	87	69	1	68	81	2	82	101	1	101
Total	356	19	390	419	30	463	488	28	517	574	22	660	690	20	764

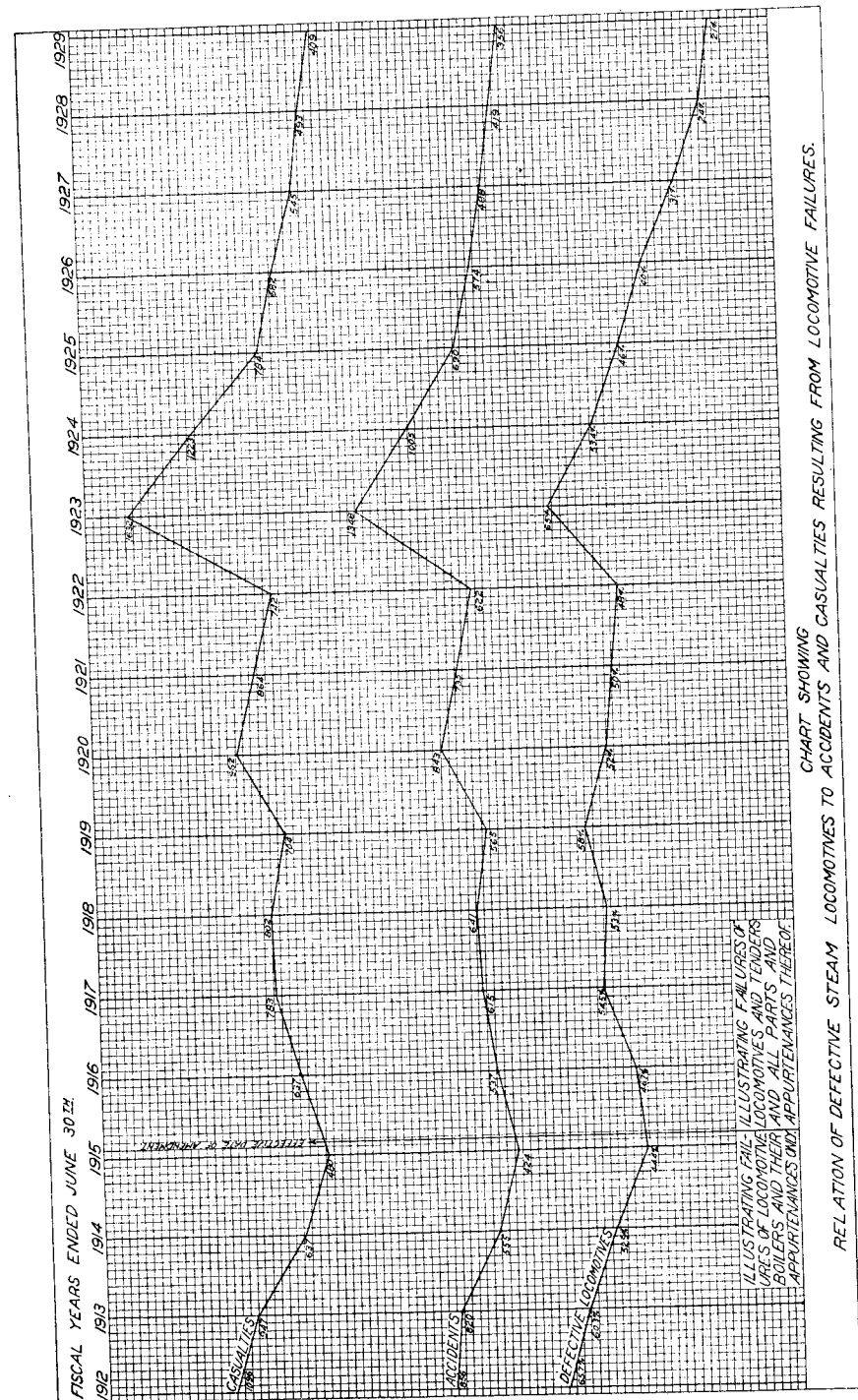


TABLE X.—Accidents and casualties resulting from failures of locomotives other than steam, and their appurtenances

Part or appurtenance which caused accident	Year ended June 30—								
	1929			1928			1927		
	Acci- dents	Killed	Injured	Acci- dents	Killed	Injured	Acci- dents	Killed	Injured
Circuit breakers.....				1		1	1		1
Insulation.....				1	1		1		1
Pantagraphs.....				2		2			
Third-rail shoes.....							1		1
Transformers.....	1		1				2		2
Miscellaneous.....									
Total.....	1	1	1	4	1	3	5	1	5

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1929	1928	1927	1926	1925	1924
1. Air compressors.....	854	1,282	1,679	2,151	1,574	1,221
2. Arch tubes.....	50	103	127	204	198	272
3. Ash pans or mechanism.....	104	133	192	211	216	257
4. Axles.....	15	7	13	8	14	19
5. Blow-off cocks.....	326	409	650	280	825	965
6. Boiler checks.....	474	914	1,043	1,200	991	1,329
7. Boiler shell.....	525	954	1,422	1,888	1,597	2,103
8. Brake equipment.....	2,715	5,214	6,572	7,062	6,497	6,920
9. Cabs or cab windows.....	1,562	1,670	2,055	2,666	2,541	1,627
10. Cab aprons or decks.....	709	852	1,086	1,307	1,165	1,293
11. Cab cards.....	232	378	575	696	665	758
12. Coupling or uncoupling devices.....	122	179	289	394	447	398
13. Crossheads, guides, pistons, or piston rods.....	1,112	2,088	2,602	3,018	2,922	3,577
14. Crown bolts.....	84	164	235	334	283	418
15. Cylinders, saddles, or steam chests.....	2,270	3,264	4,526	5,080	4,352	5,712
16. Cylinder cocks or rigging.....	775	1,007	1,634	1,904	1,801	2,376
17. Domes or dome caps.....	140	281	388	463	371	494
18. Draft gear.....	978	1,453	2,037	2,634	2,283	1,981
19. Draw gear.....	1,030	1,650	2,210	3,140	3,273	4,160
20. Driving boxes, shoes, wedges, pedestals, or braces.....	1,287	1,990	2,710	3,342	3,241	3,722
21. Fire box sheets.....	370	730	796	1,129	1,152	1,471
22. Flues.....	186	464	465	556	524	698
23. Frames, tail pieces, or braces, locomotives.....	1,063	1,354	1,682	1,973	2,036	2,580
24. Frames, tender.....	232	256	264	373	391	414
25. Gauges or gauge fittings, air.....	248	461	721	886	694	626
26. Gauges or gauge fittings, steam.....	504	969	1,425	2,038	1,809	2,026
27. Gauge cocks.....	737	1,413	2,024	3,068	3,081	3,835
28. Grate shakers.....	190	377	613	720	832	1,006
29. Handholds.....	856	1,373	2,285	3,100	2,831	2,241
30. Injectors, inoperative.....	54	93	84	78	70	94
31. Injectors and connections.....	2,808	5,563	7,188	8,303	8,064	9,985
32. Inspections or tests not made as required.....	6,638	6,623	8,839	10,646	10,436	9,740
33. Lateral motion.....	490	699	673	758	659	939
34. Lights, cab or classification.....	105	118	107	106	86	72
35. Lights, headlights.....	343	571	835	946	928	904
36. Lubricator or shields.....	286	500	746	883	1,384	565
37. Mud rings.....	411	822	1,073	1,458	1,384	1,901
38. Packing nuts.....	743	1,265	1,851	2,772	2,761	3,304
39. Packing, piston rod and valve stem.....	1,076	1,904	2,214	2,489	2,411	3,187
40. Pilot or pilot beams.....	289	386	507	638	832	937
41. Plugs or studs.....	303	619	740	1,087	1,274	1,026
42. Reversing gear.....	560	967	1,247	1,539	1,274	1,217
43. Rods, main or side, crank pins, or collars.....	2,418	4,152	5,137	5,683	4,813	6,507
44. Safety valves.....	119	172	212	270	234	188
45. Sanders.....	824	1,031	1,288	1,769	2,004	1,806
46. Springs or spring rigging.....	3,228	4,939	5,956	6,826	5,532	6,335
47. Squirt hose.....	265	478	644	975	1,008	1,321
48. Stay bolts.....	350	590	631	905	741	916
49. Stay bolts, broken.....	943	1,807	2,373	3,582	3,745	4,320
50. Steam pipes.....	662	1,020	1,308	1,587	1,590	2,305
51. Steam valves.....	339	662	774	962	832	981
52. Steps.....	1,034	1,817	2,440	3,227	3,489	2,829
53. Tanks or tank valves.....	1,199	1,941	2,747	3,489	3,489	3,393

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—					
	1929	1928	1927	1926	1925	1924
	54. Telltale holes.....	129	241	377	487	451
55. Throttle or throttle rigging.....	886	1,889	2,233	2,618	2,403	2,868
56. Trucks, engine or trailing.....	1,203	1,914	2,363	2,860	2,966	3,425
57. Trucks, tender.....	1,603	2,610	4,114	4,929	5,372	5,977
58. Valve motion.....	608	1,262	1,568	1,576	1,250	1,269
59. Washout plugs.....	1,182	2,211	2,786	3,649	3,588	3,294
60. Train control equipment.....	26	112				
61. Water glass, fittings, or shields.....	1,358	2,115	2,973	3,621	3,713	4,201
62. Wheels.....	960	1,609	2,119	2,243	2,148	2,996
63. Miscellaneous—Signal appliances, badge plates, brakes (hand).....	806	1,273	1,511	1,746	1,529	1,360
Total number of defects.....	53,998	85,530	112,008	136,973	129,239	146,121
Locomotives reported.....	63,562	65,940	67,835	69,173	70,361	70,683
Locomotives inspected.....	96,465	109,415	97,227	90,475	72,279	67,507
Locomotives defective.....	20,185	24,051	29,995	36,354	32,989	36,098
Percentage of inspected found defective.....	21	24	31	40	46	53
Locomotives ordered out of service.....	1,490	1,725	2,539	3,281	3,637	5,764

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

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30—		
	1929	1928	1927
Air compressors.....		6	5
Axles.....	1		
Batteries.....			1
Boiler.....	44	32	13
Brake equipment.....	39	32	72
Cabs or cab windows.....	3	1	
Cab floors, aprons, or deck plates.....	1	1	
Controllers, relays, circuit breakers, and switch groups.....	10	1	20
Current collecting apparatus.....	36	41	6
Draft gear.....			6
Draw gear.....	16	17	1
Driving boxes, shoes, wedges, pedestals, or pedestal braces.....		1	1
Frames, tail pieces, or braces.....	1	6	8
Fuel tank, its piping and valves.....	3	3	
Gauges and gauge fittings, air.....	4	1	
Gears and pinions.....	5	29	1
High tension equipment not properly guarded against accidental contact.....	40	84	79
Inspections or tests not made as required.....		11	
Internal combustion engine defects, including parts and appliances.....			
Insulation.....	5	5	
Jack shafts.....	3	2	1
Lateral motion, wheels.....	17	10	
Lights, cab or classification.....	5	9	
Lights, headlights.....	1		
Meters, volt and ampere.....	11	10	
Motors or generators.....	1	3	
Pilots or pilot beams.....		1	
Plugs or studs (boiler, other than fusible plugs).....		2	3
Rods, motor, main or side, drive shafts.....	8	12	
Sanders.....	24	10	
Springs or spring rigging, driving and truck.....	2	6	
Switches, hand-operated, and fuses.....	2	1	
Transformers, resistors, and rheostats.....	14	10	
Trucks.....			
Water glass, fittings, or shields.....	6	17	
Wheels.....	1	1	
Whistles, bells, or train signal system.....	20	45	
Miscellaneous.....			
Total defects.....	329	411	43
Locomotive units reported.....	1,071	1,034	9
Locomotive units inspected.....	1,099	1,119	6
Locomotive units defective.....	131	169	1
Percentage of inspected found defective.....	12	15	
Locomotive units ordered out of service.....	4	9	

INVESTIGATION OF ACCIDENTS AND GENERAL CONDITION OF LOCOMOTIVES

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

The amendment of June 7, 1924, which authorized the employment of 15 additional inspectors with subsequent increased appropriations, has enabled the bureau to function more efficiently and to keep in closer touch with the general condition of locomotives, which is strikingly illustrated in the reduction of the number of accidents resulting in casualties to persons.

For instance, in 1923 we inspected 63,657 steam locomotives, of which 65 per cent were found with reportable defects.

In 1929 we inspected 96,465 steam locomotives and 1,099 locomotive units other than steam. Twenty-one per cent of the steam locomotives and 12 per cent of the locomotive units other than steam were found with reportable defects.

The number of locomotives ordered withheld from service also shows a marked and gradual decline. For instance, in 1923 there were 7,075 steam locomotives ordered withheld from service because of being in distinct violation of the requirements, until they were put into serviceable condition as required by section 6 of the law. In 1929 there were 1,490 steam locomotives and 4 locomotive units other than steam ordered withheld from service.

In 1923 there were 1,348 accidents caused by the failure of some part or appurtenance of steam locomotives which resulted in the death of 72 persons and the serious injury of 1,560 others. In 1929 there were 356 such accidents which resulted in the death of 19 persons and the serious injury of 390 others.

These improvements have, without doubt, been made possible by the increase in the force of inspectors, the increased appropriation of funds, and by the earnest and helpful cooperation of railroad officials and employees, a large majority of whom are each year putting forth greater efforts to meet the requirements of the law. A review of the records, however, will show that there are some railroads that are falling considerably behind in their efforts to comply with the requirements, where a concentration of effort on our part may be required.

It should be borne in mind that the locomotive is the propelling power in the movement of trains and usually in the lead, and that most frequently defects of an apparently insignificant nature may and do cause some serious accidents not only to the locomotive but to the train, and that an improper or unsafe condition of a locomotive is

likely to distract the attention of enginemen from important duties and thereby cause serious oversights which may result not only in danger to life and limb but in damage to property and in inefficient performance. Therefore, it is in the interest of the carriers in the promotion of safety, efficiency, and economy of operation to put forth every reasonable effort in maintaining motive power in a high state of repair, as has been strikingly demonstrated during the past few years in the prompt, rapid, and dependable movement of traffic, as well as efficient and economical operation.

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

The graphic chart on page 5 shows the relation between the percentage of defective steam locomotives and the number of accidents and casualties to persons resulting from failure thereof, and illustrates the effect of operating locomotives in a defective condition from the viewpoint of safety.

BOILER EXPLOSIONS OR CROWN SHEET FAILURES

As in former years, boiler explosions caused by crown sheet failures were the most prolific source of fatal accidents. Sixty-eight per cent of the fatalities during the year were attributable to this cause as compared with 67 per cent in the previous year. However, there was a decrease of 18 per cent in the number of such accidents, 35 per cent decrease in the number killed, and 15 per cent decrease in the number injured as compared with the previous year; and 68 per cent decrease in the number of such accidents, 68 per cent decrease in the number killed, and 74 per cent decrease in the number injured as compared with the year 1923.

Careful study of the reports of investigation of boiler explosions caused by crown sheet failures as a result of low water indicates that the reduction in the number of such accidents has been largely, if not entirely, brought about through better maintenance, better water-indicating appliances—visibility of water glasses, proper and accessible location of gauge cocks—and better and more dependable feed-water appliances—injectors and feed water pumps.

It is strongly urged, in the interest of safety, that all nonlifting injectors be equipped with a telltale device located in the cab of the locomotive that will give warning to the enginemen in charge in the event of failure of the injector. Many of such injectors now have these devices applied, which are comparatively inexpensive, both in application and maintenance.

Special attention is directed to Plates 1 to 14 shown on pages 63 to 73. The results of these explosions illustrate the necessity for the application of all practical safeguards and the exercise of the best thought and effort of the various agencies concerned with design, construction, maintenance, and operation in order that this class of accidents may be reduced to a minimum.

Our records show that in the year 1927 there were 1,760 locomotive fire boxes equipped with thermic syphons; during the year 1928 there were 595 additional equipments and during the year 1929 there were 645; or at the close of this year there were a total of 3,000 locomotives thus equipped. During the year there were no accidents reported to the bureau where this equipment was in any way involved.

REDUCED BODY STAY BOLTS

In my fifteenth, sixteenth, and seventeenth annual reports attention was called to the danger resulting from the use of reduced body stay bolts having telltale holes which do not extend into the reduced section at least five-eighths inch. Our investigation of reduced body stay-bolt breakage shows that failure most always occurs in the reduced body at or near the fillet between the body of the bolt and the enlarged ends, and that telltale holes which do not extend into the reduced section at least five-eighths inch can not be depended upon to indicate broken bolts.

A great majority of broken stay bolts are found by leakage through telltale holes, without the aid of hammer test; therefore, if the telltale holes do not extend into the bolts to or beyond the usual point of breakage, they are not only useless as a safety feature but become a distinct menace, because telltale holes are being depended upon to a great extent in determining broken and fractured rigid stay bolts. Accidents resulting in serious and fatal injury continue to occur with this type of bolt because of the telltale holes not being of sufficient depth to perform the function for which they are intended.

Rule 26 requires that all rigid stay bolts shorter than 8 inches shall have telltale holes three-sixteenths inch in diameter and *not less than 1¼ inches* in depth in the outer end and that these holes must be kept open at all times.

A telltale hole that is not of sufficient depth to perform the function for which it is evidently intended can not be considered as meeting the requirements of the law or the rule referred to, which calls for a depth of telltale hole of *not less than 1¼ inches*.

