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TM 9-1817

WAR DEPARTMENT TECHNICAL MANUAL

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REGISTERED
30 JUN 1938
A. O. B. V.

ORDNANCE MAINTENANCE

Power Train, Chassis, and Body for 5- to 6-Ton Ponton Tractor Truck (Autocar Model U8144T)

WAR DEPARTMENT

• 28 APRIL 1944

FOR ORDNANCE PERSONNEL ONLY

WAR DEPARTMENT TECHNICAL MANUAL

TM 9-1817

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and Body for 5- to 6-Ton
Ponton Tractor Truck
(Autocar Model U8144T)



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Washington 25, D. C., 28 April 1944

TM 9-1817, Ordnance Maintenance: Power Train, Chassis, and Body for 5- to 6-Ton Ponton Tractor Truck (Autocar Model U8144T), is published for the information and guidance of all concerned.

[A.G. 300.7 (25 Feb 44)
O.O.M. 461/(TM-9) Rar. Ars. (4-28-44)]

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(For explanation of symbols, see FM 21-6.)

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★This manual supersedes pertinent information from TB ORD 20, dated 24 January 1944; TB 800-21, dated 30 November 1943; and TB 10-1000-27, dated 6 August 1943. This manual, together with TM 9-817 and TM 9-1832A, supersedes TM 10-1497, dated 1 July 1942.

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**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****CHAPTER 1****INTRODUCTION****1. SCOPE.**

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of the 5- to 6-ton, 4 x 4 Ponton Tractor Truck (Autocar Model U8144T). These instructions are supplementary to Field Manuals and Technical Manuals prepared for the using arms. This manual does not contain information which is intended primarily for the using arms, since such information is available to ordnance maintenance personnel in 100-series Technical Manuals or Field Manuals.

b. This manual contains a description of, and procedure for, disassembly, cleaning, inspection, repair, and assembly of the following vehicle components: clutch, transmission, power take-off, transfer case, drive shafts, drive shaft hand brake shoes, front axle, rear axle, service (air) brake shoes, wheels, hubs and tires, steering gear, springs and shock absorbers, frame, cab and body, winch, fifth wheel, fuel tanks, radiator, fan and hub.

c. TM 9-817 contains a description of the 5- to 6-ton, 4 x 4 Ponton Tractor Truck (Autocar Model U8144T) and technical information required for the identification, use and care of the materiel. Part one of TM 9-817 contains vehicle operating instructions. Part two contains vehicle maintenance instructions for using arm personnel charged with the responsibility of doing maintenance work within their jurisdiction. Part three contains instructions for storage and shipment of the materiel, references to all Standard Nomenclature Lists, Technical Manuals, and other publications for the materiel covered by this manual, and an index of the manual arranged alphabetically.

d. TM 9-1832A contains a description of, and procedures for disassembly, inspection, repair, and assembly of the engine used on this vehicle.

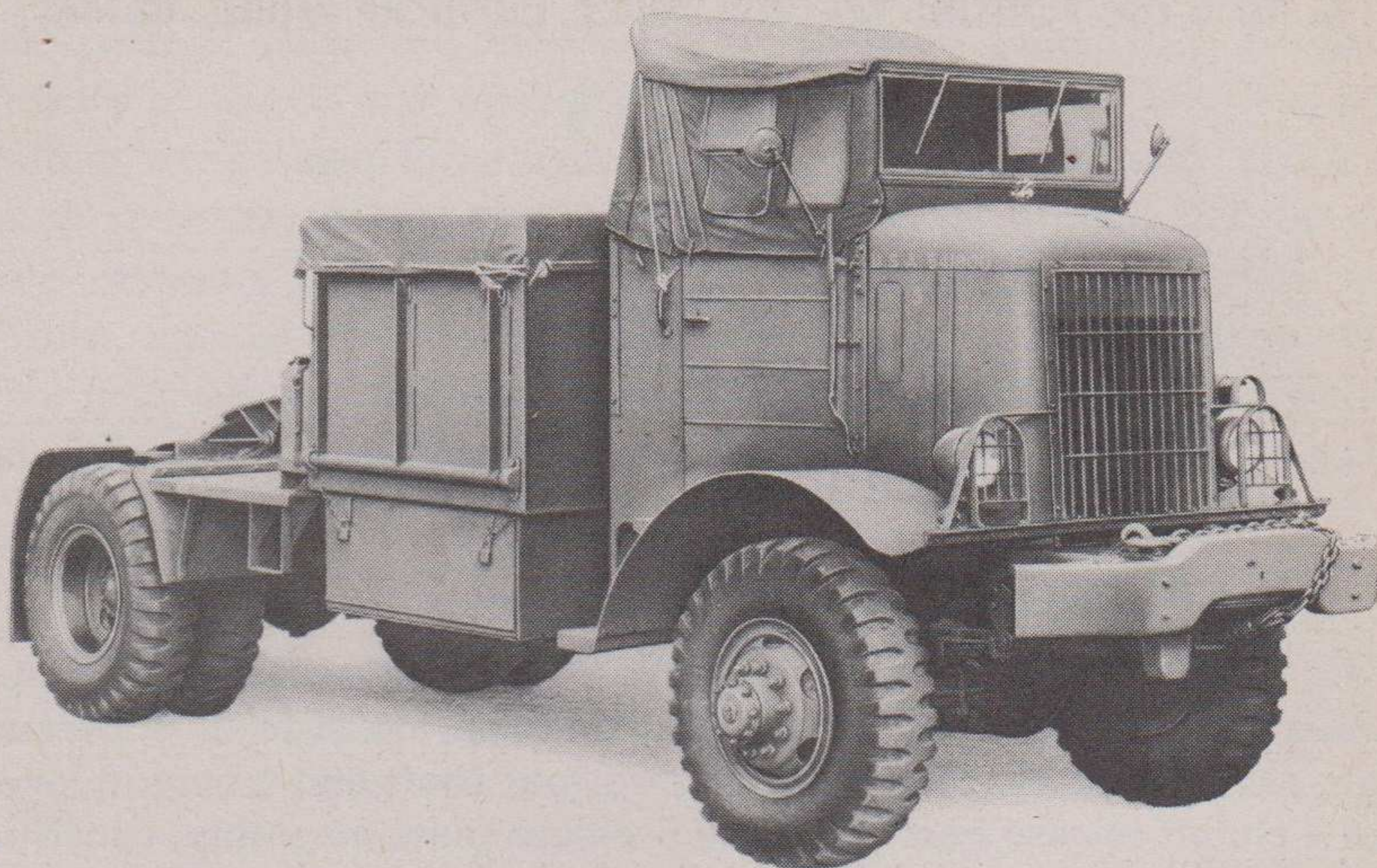
e. TM 9-1825B contains a description of, and procedures for disassembly, inspection, repair, and assembly of the cranking motor and generator used on this vehicle.

f. TM 9-1826C contains a description of, and procedures for disassembly, inspection, repair, and assembly of the carburetor used on this vehicle.

g. TM 9-1828A contains a description of, and procedures for disassembly, inspection, repair, and assembly of the fuel pump used on this vehicle.

h. TM 9-1827A contains a description of, and procedures for

INTRODUCTION



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**Figure 1 — Right Side — 5- to 6-ton 4 x 4 Ponton Tractor Truck
(Open Cab) — Front Side View**

disassembly, inspection, repair, and assembly of components of the air brake system on this vehicle.

2. VEHICLE MODIFICATION RECORDS.

a. MWO and Major Unit Assembly Replacement Record.

(1) **DESCRIPTION.** Every vehicle is supplied with a copy of A.G.O. Form No. 478 which provides a means of keeping a record of each MWO completed, or major unit assembly replaced. This form includes spacer for the vehicle name and U.S.A. registration number, instructions for use, and information pertinent to the work accomplished. It is very important that the form be used as directed, and that it remain with the vehicle until the vehicle is removed from service.

(2) **INSTRUCTIONS FOR USE.** Personnel performing modifications or major unit assembly replacements must record clearly on the form a description of the work completed and must initial the form in the columns provided. When each modification is completed, record the date, hours, and/or mileage, and MWO number. When major unit assemblies, such as engines, transmissions, and transfer cases, are replaced, record the date, hours, and/or mileage, and nomenclature of the unit assembly. Minor repairs, minor parts, and accessory replacements need not be recorded.

(3) **EARLY MODIFICATIONS.** Upon receipt by a third or fourth echelon repair facility of a vehicle for modification or repair, maintenance personnel will record the MWO numbers of modifications applied prior to the date of A.G.O. Form No. 478.

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****CHAPTER 2****CLUTCH**

Section I**DESCRIPTION AND DATA****3. DESCRIPTION AND OPERATION.**

a. **Description** (figs. 2 and 4). The single-disk type clutch, located between the engine and transmission, consists of a pressure plate assembly, disk, pilot bearing, throwout shaft and trunnion levers, and a clutch release bearing. The pressure plate assembly, consisting of a conical spring compressed against an adjusting plate and a clutch release sleeve, is attached to the clutch flywheel ring by six flywheel ring adjusting straps and nuts. Shims for adjusting the distance between the clutch release sleeve and the rear of the flywheel ring are placed under these adjusting straps. Twenty clutch pressure levers with a fulcrum ring ball in each lever are held in position between two fulcrum rings and secured to clutch release sleeve by a snap ring. The pressure levers rest against the clutch pressure plate with studs protruding through flywheel ring. Pressure plate retracting springs are placed over pressure plate studs and secured with retaining pins and washers. The clutch disk facings, composed of an asbestos composition reinforced with copper wire, are attached to the clutch disk with rivets. The splined bore of the disk hub rests on the main drive gear spline. A clutch pilot bearing (which is packed with a special heat-resistant grease) is pressed into the bore of the flywheel and provides a seat for the main drive gear. The clutch throwout shaft and trunnion levers are located in the clutch housing attached to the transmission. Bushings are used for seats of the throwout shaft. The clutch release bearing is pressed into a trunnion block which is seated on the main drive gear bearing cap. A return spring is attached to the trunnion block and a cap screw on the main drive gear bearing cap.

b. **Operation.** The clutch engages and disengages engine power with the transmission. When the clutch pedal is depressed, motion is transmitted by linkage to the trunnion block and clutch release bearing, which is brought forward against clutch release sleeve. This applies pressure on clutch pressure spring and, through an arrangement of interlocked pressure levers and fulcrum ring balls, creates a centrifugal force which opposes action of clutch pressure spring.

CLUTCH

This permits backward movement of pressure plate, thus releasing pressure of clutch disk against flywheel. When clutch is in engaged position, centrifugal force acts on pressure levers to assist action of clutch pressure spring; and, since these levers form a disk or dial plate, pressure is uniformly distributed against pressure plate and, in turn, against clutch disk. The clutch disk is mounted on main drive gear splines; therefore, pressure of disk against engine flywheel transfers power from engine to transmission and eventually to axles.

4. DATA.

Make W. C. Lipe
Model L-42-S
Disk:
 Model L-15-2
 Size 15 in.
 Type Single dry plate
Number of facings 2
Outside diameter 15 in.
Inside diameter 8 in.
Spring pressure at 1 $\frac{1}{4}$ in. height..... 535 lb

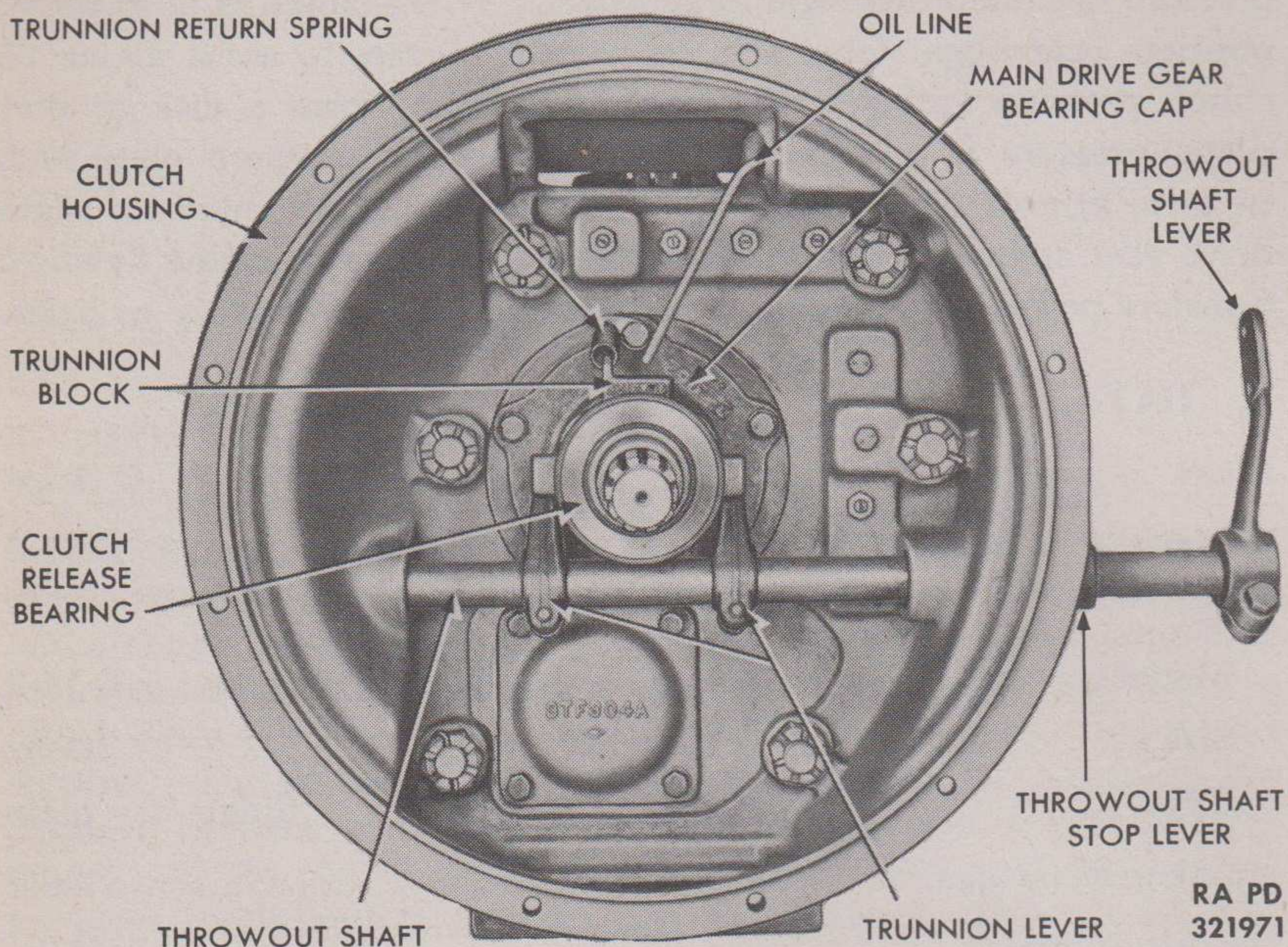
Section II

REMOVAL

5. REMOVAL.

- a. Remove Transmission. Refer to TM 9-817.
- b. Remove Clutch Pressure Plate Assembly, Disk, and Pilot Bearing. Refer to TM 9-817.
- c. Remove Clutch Release Bearing (fig. 2). Free the clutch release trunnion return spring. Slide trunnion block with attached clutch release bearing off main drive gear bearing cap.
- d. Remove Clutch Housing Assembly (fig. 2). Remove cotter pins and nuts attaching clutch housing to transmission case. Lift off clutch housing.

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Figure 2 — Clutch Housing Assembly

Section III

**DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES**

6. CLUTCH HOUSING.

a. Disassembly (fig. 3).

(1) **REMOVE THROWOUT SHAFT.** Remove trunnion lever cap screws and lock washers. Tap off trunnion levers and remove Woodruff keys. Slide clutch throwout shaft out of clutch housing.

(2) **REMOVE THROWOUT SHAFT LEVER.** Remove cap screw and lock washer securing shaft lever to throwout shaft. Tap off shaft lever and remove Woodruff key.

(3) **REMOVE STOP LEVER.** Remove cap screw and lock washer attaching stop lever to throwout shaft. Tap off stop lever. Remove adjusting cap screw and lock nut from stop lever.

(4) **REMOVE THROWOUT SHAFT BUSHINGS.** Tap bushings out of clutch housing.

CLUTCH

(5) **REMOVE COVER PLATES.** Remove cap screws and lock washers attaching top and bottom cover plates to housing. Lift off cover plates.

b. **Cleaning, Inspection, and Repair.** Wash all parts in dry-cleaning solvent. Inspect clutch housing for cracks and fractures, tapping housing with a soft hammer to test for cracks. Check clutch throwout shaft and levers for cracks and fractures, replacing cracked or broken parts. Look for burrs, nicks, and cross threads on all threaded parts, and repair or replace damaged parts. Inspect throwout shaft bushings for scoring or galling, replacing bushings if such conditions are found. Check lubrication passages to make sure they are open and clean.

c. **Assembly (fig. 3).**

(1) **INSTALL COVER PLATES.** Attach top and bottom cover plates to clutch housing with lock washers and cap screws.

(2) **INSTALL THROWOUT SHAFT BUSHINGS.** Tap bushings into position in clutch housing with oilholes in bushings alined with oilholes in housing.

(3) **INSTALL STOP LEVER.** Install adjusting cap screw and lock nut on stop lever. Tap Woodruff key into keyway and tap stop lever onto throwout shaft. Install lock washer and cap screw.

(4) **INSTALL THROWOUT SHAFT LEVER.** Install shaft lever key in keyway. Tap shaft lever onto throwout shaft and secure with lock washer and cap screw.

(5) **INSTALL THROWOUT SHAFT.** Insert shaft into left side of housing. Tap left trunnion lever key into shaft keyway and install left trunnion lever. Secure with lock washer and cap screw. Install right trunnion lever. Push throwout shaft fully into position in clutch housing.

7. CLUTCH RELEASE BEARING.

a. **Disassembly.**

(1) **REMOVE TRUNNION RETURN SPRING.** Remove spring from trunnion block.

(2) **REMOVE CLUTCH RELEASE BEARING.** Pull bearing off trunnion block with a bearing puller.

(3) **REMOVE OIL WICK.** Remove wick from oil passage in clutch release trunnion block.

b. **Cleaning, Inspection, and Repair.** Clean trunnion block and return spring with dry-cleaning solvent. The clutch release bearing is permanently packed with lubricant when manufactured; therefore, do not wash or dip bearing in dry-cleaning solvent. Wipe bearing clean with a cloth, and examine it for cracks which might permit leak-

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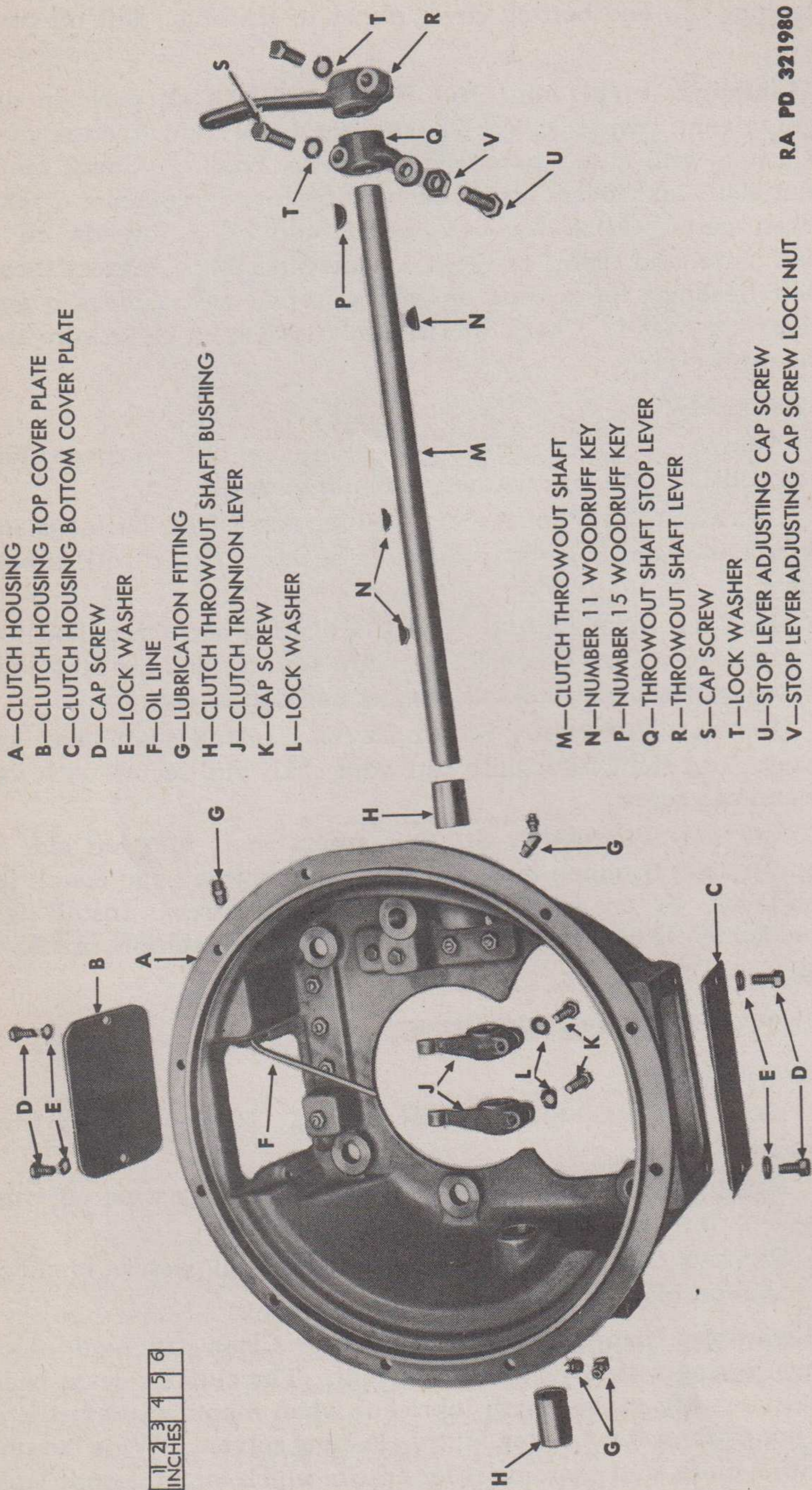


Figure 3 — Clutch Housing Disassembled

CLUTCH

age of lubricant. Check bearing for roughness, replacing bearing if these defects are found. Replace clutch release trunnion block if evidence of cracks or fractures is found. Replace trunnion return spring if it has weakened. If oil wick is gummy or flabby, install new wick.

c. Assembly.

(1) **INSTALL OIL WICK.** Insert wick into oil passage in trunnion block.

(2) **INSTALL CLUTCH RELEASE BEARING.** Carefully press bearing into position on trunnion block.

(3) **INSTALL TRUNNION RETURN SPRING.** Attach spring to trunnion block.

8. CLUTCH PRESSURE PLATE ASSEMBLY.

a. Disassembly (fig. 4).

(1) **REMOVE CLUTCH PRESSURE PLATE.** Place assembly in arbor press and compress clutch pressure spring by pressing down on clutch release sleeve. Remove four pressure plate retracting spring retainer pins and retainer washers. Lift off four pressure plate retracting springs. Release assembly from arbor press and lift off clutch pressure plate.

(2) **REMOVE CLUTCH PRESSURE LEVERS.** Place assembly in arbor press and press down on clutch flywheel ring. Remove clutch release sleeve snap ring. Lift off top clutch release fulcrum ring and remove fulcrum ring balls and clutch pressure levers. Lift out lower fulcrum ring. **CAUTION:** *This must be done with extreme care, because the clutch pressure spring exerts a pressure of approximately 600 pounds.*

(3) **REMOVE FLYWHEEL RING.** Remove assembly from arbor press and lift off flywheel ring.

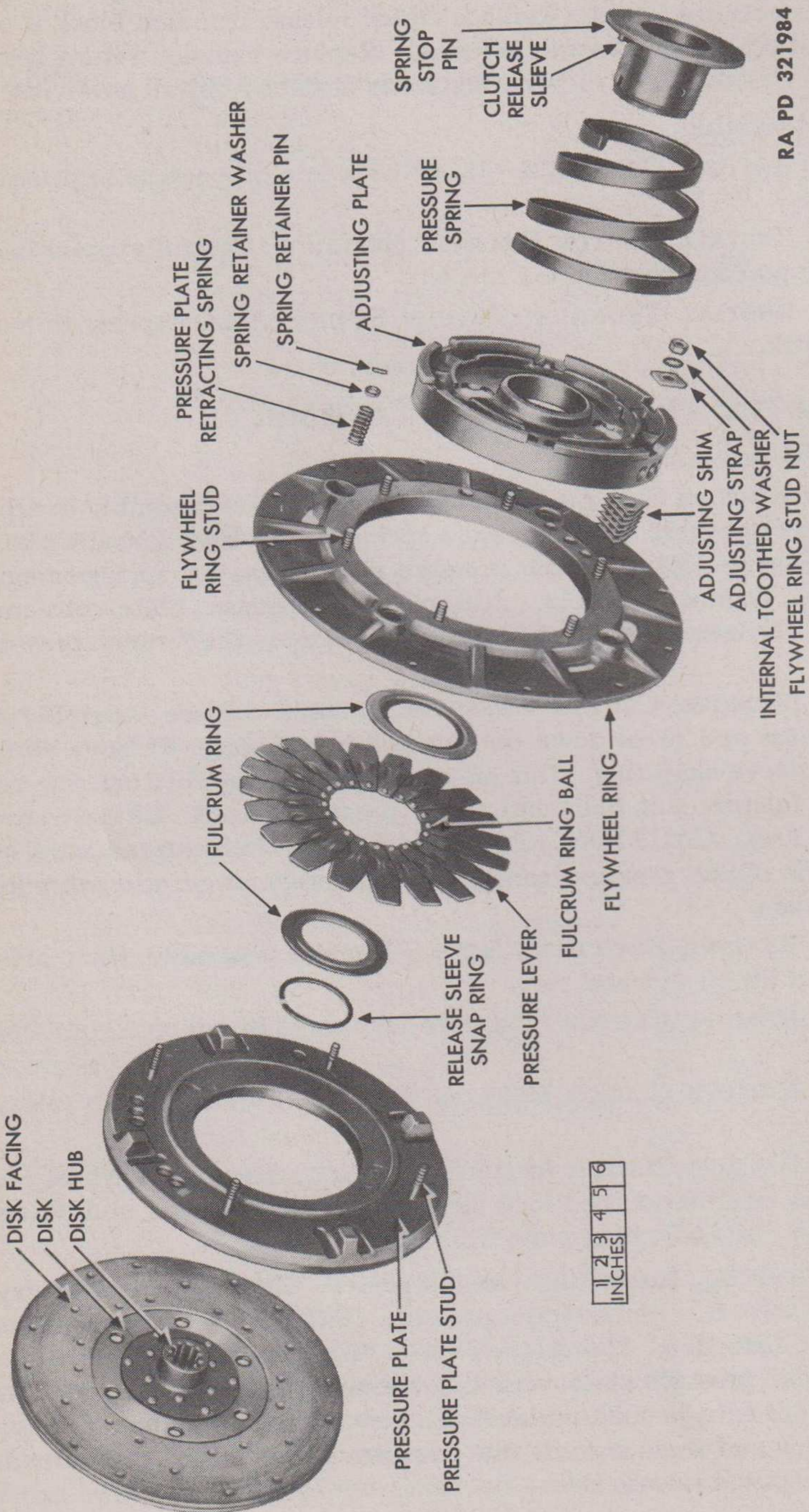
(4) **REMOVE CLUTCH PRESSURE SPRING.** Lift out clutch pressure spring.

(5) **REMOVE CLUTCH RELEASE SLEEVE.** Lift out clutch release sleeve.

(6) **REMOVE CLUTCH ADJUSTING PLATE.** Remove flywheel ring stud nuts, internal-toothed lock washers, adjusting straps, and adjusting shims. Lift adjusting plate from flywheel ring.

b. Cleaning, Inspection, and Repair. Clean all parts in dry-cleaning solvent. Place clutch pressure plate on a surface plate and check for distortion. If pressure plate is dished, install new plate. Inspect clutch pressure plate retracting springs. If springs are stretched so that gaps exist in coils, replace with new springs. Examine pressure plate studs and replace studs that are bent or have damaged threads. Examine clutch release sleeve fulcrum rings for worn or scored condi-

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5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



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1	2	3	4	5	6
INCHES					

Figure 4 — Clutch Disassembled

CLUTCH

tion in cup side and for warpage. If warped or badly worn, replace. Inspect all fulcrum ring balls for wear or flat spots, replacing any balls that are out-of-round. Check the 20 clutch pressure levers for wear at points of contact with adjusting plate, pressure plate, and fulcrum ring. If scored or bent, replace with new levers. Inspect clutch release sleeve snap ring for fractured or out-of-round condition. If snap ring is not in perfect condition, use a new ring in assembly. Examine flywheel ring for cracks or fractures, and for burs on machined surfaces. Replace cracked or broken parts; remove burs with handstone. Replace any studs on flywheel ring that are damaged. Examine adjusting plate and pressure spring for fractures and replace if broken. Inspect bore of clutch release sleeve for burs, removing burs with handstone. Test fit of sleeve in adjusting plate which should be an easy fit, not so tight that it must be tapped into adjusting plate. Thrust surface of sleeve must be free of any ridges or scores. Replace sleeve if worn or damaged.

c. Assembly (fig. 4).

(1) **INSTALL CLUTCH ADJUSTING PLATE.** Install six flywheel ring adjusting shims on each of six flywheel ring studs. Stagger shims so they alternately face right and left. Aline slots in adjusting plate with flywheel ring studs and place adjusting plate into seat and on top of adjusting shims. Place adjusting straps on each stud and secure adjusting plate to flywheel ring with internal-toothed lock washers and stud nuts.

(2) **INSTALL CLUTCH PRESSURE SPRING.** Place small end of pressure spring on clutch release sleeve, with end of spring against sleeve spring stop pin. Place flywheel ring and adjusting plate assembly on large end of spring, with end of spring against stop in adjusting plate. Using an arbor press, push down on flywheel ring and install bottom fulcrum ring over clutch sleeve. Position pressure levers around pressure plate with drilled ends in fulcrum ring. Install fulcrum ring balls, top fulcrum ring, and clutch release sleeve snap ring. Remove assembly from arbor press.

(3) **INSTALL CLUTCH PRESSURE PLATE.** Install clutch flywheel ring on pressure plate studs. Place pressure plate retracting springs and spring retainer washers on studs. Press down on washers and springs, and insert retainer pins through pressure plate studs.

9. CLUTCH DISK.

a. Disassembly (fig. 4).

(1) **REMOVE DISK FACINGS.** Drill out rivets holding disk facings to disk, drilling from smooth side of rivet. Lift facings from disk. **CAUTION:** *Do not use a brake relining machine to remove rivets as it is likely to spring disk.*

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b. **Cleaning, Inspection, and Repair.** Inspect all rivets for tightness, replacing loose rivets. Place flywheel side of disk on a surface plate to make sure it lies flat without bend or distortion. If it does not, replace disk. Examine ends of splines in hub of disk. Dress off any burs with a file or handstone. Place disk on splines of main drive gear and note fit of splines; which should allow disk splines to slide easily on splines of main drive gear without binding and with very little side play. If side play is more than barely perceptible, replace disk.

c. **Assembly.**

(1) **INSTALL DISK FACINGS** (fig. 4). Place the 2 facings on clutch disk. Rivet facings to disk with 30 clutch disk facing rivets. Make certain all rivets are pressed to a uniform thickness. Rivets must be below surface of facings on both sides of disk. Examine disk to be certain it has not been bent or distorted during riveting operation. Replace disk if bent or distorted.

10. CLUTCH PILOT BEARING.

a. **Cleaning, Inspection, and Repair.** Clean clutch pilot bearing in dry-cleaning solvent. After drying, turn bearing by hand. If it runs roughly or if balls appear to be worn, replace bearing. This bearing is packed with heat-resistant grease when clutch is assembled and does not require further attention except when replaced, at which time it must be repacked.

Section IV

INSTALLATION

11. INSTALL CLUTCH.

a. **Install Clutch Housing** (fig. 2). Attach clutch housing to transmission case with nuts and cotter pins.

b. **Install Clutch Release Bearing** (fig. 2). Slide trunnion block with installed clutch release bearing onto main drive gear bearing cap. Attach trunnion return spring to main drive gear bearing cap cap screw. Test clutch trunnion levers (par. 14).

c. **Install Clutch Pilot Bearing, Disk, and Pressure Plate Assembly.** Refer to TM 9-817.

d. **Install Transmission.** Refer to TM 9-817.

CLUTCH

Section V

TEST AND ADJUSTMENT

12. GENERAL.

a. Original setting of the clutch provides for approximately $1\frac{1}{2}$ inch of free pedal movement between pedal and toeboard or stop. Clutch readjustment is necessary when this clearance is reduced to three-fourths inch or less. Do not make pedal adjustment. Check distance between clutch release sleeve and rear face of clutch flywheel ring. When clutch is properly adjusted, this distance will measure $1\frac{1}{8}$ to $1\frac{3}{16}$ inches (fig. 5). It is not safe to depend on free pedal movement alone without checking this dimension. Distance between clutch release sleeve and rear face of clutch flywheel ring is controlled by flywheel ring adjusting shims. On this clutch, one shim moves the clutch release sleeve seven sixty-fourths inch. Movement of sleeve should not be less than one-half inch, and not more than nine-sixteenths inch in order to obtain proper clutch release. If less than one-half inch, add one shim; if more than nine-sixteenths inch, remove one shim.

13. ADJUSTMENT OF INSTALLED CLUTCH.

a. **Remove Clutch Housing Cover Plates.** Remove top and bottom clutch housing cover plates.

b. **Disconnect Linkage.** Disconnect clutch control rod clevis from clutch throwout shaft lever by removing cotter pin and clutch control rod clevis pin.

c. **Block Lever in Release Position.** Block clutch throwout shaft lever in full-release position.

d. **Turn Engine.** Use hand crank to turn engine until adjusting strap and shim pack are accessible through clutch housing opening.

e. **Loosen Adjusting Nuts.** With clutch in released position, back off the six adjusting (clutch flywheel ring stud) nuts about five full turns.

f. **Remove Blocking.** Remove blocking from clutch throwout shaft lever. This will move clutch adjusting plate away from shims.

g. **Remove Shims.** Remove shims as necessary to obtain $1\frac{1}{8}$ to $1\frac{3}{16}$ inches clearance between face of clutch release sleeve and rear face of clutch flywheel ring. To ensure full contact between pressure plate and disk, always remove same number of shims from each pack.

14. TEST OF CLUTCH TRUNNION LEVERS.

a. **Check Contact of Levers** (fig. 2). Check contact of clutch trunnion levers and lugs on clutch release trunnion block. Insert a feeler between each lug and lever at the same time. Uneven contact will not permit the block to slide freely and poor clutch engagement

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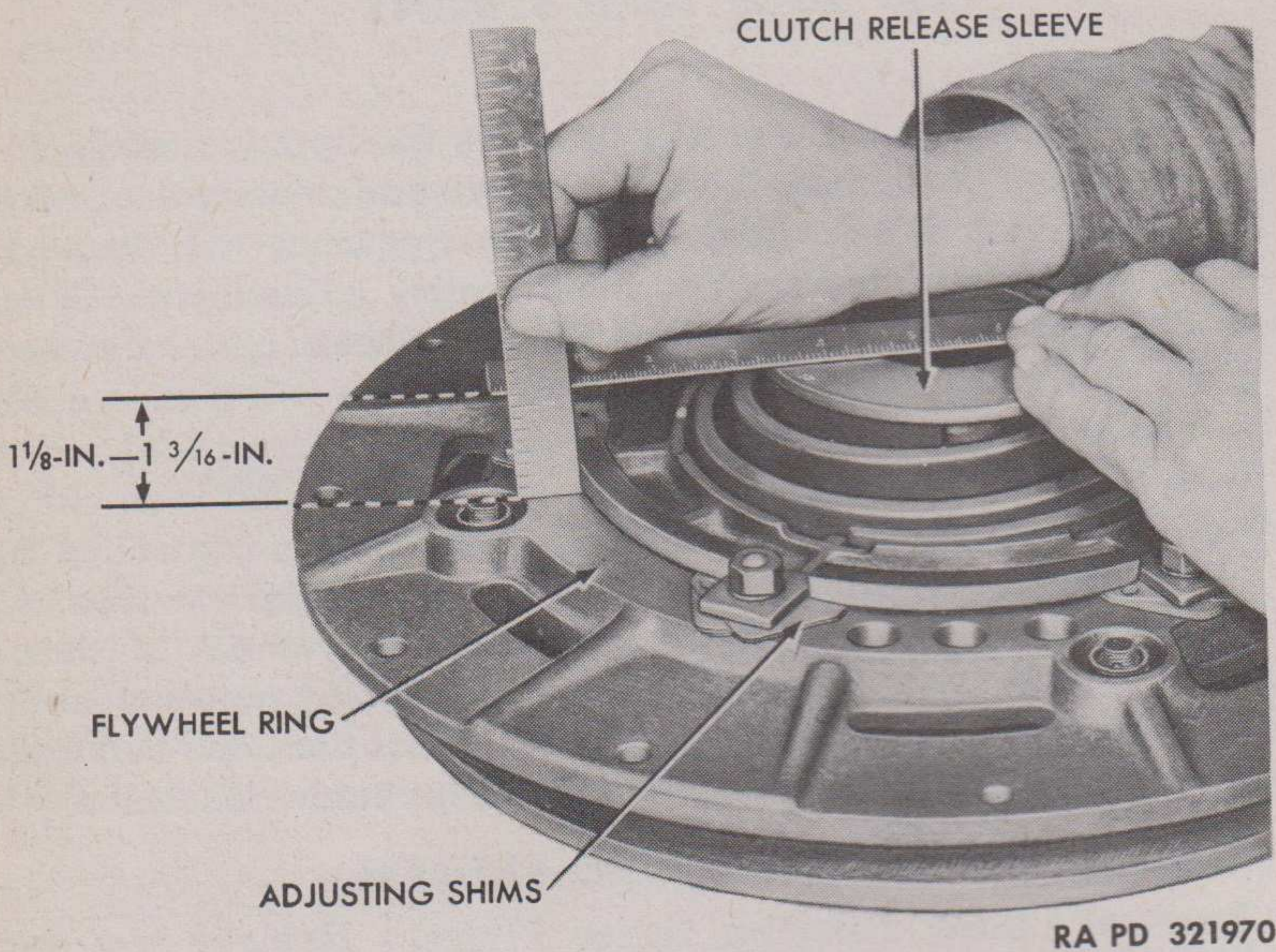


Figure 5 — Clutch Adjustment

will result. If necessary, file trunnion lever to provide even contact with trunnion block lugs.

Section VI

FITS AND TOLERANCES

15. FITS AND TOLERANCES.

a. Clutch Disk.

Hub to shaft spline clearance.....	0.001 to 0.005 in.
Out-of-true (warp) measured 1½ in. from outer edge	0.002 to 0.003 in.

b. Pressure Plate.

Driving lugs to slots in flywheel ring.....	0.004 to 0.006 in.
Out-of-true (warp) maximum	0.015 in.
Adjusting shims, quantity used under each strap with new facings..	8
Pressure spring pressure at 1¼-in. height.....	535 lb

c. Clutch Pedal.

Toeboard clearance	1 in.
--------------------------	-------

CHAPTER 3

TRANSMISSION

Section I

DESCRIPTION AND DATA

16. DESCRIPTION AND OPERATION.

a. **Description** (fig. 6). This transmission, a selective-gear type having five forward speeds and one reverse, is equipped with helical gears running in constant mesh in third speed and overdrive. Fourth speed is direct drive and fifth speed is overdrive. A power take-off opening is located on right-hand side of transmission case. A bell housing, containing the clutch release or throwout mechanism, is attached to the front of the transmission case. The gearshift lever is attached to a stub which is mounted in a bracket on the transmission cover and extends into slots in shifting rod arms and forks attached to gearshift rods. Four rod plungers and springs are located in the rear of transmission case underneath the gearshift rods. Three interlock plungers are placed between rods in the front of the case, and lock in place any rods that should not move when transmission is shifted into any desired speed. The main drive gear, which receives power from the engine through the clutch, has a splined shaft for engagement with splined hub in the clutch disk. It is supported in the transmission case by a ball bearing housed in a bearing retainer. This retainer is held in place by main drive gear bearing cap which serves as a pilot for the bell housing and a seat for the clutch release or throwout mechanism. A roller bearing in the recess of the main drive gear provides front support for the transmission mainshaft. A ball bearing in a bearing retainer supports the mainshaft at the rear.

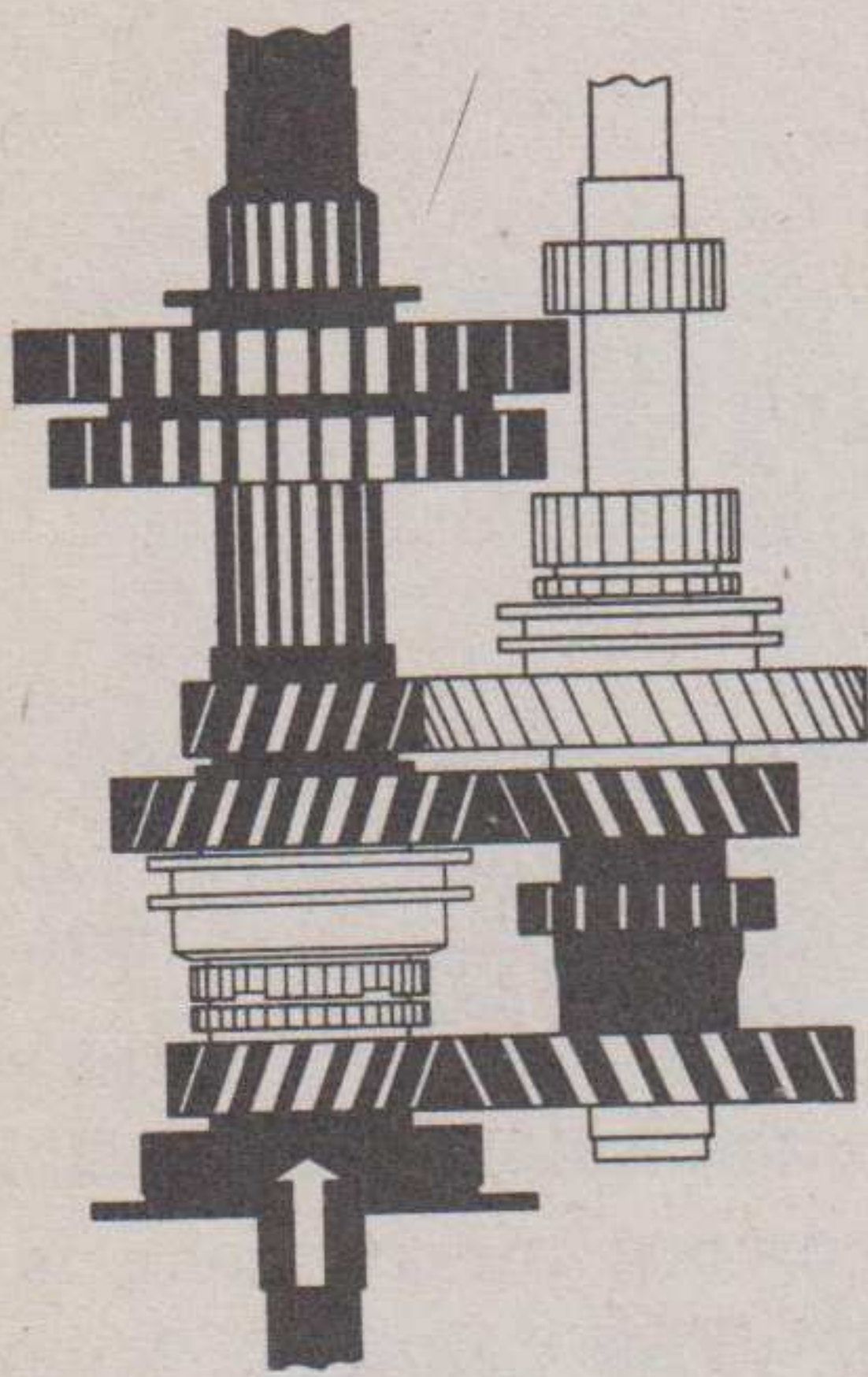
b. **Operation.** Engine power is transmitted through the clutch to the main drive gear. Power flow through transmission in various gear speeds follows: **NOTE:** *All key letters in this subparagraph refer to figure 6.*

(1) **FIRST SPEED (A).** Main drive gear to countershaft drive gear, through countershaft, up to first speed slide gear on mainshaft, and out.

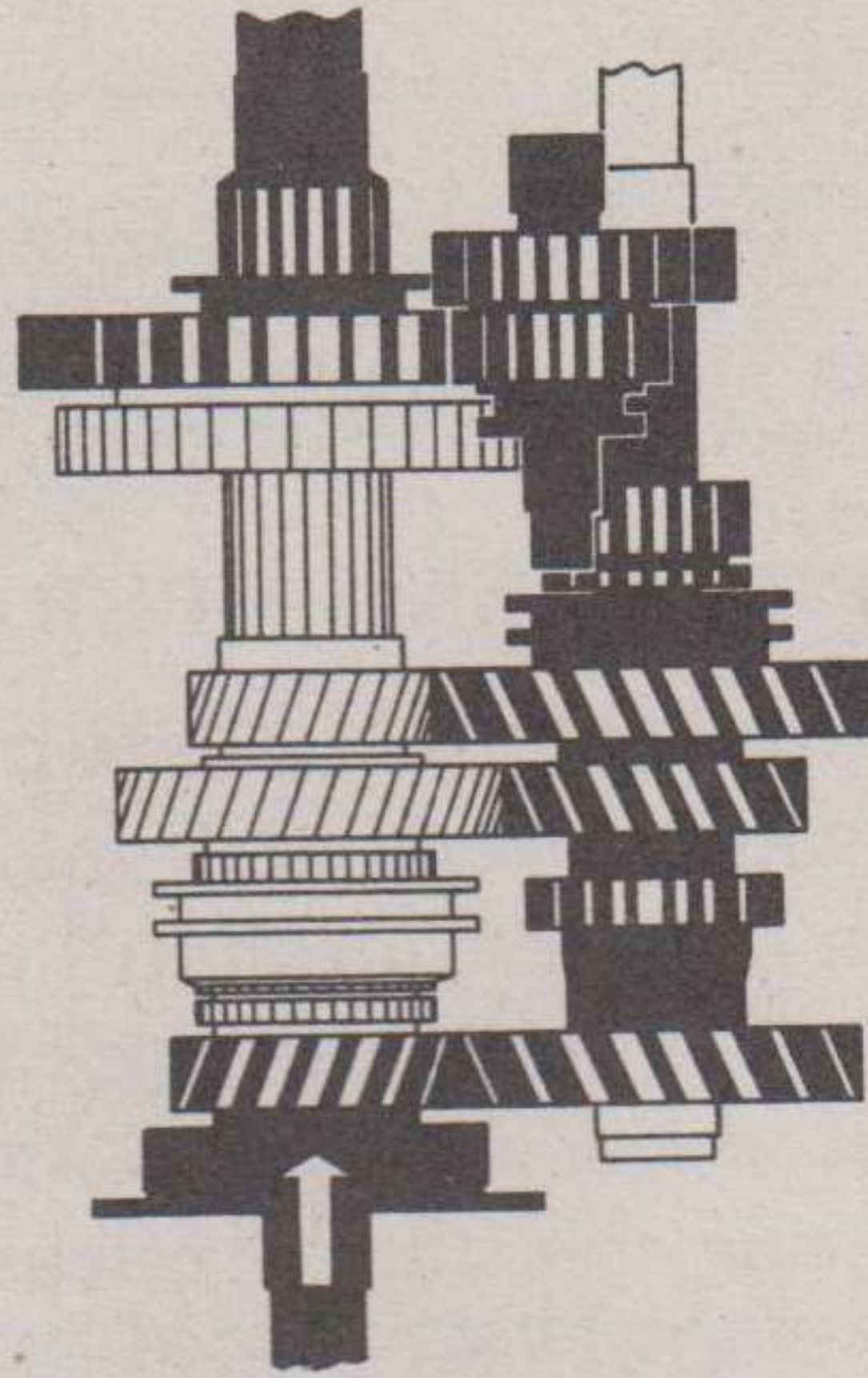
(2) **SECOND SPEED (B).** Main drive gear to countershaft drive gear, through countershaft, up to second speed slide gear on mainshaft, and out.

(3) **THIRD SPEED (C).** Third and fourth speed clutch ring engages with third and fourth speed clutch driver on mainshaft. Power flows from main drive gear to countershaft drive gear, to third speed

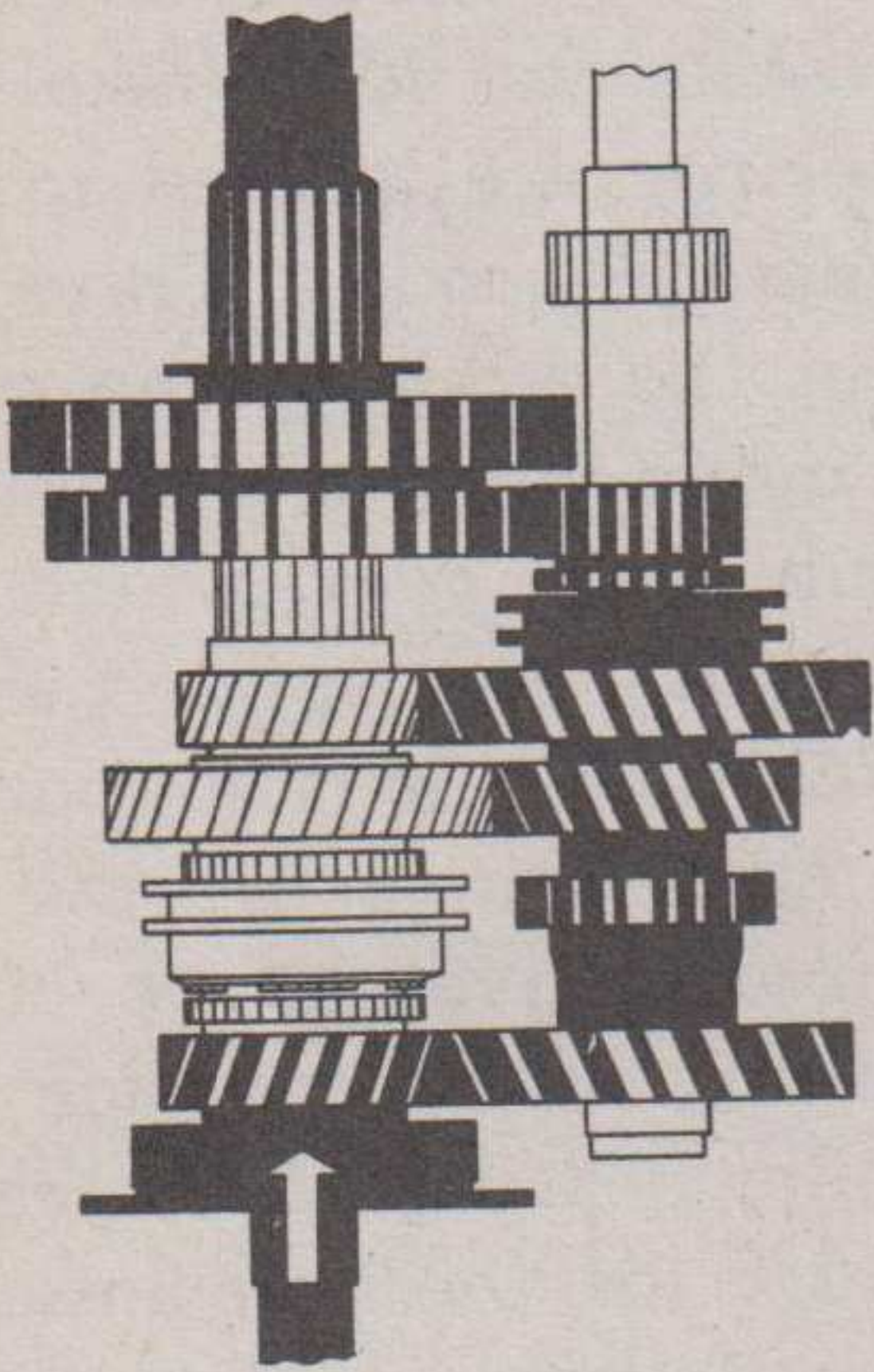
ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



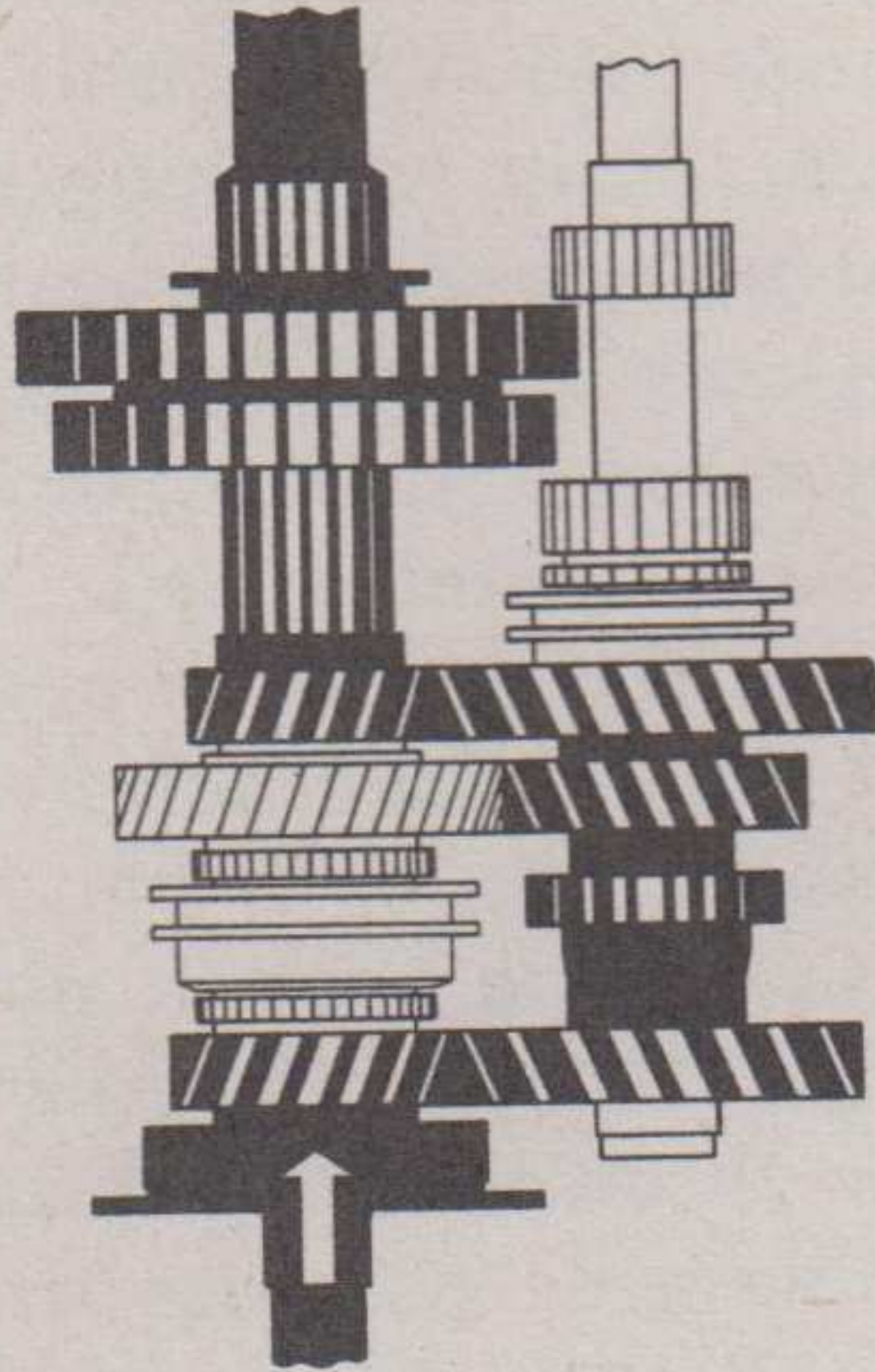
C — THIRD SPEED



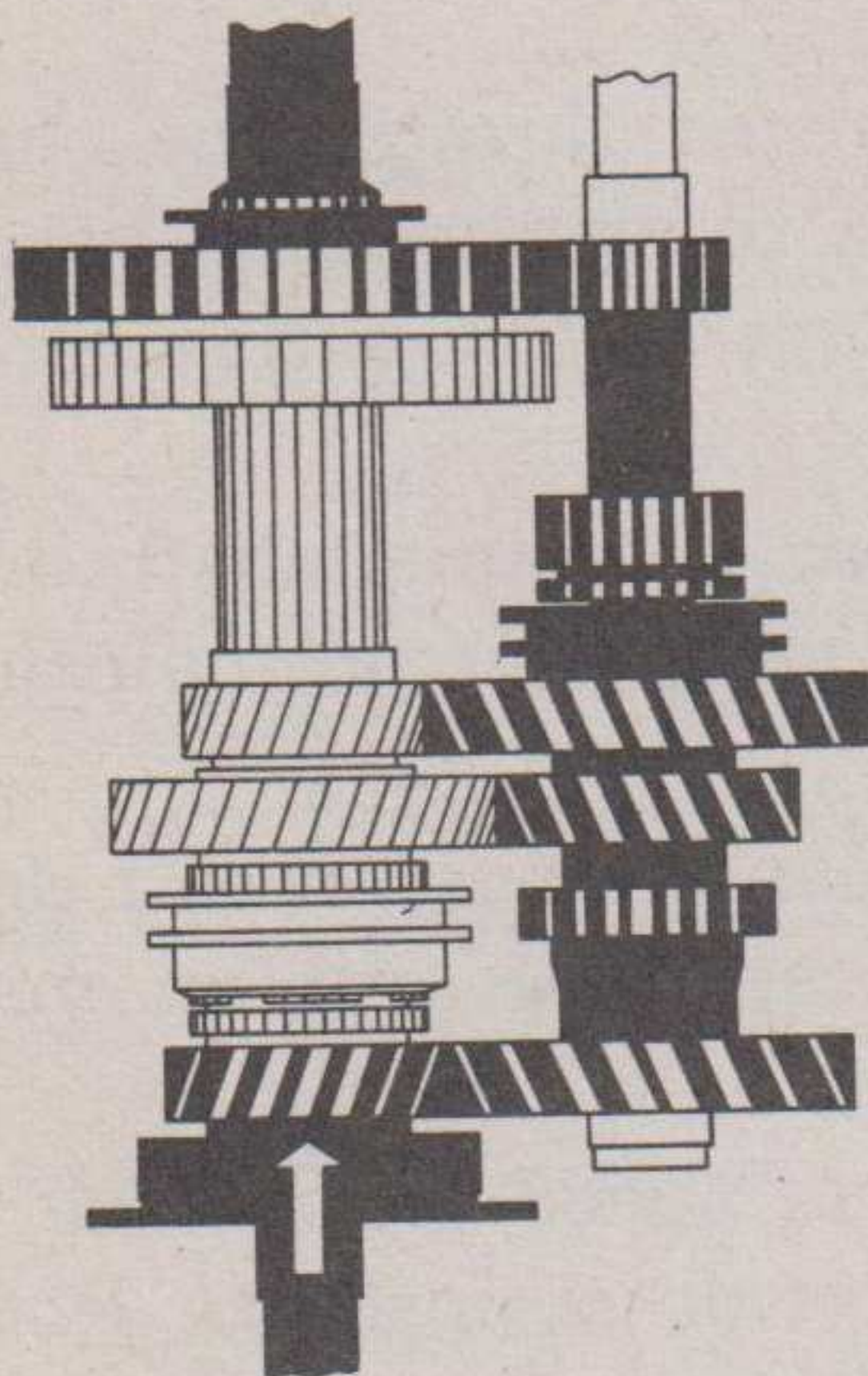
F — REVERSE



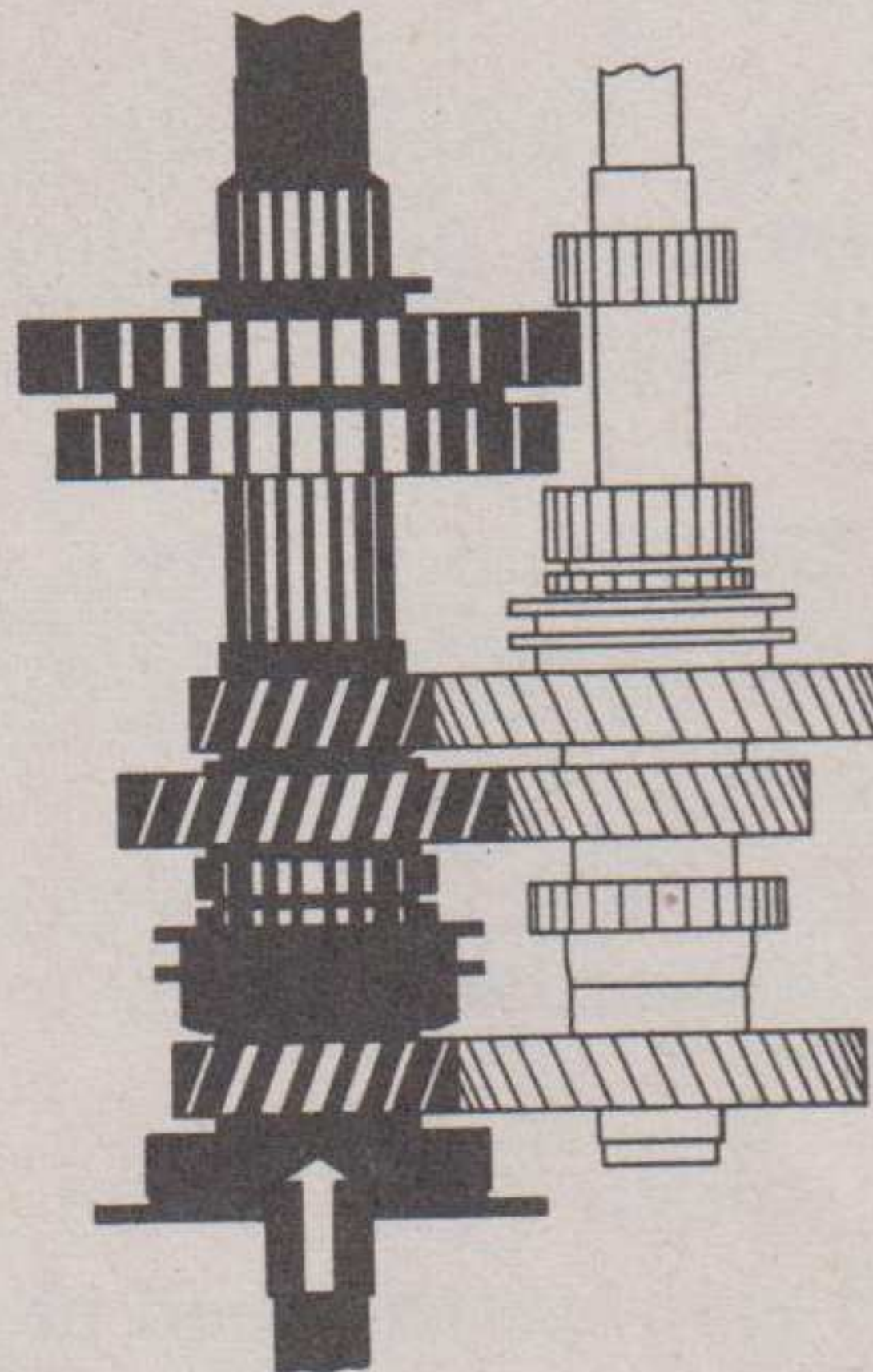
B — SECOND SPEED



E — OVERDRIVE



A — FIRST SPEED



D — FOURTH SPEED

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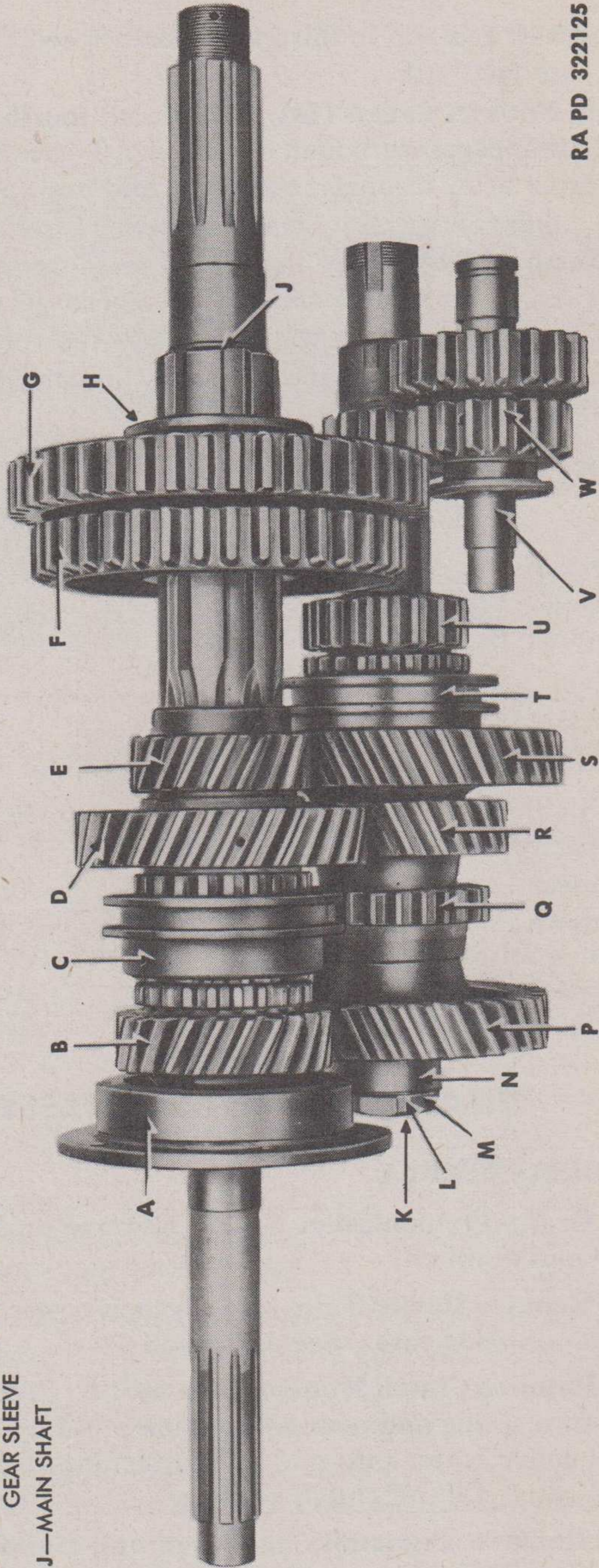
Figure 6 — Transmission Power Flow

TRANSMISSION

- R—THIRD SPEED COUNTERSHAFT GEAR
- S—OVERDRIVE COUNTERSHAFT GEAR
- T—OVERDRIVE COUNTERSHAFT GEAR CLUTCH RING
- U—COUNTERSHAFT
- V—REVERSE GEAR SHAFT
- W—REVERSE GEAR

- K—COUNTERSHAFT FRONT BEARING LOCK NUT
- L—PLAIN WASHER
- M—LOCK NUT WASHER
- N—COUNTERSHAFT FRONT BEARING INNER RACE
- P—COUNTERSHAFT DRIVE GEAR
- Q—POWER TAKE-OFF DRIVING GEAR

- A—MAIN DRIVE GEAR BEARING RETAINER
- B—MAIN DRIVE GEAR
- C—THIRD AND FOURTH SPEED CLUTCH RING
- D—THIRD AND FOURTH SPEED CLUTCH DRIVER
- E—MAIN SHAFT OVERSPEED GEAR
- F—SECOND SPEED SLIDE GEAR
- G—FIRST SPEED SLIDE GEAR
- H—FIRST AND SECOND SPEED SLIDE GEAR SLEEVE
- J—MAIN SHAFT



RA PD 322125

Figure 7 — Transmission Gears and Shafts

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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countershaft gear, up to third and fourth speed clutch driver on mainshaft, and out.

(4) **FOURTH SPEED (D).** Third and fourth speed clutch ring on mainshaft engages with main drive gear. Power flows directly through main drive gear, through mainshaft, and out.

(5) **OVERDRIVE (E).** Overdrive countershaft clutch ring engages with countershaft. Power flows from main drive gear to countershaft drive gear, up through mainshaft overspeed gear, and out.

(6) **REVERSE (F).** Main drive gear to countershaft drive gear, through countershaft reverse gear, up through first speed sliding gear on mainshaft, and out.

17. DATA.

Make	Autocar
Gear ratios:	
Reverse	7.37 to 1
First	5.90 to 1
Second	3.60 to 1
Third	1.84 to 1
Fourth (direct)	1.00 to 1
Fifth (overdrive)	0.75 to 1
Oil capacity:	
Summer	8 qt
Winter	10 qt

Section II

DISASSEMBLY INTO SUBASSEMBLIES

18. DISASSEMBLY.

a. **Drain Transmission Case.** Remove drain plug from bottom of case and drain oil.

b. **Remove Power Take-off.** Detach power take-off and adapter from transmission case. See paragraph 31.

c. **Remove Clutch Housing Assembly.** Free clutch release trunnion return spring and remove trunnion block and clutch release bearing. Remove cotter pins and nuts attaching clutch housing to transmission case. Lift off clutch housing.

d. **Remove Transmission Cover and Gearshift Lever Bracket Assembly.** Remove cap screws and lock washers attaching cover to

TRANSMISSION

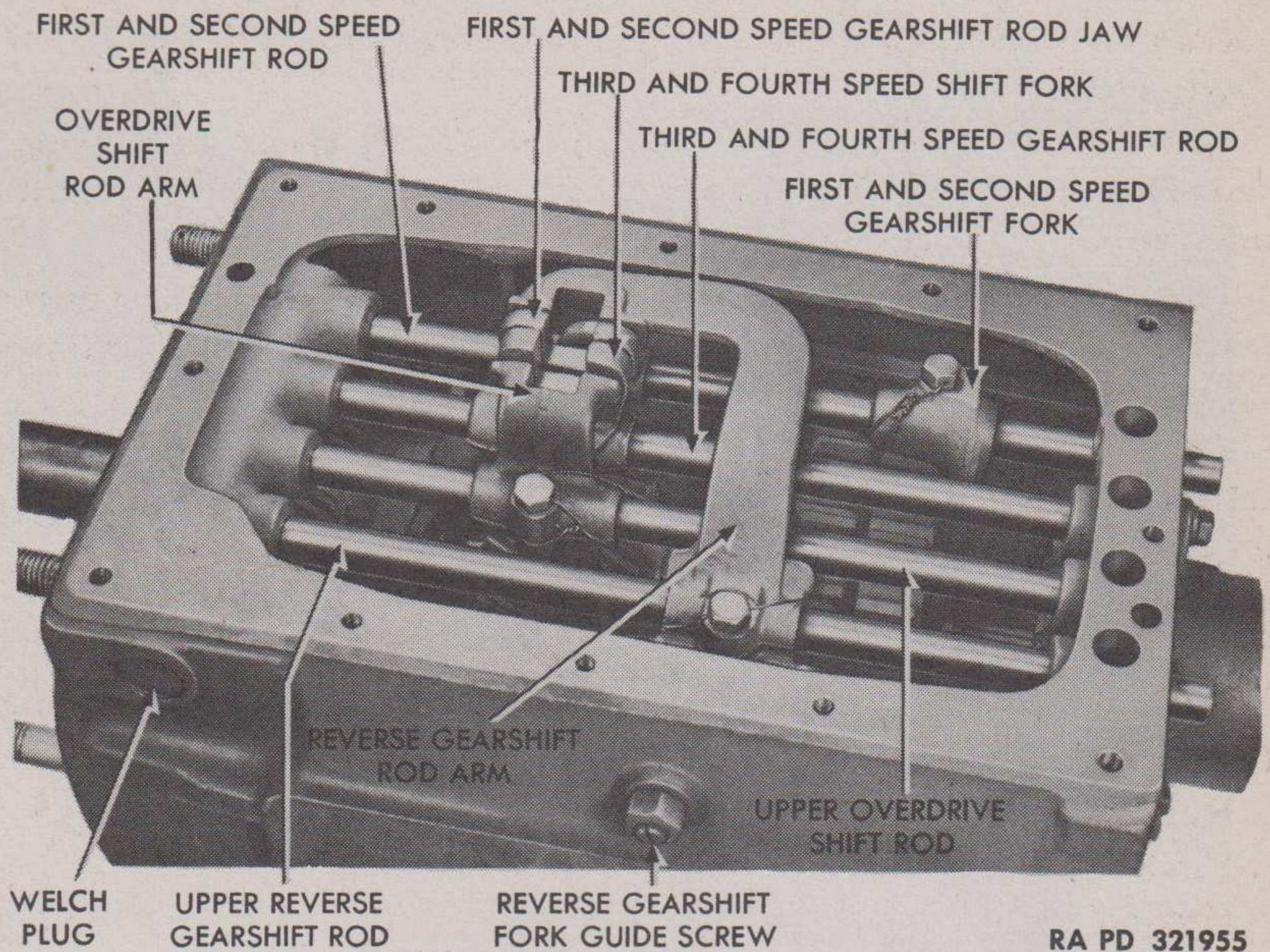


Figure 8 – Transmission Cover Removed

transmission case. Free cover from dowels by prying. Lift off cover assembly and gasket.

