TM 9-1807

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

Power Train, Chassis, and Body for 2½-Ton 6x6 Truck and 2½- to 5-Ton 6x4 Truck (Studebaker Models US6 and US6x4)

WAR DEPARTMENT • *17 MARCH 1944*

FOR ORDNANCE PERSONNEL ONLY

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Washington 25, D. C., 17 March 1944

TM 9-1807, Ordnance Maintenance: Power Train, Chassis, and Body for 2½-ton 6x6 Truck and 2½- to 5-ton 6x4 Truck (Studebaker Models US6 and US6x4), is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

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

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*This Technical Manual, together with TM 9-807 and TM 9-1832A, supersedes TM 10-1385, dated 1 February 1942; TM 10-1387, dated 3 February 1942; TM 10-1565, dated 15 February 1943; TM 10-1565 Change No. 1, dated 4 October 1943; and TM 10-1503, dated 17 July 1941.

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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 Studebaker 6x6 and 6x4 vehicles. 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, removal, disassembly, cleaning, inspection, repair, assembly, and installation of the clutch, transmission, transfer case, propeller shafts with universal joints and pillow block, axles, springs and shock absorbers, steering gear, bodies and hood, frame, fifth wheel, power take-off, winch and drive shaft, and dump body operating units.

c. TM 9-807 contains information for first and second echelons.

d. TM 9-1825B contains instructions for disassembly, cleaning, inspection, repair, and assembly of electrical equipment used on these vehicles.

e. TM 9-1826A contains instructions for disassembly, cleaning, inspection, repair, and assembly of the carburetor used on these vehicles.

f. TM 9-1827B contains instructions for disassembly, cleaning, inspection, repair, and assembly of the vacuum power brake system used on these vehicles.

g. TM 9-1827C contains instructions for disassembly, cleaning, inspection, repair, and assembly of the hydraulic brake system used on the vehicles.

h. TM 9-1828A contains instructions for disassembly, cleaning, inspection, repair, and assembly of the fuel pump used on these vehicles.

i. TM 9-1832A contains instructions for disassembly, cleaning, inspection, repair, and assembly of the engines used in these vehicles.

2. MWO AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD.

a. Description. Every vehicle is supplied with a copy of AGO

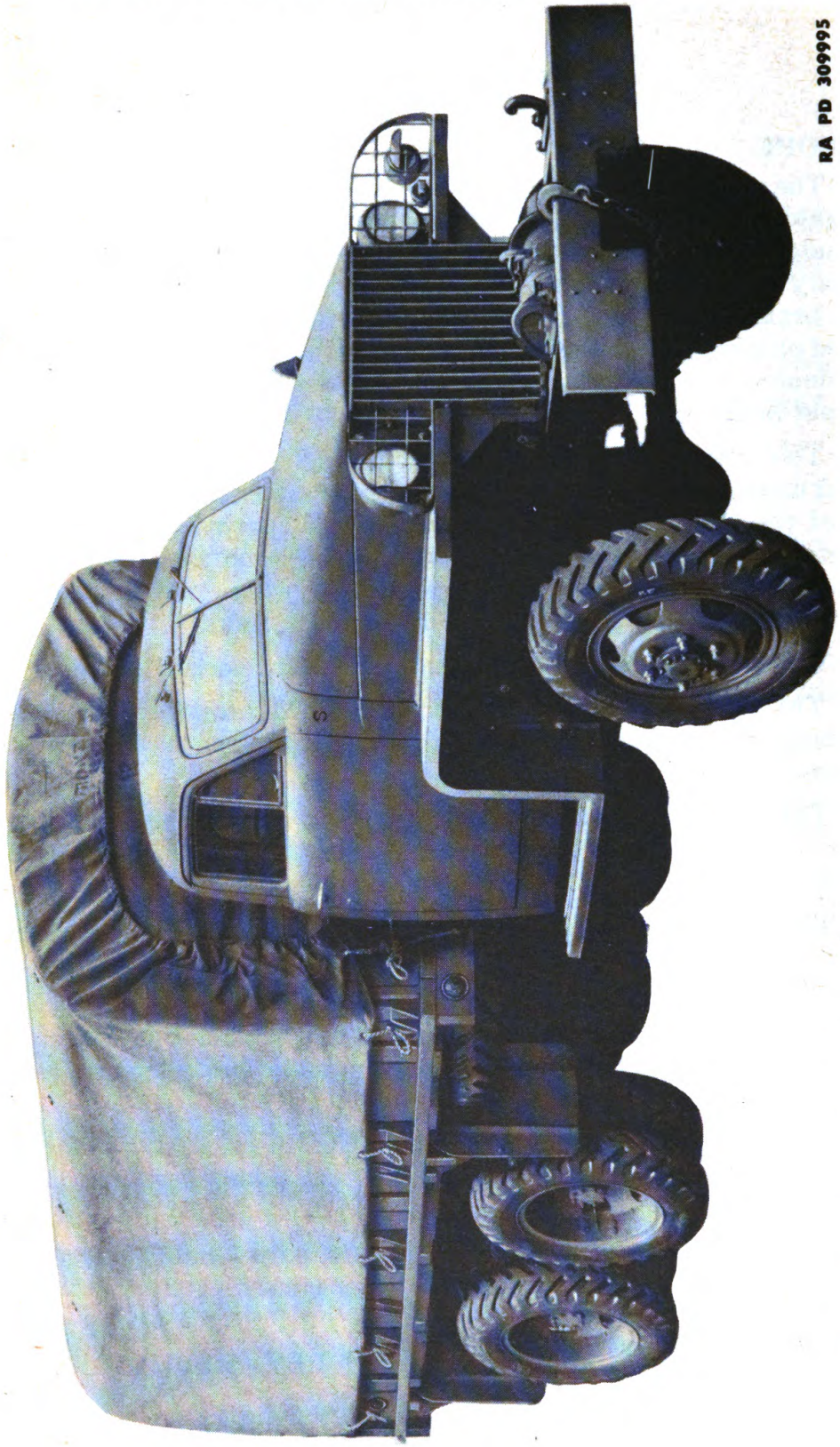

Figure 1 — 162-inch Wheelbase Cargo Truck US6 (6x6) — Right Front (With Winch)

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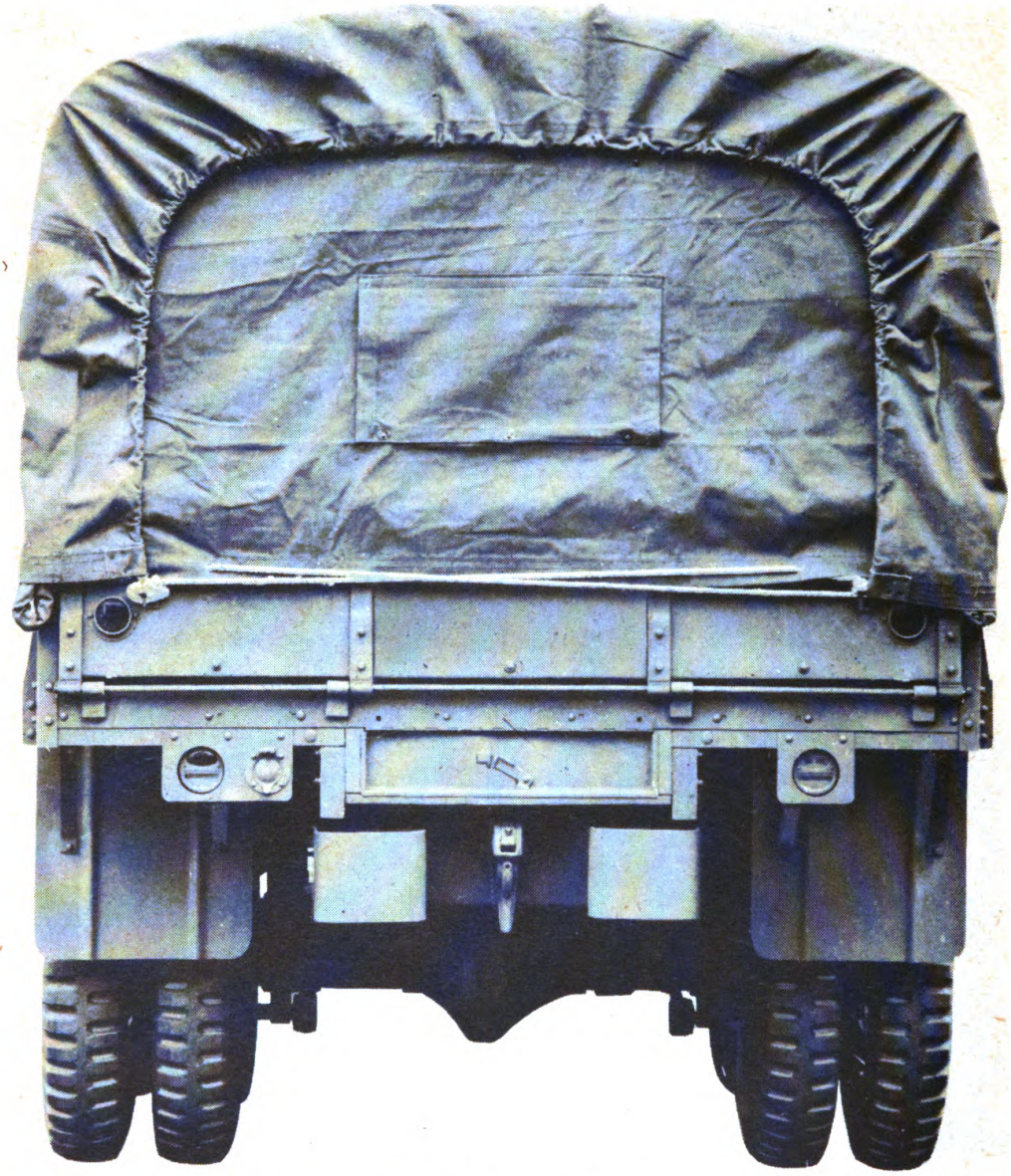
RA PD 309997

Figure 2 — 162-inch Wheelbase Cargo Truck US6x4 — Front (Less Winch)

Form No. 478, which provides a means of keeping a record of each Modification Work Order completed, or major unit assembly replaced. This form includes spaces 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.

b. Instructions for Use. Personnel performing modifications or major unit assembly replacements must record clearly on the form



RA PD 309998

Figure 3 — Cargo Truck — Rear

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 and minor parts and accessory replacements need not be recorded.

c. 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 AGO Form No. 478.

INTRODUCTION

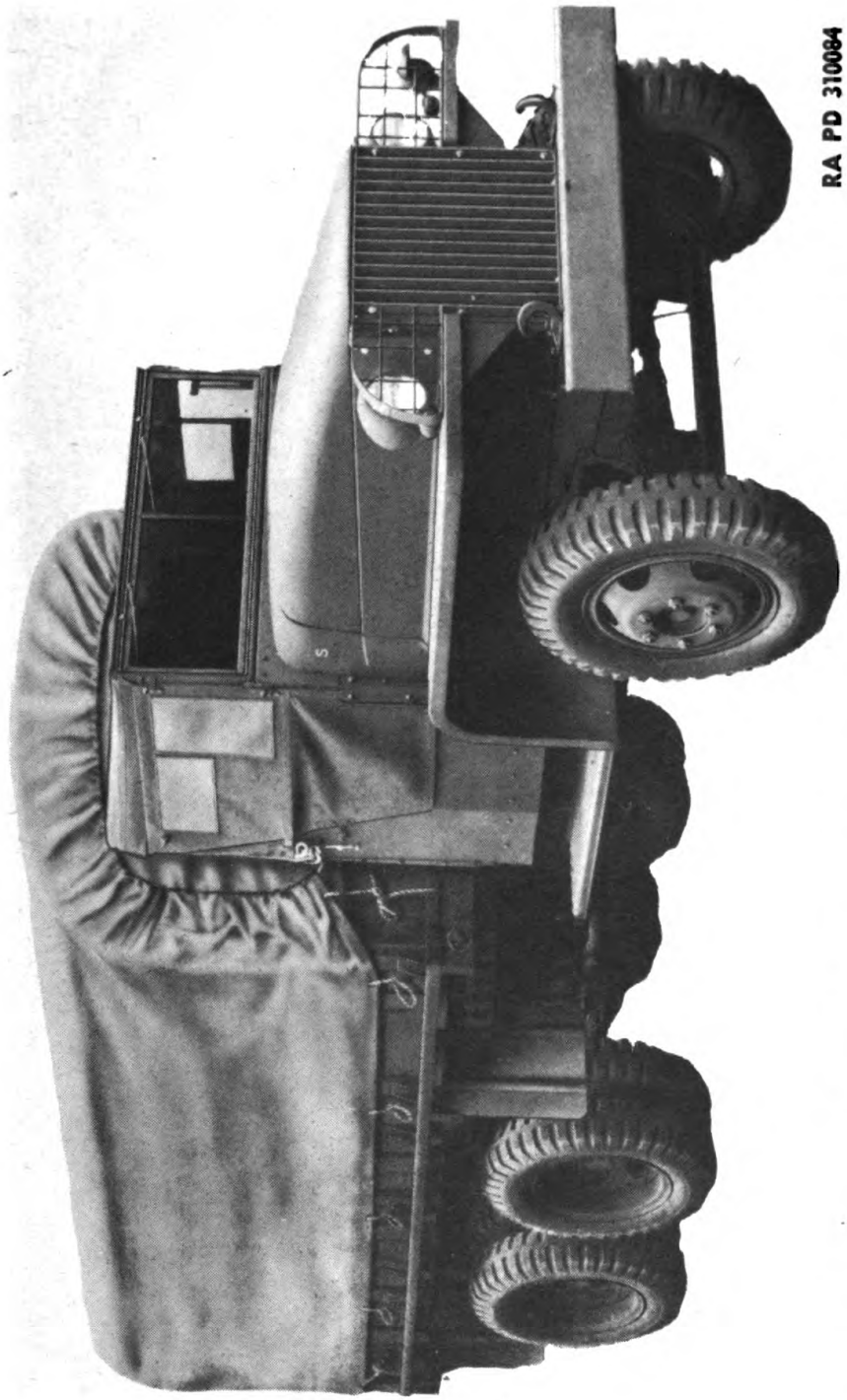


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Figure 4 — 162-inch Wheelbase Cargo Truck With Soft Top Cab, US6x4 — Right Front (Less Winch)

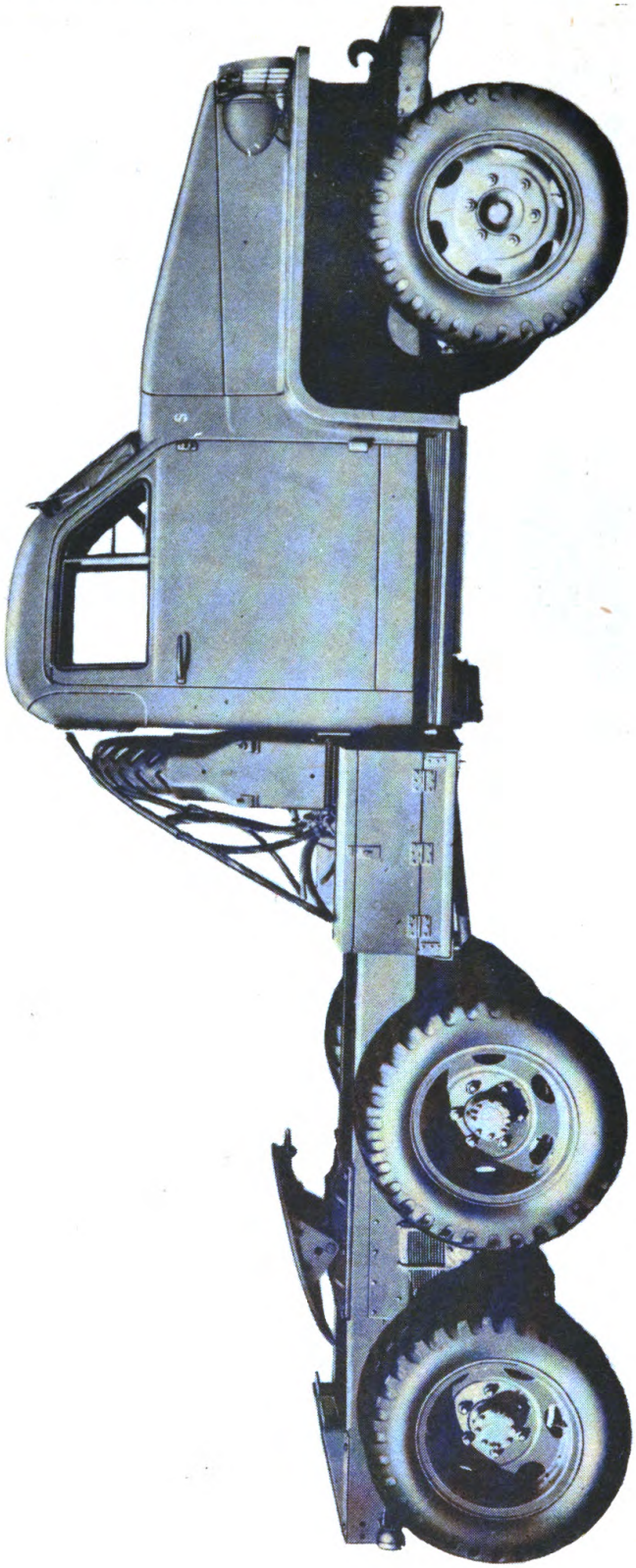

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Figure 5 — 148-inch Wheelbase Tractor Truck US6x4 — Right Side

INTRODUCTION

Figure 6 — 148-inch Wheelbase End Dump Model Truck US6 (6x6) —Body Raised

Figure 7 — 148-inch Wheelbase Side Dump Model Truck US6 (6x6) — Body Raised

CHAPTER 2

CLUTCH

3. DESCRIPTION AND DATA.

a. Description (fig. 8). The clutch consists of a driven plate with facings, and a pressure plate assembly. When the clutch pedal is released, the driven plate is gripped between the pressure plate and engine flywheel. The pressure plate assembly has a coil spring that actuates toggle levers which move the pressure plate forward when the clutch pedal is released. Depressing the clutch pedal compresses the coil spring, which relieves the pressure on the toggle levers, and the retractor springs pull the pressure plate away from driven plate.

b. Data.

Make	W. C. Lipe
Model	Z34-S
Pressure spring:	
Type	Coil
Number	1
Number of coils	3 or 4

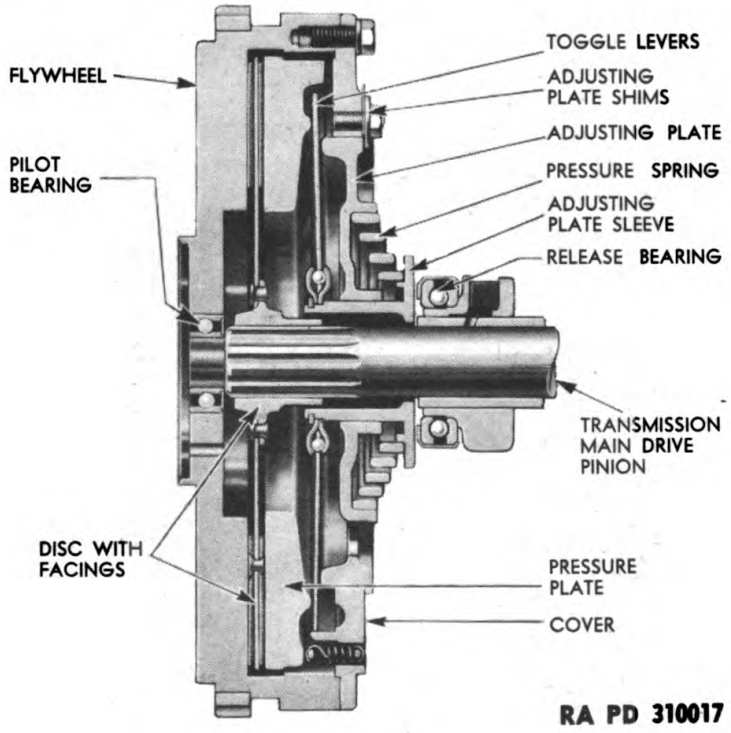

Figure 8 — Clutch — Cross Section

CLUTCH

Driven plate facings:
- Outside diameter ..... 11⅞ in.
- Inside diameter ..... 7¼ in.
- Thickness ..... 0.125 to 0.128 in.

Clutch pilot bearing:
- Type ..... Ball
- Make ..... S.R.B. 205S or B.C.A. 7205S

Clutch release bearing:
- Type ..... Ball
- Make Aetna-A959-1

4. REMOVAL.

a. Remove Transmission Assembly. Refer to TM 9-807 for removal instructions.

b. Remove Clutch Housing. Remove both bolts and nuts from clutch operating shaft sleeve, and slide sleeve onto operating shaft. Take out cap screws attaching clutch housing to flywheel housing, and remove clutch housing (fig. 9).

c. Remove Clutch Assembly. Loosen the clutch assembly to flywheel retaining screws a turn at a time. This will relieve clutch pressure spring tension on the pressure plate gradually and prevent distortion. When tension is relieved, remove screws and tilt the top of clutch assembly backward and down to a nearly horizontal position (fig. 10) to prevent the driven plate from falling off separately and being damaged.

d. Clutch Pilot Bearing Replacement. Remove the cotter pins and castle nuts that hold the flywheel to crankshaft flange. Pull flywheel away from crankshaft, and press pilot bearing out of flywheel center bore. Lubricate the replacement bearing, and press it into place in flywheel center bore so that the closed side of bearing is toward the rear. Place the flywheel in position on crankshaft flange, fasten securely with castle nuts, and install new cotter pins.

5. DISASSEMBLY.

a. Driven Plate Assembly (Disk). Use a drill to remove the rivets attaching facings to the driven plate, as punching them out will distort the plate.

b. Pressure Plate Assembly. Place the pressure plate assembly on clutch rebuilding fixture 41-C-2480, or an arbor press, with pressure plate down. Apply pressure to clutch adjusting plate sleeve, unhook the four pressure plate springs (fig. 11), and lift the cover with adjusting plate and other parts off the pressure plate. Turn the assembly over with the adjusting plate sleeve down, and compress

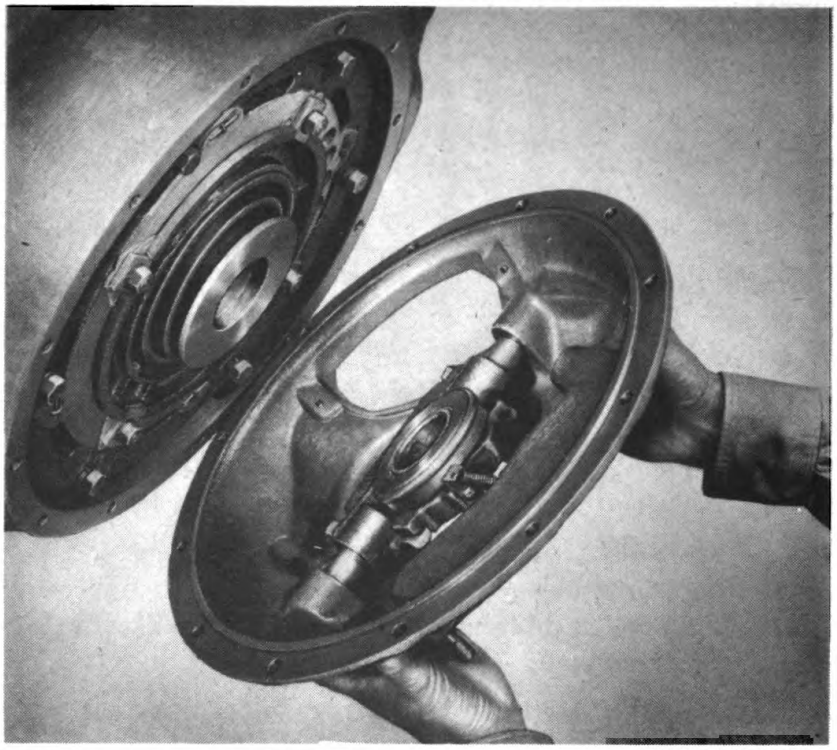

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Figure 9 — Removing Clutch Housing

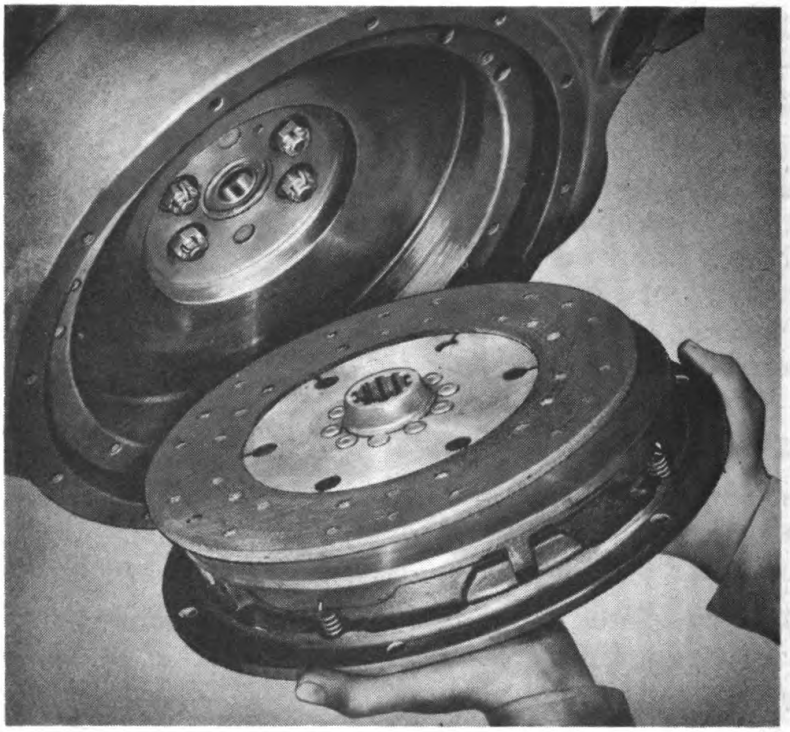

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Figure 10 — Removing Clutch Assembly

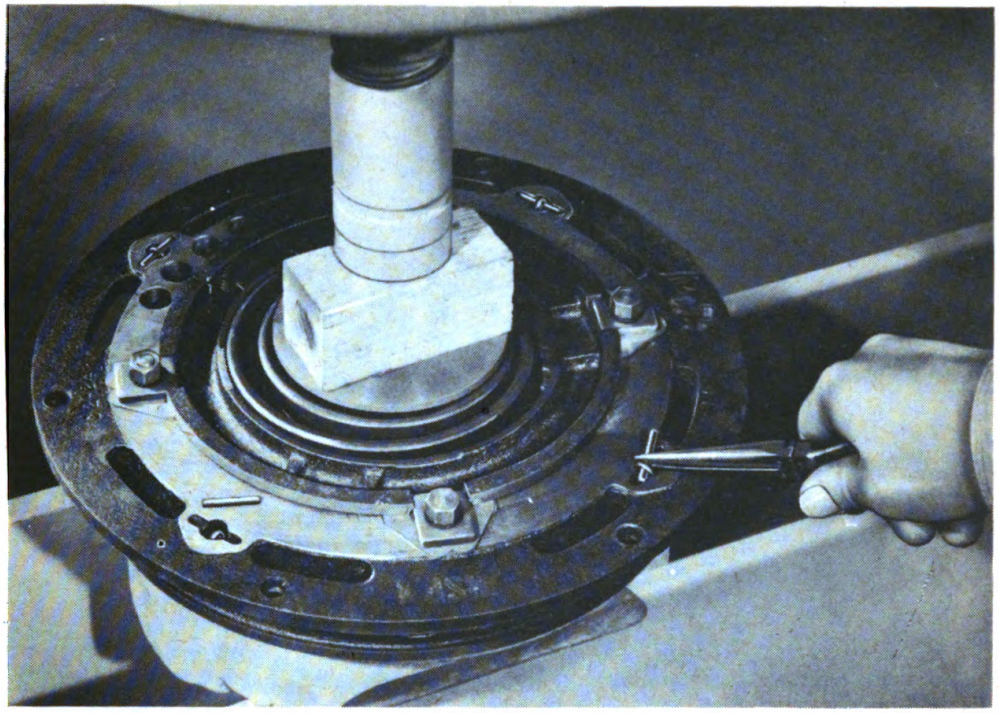

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Figure 11 — Removing Pressure Plate Spring Pins

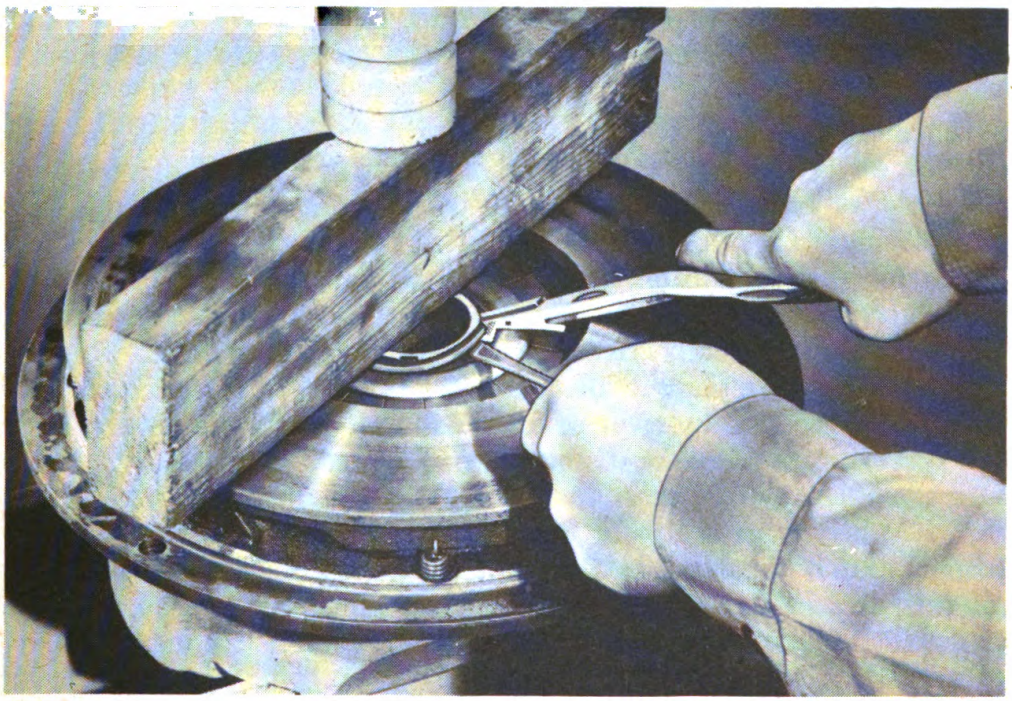

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Figure 12 — Removing Toggle Lever Retainer Snap Ring

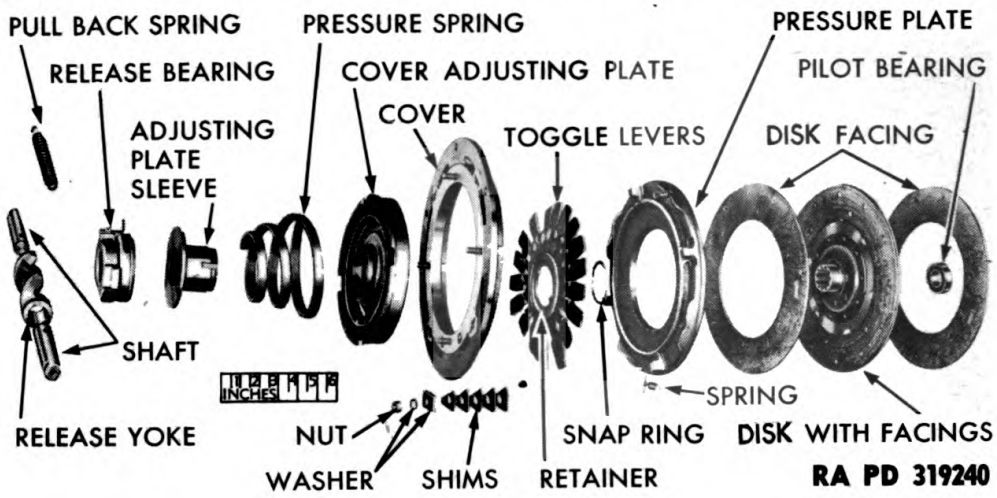


Figure 13 — Clutch Disassembled — Cross Section

the large clutch pressure spring. Remove the snap ring (fig. 12), toggle levers, and retainers. Release pressure and remove clutch pressure spring, adjusting plate, clutch cover, and adjusting plate sleeve (fig. 13).

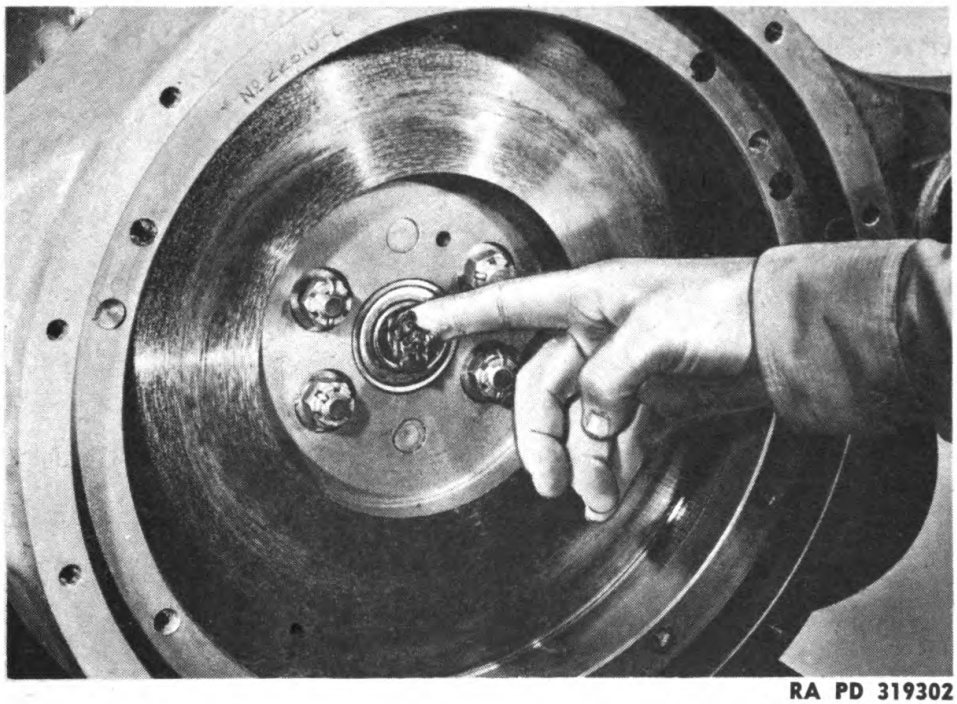
6. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Place all parts in dry-cleaning solvent, and clean thoroughly to remove all grease or oil. CAUTION: *Do not place driven plate in dry-cleaning solvent if the facings are in serviceable condition.*

b. Inspection and Repair. Inspect the driven plate disk for "run-out" or distortion, and for damaged splines. Replace driven plate assembly, or reline the driven plate with recommended facings, if it is not satisfactory for further service. Check the clutch pressure spring for proper tension, and replace if not within limits given in paragraph 10. Examine the clutch pressure plate (retractor) springs for weakness; if the coils are not close together, replace them. Replace the clutch pressure plate if "dished" more than 0.015 inch, scored from slipping, or grooved by rivet heads. Examine the toggle levers, balls, and retainers for scores or distortion, and replace as necessary. Make sure the release yoke shaft turns freely in the clutch housing, check the yoke levers for scores or damage, and replace if not satisfactory. Inspect clutch housing for cracks or damage, and replace if unsuitable for further service. Check the clutch pilot bearing for roughness or dirt, and if not satisfactory for further service, replace bearing (par. 4 d).

7. ASSEMBLY.

a. Driven Plate and Facings. Aline the countersunk holes in the facings with the holes in the driven plate. Install rivets in sets of



RA PD 319302

Figure 14 — Lubricating Clutch Pilot Bearing

three so that the heads of the first three are on one side, and the next three heads are on the other side. Set the rivets firmly with riveting tool, but do not drive rivets deep enough to crack the facings.

b. Pressure Plate, Springs, and Cover. Remove all burs from bore of the adjusting plate and adjusting plate sleeve. Place the adjusting plate sleeve on the rebuilding fixture with the clutch pressure spring small coil end over shoulder and against flange on the sleeve. Set the clutch adjusting plate and clutch cover on the spring, being sure the large coil end of spring is against the small boss on the adjusting plate. Place the toggle levers with balls and retainers in position, compress the pressure spring, and install a new snap lock ring. Release pressure, remove assembly, and place the pressure plate on the rebuilding fixture. Aline lug marked "O" on the outer edge of the pressure plate with the slot marked "O" on the outer edge of the clutch cover, and set the cover on the pressure plate. If a new pressure plate is installed, the lugs require 0.003-inch clearance in cover slots. Compress the complete assembly, and hook the four pressure plate (retractor) springs in position, being careful not to overstretch them. If the driven plate assembly or facings have been replaced, install six shims under each adjusting screw rectangular washer. Install shims so that the holes for removing them are located alternately from side to side for easy removal when adjusting the clutch.

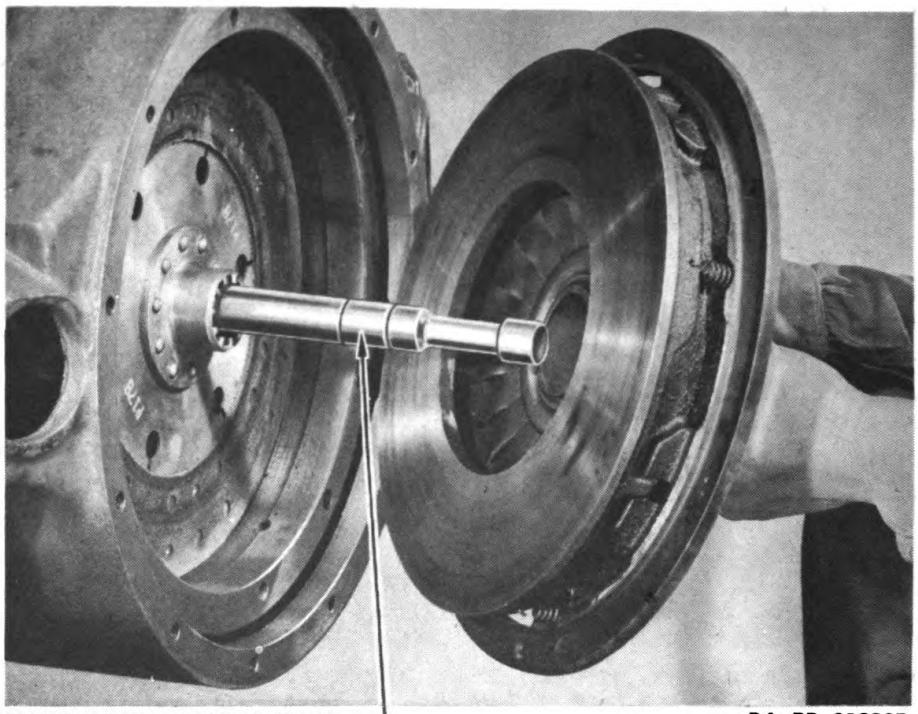


Figure 15 — Installing Clutch Assembly

8. INSTALLATION.

a. Lubrication Before Installation. Lubricate main drive pinion splines and clutch release bearing felt with engine oil. Fill the recess in front of clutch pilot bearing with roller bearing grease (fig. 14).

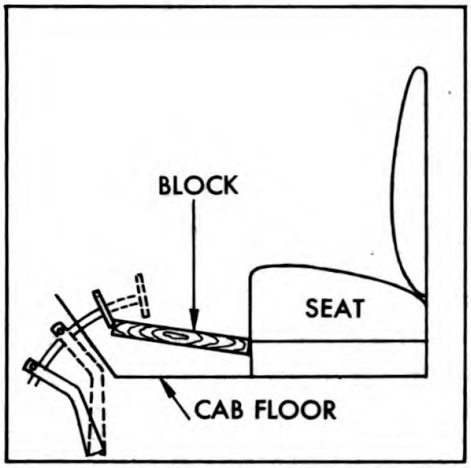
b. Fit Pressure Plate Assembly to Flywheel. If the pressure plate has been replaced, install the pressure plate assembly in the flywheel without the driven plate assembly. Make sure the outer diameter of the pressure plate does not drag or bind against the inside diameter of flywheel.

c. Install Clutch Assembly. Place clutch driven plate into position on flywheel, using clutch plate alining tool 41-T-3085 to centralize the driven plate and splined hub in relation to the clutch pilot bearing (fig. 15). Install pressure plate with retaining screws, and tighten progressively to prevent distortion and binding of plates.

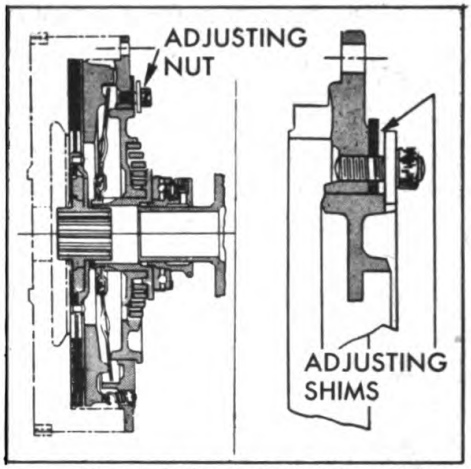
d. Install Clutch Housing. Place housing in position, and attach it to flywheel housing with cap screws, tightening in such a manner as to draw the housings together without strain or distortion. Slide clutch operating shaft sleeve into position on both shafts, alining holes in sleeve and shafts. Install sleeve bolts, nuts, and new cotter pins.

e. Install Transmission. Refer to TM 9-807 for installation instructions.

CLUTCH

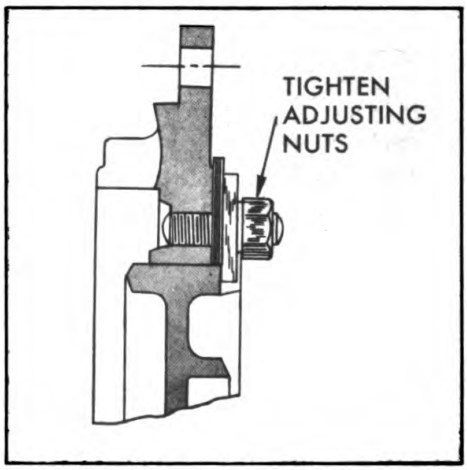


Blocking Clutch Pedal

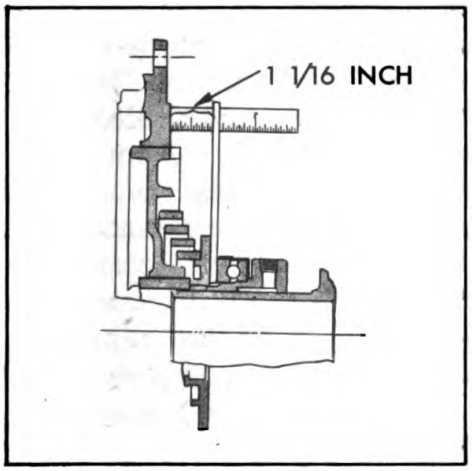


Location of the Adjusting Nuts **Adjusting Shims Released**

Adjusting Shims Removal



Adjusting Nuts Tightened



Checking Adjustment with a Straight Edge and Scale

Release Bearing to Sleeve Clearance

RA PD 310069

Figure 16 — Clutch Adjustments

9. ADJUSTMENT IN VEHICLE.

a. Checking Adjustment of Clutch. After the clutch has been installed and the linkage connected, check the clutch adjustment. Remove the handhole cover, and hold a straightedge or scale (4 in. long, attached to a chain) vertically between the release bearing and the rear face of the clutch sleeve (fig. 16). With a scale (3 in. long, attached to a chain) measure the distance from forward edge of the vertical scale to the machined surface (shim seat) of the clutch cover. This dimension, with new clutch parts and proper amount of shims under each rectangular washer must be $1\frac{1}{16}$ inches. The removal of one shim from under each washer will reduce the measurement by $\frac{5}{64}$ inch. Therefore, to obtain the correct adjustment, it will be necessary to remove shims as required until the dimension of $1\frac{1}{16}$ inches is obtained.

b. Adjustment of Clutch. Block clutch pedal down so that clutch is in released position (fig. 16). This is necessary because otherwise the rectangular adjusting washers or studs at the clutch cover adjusting points may become bent, or the threads on the studs or nuts may be stripped. With the clutch pedal blocked in the released position, back off each of the four adjusting nuts five full turns (fig. 16). Remove the block holding the pedal down, and allow clutch to engage. This will permit adjusting plate to move away from and out of contact with adjusting shims. Using sharpnosed pliers or cotter pin puller, remove one shim from under each rectangular washer (fig. 16). Be sure that shim does not tear, and that no portion of it remains under rectangular washer. Also make certain that only one shim is removed from under each washer, and that the same number of shims remain under each washer after removal of one shim. Disengage clutch, block pedal down again, and tighten the four adjusting nuts (fig. 16). Remove pedal blocking, and allow the clutch to engage. When the correct distance from the machined shim surface to the scale is obtained (fig. 16), measure the distance from the release bearing to the clutch sleeve (fig. 16). The proper clearance is not less than ⅛ inch, and not more than $\frac{5}{32}$ inch. To provide the proper clearance at this point, adjust the pedal linkage. Loosen the adjusting nut lock nut on the clutch pedal to operating shaft lever rod. Turn the adjusting nut as required until the proper clearance of ⅛ to $\frac{5}{32}$ inch is obtained. CAUTION: *Do not adjust the pedal linkage for any other reason.*

10. FITS AND TOLERANCES.

Pressure spring:

Free height 3 coils	3⅞ in.
Free height 4 coils	5½ in.
Tension (compressed to 1¼-in.)	360 to 390 lb

CLUTCH

Clutch pedal free travel	1 to 1½ in.
Clearances:	
Between splined hub and shaft	0.0005 to 0.0055 in.
Between pressure plate lugs and slots in cover	0.003 in.
Between release bearing and clutch sleeve	⅛ to 5/32 in.
Maximum allowance of "dish" in pressure plate	0.015 in.
Shim adjustment of clutch:	
Measure from clutch sleeve rear face to machined face on clutch cover	1 1/16 in.
Shim thickness	0.016

CHAPTER 3

TRANSMISSION

11. DESCRIPTION AND OPERATION.

a. The transmission has five speeds forward and one reverse. The fourth speed forward is direct drive, while the fifth speed is overdrive. Gear ratios are selected by means of a conventional-type shift lever and three shift rods. These control the three shifting forks which move the sliding gears into mesh with the driving gears.

b. Power enters the transmission from the clutch driven plate through the main drive pinion. This pinion is in constant mesh with a fixed gear on the countershaft. The countershaft revolves constantly when the engine is running and the clutch is engaged. Various drive gears, some integral with the countershaft and some keyed on it, are provided to give different gear ratios, as selected by means of the sliding gears on the mainshaft. In fourth speed or direct drive, however, the sliding (clutch) gear on the mainshaft engages directly with the internal teeth of the main drive pinion. An idler gear and shaft are used to change direction of drive for reverse speed.

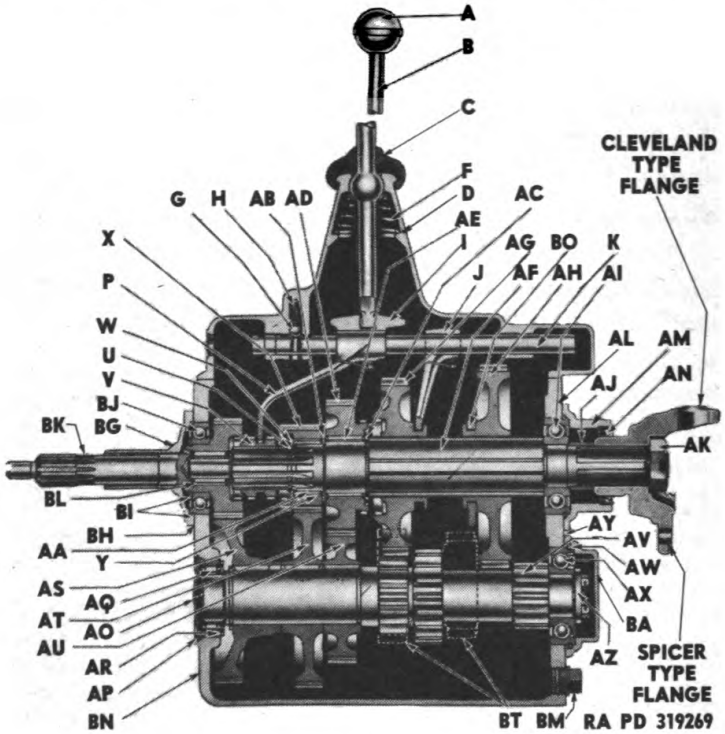


Figure 17 — Transmission — Sectional View

c. Both helical and spur-type gears are used. The main drive pinion and shaft, countershaft, and mainshaft are supported at each end with bearings (fig. 17). The case is fitted with a lubricant filler plug in the right side, and a drain plug in the rear near the bottom. All openings are sealed by means of gaskets or oil seals. The gears, bearings, etc., are lubricated by the splash system.

12. DATA.

Make ..... Warner Gear
Model ..... T 93
Type ..... Overdrive, selective sliding
Speeds ..... Five forward, one reverse
Bearings:
Main drive pinion (clutch pilot) in flywheel .... S.R.B. 205S ball or B.C.A. 7205S ball

A—LEVER BALL
B—GEARSHIFT LEVER
C—DUST CAP
D—TRANSMISSION CASE COVER
E—PIVOT PIN
F—SUPPORT SPRING
G—LOCK BALL
H—LOCK BALL SPRING
I—SECOND AND THIRD SHIFT LUG
J—SECOND AND THIRD SHIFT FORK
K—SECOND AND THIRD SHIFT ROD
L—INTERLOCK BALLS
M—FIRST AND REVERSE ROD PLUNGER
N—PLUNGER SPRING
O—FOURTH AND FIFTH SHIFT ROD
P—FOURTH AND FIFTH SHIFT FORK
Q—FIRST AND REVERSE SHIFT LUG
R—SET SCREW
S—FIRST AND REVERSE ROCKER LUG
T—FIRST AND REVERSE SHIFT ROD
U—IDLER GEAR SNAP RING
V—FOURTH AND FIFTH CLUTCH GEAR
W—RETAINER WASHER
X—FIFTH SPEED IDLER GEAR
Y—IDLER GEAR BUSHING
Z—MAIN SHAFT STEEL BUSHING PIN
AA—MAIN SHAFT STEEL BUSHING
AB—FIFTH SPEED IDLER GEAR LOCATING WASHER
AC—THIRD SPEED IDLER GEAR LOCATING WASHER
AD—THIRD SPEED IDLER GEAR
AE—THIRD SPEED IDLER GEAR BEARING ROLLERS
AF—MAIN SHAFT
AG—SECOND AND THIRD SLIDING GEAR
AH—FIRST AND REVERSE SLIDING GEAR
AI—MAIN SHAFT REAR BEARING
AJ—SPACER
AK—MAIN SHAFT NUT
AL—BEARING CAP GASKET
AM—MAIN SHAFT REAR BEARING CAP
AN—BEARING CAP OIL SEAL
AO—RETAINER PLUG
AP—RETAINER PLUG SNAP RING
AQ—COUNTERSHAFT FRONT BEARING
AR—BEARING SPACER
AS—COUNTERSHAFT DRIVE GEAR
AT—COUNTERSHAFT FIFTH SPEED GEAR
AU—COUNTERSHAFT THIRD SPEED GEAR
AV—COUNTERSHAFT WITH FIRST, SECOND, AND REVERSE GEARS
AW—COUNTERSHAFT REAR BEARING SPACER
AX—COUNTERSHAFT REAR BEARING AND SNAP RING
AY—BEARING COVER GASKET
AZ—COUNTERSHAFT REAR BEARING RETAINER
BA—COUNTERSHAFT REAR BEARING COVER
BB—POWER TAKE-OFF COVER
BC—FILLER PLUG
BD—COVER GASKET
BE—FIRST AND REVERSE ROCKER ARM PIVOT
BF—FIRST AND REVERSE ROCKER ARM
BG—MAIN DRIVE PINION BEARING CAP
BH—BEARING CAP GASKET
BI—LOCATING RING
BJ—MAIN DRIVE PINION BEARING
BK—MAIN DRIVE PINION
BL—MAIN SHAFT FRONT BEARING
BM—DRAIN PLUG
BN—TRANSMISSION CASE
BO—FIRST AND REVERSE SHIFT FORK
BP—SHIFT FORK BAR
BQ—SHIFT FORK BAR LOCK PLATE
BR—REVERSE IDLER GEAR BEARING
BS—BEARING SPACER
BT—REVERSE IDLER GEAR
BU—REVERSE IDLER GEAR SHAFT
BV—REVERSE IDLER GEAR SHAFT LOCK PLATE

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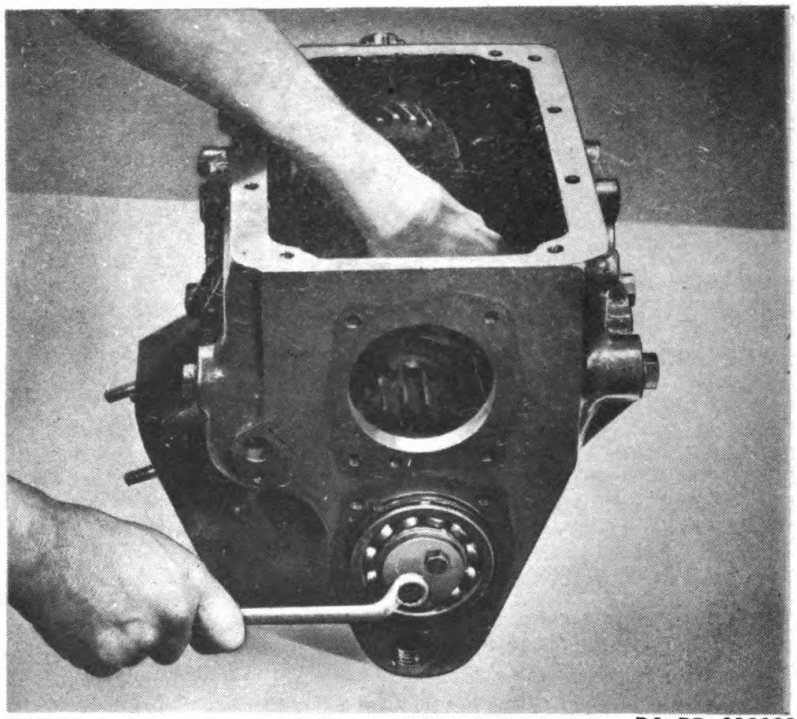
Legend for Figure 17 — Transmission — Sectional View



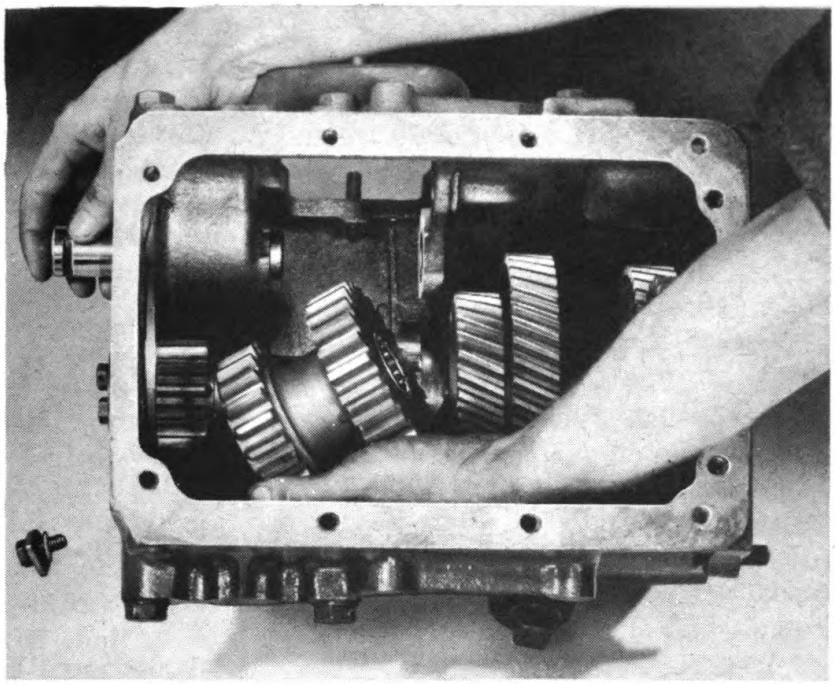
RA PD 319321

Figure 36 — Installing Countershaft Rear Bearing

screw, toothed lock washer, and new screw gasket. If left-hand transmission case to clutch housing stud has been removed from case, install and tighten it securely.

d. Mainshaft and Gears.

(1) ASSEMBLY. Lubricate all bearings, splines, and bearing surfaces. Install the third speed idler gear rear locating washer against forward shoulder of mainshaft (chamfer to rear). Install the third speed idler gear with set of small teeth toward the rear. Position the 34 rollers between mainshaft and gear, and install forward locating washer (chamfer to front). Place the small end of the locating pin into hole in fifth speed idler gear steel bushing from inside. Install bushing on mainshaft with pin toward front and the tapered end between two splines, using a hollow arbor. Install fifth speed idler gear on the mainshaft with internal teeth forward. Install splined retainer washer, correct size shim (if required) to fill space between washers and snap ring, and a new snap ring. Place fourth and fifth speed clutch gear on shaft with undercut to the rear. Install second and third speed sliding gear over splines from rear of shaft with the shifting fork groove toward the rear. Place first and reverse sliding gear on shaft splines with shifting fork groove toward front. Place roller bearing on front end of shaft.



RA PD 319318

Figure 37 — Installing Reverse Idler Gear and Shaft

(2) INSTALLATION. Place the mainshaft in the transmission case by moving the first and reverse sliding gear to the rear of shaft and tilting rear of shaft down into the case from the left. After the first and reverse sliding gear is in the case, straighten the shaft and move the rear end through bearing bore in case until front end clears main drive pinion. Move forward so that roller bearing enters recess in center of main drive pinion. Install mainshaft rear bearing on shaft and into transmission case bore. Install rear bearing snap ring, being certain that snap ring seats securely against case. Insert the first and reverse shift fork bar into bore in rear of case with lock notch at the rear end downward. Place the first and reverse shift fork into groove in first and reverse sliding gear so that the long hub extension is toward the front. Aline hole in fork hub with fork bar, and drive the bar into position. Install shift fork shaft lock plate with cap screw, toothed lock washer, and new screw gasket; and tighten securely. Install first and reverse shift fork rocker arm with bolt, lock washer, and nut, making certain it engages the shift fork. Try all parts of transmission for freedom of movement and proper operation. Install a new oil seal in mainshaft rear bearing cap using oil seal replacer (a flat steel plate), and install cap with new gasket. Start cap screws with toothed lock washers and new screw gaskets, and tighten securely. Install flange to bearing spacer, flange, castle nut, and new cotter pin on rear of mainshaft.

e. Install Power Take-off. On transmissions so equipped, place spacer with new gaskets in position. Place unit in position on studs in side of transmission, and make sure intermediate gear in take-off engages properly with reverse idler gear in tranmission. Install toothed lock washers and nuts, and tighten securely.

18. FITS AND TOLERANCES.

Mainshaft and gears:	
Third and fifth speed gear locating washer thickness	0.119 to 0.121 in.
Third and fifth speed mainshaft gear shim thickness	0.003 to 0.005 in.
Fifth speed gear bushing diameter	2.0287 to 2.0297 in.
Third speed gear roller diameter	0.1873 to 0.1876 in.
Mainshaft, out-of-true, not over	0.002 in.
Clearances between:	
Mainshaft and sliding gears:	
Low and reverse	0.0005 to 0.0025 in.
Second and third	0.0005 to 0.002 in.
Shifting fork and sliding gear	0.010 to 0.025 in.
Fifth speed gear bushings	0.002 to 0.0035 in.
End play in helical gears	0.001 to 0.004 in.
Shifting:	
Shift rail poppet spring:	
Free length	$1\frac{7}{16}$
Pounds pressure at $1\frac{5}{16}$ inch	40 to 45 lb
Reverse latch spring:	
Free length	$1\frac{9}{16}$ in.
Pounds pressure at 1 inch	30 to 35 lb
Countershaft:	
Front bearing spacer thickness	0.095 in.
Reverse gear:	
Reverse gear end thrust	0.002 to 0.013 in.

CHAPTER 4

TRANSFER CASE

19. DESCRIPTION AND OPERATION (figs. 38 and 39).

a. The transfer case has two speeds, high and low, and a neutral position (except the nonselective gearshift type used on 6x4 vehicles of former production) (fig. 39). The mainshaft drive gear turns at mainshaft speed when the mainshaft sliding gear teeth are meshed with the drive gear internal teeth during high gear operation. During low gear operation, the mainshaft drive gear turns on a bushing, and its outer teeth are meshed with the idler shaft front gear. The mainshaft sliding gear is splined on the mainshaft, and is controlled by the gearshift fork clamped to the shift shaft. The shift shaft is held in any one of three positions: "LOW," "NEUTRAL," or "HIGH" by a lock ball under spring tension, which engages the grooves in the shift shaft. The low speed gear is keyed to the center of idler shaft, and the mainshaft sliding gear meshes with it for low gear operation. The idler shaft front and rear gears are held to the shaft with tapered splines. The idler shaft rear gear meshes with the mainshaft driven gear and driven shaft gear which drives the forward rear axle. A declutch sliding clutch (6x6 vehicles only) (w, fig. 38) slides on splines at the rear end of the declutch shaft and forward end of the driven shaft to control the engagement or disengagement of the driving front axle.

20. DATA.

a. 6x6 Vehicles.

Mounting	Middle of frame
Type	Two speed with front axle declutching
Make	Timken
Model	T-79
Gear ratio:	
High gear	1.155 to 1
Low gear	2.602 to 1
Bearings:	
Make	Timken tapered roller
Mainshaft driven gear:	
Inner	3776 cone, 3720 cup
Outer	339 cone, 332 cup
Mainshaft (inner and outer)	26883 cone, 26824 cup
Idler shaft (front and rear)	26883 cone, 26824 cup
Driven shaft:	
Front	26884 cone, 26824 cup
Rear	26883 cone, 26824 cup
Declutch shaft (inner and outer)	14137A cone, 14274 cup

b. 6x4 Vehicles (Selective Gearshift Type).

Mounting ..... Middle of frame
Type ..... Two speed without declutch unit
Make ..... Timken
Model T-79-13
Gear ratio:
  High ..... 1.155 to 1
  Low ..... 1.82 to 1
Bearings:
  Make ..... Timken tapered roller
  Mainshaft driven gear:
    Inner ..... 3776 cone, 3720 cup
    Outer ..... 339 cone, 332 cup

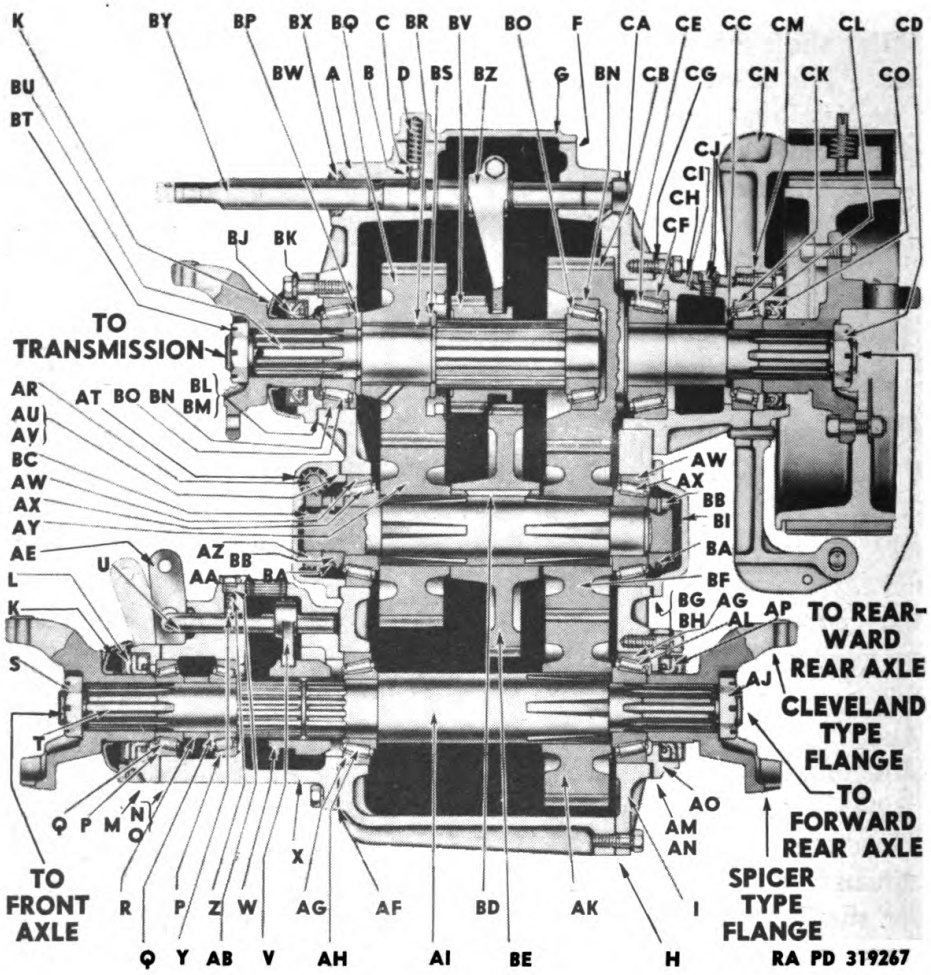


Figure 38 — Transfer Case (6x6 Model) — Sectional View

TRANSFER CASE

A—TRANSFER CASE
B—GEARSHIFT SHAFT LOCK BALL
C—LOCK PLUNGER
D—LOCK SPRING
E—DRAIN PLUG
F—COVER GASKET
G—GEAR SHIFT COVER
H—COVER GASKET
I—CASE COVER
J—LEVEL PLUG
K—DUST SHIELD
L—BEARING CAP OIL SEAL
M—DECLUTCH SHAFT CARRIER BEARING CAP
N—BEARING CAP GASKET
O—BEARING CAP SHIM
P—DECLUTCH SHAFT BEARING CUP
Q—DECLUTCH SHAFT BEARING CONE
R—BEARING SPACER
S—NUT
T—DECLUTCH SHAFT
U—DECLUTCH SHIFT SHAFT
V—DECLUTCH SHIFT FORK
W—DECLUTCH SLIDING CLUTCH
X—DECLUTCH CARRIER
Y—SHAFT LOCK BALL
Z—LOCK BALL SPRING
AA—PLUG
AB—LOCK SPRING SCREW
AC—STUD NUT
AD—STUD WASHER
AE—DECLUTCH SHIFT LEVER
AF—DECLUTCH CARRIER GASKET
AG—DRIVEN SHAFT BEARING CUP
AH—DRIVEN SHAFT FRONT BEARING CONE
AI—DRIVEN SHAFT
AJ—DRIVEN SHAFT NUT
AK—DRIVEN SHAFT GEAR
AL—DRIVEN SHAFT REAR BEARING CONE
AM—BEARING CAP SHIM
AN—BEARING CAP GASKET
AO—DRIVEN SHAFT REAR BEARING CAP
AP—BEARING CAP OIL SEAL
AQ—DRIVE PINION SLEEVE
AR—SPEEDOMETER DRIVE PINION
AS—DRIVE PINION BUSHING
AT—IDLER SHAFT FRONT BEARING CAP
AU—BEARING CAP GASKET
AV—BEARING CAP SHIM
AW—IDLER SHAFT BEARING CUP
AX—IDLER SHAFT BEARING CONE
AY—IDLER SHAFT FRONT GEAR
AZ—SPEEDOMETER DRIVE GEAR
BA—NUT SNAP RING
BB—BEARING NUT
BC—IDLER SHAFT
BD—IDLER SHAFT LOW SPEED GEAR KEY
BE—IDLER SHAFT LOW SPEED GEAR
BF—IDLER SHAFT REAR GEAR
BG—BEARING CAP SHIM
BH—BEARING CAP GASKET
BI—IDLER SHAFT REAR BEARING CAP
BJ—BEARING CAP OIL SEAL
BK—MAINSHAFT FRONT BEARING CAP
BL—BEARING CAP GASKET
BM—BEARING CAP SHIM
BN—MAINSHAFT BEARING CUP
BO—MAINSHAFT BEARING CONE
BP—DRIVE GEAR OUTER WASHER
BQ—MAINSHAFT DRIVE GEAR
BR—DRIVE GEAR BUSHING
BS—DRIVE GEAR INNER WASHER
BT—MAINSHAFT NUT
BU—MAINSHAFT
BV—MAINSHAFT SLIDING GEAR
BW—SHIFT SHAFT PACKING RETAINER
BX—SHIFT SHAFT PACKING
BY—GEARSHIFT SHAFT
BZ—GEARSHIFT FORK
CA—SHIFT SHAFT WELCH PLUG
CB—MAINSHAFT DRIVEN GEAR
CC—BEARING SHIM
CD—MAINSHAFT DRIVEN GEAR NUT
CE—MAINSHAFT DRIVEN GEAR INNER BEARING CONE
CF—MAINSHAFT DRIVEN GEAR INNER BEARING CUP
CG—BEARING CAGE GASKET
CH—MAINSHAFT DRIVEN GEAR BEARING CAGE
CI—BREATHER
CJ—BREATHER CAP
CK—MAINSHAFT DRIVEN GEAR OUTER BEARING CUP
CL—MAINSHAFT DRIVEN GEAR OUTER BEARING CONE
CM—BRAKE SUPPORT GASKET
CN—BRAKE SUPPORT
CO—BRAKE SUPPORT OIL SEAL

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Legend for Figure 53 — Transfer Case Disassembled (6x6 Model)

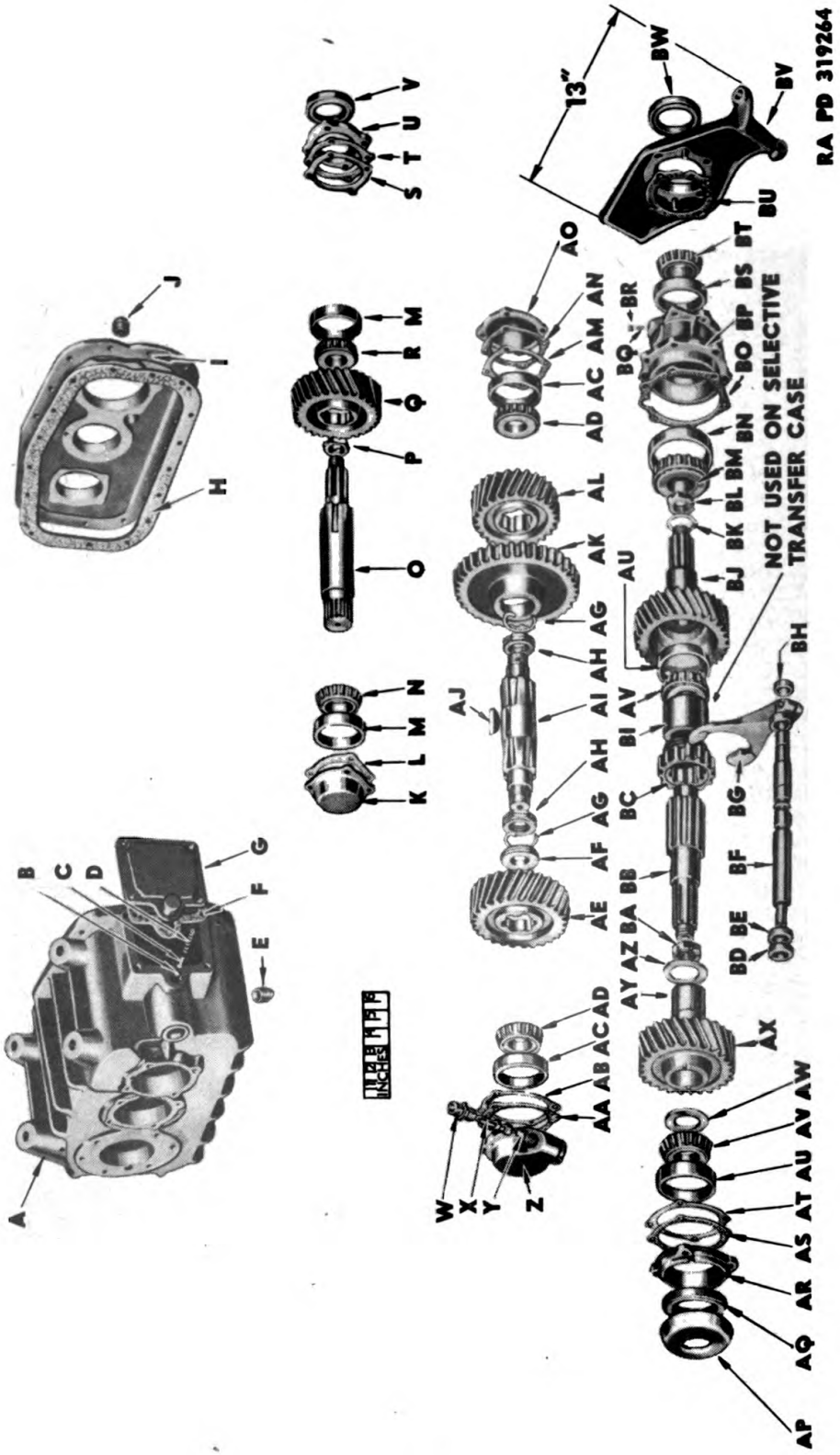

Figure 54 — Transfer Case Disassembled (6x4 Model)

TRANSFER CASE

A—TRANSFER CASE
B—GEARSHIFT SHAFT LOCK BALL
C—LOCK PLUNGER
D—LOCK SPRING
E—DRAIN PLUG
F—COVER GASKET
G—GEARSHIFT COVER
H—COVER GASKET
I—CASE COVER
J—LEVEL PLUG
K—DRIVEN SHAFT FRONT BEARING CAP
L—BEARING CAP GASKET
M—DRIVEN SHAFT BEARING CUP
N—DRIVEN SHAFT FRONT BEARING CONE
O—DRIVEN SHAFT
P—DRIVEN SHAFT NUT
Q—DRIVEN SHAFT GEAR
R—DRIVEN SHAFT REAR BEARING CONE
S—BEARING CAP SHIM
T—BEARING CAP GASKET
U—DRIVEN SHAFT REAR BEARING CAP
V—BEARING CAP OIL SEAL
W—DRIVE PINION SLEEVE
X—SPEEDOMETER DRIVE PINION
Y—DRIVE PINION BUSHING
Z—IDLER SHAFT FRONT BEARING CAP
AA—BEARING CAP GASKET
AB—BEARING CAP SHIM
AC—IDLER SHAFT BEARING CUP
AD—IDLER SHAFT BEARING CONE
AE—IDLER SHAFT FRONT GEAR
AF—SPEEDOMETER DRIVE GEAR
AG—NUT SNAP RING
AH—BEARING NUT
AI—IDLER SHAFT
AJ—IDLER SHAFT LOW SPEED GEAR KEY
AK—IDLER SHAFT LOW SPEED GEAR
AL—IDLER SHAFT REAR GEAR
AM—BEARING CAP SHIM
AN—BEARING CAP GASKET
AO—IDLER SHAFT REAR BEARING CAP
AP—DUST SHIELD
AQ—BEARING CAP OIL SEAL
AR—MAINSHAFT FRONT BEARING CAP
AS—BEARING CAP GASKET
AT—BEARING CAP SHIM
AU—MAINSHAFT BEARING CUP
AV—MAINSHAFT BEARING CONE
AW—DRIVE GEAR OUTER WASHER
AX—MAINSHAFT DRIVE GEAR
AY—DRIVE GEAR BUSHING
AZ—DRIVE GEAR INNER WASHER
BA—MAINSHAFT NUT
BB—MAINSHAFT
BC—MAINSHAFT SLIDING GEAR
BD—SHIFT SHAFT PACKING RETAINER
BE—SHIFT SHAFT PACKING
BF—GEARSHIFT SHAFT
BG—GEARSHIFT FORK
BH—SHIFT SHAFT WELCH PLUG
BI—MAINSHAFT SLIDING GEAR BLOCKING SLEEVE (NOT USED ON SELECTIVE TRANSFER CASE)
BJ—MAINSHAFT DRIVEN GEAR
BK—BEARING SHIM
BL—MAINSHAFT DRIVEN GEAR NUT
BM—MAINSHAFT DRIVEN GEAR INNER BEARING CONE
BN—MAINSHAFT DRIVEN GEAR INNER BEARING CUP
BO—BEARING CAGE GASKET
BP—MAINSHAFT DRIVEN GEAR BEARING CAGE
BQ—BREATHER
BR—BREATHER CAP
BS—MAINSHAFT DRIVEN GEAR OUTER BEARING CUP
BT—MAINSHAFT DRIVEN GEAR OUTER BEARING CONE
BU—BRAKE SUPPORT GASKET
BV—BRAKE SUPPORT
BW—BRAKE SUPPORT OIL SEAL

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Legend for Figure 54 — Transfer Case Disassembled (6x4 Model)

erly and are not forced or nicked during installation. Install the front bearing cap with speedometer drive pinion, proper shims, and a new gasket coated with sealing compound. Tighten the cap to transfer case cap screws securely.

c. Driven Shaft and Gear.