Many such bolts are improperly applied, the reduced body of the bolts being too long to permit full engagement of the threads on the enlarged ends with the threads in the holes in the sheets. The illustrations on pages 76 and 77 show typical examples of the failure of bolts of this type.

EXTENSION OF TIME FOR REMOVAL OF FLUES

Two hundred and forty-three applications were filed for extensions of time for removal of flues, as provided in rule 10. Our investigations disclosed that in 13 of these cases the condition of the locomotives was such that extensions could not properly be granted. Twenty were in such condition that the full extensions requested could not be authorized, but extensions for shorter periods of time were allowed. Thirty-nine extensions were granted after defects disclosed by our investigations had been repaired. Twelve applications were canceled for various reasons. One hundred and fifty-nine applications were granted for the full periods requested.

SPECIFICATION CARDS AND ALTERATION REPORTS

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 913 specification cards and 8,011 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, 134 specifications and 112 alteration reports were filed for locomotive units and 74 specifications and 11 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

SUITS FOR PENALTIES

Four suits for penalties, involving 32 counts for alleged violations of the Locomotive Inspection Law and Rules, were pending in the various district courts at the beginning of the year. Information of violations was lodged with the proper United States attorneys in 14 cases, involving 264 counts. Judgments in favor of the Government were obtained in 7 cases, involving 55 counts; 4 counts were dismissed by stipulation or agreement and penalties imposed on 51 counts in the sum of \$5,100. There were no adverse decisions of courts. Eleven cases, involving 241 counts, were pending in the district courts at the end of the year. The following is a brief summary of the cases:

CASES PENDING AT THE BEGINNING OF THE YEAR AND DISPOSED OF DURING THE YEAR

U. S. v. Great Southern Railroad Company, district of Oregon, involved 15 counts for use of locomotive while in defective and unsafe

condition and in violation of order of inspector. Judgment on 15 counts for \$1,500 and costs.

U. S. v. Hartford Eastern Railway Company, western district of Washington, involved 10 counts for use of locomotive while defective, in violation of inspection rules and orders of inspectors. Judgment on 10 counts for \$1,000 and costs.

U. S. v. Minneapolis, St. Paul & Sault Ste. Marie Railway Company, western district of Wisconsin, involved 6 counts for permitting the use of locomotive while in defective condition and not in compliance with rules. Judgment on 3 counts for \$300; 3 counts dismissed.

U. S. v. New York, Susquehanna & Western Railroad Company, district of New Jersey, involved 1 count for use of locomotive with defective stay bolt resulting in accident. Settled by United States attorney upon payment by defendant of penalty of \$100.

CASES INSTITUTED AND DISPOSED OF DURING THE YEAR

U. S. v. Illinois Central Railroad Company, eastern district of Illinois, involved 9 counts for violations of orders of inspectors issued because of failure to equip locomotives with cab curtains, etc., in compliance with commission's order No. 19299. Judgment on 9 counts for \$900 and costs.

U. S. v. Pennsylvania Railroad Company, middle district of Pennsylvania, involved 3 counts for violation of cab curtain order. Judgment on 3 counts for \$300 and costs.

U. S. v. Portland Terminal Company, district of Maine, involved 11 counts for violation of section 2 and rule 104. Judgment on 10 counts for \$1,000 and costs; 1 count dismissed.

CASES PENDING AT THE CLOSE OF THE YEAR

U. S. v. Chicago, Springfield & St. Louis Railroad Company, southern district of Illinois, involves 30 counts for use of locomotives while defective and in violation of rules.

U. S. v. Erie Railroad Company, western district of New York, involves 45 counts for use of locomotives while defective and in violation of rules.

U. S. v. Erie Railroad Company, northern district of Ohio, involves 6 counts for use of locomotives while defective and in violation of rules.

U. S. v. Erie Railroad Company, southern district of New York, involves 12 counts for use of locomotives while defective and in violation of rules.

U. S. v. Lake Superior & Ishpeming Railroad Company, western district of Michigan, involves 15 counts for permitting the use of locomotives while defective and in violation of rules.

U. S. v. Minneapolis, St. Paul & Sault Ste. Marie Railway Company, district of Minnesota, involves 30 counts for violations of cab curtain order.

U. S. v. New York, Chicago & St. Louis Railroad Company, northern district of Indiana, involves 53 counts for use of locomotives while defective and in violation of rule 157.

U. S. v. Pittsburgh & Shawmut Railroad Company, western district of Pennsylvania, involves 4 counts for use of locomotives while defective and in violation of rules 122 and 123.

U. S. v. Pittsburgh & West Virginia Railway Company, western district of Pennsylvania, involves 20 counts for use of locomotives while defective and in violation of rules.

U. S. v. Tennessee Railroad Company, eastern district of Tennessee, involves 10 counts for use of locomotives while in defective condition and in violation of rules.

U. S. v. Western Maryland Railway Company, district of Maryland, involves 16 counts for use of locomotives while defective, in violation of rules, and for failure to preserve intact parts affected by accident.

AMENDMENTS TO RULES FOR INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS

The commission's order No. 19299, dated May 7, 1928, amending rule 116, became fully effective November 1, 1928, and specifically required certain cab curtain equipment and cab storm windows for the protection of employes against inclemencies of the weather during given seasons of the year. The specific requirements of the amendments to rule 116 were given proper attention by the bureau. There was considerable confusion and misunderstanding on the part of various carriers as to the requirements; however, it is hoped that these requirements are now fully understood by all concerned and that the confusion which existed during the year has now been corrected and that no further trouble will be experienced.

Because of the misunderstanding of the requirements on the part of the carriers, defective cab curtain equipment is not included for the year in our report of defects found and reported by the inspectors, but will hereafter be so included.

APPEALS

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

A. G. PACK, *Chief Inspector.*

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF STEAM LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1929, BY ROADS

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

ATCHISON, TOPEKA & SANTA FE RAILWAY SYSTEM:

October 5, 1928, locomotive 3449, near Panhandle, Tex. Crown sheet failure caused by overheating due to low water; 2 injured.

**October 6, 1928, locomotive 4102, near Shopton, Iowa. Condensate return pipe line came down between engine and tender and struck air hose, setting brakes in emergency; 1 injured.

**January 1, 1929, locomotive 1660, Prescott, Ariz. Handrailing on side of boiler was not continuous which caused employee to lose hold on handrail; handrail was in two sections, one of which was located 6 inches above the other; 1 injured.

*February 13, 1929, locomotive 1872, Halstead, Kans. Knuckle pin on engine broke, permitting knuckle to slip by and train to separate, causing rough stop; 1 injured.

*March 16, 1929, locomotive 906, Chicago, Ill. Air hose on tender burst; 2 injured.

April 18, 1929, locomotive 3421, Shopton, Iowa. Water glass burst; injured by flying glass; 1 injured.

**May 24, 1929, locomotive 956, Verdumont, Calif. Bell cord caught on jacket band clamp bolts preventing bell from ringing; jacket bands divided and clamps and bolts improperly located on top of boiler; no bell-rope guide provided on side of dome (employee was struck by signal bridge while attempting to free bell); 1 killed.

Seven accidents; 1 killed, 8 injured.

ATLANTIC COAST LINE RAILROAD:

**July 9, 1928, locomotive 1684, Quitman, Ga. Arm rest gave way account of screws having worked out of arm rest hinges; 1 injured.

July 20, 1928, locomotive 322, Ravenel, S. C. Injured while attempting to shake grates; excessive lost motion in operating mechanism; 1 injured.

**August 3, 1928, locomotive 1156, Port Tampa, Fla. Burned by hot oil account of drain pipe connection to lubricator being loose; 1 injured.

*October 8, 1928, locomotive 1536, New Hope, S. C. Driving axle broke; 1 injured.

October 19, 1928, locomotive 473, near Leno, Fla. Squirt hose burst; hose worn by coming in contact with edge of cab apron; 1 injured.

February 17, 1929, locomotive 1615, near Collier, Va. Coal pusher throttle valve bonnet blew out while being tightened under pressure; 1 injured.

March 1, 1929, locomotive 400, Grand Crossing, Fla. Handrail pulled out of bracket account of pin securing handrail being missing; 1 injured.

**March 19, 1929, locomotive 421, Orangeburg, S. C. Bolt in cab roof penetrated employee's foot when he descended from coal chute to top of cab; bolts on top of cab projected through nuts from $\frac{3}{4}$ inch to $4\frac{1}{2}$ inches; 1 injured.

May 9, 1929, locomotive 1660, Natal, N. C. Main rod broke due to old fracture; 2 injured.

**May 9, 1929, locomotive 1521, Savannah, Ga. Grease cup plug blew out of rod cup while being filled with powder from a fusee; 1 injured.

**May 30, 1929, locomotive 1567, between South Rocky Mount, N. C., and Richmond, Va. Edge of tread of fire door foot pedal extension badly worn and sharp; 1 injured.

Eleven accidents; 12 injured.

BALTIMORE & OHIO RAILROAD SYSTEM:

July 13, 1928, locomotive 2737, Wolf Lake, Ind. Front coupler pivot pin broke due to old fracture, permitting cars to break away and collide with other cars; 1 injured.

August 5, 1928, locomotive 1814, Hepzibah, W. Va. Tender gangway safety chain hook broke; 1 injured.

August 9, 1928, locomotive 352, Washington, D. C. Insufficient clearance between apron and tender cistern; 1 injured.

August 22, 1928, locomotive 4496, Mount Airy, Md. Injector overflow valve (closed type) stuck open account of a steel chip, approximately $\frac{3}{8}$ by $\frac{3}{8}$ by $\frac{3}{4}$ inch, being caught under it. Injured while trying to get injector started; one injector inoperative; 1 injured.

August 29, 1928, locomotive 1429, near Georgia, Ind. Reverse lever counter-balance spring rod broke in bracket, due to old fracture on both sides, and was thrown from rapidly moving locomotive striking track employee; company's standard provided for a spring-pocket casing which was not applied to this rod; 1 injured.

**August 31, 1928, locomotive 2693, Hamden, Ohio. Drop seat in cab fell due to seat brace not having sufficient support; 1 injured.

September 10, 1928, locomotive 1181, St. George, N. Y. Driving spring main cross equalizer hanger broke due to old fracture comprising approximately 40 per cent of cross-sectional area; 1 injured.

September 11, 1928, locomotive 4864, Clarksburg, W. Va. Reverse lever unlatched from quadrant and went forward, striking engineer; apparently due to loose stop clip on quadrant; 1 injured.

September 14, 1928, locomotive 7312, McMillan, W. Va. Broken reduced body radial stay blew out of crown sheet; bolt had been broken for some time and threads on bolt were badly wasted away. The bolt broke at the junction of reduced section and enlarged outer end; 1 injured.

**September 14, 1928, locomotive 1525, Marionville, Pa. Flue broke off just inside of back flue sheet due to being badly eroded; 1 injured.

October 18, 1928, locomotive 1649, Lorain, Ohio. Ash pan operating lever came off shaft account of cotter pin for securing lever on shaft being missing; 1 injured.

**November 23, 1928, locomotive 4585, Wilmere, Del. Injured while attempting to repair broken air pipe on engine; 1 injured.

December 22, 1928, locomotive 4049, Willard, Ohio. Running board over left valve chamber gave way account of front bracket being loose; one bracket bolt broken and nuts worked off the other bracket bolt; 1 injured.

**January 1, 1929, locomotive 2908, Parma, Ohio. Drain valve to drifting valve steam pipe at right side of boiler was broken off in engine house while attempting repairs to leak at drifting pipe connection, and, by direction of the general foreman, improper repairs were made by applying a wooden plug in pipe and locomotive returned to service, the wooden plug shortly afterward blowing out, resulting in injury to an employee; 1 injured.

**February 6, 1929, locomotive 5058, Cumberland, Md. Bracket of bell worked loose; 1 injured.

February 15, 1929, locomotive 1038, Philadelphia, Pa. Connecting rod to left front section of grates broke; rod reduced in section and metal deteriorated due to overheating; 1 injured.

**March 30, 1929, locomotive 5112, Flora, Ill. Top of tender obstructed by company material shipment; 1 injured.

April 13, 1929, locomotive 5049, New Castle Junction, Pa. Trailer wheel tire broke due to old defect extending through approximately 30 per cent of cross section; 1 injured.

April 13, 1929, locomotive 5059, Creston, Ohio. Main driving wheel tire broke; 1 injured.

May 24, 1929, locomotive 5005, Wilmere, Del. Driving spring equalizer stirrup was thrown from rapidly moving locomotive striking employee who was on adjacent track; stirrup not securely applied; 1 injured.

May 31, 1929, locomotive 1688, Benwood, W. Va. Reverse lever fouled on extension handle to injector water valve; 1 injured.

*June 11, 1929, locomotive 7130, Cumberland, Md. Squirt hose blew off nipple due to being insecurely fastened; 1 injured.

June 12, 1929, locomotive 1775, Wheeling, W. Va. Top step on inside of tender water leg failed due to old defect, causing employee to fall to tender deck; 1 injured.

Twenty-three accidents; 23 injured.

BELT RAILWAY OF CHICAGO:

**January 6, 1929, locomotive 113, Chicago, Ill. Tubular water glass burst, breaking water glass shield; 1 injured.

One accident; 1 injured.

BESSEMER & LAKE ERIE RAILROAD:

January 1, 1929, locomotive 510, Queen Junction, Pa. Reversing gear air supply pipe broke off at tee fitting above reversing gear valve chamber; 1 injured. One accident; 1 injured.

BOSTON & ALBANY RAILROAD:

*April 10, 1929, locomotive 1429, North Grafton, Mass. Valve stem broke off flush with nut on front end, permitting valve stem to pull out of valve; 1 injured.

**June 22, 1929, locomotive 150, Boston, Mass. Squirt hose parted at splice due to not being properly clamped; 1 injured.

Two accidents; 2 injured.

BOSTON & MAINE RAILROAD:

*July 2, 1928, locomotive 2504, Revere, Mass. Axle of middle driver broke due to old fracture; 1 injured.

**August 4, 1928, locomotive 3678, Nashua, N. H. Injured while shaking grates; shaker bar was not company's standard bar for use on this type locomotive; 1 injured.

November 9, 1928, locomotive 3017, East Fitchburg, Mass. Flue broke off inside front flue sheet due to being heavily rolled and worn thin; 1 injured.

November 13, 1928, locomotive 2642, near Exeter, N. H. Bolt came out of back cab curtain rod support, permitting curtain rod to fall on employee's head; threads on bolt worn and nuts missing; 1 injured.

December 4, 1928, locomotive 3611, Oak Island, Mass. Insufficient clearance between reverse lever and air pipe of automatic brake valve; 1 injured.

*December 8, 1928, locomotive 3018, Johnsonville, N. Y. Handhold on locomotive gave way; 1 injured.

March 11, 1929, locomotive 2683, Westboro, N. H. Rear truck of tender of leading locomotive, second locomotive, and first car derailed caused by damage to switch by loose left front driving wheel tire on leading locomotive; 1 injured.

April 20, 1929, locomotive 4013, East Fitchburg, Mass. Throttle valve box in front end burst due to old fracture in casting and metal of poor quality; 1 injured.

Eight accidents; 8 injured.

CANADIAN PACIFIC RAILWAY:

*December 14, 1928, locomotive 6140, Newport, Vt. Injector steam valve bonnet blew out due to nut securing bonnet to body of valve having been mutilated by use of hammer; 1 injured.

One accident; 1 injured.

CAROLINA & NORTHWESTERN RAILWAY:

**August 12, 1928, locomotive 115, Oyama, N. C. Insufficient clearance between reverse lever and lagging on boiler back head; 1 injured.

One accident; 1 injured.

CENTRAL RAILROAD OF NEW JERSEY:

August 27, 1928, locomotive 757, Jersey City, N. J. Engineer's face and eyes were burned when he opened lubricator drain valve; valve improperly applied; 1 injured.

September 3, 1928, locomotive 654, Ashley, Pa. Handhold column pulled off account of bolt for securing column to end sill being missing; threads in column badly worn; 1 injured.

*November 10, 1928, locomotive 74, Bridgeton Junction N. J. Engine, tender, and one car derailed caused by center casting and side bearing of tender being defective and not properly secured to bolster, permitting tender to lean to one side; 1 injured.

March 15, 1929, locomotive 760, Mauch Chunk, Pa. Handrail post pulled out of fitting due to not being properly secured; 1 injured.

June 1, 1929, locomotive 167, Elizabeth, N. J. Guide yoke stud worked out and was struck by valve gear rocker arm causing reverse lever to move back uncontrolled when unlatched; guide yoke stud threads worn and improper fit; 1 injured.

Five accidents; 5 injured.

CHARLESTON & WESTERN CAROLINA RAILWAY:

January 24, 1929, locomotive 400, Laurens, S. C. Nuts worked off bolts securing pilot sill step foot plate to bracket permitting foot plate to fall and employee's foot to be severed by engine truck wheel; bolts securing foot plate were too short to allow for full nuts; 1 injured.

One accident; 1 injured.

CHESAPEAKE & OHIO RAILWAY:

**July 13, 1928, locomotive 1369, Forest, W. Va. Sectional manhole cover fouled on bent manhole frame when employee attempted to close cover, causing him to fall; 1 injured.

December 6, 1928, locomotive 276, Handley, W. Va. Employee fell account of step on engine broken off; 1 injured.

**June 2, 1929, locomotive 275, near Rush, Ky. Insufficient clearance between reverse lever and air brake pipe caused by improper application of stop pin in front end of reverse lever quadrant; 1 injured.

