TM 55-285

WAR DEPARTMENT TECHNICAL MANUAL

OPERATION OF RAILROADS

GENERAL INSTRUCTIONS FOR THE INSPECTION AND MAINTENANCE OF ROLLING STOCK

WAR DEPARTMENT • JANUARY 1946

WAR DEPARTMENT TECHNICAL MANUAL

TM 55-285

This manual supersedes TB 55-285-1, 24 July 1944 and TB 55-285-2, 24 August 1944.

OPERATION OF RAILROADS

GENERAL INSTRUCTIONS FOR THE INSPECTION AND MAINTENANCE OF ROLLING STOCK

WAR DEPARTMENT • JANUARY 1946

United States Government Printing Office
Washington : 1946

WAR DEPARTMENT
WASHINGTON 25, D. C., 3 January 1946

TM 55–285, Operation of Railroads, General Instructions for the Inspection and Maintenance of Rolling Stock, is published for the information and guidance of all concerned.

[AG 300.7 (16 May 45)]

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL:
EDWARD F. WITSELL
Major General
Acting The Adjutant General

DWIGHT D. EISENHOWER
Chief of Staff

DISTRIBUTION:

AAF (5); AGF (10); ASF (2); T of Opns (5); Dept (2); Base Comd (2); Arm & Sv Bd (1); S Div ASF (Dir only) (1); Tech Sv (2); SvC (2); PE (ZI) (2); H&R (2); Dist 55 (1); TZ (2); Gen & Sp Sv Sch (2); Consolidating Sta (1); TCRRS (5); A (2); T/O & E 55–202 (10); 55–228 (25); 55–229 (25); 55–235 (10); 55–236 (2); 55–238 (10); 55–239 (25); 55–302 (10); 55–500, II—Railway Maint Units, VII—Train Operating Units (10).

Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

This manual supersedes TB 55–285–1, 24 July 1944, and TB 55–285–2, 24 August 1944.

CHAPTER 1

GENERAL INSTRUCTIONS

1. Purpose

The purpose of this manual is to give personnel concerned with the operation and maintenance of railroad rolling stock pertinent regulations and proper procedures governing the inspection and maintenance of freight, passenger, and hospital cars. It is intended as a guide for car men, providing information for carrying out their duties and discharging their responsibilities.

2. Scope

Regulations set up in this manual will be more generally applicable in the zone of interior, but when and where conditions permit, the information contained herein will serve as a guide in the theaters of operation. The manual outlines procedures for necessary inspection and proper maintenance by trained personnel familiar with the fundamentals of car construction and repair. It outlines *what* to do, *where* to do it, and *when* it will be done; but it is beyond the scope of this manual to include *how* repairs will be made. Necessary report forms with instructions in their use are included in chapter 7.

3. Personnel

Efficiency rating of personnel concerned with the operation and maintenance of War Department rolling stock is based upon the appearance and mechanical efficiency of the equipment; the manner in which operational duties are performed; the efficient use of lubricants and materials; and the period for which the equipment is maintained in good operating condition without requiring extensive repairs or general overhauling.

4. Responsibilities

a. Officers in charge of War Department rolling stock will familiarize themselves with the appropriate Army Regulations (AR 35–6640) governing liability of responsible officers in case of damage to or destruction of Government property.

b. In the zone of interior, the Chief of Transportation, through the zone master mechanics, is responsible for the technical control of the operation, maintenance, and repair of War Department railroad equipment except contractor-operated railroad equipment in class IV establishments, where maintenance, inspection, and repair are carried out in accordance with provisions of pertinent War Department directives and Army Regulations. Technical control of maintenance is defined as the authority to issue instructions covering the utilization of equipment, tools, shop methods, shop lay-outs and procedures, and detailed directives to insure uniformity of quality as applicable to the items maintained.

c. In territorial departments and commands (such as the Eastern Defense Command, Panama Canal Department, and the Hawaiian Department) the commanding general of the department or command is responsible for the operating control of inspection, maintenance, and repair of War Department railroad equipment which is not operated by a unit of the Military Railway Service. Operating control of a maintenance facility embraces the organization, administration, management, and operation of a shop in accordance with prescribed procedures, including the formulation of working procedures other than those specified by higher authority or developed in connection with technical control. The commanding generals of such territorial departments and commands may call upon the Chief of Transportation for assistance in the discharge of their responsibilities.

d. In theaters of operations, the superintendent of equipment, Railway Grand Division headquarters, is responsible for the technical and operating control of inspection, maintenance, and repair of War Department railroad equipment in his division.

e. Although War Department railroad rolling stock operating on Government property is not subject to the Association of American Railroads' Interchange Rules or Interstate Commerce Commission regulations, cars offered in interchange and handled by common carriers will meet all interchange, loading, and safety appliance regulations. The zone master mechanic will have a thorough knowledge of these regulations and will be responsible for compliance by all personnel concerned. Copies of all interchange rules may be obtained from the Chief of Transportation.

f. War Department railroad equipment, operating over commercial railroads, will be inspected prior to movement from the home station to insure that no defects have developed which may result in damage to Government or private property. Upon return to its home station, equipment will be given a general inspection to determine if any defects or damage were incurred during the trip.

g. Supervisory officers and car foremen are responsible for the safety of train operation and car interchange. The execution of this responsibility requires considerable technical knowledge as well as good judgment. Efficient performance of all car repair operations, whether in car shops or on repair tracks, is essential.

h. The average car man can increase his value by constant study and practice of his craft. A well-trained car man can help reduce road failures. He should do more than make proper repairs according to authorization; he should be alert to and report conditions or defects not included on the write-up card.

i. Each car placed in service will receive proper care to insure that loss of service does not exceed that actually required by fair usage. Cars will not be returned to service with journal boxes beyond the date for repacking, worn brake hangers and pins, low couplers, defective wheels, worn brake heads and loose brake beams, truss rods, or supports. Maintenance expenditures on equipment and time out of service, are not excessive when rolling stock is properly operated, and when periodic cleaning, inspection, servicing, and running repairs are done carefully. Personnel responsible for rolling stock will realize that a potential road failure exists when a car leaves the rip track, car yard, or shop without complete and proper servicing.

5. Lubrication

Personnel concerned with the maintenance of rolling stock will follow War Department Lubrication Orders and will requisition all lubricants in accordance with the nomenclature, stock numbers, and specifications contained in SB 10–139. In case there are no Government standard specifications for a particular requirement, lubrication will be based on instructions issued by an authorized officer.

6. Safety

All personnel will read, understand, and follow regulations and instructions set forth in TM 55–281, (when published).

7. Ownership

a. The War Department, as a car owner, is responsible for and will assume the expense of all repairs resulting from ordinary wear and tear to its equipment in the United States.

b. Common carriers are responsible to car owners for all damages and are chargeable for all repairs resulting from derailment; cornering or sideswiping; collision or impact other than regular switching; undue rough handling; known theft of parts; condemnable slid flat wheels; bent axles and axles with cut journals.

c. Upon return to home stations after each trip, cars will be inspected for any defects which may have developed while in transit. Upon discovery of any defects which are the car owner's responsibility, necessary repairs will be made before car again is returned to service. Upon discovery of any defects which are the common carrier's responsibility, it will be ascertained that such defects are covered fully by defect cards attached to the car. Necessary arrangements will be made with the delivering carrier to make the repairs on authority of the defect card. Defects covered by carrier defect cards may be repaired by the War Department home station, in which event the defect card with a letter itemizing the labor and material used will be forwarded to the Chief of Transportation. A car with defects which are the carrier's responsibility or with improper or wrong repairs made while in transit, and not fully covered by defect cards, will be inspected jointly by an officer of the Transportation Corps and a representative of the delivering carrier. The carrier representative will be requested at this time to furnish defect card authority to make repairs. If the representative disclaims responsibility for such defects or wrong repairs, a joint inspection certificate will be prepared in duplicate as provided by the A.A.R. Code of Interchange Rules, and both copies for-

warded to the Chief of Transportation for further action.

Note. In the description and location of main parts of cars the following system will be used: The end of the car upon which the hand brake shaft is located is known as the "B" end and the opposite end is known as the "A" end. Looking from the "B" end of the car toward the "A" end, truck parts such as wheels, axles, and journal boxes are designated as R1, R2, R3, and R4, on the right side, and as L1, L2, L3, and L4 on the left side.

8. Failures or "Bad Order" Cars

a. Cars marked with a "Bad Order" card, indicate that they are unfit for service in their present condition. Cars seldom wear out but are made unserviceable by wrecks, derailments, switching impacts, draft gear strains caused by "run ins" and "run outs," hot boxes, and similar difficulties.

b. Repairs to "Bad Order" cars normally are administered at three types of maintenance units or yards, sized and equipped to take care of repairs of varying extent and urgency. (See ch. 2.) The three types of repair yards are emergency repair points for minor repairs; intermediate or medium repair points for repairs of more extensive nature; and general repair and remodeling points for scheduled progressive repairs and remodeling at one time of a number of cars of similar class and series.

9. Switching Practices

The following instructions on switching will be observed by train crews: personnel handling switches will see that switch points fit up to the rails after the switch is operated. Any variation from a close fitting point will be reported and repairs made before the switch is used again. Cars will not be detached from the locomotive when switching over street crossings nor will they be "dropped" or "kicked" over such crossings. Train crews will be held responsible for violations of law and town ordinances governing the blocking of highway and street crossings. Air brakes will be released and hand brakes applied when, under proper orders, it is necessary to spot cars near street crossings. Wheels will be blocked if the car is spotted on an incline or grade. Do not "drop" or "kick" cars loaded with chemicals, explosives, or inflammable liquids. Other cars will not be "kicked" against cars so loaded. *Take time in switching operations: do not take chances.*

CHAPTER 2

ECHELONS OF MAINTENANCE

10. General

Car maintenance operations in the Transportation Corps follow the five echelon system. (See TM 37–250.)

a. ZONE OF INTERIOR. Operation of utility railroads serving various posts, camps, and stations, and the maintenance of rolling stock assigned thereto may be performed by either enlisted or civilian personnel. First and second echelon maintenance of railroad equipment is the responsibility of the commanding officer of the installations to which the equipment is assigned. Higher than second echelon maintenance is the responsibility of the Chief of Transportation, except on War Department hospital cars, as set forth in (2) below.

(1) Zone master mechanics as representatives of the Chief of Transportation exercise technical control over all echelons of maintenance for War Department railroad equipment operated or domiciled at installation within the area of their respective zones.

(2) Operating control of first to fourth echelon maintenance of War Department hospital cars is the responsibility of the commanding general of the service command to which the cars are assigned. The Chief of Transportation is responsible for the technical control of maintenance of hospital cars exclusive of medical and kitchen equipment. Running gear and air brake equipment will be inspected by the railroads over whose lines the cars are operated and in accordance with the Code of Rules for the Interchange of Traffic of the Mechanical Division, Association of American Railroads.

(3) War Department owned tank cars which operate over lines of common carriers are maintained by the carrier in accordance with the foregoing code of rules.

b. THEATERS OF OPERATIONS. In addition to its own maintenance operations, the Military Railway Service may utilize to the maximum civilian personnel and existing equipment and facilities. Maintenance procedures will conform to standard railroad practices. Variations may be necessary in the five echelon system because of local conditions. Normally, Railway Operating Battalions will be responsible for the first three echelons of maintenance and Railway Shop Battalions for the fourth and fifth.

c. TERRITORIAL DEPARTMENTS. The echelons of maintenance for territorial departments and commands are similar to those in the zone of the interior. (See par. 4*c* for exceptions.)

11. First Echelon Maintenance

a. First echelon maintenance will be performed by car inspectors at the originating point of the train, and at inspection points enroute to insure safe movement of the car and its lading. On all types of equipment, it will include inspection of air brakes, brake gear, running gear, draft gear, and other equipment, and examination and lubrication of journal boxes.

b. On hospital and kitchen cars, both prior to train departure and en route, personnel assigned to or under the jurisdiction of the hospital train commander, in addition to *a* above, will be responsible for the following (see ch. 5):

(1) Stocking of other than medical supplies such as fuel, water, ice for air conditioning and other uses, electrical supplies, etc.

(2) Placing cars on and removing from standby precooling facilities when such facilities are available at loading or unloading points.

(3) Operating and controlling heating, air conditioning, and car lighting equipment.

(4) Renewing light bulbs and fuses.

(5) Checking batteries. (See sec. VII, ch. 4.)

(6) Reporting all defects and failures to train commander.

12. Second Echelon Maintenance

a. Second echelon maintenance will be performed at the originating point of train and at inspection points en route by car inspectors of military personnel or common carrier railroad personnel.

b. It will consist of such running repairs as are necessary for the safe operation of freight equipment and the safe and comfortable operation of the passenger and hospital cars. Such repairs will not require cars to be taken out of service and will include such maintenance as replacing brake shoes, applying new air hose, adjusting brakes, applying journal brasses, repacking journal boxes, applying oil in journal box, repairs to draft gear, trucks, air conditioning, heating, or car lighting equipment, any of which may be requested by the conductor or train commander.

13. Third Echelon Maintenance

a. Third echelon maintenance will be performed by maintenance personnel, either military or civilian, at the home bases of the cars or at a prescribed location. It will consist of such running and emergency repairs that require the car to be taken out of service for a short time only, such as changing defective wheels, journals, side frames, couplers, draft gear, air brake parts, repairs to trucks, piping, and minor repairs to car body.

b. In addition, on passenger equipment and hospital cars, it will consist of daily, weekly, monthly, semiannual, and annual inspections; cleaning of equipment; deodorizing and changing filters and evaporators. It will also include inspection, lubrication, and repairs to air conditioning, heating equipment and car lighting equipment, charging of batteries, maintenance of water systems and coolers, repair and replacement of hardware and linens.

14. Fourth Echelon Maintenance

a. Fourth echelon maintenance will be performed by car department personnel at a prescribed location. It will consist of medium repairs that are more extensive than running repairs but which do not require the fabrication of materials such as applying flooring, sheathing, welding, riveting, making doors, etc.

b. In the zone of interior, fourth echelon repairs may be performed, if authorized, by a common carrier railroad which has a track connection to the home base or domicile of the cars. It will consist of such inspection and repairs necessary for the cars to be accepted in interchange movement under safety requirements and standards of the Association of American Railroads. It will include only work which cannot be done by local military personnel such as—

(1) Trucks, wheel and axle inspection and repairs.

(2) Draft gear inspection and repair.

(3) Air brake equipment inspection, cleaning, and repair.

(4) Inspection and repair of hangers and supports for underneath equipment.

(5) Inspection and repair of safety appliances and appurtenances.

c. In theaters of operation, fourth echelon maintenance will be performed by the Railway Shop Battalion.

15. Fifth Echelon Maintenance

a. In the zone of the interior, fifth echelon maintenance will be performed at Transportation Corps railroad repair shops, or at common carrier railroad repair shops or car builders, when so authorized by the Chief of Transportation. It will consist of general repairs or remodeling and classified mileage shopping in accordance with the standards adopted by the Chief of Transportation.

b. In theaters of operation, fifth echelon maintenance will be performed by the Railway Shop Battalion on authority of the Railway Grand Division headquarters. It will consist of reconditioning of equipment, incorporating reclamation and limited manufacture.

CHAPTER 3

REGULATIONS GOVERNING INSPECTION AND MAINTENANCE OF ROLLING STOCK

Section I

GENERAL

16. Purpose

To assure proper inspection and maintenance of cars, personnel engaged in the operation of War Department equipment on Government property will observe the following rules governing the condition of and repairs to rolling stock. These rules are not intended to cover or include the Association of American Railroads' "Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic." Personnel concerned with the movement of cars in interchange may obtain copies of the A.A.R. regulations upon request to the Chief of Transportation. In theaters of operation, these rules will serve as an excellent guide and will be followed by all personnel when conditions permit.

17. Responsibilities (Rule No. 1)

a. In the zone of interior, the zone master mechanic has technical supervision over the inspection and maintenance of all cars in his zone and those passing through his territory. Commanding officers of installations have operating control over inspections and maintenance. Repairs will be made according to A.A.R. interchange rules whenever cars from common carriers have defects for which the car owner is responsible; and whenever War Department cars are to be offered in interchange.

b. In theaters of operations, the officer in charge of the car company of a railway operating battalion is responsible for inspections and maintenance of all cars passing through his territory, and those arriving on tracks for repairs.

18. Repairs (Rule No. 2)

In making repairs to cars, the following materials will *not* be used:

a. Brake beam hangers designed with eyes other than formed solid.

b. Brake beams less than type No. 2 capacity.

c. Cast-iron brake wheels.

d. Cast-iron or malleable iron journal wedges of other than solid back design.

e. Malleable iron couplers.

f. Coupler body having burned-out key slots.

g. Malleable or steel-backed journal bearings, or journal bearings with thickness of back through crown less than the following dimensions:

For journals 7 inches long and over, but not 9 inches ..... 11/16 inch
For journals 9 inches long and over, but not 11 inches ..... 13/16 inch
For journals 11 inches long and over, but not 12 inches ..... 15/16 inch
For journals 12 inches long and over .. 1 1/16 inch

h. Open knuckles.

i. Plain handle for angle cock.

j. Plain cast-iron brake shoes.

k. Welded cast-steel truck side frames having "T" and "L" section compression or tension members.

l. Cast-iron wheels which have been condemned by out-of-round.

m. Cast-iron wheels below nominal weight.

Section II

RELIGHTWEIGHING AND RESTENCILING OF FREIGHT CARS

19. Periodic Relightweighing (Rule No. 3)

a. Freight cars, except as otherwise provided in paragraph 20, will be relightweighed and restenciled periodically as follows:

Type of car	*First reweighing at expiration of—*	*Subsequent reweighing at expiration of—*
Composite wood and steel underframe	15 mo.	30 mo.
Steel underframe, with wood, steel, or composite superstructure frame	15 mo.	30 mo.
All-steel open-top cars, including all-steel flat cars	30 mo.	30 mo.
All-steel house and all-steel stock cars	30 mo.	30 mo.
Refrigerator cars	30 mo.	30 mo.

b. Tank cars and live poultry cars will be reweighed and restenciled only when car bears no lightweight markings, or when weight is changed 300 pounds or more by alterations or repairs.

20. Other Than Periodic Reweighing and Restenciling (Rule No. 4)

a. Freight cars (other than tank and live poultry cars) without lightweight marks or when materially changed by repairs or alterations, will be weighed and stenciled.

b. When any freight car (except refrigerator, tank, and live poultry cars) is reweighed and found to vary 300 pounds or more from the stenciled lightweight, such stenciling will be corrected.

c. When any refrigerator car is reweighed and found to vary 500 pounds or more from the stenciled lightweight, such stenciling will be corrected.

d. Tank cars and live poultry cars will be reweighed and restenciled only as provided in paragraph 19*b*.

21. Preparation for and Method of Reweighing (Rule No. 5)

a. Before reweighing:

(1) The accuracy of the scale will be certified by an authorized scale inspector.

(2) Cars will be dry and free from snow and ice.

(3) Floor and hoppers will be clean.

(4) Brine tanks and ice bunkers of refrigerator cars will be empty.

(5) Temporary fixtures, which affect the weight of car, will be removed.

b. In lightweighing, cars will be uncoupled, free at both ends, and at rest on the track scale.

22. Stenciling (Rule No. 6)

a. Stenciling will be in accordance with TM–55–289 (when published).

b. Station symbol and date (month and year) will be stenciled on cars when new, and each time they are reweighed and restenciled. On new cars the word "new" may be substituted for station symbol.

c. When necessary to restencil after reweighing, obliterate and renew only lightweight numerals, station symbol, date (month and year), and load limit numerals except as provided in *f* below. The capacity numerals and the letters "CAPY," "LD LMT," and "LT WT," when indistinct, will be renewed. Lightweight stenciling will not be placed on ends of cars and when shown there will be obliterated.

d. The lightweight stenciling will be the multiple of 100 pounds nearest the scale weight; when the scale weight indicates an even 50 pounds the lower multiple will be used.

e. The LOAD LIMIT, which is the difference between the light weight and the maximum weight on rail, will be stenciled initially on all cars (except tank and live poultry cars) by car owner. The "load limit" is the permissible weight of lading, including weight of temporary fixtures, which includes brine and ice in refrigerator cars. Stenciled load limit will not be less than nominal capacity.

f. When structural limitations or other reasons, cause the load limit of a car to be reduced, a star symbol (*), conforming in size to standard lettering for "LD LMT," will be placed at immediate left of words "LD LMT."

g. The NOMINAL CAPACITY, in multiples of 1,000 pounds, will be stenciled initially on the car and will not exceed the stenciled load limit.

h. The CUBIC CAPACITY will be stenciled initially on cars, except that such markings are not required on flat, tank, and live poultry cars.

23. Advertisements (Rule No. 7)
Banners or cards bearing advertisements or trademarks will not be attached to cars, nor to permanent stakes which are a part of the car, nor to temporary stakes supplied by shipper solely for the purpose of carrying such advertisements. However, they may be applied to the ladings or to temporary stakes used to secure lading.

Section III

AIR BRAKES AND EQUIPMENT

24. Air Brakes

a. CLEANING (Rule No. 8). (1) Cylinder and triple valve (other than the AB brake equipment) will be cleaned every 14 months; such valves on loaded cars will not be cleaned unless cars are on repair tracks for other work. In cleaning triple valve, it will be removed from the car and tested on an approved test rack.

(2) Retaining valve and centrifugal dirt collector will be cleaned when such attention is required regardless of date of last air brake cleaning. Retaining valve will be tested when cars are on repair tracks.

(3) The complete AB type freight equipment using the AB type brake cylinder will be cleaned every 3 years as indicated by markings on empty cars, and on loaded cars when on repair tracks for other work.

b. RESTENCILING (Rule No. 9). When restenciling cars after cleaning, the previous cleaning marks will be scraped off or obliterated with black paint. The month, day, year of cleaning, initials of shop or station, and USA will be stenciled with white paint on auxiliary reservoir; if this location does not present a clear view from the outside of the car, the stencil will be located near the handle of the release rod on reservoir side of car. On tank cars having only two long sills, stencil will be located on reservoir side of center sill at center of car.

c. BRAKING RATIO (Rule No. 10). With the exception of refrigerator cars weighing 53,000 pounds or more, all freight cars having single capacity brakes will have a nominal braking ratio of not less than 60 percent nor more than 75 percent of the empty car weight, based on a brake cylinder pressure of 50 pounds per square inch. Refrigerator cars weighing 53,000 pounds or more will have a nominal braking ratio of not less than 50 percent nor more than 60 percent of the empty car weight, based on 50 pounds per square inch brake cylinder pressure.

d. AIR BRAKE HOSE (Rule No. 11). Brake hose will be renewed for the following causes:

(1) Pressure burst.

(2) Leakage discernible without soapsuds test.

(3) Abrasion which has worn through outer covering and shows indication of damage to or deterioration of first layer of duck. (See figs. 1 and 2.)

(4) Cracks, longitudinal or spiral, which show indication of damage to or deterioration of first layer of duck. (See figs. 3 and 4.)

(5) Soft spots which clearly indicate that the fabric is broken down. (See fig. 5.)

(6) Loose or defective fittings at either or both ends of hose, or joiner on spliced hose.

(7) End of tube ⅜ inch or more from shoulder on either nipple or coupling, or joiner on spliced hose.

(8) Porous, as determined by soapsuds test.

25. Brake Equipment

a. GENERAL (Rule No. 12). During periodical repairs to air brakes or where car is on repair track for other work, the brake levers will be checked to assure that they conform with standard dimensions shown on metal badge plate attached to car. Wrong brake levers or wrong brake rods will be replaced with type standard to car, except where brake levers on car are of same ratio as dimensions on badge plate. Brake beams, brake hangers, hanger pins, and brackets will be checked in accordance with the condemning limits prescribed in rules 13, 14, and 15, and will be renewed or repaired if necessary. Bottom rod and brake beam safety supports will be inspected and, if necessary, repaired or renewed. When car is on shop or repair track for periodic cleaning of air brakes, the hand-brake mechanism and connections will be inspected and tested and, if necessary, lubricated to insure that they are in suitable condition for safe and effective operation.

b. BRAKE BEAM HANGERS (Rule No. 13). (1) Brake-beam hangers of round or other section, irrespective of original diameter or thickness, will be

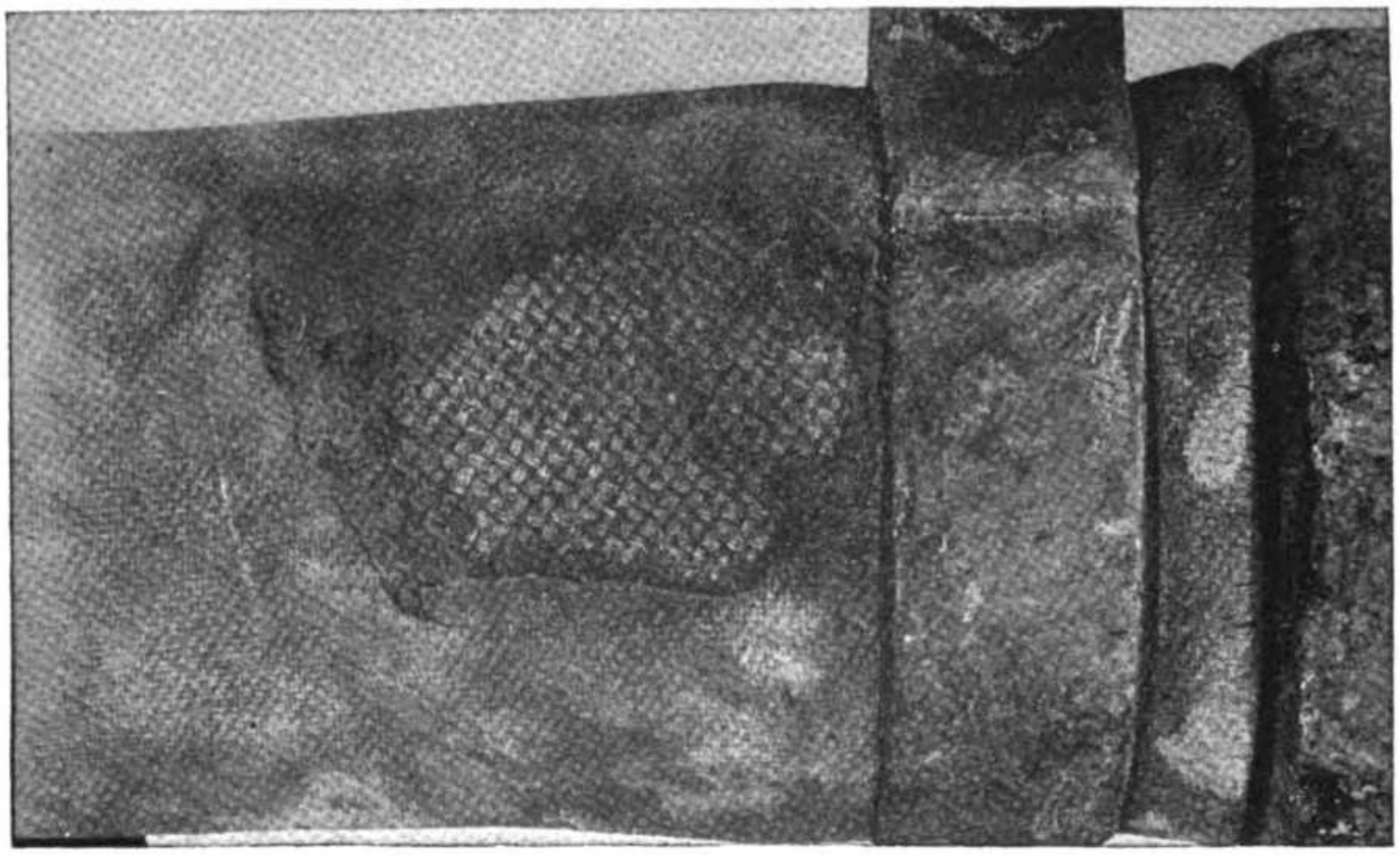


Figure 1. Hose with hole in outer cover and fabric at hole in good condition. Hose of this sort will not be removed until there is some indication of damage to the fabric.

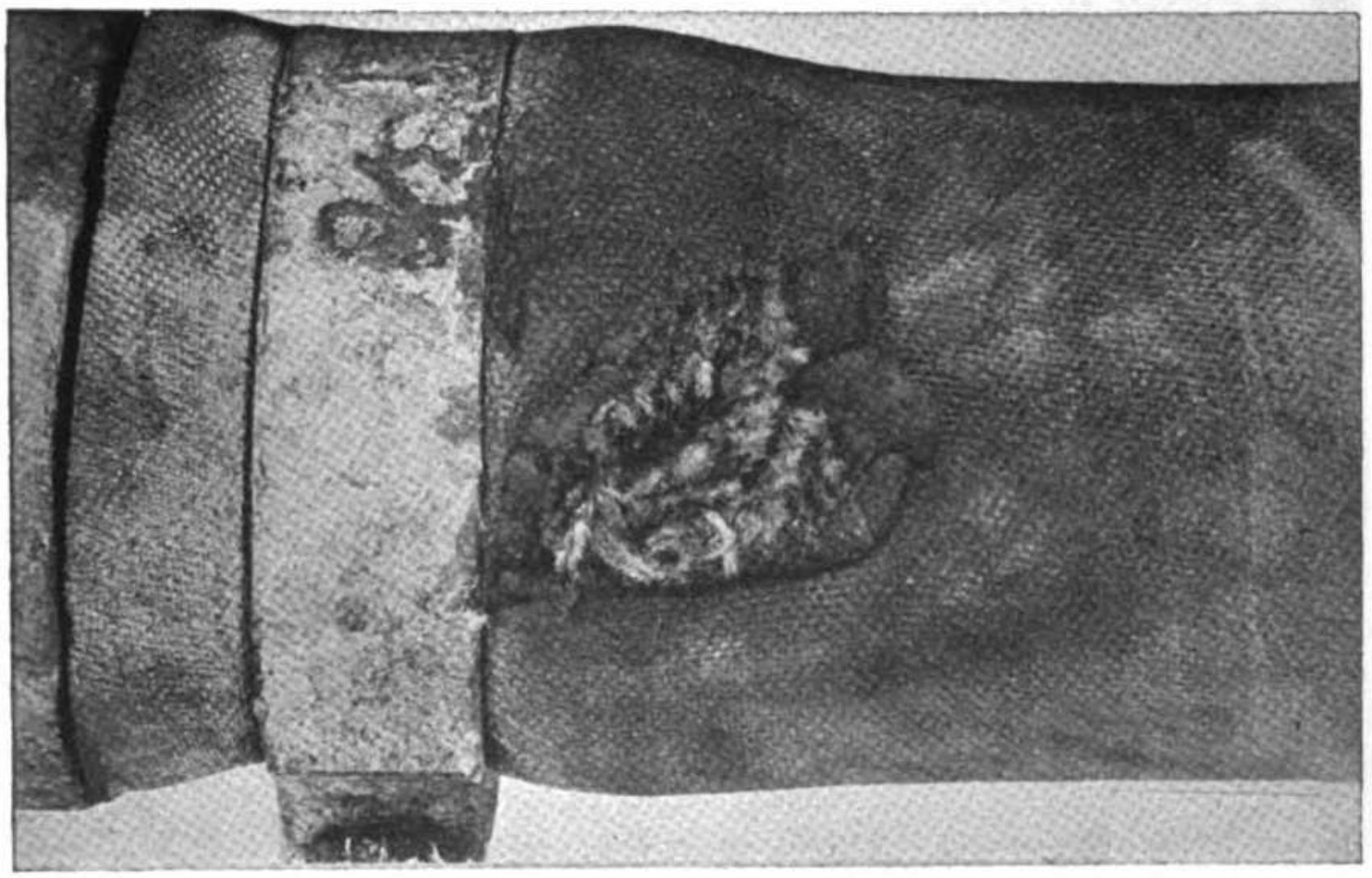


Figure 2. Hose with hole in outer cover and fabric at hole torn. When fabric at hole is torn or rotten, hose will be removed from service.

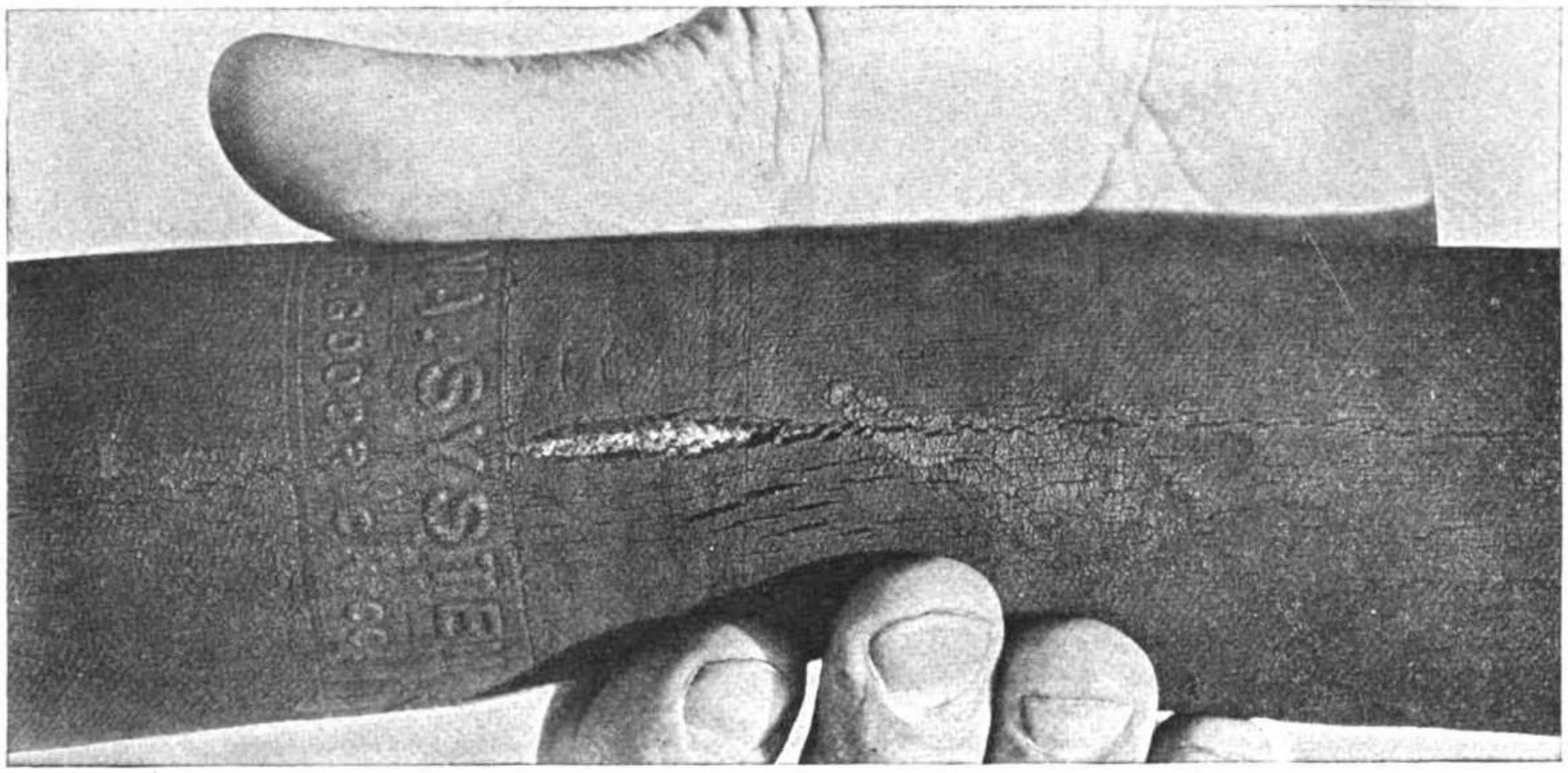


Figure 3. Hose with bad longitudinal crack in outer casing. This hose will be removed from service. Hose with a spiral crack of the same sort will be removed from service.

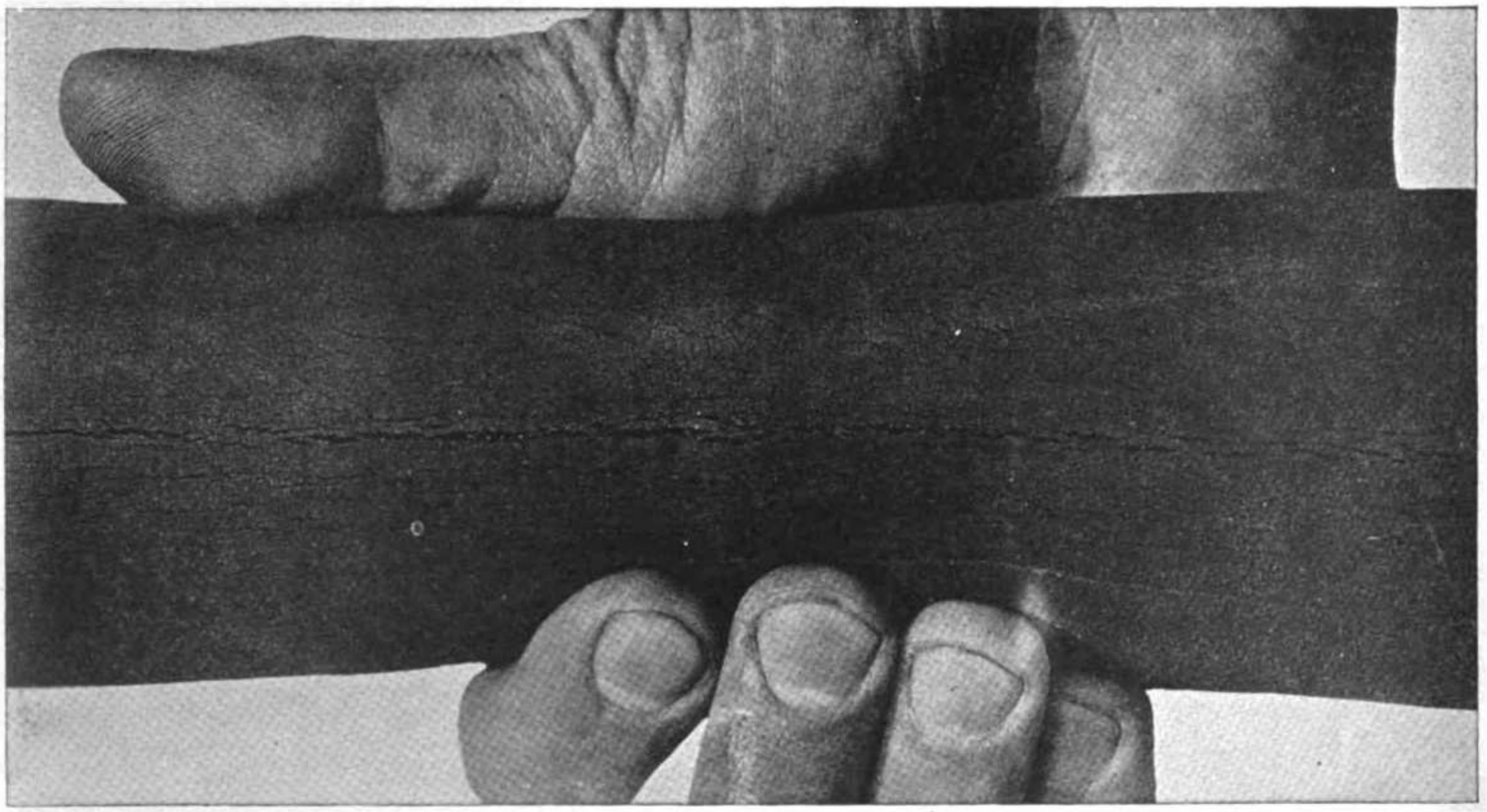


Figure 4. Hose with slight longitudinal crack. The crack in this hose is not serious enough to justify removal of the hose.

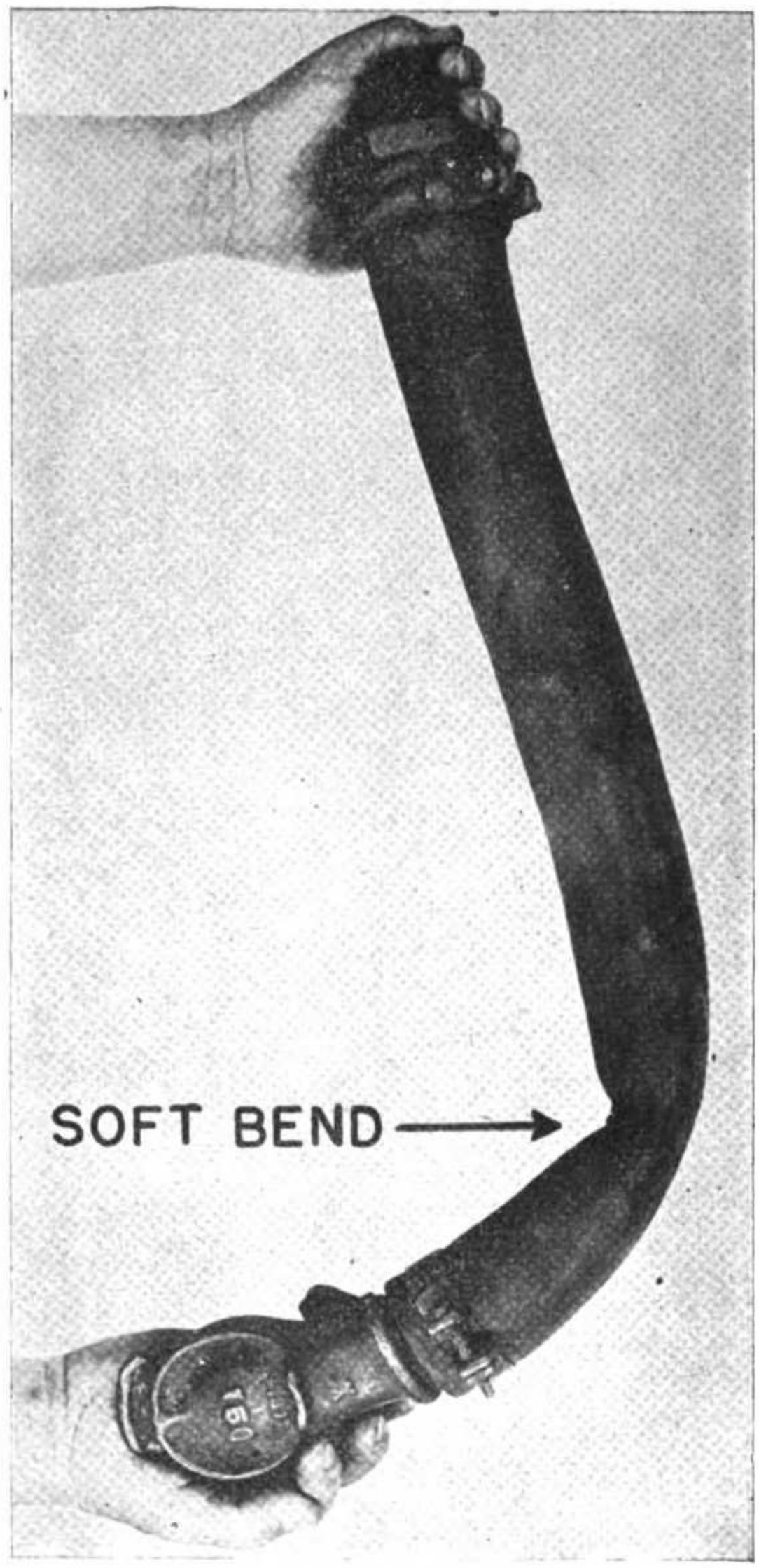


Figure 5. Hose with "soft bend." This hose bends very easily, showing that the fabric has deteriorated at the place where the hose bends and a burst at this point can be anticipated.

renewed if the vertical thickness of the top portion of the hanger is worn or reduced to $\frac{5}{8}$ inch or less.

(2) Brake-beam hangers of round or other section, irrespective of original diameter or thickness, will be renewed if the vertical thickness of the bottom portion of the hanger is worn or reduced to $\frac{3}{4}$ inch or less when measured vertically or through the corners measured on the radius.

(3) Brake-beam hanger pins or bolts, originally 1 inch or less in diameter, will be renewed if worn to $\frac{3}{4}$ inch or less at any point.

(4) Brake-beam hanger pins or bolts, originally in excess of 1 inch in diameter, will be renewed if worn to $\frac{7}{8}$ inch or less at any point.

c. BRAKE BEAMS (Rule No. 14). Brake beams will be considered as requiring renewal when tension rods are cut or worn $\frac{5}{16}$ inch or more below the original diameter, or when brake heads are worn so that:

(1) The vertical thickness of the upper portion of the top eye is worn to $\frac{7}{16}$ inch or less.

(2) Center of upper hanger openings are worn so that the opening measured vertically at hanger bearing is $1\frac{1}{2}$ inches or more.

(3) The distance between upper and lower brake shoe lugs measures $2\frac{3}{8}$ inches or more at face of head.

Note. When this distance is less than $2\frac{3}{8}$ inches through the use of an approved wear plate applied to the bottom lug, such brake head will not be considered as having reached the limit of wear. An approved wear plate is a type that allows the brake shoe key to pass through it and can be locked on the head to prevent loss of wear plate in case the brake shoe is removed. Worn brake heads without such wear plates will have these applied when distance between lugs has reached $2\frac{1}{8}$ inches.

(4) One or more toes are broken or worn off to such extent that no portion will contact the back of brake shoes when the brakes are applied.

d. BRAKE BEAM HANGER BRACKETS (Rule No. 15). Brake beam hanger brackets cast integral with truck side or bolster, having pin hole worn oblong to a depth of one-half its original diameter, or worn oblong so that the remaining material is not less than 60 percent of the original section, will be restored to original diameter by bushing or by autogenous welding process. If the hanger bracket is not cast integral with truck side or bolster, it will be repaired or renewed when pin hole is worn to the extent specified above.

Note. The wear limits as prescribed in rules 13, 14, and 15 primarily are intended to apply to inspections made of cars in shops or on repair tracks, for the reason that such parts cannot be measured or gauged with any degree of accuracy without disassembly. The determination of condemning limits of these parts in train yards will be left to the judgment of the train yard inspector.

Section IV

DAMAGED SILLS

26. Wooden Sills (Rule No. 16)

a. Longitudinal sills will not be spliced between or over cross-bearers.

b. Longitudinal sills may be spliced at both ends; intermediate or side sills may be spliced on either side of the body bolster. The nearest part of the splice will not be less than 12 inches from edge of body bolster. Intermediate sills, spliced between body bolster and cross-bearer, will be reinforced as indicated in figures 7 and 8. Intermediate sills, spliced between\bolster and end of car, and side sills, spliced on either side of bolster, will be reinforced as indicated in figure 6.

c. When splicing or renewing any longitudinal sill, reinforcement will be applied to all existing non-reinforced splices in all sills except side sills and intermediate sills between body bolster and end of car. If the old splice is a four-bolt splice, it will be reinforced in accordance with figure 7. If the old splice is a three-bolt splice, the reinforcement will be applied as indicated in figure 9.

d. Center sills will be spliced only between body bolster and cross-tie timber. The nearest part of the splice will be not less than 24 inches from edge of body bolster. Center sill splices will be in accordance with figure 7.

e. The diameter of horizontal or vertical splice bolts will be $\frac{5}{8}$ inch.

27. Steel Center Sill Splices Located at Least 7 Inches from Face of Bolster (Rule No. 17)

a. Adjacent sills may be spliced.

b. All splices will be of the butt-joint type, reinforced on both sides by plates of not over 24 inches in length, and not less than twice the length of the protruding end when the projection is less than 12 inches. The reinforcing plates will equal the thickness of the web of the sill. The splice plate on the flange side of the sill will be U-shaped, to include flanges, while the plate on the opposite side will cover the web only. Rivets will be spaced as indicated in figures 10 and 11.

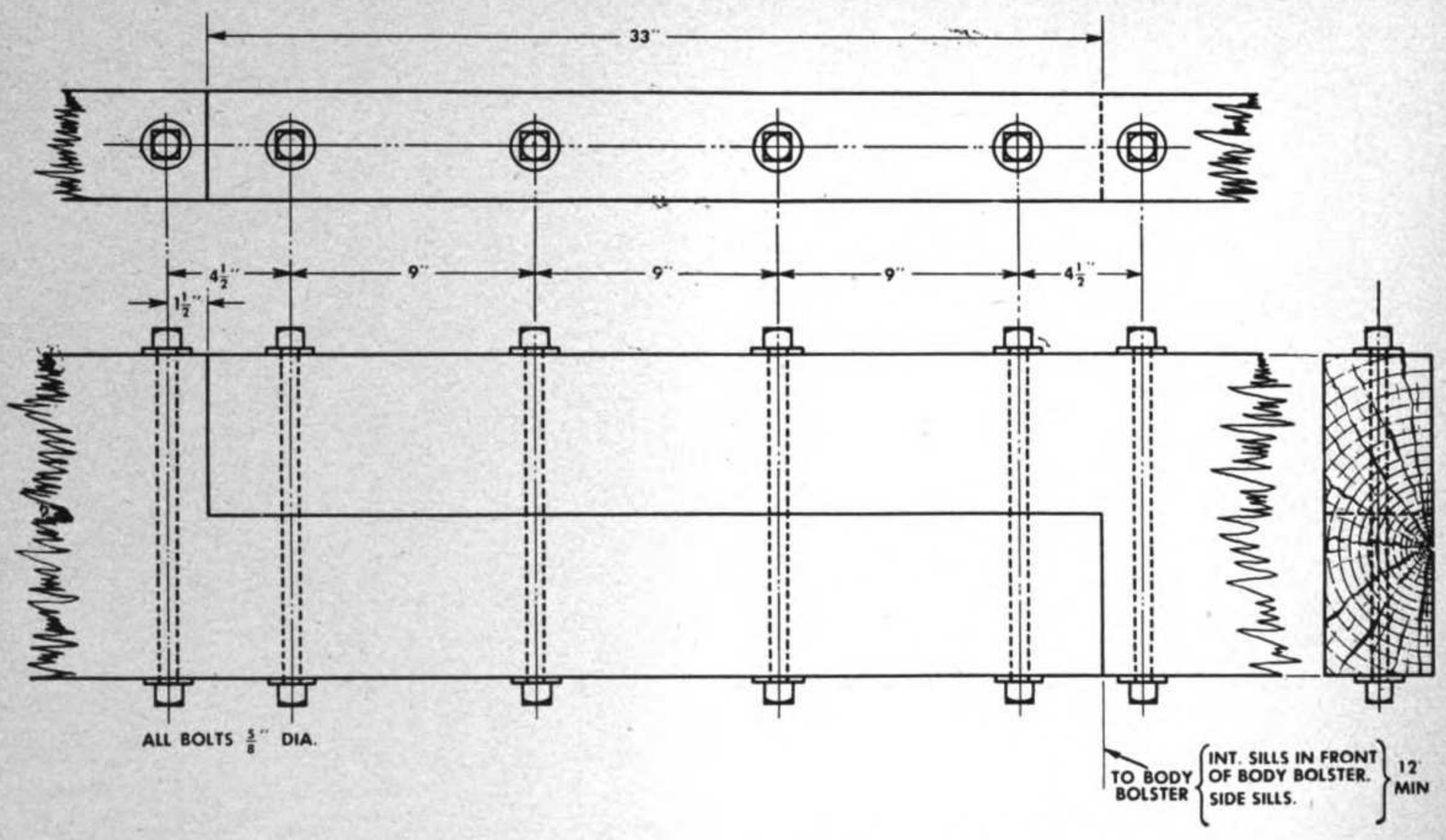


Figure 6. Intermediate and side sill. Reinforcement spliced as indicated in paragraph 26b.

c. Where autogenous welding is available, the sills will be welded after riveting the U-shaped plate on the flange side; omit the flat-plate on the web side.

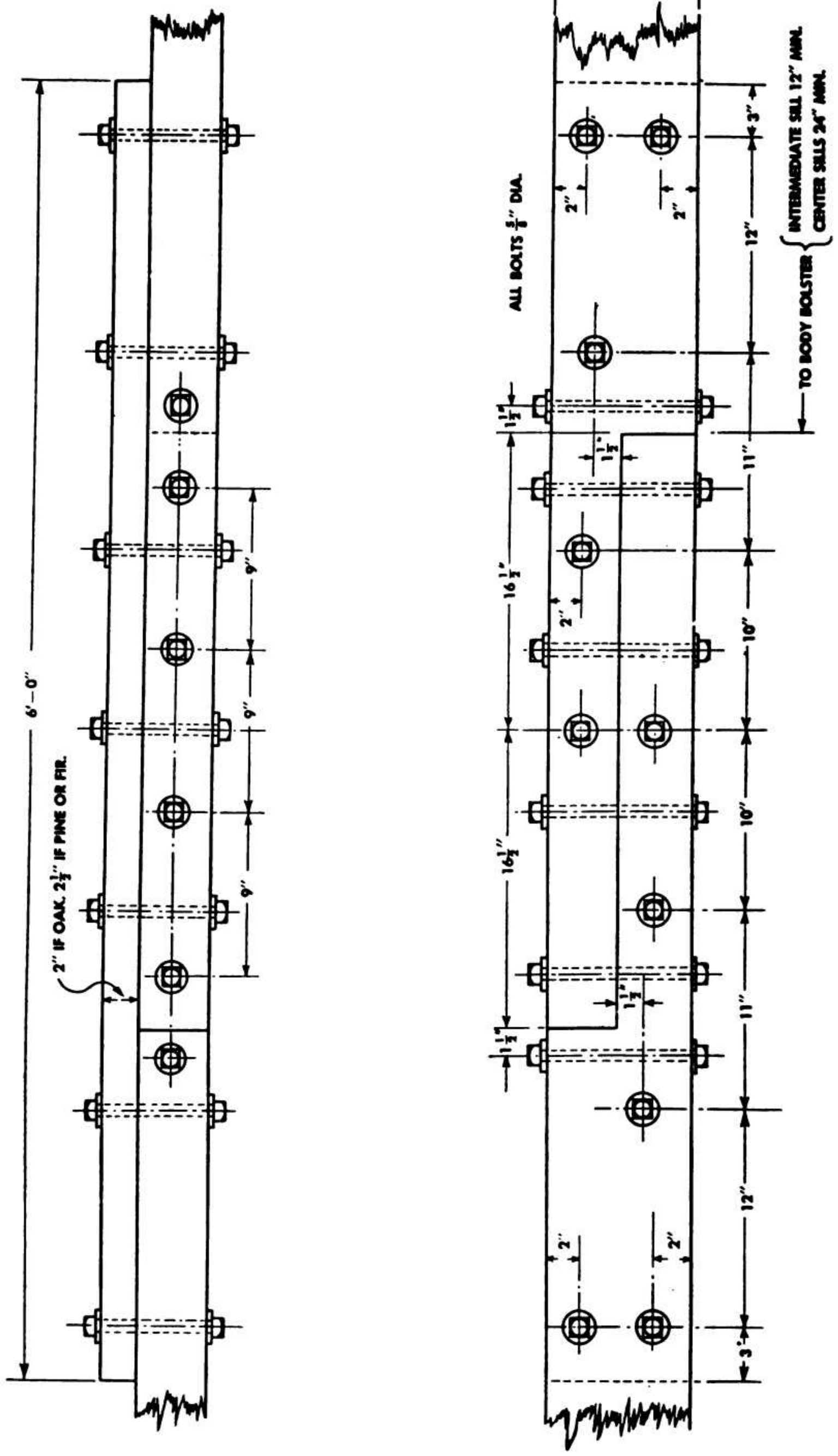


Figure 7. Intermediate sills. Reinforcement spliced as indicated in paragraph 26b.

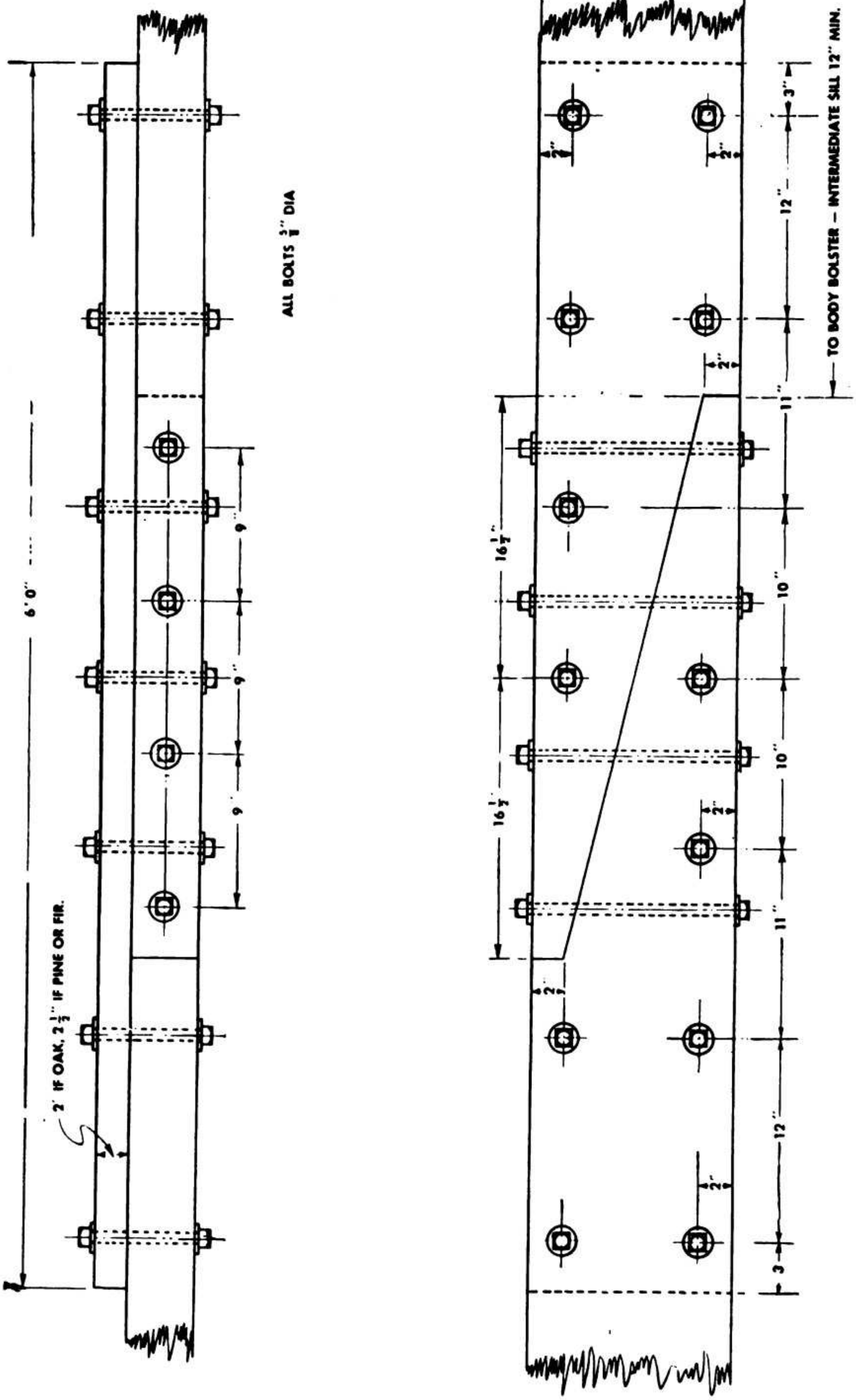
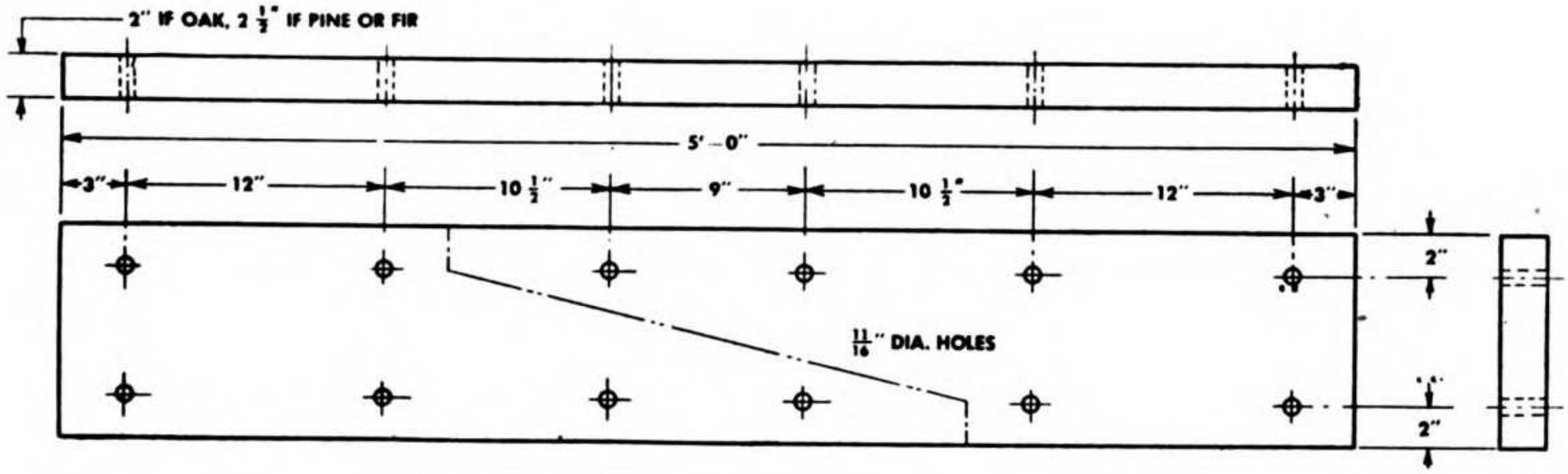


Figure 8. Intermediate sill. Reinforcement spliced as indicated in paragraph 26b.



CENTER AND INTERMEDIATE SILL THREE BOLT SPLICE REINFORCEMENT.

Figure 9. Center and intermediate sill, three-bolt reinforcement.

28. Steel Center Sill Splices Located Between Body Bolster and End Sill, and Less Than 8 Inches from Face of Bolster (Rule No. 18)

a. All splices will be of butt-joint type with the addition of a cover plate.

b. The splice plates will be as thick as the web of the sill and may be located on either side of the sill, extending 30 inches forward and behind the center line of the bolster. (See figs. 12 and 13.) Space rivets as illustrated.

29. Center Sill Splices with Riveted Type of Splice (Rule No. 19)

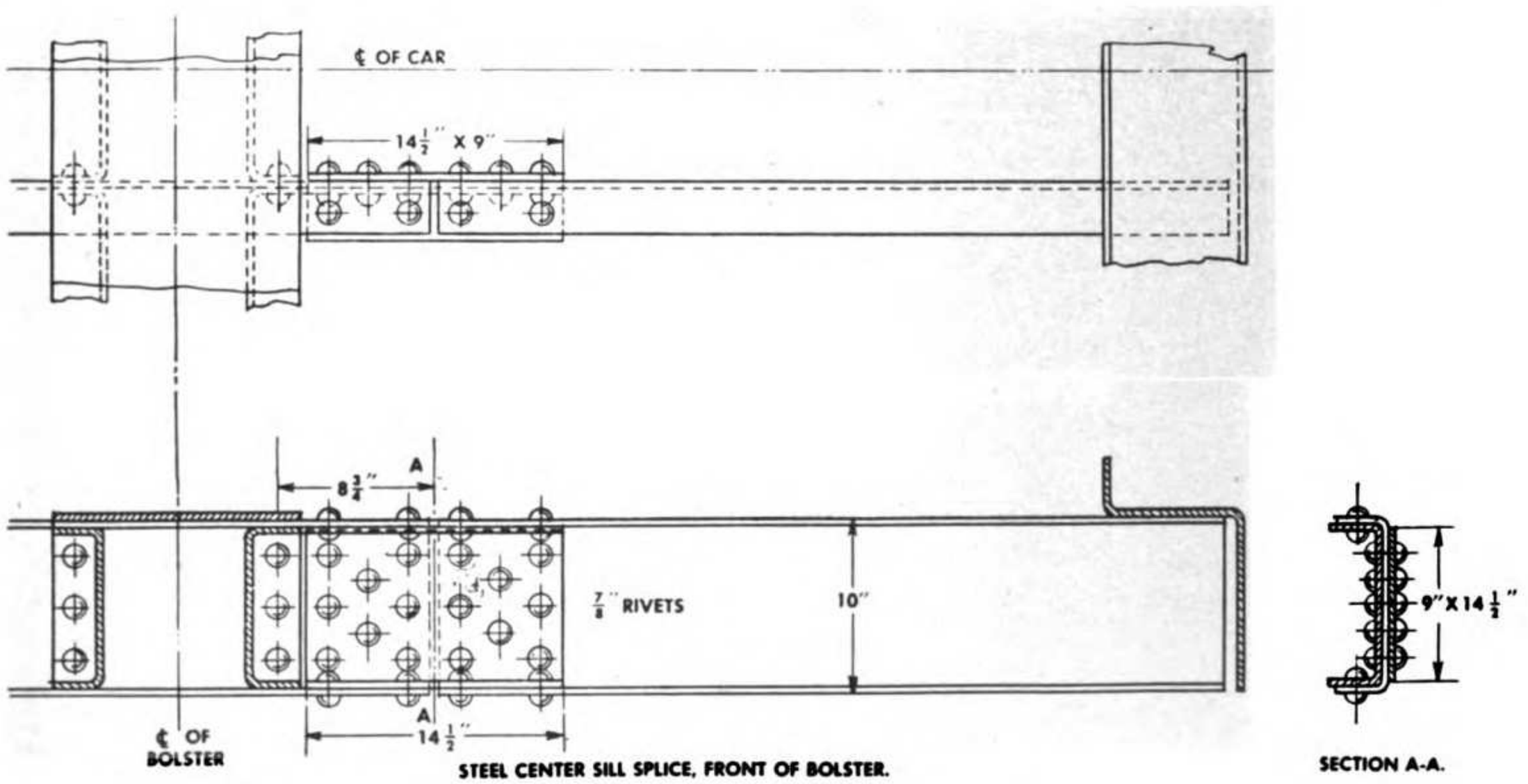
a. Splice will be located between body bolsters at any point where the construction of the car will permit and where the dimensions of the splice as indicated in figure 14 can be followed.

b. If the center sill cover plate is fractured, splice plate will be the same thickness and width as the cover plate now on the car and of a length to allow application of four rivets in each sill on each side of the fracture. Two rivets will be applied between sills at each end of this plate. All rivets in cover plates will conform to existing type on the car.

30. Center Sill Splices of Welded Type (Fig. 15). (Rule No. 20)

a. Splice will be located at any point on the center sill.

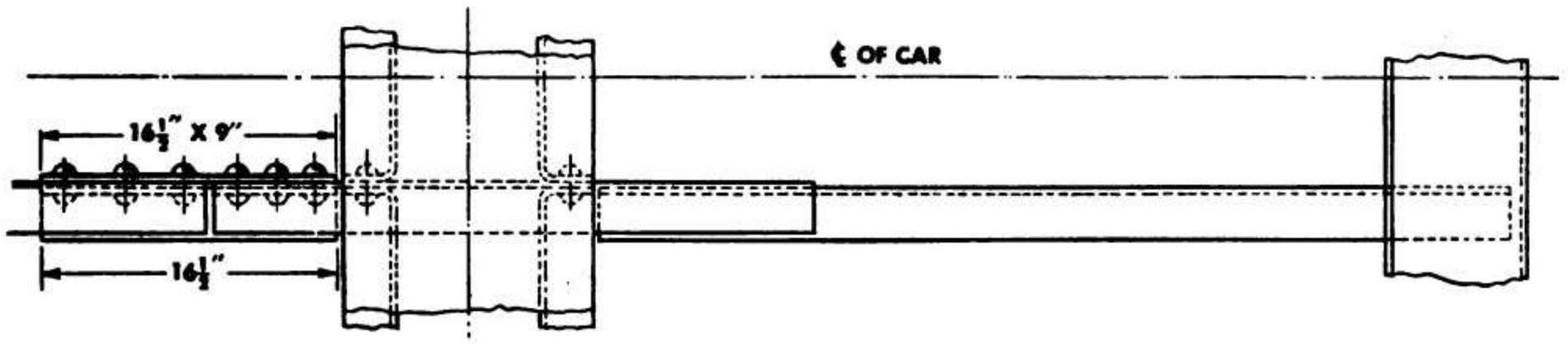
b. If the center sill cover plate is fractured, splice



STEEL CENTER SILL SPLICE, FRONT OF BOLSTER.

SECTION A-A.

Figure 10. Steel center sill splice, front of bolster.



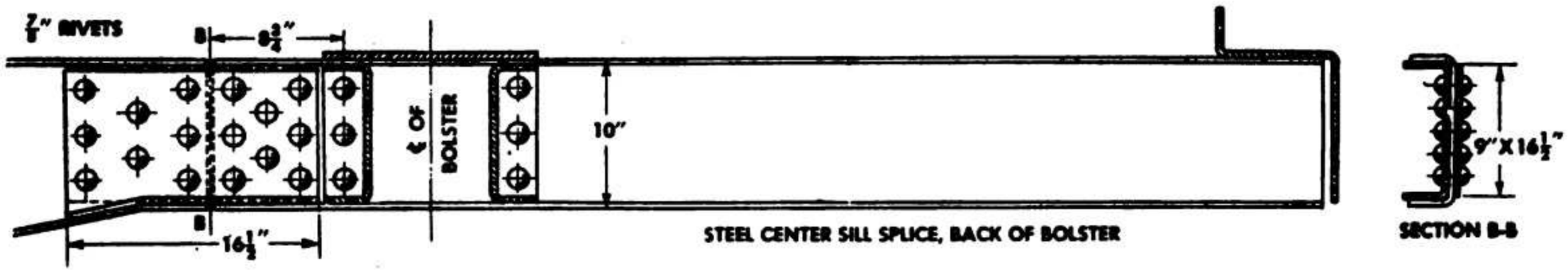


Figure 11. Steel center sill splice, back of bolster.

plate will be of the same thickness and width as the cover plate now on the car and of a length to permit application of four rivets in each sill on each side of the fracture. Two rivets will be applied between sills at each end of the plate. All rivets will conform to existing type on the car.

31. Center Sill Splice and Steel Sills Made of Plates and Angles (Rule No. 21)

a. When design is as shown in figure 16:

(1) Splice will be located behind the body bolster and as near to the bolster as the rivet spacing in the sill permits application of the number of rivets specified.

(2) The splice will be of butt-joint type.

(3) Adjacent center sill may be spliced.

(4) The splice plates will be as thick as the web plate of the sill but will not be less than 5/16 inches thick; they will not exceed 24 inches in length unless the rivet spacing in the top and bottom chords is sufficiently great to require a longer plate for application of the necessary number of rivets.

(5) If the center sill cover plate is broken, splice plate will be the same thickness and width as the cover plate on car and of a length to allow application of four rivets in each sill on each side of the joint. Two rivets will be applied between sills at each end of this plate. All rivets through the cover plate will be of existing type.

b. When designed as shown in figure 17:

(1) Splices will be of butt-joint type.

(2) Splices of this type will be used at the sloping portion of the center sill when the depth of the sill at the fracture does not exceed 16 inches.

(3) Adjacent center sill may be spliced.

(4) Types 1, 2, and 3 splices illustrate the application of splice plates to sills having the following members broken:

(*a*) Type 1 splice will be used when the top angle, web plate, and one or both bottom angles are broken. The flanged plates and flanges will be of the same thickness and width as the angles now on the car but will not be less than 3/8-inch thickness for each plate.

(*b*) Type 2 splice will be used when the web plate or one or both bottom angles are broken. The size of flanged plates will be the same as specified for type 1 splice.

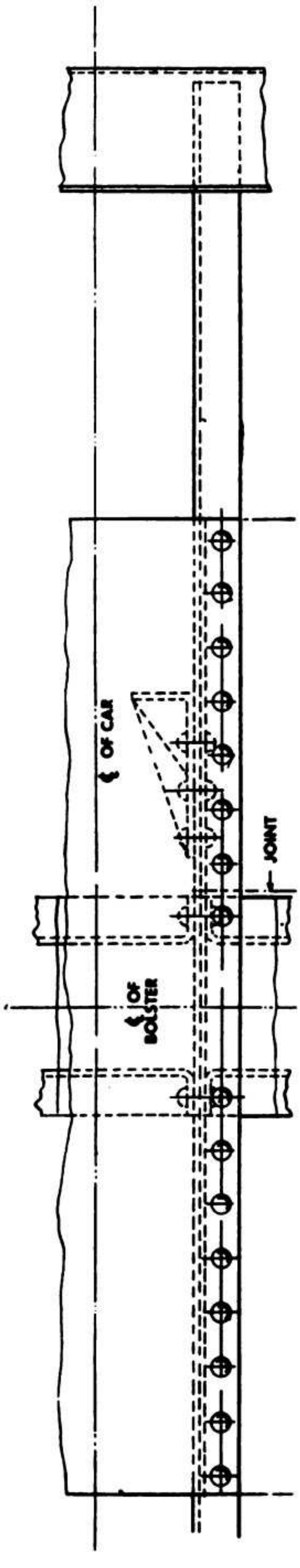
(*c*) Type 3 splice will be used when only the web plate is broken. The thickness of each splice plate will equal that of the web plate now on the car but it will not be less than 3/8-inch thick. If the center sill cover plate is broken also, this plate will be spliced in the same manner as specified for figure 16.

c. When design is as shown in figure 18:

(1) This type of splice will be used when the depth of the sill at the fracture or joint exceeds 16 inches.

(2) Adjacent sill may be spliced.

(3) The flanged angles and legs will conform in thickness and width with similar dimensions of the angle on the car.



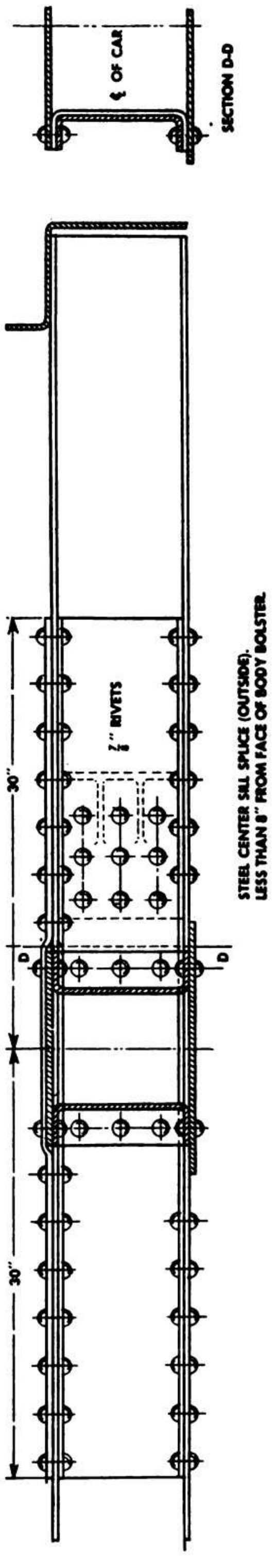
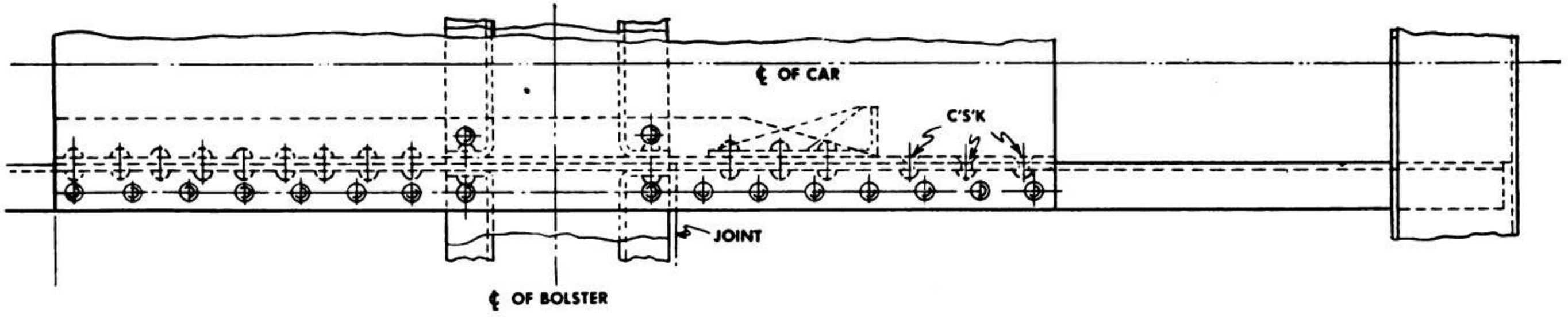


Figure 12. Steel center sill splice (outside) less than 8 inches from face of body bolster.