(1) ASSEMBLY. Press the driven shaft gear onto the shaft, and press a bearing cone on each end of the shaft with bearing cone replacer 41-R-2395-25, setting them against the shoulders (fig. 63).

(2) INSTALLATION. Place the driven shaft and gear assembly in the transfer case so that the driven shaft gear meshes with the idler shaft rear gear.

d. Case Cover.

(1) ASSEMBLY. Assemble the mainshaft driven gear bearing cage to the transfer case cover, using a new gasket coated with sealing compound. Tighten the cage to cover, attaching cap screws securely. Press the mainshaft driven gear inner bearing cone on the tail

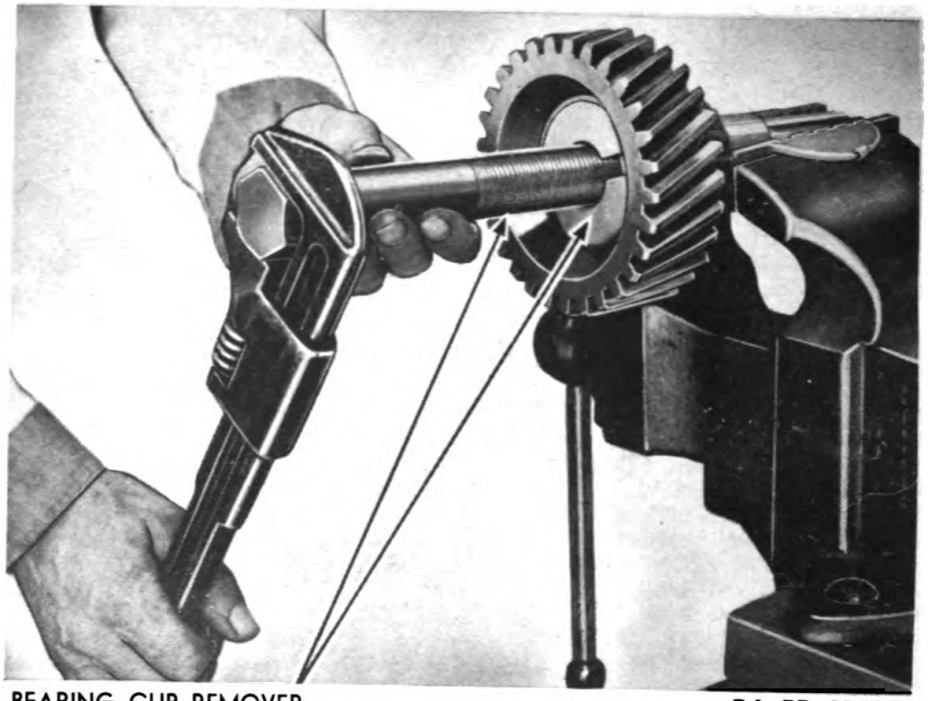


Figure 55 — Removing Mainshaft Rear Bearing Cup

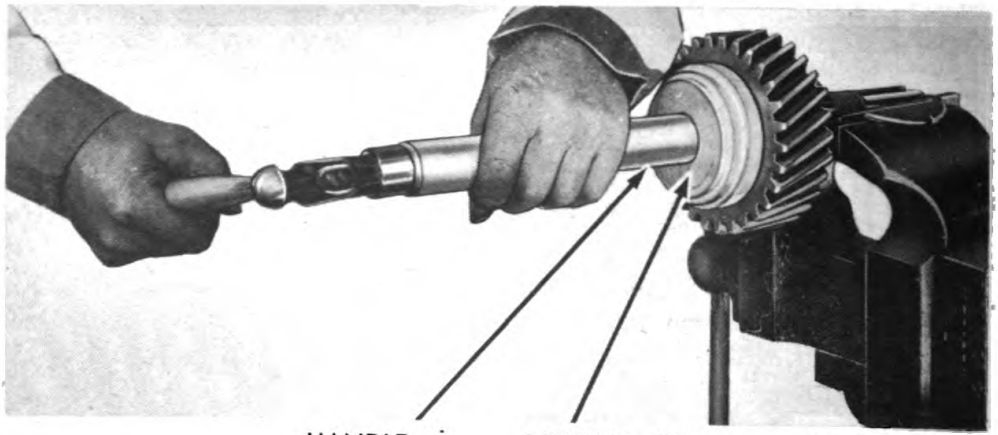


Figure 56 — Installing Mainshaft Rear Bearing Cup

shaft (fig. 64), and place the driven gear in the bearing cage. Slip the proper shims over the tail shaft, and press the outer bearing into position on the tail shaft. Place a new gasket coated with sealing compound in position, install the hand brake support bracket with dowel pins, and tighten securely with cap screws.

(2) INSTALLATION. Place a new transfer case to cover gasket coated with sealing compound in position on case. Be sure that all

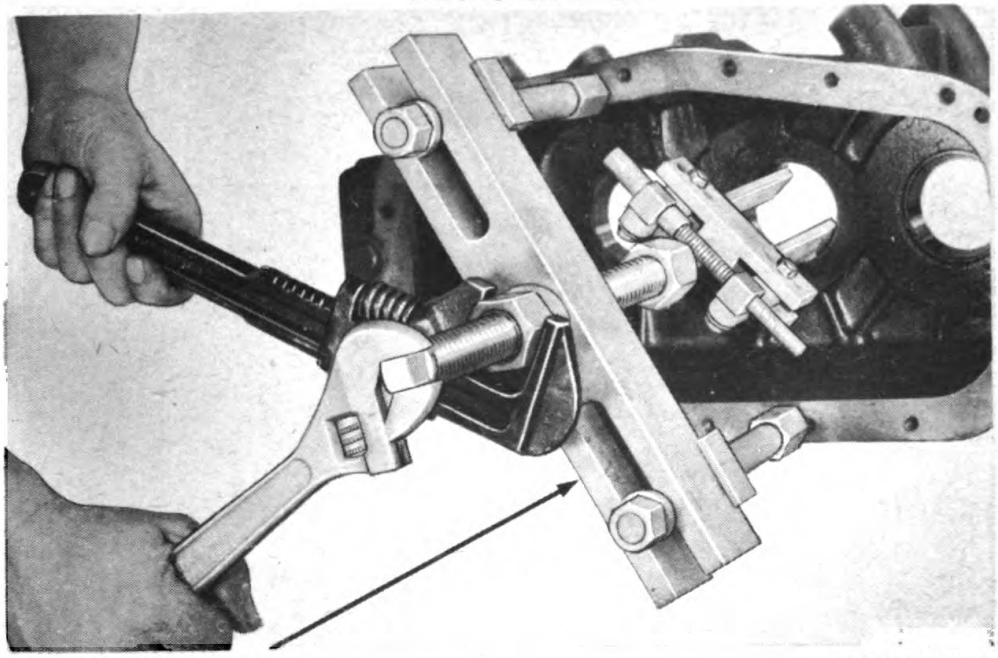


Figure 57 — Removing Bearing Cups From Case

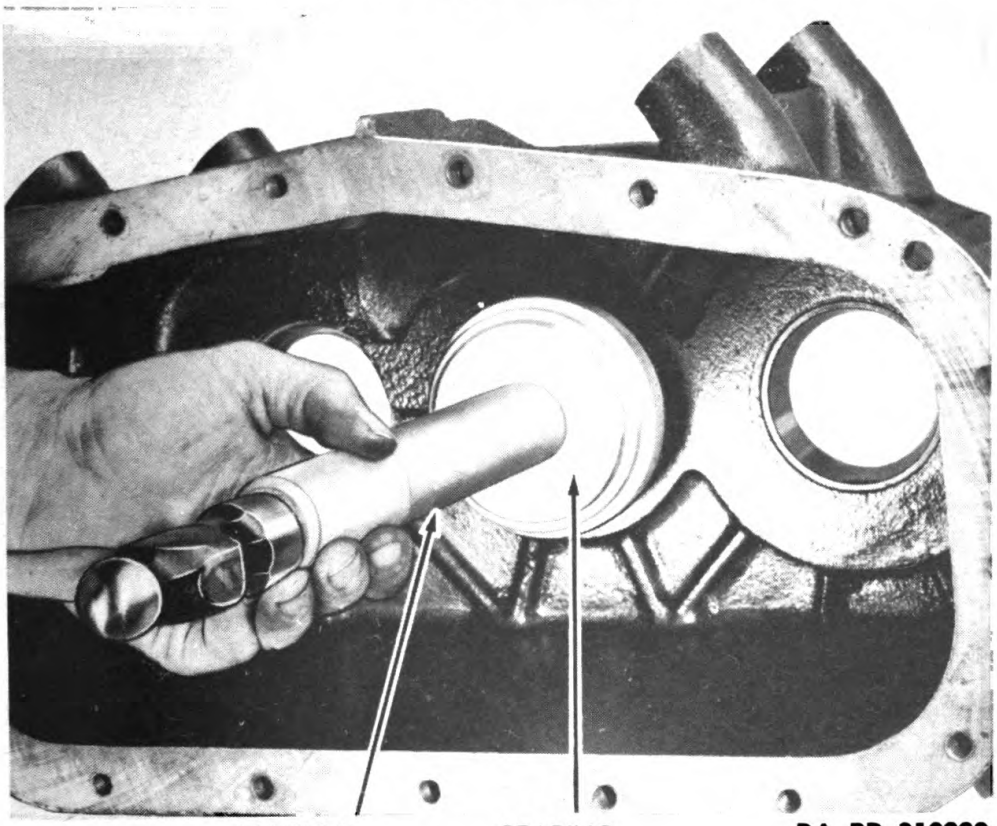
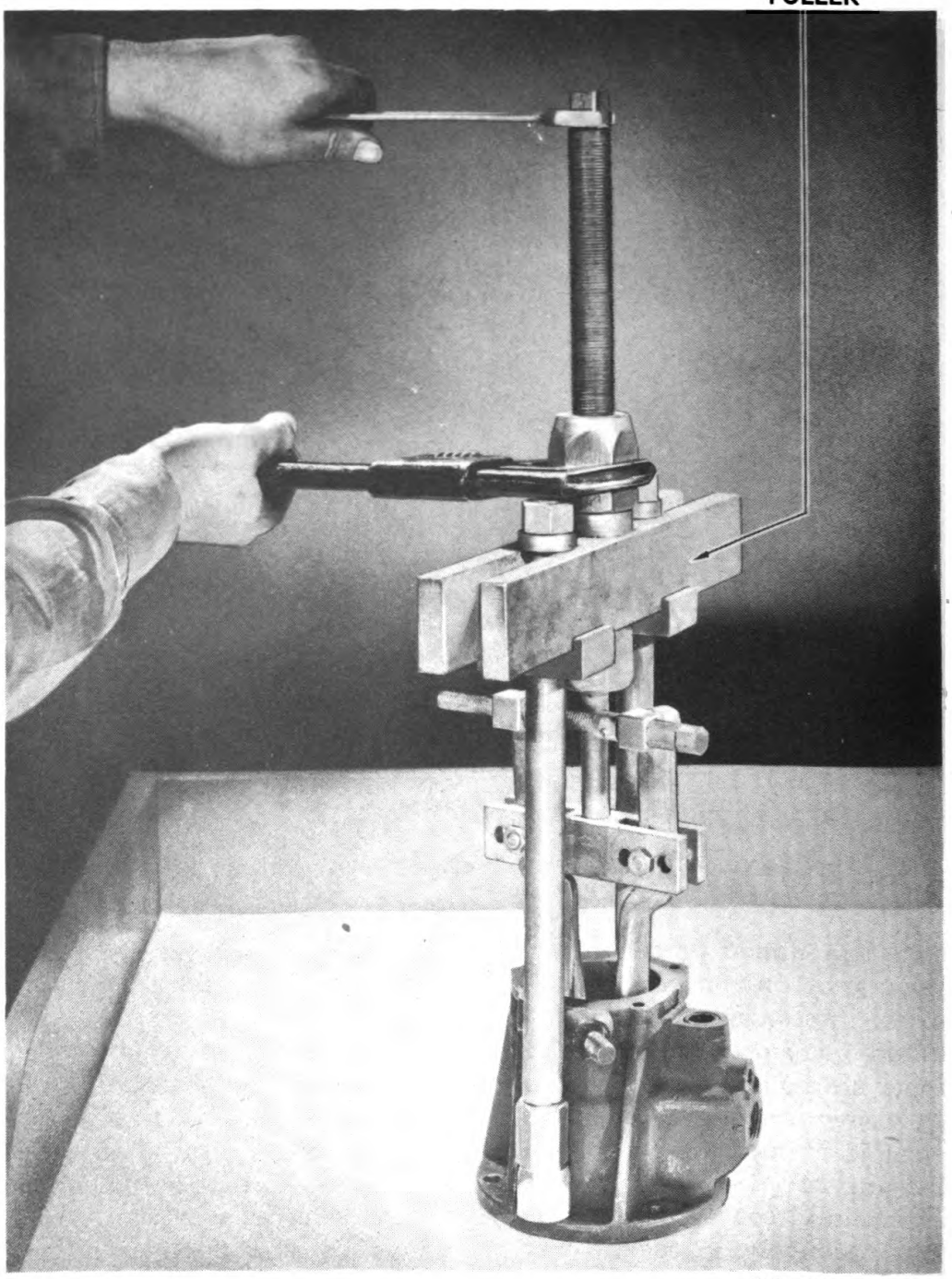


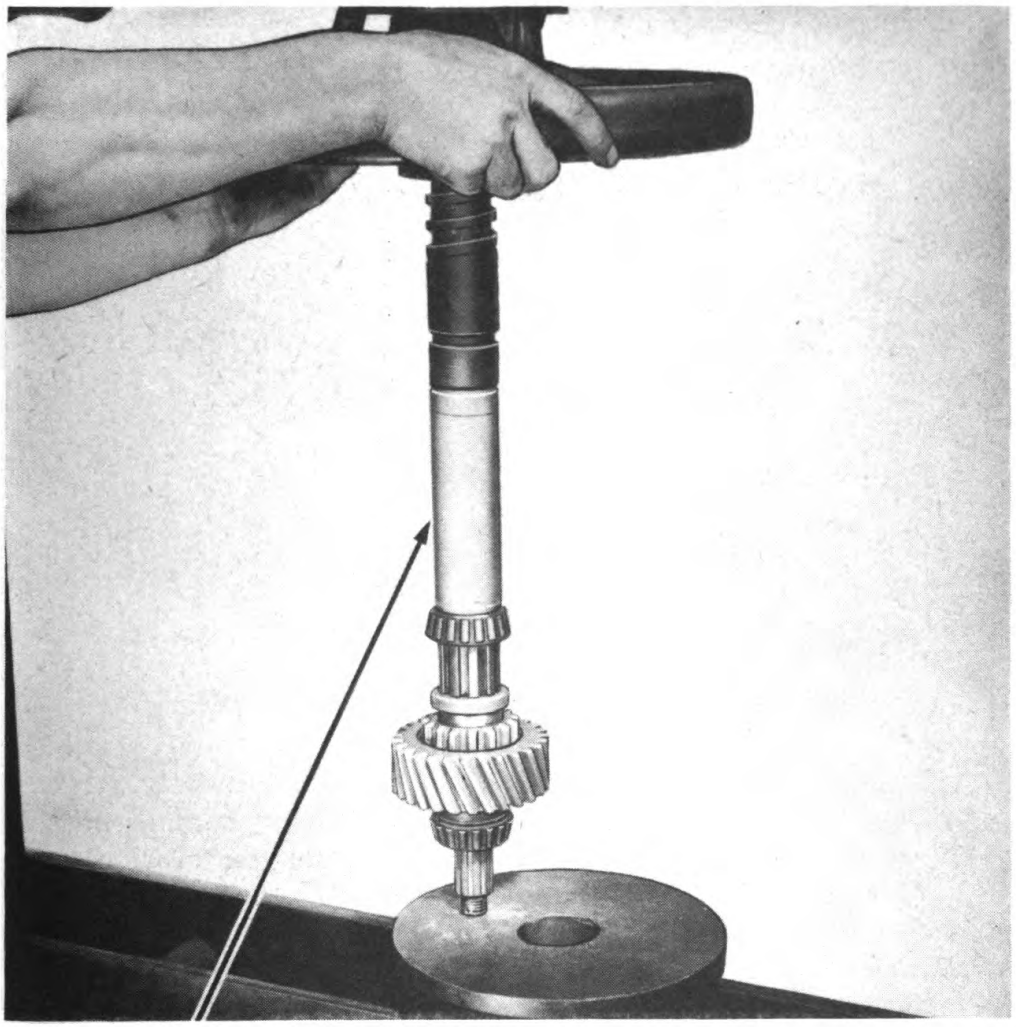
Figure 58 — Installing Bearing Cups in Case

PULLER



RA PD 319295

Figure 59 — Removing Declutch Shaft Inner Bearing Cup



BEARING REPLACER RA PD 319234

Figure 60 — Installing Mainshaft Rear Bearing Cone

shafts are alined properly in the case. Place cover with mainshaft driven gear on transfer case, aline dowel pin holes, and drive tapered dowels into position. Start all of the cover to case cap screws, and tighten progressively and securely. Install rear bearing caps with proper shims and new gaskets coated with sealing compound. Install cap screws and tighten securely. Install hand brake drum and universal joint flange on rear end of mainshaft driven gear. Place the idler and driven shaft bearing caps in position with proper shims and new gaskets coated with sealing compound. Install cap screws and tighten securely. Place the universal joint flange on rear end of driven shaft, tighten securely with castle nut, and install a new cotter pin. **NOTE:** ***On transfer case for 6x4 vehicles install driven shaft front bearing cap with proper shims, a new gasket coated with sealing compound, and tighten cap screws securely.***

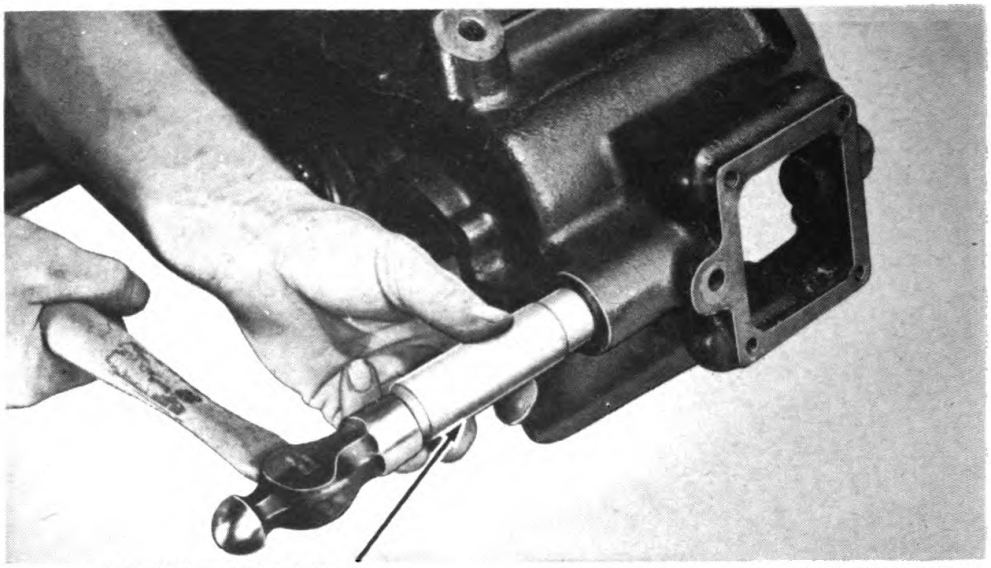
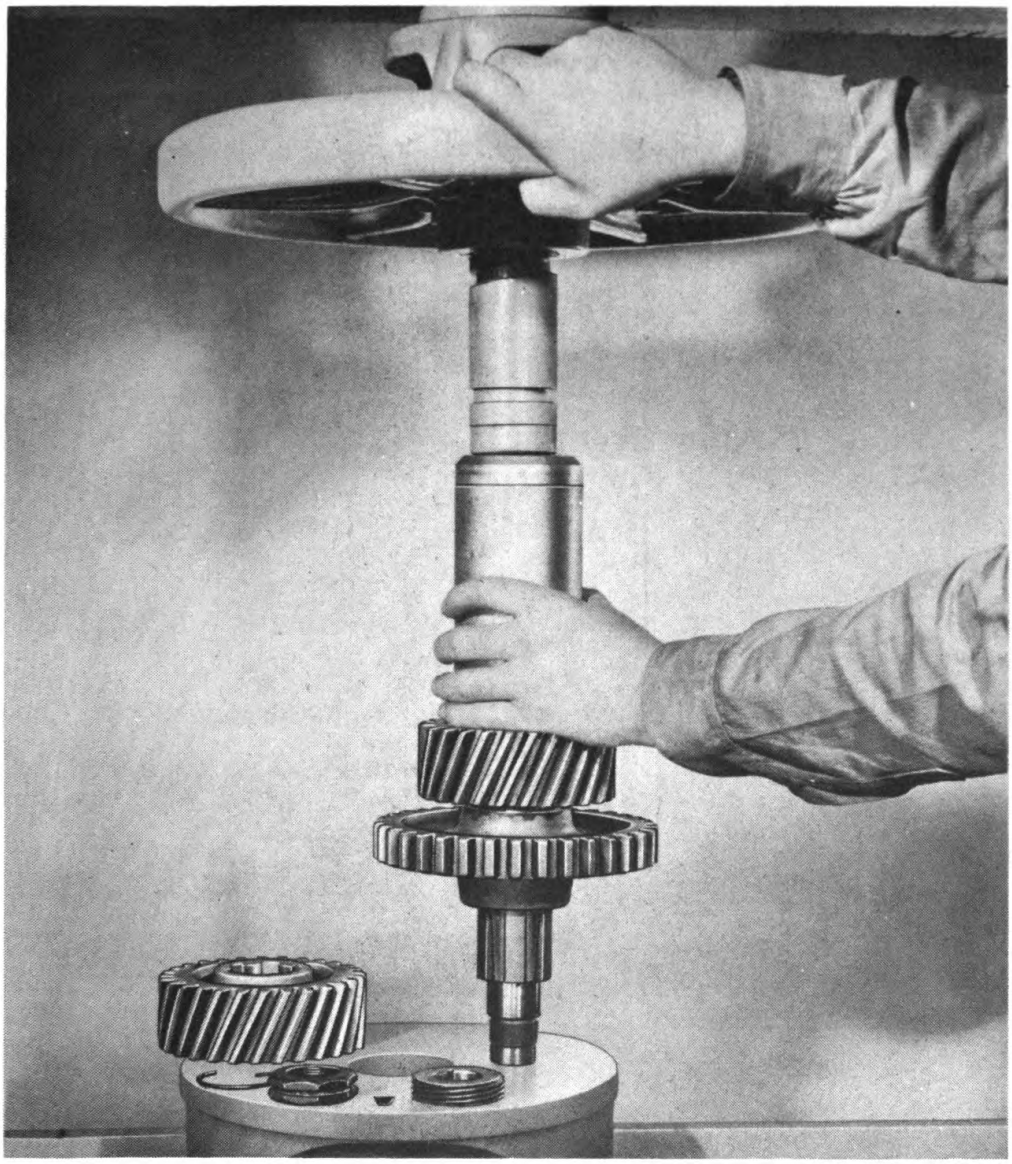


Figure 61 — Installing Shift Shaft Oil Seal

e. Declutch Carrier (6x6 Vehicles).

(1) ASSEMBLY. Press the bearing cones, with bearing spacer between them, onto the declutch shaft so that the rear bearing cone is against shoulder on shaft. Place the sliding clutch and shift fork into the carrier through opening in rear. The groove in sliding clutch and shift fork hub long extension must be toward front of carrier. Make sure the shift fork has entered groove in clutch, insert declutch shaft with bearing cones and spacer into carrier from front, and mesh small splines on shaft with splines in clutch. Press the front bearing cup into the carrier, install a new gasket coated with sealing compound, the carrier cap, and proper shims. Tighten attaching screws securely. Install shift shaft oil seal with declutch shift shaft driver 41-D-2869 (fig. 65). Push shift shaft through carrier bore and into hub of declutch shift fork. Move the shift shaft in the fork to aline the locating recess for the lock screw, and tighten screw. Place the declutch shift lever over the pivot stud on carrier and shift shaft end. Install washer, nut, and new cotter pin on pivot stud, and plain washer with a new cotter pin on shift shaft end. Place the lock ball and spring into the hole in carrier housing, and slide the shift shaft as necessary so that the ball engages the shaft notch nearest the shift fork. Install the shift shaft lock spring screw and tighten securely. Screw the pipe plug into carrier housing.

(2) INSTALLATION. Place the carrier assembly in position on front of the transfer case, using a new gasket coated with sealing compound. Install attaching cap screws and tighten securely. Place uni-



RA PD 319366

Figure 62 — Assembling Gears on Idler Shaft

versal joint flange on declutch shaft outer splines, tighten securely with castle nut, and install a new cotter pin.

f. Adjust Mainshaft Sliding Gearshift Fork. Insert the lock ball, plunger, and spring into recess in case so the lock ball engages the center groove on shift shaft. Turn the shift shaft as required to adjust the fork so that the sliding gear does not touch either the mainshaft drive gear or the low speed gear on the idler shaft. **NOTE:** *The sliding gear in the nonselective gearshift type transfer case used on 6x4 vehicles of former production is blocked into engagement with the mainshaft drive gear; therefore, adjust the fork with the shift shaft lock ball engaged in the rear groove on the shift shaft.* Place

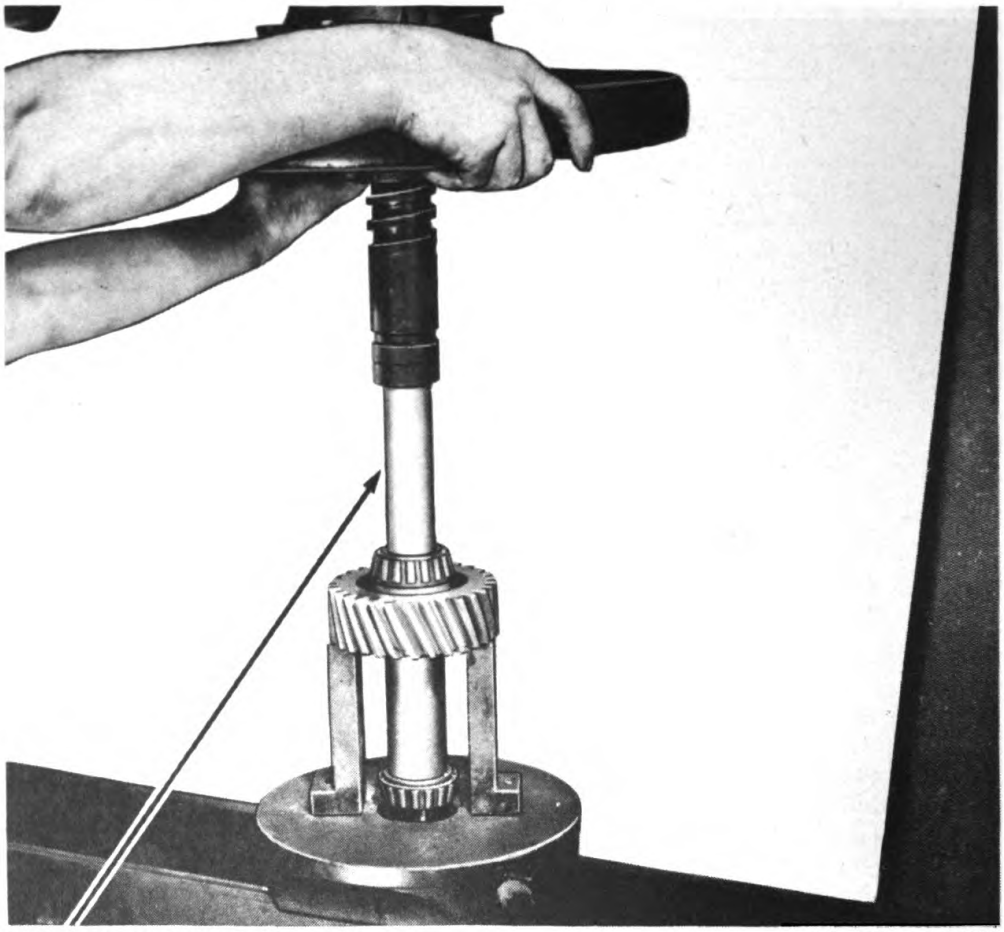


Figure 63 — Installing Driven Shaft Bearing Cones

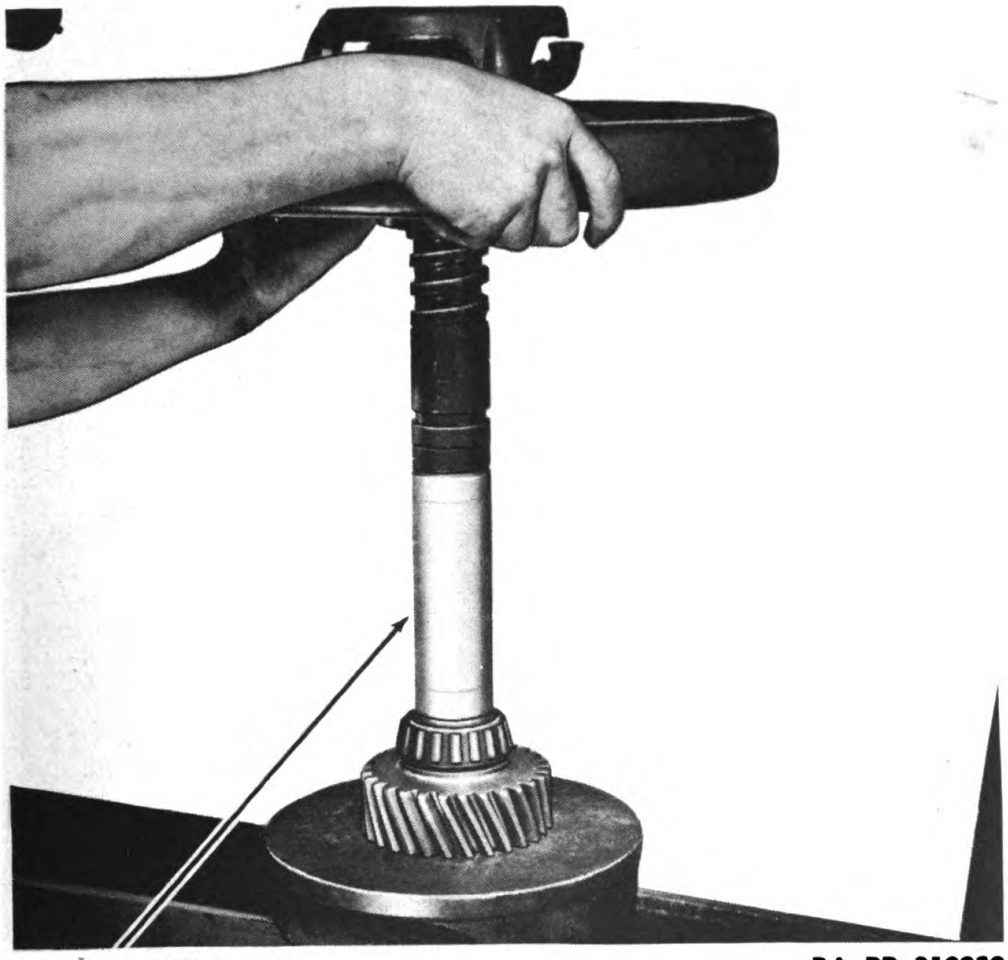
a new gasket coated with sealing compound on the gearshift cover, install the cover with cap screws, and tighten securely.

25. FITS AND TOLERANCES.

a. 6x6 Vehicles.

Bearing adjustment:

Method	Shims
Mainshaft bearing, total end play	0.003 to 0.005 in.
Idler shaft bearing, total end play	0.003 to 0.005 in.
Driven shaft rear bearing, total end play	0.003 to 0.005 in.
Mainshaft driven gear bearings	Select shim pack to give 6 to 10 inch-pounds turning effort in subassembly of tail shaft and bearings be-



BEARING REPLACER RA PD 319232

Figure 64 — Installing Mainshaft Driven Gear Inner Bearing Cone

	fore assembling oil seal and flange
Declutch bearings	No end play without perceptible drag in shaft
Gear backlash:	
Helical	0.005 to 0.008 in.
Spur	0.005 to 0.010 in.
Mainshaft drive gear:	
Bushing ream	1.6256 to 1.6264 in.
Bushing to mainshaft clearance	0.0006 to 0.0019 in.
Thrust washer thickness	0.185 to 0.187 in.
Mainshaft sliding gear:	
Gear to shift fork clearance	0.003 to 0.017 in.
Gear to mainshaft clearance	0.001 to 0.004 in.
Declutch sliding gear:	
Gear to shift fork clearance	0.031 to 0.043 in.

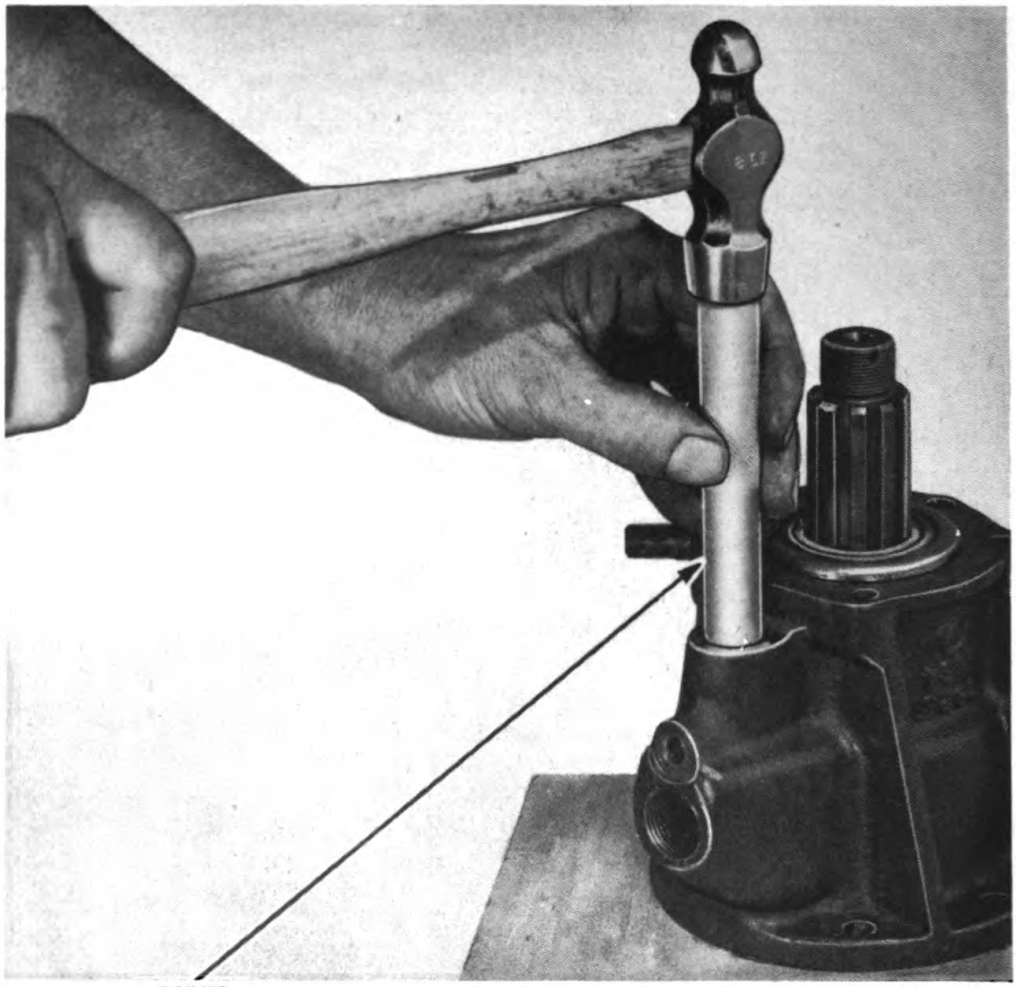


Figure 65 — Installing Declutch Shift Shaft Oil Seal

Mainshaft:
- Bearing adjustment ..... Shims, under front bearing cap
- Shims available ..... 0.003, 0.005, and 0.010 in.

Mainshaft driven gear:
- Bearing adjustment ..... Shims, in front of outer bearing
- Shims available ..... 0.020, 0.026, 0.030, and 0.034 in.

Idler shaft:
- Bearing adjustment ..... Shims, under front and rear bearing caps
- Shims available ..... 0.003, 0.005, and 0.010 in.

Driven shaft:
- Bearing adjustment ..... Shims, under rear bearing cap
- Shims available ..... 0.003, 0.005, and 0.010 in.

Declutch shaft:
- Bearing adjustment ..... Shims, under front bearing cap
- Shims available ..... 0.003, 0.005, and 0.010 in.

TRANSFER CASE

High and low shift shaft lock spring:
- Free length ..... 2 in.
- Pounds pressure at 1 inch ..... 50 to 60 lb

Declutch shift shaft lock spring:
- Free length ..... $^{17}/_{32}$ in.
- Pounds pressure at $^{11}/_{32}$ inch ..... 25 to 30 lb

b. 6x4 Vehicles.

Bearing adjustment:
- Method ..... Shims
- Mainshaft bearing, total end play ..... 0.003 to 0.005 in.
- Idler shaft bearing, total end play ..... 0.003 to 0.005 in.
- Driven shaft rear bearing, total end play ..... 0.003 to 0.005 in.
- Mainshaft driven gear bearings ..... Select shim pack to give 6 to 10 inch-pounds turning effort in subassembly of tail shaft and bearings before assembling oil seal and flange

Gear backlash:
- Helical ..... 0.005 to 0.008 in.
- Spur ..... 0.005 to 0.010 in.

Mainshaft drive gear:
- Bushing ream ..... 1.6256 to 1.6264 in.
- Bushing to mainshaft clearance ..... 0.0006 to 0.0019 in.
- Thrust washer thickness ..... 0.185 to 0.187 in.

Mainshaft sliding gear (selective-gearshift type):
- Gear to shift fork clearance ..... 0.003 to 0.017 in.
- Gear to mainshaft clearance ..... 0.001 to 0.004 in.

High and low shift shaft lock spring (selective-gearshift type):
- Free length ..... 2 in.
- Pounds pressure at 1 inch ..... 50 to 60 lb

Mainshaft:
- Bearing adjustment ..... Shims, under front bearing cap
- Shims available ..... 0.003, 0.005, and 0.010 in.

Mainshaft driven gear:
- Bearing adjustment ..... Shims, in front of outer bearing
- Shims available ..... 0.020, 0.026, 0.030, and 0.034 in.

Idler shaft:
- Bearing adjustment ..... Shims, under front and rear bearing caps
- Shims available ..... 0.003, 0.005, and 0.010 in.

Driven shaft:
- Bearing adjustment ..... Shims, under rear bearing cap
- Shims available ..... 0.003, 0.005, and 0.010 in.

CHAPTER 5

PROPELLER SHAFTS, UNIVERSAL JOINTS, AND PILLOW BLOCK

Section I

PROPELLER SHAFT WITH UNIVERSAL JOINTS

26. DESCRIPTION AND DATA.

a. Description (figs. 66 and 67). A universal joint is fastened in a yoke on each end of the shaft, and a splined slip joint is located at the end nearest the transfer case. The propeller shafts are tubular with the exception of the transmission to transfer case shaft which is solid because of its shortness. The universal joint crosses have needle bearings mounted on each journal which are in turn fastened to the yokes on the shaft and flanges. Cleveland-type universal joint bearings are held in yokes by means of lock plates and screws while the Spicer-type use lock rings or U-bolts with nuts. A splined slip joint is used to compensate for variation in the distance between connected units. These slip joints are marked and assembled so that the yokes at each end are in the same plane, to minimize vibration.

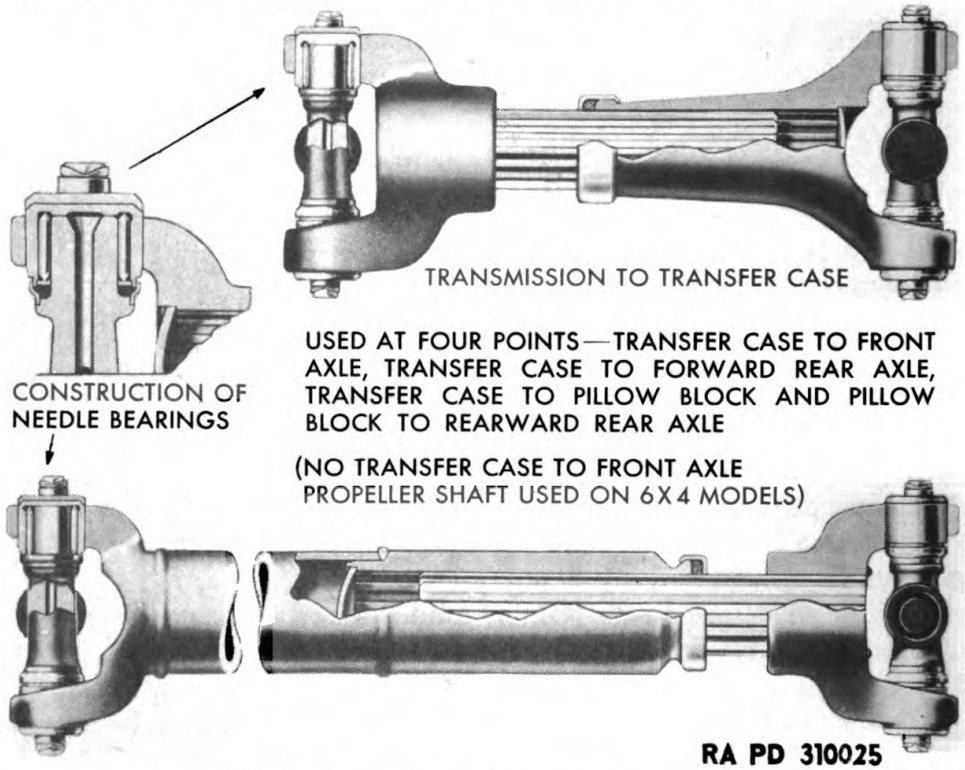


Figure 66 — Cleveland-type Propeller Shafts and Universal Joints

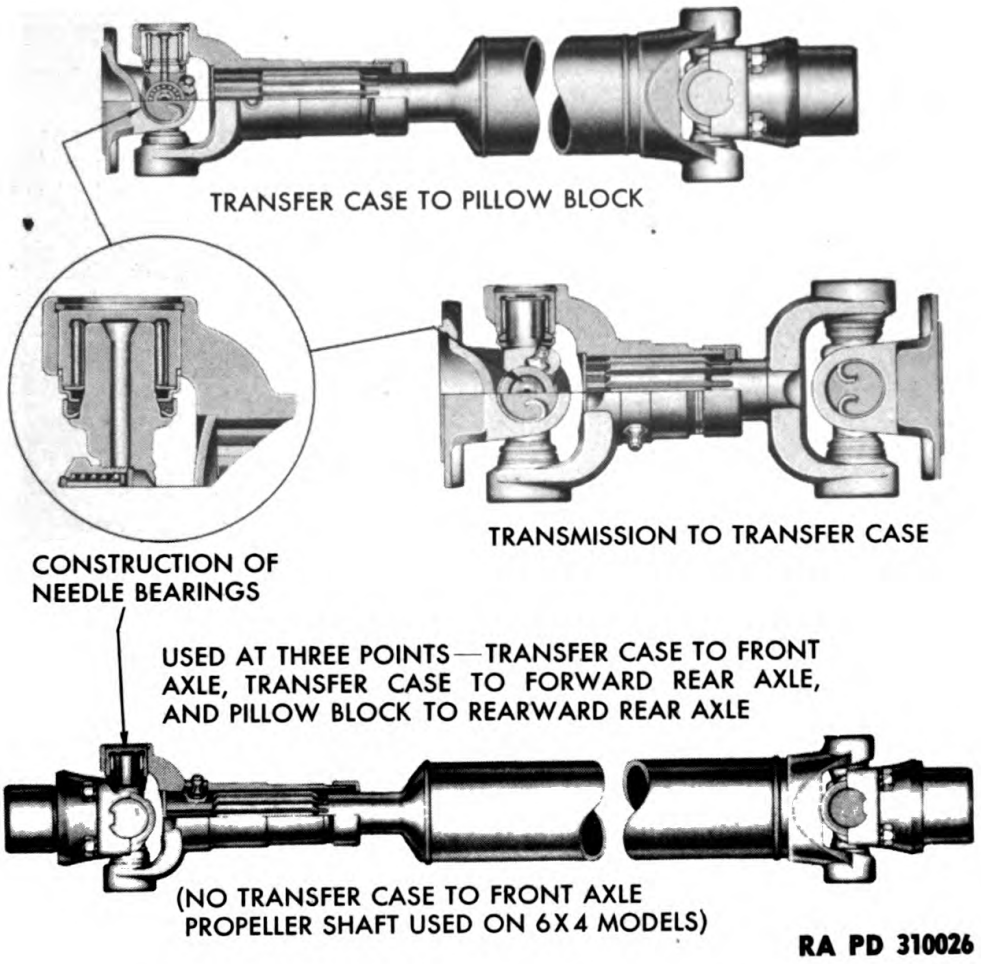


Figure 67 — Spicer-type Propeller Shafts and Universal Joints

b. Data.

(1) CLEVELAND.

Shaft diameter	2 in.
Number bearings per shaft	8

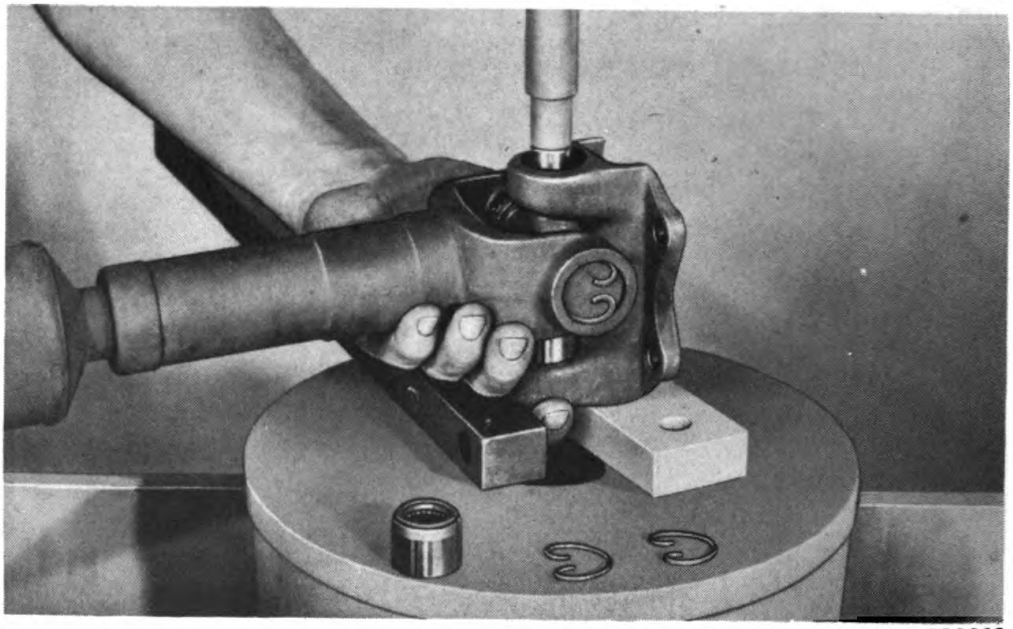
(2) SPICER.

Shaft diameter	3 in.
Number bearings per shaft	8

27. DISASSEMBLY.

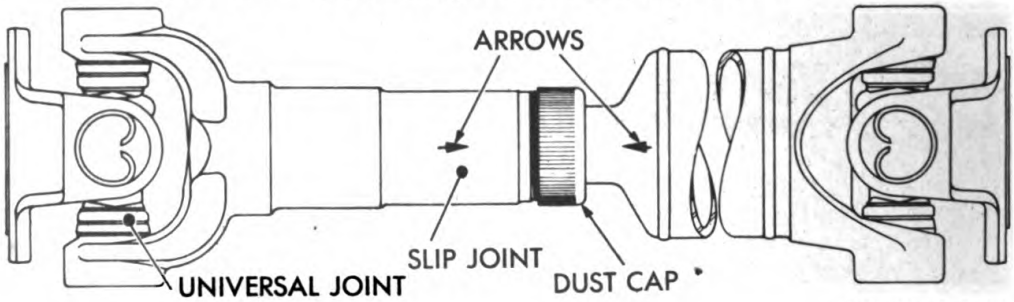
a. Cleveland.

(1) UNIVERSAL JOINTS. Remove the screws, locks, and lock plate from each bearing. Bump the universal joint cross toward one side of yoke far enough to permit removal of bearing; move the cross toward opposite side of yoke, and remove the other bearing. With one journal of cross extending through yoke bore at one side, tilt cross so



RA PD 319369

Figure 68 — Removing Cross Bearings From Yoke



RA PD 64497

Figure 69 — Propeller Shaft Alinement Marks at Slip Joint

that opposite journal clears the other yoke bore, and remove the cross. Remove universal joint cross bearing washers and retainers.

(2) SLIP JOINT. Check alinement marks on slip joint and shaft, and if not clearly defined, mark them so that slip joint and shaft may be properly assembled. Unlock slip joint sleeve yoke felt washer cap, withdraw the slip joint from shaft, and remove felt washer and cap.

b. Spicer.

(1) UNIVERSAL JOINTS. Remove lock rings holding bearings in yoke bores, press the bearings out of yoke bores far enough so that one of the bearings can be removed from cross; reverse procedure, pressing on end of cross to remove the opposite bearing (fig. 68). Move cross through one yoke bore as far as possible, tilt cross, and remove from yoke. Remove universal joint cross bearing washers and retainers.

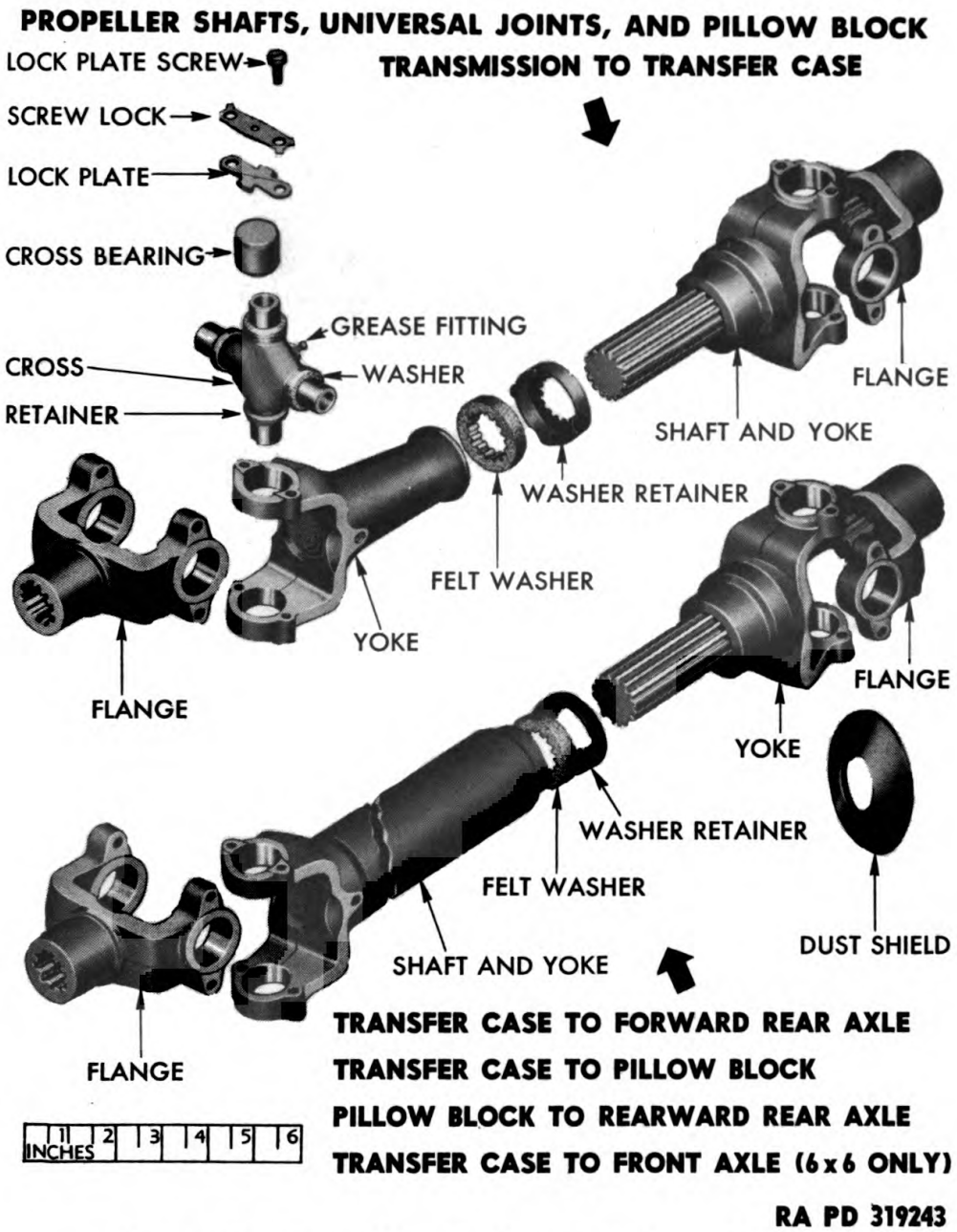


Figure 70 — Propeller Shaft and Universal Joint (Cleveland Type) — Disassembled

(2) SLIP JOINT. Unscrew slip joint sleeve yoke felt washer cap. Examine shaft and slip joint yoke for alinement marks (fig. 69), and if they are not clearly defined, mark carefully so that the joint can be assembled in same position. Withdraw shaft and remove slip joint sleeve yoke felt washer, retainer washer, and cap.

28. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts thoroughly in dry-cleaning solvent; allow bearings to remain in dry-cleaning solvent for some time so that

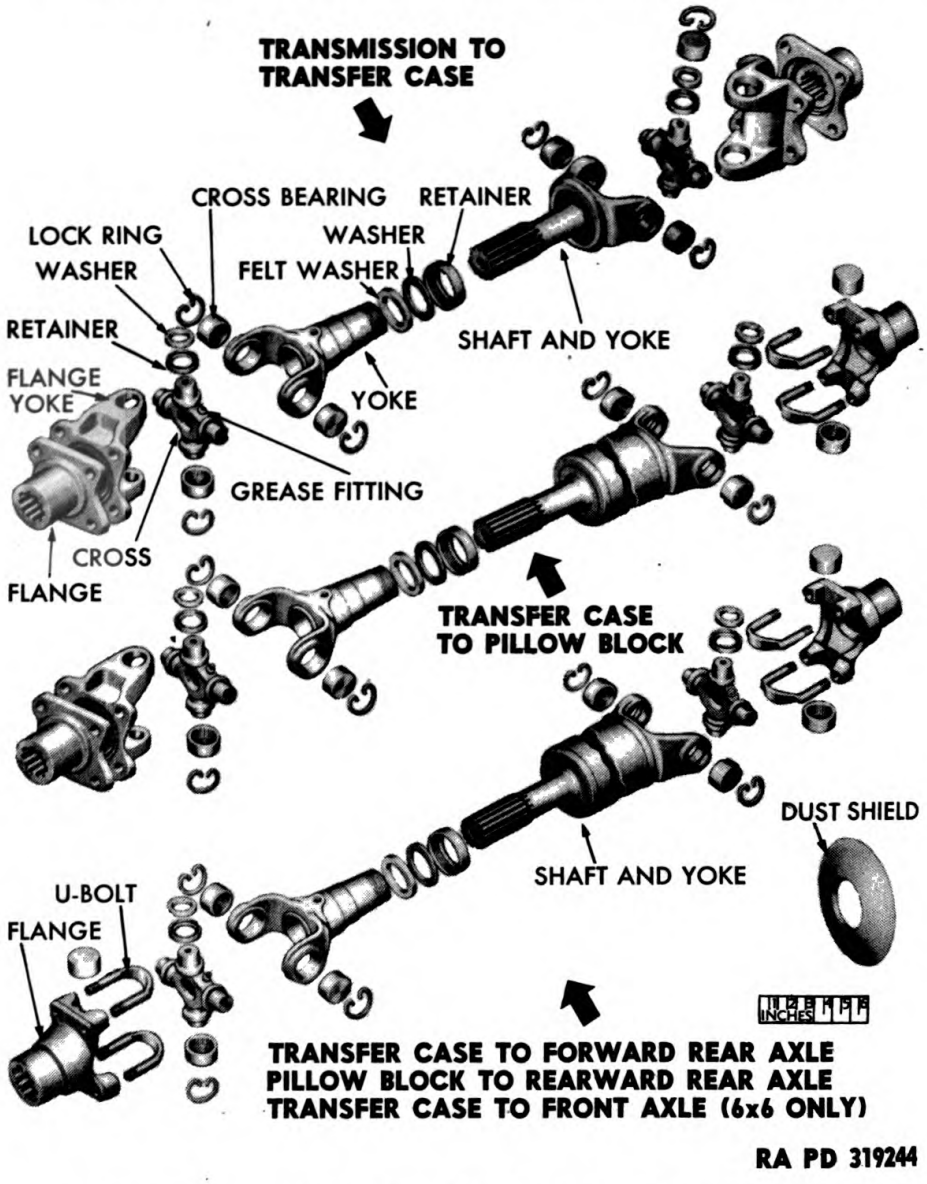


Figure 71 — Propeller Shaft and Universal Joint (Spicer Type) — Disassembled

all hard particles of lubricant are dissolved. Remove bearings from dry-cleaning solvent, and clean with a short, stiff bristled brush, and dry with compressed air. Be sure all lubricant passages in crosses are clean and open. Dry all parts with cloth or compressed air.

b. Inspection and Repair. Inspect cross journals for pits and scores, place bearings on cross, and check for excessive looseness. Examine shaft and slip joint for cracks, twists, or breakage. Replace any parts that are not satisfactory for further service. **NOTE:** *Welding a cracked or broken shaft will result in an unbalanced condition.*

29. ASSEMBLY.

a. Cleveland (fig. 70).

(1) UNIVERSAL JOINTS. Lubricate all parts and insert one journal of cross into yoke bore at one side as far as possible, tilt cross until it clears other side of yoke, then move it into position. Install washer retainer and a new washer on each journal, and press the bearings into place on cross journals and into yokes. Install lock plate, screw lock, and screws. Tighten screws securely, and bend ears on screw lock securely against flat side of screws.

(2) SLIP JOINT. Install new slip joint felt washer and retainer or cap, lubricate the shaft splines, aline the mark on the propeller shaft with mark on slip joint yoke, and slide shaft and slip joint together. Lock slip joint sleeve felt washer retainer in place.

b. Spicer (fig. 71).

(1) UNIVERSAL JOINT. Lubricate all parts, and insert one journal of cross into yoke bore at one side as far as possible, tilt cross until it clears other side of yoke, then move it into position. Install washer retainer and new washers on each journal, and press bearings into place on cross journals and into yoke bores. Install lock rings, and make sure the cross does not bind.

(2) SLIP JOINTS. Install slip joint felt washer cap, retainer washer, and new felt washer on shaft, and lubricate splines. Aline mark on shaft with mark on slip joint yoke, and install on shaft. Screw slip joint sleeve felt washer cap onto slip joint yoke.

Section II

PILLOW BLOCK ASSEMBLY

30. DESCRIPTION AND DATA.

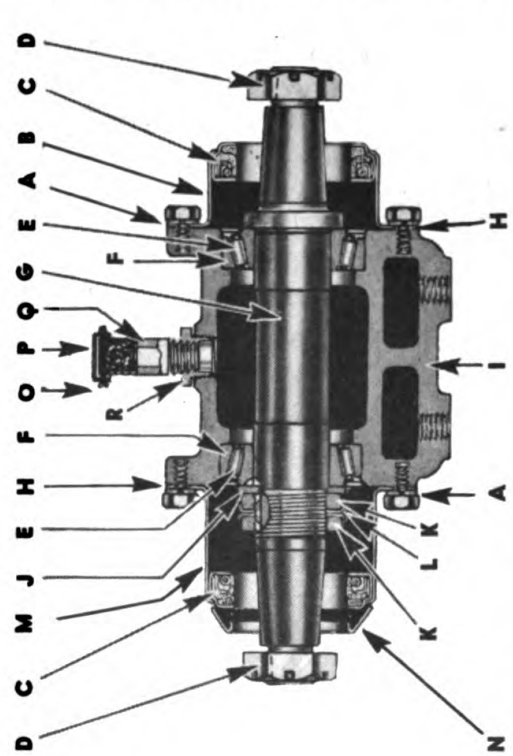
a. Description (fig. 72). The pillow block assembly acts as a midsupport for the rearward rear axle propeller shafts. It has a center shaft mounted on two opposed tapered roller bearings in an oiltight housing, with oil seals and a breather to dissipate oil vapor and relieve expansion pressure. An adjusting nut is provided on the shaft for bearing end play adjustment.

b. Data.

Bearings	Timken tapered roller
Number	Cone 16150, cup 16284

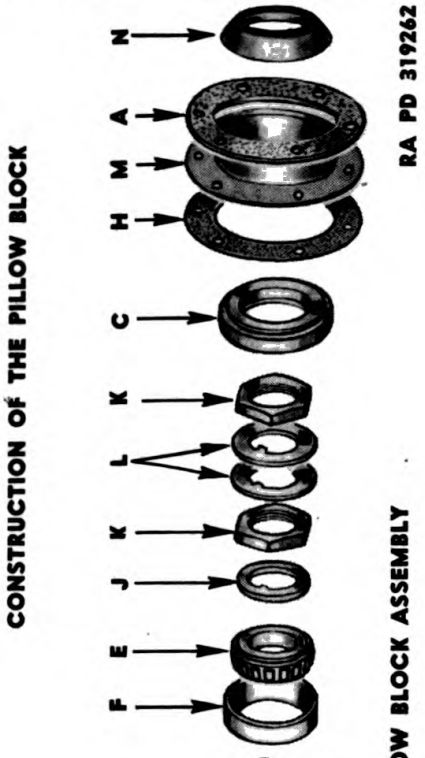
31. DISASSEMBLY.

a. Preliminary Cleaning of Assembly. Clean the exterior of pillow block assembly with dry-cleaning solvent to remove grease, dirt, and foreign matter.



CONSTRUCTION OF THE PILLOW BLOCK

A—SCREW SPACER
B—FORWARD BEARING COVER
C—OIL SEAL
D—SHAFT NUT
E—BEARING CONE
F—BEARING CUP
G—SHAFT
H—COVER GASKET
I—PILLOW BLOCK
J—ADJUSTING NUT WASHER
K—BEARING ADJUSTING NUT
L—ADJUSTING NUT LOCK
M—REAR BEARING COVER
N—DUST SHIELD
O—COTTER
P—BREATHER CAP
Q—BREATHER NIPPLE
R—BREATHER ADAPTER



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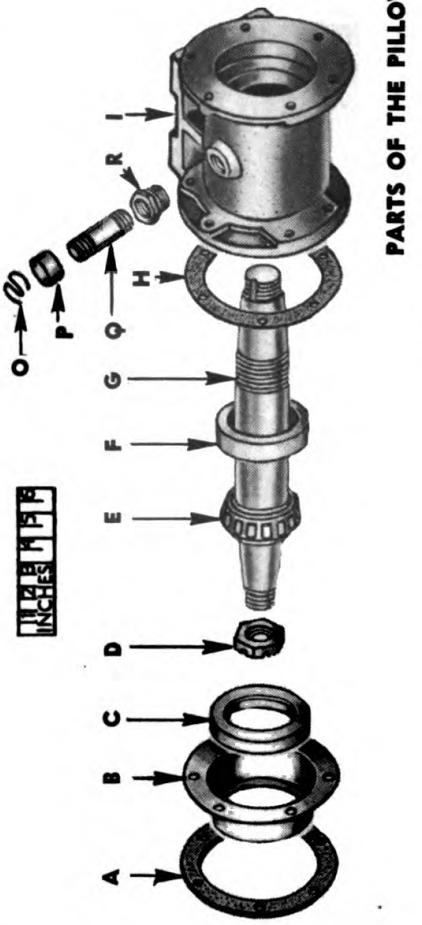

PARTS OF THE PILLOW BLOCK ASSEMBLY

Figure 72 — Pillow Block Assembly

PROPELLER SHAFTS, UNIVERSAL JOINTS, AND PILLOW BLOCK

RA PD 319368

Figure 73 — Removing Propeller Shaft Flanges From Pillow Block

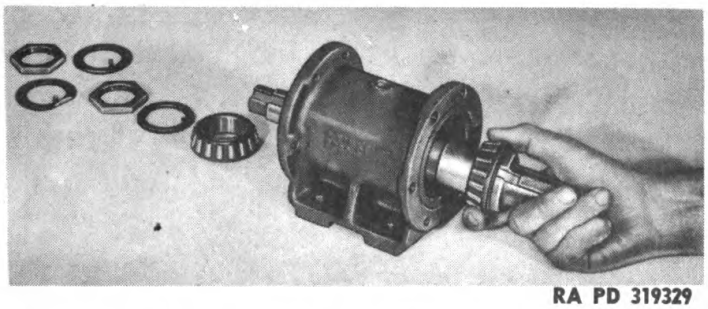

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Figure 74 — Removing Pillow Block Shaft

b. Disassembly. Remove cotter pins and castle nuts, and press the universal joint flanges off the front and rear ends of shaft (fig. 73). Take feather keys and oil seals out of keyways in shaft. Remove cap screws and lock washers from front and rear bearing covers; and re-

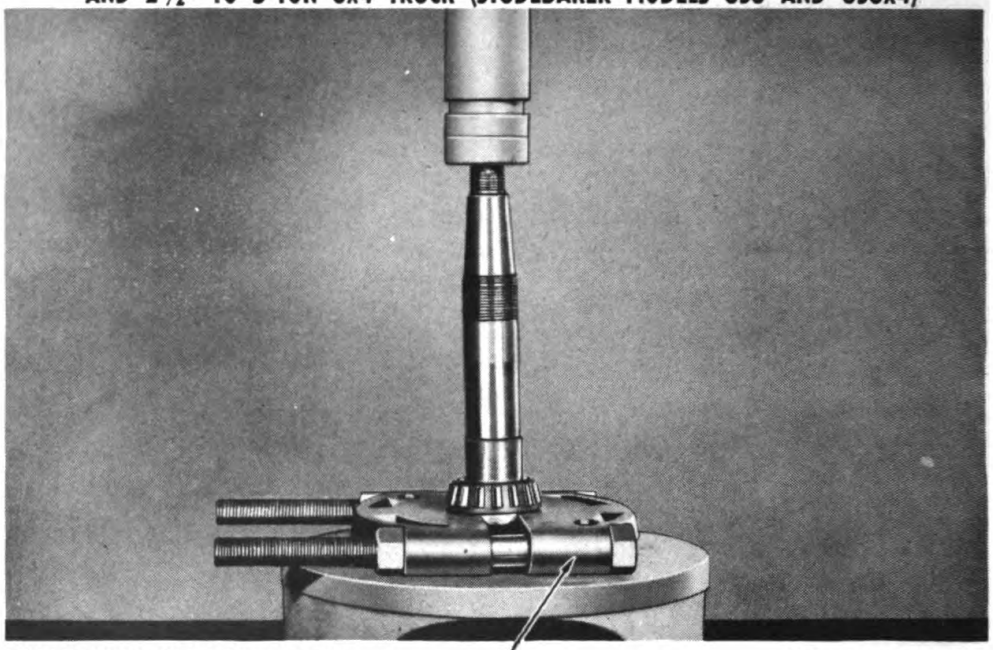


Figure 75 — Removing Rear Bearing Cone From Pillow Block Shaft

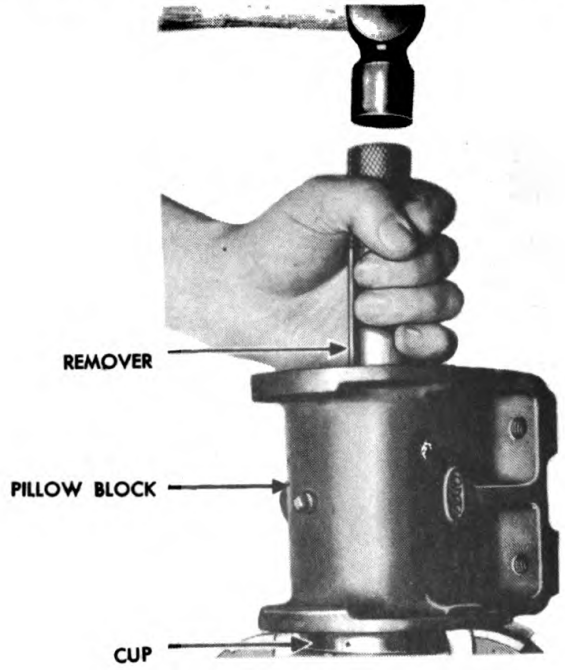


Figure 76 — Removing Bearing Cups From Pillow Block Using Remover 41-R-2384-68

move covers with oil seals, cover screw spacers, and cover gaskets. Straighten the lock and remove lock nut, both locks, adjusting nut, and washer. Pull shaft and rear bearing cone rearward out of front bearing cone and rear bearing cup (fig. 74). Remove front bearing cone

from housing, and press rear bearing cone off the shaft (fig. 75). Unscrew the breather assembly from top of housing.

32. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts thoroughly in dry-cleaning solvent. Allow bearing cones to soak in dry-cleaning solvent, and remove solid particles of lubricant by striking cones sharply against a wood block. Clean breather assembly carefully to make sure it is open. Dry parts with clean cloth or compressed air, being sure not to spin bearings with air.

b. Inspection and Repair. Carefully inspect bearing cups in pillow block for pits, scores, or other damage. If cups are to be replaced, remove them with remover 41-R-2384-68 (fig. 76), and use replacer 41-R-2396-338 to install new cups. Inspect bearing cones for scores, pits, or damage; replace if unserviceable. Check shaft for twist, damaged keyways, or cracks; replace if not satisfactory for further service. Lubricate all parts thoroughly after inspection and before assembly.

33. ASSEMBLY.

a. Press rear bearing cone on shaft from front so that large diameter of cone is toward rear, being sure it is seated firmly against forward side of flange on shaft. Insert shaft and rear bearing cone into housing from rear, and place front bearing cone in position on shaft. Install adjusting nut washer and adjusting nut, and adjust bearings to provide barely perceptible end play of shaft. Place two new nut locks on shaft, install and tighten the lock nut, and lock both nuts. Remove oil seals from front and rear bearing covers, and install new seals with a suitable replacer. Install new front and rear bearing cover gaskets coated with sealing compound, bearing covers, and cover screw spacer with cap screws and lock washers. Place feather keys in keyways and press a universal joint flange on each end of shaft. Install keyway oil seals in keyways and install washers, castle nuts, and new cotter pins. Install breather assembly in top of housing and tighten securely.

Section III

FITS AND TOLERANCES

34. PROPELLER SHAFT WITH UNIVERSAL JOINTS.

Clearance between shaft splines and yoke splines . . . 0.001 to 0.006 in.

35. PILLOW BLOCK.

Adjustment . . . . . Barely perceptible shaft end play. Bearing is to be tight without drag, and loose enough to turn freely

CHAPTER 6

FRONT AXLE

Section I

FRONT AXLE (6x6 VEHICLES)

36. DESCRIPTION AND OPERATION.

a. The driving front axle consists of a conventional-type differential (fig. 77) and axle shafts with universal joints enclosed within steering knuckle flanges (fig. 78). The differential case consists of matched halves which contain a cross with four pinion and two bevel side gears. A bevel drive (ring) gear is riveted to the differential case flange, and side bearings are pressed on the case hubs. The drive pinion is supported by two opposed tapered roller bearings and one straight roller bearing. The tapered roller bearings take radial and thrust loads and are adjustable for wear. A bronze thrust block is provided in the axle housing in line with the pinion and ring gear contact point, to take side thrust on the ring gear. The universal joints, one in each end of axle, are the constant-velocity type; they consist of two shafts, four floating balls, and one center ball held in place with two pins (fig. 78). The steering knuckles consist of two flanges and a spindle mounted on tapered bearings which are seated on studs welded to the enlarged end of the axle housing. The left and right knuckles are connected with a tie rod. Power is transmitted from the transfer case by a propeller shaft to the drive pinion, through the differential, axle shafts, and universal joints to the front wheels.

37. DATA.

Make	Timken
Housing	Split type
Drive	Through springs
Differential:	
Drive	Spiral bevel
Gear ratio	6.6 to 1
Bearings	Timken tapered roller
Cone	T.R.B. 3982
Cup	T.R.B. 3920
Drive pinion:	
Bearings:	
Straight roller	Bower S-5305-W
Tapered	Timken tapered roller

FRONT AXLE

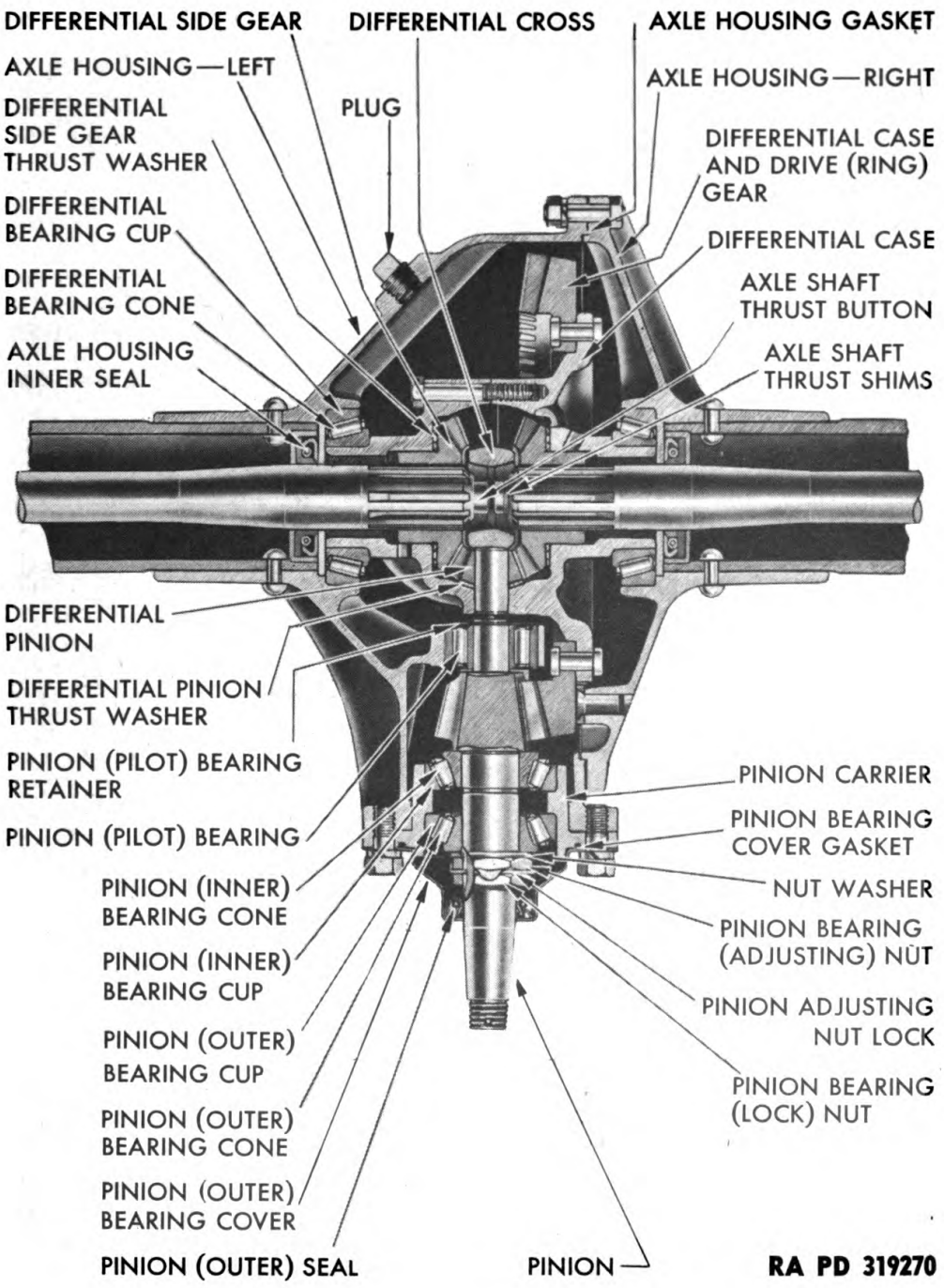


Figure 77 — Front Axle Differential — Sectional View

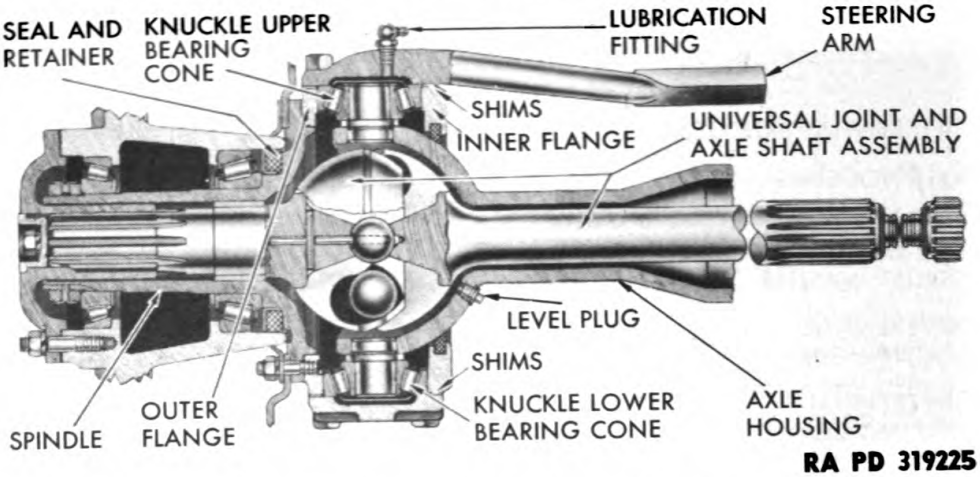


Figure 78 — Universal Joint and Steering Knuckle Left Side (6x6) — Sectional View

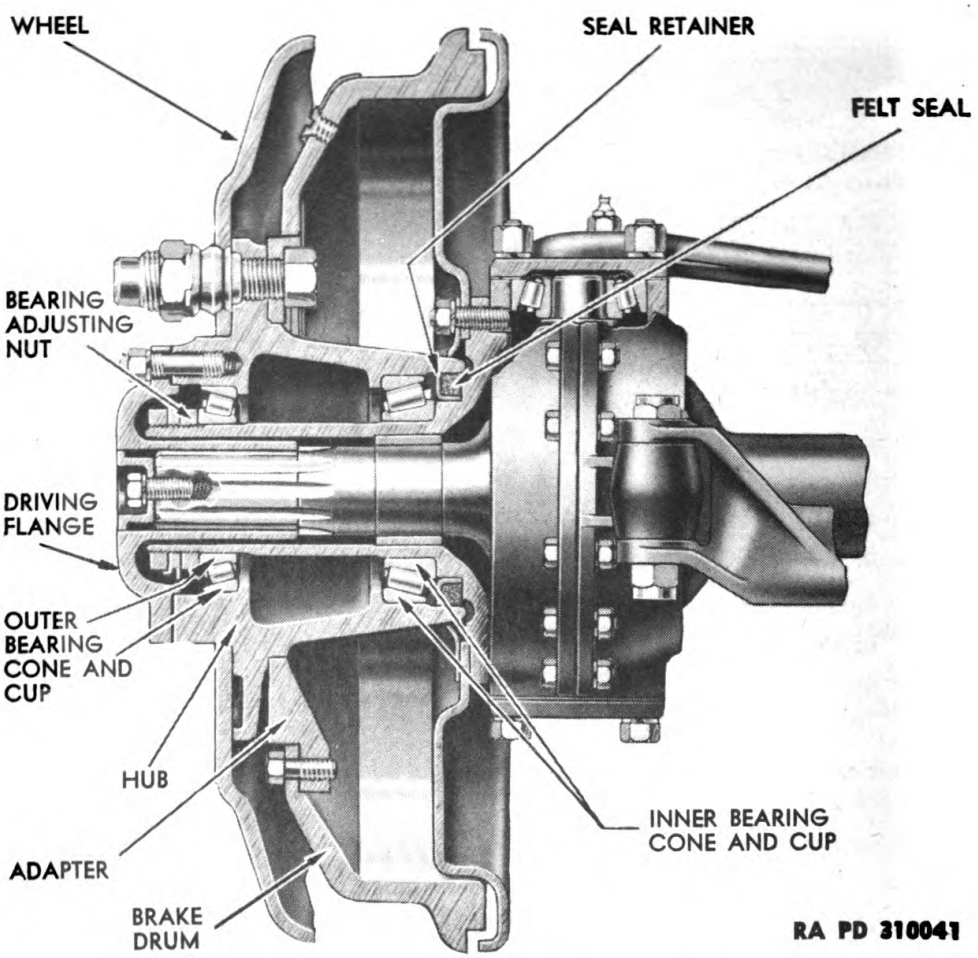


Figure 79 — Front Wheel, Hub, and Drum (6x6) (Demountable-type Drum) — Sectional View

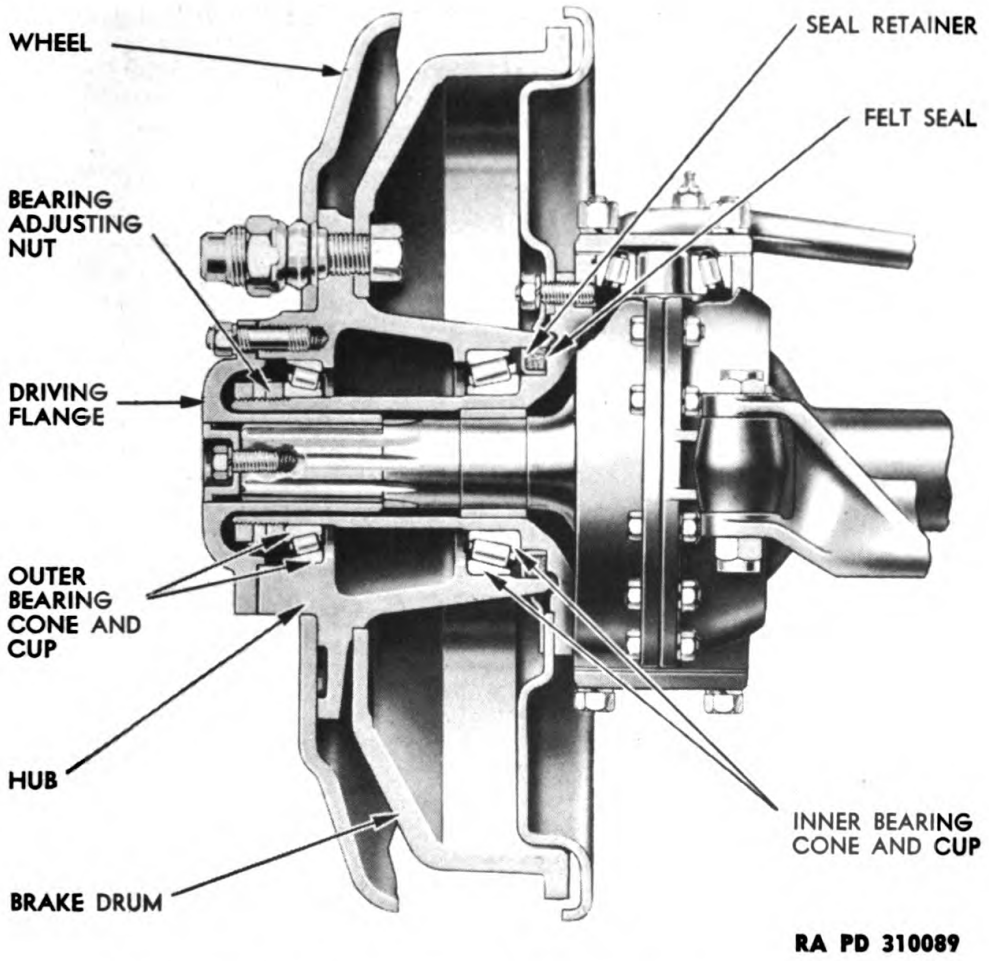


Figure 80 — Front Wheel, Hub, and Drum (6x6) (Conventional-type Drum) — Sectional View

Cone	T.R.B. 44150
Cup	T.R.B. 44348
Universal Joint	Bendix-Weiss
Steering knuckle bearings	Timken tapered roller
Cone	T.R.B. 41125
Cup	T.R.B. 41286

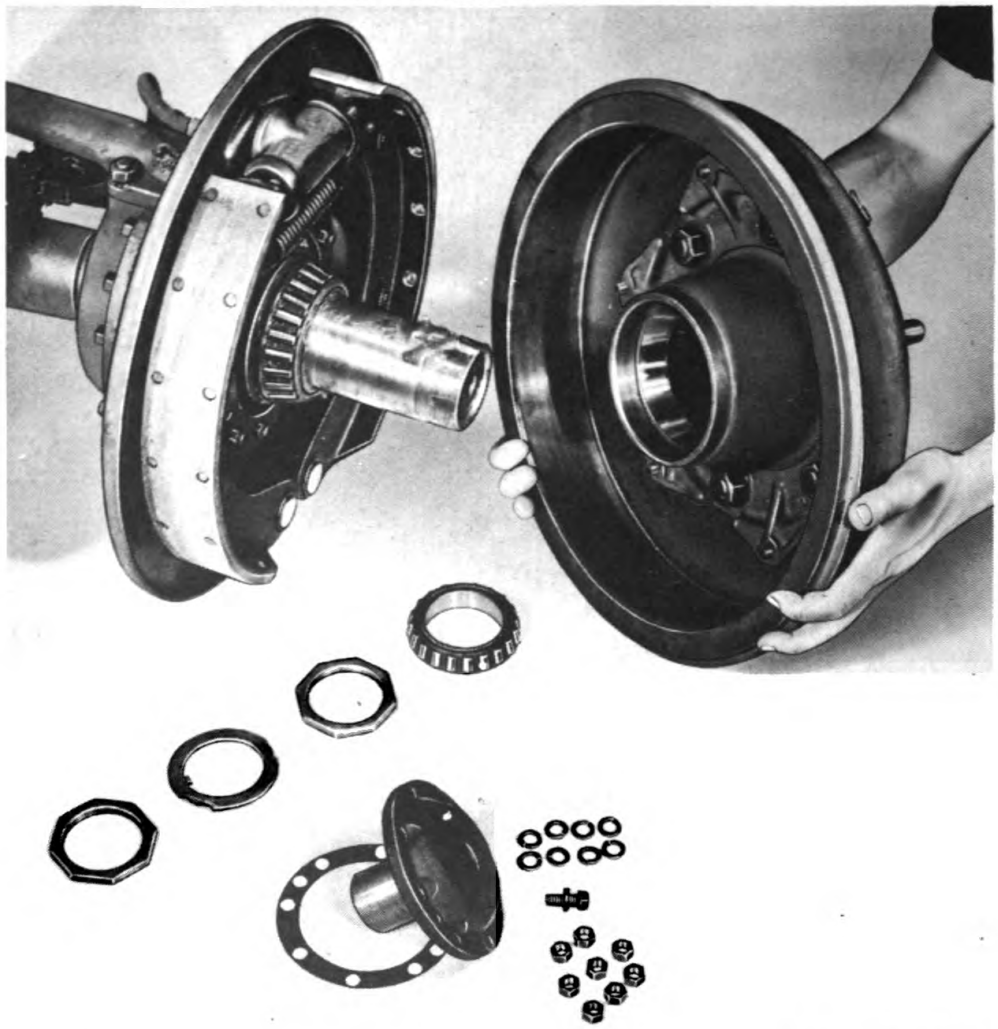
38. DISASSEMBLY.

a. Preliminary Instructions. Remove wheels and tires, and clean exterior of front axle assembly thoroughly with dry-cleaning solvent to remove grease, dirt, and foreign matter. Place the assembly on a suitable stand or bench.

b. Remove Steering Knuckle Tie Rod Assembly. Remove cotter pin, castle nut, and tie rod end bolt from each tie rod end and remove tie rod from knuckles.

c. Axle Shaft and Universal Joint.

(1) REMOVAL (figs. 79 and 80). Remove the driving flange nuts,



RA PD 319330

Figure 81 — Removing Hub and Drum From Front Axle (6x6)

lock washers, center cap screw, and driving flange. Straighten the wheel bearing adjusting nut lock so that the lock nut, lock, and adjusting nut can be removed. 'Slide hub and drum assembly from knuckle spindle (fig. 81). Remove the nuts and washers from the studs holding the brake backing plate, oil shield, and knuckle spindle to the knuckle outer flange. Remove brake backing plate (fig. 82) and the oil shield. Remove inner wheel bearing cone from spindle with universal puller (fig. 83). Tap the spindle to loosen it from the knuckle flange, and pull it off the studs. Withdraw the axle shaft and universal joint assembly (fig. 84).

(2) DISASSEMBLY (fig. 85). Drive out the retainer pin holding the center ball pin properly positioned in driven yoke and center ball. Strike the splined end of driven yoke on a wood block to move center

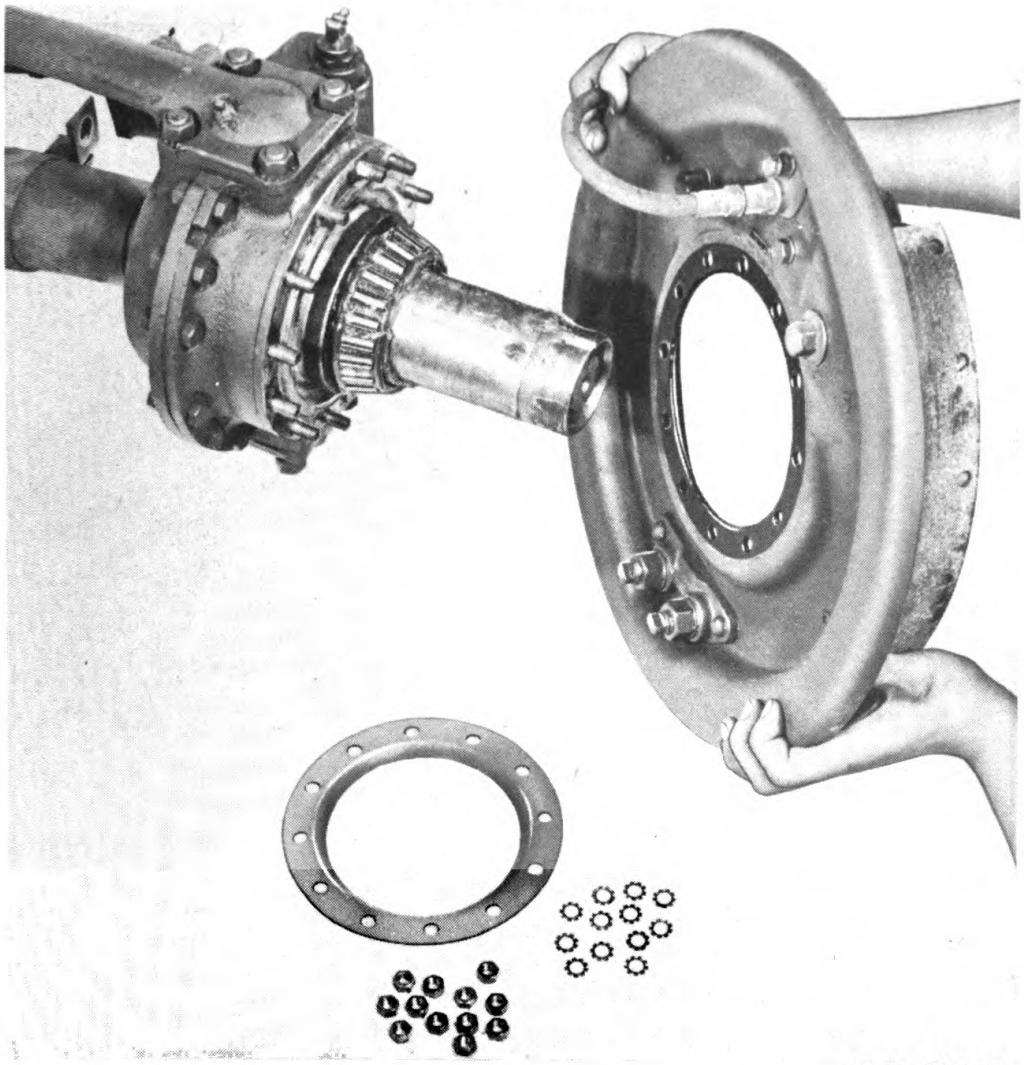


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Figure 82 — Removing Backing Plate From Front Axle (6x6)

ball pin out of center ball and into the drilled passage in yoke. Fasten driving yoke shaft in a vise on portion that is not machined. Pull driven yoke away from driving yoke as far as possible, and turn center ball so that the groove in it is alined with one of the races. Tilt the driven yoke to an extreme angle, and move the driving ball next to center ball groove, out past center ball. The remaining three driving balls and center ball will then drop out. Strike yoke end of driven yoke on a wood block to move center ball pin out of passage.

d. Drive Pinion and Carrier.

(1) REMOVAL. Remove cap screws and lock washers holding the drive pinion carrier to the housing, and withdraw assembly (fig. 86). **NOTE:** *This operation can be performed with front axle on vehicle by disengaging the front axle propeller shaft.*

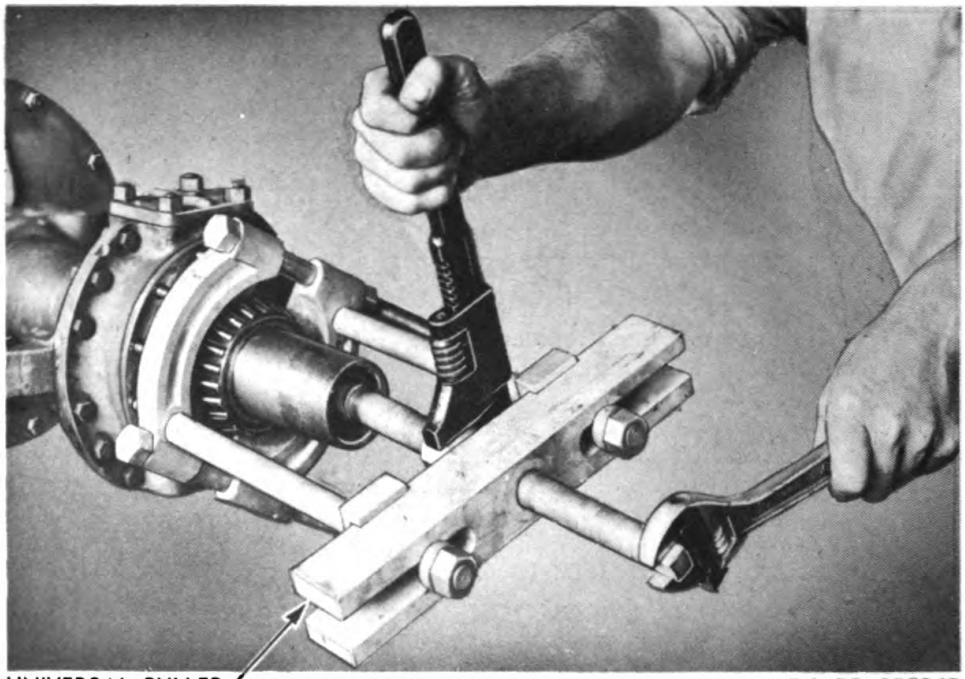


Figure 83 — Removing Front Wheel Inner Bearing Cone (6x6)

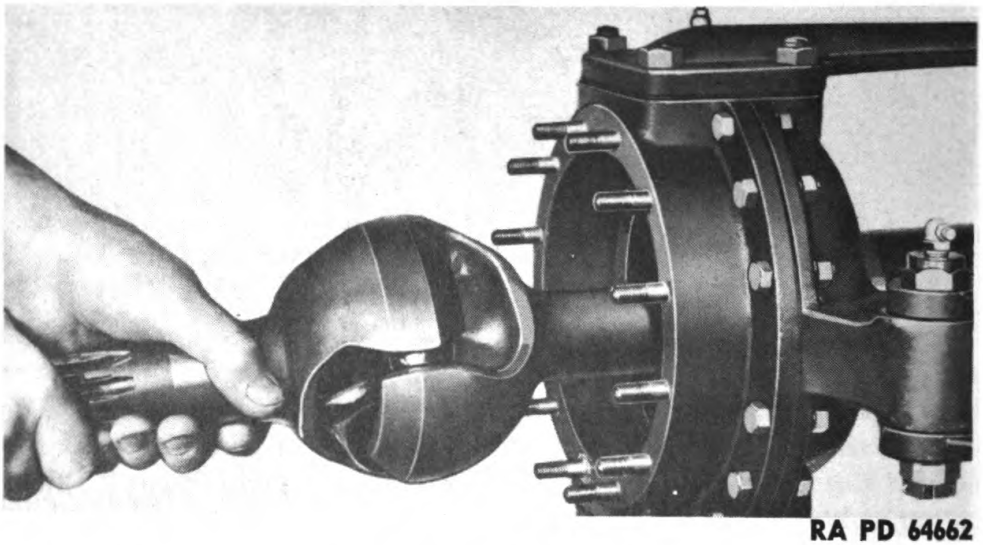


Figure 84 — Removing Axle Shaft and Universal Joint Assembly

(2) DISASSEMBLY. Take out cotter pin, remove castle nut, press or pull universal joint flange off the pinion shaft, and lift feather key out of keyway. Remove oil seal cover assembly and gasket. Straighten adjusting nut locks and remove lock nut, locks, adjusting nut, and washer. Remove pinion and inner tapered roller bearing

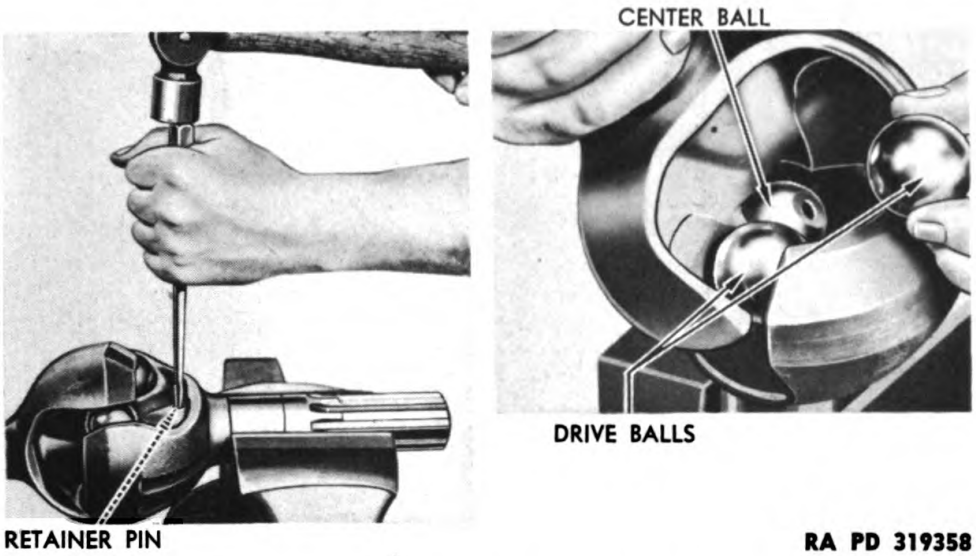


Figure 85 — Disassembling Axle Shaft Universal Joint

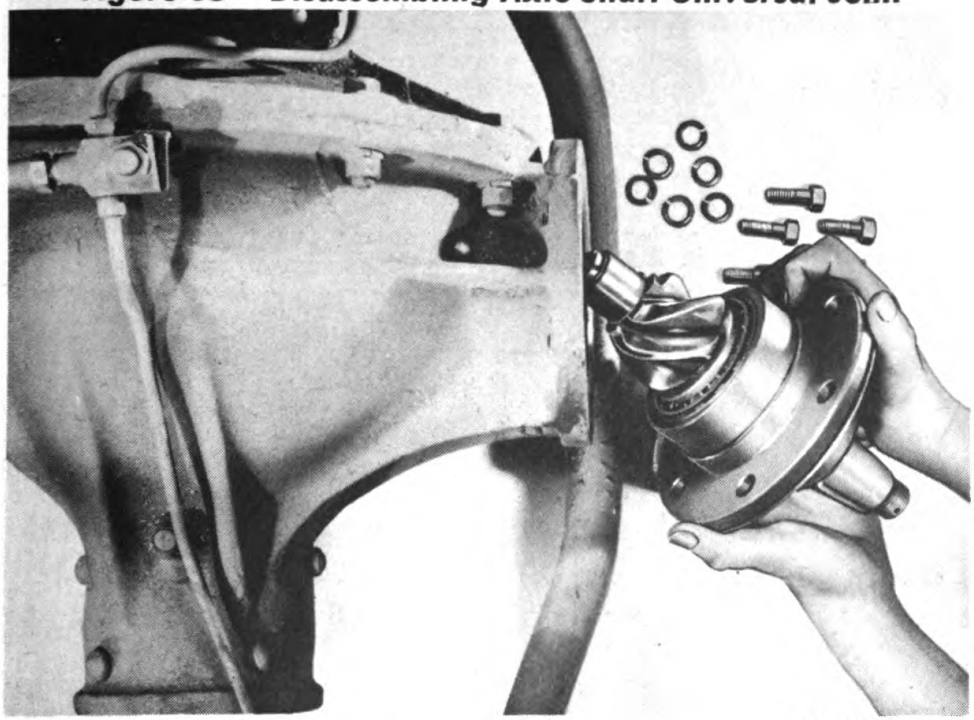
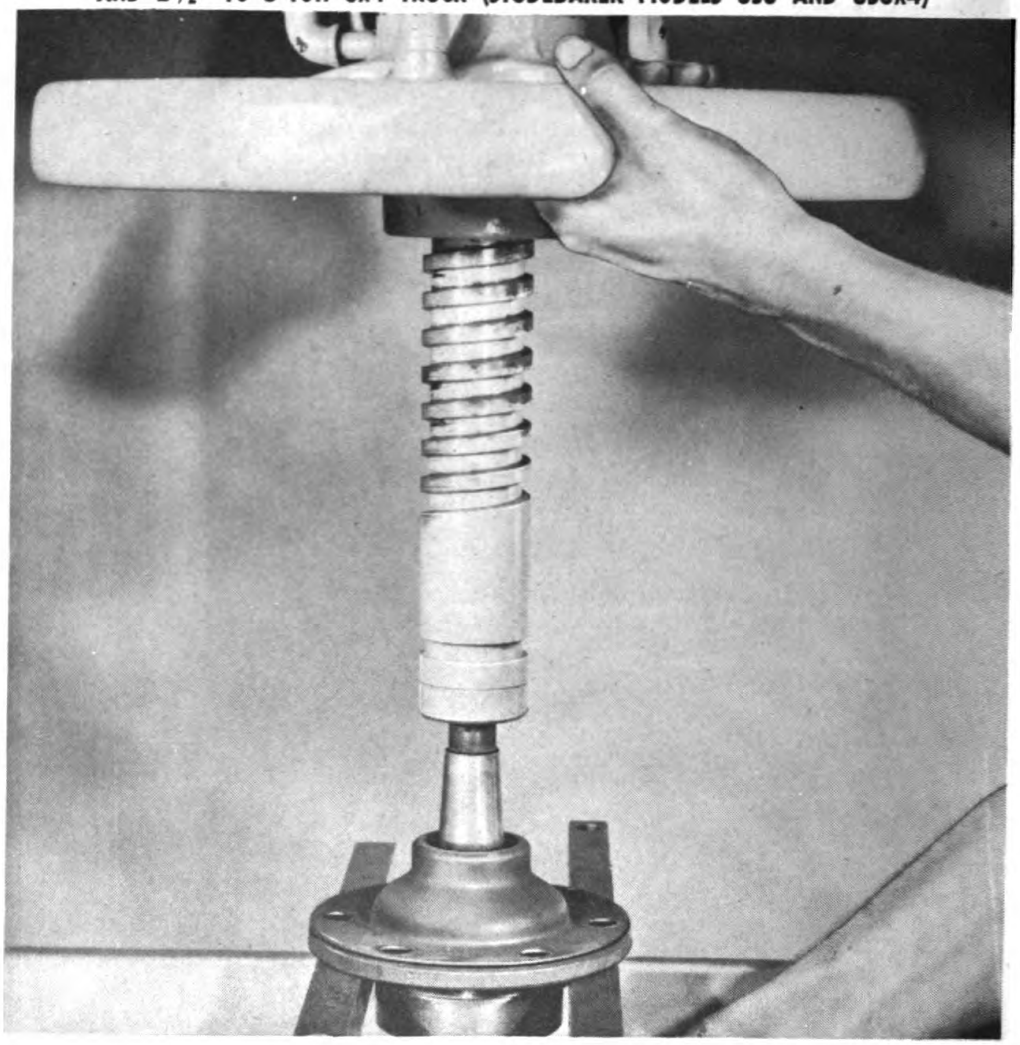


Figure 86 — Removing Pinion Assembly

cone from carrier (fig. 87). Remove the bearing cone from pinion by using a press and a plate. Use plate from puller 41-P-2905-60 (fig. 88). Lift outer tapered roller bearing cone out of carrier cup.

e. Differential Assembly.

(1) REMOVAL. Remove the nuts, lock washers, and bolts holding



RA PD 319333

Figure 87 — Removing Pinion Shaft With Front Bearing Cone From Carrier

the halves of axle housing together, and pull the split housing apart at the flange. Lift the differential assembly out of housing.

(2) DISASSEMBLY. Remove the side bearing cones from case hubs with remover 41-R-2378-30 and adapter 41-A-18-293 (fig. 89). These tools are not illustrated, but the procedure is similar. Mark both halves of differential case to facilitate assembly in proper position, and remove lock wire and cap screws holding the halves of case together. Separate case halves and lift out differential pinion cross, pinions, side bevel gears, and thrust washers (fig. 90).

f. Knuckle Flanges and Bearings. Remove the nuts from studs holding upper cap on knuckle flanges, and the cap screws that hold lower cap in position. Take off upper and lower caps with shims, and keep shims with respective caps. Remove nuts and bolts that hold

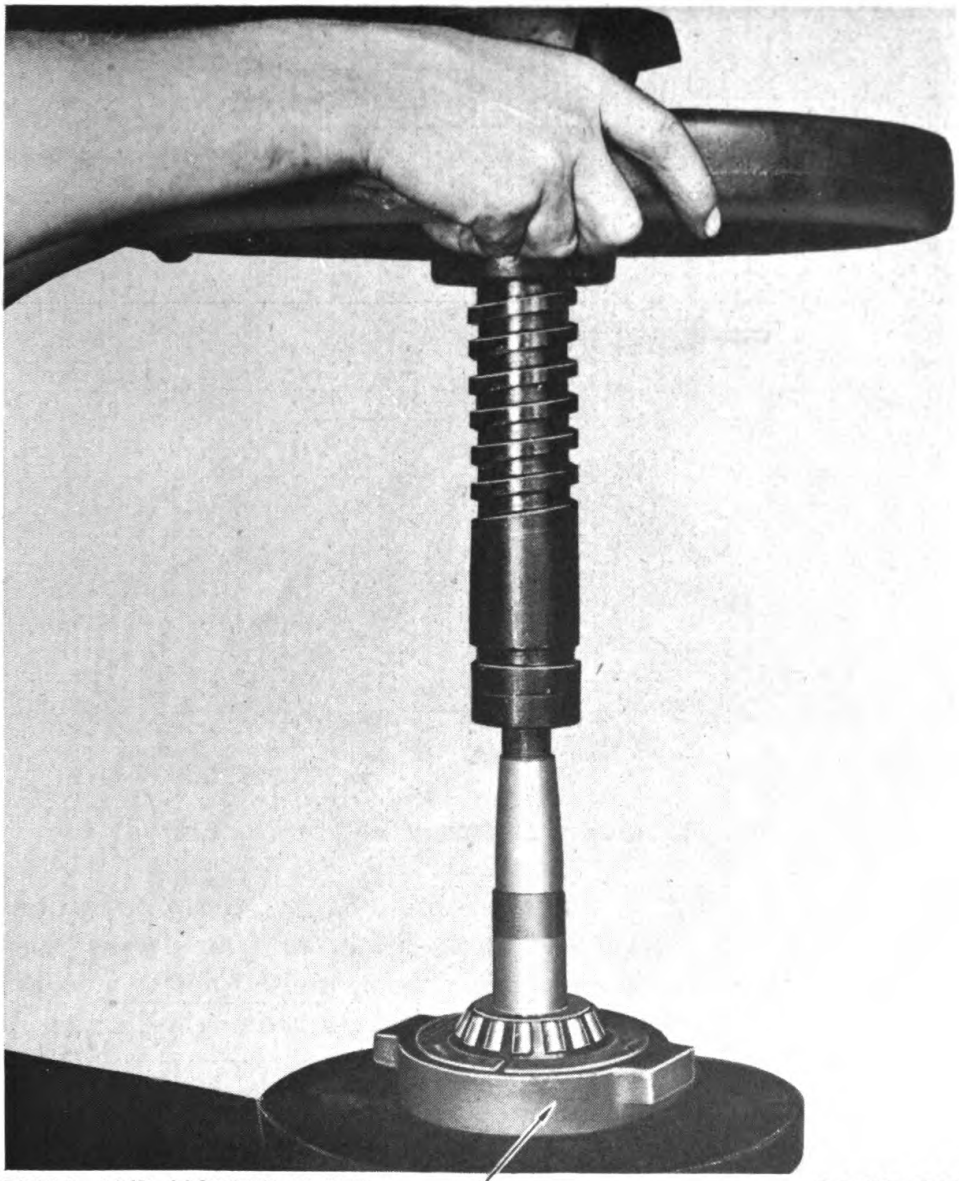


Figure 88 — Removing Front Bearing Cone From Drive Pinion

knuckle flanges together, and remove bearing cups and knuckle outer flange. Pull bearing cones from knuckle bearing cone studs with universal puller (fig. 91).

39. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Place all disassembled parts (fig. 92) in dry-cleaning solvent, and allow them to remain long enough to loosen old lubricant and foreign matter. Move the bearings up and down in dry-cleaning solvent, and turn them slowly below surface of the liquid. Strike the larger open side of the bearings against a wood block to jar loose the

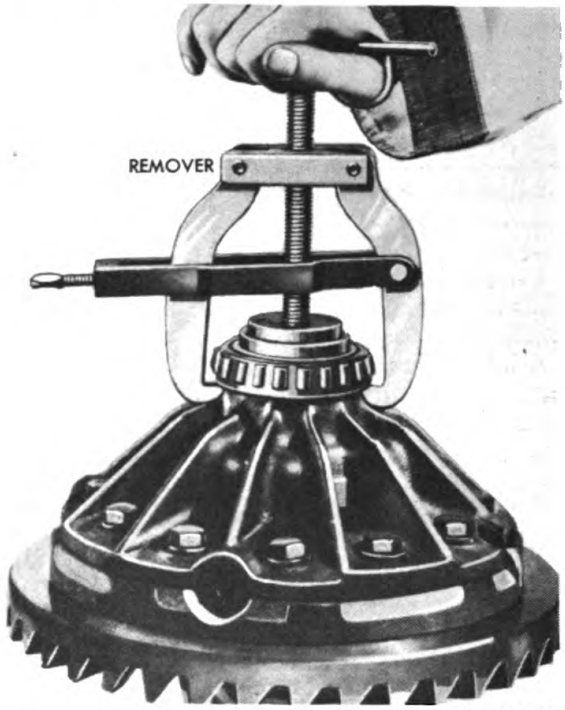


Figure 89 — Removing Differential Bearing Cones

heavier and harder particles of lubricant. Repeat these operations until the bearings are clean, and direct compressed air across bearings to remove the dry-cleaning solvent, being careful not to spin the bearings. Clean housings and all other parts thoroughly, and dry with compressed air.

b. Inspection. Examine all tapered bearing rollers and cups for scores, cracks, pits, or other damage. Inspect axle shaft universal joint parts for scratches, grooves, or flat spots on the balls. Check the axle shafts for cracks, twisted splines, or broken yokes. Inspect the differential cross for cracks or scored journals. Examine all gears for nicks, cracks, or scores. Inspect the housings, knuckle flanges, pinion carrier, and differential case for cracks, distortion, or other damage. Check the drive gear thrust block for scores, cracks, or excessive looseness in housing. Examine the drive pinion straight roller bearing for breakage or other damage; and the straight roller bearing inner race on pilot end of pinion for scores or pits. Inspect the tie rod assembly for cracks, twist, or stripped threads and the end bolt bushings for scores or pits. Examine the hubs and drums for cracks or damage, and the brake shoe linings for excessive wear or looseness. Inspect the brake backing plate for cracks, distortion, or damage.

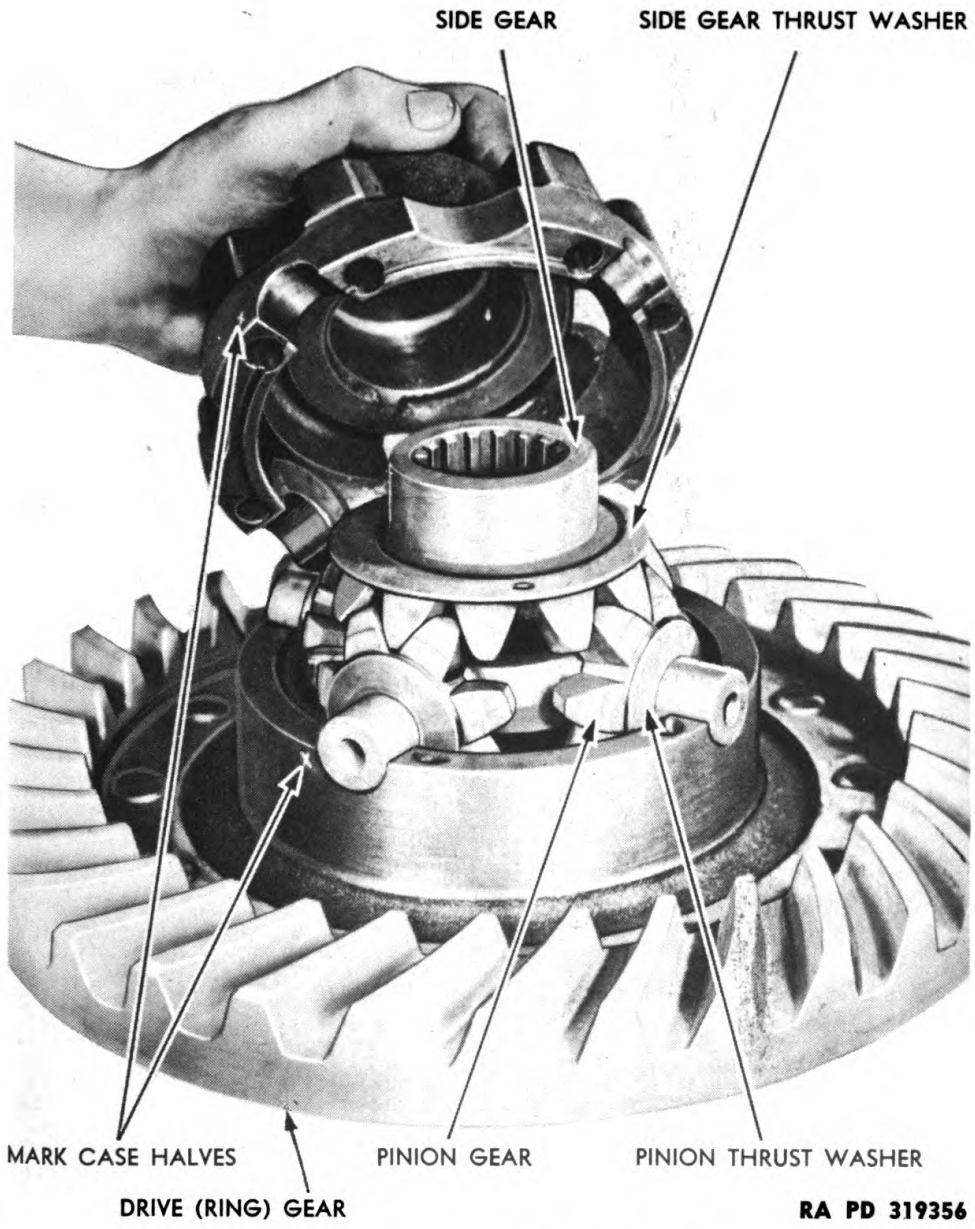
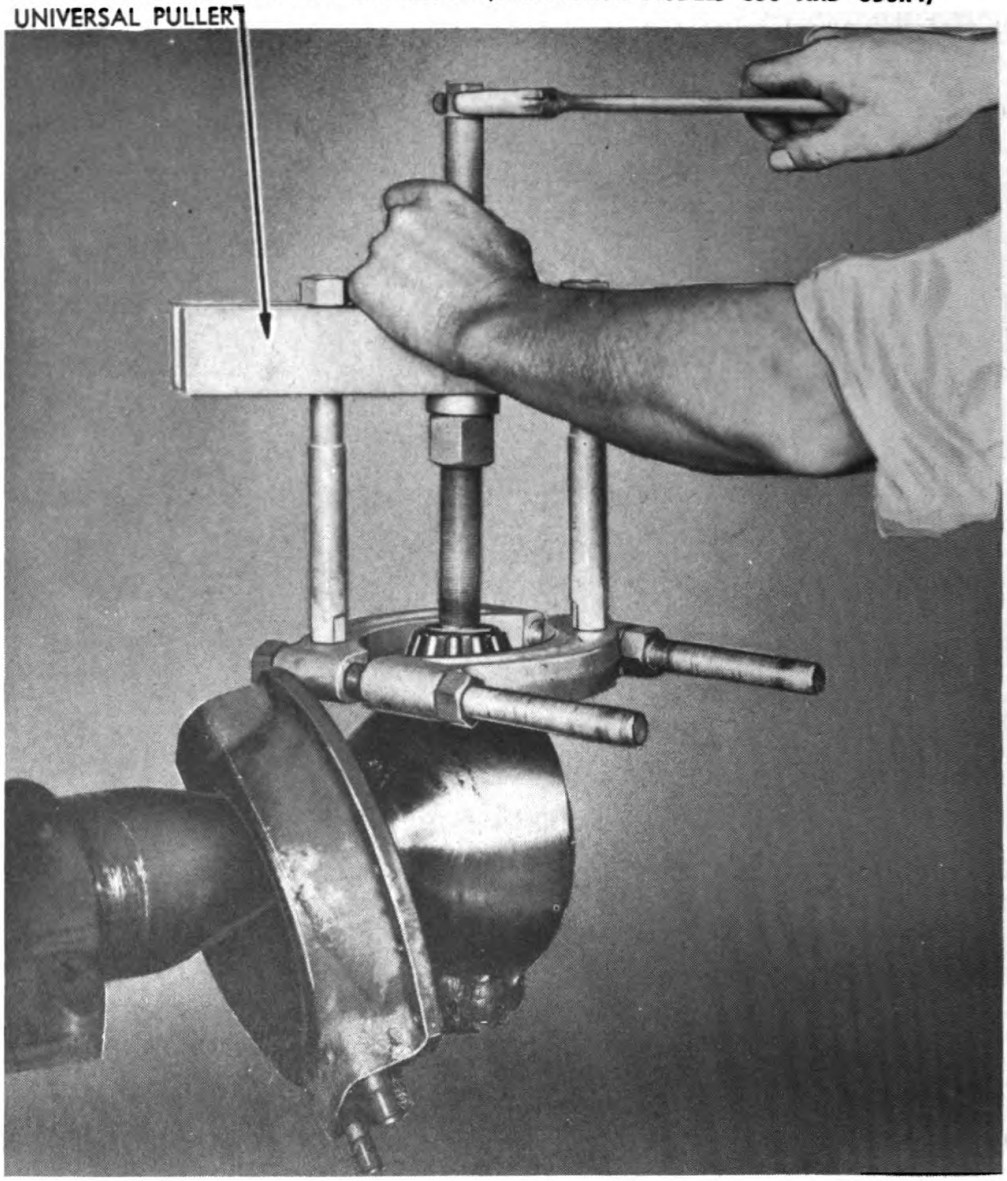


Figure 90 — Disassembling Differential Case

c. Repair.

(1) BEARINGS. Replace bearing cones and cups that have been removed and are not satisfactory for further service. If the differential side bearing cups are not serviceable, remove them with bearing cup remover 41-R-2374-25 (fig. 93), and replace with bearing cup replacer 41-R-2391-67 and handle 41-H-1074 (fig. 94). Remove the drive pinion tapered roller bearing cups with universal puller (fig. 95), and replace with pinion bearing cup replacer



RA PD 319223

Figure 91 — Removing Knuckle Bearing Cones

41-R-2395-37 if they are not satisfactory (fig. 96). If the drive pinion straight roller pilot bearing is broken or damaged, remove the rivets and retainer; then remove and replace the bearing with pinion front bearing replacer 41-R-2389-13 (fig. 97). Install the straight roller pilot bearing retainer with new rivets. Remove the snap ring that holds pinion straight roller pilot bearing inner race on pinion, and pull the race off the pinion. Install replacement race and a new snap ring on pinion.

(2) DIFFERENTIAL, PINION, AND AXLE SHAFTS WITH UNIVERSAL JOINTS. Replace any differential parts that are not suitable for fur-

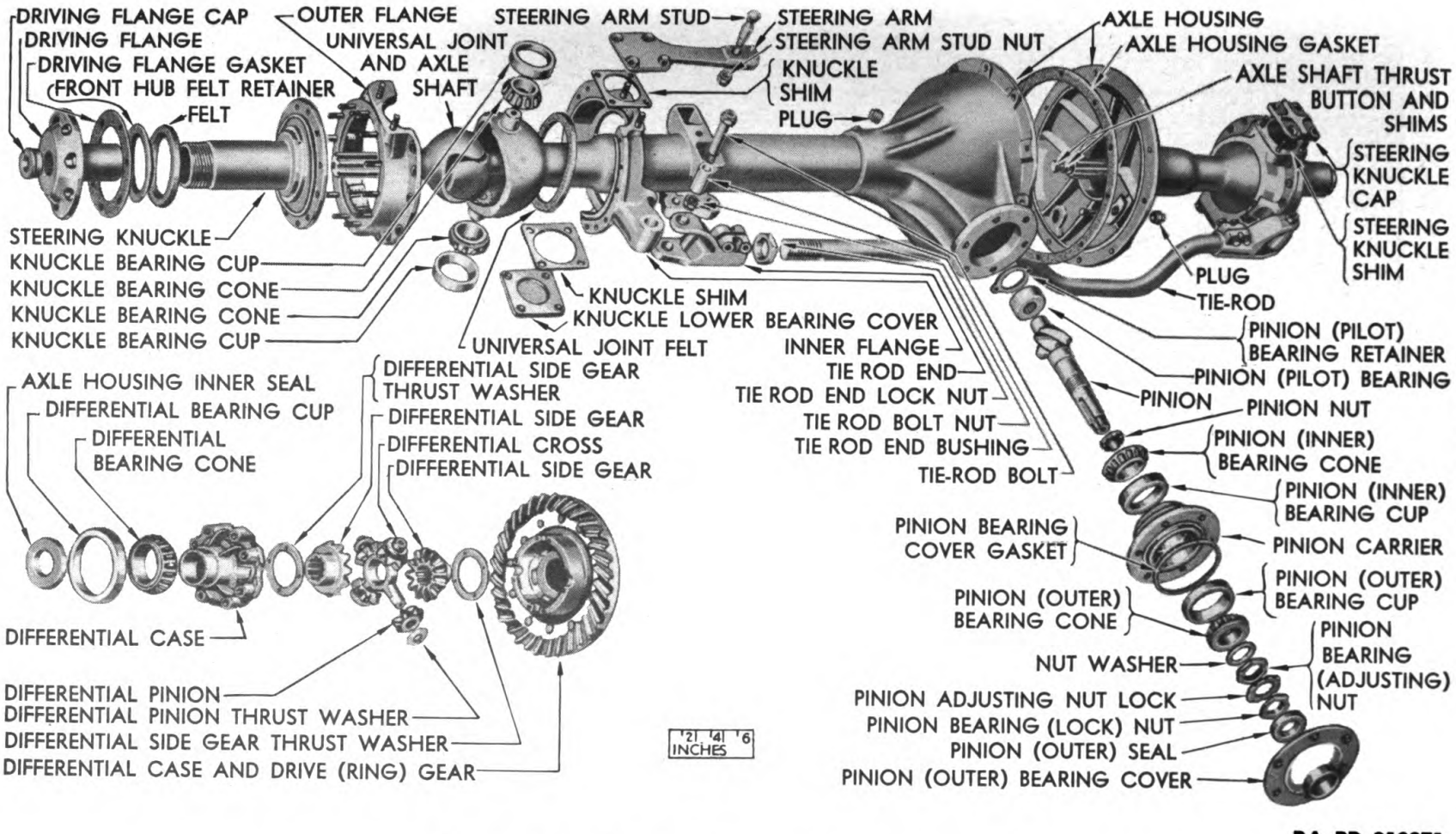


Figure 92 — Front Axle (6x6) Disassembled

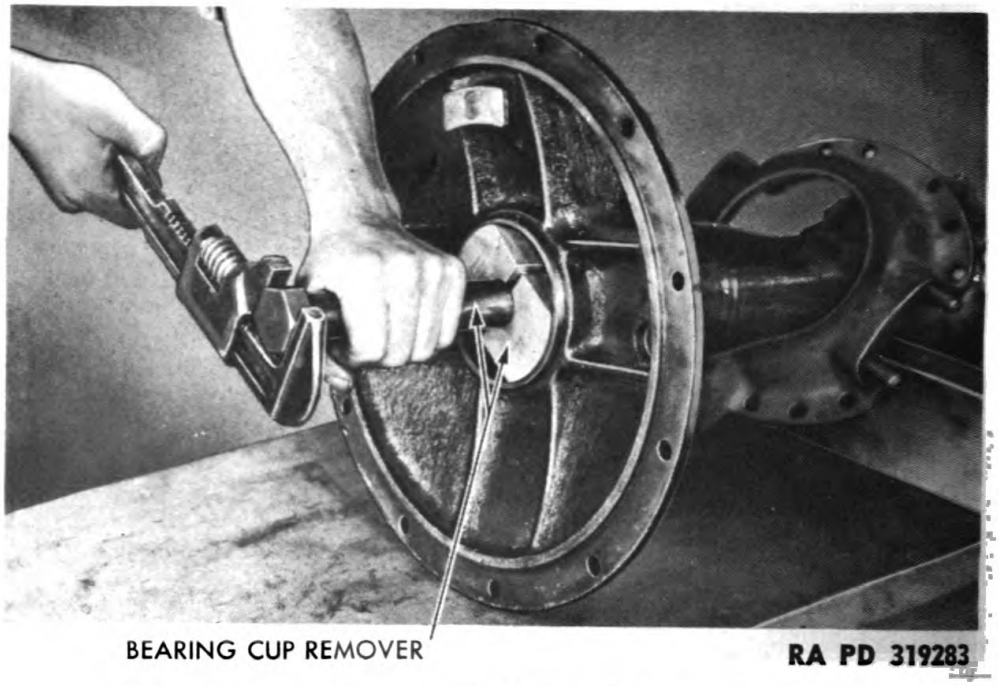


Figure 93 — Removing Differential Bearing Cups

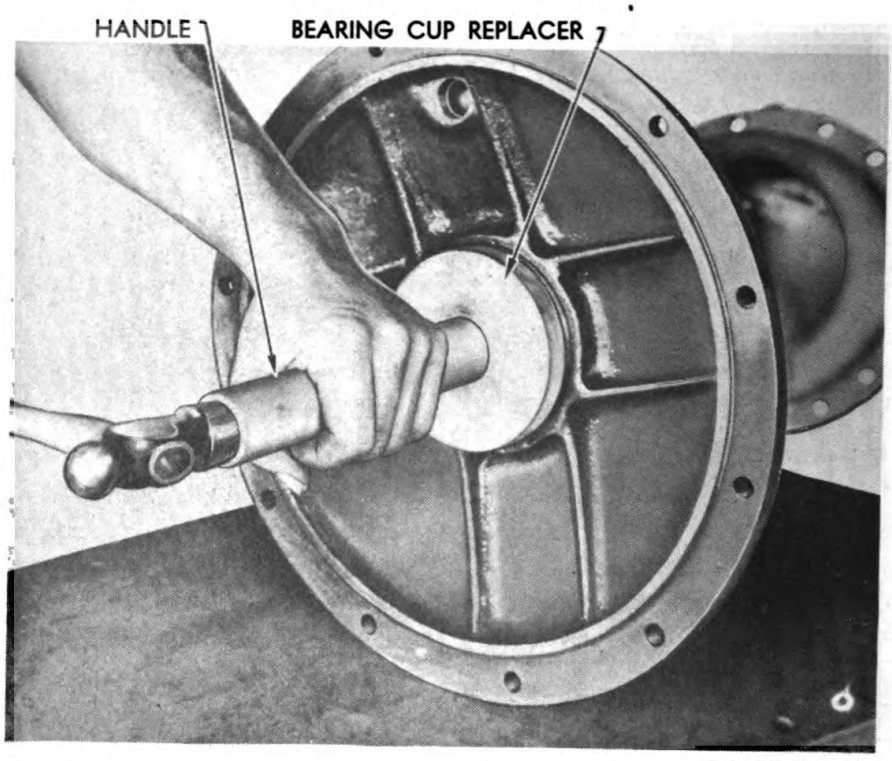
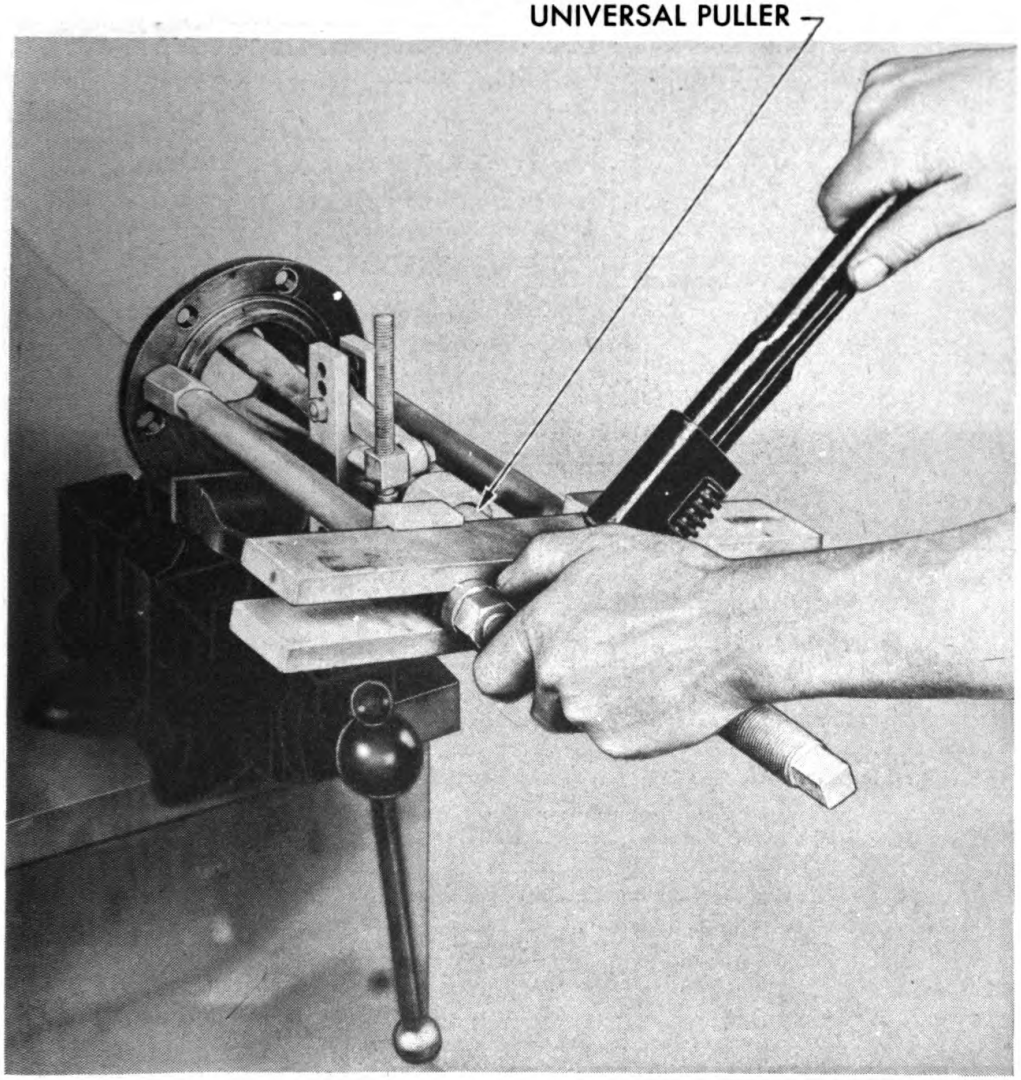


Figure 94 — Installing Differential Bearing Cups



RA PD 319286

Figure 95 — Removing Drive Pinion Bearing Cups

ther service. When either the bevel drive gear or drive pinion is unsatisfactory for service, replace both with a matched gear and pinion set. If the pinion carrier is not satisfactory for service, replace it. Replace universal joint balls that are scored or have flat spots, making sure the replacement balls are the same diameter as those removed. When the axle shaft driven yoke or driving yoke is unsatisfactory for further service, replace the axle shaft and universal joint assembly (fig. 98).

(3) HOUSINGS, KNUCKLE FLANGES, AND TIE ROD. If a satisfactory repair cannot be made on the housing by welding, replace it. Replace the bevel drive gear thrust block with a new pin, if unsatisfactory for additional service. The knuckle flanges are furnished with the housing; if not satisfactory for further service, replace the hous-

Figure 96 — Installing Drive Pinion Bearing Cups

ing. Replace tie rod parts that are unsatisfactory for service. Remove and replace tie rod end bolt bushings with tie rod bushing replacer 41-R-2389-40 (fig. 99), if the bushings are scored or pitted.

(4) HUBS, DRUMS, BRAKE SHOES, AND BACKING PLATES. Replace the hubs and drums if they are not satisfactory for further service. Remove the wheel bearing cups with universal puller (fig. 100), and replace with wheel bearing cup replacer 41-H-1780 and handle 41-H-1074 if they are no longer serviceable (fig. 101). If the brake shoe linings are worn almost to the rivet heads or are loose on the shoes, replace the linings. Replace the brake backing plates if they are not suitable for additional service.

40. ASSEMBLY.

a. Knuckle Flanges and Bearings. Install knuckle bearing cones on upper and lower studs, using knuckle bearing cone replacer 41-R-2391-84 (fig. 102). Replace the inner flange felt washers

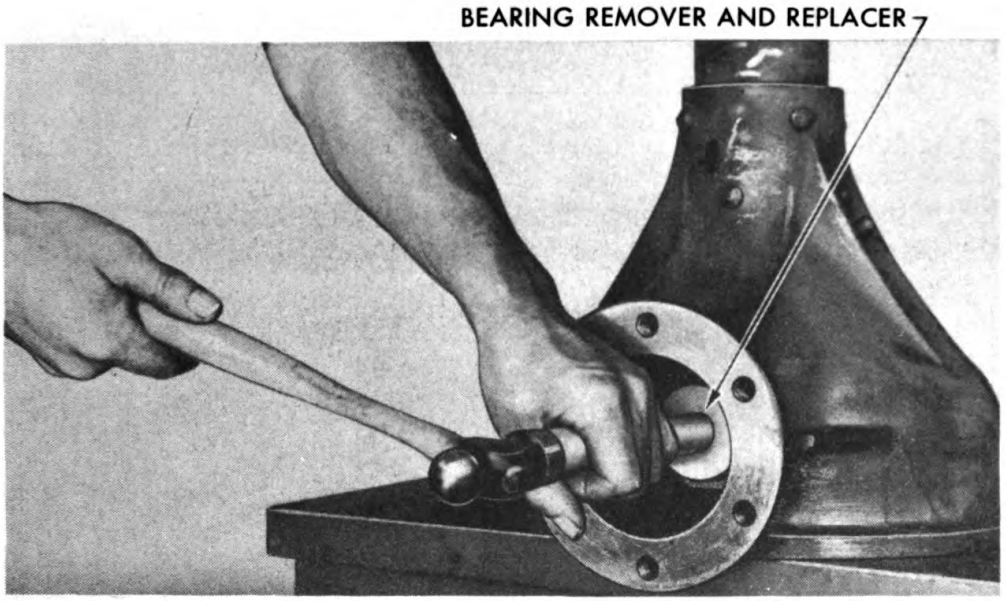


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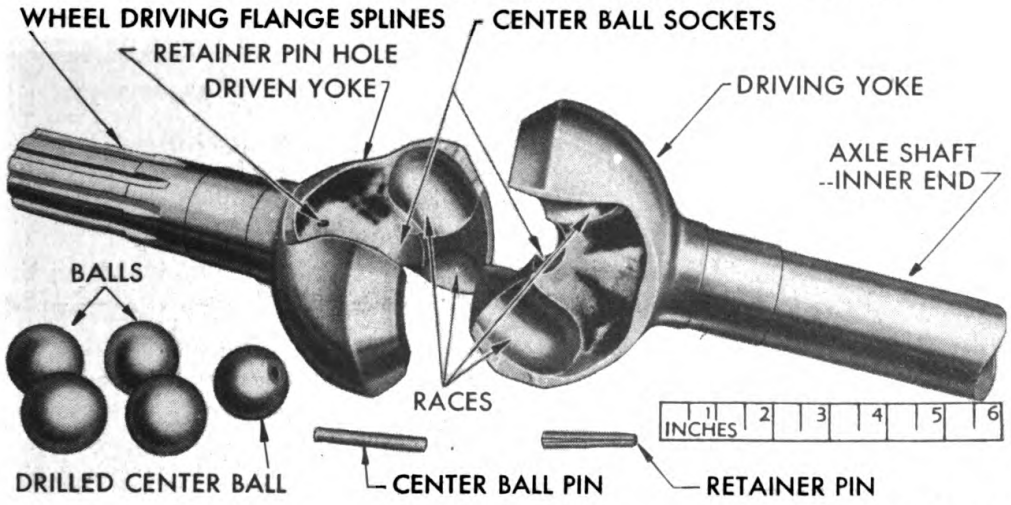
Figure 97 — Removing Drive Pinion Pilot Bearing



RA PD 319288

Figure 98 — Axle Shaft Universal Joint Disassembled

(fig. 103) and position bearing cups on bearing cones. Fasten knuckle flanges together securely with bolts, lock washers, and nuts. Place lower shims and cap in position, install cap screws with washers, and tighten securely. Install upper shims and cap over studs, place lock washers and nuts on studs, and tighten securely. Attach a spring scale to tie rod bolt hole in knuckle arm (fig. 104). A pull of 7 to 8 pounds is required to keep knuckle swinging after it has been started by hand. If knuckle thrust tension is not within the limits, add (to decrease tension) or remove (to increase tension) the same amount of shims at upper and lower bearing caps, as required.

