TM 9-1707B

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

(PERSONNEL CARRIERS M5 AND M5A1, CAR M9A1, MULTIPLE GUN MOTOR CARRIAGES M14 AND M17, AND SIMILAR IHC VEHICLES)

WAR DEPARTMENT *11 DECEMBER 1943*

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Washington 25, D. C., 11 DECEMBER 1943

TM 9-1707B—Ordnance Maintenance, Power Train, Body, and Chassis for Basic Half-track Vehicle (IHC) (Personnel Carriers M5 and M5A1, Car M9A1, Multiple Gun Motor Carriages M14 and M17, and Similar IHC Vehicles), 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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The Adjutant General.

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

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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 Half-track Personnel Carrier M5 or M5A1, Half-track Car M9A1, Multiple Gun Motor Carriage M14 or M17, and other similar half-track vehicles manufactured by International Harvester Company. Information on the detailed construction of the vehicles, disassembly and assembly procedure, inspection, maintenance, and repair is contained in two technical manuals of the 1000 series, of which this is the second. These instructions are supplementary to those in the field 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.

2. TECHNICAL MANUAL REFERENCES.

a. This manual contains a description of and procedure for removal, disassembly, inspection, cleaning, repair, reassembly, and reinstallation of the body, bogie suspension and tracks, frame, power train, springs, steering gear, drag link, and winch.

b. TM 9-707 is the operator's technical manual for the using arms.

c. TM 9-1707A is the maintenance technical manual containing information pertaining to the engine and its accessories, electrical system, fuel system, and cooling system.

d. TM 9-1827B is the maintenance technical manual containing information pertaining to the vacuum power brakes.

e. TM 9-1827C is the maintenance technical manual containing information pertaining to the hydraulic brakes.

f. TM 9-1825A is the maintenance technical manual containing information pertaining to the starter, generator, generator regulator, and distributor.

g. TM 9-1826C is the maintenance technical manual containing information pertaining to the carburetor and governor.

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3. ARRANGEMENT.

a. The arrangement of this technical manual is such that it contains descriptions, removal of units, disassembly, inspection, repair, assembly and installation of the components.

4. MAINTENANCE ALLOCATION.

a. Scope. The scope of maintenance and repair by the crew and other units of the using arms is determined by the availability of suitable tools, availability of necessary parts, capabilities of the mechanics, time available, and the tactical situation. No exact system of procedure can be prescribed which will be uniformly applicable to all types of vehicles. Many second echelon operations are often done by ordnance personnel.

b. Allocation of Maintenance. Indicated below are the maintenance duties for which, under normal circumstances, tools and parts have been provided for the using arm and ordnance maintenance personnel. Certain replacements and repairs which are the responsibility of ordnance maintenance personnel may be performed by using arm personnel when circumstances permit or require, within the discretion of the commander concerned. Echelons and words as used in this list of maintenance allocations are defined as follows:

FIRST AND SECOND ECHELON: Table III AR 850-15	Operating organization driver, operator or crew, companies and detachments, battalions, squadrons, regiments, and separate companies and detachments (first and second echelons, respectively).
THIRD ECHELON: Table III AR 850-15	Technical light and medium maintenance units, including post and port shops.
FOURTH ECHELON: Table III AR 850-15	Technical heavy maintenance and field depot units including designated post and service command shops
FIFTH ECHELON: Table III AR 850-15	Technical base units.
SERVICE: (Including preventive maintenance) par. 24 a (2) and (3) in part AR 850-15	Checking and replenishing fuel, oil, grease, water and antifreeze, air, and battery liquid; checking and tightening nuts and bolts; cleaning.

INTRODUCTION

REPLACE: Par. 24 a (5) AR 850-15	To remove an unserviceable part, assembly, or subassembly from a vehicle and replace it with a serviceable one.
REPAIR: Par. 24 a (6) in part AR 850-15	To restore to a serviceable condition, such parts, assemblies or subassemblies as can be accomplished without completely disassembling the assembly or subassembly, and where heavy riveting, or precision machining, fitting, balancing, or alining is not required.
REBUILD: Par. 24 a (6) AR 850-15	Consists of stripping and completely reconditioning and replacing in serviceable condition any vehicle or unserviceable part, subassembly, or assembly of the vehicle, including welding, riveting, machining, fitting, alining, balancing, assembling, and testing.
RECLAMATION: AR 850-15 Par. 4 (*c*) in part CIR. 75, dated 16 March '43	Salvage of serviceable or economically repairable units and parts removed from vehicles, and their return to stock. This includes the process which recovers and/or reclaims unusable articles or component parts thereof and places them in a serviceable condition.

NOTES: (1) Operations allocated will normally be performed in the echelon indicated by X.

(2) Operations allocated to the third echelon as indicated by E may be performed by these units in emergencies only.

(3) Operations allocated to the fourth echelon by E are normally fifth echelon operations. They will not be performed by the fourth echelon, unless the unit is expressly authorized to do so by the chief of the service concerned.

(4) Consult reclamation bulletins for detailed information relative to reclamation procedure.

ABSORBERS, SHOCK	ECHELONS 2nd	3rd	4th	5th
Absorber assemblies, shock (w/linkage)—service and/or replace	X			
Absorber assemblies, shock (w/linkage)—repair		X		
Absorber assemblies, shock (w/linkage)—rebuild			E	X

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

	ECHELONS			
AXLE, FRONT	2nd	3rd	4th	5th
Arm, steering knuckle—replace		X		
*Axle assembly—replace	*	X		
Axle assembly—repair		X		
Axle assembly—rebuild			E	X
Bearings, wheel—service, adjust and/or replace	X			
Carrier assembly, differential (w/ring gear and pinion)—replace and/or repair		X		
Carrier assembly, differential (w/ring gear and pinion)—rebuild			E	X
Drums, brake—replace	X			
Hub assemblies—replace	X			
Hub assemblies—repair		X		
Hub assemblies—rebuild			X	
Hub and drum assemblies—replace	X			
Retainers, wheel grease—replace	X			
Rod assembly, tie—replace	X			
Rod assembly, tie—repair		X		
Seals, trunnion housing oil—replace		X		
Shafts, axle—replace		X		
Wheel alinement, toe-in—adjust	X			
Wheel alinement, camber and caster—check		X		
AXLE, REAR (JACKSHAFT)				
*Axle assembly—replace	*	X		
Axle assembly—repair		X		
Axle assembly—rebuild			E	X
Bearings, drive sprocket—service, adjust and/or replace	X			
Carrier assembly, differential (w/ring gear and pinion)—replace and/or repair		X		
Carrier assembly, differential (w/ring gear and pinion)—rebuild			E	X
Drums, brake—replace	X			
Hub assemblies—replace	X			
Hub assemblies—repair		X		
Hub assemblies—rebuild			X	
Retainers, drive sprocket grease—replace	X			
Shafts, axle—replace	X			

*The second echelon is authorized to remove and reinstall items marked by an asterisk. However, when it is necessary to replace an item marked by an asterisk with a new or rebuilt part, subassembly or unit assembly, the assembly marked by an asterisk may be removed from the vehicle by the second echelon *only after authority has been obtained from a higher echelon of maintenance.*

INTRODUCTION

AXLE, REAR (JACKSHAFT) (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Sprocket assemblies—replace	X			
Sprocket assemblies—repair		X		
Sprocket assemblies—rebuild			E	X
BODY				
Blades, windshield wiper—replace	X			
Body assembly—replace			X	
Body assembly—repair		X		
Body assembly—rebuild			E	X
Bows—replace	X			
Bows—repair		X		
Cushions, seat—replace	X			
Door assemblies—replace	X			
Door assemblies—repair		X		
Seat assemblies—replace	X			
Seat assemblies—repair		X		
Seat assemblies—rebuild			X	
Shield assemblies, doors and windshield (armor plate)—replace	X			
Shield assemblies, doors and windshield (armor plate)—repair		X		
Top—replace	X			
Top—repair		E	X	
Ventilator—replace	X			
Ventilator—repair		X		
Windshield—replace	X			
Windshield—repair		X		
Wiper assemblies, windshield—service and/or replace	X			
Wiper assemblies, windshield—repair		X		
Wiper assemblies, windshield—rebuild			X	
BRAKE, DRIVE SHAFT (PARKING)				
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Shoe assemblies—adjust and/or replace	X			
Shoe assemblies—repair (reline)		X		
BRAKES, SERVICE (HYDROVAC)				
Cleaner assembly, air—service and/or replace	X			
Cleaner assembly, air—repair		X		
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

BRAKES, SERVICE (HYDROVAC) (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Cylinder assembly, master—replace	X			
Cylinder assembly, master—repair		X		
Cylinder assembly, master—rebuild			X	
Cylinder assembly, power (hydrovac)—replace	X			
Cylinder assembly, power (hydrovac)—repair		X		
Cylinder assembly, power (hydrovac)—rebuild			X	
Cylinder assemblies, wheel—replace	X			
Cylinder assemblies, wheel—repair		X		
Cylinder assemblies, wheel—rebuild			X	
Hose, flexible, lines and connections—replace and/or repair	X			
Shoe assemblies—adjust and/or replace	X			
Shoe assemblies—repair (reline)		X		
CLUTCH				
Bearings (pilot), release and/or replace	X			
Clutch—replace and/or repair		X		
Clutch—rebuild			E	X
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Plate, clutch driven—replace	X			
Plate, clutch driven—repair (reline)		X		
COOLING GROUP				
Connections—replace	X			
Radiator assembly—replace	X			
Radiator assembly—repair		X		
Radiator assembly—rebuild			X	
Shutter assembly, radiator—replace	X			
Shutter assembly, radiator—repair		X		
Shutter assembly, radiator—rebuild			X	
System, cooling—service	X			
Tank, surge—replace	X			
Tank, surge—repair		X		
ELECTRICAL GROUP				
Battery—service, recharge and/or replace	X			
Battery—repair		X		
Battery—rebuild			X	
Cables, battery—replace and/or repair	X			
Coil, ignition—replace	X			
Controller, electric, trailer brake—replace	X			
Controller, electric, trailer brake—repair		X		
Controller, electric, trailer brake—rebuild			E	X

INTRODUCTION

ELECTRICAL GROUP (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Horn assembly—adjust and/or replace	X			
Horn assembly—repair		X		
Lamp assemblies—adjust and/or replace	X			
Lamp assemblies—repair		X		
Regulator, current and voltage—replace	X			
Regulator, current and voltage—adjust and/or repair		X		
Regulator, current and voltage—rebuild			X	
Socket assembly, trailer coupling—replace	X			
Socket assembly, trailer coupling—repair		X		
Switch assemblies—replace	X			
Switch assemblies—repair		X		
Wiring—replace	X			
Wiring—repair		X		
ENGINE (IHC MODEL RED-450-B)				
Bearings, connecting rod (inserts)—replace		E	X	
Bearings, crankshaft (inserts)—replace		E	X	
Belts—adjust and/or replace	X			
Block and cylinder sleeves assembly—rebuild (recondition)			E	X
Breather, cylinder head—service and/or replace	X			
Breather, cylinder head—repair		X		
Carburetor assembly—adjust and/or replace	X			
Carburetor assembly—repair		X		
Carburetor assembly—rebuild			X	
Condenser, distributor—replace	X			
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Cooler, oil—replace and/or repair		X		
Cooler, oil—rebuild			E	X
Crankshaft—rebuild (recondition)			E	X
Damper, crankshaft vibration—replace		X		
Distributor assembly—adjust and/or replace	X			
Distributor assembly—repair		X		
Distributor assembly—rebuild			X	
*Engine assembly—replace	*	X		
Engine assembly—repair		X		

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ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

ENGINE (IHC MODEL RED-450-B) (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Engine assembly—rebuild			E	X
Fan and hub assembly—replace	X			
Fan and hub assembly—repair		X		
Fan and hub assembly—rebuild			X	
Filter assemblies, oil—service and replace cartridge	X			
Filter assemblies, oil—replace	X			
Filter assemblies, oil—repair		X		
Flywheel assembly—replace and/or repair		X		
Flywheel assembly—rebuild (recondition)			E	X
Gaskets, cylinder head, manifold and oil pan—replace	X			
Gears, timing—replace		X		
Generator assembly—replace	X			
Generator assembly—repair		X		
Generator assembly—rebuild			X	
Governor assembly—adjust and/or replace		X		
Governor assembly—rebuild			X	
Head, cylinder—replace and/or repair		X		
Head, cylinder—rebuild (recondition)			E	X
Housing, flywheel—replace and/or repair		X		
Housing, flywheel—rebuild (recondition)			E	X
Manifolds—replace	X			
Manifolds—rebuild			X	
Pan assembly, oil—service and replace gaskets	X			
Pan assembly, oil—replace and/or repair		X		
Pistons and rings—replace		E	X	
Plugs, spark—adjust and/or replace	X			
Plugs, spark (two piece)—repair		X		
Points, breaker, distributor — adjust and/or replace	X			
Pump assembly, fuel—replace	X			
Pump assembly, fuel—repair		X		
Pump assembly, fuel—rebuild			X	
Pump assembly, oil—replace and/or repair		X		
Pump assembly, oil—rebuild			X	
Pump assembly, water—replace	X			
Pump assembly, water—repair		X		
Pump assembly, water—rebuild			X	
Rods, connecting—replace		E	X	
Sleeves, cylinder—replace		E	X	
Starter assembly—replace	X			
Starter assembly—repair		X		
Starter assembly—rebuild			X	

INTRODUCTION

ENGINE (IHC MODEL RED-450-B) (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Thermostat—replace	X			
Valves—adjust	X			
Ventilator, crankcase—replace	X			
Ventilator, crankcase—service and/or repair		X		
Wiring, ignition—replace	X			
EXHAUST GROUP				
Muffler and exhaust pipes—replace	X			
EXTINGUISHER, FIRE				
Extinguisher, fire (carbon dioxide — CO_2) — replace	X			
Extinguisher, fire (carbon dioxide—CO_2)—service (recharge) and repair		X		
Extinguisher, fire (carbon dioxide — CO_2) — rebuild			E	X
Extinguisher, fire (carbon tetrachloride-CCl_4)—service (refill) and replace	X			
Extinguisher, fire (carbon tetrachloride-CCl_4)—repair		X		
Extinguisher, fire (carbon tetrachloride-CCl_4)—rebuild			E	X
FRAME				
Bumpers—replace	X			
Bumpers—repair		X		
Frame assembly—repair		X		
Frame assembly—rebuild			X	
Hooks, towing—replace	X			
Hooks, towing—repair		X		
Pintle assembly—replace	X			
Pintle assembly—repair		X		
Pintle assembly—rebuild			X	
Spring assemblies, front suspension—replace	X			
Spring assemblies, front suspension—repair		X		
Spring assemblies, front suspension—rebuild			E	X
FUEL GROUP				
Cleaner assembly, air—service and/or replace	X			
Cleaner assembly, air—repair		X		
Filter assembly, fuel—service and/or replace	X			
Lines and connections—replace and/or replace	X			
Tanks—service and/or replace	X			

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

	ECHELONS			
INSTRUMENTS	2nd	3rd	4th	5th
Instruments—replace	X			
Instruments—repair		X		
Instruments—rebuild			E	X
MISCELLANEOUS				
Boards, running—replace	X			
Boards, running—repair		X		
Drive assembly, speedometer—replace	X			
Drive assembly, speedometer—repair		X		
Fenders—replace	X			
Fenders—repair		X		
Hood assembly—replace	X			
Hood assembly—repair		X		
Hood assembly—rebuild			X	
Roller assembly, front—replace	X			
Roller assembly, front—repair		X		
Roller assembly, front—rebuild			E	X
POWER TAKE-OFF				
Controls and linkage—replace	X			
Controls and linkage—repair		X		
Power take-off assembly—replace	X			
Power take-off assembly—repair		X		
Power take-off assembly—rebuild			X	
SHAFTS, PROPELLER				
Shaft assemblies, propeller (w/universal joints) —replace	X			
Shaft assemblies, propeller (w/universal joints) —repair		X		
Shaft assemblies, propeller (w/universal joints) —rebuild			E	X
STEERING GROUP				
Arm, steering (pitman)—replace	X			
Gear assembly, steering—adjust	X			
Gear assembly, steering—replace and/or repair		X		
Gear assembly, steering—rebuild			E	X
Link assembly, drag—replace	X			
Link assembly, drag—repair		X		
TRACK SUSPENSION GROUP				
Bogie components—replace	X			

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TRACK SUSPENSION GROUP (Cont'd)	ECHELONS 2nd	3rd	4th	5th
Bogie components—repair		X		
Bogie components—rebuild			E	X
Idler components—replace	X			
Idler components—repair		X		
Idler components—rebuild			E	X
Mechanism, track adjusting — adjust and/or replace	X			
Mechanism, track adjusting—repair		X		
Mechanism, track adjusting—rebuild			E	X
Roller assemblies, track supporting—replace	X			
Roller assemblies, track supporting—repair		X		
Roller assemblies, track supporting—rebuild			E	X
Track assemblies—replace and/or repair	X			
Track assemblies—rebuild			E	X
TIRES				
Casings and tubes—replace	X			
Casings—repair			X	
Tubes, inner—repair	X			
TRANSMISSION AND TRANSFER CASE				
Controls and linkage—adjust and/or replace	X			
Controls and linkage—repair		X		
Housing, bell—replace and/or repair	X			
Housing, bell—rebuild (recondition)			E	X
*Transmission and transfer case assembly—replace	*	X		
Transmission and transfer case assembly—repair		X		
Transmission and transfer case assembly — rebuild			E	X
VEHICLE ASSEMBLY				
Vehicle assembly—service	X			
Vehicle assembly—rebuild (with serviceable unit assemblies)			X	
WHEELS				
Wheels, front—replace	X			
Wheels, front—rebuild			E	X

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ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

WINCH	ECHELONS 2nd	3rd	4th	5th
Band assembly, safety brake—adjust and/or replace	X			
Band assembly, safety brake—repair (reline)		X		
Cable assembly—replace	X			
Cable assembly—repair		X		
Pin, shear, universal joint—replace	X			
Shaft assembly, propeller—replace	X			
Shaft assembly, propeller—repair		X		
Shaft assembly, propeller—rebuild			E	X
Shoe assembly, drag brake—adjust and replace	X			
Shoe assembly, drag brake—repair (reline)		X		
Winch assembly—replace	X			
Winch assembly—repair		X		
Winch assembly—rebuild			X	

INTRODUCTION

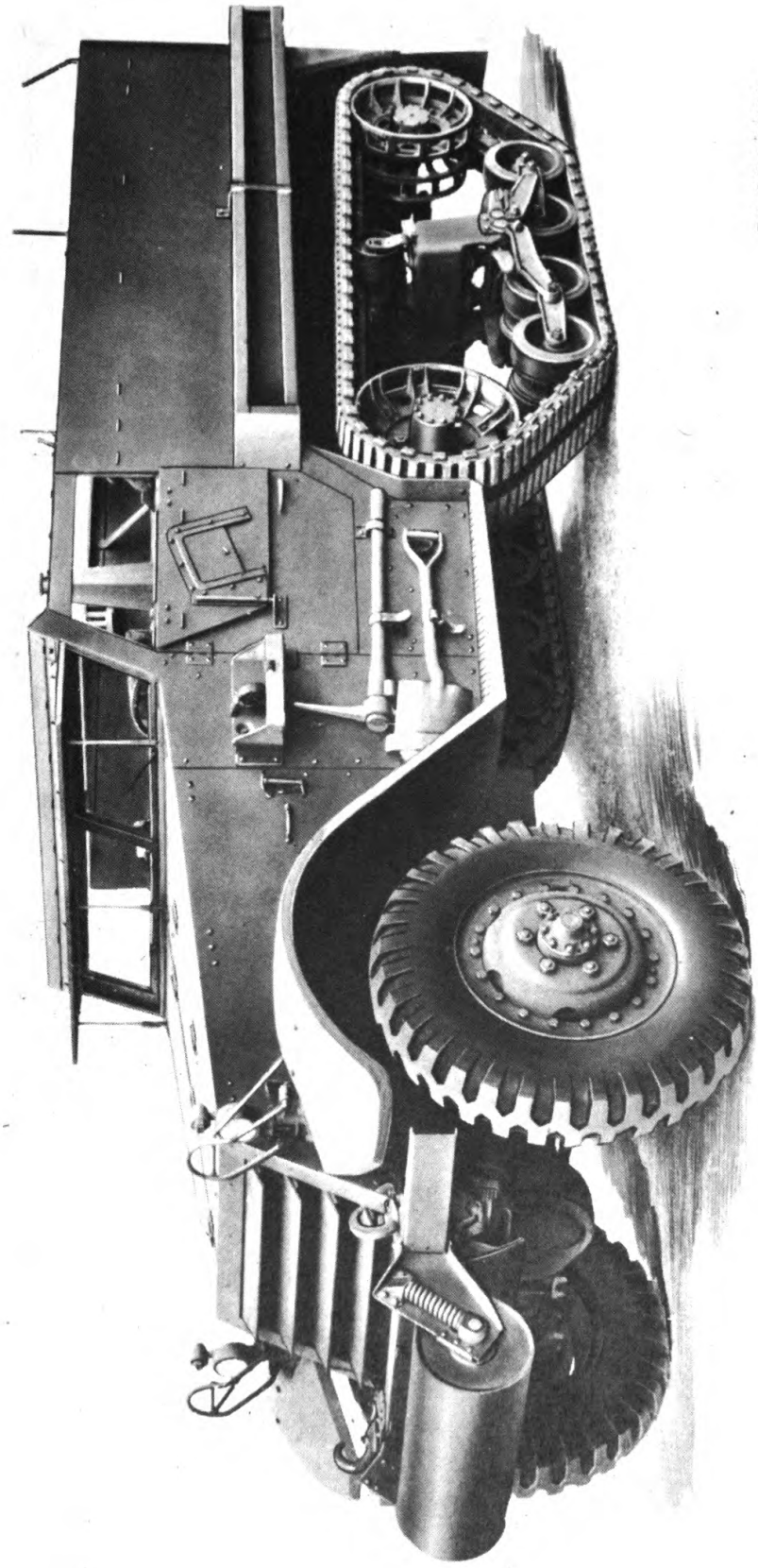

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Figure 1 — Half-track Personnel Carrier M5 — Left Front

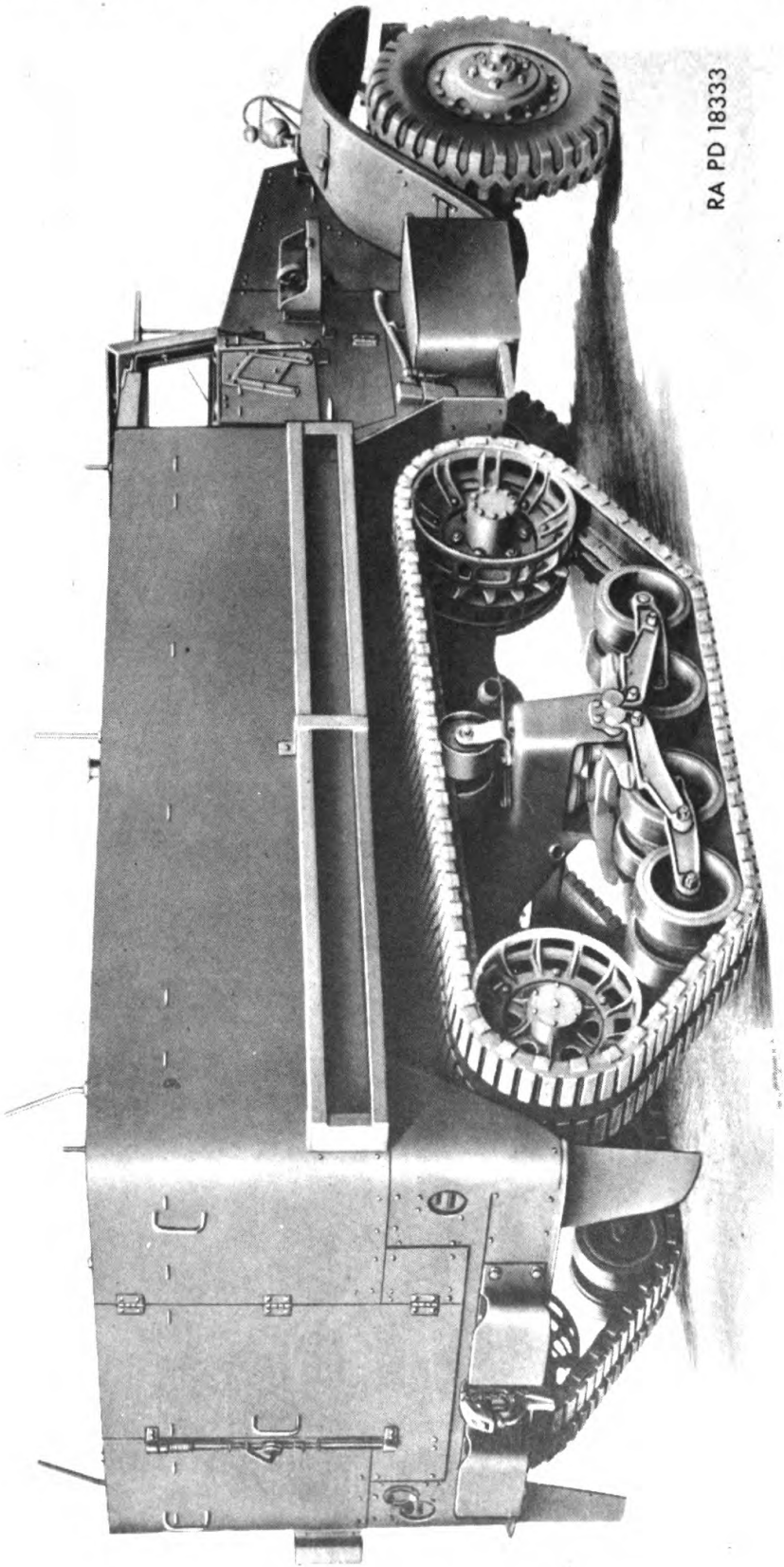

Figure 2 — Half-track Personnel Carrier M5 — Right Rear

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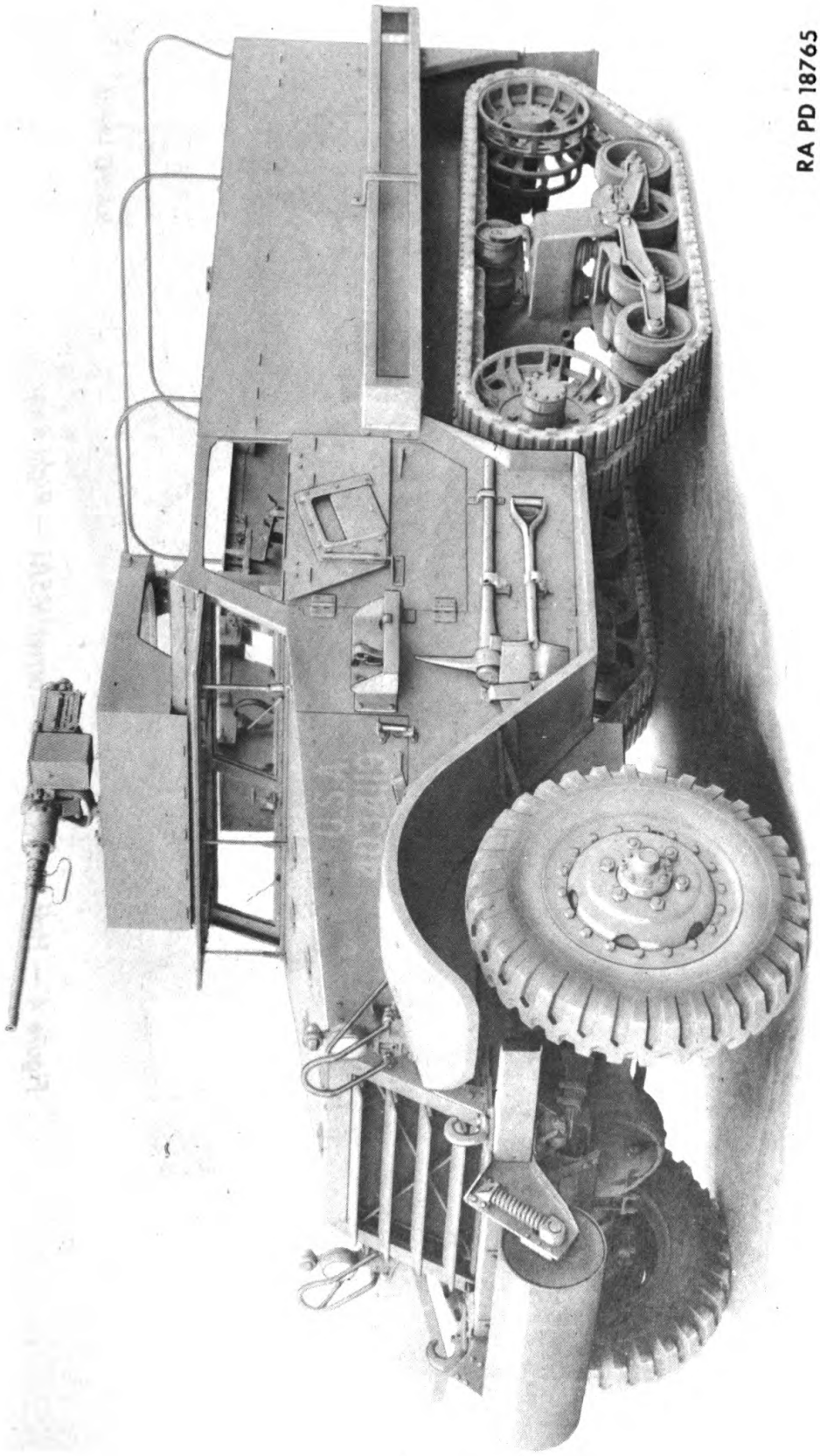

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Figure 3 — Half-track Personnel Carrier M5A1 — Left Front

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

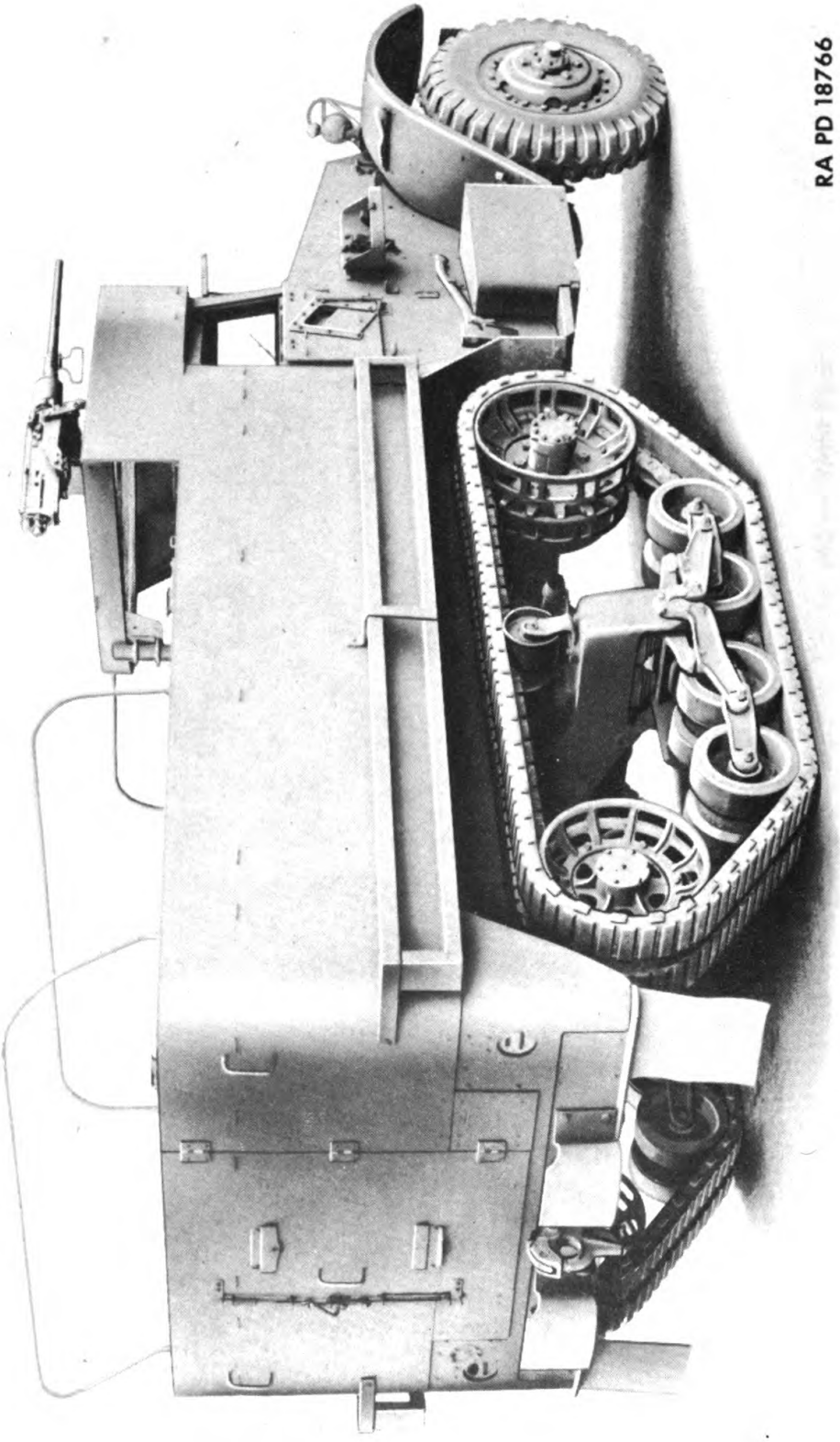

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Figure 4 — Half-track Personnel Carrier M5A1 — Right Rear

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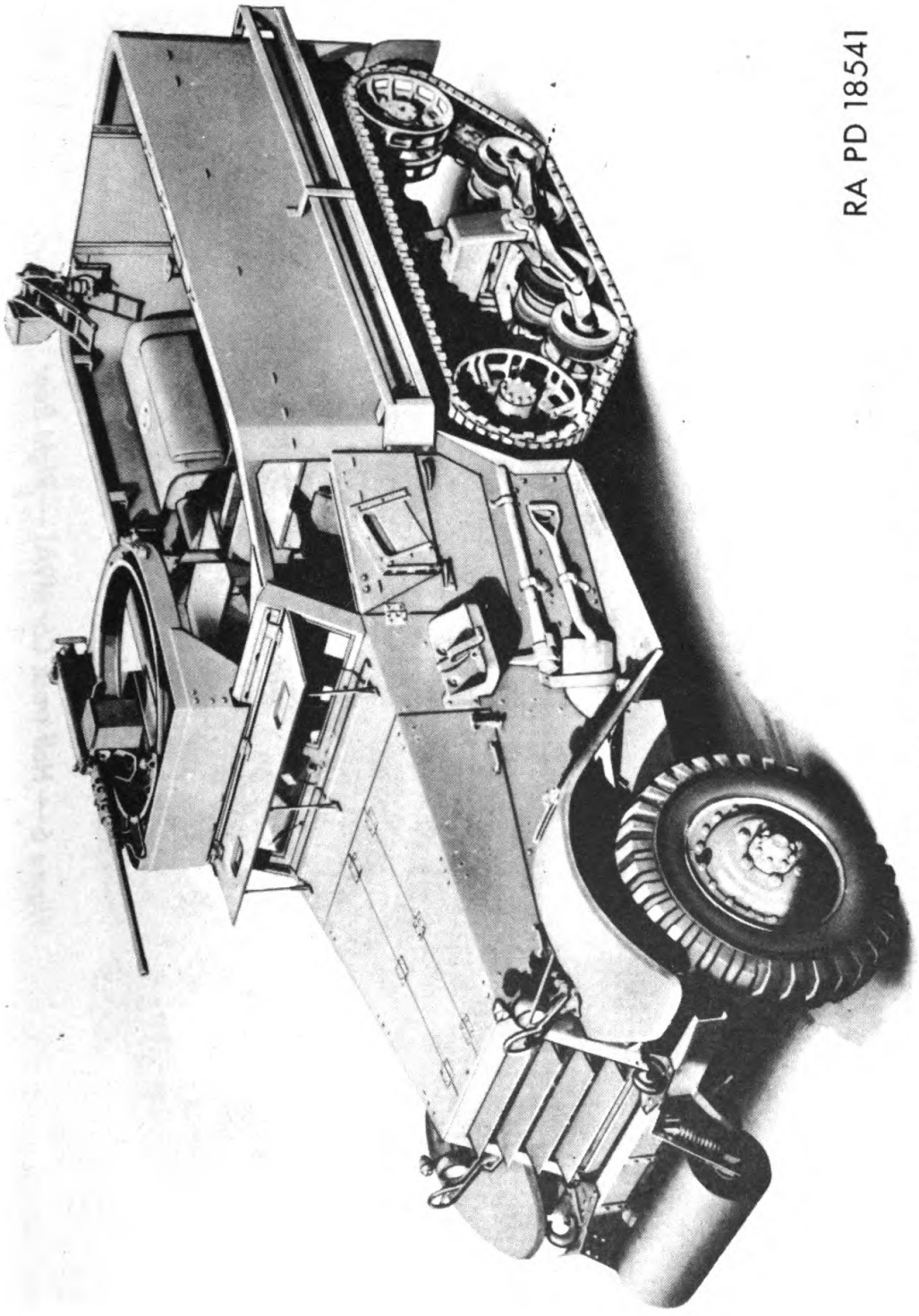

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Figure 5 — Half-track Car M9A1 — Left Front

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

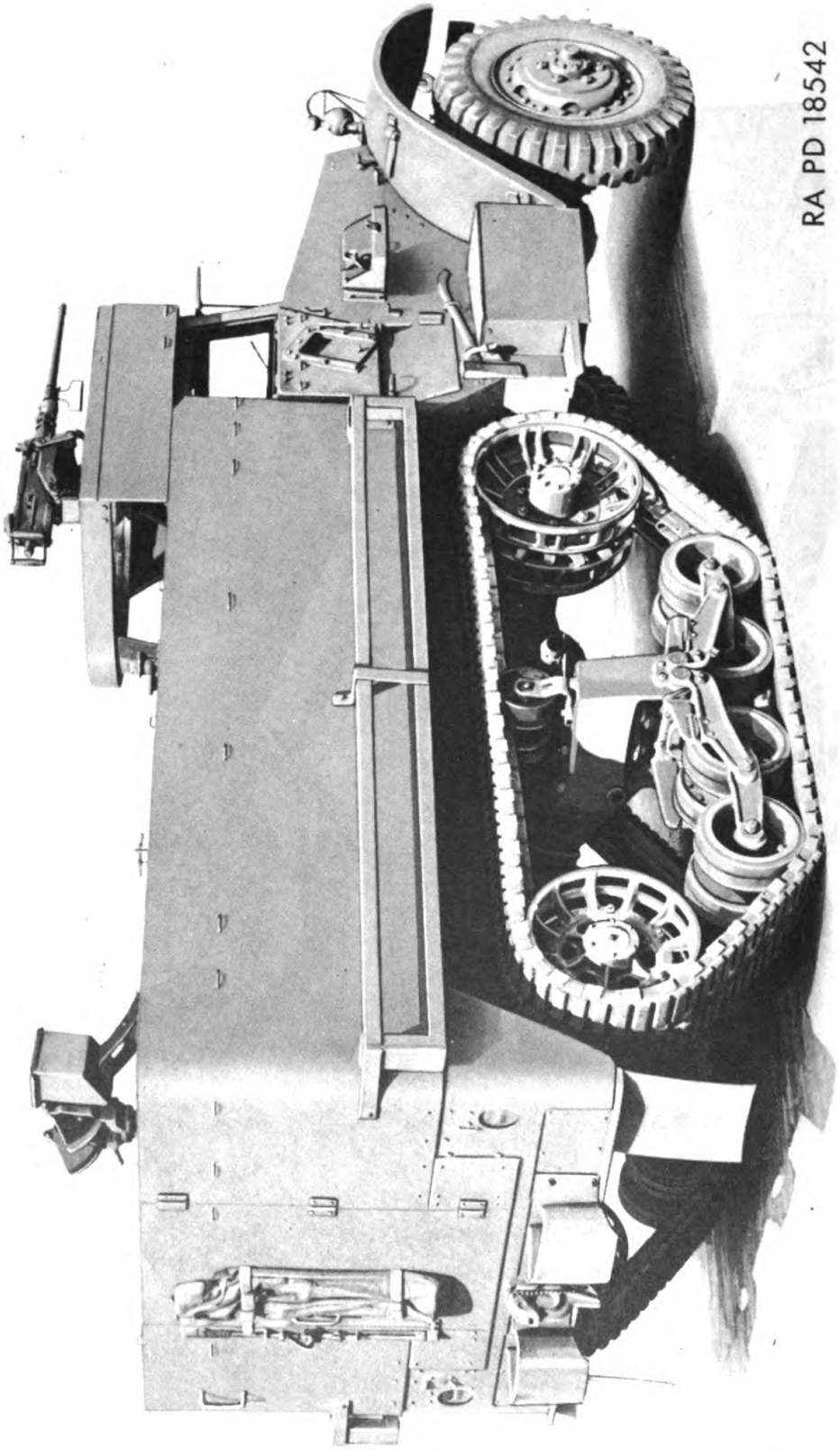

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Figure 6 — Half-track Car M9A1 — Right Rear

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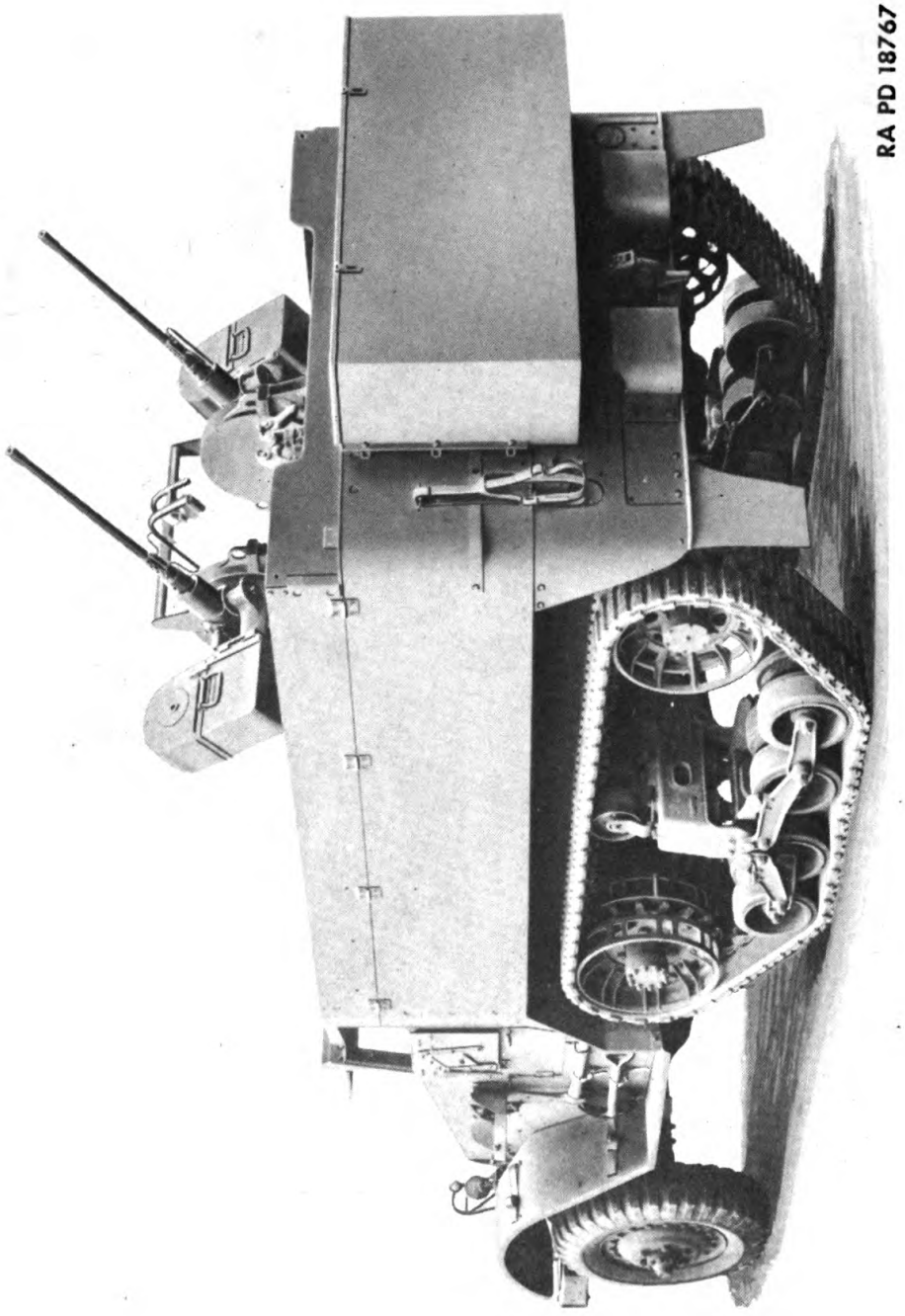
RA PD 18531

Figure 7 — Multiple Gun Motor Carriage M14 — Left Front



RA PD 18767

Figure 8 — Multiple Gun Motor Carriage M14 — Left Rear

CHAPTER 2

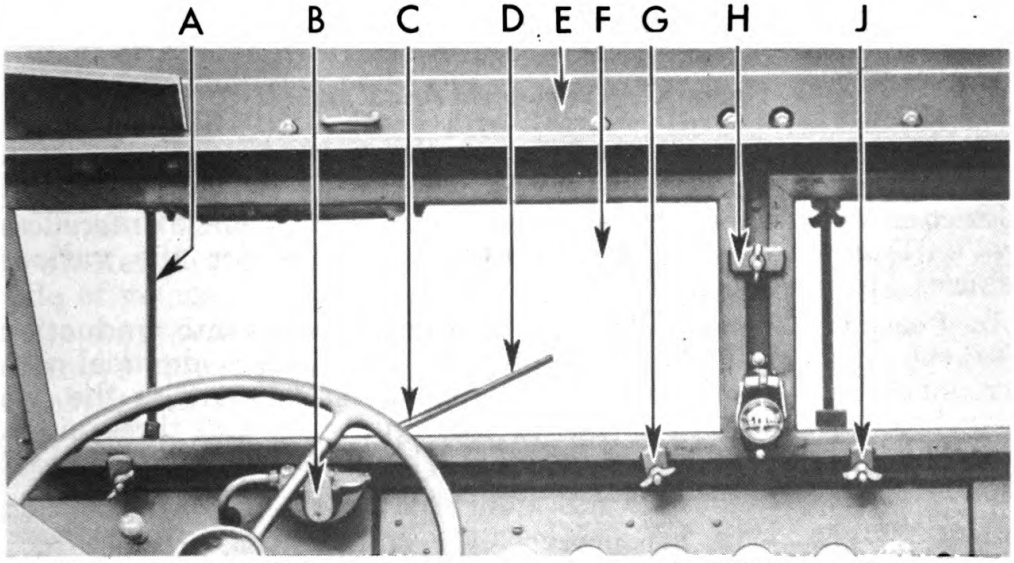
BODY AND SHEET METAL

Section I

DESCRIPTION

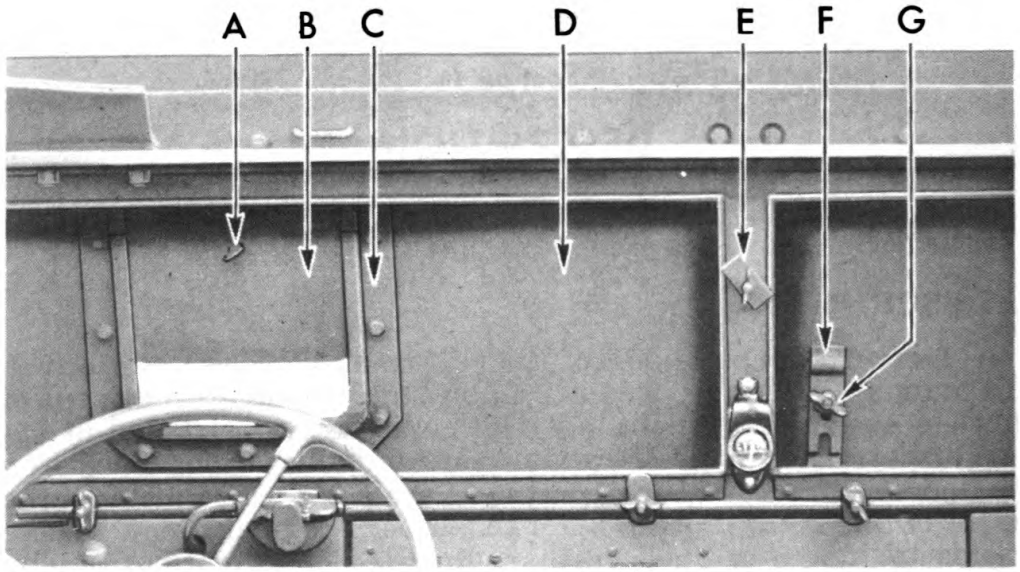
5. DESCRIPTION (figs. 1 to 10).

a. General. The bodies of the half-track vehicles described in this manual are similar in construction but differ in arrangement of stowage and seating facilities. The bodies are constructed of 5/16-inch armor plate at the sides and rear. Folding armor shields on the doors of the driver's compartment are provided to increase the height of the armor protection for the driver's compartment. These shields are hinged to the doors and supported in upright position by vertical rods latched to the doors. Vision slots with slide covers are



A—WINDSHIELD ARMOR LEFT SUPPORT ROD ASSEMBLY
B—WINDSHIELD WIPER ASSEMBLY
C—WINDSHIELD WIPER ARM
D—WINDSHIELD WIPER BLADE
E—WINDSHIELD HEADER
F—LEFT WINDSHIELD, WITH GLASS, ASSEMBLY
G—WINDSHIELD HALF CLAMP
H—WINDSHIELD FULL CLAMP
J—WINDSHIELD WING NUT
RA PD 18340

Figure 9 — Windshield and Wiper Details



A—WINDSHIELD ARMOR PORT HOLE COVER THUMB SCREW
B—WINDSHIELD ARMOR PORT HOLE COVER
C—PORT HOLE COVER RETAINER
D—WINDSHIELD ARMOR PLATE ASSEMBLY
E—CENTER RETAINER
F—ARMOR PLATE RETAINING CLAMP
G—WING NUT
RA PD 18341

Figure 10 — Windshield Armor Details

incorporated in the shields. The windshield is protected by a $\frac{5}{8}$-inch armor plate which is hinged at the top. Vehicle differences are outlined in TM 9-707. Stowage facilities for the various vehicles are described in TM 9-707.

b. Personnel Carrier M5A1. This vehicle went into production after the printing of TM 9-707 (May 21, 1943). It is identical with Personnel Carrier M5 except that the pedestal mount in the M5 body has been replaced in M5A1 by a gun ring, and three pintle sockets have been added to the M5A1 body, one at each side and one at the rear. This construction is similar to that of Half-track Car M9A1.

c. Multiple Gun Motor Carriage M17. This vehicle also went into production after the printing of TM 9-707. It is identical with the M14 with the exception of armament. In place of the Model M33 Gun with two .50 caliber guns as mounted on the M14, the M17 has the Model M42 Gun with four .50 caliber guns.

CHAPTER 2

BODY AND SHEET METAL (Cont'd)

Section II

BODY

6. REMOVAL.

a. Disconnect Wiring. Disconnect tail and stop light wiring harness at each light. Disconnect wiring harness at rear of trailer brake receptacle at left rear of body. Remove battery compartment cover armor, and disconnect radio terminal box cable from battery. Disconnect ground wires from radio terminal outlet boxes.

b. Disconnect Fuel Line to Shut-off Valves and Disconnect Fuel Gage Wires at Tanks. Close both shut-off valves behind the driver's seat. Disconnect fuel line to fuel pump at base of shut-off valve. Remove fuel tank shields by removing three screws from top of shield and three from bottom. Disconnect fuel gage sender wire from top of tank, removing terminal screw. Remove wiring from body.

c. Remove Pintle Hook and Remove Bumperettes. Remove cotter pin from pintle hook nut, and remove nut. Remove pintle hook from spring and frame assembly. Remove four bolts from each rear bumperette, and remove bumperettes from frame.

d. Remove Body Bracket Bolts. Remove six bolts from each side of vehicle at frame bracket on which body is mounted.

e. Remove Body Side Rail to Windshield Frame Bolts. Remove three bolts from each body top rail extension at windshield frame.

f. Remove Gun Ring Mount Bolts at Windshield Frame (M5A1 and M9A1 Vehicles Only). Remove three bolts at the gun ring to windshield frame mounting.

g. Cut the weld at lower rear corner of door on each side of vehicle.

h. Remove Seats and Floor Plate from Driver's Compartment. Remove driver's seat by removing four cap screws from seat base and removing seat base from adjusting rails. Remove other seats by removing cotter pins and yoke pins. Remove 22 slotted-head screws from seat base floor plate, and remove plate from driver's compartment.

i. Disconnect Body Armor from Running Boards and from Driver's Compartment Armor. Remove one bolt from each

side at rear of running board through armor support angle. Remove six slotted-head bolts from rear end of driver's compartment armor, below door opening, at each side of vehicle.

j. Remove Body from Chassis. Attach slings to body, and lift body from frame.

7. INSTALLATION.

a. Install Body on Chassis. Attach slings, and place body on chassis, being careful that body lines up with mounting brackets.

b. Connect Body Armor at Driver's Compartment Armor and at Running Boards. Line up holes in body armor and in driver's compartment armor, below door openings, and inst all six slotted-head screws on each side of vehicle. Line up holes, and install one bolt on each side of vehicle in armor at rear end of running boards through support angles.

c. Install Body Support Bracket Bolts. Install six bolts on each side of vehicle in body mounting brackets.

d. Connect Body Top Rail to Windshield Frame. Install three bolts in each body top rail extension to windshield frame bracket.

e. Connect Gun Ring Mount at Windshield Frame (on M5A1 and M9A1 Vehicles Only). Install three bolts in gun ring mounting bracket at windshield frame.

f. Install Seats and Floor Plate in Driver's Compartment. Place seat floor plate in position in driver's compartment, and line up screw holes. Install 22 slotted-head screws in floor plate. Install driver's seat on adjusting rails, and install four cap screws in seat base plate, one at each corner. Install hinged seat in position, and install retaining pins and cotter pins.

g. Install Rear Bumperettes and Install Pintle Hook. Place bumperettes in position at rear of body, and install four bolts in each. Insert pintle hook in spring and frame mounting, and install pintle hook nut and cotter pin.

h. Connect Fuel Gage Wires. Connect fuel gage sending unit wires to gage terminal at fuel tanks. Place fuel tank shields in position over tanks, alining holes properly, and install three cap screws at the bottom and three at the top of each shield.

i. Connect Fuel Line at Shut-off Valves. Connect fuel line to fuel tank shut-off valves. Open shut-off valves, and check for leaks.

j. Connect Radio Outlet Terminal Box Ground Wires and Cable. Connect ground wires at radio outlet terminal boxes, and connect radio outlet terminal cable at battery. Install battery compartment armor and retaining screws.

k. Connect trailer brake cable at outlet receptacle at rear corner of body. Connect wiring at each tail and stop light at rear of body, and test lights.

CHAPTER 2

BODY AND SHEET METAL (Cont'd)

Section III

FENDERS

8. REMOVAL.

a. Remove headlight from mounting, and insert the stowage plug. Disconnect headlight wiring harness at under side of fender. Remove three bolts connecting front fender bracket and armor plate, and two bolts connecting rear fender bracket and armor plate. Remove seven bolts connecting fender skirt and armor plate. Remove three bolts at rear end of fender connecting fender to running board on left hand side, or to battery compartment on right hand side. Lift fender from chassis.

9. INSTALLATION.

a. Place fender in position on chassis. Line up mounting holes in brackets, and install three bolts in front fender bracket. Do not tighten. Install two bolts in rear fender bracket. Do not tighten. Install seven bolts in fender skirt and armor. Do not tighten. Install three bolts in rear end of fender at running board on left hand side, or battery compartment on right hand side. Now tighten all bolts.

b. Connect headlight wiring harness at underside of fender. Install headlight, or be sure that headlight stowage plug is in the headlight socket.

CHAPTER 2

BODY AND SHEET METAL (Cont'd)

Section IV

DOORS

10. REMOVAL.

a. Driver's Compartment Door. Remove four slotted head screws from door side of hinges, two in each hinge, and remove door from driver's compartment.

b. Body Compartment Rear Door (On M5, M5A1, and M9A1 Vehicles Only). Remove six slotted-head screws from door side of three hinges, two on each hinge, and remove door from body.

11. INSTALLATION.

a. Driver's Compartment Door. Place door in position in door opening, and install two slotted-head screws in both hinges. Aline door and tighten hinge screws.

b. Body Compartment Rear Door (On M5, M5A1, and M9A1 Vehicles Only). Place door in position in door opening, and install two slotted-head screws in each of three hinges. Aline door, and tighten hinge screws.

CHAPTER 3

BOGIE SUSPENSION AND TRACKS

Section I

BOGIE SUSPENSION

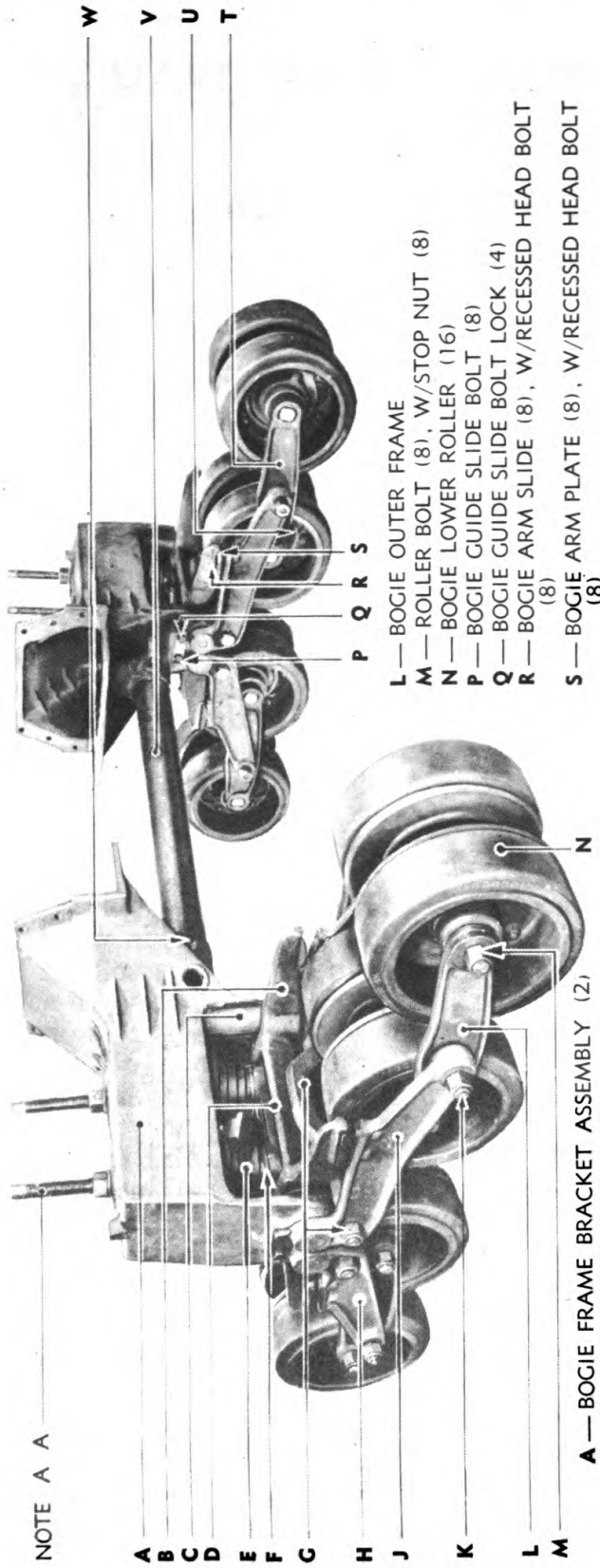
12. DESCRIPTION.

a. Construction.

(1) BOGIE (fig. 11). The bogie suspension consists of a bracket which is bolted to the frame and which has guide slides for the crab assembly bolted to the inner sides. The crab contains a gudgeon pin, the ends of which are pinned to the guide slide blocks. This pin carries the bushing-mounted spring block that supports the dual volute springs. To each of the four feet of the crab is bolted a hardened steel slide which rests on hardened steel plates bolted to the side carrying arms. The carrying arms are steel forgings having a trunnion welded to one end and the other end bolted to the bogie roller frame. The trunnion rests in a bushing in the hole in the bogie frame bracket and is held in place by the tie-bolt and safety nuts. The bogie wheels are of steel and have a rubber tire molded onto them. The wheels are bolted to a welded hub and flange by means of threaded studs which are welded into the flange. The hubs are mounted on gudgeon bolts and are fitted with tapered roller bearings, spacers, and seal retainers. Grease seals are provided on the roller frames. The wheel gudgeons are threaded on one end for a self-locking nut, and the other end is rectangular to fit into a rectangular recess in the opposite, or inner frame. The frames are held rigid by a spacer shaft, which also carries the side carrying arms. The bogies are held in alinement by means of a tubular cross support which connects the bogie frame brackets.

(2) UPPER SUPPORT ROLLER. The track upper support roller is mounted on top of the bogie frame. The roller is mounted on a gudgeon bolt on tapered roller bearings which are protected by grease seals assembled to the roller brackets.

(3) TRACK ADJUSTING IDLER. Each track adjusting idler is mounted on ball bearings which are protected by grease seals in the idler hubs. The outer bearing is held in place by a special



A — BOGIE FRAME BRACKET ASSEMBLY (2)
B — BOGIE CRAB ASSEMBLY (2)
C — BOGIE GUIDE SLIDE (2)
D — BOGIE SPRING BLOCK ASSEMBLY (2)
E — BOGIE SPRING (4)
F — BOGIE SPRING BLOCK WASHER (4)
G — BOGIE ARM TIE BOLT (4), W/STOP NUT (8)
H — BOGIE L.H. ASSEMBLY (4)
J — BOGIE R.H. ARM ASSEMBLY (4)
K — BOGIE FRAME SHAFT (4)
L — BOGIE OUTER FRAME
M — ROLLER BOLT (8), W/STOP NUT (8)
N — BOGIE LOWER ROLLER (16)
P — BOGIE GUIDE SLIDE BOLT (8)
Q — BOGIE GUIDE SLIDE BOLT LOCK (4)
R — BOGIE ARM SLIDE (8), W/RECESSED HEAD BOLT (8)
S — BOGIE ARM PLATE (8), W/RECESSED HEAD BOLT (8)
T — BOGIE INNER FRAME (4)
U — BOGIE ROLLER STUD (48), W/STOP NUT (96)
V — BOGIE CROSS TUBE
W — BOGIE CROSS TUBE BOLT (2), W/NUT (2) AND LOCK WASHER (2)

NOTE: A A SPECIAL BOLT (2), W/NUT (2), USED FOR ASSEMBLY OF SPRING BLOCK TO FRAME BRACKET AND REMOVED AT FINAL ASSEMBLY OF BRACKET TO FRAME.

RA PD 3524A

Figure 11 — Bogie Assembly — Removed

spanner nut and lock washer on the outer end of the idler shaft. A cover plate and gasket are held in place on the idler hub by six self-locking nuts. A lubricant fitting is in the center of the plate. The idler shaft passes through the lower half of the shackle and is held in place by a lock nut and cotter pin. The upper half of the shackle swings on an idler post which is supported by two brackets, one inside and one outside the frame. An idler post brace is mounted from the idler post outside the shackle to the frame side rail at the rear of the shackle. Its purpose is to brace the idler post against distortion from track tension. The idler post has a nut and washer at either end, the outer nut holding the shackle in position. At the lower side of the shackle is a boss with a tapered hole in which is located a pin that attaches the track idler adjusting screw to the shackle.

