

INTERSTATE COMMERCE COMMISSION

TENTH ANNUAL REPORT

OF THE

CHIEF INSPECTOR
BUREAU OF LOCOMOTIVE INSPECTION

TO THE

INTERSTATE COMMERCE COMMISSION

FOR THE FISCAL YEAR
ENDED JUNE 30, 1921



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ANNUAL REPORT OF THE CHIEF INSPECTOR BUREAU OF LOCOMOTIVE INSPECTION.

SEPTEMBER 30, 1921.

To the Interstate Commerce Commission:

In compliance with section 7 of the act of February 17, 1911, as amended March 4, 1915, I have the honor to submit an annual report covering the work of the Bureau of Locomotive Inspection for its tenth fiscal year ended June 30, 1921.

The data contained in this report include a résumé of all accidents resulting in serious injury or death to one or more persons, caused by the failure of some part or appurtenance of the locomotive or tender, together with the casualties resulting therefrom, also all defects of the locomotive and tender constituting violations of and approaching violations of the law and rules found and reported by our inspectors.

The tabulations and charts herewith shown have been arranged so as to permit comparison with previous years, and show in concrete form the number of locomotives inspected, the number and percentage of those inspected found defective, and the number for which special notice for repairs was issued, withholding the locomotive from service because of having defects constituting violations of the law and rules, together with the number of defects found; also the number of accidents caused by failure from any cause of the locomotive or tender and all parts and appurtenances thereof, together with the number of persons killed and injured as a result of such failure.

Number of locomotives inspected, number found defective, percentage inspected found defective, number ordered out of service, and total defects found by years.

	1921	1920	1919	1918	1917
Number of locomotives inspected.....	60,812	49,471	59,772	41,611	47,542
Number found defective.....	30,207	25,529	34,557	22,196	25,909
Percentage found defective.....	50	52	58	53	54.5
Number ordered out of service.....	3,914	3,774	4,433	2,125	3,294
Total defects found.....	104,848	95,066	135,300	78,277	84,883

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Number of accidents, number killed, and number injured as a result of failure of parts and appurtenances of the entire locomotive and tender, by years.

	1921	1920	1919	1918	1917
Number of accidents.....	735	843	565	641	616
Decrease from previous year (per cent).....	12.8	1 49.2	11.8	1 4.1	.....
Number killed.....	64	66	57	46	62
Decrease from previous year (per cent).....	3	1 15.8	1 23.9	25.8	.....
Number injured.....	800	916	647	756	721
Decrease from previous year (per cent).....	12.6	1 41.6	14.4	1 4.8	.....

¹ Increase.

The comparative table below for the fiscal years ended June 30, 1912, 1915, 1920, and 1921 shows the number of accidents, number killed, and number injured as a result of the failure of some part or appurtenance of the boiler only:

	1921	1920	1915	1912
Number of accidents.....	342	439	424	856
Number killed.....	51	48	13	91
Number injured.....	379	503	467	1,005

Derailments due to defects in or failure of some part of the locomotive or tender and the number of persons killed and injured as a result of such derailments for the fiscal years ended June 30, 1917-1921, inclusive.

	1921	1920	1919	1918	1917
Number of derailments ¹	8	7	7	2	4
Number killed.....	7	7	7	2	1
Number injured.....	30	18	6	2	21

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 in this tabulation.

Number of persons killed and injured, classified according to occupations, during the fiscal years 1917-1921, inclusive.

	1921		1920		1919		1918		1917	
	Killed.	In-jured.	Killed.	In-jured.	Killed.	In-jured.	Killed.	In-jured.	Killed.	In-jured.
Members of train crews:										
Engineers.....	15	237	16	272	14	194	11	245	16	230
Firemen.....	25	360	20	404	22	265	19	306	21	304
Brakemen.....	13	64	9	77	11	82	6	62	13	60
Conductors.....	2	20	2	19	2	16	.....	21	3	14
Switchmen.....	3	15	4	19	1	7	2	8	1	8
Roundhouse and shop employees:										
Boiler makers.....	1	7	2	9	1	9	.....	11	.....	11
Machinists.....	1	3	1	20	.....	5	.....	11	.....	8
Foremen.....	1	3	.....	3	.....	3	1	4	.....	1
Inspectors.....	5	.....	.....	1	.....	6	4	4	.....	3
Watchmen.....	4	.....	.....	3	.....	2	.....	3	.....	5
Boiler washers.....	7	.....	.....	13	.....	7	1	4	.....	7
Hostlers.....	8	.....	.....	13	.....	6	.....	8	.....	6
Other roundhouse and shop employees.....	1	25	3	30	1	11	2	19	2	19
Other employees.....	2	16	4	26	3	23	.....	26	5	22
Nonemployees.....	.....	26	.....	7	2	11	.....	24	1	23
Total.....	64	800	66	916	57	647	46	756	62	721

All accidents reported under the law to this bureau were carefully investigated and a report rendered, as required, and action taken to prevent, as far as possible, recurrences. When requested copies of such reports have been furnished parties at interest for the purpose of acquainting them with the conditions disclosed by our investigations. It is difficult to even form an approximate estimate of the far-reaching value of an impartial and thorough investigation of accidents and the publication of complete, unbiased reports.

A summary of accidents and casualties occurring during the fiscal year ended June 30, 1921, as compared with the year ended June 30, 1920, covering the entire locomotive and tender and their appurtenances, shows a reduction of 12.8 per cent in the number of accidents, 3 per cent in the number killed, and 12.6 per cent in the number injured.

During the first six months of the fiscal year 1921 accidents and casualties occurred at an alarming rate and exceeded those of any like period during the five preceding years. However, during the last six months a marked reduction is recorded. The number of accidents and casualties during the year was considerably in excess of those occurring during the year 1919, and as referred to in my last annual report, a large number of accidents resulting in serious injury were caused by the failure of what are frequently termed unimportant parts. For instance, during the year 85 accidents were caused by the failure of some part of the grate-shaking apparatus, 82 by squirt hose, and 65 by some part of the reversing gear, all of which could have been avoided by reasonable care.

The table on page 20 shows the nature of other accidents and their result, the number of which could at least have been curtailed, if not prevented, by proper inspection and repairs, as required by the law and rules.

There were no authentic records from which comparisons could be made of such accidents prior to the enactment of this law. A comparison, however, of the fiscal year ended June 30, 1912, the first year of the boiler inspection law, with the fiscal year 1915, the year in which the boiler inspection law was amended, and 1921, the present year, is of importance, and shows the far-reaching effect of proper inspection and repair, as required by the law and the rules and regulations established thereunder.

Comparing 1912, the first year of the boiler inspection law, covering parts and appurtenances of the boiler only, with the year 1915, the fourth year of the law, there is shown to be a reduction of 50 per cent in the number of accidents, 85.7 per cent in the number killed, and 53.5 per cent in the number injured.

Comparing 1912, the first year of the boiler inspection law, with the year 1921, covering parts and appurtenances of the boiler only,

there is shown to be a reduction of 60 per cent in the number of accidents, 44 per cent in the number killed and 62 per cent in the number injured.

Comparing 1915, the fourth year of the existence of the law, with the year 1921, there is shown a decrease of 19 per cent in the number of accidents, an increase of 292 per cent in the number killed, and a decrease of 17 per cent in the number injured, due to the failure of some part or appurtenance of the boiler only. Barrel explosions have been entirely eliminated, and while the so-called crown-sheet failures have materially decreased, the great increase in fatalities indicates that the severity of these failures has increased tremendously.

During the year there were a number of accidents investigated in which fire-box seams formed by the autogenous welding process were involved, where, through the failure of these seams, it is believed the result of the accident was much more serious than would otherwise have been. Autogenous welding can be used on many parts of the locomotive and tender and on parts of the stayed surfaces of the boiler with safety and economy, but inasmuch as our accident investigations show that approximately 80 per cent of the autogenously welded seams fail, where they are involved in the accidents, we believe that such methods should be avoided in fire-box crown-sheet seams where overheating and failure are liable to occur, or on any part of the boiler where the strain to which the structure is subjected is not carried by other construction which fully meets with the requirements of the law and rules, at least until some means has been developed through which the quality and tenacity of the weld may be established in advance of its failure. This should apply on all parts of the locomotive and tender where, through failure, an accident and an injury might result.

Charts on pages 15 to 18 have been prepared so that detailed consideration may be given to the source of various accidents resulting from failure of parts and appliances of locomotives and tenders. Careful consideration of these charts will readily furnish information which, if taken advantage of in accordance with the spirit and intent of the law, will assist in eliminating a large part of such accidents.

The table on page 20 shows that boiler explosions have been the most prolific source of serious and fatal injuries. There have always been more or less differing opinions among railway officials and employees and others as to the cause of boiler explosions. This being true, much thought has been given to this particular subject, and it is believed that a better understanding as to the cause of an explosion would tend to eliminate or reduce accidents from this source. Therefore, it may not be amiss to recite here well-established facts.

The primary cause of a boiler explosion is because some part of the vessel is too weak to withstand the pressure to which it is subjected, and the cause of this weakness is sometimes hard to determine. The violence which follows boiler explosions is accounted for by well-established physical laws.

All matter, whether solid, liquid, or gaseous, consists of molecules or atoms, which are in a constant state of vibration, and the result of this vibration is heat. The intensity of the heat evolved depends upon the degree of agitation to which the molecules are subjected.

The process of the generation of steam from water is simply an increase of the natural vibration of the molecules of the water caused by the application of heat until they lose all attraction for each other and become repulsive, and unless confined fly off into space, but, being confined, they continually strike against the sides of the vessel in which they are confined, thus causing the pressure which steam exerts when under confinement.

The generation of steam by the addition of heat is accomplished in two steps; heat added to water first increases the activity of the molecules and is indicated by a rise in temperature. Heat which warms the water and causes the rise in temperature is called "sensible heat." When sufficient heat is added to water, its temperature continues to rise until about 212° is reached, the temperature of boiling water under atmospheric pressure at sea level. The temperature of boiling water varies directly with the pressure to which it is subjected; the greater the pressure the higher the temperature. Under 200 pounds' pressure the boiling temperature is 388°, while under a nearly perfect vacuum water boils or becomes in ebullition and gives off a vapor at 32°, at which temperature ice begins to form under atmospheric pressure.

A British thermal unit is the quantity of heat required to raise the temperature of 1 pound of water 1°; therefore it takes 180 units to raise 1 pound of water from 32° Fahrenheit to 212°. Water does not flash into steam as soon as the temperature reaches 212°, but, on the contrary, 970 additional heat units are used in forcing the molecules apart against their mutual attraction or cohesion, which additional heat is known as "latent heat."

It will be seen from this that every pound of steam in the boiler at atmospheric pressure contains 1,150 heat units. As steam is generated and the boiler pressure increases, the heat energy in the steam also increases until each pound of steam under 200 pounds' pressure holds within itself 1,199 units of heat, and the temperature of the water in the boiler is increased to 388°.

When shell sheets rupture or crown sheets fail and the boiler pressure is suddenly reduced to atmospheric, a tremendous amount of heat energy stored in the water is instantly released and causes a

large part of the water to suddenly flash into steam, while the volume of the steam expands many times. The capacity of the boiler is then wholly inadequate to accommodate the increased volume of steam so suddenly generated, nor will the rupture permit it to escape fast enough to avoid a tremendous reaction. As a result of this reaction, we have the appalling explosions which are from time to time so forcibly brought to our attention.

The force of a boiler explosion is in proportion to the size and suddenness of the initial rupture and the temperature and volume of the water in the boiler at the time of the rupture. The average modern boiler has a capacity of approximately 500 cubic feet of water below the crown sheet and has a steam space of about 150 cubic feet. If such a boiler with 200 pounds' pressure ruptures from any cause, so as to suddenly reduce the pressure to that of the atmosphere, the released energy will amount to approximately 700,000,000 foot-pounds and if the explosion took place in two seconds approximately 690,000 horsepower would be developed.

This gives some idea of the force which accompanies many boiler failures, with their serious and fatal results, and supplies the reason for the violence which in many cases is sufficient to hurl the entire boiler several hundred feet or tear it into fragments, scattering them in every direction. A few illustrations of the extent and violence of explosions are shown on pages 74 to 83 of this report.

As previously stated, explosions result because some part of the vessel is too weak to withstand the pressure to which it is subjected. This weakness may be caused by:

1. Abnormal steam pressure.
2. Weakness in design or construction.
3. Improper workmanship.
4. Corrosion or wasting away of material.
5. Broken or defective stays.
6. Overheated crown or fire-box sheets.

A remedy for the first three causes is provided for in the law and rules by requiring that the working pressure be fixed, after careful consideration of each individual boiler by competent authorities, and by fixing a substantial factor of safety for all parts of the boiler to provide against hidden defects of material and construction.

To protect against failure due to corrosion or other defects caused by wear and usage, the law requires that regular inspections, both interior and exterior, be made and that all boilers be subjected to a hydrostatic test at regular intervals and a sworn report filed showing the conditions found and repairs made.

Failure of crown or fire-box sheets, due to overheating, may be the result of scale or grease on the fire-box sheets or from low water.

The fire-box sheets and tubes are in contact with the fire, and would become heated to that temperature if it were not for the presence of water in the boiler. As previously explained, the temperature of the water in the boiler depends on the boiler pressure, but rarely reaches a temperature greater than 400° Fahrenheit; therefore while the plates are in contact with the water on one side they can not greatly exceed this temperature, although the temperature in the fire box may exceed 2,500°, which is about the fusing point of fire-box steel.

The heat in the fire box is conducted through the plate to the water in the boiler, where it is absorbed, the sheet thus being prevented from heating to the temperature of the fire and burning gases. If, however, the transmission of the heat to the water is obstructed by scale or grease, or if the water fails to absorb the heat, due to being foamy, the plates will retain the heat, and may become red hot; or if the sheets are unprotected by water from any cause they become overheated. Metal loses strength when heated, and if heated to a high temperature has comparatively little strength to resist the pressure within the boiler, when as a result the sheets are forced off of the stays and failure occurs. It is a well-recognized fact that scale or grease may be the direct cause of an explosion. Scale may indirectly cause an explosion by restricting or closing the openings in the water-indicating appliances, thereby causing a false level of water to be registered, deceiving the enginemen. This is illustrated by plate IV, on page 76.

One of the most perplexing problems which has presented itself while operating the modern locomotive is that of securing a correct indication of the height of water over the crown sheet under all conditions of service.

In my last annual report was included a report covering tests made to determine the action of water in the boiler on the water-indicating appliances with respect to their correct registration. These tests established that gauge cocks screwed directly in the boiler do not correctly indicate the general water level while steam is rapidly escaping from the boiler, and in order to secure a proper appliance it was recommended that a water column to which three gauge cocks and one water glass were attached be applied.

As far as we have been able to determine, practically all new locomotives constructed since that report was rendered have had water columns applied. On old locomotives the application has not progressed rapidly, probably due to the difficulty in obtaining necessary appropriations. The necessity for such appliances, however, is practically unquestioned, and some roads are proceeding with the application in a very satisfactory way. It is hoped that in the near future this important appliance will be applied on all locomotives, so that

enginemen may have accurate knowledge of the general water level in the boiler under all conditions of service.

Transcribed reports showing defects found on all locomotives ordered out of service and those found approaching violations of the law and rules were furnished the chief operating officers of the carriers monthly, so that they might be fully informed of the condition of their locomotives as disclosed by our inspectors.

During the year 209 applications were filed for extension of time for the removal of flues, as provided in rule 10. Investigation showed that in 25 of these cases the condition of the locomotives was such that no extension could properly be granted; 22 were in such condition that the full extension requested could not be granted, but an extension for a shorter period within the limits of safety was allowed; 25 extensions were granted after defects disclosed by our investigation had been repaired; 38 applications were withdrawn for various reasons; and the remaining 99 were granted for the full period requested.

As provided in rule 54, there were filed 2,791 specification cards and 9,785 alteration reports. These have been carefully checked to determine whether the boilers represented were so constructed as to safely withstand the pressure to which they were being subjected and that the stresses given in the specifications and alteration reports had been correctly calculated.

On July 1, 1920, the rules became effective requiring each locomotive used in road service between sunset and sunrise to be equipped with a headlight which will enable the enginemen to see in a clear atmosphere a dark object as large as a man 800 feet ahead of the locomotive and that yard locomotives have one light on the front and one on the rear that will enable the enginemen to see 300 feet ahead of the locomotive. These requirements have been given close attention and have been fully complied with so far as it has been brought to my attention. The lighting equipment with which locomotives are now equipped seems to be meeting with the universal approval of officials and employees required to operate and maintain them.

During the year the inspectors of this bureau, at the direction of the commission, spent 962 days on special work, in connection with the transportation act of 1920 and the interstate commerce act, other than the duties required by the locomotive inspection law.

The law provides that whenever any district inspector shall in the performance of his duty find any locomotive or apparatus pertaining thereto not conforming to the requirements of the law or the rules and regulations established and approved he shall notify the carrier in writing that the locomotive is not in serviceable condition,

and thereafter shall not be used until in serviceable condition: *Provided*, That a carrier, when notified by an inspector in writing that the locomotive is not in serviceable condition because of defects set out and described in said notice, may appeal to the chief inspector to have the locomotive reexamined. The carrier, being dissatisfied with the decision of the chief inspector, may appeal to the Interstate Commerce Commission.

Under this provision of the law not a single formal appeal has been taken from the decision of any inspector during the fiscal year. This demonstrates that wisdom and good judgment have been exercised by our inspectors in the performance of their duties.

In my last annual report certain recommendations were made for the betterment of the service in accordance with section 7 of the act as amended. During the year experience has further demonstrated the wisdom of these recommendations; therefore they are respectfully renewed and the reasons therefor given.

First. That the act of February 17, 1911, be amended so as to provide for additional inspectors to be appointed by the commission as the needs of the service develop.

The act of February 17, 1911, provides that 50 inspectors be appointed, whose duties shall be to make such personal inspections from time to time of locomotive boilers under their care as might be necessary to fully carry out the provisions of the act, so the locomotive might be employed in moving traffic without unnecessary peril to life or limb. At the time this law was enacted there were approximately 63,000 locomotives coming under its jurisdiction.

This act has since been amended, extending the authority of the chief inspector and his two assistants, together with all of the inspectors, to cover the entire locomotive and tender and all of their appurtenances. The number of locomotives has increased to more than 70,000. With the extended duties of the inspectors and the increase in the number of locomotives, it is impossible for the number of inspectors now provided to adequately accomplish the purpose for which the law was established.

New duties and responsibilities have been imposed upon the commission by the transportation act of 1920, and the act to regulate commerce has been extended, and no doubt in the future, as in the immediate past, this bureau will be called on from time to time to make investigations necessary to carry out the requirements.

To be in position to effectively carry out the duties imposed, it is necessary to have an efficient corps of competent and well-trained inspectors who can be called upon when occasion requires. In order to obtain and retain in the service such inspectors, their salaries should be increased to be commensurate with the duties performed

and the responsibilities imposed. The absence of inspectors from their accustomed duties or the lack of a sufficient number is reflected by the increased number of accidents and casualties and the deficiency of motive power. It is therefore respectfully recommended that the act of February 17, 1911, be amended so as to provide for additional inspectors to be appointed by the commission as the needs of the service develop, and that adequate salaries may be paid that will obtain and retain in the service a full corps of well-trained, efficient inspectors, and that the amounts directly appropriated to carry out the provisions of the act of February 17, 1911, as amended, be increased to meet the requirements.

Second. That all locomotives not using oil for fuel have a mechanically operated fire door so constructed that it may be operated by pressure of the foot on a pedal or other suitable device located on the floor of the cab or tender at a proper distance from the fire door, so that it may be conveniently operated by the person firing the locomotive.

This recommendation is based on the results of many investigations of boiler failures of such character as to permit the steam and water contained in the boiler at the time of the accident to be discharged into the fire box, many times being directed toward the fire door.

The old swing-type door, which is largely used at present, is almost invariably blown open in case of such accidents and permits the discharging steam and boiling water, with the contents of the fire box, to be blown into the cab of the locomotive, seriously and most frequently scalding and burning the persons therein. Such accidents frequently occur while coal is being put into the fire box, and with the fire door necessarily open, under such circumstances it is impossible for it to be closed.

The automatic fire door would remain closed if closed when the accidents occur. If open, it would automatically close the moment the operator's foot was removed from the operating device, thus preventing the direct discharge of the scalding water and fire into the cab of the locomotive with such serious results.