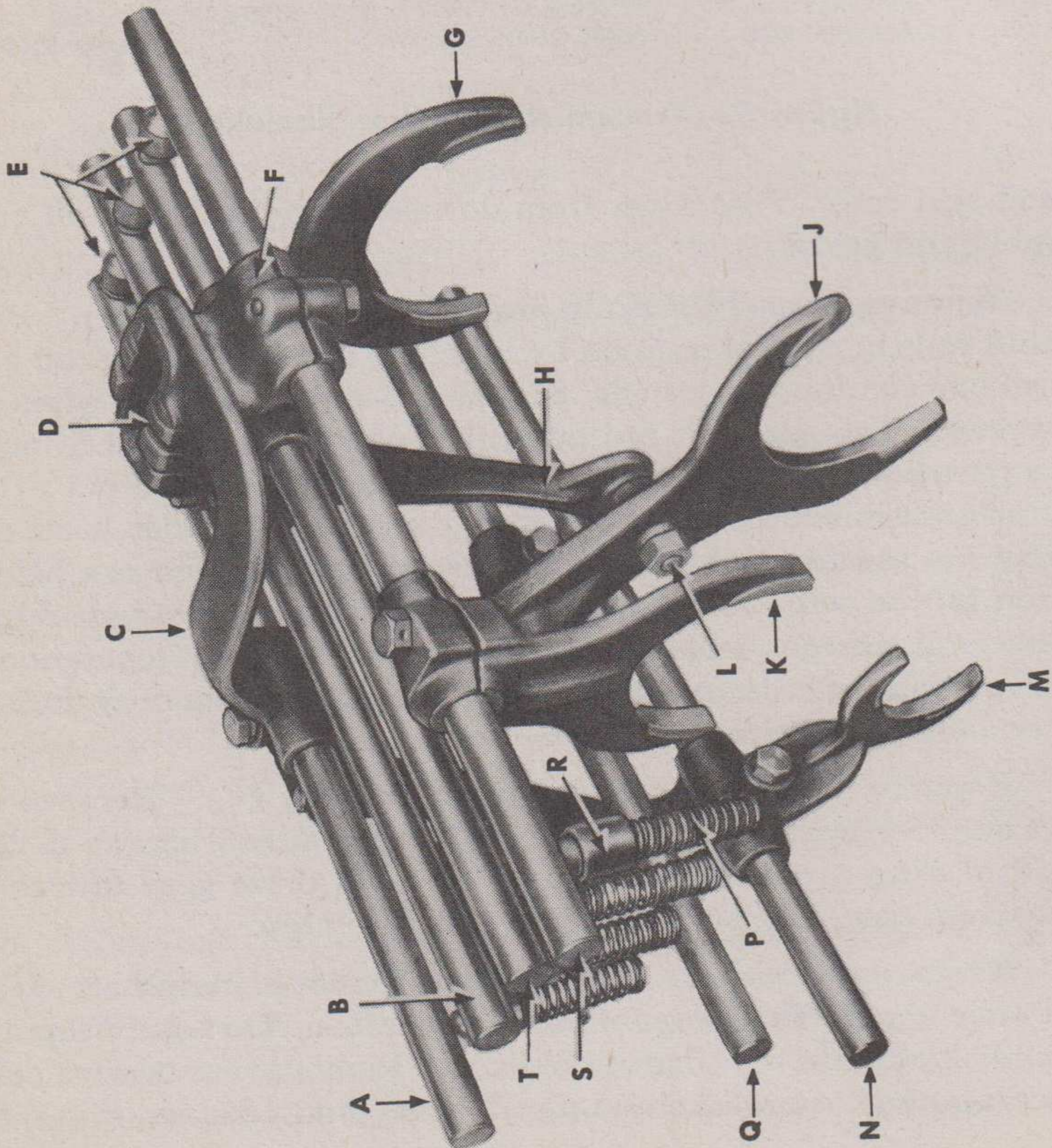
e. Remove Gearshift Rods and Arms (figs. 8 and 9). Place gearshift rods in neutral position by lining up slots in shifting rod arms to form one continuous slot (fig. 8). Remove rod arm lock wires and cap screws. Tap gearshift rod out either end of case about 5 inches. Grasp protruding end of rod with one hand and pull rod out of rod arm and transmission case, at the same time placing other hand over opening in case to catch rod plunger and spring, which are held in position by the rod and will pop out when rod is pulled out of case. Remove rod plunger from other end of case. Repeat operation to remove remaining rods and arms. **NOTE:** *No plungers or springs are used on lower overdrive and reverse rods.*

f. Remove Main Drive Gear Assembly (fig. 10). Remove cap screws and lock washers attaching main drive gear bearing cap to case. Lift off bearing cap and gasket. Tap on main drive gear to free assembly from case. Lift off main drive gear assembly.

g. Remove Mainshaft Assembly. Remove mainshaft flange cotter pin and nut. Tap flange of mainshaft spline. Do not use a puller, as it is likely to bend the edge of the flange. Remove rear bearing cover cap screws and lock washers. Lift off cover and retainer shims and

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- A—UPPER REVERSE GEARSHIFT ROD
- B—UPPER OVERDRIVE SHIFT ROD
- C—REVERSE GEARSHIFT ROD ARM
- D—OVERDRIVE SHIFT ROD ARM
- E—GEARSHIFT ROD INTERLOCK PLUNGERS
- F—FIRST AND SECOND SPEED GEARSHIFT ROD JAW
- G—THIRD AND FOURTH SPEED SHIFT FORK
- H—OVERDRIVE SHIFT ROD ARM
- J—OVERDRIVE SHIFT FORK
- K—FIRST AND SECOND SPEED GEARSHIFT FORK
- L—OVERDRIVE SHIFT ROD ARM AND FORK CONNECTING PIN
- M—REVERSE GEARSHIFT FORK
- N—LOWER REVERSE GEARSHIFT ROD
- P—GEARSHIFT ROD SPRING
- Q—LOWER OVERDRIVE SHIFT ROD
- R—GEARSHIFT ROD PLUNGER
- S—FIRST AND SECOND SPEED GEARSHIFT ROD
- T—THIRD AND FOURTH SPEED GEARSHIFT ROD



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Figure 9 — Transmission Gearshift Rods and Arms

TRANSMISSION

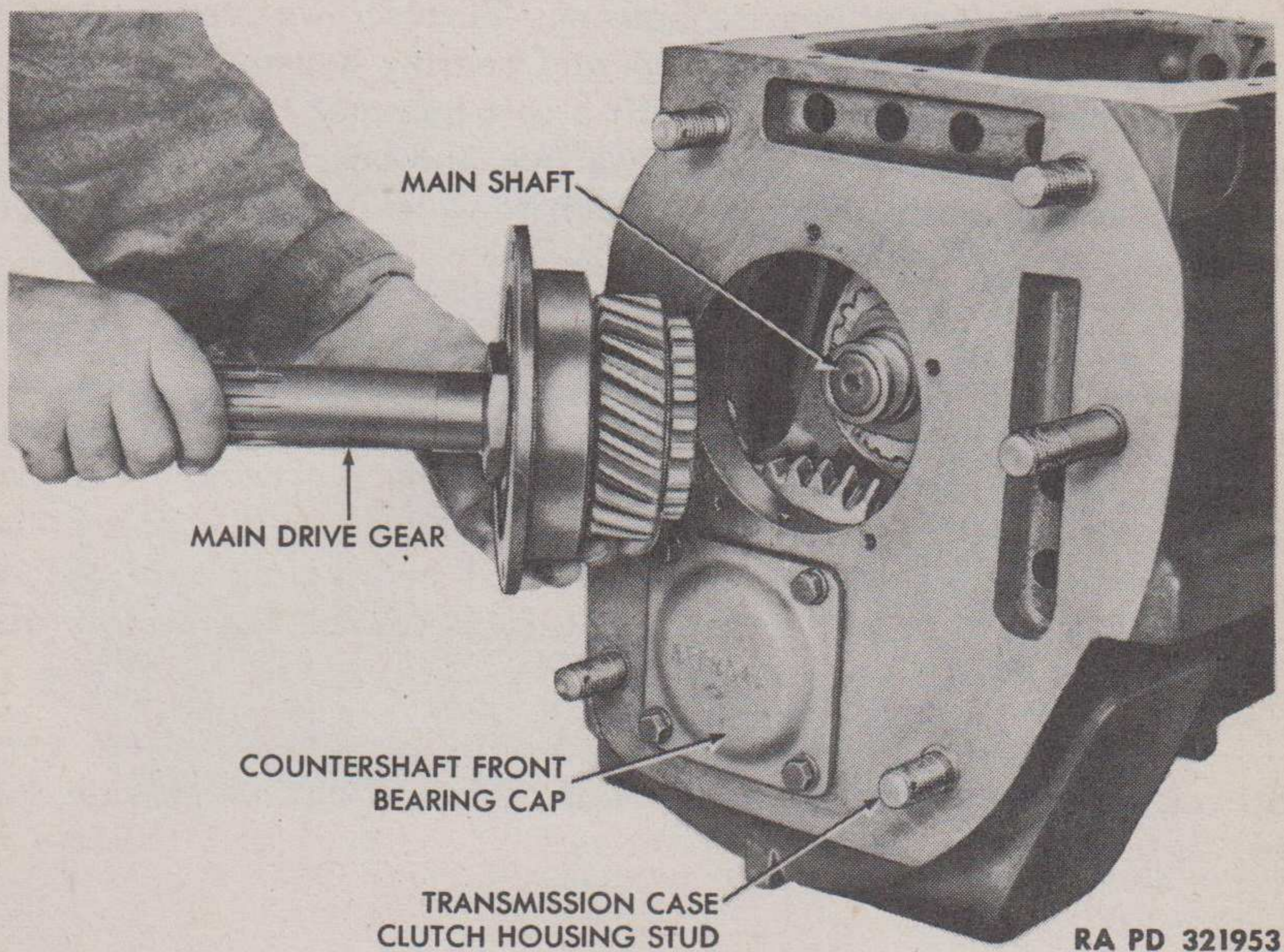


Figure 10 — Removing Main Drive Gear

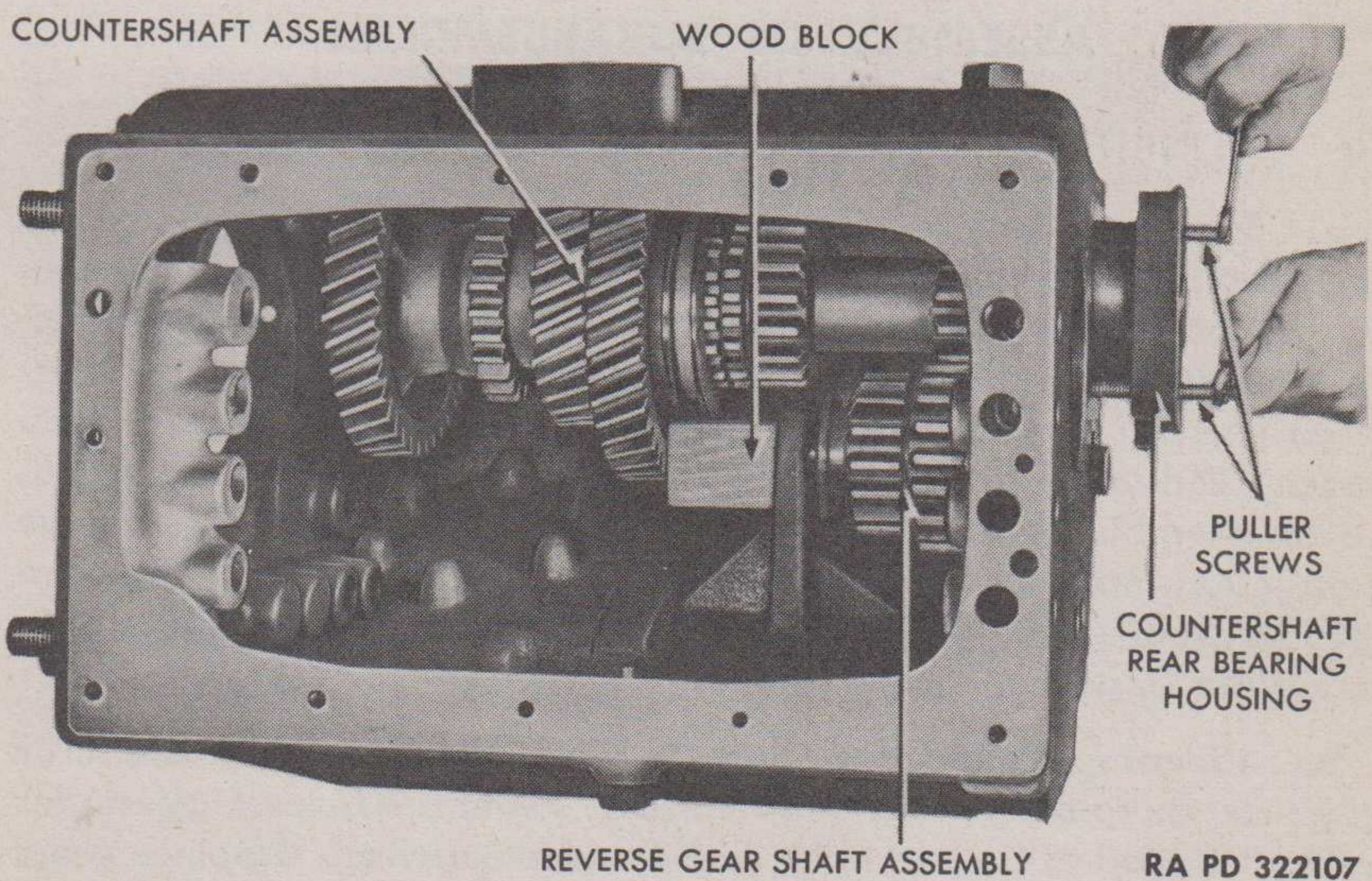


Figure 11 — Removing Countershaft Rear Bearing Housing

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slide flange spacer off mainshaft spline. Insert puller screws into two threaded holes on face of bearing housing. Turn screws evenly against transmission case, and draw bearings and bearing housing about half-way out of case. Tap mainshaft with a soft hammer to free bearings from shaft; then finish drawing out bearings and bearing housing. Lift mainshaft assembly up and out through top opening of transmission case.

h. Remove Countershaft Assembly (fig. 11). Remove cap screws and lock washers attaching front and rear countershaft bearing caps to transmission case. Lift off caps and shims. Remove rear bearing nut, lock washer, and plain washer. Place a wood block between overdrive countershaft gear and reverse gear shaft support (fig. 11). Draw countershaft rear bearings and bearing housing out of transmission case with puller screws. Lift countershaft assembly out of transmission case.

i. Remove Reverse Gear Shaft Assembly. Tap reverse gear shaft out of its support, through bore of gear, and out of transmission case. Lift out reverse gear.

Section III**DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES****19. MAINSHAFT.**

a. Disassembly (fig. 12). Slide third and fourth speed clutch ring off clutch driver. Slide first and second speed slide gear assembly off mainshaft. Remove mainshaft thrust nut and lock washer. Place assembly in an arbor press and press mainshaft through over-speed gear, third speed gear, and the third and fourth speed clutch driver. Pull main drive gear bearing inner race off end of mainshaft. To disassemble first and second speed slide gear assembly, remove eight nuts, tap out bolts, and pry gears off gear sleeve. Remove bushing from third speed gear only if damaged or worn. See subparagraph **b**, below.

b. Cleaning, Inspection, and Repair. Using a stiff brush, scrub all parts thoroughly with dry-cleaning solvent. Inspect gears for cracks, chipped or broken teeth, and evidence of wear. Replace gears if such defects are found. Examine shaft for chipped, scored, or twisted splines; if found, install a new shaft. Carefully examine third

TRANSMISSION

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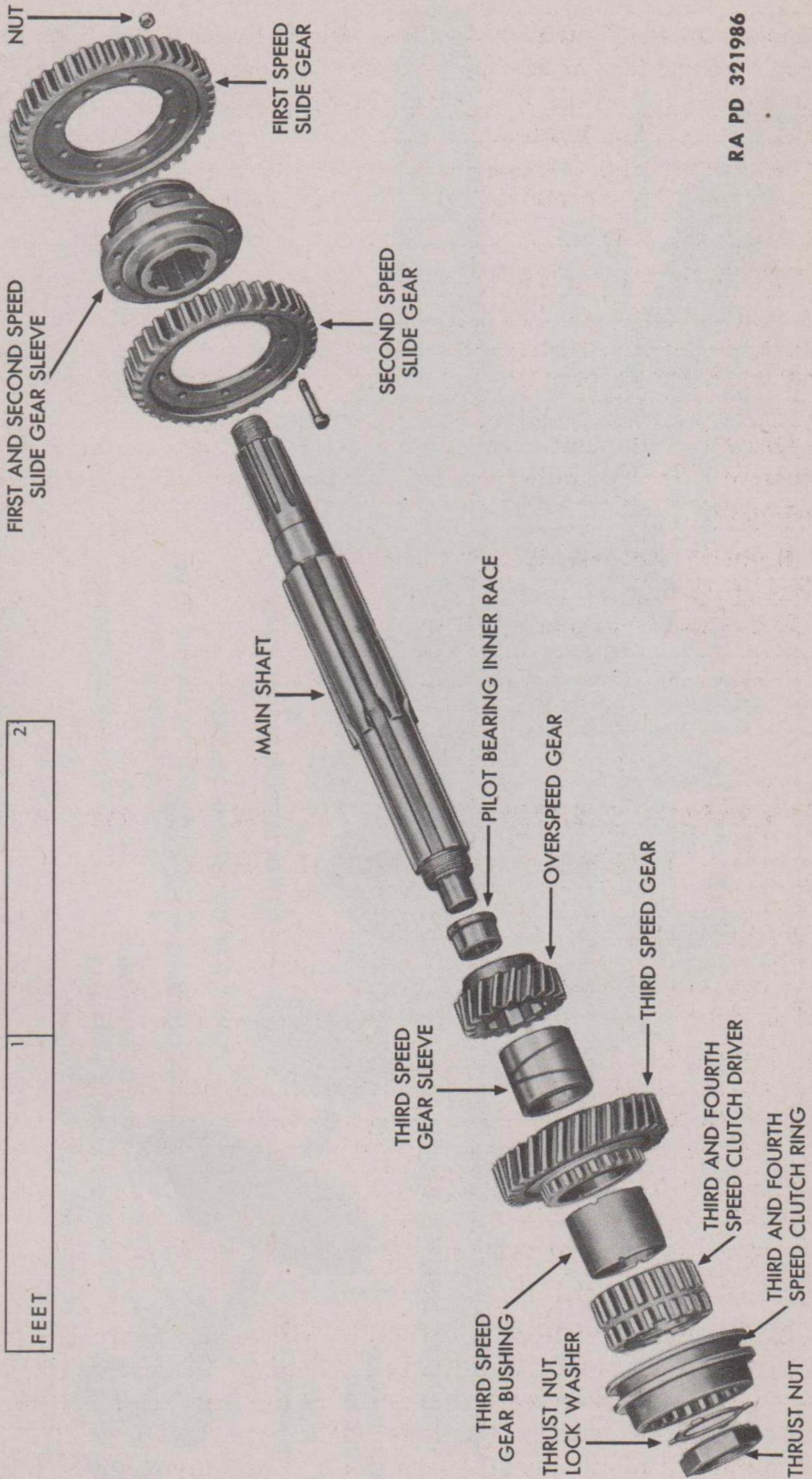


Figure 12 — Mainshaft Disassembled

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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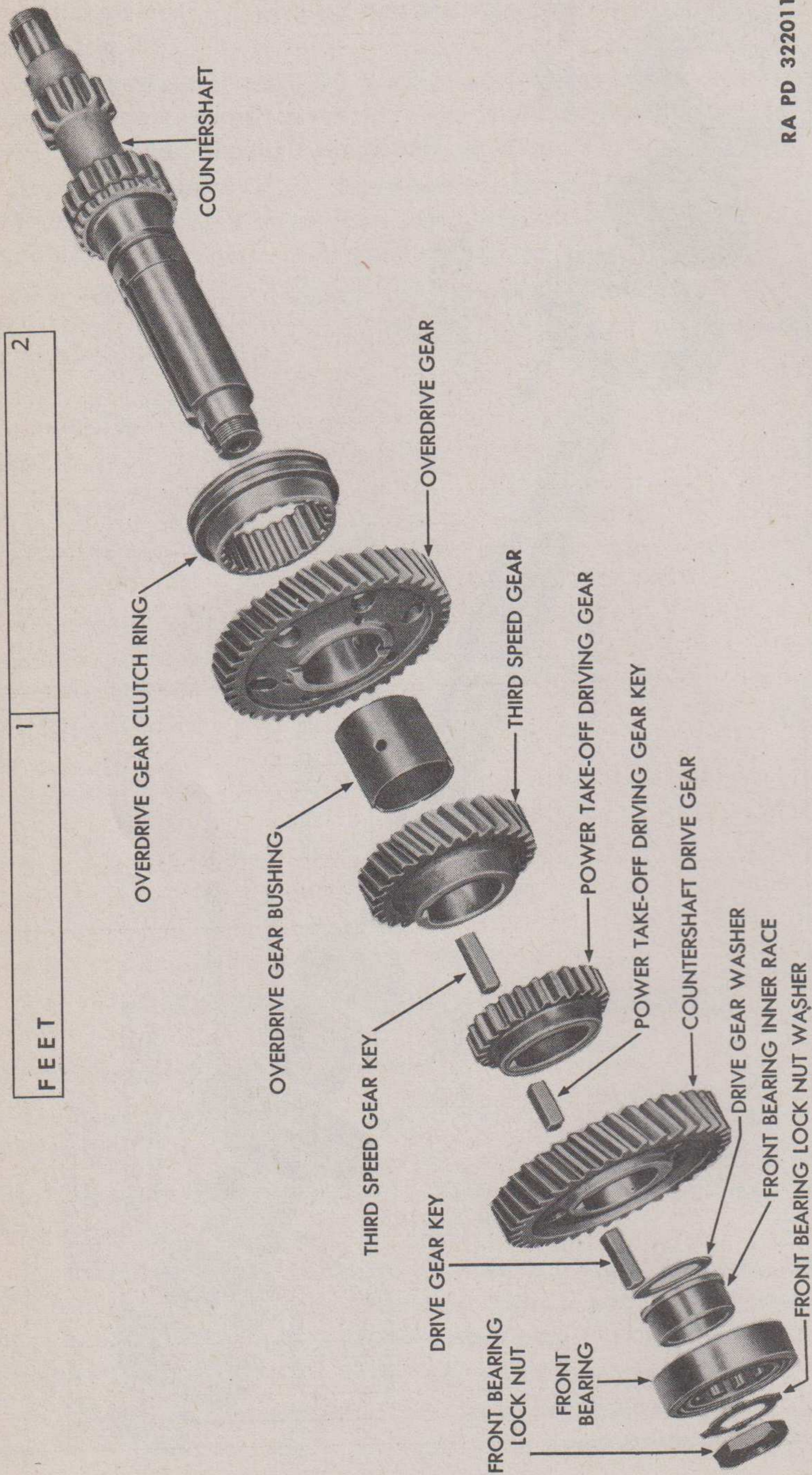


Figure 13 — Countershaft Disassembled

TRANSMISSION

speed gear bushing and sleeve for clearance, scoring, and galling. Replace sleeve if end clearance of 0.004 inch to 0.006 inch is not obtained. Remove burrs or ridges from edge of bushing with handstone. If bushing is scored or worn to a point where a feeler gage evidences a radial clearance in excess of 0.010 inch, replace it. To replace worn bushing, first remove old bushing, using an arbor press. Clean bore of gear and remove all burrs with a handstone. Lubricate outside diameter of bushing and inside diameter of gear. Press new bushing fully into gear and bend over one edge into slot on gear to lock bushing in position. Drill oilholes in bushing through holes in gear. If necessary to increase the diameter of the bushing to fit it properly to the sleeve, do so with a reamer or a honing tool. Remove all burrs and sharp edges resulting from pressing, drilling, or fitting operations.

c. **Assembly (fig. 12).** Press overspeed gear on shaft with an arbor press. Slide third speed gear sleeve in position on shaft. Slide third speed gear with installed bushing onto sleeve. Press third and fourth speed clutch driver on shaft. Install thrust nut lock washer and nut, tighten nut, and bend edge of lock washer over nut. Press main drive bearing inner race on end of shaft. Slide clutch ring over clutch driver. Assemble first and second speed slide gears by lining up both gears with bolt holes in gear sleeve, inserting bolts, and threading on nuts. Tighten nuts and peen over ends of bolts. Slide this assembly into position on shaft.

20. COUNTERSHAFT.

a. **Disassembly (fig. 13).** Remove front bearing lock nut and lock washer. Using an arbor press, press countershaft drive gear, drive gear washer, and front bearing inner race off shaft. Press off power take-off driving gear. Press off third-speed gear. Tap drive gear, power take-off, and third-speed gear keys out of countershaft keyway. Slide overdrive gear and clutch ring off shaft. Remove bushing from overdrive gear only if damaged or worn (subpar. b, below).

b. **Cleaning, Inspection, and Repair.** Follow cleaning, inspection, and repair procedure outlined for mainshaft assembly (par. 19 b). Fit, clearance, and replacement of countershaft overdrive gear bushing is the same as for mainshaft third speed gear (par. 19 b).

c. **Assembly (fig. 13).** Place overdrive gear clutch ring on overdrive gear, and slide this assembly on countershaft. Install third speed gear key in shaft keyway and press third-speed gear on shaft. Install power take-off gear key and press on power take-off driving gear. Install drive gear key and press drive gear on shaft. Position drive gear washer and press on front bearing inner race. Install front bearing lock nut washer and lock nut. Tighten nut and bend edge of washer over nut.

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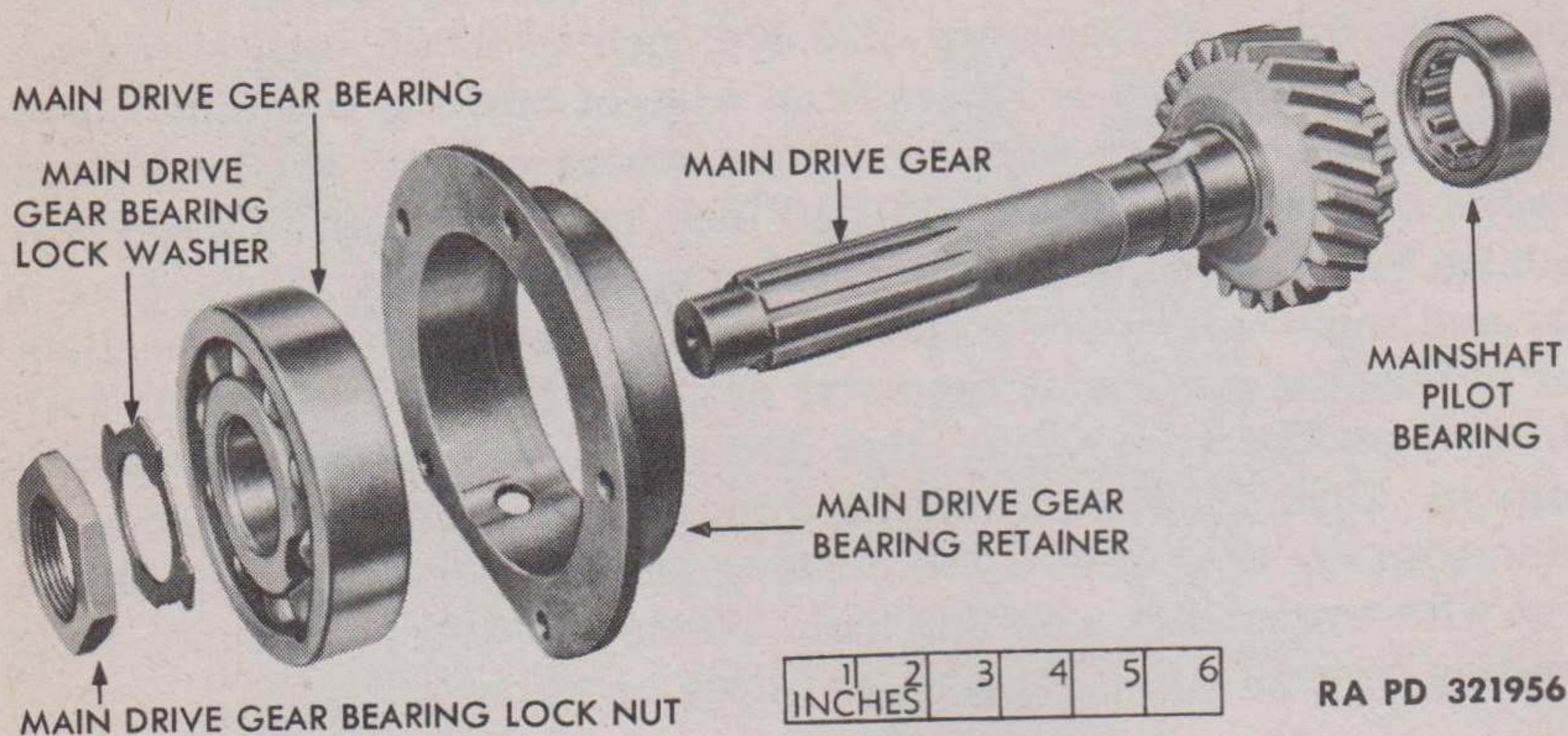


Figure 14 — Main Drive Gear Disassembled

21. MAIN DRIVE GEAR.

a. **Disassembly** (fig. 14). Remove main drive gear bearing lock nut and washer. Using an arbor press, press off main drive gear bearing and bearing retainer. Press bearing out of retainer. Using a brass drift through opening on back of main drive gear, tap out mainshaft pilot bearing.

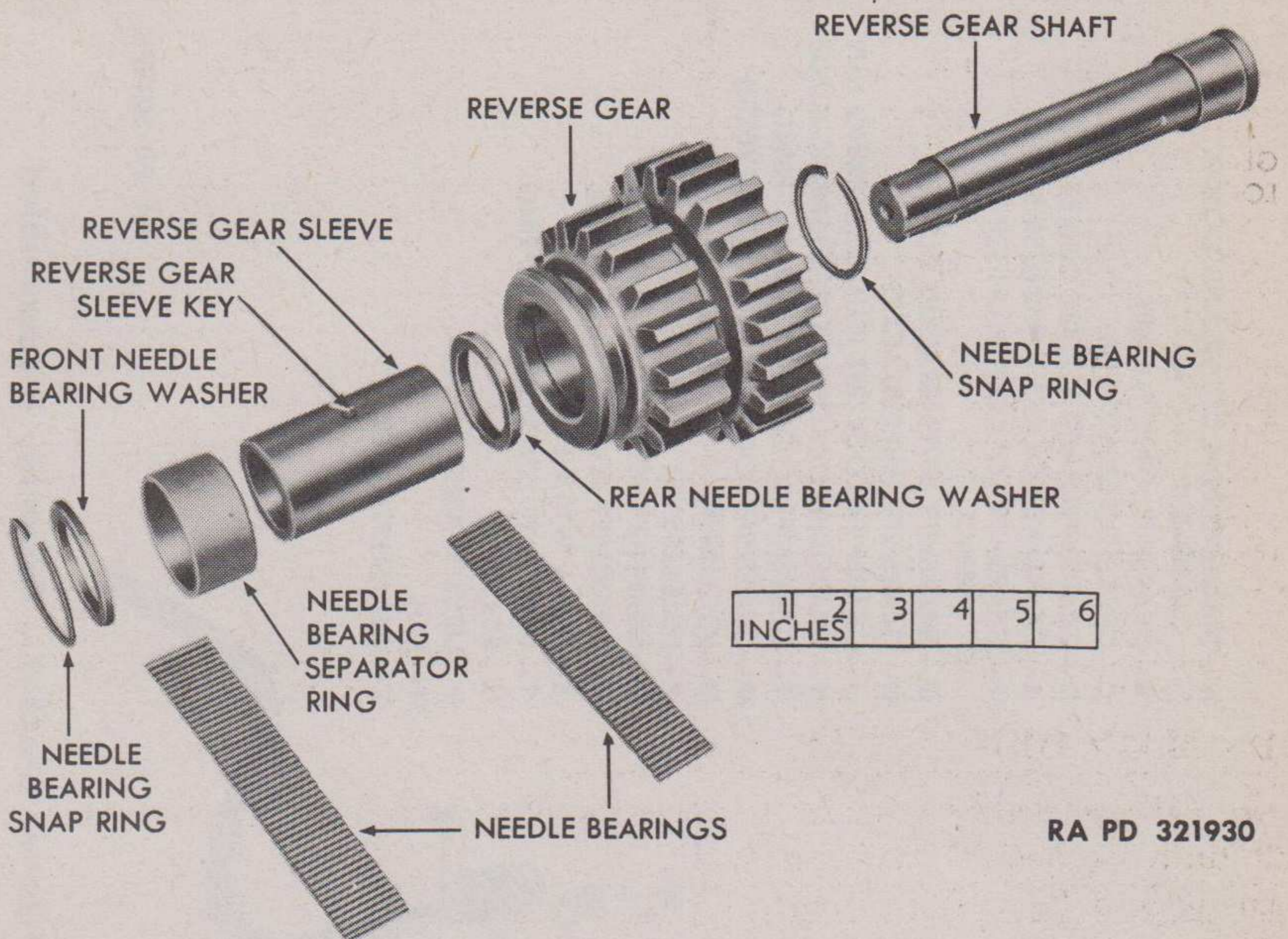
b. **Cleaning, Inspection, and Repair.** Wash all parts in dry-cleaning solvent. Immerse bearings in dry-cleaning solvent in which no other parts have been previously cleaned, keeping them in dry-cleaning solvent long enough to dissolve heavy particles of coagulated lubricant. Rotate bearings while holding them in dry-cleaning solvent. Check bearings for out-of-round condition and for discoloration of balls or rollers caused by overheating. Except for stoning to remove light scores or gall marks, do not attempt to repair a bearing. After inspection, dip bearings in lubricant and set aside in a clean container, or wrap in paper. Inspect main drive gear for cracks, chipped or broken teeth, and scored or twisted spline. Replace gear if such conditions are found. Examine bearing retainer for cracks or fractures, and replace if such defects are found.

c. **Assembly** (fig. 14). Press mainshaft pilot bearing into recess in main drive gear. Press main drive gear bearing into bearing retainer, then press this assembly on main drive gear shaft. Install bearing lock washer and nut, tighten nut, and bend edge of washer over nut.

22. REVERSE GEAR.

a. **Disassembly** (fig. 15). Place assembly in a vise and remove rear needle bearing snap ring. Force out rear needle bearing washer

TRANSMISSION



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Figure 15 – Reverse Gear Disassembled

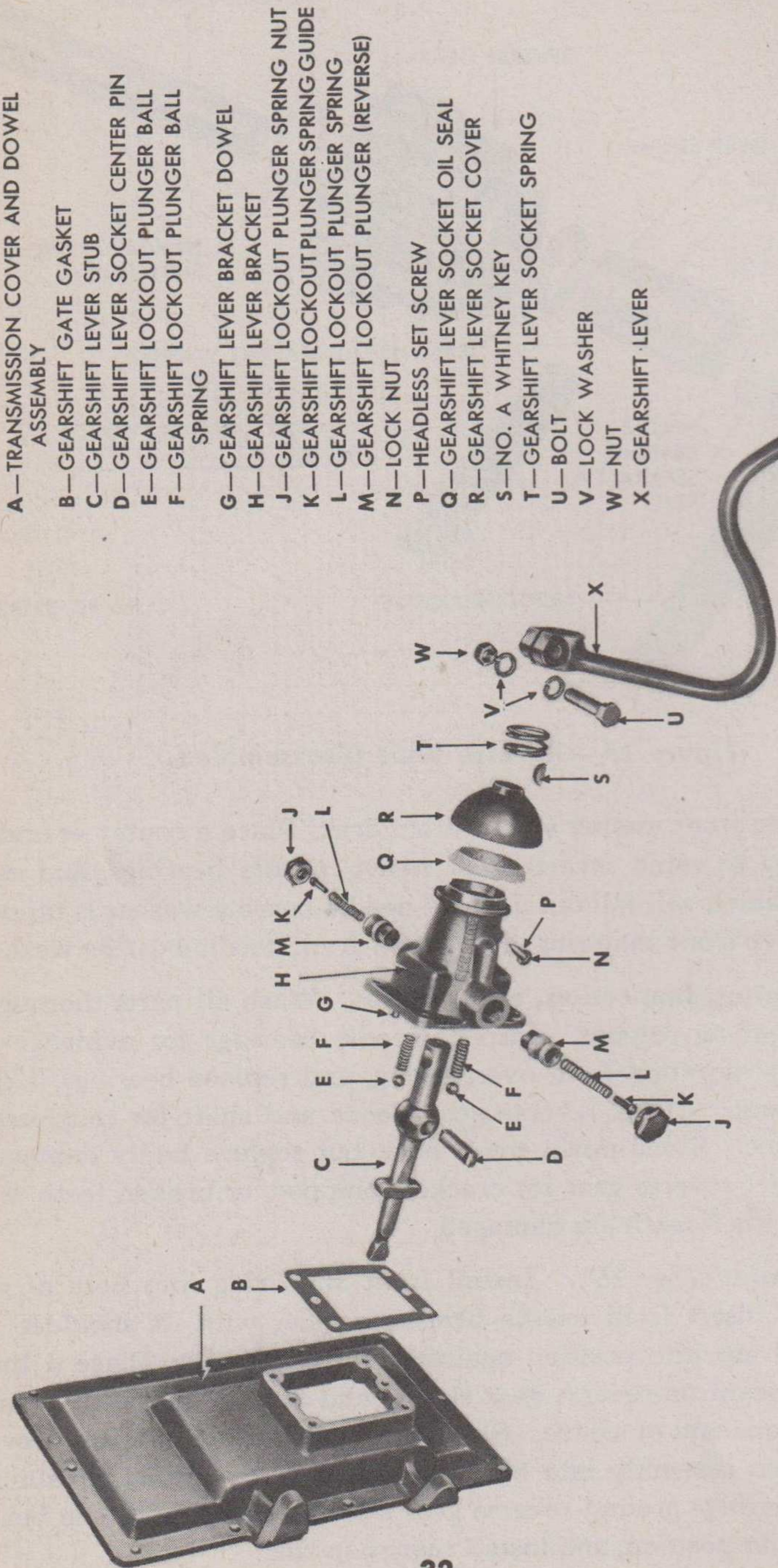
by tapping on front washer with a brass drift. Place a container under the assembly to catch reverse gear sleeve, needle bearings, and separator ring which will fall out as front needle bearing washer is tapped free. Remove front snap ring, and tap off front needle bearing washer.

b. Cleaning, Inspection, and Repair. Wash all parts thoroughly in dry-cleaning solvent. Inspect needle bearings for evidence of wear and discoloration from overheating, and replace bearings if defects are found. Check reverse gear sleeve and shaft for roughness, burs, or ridges. Stone down small burs, but replace badly damaged parts. Inspect reverse gear for cracked, chipped, or broken teeth and install new gear if teeth are damaged.

c. Assembly (fig. 15). Install front snap ring into bore of reverse gear. Insert front needle bearing washer with its shoulder to the rear and tap into position against front snap ring. Place a thin layer of lubricant on reverse gear sleeve, and arrange 53 needle bearings around one end of sleeve. Slide bearing separator ring on sleeve, and insert this assembly into bore of reverse gear. Install remaining 53 needle bearings around reverse gear sleeve. Tap rear needle bearing washer into position, and install rear snap ring.

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RA PD 321978



- A—TRANSMISSION COVER AND DOWEL ASSEMBLY
- B—GEARSHIFT GATE GASKET
- C—GEARSHIFT LEVER STUB
- D—GEARSHIFT LEVER SOCKET CENTER PIN
- E—GEARSHIFT LOCKOUT PLUNGER BALL
- F—GEARSHIFT LOCKOUT PLUNGER BALL SPRING
- G—GEARSHIFT LEVER BRACKET DOWEL
- H—GEARSHIFT LEVER BRACKET
- J—GEARSHIFT LOCKOUT PLUNGER SPRING NUT
- K—GEARSHIFT LOCKOUT PLUNGER SPRING GUIDE
- L—GEARSHIFT LOCKOUT PLUNGER SPRING
- M—GEARSHIFT LOCKOUT PLUNGER (REVERSE)
- N—LOCK NUT
- P—HEADLESS SET SCREW
- Q—GEARSHIFT LEVER SOCKET OIL SEAL
- R—GEARSHIFT LEVER SOCKET COVER
- S—NO. A WHITNEY KEY
- T—GEARSHIFT LEVER SOCKET SPRING
- U—BOLT
- V—LOCK WASHER
- W—NUT
- X—GEARSHIFT LEVER

FEET

2

Figure 16 — Transmission Cover and Gearshift Lever Bracket — Assembly Disassembled

TRANSMISSION

23 TRANSMISSION COVER AND GEARSHIFT LEVER BRACKET.

a. Disassembly.

(1) REMOVE GEARSHIFT LEVER (fig. 16). Remove nut, bolt, and lock washers attaching gearshift lever socket spring.

(2) REMOVE SOCKET COVER (fig. 16). Remove key from gearshift lever stub, and lift off socket cover and oil seal.

(3) REMOVE REVERSE LOCK-OUT PLUNGERS (fig. 16). Back off two lock-out plunger spring nuts, and remove springs and spring guides. From inside of bracket, tap out two reverse gearshift lock-out plungers. At the same time reverse two plunger balls which will drop out.

(4) REMOVE GEARSHIFT LEVER STUB (fig. 16). Loosen lock nut and back off set screw from side of gearshift lever bracket. Slightly turn gearshift lever stub; then pull stub out through bottom of bracket. Remove center pin from stub.

(5) REMOVE GEARSHIFT LEVER BRACKET (fig. 16). Remove four cap screws and lock washers attaching bracket to transmission cover. Pry bracket free of dowels, and lift off bracket and gasket.

(6) REMOVE LOCK-OUT PLUNGER BALL SPRINGS (fig. 16). Remove two lock-out plunger ball springs from seats in gearshift lever bracket.

b. **Cleaning, Inspection, and Repair.** Wash all parts thoroughly in dry-cleaning solvent. Remove all traces of old lubricant and dirt. Examine gearshift lever bracket and transmission cover for cracks, tapping with hammer to test for breaks which might not otherwise be evident. Replace bracket or cover if cracks are found. Inspect all plunger springs, replacing those weakened. If socket oil seal is worn or damaged, install a new seal. Examine the gearshift lever for cracks, and replace if found.

c. Assembly.

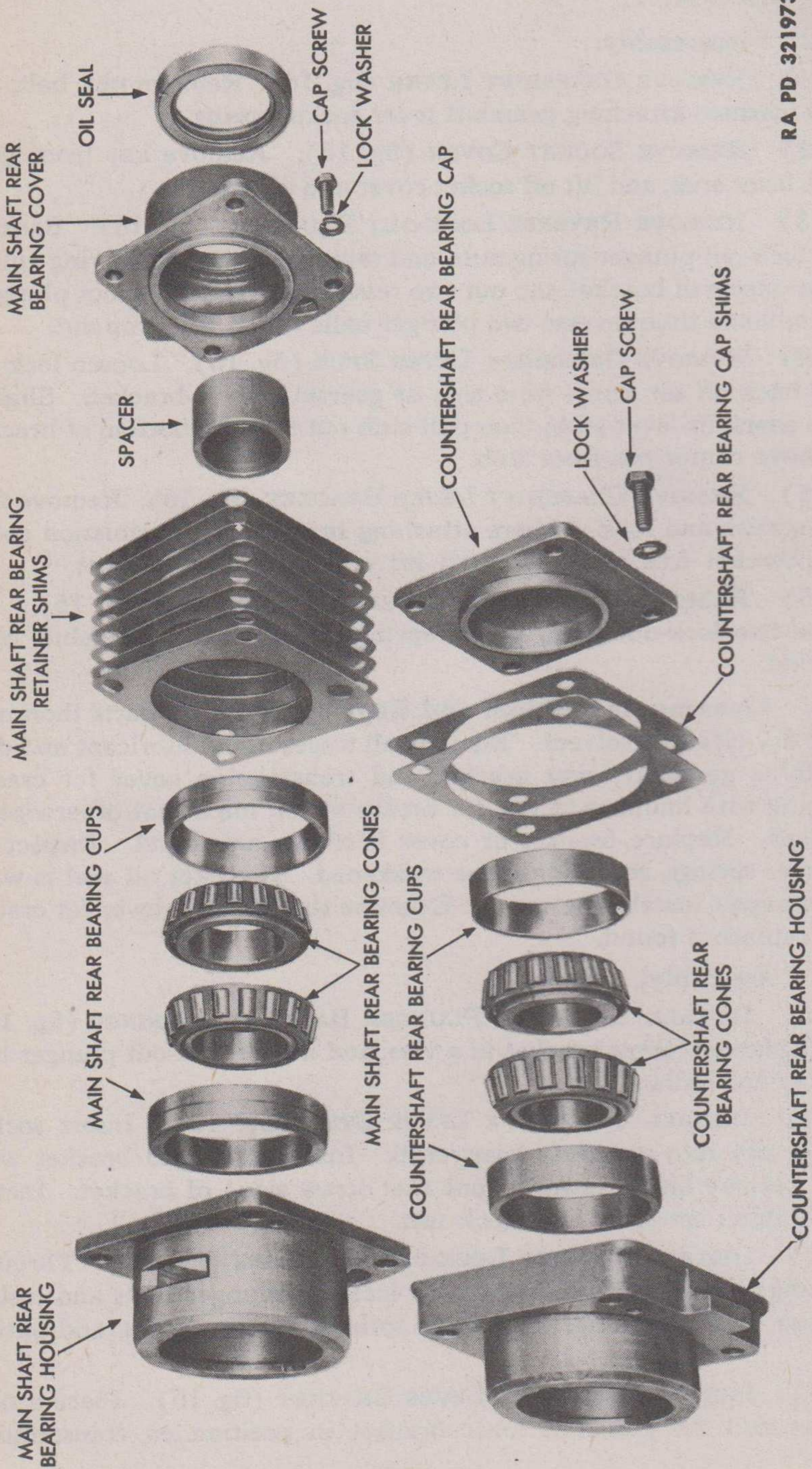
(1) INSTALL LOCK-OUT PLUNGER BALLS AND SPRINGS (fig. 16). Hold gearshift lever bracket in a vise, and install lock-out plunger ball springs and balls.

(2) INSTALL GEARSHIFT LEVER STUB (fig. 16). Insert socket center pin into gearshift lever stub. Insert stub into bracket with stub keyway facing toward front (set screw side) of bracket. Install and tighten set screw and lock nut.

(3) INSTALL REVERSE LOCK-OUT PLUNGERS (fig. 16). Through openings in bracket, press down on lock-out plunger balls and install reverse lock-out plungers, plunger springs, spring guides, and spring nuts.

(4) INSTALL GEARSHIFT LEVER BRACKET (fig. 16). Place a new gasket and the gearshift lever bracket in position on transmission

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Figure 17 — Mainshaft and Countershaft Rear Bearing Disassembled

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cover. Line up dowels with dowel holes and tap down. Install cap screws and lock washers.

(5) **INSTALL SOCKET COVER** (fig. 16). Place lever socket oil seal and socket cover in position over stub. Insert key into stub keyway, and position socket spring on cover.

(6) **INSTALL GEARSHIFT LEVER** (fig. 16). Aline keyway on gearshift lever with key on lever stub. Tap on lever until bolt holes in lever are in line with groove in stub. Install gearshift lever bolt, lock washers, and nut.

24. MAINSHAFT AND COUNTERSHAFT REAR BEARING.

a. **Disassembly** (fig. 17). Using an arbor press, press outer bearing cup out of bearing housing. Lift out both bearing cones; then press out inner bearing cup. Do not remove oil seal from rear bearing cover unless it is damaged (subpar. b, below).

b. **Cleaning, Inspection, and Repair.** Wash all parts in dry-cleaning solvent, immersing bearings in clean dry-cleaning solvent. Keep bearings in dry-cleaning solvent until old lubricant is completely dissolved; rotate rollers slowly while holding bearings in dry-cleaning solvent. After cleaning, dry bearings and inspect for evidence of wear or damage. Except for stoning to remove light scores or gall marks, do not attempt to repair bearings. Examine oil seal in bearing cover for distortion of inner diameter, tears, and flabby condition. If felt is worn or seal is otherwise damaged, remove seal from cover and install new oil seal. Inspect bearing cover and housing for cracks or fractures, replacing cracked or fractured parts.

c. **Assembly** (fig. 17). Press inner cup into bearing housing. Pack bearing cones with lubricant and insert against inner cup. Press outer bearing cup into housing.

25. TRANSMISSION CASE.

a. Disassembly.

(1) **REMOVE COUNTERSHAFT FRONT BEARING.** Tap countershaft front roller bearing out of transmission case.

(2) **REMOVE REVERSE GEARSHIFT FORK GUIDE SCREW.** Back off lock nut and remove guide screw from side of case.

(3) **REMOVE PIPE PLUGS.** Remove drain plug from bottom, and summer and winter level plugs from side of transmission case.

b. **Cleaning, Inspection, and Repair.** Wash transmission case with dry-cleaning solvent. Use a stiff brush to remove all traces of old lubricant and dirt from inner crevices. Examine case for fractures and cracks, tapping with hammer to test for cracks which might otherwise not be evident. Inspect all drilled passages to make sure

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they are open and clean. Replace transmission case if fractured or cracked. Check reverse gearshift fork guide screw, all studs, and pipe plugs for nicks, burs, cross threads, and evidence of wear. Clean up light nicks, burs, and crossed threads; replace badly worn or damaged parts. Clean and inspect countershaft front roller bearing as outlined in paragraph 24 b.

c. Assembly.

(1) **INSTALL PIPE PLUGS.** Install drain plug and the summer and winter level plugs in transmission case.

(2) **INSTALL REVERSE GEARSHIFT FORK GUIDE SCREW.** Install guide screw and lock nut in side of case.

(3) **INSTALL COUNTERSHAFT FRONT BEARING.** Tap bearing into its seat in transmission case.

Section IV

ASSEMBLY OF TRANSMISSION

26. ASSEMBLY OF TRANSMISSION.

a. Install Reverse Gear Assembly. Hold reverse gear in position inside transmission case. Insert shaft through rear of case. Line up keyway on shaft with reverse gear sleeve key and tap shaft fully into position. Make certain that cutaway part on end of shaft is in vertical position facing countershaft opening in transmission case.

b. Install Countershaft Assembly (fig. 11). Lift countershaft assembly into transmission case, keeping it toward rear of case. Move assembly forward carefully and insert shaft into front bearing. Install shims and front bearing cap with oil drain in cap facing down. Secure cap with lock washers and cap screws. Tap countershaft rear bearing assembly into position in rear of transmission case, with lip on bearing housing over cutaway end of reverse gear shaft. After housing is in place, tap lightly on rear bearings to properly seat them on countershaft. Slide plain washer on countershaft and install rear bearing lock nut washer and lock nut. Bend lock washer over nut. Do not install rear bearing cap and shims until mainshaft and main drive gear assemblies have been installed, at which time the number of shims required will be determined.

c. Install Mainshaft Assembly. Lower assembly into transmission case, keeping sliding gears toward rear of case. Before installing mainshaft rear bearing assembly, it is necessary to determine the number of shims required between bearing housing and bearing cover. Place housing assembly in a vise, install shims between hous-

TRANSMISSION

ing and cover, and tighten assembly with bolts and nuts. Enough shims must be installed so a very slight binding of bearings can be felt when turning bearings by hand. When this condition is reached, remove one 0.005-inch shim. Tap rear bearing housing into position in transmission case. Install predetermined number of shims against housing. Install rear bearing cover with lock washers and cap screws. Tap on front end of mainshaft until shaft is fully seated on rear bearings. Slide spacer into rear bearing housing and on mainshaft. Tap drive shaft flange on mainshaft spline far enough to be able to thread thrust nut on shaft. Tighten thrust nut as far as possible to press flange against spacer and install cotter pin.

d. Install Main Drive Gear Assembly (fig. 10). Tap assembly into transmission case and onto mainshaft. Using new gasket, install main drive gear bearing cap. Secure with lock washers and cap screws.

e. Install Countershaft Rear Bearing Cap. Check position of countershaft overdrive gear in relation to mainshaft overspeed gear. If edges of gears are not in line, shims must be moved from one end of countershaft to the other end until perfect alinement of gears is achieved. Place predetermined number of shims against countershaft rear bearing housing. Place rear bearing cap against shims and secure with lock washers and cap screws.

f. Install Gearshift Rods (figs. 8 and 9). Slide gears into neutral position before installing gearshift rods. First install lower reverse and lower overdrive rods, which do not use plungers or springs. Hold lower reverse gearshift fork inside transmission case. Insert rod into transmission case, through gearshift fork, and into other end of transmission case. Secure fork to rod with cap screw and safety wire. Install lower overdrive shift rod and fork in the same manner. Place gearshift rod springs and plungers into openings in back end of transmission case. Place gearshift rod interlock plungers in position in front end of case. Press down gearshift rod plunger, and insert first and second speed gearshift rod into transmission case and on through gearshift fork and jaw into the other end of transmission case. Secure fork and jaw to rod with cap screw and lock washer. Follow same procedure to install third and fourth speed, upper overdrive, and upper reverse gearshift rods and rod arms in the order given. Use new gaskets, and install top and side gearshift rod covers.

g. Install Transmission Cover and Gearshift Lever Bracket Assembly. Place a new transmission cover gasket in position on case. Lift cover assembly onto transmission case at an angle to properly place gearshift lever stub in position on gearshift rod arms. Line up dowels and tap cover assembly on transmission case. Install lock washers and cap screws.

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- h. **Install Clutch Housing Assembly.** Line up stud holes in clutch housing, and tap housing fully against transmission case. Install clutch housing, stud nuts, and cotter pins.
- i. **Install Power Take-off.** Refer to paragraph 34.

Section V

TEST

27. TEST.

- a. **Road Test.** Install transmission, and check operation in various gear speeds. Listen for excessive noise, and examine transmission case for oil leaks. If shifting into all speeds is accomplished easily and no excessive noise is apparent, correct assembly of transmission is indicated.

Section VI

FITS AND TOLERANCES

28. SERVICE INFORMATION.

- a. **Fits and Tolerances.**

Sliding gears on mainshaft splines.....	0.005 to 0.0015 in.
Third and fourth speed clutch ring on clutch driver	0.005 to 0.0015 in.
Fork on clutch ring	0.005 to 0.0020 in.
Fork on slide gear sleeve.....	0.005 to 0.0020 in.
Mainshaft out-of-true	0.005 in. maximum
Poppet spring pressure at $1\frac{5}{16}$ in.....	40 to 45 lb

CHAPTER 4

POWER TAKE-OFF

Section I

DESCRIPTION AND DATA

29. DESCRIPTION AND OPERATION.

a. **Description** (fig. 18). For operation of the winch, a power take-off unit is mounted on a special adapter on the right-hand side of the transmission. Selection of two forward speeds and one reverse speed is made through operation of a shifter lever in the cab. The adapter bracket assembly and take-off assembly are separated during removal from transmission, as one attaching cap screw is located inside the adapter bracket. In the adapter bracket, a power take-off adapter gear is mounted on a roller bearing and a gear shaft, held in position by a steel pin. This pin is driven through the bracket and one end of the gear shaft. Thrust washers are placed on each side of the adapter gear. In the power take-off assembly, roller bearings are pressed into the case and provide seats for the take-off shaft. This shaft is splined to permit movement of take-off sliding gear. A shift yoke attached to a shift rod fits a slot on the sliding gear. This yoke is held in position on the shift rod by a shift rod tube which slides over one end of the shift rod, forcing the yoke against a shoulder on the rod. Grooves in the shift yoke and shift rod tube permit entry of gearshift pawls. These pawls are forced against the yoke and shift rod tube by pawl springs, which fit into poppets threaded into top of take-off case. An idler gear, in which two roller bearings, separated by a bearing spacer, are used, is mounted in the take-off case under the take-off sliding gear. Thrust washers are used on each end of the idler gear assembly. Cap screws, threaded into each end of the idler gear pin, hold the assembly in position. An intermediate gear which is in constant mesh with the idler gear rides on a roller bearing and a bearing sleeve. A set screw holds the intermediate gear pin in the take-off case.

b. **Operation** (fig. 21). Power is transmitted from the power take-off driving gear in the transmission. This gear is in constant mesh with the take-off adapter gear which, in turn, is in constant mesh with the intermediate gear in the take-off case. Shifting of control lever into low position engages the 28-toothed, sliding gear with the 14-toothed intermediate gear. With control in high position, 20-toothed sliding gear engages 22-toothed intermediate gear. In reverse position, 28-toothed sliding gear engages 14-toothed idler gear which is in constant mesh with 22-toothed intermediate gear. With

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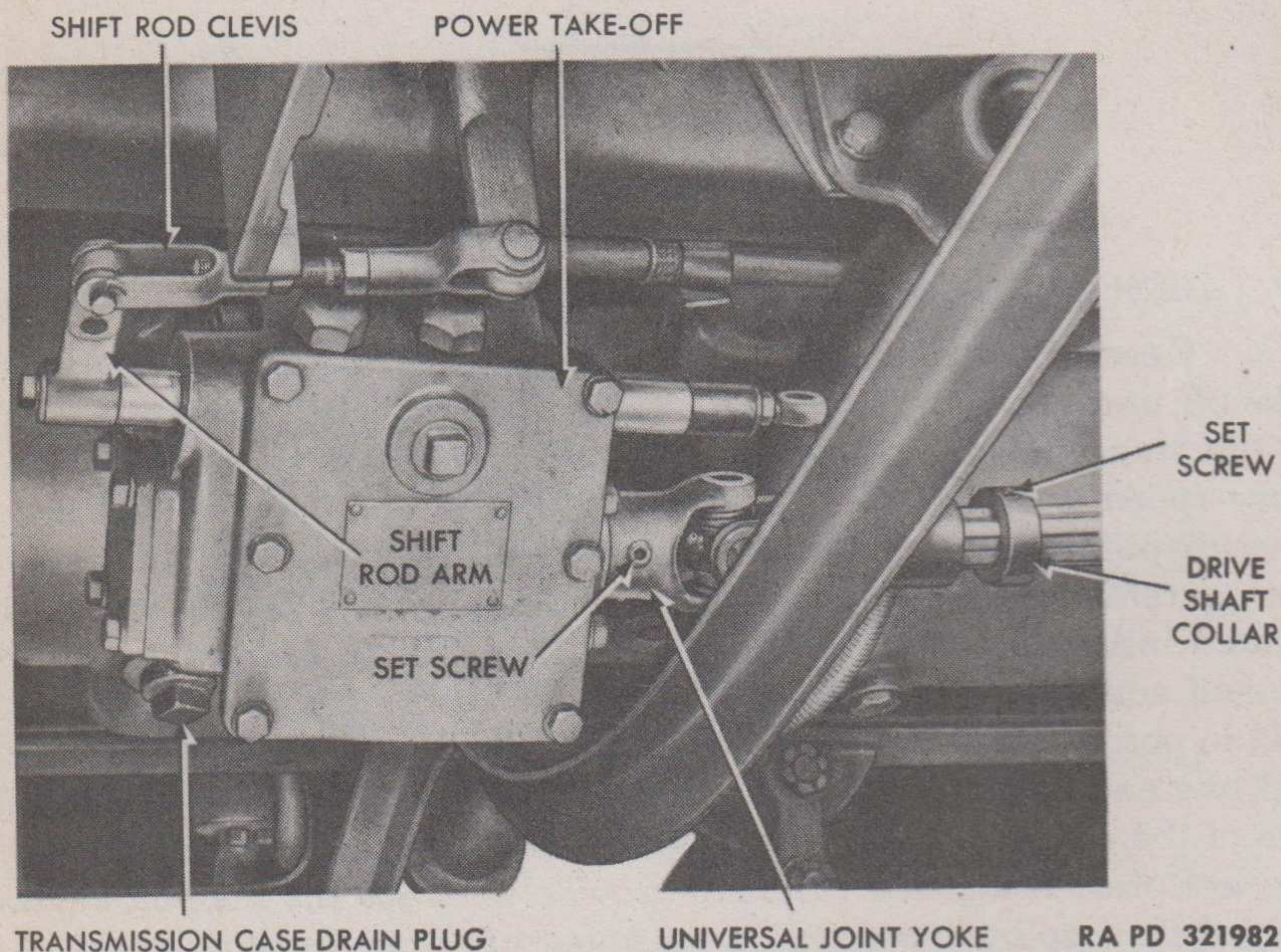


Figure 18 — Power Take-off Installed

engine operating at 1,000 revolutions per minute, the winch line speed on the first layer of 1/2-inch cable on the drum is 21 1/2 feet per minute in low gear, 47 1/2 feet per minute in high gear, and 34 feet per minute in reverse. Neutral points are between each of the gear speeds. A lock for the control lever is provided to secure the take-off in one of these neutral points.

30. DATA.

Make	Gar Wood
Model	77 Y 6000
Gear ratio, high.....	1.10 to 1
Gear ratio, low	0.50 to 1
Gear ratio, reverse	0.78 to 1

Section II

REMOVAL

31. REMOVAL.

a. **Drain Transmission and Power Take-off (fig. 18).** Drain transmission by removing drain plug from bottom of transmission case. Remove bottom cover plate from take-off case to complete draining of power take-off unit.

POWER TAKE-OFF

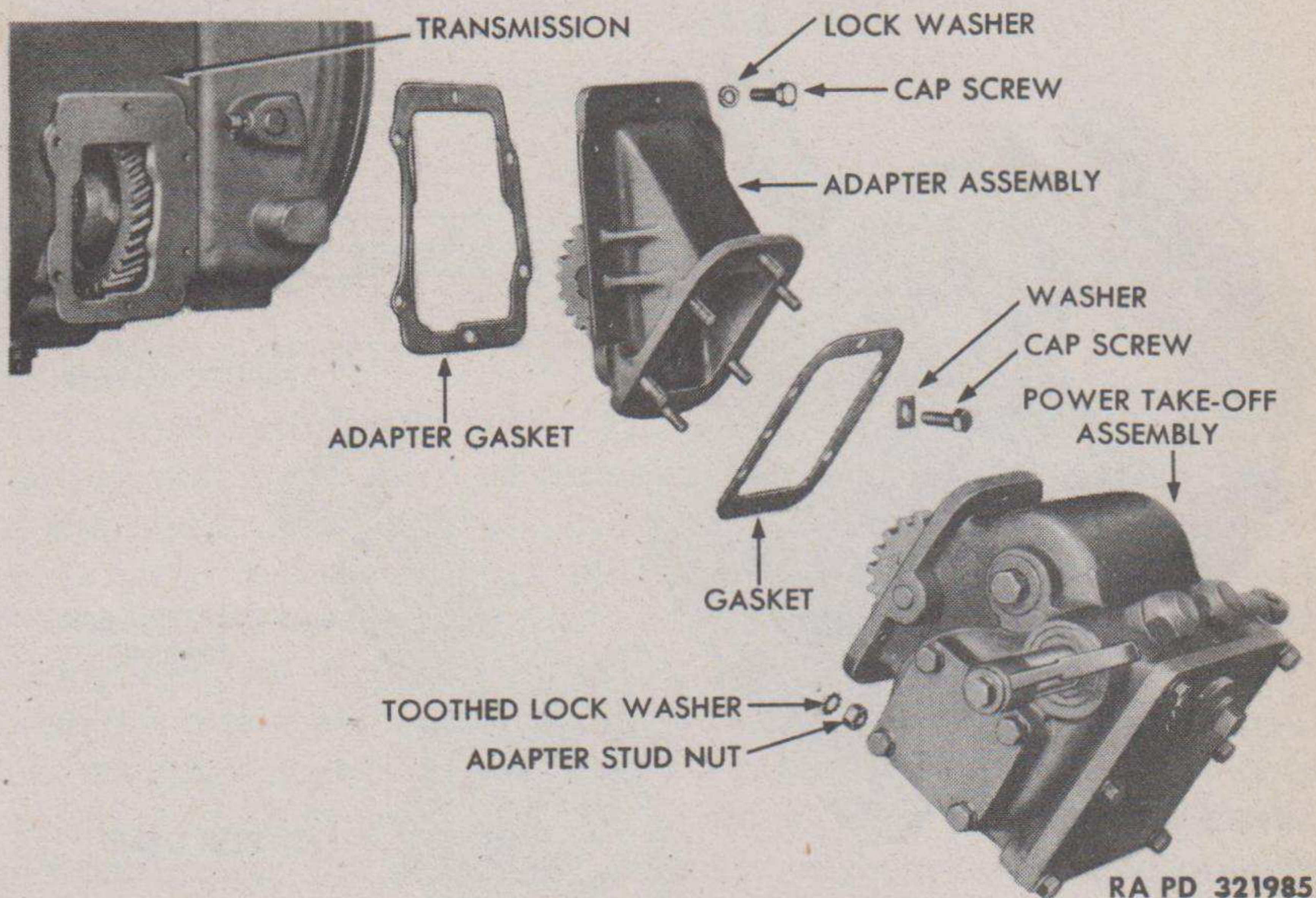


Figure 19 – Power Take-off and Adapter Removed From Transmission

b. **Detach Shift Rod** (fig. 18). Remove cotter pin and clevis pin attaching take-off shift rod clevis to shift rod arm.

c. **Detach Winch Drive Shaft** (fig. 18). Loosen set screws on universal joint yoke and drive shaft collar. Slide collar forward and tap universal joint off power take-off shaft.

d. **Remove Power Take-off Assembly** (fig. 19). Remove stud nuts and internal-toothed lock washers attaching take-off to take-off adapter. Lift off take-off assembly and gasket.

e. **Remove Power Take-off Adapter Assembly** (fig. 19). Remove one cap screw and square flat washer from inside of adapter. Remove five cap screws and lock washers attaching outer edge of adapter to transmission case. Lift off adapter and gasket.

Section III

DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES

32. POWER TAKE-OFF ADAPTER.

a. Disassembly

(1) **REMOVE ADAPTER GEAR** (fig. 20). Tap steel pin out of adapter bracket and gear shaft. Tap out gear shaft and lift adapter gear and thrust washers out of bracket. Slide adapter gear bearing from bore of gear.

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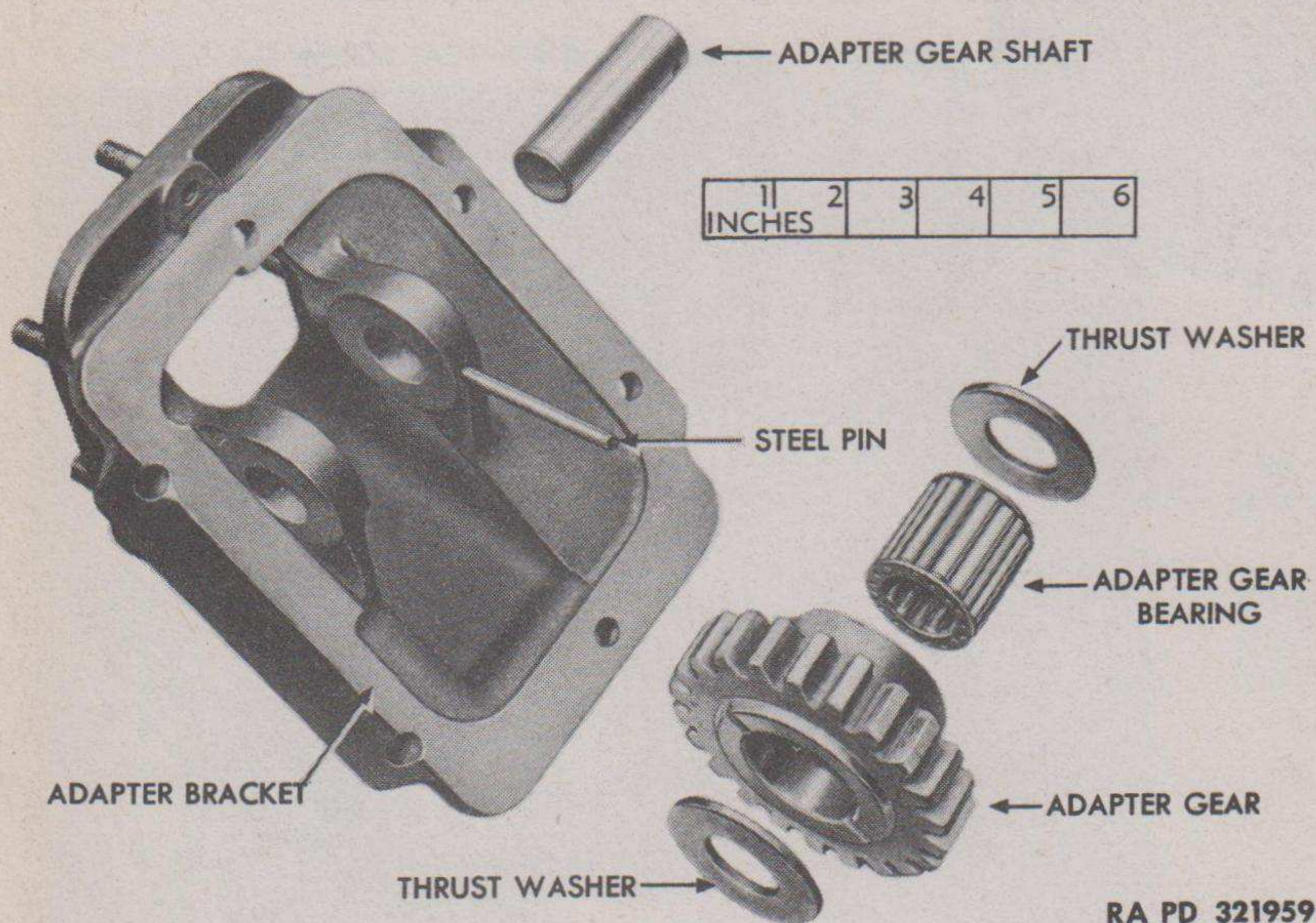


Figure 20 — Power Take-off Adapter Disassembled

b. **Cleaning, Inspection, and Repair.** Wash all parts in dry-cleaning solvent. Inspect bearing for wear or out-of-round condition of rollers. If bearing rollers are ridged, out-of-round, or cracked, replace bearing. After inspection, dip bearing in lubricant and set aside in a clean, covered container. Examine adapter bracket for cracks or fractures, replacing bracket if cracks or fractures are found. Inspect adapter gear shaft and thrust washers for burrs and nicks, and repair with a handstone if necessary.

c. **Assembly.**

(1) **INSTALL ADAPTER GEAR** (fig. 20). Slide adapter gear bearing into bore of gear. Position thrust washers and gear in adapter bracket and install gear shaft. Tap steel pin through bracket and gear shaft. Peen both ends of pin.

33. POWER TAKE-OFF.

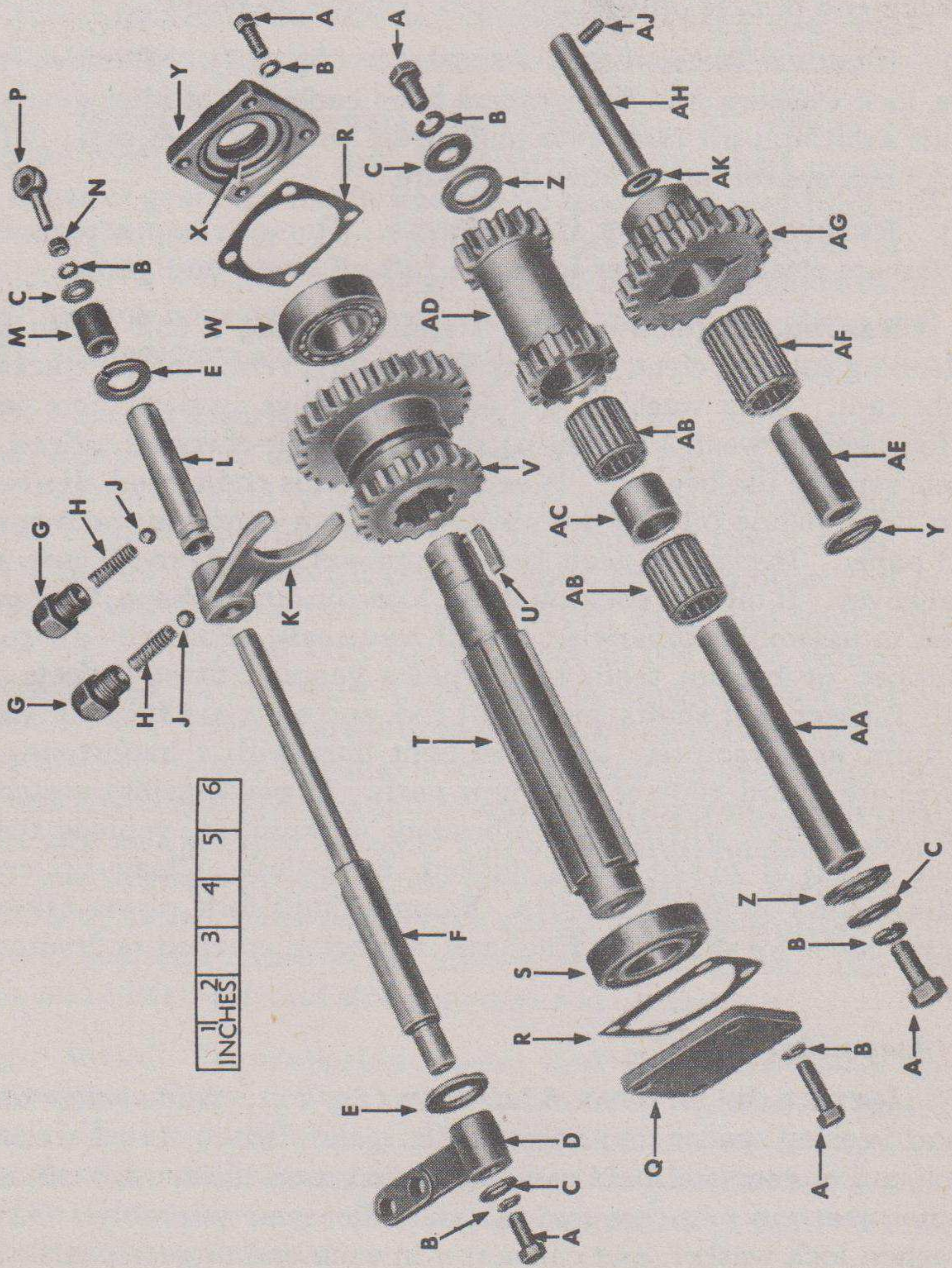
a. **Disassembly.**

(1) **REMOVE INTERMEDIATE GEAR** (fig. 21). Remove set screw securing intermediate gear pin in take-off case. Tap out gear pin and remove thrust washers and gear. Slide roller bearing and sleeve out of gear bore.

(2) **REMOVE TAKE-OFF SHAFT ASSEMBLY** (fig. 21). Tap key out of shaft keyway. Remove cap screws and lock washers attaching bear-

POWER TAKE-OFF

- A—CAP SCREW
- B—LOCK WASHER
- C—FLAT WASHER
- D—SHIFT ROD ARM
- E—OIL SEAL
- F—SHIFT ROD
- G—POPPET
- H—PAWL SPRING
- J—GEARSHIFT PAWL
- K—SHIFT YOKE
- L—SHIFT ROD TUBE
- M—SPACER
- N—LOCK NUT
- P—EYE
- Q—BEARING CAP
- R—GASKET
- S—SINGLE ROW BALL BEARING
- T—TAKE-OFF SHAFT
- U—KEY
- V—SLIDING GEAR
- W—DOUBLE ROW BALL BEARING
- X—OIL SEAL
- Y—OIL SEAL COVER
- Z—THRUST WASHER
- AA—IDLER GEAR PIN
- AB—ROLLER BEARING
- AC—BEARING SPACER
- AD—IDLER GEAR
- AE—BEARING SLEEVE
- AF—ROLLER BEARING
- AG—INTERMEDIATE GEAR
- AH—INTERMEDIATE GEAR PIN
- AJ—SET SCREW
- AK—WASHER



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Figure 21 — Power Take-off Shaft and Gear Disassembled

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ing cap and oil seal cover to take-off case. Lift off bearing cup, oil seal cover, and gaskets. Remove oil seal from cover only if damaged (subpar. b, below). Tap take-off shaft towards front of case and remove shaft with front bearing. Slide bearing off shaft. Lift take-off gear out of case. Tap rear bearing out of case.

(3) **REMOVE SHIFT ROD ASSEMBLY** (fig. 21). Unscrew poppets and lift springs and pawls from openings in take-off case. Remove cap screw, lock washer, and flat washer attaching shift rod arm to shift rod. Slide arm off shift rod. Unscrew eye from shift rod tube. Remove spacer, slide shift rod tube off shift rod and out of take-off case. Slide shift rod out of case and lift out shift rod fork. Remove oil seals from each end of case only if damaged (subpar. b, below).

(4) **REMOVE IDLER GEAR ASSEMBLY** (fig. 21). Remove cap screws, lock washers, and flat washers from each end of idler gear pin. Tap out shaft and lift idler gear and thrust washers from case. Slide bearings and spacer out of idler gear bore.

(5) **REMOVE TAKE-OFF CASE COVER**. Remove cap screws and lock washers attaching cover to case. Lift off cover and gasket.

b. Cleaning, Inspection, and Repair. Using a stiff brush and dry-cleaning solvent, clean all parts thoroughly, removing all traces of old lubricant. After washing and drying bearings, inspect them carefully for signs of wear. If bearing rollers are out-of-round, ridged, or cracked, replace the bearing. When inspection is completed, dip bearings in light engine oil and set aside in a clean container or wrap in waxed paper. Inspect oil seals before removal from take-off case and oil seal cover. If oil seal packing is not loose or out of shape, they may be used in assembly; otherwise, install new seals. Examine all gears for chipped or broken teeth and replace gears if these defects are found. Inspect gear shafts, pins, shift rod, and shift rod tube for wear, nicks, burs, and fractures. Remove light burs with a handstone. If fractures are found, replace with new parts. If pawl springs are compressed to a point where their efficiency is impaired, replace them. Replace pawls if out-of-round, nicked, or galled. Clean up cross threading found on threaded parts. Examine shift fork, power take-off case, and cover for cracks or fractures, replacing cracked or fractured parts.

c. Assembly.

(1) **INSTALL IDLER GEAR ASSEMBLY** (fig. 21). Slide roller bearings and bearing spacer into bore of idler gear. Place thrust washers on each end of gear and hold assembly in position inside take-off case. Tap idler gear pin into case and through idler gear assembly. Install flat washer, lock washer, and cap screw in each end of gear pin.

POWER TAKE-OFF

(2) **INSTALL TAKE-OFF SHAFT ASSEMBLY** (fig. 21). Tap single-row rear ball bearing into case. Hold sliding gear in position inside case. Slide take-off shaft into case, through gear, and into rear bearing. Slide double-row front ball bearing over shaft, and tap into case. Using a new gasket, install drive shaft cap and secure with lock washers and cap screws. If new oil seal is required, press seal into oil seal cover. Install a new gasket, and secure oil seal cover assembly to take-off case with lock washers and cap screws. Tap key into keyway on take-off shaft.

(3) **INSTALL SHIFT ROD ASSEMBLY** (fig. 21). If new oil seals are required, carefully press or tap new oil seals into position in take-off case. Place shift yoke on take-off gear and slide shift rod into case and through shift yoke. Slide shift rod tube into other end of case against shift yoke. Slide spacer onto end of shift rod against shift rod tube. Install flat washer, lock washer, and eye with lock nut into end of shift rod. Place shift rod arm on shift rod and secure with flat washer, lock washer, and cap screw. Insert gear shift pawls and pawl springs into opening in take-off case, and thread poppets firmly into position.

(4) **INSTALL INTERMEDIATE GEAR ASSEMBLY** (fig. 21). Insert roller bearing and bearing sleeve into bore of intermediate gear. Place thrust washers on each end of gear and hold assembly in position. Tap intermediate gear pin into case and through gear assembly. Thread set screw into case and intermediate gear pin.

(5) **INSTALL TAKE-OFF CASE COVER**. Using a new gasket, install cover. Secure with lock washers and cap screws.

Section IV

INSTALLATION

34. INSTALLATION.

a. **Install Power Take-off Adapter Assembly** (fig. 19). Using a new gasket, position adapter against transmission case. Make sure adapter gear is in mesh with transmission power take-off gear. Install cap screws and lock washers holding adapter to transmission case.

b. **Install Power Take-off Assembly** (fig. 19). Place a new gasket on adapter studs and position take-off assembly. Secure assembly to adapter with internal-toothed lock washers and stud nuts.

c. **Attach Winch Drive Shaft** (fig. 18). Position universal joint yoke on take-off shaft, and tighten yoke set screw. Slide drive shaft collar back to a distance of three-fourths inch from rear universal joint hub, and tighten collar set screw.

d. **Attach Shift Rod** (fig. 18). Attach shift rod to shift rod arm with clevis pin and cotter pin.

e. **Install Lubricant**. Fill transmission case with lubricant. Refer to TM 9-817 for quantity and type of lubricant.

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CHAPTER 5
TRANSFER CASE

Section I

DESCRIPTION AND DATA

35. DESCRIPTION AND OPERATION.

a. Description (figs. 22 and 23). A transfer case provides a means of transferring power from the transmission to the front and rear propeller shafts. It is mounted behind the transmission and arranged for two speeds: one direct, and one underdrive, with a ratio of 1.72 to 1. Speed changes are controlled by a lever in the cab. A declutching device on the front of the lower shaft is used to cut out transmission of power to the front axle when traction on the front wheels is not required. This clutch also is controlled by a lever in the cab and is arranged so that the truck cannot be operated in low range with the front axle disengaged. Power is transmitted from transmission to transfer case by the intermediate drive shaft which is attached to transfer case mainshaft flange. Ball bearings support the mainshaft at the front and rear. The main drive gear is supported on the mainshaft by two idler bearings. A low-speed sliding gear rests on the splined part of the mainshaft. Fitted into a recess on this sliding gear is a gearshift fork which is attached to a gearshift shaft. Support for the idler shaft is provided by roller bearings in front and rear. The idler gear and low-speed gear are pressed onto the idler shaft and secured by two keys in each gear. A speedometer drive gear is attached to the front of the idler shaft. An opening in the idler shaft front bearing cap provides for entry of the speedometer driven gear which meshes with speedometer drive gear. Power is transmitted to the front axle by the front drive shaft attached to a flange on the declutch shaft. A ball bearing in the declutch shaft bearing carrier supports the front of the declutch shaft. A declutch sliding clutch rest on splines of the shaft and is recessed for engagement with a declutch shift fork attached to the declutch shifting shaft. Power to rear axle is transmitted by the rear drive shaft, which is attached to the drive shaft brake disk and a flange on the rear of the driven shaft. A declutch driving clutch is mounted on splines on the front of the driven shaft. A bushing in the driven shaft provides a seat for the rear of the declutch shaft. Roller bearings are used on front and rear of the driven shaft. The driven gear is pressed onto the shaft and locked in position with two keys.