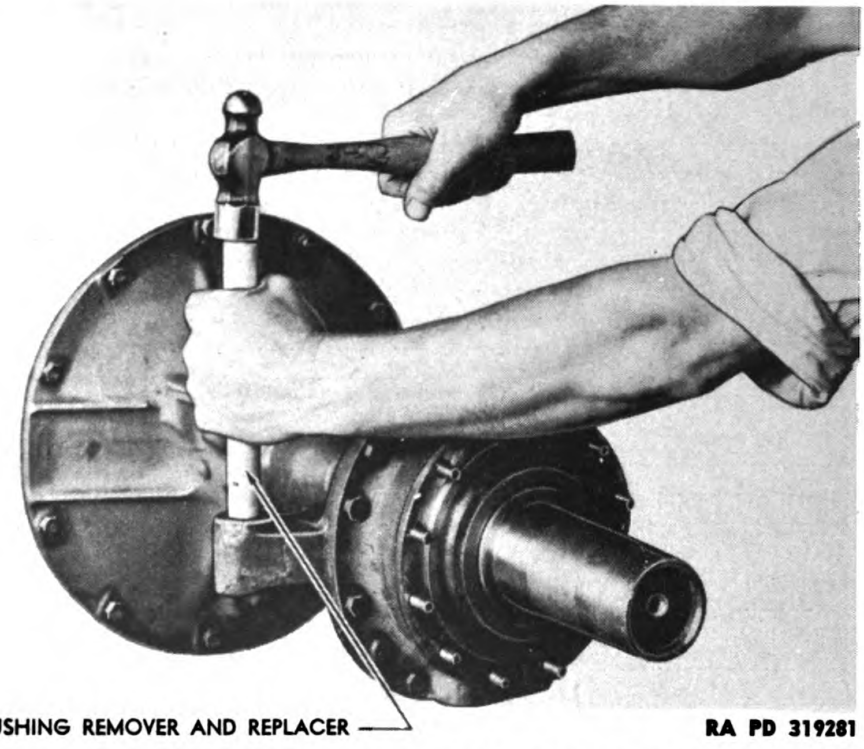


Figure 99 — Removing Tie Rod End Bolt Bushing

b. Differential Assembly.

(1) ASSEMBLY. Install differential pinions and thrust washers on cross, place side bevel gear thrust washer and gears in differential case halves, and assemble the cross with gears and halves of case together, being sure the marks coincide. Install cap screws and tighten securely. Check the clearance between thrust washers and the case, and replace parts as required if clearance is more than 0.015 inch. Lock-wire the cap screw heads to prevent loosening. Install differential bearing cones, using differential bearing replacer 41-R-2391-63 (fig. 105).

(2) INSTALLATION. Install new front axle shaft inner oil seals into axle housings. Place the differential assembly in position on right housing, set the left housing in position over differential assembly and on right housing, and bolt both halves of housing together. Tighten the bolts and nuts securely.

c. Drive Pinion and Carrier.

(1) ASSEMBLY. Install bearing cones on pinion, using pinion bearing cone replacer 41-R-2395-25 (fig. 106), and place pinion with bearing cone in carrier and bearing cup. Install opposed bearing on pinion and into cup; place adjusting nut washer and adjusting nut on pinion shaft. Adjust bearings so there is not perceptible end

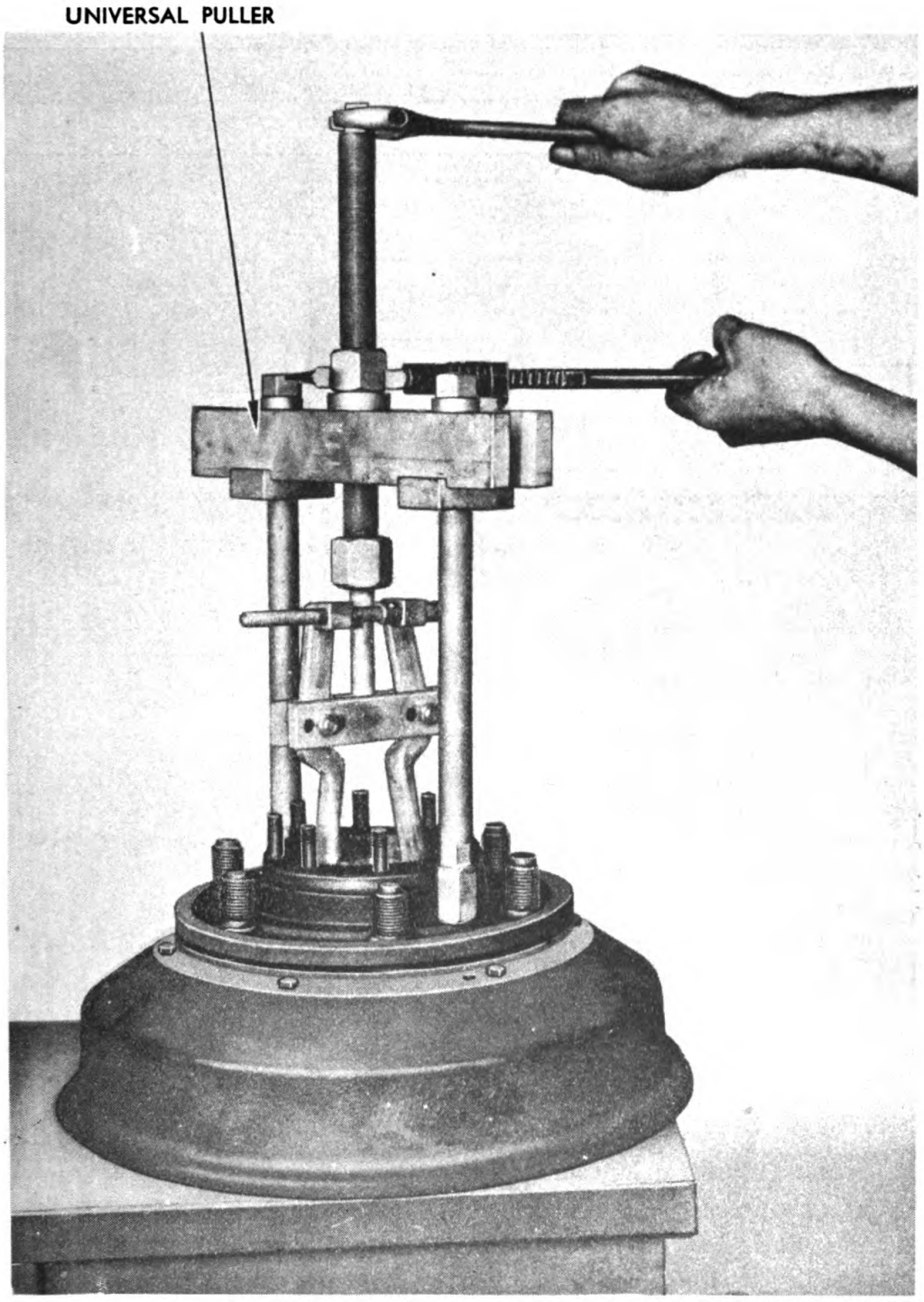


Figure 100 — Removing Wheel Bearing Cups

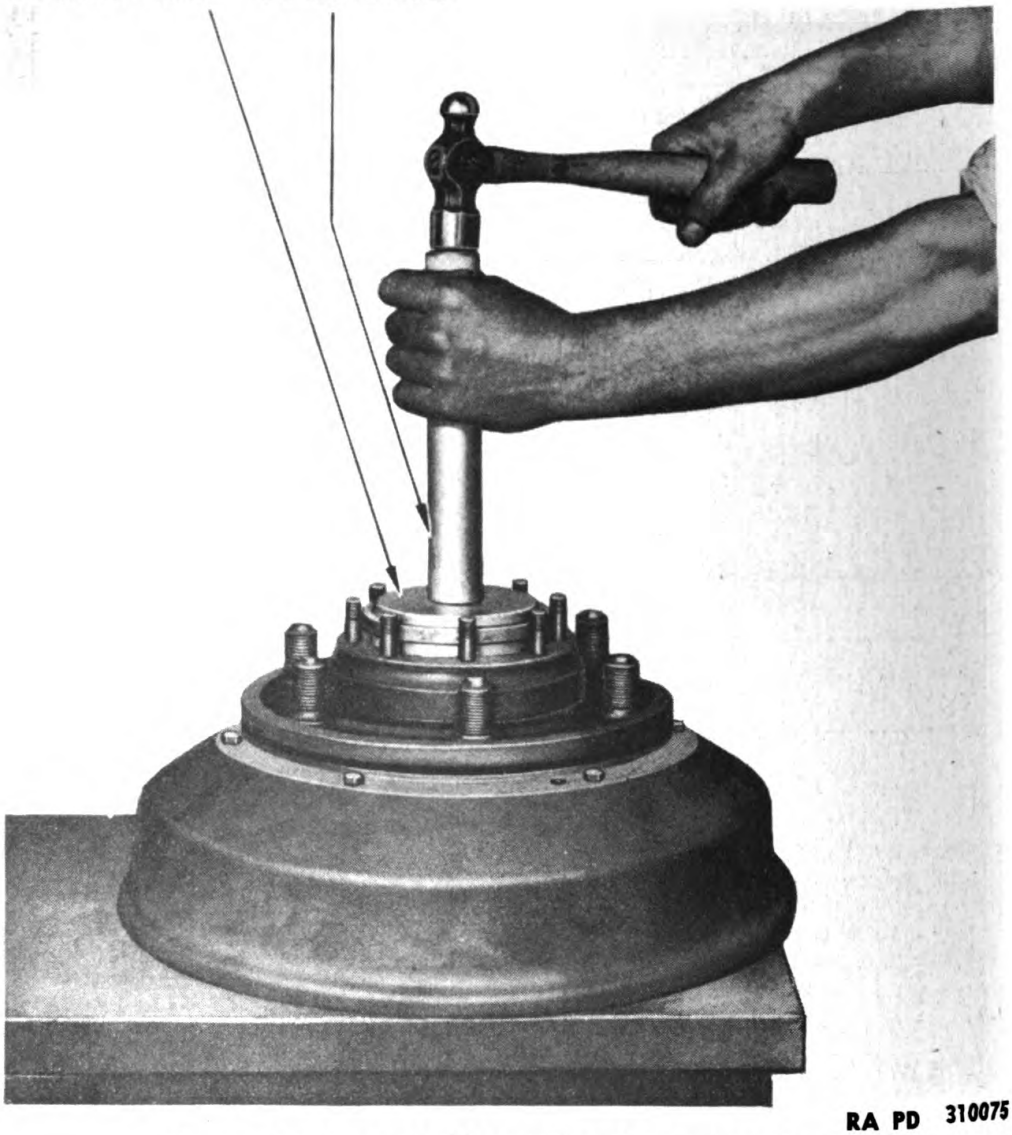


Figure 101 — Installing Wheel Bearing Cups

play. Install adjusting nut lock, lock nut, and bend tab over flat of nut. Check pinion to be sure there is no end play or binding.

(2) INSTALLATION. Position pinion and carrier in housing, being sure pilot end of pinion enters straight roller bearing, and that gears mesh properly (use shims if required). Install new oil seal in pinion outer bearing cover, and place cover in position against carrier, using a new gasket coated with sealing compound. Install cap screws with lock washers, and tighten firmly while turning pinion occasionally to make sure it is correctly alined.

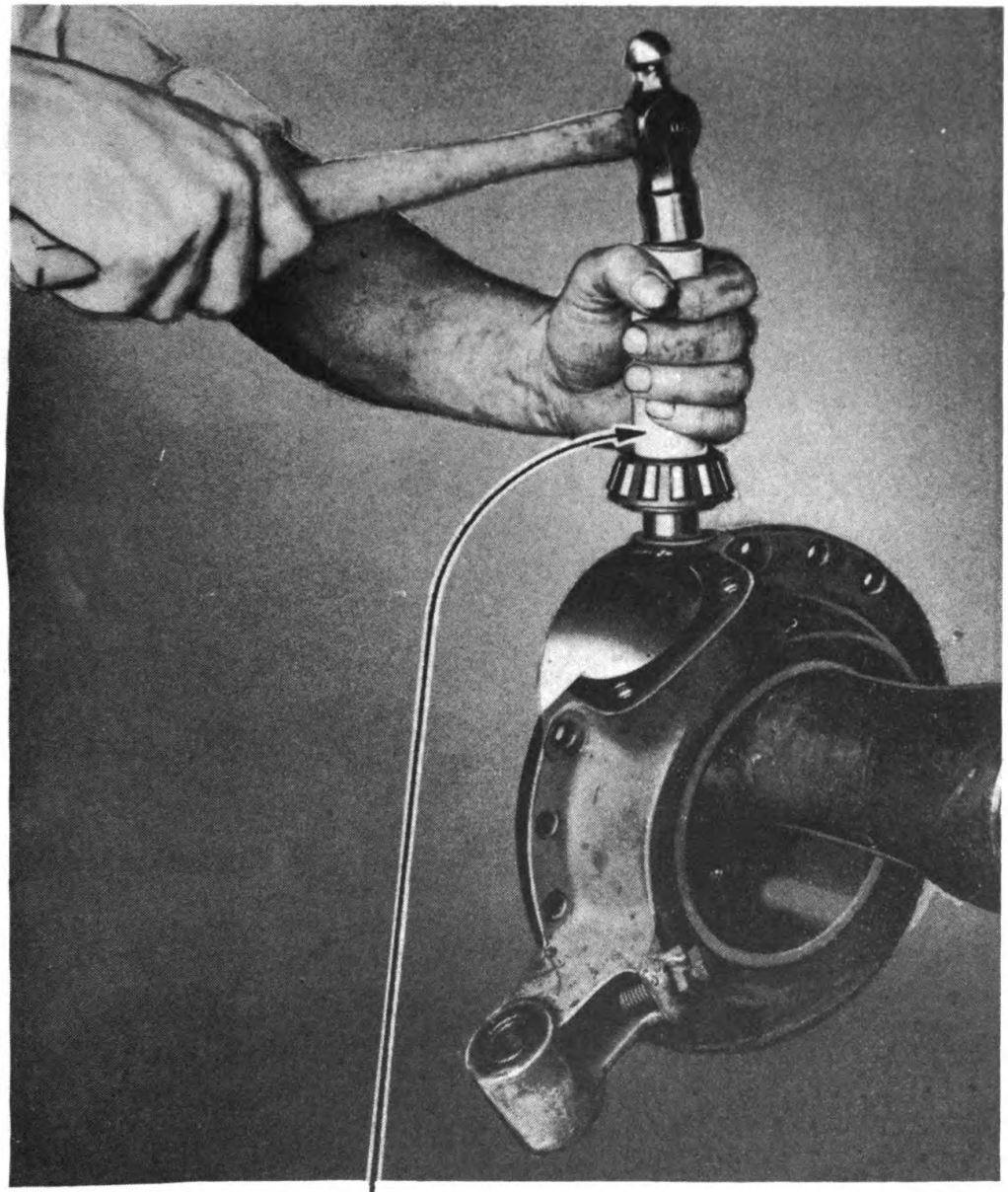


Figure 102 — Installing Knuckle Bearing Cones

d. Assembly of Axle Shafts Universal Joint. Drop the center ball pin into the drilled passage in the driven yoke (fig. 107). Fasten the differential half of the axle shaft in a vise gripping an unmachined portion. Install the center ball (one with the groove and hole drilled in it) in the center ball socket with the hole and groove facing the mechanic. Place the driven yoke on the center ball, then slip three balls into the races. Turn the center ball until the groove in it is alined with the race for the remaining ball. Tilt the joint to an extreme angle and slip the fourth ball into the race; then straighten

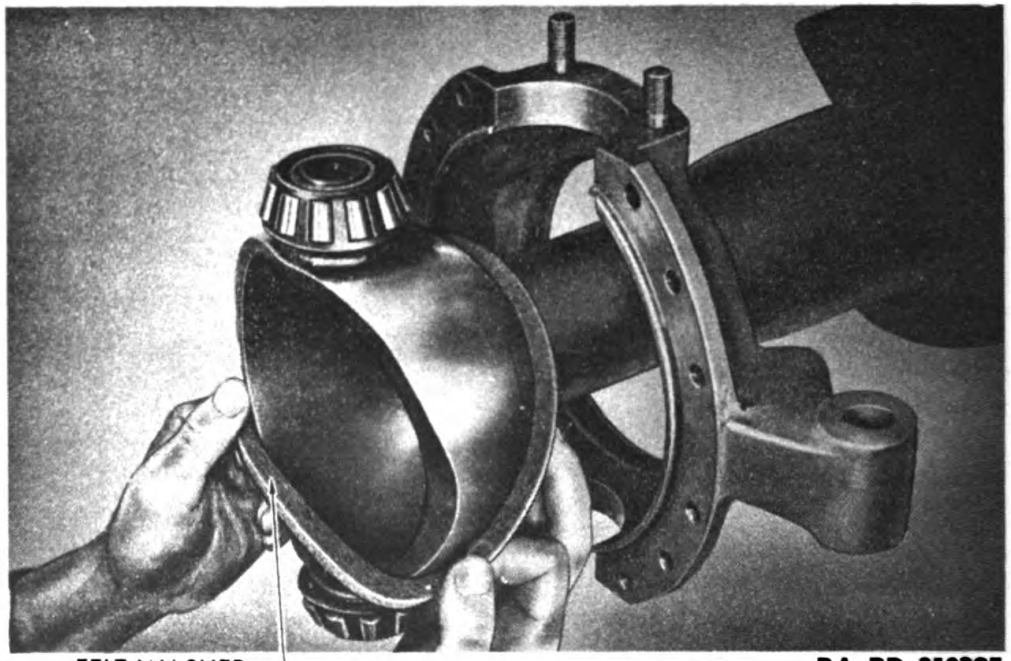


Figure 103 — Removing Inner Flange Felt Washer

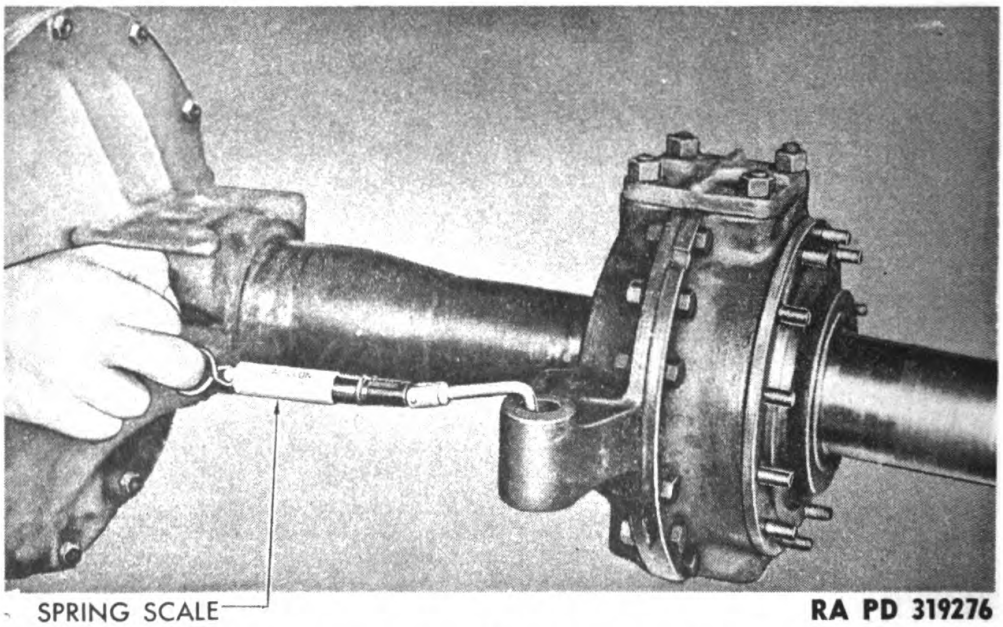


Figure 104 — Checking Steering Knuckle Tension

the driven yoke. Turn the center ball until the center ball pin drops into the hole in the ball. Install a new retainer pin, and prick-punch both ends to lock it securely in place. Pack each universal joint with general purpose grease.

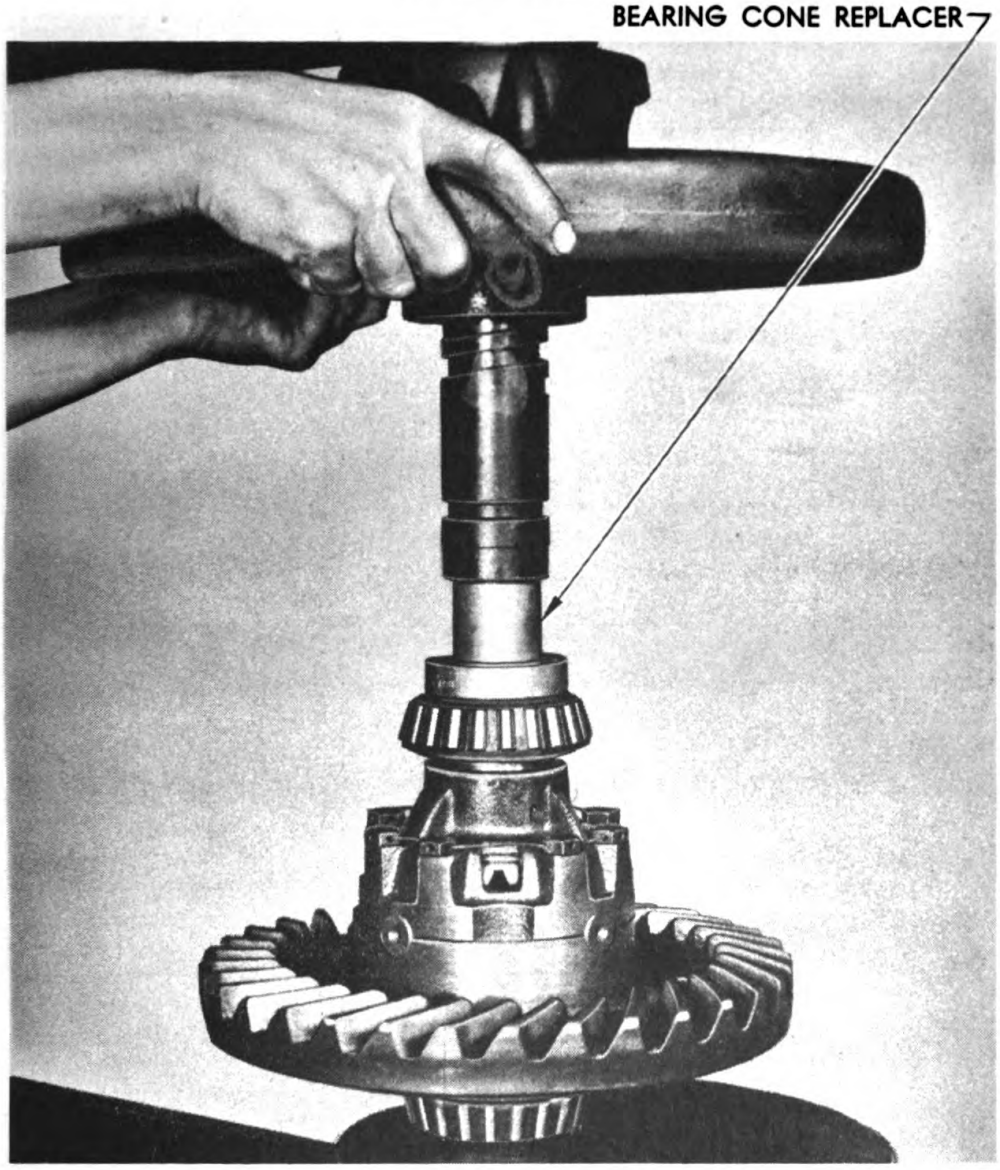


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Figure 105 — Installing Differential Bearing Cones

e. Installation of Axle Shafts and Universal Joints.

(1) INSTALL LEFT AXLE SHAFT AND UNIVERSAL JOINT. Install the long (left) axle shaft and universal joint (with permanent button in the end of inner shaft) into position in axle housing. Place left steering knuckle spindle in position on knuckle flange studs so that oil escape channel is at bottom. Install brake backing plate and oil shield on flange studs, and tighten securely to flange.

(2) INSTALL LEFT WHEEL HUB, BEARINGS, AND DRUM. Install a new wheel inner bearing oil seal on knuckle spindle with inner wheel bearing oil seal replacer 41-R-2391-83 and inner wheel bearing replacer 41-R-2392 (fig. 108). Pack the wheel inner bearing cone with

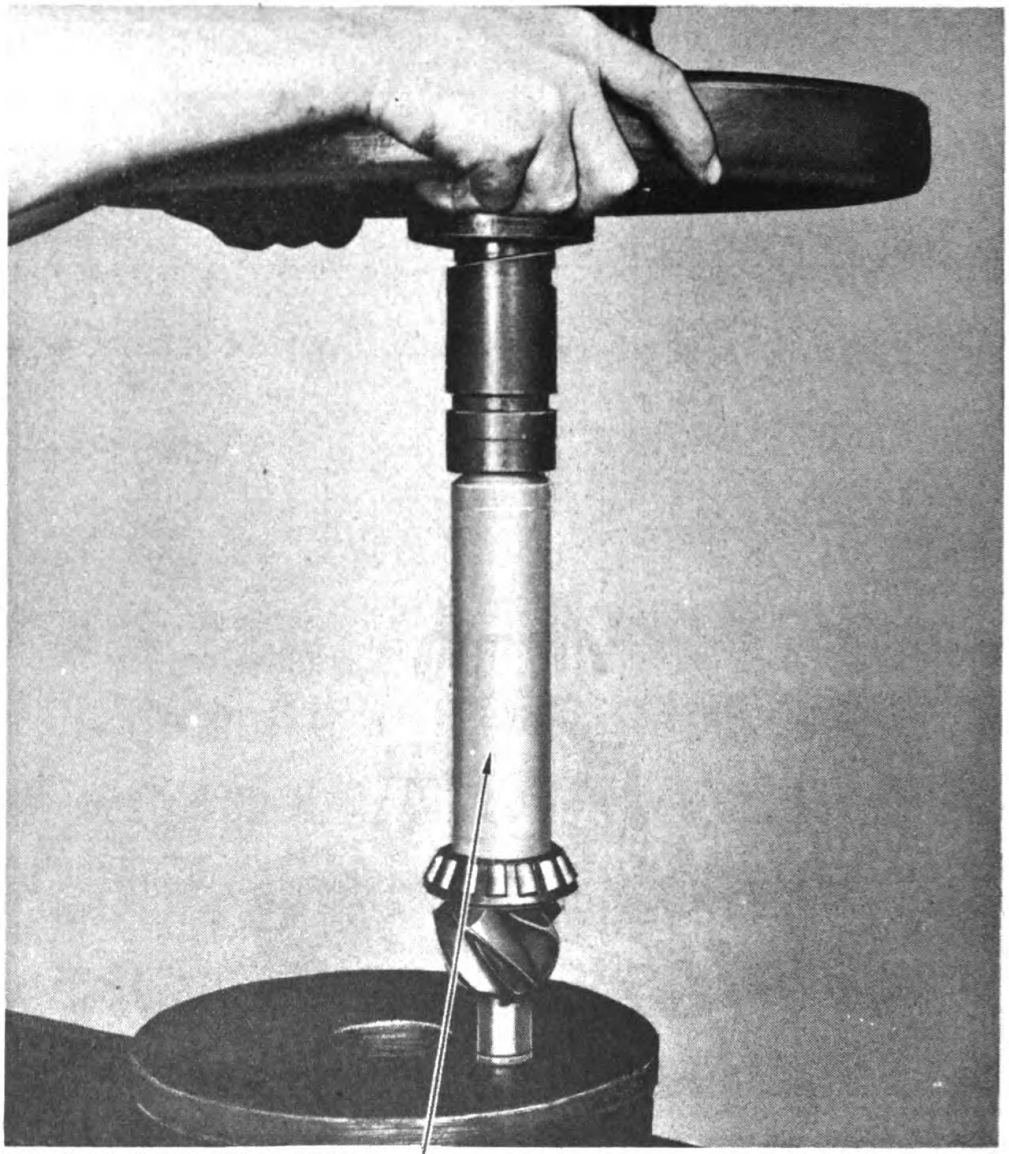

Figure 106 — Installing Drive Pinion Front Bearing Cone

proper lubricant, and install on knuckle spindle with the wheel inner bearing replacer (fig. 109). Pack the recess in wheel hub and the outer bearing cone with proper lubricant, and place in position on knuckle spindle. Install wheel bearing adjusting nut, and tighten until wheel binds while rotating hub to seat bearings properly (fig. 110). Back off adjusting nut approximately one-sixth turn so that hub rotates freely. Install nut lock, lock nut, and bend lock over a flat on each nut. Place a new driving flange gasket on hub, install the driving flange, and tighten securely to hub. Install driving flange cap, and tighten cap screw securely.

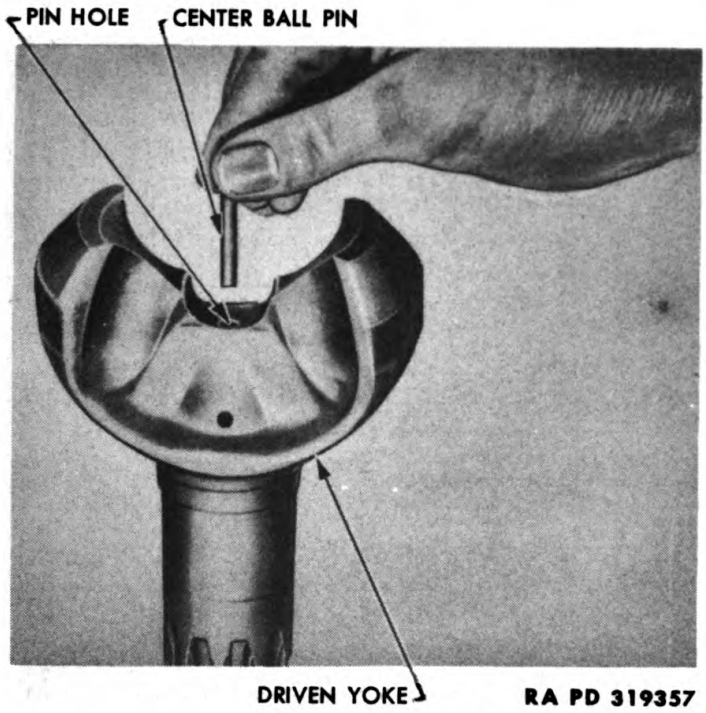

Figure 107 — Assembling Axle Shaft Universal Joint

(3) INSTALL RIGHT AXLE SHAFT AND UNIVERSAL JOINT TO CHECK BUTTON CLEARANCE. Select a button having a light tap fit in hole drilled into inner end of short shaft. Insert button in shaft without shim pack, leaving a ½-inch space between end of shaft and shoulder on button. Carefully place the right axle shaft and universal joint in axle housing so the button is not driven into shaft. (Do not push shaft in too far.) Install right steering knuckle spindle with oil escape channel at bottom, brake backing plate, and oil shield on knuckle flange studs, and tighten securely to flange.

(4) INSTALL RIGHT WHEEL HUB, BEARINGS, AND DRUM TO CHECK AXLE SHAFT BUTTON CLEARANCE. Install temporarily the right wheel hub, bearings, and drum, as outlined in step (2), above, except to install the driving flange without the gasket between hub and flange, and use only the adjusting nut. Place flange cap in position, install and tighten cap screw to draw shaft outward as far as possible. Tighten securely two driving flange stud nuts diametrically opposed. The assembling and tightening operations will have pushed the button into the inner end of the axle shaft.

(5) INSTALL SHIMS BETWEEN BUTTON AND SHAFT. Remove right driving flange, wheel hub, knuckle spindle, and axle shaft with universal joint, being careful that the clearance between button shoulder and end of shaft is not disturbed. Measure the clearance from end of axle shaft to button shoulder, and select a shim pack $\frac{1}{32}$ inch thinner

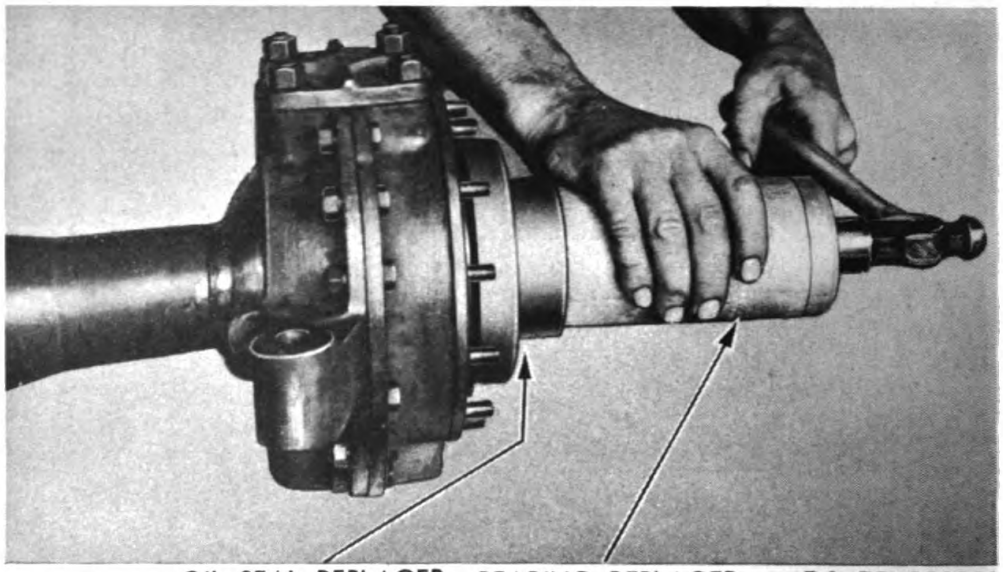

Figure 108 — Installing Front Wheel Inner Bearing Oil Seal (6x6)

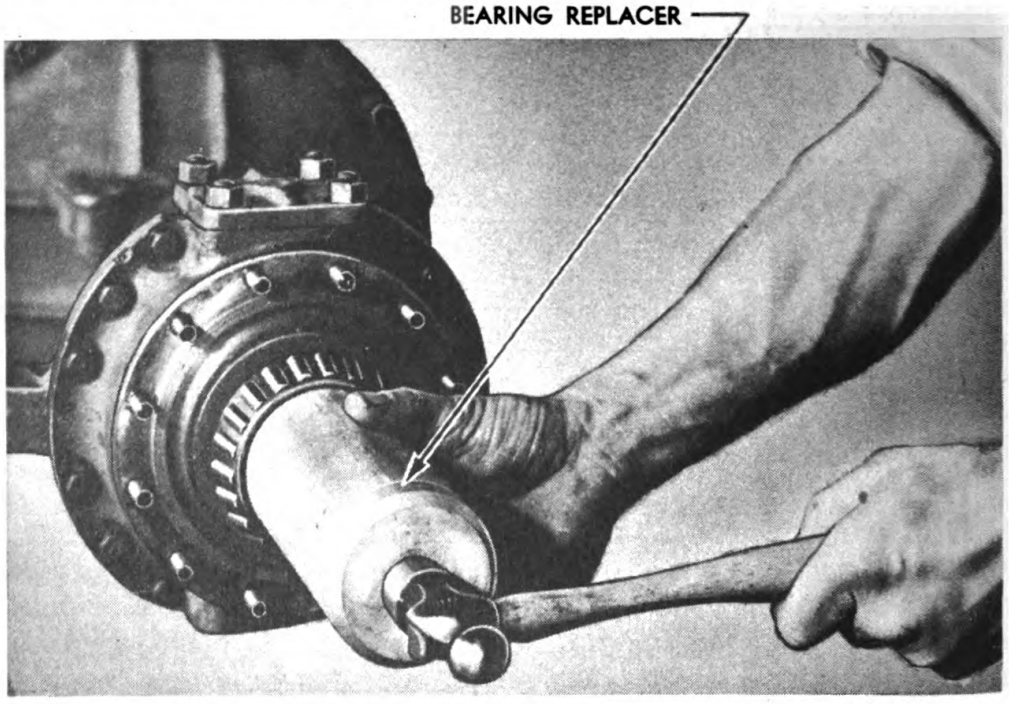

Figure 109 — Installing Front Wheel Inner Bearing Cone (6x6)

than this clearance. Remove trial button, and select a button that has a 0.001-inch larger diameter stud. Place shim pack over button stud, and tap the button stud into end of shaft with a soft hammer, until the shim pack is compressed.

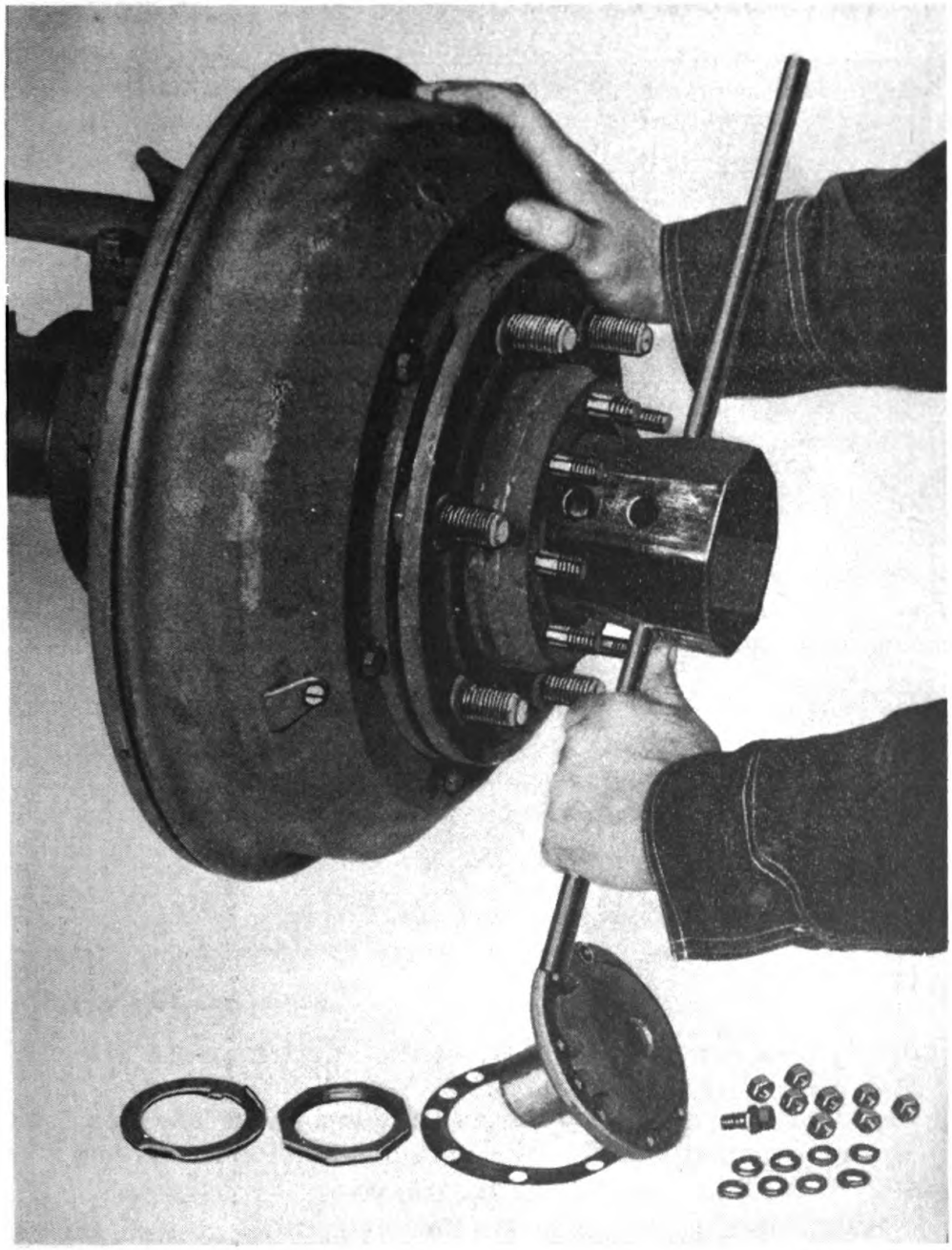

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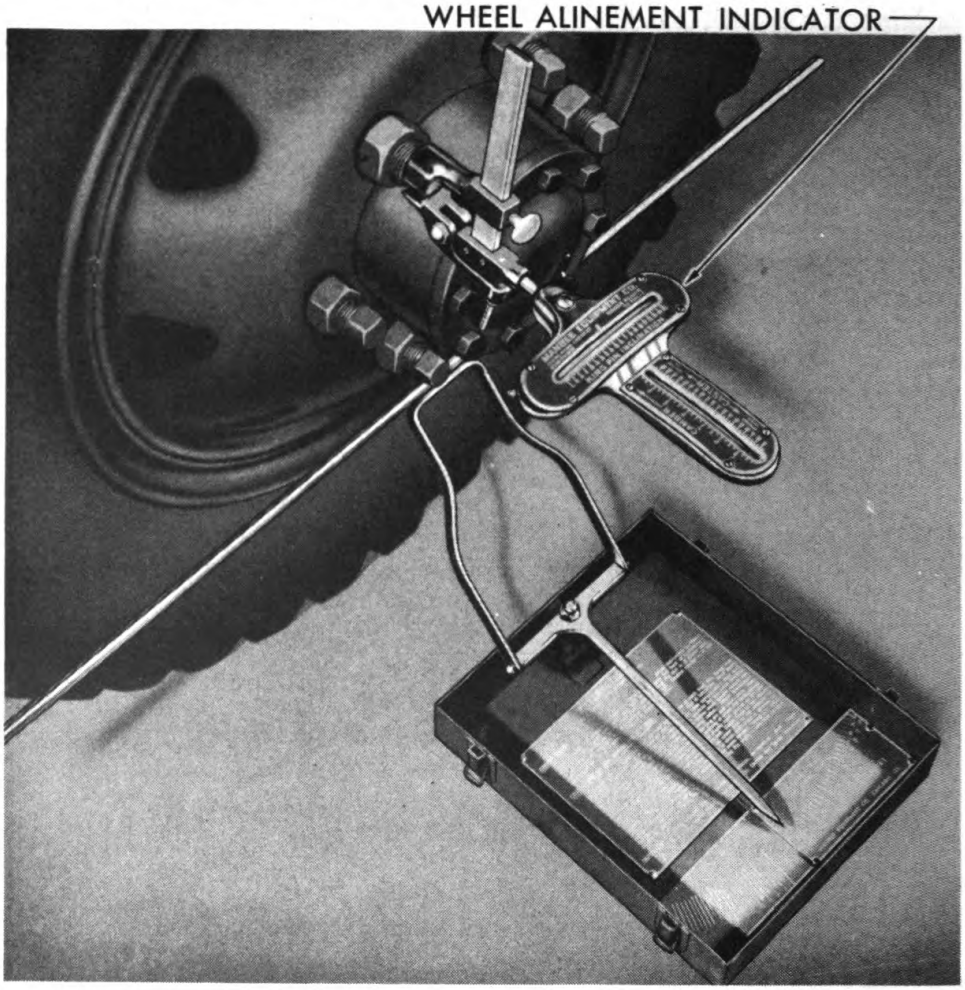
Figure 110 — Adjusting Front Wheel Bearings (6x6)

(6) INSTALL RIGHT AXLE SHAFT AND UNIVERSAL JOINT. Install right axle shaft and universal joint as instructed in step (1), above.

(7) INSTALL RIGHT WHEEL HUB, BEARINGS, AND DRUM. Install right wheel hub, bearings, and drum as outlined in step (2), above. To check axle shaft end float, loosen screws holding driving flange caps at both ends approximately ⅛ inch. Tap in cap screw head at one side as far as possible. Tap opposite cap screw inward, and measure



RA PD 319287

Figure 111 — Checking Wheel Alinement With Indicator 41-I-130

movement of cap screw to determine the amount of end float. No movement, or more than $\frac{1}{16}$-inch movement, indicates that end float is incorrect, and that readjustment is necessary.

f. Install Steering Knuckle Tie Rod Assembly. Install tie rod on knuckle flange arms, insert tie rod end bolts, and install castle nuts. Loosen clamp bolts and lock nut temporarily, and adjust toe-in after axle assembly has been installed on vehicle (par. 41 d).

41. FRONT WHEEL ALINEMENT (ON VEHICLE).

a. General. Proper front wheel alinement must be maintained at all times to ensure ease of steering and uniform tire wear. Axle caster, wheel camber, and wheel toe-in are the most important factors involved in front wheel alinement. Whenever the vehicle has been subjected to possible damage at the front end because of severe bumps

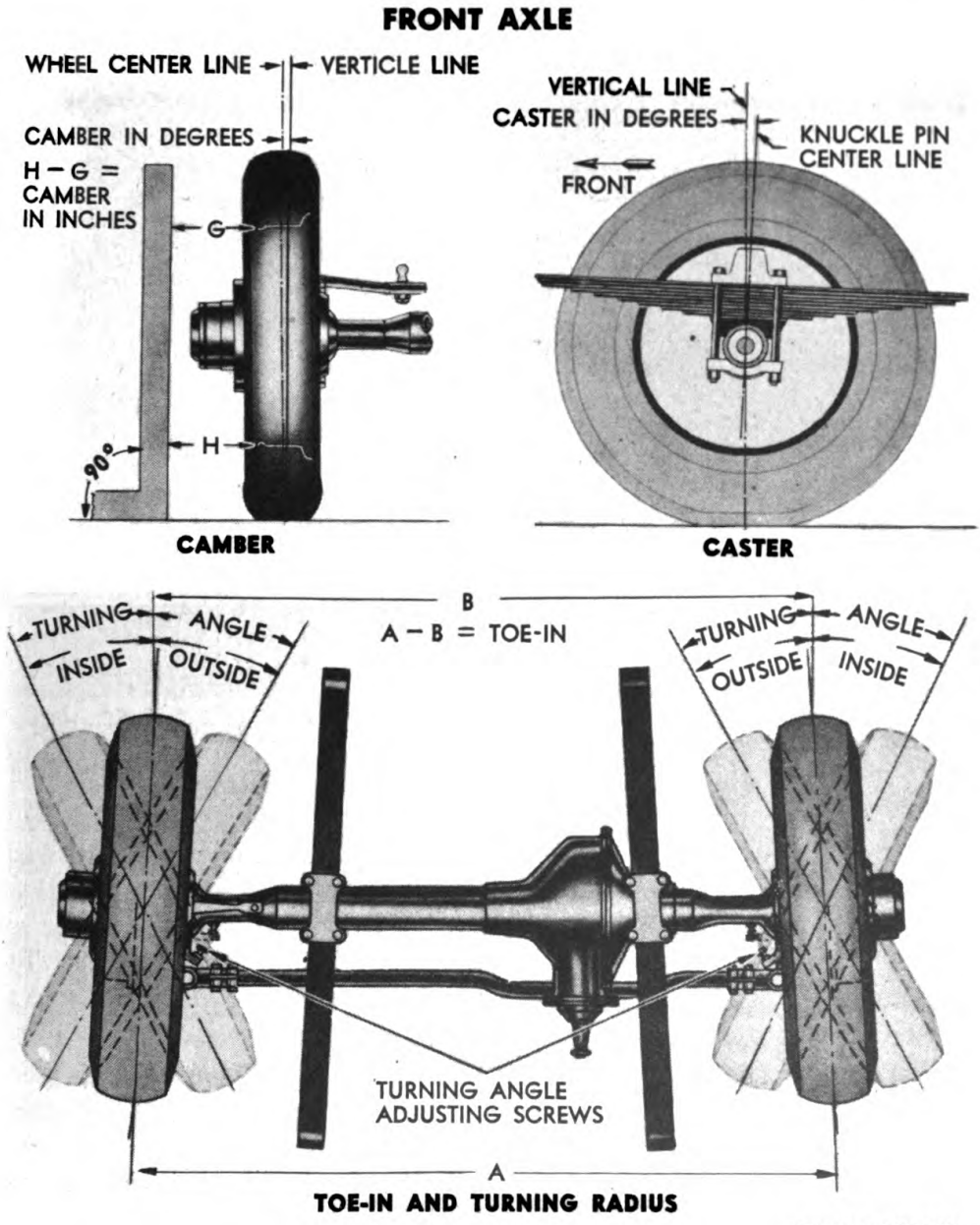


Figure 112 — Front Wheel Alinement Chart (6x6)

or a collision, check the alinement of the front wheels without delay (fig. 111). Wheel and knuckle bearings must be in proper adjustment to obtain accurate wheel alinement measurements.

b. Caster (fig. 112). Caster is the amount that the steering knuckle upper studs are inclined toward the front or rear of vehicle. Positive caster is the inclination of the top stud toward rear of vehicle, while negative or reverse caster is the inclination of the top stud toward the front of vehicle. The amount of inclination past vertical is measured in degrees, and the proper caster is 2 degrees positive (top stud toward rear). Slight caster adjustment can be made by

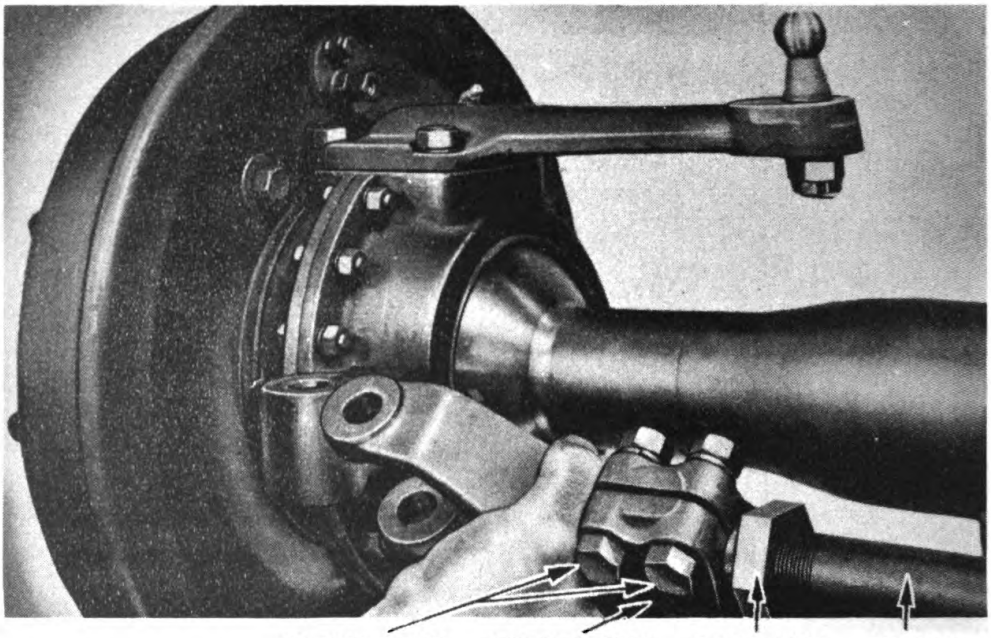


Figure 113 — Adjusting Toe-in (6x6)

installing tapered wedge plates or shims between spring and axle pad in correct position to give proper adjustment. Major misadjustment of caster indicates broken, damaged, twisted, dislocated, or excessively worn parts. The purpose of caster is to provide the stability necessary to keep the front wheels in straight-ahead position, and to assist in straightening the front wheels after making a turn.

c. Camber (fig. 112). Camber is the amount, measured in degrees, that the top of the wheels are inclined from the vertical. Positive camber is the outward inclination of the wheel at the top from vertical, while negative or reverse camber is the inward inclination of the wheel at the top from vertical. The proper positive camber of ¾ degree is set in the axle at time of manufacture and cannot be altered by adjustment. If checking reveals the camber is greater than ¾ degree positive or less than 0 degree, it indicates worn or damaged parts which must be replaced or repaired. Heating the axle to adjust the camber by bending destroys the original heat treatment of the steel and weakens the part. Cold-bending steel more than 1 degree may produce a fracture and render the part unsafe. The purpose of camber is to offset wear of the front axle parts by preventing wheels from going into negative camber after long service. Incorrect camber results in excessive tire wear.

d. Toe-in (fig. 112).

(1) DESCRIPTION. The purpose of toe-in is to offset the effect of camber on tire wear, and it is highly important that periodic checks

be made for correct wheel toe-in. If it is found to be out of adjustment, make immediate corrections, and check all front axle parts to determine whether any are bent or extremely loose. Toe-in is measured at the edge of the rim flange with wheels in the straight-ahead position.

(2) ADJUSTMENT. Loosen the lock nut on the left end of the tie rod. After loosening the clamp bolts in the tie rod left end, remove cotter pin, castle nut, and end bolt. In order to decrease the amount of toe-in, turn the tie rod left end (having 14 threads per in.) clockwise onto the rod; to increase toe-in turn the end counterclockwise (fig. 113). Slip the tie rod left end bolt into position, and check the toe-in setting. If the wheels do not toe-in approximately ⅛ inch, loosen the right end clamp bolts, and remove the cotter pin and castle nut from the tie rod end bolt. Remove the tie rod right end bolt, and make an adjustment by turning the right end (having 12 threads per in.). Install tie rod right end bolt, and readjust the left end as required to obtain front wheel toe-in within the specified limits. On completion of the adjustment, make sure that all end clamp bolts, and the lock nut on the left end of the tie rod are tightened securely, and that the tie rod is properly positioned. Tighten end bolt castle nuts securely, loosen one-half turn to prevent binding, and install new cotter pins.

e. Turning Radius. Stop (adjusting) screws are located in the right and left inner steering knuckle flanges (fig. 112). The screws are adjusted and then welded to knuckle flanges in production. Both the right and left stop screws must be adjusted if the welds are broken because they control the turning radius to either right or left. The right-hand screw controls the maximum angle to the right, and the left-hand screw controls the maximum angle to the left.

Section II

FRONT AXLE (6x4 VEHICLES)

42. DESCRIPTION AND DATA.

a. Description. Forged, bronzed, bushed knuckles attached to each end of the axle carry the front wheel bearings and the front brakes. The knuckles are attached to the axle by heavy precision-machined king pins which are held stationary in the axle by means of a tapered pin. Forged knuckle arms are keyed to the bottom of the knuckle, and a steering arm is keyed to the top of the left knuckle. A tubular tie rod of seamless steel joins the knuckle arms by means of steel ball studs located in the tie rod ends (figs. 114, 115, and 116).

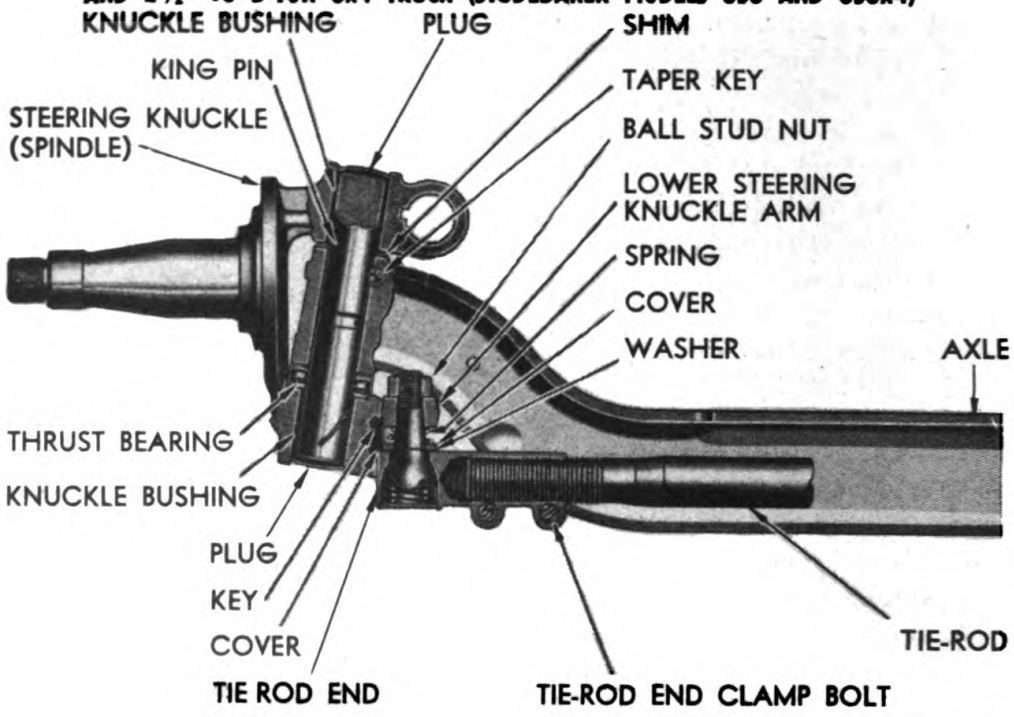


Figure 114 — Front Axle — Sectional View

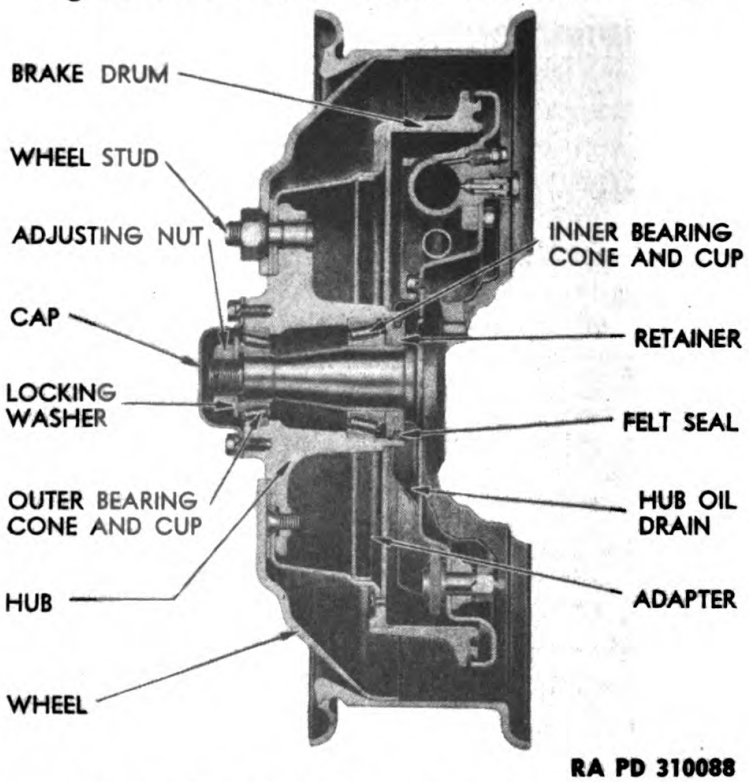


Figure 115 — Front Wheel, Hub, and Drum (6x4) (Demountable-type Drum) — Sectional View

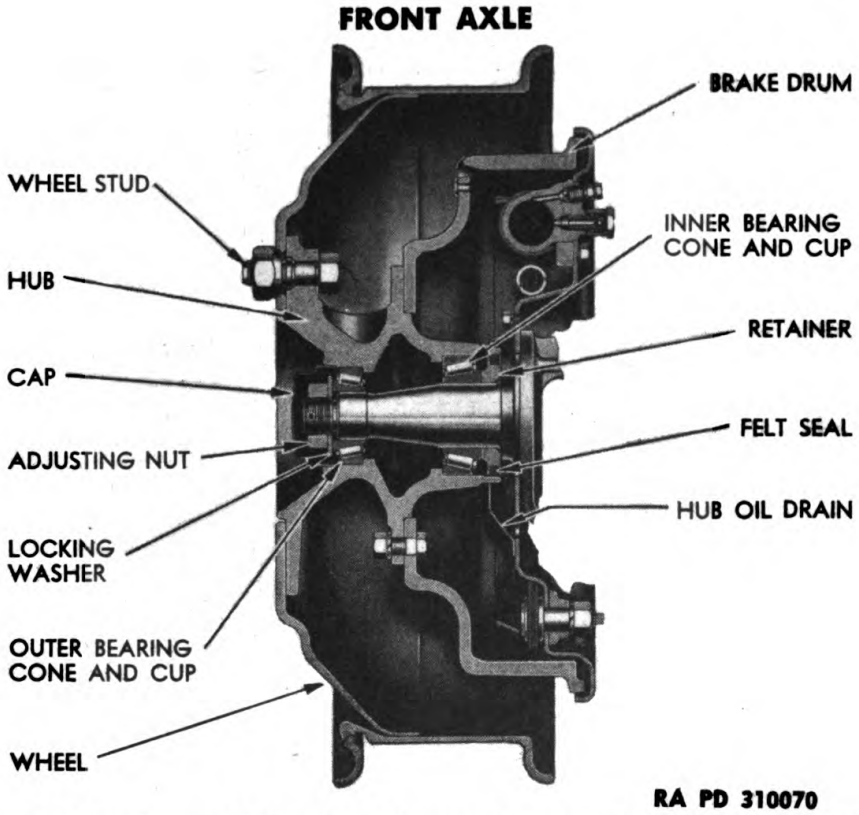


Figure 116 — Front Wheel, Hub, and Drum (6x4) (Conventional-type Drum) — Sectional View

b. Data.

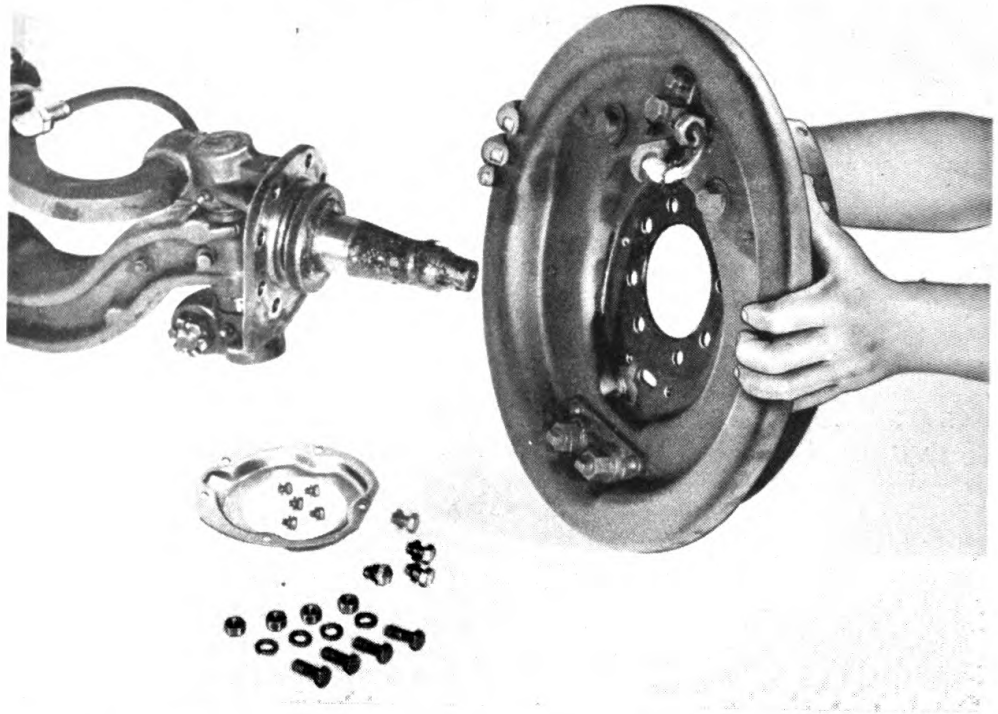
Make	Clark
Model	F-550
Type	Reverse Elliott
Knuckle thrust bearing	T.R.B. T-126

43. DISASSEMBLY.

a. Preliminary Cleaning of Assembly. Remove wheels and tires, clean the exterior of axle assembly thoroughly with dry-cleaning solvent, and dry with cloths or compressed air. Place the axle assembly on a suitable stand or rack for disassembly.

b. Remove Steering Knuckle Tie Rod Assembly. Remove cotter pins and castle nuts from ball studs holding tie rod ends to knuckle arms. Support each knuckle arm near end, pry downward on tie rod end, and strike end of knuckle arm to jar tie rod ball stud loose. Remove spring, washer, and covers from each ball stud.

c. Remove Steering Knuckle (Spindle) Assemblies. Remove hub cap, cotter pin, front wheel bearing nut, and washer; pull the hub and drum with outer bearing cone off the knuckle spindle. Take out the screws, and remove the hub oil drain. Remove cap screws and bolts and nuts holding brake backing plate to knuckle, and remove



RA PD 319349

Figure 117 — Removing Backing Plate From Front Axle (6x4)

RA PD 319351

Figure 118 — Removing Steering Knuckle Spindle Assembly

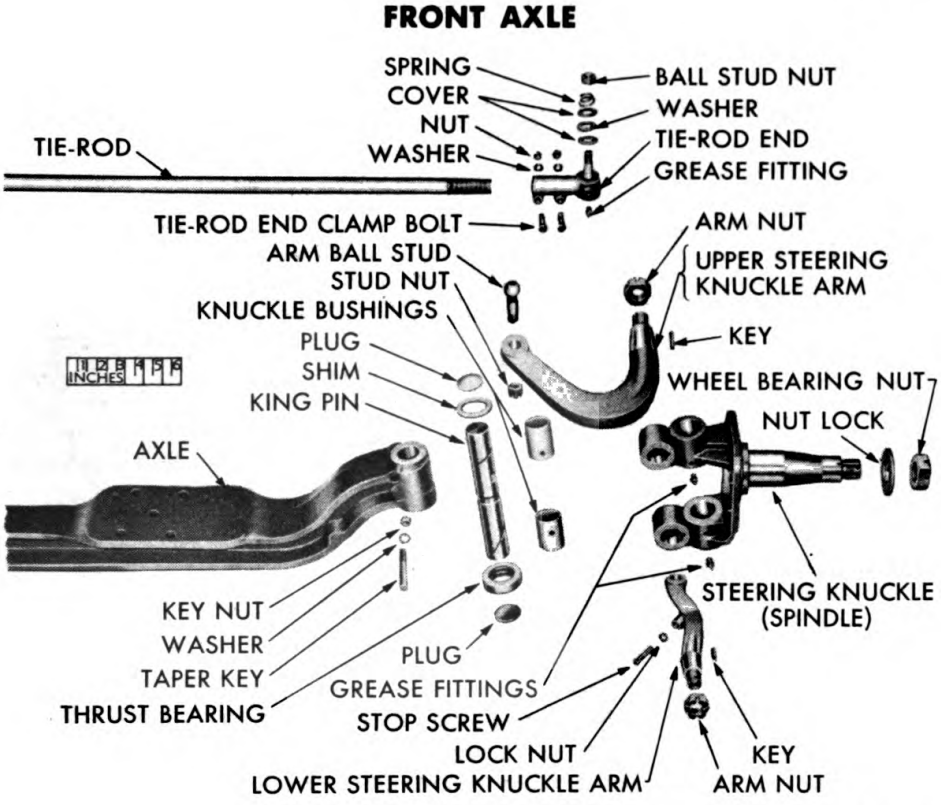


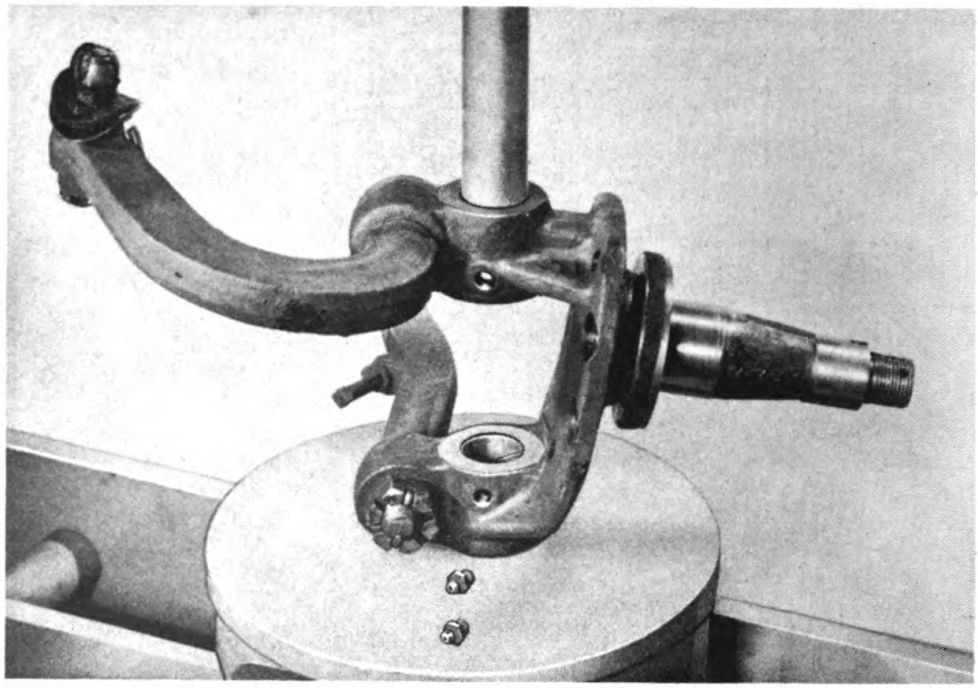
Figure 119 — Front Axle (6x4) — Disassembled

plate (fig. 117). Pull the inner bearing cone and felt washer with retainer from knuckle spindle, using universal puller. Drive a pointed tool into upper expansion plug over top of king pin, and pry plug out of knuckle. Remove nut and washer from king pin tapered key, and drive key out of axle toward front. Drive king pin downward to remove lower expansion plug and king pin. Remove the knuckle, thrust bearing, and shims from end of axle (fig. 118). The other knuckle is removed from axle end in the same manner.

44. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts (fig. 119) thoroughly with dry-cleaning solvent, except brake shoes. Clean bearings by moving them up and down in dry-cleaning solvent while turning slowly by hand. Tap large end of bearings sharply against a wood block to dislodge any solid particles; dry with compressed air, and avoid spinning bearings. Make sure all grease passages are open and free of old lubricant or foreign matter.

b. Inspection. Examine all parts carefully for pits, scores, cracks, or other damage. Inspect steering knuckle bushings and king pin for proper fit. Check axle for twist or other damage. Examine tie rods and ends for cracks, stripped threads, or other damage. Inspect brake shoe linings for excessive wear or looseness.



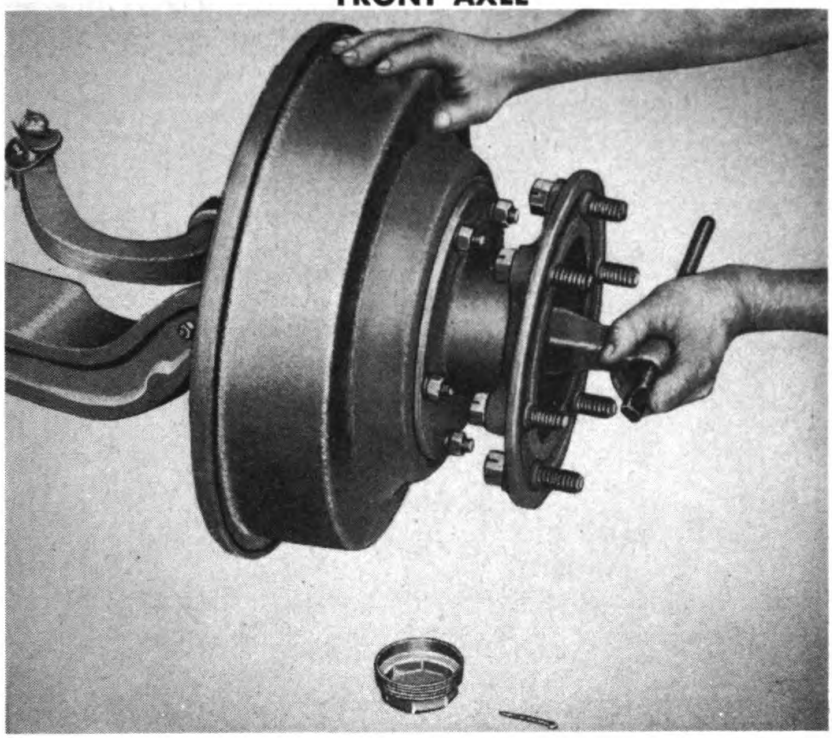
RA PD 319352

Figure 120 — Installing Steering Knuckle Bushings

c. Repair. If the axle is bent or twisted, straighten it cold provided the bend or twist does not exceed 1 degree; otherside, replace the axle. Replace knuckle bushings, if king pin to bushing clearance is greater than 0.002 inch, with a suitable remover and replacer (fig. 120); make sure lubricant holes in bushings are alined with holes in knuckles. Line-ream bushings to from 1.249 to 1.250 inches after installation. Replace the king pins, knuckles, or thrust bearings if they are not satisfactory for further service. If the tie rod or ends are not serviceable, replace parts as required. Replace the hubs and drums if they are not satisfactory for further service. Remove the wheel bearing cups with universal puller, and replace with a suitable replacer if they are no longer serviceable. If the brake shoe linings are worn almost to the rivet heads or are loose on the shoes, replace the linings. Replace the brake backing plates if they are not suitable for additional service.