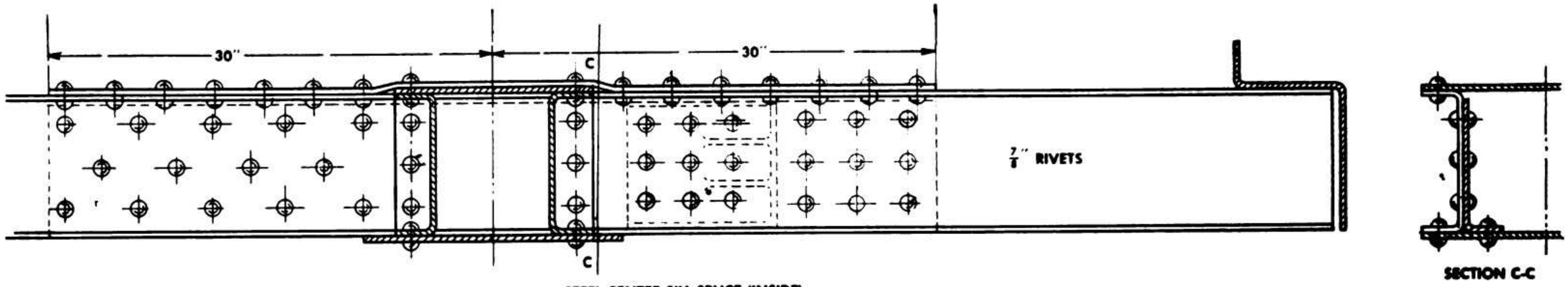


Figure 13. Steel center sill splice (inside) less than 8 inches from face of body bolster.

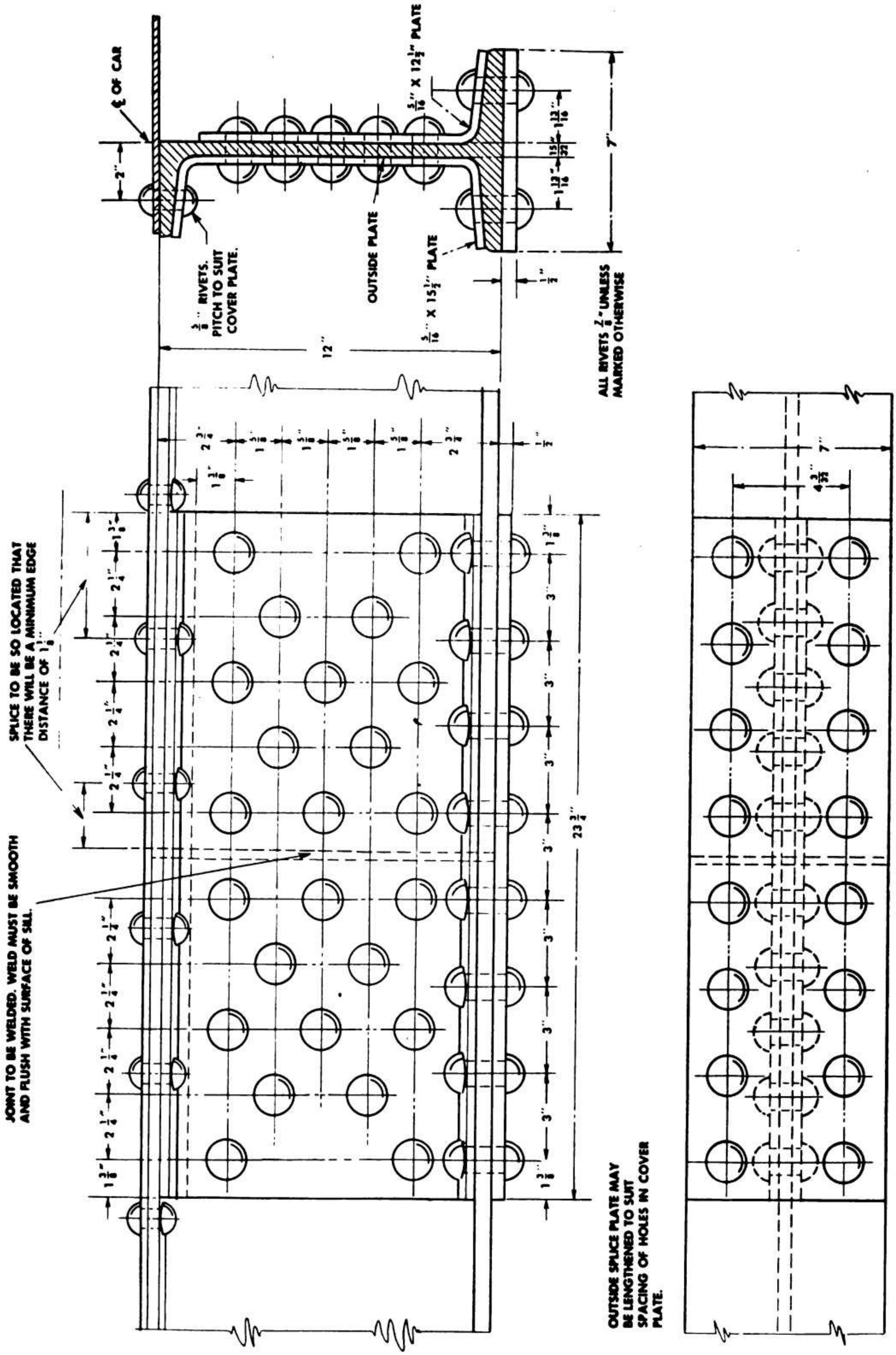
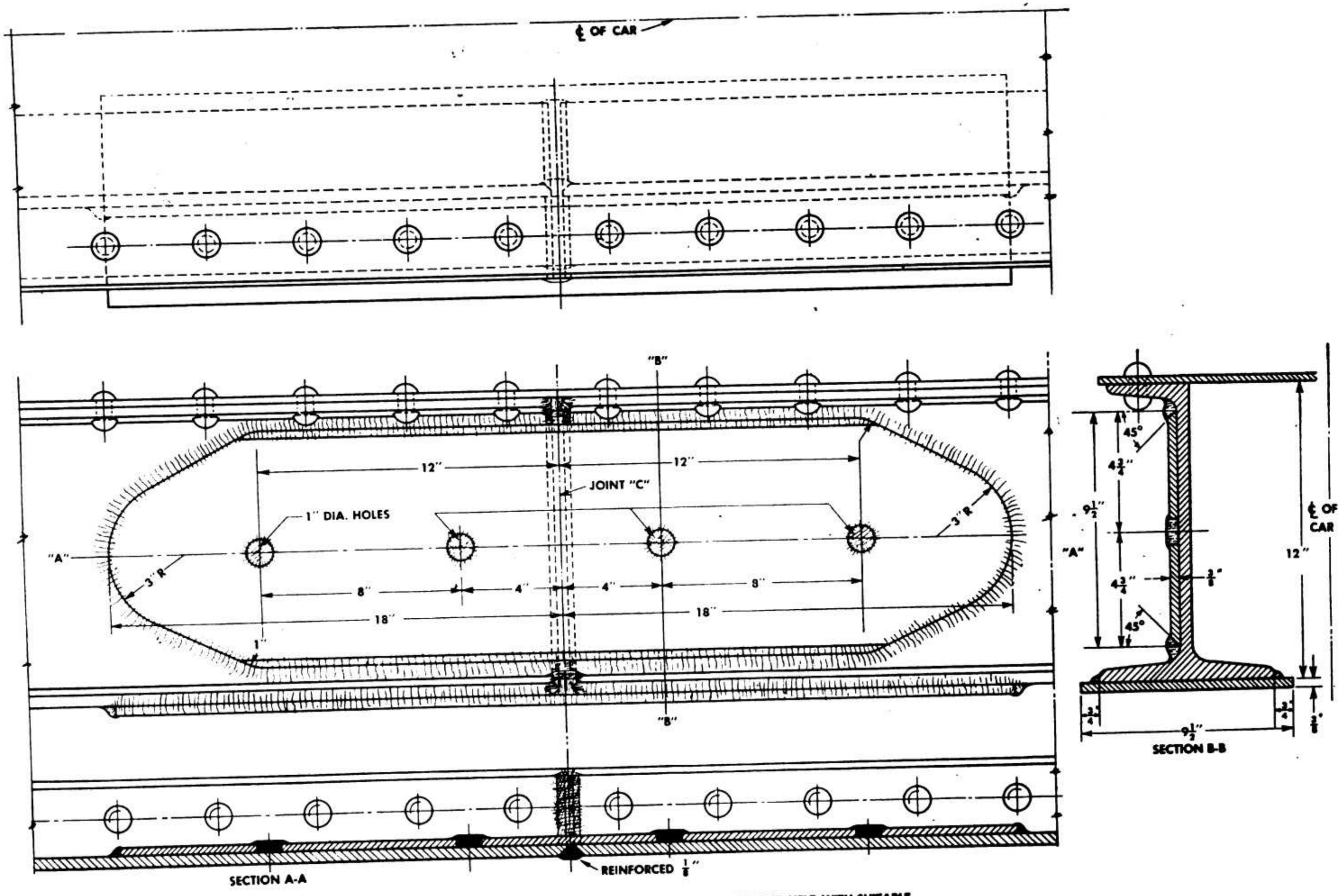


Figure 14. Method of splicing A.A.R. center sill.



THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT "C" MUST BE WELDED FIRST, USING THE BACK STEP METHOD OF WELDING ON VERTICAL SEAM, THEN WELD THE 1" HOLES IN FACE OF PLATE AFTER WHICH THE SEAMS ON THE SAME END OF PLATE SHOULD BE WELDED USING THE BACK STEP METHOD AND FOLLOW THE SAME PRACTICE ON OPPOSITE END OF SPLICE PLATE

Figure 15. A.A.R. center sill, welded splice.

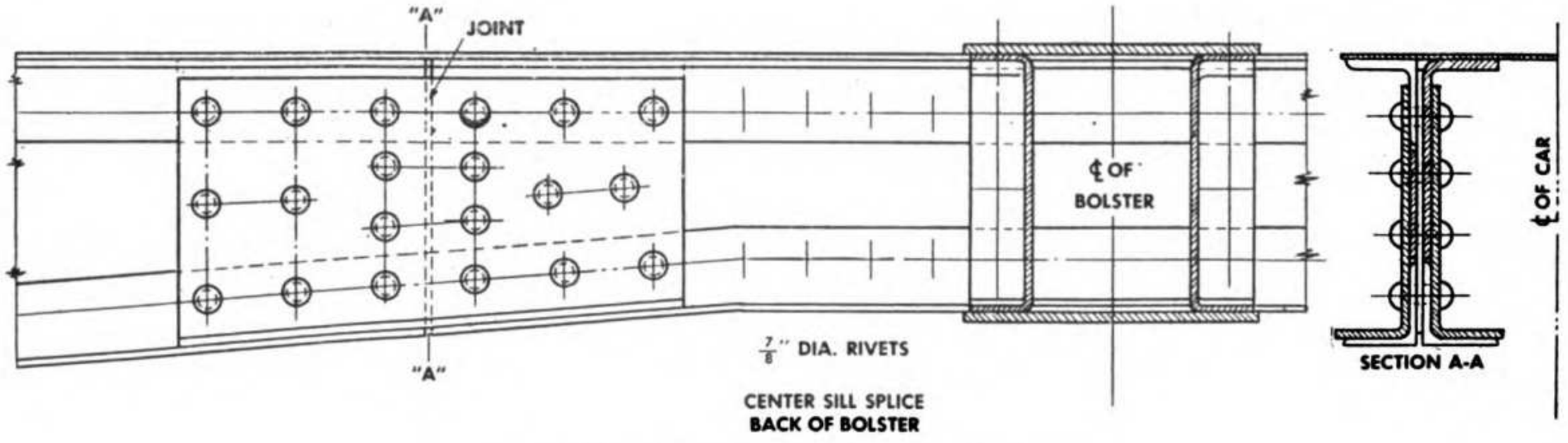


Figure 16. Center sill splice, back of bolster.

(4) Web splice plates will be as thick as the web in the car but the thickness of each plate will be not less than ⅜ inch.

(5) Rivet spacing in web splice plates will not exceed 4 inches nor be less than 2¾ inches.

(6) If the center sill cover plate is broken also, this plate will be spliced in the same manner as specified for figure 16.

32. "Z" Bar Center Sill Splice (Rule No. 22)

a. WELDED TYPE. (1) Splice will be located between body bolsters at any point where the construction of the car will permit and dimensions of the splice as indicated in figure 19 can be followed.

(2) Top splice plate of ⅜-inch thickness will have dimensions as indicated in figure 19.

(3) All welding will be performed in accordance with figure 19.

b. RIVET TYPE. (1) Splice will be located between body bolsters at any point where the construction of the car will permit and the dimensions of the splice as indicated in figure 20 can be followed.

(2) Top splice plate of ⅜-inch thickness will be of sufficient length to permit application of five rivets in each sill on each side of the fracture.

(3) Outside and inside splices will be at least 5/16-inch thick and the rivets will be spaced as shown.

(4) Bottom splice plate of ½-inch thickness will be of length to permit application of four rivets in each sill on each side of the fracture.

(5) All rivets will have ⅞-inch diameter.

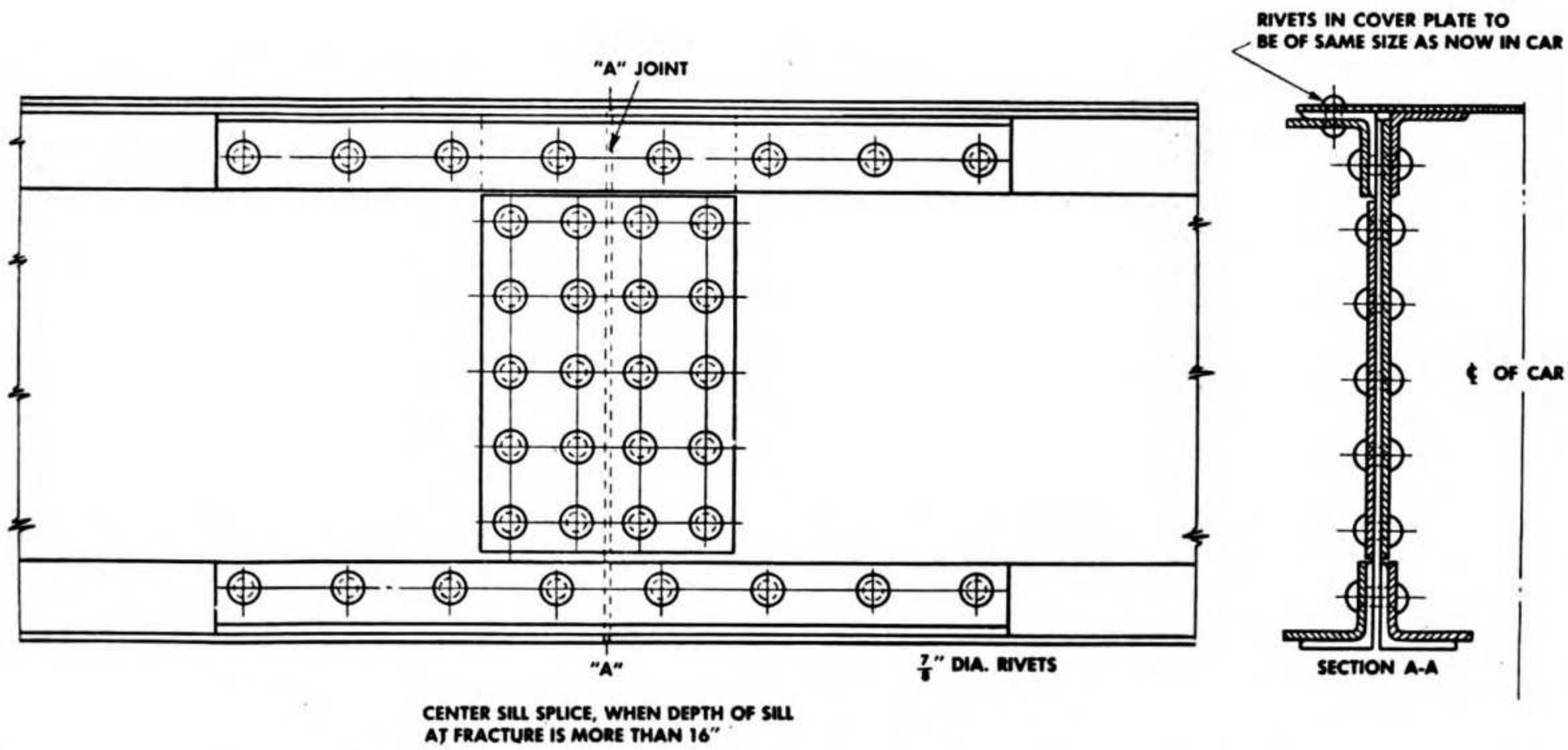
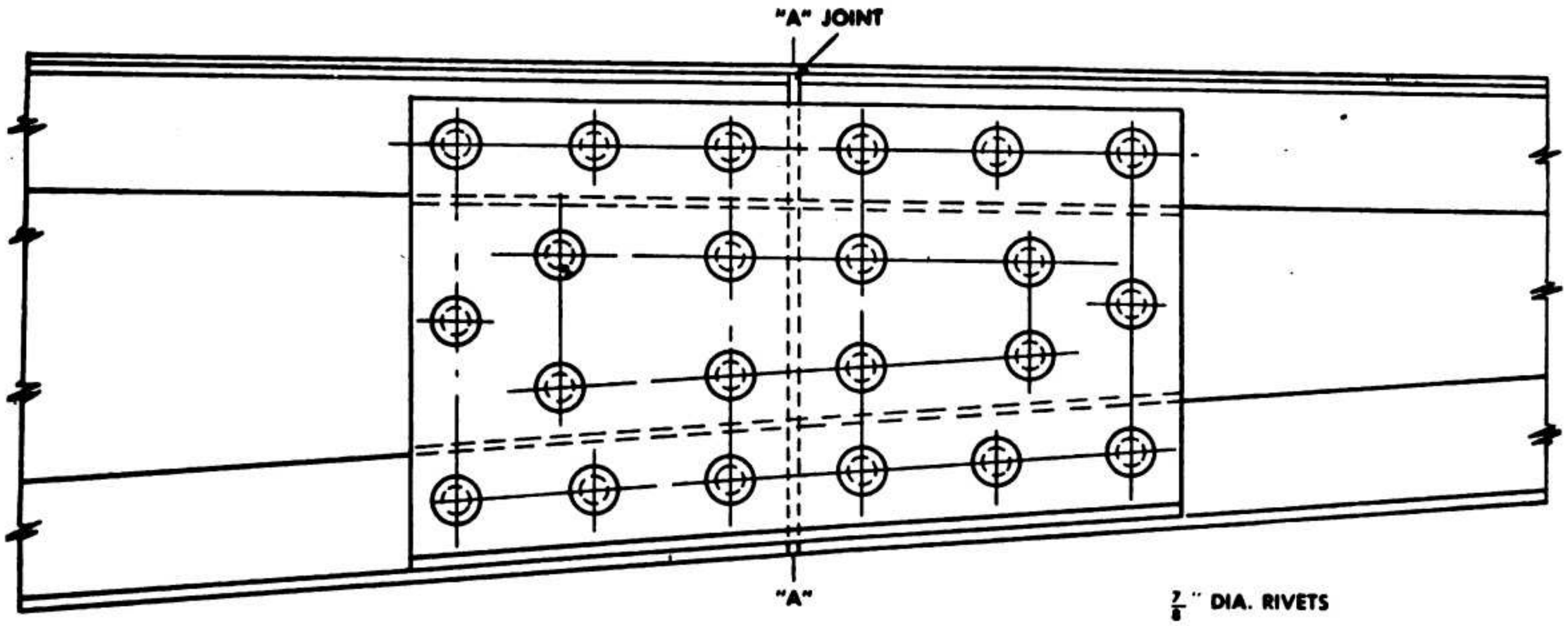


Figure 17. Center sill splice when depth of sill at fracture is not more than 16 inches.



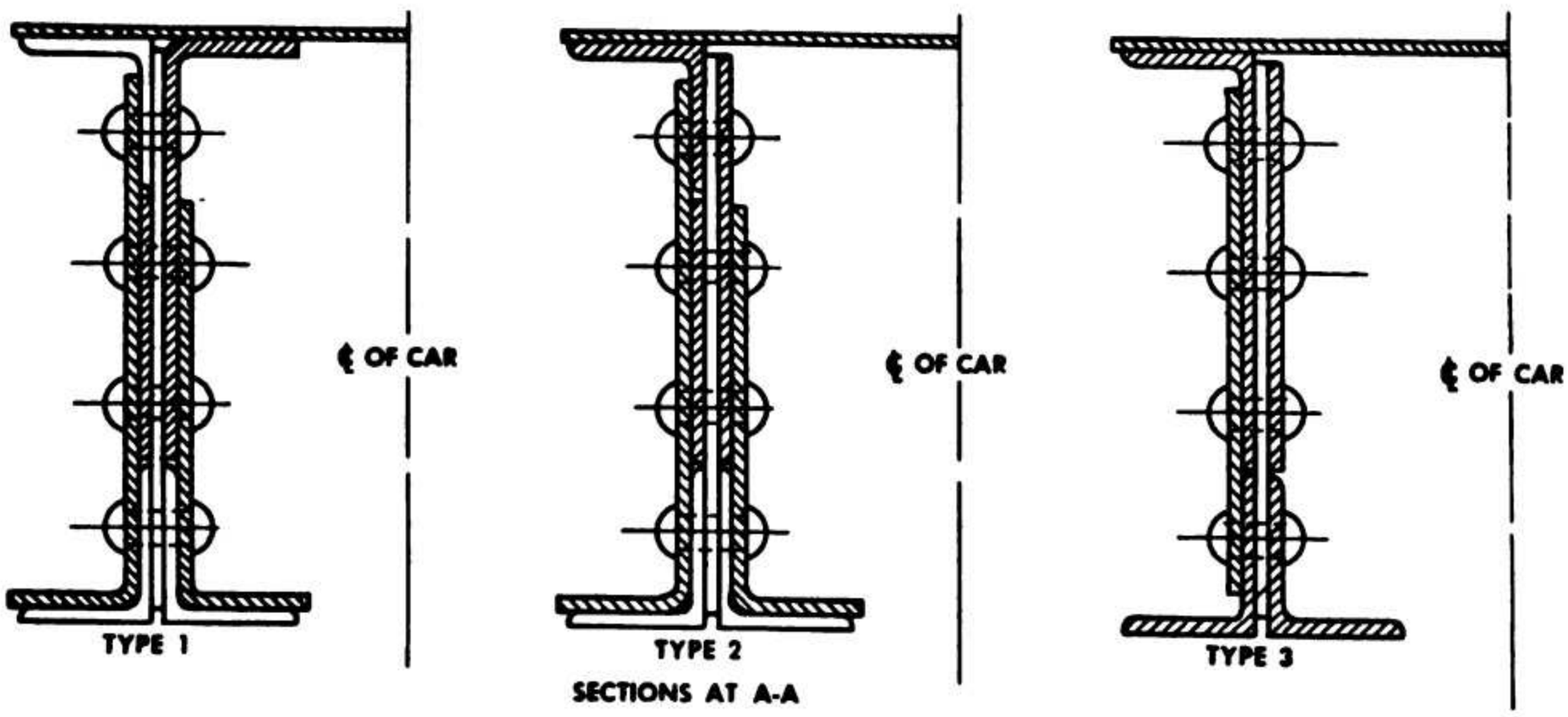


Figure 18. Center sill splice when depth of sill at fracture is more than 16 inches.

33. Side Sill Splices (Rule No. 23)

a. Riveted type as shown in figure 21.

(1) All splices will be of the butt-joint type, reinforced on both sides by plates 14 inches in length and a thickness equal to that of the web of the sill.

(2) The splice plate on the flange side of the sill will cover only the web, while the plate on the opposite side will be flanged over the bottom leg of the side sill and riveted to it, as indicated in figure 21.

(3) The splice may be located on either side of the body bolster.

(4) The rivets will be spaced as shown.

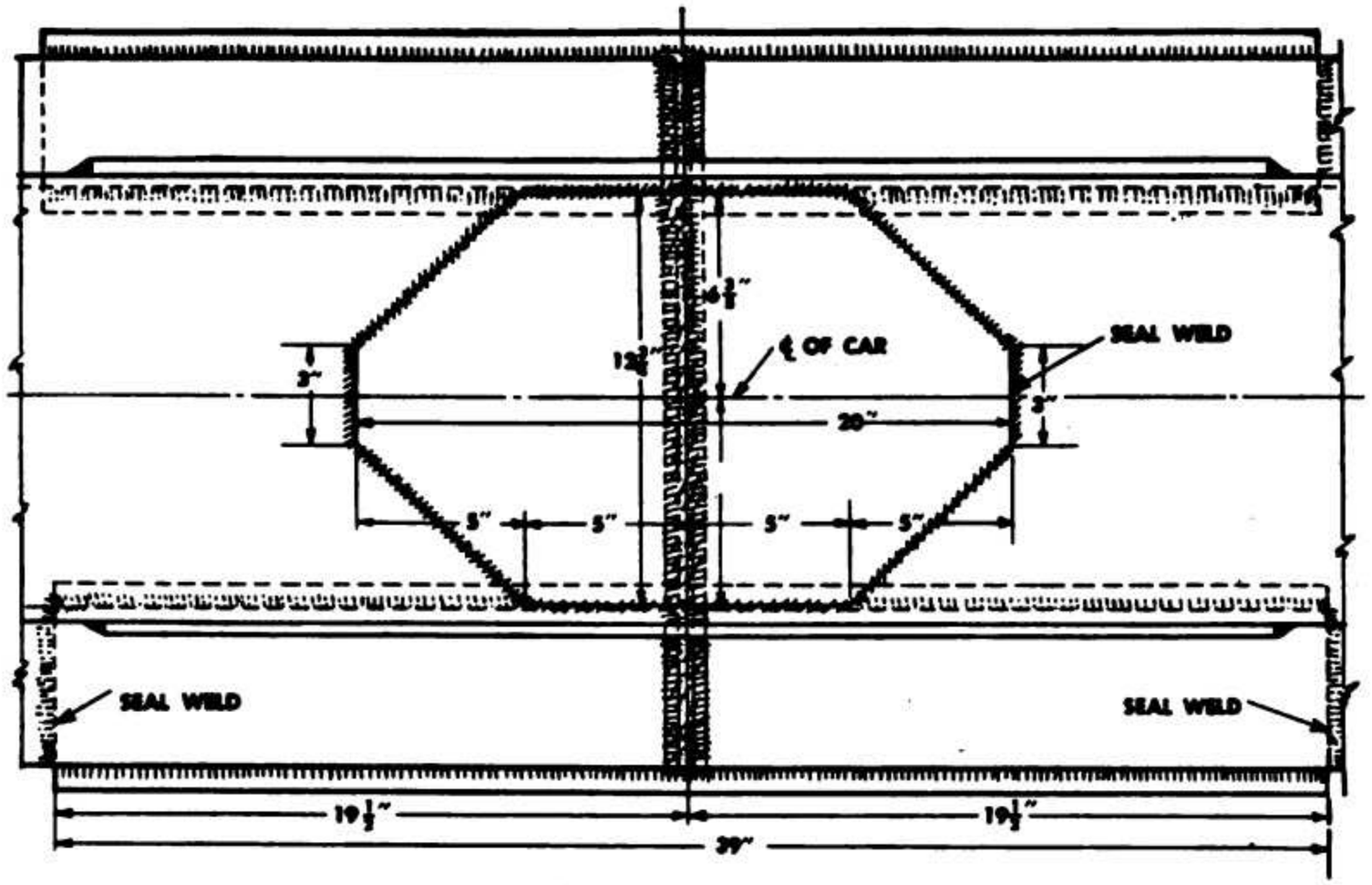
b. Welded type as shown in figure 22; splices may be located on either side of the body bolster.

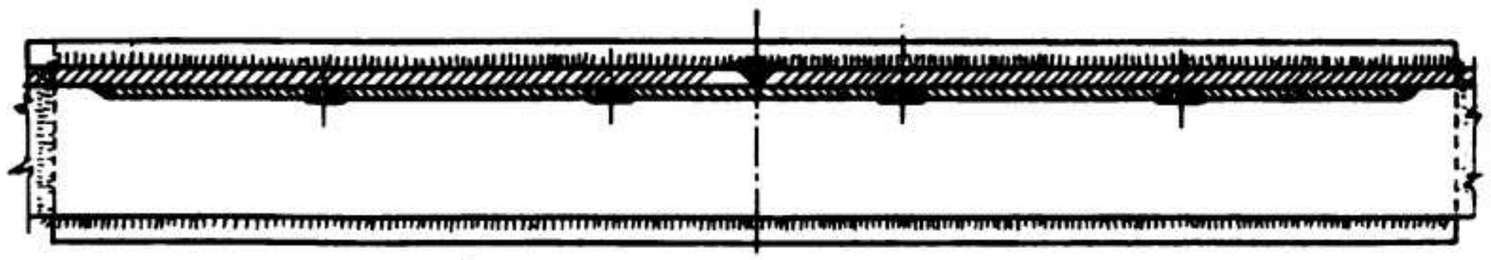
c. Riveted type as shown in figure 23; splices may be located at any point between end sills.

d. Welded type as shown in figure 24.

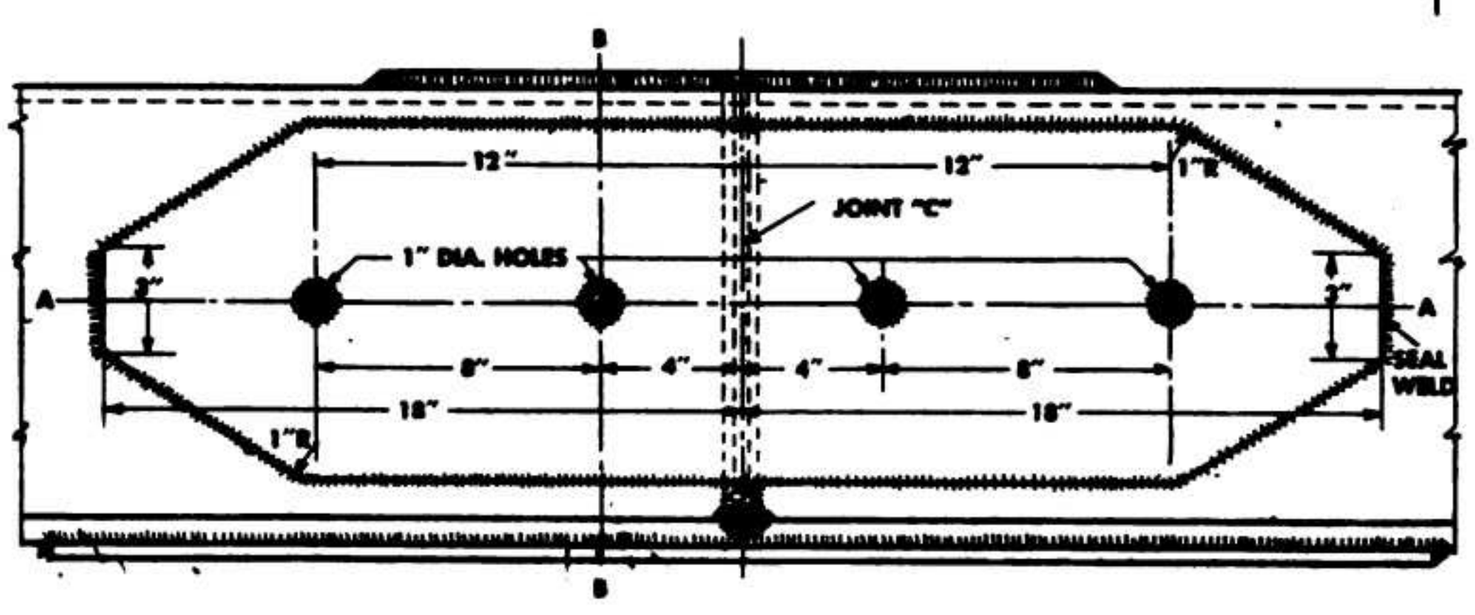
(1) Splices may be located at any point between end sills.

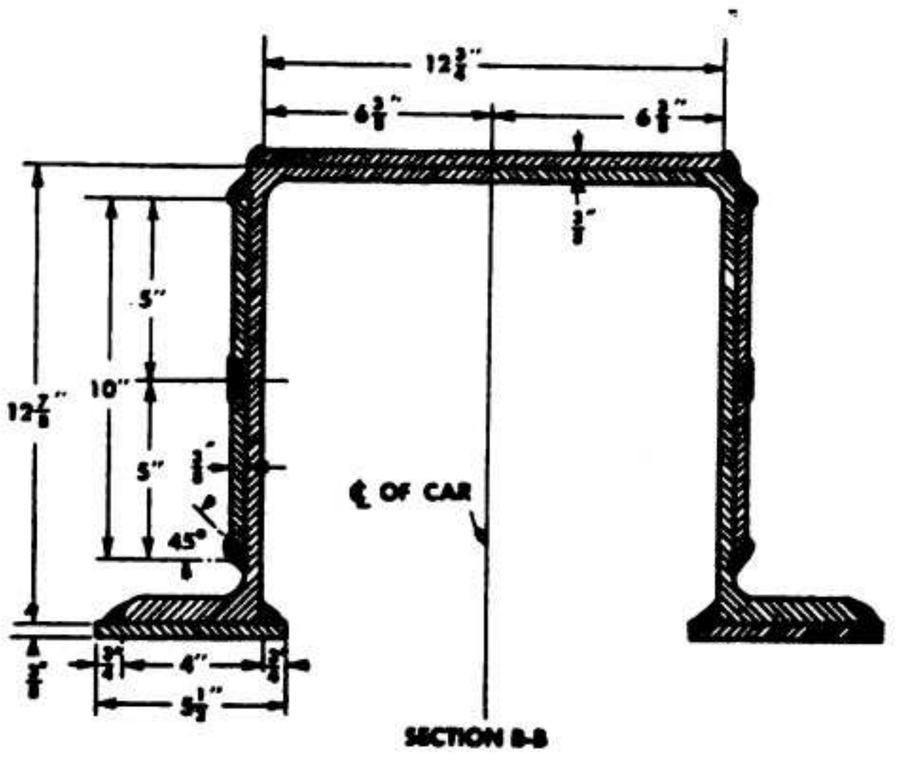
(2) The splice plate may be located on the side of the web opposite from that shown.





SECTION A-A





SECTION B-B

THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT "C" MUST BE WELDED FIRST, USING THE BACK STEP METHOD ON VERTICAL SEAM AND ACROSS TOP OF SILL. THEN WELD THE 1" HOLES IN FACE OF PLATE AFTER WHICH THE SEAMS AT EXTREME ENDS SHOULD BE WELDED USING THE BACK STEP METHOD AND FOLLOW THIS SAME PRACTICE ALONG ALL SEAMS STARTING AT END OF SPLICE PLATE AND WELDING TO JOINT "C."

Figure 19. "Z" bar center sill splice, welded type.

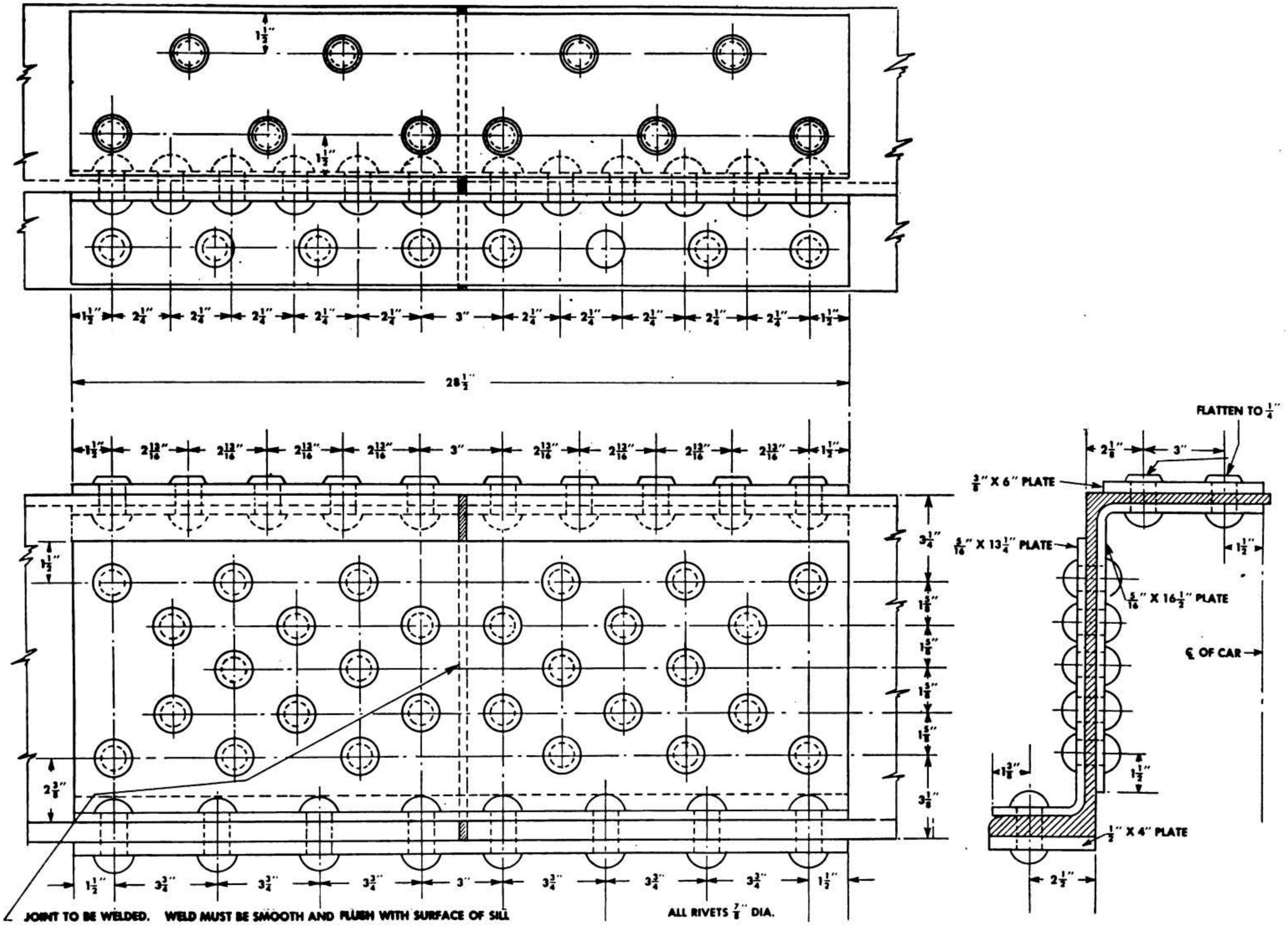


Figure 20. "Z" bar center sill splice, rivet type.

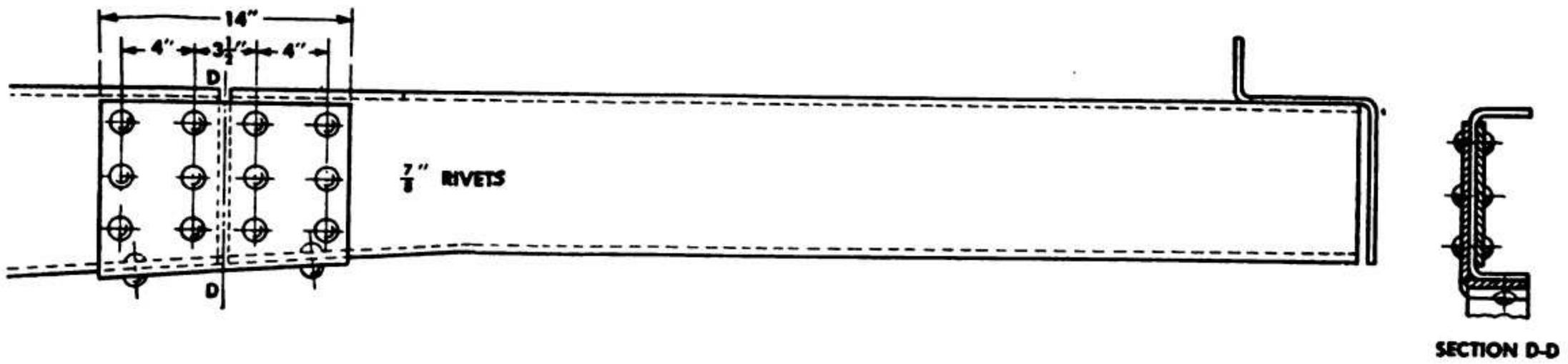


Figure 21. Side sill, riveted splice as described in paragraph 33a.

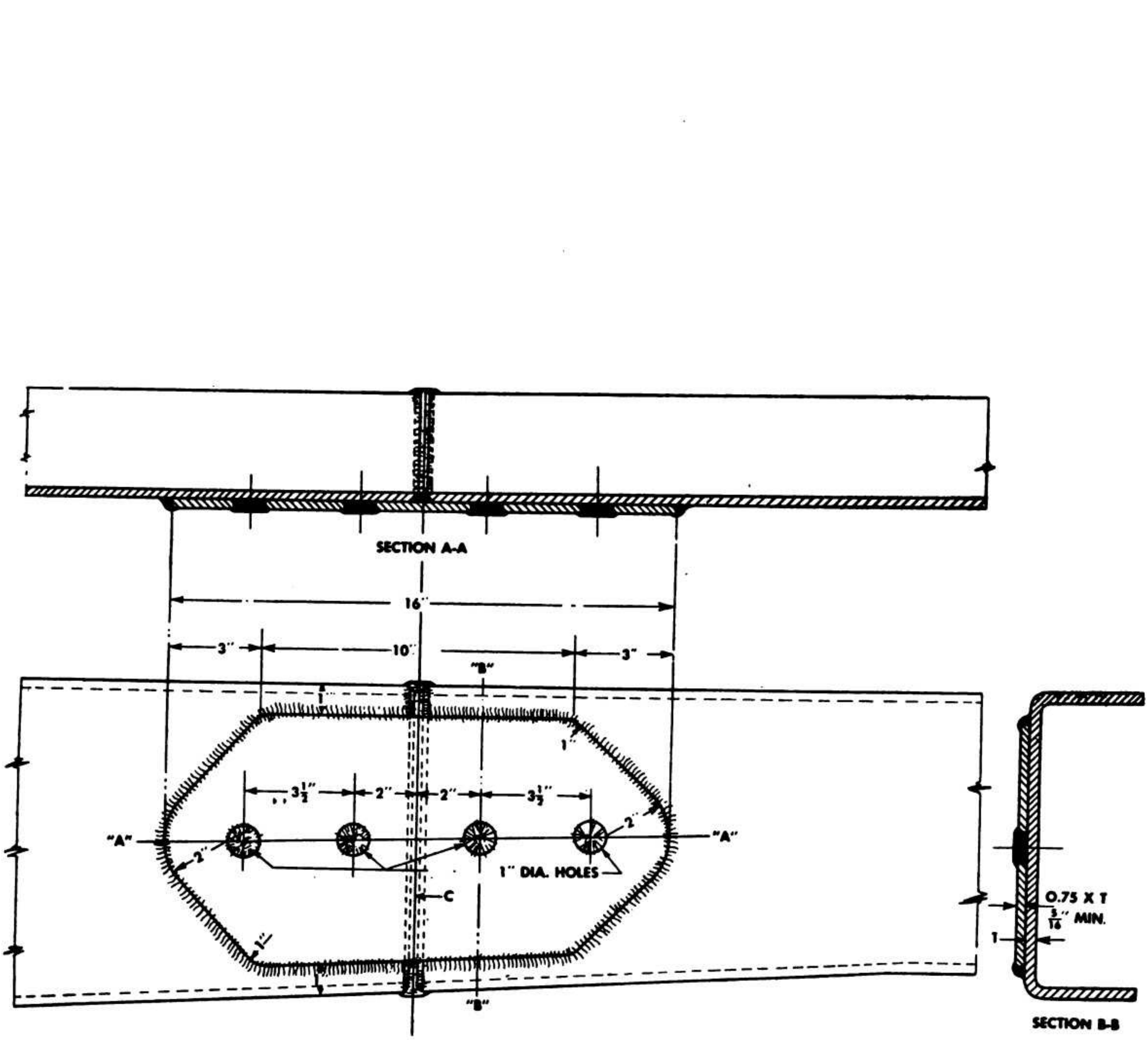


Figure 22. Side sill, welded splice, as described in paragraph 33b.

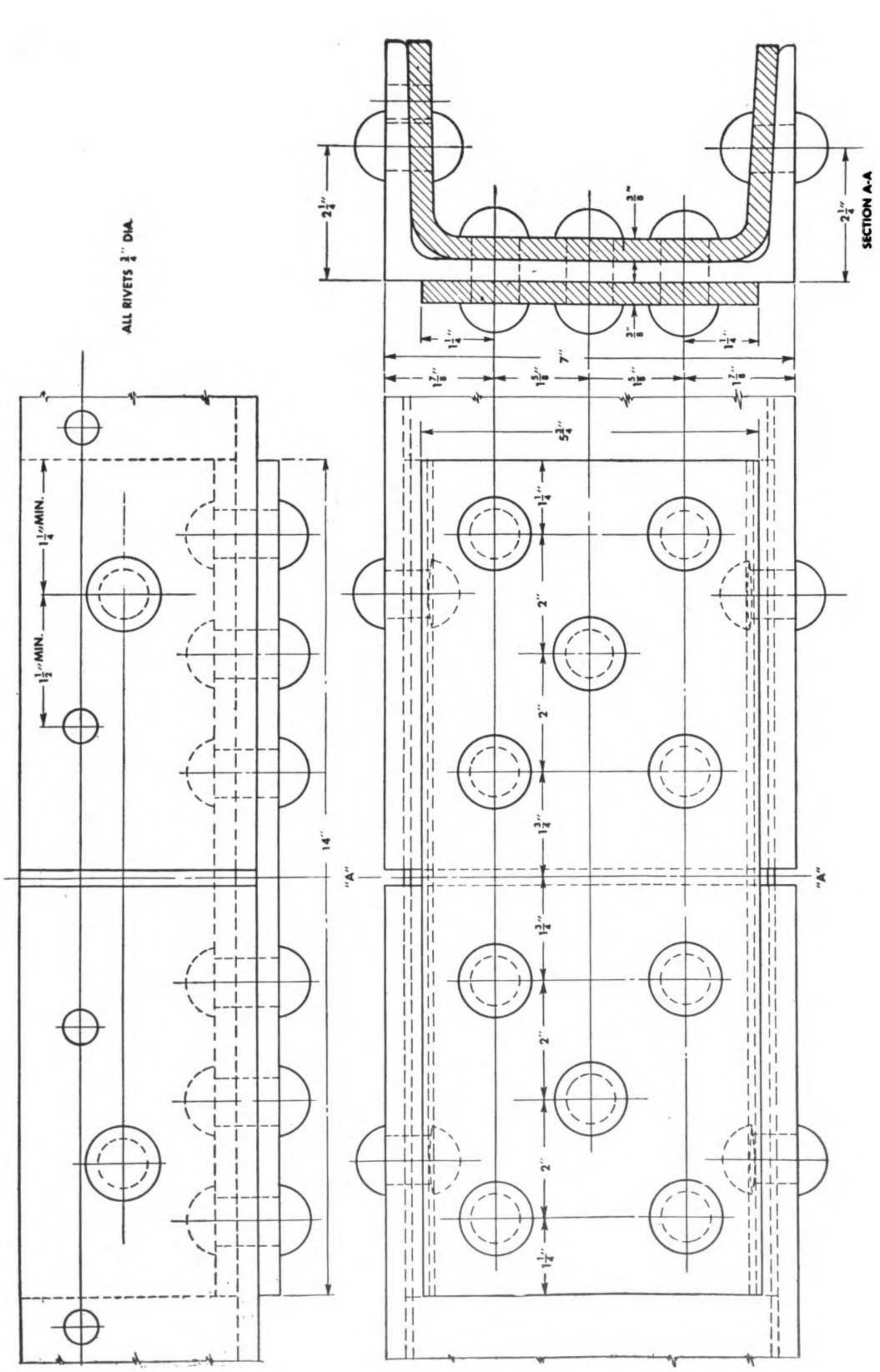
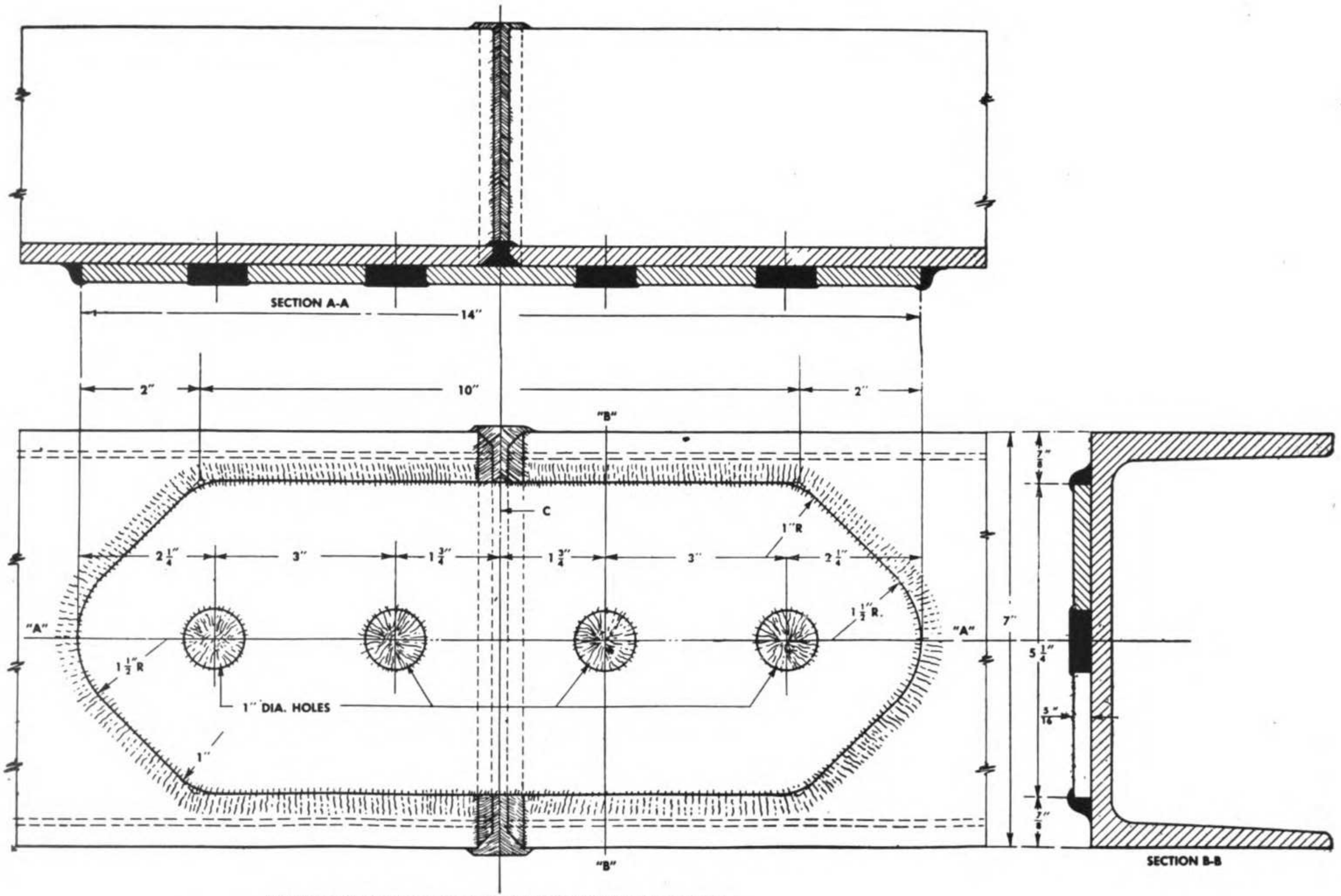


Figure 23. Side sill, riveted splice, as described in paragraph 33c.



THE SPLICE PLATE MUST BE PLACED IN POSITION AND HELD WITH SUITABLE CLAMPS TO THE SILL IN LINE BEFORE WELDING IS STARTED. JOINT "C" MUST BE WELDED FIRST, USING THE BACK STEP METHOD OF WELDING ON VERTICAL SEAM, THEN WELD THE 1" HOLES IN FACE OF PLATE AFTER WHICH THE SEAMS ON THE SAME END OF PLATE SHOULD BE WELDED USING THE BACK STEP METHOD AND FOLLOW THE SAME PRACTICE ON OPPOSITE END OF SPLICE PLATE

Figure 24. Side sill, welded splice, as described in paragraph 33d.

Section V

COUPLERS

34. Coupler Heights (Rule No. 24)

a. Cars will be maintained within the limits of standard height for couplers, measured from top of the rails to center of face of coupler knuckle. As far as possible, adjustment will be made when cars are empty. The following are regulations for standard gauge track:

(1) On empty cars, coupler heights measuring 32½ inches or less will be adjusted to 34½ inches or as near as practicable thereto but not exceeding 34½ inches.

(2) On loaded cars, coupler heights measuring 31½ inches or less will be adjusted to 33½ inches or as near as practicable thereto but not exceeding 33½ inches.

b. When adjusting coupler heights, the coupler first is placed in proper alignment with draft gear. As indicated in figures 25, 26, 27, or 28, a shim of ¼-inch thickness or more as required, will be applied for this purpose. If shim of less than ¼-inch thickness is required, realignment is unnecessary.

c. After the coupler is placed in proper alignment by shimming coupler carrier and its height is not at least ½ inch in excess of minimum dimensions specified in *a* above, further adjustment will be made at the truck springs, center plates, or journal boxes.

d. Do not use liners between male and female portions of center plates where the vertical bearing surfaces are reduced. However, where the side bearing clearance cannot be adjusted otherwise, the use of a one or two piece metal shim not to exceed ⅛ inch in thickness between the bearing surfaces of the upper and lower center plates is permissible, providing the vertical bearing surface of the center plate is not reduced below 1⅛ inches. Do not use cut washers between male and female portions of center plates.

e. When the coupler within prescribed height limits is found to be drooping (1 inch or more with key attachment, or ¾ inch or more with riveted attachment), it will be corrected as provided in *a* above. When couplers or draft gear are removed, replaced, renewed, or repaired and coupler height is within prescribed limits, the couplers and draft gears will be aligned properly as provided in *a* above.

35. Gauge Limits and Methods of Gauging Couplers (Rule No. 25)

a. WORN LIMIT-REPAIRS (WITHOUT REMOVING COUPLER FROM CAR). (1) Couplers, types D and E with distance between point of knuckle and guard arm exceeding 5 5/16 inches as measured by gauge (fig. 29), will have the defective part or parts renewed to bring coupler within the required gauge of 5⅛ inches as measured by gauge (see fig. 31). If the coupler is out of gauge, the body will not be renewed unless the application of second-hand, reconditioned or new parts (knuckle, lock and pin, any

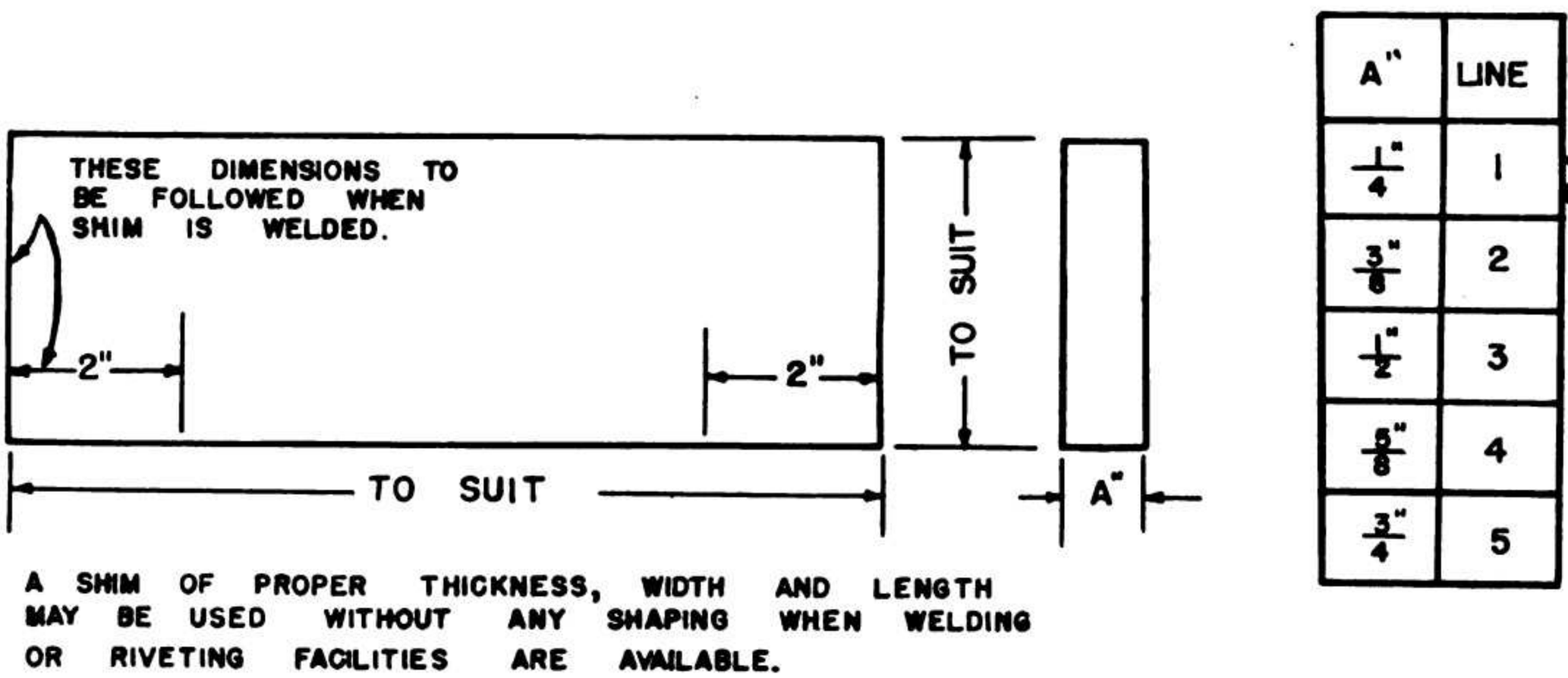
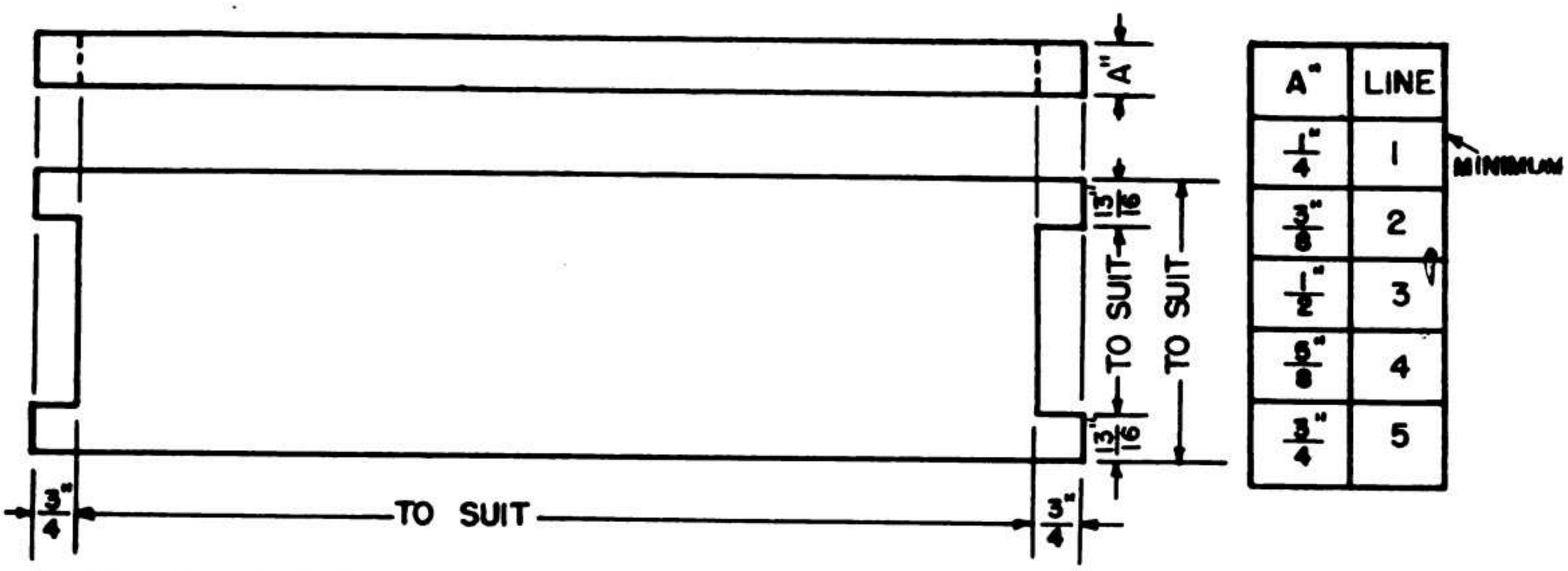
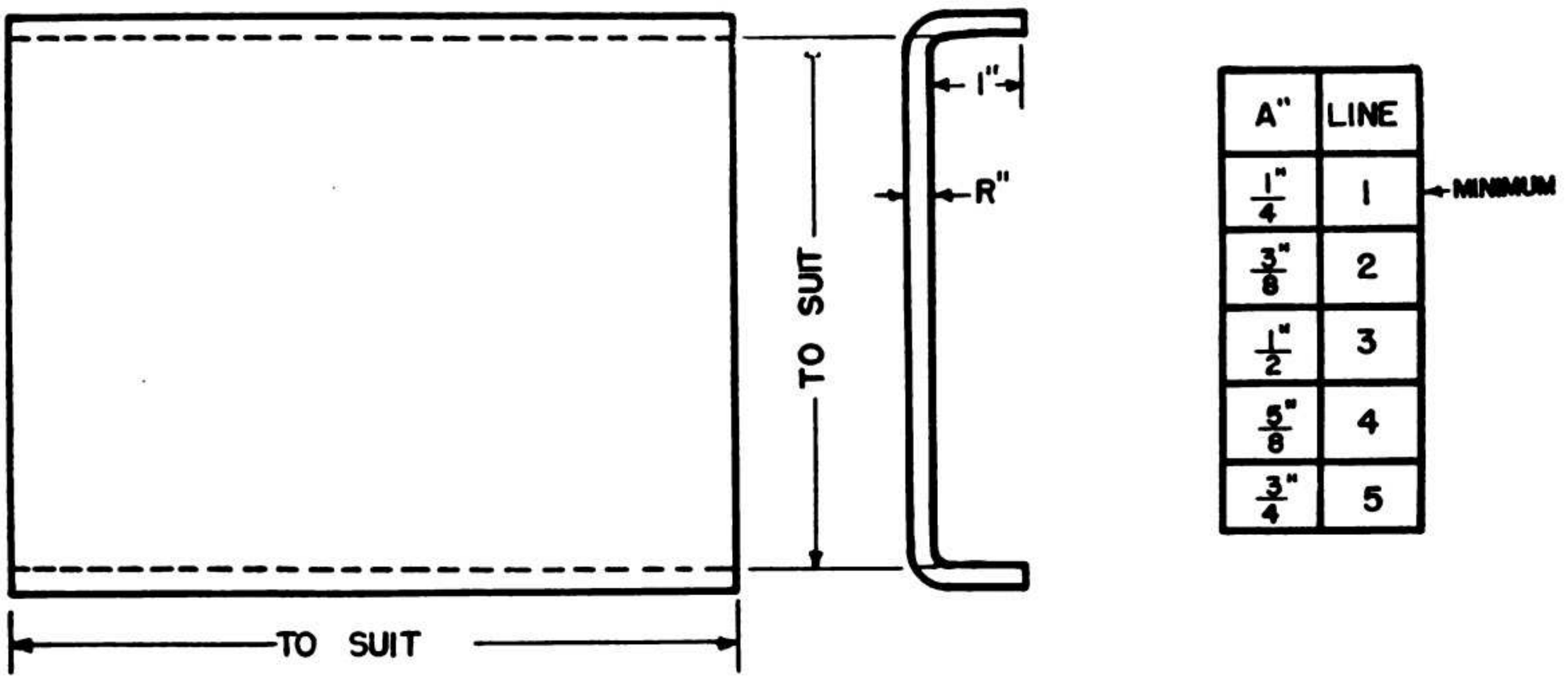


Figure 25. This style coupler shim of proper thickness, width, and length may be used without any shaping when welding or riveting facilities are available.



SHIM OF PROPER THICKNESS, WIDTH AND LENGTH MAY BE APPLIED WHERE WELDING OR RIVETING FACILITIES ARE NOT AVAILABLE.

Figure 26. This style coupler shim of proper thickness, width, and length may be applied where welding or riveting facilities are not available.



SHIM OF REQUIRED THICKNESS, WIDTH AND LENGTH MAY BE APPLIED WHERE WELDING OR RIVETING FACILITIES ARE NOT AVAILABLE.

Figure 27. This style coupler shim of required thickness, width, and length may be applied where welding or riveting facilities are not available.

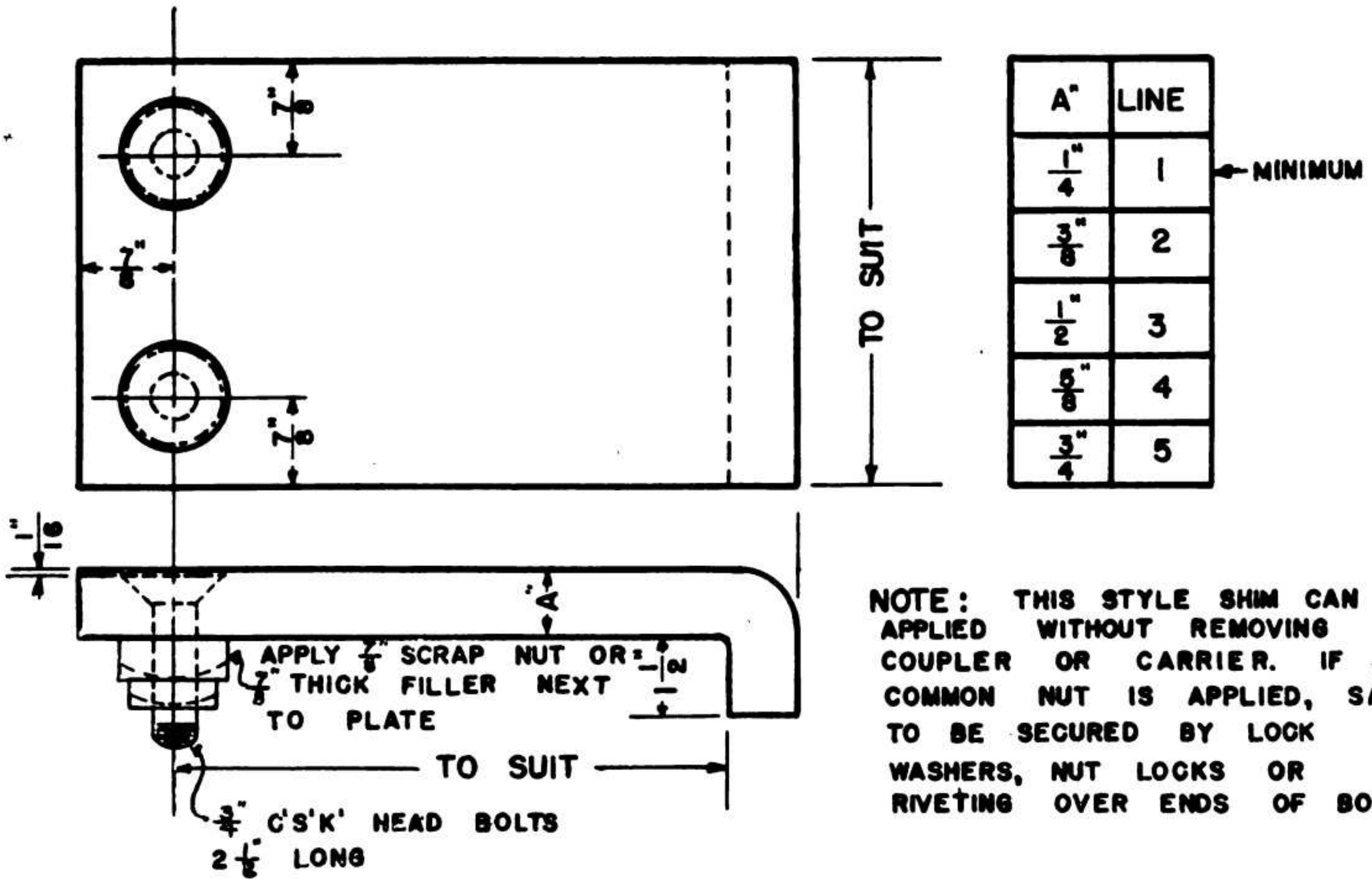


Figure 28. This style coupler shim can be applied without removing coupler or carrier, if 3/4-inch common nut is applied and secured by lock washers, nut locks, or riveting over ends of bolts.

or all), will not bring it within the required gauge of 5⅛ inches.

(2) Couplers, other than types D and E with distance between point of knuckle and guard arm exceeding 5⅛ inches measured perpendicularly to guard arm (see fig. 31), will have the defective part or parts renewed to bring coupler within required gauge of 5⅛ inches.

b. APPLICATION OF SECOND-HAND OR RECONDITIONED COUPLERS. (1) Coupler bodies, types D and E, second-hand or reconditioned, whether applied separately or as part of a complete second-hand coupler, regardless of any new, reused, reconditioned, or other second-hand parts (knuckle, lock and pin, any or all): distance from point of knuckle to guard arm will not exceed 5 inches as measured by gauge (see fig. 30). The same limit will govern if new coupler body is applied with any other reused, reconditioned, or second-hand part.

(2) In the application of second-hand or reconditioned coupler bodies or complete coupler, the shank will not be less than 21 inches in length from striking horn to crest of worn surface of butt, nor less than 3⅞ inches from pulling surface (rear) of horizontal key slot to crest of worn surface of butt, established with parallel straight edges (fig. 33). Coupler bodies having such minimum dimensions will not be removed from cars for these defects alone.

36. Coupler Bodies (Rule No. 26)

a. Coupler bodies with cracks in knuckle side wall back of knuckle tail will not be removed unless:

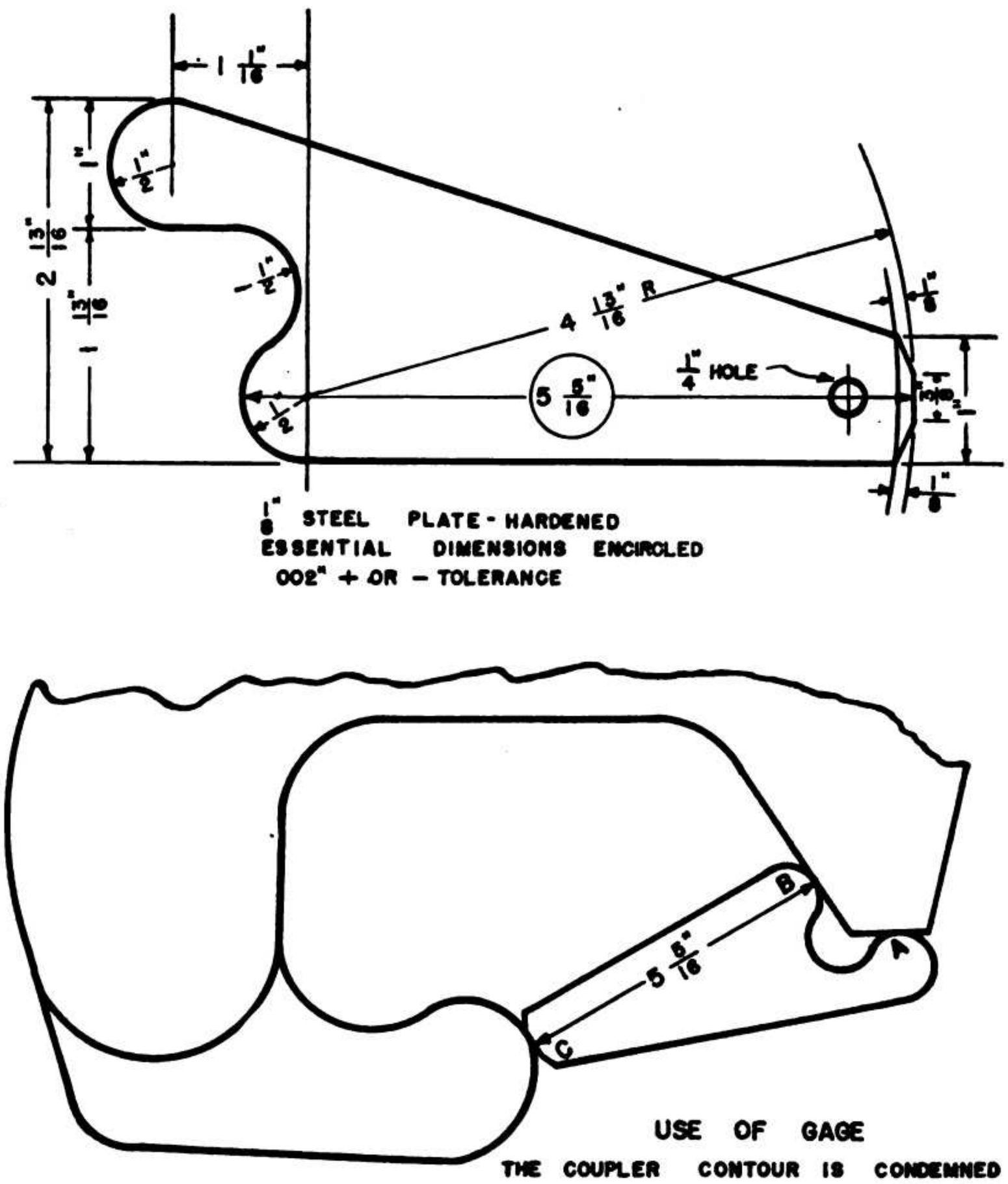
(1) Such crack extends beyond the shaded area indicated in figure 32 (4 inches above and 4 inches below the horizontal center line of knuckle side wall and 10 inches back of front edge of knuckle side wall). These cracks will be measured on the surface of coupler. When crack extends beyond the shaded area, the coupler body is condemned.

(2) Section is broken out in excess of 3 inches within this prescribed area.

b. Coupler bodies cracked within the limits specified above will be welded whenever cracked.

c. Coupler bodies having cracks within the shaded area will not be removed from cars for this defect alone.

d. Do not burn out key slots in any type of coupler body.

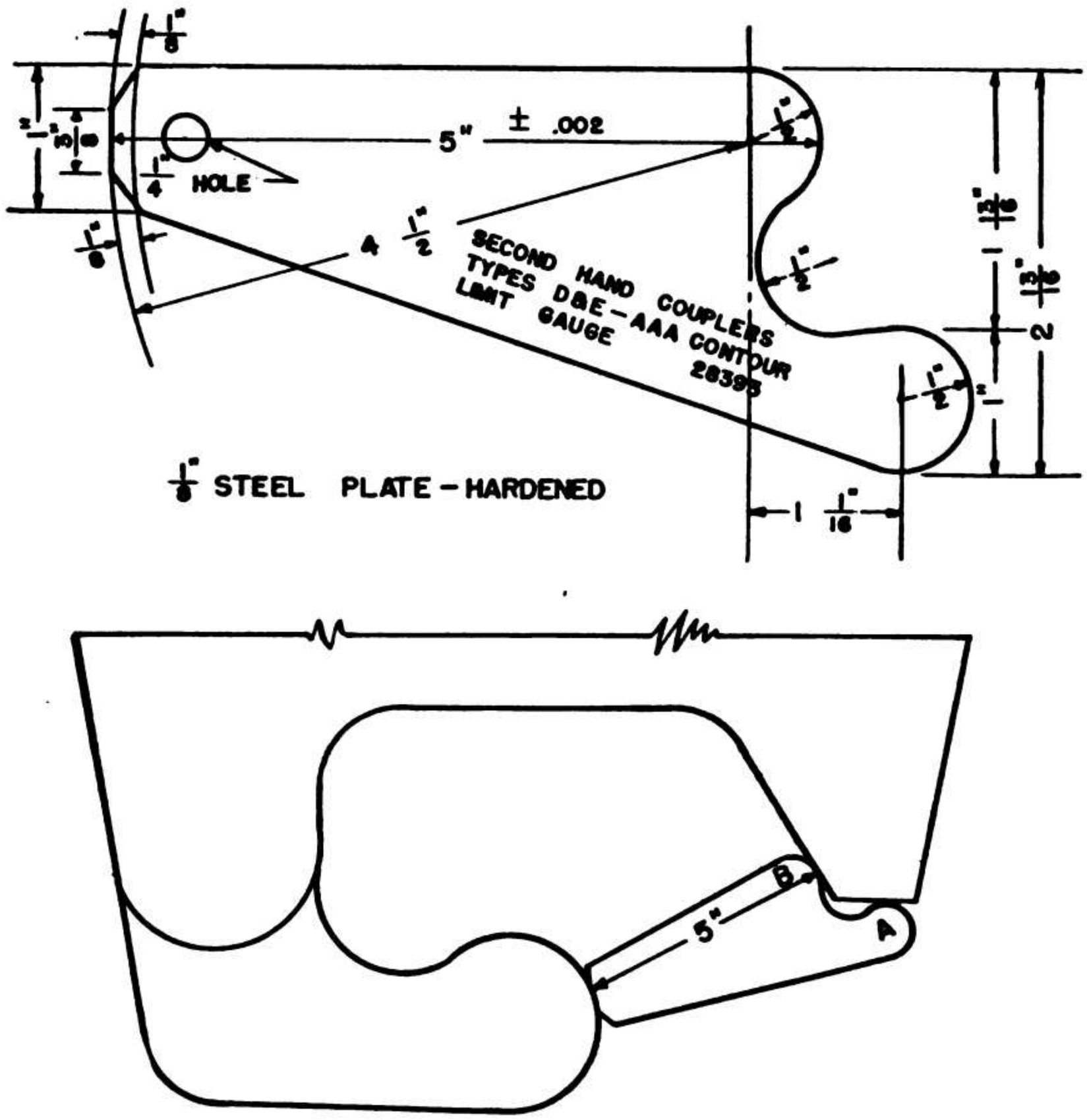


1/8" STEEL PLATE - HARDENED
ESSENTIAL DIMENSIONS ENCIRCLED
.002" + OR - TOLERANCE

USE OF GAGE

THE COUPLER CONTOUR IS CONDEMNED WHEN THE GAGE CAN BE PASSED VERTICALLY THROUGH THE CONTOUR IN THE POSITION SHOWN AND WITH POINTS "A" AND "B" CONTRACTING GUARD ARM.

