INTERSTATE COMMERCE COMMISSION

DIVISION OF
LOCOMOTIVE INSPECTION

U. S. Laws, Statutes, etc

LOCOMOTIVE BOILER INSPECTION LAW

AS AMENDED MARCH 4, 1915

WITH

RULES AND INSTRUCTIONS ESTABLISHED IN CONFORMITY THEREWITH

ALSO

SAFETY APPLIANCE STANDARDS FOR LOCOMOTIVES
AS FIXED BY ORDER OF THE COMMISSION
DATED MARCH 13, 1911

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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[PUBLIC—No. 383.]

[S. 6702.]

AN ACT To promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of this act shall apply to any common carrier or carriers, their officers, agents, and employees, engaged in the transportation of passengers or property by railroad in the District of Columbia, or in any Territory of the United States, or from one State or Territory of the United States or the District of Columbia to any other States or Territory of the United States or the District of Columbia, or from any place in the United States to an adjacent foreign country, or from any place in the United States through a foreign country to any other place in the United States. The term "railroad" as used in this act shall include all the roads in use by any common carrier operating a railroad, whether owned or operated under a contract, agreement, or lease, and the term "employees" as used in this act shall be held to mean persons actually engaged in or connected with the movement of any train.

Carriers subject to act.

"Railroad," meaning of.

"Employees," meaning of.

SEC. 2. That from and after the first day of July, nineteen hundred and eleven, it shall be unlawful for any common carrier, its officers or agents, subject to this act to

Act effective.

Unlawful to operate locomotives.

use any locomotive engine propelled by steam power in moving interstate or foreign traffic unless the boiler of said locomotive and appurtenances thereof are in proper condition and safe to operate in the service to which the same is put, that the same may be employed in the active service of such carrier in moving traffic without unnecessary peril to life or limb, and all boilers shall be inspected from time to time in accordance with the provisions of this act, and be able to withstand such test or tests as may be prescribed in the rules and regulations hereinafter provided for.

Boilers to be inspected and tested.

Chief inspector and assistants, how appointed.

Duties and powers of.

SEC. 3. That there shall be appointed by the President, by and with the advice and consent of the Senate, a chief inspector and two assistant chief inspectors of locomotive boilers, who shall have general superintendence of the inspectors hereinafter provided for, direct them in the duties hereby imposed upon them, and see that the requirements of this act and the rules, regulations, and instructions made or given hereunder are observed by common carriers subject hereto. The said chief inspector and his two assistants shall be selected with reference to their practical knowledge of the construction and repairing of boilers, and to their fitness and ability to systematize and carry into effect the provisions hereof relating to the inspection and maintenance of locomotive boilers. The chief inspector shall receive a salary of four thousand dollars per year and the assistant chief inspectors shall each receive a salary of three thousand dollars per year; and each of the three shall

Qualifications of.

Salaries and allowances of.

be paid his traveling expenses incurred in the performance of his duties. The office of the chief inspector shall be in Washington, District of Columbia, and the Interstate Commerce Commission shall provide such stenographic and clerical help as the business of the offices of the chief inspector and his said assistants may require.

Location of.

Clerical help.

SEC. 4. That immediately after his appointment and qualification the chief inspector shall divide the territory comprising the several States, the Territories of New Mexico and Arizona, and the District of Columbia into fifty locomotive boiler inspection districts, so arranged that the service of the inspector appointed for each district shall be most effective, and so that the work required of each inspector shall be substantially the same. Thereupon there shall be appointed by the Interstate Commerce Commission fifty inspectors of locomotive boilers. Said inspectors shall be in the classified service and shall be appointed after competitive examination according to the law and the rules of the Civil Service Commission governing the classified service. The chief inspector shall assign one inspector so appointed to each of the districts hereinbefore named. Each inspector shall receive a salary of one thousand eight hundred dollars per year and his traveling expenses while engaged in the performance of his duty. He shall receive in addition thereto an annual allowance for office rent, stationery, and clerical assistance, to be fixed by the Interstate Commerce Commission, but not to exceed in the case of any district inspector six

Districts, establishment of.

Inspectors, appointment and assignment of.

Salaries and allowances of.

hundred dollars per year. In order to obtain the most competent inspectors possible, it shall be the duty of the chief inspector to prepare a list of questions to be propounded to applicants with respect to construction, repair, operation, testing, and inspection of locomotive boilers, and their practical experience in such work, which list, being approved by the Interstate Commerce Commission, shall be used by the Civil Service Commission as a part of its examination.

Questions to be propounded applicants.

Ineligible for appointment.

No person interested, either directly or indirectly, in any patented article required to be used on any locomotive under supervision or who is intemperate in his habits shall be eligible to hold the office of either chief inspector or assistant or district inspector.

Rules and instructions, preparation and approval of.

SEC. 5. That each carrier subject to this act shall file its rules and instructions for the inspection of locomotive boilers with the chief inspector within three months after the approval of this act, and after hearing and approval by the Interstate Commerce Commission, such rules and instructions, with such modifications as the commission requires, shall become obligatory upon such carrier: *Provided, however,* That if any carrier subject to this act shall fail to file its rules and instructions the chief inspector shall prepare rules and instructions not inconsistent herewith for the inspection of locomotive boilers, to be observed by such carrier; which rules and instructions, being approved by the Interstate Commerce Commission, and a copy thereof being served upon the president, general manager, or general superintendent of such carrier, shall be obligatory,

and a violation thereof punished as hereinafter provided: *Provided also*, That such common carrier may from time to time change the rules and regulations herein provided for, but such change shall not take effect and the new rules and regulations be in force until the same shall have been filed with and approved by the Interstate Commerce Commission. The chief inspector shall also make all needful rules, regulations, and instructions not inconsistent herewith for the conduct of his office and for the government of the district inspectors: *Provided, however*, That all such rules and instructions shall be approved by the Interstate Commerce Commission before they take effect.

Inspectors to become familiar with condition of locomotives.

SEC. 6. That it shall be the duty of each inspector to become familiar, so far as practicable, with the condition of each locomotive boiler ordinarily housed or repaired in his district; and if any locomotive is ordinarily housed or repaired in two or more districts, then the chief inspector or an assistant shall make such division between inspectors as will avoid the necessity for duplication of work. Each inspector shall make such personal inspection of the locomotive boilers under his care from time to time as may be necessary to fully carry out the provisions of this act, and as may be consistent with his other duties, but he shall not be required to make such inspections at stated times or at regular intervals. His first duty shall be to see that the carriers make inspections in accordance with the rules and regulations established or approved by the Interstate Commerce Commission, and that carriers

Personal inspections.

First duty of inspectors.

repair the defects which such inspections disclose before the boiler or boilers or appurtenances pertaining thereto are again put in service. To this end each carrier subject to this act shall file with the inspector in charge, under the oath of the proper officer or employee, a duplicate of the report of each inspection required by such rules and regulations, and shall also file with such inspector, under the oath of the proper officer or employee, a report showing the repair of the defects disclosed by the inspection. The rules and regulations hereinbefore provided for shall prescribe the time at which such reports shall be made. Whenever any district inspector shall, in the performance of his duty, find any locomotive boiler or apparatus pertaining thereto not conforming to the requirements of the law or the rules and regulations established and approved as hereinbefore stated, he shall notify the carrier in writing that the locomotive is not in serviceable condition, and thereafter such boiler shall not be used until in serviceable condition: *Provided*, That a carrier, when notified by an inspector in writing that a locomotive boiler is not in serviceable condition, because of defects set out and described in said notice, may within five days after receiving said notice appeal to the chief inspector by telegraph or by letter to have said boiler reexamined, and upon receipt of the appeal from the inspector's decision, the chief inspector shall assign one of the assistant chief inspectors or any district inspector other than the one from whose decision the appeal is taken to

Carriers to file reports.

Ordering locomotives from service.

Appeal to chief inspector.

Action on appeal.

reexamine and inspect said boiler within fifteen days from date of notice. If upon such reexamination the boiler is found in serviceable condition, the chief inspector shall immediately notify the carrier in writing, whereupon such boiler may be put into service without further delay; but if the reexamination of said boiler sustains the decision of the district inspector, the chief inspector shall at once notify the carrier owning or operating such locomotive that the appeal from the decision of the inspector is dismissed, and upon the receipt of such notice the carrier may, within thirty days, appeal to the Interstate Commerce Commission, and upon such appeal, and after hearing, said Commission shall have power to revise, modify, or set aside such action of the chief inspector and declare that said locomotive is in serviceable condition and authorize the same to be operated: *Provided further*, That pending either appeal the requirements of the inspector shall be effective.

Appeal to Commission.

Order effective pending appeal.

SEC. 7. That the chief inspector shall make an annual report to the Interstate Commerce Commission of the work done during the year, and shall make such recommendations for the betterment of the service as he may desire.

Annual report of chief inspector.

SEC. 8. That in the case of accident resulting from failure from any cause of a locomotive boiler or its appurtenances, resulting in serious injury or death to one or more persons, a statement forthwith must be made in writing of the fact of such accident, by the carrier owning or operating said locomotive,

Accidents reported by carriers.

to the chief inspector. Whereupon the facts concerning such accident shall be investigated by the chief inspector or one of his assistants, or such inspector as the chief inspector may designate for that purpose. And where the locomotive is disabled to the extent that it can not be run by its own steam, the part or parts affected by the said accident shall be preserved by said carrier intact, so far as possible without hindrance or interference to traffic, until after said inspection. The chief inspector or an assistant or the designated inspector making the investigation shall examine or cause to be examined thoroughly the boiler or part affected, making full and detailed report of the cause of the accident to the chief inspector.

Investigation of accidents.

Locomotive or parts to be held.

Report of investigation.

Special reports to Commission.

The Interstate Commerce Commission may at any time call upon the chief inspector for a report of any accident embraced in this section, and upon the receipt of said report, if it deems it to the public interest, make reports of such investigations, stating the cause of accident, together with such recommendations as it deems proper. Such reports shall be made public in such manner as the Commission deems proper. Neither said report nor any report of said investigation nor any part thereof shall be admitted as evidence or used for any purpose in any suit or action for damages growing out of any matter mentioned in said report or investigation.

Accident reports inadmissible as evidence.

Penalty for violations.

SEC. 9. That any common carrier violating this act or any rule or regulation made under its provisions or any lawful order of any inspector shall be liable to a penalty of one

hundred dollars for each and every such violation, to be recovered in a suit or suits to be brought by the United States attorney in the district court of the United States having jurisdiction in the locality where such violation shall have been committed; and it shall be the duty of such attorneys, subject to the direction of the Attorney General, to bring such suits upon duly verified information being lodged with them, respectively, of such violations having occurred; and it shall be the duty of the chief inspector of locomotive boilers to give information to the proper United States attorney of all violations of this act coming to his knowledge.

How recoverable.

Chief inspector to report violations.

SEC. 10. That the total amounts directly appropriated to carry out the provisions of this act shall not exceed for any one fiscal year the sum of three hundred thousand dollars.

Appropriations.

Approved, February 17, 1911.

[PUBLIC—No. 318—63D CONGRESS.]

[H. R. 17894.]

AN ACT To amend an Act entitled "An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto," approved February seventeenth, nineteen hundred and eleven.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section two of the Act entitled "An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto," approved February seventeenth, nineteen hundred and eleven, shall apply to and include the entire locomotive and tender and all parts and appurtenances thereof.

Act to apply to entire locomotive and tender.

SEC. 2. That the chief inspector and the two assistant chief inspectors, together with all the district inspectors, appointed under the Act of February seventeenth, nineteen hundred and eleven, shall inspect and shall have the same powers and duties with respect to all the parts and appurtenances of the locomotive and tender that they now have with respect to the boiler of a locomotive and the appurtenances thereof, and the said Act of February seventeenth, nineteen hundred and eleven, shall apply to and include the entire locomotive and tender and

Powers and duties of inspector.

all their parts with the same force and effect as it now applies to locomotive boilers and their appurtenances. That upon the passage of this Act all inspectors and applicants for the position of inspector shall be examined touching their qualifications and fitness with respect to the additional duties imposed by this Act.

Inspectors and applicants to be examined.

SEC. 3. That nothing in this Act shall be held to alter, amend, change, repeal, or modify any other Act of Congress than the said Act of February seventeenth, nineteen hundred and eleven, to which reference is herein specifically made, or any order of the Interstate Commerce Commission promulgated under the safety appliance Act of March second, eighteen hundred and ninety-three, and supplemental Acts.

Not to change other Acts.

SEC. 4. That this Act shall take effect six months after its passage, except as otherwise herein provided.

Effective date.

Approved, March 4, 1915.

ORDER.

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 2d day of June, A. D. 1911.

Present:

JUDSON C. CLEMENTS,
CHARLES A. PROUTY,
FRANKLIN K. LANE,
EDGAR E. CLARK,
JAMES S. HARLAN,
CHARLES C. MCCHORD,
BALTHASAR H. MEYER,
} Commissioners.

IN THE MATTER OF THE PREPARATION, APPROVAL, AND ESTABLISHMENT OF RULES AND INSTRUCTIONS FOR THE INSPECTION AND TESTING OF LOCOMOTIVE BOILERS AND THEIR APPURTENANCES.