*June 25, 1929, locomotive 1474, Brushton, W. Va. Air hose blew off connection between engine and tender; 1 injured.

Four accidents; 4 injured.

CHICAGO & ALTON RAILROAD:

May 24, 1929, locomotive 600, near Shirley, Ill. Reverse lever unlatched and went to front corner; reverse lever latch spring was weak; 1 injured.

One accident; 1 injured.

CHICAGO & EASTERN ILLINOIS RAILWAY:

January 21, 1929, locomotive 1923, near Milford, Ill. Crown sheet failure caused by overheating due to low water; insufficient opening through top water glass valve caused false indication of water level (gate valve used as top valve required in excess of one revolution of operating handle before valve would start to open); 1 killed, 1 injured.

One accident; 1 killed, 1 injured.

CHICAGO & NORTH WESTERN RAILWAY:

July 21, 1928, locomotive 1571, near Beaver, Iowa. Main rod strap broke, due to old fracture, knocking out cylinder head and damaging valve gear, which caused reverse lever to unlatch and go to back position, striking engineer; 1 injured.

August 3, 1928, locomotive 50, Huron, S. Dak. Squirt hose valve leaking; valve defective; 1 injured.

September 18, 1928, locomotive 2639, Proviso, Ill. Squirt hose blew off nipple due to being insecurely applied; hose not applied according to company's standard practice; 1 injured.

September 24, 1928, locomotive 2588, near Evansville, Wis. Side rod main pin grease cup plug blew out while being tightened; side rod main pin bushing running hot; 2 injured.

*October 1, 1928, locomotive 2622, Chicago, Ill. Nozzle blew off fire hose; 1 injured.

**January 6, 1929, locomotive 1085, Gladstone Park, Ill. Broken valve ring in left valve caught in the ports and bent valve stem, causing reverse lever to unlatch and suddenly go to corner, catching employee's foot; 1 injured.

Six accidents; 7 injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

**July 3, 1928, locomotive 1255, near Glenwood Junction, Mo. Grate shaker connecting rod pin came out while grates were being shaken; 1 injured.

**July 9, 1928, locomotive 1220, Dean, Iowa. Scalded while using defective squirt hose; 1 injured.

November 23, 1928, locomotive 2830, St. Joseph, Mo. Valve ring broke and caught in port, forcing reverse lever back violently; valves apparently insufficiently lubricated; lubricator reported leaking on November 1, 4, 7, 8, 9, 10, 13, and 18, and on November 22 engine was reported not lubricating properly at two terminals; 1 injured.

January 30, 1929, locomotive 5118, Edwards, Ill. Water glass burst, breaking shield glasses; 1 injured.

*February 5, 1929, locomotive 6148, Ulm, Wyo. Leg of engineer's seat broke, due to defective metal where eye had been formed on rod; 1 injured.

**March 17, 1929, locomotive 2953, Rome, Iowa. Blow-off cock operating extension handle became disconnected from blow-off cock lever account of connecting pin working out; extension handle of improper design and insecurely attached to blow-off cock lever; 4 injured.

March 23, 1929, locomotive 5111, Berks, Nebr. Ash pan door difficult to close; lever latch of ash pan door was loose at connection to frame; 1 injured.

**March 25, 1929, locomotive 5248, Alliance, Nebr. Blow-down line in engine-house became disconnected from blow-off cock discharge pipe, due to threads on discharge pipe being stripped and in poor condition; 1 injured.

Eight accidents; 11 injured.

CHICAGO GREAT WESTERN RAILROAD:

August 14, 1928, locomotive 509, Oelwein, Iowa. Spanner nut on steam heat pipe failed while being tightened with hammer and chisel; 1 injured.

January 6, 1929, locomotive 711, Elkton, Minn. Crown sheet failure caused by overheating due to low water; left feed-water opening into boiler reduced from original area of 3.14 square inches to approximately 0.6 square inch by accumulation of hard scale; 1 killed, 1 injured.

**March 21, 1929, locomotive 482, Oelwein, Iowa. Automatic fire door stuck in closed position when fireman pressed down on operating pedal; 1 injured.

Three accidents; 1 killed, 3 injured.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD:

July 4, 1928, locomotive 3134, Glenview, Ill. Reverse lever latch failed to drop and engage teeth in quadrant when latch was released account of latch being worn at latch bolt and latch grip at end of lever binding, permitting reverse lever to continue to back end with force, catching fireman's hand between lever and back of cab; latch grip binding account of a soft iron washer having been inserted between grip and lever to take up the lateral wear; 1 injured.

July 27, 1928, locomotive 1261, Seattle, Wash. Piston rod broke in crosshead keyway, knocking out and breaking right front cylinder head; old fracture extended entirely through metal on one side of keyway and half through metal on opposite side of keyway; 1 injured.

**July 31, 1928, locomotive 3015, between Browntown and Monroe, Wis. Injured while operating reverse lever account of lever being difficult to handle; daily inspection reports for July 30, 31, August 1, 7, 9, and 13 show that lubricator was not feeding to right side; 1 injured.

August 18, 1928, locomotive 8639, North Milwaukee, Wis. Arch tube broke off at throat sheet account of being very thin due to having been excessively rolled; 2 injured.

November 14, 1928, locomotive 5008, Savanna, Ill. Right front cylinder head blew out, causing injury to employee who was riding on right front footboard; 1 injured.

November 23, 1928, locomotive 8620, Madrid, Iowa. Engine truck equalizer hanger broke through top eye due to old flaw extending through approximately 75 per cent of cross-sectional area; 1 injured.

December 28, 1928, locomotive 8137, Crivitz, Wis. Main rod broke; old fracture in front end of bearing brass fit; 1 injured.

January 11, 1929, locomotive 8609, Carterville, Mont. Shaker bar fouled on shaker post housing, prying shaker bar off post; 1 injured.

March 26, 1929, locomotive 2224, Sparta, Wis. Piece broke out of eccentric cam; old fracture; 1 injured.

**April 5, 1929, locomotive 8282, Davenport, Iowa. Sand pipe out of line with rail; sand pipe not properly clamped in position, and this condition was reported on day previous. Engineer had hand crushed while attempting to line sand pipe while locomotive was pulling train; 1 injured.

**May 17, 1929, locomotive 2374, Timber Lake, S. Dak. Squirt hose blew off nipple; 1 injured.

Eleven accidents; 12 injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

July 22, 1928, locomotive 434, Herington, Kans. Squirt hose burst; hose worn by cab apron; 1 injured.

July 26, 1928, locomotive 1294, between Ossian and Castalia, Iowa. Burned by hot water escaping through ruptures in squirt hose; 1 injured.

July 29, 1928, locomotive 1709, Magazine, Ark. Burned by hot water ejected into cab through disconnected overflow pipe account of boiler check sticking open and line check not seating; line check disk worn and disk nut missing,

permitting disk to become cocked so it would not close; overflow pipe spanner nut connection to injector was stretched and threads worn; 1 injured.

July 31, 1928, locomotive 2667, Enid, Okla. Stem to stoker by-pass valve broke off at extension handle connection; 1 injured.

*August 14, 1928, locomotive 2132, between Waurika and Fort Worth, Tex. Blow-off cock stuck open; 1 injured.

**November 17, 1928, locomotive 1012, Link, Ark. A piece of fire brick fell from passing locomotive and struck track employee; 1 injured.

November 19, 1928, locomotive 1782, near Brinkley, Ark. Flag box came loose from its fastenings on back of cab and fell, striking employee; back board of flag box defective; 1 injured.

November 26, 1928, locomotive 1954, Kismet, Kans. Valve gear reach rod broke and front end of section attached to reverse lever dropped, striking on ties and forcing reverse lever violently to back end of quadrant; stop pin missing from back end of quadrant; right and left radius rods riding bottoms of reverse link plates with reverse lever at front end of quadrant; metal of reach rod badly crystallized at point of failure; safety hanger bracket improperly located; 1 injured.

December 29, 1928, locomotive 1614, Chicago, Ill. Crown sheet failure caused by overheating due to low water; lower end of reflex type water glass completely stopped up with solidified mud which destroyed the functioning of the water glass; "Clean out water glass" was reported on November 17, December 21 and 25; 2 injured.

February 2, 1929, locomotive 1873, Liberal, Kans. Driving wheel spring equalizer post broke, permitting spring to drop on eccentric straps and cause reverse lever to unlatch and move back unexpectedly; equalizer out of level and binding on post; defective material in post; 1 injured.

**February 10, 1929, locomotive 2568, Seneca, Ill. Grate shaker rod broke due to being reduced to approximately 35 per cent of its cross-sectional area and metal very brittle due to burning account of the ash pan directly below rod being very shallow; 1 injured.

March 6, 1929, locomotive 2701, near Fairfield, Iowa. Nut worked off stoker operating valve stem allowing the extension handle to become disconnected (employee was struck by bridge while returning to cab after attempting to make repairs); 1 killed.

May 23, 1929, locomotive 2632, Brooklyn, Iowa. Left No. 3 driving wheel tire broke; 1 injured.

Thirteen accidents; 1 killed, 13 injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

November 20, 1928, locomotive 384, Humbird, Wis. Side rod broke; 1 injured.

One accident; 1 injured.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY:

February 10, 1929, locomotive 6165, near Code, Ind. Valve gear combination lever broke due to old fracture covering approximately 35 per cent of cross-sectional area; 1 injured.

April 16, 1929, locomotive 6147, near Milroy, Ind. Reverse lever became unlatched and went forcibly into full forward position catching engineer's foot between lever and triangular wooden block at front end of quadrant for use as foot brace; all teeth in reverse lever latch were badly worn and partly filled with grease and dirt; 1 injured.

April 17, 1929, locomotive 7492, Danville, Ill. Lubricator drain plug leaking; plug broken off in fitting; 1 injured.

Three accidents; 3 injured.

DELAWARE & HUDSON Co.:

**August 20, 1928, locomotive 1401, Oneonta, N. Y. Water glass burst; 1 injured.

September 11, 1928, locomotive 536, near Wells Bridge, N. Y. Squirt hose blew off; hose not clamped; 1 injured.

October 6, 1928, locomotive 1606, Carbondale, Pa. Flue failed at defective safe end weld; 1 killed.

November 27, 1928, locomotive 84, Binghamton, N. Y. Wheel came off air compressor steam valve due to threaded end being broken off, causing employee to fall; 1 injured.

April 29, 1929, locomotive 1082, Schoharie Junction, N. Y. Coupler pocket pin on front end of locomotive broke; 1 injured.
Five accidents; 1 killed, 4 injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

November 22, 1928, locomotive 1001, Dover, N. J. Main pin broke off just inside pin hub due to old fracture comprising approximately 80 per cent of cross-sectional area; 1 injured.

December 18, 1928, locomotive 966, Hoboken, N. J. Lubricator filling gauge glass and packing nut blew out of lubricator; old fracture extending into walls of filling gauge pocket comprising approximately 80 per cent of its cross-sectional area; 1 injured.

June 6, 1929, locomotive 1022, South Orange, N. J. Insufficient clearance between vertical handhold and step on end of tender deck; handhold bent in toward tender deck 1½ inches and loose at bottom end; 1 injured.
Three accidents; 3 injured.

DENVER & RIO GRANDE WESTERN RAILROAD:

December 13, 1928, locomotive 957, Denver, Colo. Water glass burst; 1 injured.

*December 21, 1928, locomotive 1145, Grand Junction, Colo. Reverse lever difficult to operate account of sliding windshield having insufficient lubrication; 1 injured.

March 3, 1929, locomotive 3412, Malta, Colo. Reverse lever went into back motion violently, catching employee's arm between lever and back of cab; rapid movement of lever permitted by absence of oil in control cylinder; 1 injured.

March 18, 1929, locomotive 1172, near Green River, Utah. Cap blew off auxiliary oil pipe to cylinders due to improper fit and defective threads; 1 injured.

May 8, 1929, locomotive 1511, Pueblo, Colo. While employee was changing position of classification lamp, flange of lamp bracket broke off, causing him to fall from running board; old flaw at point of failure; 1 injured.

**May 31, 1929, locomotive 3603, Wolcott, Colo. Grate shaker lever broke at top of socket due to old fracture; 1 injured.
Six accidents; 6 injured.

ELGIN, JOLIET & EASTERN RAILWAY:

*April 27, 1929, locomotive 590, Rondout, Ill. Brake hanger broke; old defect; 1 injured.

One accident; 1 injured.

ERIE RAILROAD:

August 19, 1928, locomotive 3119, Cameron, N. Y. Crown sheet failure caused by overheating due to low water; 3 killed.

**September 9, 1928, locomotive 3300, Hornell, N. Y. Bell stopped ringing account of defective bell ringer turning bell over and winding chain on crank arm; bell ringer air cylinder worn out of round and piston rings small, having openings approximately ¼ inch larger than standard. Employee fell when getting down from bell after making emergency repairs; no handhold at front at top of smoke box and no step at front at left side of smoke box; 1 injured.

*October 3, 1928, locomotive 84, Weehawken, N. J. Bolt fell out of brake rigging; 1 injured.

November 12, 1928, locomotive 3148, Painted Post, N. Y. Oil cup blew out of air compressor cylinder head; threads in cylinder head were badly worn and flattened; compressors were reported on November 6, 9, 10, 11, and 12, and repairs were apparently made to oil cups November 9; 1 injured.

January 16, 1929, locomotive 3033, Kenton, Ohio. Studs supporting reverse gear pulled out of boiler due to valves seizing because of lack of lubrication; 3 injured.

**January 19, 1929, locomotive 1709, Carrollton, N. Y. Drawbar pin at front of tender broke permitting cab apron to drop between locomotive and tender on account of safety chains being too long; chafing casting on front of tender not of proper radius to permit free movement on curves. Drawbar had ¾ inches vertical motion in tender drawbar pocket and hole in middle web of drawbar casting on rear of locomotive was more than 1 inch larger than holes in top and bottom webs causing excessive stresses in pins; bottom web of drawbar casting on rear of locomotive was fractured from pin hole toward rear. Another drawbar pin at front of tender was broken on January 23, but locomotive was not withdrawn from service for proper repairs to draw gear until January 30; 1 injured.

April 8, 1929, locomotive 3107, Hornell, N. Y. Air hose parted at coupling between tender and car; brake pipe on rear of tender had been too low, permitting hose to drag and wear down the engaging lug of coupling, and lug was also thin due to corrosion and usage, rendering the locking feature ineffective; 1 injured.

April 30, 1929, locomotive 4122, Hawley, Pa. Air supply pipe broke off at right No. 1 driving brake cylinder head, permitting air to escape from cylinders and release brakes, allowing locomotive, which was standing on a grade, to move; air supply pipe improperly located, permitting driving spring cross equalizer to strike it; 1 injured.

May 21, 1929, locomotive 1715, Elmira, N. Y. Rivet through rear end handhold column not properly driven in place; 1 injured.

June 4, 1929, locomotive 3347, Shenango, Pa. Water glass burst and pressure in shield forced escape pipe slip joint off connection at shield; section of slip joint containing the spring latch pin was broken out and missing and an attempt had been made to wire joint in place. "Connect up safety pipe to left water glass" was reported on May 28 and 31; 1 injured.

June 30, 1929, locomotive 2548, Watsons Run, Pa. Leading locomotive uncoupled from train account of high coupler on front end of second locomotive, causing emergency application of brakes; front coupler measured 35¼ inches above rails; 2 injured.

Eleven accidents; 3 killed, 13 injured.

FLORIDA EAST COAST RAILWAY:

*July 31, 1928, locomotive 822, West Palm Beach, Fla. Derailment caused by worn flange on front tender truck wheel; 1 injured.

One accident; 1 injured.

FORT SMITH & WESTERN RAILWAY:

**January 27, 1929, locomotive 28, Oklahoma City, Okla. Employee slipped off bottom gangway step and fell in such position that trailer wheel ran over his foot; wooden tread was worn at outside edge; 1 injured.

One accident; 1 injured.

GREAT NORTHERN RAILWAY:

**August 29, 1928, locomotive 3326, Blackfoot, Mont. Leak at union nut joining steam pipe to top of water glass; 1 injured.

*September 2, 1928, locomotive 3078, Juanita, N. Dak. Water glass broke; 1 injured.

September 26, 1928, locomotive 3126, Kintyre, Mont. Reverse lever unlatched due to reverse lever latch teeth worn. "Put teeth on reverse lever latch and spring to same so can keep engine hooked up" was reported on September 22, and proper repairs not made; 1 injured.

*October 28, 1928, locomotive 3059, Sabin, Minn. Whistle lever bolt broke or lost out; 1 injured.

November 10, 1928, locomotive 2119, Hillyard, Wash. Rivet in fire box blew out while being calked under pressure; 1 injured.

November 17, 1928, locomotive 3320, Devils Lake, N. Dak. Grate shaker bar slipped off lever due to improper fit; 1 injured.

January 26, 1929, locomotive 905, Stonehill, Mont. Valve strip fouled on a plug which worked out of pressure plate, breaking rocker box, valve yoke, and throwing reverse lever back suddenly; stud holes were drilled entirely through pressure plates and brass plugs had been applied from the face of the plate into the unused portion of stud hole; 1 injured.

January 28, 1929, locomotive 2113, Williston, N. Dak. Adjusting bolt of spring buffer between locomotive and tender broke; 1 injured.