Figure 29. Use of gauge in measuring couplers as described in paragraph 35a(1).



USE OF GAUGE

THE COUPLER CONTOUR IS CONDEMNED WHEN THE GAUGE CAN BE PASSED VERTICALLY THROUGH THE CONTOUR IN POSITION SHOWN AND WITH POINTS "A" AND "B" CONTRACTING GUARD ARM.

Figure 30. Use of gauge in measuring couplers as described in paragraph 35b(1).

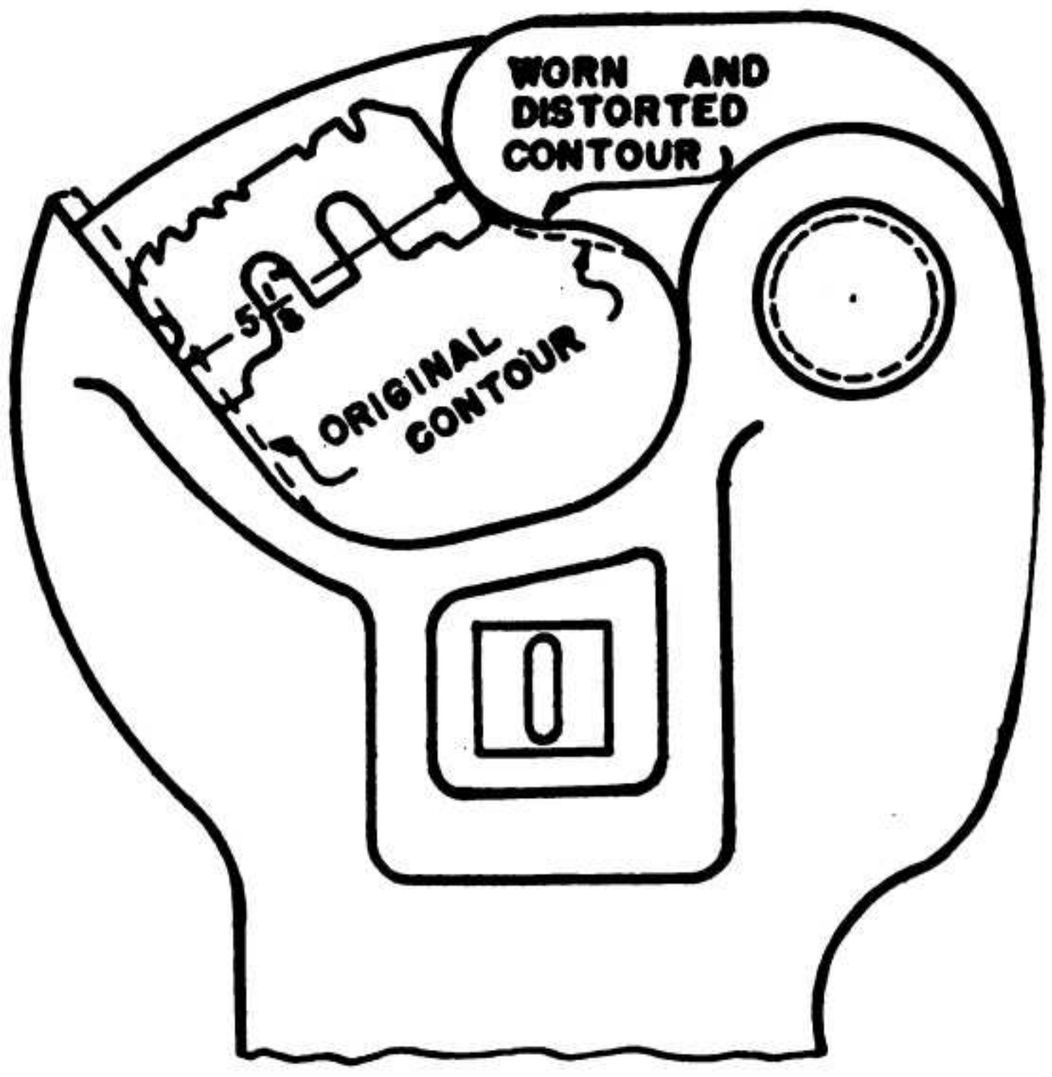


Figure 31. Use of gauge in measuring couplers as described in paragraph 35a(1).

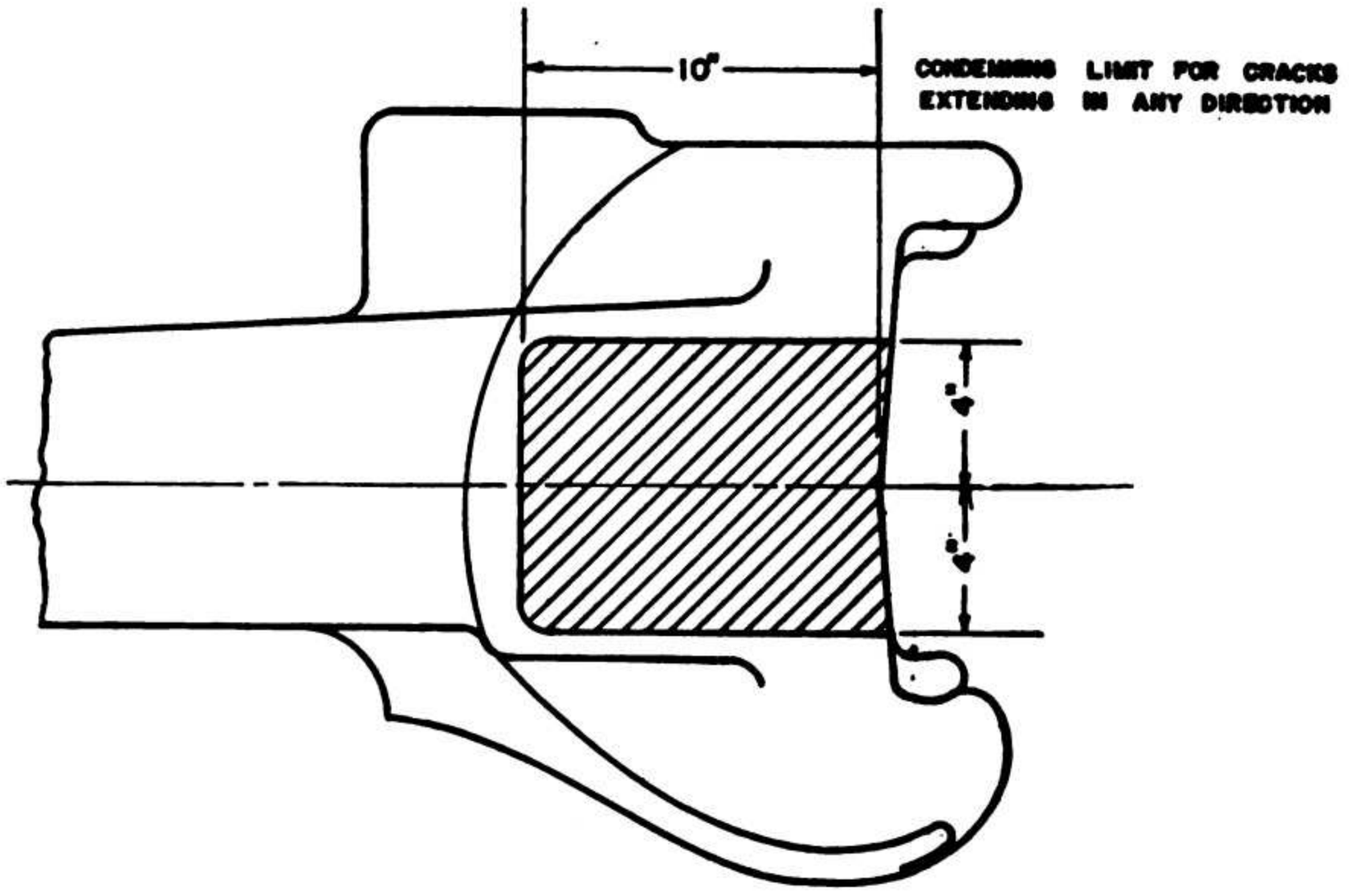
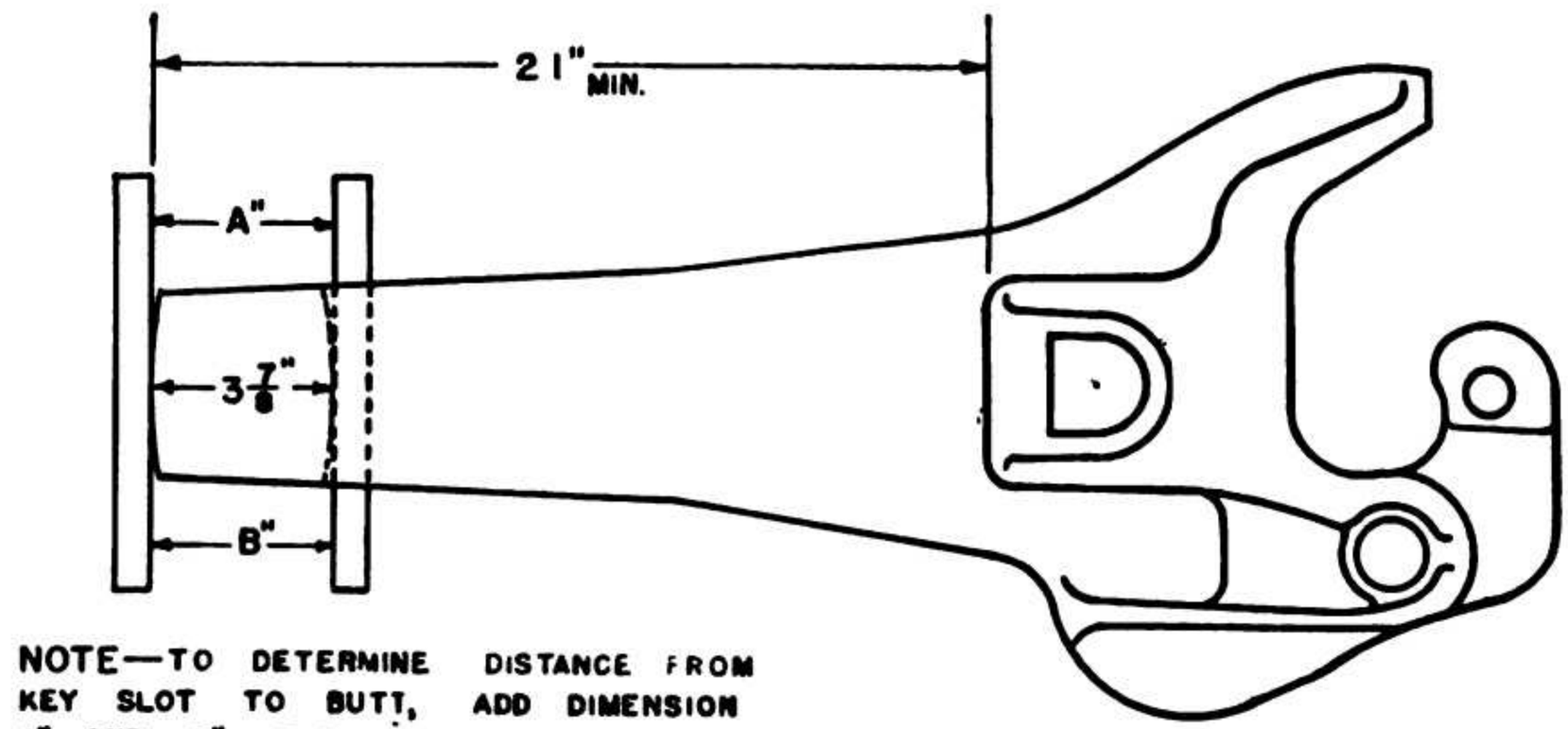


Figure 32. Use of gauge in measuring couplers as described in paragraph 36a(1).



NOTE—TO DETERMINE DISTANCE FROM KEY SLOT TO BUTT, ADD DIMENSION A" AND B", THEN DIVIDE BY TWO (2).

Figure 33. Use of gauge in measuring couplers as described in paragraph 35b(2).

Section VI

JOURNAL BOXES AND BEARINGS

37. Repacking Journal Boxes (Rule No. 27)
Journal boxes on empty cars, not repacked within 15 months as indicated by the stenciling on car, will be repacked. After the expiration of 14 months, if empty or loaded car is on repair track for other work, journal boxes will be repacked. Periodic repacking does not alter the ordinary attention to oiling and packing when necessary.

a. When it is necessary to repack journal boxes, all journal boxes will be jacked; all journal wedges and bearings removed for examination, and renewed where necessary; all boxes cleaned and repacked with properly prepared packing (new or renovated) in accordance with standard practice, and the car stenciled accordingly. Dust guards will be renewed when necessary only when wheels, journal boxes, or unit side frames are removed; renew missing and defective dust guard plugs.

b. The place, month, day, and year of repacking and reporting remarks will be stenciled with not less than 1 inch figures and letters on car body near the body bolster at diagonal corners, using the same station initial as is used for air-brake stencil. This provision also applies to new cars.

c. No change will be made in the stenciling unless all boxes are repacked.

d. If car bears no stencil showing date of previous repacking, all boxes will be repacked in accordance with *a* and *b* above.

e. Repacking will be done only when cars are on repair tracks. After the expiration of 14 months from the first repacking date, the work will be done when the car is on repair track for other work, including temporary repairs, closing drop doors, transferring and adjusting lading, etc.

38. Renewing Journal Bearings (Rule No. 28)
Journal bearings will be considered as requiring renewal when—

a. Back or lug is broken or cracked.

b. Bearing is worn ¼ inch or more lengthwise at either end, or when the combined wear lengthwise is ⅜ inch or more.

c. Lining is loose or sections broken out.

d. Lining is worn through to brass.

e. Lining is spread over the side ⅛ inch or more below the bottom edge of side wall of brass on either side, regardless of length of such spread.

f. Contour of brass is not suitable for size of journal on axle to which it is applied.

39. Journal Bearing Wedges (Rule No. 29)
Journal bearing wedges are condemnable when cracked, distorted, or broken; or if flat on top, lengthwise for a distance exceeding original diameter of journal*; or, where overall length measured at contact surfaces is reduced more than 3/16 inch.

**Example:* Wedge for 5 by 9 journal is condemnable when flat on top, lengthwise for a distance exceeding 5 inches.

Section VII

STAKE POCKETS

40. Permanent (Rule No. 30)

a. Permanent stake pockets will be attached to cars of wooden construction and secured by bolts.

b. Permanent stake pockets will be secured to cars of steel construction by rivets.

c. Stakes will be located to suit the construction of the car or the requirements of the service, but will not be farther apart than 3 feet 6 inches from center to center.

d. Stake pockets for flat cars will be 4 inches wide by 5 inches deep.

e. The spacing for stake pockets on flat cars will be a minimum of 2 feet and a maximum of 3 feet 6 inches center to center.

f. Flat cars will be provided with end stake pockets securely attached to underframe members.

41. Temporary (Rule No. 31)

a. Temporary stake pockets for flat cars and gondola cars with sides less than 30 inches high will be 4 inches wide by 5 inches deep.

b. Temporary stake pockets for gondolas with sides 30 inches and over will be 4 inches wide by 4 inches deep.

Section VIII

WHEELS AND AXLES

42. Wrought Steel Wheels

a. Rim defects. (1) *Burnt rim.* (Rule No. 32). If a portion of the flange or rim breaks off with a coarse fracture showing rough granular surfaces, it indicates that the wheel was overheated in the course of manufacture and will be withdrawn from service.

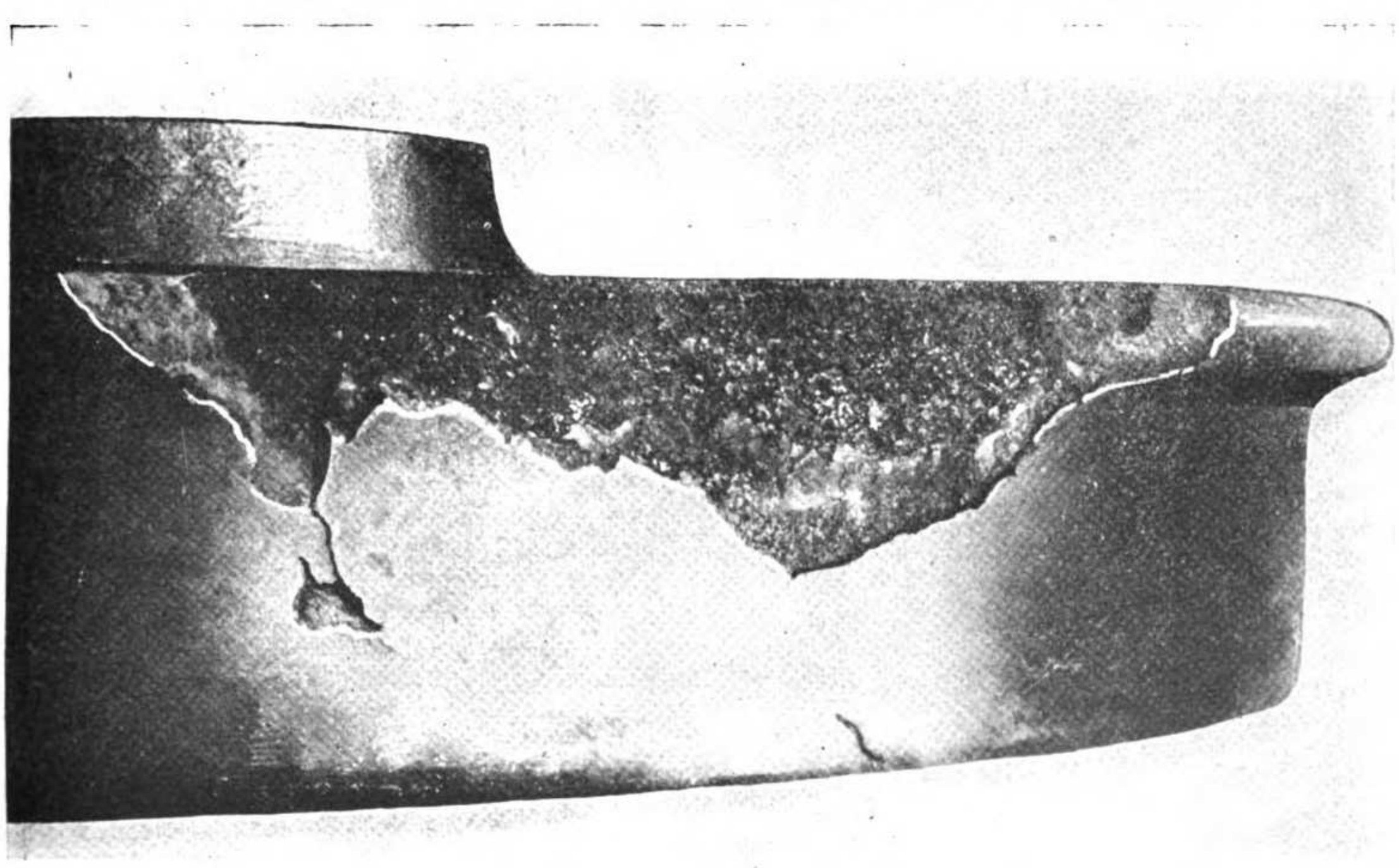


Figure 34. Burnt rim.

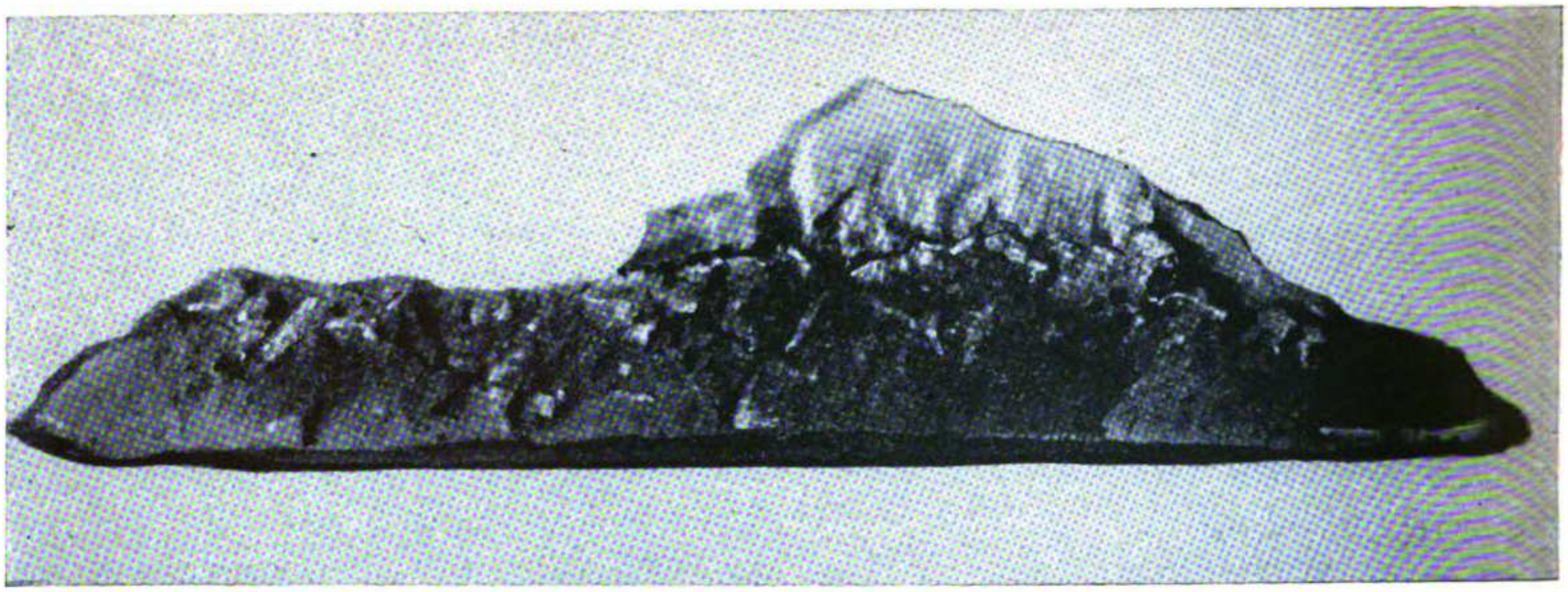


Figure 35. Piece of flange and tread which broke away from the wheel in figure 34.

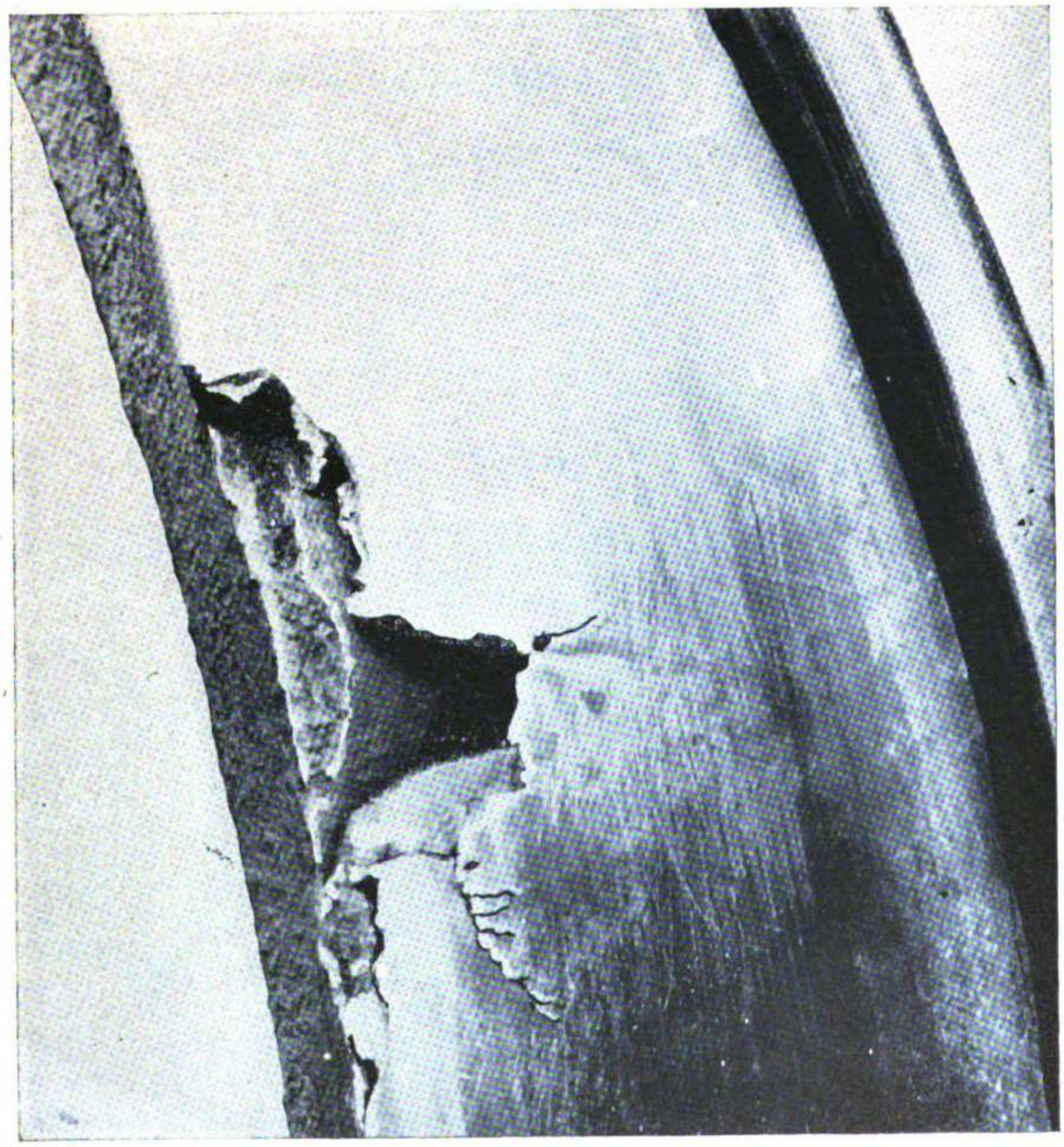


Figure 36. Shattered rim revealing smooth parting surfaces.

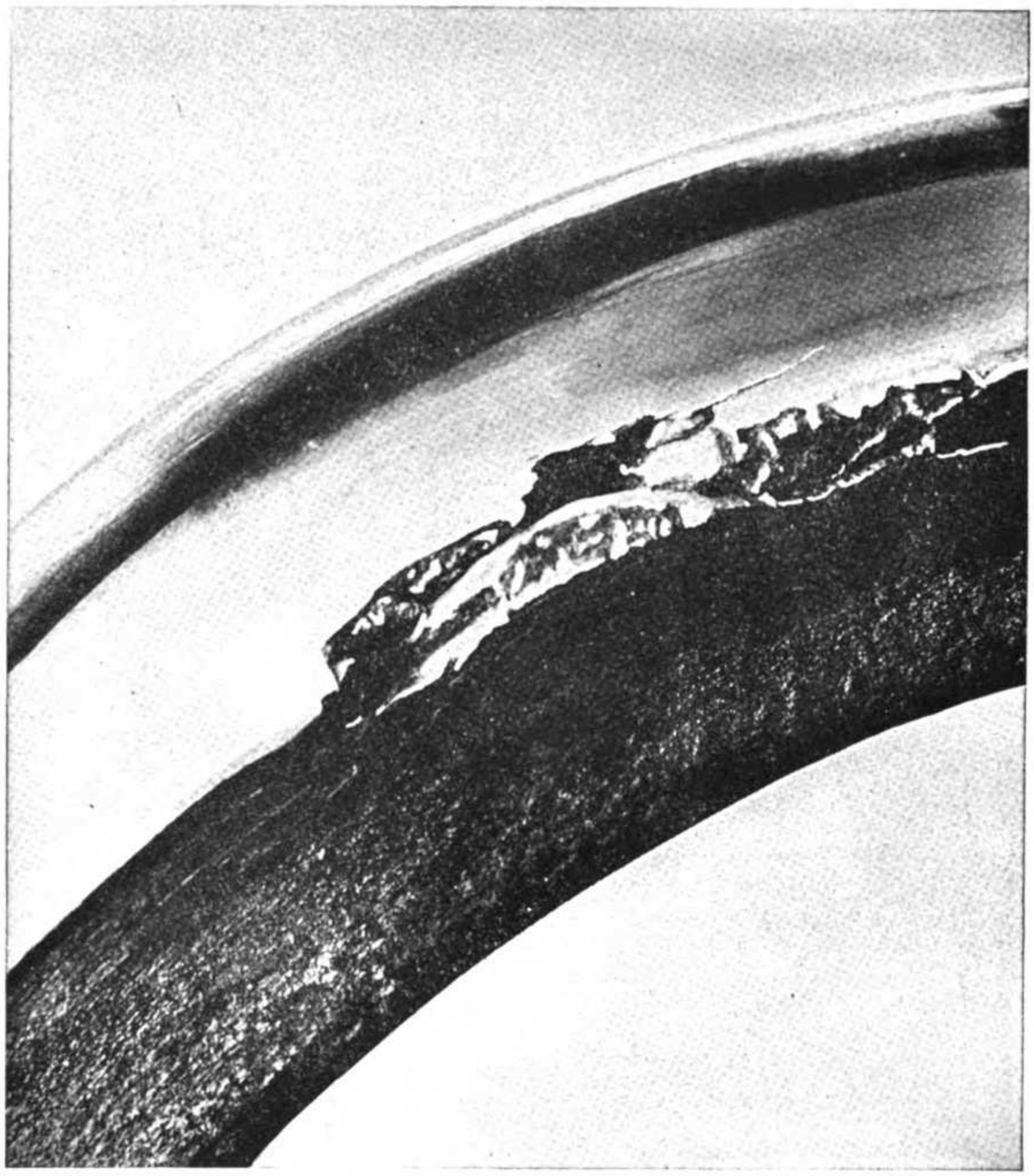


Figure 37. Shattered rim showing more of the tread broken away.

Figures 34 and 35 illustrate this defect; figure 35 shows the piece of flange and tread which broke away from the wheel in figure 34.

(2) *Shattered rim* (Rule No. 33). (*a*) If a portion of the flange or rim separates from the remainder of the wheel and reveals smooth surfaces of any considerable area, the wheel has a "shattered rim" and will be removed from service. Figure 36 shows the smooth parting surfaces, as does figure 37, which shows the same defect with more of the tread broken away. Figure 38 shows the back of the flange of the same wheel and figure 39 shows a similar defect with larger smooth areas.

(*b*) In the milder cases of shattered structure occurring on the tread of the wheel, as illustrated in figures 40 and 41, the appearance is somewhat similar to deep seated "shelling" but usually can be distinguished by the smoother parting surfaces and by the greater irregularity of the angles made by these surfaces.

(3) *Spread rim* (Rule No. 34). If the rim widens out for a short distance, either on front or back face, as illustrated in figures 42 and 43, an interior defect is indicated and the wheel will be withdrawn from service. This spreading of the rim may or may not be accompanied by shelling on the exterior of the tread. Usually it is accompanied by a slight flattening of the tread, resembling to a certain extent, a slid flat spot; this condition is indicated in figure 42. The interior defect causing the spread rim is

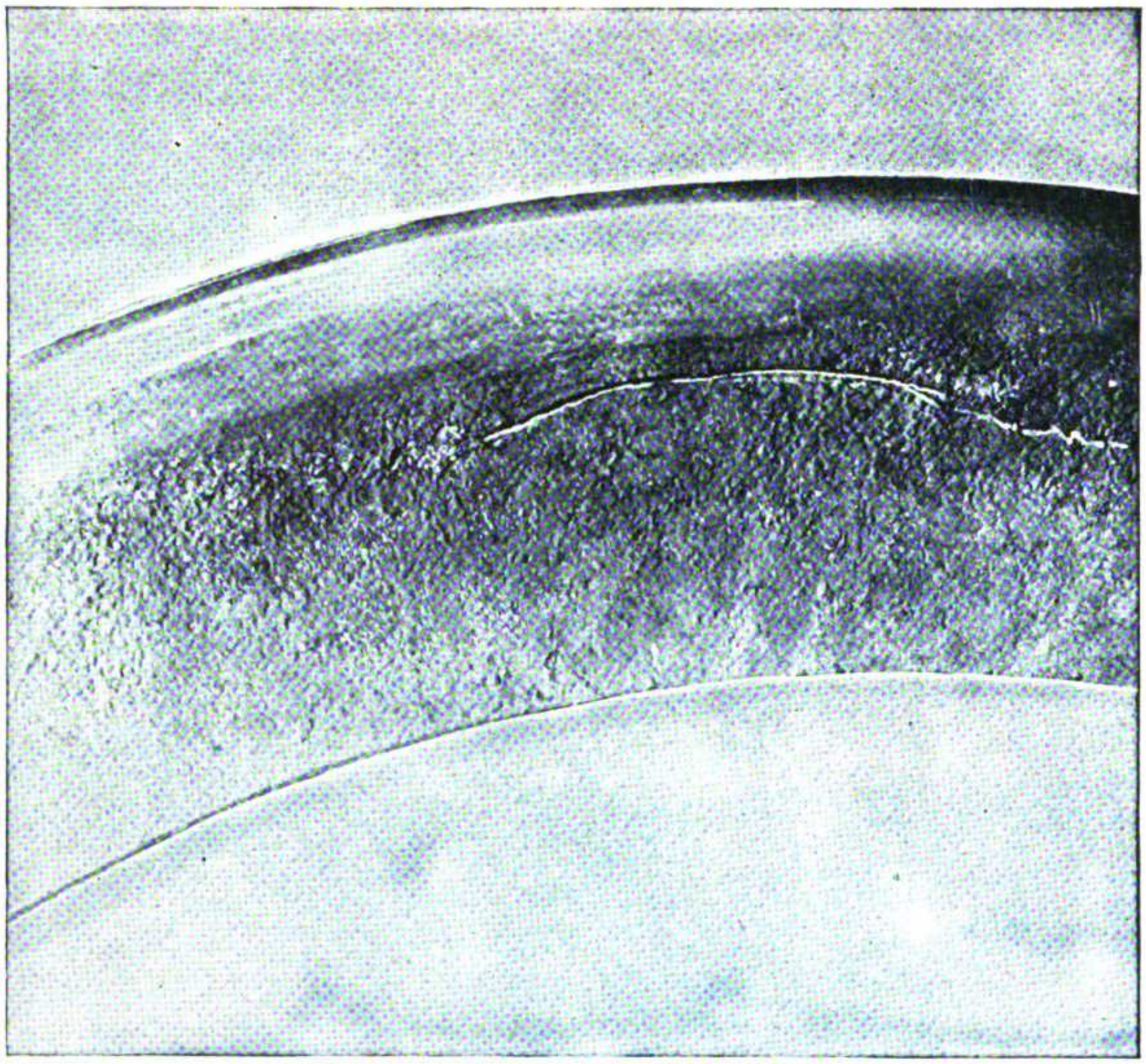


Figure 38. Shattered rim, back of flange.

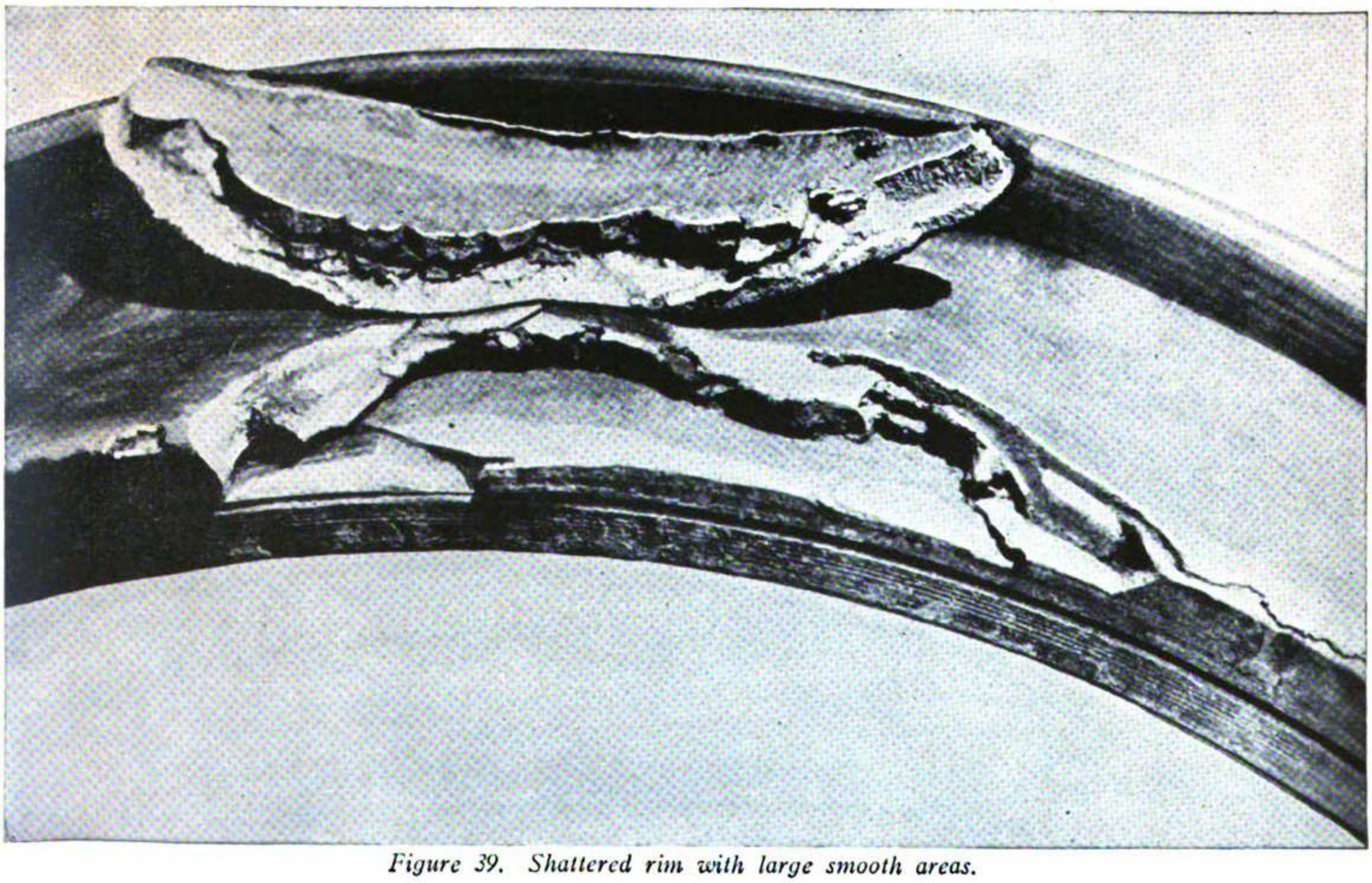


Figure 39. Shattered rim with large smooth areas.

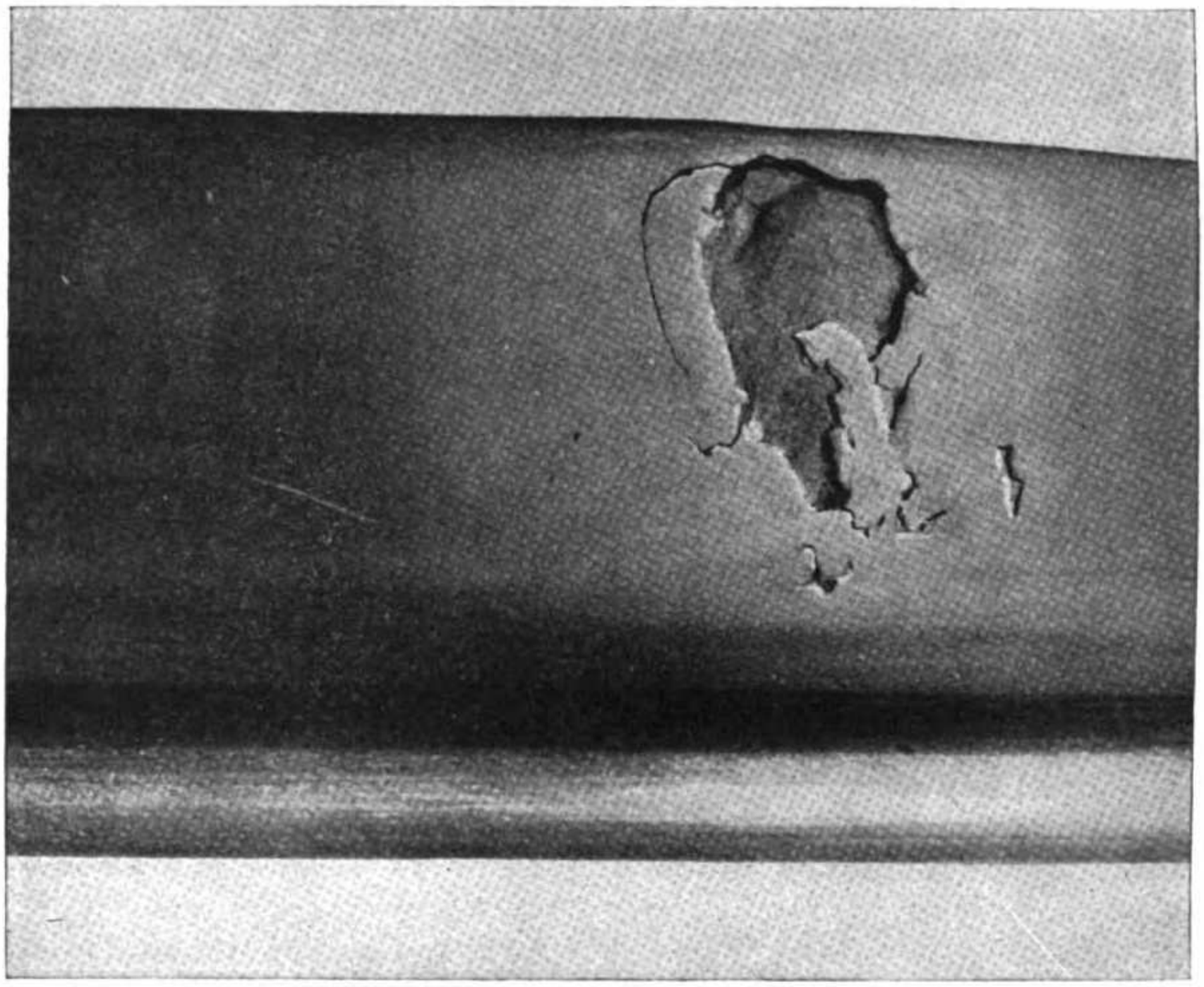


Figure 40. Shattered rim, milder type.

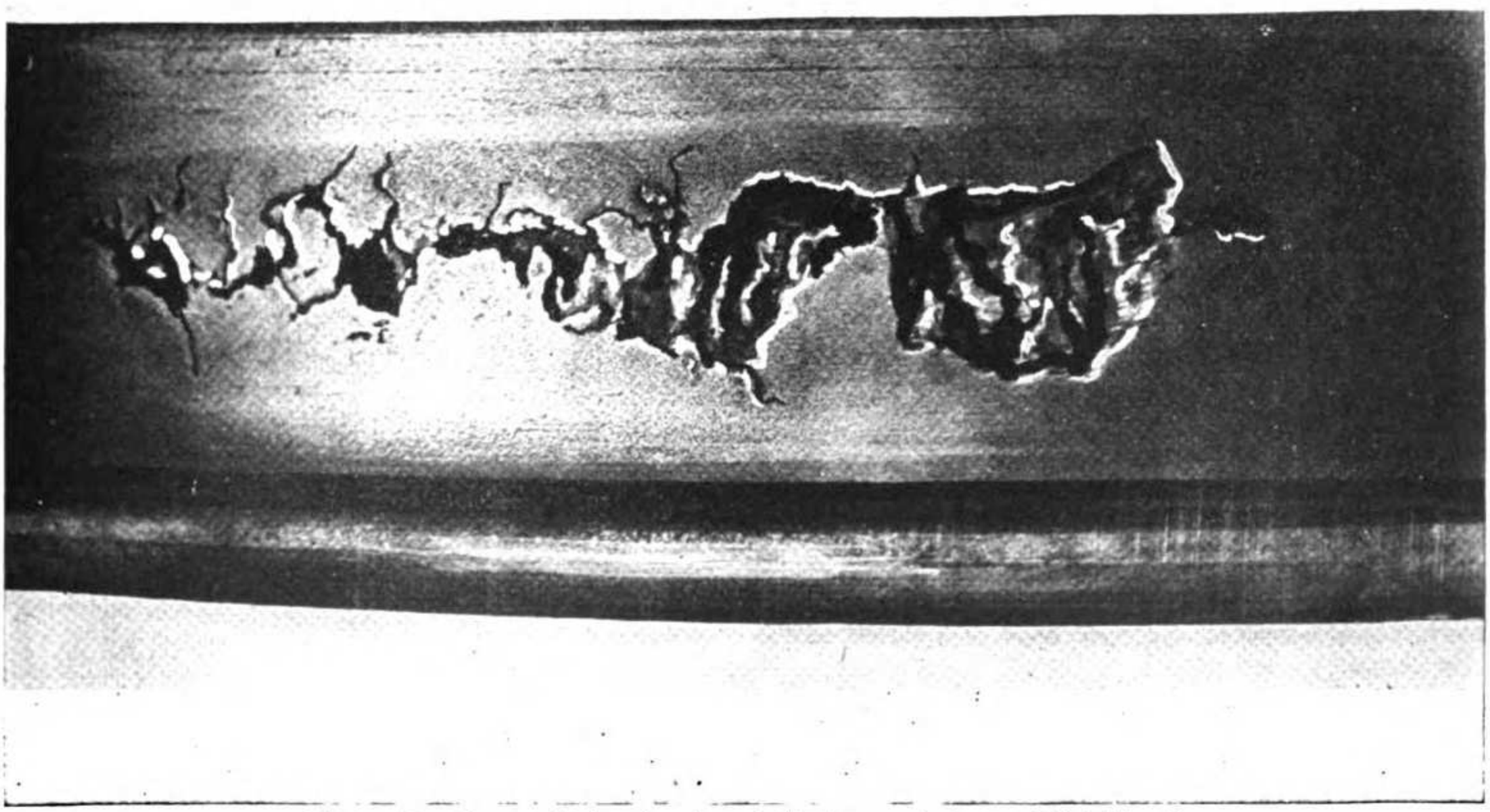


Figure 41. Shattered rim showing similarity to deep-seated "shelling."

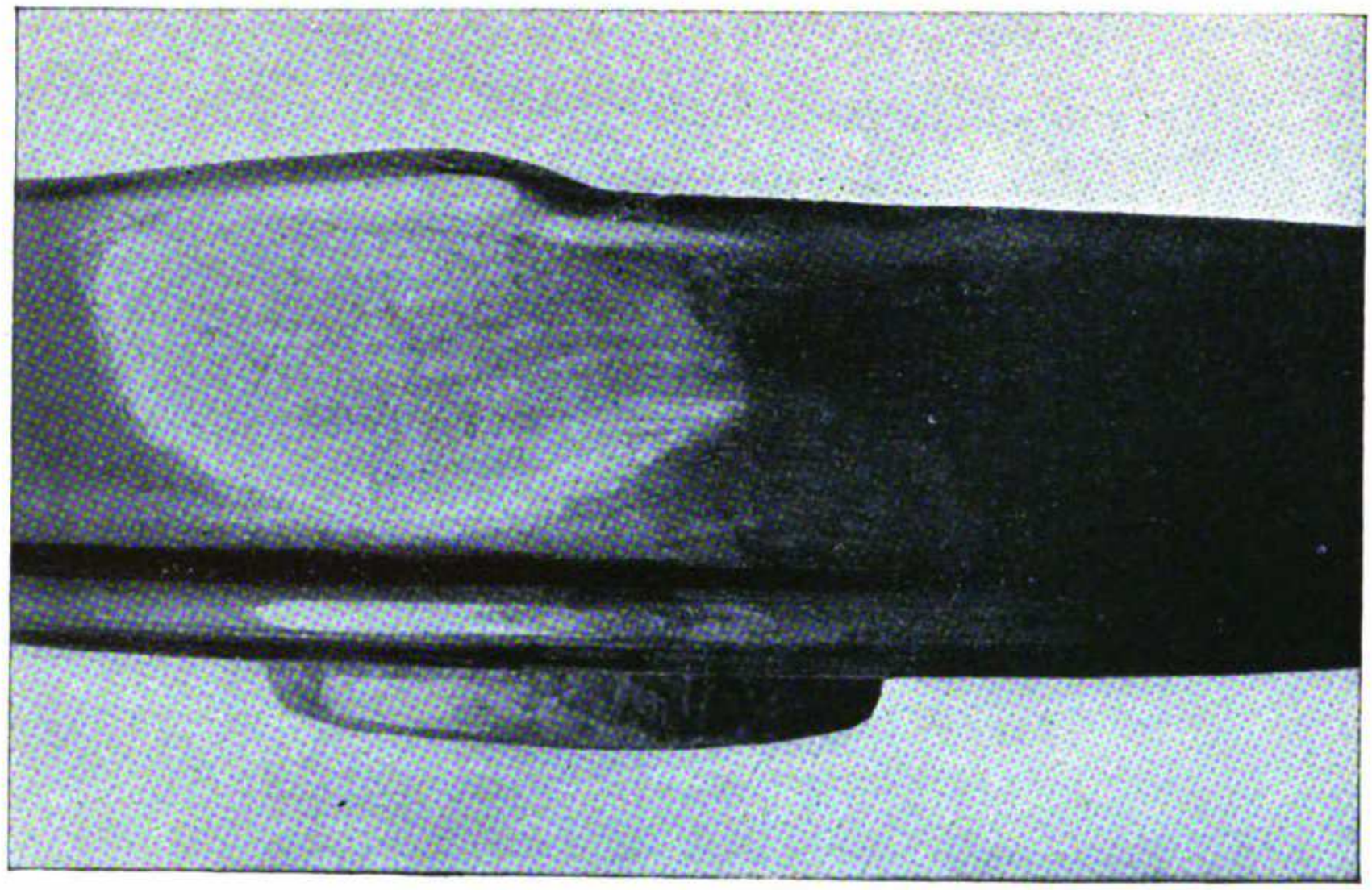


Figure 42. Spread rim.

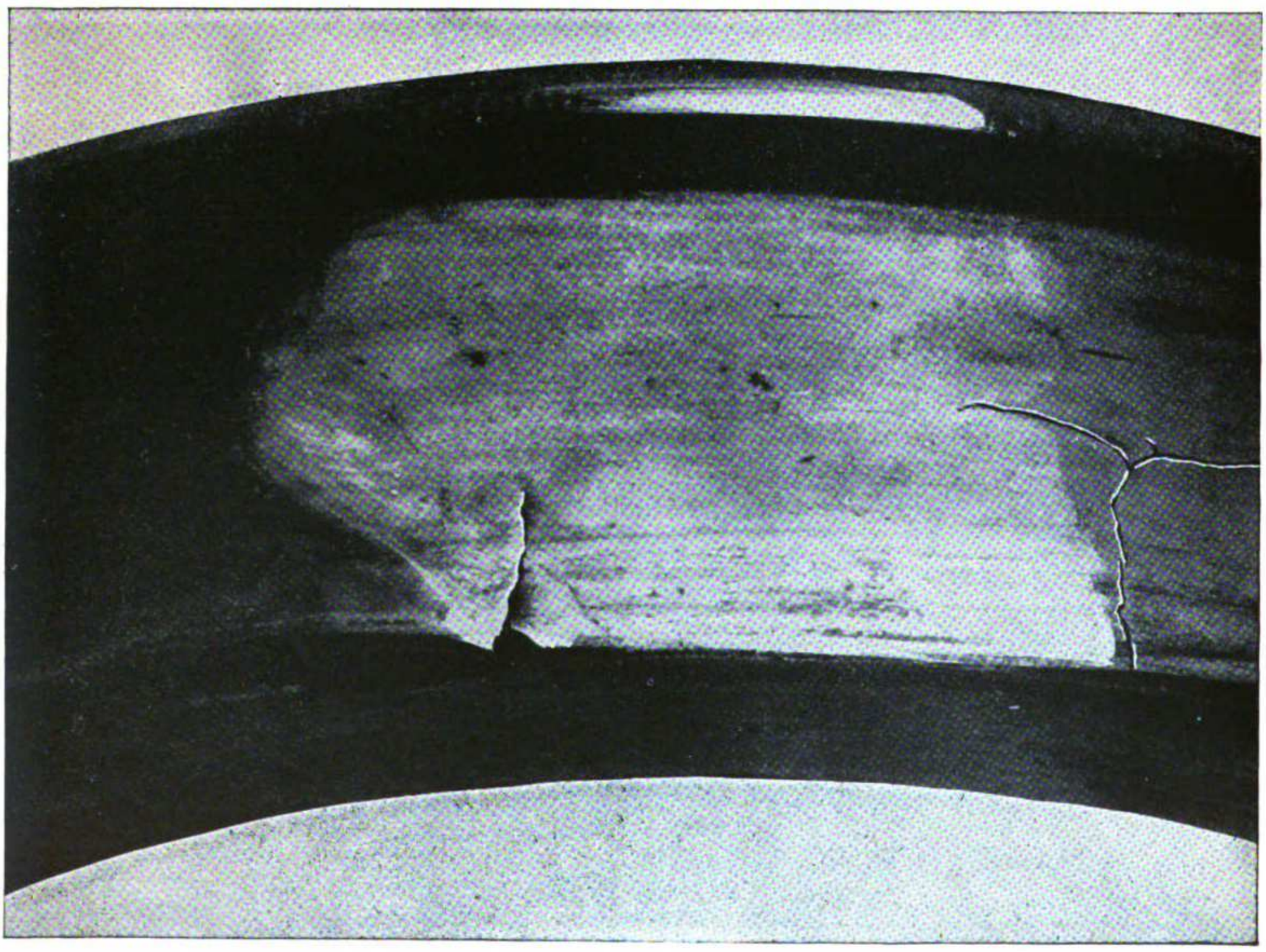


Figure 43. Spread rim.

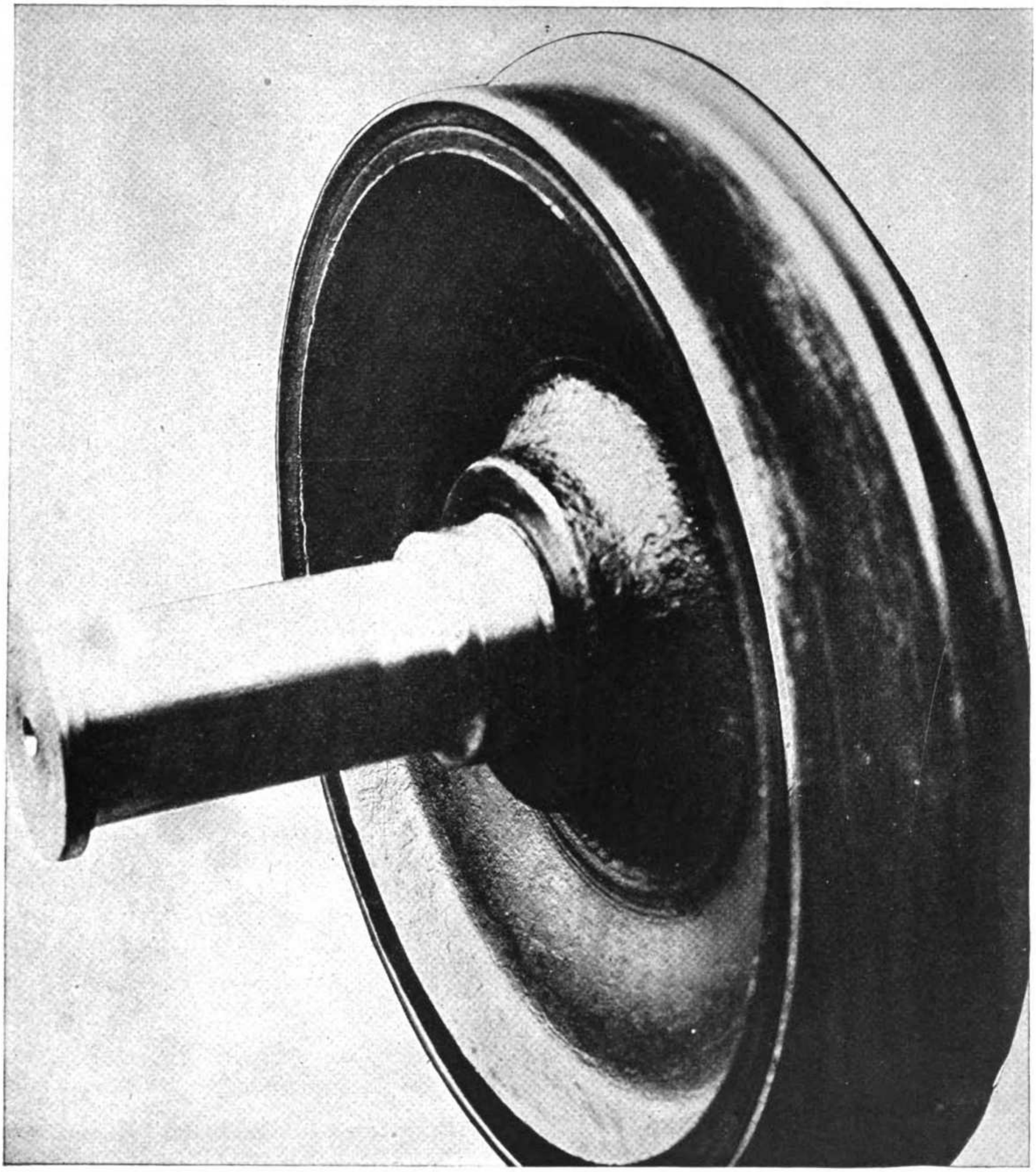


Figure 44. Illustrates uniform curling over of outer edge of rim; this is not spread rim.

similar to that leading to shattered rim. Spread rim is identified by a local spreading of the rim, usually less than 12 inches in length and is not to be confused with the uniform curling of the outer edge of the rim (fig. 44), which is a common service condition and not classed as a defect.

(4) *Subsurface defect* (Rule No. 35). The turning of a wheel which has no apparent defect on the rim or tread, sometimes discloses a laminated or flaky condition of the steel under the surface similar to shelling or shattered rim defect; such wheels will be scrapped. Figures 45 and 46 show subsurface defects which were uncovered while the wheels were being turned.

(5) *Shelled tread* (Rule No. 36). (*a*) If the surface metal of the tread breaks down and flakes or spalls, the wheel has a shelled tread. Figures 47, 48, and 49 show different degrees of shelling on the same wheel. In extreme cases, the shelling may extend completely around the circumference of the tread and may penetrate to a considerable depth. If the rim shows any tendency to widen out, as described under spread rim, or if there is evidence of shattered rim, the defect will be reported as "spread

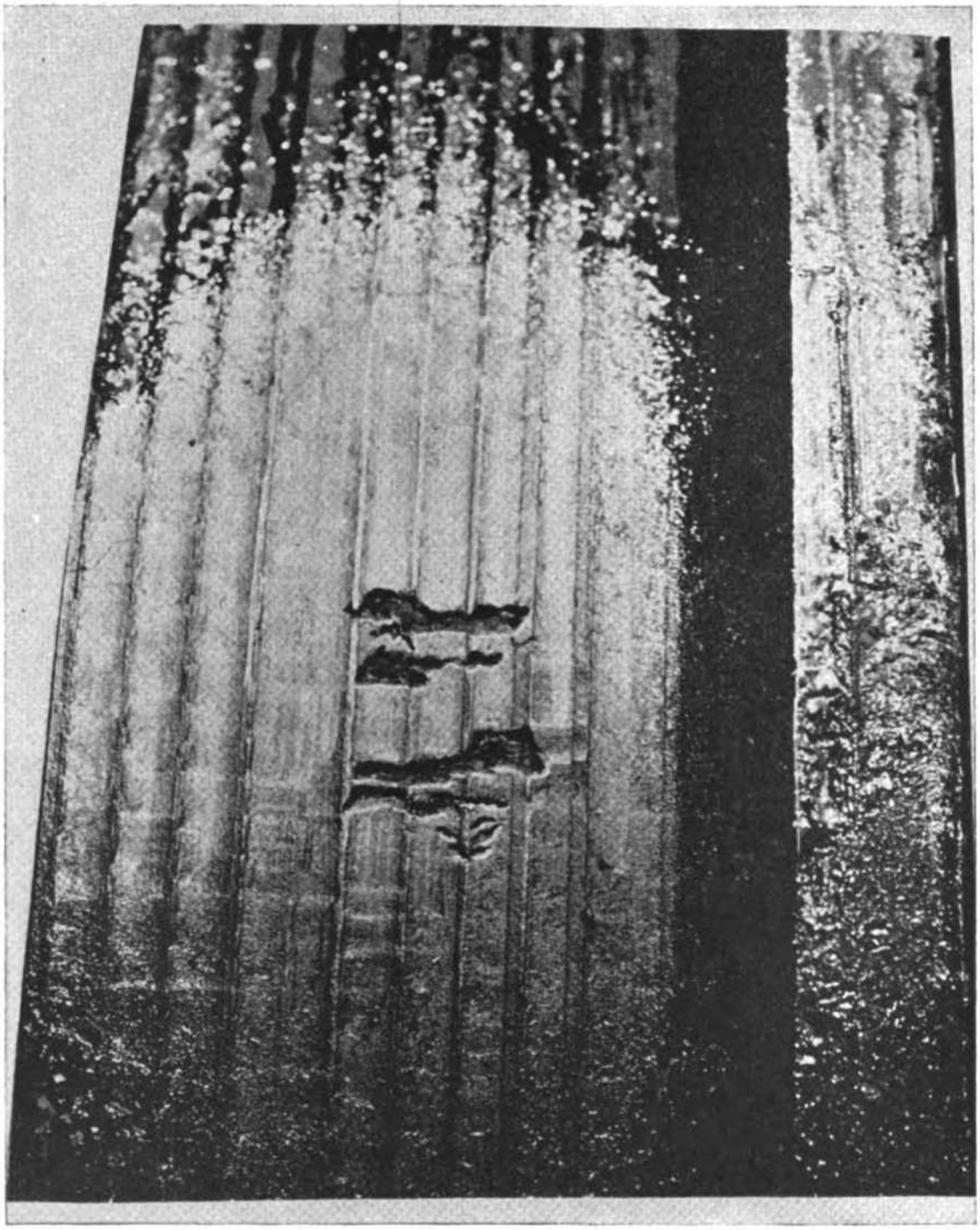


Figure 45. Subsurface defect, found on turning wheel.

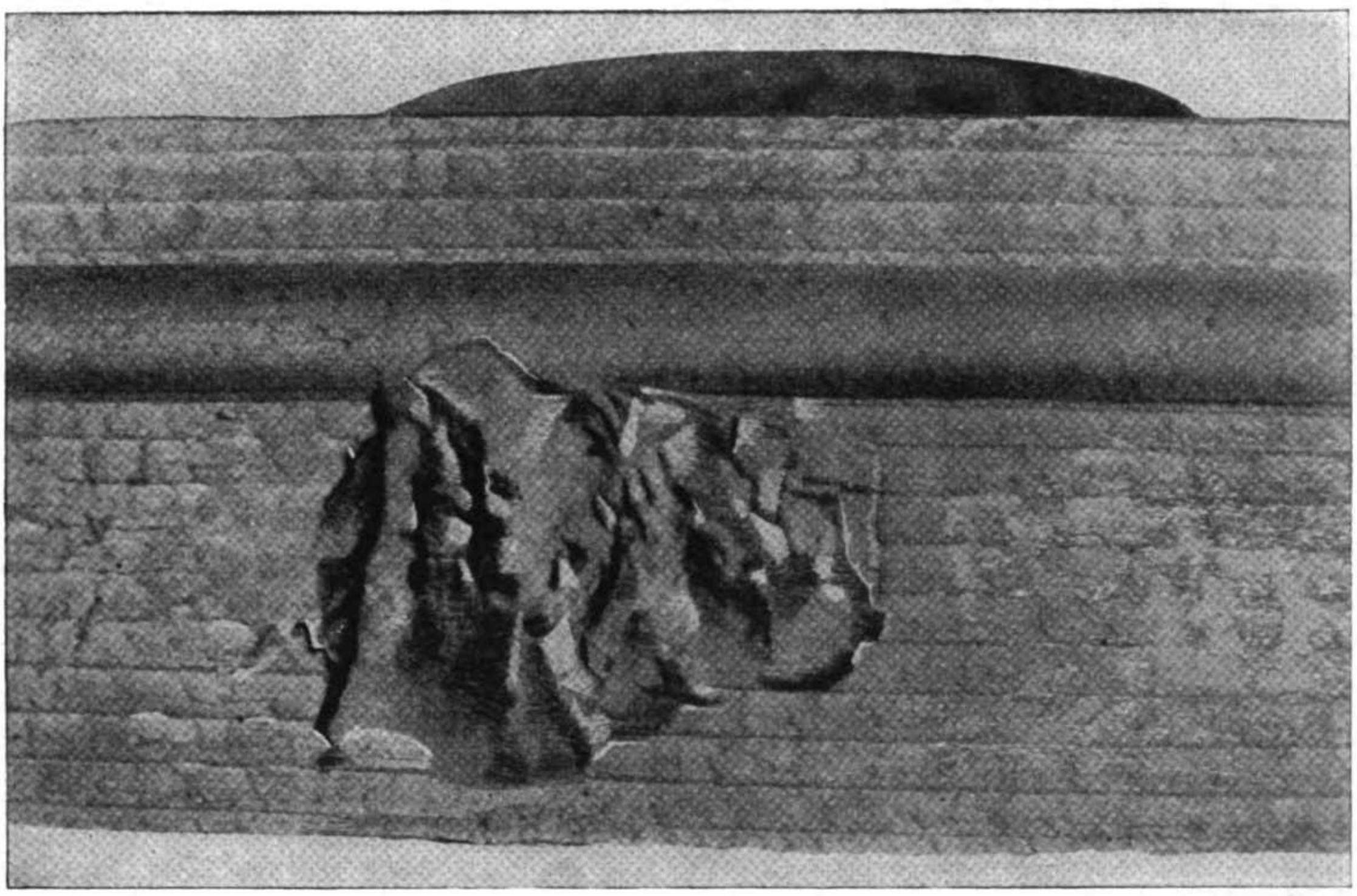


Figure 46. Subsurface defect, found on turning wheel.

Figure 47. Shelled tread.

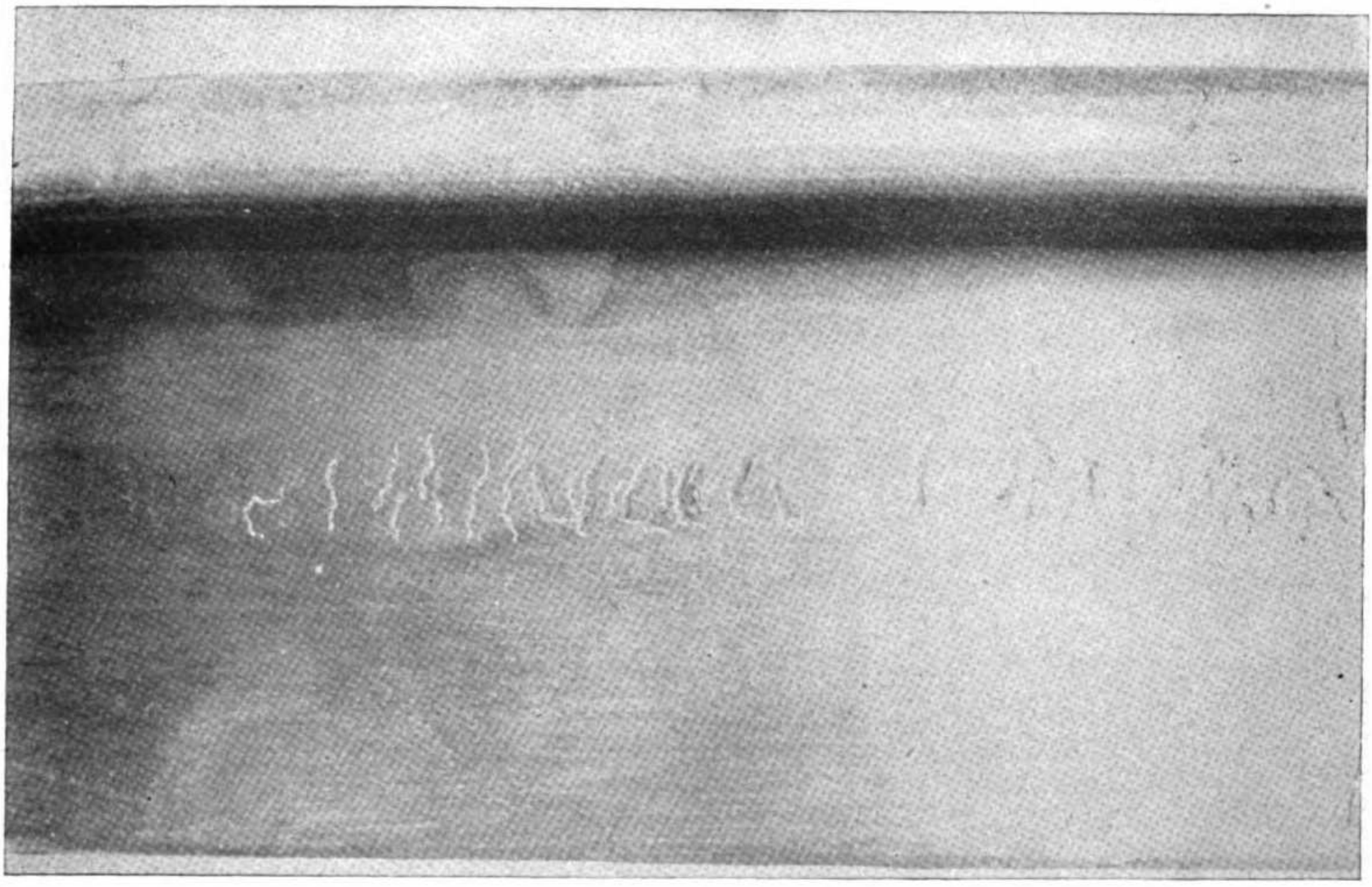


Figure 48. Shelled tread.

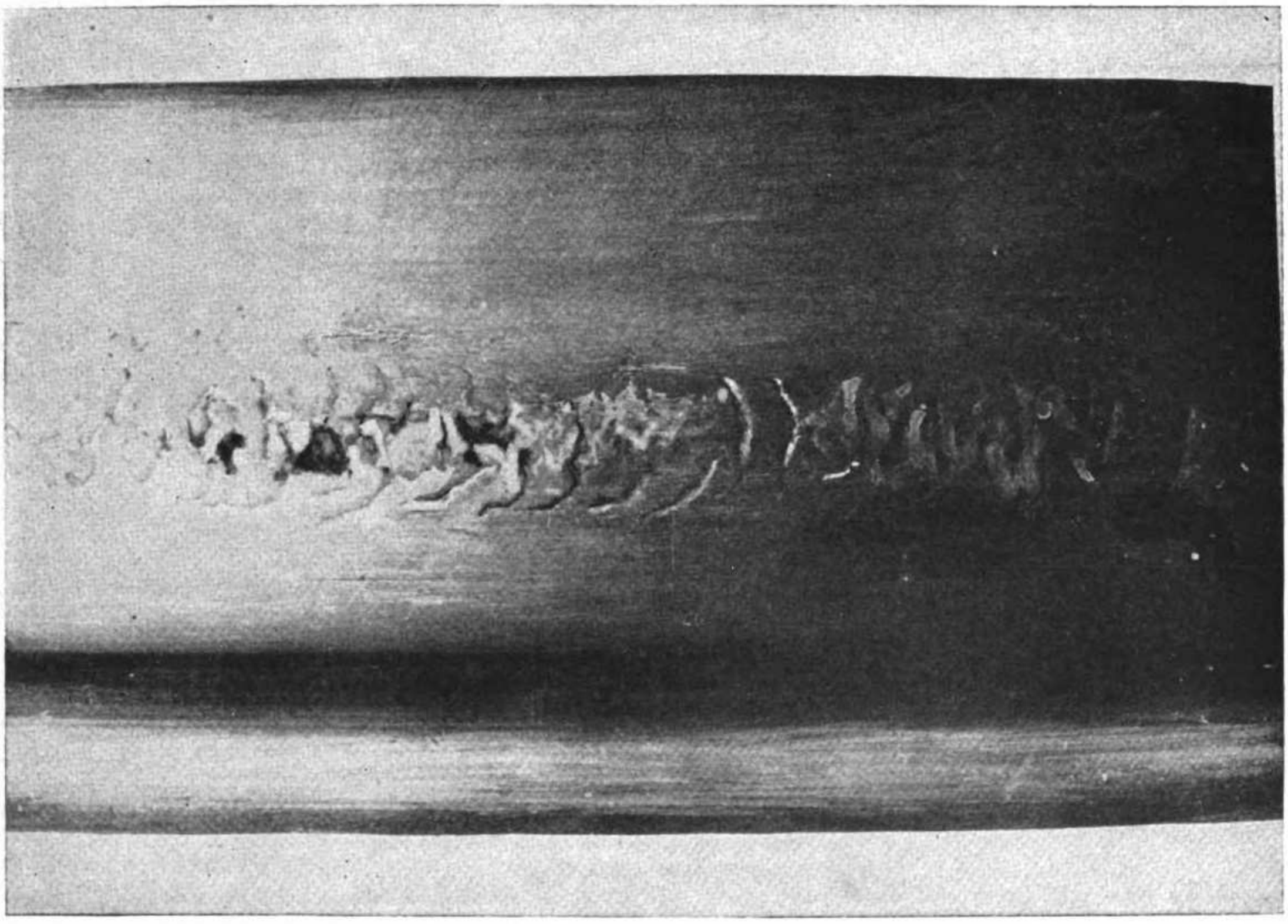


Figure 49. Shelled tread.