Whereas the fifth section of the act of Congress approved February 17, 1911, entitled "An act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto," provides, among other things, "that each carrier subject to this act shall file its rules and instructions for the inspection of locomotive boilers with the chief inspector within three months after the approval of this act, and after hearing and approval by the Interstate Commerce Commission, such rules and instructions, with such modifications as the Commission requires, shall become obligatory upon such carrier: *Provided, however,*

That if any carrier subject to this act shall fail to file its rules and instructions the chief inspector shall prepare rules and instructions not inconsistent herewith for the inspection of locomotive boilers, to be observed by such carrier; which rules and instructions being approved by the Interstate Commerce Commission, and a copy thereof being served on the president, general manager, or general superintendent of such carrier, shall be obligatory and a violation thereof punished as hereinafter provided;" and

Whereas at the expiration of the period of three months after the approval of said act many of the common carriers subject to the provisions thereof had failed to file their rules and instructions for the inspection of locomotive boilers with the chief inspector; and

Whereas the chief inspector thereupon proceeded to prepare for submission to the Interstate Commerce Commission for its approval rules and instructions for the inspection and testing of locomotive boilers and their appurtenances for such carriers so failing to file the same; and

Whereas upon due notice there came on a hearing before the Interstate Commerce Commission in the matter of the approval and establishment of the rules and instructions prepared by the said chief inspector, on the 29th day of May, 1911; and

Whereas such carriers as had filed their rules and instructions for the inspection and testing of locomotive boilers and their appurtenances with the chief inspector within three months after the passage of said act asked, through their representatives at said hearing, that such of said rules and instructions which did not fulfill the requirements of the proposed rules and instructions prepared by the chief inspector be modified to the extent necessary to conform thereto, and that such of said rules and instructions as prescribed a higher standard than that required by the rules and instructions prepared by the chief inspector be regarded as withdrawn from consideration, and joined in a request that such rules and regula-

tions as had been prepared by the chief inspector and approved by the Interstate Commerce Commission be established with uniformity for them and all other carriers subject to the act; and

Whereas at the hearing aforesaid the rules and instructions prepared by the chief inspector were submitted to the Commission for its approval and all parties appearing at said hearing were fully heard in respect to the matters involved, and said proposed rules and instructions having been fully considered by the Commission:

It is ordered, That said rules and instructions for the inspection and testing of locomotive boilers and their appurtenances, as follows, be, and the same are hereby, approved, and from and after the 1st day of July, 1911, shall be observed by each and every common carrier subject to the provisions of the act of Congress aforesaid as the minimum requirements: *Provided*, That nothing herein contained shall be construed as prohibiting any carrier from enforcing additional rules and instructions not inconsistent with the foregoing, tending to a greater degree of precaution against accidents.

INTERSTATE COMMERCE COMMISSION.

DIVISION OF

LOCOMOTIVE INSPECTION.

RULES AND INSTRUCTIONS FOR INSPECTION AND TESTING OF LOCOMOTIVE BOILERS AND THEIR APPURTENANCES.

Approved by orders of the Interstate Commerce Commission, dated June 2, 1911, September 12, 1912, and June 9, 1914.

RESPONSIBILITY FOR THE GENERAL CONSTRUCTION AND SAFE WORKING PRESSURE.

1. The railroad company will be held responsible for the general design and construction of the locomotive boilers under its control. The safe working pressure for each locomotive boiler shall be fixed by the chief mechanical officer of the company or by a competent mechanical engineer under his supervision, after full consideration has been given to the general design, workmanship, age, and condition of the boiler, and shall be determined from the minimum thickness of the shell plates, the lowest tensile strength of the plates, the efficiency of the longitudinal joint, the inside diameter of the course, and the lowest factor of safety allowed.

FACTOR OF SAFETY.

2. (*a*) The lowest factor of safety to be used for locomotive boilers constructed after January 1, 1912, shall be 4.

(*b*) The lowest factor of safety to be used for locomotive boilers which were in service or under construction prior to January 1, 1912, shall be as follows:

(*c*) Effective January 1, 1915, the lowest factor shall be 3, except that upon application this period may be extended

not to exceed one year, if an investigation shows that conditions warrant it.

Effective January 1, 1916, the lowest factor shall be 3.25.

Effective January 1, 1917, the lowest factor shall be 3.5.

Effective January 1, 1919, the lowest factor shall be 3.75.

Effective January 1, 1921, the lowest factor shall be 4.

3. (*a*) *Maximum allowable stress on stays and braces.*—For locomotives constructed after January 1, 1915, the maximum allowable stress per square inch of net cross sectional area on fire box and combustion chamber stays shall be 7,500 pounds. The maximum allowable stress per square inch of net cross sectional area on round, rectangular, or gusset braces shall be 9,000 pounds.

(*b*) For locomotives constructed prior to January 1, 1915, the maximum allowable stress on stays and braces shall meet the requirements of rule No. 2, except that when a new fire box and wrapper sheet are applied to such locomotives they shall be made to meet the requirements of rule No. 3.

TENSILE STRENGTH OF MATERIAL.

4. When the tensile strength of steel or wrought iron shell plates is not known, it shall be taken at 50,000 pounds for steel and 45,000 pounds for wrought iron.

SHEARING STRENGTH OF RIVETS.

5. The maximum shearing strength of rivets per square inch of cross sectional area shall be taken as follows:

	Pounds.
Iron rivets in single shear	38,000
Iron rivets in double shear	76,000
Steel rivets in single shear	44,000
Steel rivets in double shear	88,000

6. A higher shearing strength may be used for rivets when it can be shown by test that the rivet material used is of such quality as to justify a higher allowable shearing strength.

RULES FOR INSPECTION.

7. The mechanical officer in charge at each point where boiler work is done will be held responsible for the inspection and repair of all locomotive boilers and their appurtenances under his jurisdiction. He must know that all defects disclosed by any inspection are properly repaired before the locomotive is returned to service.

8. The term "inspector" as used in these rules and instructions, unless otherwise specified, will be held to mean the railroad company's inspector.

INSPECTION OF INTERIOR OF BOILER.

9. *Time of inspection.*—The interior of every boiler shall be thoroughly inspected before the boiler is put into service and whenever a sufficient number of flues are removed to allow examination.

10. *Flues to be removed.*—All flues of boilers in service, except as otherwise provided, shall be removed at least once every three years, and a thorough examination shall be made of the entire interior of the boiler. After flues are taken out the inside of the boiler must have the scale removed and be thoroughly cleaned. This period for the removal of flues may be extended upon application if an investigation shows that conditions warrant it.

11. *Method of inspection.*—The entire interior of the boiler must then be examined for cracks, pitting, grooving, or indications of overheating and for damage where mud has collected or heavy scale formed. The edges of plates, all laps, seams, and points where cracks and defects are likely to develop or which an exterior examination may have indicated, must be given an especially minute examination. It must be seen that braces and stays are taut, that pins are properly secured in place, and that each is in condition to support its proportion of the load.

12. *Repairs.*—Any boiler developing cracks in the barrel shall be taken out of service at once, thoroughly repaired,

and reported to be in satisfactory condition before it is returned to service.

13. *Lap joint seams.*—Every boiler having lap joint longitudinal seams without reinforcing plates shall be examined with special care to detect grooving or cracks at the edges of the seams.

14. *Fusible plugs.*—If boilers are equipped with fusible plugs they shall be removed and cleaned of scale at least once every month. Their removal must be noted on the report of inspection.

INSPECTION OF EXTERIOR OF BOILER.

15. *Time of inspection.*—The exterior of every boiler shall be thoroughly inspected before the boiler is put into service and whenever the jacket and the lagging are removed.

16. *Lagging to be removed.*—The jacket and lagging shall be removed at least once every five years and a thorough inspection made of the entire exterior of the boiler. The jacket and lagging shall also be removed whenever, on account of indications of leaks, the United States inspector or the railroad company's inspector considers it desirable or necessary.

TESTING BOILERS.

17. *Time of testing.*—Every boiler, before being put into service and at least once every 12 months thereafter, shall be subjected to hydrostatic pressure 25 per cent above the working steam pressure.

18. *Removal of dome cap.*—The dome cap and throttle standpipe must be removed at the time of making the hydrostatic test and the interior surface and connections of the boiler examined as thoroughly as conditions will permit. In case the boiler can be entered and thoroughly inspected without removing the throttle standpipe the inspector may make the inspection by removing the dome cap only, but the variation from the rule must be noted in the report of inspection.

19. *Witness of test.*—When the test is being made by the railroad company's inspector, an authorized representative of the company, thoroughly familiar with boiler construction, must personally witness the test and thoroughly examine the boiler while under hydrostatic pressure.

20. *Repairs and steam test.*—When all necessary repairs have been completed, the boiler shall be fired up and the steam pressure raised to not less than the allowed working pressure, and the boiler and appurtenances carefully examined. All cocks, valves, seams, bolts, and rivets must be tight under this pressure and all defects disclosed must be repaired.

STAYBOLT TESTING.

21. *Time of testing rigid bolts.*—All staybolts shall be tested at least once each month. Staybolts shall also be tested immediately after every hydrostatic test.

22. *Method of testing rigid bolts.*—The inspector must tap each bolt and determine the broken bolts from the sound or the vibration of the sheet. If staybolt tests are made when the boiler is filled with water, there must be not less than 50 pounds pressure on the boiler. Should the boiler not be under pressure, the test may be made after draining all water from the boiler, in which case the vibration of the sheet will indicate any unsoundness. The latter test is preferable.

23. *Method of testing flexible staybolts with caps.*—All flexible staybolts having caps over the outer ends shall have the caps removed at least once every 18 months and also whenever the United States inspector or the railroad company's inspector considers the removal desirable in order to thoroughly inspect the staybolts. The firebox sheets should be examined carefully at least once a month to detect any bulging or indications of broken staybolts.

24. *Method of testing flexible staybolts without caps.*—Flexible staybolts which do not have caps shall be tested once each month the same as rigid bolts.

Each time a hydrostatic test is applied such staybolt test shall be made while the boiler is under hydrostatic pressure not less than the allowed working pressure, and proper notation of such test made on Form No. 3.

25. *Broken staybolts.*—No boiler shall be allowed to remain in service when there are two adjacent staybolts broken or plugged in any part of the firebox or combustion chamber, nor when three or more are broken or plugged in a circle 4 feet in diameter, nor when five or more are broken or plugged in the entire boiler.

26. *Telltale holes.*—All staybolts shorter than 8 inches applied after July 1, 1911, except flexible bolts, shall have telltale holes three-sixteenths inch in diameter and not less than 1½ inches deep in the outer end. These holes must be kept open at all times.

27. All staybolts shorter than 8 inches, except flexible bolts and rigid bolts which are behind frames and braces, shall be drilled when the locomotive is in the shop for heavy repairs and this work must be completed prior to July 1, 1914.

STEAM GAUGES.

28. *Location of gauges.*—Every boiler shall have at least one steam gauge which will correctly indicate the working pressure. Care must be taken to locate the gauge so that it will be kept reasonably cool, and can be conveniently read by the enginemen.

29. *Siphon.*—Every gauge shall have a siphon of ample capacity to prevent steam entering the gauge. The pipe connection shall enter the boiler direct and shall be maintained steam tight between boiler and gauge. The siphon pipe and its connections to the boiler must be cleaned each time the gauge is tested.

30. *Time of testing.*—Steam gauges shall be tested at least once every three months and also when any irregularity is reported.

31. *Method of testing.*—Steam gauges shall be compared with an accurate test gauge or dead weight tester and

gauges found inaccurate shall be corrected before being put into service.

32. *Badge plates.*—A metal badge plate showing the allowed steam pressure shall be attached to the boiler head in the cab. If boiler head is lagged, the lagging and jacket shall be cut away so that the plate can be seen.

33. *Boiler number.*—The builder's number of the boiler, if known, shall be stamped on the dome. If the builder's number of the boiler can not be obtained, an assigned number which shall be used in making out specification cards shall be stamped on dome.

SAFETY VALVES.

34. *Number and capacity.*—Every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure more than 5 per cent above the allowed steam pressure.

35. *Setting of safety valves.*—Safety valves shall be set to pop at pressures not exceeding 6 pounds above the working steam pressure. When setting safety valves two steam gauges shall be used, one of which must be so located that it will be in full view of the person engaged in setting such valves; and if the pressure indicated by the gauges varies more than 3 pounds they shall be removed from the boiler, tested, and corrected before the safety valves are set. Gauges shall in all cases be tested immediately before the safety valves are set or any change made in the setting. When setting safety valves the water level in the boiler shall not be above the highest gauge cock.

36. *Time of testing.*—Safety valves shall be tested under steam at least once every three months, and also when any irregularity is reported.

WATER GLASS AND GAUGE COCKS.

37. *Number and location.*—Every boiler shall be equipped with at least one water glass and three gauge

cocks. The lowest gauge cock and the lowest reading of the water glass shall be not less than 3 inches above the highest part of the crown sheet. Locomotives which are not now equipped with water glasses shall have them applied on or before July 1, 1912.

38. *Water glass valves.*—All water glasses shall be supplied with two valves or shutoff cocks, one at the upper and one at the lower connection to the boiler, and also a drain cock, so constructed and located that they can be easily opened and closed by hand.

39. *Time of cleaning.*—The spindles of all gauge cocks and water glass cocks shall be removed and cocks thoroughly cleaned of scale and sediment at least once each month.

40. All water glasses must be blown out and gauge cocks tested before each trip and gauge cocks must be maintained in such condition that they can be easily opened and closed by hand without the aid of a wrench or other tool.

41. *Water and lubricator glass shields.*—All tubular water glasses and lubricator glasses must be equipped with a safe and suitable shield which will prevent the glass from flying in case of breakage, and such shield shall be properly maintained.

42. *Water glass lamps.*—All water glasses must be supplied with a suitable lamp properly located to enable the engineer to easily see the water in the glass.