45. ASSEMBLY.

a. Install Steering Knuckle (Spindle) Assemblies. Place knuckle in position over axle end, and start king pin through lower bushing; insert thrust bearing between lower portion of knuckle and axle; push king pin through bearing and into axle. Make sure the notch in king pin is toward king pin keyhole in axle. Install shims between axle and upper portion of knuckle so there is no up or down movement of knuckle and no binding. Push king pin upward into



RA PD 319373

Figure 121 — Adjusting Front Wheel Bearings

position; install king pin key, lock washer, and nut. Install new upper and lower expansion plugs in knuckle. Install new oil seal on spindle, and fasten brake backing plate securely to knuckle with bolts, nuts, washers, and cap screws. Place the hub oil drain in position and tighten securely to backing plate with cap screws. Pack wheel bearing cones with proper lubricant, and install inner bearing cone on spindle. Install hub with drum, outer bearing cone, washer, and adjusting nut. Tighten nut until hub binds, loosen one-sixth turn or sufficiently so that hub just turns freely on the bearings (fig. 121). Lock the adjusting nut with a new cotter pin, and install the hub cap. Follow the same procedure to install the other knuckle.

b. Install Steering Knuckle Tie Rod Assembly. Install the covers over each tie rod end ball stud, with a new washer between, and a coil spring. Place tie rod end ball studs into position in knuckle arms, tighten securely with castle nuts, and install new cotter pins. After axle is installed on vehicle, adjust toe-in (par. 46 e).

46. FRONT WHEEL ALINEMENT (ON VEHICLE).

a. General. In order to ensure ease of steering and satisfactory tire life, proper alinement of the front wheels must be maintained. The three principal factors governing wheel alinement are: wheel camber, axle caster, and wheel toe-in. Whenever the front axle and wheels have been subjected to heavy impacts due to a collision or

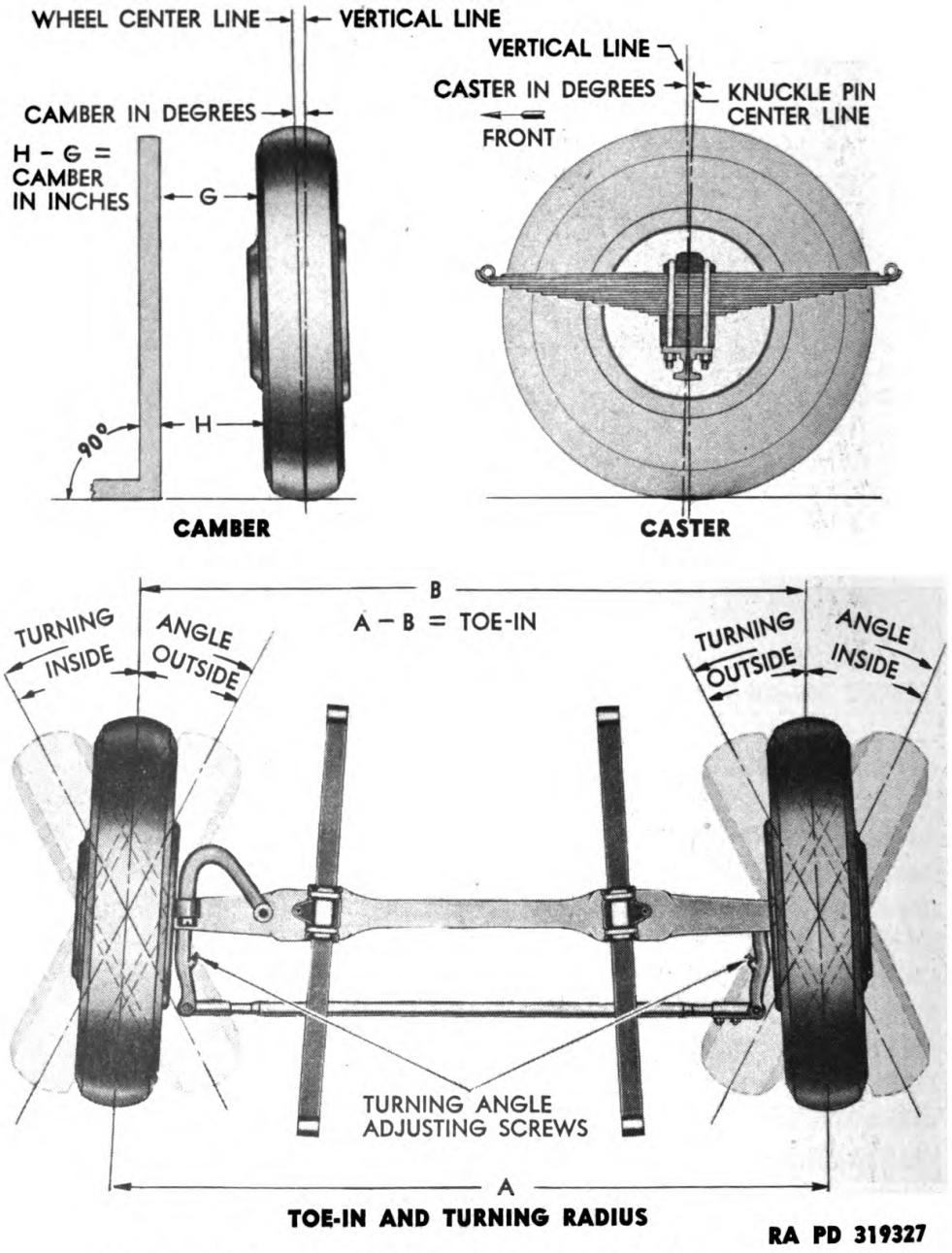


Figure 122 — Front Wheel Alinement Chart (6x4)

severe bumps, check the alinement of front wheels without delay. Wheel bearings and knuckle bearings must be in proper adjustment to obtain accurate wheel alinement measurements.

b. Caster (fig. 122). Caster is the amount that the steering knuckle king pins are inclined toward the front or rear of vehicle. Positive caster is the inclination of the king pin upper end toward rear of vehicle, while negative or reverse caster is the inclination of the

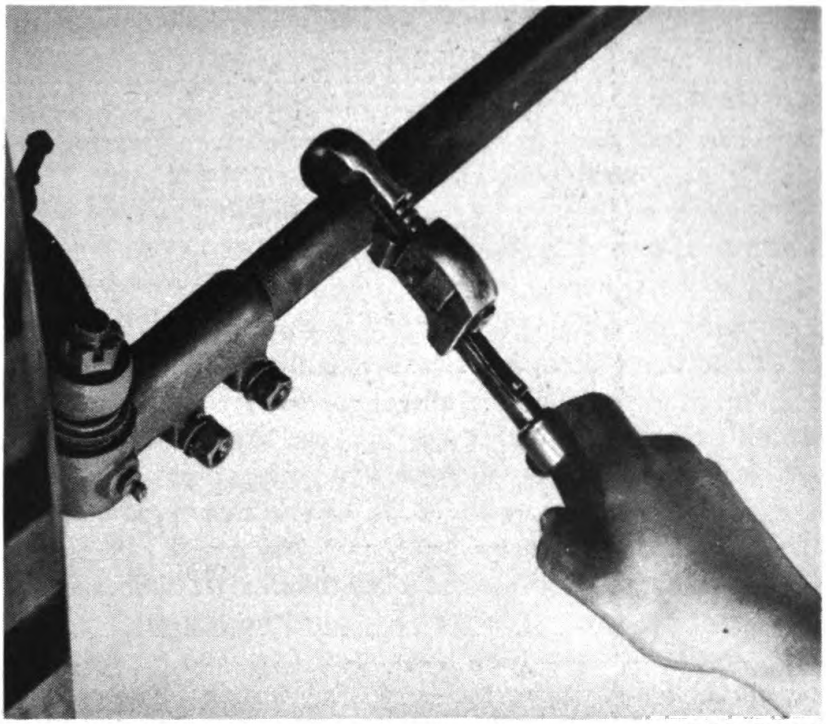


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Figure 123 — Adjusting Toe-in (6x4)

king pin upper end toward the front of vehicle. The amount of inclination past vertical is measured in degrees, and the proper caster is 1 degree 37 minutes positive (top of king pin toward rear). Slight caster adjustments can be made by installing tapered wedge plates or shims between spring and axle pad in correct manner to give proper adjustment. Major misalinement of caster indicates broken, damaged, twisted, dislocated, or excessively worn parts. The purpose of caster is to provide the stability necessary to keep the front wheels in straight-ahead position, and to assist in straightening the front wheels after making a turn.

c. Camber (fig. 122). Camber is the amount, measured in degrees, that the top of the wheels are inclined from the vertical. Positive camber is the outward inclination of the wheels at the top from vertical, while negative or reverse camber is the inward inclination of the wheel at the top from vertical. The proper positive camber of 0 to 1 degree is set in the axle at time of manufacture, and cannot be altered by adjustment. If checking reveals that the camber is greater than 1 degree positive, or less than 0 degree, it indicates worn or damaged parts which must be replaced or repaired. Heating the axle to adjust the camber by bending destroys the original heat treatment of the steel, and weakens the part. Cold-bending steel more than 1 degree may produce a fracture, and render the part unsafe. The purpose of camber is to offset wear of the front axle parts by preventing wheels

from going into negative camber after long service. Incorrect camber results in excessive tire wear.

d. King Pin Inclination. This is the amount measured in degrees that the king pins incline at the top toward the center line of the vehicle, or inward at the top. Axle design establishes the correct king pin inclination of 8½ degrees.

e. Toe-in.

(1) DESCRIPTION (fig. 122). The purpose of toe-in is to offset the effect of camber on tire wear, and it is highly important that periodic checks be made for correct wheel toe-in. If it is found to be out of adjustment, make immediate corrections, and check all front axle parts to determine whether there are any bent or extremely loose parts. Toe-in is measured at the edge of the rim flange with wheels in the straight-ahead position.

(2) ADJUSTMENT. Loosen the clamp bolts in both tie rod ends, and turn the rod clockwise (as viewed from the left end) to decrease, or counterclockwise to increase, the toe-in (fig. 123). Adjust tie rod length so that the front wheels toe-in 1/16 to ⅛ inch. The rod and ends have right- and left-hand threads, with 16 threads per inch to permit accurate adjustment. Tighten the clamp bolts securely at each end on completion of adjusting operation.

f. Turning Radius (fig. 122). The turning radius of the front wheels is governed by the setting of a stop (adjusting) screw on each knuckle arm. Proper adjustment is established during production, and is then secured by locking the stop screws and welding them to the knuckle arms. Whenever a knuckle arm is changed or the weld breaks loose, adjust the stop screw for proper turning radius, lock stop screw with lock nut, and weld to knuckle arm.

Section III

FITS AND TOLERANCES

47. FRONT AXLE (6x6 VEHICLES).

Steering knuckle up-and-down thrust:

Adjustment	Shims
Shim thickness	0.005, 0.010, and 0.030 in.
Up-and-down play	Barely perceptible, but loose enough so that bearings do not bind

Turning radius stop screw:

Maximum angle of inner wheel	28 deg
Maximum angle of outer wheel	24 deg 15 min

FRONT AXLE

Tie rod end:	
Bushing, ream	0.7495 to 0.7505 in.
Clearance, bolt to bushing	0.0005 to 0.0015 in.
Differential:	
Bearing adjustment	Nonadjustable
Gear to pinion backlash	0.006 to 0.010 in.
Gear run-out, not over	0.002 in.
Case run-out, not over	0.002 in.
Clearance between:	
Cross and pinion	0.003 to 0.007 in.
Side gear and case	0.005 to 0.009 in.
Side gear thrust washer:	
New limits	0.062 to 0.058 in.
Worn limits	0.048 in.
Pinion gear thrust washer:	
New limits	0.062 to 0.058 in.
Worn limits	0.048 in.
Pinion shaft:	
Bearing adjustment	No perceptible end play
Pinion carrier adjustment	Shim
Shim thickness	0.003 in.
Drive gear thrust block:	
Clearance, block to gear	0.015 to 0.023 in.
Block thickiness:	
New limits	0.210 to 0.214 in.
Worn limits	0.187 in.
Axle shaft:	
Run-out, not over	0.015 in.
Clearance, side gear to shaft	0.0000 to 0.004 in.
Shim pack thickness	0.038 to 0.536 in.
Adjustment	See par. 40 e
Front end alinement:	
Toe-in	$\frac{1}{16}$ to $\frac{3}{16}$ in.
Center line of steering arm ball to outside of spring	$4\frac{9}{16}$ in.
Backing plate to center line of tie rod end bolt	$\frac{3}{16}$ in.
Wheel camber	0 to ¾ deg positive
Bottom of steering arm to top of axle housing	$2\frac{5}{8}$ in.
Caster angle	2 deg positive
Turning radius:	
Cargo	35 ft
Dump	32 ft

48. FRONT AXLE (6x4 VEHICLES).

Steering knckle pin:	
Outer diameter	1.2480 to 1.2485 in.

ORDNANCE MAINTENANCE—POWER TRAIN, CHASSIS, AND BODY FOR 2½-TON 6x6 TRUCK AND 2½- TO 5-TON 6x4 TRUCK (STUDEBAKER MODELS US6 AND US6x4)

Steering knckle up-and-down thrust:

Adjustment	Shims
Shim sizes:	
Thin	0.109 to 0.114 in.
Medium	0.118 to 0.123 in.
Thick	0.127 to 0.132 in.
Up-and-down play	Loose enough so bearings do not bind with no play

Steering knuckle bushing:

Outer diameter	Press fit
Knuckle hole diameter	1.3745 to 1.3755 in.
Inner diameter	1.249 to 1.250 in.
Clearance, bushing to pin	0.005 to 0.002 in.

Turning radius stop screw:

Maximum angle of inner wheel	28 deg
Maximum angle of outer wheel	24 deg 15 min

Tie rod end:

Type	Ball joint
Serviced	As an assembly

Front end alinement:

Toe-in	1/16 to 1/8 in.
Center line of steering arm ball to outside of spring	4 5/8 in.
Backing plate to center line of tie rod ball joint stud	1 11/16 in.
Wheel camber	0 to 1 deg positive
Front axle spring pad to center of steering arm ball joint	7 11/16 in.
Caster angle	1 deg 37 min positive
King pin inclination	8½ deg
Turning radius:	
Cargo	35 ft
Tractor	32 ft

CHAPTER 7

REAR AXLES

49. DESCRIPTION.

a. The two driving rear axle units are the full-floating type with bevel driving gears. The differential case (fig. 124) consisting of matched halves, contains a cross with four pinions and two bevel side gears. A bevel drive (ring) gear is riveted to the case flange, and side bearings are pressed on the case hubs. The drive pinion is supported by two opposed tapered roller bearings and one straight roller bearing. The tapered roller bearings take radial and thrust loads, and are adjustable for wear. A bronze thrust block is provided in the axle housing in line with the pinion and ring gear contact point, to take side thrust on the ring gear. Power is transmitted from the transfer case by propeller shafts to the drive pinions, through the differentials and axle shafts, to the rear wheels. The axle shafts have flanges that are fastened to the hubs by means of studs, nuts, and split tapered dowels (figs. 125 and 126). The spring suspension and drive are taken care of by integral anchor straps and torque rod brackets on the housing. Three torque rods are connected to each axle.

50. DATA.

Make	Timken
Housing	Split type
Drive	Through torque rods
Differential:	
Gear ratio	6.6 to 1
Drive	Spiral bevel
Bearings	Timken tapered roller
Cone	T.R.B. 3982
Cup	T.R.B. 3920
Drive pinion:	
Bearings:	
Straight roller	Bower S-5305-W
Tapered	Timken tapered roller
Cone	T.R.B. 44150
Cup	T.R.B. 44348
Axle shaft:	
Diameter, differential end	1.615 to 1.620 in.
Number of splines	16

51. DISASSEMBLY.

a. Preliminary Cleaning of Assembly. Place assembly on a suitable stand or bench, and clean exterior thoroughly with dry-cleaning solvent. Dry with cloths or compressed air.

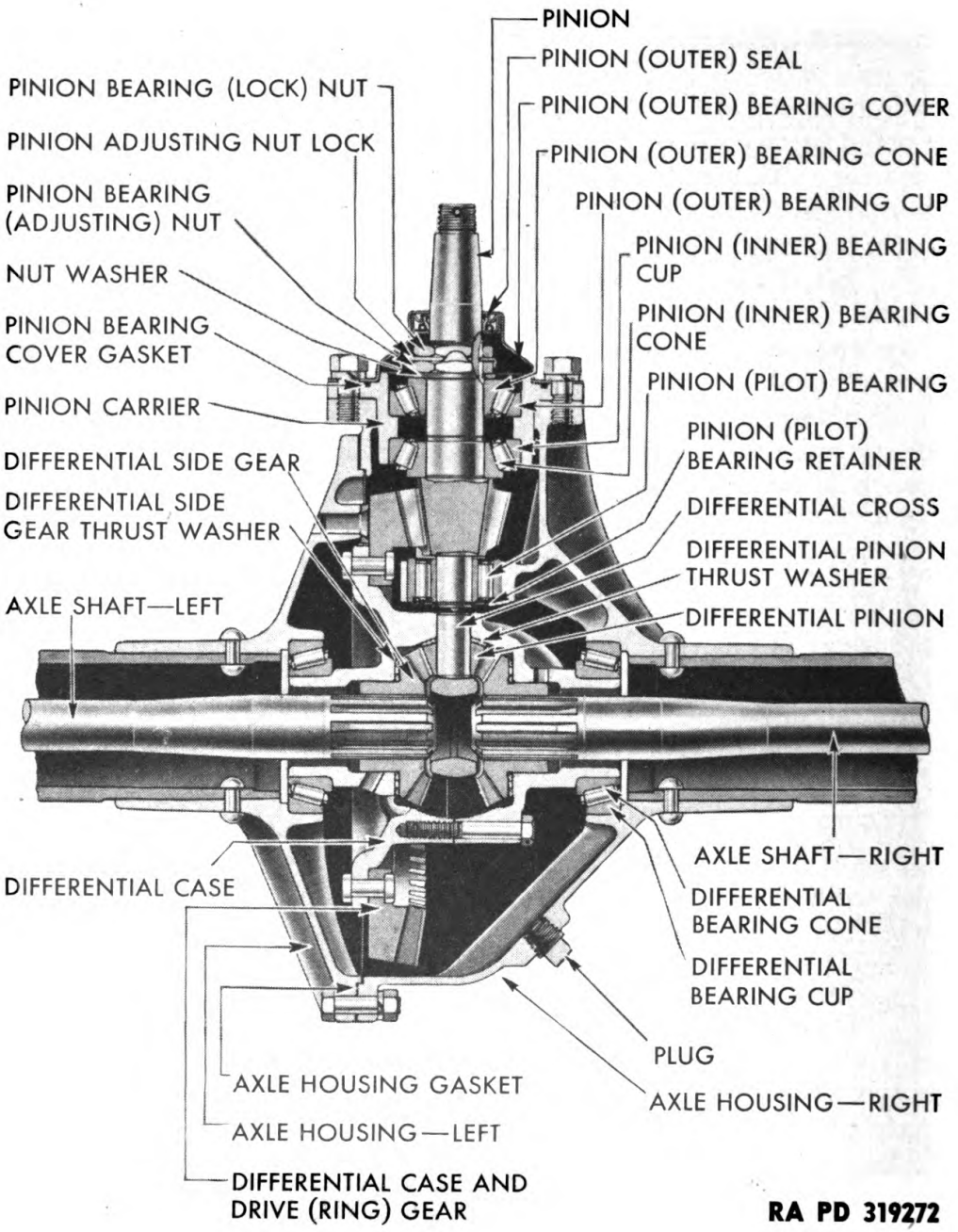

Figure 124 — Rear Axle Differential — Sectional View

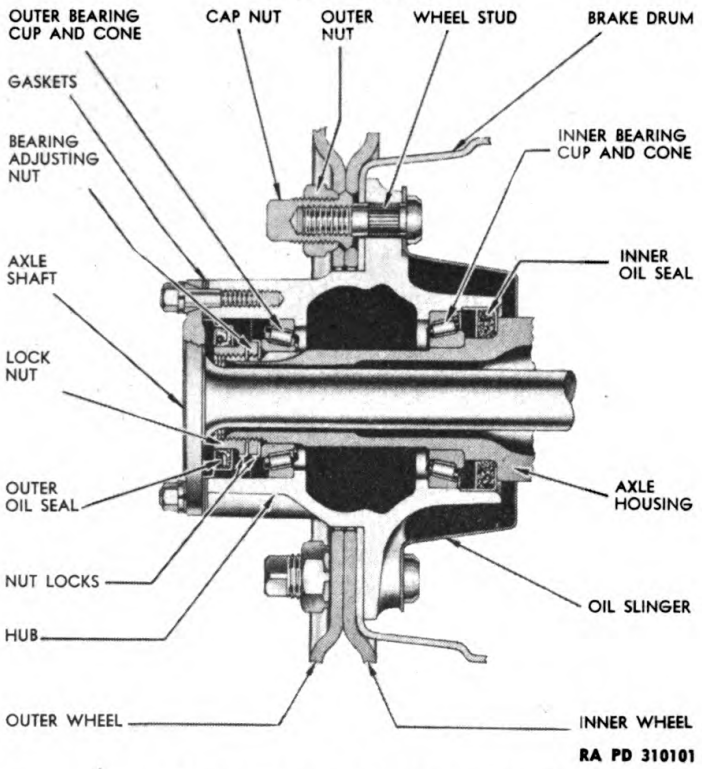

Figure 125 — Hub at Rear Wheels (Demountable-type Drum) — Sectional View

b. Remove Wheels, Hubs, and Drums. Remove wheels and tires from rearward rear axle assembly, if not previously removed. Remove nuts and washers from rear axle flange studs, and loosen the lock nuts on the axle shaft puller screws. Turn puller screws in about ½ inch to move the axle shaft flange and split tapered dowels away from hub. Unscrew axle shaft puller screws until the points are flush with the axle shaft flange inner surface, and tighten lock nuts. Drive axle shaft flange in against hub, remove the split tapered dowels, axle shaft, outer oil seal, and gaskets. Unlock and remove the lock nut, locks, and adjusting nut. Slide the hub and drum assembly off the axle housing (fig. 127). Lift outer bearing cone from hub, and drive the inner bearing cone and grease washer with retainer out of the inner cup. Repeat the procedure to remove the other hub and drum.

c. Drive Pinion and Carrier. Refer to paragraph 38 **d** for removal and disassembly of drive pinion and carrier.

d. Differential Assembly. Refer to paragraph 38 **e** for removal and disassembly of differential.

52. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts (fig. 128) thoroughly with dry-cleaning solvent and dry with cloths or compressed air. Move the bearing

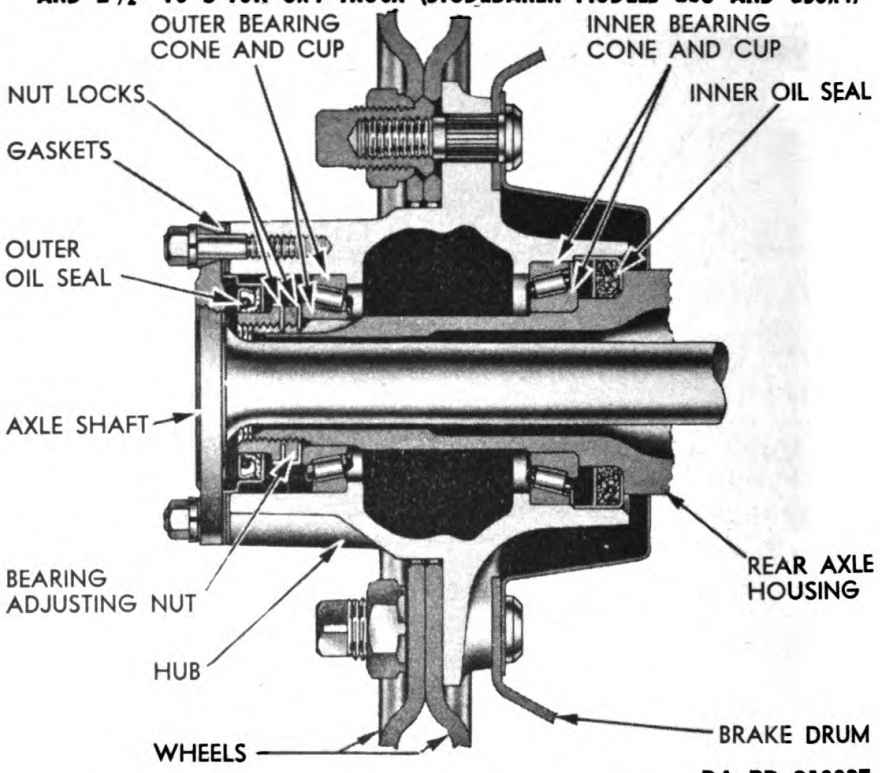

Figure 126 — Hub at Rear Wheels (Conventional-type Drum) — Sectional View

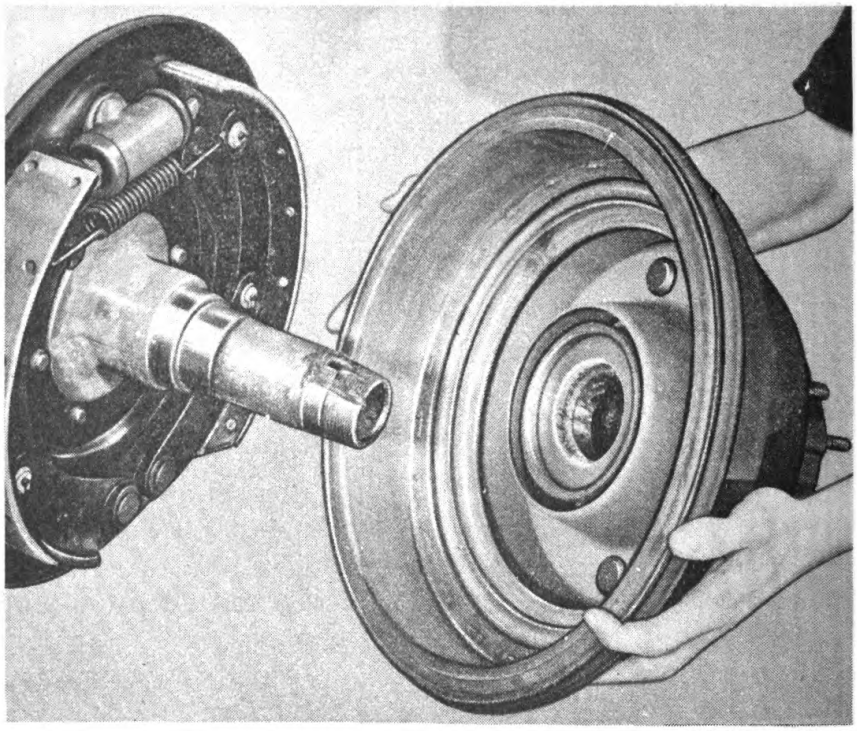

Figure 127 — Removing Hub and Drum

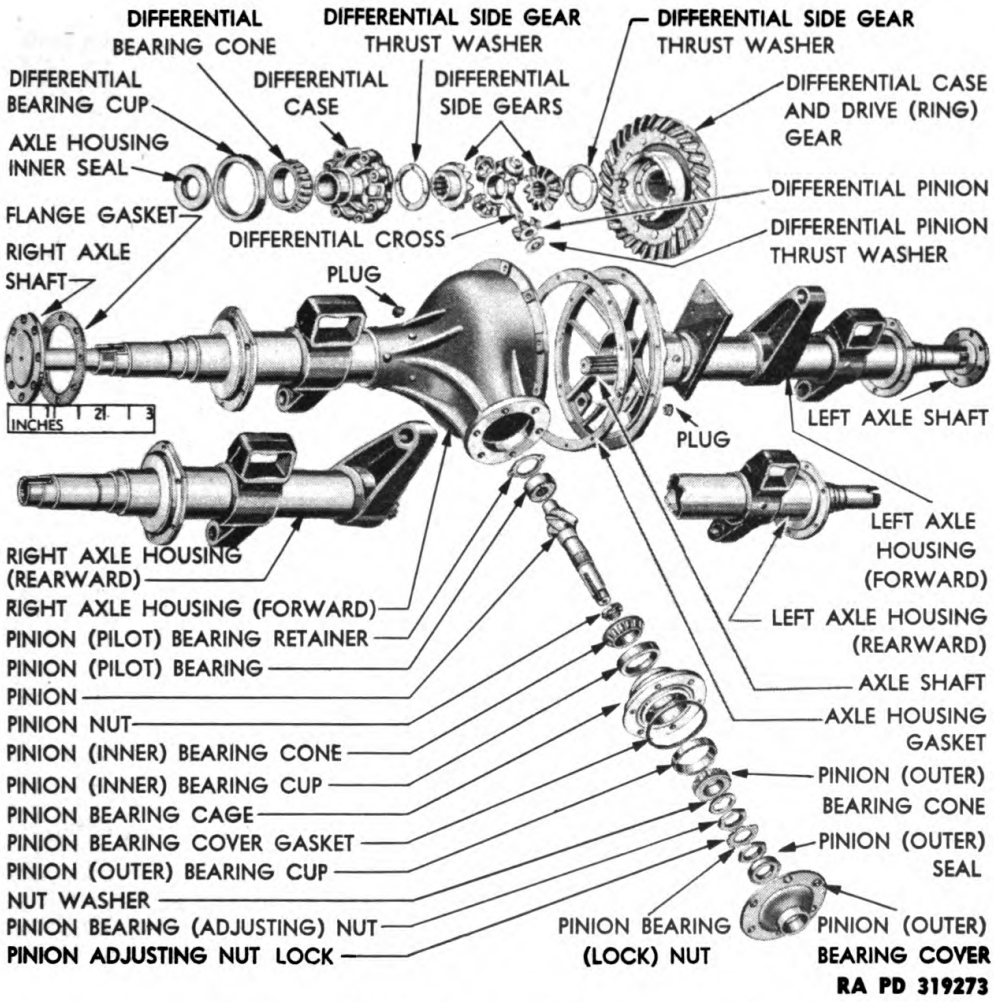

Figure 128 — Rear Axle Disassembled

cones up and down in dry-cleaning solvent, and turn them slowly below surface of liquid. Strike the large open side of bearings sharply against a wood block to remove solid particles. Dry with compressed air directed across bearings so they do not spin. Clean inside of housings thoroughly, and dry with compressed air.

b. Inspection. Examine all tapered bearing rollers and cups for scores, cracks, pits, or other damage. Check the axle shafts for cracks, twisted splines, or bent flange. Inspect the differential cross for cracks or scored journals. Examine all gears for nicks, cracks, or scores. Inspect the housings, pinion carrier, and differential case for cracks, distortion, or other damage. Check the drive gear thrust block for scores, cracks, or excessive looseness in housing. Examine the drive pinion straight roller bearing for breakage or other damage, and the straight roller bearing inner race on pilot end of pinion for scores or pits. Examine the hubs and drums for cracks or damage,

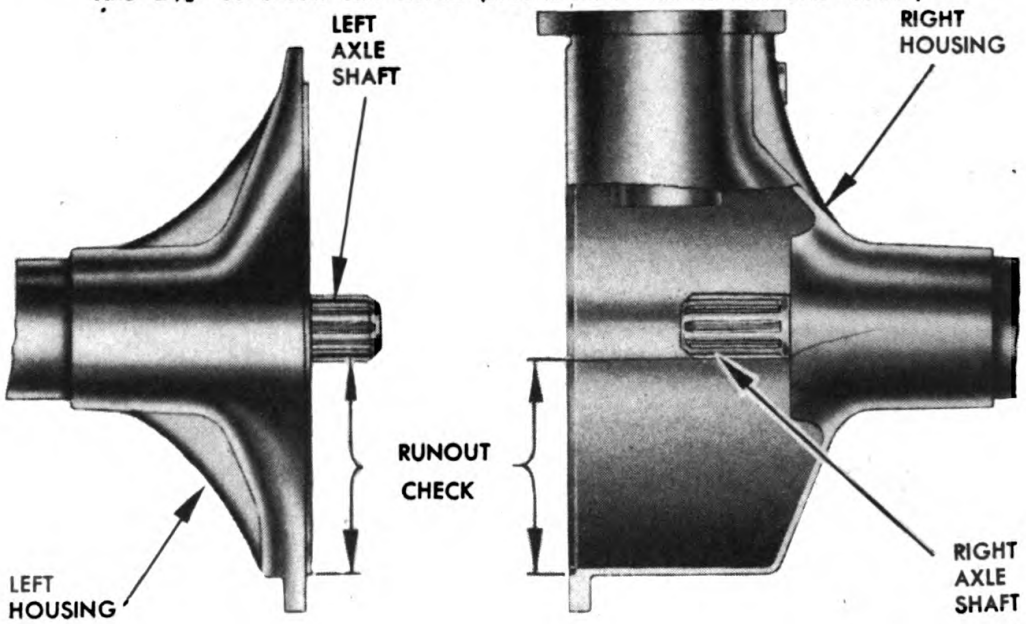

Figure 129 — Axle Shaft Run-out Check

and the brake shoe linings for excessive wear or looseness. Inspect the brake backing plate for cracks, distortion, or damage. To check axle shafts in housings for run-out, wobble, or damaged housing, temporarily install hubs and drums with wheel bearings and tighten bearing nuts so that hubs will just turn. Install axle shaft, using tapered dowels on all studs, and tighten nuts securely. Turn hub slowly (do not spin while bearings are dry), and check inner end of shaft to determine if the run-out or wobble exceeds $\frac{1}{32}$ inch (fig. 129). Measure the distance from the splines to the outer edge of the pilot shoulder on the left half of housing, and to the outer edge of recess in right half of housing. If these measurements taken at four points 90 degrees apart vary more than $\frac{1}{32}$ inch, the housing is distorted or damaged.

c. Repair.

(1) BEARINGS. Replace bearing cones and cups that have been removed and are not satisfactory for further service. If the differential side bearing cups are not serviceable, remove them with bearing cup remover 41-R-2374-25, and replace with bearing cup replacer 41-R-2391-67 and handle 41-H-1074. Remove the drive pinion tapered roller bearing cups with universal puller, and replace with pinion bearing cup replacer 41-R-2395-37 if they are not satisfactory. If the drive pinion straight roller bearing is broken or damaged, remove the rivets and retainer; then remove and replace the bearing with pinion front bearing replacer 41-R-2389-13. Install the straight roller bearing retainer with new rivets. Remove the

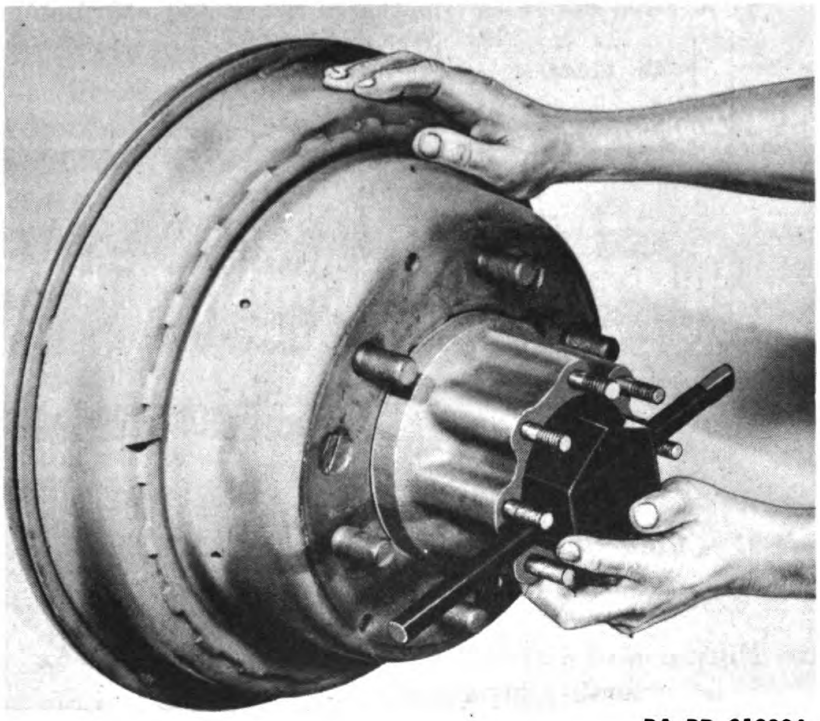

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Figure 130 — Adjusting Rear Wheel Bearings

snap ring that holds pinion straight roller bearing inner race on pinion, and pull the race off the pinion. Install replacement race and a new snap ring on pinion.

(2) DIFFERENTIAL, PINION, AND AXLE SHAFTS. Replace any differential parts that are not suitable for further service. When either the bevel drive gear or drive pinion is unsatisfactory for service, replace both with a matched gear and pinion set. If the pinion carrier is not satisfactory for service, replace it. When an axle shaft is unsatisfactory for further service, replace it.

(3) HOUSINGS. If a satisfactory repair cannot be made on the housing by welding, replace it. Replace the bevel drive gear thrust block with a new pin, if unsatisfactory for additional service.

(4) HUBS, DRUMS, BRAKE SHOES, AND BACKING PLATES. Replace the hubs and drums if they are not satisfactory for further service. Remove the wheel bearing cups with universal puller and replace with wheel bearing cup replacer 41-R-2396-12 and handle 41-H-1074, if they are no longer serviceable. If the brake shoe linings are worn almost to the rivet heads or are loose on the shoes, replace the linings. Remove the brake backing plates, and replace them with new rivets if they are not suitable for additional service.

53. ASSEMBLY.

a. Differential Assembly. See paragraph 40 b for differential assembly and installation instructions.

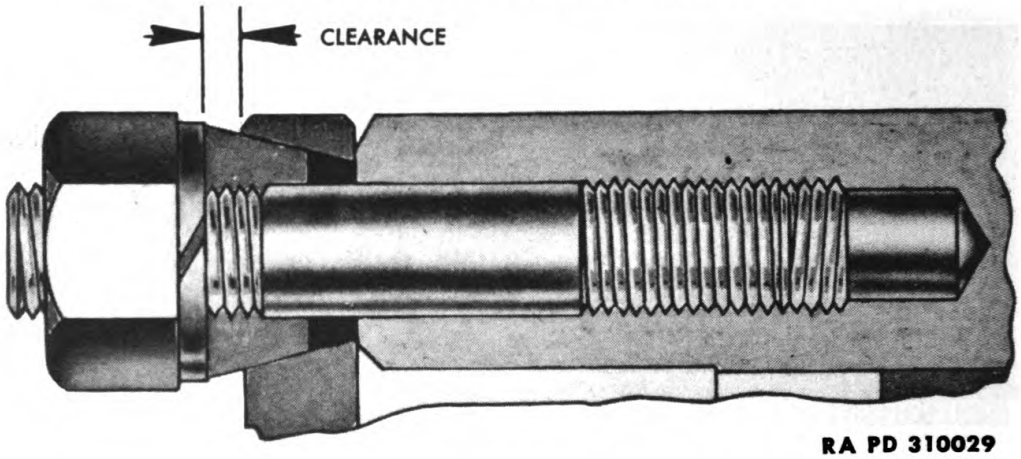

Figure 131 — Clearance Required Between Axle Shaft Stud Nut Lock Washers and Driving Flange

b. Drive Pinion and Carrier. See paragraph 40 c for drive pinion and carrier assembly installation instructions.

c. Install Wheels, Hubs, and Drums. Place the inner bearing cone into the inner bearing cup, and install a new grease washer with retainer into position. Slide the hub and brake drum as an assembly over the axle housing, install the outer bearing cone, adjusting nut lock, and adjusting nut. Tighten adjusting nut while rotating hub until it binds (fig. 130), loosen about one-sixth turn or until hub turns freely, and bend a portion of lock over a flat on adjusting nut. Install outer lock and lock nut; tighten the lock nut, and bend a portion of lock over a flat on lock nut. Install a new outer oil seal with a new gasket on each side of seal over the axle shaft flange studs in the hub. Insert splined end of axle shaft through hub, guiding splined end of axle shaft into differential side gear. Install split tapered dowels on all studs, install nuts with new lock washers, and tighten nuts alternately. There must be a slight clearance between the lock washers and driving flange when the nuts are tightened securely (fig. 131). Excessive wear on studs, dowels, or holes in the flange will be indicated when no clearance exists.

54. FITS AND TOLERANCES.

Differential:

Bearing adjustment	Nonadjustable
Gear to pinion backlash	0.006 to 0.010 in.
Gear run-out, not over	0.002 in.
Case run-out, not over	0.002 in.

Clearance between:

Pinion and cross	0.003 to 0.007 in.
Side gear and case	0.005 to 0.009 in

REAR AXLES

Side gear thrust washer:	
New limits	0.058 to 0.062 in.
Worn limits	0.048 in.
Pinion gear thrust washer:	
New limits	0.058 to 0.062 in.
Worn limits	0.048 in.
Pinion shaft:	
Bearing adjustment	Bearings must turn with no perceptible end play
Pinion carrier adjustment	Shim
Shim thickness	0.003 in.
Drive gear thrust block:	
Clearance, block to gear	0.015 to 0.023 in.
Block thickness:	
New limits	0.0210 to 0.214 in.
Worn limits	0.187 in.
Axle shaft:	
Shaft flange run-out, not over	0.015 in.
Shaft run-out at splines, not over	$\frac{1}{32}$ in.
Housing inspection:	
Variation from axle shaft splines, not over	$\frac{1}{32}$ in.

CHAPTER 8

SPRINGS AND SHOCK ABSORBERS

Section I

SPRINGS

55. DESCRIPTION AND DATA.

a. Description. The front springs are semielliptical, and each eye has a bushing. Each front spring assembly is held together with a center bolt and nut and six rebound clips. The rear springs are inverted semielliptical. Each rear spring assembly is held together with a center bolt and nut and four rebound clips. The connecting bar with brackets is fastened to the underneath side of vehicle frame. A spring seat with tapered roller bearings is mounted on each end of connecting bar to support the rear springs (fig. 132).

b. Data.

Front:

Length (center-of-eye to center-of-eye)	40 in.
Length (center-of-eye to seat-center)	20 in.
Width	2 in.
Rebound clips (each spring)	6
Number of leaves	14

Rear:

Length (over-all)	51½ in.
Length (end-to-seat-center)	25¾ in.
Width	2½ in.
Rebound clips (each spring)	4
Number of leaves	13
Spring seat bearings	Timken tapered roller
Cone, inner	T.R.B. 3767
Cup, inner	T.R.B. 3720
Cone, outer	T.R.B. 2788
Cup, outer	T.R.B. 2720

56. DISASSEMBLY.

a. Front Springs. Remove the spring rebound clip bolt, nuts, and spacers. Remove spring center bolt and nut, and separate the leaves.

b. Rear Springs. Remove spring rebound clip bolts, nuts, and spacers. Remove spring center bolt and nut, and separate the leaves.

c. Connecting Bar and Brackets.

(1) REMOVAL. Raise and support the rear of vehicle until the

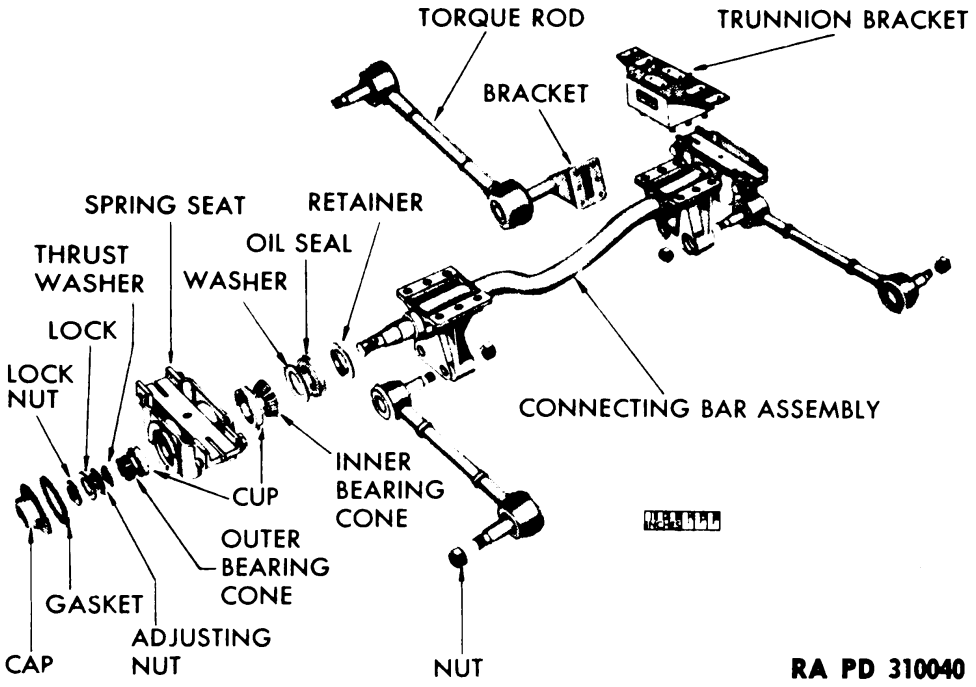

Figure 132 — Rear Spring Seat, Connecting Bar (Bogie Shaft), and Torque Rods, Disassembled

weight is off the spring seats. Remove nuts and lock washers from torque rod studs attached to connecting bar brackets. Apply pressure against each rod, and strike the bracket in front or back of the stud taper with a heavy hammer to disengage the tapered stud. Remove rear spring U-bolt nuts and U-bolts from both sides, and loosen the spring seat clamp stud nuts. Take off the nuts that hold connecting bar brackets in position, and remove the connecting bar assembly.

(2) DISASSEMBLY. Remove the spring seat bearing cap screws, cap, bearing lock nut, lock, and adjusting nut. Slide the spring seat with outer bearing cone and thrust washer off the connecting bar. Pull the inner bearing cone off the bar with the universal puller. Remove the bearing oil seal and retainer. Repeat the procedure to remove the other spring seat assembly.

57. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean the parts thoroughly in dry-cleaning solvent. Wash bearing cones carefully, and then tap the open side of the cone sharply against a wood block to dislodge any solid particles. Dry the parts with cloth or compressed air, being careful not to spin the bearing cones.

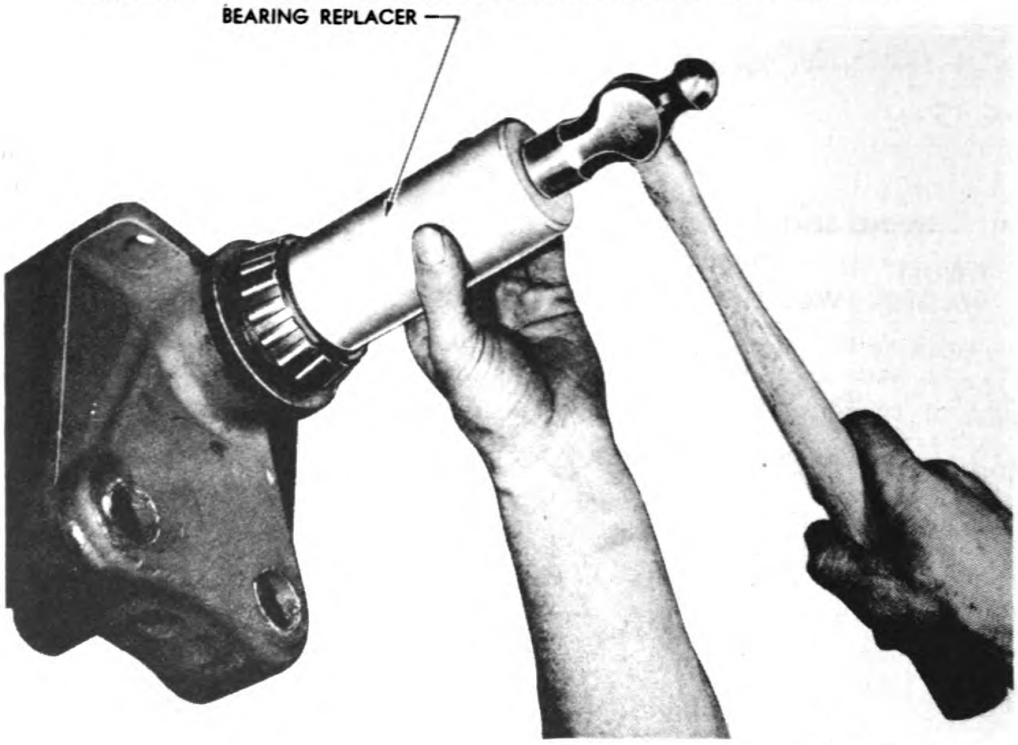

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Figure 133 — Installing Rear Spring Seat Inner Bearing Cone

b. Inspection. Examine the front spring eye and hanger bushings for scores or looseness. Inspect the front spring bolts for cracks, scores, or damage. Check the spring leaves and rebound clips for cracks, abrasions, or damage. Examine the spring seat bearing cones and cups for pits, scores, or cracks. Inspect the spring seat for cracks or damage. Check the connecting bar and brackets for cracks, twist, broken welds, stripped threads, or damage.

c. Repair. Replace the front spring eye or hanger bushings if they are not satisfactory for further service. If the front spring bolts are no longer serviceable, replace them. Replace spring leaves that are not suitable for additional service, or replace the spring assembly. Remove and replace with new rivets any rebound clips that are broken or damaged. If the spring seat or bearing cones are no longer satisfactory for service, replace them. Remove the bearing cups from the spring seat, and replace them if they are not satisfactory for further service. Replace the connecting bar and brackets if a satisfactory repair cannot be made by welding, or if otherwise not suitable for additional service.

58. ASSEMBLY.

a. Front Springs. Coat surfaces of leaves with spring lubricant, assemble leaves in proper order on the spring center bolt, install center

bolt nut, and tighten securely. Install rebound clip bolts, spacers, and nuts.

b. Rear Springs. Coat surfaces of leaves with spring lubricant, assemble leaves in proper order on spring center bolt, install center bolt nut, and tighten firmly. Install rebound clip bolts, spacers, and nuts.

c. Connecting Bar and Brackets.

(1) ASSEMBLY. Place the spring seat inner bearing oil seal retainer and new oil seal in position on connecting bar spindle. Pack spring seat bearing cones with general purpose grease, and install the inner bearing cone on connecting bar spindle with inner bearing replacer 41-R-2391-30 (fig. 133). Install the spring seat, outer bearing cone, thrust washer, and adjusting nut on the connecting bar spindle. Tighten the adjusting nut while oscillating the spring seat so that the bearings seat properly but do not bind. Install a new adjusting nut lock and lock nut, and tighten lock nut securely. Bend a portion of nut lock over flat of adjusting nut and lock nut. Place the spring seat bearing cap in position with a new gasket, install cap screws, and tighten securely. Repeat the procedure to install the spring seat on other end of connecting bar.

(2) INSTALLATION. Place the connecting bar assembly in position so that the brackets are over studs in trunnion brackets. Install the nuts on studs, tighten them securely, and stake the nuts to the studs. Place U-bolts in position over rear springs and through spring seats. Install nuts on U-bolts, make sure the end of center bolt enters recess in spring seat, and tighten the nuts securely. Tighten the spring seat clamp stud nuts. Place the torque rod studs into position in brackets, install lock washers and nuts, and tighten securely. Lower the vehicle, and fill spring seat housings with general purpose grease.

Section II

SHOCK ABSORBERS

59. DESCRIPTION AND DATA.

a. Description. The double-acting hydraulic shock absorber has two pistons which are fastened together with two screws. A cam operates the pistons, forcing the fluid through a passage in each piston and through the rebound (relief) valve (fig. 134). The rebound valve and the use of special shock absorber fluid, which has very little viscosity change, make it unnecessary to change the fluid for various temperature changes. The shock absorber links are nonadjustable and require very little attention.

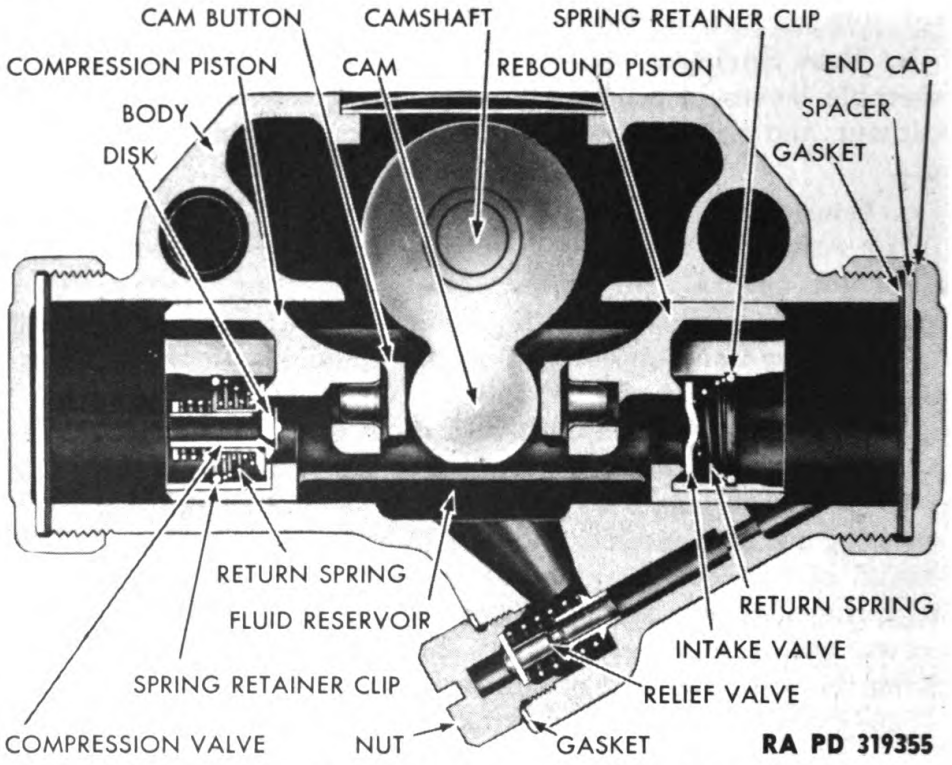


Figure 134 — Cross Section of Shock Absorber

b. Data.

Make ..... Delco
Type ..... Double-acting

60. DISASSEMBLY.

a. Preliminary Cleaning. Clean exterior of shock absorber thoroughly with dry-cleaning solvent to remove all dirt, grease, and loose paint. Dry the shock absorber with compressed air or cloth.

b. Disassembly. Place the shock absorber in a suitable fixture. Note: *Do not clamp the assembly in a vise, as pressure will distort the body and cause the pistons to seize.* Unscrew the end caps, and remove the spacers and gaskets. Take out the valve spring retainers, springs, valves, and disks. Pierce and remove the expansion plugs over the piston screws. Remove the piston screws, springs, and pistons from the body. Remove nut holding rebound (relief) valve in body, take out spring-loaded relief valve, and drain all fluid from body (fig. 135).

61. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts thoroughly in dry-cleaning solvent, and dry with cloth or compressed air. Make sure the passages in compression valve, rebound piston, and body are not clogged.

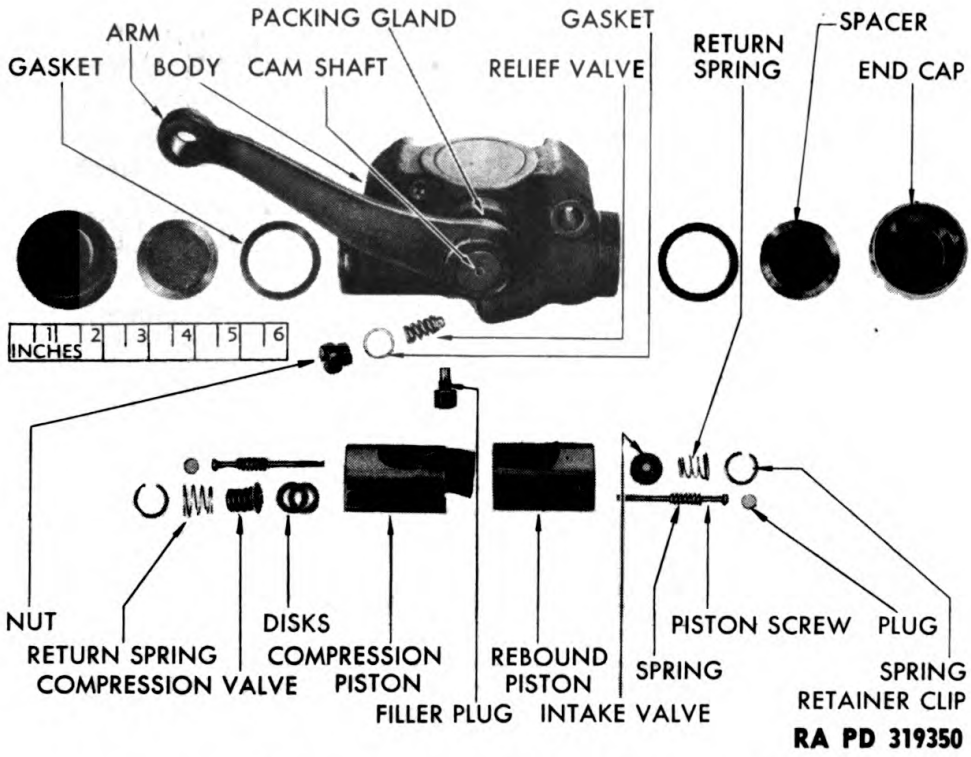


Figure 135 — Shock Absorber Disassembled

b. Inspection. Examine the cam lobe for scores or breakage. Inspect the body for leakage around the shaft, cracks, or scored cylinders. Check the arm and link for cracks, breakage, or damage. Examine the pistons for scores or breakage. Inspect the valves and disks for scores or distortion, and the springs for breakage.

c. Repair. Replace the shock absorber assembly if the cam lobe or arm are not satisfactory for further service. If the body is cracked, or leakage has occurred around the shaft, replace the shock absorber assembly. Recondition the cylinders if they are scored, and install oversize pistons. Replace any other parts that are not suitable for additional service.

62. ASSEMBLY (fig. 135).

a. File a chamfer on inner edges of rebound piston so that the antirotation spring will enter the recess. Insert the compression piston into front cylinder and the rebound piston into rear cylinder with the cam clearance up. Install the piston screws with springs and tighten; then loosen them 1 to 1½ turns to prevent binding between the cam and cam buttons. Place new expansion plugs over piston screws, and tap into position. Install disks, compression valve, spring, and retainer clip in compression piston. Place intake valve and spring in rebound piston, and install retainer clip. Insert the rebound (relief) valve into the recess in body, install the rebound valve nut with a

new gasket, and tighten securely. Place a new gasket on one end of body, set spacer on gasket, apply a small amount of grease on spacer, and install an end cap securely. Turn the shock absorber so that the open end is up, and fill to capacity with fresh shock absorber fluid. Move the shock absorber arm through several complete strokes while filling to expel air from the fluid. Install the other end cap spacer with a new gasket and cap, and tighten securely. Place shock absorber so that the body is in a horizontal plane, remove filler hole plug, and allow fluid to drain out until it is level with bottom of filler hole. Install filler hole plug with a new gasket, and tighten securely.

Section III

FITS AND TOLERANCES

63. SPRINGS.

Spring clips	Keep tight
Front spring bushing:	
Inside diameter	0.754 to 0.749 in.
Front spring hanger bushing:	
Inside diameter	0.751 to 0.753 in.
Front spring bolts:	
Diameter	0.7470 to 0.7490 in.
Rear spring seat bearing adjustment	Seats must turn with no perceptible bearing end play
Torque rods	Keep tapered studs tight in brackets

64. SHOCK ABSORBERS.

Piston sizes:	
Standard	1.4975 to 1.4970 in.
Oversize	1.4980 to 1.4975 in.
Cylinder size:	
Standard	1.4995 to 1.4990 in.
Oversize	1.5000 to 1.4995 in.
Spring tension:	
Compression valve:	
Free length	$45/64$ in.
Compressed to 0.5625 inch	80 lb

SPRINGS AND SHOCK ABSORBERS

Rebound (relief) valve:	
Free length	$4\frac{3}{64}$ in.
Compressed to 0.562 inch	70 lb
Piston screw spring:	
Free length	$\frac{3}{4}$ in.
Compressed to 0.500 inch	35 to 40 lb
Intake valve spring:	
Free length	$\frac{5}{8}$ in.
Compressed to 0.312 inch	$5\frac{1}{4}$ to $6\frac{3}{4}$ oz

CHAPTER 9

STEERING GEAR

65. DESCRIPTION AND OPERATION.

a. The steering gear consists of a housing and jacket enclosing a lever shaft and steering post (fig. 136). A bearing in the post jacket holds the upper end of post centrally in the jacket. The steering wheel is fastened to the upper end of post with a Woodruff key and nut. Provision is made through the center of the post and wheel for the horn button wire and switch. Studs on the lever shaft ride in the cam (worm) which is at the lower end of the steering post. The serrated end of lever shaft extends through frame left side member, and the Pitman arm is held on the lever shaft with a lock washer and nut. When the post is turned, the lever shaft rotates and moves the Pitman arm to steer the vehicle with the connecting rod (drag link).

66. DATA.

Type	Cam-and-twin lever
Gear ratio	18-22 to 1
Make	Ross
Model	TA-21
Cam bearings	Ball
Lever shaft	Bronze bushings
Steering wheel diameter	20 in.

67. REMOVAL.

a. Remove the hood left side panel, and disconnect and remove battery. Disconnect the horn button wire from connector below steering gear housing. Turn horn button counterclockwise one-third of its travel and remove. Take out horn contact plate screws, and pull out the plate and wire. Remove steering wheel retaining nut, pull wheel off the post with puller 41-P-2954 (fig. 137), and remove Woodruff key. Note: *On vehicles equipped with a winch, remove winch drive shaft.* Remove engine left side pan, take out cap screws holding oil filler pipe to cylinder block, and remove pipe with gasket. Make sure that alinement marks are clearly defined on the Pitman arm and end of the lever shaft. Remove the nut and lock washer that hold the Pitman arm on lever shaft. Using puller 41-P-2952, pull the Pitman arm off the lever shaft (fig. 138). Note: *On tractor trucks, disconnect and remove vacuum control and pipes.* Remove nuts, washers, and bolts that hold the steering flange to frame side member. Take off the steering post jacket bracket cap and bracket from instrument board. Move steering post and housing inward

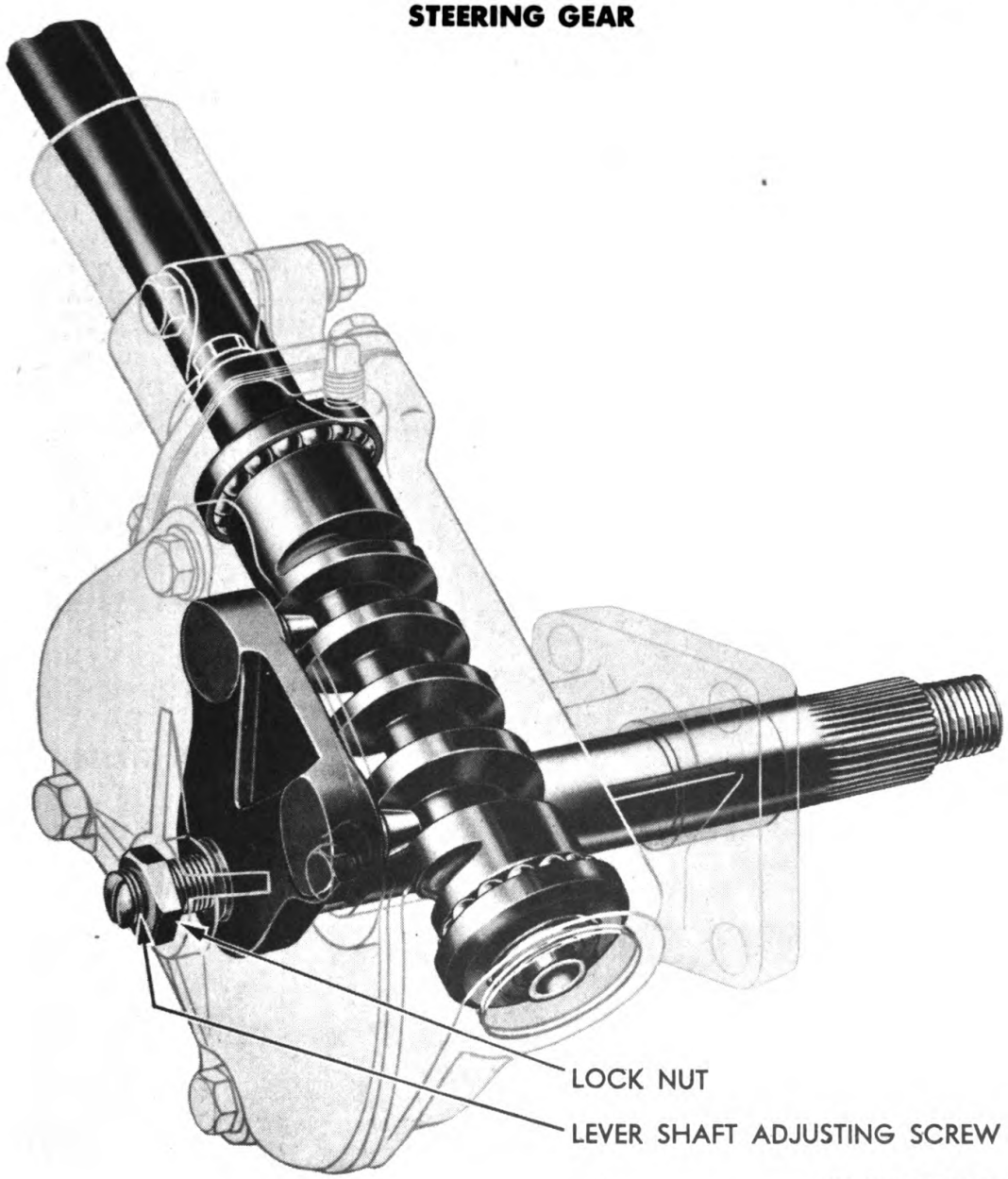


Figure 136 — Steering Gear — Phantom View

and up to pull lever shaft out of frame side member. Lower the assembly and guide it forward over the front axle and out from under vehicle (fig. 139).

68. DISASSEMBLY.

a. Preliminary Cleaning of Assembly. Clean the exterior of the assembly thoroughly with dry-cleaning solvent, and dry with compressed air or cloth. Place assembly in a suitable fixture or on a bench for disassembly.

b. Remove Cam Lever Shaft (fig. 140). Remove cap screws and washers holding side cover to housing, and lift off cover and gasket.

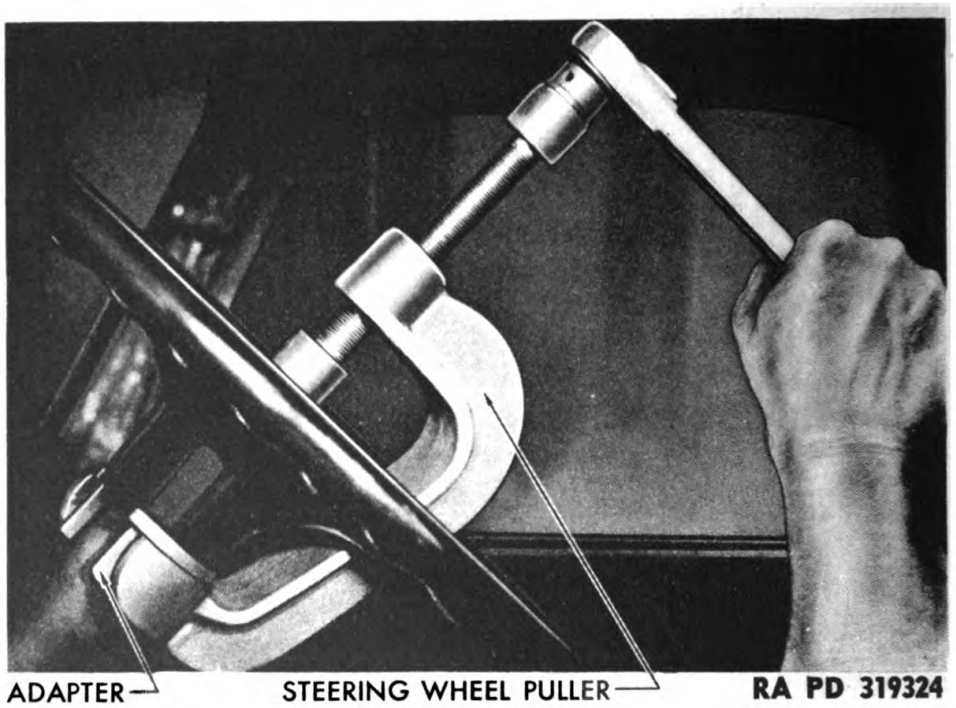


Figure 137 — Removing Steering Wheel With Puller 41-P-2954

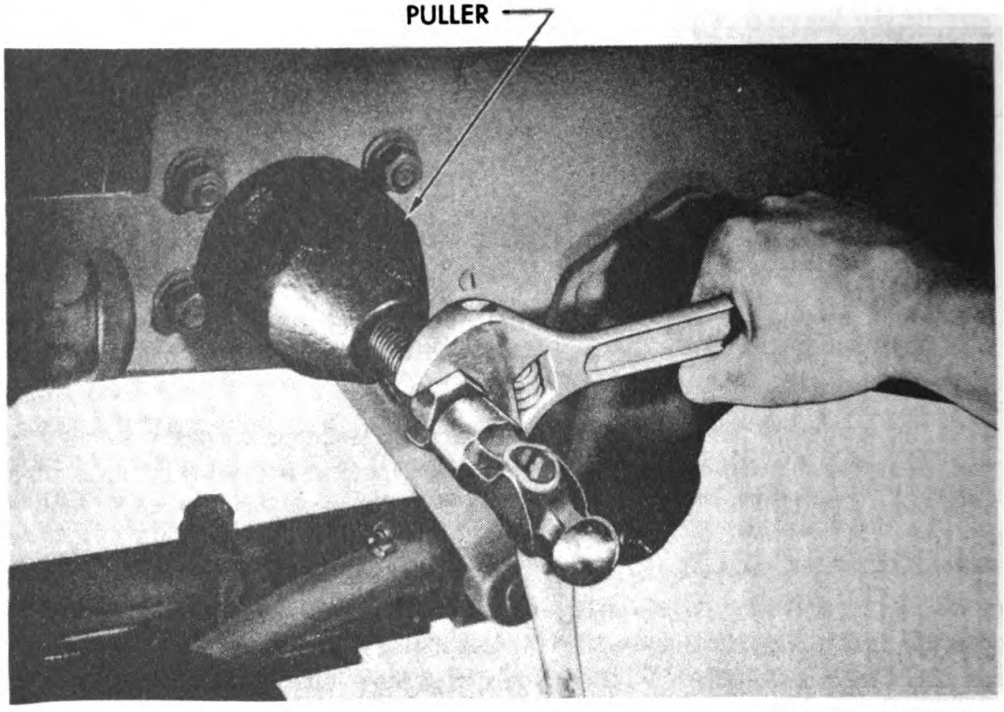
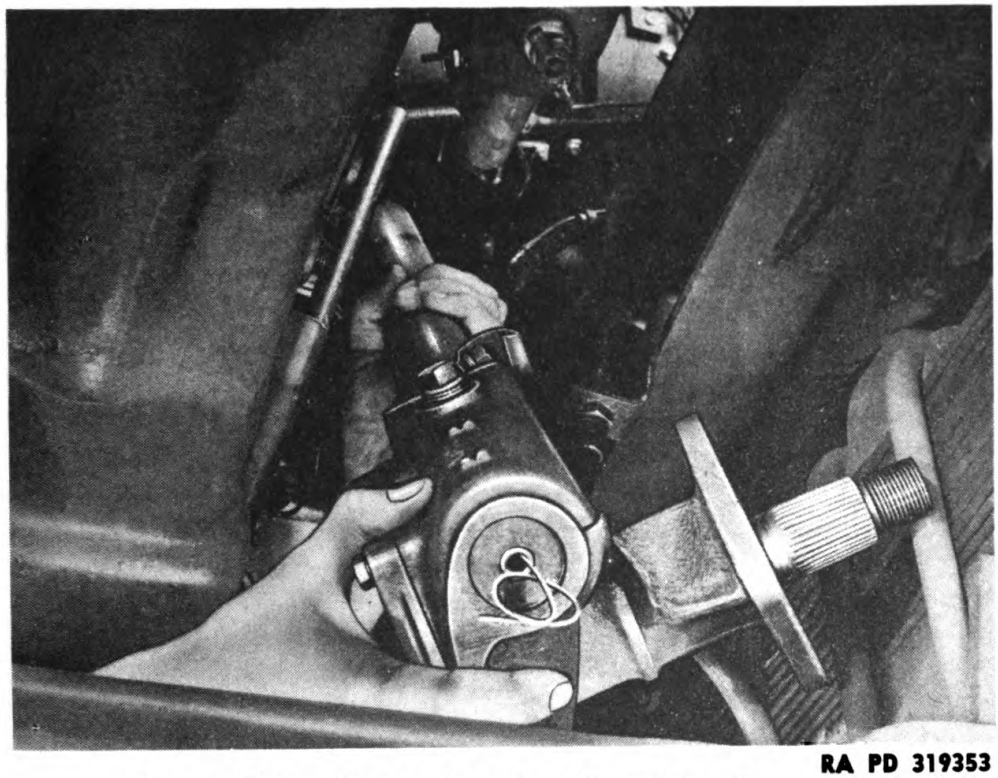


Figure 138 — Removing Pitman Arm



RA PD 319353

Figure 139 — Removing Steering Gear Assembly

Allow lubricant to drain out of housing. Remove cam lever shaft and lever shaft oil seal with gasket from housing.

c. Remove Post and Cam (fig. 140). Loosen steering post jacket clamp and remove jacket. Remove cap screws, lock washers, housing top cover, gasket, and shims. Lift the steering post and cam with bearings out of housing. Remove cam bearing cup rings, cups, and balls from the post, being careful that the balls are not lost. Push lower end cover and tube out of housing. Remove steering post jacket bearing, spring, and seat.

69. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Immerse all parts in dry-cleaning solvent and clean thoroughly. Dry bearing balls individually with cloth, and all other parts with compressed air or cloth.

b. Inspection. Examine lever shaft for nicks, flat spots, twist, or scores. Check balls and cups for flat spots, breakage, or pits. Inspect post and cam (worm) for nicks, scores, breakage, or twist. Examine the post jacket, bearing, spring, and seat for damage or breakage. Check bearing face of lever shaft adjusting screw for roughness. Place lever shaft in bushings, and check for excessive wear. Clearance limits between lever shaft and bushings are 0.0025 inch for inner bushings, and 0.0005 inch for outer bushing. Inspect the housing for cracks or damage. Examine the steering wheel for cracks or distortion.

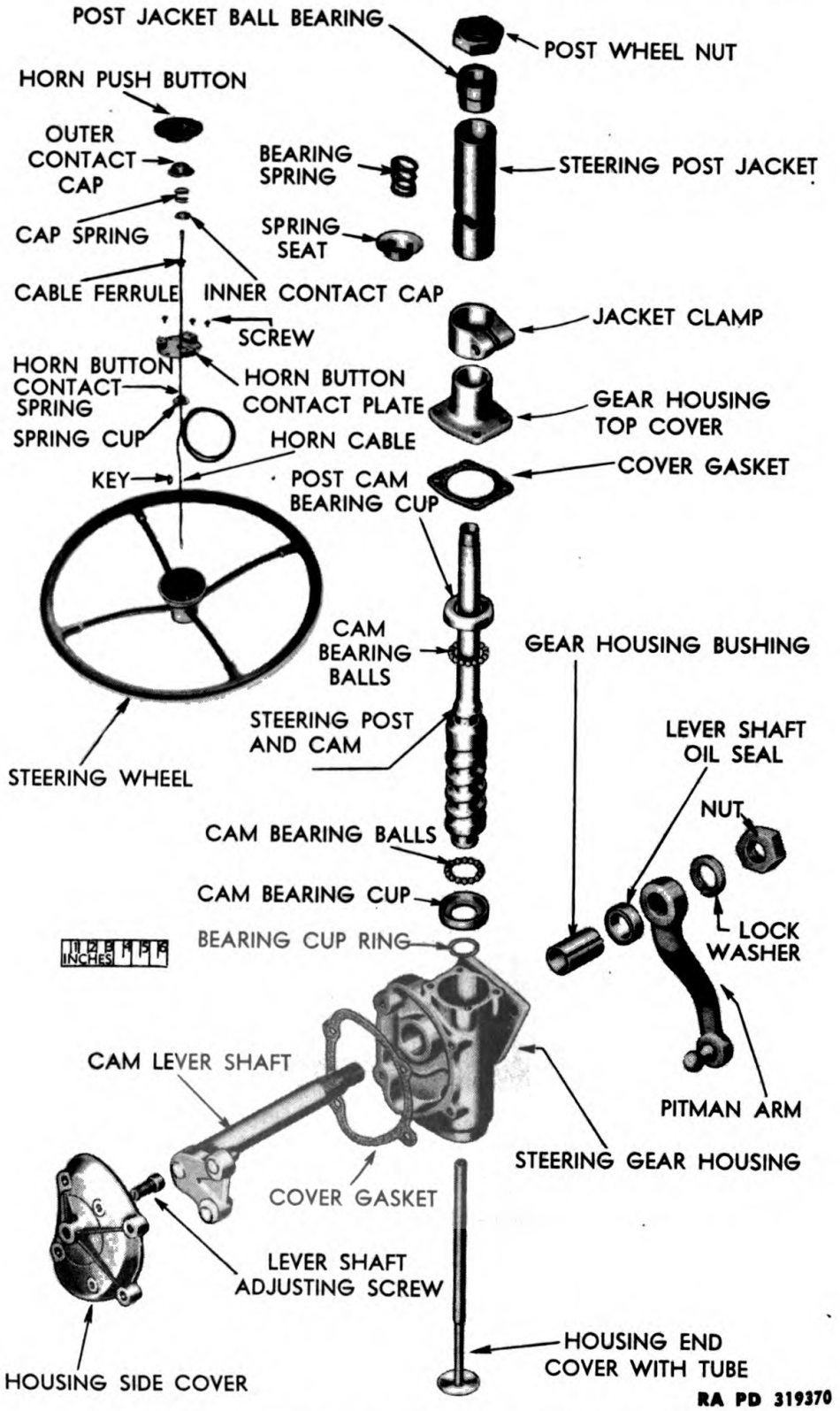


Figure 140 — Steering Gear Disassembled

c. Repair. Remove and replace bushings in housing if they are not satisfactory for further service. If the balls and cups are not suitable for additional service, replace them, provided the races on the post cam are in good condition. Replace the lever shaft and post assembly if they are no longer serviceable. If the housing cannot be placed in serviceable condition by welding, replace it. Replace the steering wheel if it is not satisfactory for further service. If the post jacket, bearing, spring, or seat are not suitable for additional service, replace them.

70. ASSEMBLY.

a. Install Post and Cam. Place bearing balls (14 in each cup) and cups in position on post cam, and install new snap rings. Insert post in housing, place a new top cover gasket on housing, and install housing top cover with a new gasket and enough shims to adjust the post until there is no end play or binding of the cam bearings. Install cap screws with lock washers and tighten securely. Place jacket and jacket clamp over post and tighten in position. Install jacket bearing seat, spring, and bearing. Press new housing end cover and tube into place.

b. Install Cam Lever Shaft. Insert cam lever shaft into housing, back out lever shaft adjusting screw until it will not contact lever shaft, and install housing side cover with a new gasket. Insert side cover cap screws and tighten securely. Tighten adjusting screw until lever shaft has end play of 0.002 to 0.003 inch, and tighten lock nut. Install new lever shaft oil seal and gasket.

71. INSTALLATION.

a. Place steering gear assembly under vehicle from the front, and over the front axle. Guide the upper end of post up between the left side of engine and frame left side member. Push the post up through hole in floor, turn the assembly as required, and insert lever shaft through hole in frame side member. Install housing flange to frame side member bolts, lock washers, and nuts. Fasten post jacket bracket to instrument board, install bracket cap with U-clamp around post jacket, and tighten nuts securely. Tighten housing flange bolt nuts securely. Insert Woodruff key into keyway in post, place steering wheel in position on post, install retaining nut, and tighten securely. Make sure the steering wheel is set at its center of travel, and place the front wheels in the straight-ahead position. Install the Pitman arm so that the mark on the lever shaft coincides with the mark on Pitman arm. Place the lock washer and nut on lever shaft and tighten securely. Insert a pilot wire into housing lower end cover tube and up through the post. Connect horn button wire to pilot wire, and pull horn button wire down through the post until the contact plate is in position. Fasten contact plate to steering wheel

with screws, install horn button, and connect horn button wire to connector below steering gear housing. Fill steering gear housing to proper level with correct lubricant. Place a new engine oil filler pipe gasket in position, install the oil filler pipe with cap screws, and tighten securely. Note: *On tractor trucks, install and connect vacuum control and pipes.* Set the battery in position, fasten securely, and connect the cables to battery posts. Install the hood left side panel and the engine left side pan. Note: *On vehicles equipped with a winch, install the winch drive shaft.*

72. FITS AND TOLERANCES.

Steering cam bearings	No end play
Cam lever shaft end play	0.002 to 0.003 in.
Cam lever shaft and bushing clearance:	
Outer	0.0005 in.
Inner	0.0025 in.
Cam lever shaft bushing bore	1.249 to 1.250 in.

CHAPTER 10

BODIES AND HOOD

Section I

CAB (STEEL TOP)

73. DESCRIPTION.

a. The cab is mounted to the frame by means of four mounting bolts and nuts. The left front corner of the cab is fastened firmly to the frame by a conventional bolt and nut. The right front corner mounting bolt, and the two mounting bolts in the rear center of cab, have a coil spring and insulating shims to give flexibility to the mounting (fig. 141). The windshield is hinged at the top, and may be opened almost to a horizontal position. Two windshield wipers individually controlled are mounted above the windshield. The instrument panel in center of instrument board carries the various instruments, while the switches and carburetor controls for the vehicle are mounted on the instrument board. A package compartment is provided in the right side of instrument board. A door equipped with a ventilator and window is mounted on each side of cab. The adjustable ventilator in the cowl is controlled by a lever under the instrument board near the center.

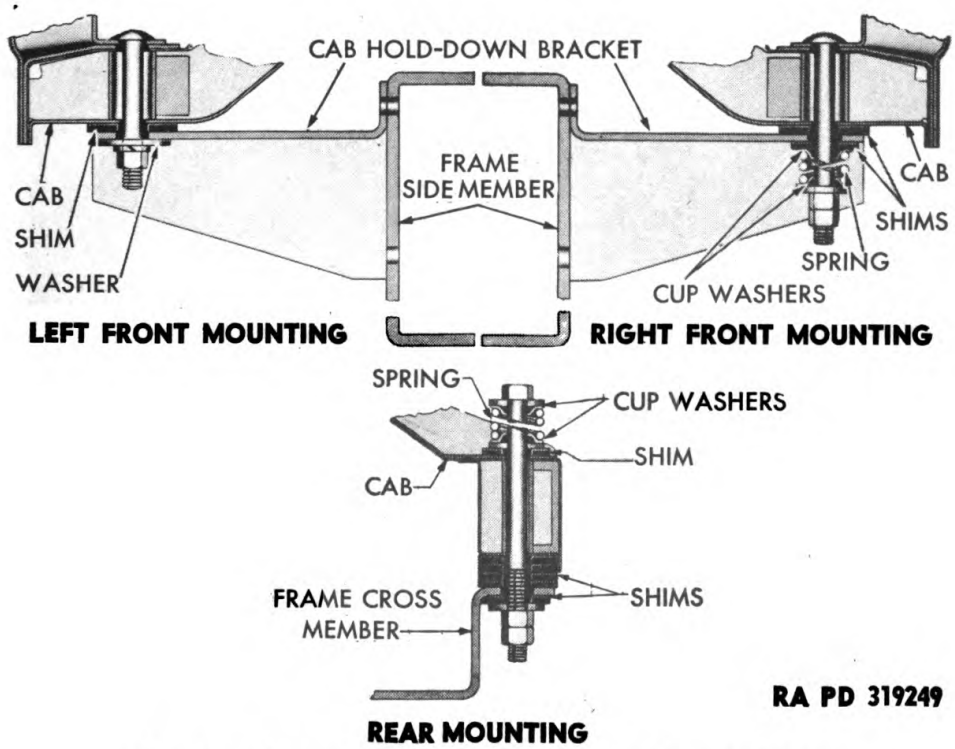
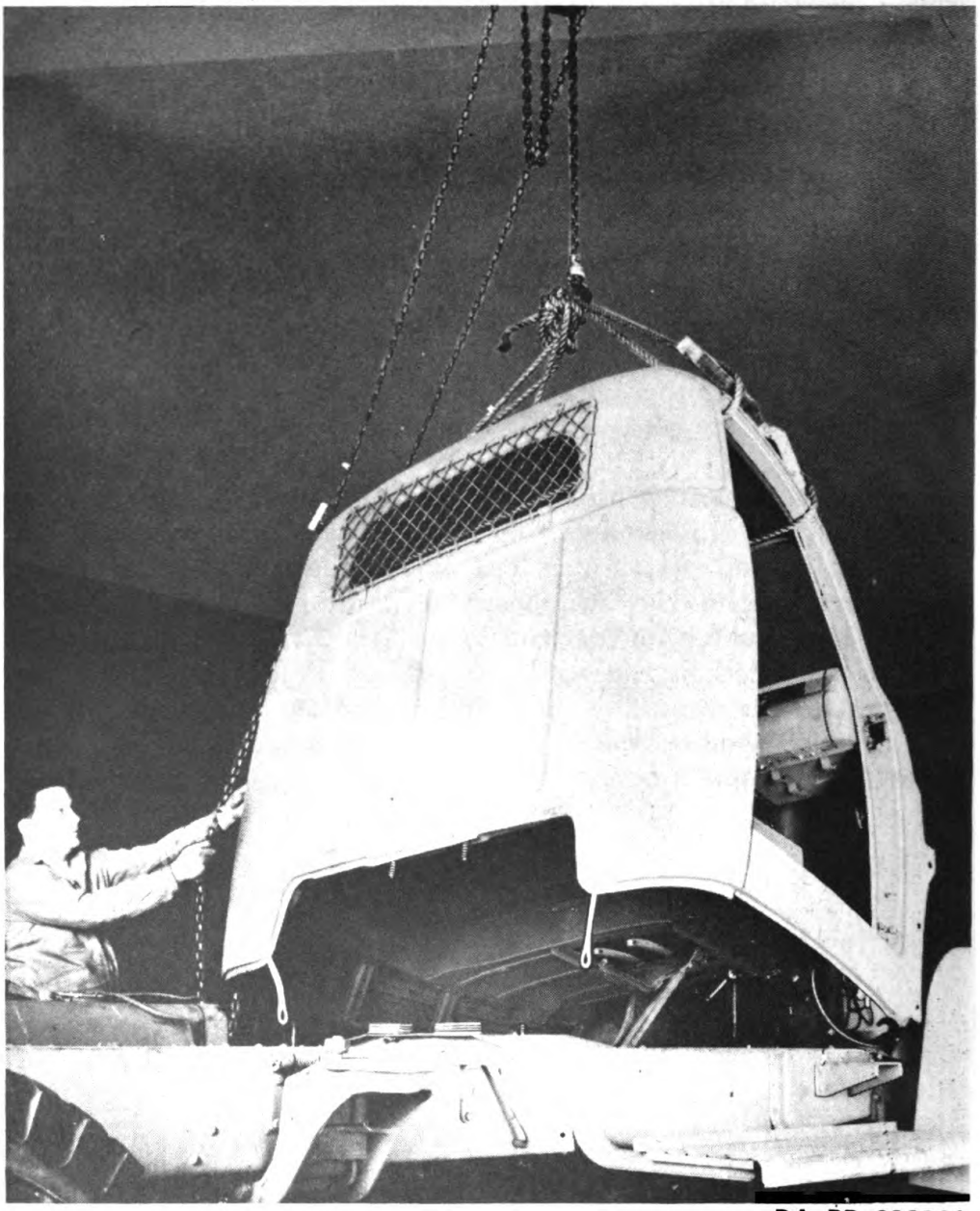


Figure 141 — Cab Mountings (Steel Top Cab)



RA PD 319364

Figure 142 — Removing Cab

74. REMOVAL.

a. Remove Hood Top and Side Panels. See paragraph 97.

b. Disconnect Pipes, Wires, and Controls. Drain cooling system, remove heat indicator element from cylinder head, and the oil pressure gage pipe from flexible coupling. Disconnect and remove the battery. Disconnect the chassis rear wiring harness from the junction block on dash. Disconnect generator to regulator wiring

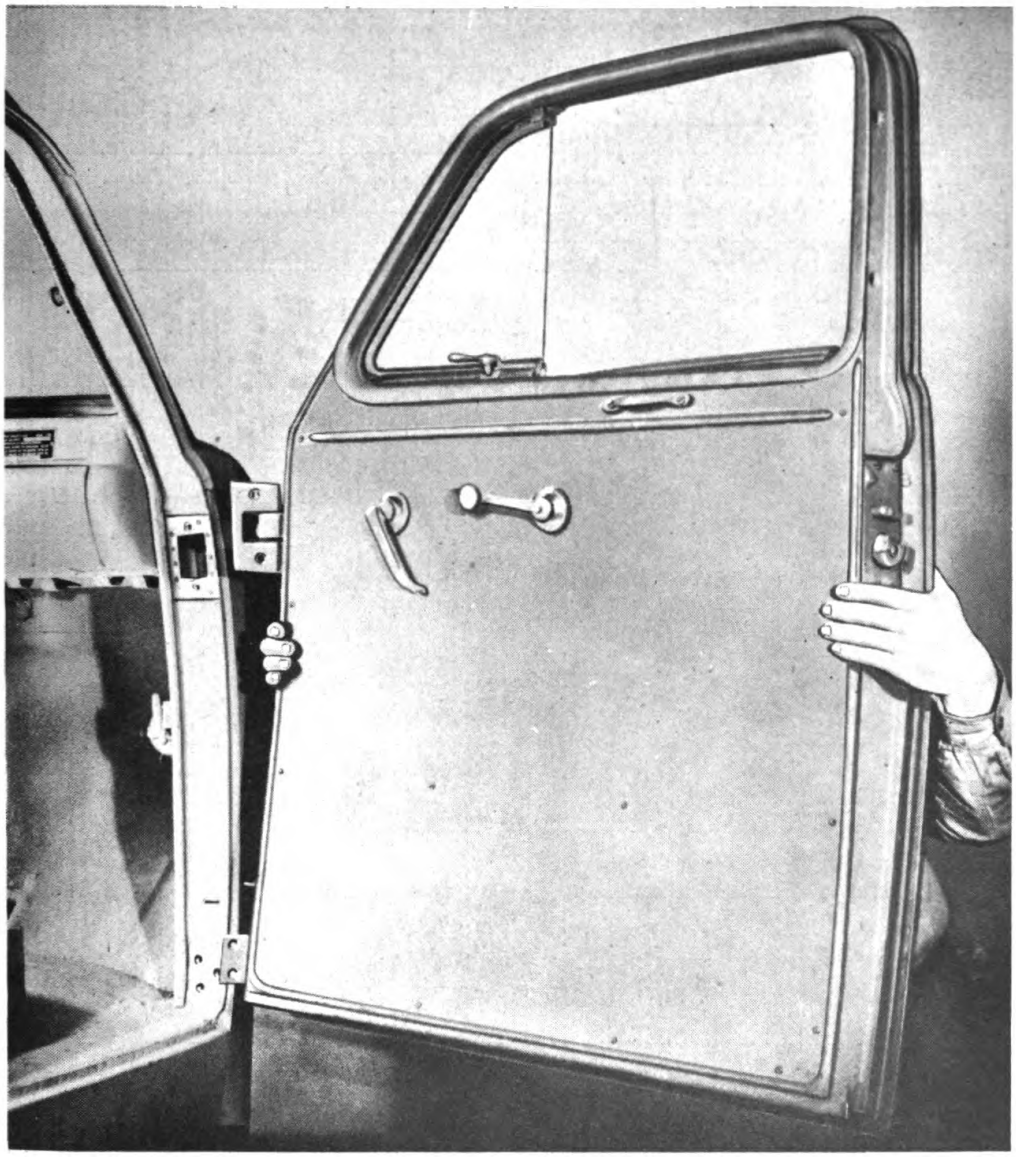


Figure 143 — Removing Door **RA PD 319339**

harness from generator and coil, and remove clips. Disconnect all wires from the cranking motor switch. Remove headlight wiring harness from clips on right fender apron, disconnect wires from junction block on right side of fan shroud, and hang the wiring harness on the dash. Remove bolt through engine to dash bond strap and dash. Take the speedometer drive shaft out of transfer case, and remove from the clips on the frame. Disconnect hand throttle and choke control from carburetor, and the accelerator rod from lever on cross shaft. Pull the windshield wiper tube from manifold pipe. Remove cab to frame bond strap screws from right and left rear corners of cab.

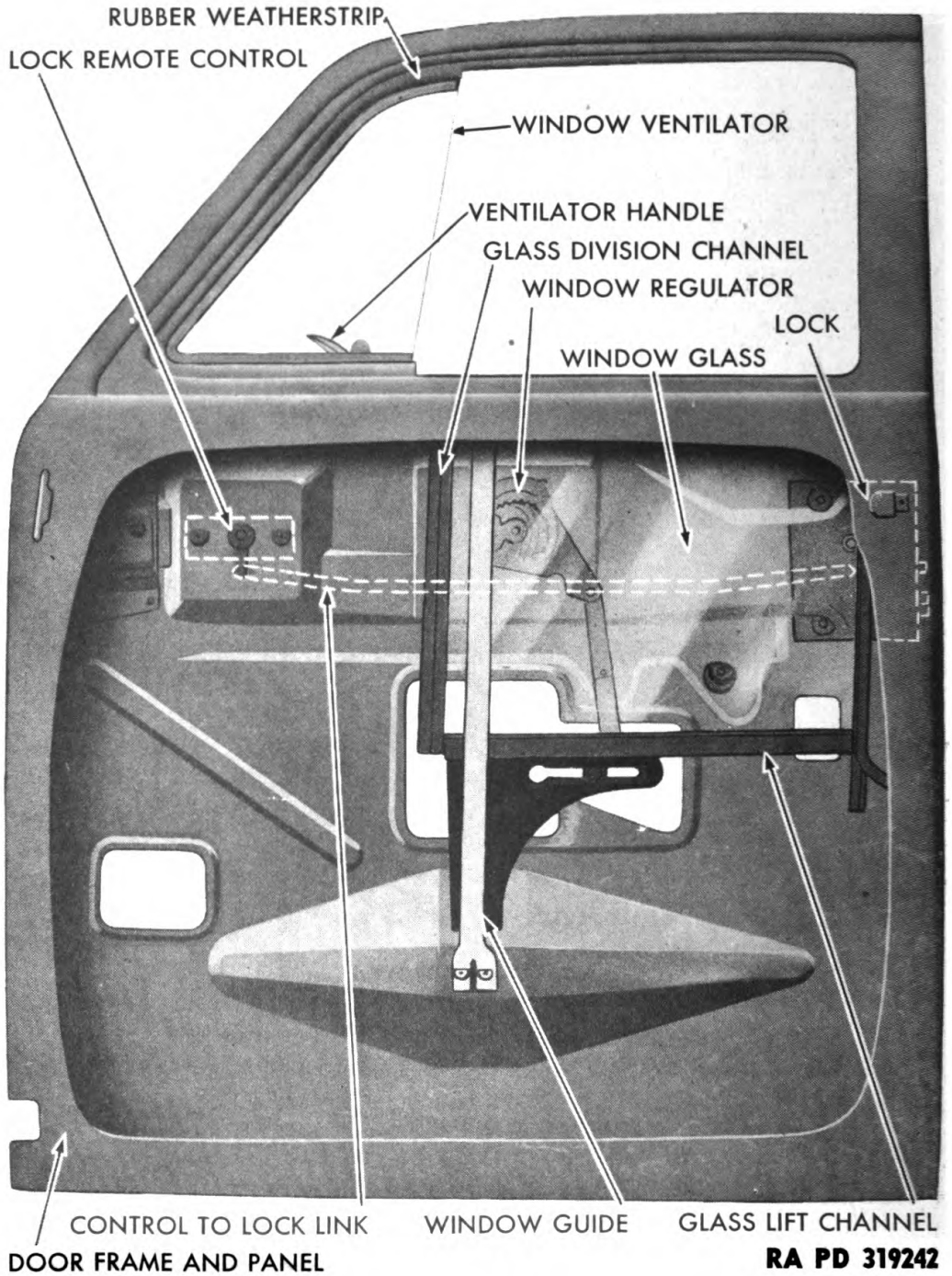


Figure 144 — Cross Section of Door Showing Operating Mechanisms

c. Remove Steering Gear. See paragraph 67.

d. Lifting Cab. Remove fender apron and fender bolts to cowl from both sides. Take off mounting bolt nuts, washers, cups, and springs; and remove bolts. Remove pedal pads, rig cab for lifting, and check to be sure everything is disconnected. Lift the cab upward slowly (fig. 142), guiding it off the pedal arms, gearshift levers, and hand brake lever.

75. REPAIR.

a. Generally, repairs to the cab can be accomplished while it is mounted on the vehicle. If damaged beyond repair, replace the cab assembly. Remove the cab to facilitate frame repairs or replacement. Patch or replace torn or frayed upholstering. Replace seat cushion or back cushion if they are beyond repair. If trim panels are torn or otherwise damaged, replace them.

76. INSTALLATION.

a. Install Cab. Lower cab into position, carefully guiding shift levers, hand brake lever, and pedal arms through openings in floor. Install cab mounting bolts (fixed at left front), shims, and springs with cups, washers, and nuts. Install pedal pads on clutch and brake pedals. Fasten fender aprons and fenders to cowl with bolts and nuts.

b. Install Steering Gear. See paragraph 71.

c. Connect Wires, Pipes, and Controls. Place windshield wiper tube on manifold pipe. Connect the accelerator rod to lever on cross shaft, and install a new cotter pin. Connect hand throttle and choke controls to carburetor. Fasten speedometer cable with clips to frame, and connect cable to transfer case. Install bolt through engine to dash bond strap and dash. Place headlight wiring harness in clips on right fender apron, and connect wires to junction block on right side of fan shroud. Connect generator to regulator wiring harness to generator and coil. Connect the chassis rear wiring harness to junction block on dash, and the proper wires to cranking motor switch. Connect oil pressure gage pipe to the flexible coupling. Insert heat indicator element in cylinder head, tighten securely, and fill cooling system. Fasten cab to frame bond straps securely with bolts, lock washers, and nuts.

d. Install Hood Top and Side Panels. See paragraph 99.

77. DOORS.

a. Removal. Cut off and take out door check rivet. Remove upper and lower door hinge to cab screws, and life door assembly away from cab (fig. 143). Disassembly of the door can be accomplished on the vehicle (fig. 144).

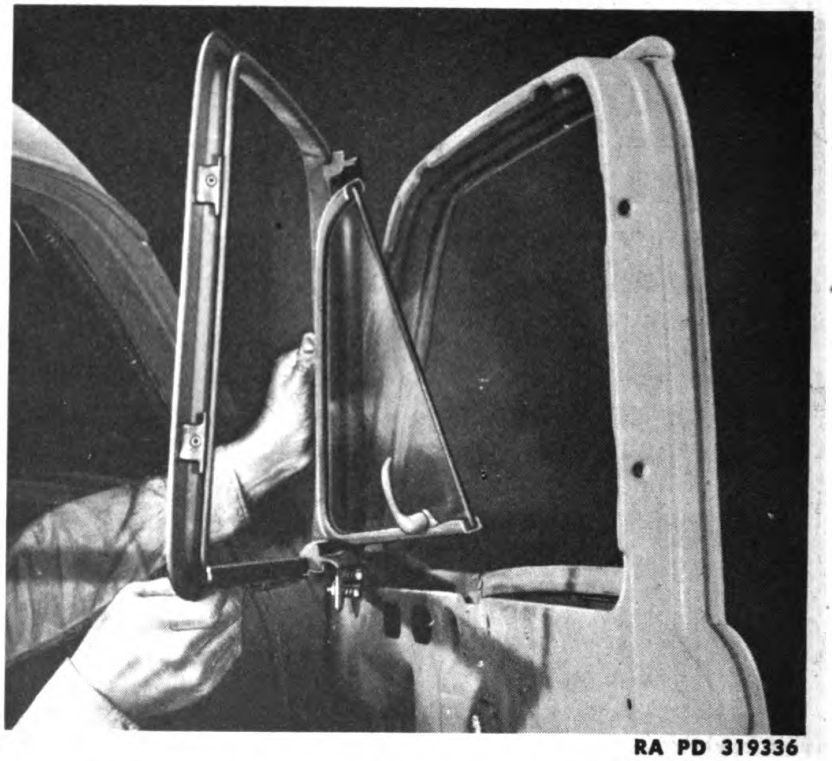


Figure 145 — Removing Door Ventilator and Moulding

b. Installation. Place door in position, and start hinge screws. Aline door latch properly with striker, and tighten hinge screws. Install new rivet in door check.

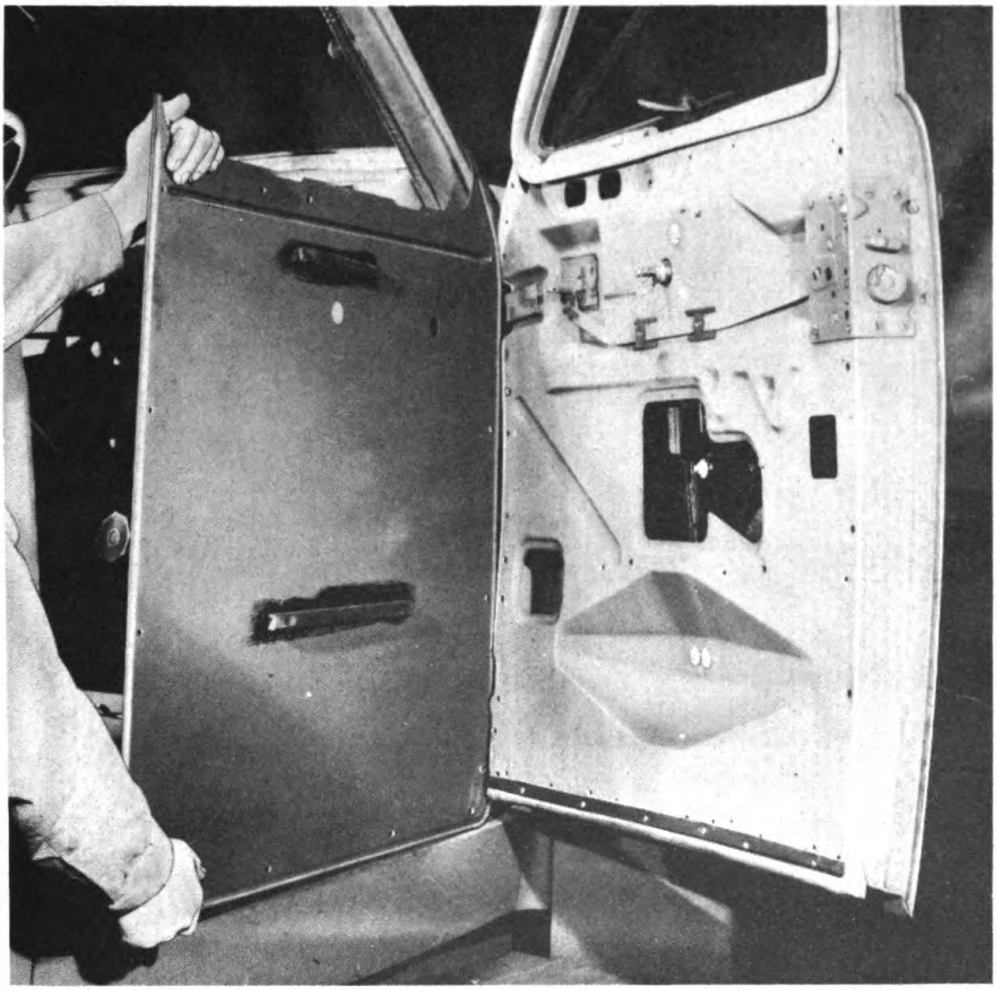
c. Disassembly.

(1) REMOVE VENTILATOR AND MOULDING. Remove screws that hold moulding to door. Lift out the moulding and ventilator assembly (fig. 145). Cut the rivet at the top, remove the nut and spring from ventilator pivot stud, and remove ventilator from moulding.

(2) REMOVE TRIM PANEL. Remove all screws attaching trim panel to door, and remove window regulator handle retaining pin, handle, plate, shim, and spring. Take out remote control door handle retaining pin, handle, plate, shim, and spring; and remove trim panel (fig. 146).

(3) REMOVE DOOR LOCK (fig. 147). Remove outside door handle. Remove screws and toothed lock washer securing lock to inner panel. Disengage the remote control link from control lever, and remove lock with link. Cut the rivet that holds the link to lock, and remove the link.

(4) REMOVE DOOR WINDOW. Take the nuts and washers off the window guide screws (fig. 148). Disengage the lower screw, reinstall nut and washer, and allow it to slide to the bottom of the guide; do the same with upper screw. Lower the window with the regulator, and



RA PD 319354

Figure 146 — Removing Door Inner Trim Panel

pull the regulator arm to the end of the slide (fig. 149) to disengage it. Slide the glass upward and out of the door (fig. 150).

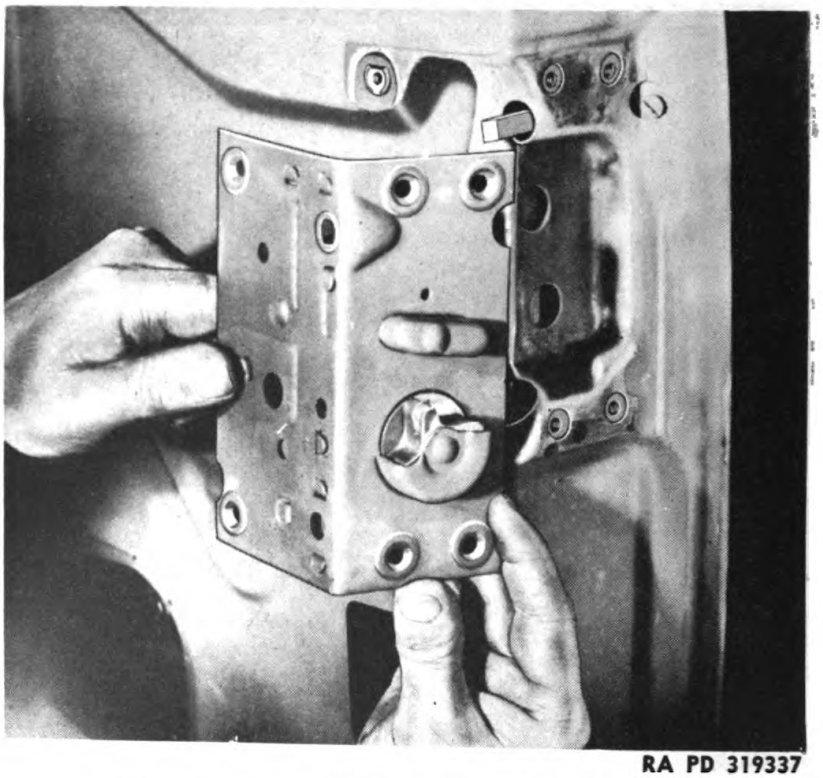
(5) REMOVE DOOR WINDOW REGULATOR. Mark location of regulator if adjustment is satisfactory, remove screws and washers, and lift out regulator (fig. 151).

(6) REMOVE HINGE. Open the door and block it in position. Take out screws holding hinge to body and door, and remove hinge.

d. Cleaning, Inspection, and Repair.

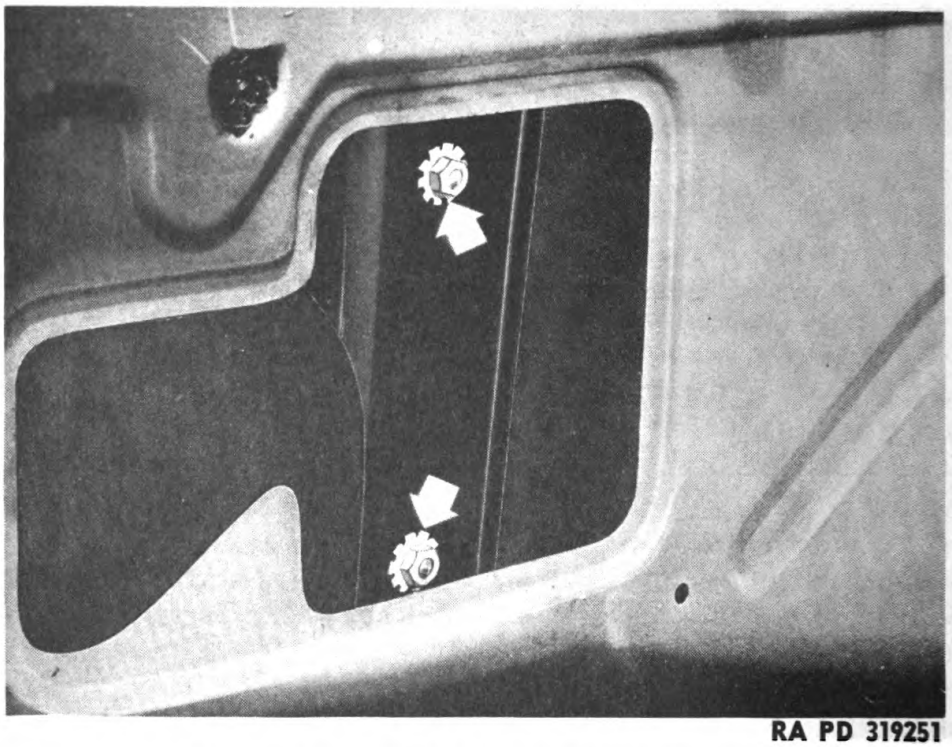
(1) CLEANING. Clean all parts (except glass) thoroughly in dry-cleaning solvent to remove all old lubricant and solid particles. Dry with compresed air or cloth.

(2) INSPECTION AND REPAIR. Check parts for proper operation, distortion, or breakage. Replace any part which is not satisfactory for further service. Replace glass only if suitable glazing equipment is available and make sure that the glass is properly sealed in lift chan-



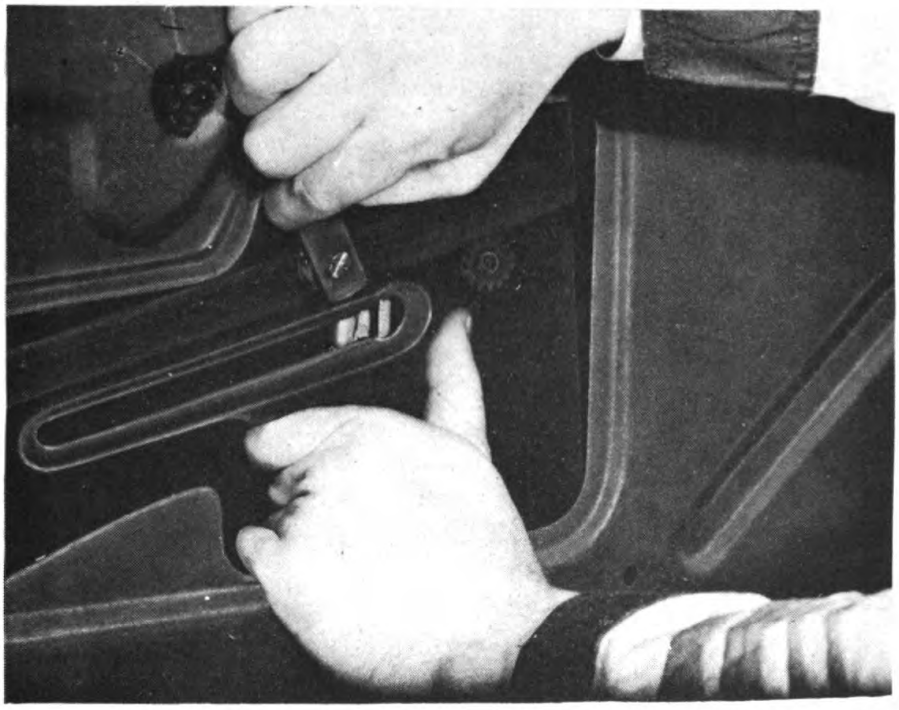
RA PD 319337

Figure 147 — Removing Door Lock



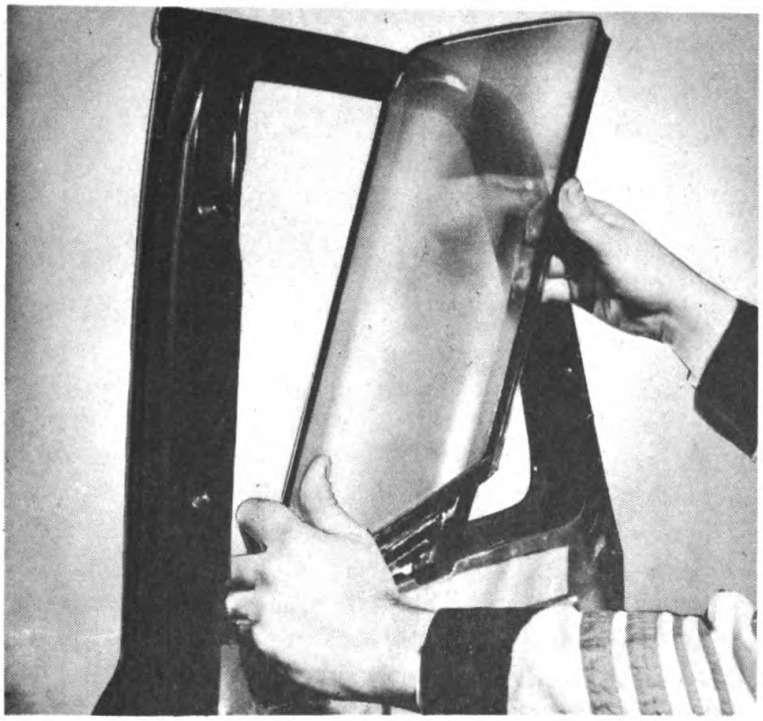
RA PD 319251

Figure 148 — Window Guide Screws



RA PD 319248

Figure 149 — Disengaging Window Regulator Arm



RA PD 319253

Figure 150 — Removing Door Window

RA PD 319275

Figure 151 — Removing Door Window Regulator

nel. Replace any weatherstrip which shows signs of deterioration.
NOTE: *Most repairs to the door can be accomplished while on the cab.*

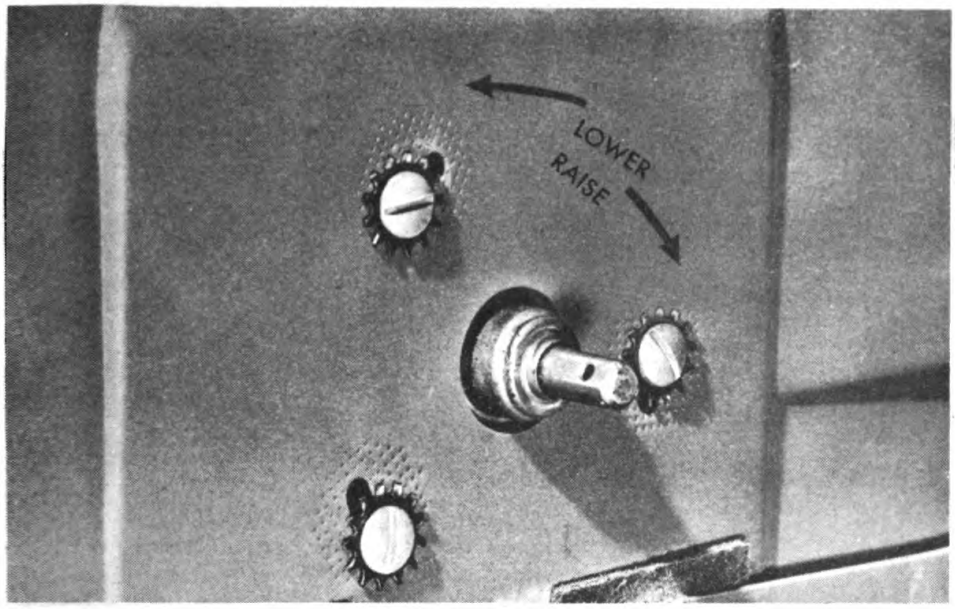
e. Assembly.

(1) INSTALL DOOR WINDOW REGULATOR. Position regulator in door according to marks, install screw with washers, and tighten securely.

(2) INSTALL DOOR WINDOW. Lubricate the regulator operating slot in channel and guide with general purpose grease, apply powdered graphite to window run, and lower window into door. Engage the regulator arm in slot, and install guide screws. Run window up and down to check adjustment. Adjust the level of the window at its lowest position by moving the regulator screws in their slots (fig. 152). Adjust the fit of the window in the window runs by changing the position of the guide screws.

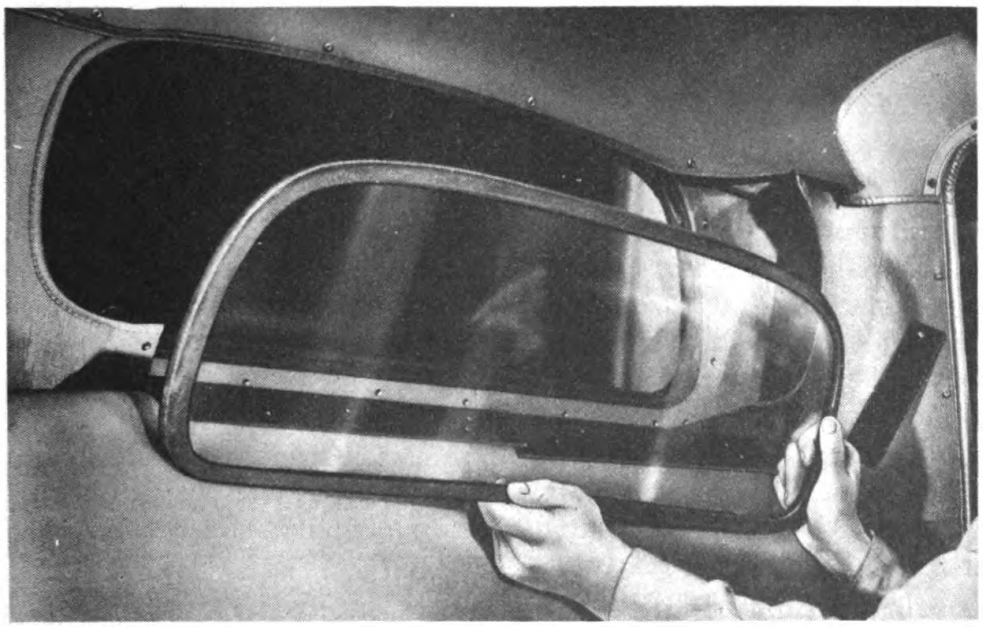
(3) INSTALL DOOR LOCK. Install remote control link on lock with a new rivet, engage link with the remote control lever, position the lock in door, and tighten the screws firmly. Install outside door handle, and tighten screw securely.

(4) INSTALL TRIM PANEL. Position trim panel on door, and install all screws. Place shim, spring, plate, and window regulator handle on regulator; install retaining pin. Place shim, spring, plate, and



RA PD 319252

Figure 152 — Level Adjustment of Door Window



RA PD 319340

Figure 153 — Removing Cab Rear Window

remote control door handle in position on remote control; install retaining pin.

(5) INSTALL VENTILATOR AND MOULDING. Lubricate the pivot points, and install ventilator in moulding, using a new rivet. Place spring and nut on pivot stud, and adjust tension. Install the moulding

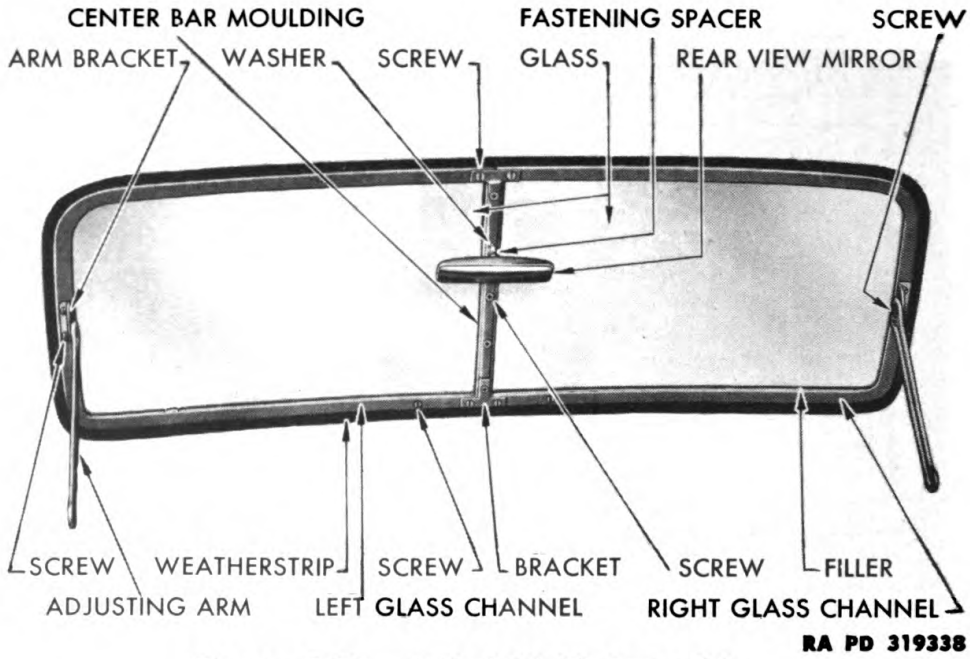


Figure 154 — Windshield Assembly

and ventilator assembly in door, insert all screws, and tighten securely.

(6) INSTALL HINGE. Place hinge in position, install screws, aline door properly to cab, and tighten screws securely.

78. BACK WINDOW.

a. Removal. Remove the glass protector screen from the cab. Take all screws out of the trim panels around the window opening and remove the rear window lower trim panel. Remove the screws holding window side and lower retainers to the inside of cab, and take off the retainers. Push the bottom of the window inward, and pull it down out of the upper retainer (fig. 153). Remove window glass channel from the glass.

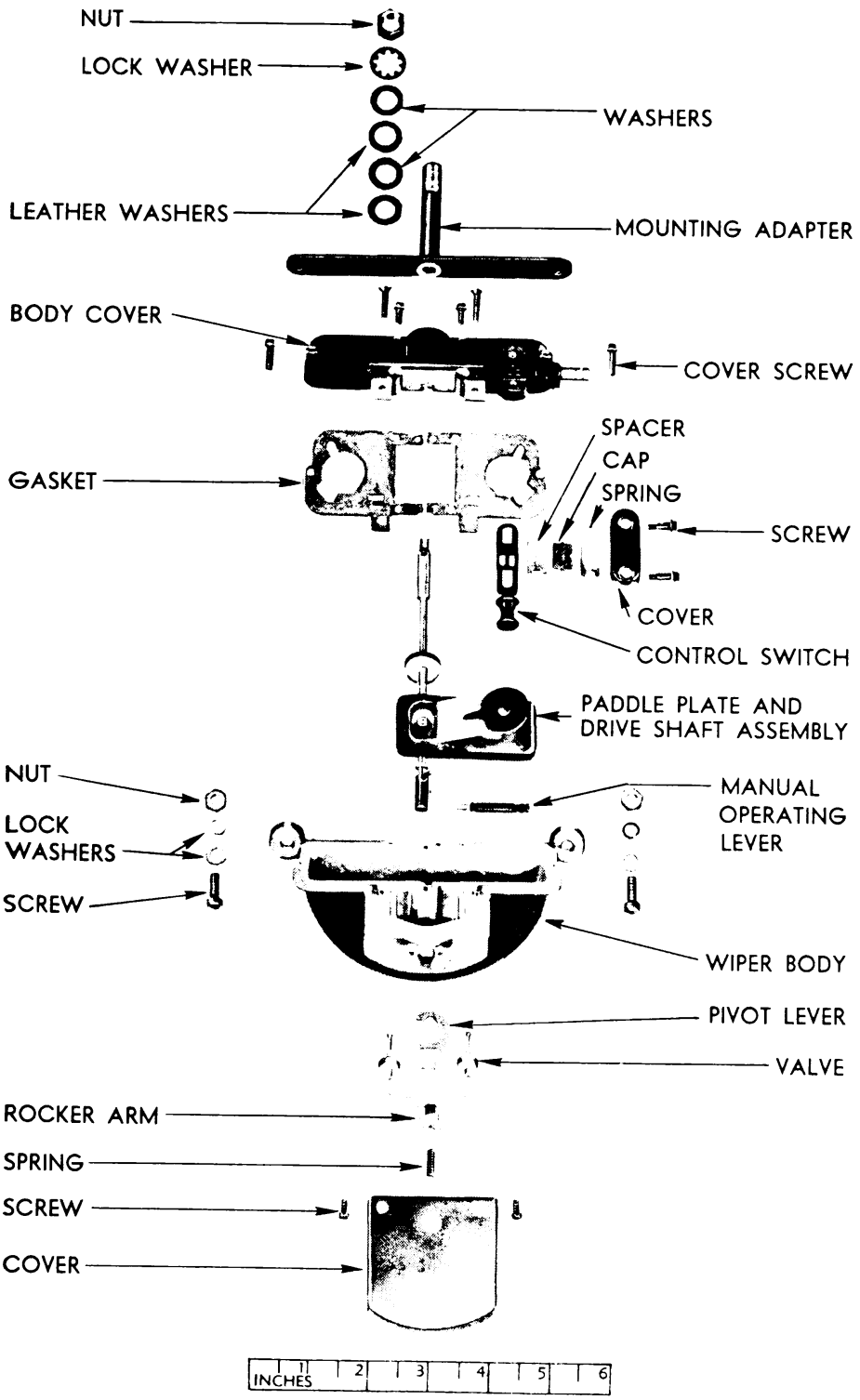
b. Cleaning, Inspection, and Repair. Clean glass thoroughly, and remove all old glass sealer adhering to channel as well as the old sealing strip from cab panel around window opening. Replace channel if unsatisfactory for further use.

c. Installation. Place sealing strip on edge of window glass, and install channel over window glass and sealing strip. Place window in position under the upper retainers. Install side and lower retainers, and tighten screws securely. Install rear window lower trim panel and all trim panel screws. Place the glass protector screen in position, and tighten screws securely.

79. WINDSHIELD ASSEMBLY.

a. Disassembly (fig. 154). Remove screws and take off the windshield center bar mouldings, bar, and weatherstrips. Take out the

BODIES AND HOOD



RA PD 319335

Figure 155 — Windshield Wiper Disassembled

channel bracket screws, and remove the glass and channel. Remove the glass from channel, and take out the filler.

b. Cleaning, Inspection, and Repair. Clean glass carefully to remove all old glass sealer and parts of the filler from glass and out of channel. Inspect weatherstrip for deterioration, and replace if unserviceable. Replace channel or other parts that are unsuitable for further use.

c. Assembly. Cut sealing strip to correct length. Coat one side of seal with engine oil. Place dry side of sealing strip along three sides of glass. Install seal and glass in channel. Cut off ends of seal to fit. Aline windshield members, push them together, and install channel bracket screws. Install the weatherstrip, center bar, and mouldings; install screws, and tighten firmly.

80. WINDSHIELD WIPER ASSEMBLY (MOTOR).

a. Disassembly (fig. 155). Tap hand operating lever out of shaft. Take out screws holding valve cover to motor, remove cover, disconnect spring, and remove valve parts. Remove screws holding body cover in position; remove cover, gasket, and paddle assembly.

b. Cleaning, Inspection, and Repair. Clean all metal parts in dry-cleaning solvent, and dry with compressed air. Inspect for dried out or broken parts on paddle, and replace if not satisfactory for further service. Examine the valve parts for breakage or damage, and replace parts that are not suitable for additional service. Inspect the body for cracks or damage, and replace the wiper assembly if it is unsuitable for service.

c. Assembly. Apply general purpose grease No. 0 to inside of wiper body and on paddle. Install paddle in body, place a new gasket and the body cover in position, being sure paddle and shaft seat properly, and tighten cover securely with screws. Insert valves with felt washers in body, and assemble rocker arm to valves. Connect spring to rocker arm and pivot lever, and hook lever over pivot. Install valve cover, and tighten screws. Press hand-operating lever into shaft, and test motor for proper operation.

Section II

CAB (SOFT TOP)

81. DESCRIPTION.

a. The soft top cab is mounted rigidly at two points in front, and spring-mounted at rear (fig. 156). The windshield is hinged at the top to the windshield frame, and may be opened by loosening adjust-

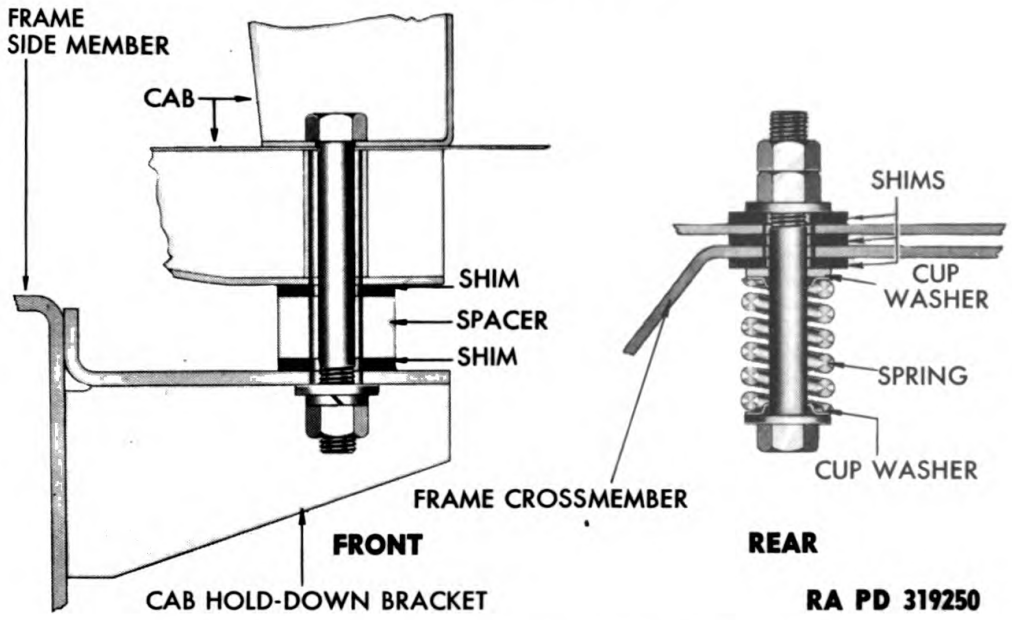


Figure 156 — Cab Mountings (Soft Top Cab)

ing arm knobs and pushing the bottom of windshield outward. The windshield frame is pivoted on each side at bottom. Windshield wipers are mounted on windshield upper channel. The instrument panel in center of instrument board contains the instruments, switches, and carburetor controls. A package compartment is provided in right side of instrument board. A cowl ventilator is provided and controlled by means of a lever under the instrument board. The top, back, and side curtains can be readily removed or installed.

82. REMOVAL.

a. See paragraph 74 for cab removal instructions.

83. REPAIR.

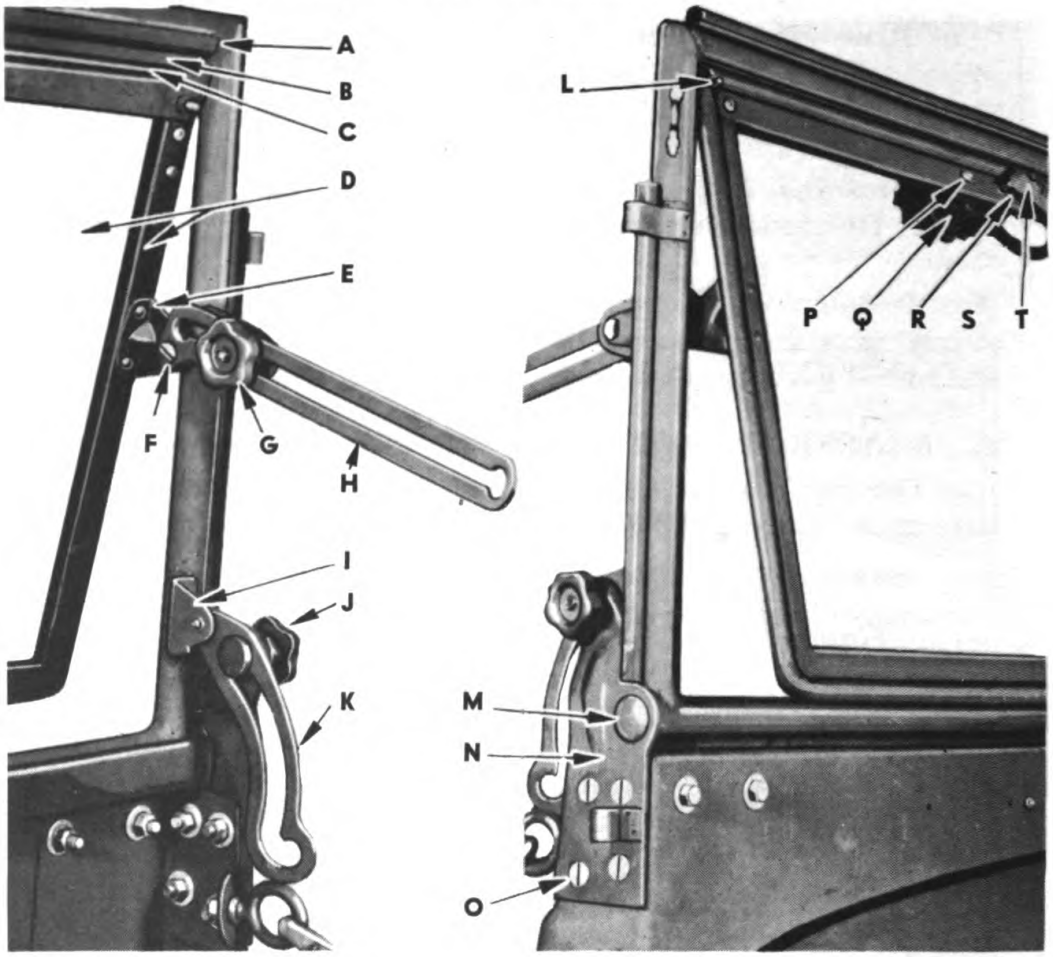
a. Generally, repairs are made with cab mounted on the vehicle. The cab is not removed unless damaged beyond repair, or when the frame needs repair or replacement. The cab curtains can be repaired on the cab. **NOTE:** *Be sure repairs do not distort and cause a misfit in the assembly.* Panels can be replaced as required without removing cab.

84. INSTALLATION.

a. See paragraph 76 for cab installation instructions.

85. WINDSHIELD ASSEMBLY.

a. Disassembly (fig. 157). Take out the upper channel retaining screws, and remove the channel with windshield wipers attached. Remove glass and filler from side and lower channel.



A — WINDSHIELD FRAME
B — FRAME HINGE STRIP
C — WINDSHIELD HINGE STRIP
D — WINDSHIELD GLASS AND CHANNEL
E — ADJUSTING ARM BRACKET
F — ARM TO BRACKET SCREW
G — WINDSHIELD ADJUSTING ARM KNOB
H — WINDSHIELD ADJUSTING ARM
I — FRAME ADJUSTING ARM BRACKET
J — FRAME ADJUSTING ARM KNOB
K — FRAME ADJUSTING ARM
L — BENT PORTION OF HINGE STRIP
M — FRAME PIVOT PIN
N — FRAME MOUNTING BRACKET
O — MOUNTING BRACKET TO COWL BOLTS
P — WIPER MOUNTING SCREW
Q — WINDSHIELD WIPER MOTOR
R — WIPER ARM AND BLADE
S — WIPER HOSE
T — WIPER ARM SHAFT NUT

RA PD 319323

Figure 157 — Windshield Mounting

b. Cleaning, Inspection, and Repair. Remove all old filler, glass sealer, and tape from glass and channels. Replace channels or glass if not suitable for further use.

c. Assembly. Install new sealing strip on side and lower portion of glass, and place glass in the side and lower channels. Place new sealing strip along top of glass, install upper channel, and retaining screws.

BODIES AND HOOD

86. WINDSHIELD FRAME.

a. Removal. Remove the top, side curtains, and windshield assembly (TM 9-807). Disconnect the wiper vacuum tube. Take out the screws and nuts holding each side bracket to cab, and remove the frame.

b. Cleaning, Inspection, and Repair. Clean the parts thoroughly, inspect for cracks or damage, and replace any which are unserviceable.

c. Installation. Support frame assembly in position and install screws, nuts, and washers (fig. 157). Connect wiper vacuum tube, and install windshield assembly, side curtains, and top (TM 9-807).

87. WINDSHIELD WIPER ASSEMBLY (MOTOR).

a. See paragraph 80 for windshield wiper disassembly, cleaning, inspection, repair, and assembly instructions.

Section III

CARGO BODY

88. DESCRIPTION AND DATA.

a. Description. The cargo body is attached to the frame, and is entirely independent of the cab (fig. 158). In addition to the box proper, the sides are equipped wtih racks which increase the cargo carrying space. The side racks are constructed in such a manner that they form seats for troop transport when lowered. A removable front rack serves as a cross support for the side racks, and protects the cab from shifting of cargo. Hollow steel stakes are provided to support these racks. Into these stakes are inserted the bows which support the top and end tarpaulins. The rear panel of the box serves as a tail gate. A tool compartment is located under the floor at the rear of the body (fig. 159).

b. Data.

Length (inside)	144 in.
Width (inside)	80 in.
Depth (top of sill to floor)	14 in.
Head room (from inside of bows to floor)	59 in.
Number of troops with equipment	16
Cargo (tons)	2½ to 5

89. REMOVAL.

a. Disconnect the rear chassis wiring harness from the trailer socket, stop and taillight, and remove harness clips. Remove the nuts

ORDNANCE MAINTENANCE—POWER TRAIN, CHASSIS, AND BODY FOR 2½-TON 6x6 TRUCK AND 2½- TO 5-TON 6x4 TRUCK (STUDEBAKER MODELS US6 AND US6x4)

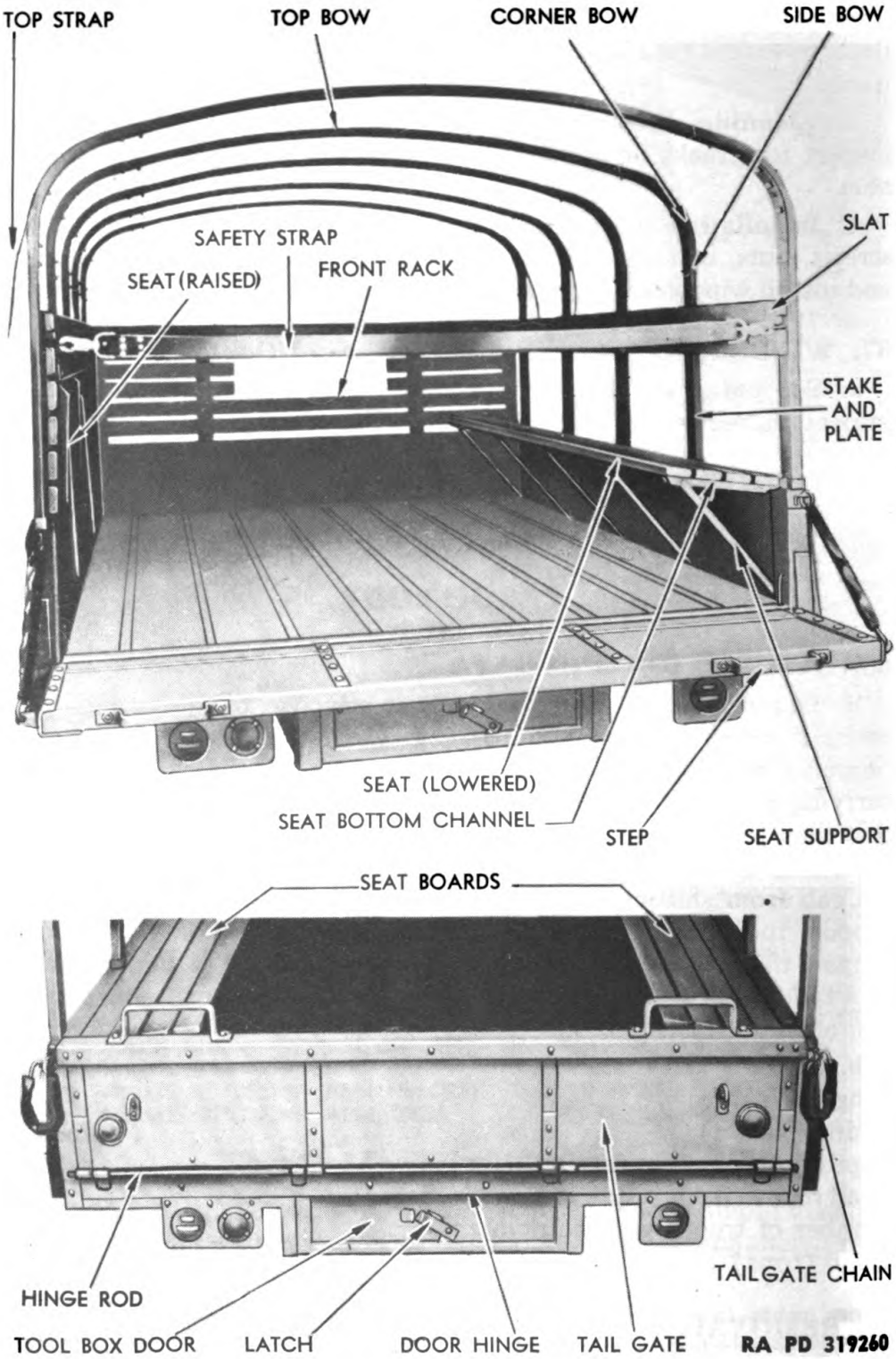


Figure 158 — Cargo Body Details

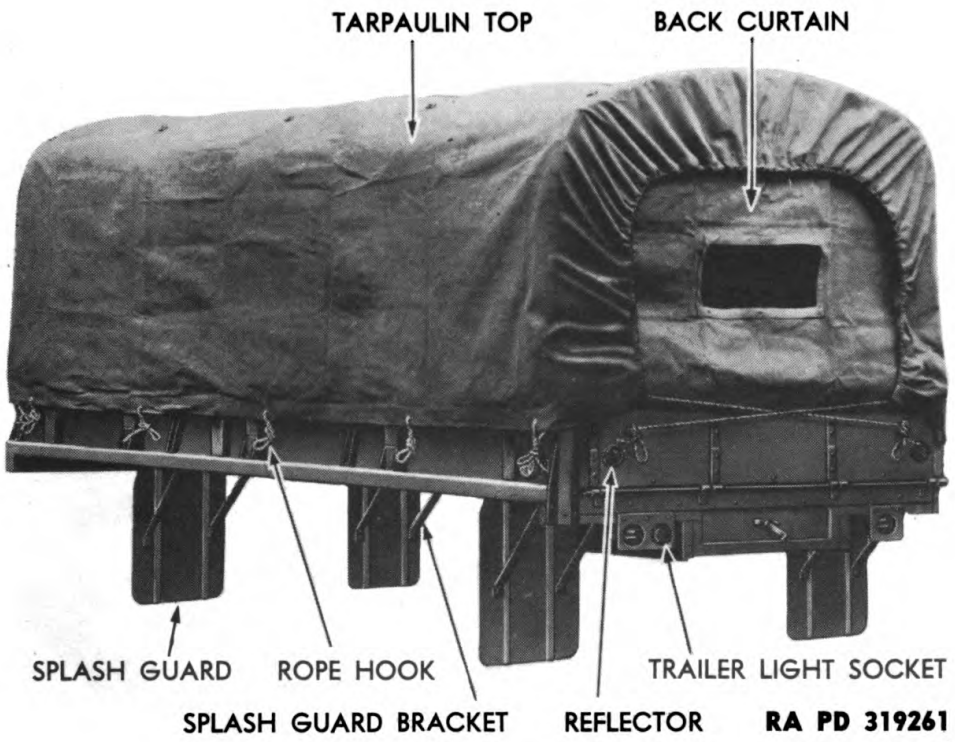


Figure 159 — Cargo Body Complete

and washers and the front bracket to frame bolts from both sides. **NOTE:** *On vehicles of former production disconnect and remove gasoline tank filler neck, and plug hose with a clean cloth.* Remove the body to frame U-bolts and plates. Open tool compartment door, remove tools, and equipment, and remove the body to frame rear bolts from both sides. Attach an X-chain to four corners of body, and lift assembly off the frame.