The automatic fire door is not a new and untried device, as there are thousands of them in service, and they are required by law in some States. The automatic fire door is also of great value in prevention of serious cracks and leaks in fire-box sheets by limiting the time the fire doors are open when placing coal on the fire, thus reducing the amount of cold air admitted, which causes loss of temperature and consequent expansion and contraction and the setting up of great strains.

Their use is also very valuable in the conservation of fuel, which is at the present time a most important item.

Third. That all locomotives be provided with a bell so arranged and maintained that it may be operated from the engineer's cab by hand and by power.

The reason for this recommendation has been thoroughly discussed on previous occasions, and its necessity seems so apparent that it hardly requires further comment. We believe, however, that this is an appliance which is vital to the safety of the employees and general public at highways and other public places traversed by the railroads. The operation of modern motive power demands the full attention of the enginemen, and it is frequently the case while passing over road crossings and through congested territories that the operators are so occupied with their other important duties that it is impossible for them to ring a bell by hand in order to give warning of approaching danger.

Fourth. That cabs of all locomotives not equipped with front door or windows of such size as to permit of easy exit have a suitable stirrup or other step and a horizontal handhold on each side approximately the full length of the cab, which will enable the enginemen to go from the cab to the running board in front of it; handholds and steps or stirrups to be securely fastened with bolts or rivets; the distance between the step and handhold to be not less than 60 inches nor more than 72 inches.

This recommendation is based on the result of investigation of accidents of a character which make it impossible for enginemen to remain in the cab and which compel them to make exit through the cab window to the ground or running board. While locomotives are operating at a high speed, to be compelled to jump from the cab window is exceedingly dangerous and invariably results in serious, if not fatal, injury.

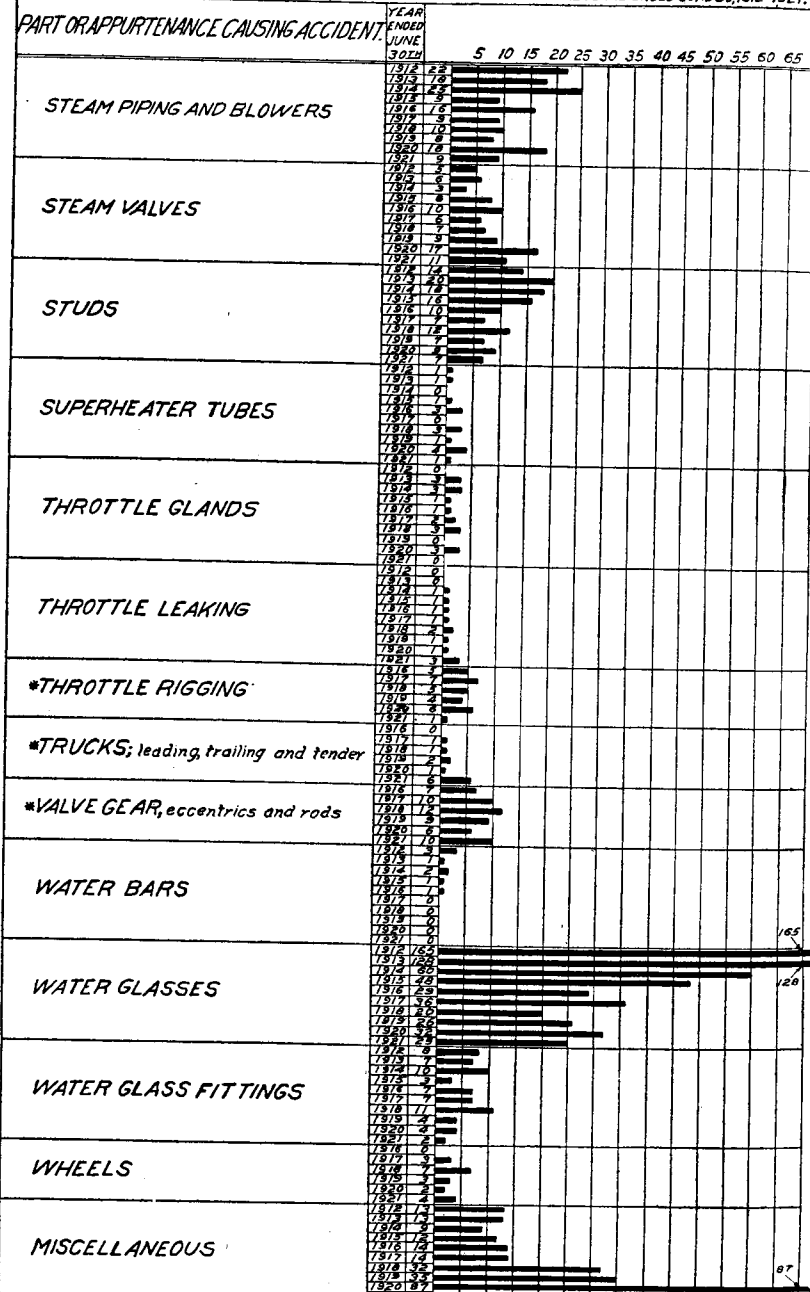
The front doors or windows on modern locomotives are so small that they will not permit the enginemen to pass out through them, thus making it necessary to climb over the roof of the cab or out through the side window when necessary to go from the cab to running board in front while in motion.

Such attachments can be applied at a nominal expense and practically without delay to the locomotive and would add greatly to the safety of the employees. Accidents resulting in fatal injury which have been investigated by this bureau show that injury and death would have been avoided had these appliances been in use.

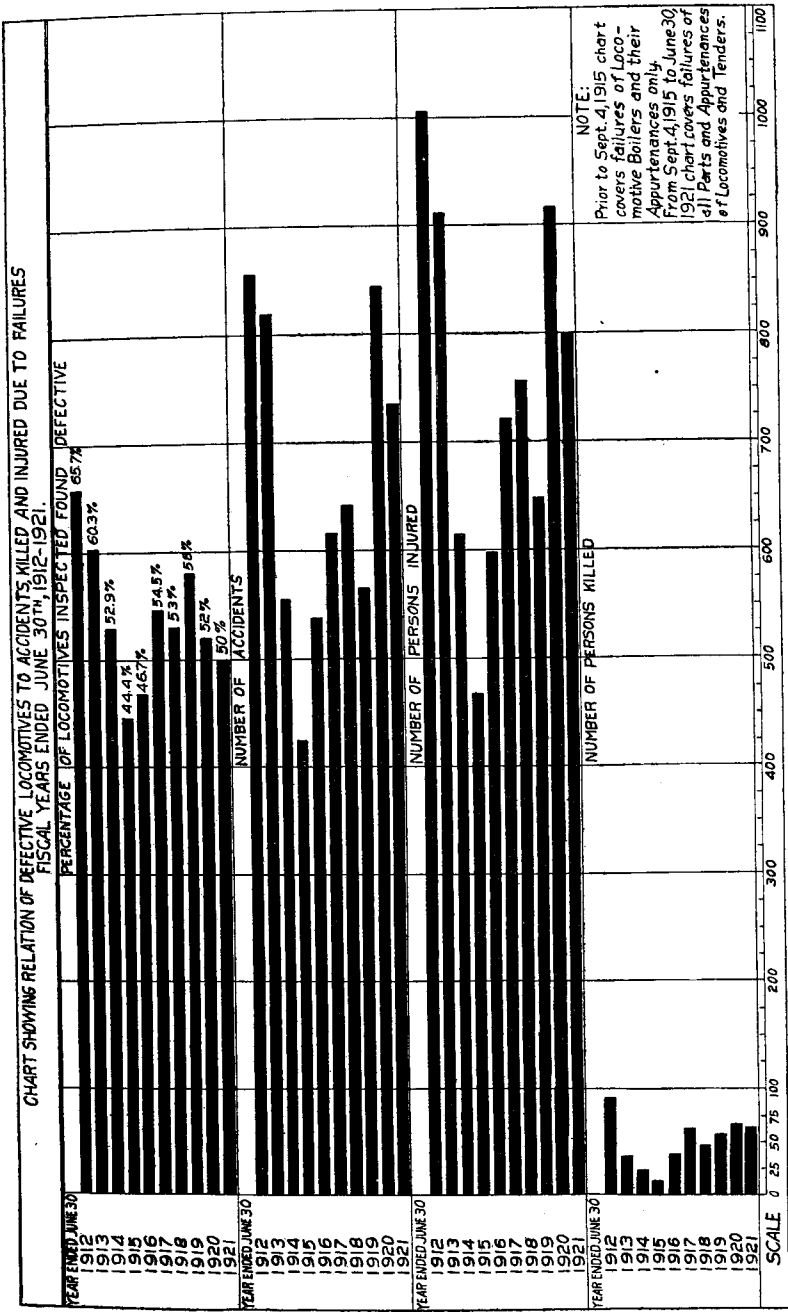
A great number of locomotives have been equipped with the appurtenances above recommended, although, like many other appliances in use, they are not maintained in a proper condition for service.

Fifth. That all locomotives where there is a difference between the readings of the gauge cocks and water glass of 2 or more inches

CHART SHOWING NATURE AND NUMBER OF ACCIDENTS OCCURRING DURING FISCAL YEARS ENDED JUNE 30, 1912-1921.



* ACCIDENTS OCCURRING UNDER AMMENDED ACT EFFECTIVE SEPT. 4, 1915



NOTE:
Prior to Sept. 4, 1915 chart covers failures of Locomotive Boilers and their Appurtenances only. From Sept. 4, 1915 to June 30, 1921 chart covers failures of all Parts and Appurtenances of Locomotives and Tenders.

Accidents and casualties resulting from failures of locomotives and tenders and their appurtenances.

Part or appurtenance which caused accident.	Year ended June 30—														
	1921			1920			1919			1918			1917		
	Accidents.	Killed.	Injured.	Accidents.	Killed.	Injured.	Accidents.	Killed.	Injured.	Accidents.	Killed.	Injured.	Accidents.	Killed.	Injured.
Air reservoirs.....	1		1	2	1	2	2		2	5		7	4	1	
Aprons.....	16		16	2	1	2	2		2	5		7	4	1	
Arch tubes.....	5		5	9	8	8	5		5	5		5	5	5	
Ash-pan blowers.....	5		5	9	1	15	7	2	9	9		16	7	4	
Axles.....	5		5	6	5	11	1	10	7		10	7	7	7	
Blow-off cocks.....	14		14	5	2	2	2	2	4		4	4	4	4	
Boiler checks.....	7		7	15	4	4	4	17	4		17	4	18	14	
Boiler explosions.....				5	6	4	4	13	1		14	13	14	13	
A. Shell explosions.....															
B. Crown sheet; low water; no contributory causes found.....	20	19	26	24	22	35	31	26	46	34	15	61	38	30	66
C. Crown sheet; low water; contributory causes or defects found.....	33	24	52	35	19	46	34	13	63	51	17	82	23	15	32
D. Firebox; defective staybolts, crown stays, or sheets.....	1	2		2	2	2		3	5		6	2			2
E. Firebox; water foaming.....	6		6	3	3	8	3	10	2		2	1			1
Brakes and brake rigging.....	11	1	13	8	8	12	8	14	6	2	4	4	1	1	3
Couplers.....	6	3	8	4	4	5	2	3	5	5	1	9	6	2	4
Crank pins, collars, etc.....	4	1	4	5	2	3	5	5	1	1	1	1	1	1	2
Crossheads and guides.....	4	1	4	4	2	2	2	2	2	2	2	2	2	2	2
Cylinder cocks and rigging.....	4	1	4	4	2	2	2	2	2	2	2	2	2	2	2
Cylinder heads and steam chests.....	4	1	4	9	9	5	7	4	4	4	4	4	4	4	4
Dome caps.....	8		8	3	1	2		1	1	1	1	1	1	1	1
Draft appliances.....	8		8	1	1	2		4	5		5	5	2		3
Draw gear.....	8		8	11	2	9	7	6	11	2	9	15	1	14	5
Fire doors, levers, etc.....	32	1	35	11	11	7	1	6	11	2	9	15	1	14	5
Flues.....	1	1	35	45	52	33	1	39	40	2	47	50	2	2	60
Flue pockets.....	8	3	5	23	23	2	7	2	2	2	2	2	2	2	8
Footboards.....	7		7	10	10	3	3	1	1	1	1	1	1	1	3
Gauge cocks.....	85		85	108	109	37	1	36	39	1	39	51	3		3
Grease cups.....	19		19	15	14	16	1	15	15	1	14	15	51		15
Grate shakers.....	8	2	6	9	1	9	4	5	9	1	10	8	1	7	7
Handholds.....	15	2	13	23	27	21	22	23	24	18	24	18	19		19
Headlights and brackets.....	15		15	23	1	29	14	20	16	12	18	16	1	18	12
Injectors and connections (not including injector steam pipes).....	12		12	14	15	11	13	12	12	12	12	11	1	12	12
Injector steam pipes.....	3		3	17	17	9	9	12	12	13	13	13	13		13
Lubricators and connections.....	3		3	3	1	3	2	2	2	2	2	2	1	1	1
Lubricator glasses.....	15		15	28	40	30	1	34	14	2	19	8	4		4
Patch bolts.....	2		2	2	2	1	1	3	2	1	3	3	1	1	12
Pistons and piston rods.....	65		65	59	59	31	2	31	40	3	40	29	1	1	1
Plugs, arch tube and washout.....	4		4	5	5	2	2	2	2	2	2	2	2	2	29
Plugs in fire box sheets.....	18		18	16	2	20	14	15	18	22	17	4	4		4
Reversing gear.....	3		3	1	1	1	1	2	2	2	2	1	1	1	20
Rivets.....	3		3	3	1	3	2	2	2	2	2	1	1	1	1
Rods, main and side.....	15		15	28	40	30	1	34	14	2	19	8	4		4
Safety valves.....	2		2	2	2	1	1	3	2	1	3	3	1	1	12
Sanders.....	65		65	59	59	31	2	31	40	3	40	29	1	1	1
Side bearings.....	4		4	5	5	2	2	2	2	2	2	2	2	2	29
Springs and spring rigging.....	18		18	16	2	20	14	15	18	22	17	4	4		4
Squirt hose.....	3		3	1	1	1	1	2	2	2	2	1	1	1	20
Stay bolts.....	3		3	9	2	18	5	2	4	7	7	6	1	1	1
Steam piping and blowers.....	82		82	82	54	54	2	54	47	6	50	69	6		6
Steam valves.....	9		9	2	2	2	2	2	6	8	8	3	5		5
Studs.....	11		11	17	17	9	10	10	10	11	9	1	13		13
Superheater tubes.....	7		7	9	17	7	10	7	17	6	17	6	1	5	5
Throttle glands.....	1		1	4	6	1	9	12	13	7	13	7	11		11
Throttle leaking.....	3		3	3	1	1	1	3	3	2	3	2	2		2
Throttle rigging.....	1		1	6	6	4	1	7	5	2	7	5	1	1	1
Trucks, leading, trailing, or tender.....	1		1	1	1	1	1	2	2	1	2	1	2		2
Valve gear, eccentrics, and rods.....	10		10	6	6	9	9	12	12	10	12	10	10		10
Water bars.....	25		25	32	32	26	26	20	20	36	36	37	37		37
Water glasses.....	1		1	4	4	4	4	11	1	10	7	7	7		7
Water-glass fittings.....	4		4	2	1	4	3	5	5	3	3	3	3		3
Wheels.....	91		91	87	86	35	35	32	43	14	14	14	14		14
Miscellaneous.....	735	64	800	843	66	916	565	57	647	641	46	756	616	62	721

ACCIDENTS AND CASUALTIES RESULTING FROM THE FAILURE OF LOCOMOTIVES AND TENDERS AND THEIR APPURTENANCES DURING THE FISCAL YEAR ENDED JUNE 30, 1921, 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.]

ALABAMA & VICKSBURG RAILWAY:

July 23, 1920, locomotive 471, Newton, Miss. Squirt hose blew off; hose insecurely clamped; 1 injured.
One accident; 1 injured.

ATCHISON, TOPEKA & SANTA FE RAILWAY:

**August 6, 1920, locomotive 1266, Ash Fork, Ariz. Headlight turbine wheel burst, due to fractured hub and turbine running at excessive speed; 1 killed.

**August 29, 1920, locomotive 1111, near Leeds, Ill. Squirt hose burst; 1 injured.

**August 29, 1920, locomotive 2165, Galveston, Tex. Water glass burst; cut by flying glass; 1 injured.

September 2, 1920, locomotive 1842, near Cameron, Ill. Injured while attempting to operate grate shaker, due to grate-shaker staff breaking 7 inches from end, where it had been welded by acetylene process; 1 injured.

**September 19, 1920, locomotive 839, Florence, Kans. Water glass burst; cut by flying glass; wire-mesh shield used; 1 injured.

*September 22, 1920, locomotive 3160, Medill, Mo. Train line broke loose from distributing valve, causing rough stop of train; threads on nipple rusted away on inside; 1 injured.

**October 7, 1920, locomotive 822, Raton, N. Mex. Water glass burst; cut by flying glass; wire-mesh shield not properly maintained; 1 injured.

**October 16, 1920, locomotive 338, Tulare, Calif. Side rod broke while running at a speed of 25 miles per hour, damaging cab of locomotive; 1 injured.

*October 20, 1920, locomotive 1304, Joseph City, Ariz. Latch spring of reverse lever fell out, due to pin not being properly fastened; 1 injured.

October 28, 1920, locomotive 944, near Shaw, Kans. Flue broke back of weld; overheated in welding; 1 injured.

October 30, 1920, locomotive 1167, near Higgins, Tex. Crown sheet failure; low water; flues leaking badly, causing engineer to take close chances on water; gauge cocks screwed into backhead; 2 injured.

*October 31, 1920, locomotives 3166 and 681, Kansas City, Mo. Engines became uncoupled account of hose being too long, setting brakes in emergency; 2 injured.

November 30, 1920, locomotive 620, Silsbee, Tex. Front end of right main rod failed, causing front cylinder head to be knocked out; 1 injured.

*December 12, 1920, locomotive 1420, Stoil, Calif. Eccentric-strap bolt broke, causing reverse lever to fly back; 1 injured.

December 22, 1920, locomotive 3222, near Monument, Colo. Crown-sheet failure; low water; operating without water glass, which had been broken a short time prior to accident; engineer unable to apply new glass, due to water-glass cocks out of alignment; 1 killed, 2 injured.

*December 28, 1920, locomotive 2120, Argentine, Kans. Seat box pulled loose and tipped over, due to being insecurely fastened; 1 injured.

December 28, 1920, locomotive 619, Galveston, Tex. Squirt hose parted at splice; hose not clamped; 1 injured.

*January 7, 1921, locomotive 3285, Florence, Kans. Grease-cup plug blew out; 1 injured.

**January 13, 1921, locomotive 2021, Kansas City, Mo. Squirt hose burst; 1 injured.

*March 13, 1921, locomotive 1337, Needles, Calif. Water glass burst; cut by flying glass; 1 injured.

March 13, 1921, locomotive 616, Beaumont, Tex. Right and left buffer-beam brackets failed; right buffer-beam bracket showed old fracture 1 by 12 inches and defective metal flaw 1½ by 2½ inches; left buffer-beam bracket shows old fracture 7 inches at greatest width and 2 inches at greatest height; 1 injured.

April 28, 1921, locomotive 1209, La Junta, Colo. Water glass burst; cut by flying glass; wire-mesh shield used; 1 injured.

May 7, 1921, locomotive 2154, Amarillo, Tex. Water glass burst; cut by flying glass; water-glass cocks out of alignment; wire-mesh shield used; 1 injured.

May 14, 1921, locomotive 2108, Kansas City, Kans. Water glass burst; cut by flying glass; wire-mesh shield used; 1 injured.

May 25, 1921, locomotive 3317, Amarillo, Tex. Water glass burst; cut by flying glass; wire-mesh shield used; 1 injured.
Twenty-five accidents; 2 killed, 27 injured.

ATLANTA & WEST POINT RAILROAD:

July 17, 1920, locomotive 129, Chehaw, Ala. Squirt hose blew off; 1 injured.
One accident; 1 injured.

ATLANTA, BIRMINGHAM & ATLANTIC RAILWAY:

June 16, 1921, locomotive 112, Arp, Ga. Keeper missing, allowing bushing to turn, preventing pin from getting lubrication and caused it to run hot; 1 injured.
One accident; 1 injured.

ATLANTIC COAST LINE RAILROAD:

*July 30, 1920, locomotive 8006, Cadillac, Fla. Reverse lever became unlatched, due to worn and loose spring; 1 injured.

August 17, 1920, locomotive 1503, Collier, Va. Shaker bar slipped off lever, due to improper fit; 1 injured.