INJECTORS.

43. Injectors must be kept in good condition, free from scale, and must be tested before each trip. Boiler checks, delivery pipes, feed water pipes, tank hose and tank valves must be kept in good condition, free from leaks and from foreign substances that would obstruct the flow of water.

FLUE PLUGS.

44. Flue plugs must be provided with a hole through the center not less than three-fourths inch in diameter. When one or more tubes are plugged at both ends the plugs must be tied together by means of a rod not less than five-eighths inch in diameter. Flue plugs must be removed and flues repaired at the first point where such repairs can properly be made.

WASHING BOILERS.

45. *Time of washing.*—All boilers shall be thoroughly washed as often as the water conditions require, but not less frequently than once each month. All boilers shall be considered as having been in continuous service between washouts unless the dates of the days that the boiler was out of service are properly certified on washout reports and the report of inspection.

46. *Plugs to be removed.*—When boilers are washed, all washout, arch, and water bar plugs must be removed.

47. *Water tubes.*—Special attention must be given the arch and water bar tubes to see that they are free from scale and sediment.

48. *Office record.*—An accurate record of all locomotive boiler washouts shall be kept in the office of the railroad company. The following information must be entered on the day that the boiler is washed:

(*a*) Number of locomotive.
(*b*) Date of washout.
(*c*) Signature of boiler washer or inspector.
(*d*) Statement that spindles of gauge cocks and water-glass cocks were removed and cocks cleaned.
(*e*) Signature of the boiler inspector or the employee who removed the spindles and cleaned the cocks.

STEAM LEAKS.

49. *Leaks under lagging.*—If a serious leak develops under the lagging, an examination must be made and

the leak located. If the leak is found to be due to a crack in the shell or to any other defect which may reduce safety, the boiler must be taken out of service at once, thoroughly repaired, and reported to be in satisfactory condition before it is returned to service.

50. *Leaks in front of enginemen.*—All steam valves, cocks, and joints, studs, bolts, and seams shall be kept in such repair that they will not emit steam in front of the enginemen, so as to obscure their vision.

FILING REPORTS.

51. *Report of inspection.*—Not less than once each month and within 10 days after each inspection a report of inspection, Form No. 1, size 6 by 9 inches, shall be filed with the district inspector of locomotive boilers for each locomotive used by a railroad company, and a copy shall be filed in the office of the chief mechanical officer having charge of the locomotive.

52. A copy of the monthly inspection report, Form No. 1, or annual inspection report, Form No. 3, properly filled out, shall be placed under glass in a conspicuous place in the cab of the locomotive before the boiler inspected is put into service.

53. Not less than once each year and within 10 days after hydrostatic and other required tests have been completed a report of such tests showing general condition of the boiler and repairs made shall be submitted on Form No. 3,[1] size 6 by 9 inches, and filed with the district inspector of locomotive boilers, and a copy shall be filed in the office of the chief mechanical officer having charge of the locomotive. The monthly report will not be required for the month in which this report is filed.

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[1] Form No. 3 should be printed on yellow paper.

Note.—Samples of boiler forms 1, 3, and 4 indicating exact size, color, weight, and grade of paper will be furnished on application.

54. (*a*) *Specification card.*—A specification card, size 8 by 10½ inches, Form No. 4, containing the results of the calculations made in determining the working pressure and other necessary data shall be filed in the office of the chief inspector of locomotive boilers for each locomotive boiler. A copy shall be filed in the office of the chief mechanical officer having charge of the locomotive. Every specification card shall be verified by the oath of the engineer making the calculations, and shall be approved by the chief mechanical officer. These specification cards shall be filed as promptly as thorough examination and accurate calculation will permit. Where accurate drawings of boilers are available, the data for specification card, Form No. 4, may be taken from the drawings, and such specification cards must be completed and forwarded prior to July 1, 1912. Where accurate drawings are not available, the required data must be obtained at the first opportunity when general repairs are made, or when flues are removed. Specification cards must be forwarded within one month after examination has been made, and all examinations must be completed and specification cards filed prior to July 1, 1913, flues being removed if necessary to enable the examination to be made before this date.

(*b*) When any repairs or changes are made which affect the data shown on the specification card a corrected card or an alteration report on an approved form, size 8 by 10½ inches, properly certified to, giving details of such changes, shall be filed within 30 days from the date of their completion. This report should cover:

A. Application of new barrel sheets or domes.

B. Application of patches to barrels or domes of boilers or to portion of wrapper sheet of crown bar boilers which is not supported by staybolts.

C. Longitudinal seam reinforcements.

D. Changes in size or number of braces, giving maximum stress.

E. Initial application of superheaters, arch or water-bar tubes, giving number and dimensions of tubes.

F. Changes in number or capacity of safety valves.

Report of patches should be accompanied by a drawing or blue print of the patch, showing its location in regard to the center line of boiler, giving all necessary dimensions, and showing the nature and location of the defect. Patches previously applied should be reported the first time the boiler is stripped to permit an examination.

ACCIDENT REPORTS.

55. In the case of an accident resulting from failure, from any cause, of a locomotive boiler or any of its appurtenances, resulting in serious injury or death to one or more persons, the carrier owning or operating such locomotive shall immediately transmit by wire to the chief inspector of locomotive boilers, at his office in Washington, D. C., a report of such accident, stating the nature of the accident, the place at which it occurred, as well as where the locomotive may be inspected, which wire shall be immediately confirmed by mail, giving a full detailed report of such accident, stating, so far as may be known, the causes and giving a complete list of the killed or injured.

ORDER.

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 11th day of October, A. D. 1915.

IN THE MATTER OF RULES AND INSTRUCTIONS FOR THE INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS IN ACCORDANCE WITH ACT OF FEBRUARY 17, 1911, AMENDED MARCH 4, 1915.

Whereas the act of March 4, 1915 (Public—No. 318, Sixty-third Congress), amending the act of February 17, 1911, making said act apply to and include the entire locomotive and tender and all their parts, requires, among other things, that each carrier subject to this act shall file its rules and instructions for the inspection of locomotives and tenders with the chief inspector within three months after the approval of the act, and after hearing and approval by the Interstate Commerce Commission such rules and instructions, with such modifications as the Commission requires, shall become obligatory upon such carrier: *Provided, however,* That if any carrier subject to this act shall fail to file its rules and instructions the chief inspector shall prepare rules and instructions not inconsistent therewith for the inspection of locomotives and tenders, to be observed by such carrier, which rules and instructions being approved by the Interstate Commerce Commission and a copy thereof being served on the president, general manager, or general superintendent of such carrier shall be obligatory, and a violation thereof punished as provided in said act; and

Whereas at the expiration of the period of three months after the approval of said act, the carriers having filed a code of rules prepared by their committee as a basis for discussion only, and having expressed a desire through their committee that the chief inspector prepare a suitable code of rules for the inspection of locomotives and tenders; and

Whereas the chief inspector thereupon, in accordance with the law and with the expressed desire of the carriers, proceeded to prepare for submission to the Interstate Commerce Commission for approval rules and instructions for the inspection of locomotives and tenders and all their parts; and

Whereas upon due notice there came on a hearing before the Interstate Commerce Commission on September 28 to October 2, 1915, inclusive, in the matter of approval and establishment of the rules and instructions prepared by the said chief inspector; and

Whereas at the hearing aforesaid the rules and instructions prepared by the chief inspector were submitted to the Commission for approval, and all parties appearing at said hearing were fully heard in respect to the matters involved; and

Whereas all of the rules prepared by the chief inspector having been agreed to by representatives of the railroad employees, and all except rules numbered 18, 29, and 31 having been agreed to by representatives of the carriers; and

Whereas it appearing that the interests of all may be best served by the immediate promulgation of the rules which have been agreed to, thus avoiding the delay incident to the consideration of evidence and briefs with respect to the said rules numbered 18, 29, and 31, which will be acted on later, the said rules and instructions having been fully considered by the Commission:

It is ordered, That the said rules and instructions for the inspection of locomotives and tenders and all their parts,

as follows, be, and the same are hereby, approved, and from and after the 1st day of January, 1916, shall be observed by each and every common carrier subject to the provisions of the act of Congress aforesaid as the minimum requirements: *Provided*, That nothing herein contained shall be construed as prohibiting any carrier from enforcing additional rules and instructions not inconsistent with the foregoing, tending to a greater degree of precaution against accidents.

It is further ordered, That changes required by paragraph 2 of rule 16, the first sentence of rule 17, paragraph 2 of rule 22, paragraph 2 of rule 43, the first sentence of rule 47, paragraph 1 of rule 50, rule 51, and paragraph 3 of rule 52 shall be made the first time locomotives are shopped for general or heavy repairs, but must be completed before January 1, 1917.

By the Commission.

[SEAL.] GEORGE B. MCGINTY,
Secretary.

ORDER.

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 6th day of June, A. D. 1916.

IN THE MATTER OF RULES AND INSTRUCTIONS FOR THE INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS IN ACCORDANCE WITH ACT OF FEBRUARY 17, 1911, AMENDED MARCH 4, 1915.

The matter of rules and instructions for the testing of steam locomotive boilers and their appurtenances being under consideration; and the matters and things involved having been duly heard and submitted by the parties, and full investigation having been had by the Commission,

It is ordered, That the rules and instructions prescribed by the Commission's order of October 11, 1915, be, and the same are hereby, amended by the addition of the following rules:

29. *Locomotives used in road service.*—Each locomotive used in road service between sunset and sunrise shall have a headlight which will enable persons with normal vision in the cab of the locomotive, under normal weather conditions, to see a dark object the size of a man for a distance of 1,000 feet or more ahead of the locomotive; and such headlights must be maintained in good condition.

Locomotives used in road service, which are regularly required to run backward for any portion of their trip, except to pick up a detached portion of their train, or in making terminal movements, shall have on the rear a headlight which will meet the foregoing requirements.

Nothing in the foregoing rules shall prevent the use of a device whereby the light may be diminished in yards and at stations to an extent that will enable the person or persons operating the locomotive to see a dark object the size of a man for a distance of 300 feet or more ahead of the locomotive under the same conditions as set forth above.

When two or more locomotives are used in the same train, the leading locomotive only, will be required to display a headlight.

31. *Locomotives used in yard service.*—Each locomotive used in yard service between sunset and sunrise shall have two headlights, one located on the front of the locomotive and one on the rear, each of which will enable persons with normal vision, in the cab of the locomotive, under normal weather conditions, to see a dark object the size of a man for a distance of 300 feet or more; and such headlights must be maintained in good condition.

It is further ordered, That said rules 29 and 31 be, and they are hereby, made applicable to all new steam locomotives put in service subsequent to October 1, 1916, and to all steam locomotives given general overhauling subsequent to October 1, 1916, and that all steam locomotives subject to the rules be equipped in conformity therewith not later than January 1, 1920.

By the Commission:

[SEAL.] GEORGE B. MCGINTY,
Secretary.

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ORDER.

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 1st day of September, A. D. 1916.

IN THE MATTER OF RULES AND INSTRUCTIONS FOR THE INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS IN ACCORDANCE WITH ACT OF FEBRUARY 17, 1911, AMENDED MARCH 4, 1915.

On further consideration of the above entitled matter,

It is ordered, That the last paragraph of the order of June 6, 1916, entered herein be, and the same is hereby, amended so as to read as follows: "It is further ordered that said rules 29 and 31 be, and they are hereby, made applicable to all new steam locomotives put in service subsequent to January 1, 1917, and to all steam locomotives given general overhauling subsequent to January 1, 1917, and that all steam locomotives subject to the rules be equipped in conformity therewith not later than January 1, 1920."

By the Commission:

[SEAL.] GEORGE B. MCGINTY,
Secretary.

ORDER.

At a General Session of the INTERSTATE COMMERCE COMMISSION, held at its office in Washington, D. C., on the 30th day of June, A. D. 1916.

IN THE MATTER OF RULES AND INSTRUCTIONS FOR THE INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS IN ACCORDANCE WITH ACT OF FEBRUARY 17, 1911, AMENDED MARCH 4, 1915.

To avoid confusion on account of duplication of numbers of the locomotive boiler inspection rules, and for more convenient reference,

It is ordered, That the rules and instructions, numbered from 1 to 62, inclusive, for the inspection and testing of steam locomotives and tenders, as prescribed by the Commission's orders of October 11, 1915, and June 6, 1916, shall be numbered from 101 to 162, inclusive.

By the Commission:

[SEAL.] GEORGE B. MCGINTY,
Secretary.

RULES AND INSTRUCTIONS FOR INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS.

IN ACCORDANCE WITH THE ACT OF MARCH 4, 1915, AMENDING THE ACT OF FEBRUARY 17, 1911.

Approved by orders of the Interstate Commerce Commission, dated October 11, 1915, June 6, 1916, and June 30, 1916.

101. The railroad company will be held responsible for the general design, construction, and maintenance of locomotives and tenders under its control.

102. The mechanical officer in charge, at each point where repairs are made, will be held responsible for the inspection and repair of all parts of locomotives and tenders under his jurisdiction. He must know that inspections are made as required and that the defects are properly repaired before the locomotive is returned to service.

103. The term "inspector" as used in these rules and instructions means, unless otherwise specified, the railroad company's inspector.

104. Each locomotive and tender shall be inspected after each trip, or day's work, and the defects found reported on an approved form to the proper representative of the company. This form shall show the name of the railroad, the initials and number of the locomotive, the place, date, and time of the inspection, the defects found, and the signature of the employee making the inspection. The report shall be approved by the foreman, with proper written explanation made thereon for defects reported which were not repaired before the locomotive is returned

to service. The report shall then be filed in the office of the railroad company at the place where the inspection is made.