(4) TRACK IDLER ADJUSTING MECHANISM. A bracket is mounted at each frame side rail just behind the bogie frame. In each of these brackets rest double coil springs. A pressure plate or retainer, an adjusting nut, and a lock nut are located on an adjusting screw which extends from within the springs to where it is attached to the idler shackle. Track tension is maintained by lengthening or shortening the adjusting screw length, thus compressing or releasing the coil springs which exert pressure against the hinged idler shackle.

b. Operation. The bogie rollers contact the inner circumference of the track band as the tracks are laid down by the sprockets. The up and down movements of the tracks, as distorted by obstacles, are transferred by the bogie rollers to the side arms, which pivot on the trunnions and transmit the movement to the crabs. The crabs in turn pivot on their gudgeon pins and also slide vertically in the guide slides, thus causing the volute springs to absorb the shock. Because of the construction, as illustrated in figure 12, only a small amount of volute spring travel is occasioned by a comparatively large amount of vertical travel of a bogie roller. The reduction of travel ratio through the system of leverages is approximately 8 : 1. For example, a 4-inch vertical travel in the front bogie roller will occasion only ½-inch volute spring travel. The construction of the track idler and spring-loaded swinging shackle permits forward and backward travel of the shackle to compensate for the distance between sprocket and idler centers, and prevents track breakage if an object finds its way between the track and the rolling parts.

13. REMOVAL.

a. For removal of bogie parts, refer to TM 9-707.

14. CLEANING.

a. All bogie parts must be scrubbed in dry-cleaning solvent until all dirt, grease and oil are removed. Bearings must be care-

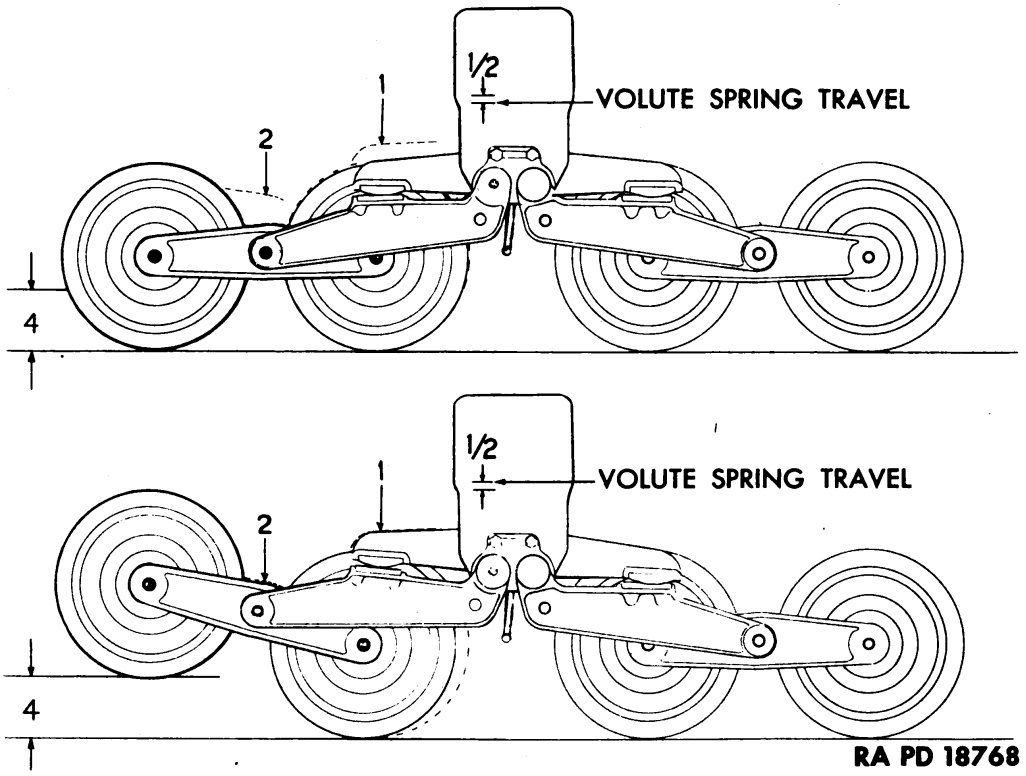


Figure 12 — Bogie Operation Diagram

fully cleaned in fresh dry-cleaning solvent to avoid entrance of dirt into the assembly. Following the cleaning operation, dip each bearing in light oil, drain, and wrap in paper to await inspection. Oil film will prevent rusting of bearing.

15. INSPECTION.

a. Inspect bogie wheels for tire wear or damage. Replace rollers when average over-all width of tread is less than 2½ inches at six equally spaced points on circumference. Also replace rollers when the average outside diameter is less than 11⅝ inches at six equally spaced points on the circumference, and when separation between tire and base measures more than ⅝ inch in length.

b. Inspect bogie wheel hub studs for damage or thread wear. Replace defective studs.

c. Inspect gudgeon shafts for bends, fractures, or damaged threaded ends. Replace defective parts.

d. All oil and grease seals must be replaced.

e. Inspect all bearings for wear or for damaged balls or rollers. Inspect bearing races for pits or other signs of damage. Replace any bearing appearing defective.

f. Inspect bogie wheel frames and carrying arms for wear at ends, and for signs of fracture or bends. Replace any defective

items. Inspect inner bogie roller frame ends at points of the weld to gudgeon shaft, and if welded sections are worn or broken from frames, reweld or replace frames.

g. Check all mounting bolts and cap screws for wear, and replace those found defective.

h. Inspect track idler for worn or broken flanges and for worn idler flange studs. Repair or replace as necessary.

16. INSTALLATION.

a. Installation of bogie component parts is outlined in TM 9-707.

CHAPTER 3

BOGIE SUSPENSION AND TRACKS (Cont'd)

Section II

TRACKS

17. DESCRIPTION (figs. 13 and 14).

a. Tracks are of endless band type, constructed of rubber moulded around steel cables which extend throughout the track length. Fifty-eight metal guides are bolted to the center section of the inner surface of the track. They serve as guides for the sprocket and track idler, retaining the track in position. The tracks are of nondirectional type, operating equally well in one direction as the other. The track guides are, however, directional, being constructed so that the vertical vanes at one end are more closely spaced than at the opposite end. This permits an overlapping of the guides and provides a continuous guide for the track. When installed, the wide portion of the track guides on the ground

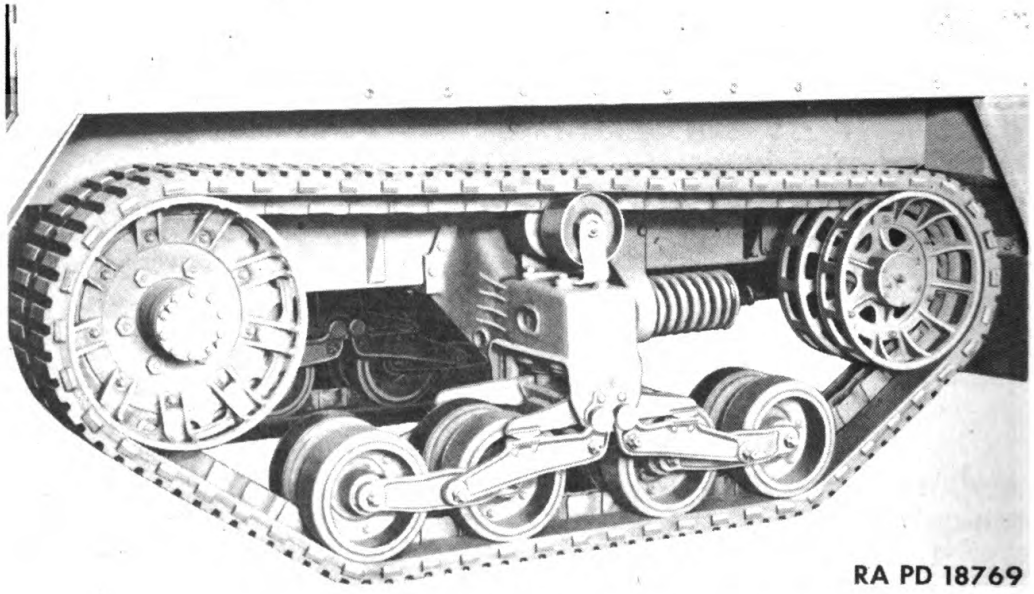
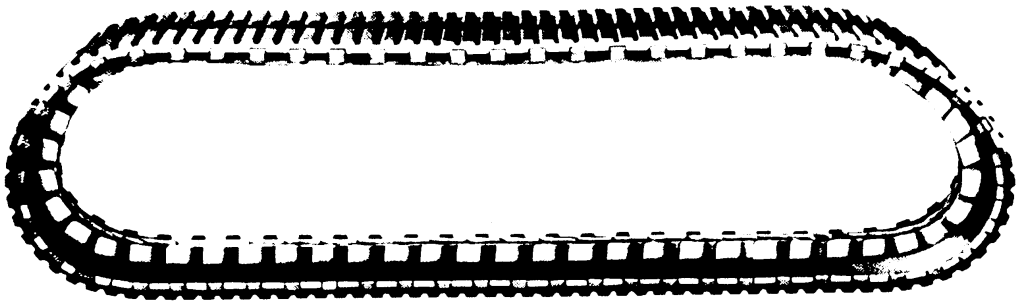


Figure 13 — Track Assembly — Installed

TRACKS



RA PD 18371

Figure 14 — Track — Removed

side of the track must be toward the front of the vehicle. The weight of the track assembly is approximately 540 pounds.

18. REMOVAL.

a. Track removal procedure is outlined in TM 9-707.

19. CLEANING AND INSPECTION.

a. Cleaning. Tracks, following removal, should be washed with water to remove all dirt and mud. Grease and oil may be removed with dry-cleaning solvent.

b. Inspection.

(1) Inspect track guides for wear or breakage. Replace defective parts. Inspect track guide bolts for looseness or thread damage, and replace where necessary.

(2) Inspect track for wear, and replace when two or more cross bars are completely exposed, when five or more cross bars are half exposed, or when five cables are exposed.

20. INSTALLATION.

a. Installation. Track installation procedure is described in TM 9-707.

b. Adjust Track Tension. This vehicle is equipped with a double coil spring adjusted idler. Remove the cover or protective wrapping on the spring-adjusting screw and nut. Clean the threads on the adjusting screw, with a wire brush if necessary. Then apply a light oil so that the tension-adjusting nut can be turned more easily. If the track sag is less than ¾ inch, the track is too tight. To loosen the track, turn the adjusting nut backward on the spring-adjusting screw shaft. This moves the rear idler forward. If the track sag is more than ¾ inch, the track is too loose. To tighten the track, turn the adjusting nut

forward on the spring-adjusting screw shaft. This moves the rear idler towards the rear. If the tension-adjusting nut is too large for the jaws of the 18-inch crescent wrench (C85526), increase the opening by grinding down both jaws equally. (See OMM 29 of June 21, 1943, items 7 and 7A.) After adjusting the track tension, operate the vehicle on a trial run over rough ground. Then make a final check to be sure the track tension is adjusted correctly. Now, adjust the idler shackle stop bolt to a clearance of approximately 2 inches between the end of the bolt and the idler shackle. When adjustment of track tension is completed, apply a light coating of heavy grease on the spring-adjusting screw threads. Then replace the cover or protective wrapping on the adjusting screw and nut.

CHAPTER 4

FRAME

21. DESCRIPTION (fig. 15).

a. Description. The chassis frame consists of channel sections braced and reinforced with pressed steel crossmembers. It is the structural center of the vehicle, carries the vehicle load, and furnishes support for the body, engine, and transmission.

b. Construction. The various channels, brackets, and supports which make up the frame are illustrated in figure 16.

22. REPAIR.

a. Alinement. Correct frame alinement is of major importance to vehicle operation. The chassis units will not function properly in a swayed, bent, or broken frame. Improper frame alinement, usually the result of an accident, places excessive strains on the various parts of the vehicle, and affects wheel alinement. Diagonal frame measurements (fig. 17) will quickly determine which, if any, section of the frame is bent, and where force should be applied to restore correct alinement. The diagonal measuring should be performed with every accuracy and care. Measurements can be taken without removing the body from the chassis, through use of a plumb bob and chalk line, as follows:

(1) Place vehicle on a level floor with tires properly inflated and track tension equally adjusted.

(2) Suspend a plumb bob from the various points on the frame (fig. 17). The plumb bob should be suspended slightly above the floor when it comes to rest. Mark the floor directly underneath it.

(3) Move the vehicle so that the diagonal distances between the chalk marks can be measured.

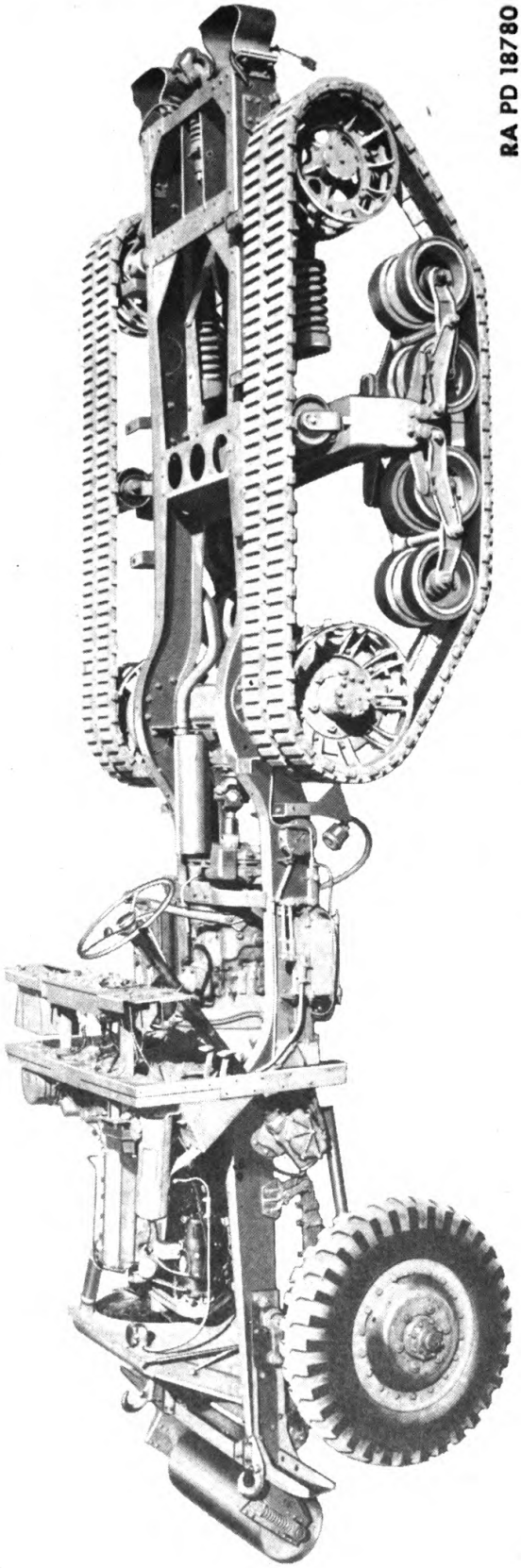
(4) Measure the various diagonals. Corresponding diagonals should agree within $\frac{1}{8}$ inch. CAUTION: *Make sure that any two diagonals compared represent exactly corresponding points on each side of the frame.*

b. Straightening. The use of heat is not recommended when straightening frames. Wherever possible, straightening should be done cold and with pressure. Frame members which are bent or buckled sufficiently to show strains after straightening should be replaced.

c. Cutting, Reinforcing, Riveting, and Welding.

(1) CUTTING. Whenever it is necessary to cut the frame, the

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)



RA PD 18780

Figure 15 — Chassis

FRAME

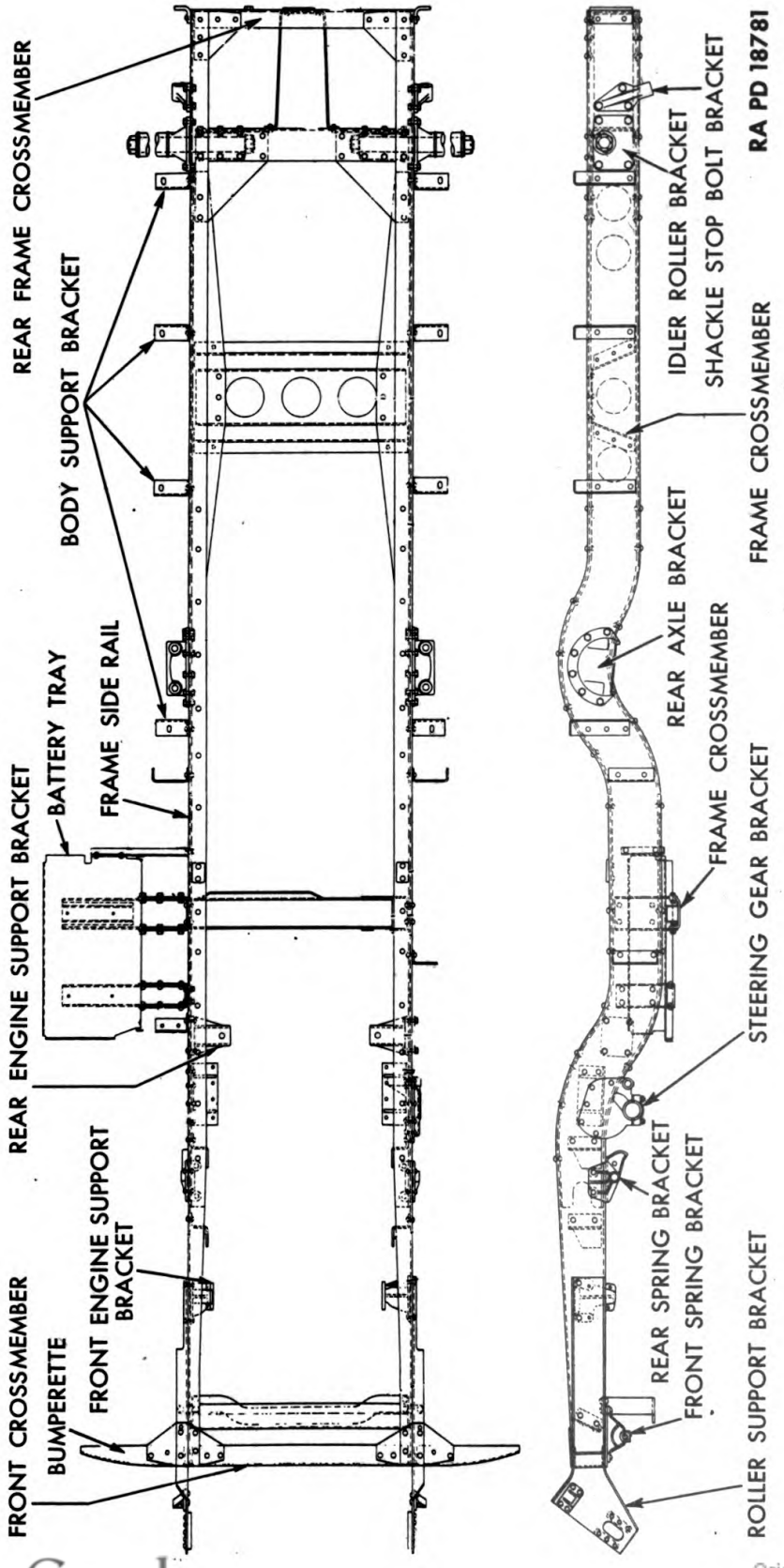


Figure 16 — Chassis Frame — Diagram

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

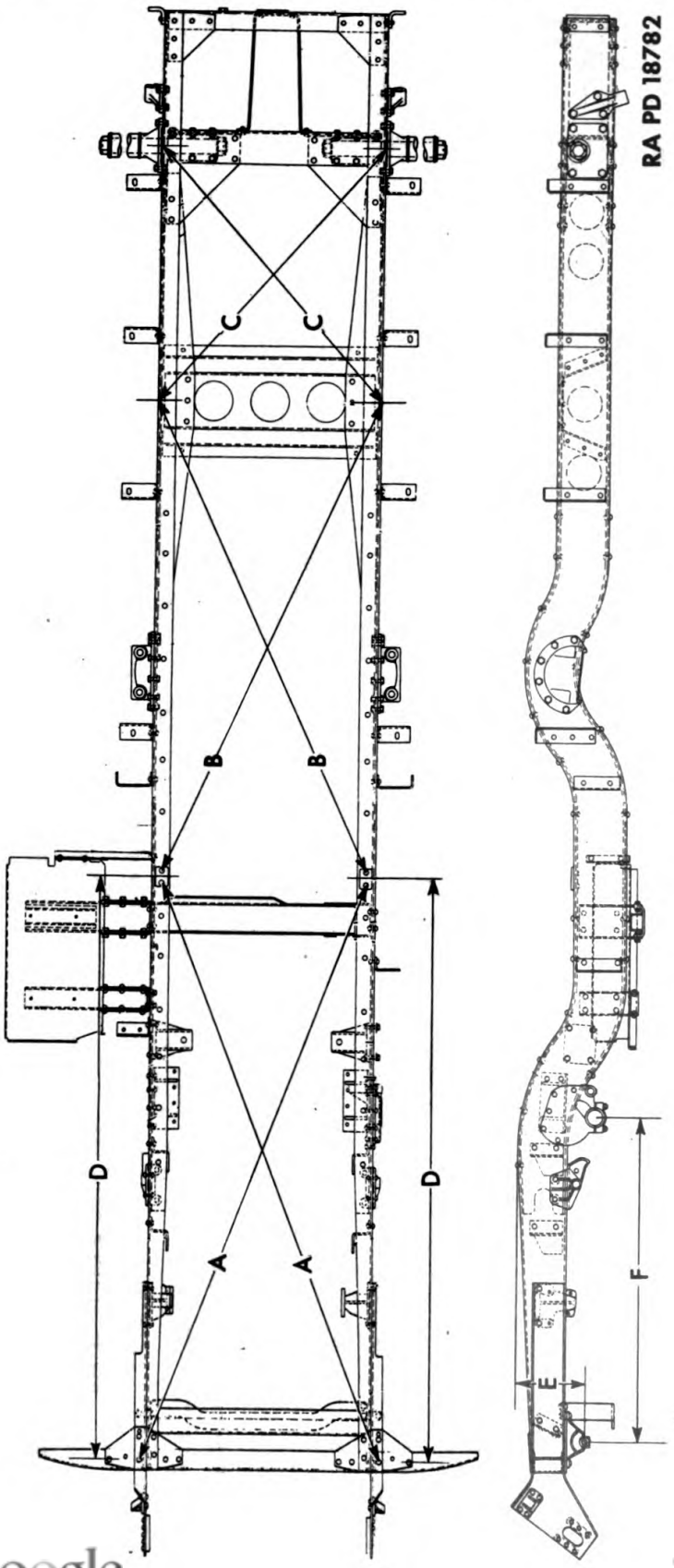


Figure 17 — Chassis Frame — Alinement Diagram

rail should be cut at an angle of 45 degrees. In other words, make the cut longer than the width of the rail. This method distributes the cut and weld over a greater area than a cut made at right angles to the rail.

(2) REINFORCING. Reinforcements can be made with flat, channel, or angle stock. Wherever possible, the reinforcement should extend the entire length of the side rail, or at least 18 inches beyond the driver's compartment crossmember. This procedure, of course, may be impractical in some instances because of the position of attaching units and existing crossmembers. The reinforcement thickness should not exceed that of the side rail to be reinforced.

(3) RIVETING. Whenever possible, parts should be surely riveted together. Where cold rivet squeezing equipment of ample capacity is not available, hot rivets should be used. The diameter of the reinforcement rivets depends upon the spacing and the number of rivets used. Generally, rivets should be from 50 to 100 percent as heavy in diameter as the total thickness of the plates to be riveted.

(4) WELDING. Electric arc-welding is recommended for all frame work. Heat of the weld is localized, and burning of the material is minimized when this method is used. Outside edges of all reinforcements used to strengthen the frame should be tack-welded to the frame after the reinforcements are riveted on. All unused holes should be filled with welding material.

CHAPTER 5

POWER TRAIN

Section I

DESCRIPTION AND DATA

23. DESCRIPTION.

a. General. The power train of the half-track vehicle consists of front axle assembly, rear axle (jackshaft) assembly, transmission and transfer case combination, and connecting propeller shaft assemblies. Power is supplied to the transmission and transfer case from the engine, detailed description of which is contained in TM 9 1707A.

24. DATA.

a. Front Axle.

Make	International
Model	FDK-1370
Type	Single reduction—full-floating
Ratio	7.16 to 1.00
Weight of assembly	820 lb

b. Rear Axle (Jackshaft).

Make	International
Model	RHT-1590
Type	Single reduction, full-floating
Ratio	4.22 to 1.00
Weight of assembly	796 lb

c. Transmission and Transfer Case.

Make	International
Design	Spicer
Model (IHC)	1856
Type	Combination
Weight of assembly:	
With power take-off	503 lb
Less power take-off	467 lb

CHAPTER 5

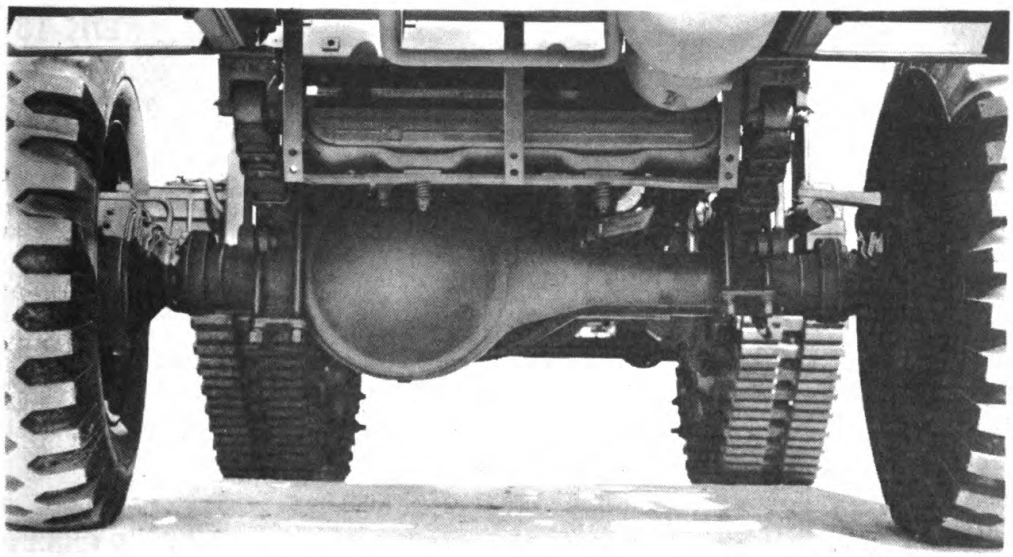
POWER TRAIN (Cont'd)

Section II

FRONT AXLE

25. DESCRIPTION AND DATA.

a. General (figs. 18 and 19). The front axle is of single-reduction, full-floating type, having a straddle-mounted bevel drive pinion and conventional type differential. The front wheels are driven through constant velocity universal joints enclosed within steering knuckles at the outer ends of the axle housing. Boots encircle the joints to prevent corrosion and rust formation on the housing



RA PD 18216

Figure 18 — Front Axle — Installed

RA PD 18215

Figure 19 — Front Axle — Removed

sleeve. These boots are replaceable without further disassembly of the axle. The constant velocity universal joints are Bendix-Weiss. The weight of the front axle assembly is approximately 820 pounds.

b. Drive End. Construction details of the front axle drive end are shown in figure 20 which illustrates the assembly of the wheel hub, bearings, seals, and axle shaft.

c. Differential. Construction details of the front axle differential are shown in figure 21.

d. Housing. The banjo type axle housing facilitates service procedure, since units can be removed without requiring housing disassembly.

e. Data.

(1) GENERAL.

Make	International
Model	FDK-1370
Type	Full-floating
Ratio	7.16 to 1.00
Weight	820 lb
Axle shaft:	
Make	Bendix-Weiss
Diameter at splines	1 13/16 in.
Number of splines	16
Bevel drive gear teeth	43
Bevel drive pinion teeth	6
Theoretical cone center	3.8127 in.
Steering knuckle spindle:	
Diameter at inner bearing	2.7488 in.
Diameter at outer bearing	2.6863 in.
Spring centers	34 1/8 in.

(*Data continued on Page 48*)

FRONT AXLE

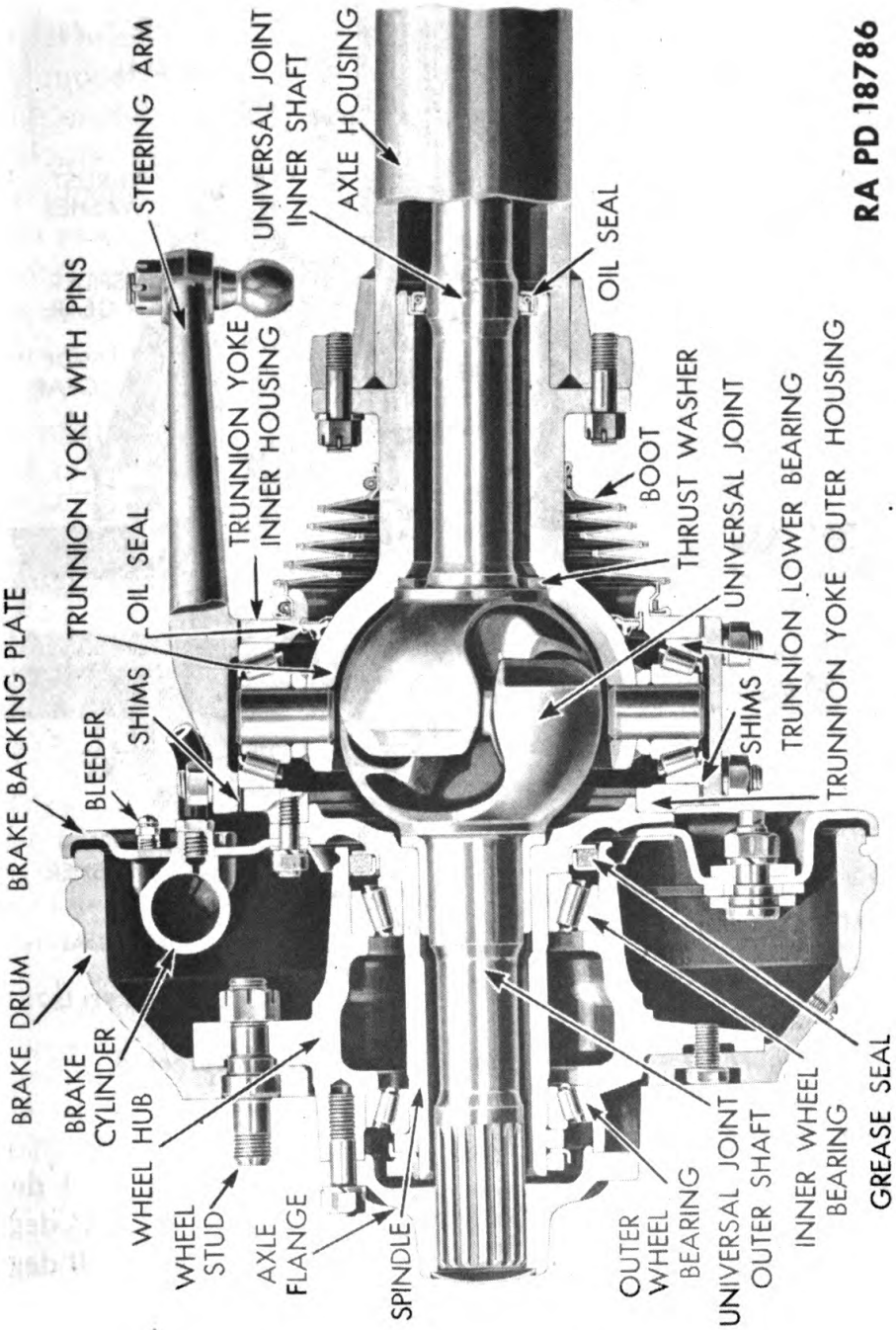


Figure 20 — Cross Section of Front Axle (Drive End)

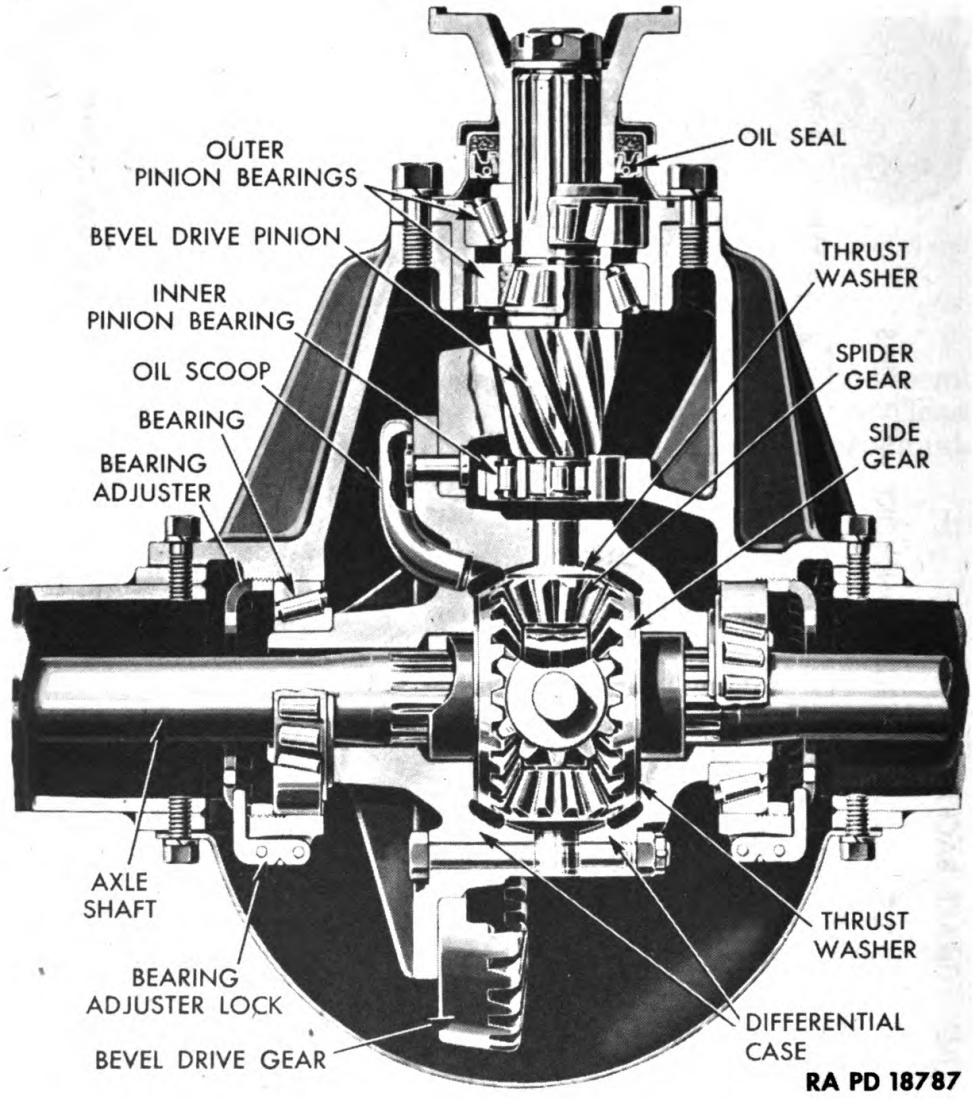


Figure 21 — Cross Section of Front Axle Differential

(2) ALINEMENT ANGLES.

Camber	1 degree
Caster	2½ degrees
King pin inclination	0 degrees
Inside turning angle (LH)	26 degrees
Outside turning angle (LH)	24½ degrees
Inside turning angle (RH)	28 degrees
Outside turning angle (RH)	23½ degrees
Toe-in of wheels	1/16 to 1/8 in.
Tread	66½ in.

FRONT AXLE

(3) BEARINGS.

Inner steering knuckle spindle (2):	
Cup model	Timken 33472
Cone model	Timken 33275
Outer steering knuckle spindle (2):	
Cup model	Timken 394-A
Cone model	Timken 399-A
Trunnion yoke (4):	
Cup model	Timken 43312
Cone model	Timken 43112
Differential carrier (2):	
Cup model	Timken 3982
Cone model	Timken 3920
Bevel drive pinion:	
Cup model (2)	Timken 53375
Cone model (2)	Timken 53178
Straddle (inner) bearing model	Hyatt-U-1306-TAM

26. REMOVAL.

a. Removal of the front axle assembly from the vehicle is detailed in TM 9-707.

27. CLEANING AND INSPECTION.

a. Cleaning. Following removal of the front axle assembly, it must be thoroughly cleaned externally of all dirt, mud, and grease, using water under pressure or dry-cleaning solvent. Brushing the assembly will facilitate the cleaning operation.

b. Inspection. Examine housing for cracks and, if found, mark locations for repair following disassembly. Examine brake backing plates for looseness and for bends. Repair or replace. Examine axle assembly for signs of looseness, loss or damage to screws, studs or nuts, and replace as necessary.

28. DISASSEMBLY.

a. Remove Axle Shaft Drive Flange. Remove eight nuts and lock washers from axle flange studs. Insert two screws in tapped holes in flange, and screw into flange to serve as puller for flange (fig. 22). Remove axle shaft drive flange and gasket from hub and shaft (fig. 23).

b. Remove Wheel Hub and Brake Drum. Straighten locking tab on bearing nut lock washer. Remove bearing outer lock nut, and bearing adjusting nut (fig. 24). Remove outer wheel bearing from hub, and lift hub and drum from spindle. Remove inner bearing from spindle.

(*Continued on Page 56*)

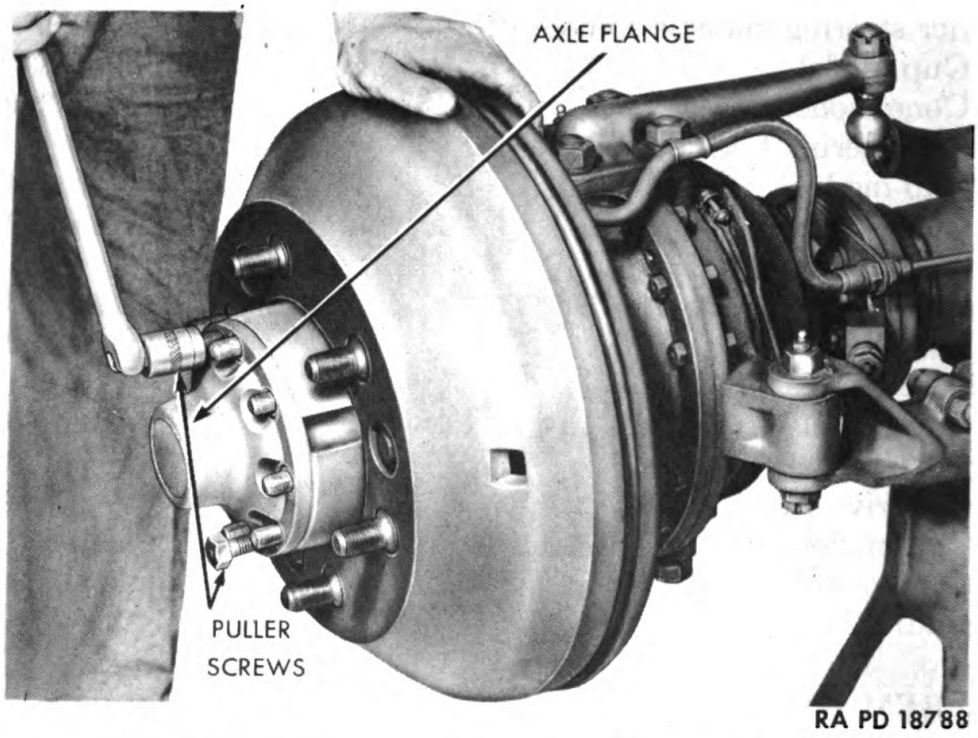


Figure 22 — Removing Axle Shaft Drive Flange

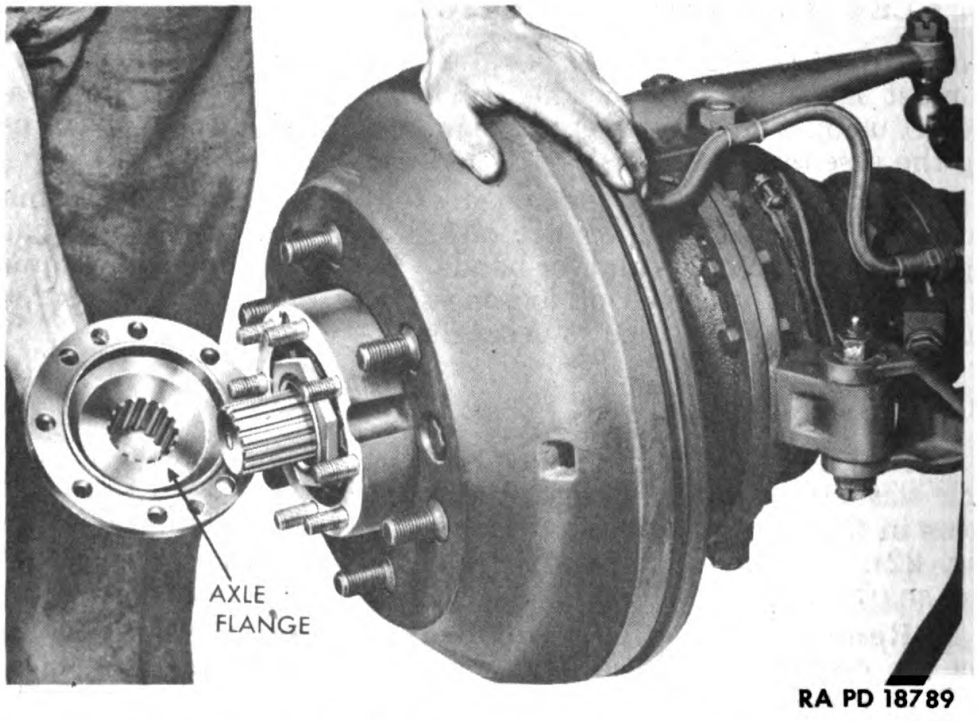


Figure 23 — Axle Shaft Drive Flange — Removed

FRONT AXLE

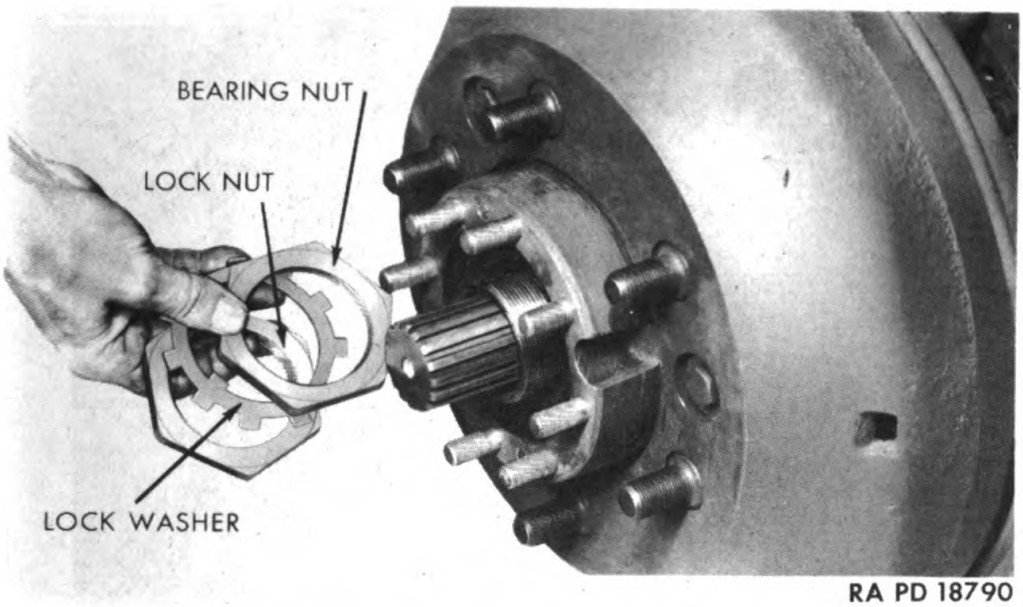


Figure 24 — Removing Wheel Bearing Nuts

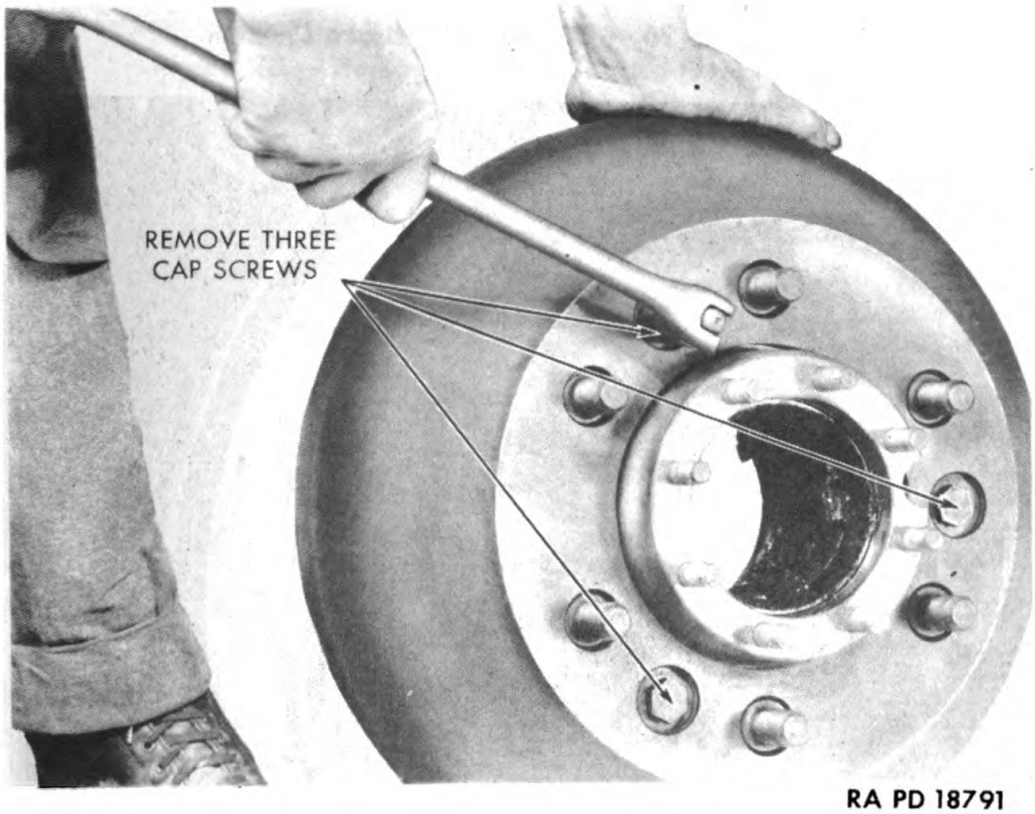


Figure 25 — Removing Brake Drum Cap Screws

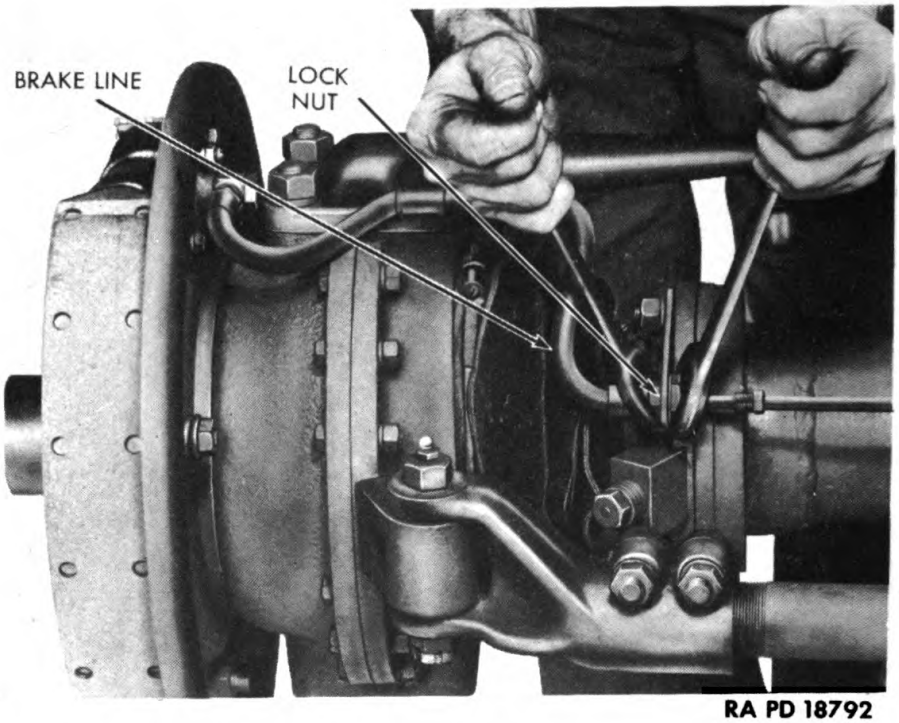


Figure 26 — Disconnecting Brake Line

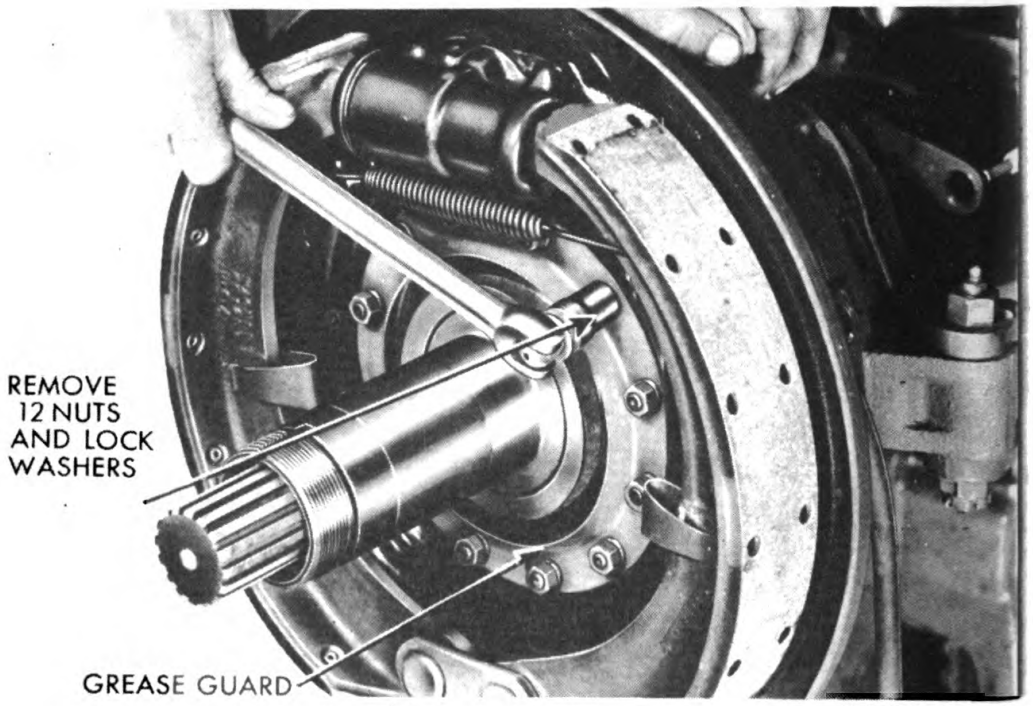


Figure 27 — Removing Grease Guard Nuts

FRONT AXLE

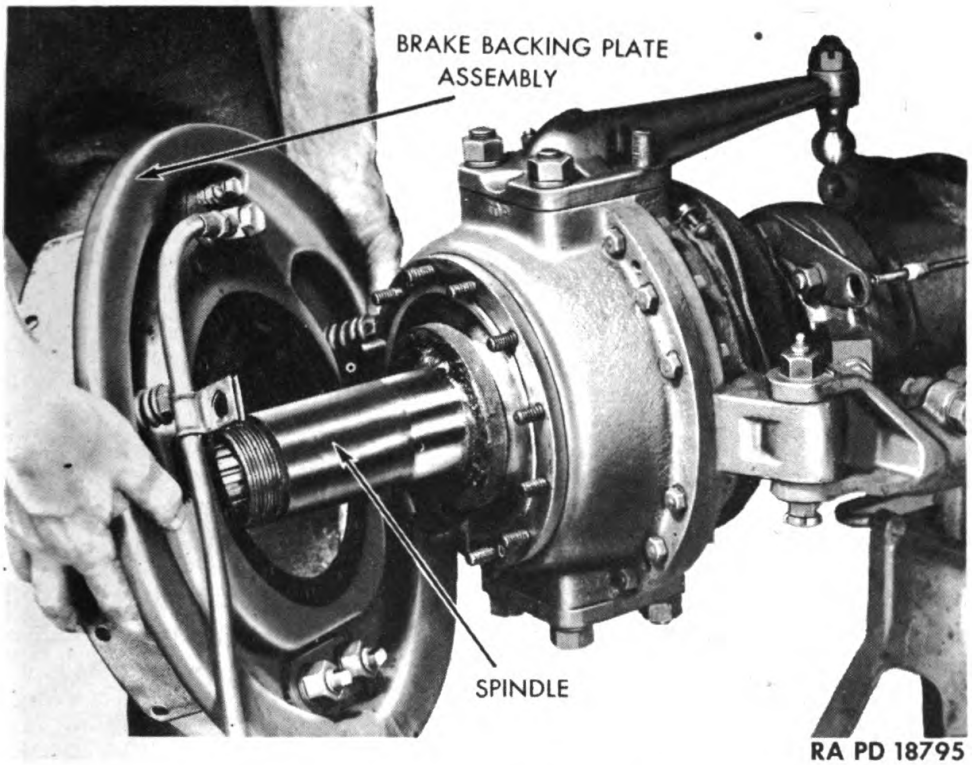


Figure 28 — Removing Brake Backing Plate Assembly

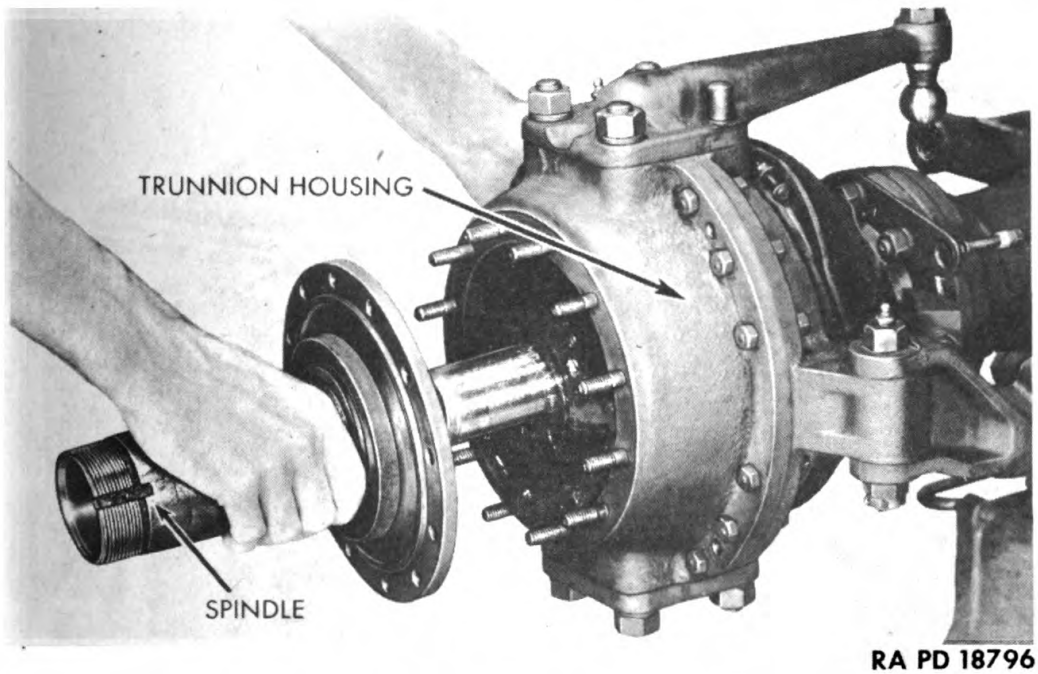


Figure 29 — Removing Front Axle Wheel Spindle

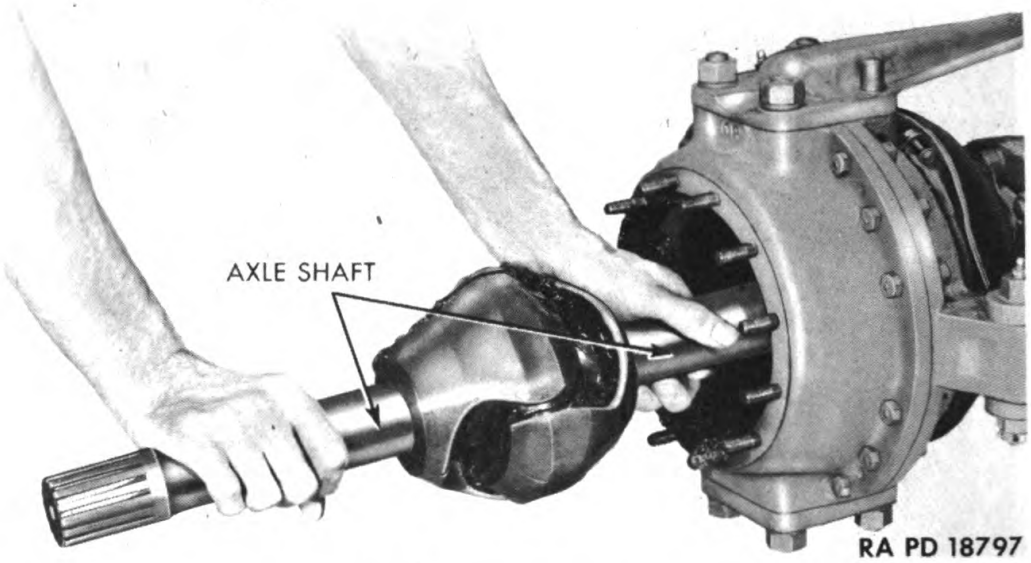


Figure 30 — Removing Front Axle Shaft

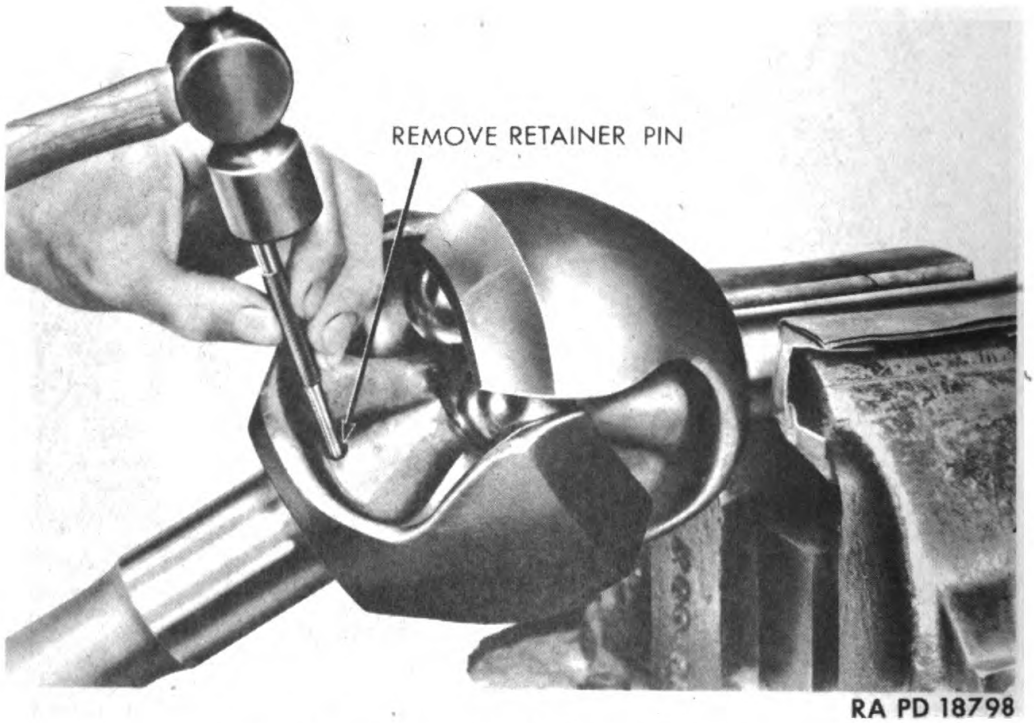


Figure 31 — Removing Universal Joint Taper Pin

FRONT AXLE

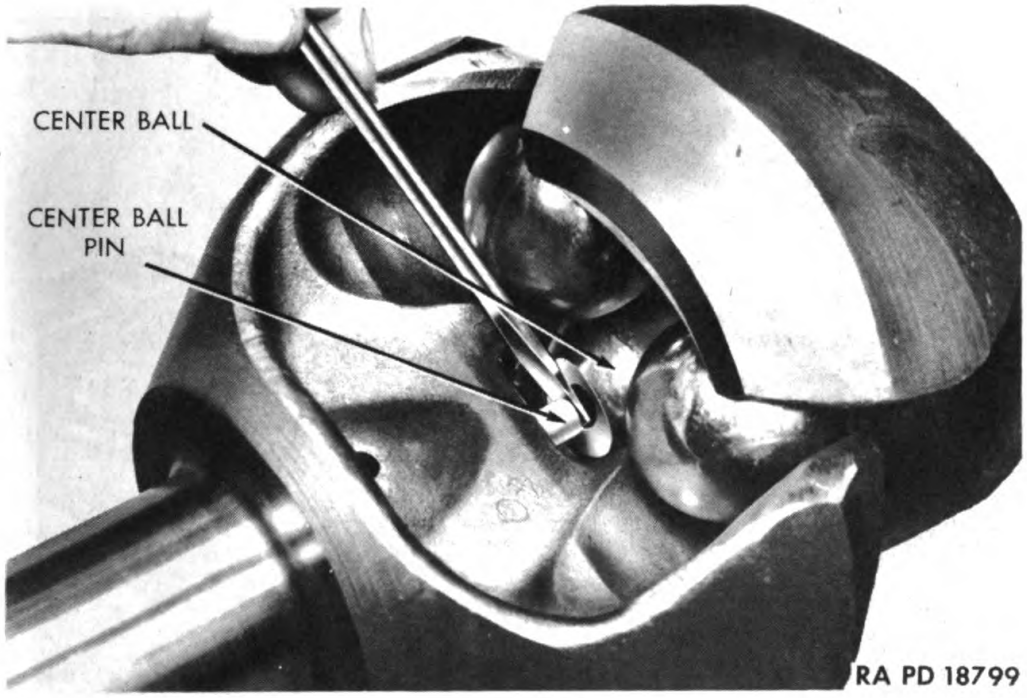


Figure 32 — Removing Universal Joint Center Ball Pin

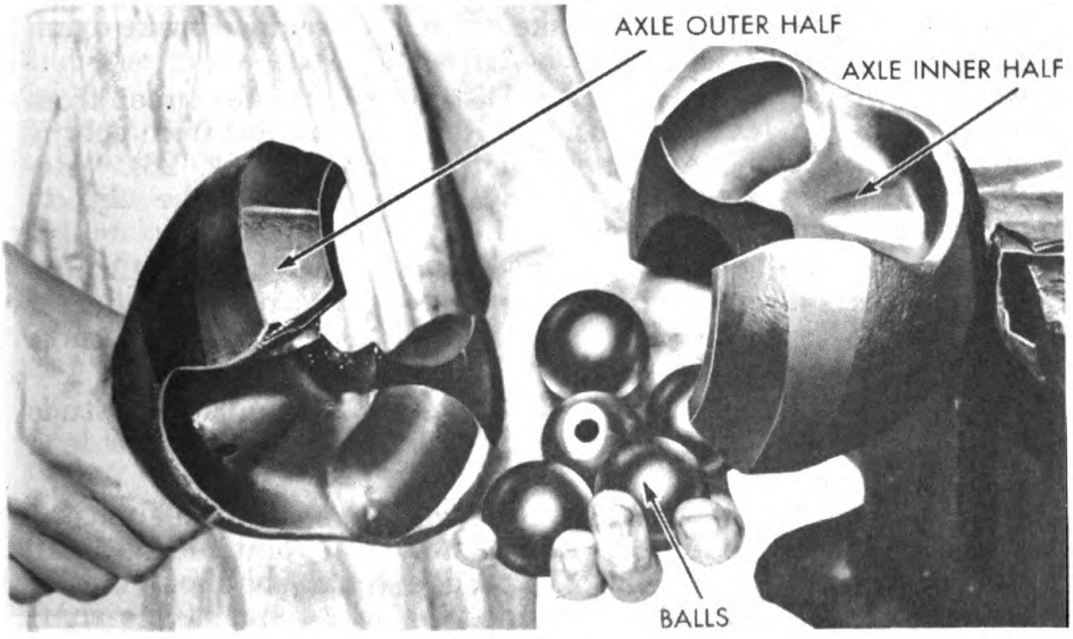


Figure 33 — Universal Joint — Disassembled

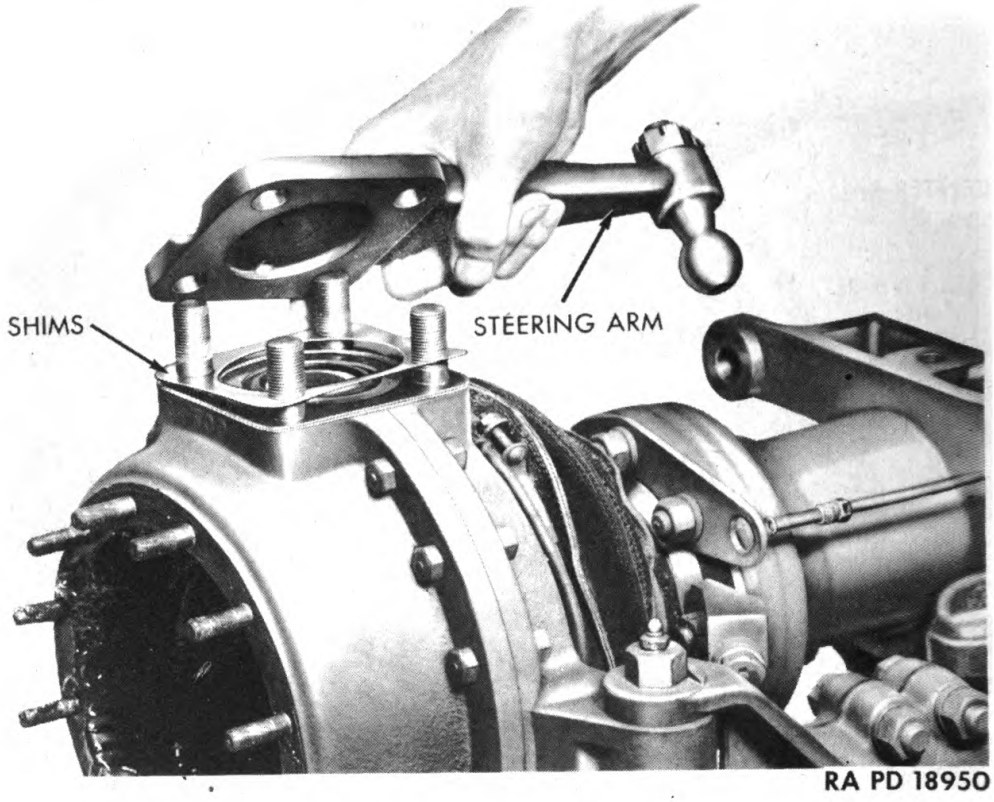


Figure 34 — Removing Front Axle Steering Arm

c. Remove Brake Drum from Hub. Remove three cap screws and lock washers from brake drum, and remove brake drum from hub (fig. 25).

d. Disconnect Brake Tube. Disconnect brake tube from bracket connection at axle housing. Remove lock nut from tubing connection, and remove connection from bracket (fig. 26). Remove nut and lock washer holding brake flexible tube clip to steering arm, and lift clip from stud.

e. Remove Brake Backing Plate Assembly. Remove 12 nuts and lock washers from studs holding grease guard or dirt deflector to brake backing plate (fig. 27). Lift off deflector from studs. Lift brake backing plate assembly from axle housing (fig. 28).

f. Remove Wheel Spindle. Remove wheel spindle from studs and from trunnion yoke housing (fig. 29). Tapping with a lead hammer will facilitate separating spindle from housing.

g. Disassemble Axle Shaft. Remove axle shaft from housing (fig. 30). Remove retainer pin from universal joint, using small pin punch and hammer (fig. 31). Slide center ball pin out of drilled center ball (fig. 32), or bounce the wheel end of the shaft on a block of wood to cause the center ball pin to move into the drilled passage in the wheel end of the axle shaft. Pull the two halves of the joint apart. With the fingers, turn the center ball so

FRONT AXLE

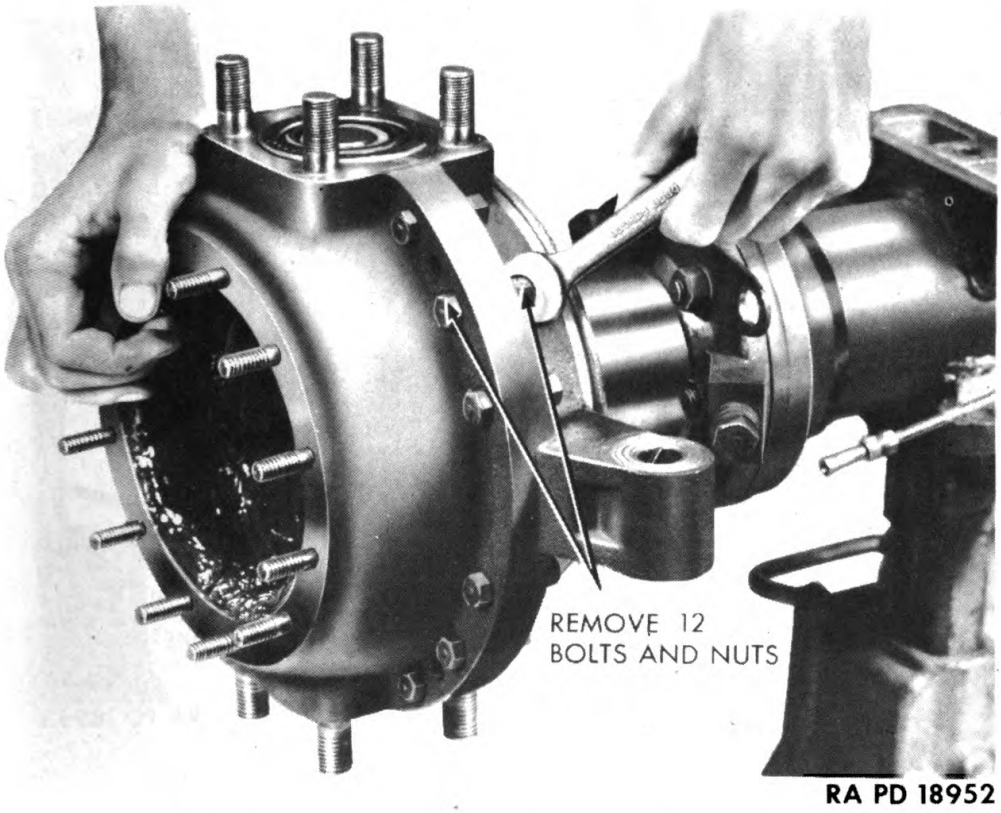


Figure 35 — Removing Trunnion Yoke Housing Bolts

that the groove in it lines up with one race to permit the first driving ball to be moved past the center ball when the joint is swung to an angle. The remaining three driving balls and center ball will then drop out (fig. 33).

h. Remove Steering Arms. Remove remaining three nuts and lock washers from upper steering arm studs. Tap steering arm to remove arm from trunnion yoke housing (fig. 34). Remove four nuts and lock washers holding lower bearing cap to housing, and remove cap. NOTE: *Remove shims from upper and lower bearings and keep separate.*

i. Disconnect Tie Rod Yoke. Remove cotter pin from tie rod yoke bolt. Remove nut from bolt, and remove bolt from yoke.

j. Remove Boot from Housing. Remove screws from inner and outer clamps holding boot at trunnion yoke housing and at axle housing. Pull zipper on boot and remove boot from housing.

k. Disassemble Trunnion Yoke Housing. Remove nuts and lock washers from 12 bolts connecting inner and outer halves of trunnion yoke housing (fig. 35). Separate inner and outer halves of housing (fig. 36).