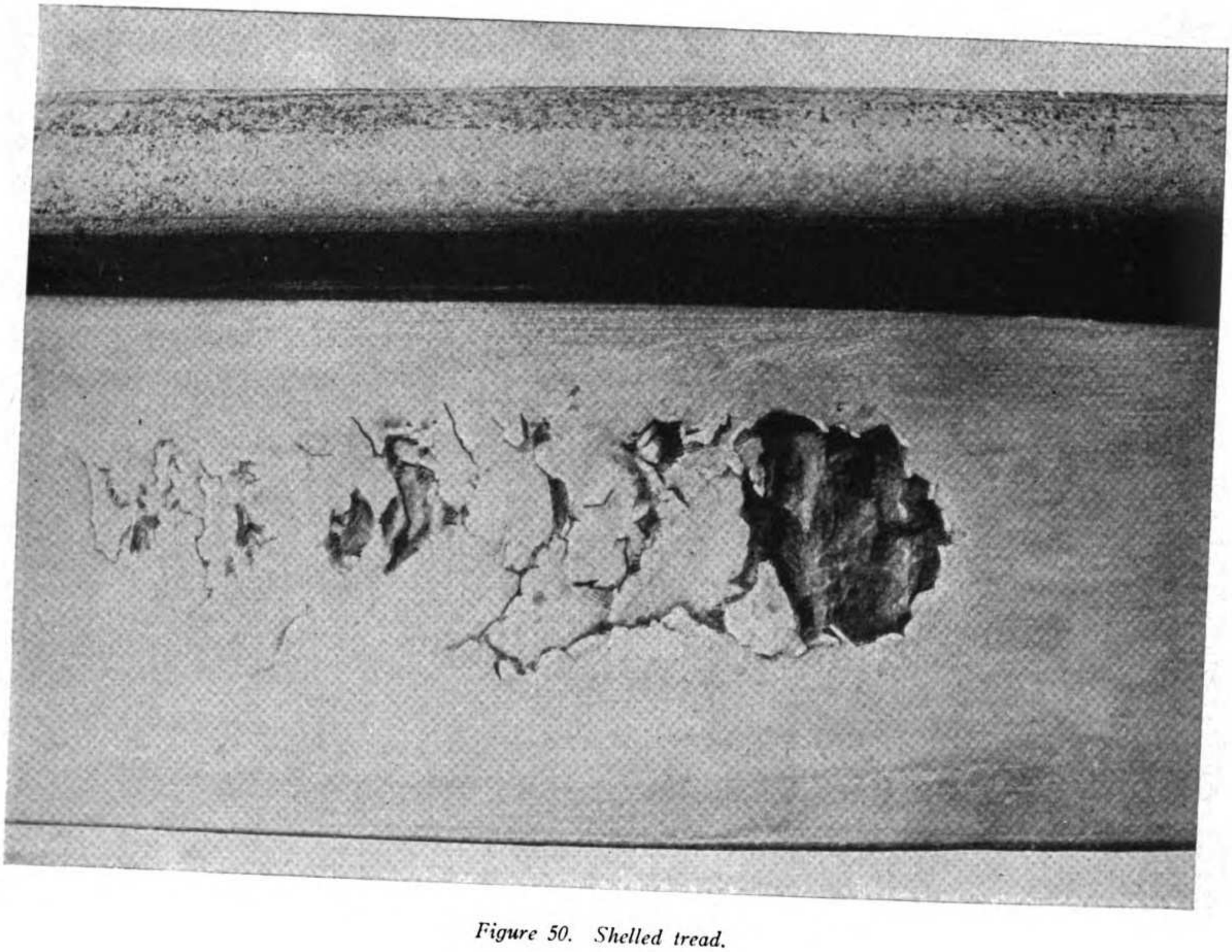


Figure 50. Shelled tread.

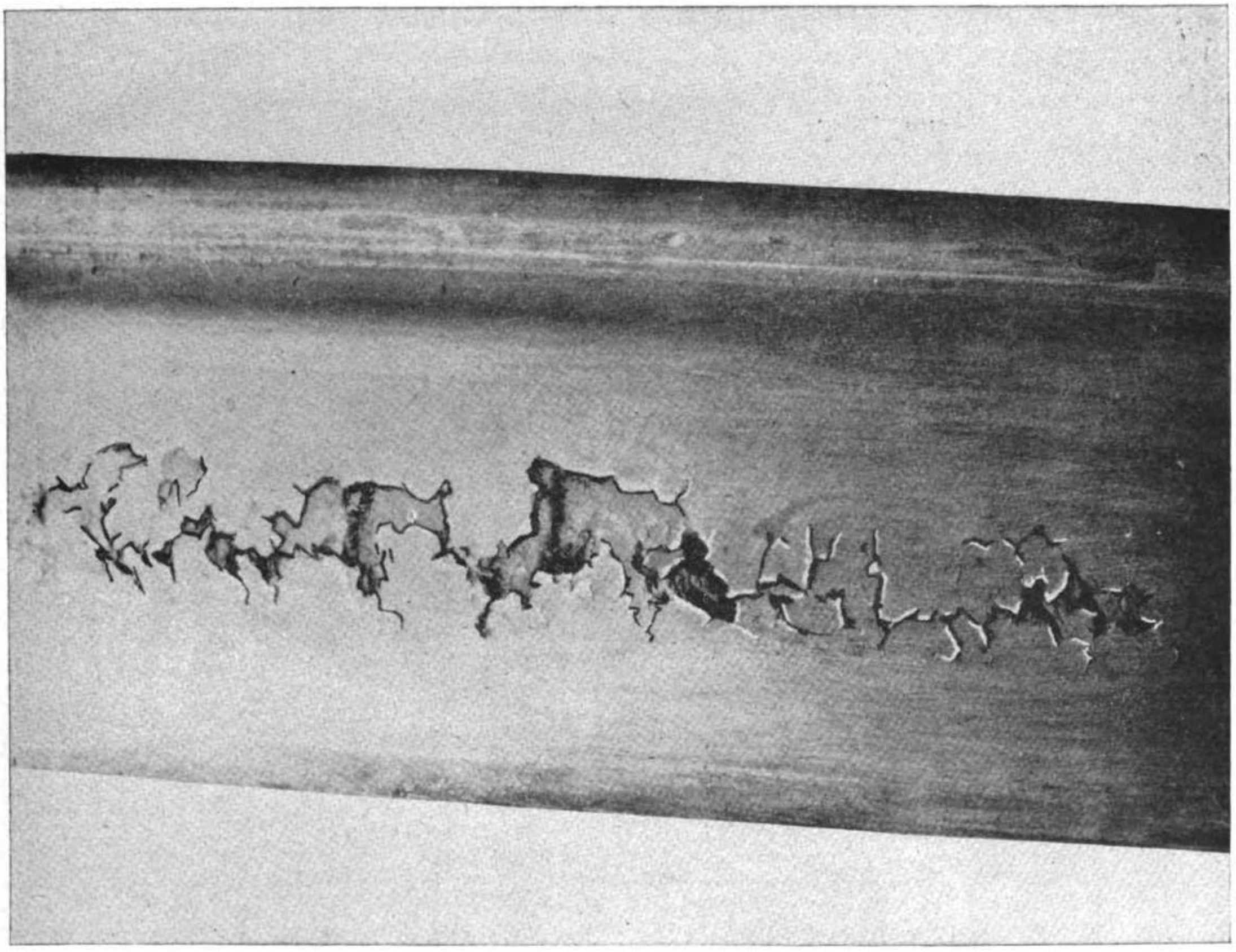


Figure 51. Shelled tread.

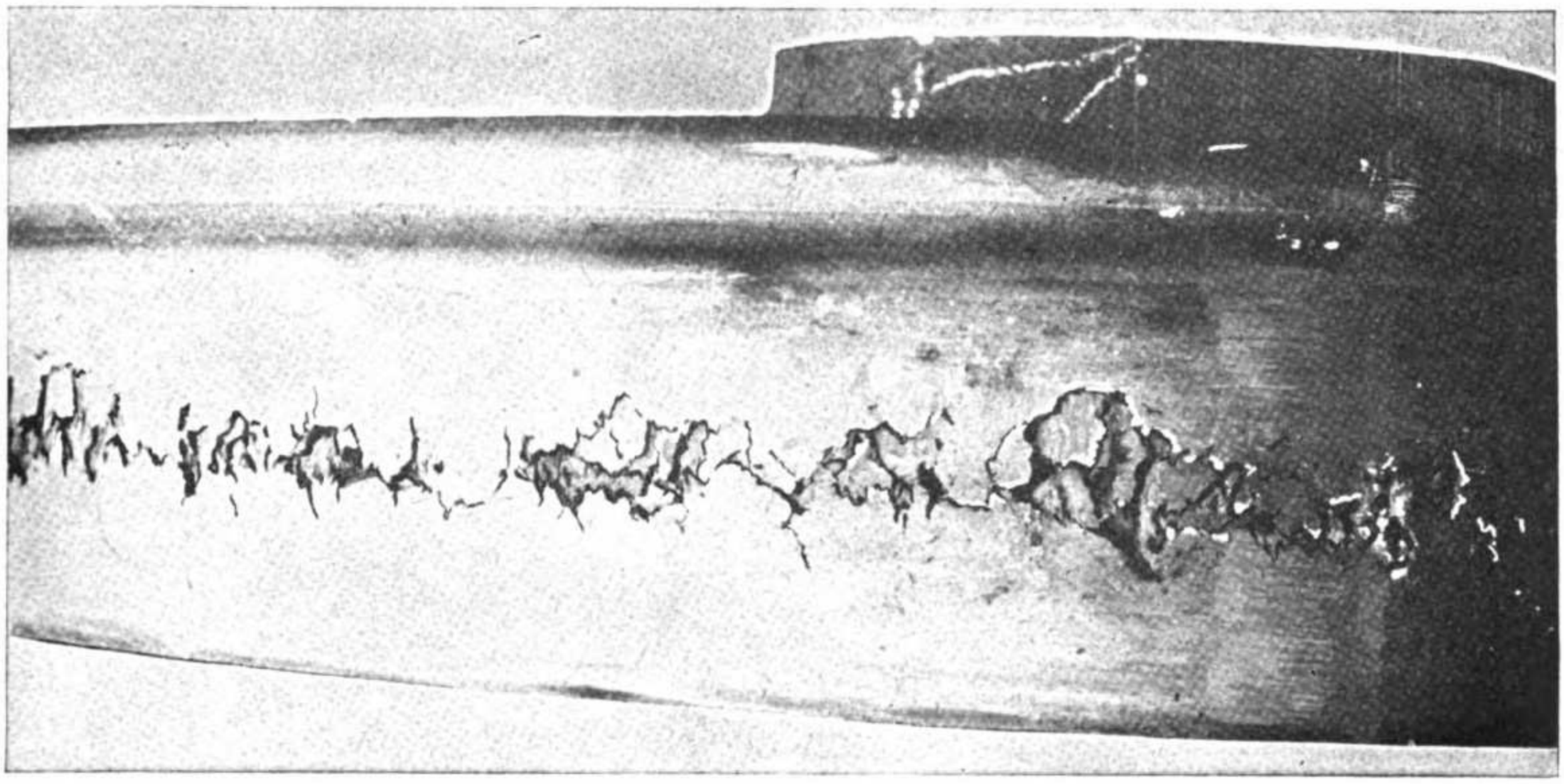


Figure 52. Shelled tread.

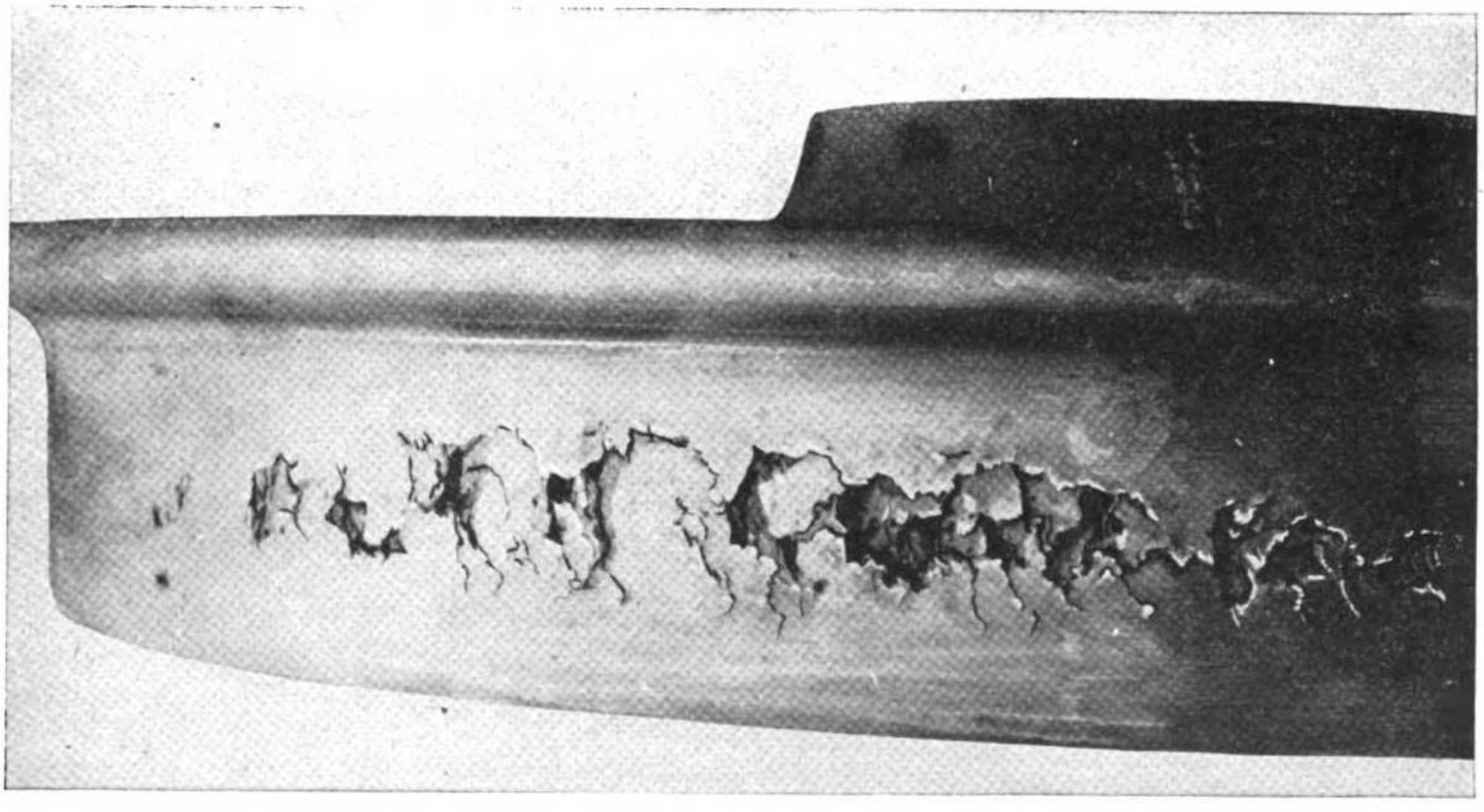


Figure 53. Shelled tread.

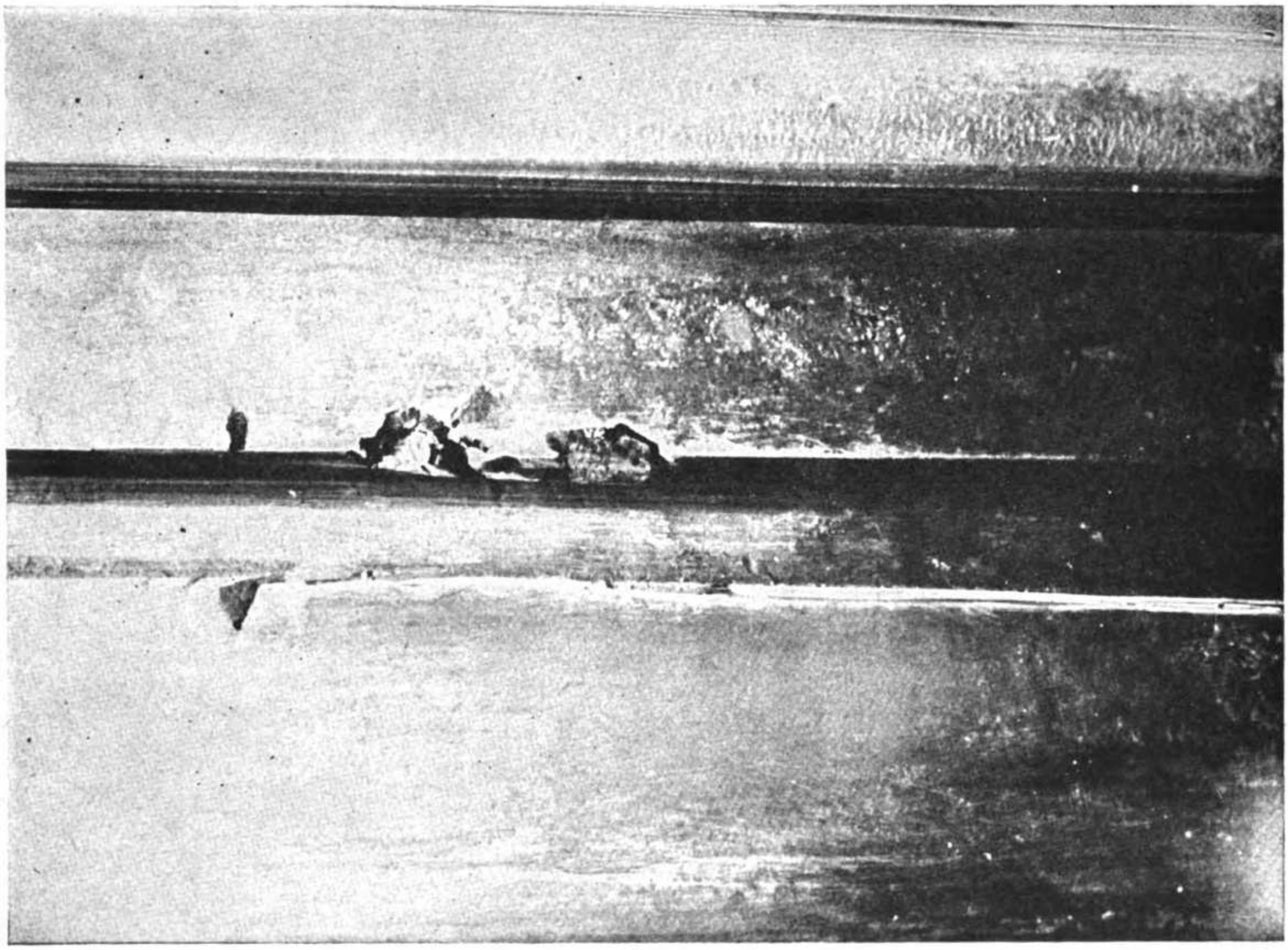


Figure 54. Shell removed by ⅜-inch cut.

rim" or "shattered rim" and not as "shelled tread."

(*b*) If the proper classification of the defect is in doubt, as would be true in the cases shown in figures 50, 51, 52, and 53 (the last three appearing on the same wheel), the wheel will be placed in the lathe and a spotting cut taken with a round nose roughing tool.

(*c*) If the defect is not removed with a cut of more than ⅜ inch in depth at any point on the tread, it will be classified as "deep shelled" and scrapped. Figure 55 shows a defect which did not clean up with ⅜-inch spotting cut; the defect is therefore classed as "deep shelled."

(*d*) If the defect is removed with a cut of ⅜ inch or less and there is no evidence of spread rim or of shattered structure, the wheel will be classed as "shelled." It will be turned to remove all defective metal or to restore tread and flange contour and then put back into service. Figure 54 illustrates a defect which a ⅜-inch "spotting cut" cleaned up, so that the wheel will be classed as "shelled," turned, and reapplied to service. Shelled wheels will be removed from service as soon as the defect is discovered.

(6) *Thermal checks* (Rule No. 37). Thermal checks are caused by intensive brake heating. When this heat is sufficiently high and concentrated in the surface of the tread it results at times in the formation of transverse cracks. These checks occur in the tread or flange invariably at right angles to the plane of the wheel (figs. 56, 57, 58, 59, 60, and 61). The most common type is illustrated in figure 56 where cracks are confined within the tread. Thermal checks which are caused by the brake shoe riding over the edge of the rim, instead of in the center of the tread are illustrated in figure 57. Figure 58 indicates that the brake shoe was bearing heavily on the flange and in addition was wearing away the back of the flange. Cracks which extend to the outside of the tread are illustrated in figure 59. Thermal checks are serious as there is no means of determining the magnitude of strains embodied in the wheel structure and the development of a thermal crack in a highly strained

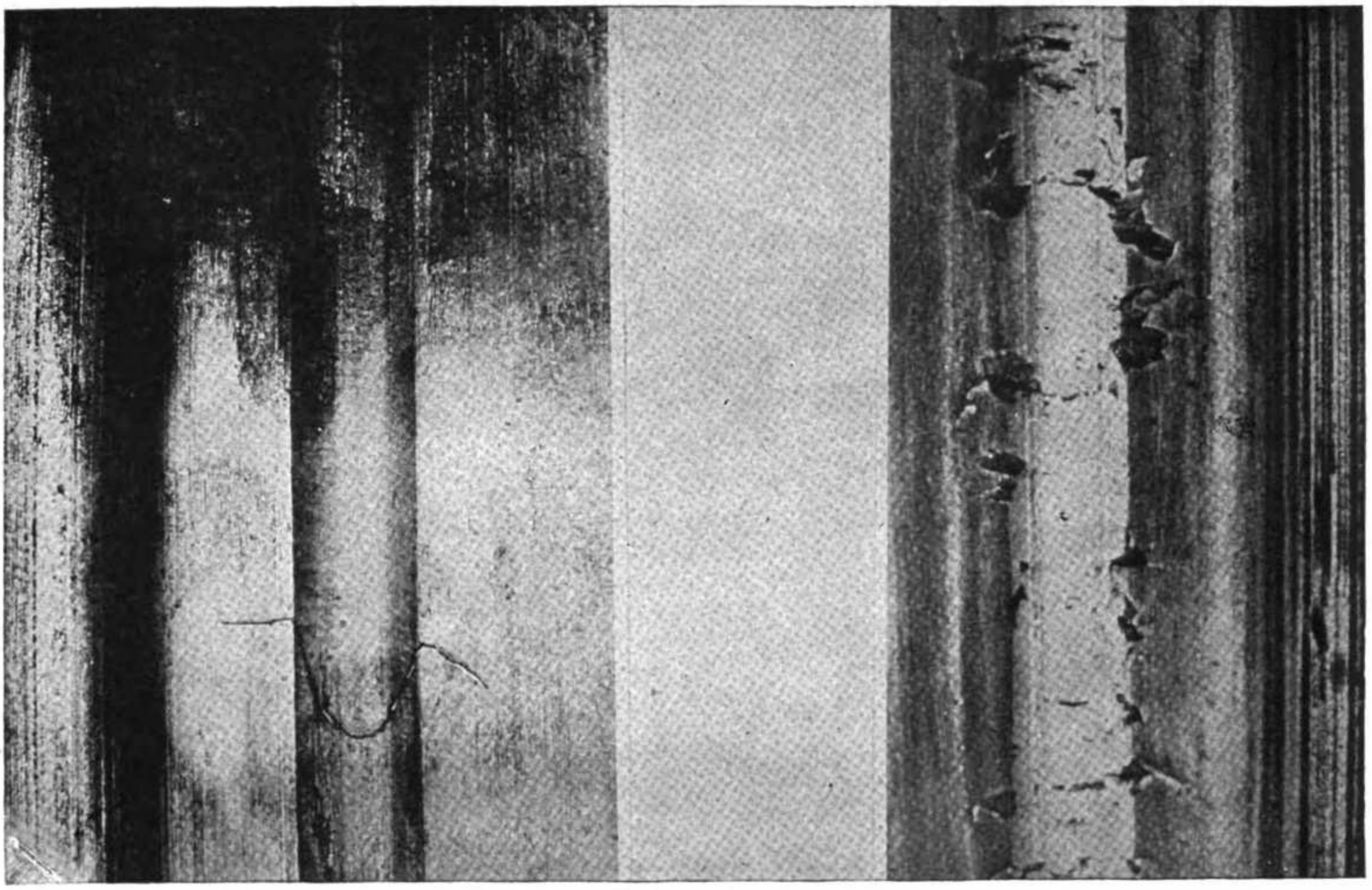


Figure 55. Deep shell, not removed with 3/8-inch spotting cut.

wheel will weaken the structure to a point where the wheel may fail.

(*a*) Wheels with thermal checks will be withdrawn from service. If wheels with thermal checks are continued in service, the cracks may develop through the rim into the plate and cause a wheel failure (figs. 60 and 61).

(*b*) Thermal checks can be removed by machining and when removed completely the wheels can be used again. When setting up the wheels in the lathe, it is good practice to mark the longest thermal check with a piece of crayon on front and the back faces of rim, then proceed with the rough cut until all evidence of the crack is removed. The entire tread then will be examined to make sure that all cracks are removed, after which a finish cut will be taken and the wheel placed in service.

(*c*) Abrasions on the tread surface such as light brake burns or skid burns usually contain a fine network of superficial and irregular lines or checks; these should not be confused with true thermal checks.

(*d*) Spalling is another tread condition and ordinarily is classed as shelling for lack of established terminology. It involves a breaking out of small portions of the tread metal between closely spaced thermal checks. The difference between "spalling" and true shelling is shown in figure 62.

(7) *Slid flat* (Rule No. 38). If slid flat spot on wheel under freight car is 2½ inches or over in length or if two or more adjoining spots are each 2 inches or more in length, the wheel will be removed and turned. If slid flat spot on the wheel under the passenger train car exceeds 11 inch in length, the wheel will be removed and turned. This defect is gauged with wheel defect gauge illustrated in figure 63 and used as indicated in figure 64.

(8) *Built-up tread* (Rule No. 39). This condition results when plastic metal from the tread of the wheel is dragged over or built up around the tread and is caused by heating, from improper braking conditions, and skidding. These conditions will be aggravated by continuing such wheels in service as they are irregular and out of round. They will be removed and turned to restore roundness as well as tread and flange contour. Figure 65 shows a mild example of this defect caused by heating while sliding the wheels; figures 66 and 67 show more pro-

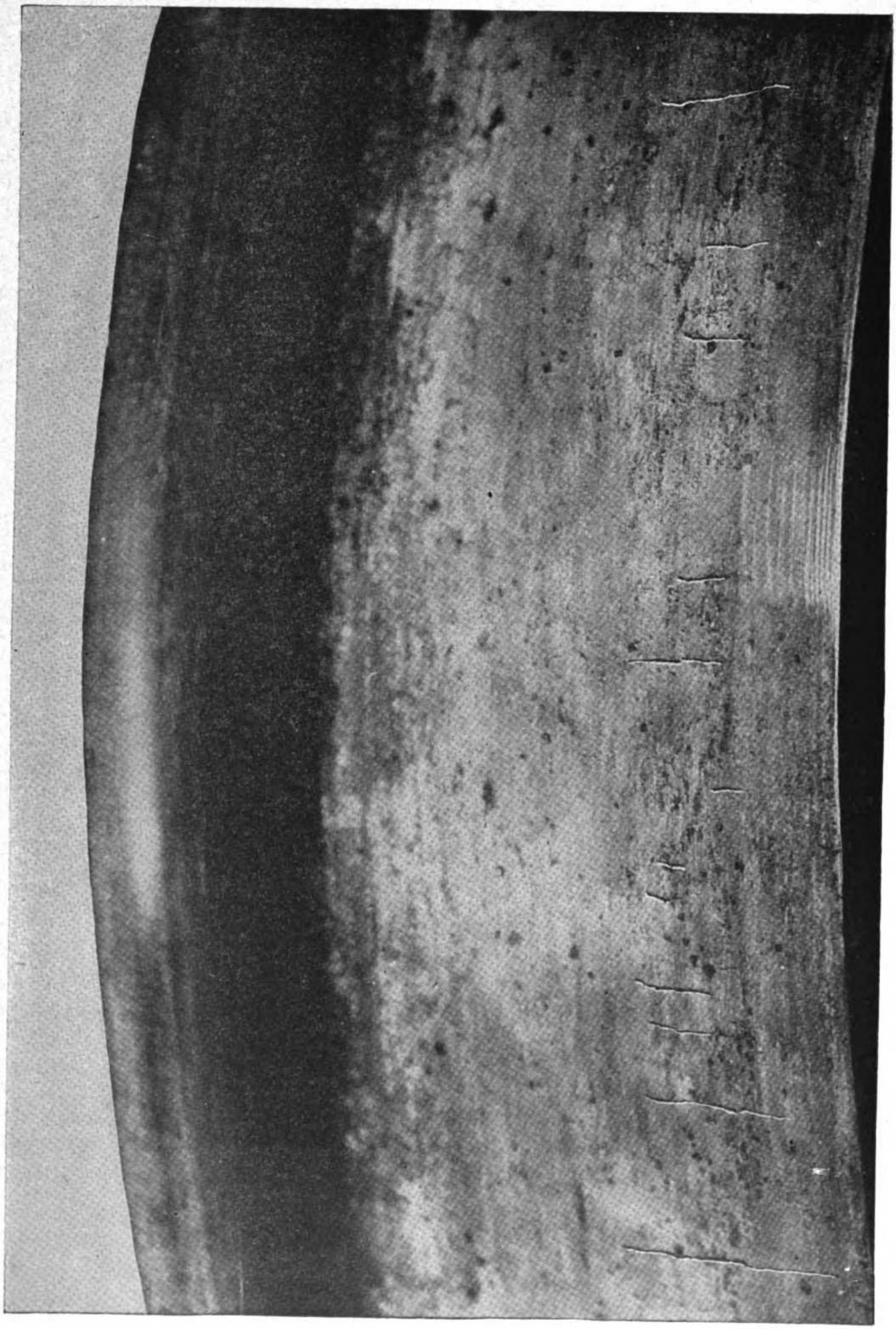


Figure 56. Thermal checks.

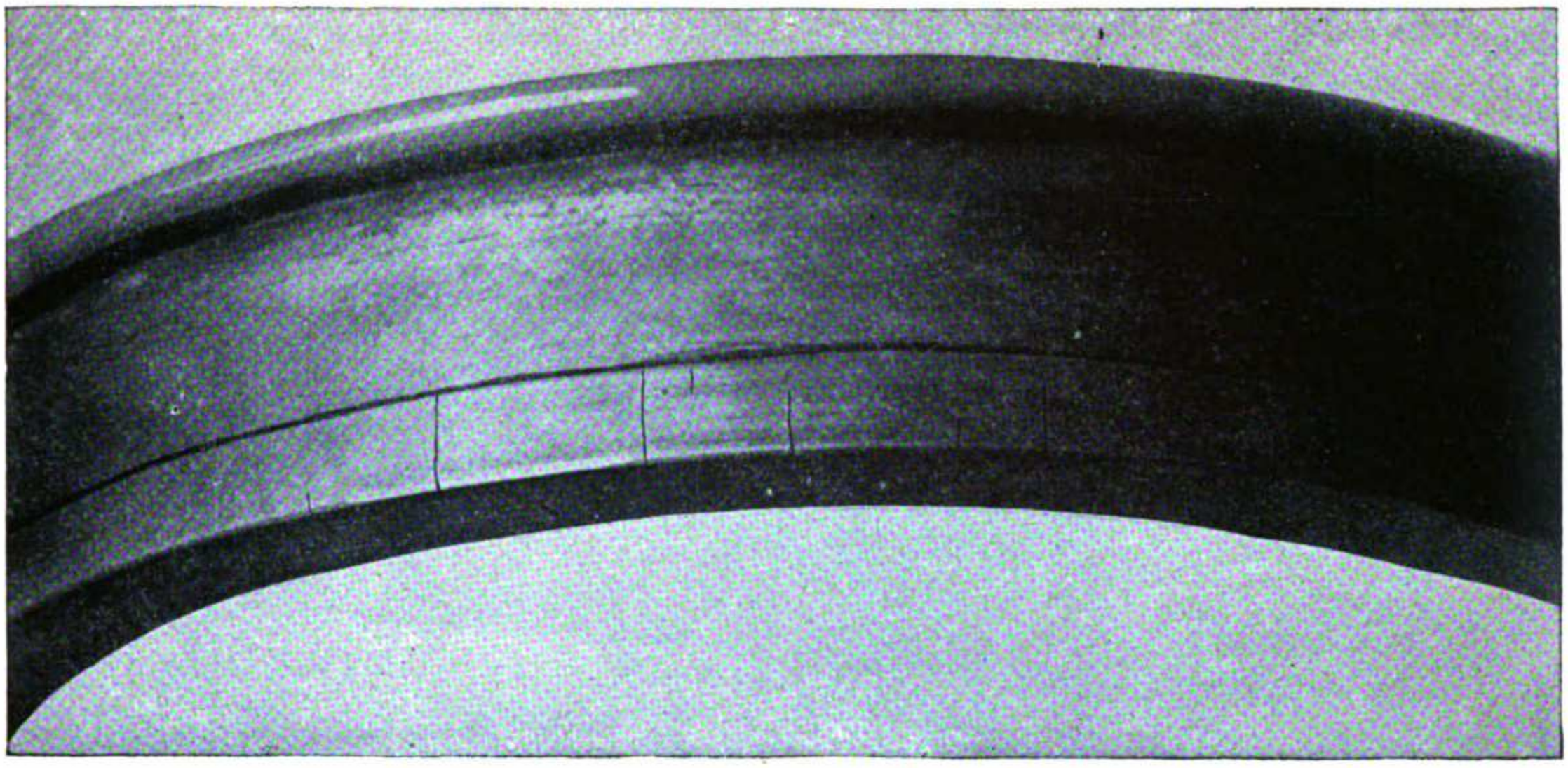


Figure 57. Thermal checks.

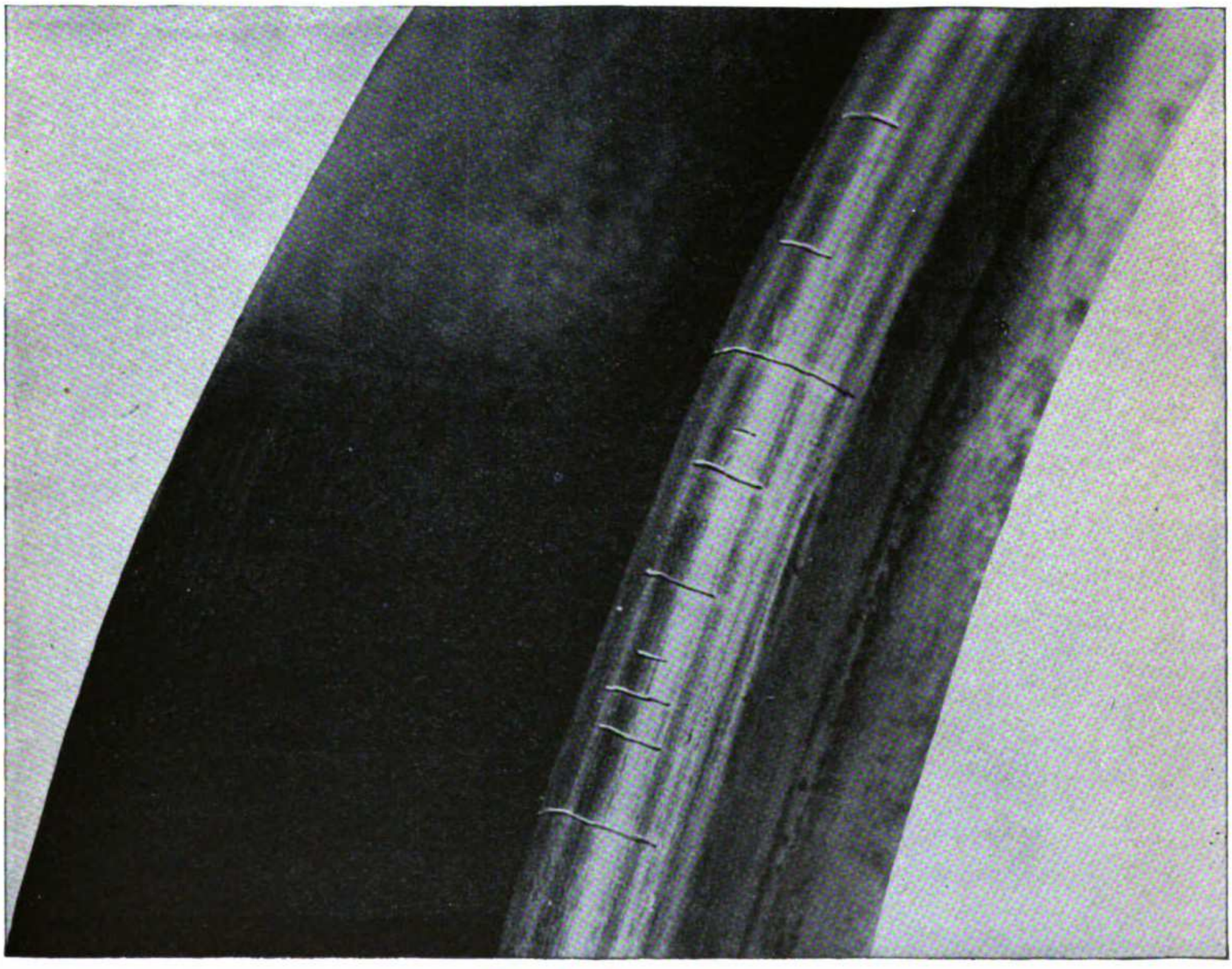


Figure 58. Thermal checks.

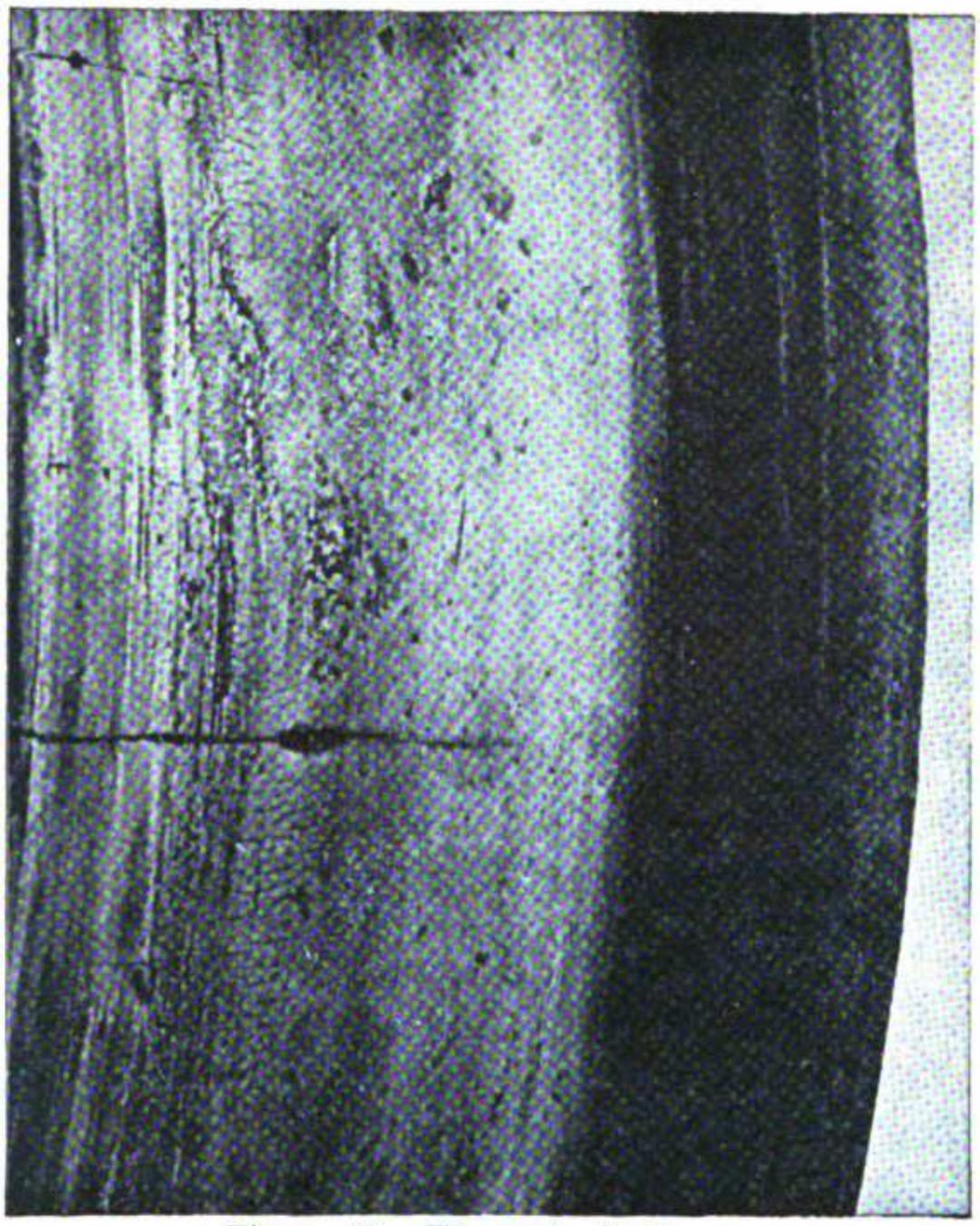


Figure 59. Thermal checks.

nounced examples; figures 68 and 69 show side and top views of such defect. This defect may also appear on cast-steel wheels.

(9) *Flange worn thin* (Rule No. 40). If flange is $^{15}/_{16}$ inch or less in thickness, wheel will be removed and turned to restore tread and flange contour. This condition is indicated only if the flange takes the wheel defect gauge (fig. 70).

(10) *Flange worn vertical* (Rule No. 41). If the flange has a vertical surface extending 1 inch or more from the tread, the wheel will be removed and turned to restore tread and flange contour. This condition is indicated by wheel defect gauge (fig. 71).

(11) *High flange* (*tread worn hollow*) (Rule No. 42). If the flange has a height of 1½ inches or more above the center of the tread, the wheel will be removed and turned to restore tread and flange contour. Provision is made on the steel wheel gauge for determining flange height.

(12) *Thin rim* (Rule No. 43). If the tread is worn so that rim thickness (fig. 72) is ¾ inch or less for wheels under freight cars or 1 inch or less for wheels under passenger train cars, the wheels

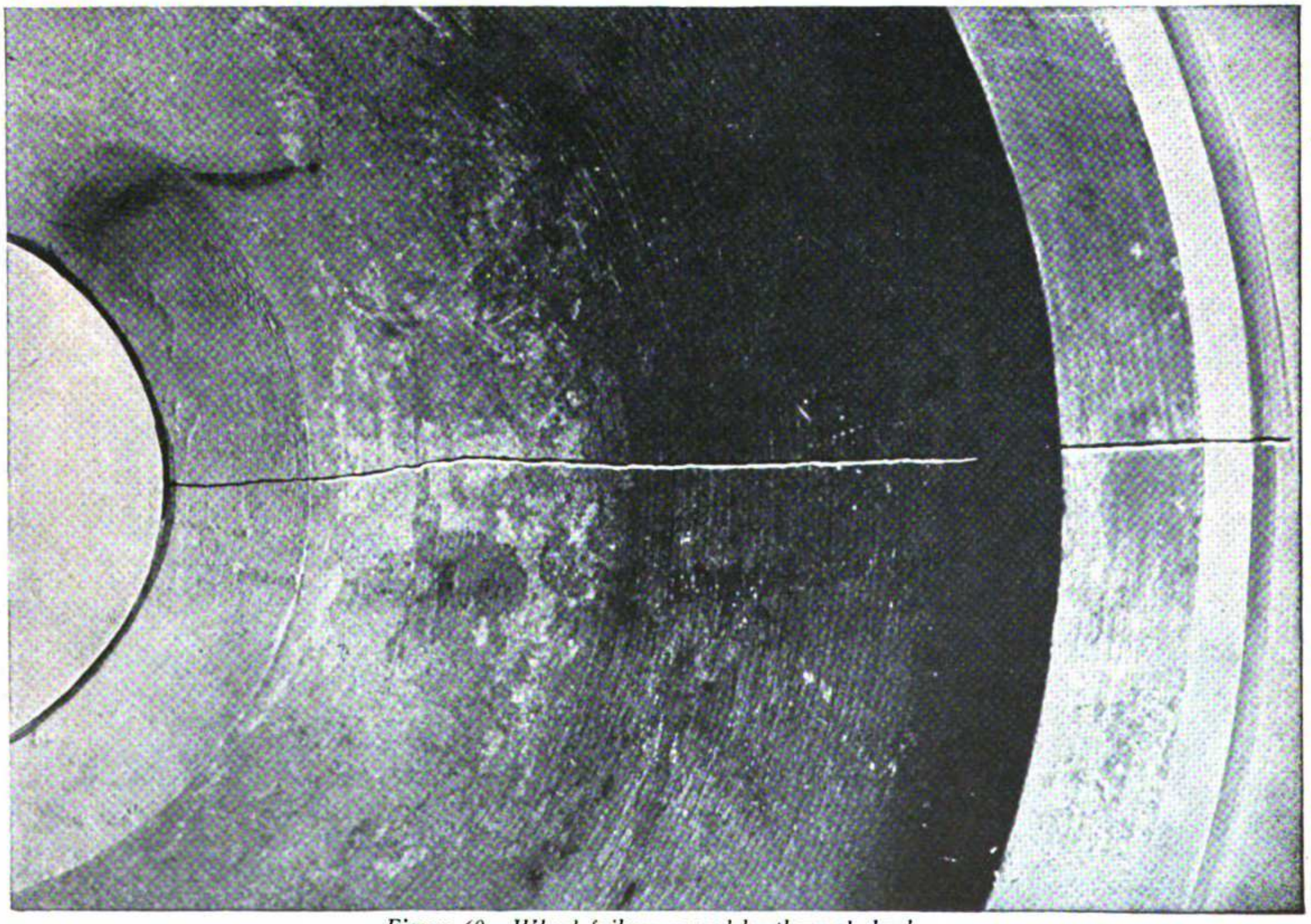


Figure 60. Wheel failure caused by thermal check.

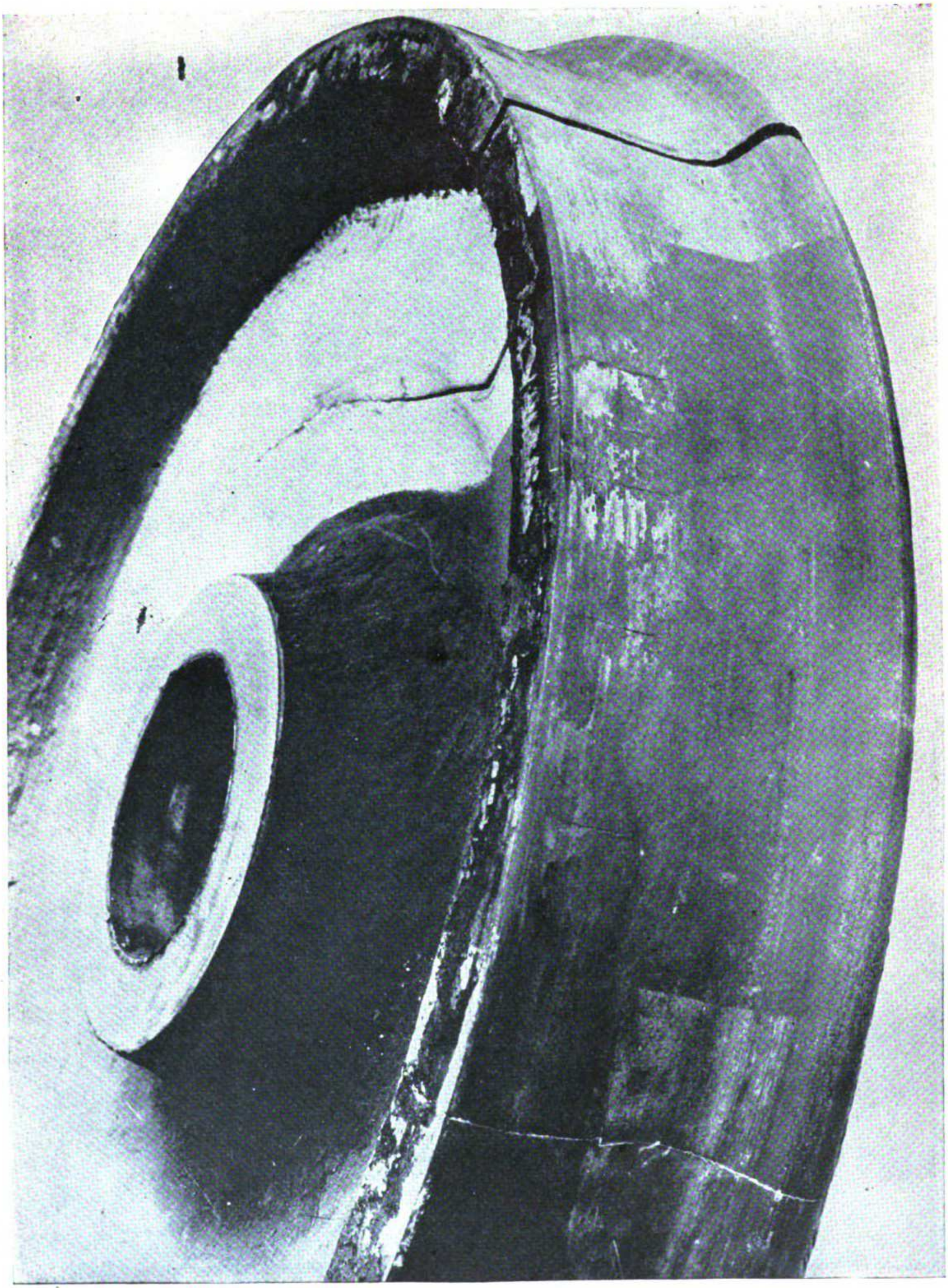


Figure 61. Wheel failure caused by thermal check.

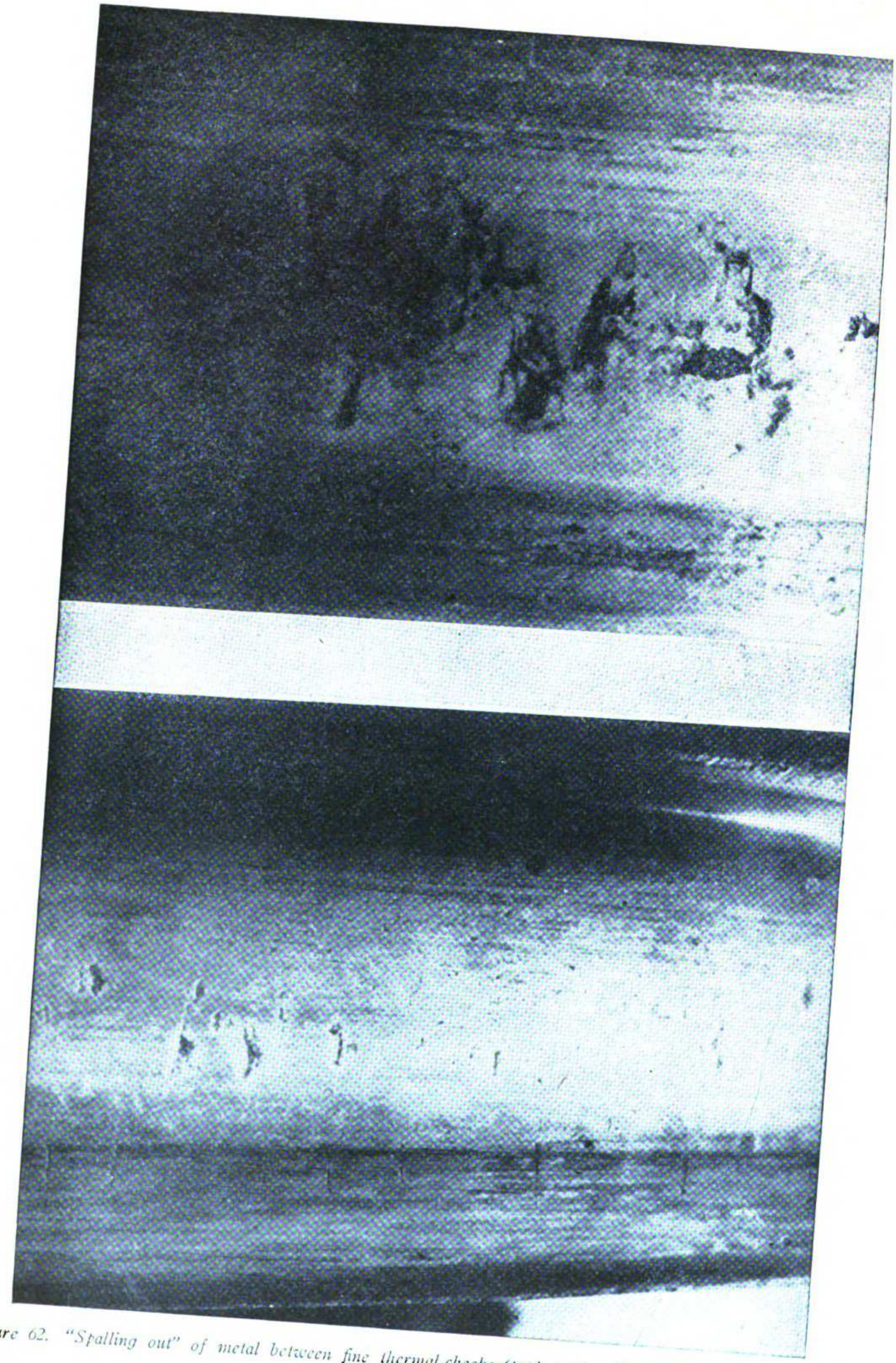


Figure 62. "Spalling out" of metal between fine thermal checks (top) compared with true shelling (bottom).

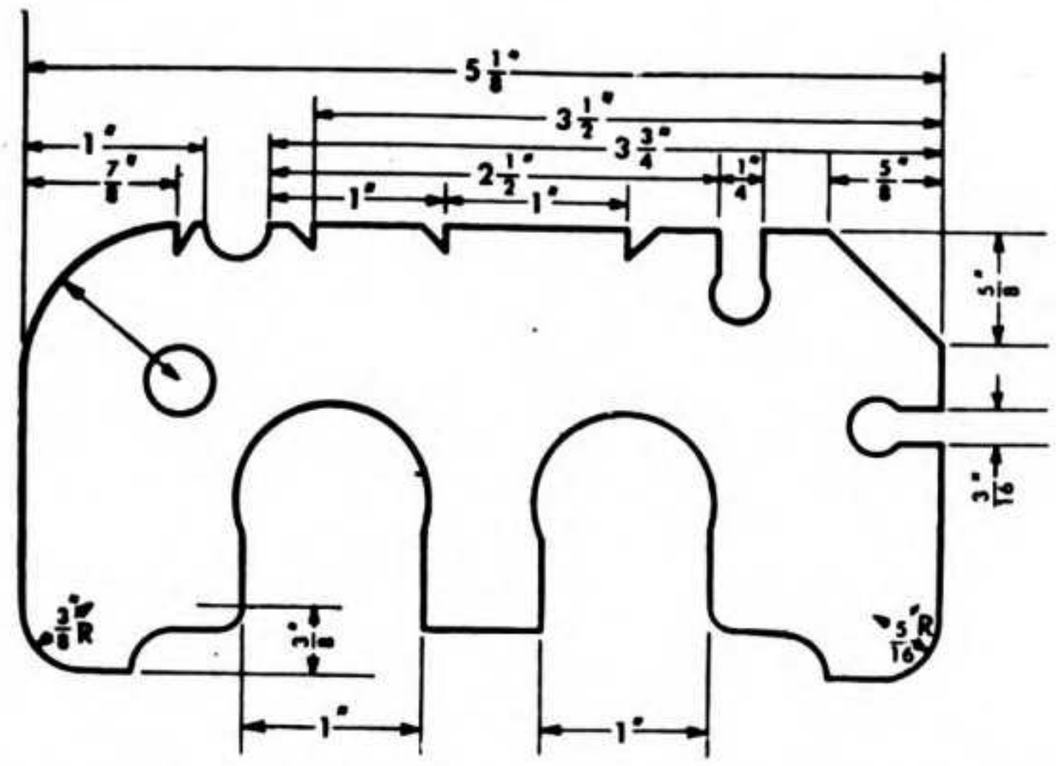


Figure 63. Wheel defect, worn coupler limit, worn journal collar and journal fillet gauge. (T. C. Stock No. 41-4012-19-020.)

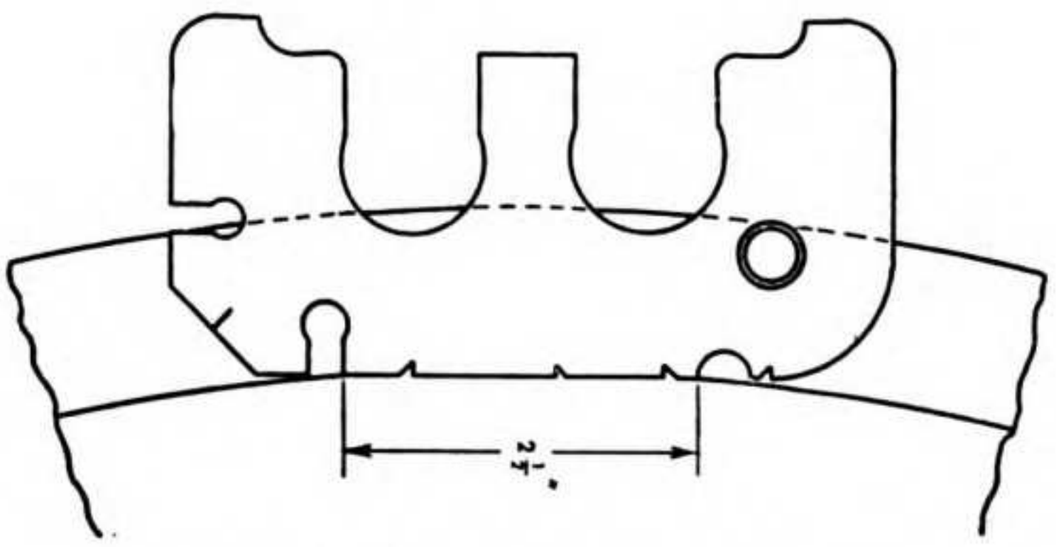


Figure 64. Method of gauging flat spots.

will be removed. If wheels removed for other defects have rim thickness reduced to these limits by turning to remove defects and restore tread and flange contour, the wheels will not be reapplied. *Exception*: Wheels with 1 inch rim thickness condemned under this rule, may be applied under freight cars.

b. WHEELS LOOSE OR OUT OF GAUGE (Rule No. 44). Wheels showing indications of being loose on the axle will be removed. Wrought-steel wheels are out of gauge if a pair measures less than 4 feet $5\frac{3}{32}$ inches back to back, measured at the base line and parallel to the axis of the axle (fig. 73); or if a pair measures more than 4 feet $6\frac{17}{32}$ inches throat to back as measured with the standard steel wheel mounting and check gauge (fig. 74). Loose wheels are caused by poor machine workmanship; wheels out of gauge result from careless mounting press practice.

c. PLATE DEFECTS (Rule No. 45). (1) Radial cracks in the plate usually originate in either the hub or the rim. Such cracks will be reported as "cracked hub" or as "radial crack in rim," and considered in accordance with *a*(6) above covering "thermal checks" or "cracked hub."

(2) Careful inspection will detect circumferential plate cracks so that the wheel can be removed before

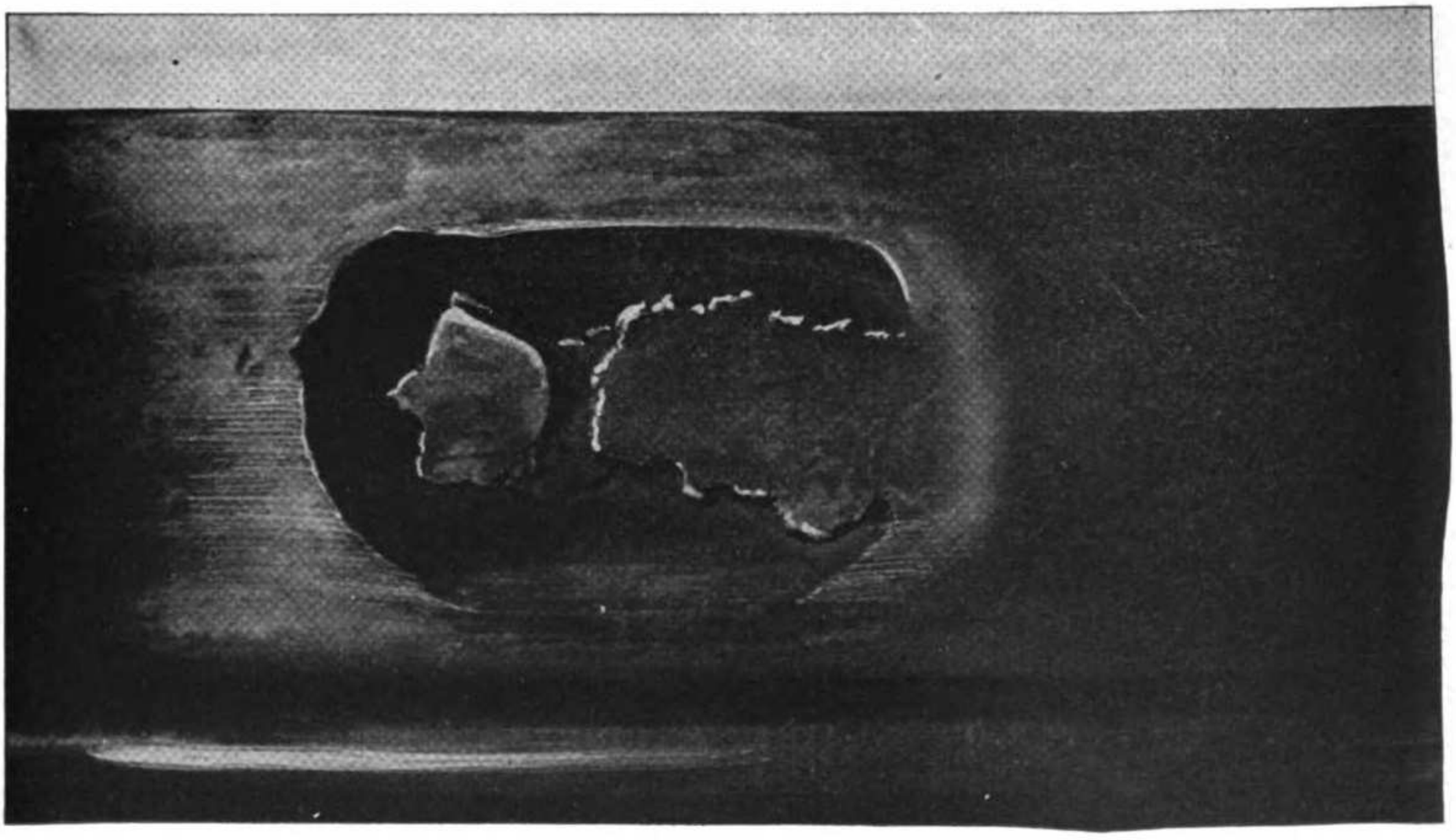


Figure 65. Built-up tread.

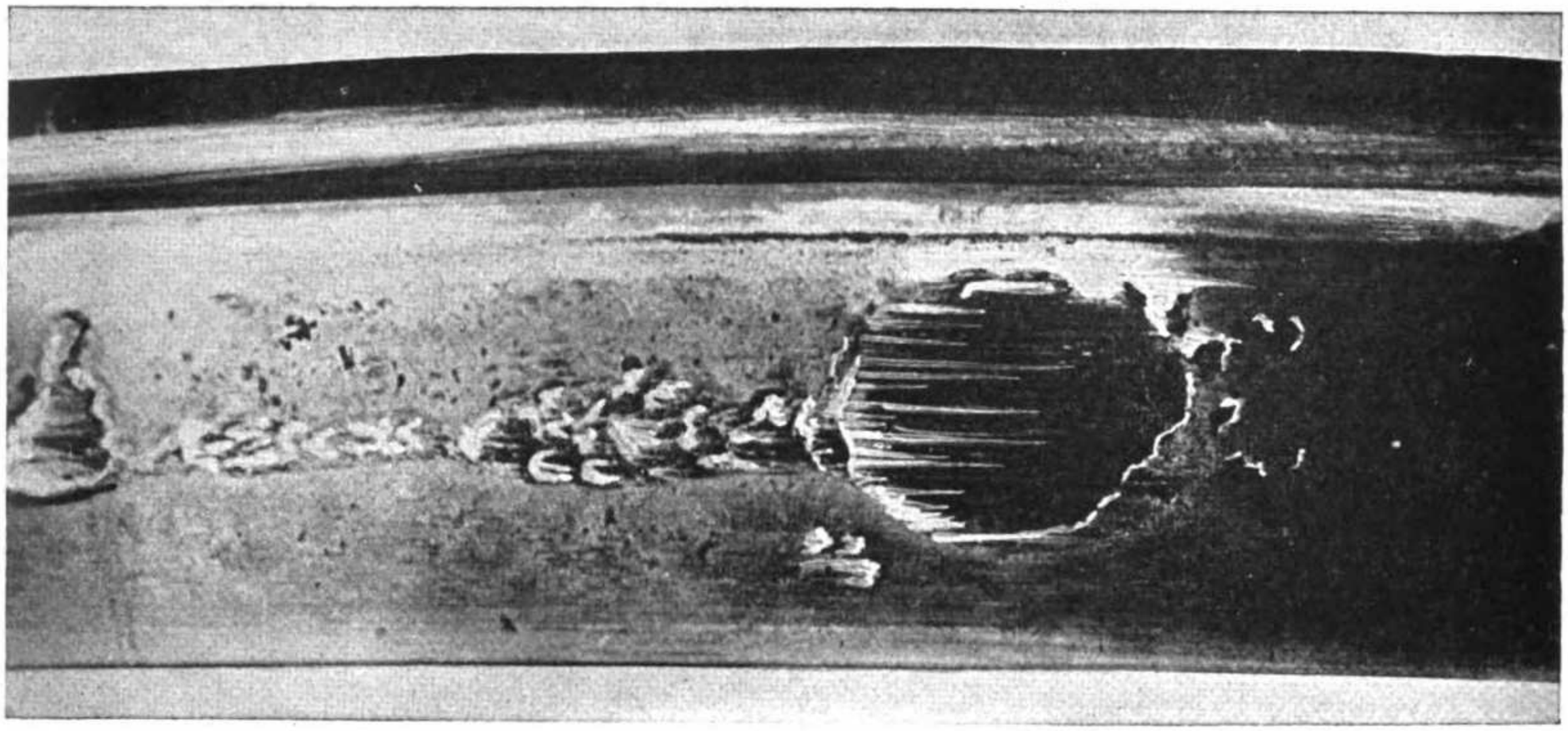


Figure 66. Built-up tread.

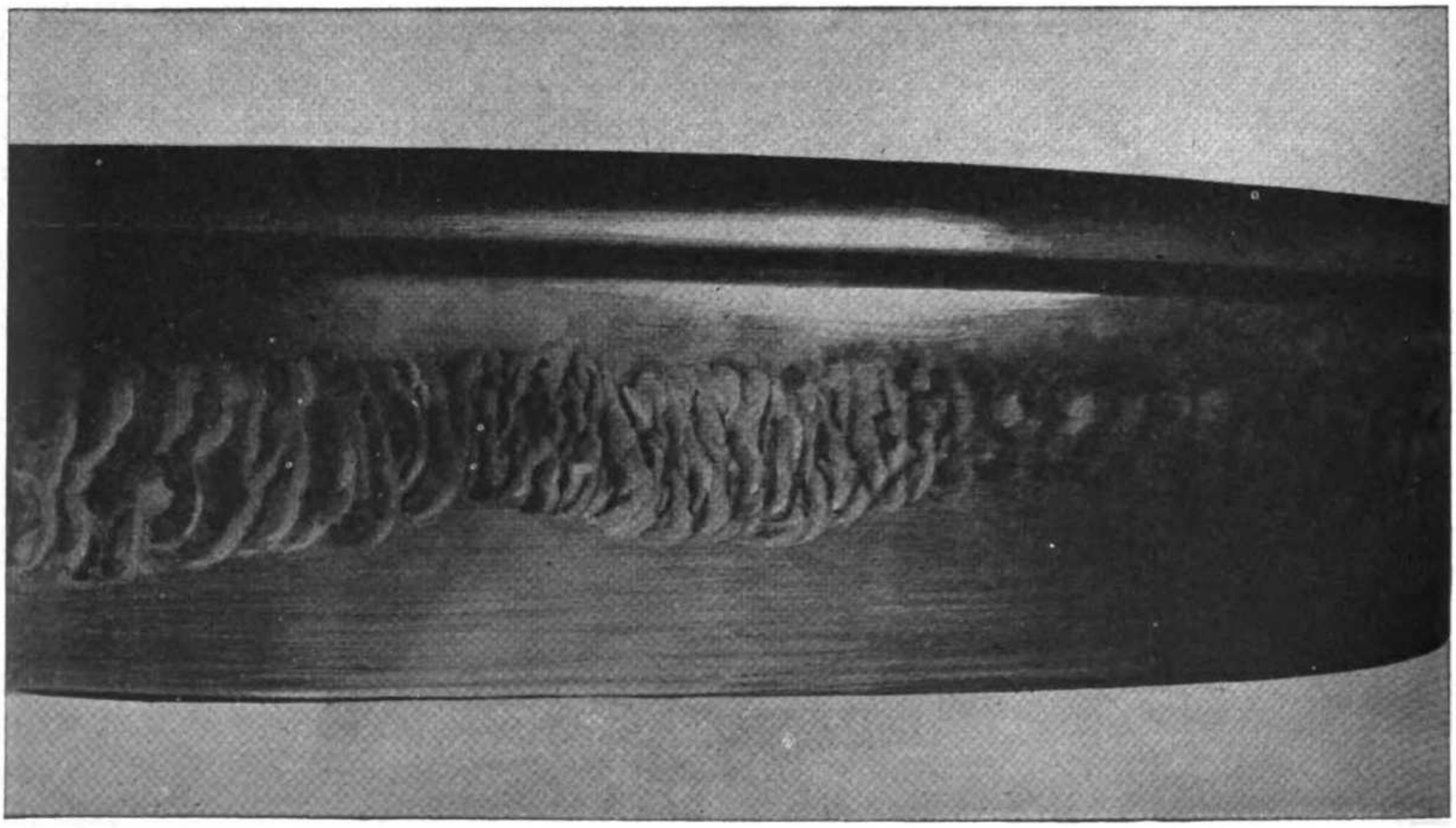


Figure 67. Built-up tread.

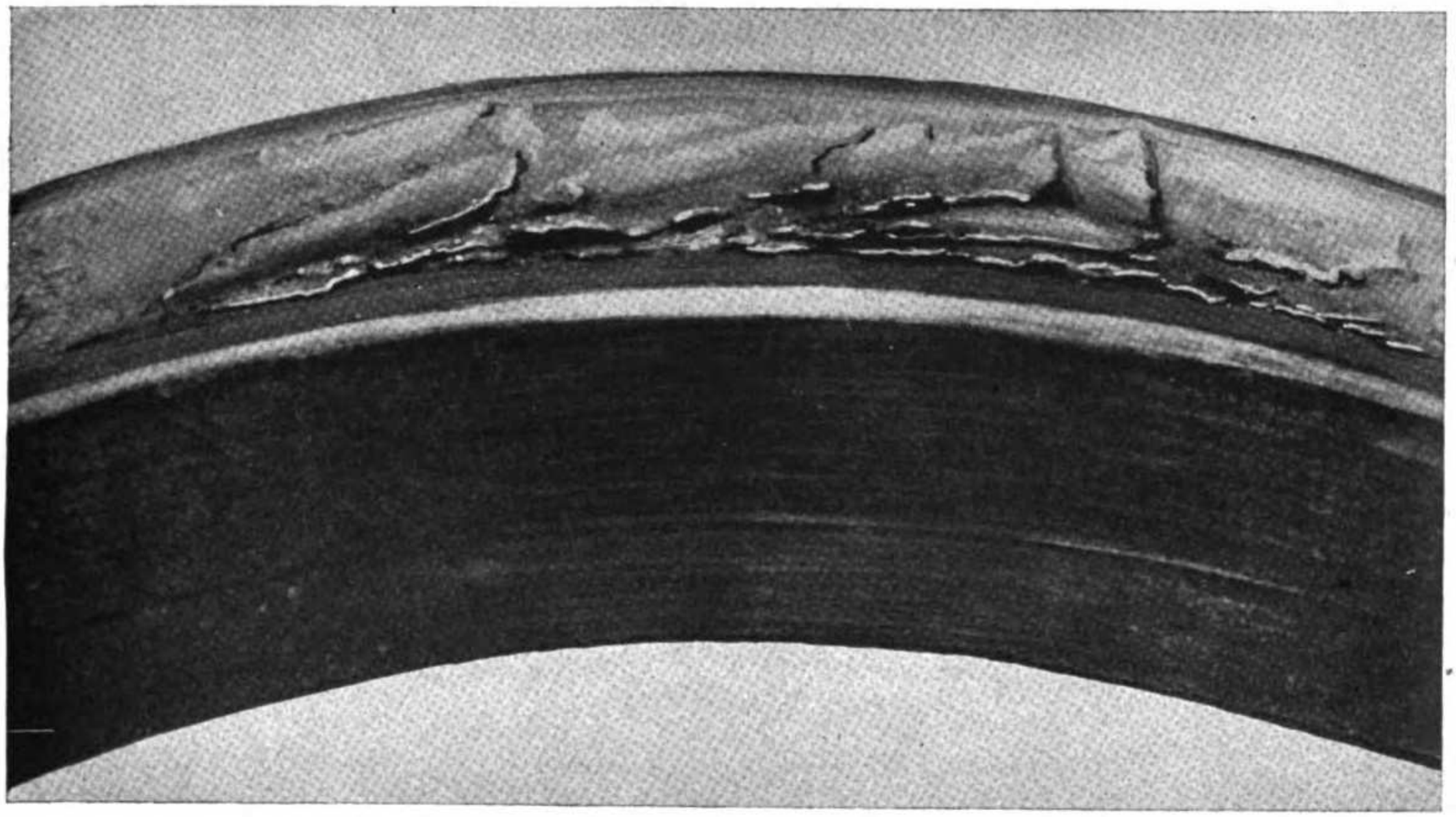


Figure 68. Built-up tread.

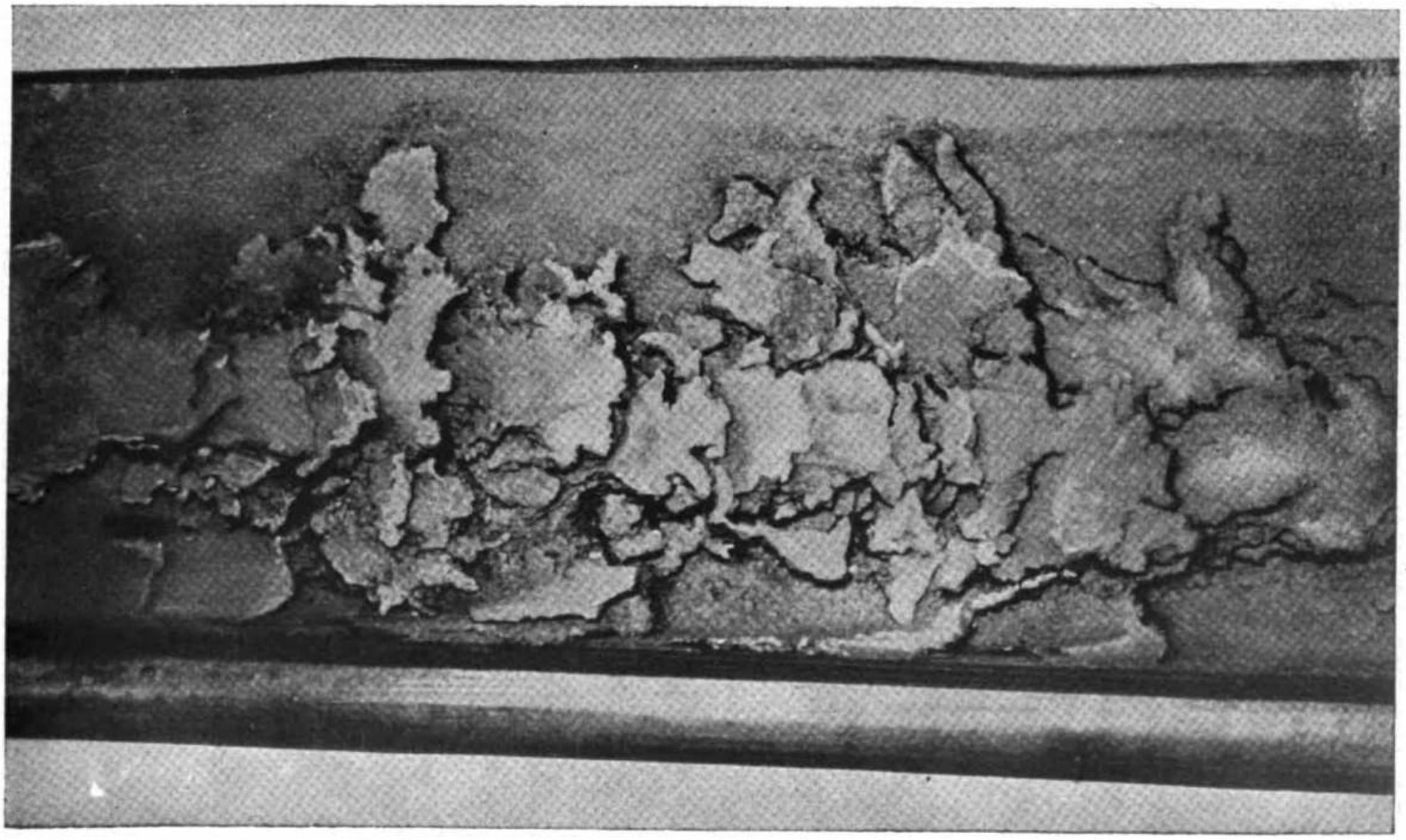


Figure 69. Built-up tread.

there is any danger of failure; they may be detected in their early stages at a length of 2 or 3 inches. If wheels with such cracks are continued in service, the crack will grow to the "cupid bow" crack, so called because it circles the hub circumferentially and has ends which turn outward toward the rim (fig. 75). If still further neglected, the crack eventually will extend out through the rim (fig. 76) resulting in a wheel failure.