ASH PANS.

105. (*a*) Ash pans shall be securely supported and maintained in safe and suitable condition for service.

(*b*) Locomotives built after January 1, 1916, shall have ash pans supported from mud rings or frames. Locomotives built prior to January 1, 1916, which do not have the ash pans supported from mud rings or frames shall be changed when the locomotive receives new firebox.

(*c*) The operating mechanism of all ash pans shall be so arranged that it may be safely operated, and maintained in safe and suitable condition for service.

(*d*) No part of ash pan shall be less than 2½ inches above the rail.

BRAKE AND SIGNAL EQUIPMENT.

106. It must be known before each trip that the brakes on locomotive and tender are in safe and suitable condition for service; that the air compressor or compressors are in condition to provide an ample supply of air for the service in which the locomotive is put; that the devices for regulating all pressures are properly performing their functions; that the brake valves work properly in all positions; and that the water has been drained from the air brake system.

107 (*a*). *Compressors.*—The compressor or compressors shall be tested for capacity by orifice test as often as conditions may require, but not less frequently than once each three months.

(*b*) The diameter of orifice, speed of compressor, and the air pressure to be maintained for compressors in common use are given in the following table:

Make.	Size compressor.	Single strokes per minute.	Diameter of orifice.	Air pressure maintained.
			Inches.	*Pounds.*
Westinghouse	9½	120	11/64	60
Do	11	100	1/8	60
Do	8½ c. c.	100	9/64	60
New York	2a	120	1/8	60
Do	6a	100	11/64	60
Do	5b	100	11/64	60

For diagram of orifice see figure No. 14.

This table shall be used for altitudes to and including 1,000 feet. For altitudes over 1,000 feet the speed of compressor may be increased 5 single strokes per minute for each 1,000 feet increase in altitude.

108 (*a*) *Testing main reservoirs.*—Every main reservoir before being put into service, and at least once each 12 months thereafter, shall be subjected to hydrostatic pressure not less than 25 per cent above the maximum allowed air pressure.

(*b*) The entire surface of the reservoir shall be hammer tested each time the locomotive is shopped for general repairs, but not less frequently than once each 18 months.

109 (*a*) *Air gauges.*—Air gauges shall be so located that they may be conveniently read by the engineer from his usual position in the cab. Air gauges shall be tested at least once each three months, and also when any irregularity is reported.

(*b*) Air gauges shall be compared with an accurate test gauge or dead weight tester, and gauges found incorrect shall be repaired before they are returned to service.

110. *Time of cleaning.*—Distributing or control valves, reducing valves, triple valves, straight-air double-check valves, dirt collectors, and brake cylinders shall be cleaned and brake cylinders lubricated as often as conditions require to maintain them in a safe and suitable condition for service, but not less frequently than once each six months.

111 (*a*). *Stenciling dates of tests and cleaning.*—The date of testing or cleaning, and the initials of the shop or station at which the work is done, shall be legibly stenciled in a conspicuous place on the parts, or placed on a card displayed under glass in the cab of the locomotive, or stamped on metal tags. When metal tags are used, the height of letters and figures shall be not less than three-eighths inch, and the tags located as follows:

(*b*) One securely attached to brake pipe near automatic brake valve, which will show the date on which the distributing valve, control valve or triple valves, reducing valves, straight-air double-check valves, dirt collectors, and brake cylinders were cleaned and cylinders lubricated.

(*c*) One securely attached to air compressor steam pipe, which will show the date on which the compressor was tested by orifice test.

(*d*) One securely attached to the return pipe near main reservoir, which will show the date on which the hydrostatic test was applied to main reservoirs.

112 (*a*). *Piston travel.*—The minimum piston travel shall be sufficient to provide proper brake shoe clearance when the brakes are released.

(*b*) The maximum piston travel when locomotive is standing shall be as follows:

	Inches.
Cam type of driving wheel brake	3½
Other forms of driving wheel brake	6
Engine truck brake	8
Tender brake	9

113 (*a*). *Foundation brake gear.*—Foundation brake gear shall be maintained in a safe and suitable condition for service. Levers, rods, brake beams, hangers, and pins shall be of ample strength, and shall not be fouled in any way which will affect the proper operation of the brake. All pins shall be properly secured in place with cotters, split keys, or nuts. Brake shoes must be properly applied and kept approximately in line with the tread of the wheel.

(*b*) No part of the foundation brake gear of the locomotive or tender shall be less than 2½ inches above the rails.

114 (*a*). *Leakage.*—Main reservoir leakage; leakage from main reservoir and related piping shall not exceed an average of 3 pounds per minute in a test of three minutes' duration, made after the pressure has been reduced 40 per cent below maximum pressure.

(*b*) Brake pipe leakage shall not exceed 5 pounds per minute.

(*c*) *Brake cylinder leakage.*—With a full service application from maximum brake pipe pressure, and with communication to the brake cylinders closed, the brakes on the locomotive and tender shall remain applied not less than five minutes.

115. *Train signal system.*—The train signal system, when used, shall be tested and known to be in safe and suitable condition for service before each trip.

CABS, WARNING SIGNALS, AND SANDERS.

116 (*a*). *Cabs.*—Cabs shall be securely attached or braced and maintained in a safe and suitable condition for service. Cab windows shall be so located and maintained that the enginemen may have a clear view of track and signals from their usual and proper positions in the cab.

(*b*) Road locomotives used in regions where snowstorms are generally encountered shall be provided with what is known as a "clear vision" window, which is a window hinged at the top and placed in the glass in each front cab door or window. These windows shall be not less than 5 inches high, located as nearly as possible in line of the enginemen's vision, and so constructed that they may be easily opened or closed.

(*c*) Steam pipes shall not be fastened to the cab. On new construction or when renewals are made of iron or steel pipe subject to boiler pressure in cabs, it shall be what is commercially known as double strength pipe, with extra heavy valves and fittings.

117. *Cab aprons.*—Cab aprons shall be of proper length and width to insure safety. Aprons must be securely hinged, maintained in a safe and suitable condition for service, and roughened, or other provision made, to afford secure footing.

119. *Cylinder cocks.*—Necessary cylinder cocks, operative from cab of locomotive, shall be provided and maintained in a safe and suitable condition for service.

120. *Sanders.*—Locomotives shall be equipped with proper sanding apparatus, which shall be maintained in safe and suitable condition for service, and tested before each trip. Sand pipes must be securely fastened in line with the rails.

121. *Whistle.*—Each locomotive must be provided with a suitable steam whistle, so arranged that it may be conveniently operated by the engineer.

DRAW GEAR AND DRAFT GEAR.

122 (*a*). *Draw gear between locomotive and tender.*—The draw gear between the locomotive and tender, together with the pins and fastenings, shall be maintained in safe and suitable condition for service. The pins and drawbar shall be removed and carefully examined for defects not less frequently than once each three months. Suitable means for securing the drawbar pins in place shall be provided. Inverted drawbar pins shall be held in place by plate or stirrup.

(*b*) Two or more safety bars or safety chains of ample strength shall be provided between locomotive and tender, maintained in safe and suitable condition for service, and inspected at the same time draw gear is inspected.

(*c*) Safety chains or safety bars shall be of the minimum length consistent with the curvature of the railroad on which the locomotive is operated.

(*d*) Lost motion between locomotives and tenders not equipped with spring buffers shall be kept to a minimum, and shall not exceed one-half inch.

(*e*) When spring buffers are used between locomotive and tender the spring shall be applied with not less than three-fourths inch compression, and shall at all times be under sufficient compression to keep the chafing faces in contact.

123. *Chafing irons.*—Chafing irons of such radius as will permit proper curving shall be securely attached to locomotive and tender, and shall be maintained in condition to permit free movement laterally and vertically.

124. *Draft gear.*—Draft gear and attachments on locomotives and tenders shall be securely fastened, and maintained in safe and suitable condition for service.

DRIVING GEAR.

125. *Crossheads.*—Crossheads shall be maintained in a safe and suitable condition for service, with not more than one-fourth inch vertical or five-sixteenths inch lateral play between crossheads and guides.

126. *Guides.*—Guides must be securely fastened and maintained in a safe and suitable condition for service.

127 (*a*) *Pistons and piston rods.*—Pistons and piston rods shall be maintained in safe and suitable condition for service. Piston rods shall be carefully examined for cracks each time they are removed, and shall be renewed if found defective.

(*b*) All piston rods applied after January 1, 1916, shall have the date of application, original diameter, and kind of material legibly stamped on or near the end of rod.

128 (*a*) *Rods, main and side.*—Cracked or defective main or side rods shall not be continued in service.

(*b*) Autogenous welding of broken or cracked main and side rods not permitted.

(*c*) Bearings and bushings shall so fit the rods as to be in a safe and suitable condition for service, and means be provided to prevent bushings turning in rod. Straps shall fit and be securely bolted to rods.

(*d*) The total amount of side motion of rods on crank pins shall not exceed one-fourth inch.

(*e*) *Locomotives used in road service.*—The bore of main rod bearings shall not exceed pin diameters more than three thirty-seconds inch at front or back end. The total lost motion at both ends shall not exceed five thirty-seconds inch.

(*f*) The bore of side rod bearings shall not exceed pin diameters more than five thirty-seconds inch on main pin, nor more than three-sixteenths inch on other pins.

(*g*) *Locomotives used in yard service.*—The bore of main rod bearings shall not exceed pin diameters more than one-eighth inch at front end or five thirty-seconds inch at back end.

(*h*) The bore of side rod bearings shall not exceed pin diameter more than three-sixteenths inch.

(*i*) Oil and grease cups shall be securely attached to rods, and grease cup plugs shall be equipped with suitable fastenings.

LIGHTS.

129 (*a*). *Locomotives used in road service.*—Each locomotive used in road service between sunset and sunrise shall have a headlight which will enable persons with normal vision in the cab of the locomotive, under normal weather conditions, to see a dark object the size of a man for a distance of 1,000 feet or more ahead of the locomotive; and such headlights must be maintained in good condition.

(*b*) Locomotives used in road service, which are regularly required to run backward for any portion of their trip, except to pick up a detached portion of their train, or in making terminal movements, shall have on the rear a headlight which will meet the foregoing requirements.

(*c*) Nothing in the foregoing rules shall prevent the use of a device whereby the light may be diminished in yards and at stations to an extent that will enable the person

or persons operating the locomotive to see a dark object the size of a man for a distance of 300 feet or more ahead of the locomotive under the same conditions as set forth above.

(*d*) When two or more locomotives are used in the same train, the leading locomotive only will be required to display a headlight.

130. *Classification lamps.*—Each locomotive used in road service shall be provided with such classification lamps as may be required by the rules of the railroad company operating the locomotive. When such classification lamps are provided they shall be kept clean and maintained in safe and suitable condition for service.

131. *Locomotives used in yard service.*—Each locomotive used in yard service between sunset and sunrise shall have two headlights, one located on the front of the locomotive and one on the rear, each of which will enable persons with normal vision, in the cab of the locomotive, under normal weather conditions, to see a dark object the size of a man for a distance of 300 feet or more; and such headlights must be maintained in good condition.

132. *Cab lights.*—Each locomotive used between sunset and sunrise shall have cab lamps which will provide sufficient illumination for the steam, air, and water gauges to enable the enginemen to make necessary and accurate readings from their usual and proper positions in the cab. These lights shall be so located and constructed that the light will shine only on those parts requiring illumination. Locomotives used in road service shall have an additional lamp conveniently located to enable the persons operating the locomotive to easily and accurately read train orders and time tables, and so constructed that it may be readily darkened or extinguished.

RUNNING GEAR.

133 (*a*). *Driving, trailing, and engine truck axles.*—Driving, trailing, and engine truck axles with any of the following defects shall not be continued in service:

(*b*) Bent axle; cut journals that can not be made to run cool without turning; seamy journals in steel axles; transverse seams in iron axles, or any seams in iron axles causing journals to run hot, or unsafe on account of usage, accident, or derailment; driving, trailing, or engine truck axles more than one-half inch under original diameter, except for locomotives having all driving axles of the same diameter, when other than main driving axles, may be worn three-fourths inch below the original diameter.

(*c*) The date applied, the original diameter of the journal, and the kind of material shall be legibly stamped on one end of each driving axle, trailing truck axle, and engine truck axle applied after January 1, 1916.

134. *Tender truck axles.*—The minimum diameters of axles for various axle loads shall be as follows:

Axle load.	Minimum diameter of journal.	Minimum diameter of wheel seat.	Minimum diameter of center.
	Inches.	*Inches.*	*Inches.*
50,000 pounds	5½	7⅜	6 1/16
38,000 pounds	5	6⅞	5⅝
31,000 pounds	4½	6¼	5 1/16
22,000 pounds	3¾	5	4⅜
15,000 pounds	3¼	4⅝	3⅞

135. (*a*) Tender truck axles with any of the following defects shall not be continued in service:

(*b*) Bent axle; cut journals that can not be made to run cool without turning; seamy journals in steel axles, or transverse seams in journals of iron axles, or unsafe on account of usage, accident, or derailment; collars broken or worn to one-fourth inch or less in thickness; fillet in back shoulder worn out.

136 (*a*). *Crank pins.*—Crank pins shall be securely applied. Shimming or prick punching crank pins will not be allowed. All crank pins applied after January 1, 1916,

shall have the date applied and kind of material used legibly stamped on end of pin.