TRANSFER CASE

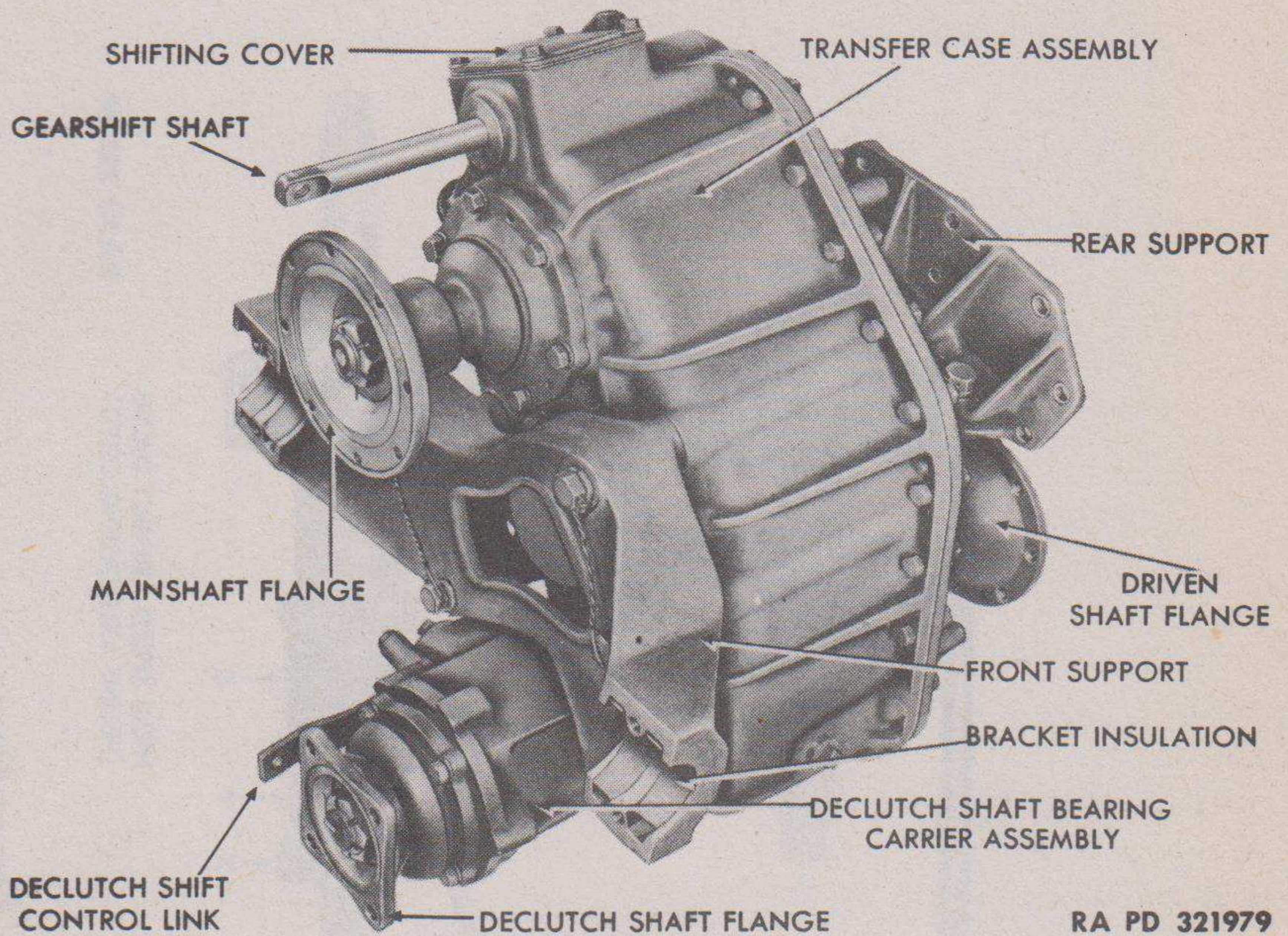
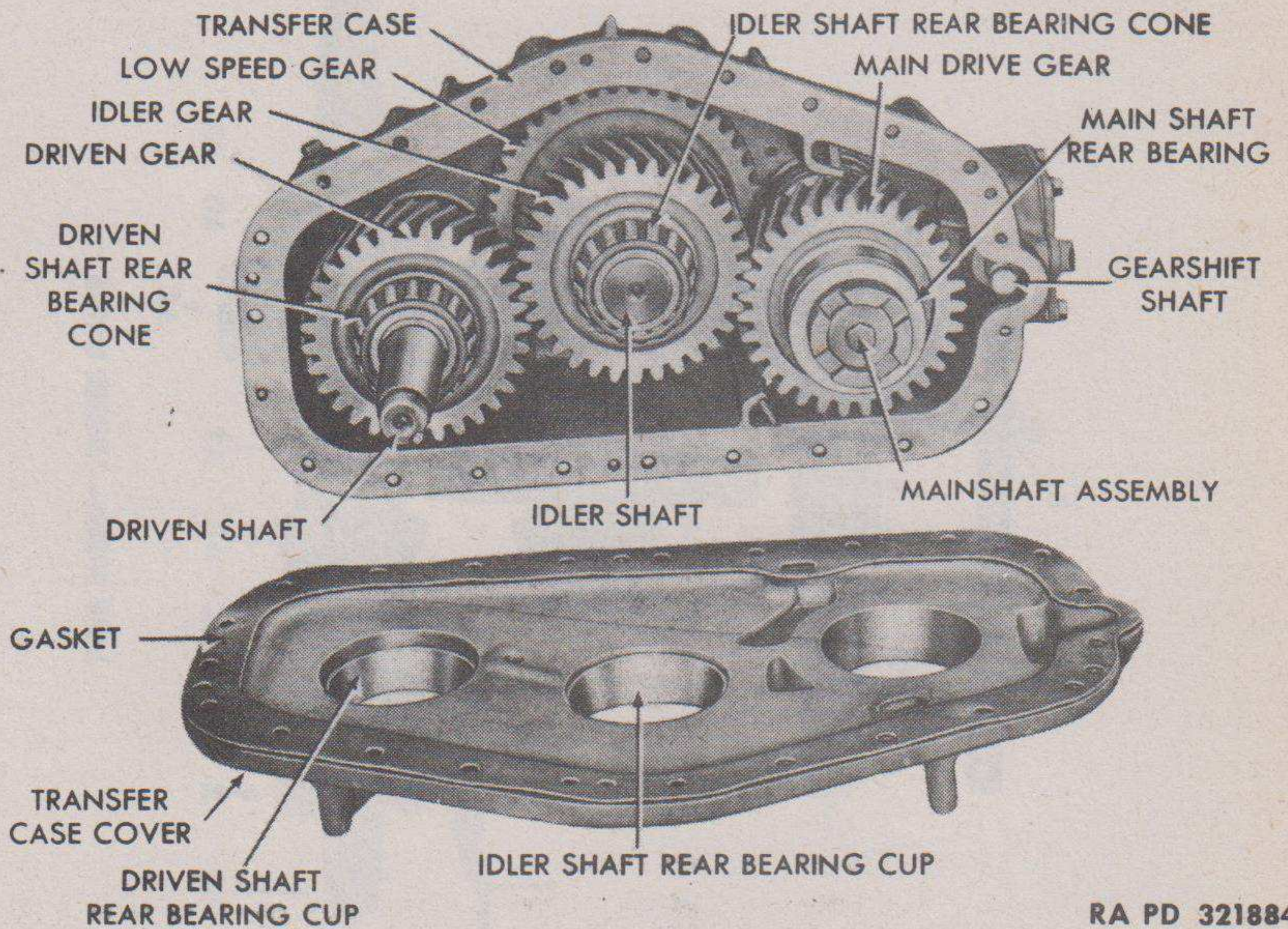


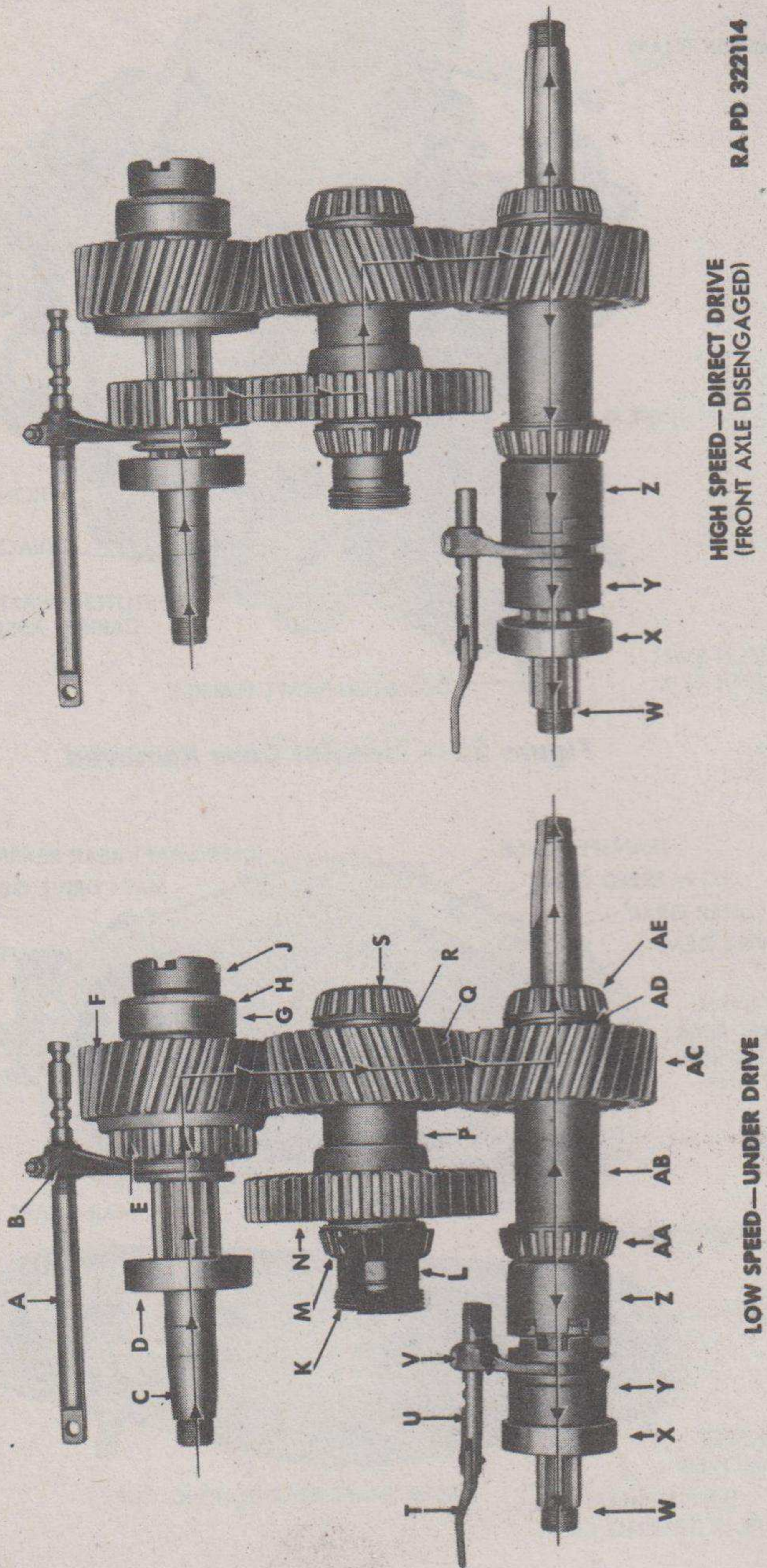
Figure 22 — Transfer Case Removed



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Figure 23 — Transfer Case Cover Removed

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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RA PD 322114

Figure 24 — Transfer Case Power Flow

TRANSFER CASE

RA PD 322114B

- | | |
|-------------------------------------|------------------------------------|
| A—GEARSHIFT SHAFT | R—IDLER SHAFT WASHER |
| B—GEARSHIFT FORK | S—IDLER SHAFT REAR BEARING CONE |
| C—MAIN SHAFT | T—SHIFT CONTROL LINK |
| D—MAIN SHAFT FRONT BEARING | U—SHIFTING SHAFT |
| E—MAIN SHAFT LOW-SPEED SLIDING GEAR | V—SHIFT FORK |
| F—MAIN DRIVE GEAR | W—DECLUTCH SHAFT |
| G—MAIN SHAFT REAR BEARING | X—DECLUTCH SHAFT BEARING |
| H—MAIN SHAFT REAR BEARING WASHER | Y—DECLUTCH SLIDING CLUTCH |
| J—MAIN SHAFT POWER TAKE-OFF CLUTCH | Z—DECLUTCH DRIVING CLUTCH |
| K—SPEEDOMETER DRIVE GEAR | AA—DRIVEN SHAFT FRONT BEARING CONE |
| L—SPEEDOMETER DRIVE GEAR SPACER | AB—DRIVEN SHAFT |
| M—IDLER SHAFT FRONT BEARING CONE | AC—DRIVEN GEAR |
| N—LOW-SPEED GEAR | AD—DRIVEN SHAFT WASHER |
| P—IDLER SHAFT | AE—DRIVEN SHAFT REAR BEARING CONE |
| Q—IDLER GEAR | |

Legend for Figure 24 — Transfer Case Power Flow

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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b. **Operation (fig. 24).** When transfer case gearshift hand lever is moved into high position, the gearshift fork in the transfer case moves the mainshaft low speed sliding gear into mesh with inner teeth on main drive gear. Power is transmitted from main drive gear to idler shaft idler gear, to driven shaft driven gear, and out to rear drive shaft. With gearshift in low position, mainshaft low speed sliding gear moves to the rear and meshes with idler shaft low speed drive gear. Power is then transmitted to idler shaft idler gear, to driven shaft driven gear, out to rear drive shaft, as well as forward through declutch shaft and front drive shaft. The front axle is automatically engaged when gearshift hand lever is moved into low position by means of a lug which is a part of the gearshift lever. Movement of gearshift hand lever into low position forces this lug against the declutch shift hand lever, thereby engaging sliding clutch on declutch shaft with driving clutch on driven shaft.

36. DATA.

Make	Timken
Model	T-76-2
Type	2-speed with front axle declutching unit
Mounting	3-point, amidship of frame
High gear ratio	1.00 to 1
Low gear ratio	1.72 to 1

Section II

DISASSEMBLY INTO SUBASSEMBLIES

37. DISASSEMBLY.

- a. **Remove Transfer Case.** Refer to TM 9-817.
- b. **Drain Transfer Case.** Remove transfer case drain pipe plug and drain oil from transfer case.
- c. **Remove Rear Support (fig. 22).** Remove lock wire and loosen cap screws connecting rear support to rear support member. Lift off transfer case rear support.
- d. **Remove Front Support (fig. 22).** Remove lock wires, cap screws, and lock washers. Pry front support free of transfer case dowel pins and lift off.
- e. **Remove Driven Shaft Flange (fig. 22).** Remove cotter pin and driven shaft nut. Tap off driven shaft flange.
- f. **Remove Mainshaft Flange (fig. 22).** Remove cotter pin and mainshaft nut. Tap off mainshaft flange.

TRANSFER CASE

g. Remove Driven Shaft Rear Bearing Cap (fig. 26). Remove driven shaft key and driven shaft flange dust cap. Remove cap screws and lock washers attaching bearing cap to transfer case. Lift off bearing cap, shims, and gaskets.

h. Remove Idler Shaft Rear Bearing Cap (fig. 28). Remove cap screws and lock washers. Lift off bearing cap, shims, and gasket.

i. Remove Mainshaft Rear Bearing Cover (fig. 27). Remove cap screws and lock washers. Lift off cover and cover gasket.

j. Remove Speedometer Driven Gear (fig. 28). Detach and remove speedometer driven gear from idler shaft front bearing cap.

k. Remove Transfer Case Cover (fig. 23). Tap out three tapered pins and remove nuts, bolts, cap screws, and lock washers attaching cover to transfer case. Lift off cover and gasket.

l. Remove Mainshaft Front Bearing Cage (fig. 27). Tap mainshaft flange key off mainshaft. Remove flange dust cap. Remove bearing cage cap screws and lock washers. Install cap screws into three tapped holes in bearing cage. Turn cap screws evenly against transfer case and force out front bearing cage. Lift off shims and gasket.

m. Remove Idler Shaft Front Bearing Cap (fig. 28). Remove cap screws and lock washers. Pry off bearing cap and remove shims and gasket.

n. Remove Shifting Cover (figs. 22 and 27). Remove cap screws and lock washers attaching cover to transfer case. Lift off shifting cover, gaskets, and baffle plate. The gearshift lock spring and plunger will pop out when cover is lifted. Remove gearshift lock ball from opening in transfer case.

o. Remove Gearshift Shaft and Fork (fig. 27). Remove cotter pin and loosen nut securing shift fork to shaft. Screw gearshift shaft out of fork and slide shaft out of transfer case. Lift gearshift fork out of case.

p. Remove Shaft Assemblies (fig. 23). Lift mainshaft, idler shaft, and driven shaft assemblies out of transfer case.

q. Remove Declutch Shaft Bearing Carrier Assembly (figs. 22 and 25). Remove cap screws and lock washers attaching carrier to transfer case. Lift off carrier assembly and carrier gasket.

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****Section III****DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES****38. DECLUTCH SHAFT AND BEARING CARRIER.****a. Disassembly (fig. 25).**

(1) **REMOVE DECLUTCH SHAFT FLANGE.** Remove cotter pin and declutch shaft nut. Tap off declutch shaft flange and attached dust shield.

(2) **REMOVE DECLUTCH SHAFT BEARING CAP.** Remove cap screws and lock washers attaching bearing cap to carrier. Lift off cap and gasket.

(3) **REMOVE DECLUTCH SHAFT OIL SEAL.** Remove oil seal from bearing cap only if damaged, using replacer 41-R-2393-525. Once removed, oil seals cannot be used again.

(4) **REMOVE DECLUTCH SHAFT.** Tap declutch shaft out of declutch sliding clutch and out of carrier.

(5) **REMOVE DECLUTCH SHAFT BEARING.** Press bearing off declutch shaft with an arbor press.

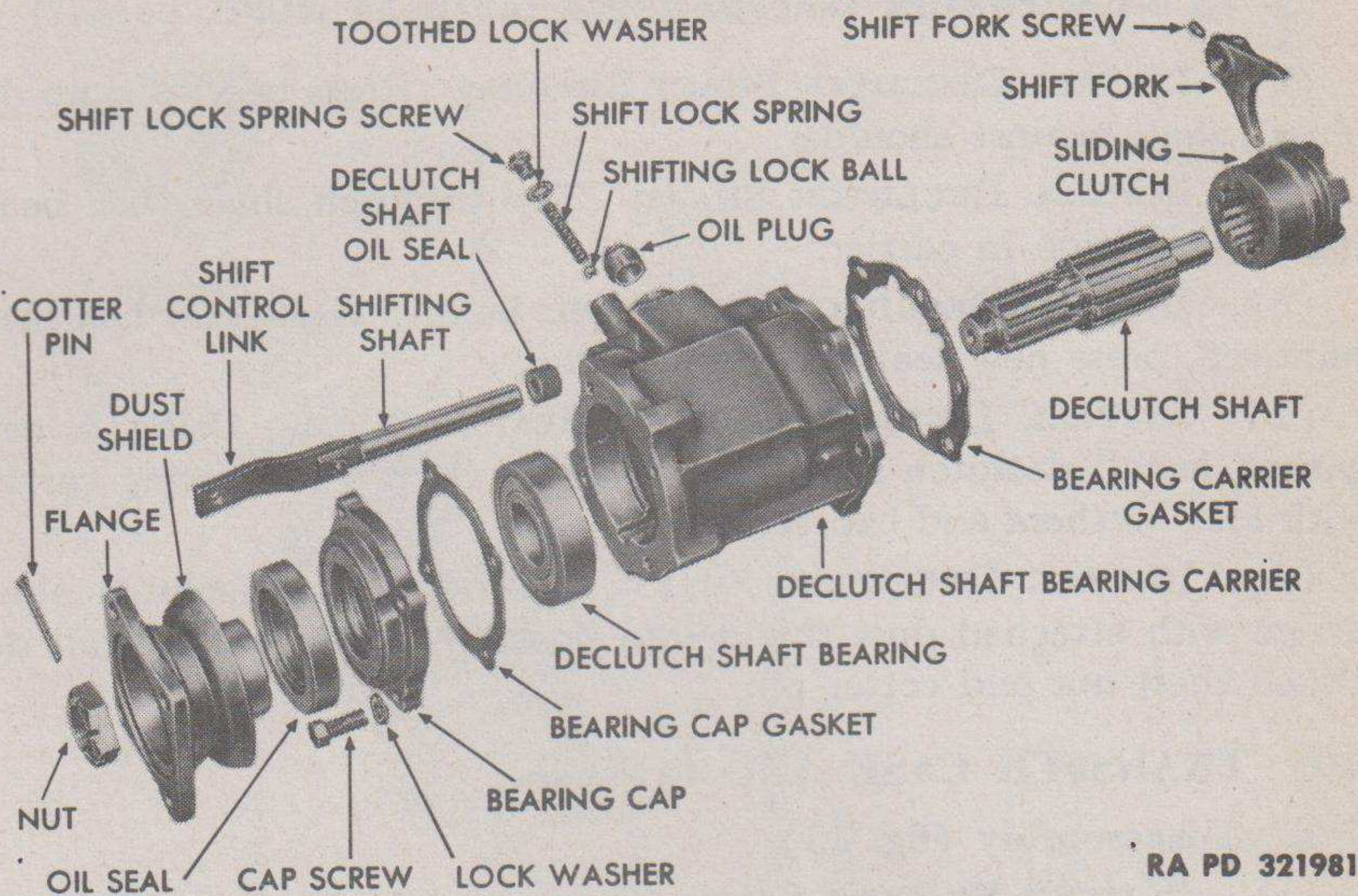
(6) **REMOVE DECLUTCH SHIFT LOCK SPRING AND BALL.** Remove cap screws and toothed lock washer securing spring and ball in carrier. Spring and ball will fly out on removal of cap screw.

(7) **REMOVE DECLUTCH SHIFTING SHAFT.** Remove bearing carrier oil plug. Through oil plug opening, loosen set screws securing declutch shift fork to shifting shaft. Lift declutch shifting shaft, sliding clutch, and shift fork out of carrier.

(8) **REMOVE DECLUTCH SHIFTING SHAFT OIL SEAL.** Remove oil seal only if damaged, using replacer 41-R-2392-350.

b. Cleaning, Inspection, and Repair. Wash all parts thoroughly in dry-cleaning solvent, using a stiff brush to remove all traces of old lubricant. Immerse the bearing in clean dry-cleaning solvent and slush it up and down to remove loose particles of lubricant. Rotate the balls slowly while holding bearing beneath the surface of the dry-cleaning solvent. After washing, dry the bearing with compressed air, directing air across bearing to avoid spinning balls. Inspect bearing carefully for signs of wear; turn bearing slowly by hand to test for worn spots or pitted balls; replace, if it drags or is chipped or pitted. Except for stoning to remove light scores or gall marks, do not attempt to repair a bearing. After inspection, dip bearing in clean lubricant and place in clean, covered container. Examine declutch shaft oil seal in the bearing cap and shifting shaft oil seal in the car-

TRANSFER CASE



RA PD 321981

Figure 25 – Declutch Shaft and Bearing Carrier Disassembled

rier without disturbing installations. Inspect seals for looseness of packing, and distortion or fracture of packing retainers. If a seal requires replacement, break it to relieve tension and prevent damage to the bore; then pry it out. Examine the carrier, flange, and bearing cap for cracks and fractures, replacing cracked or broken parts. Inspect the declutch shaft and sliding clutch for cracks and chipped or twisted splines and replace if such defects are found. Examine the declutch shifting shaft and shift fork for fractures, scoring, or signs of wear at points of contact, and replace if broken, scored, or worn. Check condition of declutch shift lock spring and lock ball. Replace ball if out-of-round or otherwise damaged; replace spring if free length measures under 2 inches or if pressure at 1 inch is under 40 pounds.

c. Assembly (fig. 25).

(1) **INSTALL DECLUTCH SHIFTING SHAFT OIL SEAL.** If oil seal has been removed, press new seal into position in bearing carrier.

(2) **INSTALL DECLUTCH SHIFTING SHAFT.** Hold declutch sliding clutch in position inside carrier. Place declutch shift fork inside carrier into slot on sliding clutch. Slide declutch shifting shaft into carrier and through shift fork. Install shift fork screw through oil plug opening. Prick-punch screw to lock it in position. Install bearing carrier oil plug.

(3) **INSTALL DECLUTCH SHIFT LOCK BALL AND SPRING.** Insert ball and spring into opening in carrier. Secure with toothed lock washer and lock spring screw.

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(4) **INSTALL DECLUTCH SHAFT BEARING.** Press bearing onto declutch shaft against shoulder.

(5) **INSTALL DECLUTCH SHAFT.** Tap declutch shaft with bearing into position in carrier.

(6) **INSTALL DECLUTCH SHAFT OIL SEAL.** If oil seal has been removed, press new seal into bearing cap.

(7) **INSTALL DECLUTCH SHAFT BEARING CAP.** Using a new gasket, install declutch shaft bearing cap. Secure to bearing carrier with lock washers and cap screws.

(8) **INSTALL DECLUTCH SHAFT FLANGE.** Tap declutch shaft flange with attached dust shield into position in carrier. Install declutch shaft nut and cotter pin.

39. TRANSFER CASE AND COVER.

a. Disassembly (fig. 23).

(1) **REMOVE BEARING CUPS.** Tap out idler shaft and driven shaft front bearing cups.

(2) **REMOVE GEARSHIFT SHAFT OIL SEAL.** Remove gearshift shaft oil seal from transfer case only if damaged.

(3) **REMOVE BEARING CUPS FROM TRANSFER CASE COVER.** Tap out driven shaft and idler shaft rear bearing cups.

b. Cleaning, Inspection, and Repair. Clean transfer case and cover with dry-cleaning solvent, using a stiff brush and scrubbing thoroughly to remove all traces of old lubricant. Examine case and cover for cracks, tapping with hammer to test for cracks which might otherwise not be evident. Weld cracks if small; otherwise replace parts. Inspect all threads for nicks, burs, or cross threading and remove small burs with handstone or smooth file. Always replace the cover gasket with new gasket.

c. Assembly (fig. 23).

(1) **INSTALL BEARING CUPS IN TRANSFER CASE COVER.** Press driven shaft and idler shaft rear bearing cup into position in transfer case cover.

(2) **INSTALL GEARSHIFT SHAFT OIL SEAL.** If oil seal has been removed, press new seal into position in transfer case.

(3) **INSTALL BEARING CUPS.** Press idler and driven shaft front bearings cups into position in transfer case.

40. DRIVEN SHAFT.

a. Disassembly (fig. 26).

(1) **REMOVE BEARING CUPS.** Lift off driven shaft front and rear bearing cups.

TRANSFER CASE

RA PD 321960

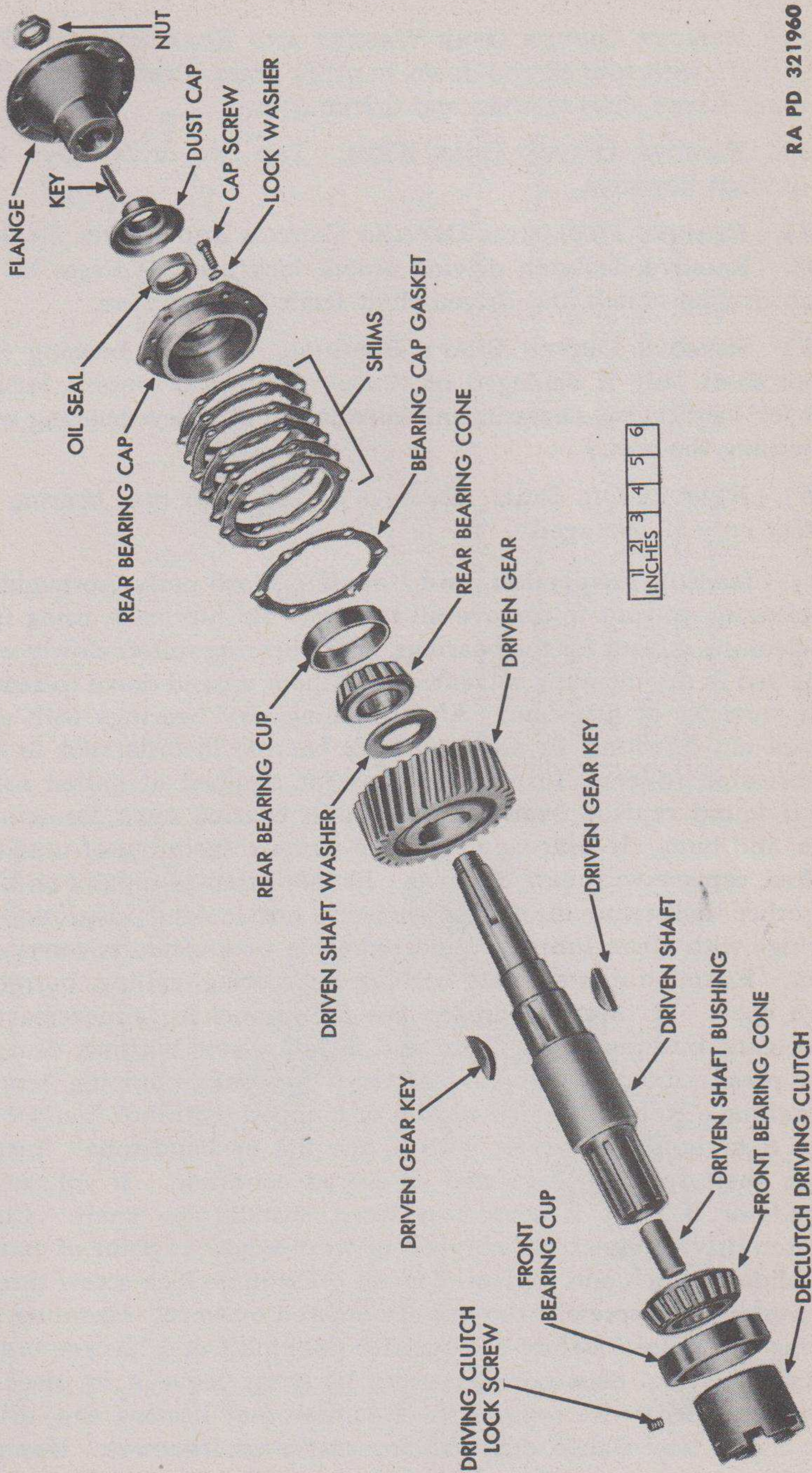


Figure 26 — Driven Shaft Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

(2) **REMOVE DRIVEN GEAR WASHER AND REAR BEARING CONE.** Place shaft, with splined end down, in arbor press. Press off rear bearing cone, driven shaft washer, and driven gear.

(3) **REMOVE DRIVEN GEAR KEYS.** Tap two driven gear keys out of shaft keyways.

(4) **REMOVE DECLUTCH DRIVING CLUTCH AND FRONT BEARING CONE.** Remove declutch driving clutch lock screw. Press off declutch driving clutch and driven shaft front bearing cone.

(5) **REMOVE DRIVEN SHAFT BUSHING.** Remove bushing from driven shaft only if damaged or worn. (Removal renders bushing unfit for further use, necessitating installation of a new bushing when assembling the unit.)

(6) **REMOVE OIL SEAL.** Remove driven shaft rear bearing cap oil seal only if damaged.

b. Cleaning, Inspection, and Repair. Wash parts thoroughly in dry-cleaning solvent to remove all traces of old lubricant, using fresh dry-cleaning solvent for the bearings. Turn bearing rollers slowly while immersed in dry-cleaning solvent. Slush them up and down to remove loose particles of lubricant. After washing, dry bearings with compressed air, directing air stream across bearing in order not to spin unlubricated rollers. Inspect bearings for chipped or galled rollers and if found replace bearings. Examine bearing cups for scoring, nicks, and burs. If bearing rollers are worn, ridged, out-of-round, or cracked, replace with new bearings. Do not attempt repairs on bearings other than removal of light scores or burs. After inspection, oil bearings with clean lubricant and set aside in a clean, covered container. Examine driven shaft bushing for scoring, galling, burred or rough spots. If these conditions are found, making it necessary to replace the bushing, drive it out and install a new bushing, using an arbor press. Examine driven gear teeth for nicks, chipping, scoring, and galling. Replace gear if nicked or chipped teeth are found. Remove light burs and scores with a fine file or handstone. Inspect driven shaft splines for twisted or scored condition. If splines are twisted, or if shaft is scored or worn, install new shaft. Check declutch driving clutch for chipped or worn edges at point of contact with sliding clutch and replace if found. Examine lock screw threads and replace lock screw if threads are crossed or worn. Examine rear bearing cap oil seal before removal for flabbiness and bent or broken retainer. If seal does not appear to be worn, leave it in place for further use; otherwise replace it. Examine rear bearing cap, driven shaft flange, and flange dust cap for cracks or fractures. Use new parts if such defects are found.

TRANSFER CASE

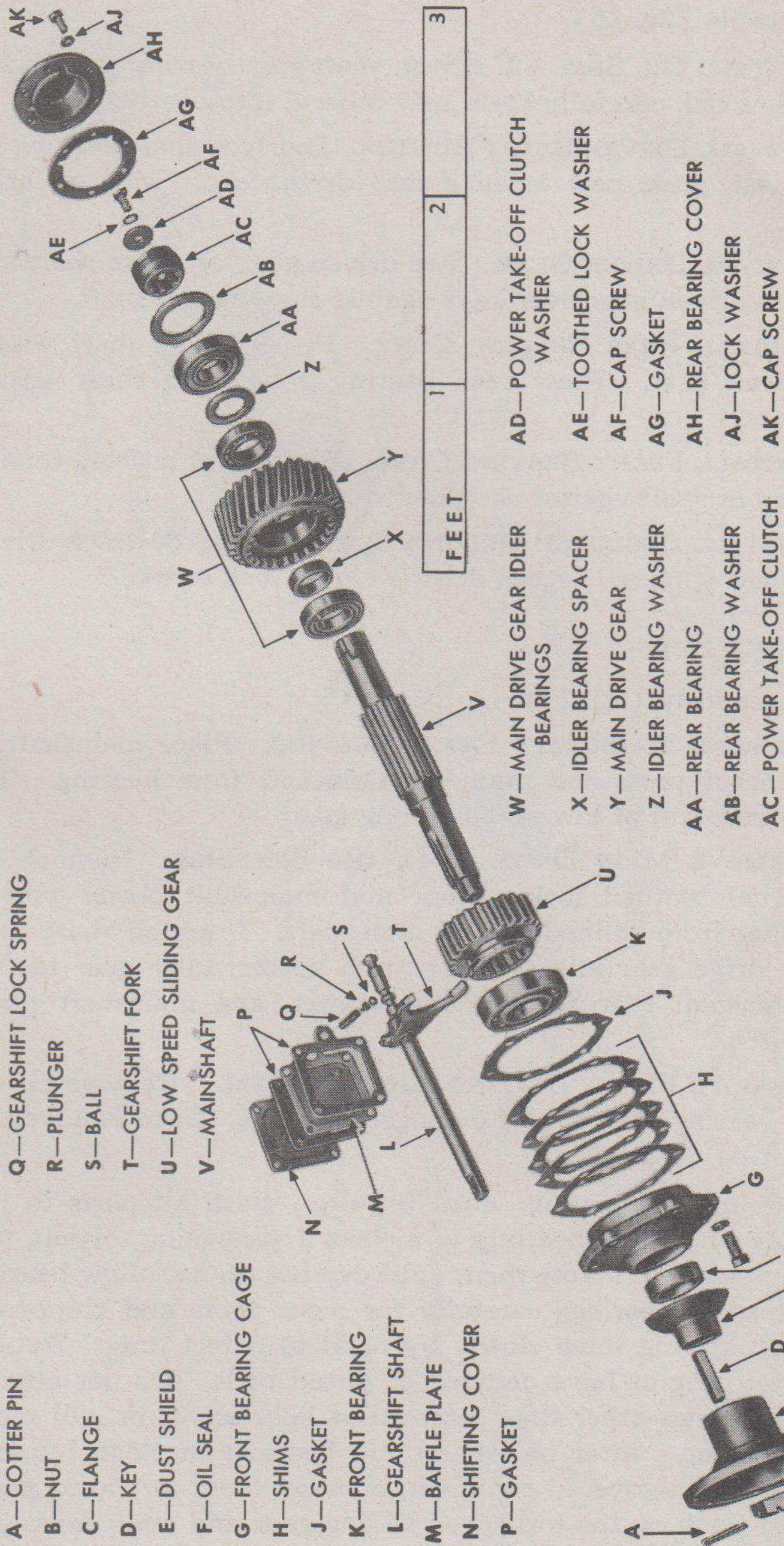


Figure 27 — Mainshaft Disassembled

TRANSFER CASE

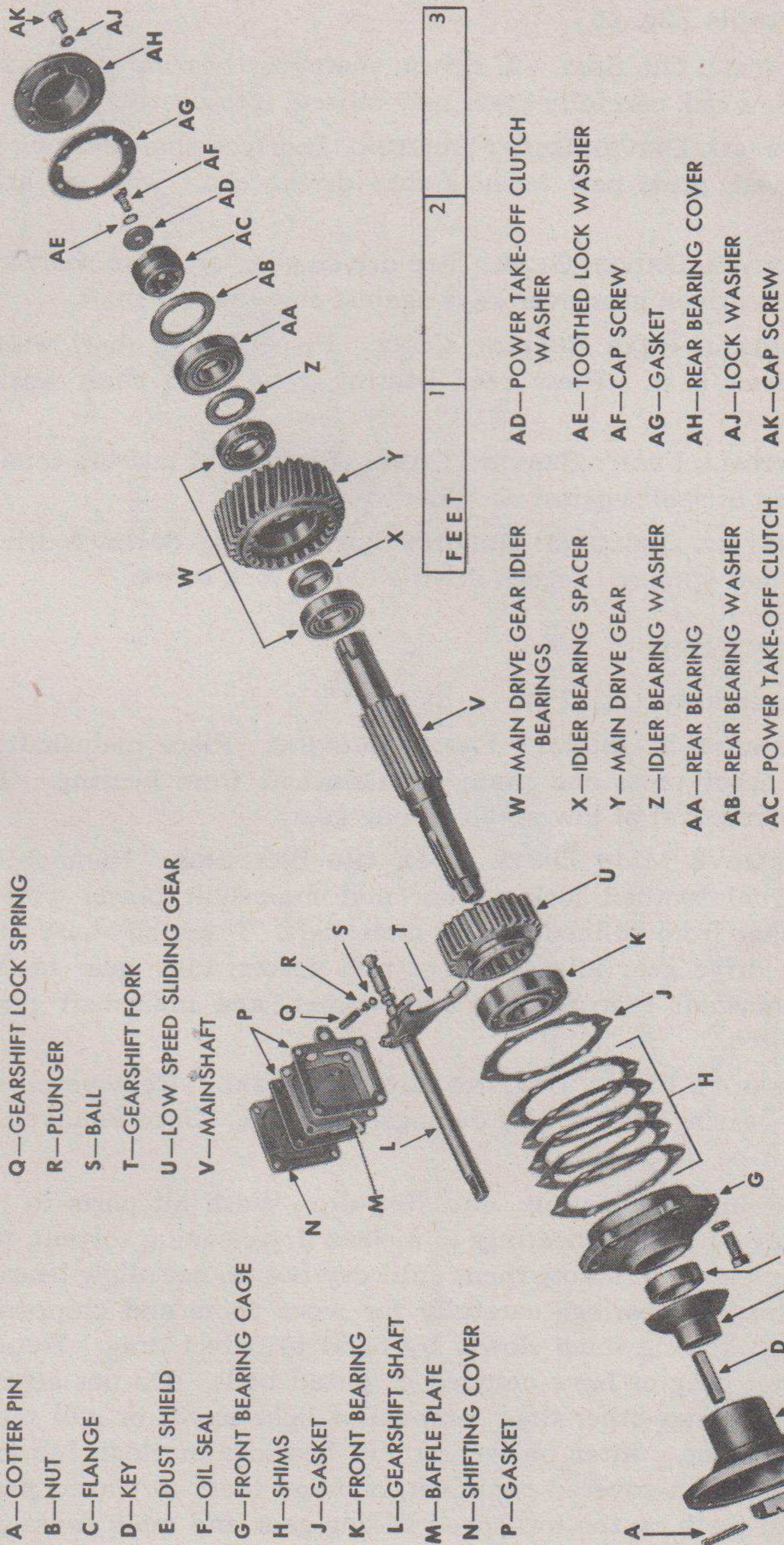
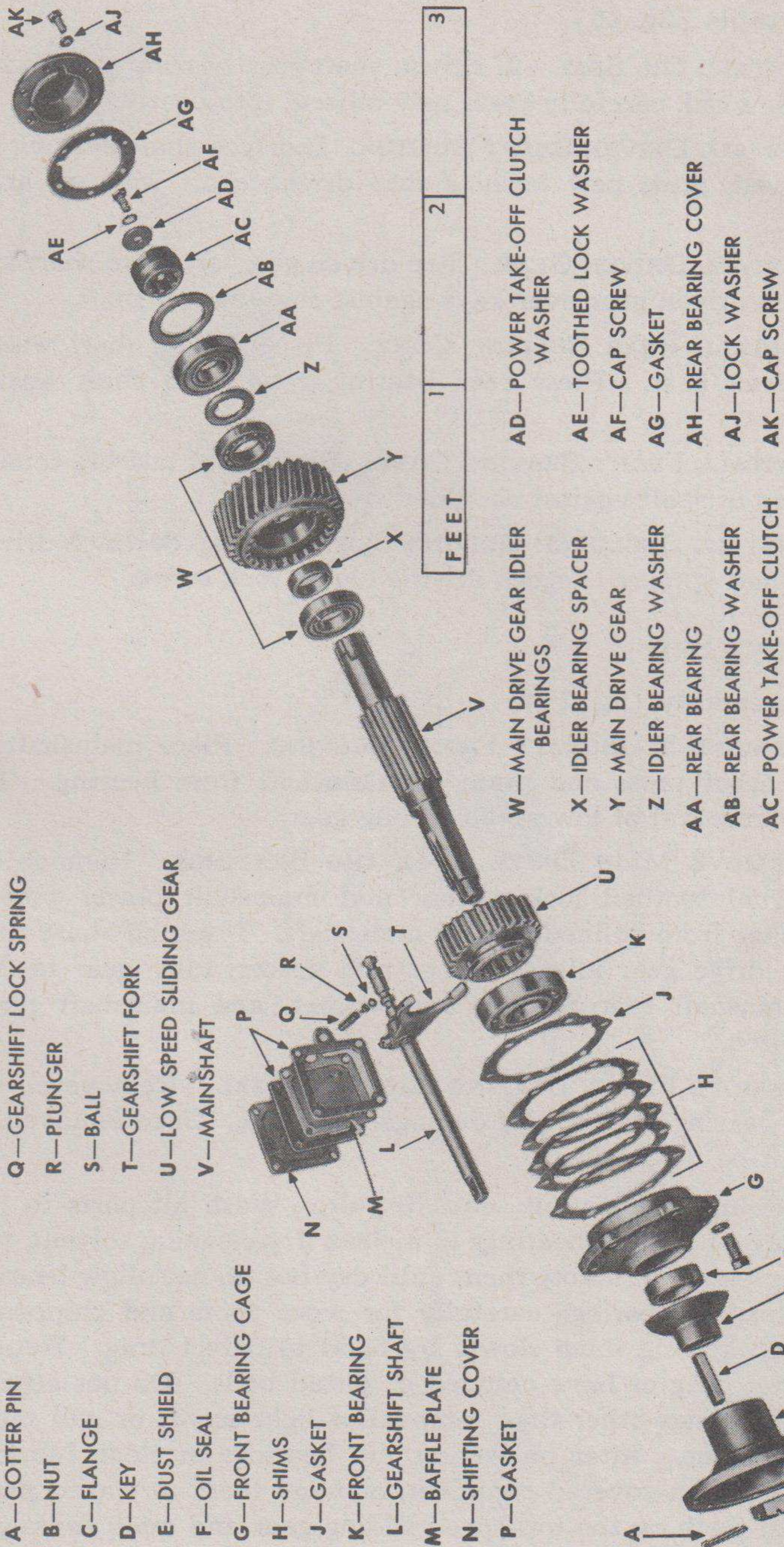


Figure 27 — Mainshaft Disassembled

TRANSFER CASE



RA PD 321957

Figure 27 — Mainshaft Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****c. Assembly (fig. 26).**

(1) **INSTALL OIL SEAL.** If driven shaft rear bearing cap oil seal has been removed, carefully press new oil seal into bearing cap.

(2) **INSTALL DRIVEN SHAFT BUSHING.** If driven shaft bushing has been removed, press new bushing into driven shaft with an arbor press.

(3) **INSTALL DRIVEN GEAR.** Tap driven gear keys into shaft keyways. Press driven gear over keys against shoulder on shaft.

(4) **INSTALL REAR BEARING CONE.** Place driven shaft washer against driven gear. Press rear bearing cone onto shaft against washer.

(5) **INSTALL FRONT BEARING CONE.** Press front bearing cone on opposite end of shaft against shoulder.

(6) **INSTALL DECLUTCH DRIVING CLUTCH.** Tap declutch driving clutch on shaft splines. Install driving clutch lock screw.

41. MAINSHAFT.**a. Disassembly (fig. 27).**

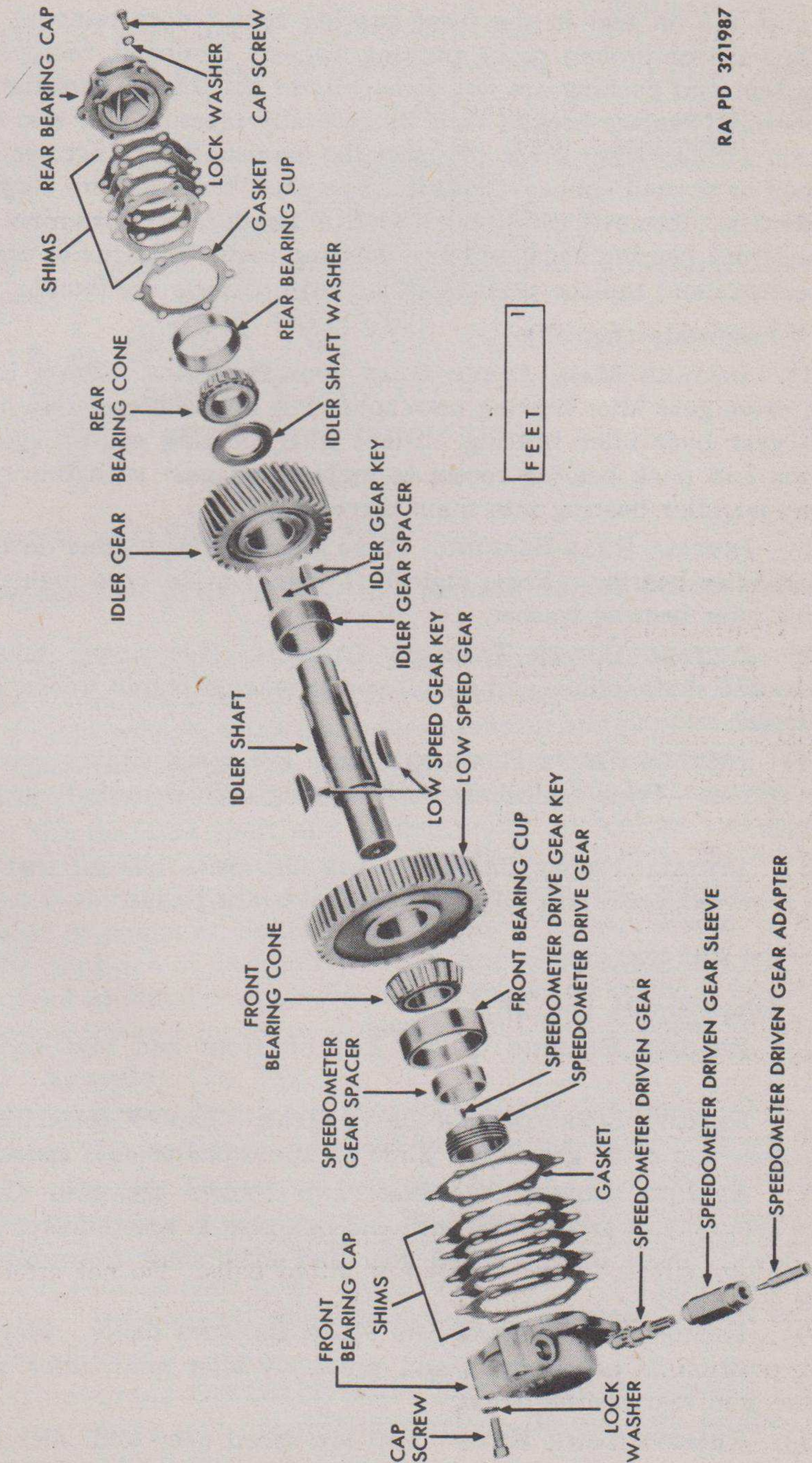
(1) **REMOVE MAINSHAFT FRONT BEARING.** Place mainshaft assembly in arbor press and press off mainshaft from bearing. This will permit removal of low speed sliding gear.

(2) **REMOVE MAIN DRIVE GEAR AND BEARINGS.** Remove cap screw internal toothed lock washer and mainshaft power take-off clutch washer from splined end of mainshaft. Press off main drive gear, main drive gear idler bearings and spacer, idler gear bearing washer, mainshaft rear bearing and washer, and mainshaft power take-off clutch.

(3) **REMOVE FRONT BEARING CAGE OIL SEAL.** Remove oil seal from front bearing cage only if damaged or worn. Once removed, oil seals cannot be used again.

b. Cleaning, Inspection, and Repair. Wash all parts in dry-cleaning solvent. Wash bearings in a clean dry-cleaning solvent, then direct compressed air across them until dry but do not allow bearings to spin. Inspect bearings carefully for worn spots and chipped or pitted balls, rotating them slowly by hand to detect drag. Replace bearings that drag or have chipped or pitted balls. Do not attempt repairs on bearings other than removal of light scores or gall marks with a handstone. After inspection, dip bearings in clean lubricant and set aside, in a covered container, or wrap them in waxed paper. Examine all teeth on the low-speed sliding gear and main drive gear for cracks or chipping. Replace gears if broken teeth are found.

TRANSFER CASE



RA PD 321987

Figure 28 — Idler Shaft Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

d. **Install Driven Shaft Rear Bearing Cap.** Using a new gasket, install bearing cap and shims. Secure with lock washers and cap screws.

e. **Install Mainshaft Rear Bearing Cover.** Using a new gasket, secure bearing cover to transfer case with lock washers and cap screws.

f. **Install Mainshaft Front Bearing Cage.** Using a new gasket, install bearing cage and shims. Secure with lock washers and cap screws.

g. **Install Mainshaft Flange.** Tap dust shield onto mainshaft and install mainshaft flange key. Tap flange onto mainshaft. Install mainshaft nut and cotter pin.

h. **Install Driven Shaft Flange.** Install dust cap and flange key. Tap flange into position, and install nut and cotter pin.

i. **Install Speedometer Drive Gear.** Place speedometer gear spacer on idler shaft. Tap gear key into shaft keyway, and install speedometer drive gear.

j. **Install Idler Shaft Front Bearing Cap.** Using a new gasket, install bearing cap and shims. Secure with lock washers and cap screws.

k. **Install Speedometer Driven Gear.** Install driven gear, gear sleeve, and adapter in opening on idler shaft front bearing cap.

l. **Install Declutch Shaft and Bearing Carrier Assembly.** Using a new gasket, attach carrier assembly to transfer case with lock washers and cap screws.

m. **Install Front and Rear Supports.** Attach supports to transfer case with lock washers and cap screws. Install lock wire through cap screw heads.

Section V

FITS AND TOLERANCES

44. SERVICE INFORMATION.

a. **Bearing Adjustments.** Shafts must have slight bearing drag with no perceptible end play when rotated by hand.

b. **Gear Backlash.**

Spur	0.005 to 0.010 in.
Helical	0.005 to 0.008 in.

TRANSFER CASE

c. Mainshaft.

Bearing adjustment method	Shims under front bearing cap
Available shim thickness	0.003, 0.005, 0.010 in.
Main drive gear bearing adjustment	Spacer between bearings
Thickness of bearing spacer	0.685 to 0.690 in.
Mainshaft rear bearing washer thickness	0.185 to 0.187 in.
Low-speed sliding gear to shifting fork clearance	0.003 to 0.017 in.
Low-speed sliding gear to mainshaft clearance	0.031 to 0.043 in.

d. Idler Shaft.

Bearing adjustment method	Shims under front and rear bearing caps
Available shim thickness	0.003, 0.005, and 0.010 in.

e. Declutch Shaft.

Bearing adjustment method	None—roller bearing type
Sliding clutch to fork clearance	0.031 to 0.043 in.
Declutch shift lock spring free length	2 in.
Pressure at 1 in.	40 to 50 lb

f. Gearshift Shaft.

Lock spring free length	2 in.
Pressure at 1 in.	50 to 60 lb

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

**CHAPTER 6
DRIVE SHAFTS**

Section I

DESCRIPTION AND DATA

45. DESCRIPTION AND DATA.

a. **Description** (fig. 29). The intermediate, front, and rear drive shafts are similar, each consisting of a shaft, a slip joint assembly, and a needle bearing universal joint on each end of the shaft. The universal joint consists of a journal mounted into two yokes on four needle bearings, which are kept in place by bearing caps and lock plates. A fixed joint flange on each universal joint attaches the respective shafts to the companion flanges of the transmission, transfer case, and front and rear axles. The winch drive shaft consists of a shaft with a universal joint at each end. Bushings held in place by snap rings are used in both universal joints. The rear yoke of the winch drive shaft is connected to the power take-off by means of a key and a set screw, the front yoke being attached to the winch worm shaft with a shear pin.

b. Data.

Intermediate drive shaft:

Make Spicer
 Model Series 1,600
 Length of stubshaft $17\frac{15}{16}$ in.

Front drive shaft:

Make Spicer
 Model Series 1,500
 Length of stubshaft $52\frac{11}{16}$ in.

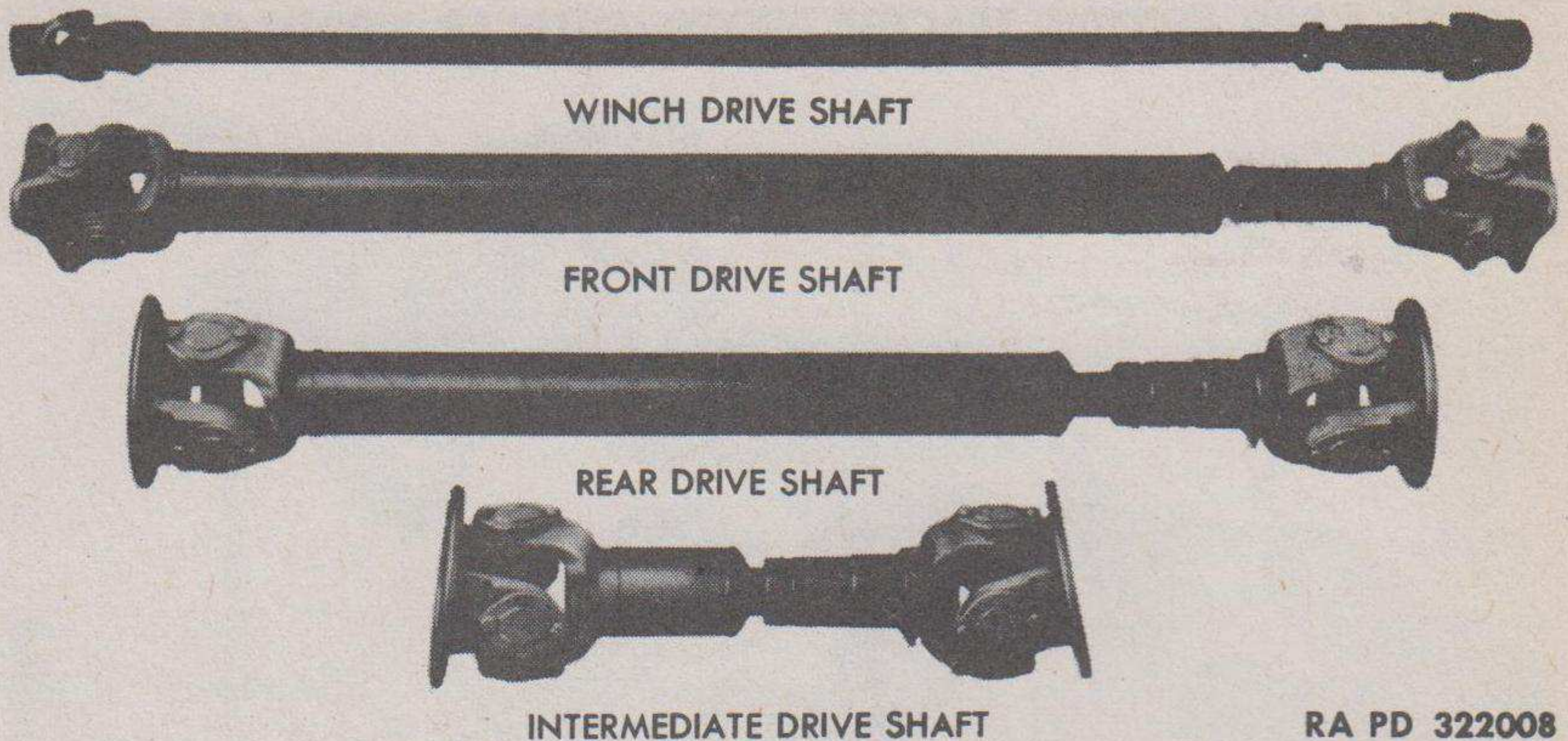
Rear drive shaft:

Make Spicer
 Model Series 1,600
 Length of stubshaft $40\frac{7}{16}$ in.

Winch drive shaft:

Make Gar Wood

DRIVE SHAFTS



RA PD 322008

Figure 29 — Drive Shafts

Section II

DISASSEMBLY

46. INTERMEDIATE, FRONT, AND REAR DRIVE SHAFTS.

a. Disassembly (fig. 30).

(1) **MARK STUBSHAFT AND SLIP JOINT SLEEVE.** If arrows on stubshaft and slip joint sleeve are not visible, mark shaft and sleeve with chalk or a punch so that they can be quickly and properly re-assembled. The original alinement is necessary to preserve the balance of the drive shaft assembly.

(2) **REMOVE LUBRICATION FITTING.** Unscrew and remove fitting from journal to prevent damage in disassembly.

(3) **REMOVE UNIVERSAL JOINT.** Unscrew dust cap from slip joint sleeve yoke. Slide universal joint off stubshaft splines. Slide dust cap, cork washer, and steel washer off splines.

(4) **REMOVE NEEDLE BEARINGS CAPS.** Straighten lock plate ends which are bent over cap screws. Remove cap screws, lock plates, and needle bearing caps.

(5) **REMOVE NEEDLE BEARINGS.** Tap journal, yoke, and joint flange around bearing seats with a soft hammer until bearings are free. Remove bearings and journal.

47. WINCH DRIVE SHAFT.

a. Disassembly.

(1) **REMOVE UNIVERSAL JOINTS (fig. 31).** Slide worm joint off drive shaft splines. Loosen drive shaft collar set screw and slide collar off drive shaft splines. Loosen set screw on take-off joint yoke

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5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

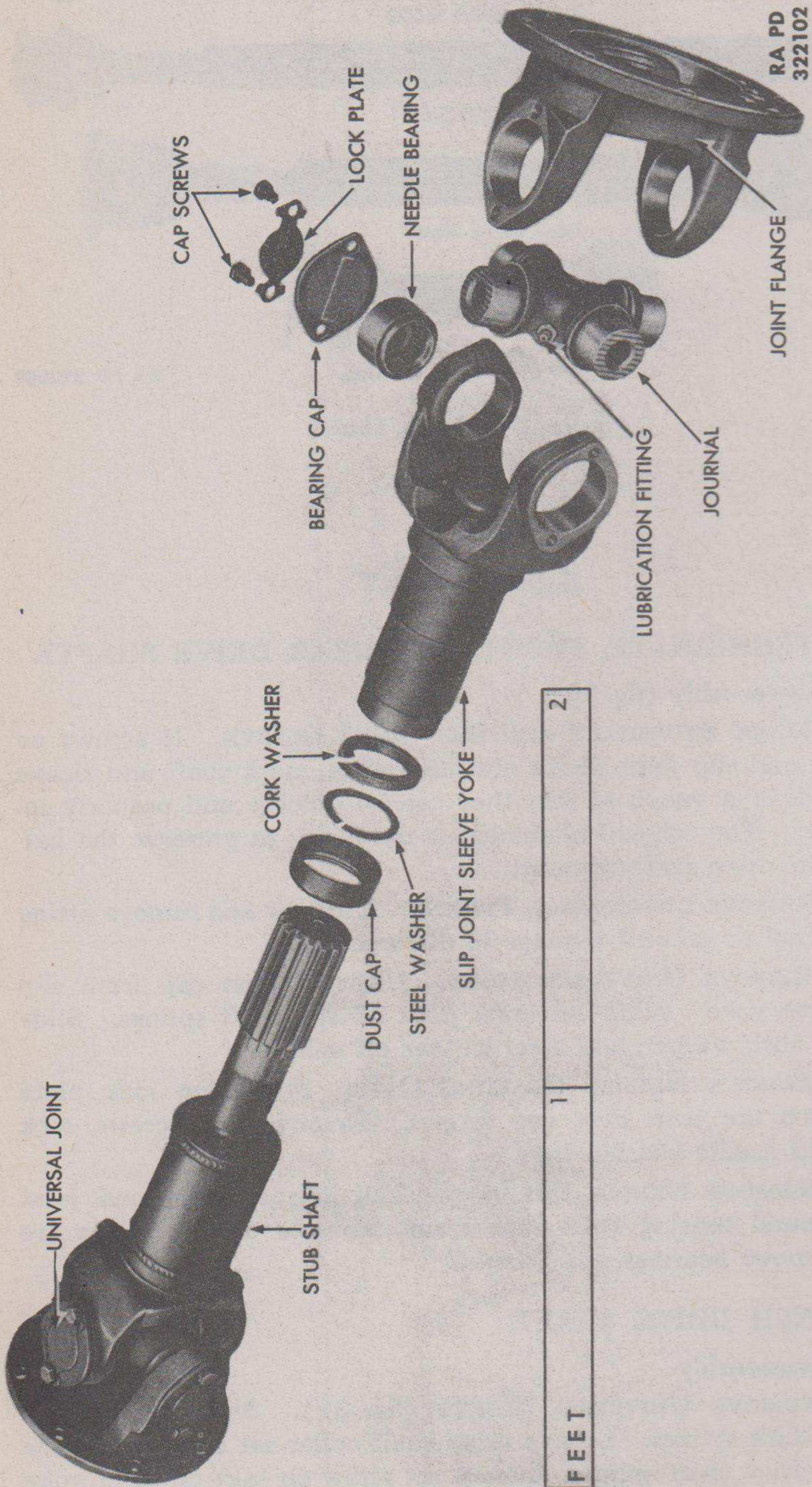


Figure 30 — Intermediate Drive Shaft Universal Joint Disassembled

DRIVE SHAFTS

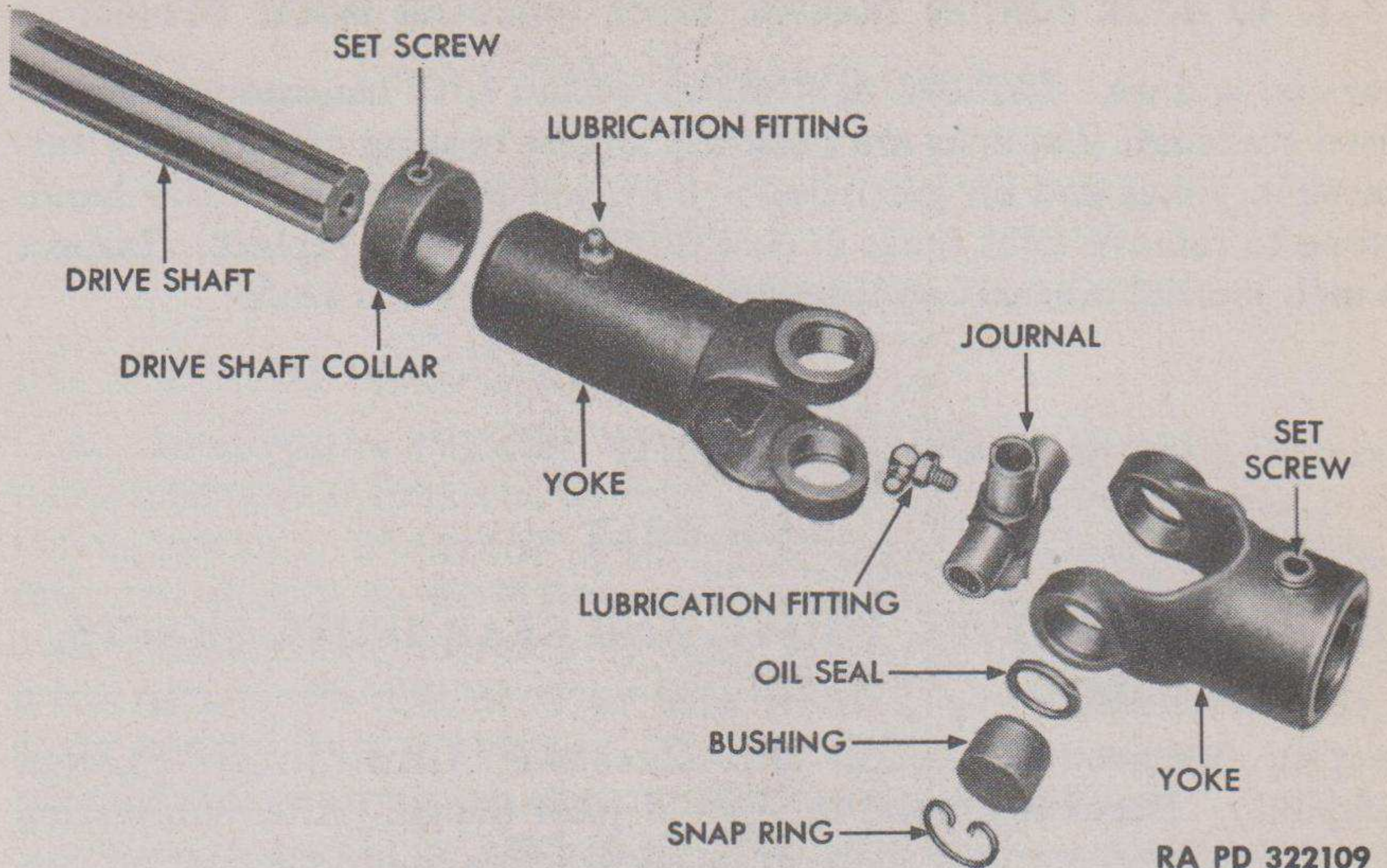


Figure 31 – Winch Drive Shaft Worm Joint Disassembled

and tap yoke off drive shaft. Tap drive shaft key out of shaft keyway.

(2) **REMOVE LUBRICATION FITTINGS** (fig. 31). Remove fittings from journal and yoke sleeve to prevent damage in disassembly.

(3) **REMOVE BUSHING** (fig. 31). Remove snap rings securing bushings in yokes (fig. 31). Tap yokes around bushing seats with a soft hammer to free bushings.

(4) **REMOVE JOURNAL** (fig. 31). Lift out journal. Slide oil seals off seats on journal.

Section III

CLEANING, INSPECTION, AND REPAIR

48. CLEANING, INSPECTION, AND REPAIR.

a. **Cleaning.** Wash all parts in dry-cleaning solvent, using clean solution for needle bearings and bushings. Keep bearings immersed in dry-cleaning solvent long enough to dissolve hardened particles of old lubricant.

b. **Inspection and Repair.** Carefully examine all bearings and bushings for evidence of damage or wear, and replace if defects are found. Work a small amount of lubricant into bearings and try them on the journal. A slight side movement is permissible, but if there is enough movement to cause backlash or jerky action, replace bearing. Inspect yokes and stubshafts for cracks or fractures and replace if found. Inspect stubshaft splines for nicks, burs, and

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

twisted splines. Remove light nicks or burs with handstone, but discard stubshaft if splines are twisted. Check bearing and bushing surfaces in yokes and on journals for burs and score marks. Use handstone to remove light burs; in case of other damage, replace. Inspect winch journal oil seals and replace damaged or worn seals.

Section IV**ASSEMBLY****49. INTERMEDIATE, FRONT, AND REAR DRIVE SHAFTS.****a. Assembly.**

(1) **INSTALL JOURNAL AND BEARINGS INTO JOINT FLANGE** (fig. 30). Position journal in yoke of joint flange. After lubricating bearings, tap them into position in joint flange and onto bearing surfaces of journal. Install bearing caps, lock plates, and cap screws. Bend ends of lock plates over cap screw heads.

(2) **INSTALL SLIP JOINT SLEEVE YOKE** (fig. 30). Position joint flange with installed journal in slip joint sleeve yoke. Tap bearings into seats in yoke and onto remaining two bearing surfaces of journal. Install bearing caps, lock plates, and cap screws. Bend ends of lock plates over cap screw heads.

(3) **ATTACH ASSEMBLY TO STUBSHAFT** (fig. 30). Slide dust cap and steel and cork washers on splines of stubshaft. Line up arrows or marks on stubshaft and slip joint sleeve and insert spline into sleeve. Thread dust cap on end of slip joint sleeve.

(4) **INSTALL LUBRICATION FITTING** (fig. 30). Thread fitting into opening in journal.

50. WINCH DRIVE SHAFT.**a. Assembly.**

(1) **INSTALL JOURNAL AND BUSHINGS** (fig. 31). Slide oil seals into place on journal. Insert journal into yoke. Lubricate bushings and tap them into yoke and on bearing surfaces of journal. Install snap rings.

(2) **INSTALL YOKE** (fig. 31). Position second yoke over journal. Install remaining two bushings and snap rings.

(3) **INSTALL LUBRICATION FITTINGS** (fig. 31). Install fittings into openings in journal and yoke sleeve.

(4) **ATTACH UNIVERSAL JOINTS TO DRIVE SHAFT** (fig. 31). Slide drive shaft collar and the worm joint on shaft splines. Install drive shaft key on other end of shaft. Tap take-off joint onto shaft and tighten set screw.

CHAPTER 7

DRIVE SHAFT HAND BRAKE

Section I

DESCRIPTION

51. DESCRIPTION.

a. **Description** (fig. 32). The drive shaft hand brake is an auxiliary mechanical brake to be used for holding the vehicle when it is not in motion. It consists of a disk mounted between the transfer case and rear drive shaft with two brake shoes on each side of the disk. These shoes, operated by cams, levers, and springs, alternately press against the disk or draw back from it, according to operation of the control lever in the cab. Because of the strain imposed on the entire power train by the operation of the brake while the vehicle is in motion, it should be used in this way only when absolutely necessary.

Section II

BRAKE SHOES

52. DESCRIPTION AND DATA.

a. **Description** (fig. 32). Braking power is obtained by the action of four brake shoes against the brake disk, a shoe being attached to each side of the front of the brake and to each side of the back of the brake. These shoes are flat and elliptical, and brake lining is attached to each shoe with eight rivets.

b. **Tabulated Data.**

Manufacturer	American Cable
Brake shoe, part No. (Autocar).....	10S0913
Lining, part No. (Autocar).....	10S0912

53. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY.

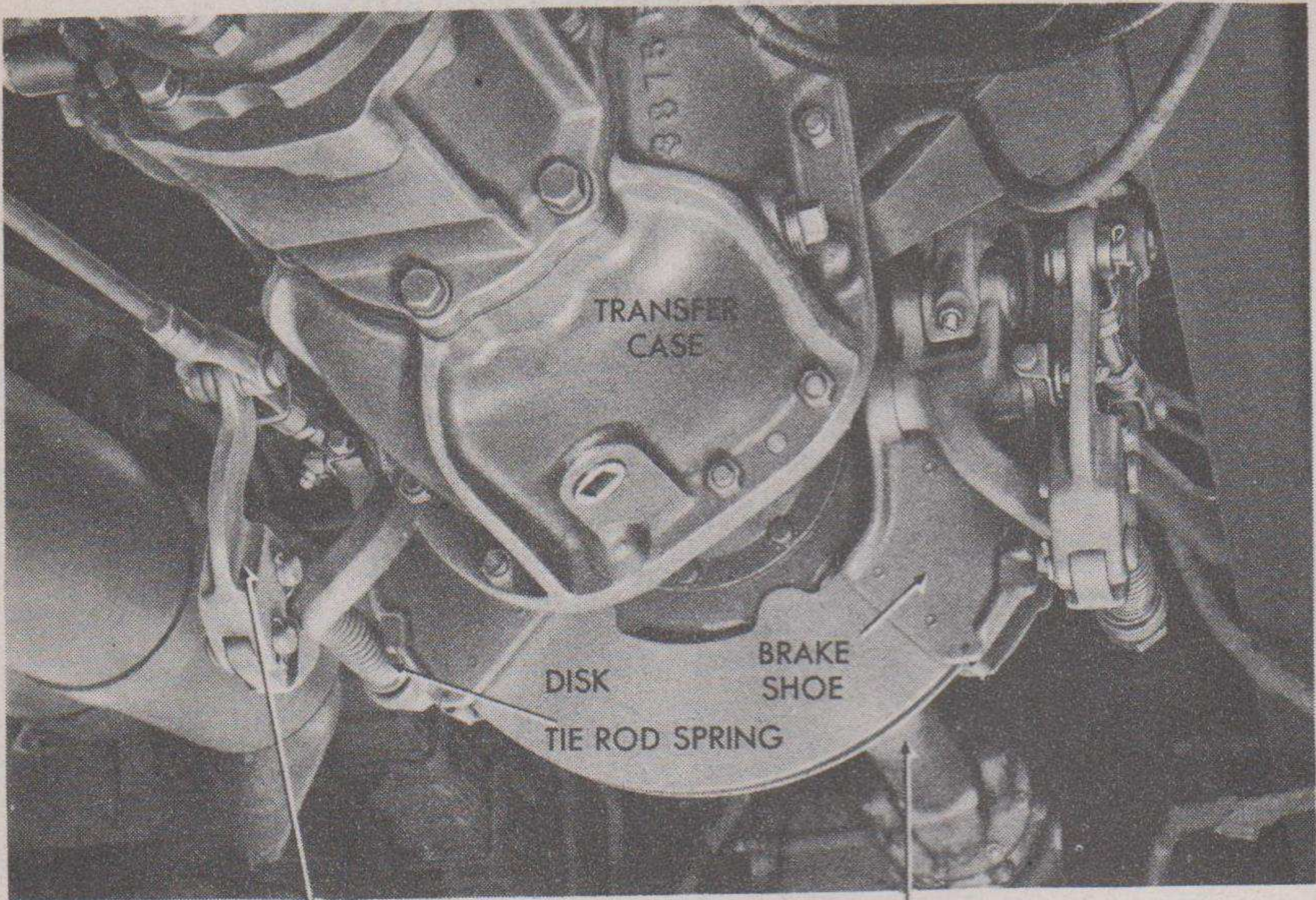
a. **Disassembly.**

(1) **REMOVE BRAKE LINING.** Place brake shoe in a vise, drive out lining rivets, and lift off lining.

(2) **REMOVE BRAKE SHOE BUSHINGS.** Remove bushings only if they are damaged or worn (subpar. b, below).

b. **Cleaning, Inspection, and Repair.** Clean brake shoes with dry-cleaning solvent, but do not permit dry-cleaning solvent to get on brake lining. Examine shoes for cracks or fractures and replace if

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



FRONT VIEW

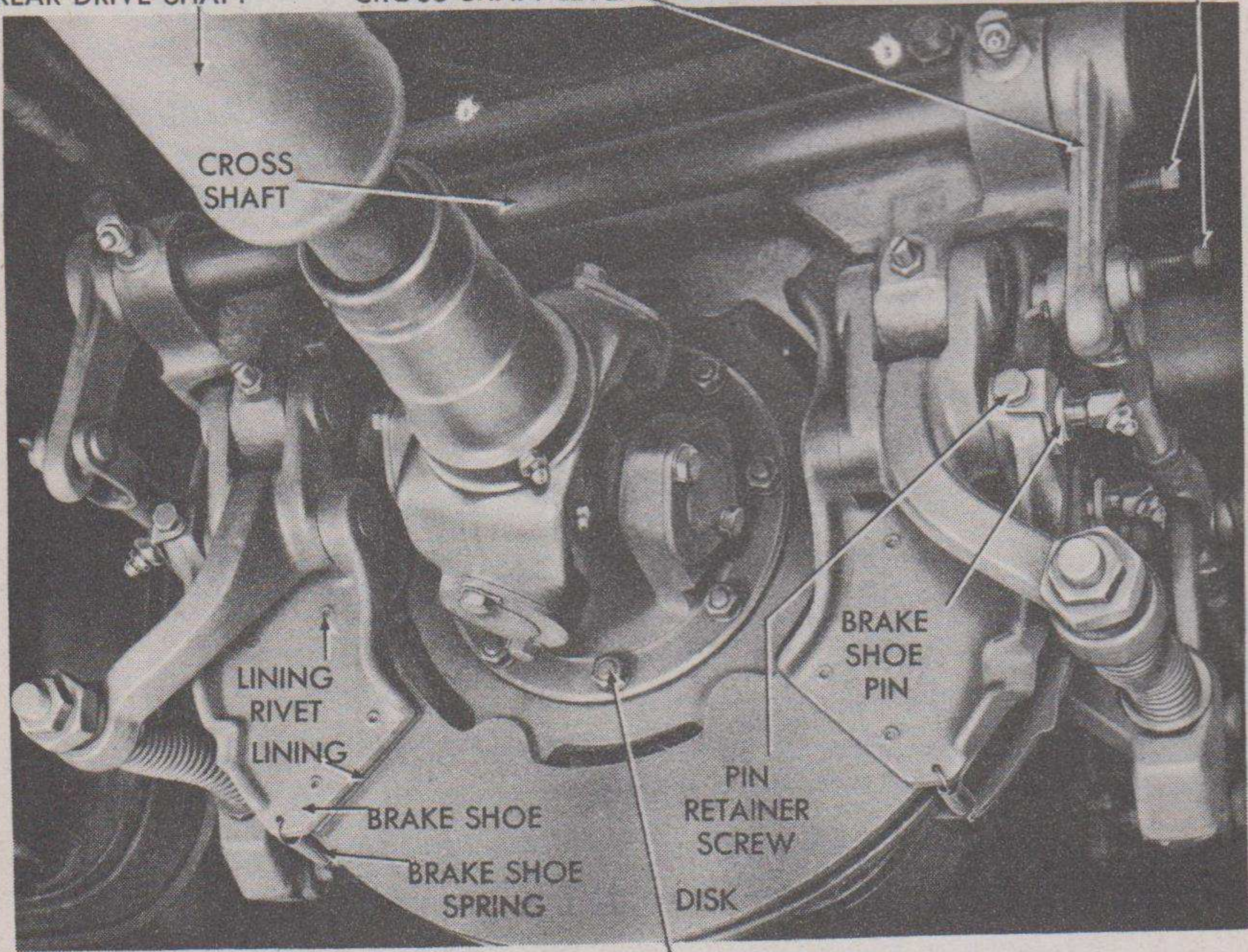
OPERATING LEVER

REAR DRIVE SHAFT

REAR DRIVE SHAFT

CROSS SHAFT LEVER

BRAKE SHOE ADJUSTING SET SCREW



REAR VIEW

DISK TO DRIVING FLANGE BOLT

RA PD 321905

Figure 32 — Drive Shaft Hand Brake

DRIVE SHAFT HAND BRAKE

cracks or fractures are found. Inspect brake shoe bushings for scoring and wear by placing a brake shoe pin in bushing. If there is more than 0.0010-inch side play between pin and bushing, remove bushing and press new bushing into shoe. Inspect all four brake shoe linings, measuring thickness of each lining. If worn to one-eighth inch or less, discard all four linings. If there is a difference of more than one thirty-second inch or more in thickness of any of the four linings, discard all four and install a new set. **NOTE:** *Always replace brake shoe linings in sets of four.*

c. Assembly.

(1) **INSTALL BRAKE SHOE BUSHINGS.** If bushing was removed, press new bushing into seat in brake shoe.

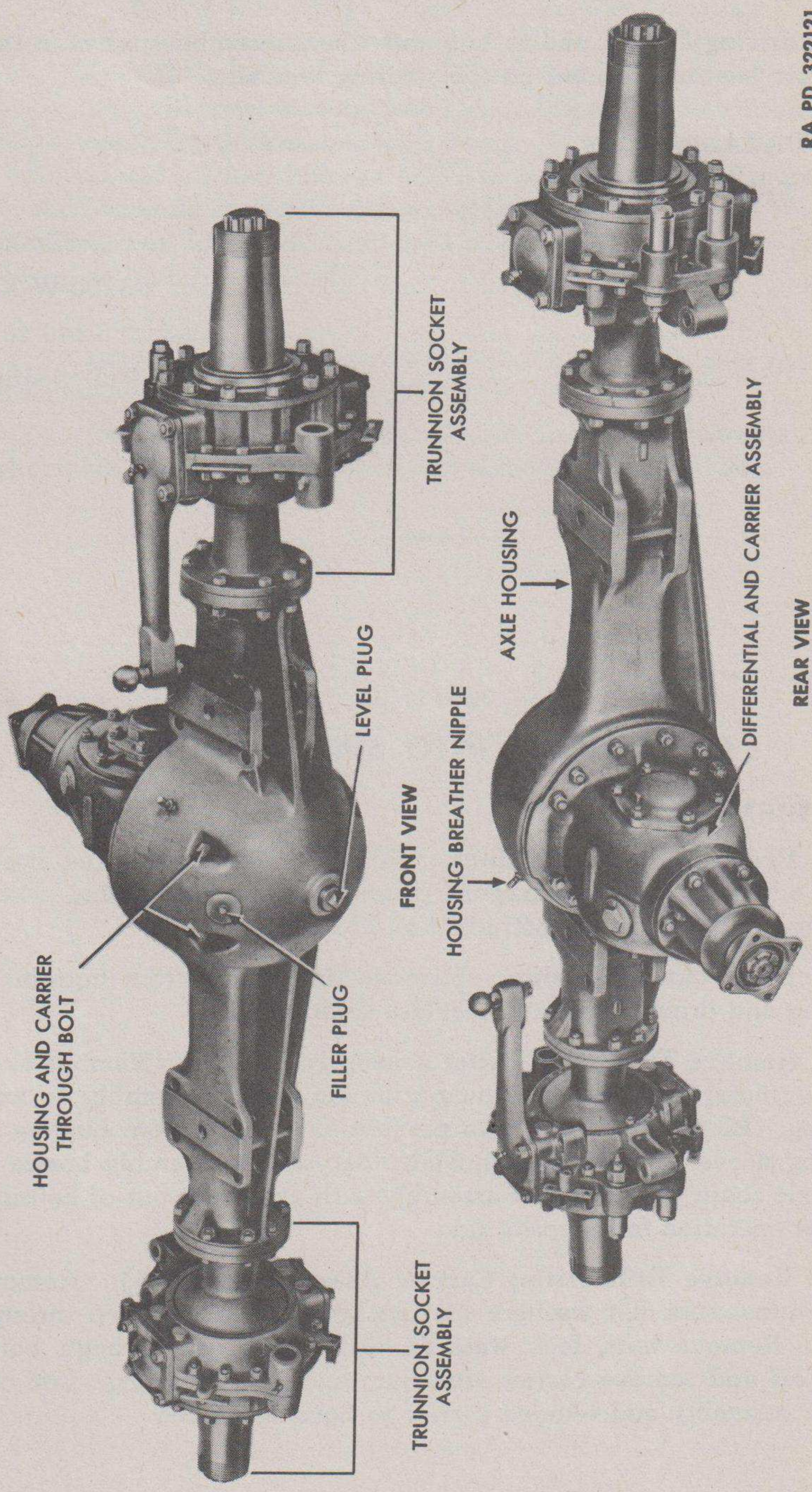
(2) **INSTALL BRAKE LINING.** Attach lining to brake shoe with eight rivets, using a brake riveting machine for the operation.