February 1, 1929, locomotive 1221, Rutland, N. Dak. Bad steam leak in fire door flange caused water to spray over tender deck and gangway; 1 injured.

May 21, 1929, locomotive 3125, Wolf Point, Mont. Uncoupling lever on rear of tender inoperative due to clevis pin missing; 1 injured.

**May 24, 1929, locomotive 3062, St. Cloud, Minn. Board of tender coal pit extension split, causing employee to fall; board of too light material and not properly applied; 1 injured.

Eleven accidents; 11 injured.

GULF COAST LINES:

November 23, 1928, locomotive (I.-G. N.) 274, Goose Creek, Tex. Crown sheet failure, while in charge of engine watchman, caused by overheating due to low water; top and bottom cocks of right water glass closed and drain valve

open account of gasket leaking; water side of left water glass coated with white scale, making it difficult to determine water level; 1 injured.

*January 25, 1929, locomotive (B. S. L. & W.) 1069, Houston, Tex. Locomotive and four cars derailed due to back end of truck radial brace not having sufficient clearance in right side of radius yoke to permit engine to curve properly; 1 injured.

Two accidents; 2 injured.

GULF, COLORADO & SANTA FE RAILWAY:

October 17, 1928, locomotive 969, near Manvel, Tex. Whistle stuck open account of whistle spring breaking and a piece of spring catching under whistle valve; 1 injured.

November 7, 1928, locomotive (A. T. & S. F.) 3887, Brownwood, Tex. Index glass and packing nut of booster engine lubricator blew out account of improper fit; threaded hole in body of lubricator was stretched oblong and too large for packing nut; 1 injured.

Two accidents; 2 injured.

HOCKING VALLEY RAILWAY:

*July 21, 1928, locomotive 205, Linworth, Ohio. Piston broke, knocking out cylinder head; 1 injured.

**November 19, 1928, locomotive 84, Wellston, Ohio. Insufficient clearance between cab apron and legs of water tank; 1 injured.

Two accidents; 2 injured.

ILLINOIS CENTRAL SYSTEM:

September 19, 1928, locomotive 2459, Kankakee, Ill. Grate shaker post latch bracket broke off at defective weld through pinhole permitting power shaker operating arm to move backward and catch engineer's foot between it and deck step; latch bracket had been broken off previously and was repaired on the day previous to this accident by autogenously welding the broken part in place though apparently no effort was made to fuse the parts of bracket; deck step so located that operating lever would strike step when in back position; 1 injured.

September 21, 1928, locomotive 7000, between Balcom and Dongola, Ill. Defective stoker slide hook slipped out of hole in slide; 1 injured.

**October 31, 1928, locomotive 1946, Chicago, Ill. Tender gangway deck block extension gave way account of block being badly decayed where attached to tender deck; 1 injured.

January 18, 1929, locomotive 3962, near Monroe, La. Crown sheet failure caused by overheating due to low water; appurtenances lost or damaged to such extent that their previous condition could not be determined; 1 killed, 2 injured.

**February 27, 1929, locomotive 1867, Sullivan, Ill. Water glass burst; injured while closing water glass cocks; 1 injured.

**March 20, 1929, locomotive 1586, Roberts, Ill. Fire door failed account of clevis becoming disconnected from air cylinder piston rod; dowel in clevis missing, permitting rod to turn and unscrew from clevis; fire door reported on February 23 and March 18; 1 injured.

*April 21, 1929, locomotive 1613, Fluker, La. Front cab window slammed shut account of set screw working loose; 1 injured.

Seven accidents; 1 killed, 8 injured.

INTERNATIONAL-GREAT NORTHERN RAILROAD:

June 1, 1929, locomotive 1066, Navasota, Tex. Insufficient clearance between overhang of cab floor and cab apron; 1 injured.

One accident; 1 injured.

LEHIGH & NEW ENGLAND RAILROAD:

August 21, 1928, locomotive 30, Bath, Pa. Portion of left front cylinder head about 8 inches in diameter blew out, carrying cylinder head casing with it; old fracture covered about 70 per cent of the broken area; 1 injured.

One accident; 1 injured.

LEHIGH VALLEY RAILROAD:

October 24, 1928, locomotive 415, Depew, N. Y. Brakes applied in emergency; defective feed valve on engine; 1 injured.

October 31, 1928, locomotive 728, Allentown, Pa. Hook and lug for securing middle section of coal gate in open position were missing, permitting coal gate to close unexpectedly and strike fireman's hand; 1 injured.

December 22, 1928, locomotive 1652, Florence, Pa. Air compressor steam pipe spanner nut failed while being tightened under pressure with hammer and chisel; spanner nut of poor material and broke at old fracture; outer surface of spanner nut mutilated by use of improper tools; 1 injured.

February 13, 1929, locomotive 3443, Jersey City, N. J. Sand pipe clamp loose and pipe out of line with the rail (engineer injured while attempting to line sand pipe while locomotive was working); 1 injured.

April 22, 1929, locomotive 2133, La Salle, N. Y. Main rod broke due to old defect; 1 injured.

June 10, 1929, locomotive 3065, Allentown, Pa. Employee thrown from foot-board due to bolt securing right front foot board to bracket coming in contact with guard rail account of step being too low; "Front steps low, step irons low" was reported on June 6 and 9; 1 injured.

**June 13, 1929, locomotive 3135, Jersey City, N. J. Reverse lever quadrant was loose on the rear bracket and out of line causing reverse lever latch to bind in quadrant; 1 injured.

Seven accidents; 7 injured.

LOS ANGELES & SALT LAKE RAILROAD:

*May 10, 1929, locomotive 3176, Kerens, Calif. Main spring equalizer on trailer truck broke and dropped to track causing derailment; 1 injured.

One accident; 1 injured.

LOUISIANA RAILWAY & NAVIGATION Co.:

**December 31, 1928, locomotive 96, Shreveport, La. Main pin broke; 1 injured.

One accident; 1 injured.

LOUISVILLE & NASHVILLE RAILROAD:

**July 7, 1928, locomotive 392, near Nelson, Ga. Right front driving spring broke; 1 injured.

July 19, 1928, locomotive 1528, Bakers, Tenn. Handle pulled off injector starting valve stem; clevis loose on stem account of threads on clevis and stem badly worn and cotter key which had been applied to hold clevis in place sheared off or lost out; 1 injured.

July 21, 1928, locomotive 1785, White City, Ala. Crown sheet failure caused by overheating due to low water; 1 killed, 1 injured.

**July 27, 1928, locomotive 1298, Bolton, Ga. Nuts securing right piston rod in crosshead worked loose; 1 injured.

July 29, 1928, locomotive 1547, Woodrow, Tenn. Bull ring broke off flush with edge of piston head for approximately 24 inches and was broken into small pieces, some of which were blown out of stack and struck employee; 1 injured.

**August 3, 1928, locomotive 1004, Copperhill, Tenn. Spring hanger broke; 1 injured.

October 7, 1928, locomotive 1777, Brodhead, Ky. Section of tender deck and front stoker slide worked out of position account of improper stop block used on stoker conveyor slide; 1 injured.

October 8, 1928, locomotive 993, near Rockdale, Tenn. Squirt hose burst due to being badly worn where it hung over edge of cab apron; 1 injured.

October 30, 1928, locomotive 943, Cincinnati, Ohio. Insufficient clearance between driver brake rigging and ash pan hopper slides; front ash pan slide out of line and binding on guide; 1 injured.

**December 5, 1928, locomotive 1781, Parksville, Ky. Employee's hand was caught between grate shaker bar and elevator of stoker while operating dump grates; swing of dump grates permitted shaker bar to foul on stoker elevator and no provision was made to limit the forward travel of dump grate lever; 1 injured.

December 10, 1928, locomotive 1185, St. Bethlehem, Tenn. Lubricator drain cock broke at old fracture while being tightened under pressure; 1 injured.

December 10, 1928, locomotive 1140, Columbia, Tenn. Cab apron tipped causing employee to fall off locomotive and tender wheel ran over his foot; apron hinges were defective and bolts for fastening hinges to cab supports were missing; 1 injured.

February 19, 1929, locomotive 1592, Mountain Creek, Ala. Main rod failed through eye at front end due to old break through bottom section; 1 injured.

March 5, 1929, locomotive 251, near West Harpeth, Tenn. Crosshead pin broke, due to old fracture at root of last thread covering approximately 90 per cent of cross-sectional area, and pin worked outward breaking guide yoke and

resulting in the locomotive being stripped on both sides and locomotive, tender, and eight cars of passenger train being derailed. All four safety chains on tender truck failed; chains of insufficient strength; 8 injured.

April 27, 1929, locomotive 382, Selma, Ala. Cylinder body blew out of air compressor governor steam valve body account of threads being badly pulled and body enlarged where cylinder screwed in; 1 injured.

**June 20, 1929, locomotive 1136, near Beldon, Tenn. Spring hanger broke; 1 injured.

June 22, 1929, locomotive 1330, Fairmount, Ga. Main steam pipe in smoke box broke at bottom flange causing back draft; 1 injured.

Seventeen accidents; 1 killed, 24 injured.

MACON, DUBLIN & SAVANNAH RAILROAD:

**November 21, 1928, locomotive 109, Minter, Ga. Side rods broke; 1 injured. One accident; 1 injured.

MAINE CENTRAL RAILROAD:

February 14, 1929, locomotive 612, Lewiston, Me. Shaker bar slipped off post; shaker bar socket burred; 1 injured.

One accident; 1 injured.

MARYLAND & DELAWARE COAST RAILWAY:

**December 13, 1928, locomotive 203, Greenwood, Del. Filler metal in fusible plug blew out. Hole for filler metal was $\frac{1}{2}$ inch greater in diameter on fire side than on water side; plug was 2 inches long and was exposed on fire side $\frac{1}{2}$ inches, extending into water space only $\frac{1}{4}$ inch; 1 injured.

One accident; 1 injured.

MICHIGAN CENTRAL RAILROAD:

**July 19, 1928, locomotive 8427, East Buffalo, N. Y. End of broken stay bolt blew out of wrapper sheet while being calked under pressure. The bolt was of the reduced body type and broke in root of fillet at enlarged outer end. Threads on bolt and in sheet were in poor condition and badly damaged due to bolt head having been heavily hammered. The sheet at this and other bolts showed excessive use of fullering tool; 1 injured.

**October 13, 1928, locomotive 7981, New Buffalo, Mich. Squirt hose burst; hose defective; 1 injured.

November 17, 1928, locomotive 131, Michigan Center, Mich. Right steam pipe burst in front end causing back draft; casting coarse grained and porous in spots and $\frac{1}{8}$ inch less in thickness than company's standard; apparently pipe had been cracked prior to failure; 1 injured.

**December 12, 1928, locomotive 7922, Jackson, Mich. Smoke arch cleaning hole cover came off causing employee to fall from running board to the ground; cleaning hole cover improper fit; 1 injured.

April 24, 1929, locomotive 125, Francisco, Mich. Cylinder steam pipe burst due to thin spot in metal and metal porous and defective; 3 injured.

Five accidents; 7 injured.

MINNEAPOLIS & ST. LOUIS RAILROAD:

July 2, 1928, locomotive 320, near Marshalltown, Iowa. Valve in bottom gauge cock disengaged from its seat; valve was $\frac{3}{8}$ inch shorter than standard, lead gasket on spindle was almost entirely worn away, and three threads on end of spindle were stripped off; 1 injured.

One accident; 1 injured.

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

**July 28, 1928, locomotive 2623, Fond du Lac, Wis. Injector steam pipe spanner nut broke due to old flaw covering approximately 75 per cent of cross-sectional area at base of collar; spanner nut reported leaking on July 22 and 27; 1 injured.

One accident; 1 injured.

MISSOURI-KANSAS-TEXAS LINES:

October 3, 1928, locomotive 902, Summit, Okla. Stoker steam pressure gauge burst; 1 injured.

One accident; 1 injured.

MISSOURI PACIFIC RAILROAD:

*October 16, 1928, locomotive 9407, Kansas City, Mo. Blow-off cock defective; 1 injured.

*December 16, 1928, locomotive 2620, Blue Rapids, Kans. Eccentric blade broke; 1 injured.

March 21, 1929, locomotive 1422, Pueblo, Colo. Rivet in throat sheet combustion chamber seam blew out while being calked under pressure; 1 injured.

*April 16, 1929, locomotive 202, Little Rock, Ark. Rung broke out of ladder on side of locomotive; 1 injured.

Four accidents; 4 injured.

MONONGAHELA RAILWAY:

June 27, 1929, locomotive 150, Mather, Pa. Grate shaker bar slipped off post; taper end of post worn permitting shaker bar to come in contact with shaker post stand; 1 injured.

One accident; 1 injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

**February 2, 1929, locomotive 536, Kingston Springs, Tenn. Trailing truck tire broke; metal crystallized; 1 injured.

One accident; 1 injured.

NEW YORK CENTRAL—LINES EAST:

July 27, 1928, locomotive 3361, Bergen, N. Y. Crown sheet failure caused by overheating due to low water; 2 killed.

July 31, 1928, locomotive 3099, Bogota, N. J. Firemen's shovel caught on ragged edge around hole in shoveling sheet; shoveling sheet badly worn and had hole approximately $8\frac{1}{2}$ by 4 inches in center; 1 injured.

August 4, 1928, locomotive 3800, Wedgewood, N. Y. Fireman's shovel caught on holes worn in apron; apron worn thin and hobs were worn through, leaving holes $\frac{1}{2}$ inch to $\frac{3}{4}$ inch in diameter; 1 injured.

November 2, 1928, locomotive 3098, Marcy, N. Y. Port plug blew out of cylinder and escaping steam broke cab window of locomotive on another track; threads in port hole in poor condition; 1 injured.

**February 18, 1929, locomotive 433, Buffalo, N. Y. Cylinder cock rigging became disconnected due to bolt losing out; 1 injured.

April 9, 1929, locomotive 5241, Palmyra, N. Y. Reverse lever difficult to operate; both links and both link blocks galled and the link blocks seized in links; 1 injured.

*June 20, 1929, locomotive 205, Belle Isle, N. Y. Fire hose leaking; 1 injured. Seven accidents; 2 killed, 6 injured.

NEW YORK CENTRAL—LINES WEST:

July 7, 1928, locomotive 4885, Durham, Ind. Crown sheet failure caused by overheating due to low water; 2 killed.

February 10, 1929, locomotive 94, Carson, Ohio. Crown sheet failure caused by overheating due to low water. Water level indicating devices lost or damaged to such extent that their previous condition could not be determined. Feed-water pump reported as not supplying the boiler on January 18, 19, 20, 21, 22, 23, 26 (two times), 27, 28, and February 2, 5 (two times), 6, and 10; 2 killed, 1 injured.

April 14, 1929, locomotive 5178, Gibson, Ind. Water glass burst; 1 injured.

April 24, 1929, locomotive 890, Tecumseh Junction, Mich. Right valve rod guide came loose from guide yoke, due to nuts losing off guide bolts, and worked forward and caught in valve gear where it was struck by other parts and both lugs broken off, causing reverse lever to fly back in quadrant; threads on lower valve rod guide bolt were defective; 1 injured.

April 29, 1929, locomotive 5210, Irving, N. Y. Marker column on pilot beam worked loose and was hurled from rapidly moving locomotive, striking track employee; nuts lost off the two bolts used to secure column to pilot beam, threads on bolts were worn, indicating that the nuts had been loose for some time; 1 injured.

June 7, 1929, locomotive 18, near Horton, Ohio. Back end of main rod strap failed due to old crack in top section at fillet; 2 injured.

Six accidents; 4 killed, 6 injured.

NEW YORK, CHICAGO & ST. LOUIS RAILROAD:

**December 26, 1928, locomotive 206, Stony Island, Ill. Pneumatic fire door opened very slowly; "Air door does not open properly" was reported on December 25; 1 injured.

January 12, 1929, locomotive 909, near Rardin, Ill. Defective globe valve in squirt hose pipe; 1 injured.

**January 17, 1929, locomotive 395, Rochester, Ind. Reverse lever went to full back position allowing valve to overtravel and catch broken exhaust ring on the sharp end of valve chamber bushing, causing the gear to reverse and catch engineer's hand between lever and boiler back head; stop missing from front end of reverse lever quadrant, permitting reverse lever to foul on back head when in full forward position; no stops in the valve gear or reverse lever quadrant to prevent overtravel of valve in either direction; 1 injured.

*January 18, 1929, locomotive 885, Charleston, Ill. Insufficient clearance between reverse lever and back of cab; 1 injured.

January 31, 1929, locomotive 891, Van Buren, Ind. Hinge lug broke off angle cock handle at rear of tender causing brakeman to fall; material in approximately 75 per cent of cross-sectional area of hinge lug was defective; 1 injured.

February 18, 1929, locomotive 852, Jefferson, Ind. Leakage from tank valve tube caused ice to form on gangway step; 1 injured.

Six accidents; 6 injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**August 11, 1928, locomotive 1380, Quinnipiack, Conn. Side rod knuckle pin broke due to old fracture; 1 injured.

August 18, 1928, locomotive 1108, South Worcester, Mass. Slipped on front beam of tender at gangway and fell to the ground; top of beam worn and bolt heads protruding above surface of deck; 1 injured.

August 20, 1928, locomotive 3335, New Britain, Conn. Grate shaker post broke off due to old fracture covering approximately 90 per cent of cross-sectional area; 1 injured.

September 1, 1928, locomotive 3433, Cedar Hill, Conn. Fire hose burst; hose worn and crimped; 1 injured.