(*b*) Crank pin collars and collar bolts shall be maintained in a safe and suitable condition for service.

137. *Driving boxes.*—Driving boxes shall be maintained in a safe and suitable condition for service. Broken and loose bearings shall be renewed. Not more than one shim may be used between box and bearing.

138. *Driving box shoes and wedges.*—Driving box shoes and wedges shall be maintained in a safe and suitable condition for service.

139. *Frames.*—Frames, deck plates, tailpieces, pedestals, and braces shall be maintained in a safe and suitable condition for service, and shall be cleaned and thoroughly inspected each time the locomotive is in shop for heavy repairs.

140 (*a*). *Lateral motion.*—The total lateral motion or play between the hubs of the wheels and the boxes on any pair of wheels shall not exceed the following limits:

	Inch.
For engine truck wheels (trucks with swing centers)	1
For engine truck wheels (trucks with rigid centers)	1½
For trailing truck wheels	1
For driving wheels (more than one pair)	¾

(*b*) These limits may be increased on locomotives operating on track where the curvature exceeds 20 degrees when it can be shown that conditions require additional lateral motion.

(*c*) The lateral motion shall in all cases be kept within such limits that the driving wheels, rods, or crank pins will not interfere with other parts of the locomotive.

141 (*a*). *Pilots.*—Pilots shall be securely attached, properly braced, and maintained in a safe and suitable condition for service.

(*b*) The minimum clearance of pilot above the rail shall be 3 inches, and the maximum clearance 6 inches.

142 (*a*). *Spring rigging.*—Springs and equalizers shall be arranged to insure the proper distribution of weight to the various wheels of the locomotive, maintained approximately level, and in a safe and suitable condition for service.

(*b*) Springs or spring rigging with any of the following defects shall be renewed or properly repaired:

(*c*) One long leaf or two or more shorter leaves broken.

(*d*) Springs with leaves working in band.

(*e*) Broken coil springs.

(*f*) Broken driving box saddle, equalizer, hanger, bolt, or pin.

143 (*a*). *Trucks, leading and trailing.*—Trucks shall be maintained in safe and suitable condition for service. Center plates shall fit properly, and the male center plate shall extend into the female center plate not less than three-fourths inch. All centering devices shall be properly maintained.

(*b*) A suitable safety chain shall be provided at each front corner of all four wheel engine trucks.

(*c*) All parts of trucks shall have sufficient clearance to prevent them from seriously interfering with any other part of the locomotive.

144 (*a*). *Wheels.*—Wheels shall be securely pressed on axles. Prick punching or shimming the wheel fit will not be permitted. The diameter of wheels on the same axle shall not vary more than three thirty-seconds inch.

(*b*) Wheels used on standard gauge track will be out of gauge if the inside gauge of flanges, measured on base line, is less than 53 inches or more than 53⅜ inches.

(*c*) The distance back to back of flanges of wheels mounted on the same axle shall not vary more than one-fourth inch.

145 (*a*). *Cast iron or cast steel wheels.*—Cast iron or cast steel wheels with any of the following defects shall not be continued in service:

(*b*) *Slid flat.*—When the flat spot is 2½ inches or over in length, or if there are two or more adjoining spots each 2 inches or over in length.

(*c*) *Broken or chipped flange.*—If the chip exceeds 1½ inches in length and one-half inch in width.

(*d*) *Broken rim.*—If the tread, measured from the flange at a point five-eighths inch above the tread, is less than 3¾ inches in width.

(*e*) *Shelled out.*—Wheels with defective treads on account of cracks or shelled out spots 2½ inches or over, or so numerous as to endanger the safety of the wheel.

(*f*) *Brake burn.*—Wheels having defective tread on account of cracks or shelling out due to heating.

(*g*) Seams one-half inch long or over, at a distance of one-half inch or less from the throat of the flange, or seams 3 inches or more in length, if such seams are within the limits of 3¾ inches from the flange, measured at a point five-eighths inch from the tread.

(*h*) *Worn flanges.*—Wheels on axles with journals 5 inches by 9 inches or over with flanges having flat vertical surfaces extending seven-eighths inch or more from the tread, or flanges 1 inch thick or less gauged at a point three-eighths inch above tread. Wheels on axles with journals less than 5 inches by 9 inches with flanges having flat vertical surfaces extending 1 inch or more from the tread, or flanges fifteen-sixteenths inch thick or less, gauged at a point three-eighths inch above the tread.

(*i*) *Tread worn hollow.*—If the tread is worn sufficiently hollow to render the flange or rim liable to breakage.

(*j*) *Burst.*—If the wheel is cracked from the wheel fit outward.

(*k*) Cracked tread, cracked plate, or one or more cracked brackets.

(*l*) Wheels out of gauge.

(*m*) Wheels loose on axle.

NOTE.—The determination of flat spots, worn flanges, and broken rims shall be made by a gauge as shown in figure 8, and its application to defective wheels as shown in figures 9, 10, 11, 12, and 13.

146 (*a*). *Forged steel or steel tired wheels.*—Forged steel or steel tired wheels with any of the following defects shall not be continued in service:

(*b*) Loose wheels; loose, broken, or defective retaining rings or tires; broken or cracked hubs, plates, spokes, or bolts.

(*c*) Slid flat spot 2½ inches or longer; or, if there are two or more adjoining spots, each 2 inches or longer.

(*d*) Defective tread on account of cracks or shelled out spots 2½ inches or longer, or so numerous as to endanger the safety of the wheel.

(*e*) Broken flange.

(*f*) Flange worn to fifteen-sixteenths inch or less in thickness, gauged at a point three-eighths inch above the tread, or having flat vertical surface 1 inch or more from tread; tread worn five-sixteenths inch; flange more than 1½ inches from tread to top of flange, or thickness of tires or rims less than shown in figures 4, 5, 6, and 7.

(*g*) Wheels out of gauge.

147. *Driving and trailing wheels.*—Driving and trailing wheel centers with divided rims shall be properly fitted with iron or steel filling blocks before the tires are applied, and such filling blocks shall be properly maintained. When shims are inserted between the tire and the wheel center, not more than two thicknesses of shims may be used, one of which must extend entirely around the wheel.

148. Driving wheel counterbalance shall be maintained in a safe and suitable condition for service.

149 (*a*). Driving and trailing wheels with any of the following defects shall not be continued in service:

(*b*) Driving or trailing wheel centers with three adjacent spokes or 25 per cent of the spokes in wheel broken.

(*c*) Loose wheels; loose, broken, or defective tires or tire fastenings; broken or cracked hubs, or wheels out of gauge.

150 (*a*). *Driving and trailing wheel tires.*—The minimum height of flange for driving and trailing wheel tires, measured from tread, shall be 1 inch for locomotives used in road service, except for locomotives originally constructed

for plain tires, when the minimum height of flange on one pair of wheels may be seven-eighths inch.

(*b*) The minimum height of flange for driving wheel tires, measured from tread, shall be seven-eighths inch for locomotives used in switching service.

(*c*) The maximum taper for tread of tires from throat of flange to outside of tire, for driving and trailing wheels for locomotives used in road service, shall be one-fourth inch, and for locomotives used in switching service five-sixteenths inch.

(*d*) The minimum width of tires for driving and trailing wheels of standard-gauge locomotives shall be 5½ inches for flanged tires, and 6 inches for plain tires.

(*e*) The minimum width of tires for driving and trailing wheels of narrow-gauge locomotives shall be 5 inches for flanged tires, and 5½ inches for plain tires.

(*f*) When all tires are turned or new tires applied to driving and trailing wheels, the diameter of the wheels on the same axle, or in the same driving wheel base, shall not vary more than three thirty-seconds inch. When a single tire is applied the diameter must not vary more than three thirty-seconds inch from that of the opposite wheel on the same axle. When a single pair of tires is applied the diameter must be within three thirty-seconds inch of the average diameter of the wheels in the driving-wheel base to which they are applied.

(*g*) Driving and trailing wheel tires with any of the following defects shall not be continued in service:

(*h*) Slid flat spot 2½ inches or more in length; flange fifteen-sixteenths inch or less in thickness, gauged at a point three-eighths inch above the tread, or having flat vertical surface 1 inch or more from tread; tread worn hollow five-sixteenths inch on locomotives used in road service, or three-eighths inch on locomotives used in switching service; flange more than 1½ inches from tread to top of flange. (See figs. 1, 2, and 3.)

NOTE.—The determination of flat spots and worn flanges shall be made by a gauge as shown in figure 8, and its application to defective tires as shown in figures 9, 10, and 11.

151 (*a*). *Minimum thickness for driving wheel and trailer tires on standard and narrow gauge locomotives:*

Weight per axle (weight on drivers divided by number of pairs of driving wheels).	Diameter of wheel center.	Minimum thickness, service limits.	
		Road service.	Switching service.
	Inches.	*Inches.*	*Inches.*
30,000 pounds and under	44 and under	1 1/2	1 1/2
	Over 44 to 50	1 5/16	1 5/16
	Over 50 to 56	1 1/8	1 1/16
	Over 56 to 62	1 1/16	1 1/16
	Over 62 to 68	1 1/2	.....
	Over 68 to 74	1 5/16	.....
	Over 74	1 1/8	.....
Over 30,000 to 35,000 pounds	44 and under	1 5/16	1 5/16
	Over 44 to 50	1 1/8	1 1/16
	Over 50 to 56	1 1/16	1 1/16
	Over 56 to 62	1 1/2	1 1/8
	Over 62 to 68	1 5/16	.....
	Over 68 to 74	1 1/8	.....
	Over 74	1 1/16	.....
Over 35,000 to 40,000 pounds	44 and under	1 1/8	1 1/16
	Over 44 to 50	1 1/16	1 1/16
	Over 50 to 56	1 1/2	1 1/8
	Over 56 to 62	1 5/16	1 1/16
	Over 62 to 68	1 1/8	.....
	Over 68 to 74	1 1/16	.....
	Over 74	1	.....
Over 40,000 to 45,000 pounds	44 and under	1 1/16	1 1/16
	Over 44 to 50	1 1/2	1 1/8
	Over 50 to 56	1 5/16	1 1/16
	Over 56 to 62	1 1/8	1 1/2
	Over 62 to 68	1 1/16	.....
	Over 68 to 74	1	.....
	Over 74	1 1/16	.....
Over 45,000 to 50,000 pounds	44 and under	1 1/2	1 3/8
	Over 44 to 50	1 5/16	1 1/16
	Over 50 to 56	1 1/8	1 1/2
	Over 56 to 62	1 1/16	1 5/16
	Over 62 to 68	1	.....
	Over 68 to 74	1 1/16	.....
	Over 74	1 1/16	.....
Over 50,000 to 55,000 pounds	44 and under	1 5/16	1 1/16
	Over 44 to 50	1 1/8	1 1/2
	Over 50 to 56	1 1/16	1 5/16
	Over 56 to 62	1	1 1/8
	Over 62 to 68	1 1/16	.....
	Over 68 to 74	1 1/16	.....
	Over 74	1 1/16	.....
Over 55,000 pounds	44 and under	1 1/8	1 1/2
	Over 44 to 50	1 1/16	1 5/16
	Over 50 to 56	1	1 1/8
	Over 56 to 62	1 1/16	1 1/16
	Over 62 to 68	1	.....
	Over 68 to 74	1 1/16	.....
	Over 74	2	.....

(*b*) When retaining rings are used, measurements of tires to be taken from the outside circumference of the ring, and the minimum thickness of tires may be as much below the limits specified above as the tires extend between the retaining rings, provided it does not reduce the thickness of the tire to less than 1½ inches from the throat of flange to the counterbore for the retaining ring.

(*c*) The minimum thickness for driving wheel tires shall be 1 inch for locomotives operated on track of 2-foot gauge.

TENDERS.

152 (*a*). *Tender frames.*—Tender frames shall be maintained in a safe and suitable condition for service.

(*b*) The difference in height between the deck on the tender and the cab floor or deck on the locomotive shall not exceed 1½ inches.

(*c*) The minimum width of the gangway between locomotive and tender, while standing on straight track, shall be 16 inches.

153. (*a*) *Feed water tanks.*—Tanks shall be maintained free from leaks, and in safe and suitable condition for service. Suitable screens must be provided for tank wells or tank hose.

(*b*) Not less frequently than once each month the interior of the tank shall be inspected, and cleaned if necessary.

(*c*) Top of tender behind fuel space shall be kept clean, and means provided to carry off waste water. Suitable covers shall be provided for filling holes.

154. *Oil tanks.*—The oil tanks on oil burning locomotives shall be maintained free from leaks. An automatic safety cut out valve, which may be operated by hand from inside and outside of cab, shall be provided for the oil-supply pipe.

155. (*a*) *Tender trucks.*—Tender truck center plates shall be securely fastened, maintained in a safe and suit-

able condition for service, and provided with a center pin properly secured. When shims are used between truck center plates, the male center plate must extend into the female center plate not less than three-fourths inch.

(*b*) Truck bolsters shall be maintained approximately level.

(*c*) When tender trucks are equipped with safety chains, they shall be maintained in a safe and suitable condition for service.

(*d*) Side bearings shall be maintained in a safe and suitable condition for service.

(*e*) Friction side bearings shall not be run in contact.

(*f*) The maximum clearance of side bearings on rear truck shall be three-eighths inch, and if used on front truck three-fourths inch, when the spread of side bearings is 50 inches. When the spread of the side bearings is increased, the maximum clearance may be increased in proportion.

THROTTLE AND REVERSING GEAR.