**September 2, 1920, locomotive 563, Nashville, N. C. Injury due to defective cam-type driving wheel brake; defect reported on two days previous to accident and no repairs made; 1 injured.

**September 17, 1920, locomotive 385, Mandeville, Fla. Handhold pulled out of bracket, due to pin missing, allowing engineer to fall from running board; 1 injured.

December 31, 1920, locomotive 938, Whaley, Va. Draw-bar pin broke, due to old crack which extended more than halfway through the pin; foot plate defective; 1 injured.

**January 7, 1921, locomotive 715, Chimax, Ga. Blow-off cock would not seat account of some foreign matter located inside of valve, and when engineer tapped on bottom of blow-off cock with hammer, pipe that screws into street ell leading from blow-off cock broke off; 1 injured.

January 10, 1921, locomotive 991, Charleston, S. C. Handrail pulled loose at brackets, due to pin working out; pin not riveted or otherwise secured; 1 injured.

January 13, 1921, locomotive 900, Castle Hayne, N. C. Handrail came loose, due to being insecurely fastened; 1 injured.

*March 22, 1921, locomotive 914, San Antonio, Fla. Reverse lever slipped out of quadrant, due to notches in quadrant being worn and heel casting on quadrant loose; 1 injured.

**May 11, 1921, locomotive 276, Ousley, Ga. Handle of steam valve pulled off, due to nut working off, causing fireman who was using it as handhold to fall; 1 injured.

**June 2, 1921, locomotive 8000, South Richmond, Va. Fireman's foot caught between cab apron and tender brake stand, due to insufficient clearance between apron and brake stand; 1 injured.

**June 3, 1921, locomotive 937, Fayetteville, N. C. Shaker bar slipped off lever, due to improper fit; fulcrum levers not of same size; 1 injured.

*June 11, 1921, locomotive 909, Carbur, Fla. Spring to reverse lever broke, causing lever to move forward suddenly; 1 injured.

June 19, 1921, locomotive 1014, Lykes, S. C. Main axle broke left side, due to old crack, stripping locomotive on that side and causing reverse lever to strike engineer; 1 injured.

*June 27, 1921, locomotive 1135, Waycross, Ga. Squirt hose blew off; 1 injured.

Fifteen accidents; 15 injured.

BALTIMORE & OHIO RAILROAD:

July 4, 1920, locomotive 1408, Washington, W. Va. Grate-shaker handle broke at bolt hole, due to old defect in material, allowing fireman to fall out of gangway while locomotive was running; 1 injured.

**July 6, 1920, locomotive 368, Cleveland, Ohio. Squirt hose burst; defective hose; 1 injured.

July 7, 1920, locomotive 1832, Baltimore, Md. Scalded by jet of water from defective injector connection; 1 injured.

July 24, 1920, locomotive 6008, Indian Creek, Pa. Crown-sheet failure; low water; top water-glass cock found closed; 1 killed, 3 injured.

September 3, 1920, locomotive 2541, near Proctor, W. Va. Crown-sheet failure; low water; no contributory causes found; all appurtenances damaged to such extent that their previous condition could not be determined; 2 killed, 4 injured.

September 7, 1920, locomotive 253, Xenia, Ohio. Petticoat pipe dropped down over exhaust nozzle, due to defective brace, causing back draft. Locomotive out of shop six days after receiving class 3 repairs; 1 injured.

*September 7, 1920, locomotive 5133, Bascom, Ohio. Connection to power reverse blew out of cylinder, account of threads stripped. Engineer plugged same with flagstaff, which blew out, scalding fireman; 1 injured.

September 8, 1920, locomotive 98, Baltimore, Md. Fuel-oil tank exploded, due to excessive pressure, caused by defective reducing valve and safety valve; 1 killed, 4 injured.

October 7, 1920, locomotive 2758, Glencoe, Ohio. Key bolt in back end of main rod broke; while disconnecting engine steam was admitted to cylinder and knocked out front cylinder head; 1 injured.

October 16, 1920, locomotive 4840, near Cherry Run, W. Va. Crown-sheet failure; low water; gauge cocks screwed directly into back-head knuckle, which under working conditions caused them to show a higher level of water than actually existed. Top water-glass valve so applied as to form a trap at the valve; 1 injured.

October 18, 1920, locomotive 4028, Baltimore, Md. Arch tube plug blew out; attempted to tighten under pressure; 2 injured.

October 19, 1920, locomotive 4008, Keyser, W. Va. Tank hose burst, due to excessive pressure caused by boiler check being held open by foreign substance and left tank valve being closed. Both boiler checks had excessive lift—eleven-sixteenths inch; both intermediate cocks broken and in bad condition; 1 injured.

November 2, 1920, locomotive 4199, Sterling, Ohio. Crown-sheet failure; low water; top water-glass cock, also intermediate cock at top of glass found closed at time of investigation. Autogenously welded seam in crown sheet failed; 2 killed, 1 injured.

November 28, 1920, locomotive 4130, near Republic, Ohio. Crown-sheet failure; low water; bottom gauge cock stopped up with scale; top gauge glass stopped up; screens missing from both tank hose; 2 injured.

**November 29, 1920, locomotive 1321, Aiken, Md. Steam-blower pipe became disconnected inside of smoke box, due to defective threads in fitting, causing back draft; 1 injured.

**January 18, 1921, locomotive 2448, Blue Island, Ill. Step to front end of safety foot rail under cab gave way; was wired in place instead of being bolted; 1 injured.

January 29, 1921, locomotive 4134, Floyd, W. Va. Crown-sheet failure; low water; bottom gauge cock stopped up with scale; other appurtenances damaged to such extent their previous condition could not be determined; electrically welded seam between flue sheet and side sheet ruptured and welded seam across top of door sheet ruptured for a distance of 34 inches on right side of center and 36 inches on the left; 4 killed.

January 29, 1921, locomotive 7033, near Terra Alta, W. Va. Washout plug blew out of front flue sheet; threads in sheet and on washout plug badly worn; 1 injured.

January 31, 1921, locomotive 4877, Sir John's Run, W. Va. Ash-pan operating shaft broke off through pinhole; 1 injured.

February 4, 1921, locomotive 2553, Smithfield, Pa. Line check valve stem broke off and wedged under boiler check valve, causing it to remain open, permitting steam pressure to blow back through injector overflow pipe, causing overflow pipe union to fail account of defective condition; 1 injured.

February 14, 1921, locomotive 4259, Singerly, Md. Crown sheet failure; low water; reflex water glass deceptive due to its reflex feature not extending to the lowest reading, causing a dark surface one-half inch at the lowest reading, indicating water after the glass was empty; 1 injured.

February 21, 1921, locomotive 2503, Glenwood, Pa. Right injector throttle-valve bonnet blew out, due to bonnet being too small to properly mesh with the threads in the body of the valve; 1 killed.

March 10, 1921, locomotive 4275, Barksdale, Md. Crown sheet failure; low water; no contributory causes found; 3 injured.

March 25, 1921, locomotive 2280, Fitz Henry, Pa. Crown sheet failure; low water; valve broken off in top-water-glass cock, causing incorrect registration; 1 injured.

** April 2, 1921, locomotive 228, Midland City, Ohio. Scalded by hot water from defective squirt hose; 1 injured.

** April 7, 1921, locomotive 1254, Washington Jct., Md. Apron broke loose from casting, due to bolt on left side of apron coming out of casting caused by threads on bolt being stripped; 1 injured.

April 12, 1921, locomotive 4587, Grays, Md. Grate-shaker lever slipped off lug, due to improper fit; 1 injured.

May 12, 1921, locomotive 4173, Sidney, Ohio. Grease-cup plug blew out, due to pin being overheated, caused by bushing turned in rod and poor threads on plug and in grease cup; 1 injured.

June 3, 1921, locomotive 2530, Eldenau, Pa. Bushing connecting the squirt-hose attachment to nipple broke off, scalding fireman; 1 injured.

June 11, 1921, locomotive 4173, Middletown, Ohio. Washout plug blew out of front flue sheet, due to threads corroded off of plug and in hole; 1 injured.

Thirty accidents; 11 killed, 40 injured.

BANGOR & AROOSTOOK RAILROAD:

* January 17, 1921, locomotive 95, Medford, Me. Shaker bar slipped off lever, due to shaker levers being bent in; 1 injured.

One accident; 1 injured.

BOSTON & ALBANY RAILROAD:

August 30, 1920, locomotive 151, Rensselaer, N. Y. Squirt hose blew off; hose insecurely clamped; 1 injured.

March 30, 1921, locomotive 923, Woronoco, Mass. Crown sheet failure; low water; bottom water-glass cock partially stopped up; valve missing from left boiler check; nipple between boiler and steam gauge stopped up; 2 injured.

Two accidents; 3 injured.

BOSTON & MAINE RAILROAD:

July 5, 1920, locomotive 2325, near Wilmington, Mass. Shaker bar slipped off lever, due to improper fit; 1 injured.

July 19, 1920, locomotive 2051, near Swampscott, Mass. Reverse lever became unlatched, allowing lever to move ahead; quadrant loose at front end and latch bolt missing; 1 injured.

July 24, 1920, locomotive 2332, Rockingham Jct., N. H. Shaker bar slipped off lever; shaker-bar socket split and end of bar worn; 1 injured.

July 29, 1920, locomotive 407, near East Deerfield, Mass. Footboard on locomotive caught on crossing plank; footboard only 7 inches above rail; 1 killed.

July 29, 1920, locomotive 2671, near Montague, Mass. Crown sheet failure; low water; right tank strainer practically covered with waste; left boiler check stuck open; 1 killed, 1 injured.

August 26, 1920, locomotive 131, Newburyport, Mass. Shaker bar slipped off, due to broken socket and improper fit; 1 injured.

September 26, 1920, locomotive 2420, Manchester, N. H. Injured while shaking grates; pin worked out of grate shaker connecting rod, allowing fireman's hand to come in contact with back head of boiler; 1 injured.

September 29, 1920, locomotive 2616, near Willows, Mass. Shaker bar slipped off lever; 1 injured.

October 8, 1920, locomotive 1026, Bondsville, Mass. Shaker bar slipped off lever, due to improper fit; 1 injured.

** October 30, 1920, locomotive 2126, Springvale, Me. Locomotive moved unexpectedly, due to throttle leaking; 1 injured.

December 16, 1920, locomotive 2412, near Exeter, N. H. Crown sheet failure; low water; bottom water-glass opening entirely stopped up with rubber gasket; gauge-cock drip stopped up; gauge cocks located in knuckle of flange of back head; 2 injured.

** February 12, 1921, locomotive 2316, near Reed's Ferry, N. H. Drawbar between locomotive and tender became disconnected due to defective casting; 1 injured.

March 25, 1921, locomotive 2665, Miller's Falls, Mass. Flue broke off at safe end weld due to defective weld; 2 injured.

Thirteen accidents; 2 killed, 14 injured.

BUFFALO & SUSQUEHANNA RAILROAD:

January 26, 1921, locomotive 275, near Germania, Pa. Grate stud blew out on account of not being screwed far enough into sheet; 1 injured.

One accident; 1 injured.

BUFFALO, ROCHESTER & PITTSBURGH RAILWAY:

* September 4, 1920, locomotive 280, East Salamanca, N. Y. Attempted to tighten branch-pipe union to boiler check, which was leaking, with hammer and wrench; when nut was struck it broke and hot water and steam blew out; 1 injured.

November 25, 1920, locomotive 442, near Cummings, Pa. Arch tube pulled out of flue sheet due to fracture of tube on water side adjacent to flue sheet, where tube had been belled; 1 injured.

Two accidents; 2 injured.

CANADIAN PACIFIC RAILWAY:

* August 2, 1920, locomotive 912, Bancroft, Me. Left back tire came off and broke left back side rod in two places, breaking two studs on outside fire-box sheet; 1 injured.

One accident; 1 injured.

CAROLINA, CLINCHFIELD & OHIO RAILWAY:

November 8, 1920, locomotive 151, Waycross, Tenn. Piston came off of rod due to defective nut on end of rod; 1 injured.

One accident; 1 injured.

CENTRAL NEW ENGLAND RAILWAY:

** January 11, 1921, locomotive 3233, Manchester Bridge, N. Y. Engineer applied brakes in emergency, when sand pipe became disconnected and fell, striking cab of engine; union on right back sand pipe broke at sand dome due to old defect; 1 injured.

One accident; 1 injured.

CENTRAL RAILROAD OF NEW JERSEY:

* September 4, 1920, locomotive 68, Communipaw, N. J. Locomotive moved due to leaky throttle valve, which allowed steam in cylinders to overcome air brake; 1 injured.

One accident; 1 injured.

CHARLESTON & WESTERN CAROLINA RAILWAY:

* July 9, 1920, locomotive 207, Parksville, S. C. Injured while shaking grates, due to grate bar becoming disconnected; 1 injured.

One accident; 1 injured.

CHESAPEAKE & OHIO RAILWAY:

* July 10, 1920, locomotive 642, Frankfort, Ky. Scalded while using squirt hose, due to hose being defective; 1 injured.

August 5, 1920, locomotive 1043, Wingina, Va. Bolts in coupler-carrier iron on rear of tender broke, permitting coupler to drop down and locomotive to become uncoupled from train; 1 injured.

October 27, 1920, locomotive 90, Ashland, Ky. Injured while attempting to tighten coupling nut of inspirator steam pipe with hammer and chisel while under pressure; nut previously damaged by use of hammer and set in tightening; 1 injured.

November 12, 1920, locomotive 865, County Line, Ohio. Crown sheet failure; low water; no contributory causes found. Combustion-chamber crown-sheet seam failed for a distance of 36 inches. Air-operated fire door remained closed; 1 injured.

December 5, 1920, locomotive 551, Thayer, W. Va. Crown-sheet failure; low water; no contributory causes found; 2 injured.

Five accidents; 6 injured.

CHICAGO & ALTON RAILROAD:

August 1, 1920, locomotive 859, Slater, Mo. Bonnet of globe valve to power reverse gear screwed out; 1 injured.

* September 7, 1920, locomotive 880 (U. S.), Shirley, Ill. Crown-sheet failure; low water; appurtenances damaged to such extent at time of explosion their previous condition could not be determined; seam between combustion-chamber

crown sheet and crown sheet proper had been welded by autogenous process and failed for 52 inches; 3 killed.

Two accidents; 3 killed, 1 injured.

CHICAGO & EASTERN ILLINOIS RAILROAD:

July 27, 1920, locomotive 3666, Villa Grove, Ill. Injector ram bonnet blew out, due to loose fit; 1 killed.

One accident; 1 killed.

CHICAGO & NORTH WESTERN RAILWAY:

**July 14, 1920, locomotive 52, Fremont, Nebr. Scalded by hot water from leaky blow-off cock; 1 injured.

July 22, 1920, locomotive 1559, Clinton, Iowa. Injured while operating reverse lever; nuts worked loose on reach-rod guide, allowing guide to bind reach rod; 1 injured.

**July 29, 1920, locomotive 1052, Escanaba, Mich. Scalded by hot water from left injector overflow pipe, due to leaky boiler check and primer valve; 1 injured.

**August 13, 1920, locomotive 43, Menominee, Mich. Water glass burst; injured while attempting to shut off connections to boiler; water-glass cock could not be turned by hand; 1 injured.

**August 14, 1920, locomotive 1587, near Flagg, Ill. Injured while attempting to operate reverse lever, due to nut working off bolt holding front of quadrant to bracket, allowing bolt to come out and causing reverse lever to unlatch and violently go to full forward position, catching engineer's foot between lever and bracket; 1 injured.

**September 4, 1920, locomotive 2481, Dixon, Ill. Injured while attempting to use squirt hose; hose defective; 1 injured.

September 14, 1920, locomotive 565, Lincoln, Nebr. Gas explosion in fire box of oil burner; main oil valve leaking, permitted oil to enter fire box; defective firing valve and atomizer; defective fire-box door; left side sheet cracked and leaking badly; 1 injured.

September 27, 1920, locomotive 562, Fremont, Nebr. Injured while operating reverse lever; left valve seat and valve cut; pin missing, allowing reverse lever when in full forward motion to come in contact with stud on boiler head; 1 injured.

*October 3, 1920, locomotive 455, Brule, Wis. Steam pipe to generator broke off at globe valve in cab of engine; 1 injured.

October 11, 1920, locomotive 1230, Chadron, Nebr. Arch-tube plug blew out; attempted to tighten under pressure; 1 injured.

*October 14, 1920, locomotive 1337, Winona, Minn. Pipe burst on hose at sprinkler attachment; 1 injured.

October 21, 1920, locomotive 1801, Missouri Valley, Iowa. Arm rest broke; old weather crack extended entire length of arm rest; 1 injured.

October 26, 1920, locomotive 1432, Racine, Wis. Injured while operating reverse lever, due to insufficient clearance between handle of reverse lever and brake valve; 1 injured.

November 5, 1920, locomotive 1350, near Iron River, Mich. Crown sheet failure; low water; top gauge cock stopped up; bottom water-glass cock partially stopped up and top of water glass partially stopped up by gasket; welded seam in fire box failed; 2 injured.

November 8, 1920, locomotive 2153, Clinton, Iowa. Footboard bracket broke; bracket had 2½-inch hole near center which had been plugged and had defective weld on each side of hole; 1 injured.

December 7, 1920, locomotive 289, near Volga, S. Dak. Reverse-lever counter-balance rod broke, due to old flaw; 1 injured.

January 17, 1921, locomotive 586, Bannerman, Wis. Injured while shaking grates, due to connecting pin lost or broken; 1 injured.

February 8, 1921, locomotive 2306, Wright, Iowa. Fire door defective, due to lost motion in the rollers on the bottom of fire doors and two bolts loose that held guide to frame; door closed on fireman's hand while putting in a fire; 1 injured.

February 10, 1921, locomotive 1717, near Essig, Minn. Nipple between boiler check and angle valve broke, due to delivery pipe being improperly braced at front end; 1 injured.

March 2, 1921, locomotive 315, near Sharon, Wis. Crown sheet failure; low water; gauge-cock drip stopped up; top gauge cock and water-glass drain cock stopped up with scale; 3 injured.

March 3, 1921, locomotive 2032, South Janesville, Wis. Tumbling shaft to ash-pan door turned suddenly, due to defective ash-pan rigging; one key and two bolts missing and other key a loose fit; 1 injured.

March 14, 1921, locomotive 1738, near Aniwa, Wis. Reverse lever latch came out of quadrant, due to weak or broken latch spring; 1 injured.

March 15, 1921, locomotive 910, Eland, Wis. While shaking grates, grate-shaker rigging pin broke or worked out; latch lock to shaker lever defective; 1 injured.

March 28, 1921, locomotive 2311, State Center, Iowa. Coal board dropped down, striking fireman's foot, due to being 1½ inches too short; 1 injured.

April 5, 1921, locomotive 1712, Milwaukee, Wis. Air-pump steam-valve handle came off, permitting fireman who was holding to it to fall to ground; handle and stem worn to loose fit; 1 injured.

April 7, 1921, locomotive 2315, Beverly, Iowa. Grate-shaker rod became disconnected, due to connecting pin missing or broken; 1 injured.

April 13, 1921, locomotive 2028, Milwaukee, Wis. Injured by reverse lever, due to insufficient clearance between improperly applied foot rest and path of reverse lever; 1 injured.

April 30, 1921, locomotive 902, Des Moines, Iowa. Headlight turbine burst; 1 injured.

May 19, 1921, locomotive 1338, Valentine, Nebr. Reverse lever handle came down against boiler head, mashing engineer's finger; no suitable stop on reverse quadrant and condition of quadrant and latch such that lever had tendency to become disengaged; 1 injured.

June 7, 1921, locomotive 43, Waseca, Minn. Nipple blew out of squirt hose pipe, due to defective fit of threads; 1 injured.

**June 19, 1921, locomotive 1733, Chatfield Junction, Minn. Injured while riding on sill step, due to insufficient clearance between vertical handhold and step when on curves; 1 injured.

June 21, 1921, locomotive 1578, Chicago, Ill. Tank hose pulled off the tender connection, due to being insecurely clamped; 1 injured.

Thirty-two accidents; 35 injured.

CHICAGO & WESTERN INDIANA RAILROAD:

*October 8, 1920, locomotive 215, Chicago, Ill. While reversing engine, fire door swung in, due to defective stop, and caught on reverse lever; 1 injured.

One accident; 1 injured.

CHICAGO, BURLINGTON & QUINCY RAILROAD:

*July 7, 1920, locomotive 3176, Sesser, Ill. Injured while operating reverse lever; quadrant too low and would not hold reverse lever in position; eccentric block hanger pin broke; 1 injured.