(*Continued on Page 61*)

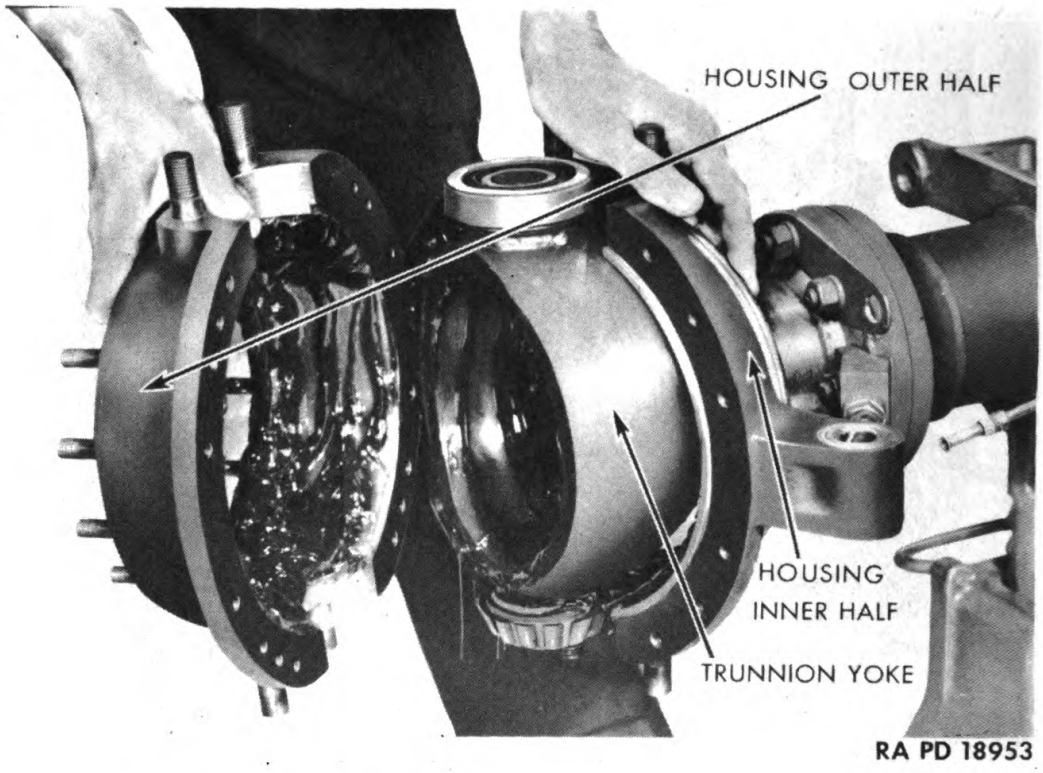


Figure 36 — Removing Trunnion Yoke Housing Outer Half

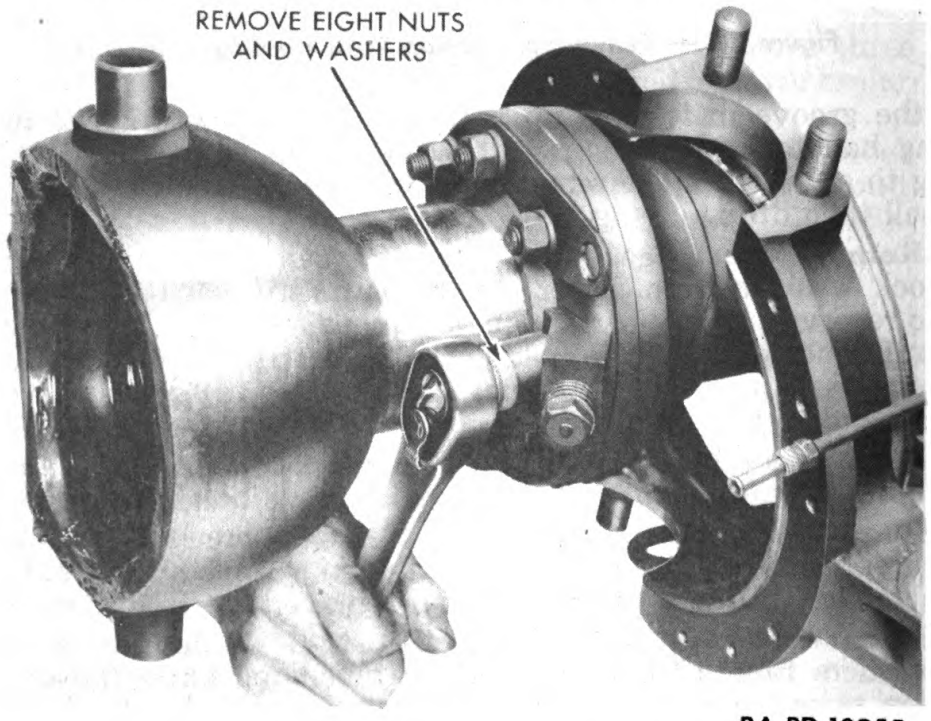


Figure 37 — Removing Trunnion Yoke to Axle Housing Nuts

FRONT AXLE

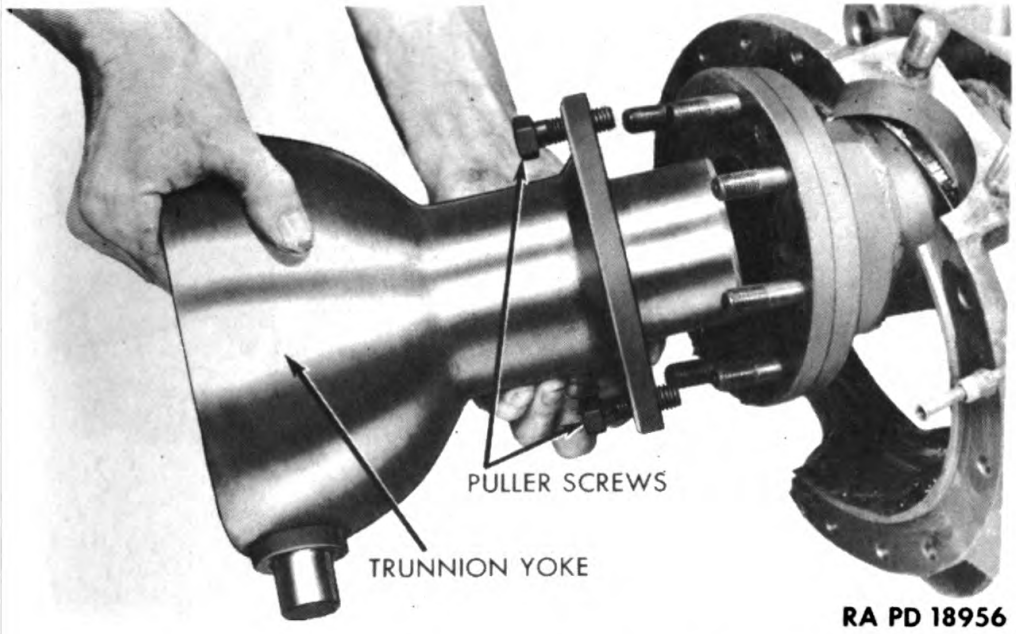


Figure 38 — Removing Trunnion Yoke

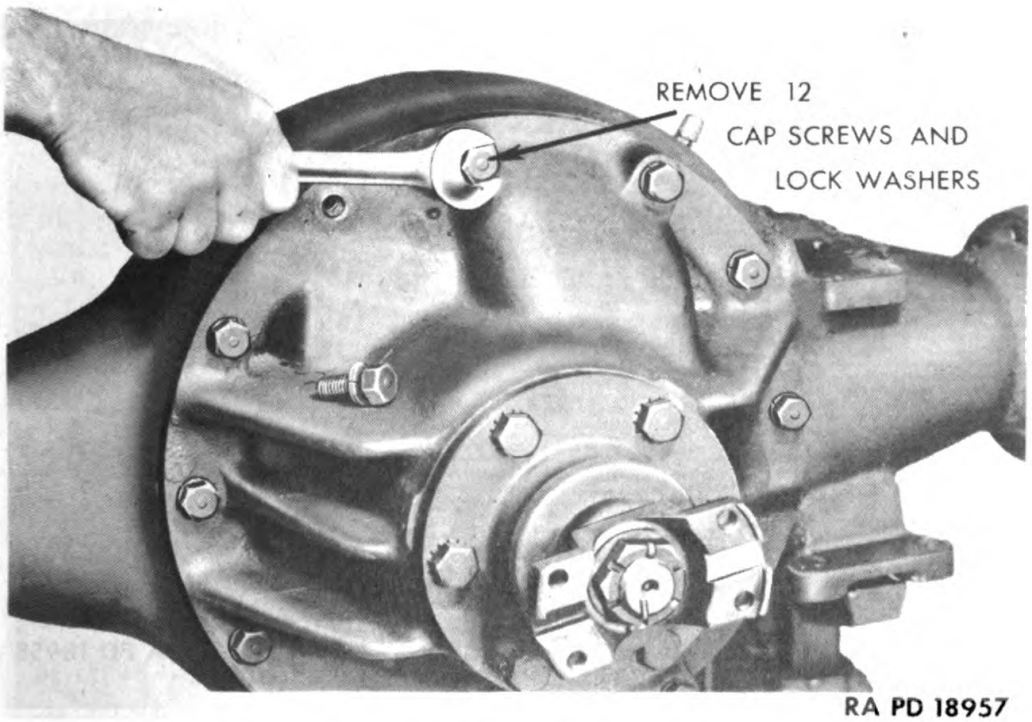


Figure 39 — Removing Differential Carrier to Housing Cap Screws

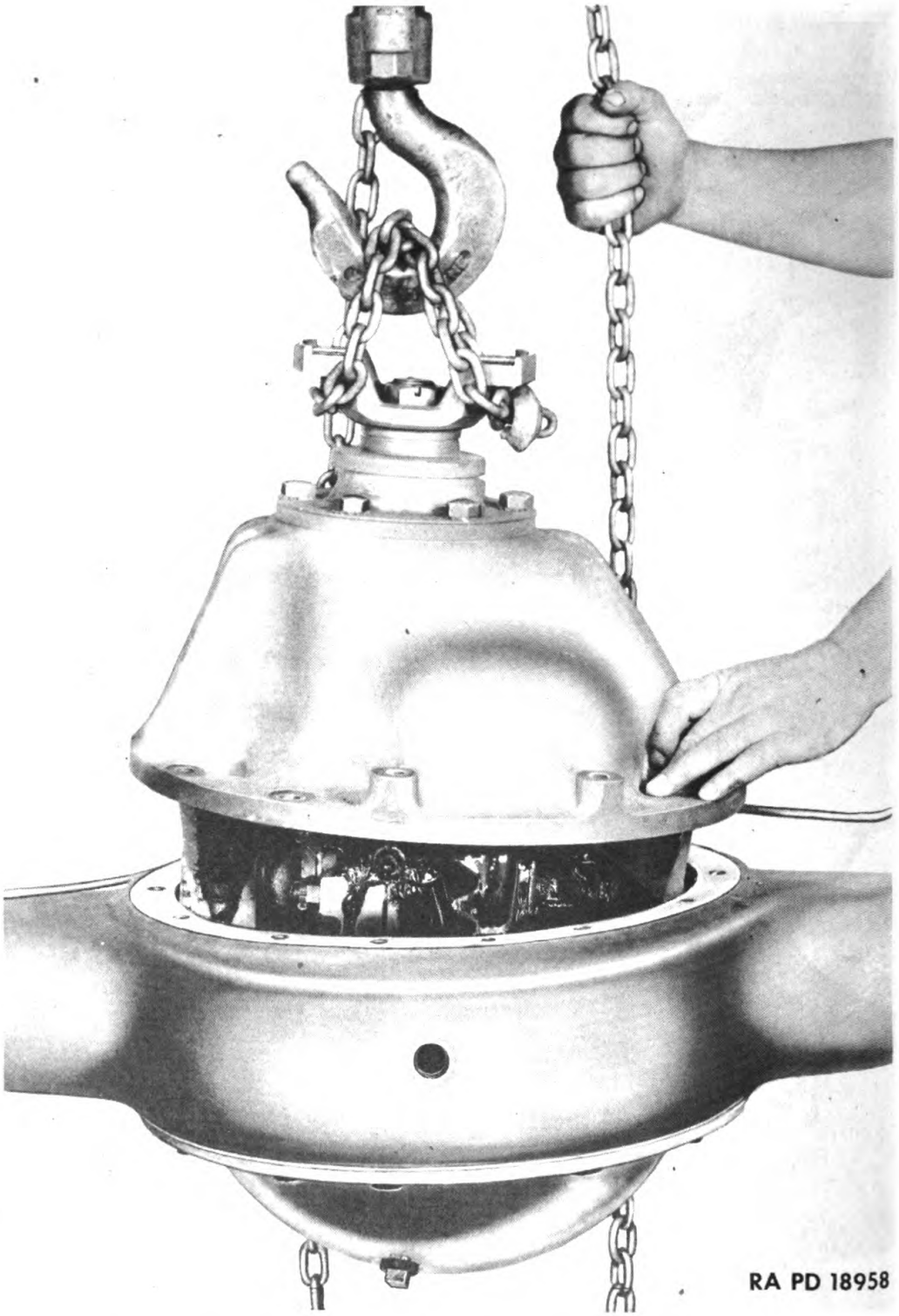


Figure 40 — Removing Differential and Carrier from Housing

FRONT AXLE

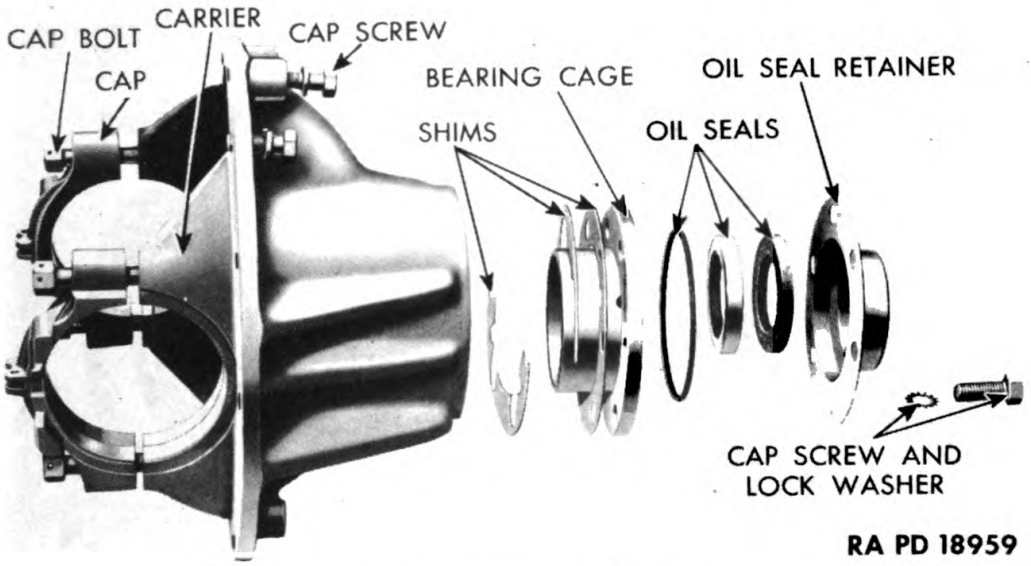


Figure 41 — Differential Carrier — Disassembled

l. Remove Trunnion Housing Bearings. Using puller (41-P-2912), remove tapered roller bearings from upper and lower trunnion yoke pins.

m. Remove Trunnion Yoke from Housing. Remove eight nuts and lock washers from studs holding trunnion yoke to axle housing (fig. 37). Screw two cap screws into threaded holes in trunnion yoke to force yoke from housing. Remove yoke (fig. 38). Lift inner half of trunnion yoke housing from axle.

(*Continued on Page 63*)

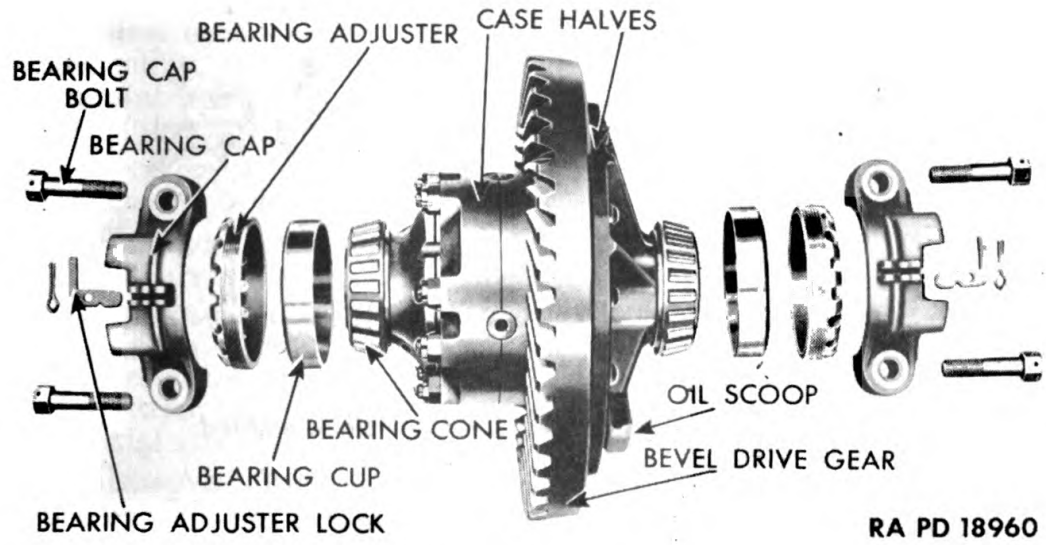


Figure 42 — Differential — Partly Disassembled

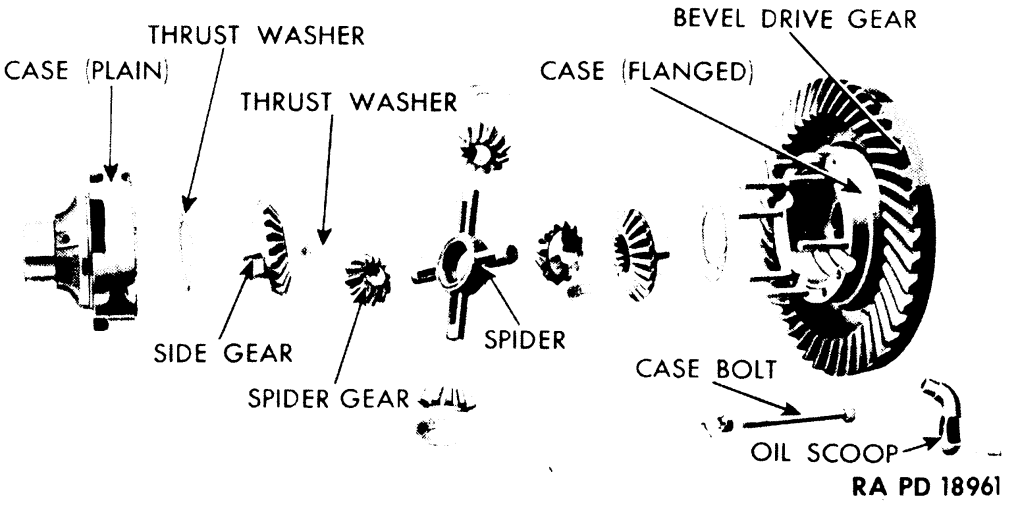


Figure 43 — Front Axle Differential — Disassembled

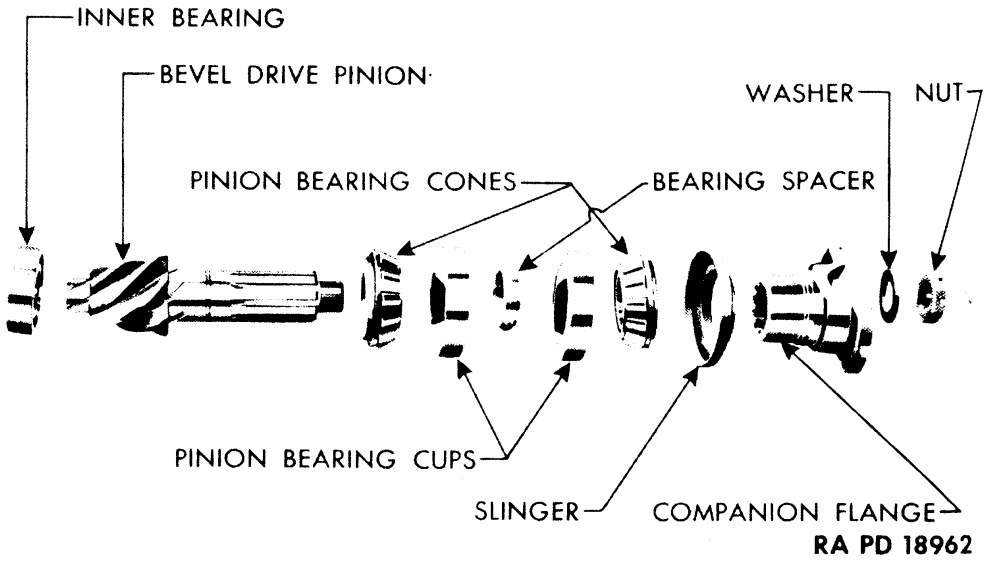


Figure 44 — Differential Pinion — Disassembled

FRONT AXLE

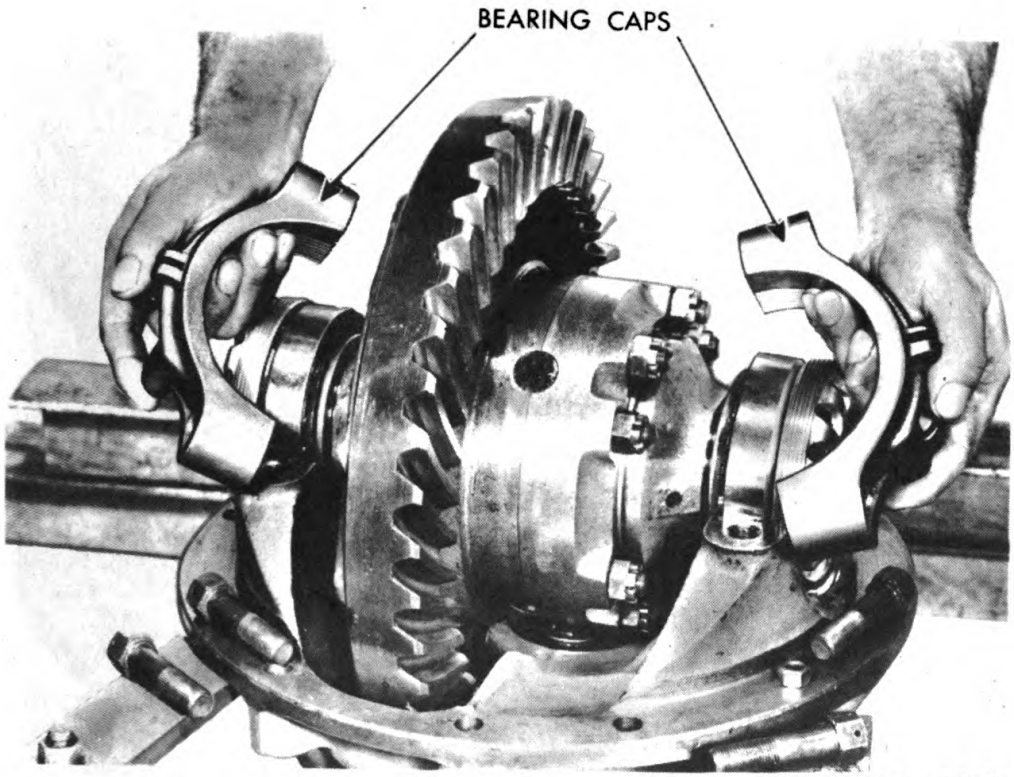


Figure 45 — Removing Differential Bearing Caps

n. Remove Differential from Axle Housing. Remove brake line retaining clip cap screws from housing at tee connection, and remove from differential carrier the cap screw holding brake line clip. Remove brake line from axle housing. Remove 12 cap screws and lock washers from differential carrier flange (fig. 39). Attach sling to differential pinion companion flange, and lift differential from housing (fig. 40).

o. Disassemble Differential. Figures 41 to 44 show details of differential construction. Install differential and carrier in stand, and disassemble as follows:

(1) REMOVE DIFFERENTIAL CARRIER BEARING CAPS. Mark caps and carrier with center punch to identify positions. Remove locking wires from carrier bearing cap bolts. Remove cotter pins from bearing adjuster locks, and remove locks from caps. Remove four differential carrier cap bolts, two on each side, and remove bearing caps (fig. 45). Remove cap screw holding oil scoop to differential case, and remove oil scoop.

(2) REMOVE DIFFERENTIAL FROM CARRIER. Remove bearing adjusters, one on each side, and remove two bearing cups. Lift differential from carrier (fig. 46).

(3) REMOVE DIFFERENTIAL BEARINGS. Using puller (41-P-2910)

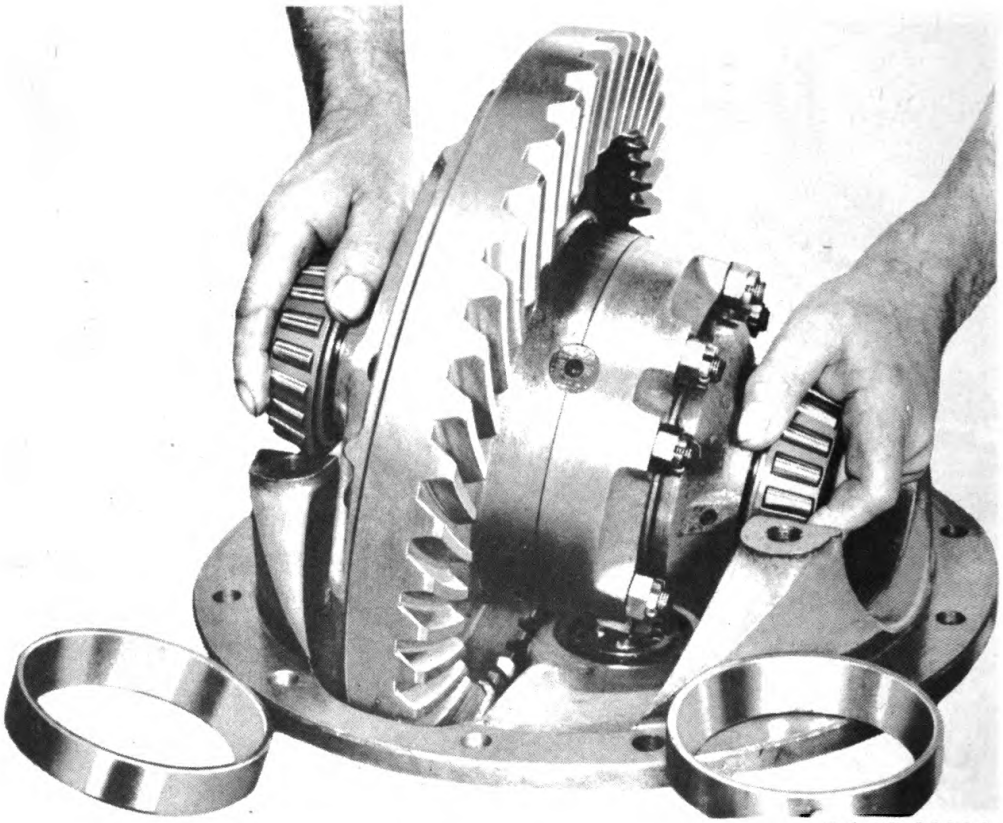


Figure 46 — Removing Differential from Carrier

and an adapter plug, remove bearings (cone and rollers) from each side of differential.

(4) REMOVE DIFFERENTIAL CASE BOLTS. Remove cotter pins from eight differential case bolts. Remove nuts from bolts, and remove bolts from differential case (fig. 47).

(5) REMOVE DIFFERENTIAL SIDE GEAR. Lift off differential case plain half, and remove side gear and thrust washer (fig. 48).

(6) REMOVE DIFFERENTIAL SPIDER AND SPIDER GEARS. Remove spider, with four spider gears and four thrust washers, from case (fig. 49). Remove remaining side gear and thrust washer.

(7) REMOVE BEVEL DRIVE GEAR. Center-punch bevel drive gear rivets on gear side, and drill through rivet heads, using a drill slightly larger than the rivet diameter. Drill down to bevel gear, and remove rivet heads (fig. 50). Punch out remaining portion of rivets from gear and carrier. NOTE: *Knocking off or "busting" rivets is dangerous from the standpoint of personal safety, and harmful because such practice may distort the gear-carrying flanged half of case, or the gear, and will elongate the rivet holes.*

(8) REMOVE BEVEL DRIVE PINION ASSEMBLY FROM CARRIER. Remove six bolts (cap screws) and lock washers from bevel drive

FRONT AXLE

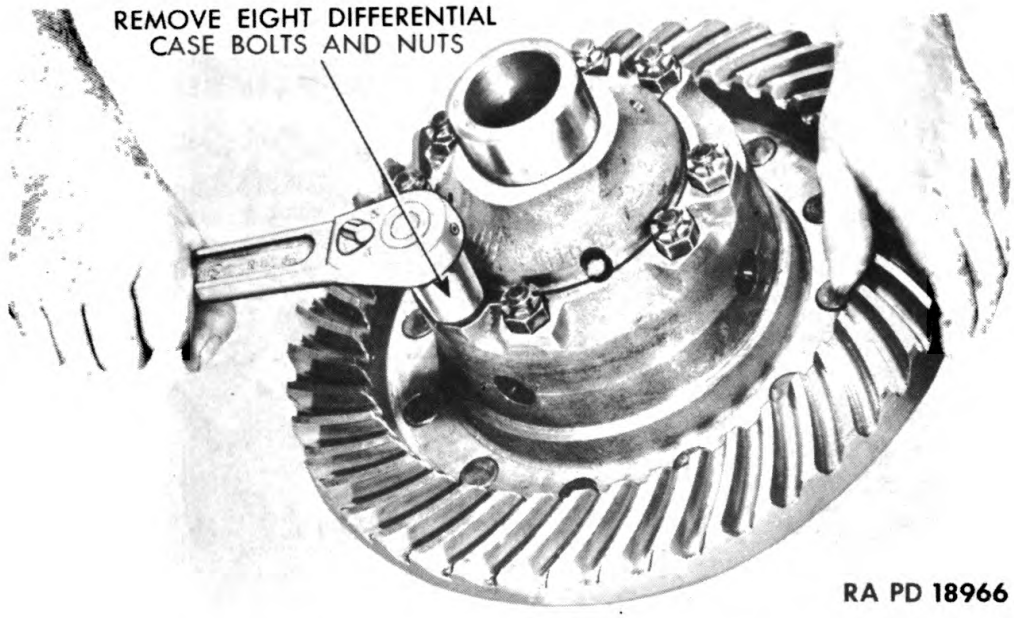


Figure 47 — Removing Differential Case Bolts

pinion cage (fig. 51). Lift pinion cage and pinion assembly out of differential carrier (fig. 52). Remove shims from carrier.

(9) DISASSEMBLE PINION CAGE ASSEMBLY. Place companion flange in vise, and remove pinion nut cotter pin and nut from bevel drive pinion. Remove companion flange from pinion. The grease slinger and oil seal retainer can now be lifted off. Remove

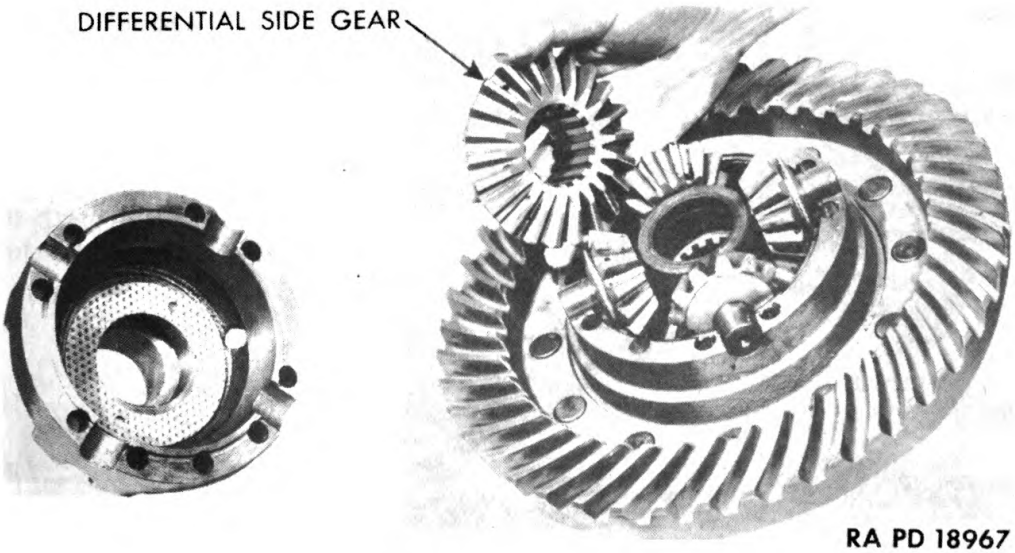


Figure 48 — Removing Differential Side Gear

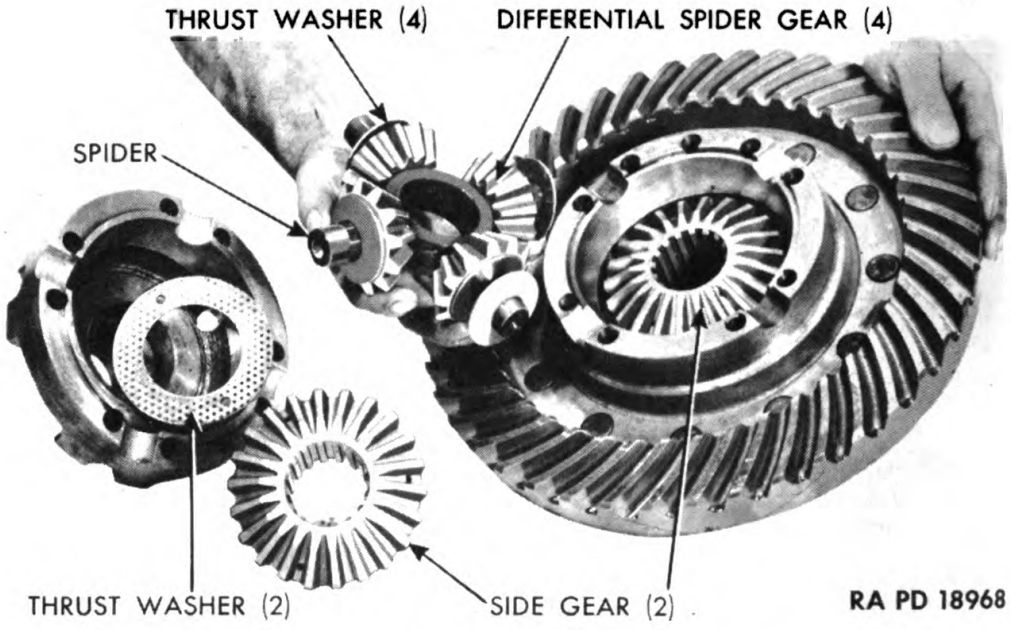


Figure 49 — Removing Differential Spider and Gears

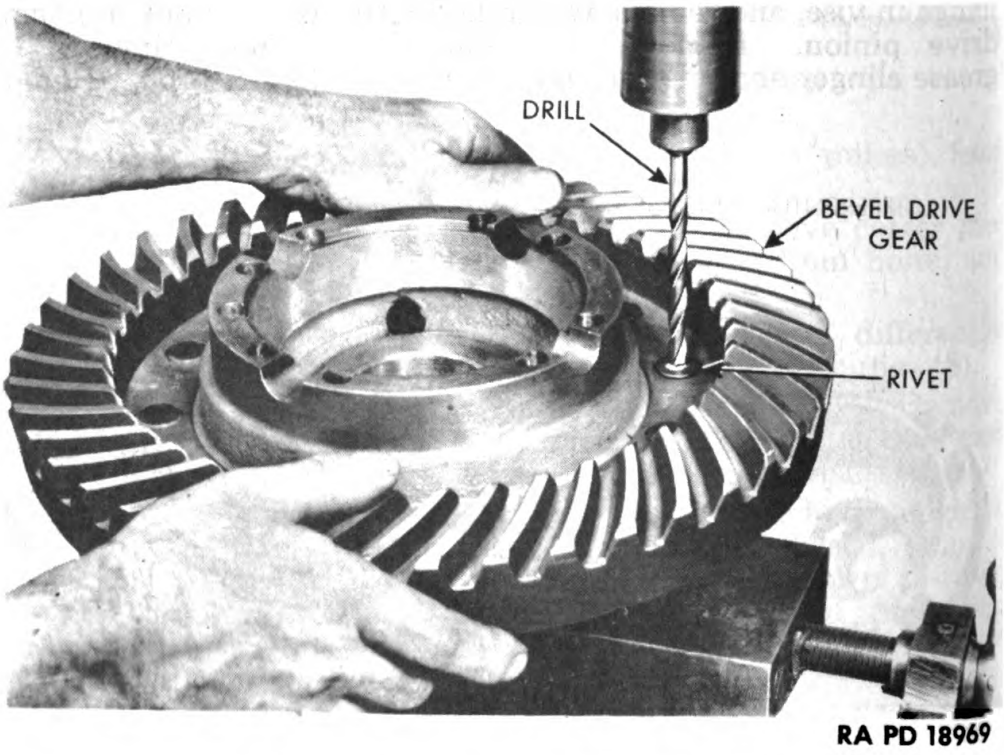


Figure 50 — Removing Bevel Drive Gear Rivet

Figure 51 — Removing Bevel Drive Pinion Cage Bolts

pinion outer bearing cone, pinion bearing cage, and pinion bearing spacer from bevel drive pinion (fig. 53).

(10) REMOVE PINION BEARINGS FROM BEVEL DRIVE PINION. Place adapter press plate beneath pinion inner or straddle bearing, and press bearing off pinion (fig. 54). Place adapter press plate beneath outer roller bearing race, and press bearing from pinion (fig. 55).

(11) DISASSEMBLE PINION BEARING CAGE. Remove cork oil seal from groove in pinion bearing cage. Remove two pinion bearing cups from pinion bearing cage.

(12) REMOVE OIL SEAL FROM OIL SEAL RETAINER. Use adapter to drive oil seal out of oil seal retainer. Remove felt washer from retainer. Remove differential carrier from stand.

29. CLEANING OF PARTS.

a. All parts, except bearings, must be cleaned thoroughly of all grease and oil. Use a steam cleaner if available. If not, wash parts with dry-cleaning solvent.

b. All bearings should be cleaned in dry-cleaning solvent, rotating the rollers in their races during the cleaning process to remove any particles of foreign matter. When cleaned, the bearings must be coated with a film of light engine oil to prevent rust, wrapped in paper, and set aside for inspection.

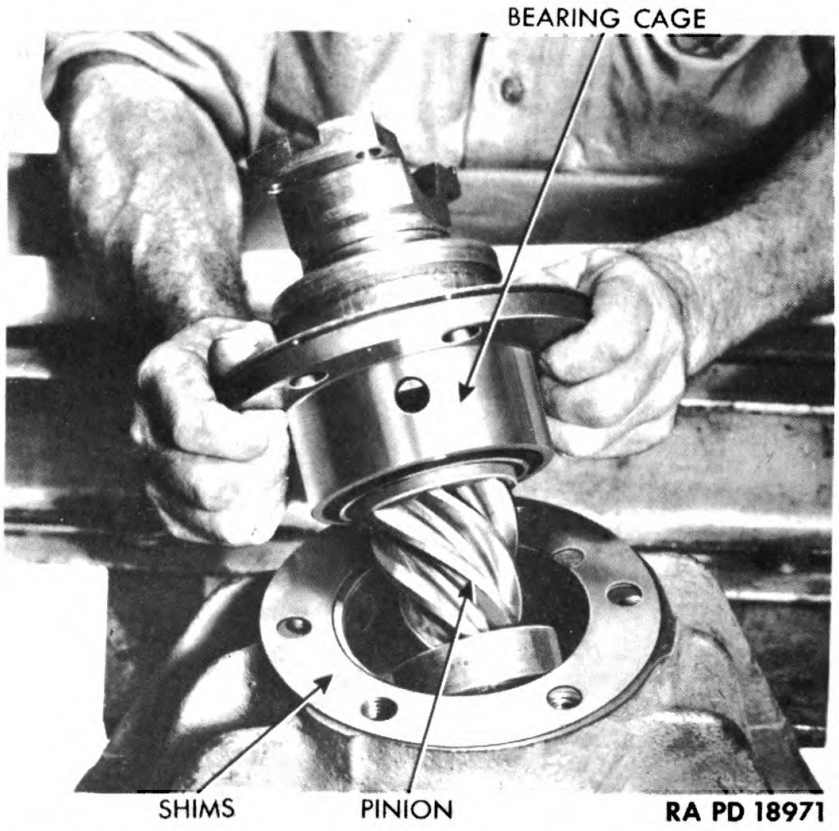


Figure 52 — Removing Bevel Drive Pinion Cage Assembly

c. Oil seals will be replaced at each major overhaul.

30. INSPECTION OF PARTS.

a. Gears and Pinions. Examine all gears and pinions for wear of teeth or for tooth breakage, and replace worn parts. If necessary to replace either bevel drive pinion or bevel drive gear, it is advisable to replace both, since they are manufactured to operate as a matched and mated set. Satisfactory performance from a wear and quietness basis cannot result from installation of a new bevel drive pinion with an old bevel drive gear, or the reverse.

b. Oil Seals and Gaskets. All oil seals and gaskets must be replaced with new ones at each overhaul or general repair.

c. Cap Screws, Bolts, and Nuts. Inspect all cap screws, bolts, nuts, and lock washers for wear, damage or breakage. Replace defective parts.

d. Bearings. Examine all bearings for pits, cracks, or roughness of rollers. Inspect races for roughness. Spin bearings and note whether any unusual sound or noise results. Replace any bearing which is defective.

FRONT AXLE

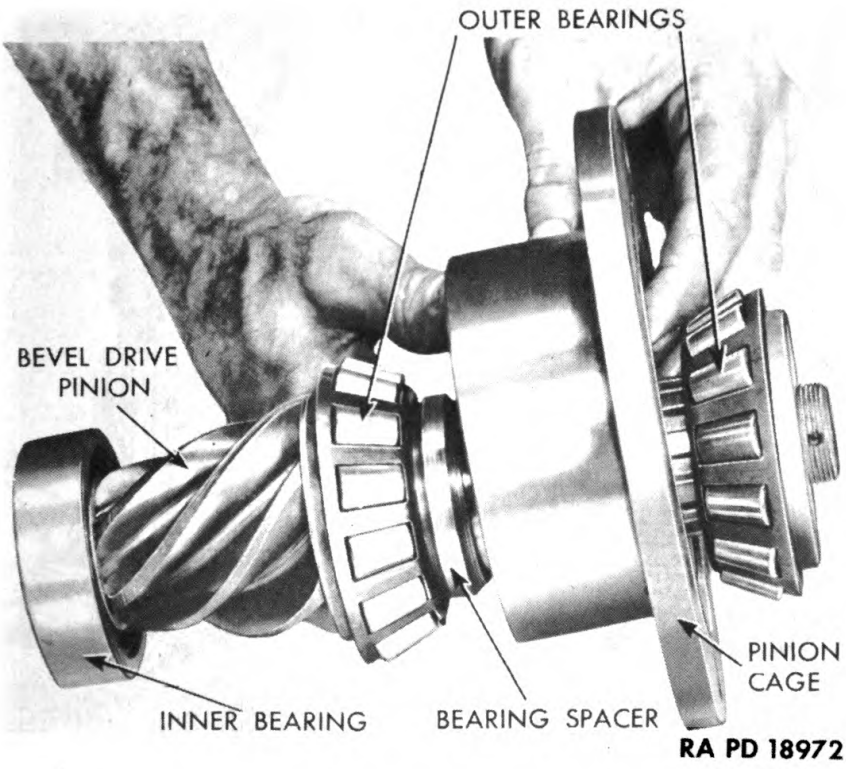


Figure 53 — Removing Bevel Drive Pinion and Bearings Assembly

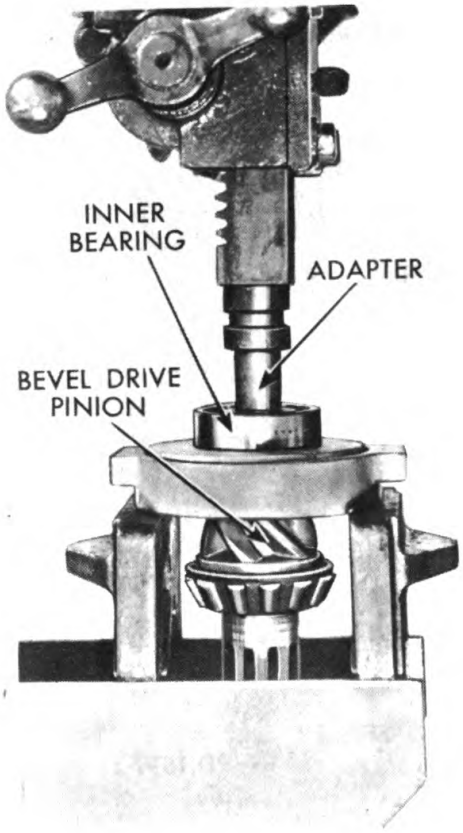
e. Housings. Examine housings for evidence of cracks or breakage. Examine at points of the weld for signs of weld failure. Minor cracks or porous places can be repaired by welding. Replace castings if broken.

f. Bushing Replacement. Bushings must be replaced at each major overhaul. Bushings in the front axle assembly in this category are as follows:

(1) SPINDLE BUSHING. The spindle contains a large sleeve bushing at the inner end. Use an adapter and a press to press this bushing out of spindle (fig. 56). Press new bushing into place in spindle, using adapter and press (fig. 57). Ream new bushings to 1.891 to 1.893 inches.

(2) TRUNNION YOKE HOUSING TIE ROD BUSHINGS. Use arbor and hammer to drive out old tie rod bushings from trunnion yoke housings. Install new bushings, and ream to 0.748 to 0.749 inch.

g. Oil Seal Replacement. Remove trunnion yoke oil seal from yoke (fig. 58). Install new oil seal in yoke (fig. 59). Remove trunnion yoke housing oil seal from housing, using flat drift and working around seal (fig. 60). Install new oil seal in housing, driving into place by using flattened drift, and working around edge of seal retainers.



RA PD 18973

Figure 54 — Removing Bevel Drive Pinion Inner Bearing

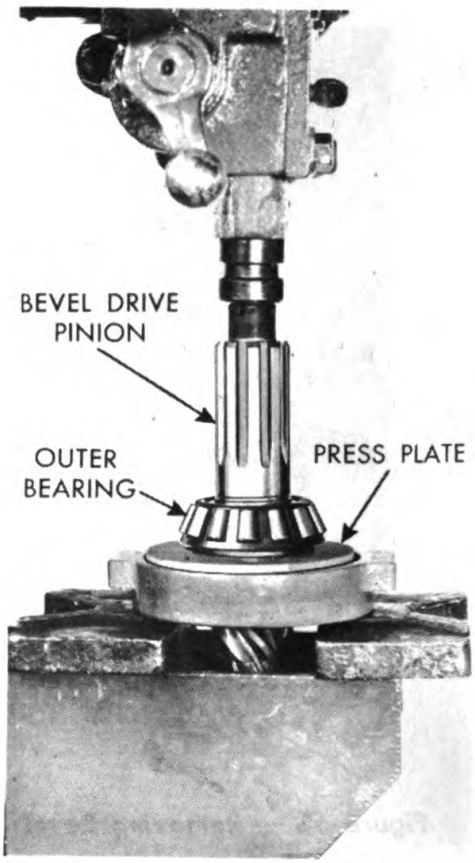


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Figure 55 — Removing Bevel Drive Pinion Outer Bearing

h. Axle Shaft and Universal Joint Parts. If either one of the yokes is found to be defective, the installation of a new joint is recommended. If the center ball pin, center ball, or any of the four driving balls contains scratches, grooves or flat spots, new parts should be installed. In the case of the driving balls, the sizes vary from 0.003-inch undersize to 0.003-inch oversize, in steps of 0.001 inch. If any or all of the driving balls are to be replaced, the old ball or balls should be measured with a micrometer and the same size new ball selected. Selective assembly is not required for center ball or center ball pin.

31. ASSEMBLY.

a. Assemble Differential.

(1) INSTALL BEVEL DRIVE GEAR ON FLANGED HALF OF DIFFERENTIAL CASE. Place bevel drive gear on flanged half of differential case, and secure with bolts and nuts in all rivet holes but one.

FRONT AXLE

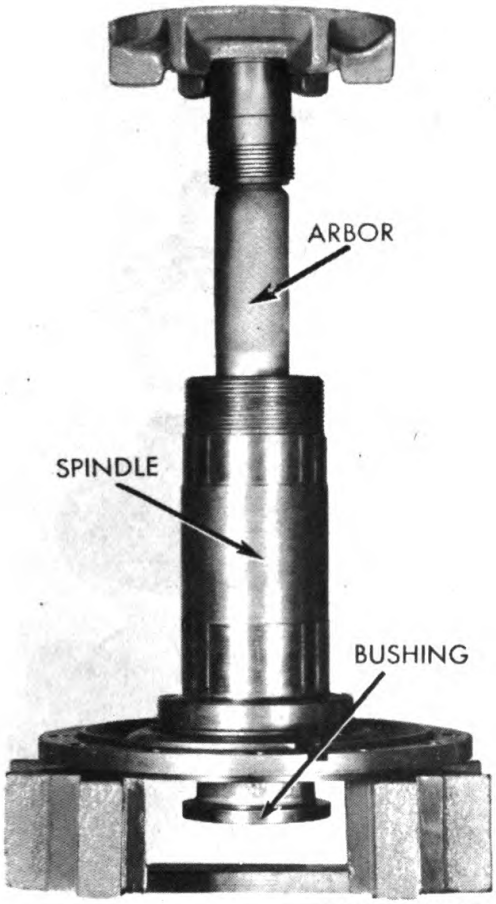


Figure 56 — Removing Wheel Spindle Bushing

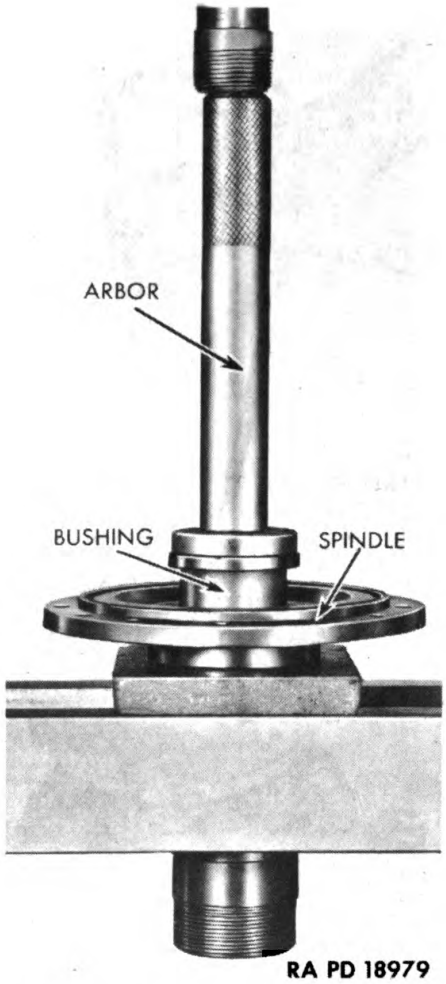


Figure 57 — Installing Wheel Spindle Bushing

Starting with empty rivet hole, install and compress rivets, using cold press method and applying 45 to 50 tons pressure per rivet. Remove one bolt at a time, and install rivet in its place. Pressure applied to cold rivets causes them to expand and fill the holes into which they are installed. Hot rivets shrink when cool, leaving space around the rivet, and invite shearing upon the application of torque. When riveting operation is completed, differential case and bevel drive gear must be checked for drive gear face run-out which should not exceed 0.003-inch indicator reading.

(2) INSTALL DIFFERENTIAL PINION GEARS AND SPIDER IN CASE FLANGED HALF. Place side gear thrust washer in place in case half, and install one side gear. Place four pinion gears on differential spider, and place one thrust washer back of each pinion gear on spider. Place spider and pinion assembly in position in case. Place remaining side gear on top of pinion gears, and place thrust washer on side gear. Coat the differential gears with gear oil.

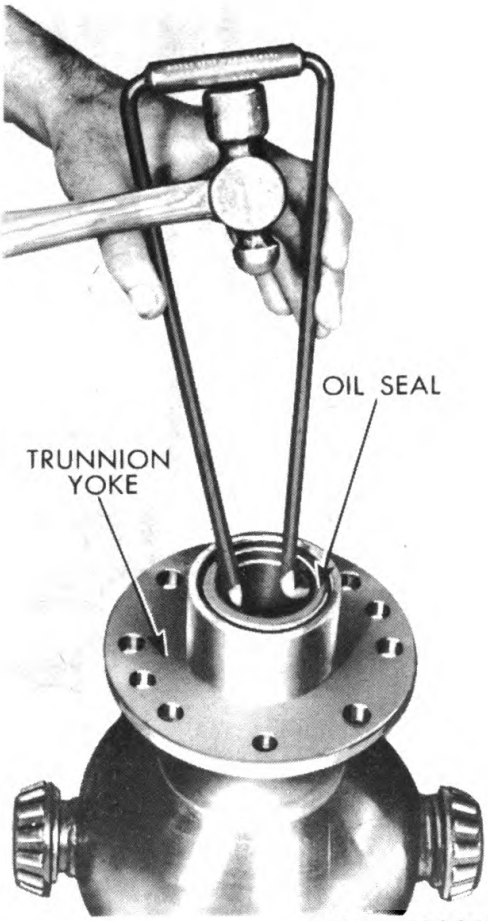


Figure 58 — Removing Trunnion Yoke Oil Seal

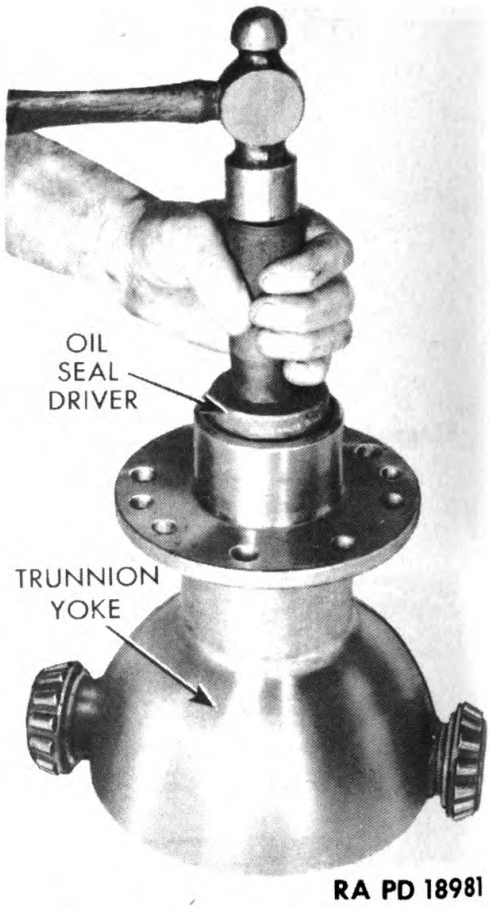


Figure 59 — Installing Trunnion Yoke Oil Seal

Place differential case plain half on top of assembly, and install bolts, nuts, and cotter pins.