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****CHAPTER 8
FRONT AXLE****Section I****DESCRIPTION AND DATA****54. DESCRIPTION AND OPERATION.**

a. **Description.** This front axle employs a double-reduction type of differential carrier which is detachable from the axle housing as a unit. The axle housing is full floating and jointed at outer ends to permit steering action of the wheels through constant-velocity type steering-driving joints. The carrier unit is mounted on a housing to the left of the axle center, permitting the front drive shaft to pass to the left of the engine and thus maintain full road clearance. The differential and spur gear are mounted between cast legs on the carrier supported by opposed tapered roller bearings held in place by carrier caps and adjusting rings. The differential assembly is composed of two halves with the spur gear attached to case flanges. The inner surfaces of both halves of the differential case are recessed to provide a seat for the differential spider on which the pinion and side gears are mounted. The bevel gear is pressed on splines of the spur pinion, which is supported by opposed tapered roller bearings. Tooth contact between the bevel gear and bevel pinion is adjusted by shims between bearing cages and carrier. The trunnion socket assemblies are attached to the axle housing ends. Oil seals at the outer ends of the housing retain differential lubricant within the housing. Steering knuckles are supported by tapered roller bearings which are pressed on the upper and lower pins of the trunnion sockets, these bearings being adjusted by shims under upper and lower bearing caps. The universal joint is mounted within the steering knuckle with the axle shaft end locked in position by means of a retainer plate and screws. A full floating hub is mounted upon the steering knuckle by means of tapered roller bearings. This construction enables the wheel, hub, spindle, trunnion socket, and axle housing to carry the load independent of the axle shaft.

b. **Operation.** Power is taken from the front drive shaft by the bevel pinion through a drive flange, and is transmitted by the pinion to the bevel gear, causing spur pinion and spur gear to rotate. Motion is then transmitted to spider pinion gears, which rotate as a unit, and to pinion side gears, which are splined to ends of axle shafts. Axle shafts transmit motion to the constant-velocity type universal joints,

FRONT AXLE



RA PD 322121

Figure 33 — Front Axle Assembly

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

to the driving flanges, and to hub and wheel assemblies which rotate on roller bearings located on the steering knuckles.

55. DATA.

a. Front Axle.

Make Timken
Model F3100-W-X-5
Ratio 8.148 to 1
Type Full floating

Section II

DISASSEMBLY INTO SUBASSEMBLIES

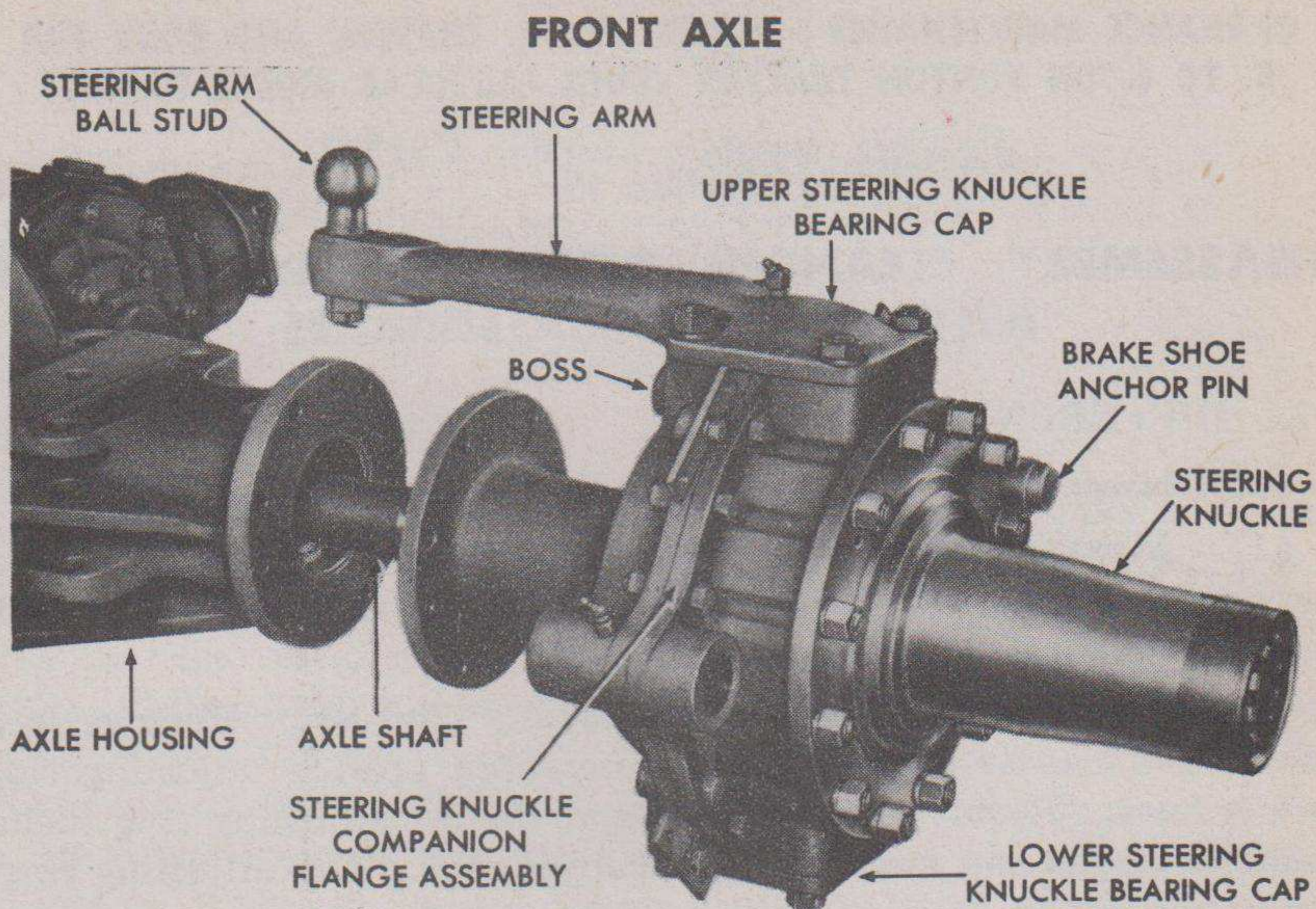
56. DISASSEMBLY.

a. Preliminary Instructions. Remove wheels and tires, brake slack adjusters and diaphragms, drum and hub assemblies, wheel bearings, and tie rod, as instructed in TM 9-817.

b. Drain Axle Housing. Remove drain plug from bottom of housing and drain lubricant. Replace drain plug.

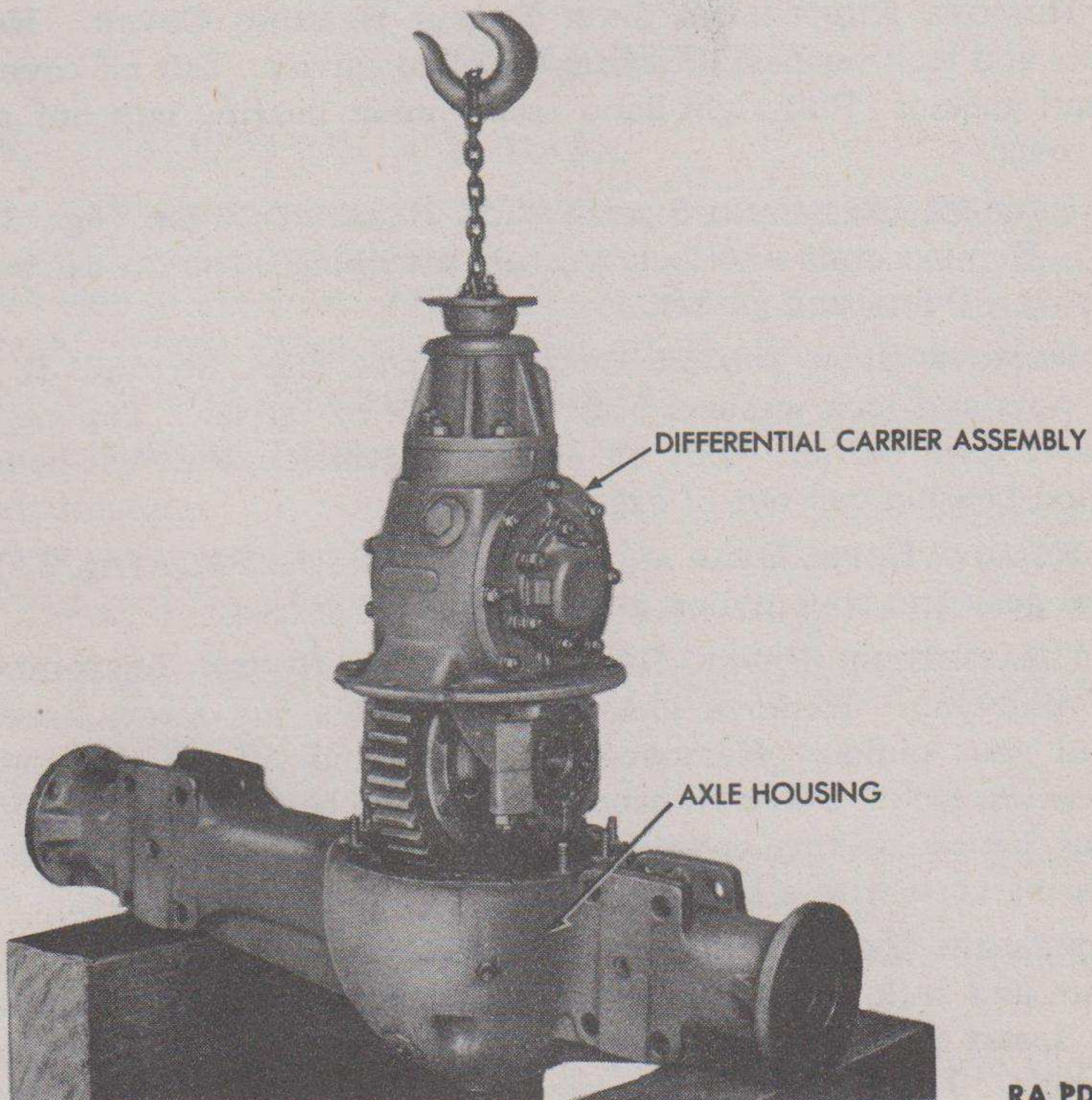
c. Remove Trunnion Socket Assembly (fig. 34). Remove nuts, lock washers, and bolts attaching trunnion socket assembly to axle housing. Block up assembly to prevent axle shafts from binding in housing sleeve while being removed. Tap socket assembly bosses to free axle shaft. Slide socket assembly with axle shaft out of housing. Repeat operation for opposite side.

d. Remove Differential Carrier Assembly (fig. 35). Remove cotter pins, nuts, flat washers, and gaskets from lower two through bolts. Remove nuts, lock washers, and upper two through bolts. Back off and remove carrier stud nuts and lock washers. Lift out carrier assembly and remove carrier to housing gasket.



RA PD 322010

Figure 34 — Removing Trunnion Socket Assembly



RA PD 322009

Figure 35 — Removing Differential Carrier Assembly

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****Section III****DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES****57. DIFFERENTIAL CARRIER.****a. Disassembly.**

(1) **MARK CARRIER AND CARRIER CAPS** (fig. 36). Punch-mark carrier and carrier caps on both sides to assure correct fit when unit is assembled.

(2) **REMOVE DIFFERENTIAL ASSEMBLY** (fig. 36). Remove lock wires from carrier cap nuts and differential bearing adjusting ring lock screws. Remove lock screws and lift off adjusting ring locks. Remove carrier cap nuts. Tap off carrier caps. Tap adjusting rings out of threads in carrier. Lift out differential assembly.

(3) **DISASSEMBLE DIFFERENTIAL ASSEMBLY** (figs. 50 and 51). Refer to paragraph 73 a (2).

(4) **REMOVE RIGHT-HAND SPUR PINION BEARING COVER**. Remove nuts and lock washers attaching cover to carrier. Lift off cover, shims, and gasket. Pull right-hand spur pinion bearing cup out of bearing cover.

(5) **REMOVE LEFT-HAND SPUR PINION BEARING COVER** (figs. 36 and 38). Remove nuts and lock washers attaching cover to carrier. Lift off cover, shims, and gasket.

(6) **REMOVE SPUR PINION BEARING CAGE** (figs. 36 and 38). Remove nuts and lock washers attaching cage to carrier. Tap cage to loosen it from carrier. Lift off cage and gasket. Pull left-hand spur pinion bearing cup out of cage.

(7) **REMOVE BEVEL GEAR AND SPUR PINION ASSEMBLY** (fig. 37). Lift bevel gear and spur pinion assembly out of carrier.

(8) **DISASSEMBLE BEVEL GEAR AND SPUR PINION ASSEMBLY** (figs. 37 and 38). Remove lock wire from two cap screw heads on end of spur pinion. Remove cap screws and lift off the spur pinion bearing lock. Using an arbor press, press bevel gear and left-hand spur pinion bearing cone off the spur pinion. Remove right-hand bearing cone with a bearing puller.

(9) **REMOVE BEVEL PINION ASSEMBLY** (figs. 37 and 38). Remove nuts and lock washers attaching bevel pinion bearing cage to carrier. Insert puller screws into two threaded holes on opposite sides of cage. Turn puller screws evenly and draw bearing cage out of carrier. Remove shims and gasket.

FRONT AXLE

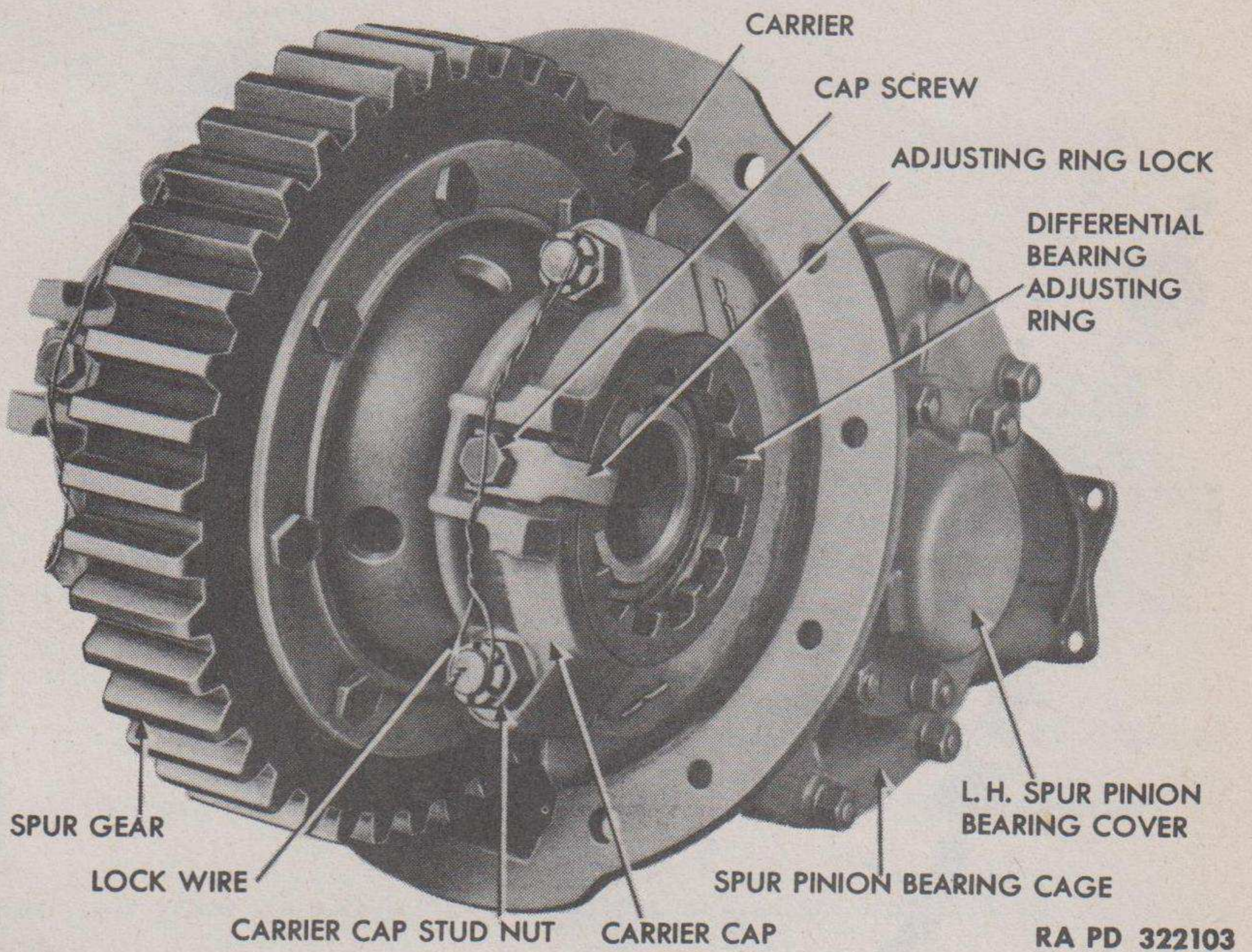


Figure 36 – Front Axle Differential Carrier Assembly

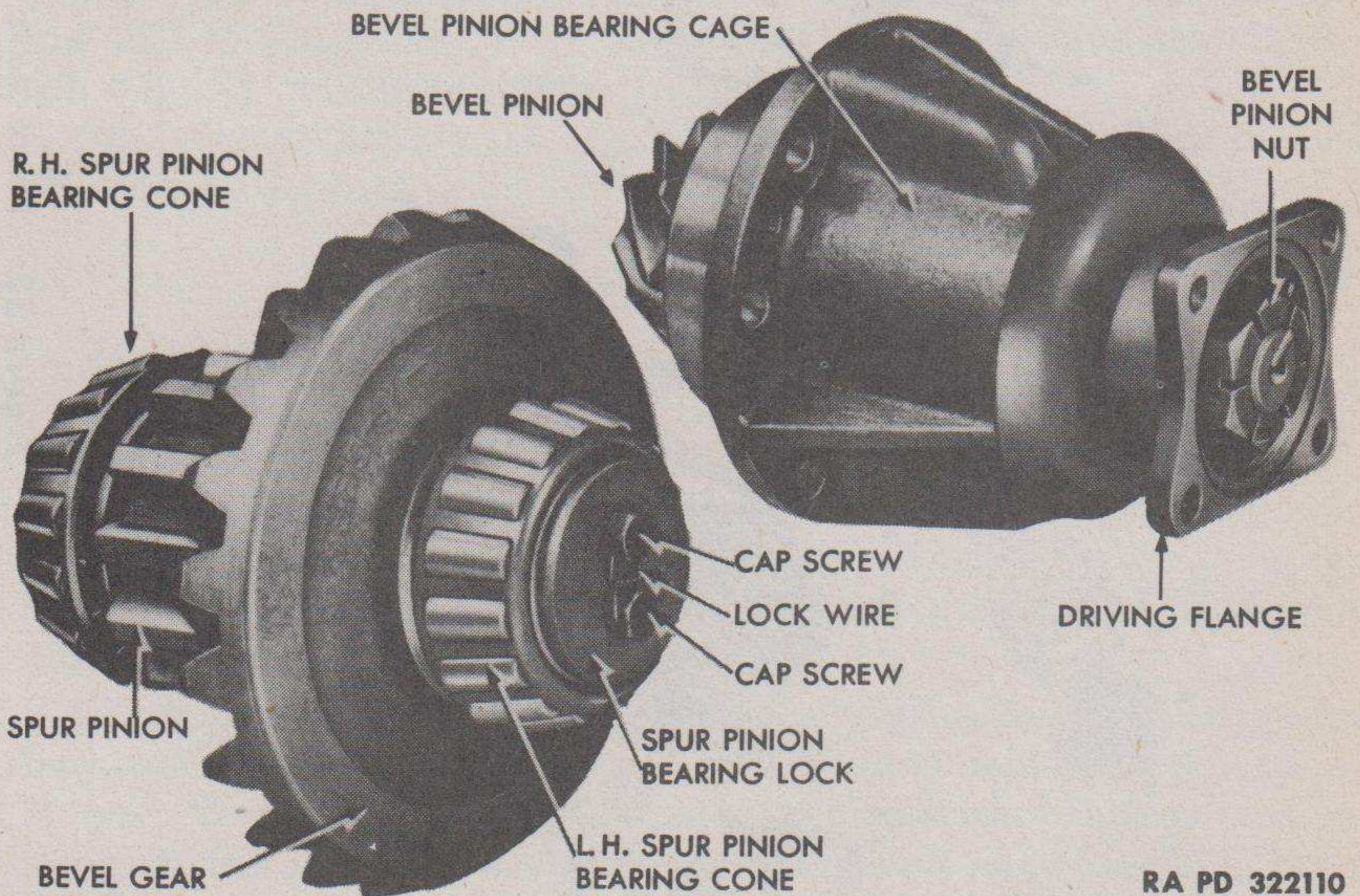
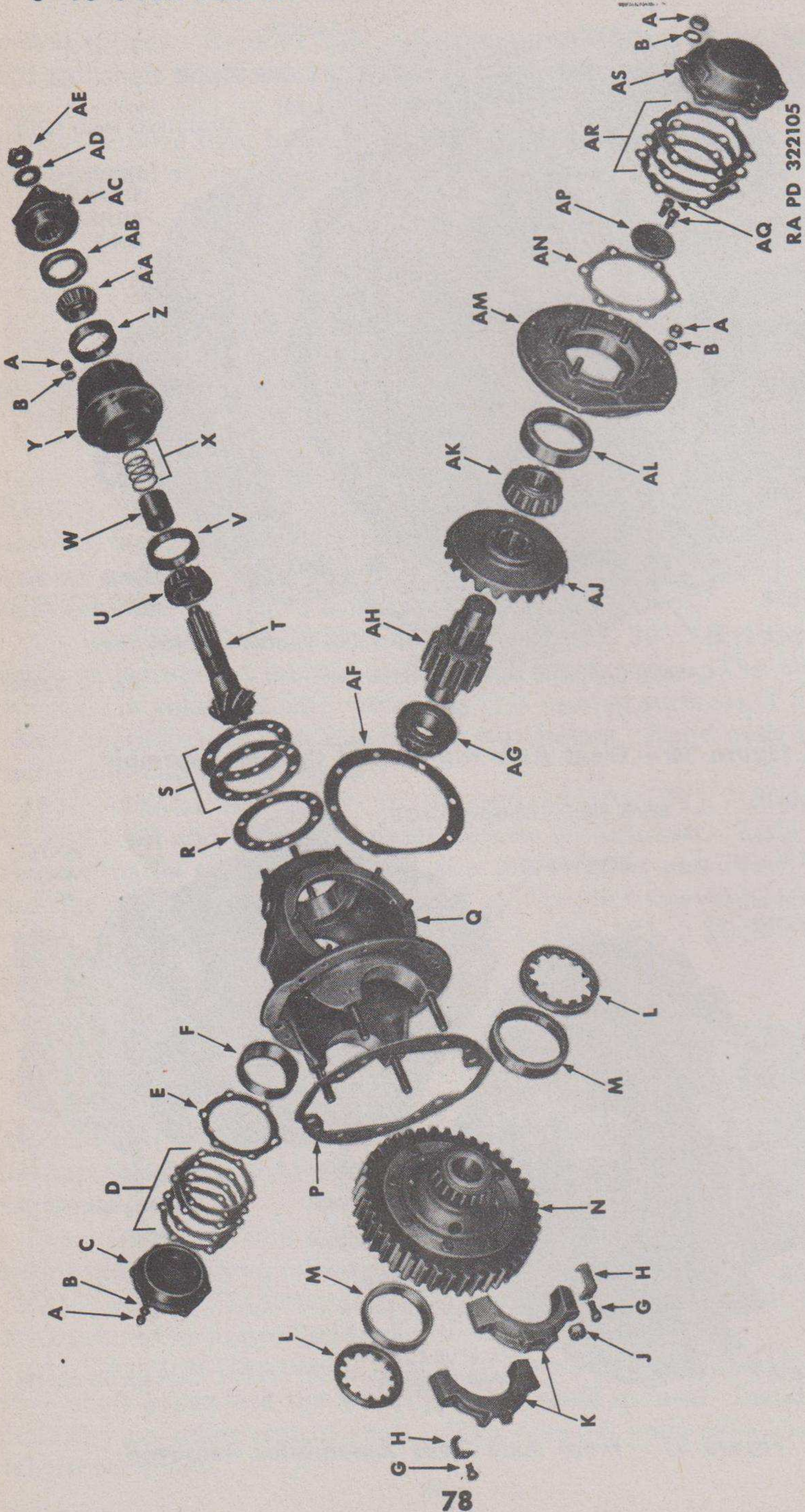


Figure 37 – Front Axle Gear Assemblies Removed

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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Figure 38 — Front Axle Differential Carrier Disassembled

FRONT AXLE

- | | |
|---------------------------------------|---------------------------------------|
| A—NUT | X—BEVEL PINION BEARING SHIMS |
| B—LOCK WASHER | Y—BEVEL PINION BEARING CAGE |
| C—R.H. SPUR PINION BEARING COVER | Z—REAR BEVEL PINION BEARING CUP |
| D—SHIMS | AA—REAR BEVEL PINION BEARING CONE |
| E—GASKET | AB—BEVEL PINION BEARING CAGE OIL SEAL |
| F—R.H. SPUR PINION BEARING CONE | AC—DRIVING FLANGE |
| G—ADJUSTING RING LOCK SCREW | AD—BEVEL PINION NUT WASHER |
| H—ADJUSTING RING LOCK | AE—BEVEL PINION NUT |
| J—CARRIER AND CAP STUD NUT | AF—GASKET |
| K—CARRIER CAP | AG—R.H. SPUR PINION BEARING CONE |
| L—DIFFERENTIAL BEARING ADJUSTING RING | AH—SPUR PINION |
| M—DIFFERENTIAL BEARING CUP | AJ—BEVEL GEAR |
| N—DIFFERENTIAL ASSEMBLY | AK—L.H. SPUR PINION BEARING CONE |
| P—CARRIER TO HOUSING GASKET | AL—L.H. SPUR PINION BEARING CUP |
| Q—DIFFERENTIAL CARRIER | AM—SPUR PINION BEARING CAGE |
| R—GASKET | AN—GASKET |
| S—SHIMS | AP—SPUR PINION BEARING LOCK |
| T—BEVEL PINION | AQ—SPUR PINION BEARING LOCK SCREW |
| U—FORWARD BEVEL PINION BEARING CONE | AR—SHIMS |
| V—FORWARD BEVEL PINION BEARING CUP | AS—L.H. SPUR PINION BEARING COVER |
| W—BEVEL PINION BEARING SPACER | |

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Legend for Figure 38 — Front Axle Differential Carrier Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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(10) **DISASSEMBLE BEVEL PINION ASSEMBLY** (figs. 37 and 38). Remove cotter pin, bevel pinion nut, and washer. Support shoulder of bearing cage in an arbor press. Press down on flange end of bevel pinion and press pinion forward bearing cone, bearing spacer, and shims out of drive flange and bevel pinion bearing cage. Slide spacer and shims off pinion. Pull forward bearing cone off bevel pinion with replacer 41-R-2384-115. Pull oil seal out of bearing cage, and lift out rear bearing cone. Pull forward and rear bearing cups out of bearing cage.

b. Cleaning, Inspection, and Repair. Wash all parts in dry-cleaning solvent before inspection, scrubbing with brush to remove all particles of old lubricant. Immerse bearings into clean dry-cleaning solvent and allow them to remain long enough to loosen hardened lubricant. Revolve bearings slowly below the surface of the liquid. When bearings are clean, dry them with compressed air, directing air across and through bearings so they do not spin. Inspect rollers and bearing cups for chipping, cracks, or worn spots. Do not attempt repairs on bearings other than removal of light burs with a handstone. After inspection, dip bearings in lubricant and store in a clean covered container, or wrap in paper until needed for assembly. Examine all gears for chipped, cracked, or scored teeth and replace damaged gears. If bevel pinion is found damaged, replace bevel pinion and bevel gear. (This is necessary because bevel pinion and bevel gear are a matched and lapped set.) Check fit of differential pinion gears on spider. If damaged pinion gear is found, install a new set of four gears. Examine differential side gears for proper fit of gear hubs in halves of differential case. If gears are worn or damaged, replace the set. Inspect thrust washers for wear and replace thrust washer if wear exceeds limit of 0.048 inch. Inspect bevel pinion bearing cage oil seal for misshaped inner diameter and looseness of packing. Replace seal if such conditions are found.

c. Assembly.

(1) **ASSEMBLE BEVEL PINION ASSEMBLY** (fig. 38). Press forward bearing cone onto bevel pinion against bevel pinion gear teeth. Slide bearing spacer onto bevel pinion with flat edge of spacer against forward bearing cone. Slide shims against bearing spacer. Press forward bearing cone into bevel pinion bearing cage until it is flush with outer edge of cage. Press rear bearing cone into cage against shoulder. Lubricate rear bearing cone and place it in seat in rear cup. Press oil seal into cage until flush with outer edge. Position bevel pinion with forward bearing cone, spacer, and shims in bearing cage. Press drive flange onto splines of bevel pinion and install bevel pinion washer, nut, and cotter pin.

FRONT AXLE

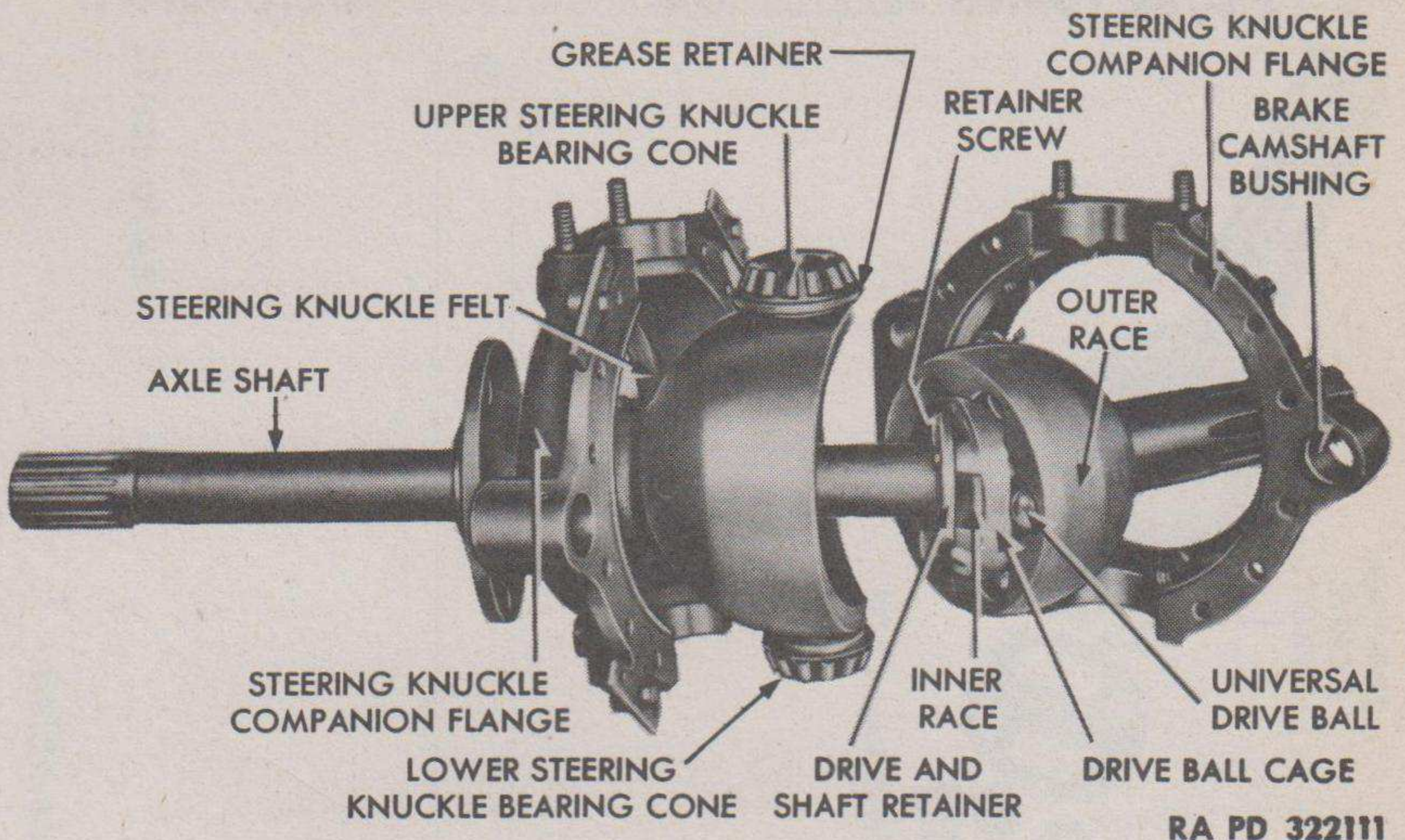


Figure 39 – Trunnion Socket Partly Disassembled

(2) ASSEMBLE BEVEL GEAR AND SPUR PINION ASSEMBLY (fig. 38). Press bevel gear onto splines of spur pinion against spur gear teeth. Press left-hand bearing cone on spur pinion against back of bevel gear. Install spur pinion bearing lock, two cap screws, and lock wire. Press right-hand bearing cone on spur pinion against spur pinion gear teeth.

(3) ASSEMBLE DIFFERENTIAL ASSEMBLY (figs. 50 and 51). Refer to paragraph 73, c (8).

(4) INSTALL BEVEL PINION ASSEMBLY. Position a new gasket on carrier studs. Place shims against gasket. Install assembly in carrier and secure with lock washers and nuts.

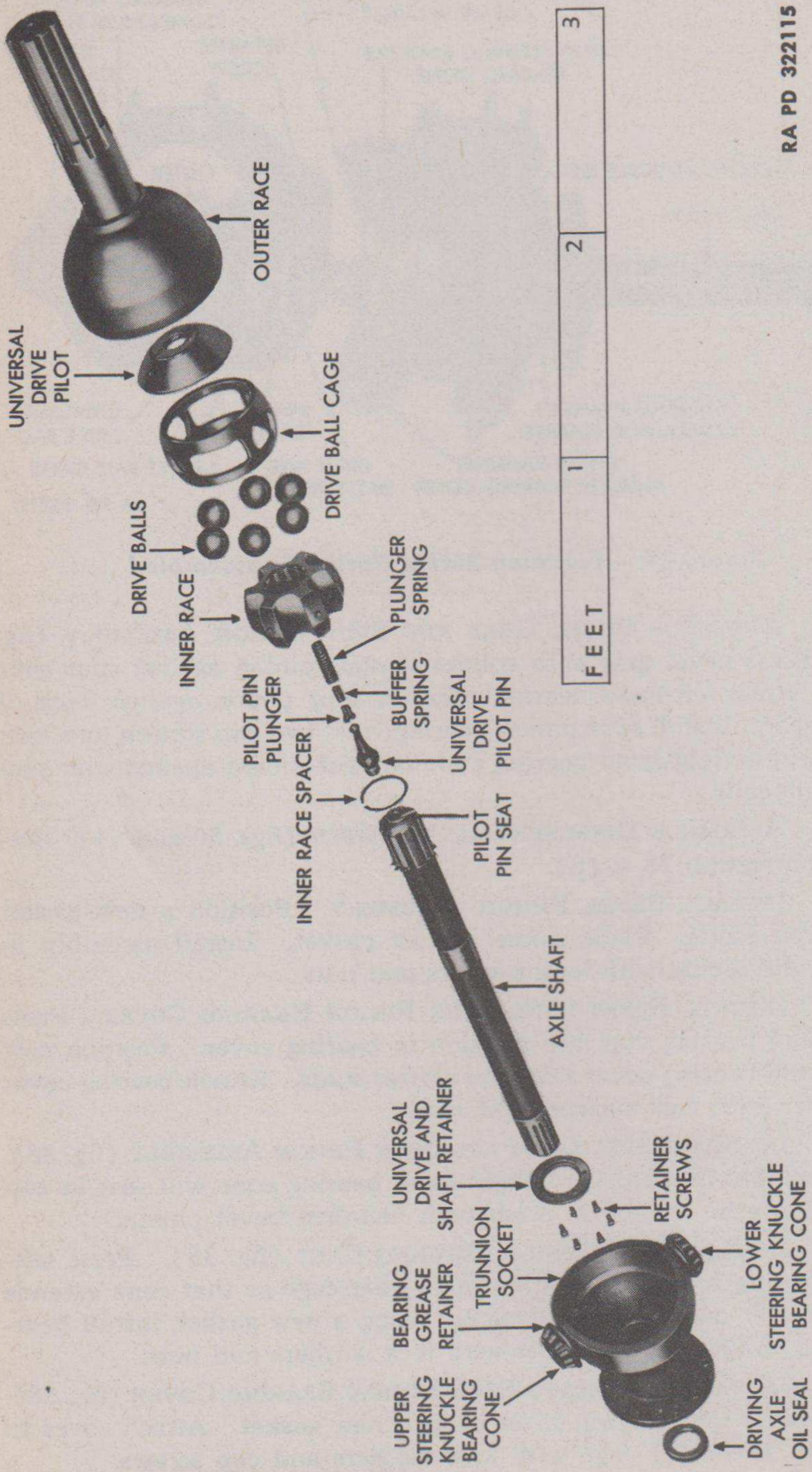
(5) INSTALL RIGHT-HAND SPUR PINION BEARING COVER. Press right-hand bearing cup into position in bearing cover. Position new gasket and bearing cover shims on carrier studs. Attach bearing cover to carrier with lock washers and nuts.

(6) INSTALL BEVEL GEAR AND SPUR PINION ASSEMBLY (fig. 38). Lift assembly into carrier. Right-hand bearing cone will seat in cup and bevel gear will be in mesh with installed bevel pinion.

(7) INSTALL SPUR PINION BEARING CAGE (fig. 38). Press left-hand bearing cone into position in bearing cage so that cone extends $\frac{1}{8}$ inch over outside edge of cage. Using a new gasket, install bearing cage and secure to carrier with lock washers and nuts.

(8) INSTALL LEFT-HAND SPUR PINION BEARING COVER (fig. 38). Install shims and bearing cover using a new gasket. Attach cover to spur pinion bearing cage with lock washers and cap screws.

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Figure 40 — Front Axle Universal Joint Disassembled

FRONT AXLE

(9) CHECK BEARING ADJUSTMENT AND TOOTH CONTACT OF BEVEL GEAR AND BEVEL PINION (fig. 68). Refer to paragraph 76.

(10) INSTALL DIFFERENTIAL ASSEMBLY (figs. 36 and 38). Place differential bearing cups on the bearing cones, and lift assembly into position in carrier. Differential spur gear must mesh with spur pinion. Place bearing adjusting rings against bearings with threads in rings engaged with threads in carrier. Install carrier caps, making certain that threads in caps are engaged with threads in adjusting rings. Install carrier cap nuts. Check differential bearing adjustment (par. 75 c), and install bearing adjusting lock and lock screw. Install lock wire.

58. TRUNNION SOCKET.

a. Disassembly.

(1) REMOVE STEERING KNUCKLE (figs. 34 and 40). Remove nuts and lock washers attaching steering knuckle to steering knuckle companion flange assembly. Lift off steering knuckle.

(2) REMOVE UPPER STEERING KNUCKLE BEARING CAP (fig. 34). Remove nuts and lock washers attaching bearing cap (which is a part of steering arm) to top of companion flange assembly. Tap off bearing cap and remove shims.

(3) REMOVE STEERING ARM BALL STUD (fig. 34). Remove cotter pin and ball stud nut. Tap out steering arm ball stud.

(4) REMOVE LOWER STEERING KNUCKLE BEARING CAP (fig. 34). Remove cap screws and lock washers attaching bearing cap to companion flange assembly. Lift off bearing cap and shims.

(5) REMOVE BRAKE SHOE ANCHOR PINS (fig. 34). Remove anchor pin nuts and lock washers. Pull out anchor pins.

(6) REMOVE STEERING KNUCKLE COMPANION FLANGES (figs. 34 and 39). Remove cap screws, nuts, lock washers, and bolts holding two halves of companion flanges together. Tap flanges apart. Remove flanges, upper and lower steering knuckle bearing caps, and trunnion socket. Remove felt and felt retainer from inside of right half of companion flange.

(7) REMOVE STEERING KNUCKLE BEARINGS (figs. 39 and 40). Using a bearing puller, remove lower bearing cone and upper bearing cone with its grease retainer from seats on trunnion socket. Remove driving axle oil seal only if damaged or worn (subpar. h, below).

(8) REMOVE AXLE SHAFT (figs. 39 and 40). Remove lock wire which is threaded through heads of universal drive and shaft retainer screws. Remove retainer screws and retainer. Pull axle shaft out of universal drive inner race. Lift universal drive pilot pin out of pilot pin seat in end of axle shaft.

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(9) **REMOVE UNIVERSAL DRIVE BALLS** (figs. 39 and 40). Lift inner race spacer off edge of inner race. Revolve drive ball cage and inner race within seat in universal drive outer race into positions which will permit removal of the six drive balls.

(10) **REMOVE INNER RACE AND DRIVE BALL CAGE** (figs. 39 and 40). Revolve inner race and drive ball cage until universal drive pilot is accessible. Lift out drive pilot; then lift out inner race and drive ball cage.

(11) **REMOVE PLUNGER SPRING** (fig. 40). Lift universal drive pilot pin plunger, plunger spring, and buffer spring out of outer race. Pull plunger out of plunger spring and remove buffer spring from inside of plunger spring.

b. Cleaning, Inspection, and Repair. Wash parts in dry-cleaning solvent before inspection. Immerse bearings in dry-cleaning solvent in which no other parts have been cleaned, and allow them to remain until hardened lubricant is loosened. Slush bearings up and down and revolve them slowly below the surface of the liquid. When bearings are clean, dry them by directing compressed air across and through bearings, but do not allow unlubricated bearings to spin. Examine rollers and cups for cracks or worn spots and replace damaged or worn bearings. Do not attempt repairs on bearings other than removal of light scores with a handstone. After inspection, dip bearings in lubricant and store in a clean covered container or wrap in waxed paper. Examine the driving axle oil seal while it is installed in the trunnion socket. If seal is damaged, or if packing is loose and flabby, remove it and install a new seal. Inspect brake camshaft bushings in both halves of steering knuckle companion flanges for burrs and score marks and remove light burrs with handstone. Test fit of camshaft in bushings, replacing bushings if side play is in excess of 0.0010 inch. Check condition of bushing in steering knuckle and replace bushing if inner diameter is scored, worn, or out of shape. Inner diameter is held to a tolerance of 2.770 inches and has a clearance on the shaft of 0.0010 to 0.0012 inch. Examine steering knuckle felt for flabby or torn condition, replacing worn or damaged felt. Examine axle shaft and shaft on universal joint outer race for signs of cracks, fractures, or twisting of splines, replacing axle shaft or outer race if such defects are found. Inspect inner race and universal drive balls for rough spots and gall marks. Stone down small burrs; replace drive balls if they measure under 1.623 inches. Check condition of drive ball cage. Replace cage if cracked or scored.

c. Assembly.

(1) **INSTALL PLUNGER SPRING** (fig. 40). Place buffer spring

FRONT AXLE

inside of plunger spring. Insert universal drive pilot pin plunger into end of plunger spring and install this assembly into the outer race. Be sure the curved socket end of plunger faces upward.

(2) **INSTALL DRIVE BALL CAGE** (figs. 39 and 40). Place cage into outer race with elongated slots in cage over opposite ribs in outer race.

(3) **INSTALL INNER RACE** (figs. 39 and 40). Rotate cage to a vertical position and insert inner race. To do so, line up any two opposite ribs of the inner race with the two elongated slots in the cage and rotate inner race into position. **CAUTION:** *Exercise extreme care in this assembly. Do not force or jam parts together. They will slip together easily when properly installed.*

(4) **INSTALL UNIVERSAL DRIVE PILOT** (fig. 40). Rotate drive ball cage so that shaft retainer screw holes in inner race face toward bottom of outer race. Place universal joint pilot on the cage and rotate assembly back to its normal position. Pilot is now on the bottom and inner race retainer screw holes on top.

(5) **INSTALL LUBRICANT.** Pack entire assembly with general purpose grease.

(6) **INSTALL UNIVERSAL DRIVE BALLS** (figs. 39 and 40). Tilt inner race and drive ball cage to bring one of the ball sockets of the cage in line with a raceway in joint of outer race and upward sufficiently to allow one drive ball to be dropped into place. Tilt inner race and cage to other five positions and install remaining drive balls.

(7) **INSTALL PILOT PIN** (fig. 40). Drop universal joint pilot pin into the assembly with small end down so it will seat on head of pilot pin plunger in bottom of outer race.

(8) **INSTALL AXLE SHAFT** (figs. 39 and 40). Place inner race spacer on top of inner race. Insert axle shaft into splines of inner race. Slide universal drive and shaft retainer over axle shaft into position on inner race. Install retainer screws and lock wire.

(9) **ASSEMBLE TRUNNION SOCKET** (fig. 40). If oil seal has been removed, press a new seal into position in trunnion socket. Place bearing grease retainer on upper knuckle bearing pin. Press upper bearing cone on bearing pin against grease retainer. Press lower bearing cone on bottom knuckle bearing pin.

(10) **INSTALL STEERING KNUCKLE COMPANION FLANGES** (fig. 39). Slide steering knuckle assembly over axle shaft and onto universal joint assembly. Install felt and felt retainer into recess in right half companion flange; then position flange over trunnion socket assembly. Position left half companion flange to meet right half around upper and lower knuckle bearing cones. Hold assembly together by installing four bolts, lock washers, and nuts.

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(11) **LUBRICATE KNUCKLE BEARINGS** (fig. 39). Pack upper and lower knuckle bearing cones with general purpose grease.

(12) **INSTALL KNUCKLE BEARING CAPS** (fig. 34). Tap upper and lower steering knuckle bearing cups into position and install remaining companion flange cap screws, bolts, lock washers, and nuts. Position shims over lower bearing cap opening. Install lower bearing cap with cap screws and lock washers. Tap steering arm ball stud into end of steering arm, and install stud nut and cotter pin. Install upper bearing cap shims and the bearing cap which is a part of the steering arm. Secure cap to companion flanges with lock washers and stud nuts.

(13) **INSTALL STEERING KNUCKLE** (fig. 34). Slide steering knuckle with installed bushing over shaft of outer race. Attach knuckle to companion flange assembly with lock washers and stud nuts.

(14) **INSTALL BRAKE SHOE ANCHOR PINS** (fig. 34). Insert anchor pins through companion flange assembly, and install lock washers and anchor pin nuts.

59. FRONT AXLE HOUSING.

a. Disassembly.

(1) **REMOVE PLUGS.** Unscrew and remove drain, filler, and level plugs from axle housing.

(2) **REMOVE BREATHER NIPPLE.** Remove breather nipple reducer and breather nipple from axle housing. Thread nipple out of reducer.

(3) **REMOVE HOUSING SLEEVES.** It usually is advisable to replace the complete housing if a worn or damaged sleeve is found. If necessary to remove sleeve and replace with new sleeve, use an axle housing sleeve puller.

b. Cleaning, Inspection, and Repair. Wash parts thoroughly with dry-cleaning solvent, scrubbing with a stiff brush to remove all traces of hardened lubricant. Examine axle housing for cracks and fractures, tapping with hammer to test for cracks which might otherwise not be evident. Weld small cracks; replace housing if badly fractured. Examine all threaded parts for burrs, cross threading, and bent studs. Remove light burrs with a handstone. Replace damaged studs.

c. Assembly.

(1) **INSTALL HOUSING SLEEVES.** If sleeves have been removed, press new sleeves into position in axle housing.

FRONT AXLE

- (2) **INSTALL BREATHER NIPPLE.** Thread nipple into nipple reducer. Thread this assembly into opening in axle housing.
- (3) **INSTALL PLUGS.** Thread drain, filler, and level plugs into opening in axle housing.

Section IV

ASSEMBLY OF FRONT AXLE

60. ASSEMBLY.

- a. **Install Differential Carrier Assembly (fig. 35).** Position a new carrier to housing gasket over carrier studs. Lower differential carrier assembly into housing and install four through bolts. Use gaskets, flat washers, nuts, and cotter pins on lower through bolts; lock washers and nuts on upper through bolts. Install lock washers and carrier stud nuts.
- b. **Install Trunnion Socket Assembly (fig. 35).** Lift assembly and slide axle shaft into axle housing. If necessary, rotate driving flange to mesh splines of axle shaft and differential. Attach flange of trunnion socket to flange on axle housing with bolts, lock washers, and nuts. Follow same procedure to install opposite trunnion socket assembly.
- c. **Install Lubricant.** Refer to TM 9-817 for quantity and type of lubricant to be installed.
- d. **Install Front Axle.** Install tie rod, wheel bearings, drum and hub assemblies, brake slack adjusters and diaphragms, wheels and tires, and complete assembly as instructed in TM 9-817.

Section V

TESTS AND ADJUSTMENTS

61. TESTS AND ADJUSTMENTS.

- a. **Adjustment of Bearings.**
 - (1) **SPUR PINION SHAFT BEARINGS (fig. 38).** These tapered roller bearings are adjusted by means of shims located between the spur shaft bearing cages and carrier. To adjust, remove shims until bearings bind; then add a 0.001-inch or 0.002-inch shim to provide an adjustment of 0 to 0.002 inch, tight.
 - (2) **STEERING KNUCKLE BEARINGS.** Turn steering knuckle; if

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steering knuckle bearings bind, add shims under bearing caps (fig. 34). The bearings must not be over 0.002 inch, loose.

(3) **BEVEL PINION BEARINGS** (fig. 38). The tapered roller bearings are adjusted by the bearing shims between bearing spacer and rear bearing cone. Assemble bevel pinion assembly (par. 57 c (1)), and turn pinion shaft. Shaft should turn with no appreciable end play. To adjust, disassemble bevel pinion assembly (par. 57 a (10)), add or remove shims, reassemble, and test for end play.

b. **Adjustment of Spiral Bevel Axle Gears.** Backlash adjustment of front axle gears is the same as for rear axle (par. 76).

Section VI

FITS AND TOLERANCES

62. SERVICE INFORMATION.

a. Differential.

Bearing adjustment	0.000 to 0.002 in. tight
Gear to pinion backlash	0.005 to 0.015 in.
Spur gear eccentricity	0.000 to 0.004 in.
Case run-out	0.000 to 0.004 in.
Pinion to spider clearance	0.000 to 0.006 in.
Side gear to axle shaft splines	0.002 to 0.006 in.
Side gear thrust washers:	
New limits	0.058 to 0.062 in.
Worn limits	0.048 in.
Pinion gear thrust washers:	
New limits	0.058 to 0.062 in.
Worn limits	0.048 in.

b. Axle Alinement.

Toe-in	$\frac{3}{16}$ to $\frac{5}{16}$ in.
Camber angle	0 deg
Caster	4 to 5½ deg

c. Right-hand Turning Angle.

Right wheel	28 deg
Left wheel	24 deg

d. Left-hand Turning Angle.

Left wheel	28 deg
Right wheel	24 deg

FRONT AXLE

Section VII

FRONT END ALINEMENT

63. PRELIMINARY INSTRUCTIONS.

a. Five main points must be considered in correct front end alinement (sometimes called steering geometry). These five points are camber, caster, turning radius, kingpin inclination, and toe-in of front wheels. These five points should be checked since all are related. The checking of these five points can be done on a combination frame straightener and wheel alinement machine, or on a level floor, using two turning radius plates. Procedure is identical in either case.

b. Make the following general inspection before checking front end alinement:

(1) Inflate all tires to 70 pounds. Check the front wheel bearing adjustments and, if correct, make the adjustment given in TM 9-817.

(2) Check for looseness of the wheel at the knuckle. The knuckle bushing should have a clearance of 0.0010 to 0.0012 inch on the shaft. If the clearance exceeds these figures, permitting excessive looseness at this point, tap out old bushing and replace.

(3) Check for looseness at the steering arm drag link, and adjust the drag link if necessary. Refer to TM 9-817.

(4) Check for looseness in the steering gear, and adjust if necessary. Refer to TM 9-817.

(5) Check shock absorber action, and correct if necessary TM 9-817.

64. CHECKING FRONT WHEEL CAMBER AND WHEEL RUN-OUT.

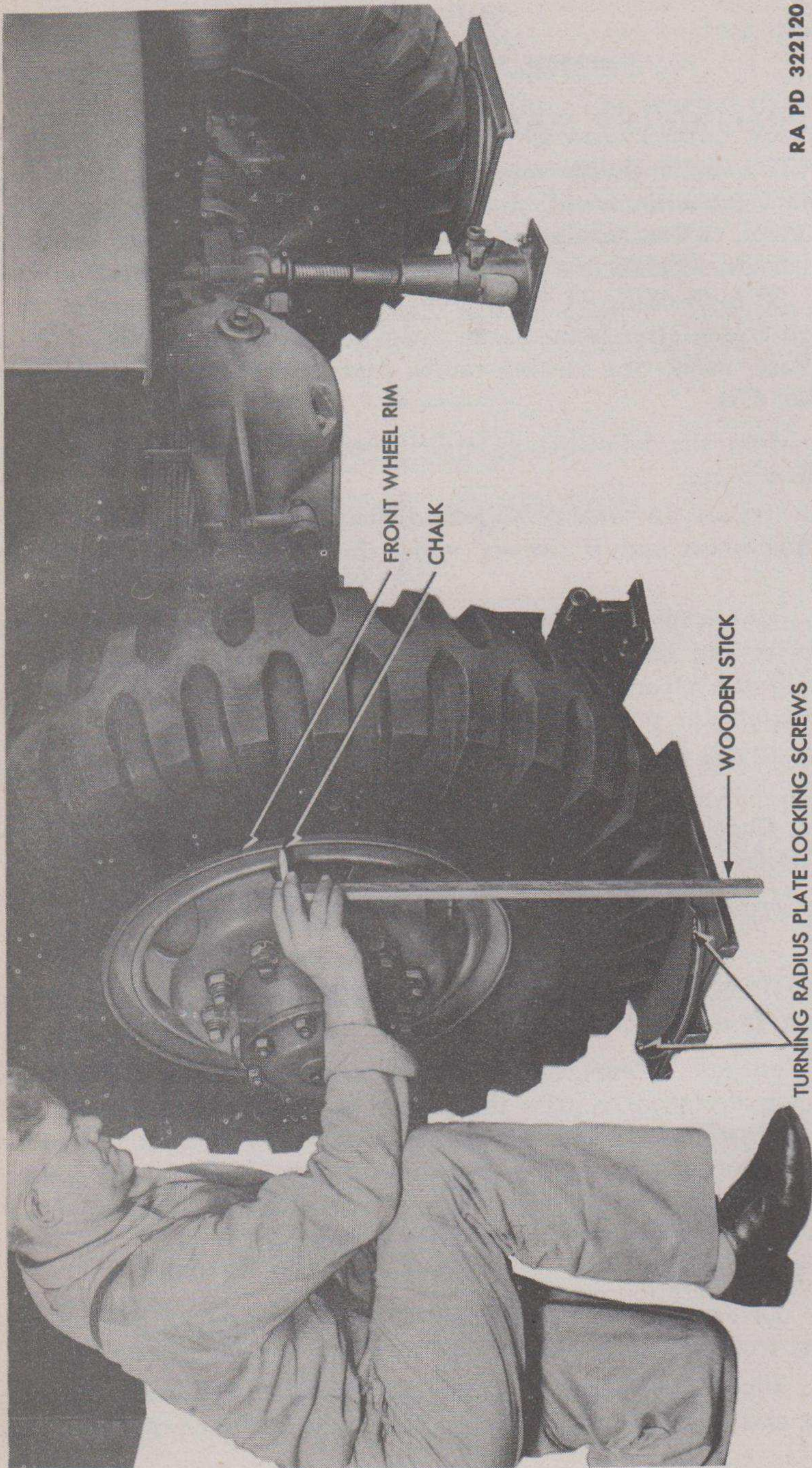
a. **General.** Wheel camber is the outward tilt of the front wheels at the top designed to keep the center of the tire tread in contact with the road. Although this tilt is built into the front axle, it is necessary to check camber to determine whether the front axle housing has been sprung or bent, thereby affecting the camber of the wheels and causing wear of the front tires.

b. **Preliminary.**

(1) Drive onto the two turning radius plates. Stop the vehicle with the front wheels resting on the center of the plates (fig. 41).

(2) Place the hydraulic jacks under each end of the front axle housing and raise both front wheels about one-half inch off the plates (fig. 41).

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Figure 41 — Marking Wheel Run-out

FRONT AXLE

c. Check Wheel Run-out.

(1) Before checking camber it is necessary to check front wheel run-out (wobble) because camber cannot be accurately checked if the wheel does not run true. The caster, camber, and kingpin gage used to check camber cannot give an accurate check if the gage is placed against any portion of the wheel that is bent or out of line.

(2) To check wheel run-out, hold a piece of chalk so that it is just about to touch the rim of the wheel and spin the wheel by hand (fig. 41), using any piece of stick or rod to support the hand and hold it steady. The point where the chalk marks the wheel rim is where the wheel is bent or wheel run-out exists. If wheel run-out is over one-sixteenth inch, replace it before proceeding with the camber test.

d. Checking Camber.

(1) If run-out is less than one-sixteenth inch, stop the wheel so that the section of the wheel marked with chalk is at the rear.

(2) Make certain wheels are in a straight-ahead position, and remove the turning radius plate locking screws (fig. 41).

(3) Release the hydraulic jacks, allowing the front wheels to rest on the center of the plates (fig. 41). The plates will move a little when the screws are removed.

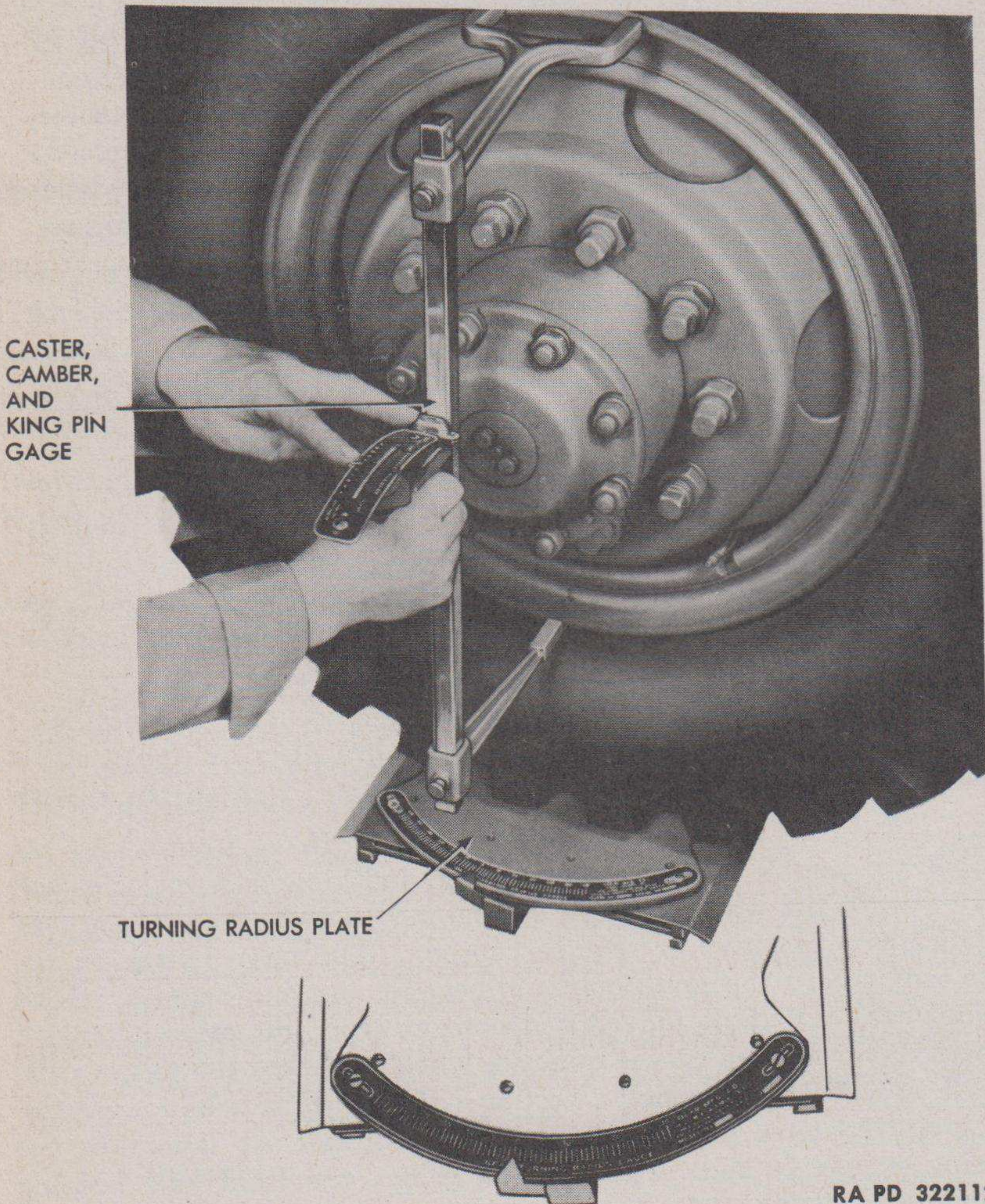
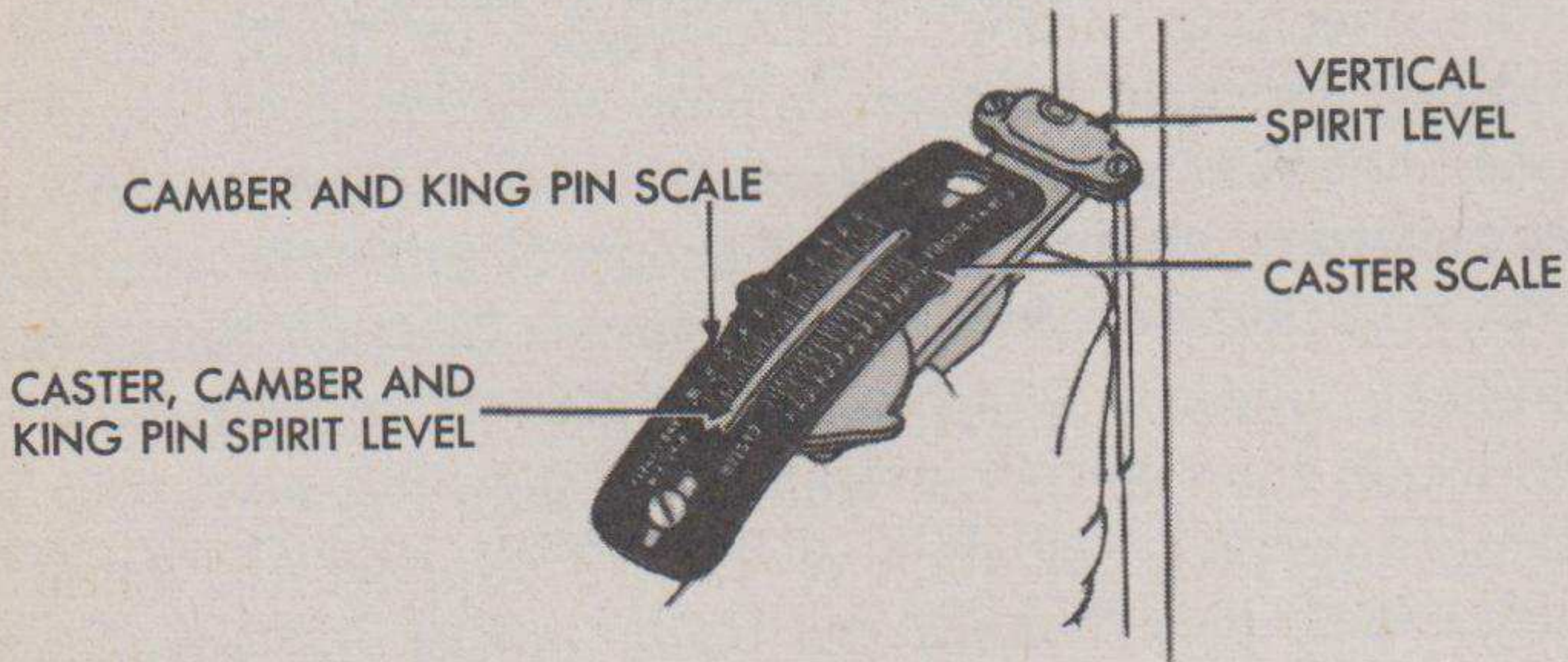
(4) Hold the caster, camber, and kingpin gage against the wheel (fig. 42), with feet of gage adjusted up or down so that they touch the wheel rim.

(5) Observe the bubble in the vertical spirit level (fig. 42), and move the gage clockwise or counterclockwise until the bubble shows the gages to be vertical.

(6) Next, loosen the screws in the camber and kingpin scale (fig. 42), and slide the scale in or out until zero on the scale is opposite the red line at the side of the scale. Tighten the screws.

e. Reading Camber and Kingpin Scale. If the front wheel has camber, the bubble in the caster, camber, and kingpin spirit level will move toward the wheel. If the bubble moves away from the wheel, it indicates a negative or reverse camber. The large marks on the scale are degrees, the small marks in between are half-degrees. Read the degrees the bubble moved and note in which direction it moved. Repeat this operation on the opposite wheel and note the degrees the bubble moved and in which direction. If the inspections covered in paragraph 63 have been made and all conditions are favorable, the reading should be zero degree. If it is not, the front axle housing probably is sprung and must be straightened or replaced to obtain the zero reading.

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Figure 42 — Checking Camber

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f. **Camber Adjustment.** Replace front axle housing if necessary and recheck camber and wheel run-out.

65. CHECKING CASTER OF FRONT WHEELS.

a. **General.** The caster of front wheels is obtained by tilting the front axle backward at the top and forward at the bottom. This tilting is engineered into the front axle at manufacture and is obtained by the proper relation of the spring seat on the axle to the front springs. Correct caster makes steering easy because it provides a pivot ahead of the contact point of the wheel. Too much negative or positive caster makes steering difficult.

b. **Preliminary.**

- (1) Drive on the two turning radius plates.
- (2) The front wheels must rest on the center of the turning radius plates (fig. 68) in a straight-ahead position.
- (3) Install the pedal depressor tool on the brake pedal, locking the brakes on the front wheels.
- (4) Remove the two locking screws (fig. 41) from each turning radius plate.

c. **Adjust Turning Radius Plates.** The turning radius plates will always move a little when the locking screws are removed. To correct this movement, loosen the screws that hold the turning radius plate scale to the plate, then slide the scale in either direction to bring the zero in line with the pointer at the side of the scale, and tighten the screws.

d. **Check Caster of Right Front Wheel.**

- (1) Check the caster on the right front wheel by turning the steering wheel as though you were making a left turn. Turn until the turning radius plate scale reads 20 degrees.
- (2) Hold the caster, camber, and kingpin gage against the wheel (fig. 43). The feet of the gage should be adjusted up or down so that they touch the wheel rim.
- (3) Observe the bubble in the vertical spirit level (fig. 43), and move the gage clockwise or counterclockwise until the bubble shows the gage to be vertical.
- (4) Loosen the screws in the caster scale. Push the caster scale in or out until zero on the caster scale is opposite the bubble of the caster, camber, and kingpin spirit level (fig. 43). Tighten the screws.
- (5) Remove the gage from the right wheel, but do not alter the position of the caster scale. Turn the steering wheel as though making a right turn until the turning radius plate scale reads 20 degrees.
- (6) Place the caster, camber, and kingpin gage against the right wheel again. The caster, camber, and kingpin spirit level bubble

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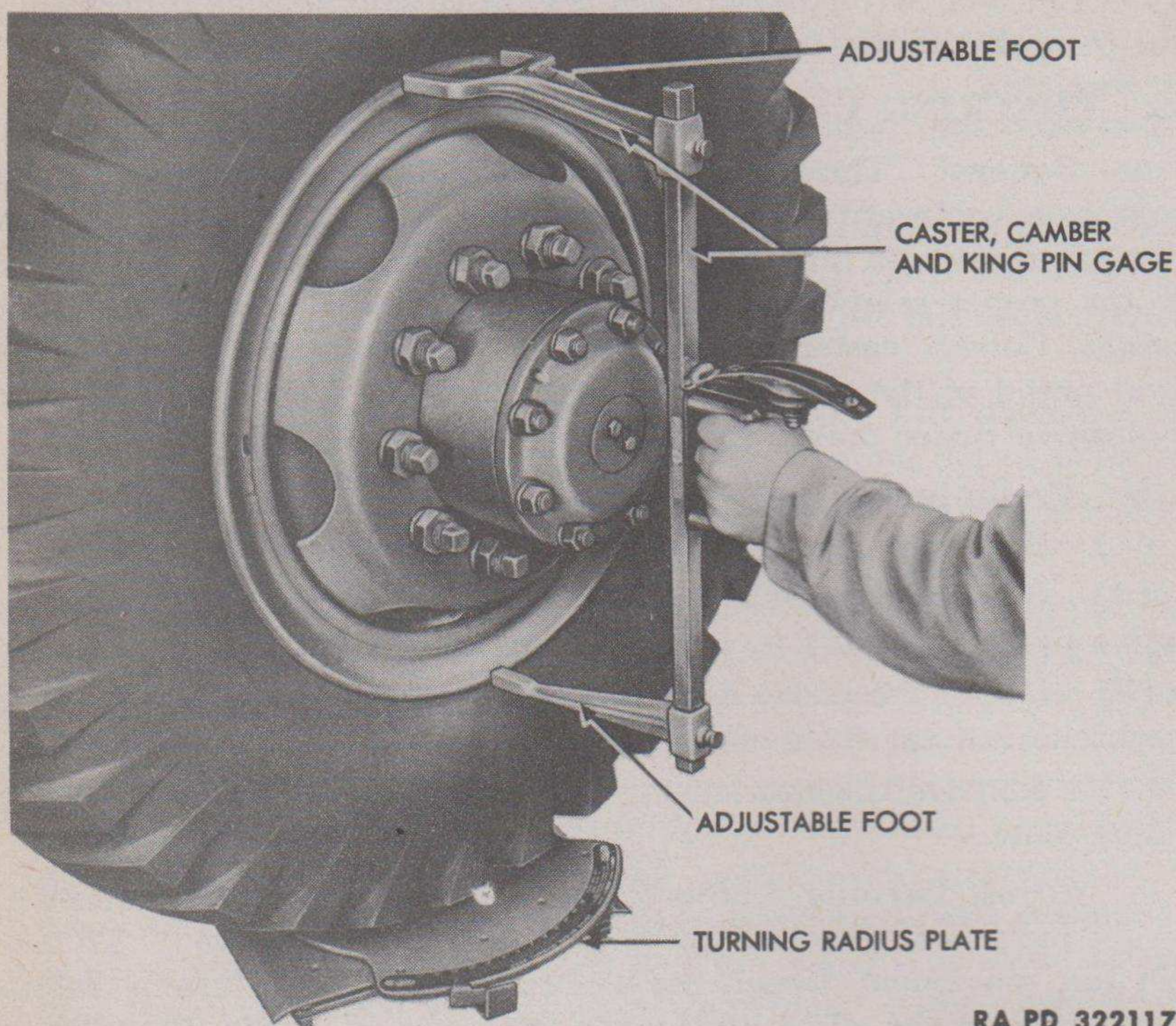


Figure 43 — Checking Caster

will move. When the bubble moves toward the wheel, the wheel has a positive caster. When the bubble moves away from the wheel, it indicates a negative or reverse caster. The large marks on the scale are degrees; the small marks in between are half-degrees. Read the degrees the bubble moved on the caster scale. The degree mark that is opposite the center of the bubble is the amount of caster in the right wheel.

e. **Check Caster of Left Front Wheel.** Repeat the above operation on the left wheel, starting with the left wheel turned as though making a right turn.

f. **Caster Adjustment.** The correct amount of caster is indicated by a reading of exactly 5 degrees. If the caster is incorrect, loosen the front spring U-bolts, pry loose the front axle from the front spring, and adjust with shims (subpar. g, below).

g. **Installing Shim.**

(1) Correct adjustment is obtained by the use of special wedge-shaped shims of 1, 2, or 3 degree thickness. Now insert a wedge-

FRONT AXLE

shaped shim, thick end first, so that the groove in the shim fits around the spring center bolt. The shim is inserted from the front to tilt the axle backward and from the rear to tilt the axle forward. Tilting the axle backward increases caster, and tilting it forward decreases caster.

(2) Again check caster with the caster, camber, and kingpin gage. Change thickness of wedge if 5-degree reading is not obtained.

(3) Always check the camber after adjusting caster.

66. CHECKING TURNING RADIUS.

a. General.

(1) Turning radius (also called toe-out on curves) determines the circles that the front wheels make in completing a right or left turn. The inside wheel turns at a sharper angle and rolls around in a smaller circle than the outer wheel.

(2) Turning radius is built in at manufacture by the installation of two turning radius set screws on the front axle. These set screws serve as stoppers to limit the turning arc of the wheels to the right or left. The screws are adjustable, and the setting can be altered by loosening nut and turning the screw to reduce turning radius. It is necessary to check the turning radius to discover whether or not either of the two knuckle steering arms is bent. If the check shows the turning radius to be incorrect, one or both of the knuckle steering arms must be straightened or replaced.

b. Preliminary.

(1) Drive on the two turning radius plates. The front wheels must rest on the center of the turning radius plates in a straight-ahead position.

(2) Remove the two turning radius plate locking pins from each plate.

(3) Loosen the screws holding the turning radius plate scale to the plate. Then slide the scale in either direction to bring the zero in line with the pointer at the side of the scale. Tighten the screws.

c. Checking Left Turning Radius.

(1) Turn the steering wheel to the left until turning radius plate scale under right wheel reads 20 degrees.

(2) Now read the scale on the turning radius plate under the left wheel. It should read $22\frac{1}{2}$ degrees, with an allowable variation of plus 10 degrees. No minus degree variation is permissible. If the reading varies from these limits, the knuckle steering arm on the right side is bent.

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(1) Turn the steering wheel to the right until the turning radius plate scale under the left wheel reads 20 degrees ahead of the zero mark on the scale.

(2) Now read the scale on the turning radius plate under the right wheel. It should read 22½ degrees, with an allowable variation of plus 1 degree. No minus degree variation is permissible. If the reading varies from these limits, the knuckle steering arm on the left side is bent.

e. Turning Radius Adjustment. If possible, replace bent knuckle steering arms with new knuckle steering arms. If new knuckle steering arms cannot be obtained, the bent arms can be straightened cold or hot. Straighten the bent arm until the distance from the knuckle ball on the steering arm to the wheel or brake backing plate measures the same as the opposite arm. As a further check, measure the distance from the arm to the frame or any other convenient point from which a measurement can be made. If both steering arms are bent, make frequent checks on the turning radius plates while the arms are being straightened. When the arms are straight, the turning radius plates will show the correct turning radius. **NOTE:** *For cold and hot straightening, see paragraph 68.*

67. CHECKING KINGPIN INCLINATION ANGLE.

a. General. Kingpin inclination is the outward tilt at the bottom of the kingpins in the trunnion socket. The inclination is set at manufacture in order to counteract the camber angle and help put the center of the tire tread in contact with the road. There is no adjustment of kingpin inclination angle. The check is made to show whether the steering knuckle is bent, or whether the knuckle bearings are worn.

b. Preliminary.

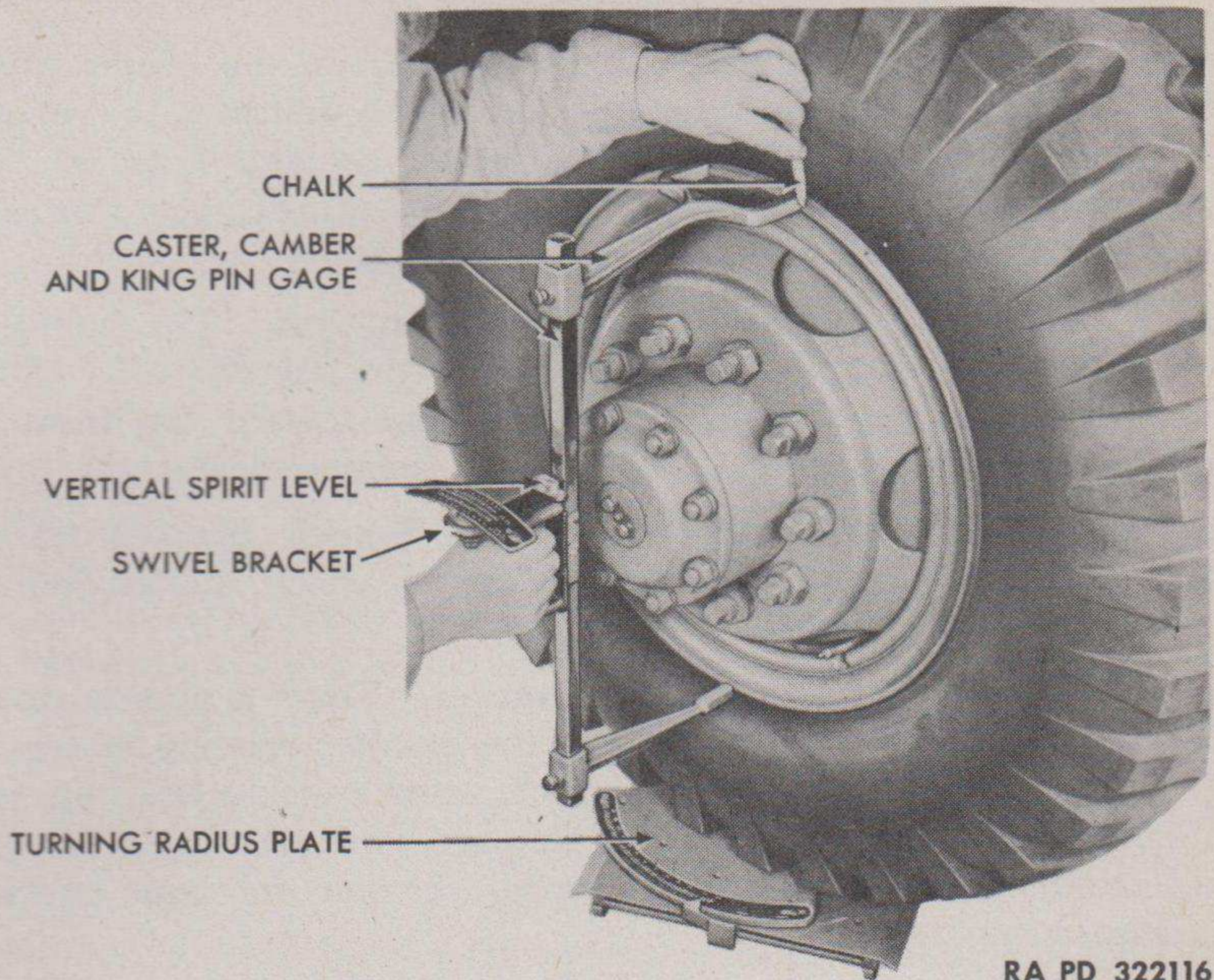
(1) Drive on two turning radius plates. The front wheels must rest on the center of the turning plate in a straight-ahead position.

(2) Remove the two turning radius plate locking pins from each plate.

(3) Install the pedal depressor tool on the brake pedal, locking the brakes on the front wheels.

c. Adjust Turning Radius Plates. Loosen the screws holding the scale to the plate; then turn the scale in either direction to bring the zero on the scale in line with the pointer at the side of the scale in place.

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Figure 44 – Checking Kingpin Inclination

d. **Set Wheels for Right Turn.** Turn the steering wheel to the right until it cannot be turned any further; then turn back until the turning radius plate scale under the right wheel reads 25 degrees. This will take up any existing slack in the front wheel braking system.

e. **Check Kingpin Inclination on Right Wheel.** Place the caster, camber, and kingpin gage against the right wheel rim. Adjust the feet of the gage up or down so that they touch the wheel rim. Observe the bubble in the vertical spirit level, and move the gage clockwise or counterclockwise until the bubble in the level shows the gage to be vertical. Turn the swivel bracket so that the camber and kingpin scale is parallel to the wheel. Loosen the screws in the camber and kingpin scale and slide the scale until zero on the scale is opposite the center of the scale spirit level bubble. Tighten the screws. Mark with chalk the location of the feet of the gage at the top and bottom of the wheel rim. Remove the gage from the wheel, being careful not to alter the position of the camber and kingpin scale. Turn the steering wheel to the left until the turning radius plate scale under the right wheel reads 25 degrees ahead of the zero mark on the scale. Place the feet of the caster, camber, and kingpin gage against the right wheel at the same spots previously marked with chalk. This time disregard the vertical spirit level, because the gage is not setting in a vertical position when reading kingpin in-

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clination. Read the number of degrees opposite the center of the bubble on the camber and kingpin scale, which indicates the amount of kingpin inclination. The reading should be zero degrees. The large marks on the camber and kingpin scale are degrees; the small marks in between are half-degrees.

f. **Positive and Negative Kingpin Inclination.** The bubble in the camber and kingpin scale will move toward the rear of the wrecker for positive kingpin inclination, and toward the front for negative inclination.

g. **Check Kingpin Inclination of Left Wheel.** Repeat the procedure outlined in the previous six steps to check the kingpin inclination of the left wheel.

h. **Adjustment of Kingpin Inclination.** There is no adjustment for incorrect kingpin inclination. If the camber reading is correct, but the kingpin inclination is incorrect, worn knuckle bearings or a bent steering knuckle is indicated. Replace worn bearings. If available, install new steering knuckle as replacement for bent knuckle; otherwise straighten it.