July 10, 1920, locomotive 6306, Centralia, Ill. Headlight turbine burst, due to governor having been improperly applied; turbine wheel loose on shaft; 1 injured.

August 2, 1920, locomotive 1096, Viola, Ill. Scalded while using squirt hose; hose badly worn and defective; 1 injured.

August 12, 1920, locomotive 2132, Oak Hill, Ill. Injured while attempting to open blow-off cock with a coal-pick handle; account of blow-off cock being inoperative from the cab; 1 injured.

**August 15, 1920, locomotive 1420, North Kansas City, Mo. Front-end handhold slipped in brackets, due to not being securely fastened at both ends; 1 injured.

August 16, 1920, locomotive 5318, Earlville, Ill. Squirt hose blew off; hose insecurely clamped; 1 injured.

August 24, 1920, locomotive 2501, St. Joseph, Mo. Injector delivery-pipe heater pipe broke off at connection to boiler-check cage; 1 injured.

*September 4, 1920, locomotive 3142, Gillette, Wyo. Reverse lever became unlatched, due to right transmission pin being lost; 1 injured.

*September 22, 1920, locomotive 2007, Dayton's Bluff, Minn. Fireman's seat fell, due to nails holding it to back of cab pulling out; 1 injured.

September 23, 1920, locomotive 2906, near Phillips, Nebr. Packing nut worked off from globe valve, allowing pressure to work valve open, scalding fireman; globe valve not properly packed; 1 injured.

September 24, 1920, locomotive 5069, Blanding, Ill. Squirt hose parted at splice; splice not clamped; 1 injured.

October 21, 1920, locomotive 1976, Galena Junct., Ill. Injured while using defective squirt hose; 1 injured.

November 8, 1920, locomotive 2909, Lincoln, Nebr. Steam-heat-valve bonnet screwed out of body of valve, due to not being properly applied; 1 injured.

November 9, 1920, locomotive 2051, near Kent, Iowa. Flue broke at weld; overheated in welding; 1 injured.

November 11, 1920, locomotive 1942, Ferry, Nebr. Arch tube washout plug blew out; attempted to tighten under pressure; plug applied cross-threaded; 2 injured.

December 2, 1920, locomotive 5253, Galesburg, Ill. Scalded by leakage from stoker-engine throttle while attempting to operate ash-pan lever; ash-pan lever was so located that it could not be operated without operator getting under stoker engine; 1 injured.

December 14, 1920, locomotive 1816, Centralia, Ill. Blow-off cock opened when handle was struck by ash-pan lever, due to improper location of handle; 1 injured.

*December 23, 1920, locomotive 2310, Creston, Iowa. Stoker-hopper door gave way when fireman stepped on it, due to broken hinge; 1 injured.

January 14, 1921, locomotive 3139, Cambria, Wyo. Fireman's seat fell, due to leg of seat slipping through hole in floor of cab; 1 injured.

January 21, 1921, locomotive 2835, Galesburg, Ill. Water glass and water-glass shield burst; cut by flying glass; 1 injured.

March 3, 1921, locomotive 1507, Hastings, Nebr. Cotter key lost out of apron hinge, allowing apron to part from engine and fireman to fall between engine and tender; 1 injured.

*March 13, 1921, locomotive 2116, Canton, Mo. Squirt hose blew off; hose defective; 1 injured.

March 22, 1921, locomotive 5227, near Galva, Ill. Steam pipe to coal hoist blew off at union near three-way cock; threads in pipe badly worn and stripped; 1 injured.

**April 17, 1921, locomotive 1149, Ferry, Nebr. Water glass burst, breaking water-glass shield; cut by flying glass; 1 injured.

June 26, 1921, locomotive 2800, Hastings, Iowa. Engine truck hanger broke, due to flaw in material, allowing bottom end to hang down and catch crossing plank; 1 injured.

Twenty-five accidents; 26 injured.

CHICAGO GREAT WESTERN RAILROAD:

December 13, 1920, locomotive 316, Minneapolis, Minn. Water glass burst; cut by flying glass; one panel of water-glass shield missing; defect reported on day previous to accident and repairs not made; 1 injured.

One accident; 1 injured.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY:

July 12, 1920, locomotive 8647 (U. S.), Oakwood, Wis. Left main rod broke, badly damaging locomotive and puncturing inside and outside throat sheets; 2 injured.

July 17, 1920, locomotive 5604, Kellogg, Minn. Crown sheet failure; low water; no contributory causes found; 3 killed.

*July 17, 1920, locomotive 8075, Burlington, Wis. Shaker bar slipped off post, due to improper fit; 1 injured.

August 22, 1920, locomotive 2328, Wachusett, Mont. Flue broke at weld; defective weld; 1 injured.

*August 22, 1920, locomotive 8630, Shermarville, Ill. Shaker bar slipped off post, due to improper fit; 1 injured.

**September 4, 1920, locomotive 8171, Monroe Center, Ill. Squirt hose became disconnected, scalding fireman; 1 injured.

October 3, 1920, locomotive 9607, Marengo, Wash. Engine deck defective, due to floor not being properly bolted down; 1 injured.

*November 16, 1920, locomotive 2809, Britt, Iowa. Struck by broken driving-spring leaf, which broke and flew from engine while running; 1 injured.

November 24, 1920, locomotive 8109, McIntosh, S. D. Shaker bar became disconnected, due to bolt working out of grate-shaker rigging; 1 injured.

December 4, 1920, locomotive 7120, Chicago, Ill. Lubricator filling plug blew out; threads stripped in body of lubricator; 1 injured.

December 7, 1920, locomotive 8056, Fulton, Ill. Injured while attempting to operate reverse lever; adjusting rod to counterbalance spring failed; rod worn and defective; 1 injured.

December 28, 1920, locomotive 8051, Selby, S. D. Flue broke at safe end weld; flue wasted away to almost paper thickness at time of welding; 1 injured.

January 11, 1921, locomotive 2604, Inwood, Iowa. Reverse lever became unlatched; key bolts being lost out allowed wedge key to work out, catching eccentric arm; eccentric arm key broke and arm dropped off pin, causing undue strain on valve gear; 1 injured.

January 19, 1921, locomotive 7048, Galewood, Ill. Water glass and panels in water-glass shield burst; flying glass struck fireman, causing loss of one eye; 1 injured.

**February 24, 1921, locomotive 8224, Bensenville, Ill. Shaker bar slipped off lever, due to improper fit; 1 injured.

February 28, 1921, locomotive 7611, Milwaukee, Wis. Reverse lever struck boiler head, due to no stop pin or block at front end of quadrant; 1 injured.

March 22, 1921, locomotive 8203, Somer's, Wis. Blow-off cock stuck open and could not be closed from cab; fireman in attempting to close it fell into steam and water issuing from boiler and was seriously scalded; 1 injured.

April 11, 1921, locomotive 5588, Camanche, Iowa. Squirt hose blew off nipple, due to being insecurely clamped; 1 injured.

April 18, 1921, locomotive 6316, Milwaukee, Wis. Section of coal gate swung closed, due to latch missing; 1 injured.

April 30, 1921, locomotive 6114, Woodward, Iowa. Water glass and water-glass shield broke; cut by flying glass; 1 injured.

**May 11, 1921, locomotive 512, Morton Grove, Ill. Shaker bar slipped off lever, due to improper fit; 1 injured.

May 16, 1921, locomotive 8245, Savanna, Ill. Rivet blew out of back seam of left wing of inside throat sheet; rivet defective and improperly applied; 1 injured.

May 18, 1921, locomotive 320, near Perry, Iowa. Eccentric strap broke, causing reverse lever to go into corner, injuring hand of engineer; 1 injured.

June 30, 1921, locomotive 7137, Milwaukee, Wis. Water glass burst, breaking glass panels in water-glass shield; panels inadequate in strength; 1 injured.

Twenty-four accidents; 3 killed, 24 injured.

CHICAGO, PEORIA & ST. LOUIS RAILROAD:

February 2, 1921, locomotive 71, East Peoria, Ill. Lubricator filling glass broke; glass defective when applied; 1 injured.

One accident; 1 injured.

CHICAGO, ROCK ISLAND & PACIFIC RAILWAY:

July 22, 1920, locomotive 2136, near Earlsboro, Okla. Flue broke at weld; overheated in welding; 1 injured.

July 29, 1920, locomotive 3002, near Mabel, Mo. Nut came off crosshead pin, permitting pin to drop out, bending left front side rod and bottom guide; 1 killed, 1 injured.

*July 31, 1920, locomotive 2317, Colfax, Iowa. Shaker bar slipped off post, due to improper fit; 1 injured.

**August 5, 1920, locomotive 2560, Sharon, Iowa. Fire-door lever broke; 1 injured.

August 16, 1920, locomotive 710, near Galloway, Ark. Reverse lever slipped out of quadrant; teeth in quadrant worn; 1 injured.

August 16, 1920, locomotive 2107, Boonesville, Ark. Handrail broke at weld; 1 injured.

August 21, 1920, locomotive 2137, near Yukon, Okla. Shaker bar slipped off lever, due to improper fit; 1 injured.

August 23, 1920, locomotive 2578, Cedar Rapids, Iowa. Blow-off cock turned in boiler, causing engineer's hand to be caught between blow-off cock lever and running board; 1 injured.

August 31, 1920, locomotive 2524, near Peabody, Kans. Shaker bar slipped off lever, due to improper fit; 1 injured.

**September 3, 1920, locomotive 1222, Amarillo, Tex. Buffer beam pulled loose from frame, due to top bolts in right buffer-beam brackets breaking and shifting unusual strain on lower portion of cast-iron brackets and causing them to break. Pilot beam reported defective on daily inspection reports on August 16, 19, 20, 21, 23, and 25; 1 injured.

September 4, 1920, locomotive 1511, near Artesian, Ark. Marker bracket pulled loose from smoke box, due to rivet heads worn away; 1 injured.

*September 4, 1920, locomotive 215, Chicago, Ill. Squirt hose burst; hose old and considerably worn; 1 injured.

September 4, 1920, locomotive 1608, Burr Oak, Ill. Steam and water escaping around injector overflow-valve stem, due to left boiler-check valve being broken off near to valve seat, causing bad leak. Fracture indicated break had existed for some time prior to accident. Condition had been reported September 2 and 3, with repairs reported made, but which was evidently incorrect; 1 injured.

September 10, 1920, locomotive 1744, near Shirley, Colo. Crown-sheet failure, low water; no contributory causes found; appurtenances damaged to such extent at time of accident their previous condition could not be determined. Welded side sheet seams on both sides, located approximately 40 inches below crown sheet, failed; 2 injured.

September 23, 1920, locomotive 1778, Medford, Okla. Injector overflow pipe blew off, due to threads in union nut being rusted and corroded away; 1 injured.

October 23, 1920, locomotive 201, Fort Worth, Tex. Crown sheet failure; low water; water foaming badly; 3 killed, 1 injured.

December 11, 1920, locomotive 1296, Topeka, Kans. Counterbalance-spring rod broke, due to defective weld; 1 injured.

December 18, 1920, locomotive 1712, near Pulaski, Ark. Flue broke at safe end weld; overheated in welding; 2 injured.

January 15, 1921, locomotive 814, Otego, Kans. Left injector steam-pipe nut blew off; threads on injector throttle badly worn and threads in spanner nut to steam pipe stripped. Steam-pipe union reported defective on same day previous to accident and repairs not made; 1 injured.

* February 5, 1921, locomotive 1865, El Reno, Okla. Engine apron moved when bolt holding it broke off; 1 injured.

February 5, 1921, locomotive 1301, near Ellsworth, Minn. Collar broke off of left injector steam pipe on account of having been machined out on the inside to a thickness of only one-sixteenth inch to three-thirty-seconds inch to fit steam pipe and brazed only two-thirds of its length; 1 injured.

February 11, 1921, locomotive 3021, near Fairfield, Iowa. Shaker bar slipped off post, due to improper fit; 1 injured.

February 22, 1921, locomotive 1452, between Amarillo, Tex., and Sayre, Okla. Defective shoveling sheet caused shovel to catch, spraining fireman's wrist; 1 injured.

March 4, 1921, locomotive 2119, Red Oak, Okla. Lower hole in engine deck casting for drawbar pin was broken out, allowing drawbar pin to bend back and drawbar to slip off pin and engine and tender to separate. Repairs had been made by autogenous welding previous to accident; 1 injured.

March 7, 1921, locomotive 558, Walker, Iowa. Right back side rod collar broke, allowing side rod to come off of pin while running; 1 injured.

March 15, 1921, locomotive 1633, Blue Island, Ill. Handrail column at front of locomotive broke, due to column being thin and fractured; 1 injured.

April 3, 1921, locomotive 3008, Altamont, Mo. Power grate shaker was inoperative and had been so reported on March 28, April 2, 4, 9, and 11, and repairs not made. Fireman injured trying to clean fire with hand grate shaker when he received injuries incapacitating him for 50 to 60 days; 1 injured.

April 18, 1921, locomotive 3020, near Lineville, Iowa. Shaker bar slipped off post, due to improper fit; 1 injured.

April 20, 1921, locomotive 1966, Phillipsburg, Kans. Left No. 2 driving brake hanger came off pin, allowing brake beam to fall, due to key missing from hanger pin; 1 injured.

* June 11, 1921, locomotive 1451, Shamrock, Tex. Shovel struck against hole in shovel sheet; 1 injured.

Thirty accidents; 4 killed, 32 injured.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA RAILWAY:

* July 17, 1920, locomotive 54, Minneapolis, Minn. Piece broke out of step, causing fireman to fall; 1 injured.

* July 20, 1920, locomotive 28, Stone, Minn. Board on seat box broke; 1 injured.

August 4, 1920, locomotive 202, Pender, Nebr. Squirt hose parted at splice; 1 injured.

August 19, 1920, locomotive 291, near South Cut, Nebr. Squirt hose burst; hose defective; 1 injured.

September 21, 1920, locomotive 222, near Ottawa, Minn. Squirt hose blew off; hose not clamped; 1 injured.

December 28, 1920, locomotive 313, St. James, Minn. Running-board bracket broke, due to old break in bracket; 1 injured.

January 2, 1921, locomotive 401, near Altoona, Wis. Main driving axle broke, due to old flaw in axle; 1 injured.
Seven accidents; 7 injured.

CHICAGO, TERRE HAUTE & SOUTHEASTERN RAILWAY:

* March 26, 1921, locomotive 655, West Clinton, Ind. Nut came off blow-off cock-lever stem, allowing steam to strike lever and turn it; 1 injured.
One accident; 1 injured.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS RAILWAY:

* July 17, 1920, locomotive 6684, Greensburg, Ind. Fell between engine and tank when apron tipped, due to bolt having worked out of apron which connects tank and engine; 1 injured.

February 15, 1921, locomotive 7386, Indianapolis, Ind. Headlight bracket fell, due to bolts breaking; bracket supported by four bolts, one of which had been broken off for a long time and two others showed old fractures of about two-thirds of their area; 1 injured.

March 14, 1921, locomotive 7356, Indianapolis, Ind. Piece of footboard about 18 inches by 2½ inches split off, causing switchman to fall; 1 injured.

March 23, 1921, locomotive 6011, Columbus, Ohio. Arch-tube washout plug blew out; attempted to tighten under pressure; plug applied cross-threaded; 1 injured.

June 8, 1921, locomotive 6112, Indianapolis, Ind. Brakeman fell from pilot step, due to metal tread being worn smooth and front of step tipped downward seven-sixteenths inch; 1 killed.

Five accidents; 1 killed, 4 injured.

CLINTON & OKLAHOMA WESTERN RAILWAY:

** December 9, 1920, locomotive 26, near Clinton, Okla. Headlight motor burst, due to excessive speed because of defective governor; 1 killed.
One accident; 1 killed.

COLORADO & SOUTHERN RAILWAY:

* July 12, 1920, locomotive 605, Folsom, N. Mex. Burned by hot grease while screwing down dope plug on main rod, due to dope plug blowing out; fusee powder put in grease cup; 1 injured.

October 22, 1920, locomotive 620, Guernsey, Wyo. Bonnet blew out of valve in heater line to oil tank, due to being insecurely tightened; 1 injured.
Two accidents; 2 injured.

COLUMBUS & GREENVILLE RAILROAD:

January 31, 1921, locomotive 200, Columbus, Miss. Lubricator sight glass and nut blew out, due to threads in body of lubricator being badly worn; 1 injured.

One accident; 1 injured.

DELAWARE & HUDSON COMPANY:

July 4, 1920, locomotive 1612, Forest City, Pa. Steam pipe to air pump became disconnected at elbow connection; air-pump steam pipe not sufficiently clamped to avoid severe vibration; 1 injured.

** July 12, 1920, locomotive 766, Glens Falls, N. Y. Flue broke at weld; defective weld; 1 injured.

July 12, 1920, locomotive 1602, near Forest City, Pa. Injector steam-pipe spanner nut broke while attempting to tighten; spanner nut mutilated by use of improper tools in tightening at previous times; 1 injured.

September 3, 1920, locomotive 594, Loon Lake, N. Y. Injector steam pipe failed at brazing; 2 injured.

November 9, 1920, locomotive 24, Binghamton, N. Y. Handrail gave way; pin holding rail in casting worked out, allowing handrail to become loose and work out; 1 injured.

November 21, 1920, locomotive 1028, Avoca, Pa. Flue broke at weld; overheated in welding; 1 injured.

December 11, 1920, locomotive 455, Wilkes-Barre, Pa. Main driving axle broke while locomotive was running at a speed of 35 miles per hour; old defect in axle 1½ inches in depth; 1 injured.

December 24, 1920, locomotive 1093, Delanson, N. Y. Cab ventilator defective and bolt which fastens lever to bracket broke when fireman attempted to close ventilator; 1 injured.

January 30, 1921, locomotive 762, Elsmere, N. Y. Nut worked loose on fire-door adjusting spring, which allowed fire door to close, catching fireman's hand; 1 injured.

February 2, 1921, locomotive 883, Archbald, Pa. Reverse lever became unlatched, due to broken frame and boiler loose on frames; 1 injured.

February 13, 1921, locomotive 801, near Port Kent, N. Y. Left main, left back, and intermediate side rods broke and punctured inside throat sheet; 1 injured.

* February 23, 1921, locomotive 746, Westport, N. Y. Shaker bar slipped off, due to improper fit; 1 injured.

June 29, 1921, locomotive 508, Ballston Spa, N. Y. Insufficient clearance around reverse-lever handle, allowing engineer's hand to be mashed when reverse lever went into forward motion; 1 injured.

Thirteen accidents; 14 injured.

DELAWARE, LACKAWANNA & WESTERN RAILROAD:

* August 1, 1920, locomotive 978, Chenango Forks, N. Y. Bolt in front end of ash-pan rod broke; 1 injured.

January 9, 1921, locomotive 1125, Buffalo, N. Y. Water glass burst; cut by flying glass; 1 injured.

Two accidents; 2 injured.

DENVER & RIO GRANDE RAILROAD:

December 17, 1920, locomotive 1181, near Malta, Colo. Spanner nut on left injector steam pipe at injector throttle connection broke, due to old flaw in nut; use of hammer and set in tightening and nut of too-light construction; 2 injured.

One accident; 2 injured.

DETROIT, TOLEDO & IRONTON RAILROAD:

July 22, 1920, locomotive 82, Napoleon, Ohio. Water glass burst; cut by flying glass; 1 injured.

September 7, 1920, locomotive 100, Springfield, Ohio. Crown sheet failure; low water; appurtenances damaged and destroyed to such extent their previous condition could not be determined. Initial failure evidently occurred in auto-generously welded seam between flue and crown sheets. Welded longitudinal seam between left side sheet and patch failed for a distance of 78 inches; 1 killed.

Two accidents; 1 killed, 1 injured.

DULUTH, MISSABE & NORTHERN RAILWAY:

* August 2, 1920, locomotive 324, Proctor, Minn. Washout plug blew out while attempting to tighten under pressure; 2 injured.

October 25, 1920, locomotive 103, Maney, Minn. Flue broke at weld; overheated in welding; fire-door latch and catch badly worn, allowing door to open easily; 1 injured.

March 2, 1921, locomotive 319, near Peyton, Wis. Right main crank pin broke in wheel fit; old flaw at point of fracture extended for a distance of 3 inches; metal crystallized; 2 injured.

June 12, 1921, locomotive 208, Proctor, Minn. Crown sheet failure, due to low water; water glass and shield glasses very dirty, making it impossible to see water in glass for a distance of 1½ inches above the lowest reading; shield glasses are securely applied in shield and can not readily be removed for cleaning; water glass located behind stoker pipe and not plainly visible from engineer's seat; steam valve to water glass applied so as to form a trap; 1 injured.