(3) INSTALL DIFFERENTIAL SIDE BEARINGS. Install differential bearing cones on differential case hubs (fig. 61). Install oil scoop and retaining cap screw.

b. Assemble Bevel Drive Pinion and Case Assembly.

(1) INSTALL BEVEL DRIVE PINION BEARING CUPS IN BEARING CAGE. Drive both bearing cups into bearing cage (fig. 62).

(2) INSTALL BEVEL DRIVE PINION BEARINGS ON PINION. Warm bevel drive pinion outer roller bearing in hot oil, and press bearing onto bevel drive pinion. Force inner or straddle bearing over end of pinion and press into place (fig. 63). Stake straddle bearing in place, using press and special staking tool (fig. 64).

(3) INSTALL OIL SEALS. Install new cork oil seal ring in groove in pinion bearing cage. Install new felt oil seal in front of bevel

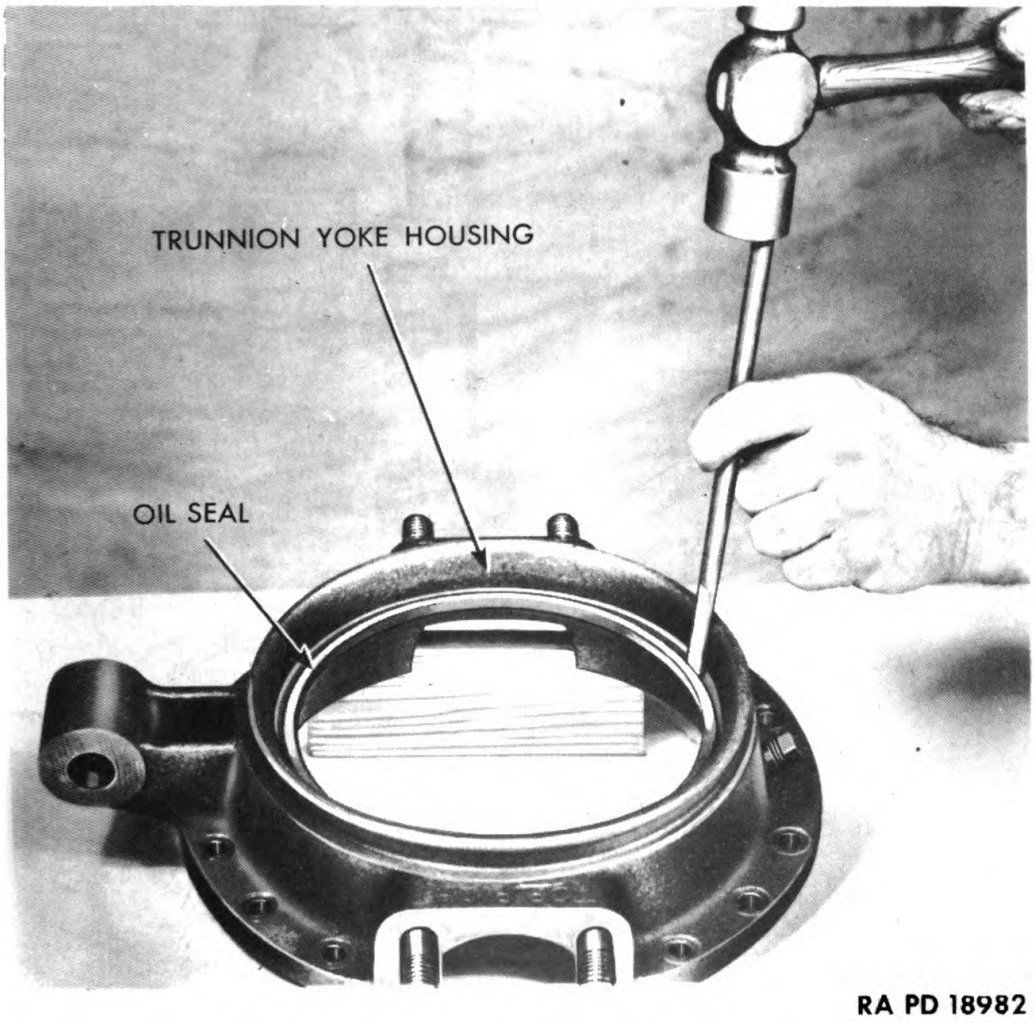


Figure 60 — Removing Trunnion Yoke Housing Oil Seal

drive pinion oil seal retainer and, using an adapter, drive new oil seal into place in seal retainer (fig. 65).

(4) ASSEMBLE BEVEL DRIVE PINION AND PINION CAGE ASSEMBLY. Assembly must be made so that there will be no bearing end play. To accomplish this, preliminary assembly must be made without the oil seal retainer. Place pinion bearing spacer over pinion shaft, and place pinion bearing cage over pinion bearing previously installed. Invert outer pinion bearing and place in bearing cage. Install companion flange and nut, but do not install cotter pin. Now check pinion bearing fit as follows: Place assembly in vise and mount dial indicator on companion flange with indicator pointer resting on upper face of bearing cage ("A," fig. 66). Grasp the bearing retainer with the tips of the fingers, and work the bearings up against the back face of the pinion ("B," fig. 66). With the bearings held firmly against the

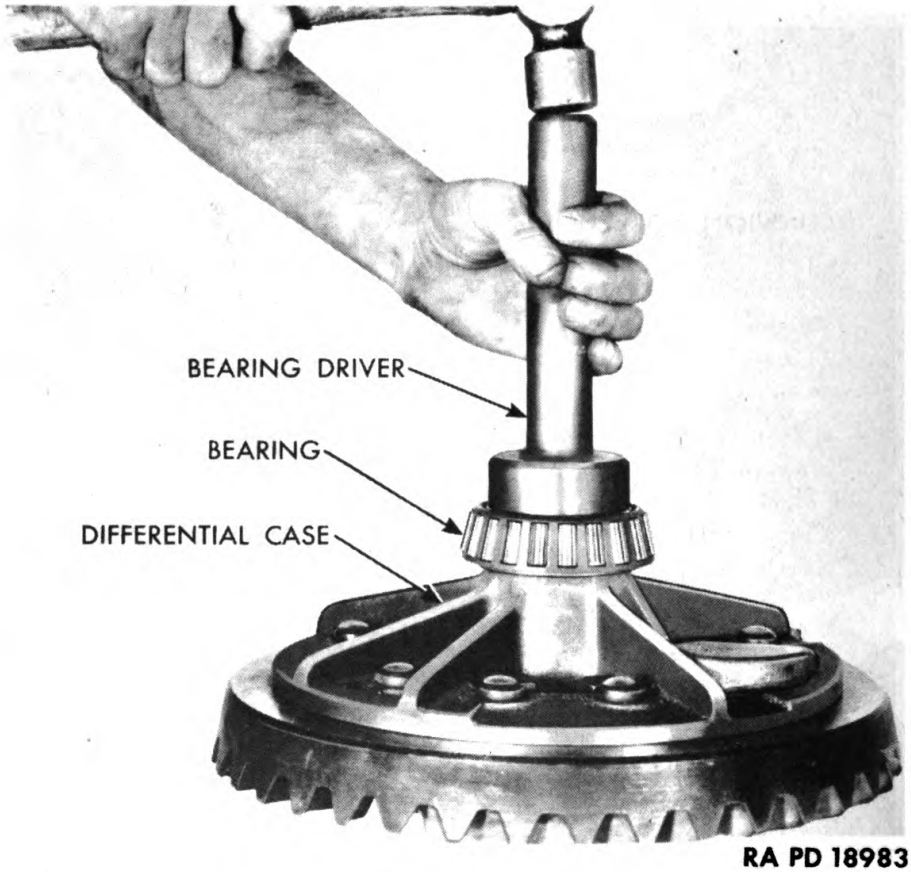


Figure 61 — Installing Differential Bearing

pinion, move the cage up and down, and observe the dial indicator reading. NOTE: *It is impossible to determine the end play accurately unless the bearing is worked loose and up against the pinion. Assemblies having as much as 0.005-inch end play can not be moved enough to show on the dial indicator until the bearing has been worked away from the cup.*

(5) PRELOAD PINION BEARINGS. Preloading of the pinion bearings is accomplished by replacing the bearing spacer with one smaller to the extent of the amount of end play plus 0.002 inch for the loading. Spacers are varied in thickness. Measure spacer with a micrometer (fig. 67). Before reassembling the pinion cage assembly, the bearings must be coated with universal gear lubricant. Reassemble pinion cage assembly, installing oil seal retainer, and tighten companion flange nut with wrench having approximately 30-inch leverage. NOTE: *Oil seal must be soft and pliable before being installed.* Dip seal in hot oil and work this oil into seal.

(6) TEST ADJUSTMENT. In order to determine if insufficient or excessive preload has been applied, place assembly in a vise with the jaws clamping together on the flange of the pinion bearing

FRONT AXLE

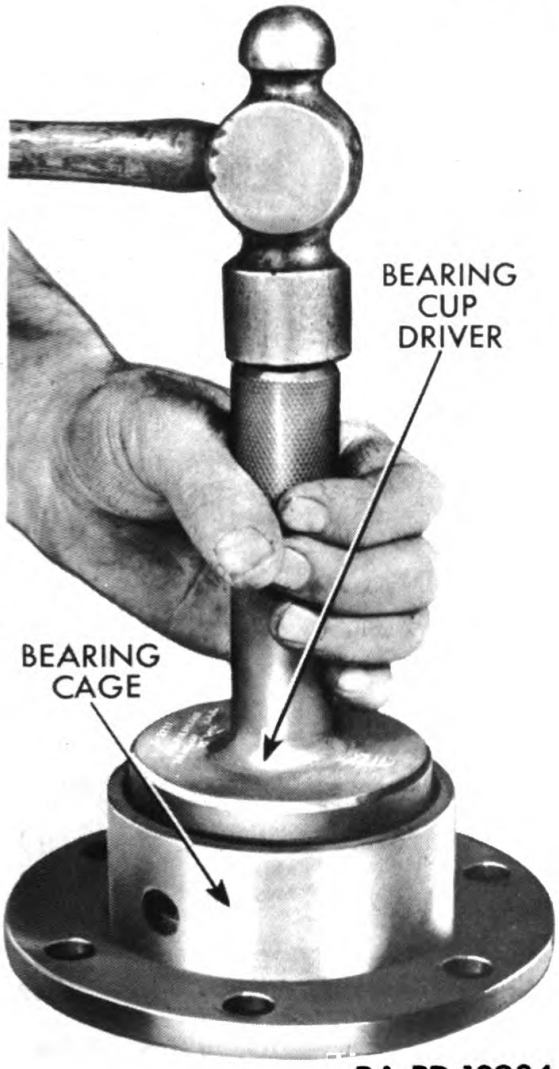


Figure 62 — Installing Bevel Drive Pinion Bearing Cup

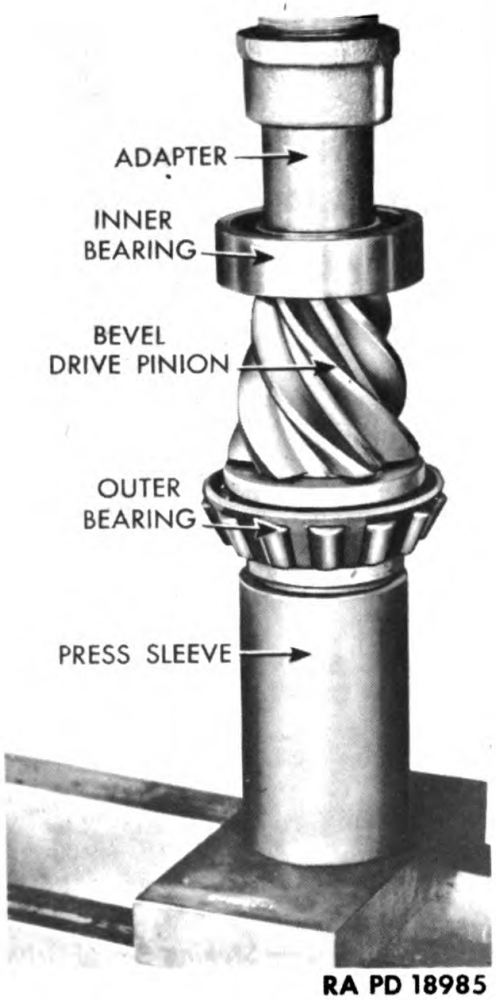


Figure 63 — Installing Bevel Drive Pinion Bearing

cage and with the assembly in a horizontal position. Grasp the companion flange with one hand and attempt to turn. If the pinion turns freely, the assembly is too loose. If pinion can not be turned, assembly is too tight. The ideal condition is for the pinion to require full hand pressure to turn ¼ turn.

c. Install Pinion and Cage Assembly in Differential Carrier. After bevel drive pinion bearing adjustment is completed as outlined in subparagraphs (5) and (6) above, the assembly must be installed in the differential carrier and adjusted in accordance with theoretical cone center. Matched and mated gears are marked to indicate their proper adjustment (fig. 68). The figure "—8" on the end of the bevel drive pinion indicates that the bevel drive pinion must be installed 0.008 inch further into the carrier than the theoretical cone center distance of 3.8127 inches, or a

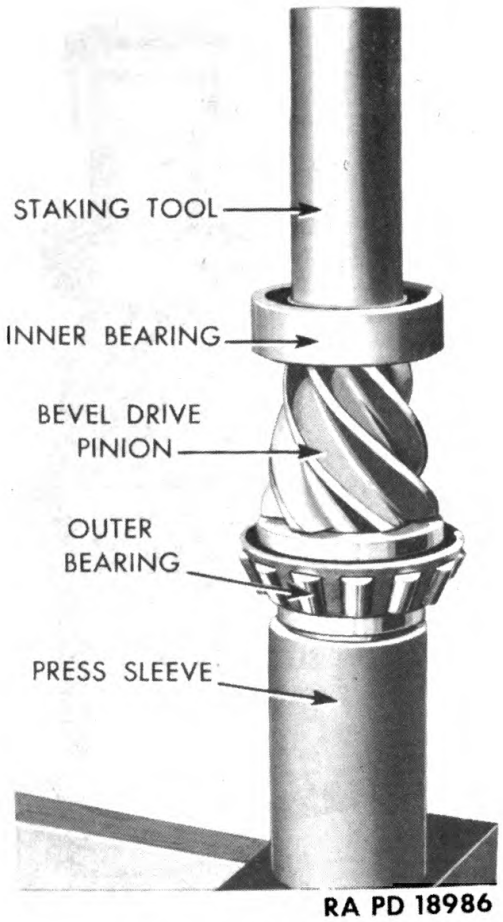


Figure 64 — Staking Bevel Drive Pinion Bearing

Figure 65 — Installing Bevel Drive Pinion Oil Seal

distance of 3.8047 inches from the center of the carrier bearing bores to the end of the bevel drive pinion, as measured with a special micrometer. The figure "8" on the edge of the bevel drive gear indicates that backlash of 0.008 inch between the bevel drive pinion and bevel drive gear is required. Adjustment of the bevel drive pinion is as follows:

(1) Shims are provided in varied thicknesses. Place shims totalling approximately 0.020 inch on carrier face, lining up cap screw holes and oilhole. Install bevel drive pinion and bearing cage assembly into the carrier, being careful to line up oilhole in carrier and in pinion bearing cage (fig. 69). Install two cap screws in pinion bearing cage to hold assembly.

(2) Invert differential carrier and mount micrometer assembly in carrier bearing bores (fig. 70). Measure distance to end of bevel drive pinion, and write down figures, for example, 3.8177 inches. Subtraction of 3.8047 inches, the corrected theoretical cone center established in subparagraph (c) from actual measure-

FRONT AXLE

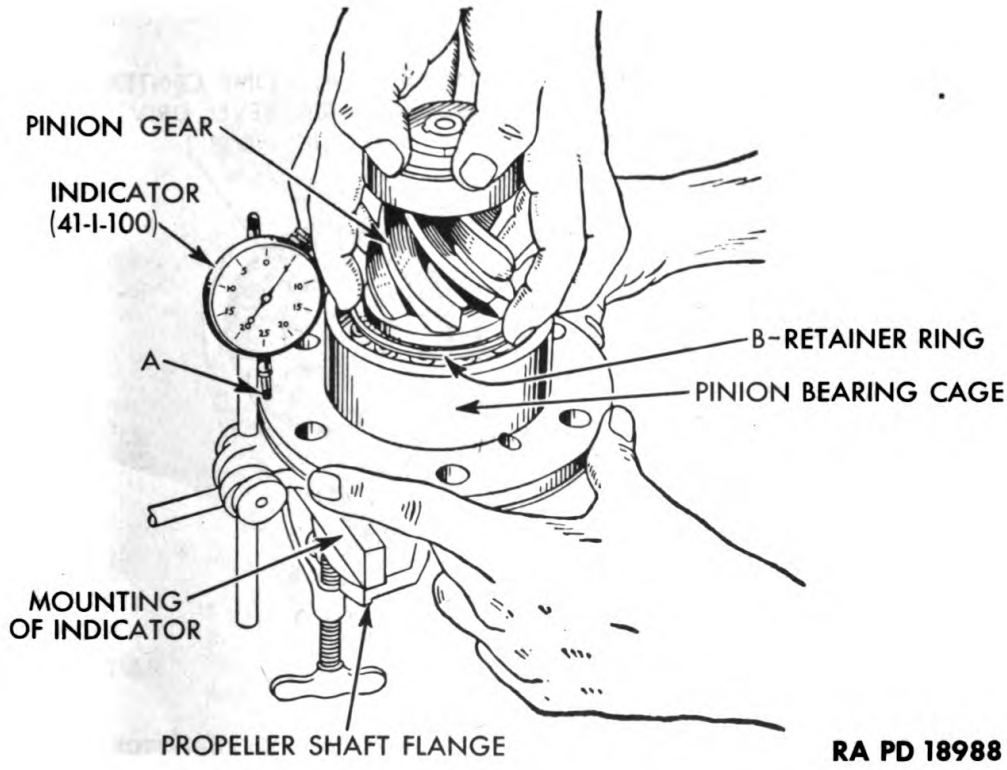


Figure 66 — Checking Bevel Drive Pinion Bearing End Play

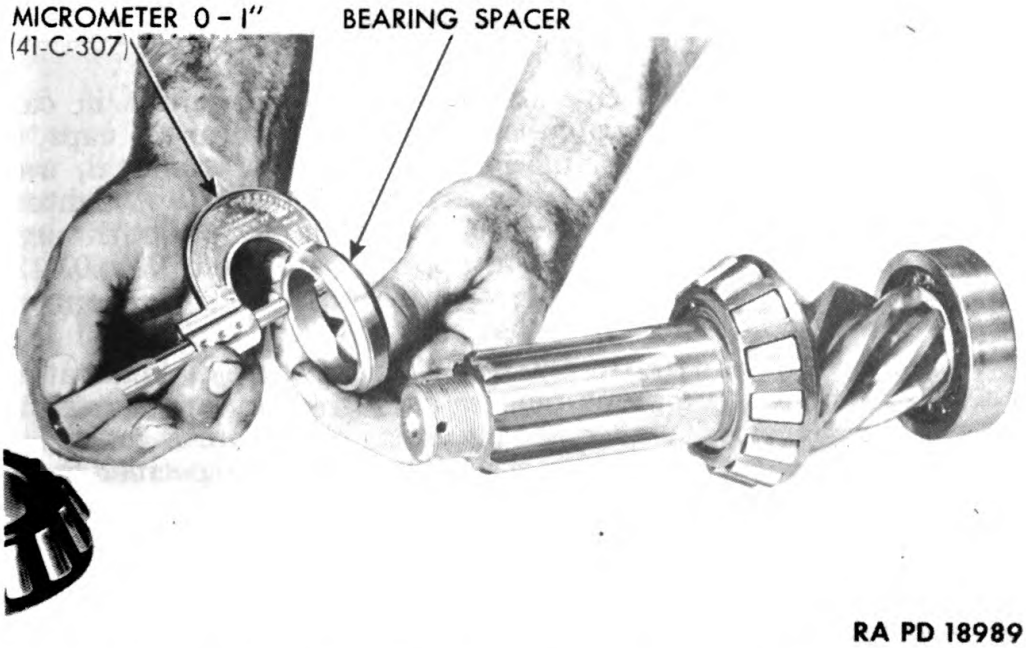


Figure 67 — Measuring Bevel Drive Pinion Bearing Spacer

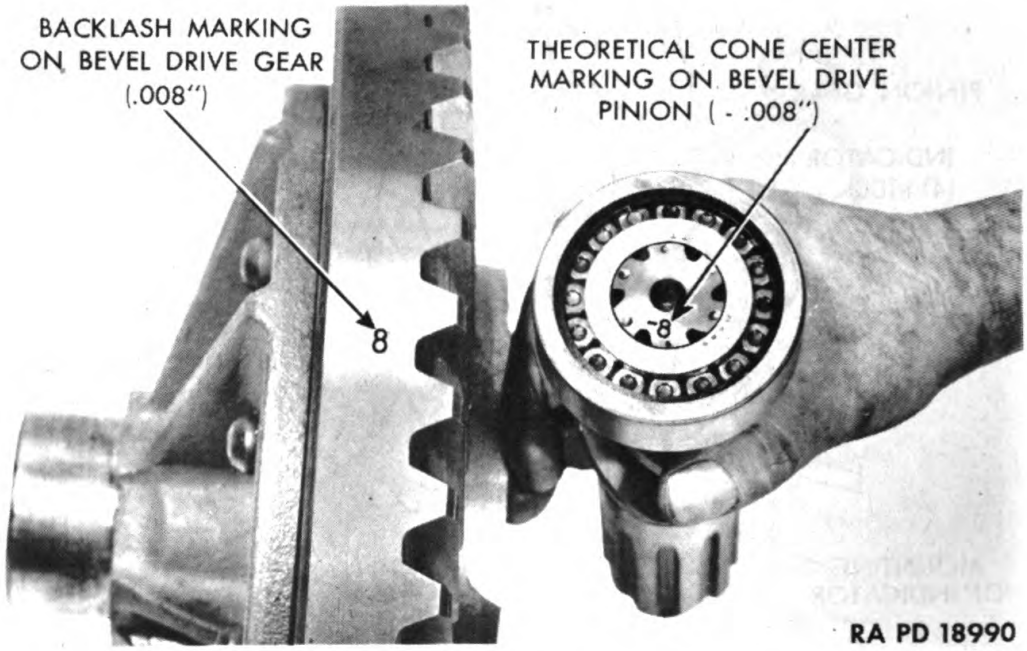


Figure 68 — Bevel Drive Pinion and Drive Gear Markings

ment 3.8177 inches, indicates that pinion must be moved into carrier an additional 0.013 inch. Loosen two retaining cap screws from bearing cage, remove one 0.010-inch shim and one 0.003-inch shim, and retighten cap screws (fig. 71). Recheck measurement, attempting to arrive at as close to the calculated distance of 3.8047 inches as possible. Install and tighten remaining four cap screws and lock washers in pinion bearing cage.

d. Install Differential in Carrier. Place differential in carrier, install carrier bearing cups, place carrier bearing caps in position according to marking made at time of removal, and screw bearing adjusters into place. Install, but do not tighten, carrier bearing cap bolts. Adjust differential position through movement of adjusters to provide approximately 0.010- to 0.012-inch backlash between bevel drive gear and bevel drive pinion. Use side bearing adjuster for adjustment (fig. 72).

e. Adjust Differential in Carrier. Mount three dial indicators on carrier flange, having one pointer against each carrier bearing and the third one so installed that gear backlash can be measured (fig. 73). Adjust carrier bearing adjusters to provide specified backlash (measurement marked on side of gear). Set the two side dial indicators at zero. Now tighten each adjuster to provide 0.006- to 0.010-inch movement on the indicator dial at each bearing, or a total of 0.012-to 0.020-inch movement. This places a preload on the bearings. NOTE: *This is generally about a notch on each adjuster*. Tighten carrier bearing cap bolts, install adjuster locks and cotter pins, and install carrier bearing cap bolt lock wires.

FRONT AXLE

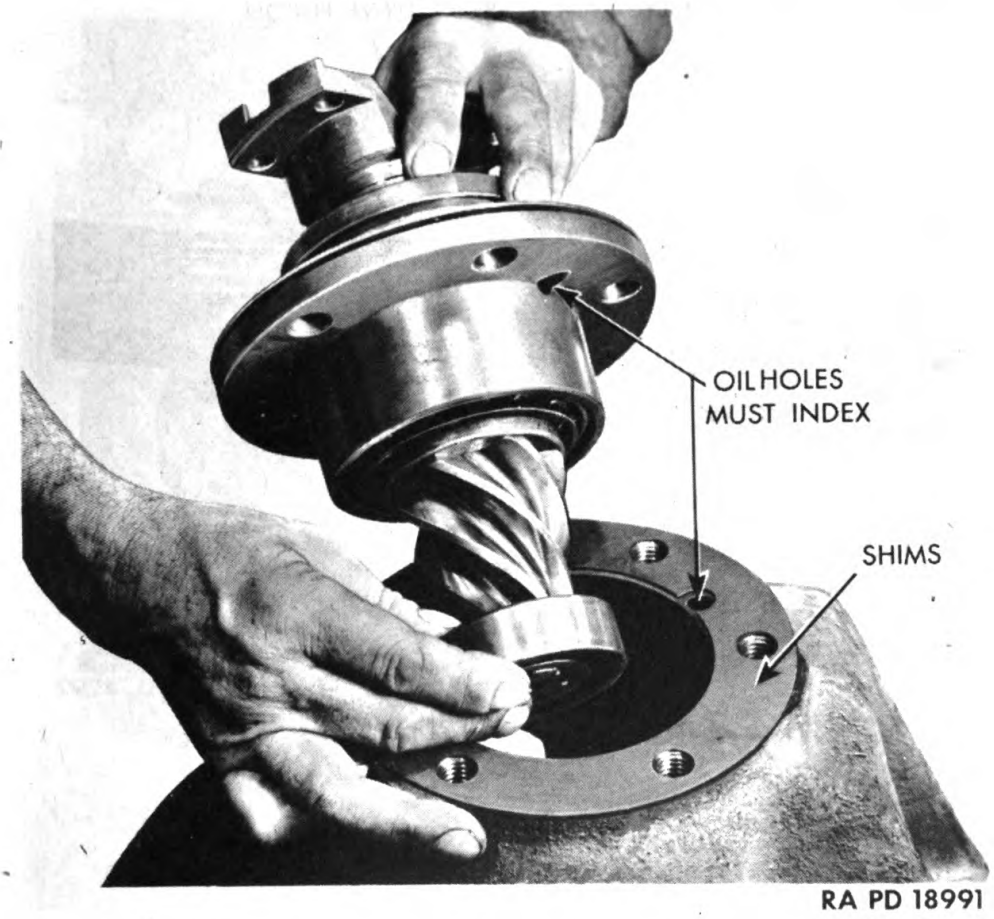


Figure 69 — Installing Bevel Drive Pinion Cage

f. NOTE: *If special equipment used in above for proper adjustment of bevel drive pinion and bevel drive gear is not available, the only alternative will be to adjust according to the conventional tooth impression method. At its best, however, this procedure is inaccurate and not productive of best results in either gear life or quietness.*

g. Install Differential and Carrier in Axle Housing. Install new gasket, install differential and carrier into axle housing, and install 12 cap screws and lock washers.

h. Install Trunnion Yoke to Axle Housing. Place inner half of trunnion yoke housing over end of axle housing, noting that halves are marked to indicate position in accord with side of axle on which they are being mounted. Install trunnion yoke in end of axle housing, and install retaining nuts and lock washers.

i. Install Trunnion Yoke Bearings on Yoke Pins. Drive upper and lower trunnion yoke bearings into place on trunnion yoke pins (fig. 74).

j. Assemble Trunnion Yoke Housing. Install outer half of

(*Continued on Page 82*)

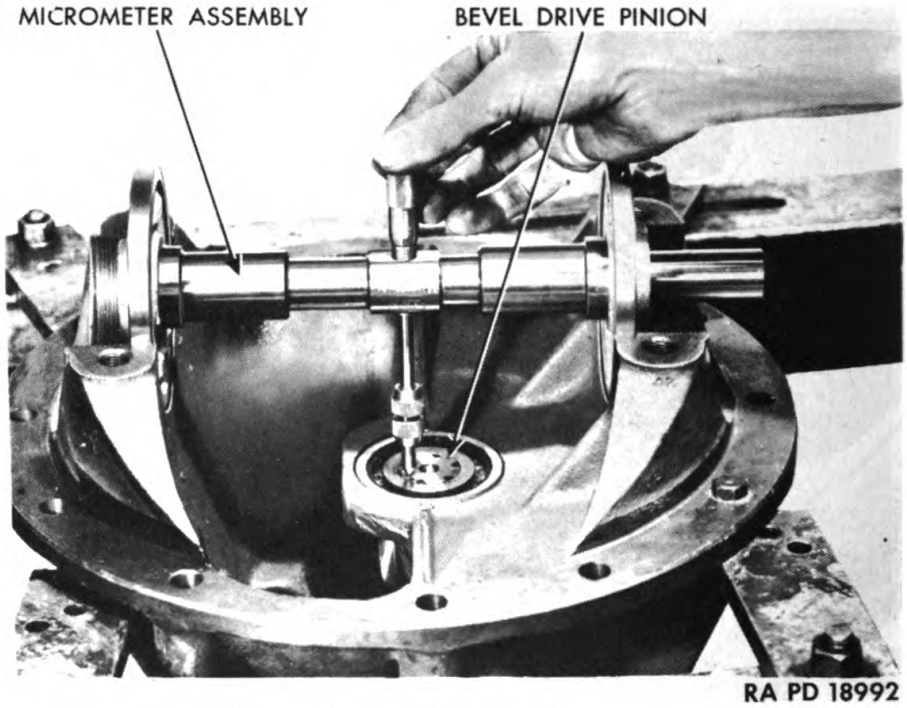


Figure 70 — Measuring Bevel Drive Pinion Cone Center

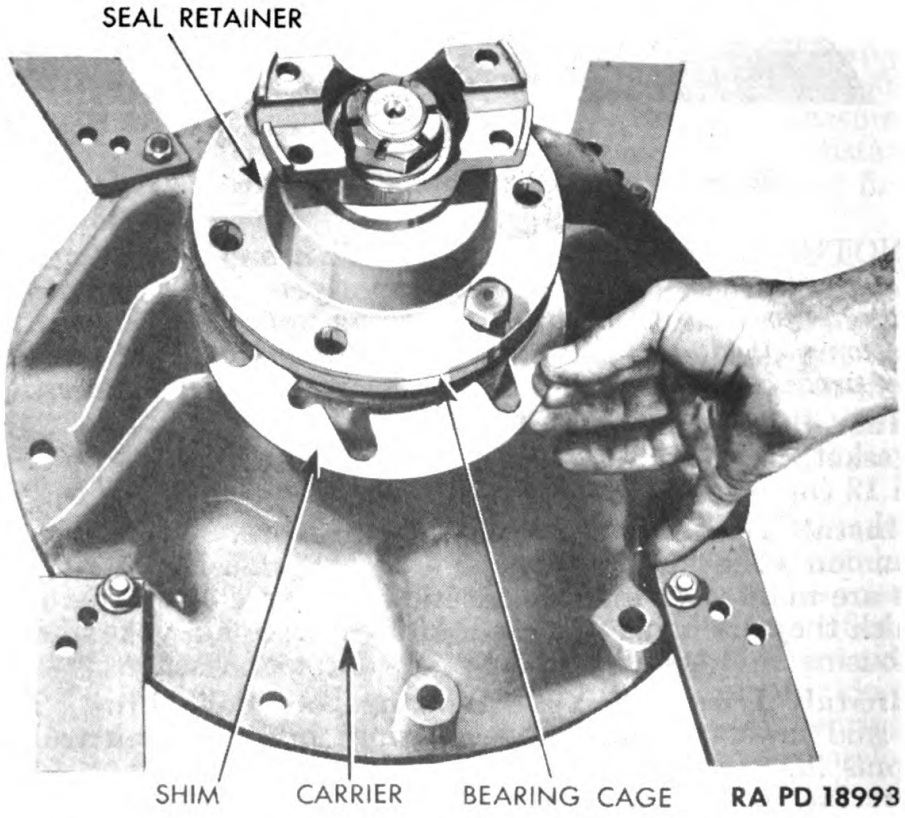


Figure 71 — Removing Bevel Drive Pinion Adjustment Shim

FRONT AXLE

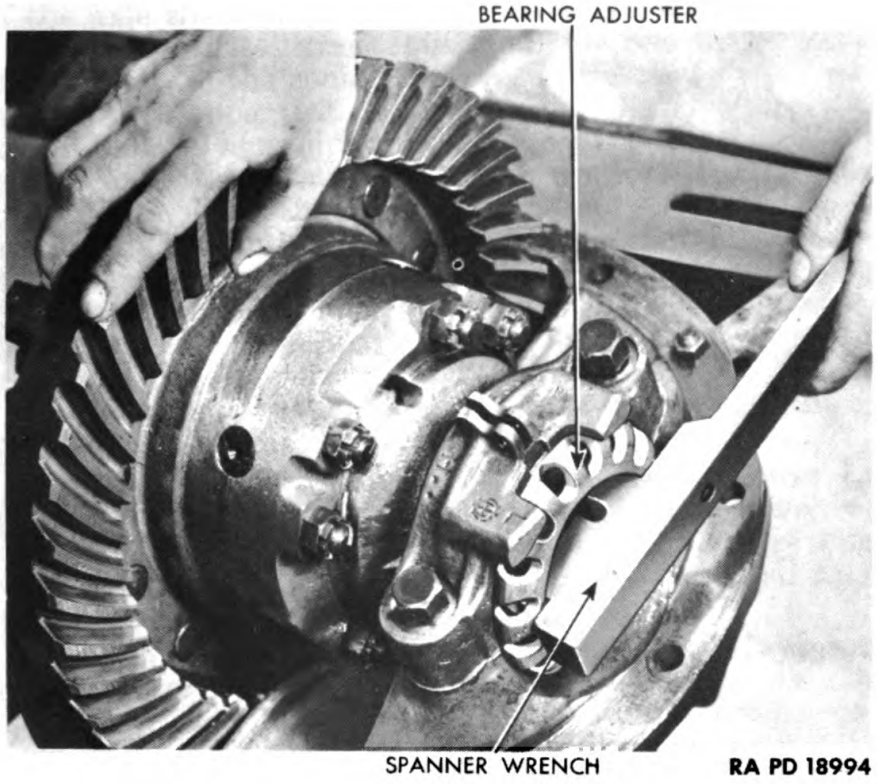


Figure 72 — Adjusting Differential Side Bearing

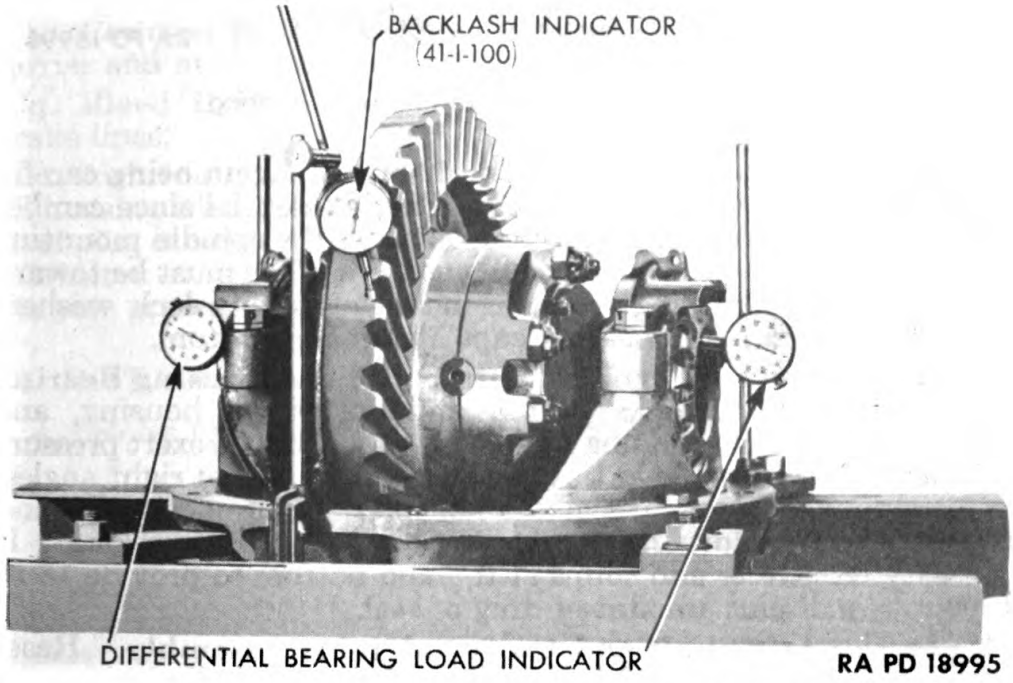


Figure 73 — Differential Bearing and Gear Backlash Adjustment

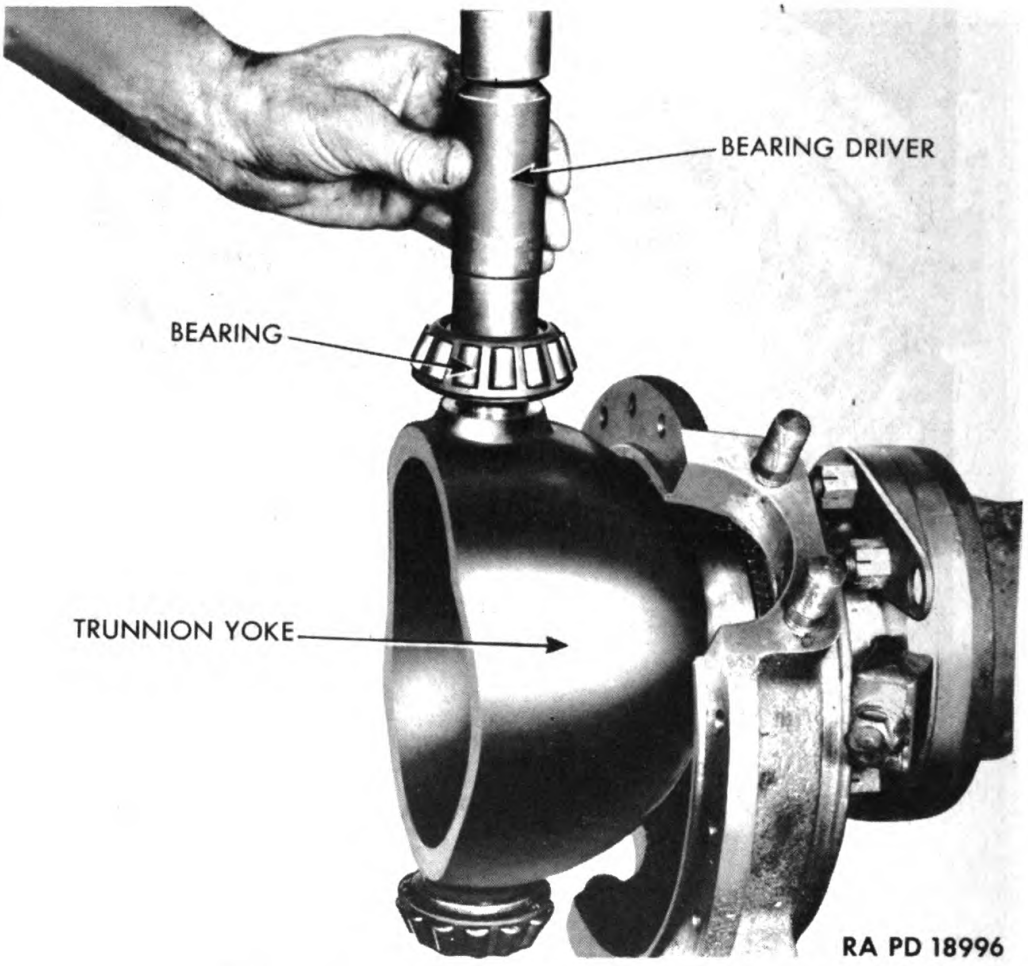


Figure 74 — Installing Trunnion Yoke Bearing

trunnion yoke housing to inner half of housing, again being careful to note marked position of housing. This is essential since camber is built into the outer half of the housing at the spindle mounting surface. The wide portion of the mounting surface must be toward the top. Install housing retaining bolts, nuts, and lock washers after inserting trunnion bearing cups at top and bottom.

k. Install Steering Arm on Trunnion Yoke Housing Bearing Caps. Place shim packs at top and bottom of housing, and install caps. Install retaining nuts loosely so as not to exert pressure on bearings. Hook scale at tie rod bolt hole and pull at right angles, noting amount of drag on seal and housing. Tighten cap nuts and recheck, noting additional load imposed by bearing preload. If necessary remove or add shims at top and bottom to provide 15 to 20 pounds pull plus amount of drag of seal.

l. Install Axle Shaft and Universal Joint Assembly. Reassemble universal joint as follows: Drop the center ball pin into the drilled passage in the wheel end of the joint. Place the differential

end of the axle shaft in a vise, being careful not to clamp at any ground surface. Install the center ball, the one with groove and hole drilled in it, in the center ball seat in the shaft, with hole and groove facing the operator. Place the wheel end of the joint on the center ball. Then slip three balls into the races. Turn the center ball until the groove in it lines up with the race for the remaining ball. Joint should now be tipped to extreme angle to slip the fourth ball into the race. Now straighten up the wheel end of the shaft. Reaching in with the fingers, turn the center ball until the center ball pin drops into the hole in the center ball. Install the retainer pin, and prick-punch both ends to lock it securely in place. Use new retainer pin if available. Place axle shaft and joint assembly in housing, fitting the inner shaft splines into the differential side gear splines.

m. Install Brake Backing Plate with Brakes, and Install Spindle. Place brake backing plate and brake assembly over housing studs. Install spindle over studs, making sure that slot is toward bottom. Place slinger in position, and install retaining nuts and lock washers.

n. Install Wheel Hub and Drum. Install oil seal retainer and oil seal on spindle. Install wheel inner bearing on spindle. Install wheel hub and drum on spindle, and install outer wheel bearing and adjusting nut. Rotate drum and hub while tightening adjusting nut until bind is felt. Then back off nut $\frac{1}{6}$ turn. Install lock washer and lock nut.

o. Install Axle Shaft Drive Flange. Install axle shaft drive flange over shaft splines, and install retaining nuts and lock washers.

p. Connect Brake Tubing. Connect brake tube at differential carrier and at trunnion yoke housing.

q. Bleed Brake System. Refer to TM 9-707 for bleeding brake lines.

r. Lubricate Axle. Remove differential oil level plug, and fill housing with 10 pints of universal gear lubricant SAE. Remove level plug at side of trunnion yoke housing, and fill housing through lubricator at top of housing with 2 pounds, 11 ounces of general purpose grease.

32. INSTALLATION.

a. Refer to TM 9-707 for the installation of front axle.

CHAPTER 5

POWER TRAIN (Cont'd)

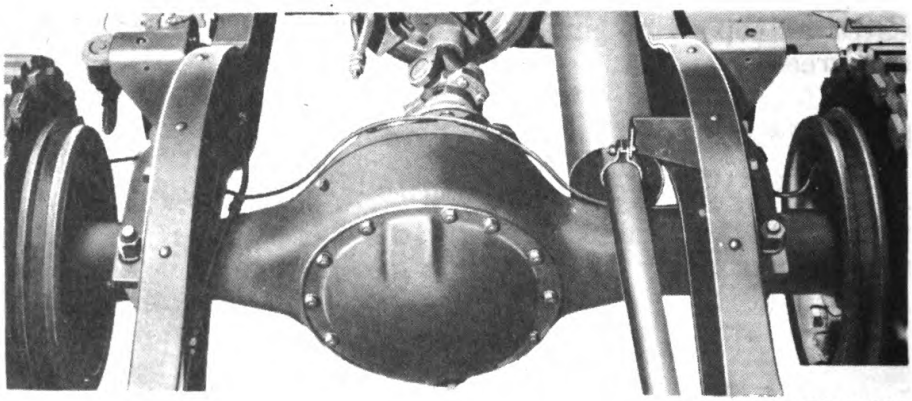
Section III

REAR AXLE

33. DESCRIPTION AND DATA (figs. 75 and 76).

a. Description. The rear axle is of single-reduction type with a straddle-mounted bevel drive pinion and conventional type differential. The housing is of banjo type and the differential and carrier are installed as an assembly. The weight of the rear axle assembly is approximately 790 pounds.

b. Construction. The construction of the differential is similar to that of the front axle (figs. 41 to 44), and the axle is of full-floating design so that the sprocket drive shaft carries none of the load but serves only to drive the sprocket. The gear ratio of the rear axle differs from the ratio of the front axle.



RA PD 18226

Figure 75 — Rear Axle — Installed

REAR AXLE

RA PD 18358

Figure 76 — Rear Axle — Removed

c. Data.

(1) GENERAL.

Make	International
Model	RHT–1590
Type	Single reduction—bevel gear
Ratio	4.22 to 1.00
Weight	796 lb

(2) SPECIFIC.

Axle shaft:	
Diameter at splines	1.875 in.
Number of splines	16
Bevel drive gear teeth	38
Bevel drive pinion:	
Number of teeth	9
Theoretical cone center	3.8125 in.

(3) BEARINGS.

Drive sprocket:	
Inner cone (2)	Timken 47679
Inner cup (2)	Timken 47620
Outer cone (2)	Timken 33251
Outer cup (2)	Timken 33462
Differential carrier:	
Cone (2)	Timken 3982
Cup (2)	Timken 3920
Bevel drive pinion:	
Cone (2)	Timken 53178
Cup (2)	Timken 53375
Straddle bearing (1)	Hyatt V-1806-TAM

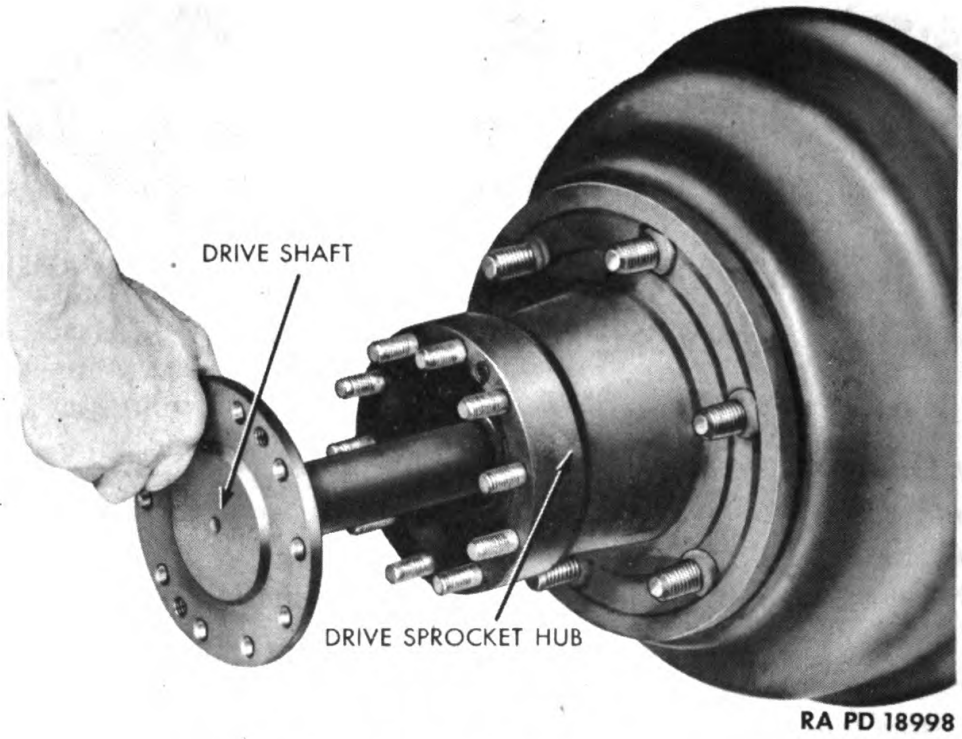


Figure 77 — Removing Rear Axle Drive Shaft

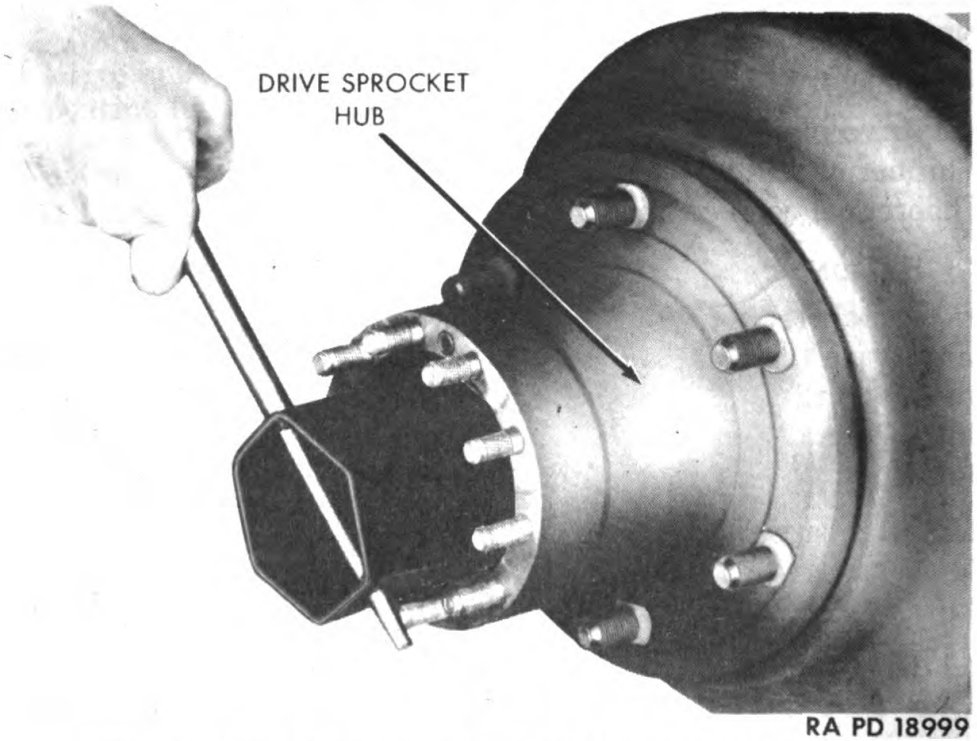


Figure 78 — Removing Drive Sprocket Bearing Nut

REAR AXLE

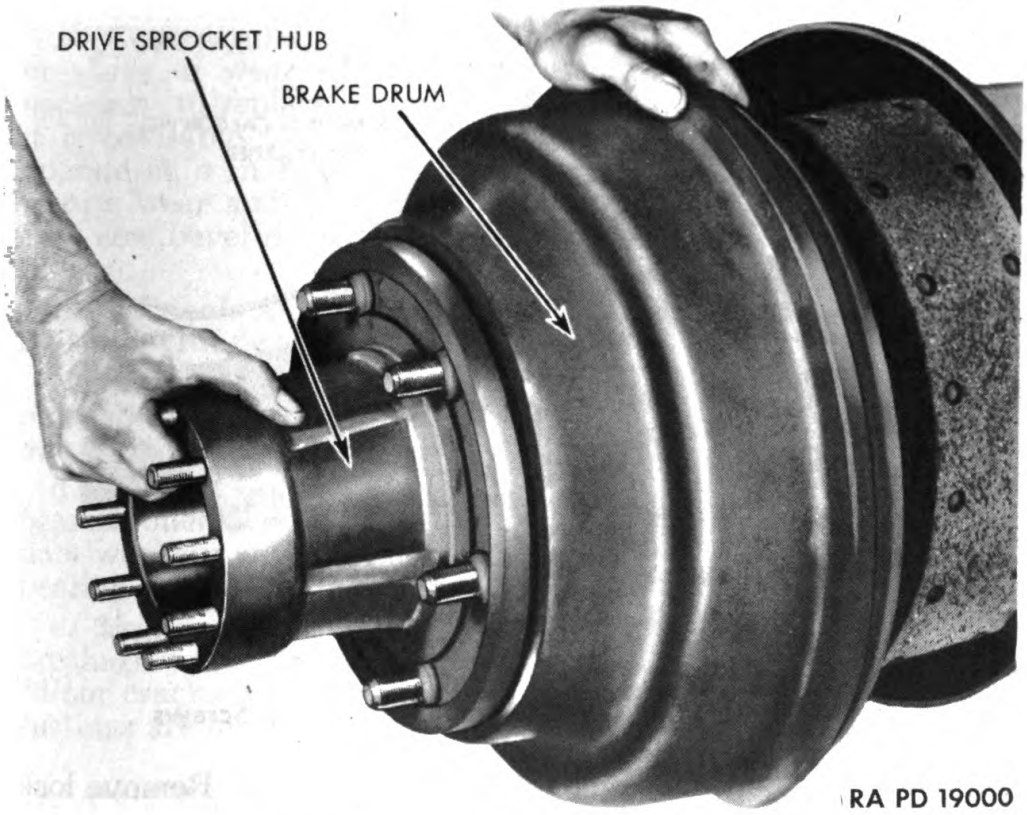


Figure 79 — Removing Drive Sprocket Hub

34. REMOVAL.

a. For removal of the rear axle assembly, refer to TM 9–707.

35. CLEANING AND INSPECTION.

a. Cleaning. Following removal, the rear axle assembly must be cleaned externally either with a steam cleaner or by scrubbing with dry-cleaning solvent.

b. Inspection. Inspect rear axle for cracks, breakage, or loss of parts. Replace damaged or missing parts.

36. DISASSEMBLY.

a. Drain Lubricant. Remove magnetic drain plug from bottom of housing, and drain lubricant.

b. Remove Axle Shaft. Remove 10 driving shaft flange nuts and lock washers from studs. Screw two flange screws into threaded holes, and force shaft from housing. Remove driving shaft from housing (fig. 77).

c. Remove Drive Sprocket Hub. Straighten tang on bear-

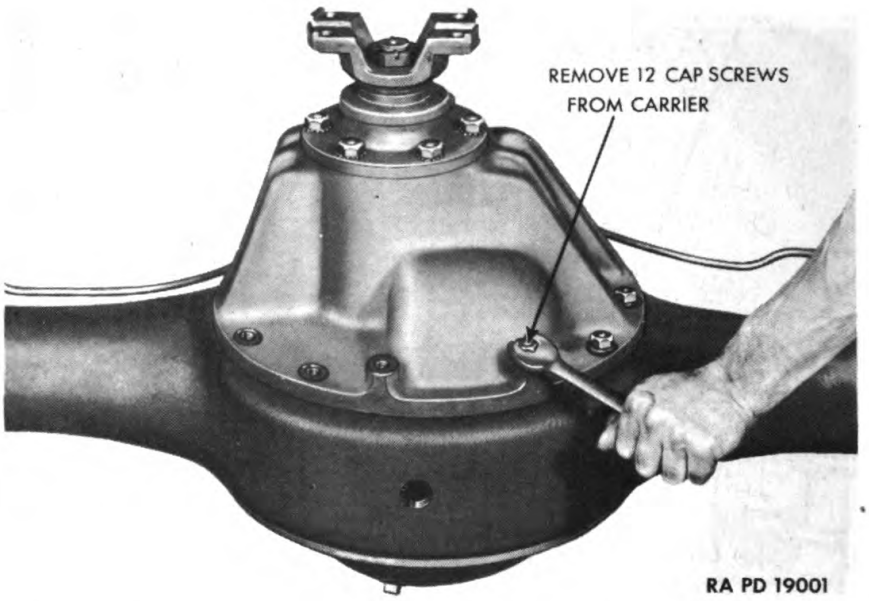


Figure 80 — Removing Differential Carrier Cap Screws

ing nut lock washer, and remove bearing lock nut. Remove lock washer and bearing adjusting nut (fig. 78). Remove drive sprocket hub from axle (fig. 79).

d. Remove Brakes. For removal of brakes, refer to TM 9–707.

e. Remove Differential and Carrier. Remove 12 cap screws and lock washers from differential carrier flange (fig. 80). Attach chain to companion flange and, using hoist, lift differential and carrier from axle housing (fig. 40).

f. Disassemble Differential. With the exception of the bevel drive pinion and bevel drive gear ratios, the front and rear axle differentials are indentical in construction. Therefore, for detailed disassembly instructions, refer to paragraph 28 O, (1) to (12).

g. Remove Axle Housing Cover. Remove 12 retaining cap screws and lock washers from inspection cover, and remove cover and gasket.

37. CLEANING OF PARTS.

a. All parts, except bearings, must be cleaned thoroughly of grease and oil. Use a steam cleaner if available. If not, wash parts with dry-cleaning solvent.

b. All bearings must be cleaned in dry-cleaning solvent, rotating the rollers in their races during the cleaning process, to remove any particles of foreign matter. When cleaned, the bearings must be coated with a film of light engine oil to prevent rust, wrapped in paper, and set aside for inspection.

REAR AXLE

38. INSPECTION OF PARTS.

a. Gears and Pinions. Examine all gears and pinions for breakage or wear of teeth, and replace all damaged parts. If necessary to replace either bevel drive pinion or bevel drive gear, it is advisable to replace both, since they are manufactured to operate as a matched and mated set. Satisfactory performance from a wear and quietness basis can not result from installation of a new bevel drive pinion with an old bevel drive gear, or the reverse.

b. Oil Seals and Gaskets. All oil seals and gaskets must be replaced with new ones at each overhaul or general repair.

c. Cap Screws, Bolts, and Nuts. Inspect all cap screws, bolts, nuts, and lockwashers for wear, damage, or breakage. Replace defective parts.

d. Bearings. Examine all bearings for pits, cracks, or roughness of rollers. Inspect all races for roughness. Spin bearings and note whether any unusual sound or noise results. Replace any bearing cone or bearing cup found defective.

e. Housing. Examine axle housing for evidence of cracks or breakage. Examine at point of welds for signs of weld failure. Minor cracks or porous places can be repaired by arc-welding. If castings are broken, replacement must be made.

39. ASSEMBLY.

a. Assemble Differential and Carrier. Refer to paragraph 31a to f concerning front axle differential with the following exception:

(1) BEVEL DRIVE GEAR RIVETS. The rivets of the rear axle bevel drive gear require 60 to 70 tons pressure for proper compressing. For front axle bevel drive gear installation, refer to paragraph 31 a (1).

b. Install Differential and Carrier in Housing. Place new gasket in position on housing, and line up cap screw holes. Lower differential and carrier into place in housing, and install 12 cap screws and lock washers in flange.

c. Install Rear Axle Inspection Cover. Install new gasket and install rear axle inspection cover at rear of axle housing. Install 12 retaining cap screws and lock washers.

d. Install Brakes. For installation of brakes, refer to TM 9 707.

e. Install Drive Sprocket Hub and Drum. Lift drive sprocket hub and drum assembly into place on the axle housing, and install drive sprocket outer bearing and bearing adjusting nut. While rotating drive sprocket hub, tighten nut until a definite drag is felt. Back off adjustment nut $\frac{1}{6}$ turn. Install adjusting nut lock washer and lock nut.

f. Install Drive Sprocket Drive Shaft. Install drive shaft in

housing, using new gasket, and install 10 retaining nuts and lock washers.

g. Fill Housing with Lubricant. Remove rear axle housing filler plug, and fill with 4½ quarts universal gear lubricant. Replace filler plug. NOTE: *Level of lubricant should be checked after axle has been operated. If necessary, add lubricant to bring level to ½ inch below level of filler hole when lubricant is cool.*

40. INSTALLATION.

a. Installation of rear axle is described in TM 9–707.

CHAPTER 5

POWER TRAIN (Cont'd)

Section IV

PROPELLER SHAFTS

41. DESCRIPTION AND DATA.

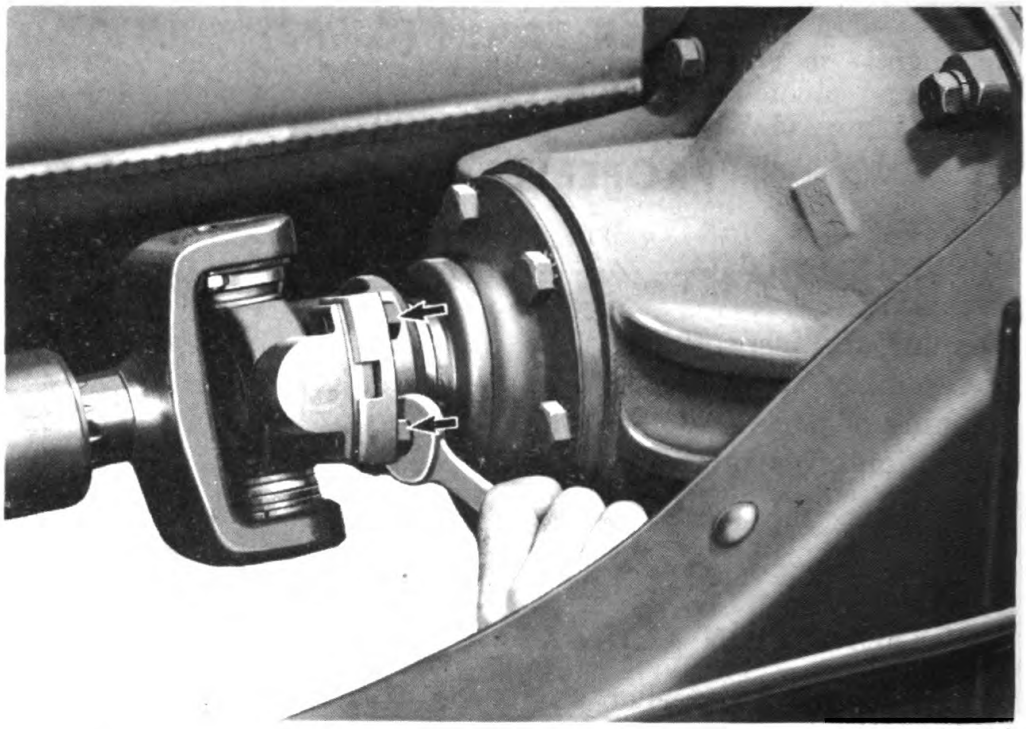
a. General. Propeller shafts on this vehicle are provided between the transfer case and rear axle, between the transfer case and front axle, and, on winch-equipped vehicles, between the transmission power take-off and the winch. Each propeller shaft serves to transmit power from its source to the driven unit.

b. Construction. All of the propeller shafts are similar in design in that each has a universal joint at both ends and each shaft has one slip joint. The front axle and rear axle propeller shafts attach to companion flanges at each end. The winch propeller shaft or drive shaft attaches to the power take-off by means of a drive key and at the winch by means of a shear pin through the slip yoke.

c. Data.

(1) FRONT AXLE PROPELLER SHAFT.

Make	Mechanics
Manufacturer's No.	2A-3780
Length—center to center	40 3/16 in.
Tube diameter	2 in.
Universal joint type	5CR
Spline length	6 1/2 in.
Diameter over splines	1.4980 to 1.4985 in.
Number splines	10
Tube diameter	2 in.