68. STRAIGHTENING BENT AXLE PARTS.

a. **Procedure.** The following straightening operations should be performed only in an emergency or when replacement parts are not available. In all cases, replace parts at the first opportunity.

(1) **COLD STRAIGHTENING.** If possible, all bending should be done cold (without any heat being applied to the part), because in this way all hardening or tempering of the part is retained. However, cold bending more than 1 degree is unsafe because it may cause a fracture of the steel. Cold straightening also varies with the ductility of the heat-treated part. Thus axle shafts, which possess little ductility, are almost impossible to straighten; axle housings and steering knuckles, which possess greater ductility, can be straightened.

(2) **HOT STRAIGHTENING.** An acetylene torch or an electric arc must be carefully used when heating a bent part, because overheating will reduce the strength of the part by as much as 90 percent. Always use the lowest heat possible to accomplish the straightening. Do not heat knuckle steering arms, axle housings, and steering knuckles over 1,200° F, which corresponds to a very dull red, barely perceptible in the daytime and dull in the dark. All heated parts must be quenched and tempered, and not allowed to cool in the air. The type of quenching and tempering must be decided by someone experienced in heat treating. Inspect each heat-treated part for hardness after straightening.

CHAPTER 9
REAR AXLE

Section I
DESCRIPTION AND DATA

69. DESCRIPTION AND OPERATION.

a. **Description** (fig. 45). This rear axle is the double-reduction type in which the first reduction is obtained through a set of spiral bevel gears and the second through a set of straight spur gears. The entire gear set is mounted in a carrier (fig. 49) and is detachable from the axle housing as a unit. The spur pinion, through shaft, and differential are mounted on roller bearings, the bevel gear being pressed on the hub of the spur pinion and locked in position with a key. The differential and spur gear are mounted between cast legs on the carrier. They are supported by opposed tapered roller bearings held in place by adjusting rings and locks. The differential assembly (fig. 50) is composed of two halves with the spur gear attached to case flanges by means of bolts, castle nuts, and cotter pins. The inner surfaces of both halves of the differential case are recessed to provide a seat for the differential spider on which the pinion and side gears are mounted (fig. 51). The through shaft and bevel pinion gear are mounted on tapered roller bearings. The rear bearing is pressed directly on the shaft and the front bearing is pressed on the hub of the bevel pinion gear, which in turn is pressed on splines of through shaft. The axle housing (fig. 48) is a large 1-piece steel casting with inserted sleeves which carry the weight and provide for a full floating drive.

b. **Operation.** Power is taken from the rear drive shaft by the through shaft bevel pinion through the drive flange. From the through shaft pinion, power is transmitted to the bevel gear which in turn rotates the differential case and spider pinion gears. Spider pinion gears rotate as a unit and transmit motion to side gears and thence to axle shafts to which pinion side gears are splined. Motion is transmitted by axle shafts to wheel hubs to which flanges on ends of axle shafts are attached.

70. DATA.

a. **Rear Axle Assembly.**

Make	Timken
Model	R-3100-W-X-2
Ratio	8.148 to 1
Type	Double-reduction, full-floating

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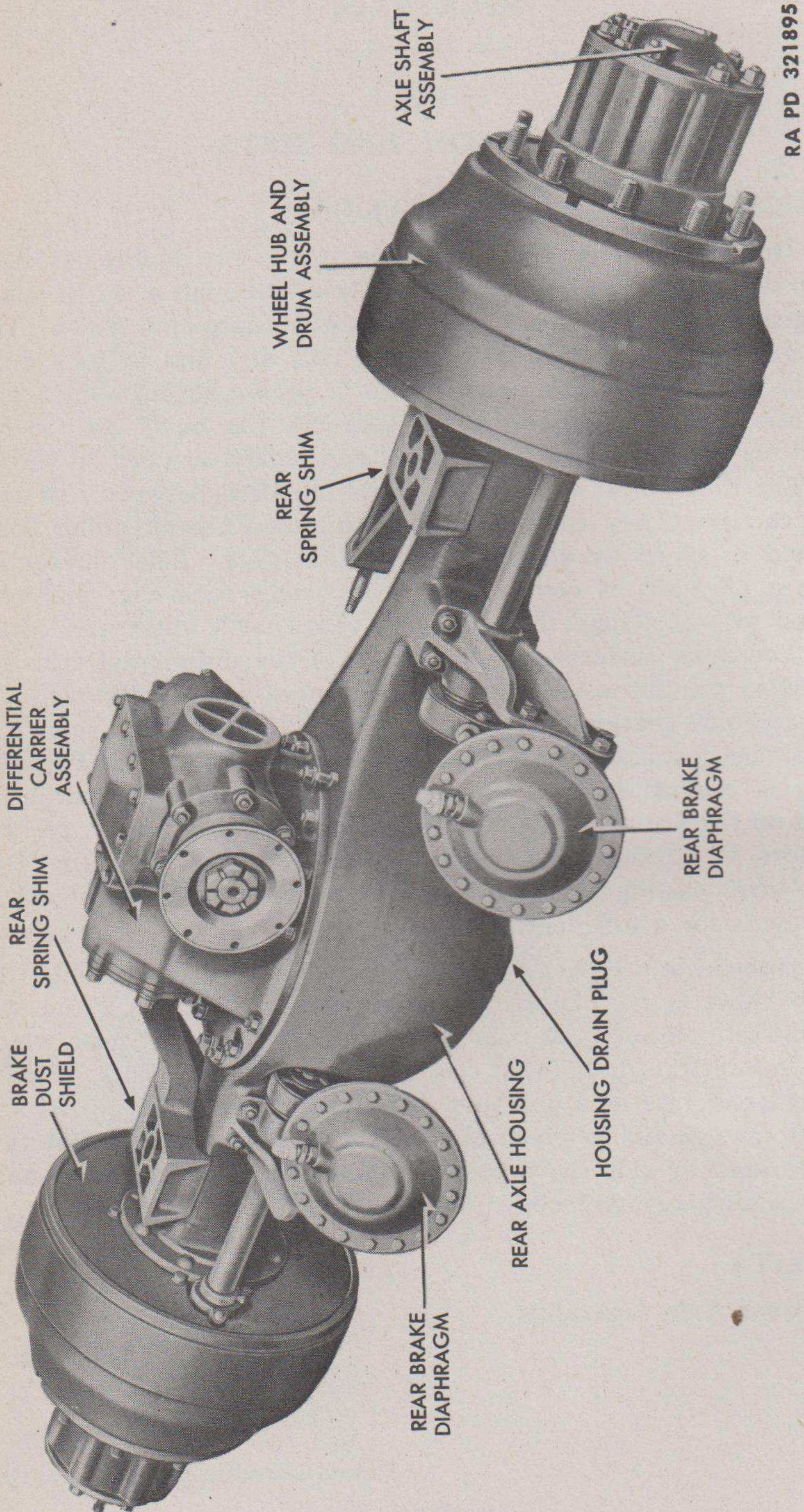
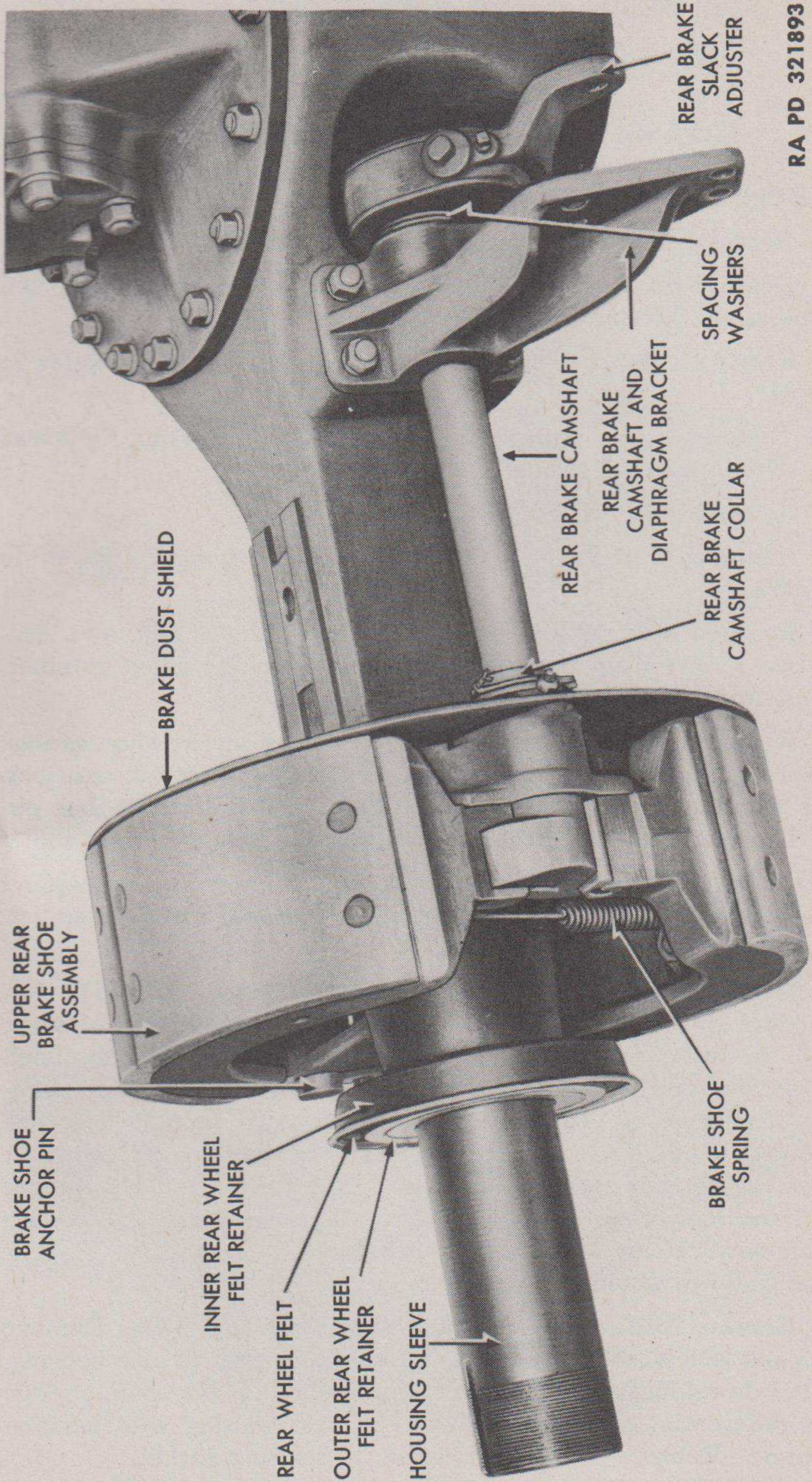


Figure 45 — Rear Axle Assembly Removed

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Figure 46 — Rear Brake Assembly — Wheel Hub and Drum Removed

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- a. **Remove Rear Axle Assembly.** Refer to TM 9-817.
- b. **Drain Rear Axle (fig. 45).** Remove housing drain plug and drain lubricant. Remove lubrication fittings.
- c. **Remove Rear Brake Diaphragms (fig. 45).** Refer to TM 9-817.
- d. **Remove Rear Spring Shims (fig. 45).** Tap left and right rear spring shims off axle housing.
- e. **Remove Axle Shaft.** Refer to TM 9-817.
- f. **Remove Wheels, Wheel Hubs, and Bearings.** Refer to TM 9-817.
- g. **Remove Rear Wheel Felt and Felt Retainers (fig. 46).** Remove two screws from outer felt retainer. Slide rear felt retainer, felt, and front retainer off axle housing sleeve.
- h. **Remove Brake Shoes (fig. 46).** Release brake shoe springs from spring pins and remove springs. Remove cap screw and lock washer securing brake shoe anchor pin lock, and tap out anchor pin lock. Tap out top and bottom anchor pins and lift off brake shoes.
- i. **Remove Brake Dust Shields (fig. 46).** Remove cap screws and lock washers attaching top and bottom dust shields to brake spider. Lift off dust shields.
- j. **Remove Brake Slack Adjuster and Camshaft (fig. 46).** Remove cotter pin and slack adjuster washer. Mark position of slack adjuster in relation to camshaft splines with chalk or light punch marks to facilitate assembly. Remove lock wire and back off camshaft collar screw two turns. Tap camshaft until enough clearance is obtained to lift slack adjuster and spacing washers off camshaft splines; then tap camshaft out of its seat in camshaft and diaphragm bracket and rear brake spider. *NOTE: Components and procedure for their removal are identical for either side of rear axle. Repeat steps as outlined above for opposite side.*
- k. **Remove Differential Carrier Assembly (fig. 47).** Remove 16 nuts and lock washers attaching differential carrier to axle housing. Pry out 1 dowel located on carrier to housing stud. Tie chain or rope around differential carrier and lift out of axle housing with hoisting equipment. Remove differential carrier to housing gasket.

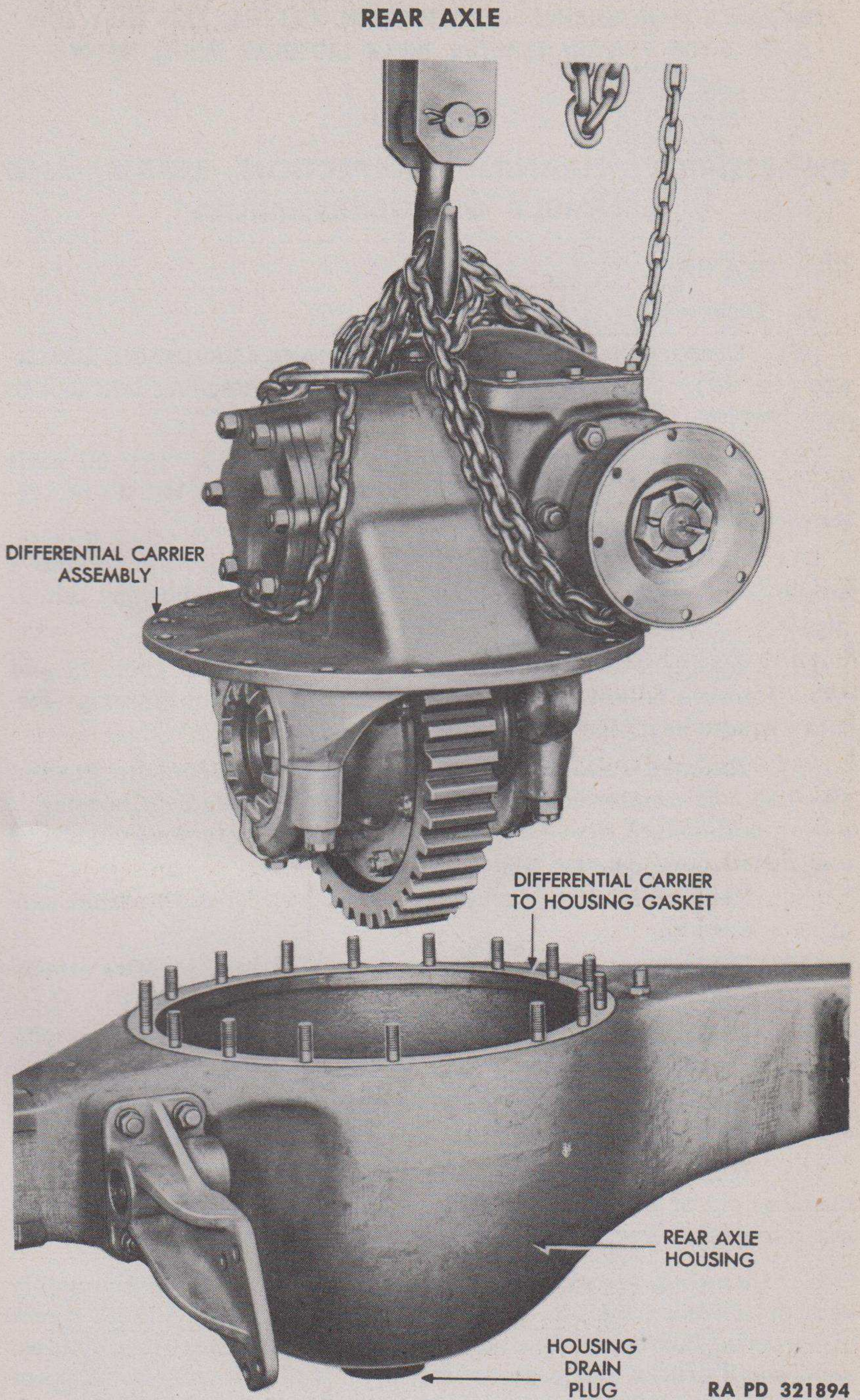


Figure 47 — Removing Differential Carrier Assembly

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Section III

**DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES**

72. HOUSING.

a. Disassembly.

(1) REMOVE REAR BRAKE CAMSHAFT AND DIAPHRAGM BRACKETS (fig. 48). Remove nuts and lock washers attaching brackets to axle housing. Lift off brackets.

(2) REMOVE AXLE SHAFT OIL SEALS (fig. 48). Pry oil seals out of housing sleeves if seals are damaged or worn, but do not remove them if in good condition.

(3) REMOVE HOUSING BREATHER NIPPLE (fig. 48). Remove nipple from axle housing, and back breather nipple bushing out of nipple.

(4) REMOVE HOUSING DRAIN AND FILLER PLUGS (figs. 45 and 48). Remove hollow-head drain plug from bottom of housing. Remove square-head filler plug from rear of housing.

(5) REMOVE REAR BRAKE SPIDER AND AXLE HOUSING SLEEVE (fig. 48). It usually is advisable to replace the complete housing if a worn or damaged sleeve is found. If necessary to remove old sleeve and install new one, use the following procedure:

(a) Remove housing sleeve retaining screw (fig. 48) from side of axle housing.

(b) Remove six rivets, two cap screws, and lock washers attaching rear brake spider to axle housing (fig. 48).

(c) Using an axle housing sleeve puller, pull housing sleeve with attached brake spider out of rear axle housing (fig. 48).

(d) Place housing sleeve in arbor press and press off rear brake spider.

(6) REMOVE REAR BRAKE SPIDER BUSHINGS (fig. 48). Tap bushings out of seat in brake spider if replacement is required, but do not remove otherwise.

b. Cleaning, Inspection, and Repair. Wash all parts thoroughly with dry-cleaning solvent, using a stiff brush and removing all traces of hardened lubricant. Examine axle housing for cracks or fractures; weld small cracks, but replace housing if badly fractured. Inspect axle shaft oil seals while installed in housing. If inner diameter is out of shape or felt is loose or flabby, remove oil seals and install new

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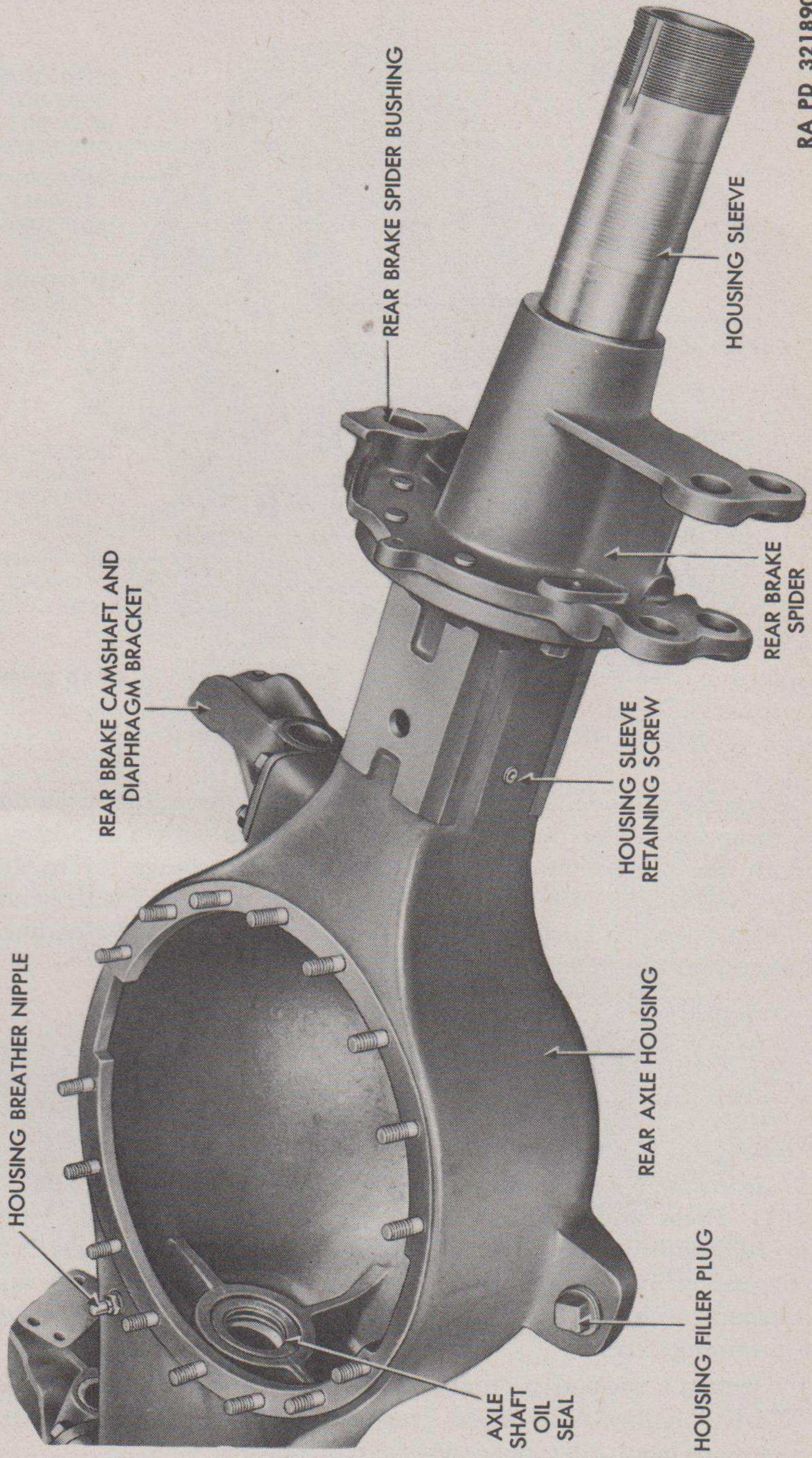


Figure 48 - Rear Axle Housing and Sleeve Assembly

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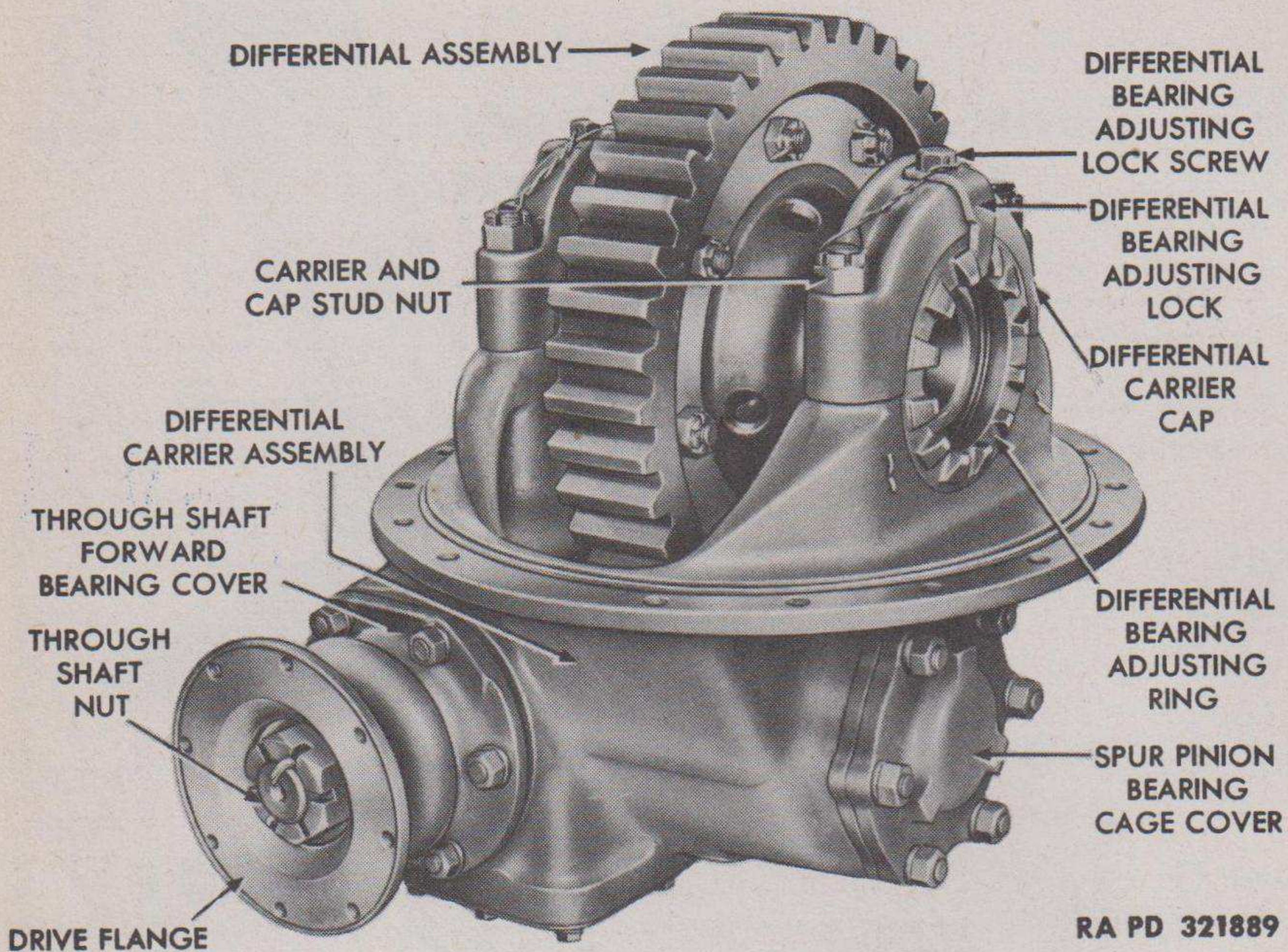


Figure 49 — Differential Carrier Removed

seals. Examine threaded openings in housing and threads on breather nipple, drain, and filler plugs. Remove light burs with a handstone or smooth file. Examine edges of brake spider bushings for roughness, burs, and ridges. Remove burs and light score marks with handstone. Replace worn bushings which show an excess radial clearance when brake camshaft is installed.

c. Assembly.

(1) **INSTALL REAR BRAKE SPIDER BUSHINGS** (fig. 48). Carefully press bushings into brake spider with an arbor press. Break sharp edges of bushings and remove burs resulting from pressing operation.

(2) **INSTALL REAR BRAKE SPIDER AND AXLE HOUSING SLEEVE** (fig. 48). Press brake spider into position on axle housing sleeve. Line up rivet and bolt holes in spider with holes in axle housing, and drive the assembly into axle housing. Install rivets, cap screws, and lock washers securing assembly to axle housing. Install housing sleeve retaining screw.

(3) **INSTALL HOUSING DRAIN AND FILLER PLUGS** (figs. 45 and 48). Thread hollow-head drain plug into bottom of axle housing. Thread square-head filler plug into rear of housing.

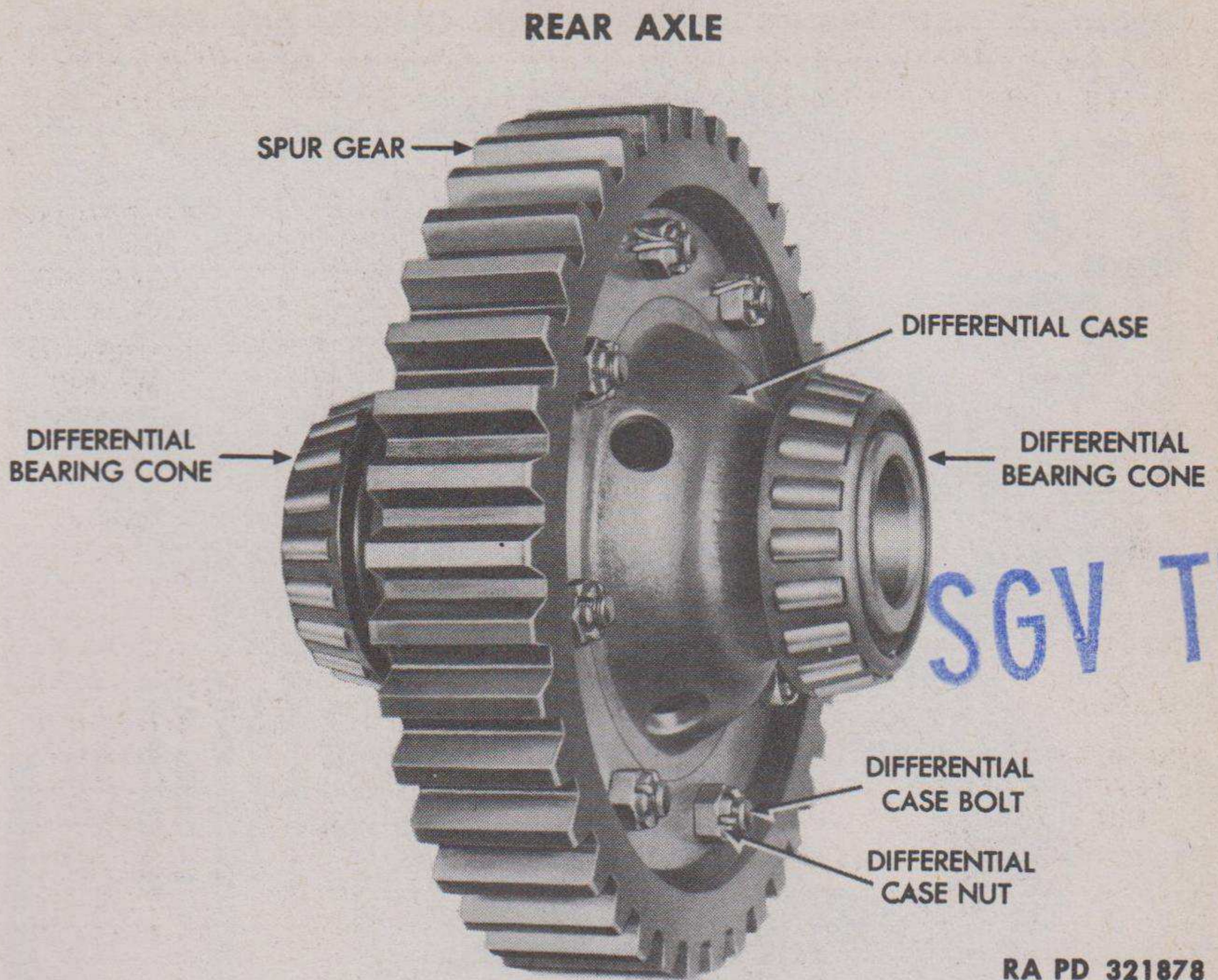


Figure 50 – Differential Removed

(4) **INSTALL HOUSING BREATHER NIPPLE** (fig. 48). Thread breather nipple into nipple bushing. Thread this assembly into top of axle housing.

(5) **INSTALL AXLE SHAFT OIL SEALS** (fig. 48). Tap oil seals into position in axle housing.

(6) **INSTALL REAR BRAKE CAMSHAFT AND DIAPHRAGM BRACKETS** (fig. 48). Attach brackets to axle housing by installing lock washers and stud nuts.

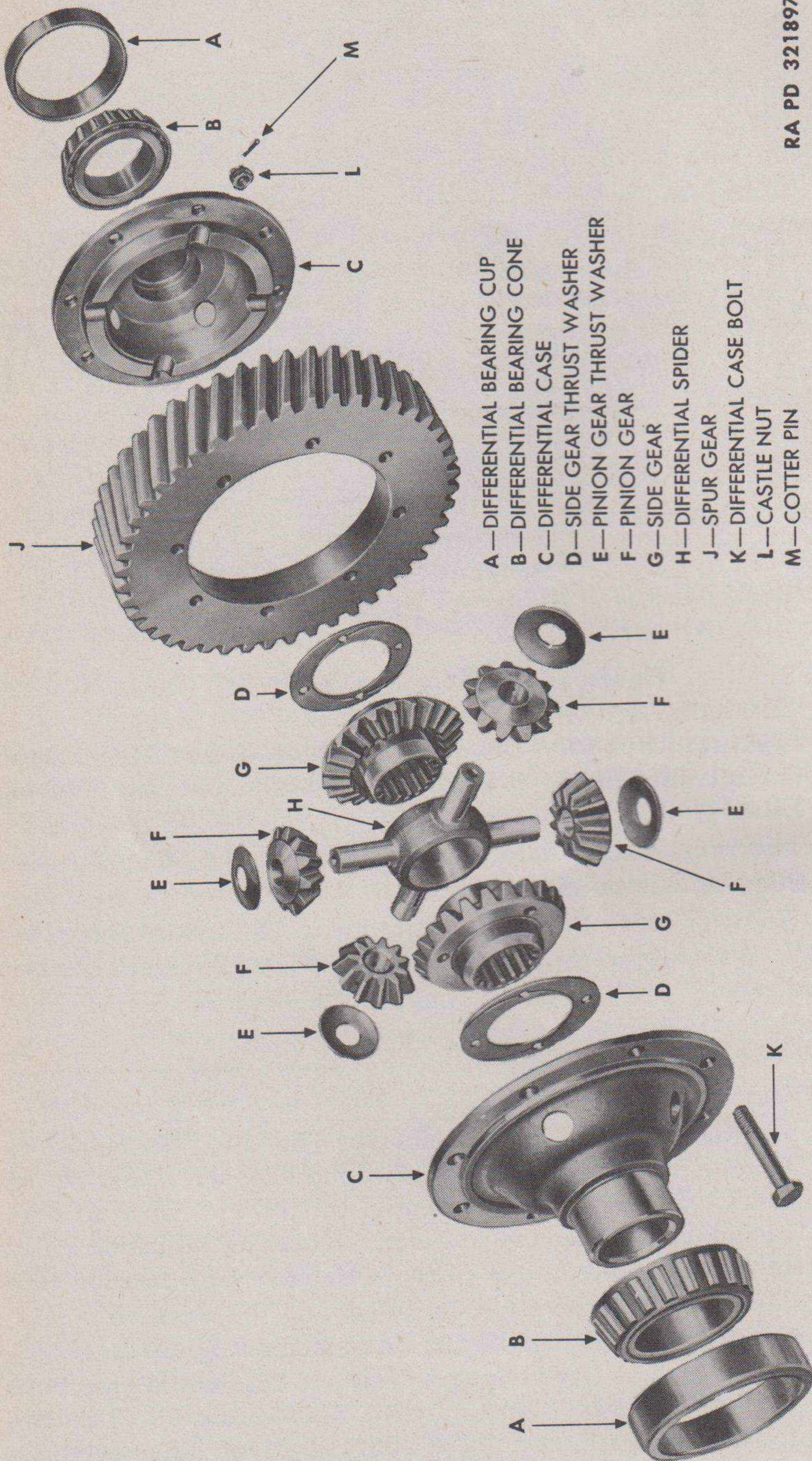
73. DIFFERENTIAL CARRIER.

a. Disassembly.

(1) **REMOVE DIFFERENTIAL ASSEMBLY** (fig. 49). Remove lock wires. Remove differential bearing adjusting lock screw and lift off adjusting lock. Remove four differential carrier and cap stud nuts. Lift off carrier caps. Remove differential bearing adjusting rings. Lift differential assembly out of carrier. Remove both bearing cups which will be free when assembly is lifted.

(2) **DISASSEMBLE DIFFERENTIAL ASSEMBLY** (fig. 50 and 51). Remove cotter pins and castle nuts. Tap out differential case bolts and lift off the thin case with attached bearing cone. (The two halves of the differential case have bolt flanges of different thick-

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Figure 51 — Differential Disassembled

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nesses.) Place assembly on bench with open end up and lift out side gear thrust washer and side gear. Lift with a screwdriver and remove the spider and pinion gears and the remaining side gear and thrust washer. Tap opposite side case with attached bearing cone out of differential spur gear. Using replacer 41-R-2384-165, pull bearing cones from both halves of case.

(3) **REMOVE TOP COVER AND INSPECTION PLUG** (fig. 52). Remove lock wire attached to top cover and inspection plug. Remove cap screws and lock washers securing top cover to carrier case. Lift off top cover and gasket. Unscrew and lift off inspection plug, and remove inspection plug gasket.

(4) **REMOVE THROUGH SHAFT BEARING COVERS** (fig. 52). Through top cover opening, place a hardwood block or a soft piece of metal between bevel and pinion gear. Remove through shaft cotter pin and nut. Tap off drive flange and attached dust shield. Remove stud nuts and lock washers attaching forward bearing cover to carrier case. Lift off bearing cover, shims, and gasket. Remove stud nuts and lock washers attaching rear bearing cover to carrier. Lift off rear bearing cover, shims, and gasket.

(5) **REMOVE THROUGH SHAFT FORWARD BEARING COVER OIL SEAL** (fig. 52). Tap oil seal out of bearing cover if damaged, but do not remove otherwise.

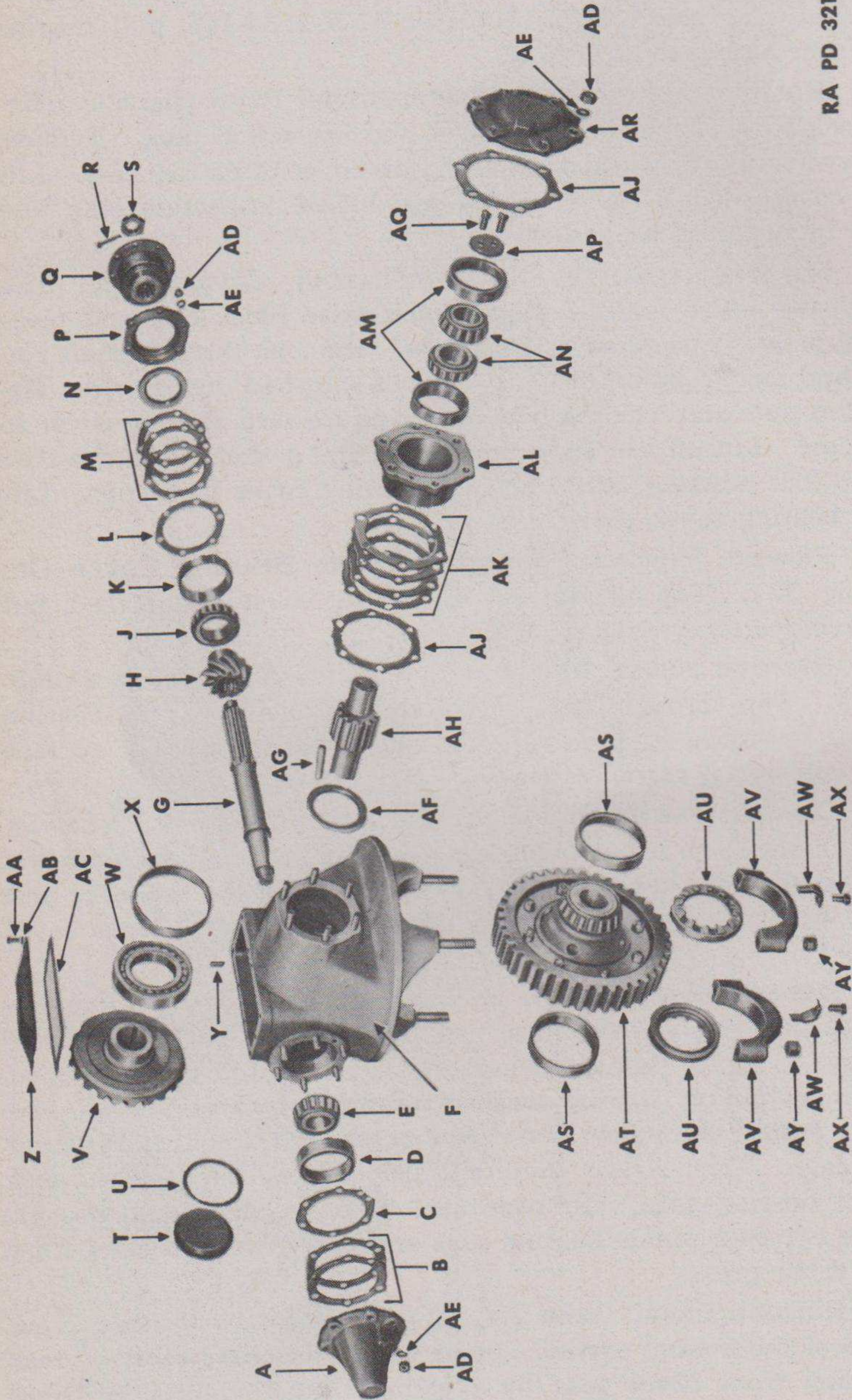
(6) **REMOVE BEVEL PINION AND THROUGH SHAFT ASSEMBLY** (fig. 52). Tap through shaft with bevel pinion gear, rear bearing cone, and front bearing cone and cup out of carrier case. Tap rear bearing cup out of carrier case.

(7) **DISASSEMBLE BEVEL PINION AND THROUGH SHAFT ASSEMBLY** (fig. 52). Using an arbor press, remove rear bearing cone which is pressed on shoulder at tapered end of shaft. Turn the assembly and press off bevel pinion and attached front bearing cone. Press bevel pinion out of bearing cone.

(8) **REMOVE SPUR PINION BEARING CAGE** (fig. 52). Remove stud nuts and lock washers attaching bearing cage cover to carrier case. Lift off cover shims and gasket. Remove lock wire attached to two spur pinion bearing washer screws. Remove screws and washers. Install two puller screws into threaded holes in spur pinion bearing cage. Turn screws simultaneously against carrier case, and draw out bearing cage with bearings. Remove shims and gasket. Press the two spur pinion bearing cups and cones out of bearing cage with an arbor press.

(9) **REMOVE BEVEL GEAR** (fig. 52). Remove bevel gear screw from top of differential carrier. Place carrier in arbor press. Press spur pinion from bevel gear by pressing through inspection plug opening in carrier. Lift out bevel gear with bearing, bearing spacer,

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Figure 52 — Differential Carrier Disassembled

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- A—THROUGH SHAFT REAR BEARING COVER
- B—THROUGH SHAFT REAR BEARING COVER SHIMS
- C—THROUGH SHAFT REAR BEARING COVER GASKET
- D—THROUGH SHAFT REAR BEARING CUP
- E—THROUGH SHAFT REAR BEARING CONE
- F—DIFFERENTIAL CARRIER
- G—THROUGH SHAFT
- H—BEVEL PINION
- J—THROUGH SHAFT FORWARD BEARING CONE
- K—THROUGH SHAFT FORWARD BEARING CUP
- L—THROUGH SHAFT FORWARD BEARING COVER GASKET
- M—THROUGH SHAFT FORWARD BEARING COVER SHIMS
- N—THROUGH SHAFT FORWARD BEARING COVER OIL SEAL
- P—THROUGH SHAFT FORWARD BEARING COVER
- Q—DRIVE FLANGE
- R—THROUGH SHAFT NUT COTTER PIN
- S—THROUGH SHAFT NUT
- T—DIFFERENTIAL CARRIER INSPECTION PLUG
- U—DIFFERENTIAL CARRIER INSPECTION PLUG GASKET
- V—BEVEL GEAR
- W—BEVEL GEAR BEARING
- X—BEVEL GEAR BEARING SLEEVE
- Y—BEVEL GEAR SCREW
- Z—DIFFERENTIAL CARRIER TOP COVER
- AA—CAP SCREW
- AB—LOCK WASHER
- AC—DIFFERENTIAL TOP COVER GASKET
- AD—NUT
- AE—LOCK WASHER
- AF—BEVEL GEAR BEARING SPACER
- AG—BEVEL GEAR KEY
- AH—SPUR PINION
- AJ—SPUR PINION BEARING CAGE AND COVER GASKET
- AK—SPUR PINION BEARING SHIMS
- AL—SPUR PINION BEARING CAGE
- AM—SPUR PINION BEARING CUP
- AN—SPUR PINION BEARING CONE
- AP—SPUR PINION BEARING WASHER
- AQ—SPUR PINION BEARING WASHER SCREWS
- AR—SPUR PINION BEARING CAGE COVER
- AS—DIFFERENTIAL BEARING CUP
- AT—DIFFERENTIAL ASSEMBLY
- AU—DIFFERENTIAL BEARING ADJUSTING RING
- AV—DIFFERENTIAL CARRIER CAP
- AW—DIFFERENTIAL BEARING ADJUSTING LOCK
- AX—DIFFERENTIAL BEARING ADJUSTING LOCK SCREW
- AY—DIFFERENTIAL CARRIER CAP NUT

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and bearing sleeve. Remove bevel gear key from spur pinion. Support bevel gear in a vise and remove bearing from hub of bevel gear with a bearing puller.

b. Cleaning, Inspection, and Repair. Wash all parts thoroughly in dry-cleaning solvent before inspection, immerse bearings in a clean solution until hardened lubricant is removed. Rotate bearings slowly under surface of dry-cleaning solvent. When bearings are clean, dry them with compressed air directed across and through bearings so unlubricated bearings do not spin. Inspect rollers and bearing cups for chipping, cracks, or worn spots, replacing bearings if such defects are found. Do not attempt repairs on bearings other than removal of light burs with a handstone. After inspection, dip bearings in lubricant and store in clean, covered containers, or wrap in clean paper. Check all gears for chipped, cracked, or scored teeth. If bevel pinion gear on through shaft is damaged, replace both bevel pinion and bevel gear. Check fit of differential pinion gears on spider. If damaged pinion gear is found, a new set of four gears must be installed. Examine differential side gears for damaged teeth and determine if gear hubs fit properly in halves of differential case. If gears are worn or damaged, replace the set. Inspect thrust washers for wear, and replace worn washers. Inspect through shaft forward bearing cover oil seal for misshapen inner diameter and looseness of packing before removal from bearing cover. Do not remove if seal is not damaged. Examine axle shafts for evidence of twisting at either end, noting condition of splines. Replace shaft if splines are worn or damaged.

c. Assembly.

(1) **INSTALL BEVEL GEAR** (fig. 52). Press bevel gear bearing on hub of bevel gear. Tap bevel gear spacer against bearing. Install bevel gear bearing sleeve into carrier with slot in sleeve at top. Install bevel gear screw. Tap bevel gear key into keyway in spur pinion. Position bevel gear in carrier. Press spur pinion into bevel gear.

(2) **INSTALL SPUR PINION BEARING CAGE** (fig. 52). Press one of the two bearing cups into bearing cage. Place a new gasket and spur pinion bearing cage shims in position on studs; then press bearing cage to seat in carrier. Press each of the two bearing cones on spur pinion, the first with taper slanting toward spur pinion and the second with taper slanting away. Press outer bearing cone into bearing cage. Install spur pinion bearing washer and screws into end of spur pinion. Install lock wire through screwheads. Using new gasket, install bearing cage cover. Secure with lock washers and stud nuts. Check bearing adjustment (par. 75 a).

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(3) **ASSEMBLE BEVEL PINION AND THROUGH SHAFT ASSEMBLY** (fig. 52). Press through shaft rear bearing cone on through shaft. Press forward bearing cone on hub of bevel pinion and press this assembly on splined end of through shaft.

(4) **INSTALL BEVEL PINION AND THROUGH SHAFT ASSEMBLY** (fig. 52). Press through shaft rear bearing cup into seat in carrier. Insert through shaft assembly into carrier and install front bearing cup.

(5) **INSTALL THROUGH SHAFT FORWARD BEARING COVER OIL SEAL** (fig. 53). If oil seal has been removed, press a new seal into position in forward bearing cover.

(6) **INSTALL THROUGH SHAFT BEARING COVERS** (fig. 52). Place a new gasket and rear bearing cover shims in position on studs. Oilholes in gasket and shims must line up with oilholes in carrier. Install through shaft rear bearing cover with oil groove in cover alined with oilholes in shims. Secure cover to carrier with lock washers and cap screws. Place a new gasket and forward bearing cover shims in position on studs, and install forward bearing cover. Secure cover to carrier with lock washers and stud nuts. At this point, check bearing adjustment (par. 75 b) and tooth contact of bevel gear and pinion (par. 76). After adjustments have been made, tap drive flange onto splines of through shaft and install through shaft nut and cotter pin (fig. 52).

(7) **INSTALL TOP COVER AND INSPECTION PLUG** (fig. 52). Using new gaskets, install top cover and inspection plug. Install lock wire through a top cover cap screw head and drilled opening in inspection cover.

(8) **ASSEMBLE DIFFERENTIAL ASSEMBLY** (figs. 50 and 51). Using replacer 41-R-2384-165, install one of the differential bearing cones on hub of thin half of differential case. Rest case on bearing cone, place differential gear in position with flat side of gear down, and bolt holes in gear and case alined. Insert one side gear thrust washer and side gear into case. Next, place pinion gears and thrust washers on differential spider arms and install in mesh with side gear. Install remaining side gear and thrust washer. Press bearing cone on thick half of differential case and place assembly on differential gear with bolt holes alined. Tap differential case bolts into position with tapered ends of heads facing toward gear teeth. Install castle nuts and lock washers.

(9) **INSTALL DIFFERENTIAL ASSEMBLY** (figs. 49 and 52). Place carrier on a bench with large circular opening facing upwards. Place differential bearing cups on the bearing cones and lift assembly into position in carrier. Differential spur gear must mesh with spur pinion. Place bearing adjusting rings against bearings with threads in rings

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engaged with threads in carrier. Install carrier caps, making certain that threads in caps are properly engaged with threads in adjusting rings. Install carrier cap nuts. Check differential bearing adjustment (par. 75), and install bearing adjusting lock and lock screw. Install lock wire.

Section IV

ASSEMBLY OF REAR AXLE

74. ASSEMBLY OF REAR AXLE.

a. **Install Differential Carrier Assembly (fig. 47).** Place a new gasket in position on rear axle housing. Lower differential carrier assembly into rear axle housing with drive flange facing forward. Position 1 dowel on carrier to housing stud and install 16 lock washers and stud nuts securing differential carrier assembly to rear axle housing.

b. **Install Brake Camshaft and Slack Adjuster (fig. 46).** Slide camshaft through rear brake spider. Place camshaft collar on camshaft; then slide camshaft on through rear brake camshaft and diaphragm bracket. Install spacing washers and slack adjuster on end of camshaft, with marks made at time of disassembly on camshaft spline and slack adjuster aligned. Install slack adjuster washer and cotter pin. Push camshaft collar against brake spider and install collar screw and lock wire.

c. **Install Brake Shoes (fig. 46).** Position brake shoes on brake spider and install brake shoe anchor pins. Install anchor pin lock and secure with lock washer and cap screw. Install brake shoe springs.

d. **Install Brake Dust Shields (fig. 46).** Position top and bottom dust shields against brake spider. Attach dust shields to brake spider with lock washers and cap screws.

e. **Install Rear Wheel Felt and Felt Retainers (fig. 46).** Slide felt and retainers onto housing sleeve as a unit. Attach to rear brake spider with retainer screws.

f. **Install Wheel Bearings, Hub, and Wheels.** Refer to TM 9-817.

g. **Install Axle Shaft.** Refer to TM 9-817.

h. **Install Rear Brake Diaphragm.** Refer to TM 9-817.

REAR AXLE

- i. Install Rear Spring Shims (fig. 45). Tap left and right rear spring shims into position on axle housing.
- j. Lubricate Rear Axle Assembly. Refer to TM 9-817 for proper lubrication specifications.

Section V

TEST AND ADJUSTMENT

75. ADJUSTMENT OF BEARINGS.

a. **Spur Pinion Bearings** (fig. 52). These tapered roller bearings are adjusted by means of shims located between bearing cage and carrier. To adjust, remove shims until bearings bind; then add a 0.001-inch or a 0.002-inch shim to provide an adjustment of 0.000 inch to 0.002 inch, tight.

b. **Through Shaft Bearings** (fig. 52). Adjust through shaft bearings by removing shims under bearing covers to eliminate all play, and adjust to 0.000 inch to 0.002 inch, tight. Upon completion of bearing adjustment, check tooth contact by bevel gear and pinion (par. 76) and shift through shaft endways by adding or removing shims until correct tooth contact is obtained.

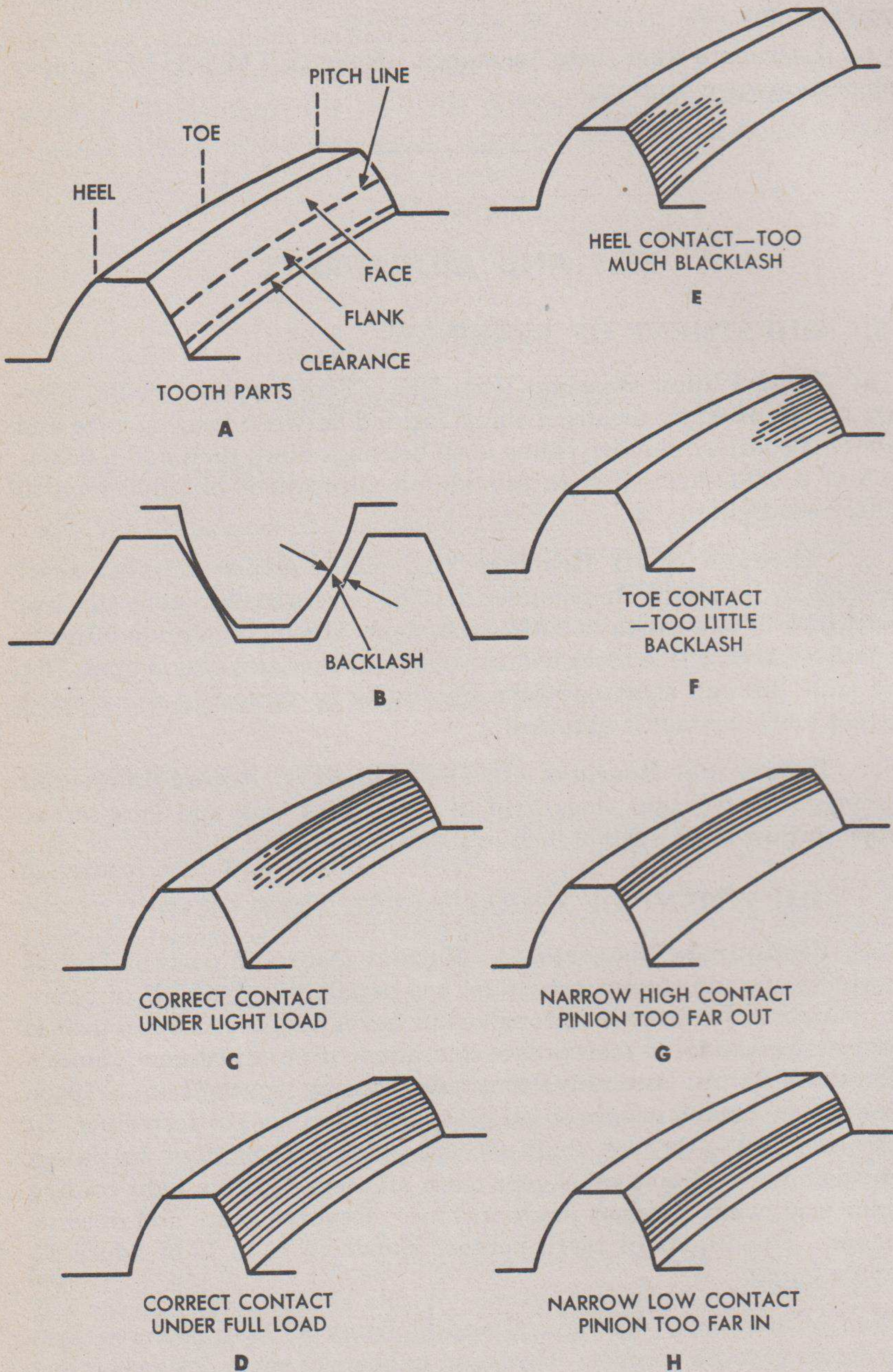
c. **Differential Bearings** (figs. 49 and 52). Adjust differential bearings with adjuster rings held in place by a lock and lock screw. Proper adjustment is 0.000 inch to 0.002 inch, tight.

76. ADJUSTMENT OF SPIRAL BEVEL AXLE GEARS.

a. **Preliminary Instructions.** Various gear tooth parts and terms referred to in adjustment procedure are detailed in A and B of figure 53. Proper adjustment of through shaft bevel pinion and bevel gear is absolutely essential to their proper operation. For adjustment, remove differential carrier assembly from axle housing (par. 71 k). Place assembly in a stand or vise so all gears and bearings are accessible. In a test set-up, the through shaft and spur pinion cages must be pulled tightly in place. Paint bevel gear teeth all around with a light coating of red lead, white lead, or prussian blue. Revolve gears and observe contact. Conditions of tooth contact shown in C to L of figure 53 may be found.

b. **Adjustment** (fig. 53). C and D, figure 53 both represent correct forms of tooth contact. However, in gears of some designs correct contact will not cover the full width of the tooth face, but there will be a strip along the top of the tooth from $\frac{1}{32}$ inch to $\frac{1}{16}$ inch wide which

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Figure 53 — Adjustment of Bevel Pinion and Bevel Gear

REAR AXLE

will not show contact. If contact is of approximate length and location shown in C and D and of fair width above and below pitch line, it may be considered satisfactory. At light load, such as turning the gear by hand, a $\frac{3}{4}$ -inch to $\frac{7}{8}$ -inch contact starting at the toe (C, fig. 53) is to be desired. Under a heavy load, a contact more closely approximating figure D should be obtained. However, any contact between these two conditions may be considered satisfactory. Continue to paint, run, and adjust until proper contact is obtained.

c. Corrective Adjustments.

(1) E, FIGURE 53. If contact favors heel of tooth, there is too much backlash. To remedy, adjust bevel gear toward pinion.

(2) F, FIGURE 53. If contact favors toe of tooth, too little backlash is indicated. Correct by adjusting gear away from pinion.

(3) G, FIGURE 53. If contact is too narrow and toward top of tooth, it indicates that the pinion is too far out. Adjusting pinion toward gear ordinarily will widen out bearing contact to approximate figures C and D.

(4) H, FIGURE 53. This is the exact opposite of figure G and may be corrected by moving pinion out away from bevel gear until correct contact is obtained.

d. Backlash. In making pinion adjustments, be sure to check and maintain proper backlash. Moving the pinion back toward bevel gear reduces backlash and moving it forward away from gear increases backlash. Adjust the differential or through shaft sidewise to compensate for this loss or gain. Limits for backlash are from 0.005 inch to 0.015 inch.

77. TEST.

a. Road Test. After all adjustments have been made and tooth contact approximates the contact shown in C and D of figure 53, make sure that all nuts, bolts, and cap screws are securely locked. Replace differential carrier assembly into axle housing (par. 74 a) and install rear axle assembly on vehicle (TM 9-817). Road test vehicle and listen for axle noise at all speeds from 5 to 40 miles per hour on both drive and coast. If noise is found, condition may be improved by movement of pinion the thickness of one thin paper shim either way from original position. This slight adjustment will not materially change tooth contact and backlash.

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Section VI

FITS AND TOLERANCES

78. SERVICE INFORMATION.

a. Differential.

Bearing adjustment	0.000 to 0.002 in., tight
Gear to pinion backlash	0.005 to 0.015 in., tight
Spur gear eccentricity	0.000 to 0.004 in., tight
Case run-out	0.000 to 0.004 in., tight
Pinion to spider clearance	0.004 to 0.006 in., tight
Side gear to axle shaft splines	0.002 to 0.006 in., tight
Side gear thrust washers:	
New limits	0.058 to 0.062 in., tight
Worn limits	0.048 in., tight
Pinion gear thrust washers:	
New limits	0.058 to 0.062 in., tight
Worn limits	0.048 in., tight

b. Through Shaft.

Bearing adjustment method	Shims
Bearing adjustment	0.000 to 0.002 in., tight

c. Spur Pinion.

Bearing adjustment method	Shims
Bearing adjustment	0.000 to 0.002 in., tight

CHAPTER 10
SERVICE (AIR) BRAKE SHOES

Section I

DESCRIPTION AND DATA

79. DESCRIPTION AND DATA.

a. **Description** (figs. 54 and 55). Two brake shoes are attached to a backing plate inside each of the four brake drums, two anchor pins holding adjacent ends of the shoes in place. The opposite ends of the shoes are connected by a brake shoe spring. A cam is located between these ends, its function being to push the ends of the shoes apart when the brakes are applied, thus pressing the lining riveted to the shoes against the brake drums, creating braking action. The function of the spring is to pull the shoes away from the drums when the brakes are released. The front shoes differ slightly from the rear shoes because space limitations require a shorter lift on the operating cases; also, the front shoes are mounted on eccentric pins, which can be rotated to bring the shoes closer to the drum at the anchor pin end.

b. Tabulated Data.

Manufacturer	Timken
Model—front brakes:	
Right-hand upper	A2—3822F6
Right-hand lower	A1—3822E5
Left-hand upper	A2—3822E5
Left-hand lower	A1—3822F6
Model—rear brakes:	
Upper	A28—32225253
Lower	A29—3222S-253
Diameter:	
Front	17¼ in.
Rear	17¼ in.

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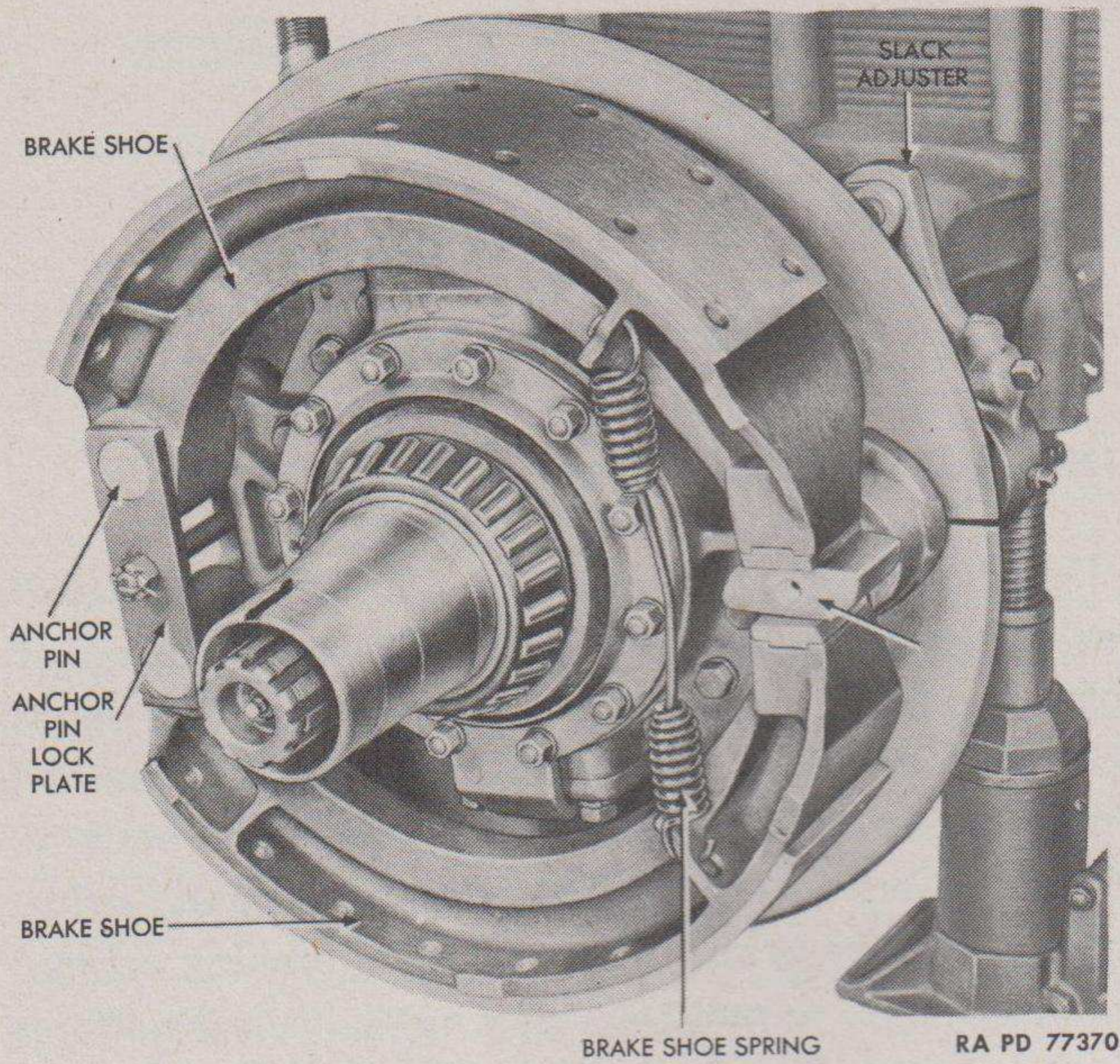


Figure 54 — Front Brake Shoes Installed

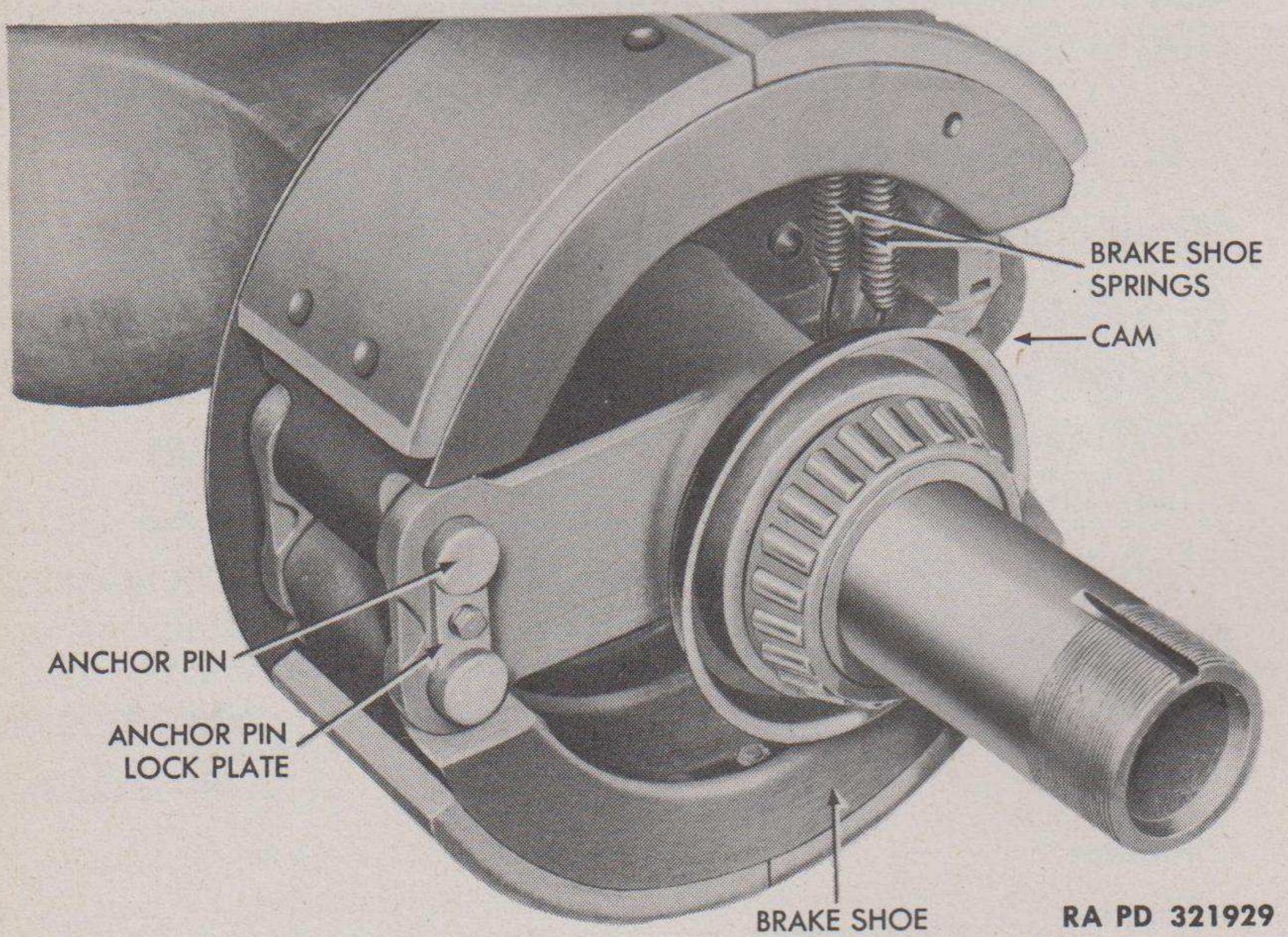


Figure 55 — Rear Brake Shoes Installed

SERVICE (AIR) BRAKE SHOES

Section II

DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY

80. DISASSEMBLY.

a. **Remove Brake Shoe Lining.** Drive out the 16 rivets attaching lining to front brake shoe and lift off lining. Remove nuts, internal-toothed washers, and bolts attaching lining to rear brake shoe. Lift off lining.

b. **Remove Brake Shoe Bushings.** Remove bushings from brake shoes only if inspection reveals they are damaged or worn (par. 81 b).

c. **Remove Brake Shoe Wear Plates.** Drive out pins attaching wear plates to front brake shoes. Remove screw attaching wear plate to rear shoes. Lift off wear plate.

81. CLEANING, INSPECTION, AND REPAIR.

a. **Cleaning.** Clean brake shoe metal parts with dry-cleaning solvent to remove dirt and grease, but do not allow dry-cleaning solvent to contact brake shoe linings.

b. **Inspection and Repair.** Inspect brake shoe lining for dirt or grease. Remove dirt with a wire brush. If any grease is soaked into lining, replace with a new lining. If contact surface of brake shoe drum requires repair, replace brake shoe linings also. Inspect brake shoe bushing while installed in shoe. Check bushing for wear by placing brake shoe anchor pin in bushing and trying to insert a narrow 0.005-inch feeler gage between anchor pin and bushing. If feeler blade will pass between bushing and anchor pin, replace bushing. If brake shoe wear plate is scratched, or shows wear from contact with the brake cam, replace with a new brake shoe wear plate.

82. ASSEMBLY OF BRAKE SHOES.

a. **Install Brake Lining.** Start riveting at one end of the lining and progressively work around the assembly. Attach two sections of lining to each rear brake shoe by inserting brake shoe lining bolts through lining and shoe, and installing internal toothed washers and nuts. If it is necessary to reface brake drum, thereby removing a thickness of metal from contacting surface of the brake drum, the same thickness of shim stock must be installed between brake shoe lining and brake shoe.

b. **Install Brake Shoe Bushings.** If bushing has been removed, press a new bushing seat in brake shoe, using an arbor press. Remove any burrs or rough edges resulting from pressing operation.

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c. **Install Brake Shoe Wear Plate.** Place a new plate in position on front brake shoe, insert wear plate pin, and press into position with an arbor press. Attach wear plate to rear brake shoe with flat headed machine screw.

Section III**TEST AND ADJUSTMENT****83. REAR BRAKE SHOES.**

a. **Test and Adjustment.** Install brake assemblies. Using two hydraulic jacks, raise rear wheels and tires clear of ground. Starting with either rear wheel, loosen brake drum inspection cover cap screw and turn cover to one side. Insert a 0.010-inch feeler gage about 9 inches long through brake drum inspection hole between brake shoe lining and brake drum. Rotate wheel and tire slowly, moving feeler gage around upper and lower brake shoe lining assemblies. The 0.010-inch gage must fit with a slight drag at any position around the assembly. Adjust slack adjuster for correct fitting of brake shoes and brake drums. Remove feeler gage. Turn brake drum inspection cover in position over brake drum inspection hole and tighten screw. Repeat the above inspection and adjustment operations for other rear wheel. Lower wheels to ground and remove hydraulic jacks.

84. FRONT BRAKE SHOES.

a. **Test and Adjustment.** Install front brake assemblies. Using two hydraulic jacks, raise front wheels and tires clear of ground. Starting with either front wheel, loosen brake drum inspection cover cap screw and turn cover to one side. Insert a 0.010-inch feeler gage about 9 inches long through brake drum inspection hole between brake shoe lining and brake drum contacting surface. Rotate wheel and drum slowly to bring feeler gage around to anchor pin end of upper brake shoe. Loosen upper brake shoe anchor pin nut. Turn upper anchor pin clockwise or counterclockwise until feeler gage is gripped, but may be withdrawn. Hold anchor pin in this position, and tighten upper anchor pin nut. Repeat operations to adjust anchor pin end of lower brake shoe.

CHAPTER 11
WHEELS, HUBS, AND TIRES

Section I

DESCRIPTION AND DATA

85. DESCRIPTION.

a. **General.** This vehicle is equipped with 7 identical wheels which may be mounted singly or dually on front and rear hub assemblies. Normally, dual wheels are employed on the rear, while the front uses single wheels. A spare wheel is carried at rear of ponton body on a tire carrier. The wheels are attached with 10 inner and 10 outer stud cap nuts, the inner nuts having square heads stamped "R" or "L" to indicate right-hand and left-hand threads. Nuts with right-hand threads are used to attach wheels on right-hand side of vehicle; nuts with left-hand threads are used to attach wheels on left-hand side of truck. Outer nuts have hex heads and are mounted on inner nuts even when the outer wheel is not used. Wheels mounted dually are installed in reverse position to each other. Hubs and wheel bearings are attached at each end of front and rear axle shafts. Bearings, cups, and cover are snug fit to axle shaft and the hub assembly is installed on bearings and secured by a bearing nut. A felt oil seal and two retainer washers between bearing cone and brake housing assembly prevent lubricant from passing to brake drum. Tires are 14-ply mud and snow-type thread, bus-balloon type.

86. DATA.

a. **Wheels.**

Make Budd wheel

b. **Wheel Bearings.**

Make Timken

Type Tapered roller

Number of bearings 2

c. **Tires.**

Make Lee

Type Bus-balloon, mud and snow

Size 12.00 x 20

d. **Air Pressure.**

Hard-surface operation 70 lb

Off-road operation 60 lb

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Section II

CLEANING, INSPECTION, AND REPAIR

87. WHEELS.

a. **Cleaning.** Wash wheels with water to remove all mud and dirt, using a soda ash solution or dry-cleaning solvent to remove all grease. If hubs and wheels are to be painted, soda ash solution must be used.

b. **Inspection and Repair.** Inspect wheel bolts and nuts for stripped or damaged threads and repair or replace. Examine wheels and rims for dents, damage, and loose rivets. Bent or dented wheel parts can in some instances be straightened and minor breaks or loose welds may be remedied by brazing and welding (refer to TM 9-2852); otherwise replace. Test wheel for run-out as instructed in paragraph 64 and replace wheel if run-out exceeds one-sixteenth inch.

88. HUBS.

a. **Cleaning, Inspection, and Repair** (fig. 87). Remove all dirt and grease with dry-cleaning solvent. If hub is to be painted, wash exterior with soda ash solution. Inspect hubs for scored machined surfaces; repair light scores with crocus cloth, but replace hub if deeply scored. Inspect hub studs for damaged or burred threads and straighten threads with thread die if burred. Inspect bearing cups for scores, and, if found, replace cup by driving out of hub and pressing in new cup. Examine brake drum for scores; if found, remove drum by removing nuts and studs attaching it to hub and reface. Wash bearings in dry-cleaning solvent and inspect for smooth operation, scores, and nicks. Remove light scores, but replace bearings if otherwise damaged. Inspect axle shaft for sprung condition, and replace shaft if sprung over 0.002 inch.

89. TIRES.

a. **Cleaning, Inspection, and Repair.** Wash tire, tube, and flap with water. Inflate tube and submerge in water to locate leaks by presence of bubbles. Examine exterior of tire for cuts in rubber. Probe all cuts to locate and remove pieces of glass and metal. Inspect interior of tire to see if it has breaks in cord, if inside is scuffed,

WHEELS, HUBS, AND TIRES

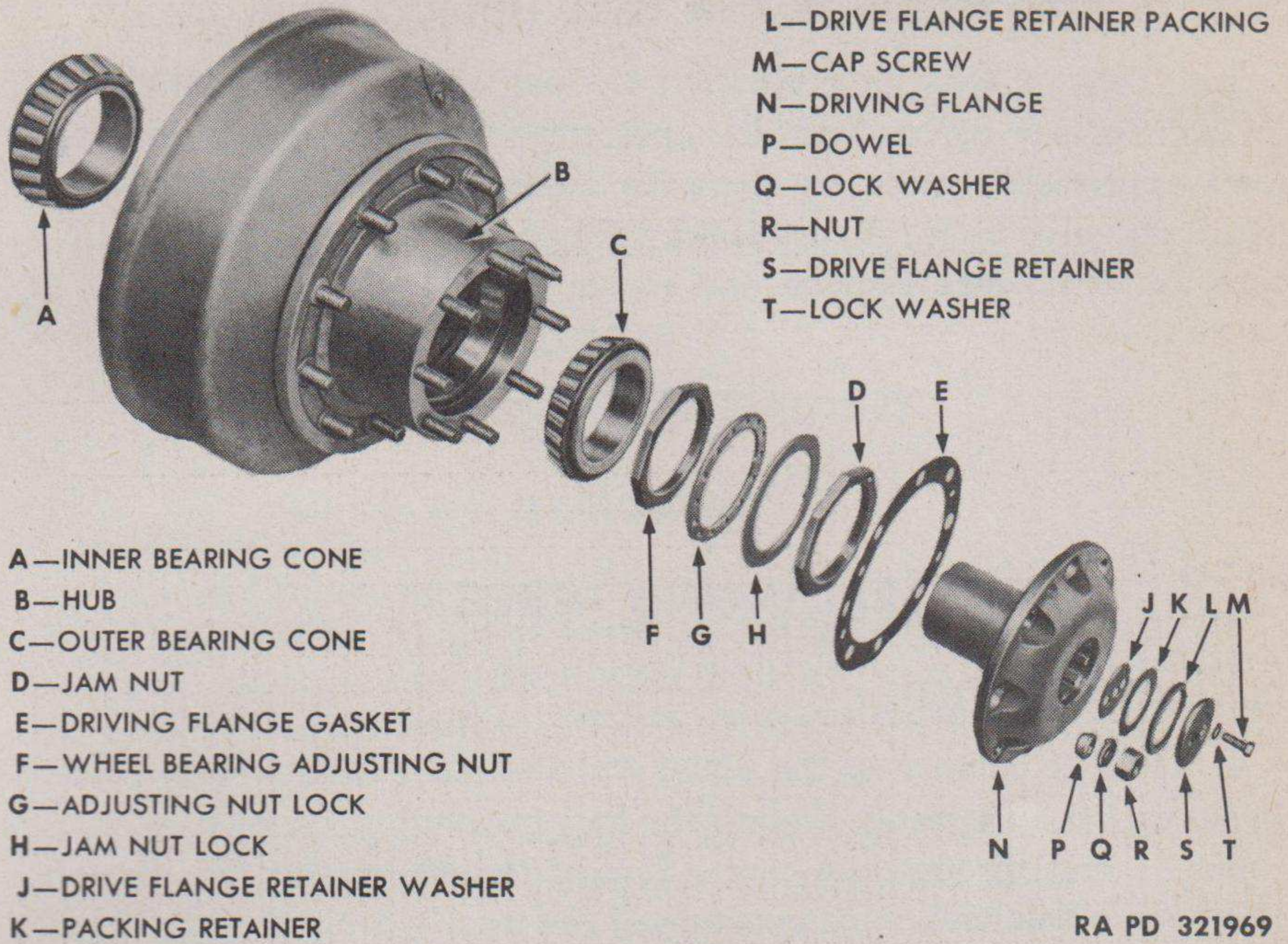


Figure 56 — Front Hub and Bearings Disassembled

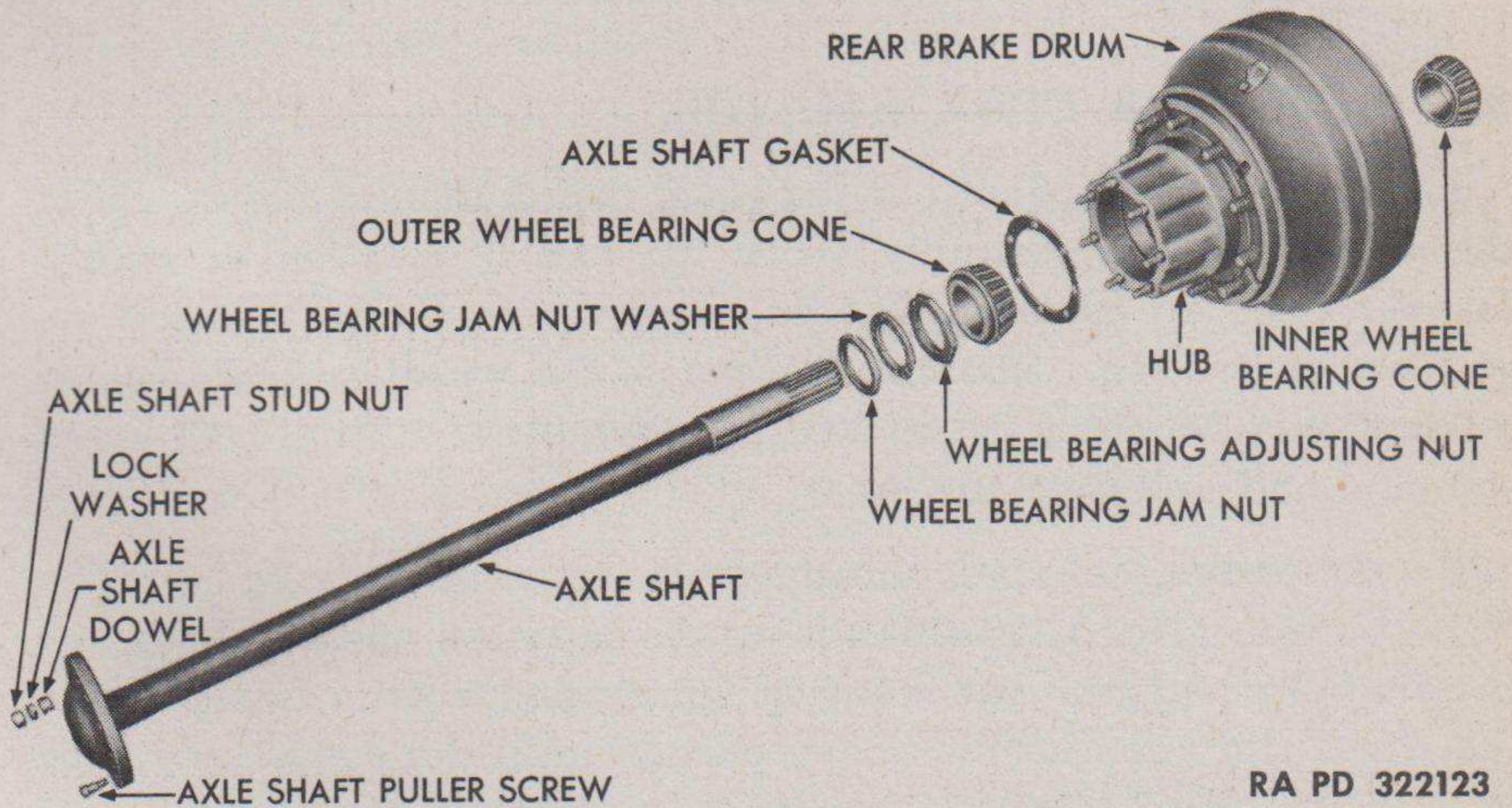


Figure 57 — Rear Hub and Bearings Disassembled

or if any foreign objects are protruding through; replace tire if these defects are found. Examine flap and replace if torn. Repair small leaks in inner tube by vulcanizing, but do not use cold patches. Replace tube if torn. Examine outside of tire, and replace if badly worn or cut.