Four accidents; 6 injured.

EL PASO & SOUTHWESTERN SYSTEM:

* September 21, 1920, locomotive 308, Roy, N. Mex. Pilot step broke, due to old flaw in weld on the step rod; 1 injured.

* October 22, 1920, locomotive 125, Tularosa, N. Mex. Injured by reverse lever dropping down, account of pin missing in front end of quadrant; 1 injured.

Two accidents; 2 injured.

ERIE RAILROAD:

July 4, 1920, locomotive 49, Jersey City, N. J. Lubricator filling glass blew out, due to threads on retaining nut being stripped; 1 injured.

July 4, 1920, locomotive 3005, Thompson, Pa. Flue broke at weld; 1 injured.

July 24, 1920, locomotive 611, Secaucus, N. J. Cylinder head blew out, due to accumulation of water in cylinder, caused by cylinder cocks being inoperative; 1 injured.

August 17, 1920, locomotive 1752, Big Flats, N. Y. Crown sheet failure; low water; water glass leaking badly and gauge-cock drip nearly stopped up; 4 injured.

August 19, 1920, locomotive 4120, Pymatuning, Pa. Washout plug blew out; threads on plug defective, and plug showed evidence of having been applied cross-threaded; 1 injured.

August 28, 1920, locomotive 1678, Mingo, Ohio. Flue broke at weld; overheated in welding; 1 injured.

* September 2, 1920, locomotive 2019, Painted Post, N. Y. Squirt hose became disconnected; 1 injured.

* September 14, 1920, locomotive 1884, Jersey City, N. J. Shaker bar broke, due to old flaw; 1 injured.

November 9, 1920, locomotive 1625, Langdon, N. Y. Crown sheet failure; cause undetermined; 1 injured.

November 23, 1920, locomotive 796, near Rivare, Ind. Injector steam-pipe spanner nut broke at fountain connection, due to material in nut being too light; 1 injured.

January 8, 1921, locomotive 3120, Burns, N. Y. Crown sheet failure; low water; bottom water-glass cock entirely stopped up with gasket, and parts of the gasket had worked up into the nipple of the Klinger water glass; 3 injured.

March 18, 1921, locomotive 2069, Southport, N. Y. Ash-pan blower pipe elbow broke, due to bad crack in cast-iron elbow; 1 injured.

April 21, 1921, locomotive 2049, Attica, N. Y. Flue broke off 15 inches from the back flue sheet, due to being wasted away to three sixty-fourths inch in an old safe end weld; 1 injured.

Thirteen accidents; 18 injured.

FORT SMITH & WESTERN RAILROAD:

* September 19, 1920, locomotive 2, Guthrie, Okla. Defective globe valve in blow-off cock discharge pipe; 1 injured.

One accident; 1 injured.

FORT WORTH & DENVER CITY RAILWAY:

October 14, 1920, locomotive 802 (C. & S.), near Washburn, Tex. Crown sheet failure; low water; no contributory causes found; 1 injured.

** November 1, 1920, locomotive 156, Oklaunion, Tex. Bolt came out of fire-box door lining, allowing door shutter to fall open and fire to pop out; 1 injured.

** November 11, 1920, locomotive 157, Rhome, Tex. Bolt in quadrant-lever latch broke, allowing lever to fly back; 1 injured.

Three accidents; 3 injured.

GEORGIA & FLORIDA RAILWAY:

* July 23, 1920, locomotive 210, Douglas, Ga. Lubricator plug broke off while attempting to tighten; defective plug; 1 injured.

One accident; 1 injured.

GEORGIA, FLORIDA & ALABAMA RAILWAY:

July 23, 1920, locomotive 201, near Rowena, Ga. Crown sheet failure; low water; no contributory causes found; 2 killed.

One accident; 2 killed.

GRAND TRUNK RAILWAY SYSTEM:

December 22, 1920 locomotive 433, near Owosso, Mich. Arch tube pulled out of flue sheet; tube extended through sheet only three-sixteenth inch at top and flush with sheet at bottom and not belled or beaded; tube bulged in two places and showed evidence of leakage at bulge; 1 injured.

One accident; 1 injured.

GREAT NORTHERN RAILWAY:

July 21, 1920, locomotive 1958, Brookston, Minn. Squirt hose parted at splice; hose not securely clamped; 1 injured.

** July 24, 1920, locomotive 1832, Great Falls, Mont. Injured while using squirt hose; hose defective; 1 injured.

August 22, 1920, locomotive 1952, Kelly Lake, Minn. Broken rivet blew out of left side sheet while being calked under pressure; 1 injured.

August 27, 1920, locomotive 1154 near Troy, Mont. Leaky tank caused the shoveling sheet to be slippery and the fireman to fall from the locomotive; 1 injured.

August 31, 1920, locomotive 1962, Kelly Lake, Minn. Arch tube pulled out of throat sheet; tube did not extend through sheet far enough to be belled or beaded; 1 injured.

September 2, 1920, locomotive 1639, Stanley, N. Dak. Squirt hose parted at splice; hose not securely clamped; 1 injured.

*September 10, 1920, locomotive 1110, Russell, Minn. Shaker bar slipped off; shaker bar too large for post; 1 injured.

October 9, 1920, locomotive 3116, Bowdoin, Mont. Washout plug blew out, due to not being properly tightened after locomotive was washed; 1 injured.

December 7, 1920, locomotive 1120, near Green Valley, Minn. Grate-shaker casting stud blew out, due to threads being stripped when applied; 1 injured.

*December 25, 1920, locomotive 950, Brook Park, Minn. Fill-up connection cap in left injector blew off, due to not being screwed up tight at connection; 1 injured.

March 7, 1921, locomotive 727, Boyds, Wash. Cistern-anchor bolt broke, due to old fracture, allowing tank to raise and catch fireman's foot; 1 injured.

March 21, 1921, locomotive 1753, Whitefish, Mont. Angle cock blew off air pipe at rear of tender, due to worn threads; 1 injured.

April 16, 1921, locomotive 1443, Hillyard, Mont. Bull's-eye lubricator-register glass and packing nut blew out, due to threads on nut and in body of lubricator being stripped; 1 injured.

April 21, 1921, locomotive 12, Spokane, Wash. Shaker bar became disconnected from post, due to pin connecting the arm on bottom end of post to grate rod working out; cotter pin missing; 1 injured.

**June 8, 1921, locomotive 1752, Stonehill, Mont. Piston rod broke, knocking out front cylinder head; a transverse crack extended two-thirds through the rod; 1 injured.

June 27, 1921, locomotive 329, Pendroy, Mont. Cap blew off injector delivery pipe, due to threads on cap being badly worn; 1 injured.

June 30, 1921, locomotive 1523, Clontarf, Minn. Draw bar between engine and tender failed due to old fracture; safety chains so long that slack permitted locomotive to move away from tender far enough to allow apron to hang down and fireman's foot slipped through opening; 1 injured.

Seventeen accidents; 17 injured.

GREEN BAY & WESTERN RAILROAD:

*August 28, 1920, locomotive 3, Grand Rapids, Wis. Squirt hose blew off; 1 injured.

One accident; 1 injured.

GULF COAST LINES:

*December 12, 1920, locomotive 65 (N. O. T. & M.), Krotz Springs, La. Water glass burst; cut by flying glass; 1 injured.

One accident; 1 injured.

HOCKING VALLEY RAILWAY:

*December 3, 1920, locomotive 227, Dundas, Ohio. Injured while getting down from boiler, due to step to generator being missing; 1 injured.

One accident; 1 injured.

ILLINOIS CENTRAL RAILROAD:

July 4, 1920, locomotive 1090, Fort Dodge, Iowa. Washout plug blew out; attempted to tighten under pressure; plug cross-threaded; 1 injured.

**August 21, 1920, locomotive 777, Lake Cormorant, Miss. Injured while using squirt hose; valve leaky; 1 injured.

**September 15, 1920, locomotive 616, Vicksburg, Miss. Shaker-bar lever broke at weld; defective weld; 1 injured.

**October 24, 1920, locomotive 859, near Greenlaw, La. Flue broke at weld; overheated in welding; 1 injured.

December 28, 1920, locomotive 138, Chicago, Ill. Cap blew off blower pipe, due to worn and effective threads on nipple pipe; 1 injured.

February 6, 1921, locomotive 1035, Bois, Ill. Flue broke off at front flue sheet where the end of the flue rolls had cut the flue; this and seven adjacent flues were badly pitted; 1 injured.

March 18, 1921, locomotive 976, Hammond, La. Handrail on Vanderbilt type of tender broke at connection to clamp at back of coal board; 1 injured.

Seven accidents; 7 injured.

INDIANA HARBOR BELT RAILROAD:

January 24, 1921, locomotive 312, Burnham, Ill. Cylinder-cock rod became disconnected, due to bolt that connects these rods on right side coming out and causing lever to fly back; 1 injured.

One accident; 1 injured.

INTERNATIONAL & GREAT NORTHERN RAILWAY:

August 25, 1920, locomotive 250, Sellers, Tex. Water glass burst; cut by flying glass; 1 injured.

*September 18, 1920, locomotive 252, Round Rock, Tex. Shaker bar became disconnected, due to pin working out; 1 injured.

January 19, 1921, locomotive 211, Houston, Tex. Water glass burst; cut by flying glass; wire-mesh shield torn for a distance of 2½ inches; 1 injured.

*February 13, 1921, locomotive 405, Mart, Tex. Scalded by hot water from defective squirt hose; 1 injured.

Four accidents; 4 injured.

KANSAS CITY SOUTHERN RAILWAY:

*August 6, 1920, locomotive 73 (point of accident not shown). Injured while operating reverse lever; lever would not remain in quadrant account of block not properly adjusted; 1 injured.

August 25, 1920, locomotive 400, Heavener, Okla. Squirt hose blew off; hose insecurely clamped and hose pipe nipple not turned down; 1 injured.

October 9, 1920, locomotive 83, Kansas City, Mo. Injured due to leaky blow-off cock; blow-off discharge pipe bent so that it formed a pocket which allowed water to accumulate and gush out; 1 injured.

April 23, 1921, locomotive 494, Sandel, La. Crown-sheet failure; low water; right boiler check valve stuck open, due to an accumulation of scale in valve case (no line check in injector delivery pipe); 16 staybolts broken prior to accident; crown sheet and side sheets badly pitted around the holes of 293 stays; 2 killed, 1 injured.

Four accidents; 2 killed, 4 injured.

LAKE ERIE & WESTERN RAILROAD:

November 9, 1920, locomotive 5352, Sedamsville, Ohio. Injector steam pipe failed at coupling nut at injector; nut too large and rubber gasket used in connection to prevent leakage; 1 injured.

**December 28, 1920, locomotive 5516, Marlott Park, Ind. Superheater flue broke near safe end weld; overheated in welding; 2 injured.

Two accidents; 3 injured.

LEHIGH VALLEY RAILROAD:

July 3, 1920, locomotive 2015, near Rummerfield, Pa. Manhole cover of diaphragm covering superheater units gave way, allowing cover to fall over exhaust causing back draft; 1 injured.

July 25, 1920, locomotive 2015, Cheektowago, N. Y. Crown-sheet failure due to broken crown stays which permitted crown sheet to pocket over area 68 inches long and 16 inches wide and pull off of 12 good stays; 37 broken stays were found within the pocketed area and 25 broken and 15 fractured stays were found outside the pocketed area; last inspection was 20 days prior to accident, when company rendered report stating that all crown stays and staybolts were left in "good" condition; 2 killed.

October 20, 1920, locomotive 3147, Jersey City, N. J. Crown-sheet failure; low water; bottom water-glass cock partially stopped up with scale formation; 1 killed, 2 injured.

November 15, 1920, locomotive 336, Mount Carmel, Pa. Left main crank pin broke, due to old fracture, while locomotive was running light at an approximate speed of 20 miles per hour on descending grade of 1.74 per cent; reversing gear and brake equipment were damaged and rendered inoperative; locomotive continued down grade until it attained an estimated speed of 50 miles per hour, when it collided with a passenger train standing at the station; 3 killed, 1 injured.

November 24, 1920, locomotive 4027, Readers, N. Y. Shaker bar slipped off post, due to poor design and worn post; 1 injured.

*December 1, 1920, locomotive 800, Coplay, Pa. Hinge on manhole cover was broken, and when brakeman stepped on cover it tipped over, allowing him to fall into tank; 1 injured.

February 9, 1921, locomotive 2000, Flagtown, N. J. Blind pocket supporting a dead grate bar blew out of fire-box throat sheet, due to not having been properly prossered in sheet, also pocket being too long for the water space and copper ferrule used being split; 1 killed.

February 24, 1921, locomotive 3133, Jersey City, N. J. Crown-sheet failure; low water; appurtenances damaged to such extent their previous condition could not be determined; autogenously welded crown-sheet flue-sheet seam failed its entire length; left side sheet seam failed through weld; the failure of these seams unquestionably increased the force of this explosion; 3 killed, 1 injured.

April 20, 1921, locomotive 929, near Victor, N. Y. Crown-sheet failure; low water; no contributory causes found; 3 killed, 1 injured.

June 3, 1921, locomotive 932, Alexander, N. Y. Drifting-valve bonnet blew out, due to loose fitting threads; 1 injured.

June 29, 1921, locomotive 382, Gracedale, Pa. Grease-cup plug broke while being reapplied after attempting to cool main pins, which were running hot, allowing hot grease to fly into engineer's eyes and face, due to weak construction of hollow plug; 1 injured.

Eleven accidents; 13 killed, 11 injured.

LOS ANGELES & SALT LAKE RAILROAD:

October 20, 1920, locomotive 3417, Hicks, Calif. Struck by piece of pipe flying off engine; one slat of pilot missing on arrival at destination; 1 injured.

*April 16, 1921, locomotive 3631, Acoma, Nev. Foot caught between reverse lever and boiler head, due to catch bolt missing; 1 injured.

**June 22, 1921, locomotive 3719, Las Vegas, Nev. Squirt hose blew off nipple, due to being insecurely clamped; 1 injured.

Three accidents; 3 injured.

LOUISVILLE & NASHVILLE RAILROAD:

July 5, 1920, locomotive 943, Sheffield Ala. Squirt-hose valve bonnet blew out, due to flange breaking off bonnet nut; 1 injured.

July 19, 1920, locomotive 542, South Louisville, Ky. Equalizing king pin broke, causing locomotive to drop at front end; 1 injured.

July 26, 1920, locomotive 717, Louisville, Ky. Squirt hose burst; defective hose; 1 injured.

**August 5, 1920, locomotive 1287, Strasburg, Ala. Reverse lever became unlatched and went into forward corner, due to latch pin and spring missing; 1 injured.

*August 31, 1920, locomotive 342, Choctaw, Ala. Injured while operating reverse lever, due to insufficient clearance between cab and lever; 1 injured.

September 3, 1920, locomotive 2103, Corbin, Ky. Injured while draining lubricator, due to drain pipe being loose at elbow; 1 injured.

September 8, 1920, locomotive 1213, Wawbeek, Ala. Ash-pan lever slipped off shaft, due to cotter key coming out of shaft; 1 injured.

September 12, 1920, locomotive 2083, Boyles, Ala. Injured while shaking grates, due to rod becoming disconnected; grate connecting pin lost out or broken; 1 injured.

**September 20, 1920, locomotive 1327, Etowah, Tenn. Squirt hose blew off; hose not securely clamped; 1 injured.

**September 21, 1920, locomotive 1365, near Morton, Ky. Injured, due to defective squirt hose valve; 1 injured.

September 26, 1920, locomotive 929, Latonia, Ky. Squirt-hose valve bonnet blew out; 1 injured.

October 20, 1920, locomotive 867, East Wood, Ky. Water cooler fell, striking fireman, due to weakened condition of screws that held it in place; 1 injured.

November 2, 1920, locomotive 1503, Guthrie, Ky. Shaker bar slipped off lever; 1 injured.

November 8, 1920, locomotive 1226, McGehee, Ala. Injured, due to shovel striking hole worn in shovel sheet; 1 injured.

November 12, 1920, locomotive 102, Opp, Ala. Tender deck was about 3 inches narrower than width of tender, and to overcome this a block of wood 2 inches by

3 inches by 12 inches had been nailed on to fill out offset; this became loose and turned, causing engineer to fall out of gangway; 1 injured.

*November 23, 1920, locomotive 1195, Calera, Ala. Collision; engineer unable to see stop signal, account of steam escaping from cylinder of engine; 1 injured.

December 26, 1920, locomotive 737, Brent, Fla. Right main driving tire broke, allowing broken wheel center to separate and break both side rods, bending running boards, guides, and rocker arms; hub was cracked and banded; 2 injured.

**January 7, 1921, locomotive 1565, near Spring Lake, Ky. Engine and tender separated from train, due to low coupler on rear of tender; 2 injured.

January 14, 1921, locomotive 745, near McDavid, Fla. Crown-sheet failure; low water; no contributory causes found; 1 injured.

**January 20, 1921, locomotive 238, Fagin, Tenn. Reverse lever flew out of quadrant, due to pinion at bottom of reverse lever being worn; 1 injured.

February 22, 1921, locomotive 1180, Replap, Ala. Arch stud blew out; stud defective and improperly applied; 1 injured.

February 23, 1921, locomotive 244, Guthrie, Ky. Grate shaker slipped off lever, due to improper fit; 1 injured.

**March 2, 1921, locomotive 1502, Nocturne, Ky. Cab apron caught on heads of bolts in shovel sheet; when rounding curve the apron buckled and when released bounded upward, causing serious injury; 1 injured.

**March 4, 1921, locomotive 957, near Ashley, Ill. Injured while firing locomotive with door disconnected; inspection showed door frame broken in two; 1 injured.

March 8, 1921, locomotive 882, Covington, Ky. Manhole cover forced from top of tank by rush of water when locomotive made sudden stop; no hinges or other proper fastenings used to prevent cover from coming off; 1 injured.

March 11, 1921, locomotive 1338, Dorsett, Tenn. Back side-rod knuckle pin worked out; 1 injured.

March 14, 1921, locomotive 1101, Maloney, Ky. Dump grate became disconnected and dropped down, causing ash pan to fill with live fire, burning grate-shaker connecting rod to such extent that rod broke when grates were being shaken; 1 injured.

March 20, 1921, locomotive 135, Keystone, Ala. Main pin broke off, due to old break extending two-thirds through the pin; 1 injured.

**April 3, 1921, locomotive 1550, Cozatt, Ky. Lid on right section of manhole had become disconnected and missing, allowing fireman to fall into tank; 1 injured.

**April 18, 1921, locomotive 1422, Boyles, Ala. Injured while shaking grates, due to reach rod becoming disconnected from shaker bar; 1 injured.

April 23, 1921, locomotive 1106, Etowah, Tenn. Plug in fire-box sheet knocked through sheet while attempting to talk under pressure; threads in hole and on stud corroded away; proper attention had not been given to the leaks when reported; 1 injured.

May 1, 1921, locomotive 1510, Guthrie, Ky. Shaker bar slipped off lever, due to improper fit; 1 injured.

**May 29, 1921, locomotive 1438, Evarts, Ky. Injury due to catch under seat being improperly applied; 1 injured.

May 29, 1921, locomotive 1240, Hendersonville, Tenn. Squirt hose burst; hose defective; 1 injured.

June 6, 1921, locomotive 621, Montgomery, Ala. Right front brake hanger, which holds adjusting rod, broke off from frame, striking links and knocking reverse-lever latch out of quadrant; brake hanger had an old crack about half-way through on the inside of bend where bolted to frame; 1 injured.

Thirty-five accidents; 37 injured.

MAINE CENTRAL RAILROAD:

*August 19, 1920, locomotive 604, Bangor, Me. Squirt hose blew off; 1 injured.

*September 28, 1920, locomotive 381, Burnham Junction, Me. Squirt hose burst; 1 injured.

October 2, 1920, locomotive 602, near Richmond, Me. Crown sheet failure; low water; bottom water-glass connection nearly stopped up with scale; water-glass drain cock stopped up; gauge cocks partially stopped up with sediment; 3 injured.

January 14, 1921, locomotive 352, near Bemis, N. H. Failure of drawbar and safety chains between locomotive and tender; drawbar had transverse

crack at point of failure; link in one safety chain, which failed, was crystallized and link in the other safety chain had a defective weld; 1 killed, 1 injured.
Four accidents; 1 killed; 6 injured.