RA PD 18364

Figure 81 — Disconnecting Rear Propeller Shaft from Rear Axle

(2) REAR AXLE PROPELLER SHAFT.

Make	Mechanics
Manufacturer's No.	2A-3776
Universal joint type	7CR
Length of splines	2 11/16 in.
Diameter over splines	1.9970 to 1.9975 in.
Number of splines	10

(3) WINCH DRIVE SHAFT.

Make	Spicer
Manufacturer's No.	920-SF
Length—center to center	67½ in.
Length of splines	2 in.
Diameter of splines	1.248 to 1.249 in.
Number of splines	16
Tube diameter	1¼ in.

42. REMOVAL.

a. Propeller Shaft to Front Axle. The propeller shaft from the transfer case to the front axle is removed as follows:

PROPELLER SHAFTS

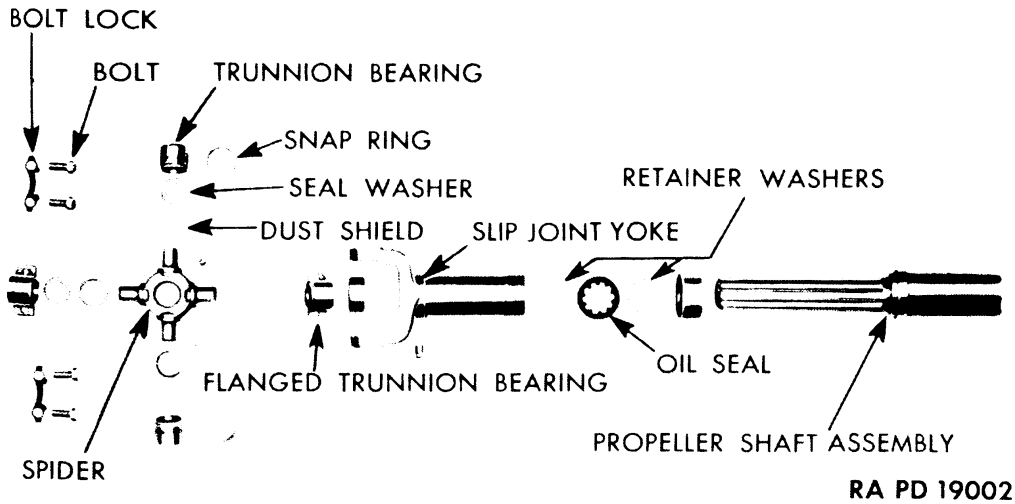


Figure 82 — Rear End of Front Axle Propeller Shaft — Disassembled

(1) DISCONNECT AT FRONT AXLE. Straighten locking tabs on lock plates and remove four bolts from the companion flange propeller shaft bearings. Lower propeller shaft end, and place wire around trunnion bearings to hold in place on spider.

(2) DISCONNECT AT TRANSFER CASE. Straighten locking tabs on lock plates and remove four bolts from propeller shaft bearings at companion flange. Lower propeller shaft end, and place wire around trunnion bearings to hold in place on spider.

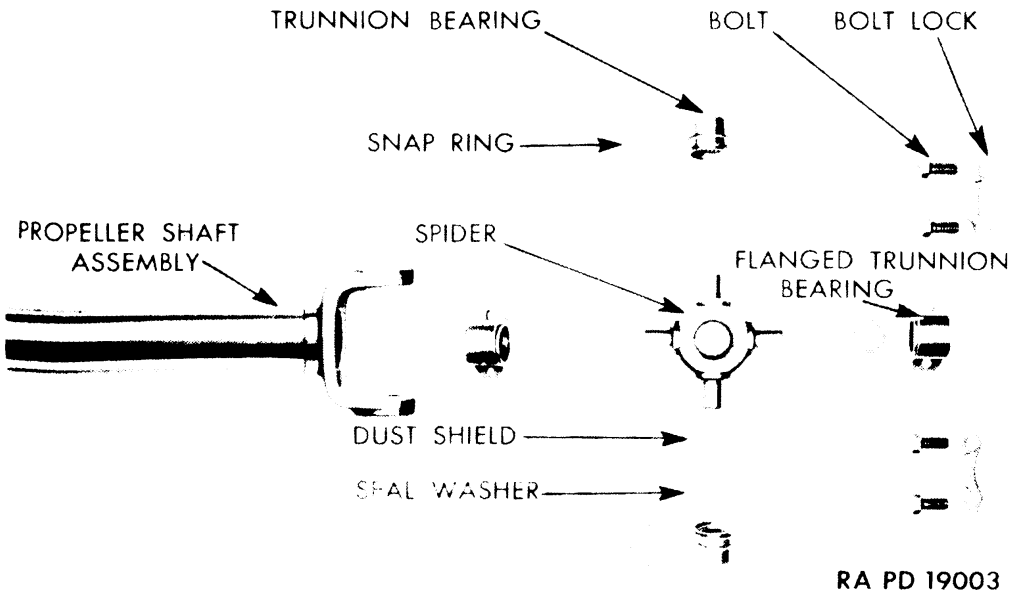


Figure 83 — Front End of Front Axle Propeller Shaft — Disassembled

Figure 84 — Removing Flanged Trunnion Bearings

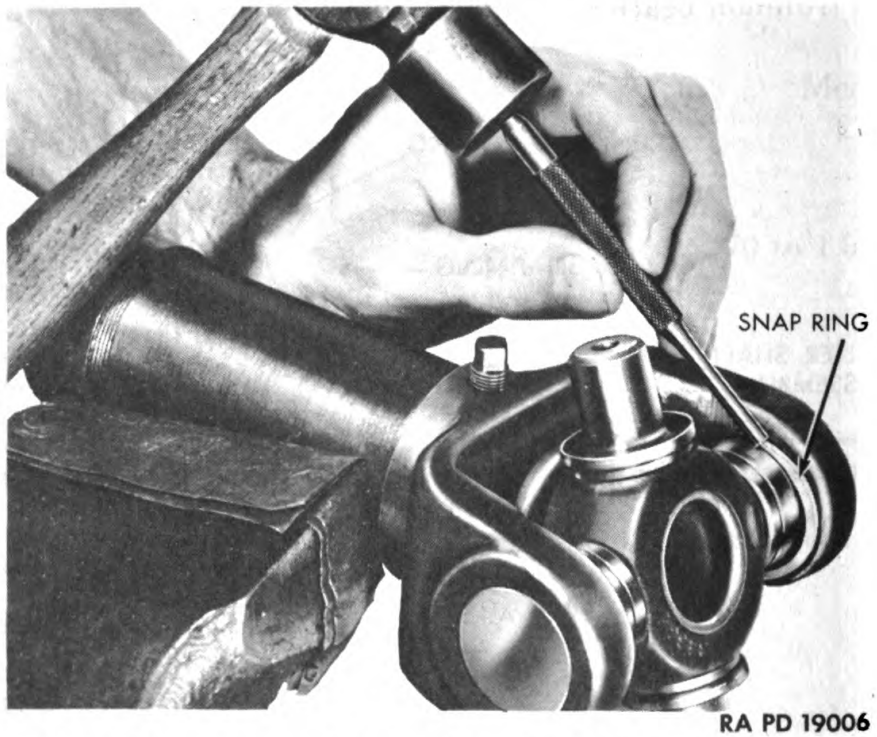
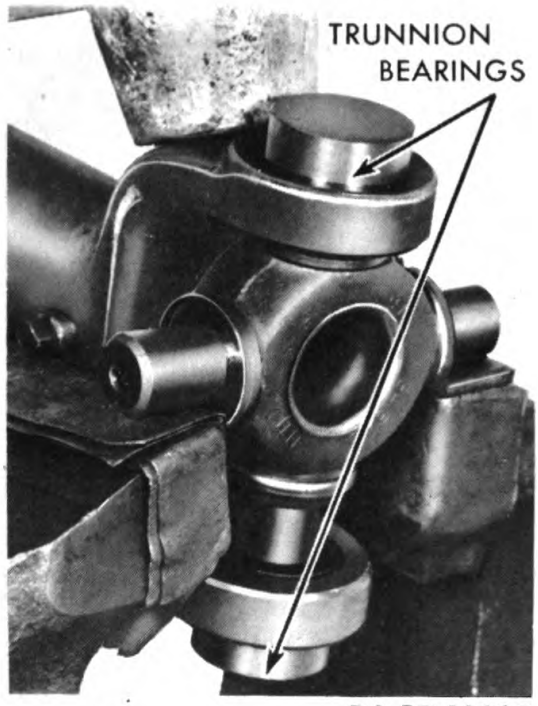


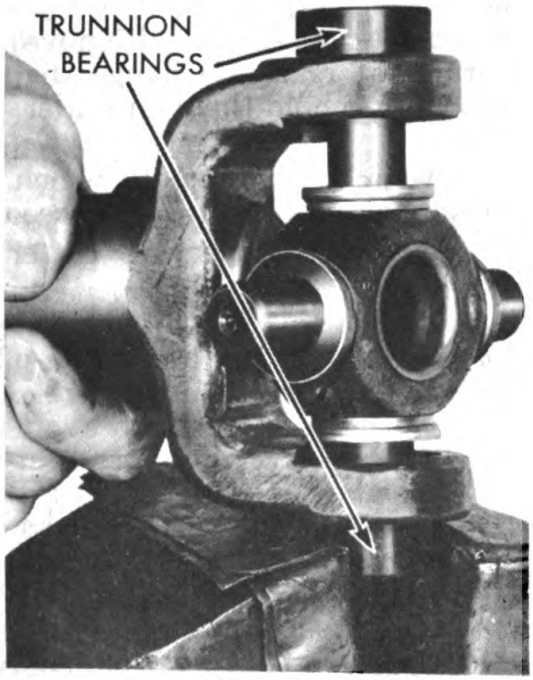
Figure 85 — Removing Round Trunnion Bearing Snap Ring

PROPELLER SHAFTS



RA PD 19008

Figure 86 — Loosening Opposite Round Trunnion Bearing



RA PD 19009

Figure 87 — Removing Round Trunnion Bearing

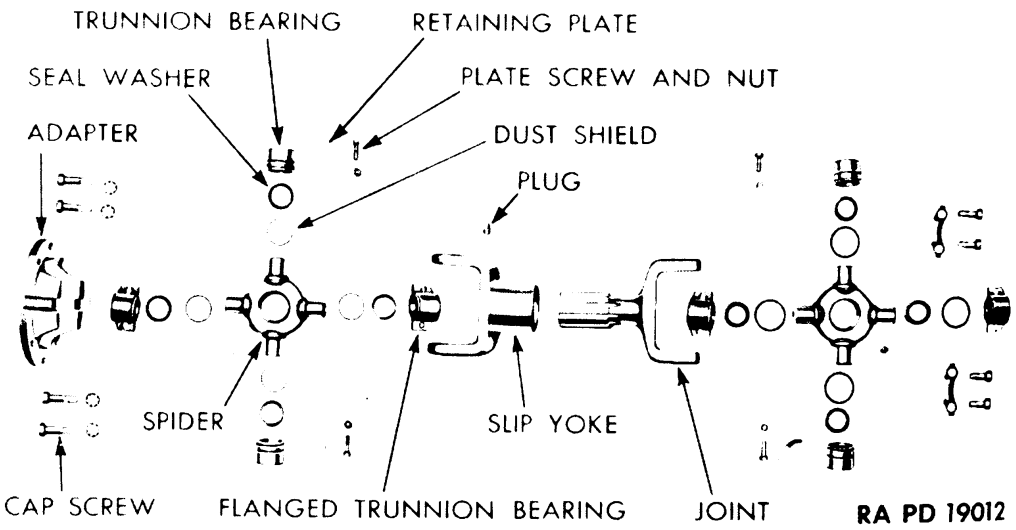


Figure 88 — Rear Axle Propeller Shaft — Disassembled

b. Propeller Shaft to Rear Axle. Removal of the propeller shaft from the transfer case to the rear axle is accomplished as follows:

(1) DISCONNECT AT TRANSFER CASE. Remove six nuts from six cap screws holding companion flange to brake disk. Two cap screws will remain, holding the brake disk to the companion flange at the transfer case.

(2) DISCONNECT AT REAR AXLE. Remove four bolts from propeller shaft bearings at rear axle flange (fig. 81). Place wire around trunnion bearings to hold them on spider. Lower propeller shaft assembly.

c. Drive Shaft to Winch. To remove winch drive shaft from the transmission power take-off to winch, proceed as follows:

(1) DISCONNECT AT WINCH. Remove cotter pin from shear pin in slip joint, and remove shear pin.

(2) DISCONNECT AT POWER TAKE-OFF. Remove four cap screws from companion flange at power take-off. Lower winch drive shaft.

43. CLEANING AND INSPECTION.

a. Cleaning. Following removal, propeller shafts must be cleaned of all dirt, grease, or oil either by using a steam cleaner or by scrubbing with dry-cleaning solvent.

b. Inspection. Inspect shaft for signs of failure at weld at ends of tubes, and for apparent bends or breakage of shaft. Inspect for loss of parts. Inspect mounting bolts and nuts for wear of threads. Replace damaged or missing parts. Inspect shear pin for any sign of wear or bend, and replace with new pin if necessary.

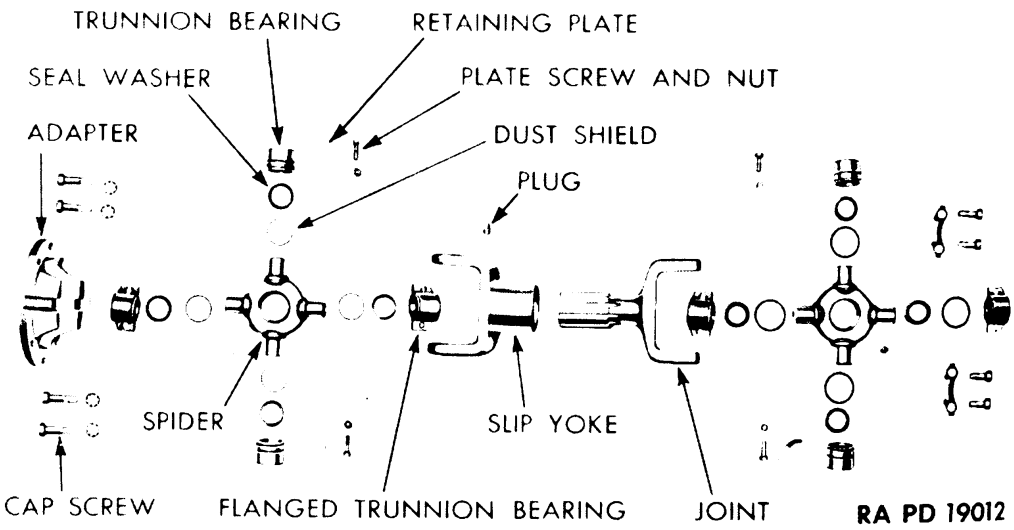


Figure 88 — Rear Axle Propeller Shaft — Disassembled

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a. Cleaning. Following removal, propeller shafts must be cleaned of all dirt, grease, or oil either by using a steam cleaner or by scrubbing with dry-cleaning solvent.

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PROPELLER SHAFTS

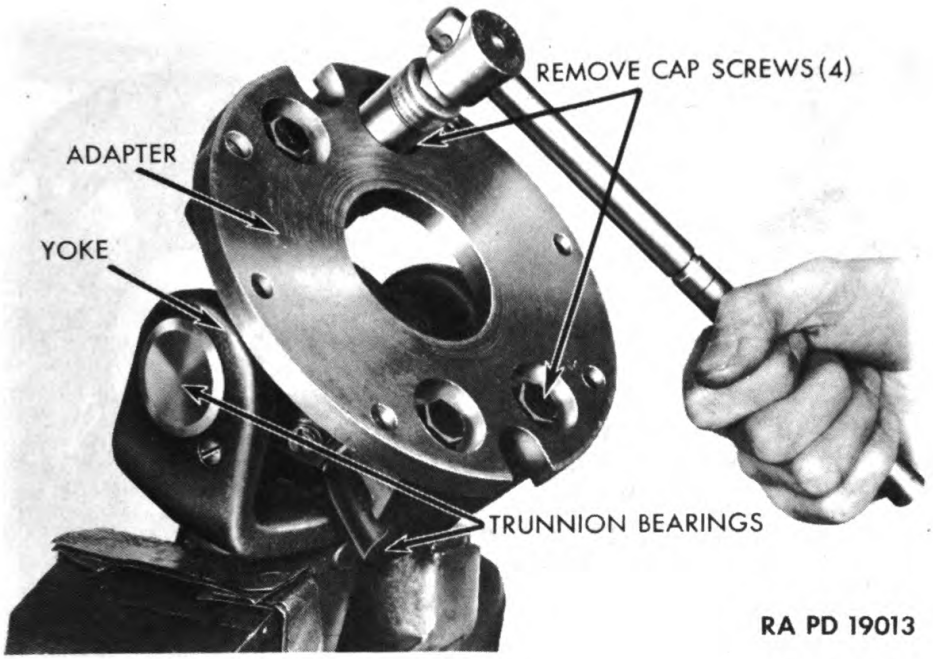


Figure 89 — Removing Rear Axle Propeller Shaft Adapter Cap Screws

44. DISASSEMBLY.

a. Front Axle Propeller Shaft (figs. 82 and 83).

(1) REMOVE WIRE FROM BEARINGS. Mount propeller shaft in vise which has protected jaws. Remove wire from around trunnion bearings.

(2) LIFT OFF SPIDER BEARINGS. Remove flanged trunnion bearings from spider (fig. 84).

(3) REMOVE SPIDER BEARING SNAP RINGS. Use punch and hammer to drive spider bearing snap rings from grooves in bearings (fig. 85).

(4) REMOVE SPIDER FROM YOKE. Place spider across vise jaws, and strike yoke with lead hammer. This will force one round spider bearing from bore in yoke. Invert yoke and repeat process of striking yoke to force second round spider bearing from yoke bore (fig. 86). Remove one bearing from yoke by holding in vise and working yoke off bearing (fig. 87). Remove spider from yoke by moving down into yoke and turning out of yoke. Remove remaining spider bearing from yoke.

(5) REMOVE SPIDER BEARING DUST SHIELDS. Using some such tool as a soft drift, tap gently against rear face of dust shields to remove from spider.

b. Rear Axle Propeller Shaft (fig. 88). While the construction of the rear axle propeller shaft is, in general, the same as that of the front axle propeller shaft, there are minor differences in construction. Disassembly is as follows:

Figure 90 — Removing Rear Axle Propeller Shaft Adapter and Flanged Trunnion Bearings

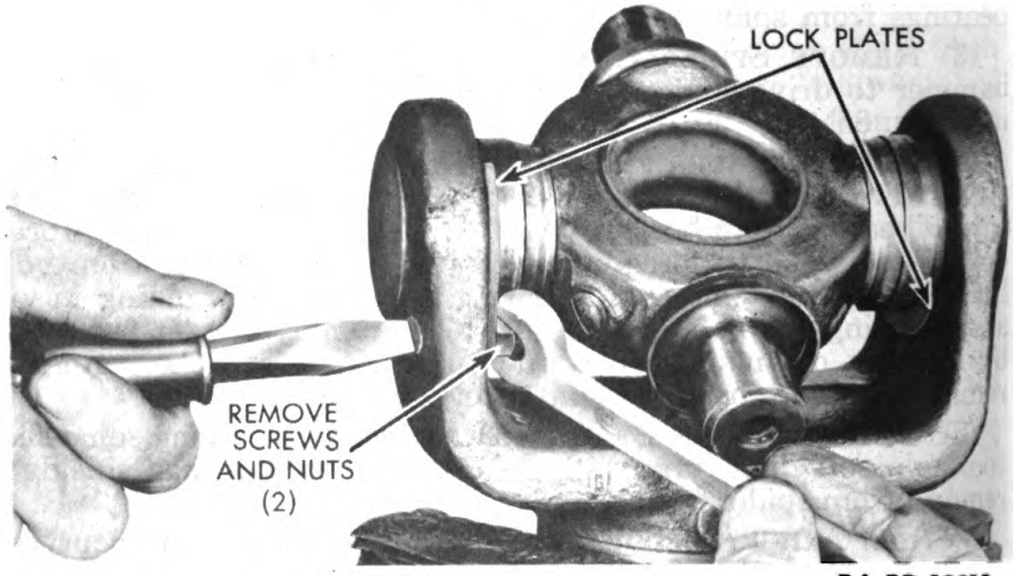


Figure 91 — Removing Trunnion Bearing Lock Plate Bolt

PROPELLER SHAFTS

Figure 92 — Removing Trunnion Bearing Lock Plate

Figure 93 — Loosening Opposite Round Trunnion Bearing

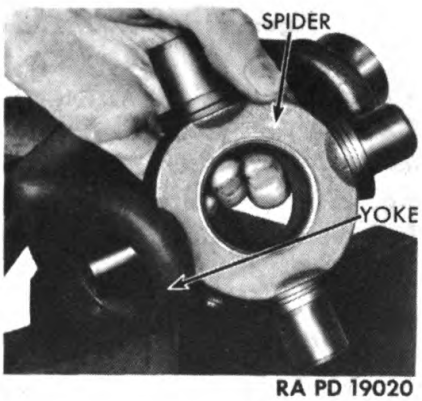


Figure 94 — Removing Rear Axle Propeller Shaft Spider

(1) REMOVE PROPELLER SHAFT ADAPTER. Mount rear propeller shaft in protected vise jaws. Remove four cap screws (bolts) from adapter and flanged trunnion bearings (fig. 89). Lift off adapter and remove flanged trunnion bearings from spider (fig. 90).

(2) REMOVE TRUNNION BEARING LOCK PLATES FROM ROUND BEARINGS. Remove lock screw and nut from each retaining lock plate (fig. 91). Use punch and hammer to drive lock plates from grooves in round trunnion bearings (fig. 92).

(3) REMOVE SPIDER FROM YOKE. Support spider on protected jaws of vise, and strike yoke with lead hammer to force one round trunnion bearing out of yoke bore. Invert yoke and spider, and repeat process to drive other round bearing from bore (fig. 93). Remove one bearing from yoke by holding in vise and striking yoke from underneath to remove bearing. Remove spider from yoke by working down into yoke bore and turning spider out of yoke (fig. 94). Remove remaining trunnion bearing.

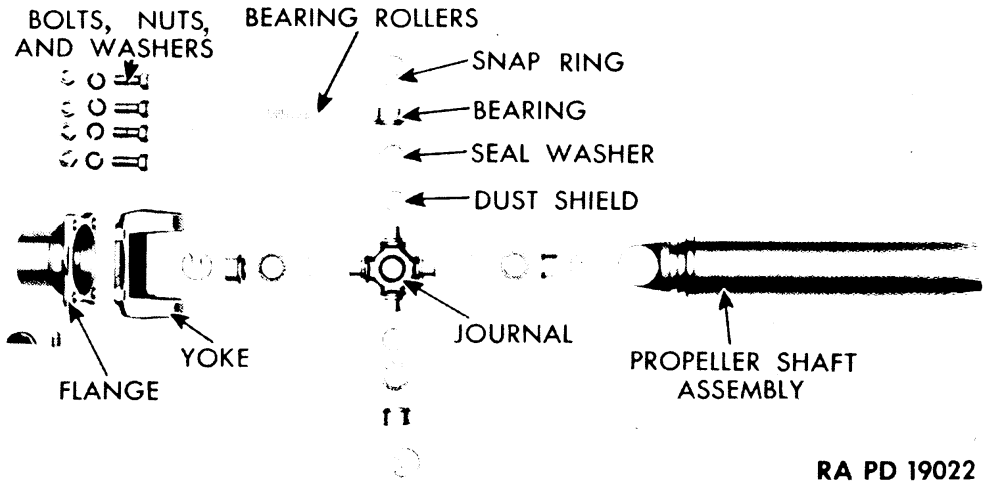


Figure 95 — Rear End of Winch Drive Shaft — Disassembled

(4) Remove Bearing Dust Shields from Spider. Support spider in vise and, using screwdriver and hammer, tap lightly against rear face of dust shieids to remove from spider.

c. **Winch Drive Shaft** (figs. 95 and 96). While the winch drive shaft is similar to the propeller shafts of the front and rear axle, there are minor structural differences. Disassembly is as follows:

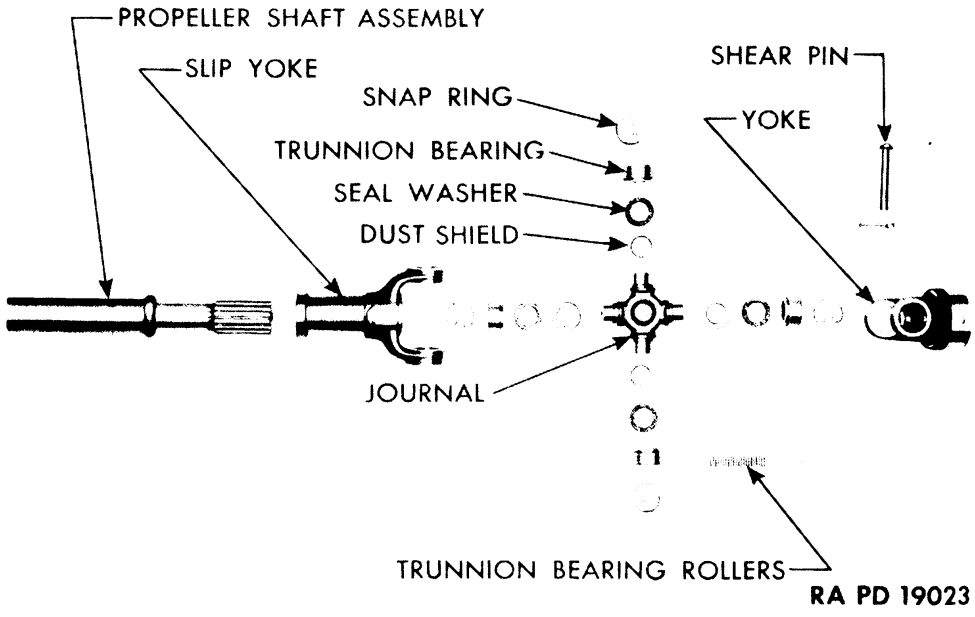


Figure 96 — Front End of Winch Drive Shaft — Disassembled

PROPELLER SHAFTS

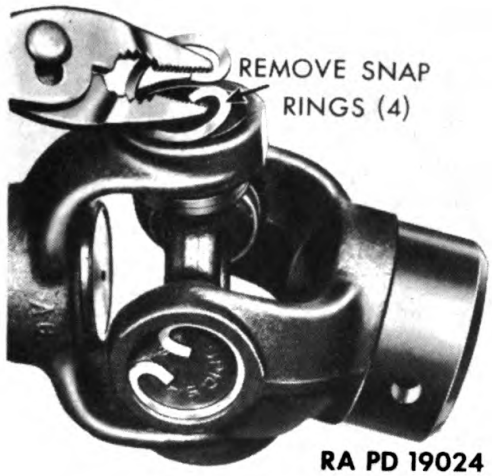


Figure 97 — Removing Trunnion Bearing Snap Ring

(1) REMOVE JOURNAL FROM SLIP JOINT SLEEVE YOKE AND FROM SLIP JOINT YOKE. Support drive shaft in protected vise jaws, and remove snap rings from grooves above trunnion bearings (fig. 97). Support slip joint yoke on vise jaws, and strike slip joint sleeve with lead hammer to force trunnion bearings from slip joint sleeve bores (fig. 98). Remove one bearing by holding in vise and working slip joint sleeve yoke off bearing (fig. 99). Remove slip

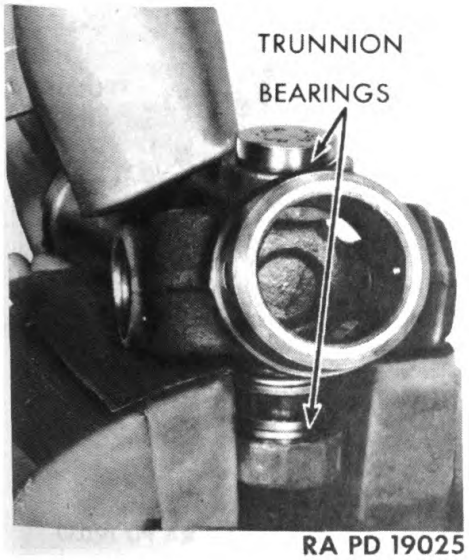


Figure 98 — Loosening Trunnion Bearing

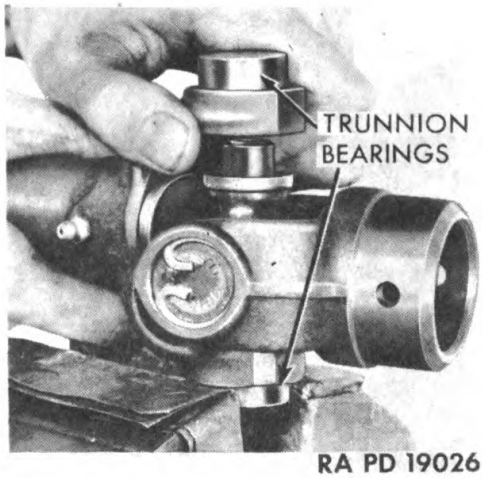


Figure 99 — Removing Trunnion Bearing

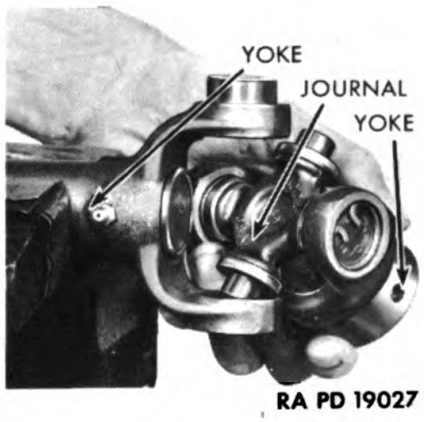


Figure 100 — Removing Winch Drive Shaft Journal and Yoke

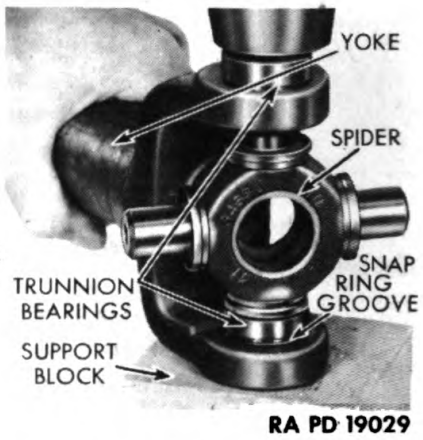


Figure 101 — Installing Trunnion Bearing

joint sleeve yoke and journal from slip joint yoke by tilting out of slip joint yoke (fig. 100). Repeat above process to remove journal from slip joint sleeve yoke.

(2) REMOVE JOURNAL BEARING DUST SHIELDS. Using hammer and screwdriver, tap lightly on rear face of dust shields (gasket retainers) to remove from journal.

45. CLEANING OF PARTS.

a. Following disassembly of any propeller shaft, all parts must

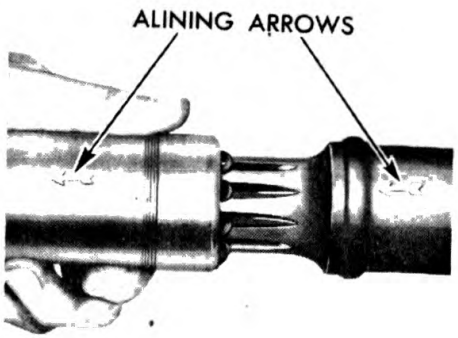


Figure 102 — Alinement of Arrows on Front Propeller Shaft

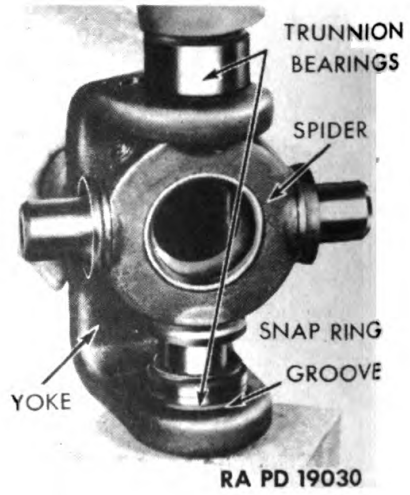


Figure 103 — Installing Trunnion Bearing

PROPELLER SHAFTS

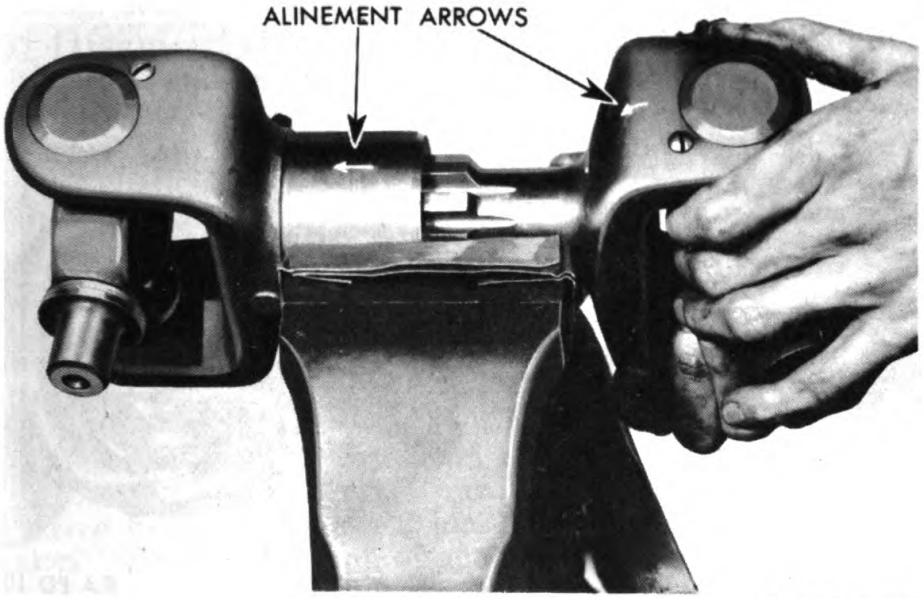


Figure 104 — Alinement of Arrows on Rear Propeller Shaft

be washed clean of all grease, dirt, or oil in dry-cleaning solvent.

46. INSPECTION OF PARTS.

a. Tubes. Propeller shaft tubes which are bent or broken must be replaced.

b. Gaskets. All oil and grease gaskets must be replaced at each general repair or overhaul.

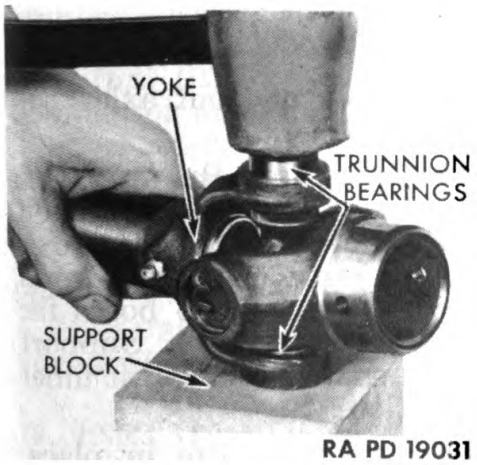


Figure 105 — Installing Trunnion Bearing

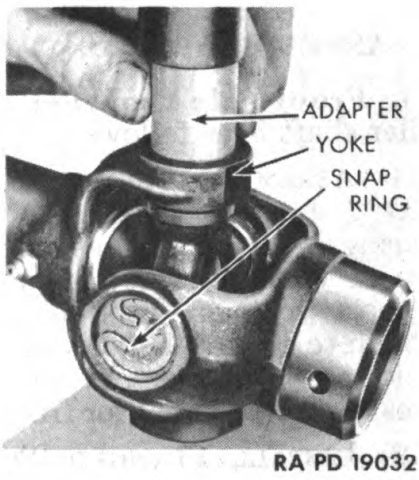


Figure 106 — Driving in Trunnion Bearing Using Adapter

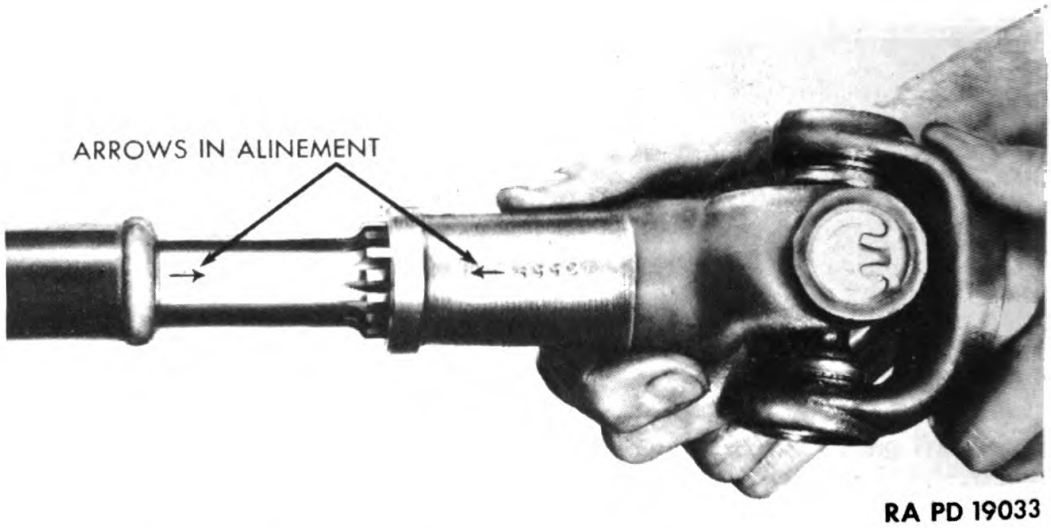


Figure 107 — Alinement of Arrows on Winch Propeller Shaft

c. Bearings. Inspect all bearing assemblies for free operation of needle rollers, and inspect needle rollers for wear. If worn, replace with new bearing assemblies.

d. Splines. Inspect splines of propeller shafts and slip joints. If worn, replace affected unit.

e. Journals and Spiders. Inspect for wear on journal or spider bearing surfaces. Replace affected parts if worn.

f. Snap Rings. Inspect all bearing retaining snap rings, and if distorted or worn, replace with new snap rings.

47. ASSEMBLY.

a. Front Axle Propeller Shaft. Assembly of front axle propeller shaft is as follows:

(1) ASSEMBLE SPIDER AND ROUND TRUNNION BEARINGS IN SHAFT. Install dust shields on spider. Place one round trunnion bearing in place in yoke bore, but only drive in flush with inner face of yoke. Insert spider, and place opposite bearing in bore. Support yoke on wood block, and drive bearings into bores far enough to permit installing retaining snap rings (fig. 101). Support spider on vise jaws, and tap yoke to drive snap rings against inner faces of yokes. Test for freedom of operation.

(2) INSTALL FLANGED TRUNNION BEARINGS. Wire in place.

(3) INSTALL SLIP JOINT YOKE ON TUBE SPLINES. Install new felt oil seal in yoke between two seal retainer washers, and install retainer cap, lining up splines before tightening cap. Install yoke

PROPELLER SHAFTS

on tube, noting that arrows on tube and on yoke register for alinement (fig. 102).

(4) LUBRICATE UNIVERSAL JOINTS. Fill universal joints with low pressure gun using general purpose grease No. 1 until grease shows at seals.

b. Rear Axle Propeller Shaft. Assembly of the rear axle propeller shaft is, in general, similar to the procedure for the front axle propeller shaft with a few minor exceptions. Procedure is as follows:

(1) INSTALL SPIDER IN YOKE. Install dust shields on spider. Drive one round trunnion bearing into yoke just flush with inner surface of yoke. Insert spider in yoke, and drive opposite trunnion bearing into bore. Support yoke on wood block, and drive bearings into yoke far enough to permit installation of bearing lock plates (fig. 103). Insert lock plates and retaining bolts and nuts. Peen end of bolts to prevent loss of nut. Support spider on vise jaws, and drive bearings out until lock plates rest against inner yoke surfaces. Test for freedom of operation.

(2) INSTALL PROPELLER SHAFT ADAPTER ON FRONT END OF SHAFT. Install flanged trunnion bearings on spider, mount adapter in position, and install four retainer bolts and lock washers.

(3) INSTALL FLANGED BEARINGS ON REAR SPIDER. Wire in place.

(4) INSTALL FRONT YOKE OVER SPLINES OF REAR YOKE. Connect front and rear yokes, and make sure arrows are in alinement (fig. 104).

c. Winch Drive Shaft. Assembly of the winch drive shaft is as follows:

(1) ASSEMBLE WINCH DRIVE SHAFT JOURNAL IN YOKES. Install dust shields (gasket retainers) on journal. Lubricate bearings with general purpose grease No. 1. Install new gaskets. Drive one trunnion bearing into yoke bore flush with outer surface of yoke. Insert journal in position in yoke, and drive opposite bearing into bore (fig. 105). Drive bearings into yoke far enough to permit installation of snap rings in grooves (fig. 106). Install snap rings. Support on vise jaws, and drive bearings outward to secure snap rings in grooves. Test for freedom of joint operation.

(2) ASSEMBLE SLIP JOINT SLEEVE YOKE OVER SPLINE OF SHAFT. Place slip joint sleeve yoke over splines of shaft, noting that arrows on shaft and slip joint sleeve yoke are in alinement (fig. 107).

(3) LUBRICATE SLIP JOINT SLEEVE YOKE. Fill slip joint sleeve yoke with general purpose grease No. 1.

48. INSTALLATION.

a. Front Axle Propeller Shaft. Installation of the front propeller shaft is as follows:

(1) INSTALL SLIP JOINT END AT TRANSFER CASE. Use new lock

washers and lock plates, and connect trunnion bearings at companion flange at transfer case. Install four bolts.

(2) INSTALL TUBE AT FRONT AXLE. Connect tube and slip joint (if disconnected), assuring that arrows are in alinement. Connect trunnion bearings at companion flange at front axle, using new lock washers and lock plates. Install four bolts.

b. Rear Axle Propeller Shaft. Installation of the rear axle propeller shaft is as follows:

(1) CONNECT PROPELLER SHAFT AT TRANSFER CASE. Making sure that arrows of front and rear sections of propeller shaft are in alinement, connect adapter at brake disk, and install six bolts and nuts.

(2) CONNECT PROPELLER SHAFT AT REAR AXLE. Install four bolts and new lock plates in trunnion bearings at rear axle companion flange.

c. Winch Drive Shaft. Installation of the winch drive shaft is as follows:

(1) INSTALL SLIP JOINT END YOKE ON WINCH. Place slip joint end yoke over winch shaft, and install shear pin and cotter pin.

(2) INSTALL DRIVE SHAFT REAR SECTION. Insert drive shaft splined end in slip joint sleeve yoke splines, making sure arrows are in correct alinement. Connect drive shaft rear companion flange to power take-off companion flange, and install four cap screws and lock washers.

CHAPTER 5

POWER TRAIN (Cont'd)

Section V

TRANSMISSION AND TRANSFER CASE

49. DESCRIPTION AND DATA.

a. Description (figs. 108 to 111). The transmission and transfer case combined unit is mounted to the rear of the engine. The clutch housing is attached to the engine flywheel housing. The transmission is a constant-mesh helical-gear type with four forward speeds and one reverse speed. The transfer case has both direct drive and under-drive. It also incorporates a declutching device for engaging and disengaging the front axle drive. The transmission case and transfer case are bolted together but may be separated for individual servicing of the two units. The transmission has a covered opening at the left-hand side for installation of a power take-off for the winch drive on winch-equipped vehicles. The transmission shift lever is mounted at the transmission. Two additional shift levers, mounted on a common pivot pin on the side of the transmission, are provided to control the transfer case range and front axle engagement. Control for the transfer case, both for the front axle and for the transfer case gear range, is accomplished by control rods. The weight of the combined transmission and transfer case assembly is approximately 503 pounds when equipped with power take-off. The weight of the power take-off is approximately 36 pounds.

b. Operation and Controls. A gear shift diagram plate (fig. 112) showing the shift positions is mounted on the instrument panel extension at the left-hand side. Shifter levers and controls are shown in position in the driver's compartment in figure 113. Power is received by the transmission from the engine through the clutch and transmission main drive gear, whose splined shaft engages with the clutch splined hub. Power then flows through the transmission to the transfer case by means of the transfer case

mainshaft drive gear and finally to the rear axle propeller shaft, and if desired, also to the front axle propeller shaft.

(1) TRANSMISSION GEARS. All gears in the transmission rotate at all times during periods of vehicle operation. The first, second, and third speed gears, however, rotate freely on the transmission mainshaft and must be locked to the shaft by means of a clutch gear or collar in order to provide a path of power flow through the unit. The various transmission speeds and gear ratios are selected by locking any one of these three gears, or locking the main drive gear, to the mainshaft. With none of the gears locked to the main shaft, the transmission is in the neutral position.

(2) FIRST SPEED. The first movement of the shift lever toward the first speed position moves the lower end of the shift lever to the right, where it engages in the slot provided in the first and second speed shift rod bracket; then as the lever is moved forward to complete the shift, moving the shift fork and the rod, the first, second, and reverse speed mainshift clutch collar is moved toward the rear where it engages with the clutch teeth on the first speed gear. This locks the first speed gear to the mainshaft, causing a power flow from the main drive gear through the countershaft to the mainshaft first speed gear which drives the mainshaft to which it is now locked (fig. 114).

(3) SECOND SPEED. Shifting into second speed moves the first and second speed shift rod forward, thereby moving the first, second, and reverse speed mainshaft clutch collar forward. This locks the second speed gear to the mainshaft, causing a power flow from the main drive gear through the countershaft to the mainshaft second speed gear, and finally out through the mainshaft (fig. 115).

(4) THIRD SPEED. The shifting sequence into third speed is similar to that of first and second speeds, except that in this case the third and fourth speed shift rod and clutch gear are moved toward the rear. Figure 116 shows the power flow.

(5) FOURTH SPEED. When the transmission is shifted into fourth or high speed, the third and fourth speed clutch gear is moved forward and engages with the internal clutch teeth in the main drive gear. The path of power flow is now directly from the main drive gear to the mainshaft, without passing through the countershaft (fig. 117). The countershaft continues to rotate and so provides lubrication to the mainshaft gears and bearings by splashing the oil upward as it turns.

(6) REVERSE SPEED. When the transmission is shifted into reverse speed, the lower end of the shift lever depresses the lock plunger and lock spring in the reverse speed shift rod bracket. This forces the ball in the bracket into a recess cut in the reverse speed shift rod, and locks the bracket to the rod. NOTE: *If the bracket were locked at all times, the reverse speed shift rod would be moved also when shifting into first and second speeds, since the shift*

(*Continued on Page 114*)

TRANSMISSION AND TRANSFER CASE

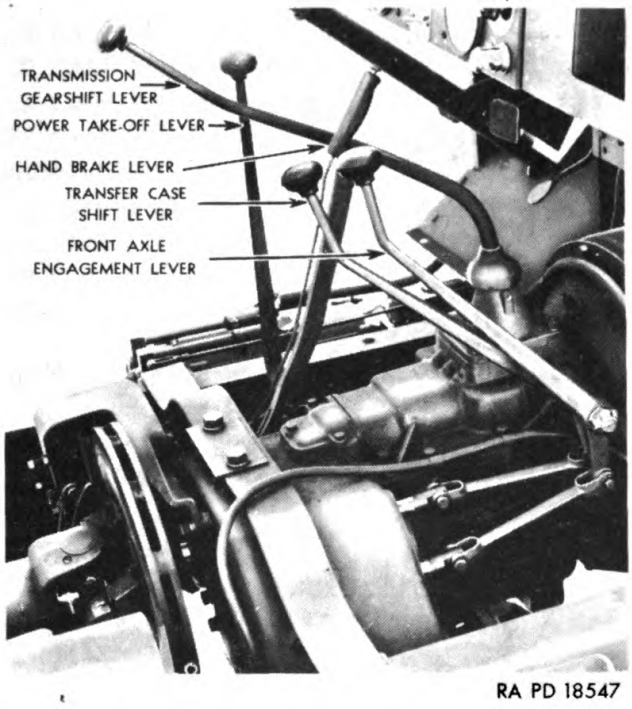


Figure 108 — Transmission and Transfer Case Installed — Right Side

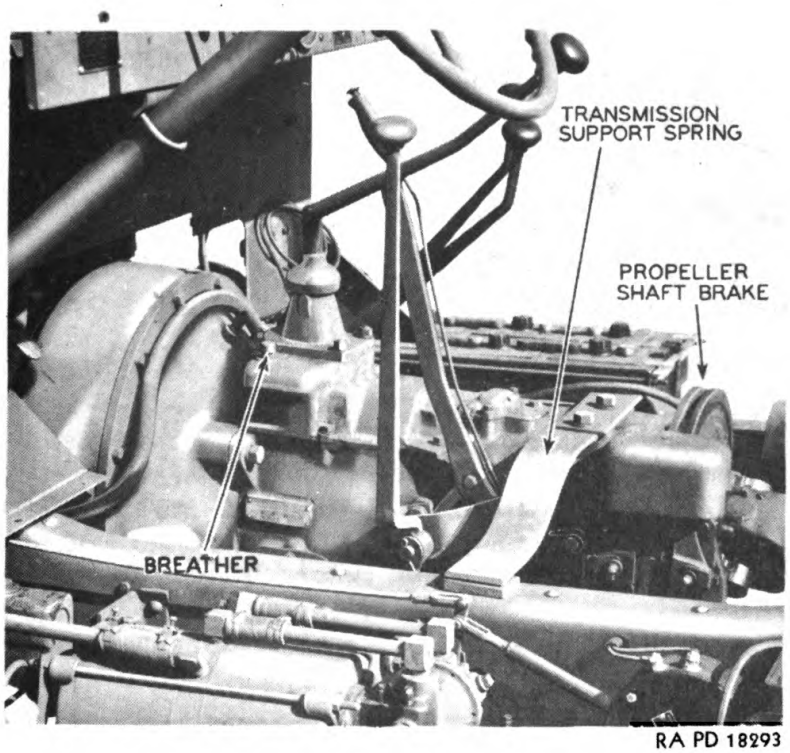


Figure 109 — Transmission and Transfer Case Installed — Left Side

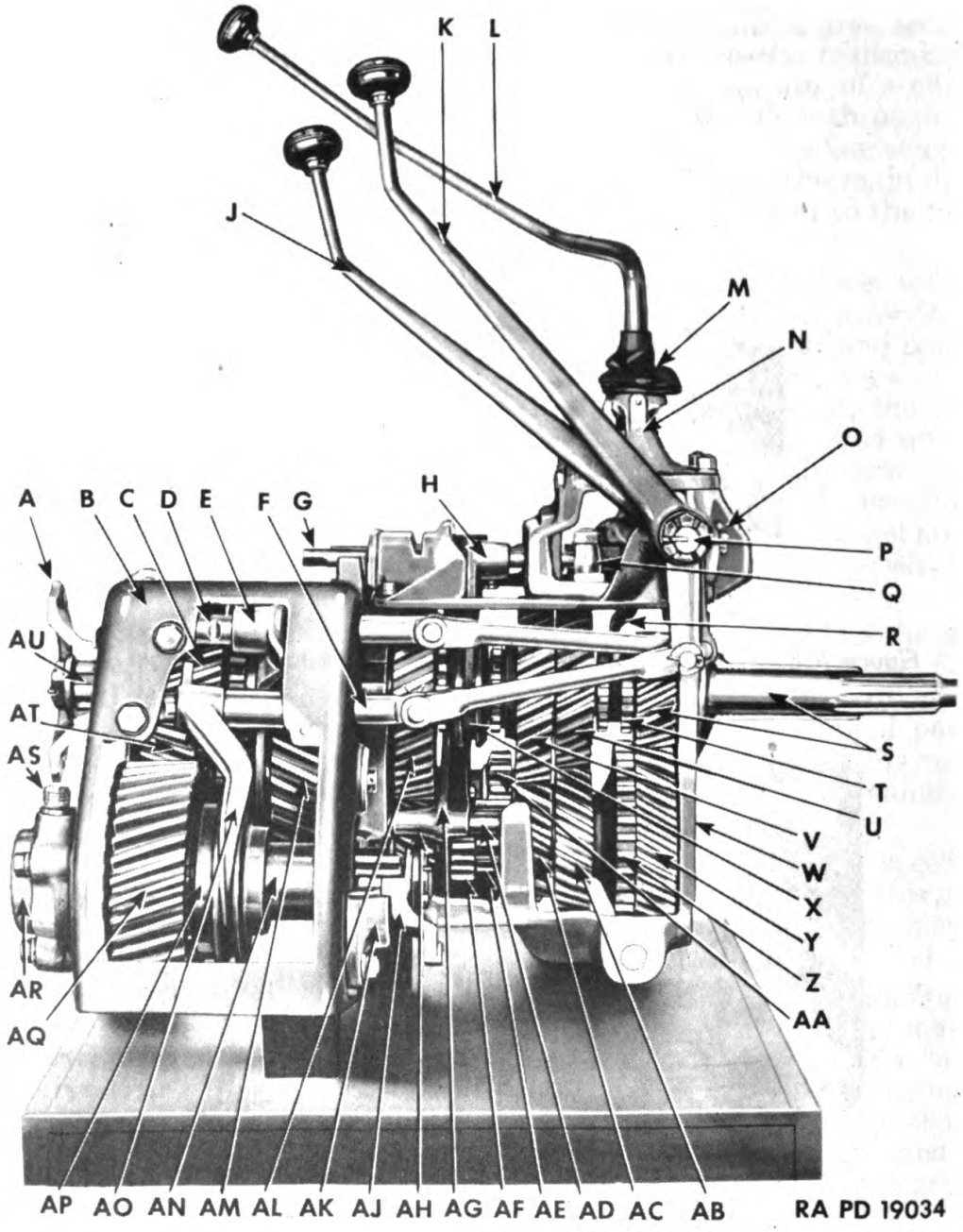


Figure 110 — Cross Section of Transmission and Transfer Case — Right Side

TRANSMISSION AND TRANSFER CASE

A—REAR AXLE PROPELLER SHAFT COMPANION FLANGE
B—TRANSFER CASE
C—TRANSFER CASE MAINSHAFT UNDER-DRIVE GEAR
D—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT ROD
E—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT FORK
F—TRANSFER CASE FRONT DRIVE SHIFT ROD
G—TRANSMISSION FIRST AND SECOND SPEED SHIFT ROD
H—TRANSMISSION FIRST AND SECOND SPEED SHIFT FORK
J—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT LEVER
K—TRANSFER CASE FRONT DRIVE SHIFT LEVER
L—TRANSMISSION MAIN SHIFT LEVER
M—TRANSMISSION MAIN SHIFT LEVER BOOT
N—TRANSMISSION SHIFTER HOUSING COVER
O—TRANSMISSION SHIFTER HOUSING
P—TRANSFER CASE SHIFT LEVER PIVOT PIN
Q—TRANSMISSION FIRST AND SECOND SPEED SHIFT ROD BRACKET
R—TRANSMISSION THIRD AND FOURTH SPEED SHIFT FORK
S—TRANSMISSION MAIN DRIVE GEAR
T—TRANSMISSION THIRD AND FOURTH SPEED CLUTCH GEAR
U—TRANSMISSION MAINSHAFT THIRD SPEED GEAR
V—TRANSMISSION MAINSHAFT SECOND SPEED GEAR
W—TRANSMISSION CASE
X—TRANSMISSION MAINSHAFT FIRST AND SECOND SPEED CLUTCH COLLAR
Y—TRANSMISSION COUNTERSHAFT DRIVE GEAR
Z—TRANSMISSION COUNTERSHAFT POWER TAKE-OFF GEAR
AA—TRANSMISSION REVERSE IDLER GEAR
AB—TRANSMISSION COUNTERSHAFT THIRD SPEED GEAR
AC—TRANSMISSION COUNTERSHAFT SECOND SPEED GEAR
AD—TRANSMISSION REVERSE SPEED SHIFT ROD
AE—TRANSMISSION COUNTERSHAFT
AF—TRANSMISSION COUNTERSHAFT REVERSE SPEED CLUTCH GEAR
AG—TRANSMISSION REVERSE SPEED LOWER SHIFT FORK
AH—TRANSMISSION COUNTERSHAFT FIRST SPEED GEAR
AJ—TRANSFER CASE FRONT AXLE PROPELLER SHAFT COMPANION FLANGE
AK—TRANSFER CASE FRONT DRIVE SHAFT FRONT BEARING CAP
AL—TRANSMISSION MAINSHAFT FIRST SPEED GEAR
AM—TRANSFER CASE INTERMEDIATE SHAFT UNDER-DRIVE GEAR
AN—TRANSFER CASE FRONT DRIVE SHAFT
AO—TRANSFER CASE FRONT DRIVE SHIFT FORK
AP—TRANSFER CASE FRONT DRIVE SHAFT CLUTCH COLLAR
AQ—TRANSFER CASE FRONT DRIVE GEAR
AR—TRANSFER CASE FRONT DRIVE SHAFT REAR BEARING CAP
AS—SPEEDOMETER DRIVE GEAR SLEEVE
AT—TRANSFER CASE INTERMEDIATE SHAFT
AU—TRANSFER CASE MAINSHAFT

RA PD 19034B

Legend for Figure 110

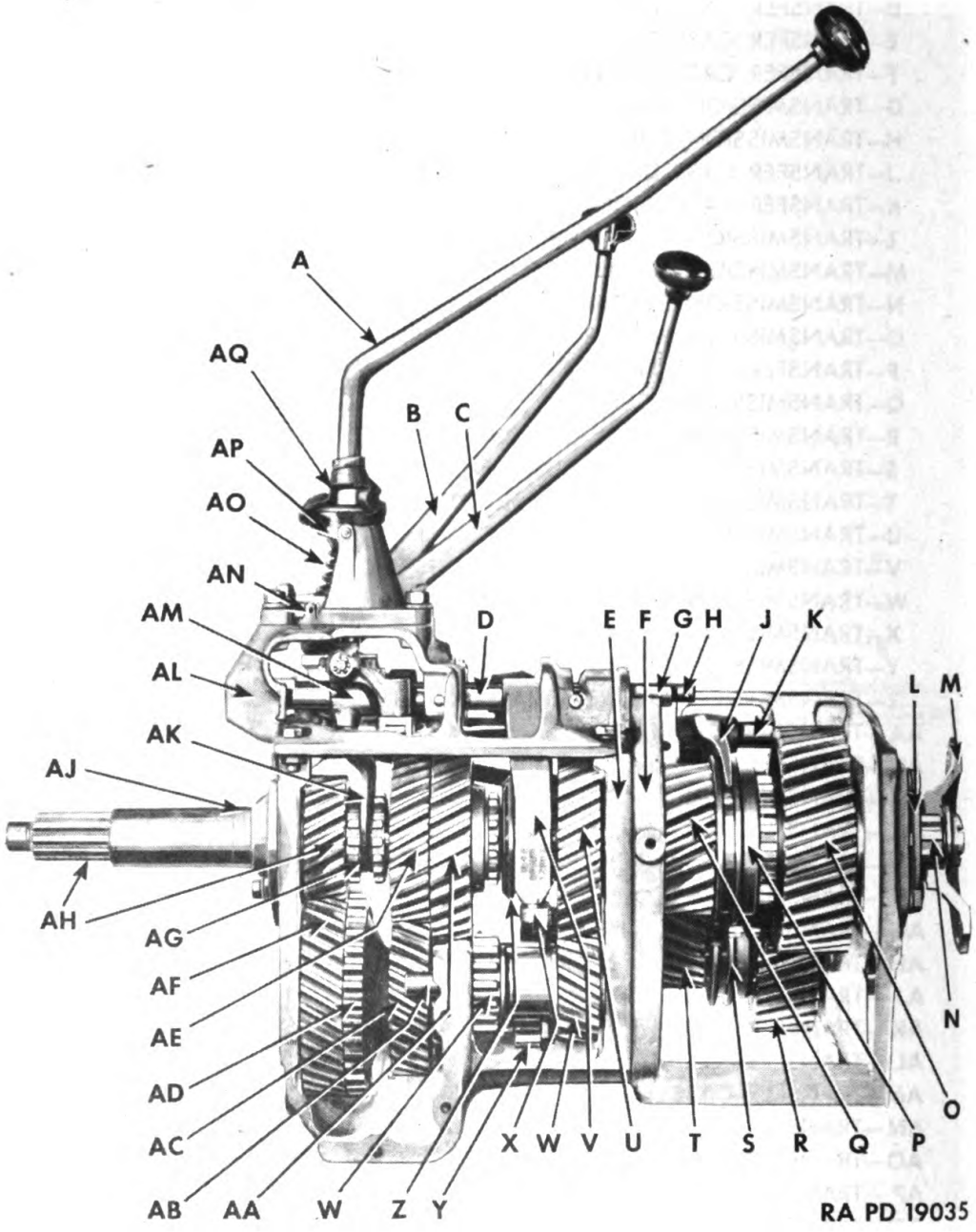


Figure 111 — Cross Section of Transmission and Transfer Case — Left Side

TRANSMISSION AND TRANSFER CASE

A—TRANSMISSION MAIN SHIFT LEVER
B—TRANSFER CASE FRONT DRIVE SHIFT LEVER
C—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT LEVER
D—TRANSMISSION REVERSE SPEED SHIFT ROD
E—TRANSMISSION CASE
F—TRANSFER CASE
G—TRANSMISSION THIRD AND FOURTH SPEED SHIFT ROD
H—TRANSMISSION FIRST AND SECOND SPEED SHIFT ROD
J—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT FORK
K—TRANSFER CASE DIRECT AND UNDER-DRIVE SHIFT ROD
L—TRANSFER CASE MAIN SHAFT REAR BEARING CAP
M—TRANSFER CASE REAR AXLE PROPELLER SHAFT COMPANION FLANGE
N—TRANSFER CASE MAIN SHAFT
O—TRANSFER CASE MAIN SHAFT UNDER-DRIVE GEAR
P—TRANSFER CASE MAIN SHAFT CLUTCH COLLAR
Q—TRANSFER CASE MAIN SHAFT DRIVE GEAR
R—TRANSFER CASE FRONT DRIVE SHAFT GEAR
S—TRANSFER CASE FRONT DRIVE SHAFT CLUTCH COLLAR
T—TRANSFER CASE INTERMEDIATE SHAFT UNDER-DRIVE GEAR
U—TRANSMISSION MAINSHAFT FIRST SPEED GEAR
V—TRANSMISSION UPPER REVERSE SPEED SHIFT FORK
W—TRANSMISSION REVERSE IDLER GEAR
X—TRANSMISSION LOWER REVERSE SPEED SHIFT FORK
Y—TRANSMISSION COUNTERSHAFT REVERSE SPEED CLUTCH GEAR
Z—TRANSMISSION MAINSHAFT FIRST AND SECOND SPEED CLUTCH COLLAR
AA—TRANSMISSION MAINSHAFT SECOND SPEED GEAR
AB—TRANSMISSION REVERSE IDLER SHAFT
AC—TRANSMISSION COUNTERSHAFT THIRD SPEED GEAR
AD—TRANSMISSION COUNTERSHAFT POWER TAKE-OFF GEAR
AE—TRANSMISSION MAINSHAFT THIRD SPEED GEAR
AF—TRANSMISSION COUNTERSHAFT DRIVE GEAR
AG—TRANSMISSION MAINSHAFT THIRD AND FOURTH SPEED CLUTCH GEAR
AH—TRANSMISSION MAIN DRIVE GEAR
AJ—TRANSMISSION MAINSHAFT FRONT BEARING COVER
AK—TRANSMISSION THIRD AND FOURTH SPEED SHIFT FORK
AL—TRANSMISSION SHIFTER HOUSING
AM—TRANSMISSION REVERSE SPEED SHIFT ROD BRACKET
AN—TRANSMISSION SHIFTER HOUSING BREATHER
AO—TRANSMISSION MAIN SHIFT LEVER SUPPORT SPRING
AP—TRANSMISSION SHIFTER HOUSING COVER
AQ—TRANSMISSION MAIN SHIFT LEVER LEATHER BOOT

RA PD 19035B

Legend for Figure 111

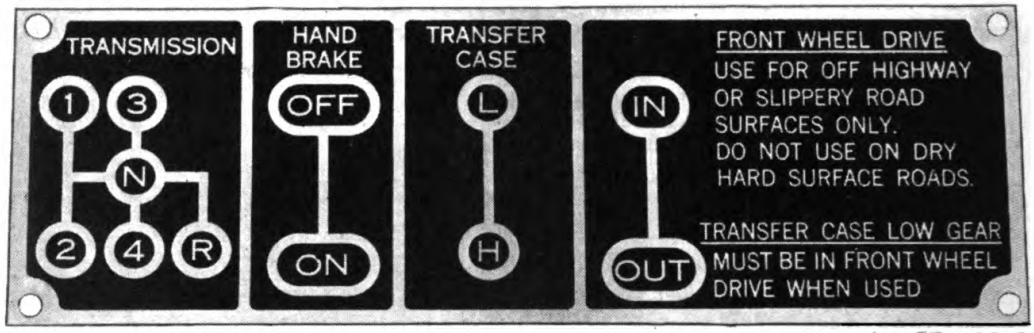


Figure 112 — Gearshift Diagram Plate

brackets are connected by a relay lever. Shifting into reverse speed moves the reverse speed shift fork which is locked to the rod. The lower reverse shift fork, moved by the upper fork, slides forward on its shaft and pushes the countershaft reverse speed clutch gear forward, engaging it with the spur gear portion of the reverse idler gear. By means of the relay lever, which pivots abouts its mounting screw, the first and second speed shift rod bracket and shift rod are moved toward the rear, thereby shifting into first speed. Thus, the shift into reverse speed automatically shifts the transmission mainshaft sliding clutch into first speed gear position as well. The flow of power is therefore from the main drive gear to the countershaft, to the countershaft reverse speed clutch gear, to the spur gear portion of the reverse idler gear, to the helical gear portion of the reverse idler gear, to the mainshaft first speed gear (in constant mesh with the helical portion of the reverse idler gear), to the mainshaft, and on to the transfer case (fig. 118).