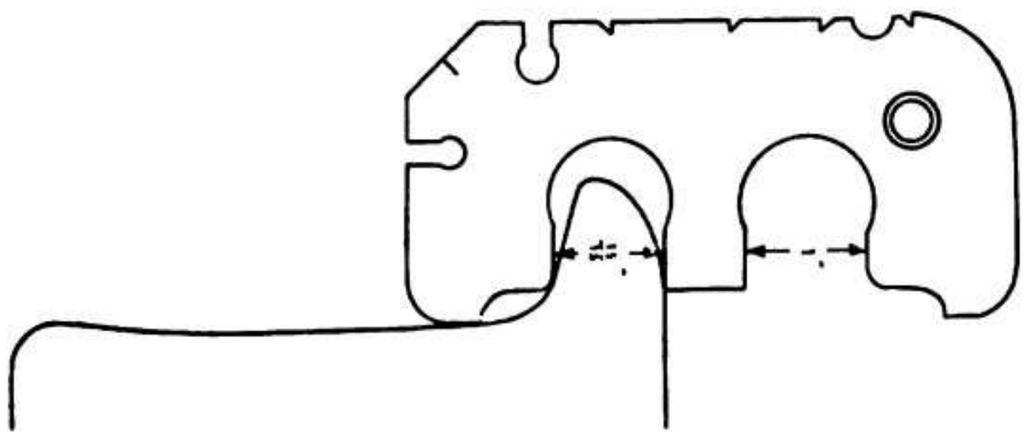


Figure 70. Method of gauging thin flanges. Condemnable.

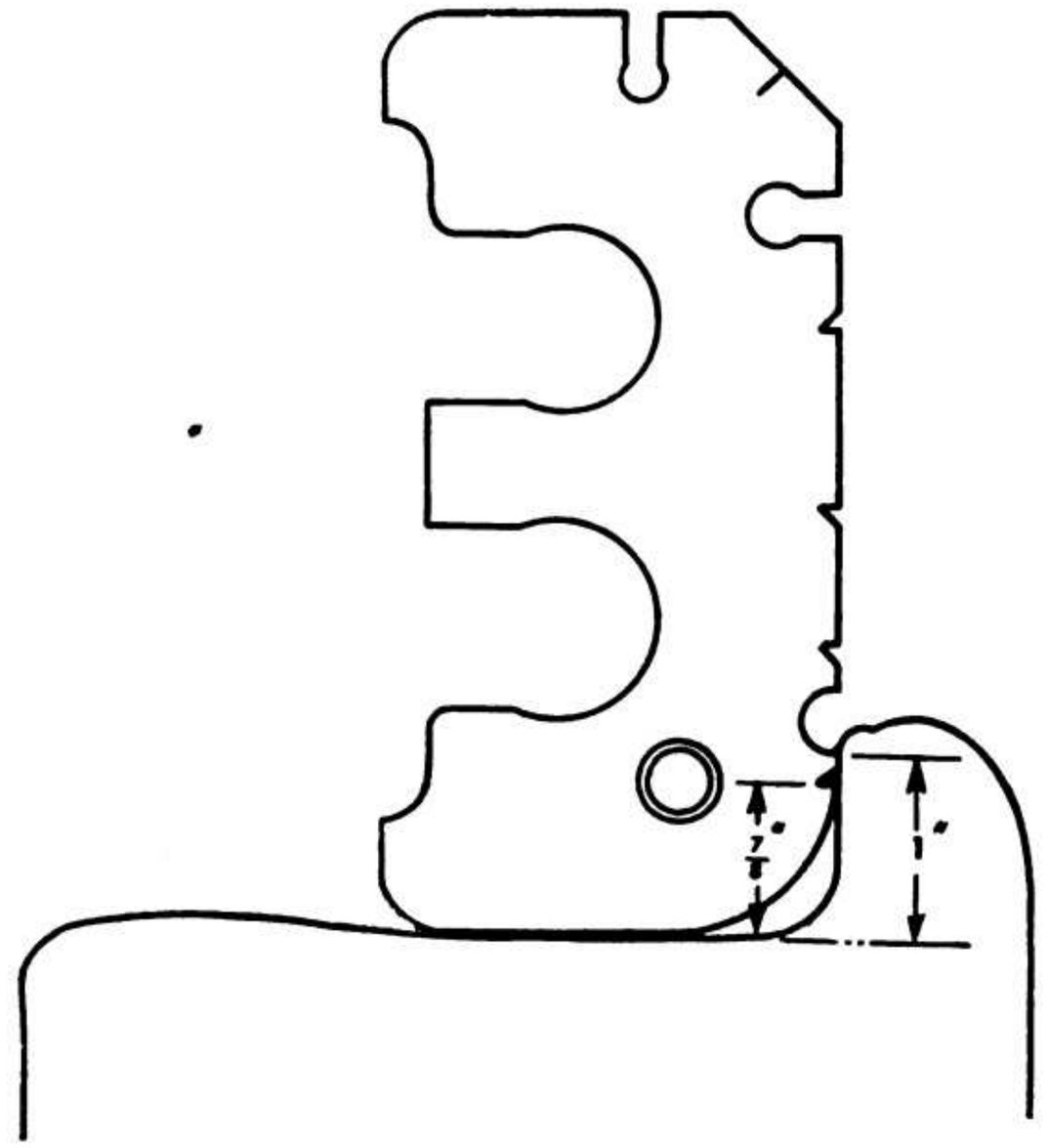


Figure 71. Method of gauging vertical flanges. Condemnable.

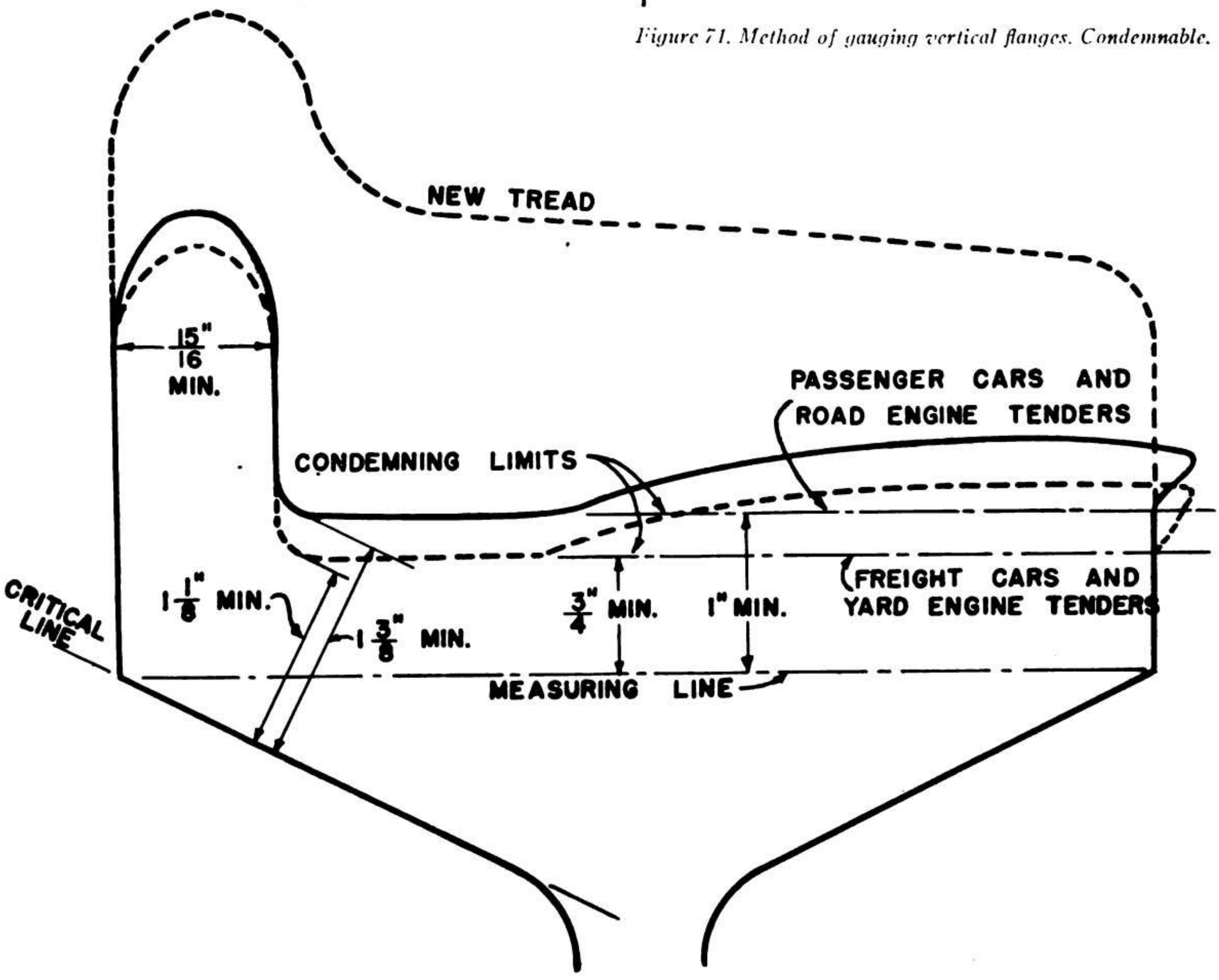


Figure 72. Condemning limits for wrought steel wheels.

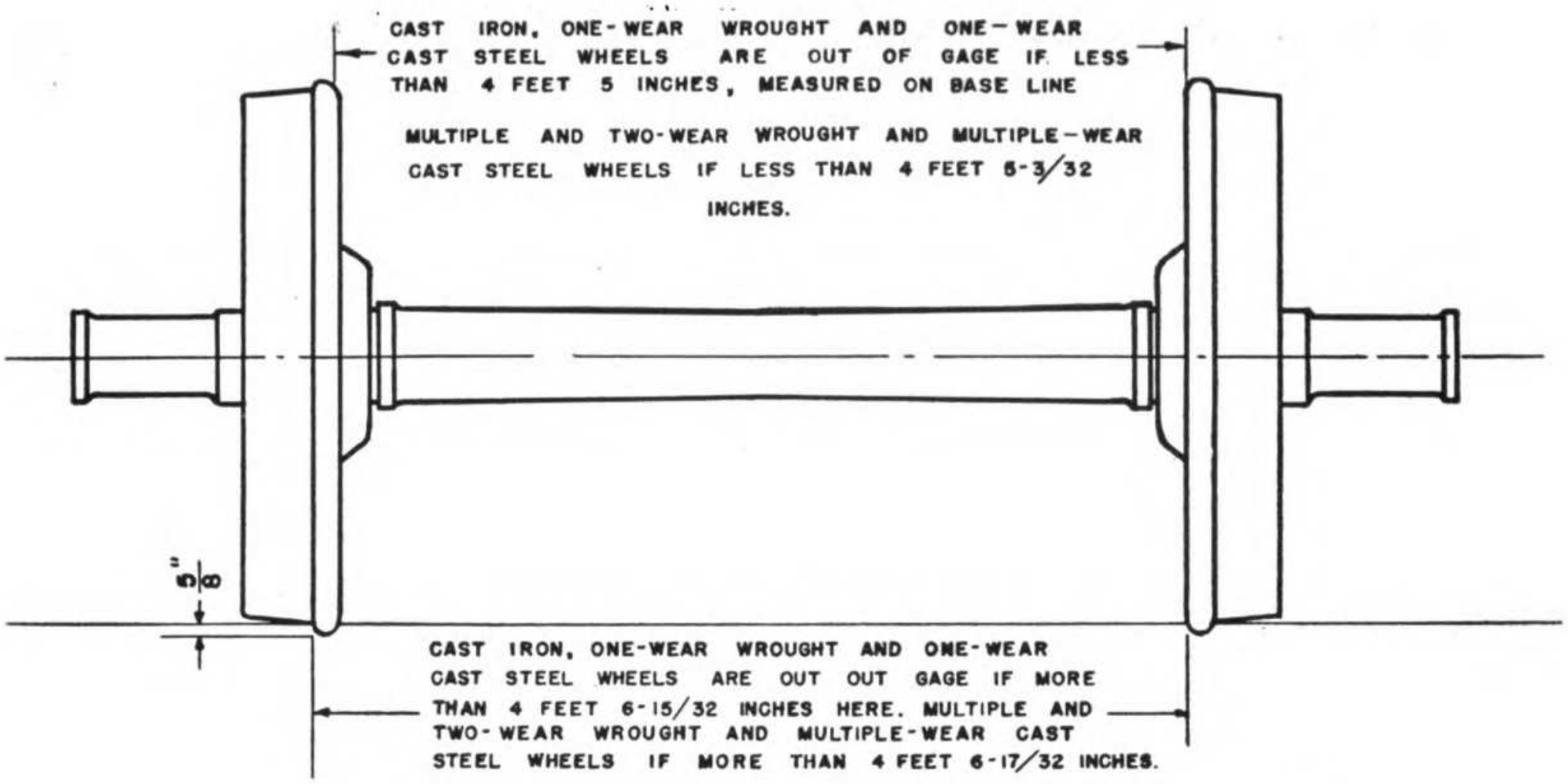


Figure 73. Spacing limits for cast-iron, one-wear wrought steel, one-wear cast steel and multiple-wear, two-wear wrought and multiple-wear cast steel wheels.

(3) Plate cracks also originate in holes burned in the plate (figs. 77 and 78). *Any wheels showing evidence of the application of the torch or electric arc, are to be withdrawn from service and will not be reapplied.* The application of the torch or electric arc, to any part of the wheel for burning or welding is extremely dangerous and will not be done.

d. Hub defects (Rule No. 46). Hub failures take the form of radial cracks (figs. 79 and 80). These show the back and front of the hub of the same wheel. Cracks usually occur during mounting.

43. Cast Iron Wheels

a. Slid flat (Rule No. 47). A slid flat wheel is condemnable when the spot is 2½ inches or over in length or if there are two or more adjoining spots 2 inches or over in length (figs. 81 and 82). It will be removed promptly when discovered. A slid flat spot exceeding 1 inch in length is condemnable under passenger train cars. This defect is gauged with the wheel defect gauge shown in figure 63 and used as illustrated in figure 64.

b. Shell-out (Rule No. 48). A freight car wheel is condemnable when shell-out spots are 2½ inches or over (fig. 83). A shell-out spot derives its name from the fact that it resembles an inverted oyster shell with high center. Furthermore, one wheel of a pair may develop shell-out and the other wheel be unimpaired. A shell-out 1 inch long or over is condemnable under passenger train care. The measurement of the length of the spot is made circumferentially and not across the tread. The high spot in the center is the distinctive feature of a shell-out (fig. 83).

c. Seams (Rule No. 49). (1) One of the most serious defects in cast iron wheels is the seam in the tread. When this defect is located close to the flange, it generally causes breaking off of the flanges; sometimes the surface metal may cover the entire seam and a flange may break off before there is any evidence of a seam on the surface.

(2) A wheel will be removed when any seam is found running lengthwise and within the limit of 3¾ inches of flange, gauged as shown in figure 97. Inspectors will take special precaution to discover any indication of seams. Figure 84 illustrates a seam in the tread. Seams such as this may develop in different parts of the tread.

d. Worn through chill (Rule No. 50). Wheels occasionally are found with a flat or low spot where the wheels have never been slid; this is caused by the chill being too low in these wheels. When the chilled metal or white iron is worn through, the soft grey iron is exposed and flattened out (fig. 85). The wheels will not be removed from service for this defect if the tread is not out of round in excess of

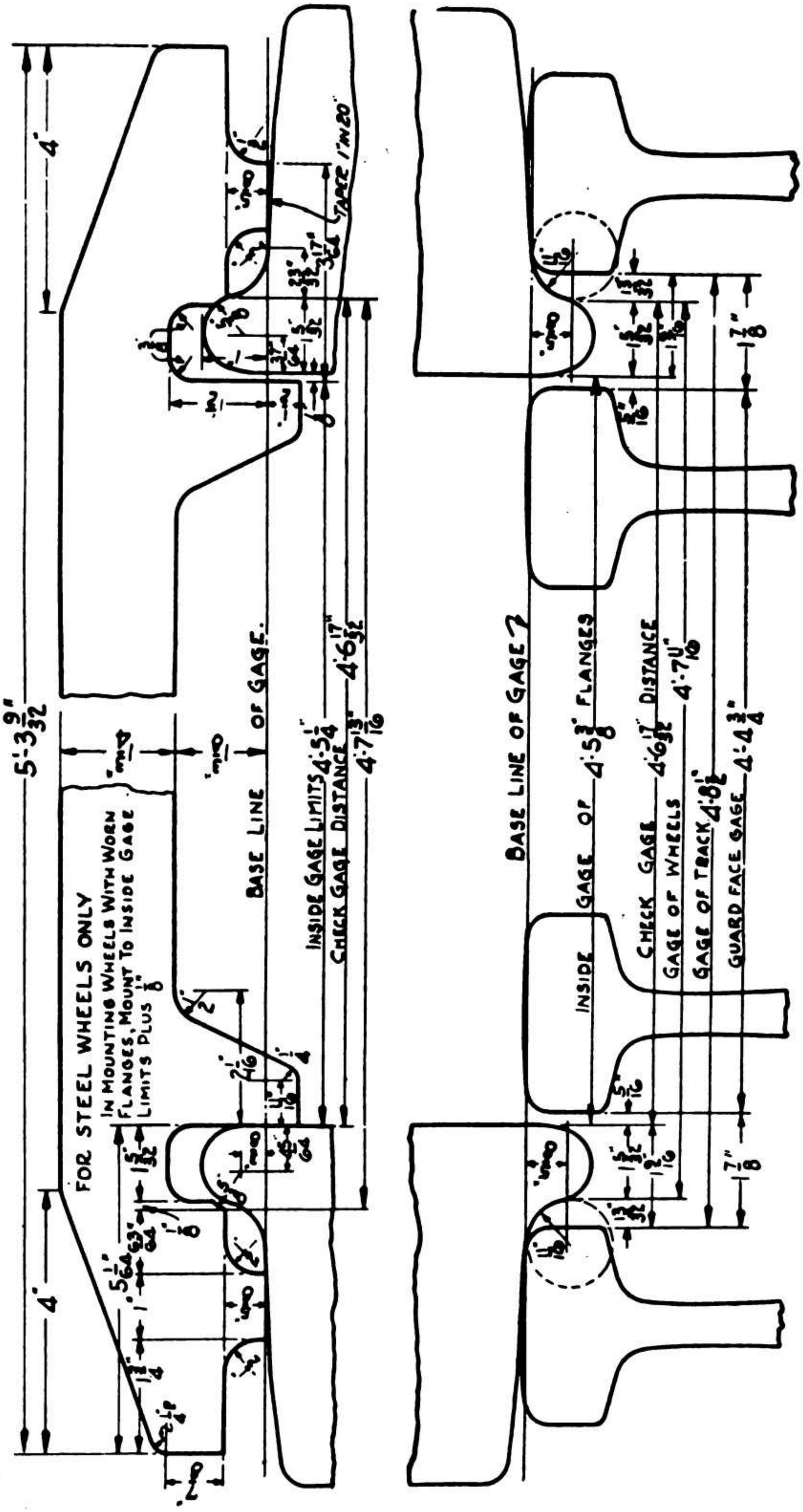


Figure 74. Mounting gauge for multiple and two-wear wrought steel wheels and multiple wear cast steel wheels. (T.C. Stock No. 41-4012-16-022.)

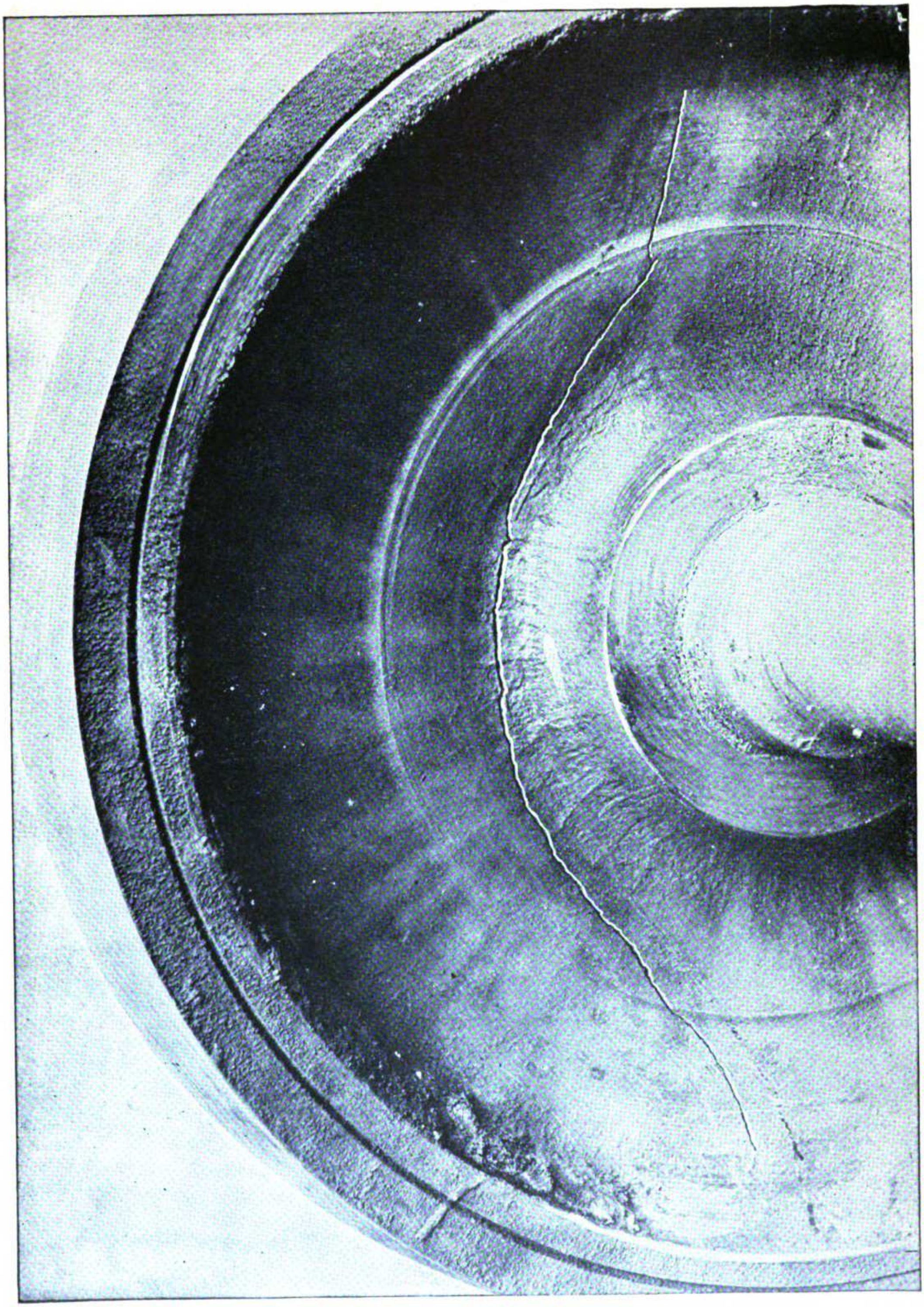


Figure 75. Circumferential crack ("Cupid's Bow" Type).

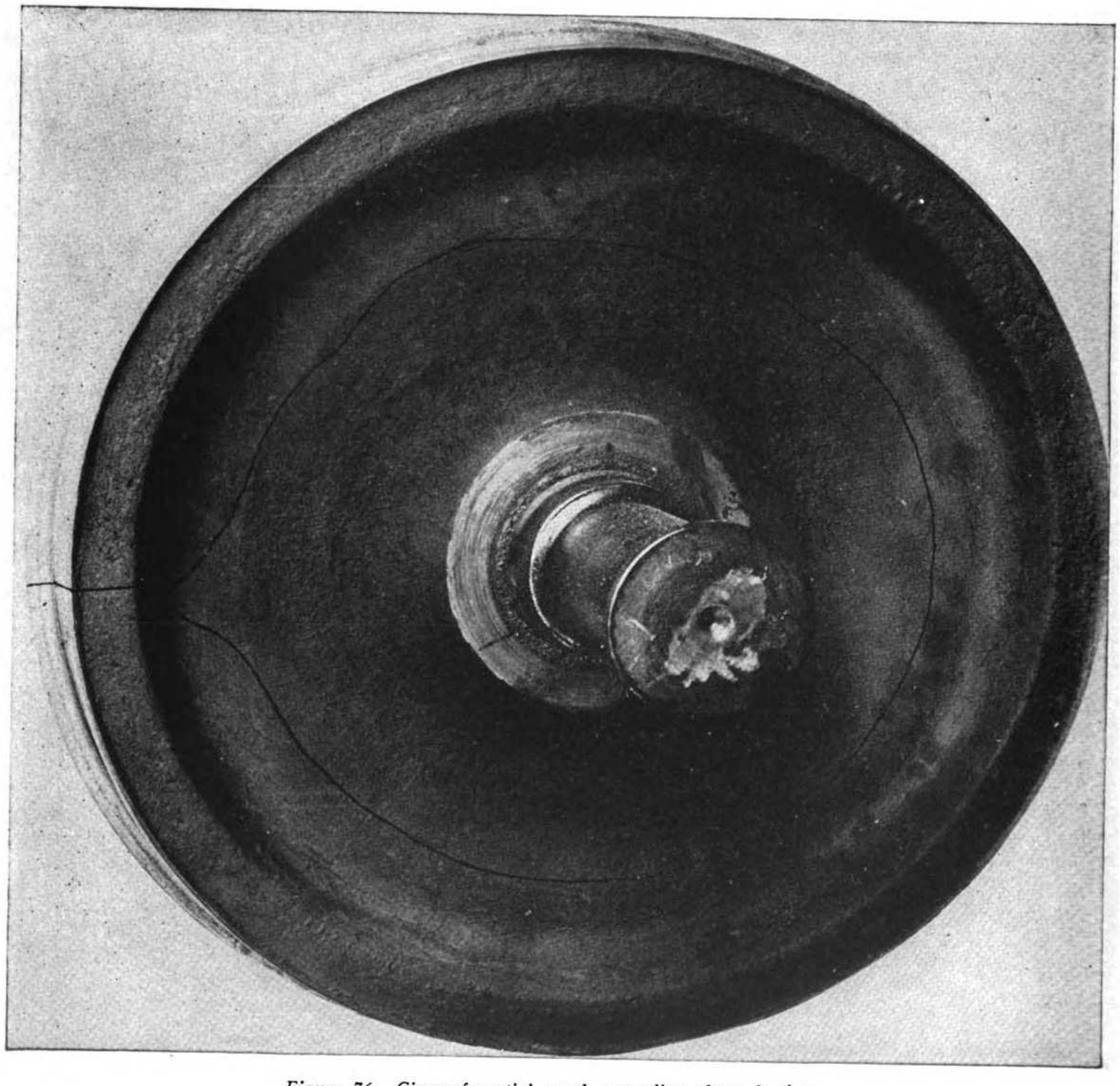


Figure 76. Circumferential crack extending through rim.

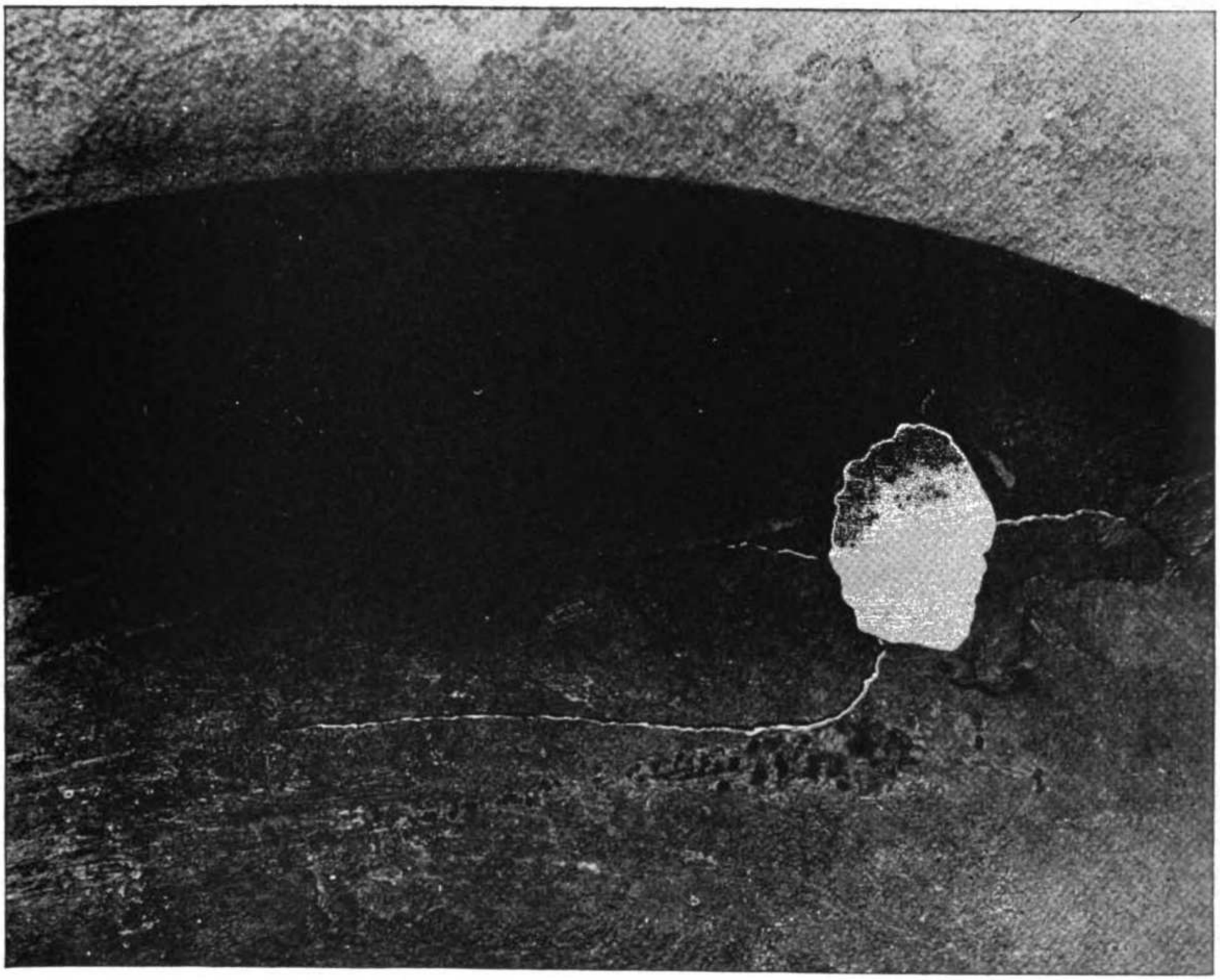


Figure 77. Crack, originating from hole burned in plate.

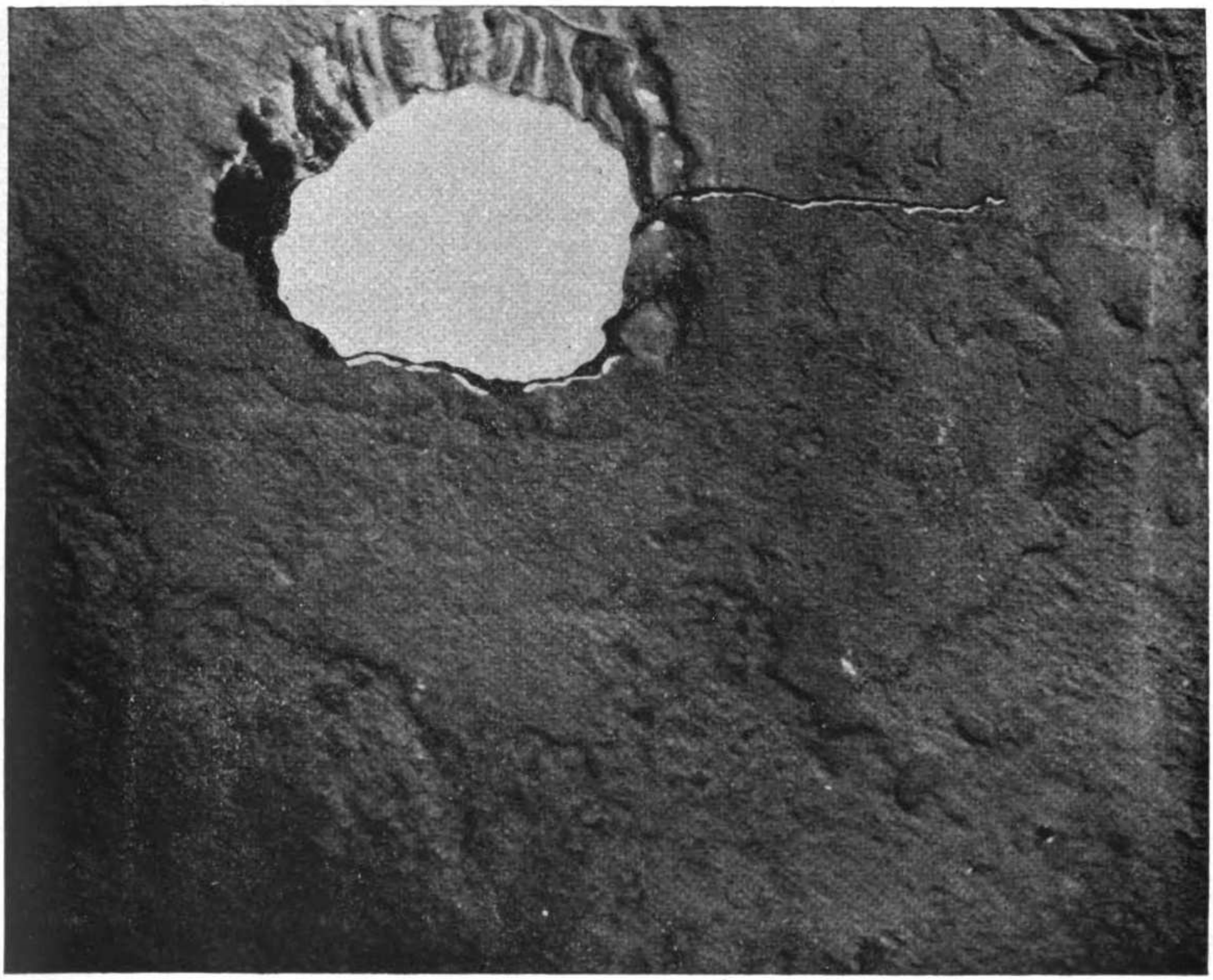


Figure 78. Crack, originating from hole burned in plate.

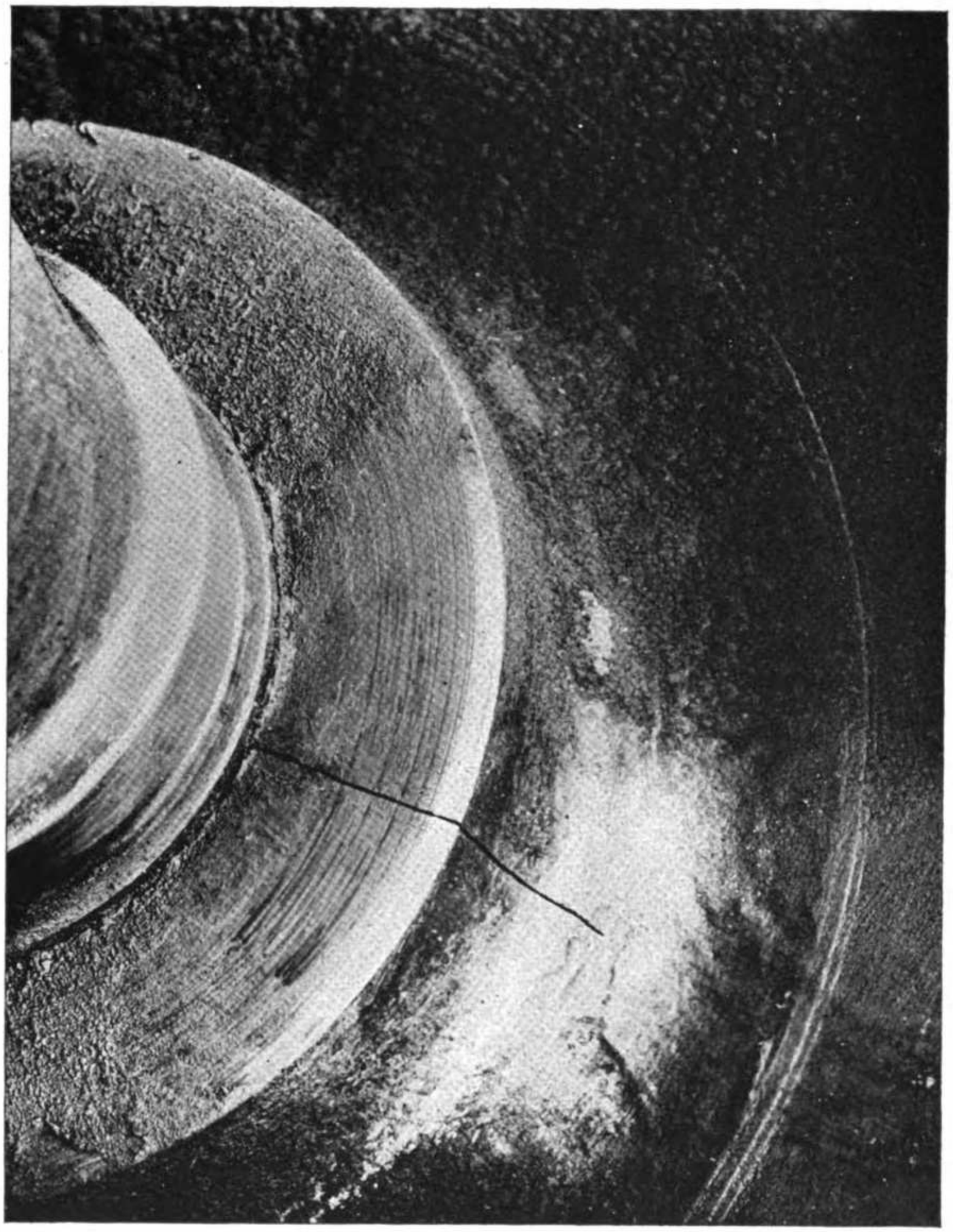


Figure 79. Cracked hub.

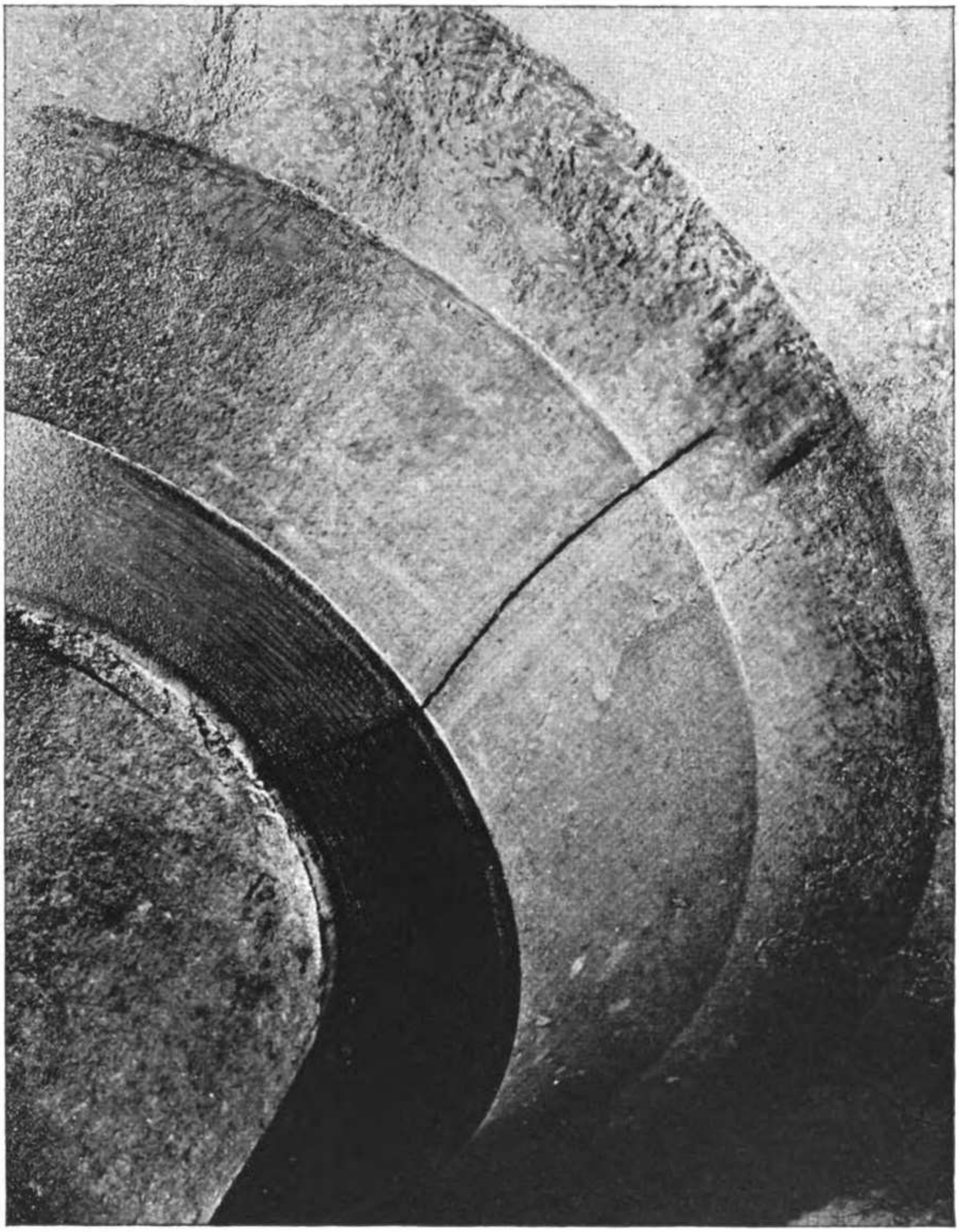


Figure 80. Cracked hub.

$\frac{3}{64}$ inch within an arc of 12 inches or less, as measured by the gauge shown in figure 86. Care will be taken to distinguish this defect from flat spots caused by sliding wheels.

e. OUT OF ROUND (Rule No. 51). Wheels often are encountered with a low spot on the tread for which worn through chill is not responsible. Wheels that are out of round to the limits prescribed by the gauge (fig. 86) will be withdrawn from service. When applying the gauge for out of round wheels the gauge will be located centrally on the tread (fig. 87).

f. FLANGES WORN THIN OR VERTICAL (Rule No. 52). Gauging of worn flanges will be given careful attention as a worn flange below the condemning limit may lead to breakage of the flange. The wheel defect gauge is used as shown in figure 70 for measurement of worn flange and as shown in figure 71 for vertical flange. (See fig. 88 for example of vertical flange.) The flange to be condemnable will contact the limit point of the gauge and not merely have a flat surface to the limit height.

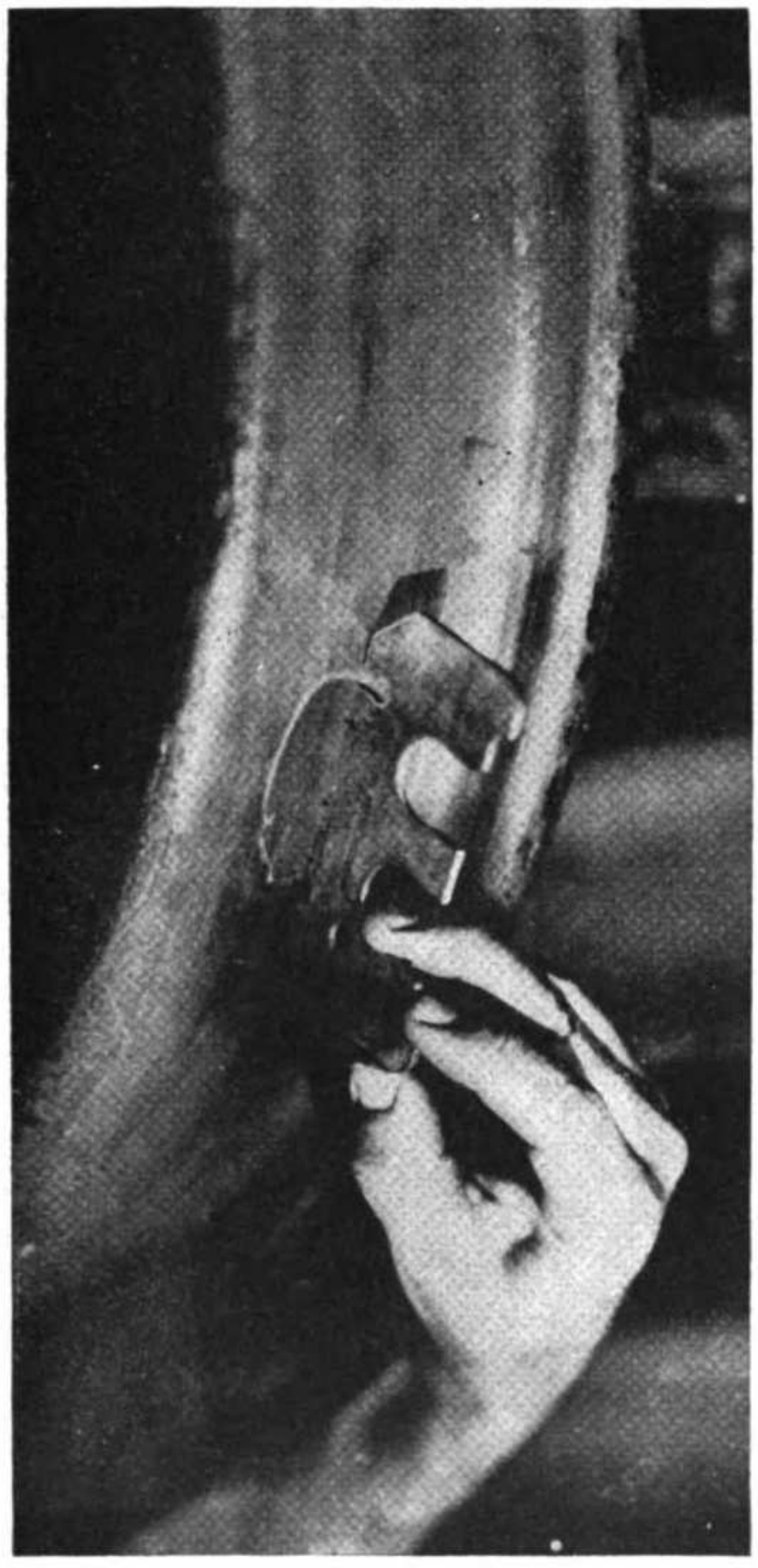


Figure 81. Slid flat, cast-iron wheel.

g. BRAKE BURN CRACKS (Rule No. 53). Wheels having defective treads because of transverse cracks due to heating, will be condemned under the following conditions:

(1) Brake burn checks or cracks consisting of transverse cracks in the tread are results of excessive heating developed by the brake shoe. The chilled iron in the tread of a cast iron wheel cannot withstand this excessive localized heating, and checking or cracking results. Wheels will be removed when extent of brake burn is—

(*a*) Over $2\frac{3}{4}$ inches in length.

(*b*) Over 1 inch in length extending beyond point "B" toward point "C" (fig. 89).

(*c*) Of any length extending above, or when entirely above point "C" located midway between points "B" and "A" (fig. 89).

(2) Conditions (*b*) and (*c*) above are to be determined with gauge shown in figure 63 and applied as illustrated in figure 89.

Figure 82. Double slid flat, cast-iron wheel.

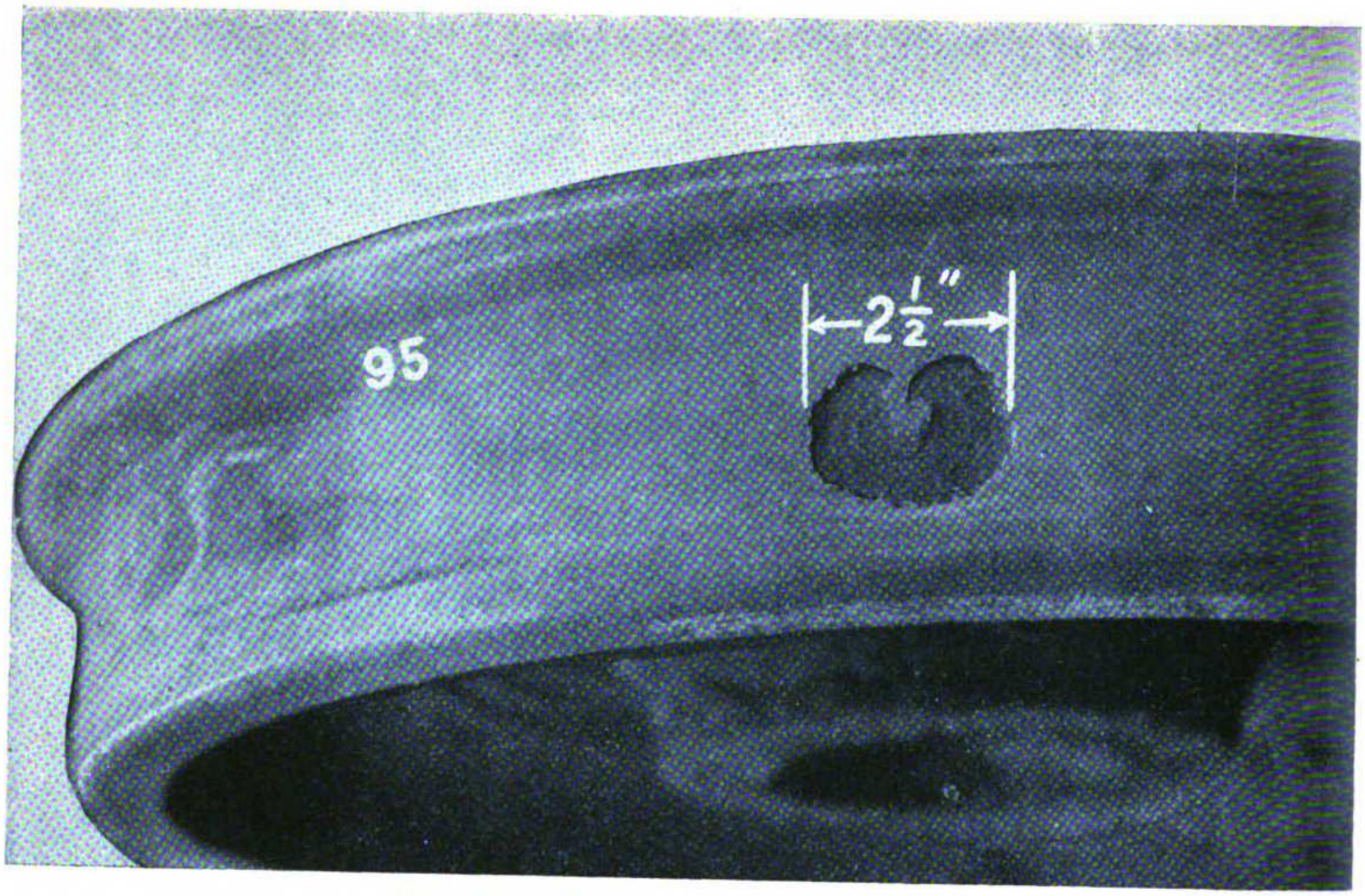


Figure 83. Shell-out, cast-iron wheel. Condemnable.

Figure 84. Seam in tread, cast-iron wheel.

(3) Condemning wheels as soon as these lines or checks develop is wasteful unless they are located as defined above. The accompanying figures 90 and 91 show cases of brake burn wheels which will be left in service. Figures 92 and 93 show cases which will be condemned under the rule.

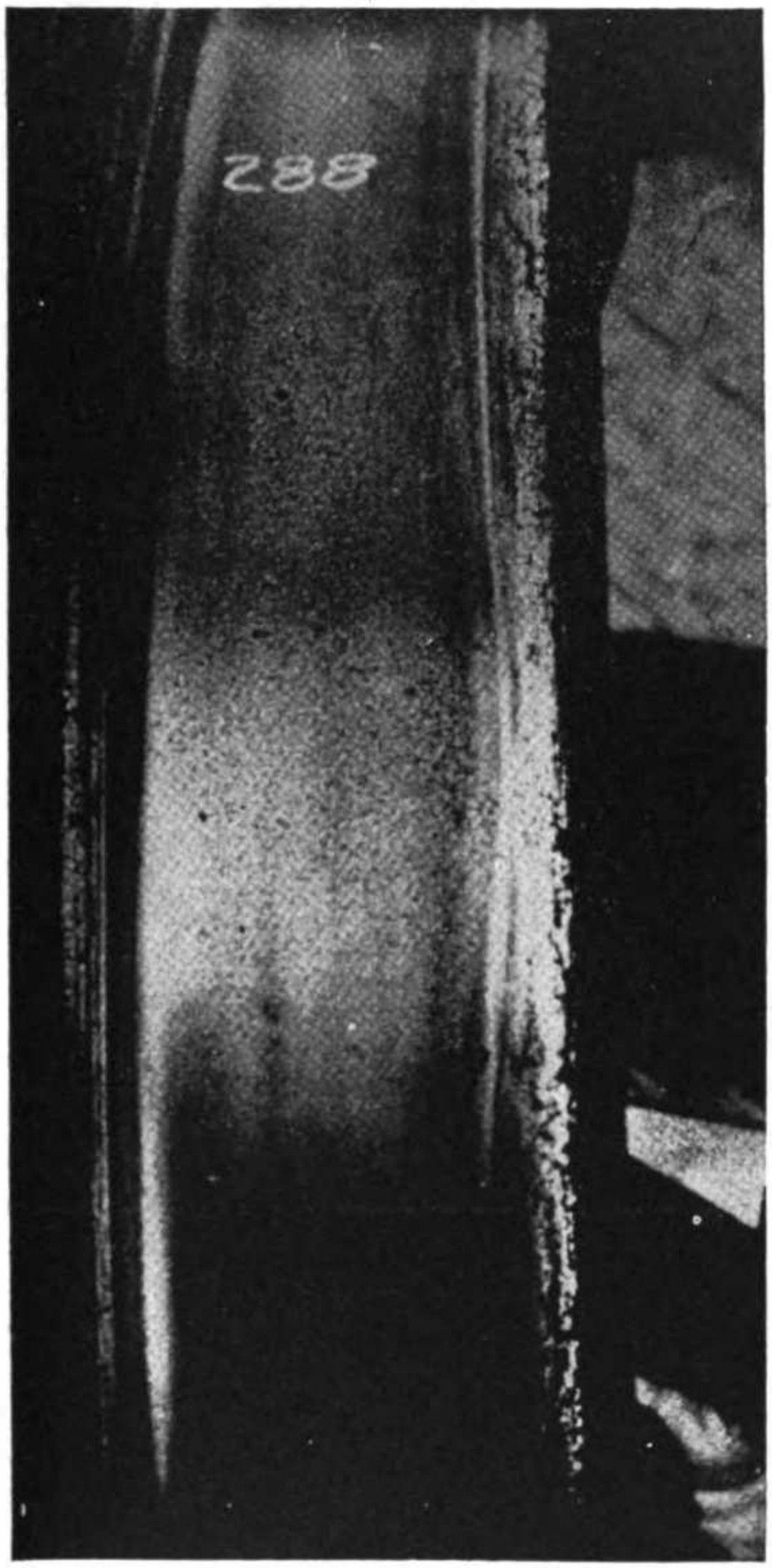


Figure 85. Worn through chill, cast-iron wheel.

h. COMBINATION TREAD DEFECTS (Rule No. 54). Cast iron wheels are condemnable when they have three or more defects not more than 3 inches apart which extend circumferentially on tread for a distance of 12 inches or more as measured by the gauge (fig. 86). These defects may consist of any or all of the following:

(1) Shelled out spots, 1 inch long or over but less than dimensions stipulated in rule 43.

(2) Flat spots (except slid-flat spots). 1 inch long or over but less than dimensions stipulated in rule 48.

(3) Brake burn, where metal has fallen out for a continuous circumferential length of ½ inch or over but less than dimensions stipulated in rule 53. Figure 94 illustrates this combination of defects.

i. TREAD WORN HOLLOW (Rule No. 55). Use gauge (fig. 95) for the condemning of cast iron and one-wear cast steel wheels for tread worn hollow. Wheels often are condemned which have not reached this limit because of the mistaken impression that a less worn tread is dangerous to run or is hard on the track. The true limit to wearing hollow of the tread is the height of the flange, and the above mentioned gauge is based on this fact. It is wasteful to remove wheels for tread worn hollow before the gauge limit actually is reached. A typical example of a wheel properly condemnable for tread worn hollow is shown in figure 96.

j. BURST HUB (Rule No. 56). This defect is a radial crack in hub which usually develops at the wheel press. This double-plate wheel usually is cracked in back hub through core leg opening, but in single plate wheels the crack occurs in front hub. (See fig. 97.) It is caused either by improper methods of mounting, such as excessive pressure from improper fit allowances, taper in wheel bore or axle wheel seat or gauging; or by excessively hard hubs which sometimes occur in wheels improperly annealed at the foundry. The improper fit allowances often are the result of using lubricants of the wrong consistency. Such wheels will be scrapped.

k. CRACKED OR BROKEN FLANGE, PLATE, OR BRACKET (Rule No. 57). Inspectors will check carefully for any indications of cracks in the plate, brackets, or flange, as such wheels are likely to fail. Generally wheels break from the inside outward. A typical example of cracked plate is illustrated in figure 98.

l. CHIPPED FLANGE (Rule No. 58). Wheels are condemnable if the flange is chipped more than 1½ inches in length and ½ inch in width. A typical example of a wheel condemnable for chipped flange is illustrated in figure 99. In many cases where chip is shallow it will not interfere with the serviceability of the wheel and therefore will not be condemned. This

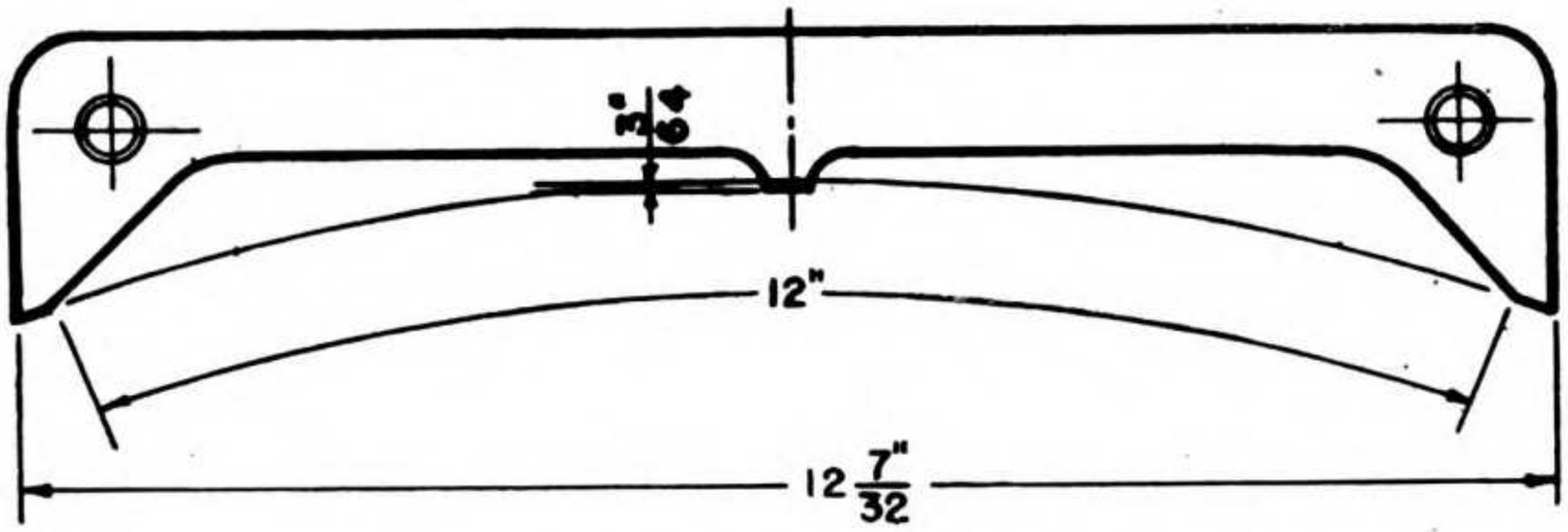


Figure 86. Gauge for worn through chill and out-of-round 33-inch wheels. (T.C. Stock No. 41-4012-22-020..)

is particularly true if chip is on the back of the flange. (See fig. 100.)

m. BROKEN RIM (Rule No. 59). Cast iron wheels frequently are condemned for chipping out of the metal at the outside edge of the rim. The limit of distance from the flange for breaks which slope inwardly is 3¾ inches and 3½ inches for breaks which are vertical or slope outwardly. Figures 101, 102, and 103 illustrate methods of gauging broken rims.

n. WHEELS LOOSE OR OUT OF GAUGE (Rule No. 60). Wheels will be removed from service when loose on axle or out of gauge. Oil working out at the inside of the wheel fit is an indication of a loose wheel. Wheels will show out of gauge (fig. 73) on one side if the axle is bent. The same effect is produced if wheels are bored diagonally.

o. WHEELS SUBJECTED TO FIRE (Rule No. 61). Cast-iron wheels which have been subjected to fire are ordinarily unfit for service as the heat may have drawn out the chill and caused other injury to the structure. Cases arise, however, wherein wheels which were in a fire have not become unduly heated and are not damaged. A certain amount of judgment is necessary to pass on their fitness for service. The coloring of the wheel usually will indicate the degree of heating, but in order to determine definitely if the wheels have been damaged, several wheels should be broken and the chill conditions examined. A competent officer will make such examination. If it is not possible to make these tests, none of the wheels will be returned to service.

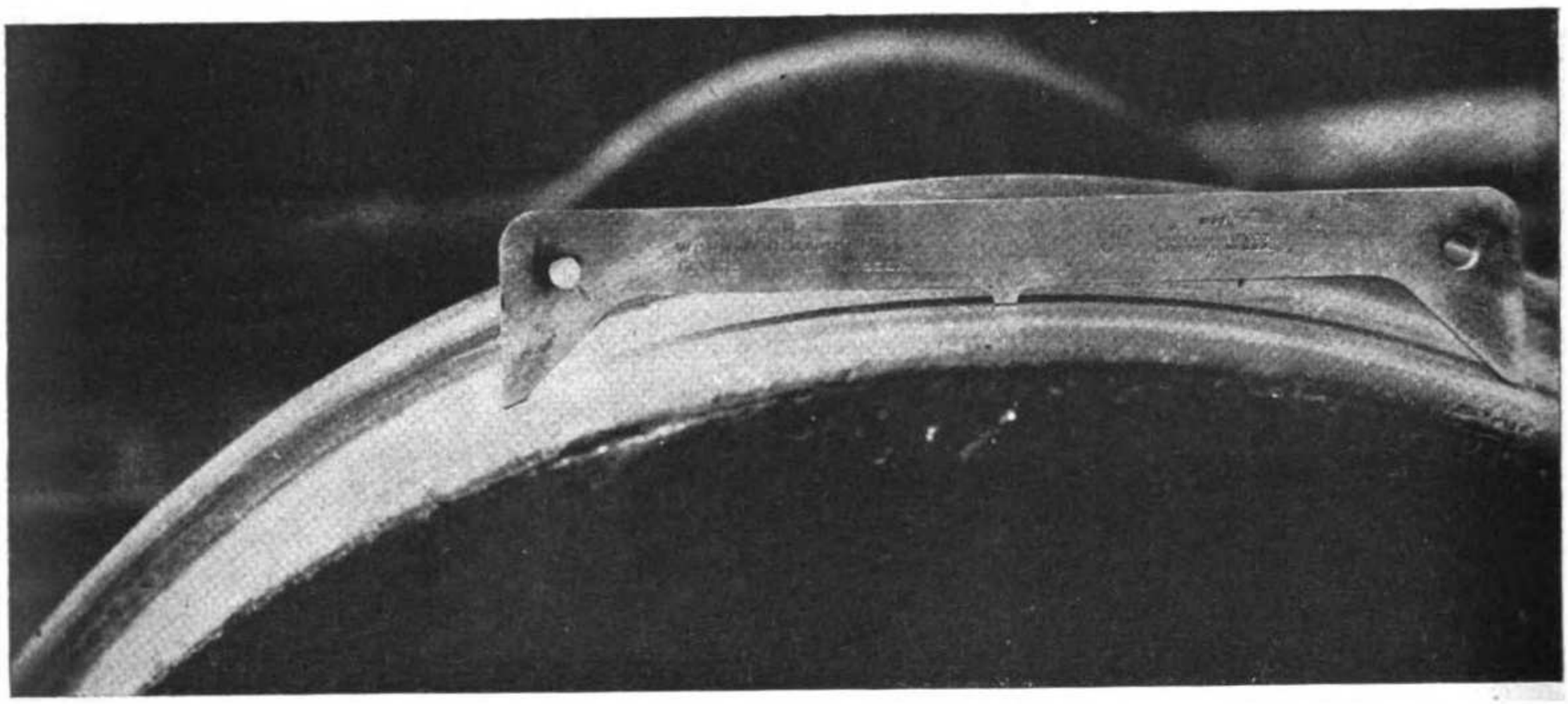


Figure 87. Out-of-round 33-inch diameter wheel.

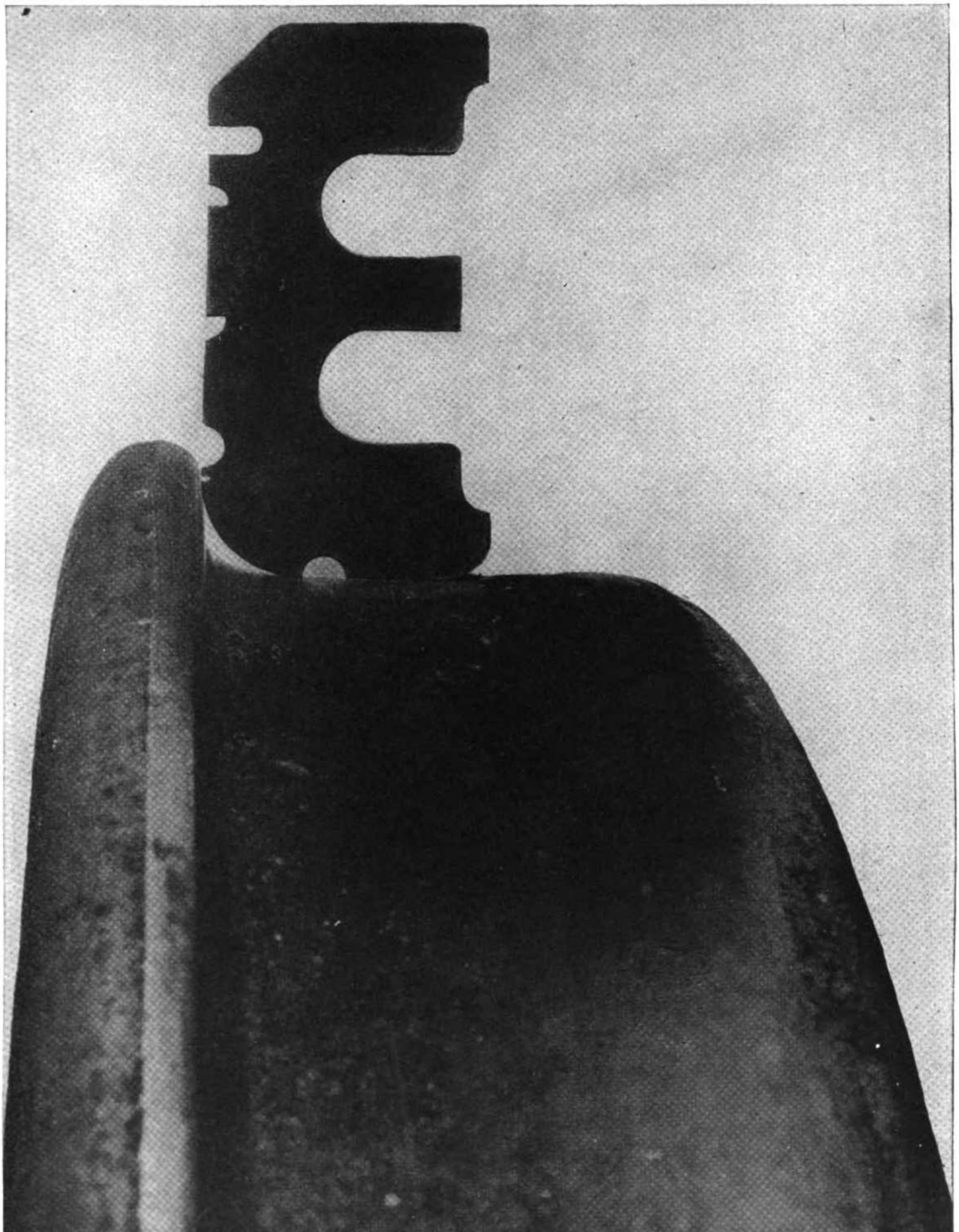


Figure 88. Vertical flange, cast-iron wheel. Condemnable.

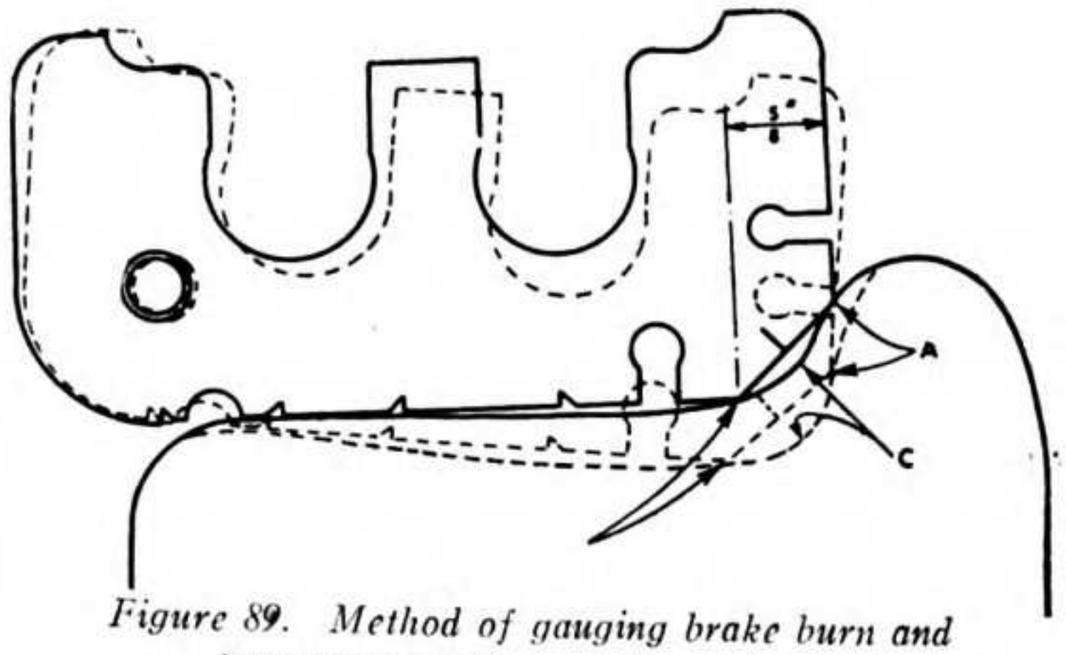


Figure 89. Method of gauging brake burn and transverse cracks, cast-iron wheels.

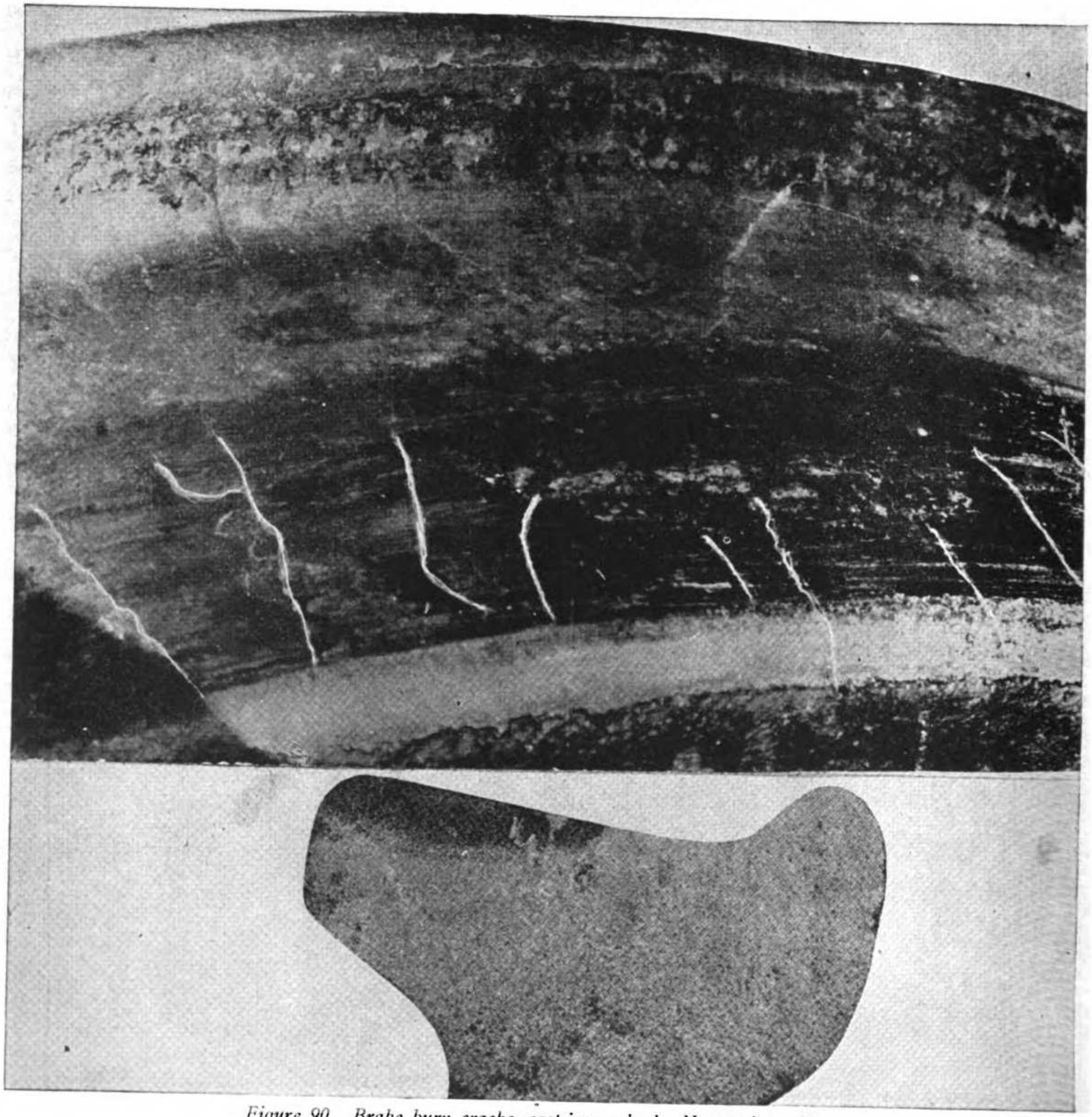


Figure 90. Brake burn cracks, cast-iron wheels. Noncondemnable.