MICHIGAN CENTRAL RAILROAD:

September 7, 1920, locomotive 7725, West Detroit, Mich. Cylinder head blew out; 1 injured.

December 18, 1920, locomotive 7943, Alexis, Ohio. Injured while operating reverse lever, due to stop block on quadrant missing; 1 injured.

December 24, 1920, locomotive 7945, near Delhi, Mich. Right main rod broke, due to old flaw; right and left main binders loose; right cylinder working on frame; left main driving-box crown brass broken and pounding bad; right main driving-box crown brass loose in box and pounding bad; rods had been reported defective on December 1, 2, 8, 12, 13, 16, 17, 18, 20, 21, 23, and 24; 2 injured.
Three accidents; 4 injured.

MINNEAPOLIS & ST. LOUIS RAILROAD:

**October 18, 1920, locomotive 305, between Oskaloosa, Iowa, and Monmouth, Ill. Injured while operating reverse lever, due to standpipe leaking and washing oil off valves, which had been reported three times before repairs were made; 1 injured.
One accident; 1 injured.

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

July 17, 1920, locomotive 3007, Ashland, Wis. Water glass burst; cut by flying glass; 1 injured.

January 4, 1921, locomotive 2443, Jewett, Wis. Main rod broke, due to old crack which had been autogenously welded; 1 injured.

June 27, 1921, locomotive 2619, Ladysmith, Wis. Handle pulled off globe valve in front end of injector delivery pipe while being closed, allowing engineer to fall off running board, due to handle being insecurely attached; 1 injured.
Three accidents; 3 injured.

MISSOURI, KANSAS & TEXAS LINES:

July 4, 1920, locomotive 108, Sedalia, Mo. Right front footboard 6½ inches above top of rail, which, being 2¾ inches below minimum requirement, permitted footboard-bracket bolt to strike road-crossing plank, springing footboard bracket and throwing switchman off; 1 killed.

* July 15, 1920, locomotive 721, Vinita, Okla. Main rod came down; while removing side rod steam entered cylinder and forced it back, striking fireman; 1 injured.

July 29, 1920, locomotive 67, Russellville, Ark. Squirt hose burst where badly worn; 1 injured.

* August 30, 1920, locomotive 748, Woodbine, Tex. Squirt hose blew off; 1 injured.

* September 9, 1920, locomotive 643, Baden, Mo. Squirt hose burst; 1 injured.

September 24, 1920, locomotive 858, near Atoka, Okla. Crown-sheet failure; low water; water glass applied too short, permitting gasket to squeeze past end of glass and interfere with proper circulation; 1 killed, 2 injured.

October 2, 1920, locomotive 216, Parsons, Kans. Washout plug blew out; attempted to tighten under pressure; 1 injured.

November 13, 1920, locomotive 409, Bartlesville, Okla. Turbine wheel burst, due to governor inoperative, permitting turbine to run at excessive speed; 1 injured.

November 25, 1920, locomotive 389, Parsons, Kans. Lubricator filling plug screwed out of lubricator in trying to stop leak while under pressure, due to lubricator being equipped with bushing with left-hand threads and plug with right-hand threads; 1 injured.

**December 9, 1920, locomotive 401, San Antonio, Tex. Water glass burst; cut by flying glass; 1 injured.

**December 31, 1920, locomotive 845, Caney, Okla. Shaker bar slipped off grate, due to cotter key missing; 1 injured.

* January 17, 1921, locomotive 706, Ladue, Mo. Spanner nut at end of injector throttle blew off; 1 injured.

March 27, 1921, locomotive 555, Cumby, Tex. Crown-sheet failure; low water; water glass missing; 2 killed.

April 1, 1921, locomotive 382, Ladue, Mo. Injured by reverse lever, due to latch spring missing; 1 injured.

* April 4, 1921, locomotive 246, near Parker, Kans. Shaker bar broke; 1 injured.

** June 19, 1921, locomotive 262, Bellmead, Tex. While reversing engine caught finger between loose jacket on boiler and reverse lever; 1 injured.
Sixteen accidents; 4 killed; 15 injured.

MISSOURI PACIFIC RAILROAD:

July 15, 1920, locomotive 1256, Claremore, Okla. Shaker bar slipped off lever, due to improper fit; 1 injured.

July 18, 1920, locomotive 6, North Little Rock, Ark. Squirt-hose operating valve located too low, causing cab apron to rub handle and open valve; 1 injured.

* July 19, 1920, locomotive 2715, Masonville, Ark. Squirt hose blew off; 1 injured.

** July 21, 1920, locomotive 9519, Fort Smith, Ark. Clinker hook broke while cleaning fire, causing employee to fall; 1 injured.

July 24, 1920, locomotive 2709, Snow Lake, Ark. Back-up eccentric strap broke, causing reverse lever to fly out of quadrant; 1 injured.

July 25, 1920, locomotive 81, near Kirkwood, Mo. Squirt hose burst; defective hose; 1 injured.

August 5, 1920, locomotive 436, Conway, Ark. Injured while closing throttle; insufficient clearance between throttle lever and gauge cock; 1 injured.

August 5, 1920, locomotive 51, Gurdon, Ark. Dump-grate lever bracket stud blew out; stud entered sheet only three threads and threads in sheet stripped; 1 injured.

August 6, 1920, locomotive 1252, De Soto, Mo. Injured while shaking grates, due to shaker bar becoming disconnected; 1 injured.

August 10, 1920, locomotive 172, Paragould, Ark. Tender deck at gangway defective, causing employee to fall out of gangway; 1 injured.

** August 18, 1920, locomotive 450, Samples, Ark. Injured while operating reverse lever; stop block missing from front end of quadrant, allowing insufficient clearance between lever in full forward position and boiler back head; 1 injured.

** August 22, 1920, locomotive 9426, North Little Rock, Ark. Reverse lever flew out of quadrant, due to latch being worn; 1 injured.

August 26, 1920, locomotive 30, Bald Knob, Ark. Shaker bar slipped off, due to improper fit and defective shaker-bar socket; 1 injured.

* September 3, 1920, locomotive 6401, Scott City, Kans. Shaker bar broke while shaking grates; 1 injured.

October 1, 1920, locomotive 6415, Everest, Kans. Injured while attempting to close water-glass cocks after water glass burst, due to water-glass cocks being difficult to close; 1 injured.

October 9, 1920, locomotive 410, McGehee, Ark. Reverse lever knocked to rear position, striking engineer; teeth of reverse-lever latch worn so that it would not properly secure reverse lever in all positions; 1 injured.

October 27, 1920, locomotive 427, near Cadet, Mo. Fireman's shovel caught in hole in badly worn shovel sheet; 1 injured.

November 1, 1920, locomotive 1806, near Blackville, Ark. Squirt-hose operating valve worked open; valve so located as to rub cab apron and cause to work open; 1 injured.

November 17, 1920, locomotive 1201, Eureka, Kans. Injured by leaky blow-off cock; 1 injured.

November 19, 1920, locomotive 57, Paragould, Ark. Oil cup broke off operating valve of steam-grate shaker, permitting steam to be discharged through oil-cup opening, when employee opened valve; 1 injured.

November 26, 1920, locomotive 2635, near Dean, Ark. Pilot, insecurely applied, drooped sufficiently to strike ties and ballast; 1 injured.

** November 27, 1920, locomotive 8609, Arkansas City, Ark. Shaker bar slipped off post, due to improper fit; 1 injured.

November 29, 1920, locomotive 13, near Hanson, Okla. Injured while closing dump grates with shaker bar; small piece broken out of shaker-bar socket, and lever of improper taper; 1 injured.

December 9, 1920, locomotive 107, near Bethel, Ark. Locomotive became uncoupled from leading engine, causing emergency application of brakes and the derailment of the forty-second and forty-third cars in train, with serious damage to one of them; front coupler badly worn; knuckle pin worn and bent and horn of knuckle and coupler lock worn; 2 injured.

January 3, 1921, locomotive 2662, Mulberry, Ark. Squirt hose blew off, due to clamp not being properly tightened; 1 injured.

January 3, 1921, locomotive 153, Swartz, La. Steam-chest release valve was broken and leaking badly; injured while trying to make necessary repairs to get engine to terminal; 2 injured.

** January 25, 1921, locomotive 7508, near Varner, Ark. Shaker bar slipped off of fulcrum lever, due to improper fit; 1 injured.

February 9, 1921, locomotive 1315, Myrick, Mo. Shaker bar slipped off lever, due to improper fit; 1 injured.

** February 25, 1921, locomotive 3604, Joplin, Mo. Washout plug blew out, due to being insecurely applied; 1 injured.

Twenty-nine accidents; 31 injured.

MOBILE & OHIO RAILROAD:

* September 15, 1920, locomotive 418, Roseborough, Ill. Reverse lever slipped out of quadrant; back end of quadrant was loose where bolted to running board; 1 injured.

** December 21, 1920, locomotive 420, Weaver Hill, Ill. Injured while operating reverse lever, due to improper counterbalance for reverse gear and stop missing from reverse-lever quadrant; 1 injured.

Two accidents; 2 injured.

NASHVILLE, CHATTANOOGA & ST. LOUIS RAILWAY:

November 4, 1920, locomotive 659, Rockledge, Tenn. Petticoat pipe came down, causing back draft; 2 injured.

April 25, 1921, locomotive 607, Hills Park, Ga. Handrail slipped out of place, due to pin missing; 1 injured.

Two accidents; 3 injured.

NEVADA NORTHERN RAILWAY:

** November 1, 1920, locomotive 21, Ely, Nev. Boiler-check cap blew off; defective threads on cap; 1 injured.

One accident; 1 injured.

NEW YORK CENTRAL LINES—EAST:

** July 30, 1920, locomotive 284, East Buffalo, N. Y. Flue broke at weld; overheated in welding; 1 injured.

September 6, 1920, locomotive 2158, Wassaic, N. Y. Reverse lever became unlatched and moved to full forward position while locomotive was hauling passenger train at about 40 miles per hour, with sufficient force to knock quadrant stud out of boiler, allowing contents of boiler to empty into cab; 1 injured.

September 7, 1920, locomotive 750, Belle Isle, N. Y. Squirt hose blew off; hose insecurely clamped; 1 injured.

September 20, 1920, locomotive 5169, near Mattoon, N. Y. Crown sheet failure; low water; right water-glass cock stopped up with hard scale. Auto-genuously welded combustion-chamber crown-sheet seam failed; 3 killed.

* October 18, 1920, locomotive 3301, West Albany, N. Y. Engine lost indicator plug, and when meeting passenger train the escaping steam broke windows of cars in that train and passenger was cut by glass; 1 injured.

October 21, 1920, locomotive 2633, near Batavia, N. Y. Crown sheet failure; low water; no contributory causes found; appurtenances damaged to such extent at time of accident that their previous condition could not be determined; 3 killed.

November 3, 1920, locomotive 3905, Newark, N. Y. Flue broke off at safe end weld; flue badly wasted away at point of fracture, due to overheating in welding; 2 injured.

November 11, 1920, locomotive 2084, Webster, N. Y. Cylinder head blew out; 1 injured.

January 15, 1921, locomotive 2919, Clearfield, Pa. Injector coupling nut to left branch pipe failed, due to defective threads and enlarged nut; 1 injured.

January 16, 1921, locomotive 2529, Verona, N. Y. Crown sheet failure; low water; right injector would prime only when water valve was almost closed; gauge-cock drip pipe stopped up and tank had large accumulation of coal, rivets, bolts, etc.; 2 injured.

** February 8, 1921, locomotive 2975, West Albany, N. Y. Handrail gave way, due to threads stripped at union connection; 1 injured.

March 6, 1921, locomotive 3144, Syracuse, N. Y. Crown sheet failure; low water; no contributory causes found; 3 injured.

* April 29, 1921, locomotive 5123, Corning, N. Y. While changing glass in marker on rear of tender, bracket broke, causing brakeman to fall to ground; 1 injured.

Thirteen accidents; 6 killed, 15 injured.

NEW YORK CENTRAL LINES—WEST:

September 14, 1920, locomotive 529 (K. & M.), Chauncey, Ohio. Grease-cup plug worked loose and blew out; 1 injured.

September 21, 1920, locomotive 4124, near Ashtabula, Ohio. Flue broke at safe-end weld; overheated in welding, and corroded; 2 injured.

* September 24, 1920, locomotive 2654, Pinola, Ind. Shaker bar broke at point where it had been welded; 1 injured.

** October 22, 1920, locomotive 5854, Bristol, Ind. Injured while operating reverse lever, due to lever latch breaking; 1 injured.

March 20, 1920, locomotive 4886, Cleveland, Ohio. Shaker staff broke, due to old flaw which extended 25 per cent through the staff; 1 injured.

May 15, 1921, locomotive 3981, Swanton, Ohio. Squirt hose blew off nipple, due to not being clamped; 1 injured.

Six accidents; 7 injured.

NEW YORK, CHICAGO & ST. LOUIS RAILROAD:

October 15, 1920, locomotive 40, Cleveland, Ohio. Water glass burst; cut by flying glass; panel glass missing from right side of shield; 1 injured.

** January 4, 1921, locomotive 441, Ober, Ind. Water glass burst; cut by flying glass; 1 injured.

April 4, 1921, locomotive 320, Chicago, Ill. Flue broke off near weld; overheated in welding; 1 injured.

Three accidents; 3 injured.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD:

** July 1, 1920, locomotive 2343, Providence, R. I. Coupler knuckle on front end of locomotive opened, causing cars to become uncoupled; 1 injured.

** July 3, 1920, locomotive 1316, North Haven, Conn. Cab apron worn smooth, causing fireman to fall; 1 injured.

** July 4, 1920, locomotive 2412, Boston, Mass. Coal board broke, permitting fireman to fall; 1 injured.

July 18, 1920, locomotive 451, South Weymouth, Mass. Nuts worked off clevis pin and link block pin and caused reverse lever to fly off quadrant; 1 injured.

July 18, 1920, locomotive 1316, near Windsor, Conn. Cylinder head blew out; 1 injured.

July 21, 1920, locomotive 830, Pittsfield, Mass. Lubricator-filling plug blew out; defective threads on plug; 1 injured.

July 22, 1920, locomotive 2465, Bridgeport, Conn. Petticoat pipe became disconnected, causing back draft; 1 injured.

August 1, 1920, locomotive 809, Boston, Mass. Reverse lever became unlatched due to latch being worn; 1 injured.

August 13, 1920, locomotive 2444, Taunton, Mass. Shaker lever became disconnected; 1 injured.

** October 1, 1920, locomotive 3214, Maybrook, N. Y. Hinge broke on apron over coal conveyor, due to pin and bolt working out; 1 injured.

** October 3, 1920, locomotive 3017, Westfield, Mass. Injured while operating coal pusher, due to piece of wire inserted in pin on handle instead of cotter pin; 1 injured.

October 20, 1920, locomotive 1326, near Carolina, R. I. Water-glass drip pipe broke off at connection to drain valve, due to badly worn and defective bushing; 1 injured.

** October 23, 1920, locomotive 129 (C. N. E.) Hampton, Conn. Injured while shaking grates, due to bolt coming out of grate shaker lever; 1 injured.

November 1, 1920, locomotive 484, Newington, Conn. Brake shoe on right side of tender flew off, due to broken keyways on brake head. Brake shoes reported defective on October 27, 28, and November 1; 1 injured.

** November 6, 1920, locomotive 1006, West Haven, Conn. Main and side rods on left side of locomotive broke, causing locomotive to strip on that side; 1 injured.

*November 7, 1920, locomotive 2375, Greens Farms, Conn. Studs on reverse lever bracket blew out; 1 injured.

**November 22, 1920, locomotive 486, Torrington, Conn. Too much lost motion in grate-shaking levers and not sufficient clearance between shaking lever and seat box; 1 injured.

**December 22, 1920, locomotive 422, Stanley, Mass. Defective blower pipe in front end of locomotive caused smoke and fire to blow back into the cab when applied; 1 injured.

December 23, 1920, locomotive 375, near Derby, Conn. Broken balance-valve strip spring caused engineer to lose control of reverse lever while handling locomotive; 1 injured.

December 31, 1920, locomotive 3332, Guilford, Conn. Sections of manhole cover out of place, causing fireman to fall; hinges broken and disconnected; 1 injured.

**January 24, 1921, locomotive 1533, Allerton, Mass. Injured while shaking grates, due to pin coming out of forward end of grate shaker rod; 1 injured.

February 25, 1921, locomotive 3221, Poughkeepsie, N. Y. Drawbar at rear of tender failed, causing locomotive to part from train; drawbar shank at point of failure showed an old and concealed defect comprising about 50 per cent of the cross-sectional area; 1 injured.

March 5, 1921, locomotive 491, Cooks, Conn. Steam-heat pipe blew out of turret, due to threads on nipple worn and corroded; 1 injured.

March 9, 1921, locomotive 1257, Uxbridge, Mass. Seat box fell, due to not being securely fastened to cab; 1 injured.

**March 12, 1921, locomotive 3208, Cedar Hill, Conn. Coupler on rear of tender dropped down, allowing engine to separate from train, due to broken coupler yoke; 1 injured.

April 4, 1921, locomotive 541, Hyde Park, Mass. Grate-shaker connecting rod disconnected in ash pan, due to bolt or pin working out; 1 injured.

April 8, 1921, locomotive 2442, Boston, Mass. Cab handhold broke, due to flaw in material; 1 injured.

April 9, 1921, locomotive 465, Easton, Mass. Injured while operating reverse lever, due to stop block on quadrant missing, allowing reverse lever to move forward against reducing valve; 1 injured.

May 3, 1921, locomotive 1268, South Weymouth, Mass. Employee was struck by ash-pan slide flying from passing locomotive; 1 injured.

June 22, 1921, locomotive 205, near Cobalt, Conn. Eccentric straps broke, causing reverse lever to fly out of quadrant; 1 injured.

Thirty accidents; 30 injured.

NORFOLK & WESTERN RAILWAY:

*August 9, 1920, locomotive 1701, Kinney, Va. Injured while closing ash pan; lever too long to allow proper clearance with upper wing of ash pan; 1 injured.

**August 24, 1920, locomotive 1160, Roanoke, Va. Reverse-lever counter-balance springs coupled to tumbling shaft by means of a link which rendered the springs inoperative; 1 injured.

**November 11, 1920, locomotive 1415, Shenandoah, Va. Lug broke off front coupler, due to old fracture, allowing locomotives to separate, resulting in emergency application of air brakes; 2 injured.

**November 25, 1920, locomotive 1020, Vesuvius, Va. Shaker bar slipped off; 1 injured.

**December 3, 1920, locomotive 1104, Roanoke, Va. Shaker bar slipped off lever, due to improper fit; 1 injured.

December 9, 1920, locomotive 807, Petersburg, Va. Flue broke at butt weld; defective weld; 1 injured.

December 26, 1920, locomotive 1442, McKenzie, W. Va. Handrail on right side of locomotive disconnected, causing brakeman to fall from running board; 1 injured.

*December 27, 1920, locomotive 1335, Roanoke, Va. Engine and tender parted from train, due to defective coupler on rear of tender; nuts missing off two bolts on right side of carrier-iron bolts; 1 injured.

**February 4, 1921, locomotive 1160, near Disputanta, Va. Stud bolt in union link plate on left crosshead failed, resulting in valve on left side stopping in position covering the ports, and the consequent pressure by compression caused left front cylinder head to be blown out; 1 injured.

February 9, 1921, locomotive 462, Berryville, Va. Two steel channels, to which tender drawbar casting was attached, broke just behind drawbar casting, causing end sill and safety chains to break and engine to separate from tender; right center sill was broken through and left one was broken about halfway through prior to accident; 1 injured.

May 3, 1921, locomotive 598, St. James, Md. Injured while operating reverse lever; reverse-lever latch worn and stop pin missing in front end of quadrant; 1 injured.

Eleven accidents; 12 injured.

NORTHERN PACIFIC RAILWAY:

*August 3, 1920, locomotive 2201, Gallatin, Mont. Pin on rear driver of engine broke flush with hub, due to old flaw in pin; 1 injured.

August 9, 1920, locomotive 2449, Glendive, Mont. Spanner nut failed at connection with line check and delivery pipe; threads worn and stripped and nut loose on check; 1 injured.

**August 16, 1920, locomotive 1616, Vista, Wash. Scalded by hot water from squirt hose; defective hose; 1 injured.

**September 24, 1920, locomotive 2136, near Buffalo, Minn. Air-whistle diaphragm came loose and fell from bracket, due to bolt working out; 1 injured.