156. *Throttles.*—Throttles shall be maintained in safe and suitable condition for service, and efficient means provided to hold the throttle lever in any desired position.

157. *Reversing gear.*—Reversing gear, reverse levers, and quadrants shall be maintained in a safe and suitable condition for service. Reverse lever latch shall be so arranged that it can be easily disengaged, and provided with a spring which will keep it firmly seated in quadrant. Proper counterbalance shall be provided for the valve gear.

158. Upon application to the Chief Inspector, modification of these rules, not inconsistent with their purpose, may be made for roads operating less than five locomotives, if an investigation shows that conditions warrant it.

FILING REPORTS.

159. *Report of inspection.*—Not less than once each month and within 10 days after inspection a report of inspection, Form No. 1, size 6 by 9 inches, shall be filed

with the United States Inspector in charge for each locomotive used by a railroad company, and a copy shall be filed in the office of the chief mechanical officer having charge of the locomotive.

160. A copy of the monthly inspection report, Form No. 1, or annual inspection report, Form No. 3, properly filled out, shall be placed under glass in a conspicuous place in the cab before the locomotive inspected is put into service.

161. Not less than once each year, and within 10 days after required tests have been completed, a report of such tests, showing general condition of the locomotive, shall be submitted on Form No. 3, size 6 by 9 inches, and filed with the United States Inspector in Charge, and a copy shall be filed in the office of the chief mechanical officer having charge of the locomotive. The monthly report will not be required for the month in which this report is filed.

Form No. 3 should be printed on yellow paper.

NOTE.—Samples of Forms Nos. 1 and 3, indicating exact size, color, weight, and grade of paper, will be furnished on application.

ACCIDENT REPORTS.

162. In the case of an accident resulting from failure, from any cause, of a locomotive or tender, or any appurtenances thereof, resulting in serious injury or death to one or more persons, the carrier owning or operating such locomotive shall immediately transmit by wire to the Chief Inspector, at his office in Washington, D. C., a report of such accident, stating the nature of the accident, the place at which it occurred, as well as where the locomotive may be inspected, which wire shall be immediately confirmed by mail, giving a full detailed report of such accident, stating, so far as may be known, the causes and giving a complete list of the killed or injured.

NOTE.—Locomotive boilers and their appurtenances will be inspected in accordance with the order of the Commission, dated June 2, 1911.

Safety appliances on locomotives will be inspected in accordance with the order of the Commission, dated March 13, 1911, extract from which appears on page 77.

REVISED STATUTES OF THE UNITED STATES.

[As amended by act of Mar. 4, 1909; 35 Stat., 1088.]

SEC. 125. Whoever, having taken an oath before a competent tribunal, officer, or person, in any case in which a law of the United States authorizes an oath to be administered, that he will testify, declare, depose, or certify truly, or that any written testimony, declaration, deposition, or certificate by him subscribed is true, shall willfully and contrary to such oath state or subscribe any material matter which he does not believe to be true, is guilty of perjury, and shall be fined not more than two thousand dollars and imprisoned not more than five years.

MONTHLY LOCOMOTIVE INSPECTION AND REPAIR REPORT.

Form No. 1.

Locomotive {Number.....
Initial.....

....., 191 .

..... *Company.*

In accordance with the act of Congress approved February 17, 1911, as amended March 4, 1915, and the rules and instructions issued in pursuance thereof and approved by the Interstate Commerce Commission, all parts of locomotive No. ....., including the boiler and appurtenances, were inspected on ....., 191 , at ....., and all defects disclosed by said inspection have been repaired, except as noted on the back of this report.

1. Steam gauges tested and left in good condition on....., 191 .
2. Safety valves set to pop at ..... pounds, ... pounds, ...pounds on ....., 191 .
3. Were both injectors tested and left in good condition? .....
4. Were steam leaks repaired? .....
5. Condition of brake and signal equipment, ...
6. Condition of draft gear and draw gear, ...
7. Condition of driving gear, ...
8. Condition of running gear, ...
9. Condition of tender, ...

I certify that the above report is correct.

....., *Inspector.*

10. Was boiler washed and gauge cocks and water glass cock spindles removed and cocks cleaned? .....
11. Were steam leaks repaired? .....
12. Condition of staybolts and crown stays, ...
13. Number of staybolts and crown stays renewed, ...
14. Condition of flues and firebox sheets, ...
15. Condition of arch and water bar tubes, if used, ...
16. Were fusible plugs removed and cleaned? .....
17. Date of previous hydrostatic test, ..., 191 .
18. Date of removal of caps from flexible staybolts, ..., 191 .

I certify that the above report is correct.

....., *Inspector.*

STATE OF.....
COUNTY OF..... } *ss:*

Subscribed and sworn to before me this ..... day of ....., 191 , by ..... inspectors of the ..... Company.

.....
Notary Public.

The above work has been performed and the report is approved.

.....
Officer in Charge.

58

Form No. 2.

Locomotive { Number..... / Initials ..... }

..... *Railroad.*

LOCOMOTIVE INSPECTION REPORT.

INSTRUCTIONS.—Each locomotive and tender must be inspected after each trip or day's work and report made on this form, whether needing repairs or not. Proper explanation must be made hereon for failure to repair any defects reported, and the form approved by foreman, before the locomotive is returned to service.

Inspected at ....., time ..... m. Date ..... 191 -.

Repairs needed:

.....

.....

.....

.....

.....

.....

Condition of injectors..... Water glass..... .....

Condition of gauge cocks ..... Brakes.....

Condition of piston rod and valve stem packing ....

Safety valve lifts at ..... pounds. Seats at ..... pounds.

Main reservoir pressure, ... pounds. Brake pipe pressure, ... pounds.

(Signature) .....,

(Occupation) .....

The above work has been performed, except as noted, and the report is approved.

.....,

Foreman.

NOTE.—Additional items may be added to this form if desired.

ANNUAL LOCOMOTIVE INSPECTION AND REPAIR REPORT.

Form No. 3.

Locomotive { Number .....
Initial .....

....., 191 .

..... *Company.*

In accordance with the act of Congress approved February 17, 1911, as amended March 4, 1915, and the rules and instructions issued in pursuance thereof and approved by the Interstate Commerce Commission, all parts of locomotive No. ....., including the boiler and its appurtenances, were inspected on ....., 191 , at ....., and all defects disclosed by said inspection have been repaired, except as noted on the back of this report.

1. Date of previous hydrostatic test, ..., 191 .
2. Date of previous removal of caps from flexible staybolts . 191 .
3. Date of previous removal of flues, ..., 191 .
4. Date of previous removal of all lagging, ..., 191 .
5. Hydrostatic test pressure of ..... pounds was applied.
6. Were caps removed from all flexible staybolts? .....
7. Were all flues removed? ..... Number .....
8. Condition of interior of barrel, ...
9. Was all lagging removed? .....
10. Condition of exterior of barrel, ...
11. Was boiler entered and inspected? .....

I certify that the above report is correct.

12. Was boiler washed? Water glass cocks and gauge cocks cleaned? .....
13. Condition of crown stays and staybolts, ...
14. Condition of sling stays and crown bars, ...
15. Condition of firebox sheets and flues, ...
16. Condition of arch tubes, ... Water bar tubes, ...
17. Condition of throat braces, ...
18. Condition of back head braces, ...
19. Condition of front flue sheet braces, ...
20. Were fusible plugs removed and cleaned? .....
21. Were steam leaks repaired? .....

....., *Inspector.*

22. Were steam gauges tested and left in good condition? .....
23. Safety valves set to pop at ..... pounds, ... pounds, ... pounds.
24. Were both injectors tested and left in good condition? .....
25. Were steam leaks repaired? .....
26. Hydrostatic test of ..... pounds applied to main reservoirs.

I certify that the above report is correct.

27. Condition of brake and signal equipment, ...
28. Were drawbar and drawbar pins removed and inspected? .....
29. Condition of draft gear and draw gear, ...
30. Condition of driving gear, ...
31. Condition of running gear, ...
32. Condition of tender, ...

....., *Inspector.*

STATE OF .....
COUNTY OF ..... } ss.

Subscribed and sworn to before me this ..... day of ....., 191 , by ....., inspectors of the ..... Company

..... *Notary Public.*

The above work has been performed and the report is approved.

..... *Officer in Charge.*

Form no. 4.

Specification Card for Locomotive No.....

Owned by ..... Railroad Company.

Operated by ..... Railroad Company.

Builder .....
Builder's No. of Boiler.....
When built .....
Where built.....
Type of boiler .....
Material of boiler shell sheets .....
Material of rivets.....
Dome, where located .....
Grate area in sq. ft.....
Height of lowest reading of gauge glass above crown sheet ... .
Height of lowest gauge cock above crown sheet .....
Water bar tubes, O. diam ..... thickness .....
Arch tubes, O. diam ..... thickness .....
Fire tubes, number .....
" " O. diam ..... length .....

Safety valves:

No.	Size.	Make.	Style.

Firebox stay bolts, O. diam ..... spaced .....x .....
Combustion chamber stay bolts, O. diam .....
" " " " spaced ..... x .....
Crown stays, O. diam., top ..... bottom .....
" " spaced ..... x .....
Crown bar rivets, O. diam., top ..... bottom .....
" " " spaced ..... x .....
Water space at firebox ring, sides .....
back ..... front .....
Width of water space at sides of firebox measured at center line of boiler, front ..... back .....

Shell sheets:
Front tube ..... thick.
1st course ..... " ..... I. diam.
2d " ..... " ..... "
3d " ..... " ..... "
Mem.: When courses are not cylindrical give inside diameter at each end.
Firebox:
Thickness of sheets—
Tube ..... Crown ..... Side .....
Door ..... Combustion chamber .....
Inside throat (if tube sheet is in two pieces) .....
External firebox:
Thickness of sheets—throat ..... back head .....
Roof ..... sides .....
Dome inside diam. .....
Thickness of sheet ..... base ..... liner .....
Were you furnished with authentic records of the tests of materials used in boiler? .....
Records on file in the office of the .....
of the ..... Company show that the lowest tensile strength of the sheets in the shell of this boiler is:
1st course ..... pounds per sq. in.
2d " ..... " " " "
3d " ..... " " " "
Is boiler shell circular at all points? .....
If shell is flattened, state location and amount .....
.....
Are all parts thoroughly stayed? .....
Are dome and other openings sufficiently reenforced? .....
Is boiler equipped with fusible plugs? .....

Make working sketch here or attach drawing of longitudinal and circumferential seams used in shell of boiler, indicating on which courses used, and give calculated efficiency of weakest longitudinal seam.

The maximum stresses at the allowed working pressure were found by calculation to be as follows:

Stay bolts at root of thread ..... lbs. per sq. in.
Stay bolts at reduced section ..... " " " "
Crown stays or crown bar rivets at root of thread or smallest section, top ..... lbs. per sq. in.
Crown stays or crown bar rivets at root of thread or smallest section, bottom ..... lbs. per sq. in.

Round and rectangular braces ..... lbs. per sq. in.
Gusset braces ..... " " " "
Shearing stress on rivets ..... " " " "
Tension on net section of plate in longitudinal seam of lowest efficiency, pounds per sq. in. .....

Dimensions and data taken from locomotive were furnished by .....
Data upon which above calculations were made were obtained from drawing No. .....
dated ..... furnished by ..... Company.

.....
Mechanical Engineer.

STATE OF .....
COUNTY OF ..... } *ss:*

.....being duly sworn says that he is the officer who signed the foregoing specification, that he has satisfied himself of the correctness of the drawings and data used, has verified all of the calculations, and has examined the record of present condition of boiler dated ..... and sworn to by inspector .....
and believes that the design, construction, and condition of boiler No. ..... renders it safe for a working pressure of ..... pounds per square inch.

.....
(Name of affiant.)

Subscribed and sworn to before me
this ..... day of ....., 191

.....
Notary Public.

Approved:

.....

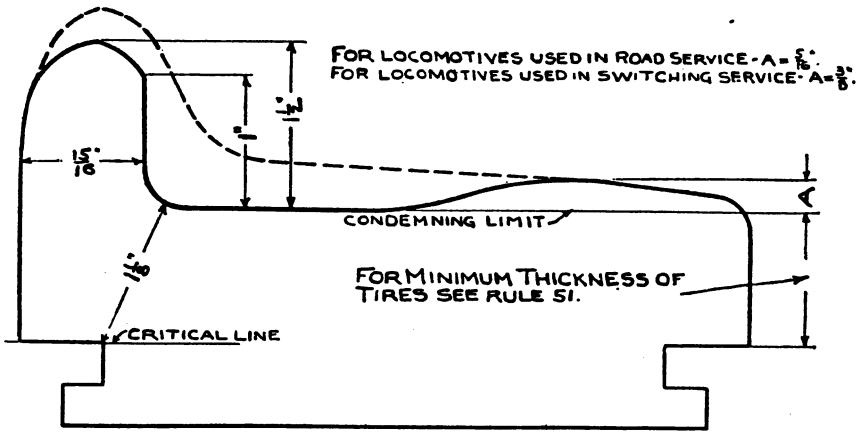


FIG. 1.—STEEL TIRE.

Retaining ring fastening. Driving and trailing wheels.