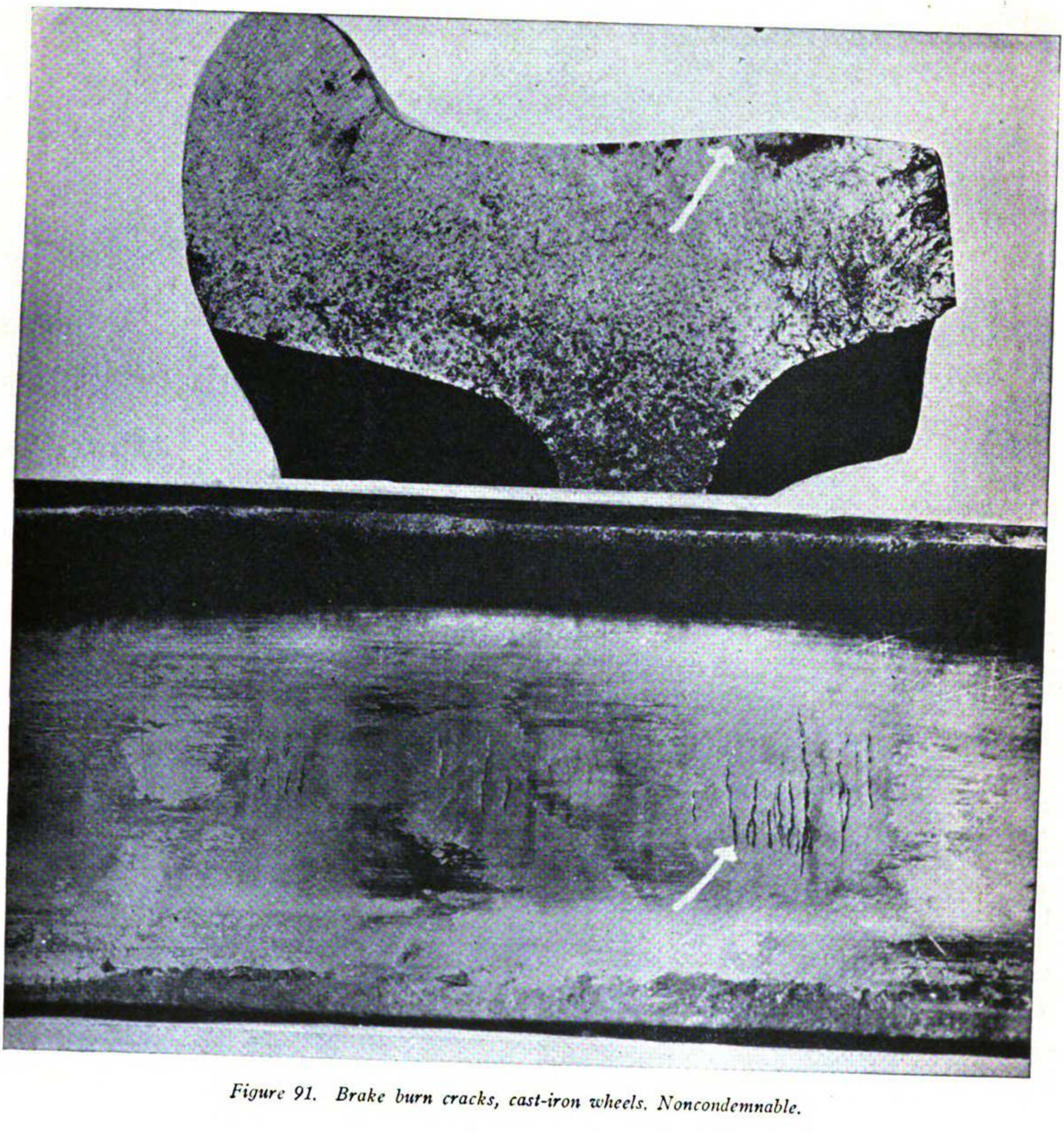


Figure 91. Brake burn cracks, cast-iron wheels. Noncondemnable.

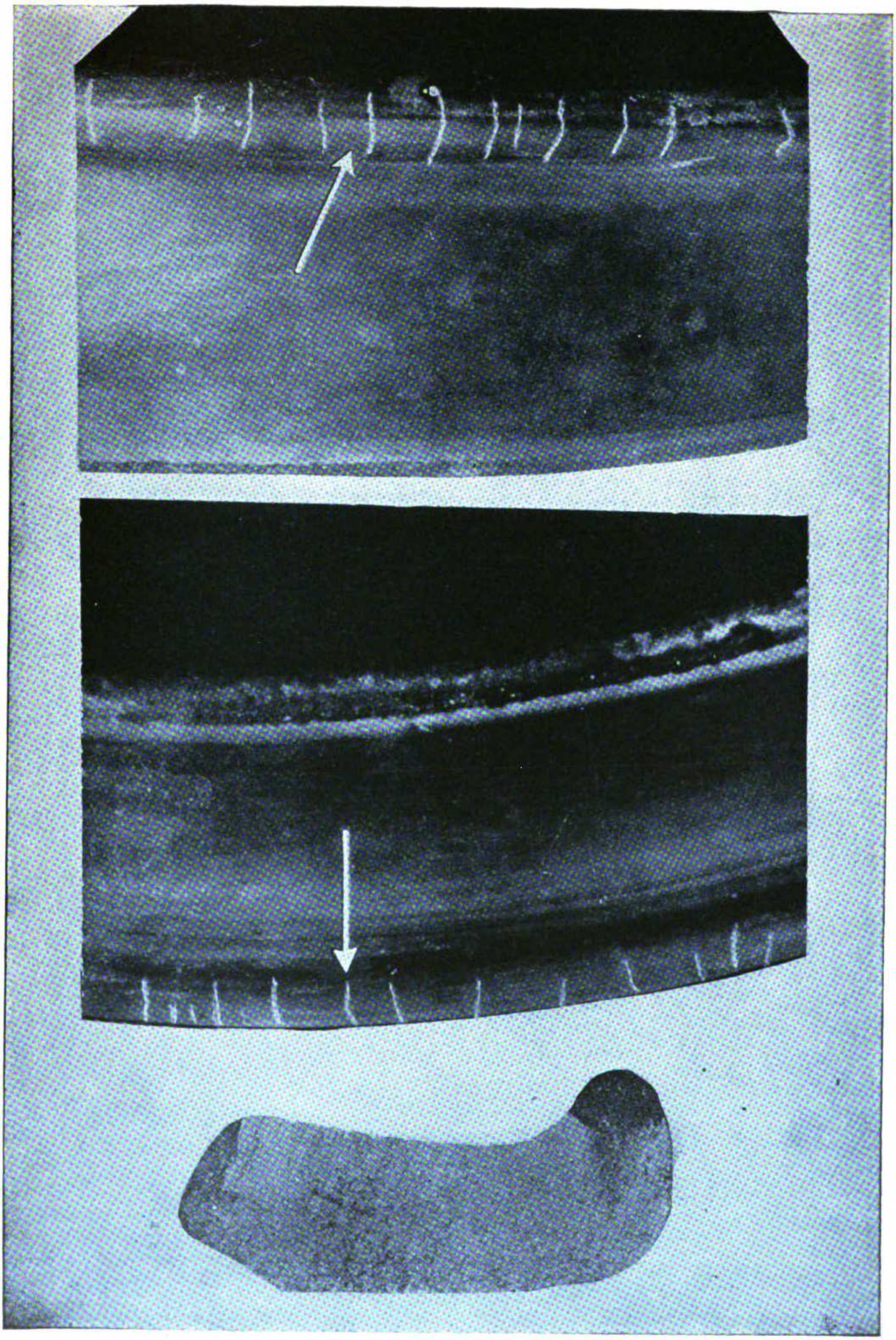


Figure 92. Brake burn cracks in flange, cast-iron wheel. Condemnable.

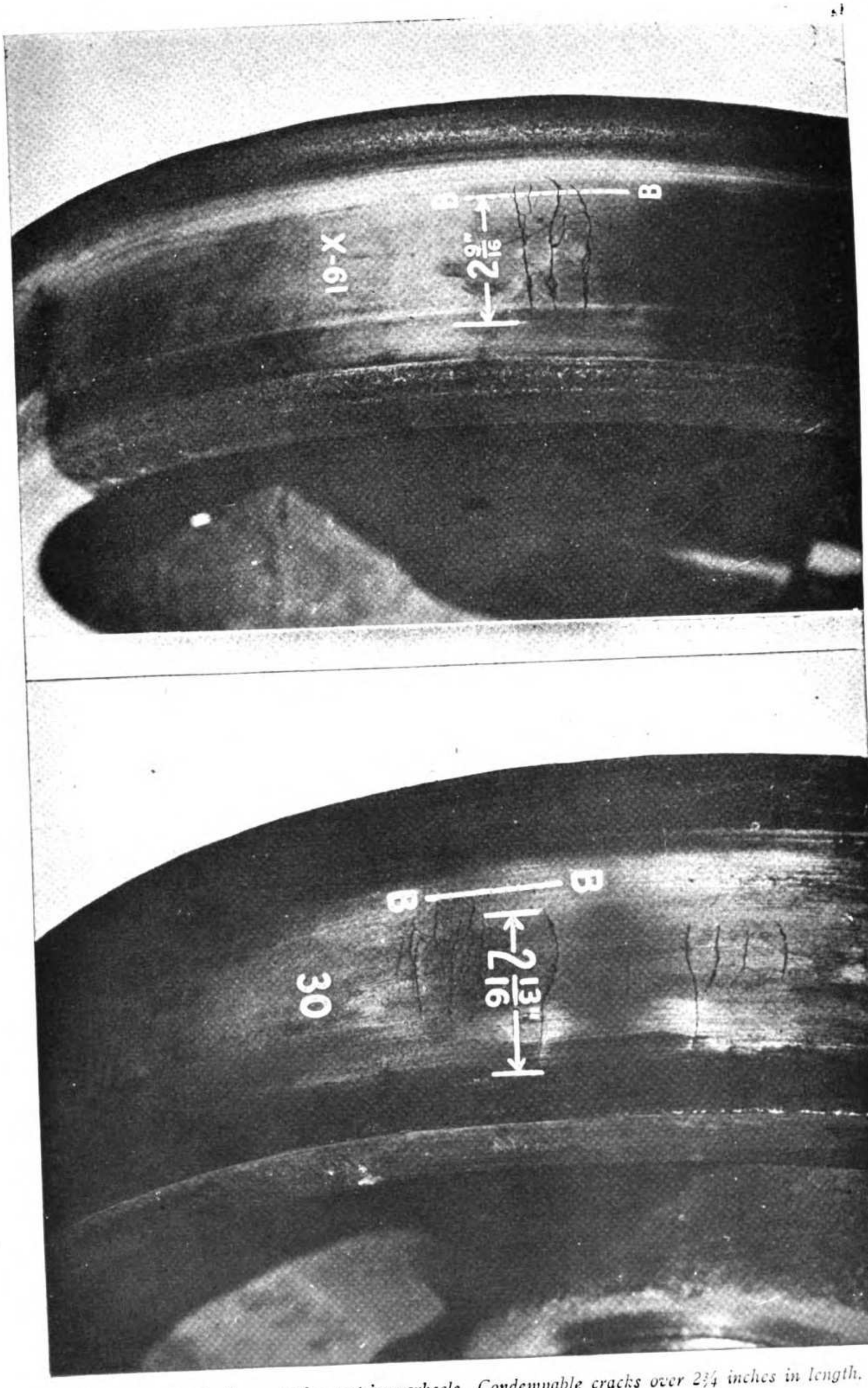


Figure 93. Brake burn cracks, cast-iron wheels. Condemnable cracks over 2¾ inches in length.

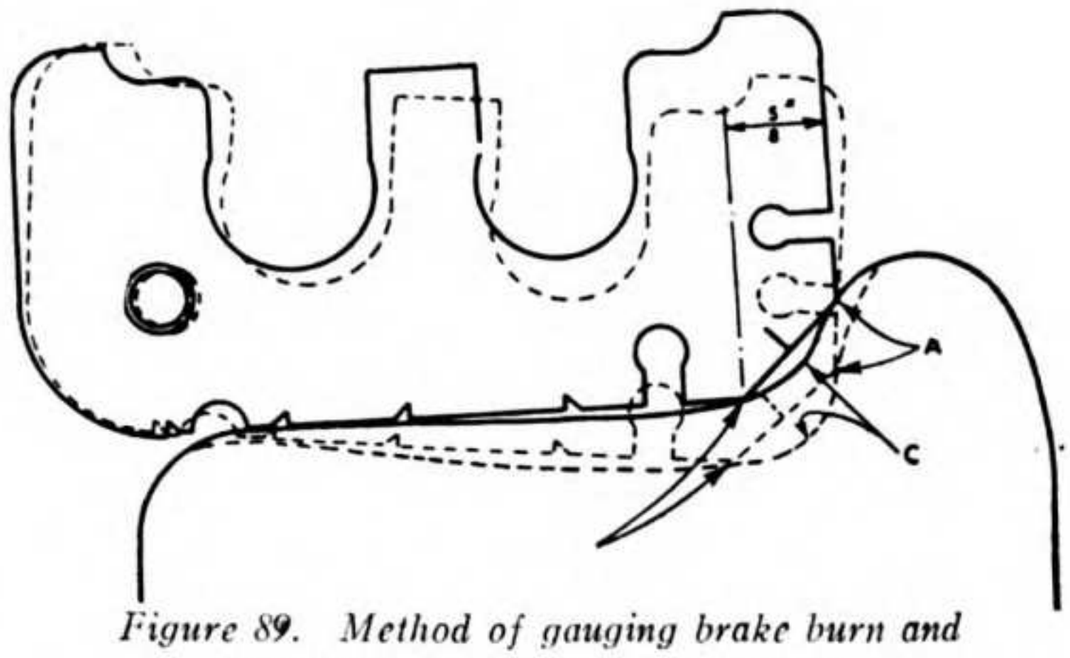


Figure 89. Method of gauging brake burn and transverse cracks, cast-iron wheels.

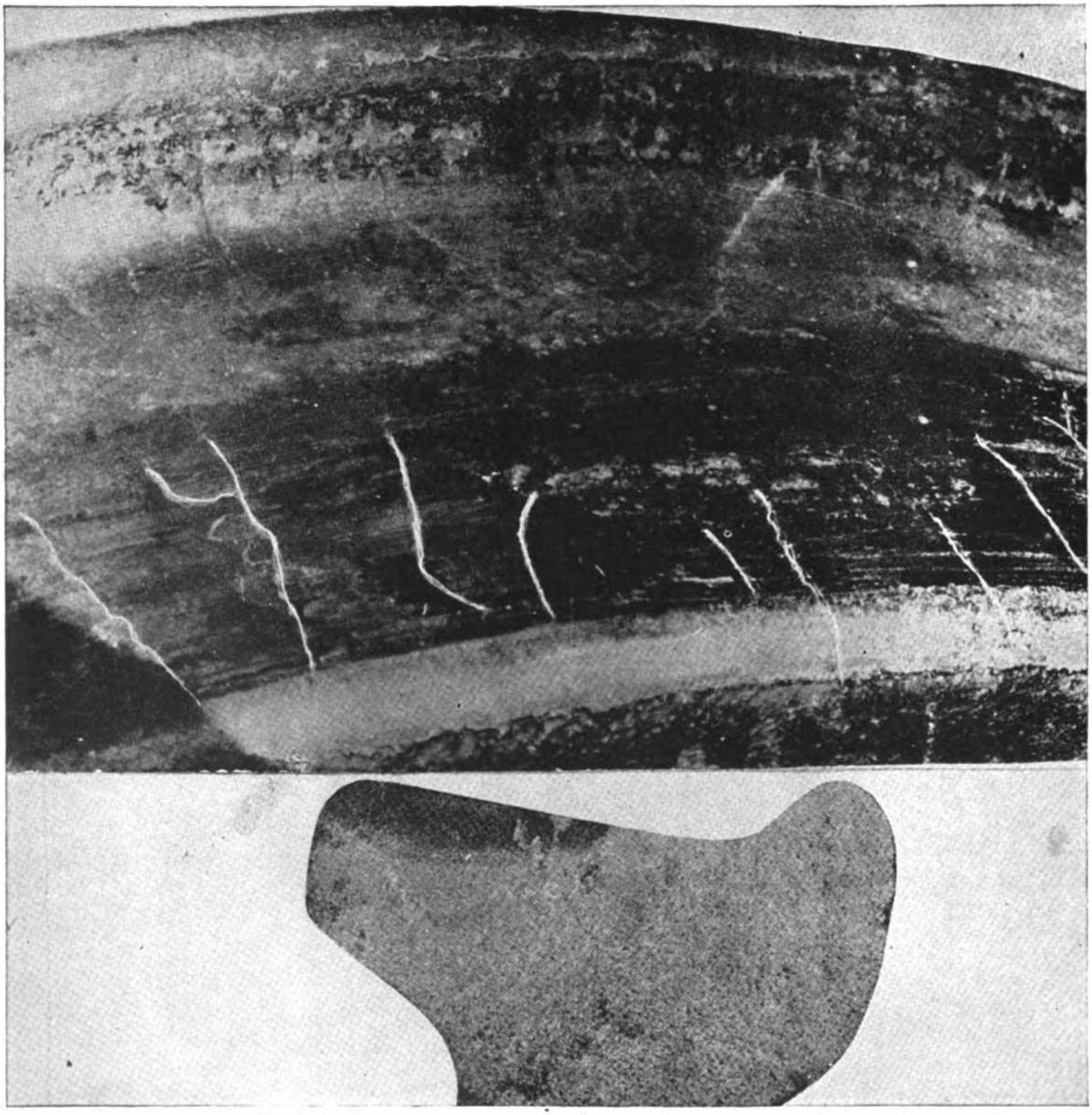


Figure 90. Brake burn cracks, cast-iron wheels. Noncondemnable.

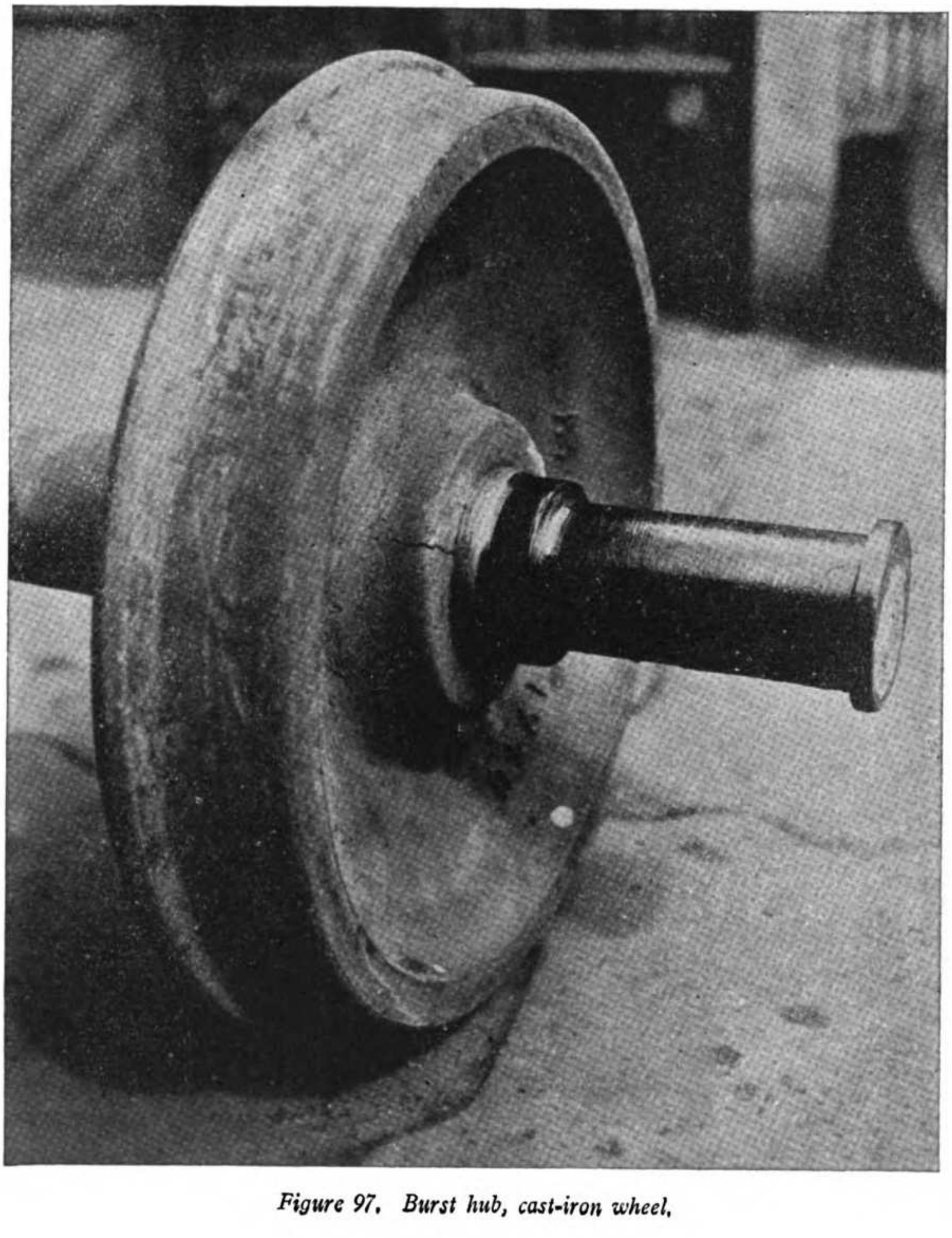


Figure 97. Burst hub, cast-iron wheel.

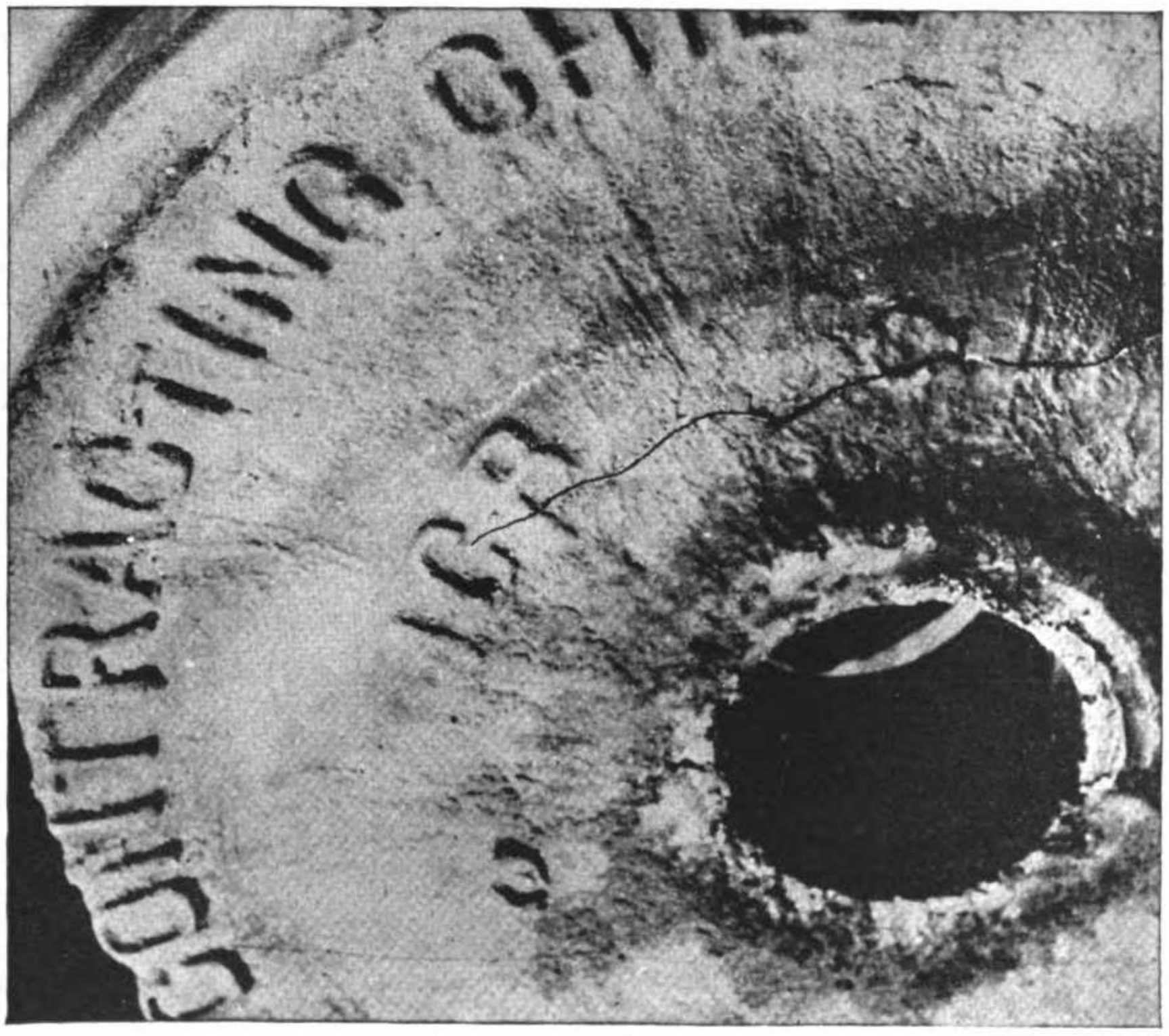


Figure 98. Cracked plate, cast-iron wheel. Condemnable.

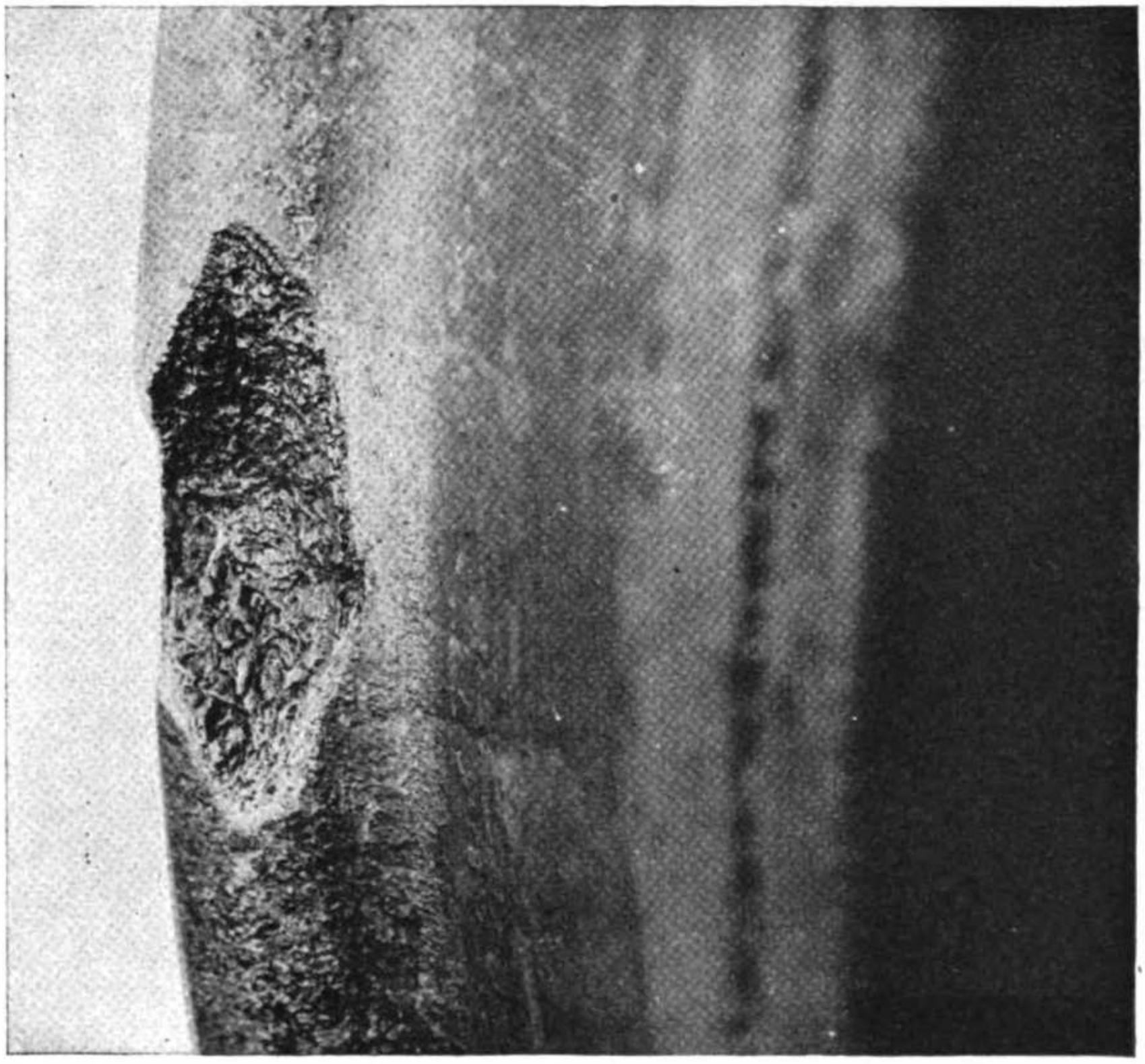


Figure 99. Chipped flange, cast-iron wheel. Condemnable.

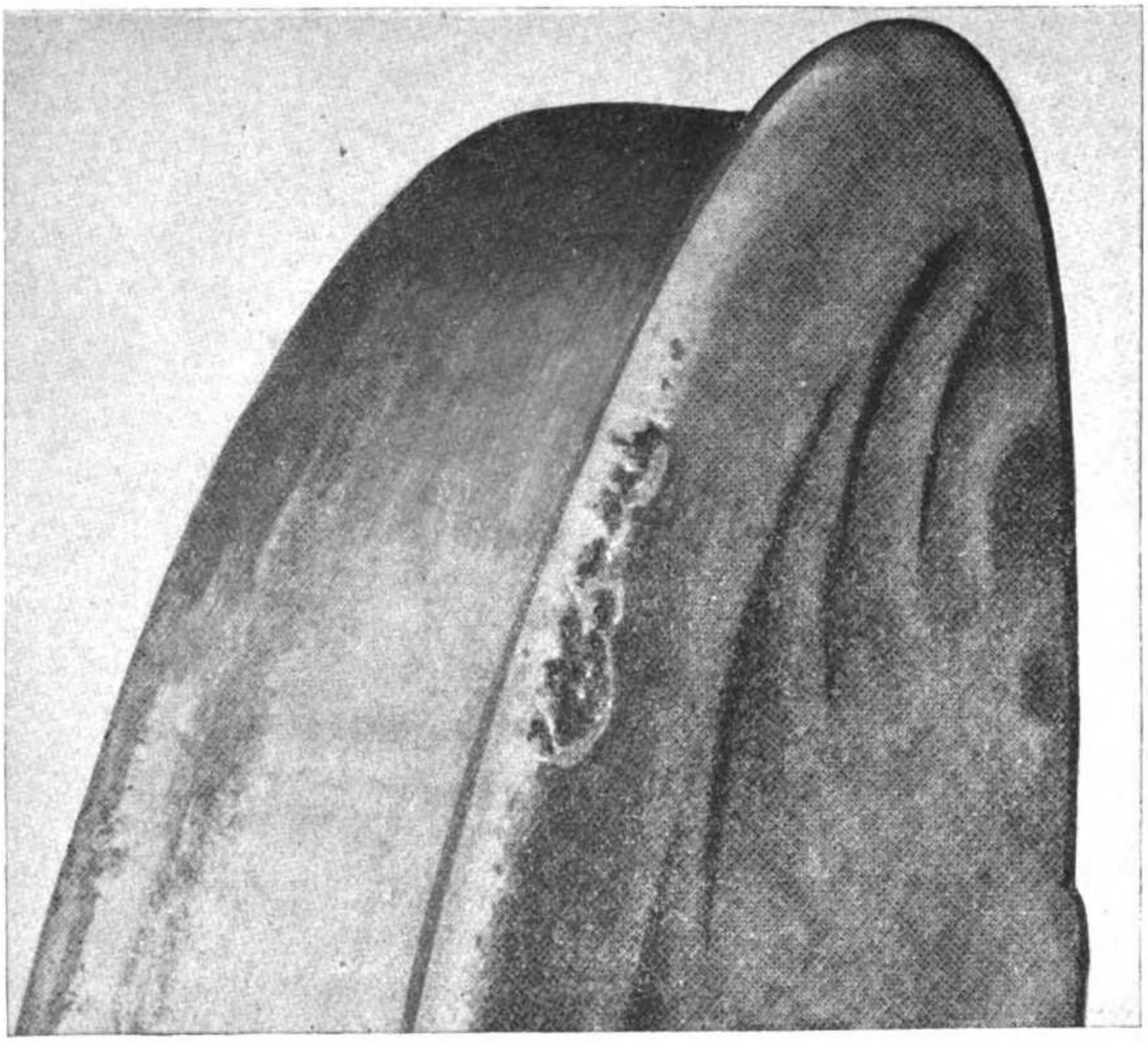


Figure 100. Chipped flange, cast-iron wheels. Noncondemnable.

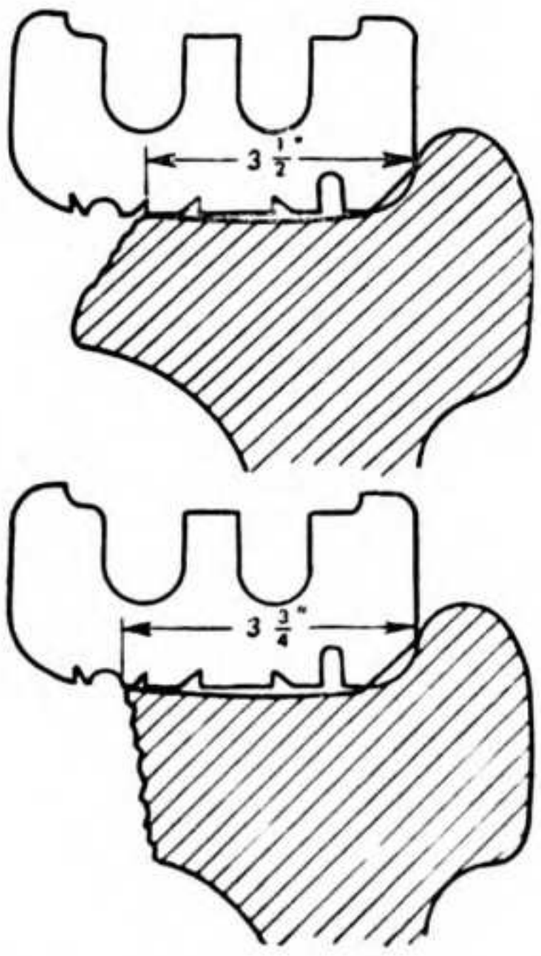


Figure 101. Methods of gauging broken rims. Condemnable.

44. Axles (Rule No. 62)

a. Axles will be removed from service for the following causes:

(1) If less than the limits of wear as prescribed in columns C, D, and E of table shown in figure 104, or when the condemning limits in columns F and H are reached.*

(2) When axles are cracked.

(3) When axles have seamy journals.

(4) When fillets at the back of journals are less than 1/8-inch radius on axles of 40,000 pounds capacity, are less than 5/16-inch radius on axles of

*Nominal capacity of axle, as shown in column "B," means any capacity in multiples of 1,000 pounds as stenciled on car, based on its light weight and total allowable weight for car and its lading as shown in column "A." Consideration will also be given to structural limitations. In no event may the nominal capacity, as stenciled on car, exceed the stenciled load limit. New dimensions and limits of wear specified above are applicable to the type of axle (fig. 104) in either freight or passenger service, except that limit of wear dimension "F" applies only to freight service.

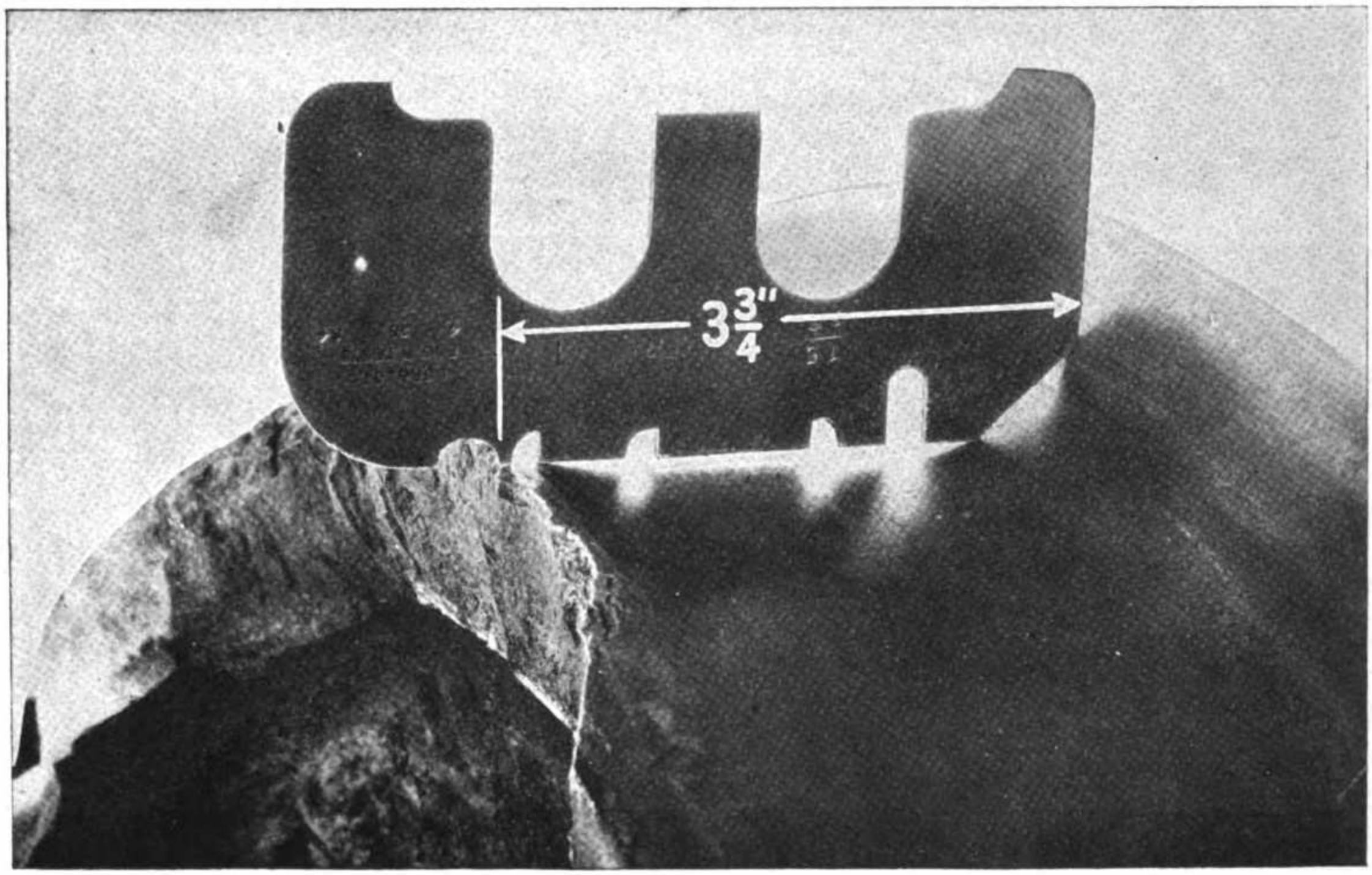


Figure 102. Broken rim, cast-iron wheels. Condemnable.

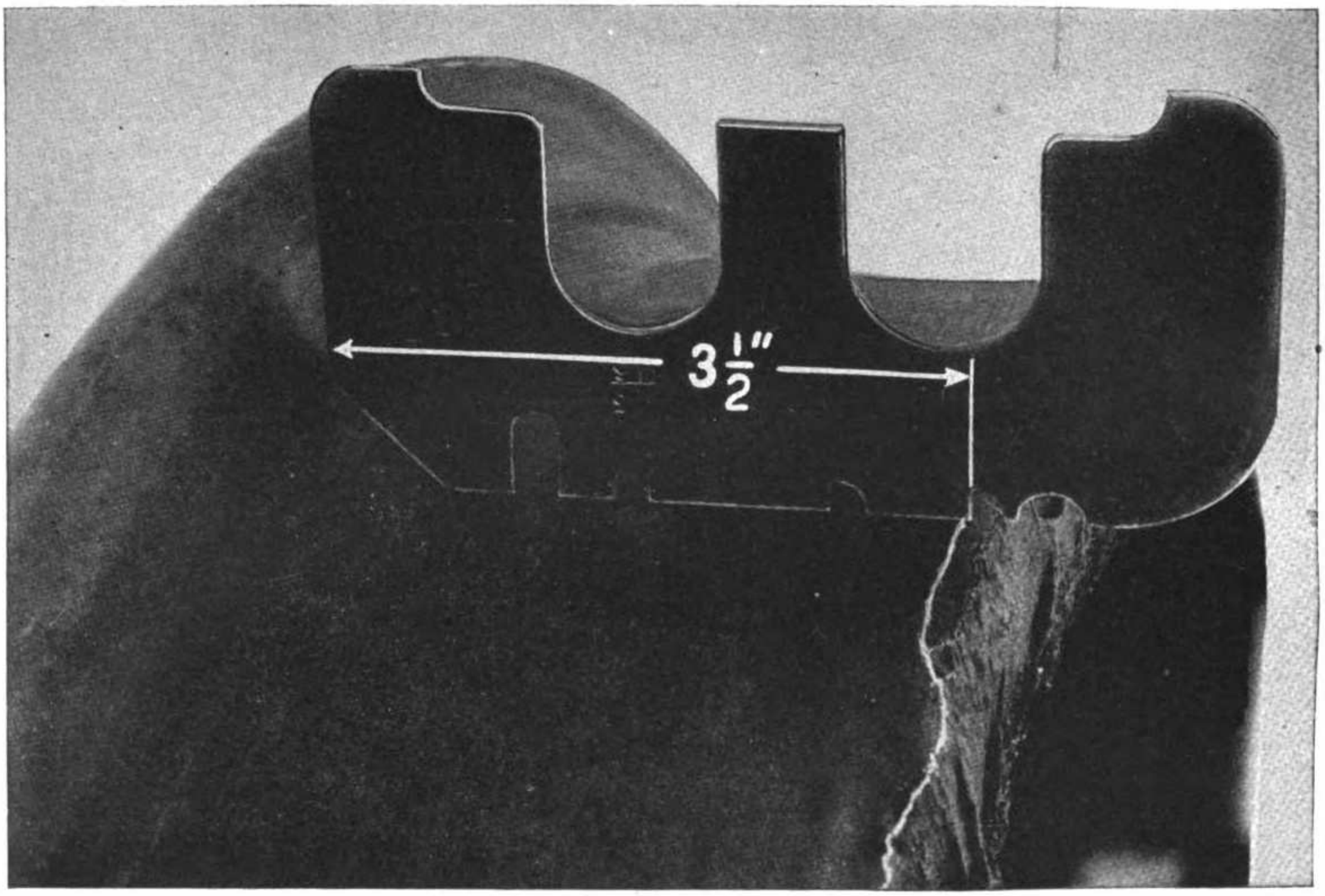


Figure 103. Broken rim, cast-iron wheels. Condemnable.

60,000 pounds capacity, and are less than $\frac{3}{8}$-inch radius on axles of greater capacity.

(5) When length of journal is increased $\frac{11}{16}$ inch over standard length. (Journal length gauge (fig. 105) will be used for checking correct length journals.)

(6) When collar is broken or worn to $\frac{3}{16}$ inch or less in thickness.

b. Cars may be loaded to the limit shown in column A of the table except where stencil load limit is reduced as indicated by a star (*) on each side of the car.

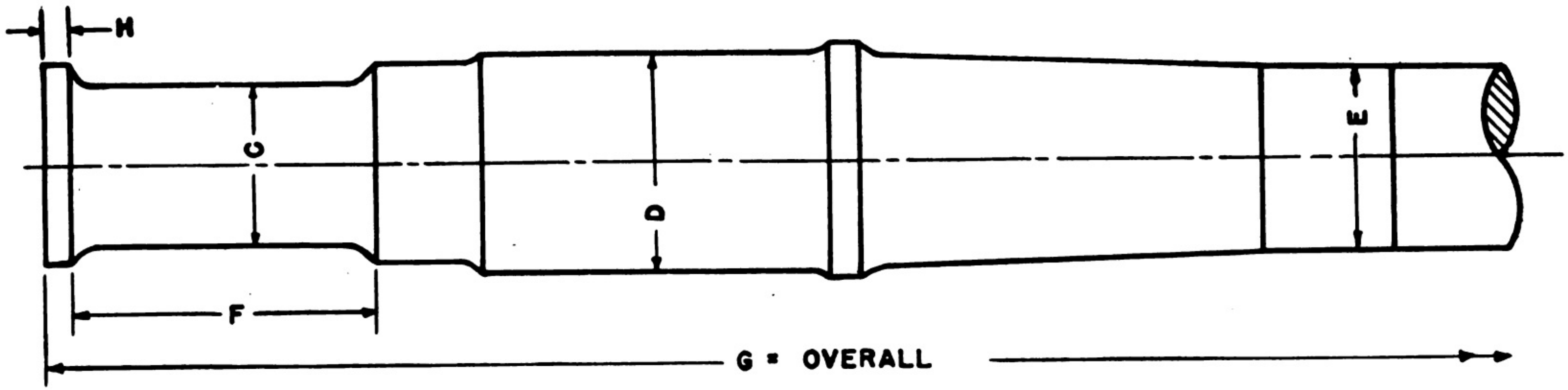
Section IX

FUSION AND BRONZE WELDING

45. General Regulations

a. QUALIFICATIONS OF OPERATORS (Rule No. 63). Welding by any process requires the utmost care and good judgment on the part of the welding operator. The operator's ability to perform satisfactorily the work in question and by the process selected will be certified by the mechanical officer in charge on the basis of tests for qualifying welders.

b. PREPARATION (Rule No. 64). The edges of pieces to be welded will be prepared as illustrated in figures 106 and 107. If both sides of the fractured member are accessible, the fracture will be prepared as in figure 106; when only one side of the fractured member is accessible, figure 107 will be followed. The entire crack or fracture will be cut, chipped, or ground out so that no portion of the crack remains. The surfaces upon which new material is to be deposited, will be clean and reasonably smooth. If the surfaces are prepared by flame cutting the oxide scale will be removed before welding is



STANDARD AXLES, LIMITS OF WEAR AND DIMENSIONS, NEW

AXLE DESIGNATION	A TOTAL WEIGHT ON RAIL	B *NOMINAL CAPACITY	LIMITS OF WEAR					DIMENSIONS, NEW					
			WEAR LESS THAN			WHEN REACHED							
			C	D	E	F	H	C	D	E	F	G	H
A. A. R.	LB.	LB.	IN.	IN.	IN.	IN.	IN	IN.	IN.	IN.	IN.	FT.-IN.	IN.
3 3/4" x 7"	66,000	40,000	3 1/4"	4 7/8"	4 3/16"	7 11/16"	3/16"	3 3/4"	5 1/8"	4 1/4"	7"	6 11 1/4"	5/8"
4 1/4" x 8"	103,000	60,000	3 3/4"	5 1/2"	4 11/16"	8 11/16"	3/16"	4 1/4"	5 3/4"	4 3/4"	8"	7 0 1/4"	5/8"
5" x 9"	136,000	80,000	4 1/2"	6 1/4"	5 1/4"	9 11/16"	3/16"	5"	6 1/2"	5 3/8"	9"	7 2 1/2"	3/4"
5 1/2" x 10"	169,000	100,000	5"	6 3/4"	5 3/4"	10 11/16"	3/16"	5 1/2"	7"	5 7/8"	10"	7 4 1/2"	3/4"
6" x 11"	210,000	140,000	5 1/2"	7 3/8"	6 5/16"	11 11/16"	3/16"	6"	7 5/8"	6 7/16"	11"	7 6 3/4"	7/8"
6 1/2" x 12"	251,000	200,000	6"	7 7/8"	6 3/4"	12 11/16"	3/16"	6 1/2"	8 1/8"	6 7/8"	12"	7 8 3/4"	7/8"

Figure 101. Table of new dimensions and limits of wear for standard axles.

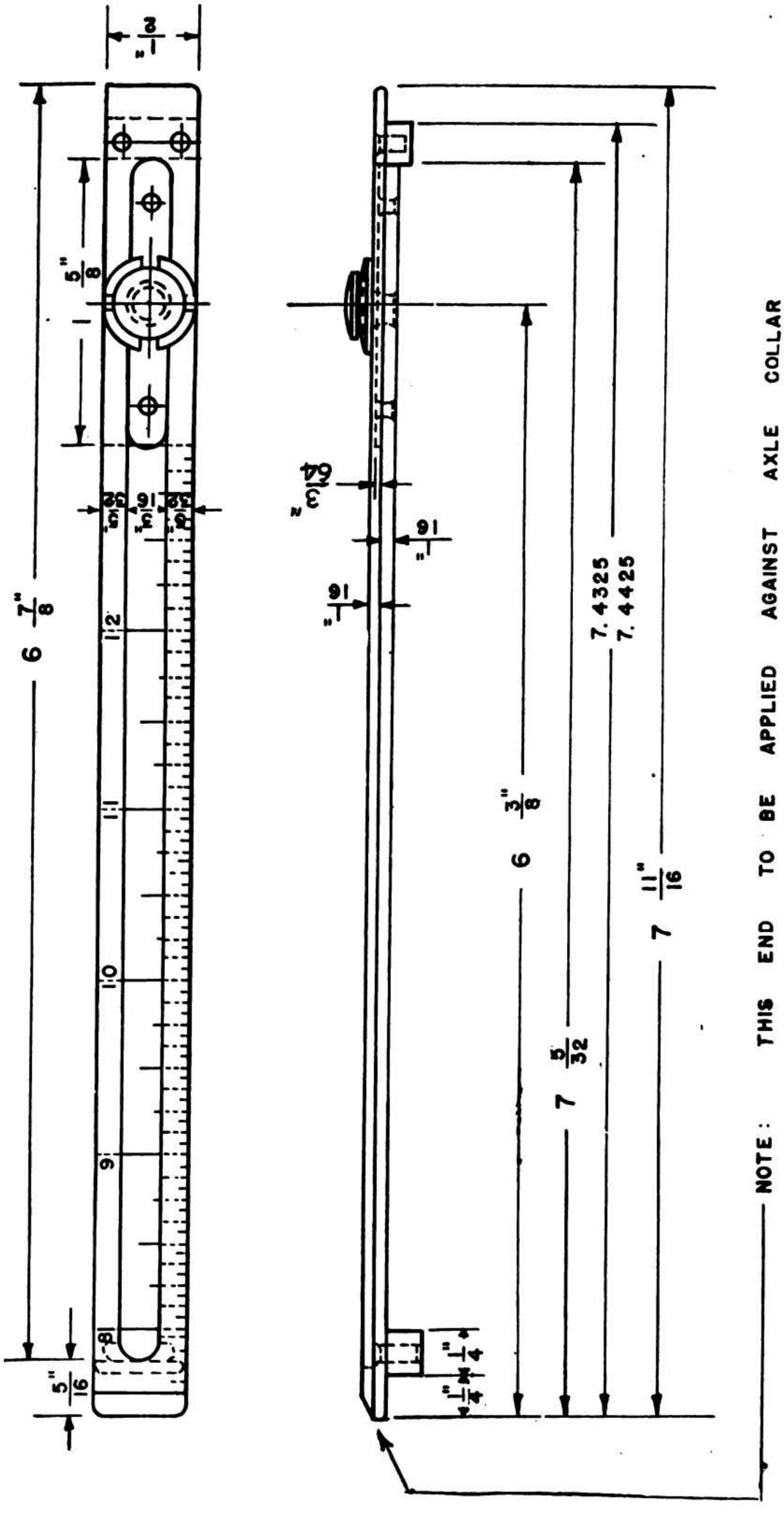
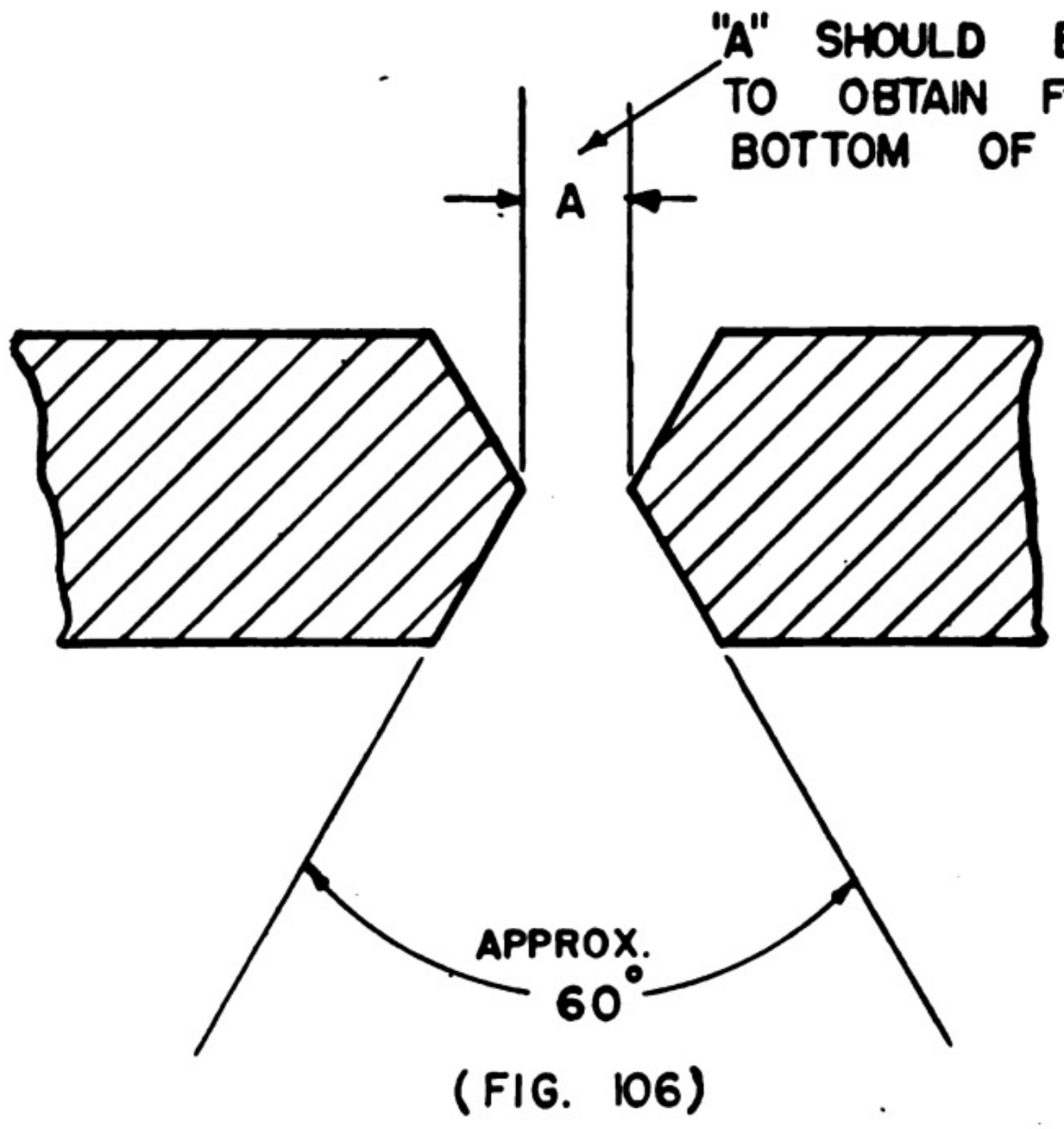
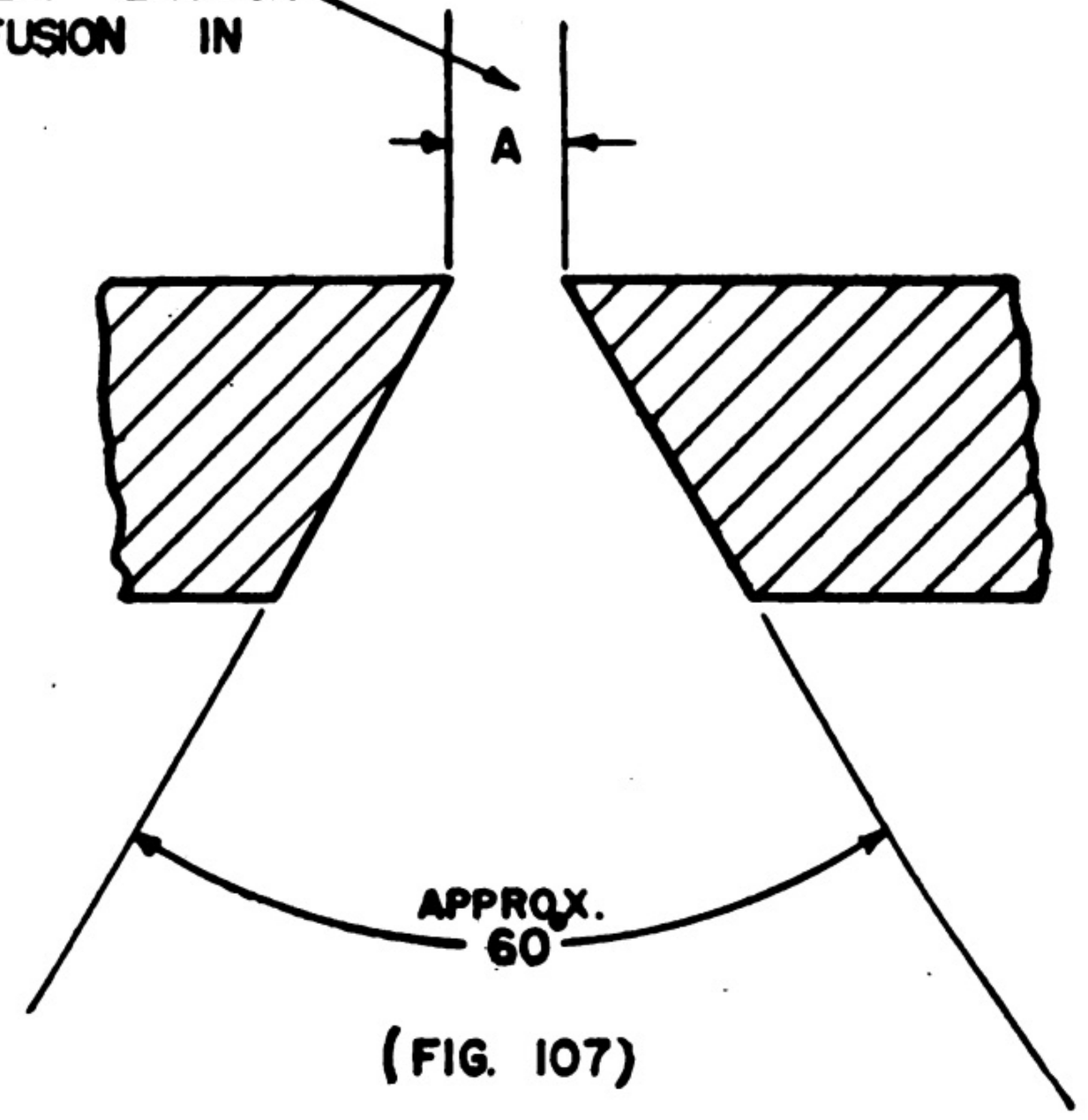


Figure 105. Journal length gauge. (T.C. Stock No. 41-4004-12-020.)



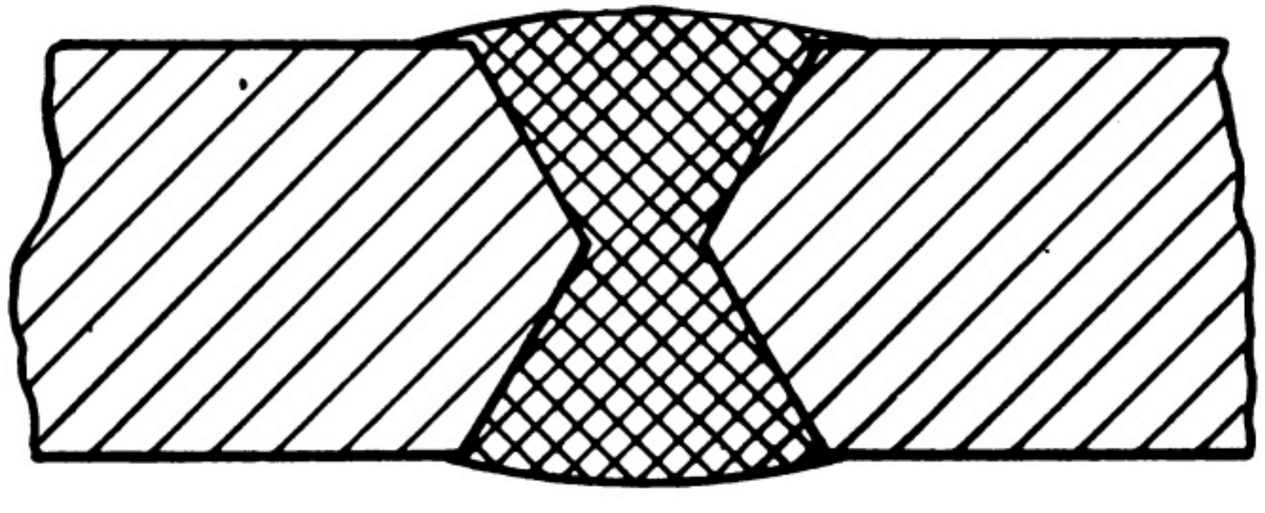
(FIG. 106)

Figure 106. Welding procedure when both sides of fracture are accessible.



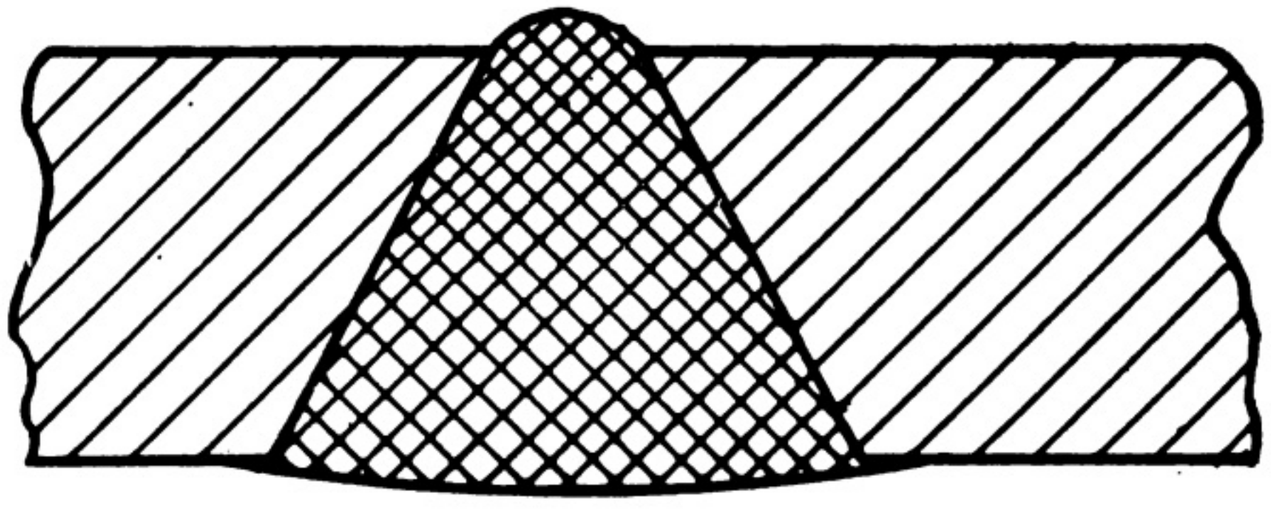
(FIG. 107)

Figure 107. Welding procedure when only one side of fracture is accessible.



(FIG. 108)

Figure 108. Completed weld contour of figure 106.



(FIG. 109)

Figure 109. Completed weld contour of figure 107.

begun. On malleable iron or cast iron any flame cut surface and affected area will be removed by chipping or grinding.

c. WELDING PROCEDURE (Rule No. 65). For arc welding any proven procedure may be used. It is good practice to employ multiple pass welding in layers approximately ⅛-inch thick laid with a slight oscillating movement of the electrode. In oxyacetylene welding or bronze welding the weld deposit will be made with a single pass.

d. WELD CONTOUR (Rule No. 66). Completed welds will follow the contour shown in figures 108 and 109. Heavy reinforcement is not necessary. The weld should not produce a notch effect at the junction of the weld with the parent material and every precaution will be taken to avoid abrupt changes in section thickness at the line of fusion.

e. BUILDING UP WORN SURFACES (Rule No. 67). Worn surfaces to be built up with new metal will be made clean and reasonably smooth. The deposited metal will be dressed to the required dimensions.

f. HEAT TREATMENT AFTER WELDING (Rule No. 68). (1) Parts for which annealing, normalizing, or stress relieving are required, will be heated uniformly to the specified temperature at a maximum rate of 1 hour per inch of thickness of material and will be held at this temperature for not less than 1 hour. Temperatures of furnace and material will be measured with pyrometers.

(2) For annealing, the temperature will be 1500° to 1600°F. and, if performed in a furnace, the material will be removed and allowed to cool in still air. Local stress relieving of material is permissible by heating the part to a red heat with blow torch and allowing it to cool in still air.

46. Welding Limitations (Rule No. 69)

a. Welding by either the electric or oxyacetylene process will be permitted on parts within the limitations referred to in *d* below except that parts made of high alloy steel subject to severe embrittlement, will not be welded nor have fusion heats applied to them. This will not be construed to include low alloy high tensile steels normally applicable to welding processes. Heat-treated carbon steels will not be welded nor have fusion heats applied to them unless such parts can be reheat-treated (duplicating the original heat treatment) after welding to restore former properties.

b. Car parts, other than listed under welding limitations, may be repaired by welding, provided the weld metal joint equals or exceeds the physical properties of the section welded.

c. Where it is permissible to weld malleable iron parts, it is mandatory to use the oxyacetylene (or equivalent gas) bronze welding process for making repairs in sections subject to tensile stresses. For malleable iron sections subject to compression stresses only, it will be permissible to use the arc welding process.

d. Personnel engaged as welding operators will observe the following limitations as to specified parts:

Part	*Limitations*
Arch bars, truck	No welding permitted.
Axles	Building up of worn end collars is permitted (electric welding preferred) to a finished thickness of at least ⅜ inch but not exceeding new dimension. Do not weld cracks or fractures, weld on an entire collar, or build up surfaces other than end collars.
Bolsters, cast steel	Building up worn surfaces is permissible providing the material remaining in the part is equal to 60 percent of the original section (heat treatment not required). No restrictions on welding cracks, fractures or complete break. Parts will be removed from car before welding, and normalized after welding.
Bolsters, pressed or structural steel	No restrictions.
Braces, body	No restrictions.
Brake beam tension members	No welding of cracks or fractures or building up permitted.
Carlines	No restrictions.
Center plates, malleable iron	Will be removed and bronze welded.
Center plates, cast or forged steel	No restrictions. If removed from car, parts will be stress relieved after welding.

Part	Limitations
Couplers and coupler parts	Welding operations will be done only at such points as are equipped with gauges to bring the reclaimed parts within the prescribed limits.
Coupler, rigid shank lengths	May be restored by welding.
Coupler, swivel shank length	May be restored by welding; will be normalized after welding.
Couplers, key slot	May be restored by welding; will be normalized after welding.
Couplers, shank wear at carrier	Coupler shanks which are worn ¼ inch but not in excess of ⅜ inch depth into the bottom wall, will be restored by welding; will be normalized after welding. Couplers worn in excess of ⅜ inch in this location will be scrapped.
Couplers, knuckle side wall cracks	May be reclaimed by welding except when cracks in the wall back of the knuckle tail extend more than 4 inches above or below the horizontal center of knuckle side wall (as measured on surface of coupler); or section broken out in this area and having any dimension in excess of 3 inches; will be normalized after welding.
Couplers, guard arm cracks	May be welded; will be normalized after welding.
Coupler knuckles	Worn surfaces may be built up by welding. Excess weld metal will be removed and part will be checked with proper gauges to insure interchangeability and proper operation. Cracks or fractures will not be welded.
Coupler knuckle throwers	Worn surfaces may be built up by welding.
Coupler locks	Worn surfaces may be built up by welding.
Coupler lock lifters	Worn surfaces on top lock lifters may be restored by welding.
Coupler pins	No welding permitted.
Coupler yokes, cast steel	When yoke is removed from car and found to be worn not in excess of ⅛-inch average depth on one strap it will be turned over and reapplied to car. If worn in excess of ⅛ inch and not exceeding 20 percent of the cross sectional area of the strap, it will be restored by welding. Cast steel vertical yokes with horizontal key may be welded in the keyway if the wear does not exceed ⅜ inch, maintaining the nominal dimension from inside back wall of yoke to front of keyway. Yokes will be normalized after welding. Cracks and fractures may be welded providing the area of the crack is less than ⅖ or 40 percent, of the total area through the section at point of fracture, except when they are at front of keyway, in the strap, at rear end of yoke, or in front section extending transversely into top or bottom strap. Cracks or fractures of any extent through web portion from rear end of key slot, either one or both sides, may be welded. Yokes will be normalized after welding.
Coupler yokes, vertical, forged steel	When yoke is removed from car and found to be worn not in excess of ⅛-inch av-

Part	Limitations
	erage depth on one strap, it will be turned over and reapplied to car. If worn in excess of ⅛ inch and not exceeding 20 percent of the cross sectional area of the strap, it will be restored by welding. If holes are worn in excess of ⅛ inch beyond original diameter, the yokes will not be reapplied to car without restoring the holes to normal diameter. Yokes will be stress-relieved after welding.
Draft arms	No restrictions.
Draft lugs, malleable iron	See paragraph 46*c*.
Draft lugs, cast or forged steel	No restrictions.
Equalizers, truck	No welding of cracks or fractures permitted.
Grab iron	No welding permitted.
Hand brakes, geared	Welding of cracks or fractures in operating parts of power handbrakes, or building up of the horizontal shafts, is not permitted. However, this does not prohibit forge welding of the rod which extends from the bell crank near the bottom of the car to the hand brake near the top of the car or the hand brake connecting rod.
Hanger, brake beam	Cracks and fractures will not be welded. Building up worn eyes is permitted.
Hanger, spring or bolster	Cracks or fractures will not be welded. Worn areas may be built up provided material remaining in part is not less than 80 percent of the original section; will be normalized after welding.
Hanger bracket, brake beam	Cracks or fractures may be welded, normalizing being required if weld is located closer than 1 inch from inside flange of side frame. Brake hanger brackets may be renewed or other types substituted by welding; normalizing being required if weld is located closer than 1 inch from inside flange of side frame. Building up worn holes is permitted.
Heads, brake beam, cast steel	No restrictions.
Heads, brake beam, malleable iron	See paragraph 46*c*.
Journal boxes (not integral)	No restrictions.
Ladders and supports	No welding permitted.
Levers, brake	Cracks or fractures will not be welded. Holes may be built up provided that material remaining in part is not less than 80 percent of the original section.
Plates, end or side	No restrictions.
Posts, end, side or door	No restrictions.
Sheets, body or roof	No restrictions.
Sills	Welding permitted. (See sec. 4 for details of splices.)
Sill steps and their supports	No welding permitted.
Shaft, brake	No welding permitted.
Stakes	No restrictions.
Spring planks	No restrictions, except where thickness is reduced to less than ¼ inch due to corrosion; spring plank will be removed for welding.
Tanks of tank cars	No welding of cracks or fractures permitted unless authorized. Welding metal card holders directly to tank of tank cars is not permitted. This prohibition also applies to card holders now secured in such manner when requiring reapplication account loose, or renewal.
Tie bar, truck	No welding permitted.
Top chord angles of open-top cars	No restrictions.

Part	*Limitations*
Transom, truck (meaning the cross member each side of bolsters which ties the side frames together)	May be welded in place by removing truck from under car body.
Truck sides, cast steel	Building up worn surfaces is permissible providing the material remaining in part is equal to 60 percent of the original section. Welding cracks or fractures is permissible when the area of the crack is less than ⅖, or 40 percent of the total area through the section at point of fracture. Part will be removed from car before welding; and normalized after welding.
Truck sides, pressed or structural	No restrictions.
Uncoupling levers	No welding of cracks or fractures permitted.
Wheels, brake	No welding of cracks or fractures permitted.
Wheels, car or tires	No welding permitted.

e. Location and extent of cracks which may be welded.

(1) *Couplers.* (*a*) Transverse cracks, including shrinkage cracks, in shank of coupler located from 1 inch in front of the key slot to and including back wall of horn, may be welded; there is no limitation in length or depth of cracks that may be welded.

(*b*) Cracks in guard arm and front face of coupler, including cracks extending full length of face, into lock opening, and into top and bottom wall, may be welded. If crack is open more than 1/16 inch, parts will be pressed back to original contour before welding is attempted.

(*c*) Cracks in knuckle side wall may be welded provided they do not extend beyond the shaded area (fig. 32). A broken out section within this area not exceeding 3 inches in any direction, may be repaired by welding in a piece of proper shape and thickness.

(2) *Cast-steel yokes.* (*a*) Cracks in straps, not closer than 3 inches to junction with rear of yoke, may be welded regardless of extent or direction of crack. If crack stands open, means will be used to hold the severed ends in proper relation while welding so that the length of the strap is not changed.

(*b*) Cracks anywhere in front section of yoke, including keyslot, may be welded.

(*c*) Cracks in rear end of yokes, including 3 inches of adjacent strap, will not be welded.

f. General instructions regarding welding of couplers and cast steel yokes.

(1) Welding of cracks in couplers and cast steel yokes will be made by the electric process, using a shielded arc electrode.

(2) Cracks in couplers will be prepared for welding by single veeing (fig. 107) so that all welding will be done from the outside.

(3) Cracks in yokes, if both sides of the fractured member are accessible, will be prepared (fig. 106) and the weld will be made from the outside.

(4) In all cases, the entire crack will be cut out far enough to the rear so that no portion of the crack will remain in the metal, and the surfaces where new metal is to be deposited will be clean and reasonably smooth.

(5) If a gas pocket is encountered when cutting out a crack or making a weld, and it cannot be entirely removed, the part will be scrapped.

(6) On couplers, welds will be dressed so that there is no projection on the front face, inside of guard arm, or bottom of shank; also no projections or beads will be allowed inside the knuckle or lock cavities which might interfere with operation of the coupler.

(7) On yokes, welds will be dressed flush with parent metal on the inside and outside of straps and in the keyslots. Front end of key slots will be gauged from the rear bearing surface of yoke to insure equal length on each side of the yoke so that it will line up properly in assembly.

(8) After welding, couplers and cast-steel yokes will be normalized in a furnace, using pyrometers or other satisfactory temperature measuring devices. Casting will be heated slowly and uniformly to a temperature of 1500° to 1600°F., allowing at least 2 hours to reach this temperature, and holding the casting at that temperature for a period of 1½ to 2 hours. This casting then will be removed from the furnace and cooled in still air, care being taken to protect it from strong drafts, rain, or snow. In no case will any casting be quenched in water or other liquid medium.

CHAPTER 4

INSPECTION AND MAINTENANCE

Section I

GENERAL

47. Classification Points

Normally cars are inspected and maintained at interchange points; at classification yards (both on arrival and departure); and at loading points, such as freight houses, industrial plants, and military posts. Cars requiring maintenance that cannot be completed in time for movement of train, will be cut out and billed to shop or repair tracks for servicing.

a. At interchange points, cars are inspected and necessary maintenance performed so that equipment conforms with Interstate Commerce Safety Appliance Regulations and Association of American Railroad Rules governing interchange and loading.

b. At classification yards, cars are inspected on arrival for defects requiring immediate attention. Cars are inspected prior to departure for defects that may prevent them from reaching their destination under load. Inspection also will be made of running gear and draft gear and for bad or shifted lading.

c. At loading points, cars are inspected to make sure the cars are in safe and suitable condition before the train is permitted to move. This inspection also will determine the suitability of the cars for proposed lading and to insure that all rules are observed.

48. Classification of Repairs

a. At shop or repair points where car repairs are made, the class of repairs will be determined by the number of man hours required to make the repairs. This classification will include only the applied labor of personnel working directly on the car and will not include cost of material nor labor preparing material in blacksmith shop, machine shop, air brake test room, wood mill, etc.

b. Repairs will be designated light, medium, or heavy as follows:

(1) *Light repairs.* Labor under 20 man hours.

(2) *Medium repairs.* Labor 20 hours to 50 hours.

(3) *Heavy repairs.* Labor 50 hours and over.

Section II

CAR INSPECTORS

49. Qualifications

The Association of American Railroads has set up minimum requirements and tests for car inspectors. Car inspectors in the zone of interior who inspect cars in interchange will pass these tests, and will make a grade of 75 percent in an examination covering A.A.R. Interchange and Loading Rules. War Department personnel who inspect Government-owned cars will pass an oral or written examination, consisting of questions compiled by a competent officer in the car department.

50. Responsibilities

a. It will be the duty and responsibility of car inspectors in freight train yards to—

(1) Inspect all cars.

(2) Pass judgment on mechanical condition of cars and their ability to proceed to destination.

(3) Classify cars for loading of suitable commodity.

(4) Make all necessary repairs possible.

(5) Shop and properly card all cars that cannot be repaired in train yard.

(6) Handle inbound and outbound trains for inspection and testing of air and hand brakes, and journal lubrication.

(7) Inform proper person when train is in satisfactory condition for departure.

b. It is the duty and responsibility of car inspectors in interchange yards to—

(1) Make inspection of all cars handled through interchange.

(2) Protect the War Department from loss by obtaining defect cards from the delivering carrier for any and all defects for which the carrier is responsible.

(3) Expedite movement of freight by having all cars offered in interchange in an acceptable condition.