September 24, 1928, locomotive 1390, Guilford, Conn. Bolts worked out of hanger bracket, permitting ash pan operating lever to drop to track and catch on crossing plank, resulting in injury to crossing watchman; 1 injured.

September 25, 1928, locomotive 159, Bristol, Conn. Forward quadrant bracket stud blew out; the other quadrant bracket stud was broken off close to boiler shell; 2 injured.

October 18, 1928, locomotive 3300, Providence, R. I. Stoker coal slide hook slipped out of hole, causing employee to fall against boiler butt; when slide was pulled back the end of hook would strike on conveyer casting and automatically throw hook out of hole; 1 injured.

November 24, 1928, locomotive 3551, Broad Brook, Conn. Flue sheet of McClellon type firebox cracked open circumferentially through the bend at connection to boiler shell for approximately 18 inches; 3 injured.

**December 4, 1928, locomotive 3216, Shelton, Conn. Stoker conveyor drive shaft universal joint pin dropped out of position account of rivet working out; 1 injured.

January 3, 1929, locomotive 1367, Providence, R. I. Tank hose coupling leaking; 1 injured.

**April 13, 1929, locomotive 414, Millville, Mass. Reverse lever went to full back position while engineer was attempting to move it forward; valves dry and out of square; too much clearance between reverse lever latch and quadrant; 1 injured.

May 8, 1929, locomotive 1259, Buzzards Bay, Mass. Injured while shaking grates; grate shaker post bracket was loose due to one bolt missing and the remaining bolt loose, causing excessive lost motion in shaker rigging; 1 injured.

Twelve accidents; 15 injured.

NORFOLK & WESTERN RAILWAY:

September 21, 1928, locomotive 200, Petersburg, Va. Steam heat pipe to brakeman's cupola was broken off through nipple at globe valve connection, causing employee to be burned when he opened valve to steam heat pipe; 1 injured.

December 12, 1928, locomotive 1304, Eckman, W. Va. Arch tube plug blew out of back boiler head while being tightened under pressure; plug not properly tightened after boiler wash; 1 injured.

Two accidents; 2 injured.

NORTHERN PACIFIC RAILWAY:

**August 3, 1928, locomotive 1821, near Lind, Wash. Undesired emergency application of brakes caused by vent valve on tender opening; 1 injured.

**August 9, 1928, locomotive 1788, Gregory, Minn. Main driving journal broke off 11 inches from wheel hub, caused by a flaw in journal; 1 injured.

**August 31, 1928, locomotive 1717, Cocolalla, Idaho. Main driving wheel axle broke due to old fracture; 1 injured.

**September 10, 1928, locomotive 1731, near Jamestown, N. Dak. Water glass burst; 1 injured.

September 24, 1928, locomotive 2456, Staples, Minn. Water glass burst, breaking two of the glasses in shield; 1 injured.

**November 28, 1928, locomotive 1825, Parkwater, Wash. Rivet blew out of back flue sheet seam while fire crack leading from rivet hole was being calked under pressure; 1 injured.

November 29, 1928, locomotive 1767, Bradley, Mont. Lap-and-lead lever broke due to old fracture; 1 injured.

*January 9, 1929, locomotive 1859, Kurtz, N. Dak. Drawbar on tender pulled out; 1 injured.

**January 27, 1929, locomotive 1275, Parkwater, Wash. Shovel struck on nail in shoveling sheet; 1 injured.

March 16, 1929, locomotive 1731, Minneapolis, Minn. Injector steam pipe blew off at steam turret fitting due to being improperly secured; spanner nut too large to fit threaded end of steam throttle and had 10 threads pitch to be screwed onto throttle having 8 threads pitch; 1 injured.

March 16, 1929, locomotive 451, Tilden Junction, Minn. Scalded by hot water and steam escaping through crack in squirt hose pipe; 1 injured.

June 3, 1929, locomotive 2503, Oakes, N. Dak. Water glass burst, breaking two glass panels in shield; 1 injured.

Twelve accidents; 13 injured.

OREGON SHORT LINE RAILROAD:

August 1, 1928, locomotive 3128, North Salt Lake, Utah. Right No. 1 flange oiler nozzle was broken off and thrown from rapidly moving locomotive through cab window of another locomotive and struck its engineer; one of the bolts supporting bracket to which oil pipe was attached broke and worked out which permitted bottom end of bracket to swing out in the path of side rod, breaking the remaining bracket bolt and oil pipe at nozzle; 1 injured.

One accident; 1 injured.

PENNSYLVANIA RAILROAD:

July 21, 1928, locomotive 1329, Bennington, Pa. Flue broke off at defective safe end weld; 1 injured.

August 19, 1928, locomotive 5341, Ardwick, Md. Left inside link trunnion oil cup top dropped down, and was thrown back through left front cab door of second locomotive; oil cup top not properly tightened; 1 injured.

August 28, 1928, locomotive 3419, Kearny, N. J. Right front cylinder head failed its entire circumference at throat of stud flange; old defect in throat of flange; 1 injured.

September 13, 1928, locomotive 4421, Canton, Ohio. Reflex type water glass burst; 1 injured.

October 21, 1928, locomotive 5171, Baltimore, Md. Front cross equalizer broke in reduced section near end; 30 per cent old defect at point of failure; 1 injured.

October 26, 1928, locomotive 2962, near Portage, Pa. Crown sheet failure caused by overheating due to low water; nipple of bottom fitting of water glass had been cut off approximately flush with inside of back head liner permitting circulation of water in boiler to cause erratic action of water in the gauge glass; gauge cocks did not give true reading of water level when locomotive was in operation. Unreliable indications of water glass previously reported; 1 injured.

October 31, 1928, locomotive 4566, Glenover, Pa. Squirt hose valve worked open; valve improperly packed; 1 injured.

November 1, 1928, locomotive 3251, Coatesville, Pa. Left No. 1 crank pin collar bolt broke permitting collar to fall from rapidly moving locomotive and strike track employee; bolt showed about 75 per cent old fracture; "Left front side rod collar bolt loose" was reported on October 6 and 12; 1 injured.

November 14, 1928, locomotive 4641, Goldsboro, Pa. Train line air hose became uncoupled between engine and tender causing sudden stop; coupling had only about 1 inch clearance above the rails, permitting it to strike on high cross-overs, guard rails, etc., shearing the lock pin; 1 injured.

November 22, 1928, locomotive 6885, Morrisville, Pa. Flue failed at front flue sheet due to having been excessively rolled; 1 injured.

November 28, 1928, locomotive 420, Odenton, Md. Bottom section of tender coal gates came open due to not being properly closed and secured; left bottom

section of coal gate worn on hinges and sagging down; stop missing on left bottom section and no safety key in bottom lock; 1 injured.

**January 16, 1929, locomotive 5334, Wilmerding, Pa. Tender brake beam hanger broke, permitting brake rigging to come down; 1 injured.

January 27, 1929, locomotive 6580, Altoona, Pa. Water glass burst; water glass improperly assembled; 1 injured.

February 6, 1929, locomotive 5431, Homewood, Pa. Headlight on locomotive failed and locomotive was continued in service without a headlight for 52 miles, during which time it struck and instantly killed a track employee. Accident occurred at 11.15 p. m. while locomotive was being operated at speed of 45 miles per hour. At time of headlight failure locomotive had made only 35 miles since previous failure of headlight; 1 killed.

February 6, 1929, locomotive 4188, Northumberland, Pa. Flue failed in safe end due to old defect covering approximately 60 per cent of cross-sectional area; overheated when safe end was applied; 2 injured.

February 7, 1929, locomotive 2285, Ardmore, Pa. Reverse lever flew backward while being hooked up; valves out of square and reversing gear and valve gear in worn condition; valve gear defects reported on January 12, 19, 21, 22, 24, 26, 31, and February 4, 7, 8, and 12; 1 injured.

February 26, 1929, locomotive 175, East Altoona, Pa. Expansion crown stay broke immediately below bottom of sleeve, and sleeve together with cap and broken end of stay blew out of roof sheet; crown stay sleeve improperly applied and threads on sleeve deteriorated to such extent they had no holding power; crown stay showed old fracture covering approximately the entire cross-sectional area; 1 injured.

February 26, 1929, locomotive 2523, Wilmore, Pa. Water scoop operating lever was thrown forward striking employee, due to scoop fouling on bottom of water pan and being forced upward; water scoop damaged and out of adjustment and had not been properly repaired when the condition was reported on February 9; 1 injured.

April 7, 1929, locomotive 3750, Morrisville, Pa. Steam heat pipe connection at high pressure side of regulating valve failed; spanner nut stretched and badly mutilated by use of set or chisel and threads in nut and on valve nipple were in poor condition; coupling at valve was made by forcing pipe into position, causing a severe strain on pipe and coupling which was augmented by pressure exerted by front plate of steel cab bearing against pipe at hole in plate through which pipe passed; cab was loose and shifted and had been repeatedly reported loose at both terminals; 1 injured.

April 12, 1929, locomotive 2929, Radebaugh, Pa. Crown sheet failure caused by overheating due to low water; 2 injured.

April 15, 1929, locomotive 6842, Crestline, Ohio. Reflex type water glass burst; 1 injured.

April 16, 1929, locomotive 8622, Coshocton, Ohio. Reflex type water glass burst; 1 injured.

April 17, 1929, locomotive 2112, near Seward, Pa. Driver brake shoe broke and parts of it were thrown from wheel, striking track employee; 1 injured.

April 29, 1929, locomotive 982, near Gallitzin, Pa. Side rod broke; inspection and repair reports show that driving rod work was frequently reported during the 30 days preceding the accident; 1 injured.

May 2, 1929, locomotive 4586, Donohoe, Pa. Injector delivery pipe pulled out of union nut at check valve; union coupling in unsafe condition; check valve guide stem broken, injector and delivery pipe not rigidly supported; connection that failed was reported leaking on April 29 and 30, and "Inspirator bracket bolts loose" was reported on May 2; 1 injured.

May 3, 1929, locomotive 1462, Kittaning, Pa. Turret valve casing blew off top of boiler while locomotive was moving at a speed of 60 miles per hour and struck track employee; flange of casing was not designed wide enough to extend slots in same over anchor bolt holes in roof sheet; 1 injured.

May 3, 1929, locomotive 3746, near Bowie, Md. End of broken driving box pedestal brace bolt was thrown from rapidly moving locomotive and struck track employee; old break in bolt at first thread in top nut; 1 injured.

May 20, 1929, locomotive 8105, Limesdale, Ind. Injured while attempting to make repairs to right elevator of duplex stoker which was inoperative account of a bolt wedged between elevator screw and casing; no cleaning iron for elevator shaft screws supplied on locomotive; feed valve on automatic brake valve extended directly above stoker elevator pawl shifter clearing it only $\frac{1}{4}$ inch; ball joint cover missing from forward portion of conveyor trough; "Change feed valve so

that right elevator pawl can be raised, can not reverse elevator" was reported and signed for on May 18, but change was not made; 1 injured.

May 21, 1929, locomotive 7182, Danville, Ohio. Engineer's drop seat gave way due to rear hinge board pulling loose from side of cab; 1 injured.

May 25, 1929, locomotive 3633, Southport, N. Y. Air-operated bell stopped ringing; bell loose in yoke and clapper hanger shifted so that clapper would not strike when bell was swinging; bell rigging defective; bell reported not ringing on May 8, 12, 13, 16, and 25; 1 injured.

**June 18, 1929, locomotive 1981, Harrisburg, Pa. Train made sudden stop caused by defective automatic brake valve; valve reported on June 16 and 17; 1 injured.

June 27, 1929, locomotive 88, Logansport, Ind. Squirt hose parted at splice; 1 injured.

June 29, 1929, locomotive 3108, Pittsburgh, Pa. Defective steam ell in steam heat pipe between regulator and steam heat throttle valve broke off at connection to union in cab; 1 injured.

Thirty-three accidents; 1 killed, 34 injured.

PITTSBURG & SHAWMUT RAILROAD:

January 30, 1929, locomotive 227, Sulger, Pa. Drawbar broke through eye at front end and both safety chains broke through defective welds in links, causing locomotive and tender to separate and employee to fall to the ground between the rails; crack at end of drawbar pin hole and material of drawbar inferior; excessive slack in safety chains prevented apron from covering space between locomotive and tender by more than 3 inches when safety chains were taut; 1 injured.

One accident; 1 injured.

PORTLAND TERMINAL CO.:

March 7, 1929, locomotive 822, Portland, Me. End of broken stay bolt blew out of fire box side sheet while locomotive was moving at speed of about 6 miles per hour in switch service; bolt was too long when applied and only approximately two full threads engaged with threads in inside fire box sheet and these had been badly damaged due to calking. This was a reduced body bolt, $1\frac{1}{16}$ inches in diameter at threaded ends and $1\frac{3}{16}$ inch in reduced section and broke near root of fillet at outer end which was beyond the depth of telltale hole; 1 injured.

One accident; 1 injured.

RAPID CITY, BLACK HILLS & WESTERN RAILROAD:

October 12, 1928, locomotive (C. B. & Q.) 1578, Big Bend, S. Dak. Crown sheet failure caused by overheating due to low water; all three gauge cocks and bottom end of right water glass were stopped up and inner surface of water glass was coated; right water glass drain valve three-fourths of a turn open and body of valve stopped up solid; 2 injured.

One accident; 2 injured.

READING CO.:

**March 26, 1929, locomotive 1641, Lofty, Pa. Packing blew out of air pump; 1 injured.

May 3, 1929, locomotive 587, Sellersville, Pa. Reverse lever unlatched and went forward suddenly striking employee; 1 injured.

May 28, 1929, locomotive 1464, Philadelphia, Pa. Grate shaker lever slipped off post due to improper fit; shaker post had been upset which prevented lever from being properly applied; 1 injured.

Three accidents; 3 injured.

RIO GRANDE SOUTHERN RAILROAD:

July 5, 1928, locomotive 20, Telluride, Colo. Water glass burst, breaking water glass shield; 1 injured.

One accident; 1 injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

August 6, 1928, locomotive 4109, near Monett, Mo. Bolt lost out of angle iron in smoke box, permitting angle iron to drop sufficiently to allow deflector plate to swing over exhaust nozzle, causing back draft; 1 injured.

**January 27, 1929, locomotive 4024, Monett, Mo. Water glass burst and flying glass struck employee in eyes and on face; 1 injured.

January 30, 1929, locomotive 662, Clinton, Mo. Headlight turbine wheel burst breaking turbine cover and flying parts struck employee; governor failed to function properly, permitting excessive speed; 1 injured.

March 28, 1929, locomotive 496, Blytheville, Ark. Engineman injured while working on sanders; "Clean out sanders" was reported on March 27 and repairs not made; 1 injured.

**May 31, 1929, locomotive 4139, Many Islands, Ark. Whistle stuck open; 1 injured.

June 25, 1929, locomotive 1015, between Rush Tower and Brickeys, Mo. Lateral liner on the face of right driving wheel broke and a piece of same struck the driving wheel and was thrown to the right of track, striking a track employee; 1 killed.

Six accidents; 1 killed, 5 injured.

SEABOARD AIR LINE RAILWAY:

*July 1, 1928, locomotive 401, Edison, Ga. Main rod key lost out; 1 injured.

October 8, 1928, locomotive 1134, Richmond, Va. Front end handrail column gave way due to old fracture, causing employee to fall from footboard; 1 injured.

October 8, 1928, locomotive 256, Raleigh, N. C. Latch for holding tender tool box lid open was defective, permitting tool box lid to fall on employee's arm; 1 injured.

December 15, 1928, locomotive 240, between Neuse and Wake Forest, N. C. Signal box fell from its position on back of cab due to not being properly secured; 1 injured.

December 17, 1928, locomotive 650, Crystal Springs, Fla. Clamp missing from blow-off cock pipe, permitting bent end of pipe to point upward and the hot water to strike employee who was on the running board; 1 injured.

December 23, 1928, locomotive 607, Jacksonville, Fla. Eccentric strap broke causing reverse lever to fly back and catch engineer's arm; eccentric block loose and riding block key; eccentric block was reported loose six times since December 1; 1 injured.

March 14, 1929, locomotive 313, near Ocala, Fla. Low coupler at rear of tender permitted train to separate between tender and first car, causing emergency application of brakes; 1 injured.

**May 11, 1929, locomotive 681, Lobman, Ala. Guide yoke broke; 1 injured.

**May 11, 1929, locomotive 1094, Montgomery, Ala. Bell cord broke due to being badly worn; 1 injured.

June 2, 1929, locomotive 1110, Raleigh, N. C. Rear tender truck derailed due to wedge of radial buffer being too tight; 1 injured.

*June 24, 1929, locomotive 702, Jacksonville, Fla. Brake beam hanger bolt broke; 1 injured.

Eleven accidents; 11 injured.

SOLVAY PROCESS CO.:

**December 13, 1928, locomotive 35, Solvay, N. Y. End handhold at rear of tender gave way on left side account of bolt being sheared and handhold broke at weld which was about 90 per cent defective; bolts securing handhold were sheared on the previous day when cistern was shifted in an accident; sufficient inspection was not made to disclose condition of handhold, but it was known that cistern was loose on frame when locomotive was dispatched; 1 killed.

One accident; 1 killed.

SOUTHERN RAILWAY SYSTEM:

July 26, 1928, locomotive 4898, Atlanta, Ga. Hook slipped out of hole in stoker conveyor slide account of being bent; 1 injured.

**August 1, 1928, locomotive 1470, Melrose, N. C. Key bolt securing grate bar arm to straps fell out due to split key losing out, permitting grate to work open; 1 injured.