(7) TRANSFER CASE GEARS. As in the transmission, all the transfer case gears rotate at all times during vehicle operation. The intermediate shaft under-drive gear and the front axle drive shaft gear are needle-bearing mounted and rotate freely on their respective shafts. It is therefore necessary to lock them to their shafts whenever it is desired to include them in the path of power flow through the transfer case.

(8) DIRECT DRIVE AND UNDER-DRIVE. The shift into either direct drive (high) or under-drive (low) through the transfer case is accomplished by means of the left-hand shift lever at the right side of the transmission shifter housing. Moving the shifter lever to the rear, to shift into direct drive, moves forward the direct and under-drive shift rod and double yoke fork. This moves the mainshaft and intermediate shaft clutch collars forward (the double yoke fork being mounted on both collars). The mainshaft clutch collar engages with the clutch teeth on the transfer case mainshaft drive gear and locks the mainshaft drive gear to the mainshaft. The flow of power through the transfer case is directly to the

TRANSMISSION AND TRANSFER CASE

mainshaft and out to the rear axle propeller shaft. Moving the shifter lever forward to shift into under-drive gear moves the clutch collars to the rear, disengaging the mainshaft clutch collar from the drive gear and locking the intermediate shaft under-drive gear to the intermediate shaft by means of the clutch collar. The path of power flow is therefore from the main drive gear through the intermediate shaft under-drive gear, the intermediate shaft, and the mainshaft under-drive gear, to the mainshaft.

(9) FRONT DRIVE. The shift into or out of front axle drive is performed by moving the right-hand shift lever, thereby moving the front drive shaft clutch collar into or out of engagement with the front drive shaft gear. Moving the shift lever forward moves the shift rod, yoke fork, and clutch collar to the rear, engaging the clutch collar with the clutch teeth on the gear. This locks the gear to the shaft and the front drive is engaged. The flow of power is from the integral gear on the intermediate shaft, which always has power available since it is either giving power to, or receiving power from, the mainshaft under-drive gear, to the front drive shaft gear, and then to the shaft. Moving the shift lever to the rear disengages the clutch collar from the front drive shaft gear and thereby disengages the front drive.

c. Data.

(1) SPECIFICATIONS.

Make	International
Design	Spicer
Model (IHC)	1856
Type	Combination transmission
Mounting	Unit power plant

(2) GEAR RATIOS.

	DIRECT	UNDER-DRIVE
First speed	4.92:1	12.20:1
Second speed	2.60:1	6.44:1
Third speed	1.74:1	4.31:1
Fourth speed	1.00:1	2.48:1
Reverse speed	4.37:1	10.83:1

(3) TRANSMISSION.

Type	Constant mesh
Speeds	Four forward—one reverse

(4) TRANSMISSION BEARINGS:

Main drive gear:

Type	Ball
Make and number	ND-47511

(*Continued on Page 123*)

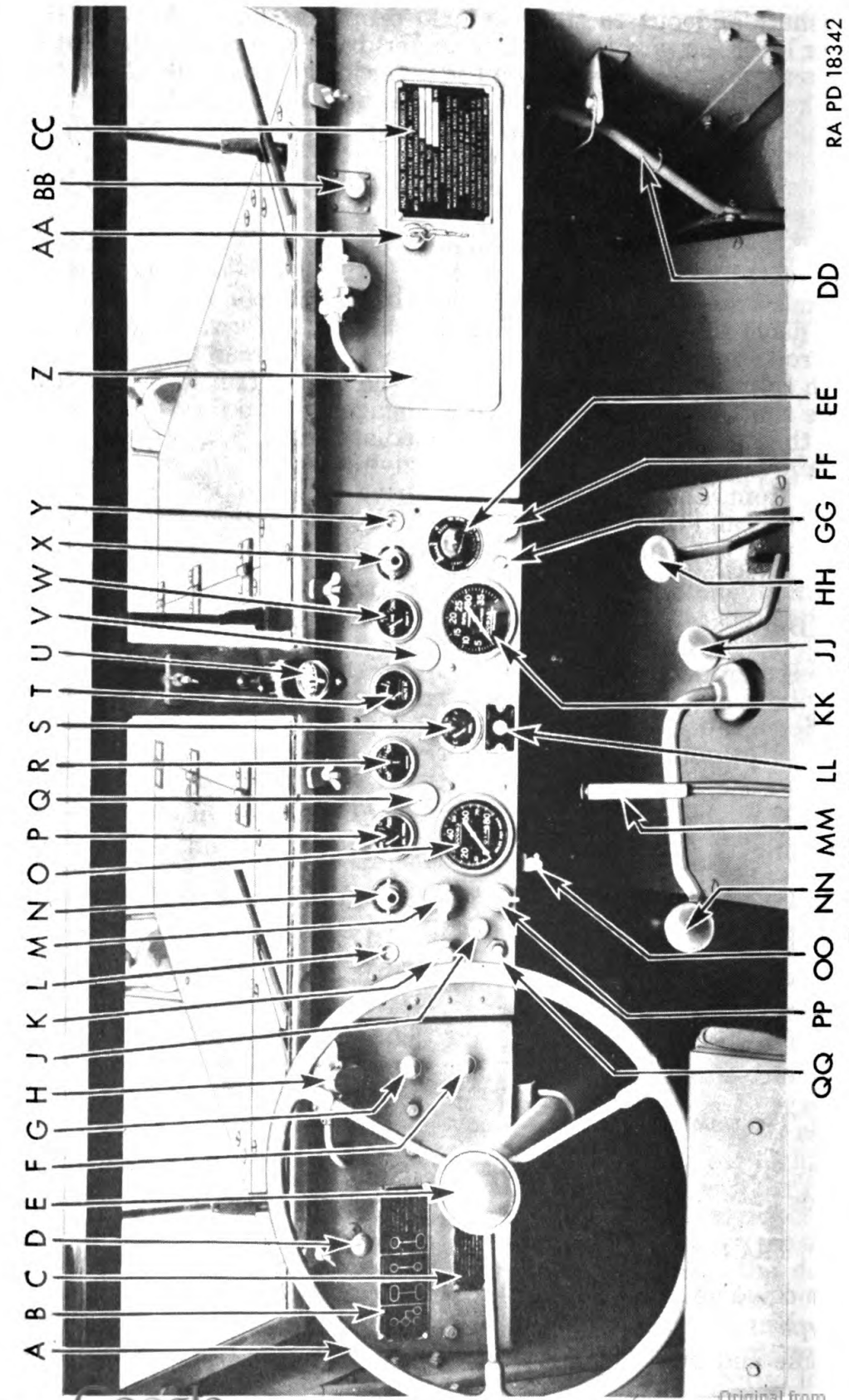


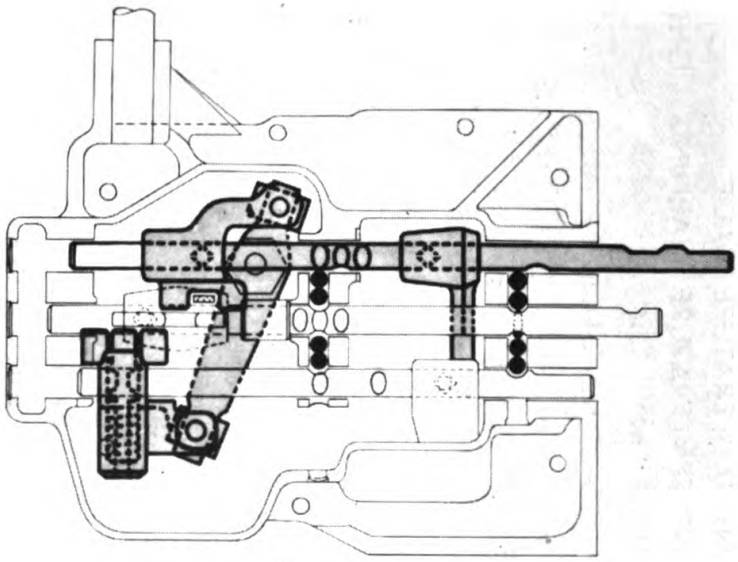
Figure 113 — Instrument Panel and Controls

TRANSMISSION AND TRANSFER CASE

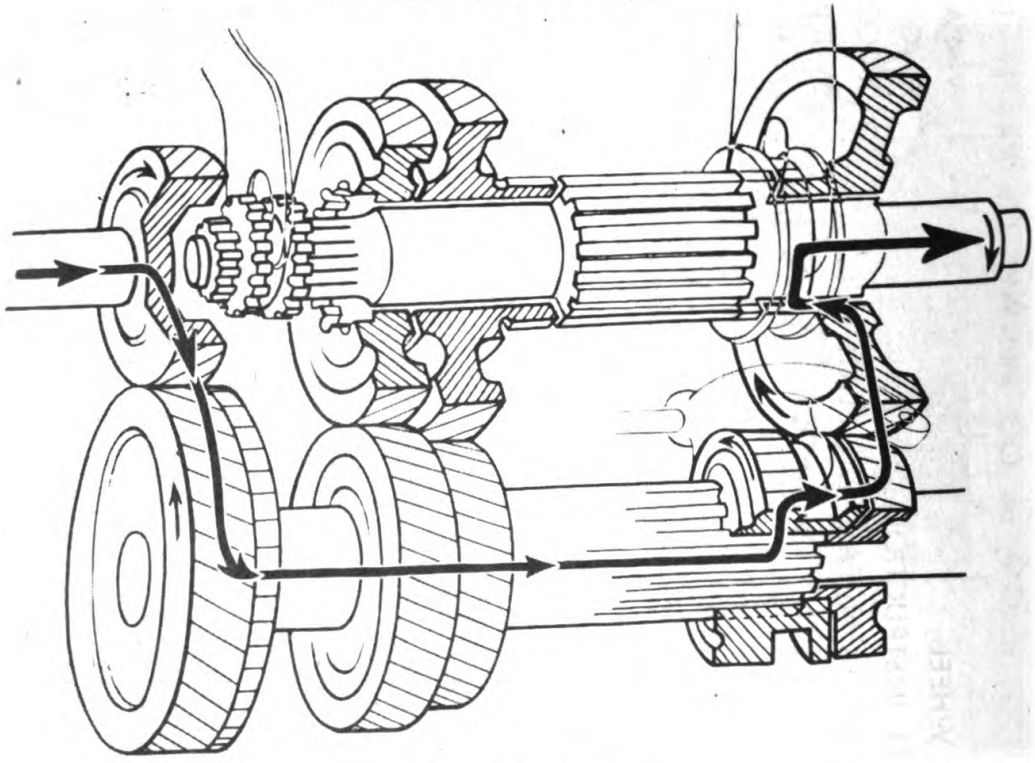
A—STEERING WHEEL
B—GEAR SHIFT INSTRUCTION PLATE
C—WINCH OPERATION CAUTION PLATE
D—COMPARTMENT VENT CONTROL
E—HORN BUTTON
F—THROTTLE CONTROL
G—CHOKE CONTROL
H—WINDSHIELD WIPER ASSEMBLY
J—PANEL LIGHT SWITCH
K—BLACKOUT DRIVING LAMP SWITCH
L—INSPECTION LAMP SOCKET
M—BLACKOUT AND SERVICE LIGHT SWITCH
N—OIL PRESSURE WARNING LIGHT
O—SPEEDOMETER
P—OIL PRESSURE GAGE
Q—PANEL LIGHT COVER
R—AMMETER
S—FUEL GAGE
T—VOLTMETER
U—COMPASS
V—PANEL LIGHT COVER
W—COOLANT TEMPERATURE GAGE
X—COOLANT TEMPERATURE WARNING LIGHT
Y—INSPECTION LAMP SOCKET
Z—MAP COMPARTMENT DOOR
AA—MAP COMPARTMENT DOOR LOCK
BB—AIR CLEANER CONTROL
CC—VEHICLE REGISTRATION PLATE
DD—RADIATOR SHUTTER CONTROL LEVER
EE—RHEOSTAT LOAD CONTOL FOR TRAILER BRAKES
FF—MAP READING LAMP
GG—MAP READING LAMP SWITCH
HH—FRONT AXLE SHIFT LEVER
JJ—TRANSFER CASE SHIFT LEVER
KK—TACHOMETER
LL—FUEL TANK SELECTOR SWITCH
MM—HAND BRAKE LEVER
NN—TRANSMISSION SHIFT LEVER
OO—SPEEDOMETER RE-SET SHAFT
PP—IGNITION SWITCH
QQ—STARTER BUTTON

RA PD 18342B

Legend for Figure 113



A. SHIFT ROD POSITION

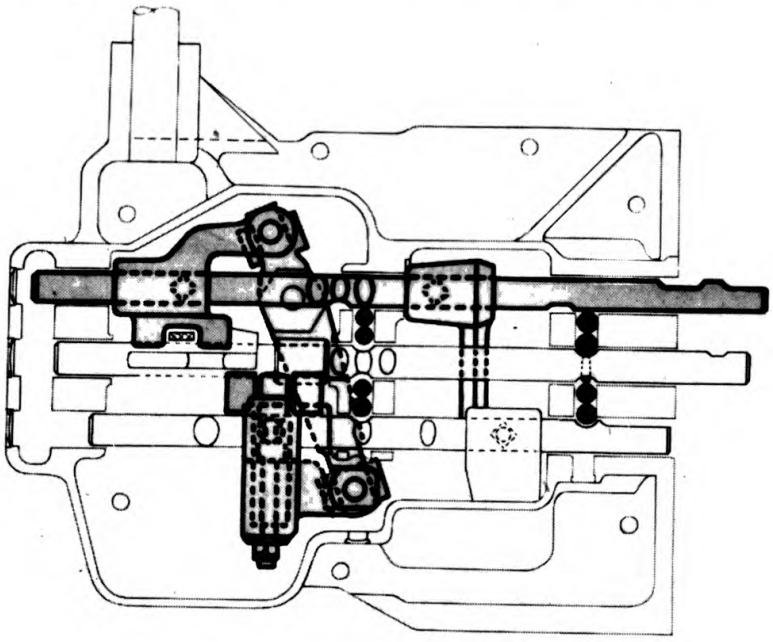


B. POWER FLOW

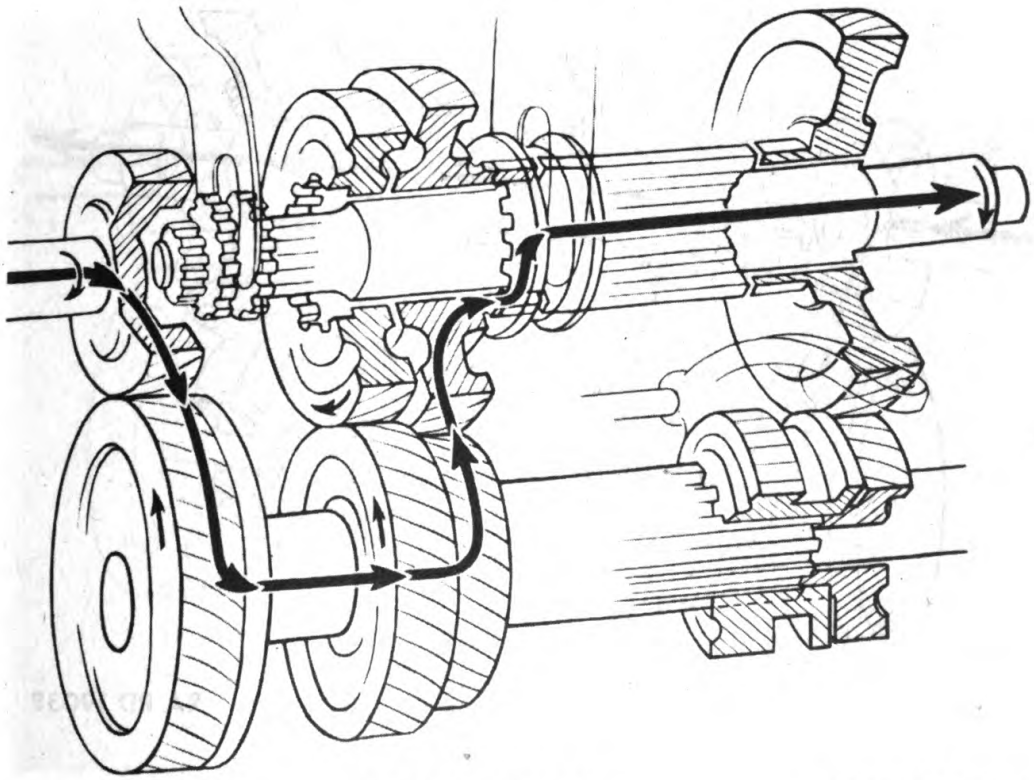
RA PD 19036

Figure 114 — First Speed Power Flow Diagrams

TRANSMISSION AND TRANSFER CASE

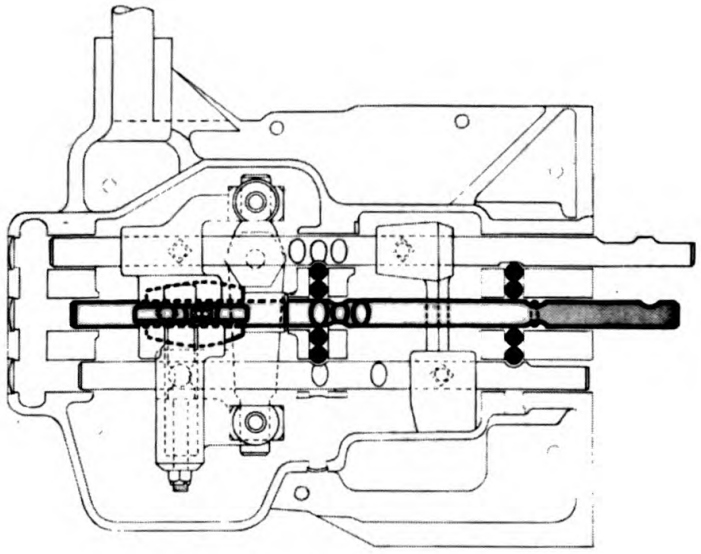


A. SHIFT ROD POSITION

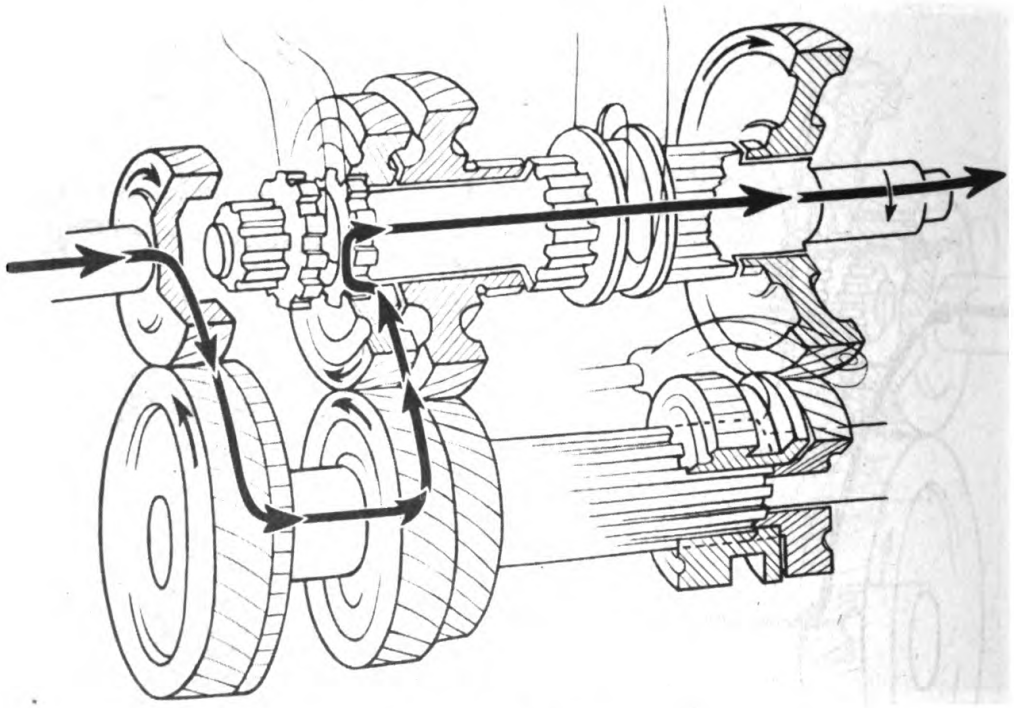


B. POWER FLOW RA PD 19037

Figure 115 — Second Speed Power Flow Diagrams



A. SHIFT ROD POSITION

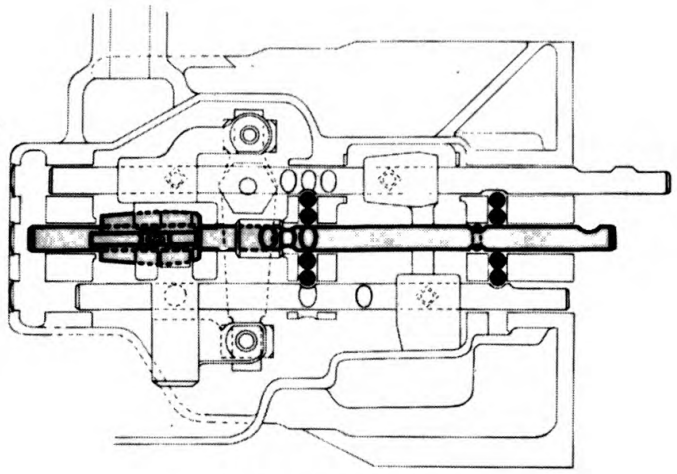


B. POWER FLOW

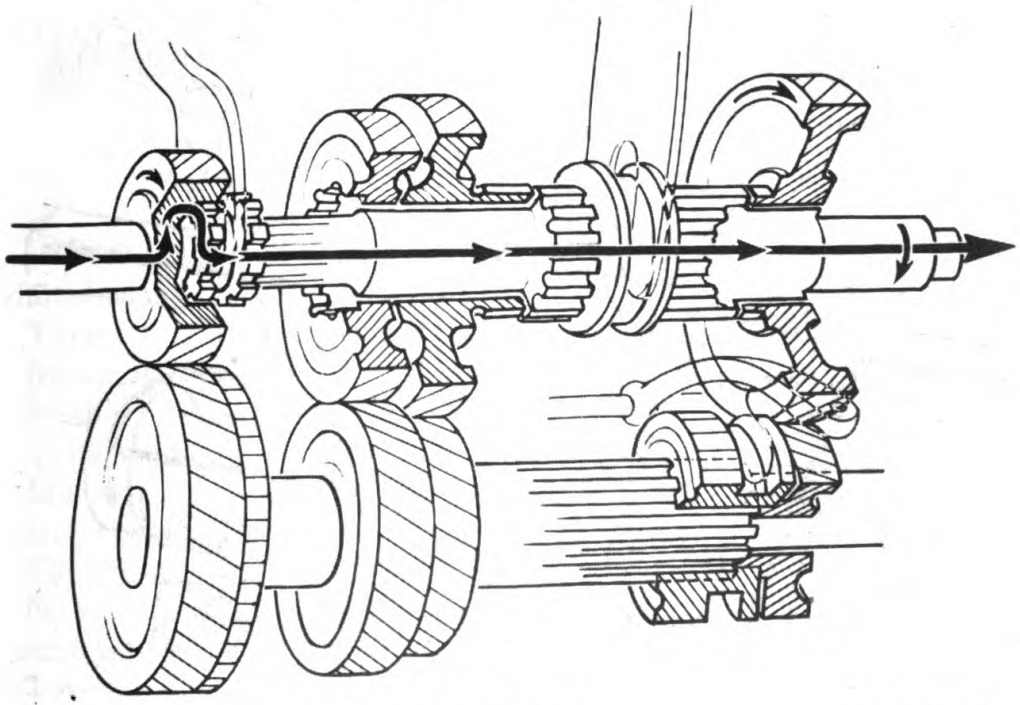
RA PD 19038

Figure 116 — Third Speed Power Flow Diagrams

TRANSMISSION AND TRANSFER CASE



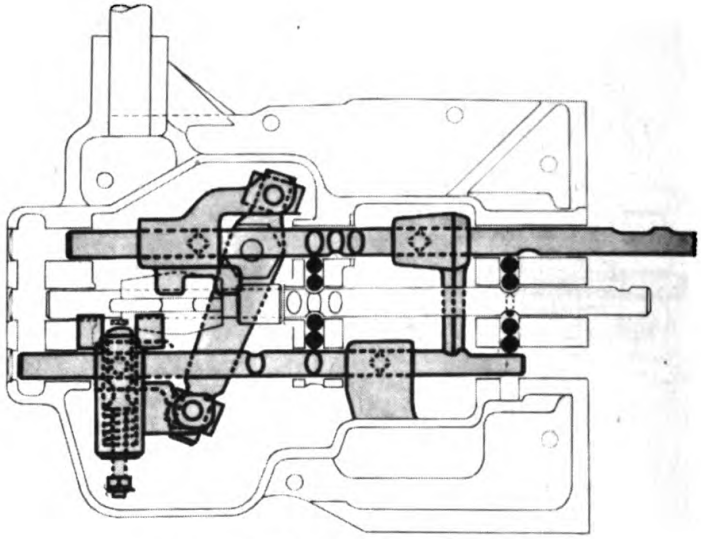
A. SHIFT ROD POSITION



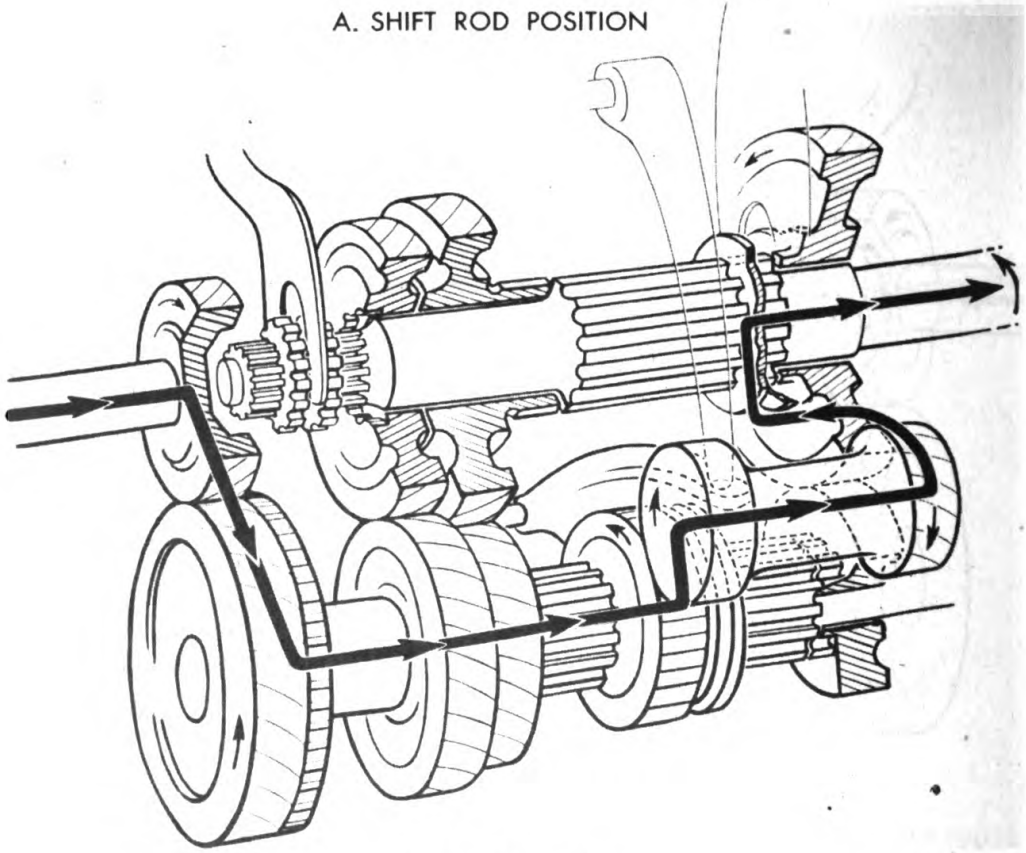
B. POWER FLOW

RA PD 19039

Figure 117 — Fourth Speed Power Flow Diagrams



A. SHIFT ROD POSITION



B. POWER FLOW

RA PD 19040

Figure 118 — Reverse Speed Power Flow Diagrams

TRANSMISSION AND TRANSFER CASE

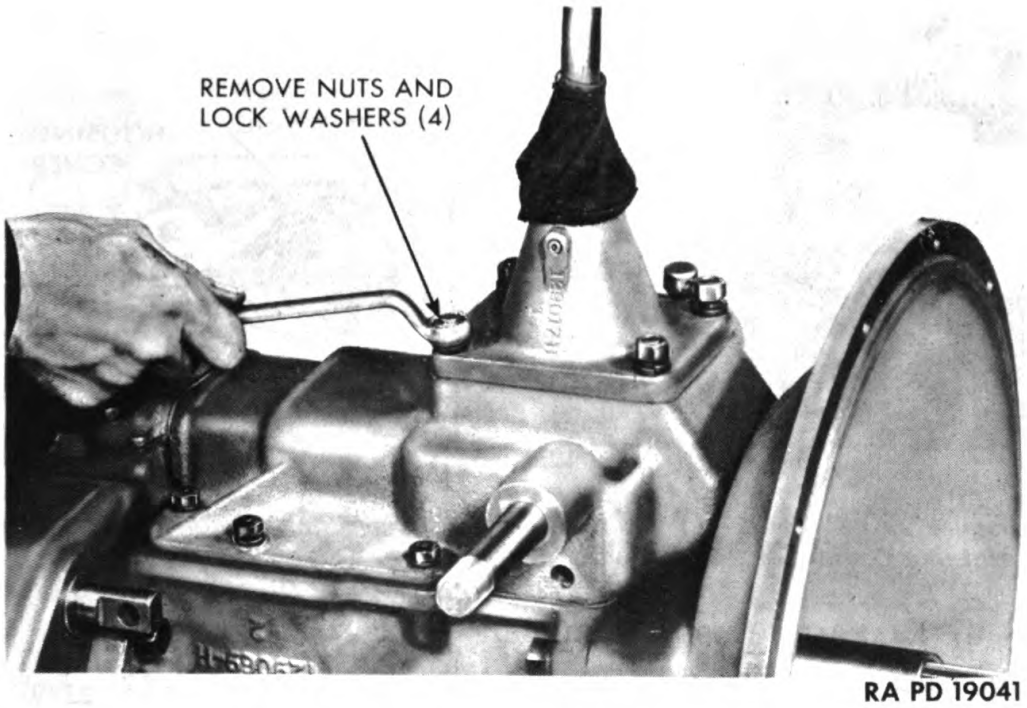


Figure 119 — Removing Shifter Housing Cover Nuts

TRANSMISSION BEARINGS DATA—*Continued from Page 115.*

Mainshaft front pilot:
- Type . . . . . Roller
- Make and number Hyatt–U–1206–TM

Mainshaft rear:
- Type . . . . . Ball
- Make and number IHC–ST–236

Countershaft front:
- Type . . . . . Roller
- Make and number Hyatt–1207–TS

Countershaft rear:
- Type . . . . . Ball
- Make and number IHC–ST–233

Reverse idler gear . . . . . Bushings

(5) TRANSFER CASE.

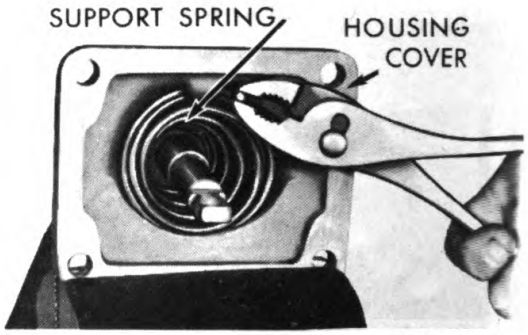
Type . . . . . Direct and under-drive, front axle declutching

Gear Ratios:
- Direct (high) 1.00:1
- Under-drive (low) 2.48:1

(*Continued on Page 124*)


RA PD 19042

Figure 120 — Removing Shifter Housing Cover and Shifter Lever



RA PD 19043

Figure 121 — Removing Shift Lever Support Spring

(6) TRANSFER CASE BEARINGS.

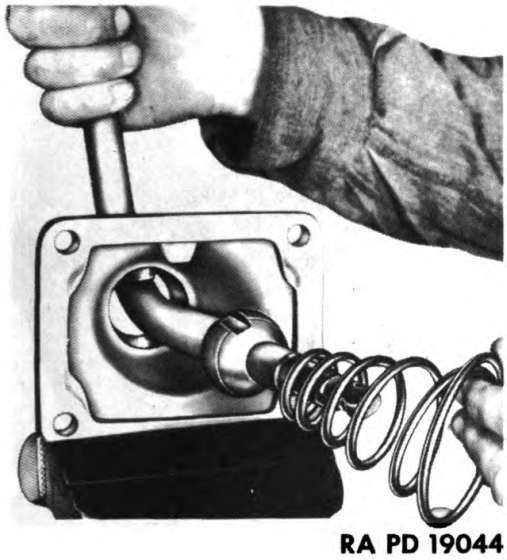
Mainshaft front pocket:
Type . . . . . Roller
Make and number . . . . . Hyatt U–1306–TM
Mainshaft rear:
Type . . . . . Ball
Make and number IHC–ST–251
Intermediate shaft and front drive shaft, front and rear:
Type . . . . . Tapered roller
Cone and roller make and number . . . . . Timken 25577
Cup make and number . . . . . Timken 25520
Intermediate shaft under-drive gear:
Type . . . . . Needle
Make and number . . . . . Spicer 22–4821
Front drive shaft gear:
Type . . . . . Needle
Make and number . . . . . Spicer 98–776

50. REMOVAL.

a. Instructions covering the removal of the transmission and transfer case assembly are detailed in TM 9-707.

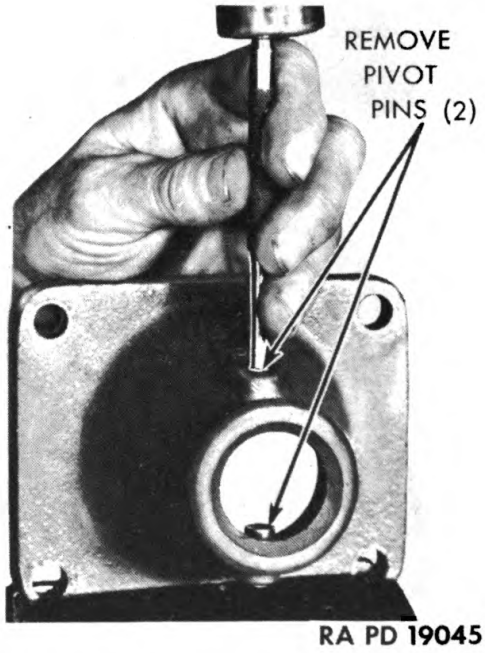
51. CLEANING AND INSPECTION.

a. **Cleaning.** Following removal of the transmission and transfer case from the vehicle, the combined unit must be cleaned



RA PD 19044

Figure 122 — Removing Shift Lever and Support Spring



RA PD 19045

Figure 123 — Removing Shift Lever Pivot Pins

of all dirt, grease, and oil either by using a steam cleaner or by scrubbing with dry-cleaning solvent.

b. Inspection. Inspect unit externally for obvious loss of parts, or for housing cracks or breakage.

52. DISASSEMBLY.

a. Remove Transfer Case Shift Levers. Remove cotter pins and yoke pins from shift lever links. Remove links from shift levers and from shift rods. Remove cotter pin from shift lever stud nut, and remove nut and washer from stud. Remove shift levers from stud.

b. Remove Transmission Shifter Housing Cover Assembly. Place transmission gears in neutral position. Remove four nuts and lock washers from housing studs (fig. 119). Lift off shift lever and housing cover assembly, and remove gasket (fig. 120).

c. Disassemble Main Shift Lever and Shifter Housing Cover. Remove shift lever knob by unscrewing from lever. Remove retaining wire from leather boot seal, and remove boot from shift lever. Remove shift lever support spring from housing cover by mounting latter in a vise, gripping end of spring with pliers, and twisting spring off of retaining lug inside its cover (fig. 121.) Remove shift lever and spring through bottom of cover (fig. 122). Remove shift lever pivot pins from cover, driving both out from outside by means of a punch (fig. 123).

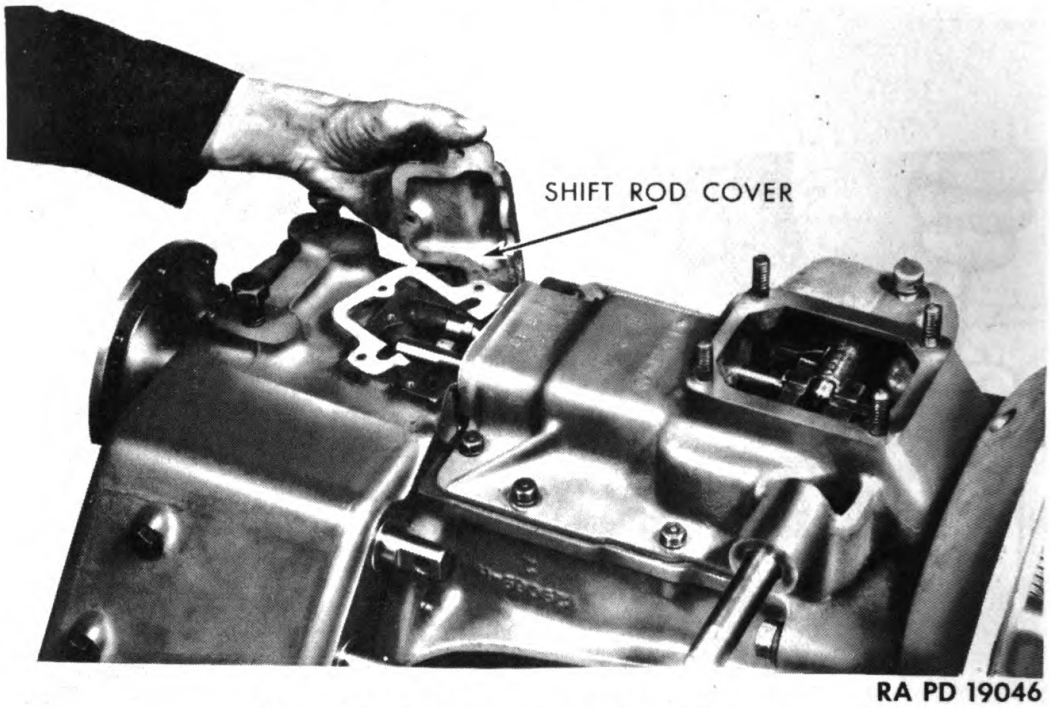


Figure 124 — Removing Shift Rod Cover

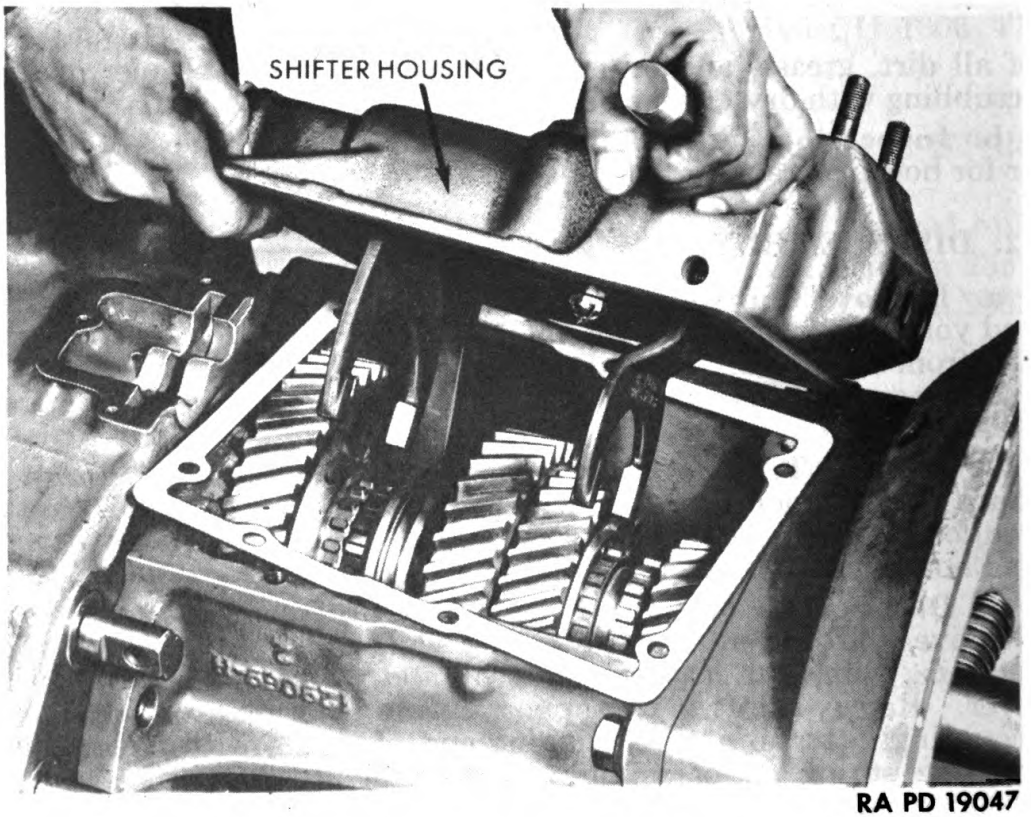


Figure 125 — Removing Shifter Housing Assembly

TRANSMISSION AND TRANSFER CASE

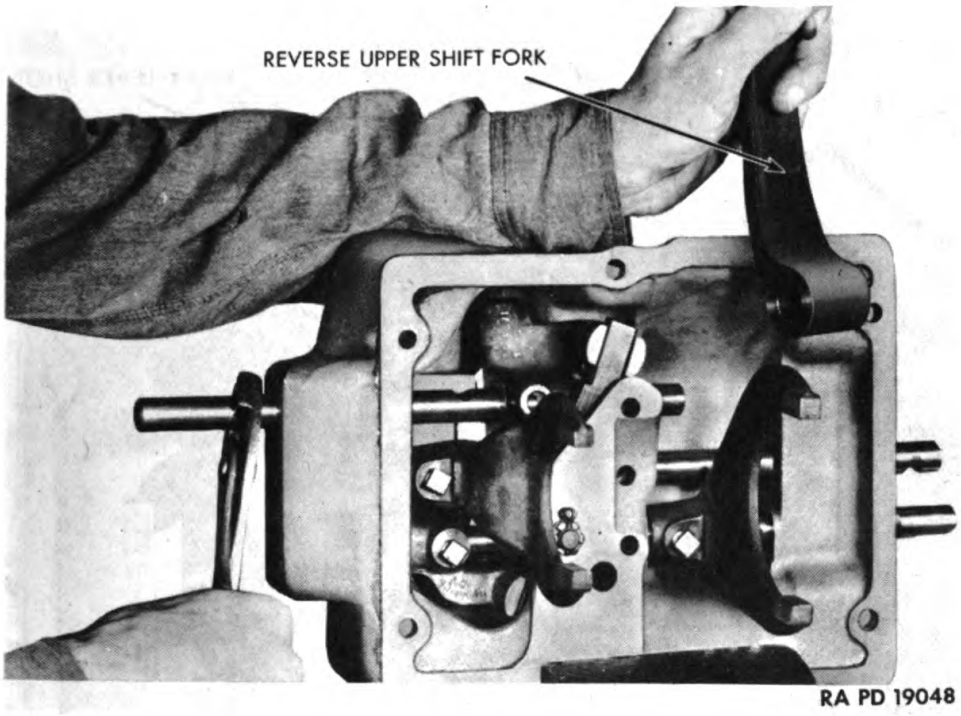


Figure 126 — Removing Reverse Speed Upper Shift Fork

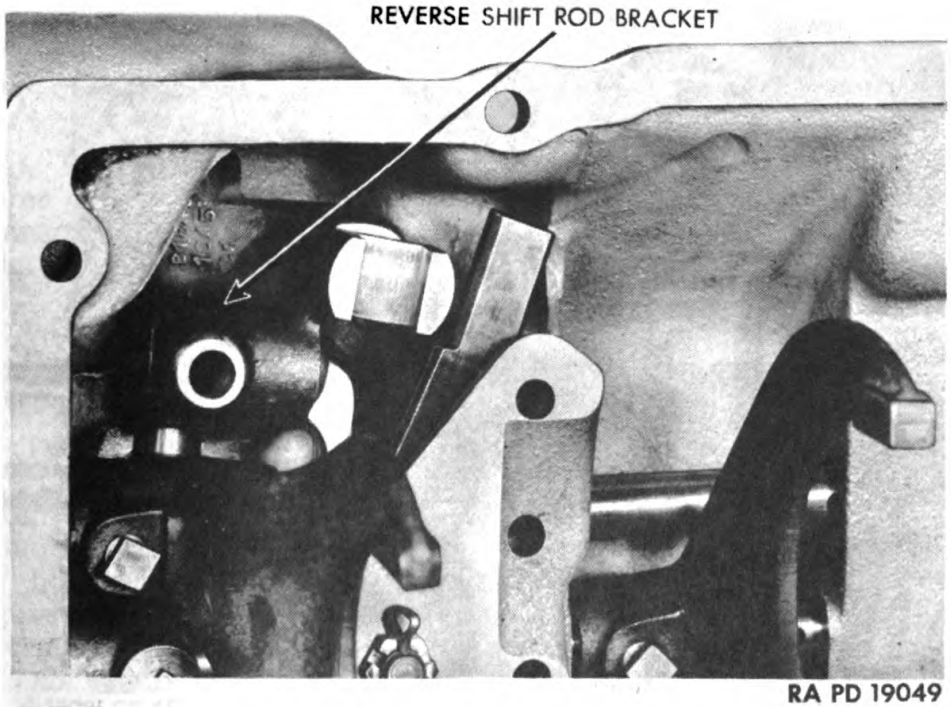


Figure 127 — Removing Reverse Shift Rod Bracket

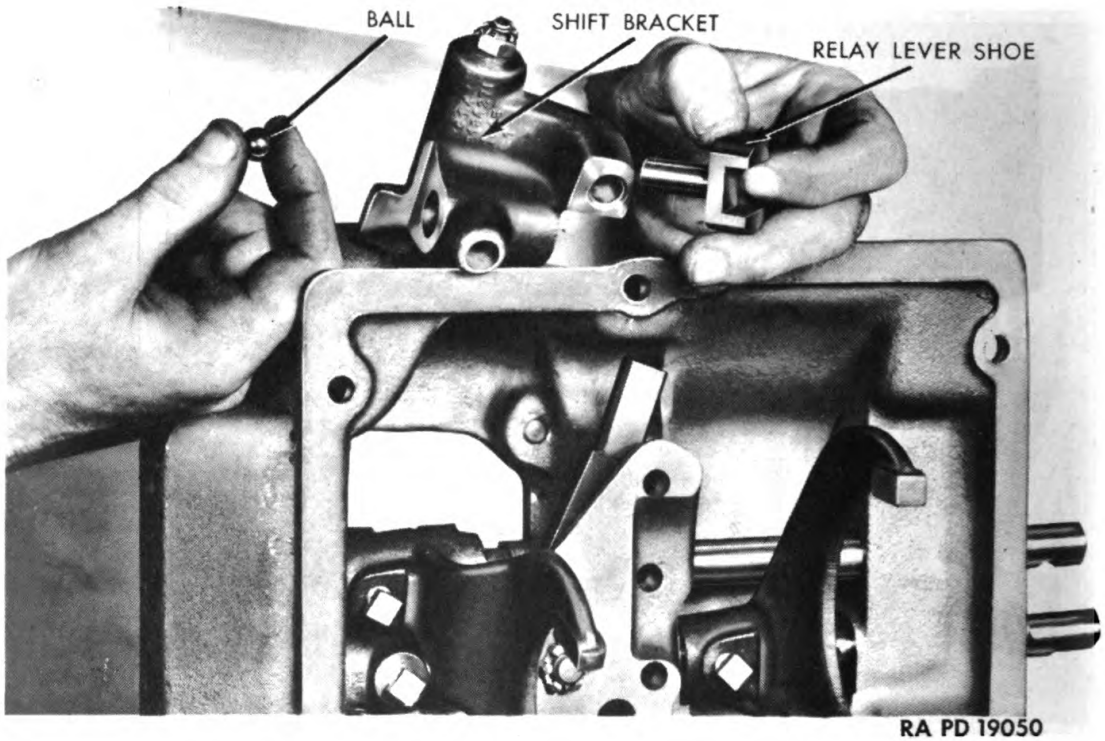


Figure 128 — Removing Reverse Shift Rod Bracket, Ball, and Relay Lever Shoe

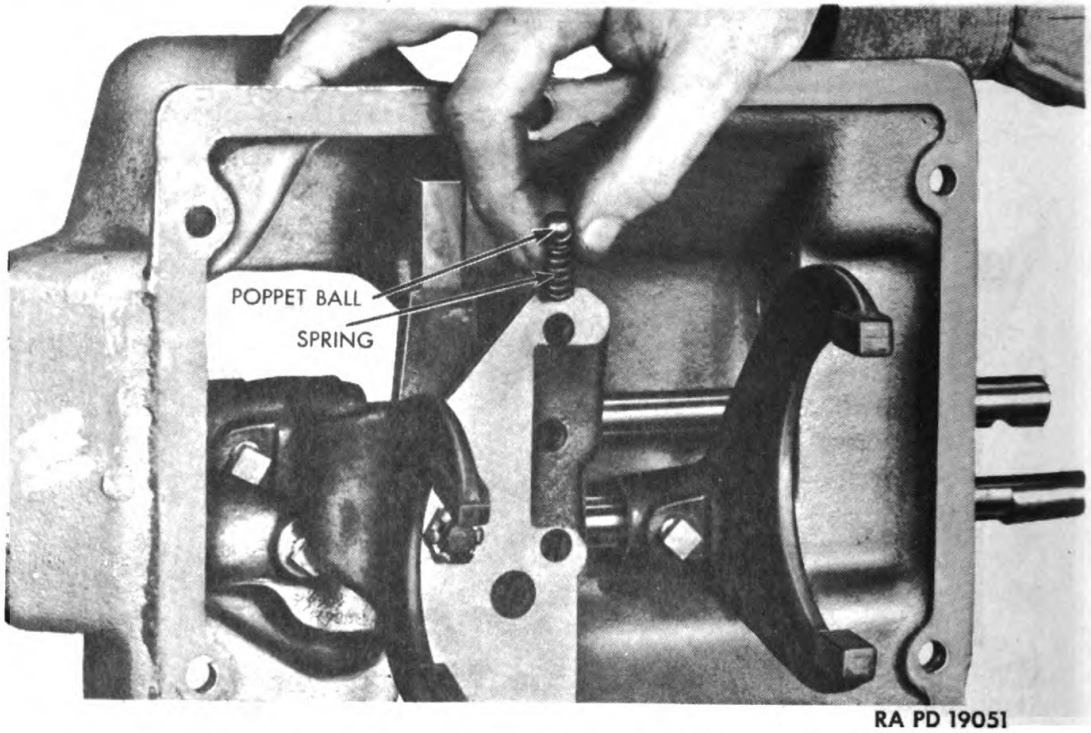


Figure 129 — Removing Reverse Shift Rod Poppet Ball and Spring

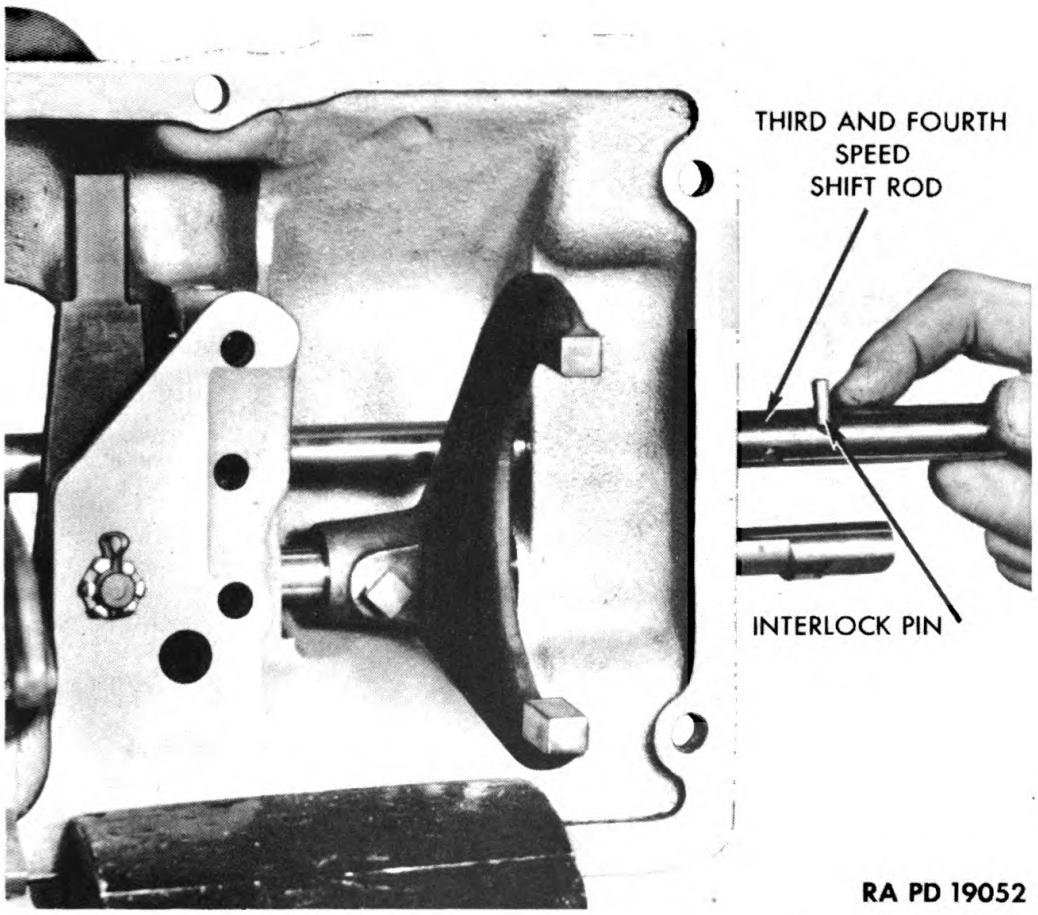


Figure 130 — Removing Third and Fourth Speed Shift Rod

d. Remove Shift Rod Cover from Transfer Case. Remove three cap screws and lock washers from shift rod cover at rear of transmission on top of transfer case. Remove cover and gasket (fig. 124).

e. Remove Transmission Shifter Housing Assembly. Remove seven cap screws and lock washers from transmission shifter housing, and lift housing and gasket from transmission (fig. 125).

f. Disassemble Shifter Housing.