(4) Carry out all general and local instructions pertaining to the handling of cars through interchange.

c. It is the duty and responsibility of car inspectors on passenger and hospital cars to—

(1) Make a thorough inspection of the cars.

(2) Make all necessary repairs that can be accomplished without shopping the cars.

(3) Make sure that air and hand brakes are in proper working condition.

(4) Make sure that air-conditioning equipment is operating properly.

(5) Make sure that cars are iced and watered.

Section III

INSPECTION—ALL CARS

51. General

a. Inspection will be made of each car in the train after a trip or movement and will include checks and examinations that can be made without removing parts of the car. Any defects found will be corrected before the car is permitted to be moved, loaded, originated in a train, or dispatched from a connecting or interchange point. Flame torches will not be used in inspecting cars; *use only inspector's lamp with glass reflector.*

b. In making inspection of cars, it will be the duty and responsibility of the inspector to—

(1) Refuse acceptance of foreign cars received from connecting lines which are not in a safe and suitable condition.

(2) Delay release of loaded cars received in unsafe and unsuitable condition until they are conditioned properly.

(3) Inspect all Federal safety appliances to see that they are in proper condition and meet the requirements of the Federal regulations before permitting cars to go forward.

(4) Check all cars for loose or protruding parts extending from the roof and sides of the car.

(5) Make sure that the running gear, including wheels, journals, and side bearing clearances, are in good condition. Inspect all wheels for defects such as seams in the throat of flange or treads, or cracked plates or brackets. (See sec. VIII, ch. 3.)

(6) Make sure that draft gear is in good condition; also that carrier iron bolts, nuts, and rivets, as well as straps and plates under draft gear, are tight and drawn up in place.

(7) Inspect and gauge couplers.

(*a*) Determine if they are worn beyond condemning limit gauge; watch for cracks and wear to coupler parts, yokes, rivets, draft key and key way slots, and renew defective parts.

(*b*) Inspect top operated type "D" coupler to see that the anticreep feature of the top lock lifter prevents the upward movement of the lock.

(*c*) Gauge couplers to see that they are within the proper height from rail in accordance with rule 24.

(*d*) Inspect coupler-operating levers to see that they operate the coupler properly.

(*e*) Tap with inspector's hammer each coupler cross key retainer, or its substitute used in place of the retainer, to determine that each is secured properly.

(8) Inspect journal boxes by raising the lids and making sure that the journal bearing and wedges are in good condition, that the packing is placed properly in the box, and there is sufficient oil to prevent heating of the journal.

(9) Test each box nut with inspector's hammer to make sure it is secured tightly.

52. Brakes

In checking car brakes inspectors will:

a. Check all foundation brake gear, truck, and body brake levers to make sure they conform to requirements; if brake lever badge plate is missing it will be applied to car as required by the instructions.

b. Inspect carefully brake beams, brake beam connections, and brake hangers to make sure that they are in good condition, with brake-connecting pins in place and cotter or split key spread sufficiently in the pin.

c. Tap with inspector's hammer each brake beam truss rod nut and brake hanger nut to make sure it is tight and in place.

d. Make sure brake levers, bottom rods, and bottom rod and brake beam safety support are in good condition; that brake pins are in place; and cotter pin or split keys spread sufficiently in brake pins.

e. Inspect brake shoes and brake heads.

(1) Make sure they are in good condition and that brake shoe keys are fastened securely.

(2) Make sure brake shoes are of proper thickness; remove and scrap any shoes worn to ¼-inch thickness at any point.

(3) Reverse irregular brake shoes to obtain maximum service from the metal.

f. Test hand brake to determine operative condition.

(1) Check the length of the hand brake chain to make sure it does not prevent the proper application of the brake.

(2) Make sure brake chain links are at least ⅜ inches in diameter at points where worn.

(3) Make sure that brake chain does not have more slack than the length of one standard link in chain when piston rod is back in full release and brake shaft is set with eye bolt pointing with straight line of chain.

g. Check lubrication of the bearing points around square brake shaft. (Due to dust and corrosion these points will be oiled freely when cars pass over repair tracks.)

h. Check the ratchet wheel, ratchet pawl, and brake wheel, to see that they are in place and secured properly, and that shaft is held in place at the bottom of the support by a cotter pin or split key through the shaft.

i. Make sure that hand brakes, with vertical wheel, are lubricated, and note if axles are corroded in the bearings making brake inoperative.

j. Examine hand brake pins and bolts to see that they are in place and secured properly.

k. See that triple valves, other than "AB" type freight brake equipment, are cleaned within the required 14-month period and are in operative condition.

l. Make sure that the "AB" type freight brake equipment is maintained and cleaned at 36-month intervals.

m. Test thoroughly retaining valve and its piping at last inspection point prior to descending heavy grades; at other points make visual inspection of retaining valves and piping. Never permit cars to leave the shop track without a thorough test and necessary repairs to the air brake equipment, including the retaining valve and its piping.

n. At inspection points, adjust piston travel to 7 inches.

o. Make sure that the brakes do not leak off and that the couplings, gaskets, and rubber hose are in good condition.

p. Test angle cocks and pipe brackets to see that they are fastened securely and in operative condition.

q. Make sure that reservoir, triple valve, and brake cylinder are attached securely to bracket, that air brakes are in good condition, and that brakes set and release.

53. Center Plates

Inspectors will make certain that body and truck center plates are not broken and are secured properly with all rivets tight; also that the king or center pin is in place to prevent the car slipping from position on the truck. See that center pin is secured in place to keep it from falling out when car is being turned over on a dumping machine.

54. Safety Appliances

Inspectors will check safety appliances to see that they meet requirements of the Federal Safety Appliance Laws and the A.A.R. Rules. This includes the brake shaft, brake chain, ratchet dog, ratchet wheel, brake wheel, and units on top of brake shaft bolting the brake wheel in place. Any of these parts found defective or at variance with the requirements will be repaired or renewed.

55. Doors on Closed and Open Cars

a. In the inspection of doors on box cars, inspectors will—

(1) Examine and operate side and end doors.

(2) See that doors work freely and that entire door mechanism is in good condition.

(3) Examine door post grain door nailing strips and replace any missing bolts that secure the grain door nailing strips.

(4) See that the bottom door guides are in place and tight to prevent pilfering of cars.

(5) See that door locks and hasps are in proper condition and secured in place so that doors can be sealed properly.

(6) Make sure that the door hanger at top of door is tight and secured in place so that the doors will be operative and held securely.

b. In the inspection of doors on hopper cars, inspectors will—

(1) Examine doors and door mechanisms.

(2) Renew defective parts.

(3) Adjust the door mechanism properly to insure tightly closed doors.

c. In the inspection of doors on open cars, inspectors will—

(1) Make sure that they will close tightly and are in operative condition.

(2) See that the door mechanism is intact so that door can be closed and locked properly.

56. Roofs

a. Roofs of cars will be maintained in proper condition to insure protection of contents in car.

b. All steel roofs will be inspected to see that rivets are tight and that none is sheared off.

57. Sills

In cars equipped with metal underframe or steel center sills inspectors will see if the sills are cracked or buckled. If wooden sills are used, inspectors will make sure that they are not rotten, broken, or split. Broken, cracked, or buckled sills usually are found directly in front of or behind the body bolster; close inspection will be made at these points to detect any of the above defects.

58. Additional Inspections

For inspections pertinent to tank cars, passenger cars, and refrigerator cars (see secs. IV, V, and VI below). For inspection of hospital cars (see ch. 5).

Section IV

TANK CARS

59. General

The classification, "Tank Cars," includes any car, other than a box car, designed for the transportation of liquids or compressed gasses, to which is attached one or more metal or wooden tanks not detachable for filling or emptying.

60. Inspection

a. Personnel handling the inspection of tank cars will familiarize themselves with the I.C.C. and A.A.R. classifications and use of each type of tank car to determine whether or not the contents of any car are classified properly and are safe to handle.

b. Tank cars will be inspected under load; all parts of the cistern will be examined carefully for leaks and the discharge valve checked to see that it is watertight. The inspector will not permit a tank car to be moved when leaks are discovered at the discharge valve or at any part of the cistern. Tank cars loaded with liquids other than gasoline, naphtha, and petroleum oil will be placed on the shop track and repaired immediately. Personnel will—

(1) Never approach a leaky tank car with an open light.

(2) Transfer load from leaky tank as quickly as possible.

(3) Make temporary repairs if tank leaks badly. If the outlet casting is broken off and the valve is leaking, pack leak tightly with waste or rags held together with a heavy lubricant soap; use clay if necessary.

c. Inspection will be made of dome covers and heater coils.

d. Inspection of trucks, brake rigging, couplers, draft gears, and underframes will be performed in the same manner as on other types of freight cars.

61. Maintenance

a. When cars are in the shop, the safety valves will be inspected. If the lading of the car is asphalt

or any similar product, it may congeal and the valve will not unseat at the prescribed pressure. Certain classes of lading do not require safety valves and are equipped with safety vents; these vents will be inspected to make sure that the disk is not ruptured.

b. Before any maintenance personnel enters a tank to make repairs, it will be cleaned thoroughly for safety. The easiest method is to remove the outlet cap and valve and blow a jet of steam into the dome while the cover is over the dome opening. The steam vapor will condense on the tank walls, run to the bottom, and pass through the outlet taking oil with it. After 4 or 5 hours of steaming the residue can be swept and flushed out with cold water.

c. If tanks have contained acid, tar, or heavy grease, it is necessary to "boil" them out. The tank will be filled with water, 400 to 500 pounds of caustic soda added, and steam turned inside the tank; the "boiling out" process may take as much as 48 hours. After treatment, the tank will be washed thoroughly with water as the caustic solution causes painful burns on contact.

d. While making repairs to an uncleaned car, personnel will not use a blowtorch or welding torch in such a manner that the flame will touch the tank.

e. Leaks in seams may be caulked temporarily by packing them with twine pushed in place with a sharpened piece of wood. A metal tool will not be used for this purpose. After the twine caulking is tamped in place, soap is rubbed over it to form a ridge. When the leak is plugged temporarily, the contents of the tank will be transferred to another car. Whenever possible, the empty tank selected should have contained lading similar to that in the leaky car; otherwise the transferred lading may be contaminated.

f. Other repairs are handled in the same manner as on other types of freight cars.

Section V

REFRIGERATOR CARS

62. Inspection

a. In addition to the usual inspections given to general types of freight cars, doors, hatches, and any other openings of refrigerator cars will be inspected to insure tightness of fit; roof, floor, and side walls will be inspected for leaks.

b. Bunkers will be checked to see that there is sufficient ice; condition of lading will be inspected.

63. Maintenance

Since insulation material loses its effectiveness when it becomes watersoaked, the floor, sides, and roof of the car will be kept in waterproof condition by stopping all leaks with a waterproof compound. In repairing the roof or any section lined with insulation, care will be taken to see that insulation is replaced exactly as it was originally.

Section VI

PASSENGER CARS

64. General Inspection

a. The same general inspection required for freight equipment will be followed for passenger car trucks, wheels, axles, couplers, draft gear, brakes, brake-rigging, superstructure, and the like. In addition, cars will be inspected for cleanliness of windows and interior upholstery, and need for repainting. Equipment items such as water coolers, lavatories, fans, and air-conditioning equipment will be inspected and, if necessary, repaired.

b. Since passenger cars carry human cargo and any negligence in inspection may result in injury or loss of life, inspectors will make sure that the following are in good condition: steam hose and connectors, regulators, traps, magnetic valves, generators, drives, batteries, compressors, motors, refrigerator pipes, and controls.

65. General Maintenance

a. The maintenance of passenger equipment differs from that of freight cars in that a large portion of the equipment is designed and arranged especially for some particular train or type of service. As extra cars are seldom available, the individual car usually

is maintained while actually in service and maintenance is done during time of ordinary layover.

b. When thorough maintenance work is performed at terminals, the cars will be available for longer periods of service without shopping for general overhaul.

Section VII

CAR LIGHTING EQUIPMENT

66. Generators

a. ADJUSTMENTS. Underframe belt-driven generators will be hung from the car so that the hanger yoke of the generator will be inclined slightly toward the trucks when the belt is applied. This gives the belt proper tension to avoid slipping on the pulleys. Another method of regulating belt tension is to measure the distance with a flexible tape around both pulleys with the generator hanging in its proper position, after which the belt will be cut 6 inches shorter than the measurement taken by tape. This measurement will be taken when the belt is removed. Care will be taken that axle and generator pulleys are kept in proper alignment to avoid loss of belts. This is important as the charging rate to batteries is entirely dependent on the proper operation of the generator.

b. COMMUTATORS. Hanger pin of the generator will be kept well lubricated at all times to insure proper belt tension as trucks change their position while the car is in motion. Dust covers will be removed at regular periods and brushes and reversing devices will be examined thoroughly. Brushes will be free but not loose in the holders and will not be allowed to wear beyond the point where the pressure springs do not hold them firmly in contact with the commutator. Commutator will be clean and have a bright smooth surface at all times. If the commutator is blackened, pitted, or burned so that it cannot be cleaned easily in its place in the generator, it will be removed and turned in a lathe, care being taken that only the necessary amount of copper is removed to true up the face of the commutator. Commutator will be finished with fine sandpaper and the mica between the bars will be undercut to approximately $\frac{1}{16}$ inch with either a power or hand tool, care being taken to see that all mica in the slot is removed to this depth after beveling slightly. The edges of the commutator will be inspected carefully to insure that no particles of copper remain in the slots.

c. LUBRICATION. Lubrication of the generator bearing will be done carefully through the use of grease, general purpose, No. 2, Product Symbol WB. Care will be taken not to over-fill the bearing housings, as too much grease in the ball or roller bearing is as bad as not enough because of the heat developed by friction of the bearing rotating through the mass of grease. The average quantity of grease for any type of ball bearing is about two-thirds the capacity of the bearing housing. Grease retainers or gaskets will be inspected carefully so that no grease may work into the interior of the generator. Grease on the commutator causes poor commutation and may result in burning out of the armature. Grease on the field coils is injurious to the insulation.

d. CLEANING. All connections to the brush holders and reversing devices will be kept tight and clean; in case of excessive dust accumulation, the interior of the generator may be blown out with dry compressed air at low pressure. Leads from the generator will be watched for chafing and their connections kept tight and clean on the terminal block.

e. HEAVY REPAIRS. The above instructions are intended for use in maintenance of equipment in service. If heavy repairs are necessary, the generator will be removed from the car and overhauled thoroughly, and all bearings and other parts cleaned and replaced with new parts if necessary. Insulation resistance of field coils and armature will be tested and all insulation cleaned and new insulation applied if necessary. Insulation will not be allowed to drop below one megohm.

67. Batteries

a. LEAD ACID TYPE. (1) The solution in the batteries will be maintained to cover the entire area of the plates and the height of this solution will be kept normal by the addition of water. Only water known to be free of mineral and alkalies will be used; if possible, use distilled water.

(2) Batteries require periodic attention consisting of checks for the height of solution, and a reading of the specific gravity which indicates if the battery is charged sufficiently. Batteries and battery boxes will be kept clean and well painted. Connections will be kept tight and clean. Batteries that are consistently low in gravity, if no adjustment can be made in regu-

lating apparatus, will be charged often enough to keep them approximately at their rated specific gravity. The charging rate will be governed by the condition of the battery, that is, when a battery is practically discharged a higher current may be used than when the battery is only partly discharged. These charging rates will be governed by the ampere-hour capacity of the battery as listed on the battery name plate. During charging, the battery will be watched to see that it does not gas too freely. Open flame will not be allowed near gassing batteries. The temperature of the solution will not be allowed to raise above 110°F. as this overheats the battery and causes heavy gassing with resultant loss of solution.

(3) Voltage checks will be made frequently of batteries in service and voltage readings of batteries on charge will be taken at intervals. When batteries are being charged, the specific gravity will be checked each hour, and when no further rise in gravity is noted the battery is considered as fully charged.

(4) Connection between cells or batteries will be kept tightened and in good condition; any accumulation of dirt or acid on the outside of batteries and cables will be washed off with water. Battery trays and wooden parts will be treated with an alkaline solution. Batteries will be blocked securely in the box so that they will not shift when car is in motion; this helps to eliminate slopping of acid and injury to battery case.

(5) An idle battery standing in a discharged state for a long period of time may not come up to full initial charge promptly. In this event the battery charging will be continued until the battery is fully charged or until it is ascertained that the battery is faulty in which case it should be replaced.

b. ALKALINE OR EDISON TYPE. (1) The alkaline battery is similar in operation to the lead acid type battery, however the normal specific gravity of the electrolyte changes little between charge and discharge.

(2) In the alkaline battery, the condition is best determined by checking the battery voltage under load. The open circuit voltage is 1.2 volts per cell.

(3) Solution in the alkaline battery will be maintained in the same manner as the acid type of battery using distilled water; keep plates covered 1½ inches. The gas from the alkaline battery is explosive and the same precautions will be exercised as recommended in *a* (2) above.

c. SHOPPING BATTERIES. Batteries will not be allowed to remain in continuous service without a capacity test for a period greater than 30 months. The work done in overhauling the battery at this time will be so thorough that there will be no necessity for returning the battery for painting, solution renewal, or cell repairs before the next normal car shopping period. At the time cars are shopped, batteries will be brought into the battery room for testing, cleaning, and painting.

68. Relays and Regulators

When the generator voltage exceeds the battery voltage, the switch closes and the generator is connected to the battery. When the generator voltage drops below battery voltage, the battery supply coil becomes the stronger and pulls the switch open, preventing the current from the battery passing into the generator.

a. From the main switch, the generator current passes through a resistance regulator. This device regulates the generator output by controlling its field excitation, thus limiting its output to the requirements of the battery and lamp load.

b. Current passing to the lamps also passes through a regulator that operates on the same principles as the generator regulator, holding the voltage constant. This prevents flickering of the lights and saves bulbs. Both these regulators have air dash pots which dampen the movements of the links and levers keeping them steady and preventing sudden surges and flutterings of the apparatus. These dash pots have adjustable air vents and will be adjusted to keep regulators operating smoothly. They will work freely at all times, and care will be taken to see that they do not stick. All hinge pins on regulators will be checked at regular intervals, kept free from sticking, and maintained in smooth condition. Dust and dirt will not be allowed to collect on regulators, as this is one cause of sticking of dash pots and hinge pins. Dust may be blown off with dry compressed air at low pressure.

c. All electrical contacts will be kept clean and in good condition; all wiring will be maintained carefully and checked for shorts and grounds at regular intervals. Fuses will be of proper sizes and kept tight in holders.

Section VIII

HAND BRAKES

69. Inspection and Maintenance

a. When the hand brake is applied tightly, all brake shoes should be in solid contact with the car wheels. When hand brakes do not have sufficient power to provide this contact, adjustments will be made to meet this requirement.

b. If the hand brake wheel or lever is fitted directly to the brake shaft or operating shaft, it will be secured tightly so that both will rotate in unison when moved in the direction of brake application.

c. Gears used in transmitting power from an operating shaft to the brake shaft, winding drum, or similar arrangement, will be fitted securely and will be maintained to mesh properly.

d. Hand brake wheel or hand brake lever, connected to brake shaft or operating shaft with a ratchet arrangement, will be maintained so that this ratchet (distinguished from hand brake ratchet) operates freely and its pawl is snapped snugly into the ratchet teeth by a suitable arrangement. The angle of contact between the ratchet pawl and teeth will be maintained at all times so that the pawl will not slip when a pull is exerted in the direction of brake application.

e. Hand brake pawls and ratchets will be maintained to engage safely and securely when the brake is applied; they will be anchored to brake shaft, drum, or support to hold the brake applied to any degree, will be maintained in proper position, and will operate freely.

f. The brake shaft together with its brackets, bearing, and housing, will be maintained securely in position to avoid lost motion, misalignment, and undue friction. Where brake shaft bearings are subject to accumulation of dirt or other foreign matter, or where the shaft passes through end sills or other parts of the car structure, the openings will be made large enough for easy cleaning.

g. Hand brake chain slack will be sufficient and will not exceed the amount required to connect properly the hand brake rigging when all parts are in their full release position. Hand brake chain hangers, or carriers, will provide clearance or bearing surface to prevent chains fouling and developing undue resistance to movement. Where carriers or supports are covered with dirt or other foreign matter they will be cleaned with sufficient frequency to provide for their free and unrestricted movement.

h. Brake rods, levers, cables, or connections, will be kept from binding or fouling and will be maintained to move freely in their supports, carriers, or hangers.

i. Cotter or split keys, bolts, pins, or other means of securing hand brake parts in place, will be maintained in proper condition to provide for safe and suitable operation of the hand brake.

j. Bell cranks and sheave wheels will be anchored securely in position and maintained to move freely in bearings or supports, providing for free movement of hand brake chains, rods, or levers.

Section IX

LUBRICATION AND CARE OF WASTE PACKED JOURNALS

70. Hot Box

Serious delays in railroad transportation may result from failure of the car journal bearings. The most frequent cause of bearing failure is a condition known as "hot box," which is defined as any ususual increase in bearing temperature sufficient to cause failure unless given prompt attention. Hot boxes usually are caused by improper functioning of the bearing lubricant. Proper selection of lubricating and packing materials and their proper application are the best insurance against breakdown.

71. Materials

a. The lubricant prescribed for use in journal boxes is oil, lubricating, car and locomotive engine, Product Symbol OC. If oil of this specification is not available, the recommendations of an authorized officer will be followed.

b. The lubricant is applied to the journal by means of waste which is saturated with the oil and packed into the box along with a small excess of oil. The oil is soaked up by the waste and transferred to the journal by wick or capillary action. Selection of

suitable waste is important. The waste will be new, renovated, of high quality, free from dirt, lint, short fuzzy strands, lumps or knots, sweepings, wire, straw, paper, or similar foreign matter. Waste, long fiber, wool, colored, Federal Specification DD–W–116, will be used. It will also be permissible to use the best quality waste obtainable from commercial railroads. The waste will have good resiliency and good capillarity to secure efficient transfer of oil to the journal. Jute or any other fiber or thread will not be used.

72. Preparation of New Packing

a. The waste will be loosened thoroughly, placed in a saturating vat, and kept submerged in new or properly renovated car oil; oil will be maintained at a temperature of not less than 70°F. for a period of at least 48 hours to insure thorough saturation. Waste then will be drained to remove excess oil until the packing is in a resilient or elastic condition. Care will be taken to see that oil does not drip from drained packing when lifted from the drain rack, but oil should flow from it when the packing is squeezed in the hand. The proper ratio is 3½ pints of oil for each pound of waste.

b. Any process of saturation that will accomplish the same result may be used.

c. Prepared packing when in storage will be turned at least once each 24 hours and the oil which has accumulated in the bottom of the container will be drawn off and poured over the top of the packing.

73. Preparation of Renovated Packing

a. When packing is being removed from journal boxes for any purpose, it will be pulled into a container, avoiding contact with the ground or any other place where it may pick up grit or dirt, and will be taken to the waste reclaiming plant if available. Packing will not be reused until renovated.

b. Renovated waste will be saturated with new or renovated car oil, and must be in a resilient and elastic condition; it will not contain excess oil.

c. Prepared renovated packing in storage will be turned over at least once each 24 hours and the oil which has accumulated in the bottom of the container will be drawn off and poured over the top of the packing. The proper ratio is 1½ pints of oil for each pound of waste.

d. Renovated car oil is oil which is removed from journal packing waste and put through a cleaning process whereby dirt and foreign matter are eliminated.

74. Preparation of Journal Boxes

a. Before packing a journal box, the oil cellar, including the dust guard opening, will be cleaned thoroughly of all dirt, sand, scale, grit, and water. When new journal boxes are applied, or when reapplying boxes, the interior of the box, including the dust guard opening, will be cleaned as above, and close-fitting dust guards, dust guard plugs, and box lids will be applied. Boxes will be inspected for cracks which permit oil leakage.

b. The journal bearing will be cleaned thoroughly and fitted to the journal; sandpaper, emery paper, or emery cloth will not be used on journal or bearing for fitting.

c. When the box, bearing, wedge, and journal are ready for assembling, make sure that the bearing has at least a 2-inch crown bearing on the journal throughout the length of the journal and is free at sides of the journal; if not, bearing will be refitted. Before finally applying the bearing to the journal, the surface of the bearing will be given a coating of car oil.

d. Care will be exercised to see that the surface of the journal is smooth and thoroughly clean before applying bearing. *Never wipe the bearing surface of the journal bearing with waste.*

75. Method of Packing Journal Boxes

a. BACK ROLL. In packing a journal box, first a back roll will be inserted under the journal to the extreme rear of the box, as shown at A, figure 110. The roll will be well up against the journal in order to lubricate properly the fillet at the end of the journal and to keep out dust.

(1) The roll will be 3 inches in diameter and of sufficient length to suit the diameter of the journal and allow the ends to be 1 inch below the center line of the journal.

(2) Machine-made rolls will not be used; rolls will be prepared by hand by the box-packer from saturated packing and will not be made in advance and stored.

b. BODY PACKING. In applying the body packing the front of the box will be wiped clean with a rag (not waste), after which sufficient packing, preferably in one piece, will be applied as illustrated in figure 110, filling firmly the space, B, under the journal to prevent settling; care will be taken to have the packing bear evenly along the full length of the lower half of the journal. Packing is then placed across the full width of the mouth of the

journal box and strands allowed to hang outside. More packing is added before placing the hanging strands inside the box; this has the effect of binding all the packing in one mass. The top of the packing will be 1 inch below the center line of the journal. After the body of the packing is applied firmly from the back roll to the inner or back face of the journal collar, it will be finished off at the front or outer end straight down from the inside face of the journal collar as shown at C, figure 110, or inclined toward the front of the box as shown at D, figure 110. No loose ends or threads will protrude at the sides or ends, such ends being tucked carefully under the sides of the packing; nor will any pieces of packing be laid along the side of journal, as such pieces may become caught under the bearing and cause a hot box. Free oil will be added to any boxes that do not appear to contain sufficient oil after boxes are packed.

76. Cleaning and Applying Bearings

a. Journal bearings will be cleaned thoroughly and bored or broached to a proper contour before being applied. This is necessary in order to secure a uniform bearing on the journal, to remove irregularities, and to detect imperfections in the lining.

b. Do not use sandpaper, emery paper, or emery cloth, for the purpose of removing irregularities from the bearing surface; if necessary, a half-round file or scraper may be used. Journal bearings with loose lining, section broken out, spread over the side, or worn to the brass, will be renewed.

c. When applying or replacing a journal bearing, a coating of car oil will be applied to the bearing surface; never wipe the bearing surface of the journal bearing with waste.

77. Inspection and Care of Journals

a. Personnel concerned with the inspection of journal boxes will observe the following regulations:

(1) The back of the box will be probed with a packing tool to determine if packing section A, figure 110, has worked away from the fillet of the journal; if so, it will be set up to the journal with a packing tool. Packing section B, figure 110, will be checked and, if down, will be set up firmly against the journal with the packing tool.

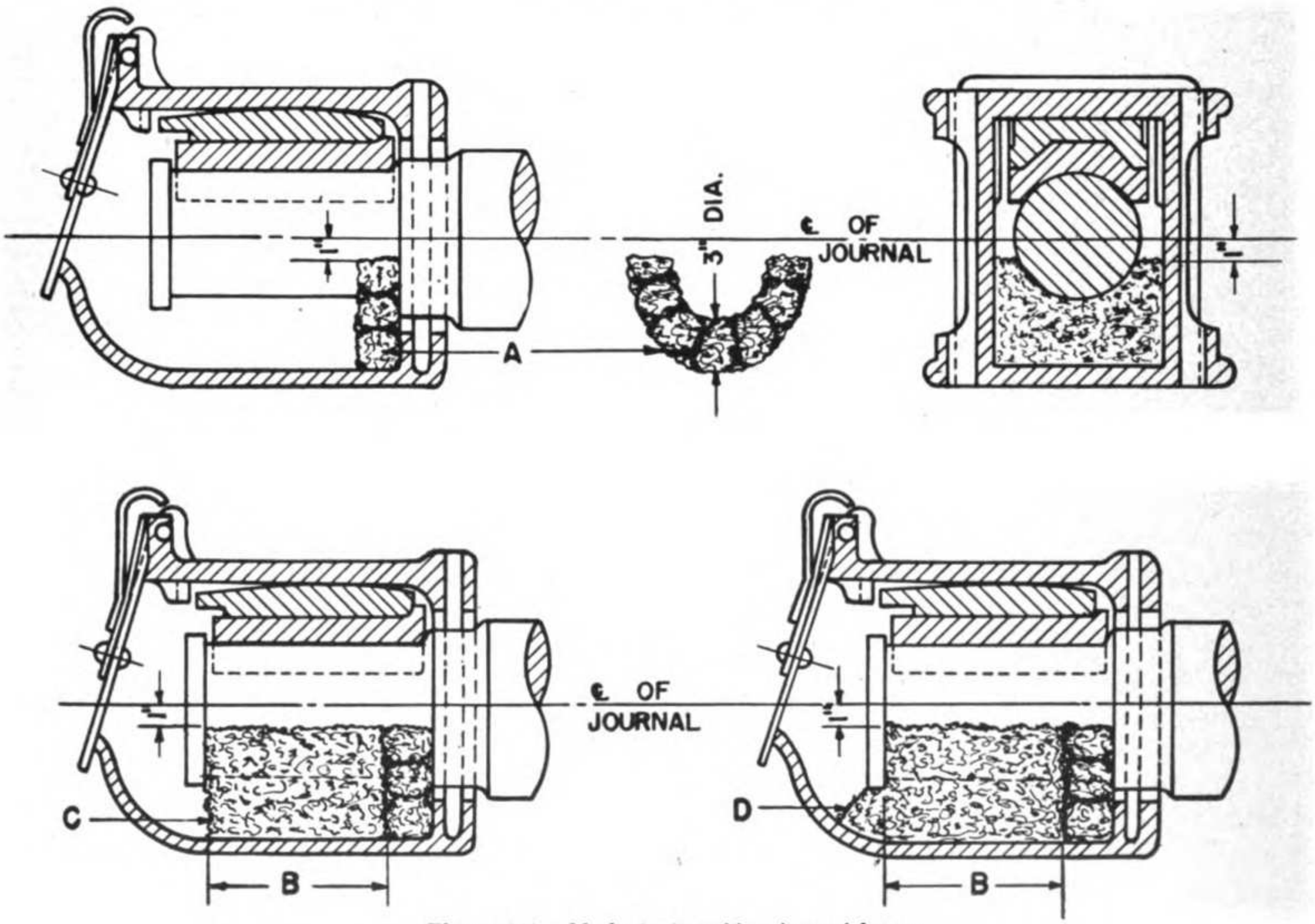


Figure 110. Method of packing journal boxes.

(2) If packing in section B is found to be glazed on the surface in contact with the journal, the surface will be broken up with the packing knife by loosening the front end, and working the packing against the bottom and sides of the journal to bring a fresh surface against the journal. Care will be taken to see that loose ends are tucked in.

(3) Outer wedge or portion of packing will be removed when packing is worked over, and will be kept clean.

(4) When grease, or any cooling compound, is found mixed with the packing, the packing will be removed from the box and box repacked with fresh packing.

(5) If packing contains water, the box will be repacked.

(6) The end of the journal will be inspected carefully; if the center is found dry, it indicates poor lubrication, defective journal bearing, or dry packing. The bearing and wedge will be removed for inspection and renewed if found defective.

(7) When bearings require renewal on account of heating, a careful examination will be made of the journals before applying new bearings.

(8) On all freight cars receiving inspection at originating points, and on all passenger cars at originating terminals, the car inspectors or box packers inspecting the journal boxes will draw the point of the waste grab hook back and forth along the bottom edge of both sides of the bearing toward the journal for the purpose of locating and removing lint or waste that may have been drawn to this point by the movement of the journal. At the same time it will be noted if the lining of the bearing is broken; if so, renewals will be made. Make sure, also, that bearing and wedge are in their proper positions.

(9) After inspection is completed, no strands of packing will be left hanging out of the box, and the box lid will be closed tightly to exclude dust.

(10) At every stop, maintenance personnel will check all journals. If the temperatures of the boxes are above normal as indicated by a slightly smoking condition, the hot box will be reported, the boxes marked, and the journal, brass, and wedge inspected carefully.

(11) Cars standing on a side track or stored for any length of time will not be placed in service until the boxes are examined and the journals and bearings adjudged in good condition.

b. When there are no inspectors or repairmen at yards or sidings where cars are taken into trains, or at points where cars are received from other lines, the trainmen (so far as it is possible to do so without delaying trains, or seriously interfering with their other necessary duties) will examine the journal boxes, and, if necessary, condition of packing. A little time and attention while the journal box is cool may avoid a hot box and subsequent delay to a train. While the cars are in motion, trainmen will be alert for smoke or the characteristic smell of burning rags and oil as these are the first indications of a "hot box."

c. Prolonged idleness of cars equipped with standard journal bearings may result in rusting and pitting of the journals if preventive steps are not taken. Pitted journals will cause overheating and bearing failures during the movement. The oil will drain from that part of the journal above the waste and leave the metal exposed to the atmosphere. The entire bearing is lubricated only when the cars are in motion, that is, when the journals are revolving continuously in the waste and oil. In order to prevent rusting of the bearings from atmospheric exposure they will be protected at all times with oil or rust-preventive compound, as specified below. One of the following alternative procedures will be followed:

(1) War Department railroad cars will be set in motion at least once each week and the journals examined to make sure the entire surface is coated with a film of oil. In addition to the weekly movement, the cars or trucks will be moved a minimum of 100 feet once each month.

(2) If it is not possible to move the cars or trucks, the waste from the boxes will be removed and the entire surface of the journal coated thoroughly with rust-preventive compound, using compound, rust-preventive, light, Product Symbol CL, for short or temporary periods of inactivity. The metal surface so protected will be inspected once every 2 weeks and recoated if necessary. For long periods of inactivity, compound, rust-preventive, heavy, Product Symbol CH, will be used. Either compound will be wiped off thoroughly and the journal boxes repacked with waste and oil before cars are placed in service.

78. Brasses and Wedges

a. When journal brasses are pulled, the box and parts it contains will be inspected before repacking. Brasses will be wiped clean with rags, visually inspected, hammer-tested for faulty or loose lining, and oil applied before reinserting. Bearing is hammer-tested by suspending the brass in one hand or balancing it on its back on a metal strip not over 2

inches wide, and tapping the corners with a hammer. A clear ring indicates that the lining is tight; a dull or dead sound indicates loose or cracked lining. All defective brasses will be scrapped.

b. Wedges will be cleaned carefully and gauged with a standard gauge. Wedges will be checked for proper seat on brass and oil tops before being applied. Wedges which do not gauge properly or which are cracked or distorted will be scrapped. The wedge will be seated properly on the crown of the bearing to prevent it from pinching the side of the bearing or resting on the lugs.

Section X
WHEELS AND AXLES

79. General

Wheel and axle failures may cause loss in property and danger to human life. To control these failures as far as possible, responsible personnel will supervise their shop practices to produce the best results. Rules governing condition of, and repairs to, rolling stock (see sec. VIII, ch. 3), contain information for the car inspectors at terminals, mechanics in the shops, and supervisory officers. However, personnel concerned in any way with wheel and axle work should familiarize themselves with a general knowledge of the subject even though their particular duties may not involve all of the features covered. Since the removal of defective wheels from under empty cars causes less complication and trouble than when it is necessary to remove them from under loaded cars, car inspectors will be particularly alert to discover defective wheels under empty cars at the final destination.

80. Types of Wheels

Two general types of wheels are used under cars for passenger and freight service:

a. CAST-IRON WHEELS. Cast-iron wheels, sometimes called chilled tread wheels, are commonly used under freight cars, although wrought steel one-wear and two-wear wheels are being applied in increasing numbers.

b. WROUGHT STEEL WHEELS. Wrought steel wheels are made in a wide range of designs and in various compositions, heat treated and untreated. Wrought steel wheels are classified as multiple wear, two-wear, and one-wear; they are marked "AAR MW" for multiple wear, "AAR 1W" for one-wear, and "AAR 2W" for two-wear. Usually, such marks are placed on the back of the wheel rim with the year and the manufacturer's brand.

(1) Multiple wear wheels are used for driving wheels of electric and Diesel-electric locomotives, for locomotive engine trucks, trailer and tender trucks, and for passenger and freight cars.

(2) One- and two-wear wheels are of lighter design than the multiple wear wheels and are used only under freight cars.

(*a*) One-wear wheels have a minimum rim thickness of 1¼ inches which does not permit restoration of flange or treads to the original contour after they are worn to the condemning limit. The wheels can be reclaimed, however, by turning to the thinner flange contour of the multiple wear wheels.

(*b*) Two-wear wheels have a minimum rim thickness of 2 inches which allows for one restoration to original contour after the tread or flange is worn to the limit.

c. WHEEL DEFECTS. Wheel defects as illustrated and described in section VIII, chapter 3, provide wheel shop men and terminal inspectors with a guide for deciding whether to retain or remove wheels; also whether it is better in the interest of safety to machine the wheels and put them back into service, or to withdraw them from service pending further investigation. References to the governing rules, both for freight and passenger cars, are given for each defect described in that section.

Section XI
SURFACE MAINTENANCE

81. Painting and Lettering

Equipment will be well painted at all times to prevent rust and deterioration. All lettering and numbering will be clear and legible. Personnel concerned will repaint and restencil when necessary to accomplish this result.

a. The original standard Army color and method of stenciling on any car will not be changed or altered unless authorized by the Chief of Transportation, zone of the interior, or the Railway Grand Division headquarters, theaters of operations. Information as to color of paint, size and location of letters and numbers, may be obtained from authorized sources.

b. All paint and materials will conform to applicable War Department specifications and schedule of drying time. Before any primer is applied, all surfaces will be cleaned thoroughly, and free from oil, grease, scale, rust, and weld spatter.

c. The process of painting cars includes the preparation of the surfaces to be painted as well as the application of the several paint coats.

(1) A considerable portion of the painting will be done on the various parts of the car while it is being repaired or assembled.

(2) The contact surfaces of the wood sheathing and the steel framing of so-called single-sheathed house cars and of composite gondolas and similar open topped cars will be painted to prevent weathering and corrosion.

(*a*) A heavy coat of priming paint will be applied to the wood surface.

(*b*) If the steel surface is of new material, it will be cleaned of mill scale and covered either with the same priming paint used on the wood or the special primer for steel surfaces.

(*c*) If the steel surface is not of new material it will be scraped clean of all rust, brushed with a steel brush or sand blasted, and then treated with the priming coat.

(*d*) The contact surfaces of metal to metal joints will be prepared also and treated during the assembly of the car.

(*e*) After cleaning, a coating of red lead or some approved joint cement will be applied to contacting surfaces. The cement will be suitable for the process used in securing the parts in place, that is, riveting or welding.

(*f*) It is desirable to prime the matched edges of all wood sheathing before applying the paint. This can be done by hand or by spraying, if the material is in a pile without spacers between the separate boards.

(3) During the painting of the car, it will be protected from the weather. Retaining valves and air hose will be well-covered. Surfaces will not be painted that show evidence of moisture. The minimum protection of a shed located in line with the outgoing tracks of the repair shop or shed will be provided over the tracks assigned to car painting. Cross-overs will be placed in those tracks in the space between the repair shop and paint shed, so that a car can be moved from any of the shop tracks to any one of the paint shed tracks; the sand blast shed, if used, may be located in this same area.

CHAPTER 5

HOSPITAL CARS

82. General

The following maintenance and inspection program is concerned chiefly with hospital cars operating in the zone of the interior. In theaters of operations, the same inspection and maintenance procedures (except for instructions pertinent to certain specialties such as air-conditioning and heating systems) will be followed for all types of equipment when used as hospital cars.

83. First Echelon Maintenance

a. PRIOR TO DISPATCHMENT FROM MAINTENANCE AREA. (1) After a train is made up utility personnel will check each car and see that it is stocked with necessary supplies such as ice, water, spare light bulbs, and fuses.

(2) One person responsible for the operation of the electrical, air-conditioning, and car equipment, will be assigned to each car to test all lights, fans, and electrical appliances, and report any necessary repairs to the train commander.

(*a*) During the cooling season, air-conditioning equipment will be operated long enough to determine that it is working properly. Ice-activated cars will be inspected to see that the ice bunkers are full; if not, arrangements will be made to fill them prior to loading of patients.

(*b*) During the heating season, cars will be checked to see that they are warm and comfortable; heating equipment will be checked to determine that it is operating properly.

(*c*) All batteries will be checked to see that they are fully charged.

(*d*) All heat valves will be inspected to see that they are working automatically, and are in the "off" position when the air-conditioning system is operating.

(*e*) Toilets, water spigots, sinks, doors, window shades, and all hardware will be checked for proper operation.

b. PRIOR TO LOADING OF PATIENTS. (1) All air-conditioning or heating equipment will be operated a sufficient length of time to insure proper temperature in cars.

(2) Lights will be turned on as needed.

(3) Shutters for controlling outside air will be placed in such position that at least one-half of the air in the car is outside air.

(4) To conserve battery power, cars will be connected to standby facilities when available and will not be disconnected until 10 minutes prior to train's departure.

(5) Vestibule diaphragm curtains will be attached after entire train is made up.

c. EN ROUTE. (1) Personnel responsible for the air-conditioning and electrical equipment will make periodic inspections while en route to see that all generators, air conditioning equipment, lights, and all other apparatus, are functioning properly.

(2) Defects will be reported to the train commander and sufficient information furnished so that he can wire the next railroad maintenance point for repairs.

(3) At any stop and when sufficient time is available, ice bunkers will be inspected on ice-activated cars; the train commander will be advised as to the consumption rate of ice so that arrangements can be made for re-icing.

(4) Water consumption will be noted and tanks refilled at each available station; particular attention will be given to refilling water tanks in kitchen cars.

(5) If generator becomes inoperative, check for blown fuses. If fuses continue to blow or the generator fails to operate with good fuses, the car will be connected by train line jumper to another car.

(*a*) To trainline a car, the trainline jumper should be removed from regulator locker and plugged into the overhead receptacle in the vestibule. After the jumper is plugged in and locking screws tightened, close trainline switches in both cars and check link fuses in switches.

(*b*) On all trainlined cars, electrical load will be reduced to the minimum.

(*c*) Only one car with faulty generator will be trainlined to a car with generator operating.

(*d*) A full report of generator failures will be made to the train commander. The railroad representative may be consulted as to the next maintenance point en route so that repairs can be requested by wire.

(6) A report of all failures and repairs made will be left in the regulator locker so that at the termination of the run the maintenance force will be advised of troubles encountered.

(7) When air conditioning is required, the following positions of the cooling selector switch will be observed:

Outside temperature	Switch position
Below 80° F.	Low.
80° F. to 90° F.	Medium.
Above 90° F.	High.

(*a*) If the car does not become sufficiently cool when all switch positions are tried, cooling switch should be placed in the HIGH position and cooling test posts short circuited with a piece of wire or a paper clip. Report faulty condition on arrival at destination.

(*b*) When heat is desired, all switches must be set at one of the positions for heating. If the heating system does not operate, heat valve toggle switches should be placed in the emergency position and heat control valves operated by hand.

(*c*) The blower fan must be in operation at all times when the car is occupied.

d. AFTER DISCHARGE OF PATIENTS AT DESTINATION. (1) All electrical and air-conditioning equipment will be switched off.

(2) All vestibule diaphragm curtains will be detached.

(3) All trainline jumpers will be removed and replaced in electrical locker.

(4) Any defects noted or repairs made en route will be reported to the maintenance personnel.

(5) All cars will be locked when not in service.

84. General Inspection and Yard Maintenance

a. When cars return from each trip they will be inspected immediately and arrangements made for any necessary repairs.

b. All reports of faulty operation of equipment en route will be noted and equipment repaired.

c. Inspections and maintenance schedules will consist of the following types:

(1) Trip inspection.

(2) Ten-day inspection.

(3) Monthly inspection.

(4) Semiannual inspection.

(5) Annual inspection.

d. When required repairs are to be made by railroad maintenance personnel, the railroad company concerned will be notified immediately.

85. Trip Inspection

a. GENERAL. (1) Thoroughly clean exterior and interior of cars to pass ordinary medical inspection.

(2) Inspect and make or report repairs necessary to all underneath equipment, trucks, running gear, hardware, piping, wiring, etc.

(3) Drain all water tanks, flush out, and refill.

b. CAR LIGHTING EQUIPMENT. (1) Take battery gravity readings and if necessary place batteries on charge.

(2) Turn on all light switches, replace all burned-out bulbs, and clean all fixtures.

(3) Check operation of lamp regulators with lights turned on.

(4) Check fuses and contacts of generator regulator; if batteries are discharged, check operation of generator, generator regulators, and field carbons by motorizing the generator.

(5) Clean regulators and regulator lockers.

(6) Turn off all lights.

(7) If trainline jumpers are connected, disconnect jumpers and place in locker.

(8) Check stock of fuses and light bulbs and replenish if necessary.

(9) Check commutator and brushes on all fans and blowers.

(10) Check commutator and brushes on generator.

(11) Inspect generator belts.

c. TEMPERATURE CONTROL EQUIPMENT. (1) Turn on blower fan and set all controls for low heating, after which—

(*a*) Check all heating thermostats by using ice and a cloth dipped in hot water to cool and heat thermostat tubes alternately.

(*b*) Check operation of all heat control valves.

(*c*) Repeat above checks for all other positions of the heat selector switch.

(2) Set controls for low cooling, after which—

(*a*) Repeat operations described in (1)(*a*) above to check cooling thermostats; make sure that cooling equipment starts and stops by the operation of the thermostat tubes.

(*b*) Repeat test for all other positions of the cooling selector switch.

d. AIR CONDITIONING EQUIPMENT. (1) *General.*

(*a*) Wipe out all grills and air outlets.

(*b*) Remove and clean all air filters.

1. Clean paper filters by blowing out with air under low pressure; discard all dry filters and install new.

2. Clean metallic filters by blowing out with high pressure air blast. If extremely dirty or dry, wash metal filter in an approved cleaner solution. After drying, dip in oil, engine, Product Symbol OE 10; remove all excess oil before reinstalling on car.

(2) *Ice activated system.* (*a*) Set all controls for high cooling and short circuit cooling test posts.

(*b*) Check all spray heads in ice bunkers.

(*c*) Check water pump and shaft stuffing box.

(*d*) Check all ice bunkers and clean if necessary.

(*e*) Remove and clean sump strainer.

(*f*) Check brushes on pump motor.

(*g*) Check blower fan and brushes.

(3) *Mechanical system.* (*a*) Set all controls for high cooling and short circuit cooling test posts.

(*b*) Plug in alternating current standby cable and operate equipment.

(*c*) With all equipment operating normally, check head pressure and back pressure in accordance with the following values:

1. Back pressure. Should read between 28 and 45 pounds, depending upon temperature of air from evaporator.

2. Head pressure. Should agree within 10 pounds with following table:

Air temperatures	Idle head pressure (lb. per sq. in.)	Head pressure (lb. per sq. in.)
80°	84	170
85°	92	175
90°	100	185
95°	108	190
100°	117	200
105°	126	210
110°	136	220

(*d*) Check all connections at evaporator and expansion valves for signs of freon leaks; if oil is observed, check with leak detector.

(*e*) Remove doors from compressor box and check all connections and valves for signs of leaking.

Note. A small amount of oil at the flywheel of the compressor is necessary for the operation of the compressor seal, however, keep all connections, valves, and gauges clean so that indications of oil are readily observed.

(*f*) After equipment has been operating for at least 30 minutes, check oil level and freon level.

(*g*) See that interior of car has cooled and cooling system is operating properly.

(*h*) Keep all gauges, valves, and connections clean throughout the refrigerating system.

(*i*) Check belts.

(*j*) Check blower fan and brushes.

(*k*) Check voltage across speed control test posts.

(*l*) Make visual inspection of axle drive and shafts.

e. HEATING EQUIPMENT. Heat in hospital cars may be required at any time, hence the following inspections will be made during all seasons:

(1) Check vapor regulators; see that they are operating properly and that only a small amount of steam escapes from bottom of regulator.

(2) Check all heat valves; see that they do not bind and that they operate freely.

(3) See that all hand-operated valves are open so that steam is available to the automatic valve.

(4) See that end valves are free and can be operated by either the handle inside the vestibule or by the handle at the end of the car.

(5) See that all steam connectors operate properly and are fitted with a gasket.

(6) During freezing weather, see that all cars have a minimum steam pressure of 6 pounds per car; when cars are not connected to a steam line, see that all tanks and piping are drained of water and blown out.

86. Ten-day Inspection

a. GENERAL. Cars will be deodorized with a suitable deodorizing agent.

b. CAR LIGHTING EQUIPMENT. (1) Repeat trip inspection.

(2) Remove belt or shaft and motorize generator in both directions.

(3) Examine generator suspension.

(4) Examine axle and generator pulleys; see that they are secure.

(5) Check bearings for wear by lifting up on generator pulley.

(6) Check shaft for play by rocking armature back and forth.

(7) Check operation of pole changers by rotating armature slowly in each direction.

(8) Lubricate oil supporting shaft, link pins, and tension rod threads.

c. TEMPERATURE CONTROL EQUIPMENT. (1) Repeat trip inspection.

(2) Remove control panel covers and clean all parts of control panels.

d. AIR-CONDITIONING EQUIPMENT. (1) *Ice-activated system.* (*a*) Repeat trip inspection.

(*b*) Check operation of float valve.

(2) *Mechanical system.* (*a*) Repeat trip inspection.

(*b*) Check speed control and caterpillar unit.

(*c*) Check brushes on standby motor.

(*d*) Clean compressor box.

(*e*) Check alternating current standby starting relay.

87. Monthly Inspection

a. CAR LIGHTING EQUIPMENT. (1) Repeat trip and 10-day inspections.

(2) Check electrolyte in batteries and add water if necessary.

(3) Wash exterior of batteries and interior of battery boxes with an alkaline solution composed of 1 pound of soda for each gallon of water.

(4) Clean and check all battery connections.

(5) See that batteries are blocked properly.

b. TEMPERATURE CONTROL EQUIPMENT. (1) Repeat trip and 10-day inspections.

(2) Check operation of all relays.

(3) Check all fuses.

(4) Check all control wiring; clear any grounded wire.

c. AIR-CONDITIONING EQUIPMENT. (1) *General.* (*a*) Blow out in reverse direction with compressed air the air ducts, plenum chambers, and evaporators.

(*b*) Wash the evaporators with a suitable cleaning agent.

(2) *Ice-activated system.* Repeat trip and 10-day inspections.

(3) *Mechanical system.* (*a*) Repeat trip and 10-day inspections.

(*b*) Check cut-out switch against following table of correct pressures:

Low pressure		High pressure	
Cut out	Cut in	Cut out	Cut in
8–10 pounds	20–25 pounds	250 pounds	220 pounds

Note. Low pressure may be tested by pumping down the refrigerating system. High pressure can be checked only by operating the system with compressor box doors open and by blocking off the air around the condensers.

(*c*) Check operation of expansion valves; see that the entire surface of the evaporator is cool.

(*d*) Wash compressor box and condensers with water.

(*e*) Check and operate all valves.

(*f*) Check all bolts, nuts, and supports of axle drive and shafts.

88. Semiannual Inspection

a. CAR LIGHTING EQUIPMENT. (1) Repeat trip, 10-day, and monthly inspections.

(2) Check lamp and generator regulators for proper setting of voltage and amperes.

(3) Test all lighting circuits for grounds, and clear if necessary.

(4) Remove generator leads from connection block and clean all terminals.

(5) Motorize the generator and check for faulty bearings.

(6) Check generator brush rigging, pole changer, field coils, armature, and commutator.

(7) Blow out generator with compressed air.

(8) Inspect all suspension parts for wear.

(9) Check alignment of generator.

(10) Inspect axle pulleys for cracks or breaks.

(11) Clean and renew defective parts of standby charging receptacles.

(12) Clean and paint battery boxes with black acid-resisting paint, specification No. U.S.A. 3–106, latest issue, type 1.

b. TEMPERATURE CONTROL EQUIPMENT. (1) Repeat trip, 10-day, and monthly inspections.

(2) Remove and clean all thermostats.

(3) Remove and clean all heat valves.

c. AIR-CONDITIONING EQUIPMENT (BOTH ICE ACTIVATED AND MECHANICAL SYSTEMS). (1) Repeat trip, 10-day, and monthly inspections.

(2) Check all supports and hangers.

(3) Check all piping and pipe clamps.

(4) Blow out all motors with compressed air and inspect.

89. Annual Inspection

a. CAR LIGHTING EQUIPMENT. (1) Repeat trip, 10-day, monthly, and semiannual inspections.

(2) Remove generator heads, armature, and brush rigs.

(3) Clean, overhaul, and grease generator.

(4) Paint field coils with glyptal, Federal stock No. 52–P–8057–710–Red; 52–P–8057–20–Black.

(5) Check all generator parts for condemning limits and install new parts if necessary.

(6) Clean, test, and overhaul lamp regulators.

(7) Clean, overhaul, and grease all fans.

(8) Clean and overhaul all switches and switchboards.

(9) Check and repair all fixtures; paint all reflectors with white glyptal.

b. TEMPERATURE CONTROL EQUIPMENT. (1) Repeat trip, 10-day, monthly, and semiannual inspections.

(2) Remove control panels and check all resistors, relays, circuit breakers, switches, and connections.

c. AIR-CONDITIONING EQUIPMENT. (Must be completed by 31 March of each year.)

(1) *Ice-activated systems.* (*a*) Repeat trip, 10-day, monthly, and semiannual inspections.

(*b*) Wash out all bunkers and piping.

(*c*) Check and repair ice bunkers and bunker lining.

(*d*) Renew piping where needed.

(*e*) Clean, overhaul, and grease pump and pump motor.

(*f*) Clean, overhaul, and grease blower fan and blower fan motors.

(2) *Mechanical systems.* (*a*) Repeat trip, 10-day, monthly, and semiannual inspections.

(*b*) Clean, overhaul, and lubricate caterpillar unit.

(*c*) Clean, overhaul, and lubricate speed control; paint field coils with glyptal, Federal stock No. 52–P–8057–710–Red; 52–P–8057–20–Black.

(*d*) Check complete drive unit for wear, noise, balance, and eccentricity; also check drive shafting and belts for wear and condemning limits. (This check will be made with drive cog belts loose or removed and standby electric cable connected; controls will be set for medium cooling and speed control test posts will be short circuited.)

(*e*) Clean, overhaul, and grease standby motor.

(*f*) Clean, overhaul, and grease blower fan and blower fan motor.

(*g*) Check freon piping insulation and renew if necessary.

(*h*) Check all expansion valves for operation and superheat setting.

d. STEAM HEAT EQUIPMENT.* (1) Repeat trip inspection.

(2) Remove steam heat regulators, traps, and valves.

(*a*) Disassemble and clean all parts, removing scale.

(*b*) Check operating mechanisms and repair or replace worn parts.

(*c*) Reassemble and install.

(3) Apply maximum available steam pressure (not to exceed 175 pounds) to the steam heating system of each car and check all piping, valves, regulators, and radiators for leaks and steam blows by manually opening all steam heat valves.

(4) Operate the heating system normally and check all traps, pressure regulating valves, and control valves for proper performance and leaks.

90. Lubrication

Maintenance personnel will observe the following instructions and specification for lubricating all equipment:

a. CAR JOURNALS. (1) *Standard car journals.* Check each day and oil as needed with oil, lubricating, car and locomotive engine, Product Symbol OC.

*Repairs found necessary as a result of this inspection must be completed not later than 30 September of each year.

(2) *Roller bearing journals.* During monthly inspection, remove oil plug and check for moisture; keep oil at prescribed level using oil, lubricating, steam cylinder, Product Symbol OSC.

b. EXHAUST FANS. (1) *Equipped with sleeve bearing.* Lubricate during monthly inspection, using oil, engine, Product Symbol OE 30; do not add too much oil.

(2) *Equipped with ball bearings.* Lubricate during monthly inspection using grease, general purpose No. 2, Product Symbol WB.

c. BLOWER FAN. (1) *Equipped with sleeve bearing.* Lubricate every 3 months through cap at each end of housing using oil, engine, Product Symbol OE 30.

(2) *Equipped with ball bearing.* Lubricate during monthly inspection through plug at each end of housing using grease, general purpose No. 2, Product Symbol WB.

d. PUMP MOTOR. Lubricate every 3 months using grease, general purpose No. 2, Product Symbol WB.

e. WATER PUMP. Lubricate every 3 months using grease, water pump, Product Symbol WP.

f. AXLE DRIVE. (1) *Gear case.* Lubricate during 10-day inspection by checking oil level and filling case to proper level indicated on gauge rod; use oil, gear universal, Product Symbol GO 90.

(2) *Support bar, equipped with grease fittings.* Lubricate during monthly inspection using grease, general purpose No. 2, Product Symbol WB.

g. UNIVERSAL DRIVE SHAFT. During 10-day inspection lubricate universal joints through grease plugs using lubricant, gear universal, Product Symbol GO 90; lubricate splines with grease, general purpose No. 2, Product Symbol WB.

h. SPEED CONTROL. (1) *Main shaft bearings and governor.* During monthly inspection check oil plug at side of case and fill with oil to level of oil cup, using oil, engine, Product Symbol OE 30.

(2) *Armature bearings.* During semiannual inspection pack bearings with grease, general purpose No. 2, Product Symbol WB.

i. STANDBY MOTOR. During semiannual inspection lubricate through grease plugs at each end of motor, using grease, general purpose No. 2, Product Symbol WB.

j. COMPRESSOR. During trip inspection check oil and, if necessary, add sufficient oil to maintain oil level in sight glass after compressor has operated at least 30 minutes; use oil, lubricating, refrigerant compressor, Product Symbol OR.

k. CONDENSER FAN. During monthly inspection lubricate through grease plug at top of each bearing, using grease, general purpose No. 2, Product Symbol WB.

l. GENERATOR. (1) *With alemite fittings.* During monthly inspection add at grease plug ½ ounce of grease, general purpose No. 2, Product Symbol WB.

(2) *Without grease fittings.* During semiannual inspection pack bearings, using grease, general purpose No. 2, Product Symbol WB.

m. GENERATOR SUSPENSION. During 10-day inspection lubricate all moving parts with oil, engine, Product Symbol OE 30. During monthly inspection lubricate suspension bearings, using grease, general purpose No. 2, Product Symbol WB.

91. Care of Battery

The battery is an important part of the electrical equipment and must receive careful maintenance. Maintenance personnel will—

a. Take a gravity reading from one cell during each trip inspection.

Note. Use a different cell each time rotating through all cells of the entire battery; gravity readings will be taken before adding any water and with the electrolyte not more than ¼ inch below the bottom of the filling tube.

b. Gravity readings will be checked with those shown on the battery name plate. Batteries will be recharged when gravity falls 30 points below full charge rating.

c. Compensate for storage losses when cars are not in use by proper charging; consult battery name plate for proper rate of charge.

Note. Gravity reading will be read before and after charging and the amount of charge adjusted to meet requirements.

d. During monthly inspections, and more often if necessary, wash thoroughly all batteries and battery boxes; clean and tighten all connections; cover connections with a heavy lubricant, using petrolatum, Product Symbol PET, and treat all parts exposed to acid fumes or acid solution with an alkaline solution, using 1 pound of soda for each gallon of water.

e. If batteries are hot after completion of a trip, check generator regulators for proper setting.

f. Maintain electrolyte level to within ¼ inch of the bottom of the filling tube by adding water.

g. Check for proper blocking of batteries in battery boxes. (Clearance of ⅛ inch is allowable around all blocking; batteries will *not* be wedged in tight.)

h. Paint the interior of battery boxes, wooden trays, and other parts which may be affected by acid, with black, acid resisting paint, U.S. Army Specification, 3–106, type 1, latest issue.

CHAPTER 6

AIR BRAKES

Section I

GENERAL

92. Responsibilities

a. GENERAL. All personnel responsible for train operation or the maintenance of air brakes, either directly or indirectly, will understand elementary air brake functions and principles of operation to insure safety and economy in the handling of freight and passenger traffic with a minimum loss of life or damage to rolling stock and lading.

b. ENGINEMEN, FIREMEN, CONDUCTORS, BRAKEMEN, AND TRAIN CREWS. The first essential for this class of personnel is the ability to manipulate skillfully the brake system as a whole; this involves a general knowledge of the functions and features obtainable in a given system. It is necessary to learn how to make preliminary train tests before starting, and how to operate the brake valve to secure best results in train control under the different running conditions that exist in any given territory. It is of secondary importance that these personnel have a general knowledge of the various individual devices which compose a brake system and be familiar with the movement of parts and the intricacies of various air pressures in chambers, ports, and passages.

c. AIR BRAKE FOREMEN, REPAIRMEN, AND TEST RACK OPERATORS. This class of personnel is concerned primarily with the initial construction, operations, and proper functioning of moving parts of individual air brake devices. Therefore the study of ports, passages, chambers, air pressures, and the principles of internal operation are of first importance. A knowledge of manipulation is secondary, but should be encouraged as far as time and opportunity permit.

d. AIR BRAKE INSTRUCTORS, INSPECTORS, ROAD FOREMEN OF ENGINES, AND TRAIN MASTERS. These officials and personnel will understand the functions and features available in each type of freight and passenger car brake equipment. They will be familiar with general recommendations as to manipulation of air brake systems and specific instructions thereto, including a thorough understanding of the conditions which produce break-in-two, slidflat wheels, excessive shocks and strains in train handling, or other damage to rolling stock and lading. They will know the internal operation and functioning of individual devices, the maintenance of apparatus in service, and train tests for brake efficiency. They should know approved methods of organization and instruction for the different classes of personnel.

Section II

FREIGHT EQUIPMENT CARS

93. Precautions

Before undertaking any work on freight equipment cars where an application of the brakes might result in personal injury, personnel will close cut-out cock in branch pipe and block reservoir valve open. Release valve rods will not be distorted or bent to block release valve open. With AB equipment, a wedge will not be driven into the duplex release valve

assembly as this may damage it. Personnel cutting out brakes will be held responsible for cutting in such brakes after maintenance work is completed.

94. Rolling Stock Not Equipped with Air Brakes

The following instructions will govern the preparation and handling of rolling stock which is not equipped with air brakes, but which possesses an efficient hand brake, hand holds, sill steps, and the like, in accordance with the A.A.R. Safety Appliance Acts. This also covers special equipment such as steam shovels, derricks, and the like, that may be offered in interchange.

a. Any rolling stock not equipped with a brake pipe, will be fitted with a temporary 1¼-inch brake pipe, with a 1¼-inch angle fitting and standard air hose on both ends. At each angle fitting a standard shipping tag will be placed bearing the date and station where the pipe was applied.

b. Not more than 15 percent of the rolling stock in any train will be hand-braked; the remaining 85 percent will be power-braked with operative air brake equipment. The tender is considered as a piece of rolling stock. Hand-braked rolling stock, as mentioned above, will not be placed next to tender, but can occupy any other position in train ahead of the caboose. Where more than one hand-braked car is to be handled in a train, they will be scattered throughout the train in order to be protected by those equipped with power brakes.

95. Test and Repairs in Terminal Yards

a. Terminal test will be given all trains at originating points by inspectors or trainmen. Yard air lines used for making such test will be blown free of moisture in train yards before coupling to car air hose.

b. When inspectors are employed to make a general inspection of all cars upon arrival at terminals, they will make a visual inspection of piston travel, retaining valves and pipes, released valves and rods, brake rigging, hand brakes, hose and position of angle cocks, and will make necessary repairs or mark for repair tracks any cars to which yard repairs cannot be made promptly. Freight trains arriving at terminals where facilities are available for immediate (inbound) brake inspection will be allowed to remain idle with air brakes fully applied.

c. Freight trains will not depart from dispatching points, where men and materials are available for repairs, without all air brakes being in good repair and operating properly. Cars with inoperative brakes will be repaired or shopped.

d. Trains will be "stretched" before air brakes are tested in order to locate defects more readily. The air brake system will be charged to 70 pounds pressure from either yard line or locomotive, after which a careful inspection will be made of brake pipes and connections, hose, cut-out and angle cocks; any necessary repairs will be made. If brakes are tested from a yard line, a testing device will be used.

e. After brake pipe leaks are repaired, a terminal test will be made by making a 15-pound brake pipe reduction from full pressure. Brake-pipe leakage will not exceed 5 pounds per minute. If train is not fully charged during this test, the application of brakes will cause brake-pipe pressure to flow to the point where it is the lowest, and will be indicated on the gauge as brake pipe leakage. Trains, therefore, will be charged fully before brakes are applied. Type "AB" equipment with empty reservoirs require at least 7 minutes to charge. After brakes are applied, train will be inspected to determine—

(1) If triple valve or AB valve will operate on service applications.

(2) Piston travel.

(3) Brake cylinder (and brake cylinder pipe) leakage.

(4) Condition of retaining valve and its piping.

(5) That brake rigging does not bind or foul, and shoes are firmly against the wheels.

f. If inspectors cannot check entire train in 10 minutes, brakes may be released, recharged, and another test made for brakes which were not inspected on first test. Any and all defects found by this examination with brakes applied will be repaired or car shopped.

g. After train is inspected with the brakes applied, brakes will be released either from yard line through choke on testing device or from locomotive. Each car will then be inspected to see that its brake has released without the use of release valve rod. Brakes failing to release from yard line or locomotive will not operate properly on line of road. Where brakes are tested from yard air lines, leave air attached until locomotive is coupled. Car men will report to the conductor and engineman the number of air brake cars in service in the train and the condition of the brakes. Brakes which will not apply or release properly will be repaired or car shopped.

h. Making the terminal test from yard charging plant is restricted to trains that are made up on one

track only, and where the yard charging plant testing device is attached to same point in train where the locomotive will couple. Trains failing to meet these requirements will receive terminal test after the road locomotive is coupled. Where terminal test is made from yard plant, only a road test is necessary after locomotive couples.

i. Road test will be made as follows: after locomotive is attached and brake pipe pressure equalized, the engineman, upon receipt of signal from trainmen or inspectors, will make a 15-pound continuous brake pipe reduction, noting that brake valve discharges the proper amount of air. After brake valve exhaust closes, engineman will time brake-pipe leakage for 1 minute; brake-pipe leakage will not exceed 5 pounds from 55 pounds. When trainmen or inspectors observe rear brakes apply, they will signal to engineman to release brakes when the brake-pipe leakage test is completed. If the release of rear brakes takes place, it will indicate that no angle cocks were left closed.

j. The following air brake test will be made at points where motive power or engine or train crew is changed: as soon as the locomotive is coupled to the train and the required pressure of 70 pounds is equalized throughout the train, the engineman, upon request of trainmen or inspectors, will make a 15-pound continuous brake-pipe reduction and hold brakes applied until trainmen or inspectors have examined the brakes on the tender and each car. When brake valve exhaust closes, the engineman will time brake-pipe leakage for 1 minute; brake-pipe leakage will not exceed 5 pounds from 55 pounds. If the trainmen or inspectors find that the brakes have applied properly, they will signal for brakes to be released and engineman will release brakes. Where trainmen make the inspection, they will examine the brakes on each car to make sure that brakes have released properly and without the use of release valves before train is allowed to depart. If car inspectors are making the inspection, they will station themselves at locomotive and observe that the brakes on each car are released as train pulls out. If any brakes are found not to have released properly, inspectors will signal to trainmen on rear end of train who will stop train so that condition can be corrected.

k. In addition to the above terminal test, at last terminal inspection point where trains are prepared for the descent of mountain grades, a thorough test of the retaining valve and its piping will be made and all defects corrected. Retaining valves (with triple valve or AB valve in release position) must retain brake cylinder pressure for 2½ minutes, and show a good exhaust when handle is turned down.

l. When piston travel exceeds 9 inches, or is less than 7 inches, it will be adjusted to 7 inches. At last inspection point prior to descending mountain grades, piston travel will be adjusted to 7 inches on tonnage trains.

m. With AB equipment, from 60 to 70 seconds is required for the brake pipe vent valve to close after brakes have applied in emergency. Do not release such brakes until required time has elapsed and the "blow" has stopped. Pulling the release rod to the limit of its travel will bleed both the emergency reservoir volume and the auxiliary reservoir volume on a car. Pulling the release rod lightly until a discharge of air is heard bleeds the auxiliary reservoir volume only.

96. Test and Repairs in Shop and on Shop Tracks

a. Yard air lines will be blown out to clear them of moisture before they are connected to brake hose on car.

b. Cylinders and triple valves, other than those specified hereinafter, and not cleaned within 14 months, as indicated by standard markings, will be cleaned on empty cars; also on loaded cars on repair tracks for other work. After the expiration of 15 months, the air brakes on all cars will be cleaned.

c. Type AB freight brake equipment not cleaned within 35 months, as indicated by standard markings, will be cleaned on empty cars; also on loaded cars on repair tracks for other work. After the expiration of 36 months, the air brakes on all cars will be cleaned.

d. The single car testing device, T.C. stock No. 18–8084–80–100 (figs. 111 and 112) provides a means of making a general check on the condition of the brake equipment on "in date" cars while in service and on cars having undergone "periodic repairs," without removing any device from the car.

(1) There are two types of the single car testing device which are similar in appearance; one for passenger cars and the other for freight cars. The passenger device can be identified by the name plate which is marked "PASS.;" the name plate on the freight device is marked "FRT."

(2) With this device tests can be made to determine if the operating valve or any associated device should be removed from the car for tests on their

respective test racks.* Results obtained will be considered as a preliminary check only, since the exact condition of any device can be determined only on a standard test rack, T.C. stock No. 18–6207–76–120, provided for that purpose.

(3) If the operating valve fails to pass the specified tests, it will be determined if the single car testing device is at fault; under no circumstances will the operating valve be condemned before tested on the standard test rack.

(4) Care will be exercised in moving the test device handle back to position No. 3 (lap) (figs. 111 and 112) after making brake pipe reductions of 15 pounds or more in position No. 5. When snapped back, the temperature effect will cause the brake pipe pressure to rise 1½ to 2 pounds and may be the cause of an undesired release. The device handle will be moved slowly toward Lap position.

(5) When testing cars having double brake equipment, each equipment will be tested separately, that is, one operating valve will be cut out while the other equipment is being tested, and vice versa. A complete test (including brake-pipe leakage) will be made with each equipment. The brake-pipe leakage test with each equipment is necessary in order to detect any leakage past the operating valve cut-out cock, operating valve pipe connections, and the like.

*By operating valve is meant a device on each car the operation of which results in admission of air to the brake cylinder, release of air from the brake cylinder, and changing of one or more reservoirs.

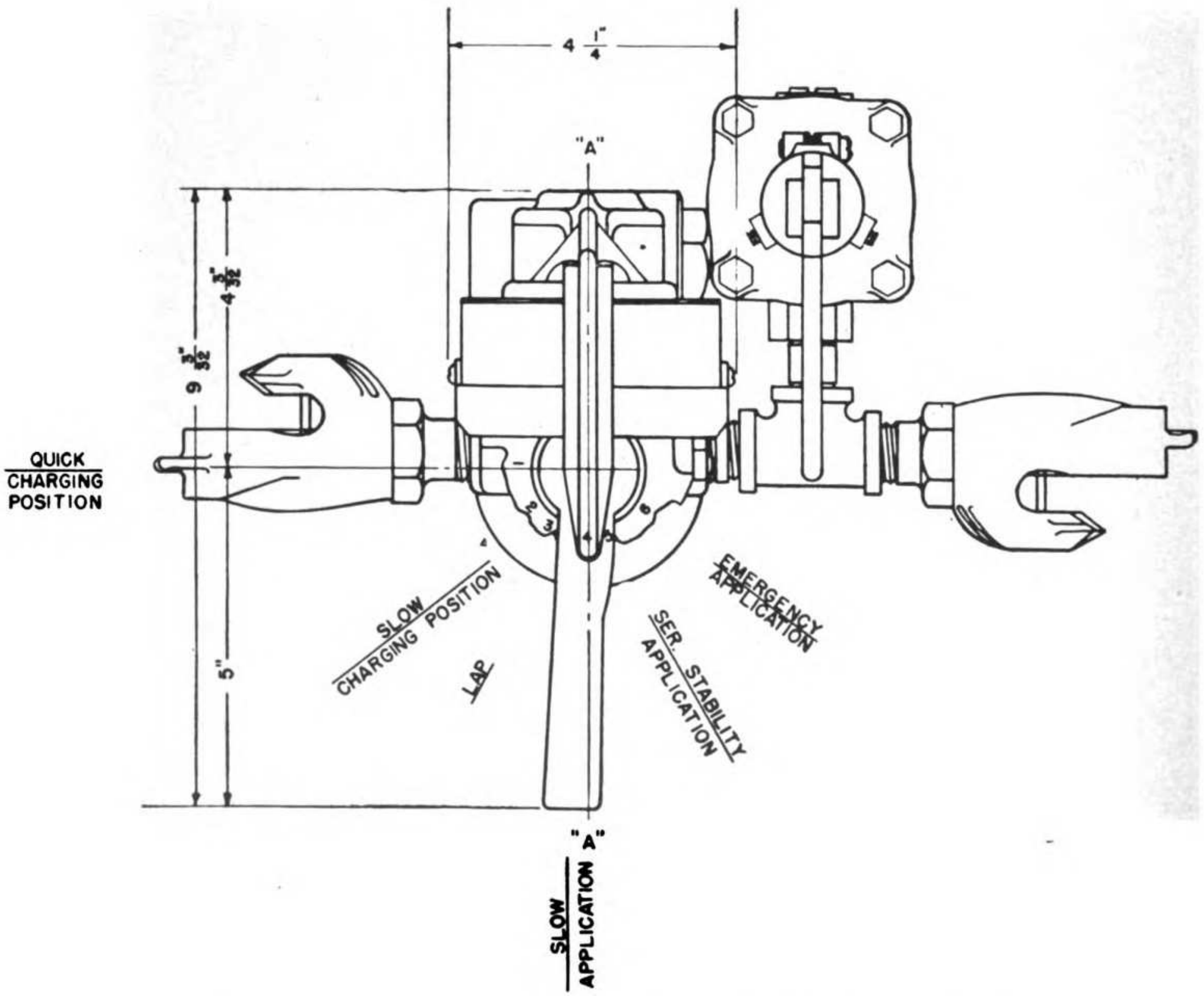


Figure 111. Single car testing device (top view). (TC stock No. 18–8084–80–100.)

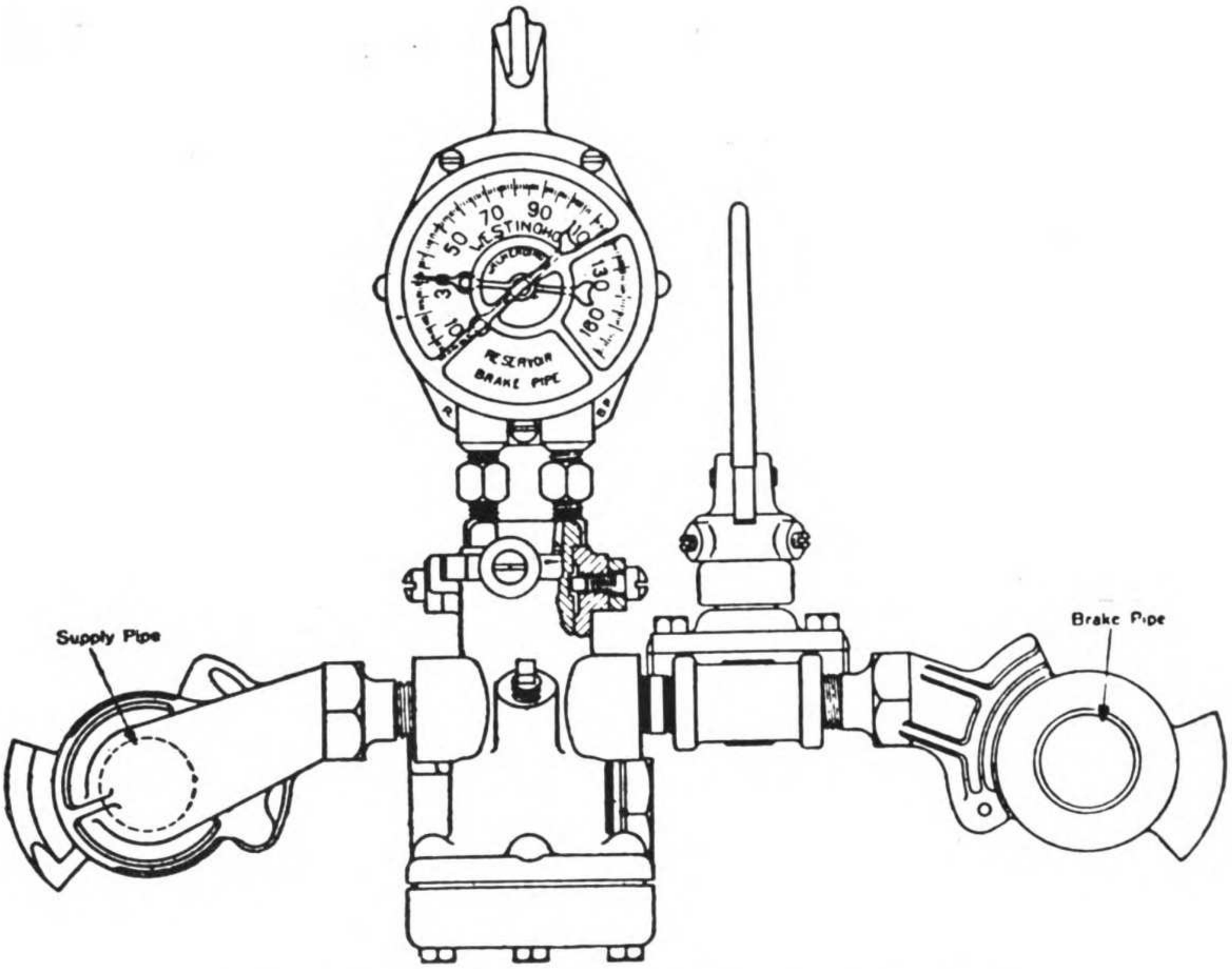


Figure 112. Single car testing device (side view). (TC stock No. 18–8084–80–100.)