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b. **Test.** Check air pressure daily and inflate to 60 or 70 pounds for soft-surface or hard-surface operation, respectively. If any tire loses appreciably more air than the others, indicating a leak, place liquid on valve to see if core leaks. Replace leaky cores, but if valve core shows no leak remove and repair tire.

Section III

BALANCING WHEELS

90. DESCRIPTION.

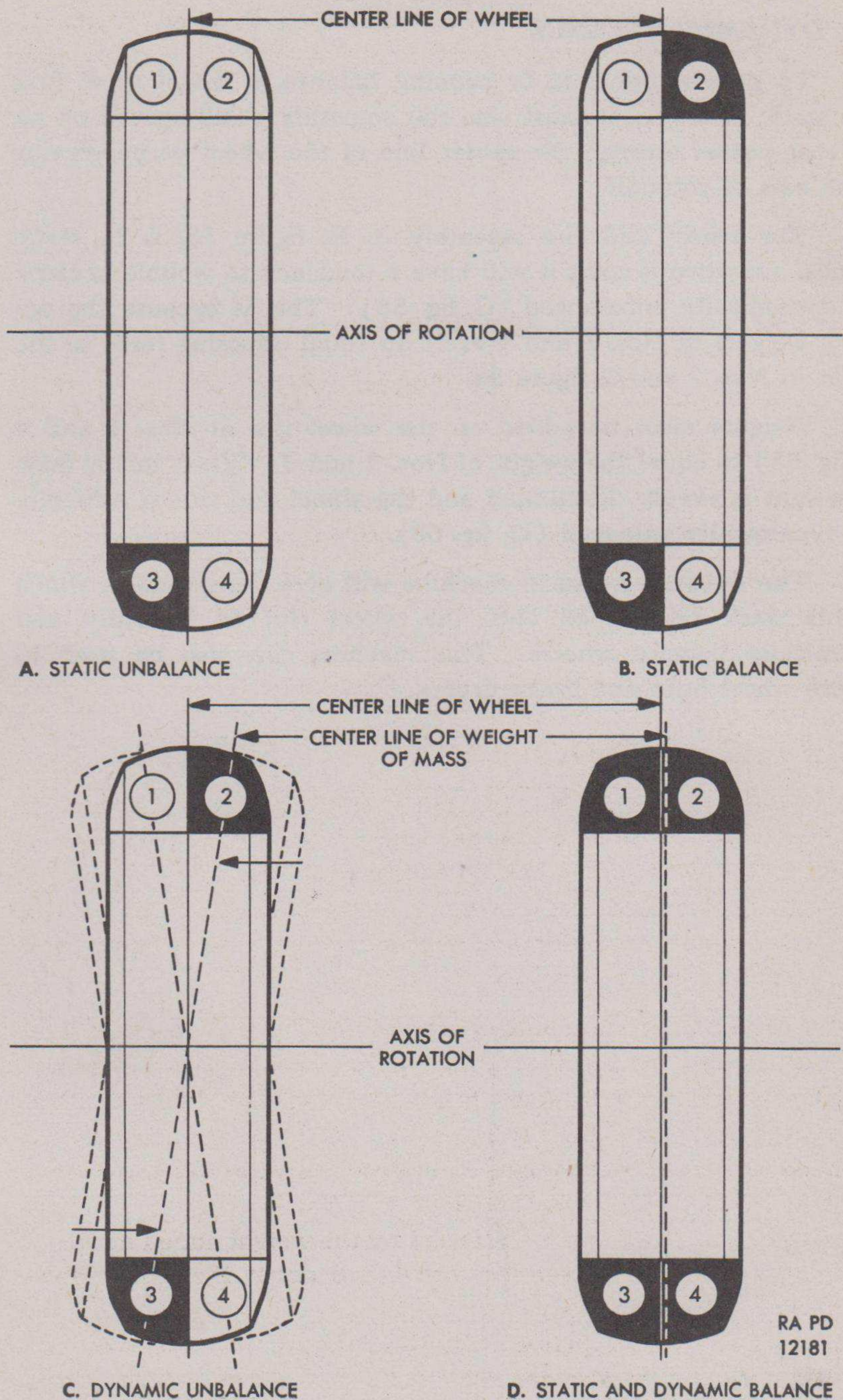
a. Wheel balance is the equal distribution of the weight of the wheel and tire assembly around the axis of rotation (known as static balance) and through the center line of the wheel and tire (known as dynamic balance). If the action of the front wheels causes difficult or unsteady operation of the steering wheel, first check the tire air pressure, and then the tire and wheel balance.

91. STATIC OR STILL BALANCE.

a. Static or still balance is the equal distribution of the weight of the wheel and tire assembly about the axis of rotation in such a manner that the assembly has no tendency to rotate by itself regardless of position. Static unbalance of the wheel and tire causes a hopping or pounding action which leads to road tramp, high speed shimmy, and excessive tire wear.

b. A condition of static unbalance is shown in A, figure 58. The black portion (No. 3, fig. 58), being the heaviest, will rotate to the bottom. To obtain a true static balance, weights must be added on the wheel rim opposite the heavy portion until the condition shown in B is obtained. Here the sum of the weights of No. 1 and No. 2, figure 58, equal the sum of the weights of No. 3 and No. 4. The heavier weight at No. 3 is now balanced by the weight added at No. 2. The weight, therefore, is equally distributed about the axis. However, this wheel is not in dynamic balance because No. 1 is lighter than No. 2 and No. 4 is lighter than No. 3, figure 58. The dynamic balancing machine determines the points on the wheel rim where weights must be added.

WHEELS, HUBS, AND TIRES



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Figure 58 — Static and Dynamic Balance of Wheel and Tire

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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a. To possess dynamic or running balance, a wheel must first have static balance. It must also run smoothly at all speeds on an axis that passes through the center line of the wheel perpendicular to the axis of rotation.

b. The wheel and tire assembly in B, figure 58, is in static balance, but when it spins it will have a tendency to wobble because it is dynamically unbalanced (C, fig. 58). This is because the opposing weights at Nos. 1 and 4 exert an equal opposing force to the weight at Nos. 2 and 3, figure 58.

c. Weights must be added on the wheel rim at Nos. 1 and 4 (C, fig. 58) to equal the weight of Nos. 2 and 3. When this is done the weight is evenly distributed and the wheel and tire is statically and dynamically balanced (D, fig. 58).

d. The dynamic balancer machine will give the points at which weights must be clipped onto the wheel rim to statically and dynamically balance wheels. This machine can also be used to balance wheel hubs and brake drums.

CHAPTER 12
STEERING GEAR

Section I

DESCRIPTION AND DATA

93. DESCRIPTION AND OPERATION.

a. **Description.** The steering gear assembly is mounted on a support bracket attached to frame side rail at front left-hand side of vehicle. It extends from the steering arm attached to left front wheel assembly through the steering gear housing to the steering wheel in the cab. The gear is the roller mounted twin-lever type, the twin-lever arrangement being an integral part of the cross shaft to which the steering gear arm is attached. Except for bushings on the cross shaft, contacting surfaces have ball or roller bearings. The wheel and cam tube is supported on three ball bearings, the upper end of the steering wheel tube being carried in a ball bearing fitted in steering column jacket tube cover while the upper and lower ends of the cam are ground as ball bearing races. A spring-type retainer holds the bearing balls and outside races in position. Adjustment of these bearings is effected by shims under the top housing cover. Tapered studs on the lever shaft are mounted on tapered roller bearings to provide a rolling contact with grooves in the cam. Contact or backlash between the tapered studs and cam is primarily adjusted by turning an adjusting screw in the steering gear housing side cover.

b. **Operation.** When steering wheel and cam are turned, the tapered studs of the lever shaft are moved through grooves of the cam. This action rotates the lever shaft thereby providing angular movement of the steering arm on the left front wheel assembly.

94. DATA.

a. **Steering Gear.**

Make	Ross
Type	Roller mounted twin-lever
Model	T-74
Gear ratio:	
Straight-ahead driving	23 to 1
Parking	27 to 1

b. **Bearings.**

Cam	Ball
Stud bearing units	Tapered roller
Lever shaft	Bronze bushings
Wheel and cam tube	Ball

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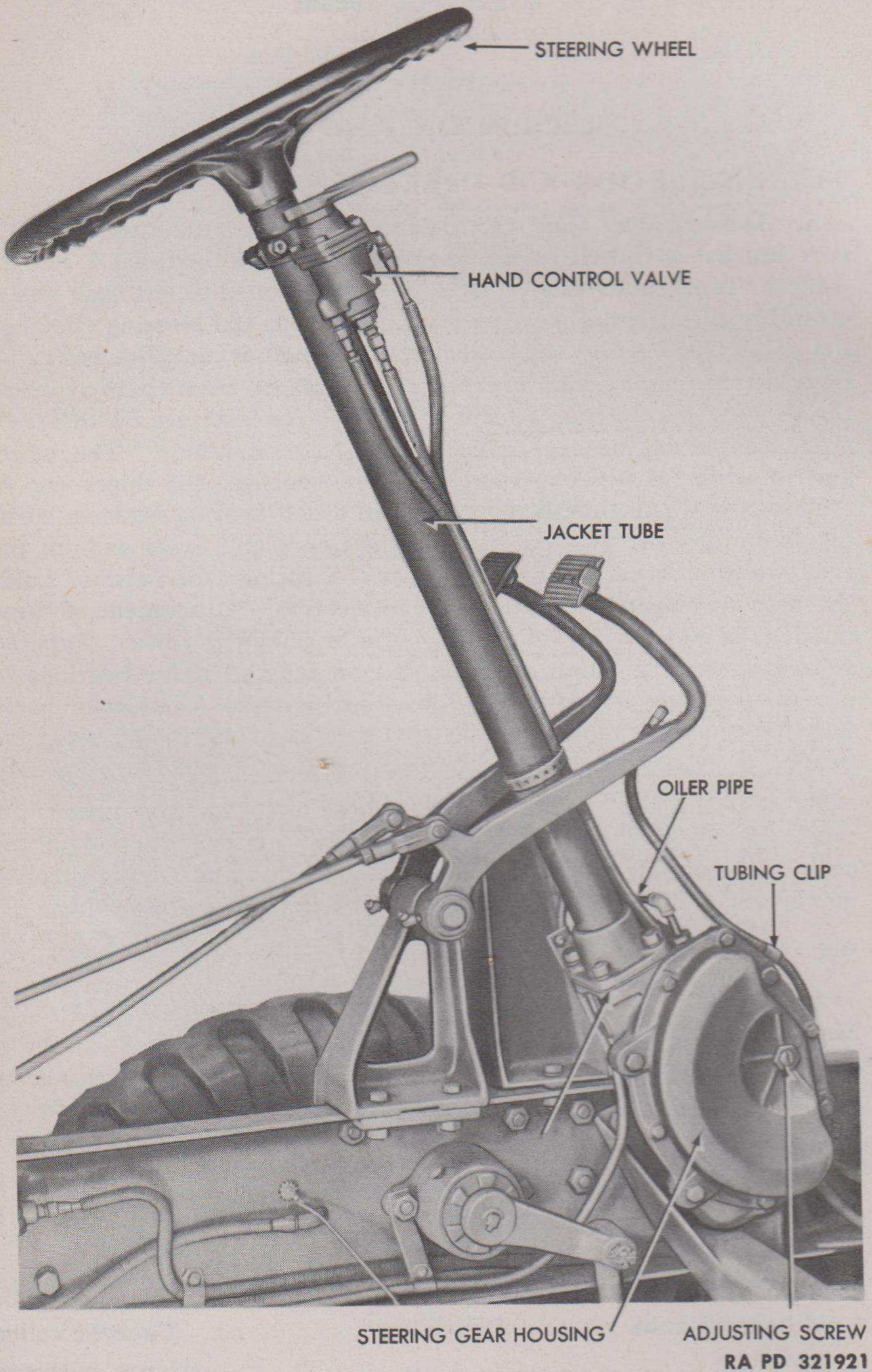


Figure 59 — Steering Gear Installed

STEERING GEAR**Section II****REMOVAL****95. REMOVAL.**

a. **Remove Floorboards and Toeboards** (fig. 72). Remove the screws, flat washers, internal-toothed lock washers, and lock washers which secure left-hand floorboard clamp plate, left-hand toeboard, and toeboard insert. Lift out floorboards and toeboards.

b. **Remove Oiler Pipe.** Remove left-hand splash shields (par. 121 e). Remove clip bolt, lock washer, and nut attaching oiler pipe clip to left-hand front cab support bracket. Unscrew oiler pipe from fitting in steering gear case.

c. **Remove Horn Button Assembly** (fig. 60). Disengage horn button wire from horn relay switch attached to horn support bracket between horns. Press button down firmly and turn it to right or left far enough to release it from steering wheel. Remove button contact cup, contact cap, and horn button spring from base plate. Pull cable upper terminal assembly and insulating ferrule from top of steering column.

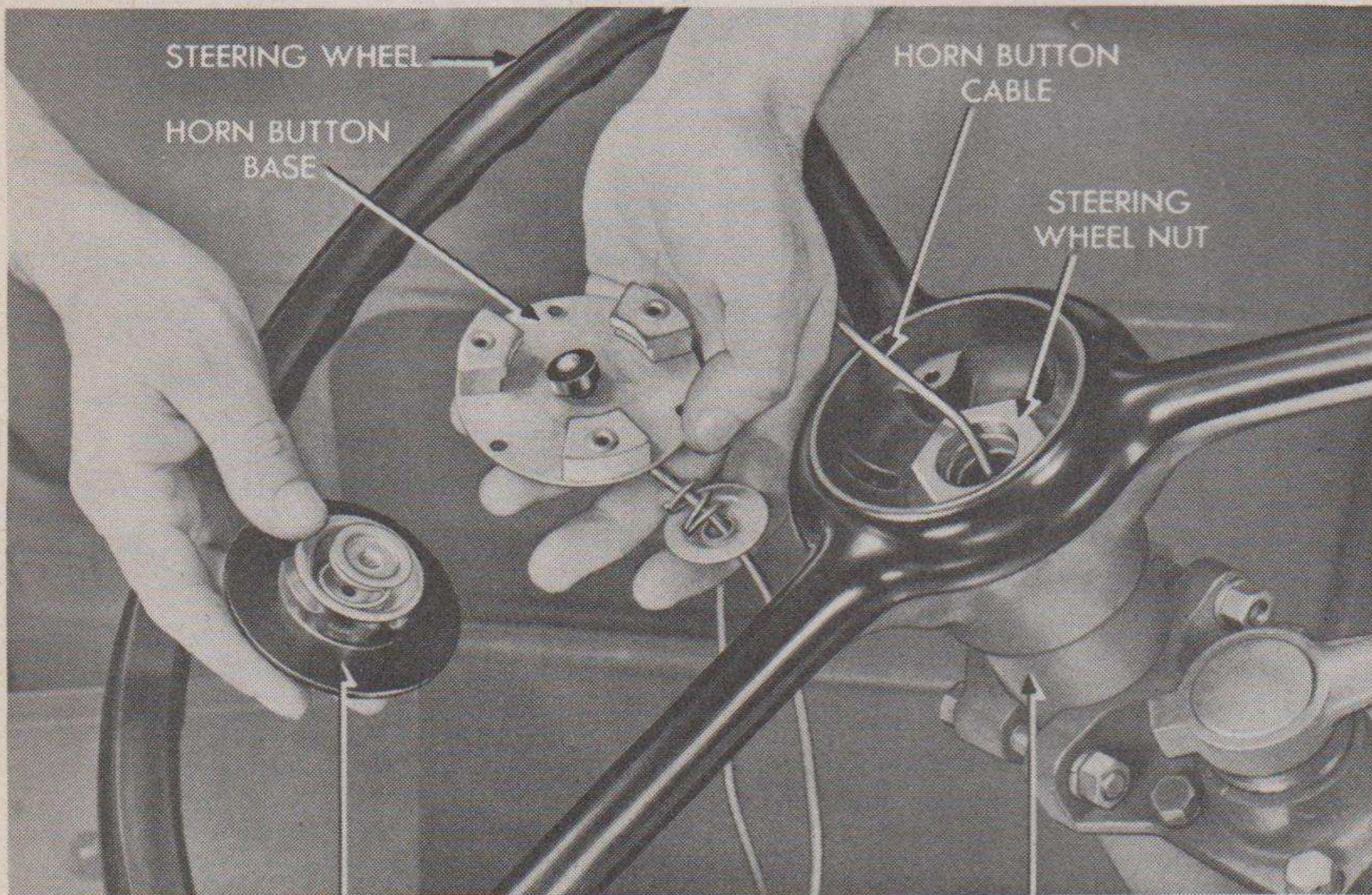
d. **Remove Steering Wheel** (fig. 60). Remove wheel nut. Using steering wheel puller, lift steering wheel from jacket tube.

e. **Disconnect Tubes and Cables.** Remove two cap screws, lock washers, and nuts from hand control valve bracket (fig. 61). Lift off bracket. Remove tube clip bolt and nut from steering column. Push hand control valve and air tubes away from steering column. Remove housing side cover cap screw which secures tube clip to steering gear housing (fig. 62). Pull tube away from steering gear housing, and install cap screw back in housing. Remove nut and lock washer from steering gear housing stud which secures speedometer cable clip to lower end of steering column. Pull off speedometer cable, and install nut and lock washer. Remove cable located behind compressor pulley.

f. **Disconnect Clutch and Brake Pedal Levers** (fig. 62). Remove cotter pins and clevis pins from clutch control rod clevis and brake control rod clevis. Pull back clutch and brake pedal levers.

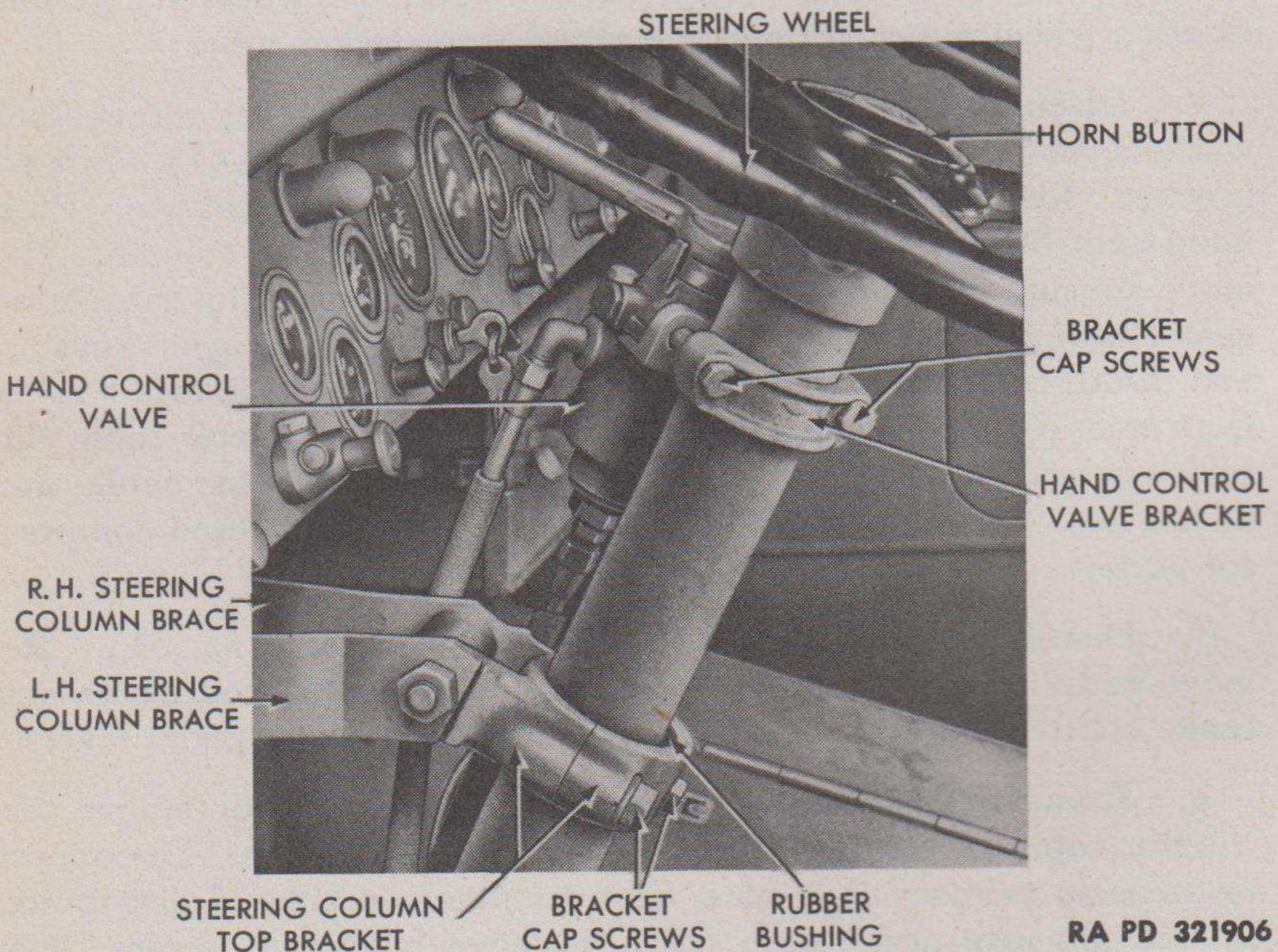
g. **Remove Distributor.** Unsnap spring clips and remove distributor cap. Leave high-tension wires attached to cap. Disconnect low-tension primary lead wire from terminal on side of distributor. Loosen advance arm clamp bolt. Remove hold-down screw. Lift distributor from tachometer adapter.

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Figure 60 — Removing Horn Button



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Figure 61 — Upper End of Steering Column

STEERING GEAR

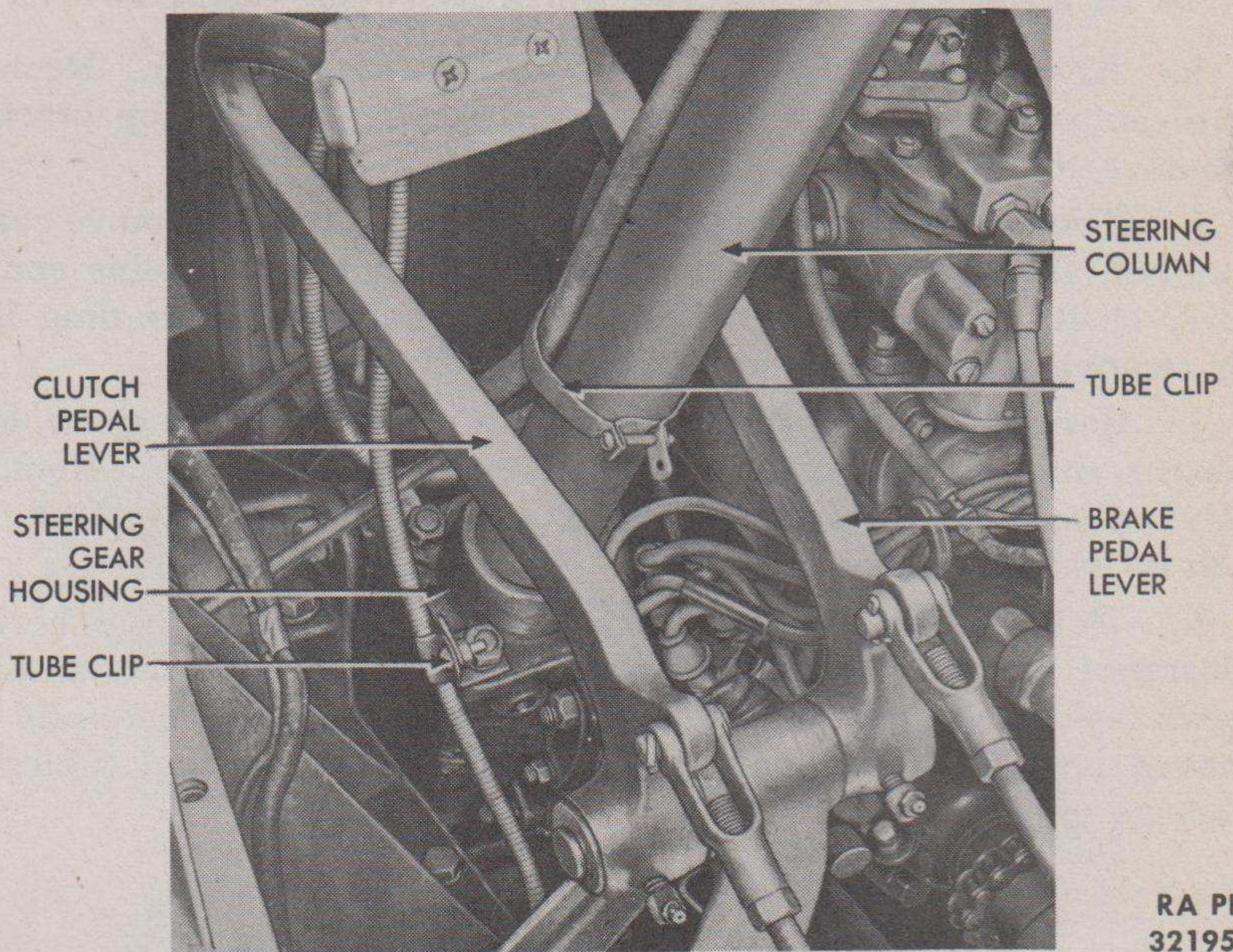


Figure 62 — Lower Part of Steering Column

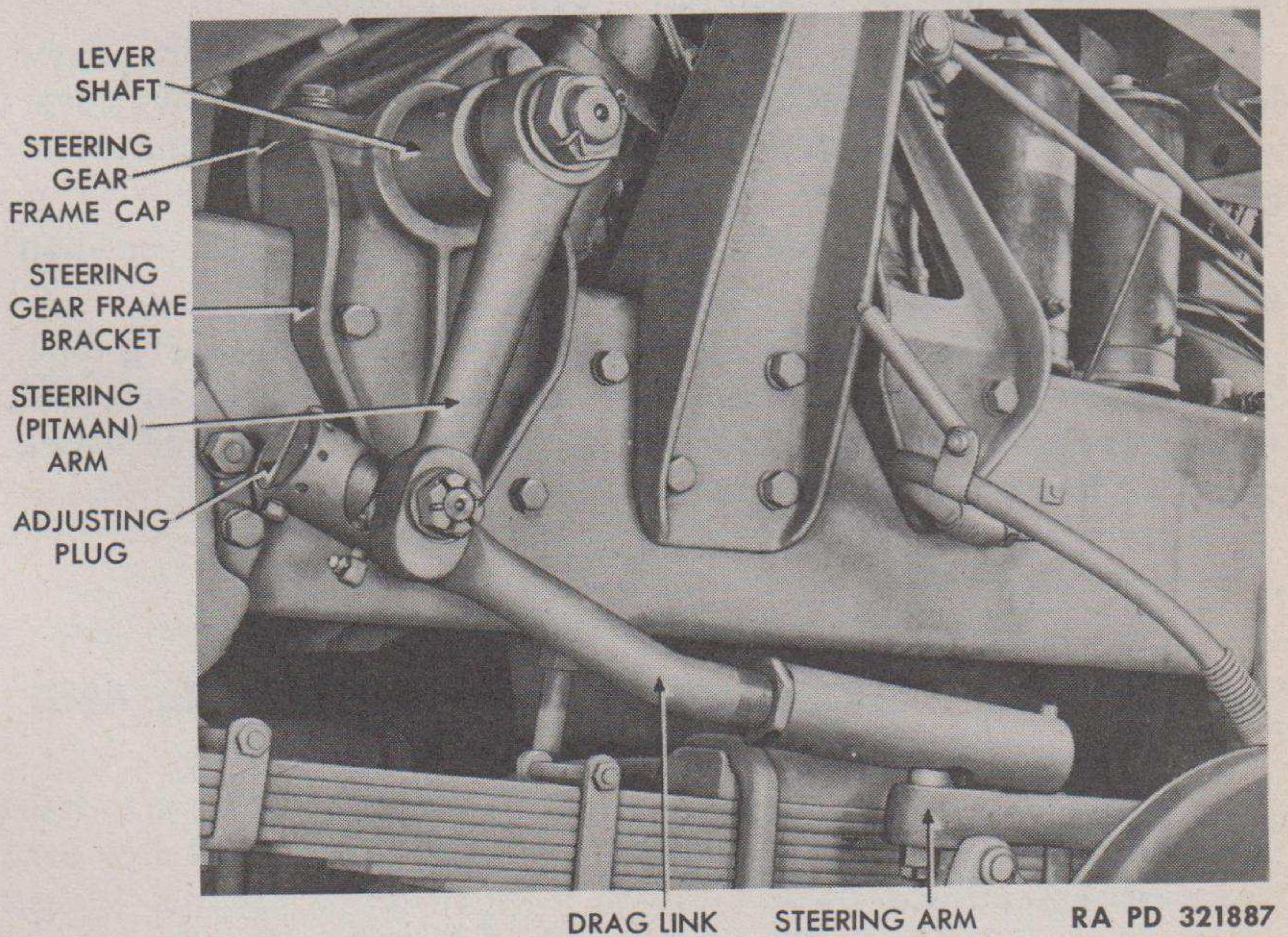


Figure 63 — Drag Link Installed

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h. **Remove Steering Column Top Bracket** (fig. 61). Remove two cap screws and lock washers from steering column top bracket. Remove top bracket and felt bushing.

i. **Disconnect Steering (Pitman) Arm** (fig. 63). Remove cotter pin, nut, and lock washer which secure arm to tapered spline end of lever shaft. Tap arm from shaft. Disconnect arm from drag link by removing cotter pin and nut.

j. **Remove Steering Gear Frame Cap.** Remove cap screw, lock washer, and nut from upper part of steering gear frame cap. Remove two cap screws, lock washers, and tapped bar from each end of cap. Lift off steering gear frame cap.

k. **Remove Steering Gear.** Pull steering gear up until there is clearance to rotate the assembly so that lever shaft points straight down inside the frame side rail. Steering gear must be carefully removed up through left cab door. Be careful not to foul cables or damage parts.

Section III

DISASSEMBLY INTO SUBASSEMBLIES

96. DISASSEMBLY.

a. **Remove Housing Cover** (fig. 65). Loosen adjusting screw lock nut. Back off adjusting screw about three turns. Remove cover cap screws, nuts, bolts, and lock washers. Lift off cover and cover gasket.

b. **Remove Lever Shaft Assembly** (fig. 65). Lift lever shaft assembly out of housing.

c. **Remove Top Cover and Jacket Tube Assembly** (fig. 65). Remove top cover stud nuts and lock washers. Lift jacket tube and top cover from steering gear housing. Lift cam bearing adjusting shims off housing and wheel tube.

Section IV

DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES

97. LEVER SHAFT.

a. Disassembly.

(1) **REMOVE STUD ROLLER BEARINGS** (fig. 64). Straighten prong of stud nut prong washer. Remove stud nut and prong washer.

STEERING GEAR

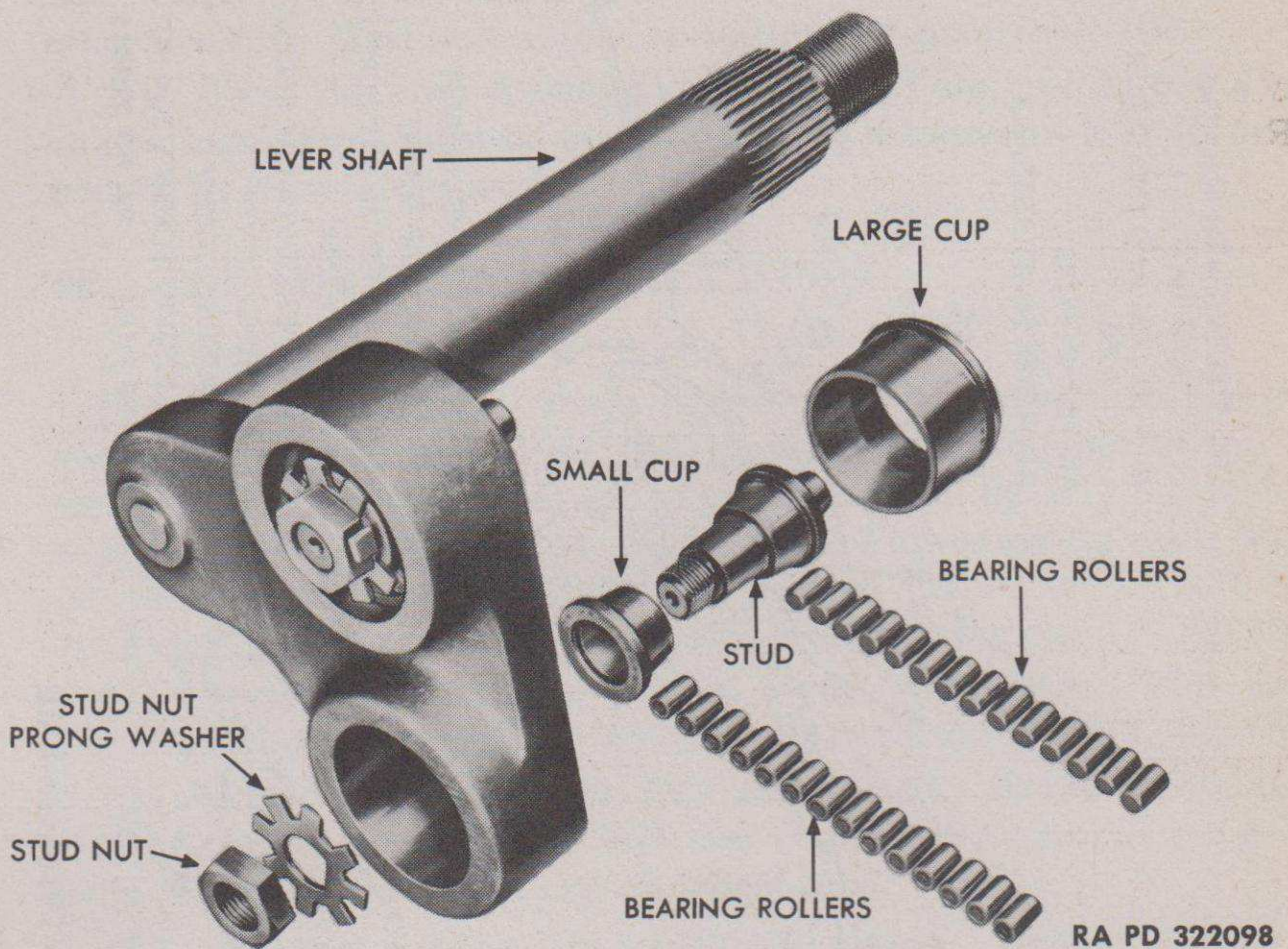


Figure 64 – Lever Shaft Disassembled

Place assembly in arbor press with threaded end of stud up and press stud out of lever shaft. Catch the 28 bearing rollers and the small cup as stud is being pressed out. Press large cup out of lever shaft. Repeat operation to remove other bearing.

b. Cleaning, Inspection, and Repair. Wash all parts in dry-cleaning solvent, using clean solution for bearings, which must be thoroughly soaked to remove hardened grease. Inspect studs, cups, and bearing rollers for chipping, cracks, and scoring. Remove light burs with handstone, but replace entire bearing in case any other damage to a part is found. Examine threads on lever shaft and clean up burred threads with fine mill file. Inspect lever shaft spines for twisted condition and replace with new shaft if found.

c. Assembly.

(1) **INSTALL STUD ROLLER BEARINGS** (fig. 64). Install large bearing cup into seat in lever shaft. Position stud in bearing cup and pack with lubricant. Place 14 bearing rollers around tapered bearing surface of stud. Pack lubricant around bearing surface of small cup, position 14 rollers around it, and carefully insert small cup and rollers over stud and into bore of large cup. Install prong washer and stud

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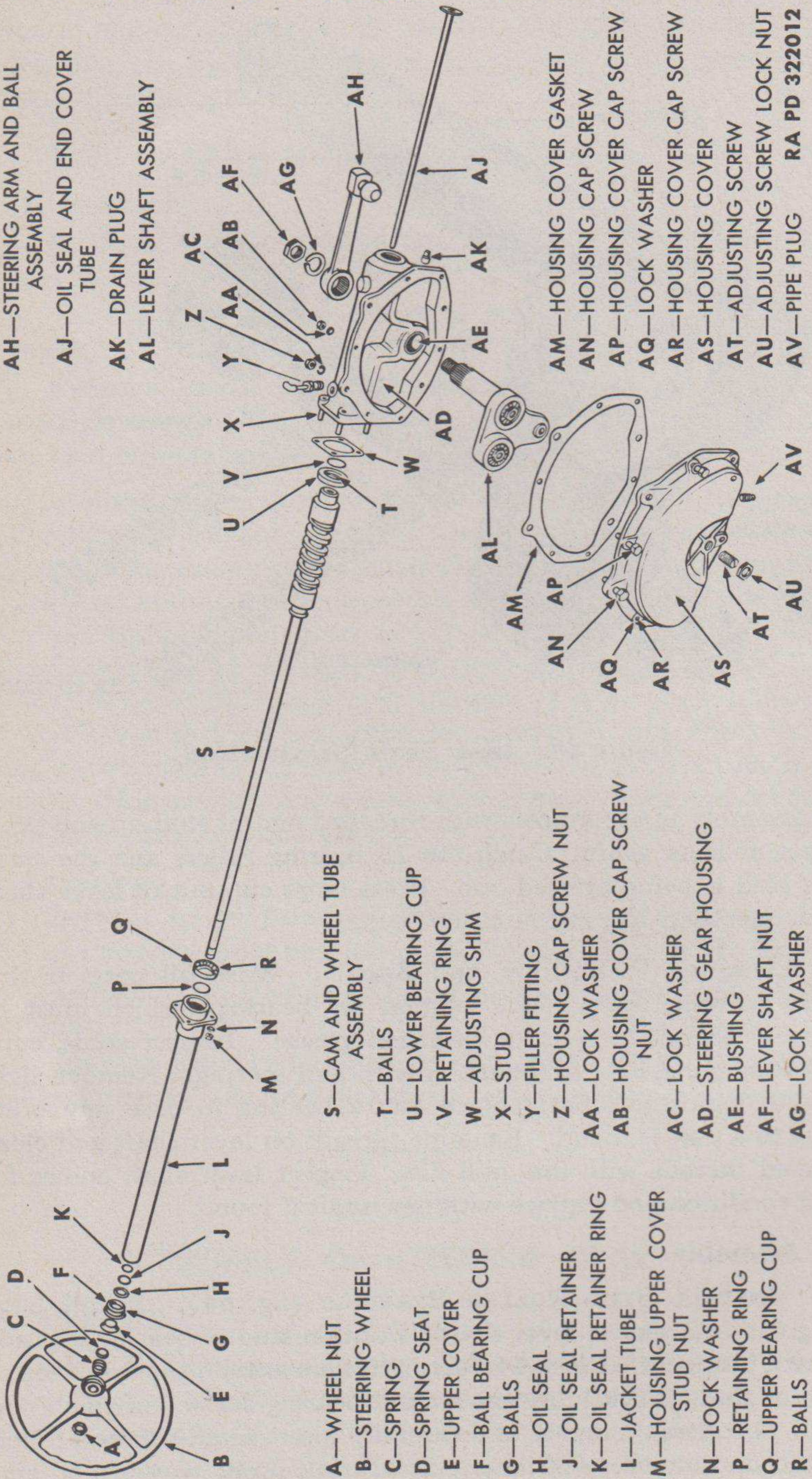


Figure 65 — Steering Gear Disassembled

STEERING GEAR

nut. Bend prong of washer over nut. Repeat operation to install other bearing. Test and adjust as outlined in paragraph 102.

(2) **TEST BEARING ASSEMBLY** (fig. 64). Turn stud to test drag on bearings. Drag must be heavy, requiring a torque of 5 to 11 inch-pounds to revolve the stud.

98. TOP COVER AND JACKET TUBE.

a. Disassembly.

(1) **REMOVE WHEEL TUBE BEARING.** Pull wheel tube bearing spring (C, fig. 65) and upper spring seat (D, fig. 65) out of top of jacket tube. Pry the wheel tube bearing cup (F, fig. 65) out of top of jacket tube. Pry snap ring (K, fig. 65) off lower spring seat. Pull off oil seal retainer (J, fig. 65) and oil seal (H, fig. 65). Lift out lower spring seat and balls (G, fig. 65) from bearing cup (F, fig. 65).

(2) **REMOVE CAM AND WHEEL TUBE ASSEMBLY.** Pull cam and wheel tube assembly (S, fig. 65) out of jacket tube (L, fig. 65).

(3) **REMOVE UPPER BALL CUP AND BALLS.** Remove retaining ring (P, fig. 65) from upper ball cup (Q, fig. 65). Lift out the 14 balls (R, fig. 65) and pull cup off wheel tube.

(4) **REMOVE LOWER BALL CUP AND BALLS.** Remove retaining ring (V, fig. 65) and 14 balls from lower ball cup (U, fig. 65). Slide lower ball cup off wheel tube.

b. **Cleaning, Inspection, and Repair.** Clean parts with dry-cleaning solvent before inspection, making sure all traces of old lubricant are removed. Inspect ball cups and balls for chipping, flat spots, or scoring and replace all parts with these defects. Examine wheel tube bearing for scoring and replace bearing if scored. Inspect cam for fractures and rough spots. Remove small burs, but replace cam if fractured. Cam thread is copper-plated for initial service; therefore, disregard worn-off condition.

c. Assembly.

(1) **INSTALL LOWER BALL CUP AND BALLS.** Slide lower ball cup (U, fig. 65) on lower end of wheel tube. Pack cup with lubricant and install 14 balls (T, fig. 65). Install retaining ring (V, fig. 65).

(2) **INSTALL UPPER BALL CUP AND BALLS.** Pack upper ball cup (Q, fig. 65) with lubricant and slide it on wheel tube. Install 14 balls (R, fig. 65) in ball cup. Install retaining ring (P, fig. 65).

(3) **INSTALL CAM AND WHEEL TUBE ASSEMBLY.** Slide cam and wheel tube assembly (S, fig. 65) into jacket tube (L, fig. 65).

(4) **INSTALL WHEEL TUBE BEARING.** Pack bearing cup (F, fig. 65) with lubricant. Place balls (G, fig. 65) in bearing cup. Install lower spring seat in bearing cup. Install oil seal (H, fig. 65)

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and oil seal retainer (J, fig. 65) on lower spring seat. Install oil seal retaining ring (K, fig. 65) on lower spring seat. Press wheel tube bearing into top of jacket tube.

99. STEERING GEAR HOUSING AND COVER.

a. Disassembly.

(1) **REMOVE END COVER AND OIL SEAL TUBE.** Tap lower end cover and oil seal tube (JJ, fig. 65) out of lower end of housing.

(2) **REMOVE OIL PLUGS.** Remove drain plug and filler fitting from housing.

(3) **REMOVE LEVER SHAFT BUSHINGS.** Press inner and outer lever shaft bushings (EE, fig. 65) out of housing only if bushings are damaged or worn (subpar. c, below).

b. Cleaning, Inspection, and Repair. Wash parts thoroughly with dry-cleaning solvent. Inspect lever shaft bushings while installed in housing, examining bushings for rough spots and testing fit of lever shaft in bushings. If inspection shows scoring or side play, remove old bushings and press new bushings into housing. After installing new bushings, measure lever shaft with a micrometer; then ream bushings to 0.0005 inch over the size of lever shaft. Inspect lower end cover and oil seal tube for distortion and check fit in housing. Lower end cover must be a tight fit and oil seal tube must be straight. If inspection shows tube to be bent or lower end cover to be loose in housing, replace tube.

c. Assembly.

(1) **INSTALL LEVER SHAFT BUSHINGS.** Press new bushings (EE, fig. 65) into housing if old bushings were removed (subpar. b, above).

(2) **INSTALL OIL PLUGS.** Thread drain plug and filler fitting into housing.

(3) **INSTALL END COVER AND OIL SEAL TUBE.** Install end cover and oil seal tube (JJ, fig. 65) into lower end of housing.

Section V

ASSEMBLY OF STEERING GEAR

100. ASSEMBLY.

a. Install Top Cover and Jacket Tube Assembly (fig. 65). Position cam bearing adjusting shims on housing. Lift top cover and jacket tube assembly into position, inserting cam into housing. Attach top cover to housing with lock washers and stud nuts.

STEERING GEAR

b. **Install Lever Shaft Assembly** (fig. 65). Lift lever shaft assembly into position in housing.

c. **Install Housing Cover** (fig. 65). Using a new gasket, attach housing cover to housing with cap screws, bolts, lock washers, and nuts.

Section VI

INSTALLATION

101. INSTALLATION.

a. **Insert Steering Gear Through Body.** Pass a rope around the lower end of the steering gear to aid in lowering it into position. Open left cab door and insert steering gear with lever shaft straight down. When steering gear is down as far as possible, rotate it until lever shaft clears the fender. Using pinch bars, position the lever shaft in the steering gear frame bracket.

b. **Install Steering Gear Frame Cap.** Place steering gear frame cap in position and install two cap screws, lock washers, and bar which secure the frame cap to the frame bearing. Install cap screw, lock washer, and nut which secure frame cap to steering gear housing.

c. **Connect Steering (Pitman) Arm** (fig. 63). Tap steering arm on tapered spline end of lever shaft. Secure with lock washer, nut, and cotter pin. Attach drag link to arm.

d. **Install Steering Column Top Bracket** (fig. 61). Place felt bushing and two halves of steering column top bracket in position on steering column. Attach two cap screws and lock washers which secure it to steering column braces.

e. **Install Distributor.** Insert base of distributor into its boss in tachometer adapter. Install hold-down screw. Connect low tension primary lead to terminal on side of distributor. Connect ground wire to terminal on side of distributor. Place cap (with attached wires) in position on distributor and engage spring clips.

f. **Connect Tubes and Cables** (fig. 62). Install cap screw, lock washer, and nut attaching tachometer cable clip to its bracket located behind compressor pulley. Install speedometer cable clip on rear left-hand stud of steering gear housing. Attach nut and lock washer. Position tube clip on steering gear housing and install cap screw, lock washer, and nut. Install tube clip which secures air tubes to steering column between foot pedals. Install hand control valve bracket cap screws, lock washers, and nuts which secure hand control valve to steering column.

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g. **Connect Clutch and Brake Pedal Levers** (fig. 62). Position clutch and brake pedal levers so that clevis pins can be inserted through clutch and brake control rod clevises and levers. Install cotter pins.

h. **Install Oiler Pipe.** Screw oiler pipe into fitting. Attach oiler pipe clip to left-hand front cab support bracket with cap screw, lock washer, and nut.

i. **Install Steering Wheel** (fig. 60). Position steering wheel on jacket tube. Screw on steering wheel nut.

j. **Install Horn Button Assembly** (fig. 60). Thread cable and upper terminal assembly through insulating ferrule down into steering column. Position horn button spring, contact cap, and contact cup on base plate. Position horn button on contact cup. Depress button firmly and turn to right or left until button is secured to steering wheel. Connect horn button wire to relay switch.

k. **Install Floorboards and Toeboards** (fig. 72). Install left-hand toeboard insert, left-hand toeboard, and left-hand floorboard and floorboard clamp plate with lock washers, internal toothed lock washers, flat washers, and screws.

l. **Adjust Steering Gear Assembly.** Refer to paragraph 102.

Section VII

TEST AND ADJUSTMENT

102. TEST AND ADJUSTMENT.

a. **General.** Three adjustments can be made on this steering gear; adjustment of upper and lower cup ball bearings on cam, adjustment of the ball stud for backlash and adjustment of the stud roller bearing units in the lever shaft. Before making any of these adjustments on the steering gear, check front wheel toe-in (TM 9-817), caster, and camber (pars. 65 and 66); disconnect drag link from steering arm and ball assembly as instructed in TM 9-817 to free steering gear of all load.

b. **Adjust Upper and Lower Cup Ball Bearings on Cam** (fig. 65). Loosen housing side cover adjusting screw to relieve pressure of ball stud against grooves in cam. Turn steering wheel with thumb and forefinger. If more than a slight drag is felt, loosen the four upper cover plate hex nuts, lift cover plate up, and add thin shim.

STEERING GEAR

(Shims are 0.002, 0.003, and 0.010 inch thick and must be cut at the holes to permit installation or removal without completely removing jacket tube.) Tighten hex nuts to draw cover plate tightly against shims, and again test by turning steering wheel. If looseness is felt when turning steering wheel with thumb and forefinger, repeat above operation, but remove a shim; then tighten down upper cover plate, and recheck action of steering wheel. When adjustment is completed, adjust the ball stud for backlash (subpar. c, below).

c. Adjust Ball Stud for Backlash (fig. 65). Backlash of the stud in the cam groove shows up as end play of lever shaft and as backlash at steering wheel and ball on steering arm. Make adjustment with steering gear in midposition. Backlash in the end position is normal, and is not objectionable. Test for backlash by turning steering wheel slowly from one extreme position to the other. A slight drag must be felt in midposition. If no drag is felt, turn the adjusting screw clockwise. If too much drag is felt, turn adjusting screw counterclockwise. When adjustment is completed, lock adjusting screw in position by tightening adjusting screw lock nut. Recheck action by turning steering wheel. Connect drag link (TM 9-817).

d. Adjust Stud Roller Bearing Units (fig. 65). In some cases, it may be necessary to adjust the stud roller bearing units in the lever shaft. When properly adjusted, a heavy drag will be felt while turning the studs. To test and adjust units, remove housing side cover adjusting screw and lock nut. Then remove nuts, cap screws, and lock washers which attach side cover to housing, and lift off cover. Straighten prong of lock washer, and remove nut and washer from end of stud. Do not use washer again, but place new washer on stud and install nut. Hold lock washer with wrench to keep stud from turning and tighten nut. Turn stud by means of lock washer and wrench to test bearing adjustment. If stud turns freely, nut must be tightened. If stud can be turned but a heavy drag is felt, the adjustment is correct. Lock adjustment by bending a prong of washer over side of nut. Repeat operation to test and adjust other unit. Attach side cover to housing with lock washers, nuts, and cap screws. Insert adjusting screw and lock nut into position in housing side cover, and make the backlash adjustment as outlined in subparagraph c, above.

e. Aline Column. Determine whether misalignment exists by releasing upper steering gear column bracket, and noting whether column moves from its original position. If it does, it has been bent or mounted out-of-line and must be reclamped in the new position; the steering gear frame bracket must be shifted and shimmed to relieve this condition. If column is bent so that above adjustment will not correct, replace tube.

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Section VIII

FITS AND TOLERANCES

103. FITS AND TOLERANCES.

Cam thrust	1 or 2 lb
Backlash	Barely perceptible
Lever shaft clearance	0.0005 to 0.0025 in.
Stud roller bearing unit	4 to 11 in.-lb
Shims	0.002, 0.003, and 0.010 in.

CHAPTER 13
SPRINGS AND SHOCK ABSORBERS

Section I
SPRINGS

104. DESCRIPTION AND DATA.

a. **Description.** Semielliptic, overslung springs of heat-treated alloy steel are used on the front and rear, being held down to axles by heavy alloy steel spring clips and seats. The rear springs are assisted in carrying heavy loads by auxiliary or helper springs, which contact special brackets on the outside of the frame side rails as rear springs flatten out. Because the drive of the entire vehicle is carried through the rear spring under usual operating conditions, a relatively flat spring is used. Therefore, the rear spring will go into reverse camber at times under heavy loads. The front springs employ a conventional pin and shackle mounting with large bronze replaceable bushings in spring eyes and shackle brackets. On this vehicle, the shackle is at the rear end of the spring. The front ends of rear springs are attached to the frame by a steel pin, bronze bushing, and steel bracket; the rear ends of the rear springs are attached to the frame by an overslung shackle.

b. **Data.**

Front springs:

Center to center of eyes	43½ in.
Center of eye to seat center	21¾ in.
Width	3 in.
Number of rebound clips	2
Number of leaves	12

Rear Spring:

Center to center of eye	53 in.
Center of eye to seat center	26½ in.
Number of rebound clips	4
Number of leaves	12
Total thickness	5¼ in.

Auxiliary springs:

Load center	37½ in.
Load center to seat center	18¾ in.
Width	3½ in.
Number of leaves	5
Total thickness	1⅞ in.

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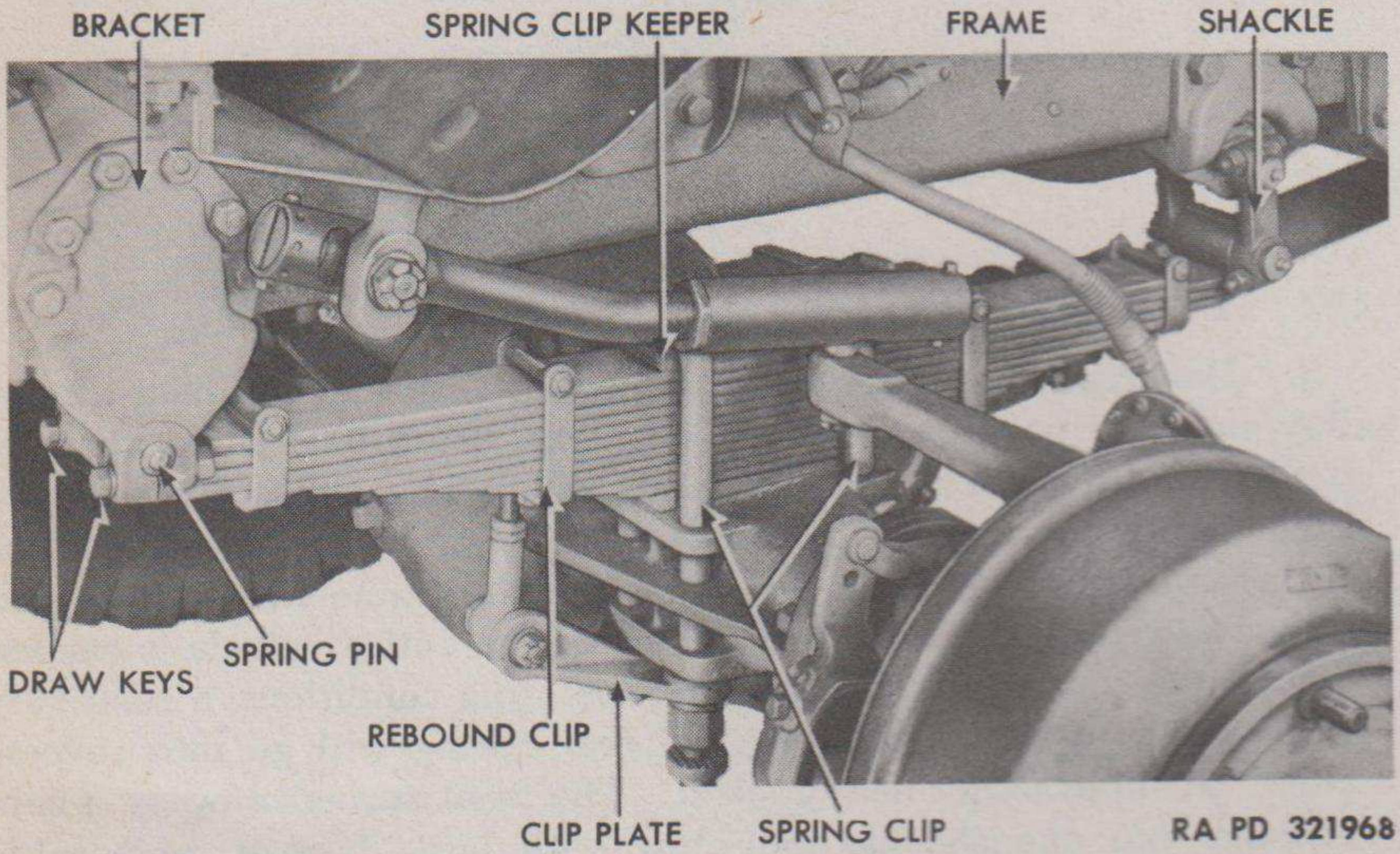


Figure 66 — Front Spring Installed

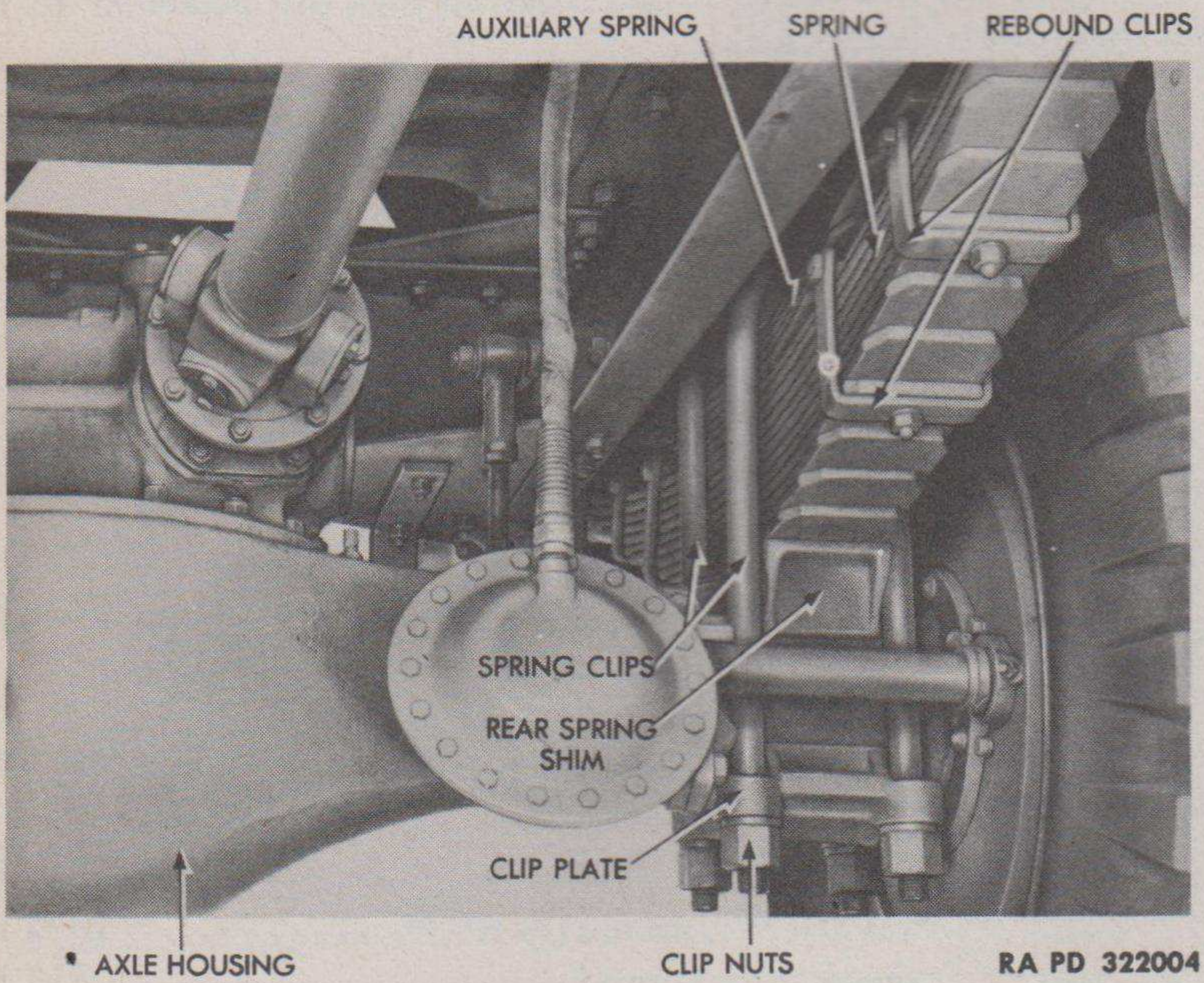


Figure 67 — Rear Spring Installed

SPRINGS AND SHOCK ABSORBERS

105. DISASSEMBLY.

a. **Disassemble Front Spring** (fig. 66). Press spring bushings from spring. Remove center bolt nut, and drive center bolt from spring. Remove spring rebound clip bolt nut from rebound clip bolt on each of the four rebound clips. Pull bolts from rebound clips. Separate spring leaves. Remove nut, lock washer, and plow bolt which secure each of the four rebound clips to spring leaf.

b. **Disassemble Rear Spring** (fig. 67). Press spring bushings from spring. Remove center bolt nut and drive center bolt from spring. Lift auxiliary spring from main spring. Remove spring rebound clip bolt nut from rebound clip bolt on each of the four rebound clips. Pull bolts from rebound clips. Separate spring leaves. Remove nut, lock washer, and plow bolt which attach each rebound clip to spring leaf.

106. CLEANING, INSPECTION, AND REPAIR.

a. Wash all parts in dry-cleaning solvent and dry with cloth. Inspect spring leaves for breaks, and either replace broken leaves or entire spring, depending upon the position of the particular leaves found to be defective. If long leaves at top of spring need replacement, install all leaves from main plate down. Do not install any new leaves in middle or lower part of spring, but replace entire spring instead. Examine spring pins and bushing for scoring, and make sure pins fit snugly in bushing without perceptible play. If scoring is present or fit is loose, replace both pin and bushing. Inspect rebound clips for bends, breaks, and elongated bolt holes; replace clips with breaks or elongated bolt holes. Examine all bolts and nuts for breaks and stripped or jammed threads, and replace those found defective. Replace broken or flattened washers.

107. ASSEMBLY.

a. **Assemble Front Spring** (fig. 66). Coat spring leaves with graphite lubricant. Attach each of the four rebound clips to spring leaf with plow bolt, lock washer, and nut. Assemble spring leaves, and install rebound clip bolt and nut in each rebound clip. Tap center bolt into spring from bottom of spring, and install center bolt nut. Press spring bushing into each end of spring.

b. **Assemble Rear Spring** (fig. 67). Coat leaves of main spring and auxiliary spring with graphite lubricant. Attach each of four rebound clips to spring leaf with plow bolt, lock washer, and nut. Assemble leaves, and install rebound clip bolts and nuts. Position auxiliary spring on main spring, and tap center bolt into position from under side of main spring. Install center bolt nut. Press spring bushings into spring.

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108. FITS AND TOLERANCES.

Spring pin in bushing..... Snug fit without perceptible play

Section II

SHOCK ABSORBERS

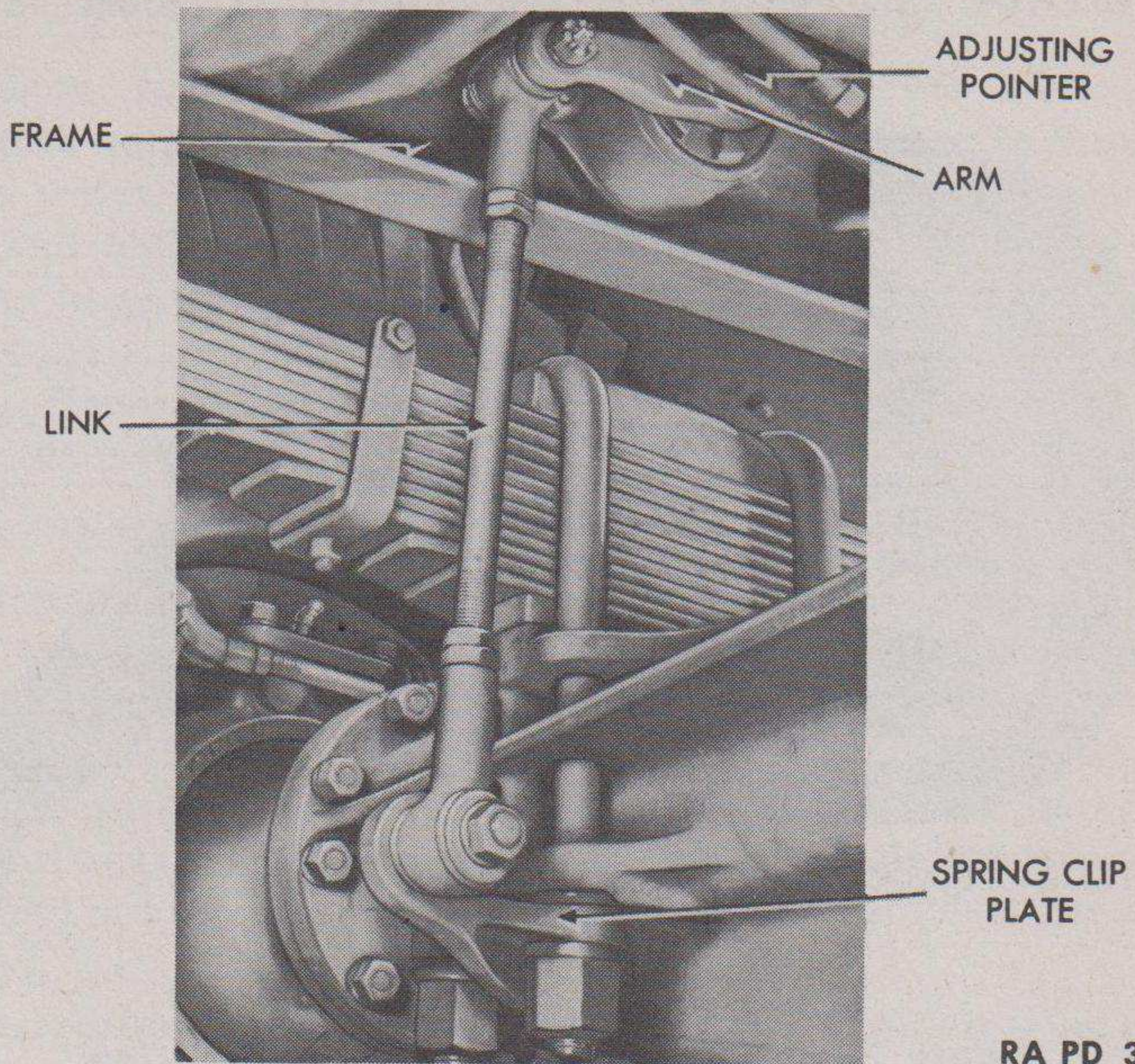
109. DESCRIPTION.

a. **Description.** Four double-acting, oscillating vane, lever-and-link-mounting type shock absorbers are used on these vehicles.

(1) **CONSTRUCTION.** The shock absorber body is made of machined steel and is cylindrical in shape with one end integral. A filler plug is located on its side. Flanges at the base have bolt holes for bolting absorber to frame. The open end of the body has female threads to take the machined steel cover, notches in the cover providing for its installation and removal with a heavy spanner wrench. A hole machined in the center of the cover permits the splined end of the wing shaft or central operating shaft to protrude. Space is allowed for packing between the wing shaft and cover. The wing shaft is drilled along its axis to allow the adjusting valve stem to extend out through the wing shaft, and an adjusting pointer is pressed on the end of the adjusting valve stem. Space is provided under a small drilled plug in the end of the wing shaft for packing around the adjusting valve stem. The bladed inner end of the adjusting valve stem fits into a slot in the mainshaft of the adjusting valve, which consists of a threaded shaft and return spring mechanism with a metering action. Rotation of the adjusting pointer increases or decreases amount of fluid flowing between valve and seat. Thus, the valve provides the means for adjusting the stiffness of shock absorber action. The main part of the shock absorber body cavity is occupied by a flange of special design. This flange contains a ball check valve, and is retained in the body by a heavy coil spring and washer-type spring retainer. A sturdy steel arm is pressed on the protruding splined end of wing shaft. A heavy, heat-treated steel bolt connects the arm to a link which extends to the axle. This link has large rubber bushings in each link end assembly. The two end assemblies are screwed on the threaded link and locked with lock nuts.

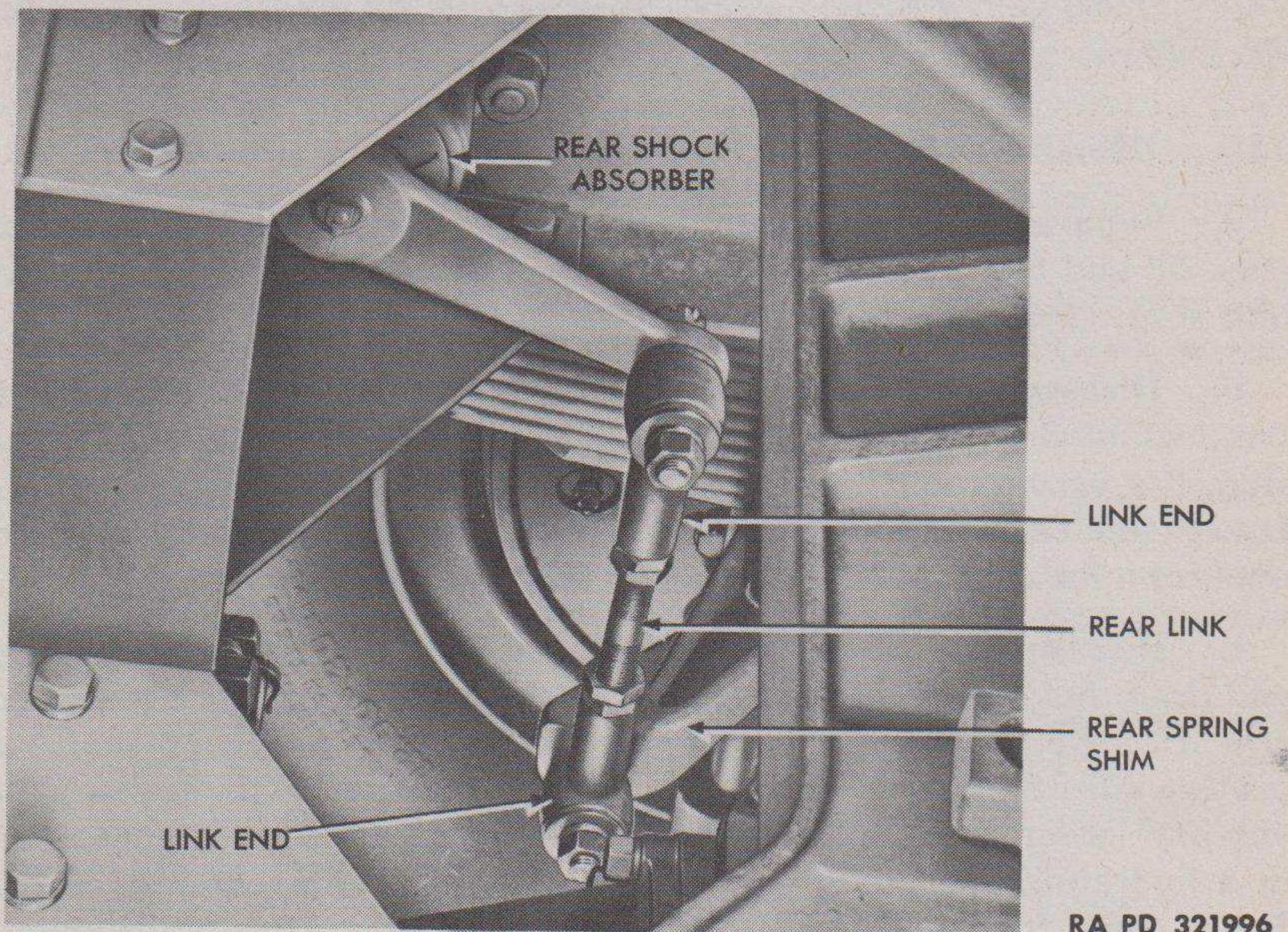
(2) **OPERATION.** These are rotary-type shock absorbers which operate hydraulically. As the axle moves up and down, the shock absorber arm rotates the central operating shaft. Rotation of the shaft forces the fluid through small spring-loaded valves, thus creating resistance to the movement of the arm. The design is such that greater

SPRINGS AND SHOCK ABSORBERS



RA PD 320888

Figure 68 — Front Shock Absorber Installed



RA PD 321996

Figure 69 — Rear Shock Absorber Installed

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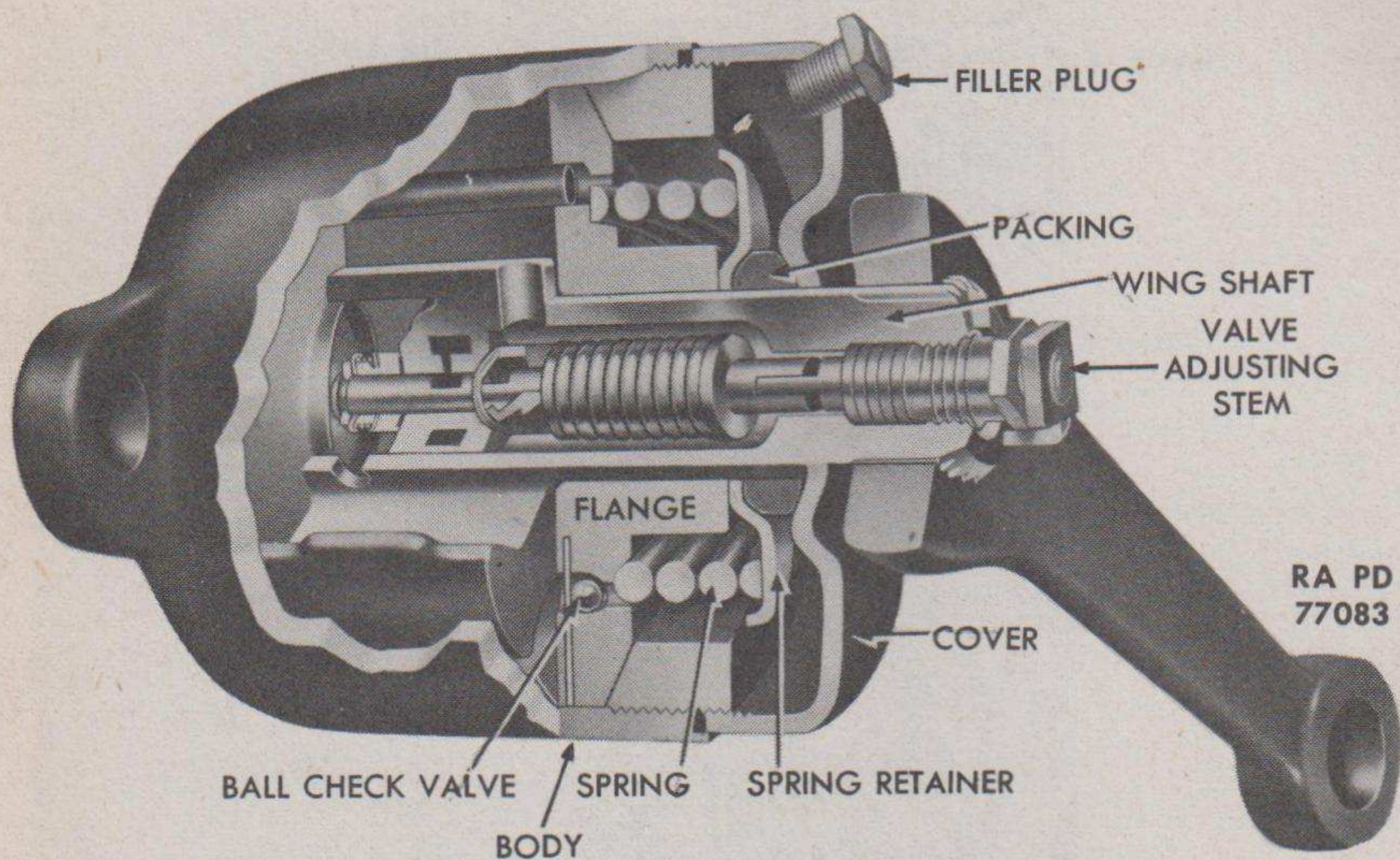


Figure 70 — Shock Absorber — Cutaway View

resistance is offered to spring recoil than to spring compression. The rubber bushing in the shock absorber links offer an additional cushioning effect.

110. DISASSEMBLY.

a. **Separate Shock Absorber Link From Shock Absorber** (figs. 68 and 69). Remove nut and lock washer from shock absorber link stud. Pull link from shock absorber.

b. **Disassemble Shock Absorber Link** (figs. 68 and 69). Remove nut, lock washer, and flat washer from shock absorber link stud. Tap stud, flat washer, and two rubber bushings from link end assembly. Loosen link end assembly block nuts. Screw link end assembly and lock nuts from link. Repeat procedure to disassemble other end assembly.

c. **Disassemble Shock Absorber** (fig. 70). Remove filler plug and drain fluid from shock absorber. Attach puller to shock absorber arm with short piece of pipe between puller screw and wing shaft to protect adjusting valve. Pull arm from wing shaft. Clamp body in vise and loosen cover, but do not remove cover. Place shock absorber in a hydraulic press with ram of press resting lightly against cover. Screw cover from body and release hydraulic press slowly. Remove shock absorber from hydraulic press. Turn shock absorber over and tap body to remove parts from inside body.

SPRINGS AND SHOCK ABSORBERS

111. CLEANING, INSPECTION, AND REPAIR.

a. **Clean, Inspect, and Repair Shock Absorber Link.** Clean metal parts with dry-cleaning solvent. Wash rubber bushings with soap and water. Inspect metal parts to determine if any are bent or broken, and replace defective parts. Inspect link, studs, and nuts to see if any have stripped or jammed threads. Clean small burs from threads with a file; replace parts having stripped or badly jammed threads. Examine rubber bushings, and replace any found to be damaged or in doubtful condition.