**September 24, 1920, locomotive 1291, Townsend, Mont. Water glass burst; cut by flying glass; 1 injured.

**October 3, 1920, locomotive 1572, Superior, Wis. Injured while operating reverse lever; lever worked hard due to leaky throttle; 1 injured.

November 19, 1920, locomotive 1401, Aldrich, Minn. Shaker bar slipped off lever, due to improper fit; 1 injured.

**December 20, 1920, locomotive 2324, Northtown, Minn. Locomotive parted from train, causing sudden application of brakes; pilot beam behind coupler casting on locomotive was splintered, which did not leave a solid bearing behind coupler; 1 injured.

**April 3, 1921, locomotive 2197, Spire Rock, Mont. Top coal gate swung shut, causing injury to fireman; lug which holds gate open was worn so it would not stay fastened; 1 injured.

May 23, 1921, locomotive 2089, Schley, Mont. Petticoat pipe came down, causing back draft, due to brackets not properly bolted; 1 injured.

June 27, 1921, locomotive 1618, Wymer, Wash. Squirt hose parted at splice; 1 injured.

Eleven accidents; 11 injured.

OREGON SHORT LINE RAILROAD:

May 25, 1921, locomotive 591, near Farmington, Utah. Left steam pipe burst, due to thin wall and defect in casting 12 inches in length; 1 injured.

One accident; 1 injured.

OREGON-WASHINGTON RAILWAY & NAVIGATION Co.:

December 31, 1920, locomotive 4906, Albina, Oreg. Injured while dumping ash pan, due to improperly located feed-pipe brace; 1 injured.

One accident; 1 injured.

PENNSYLVANIA SYSTEM:

*July 2, 1920, locomotive 8583, New Castle, Ind. Cap on overflow valve to right injector blew off; due to worn condition of threads on overflow connection; 1 injured.

July 2, 1920, locomotive 6077, Richland, N. J. Crown-sheet failure; low water; no contributory causes found; 1 killed.

*July 4, 1920, locomotive 8642, Clayton, Ind. Squirt hose blew off at pipe connection in cab; 1 injured.

**July 4, 1920, locomotive 845, Lewistown, Pa. Injured while operating reverse lever, due to valve yoke striking on axle; 1 injured.

*July 10, 1920, locomotive 1389, Bulger, Pa. Squirt hose burst; 1 injured.

*July 21, 1920, locomotive 99, Hoagland, Ind. Squirt hose became disconnected, due to improperly fitted clamp; 1 injured.

*July 25, 1920, locomotive 1075, Trafford, Pa. Engine and tender parted, due to draw-bar pin on engine breaking, which allowed enough slack to cause safety chains to break; 1 injured.

**August 7, 1920, locomotive 8524, near Columbia City, Ind. Blower pipe became disconnected at valve; 1 injured.

August 7, 1920, locomotive 2273, Pittsburgh, Pa. Lubricator filling plug blew out; threads on plug and in lubricator worn; 1 injured.

August 7, 1920, locomotive 1136, Newport, Pa. Flue broke, due to metal being badly corroded and wasted away; 1 injured.

**August 8, 1920, locomotive 2547, Northumberland, Pa. Injured while using squirt hose; defective hose; 1 injured.

August 17, 1920, locomotive 8998, Bicknell, Ind. Flue broke, due to being excessively prossered; about 60 per cent of the flues had been excessively prossered with improper prossers; the back flue sheet is one-half inch thick and prossers used were made for three-eighth-inch flue sheets; 1 injured.

*August 17, 1920, locomotive 3279, Pittsburgh, Pa. Squirt hose became disconnected; 1 injured.

August 22, 1920, locomotive 2354, East Altoona, Pa. Lubricator oil-control valve broke off while attempting to tighten; 1 injured.

August 23, 1920, locomotive 7935, Camp Dennison, Ohio. Flue broke at safe end weld; overheated in welding; 1 injured.

September 2, 1920, locomotive 3420, East Altoona, Pa. Arch-tube plug blew out; plug applied cross-threaded; attempted to tighten under pressure; 1 injured.

**September 3, 1920, locomotive 4015, Baltimore, Md. Derailment, left engine-truck spring broken, throwing excessive weight on one side and causing wheels to mount frog at crossover; 1 injured.

**September 3, 1920, locomotive 1526, New Brunswick, N. J. Injured by flying piece of iron from lap-and-lead lever, which broke, due to old flaw, while locomotive was in motion; 2 injured.

*September 4, 1920, locomotive 8405, Burgettstown, Pa. While cleaning fire, blaze blew out account of defective blower; 1 injured.

*September 5, 1920, locomotive 8797, Vandalia, Ill. Grate-shaker lever became disconnected, account of cotter key being broken or missing; 1 injured.

September 6, 1920, locomotive 9922, New Waterford, Ohio. Flue broke off inside of flue sheet, due to flue being thinned by leakage and repeated working; 1 killed.

**September 7, 1920, locomotive 1166, Altoona, Pa. Squirt hose parted at splice; not securely spliced; 1 injured.

*September 12, 1920, locomotive 9965, Alliance, Ohio. Apron between engine and tender failed, account of pin working out; 1 injured.

**September 17, 1920, locomotive 7939 (L. M.), Columbus, Ohio. Rivet blew out of fire-box sheet while attempting to calk with 190 pounds of pressure on boiler; head missing from rivet on water side; 1 injured.

September 18, 1920, locomotive 3172, West Philadelphia, Pa. Washout hand-hold-plate gasket blew out of throat sheet; metal around opening in sheet corroded and wasted away to one-eighth inch in thickness; 1 injured.

September 18, 1920, locomotive 278, Philadelphia, Pa. Lubricator-oil pipe broke off, due to defective nipple connection; 1 injured.

*September 19, 1920, locomotive 8373, Bowerston, Ohio. Brakeman sitting alongside of track; pilot step flew off of passing passenger train engine and struck him on head, killing him instantly; 1 killed.

September 23, 1920, locomotive 850, Altoona, Pa. Lubricator-pipe valve bushing broke off at lubricator connection, due to old defect; 1 injured.

*September 28, 1920, locomotive 2028, Pittsburgh, Pa. Arch tube broke, scalding fireman; 1 injured.

**October 8, 1920, locomotive 7510, Chicago, Ill. Relief valve blew out of left back cylinder head; 1 injured.

*October 12, 1920, locomotive 7230, Cleveland, Ohio. Flue burst; 1 injured.

*October 18, 1920, locomotive 9066, Tiffin, Ohio. Shaker bar slipped off lever; 1 injured.

*October 24, 1920, locomotive 9428, Zoarville, Ohio. Grate-shaker bar slipped off lever; 1 injured.

*October 29, 1920, locomotive 4223, Lock Haven, Pa. Engine truck wheels derailed, due to flange on right engine truck wheel being worn below gauge and sharp; 1 injured.

November 1, 1920, locomotive 1776, Harrisburg, Pa. Steam-heat valve at rear of tender burst; valve subjected to undue strain account of water of condensation entrapped in steam-heat pipe line, causing hammer blow when live steam was admitted; old fracture in valve; 1 injured.

*November 4, 1920, locomotive 3162, near Unionville, Pa. Struck by piece of right main driving-box hub liner, which broke off and was thrown from passing locomotive; 1 injured.

November 14, 1920, locomotive 4036, Garland, Pa. Eccentric rod broke; 1 injured.

November 18, 1920, locomotive 17123, Canton, Ohio. Boiler check flange blew off; attempted to repair leakage of check-flange gasket by calking; 2 studs broken at root of thread at barrel and other studs badly crystallized and partially broken; 1 killed, 1 injured.

November 29, 1920, locomotive 3171, Menlo Park, N. J. Crown sheet failure; low water; gauge-cock drip stopped up; heavy accumulation of scale at base of crown bolts; first safety valve lifted at 198 pounds, while badge plate showed 175 pounds allowed working pressure; 1 injured.

December 2, 1920, locomotive 1452, Portage, Pa. Flue failure, due to material being deteriorated and wasted away; 1 injured.

**December 3, 1920, locomotive 3748, Stemmers Run, Md. Drain pipe flew from locomotive moving at approximate speed of 40 miles per hour and struck employee who was standing near track; 1 injured.

*December 7, 1920, locomotive 400, Lockport, Pa. Manhole cover on tender missing, allowing fireman to fall into manhole; 1 injured.

*December 8, 1920, locomotive 7458, Leetsdale, Pa. Shaker bar became dislodged from lever, due to improper fit; 1 injured.

December 21, 1920, locomotive 86, Sinnamahoning, Pa. Flue broke just inside of front flue sheet, due to flue being wasted away to about one-sixteenth inch thickness at safe end weld where flue had been cut for length within three-fourths inch of weld when applied about 60 days previously; 1 injured.

December 25, 1920, locomotive 8726, Spencer, Ind. Brazing collar blew off of left injector steam pipe, due to being of improper design and construction and improperly applied; 1 injured.

December 31, 1920, locomotive 782, Philadelphia, Pa. Steam-heat valve broke off at threaded connection to steam turret, due to old defect and improper application. Valve reported defective seven different times prior to accident and repairs not made; 1 injured.

*January 11, 1921, locomotive 7282, Canton, Ohio. Broken rivet blew out; rivet had been heavily calked and had been overheated when applied; 2 injured.

*January 12, 1921, locomotive 3651, Peters Creek, Pa. Crosshead arm became disconnected from right crosshead, causing valve to trap steam in front end of cylinder, forcing cylinder head out, at which time cylinder-cock rigging lever was violently forced against engineer's leg; 1 injured.

*January 18, 1921, locomotive 9859, Orrville, Ohio. Driving-wheel tire came off, due to not being properly fitted to the wheel center; 1 injured.

*January 26, 1921, locomotive 662, Windber, Pa. Intermediate side rod on right side broke, striking reach rod and bending reverse lever so as to cause injury to engineer; 1 injured.

January 29, 1921, locomotive 2974, Marianna, Pa. Right back crank pin broke due to old fracture extending approximately two-thirds the cross-sectional area of the pin at a point about 1 inch in the wheel fit from the outside face of the wheel center; 1 injured.

*January 31, 1921, locomotive 9823, Newcomerstown, Ohio. Tender and three passenger-train coaches derailed while running at a speed of about 35 miles per hour, due to loss of two bolts securing left tie bar on left front pedestal on front tender truck, allowing it to drop down and strike stock rail of turnout; 21 injured.

February 1, 1921, locomotive 3500, Trenton, N. J. Draft-pipe bolts and lugs gave way, allowing draft pipe to swing over exhaust and cause back draft while locomotive was working; 1 injured.

February 1, 1921, locomotive 1995, Philadelphia, Pa. Throttle valve stuck open, due to faulty construction of rigging inside of boiler, causing parts to bind; 1 injured.

*February 2, 1921, locomotive 1051, Marion, N. J. Crown sheet failure; low water; no contributory causes found; 1 injured.

February 3, 1921, locomotive 3741, Baltimore, Md. Derailment, due to broken engine-truck spring (old defect); 2 injured.

February 12, 1921, locomotive 241, Birmingham, Pa. Blower pipe became disconnected in cab, due to loose and improper fitting valve connection; 1 injured.

February 24, 1921, locomotive 1798, Kane, Pa. Flue failure; 1 injured.

February 27, 1921, locomotive 8220, Pittsburgh, Pa. Locomotive derailed on frog while hauling a passenger train, due to broken engine-truck spring and hanger disconnected; 1 injured.

March 6, 1921, locomotive 9631, Lima, Ohio. Slipped on apron and dislocated shoulder, due to apron being worn smooth and slippery; 1 injured.

March 14, 1921, locomotive 3680, Derry, Pa. Left extended piston-rod cross-head stud failed, allowing crosshead to fly out; stud stripped and cotter hole sheared; 1 injured.

March 21, 1921, locomotive 8640, Coatesville, Ind. Left main driving axle broke, causing various parts of valve motion to break and reverse lever to jump out of quadrant; old fracture extended about two-thirds through the axle; 2 injured.

April 18, 1921, locomotive 5230, Renova, Pa. Injector steam-pipe spanner nut broke; nut badly mutilated by the use of set or chisel used instead of spanner wrench; 1 injured.

**April 20, 1921, locomotive 1520, near Petersburg, Pa. Derailment; left wheel of engine truck mounted switch point, due to sharp flange; 1 injured.

**May 4, 1921, locomotive 8388, Indianapolis, Ind. Shaker bar slipped off lever, due to excessive taper of lever and lever too large for shaker bar; 1 injured.

**May 18, 1921, locomotive 9439, Xenia, Ohio. Shaker bar slipped off lever, due to improper fit; 1 injured.

**May 22, 1921, locomotive 1693, East Altoona, Pa. Squirt hose blew off nipple, due to not being clamped; 1 injured.

May 24, 1921, locomotive 347, Bessemer, Pa. Flue broke off in front tube sheet at an old weld; 1 injured.

June 11, 1921, locomotive 8894, Decatur, Ill. Plug blew out of fire box right side sheet; plugged crack had been excessively calked and threads in side sheets were practically worn away; 1 injured.

June 13, 1921, locomotive 943, Harrisburg, Pa. Squirt hose burst; hose defective; 1 injured.

June 18, 1921, locomotive 8654, Wellsville, Ohio. Shaker bar handle slipped off post, due to improper fit; 1 injured.

June 25, 1921, locomotive 60, Mount Carbon, Pa. Fireman slipped on cab apron, due to apron worn smooth; 1 injured.

June 30, 1921, locomotive 3747, Patuxent, Md. Scalded by hot water from defective squirt hose; 1 injured.

Seventy-three accidents; 4 killed, 94 injured.

PERE MARQUETTE RAILWAY:

*November 3, 1920, locomotive 167, Coleman, Mich. Handrail on tank of engine pulled off at one end, due to bolts having worked loose; 1 injured.

One accident; 1 injured.

PHILADELPHIA & READING RAILWAY:

July 26, 1920, locomotive 1192, Camden, N. J. Grate-shaker lever-bracket stud blew out; threads on stud stripped; 1 injured.

*August 14, 1920, locomotive 698, Gwynedd Valley, Pa. Transmission-bar hanger on left side of engine broke, due to flaw in weld, causing reverse lever to spring back; 1 injured.

*September 7, 1920, locomotive 116, Atlantic City, N. J. Fell from engine account of step missing; 1 injured.

September 13, 1920, locomotive 988, Lenape, Pa. Squirt hose blew off, due to defective connection; 1 injured.

September 18, 1920, locomotive 1018, Birdsboro, Pa. Injured by discharge of steam and hot water from injector feed pipe, due to leaky and badly corroded boiler checks; boiler checks reported leaking on September 10, 13, 14, 15, 16, 17, and 18 and repairs not made; 1 injured.

**October 6, 1920, locomotive 320, Royersford, Pa. Engineer fell from running board while trying to close cylinder cocks, due to cylinder-cock rod being disconnected and cylinder cocks defective. Cylinder cocks had been reported defective on October 4 and 5. Locomotive engaged in hauling passenger train at estimated speed of 20 miles per hour; 1 injured.

October 14, 1920, locomotive 330, Philadelphia, Pa. Steam heat valve broke off at casing; 1 injured.

*November 14, 1920, locomotive 1743, Lees Cross Roads, Pa. Slipped on apron, due to corrugation being worn smooth and apron wet from rain; 1 injured.

*November 19, 1920, locomotive 212, Lebanon Valley Jct., Pa. Journal box on truck of engine tank broken, causing train to part and tank and four coaches to be derailed; break appeared to be old defect; 1 injured.

**January 13, 1921, locomotive 609, Philadelphia, Pa. Main-rod key worked out and fell from engine on elevated track, striking pedestrian; 1 injured. Ten accidents; 10 injured.

PITTSBURG & LAKE ERIE RAILROAD:

July 21, 1920, locomotive 9550, Brownsville Jct., Pa. Crown sheet failure; low water; gauge-cock drip stopped up; bottom water-glass cock found closed by two different men immediately after explosion; boiler check on left side reported sticking and leaking on 13 different occasions from June 2 to date of accident; 3 injured.

One accident; 3 injured.

RICHMOND, FREDERICKSBURG & POTOMAC RAILROAD:

October 18, 1920, locomotive 85, near Alexandria, Va. Crown sheet failure; low water; gauge-cock drip pipe stopped up; steam pipe at top of water glass bent in such manner as to form a trap, rendering the reading of the water glass unreliable; 1 injured.

One accident; 1 injured.

RIVER TERMINAL RAILWAY:

*November 17, 1920, locomotive 38, Cleveland, Ohio. Handrail broke at column, causing fireman to fall; 1 injured.

One accident; 1 injured.

ST. LOUIS-SAN FRANCISCO RAILWAY:

July 3, 1920, locomotive 1011, Sapulpa, Okla. Squirt hose burst; defective hose; 1 injured.

July 10, 1920, locomotive 41, Memphis, Tenn. Flue broke; flue wasted away to about one sixty-fourth of an inch in thickness at point of failure; 1 injured.

August 5, 1920, locomotive 1237, Ten Brook, Mo. Handrail pulled out of column socket; handrail too short; 1 injured.

**August 14, 1920, locomotive 819, Sapulpa, Okla. Fire-door chain broke where it had been wired to throttle fulcrum, causing fireman to fall; 1 injured.

August 17, 1920, locomotive 4024, White Oak, Okla. Shaker bar slipped off lever, due to improper fit; 1 injured.

**August 27, 1920, locomotive 4010, Vinita, Okla. Shaker bar slipped off post; shaker bar of improper design; 1 injured.

**September 18, 1920, locomotive 1307, near Arlington, Mo. Reverse lever came unlatched, due to one latch spring missing and another one weak and failing to hold reverse lever in place; 1 injured.

September 28, 1920, locomotive 1221, Newburg, Mo. Blow-off cock discharge pipe blew out, due to badly worn threads in discharge end of blow-off cock; 1 injured.

October 3, 1920, locomotive 729, Cache, Okla. Squirt hose burst; hose worn and defective; 1 injured.

*October 4, 1920, locomotive 747, Stephenville, Tex. Spring hanger broke, allowing reverse lever to fly back; 1 injured.

October 11, 1920, locomotive 989, Sapulpa, Okla. Reverse lever became unlatched, due to badly worn parts; 1 injured.

**October 16, 1920, locomotive 1068, Phillipsburg, Mo. Shaker bar slipped off lever; 1 injured.

October 19, 1920, locomotive 4005, Chelsea, Okla. Injured while making repairs to stoker which had stopped working, due to rack being stripped off end of piston rod; defective threads on piston; 1 injured.

November 12, 1920, locomotive 1003, Neutral, Kans. Crown-sheet failure; low water; gauge-cock drip stopped up with mud so water would not drain out; 1 injured.

**November 15, 1920, locomotive 770, Ten Brook, Mo. Squirt hose burst; 1 injured.

November 16, 1920, locomotive 1337, Cherokee, Kans. Shaker bar slipped off lever, due to improper fit; 1 injured.

December 23, 1920, locomotive 4029, Stroud, Okla. Shaker bar slipped off post, due to improper fit; 1 injured.

* December 26, 1920, locomotive 15, Valley Park, Mo. Coupler on rear of engine broke, allowing train to separate and rear of train to run down and collide with two other engines; 1 injured.

* December 30, 1920, locomotive 954, Amory, Miss. Engine became uncoupled from cars, due to pin which holds the coupler and pocket breaking; 1 injured.

January 13, 1921, locomotive 1335, near Olathe, Kans. Shaker bar slipped off, due to improper fit; 1 injured.

March 1, 1921, locomotive 58, Sills, Mo. Plate in front netting became loose and fell down over exhaust nozzle causing back draft; 1 injured.

March 17, 1921, locomotive 1204, near Wilcox, Miss. Left radius rod broke, due to inferior grade of iron, stripping valve gear on left side; 1 injured.

March 22, 1921, locomotive 3693, Memphis, Tenn. Rear grab iron broke through top bolt hole on right side, due to old crack, as switchman attempted to mount footboard; 1 injured.

March 31, 1921, locomotive 524, Scammon, Kans. Squirt hose burst; hose defective; 1 injured.

Twenty-four accidents; 24 injured.

ST. LOUIS SOUTHWESTERN RAILWAY:

** July 10, 1920, locomotive 416 (M. P.), Illmo, Mo. Squirt hose blew off of nipple; hose insecurely clamped; 1 injured.

** July 17, 1920, locomotive 312, Piggott, Ark. Injector primer valve and bonnet blew out; threads on bonnet stripped; 1 injured.

* December 29, 1920, locomotive 664, Eylau, Tex. Engine and tender became uncoupled, allowing fireman to fall between them. Drawbar pin worked up, allowing pin to work out of drawbar; 1 injured.