(1) REMOVE REVERSE SPEED SHIFT ROD, BRACKET, AND FORK. NOTE: *This rod is the shortest of the three.* Remove lock wires from shift fork and shift bracket set screws. Remove set screw from reverse upper shifter fork. Drive shift rod out through front of housing, removing small expansion plug. Remove reverse upper shift fork from housing (fig. 126). Continue removal of shift rod until shift rod bracket is free from rod (fig. 127). NOTE: *Do not lose reverse shift bracket lock ball (fig. 128).* Remove reverse shift bracket, ball, and relay lever shoe from housing (fig. 128). Remove reverse shift rod poppet ball and spring (fig. 129). Remove

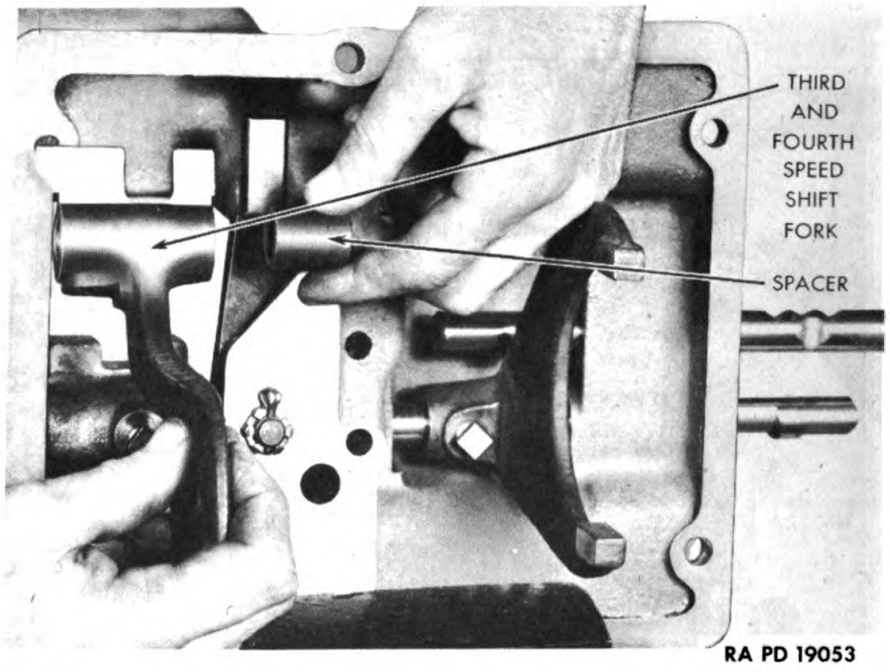


Figure 131 — Removing Third and Fourth Speed Shift Fork

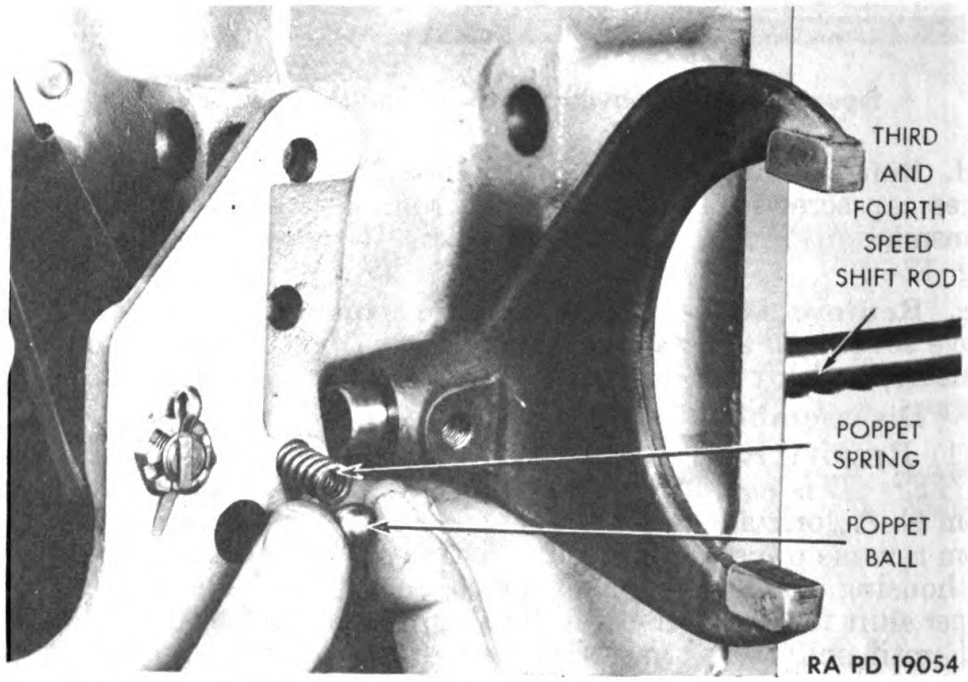


Figure 132 — Removing Third and Fourth Speed Shift Rod Poppet Ball and Spring

TRANSMISSION AND TRANSFER CASE

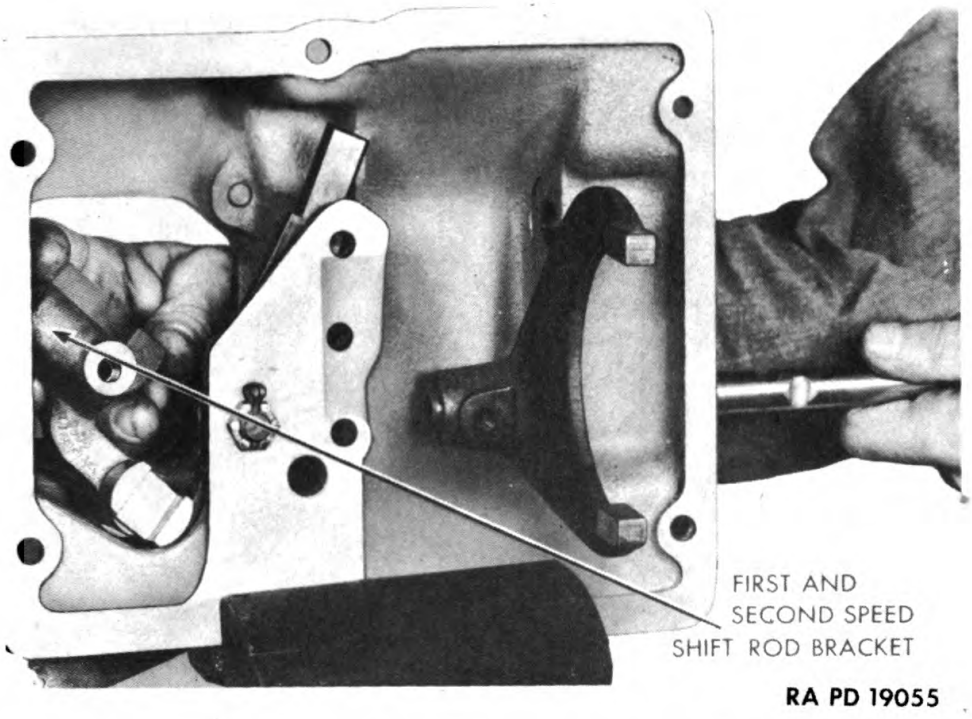


Figure 133 — Removing First and Second Speed Shift Rod Bracket

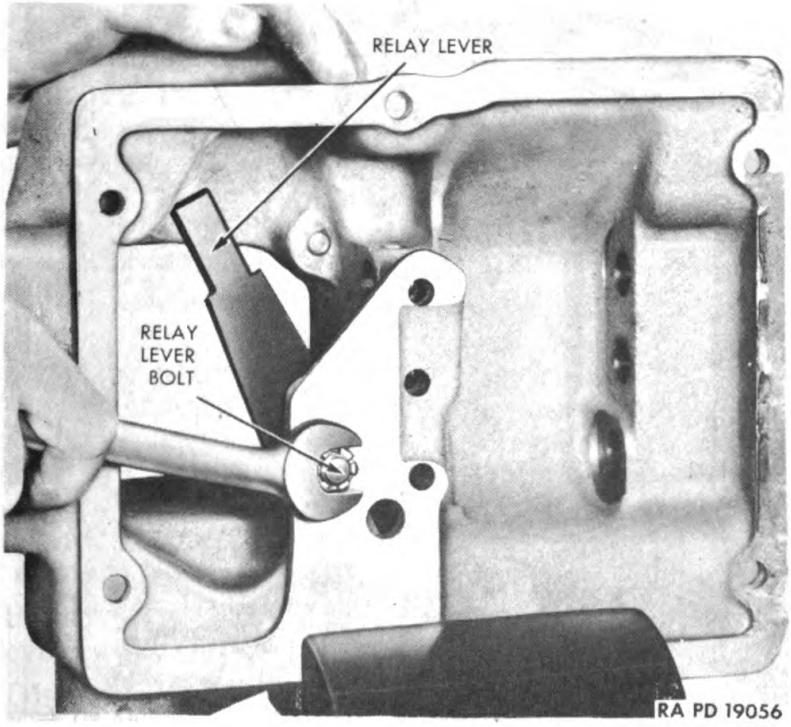
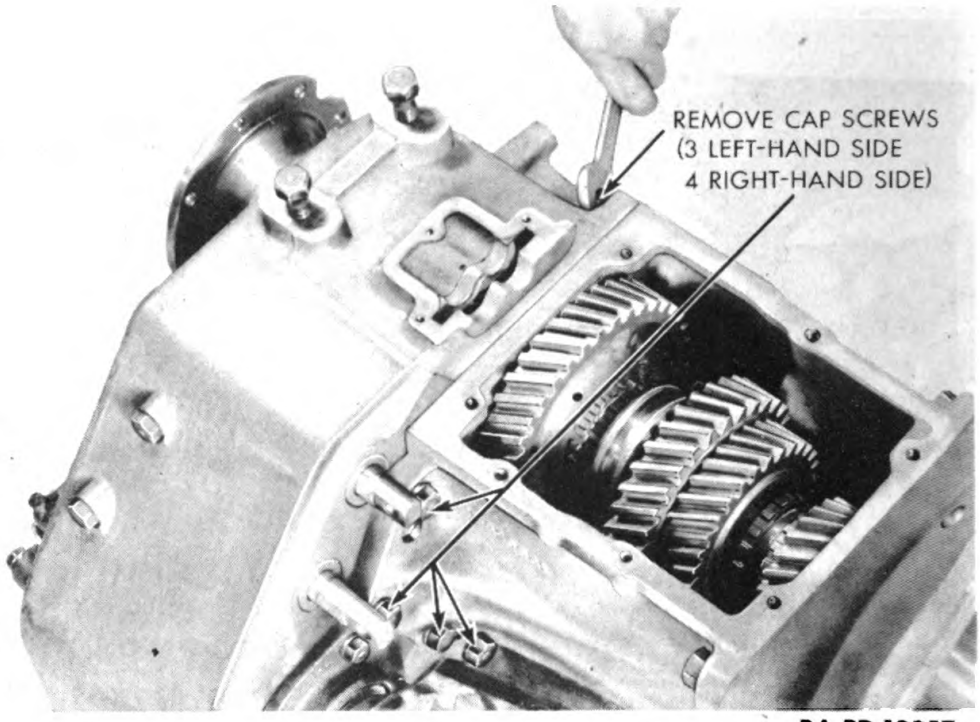
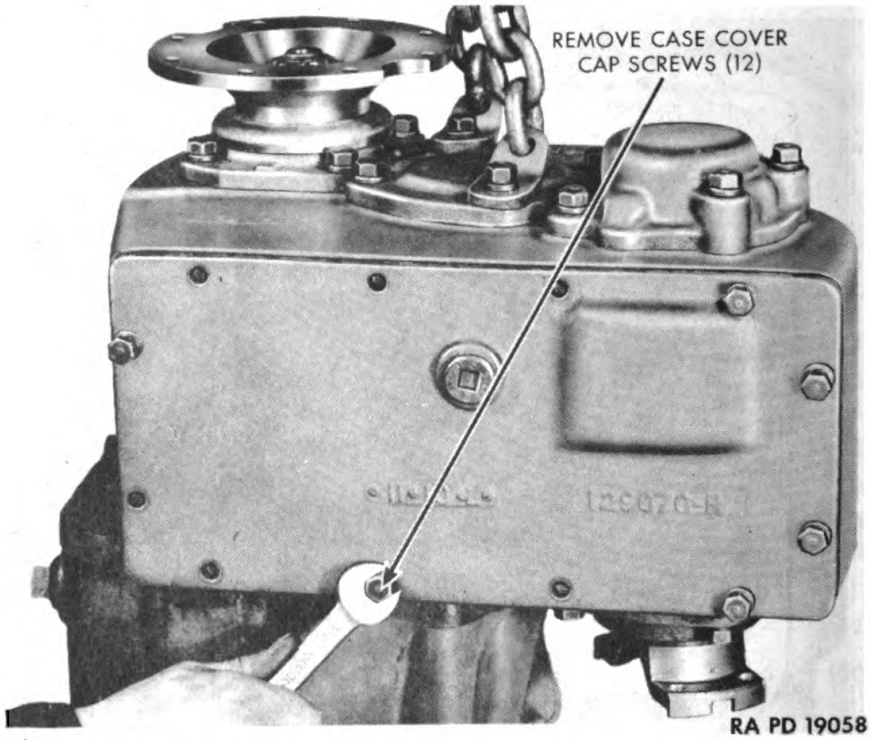


Figure 134 — Removing Relay Lever



RA PD 19057

Figure 135 — Removing Transmission Case to Transfer Case Cap Screws



RA PD 19058

Figure 136 — Removing Transfer Case Bottom Cover Cap Screws

TRANSMISSION AND TRANSFER CASE

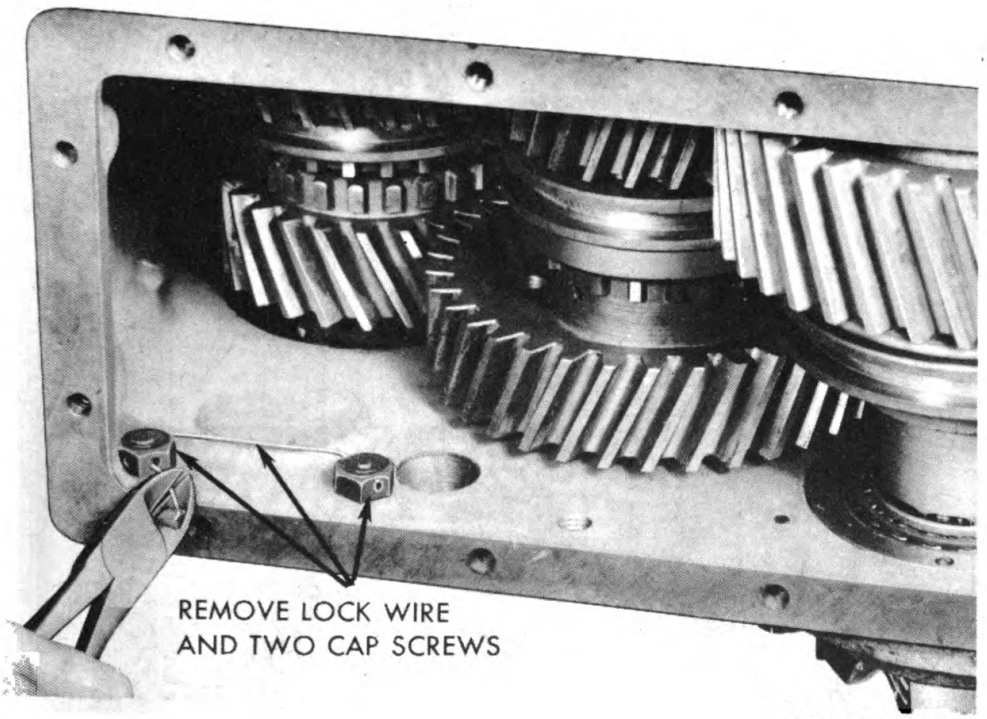


Figure 137 — Removing Inside Screws Lock Wire

interlock balls, two at rear and two at center of housing. Remove poppet ball and spring at center of housing.

(2) REMOVE THIRD AND FOURTH SPEED SHIFT ROD AND FORK. Remove set screw from shift fork, and pull shift rod through rear of housing until small interlock pin can be removed from hole in shift rod (fig. 130). Continue pulling rod out of housing until free of shift fork and small spacer (fig. 131). Complete removal of rod. Remove interlock balls, two at rear and two at center of housing. Remove shift rod poppet ball and spring at center of housing (fig. 132).

(3) REMOVE FIRST AND SECOND SPEED SHIFT ROD, BRACKET, AND FORK. Remove set screws from bracket and fork, and pull shift rod out through rear of housing until shift bracket is free from shaft, then lift out bracket (fig. 133). Continue pulling rod out until shift fork is free from rod, then lift out fork. Complete shift rod removal, and remove two shift rod interlock balls at rear and two at center. Remove shift rod poppet ball and spring.

(4) REMOVE RELAY LEVER. Remove cotter pin and nut from relay lever pivot screw (fig. 134). Lift out relay and pivot screw.

(5) DISASSEMBLE REVERSE SHIFT BRACKET AND LOCK PLUNGER. Remove cotter pin and nut from end of plunger of reverse shift bracket. Remove plunger and spring from bracket.

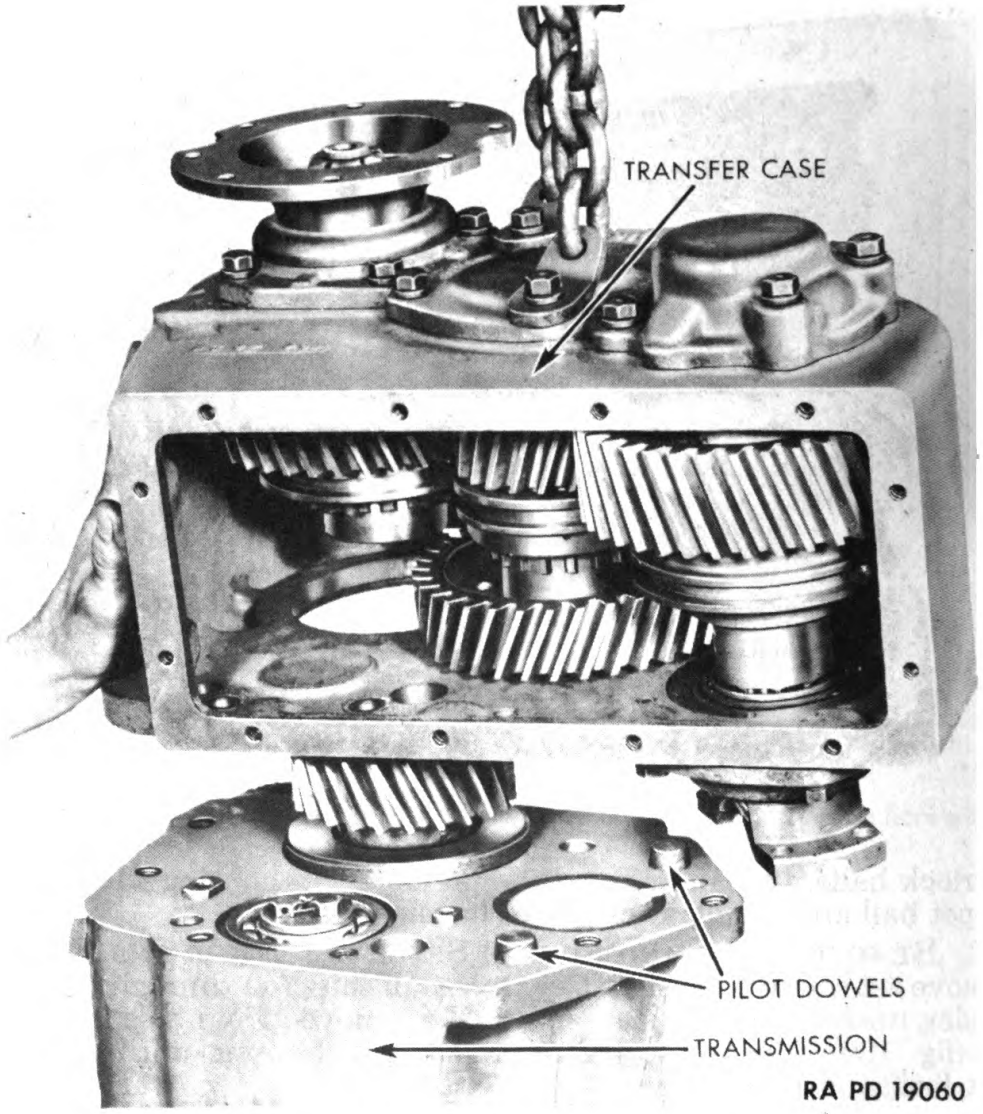


Figure 138 — Lifting Transfer Case from Transmission

g. Separate Transmission from Transfer Case.

(1) REMOVE OUTSIDE AND INSIDE CAP SCREWS. Remove 3 cap screws from left side of transmission and transfer case and remove 4 cap screws from right side (fig. 135). Place transmission and transfer case on end on clutch housing. Support assembly on 2 wood blocks, approximately 5 x 5 x 18 inches. Remove 12 cap screws from bottom cover of transfer case (fig. 136). Remove cover plate and gasket from transfer case. Remove lock wire from 2 cap screws inside transfer case (fig. 137), and remove cap screws from case.

(2) LIFT TRANSFER CASE FROM TRANSMISSION CASE (fig. 138). NOTE: *Cases are difficult to separate because transfer case mainshaft*

TRANSMISSION AND TRANSFER CASE

Figure 139 — Removing Transmission Main Drive Gear Lock Washer

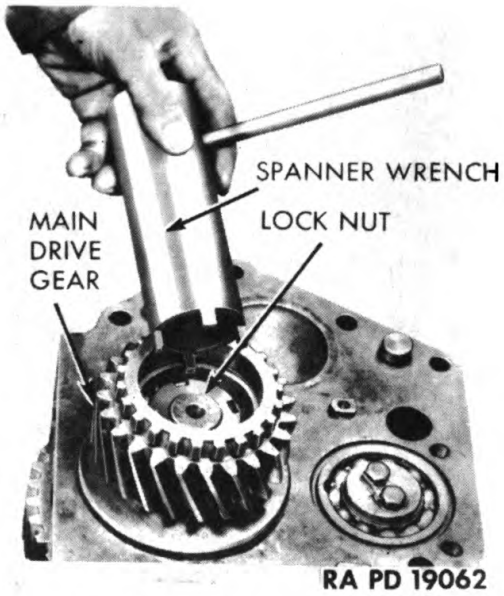


Figure 140 — Removing Main Drive Gear Lock Nut

front roller bearing sticks in transfer case main drive gear which is mounted on rear end of transmission mainshaft. Also the transmission mainshaft rear bearing retainer, thrust washer, and dowel pins may stick, causing further difficulty in separation. Pry cases apart until free. Placing a jack beneath transfer case on dowel side may help. Remove gasket from transmission case.

h. Remove Transfer Case Main Drive Gear from Transmission Mainshaft. This gear is essentially a part of the transfer case although it is fastened to the transmission and listed with

(*Continued on Page 142*)

Figure 141 — Main Drive Gear Lock Washer and Lock Nut — Removed

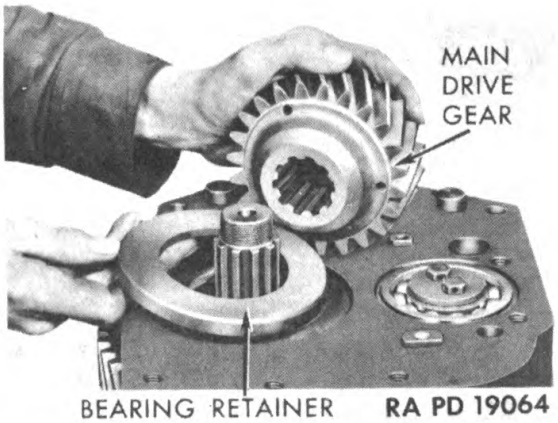


Figure 142 — Removing Main Drive Gear and Bearing Retainer

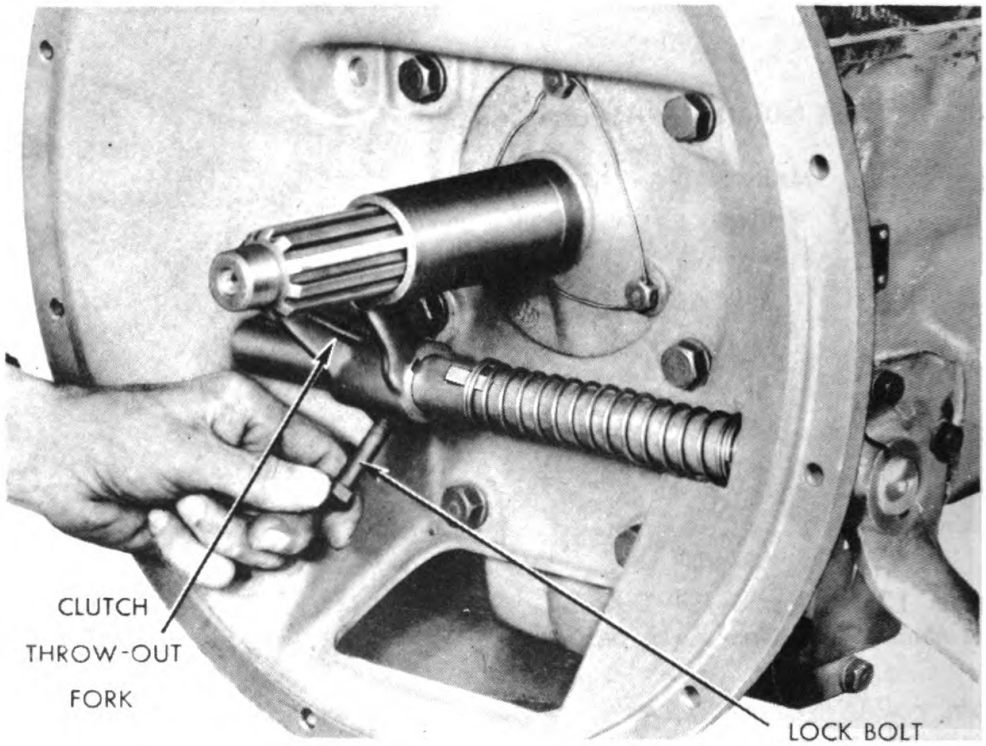


Figure 143 — Removing Clutch Throw-out Fork Lock Bolt

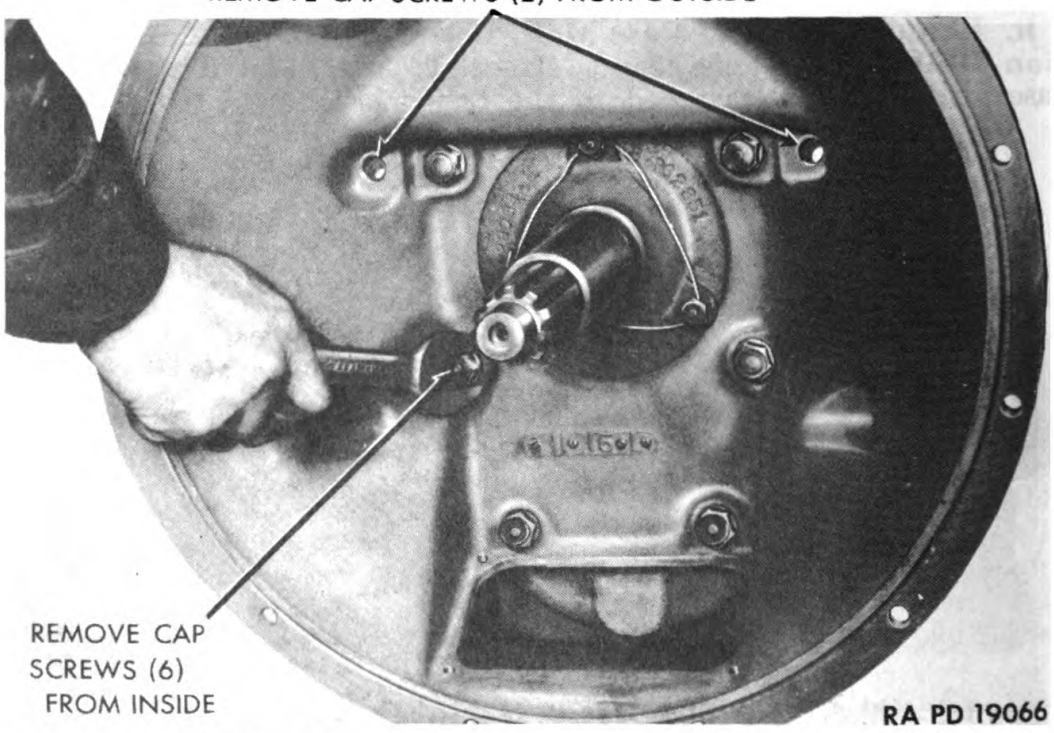


Figure 144 — Removing Transmission Bell Housing Cap Screws

TRANSMISSION AND TRANSFER CASE

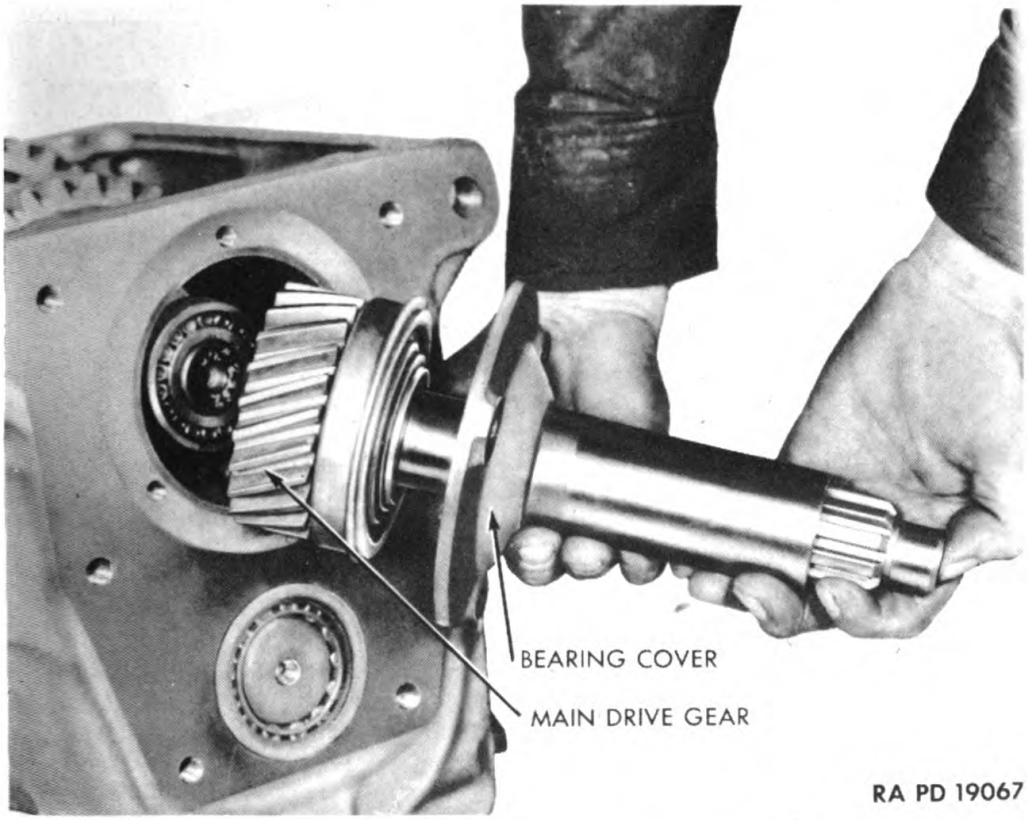


Figure 145 — Removing Main Drive Gear and Bearing Cover

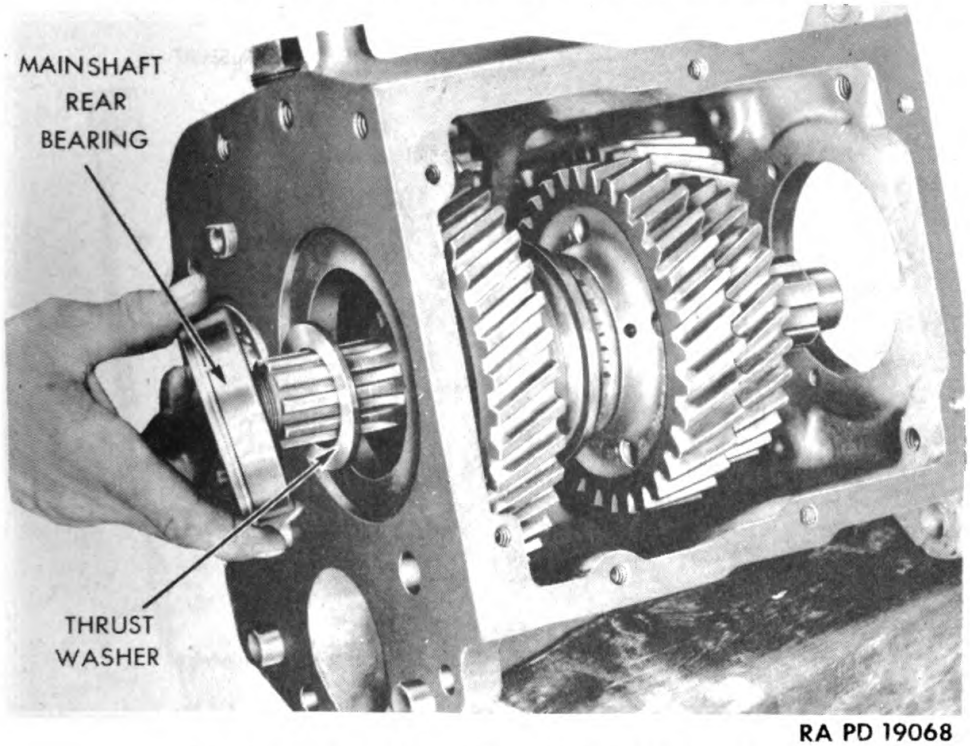


Figure 146 — Removing Mainshaft Rear Bearing

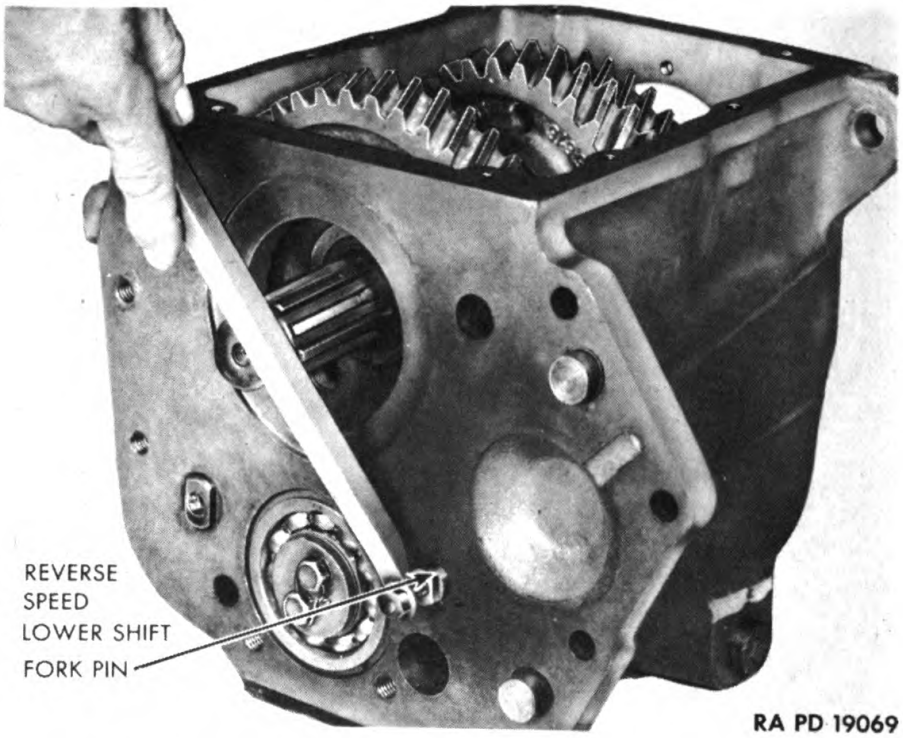


Figure 147 — Removing Reverse Speed Lower Shift Fork Pin

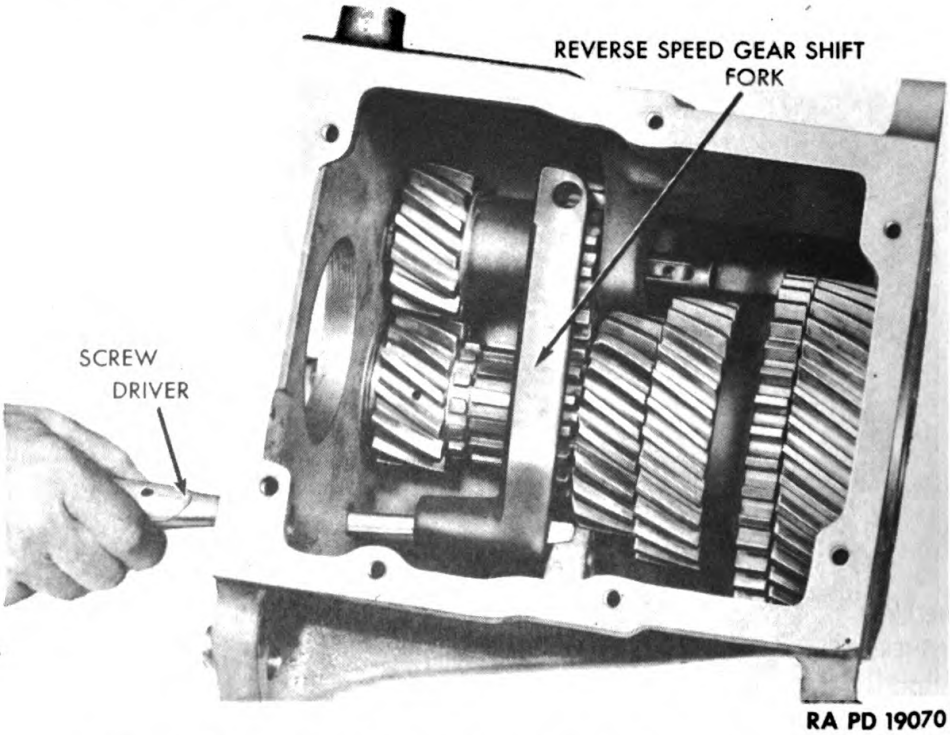


Figure 148 — Positioning Reverse Speed Lower Shift Fork

TRANSMISSION AND TRANSFER CASE

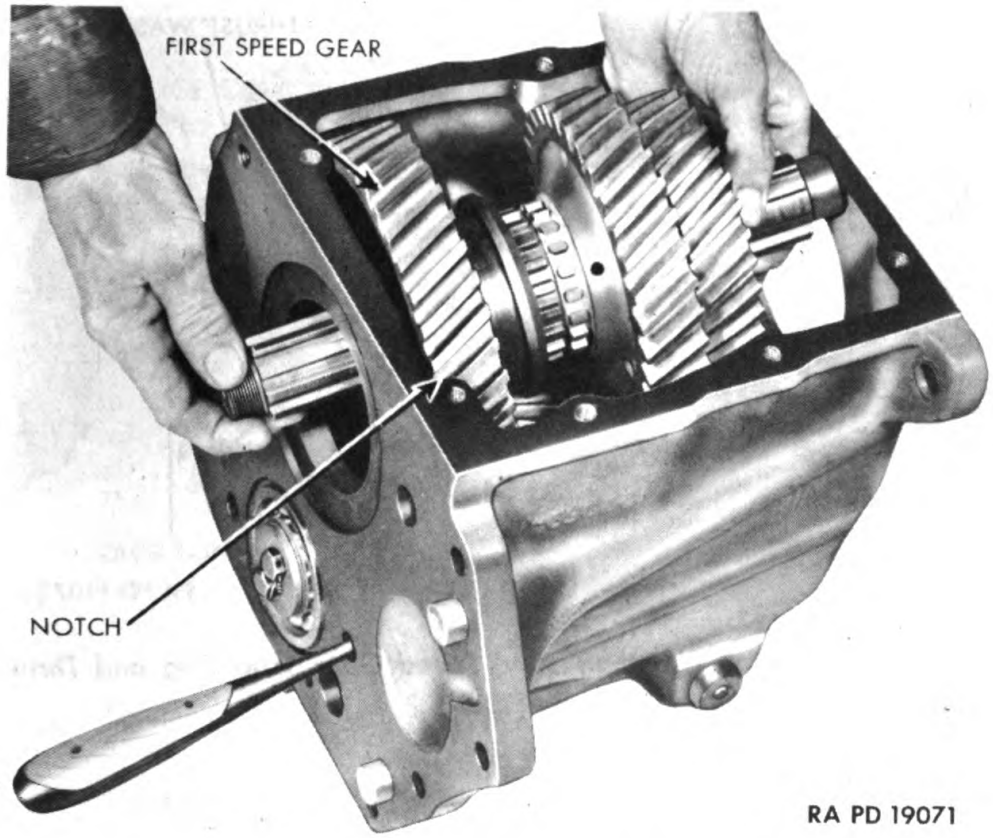


Figure 149 — Removing Transmission Mainshaft

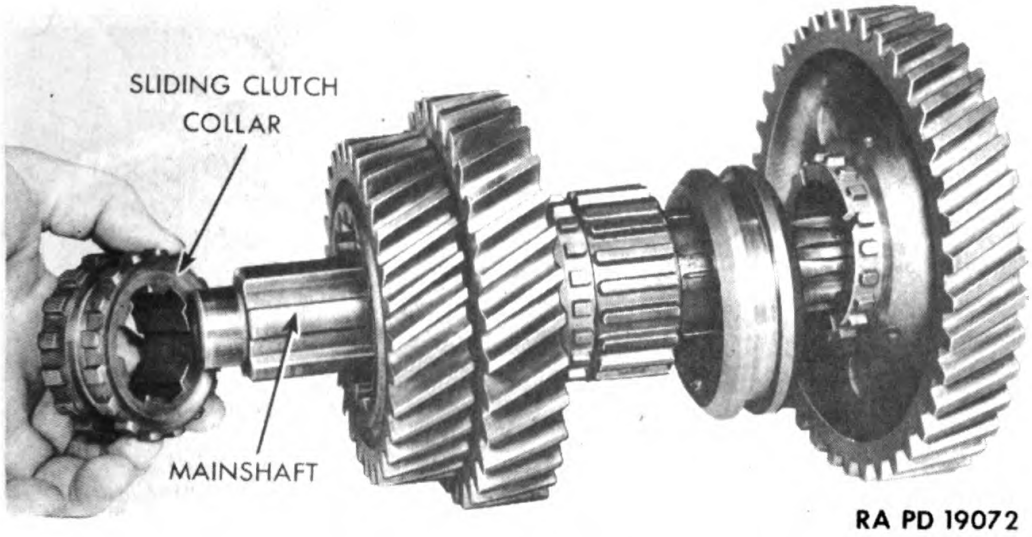


Figure 150 — Removing Third Speed and Fourth Speed Sliding Clutch Collar

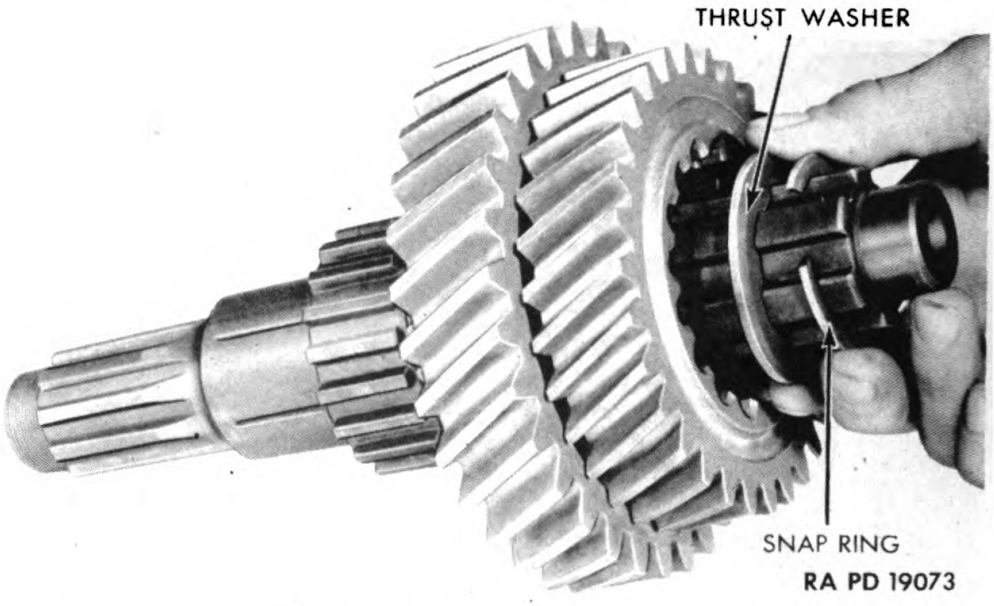


Figure 151 — Removing Mainshaft Third Speed Gear Snap Ring and Thrust Washer

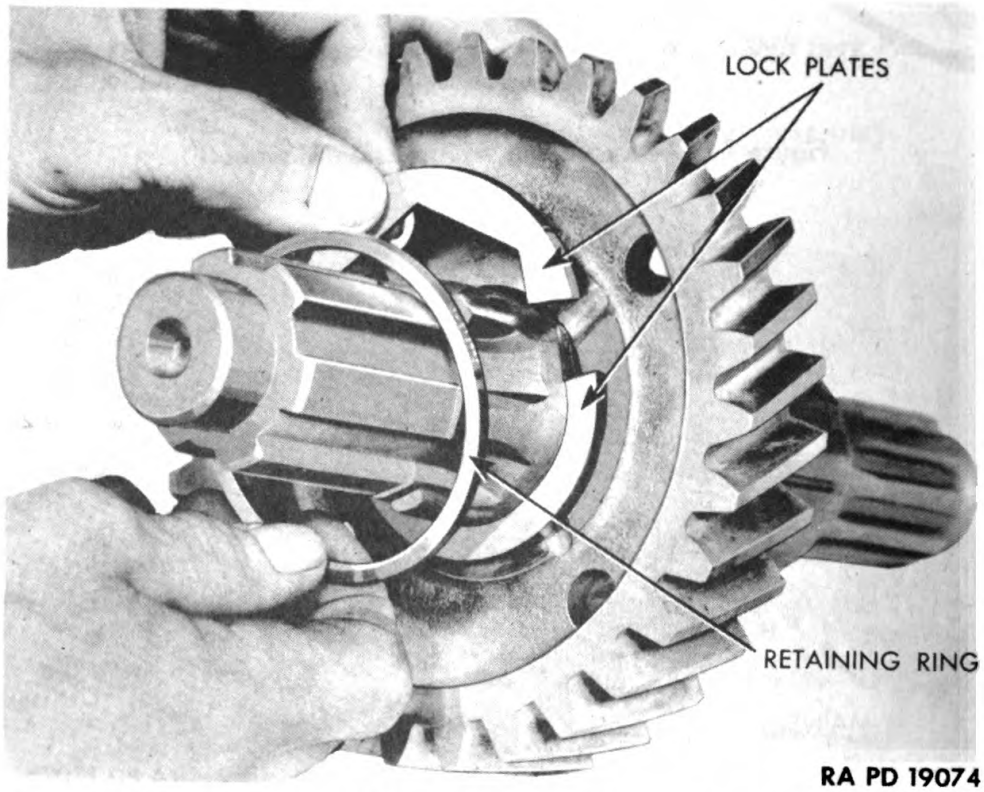


Figure 152 — Removing Mainshaft Second Speed Gear Lock Plates and Retaining Ring

TRANSMISSION AND TRANSFER CASE

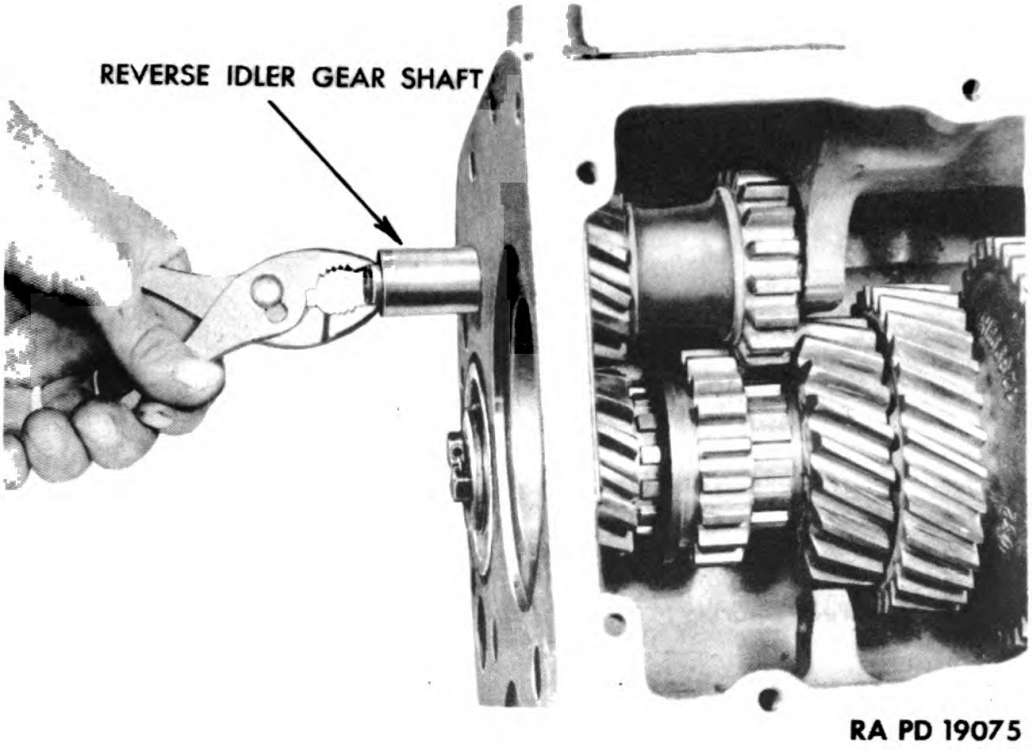


Figure 153 — Removing Reverse Idler Gear Shaft

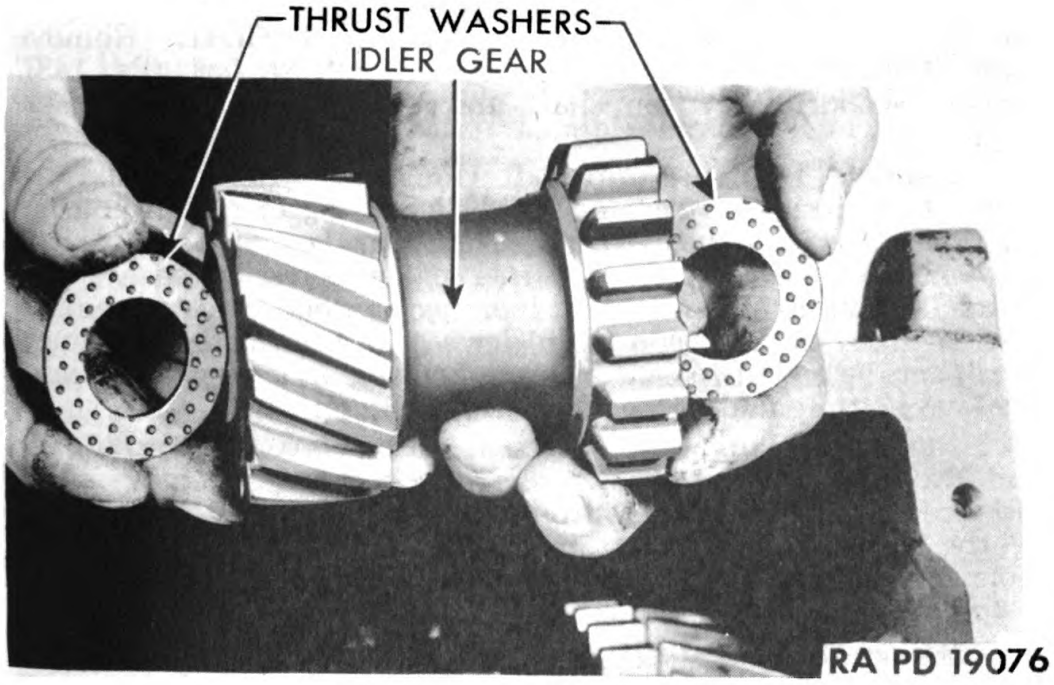


Figure 154 — Removing Reverse Idler Gear and Thrust Washers

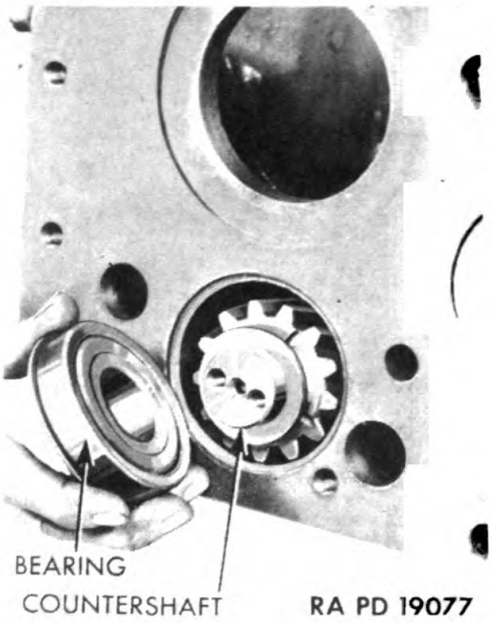


Figure 155 — Removing Countershaft Rear Bearing

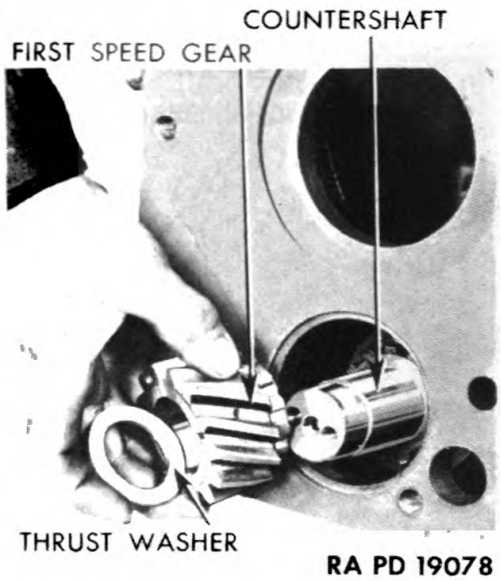


Figure 156 — Removing Countershaft First Speed Gear

transmission parts. Straighten special lock washer locking transfer case main drive gear to transmission shaft (fig. 139). Unscrew nut holding gear on shaft (fig. 140), and remove nut and special lock washer (fig. 141). Remove gear from shaft. Gear can probably be removed from splines by hand. If tight, however, use a puller (fig. 142).

i. Remove Clutch Throw-out Fork and Shaft. Remove clamp bolt and nut from throw-out, or release fork (fig. 143). Remove Woodruff key from shaft, and remove shaft from left side of housing.

j. Remove Transmission Bell Housing. Remove six cap screws from inside of transmission bell housing or clutch housing (fig. 144). Remove two cap screws from outside, one at upper right and one at upper left front corner of transmission case. Tap clutch housing lightly with lead hammer or wood block to remove housing from transmission main drive gear bearing and retainer, which acts as a pilot to center clutch housing on transmission case. Remove housing and gasket from transmission case.

k. Remove Transmission Mainshaft Front Bearing Cover and Main Drive Gear. After removing lock wire, remove three cap screws and lock washers from front bearing cover. Tap cover lightly to loosen from recess in case, and lift cover from case or remove with main drive gear. Tap gear lightly with lead hammer to free from case (fig. 145).

l. Disassemble Main Drive Gear and Bearing. Remove retaining snap ring from bearing. Press bearing from shaft.

m. Remove Transmission Mainshaft with Gears. Pull pilot

bearing from front end of mainshaft. Pull rear bearing and retainer from mainshaft, and remove thrust washer (fig. 146). Pull reverse speed lower shift fork slide pin from rear of transmission case. Use a 5/16 x 1 inch SAE cap screw and small bar to start pin (fig. 147). Complete removal of pin with pliers. Slide reverse speed gear clutch and lower shift fork forward against the countershaft second speed gear. NOTE: *The gear and fork must be in this position to permit removal of mainshaft and gear assembly* (fig. 148). To hold in this position, insert a medium screwdriver through the pin hole in case and fork, wedging the end of the screwdriver on the reenforcing rib in the bottom center of transmission case. Lift front end of mainshaft and move slightly toward right side of case, while moving rear end slightly toward left side of case. The right side of the large first speed gear must index with notch in transmission case just inside cap screw boss on right rear flange of case. The left side of gear must clear front of cap screw boss on left side of case. Lift shaft and gears from case (fig. 149). Remove screwdriver, and remove reverse lower shift fork from case.

n. Disassemble Transmission Mainshaft and Gears. Remove third and fourth speed sliding clutch collar (gear) from front end of mainshaft (fig. 150). Remove transmission mainshaft first speed gear, which is free on shaft, from rear end of mainshaft. Remove first speed clutch collar from shaft. Remove mainshaft third speed gear retainer snap rings at front end of shaft by prying out of groove, and remove splined thrust washer (fig. 151). Remove mainshaft third speed gear, which is free on shaft, from mainshaft. Remove mainshaft second speed gear retaining ring, and pry split lock washer (lock plates) out of groove in shaft (fig. 152). Remove mainshaft second speed gear, which is free on shaft, from mainshaft.

o. Remove Reverse Speed Idler Gear and Shaft. Drive or pry idler gear shaft toward rear of case until front end is clear of support in transmission case. Complete removal of shaft with pliers (fig. 153). Remove reverse speed idler gear and two thrust washers, one at each end of gear, from case (fig. 154).

p. Remove Transmission Countershaft and Gears. Remove lock wire from two cap screws at rear end of countershaft. Remove both cap screws and rear bearing retaining washer. Slide countershaft assembly toward rear until free of case, then pull bearing from countershaft (fig. 155). Remove countershaft first speed gear thrust washer and first speed gear which is free on shaft, from shaft (fig. 156). Lift countershaft assembly out of case, raising front end first (fig. 157). Drive or press countershaft front bearing out of case.

q. Disassemble Transmission Countershaft. Slide countershaft reverse speed clutch gear off rear end of countershaft. Remove countershaft front bearing washer, and remove countershaft drive gear snap ring, prying from groove in shaft (fig. 158). Using a puller (41-P-2905-60), remove large countershaft drive gear from shaft (fig. 159), and remove Woodruff key. Remove countershaft

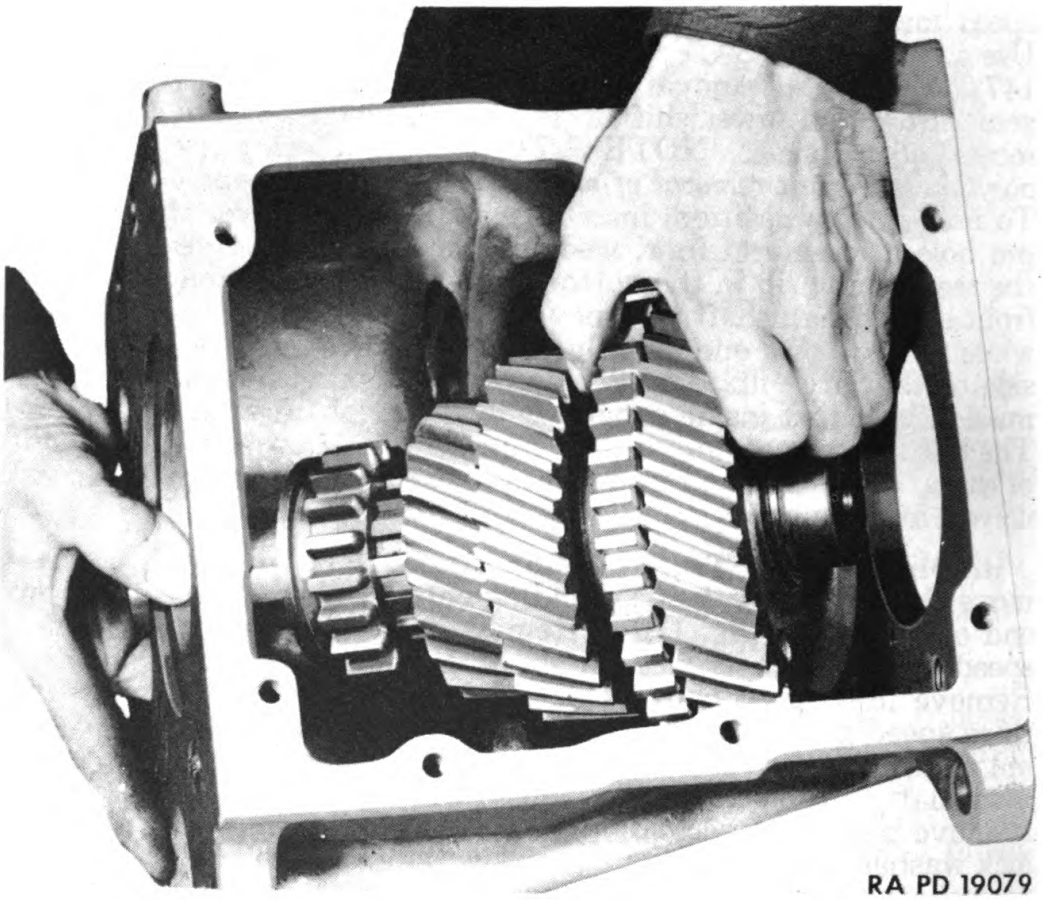


Figure 157 — Removing Countershaft Assembly

power take-off gear from shaft, using a press (fig. 160). Remove Woodruff key from shaft. Press countershaft third speed gear off from shaft (fig. 161), and remove Woodruff key. NOTE: *Countershaft second speed gear is not removed as it is integral with countershaft.*

r. Remove Transfer Case Front Axle Drive Gear and Shaft. Remove four cap screws and lock washers from front axle drive shaft front bearing cap (fig. 162). Remove four cap screws and lock washers from front axle drive shaft rear bearing cap, and remove bearing cap with speedometer driven gear and shims from case (fig. 163). Remove lock wire from two retaining cap screws in rear end of front axle drive shaft. Remove cap screws and bearing cone retaining washer. Pull or pry speedometer drive worm gear from shaft (fig. 164). Note that hub of gear is toward bearing. Remove Woodruff key from shaft. Place a wood block, 2 x 3½ x 3½ inches, between gear and front wall of transfer case. Attach puller by means of screws so that it can be used as a pusher, and push shaft through tapered roller bearing cone until shaft is free from bearing cone (fig. 165). Complete removal of shaft by pulling

TRANSMISSION AND TRANSFER CASE

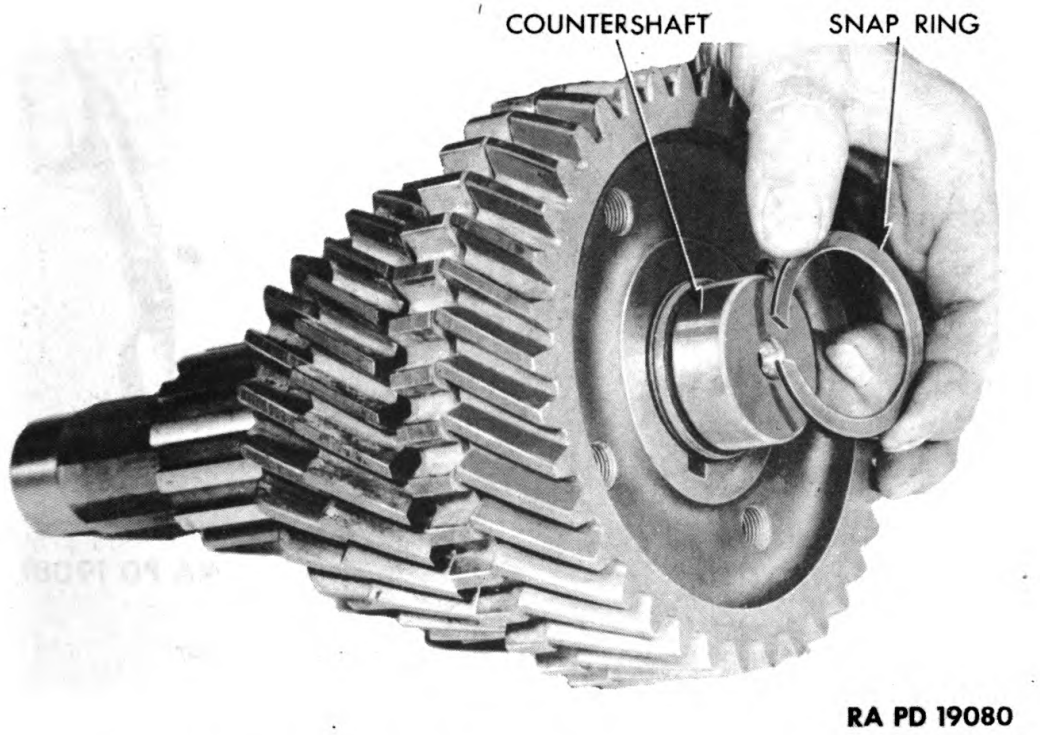


Figure 158 — Removing Countershaft Drive Gear Snap Ring

through front of case. Front axle drive gear is mounted on shaft on two rows of needle bearings. There are 53 bearings in each row. The bearing cone, needle bearings, and thrust washer will drop to the bottom of the transfer case when the shaft is removed (fig. 166). Lift front axle drive shaft gear and sliding clutch collar out of case. Remove bearing cone, needle bearings, and thrust washer from case. Drive rear bearing cup out of case.

s. Disassemble Transfer Case Front Axle Drive Shaft. Remove thrust washer from rear end of front axle drive shaft (fig. 167). Mount shaft in vise, and remove cotter pin from companion flange nut. Remove companion flange nut. Slide companion flange off of shaft, and remove bearing cap (fig. 168). Press bearing off of shaft, press clutch gear from shaft, and remove Woodruff key from shaft.

t. Remove Transfer Case Rear Axle Propeller Shaft Companion Flange. Remove cotter pin from companion flange nut. Remove nut and washer. Remove companion flange from shaft.

u. Remove Transfer Case Intermediate Shaft and Gears. Remove four cap screws and lock washers holding intermediate shaft rear bearing cap to case. Pry cap out of case, and lift off cap and shims. Remove lock wire from two cap screws at front end of intermediate shaft. Remove two cap screws and bearing cone retaining washer. Attach puller with screws so that it can be used

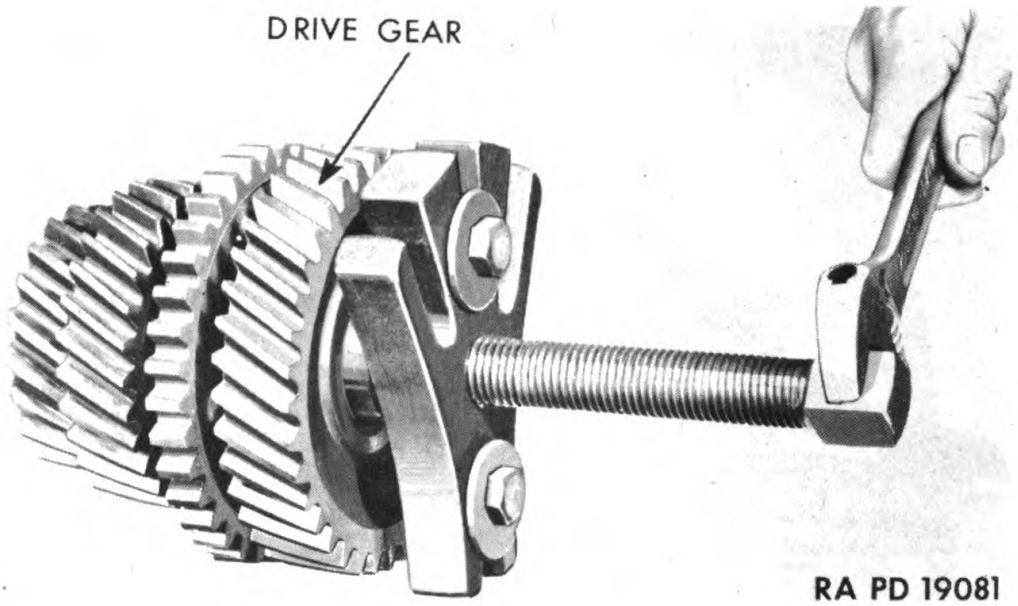


Figure 159 — Removing Countershaft Drive Gear

as a pusher, and place a small wood block, 2 x 3½ x 3½ inches, between gear and rear wall of case (fig. 169). Push shaft through tapered roller bearing cone until shaft is free of cone. Complete removal by pulling shaft through rear of case by hand (fig. 170). The transfer case intermediate shaft under-drive gear is mounted on two rows of needle bearings, each row having 53 bearings. Bearing cone, needle bearings, and thrust washer will drop to bottom of case when shaft is removed. Lift gear and sliding clutch collar out of case (fig. 171). Remove bearings and thrust washer from case before proceeding. Drive front bearing cup from case.

v. Disassemble Transfer Case Intermediate Shaft. Press tapered roller bearing cone from shaft.

w. Remove Transfer Case Main Shaft. Remove four cap screws and lock washers holding bearing cap and oil seal to transfer case. Remove cap with oil seal and gasket from case (fig. 172). Place a small wood block, 2 x 3½ x 3½ inches, between under-drive gear and front of case, and drive mainshaft out of gear, using a lead hammer (fig. 173). Thrust washer will drop to bottom of case when shaft is removed. Remove gear and sliding clutch collar from case (fig. 174). Remove thrust washer from bottom of case, and drive bearing out of case.

x. Disassemble Transfer Case Mainshaft. Press mainshaft pocket roller bearing from shaft (fig. 175).

y. Remove Transfer Case Shift Forks and Rods. Remove two poppet ball and spring retainer screws from upper right-hand side of transfer case, and remove springs and poppet balls (fig. 176). Remove shift fork set screw lock wires, and remove set screws from

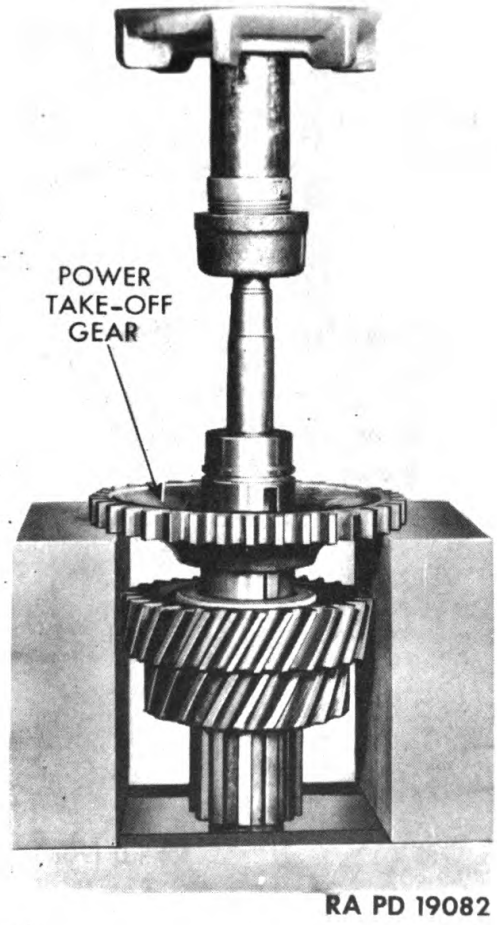


Figure 160 — Removing Countershaft Power Take-Off Gear

shift forks. Pull front axle drive shift rod through front of case, and lift out shift fork and spacer (fig. 177). Pull direct and underdrive shift rod through front of case, and remove shift fork from case (fig. 178). Remove shift rod oil seals from case.

z. Disassemble Transfer Case Front Axle Drive Gear Shaft Front and Rear Bearing Caps. Drive oil seal from front bearing cap. Use puller to pull bearing cup out of cap. Remove speedometer driven gear sleeve from rear bearing cap, and pull gear from cap. Use puller to remove bearing cup from cap.

aa. Disassemble Transfer Case Intermediate Shaft Rear Bearing Cap. Use puller to remove bearing cup from bearing cap.

ab. Disassemble Transfer Case Main Shaft Rear Bearing Cap. Drive oil seal out of cap.