August 16, 1928, locomotive 790, near Louisville, Ky. Burned by back draft through fire door caused by petticoat pipe being loose and out of alinement and a sand hole in exhaust pipe; 1 injured.

September 10, 1928, locomotive 4823, Coolwell, Va. Crown sheet failure caused by overheating due to low water; 2 injured.

September 22, 1928, locomotive 4587, Amelia, Va. Main driving axle broke off at wheel fit due to old fracture; 1 injured.

**October 15, 1928, locomotive 760, Harrisonburg, Va. Insufficient clearance between reverse lever grip and fire door air pipes account of air pipes improperly located and reverse lever stop block missing; 1 injured.

**October 19, 1928, locomotive 1346, Chattanooga, Tenn. Throttle difficult to handle, causing a hard coupling; throttle reported on October 15, 18, and 20; 1 injured.

**November, 3, 1928, locomotive 604, Elko, S. C. Main rod broke where welded at old fracture; 1 injured.

**December 19, 1928, locomotive 6366, Huntersville, N. C. Crosshead broke; 1 injured.

December 28, 1928, locomotive 652, Bluford, Ill. Crown sheet failure caused by overheating due to low water; 1 injured.

**December 29, 1928, locomotive 455, White Pond, S. C. Strip for holding cab windows in position at the top became loose, permitting window sash to fall and strike engineer; 1 injured.

February 13, 1929, locomotive 1884, Birmingham, Ala. Blow-off cock leaking; 1 injured.

April 8, 1929, locomotive 839, Greenwood, S. C. Injector line check pulled off threads at front spanner nut; threads in spanner nut were in poor condition and spanner nut was too large for proper fit and had been mutilated by tools; 1 injured.

*May 29, 1929, locomotive 4020, Leonard, Va. Air hose burst between high and low pressure engines; 1 injured.

June 25, 1929, locomotive 761, Mount Carmel, Ill. Air hose at rear of tender burst; 1 injured.

Fifteen accidents; 16 injured.

SOUTHERN PACIFIC—LINES EAST:

August 6, 1928, locomotive (T. & N. O.) 139, Dallas, Tex. Insufficient clearance between vertical cab handhold and end of tender frame; 1 injured.

**April 1, 1929, locomotive (T. M.) 896, near Brin, Tex. Drawbar pin worked out of deck casting due to safety pin being missing and apron dropped account of safety chains being too long, resulting in injury to an employee who was standing on apron; 1 injured.

May 22, 1929, locomotive (T. & N. O.) 133, Houston, Tex. Bonnet of blow-down valve blew out due to threads in hub nut and on body of blow-down valve being badly stripped; 1 injured.

May 27, 1929, locomotive (G. H. & S. A.) 803, Nacogdoches, Tex. Fireman fell to the ground when he tripped over blow-off cock safety valve handle which extended above running board 2¼ inches; valve handle improperly located; 1 injured.

June 12, 1929, locomotive (T. & N. O.) 633, Janice, Tex. Squirt hose valve worked open; packing nut of squirt hose valve loose; 1 injured.

Five accidents; 5 injured.

SOUTHERN PACIFIC—LINES WEST:

July 2, 1928, locomotive (C. P.) 3639, near Cochise, Ariz. Petticoat pipe came down on one side and swung across exhaust nozzle tip, causing back draft; four bolts, ¼ inch in diameter, used to support petticoat pipe and these were single nutted; one bolt was broken and nuts worked off two of the remaining three bolts; 1 injured.

July 17, 1928, locomotive 3229, near Herrin, Nev. Brake pipe branch pipe broke off at distributing valve causing emergency application of brakes; branch pipe had broken off through nipple at distributing valve on July 11 and improper repairs were made; 1 injured.

December 2, 1928, locomotive 4345, Deady, Oreg. Left No. 3 driving wheel tire slipped outward on wheel center and mounted switch frog causing derailment of locomotive, tender, and 8 cars of passenger train; 10 injured.

April 3, 1929, locomotive 4386, near Robsart, N. Mex. Left eccentric rod broke at fracture at inside top of rod and the part attached to eccentric crank swung around and knocked the final discharge valve cage off air compressor permitting the air to escape from main air reservoir and the resulting loss of control of the locomotive terminated in a head-on collision. Locomotive was running light at time of accident, having been cut off passenger train account of this eccentric rod being bent; left piston valve and left cylinder were found insufficiently lubricated; daily inspection and repair reports indicate that valve and cylinder lubrication trouble was common and considerable valve work was also reported; 3 injured.

April 6, 1929, locomotive 3698, Los Angeles, Calif. Washout plug blew out while preparing to tighten it under pressure; plug had been applied cross-threaded; 1 injured.

**May 5, 1929, locomotive (E. P. & S. W.) 3401, Tucumcari, N. Mex. Part of left front footboard on locomotive split off; footboard of inferior grade of cross-grained pine; 1 injured.

May 12, 1929, locomotive 3680, Montague, Calif. Rung of tender gangway ladder broke off flush with sides of ladder due to metal being crystallized; 1 injured.

**May 22, 1929, locomotive 1825, Brighton, Calif. Squirt hose burst due to being badly worn; 1 injured.

June 20, 1929, locomotive 2795, Sabino, Ariz. Squirt hose valve worked open; squirt hose pipe not securely clamped allowing excessive vibration; 1 injured.

Nine accidents; 20 injured.

SPOKANE INTERNATIONAL RAILWAY:

*February 8, 1929, locomotive 1146, Bonner's Ferry, Idaho. Locomotive slipped driving wheel tires which broke switch point and guard rail causing derailment of first 10 cars in train; 1 injured.

One accident; 1 injured.

UNION RAILROAD:

March 2, 1929, locomotive 58, Rankin, Pa. Fusion welds attaching coal gate plate on tender water legs failed allowing plate to drop; weld at one end had been broken for some time; 1 injured.

One accident; 1 injured.

UNION PACIFIC RAILROAD:

March 24, 1929, locomotive 3613, near Granite Canon, Wyo. Superheater flue broke off at safe end weld due to having been excessively rolled and reduced to $\frac{3}{4}$ inch in thickness when safe end was applied; 1 injured.

One accident; 1 injured.

WABASH RAILWAY:

**July 2, 1928, locomotive 2320, Springfield, Ill. Driving spring hanger broke; 1 injured.

October 2, 1928, locomotive 838, Forrest, Ill. Employee's foot broke through cab roof causing him to fall from top of cab to tender; roof boards in top of cab were badly splintered over area of about 2 square feet and defective place was covered over with canvas; 1 injured.

November 10, 1928, locomotive 2600, near Oakley, Ill. Crown sheet failure caused by overheating due to low water; 1 injured.

May 4, 1929, locomotive 664, Blue Mound, Ill. Insufficient clearance around reverse lever; 1 injured.

Four accidents; 4 injured.

WASHINGTON TERMINAL:

March 7, 1929, locomotive 22, Washington, D. C. Flue failed adjacent to back flue sheet due to being wasted away to approximately $\frac{1}{4}$ inch in thickness; 1 injured.

One accident; 1 injured.

WESTERN MARYLAND RAILWAY:

February 16, 1929, locomotive 825, Waynecastle, Pa. Left main driving axle broke at outside end of journal due to old fracture covering approximately 60 per cent of cross-sectional area; 1 injured.

**March 15, 1929, locomotive 824, Hancock, Md. Burned by hot grease and oil which squirted out when grease cup cap on back end of right main rod was removed to fill grease cup account of back end main rod brass running hot; 1 injured.

Two accidents; 2 injured.

WESTERN PACIFIC RAILROAD:

October 2, 1928, locomotive 329, Winnemucca, Nev. Boiler check stuck open; 1 injured.

October 29, 1928, locomotive 209, Clio, Calif. Side rod broke through eye at crank pin due to old fractures on both sides of eye; 2 injured.

November 30, 1928, locomotive 20, Luke, Nev. Valve stem failed through cross section at keyway in crosshead fit; old fracture, 1 inch in depth, at point of failure; 1 injured.

Three accidents; 4 injured.

WHEELING & LAKE ERIE RAILWAY:

**March 15, 1929, locomotive 4317, Toledo, Ohio. Arm rest on cab window sill broke off due to being insecurely applied; 1 injured.

One accident; 1 injured.

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF LOCOMOTIVES OTHER THAN STEAM AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1929, BY ROADS

[A double star (**) indicates accident not properly reported, as required by rule 335. A complete investigation, therefore, could not be made, inasmuch as the bureau was not apprised of the accident in sufficient time after it occurred to permit it to be properly investigated.]

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

**November 26, 1928, locomotive 031, New York, N. Y. Inhaling gas escaping from uptake of oil-fired heating boiler through openings in casing caused serious illness of fireman; 1 injured.

One accident; 1 injured.

TABLE XIII.—Number of steam locomotives inspected, found defective, and ordered from service, etc.

Parts defective, inoperative or missing, or in violation of the rules	Akron, Canton & Youngstown	Alabama, Tennessee & Northern	Albion & Southern	Ann Arbor	Atchison, Topeka & Santa Fe	Atlanta & West Point	Atlanta, Birmingham & Coast	Atlantic & Yadkin	Atlantic Coast Line	Baltimore & Ohio Lines East	Baltimore & Ohio Lines West	Bangor & Aroostook	Belt Ry. of Chicago	Bessemer & Lake Erie	Birmingham Southern	Boston & Albany	Boston & Maine	Buffalo & Susquehanna	Buffalo Creek	Buffalo, Rochester & Pittsburgh	Camus Prairie	Cambria & Indiana	Canadian National	Canadian Pacific		
	1 Air compressors.....	8				28		1			18	25		3	2			1	1			1	1	5	1	
2 Arch tubes.....	4				3					2	2													2		
3 Ash pans or mechanism.....										1	1													3		
4 Axles.....																								4		
5 Blow-off cocks.....	1				11					5	7		1	1										5		
6 Boiler checks.....		1			7					11	17		1	1										6		
7 Boiler shell.....					14					14	17		1	1										7		
8 Brake equipment.....	5				69					18	54		32	33										8		
9 Cabs or cab windows.....	18				14					15	83		32	33										9		
10 Cab aprons or decks.....	5				8					38	60		3	3										10		
11 Cab cards.....	2		2		2					16	27		1	1										11		
12 Coupling or uncoupling devices.....	3		2		1					7	8													12		
13 Crossheads, guides, pistons, or piston rods.....	36	2			39					1	4													13		
14 Crown bolts.....	1				1					6	4													14		
15 Cylinders, saddles, or steam chests.....	5		1		57					49	28		1	1										15		
16 Cylinder cocks or rigging.....	3		1		49					6	7		13	14										16		
17 Domes or dome caps.....	2			1	2					10	4		5	1										17		
18 Draft gear.....			4	1	17					2	4		7	7										18		
19 Draw gear.....	6		3	1	13					3	18		4	4										19		
20 Driving boxes, shoes, wedges, pedestals, or braces.....	6		3		57					3	15		6	2										20		
21 Fire box sheets.....	2				1					5	64		2	8										21		
22 Flues.....	1				1					10	9		3	3										22		
23 Frames, tail pieces or braces, locomotive.....	9				26	1				6	6		1	5										23		
24 Frames, tender.....	11				11	1				11	1			1										24		
25 Gauges or gauge fittings, air.....					7					6	23			5										25		
26 Gauges or gauge fittings, steam.....	4			1	11					7	8		2	3										26		
27 Gauge cocks.....		1			20					15	7													27		
28 Grate shakers.....	2				4					8	18		5	3										28		
29 Handholds.....	2			1	28					5	4													29		
30 Injectors, inoperative.....					8	1				6	6			4										30		
31 Injectors and connections.....	9	2	1	5	96					1	1		6	1										31		
32 Inspections or tests not made as required.....	42		8	7	205	1				8	29		11	23										32		
33 Lateral motion.....	2				8					5	10		1	2										33		
34 Lights, cab or classification.....					4						1													34		
35 Lights, headlights.....	3			2	4					6	16			2										35		
36 Lubricator or shields.....	10				4					10	14		2	2										36		
37 Mud rings.....					1					7	10		1	4										37		
38 Packing nuts.....	4	1		2	20					2	6			2										38		
39 Packing, piston rod and valve stem.....	1		1	1	31					4	7		10	10										39		
40 Pilot or pilot beams.....	2				4					21	58		14	5										40		
41 Plugs or studs.....	1				3					2	3		1	1										41		
42 Reversing gear.....	3		1	1	10					16	4		1	1										42		
43 Rods, main or side, crank pins or collars.....	13	3	3	1	51					3	21		42	1										43		
44 Safety valves.....					3					91	44		6	12										44		
45 Sanders.....	5			5	26					4	1													45		
46 Springs or spring rigging.....	16		1	3	86					2	31		1	1										46		
47 Squirt hose.....	2				14					10	117		10	10										47		
48 Stay bolts.....	11				14					3	5		3	4										48		
49 Stay bolts, broken.....	2				11					7	13		9	2										49		
50 Steam pipes.....	5			1	12					9	25		4	2										50		
51 Steam valves.....	1				18					2	11		30	4										51		
52 Steps.....	4				4					3	3		1	1										52		
53 Tanks or tank valves.....	2			1	27					7	2		10	13										53		
54 Telltale holes.....					22					5	26		48	38										54		
55 Throttle or throttle rigging.....	6			1	31	1				3	1		1	1										55		
56 Trucks, engine or trailing.....	3	2			42					4	10		32	23										56		
57 Trucks, tender.....	4				17					4	7		43	42										57		
58 Valve motion.....	2				34					8	14		25	21										58		
59 Washout plugs.....	14			2	54	2				1	2		14	25										59		
60 Train control equipment.....										2	16		19											60		
61 Water glass, fittings or shield.....	3	1		3	28					13	24		29	6										61		
62 Wheels.....	9				13					2	23		14	3										62		
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).....	1				45					1	13		28	5										63		
Number of defects.....	260	13	28	49	1,431	9				117	3	305	1,370	1,476	44	185	177	1	158	374	137	133	14	22	212	70
Locomotives reported.....	29	19	22	59	1,971	53				80	17	1,028	2,447	86	96	139	23	326	799	51	20	277	18	13	235	153
Locomotives inspected.....	111	19	26	157	3,225	50				168	30	1,736	2,397	90	103	154	7	436	1,105	105	12	406	32	13	167	75
Locomotives defective.....	52	7	8	14	464	3				46	3	169	349	349	28	36	34	1	71	175	22	41	5	4	56	24
Percentage of inspected found defective.....	47	37	31	9	14	6				27	10	10	15	17	31	35	22	14	16	16	21	10	16	31	34	32
Locomotives ordered out of service.....	12	1			14					2	1	2	10	17	1	4			3	11					7	1

TABLE XIII.—Number of steam locomotives inspected, found defective, and ordered from service, etc.—Continued

Parts defective, inoperative or missing, or in violation of the rules		Colorado & Wyoming	Columbus & Greenville	Conemaugh & Black Lick	Copper Range	Copper River & Northwestern	Cumberland & Pennsylvania	Davenport, Rock Island & Northwestern	Delaware & Hudson	Delaware, Lackawanna & Western	Denver & Rio Grande Western	Denver & Salt Lake	Detroit & Mackinac	Detroit & Toledo Shore Line	Detroit Terminal	Detroit, Toledo & Iron-ton	Donora Southern	Duluth & Iron Range	Duluth & Northeastern	Duluth, Missabe & Northern	Duluth, South Shore & Atlantic	East Broad Top R. R. & Coal	East St. Louis Junction	East Tennessee & West. North Carolina	Elgin, Joliet & Eastern
1	Air compressors	3	2						1	26	20				3					2					1
2	Arch tubes									1															2
3	Ash pans or mechanism									8	1														3
4	Axles																								4
5	Blow-off cocks									2	6														5
6	Boiler checks								1	4	1			2		1									6
7	Boiler shell									15	6		1												7
8	Brake equipment	5		1	2				2	51	33	1		1	2			1				14	1	3	8
9	Cabs or cab windows	1							2	10	51		1	1	1	4									9
10	Cab aprons or decks	1							1	1	7			1	1	1					3				10
11	Cab cards								1	4				1	1	1									11
12	Coupling or uncoupling devices									3												7	2		12
13	Crossheads, guides, pistons, or piston rods									17	52	5									1				13
14	Crown bolts									1															14
15	Cylinders, saddles, or steam chests	3							3	49	34	21		1		1						2		1	15
16	Cylinder cocks or rigging	1		2					1	3	10	3													16
17	Domes or dome caps									1	5														17
18	Draft gear	2		1					3	10	27	1		1				1	1		5			1	18
19	Draw gear	1		1					1	12	19										2				19
20	Driving boxes, shoes, wedges, pedestals, or braces								1	6	13	46											1	2	20
21	Fire box sheets	1	1							11	5	2													21
22	Flues	1								1	1														22
23	Frames, tail pieces or braces, locomotive									30	13										1				23
24	Frames, tender									3	3											1			24
25	Gauges or gauge fittings, air									3	1										2				25
26	Gauges or gauge fittings, steam									17	3										2				26
27	Gauge cocks			1	1					19	12		1								3				27
28	Grate shakers								1	3	1	1								1					28
29	Handholds	1		1					1	16	8	4	2					2	2		8				29
30	Injectors, inoperative									1	1														30
31	Injectors and connections	3	4						6	78	42	4		2	2			1			3		2	2	31
32	Inspections or tests not made as required								6	9	42	25	6	1	2	12					15		3	1	32
33	Lateral motion									13	9										1				33
34	Lights, cab or classification				1					14	6														34
35	Lights, headlights				2					5	18	2							1		2				35
36	Lubricator or shields									13	4														36
37	Mud rings	2								10	42														37
38	Packing nuts									17	9	3													38
39	Packing, piston rod and valve stem	3		2					2	1	5	7	1									2		2	39
40	Pilot or pilot beams									2	1	4													40
41	Plugs or studs									2	5	6													41
42	Reversing gear									2	4														42
43	Rods, main or side, crank pins or collars	3				3			6	1	50	41	4								1	1		2	43
44	Safety valves									1	5	5													44
45	Sanders	4							1	9	75	2	1		1	1					5			3	45
46	Springs or spring rigging	5		1	2					29	75	11							2			5			46
47	Squirt hose									1	4	2													47
48	Stay bolts									1	7														48
49	Stay bolts, broken			4						9	22	4													49
50	Steam pipes									22	4														50
51	Steam valves									15	5														51
52	Steps	1		1					1	14	4		3	1	1			2	1		6	1		2	52
53	Tanks or tank valves									1	13	28	1		3				2						53
54	Telltale holes									1	30	9													54
55	Throttle or throttle rigging	1	1							2	15	11	1		3			1			1	1		1	55
56	Trucks, engine or trailing									1	12	41	1												56
57	Trucks, tender	1		3						1	32	26		1							7	3	1	2	57
58	Valve motion			1						32	41														58
59	Washout plugs									29	37														59
60	Train control equipment									1	12	3	2	1	4										60
61	Water glass, fittings or shield	1		1		1			1	1	9	10	2		1						12	3	2	1	61
62	Wheels								2	9	31	1	3								3	3		1	62
63	Miscel.—Signal appliances, badge plates, brakes (hand)		1	1						9	31	1	3											2	63
Number of defects		44	12	23	18		8	30	49	851	972	80	23	9	44	10	14	8	1	149	24	16	28	51	
Locomotives reported		27	27	33	20	19	16	11	448	697	477	58	23	39	35	72	17	92	10	102	73	11	11	12	260
Locomotives inspected		57	28	12	18		14	32	696	957	703	101	24	38	45	149	6	45	8	71	84	24	15	23	274
Locomotives defective		12	7	7	5		4	6	18	203	255	19	8	3	14	8		10	3	1	20	6	4	7	13
Percentage of inspected found defective		21	25	58	28		29	19	2.6	21	36	19	33	8	31	5		22	37	1	24	25	27	30	4.7
Locomotives ordered out of service		1		2	1		1	2		17	32	2			1			1			4			1	