* January 19, 1921, locomotive 583, Clarendon, Ark. Shaker bar broke; 1 injured.

June 10, 1921, locomotive 600, Idalia, Mo. Reverse lever latch worked out of quadrant, due to loose latch bolt; 1 injured.

Five accidents; 5 injured.

SAN ANTONIO & ARANSAS PASS RAILWAY:

* July 22, 1920, locomotive 232, San Antonio, Tex. Injured while operating reverse lever, due to band around boiler jacket being loose; 1 injured.

One accident; 1 injured.

SEABOARD AIR LINE RAILWAY:

* August 25, 1920, locomotive 674, Andrews, S. C. Spring hanger broke; 1 injured.

** August 28, 1920, locomotive 272, Maxton, N. C. Throttle lever fulcrum broke through eye at boiler connection, due to throttle being packed too tight; 1 injured.

November 10, 1920, locomotive 1053, Savannah, Ga. High coupler on locomotive and low coupler on car, allowing locomotive and cars to separate on grade and cars to run away; 1 killed.

** November 12, 1920, locomotive 632, Asbury, N. C. Knuckle pin worked out of right side rod, allowing back section of side rod to fly around and break running board under the cab; 1 injured.

November 27, 1920, locomotive 1599, Jacksonville, Fla. Crown sheet failure: low water; no contributory causes found; autogenously welded seam in crown sheet failed; 1 killed, 3 injured.

* December 5, 1920, locomotive 194, Helena, Va. Injured while cleaning grates account of grates being defective; 1 injured.

January 30, 1921, locomotive 1567, near Waxhaw, N. C. Crown sheet failure: low water; no contributory causes found; 1 injured.

* March 27, 1921, locomotive 1055, Tampa, Fla. Injured while attempting to open ash pan, due to key bolt coming out; 1 injured.

May 23, 1921, locomotive 975, Cayce, S. C. Arch-tube plug blew out while attempting to tighten under pressure; threads on plug defective; 1 injured.

Nine accidents; 2 killed, 10 injured.

SHARPSVILLE RAILROAD:

* October 22, 1920, locomotive 344, Sharpsville, Pa. Loose blow-off cock blew off while attempt was made to tighten; 1 injured.

One accident; 1 injured.

SOUTHERN RAILWAY:

* July 1, 1920, locomotive 1365, Spartansburg, S. C. Squirt hose blew off; injured.

** July 2, 1920, locomotive 539, Juliette, Ga. Reverse lever became disconnected, due to nuts working off bolts at bottom end of reverse lever at frame; injured.

* July 4, 1920, locomotive 1480, Calverton, Va. Injured while shaking grates, due to pin in stop latch working out; 1 injured.

* July 7, 1920, locomotive 1738, Hamburg, S. C. Squirt-hose connection blew off; connection screwed into pipe only three threads; 1 injured.

* July 8, 1920, locomotive 8254, Reids, Ga. Injured while operating reverse lever; valve gear not properly balanced; 1 injured.

** July 9, 1920, locomotive 1626, Spencer, N. C. Squirt hose blew off; hose not properly clamped; 1 injured.

** July 10, 1920, locomotive 400 (G. S. & F.), Elko, Ga. Flue broke off at head where it had been autogenously welded to sheet; 1 injured.

* July 11, 1920, locomotive 509, Tyrone, Ky. Injured while operating reverse lever; valves dry, due to lack of lubrication; eccentric-strap bolts loose and broken; eccentric set screws missing and transmission-bar hangers loose; work reports prior to accident contained items on 13 different occasions pertaining to valve gear, but repairs were not made and locomotive continued in service without repairs after this accident occurred; 1 injured.

* July 16, 1920, locomotive 6600, Tannehill, Ala. Main rod broke through keyway; inspection showed a small old crack on the inner side of rod; 1 injured.

** July 22, 1920, locomotive 310, Siler City, N. C. Squirt hose blew off; insecurely clamped; 1 injured.

* July 29, 1920, locomotive 1553, Rock Hill, S. C. Footboard caught on switch frog and tore off, due to bolt reaching through foot board too far and catching on guard rail; 1 injured.

* August 8, 1920, locomotive 6176, Cincinnati, Ohio. Grate-shaker bar slipped off lever, due to excessive taper; 1 injured.

* August 9, 1920, locomotive 640, Francisco, Ind. Injured while operating reverse lever; right rocker arm and transmission bar, all four eccentric blades, and both links badly worn and improperly repaired; 1 injured.

* August 10, 1920, locomotive 859, New Albany, Ind. Whistle valve stuck open, due to piece of drilled stud shell being lodged in whistle valve seat; "Whistle valve sticks open" shown on daily inspection report for August 10 and repairs indicated; 2 injured.

* August 11, 1920, locomotive 723, Ashley Junction, S. C. Squirt hose blew off; 1 injured.

** August 19, 1920, locomotive 69, near Eckerty, Ind. Cab apron worn smooth where fireman stands; 1 injured.

** August 22, 1920, locomotive 855, Kingsville, S. C. Squirt hose pulled off; hose not securely clamped; 1 injured.

** September 21, 1920, locomotive 1204, Duncan, S. C. Valve-rod key worked out while engineer was reversing lever, due to improper inspection; 1 injured.

* September 22, 1920, locomotive 698, Sycamore, Va. Squirt hose blew off; not securely clamped and hose old and badly deteriorated; 1 injured.

* September 25, 1920, locomotive 1326, near Macon, Ga. Bolt broke or worked out of front of cylinder cock lever, allowing lever in cab to strike engineer; 1 injured.

* September 27, 1920, locomotive 738, Chattanooga, Tenn. Main reservoir pipe blew out; defective threads in reservoir, causing emergency application of brakes; 1 injured.

** October 5, 1920, locomotive 1207, near Cornwall, S. C. Squirt hose blew off, due to being insecurely applied; 1 injured.

* October 16, 1920, locomotive 6682, Chattanooga, Tenn. Cab apron became disconnected, permitting fireman's leg to be caught between engine and tender; 1 injured.

* October 18, 1920, locomotive 6913, Vossburg, Miss. Injured while applying plug to hole in right steam chest, from which drifting valve had blown out; 1 injured.

* October 22, 1920, locomotive 523, Benaja, N. C. Squirt-hose pipe broke off at elbow; 1 injured.

* October 24, 1920, locomotive 610, Town Creek, Ala. Left back section of side rods became disconnected, due to knuckle pin working out; 2 injured.

November 1, 1920, locomotive 6201, Oakdale, Tenn. Steam-heat hose between engine and tender left uncoupled and hanging; caught and broke connection in cab, pulling off water glass in cab; 1 injured.

November 5, 1920, locomotive 5025, Kings Mountain, N. C. Crown sheet failure; low water; no contributory causes found; 2 injured.

November 11, 1920, locomotive 6351, Kings Mountain, Ky. Ash-pan blower pipe blew out of union, due to threads being practically wasted and worn away; 1 injured.

November 11, 1920, locomotive 580, Bell, Ky. Ash-pan blower-pipe union became disconnected; threads in nut on blower valve eaten away and seat on sleeve pitted, indicating union nut had not been tight for some time; 1 injured.

November 13, 1920, locomotive 6469, near Somerset, Ky. Shaker bar slipped off post, due to excessive taper of lever; 1 injured.

** November 16, 1920, locomotive 6586, Atlanta, Ga. Injured while operating shaker bar; shaker post not of sufficient length; 1 injured.

November 19, 1920, locomotive 1584, Macon, Ga. Injured while operating shaker bar; pin connecting lever to shaker rod in ash pan either broke or worked out; 1 injured.

** November 27, 1920, locomotive 753, Dallas, Ga. Lubricator steam pipe broke; 1 injured.

November 29, 1920, locomotive 6371, Pilot Mountain, Tenn. Arch tube pulled out of throat sheet; tube had not been beaded or belled to hold it in place; 1 injured.

November 30, 1920, locomotive 1243, Sumner, N. C. Autogenously welded crack 21 inches long in boiler head failed its entire length; 2 injured.

December 2, 1920, locomotive 6020, Citico, Tenn. Shaker bar slipped off post, due to improper fit; 1 injured.

* December 16, 1920, locomotive 4577, Harbin, S. C. Injector steam pipe failed where it had been brazed; 1 injured.

December 26, 1920, locomotive 4602, near Eden, Ala. Injured while operating reverse lever, due to insufficient clearance between lever in full forward position and boiler head; 1 injured.

December 28, 1920, locomotive 6371, Oneida, Tenn. Injured while shaking grates, due to insufficient clearance between shaker bar and appurtenances on boiler back head; 1 injured.

* January 1, 1921, locomotive 1106, Efland, N. C. Reverse lever flew back, account of valve stem becoming disconnected; 1 injured.

January 14, 1921, locomotive 6354, Lansing, Tenn. Injured while starting street stoker, due to insufficient clearance between drain pipe and fly wheel; 1 injured.

January 14, 1921, locomotive 6501, Meridian, Miss. Bottom arm of shaker lever became disconnected, account of cotter key shearing off; 1 injured.

January 29, 1921, locomotive 6421, Chattanooga, Tenn. Hand cut by sharp edge of steam-gauge light guard; edge sharp and not properly protected; 1 injured.

January 29, 1921, locomotive 738, Moscow, Tenn. Squirt hose blew off, due to being insecurely attached to nipple; 1 injured.

January 30, 1921, locomotive 4503, Leeds, Ala. Grease-cup plug blew out while being replaced after filling cup, due to pin running hot; 1 injured.

February 17, 1921, locomotive 1034, Hiram, Ga. Grate-shaker lever broke; old flaw at point of fracture; 1 injured.

February 23, 1921, locomotive 1040, Conway, Ky. Injured while operating reverse lever, due to overtravel of reverse lever in forward motion; stop pin in front end of quadrant located 1½ inches too far ahead, permitting handle of reverse lever to strike air pipes on back head; 1 injured.

February 26, 1921, locomotive 6462, Anniston, Ala. Injured while shaking grates; a straight shaker bar being used, which struck oil stand over fire door when pushed ahead; 1 injured.

March 14, 1921, locomotive 4597, Ferguson, Ky. Injured while cleaning ash pans, due to ash-pan blower valve leaking around packing nut at stem. No extension handle attached to lever to give safe distance for operator; 1 injured.

May 6, 1921, locomotive 570, Glen Alpine, N. C. Right valve stem broke, causing reverse lever to fly back; striking engineer while in the act of changing position of lever; 1 injured.

May 14, 1921, locomotive 6261, Lexington, Ky. Reverse lever came out of quadrant, due to excessive lost motion in reverse-lever latch and rigging; notches in quadrant badly worn; 1 injured.

* May 19, 1921, locomotive 1656, Atlanta, Ga. Footboard tilted causing hitchman to fall off, due to heads of bolts fastening footboard having worked loose; 1 injured.

May 21, 1921, locomotive 349, Round Mountain, Ala. Injured while shaking grates, due to too much lost motion in grate-shaking apparatus; 1 injured.

May 25, 1921, locomotive 6015, Chattanooga, Tenn. Air fire door closed and caught fireman's hand while raking fire, due to pin that operated the air valve being worn; 1 injured.

June 1, 1921, locomotive 6886, Barnett, Miss. Left injector steam pipe broke at collar to injector, due to old fracture extending nearly through and two-thirds around pipe; injector not properly bolted to brace; 1 injured.

June 18, 1921, locomotive 746, near Greenvier, Ala. Reverse lever came out of quadrant, due to weak latch spring; 1 injured.

Fifty-seven accidents; 61 injured.

SOUTHERN PACIFIC—EAST:

July 4, 1920, locomotive 77 (T. & N. O.), El Paso, Tex. Injector-primer valve bonnet blew out, due to loose fit; threads in injector body defective; 1 injured.

January 15, 1921, locomotive 251 (L. W.), near Elgin, Tex. Right side rod broke at defective forge weld; 1 injured.

June 17, 1921, locomotive 785 (G. H. & S. A.), San Antonio, Tex. Heater lock bonnet, nut, and check blew out of right injector, due to nut which holds bonnet to body of injector not being properly fastened; 1 injured.

June 26, 1921, locomotive 134 (T. & N. O.), El Paso, Tex. Handrail and upright on Vanderbilt tank broke, permitting engineer and fireman to fall to ground; 2 injured.

Four accidents; 5 injured.

SOUTHERN PACIFIC—WEST:

July 14, 1920, locomotive 1211, Los Angeles, Calif. Gas headlight exploded, due to hose becoming disconnected; 1 injured.

* July 16, 1920, locomotive 1205, River Station, Calif. Right front gangway step fell; casting showed small old flaw which developed into a heavy clean break; 1 injured.

July 17, 1920, locomotive 1136, Ogden, Utah. Gas headlight exploded, due to burner being broken; 1 injured.

August 4, 1920, locomotive 4200, near Mystic, Calif. Cab brace stud blew out; threads on stud and in hole worn; defect previously reported and repairs not made; 1 injured.

* October 5, 1920, locomotive 1143, Watsonville Junction, Calif. Rod that works down from the brake cylinders had broken, come down, and caught between ties and throw rod to switch; when engineer pulled brake head the broken rod came loose, allowing brake cylinder rod to throw shoe against wheels, catching his finger; 1 injured.

** October 12, 1920, locomotive 2743, San Luis Obispo, Calif. Lubricator drain plug blew out while attempting to tighten under pressure; 1 injured.

October 31, 1920, locomotive 2451 (C. P.), near Pequoop, Nev. Left main driving tire broke; 1 killed.

November 26, 1920, locomotive 2560, near Glendale, Oreg. Main driving axle broke; old defect in axle approximately 40 per cent of the area of axle; 1 injured.

* November 30, 1920, locomotive 1706, Araby, Ariz. Emergency application of brakes due to defective triple valves in train contributed to by defective braking apparatus on engine. Inspection showed dirty feed valve, leaky rotary valve, and equalizing reservoir pipe plugged with a penny for a gasket; 1 injured.

February 23, 1921, locomotive 2368, Jaynes, Ariz. Injured while operating reverse lever, due to insufficient clearance between lever in full forward position and foot brace, located on quadrant in direct line with reverse lever; 1 injured.

Ten accidents; 1 killed, 9 injured.

SPOKANE, PORTLAND & SEATTLE RAILWAY:

* March 11, 1921, locomotive 363, Portland, Oreg. Reverse lever flew back account of threads stripped on reverse-lever fulcrum; 1 injured.
One accident; 1 injured.

TEXAS & PACIFIC RAILWAY:

October 9, 1920, locomotive 419, Ione, Tex. Injured while operating reverse lever; insufficient clearance between reverse lever and boiler head; 1 injured.
* November 13, 1920, locomotive 404, Rutherford, Tex. Derailment, due to tire on right No. 3 tender truck breaking; examination of the failed tire shows same to have old defects in the form of cracks, starting from the interior surface and extending outward one-half of the thickness of the material; 2 injured.
January 8, 1921, locomotive 233, near Abington, La. Crown sheet failure due to low water; right tank well full of scale and rust; numerous openings in right strainer stopped up; 1 injured.
Three accidents; 4 injured.

TOLEDO & OHIO CENTRAL RAILWAY:

January 13, 1921, locomotive 9685, Heath, Ohio. Right back side rod broke at knuckle connection, due to old crack; knuckle-pin hole at some previous time had been reduced by autogenous welding and rebored; 1 injured.
* March 7, 1921, locomotive 9667, Columbus, Ohio. Head engine separated from train due to low drawbar on engine, resulting in collision, caused by rear engine pushing cars ahead; filler blocks in drawhead casting missing; 1 injured.
Two accidents; 2 injured.

TOLEDO, ST. LOUIS & WESTERN RAILROAD:

** June 22, 1921, locomotive 37, near Holgate, Ohio. Eccentric and eccentric strap broke, the broken parts forcing a hole into outer throat sheet; 1 injured.
One accident; 1 injured.

TRANS-MISSISSIPPI TERMINAL RAILROAD:

June 1, 1921, locomotive 319 (T. & P.), New Orleans, La. Crown sheet failure; low water; top water-glass cock open only one-sixteenth of a turn, which would cause water to rise in glass and show false level; 1 injured.
One accident; 1 injured.

UNION PACIFIC RAILROAD:

August 9, 1920, locomotive 4601, Council Bluffs, Iowa. Blow-off cock operating lever became disconnected, due to bolt working out; 1 injured.
September 18, 1920, locomotive 4411, Council Bluffs, Iowa. Reverse-lever latch broke, due to bolt coming out of crank arm and crank pin, which allowed arm to come off main pin and drop to ground, causing undue strain on motion work; 1 injured.
March 3, 1921, locomotive 2491, Laramie, Wyo. Air hose on engine burst, causing sudden stop of train; 1 injured.
Three accidents; 3 injured.

VIRGINIAN RAILWAY:

* August 14, 1920, locomotive 460, Sewalls Point, Va. Squirt-hose pipe blew off; 1 injured.
* August 17, 1920, locomotive 421, Herndon, W. Va. Injured while attempting to get on engine, due to first step on engine being loose; 1 injured.
* April 10, 1921, locomotive 718, Pemberton, Va. High-pressure wrist pin worked out, fouling side rods, causing them to break; 1 injured.
Three accidents; 3 injured.

WABASH RAILWAY:

August 18, 1920, locomotive 660, Mimsion, Mich. Injector steam pipe pulled out of sleeve, due to not being properly brazed; 1 injured.
September 17, 1920, locomotive 378, near Tracy, Iowa. Rear driving-wheel brake-beam hanger became disconnected, allowing beam to drop and come in contact with blow-off cock discharge pipe, forcing blow-off cock spindle out of boiler; 1 injured.
** October 15, 1920, locomotive 265 (point of accident not shown). Bolt came out of apron hinge, causing injury to fireman who was standing on apron shaking grates; 1 injured.

October 30, 1920, locomotive 585, Lafayette, Ind. Shaker bar slipped off post, due to improper fit; socket in end of shaker bar had no opening at top for post to extend through; 1 injured.

December 12, 1920, locomotive 668, Willeys, Ill. Flue broke at weld; 1 injured.

December 18, 1920, locomotive 2438, Butler, Ind. Injured due to leaky blow-off cock; 1 injured.

** January 8, 1921, locomotive 707, Illiopolis, Ill. Injector steam pipe pulled loose from brazing on collar; 1 injured.

February 4, 1921, locomotive 2006, High Hill, Mo. Globe-valve handle to No. 2 air compressor pulled off of spindle while being used as handhold while working on air compressor, allowing engineer to fall to ground; 1 injured.

April 3, 1921, locomotive 2017, Clifton, Mo. Plug blew out of blow-off discharge pipe, due to threads in coupling attached to pipe badly worn; 1 injured.

April 21, 1921, locomotive 898, Delphi, Ind. Piece blew out of right front cylinder head, due to old defect; 1 injured.

* June 5, 1921, locomotive 391, Albia, Iowa. Squirt hose burst; 1 injured.

Eleven accidents; 11 injured.

WESTERN MARYLAND RAILWAY:

** February 8, 1921, locomotive 404, Greendale, Pa. Connecting-rod bolt that connects to cylinder-cock valve rod lost out due to nut losing off and allowed connecting rod to drop to ground, causing cylinder-cock rod to fly backward and strike engineman; 1 injured.

One accident; 1 injured.

WESTERN PACIFIC RAILROAD:

* November 8, 1920, locomotive 2, Delle, Utah. Fell from running board while locomotive was running, account of handrail becoming disconnected about 10 ft from the front end. 1 injured.

* June 20, 1921, locomotive 5, Sacramento, Calif. Locomotive caught fire, due to leaky firing valve; 1 injured.

Two accidents; 2 injured.

HEELING & LAKE ERIE RAILWAY:

July 26, 1920, locomotive 8401, Oak Harbor, Ohio. Crown sheet failure; low water; top water-glass cock so arranged as to form a pocket in steam connection to glass, thus causing false indication of water; bottom water-glass cock did not extend through sheet; gauge-cock drip stopped up; 1 injured.

December 2, 1920, locomotive 4305, Warrington, Ohio. Bonnet of squirt-hose valve blew off; 1 injured.

* February 5, 1921, locomotive 4312, Adena, Ohio. Reverse lever became unhooked, catching engineer's foot; nuts broken off end of pin that connects the back end of valve rod to bell crank and allowed pin to work out and strike gear frame, interfering with valve travel; 1 injured.

Three accidents; 3 injured.

MOO & MISSISSIPPI VALLEY RAILROAD:

February 25, 1921, locomotive 335, West Junction, Tenn. Cab-apron bolt lost, allowing fireman to fall between engine and tender; 1 injured.

One accident; 1 injured.