112. ASSEMBLY.

a. **Assemble Shock Absorber Link.** Screw both link end assembly lock nuts well on each end of link. Screw link end assemblies into position on link. Tighten lock nuts against end assembled. Position the two rubber bushings in one link end assembly. Place flat washer on shock absorber link stud up against collar. Insert stud through rubber bushings within link end assembly. Install flat washer, lock washer, and nut on stud. Repeat procedure to assemble other link end assembly.

b. **Assemble Shock Absorber (fig. 70).** Position wing shaft in body. Install flange in body over wing shaft, making sure to align dowel pin and hole. Tap flange to seat and place new gasket in position around outside diameter of flange. Install flanged washer rim downward to hold gasket in place. Place spring, spring retainer, and oil seal packing over wing shaft. Place cover on spring retainer and press into body sufficiently to engage threads, using a hydraulic press for this operation. Tighten cover into body. Press shock absorber arm onto wing shaft. Fill shock absorber with heavy shock absorber fluid, and install filler plug.

c. **Install Link on Shock Absorber.** Insert shock absorber link stud through hole in end of shock absorber arm. Install lock washer and nut on stud.

113. TESTS AND ADJUSTMENT.

a. **Test Shock Absorber Action.** Anchor body firmly in vise or attach it to frame. Use a long-handled wrench or pipe on shock absorber arm to move it. Slow movement of arm in each direction under heavy pressure indicates proper functioning of shock absorber.

b. **Adjust Shock Absorber.** Turn adjusting pointer clockwise to soften action, counterclockwise to stiffen action. Make adjustments one notch at a time. Do not turn pointer beyond stops on housing.

114. CAPACITY.

Fluid level:

Minimum.....	1/2 in. below filler plug opening
Maximum.....	Completely filled body cavity

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CHAPTER 14

FRAME, CAB, AND BODY

Section I

FRAME

115. DESCRIPTION.

a. The frame is formed of channel steel side rails and cross members bolted together and reinforced by corner gussets bolted across each corner. The pintle hook bearing plates, which provide a seat for the pintle assembly, are bolted to the rear crossmembers.

116. TESTING OF FRAME.

a. **Preliminary Instructions.** The frame must be checked for alinement, with centering gages, before removal from vehicle.

b. **Install Centering Gages.** Place vehicle on a level floor or on a combination frame straightener and wheel alinement machine. Install three centering gages on frame of vehicle. Place first centering gage near front end of frame, second centering gage near center of frame, and third centering gage near end of frame.

c. **Check Alinement.** Sight along the three centering gages. If frame is straight, the three pointers will be in line. If pointers are not in line, frame is bent. Straighten frame in frame straightener machine.

117. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY.

a. **Disassembly.** Crossmembers and gussets are bolted to the frame and may be removed for replacement by removing nuts, bolts, and lock washers.

b. **Cleaning.** Clean dirt and mud from frame with water and a brush. Remove grease with soda ash solution (TM 9-850).

c. **Inspection.** Inspect frame, crossmembers, and gussets for cracks or fractures. Inspect bolt holes for out-of-round or elongated condition.

d. **Repair.** Weld cracked or fractured frames; weld braces or patches inside the frame at weakened or broken places. Weld out-of-round holes and then drill or bore them to proper size. Remove broken crossmembers and gussets by taking off the attaching nuts, bolts, and lock washers; then weld or replace.

FRAME, CAB, AND BODY

Section II

PINTLE

118. DESCRIPTION.

a. The pintle hook is attached to two bearing plates mounted on two frame crossmembers at the rear of the truck. The top of the hook operates as a jaw which can be opened to provide a 2-inch opening. The jaw is locked in either open or closed position by engagement of a square-shaped tooth in the jaw to a similarly shaped recess in the body of the hook, these parts being held in engagement by a tension spring on the jaw lock. When closed, the jaw can be locked with a lock pin attached by a chain to the pintle body. A heavy coil spring, mounted on the pintle hook shaft between the bearing plates, reduces shocks caused by stopping and starting.

119. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY.

a. Disassembly.

(1) REMOVE LOCK PIN (fig. 71). Pull lock pin out of hook jaw and jaw lock. Remove screw attaching chain to pintle hook.

(2) REMOVE HOOK JAW (fig. 71). Remove cotter pin and nut from hook jaw bolt. Tap out bolt, and remove hook jaw and jaw lock.

(3) REMOVE JAW LOCK (fig. 71). Remove jaw lock pin retaining screw and lock washer. Tap out jaw lock pin, and remove jaw lock from hook jaw.

b. Cleaning, Inspection, and Repair. Clean parts with dry-cleaning solvent. Examine all parts for cracks or fractures, and weld small cracks. Inspect threads for burs and cross threading. Remove burs with a fine file or a handstone; replace parts that cannot be repaired. Inspect pintle spring; if broken, replace with new spring.

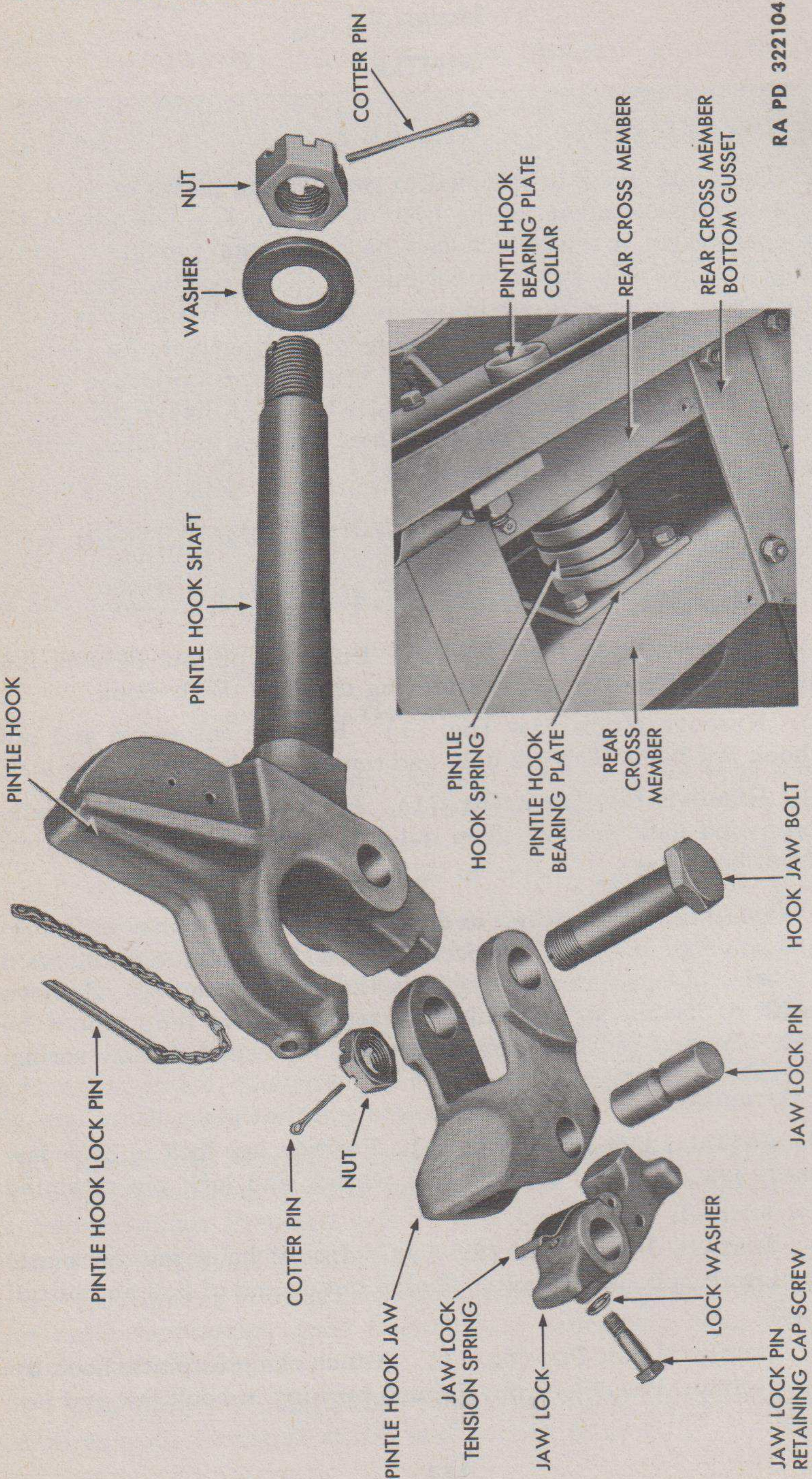
c. Assembly.

(1) INSTALL JAW LOCK (fig. 71). Position jaw lock in hook jaw and insert jaw lock pin. Install lock washer and lock pin retaining screw.

(2) INSTALL HOOK JAW (fig. 71). Install hook jaw on pintle hook by inserting hook jaw bolt. Thread nut on end of bolt and install cotter pin.

(3) INSTALL LOCK PIN (fig. 71). Attach chain to pintle hook by installing screw. Insert lock pin through opening in hook jaw and jaw lock.

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5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



RA PD 322104

Figure 71 — Pintle Disassembled

FRAME, CAB, AND BODY

Section III

CAB

120. DESCRIPTION.

a. While open or closed cab assemblies are provided for this model vehicle, this section covers the open cab only. The open cab, constructed of sheet steel in a silhouette design, is mounted on cab support brackets and cushioned from road shocks by antirattle shims. Access to the engine is gained by removing the engine hood inside the cab and the splash shields beneath the front fenders. Removable fabric top, rear curtain, and side curtains completely enclose the cab interior. The vehicle has two windshield wipers with one mounted at the top center of each side of the divided windshield, the motor for each wiper being supported by a bracket attached to the inside top of the windshield frame. Power of the motor is transmitted through a shaft extending from the motor to the wiper arm outside the windshield. A removable blade is attached to the end of each arm. Wiper motors are individually air-operated and controlled by two valves attached to the instrument panel. The degree of valve opening determines the speed of wiper action. Other parts include: adjustable windshield, doors, rear vision mirrors, grab handles, fenders, and steps.

121. REMOVAL.

a. **Remove Batteries** (fig. 73). Lift out driver's seat cushion, and lift up seat pan. Disconnect cables from battery terminals. Remove nuts and lock washers from battery hold-down studs. Lift out battery hold-down frame assembly. Remove batteries from vehicles.

b. **Remove Battery Ground Cable.** Remove cap screw, nut, and internal-toothed washer securing battery ground cable to left-hand frame side rail; lift out battery ground cable.

c. **Disconnect Battery to Magnetic Switch Cable** (fig. 73). Remove battery to magnetic switch cable from battery box by pushing it down through slot.

d. **Remove Toeboards and Floorboards** (fig. 72). Remove the screws, flat washers, and lock washers which secure left side of engine hood to floorboard frame. Disengage the two latches on right-hand side of hood. Lift out engine hood. Remove the screws, flat washers, internal-toothed lock washers, and lock washers which secure floorboards and toeboards to cab frame. Remove screws, flat washers, and internal-toothed lock washers which secure gearshift finish plate. Lift out gearshift finish plate.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

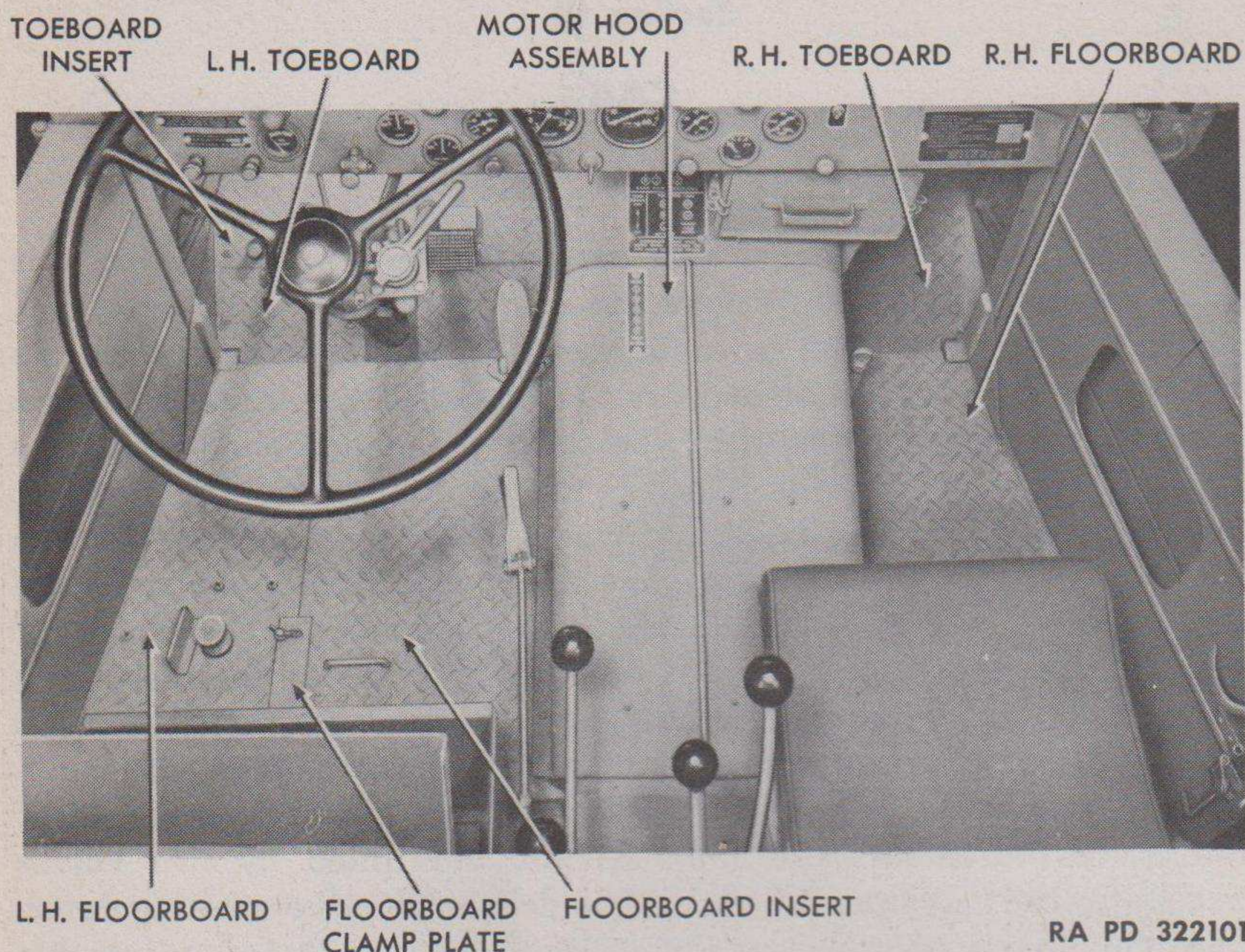


Figure 72 — Floorboards Installed

e. **Remove Splash Shields** (fig. 74). Remove the wing screws, flat washers, and lock washers which attach splash shields to under side of right and left front fenders. Disconnect radio suppression bond from large splash shields. Lift off splash shields.

f. **Disconnect Radio Suppression Bonds.** Disconnect the following radio suppression bonds: Front right-hand corner of cab to frame rail, front left-hand corner of cab to frame rail, right-hand rear of cab to ponton body and to rear cab support, left-hand rear of cab to ponton body and to rear cab support, right-hand floorboard support to manifold shield, condenser on generator to generator cable assembly, and brush guard to frame crossmember.

g. **Disconnect Wiring Harness** (fig. 75). Remove screws and lock washers securing cover to junction block. Disconnect 10 wiring harness terminals from left side of junction block. Remove wiring harness clip from lower end of junction block.

h. **Disconnect Wiring From Generator.** Disconnect three wires and radio suppression bond from top of generator. Tag wires to facilitate installation.

i. **Disconnect Wiring From Cranking Motor Switch.** Remove red wires from terminals at top and bottom of switch.

FRAME, CAB, AND BODY

RA PD 322106

- A—CABLE (TO "B +" TERMINAL OF CRANKING MOTOR SWITCH)
- B—POSITIVE POST
- C—LEFT-HAND BATTERY
- D—GROUND CABLE
- E—CABLE (BATTERY TO MAGNETIC SWITCH)
- F—CABLE (TO "A -" TERMINAL OF CRANKING MOTOR SWITCH)
- G—RIGHT-HAND BATTERY
- H—SEAT PAN AND BATTERY BOX
- J—BATTERY HOLD-DOWN FRAME

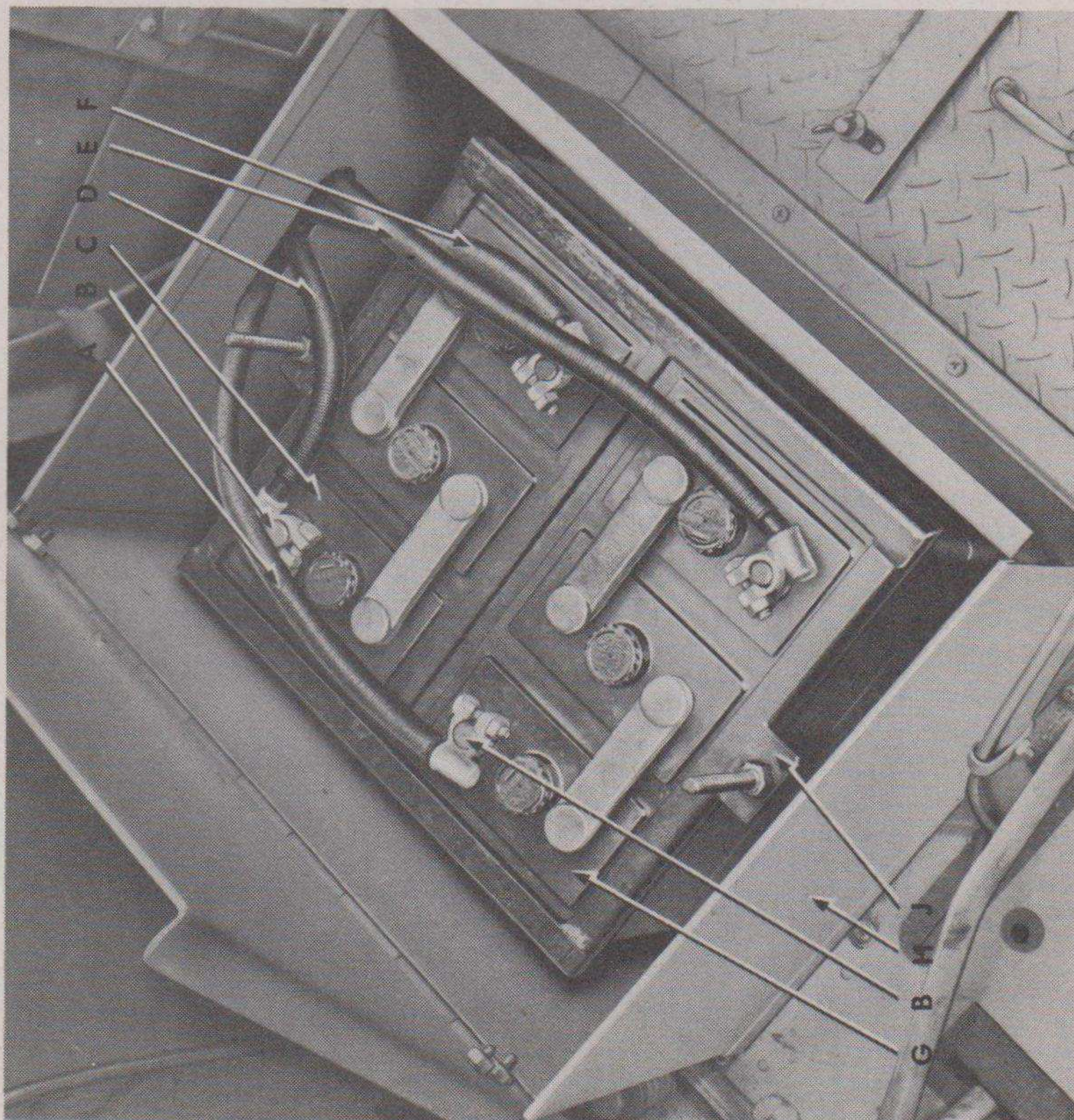
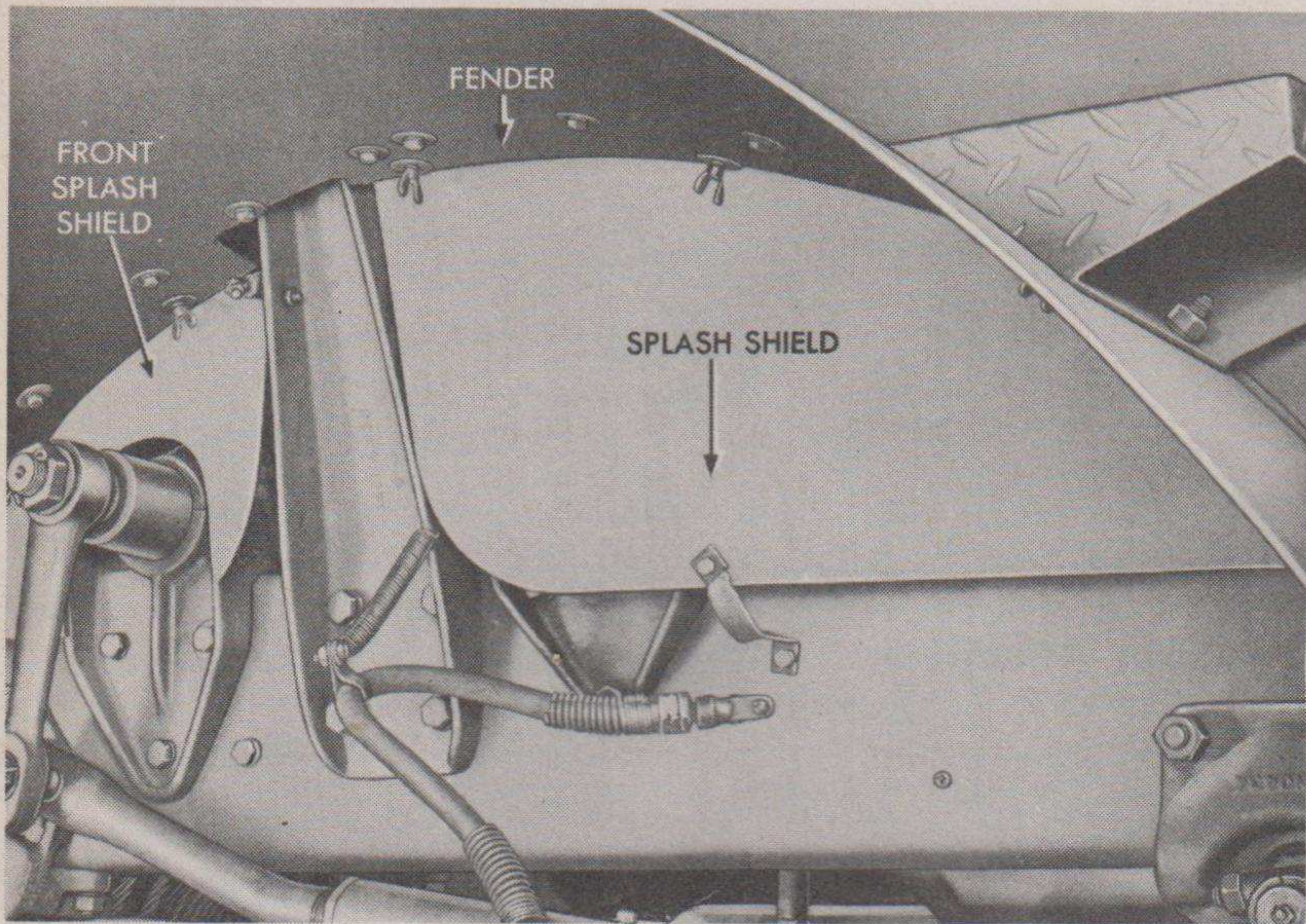


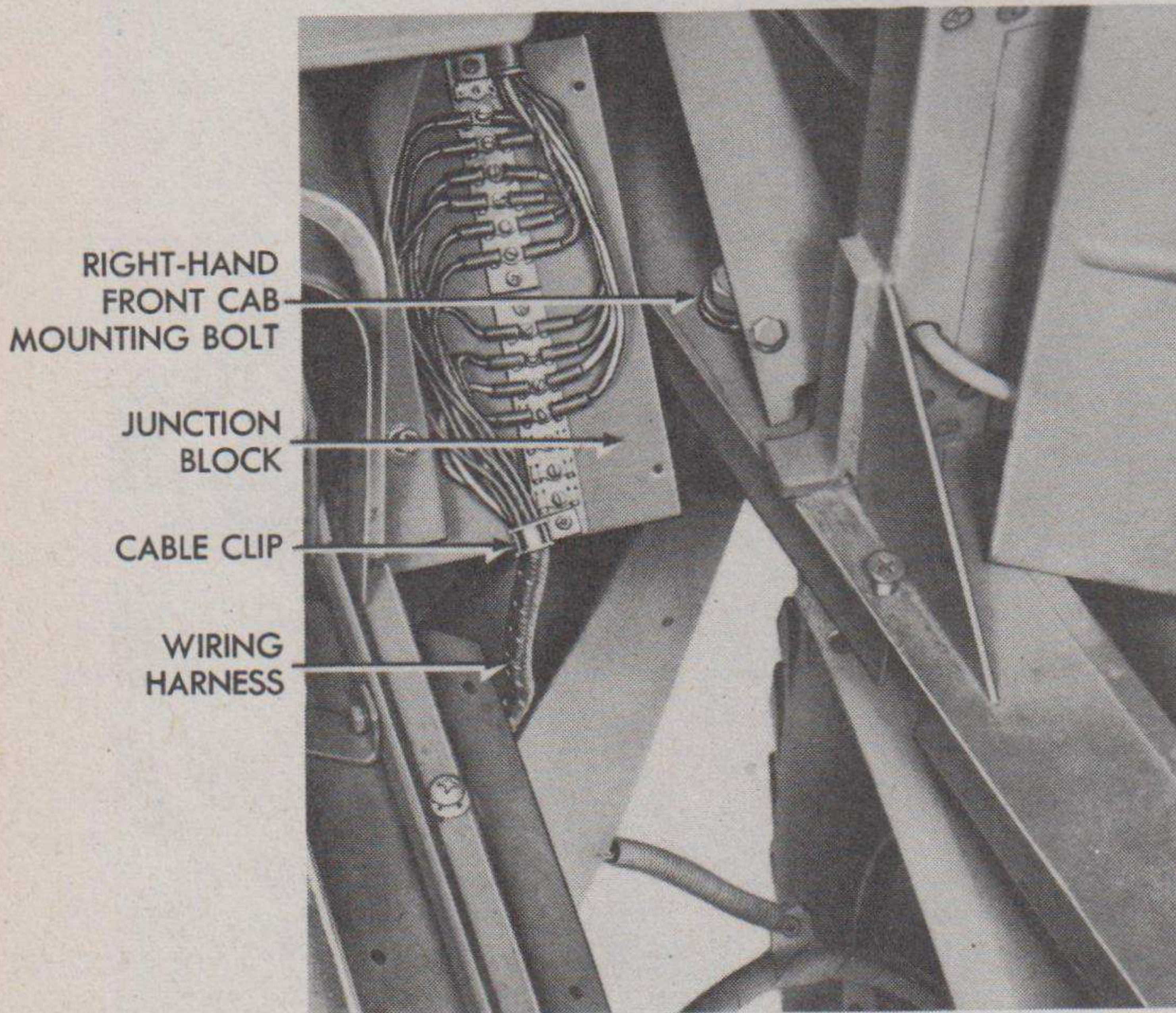
Figure 73 — Batteries Installed

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



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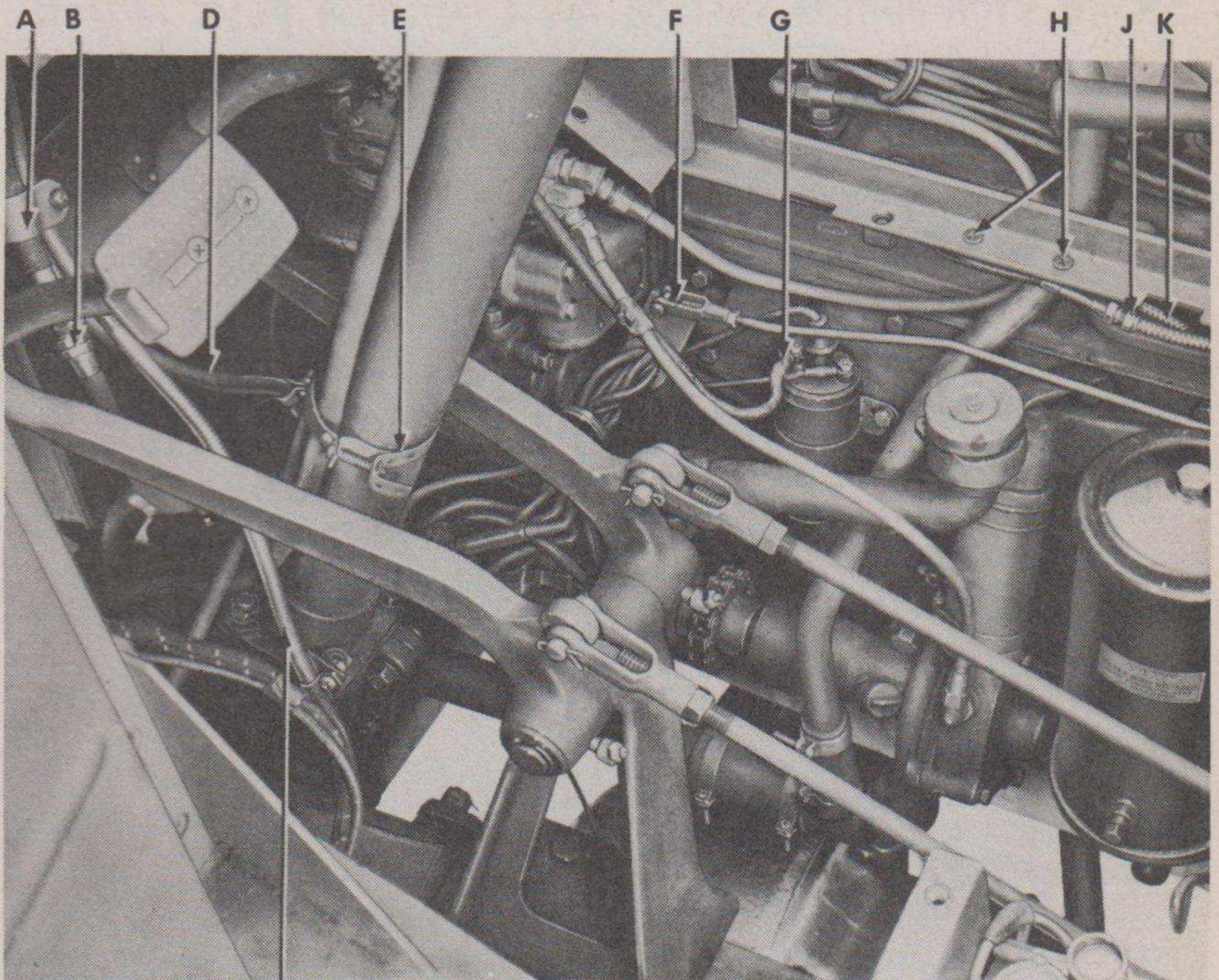
Figure 74 — Splash Shields Installed



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Figure 75 — Junction Block Installed

FRAME, CAB, AND BODY



- C
A—TUBING CLIP
B—AIR GAGE HOSE UNION
C—SPEEDOMETER CABLE
D—TACHOMETER CABLE
E—TACHOMETER WIRE CLIP
F—CARBURETOR CONTROL ROD CLEVIS
G—IGNITION SWITCH TO COIL WIRE
H—OIL TUBE CLIPS
J—VISCOSITY GAGE TUBE CONNECTOR
K—OIL PRESSURE GAGE TUBE CONNECTOR

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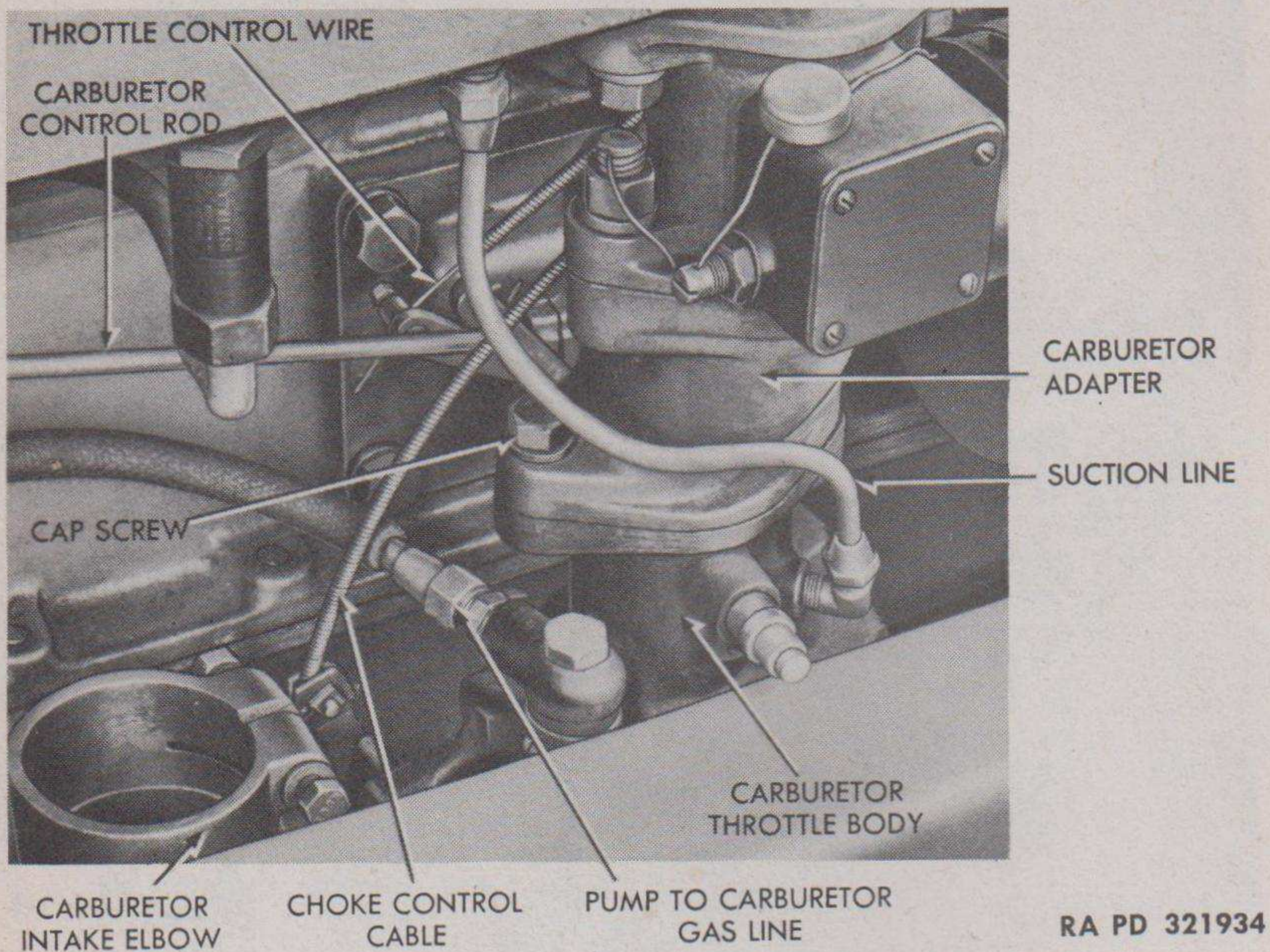
Figure 76 — Floorboards Removed To Show Cables, Linkage, and Miscellaneous Connections — Left Side View

j. Disconnect Wire From Coil. Disconnect ignition switch to coil wire from coil (fig. 76).

k. Disconnect Horn Wire. Break horn wire by pulling apart the snap socket at base of steering column. Remove clamp bolt, nut, and lock washers; free horn wire from steering gear case.

l. Disconnect Controls From Carburetor (fig. 77). Loosen screws and clamps securing choke and throttle control wires to carburetor. Pull out wires. Loosen bolts on brackets securing both wires to front valve cover plate and engine manifold. Free wires.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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RA PD 321934

Figure 77 — Carburetor Controls

m. Disconnect Speedometer Cable From Speedometer. Back off knurled nut attaching cable to speedometer. Pull out cable.

n. Disconnect Tachometer Cable From Tachometer. Back off knurled nut attaching cable to tachometer. Pull out cable.

o. Remove Speedometer and Tachometer Cables From Cowl. Remove screw and lock washer, and open cable clamp on cowl. Free speedometer and tachometer cables and lay them aside.

p. Disconnect Air Gage Hose. Separate air gage hose at union located between clutch and brake pedal (B, fig. 76).

q. Remove Air Cleaner Air Pipe. Loosen clamps at each end of air pipe. Remove air pipe.

r. Disconnect Heat Indicator Cable. Loosen the nut securing cable to rear end of water outlet manifold. Pull tube from manifold. Remove nut, lock washer, clip, and screw securing cable to engine and to lower end of upper hose connection. Pull cable free.

s. Disconnect Viscometer and Oil Pressure Gage Tubes (fig. 76). Remove two bolts and lock washers from cab floor support, and release oil tubes from clips (H, fig. 59). Disconnect tubes at connec-

FRAME, CAB, AND BODY

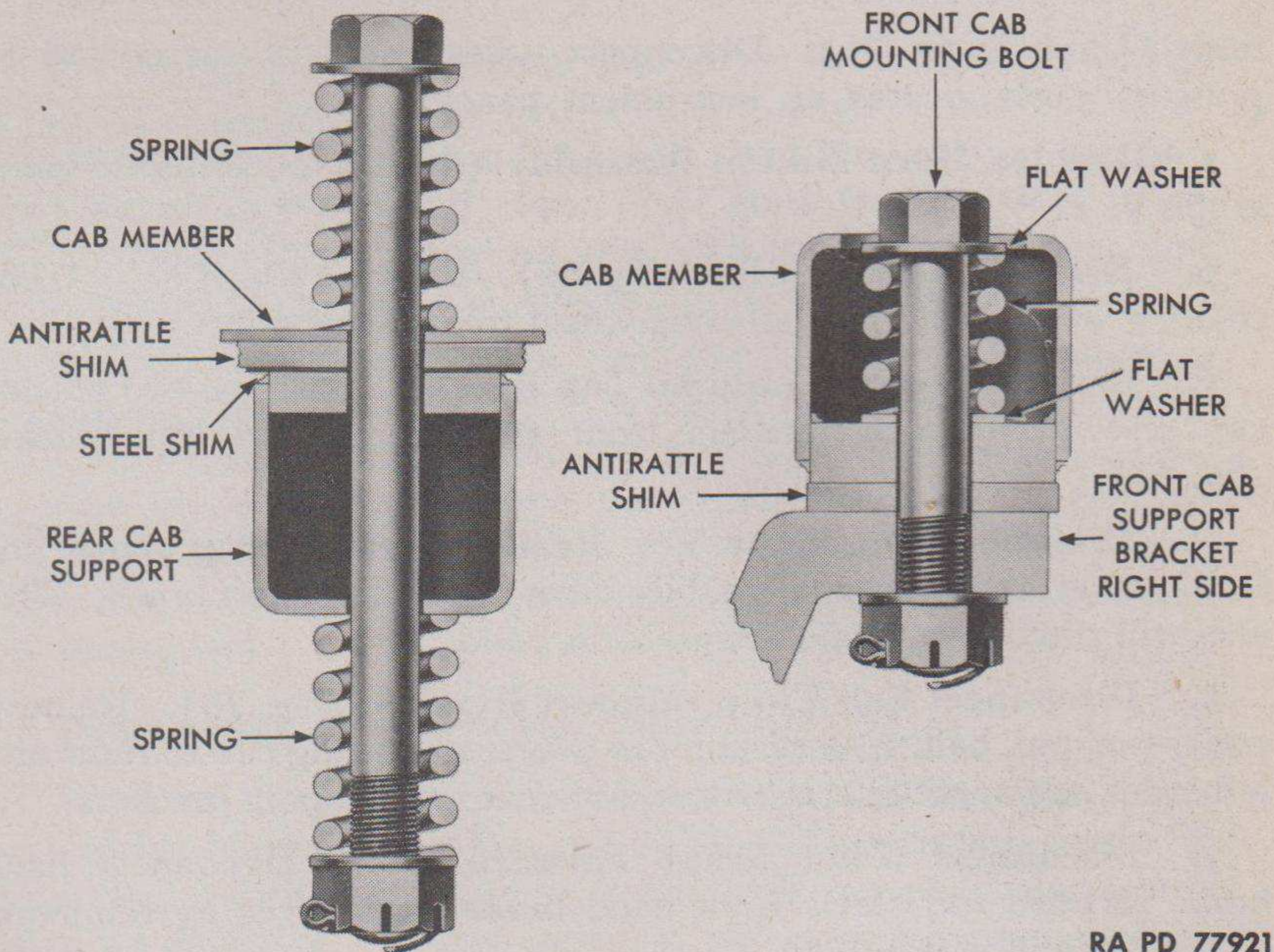


Figure 78 – Cab Mountings – Sectionalized View

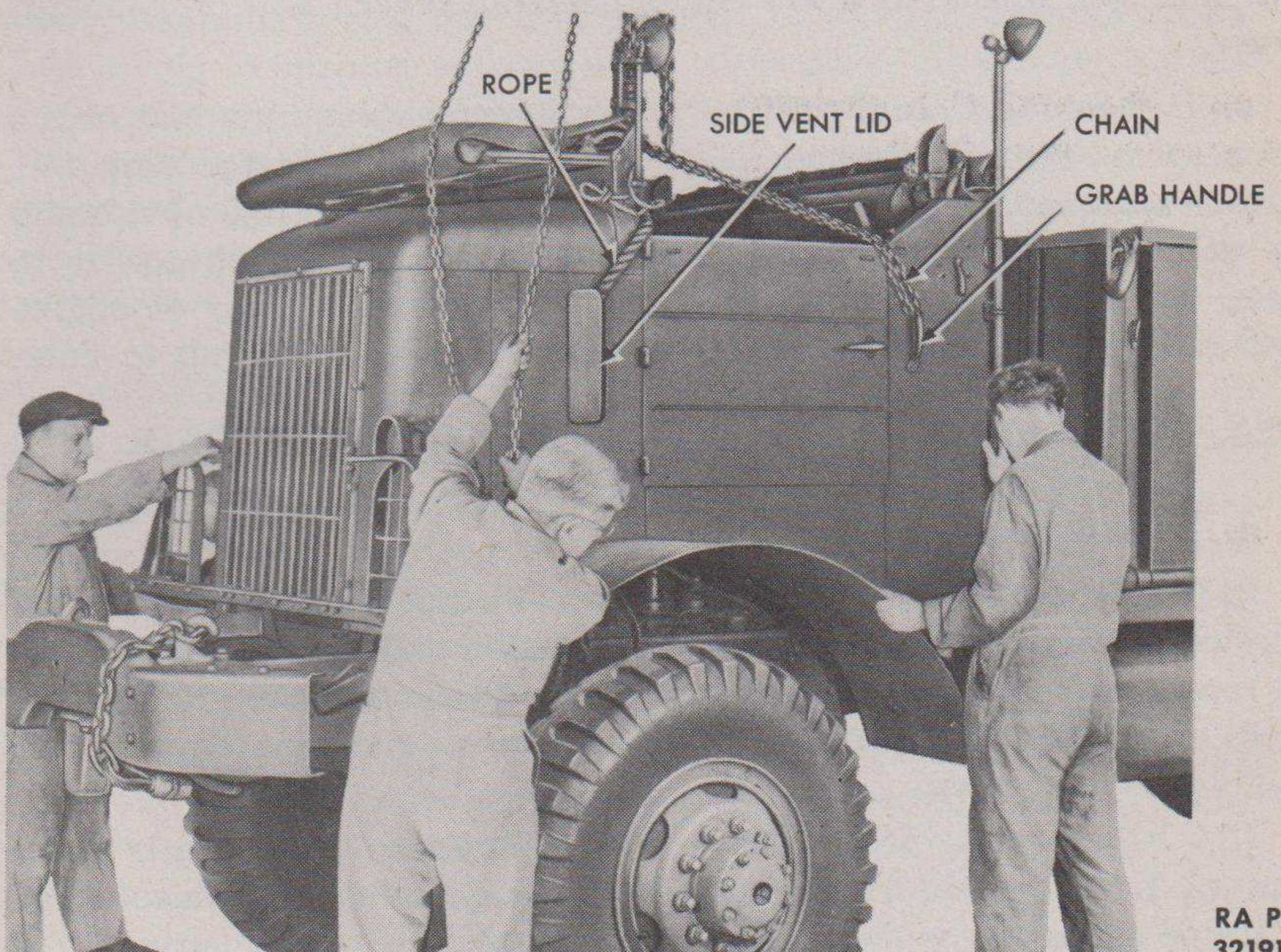


Figure 79 – Removing Open Cab

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

tions (J and K, fig. 76). Disconnect tubes from viscometer and oil pressure gages located on instrument panel.

t. **Remove Horn Button Assembly** (fig. 130). Refer to paragraph 95 c.

u. **Remove Steering wheel** (fig. 60). Remove wheel nut. Using steering wheel puller, lift steering wheel from jacket tube.

v. **Remove Steering Column Top Bracket**. Remove two bracket cap screws and lock washers from steering column top bracket (fig. 61).

w. **Disconnect Radiator Top Brace**. Remove cap screw and lock washer securing radiator inlet elbow to radiator top brace. This also will disconnect radio suppression bond.

x. **Disconnect Cab From Support Brackets** (fig. 78). Remove cotter pin, nut, bolt, springs, and flat washers securing cab to right and left front cab support brackets and to rear cab support bracket.

y. **Disconnect Hand Brake Forward Rod**. Disconnect hand brake forward rod clevis from hand brake shaft lever by removing cotter pin and clevis pin.

z. **Remove Gearshift Lever**. Remove gearshift lever cap screw, nut, and lock washer at lower end of gearshift lever. Lift off gearshift lever.

aa. **Remove Cab** (fig. 79). Open the cowl side nuts and pass a rope across the cab through both vents. Attach rope to chain fall. Attach a second rope or chain to grab handles on each side of cab and to chain fall. Raise cab straight up, with a man at each corner to keep cab from fouling. When lower part of cab is clear of engine and radiator, roll chassis back from under cab. Lower cab to floor.

122. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES.**a. Windshield.**

(1) **DISASSEMBLY** (fig. 80). Remove inner quadrant adjusting screws. Lift windshield to horizontal position and slide it out of hinge at top of outer frame assembly. Remove screws attaching top frame strip of windshield assembly to center and outer frame strips. Lift out windshield glass.

(2) **CLEANING, INSPECTION, AND REPAIR**. Wash parts with water. If windshield frame requires painting, use a soda ash solution. If frame strips are bent, straighten or replace.

(3) **ASSEMBLY** (fig. 80). Insert glass into recesses of center, bottom, and outer frame strips. Position top strip and secure with

FRAME, CAB, AND BODY

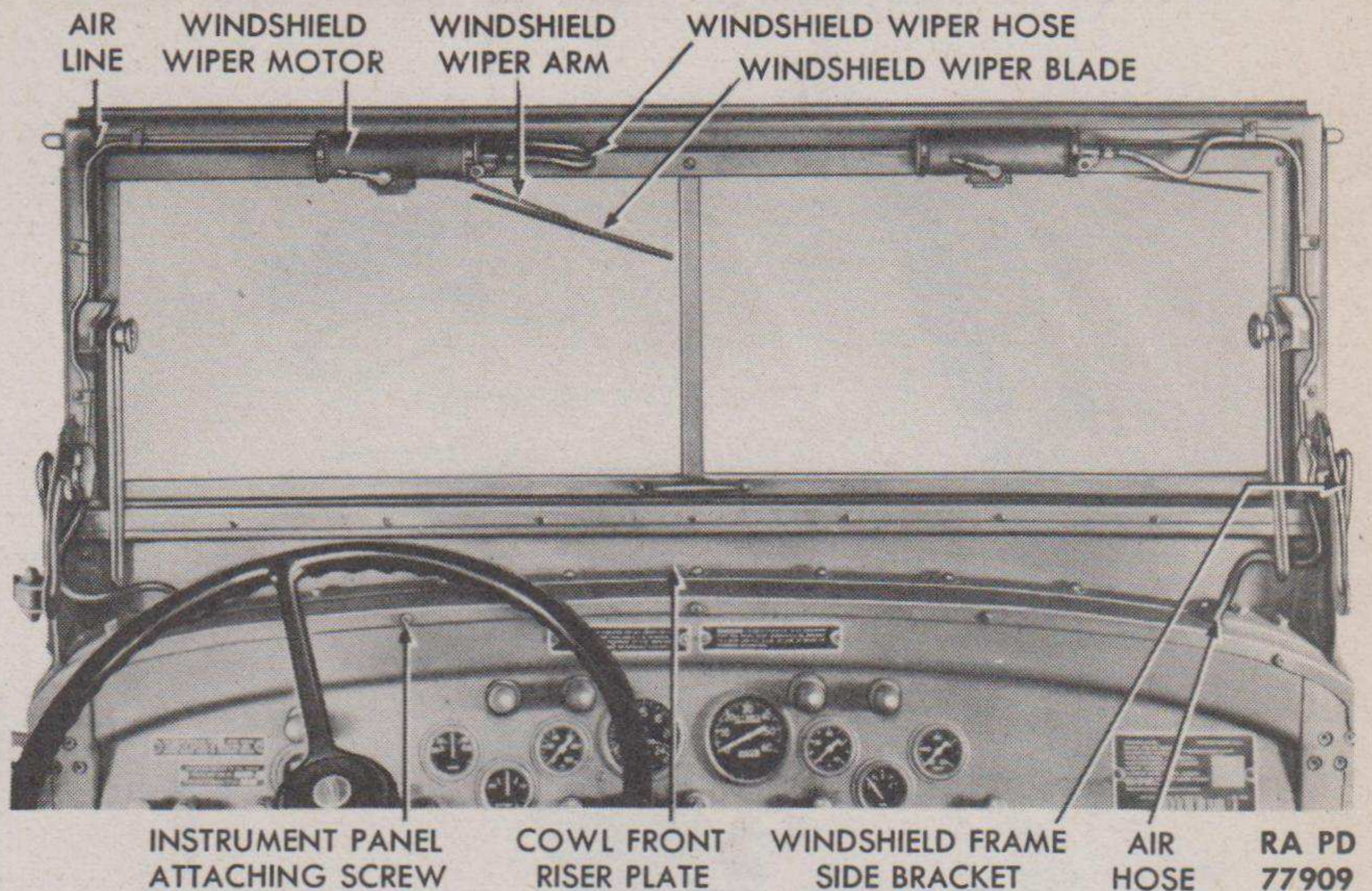


Figure 80 – Windshield Installed

screws. Slide top windshield frame strip into hinge of outer frame assembly. Install inner quadrant adjusting screws.

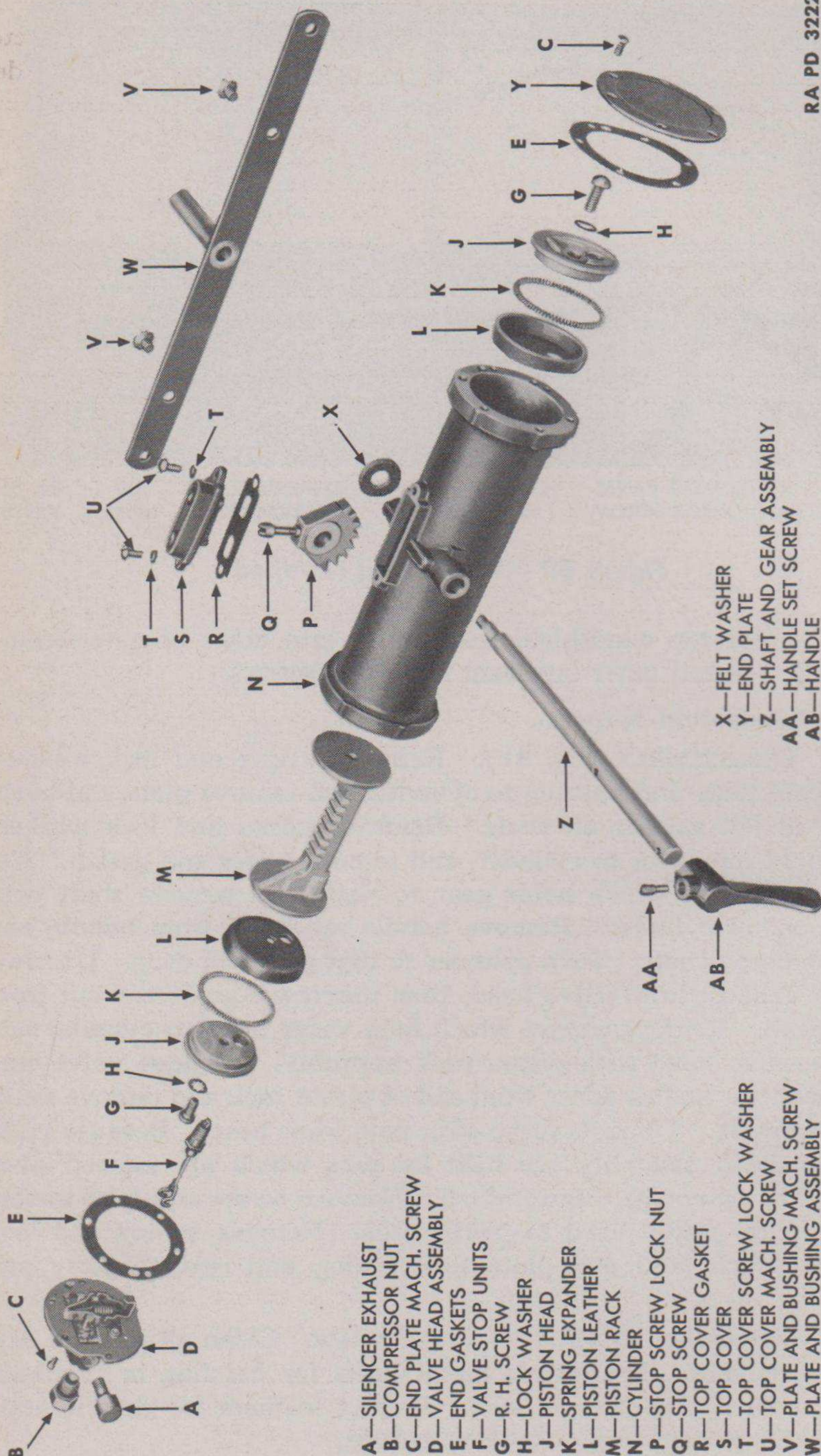
b. Windshield Wipers.

(1) **DISASSEMBLY** (fig. 81). Remove screws and lock washers which hold plate and bushing to cylinder, and remove plate and bushing. Pull felt washer off shaft. Remove screws and lock washers which hold top cover to cylinder, and remove cover and gasket. Remove stop screw which holds gear to shaft and remove shaft with handle out of cylinder. Remove handle set screw from handle and pull handle off shaft. Turn cylinder so that gear will drop. Unscrew silencer exhaust from valve head; then unscrew compressor nut from valve head. Remove screws which hold valve head to cylinder and remove valve head with piston rack assembly. Remove valve stop unit connector hollow screw from end of piston rack and remove valve head assembly. Unhook valve stop unit from head. Because parts of valve head assembly are held by pins which are peened over, these parts cannot be disassembled. Remove screw and lock washer which secure piston head to piston rack. Remove screws and lock washers which hold end plate to cylinder, and remove plate and gasket.

(2) **CLEANING, INSPECTION, AND REPAIR.** Clean all parts in dry-cleaning solvent. Inspect all metal parts for bending or breaking. Replace parts if bent or broken. Inspect leathers for deterioration and replace if necessary. Replace gaskets.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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RA PD 322246



- A—SILENCER EXHAUST
- B—COMPRESSOR NUT
- C—END PLATE MACH. SCREW
- D—VALVE HEAD ASSEMBLY
- E—END GASKETS
- F—VALVE STOP UNITS
- G—R. H. SCREW
- H—LOCK WASHER
- J—PISTON HEAD
- K—SPRING EXPANDER
- L—PISTON LEATHER
- M—PISTON RACK
- N—CYLINDER
- P—STOP SCREW LOCK NUT
- Q—STOP SCREW
- R—TOP COVER GASKET
- S—TOP COVER
- T—TOP COVER SCREW LOCK WASHER
- U—TOP COVER MACH. SCREW
- V—PLATE AND BUSHING MACH. SCREW
- W—PLATE AND BUSHING ASSEMBLY
- X—FELT WASHER
- Y—END PLATE
- Z—SHAFT AND GEAR ASSEMBLY
- AA—HANDLE SET SCREW
- AB—HANDLE

Figure 81 — Windshield Wiper Motor Disassembled

FRAME, CAB, AND BODY

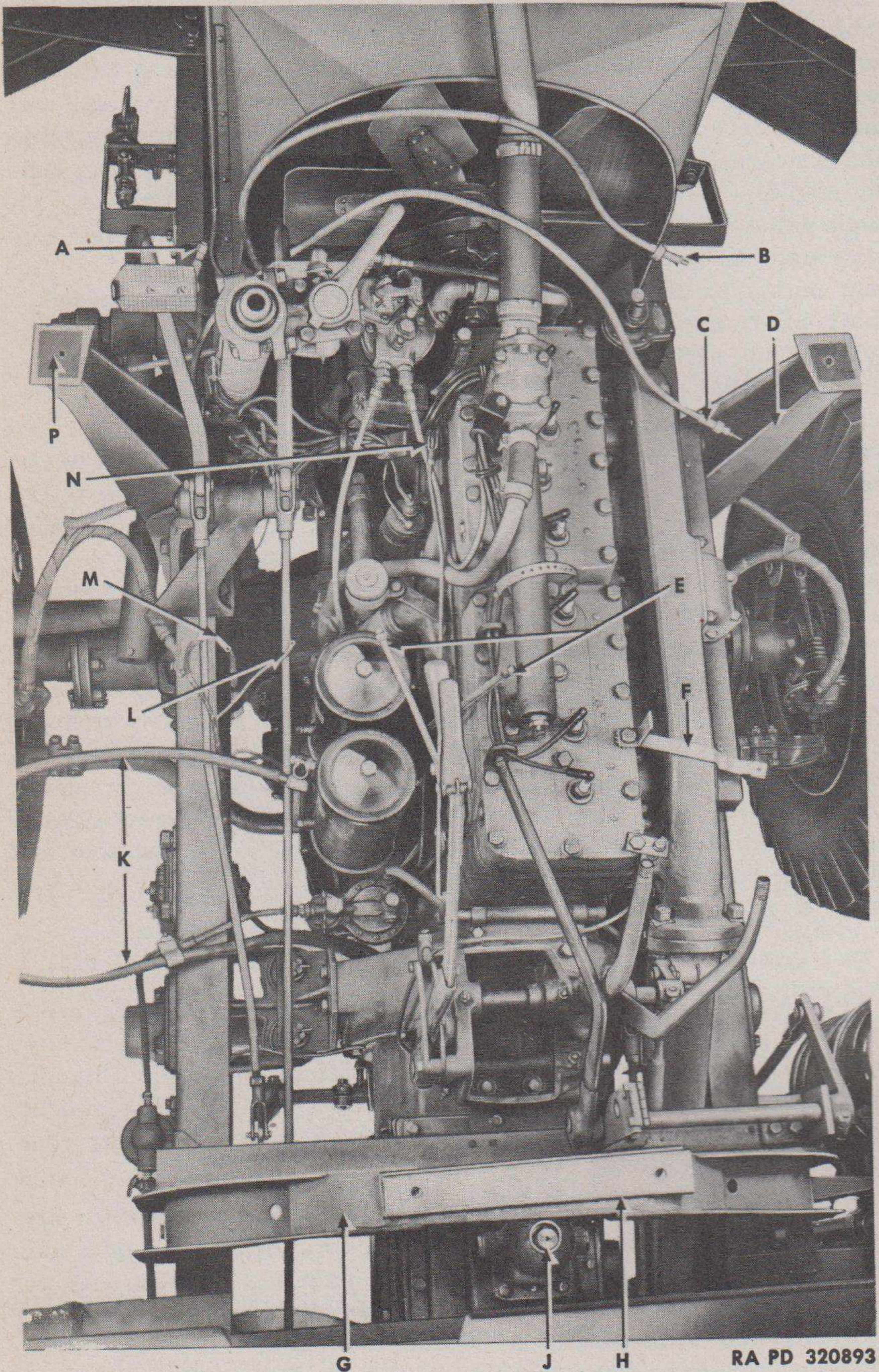
(3) **ASSEMBLY** (fig. 81). Position leather, spring expander, and piston head to valve stop unit end of rack; insert screw and lock washer in piston head and tighten. Screw valve stop unit connector hollow screw into piston head. Insert valve stop, spring expander, leather piston head, and rack in cylinder; shove them through until rack projects through cylinder. Position leather spring expander and piston head to rack, insert screw and lock washer in piston head, and tighten. Pull piston and rack assembly through cylinder, and hook valve stop unit to valve head assembly. Position valve head plate and end plate, insert screws, tighten center rack, and drop rack gear onto rack through top cover hole. Position handle on end of shaft, insert handle set screw, and shove handle and shaft through cylinder and rack gear. Drop stop screw into gear, position shaft by turning so that stop screw will go through hole in shaft, and tighten set screw. Position top cover and gasket, insert two screws and lock washers, and tighten. Slide felt washer on end of shaft. Position frame and bushing by inserting shaft through bushing. Insert screws and lock washers securing plate and bushing assembly to cylinder, and tighten. Position exhaust silencer and compressor nut to valve head, and screw them in until tight. Hook unit valve stop to valve head, and insert in hole of piston head. Position spring expanders, piston leathers, and piston heads to rack and insert internal-toothed washers and screws. Insert valve unit assembly and piston and rack assembly into position, and fasten end plates to cylinder with end plate screws. Place shaft and gear assembly in cylinder, insert screw and lock nut into gear assembly, and tighten. Position top cover, gasket, and handle. Insert screws and lock washers. Screw silencer exhaust and compressor nuts into cylinder. Position felt washer and plate and bushing assembly to cylinder, and insert screws and lock washers.

c. Doors.

(1) **DISASSEMBLY.** Remove nut and lock washer securing inside handle to shaft of outside handle, and lift off inside handle. Remove two screws attaching outside handle plate to door and pull out handle. Remove four screws securing lock inside door compartment, and lift out lock. Remove two screws attaching male dovetail to door edge, and lift off dovetail.

(2) **CLEANING, INSPECTION, AND REPAIR.** Clean lock with dry-cleaning solvent. Wash dirt and mud off door with water, or a soda ash solution (TM 9-850), if it is to be painted. Inspect lock for broken springs, replacing lock if springs are broken. Examine door for dents and broken hinges. Bump out dents. Replace broken hinges by removing four attaching screws, pulling out broken hinge, and installing new hinge.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)



RA PD 320893

Figure 82 — Cab Removed — Top View of Vehicle

FRAME, CAB, AND BODY

- A—AIR GAGE HOSE UNION
- B—TACHOMETER CABLE
- C—SPEEDOMETER CABLE
- D—RIGHT-HAND FRONT CAB SUPPORT BRACKET
- E—VISCOMETER AND OIL PRESSURE GAGE TUBES
- F—RADIO BOND
- G—REAR CAB SUPPORT
- H—ANTIRATTLE SHIM
- J—GEARSHIFT LEVER STUB
- K—BATTERY TO MAGNETIC SWITCH CABLE
- L—CRANKING MOTOR SWITCH TO MAGNETIC SWITCH WIRE
- M—CRANKING MOTOR SWITCH TO CRANKING MOTOR TERMINAL POST WIRE
- N—CARBURETOR CONTROL ROD CLEVIS
- P—ANTIRATTLE SHIM

RA PD 320893B

Legend for Figure 82 — Cab Removed — Top View of Vehicle

(3) ASSEMBLY. Secure lock in position inside door compartment with four screws. Insert shaft of outside handle through door and lock. Secure with two screws. Position inside handle on protruding end of shaft, and install lock washer and nut. Attach male dovetail to edge of door with two screws.

123. INSTALLATION.

a. **Install Slings to Cab** (par. 121 aa). Lower cab over engine and position it on supporting brackets. Raise rear of cab sufficiently to insert steel shim and fabric antirattle shim between cab and rear cab support. Install two rear cab mounting bolts, with spring on end of each from above. Raise each side of the cab and insert antirattle fabric shim between cab and front cab support brackets. Insert cab mounting bolts, springs, flat washers, nuts, and cotter pins. **NOTE:** *Right-hand cab mounting bolt is inserted from above and left-hand bolt is inserted from below. One spring is used and installed on the upper part of each bolt.*

b. **Connect Battery to Magnetic Switch Cable.** Insert battery to magnetic switch cable through floor plate and slot in battery box.

c. **Attach Battery Ground Cable.** Install battery ground cable on left-hand frame side rail with cap screw, nut, and toothed lock

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

washer. Insert battery end of cable through floor plate and battery box.

d. **Install Gearshift Lever.** Place gearshift lever on gearshift lever stud and attach with cap screw, lock washer, and nut.

e. **Attach Hand Brake Forward Rod.** Connect hand brake forward rod clevis to hand brake shaft lever. Insert clevis pin and cotter pin.

f. **Connect Radiator Top Brace.** Install cap screw and lock washer securing radiator top brace to radiator inlet elbow. Radio suppression bond is also attached to this cap screw.

g. **Install Steering Column Top Bracket (fig. 61).** Install top bracket and two bracket cap screws and lock washers.

h. **Install Steering Wheel (fig. 60).** Position steering wheel on jacket tube. Screw on steering wheel nut.

i. **Install Horn Button Assembly (fig. 130).** Refer to paragraph 101 j.

j. **Connect Viscometer and Oil Pressure Gage Tubes.** Connect two ends of viscometer tube and oil pressure gage tube (J and K, fig. 76). Attach both tubes to cab floor support by clips (H, fig. 76). Connect tubes to viscometer and oil pressure gages located on instrument panel.

k. **Connect Heat Indicator Cable.** Insert tube in rear end of water outlet manifold. Tighten nut securing cable to manifold. Install clip, nut, lock washer, and screw securing cable to engine head and lower end of upper hose connection.

l. **Install Air Cleaner Air Pipe.** Install air pipe between air cleaner and carburetor. Tighten clamps at each end of air pipe.

m. **Connect Air Gage Hose.** Connect air gage hose at union between clutch and brake pedal (B, fig. 76).

n. **Install Speedometer and Tachometer Cables.** Install cable clip which secures speedometer and tachometer cables to cowl.

o. **Connect Tachometer Cable to Tachometer.** Insert end of cable into opening in tachometer. Secure by installing knurled nut.

p. **Connect Speedometer Cable to Speedometer.** Insert end of cable into opening in speedometer. Secure by installing knurled nut.

q. **Connect Controls to Carburetor (fig. 77).** Push in choke control on dash. Open carburetor air shutter or choke valve. Attach choke control cable to air shutter lever and throttle control wire to carburetor throttle lever. Be sure throttle is closed when throttle

FRAME, CAB, AND BODY

control on dash is in. Connect carburetor control rod to throttle lever; then attach throttle and choke control wires to clip in front valve cover plate and tighten clamp bolt.

r. **Connect Horn Wire.** Connect ends of horn wire by joining snap connection at base of steering column.

s. **Connect Wire to Coil.** Connect ignition switch to coil wire to coil (fig. 76).

t. **Connect Wiring to Cranking Motor Switch.** Attach large red wire from harness to left rear terminal and small red wire to bottom right side terminal.

u. **Connect Wiring to Generator.** Three wires project from harness at generator. Connect as follows: Black to ground screw, yellow to field (small) terminal, and red to armature (large) terminal. Mount condenser on ground screw and connect its lead to armature terminal. Connect bond strap (generator to frame side rail) to ground screw.

v. **Connect Wiring to Junction Block** (fig. 75). Connect 10 wiring harness terminals to left side of junction block, matching color of wires attached to right side of junction block. Secure wiring harness to lower end of junction block by harness clip. Install junction block cover.

w. **Connect Radio Suppression Bonds.** Connect radio suppression bonds removed in paragraph 121 f.

x. **Install Toeboards and Floorboards** (fig. 72). Position toeboards, floorboards, and gearshift finish plate to cab frame. Install screws, flat washers, internal-toothed washers and lock washers. Position engine hood over engine. Secure left-hand side with three screws, lock washers, and flat washers; secure right-hand side with the two latches.

y. **Install Splash Shields** (fig. 74). Position the four splash shields to under side of right and left front fenders and secure with wing screws, flat washers, and lock washers. Connect radio suppression bond to large splash shields.

z. **Install Battery Ground Cable.** Attach battery ground cable to left-hand frame side rail with internal-toothed washer and cap screw. Pull battery end of cable up into battery box.

aa. **Install Battery to Magnetic Switch Cable** (fig. 73). Pull cable up into position in battery box.

bb. **Install Batteries** (fig. 73). Place batteries in battery box with positive posts (slightly larger posts) toward the rear. Place battery hold-down frame on batteries. Secure with the two stud nuts and lock washers, drawing nuts up snug but not tight. Connect left-

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hand battery as follows: Cable from "A" terminal of cranking motor switch to negative post, ground cable to positive post. Connect right-hand battery as follows: Cable from cranking motor magnetic switch to negative post, cable from "B+" terminal of cranking motor switch to positive post. Lightly grease exposed metal parts of cable terminals and posts after connection is made. Lower seat pan and install cushion. Check installation of batteries by starting engine with cranking motor. Satisfactory starting and a charge reading on ammeter indicate correct installation.

Section IV

BODY

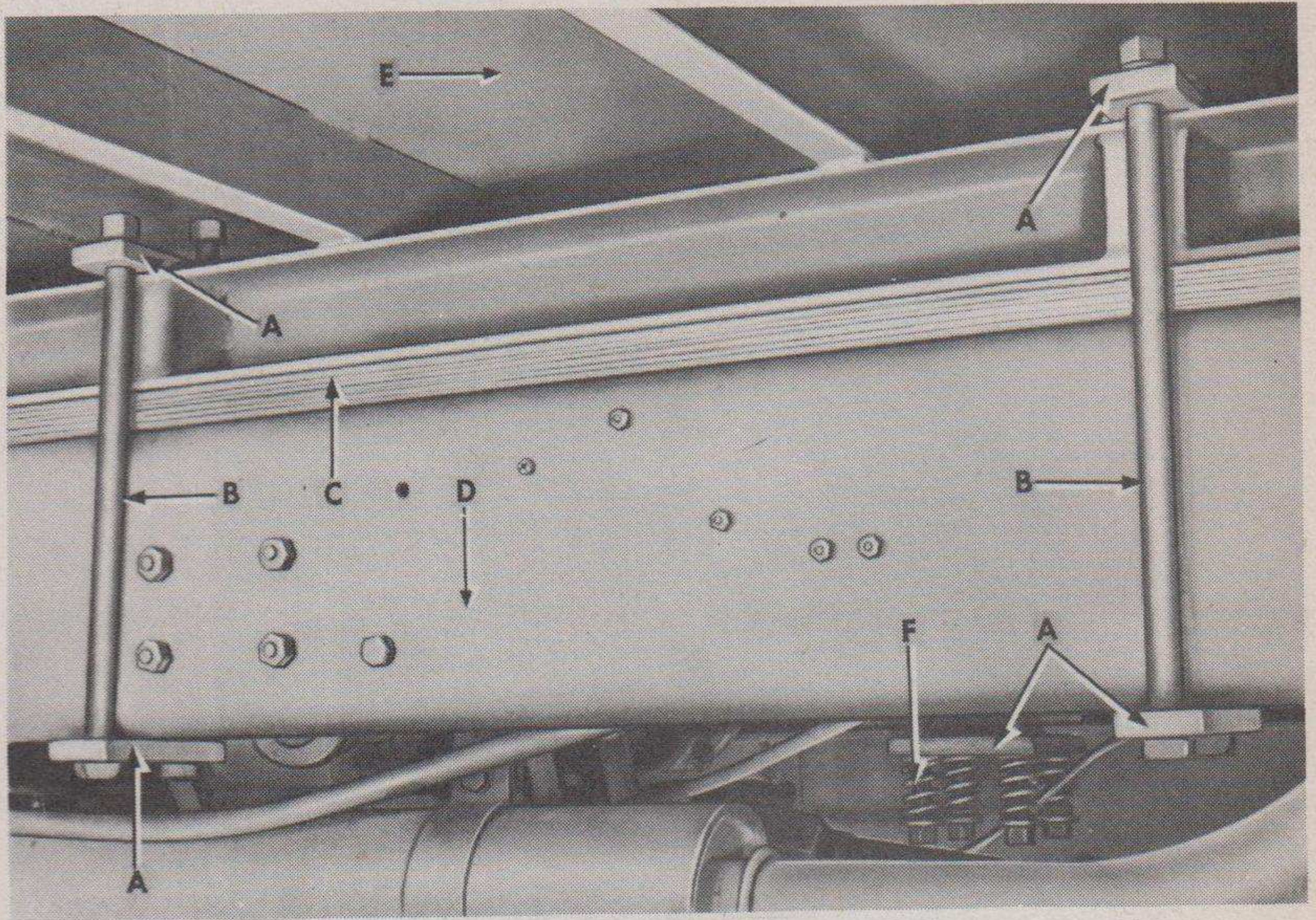
124. DESCRIPTION.

a. The ponton body, mounted directly behind the cab, rests on wood body sills and is clamped to the left and right frame rails by mounting bolts and plates. Two endgates, one on each side, are hinged at the bottom and provided with eyelet bars at top corners. To lock gates in closed position, an S-hook is inserted through eyelet bars on gates and a single chain link on ponton body. A tarpaulin is provided to completely cover the top of body. The spare tire is mounted at the rear of the body.

125. REMOVAL.

- a. **Remove Tool Box.** Lift tools out of tool box. Remove four bolts at each end of tool box. Lower tool box to floor.
- b. **Disconnect Radio Suppression Bonds.** Disconnect two flexible bond straps joining back of cab to body.
- c. **Remove Mounting Bolts (fig. 83).** From right side, remove four mounting bolts, nuts, lock washers, and mounting bolt plates. From left side, remove four mounting bolts, flat washers, body hold-down springs and nuts, and one mounting bolt plate.
- d. **Remove Spare Wheel and Tire.** Remove three wheel nuts securing wheel to bracket at rear of ponton body. Lift off spare wheel and tire.
- e. **Disconnect Hose Coupling Rear Frame Brackets (fig. 84).** Remove bolts, nuts, and lock washers which secure left- and right-hand hose coupling rear frame brackets to ponton body.
- f. **Remove Ponton Body.** Lift off ponton body with a chain fall.

FRAME, CAB, AND BODY



A—MOUNTING BOLT PLATES
B—MOUNTING BOLT
C—WOOD BODY SILL

D—RIGHT FRAME RAIL
E—PONTON BODY
F—BODY HOLD-DOWN SPRINGS

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321975

Figure 83 — Ponton Body Mounting

126. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES.

a. **Disassembly.** Lower end gates to open position. Remove cap screws and lock washers attaching endgate hinges to ponton body. Lift off end gate.

b. **Cleaning, Inspection, and Repair.** Wash body and endgates with water to remove dirt and mud. If painting is required, wash with a soda ash solution (TM 9-850). Inspect body and gates for cracks, fractures, and dents. Weld cracks and bump out dents. Examine bushings in endgate hinges, removing rough spots found. Examine mounting bolts for damaged threads. Repair threads with thread die or, if badly damaged, replace bolts. Inspect wood body sills and install new sills if breaks are found.

c. **Assembly.** Lift endgate into position and install endgate hinges. Attach hinges to ponton body with lock washers and cap screws.

127. INSTALLATION.

a. **Install Wood Body Sills** (fig. 83). Position body sills on left- and right-hand frame rails.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
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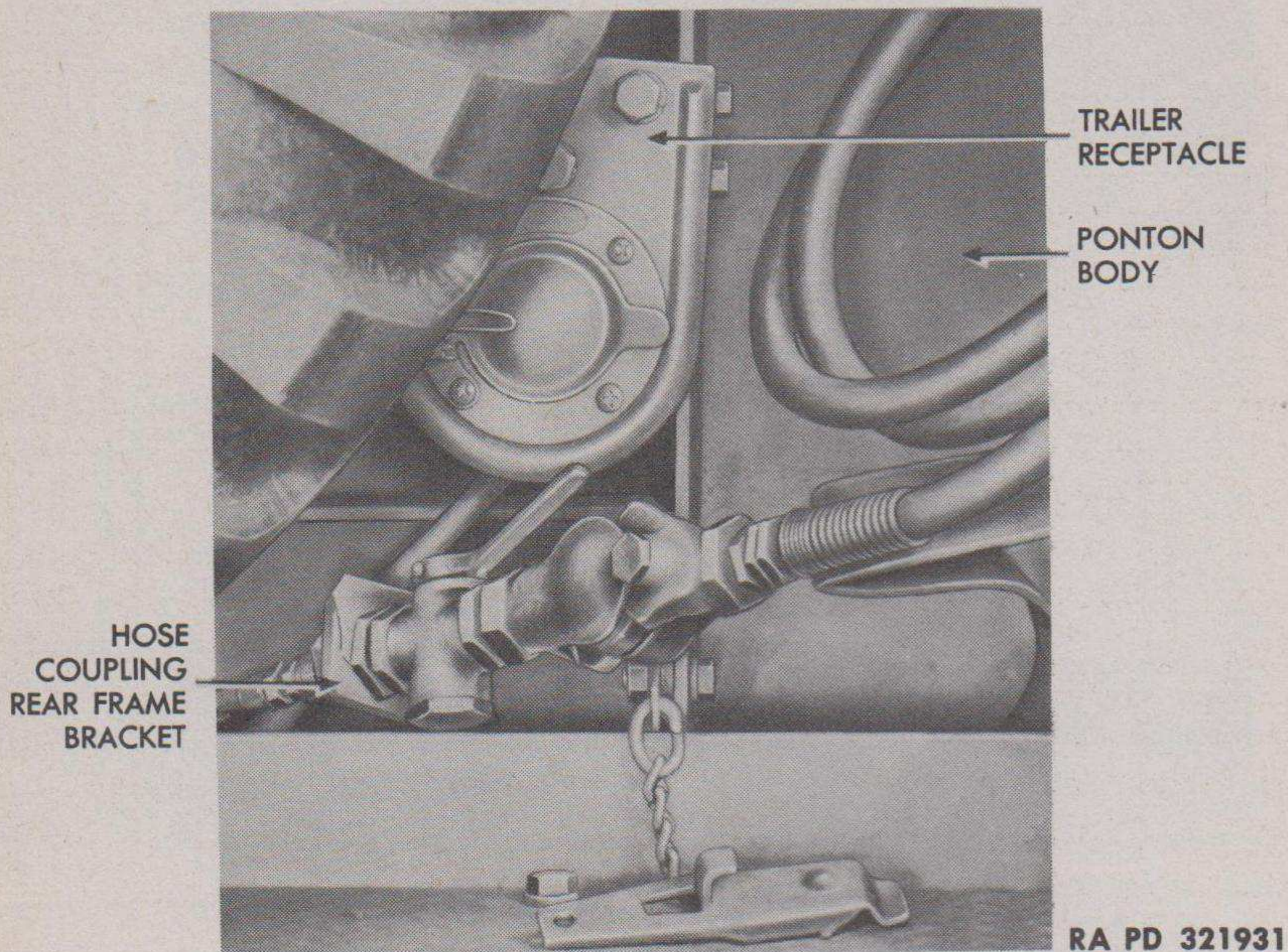


Figure 84 — Trailer Receptacle

b. **Install Mounting Bolts** (fig. 83). Lift body into position across frame rails on the wood body sills. Insert rear right-hand mounting bolts in lower mounting bolt plate. Position bolts on each side of right-hand frame rail. Install top mounting bolt plate, lock washers, and nuts. Install front right-hand mounting bolts in the same manner. Install four left-hand body mounting bolts, mounting bolt plates, body hold-down springs, flat steel washers, and nuts. Tighten nuts until length of each spring is 2 inches.

c. **Connect Hose Coupling Rear Frame Brackets** (fig. 84). Install right- and left-hand hose coupling rear frame brackets to ponton body with bolts, lock washers, and nuts.

d. **Install Spare Wheel and Tire.** Lift wheel and tire in position against bracket at rear of body. Secure with three wheel nuts.

e. **Connect Radio Suppression Bonds.** Connect the two cab to body flexible bond straps to ponton body at right and left side of front end of body.

f. **Install Tool Box.** Position tool box on right side of vehicle. Install four bolts at each end of tool box. Replace tools and equipment in tool box.