97. Brakes Not Due for Periodic Attention

Responsible personnel will—

a. Connect single car testing device (freight type) to yard air line and to car brake hose; blow air through brake pipe and out the open angle cock on opposite end of car to dislodge pipe scale and dirt; then apply dummy coupling to opposite hose, and charge system. Apply soapsuds test to air hose and angle cocks; replace cut-out cocks which leak around the top of key.

b. Check defects in angle cocks, such as handle socket loose on key, broken stop lug on handle socket, and excessive play at the hinge pins. (Any or all of these conditions may permit the stop on handle socket to pass over the stop lug on body for full and closed positions, and may result in serious brake trouble.) Remove angle cock possessing any of above defects and send to the designated shop for repairs. On caboose cars, test angle cocks through key for leakage; replace if defective.

c. Apply brake cylinder testing device to triple valve exhaust port or retaining valve exhaust port; assemble these testing devices locally.

d. Test the triple valve or AB valve; if valve fails in any of the tests, clean, repair if necessary, and restencil the entire brake equipment.

e. Test the brake cylinder by applying and releasing the brake. Make sure that brake cylinder leakage does not exceed 8 pounds per minute from an initial pressure of 50 pounds. If leakage exceeds 8 pounds, clean, repair if necessary, and restencil the entire brake equipment. On cars with AB equipment, coat the piston pipes with brake cylinder lubricant, A.A.R. Specification M–914.

f. Test the retaining valve and its piping by making a 20 pound brake-pipe reduction; then release

brake. Observe if vent port is open. With valve in high pressure position, make sure that it holds the brake applied for 3 minutes. See that there is no leakage in retaining valve piping during this test. If retaining valve will not pass this test, clean the valve, apply new or repaired valve, and repeat test. Replace wasp excluders in retaining valves on cars so equipped.

g. During the above tests, if air hose possesses any of the condemnable defects covered by section III, chapter 3, replace hose.

h. If piston travel is less than 7 inches or more than 9 inches, adjust to 7 inches. See that pipe clamps are tight, angle cocks in their proper positions, and brake cylinders and reservoirs bolted tightly to their supports. A bar will be used to determine if cylinders or reservoirs are loose.

98. Brakes Due for Periodic Attention, with Excessive Brake Cylinder Leakage, or Defective Triple Valves

Responsible personnel will—

a. After note is made of old stencil, scrape lettering off completely and paint over with quick drying black paint. Connect single car testing device to yard air line and car and blow out brake pipe. Then attach dummy coupling to hose on opposite end of car. Cut out brake and disconnect brake rigging at brake cylinder and apply piston clamp to piston sleeve. Remove nuts from brake cylinder head with ½-inch wrench, and remove entire piston and nonpressure head. Charge auxiliary reservoir and then make emergency application in order to blow dirt from auxiliary reservoir tube. When doing this make certain that no one is in front of brake cylinder where a person might receive injuries to the eyes. Close cut-out cock in branch pipe, leaving single car testing device in position No. 1 (fig. 112).

b. Remove cap or bottom from centrifugal dirt collector and clean and dry it thoroughly. Then open cut-out cock in branch pipe and blow it out. Apply compound, antiseize, Product Symbol AS to the cap threads of collectors, and replace. If toad stool is deteriorated badly or broken off, apply a cap in good condition. If check valve is bent or missing, apply a new one. See that dirt collectors stand vertically, with dirt chamber down and with arrow pointing toward triple valve.

c. Make sure that triple valve is of the type standard to car, and then remove it from its studs. Apply repaired triple valve to the reservoir. Use only one gasket between the triple valve and auxiliary reservoir with good beads around the holes. Place the gasket on the triple valve with the beaded side towards the triple valve; then apply both gasket and triple valve to reservoir studs. Use only standard triple valve studs and nuts to attach triple valve to reservoir. Make sure that the studs have good threads and are screwed firmly into reservoir; never use old hose gaskets in triple valve unions.

d. Clean out the inside of the brake cylinder body with a dull scraper and wipe thoroughly with dry waste. Avoid using oil unless necessary; remove rust spots with emery cloth. Wipe dry and clean the piston head, release spring, and packing cup or leather; if leather or cup is worn thin or cracked, replace with a new composition packing cup. When the cup or leather is off the piston head, tighten any loose studs and clean the head thoroughly. Tighten the stud nuts evenly and make sure that packing is central on piston head.

e. See that expanders are not used with composition packing cups. Do not use packing cups which have become old and hard from age, as they will not be air tight in cold weather. Lubricate the interior of the brake cylinder with brake cylinder lubricant A.A.R. Specification M–914; also coat the packing cup or leather lightly and fill recess next to follower with this lubricant. Use an expander with packing leathers but not with packing cups. Use care in replacing piston in brake cylinder to avoid damaging the packing cup. Do not use a sharp tool to help enter packing cup into cylinder. If cylinder is equipped with a brake cylinder protector, do not turn piston after entering it into cylinder to avoid destroying the protector.

f. Carry brake cylinder lubricant A.A.R. Specification M–914 in special pail furnished air brake repairmen for the purpose of carrying lubricant; to exclude dirt, keep lubricant covered. Use approximately 4 ounces of lubricant in either 8- or 10-inch cylinders.

g. After the piston is placed in the brake cylinder, tighten all supporting bolts between cylinder and reservoir and their supports. After the push rod is connected, inspect all pins and cotters in the brake rigging. Make sure that air hose and angle cocks are in their proper position, and all pipes clamped properly. Use compound, antiseize, Product Symbol AS, on male threads in pipe work; never use white or red lead on threads, nor use the compound on the female threads.

h. Remove the cap from the retaining valve, wipe off the valves and seats, and blow out the pipe by

applying and releasing the brake. See that retaining valve and piping are secured properly to car.

i. Charge air brake system from yard air line and apply soapsuds test to all cocks, pipe joints, air hose and around triple valve, and repair all leakage. If an air hose possesses any of the condemnable defects (see sec. III, ch. 3, rule No. 8) replace hose, then apply brake cylinder testing device to triple valve exhaust port or retaining valve exhaust. Test triple valve as specified in single car testing device code of tests to ascertain if it operates properly. Test brake cylinder to insure that it does not leak more than 5 pounds per minute from an initial pressure of 50 pounds. (Brake is applied fully and released with a single car testing device for this test. Brake cylinder leakage is shown by test gauge on brake cylinder testing device.) Next test retaining valve by applying the brake fully and when triple valve is released, make sure that the retaining valve holds the brake applied for 3 minutes, at the end of which time the air must discharge at the retaining valve exhaust. See if vent port in retaining valve is open. Replace wasp excluder in retaining valve exhaust port if it is standard to the car.

j. When caboose brakes receive periodic attention, or when reported defective by trainmen, compare the air gauge with the gauge on the single car testing device. Replace caboose gauges when 3 pounds or more variation is noted. On caboose cars, test the angle cocks through the key for leakage, and replace any defective angle cock with one in good condition.

k. Adjust piston travel to 7 inches when less than 7 inches or more than 9 inches. Be sure that worn shoes are replaced and brake rigging adjusted with equal live lever travel. Check brake rigging with the badge plate.

l. As brake equipment is now ready for stenciling, stencil neatly, using white lead only. Make certain that all old stencils are scraped off and painted over.

99. AB Brake Equipment

a. GENERAL. (1) Since heavier cars, greater tonnage, longer trains, and higher speeds require a more effective brake than the single capacity freight car brake (K triple valve), the "AB" freight brake was designed to meet these requirements. It is anticipated that all newly-designed Government freight cars in the zone of interior will be equipped with the new style brake, and old cars will have brakes changed over to the new design. All personnel, therefore, will familiarize themselves with the operation and maintenance instructions concerning the "AB" brake equipment.

(2) The "AB" type brake provides protection of valve elements against the entrance of grit and thus extends the interval between cleaning and repairs; in addition, it improves the dependability of brake operation.

(3) All brake parts will be inspected at each cleaning period to insure their being serviceable, clean, and properly lubricated when reapplied to the car.

b. MAINTENANCE. (1) Reconditioning of "AB" equipment will be in accordance with rule 8, sec. III, ch. 3, which provides that "AB" brake cylinders will be cleaned at least once each 36 months, and partial "AB" equipment using old style type "K" brake cylinder will be cleaned at least once each 15 months.

(2) The air hose, angle cocks, cut-out cock, dirt collector, retaining valve, and all piping will be maintained according to the foregoing instructions. (See pars. 93 and 94.) With "AB" equipment, if the duplex release valve is broken and the brake possesses no other defect in the AB valve and is not out of date for cleaning, the release valve will be repaired on the car.

(3) The service and emergency portions of the AB valve will be removed from the car, the bracket blown out, and reconditioned portions applied. Protection caps will be removed from reconditioned portions at the car and applied promptly to old portions removed. When caps are removed, care will be taken to prevent the main piston ring from coming out of the bushing. Should this occur, compress the ring with finger nails until it reenters the bushing. Do not pound on the face of the piston as this damages the bushing.

(4) All cylindrical strainers will be removed from AB valve pipe brackets and forwarded to a designated repair shop for cleaning. A new or clean strainer is in the pocket of service portion shipping cover, and all reconditioned valves and the dirty strainer when removed from pipe bracket will be placed in this pocket so that it will accompany the service portion to shop for reconditioning. All service and emergency portions will be protected with shipping cover.

(5) Whenever AB valves are removed from common carrier cars and forwarded to repair shops for reconditioning, they will be tagged properly with linen shipping tags. Indicate on tags the initial and number of the car from which the valve is removed

and the name of the station which is shipping the valve for repairs; this will prevent loss of billing for any new parts applied.

(6) A ¼-inch cotter-key will be used to secure release valve handle to release valve rod. Where smaller keys are found, they will be removed and replaced with the ¼-inch size.

c. AB BRAKE CYLINDER. (1) When necessary to clean and lubricate the AB brake cylinder, it will be dismantled by removing the nonpressure head and piston assembly.

(2) The packing cup will be removed, cleaned, and inspected. If there are any deep cracks or deep scratches on the packing bearing surface, or if the packing will not hold a proper bearing on the cylinder wall, it will be replaced.

(3) Before the packing cup is replaced or reapplied, the felt swab of the lubricator assembly on the piston will be cleaned carefully by brushing, and relubricated by soaking the unit in oil, lubricating Product Symbol OC. If visual inspection indicates that the swab does not have full contact with the cylinder wall, as will be the case if the felt does not extend evenly above the holder, the swab will be adjusted to provide proper contact. This may be accomplished by inserting a tool with thin blade between the felt and the holder, running this tool around the edge of the swab, and prying up the felt wherever necessary. The cylinder also will be scraped and wiped clean with dry waste to remove old lubricant and dirt, after which the walls will be relubricated with brake cylinder lubricant, A.A.R. Specification M–914.

(4) While the cylinder is dismantled the release spring will be inspected and cleaned in order to remove any rust or dirt which may be clinging to it. If the spring possesses rust spots, it will be coated with brake cylinder lubricant A.A.R. Specification M–914 after cleaning.

(5) The hair strainer and the piston rod seal in the nonpressure head will be removed, cleaned, and inspected thoroughly. Strainer can be removed for inspection from the inside of the nonpressure head by compressing the wire spring which retains it. If the hair in the strainer is broken or deteriorated so that it cannot be put into good condition by cleaning in oil, lubricating, Product Symbol OC and blowing out, it will be renewed.

(6) The piston rod will be cleaned and all rust or rust spots removed. If the piston rod seal rings show excessive wear or any other defects which would interfere with their sealing function, they will be renewed. Piston sleeve will be coated with brake cylinder lubricant A.A.R. Specification M–914. The felt ring will be soaked in oil, lubricating, Product Symbol OC.

(7) When assembling the dismantled brake cylinder, care will be taken to insure that no dirt or other foreign substance enters the cylinder before it is closed.

(8) AB equipment will be tested with single car testing device (freight type) T.C. stock number 18–8084–80–100.

(9) Empty cars will be reconditioned when found out of date for periodic attention. All cars on shop tracks, whether out of date for brake cleaning or not, will receive the proper repairs if they fail to meet the prescribed tests as outlined in these instructions, that is, when brakes are not out of date the stenciling will be ignored and the actual test of brake will determine whether the work is necessary.

100. Miscellaneous Instructions

a. All gaskets will be renewed on type "K" combined cylinders and reservoirs when repaired on shop tracks. Used reservoirs must have a hydrostatic test of 150 pounds pressure before being applied to a new or rebuilt car. Reservoirs failing this test will be scrapped.

b. When ordering new retaining valves, the release control retainer will be specified. All vents in retaining valves will be protected when painting cars. Retaining valve springs will not be stretched; when found stretched will be removed and scrapped.

c. Any angle cock or cut-out cock which has been removed on account of leakage or any other defect will be sent to a designated shop for repairs. After repairs are made they will be painted.

d. Before a passenger equipment car is placed in a freight train, brake piston travel will be adjusted to 8 inches. If car is equipped with "UC" brakes, all reservoirs will be drained of pressure and the application piston cover changed from "Graduated Release" to "Direct Release" position. Safety valve on universal valve will be adjusted to 25 pounds with a test gauge, and a shipping tag reading "Adjusted for 25 pounds" applied to the valve. If there is a cut-out cock in emergency reservoir pipe, it will be closed. If car is equipped with "LN" brakes, safety valve will be adjusted and tagged as described above. In addition, cut-out cock in supplementary reservoir pipe will be closed and the drain cock left open.

When cars are to be returned to passenger service, safety valves will be adjusted to 60 pounds and tags removed. Cocks in supplementary and emergency reservoir pipes will be opened and application piston cover set for "Graduated Release." Application piston cover must never be removed for rotation unless all air pressure is exhausted from all reservoirs.

e. Troop trains containing freight cars will carry 90 pounds brake-pipe pressure. Where such trains consist of mixed passenger and freight equipment, the caps on control valves or universal valves will be set for "Direct Release." With LN equipment, close cock in pipe to supplementary reservoirs. It will be unnecessary to disturb the safety valve adjustment, which will remain at 60 pounds.

f. When caboose brakes receive periodic attention, or when reported by trainmen, the air gauge will be compared with the gauge on the single car testing device. Caboose gauges will be replaced when 3 pounds or more variation is noted.

g. Retaining valves and air hose will be protected when painting cars.

h. Caboose cars equipped with type A–1 caboose valve will have the following instructions placed under glass near the caboose valve:

(1) The practice of making brake applications from the rear of freight trains will be avoided except in emergency. Under all circumstances avoid causing break-in-twos, or damage to equipment and lading.

(2) When not in use, keep handle of caboose valve in "Lap" position, at extreme left.

(3) When an emergency arises which makes it necessary to stop the train in the shortest possible distance, move handle quickly to position marked "APP" at extreme right and leave it there until train stops.

(4) When necessary to stop train from rear where no immediate emergency exists, move handle to right until latch engages notch marked "2." Leave handle in this position until brake pipe gauge hand stops falling. If this reduction is insufficient to stop train, move handle to right to notch "3" and leave it there until brake-pipe pressure stops falling. If this reduction is still insufficient, positions "4" and "5" may be used.

(5) Never advance handle to right while brake-pipe pressure is still falling, except to make an emergency application.

(6) After train stops, move handle to "Lap" position at extreme left.

Section III

PASSENGER AND HOSPITAL EQUIPMENT CARS

101. General

Before undertaking any work on passenger and hospital trains, also passenger equipment cars where an application of the brakes may result in personal injury, brakes will be cut out and rendered inoperative in the following manner:

a. Cut-out cock in branch pipe leading to triple valve, control valve, or universal valve will be closed and all reservoir drain cocks opened.

b. For the purpose of applying brake shoes without cutting out valve and draining reservoirs, brake cylinder pipe cock on cars so equipped may be closed.

c. Personnel performing work on cars will be held responsible for closing cocks and cutting in brakes when work is completed.

102. Coach Yard Inspection and Tests

a. In coach yards a testing device for passenger and freight air brakes will be assembled locally and used for making brake tests.

b. Before connecting yard air line to brake pipe and signal pipe of cars to be tested, an inspection will be made to insure that—

(1) Hand brakes are operative.

(2) All hose are connected and angle cocks in signal line are open.

(3) All angle cocks are of the self-locking type and are free from defects.

(4) Cut-out cocks in air signal pipe at ends of cars have handles pointing downward when open.

(5) Supplementary reservoirs and water-raising systems are cut in.

(6) Angle cocks and air hose are set properly and pipes at end of cars are located properly and clamped securely.

(7) Hose is not loose on nipples or visually defective.

c. Moisture will be blown out of yard air line before connecting to cars, then connect air line to testing device and to brake-pipe and signal line of the cars under test; allow the system to charge. Where centrifugal dirt collectors are equipped with drain cocks or quick discharge valves, they will be drained; where branch pipe cut-out cock is not built into dirt collector, this cock will be closed before the dirt collector is drained.

d. Inspectors will pull signal cords in each car to insure that car discharge valves open and close properly; they will test conductor's valves by pulling cords in all cars so equipped. Inspector will make sure that both green and red cords leading to car discharge and conductor's valves are free from knots, run properly over pulleys, and are of sufficient length to avoid shrinkage in damp weather. (Red cord only will be used on conductor's valve; white cord will be used in Pullman cars for the air signal where this color is standard.)

e. Inspectors will check train brakes for leakage as follows:

(1) With train fully charged, make an initial brake-pipe reduction of 8 pounds, followed by a light reduction of 2 pounds.

(2) Check air gauges to make sure that brake-pipe leakage does not exceed 3 pounds per minute.

(3) Inspect each car to make sure that all brakes have applied. Brakes failing to apply on the above reductions totaling 10 pounds will be tested with the passenger type, single car testing device. Reduction will be continued until a total reduction of 25 pounds from full brake-pipe pressure is made.

f. Cars will be inspected for brake cylinder piston travel.

(1) Body-mounted brake cylinders will have piston travel adjusted for 8 inches.

(2) Truck-mounted brake cylinders on lightweight Pullman cars will have piston travel adjusted for 4½ inches if found to be less than 4 inches, or more than 5 inches.

(3) Truck-mounted brake cylinders on lightweight cars will have piston travel adjusted for 5 inches if found to be less than 4 inches, or more than 6 inches.

(4) As emergency brake cylinders of "PC" equipment do not operate on service brake application, the service brake cylinder will be adjusted for 8-inch travel and then the emergency cylinder automatic slack adjuster will be adjusted to permit the same travel.

(5) Piston travel will be adjusted after brake shoes or wheels are changed.

g. When inspecting for piston travel, it will be noted if all shoes are against the wheels and levers are not fouling, and only such hand brakes are set as are necessary to hold cars.

h. Inspectors will make sure that at least 4 inches remain on slack adjuster for take-up; otherwise the foundation brake rigging will be readjusted.

i. Release test of brakes will be made by allowing brake-pipe to charge through by-pass in testing device. Any valves failing to release will be tested with the single car testing device.

j. In addition to the regular coach yard inspection and test, and before cars are placed in a train, brakes will be tested with the single car testing device to insure that leakage is at a minimum and valves operate properly. Before the above test is made, all reservoirs will be drained to insure that they are free from moisture.

k. When a car is tested with the single car testing device, all air hose piping and valves will be given the soapsuds test under steam; and all leakage eliminated.

103. Terminal Test

a. As soon as the locomotive is coupled to the train, and the required brake-pipe pressure is equalized throughout the brake system, the engineman, upon request of the inspector, will make a 30-pound service application of the brakes, and hold them applied until the inspectors examine the brakes on the tender and on each car.

b. If inspectors find that the brakes have applied properly, they will signal (by communicating whistle) from the rear end of the train to the engineman who will release brakes. The test is not complete until the inspectors have examined the brakes on each car to make sure that they have released properly and without the use of release valves, after which they will report to the engineman and conductor the condition of the brakes and the number of cars in the train. Inspector will advise engineer of any freight equipment cars in the train and the types of brakes in use thereon.

c. When searching for undesired quick brake action, the engineman should be requested to make an 8-pound brake-pipe reduction; if any type "L" or type "P" triple valve does not respond to this reduc-

tion, as indicated by brake not applying, it is probably responsible for the undesired quick action.

d. At points where motive power, or engine crew or train crew, is changed, test of the air brakes will be made as follows:

(1) After the required brake-pipe pressure is equalized throughout the train, the engineman upon request of a trainman or inspector will make a 30-pound continuous service application of the brakes, noting if the brake valve discharges the proper amount of air and holds brakes applied until the trainman or inspector has examined the brakes on the tender and on each car. Brake-pipe leakage will not exceed 5 pounds per minute.

(2) If the trainman or inspector finds that the brakes have applied properly he will signal by communicating whistle from the rear end of the train to the engineman who will release the brakes. Where the trainman makes the inspection he will examine the brakes on each car to make certain that they have released properly and without the use of release valves. Such inspection will be made before train is allowed to depart. If the car inspector makes the inspection he will station himself at the locomotive and observe if the brakes on each car are released as train pulls out. If any brakes do not release properly, the car inspector will signal to trainman on the rear end of train who will stop train by communicating whistle signal so that the trouble can be remedied.

e. In cold weather, after engine is attached to cars and brakes applied, inspector will open rear angle cock long enough to drain any moisture that has accumulated in the brake pipe.

f. Before leaving terminals each train will be examined carefully to make sure that the air brakes on all cars are in effective operating condition. Where brakes are found inoperative at division points or division terminals repairs will be made if possible without excessive delay. Where repairs would cause excessive delay, the next division point or division terminal will be informed by wire, stating car number and type of brake equipment or rigging that is defective so that material necessary for repairs can be on hand when train arrives for such repairs. In no instance will a train be operated with less than 85 percent operative air brakes unless specific instructions are issued by the proper authority. Such instructions will specify how train will be handled.

g. A car with inoperative air brakes will have brakes cut out and all reservoir drain cocks opened. Such cars will not be placed as the first car in a train, except when the train is being handled by Diesel electric locomotive or steam locomotive with tender equipped with brake-pipe vent valve. When the tender is not equipped with brake-pipe vent valve the car will be switched to another location in train. A car having the hand brakes inoperative will not be placed as the rear car in a train. Unless authorized by proper authority, a car having air brakes inoperative will not be placed as the rear car of a passenger train. If, however, proper authority cannot be secured, the conductor will switch that car to some part of the train where it will be protected by other cars with operative brakes. If car is of a type that cannot be placed between other cars, it will be set out. During the time the car with inoperative air brakes is on rear of train it will be protected by a person riding the car to operate hand brake if necessary.

h. If any brakes fail to release properly, following a terminal test, the inspector will have the engineman repeat the test once or twice instead of bleeding the pressure in car reservoirs. The inspectors will be careful, however, to make sure that brakes are not being held applied by a faulty retaining valve or a set hand brake.

104. Periodic Attention

a. When air brake equipment is due for periodic attention, the following will govern the cleaning, repairing, and testing of such equipment:

(1) Brake cylinders without protectors or sealed nonpressure heads will be cleaned every 6 months.

(2) Brake cylinders with protectors or sealed nonpressure heads (type U) will be cleaned every 12 months.

(3) Cars with type "P" and "L" triple valves and type U–12 and U–12–B Universal valves will be cleaned every 6 months.

(4) Cars with type U–12–BC and U–12–BD Universal valves will be cleaned every 12 months.

(5) Cars with type D–22 control valves will be cleaned every 12 months, at which time the brake cylinder relay valve will be cleaned.

(6) For cars not regularly assigned, the brake equipment will be cleaned every 12 months, with the exception of cars having any type of Universal valve or D–22 control valve; these will be cleaned every 15 months.

b. When cars are in shop or on repair tracks for defective brakes or for removal of slid flat wheels caused by defective brakes, they will have the triple

valve or Universal valve and the safety valve or high speed reducing valve, cleaned, lubricated, tested, and stenciled regardless of last cleaning date. The brake rigging will be examined also to see that all rods and levers are in accordance with standard prints. Lock nuts will be tightened on slack adjusters on trucks with clasp brakes.

c. When cars are on shop track or wheel pit for any repair work, the brake equipment will be tested with the single car testing device. All hose, piping, and valves will be given the soapsuds test under pressure to detect leakage.

d. For locating frozen protection valves and leaky intercepting valve seats in Universal valves, test gauge will be applied to drain cock in emergency reservoir. Emergency reservoir pressure should not fall during service applications of the brake.

e. If defective triple or Universal valves fail to pass code with single car testing device, they will be removed and tagged with car and train number and sent to a designated repair shop where they will be tested on standard test rack.

f. All Universal valves, control valves, and type "L" triple valves will be operated in graduated release position.

105. Brake Cylinders

a. At time of periodic attention all follower studs on brake cylinders will be examined and any found loose will be removed, the threaded portion covered with white lead, and then reapplied.

b. Composition packing cups are standard for new equipment and renewals, except for truck-mounted type "U" brake cylinders where the snap-on type of cup will be used; expanders will not be used with either type of cup.

c. The inside walls of brake cylinders, as well as the piston and rod will be cleaned thoroughly by scraping and rubbing with dry waste; if necessary to remove any deposit, use oil, Product Symbol OC. All rust spots will be removed and the leakage groove cleaned.

d. The cylinder wall and all exposed surfaces of the packing cup will be coated liberally with brake cylinder lubricant A.A.R. Specification M–914 using approximately the following amounts:

Diameter of brake cylinder	Ounces of lubricant to be used
8 inches and 10 inches.....	4
12 inches and 14 inches.....	5
16 inches and 18 inches.....	6

c. The "V" shaped space between the piston and the packing cup or leather will be filled with brake cylinder lubricant A.A.R. Specification M–914. When type "U" cylinders are dismantled for reconditioning, the nonpressure head strainer will be removed and cleaned thoroughly with kerosene. The piston pipe protector seals and swab will be removed, cleaned, worn parts replaced, and lubricated liberally with oil, Product Symbol OC.

f. After the type "U" brake cylinder is reassembled, at least 50 pounds of air pressure will be applied and cylinder and its pipe given the soapsuds test to detect leakage. All leakage will be eliminated. After the standard type of cylinder is placed on car, test gauge will be applied and leakage will not exceed 5 pounds per minute from an initial cylinder pressure of 50 pounds.

106. Triple Valves

a. At time of periodic attention, triple valves, Universal valves, and control valves will be reconditioned. Gaskets used between valves and their supporting brackets will possess perfect beads and be applied with beaded side toward valve. The surfaces divided by the gaskets will be clean, and only one gasket will be used.

b. After brake equipment is reconditioned, it will be tested with the single car testing device (passenger type), at which time all hose, piping, and valves will be given the soapsuds test under pressure.

c. Faulty safety valves will be removed from triple valves while still on car and wired to valve for shipment to a repair shop.

107. Automatic Slack Adjusters

Slack adjusters will be cleaned, lubricated with oil, Product Symbol OC, and tested each time car receives class repairs. They will also be tested each time brake cylinder is cleaned, and if defective will be repaired. Miscellaneous bolts and cap screws will not be substituted for the standard stop screws. Stop screws will be maintained, and kept tight in the ratchet nut. Cylinders will be cleaned and lubricated in the same manner as a brake cylinder. A sufficient quantity of compound, antisieze, Product Symbol AS, will be placed in adjusting nut so that it touches bottom of screw. Adjuster screw will not be painted nor oiled.

108. Brake Shoes

a. Cars with under-frame mounted brake cylinders will not be turned out of a car repair shop with an

entire set of new shoes. Fifty percent of the shoes will be partially worn and staggered with the new shoes; this is to insure that it will not be necessary for line of road stations to cut pull rods when all shoes become worn. Rods on new cars, or cars which have received class repairs, will be of such length that slack adjuster will be at its minimum length with sufficient shoe clearance on all beams. Cars with truck-mounted brake cylinders may have all new shoes when turned out of shop.

b. When new brake shoes are to be applied, the necessary slack may be obtained by turning the slack adjuster nut one-quarter turn to the right (direction to take up slack) to insure that pawl is disengaged; then the slack adjuster nut will be turned to the left until the slack is sufficient to permit at least ¼ inch more than standard travel after the new shoes are applied. The adjustment will not be changed at any other point in the rigging except to correct improper changes previously made.

c. If the adjuster crosshead is at the outer end of the adjuster body and locked, stop screw will be loosened about ⅛ inch, the adjuster nut turned one-quarter turn to the right to free the pawl and then to the left to let out the required slack. The stop screw will be retightened using two wrenches to make it secure.

d. When brake shoes are renewed, the brake will be applied with a full service application. Piston travel will be measured and recorded (travel should be at least ¼ inch more than standard in order to operate the slack adjuster). The brake and slack adjuster cylinders will be inspected, and the joints of the adjuster cylinder pipe tested for leakage. A chalk mark will be placed across the casing and the adjuster nut to show whether the adjuster has operated during the application. Then the brake will be released and note made if the adjuster nut has turned, indicated by the chalk line being broken. Piston travel then will be adjusted to standard as described above.

e. Before a passenger equipment car is placed in a freight train, piston travel will be adjusted to 8 inches. If car is equipped with "UC" brakes, all reservoirs will be drained of pressure and the application piston cover changed from "Graduated Release" to "Direct Release" position. Safety valve on Universal valve will be adjusted to 25 pounds with a test gauge, and a shipping tag reading "Adjusted for 25 pounds" applied to valve. If there is a cut-out cock in emergency reservoir pipe, it will be closed. If car is equipped with "LN" brakes, safety valve will be adjusted and tagged as described above. In addition, cut-out cock in supplementary reservoir pipe will be closed and its drain cock left open. When cars are to be returned to passenger service, safety valves will be adjusted to 60 pounds and tags removed. Cocks in supplementary and emergency reservoir pipes will be opened and application piston cover set for "Graduated Release." Application piston cover will not be removed for rotation unless all air pressure is exhausted from all reservoirs.

f. Troop trains containing freight cars carry 90 pounds brake-pipe pressure. Where such trains consist of mixed passenger and freight equipment, the caps on control valves or Universal valves will be set for "Direct Release." With "LN" equipment, cut-out cock in pipe to supplementary reservoirs will be closed. It will be unnecessary to disturb the safety valve adjustment, which will remain at 60 pounds.

Section IV

CARS IN FLOODS

109. Precautions

a. Where it is probable that flood waters will rise high enough to enter the brake-pipe or submerge the air brake equipment on freight or passenger equipment cars standing in flooded area, and it is impossible to move them to higher ground, the angle cocks will be closed at both ends of each car or at the ends of each cut of cars.

b. Before placing cars which have been in floods in service, it will be ascertained whether or not water and sediment have entered the brake pipe or parts of the brake equipment. If water is not present in the brake pipe, centrifugal dirt collector will be examined and cleaned. If there is still no evidence of water entering the system, car will be tested with the single car testing device, in accordance with the latest test code, and will be restored to service if it passes all tests.

110. Reconditioning

The entire brake equipment on cars which were submerged in flood waters, will be cleaned, lubricated, tested, and stencilled, per standard instructions. In addition, the following work will be performed:

a. Auxiliary, supplementary, emergency, service reservoirs, and combined auxiliary and emergency reservoirs, will have all water and sediment removed from their interior. If sediment is present they will be washed clean and dried thoroughly. Since there are no drain plugs in the reservoir used with AB equipment, the reservoir portions will be taken apart and cleaned thoroughly by washing and drying. Universal valve pipe brackets, AB valve pipe brackets, and brake cylinder heads upon which the type "L" triple valve is mounted, will have all piping disconnected and all interior ports and cavities washed out and dried thoroughly.

b. Brake pipes, brake pipe branches, brake cylinder pipes, reservoir pipes, and retaining valve pipes will be given interior examination to make sure that they are free of water and sediment. If necessary, a stream of water may be used to clean them, after which they will be blown dry with compressed air.

CHAPTER 7

OPERATING AND INSPECTION REPORT FORMS

111. General

a. Included in this chapter are pertinent operating and inspection report forms for rolling stock. In the zone of the interior, these will be maintained or prepared as directed by the installation responsible for the equipment. In a theater of operations, these reports will be maintained or prepared as directed by the Military Railway Service headquarters.

b. Included in this chapter also are instructions governing the preparation of these operating and inspection reports; personnel responsible for their preparation will be guided by these instructions.

112. WD AGO Form 55–154 (Record of Special Tests Made on Air Brake Equipment) (fig. 113)

This will be completed in triplicate by person in charge of testing equipment whenever cars develop faulty air brakes causing trouble or delay to trains, damage to wheels, or other difficulties. Items on this form pertaining to condition of feed valve, condition of compressor governor, condition and type of brake valves, main reservoir safety valve, condition of dead man's device, condition of air signal equipment, signal pipe leakage, signal valve, condition of reducing valve, and condition of air gauges will be completed only when rail motor cars or other types of self-propelled cars equipped with air brakes are tested; these items will *not* be filled in when testing freight or passenger cars. In theaters of operations, one copy will be retained on file at the installation, one copy forwarded to the commanding officer of the Railway Operating Battalion, and one copy forwarded to Railway Grand Division headquarters. In the zone of interior, one copy will be retained on file at the installation and two copies will be forwarded to the Zone Transportation Officer, Attention: Zone Master Mechanic.

113. WD AGO Form 55–155 (A. A. R. Defect Card) (fig. 114).

This will be used only in the zone of interior for operations in conjunction with railroads subscribing to the Association of American Railroads' Rules of Interchange. It provides authority to repair interchange cars having defects for which delivering line is responsible.

a. The form will be completed in triplicate to provide two paper copies for record purposes and one cardboard copy. The cardboard copy is printed on both sides and after being completed will be attached securely to the side of the car. One paper copy will be retained on file at the originating point and the original paper copy will be forwarded to the Zone Transportation Officer, Attention: Zone Master Mechanic. Defect card will be supported by WD AGO Form 55–241 (Report of Cars Damaged).

b. The A. A. R. Defect Card is used as follows: If a car owned by a railroad which subscribes to the A. A. R. Code of Rules is damaged while the car is within the confines of a Government installation, including damage by derailment, bad handling, or loading or unloading by War Department personnel, the transportation officer of the installation will make an inspection to determine the extent of the damage and to affix responsibility. The transportation officer then will execute the defect card as outlined above giving the necessary information.

c. If railroad equipment while in a Government installation is damaged by personnel *not* under the jurisdiction of the War Department, the transportation officer will fix the responsibility and advise the local agent of the railroad serving the installation of all particulars and to handle all charges and arrangements directly with the persons responsible.

d. When cars are not in a Government installation but are damaged by War Department personnel, the

RECORD OF SPECIAL TESTS MADE ON AIR BRAKE EQUIPMENT	ROAD	LOCATION	DATE OF TEST

SECTION 1 — **GENERAL INFORMATION**

DATE	TRAIN NUMBER	CAR NUMBER	INITIAL OR NAME
STYLE OF EQUIPMENT		PLACE LAST CLEANED	DATE LAST CLEANED

SECTION 2 — **TESTS MADE WITH TEST TRUCK OR SINGLE CAR TEST DEVICE**

SUPPLY PRESSURE DURING TEST (Lbs)	BRAKE PIPE PRESSURE DURING TEST (Lbs)	BRAKE PIPE LEADAGE BEFORE MAKING REPAIRS (Lbs per minute)
CAUSE AND LOCATION OF EXCESSIVE LEAKAGE		
BRAKE PIPE REDUCTION REQUIRED TO APPLY IN SERVICE (Lbs)	TEST VALVE FAILED ON: APPLICATION, SERVICE STABILITY OR RELEASE	DID TRIPLE VALVE SUPPLYING AIR TO WATER RAISING SYSTEN FAIL (See note)
PISTON TRAVEL: SERVICE CYLINDER	EMERGENCY CYLINDER	
CONDITION OF RETAINING VALVE, SLACK ADJUSTER, HAND BRAKE, BRAKE RODS, LEVERS, ETC.		

DID BRAKE SHOES SHOW INDICATIONS OF BRAKES STICKING	OUTSIDE TEMPERATURE	DID ICE OBSTRUCT VALVE EXHAUST PORTS (What ports)
WAS CONTROL OR TRIPLE VALVE COATED WITH ICE	DID ICE OBSTRUCT OPERATION OF SAFETY VALVE	CONDITION OF DIRT COLLECTORS AND STRAINERS
BRAKE CYLINDER LEAKAGE (Lbs per minute)	PLACE LAST CLEANED	DATE LAST CLEANED
KIND AND CONDITION OF BRAKE CYLINDER PACKING	KIND AND CONDITION OF BRAKE CYLINDER LUBRICANT	
CONDITION OF FEED VALVE		ADJUSTED (Lbs)
CONDITION OF COMPRESSOR GOVERNOR	ADJUSTED CUT-IN (Lbs)	CUT-OUT (Lbs)

CONDITION AND TYPE OF BRAKE VALVES: NO. 1 END	NO. 2 END	MAIN RESERVOIR SAFETY VALVE OPENS AT (Lbs)	CLOSES AT (Lbs)
CONDITION OF DEAD MAN'S DEVICE: NO. 1 END	NO. 2 END	CONDITION OF AIR SIGNAL EQUIP	SIGNAL PIPE LEAKAGE (Lbs per minute)
SIGNAL VALVE: NO. 1 END	NO. 2 END	CONDITION OF REDUCING VALVE	ADJUSTED (Lbs)
CONDITION OF AIR GAUGES		SLID WHEELS	
		BOXES 1 3 5 7 9 11 / 2 4 6 8 10 12	SLID FLAT WHEELS 1 3 5 7 9 11 / 2 4 6 8 10 12
FREIGHT BRAKE EQUIPMENT: CAR LENGTH (Ft)		SINGLE SHOE OR CLASP BRAKE	
BRAKE CYLINDER PRESSURE OBTAINED FROM 10 POUND REDUCTION		TEST MADE BY (Signature)	

Triple valve supplying air to water raising system must be tagged No. 1 when removed from the car.

SECTION 3 — **WATER PRESSURE SYSTEM**

PRESSURE GOVERNOR OPENS AT (Lbs)	CONDITION OF GOVERNOR	CONDITION OF CHECK VALVE	TEST MADE BY (Signature)

SECTION 4 — **VAPOR CAR HEATING SYSTEM**

CONDITION OF SELECTOR SWITCH PISTON AND GASKET	TEST MADE BY (Signature)

SECTION 5 — **SHOP AIR BRAKE TESTS**

LOCATION	DATE	DIFFERENTIAL TO APPLY (Lbs)	RING LEAKAGE, RELEASE (Lbs)
RING LEAKAGE, EQUALIZING (Lbs)	VALVE NO. 1 (Lbs)	VALVE NO. 2 (Lbs)	
FRICTION OF: EQUALIZING PISTON AND SLIDE VALVE (Lbs)	VALVE NO. 1 (Lbs)	VALVE NO. 2 (Lbs)	
RELEASE PISTON AND SLIDE VALVE (Lbs)	CHARGING VALVE (Lbs)	GRADUATED RELEASE PISTON STOP (Lbs)	EMERGENCY PISTON AND SLIDE VALVE (Lbs)
PROTECTION VALVE (Lbs)	INTERCEPTING VALVE (Lbs)	HIGH PRESSURE VALVE (Lbs)	CUT-OFF VALVE (Lbs)
CAUSE OF EXCESSIVE FRICTION		CAUSE OF EXCESSIVE RING LEAKAGE	
WHAT TEST DID VALVE FAIL ON		KIND AND CONDITION OF LUBRICANT	

VALVE NO. 1	VALVE NO. 2	SAFETY VALVE OR M. S. REDUCING VALVE OPENED AT (Lbs)	VALVE NO. 1 (Lbs)
VALVE NO. 2 (Lbs)	SAFETY VALVE OR M. S. REDUCING VALVE CLOSED AT (Lbs)	VALVE NO. 1 (Lbs)	VALVE NO. 2 (Lbs)
Remarks are to be placed on reverse side.		TEST MADE BY (Signature)	

WD AGO FORM 55-154
1 APR 1945

28-44984-21620

Figure 113. WD AGO Form 55-154 (Record of Special Tests Made on Air Brake Equipment).

officer in charge of the personnel responsible for the damages will contact the transportation officer of the nearest War Department installation and advise him of all particulars. The transportation officer will affix responsibility and execute the defect card as outlined in *a* above.

A.A.R. DEFECT CARD CHIEF OF TRANSPORTATION, U.S. ARMY	Fill in defects. Attach this card to car per AAR Rule 14.	DATE

CAR SPECIFIED BELOW WILL BE RECEIVED AT ANY POINT ON U.S. ARMY TRACKAGE WITH THE FOLLOWING DEFECTS:

CAR NUMBER	INITIALS	SIGNATURE AND RANK	TRANSPORTATION OFFICER AT

WD AGO FORM 55-155
1 APR 1945

26-46127-32400

Figure 114. WD AGO Form 55–155 (A. A. R. Defect Card).

114. WD AGO Form 55–156 (Battery Removal and Application Record) (fig. 115)

This will be completed in duplicate by person in charge of battery removals from and applications to cars equipped with electric lighting systems, including passenger and hospital equipment. One copy will be kept on file at the installation, and one copy will be forwarded to the Railway Grand Division headquarters in theaters of operations, or to the Zone Transportation Officer, Attention: Zone Master Mechanic, in the zone of interior.

WD AGO FORM 55-156
1 APR 1945

BATTERY REMOVAL RECORD

Date _____ Set No. _____

Make _____

Capacity _____

Mfr's type _____

No. of trays _____

Removed from car _____

Location _____

Signed _____
Foreman.

GPO 16—44716-1

BATTERY APPLICATION RECORD

Date _____ Set No. _____

Make _____ New / Cleaned / Equalized / Rebuilt

Capacity _____

Mfr's type _____

Order No. _____ Date New _____

Applied to car _____

Location _____

Signed _____
Foreman.

GPO 16—44716-1

Figure 115. WD AGO Form 55–156 (Battery Removal And Application Record).

115. WD AGO Form 55–157 (Report of Changes in Car Numbers) (fig. 116)

This will be completed in triplicate when cars are converted from one class of service to another or when car number is changed for any other reason. One copy will be retained on file at the installation making the change. In theaters of operations, two copies will be forwarded to the Railway Grand Division headquarters which will retain one copy and forward the other copy to the Chief of Transportation, Washington 25, D. C. In the zone of interior, one copy will be sent to the Zone Transportation Officer, Attention: Zone Master Mechanic, and one copy will be sent to the Chief of Transportation, Washington 25, D. C.

REPORT OF CHANGES IN CAR NUMBERS | REPORT NO. | SHEET NO. | NO. OF SHEETS

LOCATION | DATE

FROM			TO		
INITIAL	NUMBER	TYPE	INITIAL	NUMBER	TYPE

REMARKS (For additional space use reverse side)

CERTIFIED CORRECT BY (Signature and title of authorized official)

WD AGO FORM 1 APR 1945 55-157 25-45370-16,070

Figure 116. WD AGO Form 55–157 (Report of Changes In Car Numbers).

116. WD AGO Form 55–158 (Hospital Car Inspection and Repair Record) (fig. 117)

This is a progressive record of inspection and repairs given War Department hospital cars and will be maintained on the car at all times in a suitable holder located on the back of the electrical locker door. Inspectors will initial each item inspected by him and the person in charge will sign his full name under that of the inspector. When a card is completed it will be sent to the Railway Grand Division headquarters in theaters of operation, or to the Chief of Transportation in the zone of interior, and a new card placed on the locker door.

117. WD AGO Form 55–159 (Equipment Record for Hospital Cars) (fig. 118)

This provides a record of batteries, generator, refrigerating unit, and other components of railway hospital equipment and includes information such as type of car, type of truck, size of journal, car builders, and truck manufacturer. It will be completed in duplicate for each unit of equipment at installation where cars are assigned. One copy will be retained on file at the installation to which the car is assigned and one copy will be forwarded to the Chief of Transportation in the zone of the interior or to the Railway Grand Division headquarters, in theaters of operations.

118. WD AGO Form 55–160 (Record of Cleaning Water Tanks on Hospital and Kitchen Cars) (fig. 119)

This will be maintained to indicate when water tanks and drinking water containers were drained and cleaned; it will be carried currently in holders provided for that purpose in all hospital and kitchen cars. When water tanks are sterilized or before cars are released from shop, a notation, "Sterilized," will be made under caption, "Water Tanks," giving the date on which it received this attention. Records on this form will be entered consecutively by foreman in charge or by person doing the work immediately after work is completed. When card is filled completely, it will be removed and filed for further reference in the office of the foreman in charge, and a fresh card inserted in the holder.

119. WD AGO Form 55–161 (Air Brake Defect Card) (fig. 120)

This will be used by car inspection or train conductor to tag car having inoperative brakes so that the defective condition will be noticed readily. Inspector or conductor finding brakes inoperative will cross off defect listed on card and attach card to brake pipe close to triple valve. In the zone of interior, inspector of other personnel after completing repairs

HOSPITAL CAR INSPECTION AND REPAIR RECORD

CAR NUMBER	DATE THIS CARD APPLIED
TYPE OF GENERATOR	TYPE OF GEN. REGULATOR
TYPE OF LAMP REGULATOR	TYPE OF AIR CONDITIONING
LAST SEMI ANNUAL INSPECTION	LAST ANNUAL INSPECTION
MONTH	YEAR

To be filled in at time work is performed. All work other than inspection to be recorded on last sheet. When card has expired it is to be sent to O.C.T., Rail Div., Wash. D.C.

DAY OF MO.	INSPECTION		ELECTRICAL						TEMP. CONTROL			COOLING				HEATING			RUNNING GEAR				INSPECTOR
	CLASS	PLACE	BATTERIES	GENERATOR	REGULATOR	WIRING	BLOWER FAN	EXHAUST FAN	THERMOSTAT	HEAT VALVE	PANEL	PUMP OR COMPRESSOR	PIPING	FILTERS	DUCTS	PIPING	TRAPS	STEAM REGULATOR	BRAKES	TRUCKS	JOURNALS	DRAW BAR	
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							
14																							
15																							
16																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							
25																							
26																							
27																							
28																							
29																							
30																							
31																							

REMARKS

WD AGO FORM 55-158
1 APR 1945

Figure 117 (1). WD AGO Form 55–158 (Hospital Car Inspection And Repair Record). (Front.) (Second and third pages are the same as the front.)

WORK OTHER THAN INSPECTION *(Data to be filled in at time work is performed)*	
DAY	FIRST MONTH
DAY	SECOND MONTH
DAY	THIRD MONTH

Figure 117 (2). WD AGO Form 55–158 (Hospital Car Inspection And Repair Record). (4th page.)

EQUIPMENT RECORD FOR HOSPITAL CARS	CAR NO.	LOCATION	DATE
	TYPE CAR		TYPE AIR CONDITIONING
	KITCHEN		ICE ACTIVATED
RECONVERSION BUILDER	WARD		PULLMAN MECHANICAL
	WARD DRESSING		FRIGIDAIRE ELECTRO-MECH.
ORIGINAL BUILDER OR OWNER	TYPE TRUCK		
TRUCK MANUFACTURER	JOURNAL SIZE		

BATTERIES	GEN. REG.
MFG.	MFG.
TYPE	TYPE
NO. OF CELLS	CAT. NO.
AMP. HR. CAPACITY	SER. NO.
SPECIFIC GRAVITY	VOLT SETTING HOT
SERIAL NO.	AMP. SETTING
DATE NEW	MAIN FUSE CAPACITY
GENERATOR	FIELD FUSE CAPACITY
MFG.	AUTO. SWITCH
TYPE	MFG.
VOLT	TYPE
CAPACITY	CAT. NO.
SERIAL NO.	SER. NO.
CAT. NO.	SET AT *(Volts)*
GEN. BELT	LAMP REG.
TYPE	MFG.
SIZE	TYPE
CAT. NO.	CAT. NO.
GEN. PULLEY	SER. NO.
TYPE	VOLT SETTING HOT
CAT. NO.	LIGHT SW. BOARD
AXLE PULLEY	MFG.
TYPE	CAT. NO.
CAT. NO.	NO. OF CIRCUITS
BLOWER FAN	REFRIGERATING UNIT
MFG.	MFG.
TYPE	TYPE
CAT. NO.	CAT. NO.
BLOWER FAN MOTOR	CAPACITY *(Tons)*
MFG.	COMPRESSOR OR SUMP PUMP
TYPE	MFG.
SER. NO.	TYPE
CAT. NO.	CAT. NO.
VOLT	SERIAL NO.
HORSEPOWER	SPEED CONTROL
EVAPORATOR	TYPE
MFG.	CAT. NO.
TYPE	POWELL DRIVE
CAPACITY	TYPE NO.
EXPANSION VALVES	CAT. NO.
AMOUNT	BELT TYPE
MFG.	BELT SIZE
TYPE	STAND BY MOTOR
CAT. NO.	MFG.
LAMP WATTAGE	TYPE
25 WATTS	VOLTAGE
40 WATTS	HORSEPOWER
50 WATTS	CAT. NO.

WD AGO FORM 1 APR 1945 55-159

Figure 118 (1). WD AGO Form 55–159 (Equipment Record For Hospital Cars). (Front.)

CONDENSOR (R.H. L.H.)	STAND BY PANEL
MFG.	MFG.
TYPE	TYPE
CAT. NO.	CAT. NO.
CONDENSOR FAN	BATTERY CHARGER ON CAR
MFG.	MFG.
TYPE	TYPE
CAT. NO.	CAT. NO.
BELT TYPE	VOLTS
BELT CAT. NO.	AMPS.
NO. OF BELTS	NO. OF UNITS ON CAR
COMPRESSOR MOTOR OR PUMP MOTOR (Elect.-Mech. or ice actu)	COMP. CONTROL PANEL
MFG.	MFG.
TYPE	TYPE
CAT. NO.	VOLTAGE
HORSEPOWER	AUXILIARY LIGHTING TRANSFORMER
VOLTS	MFG.
NO. OF BELTS	TYPE / VOLTAGE
TYPE OF BELTS	CAPACITY
CAT. NO. OF BELTS	CYCLES
MECH. DRIVE	CAT. NO.
(Pullman Mech. Only)	RECEPTACLES
DRIVE SHAFT (Powell Drive to speed control)	NO. OF BATTERY CHARGING
MFG.	MFG.
TYPE	TYPE
COMPRESSED LENGTH	CAT. NO.
SHORT SHAFT	CAPACITY
MFG.	NO. OF STAND BY (A.C.)
TYPE	MFG. / CAT. NO.
COMPRESSED LENGTH	TYPE / CAPACITY

TEMPERATURE CONTROL		
TYPE	MANUFACTURER	CATALOG NUMBER
AUXILIARY FANS		
REMARKS		

Figure 118 (2). WD AGO Form 55–159 (Equipment Record For Hospital Cars). (Back.)

will make notation "repairs made" on card and forward it to the officer in charge at installation. In theaters of operations, the inspector or other personnel, after completing repairs, will make similar notation and forward card to officer in charge of air brake repairs in the Railway Operating Battalion.

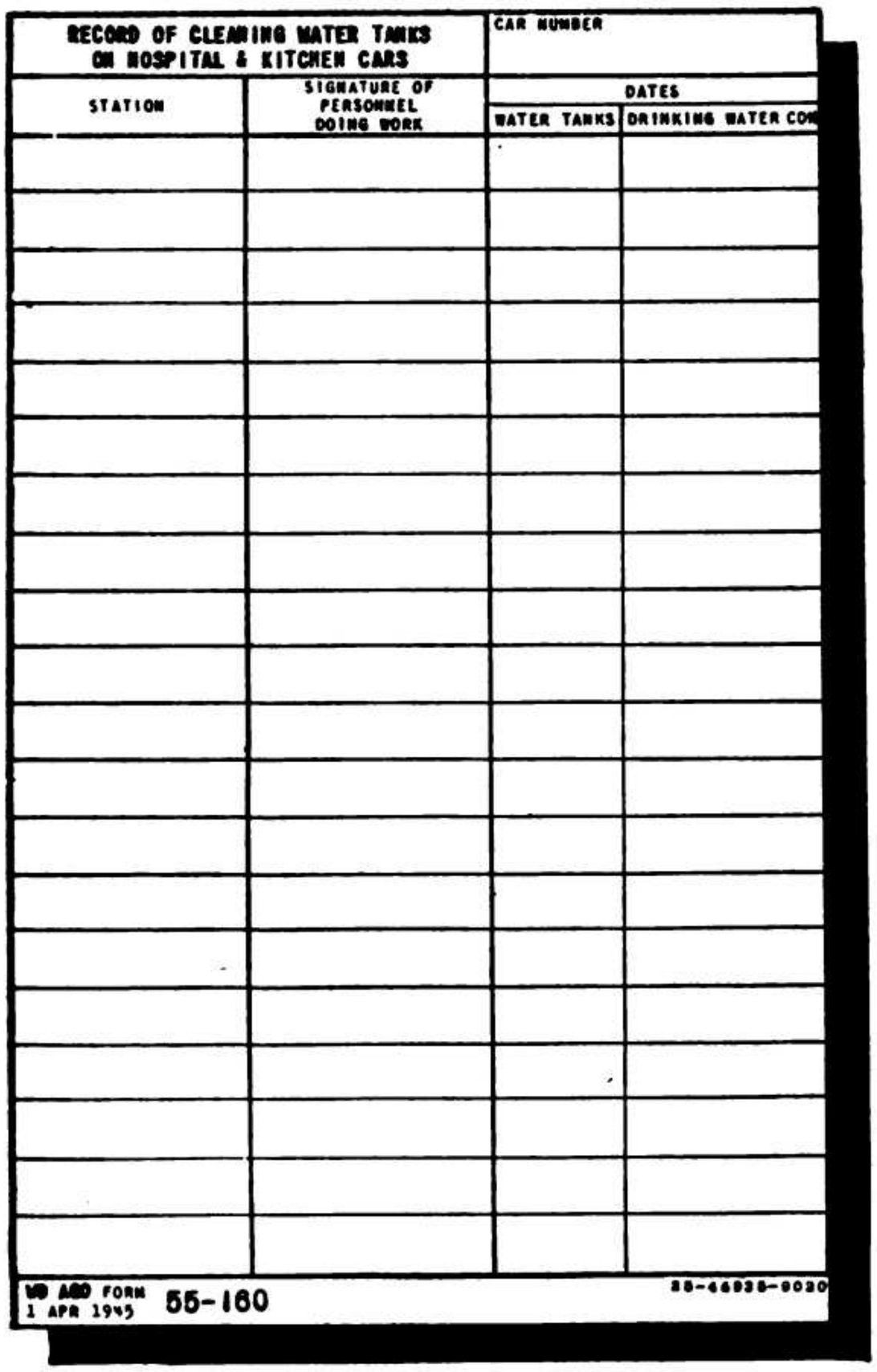


Figure 119. WD AGO Form 55–160 (Record of Cleaning Water Tanks On Hospital And Kitchen Cars).

120. WD AGO Form 55–162 (Inspector's Record) (fig. 121)

This will be used by car inspectors for reporting all defects on cars inspected by them, and will include cars having defective hand brakes, cars carded to repair tracks, cars carded for reweighing, cars given inspection for other purposes, and other pertinent inspection information. In theaters of operations, the completed form will be sent to the officer in charge of car repairs in the operating battalion. In the zone of interior, the completed form will be forwarded to the transportation officer at the installation where the inspections were made.

121. WD AGO Form 55–163 (Car Inspector's Train Report) (fig. 122)

This will be used by the chief car inspector in making report of inspection of each train arriving or leaving terminal or originating point where car inspectors are located. In theaters of operations, this report will be retained on file by the officer in charge of car repairs in the Railway Operating Battalion. In the zone of interior, the report will be retained on file at the installation.

122. WD AGO Form 55–164 (Bad Order Card) (fig. 123)

This will be completed by car inspectors or other personnel engaged in the inspection of railroad rolling stock in train assembly yards, or other places where it is ascertained if cars are in safe and suitable condition for service, and is used to indicate equipment requiring repairs before further usage.

a. Information required may be written in pencil and will include date, car number, nature of defect, place carded, whether loaded or empty, and name of inspector.

b. The side of the card having the words "Bad Order" on a *black* background will be used when the defective condition of a loaded car is such that it can be moved to destination within the local switching district for unloading before repairs need be made. This form also may be used when forwarding bad order empty cars from one shop, or from one repair point to another for repairs.

c. Cards with the words "Bad Order" on a *red* background will be used to designate cars that are in such defective condition that they are not to be handled except to repair tracks.

d. Cards carry the words "light" and "heavy" on each side; marking one or the other of these words will indicate whether the car is to be placed on the light or the heavy repair track for necessary repairs.

e. One card will be applied to each side of a bad order car. On cars having wood sides, the card will be placed below car number; on cars with steel sides, cards will be placed on the boards provided for this purpose.

f. Bad order cards will not be removed from car until repairs are completed and then only by authorized personnel. In both zone of interior and theaters of operations, the inspector responsible for repairs will remove and destroy card when he declares the car ready for service.

WD AGO FORM 55-161
1 APR 1945

Air Brake Defect Card

Car Initial **Car No.** **Date**

DEFECTS

1 Triple Valve.
2 Reservoir.
3 Cylinder.
4 Cylinder Packing.
5 Release Valve.
6 Brake Rigging.
7 Cut Out Cock.
8 Angle Cock.
9 Cross Over Pipe.
10 Train Pipe.
11 Hose or Coupling.
12 _____
13 _____

Place _____

APPLICATION OF CARD.

Conductor or Inspector will cross off defect on card and attach to branch pipe as close to triple valve as possible.

Inspector after making repairs will forward card to master mechanic.

Inspector _____

Cond'r Train No. _____

Figure 120. WD AGO Form 55–161 (Air Brake Defect Card).

123. WD AGO Form 55–165 (Conductor's Report of Damaged or Defective Cars) (fig. 124)

This will be completed in duplicate by the conductor in charge of train to advise the car inspector or foreman at terminal with detailed information covering defects which developed while cars were en route. One copy will be sent to the car foreman or inspector at end of the trip and one copy will be forwarded to the commanding officer, Railway Operating Battalion, in theaters of operations, or to commanding officer of the installation at which car terminates, zone of the interior.

124. WD AGO Form 55–166 (Report of Rolling Stock Repaired) (fig. 125)

In theaters of operations this will be completed daily in duplicate and will include all cars repaired or held for repairs at installation, and all car repairs made at both shop and running repair points for that day. The report will be made by officer in charge at shop or repair tracks making the repairs. One copy will be retained by the installation, and one copy will be forwarded to the Railway Grand Division headquarters. In the zone of interior this report will be prepared on the 16th and the last day of each month and will include all cars repaired during those periods, as well as the number of cars awaiting repair and under repair. It will be prepared by the officer in charge of railroad repair facilities making repairs in excess of second echelon. One copy will be retained by the installation and one copy will be forwarded to the Zone Transportation Officer, Attention: Zone Master Mechanic.

125. WD AGO Form 55–237 (Rolling Stock Specification Card) (fig. 126)

This will be used to provide information as to classification, type, capacity, gauge, builder, and other pertinent information for all rolling stock, including freight, passenger, hospital kitchen, work and shop cars. When all cars of a group, type, or class are identical, only one card will be required for that group; a new card will be corrected to indicate exceptions. If required data are not available, the information will be obtained from drawings and specifications or by inspection of the car. A specification card for each car in service will be forwarded to the Railway Grand Division headquarters in theaters of operations or to the Chief of Transportation, Washington 25, D. C. in the zone of interior.

[redacted]OR'S RECORD | PLACE | DATE

[redacted] | TIME ARRIVED | FROM

TIME INSPECTION STARTED | TIME COMPLETED | SIGNATURE OF INSPECTOR

CAR NUMBER	INITIALS	KIND	LOADED OR EMPTY	CONDITION

WD AGO FORM 1 APR 1945 55-162 [redacted]

Figure 121. WD AGO Form 55–162 (Inspector's Record).

126. WD AGO Form 55–241 (Report of Cars Damaged) (fig. 127)

This will be completed in triplicate by the car inspector when cars are found in damaged condition. One copy will be retained on file at the installation initiating the report and two copies will be forwarded to the Railway Grand Division headquarters in theaters of operations. In the zone of interior, one copy will be retained on file at the installation initiating the report, and two copies used to supplement the information on A.A.R. Defect Card—WD AGO Form 55–155 and both reports will be forwarded to the Chief of Transportation, Washington 25, D. C.

127. WD AGO Form 468 (War Department Unsatisfactory Equipment Report) (fig. 128)

This form will be used for reporting manufacturing, design, or operational defects in equipment and will be completed in triplicate as directed on this form by the person in charge of maintaining the equipment. One copy will be retained on file by the using or service organization, and two copies for the use of the technical service will be forwarded to the Railway Grand Division headquarters in theaters of operations, or to the Zone Transportation Officer, Attention: Zone Master Mechanic in the zone of interior.

128. WD AGO Form 55–126 (Request and Receipt for Spare Parts, Supplies, Services, or Repairs for U. S. Army Hospital Cars from the Pullman Company or Railroads) (fig. 129)

a. This request will be completed by the train commander or maintenance officer, in quadruplicate, whenever it is essential to secure ordinary supplies, including ice for air conditioning, spare parts, repairs, and services, for immediate use from a railroad or the Pullman company; this form will not be used to secure spare parts or supplies for stock. The original and duplicate copies will be forwarded to the railroad or Pullman company representative; the triplicate copy will be forwarded to the Chief of Transportation, Attention: Rail Division, Washington 25, D. C.; and the quadruplicate copy will be retained by the service unit to which the cars are assigned.

b. The Office of the Chief of Transportation will be responsible for the processing of all bills for spare parts, supplies, repairs, and services supplied by the railroad or Pullman company for specific War Department owned hospital cars.

(1) The railroads or Pullman company will submit invoice in quadruplicate, together with the original WD AGO Form 55–126, to the Office of the Chief of Transportation, Attention: Rail Division, Washington 25, D. C.

(2) The Office of the Chief of Transportation will check all invoices submitted by railroads to insure that all invoices submitted by them are in accordance with the Association of American Railroads' Code of Rules, Governing the Condition of, and Repairs to, Passenger Equipment Cars in Interchange to which the War Department is signatory. Invoices submitted in accordance with these rules will be processed by the Office of the Chief of Transportation for payment.

(3) The Office of the Chief of Transportation will check all invoices submitted by the Pullman company or by railroads who are not members of the Association of American Railroads and do not

CAR INSPECTOR'S TRAIN REPORT	TRAIN NUMBER	ENGINE NUMBER	STATION	DATE

INCOMING		OUTGOING	
TIME OF ARRIVAL	TIME INSPECTION COMMENCED	TIME TRAIN CALLED TO LEAVE	TIME TRAIN MADE COMPLETE
TIME INSPECTION COMPLETED	AIR BRAKE INSPECTION MADE ☐ YES ☐ NO	TIME ENGINE COUPLED	TIME INSPECTION COMPLETED *(Including yard air test)*
BY		TIME ENGINEMAN SET BRAKES	TIME TRAIN O.K.
TOP INSPECTED BY		TIME TRAIN DEPARTED	YARD AIR PRESSURE WAS USED ON TRAIN BEFORE ENGINE WAS COUPLED ☐ YES ☐ NO
CABOOSE NUMBER	NUMBER OF CARS IN TRAIN	IF NOT STATE WHY	
NUMBER CARS BAD ORDER	BLUE SIGNAL WAS DISPLAYED ☐ YES ☐ NO	CABOOSE NUMBER	NUMBER OF CARS IN TRAIN
JOURNAL BOXES WERE INSPECTED AND PACKING ADJUSTED ☐ YES ☐ NO		NUMBER CARS BAD ORDER	BLUE SIGNAL WAS DISPLAYED ☐ YES ☐ NO
REMARKS		SHOW BRAKE PIPE LEAKAGE	JOURNAL BOXES INSPECTED AND PACKING ADJUSTED ☐ YES ☐ NO
		GIVE REASON FOR ANY DELAY IN GETTING TRAIN OUT	
SIGNATURE OF INSPECTOR	SHIFT	SIGNATURE OF INSPECTOR	SHIFT

WD AGO FORM 55-163
1 APR 1945

25-44933-2160

Figure 122. WD AGO Form 55–163
(Car Inspector's Train Report).

So State:—When damage is due to Derailment, Cornering, Sideswiping, Telescoping or other handling Line Responsibility Conditions.

WD AGO FORM 55–164
1 APR 1945

SHOP LIGHT HEAVY To _____ Shop

_____ 19____

16—44641-1 GPO

BAD ORDER

DEFECT _____

_____

Car Initials _____ **No.** _____ **Loaded or Empty** _____

Place Carded _____ **Inspector** _____

Figure 123. WD AGO Form 55–164
(Bad Order Card).

CONDUCTOR'S REPORT OF DAMAGED OR DEFECTIVE CARS	Conductors will fill out in duplicate. The original report will be handed to Foreman or inspector at end of run. The duplicate copy will be sent to Division Superintendent or equivalent on arrival at terminal.		
LINE	DIVISION	TRAIN NUMBER	DATE
REPORTED TO CAR INSPECTOR AT *(Location)*	NUMBERS OF DAMAGED CARS	DAMAGED CARS WERE TURNED OVER TO CONDUCTOR AT *(Location)*	
DESCRIPTION OF DAMAGE			
CARS DAMAGED IN TRAIN *(Car numbers and description of damage)*			
		SIGNATURE OF CONDUCTOR	

WD AGO FORM 1 APR 1945 55-165

28-44764-1622

Figure 124. WD AGO Form 55-165 (Conductor's Report Of Damaged Or Defective Cars).

subscribe to the A.A.R. Code of Rules, to determine their correctness and, if found reasonable and accurate, will issue company purchase orders.

c. All hospital and hospital kitchen cars will carry a supply of these forms.

129. Territorial Departments and Commands

Installations located outside the continental limits of the United States which are under the jurisdiction of territorial departments or commands will forward two copies of WD AGO Forms 55–157, 55–237 and 468 to the Chief of Transportation, U. S. Army, Washington 25, D. C. Reports herein required to be forwarded to the zone master mechanic, zone of interior, will be forwarded to the commanding general of the department or command having jurisdiction over the installation in which the equipment is operated and maintained.

130. Requisitioning Forms

Forms will be requisitioned through normal channels from adjutant general depots in numbered service commands by installations within the continental limits of the United States, and from the port of embarkation, adjutant general depots, by installations located outside the continental limits of the United States.

REPORT OF ROLLING STOCK REPAIRED	LOCATION	DATE	CONTROL APPROVAL SYMBOL TOR-42

CARS RELEASED THIS DATE OR PERIOD

CAR NUMBERS	TYPE OF CAR	CLASS OF REPAIR	CAR NUMBERS	TYPE OF CAR	CLASS OF REPAIR	CAR NUMBERS	TYPE OF CAR	CLASS OF REPAIR

TOTAL NUMBER OF CARS REPAIRED AND RELEASED FOR SERVICE

NUMBER OF CARS IN SHOP OR RELEASED

STATUS	TYPE OF CAR									
AWAITING REPAIRS										
UNDER REPAIR										
RELEASED THIS DAY (T of O only)										
RELEASED THIS MONTH (T of O only)										
OTHER										

REMARKS	SIGNATURE OF OFFICER IN CHARGE

WD AGO FORM 1 MAY 1945 55-166

Figure 125. WD AGO Form 55–166 (Report of Rolling Stock Repaired).

ROLLING STOCK SPECIFICATION CARD

CARS COVERED

ASSIGNMENT

TYPE	GAUGE	BUILDER	DATE	U.S. ARMY SPEC. NO.	BUILDER SPEC. NO.

CAPACITY

CUBIC FEET *(Level full)*	PASSENGERS *(Seated)*	BAGGAGE COMPARTMENT	POUNDS OR GALLONS
LIGHTWEIGHT	LOAD LIMIT	TYPE OF TRUCKS	NUMBER OF AXLES
SIZE OF JOURNALS	SIZE AND KIND OF WHEELS	TYPE AND SIZE OF COUPLERS	TYPE OF BRAKES

INSIDE DIMENSIONS			OUTSIDE DIMENSIONS			
LENGTH	WIDTH	HEIGHT	EXTREME WIDTH	EXTREME LENGTH	EXTREME HEIGHT	WIDTH AT EAVES

OVER-ALL HEIGHT FROM RAIL				DOORS			
EXTREME WIDTH	TO EAVES	TOP OF RUN'G BD.	EXTREME HEIGHT	LOCATION	NUMBER	WIDTH	HEIGHT

WINDOWS

LOCATION	SIZE

SPECIAL EQUIPMENT.

WD AGO FORM 1 APR 1945 **55-237** This form supersedes WD AGO Form 55-237, 15 August 1944 (Old WD TC MRS Form 516, 1 March 1944), which may be used until existing stocks are exhausted.

Figure 126. WD AGO Form 55-237 (Rolling Stock Specification Card).

REPORT OF CARS DAMAGED	STATION
	DATE
NAME OF YARD WHERE DAMAGE OCCURRED OR WAS FOUND UPON ARRIVAL	
TRAIN	LINE
CAR NUMBER AND INITIALS	LOCATION IN TRAIN
DESCRIPTION OF DAMAGE *(Including how and where damaged)*	
DISPOSITION MADE	
ESTIMATED DAMAGE	SIGNATURE OF INSPECTOR

WD AGO FORM 1 MAR 1945 · 55-241 REPLACES EDITION OF 15 AUGUST 1944 WHICH MAY BE USED. 28-42070-100020

Figure 127. WD AGO Form 55-241 (Report Of Cars Damaged).

WAR DEPARTMENT

UNSATISFACTORY EQUIPMENT REPORT

FOR	TECHNICAL SERVICE — MATÉRIEL		DATE
FROM	ORGANIZATION		STATION
TO	NEXT SUPERIOR HEADQUARTERS	STATION	TECHNICAL SERVICE

COMPLETE MAJOR ITEM

NOMENCLATURE	TYPE	MODEL	
MANUFACTURER	U. S. A. REG. No.	SERIAL No.	DATE RECEIVED
EQUIPMENT WITH WHICH USED *(if applicable)*			

DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE

PART No.	TYPE	MANUFACTURER	DATE INSTALLED
DESCRIPTION OF FAILURE AND PROBABLE CAUSE *(If additional space is required, use back of form)*			

DATE OF INITIAL TROUBLE	TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE					
	YEARS	MONTHS	DAYS	YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS

BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN

TRAINING OR SKILL OF USING PERSONNEL			RECOMMENDATIONS *(If additional space is required, use back of form)*
POOR	FAIR	GOOD	

ORIGINATING OFFICER

TYPED NAME, GRADE, AND ORGANIZATION	SIGNATURE

FIRST ENDORSEMENT

TO CHIEF	TECHNICAL SERVICE	OFFICE	
NAME, GRADE, AND STATION		STATION	DATE

Instructions

1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in matériel. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.
2. This form will be used for reporting manufacturing, design, or operational defects in matériel, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of matériel.
3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 750-10 (change No. 3).
5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable.
6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.
7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels.
8. Necessity for using this form will be determined by the using or service troops.

W.D., A. G. O. Form No. 468
30 August 1944

This form supersedes W. D., A. G. O. Form No. 468, 1 December 1943, which may be used until existing stocks are exhausted.

U. S. GOVERNMENT PRINTING OFFICE 16—61860-1

Figure 128. WD AGO Form 468 (War Department Unsatisfactory Equipment Report).

REQUEST AND RECEIPT FOR SPARE PARTS, SUPPLIES, SERVICES OR REPAIRS FOR U.S. ARMY HOSPITAL CARS FROM THE PULLMAN CO. OR RAILROADS	DATE	MAIN NUMBER
	PLACE	HOSPITAL TRAIN UNIT

INSTRUCTIONS

1. This request will be initiated by the Train Commander or Maintenance Officer to secure ordinary supplies, services, repairs or spare parts essential to the efficient operation of U. S. Army Hospital cars. This form will not be used to secure spare parts or supplies for stock but only for immediate use.

2. Ordinary supplies include ice for air conditioning.

3. Preparation. - The form will be prepared in quadruplicate.

4. Each copy will be marked "original", "duplicate", "triplicate" or "quadruplicate" to properly identify it.

5. The copies will be distributed as follows: - Original and duplicate will be given to the railroad or Pullman Company representative. The triplicate will be sent direct to the Office of the Chief of Transportation, Rail Division, Washington 25, D.C. The quadruplicate will be retained in the files of the installation preparing the form.

6. When submitting their invoice, the Pullman Company or the railroads will attach the original to their invoice and retain the duplicate.

7. Railroads who are members of the Association of American Railroads will submit their invoice in accordance with AAR rules and prices.

Please furnish the spare parts, supplies, services or repairs specified, respectively, for the U. S. Army Hospital Cars identified.	SIGNATURE OF TRAIN C.O. OR MAINT. OFFICER

CAR NUMBER	SUPPLY, SERVICE OR REPAIR	LABOR		COST OF MATERIAL	TOTAL OR NET PRICE
		HOURS	COST		
	TOTALS				

We certify that the spare parts, supplies, services or repairs have been received and accepted by the War Department and were carefully inspected and found to be satisfactory.

RAILROAD COMPANY	SIGNATURE OF RAILROAD REPRESENTATIVE	SIGNATURE OF OFFICER IN CHARGE

WD AGO FORM 1 JUL 1945 55-126 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

Figure 129. WD AGO Form 55-126 (Request and Receipt for Spare Parts, Supplies, Services, or Repairs for U. S. Army Hospital Cars from the Pullman Co. or Railroads).

APPENDIX

NUMERICAL INDEX OF REGULATIONS GOVERNING INSPECTION AND MAINTENANCE OF ROLLING STOCK

(Chapter 3)

RULE NO.

General

1. Responsibilities.
2. Repairs.

Relightweighing and restenciling of freight cars

3. Periodic relightweighing.
4. Other than periodic reweighing and restenciling.
5. Preparation for and method of reweighing.
6. Stenciling.
7. Advertisements.

Air brakes and equipment

8. Cleaning.
9. Restenciling.
10. Braking ratio.
11. Air brake hose.
12. General instructions—brake equipment.
13. Brake beam hangers.
14. Brake beams.
15. Brake beam hanger brackets.

Damaged sills

16. Wooden sills.
17. Steel center sill splices located at least 7 inches from face of bolster.
18. Steel center sill splices located between body bolster and end sill, and less than 8 inches from face of bolster.
19. Center sill splices with riveted type of splice.
20. Center sill splices of welded type, figure 15.
21. Center sill splice and steel sills made of plates and angles.

RULE NO.

22. "Z" bar center sill splice.
23. Side sill splices.

Couplers

24. Coupler heights.
25. Gauge limits and methods of gauging couplers.
26. Coupler bodies.

Journal boxes and bearings

27. Repacking journal boxes.
28. Renewing journal bearings.
29. Journal bearing wedges.

Stake pockets

30. Permanent.
31. Temporary.

Wheels and axles (Wrought steel wheels)

32. Burnt rim.
33. Shattered rim.
34. Spread rim.
35. Subsurface defect.
36. Shelled tread.
37. Thermal checks.
38. Slid flat.
39. Built-up tread.
40. Flange worn thin.
41. Flange worn vertical.
42. High flange (tread worn hollow).
43. Thin rim.
44. Wheels loose or out of gauge.
45. Plate defects.
46. Hub defects.

RULE NO.

(Cast-iron wheels)

47. Slid flat.
48. Shell-out.
49. Seams.
50. Worn through chill.
51. Out of round.
52. Flanges worn thin or vertical.
53. Brake burn cracks.
54. Combination tread defects.
55. Tread worn hollow.
56. Burst hub.
57. Cracked or broken flange, plate, or bracket.
58. Chipped flange.
59. Broken rim.

RULE NO.

60. Wheels loose or out of gauge.
61. Wheels subjected to fire.

(Axles)

62. Axles.

Fusion and bronze welding

63. Qualifications of operators.
64. Preparation.
65. Welding procedure.
66. Weld contour.
67. Building up worn surfaces.
68. Heat treatment after welding.
69. Welding limitations.

INDEX

☆ U. S. GOVERNMENT PRINTING OFFICE: 1946—675387