TABLE XIII.—Number of steam locomotives inspected, found defective, and ordered from service, etc.—Continued

Parts defective, inoperative or missing, or in violation of the rules		Kansas City, Mexico & Orient	Kansas City Southern	Kansas City Terminal	Kansas, Oklahoma & Gulf	Kentucky & Indiana Terminal	Kirby Lumber Co.	Lake Superior & Ishpeming	Lake Superior Term. & Transfer	Lake Terminal	Lehigh & Hudson River	Lehigh & New Eng. Land	Lehigh Valley	Litchfield & Madison	Long Island	Los Angeles & Salt Lake	Louisiana & Arkansas	Louisiana & North-west	Louisiana Ry. & Navigation Co.	Louisville & Nashville	Louisville, Henderson & St. Louis	McCloud River	McKeesport Connecting	Macon, Dublin & Savannah	Maine Central	
		1	Air compressors	4	1																	49				
2	Arch tubes												52		3	1	1			5						2
3	Ash pans or mechanism												1							7						3
4	Axles												4													4
5	Blow-off cocks	1		3									6		4	3			11	13					1	5
6	Boiler checks												13		4	1			2	12					6	
7	Boiler shell	1	1										45		5	5			4	24					7	
8	Brake equipment	2	17	1			1						47		9	9			8	138				1	8	
9	Cabs or cab windows	4											47		8	18			2	88				3	9	
10	Cab aprons or decks	1	3	1									18		4	5			6	36				4	10	
11	Cab cards												3		1	1			5	36				1	11	
12	Coupling or uncoupling devices	3	1										3						3	9					12	
13	Crossheads, guides, pistons, or piston rods	4											35	1	3	3		2	9	36					4	
14	Crown bolts												3						1	3					13	
15	Cylinders, saddles, or steam chests	11	3										128	3	1	1	1	2	19	84				1	15	
16	Cylinder cocks or rigging	1		1									37	1					3	29					16	
17	Domes or dome caps			1									3		1				5	5					17	
18	Draft gear	2		1									35	2	10	2			86	1			1	3	18	
19	Draw gear	1											8		2	2			140	1				4	19	
20	Driving boxes, shoes, wedges, pedestals, or braces	1	2	2									43	1	3	3	2		49	2				1	20	
21	Fire box sheets	1	1										17	5	2	2			15	5					21	
22	Flues	1	1										13	1	2	2			5	5					22	
23	Frames, tail pieces or braces, locomotive	3		1									48	2	4	2			18	55			3		23	
24	Frames, tender												6		2	1			3	2					24	
25	Gauges or gauge fittings, air			2									12		2	2			6	6					25	
26	Gauges or gauge fittings, steam			2									21	1	4	4			57	1					26	
27	Gauge cocks	2	1	1									13		2	7			76						27	
28	Grate shakers		2	2									11		1										28	
29	Handholds	10	3	3									55		11	4			4	10					29	
30	Injectors, inoperative			2									2						2	2					30	
31	Injectors and connections	7	5	4									63	2	27	17	1	6	12	143					31	
32	Inspections or tests not made as required	6	1	1			2						217	2	20	12	2	10	53	410		1		5	32	
33	Lateral motion												48		1				3	32					33	
34	Lights, cab or classification																		2	2					34	
35	Lights, headlights												34		1				3	3					35	
36	Lubricator or shields	2											12		3	1			2	9					36	
37	Mud rings	6											12	2	3	4			2	6					37	
38	Packing nuts		1										22	2	5	2			78						38	
39	Packing, piston rod and valve stem		2										48		1				12	6					39	
40	Pilot or pilot beams	1											15		3				32						40	
41	Plugs or studs	1		1									7		3	2			19						41	
42	Reversing gear												11		4	2			29						42	
43	Rods, main or side, crank pins or collars	11	4										94	2	11	6	1		109						43	
44	Safety valves	2											14		2										44	
45	Sanders		1										8			13			12						45	
46	Springs or spring rigging	9	3										92	6	7	18			16	290		2		8	46	
47	Squirt hose		2										5		2				5						47	
48	Stay bolts		1										6		1				27						48	
49	Stay bolts, broken												4						9						49	
50	Steam pipes		1										18		7				8	26					50	
51	Steam valves														3				1	8					51	
52	Steps	5	5				1						27	1	1	5			8	48					52	
53	Tanks or tank valves	2	1										49	3	10	7			69						53	
54	Telltale holes												2			1			2						54	
55	Throttle or throttle rigging	1	3										7		3				16						55	
56	Trucks, engine or trailing		1				1						98		4	4			8	78					56	
57	Trucks, tender												32	3	2	2			5	13					57	
58	Valve motion	4	1	1									12						2	17					58	
59	Washout plugs	2	1	3			2						22		14				3	92					59	
60	Train control equipment												9												60	
61	Water glass, fittings or shield	4	5			3							26	2	6	7			4	59					61	
62	Wheels	1			3		1						3			1			17	34					62	
63	Miscellaneous.—Signal appliances, badge plates, brakes (hand)	5	5	1									24		10	7			1	35					63	
Number of defects		140	86	32	5	3	9	264	1	23	41	83	1,833	52	246	164	9	63	376	2,834		3		49	172	
Locomotives reported		73	160	36	30	30	10	32	11	19	34	63	790	12	124	208	43	11	68	1,326		40	14	17	209	
Locomotives inspected		94	291	34	67	24	4	42	10	9	52	136	1,261	16	98	305	45	26	2,111		31	7	17	49	262	
Locomotives defective		25	23	8	1	2	2	22	1	5	13	28	492	12	58	74	2	13	62	689		2		12	71	
Percentage of inspected found defective		27	7.9	24	1	8	50	52	10	56	25	21	39	75	59	24	4	50	38	33		29		24	27	
Locomotives ordered out of service		2	1		1		1	7		1	1	4	42	3	2	3		4	24	32					1	

TABLE XIII.—Number of steam locomotives inspected, found defective, and ordered from service, etc.—Continued

Parts defective, inoperative or missing, or in violation of the rules	Maryland & Penn- sylvania	Mercer Valley	Michigan Central	Midland Valley	Minarets & Western	Minneapolis & St. Louis	Minneapolis, North- field & Southern	Minneapolis, St. Paul & S. Ste. Marie	Minnesota & Inter- national	Minnesota, Dakota & Western	Minnesota Transfer	Mississippi Central	Mississippi River & Bonne Terre	Mississippi Southern	Missouri & North Arkansas	Missouri Illinois	Missouri-Kansas- Texas Lines	Missouri Pacific	Mobile & Ohio	Monongahela Con- necting	Monongahela	Montour	Nashville, Chatta- nooga & St. Louis	Nevada-California- Oregon
	1 Air compressors.....			35	1		1	1	7			1				10			17					8
2 Arch tubes.....																								2
3 Ash pans or mechanism.....			1					5																3
4 Axles.....																								4
5 Blow-off cocks.....			6																					5
6 Boiler checks.....			12					3																6
7 Boiler shell.....			14					2																7
8 Brake equipment.....	3	1	53			1		42	1		3													8
9 Cabs or cab windows.....		3	77					3																9
10 Cab aprons or decks.....	1	3	16					12	1															10
11 Cab cards.....			6					2			1													11
12 Coupling or uncoupling devices.....			6					2			1													12
13 Crossheads, guides, pistons, or piston rods.....			1					4																13
14 Crown bolts.....			19					4				1												14
15 Cylinders, saddles, or steam chests.....			3					6																15
16 Cylinder cocks or rigging.....	3		25					3																16
17 Domes or dome caps.....	3		13					1																17
18 Draft gear.....			13					7																18
19 Draw gear.....			19					12																19
20 Driving boxes, shoes, wedges, pedestals, or braces.....	1		19					12	2	1														20
21 Fire box sheets.....			16					6																21
22 Flues.....	1		2					6		2														22
23 Frames, tail pieces or braces, locomotive.....	3	1	7					3																23
24 Frames, tender.....			5					4																24
25 Gauges or gauge fittings, air.....			7					1	2															25
26 Gauges or gauge fittings, steam.....			14					4																26
27 Gauge cocks.....			16					1																27
28 Grate shakers.....			16					2			2													28
29 Handholds.....		1	6	1				3																29
30 Injectors, inoperative.....			14					1		2														30
31 Injectors and connections.....			1					5			2													31
32 Inspections or tests not made as required.....	1	1	96					11			2													32
33 Lateral motion.....	3	1	190			20		2			13													33
34 Lights, cab or classification.....	1		2					10	1															34
35 Lights, headlights.....								1																35
36 Lubricator or shields.....			2					2																36
37 Mud rings.....			3					1																37
38 Packing nuts.....			14					3																38
39 Packing, piston rod and valve stem.....	1	1	32					3																39
40 Pilot or pilot beams.....			7			3		4				1												40
41 Plugs or studs.....			3			1		4	1															41
42 Reversing gear.....	1		9					2																42
43 Rods, main or side, crank pins or collars.....			12			2		13		1														43
44 Safety valves.....	4		34			2		5																44
45 Sanders.....			2					20																45
46 Springs or spring rigging.....			34			1		16		1														46
47 Squirt hose.....	4		54			3		2			1													47
48 Stay bolts.....			10			1		1			1													48
49 Stay bolts, broken.....			15					21	2															49
50 Steam pipes.....	1		1					3																50
51 Steam valves.....		1	37			2		1																51
52 Steps.....			22			1		12	2	1	2													52
53 Tanks or tank valves.....	1		16			5		6		1														53
54 Telltale holes.....			39			2		4																54
55 Throttle or throttle rigging.....								6																55
56 Trucks, engine or trailing.....			29			1		1	1															56
57 Trucks, tender.....			25			1		6																57
58 Valve motion.....	1		21			1		42	1	2	2	3												58
59 Washout plugs.....			6					4	1															59
60 Train control equipment.....			22			9		4																60
61 Water glass, fittings or shield.....								8			6													61
62 Wheels.....	1	2	53			3		11			1													62
63 Miscellaneous.—Signal appliances, badge plates, brakes (hand).....	4		8			3		2			2													63
Number of defects.....	38	13	1,240	2		115	11	423	16	12	37	9		26	307	35	42	652	107	50	18		938	8
Locomotives reported.....	14	10	619	30	10	218	11	470	16	10	20	20	18	11	31	14	516	1,268	235	31	69	20	249	11
Locomotives inspected.....	33	12	847	73	12	519	16	785	31	14	44	42	43	11	65	48	1,061	2,303	32	95	19		528	16
Locomotives defective.....	14	1	301	1		46	4	107	8	3	14	6		6	47	16	11	197	46	10	8		195	4
Percentage of inspected found defective.....	42	8	36	1		9	25	14	26	21	32	14		55	72	33	23	15	14	31	8		37	25
Locomotives ordered out of service.....	3	1	9			1		5			1			4	8	2	1	6	6	3			15	

TABLE XIII.—Number of steam locomotives inspected, found defective, and ordered from service, etc.—Continued

Parts defective, inoperative or missing, or in violation of the rules	Pittsburg & Shawmut	Pittsburgh & West Virginia	Pittsburgh, Chartiers & Youghiogheny	Pittsburg, Shawmut & Northern	Portland Terminal	Public Belt of New Orleans	Quebec Central	Raritan River	Reading Company	Republic Iron & Steel (Ala.)	Republic Iron & Steel (Ohio)	Richmond, Fredericksburg & Potomac	Rio Grande Southern	River Terminal	Rutland	St. Joseph & Grand Island	St. Louis & Hannibal	St. Louis-San Francisco	St. Louis Southwestern	San Antonio, Uvalde & Gulf	San Diego & Arizona	Sandy River & Rangeley Lakes	San Joaquin & Eastern	Savannah & Atlanta	
	1 Air compressors.....		12						17		1	1		1			1	2	20	1					1
2 Arch tubes.....		13																							2
3 Ash pans or mechanism.....								2													2				3
4 Axles.....								1																	4
5 Blow-off cocks.....		2						1																	5
6 Boiler checks.....		4				1		17																	6
7 Boiler shell.....		1						40																	7
8 Brake equipment.....		23						94	1																8
9 Cabs or cab windows.....		7						34																	9
10 Cab aprons or decks.....		5						27																	10
11 Cab cards.....								3																	11
12 Coupling or uncoupling devices.....								1																	12
13 Crossheads, guides, pistons, or piston rods.....								55																	13
14 Crown bolts.....		4						4																	14
15 Cylinders, saddles, or steam chests.....		11			2			90																	15
16 Cylinder cocks or rigging.....		6						15																	16
17 Domes or dome caps.....		3						14																	17
18 Draft gear.....		7						29																	18
19 Draw gear.....								23																	19
20 Driving boxes, shoes, wedges, pedestals, or braces.....		3						16																	20
21 Fire box sheets.....		17			5	1		37																	21
22 Flues.....					1			24																	22
23 Frames, tail pieces or braces, locomotive.....								25																	23
24 Frames, tender.....																									24
25 Gauges or gauge fittings, air.....		1						4																	25
26 Gauges or gauge fittings, steam.....		2						36																	26
27 Gauge cocks.....		11						29																	27
28 Grate shakers.....								15																	28
29 Handholds.....		1						53																	29
30 Injectors, inoperative.....								2																	30
31 Injectors and connections.....	1	36		3				1																	31
32 Inspections or tests not made as required.....	1	19			1			128																	32
33 Lateral motion.....		15						341	1																33
34 Lights, cab or classification.....								4																	34
35 Lights, headlights.....		1						7																	35
36 Lubricator or shields.....		2			1			17																	36
37 Mud rings.....		4						41																	37
38 Packing nuts.....	1	13						91																	38
39 Packing, piston rod and valve stem.....		5			3			2																	39
40 Pilot or pilot beams.....	1	4						6																	40
41 Plugs or studs.....		5						8																	41
42 Reversing gear.....		2						9																	42
43 Rods, main or side, crank pins or collars.....		38						77																	43
44 Safety valve.....								4																	44
45 Sanders.....	1	4						11																	45
46 Springs or spring rigging.....		17			1			32																	46
47 Squirt hose.....		2						20																	47
48 Stay bolts.....		17						6																	48
49 Stay bolts, broken.....		4						14																	49
50 Steam pipes.....		5						5																	50
51 Steam valves.....		2						21																	51
52 Steps.....		12			3	1		1																	52
53 Tanks or tank valves.....		17						21																	53
54 Telltale holes.....								1																	54
55 Throttle or throttle rigging.....		2			1			63																	55
56 Trucks, engine or trailing.....		5						22																	56
57 Trucks, tender.....		3			3			4																	57
58 Valve motion.....		11						34																	58
59 Washout plugs.....		17						47																	59
60 Train control equipment.....								15																	60
61 Water glass, fittings or shield.....	2	9						54																	61
62 Wheels.....		6			2			24																	62
63 Miscellaneous—Signal appliances, badge plates, brakes (hand).....		5						22																	63
Number of defects.....	7	429		25	2	5	2	34	1,896	2	135	40		72	20	9	50	706	61		41			34	
Locomotives reported.....	24	30		10	34	24	10	17	1,011	12	24	110	13	16	83	37	20	910	248	17	18	10	12	13	
Locomotives inspected.....	54	93		11	66	8	1	17	1,697	6	30	117	13	24	184	45	28	1,532	351	79	47	15	14	10	
Locomotives defective.....	2	53			5	1		1	553	1	20	21		17	11	5	12	215	15		18			8	
Percentage of inspected found defective.....	4	57			8	12		1	33	17	67	18		71	6	11	43	14	4.3		38			80	
Locomotives ordered out of service.....		30			1			1	31		10	1		5			1	7	2		4				