CHAPTER 15

WINCH

Section I

DESCRIPTION AND DATA

128. DESCRIPTION AND OPERATION.

a. **Description** (fig. 85). A winch assembly is attached to the left- and right-hand frame rails behind the front bumper with the left end of the drum shaft supported on a brass sleeve housed in the end frame assembly. The clutch yoke and drag brake are attached to the end frame by a pin, and a clutch sliding on feather keys is located on the drum shaft between the end frame and drum hub. Fixed clutch jaws are on the drum hub. A left-hand worm gear bolted onto a spider is pressed on the right end of the drum shaft and locked in place by two keys. Ball bearings support the right-hand worm gear at the front and rear. A brake case, attached to the front of the gear case, houses a brake disk attached to forward end of the worm shaft and a brake band assembly.

b. **Operation.** The winch is controlled by a power take-off shifter lever in the cab, operating the take-off in either of two forward speeds or one reverse speed. Power is transmitted from main transmission to power take-off and winch drive shaft to the worm shaft of the winch. This right-hand worm meshes with the left-hand worm gear keyed on the drum shaft. Motion then is transmitted from drum shaft to cable winding drum by engaging sliding clutch with fixed clutch jaws on drum hub.

129. DATA.

Make	Gar Wood
Model	3U615
Drive	Power take-off to jaw clutch on end frame
Control	{ Power take-off control in cab { Free spooling control on winch
Cable:	
Length	300 ft
Diameter	5/8 in.
Load capacity, low speed (first layer on drum).....	15,000 lb
Worm reduction	29 to 1

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

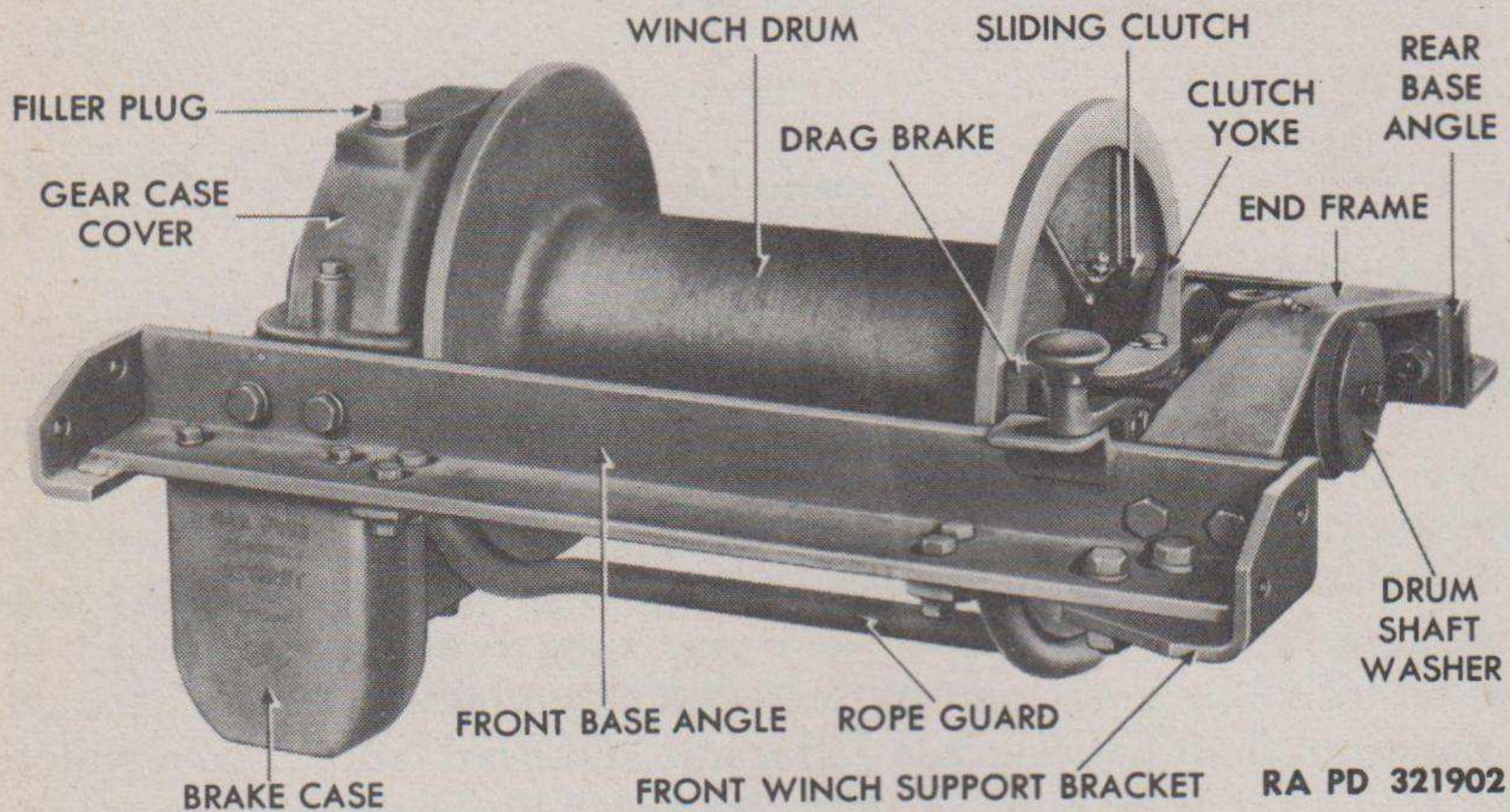


Figure 85 — Winch Assembly

Section II

DISASSEMBLY INTO SUBASSEMBLIES

130. DISASSEMBLY.

- a. **Remove Winch Assembly.** Refer to TM 9-817.
- b. **Drain Gear Case (fig. 86).** Remove drain plug from bottom of gear case and drain lubricant.
- c. **Remove Base Angles (fig. 85).** Remove cap screws, nuts, lock washers, and bolts attaching front and rear base angles to winch end frame and gear case. Lift off rear base angle and front base angle with attached rope guard.
- d. **Remove End Frame, Clutch and Drag Brake Assembly (fig. 85).** Remove cap screw and lock washer from end of drum shaft. Lift off drum shaft washer and shims. Lift off end frame, and clutch and drag brake assembly. Frame thrust ring will fall free on removal of end frame. Remove sliding clutch from clutch yoke.
- e. **Remove Drum, Drum Shaft, and Left-hand Worm Assembly.** Remove cap screw and lock washer from worm end of drum shaft. Lift off drum shaft washer and shims. Remove cap screws and lock washers attaching gear case cover to gear case. Lift off cover and cover gasket. Lift worm end of drum shaft out of gear case (fig. 87). Slide outer gear case bushing and gear thrust washer off end of shaft.

WINCH

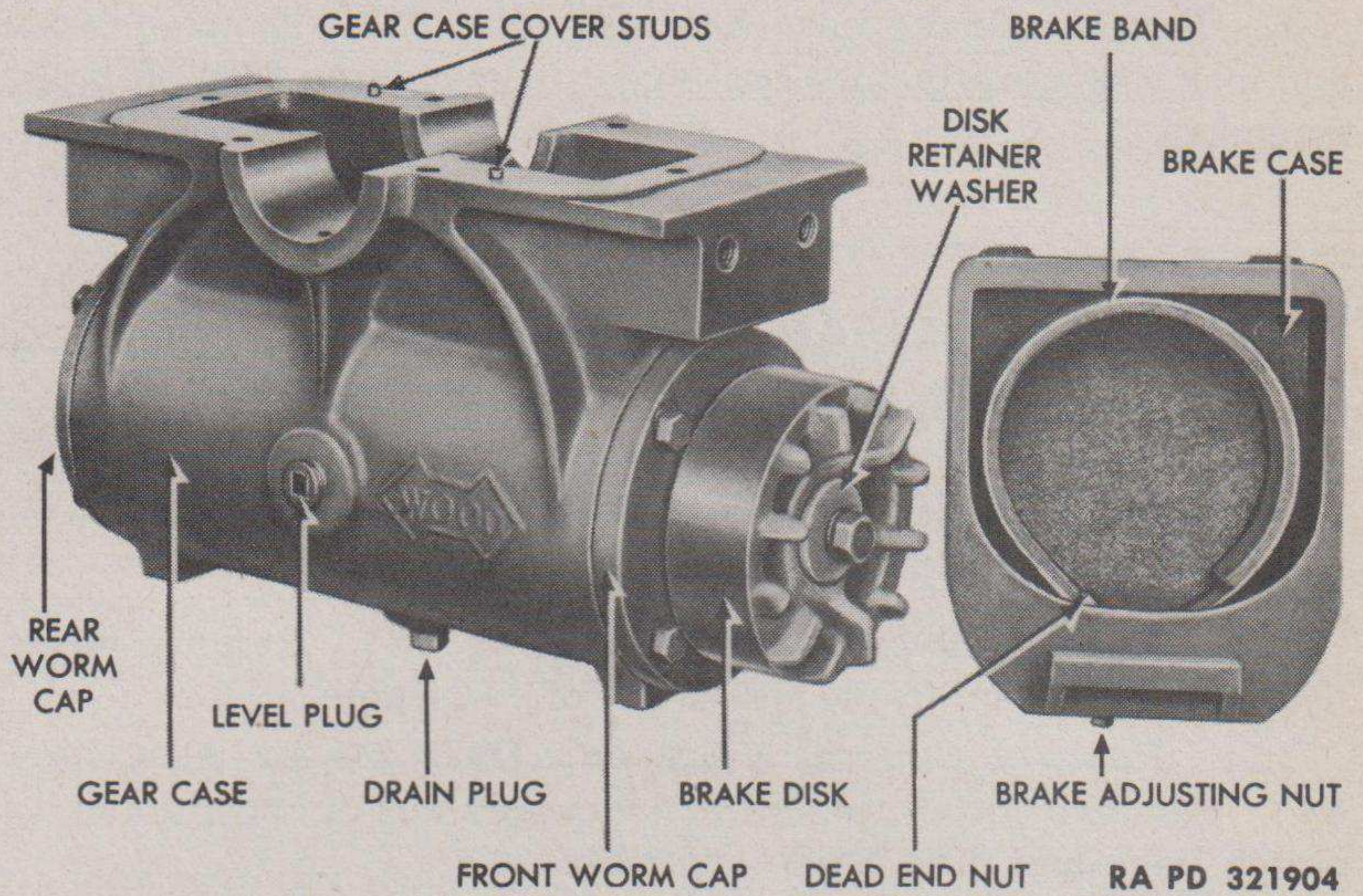


Figure 86 — Winch Gear Case Assembly — Brake Case Removed

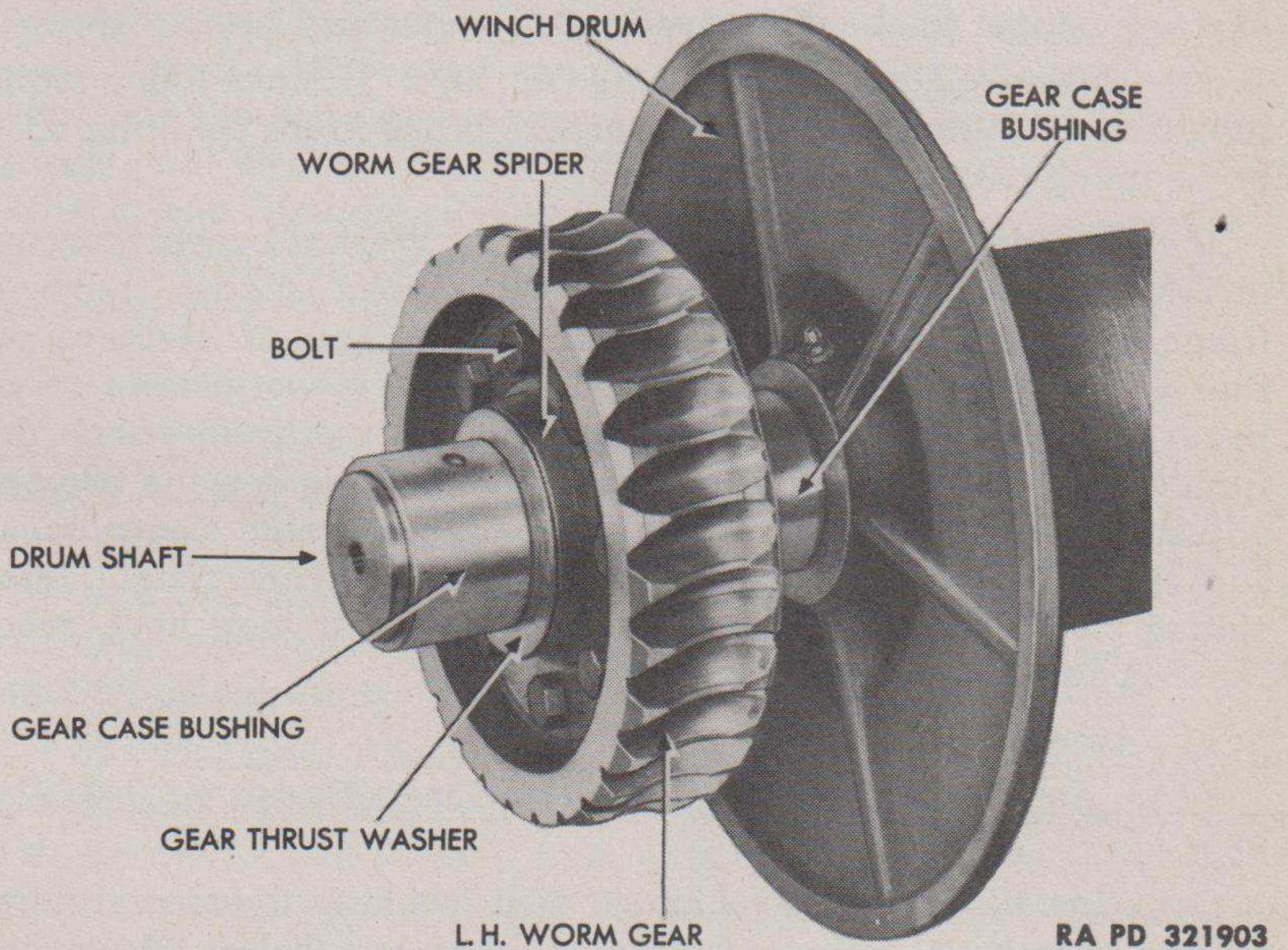


Figure 87 — Left-hand Worm and Drum Assembly — Gear Case Removed

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

f. **Remove Brake Case Assembly** (fig. 86). Remove cap screws and lock washers attaching brake case to gear case. Tap off brake case assembly.

Section III

**DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES**

131. END FRAME, CLUTCH, AND DRAG BRAKE.

a. Disassembly.

(1) **REMOVE END FRAME SLEEVE** (fig. 88). Remove lubrication fitting and pull end frame sleeve out of end frame.

(2) **REMOVE CLUTCH YOKE AND DRAG BRAKE ASSEMBLY** (fig. 88). Remove cotter pin and tap yoke pin out of end frame. Lift off clutch yoke and drag brake assembly.

(3) **DISASSEMBLED CLUTCH YOKE AND DRAG BRAKE ASSEMBLY** (fig. 88).

(a) *Remove Drag Brake Bolt and Spring.* Remove two brake spring check nuts. Lift off drag brake bolt and spring.

(b) *Remove Poppet Knob* (fig. 88). Clamp poppet in a vise and unscrew poppet knob. Remove knob, poppet, and poppet spring.

(c) *Remove Drag Brake Lining* (fig. 88). If brake lining requires replacement (subpar. b, below), remove brake lining by filing off two brake lining rivets.

b. Cleaning, Inspection, and Repair. Wash all parts thoroughly in dry-cleaning solvent. Examine clutch yoke, sliding clutch, end frame, and drag brake shoe for cracks or fractures. Replace parts that are cracked or fractured. If drag lining is worn down to rivet heads, replace lining. If drag brake does not prevent winch drum from spinning when cable is pulled off by hand, tighten the two brake adjusting nuts, or replace lining. Inspect end frame sleeve, making sure that oil passages in sleeve and fitting are open and clean. Inspect sliding clutch for worn or damaged jaws and, if jaws have become tapered, replace sliding clutch.

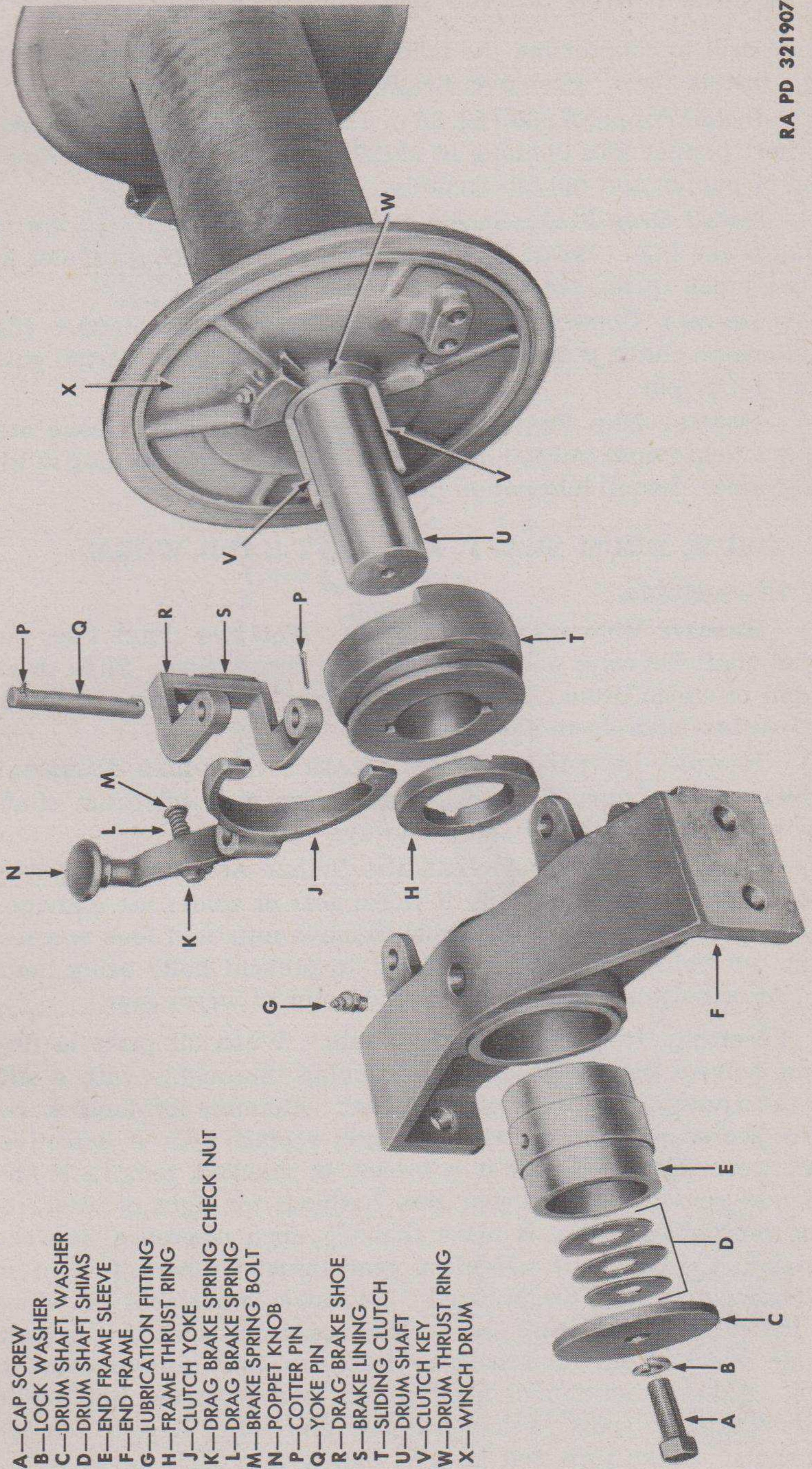
c. Assembly.

(1) **ASSEMBLE CLUTCH YOKE AND DRAG BRAKE ASSEMBLY** (fig. 88).

(a) *Install Drag Brake Lining.* If it has been found necessary to replace drag brake lining, install new lining as follows: Clamp brake shoe in vise. Cut a $\frac{3}{4}$ - x 2- x $\frac{3}{16}$ -inch piece of brake lining. Clamp lining on shoe and drill two rivet holes ($\frac{5}{32}$ -in. drill) in lining. Use

WINCH

RA PD 321907



- A—CAP SCREW
- B—LOCK WASHER
- C—DRUM SHAFT WASHER
- D—DRUM SHAFT SHIMS
- E—END FRAME SLEEVE
- F—END FRAME
- G—LUBRICATION FITTING
- H—FRAME THRUST RING
- J—CLUTCH YOKE
- K—DRAG BRAKE SPRING CHECK NUT
- L—DRAG BRAKE SPRING
- M—BRAKE SPRING BOLT
- N—POPPET KNOB
- P—COTTER PIN
- Q—YOKE PIN
- R—DRAG BRAKE SHOE
- S—BRAKE LINING
- T—SLIDING CLUTCH
- U—DRUM SHAFT
- V—CLUTCH KEY
- W—DRUM THRUST RING
- X—WINCH DRUM

Figure 88 — End Frame, Clutch and Drag Brake Disassembled

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR 5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

$\frac{5}{16}$ -inch drill to countersink the holes two-thirds the thickness of the lining. Install rivets. Peen over heads of rivets.

(b) *Install Poppet Knob* (fig. 88). Place poppet spring on poppet, and insert poppet into opening in clutch yoke. Screw poppet knob on end of poppet and tighten securely.

(c) *Install Drag Brake Spring and Bolt* (fig. 88). Place spring on drag brake bolt. Insert bolt into opening in clutch yoke, and install two brake spring check nuts.

(2) **INSTALL CLUTCH YOKE AND DRAG BRAKE ASSEMBLY** (fig. 88). Position clutch yoke and drag brake on end frame. Install yoke pin and cotter pin.

(3) **INSTALL END FRAME SLEEVE** (fig. 88). Insert sleeve into opening in end frame with oil hole in sleeve alined with opening in top of end frame. Install lubrication fitting.

132. DRUM, DRUM SHAFT, AND LEFT-HAND WORM.

a. Disassembly.

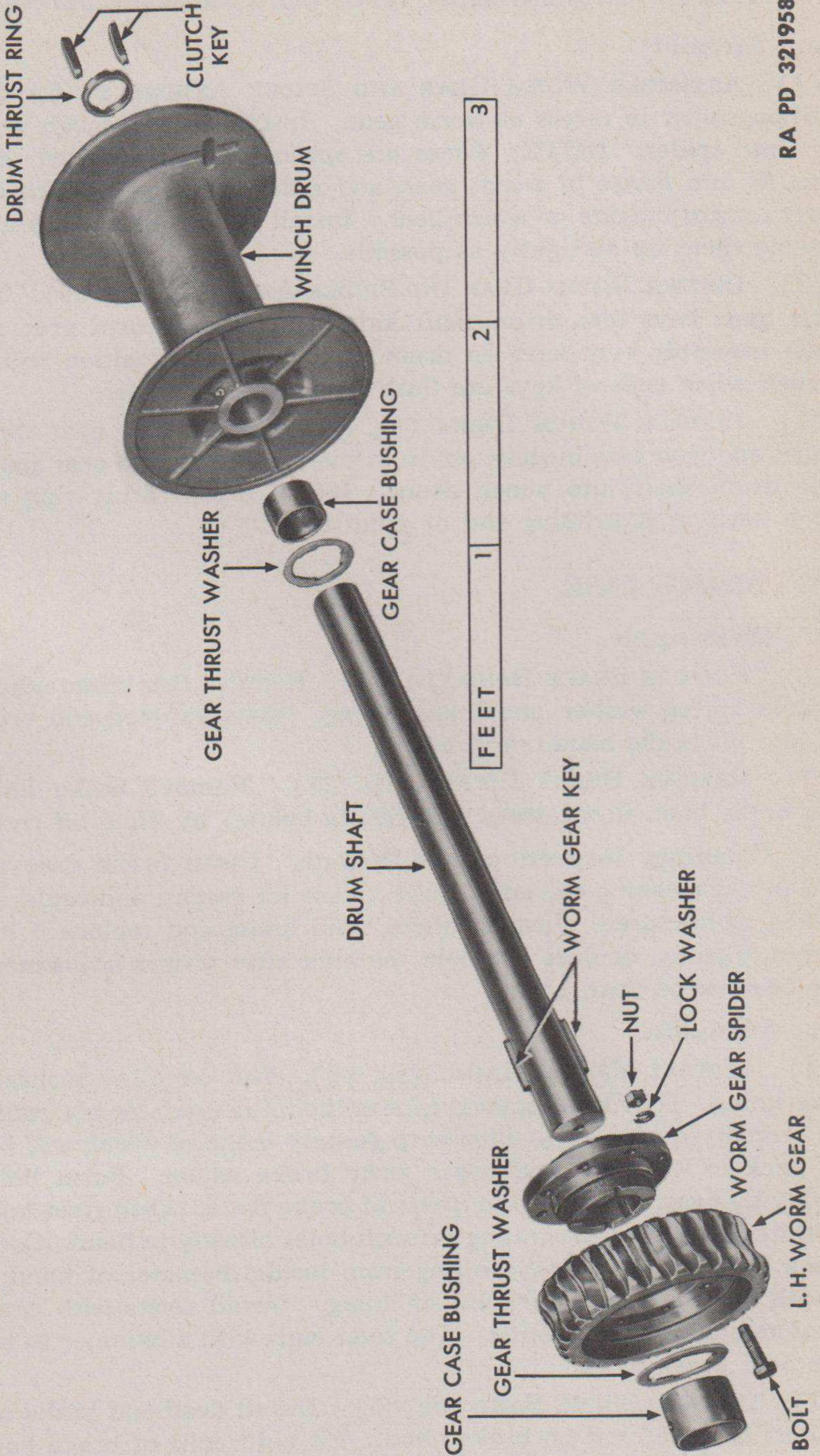
(1) **REMOVE WINCH DRUM** (fig. 89). Tap two clutch keys out of drum shaft keyways and slide off drum thrust ring. Slide drum shaft out of winch drum. Remove inner gear case bushing and gear thrust washer from drum shaft.

(2) **REMOVE LEFT-HAND WORM GEARS AND SPIDER ASSEMBLY** (fig. 89). Using an arbor press, press worm gear off drum shaft. Tap worm gear keys out of shaft keyways.

(3) **DISASSEMBLE WORM GEAR AND SPIDER ASSEMBLY** (fig. 89). This operation is necessary only if worm gear or spider are damaged (subpar. b, below). To disassemble, remove nuts and lock washers and tap out bolts, using a soft hammer to prevent bolts being damaged. After bolts are removed, tap spider out of worm gear.

b. Cleaning, Inspection, and Repair. Wash all parts in dry-cleaning solvent before inspection, scrubbing thoroughly with a stiff brush to remove all traces of old lubricant. Examine left-hand worm gear for scored, broken, or cracked teeth; replace gear if defective. Inspect worm gear spider; if it is broken or cracked, remove it and install new spider. Inspect gear case bushings for signs of wear, replacing bushings if there is more than $\frac{1}{32}$ -inch clearance between bushings and drum shaft. Replace gear thrust washers if worn so that depressions have disappeared. Eccentric movement of winch drum indicates a bent drum shaft. Replace drum shaft if it is bent. Examine winch drum for cracks or fractures, and replace drum if broken. Check condition of fixed clutch jaws on drum hub. File off burrs and rough spots. File worm gear and clutch keys to remove rough spots. Make sure that keys fit tightly into shaft keyways.

WINCH



RA PD 321958

Figure 89 — Left-hand Worm Gear, Drum, and Drum Shaft Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****c. Assembly.**

(1) **ASSEMBLE WORM GEAR AND SPIDER ASSEMBLY** (fig. 89). Position spider in recess of worm gear. Install bolts through worm gear into spider. *NOTE: These are special bolts, machined for a drive fit into flange of worm gear, and must be installed with bolt heads toward outside of worm gear.* Install lock washers and nuts, drawing them up as tightly as possible.

(2) **INSTALL WORM GEAR AND SPIDER ASSEMBLY** (fig. 89). Tap worm gear keys into drum shaft keyways. Press worm gear and spider assembly over keys on drum shaft. Correct position will be reached when ends of keys are flush with edges of spider.

(3) **INSTALL WINCH DRUM** (fig. 89). Slide inner gear thrust washer and gear case bushing on drum shaft against worm gear spider. Slide drum shaft into winch drum. Install drum thrust ring and clutch keys on protruding end of drum shaft.

133. BRAKE CASE.**a. Disassembly.**

(1) **REMOVE BRAKE BAND** (fig. 86). Remove two brake adjusting nuts, spring washer, and brake spring. Remove dead end brake nut, and lift brake band out of case.

(2) **REMOVE BRAKE LINING** (fig. 86). Remove brake lining from brake band if necessary (subpar. b, below) by filing off rivets.

b. Cleaning, Inspection, and Repair. Clean brake case and band in dry-cleaning solvent. Inspect case for cracks, and replace if cracked or fractured. Inspect brake band lining and replace if it is charred, gummy, or does not hold the load after proper adjustments have been made (par. 139).

c. Assembly.

(1) **INSTALL BRAKE LINING** (fig. 86). Cut off 12 $\frac{3}{4}$ inches of brake lining. *NOTE: A special type of lining is used; do not substitute ordinary brake lining filled with gummy material which will boil out, stick to the disk, and cause jerky brake action.* Form lining roughly by hand and clamp to inside of brake band. Drill rivet holes five thirty-seconds inch, drilling through holes already in band. Countersink with $\frac{5}{16}$ -inch drill, drilling from inside diameter of band to a depth two-thirds the thickness of lining. Install rivets with heads in countersunk holes in lining. Tap rivet ends with a hammer to bur them over brake band.

(2) **INSTALL BRAKE BAND** (fig. 86). Install dead end brake nut on short threaded rod on brake band. Fit both ends of brake band into case. Install dead end brake nut on end of brake band outside

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WINCH

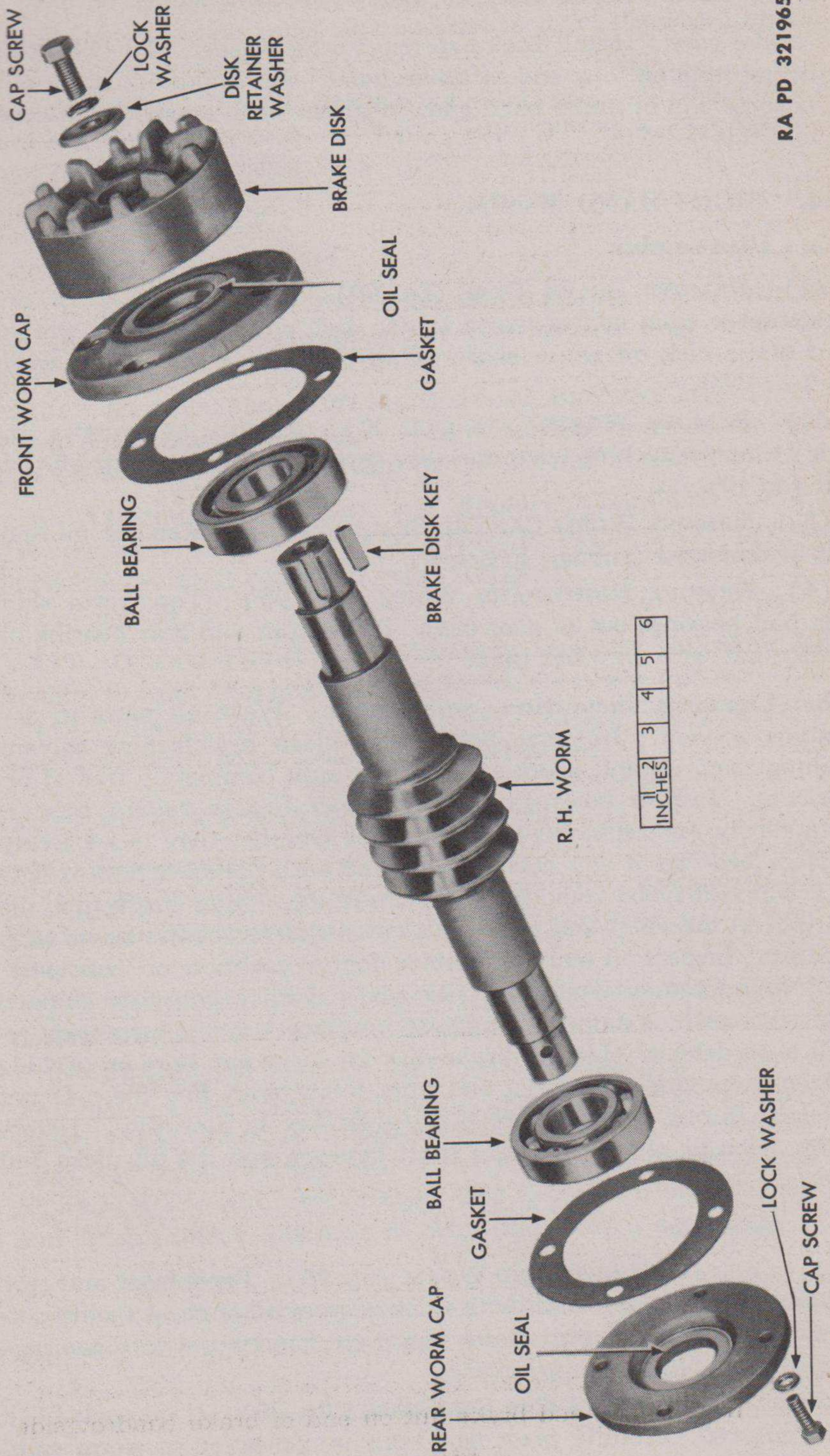


Figure 90 — Right-hand Worm Disassembled

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)**

the brake case. Install brake spring, spring washer, and two brake adjusting nuts on long end of brake band. Set brake adjusting nuts at extreme end of brake band end. Tighten them against each other to hold this position.

134. RIGHT-HAND WORM.**a. Disassembly.**

(1) **REMOVE BRAKE DISK** (fig. 90). Remove cap screw and lock washer from end of worm shaft. Lift off disk retainer washer. Tap brake disk off worm shaft. Tap brake disk key out of worm shaft keyway.

(2) **REMOVE WORM CAPS** (fig. 90). Remove cap screws and lock washers attaching front and rear caps to gear case. Lift off caps and cap gaskets.

(3) **REMOVE WORM CAP OIL SEALS** (fig. 90). Remove oil seals only if damaged (subpar. b, below).

(4) **REMOVE RIGHT-HAND WORM** (fig. 90). Tap worm shaft with ball bearings out of gear case. Press front and rear bearing off worm shaft with an arbor press.

b. Cleaning, Inspection, and Repair. Wash all parts in dry-cleaning solvent. Immerse bearings in clean dry-cleaning solvent, slushing them up and down and soaking until completely free of old lubricant. Inspect bearings for chipped or broken rollers, rotating them slowly (not spinning) to determine whether they move freely. Replace bearings if any defects are found with the exception of light burs, which may be removed with handstone. After inspection, dip bearings in lubricant and place in a clean covered container or wrap in paper. Inspect oil seals for breaks, flabby condition, or loose packing; if found, remove and install new seals. Inspect worm for chipped or broken teeth or damaged shaft, and replace worm if inspection reveals such defects. Inspect brake disk for nicks and burs on braking surface, removing any nicks and burs found with fine file. If not damaged during removal, use brake disk key in assembly. Before using, check fit of key in worm shaft keyway, and file off nicks and burs.

c. Assembly.

(1) **INSTALL RIGHT-HAND WORM** (fig. 90). Press front and rear ball bearings on worm shaft with thick edge of outer races facing outward toward ends of worm shaft. Tap right-hand worm with bearings installed into position in gear case.

(2) **INSTALL WORM CAP OIL SEALS** (fig. 90). If oil seals have been removed, carefully press new seals into position in worm caps.

WINCH

(3) **INSTALL WORM CAPS** (figs. 86 and 90). Using new gaskets, install front and rear caps. Secure caps to gear case with lock washers and cap screws.

(4) **INSTALL BRAKE DISK** (figs. 86 and 90). Tap brake disk key into keyway on end of worm shaft. Tap brake disk onto shaft. Install disk retainer washer, lock washer, and cap screw.

135. BASE ANGLES.

a. Disassembly.

(1) **REMOVE ROPE GUARD** (fig. 85). Remove nuts, lock washers, and bolts attaching rope guard to front base angle and lift off rope guard.

(2) **REMOVE FRONT WINCH SUPPORT BRACKET** (fig. 85). Remove nuts, lock washers, and bolts attaching front winch support bracket to front base angle, and lift off support brackets.

b. Cleaning, Inspection, and Repair. Clean parts with dry-cleaning solvent and examine for cracks or fractures. Repair minor breaks by welding; replace if badly fractured.

c. Assembly.

(1) **INSTALL FRONT WINCH SUPPORT BRACKET** (fig. 85). Attach bracket to front base angle with bolts, lock washers, and nuts.

(2) **INSTALL ROPE GUARD** (fig. 85). Attach rope guard to front base angle with bolts, lock washers, and nuts.

136. GEAR CASE AND COVER.

a. Disassembly.

(1) **REMOVE OIL PLUGS** (figs. 85 and 86). Remove drain and level plugs from gear case. Remove filler plug from top of gear case cover.

(2) **REMOVE DOWELS** (fig. 86). If gear case bushing or cover dowels are damaged, pull out dowels.

b. Cleaning, Inspection, and Repair. Wash gear case and cover with dry-cleaning solvent, scrubbing with a stiff brush to remove all traces of old lubricant. Inspect case and cover for cracks or fractures, and replace broken case or cover. Pull out any damaged dowels and replace with new dowels. See that all oil passages are open and clean. Check condition of plugs, replacing if necessary.

c. Assembly.

(1) **INSTALL DOWELS** (fig. 86). If dowels have been removed, tap new bushing dowels or cover dowels into openings in gear case.

(2) **INSTALL OIL PLUGS** (figs. 85 and 86). Install drain and level plug in gear case. Install filler plug in top of gear case cover.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

Section IV

ASSEMBLY OF WINCH

137. ASSEMBLY.

a. **Install Brake Case Assembly** (fig. 86). Attach brake case to front of gear case with lock washers and cap screws.

b. **Install Drum, Drum Shaft, and Left-hand Worm Assembly** (fig. 87). Place outer gear thrust washer on end of drum shaft against worm gear with depressions in washer face toward gear. Slide outer gear case bushing on drum shaft. Lift assembly and position left-hand worm in gear case, making certain that front and rear gear case bushings are properly seated on bushing dowels. Using a new gasket, install gear case cover. Attach drum shaft shims and washer to end of shaft with lock washer and cap screw.

c. **Install End Frame, Clutch and Drag Brake Assembly** (figs. 85 and 88). Position sliding clutch on clutch yoke. Hold frame thrust ring in position between sliding clutch and end frame and slide assembly on drum shaft. Install drum shaft shims and washer against end of drum shaft with lock washer and cap screw.

d. **Install Base Angles** (fig. 85). Attach front and rear base angles to winch end frame and gear case with bolts, cap screws, lock washers, and nuts.

e. **Install Lubricant.** Remove filler plug from top of gear case cover and level plug from gear case. Fill gear case with lubricant up to level plug opening. Install level and filler plugs.

f. **Install Winch Assembly.** Refer to TM 9-817.

Section V

TEST AND ADJUSTMENT

138. FUNCTION OF WINCH BRAKE.

a. **Action of Brake When Properly Adjusted.** Brake band on winch, when properly adjusted, will prevent winch drum from turning worm gear when power take-off is in neutral, or after shear pin has failed. When winch is reversed by power, brake band will allow drum to turn for cable unwinding.

139. TEST AND ADJUSTMENT OF BRAKE.

a. **Test.** To test holding action of brake, place vehicle at top of a steep grade. Fasten winch cable to another truck at bottom of grade, and start pulling the truck up grade. After a short pull, de-

WINCH

press engine clutch pedal. Winch will stop pulling, and vehicle being pulled should not roll backward.

b. Adjustment. If brake band does not hold vehicle, increase tension of brake spring located under brake case. Turn first adjusting nut one-half turn, and jam second nut against first nut to hold location. Repeat brake test. Continue to increase brake tension until satisfactory result is obtained.

Section VI

FITS AND TOLERANCES

140. FITS AND TOLERANCES.

a. End Frame Sleeve.

Inside diameter 2.440 in. to 2.442 in.

Wear limit 2.450 in.

b. Gear Case Bushings.

Inside diameter 2.440 in. to 2.442 in.

Wear limit 2.450 in.

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

CHAPTER 16
FIFTH WHEEL

Section I

DESCRIPTION AND DATA

141. DESCRIPTION AND OPERATION.

a. **Description** (fig. 91). A fifth wheel, composed of a base and a sub-base assembly, is mounted on the frame at the rear of the vehicle. Two coupler jaws are held in position beneath the base by coupler jaw pins. A plunger lock assembly, consisting of a plunger and plunger spring, is actuated by an operating handle and provides the means of placing coupler jaws into receiving position for a coupling pin on the vehicle to be towed. A support bracket shaft extends through the base assembly and a walking beam, which rests on leveling springs and is attached to the sub-base by a lateral shaft. Adjusting wedges extending into the sub-base openings and under each side of the walking beam are held in position by wedge bolts.

b. **Operation.** The coupler jaws are held in locked position by the plunger lock which extends into cutaway section on coupler jaws. A safety latch attached to the base and extending over end of plunger lock prevents unlocking of jaws. When the safety latch is swung aside and the operating handle is pushed forward, a plunger lock latch, actuated by a spring, snaps against the side of plunger lock and holds lock in receiving position. A pin on the left coupler jaw releases the plunger lock latch when jaws are spread, thereby allowing the plunger lock to enter a recess in the jaws, and locking them in coupling position. Side motion is allowed by leveling springs under the walking beam and controlled by adjusting wedges on each side of the beam. Eight lubrication fittings are provided for greasing the various parts.

142. DATA.

Make Dayton
Model FWU-33QB
Type Semiautomatic Universal
Base diameter 33 in.

FIFTH WHEEL

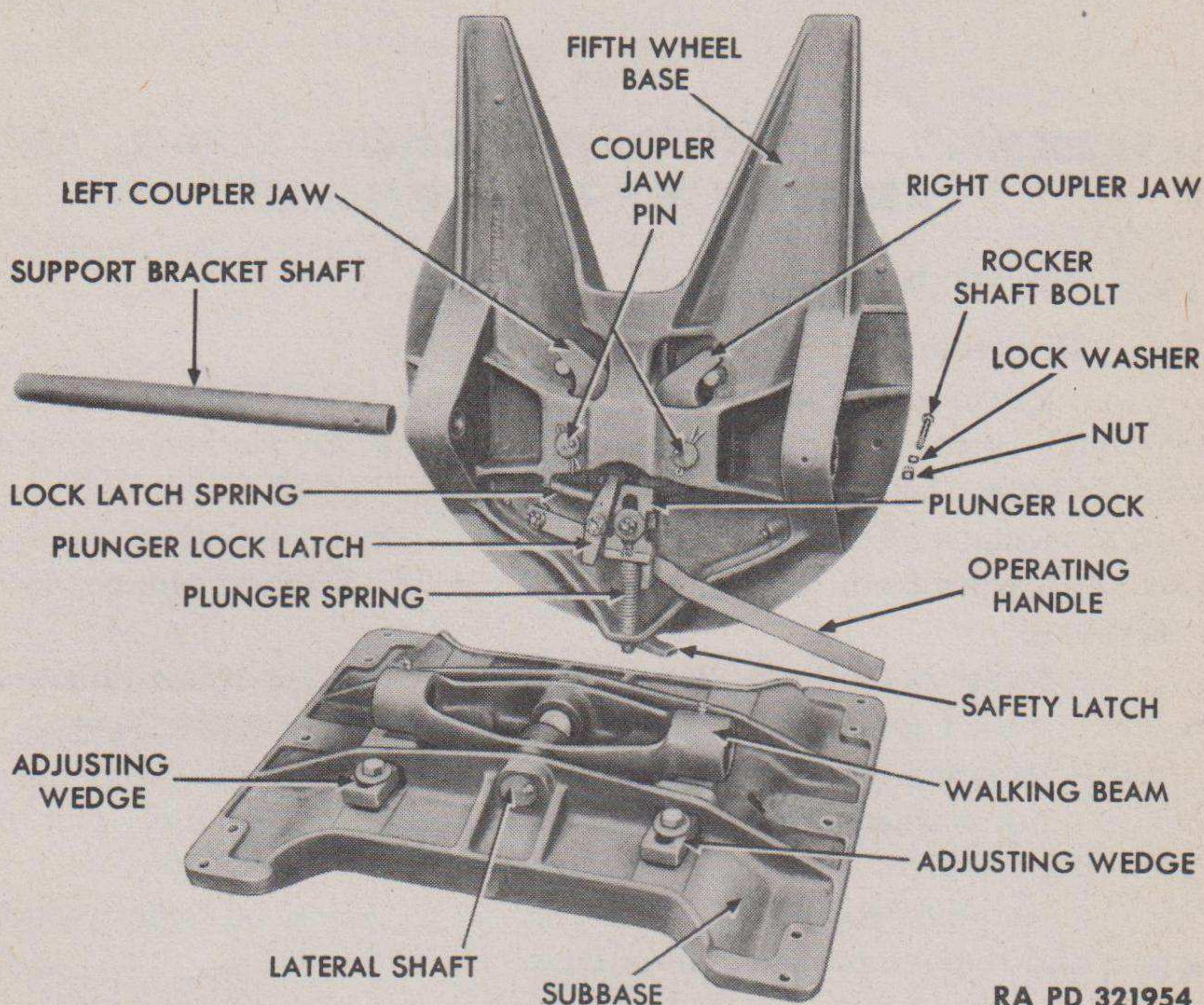


Figure 91 – Fifth Wheel Base and Sub-base Assemblies

Section II

DISASSEMBLY INTO SUBASSEMBLIES

143. DISASSEMBLY INTO SUBASSEMBLIES.

a. **Remove Fifth Wheel Assembly.** Remove nuts, lock washers, and bolts attaching fifth wheel sub-base to left and right frame rails. Lift off fifth wheel assembly with hoisting equipment.

b. **Remove Base Assembly (fig. 91).** Remove nut, lock washer, and bolt securing support bracket shaft to fifth wheel base. Tap out support bracket shaft and remove shims. Lift fifth wheel base assembly from seat on sub-base.

**ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)****Section III****DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND
ASSEMBLY OF SUBASSEMBLIES****144. FIFTH WHEEL BASE.****a. Disassembly.**

(1) **REMOVE PLUNGER LOCK LATCH** (fig. 91). Release plunger lock latch spring. Remove cotter pin, nut, and flat washer attaching latch to base. Lift out plunger lock latch and spring.

(2) **REMOVE PLUNGER LOCK** (fig. 91). Remove cotter pin, nut, and flat washer from fifth wheel plunger stud. Lift out plunger lock and spring.

(3) **REMOVE COUPLER JAWS** (fig. 91). Remove cotter pins and tap out coupler jaw pins. Lift out pin washers and coupler jaws.

(4) **REMOVE OPERATING HANDLE** (fig. 91). Remove cotter pin, nut, and flat washer attaching operating handle to base stud. Lift off operating handle.

(5) **REMOVE SAFETY LATCH** (fig. 91). Back off safety latch screw, and remove plunger safety latch.

b. Cleaning, Inspection, and Repair. Wash all parts with dry-cleaning solvent, scrubbing thoroughly to remove all traces of old lubricant. Inspect coupler jaws carefully for cracks and fractures. If jaws are cracked, fractured, or worn to a point where backlash in engagement with towed vehicle is apparent, replace jaws. Examine coupler jaw pins for cracks and replace broken or damaged pins. Replace any springs that have lost their efficiency. Inspect all threaded parts for cross threads; clean threads or replace parts. Make sure that lubrication passages are open and clean.

c. Assembly.

(1) **INSTALL COUPLER JAWS** (fig. 91). Place coupler jaws and flat washers in position. Tap coupler jaw pins through base and jaws. Install cotter pins through openings in jaw pins.

(2) **INSTALL PLUNGER LOCK** (fig. 91). Slide plunger spring on plunger lock. Insert plunger lock into cutaway opening between coupler jaws. Secure with flat washer, nut, and cotter pin.

(3) **INSTALL PLUNGER LOCK LATCH** (fig. 91). Position plunger lock latch on base stud. Install flat washer, nut, and cotter pin. Attach plunger lock latch spring to base.

(4) **INSTALL OPERATING HANDLE** (fig. 91). Position operating handle over end of plunger spring and on fifth wheel base stud. Secure with flat washer, nut, and cotter pin.

FIFTH WHEEL

(5) **INSTALL SAFETY LATCH** (fig. 91). Place safety latch in position over end of plunger. Attach latch to base with safety latch screw.

145. FIFTH WHEEL SUB-BASE.

a. Disassembly.

(1) **REMOVE ADJUSTING WEDGES** (fig. 91). Remove nuts, lock washers, bolts, and flat washers attaching wedges to sub-base. Tap out adjusting wedges.

(2) **REMOVE LATERAL SHAFT** (fig. 91). Press down on walking beam with an arbor press. Tap out lateral shaft.

(3) **REMOVE WALKING BEAM** (fig. 91). Release pressure on arbor press, and lift off walking beam and leveling springs.

b. Cleaning, Inspection, and Repair. Clean all parts thoroughly with dry-cleaning solvent. Inspect sub-base, walking beam, lateral shaft, and wedges for cracks or fractures. Weld small cracks; replace any badly worn or damaged parts. Check condition of leveling springs.

c. Assembly.

(1) **INSTALL WALKING BEAM** (fig. 91). Place sub-base in an arbor press. Place leveling springs in position on sub-base. Press walking beam over leveling springs until shaft openings are in line.

(2) **INSTALL LATERAL SHAFT** (fig. 91). Tap lateral shaft through sub-base and walking beam. Cut-out section on shaft must be on top. Remove assembly from arbor press.

(3) **INSTALL ADJUSTING WEDGES** (fig. 91). Position wedges through openings in sub-base. Install wedge bolts, flat washers, nuts, and cotter pins.

Section IV

ASSEMBLY OF FIFTH WHEEL

146. ASSEMBLY OF FIFTH WHEEL.

a. Install Base Assembly (fig. 91). Place base assembly in position between walking beam and over sub-base assembly. Tap support bracket shaft through base and walking beam. Install bolt, lock washer, and nut through end of shaft.

b. Install Fifth Wheel Assembly. Lift assembly into position between frame rails. *NOTE: The center line of the lower fifth wheel should not be more than 6 inches and not less than 5½ inches ahead of the center line of the rear axle. Attach sub-base to frame rails with bolts, lock washers, and nuts.*

ORDNANCE MAINTENANCE — POWER TRAIN, CHASSIS, AND BODY FOR
5- TO 6-TON PONTON TRACTOR TRUCK (AUTOCAR MODEL U8144T)

CHAPTER 17
FUEL SYSTEM

Section I
DESCRIPTION

147. DESCRIPTION.

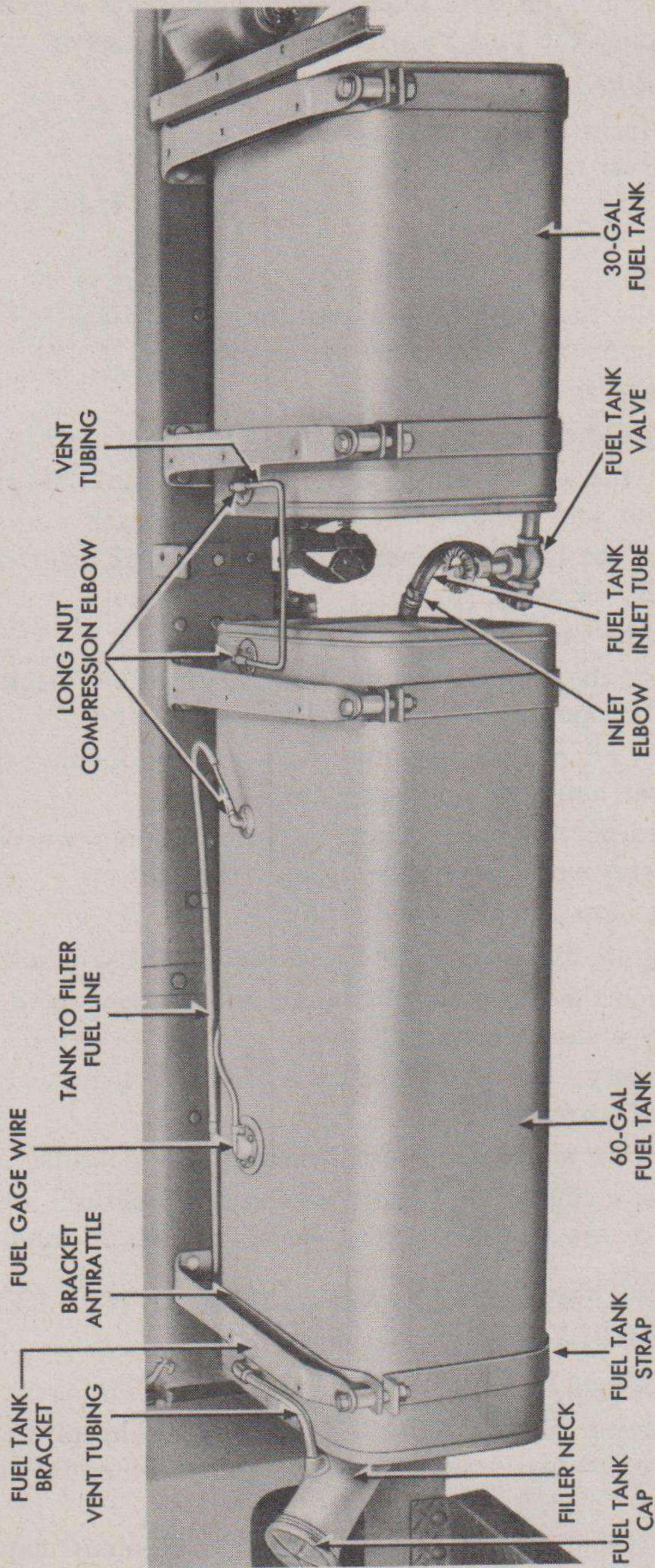
a. The fuel supply of the vehicle is stored in two tanks attached to the outside of the chassis frame in front of the rear wheels. The fuel travels from the 30-gallon tank to the 60-gallon tank, from the 60-gallon tank to the fuel filter mounted on the outside of the left frame rail. It then travels from the fuel filter to the fuel pump mounted on the left side of the engine at approximately the same level as the top of the chassis frame top. From the fuel pump the fuel then goes to the carburetor mounted on the right-hand side of the engine. Here the fuel is mixed with air and the resulting vapor injected into the combustion chambers of the cylinder heads. A flexible woven tube connects the two tanks, but all other fuel lines are rigid. The function of the fuel filter is to remove all dirt and foreign particles from the fuel as it passes through the filter's laminated cylindrical filtering element. The fuel pump acts to draw the fuel through the line from the supply tanks and force it under pressure into the carburetor. This is done by vacuum and pressure created by the up-and-down movement of the pump's diaphragm actuated by a cam on the engine camshaft.

Section II
FUEL TANKS

148. DESCRIPTION AND TABULATED DATA.

a. **Description** (fig. 92). Two rectangular fuel tanks of 60- and 30-gallon capacity, respectively, are attached to the outside of the chassis frame ahead of the left rear wheel. These are heavy sheet-weld assemblies connected by a valve and full tank inlet tube. Two cast brackets, bolted to the frame side rail, extend out over each tank, with two steel straps around each tank securing it to the brackets. The fuel outlet elbow and gage connections are on top of the forward tank. A drain plug is located in a sump in the under side of each tank. The filler neck, which is equipped with an external air outlet tube and is an integral part of the 60-gallon forward tank, extends obliquely from the tank near its upper left corner. The neck

FUEL SYSTEM



RA PD 321948

Figure 92 — Fuel Tanks Installed, Ponton Body and Deck Plate Removed

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contains a removable tank filler sleeve which acts as a strainer, and a chain attaches the tank cap to the tank filler sleeve.

b. Tabulated Data.

Capacity of front tank	60 gal
Capacity of rear tank	30 gal
Mounting	Left-hand frame side rail

149. TEST.

a. Test the fuel tank before and after repairing it. Use either of the two methods outlined in this paragraph.

(1) THE WET METHOD.

(a) Plug tightly all openings except the filler neck.

(b) Dry the entire outer surface of the tank thoroughly with compressed air and a clean, dry rag.

(c) Place the tank on a bench on top of blocks so that the under side can easily be seen.

(d) Fill the tank with water.

(e) Insert the end of the air hose in the filler neck, and cover the rest of the opening with the palm of one hand.

(f) Apply air pressure against the water by opening the air valve with the other hand for a few minutes.

(g) Examine the entire tank for moist spots where, if a leak exists, the water would have been forced through.

(2) THE AIR PRESSURE METHOD.

(a) Plug all openings except the fuel outlet connection.

(b) Attach the loose end of the air supply hose to the fuel outlet connected by a short threaded tube.

(c) Submerge the fuel tank in a tank of clean water, or cover the tank with soapy water.

(d) Turn on air pressure not to exceed 15 pounds.

(e) Draw a ring around each spot on the fuel tank where bubbles appear to indicate where the tank leaks and needs repairing.

150. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY.

a. Disassembly.

(1) **REMOVE DRAIN PLUGS.** Remove drain plugs from tank sumps. Remove cap screws securing sumps to outlet, and lift out sumps.

(2) **REMOVE FUEL GAGE TERMINAL.** Remove cap screws securing terminal to top of tanks, and lift out terminal.

FUEL SYSTEM

(3) **REMOVE VALVE.** Unscrew valve with outlet elbow from 30-gallon feed tank. Unscrew outlet elbow.

(4) **REMOVE FUEL TANK FILLER SLEEVE.** Unscrew fuel tank cap. Twist tank filler sleeve, and remove from filler neck.

(5) **REMOVE COMPRESSION ELBOWS.** Unscrew compression elbows from top of tanks.

b. Cleaning, Inspection, and Repair.

(1) **CLEANING.** The following methods, listed in order of preference, can be used to clean the tanks thoroughly.

(a) *First Method.* Fill a 5-gallon can with heavy-duty alkaline cleaner compound. Dissolve in 50 gallons of water and bring the solution to the boiling point in a large steam-heated vat. Remove the caps, plugs, and inspection hole covers; place all parts in vat and boil at least 30 minutes to eliminate all inflammable material. Rinse the tank with water and dry with compressed air before testing or repairing it.

(b) *Second Method.* Flush the fuel tank for 15 minutes with boiling water to overflow at the top; then steam tanks 3 hours. Admit live steam at top of tank and allow it to escape through bottom outlets. If live steam is not available, flush with boiling water continuously for 3 or 4 hours, and dry tank thoroughly with compressed air. This process is not positive, and should be used only when it is impossible to use first method.

(c) *Third Method.* Drain tank thoroughly. Pour approximately 1 gallon of carbon tetrachloride into the tank and flush thoroughly. Allow some fluid to remain in tank while repairs are being made.

(2) **INSPECTION AND REPAIR.** Examine all parts for cracks or fractures. Inspect hangars, strips, supports, nuts, and palnuts for breaks and stripped threads. Replace all damaged or defective parts. If a leak occurs in the body, top, or bottom of tank and the tank is otherwise in good condition, repair it by welding or brazing. Repair the tank as soon as possible after damage is done, in no case waiting more than 30 minutes. When tank is to be repaired by soldering, it usually will not have to be cleaned according to procedure described above, but tank must be thoroughly drained and blown out with compressed air to remove all volatile residue. **CAUTION:** *As further safeguards, do not heat soldering iron red hot. Be careful when handling fuel tanks to avoid producing sparks. Do not use power sanding machine or other equipment likely to produce sparks.*

c. Assembly.

(1) **INSTALL DRAIN PLUGS.** Install sumps at bottoms of tank outlets and secure with cap screws. Install drain plugs in sumps.

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(2) **INSTALL FUEL GAGE TERMINAL.** Install terminal at top of 60-gallon tank and secure with cap screws.

(3) **INSTALL VALVE.** Screw outlet elbow into valve and install valve on fuel tank.

(4) **INSTALL FUEL TANK FILLER SLEEVE.** Twist tank filler sleeve into position in filler neck and screw on tank cap.

(5) **INSTALL COMPRESSION ELBOWS.** Install compression elbows in tops of tanks.

CHAPTER 18

COOLING SYSTEM

Section I

DESCRIPTION

151. DESCRIPTION AND OPERATION.

a. **Description.** The cooling system is composed of three major units: radiator, water pump, and fan. Accessories include: rubber hose connections, two pet cocks, metal tubes, thermostat, fan belts, and a water outlet manifold.

b. **Operation.** The water pump, mounted on the left-hand side of the cylinder block, and chain, coupled to the accessory drive shaft which drives it, circulates coolant through the system under pressure. The temperature of the fluid is alternately raised as it passes through the cylinder block and then lowered as it passes through the radiator, against which the fan directs a cooling flow of air. During the warming up period when it is desirable to bring the engine temperature up to the correct operating level quickly, the coolant is prevented from entering the radiator by a closed thermostat at the front end of the water outlet manifold. This thermostat opens at 183° F and closes at 157° F. When open, the fluid is routed from the engine through the radiator from top to bottom and back to the engine. When closed, as during the warming up period, a metal bypass tube carries the coolant from the water outlet manifold to the water pump, bypassing the radiator. The system is drained by two pet cocks.

Section II

RADIATOR

152. DESCRIPTION AND DATA.

a. **Description.** The radiator assembly is mounted ahead of engine on the frame front crossmember. It consists of two tanks (upper and lower), a tube-and-fin type core, an inlet opening and a filler opening (upper tank), a thermostatically controlled overflow pipe opening (upper tank), and an outlet opening (lower tank). The core consists of a number of flat vertical tubes connecting upper and lower tanks, the tubes being completely enclosed by fins, which are thin metal sheets positioned horizontally between tanks at about 1/8-inch intervals. All parts are welded together as a unit.

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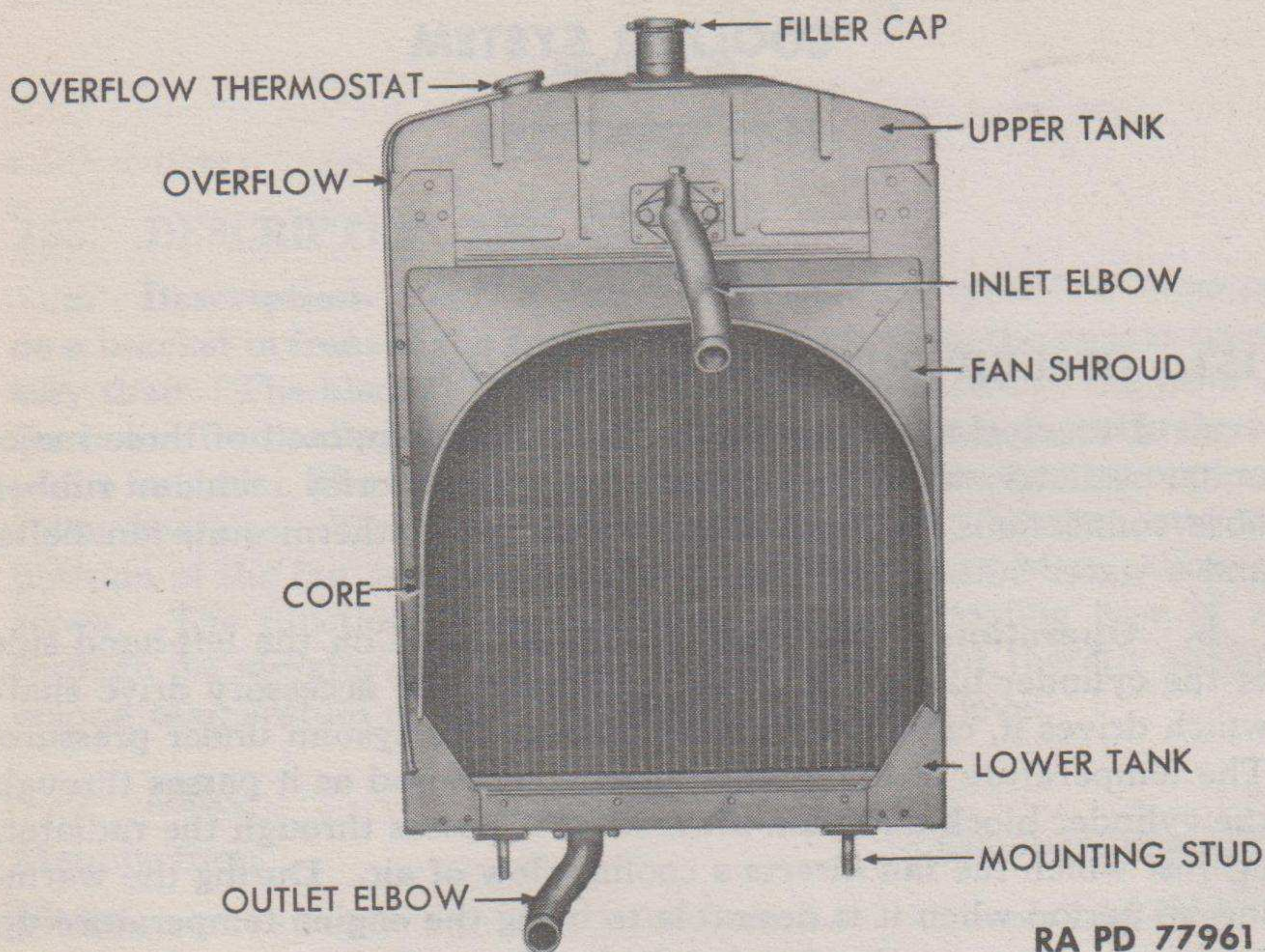


Figure 93 — Radiator

b. **Operation.** The cooling fluid enters upper tank of radiator through an outlet opening at the rear. Cooling occurs as fluid from upper tank passes to lower tank through air-cooled core tubes. The outlet elbow at bottom of lower tank permits fluid to be returned to engine to absorb heat. If the fluid becomes overheated and expands beyond the limits of the system, it will be drained off by means of an overflow pipe attached to the upper tank.

c. **Data.**

Radiator:

Make	G. & O. Mfg. Co.
Type	Tube and fin
Core	Brass and copper
Capacity (cooling system)	40 qt

Thermostat:

Make	Bishop and Babcock
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153. **TEST.**

a. **Test for Obstruction.** Plug outlet opening at bottom of lower tank. Stand radiator up. Remove filler cap and fill radiator with water; then remove plug from outlet opening. A fast flow of water from radiator indicates freedom from obstruction. A mere trickle or small

COOLING SYSTEM

flow of water signifies that radiator is clogged. Clean out radiator (subpar. b, below).

b. **Test for Leak.** Plug outlet opening at bottom of lower tank. Remove the overflow thermostat and plug opening. Remove filler cap and connect air equipment to opening, making sure connection is tight. Submerge tank in water and blow air into radiator with about six pounds pressure. Hold radiator still and observe water for bubbles. Consistent repetition of bubble formation indicates leak. Change position of radiator as necessary to determine exact source of leak. Repair leak (par. 154 d).

c. **Test Thermostat.** Place thermostat in water with another properly functioning thermostat graduated to 190 degrees and heat water. Thermostat should begin to open at approximately 157 degrees, be fully open when temperature of water reaches 183 degrees, and should reverse this action as water cools.

154. DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY.

a. **Disassembly.** Remove filler cap and overflow thermostat. Pry off overflow pipe from outside of radiator.

b. **Cleaning.** Blow compressed air through fins and tubes of radiator core to remove insects and dirt. Clean outer surfaces of upper and lower tanks with dry-cleaning solvent. Fill cooling system with a solution composed of one pound of sal soda per gallon of water. Run engine 15 minutes at normal operating temperature and drain system. Flush system with clean water. Refill system with water or antifreeze, according to atmospheric temperature.

c. **Inspection and Repair.** Check core for condition of fins and tubes. Straighten bent fins. Solder cracked tubes for temporary repair. Inspect tanks and filler neck, and repair temporarily by soldering if necessary. Replace other broken or damaged parts. Check gaskets, and replace any found damaged.

d. **Assembly.** Install overflow thermostat. Position overflow pipe on radiator and solder at enough points necessary to hold it in position. Install filler cap. Test radiator again for leaks and obstruction (subpars. a and b above).

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Section III

FAN AND HUB

155. DESCRIPTION AND DATA.

a. **Description.** The 6-blade, roller-bearing type fan, mounted on a bracket in front of the engine, is belt driven from the engine accessory shaft. The blades are riveted to a spider attached to the front of the hub. Two pulleys to take the two driving belts are an integral part of the fan hub. The fan spindle is mounted inside the hub on opposed roller bearings. The spindle is secured to the fan bracket, and the position of the fan assembly can be altered by means of an adjusting screw. The function of the fan is to project a cooling flow of air through the radiator and into the engine compartment, thereby holding engine temperature down to the correct operating level.

b. **Data.**

Manufacturer	Schwitzer-Cummins
Model	A-111545
Number of blades	6
Diameter of blades	22 in.
Drive	Double V-belts

156. DISASSEMBLY.

a. **Remove Bracket.** Remove cap screws and lock washers which hold fan in blade assembly on fan hub; then remove blades and gasket. Remove fan spindle jam nut, lock washer, and rear clamp washer which holds bracket on spindle. Loosen adjusting screw nut; unscrew adjusting screw from bracket and spindle. Remove bracket and front clamp washer.

b. **Remove Spindle.** Remove spindle from nut cotter pin and washer; then remove front bearing cone from hub. Remove lock wire, cork washer, cork retaining washer, and gasket from spindle. Drive spindle out of hub; then press rear cone off spindle.

157. CLEANING, INSPECTION, AND REPAIR.

a. **Cleaning.** Wash parts in dry-cleaning solvent. Immerse bearing cones and rollers in dry-cleaning solvent until all grease is removed.

b. **Inspection and Repair.** Inspect cups in hub and, if scored, replace by pressing out old cups and pressing in new cups. Inspect

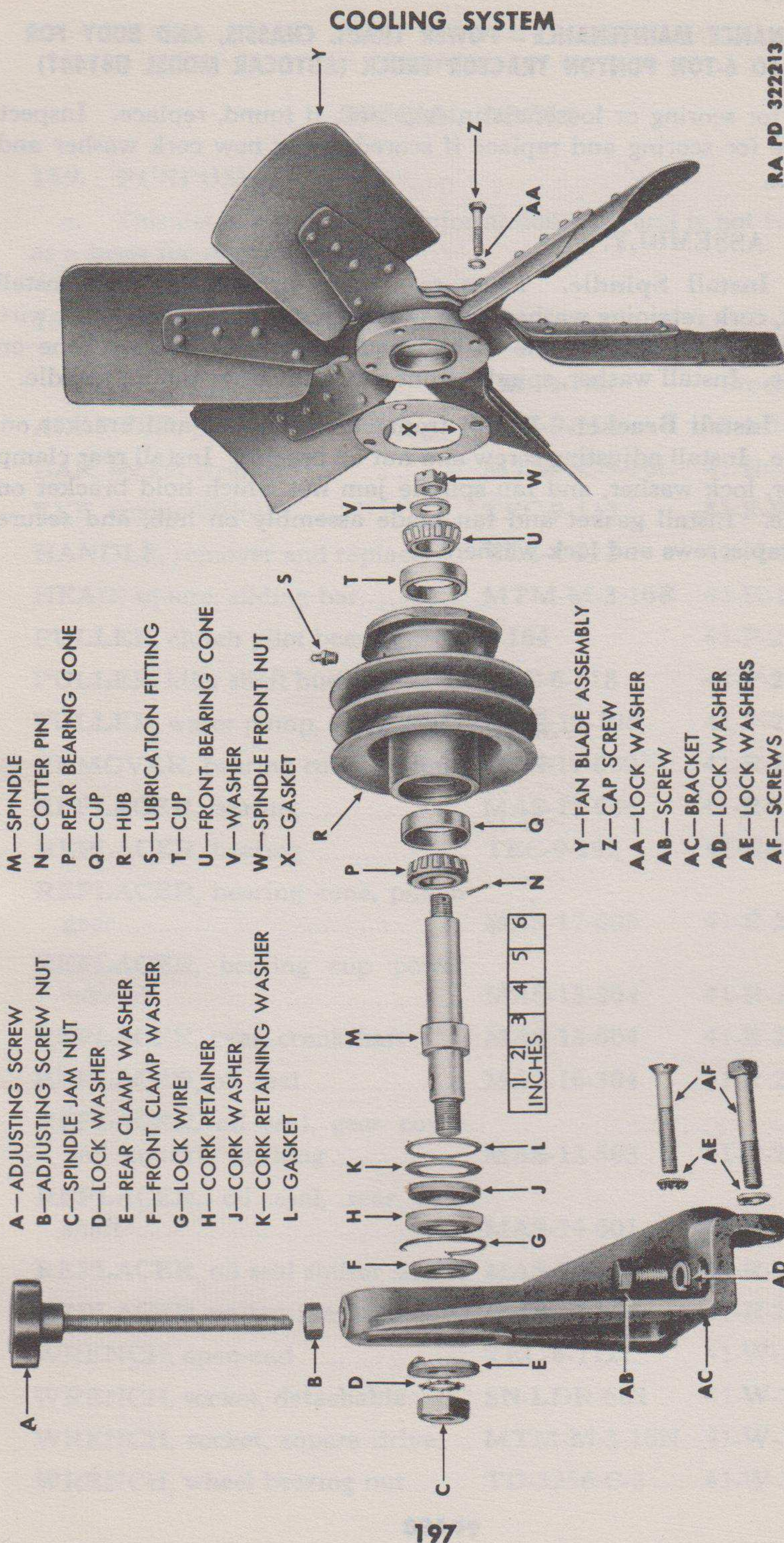


Figure 94 — Fan and Hub Disassembled

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cones for scoring or looseness in cage and, if found, replace. Inspect spindle for scoring and replace if scored, using new cork washer and gaskets.

158. ASSEMBLY.

a. Install Spindle. Press rear cone on spindle; then install gasket, cork retaining washer, cork washer, cork retainer, and lock wire on spindle. Install spindle in hub and press front bearing cone on spindle. Install washer, spindle front nut, and cotter pin on spindle.

b. Install Bracket. Install front clamp washer and bracket on spindle. Install adjusting screw and nut on bracket. Install rear clamp washer, lock washer, and fan spindle jam nut which hold bracket on spindle. Install gasket and fan blade assembly on hub, and secure with cap screws and lock washers.

CHAPTER 19
SPECIAL TOOLS

159. PURPOSE.

a. This list is furnished for information only and is not to be used as a basis for requisitioning.

160. SPECIAL TOOLS.

Name	Mfr's No.	Federal Stock No.
ADAPTER, puller shaft bushing....	TEC-9-112	41-A-18-210
BAR, socket wrench.....	MTM-M-3-16L	41-B-312-200
EYE, engine lifting.....	TEC-9-113	41-E-628
HANDLE, remover and replacer....	TEC-4-223	41-H-1397
HEAD, square, sliding bar.....	MTM-M-3-16E	41-H-1779-50
PULLER, clutch pilot bearing.....	J-164	41-P-2906-15
PULLER, idler shaft bushing.....	TEC-6-118	41-P-2940-300
PULLER, water pump, drive gear..	MAS-14-108	41-P-2958-15
REMOVER, bearing cone, pinion..	MAS-17-609	41-R-2368-250
REPLACER, bearing.....	MAS-17-604	41-R-2384-165
REPLACER, bearing.....	TEC-9-192	41-R-2384-945
REPLACER, bearing cone, pinion gear	MAS-17-605	41-R-2384-115
REPLACER, bearing cup power take-off	MAS-13-504	41-R-2385-260
REPLACER, gear, crankshaft.....	MAS-13-604	41-R-2389-905
REPLACER, oil seal.....	MAS-16-304	41-R-2392-350
REPLACER, oil seal, gear cover and knuckle bushing	MAS-13-503	41-R-2393-695
REPLACER, oil seal, rear axle shaft	MAS-14-601	41-R-2393-450
REPLACER, oil seal shifter shaft..	MAS-14-551	41-R-2393-525
REPLACER, pulley, fan drive.....	MAS-13-506	41-R-2396-275
WRENCH, open-end	TEC-6-112	41-W-1468-475
WRENCH, socket, detachable.....	SN-LDR-683	41-W-3059-40
WRENCH, socket, square drive....	MTM-M-3-16N	41-W-3058-300
WRENCH, wheel bearing nut.....	TD-3256-C-3	41-W-3825-70

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REFERENCES

PUBLICATIONS INDEXES.

The following publications indexes should be consulted frequently for latest changes to or revisions of the publications given in this list of references and for new publications relating to materiel covered in this manual:

- a. Introduction to Ordnance Catalog (explaining SNL system) ASF Cat.
ORD 1 IOC
- b. Ordnance Publications for Supply Index (index to SNL's) ASF Cat.
ORD 2 OPSI
- c. Index to Ordnance Publications (listing FM's, TM's, TC's, and TB's of interest to ordnance personnel, OPSR, MWO's, BSD, S of SR's, OSSC's, and OFSB's; and includes Alphabetical List of Major Items with Publications Pertaining Thereto) OFSB 1-1
- d. List of Publications for Training (listing MR's, MTP's, T/BA's, T/A's, FM's, TM's, and TR's concerning training) FM 21-6
- e. List of Training Films, Film Strips and Film Bulletins (listing TF's, FS's, and FB's by serial number and subject)..... FM 21-7
- f. Military Training Aids (listing Graphic Training Aids, Models, Devices, and Displays)..... FM 21-8

STANDARD NOMENCLATURE LISTS.

- Cleaning, preserving and lubrication materials, recoil fluids, special oils, and miscellaneous related items SNL K-1
- General tools, and supplies, ordnance base automotive maintenance company (engine rebuild)..... SNL N-327
- Ordnance maintenance sets SNL N-21
- Soldering, brazing, and welding materials, gases and related items SNL K-2
- Tool-sets, motor transport SNL N-19

REFERENCES

Tool-sets, for ordnance service command automotive shops	SNL N-30
Tools, maintenance for repair of automotive vehicles	SNL G-27 Vol 1
Truck, 5- to 6-ton, 4 x 4, C.O.E. (Autocar Model U8144T)	SNL G-511

EXPLANATORY PUBLICATIONS.

Fundamental Principles.

Automotive electricity	TM 10-580
Basic maintenance manual	TM 38-250
Electrical fundamentals	TM 1-455
Fuels, lubricants, cleaners, and preservatives.....	TM 9-2835
Internal combustion engine, the.....	TM 10-570
Military motor vehicles	AR 850-15
Motor vehicle inspections and preventive maintenance service	TM 9-2810
Precautions in handling gasoline.....	AR-850-20
Standard military motor vehicles.....	TM 9-2800

Operation of Materiel.

5- to 6-ton 4 x 4 ponton tractor truck (Autocar)....	TM 9-817
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Maintenance and Repair.

Cleaning, preserving, lubricating and welding materials and similar items issued by the Ordnance Department	TM 9-850
Cold weather lubrication and service of combat vehicles and automotive materiel.....	OFSB 6611
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
Ordnance maintenance: Electrical equipment (Auto-Lite)	TM 9-1825B
Ordnance maintenance: Electrical equipment (Delco Remy)	TM 9-1825A

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- Ordnance maintenance: Power brake systems
(Bendix-Westinghouse) TM 9-1827A
- Ordnance maintenance: Carburetors (Zenith)..... TM 9-1826C
- Ordnance maintenance: Speedometers, tachom-
eters, and recorders..... TM 9-1829A

Protection of Materiel.

- Camouflage FM 5-20
- Chemical decontamination, materials and equip-
ment TM 3-220
- Decontamination of armored force vehicles..... FM 17-59
- Defense against chemical attack..... FM 21-40
- Explosives and demolitions..... FM 5-25

Storage and Shipment.

- Ordnance storage and shipment chart, group G—
Major items OSSC-G
- Registration of motor vehicles..... AR 850-10
- Rules governing the loading of mechanized and
motorized army equipment, also major caliber
guns, for the United States Army and Navy, on
open top equipment published by Operations
and Maintenance Department of Association of
American Railroads
- Storage of motor vehicle equipment..... AR 850-18

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