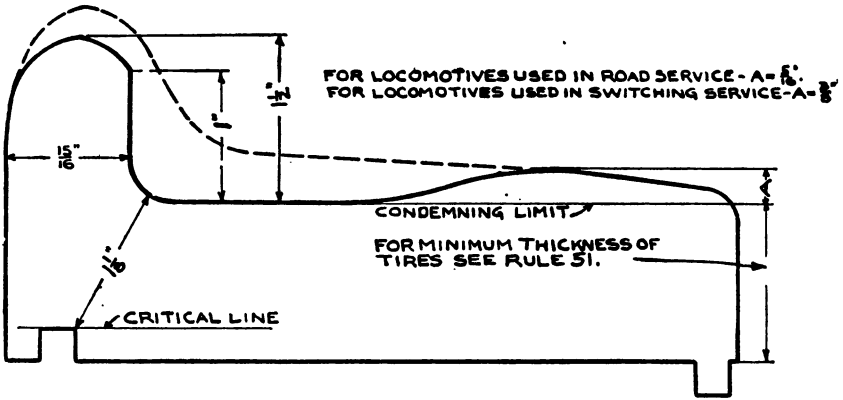


FIG. 2.—STEEL TIRE.

Shrinkage fastening with shoulder and retaining segments. Driving and trailing wheels.

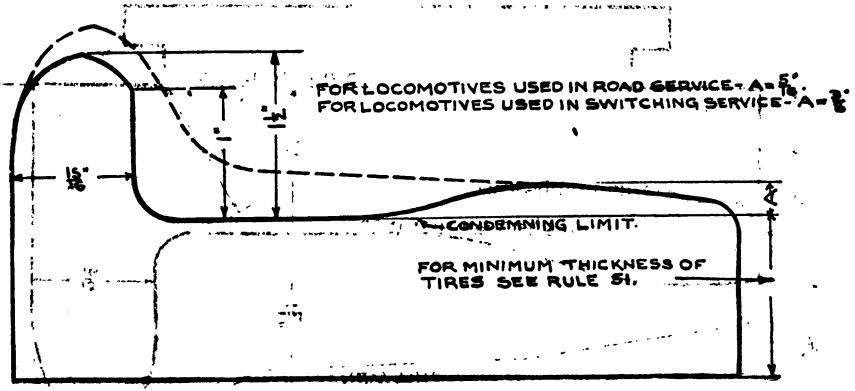


FIG. 3.—STEEL TIRE.

Shrinkage fastening. Driving and trailing wheels.

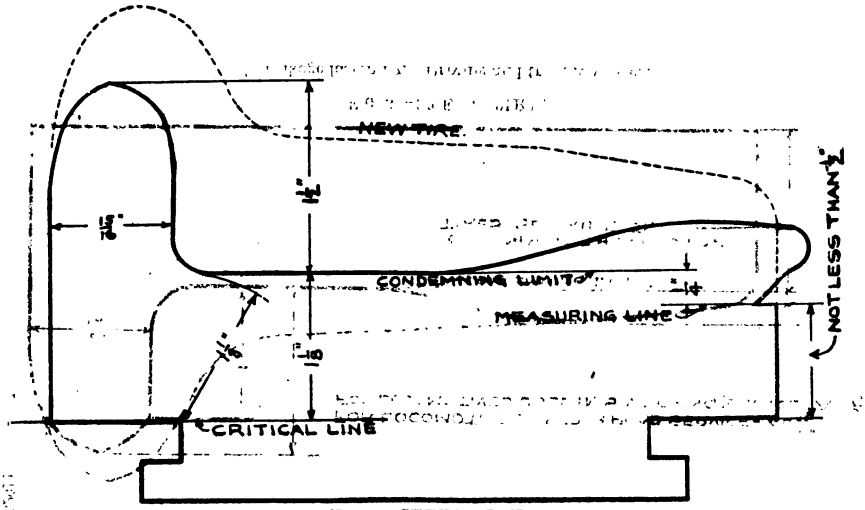


FIG. 4.—STEEL TIRE.

Retaining ring fastening. Minimum thickness for steel tires. Engine and tender truck wheels. (See Rule 46.)

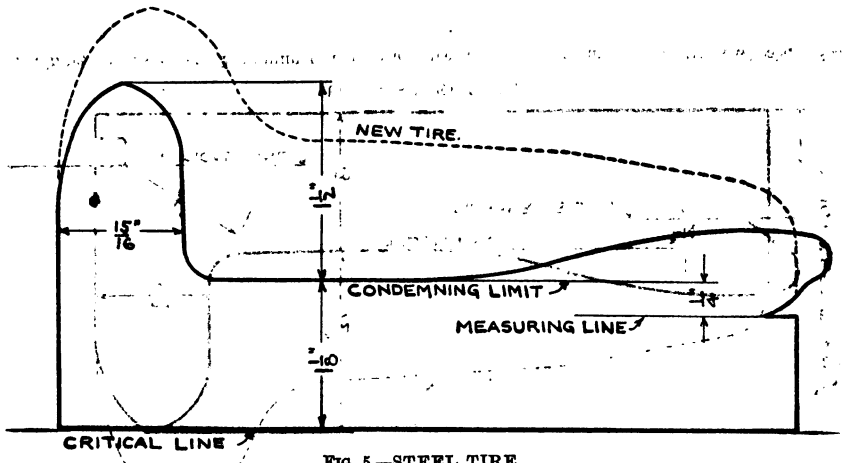


FIG. 5.—STEEL TIRE.

Shrinkage fastening only. Minimum thickness for steel tires. Engine and tender truck wheels. (See Rule 46.)

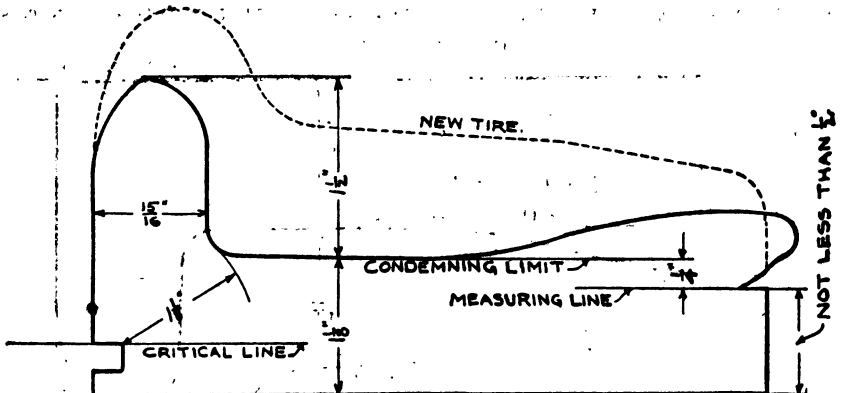
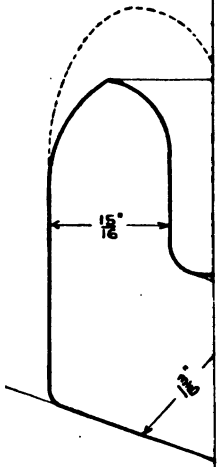
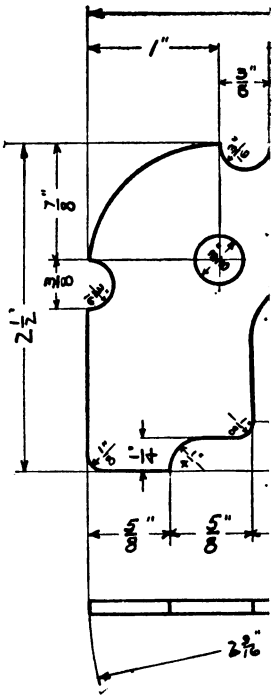


FIG. 6.—STEEL TIRE.

Retaining ring fastening. Minimum thickness for steel tires. Engine and tender truck wheels. (See Rule 46.)



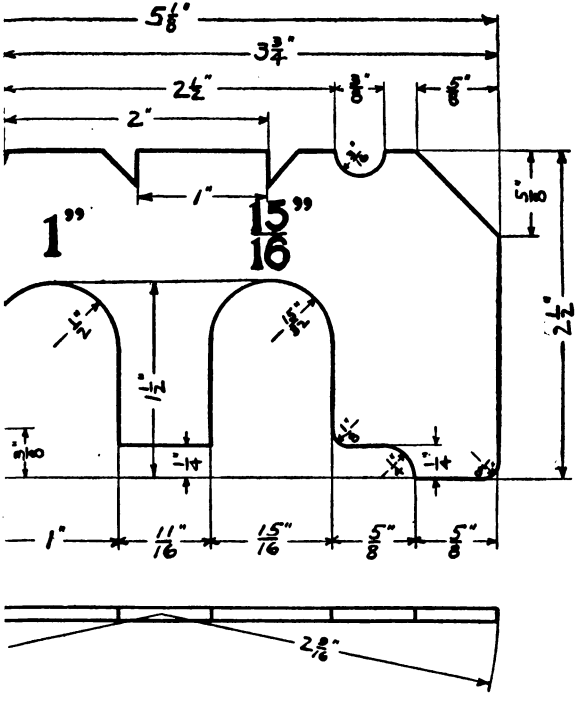


Minimum th

52914°—16. (To face

F

This gauge to be used in deterr



IG. 8.—WHEEL DEFECT GAUGE.

nining flat spots, worn flanges, and broken rims. (See Rules 45, 46, and 50.)

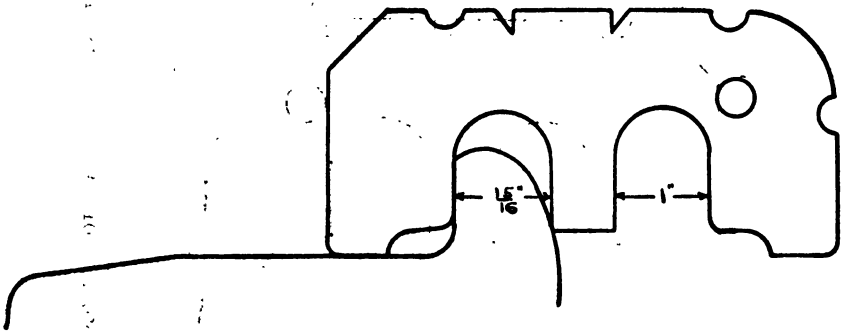


Fig. 9.—METHOD OF GAUGING WORN FLANGES.

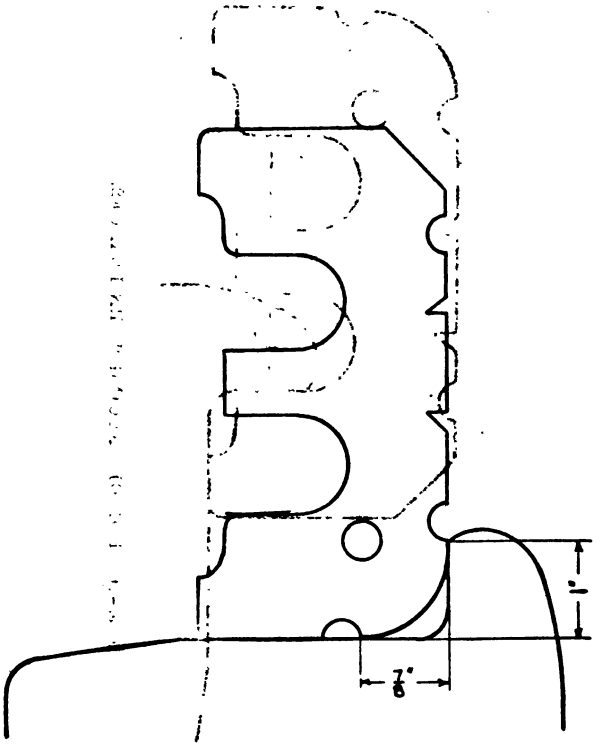


FIG. 10.—METHOD OF GAUGING WORN FLANGES.

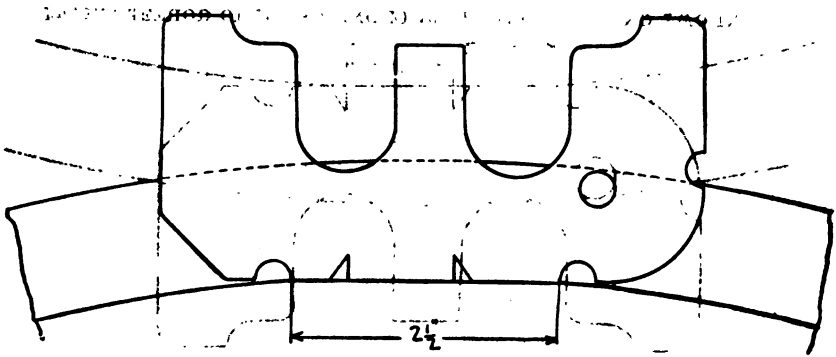


FIG. 11.—METHOD OF GAUGING SHELLED AND FLAT SPOTS.

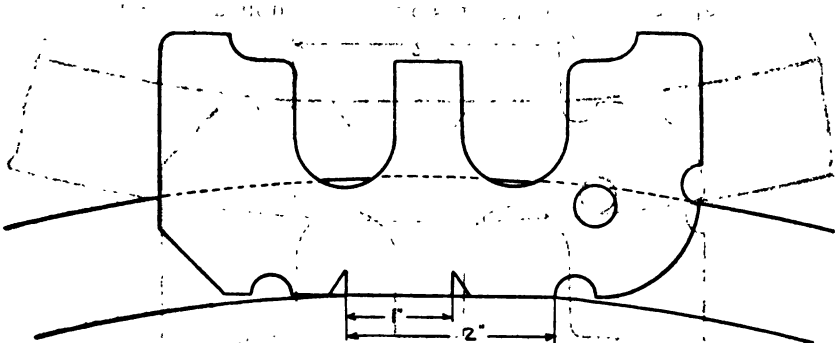


FIG. 12.—METHOD OF MEASURING FLAT SPOTS OF ONE AND TWO INCHES.