90. REPAIR.

a. Steel Bodies (fig. 160). Practically all repair work on steel bodies can be done with body mounted on vehicle. If body is damaged beyond repair, replace it. If for any reason repairs are made while body is off the vehicle, care must be taken to keep body in alinement; otherwise, difficulty will be encountered during installation. Replace bows, seats, or tarpaulins if they are beyond repair, or are not serviceable.

b. Wood Bodies (fig. 161). The rugged wood bodies are constructed in such a manner that most parts can be replaced individually without disassembly of complete body, and while body is on vehicle. Paint new or replaced parts to prevent deterioration. Repairs to bows, seats, and tarpaulins can be accomplished either on or off the body. Replace parts that are not satisfactory for further service and are beyond repair.

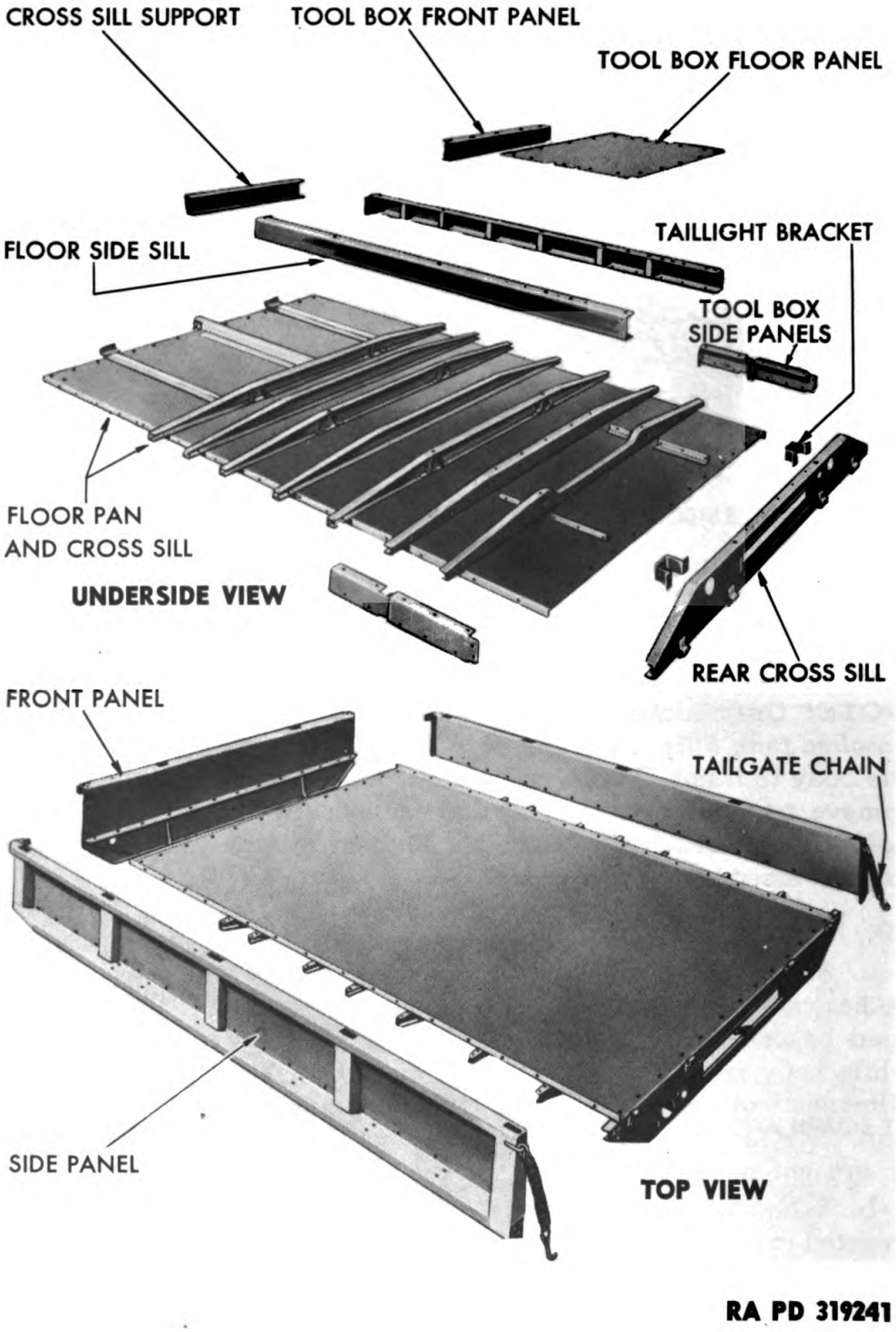


Figure 160 — Metal Cargo Body Disassembled

BODIES AND HOOD

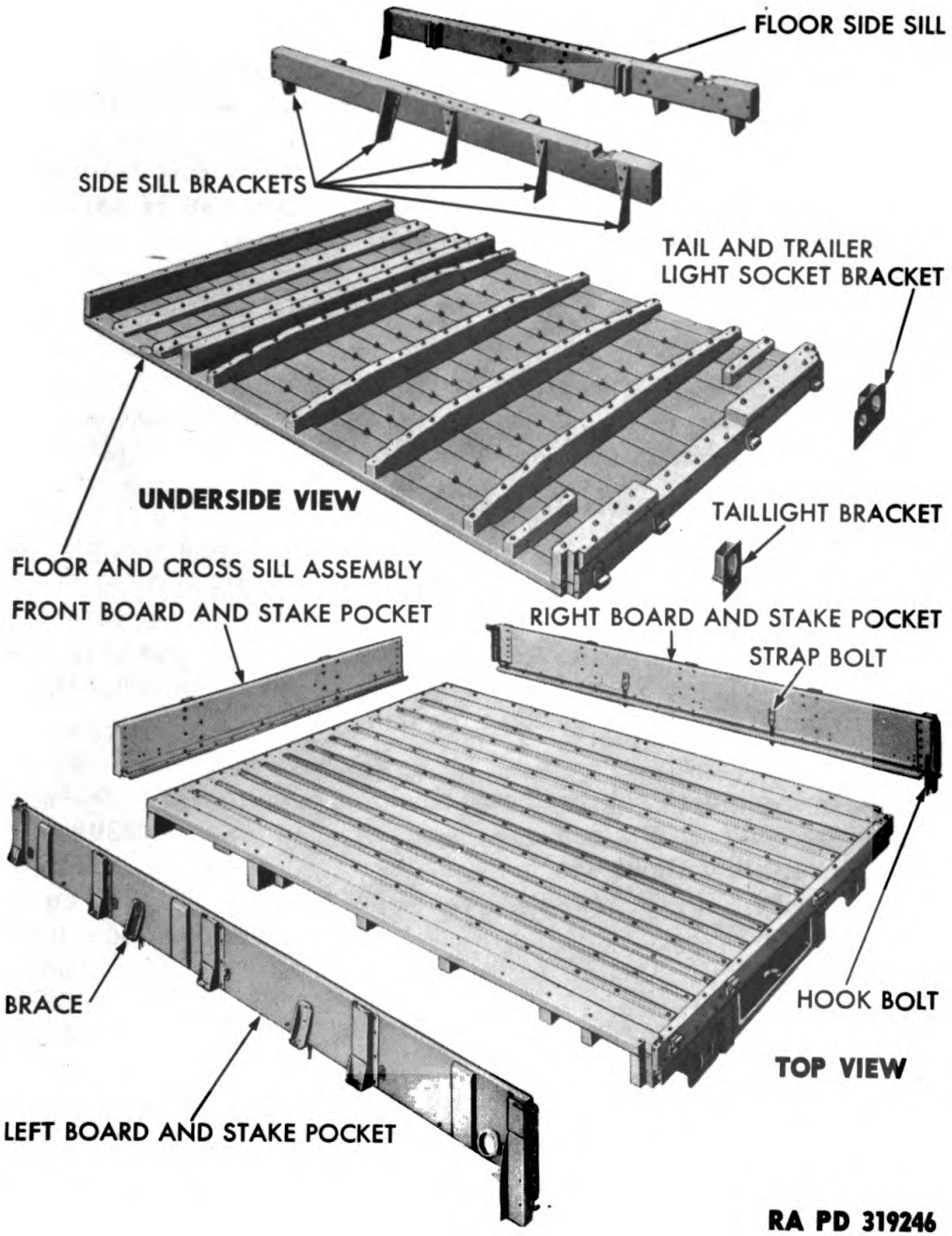


Figure 161 — Wood Cargo Body Disassembled

91. INSTALLATION.

a. Lift the body into position over frame and lower until almost resting on frame, guide front bracket holes into alinement with frame holes, and use drifts to preserve location. While still supporting body, enter rear bolts through frame, and lower body until it rests on frame. Install body to frame U-bolts, plates, and nuts; and tighten nuts securely. Install front bolts, nuts, and washers. Place nuts on rear bolts, and tighten all nuts securely. Connect the wiring harness to trailer socket, stop and taillight, and remove chain. Place tools and equipment in tool compartment, and close the door.

Section IV

DUMP BODIES

92. DESCRIPTION AND DATA.

a. Description. Two types of steel dump bodies are in use, the end and side dump. The end gate and side gate are pivoted at the top, and latched at the bottom. A lever on the left front corner of the body unlatches through linkage the lower catch on the gate, permitting gate to open when body is raised. A shield is mounted on the front panel to protect the cab from damage.

b. Data.

Height, over-all, with cab protector shield	91⅜ in.
Length, over-all, with winch	239$^{9}/_{16}$ in.
Length, over-all, without winch	225 in.
Body capacity	2½ cu yd
Type of body	End or side dump
Inside body length	108 in.
Inside body width	78 in.
Dumping angle (minimum)	50 deg
Hoist	Single cylinder, hydraulic

93. REMOVAL.

a. End Dump. Raise body with hoist to approximately a 40-degree angle. Attach an overhead hoist to the front body, and raise sufficiently to remove load from body hoist. Take out groove retaining pins from link arm pivot pins, and remove pivot pins. Retract body hoist, and lower front of body to frame. Remove the groove retaining pins from the body hinge pins, and pull both hinge pins out of hinges. Attach chain to four corners of the body, and raise body off the frame.

b. Side Dump. Raise body with hoist to an angle of approximately 40 degrees. Attach an overhead hoist to raised side, and lift to relieve load from body hoist. Remove groove retaining pin from hoist to body wrist pin, and take out pin. Retract the body hoist, and lower body to frame. Remove the groove pins from body hinge pins, and pull out both hinge pins. Attach a chain to four corners of the body, and lift body off the frame.

94. REPAIR.

a. Most repairs to the body can be done on the vehicle as efficiently as when removed. Replace the body if damaged beyond repair.

95. INSTALLATION.

a. End Dump. Place body in position on frame, aline body hinges with frame, insert hinge pins, and install groove retaining pins. Unhook chain from rear corners of body, and raise front of body to about approximately a 40-degree angle. Raise body hoist mechanism slowly, guiding body links so that they enter the cross shaft levers. Install link pivot pins and groove retaining pins. Release overhead hoist chain, and retract body hoist. Raise body several times to check for proper operation of body hoist and linkage.

b. Side Dump. Place body in position on frame, aline body hinges with frame, insert hinge pins, and install retaining pins. Unhook the two chains from the hinged side of body, and raise the other side of body to approximately 40 degrees. Raise body hoist mechanism slowly, guiding piston rod head block to position between body brackets. Install wrist pin, groove retaining pin, and remove chains. Raise body several times to check operation of body hoist and linkage.

Section V

HOOD

96. DESCRIPTION.

a. The hood consists of the top hood section and hood side panels. The hood top is hinged at the rear and raises from the front. A prop is attached to hold it open. Springs are used to help support the weight in raising and lowering. The hood side panels are held in position with wing nuts and screws.

97. REMOVAL.

a. Unlatch hood, and prop it open with an external support. Remove cotter pin, washer, spring, and clevis pin from the upper end of prop. Telescope the hood prop, and leave it fastened to the radiator

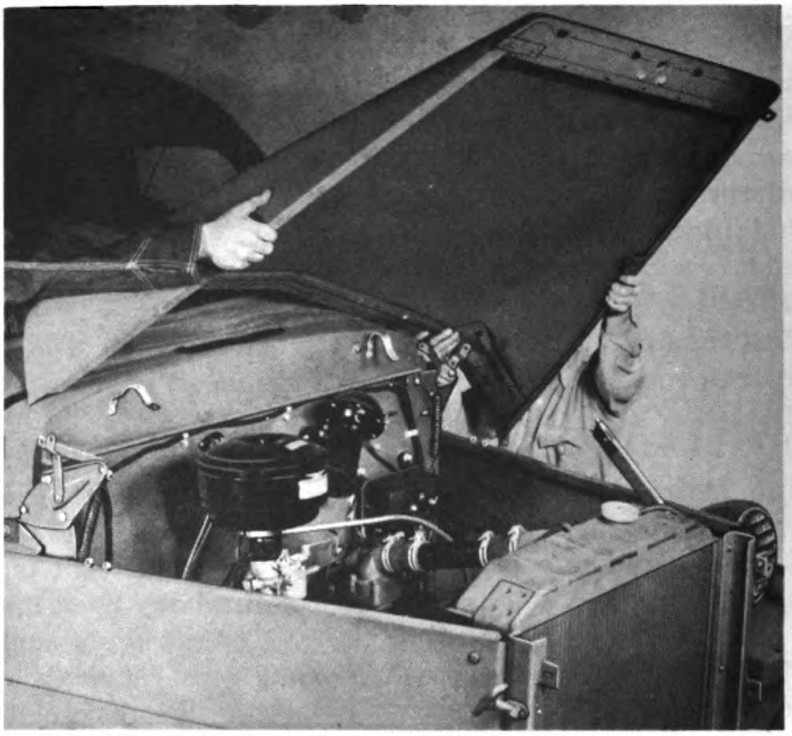


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Figure 162 — Removing Hood Top Assembly

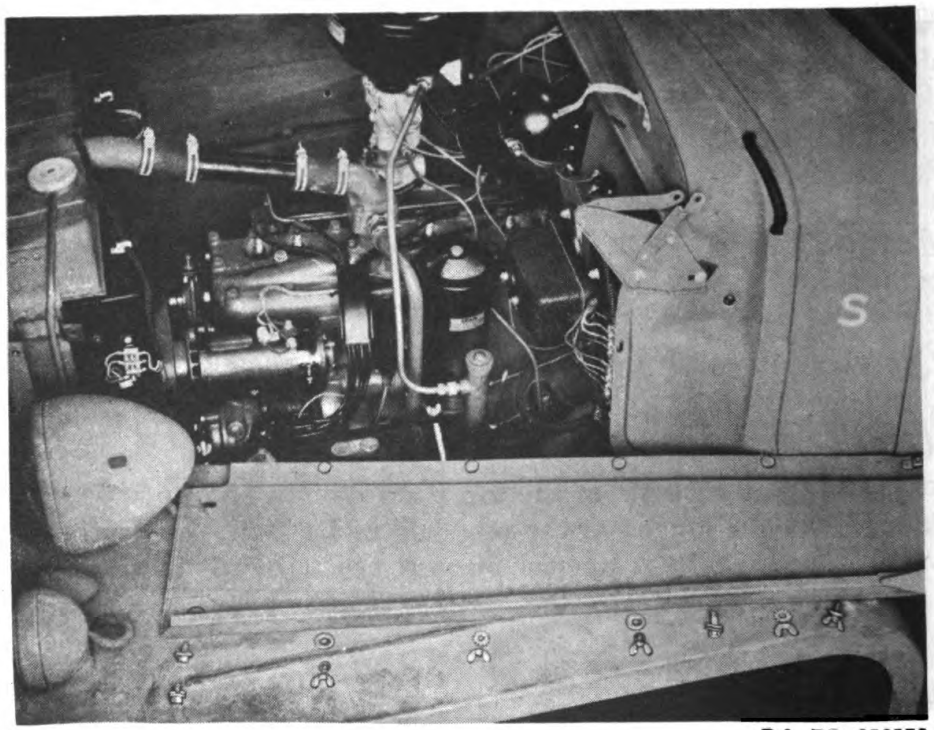

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Figure 163 — Hood Left Side Panel Removed

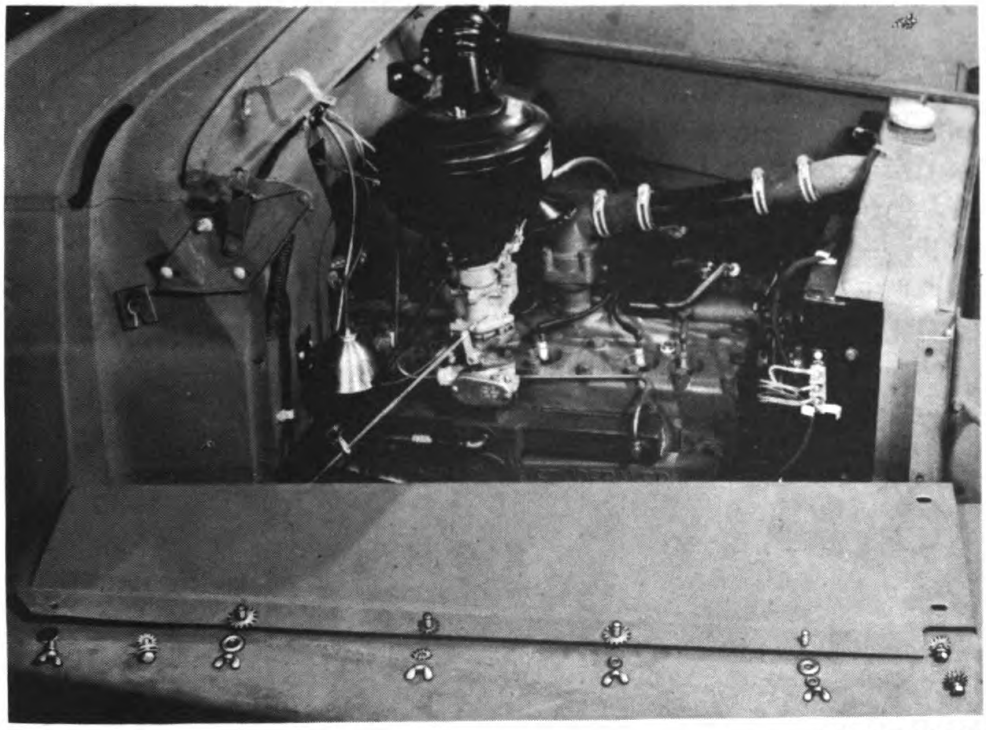

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Figure 164 — Hood Right Side Panel Removed

frame. Remove screws holding the two bond straps to hood. Remove the cotter pins and castle nuts holding the hood hinge upper links to the hood. Pull upper links off the studs, and lower against dash. Remove the cotter pins and castle nuts holding the hood hinge lower links to the hood, push links off the hood studs and back out of the way, and remove hood (fig. 162). Remove hood side panel to radiator screws and panel to dash screws. Remove panel to fender and fender apron wing nuts and wing studs, and lift hood side panel off the vehicle (figs. 163 and 164).

98. REPAIR.

a. Repairs to the hood top or side panels usually can be accomplished as easily on the vehicle as off the vehicle. Replace the hood top or side panels if they are damaged beyond repair. If parts of the hinge or return springs are damaged or broken, replace them. If hood support is unsatisfactory, replace it.

99. INSTALLATION.

a. Place hood side panels in position, install hood panel to fender apron wing studs, and wing nuts. Install hood side panel to radiator and dash screws. Place hood in position, and prop it open. Install hood hinge lower links over the hood studs. Install hood stud castle nuts, tighten nuts, and install new cotter pins. Place the hood hinge

upper links over hood studs. Install hood stud castle nuts, tighten securely, and install new cotter pins. Raise hood prop, install clevis pin, spring, washer, and new cotter pin to fasten prop on hood. Fasten the two bond straps to the hood, being sure the toothed lock washers are between the bond straps and the hood, and tighten screws securely. Adjust hood as required to obtain proper alinement at cab and radiator frame.

CHAPTER 11

FRAME

100. DESCRIPTION AND DATA.

a. Description. The frame serves as the structural center of the vehicle and consists of the side members, various crossmembers, brackets, and gussets (figs. 165 and 166). These latter items are attached to the frame side members at their proper location by means of rivets. Various accessories are also attached to the frame, such as bumpers, towing hooks, pintle hooks, and winch extensions.

b. Data.

	Wheelbase	
	148 inches	162 inches
Side member height	8 9/16 in.	8 9/16 in.
Side member width	3 in.	3 in.
Side member thickness	1/4 in.	1/4 in.
Number of crossmembers:		
Former production	5	5
Present production	5	6
Width of frame, front	30 1/8 in.	30 1/8 in.
Width of frame, rear	34 1/16 in.	34 1/16 in.
Total length of frame less winch	222 9/16 in.	241 7/16 in.
Total length of frame with winch	237 1/8 in.	256 in.

101. FRAME ALINEMENT.

a. General. Whenever the vehicle has been subjected to any accident which might result in a "swayed" or sprung frame, make a careful check for proper frame alinement, correct steering geometry, and alinement of the axles. When a frame is suspected of being out of alinement because of a collision or some other form of accident, remove parts and units as required so that actual frame measurements may be taken on the frame itself. Where it is desired to make only a rough or preliminary check, the transfer method may be used. This does not require removal of the body, engine, cab, or other units; however, measurements must be taken carefully.

b. Cleaning. Wash the frame completely with water; remove any accumulation of grease, oil, and other foreign matter which water will not take off, with dry-cleaning solvent. Be sure all sections are cleaned so that inspection and alinement, if necessary, can be accomplished properly.

c. Inspection.

(1) LOCATE CENTER LINE. This method of checking frame alinement is proposed on the premise that the front axle and connecting bar are not bent. Any distortion that changes the length or position of these parts would not give a true center line location. In such an event it would be necessary to work from the rear axles, provided

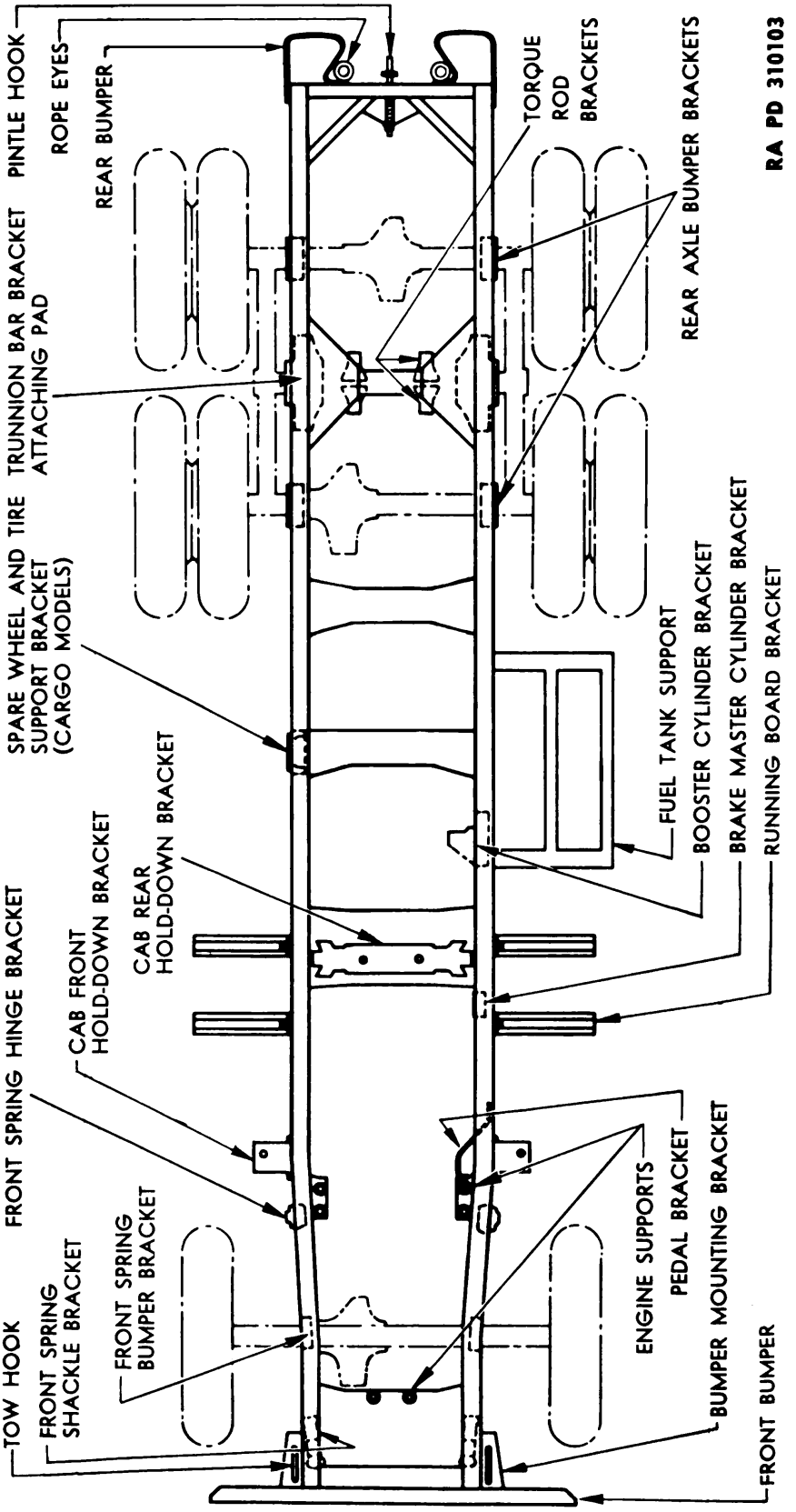

Figure 165 — Frame and Brackets (162-inch Wheelbase Vehicles)

FRAME

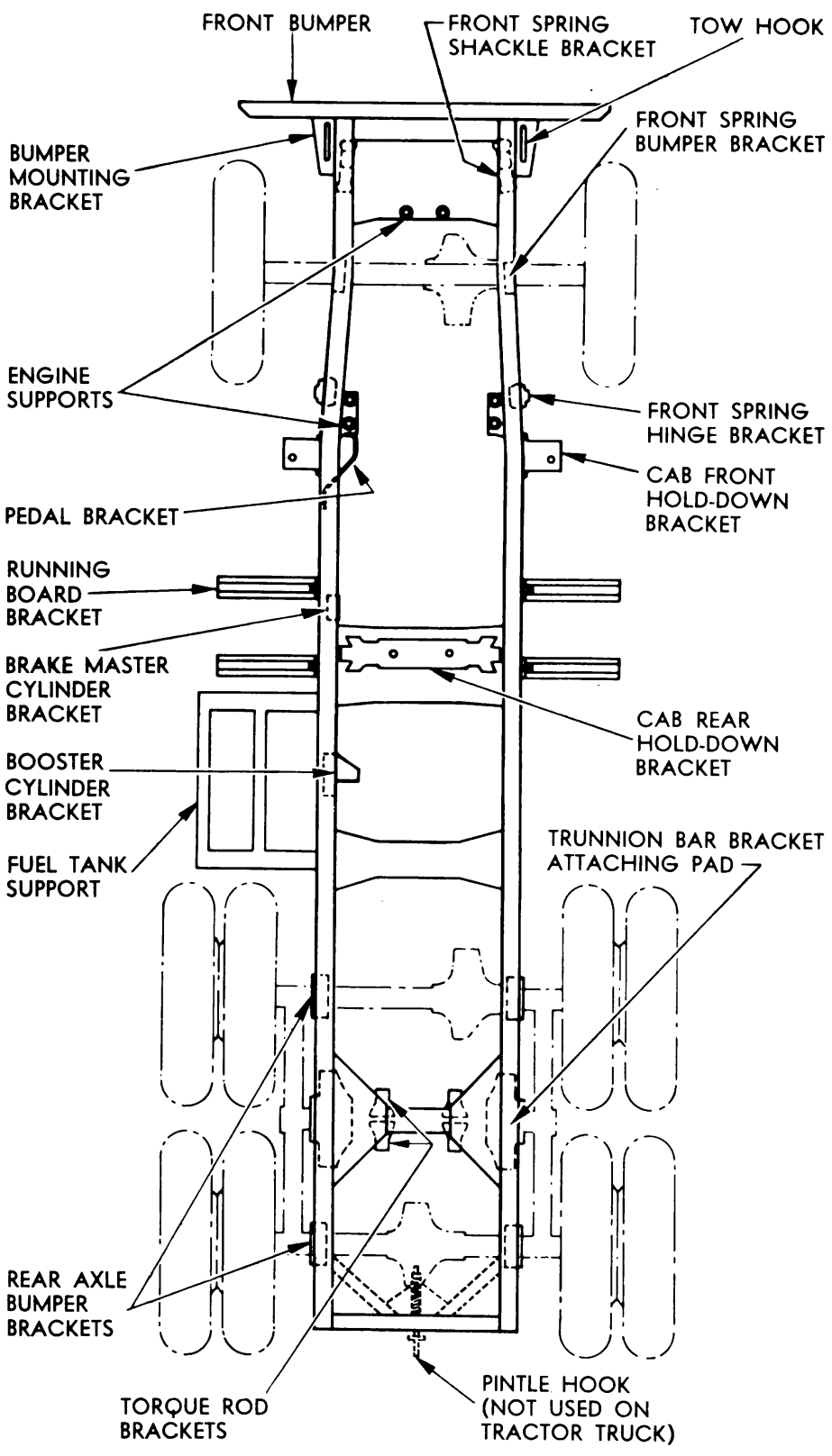

Figure 166 — Frame and Brackets (148-inch Wheelbase Vehicles)

they were not damaged. Place the vehicle on a floor that is smooth and level. Refer to the frame alinement diagram (fig. 167) to locate the points "0" on the floor with a plumb bob and line. By careful measurement, find the exact center between the points indicating the front axle and those indicating the connecting bar. Using a chalk line, make a mark extending beyond the front and rear limits of the vehicle's length, indicating the center line of vehicle. This mark will also be the ideal center line of the frame.

(2) LOCATE CHECKING POINTS. Using a square and measuring at a right angle (90 degrees) to the center line, establish the over-all frame width points at the rear of the frame and at the location of crossmember No. 2. (Use half of the width measurements given on the frame diagram.) Make a mark with a chalk line through these points in transferring the width of the frame main section to the floor. Repeat this same procedure at the front, measuring at a right angle (90 degrees) to the center line, and establish marks on the floor which represent the width of the narrow section of the frame.

(3) CHECKING FRAME ALINEMENT. With the plumb bob line flat against the outer vertical face of the frame, the point of the bob should coincide with the ideal frame lines on the floor within ⅛ inch. Variations of over ⅛ inch indicate that the frame is misalined, and it is likely that one or more of the axles are not at right angles to the center line. Make marks on the floor to indicate the frame length and mark the diagonals 1, 2, and 3 with a chalk line. Check to see if 1 equals 1, 2 equals 2, and 3 equals 3. With the measurements obtained, it can be determined which section or sections of the frame have been damaged. It is desirable to do the corrective work where the ideal frame lines have been established on the floor, because the correctness of the repair can be verified as the work progresses.

d. Repair.

(1) STRAIGHTEN. Straighten all frame members when cold, as heat weakens the structural characteristics of the frame material. Whenever an inspection of straightened frame members reveals signs of strain or cracks, reinforce and weld the parts, or replace them with new rivets. Fatigue fractures in straightened frame members are sometimes overlooked, because they are not easily detected. Therefore, apply a film of whiting and water mixture to the member that was straightened. After the mixture has dried thoroughly, strike the section with a light hammer. If very small fatigue fractures have developed, the whiting film will usually crack at the exact location of the fracture.

(2) REINFORCING. If it becomes necessary to cut the frame, cut the member at an angle of 45 degrees in order to distribute the cut and the weld over an area twice the width of the member. Flat, channel, or angle stock can be used in making reinforcements; how-

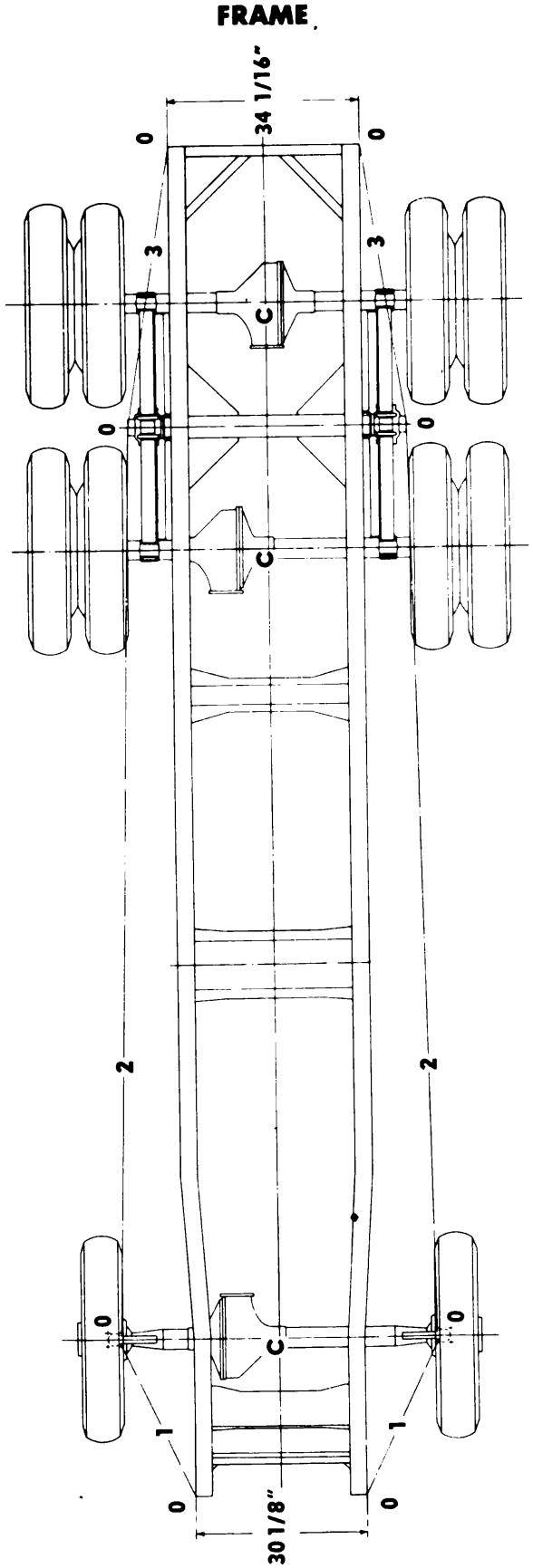

Figure 167 — Frame Alinement Chart

ever, angle stock is preferable because a minimum amount of fitting is involved. Reinforcement stock thickness should not exceed that of the side member to be reinforced. Where possible, extend the reinforcement at least 18 inches beyond the nearest frame crossmember.

(3) RIVET AND WELD. Hot-rivet the reinforcement securely in position wherever possible. The diameter of the rivets used for reinforcement will depend on the spacing and number of rivets. Generally, use rivets with a diameter that is 50 percent to 100 percent greater than the plate thickness. To obtain complete and thorough fusion at the cut in the side member, weld the outside edges of the reinforcement to the frame after riveting. Where possible, use electric arc welding to weld the frame, because burning of the metal is then minimized, and the heat is localized. Fill any unused holes with welding material. Use welding rod that consists of substantially the same material as that used in the frame.

(4) REPLACEMENT. When the frame is damaged beyond repair, remove all units, wires, pipes, connecting bar assembly with brackets, running board brackets, and install them on replacement frame.

CHAPTER 12

FIFTH WHEEL (6x4 TRACTOR TRUCK)

102. DESCRIPTION AND DATA.

a. Description. The semitrailer coupler used on the tractor truck is usually termed the fifth wheel. It is located on the frame over the tandem rear axles. The king pin on the semitrailer slips into a split jaw coupler on the fifth wheel which is then locked shut. A lever is used to unlock the jaws and release the king pin for uncoupling the semitrailer. Flexibility of coupling is obtained by pivoting the base to a walking beam which in turn is pivoted on the sub-base. This allows movement in all planes.

b. Data.

Make ..... Dayton steel foundry

103. DISASSEMBLY.

a. Preliminary Cleaning of Assembly. Place assembly on suitable work bench, and scrape off all accumulated old lubricant and dirt. Clean assembly thoroughly with dry-cleaning solvent.

b. Remove Base and Walking Beam from Sub-base. Support base of fifth wheel with a hoist. Remove nut, lock washer, and bolt from fifth wheel support rocket shaft; then pull the shaft out of base and walking beam; lift the base off the walking beam, and remove the shims. Remove fifth wheel lateral shaft from walking beam and sub-base; lift walking beam and leveling springs off the sub-base (fig. 168). Remove fifth wheel adjusting wedge nuts, lock washers, bolts, plain washers, and the wedges.

c. Base and Jaws. Remove cotter pin and castle nut from fifth wheel operating handle stud, and remove handle. Take cotter pins out of coupler jaw fastening pins; remove jaws, washers, and pins.

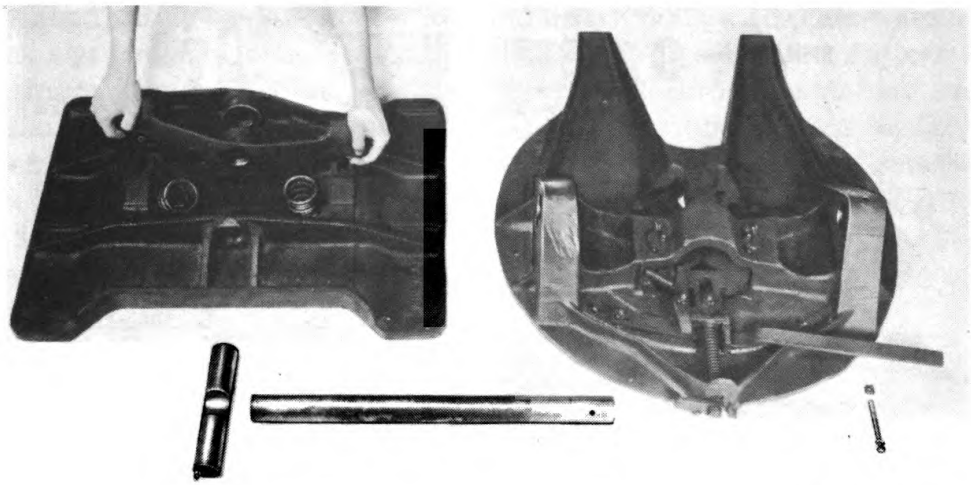

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Figure 168 — Disassembling Fifth Wheel

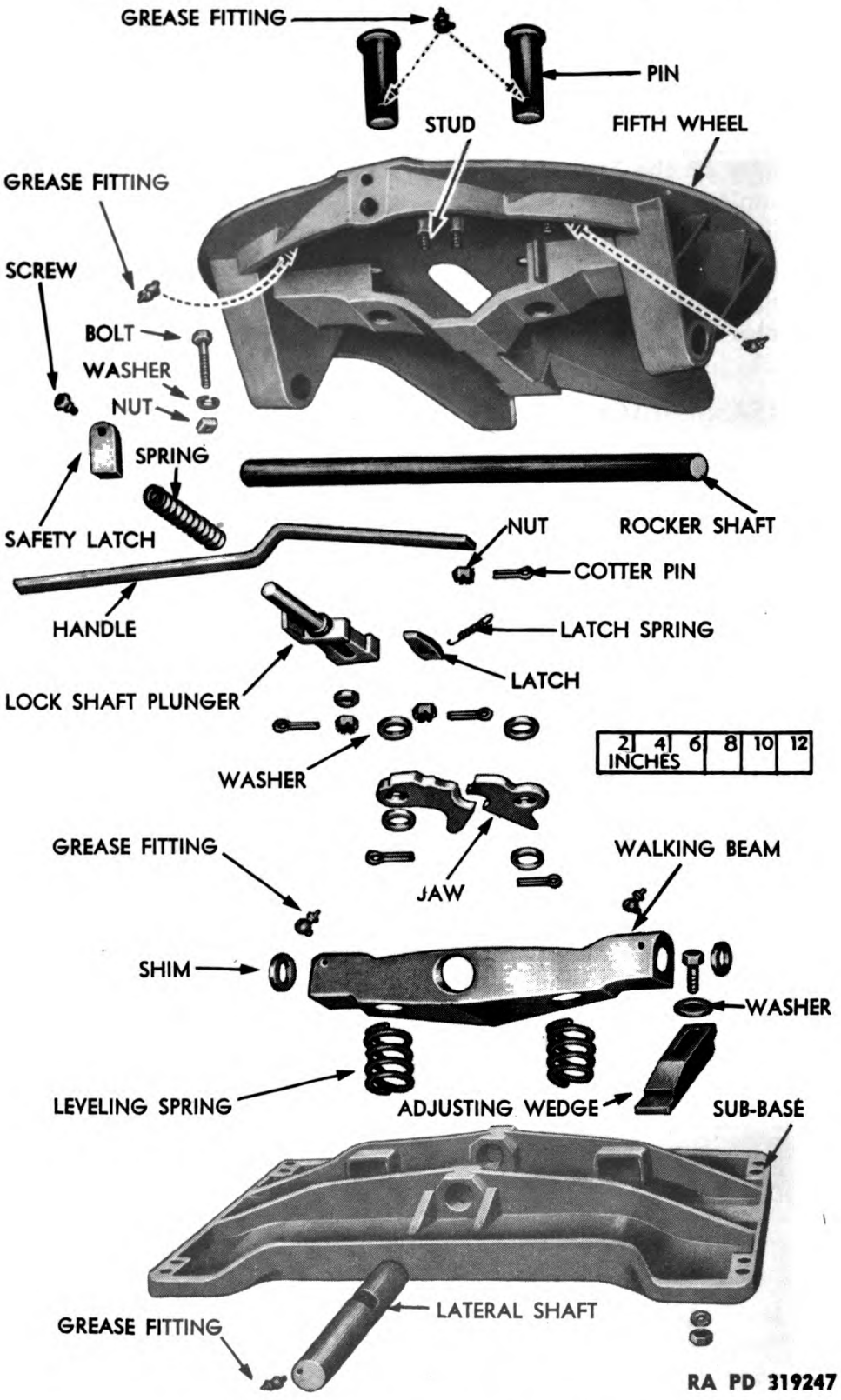

Figure 169 — Fifth Wheel Disassembled

Remove cotter pin, take nut off the plunger lock latch stud, and remove lock latch and spring. Take out plunger safety latch screw, and remove latch. Remove cotter pin, nut, and washer from lock shaft plunger assembly stud, and remove plunger assembly and spring.

104. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Place all parts (fig. 169) in dry-cleaning solvent and clean thoroughly. Dry with compressed air, and make sure that all grease passages and fittings are open.

b. Inspection. Inspect shafts and jaw pins carefully for pits, grooves, or breakage. Examine jaws for elongation of coupler or fastening holes. Check bores in walking beam for elongation, pits, or scores. Inspect grease passages to make certain they are open so that the pivot points can be properly lubricated. Check the lock latches and jaws for rounded corners at locking points. Examine the base, walking beam, and sub-base for cracks or damage.

c. Repair. If shafts or jaw pins are unserviceable, replace them. Replace the walking beam if it is not suitable for further use. Replace jaws or lock latches if not satisfactory for additional service. Replace any other parts which are not serviceable. If base or sub-base cannot be placed in serviceable condition by welding, replace as required.

105. ASSEMBLY.

a. Base and Jaws. Place lock shaft plunger assembly and spring on stud and install washer, nut, and a new cotter pin. Install plunger lock latch on stud, with a nut and new cotter pin. Install plunger safety latch and screw. Place coupler jaw fastening pins in position; install washers, jaws, washers, and new cotter pins. Place fifth wheel operating handle on stud, install castle nut, and a new cotter pin.

b. Install Base and Walking Beam on Sub-base. Place fifth wheel adjusting wedges in position, and install bolts with plain washers, lock washers, and nuts. Install walking beam and leveling springs in position on sub-base, and insert lateral shaft through sub-base and walking beam. Hoist base into position over sub-base and walking beam, and lower into place. Install an equal amount of shims between the ends of walking beam and base pivot arms to eliminate end play, and push the support rocker shaft into place. Install rocker shaft bolt, lock washer, and nut. Lubricate the assembly thoroughly.

106. FITS AND TOLERANCES.

Rocker shaft diameter	2 in.
Lateral shaft diameter	2 in.
Coupler jaw pin diameter	1¾ in.
Walking beam end play	Shims
Shim thickness	1/32, 1/16, and 1/8 in.

CHAPTER 13

POWER TAKE-OFF

107. DESCRIPTION AND OPERATION.

a. Two types of power take-off units (single and dual), are used on these vehicles. The single type (figs. 170 and 171) is used on vehicles equipped with a winch only, while the dual type (fig. 172) is used on vehicles equipped with a winch and hoist, or hoist only. Engagement of the take-off is controlled by means of levers in the cab. Either power take-off unit has high, low, reverse, and two neutral positions for winch operation. The dual power take-off unit has an engaged position for hoist pump operation, and a neutral position. The power is transmitted from the take-off unit to the winch or hoist pump by means of a drive shaft.

108. DATA.

Make:		
Single-type	Spicer	Detroit Harvester
Dual-type	Spicer	.....
Model:		
Single-type	YR6S	6100-6
Dual-type	YAG6M	.....
Speeds for winch:		
Pulling	2	2
Reverse	1	1
Neutral	2	2
Speed for hoist (dual-type only)	1	.....
Drive	From transmission	From transmission
Controls	In cab	In cab

109. REMOVAL.

a. Drain lubricant from transmission. Remove the cotter pins and clevis pins attaching the shift rods to the shift shaft eyes. Disconnect and lower winch and/or hoist pump drive shafts from the power take-off unit. After placing a drain pan under the power take-off unit, loosen attaching nuts, and allow lubricant to drain out of unit. Support unit and unscrew the nuts while moving unit outward on studs. Remove unit, spacer, and gaskets. Tilt the unit, and pour out remaining lubricant. Cover the opening in transmission to keep out dirt and other foreign matter.

POWER TAKE-OFF

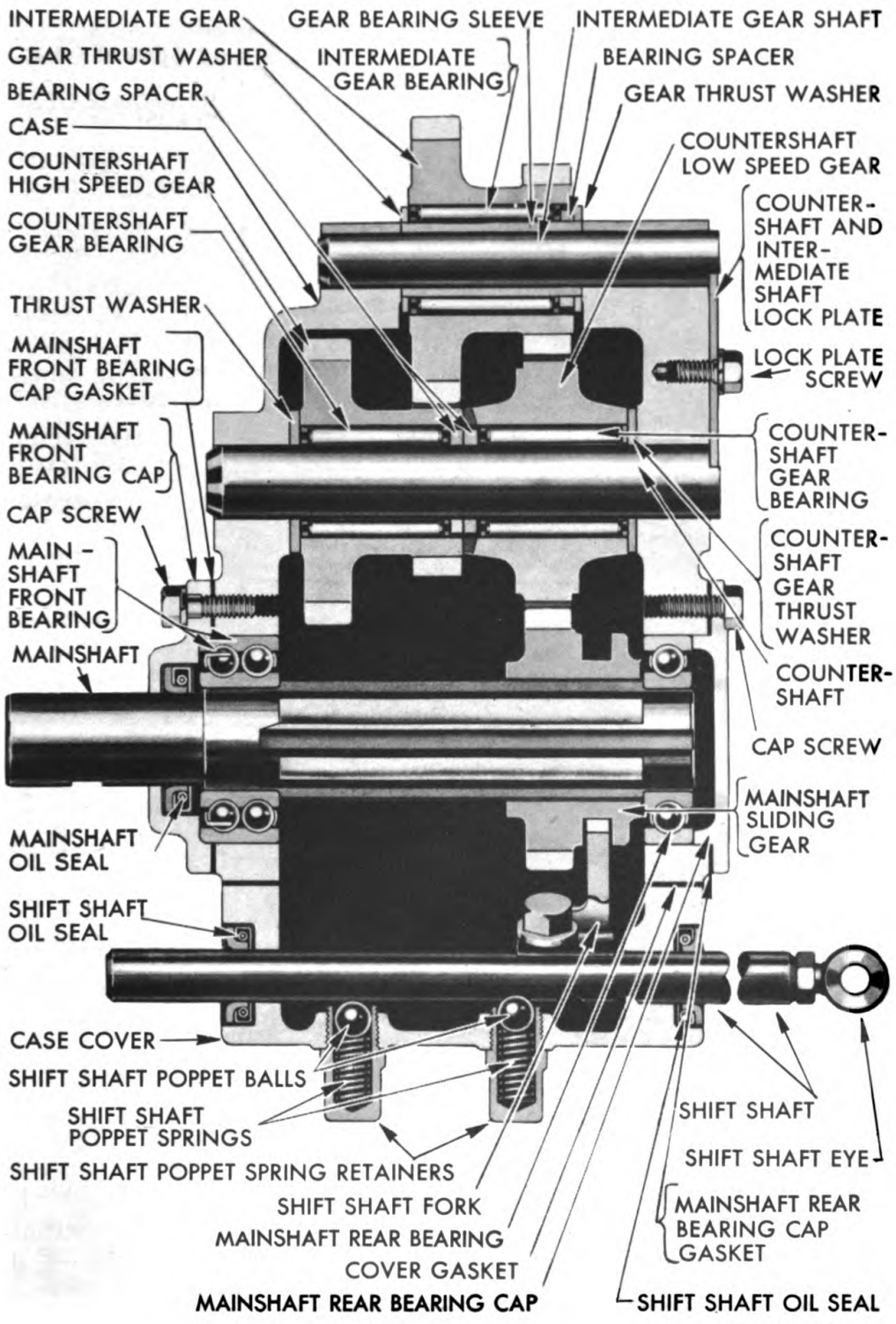

Figure 170 — Power Take-off (Spicer Type — Winch Only) — Sectional View

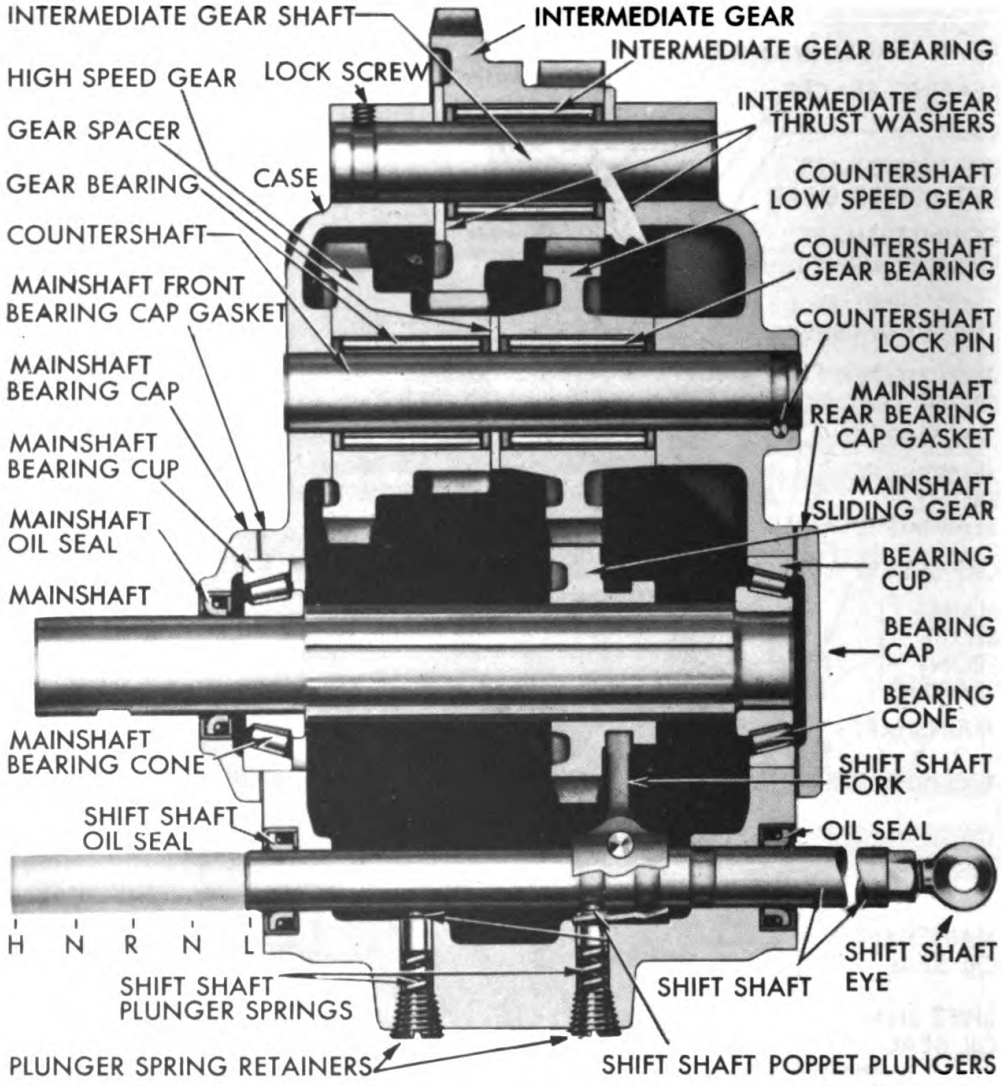

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Figure 171 — Power Take-off (Detroit Harvester Type) — Sectional View

110. DISASSEMBLY.

a. Detroit Harvester.

(1) REMOVE INTERMEDIATE SHAFT AND GEAR. Take out the socket-head set screw holding the intermediate shaft in position. Press out the shaft; and remove gear, thrust washers, and bearing as shaft moves rearward.

(2) REMOVE COUNTERSHAFT AND GEARS. Take out the lock pin at rear of countershaft, and press countershaft out the rear end of case. Remove the gears, bearings, and spacer from case.

(3) REMOVE MAINSHAFT AND GEARS. Take the cap screws and lock washers out of the mainshaft front and rear bearing caps, and

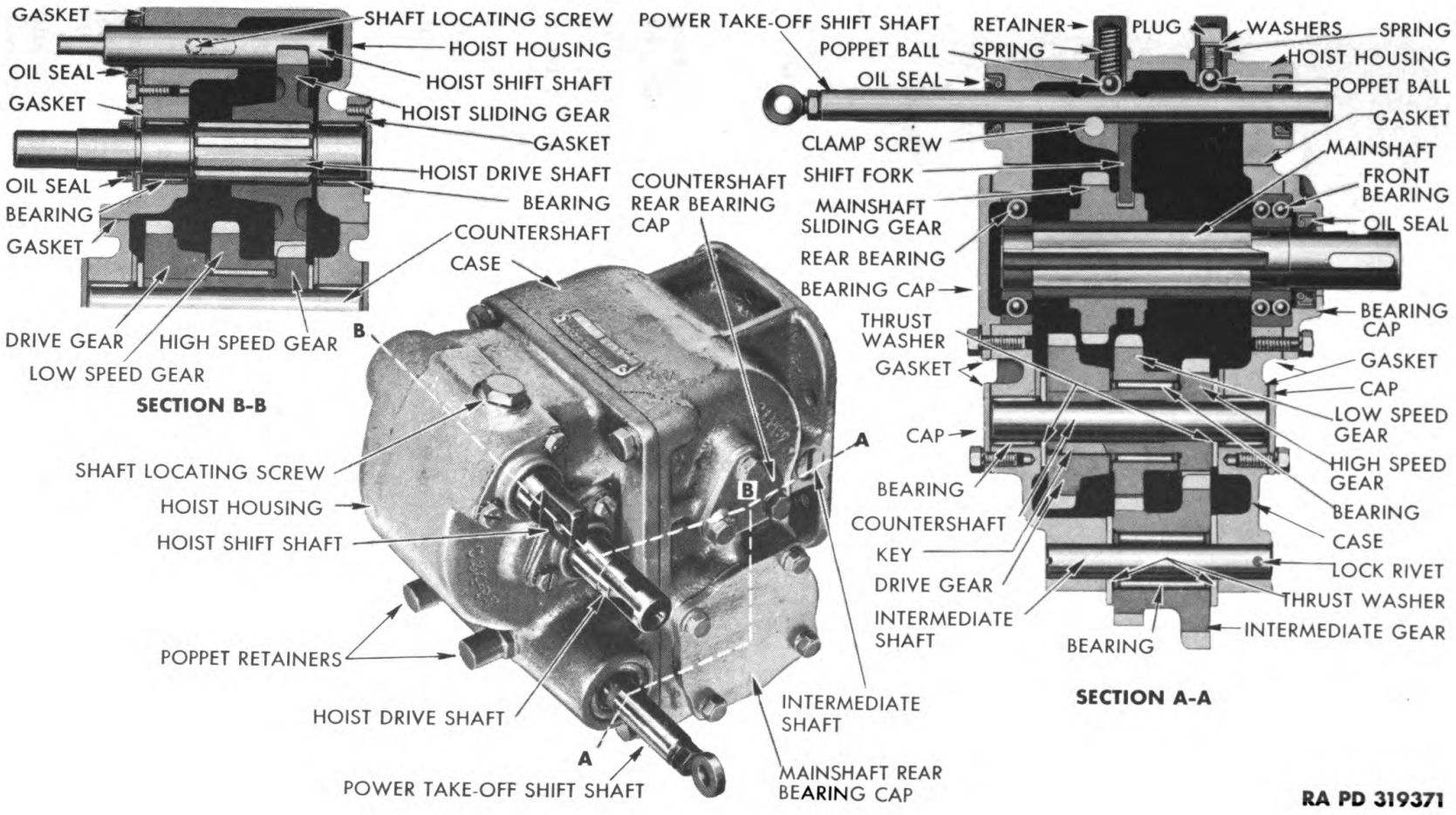
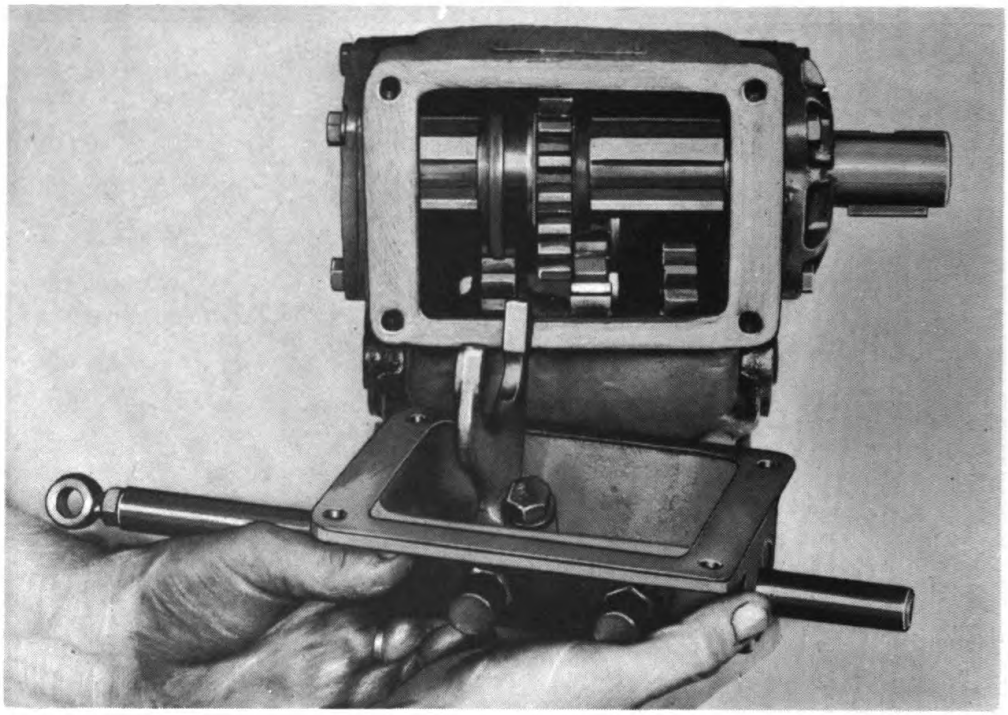


Figure 172 — Power Take-off (Spicer, Dual Type) — Sectional View



RA PD 319342

Figure 173 — Removing Power Take-off Cover

remove caps. Press the mainshaft forward until the forward bearing cup is out of bore. Remove cup and pull front bearing cone off the mainshaft with the universal puller. Insert mainshaft rear bearing cone into the cup and press rearward. Move the sliding gear off front end of the shaft as shaft with bearing cone is removed from rear of case. Press rear bearing cone off the mainshaft.

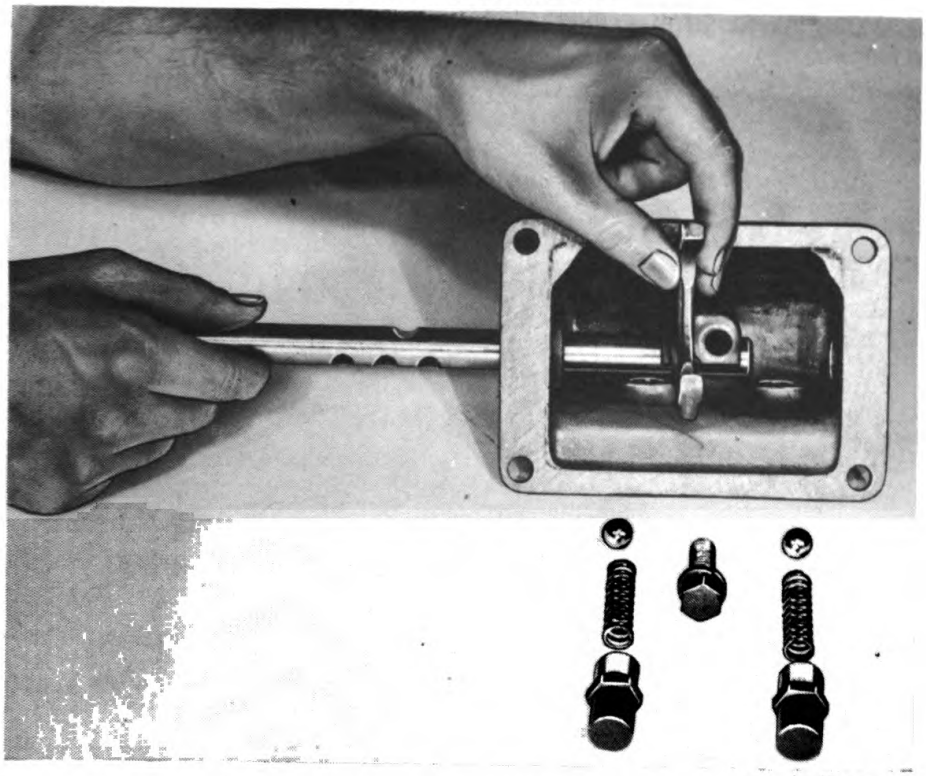
(4) REMOVE SHIFT SHAFT AND FORK. Remove the shift shaft poppet plunger spring retainers, springs, and plungers. Cut lock wire and remove shift shaft fork clamp screw. Slide shaft out the rear of case, and remove shift fork.

b. Spicer (Single-type) (fig. 178).

(1) COVER ASSEMBLY. Remove cap screws, lock washers, cover, and gaskets (fig. 173). Remove shift shaft poppet ball spring retainers and tip case to permit springs and poppet balls to fall out. Remove shift shaft fork clamp screw, and pull shaft rearward out of case, removing shift shaft fork during operation (fig. 174).

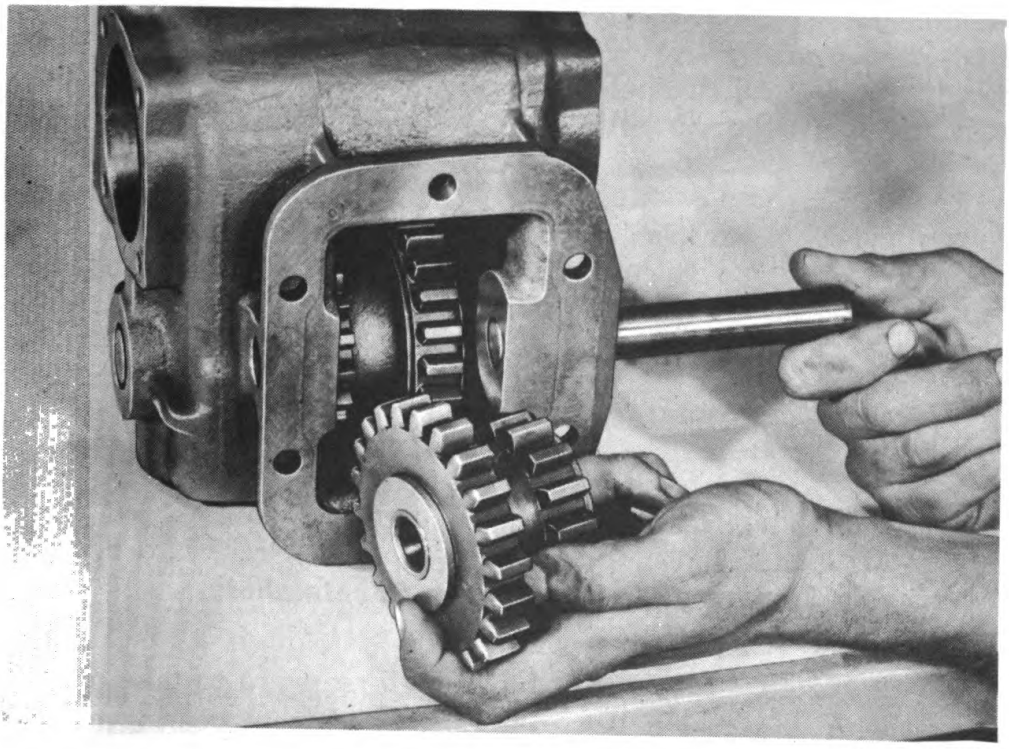
(2) REMOVE INTERMEDIATE SHAFT AND GEAR. Remove cap screw, lock washer, and lock plate from rear of case. Press shaft rearward out of case, removing thrust washers, gear, bearing, sleeve, and spacer during the operation (fig. 175).

(3) REMOVE MAINSHAFT AND GEARS. Take out cap screws and lock washers holding front and rear bearing caps to case, and remove



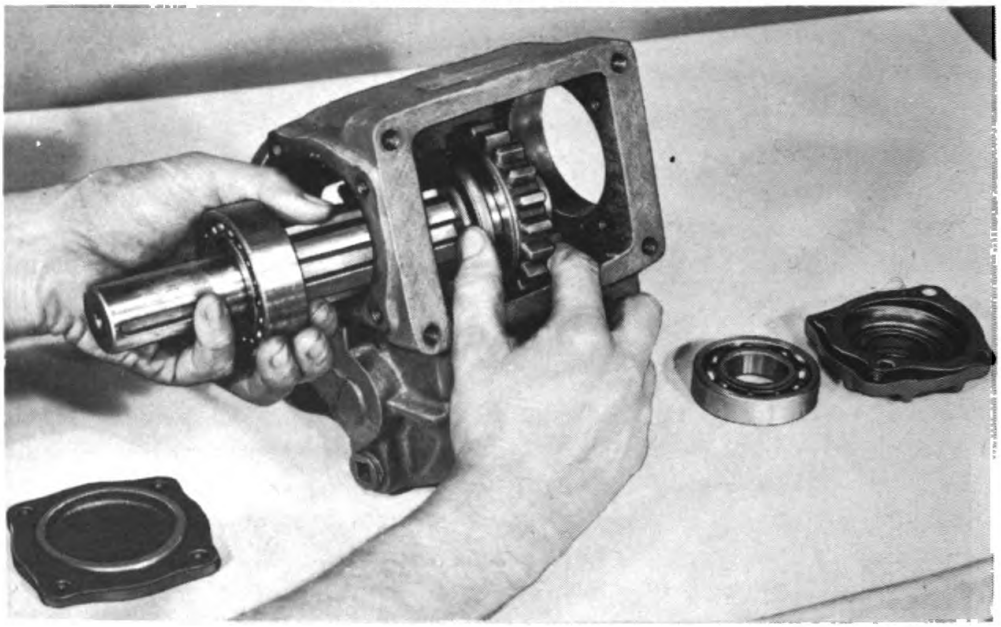
RA PD 319343

Figure 174 — Disassembling Cover



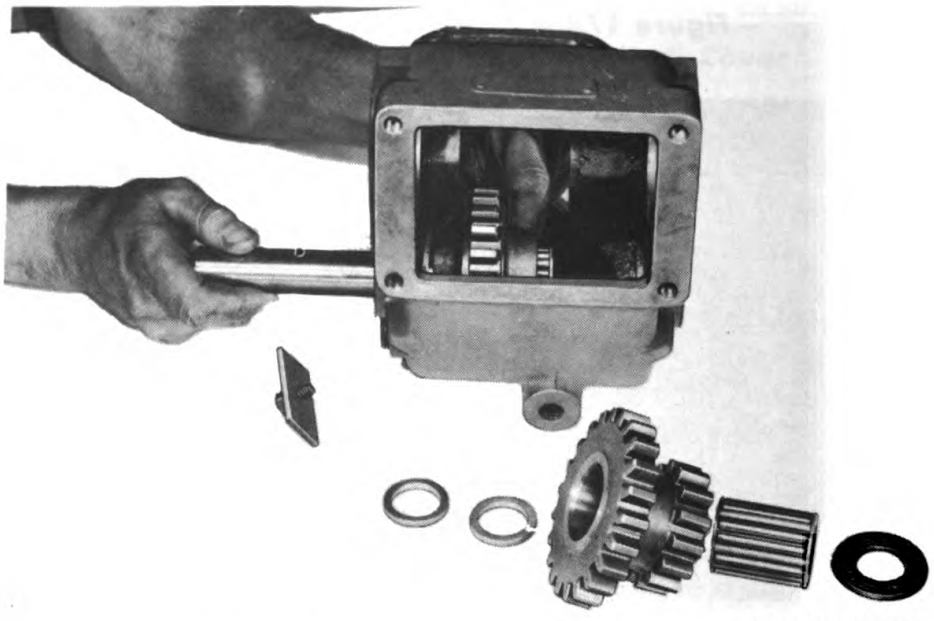
RA PD 319344

Figure 175 — Removing Intermediate Gear and Shaft



RA PD 319345

Figure 176 — Removing Mainshaft Assembly



RA PD 319363

Figure 177 — Removing Countershaft

caps with gaskets. Move shaft far enough rearward to take off rear bearing with universal puller. Pull shaft and front bearing out the front of case, sliding the gear off rear end of shaft during the operation (fig. 176). Press front bearing off the shaft.

(4) REMOVE COUNTERSHAFT AND GEARS. Press countershaft rearward out of case, removing thrust washers, gears, bearings, and spacers during the operation (fig. 177).

c. Spicer (Dual-type) (fig. 179).