TABLE XIII.—Number of steam locomotives inspected,

Parts defective, inoperative or missing, or in violation of the rules		Delaware	Union Pacific	Union Railroad	Upper Merion & Plymouth	Utah
1	Air compressors		24			
2	Arch tubes		1			
3	Ash pans or mechanism					
4	Axles		4			
5	Blow-off cocks		3			
6	Boiler checks		5		1	1
7	Boiler shell	1	30		4	
8	Brake equipment		25		9	
9	Cabs or cab windows		2			
10	Cab aprons or decks		4			
11	Cab cards		2			
12	Coupling or uncoupling devices		15		1	
13	Crossheads, guides, pistons, or piston rods					
14	Crown bolts		87		4	
15	Cylinders, saddles, or steam chests		19		1	3
16	Cylinder cocks or rigging		2			
17	Domes or dome caps		18	1	1	
18	Draft gear		3		1	
19	Draw gear		33			
20	Driving boxes, shoes, wedges, pedestals, or braces		4		1	
21	Fire box sheets		1			
22	Flues		6			
23	Frames, tail pieces or braces, locomotive		1	1		
24	Frames, tender		3		1	
25	Gauges or gauge fittings, air		12			
26	Gauges or gauge fittings, steam		12	2	1	
27	Gauge cocks		12			
28	Grate shakers	2	10		3	
29	Handholds		1			
30	Injectors, inoperative		29		2	
31	Injectors and connections	1	29	4	24	
32	Inspections or tests not made as required		1			
33	Lateral motion					
34	Lights, cab or classification		3			
35	Lights, headlights		6		2	
36	Lubricator or shields	1	2			
37	Mud rings		3		1	
38	Packing nuts		17		3	
39	Packing, piston rod and valve stem		7			
40	Pilot or pilot beams		5			
41	Plugs or studs		3			
42	Reversing gear		42		5	
43	Rods, main or side, crank pins or collars					
44	Safety valves		13			
45	Sanders		52	2	3	
46	Springs or spring rigging		1			
47	Squirt hose		5			1
48	Stay bolts		15			
49	Stay bolts, broken		6			
50	Steam pipes		2			
51	Steam valves		10		2	
52	Steps		17		4	
53	Tanks or tank valves		1		1	
54	Telltale holes		1	1	6	
55	Throttle or throttle rigging		9	3		
56	Trucks, engine or trailing		11		1	1
57	Trucks, tender	1	6			
58	Valve motion		25			
59	Washout plugs					
60	Train-control equipment		20	1	3	
61	Water glass, fittings or shield		5	7	2	
62	Wheels		21			
63	Miscellaneous—Signal appliances, badge plates, brakes (hand)					
Number of defects		6	705	22	87	6
Locomotives reported		29	859	157	12	16
Locomotives inspected		85	1,462	43	43	18
Locomotives defective		3	242	4	26	2
Percentage of inspected found defective		4	17	9	60	11
Locomotives ordered out of service			8	2	7	

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

Virginia	Wabash	Washington Terminal	Western Maryland	Western Pacific	Wheeling & Lake Erie	Wheeling Steel Corporation	Wichita Falls & Southern	Winston-Salem South-bound	Woodward Iron	Wrightsville & Ten-mile	Roads with less than 10 locomotives	Total defects	
1	2		5	3	3	1					66	854	
					1						3	50	
			1			1					6	104	
											0	15	
	1		1	1	1				1		11	326	
	2		8	1	3	1	1				42	474	
	1		3	3	8					2	57	525	
	2		13	5	8	2					398	2,715	
	4		6	6	40						185	1,562	
			1	1	6			1			100	709	
			1	1	2	2					79	232	
			2		1						43	122	
	2	2	8	8	14			2			125	1,112	
											18	84	
	9		4	3	19	6	1				255	2,270	
			1		3	3					92	775	
			2		2	2					9	140	
	2		2	3	6	2					133	978	
	3		4		4						167	1,030	
	3		3	1	7	1				1	143	1,287	
	1		1		3						66	370	
			6		1						50	186	
	6		10	2	2		1			1	119	1,063	
			3		1						36	232	
					3						17	248	
			3		7						28	504	
			2		2						91	737	
					8						11	190	
	1				8	2					184	856	
											5	54	
											357	2,808	
	12		13	9	16	2			2		538	6,638	
	8		18	2	79	8	1			1	55	4,900	
				4	3						3	105	
											40	343	
			1	2	6						24	286	
	1		3	2	6						37	411	
	3		2		6						88	743	
	1		2		13			1		1	186	1,076	
	2				1	3					46	289	
	1				2						36	303	
			2		2						32	560	
					4						365	2,418	
	2		1		32	1					17	119	
	1		6		2						37	824	
	2		7		1						254	3,228	
	1				1						42	265	
	1		13		26					1	40	350	
	1		4		4						353	943	
	2		4		4	1					31	662	
			1		1						20	339	
			12		1						254	1,034	
					11			2		1	126	1,199	
			2		4						60	129	
			4		2						92	886	
	1		2		1						188	1,203	
	3		6		5	7	1				384	1,603	
			6		1						57	608	
	1		11		21	16	1				89	1,182	
											26	260	
			9		4						160	1,358	
			1		5					1	229	960	
			3		1						43	806	
	71	38	1	225	187	446	45	6	6	4	8	6,822	53,998
	161	664	18	267	170	196	17	18	11	15	13	2,313	63,562
	174	1,133	10	338	232	244	20	25	15	7	24	2,994	96,465
	39	17	1	88	57	102	10	1	5	2	3	1,245	20,185
	22	1.5	10	26	25	42	50	4				41	21
		1	3	3	9	7		1	33	29	12	232	1,490

TABLE XV.—Summary of comparison of the percentage of steam locomotives inspected and found defective, with the number ordered out of service for the year ended June 30, on roads reporting on 25 or more locomotives

Road	Percentage inspected defective						Ordered out of service					
	1929	1928	1927	1926	1925	1924	1929	1928	1927	1926	1925	1924
Akron, Canton & Youngstown.....	47	42	42	54	56	57	12	4	1	1	5	
Ann Arbor.....	9	4	25	65	71	87			2	13	15	
Athol, Topeka & Santa Fe.....	14	17	24	32	32	36	14	10	40	30	30	
Atlanta & West Point.....	6	10	9	14	23	13			1		4	
Atlanta, Birmingham & Coast.....	27	24	40	51	54	82	2		8	6	12	
Atlantic Coast Lines.....	10	15	30	38	35	40	2	2	4	16	15	
Baltimore & Ohio—East.....	15	21	30	46	52	55	10	20	32	107	113	
Baltimore & Ohio—West.....	17	28	49				17	25	72			
Bangor & Aroostook.....	31	23	43	29	28	37	1	2	3	4	1	
Belt Ry. of Chicago.....	35	64	54	46	51	76	4	7	5	7	4	
Bessemer & Lake Erie.....	22	23	21	26	63	28	6	12	1	1	1	
Boston & Albany.....	16	24	26	28	47	52			4	4	10	
Boston & Maine.....	16	20	23	27	36	53	3	2	13	14	23	
Buffalo & Susquehanna.....	21	34	29	36	54	24	11	13	3	4		
Buffalo, Rochester & Pittsburgh.....	10	9	14	28	51	39		4	9	9	26	
Canadian National.....	34	47	50	57	50	45	7	9	30	29	24	
Canadian Pacific.....	32	37	44	52	56	59	1		4	9		
Carnegie Steel.....	15	24	34	66	48	75		8	5	2	3	
Central of Georgia.....	19	19	30	42	37	40	5	4	10	13	8	
Central R. R. of New Jersey.....	42	33	38	41	47	66	14	6	20	23	46	
Central Vermont.....	12	9	11	26	27	41	1	1	1	1	2	
Charleston & Western Carolina.....	28	27	58	66	63	55	2		2	1	2	
Chesapeake & Ohio.....	17	21	28	39	49	64	5	8	26	42	29	
Chicago & Alton.....	3	9	14	33	35	39	3	3	5	11	9	
Chicago & Eastern Illinois.....	28	26	38	50	64	65	3	13	25	30	31	
Chicago & North Western.....	12	11	19	32	35	38	8	9	18	42	29	
Chicago & Western Indiana.....	43	45	22	71	86	92	3	1		2	2	
Chicago, Burlington & Quincy.....	14	17	21	34	46	53	18	20	39	86	185	
Chicago Great Western.....	11	14	20	36	40	36	2		7	10	15	
Chicago, Indianapolis & Louisville.....	26	23	29	36	45	39	2	10	14	10	7	
Chicago, Milwaukee, St. Paul & Pacific.....	9	12	13	21	27	27	5	4	9	7	12	
Chicago River & Indiana.....	5	5		24	70	70						
Chicago, Rock Island & Pacific.....	17	21	29	45	55	74	13	27	49	78	124	
Chicago, St. Paul, Minneapolis & Omaha.....	17	23	30	39	46	45	6	3	12	11	20	
Cleveland, Cincinnati, Chicago & St. Louis.....	24	22	34	46	44	44	16	18	37	56	47	
Clinchfield.....	38	15	25	35	76	81	5	1	4	1	4	
Colorado & Southern.....	43	46	40	59	76	70	10	7	4	24	52	
Colorado & Wyoming.....	21	28	27	32	15	8	1	5	3	1	2	
Columbus & Greenville.....	25	15	21	15	26	26						
Conemaugh & Black Lick.....	58	47		14			2	1				
Delaware & Hudson.....	3	4	9	18	24	45			1	2	2	
Delaware, Lackawanna & Western.....	21	20	22	33	36	50	17	8	4	10	3	
Denver & Rio Grande Western.....	36	38	54	55	58	77	32	21	88	91	72	
Denver & Salt Lake.....	19	22	44	46	68	89	2		7	9	39	
Detroit & Toledo Shore Line.....	8	32	33	50	51	44			1	3	5	
Detroit Terminal.....	3	18	46	59	72	63	1			3	7	
Detroit, Toledo & Ironton.....	5	15	10	28	30		1	1	3	2	4	
Duluth & Iron Range.....	22	15	20	39	43	56	1			1	4	
Duluth, Missabe & Northern.....	1	2	12	20	37	37			2		1	
Duluth, South Shore & Atlantic.....	24	18	29	44	35	48	4				5	
Elgin, Joliet & Eastern.....	5	9	13	32	68	83			1	3	58	
Florida East Coast.....	45	49	30	40	39	40	137	157	41	58	26	
Fort Smith & Western.....	7	4	21	39	22	27			1			
Fort Worth & Denver City.....	49	41	60	59	62	42	5	2	5	2	2	
Georgia.....	13	18	23	36	36	72	2	2	3	17	8	
Georgia & Florida.....	11	9	12	14	34	39	3				2	
Grand Trunk.....	47	31	55	78	62	64	2	1	2	2	3	
Great Northern.....	28	32					4					
Great Northern.....	31	29	33	44	46	51	42	26	27	59	31	
Green Bay & Western.....	45	41	47	66	67	70	1	1	1	4	9	
Gulf Coast Lines.....	7	13	58	45	59	53		3	15	13	26	
Gulf, Colorado & Santa Fe.....	19	29	47	32	45	48	6	13	31	17	32	
Hocking Valley & Northern.....	22	14	23	26	38	47	1	4	2	2	7	
Hocking Valley.....	33	47	56	61	65	62	3	8	17	16	12	
Illinois Central.....	10	8	14	26	30	31	14	13	35	35	30	
Indiana Harbor Belt.....	1	3	14	47	52	86					1	
International Great Northern.....	5	6	27	28	29	42		1	11	18	9	
Kansas City, Mexico & Orient.....	27	58	73	69	77	82	2	22	28	19	17	
Kansas City Southern.....	8	9	26	43	52	71	1		12	27	11	
Kansas City Terminal.....	24	18	24	53	80	74		1			2	
Kansas, Oklahoma & Gulf.....	1	42		33	43	37	1		6		1	
Kentucky & Indiana Terminal.....	5		6	86								
Lake Superior & Ishpeming.....	52	38	39		46	50	7	2	1		2	
Lehigh & Hudson River.....	25	34	20	39	14	50	1			1	1	

TABLE XV.—Summary of comparison of the percentage of steam locomotives inspected and found defective, with the number ordered out of service for the years ended June 30, on roads reporting on 25 or more locomotives—Continued

Road	Percentage inspected defective						Ordered out of service					
	1929	1928	1927	1926	1925	1924	1929	1928	1927	1926	1925	1924
Lehigh & New England.....	21	27	26	39	65	65	4	6	2	3	5	5
Lehigh Valley.....	39	35	26	33	36	54	42	19	14	19	26	96
Long Island.....	59	57	48	29	35	47	2	3	3		1	6
Los Angeles & Salt Lake.....	24	19	26	41	51	72	3	1		11	14	41
Louisiana & Arkansas.....	4	8	50	53	41	35		1	6	11	4	2
Louisiana Railway & Navigation.....	38	34	53	51	73	63	24	14	37	47	54	23
Louisville & Nashville.....	33	32	41	54	57	57	32	40	54	61	94	78
Louisville, Henderson & St. Louis.....	16	21	50	80	22		2					
Maine Central.....	27	34	42	42	41	51	1	5	6	6	14	16
Michigan Central.....	36	44	57	66	66	68	9	15	38	37	44	34
Midland Valley.....	1	31	42	26	40	46		6	1	1	2	
Minneapolis & St. Louis.....	9	10	17	30	35	36	1	1	7	6	6	6
Minneapolis, St. Paul & Sault Ste. Marie.....	14	9	13	17	25	29	5	2	2	1	4	1
Missouri & North Arkansas.....	72	88	92	80	91	77	8	10	17	7	12	8
Missouri-Kansas-Texas.....	1	3	13	32	42	62		3	6	25	22	104
Missouri Pacific.....	9	14	20	41	59	71	6	12	24	75	131	233
Mobile & Ohio.....	14	14	29	41	38	40	6	3	19	15	11	6
Monongahela Connecting.....	31	37	53	50	43		3	9	5	6		
Monongahela.....	8	16	23	9	8				1		1	
Nashville, Chattanooga & St. Louis.....	37	20	34	58	74	78	15	4	17	25	37	24
Newburgh & South Shore.....	41	52	81	92	78				1	8	21	
New Orleans Great Northern.....	7	31	32	39	31	21		2	2	3	1	1
New York Central—East.....	14	24	25	32	43	44	6	16	19	27	27	24
New York Central—West.....	25	31	41	55	66	52	22	42	55	94	59	28
New York, Chicago & St. Louis.....	24	23	31	38	48	65	30	12	14	31	47	83
New York, New Haven & Hartford.....	12	16	23	30	39	59			5	11	12	47
New York, Ontario & Western.....	38	38	36	37	44	51	16	10	6	6	5	5
Norfolk & Western.....	23	28	42	44	49	64	9	16	24	22	24	65
Norfolk Southern.....	24	37	45	46	45	52	2	7	4	4	5	8
Northern Pacific.....	13	18	29	35	37	45	6	12	50	50	28	31
Northwestern Pacific.....	1	6	6	8	6	26						
Oregon Short Line.....	22	15	27	32	42	44			1	2	7	3
Oregon-Washington Railway & Navigation.....	12	12	17	23	11	18			4	6	6	6
Pennsylvania.....	33	36	44	49	61	73	153	240	335	401	573	1,432
Peoria & Pekin Union.....	14	18	23	37	31	44					1	2
Pere Marquette.....	21	26	38	41	57	59	8	5	14	14	21	37
Philadelphia, Bethlehem & New England.....	65	55	74	70	76	71	16	8	14	3	2	1
Pittsburgh & Lake Erie.....	6	15	12	10	10	26			1		1	
Pittsburgh & West Virginia.....	57	30	39	49			30	9	8	2		
Pittsburgh, Shawmut & Northern.....	8	18	25	48	53	9	1	5	2	5		
Reading.....	33	36	42	46	48	52	31	39	22	31	26	12
Richmond, Fredericksburg & Potomac.....	18	18	30	43	43	36	1		1		2	2
Rutland.....	6	8	12	36	44	44			1	1	3	4
St. Joseph & Grand Island.....	11	10	36	49	38	59			1		1	2
St. Louis-San Francisco.....	14	18	22	39	49	73	7	8	12	24	65	280
St. Louis Southwestern.....	4	12	22	32	47	62	2	8	22	16	14	24
Seaboard Air Line.....	37	53	56	61	51	52	24	40	43	42	33	35
South Buffalo.....	23	34	29	56	75	52			4	1	1	
Southern Pacific—East.....	5	11	13	27	30	36	3	5	10	44	37	34
Southern Pacific—West.....	24	23	27	32	33	30	47	25	50	58	51	24
Southern Pacific of Mexico.....	30	50	100		100	100	2	1	3		1	
Southern.....	12	15	24	35	36	42	13	13	38	55		