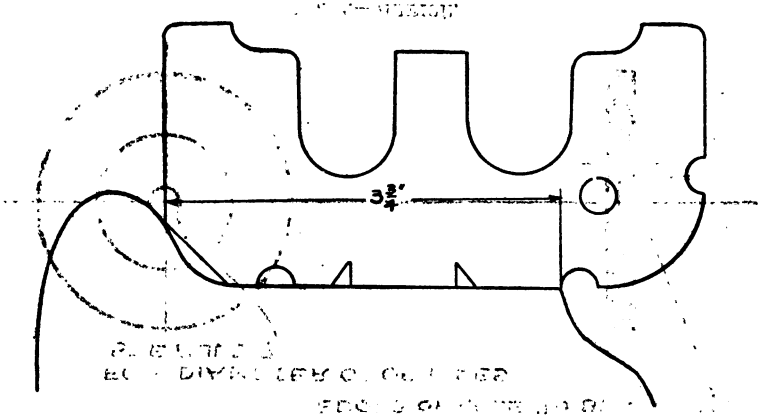


FIG. 13.—METHOD OF GAUGING BROKEN RIMS.

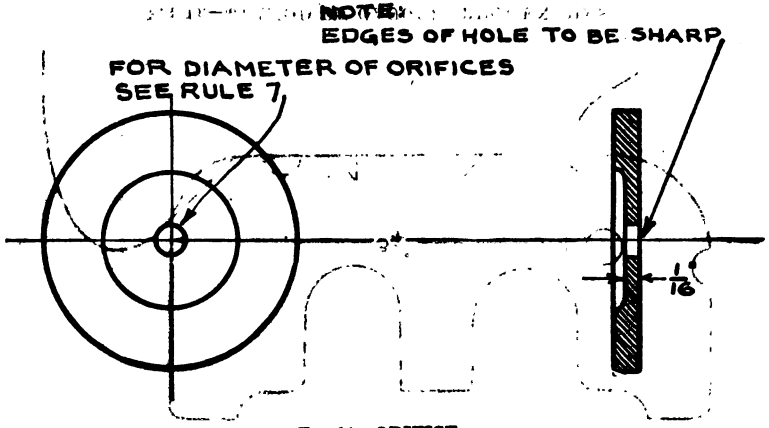


FIG. 14.—ORIFICE.

SAFETY APPLIANCE STANDARDS FOR LOCOMOTIVES, AS FIXED BY ORDER OF THE COMMISSION DATED MARCH 13, 1911.

STEAM LOCOMOTIVES USED IN ROAD SERVICE.

TENDER SILL-STEPS.

Number:

Four (4) on tender.

Dimensions:

Bottom tread not less than eight (8) by twelve (12) inches, metal.

[*May have wooden treads.*]

If stirrup-steps are used, clear length of tread shall be not less than ten (10), preferably twelve (12), inches.

Location:

One (1) near each corner of tender on sides.

Manner of application:

Tender sill-steps shall be securely fastened with bolts or rivets.

PILOT SILL-STEPS.

Number:

Two (2).

Dimensions:

Tread not less than eight (8) inches in width by ten (10) inches in length, metal.

[*May have wooden treads.*]

Location:

One (1) on or near each end of buffer-beam, outside of rail and not more than sixteen (16) inches above rail.

Manner of application:

Pilot sill-steps shall be securely fastened with bolts or rivets.

PILOT-BEAM HANDHOLDS.

Number:

Two (2).

Dimensions:

Minimum diameter, five-eighths (⅝) of an inch, wrought iron or steel.

Minimum clear length, fourteen (14), preferably sixteen (16), inches.

Minimum clearance, two and one-half (2½) inches.

Location:

One (1) on each end of buffer-beam.

[*If uncoupling-lever extends across front end of locomotive to within eight (8) inches of end of buffer-beam, and is seven-eighths (⅞) of an inch or more in diameter, securely fastened, with a clearance of two and one-half (2½) inches, it is a handhold.*]

Manner of application:

Pilot-beam handholds shall be securely fastened with bolts or rivets.

SIDE-HANDHOLDS.

Number:

Six (6).

Dimensions:

Minimum diameter, if horizontal, five-eighths (⅝) of an inch; if vertical, seven-eighths (⅞) of an inch, wrought iron or steel.

Horizontal, minimum clear length, sixteen (16) inches.

Vertical, clear length equal to approximate height of tank.

Minimum clearance two (2), preferably two and one-half (2½), inches.

Location:

Horizontal or vertical: If vertical, one (1) on each side of tender within six (6) inches of rear or on corner, if horizontal, same as specified for "Box and other house cars."

One (1) on each side of tender near gangway; one (1) on each side of locomotive at gangway; applied vertically.

Manner of application:

Side-handholds shall be securely fastened with not less than one-half (½) inch bolts or rivets.

REAR-END HANDHOLDS.

Number:

Two (2).

Dimensions:

Minimum diameter, five-eighths (⅝) of an inch, wrought iron or steel.

Minimum clear length, fourteen (14) inches.

Minimum clearance two (2), preferably two and one-half (2½), inches.

Location:

Horizontal: One (1) near each side of rear end of tender on face of end-sill. Clearance of outer end of handhold shall be not more than sixteen (16) inches from side of tender.

Manner of application:

Rear-end handholds shall be securely fastened with not less than one-half (½) inch bolts or rivets.

UNCOUPLING-LEVERS.

Number:

Two (2) double levers, operative from either side.

Dimensions:

Rear-end levers shall extend across end of tender with handles not more than twelve (12), preferably nine (9), inches from side of tender with a guard bent on handle to give not less than two (2) inches clearance around handle.

Location:

One (1) on rear end of tender and one (1) on front end of locomotive. Handles of front-end levers shall be not more than twelve (12), preferably nine (9), inches from ends of buffer-beam, and shall be so constructed as to give a minimum clearance of two (2) inches around handle.

Manner of application:

Uncoupling-levers shall be securely fastened with bolts or rivets.

COUPLERS.

Locomotives shall be equipped with automatic couplers at rear of tender and front of locomotive.

STEAM LOCOMOTIVES USED IN SWITCHING SERVICE.

FOOTBOARDS.

Number:

Two (2) or more.

Dimensions:

Minimum width of tread, ten (10) inches, wood.

Minimum thickness of tread, one and one-half (1½), preferably two (2), inches.

Minimum height of back-stop, four (4) inches above tread.

Height from top of rail to top of tread, not more than twelve (12) nor less than nine (9) inches.

Location:

Ends or sides.

If on ends, they shall extend not less than eighteen (18) inches outside of gauge of straight track, and shall be not more than twelve (12) inches shorter than buffer-beam at each end.

Manner of application:

End footboards may be constructed in two (2) sections, *provided* that practically all space on each side of coupler is filled; each section shall be not less than three (3) feet in length.

Footboards shall be securely bolted to two (2) one (1) by four (4) inches metal brackets, *provided* footboard is not cut or notched at any point.

Manner of application—Continued.

If footboard is cut or notched or in two (2) sections, not less than four (4) one (1) by three (3) inches metal brackets shall be used, two (2) located on each side of coupler. Each bracket shall be securely bolted to buffer-beam, end-sill or tank-frame by not less than two (2) seven-eighths ($\frac{7}{8}$) inch bolts.

If side footboards are used, a substantial handhold or rail shall be applied not less than thirty (30) inches nor more than sixty (60) inches above tread of footboard.

SILL-STEPS.

Number:

Two (2) or more.

Dimensions:

Lower tread of step shall be not less than eight (8) by twelve (12) inches, metal.

[*May have wooden treads.*]

If stirrup-steps are used, clear length of tread shall be not less than ten (10), preferably twelve (12), inches.

Location:

One (1) or more on each side at gangway secured to locomotive or tender.

Manner of application:

Sill-steps shall be securely fastened with bolts or rivets.

END-HANDHOLDS.

Number:

Two (2).

Dimensions:

Minimum diameter, one (1) inch, wrought iron or steel.

Minimum clearance, four (4) inches, *except* at coupler casting or braces, when minimum clearance shall be two (2) inches.

Location:

One (1) on pilot buffer-beam; one on rear end of tender, extending across front end of locomotive and rear end of tender. Ends of handholds shall be not more than (6) inches from ends of buffer-beam or end-sill, securely fastened at ends.

Manner of application:

End-handholds shall be securely fastened with bolts or rivets.

SIDE-HANDHOLDS.

Number:

Four (4).

Dimensions:

Minimum diameter, seven-eighths ($\frac{7}{8}$) of an inch, wrought iron or steel.

Clear length equal to approximate height of tank.

Minimum clearance, two (2), preferably two and one-half ($2\frac{1}{2}$), inches.

Location:

Vertical. One (1) on each side of tender near front corner; one (1) on each side of locomotive at gangway.

Manner of application:

Side-handholds shall be securely fastened with bolts or rivets.

UNCOUPLING-LEVERS.

Number:

Two (2) double levers, operative from either side.

Dimensions:

Handles of front-end levers shall be not more than twelve (12), preferably nine (9), inches from ends of buffer-beam, and shall be so constructed as to give a minimum clearance of two (2) inches around handle.

Rear end levers shall extend across end of tender with handles not more than twelve (12), preferably nine (9), inches from side of tender, with a guard bent on handle to give not less than two (2) inches clearance around handle.

Location:

One (1) on rear end of tender and one (1) on front end of locomotive.

HANDRAILS AND STEPS FOR HEADLIGHTS.

Switching locomotives with sloping tenders with manhole or headlight located on sloping portion of tender shall be equipped with secure steps and handrail or with platform and handrail leading to such manhole or headlight.

END-LADDER CLEARANCE.

No part of locomotive or tender *except* draft rigging, coupler and attachments, safety-chains, buffer-block, foot-board, brake pipe, signal pipe, steam-heat pipe or arms of uncoupling lever shall extend to within fourteen (14) inches of a vertical plane passing through the inside face of knuckle when closed with horn of coupler against buffer block or end sill.

COUPLERS.

Locomotives shall be equipped with automatic couplers at rear of tender and front of locomotive.

SPECIFICATIONS COMMON TO ALL STEAM LOCOMOTIVES.

HAND-BRAKES.

Hand brakes will not be required on locomotives nor on tenders when attached to locomotives.

If tenders are detached from locomotives and used in special service, they shall be equipped with efficient hand-brakes.

RUNNING-BOARDS.

Number:

Two (2).

Dimensions:

Not less than ten (10) inches wide. If of wood, not less than one and one-half (1½) inches in thickness; if of metal, not less than three-sixteenths ($\frac{3}{16}$) of an inch, properly supported.

Location:

One (1) on each side of boiler extending from cab to front end near pilot-beam.

[*Running boards may be in sections. Flat top steam-chests may form section of running board.*]

Manner of application:

Running boards shall be securely fastened with bolts, rivets or studs.

Locomotives having Wootten type boilers with cab located on top of boiler more than twelve (12) inches forward from boiler head shall have suitable running-boards running from cab to rear of locomotive, with handrailings not less than twenty (20) nor more than forty-eight (48) inches above outside edge of running boards, securely fastened with bolts, rivets or studs.

HANDRAILS.

Number:

Two (2) or more.

Dimensions:

Not less than one (1) inch in diameter, wrought iron or steel.

Location:

One on each side of boiler extending from near cab to near front end of boiler, and extending across front end of boiler, not less than twenty-four (24) nor more than sixty-six (66) inches above running-board.

Manner of application:

Handrails shall be securely fastened to boiler.

TENDERS OF VANDERBILT TYPE.

Tenders known as the Vanderbilt type shall be equipped with running boards; one (1) on each side of tender not less than ten (10) inches in witdh and one on top of tender not less than forty-eight (48) inches in width, extending from coal space to rear of tender.

There shall be a handrail on each side of top running board, extending from coal space to rear of tank, not less than one (1) inch in diameter and not less than twenty (20) inches in height above running board from coal space to manhole.

There shall be a handrail extending from coal space to within twelve (12) inches of rear of tank, attached to each side of tank above side running board, not less than thirty (30) nor more than sixty-six (66) inches above running board.

There shall be one (1) vertical end handhold on each side of Vanderbilt type of tender, located within eight (8) inches of rear of tank extending from within eight (8) inches of top of end-sill to within eight (8) inches of side handrail. Post supporting rear end of side running board if not more than two (2) inches in diameter and properly located, may form section of handhold.

An additional horizontal end handhold shall be applied on rear end of all Vanderbilt type of tenders which are not equipped with vestibules. Handhold to be located not less than thirty (30) nor more than sixty-six (66) inches above top of end-sill. Clear length of handhold to be not less than forty-eight (48) inches.

Ladders shall be applied at forward ends of side running boards.

HANDRAILS AND STEPS FOR HEADLIGHTS.

Locomotives having headlights which can not be safely and conveniently reached from pilot beam or steam chests shall be equipped with secure handrails and steps suitable for the use of men in getting to and from such headlights.

A suitable metal end or side ladder shall be applied to all tanks more than forty-eight (48) inches in height, measured from the top of end-sill, and securely fastened with bolts or rivets.

COUPLERS.

Locomotives shall be equipped with automatic coupler at rear of tender and front of locomotive.

NOTE.—Prescribed standard height of drawbars: Standard gauge railroads—maximum 34½, minimum 31½ inches; narrow gauge railroads—maximum 26, minimum 23 inches; 2-foo tgauge railroads—maximum 17½, minimum 14½ inches.

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