(1) HOIST POWER TAKE-OFF HOUSING. Take out cap screws with lock washers, and remove housing from case. Remove shift shaft (for winch) poppet spring retainers, springs, and balls from housing; remove lock wire, loosen clamp screw in shift shaft fork, and pull shift shaft rearward out of housing, removing shift fork at same time. Remove screws from hoist power take-off drive shaft bearing caps, and remove caps with gaskets. Move shaft rearward out of sliding gear and housing; remove sliding gear from housing and bearings from shaft. Remove cap screws from shift shaft oil seal and gasket (for hoist pump). Take out shift shaft locating screw, pull shaft out of housing, and remove poppet ball and spring.

(2) REMOVE MAINSHAFT AND GEAR. Remove key from front end of shaft, take cap screws and lock washers out of mainshaft bearing caps, and remove caps with gaskets. Press mainshaft rearward, and pull rear bearing off the shaft with universal puller. Slide shaft with front bearing forward out of case, removing the sliding gear from shaft splines. Press the front bearing off the shaft.

(3) REMOVE COUNTERSHAFT AND GEARS. Remove cap screws, lock washers, bearing caps, and gaskets from front and rear of countershaft. Move shaft rearward out of case, thrust washers, countershaft gear cluster, and bearings. Remove countershaft gear cluster, thrust washers, and bearings from case. Press the drive gear off the high speed gear extension, take key out of keyway, and remove low speed gear and bearing.

(4) INTERMEDIATE SHAFT AND GEAR. Take the lock rivet out of intermediate gear shaft. Press shaft forward out of case, thrust washers, gear, and bearing. Remove gear, bearing, and thrust washers from case.

111. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Immerse all parts in dry-cleaning solvent. Clean inside and outside of case and housing thoroughly. Strike open side of bearings on a wood block to dislodge solid particles of old lubricant, and dry with compressed air, being careful not to spin the bearings. Be sure all lubricant holes in the gears are open. Make certain all old lubricant is completely removed from all parts.

b. Inspection. Examine bearing cones and cups closely for pits, scores, or other damage. Inspect gear teeth and bores for pits, scores, or nicks. Check housing and case for breaks or other damage. Examine poppet springs for breakage and balls for scores, flat spots, or breakage. Inspect all shafts for scores, pits, or damage.

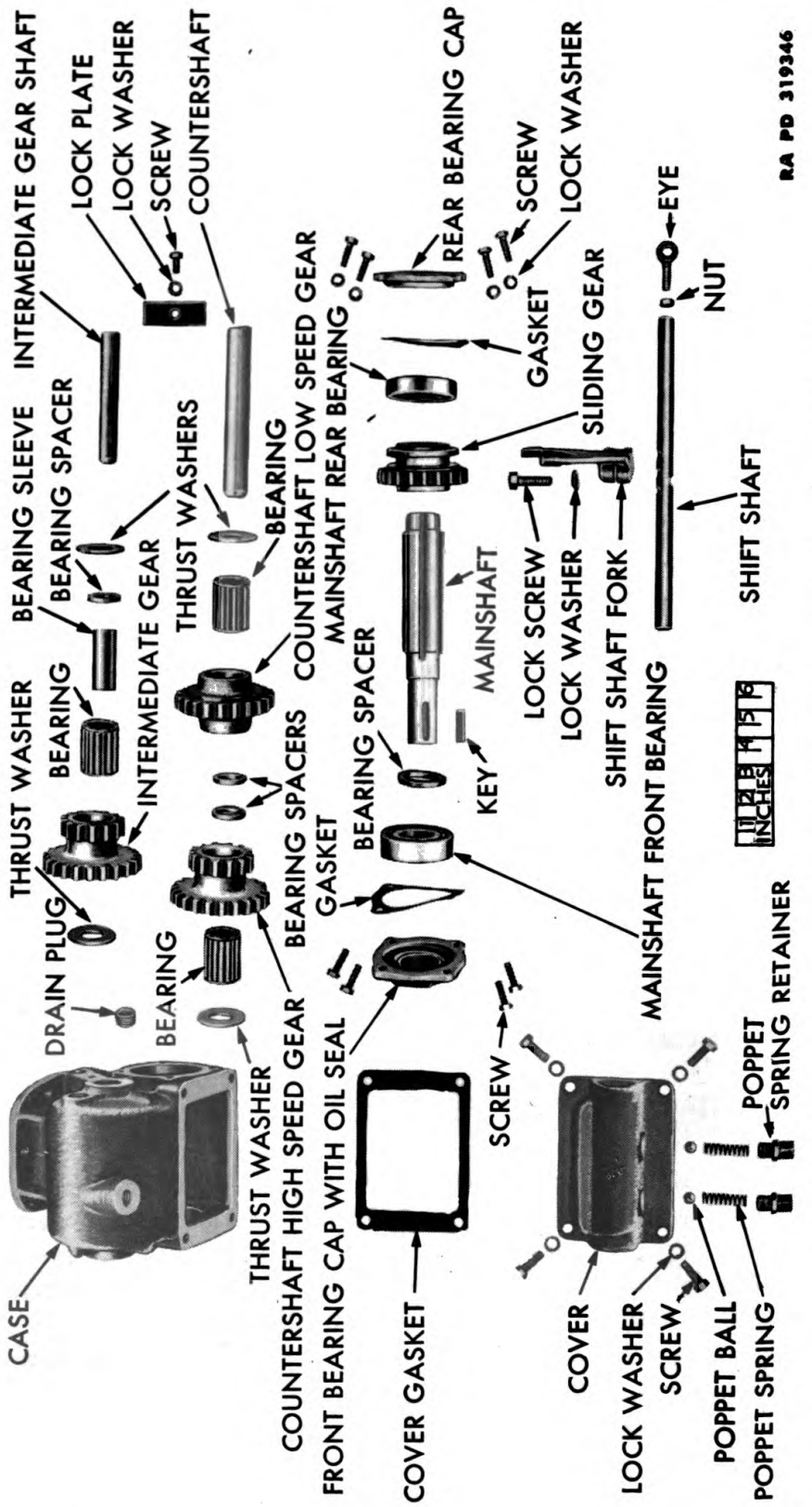


Figure 178 — Power Take-off (Spicer Type — Winch Only) Disassembled

POWER TAKE-OFF

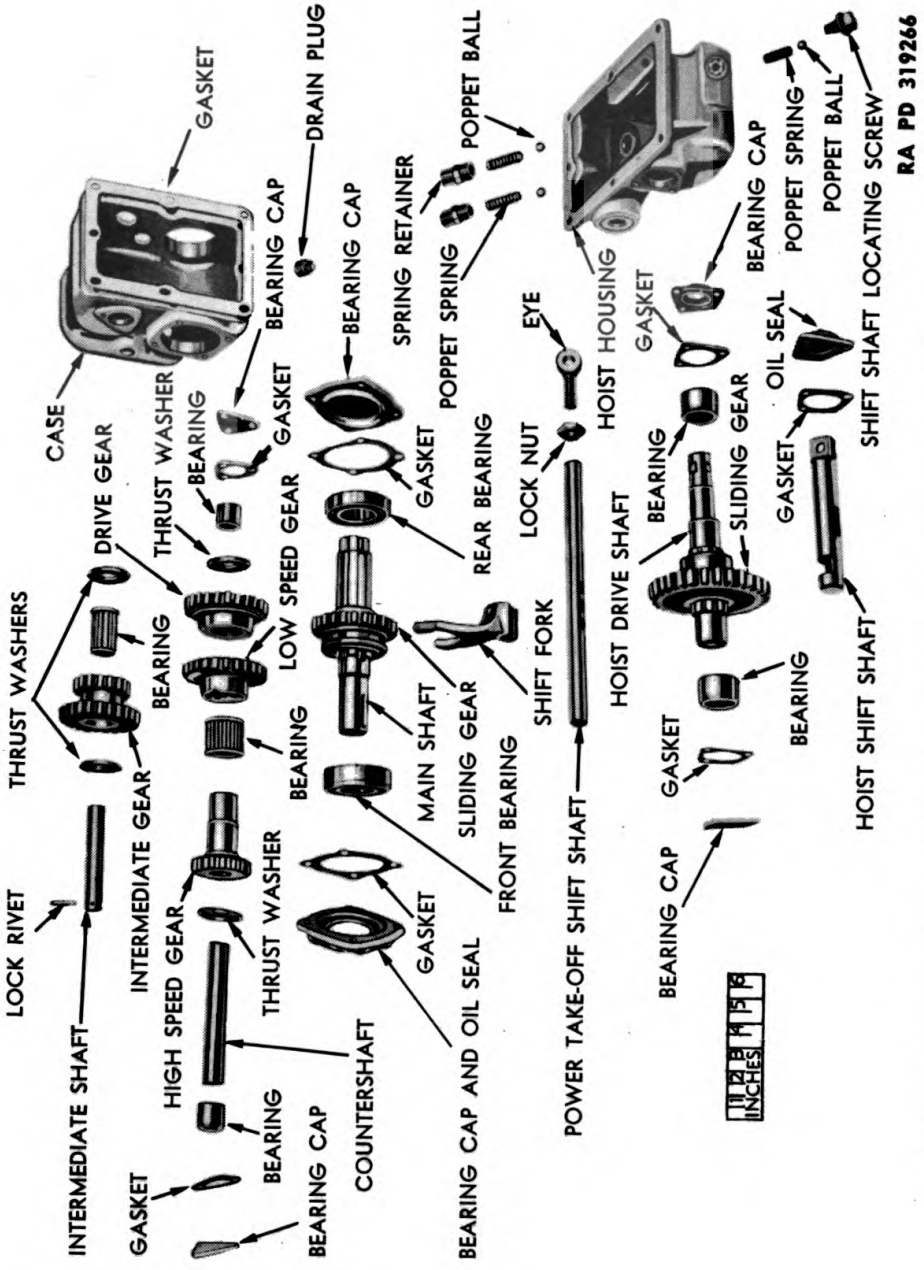


Figure 179 — Power Take-off (Spicer — Dual Type) Disassembled

c. Repair. Replace all oil seals and any unserviceable gears, bearing cones, bearing cups, or shafts. If a suitable repair cannot be made on a case or housing by welding, replace as required. Replace poppets or springs that are unsuitable for further service.

112. ASSEMBLY.

a. Detroit Harvester (fig. 171).

(1) INSTALL SHIFT SHAFT AND FORK. Install new shift shaft oil seals in the case. Insert shaft into rear of case, place shift fork on shaft, and push shaft through fork and front of case. Install shaft fork cap screw with lock washer, and lock-wire in position. Place poppet plungers in passages, and install springs and retainers.

(2) INSTALL MAINSHAFT AND GEARS. Press rear bearing cone on mainshaft, and insert shaft through rear bore of case. Place mainshaft sliding gear over front end of mainshaft so the fork groove is toward the rear, engage the fork in groove, and push mainshaft through gear until rear bearing is in the bore. Install rear bearing cup in bore, and install rear bearing cap with a new gasket. Press front bearing cone on front end of mainshaft and front bearing cup in bore. Install a new oil seal in front bearing cap, place cap with proper amount of new gaskets in position so the bearings have a slight drag, and tighten cap screws securely.

(3) INSTALL COUNTERSHAFT AND GEARS. Insert a dummy shaft into the case from the front until it extends into the case approximately 1 inch. Install the high speed gear with bearing, spacer, and low speed gear with bearing, on the shaft as it is pushed through the case. Start the countershaft into case from rear and press it forward, removing dummy shaft, until rear of countershaft is even with case. Install the lock pin to lock the countershaft in position.

(4) INSTALL INTERMEDIATE SHAFT AND GEAR. Insert bearing in bore of gear, place spacer washers in position on each end of gear, and slide gear into opening in case. Aline bore of gear with holes in case, insert shaft into forward end of case, and press in until front end is even with case. Install socket-head set screw to lock the shaft in place.

b. Spicer (Single-type) (fig. 170).

(1) INSTALL COUNTERSHAFT AND GEARS. Insert the chamfered end of shaft into the case from rear until approximately 1 inch extends inside, and install a thrust washer over end of shaft with oil grooves toward case. Place bearing in low speed gear bore, and slide the gear and bearing over the end of shaft so the oil grooves are toward center of case. Install a bearing spacer in low speed gear bore, and press shaft toward front until end of shaft is flush with forward face of spacer. Place high speed gear bearing into hub of gear, and install bearing spacer in high speed gear hub (at end with

small gear). Hold the gear, bearing, and spacer in position so the small gear is toward low speed gear, aline bearing bore with shaft, and push shaft into high speed gear bearings. Insert a thrust washer (between high speed gear and case) with oil grooves toward case, and push shaft forward until the offset portion is even with rear of case.

(2) INSTALL MAINSHAFT AND GEARS. Press double-row ball bearing in position on front of mainshaft, insert shaft through front bore of case, and install sliding gear on shaft splines with shifting groove to rear. Push shaft through until rear end extends beyond rear of case, and install rear bearing on shaft. Place rear bearing cap in position with a new gasket, and tighten cap screws firmly. Install a new oil seal in front bearing cap, place cap in position using a new gasket, and tighten securely with cap screws.

(3) INSTALL INTERMEDIATE SHAFT AND GEAR. Insert the sleeve, bearing, and bearing spacer inside the gear; place a thrust washer at each end of gear so that oil grooves will be toward case. Place gear with bearing and thrust washers into position in case, aline bearing bore with bore in case, insert chamfered end of shaft into case from rear, and press it forward until the offset portion is flush with rear of case. Install lock plate and cap screws with lock washers, and tighten securely.

(4) INSTALL COVER ASSEMBLY. Install new shift shaft oil seals in the cover. Insert shift shaft into cover from rear, place shift shaft fork on shaft with offset to the front, push shaft into position, install fork clamp screw, and tighten firmly. Place poppet balls and springs into passages and install retainers. Using a new gasket install cover to case, being sure that shift fork engages groove in sliding gear.

c. Spicer (Dual-type) (fig. 172).

(1) INSTALL COUNTERSHAFT AND GEARS. Install low speed gear bearing and gear on high speed gear extension with the low speed gear hub extension toward high speed gear. Insert key in keyway on undercut portion of high speed gear extension, and press drive gear into position so that hub extension of drive gear is toward low speed gear. Place countershaft front and rear bearings in case, insert countershaft through rear bearing just far enough to install rear thrust washer. Install rear thrust washer over end of countershaft with oil grooves toward case, and place countershaft gear cluster in case with high speed gear at front. Aline bore in high speed gear with countershaft, push countershaft through high speed gear, place front thrust washer in position with oil grooves toward case, and push countershaft into position. Install front and rear bearing caps with new gaskets, and tighten cap screws securely.

(2) INSTALL MAINSHAFT AND GEAR. Press double-row ball bearing in position on front of mainshaft, insert shaft through front bore of case, and install sliding gear on shaft splines with shift fork groove at front. Push shaft through until rear end extends beyond rear of

case, and install rear bearing on shaft. Place rear bearing cap in position using a new gasket, and tighten securely with cap screws. Install a new oil seal in front bearing cap, place cap in position using a new gasket, and tighten securely with cap screws. Place a key in keyway near front end of shaft.

(3) INTERMEDIATE SHAFT AND GEAR. Place the bearing inside the gear and a thrust washer at each end of gear so the oil grooves will be toward the case. Install gear with bearing and thrust washers into position in case, and aline bearing bore with bore in case. Insert undrilled end of shaft into case from front, and press the shaft into position so the drilled hole in shaft is alined with hole in front of case. Install a new lock rivet to hold shaft in place.

(4) HOIST POWER TAKE-OFF HOUSING. Place shift shaft poppet ball spring and ball into passage in housing. Insert notched end of shift shaft (for hoist pump) into housing from rear, install oil seal using a new gasket, and tighten securely with cap screws. Turn the shift shaft so the notch near the inner end will be toward the sliding gear, and install the shift shaft locating screw. Insert splined end of hoist power take-off drive shaft into housing from rear. Place sliding gear teeth into notch in shift shaft with the hub extension toward rear, push drive shaft through the gear splines, and into position. Place front and rear bearings in position on shaft, install front bearing cap using a new gasket, tighten screws securely, and stake the screws to lock them. Install a new oil seal in rear bearing cap, place cap in position using a new gasket, and tighten securely to housing with cap screws. Install new shift shaft oil seals in housing, and insert shift shaft (for winch) through oil seal in rear of housing. Place fork on shift shaft with hub extension toward rear, and push shift shaft through the fork and front oil seal. Position fork properly on shift shaft, tighten clamp screw, and install a new lock wire. Install shift shaft poppet balls, springs, and retainers.

(5) INSTALL HOIST POWER TAKE-OFF HOUSING. Install a new housing to case gasket, and place the housing in position on case. Make sure the shift shaft fork enters the groove in the mainshaft sliding gear. Install cap screws with lock washers, and tighten housing securely to case.

113. INSTALLATION.

a. Install spacer on studs with a new gasket on each side of spacer. Support unit carefully, and move it into position on studs just far enough to start nuts and lock washers on all studs (fig. 180). After all nuts are started on studs, tighten nuts alternately until the unit is fastened securely to the transmission. Connect the control rods to the shift shaft eyes and adjust them, if necessary, so the gears engage and disengage properly. Connect the winch drive shaft and/or the

RA PD 319341

Figure 180 — Installing Power Take-off

hoist pump drive shaft to the power take-off unit. Fill the transmission to the proper level with lubricant of correct viscosity (Lubrication Guide).

114. LINKAGE ADJUSTMENT.

a. Winch Equipped Vehicles. Remove the clevis pin holding the adjustable linkage rod in position. Move the shift lever as necessary to engage the lock within the driver's compartment which holds the shift lever in neutral. Work the power take-off shifting mechanism at the unit until the sliding gear is in the neutral position nearest rear of power take-off unit. Change the effective length of the adjustable linkage rod by turning the clevis until the clevis pin hole is in alinement with the hole in the shift shaft eye. Install the clevis pin and a new cotter pin.

b. Hoist Equipped Vehicles. Adjustment of controls for the power take-off is accomplished by means of a clevis on operating rod attached to shift shaft. Remove cotter pin and clevis pin, and loosen clevis lock nut. Adjust length of rod so shift shaft can be moved into the fully engaged or disengaged position without binding. Install clevis pin, a new cotter pin, and tighten clevis lock nut.

115. FITS AND TOLERANCES.

a. Detroit Harvester.

Clearance between mainshaft and sliding gear splines	0.002 in.
Clearance between shift shaft fork and sliding gear groove	0.010 in.
Thrust washer thickness:	
Intermediate gear washer	0.122 in.

b. Spicer (Single-type).

Clearance between mainshaft and sliding gear splines	0.002 in.
Clearance between shift shaft fork and sliding gear groove	0.010 in.
Thrust washer thickness:	
Intermediate gear washer	0.122 in.
Countershaft washers	0.122 in.

c. Spicer (Dual-type).

Clearance between mainshaft and sliding gear splines	0.002 in.
Clearance between shift shaft fork and sliding gear groove	0.010 in.
Thrust washer thickness:	
Intermediate gear washer	0.122 in.
Countershaft gear washer	0.122 in.

CHAPTER 14

WINCH AND DRIVE SHAFT

Section I

WINCH

116. DESCRIPTION AND OPERATION.

a. The winch consists of a worm and shaft which drives a worm gear that is keyed to a shaft (fig. 181). A bushed drum is mounted on the worm gear shaft which is controlled by a sliding clutch. The worm shaft is driven by a drive shaft connected to a power take-off unit mounted on the transmission. The hand-operated sliding clutch is keyed to the worm gear shaft outside of the winch drum, and must be engaged with the jaws on the side of the winch drum when the winch is to be operated. Disengagement of the sliding clutch permits the drum to turn on the worm gear shaft. Two brakes are provided to control the winch drum. The worm shaft brake prevents the winch drum from rotating under load, when the power take-off is disengaged. The shifter bracket brake prevents the drum overrunning the cable when the cable is being unreeled (fig. 182).

117. DATA.

Make ..... Heil
Model 125S
Drive ..... From power take-off at transmission
Bearings:
  Worm shaft ..... Ball
  Worm gear shaft ..... Bronze bushings

118. DISASSEMBLY.

a. Preliminary Cleaning. Clean the exterior of winch assembly thoroughly with dry-cleaning solvent, and dry with compressed air. Place the assembly in a suitable stand or on a work bench.

b. Remove Sliding Clutch, Shift Lever, and Winch Cable Drum. Take the grease fitting out of the worm gear shaft bearing at the support bracket. Remove the nut, lock washer, and bolt attaching the worm gear shaft bearing support bracket to the front angle support. Take out the cap screw holding the worm gear shaft right end plate on the shaft. Remove plate and shims from end of shaft, keeping shims with plate. Slip bearing support bracket, spacer, winch shift lever (with handle), and sliding clutch off the shaft. Take the two sliding clutch keys out of the shaft, and slide the winch cable drum with spacer off the shaft. Remove cotter pin from shifter pivot shaft, and disassemble winch shift lever and shifter bracket.

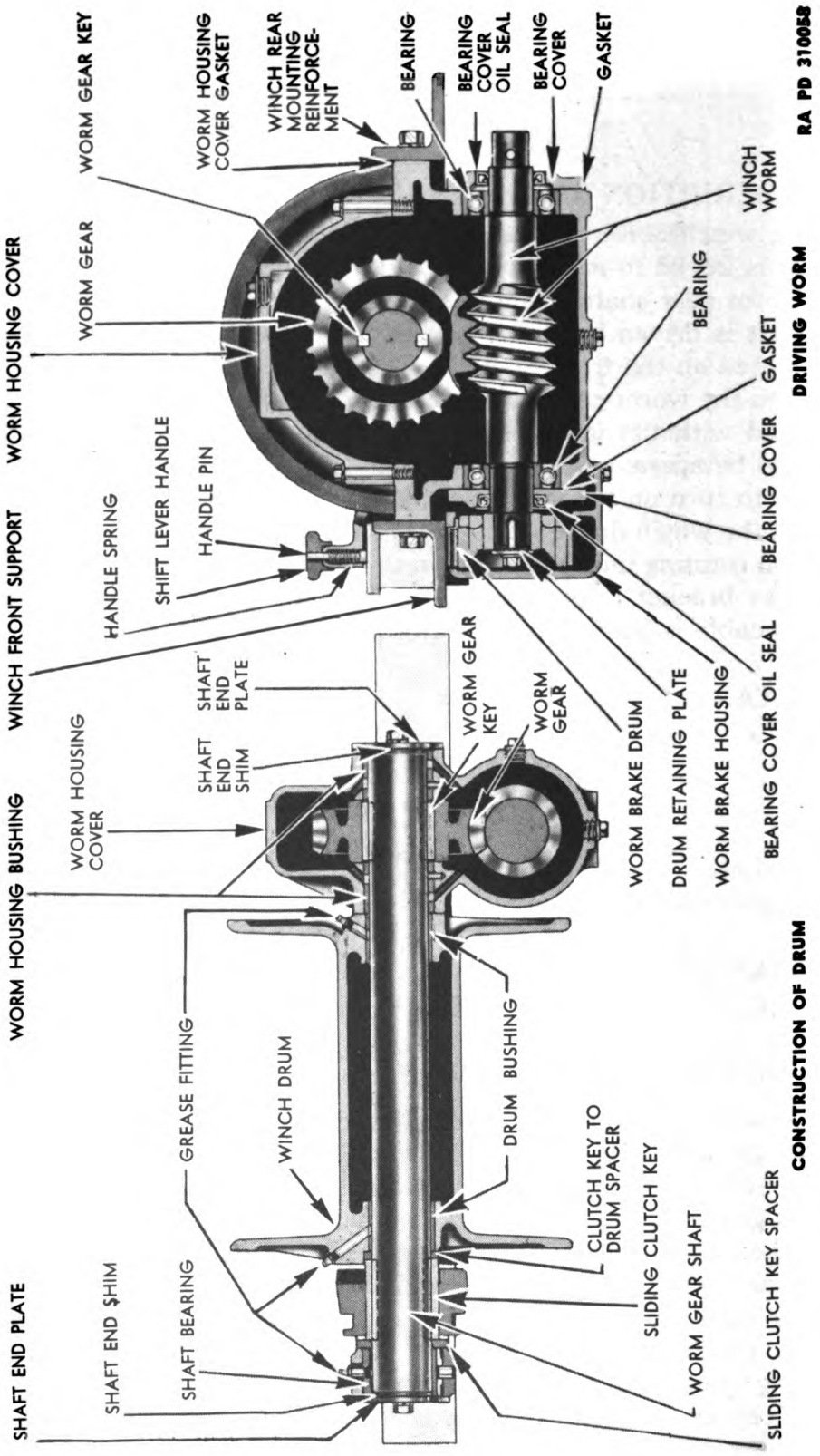
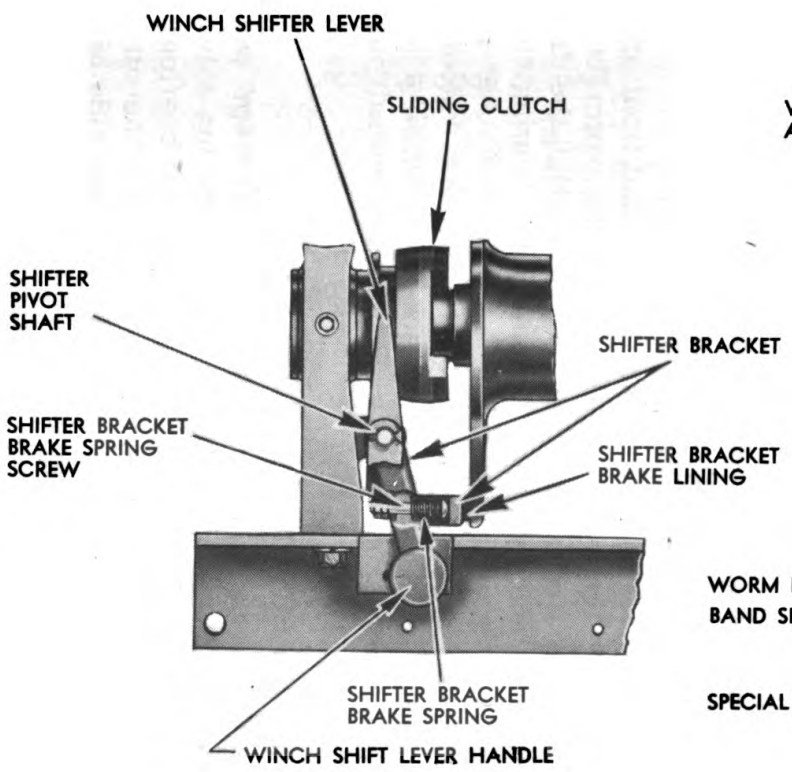
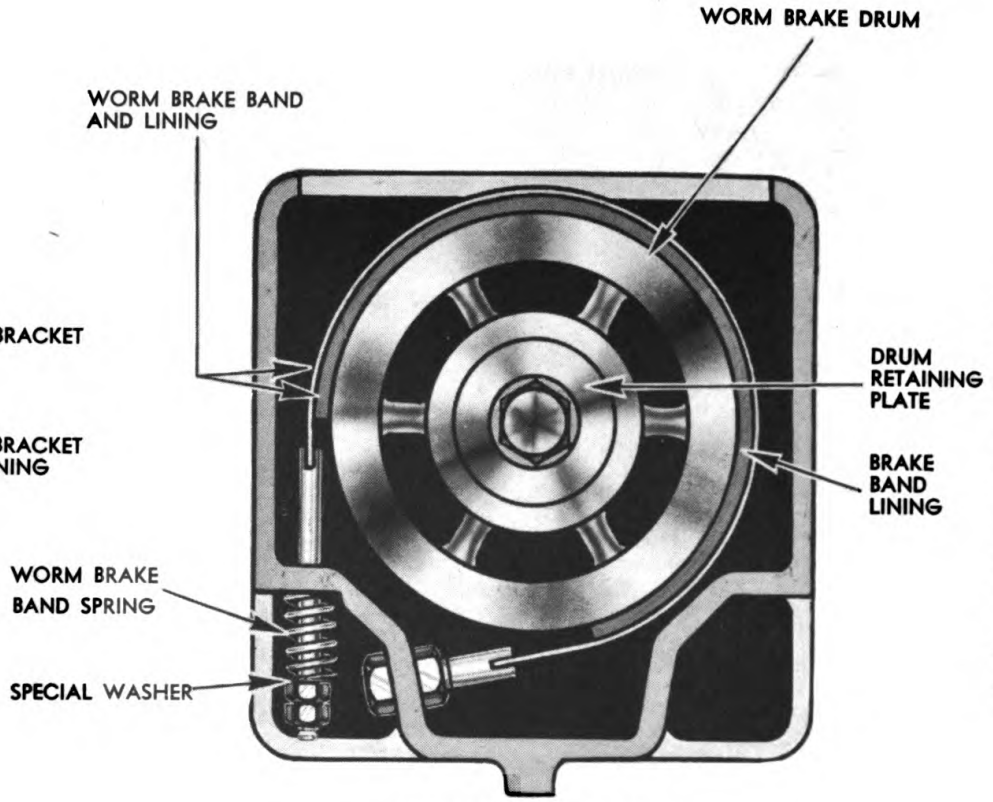


Figure 181 — Winch — Sectional Views



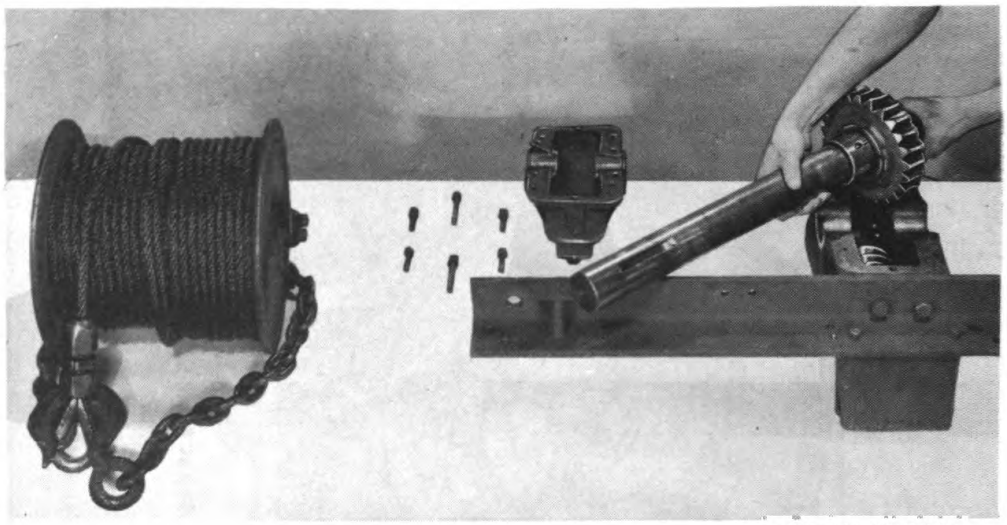
SLIDING CLUTCH AND SHIFTER



CONSTRUCTION OF BRAKE

RA PD 310059

Figure 182 — Winch Clutch and Brake



RA PD 319361

Figure 183 — Disassembling Winch

c. Remove Worm Gear and Shaft. Remove the worm gear shaft left end plate cap screw, and take the plate and shims from end of shaft, being sure to keep shims with the plate for reinstallation in the same position. Take out the screws attaching the worm housing cover to the housing, and remove the cover with gasket. Lift out the worm gear shaft with gear and bushings (fig. 183). Slide outer bushing off the shaft, press shaft out of worm gear, remove keys, and inner bushing.

d. Remove Winch Worm. Loosen the lock nut and worm brake band adjusting nut on the bottom of the worm brake housing to release lining pressure on the worm brake drum. Take out the screws attaching the worm brake housing to the worm housing and front angle support, and remove the brake housing. Remove the worm brake drum, and cap screw, lock washer, and retaining plate. Pull the drum off the worm shaft, and remove the key. Remove the bearing cover to winch worm housing attaching screws. Take the front and rear bearing covers with oil seals and gaskets off the housing. Remove the worm and bearings from front of the winch worm housing. Remove bearings from worm shaft, using a press and universal puller plate.

119. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all the disassembled parts (except worm brake band lining) (fig. 184) thoroughly with dry-cleaning solvent, and dry with compressed air or cloth. Immerse the ball bearings in dry-cleaning solvent, and turn the bearings slowly under the surface of the dry-cleaning solvent. Remove and strike the open side of the bearings on a wood block to dislodge all hard particles of lubricant. Repeat the operation until every trace of lubricant or foreign matter

WINCH AND DRIVE SHAFT

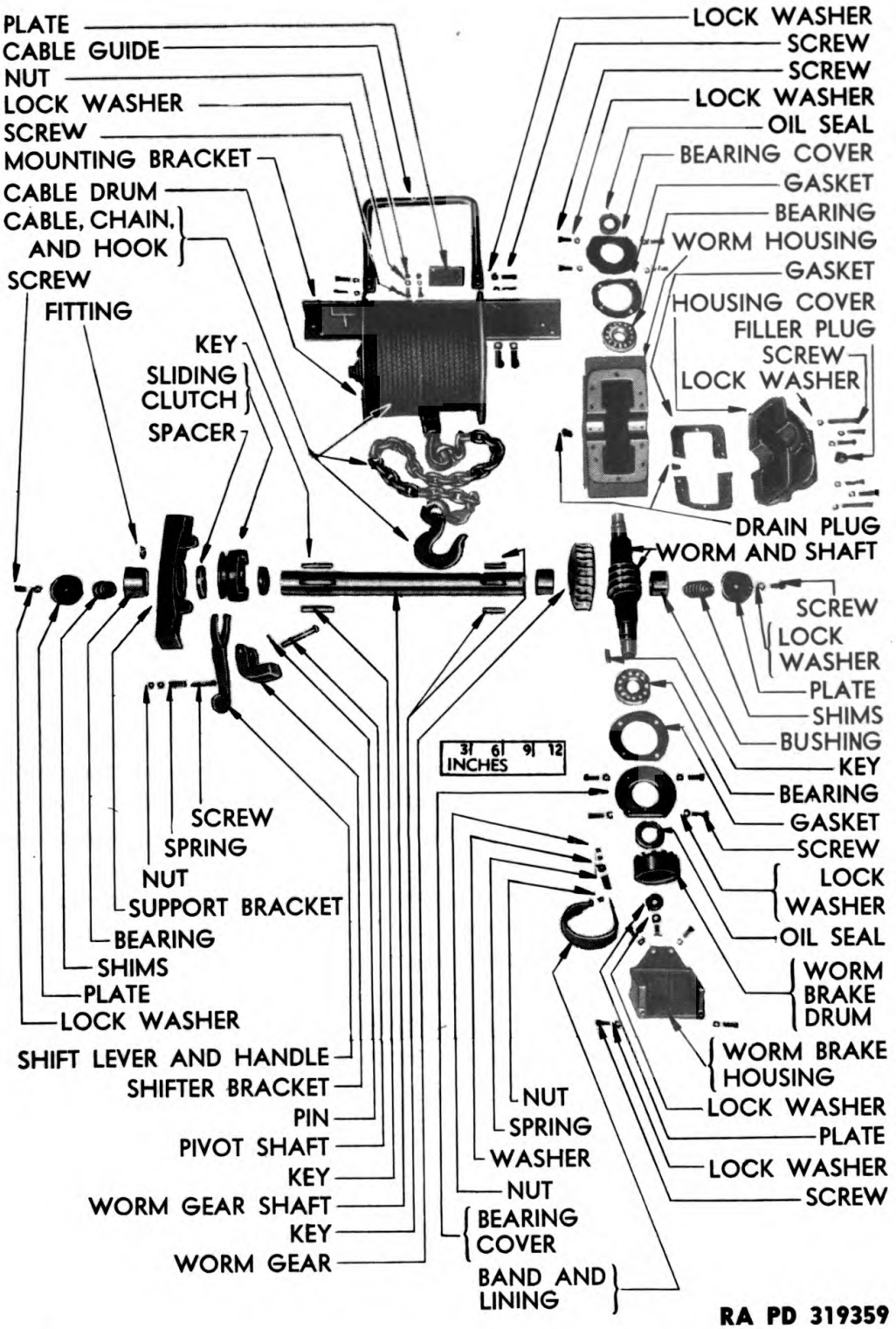


Figure 184 — Winch Disassembled

is removed from the bearings. Blow the bearings dry with compressed air directed across the bearings, being sure not to spin the bearings. Make sure the lubricant passages in the housing and winch drum are not obstructed.

b. Inspection. Inspect bearings for scores, breakage, or flat balls, and bushings for scores or damage. Check the worm, worm gear, and shafts, for cracks, chipped teeth, or scoring. Try the sliding clutch for free movement on worm gear shaft and keys. Examine the sliding clutch winch shift lever and handle for breakage. Check housings, covers, winch cable drum, and winch worm brake drum, for cracks or breakage. Examine shifter bracket brake spring and worm brake band spring for broken coils or damage. Inspect the brake linings for breakage or wear too close to rivet heads.

c. Repair. Replace bearings and bushings that are not serviceable. If the winch worm, worm gear, or shaft are not satisfactory for additional service, replace as required. Hone small nicks on gear teeth or shafts lightly to remove. If the sliding clutch does not slip freely on the worm gear shaft and keys, remove burs or nicks from the keys, keyways, shaft, and bore by honing. Replace any springs that are not satisfactory for further service. If cracked housings, covers, or winch cable drum cannot be made serviceable by welding, replace as required. Replace lining that is worn too close to rivet heads.

120. ASSEMBLY.

a. Install Winch Worm. Press bearings on worm shaft, and install assembly into the housing through the front end of the housing. Place the bearing caps with new oil seals (that have been soaked in engine oil) and gaskets coated with joint and thread compound, over the ends of the worm shaft, and tighten the attaching screws securely. Install the worm brake drum key in keyway on worm shaft, and place the drum in position on shaft. Place the retaining plate in position, install cap screw with lock washer, and tighten securely. Assemble the worm brake band with lining in the worm brake housing, install it on the worm housing, and tighten securely with the attaching screws.

b. Install Worm Gear and Shaft. Slide the inner bushing over left end of worm gear shaft, install keys in keyways, press worm gear on shaft, and place outer bushing on left end of shaft. Place the worm gear shaft and gear with bushings into the housing, and mesh the gear with the worm. Be sure the bushings are correctly positioned on the locating dowel pins in the housing and lubricate the gear, worm, and bearings. Install a new gasket coated with joint and thread compound, place the cover on the housing, and tighten securely with cap screws. Place the end plate (with proper shims) on left end of shaft, and tighten the screw securely.

c. Install Sliding Clutch, Shift Lever, and Winch Cable Drum. Slide the winch cable drum and spacer onto the worm gear shaft. Tap the sliding clutch keys into keyway in shaft. Place the sliding clutch on the shaft, with jaws toward the drum, and install the clutch to bracket spacer on the shaft. Assemble the winch shift lever and shifter bracket on the worm gear shaft bearing support bracket with shifter pivot shaft, and install a new cotter pin. Insert the winch shift lever shift fork into groove on sliding clutch, place bearing in support bracket, and install over the end of the shaft. Move the clutch, shift lever, and support bracket with bearing into position on shaft. Make sure the keys in shaft enter keyways in the sliding clutch. Install the bolt attaching the bearing support bracket to the front angle support. Place the end plate with proper shims on the right end of shaft, and securely tighten the cap screw. Install the grease fitting in support bracket bearing.

d. Preliminary Adjustment.

(1) WORM BRAKE BAND. Engage the sliding clutch jaws with the winch cable drum jaws. Tighten the adjusting nut on the worm brake band until a slight drag is noticed on the worm shaft when turned by hand. Tighten brake band lock nut securely. Readjust after installation on vehicle as instructed in TM 9-807.

(2) SHIFTER BRACKET BRAKE. Move the clutch shift lever to disengage the sliding clutch jaws from drum, and secure in this position with handle locking pin. Insert a wedge between shifter bracket and head of tension bolt, pry the tension bolt outward, and loosen the lock nut. Adjust the spring tension with the adjusting nut, remove wedge, and turn drum by hand to determine the amount of drag. Tighten the lock nut when the adjustment is satisfactory.

Section II

DRIVE SHAFT

121. DESCRIPTION AND DATA.

a. Description. Winch drive shafts are solid, and may be either the Spicer or Cleveland type. The Spicer-type universal joint cross with bearings is held in the yoke with lock rings. The Cleveland-type universal joint cross with bearings is held in the yoke with lock plates, screw locks, and screws. Either type of winch drive shaft has a universal joint on each end. A slip joint is provided at the power take-off end on Spicer shafts, and at the winch end on Cleveland shafts, to compensate for the changing distances between the connected units (fig. 185).

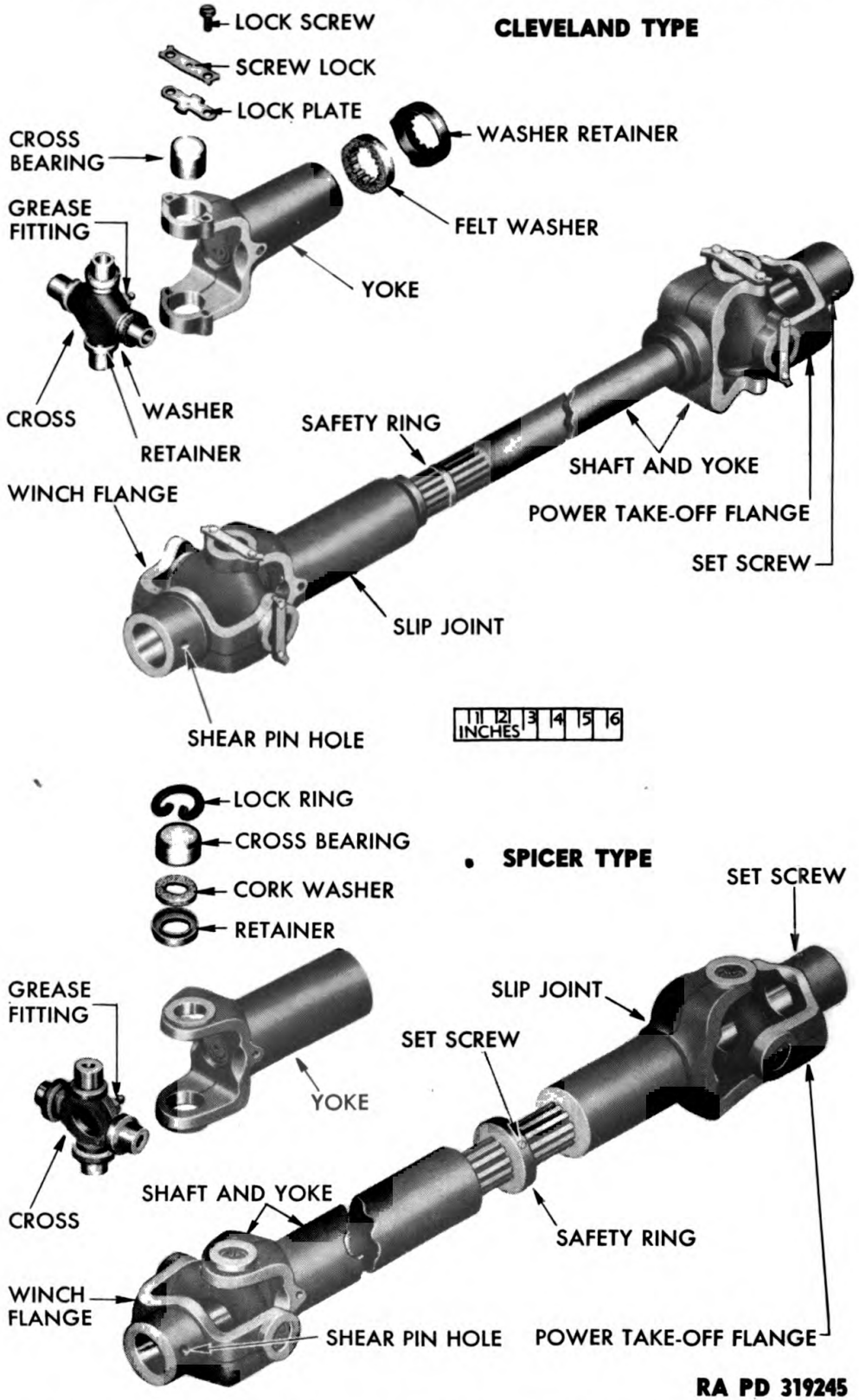


Figure 185 — Winch Drive Shaft and Joint Disassembled

b. Data.

Make	Spicer	Cleveland
Cross-bearing type	Needle	Needle

122. DISASSEMBLY.

a. Cleveland.

(1) UNIVERSAL JOINTS. Remove the screws, locks, and lock plate from each bearing. Bump the universal joint cross toward one side of yoke far enough to permit removal of bearing; move the cross toward opposite side of yoke, and remove the other bearing. With one journal of cross extending through yoke bore at one side, tilt cross so that opposite journal clears the other yoke bore, and remove the cross. Remove universal joint cross bearing washers and retainers. Repeat the procedure to remove the bearings and cross from flange yoke.

(2) SLIP JOINT. Check alinement marks on shaft and slip joint and if not clear, mark them so they may be assembled properly. Pull the slip joint off the shaft splines, and remove the felt washer with retainer. Remove the safety ring with snap ring pliers.

b. Spicer.

(1) UNIVERSAL JOINTS. Remove lock rings holding bearings in yoke bores, press the bearings out of yoke bores far enough so that one of the bearings can be removed from cross; reverse procedure, and press on end of cross to remove the opposite bearing. Move cross through one yoke bore as far as possible, tilt cross, and remove from yoke. Remove universal joint cross bearing washers and retainers. Repeat the procedure to remove the bearings and cross from flange yoke.

(2) SLIP JOINT. Examine slip joint and shaft for alinement marks and if not clear, mark them so they can be assembled properly. Pull the shaft out of slip joint, loosen set screw in safety ring, and remove ring from shaft.

123. CLEANING, INSPECTION, AND REPAIR.

a. Cleaning. Clean all parts thoroughly in dry-cleaning solvent. Allow bearings to remain in dry-cleaning solvent for some time so that all hard particles of lubricant are dissolved. Remove bearings from dry-cleaning solvent, clean with a short stiff-bristled brush, and dry with compressed air. Be sure all lubricant passages in crosses are clean and open. Dry all parts with cloth or compressed air.

b. Inspection and Repair. Inspect cross journals for pits and scores, place bearings on cross, and check for excessive looseness. Examine shaft and slip joint for cracks, twist, or breakage. Replace any parts that are not satisfactory for further service. Welding a cracked or broken shaft will result in an unbalanced condition. Replace the safety ring if it is broken or damaged.

124. ASSEMBLY.

a. Cleveland.

(1) UNIVERSAL JOINTS. Lubricate all parts and insert one journal of cross into yoke bore at one side as far as possible, tilt cross until it clears other side of yoke, then move it into position. Install washer retainer and a new washer on each journal, and press the bearings into place on cross journals and into yoke bores. Install lock plate, screw lock, and screws. Tighten screws securely, and bend ears on screw lock securely against flat side of screws. Repeat the procedure to install the cross and bearings in flange yoke.

(2) SLIP JOINT. Place safety ring in position on shaft. Install a new slip joint felt washer with retainer, and lubricate shaft splines. Aline mark on slip joint with mark on drive shaft, slide the slip joint on shaft splines, and fasten felt washer retainer in position.

b. Spicer.

(1) UNIVERSAL JOINTS. Lubricate all parts, and insert one journal of cross into yoke bore at one side as far as possible, tilt cross until it clears other side of yoke, then move it into position. Install washer retainer and new washers on each journal, and press bearings into place on cross journals and into yoke bores. Install lock rings, and make sure the cross does not bind. Repeat the procedure to install the cross bearings in flange yoke.

(2) SLIP JOINT. Slide safety ring on shaft splines, and fasten in position with set screw. Lubricate shaft splines, aline mark on shaft with mark on slip joint, and slide the slip joint on shaft splines.

Section III

FITS AND TOLERANCES

125. WINCH.

Worm shaft bearings	Ball, M.R.C. - 7309, N. D. - H20309
Diameter of worm gear and drum shaft	2.4365 in.
Bushings:	
Inside diameter	2.442 in.
Outside diameter:	
Gear end of shaft	2.689 in.
Clutch end of shaft	2.689 in.
Drum	2.689 in.
Minimum clearance between sliding clutch and worm gear shaft	0.004 in.
Shims used on shaft end plates	0.010 in.

CHAPTER 15

DUMP BODY OPERATING UNITS

126. DESCRIPTION AND OPERATION.

a. A hydraulic cylinder is used to raise and lower the body. A gear pump is used to pump fluid into the cylinder for raising the body. The valve in the pump is operated by a control in the cab, to direct the flow of fluid. The pump is driven by a drive shaft connected to the power take-off. The drive shaft has a universal joint at each end, and a slip joint near the power take-off unit. On the rear dump body the piston rod connects to a cross shaft with levers that operate the linkage attached to the body. On the side dump body the piston rod connects directly to the support on the bottom of the body (fig. 186).

127. DATA.

Drive shaft with universal joints	Blood Bros.
Pump	Heil AA—165
Hoist:	
Make	Heil
Fluid capacity	3½ gal
Pump valve control	Lever in cab
Down	Lock
Halfway up	Raise
Up	Release

128. HOIST CYLINDER ASSEMBLY.

a. Disassembly (fig. 187). Remove hoist piston rod head block, piston rod packing nut, and packing. Remove the stud nuts, and take off the cylinder head with gasket. Pull the piston rod, piston, and rings out of the cylinder. Take off stud nuts, and remove cylinder adapter with gasket. Remove various pipe plugs from cylinder and rings from piston.

b. Cleaning, Inspection, and Repair. Clean all parts thoroughly in dry-cleaning solvent, and dry with compressed air. Be sure piston ring grooves and all passages are clean and open. Examine piston for breakage, scores, or other damage. Inspect the cylinder for cracks, scores, or damage. Examine cylinder head for cracks or stripped threads. Replace any parts that are not satisfactory for further service.

c. Assembly. Install new rings on piston and lubricate with engine oil. Insert piston with rings into cylinder, install cylinder head with new gasket in position on cylinder, and tighten stud nuts securely. Install new packing and packing nut, and tighten. Place cylinder adapter with a new gasket in position on front end of cylinder, and

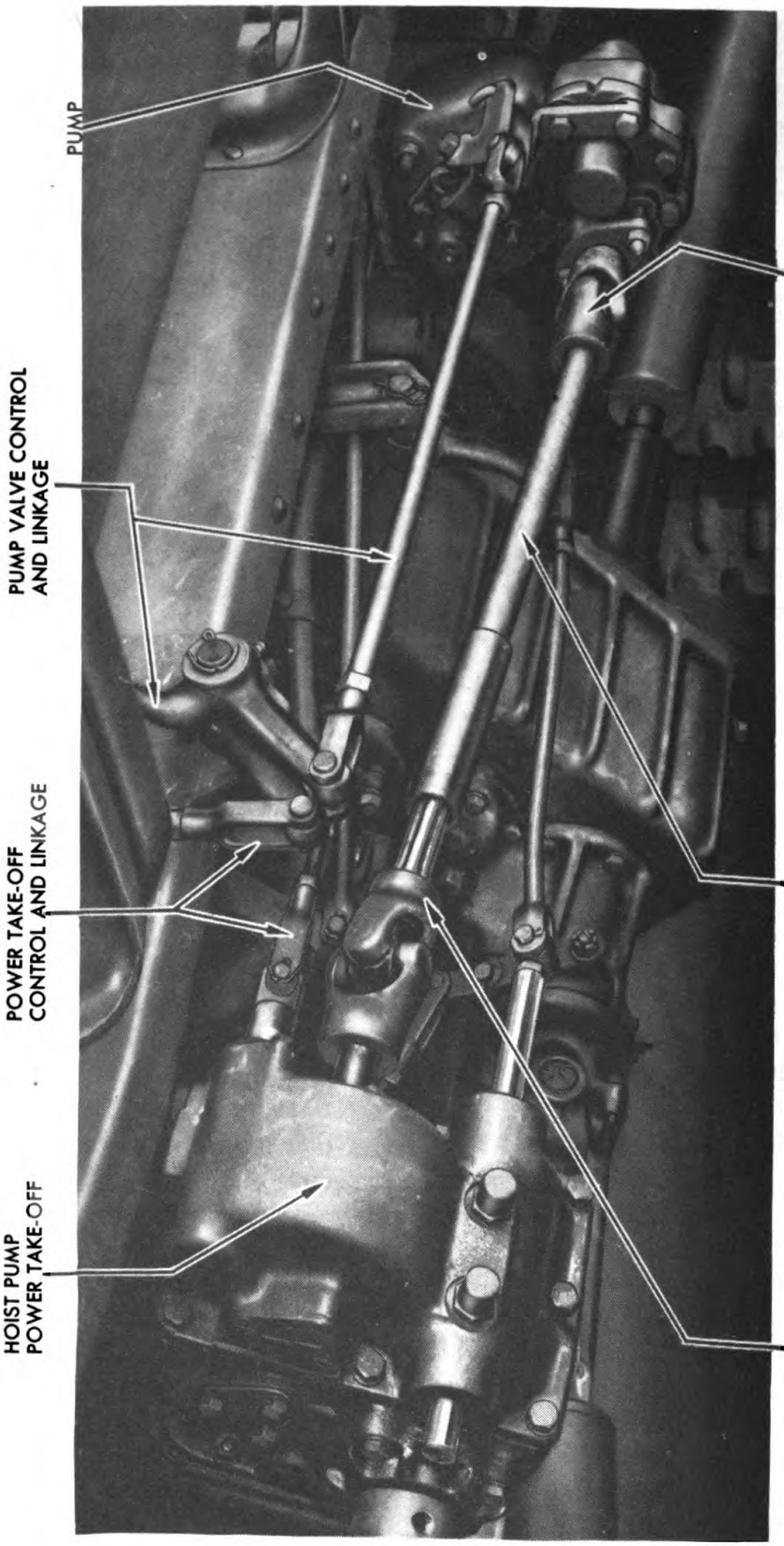


Figure 186 — Dump Body Operating Units and Linkage

DUMP BODY OPERATING UNITS

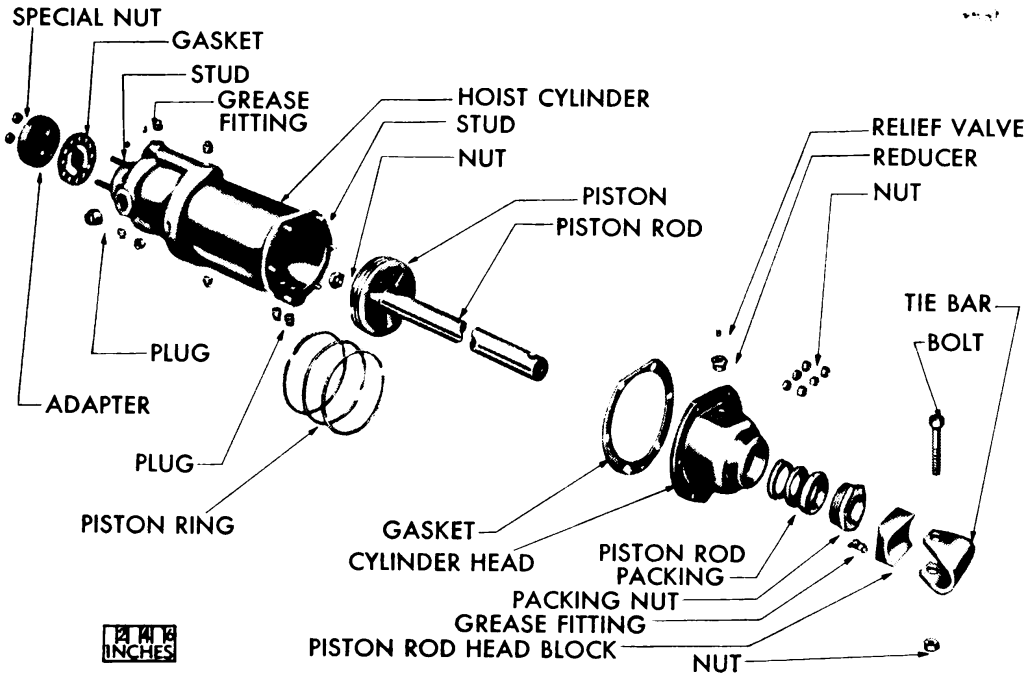


Figure 187 — Hoist Cylinder Disassembled

tighten stud nuts securely. Install all pipe plugs and tighten. Place head block on piston rod.

129. HOIST PUMP ASSEMBLY.

a. Disassembly (fig. 188). Take off the stud nuts, and remove the drive gear shaft packing gland. Remove cap screws that hold the cover to body, lift cover from body, and unhook link from control valve lever. Remove drive gear, idler gear, and wear plates from body. Loosen control valve lever set screw, remove lever, and take Woodruff key out of valve shaft. Remove control valve gland packing nut, cap screws, gland, and control valve. Unscrew the check valve plug from body, and remove the check valve body, ball, and spring. Remove the nuts and bolts that hold the adapter pad to body, and lift adapter from body.

b. Cleaning, Inspection, and Repair.

(1) CLEANING. Remove packing from glands, clean all parts thoroughly with dry-cleaning solvent, and dry with compressed air or cloth.

(2) INSPECTION. Examine cover for cracks or damage and bushings for scores or pits. Check the bell crank and bracket for distortion or breakage. Inspect the gears and wear plates for nicks, scores, or damage. Examine the control valve for scores or breakage and the lever for cracks. Make sure the check valve ball seats properly on the check valve body. Check the body for cracks or scores, and the bushings for scores or pits.

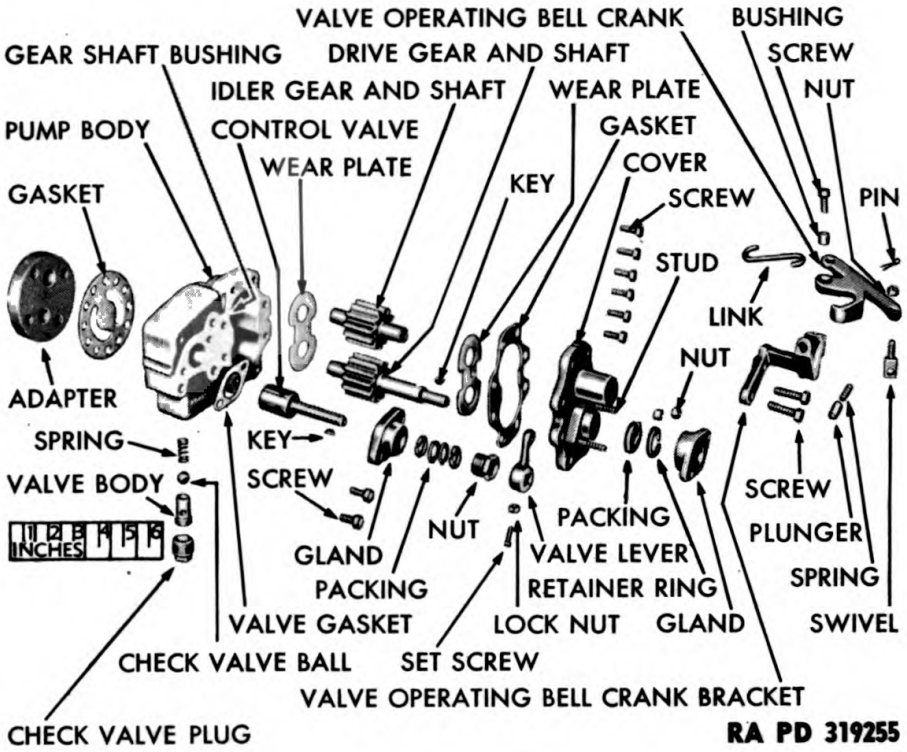


Figure 188 — Hoist Pump Disassembled

(3) REPAIR. Replace the cover or body if any cracks cannot be repaired by welding. Install new bushings if the original bushings are not satisfactory for further service. If the bell crank and bracket are not suitable for additional service, replace them. Remove small nicks from gear teeth with a hone; however, if the gears or wear plates are not serviceable, replace them. Replace any other parts that are no longer satisfactory for further service.

c. Assembly. Place a new adapter pad gasket on body, install the adapter pad, insert bolts through pad and body, install nuts, and tighten securely. Place the check valve spring, ball, and body into passage in pump body; install pipe plug, and tighten securely. Insert control valve shaft into gland, install new packing, and screw packing nut into gland until moderately tight. Place Woodruff key in keyway on valve shaft, install valve lever, tighten set screw, and lock with lock nut. Install a new gland gasket on body, place valve and gland assembly in position, and fasten gland securely to body with cap screws. Place a wear plate into gear recess in body, install the idler and drive gears, and the other wear plate. Install a new cover gasket on body, place cover assembly in position, and hook the link to the control valve lever. Install the cap screws, and tighten the cover securely to body. Place new packing in position around drive gear shaft, and

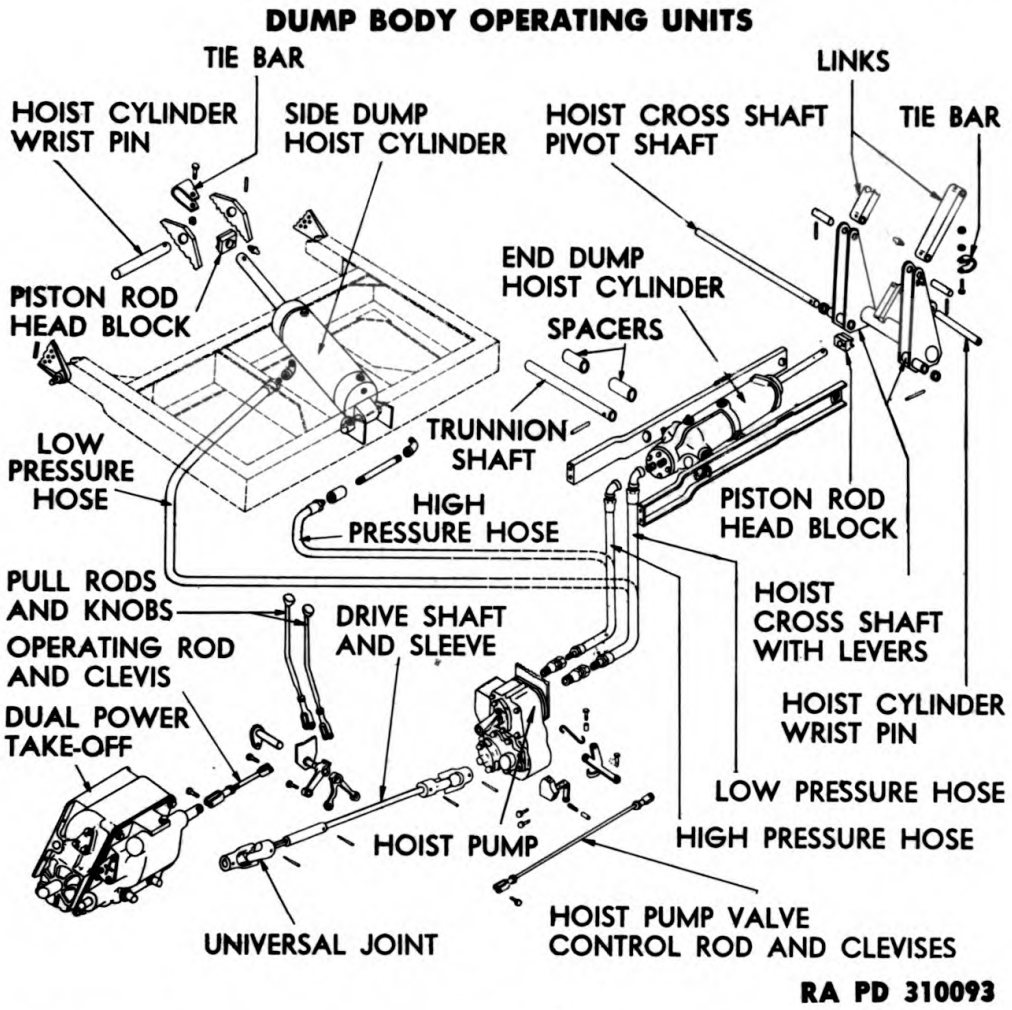


Figure 189 — Dump Body Operating Mechanism Disassembled

install the retainer ring. Install drive gear shaft packing gland, and tighten the stud nuts moderately.

130. HOIST PUMP DRIVE SHAFT.

a. Disassembly (fig. 189). Mark the universal joints, splined shaft, sleeve, and drive shaft to aid in proper assembly of the parts. Pull the front universal joint with splined shaft out of the sleeve, remove the tapered pin, and slide universal joint off the end of splined shaft. Remove the tapered pin that holds the sleeve to drive shaft, and pull shaft out of sleeve. Drive out the tapered pin that holds rear universal joint to drive shaft, and remove universal joint from shaft.

b. Cleaning, Inspection, and Repair. Clean all parts thoroughly in dry-cleaning solvent, and dry with compressed air or cloth. Inspect universal joints for breakage, looseness, or damage. Examine the shafts for cracks, and twisted or damaged splines. Check the sleeve for cracks and damage to splines. Replace any parts that are not satisfactory for further service.

c. Assembly. Aline the mark on drive shaft with mark on rear universal joint, insert shaft into joint flange, install a new tapered pin, and stake it in position. Place the sleeve on the drive shaft so the marks are alined, install a new tapered pin, and stake it in position. Install the front universal joint on the splined shaft with the marks in alinement, insert a new tapered pin, and stake it in position. Aline the mark on splined shaft with mark on sleeve, apply lubricant to splines, and insert the splined shaft into the sleeve.

131. FITS AND TOLERANCES.

a. Hoist Cylinder.

Cylinder bore:	
Rear dump	6.003 in.
Side dump	7.175 in.
Piston diameter:	
Rear dump	5.993 in.
Side dump	7.145 in.
Piston rod diameter:	
Rear dump	1¾ in.
Side dump	2 in.
Piston rings	3
Width:	
Rear dump	0.1555 in.
Side dump	0.1870 in.
Piston-to-cylinder clearance:	
Rear dump	0.010 in.
Side dump	0.030 in.

b. Hoist Pump.

Gear shaft diameter	0.936 in.
Gear shaft bushing diameter (inside)	0.942 in.
Control valve diameter	1.375 in.
Control valve-to-bore clearance	0.00025 in.

CHAPTER 16

SPECIAL TOOLS

132. SPECIAL TOOLS.

a. Tools Common to 6x6 and 6x4 Trucks.

Tool	Federal Stock Number
ADAPTER, diff. side brg. (use with 41-R-2378-30) (front and rear)	41-A-18-293
GAGE, plug, go and no-go valve stem guides	41-G-254-355
HANDLE, driver	41-H-1074
HEAD, driver, remover and replacer brg. cup (front wheel, inner and outer)	41-H-1780
PULLER, bearing, tapered cups and cones, screw type (front and rear)	41-P-2903-750
PULLER, timing gear, crankshaft	41-P-2956-6
REAMER, hand straight shank, 1.500 inch (water pump bushing, large)	41-R-905-350
REMOVER, diff. side brg. outer race and main drive gear race	41-R-2374-25
REMOVER, drive pinion, flange, diff. side bearing (front and rear)	41-R-2378-30
REMOVER, support pillow block brg. cup	41-R-2384-68
REMOVER, universal joint flange, crankshaft fan pulley and hub drive shaft	41-R-2384-82
REMOVER, water pump bushing, large	41-R-2384-177
REMOVER, water pump drive gear distributor	41-R-2384-275
REMOVER, water pump impeller	41-R-2384-285
REMOVER, water pump oil seal	41-R-2384-300
REMOVER, and replacer, bushing and oil seal steering gear	41-R-2377-275
REMOVER and replacer, pinion front support bearing (front and rear)	41-R-2389-13
REMOVER and replacer, set water pump bushing, small,	41-R-2389-65
(Consisting of:	
Remover	41-R-2384-175
Replacer	41-R-2399-110
Reamer, with guide metal case)	41-R-849
REMOVER and replacer, trans. mainshaft and rear brg.	41-R-2389-46
REPLACER, bogie spring seat cross shaft brg.	41-R-2391-30
REPLACER, crankshaft, oil seal	41-R-2391-51
REPLACER, diff. side brg.	41-R-2391-63
REPLACER, diff. side brg. outer race (front and rear)	41-R-2391-67

Tool	Federal Stock Number
REPLACER, flywheel housing oil seal	41-R-2391-81
REPLACER, pillow block bearing cone	41-R-2396-325
REPLACER, pillow block brg. cup (transfer case output shaft)	41-R-2397-28
REPLACER, pinion brg. (front brg.) (front and rear axle)	41-R-2395-25
REPLACER, pinion cage and bogie spring seat race	41-R-2395-37
REPLACER, rear axle wheel brg. inner and outer race	41-R-2396-12
REPLACER, support pillow block brg. cup	41-R-2396-338
REPLACER, support pillow block seal	41-R-2396-350
REPLACER, water pump bushing, large	41-R-2399-112
REPLACER, water pump drive gear (distributor and main drive)	41-R-2399-130
REPLACER, water pump oil seal	41-R-2399-165
WRENCH, crowfoot, engine oil pressure regulating	41-W-871-40
WRENCH, diff. adjusting (front and rear)	41-W-874
WRENCH, pinion bearing and pillow block shaft lock nut 2″ (front and rear)	41-W-1616
WRENCH, socket, crankshaft ratchet nut	41-W-2573-450
b. Additional Tools for 6x6 Truck.	
ADAPTER, for removing and replacing transfer case mainshaft pilot brg. (use with 41-R-2389-46)	41-A-18-271
REMOVER, speedometer gear	41-R-2384-50
REMOVER and replacer, tie rod bushing	41-R-2389-40
REPLACER, front axle oil seal	41-R-2392-25
REPLACER, front axle steering knuckle brg.	41-R-2391-84
REPLACER, front axle spindle inner brg.	41-R-2391-83
REPLACER, transfer case brg.	41-R-2397-25
REPLACER, transfer case bearing cone	41-R-2397-26
REPLACER, transfer case main drive gear inner brg. cup	41-R-2397-29
REPLACER, transfer case and main drive cage cup	41-R-2397-60

REFERENCES

PUBLICATIONS INDEXES.

The following publications indexes should be consulted frequently for latest changes to or revisions of references given in this chapter and for new publications relating to materiel covered in this manual:

Introduction to Ordnance Catalog (explaining SNL system)	ASF Cat. ORD 1 IOC
Ordnance Publications for Supply Index (index to SNL's)	ASF Cat. ORD 2 OPSI
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
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
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
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
Interchangeability chart of organizational tools for ordnance vehicles	SNL G-19
Soldering, brazing and welding materials, gases and related items	SNL K-2
Tools, maintenance for repair of automotive vehicles	SNL G-27 Vol. 1
Tool sets — motor transport	SNL N-19
Tool sets, for ordnance service command, automotive shops	SNL N-30
Truck, 2½-ton, 6x4 and 2½-ton, 6x6 (Studebaker)	SNL G-630

EXPLANATORY PUBLICATIONS.

Fundamental Principles.

Automotive electricity	TM 10-580
Automotive lubrication	TM 10-540
Basic Maintenance Manual	TM 38-250
Electrical fundamentals	TM 1-455
Military motor vehicles	AR 850-15

ORDNANCE MAINTENANCE—POWER TRAIN, CHASSIS, AND BODY FOR 2½-TON 6x6 TRUCK AND 2½- TO 5-TON 6x4 TRUCK (STUDEBAKER MODELS US6 AND US6x4)

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.	
2½-ton 6x6 truck and 2½- to 5-ton 6x4 truck (Studebaker models US6 and US6x4)	TM 9-807
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 6-11
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
Ordnance maintenance: Carburetors (Carter)	TM 9-1826A
Ordnance maintenance: Electrical equipment (Auto-Lite)	TM 9-1825B
Ordnance maintenance: Fuel pumps	TM 9-1828A
Ordnance maintenance: Hercules engines (series JX model B, C, D and E; series RX model B and C; series HX model C and D; series WX model LC 3)	TM 9-1832A
Ordnance maintenance: Hydraulic brakes (Wagner)	TM 9-1827C
Ordnance maintenance: Vacuum brake systems (Bendix BK)	TM 9-1827B
Protection of Materiel.	
Camouflage	FM 5-20
Chemical decontamination, materials and equipment	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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