53. CLEANING OF PARTS.

a. Following disassembly, all parts, with the exception of bear-

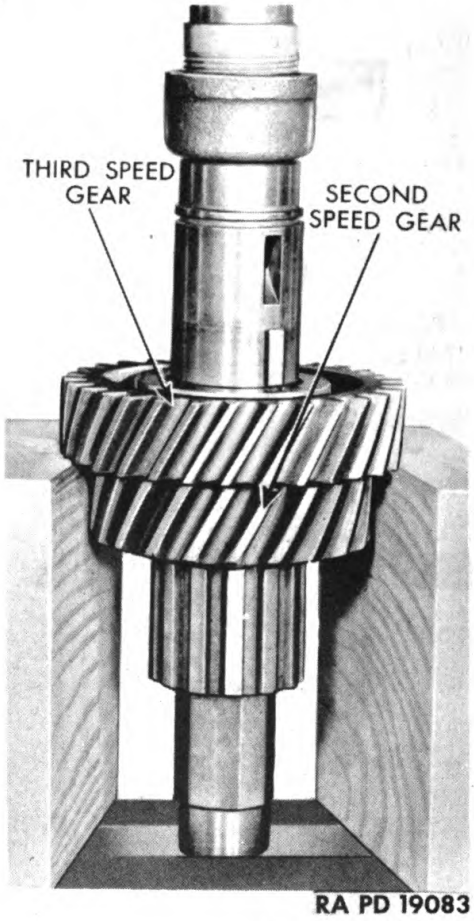


Figure 161 — Removing Countershaft Third Speed Gear

ings, must be thoroughly cleaned in dry-cleaning solvent to remove all dirt and oil.

b. Cleaning Bearings. Place bearings in dry-cleaning solvent, allowing them to remain long enough to loosen grease and lubricant. After soaking, bearings must be alternately slushed up and down in the cleaning fluid and spun slowly below the surface of the liquid to remove as much of the old grease as possible. Remove the bearings from the dry-cleaning solvent, and strike the sides of the bearings against a wood block to jar loose heavier and harder particles of lubricant. Repeat immersions and striking operations until bearings are cleaned. Blow out bearings to remove last traces of old lubricant, being careful to direct air pressure across bearings without spinning them. Coat bearings with film of light oil, and wrap in paper preparatory to inspection.

54. INSPECTION OF PARTS.

a. Bearings. Inspect rollers, balls, and races carefully for chip-

(*Continued on Page 156*)

Figure 162 — Removing Transfer Case Front Axle Drive Shaft Front Bearing Cap Screws

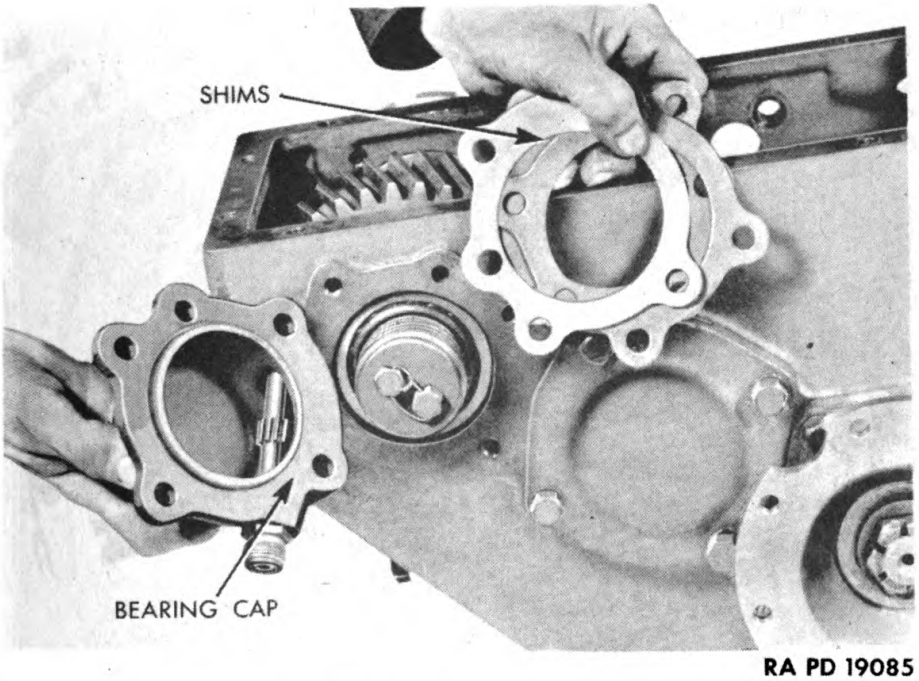


Figure 163 — Removing Transfer Case Front Axle Drive Shaft Rear Bearing Cap

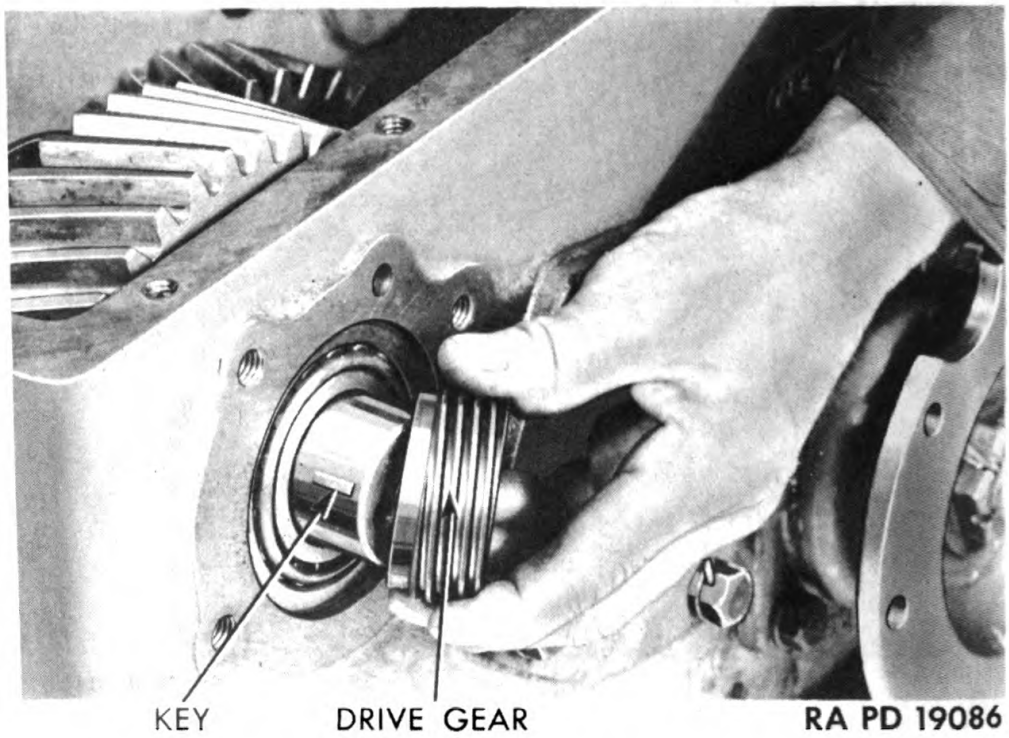


Figure 164 — Removing Speedometer Drive Gear

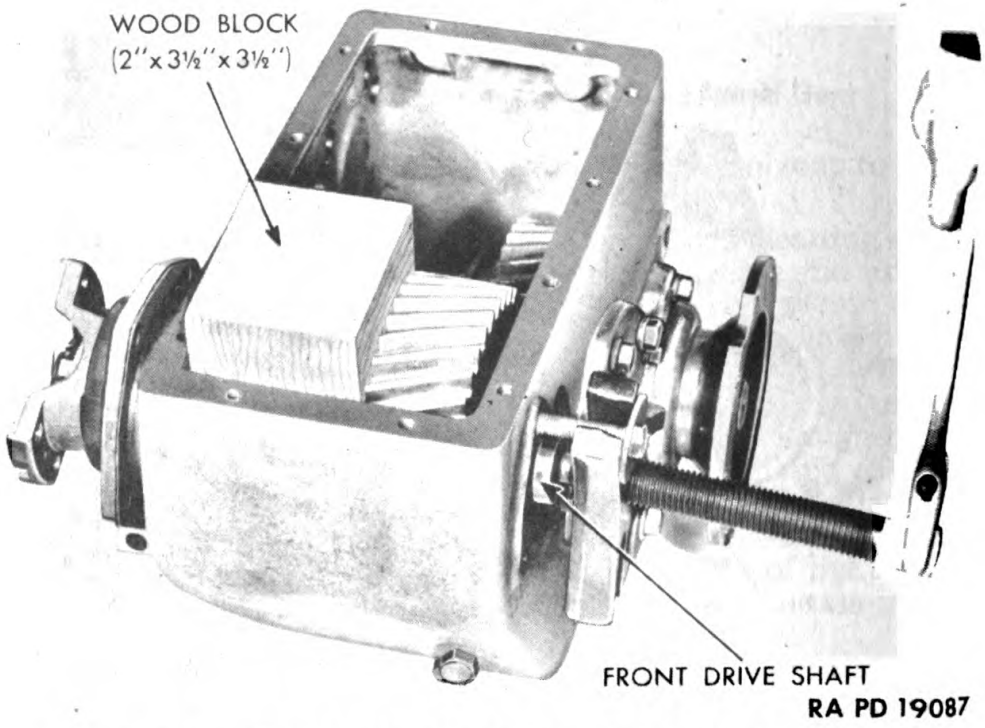


Figure 165 — Pressing Front Axle Drive Shaft from Transfer Case

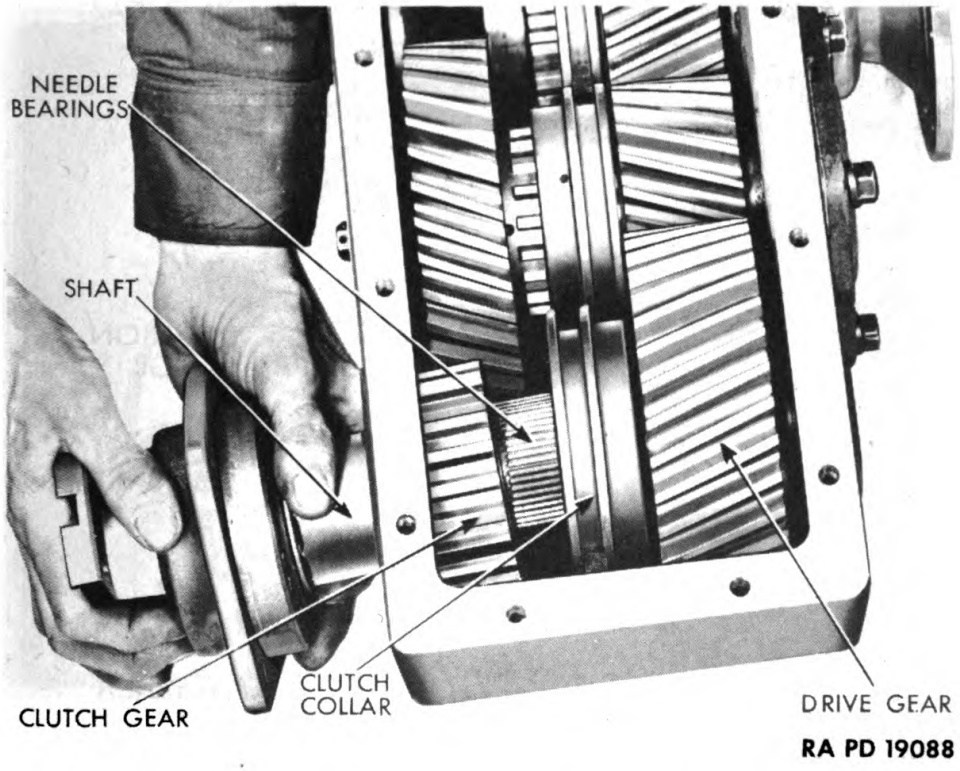


Figure 166 — Removing Front Axle Drive Shaft

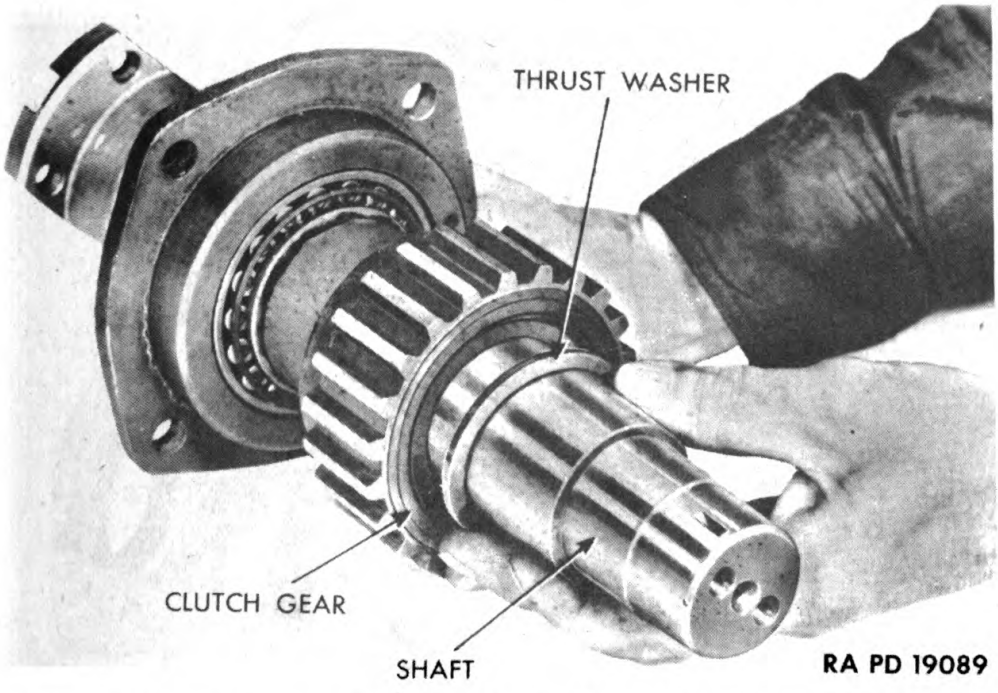


Figure 167 — Removing Front Axle Drive Shaft Clutch Gear Thrust Washer

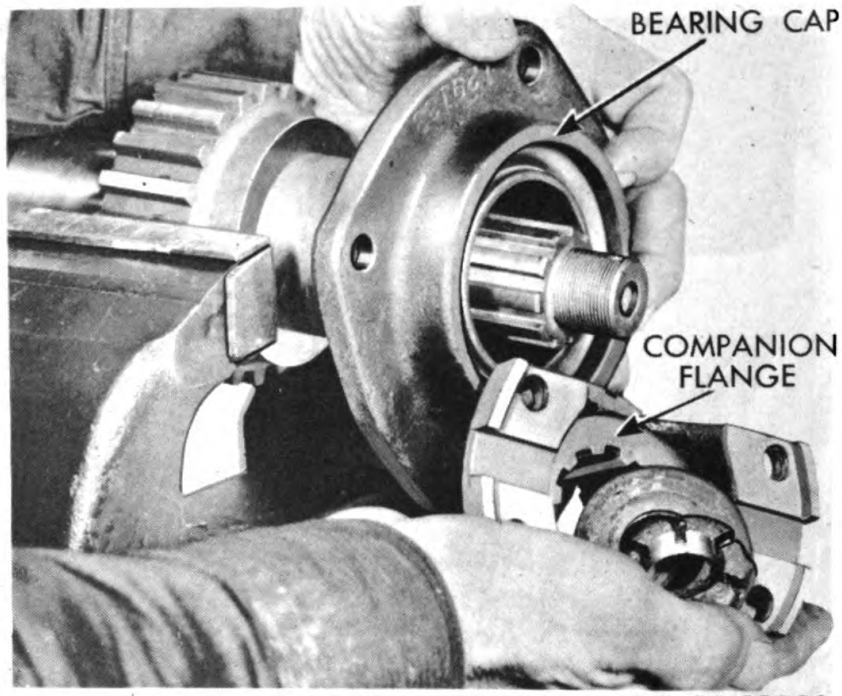


Figure 168 — Removing Companion Flange and Bearing Cap

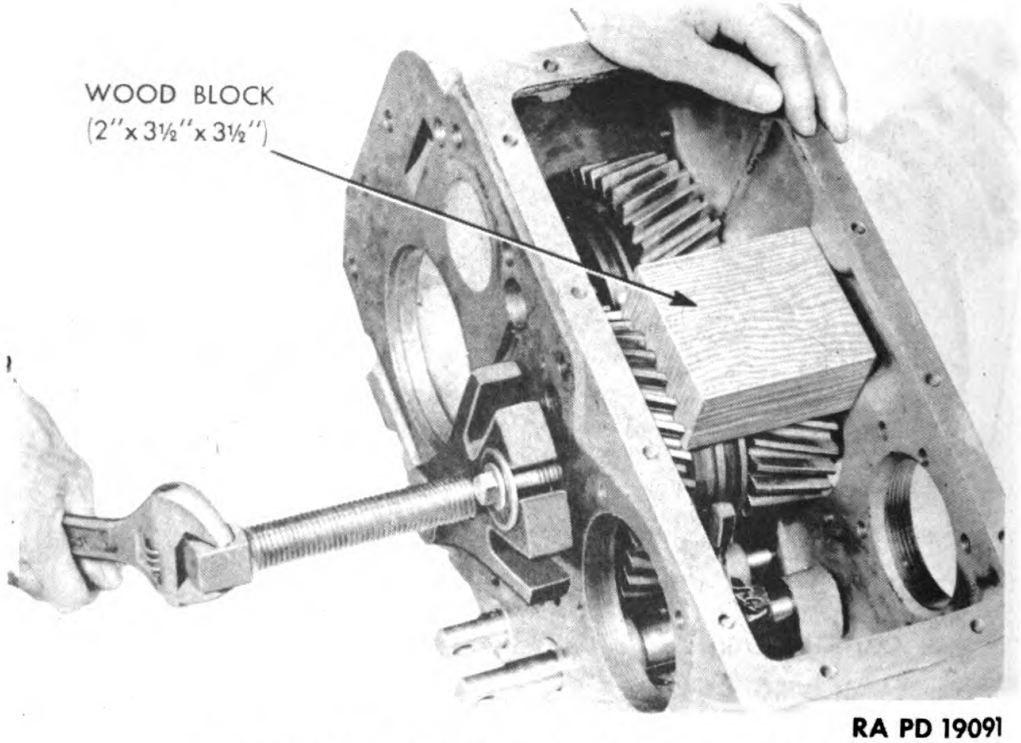


Figure 169 — Pressing Out Intermediate Shaft

TRANSMISSION AND TRANSFER CASE

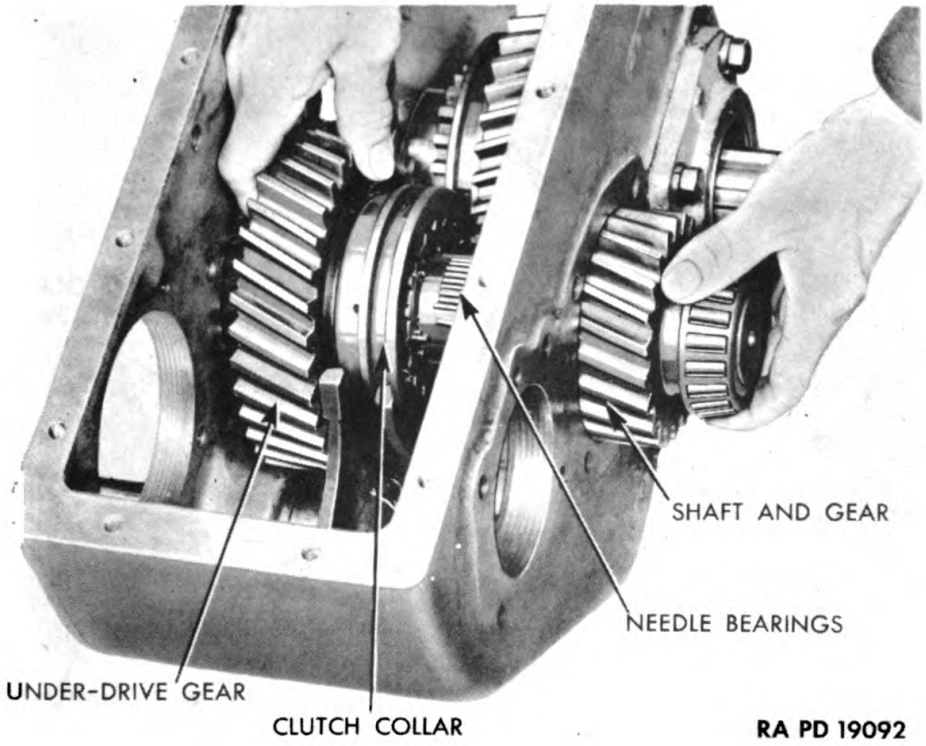


Figure 170 — Removing Intermediate Shaft

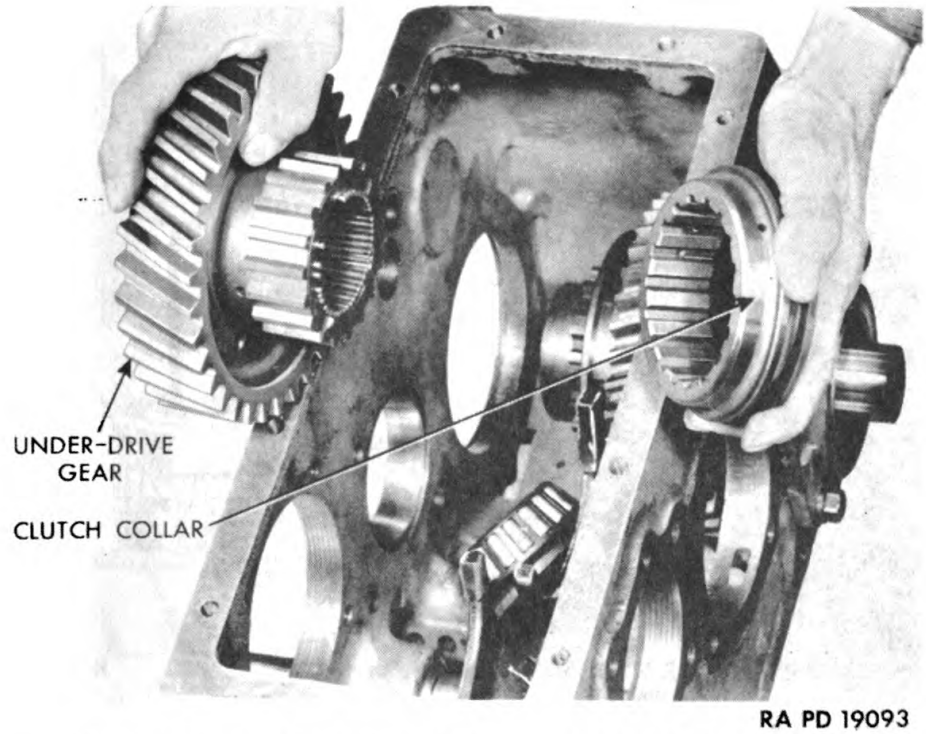


Figure 171 — Removing Under-Drive Gear and Clutch Collar

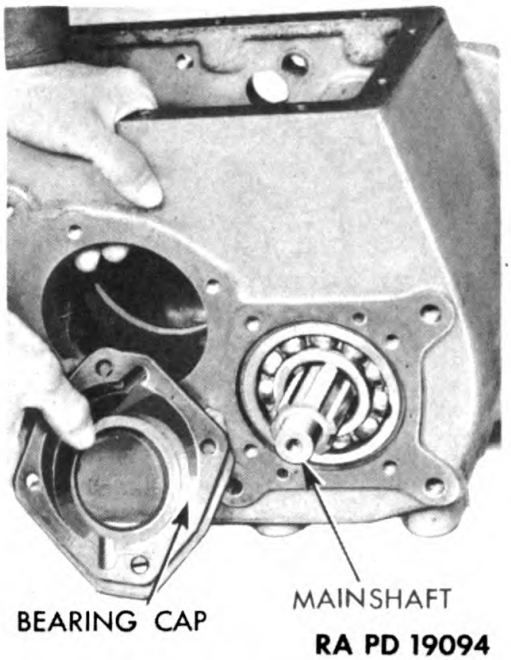


Figure 172 — Removing Mainshaft Rear Bearing Cap

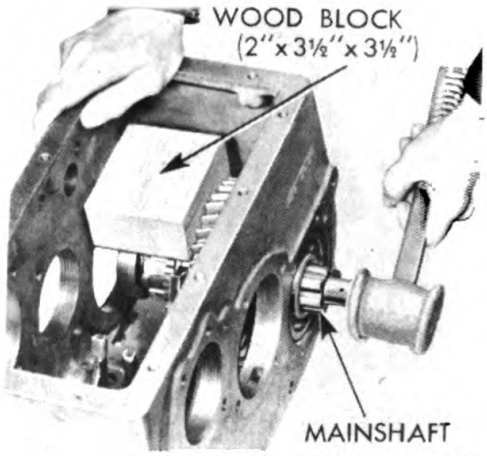


Figure 173 — Driving Mainshaft Out of Gear

Figure 174 — Removing Drive Gear and Clutch Collar

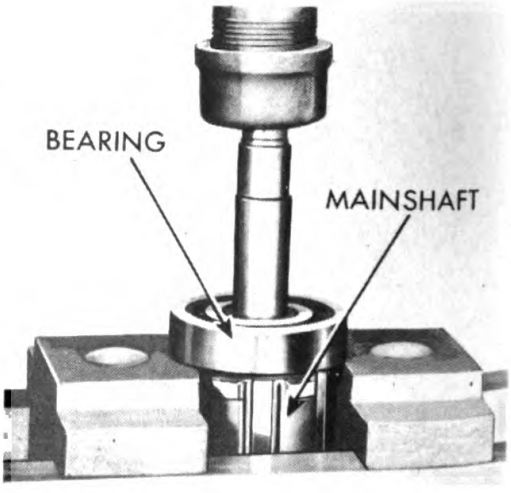


Figure 175 — Removing Mainshaft Bearing

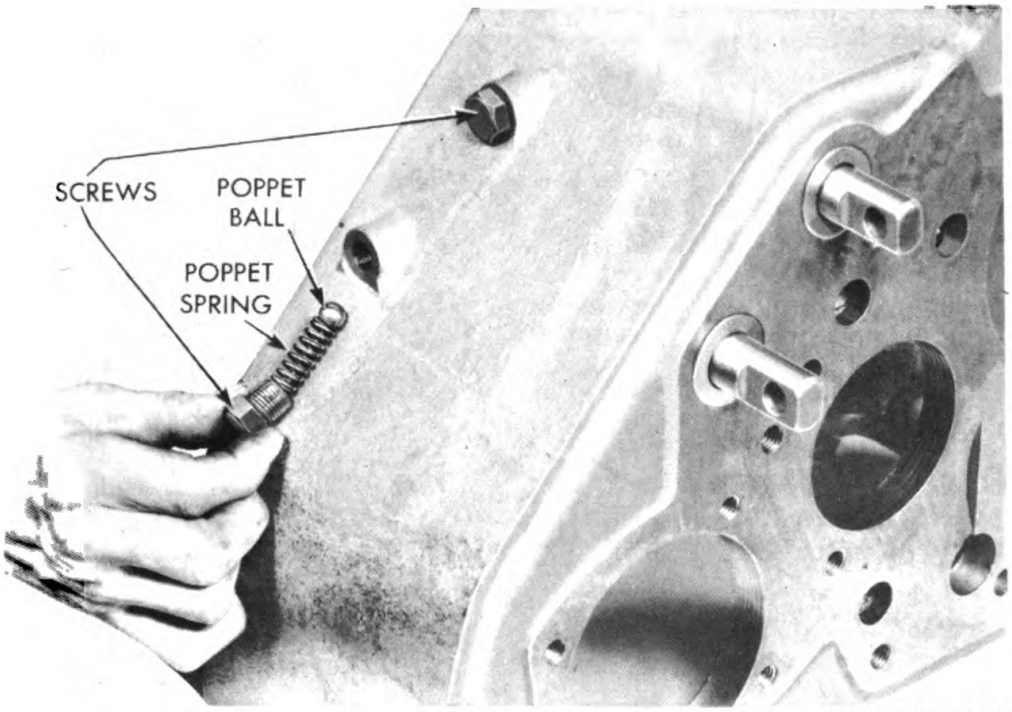


Figure 176 — Removing Shift Fork Poppet Ball and Spring

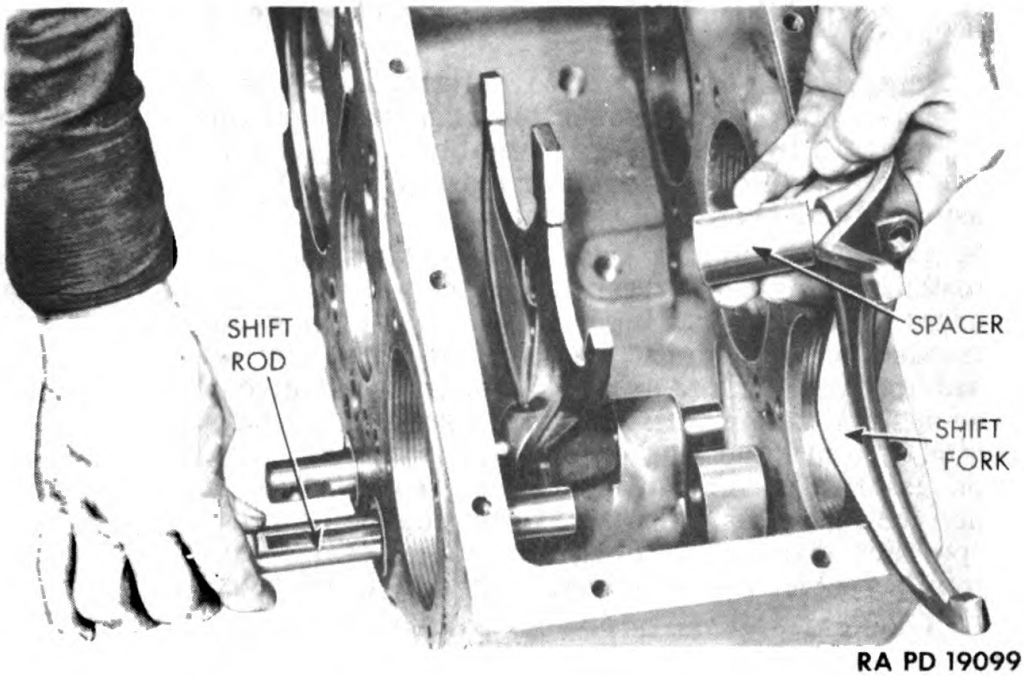


Figure 177 — Removing Front Drive Shift Fork

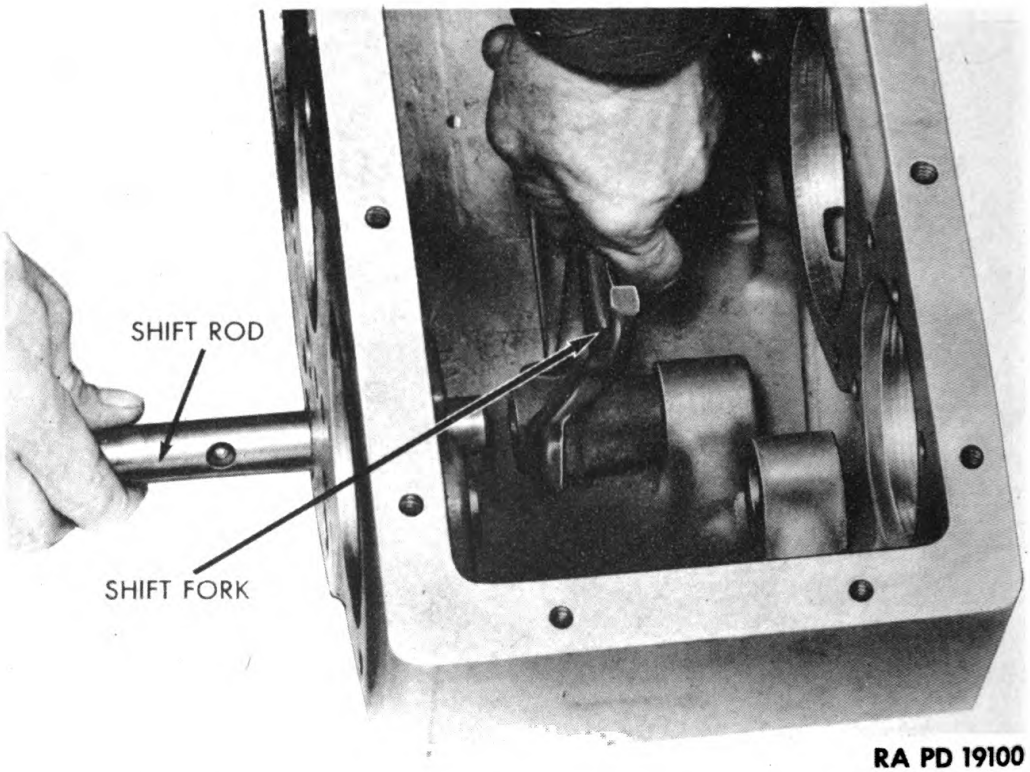


Figure 178 — Removing Direct and Under-Drive Shift Fork

ping, cracks, or worn spots to determine fitness of bearings for future use. Replace damaged bearings with new ones. Lubricate bearings with light oil before assembling to prevent scoring during initial periods of operation after reassembly but before the transmission oil has been able to penetrate.

b. Oil Seals. Spring-loaded leather type oil seals are used in the transfer case mainshaft rear bearing cap and front drive shaft front bearing cap. Inspect these seals carefully for evidence of failure. Damaged oil seals must be replaced with new ones to prevent possible future failure of the seals that would cause damage to bearings and gears. Before installing oil seals, soak them in warm engine oil until the leather portion of the seal is soft and pliable. This assures an efficient leakproof seal and assists installation. When installing seals, coat the outer edge with a sealing compound to prevent leakage of lubricant around seal. Oil seals must be carefully replaced so that they fully seat in the caps.

c. Gaskets. It is advisable to replace all gaskets when reassembling.

d. Transmission-Transfer Case. Remove magnetic drain plugs and clean off all metallic particles which may have been attracted

by the plugs. Inspect housing for cracks or misalinement, especially after an accident or collision.

e. Transmission Mainshaft and Main Drive Gear. Check condition of main drive gear spline for evidences of chipping, twisting, or wear. Replace the gear if damaged. Inspect mainshaft splines and clutch teeth, and replace if worn or chipped. Check clearance of clutch gear and clutch collar on shaft, and replace gear or collar if it exceeds tolerances. Examine gear and clutch teeth for nicks or wear. Remove small nicks with an oil stone. Replace badly worn gears. Check thickness of thrust washers, and replace if worn. Check clearances between gears and shaft. If excessive, rebush or replace gears. Clean and inspect bearings, and replace if worn or scored.

f. Transmission Countershaft. Inspect gear teeth for wear or nicks. Replace if necessary. Inspect splines on shaft for wear or chipping, and replace shaft if spline is worn. Check clearance of first speed gear on shaft. Replace or rebush gear if clearance is excessive. Check thickness of thrust washers and replace if worn.

g. Transfer Case Front Drive Shaft. Inspect shaft for wear, especially at points of contact with needle bearings. Replace if worn. Inspect gear teeth for wear and nicks, and replace if damaged. Inspect needle bearings for wear, scratches, or nicks, and replace if worn. Check thickness of thrust washers, and replace if worn. Check clearance of clutch collar on clutch gear and of front drive shaft gear on shaft. Replace shaft or collar if clearance is excessive. Clean and inspect bearings. Shims are provided on the rear bearing cap to adjust end play of the tapered roller bearings. Remove or replace a sufficient number of shims to allow the shaft to rotate freely without end play.

h. Transfer Case Intermediate Shaft. Inspect shaft for wear, especially at points of contact with needle bearings. Replace if worn. Inspect gear teeth for wear and nicks. Replace gear if damaged. Inspect needle bearings for wear, scratches, or nicks, and replace if damaged. Check thickness of thrust washers, and replace if worn. Check clearance of clutch collar on clutch gear, and of front drive shaft gear on shaft. Replace shaft or collar if clearance is excessive. Clean and inspect bearings. Shims are provided on the rear bearing cap to adjust end play of the tapered roller bearings. Remove or replace a sufficient number of shims to allow the shaft to rotate freely without end play.

i. Transfer Case Mainshaft. Inspect shaft for wear or twisting, and replace if damaged. Inspect clutch collar and clutch teeth on gear, and inspect gear teeth for wear. Replace if worn or damaged. Clean and inspect bearings.

55. ASSEMBLY.

a. Assemble Transfer Case Mainshaft Rear Bearing Cap. Install new oil seal in bearing cap.

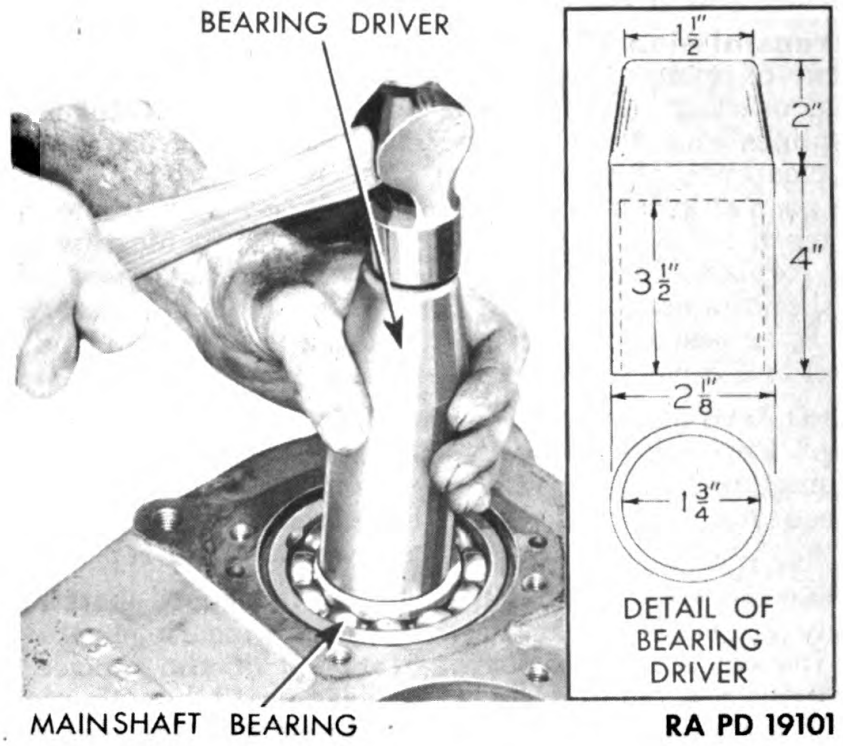


Figure 179 — Installing Mainshaft Bearing

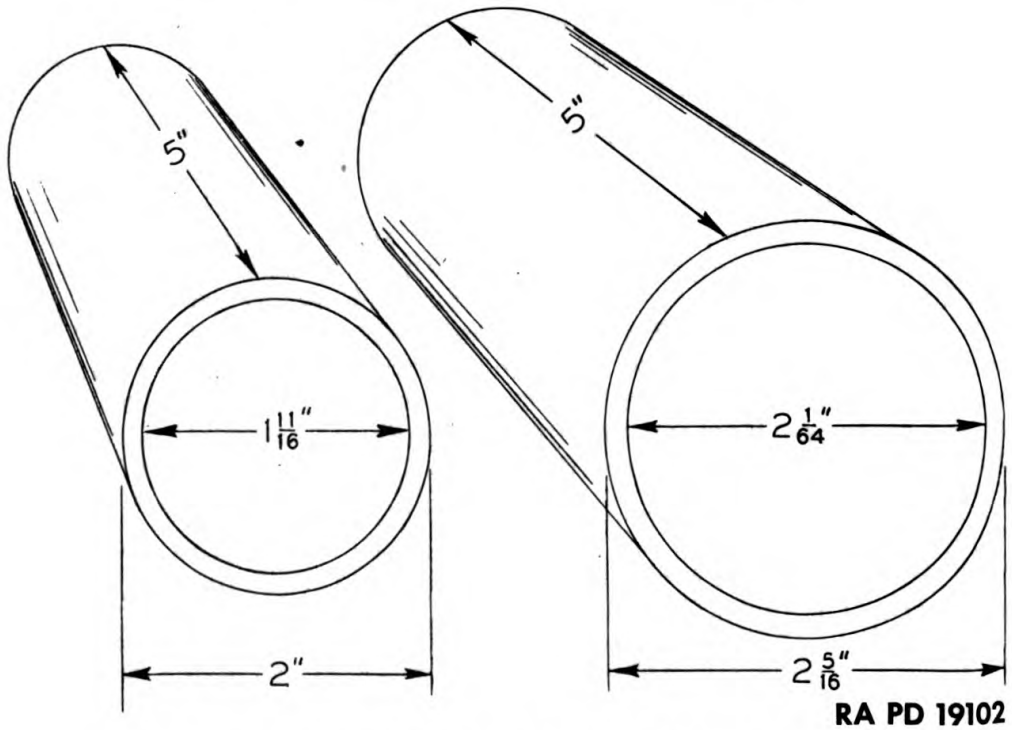


Figure 180 — Needle Bearing Retaining Sleeve Details

b. Assemble Transfer Case Intermediate Shaft Rear Bearing Cap. Press bearing cup into place in cap.

c. Assemble Transfer Case Front Axle Drive Gear Shaft Front and Rear Bearing Caps. Install bearing cup in front cap, and install new oil seal in front cap. Install speedometer driven gear and sleeve in rear cap.

d. Install Transfer Case Shift Fork Rod and Shift Forks. Install new oil seals in bores in transfer case for shift fork rods. Place direct and under-drive shift rod through front of case, and place shift fork in position in case with long portion of hub toward rear. Insert rod through fork. Insert front axle drive shift rod through front of case, and install shift fork and spacer, pushing shift rod through fork and spacer. Install shift fork set screws and lock wires. Install shift fork rod, poppet balls and springs, and retainer plugs at upper right-hand side of transfer case.

e. Assemble Transfer Case Mainshaft. Press mainshaft pocket roller bearing onto shaft.

f. Replace Transfer Case Mainshaft. Assemble mainshaft clutch collar on mainshaft under-drive gear. Shoulder of collar fits into recess in gear. Drop gear and collar onto direct and under-drive shift fork, with collar toward front of case. Slide mainshaft through gear, threaded end first, from front of case. Replace rear bearing thrust washer through rear bearing bore in case. Replace snap ring on bearing, and drive bearing into position in case (fig. 179). After bearing is installed, hold it in place and drive front end of mainshaft until shaft is fully engaged in under-drive gear. Install rear bearing cap and oil seal with new gasket, and install four cap screws and lock washers.

g. Assemble and Install Transfer Case Intermediate Shaft and Gears.

(1) Install rear tapered roller bearing cone onto transfer case intermediate shaft. Grease the bore of the intermediate shaft under-drive gear with heavy grease, such as wheel bearing or water pump grease. Place needle bearing spacer in bore, and arrange needle bearing rollers in bore in two rows, one on each side of spacer. There are 53 rollers in each row. Assemble intermediate shaft clutch collar on under-drive gear with shoulder of collar in recess of gear. Place gear and collar onto shift fork with collar toward rear of case.

(2) The next operation (3) can be facilitated by using two sleeves 5 inches long, the outer sleeve having an outside diameter of $2\frac{5}{16}$ inches and an inside diameter of $2\frac{1}{64}$ inches, and the inner sleeve having an outside diameter of 2 inches and an inside diameter of $1\frac{11}{16}$ inches (fig. 180). To hold needle bearing rollers in gear, place the inner sleeve inside the gear after rollers have been installed. Enter the outer sleeve through the bearing bore in front of case, and slide it over the inner sleeve extending through the gear. Holding the outer sleeve against the gear, enter the small portion of the shaft

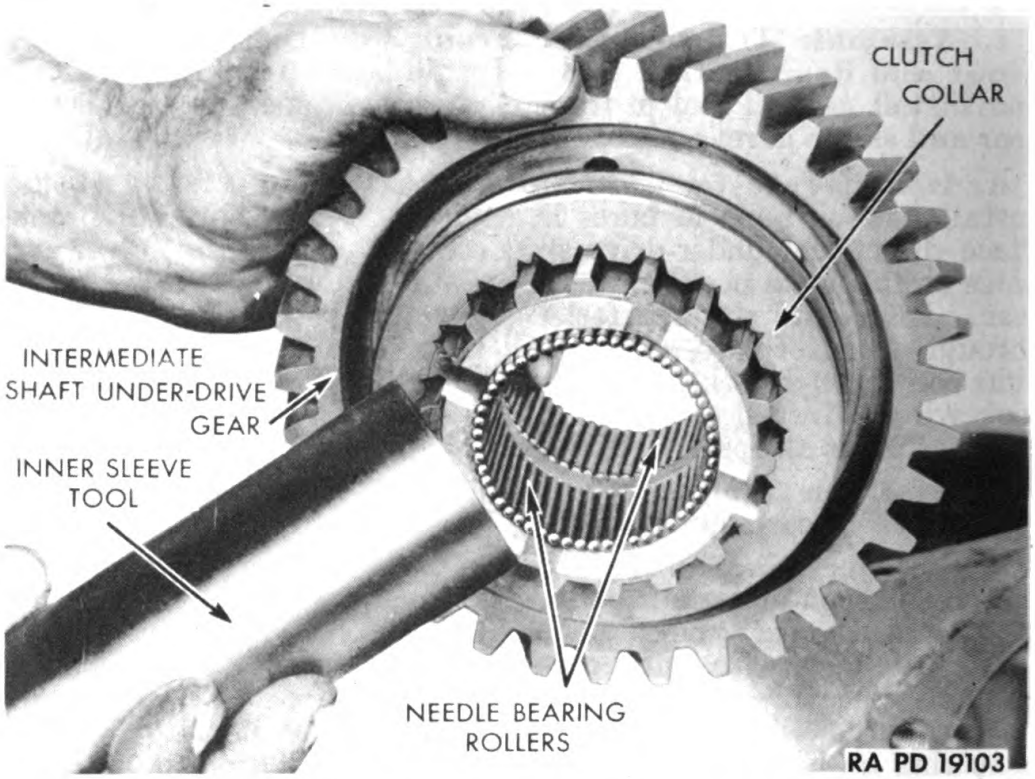


Figure 181 — Installing Needle Bearing Retaining Sleeve

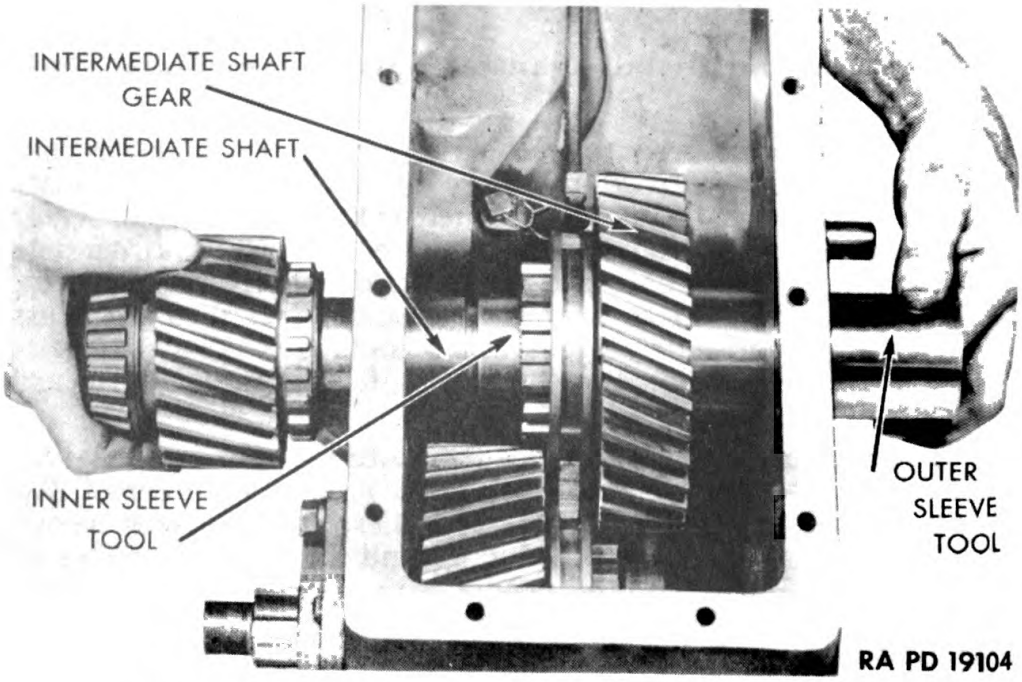


Figure 182 — Installing Intermediate Shaft Using Sleeves

TRANSMISSION AND TRANSFER CASE

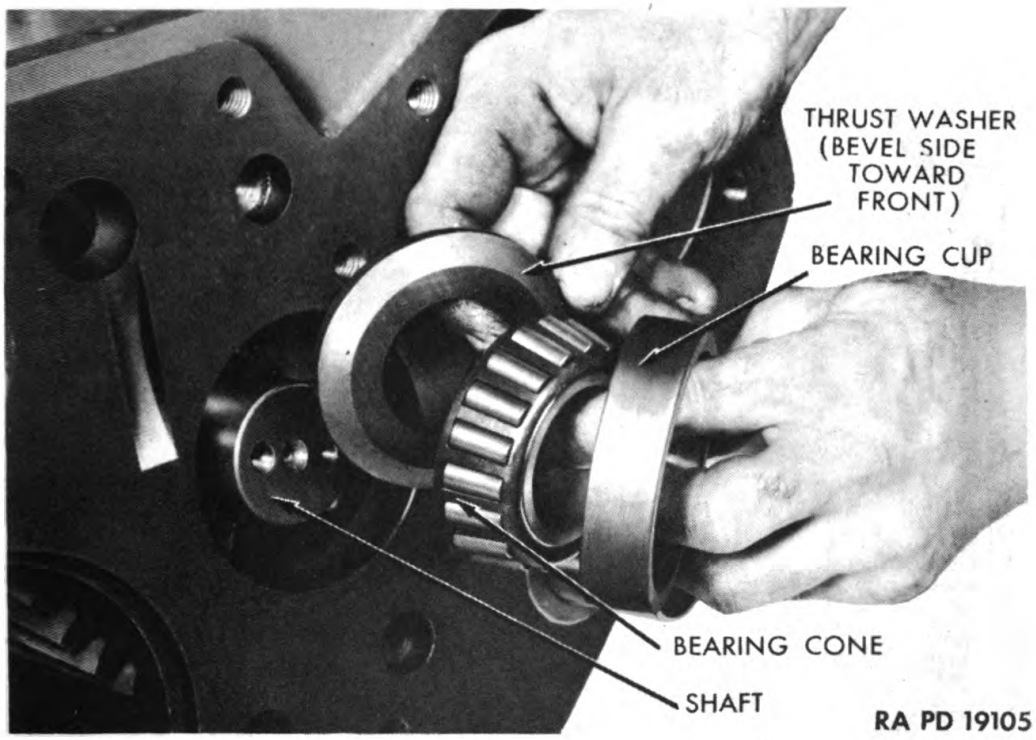


Figure 183 — Installing Needle Bearing Thrust Washer

in the inner sleeve against the shoulder. Push the shaft through the gear, forcing the inner sleeve into the outer sleeve which is held against the gear, and preventing the needle bearing rollers from being pushed out. The sleeves in use are shown in figures 181 and 182.

(3) Slide the intermediate shaft through the rear bearing bore and through the gear, being careful not to push needle bearings out of gear. Install bearing thrust washer through front of case with bevel side toward front (fig. 183). Install bearing cone in shaft. Install bearing cone retaining washer and two ⅜-inch cap screws. Lock cap screws with wire. Install front bearing cup in case and drive in flush with case. Install rear bearing cap with cup and shims. NOTE: *Bearings must be adjusted after transfer case is assembled to transmission case.* Remove or add shims so that shaft will rotate freely without end play.

h. Assemble and Install Transfer Case Front Axle Drive Gear Shaft. Install Woodruff key, and press clutch gear onto shaft. Install front roller bearing cone on shaft. Grease bore of transfer case front axle drive shaft gear with heavy grease, such as wheel bearing or water pump grease. Place needle bearing spacer in bore, and arrange needle bearing rollers in bore in two rows, one on each side of spacer. There are 53 rollers in each row. Assemble front drive shift collar on front drive gear with shoulder of collar in recess of gear. Place gear and collar onto shift fork with collar

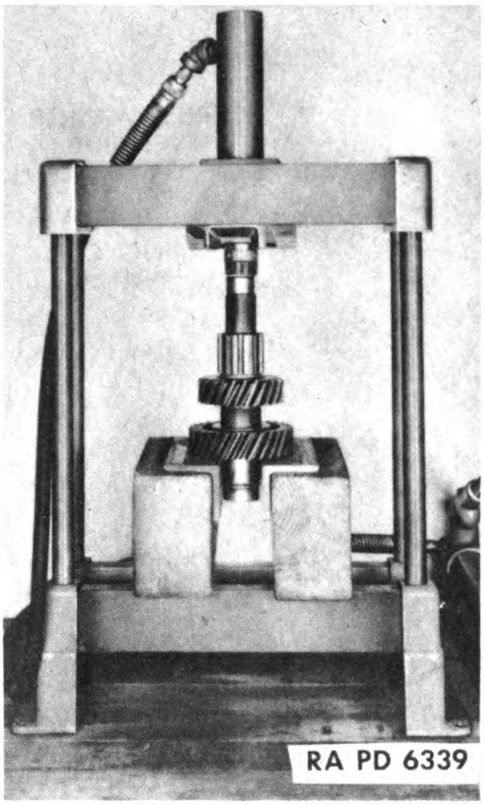


Figure 184 — Pressing on Transmission Countershaft Third Speed Gear

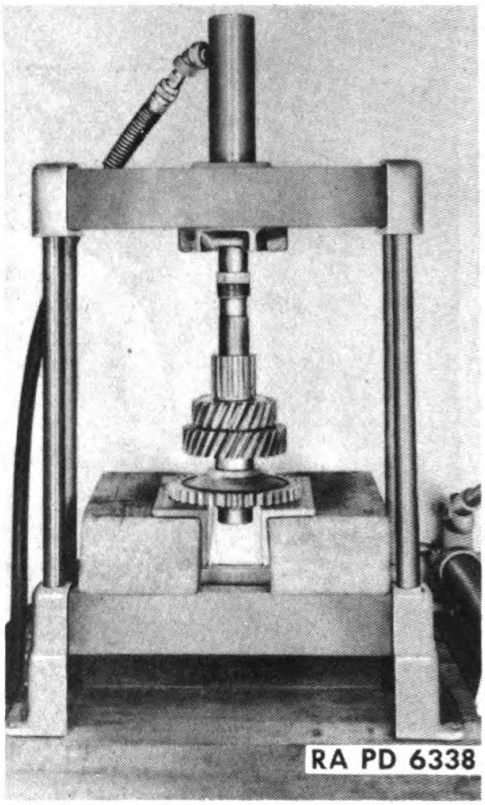


Figure 185 — Pressing on Transmission Countershaft Power Take-Off Gear

toward front of case. Slide front drive shaft through front bearing bore of case and through front drive shaft gear, being careful not to push needle bearings out of gear. NOTE: *Refer to subparagraph* g (2) *above.* Install bearing thrust washer on shaft through rear of case. Install front bearing cap with oil seal and bearing cup. Install and tighten four cap screws and lock washers. Install rear bearing cone, and install small Woodruff key and speedometer drive gear. Shoulder on speedometer drive gear must be toward bearing. Install retaining washer, two cap screws, and lock wire. Install rear bearing cap with speedometer driven gear and sleeve, and install shims. Remove or add shims so that shaft will rotate freely without end play. Install front propeller shaft companion flange, washer, retaining nut, and cotter pin. Install rear propeller shaft companion flange, washer, retaining nut, and cotter pin.

i. Assemble and Install Transmission Countershaft. Install Woodruff key in countershaft, and press countershaft third speed gear onto shaft (fig. 184). Install Woodruff key in shaft, and press power take-off gear onto shaft (fig. 185). Install Woodruff key in shaft, and press countershaft drive gear onto shaft (fig. 186). Install countershaft gear retainer snap ring, and place washer on

TRANSMISSION AND TRANSFER CASE

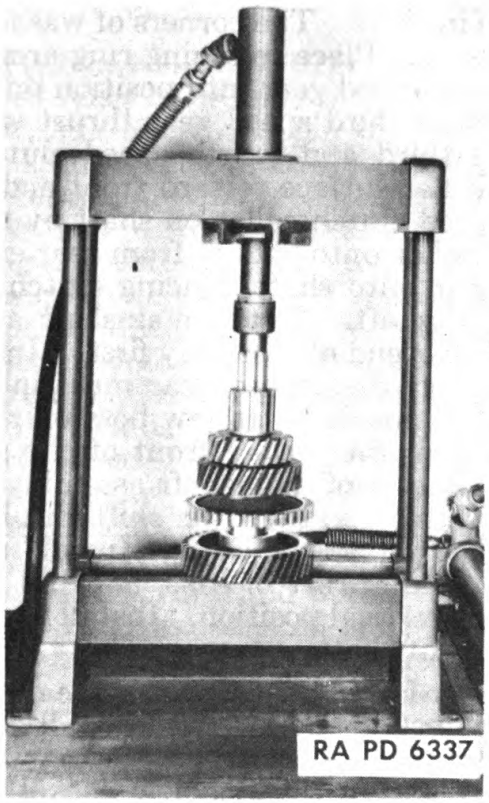


Figure 186 — Pressing on Transmission Countershaft Drive Gear

front end of countershaft. Drive countershaft front bearing into front bore of transmission case. Slide countershaft reverse clutch gear onto rear end of countershaft with shift fork collar toward rear, and install front bearing washer on front end. Tilt rear end of countershaft assembly down and place countershaft into case. Slip front end of shaft into front bearing. Install countershaft first speed sliding gear onto shaft through rear bearing bore in case. Replace first speed gear thrust washer. Install countershaft rear bearing into case. Install rear bearing retainer washer, two cap screws, and locking wire.

j. Install Lower Reverse Shift Fork. Replace shift fork in slot of countershaft reverse clutch gear.

k. Install Reverse Idler Gear in Position with a Brass Thrust Washer at Each End. Insert idler gear shaft through hole in rear of case with clutch teeth toward front. Keep oil slot facing upward, and tap shaft into position. Front brass washer must seat on the larger diameter of shaft in order to allow shaft to be completely inserted. Hold washer in place while driving shaft into place.

l. Assemble and Install Transmission on Mainshaft. Place

mainshaft in vise with threaded end down. Slide second speed gear into position with clutch teeth down. Install two halves of washer into groove in shaft. The corners of washer must fit exactly with corners of groove. Place retaining ring around two halves of washer. Install third speed gear into position on shaft with clutch teeth upward. Install third speed gear thrust washer, and install snap ring. Install third and fourth speed clutch gear on shaft, installing gear with flat surface toward front end of shaft. Install first and reverse speed clutch collar on shaft by turning shaft over and sliding clutch collar onto splines from rear end. Install mainshaft first speed gear onto shaft, placing clutch teeth downward, toward front end of shaft. Install mainshaft and gear assembly into case, lowering rear end of assembly first. Installation requires that right side of large first speed gear must index with notch in transmission case just inside cap screw boss on right rear flange of case. Left side of gear must clear front of cap screw boss on left side of case. Installation of mainshaft assembly requires that the reverse speed gear clutch and the lower shift fork be forward against the countershaft second speed gear. Install reverse shift fork guide rod through hole in rear of case, and tap into place. Keep flat portion of rod in vertical position. Install mainshaft front pilot bearing on front end of shaft.

m. Install Transmission Main Drive Gear. Assemble bearing on shaft, and install snap ring. Install transmission main drive gear into position, then drive bearing into case. Install mainshaft front bearing cap, using new gasket, and install three cap screws, lock washers, and lock wire. NOTE: *Be sure that oil return holes in cap and gasket are at bottom.*

n. Install Transmission Mainshaft Rear Bearing. Install first gear thrust washer on rear end of shaft, and replace rear bearing. Replace rear bearing retainer thrust plate.

o. Install Transfer Case Mainshaft Drive Gear. Slide mainshaft drive gear onto rear end of transmission main shaft, and replace lock washer and lock nut. Be sure inner locking tangs are in recesses in gear. Peen lock washer in at least two slots in lock nut.

p. Install Transmission Clutch Housing. Install new gasket, and place clutch housing in position on front of transmission case. Install six cap screws at inside of housing and two cap screws at front corners of transmission, one at upper right and one at upper left.

q. Install Clutch Throw-out Fork and Shaft. Insert throw-out shaft through left side of clutch housing and through clutch release fork shaft spring. Insert Woodruff key in shaft. Drive the shaft into yoke, and install clamp bolt, nut, and lock washer.

r. Assemble Transfer Case to Transmission Case. Install new gasket on rear face of transmission, and support transmission on clutch housing. Lower transfer case onto transmission, and install seven cap screws and lock washers on outside of case. Install two cap screws, lock washers, and lock wire inside of transfer case.

TRANSMISSION AND TRANSFER CASE

s. Install Transfer Case Cover Plate. Install new gasket, and install transfer case bottom plate with 12 cap screws and lock washers.

t. Assemble Transmission Shifter Housing. Replace reverse and first speed relay lever, inserting lever in place and installing shoulder screw, nut, and cotter pin (fig. 134). Replace poppet springs, dropping springs into place in housing through holes in center (fig. 132). Install first and second speed shift rod in position with set screw hole toward front. Slide shift rod through hole in rear end of housing and through fork. Drop poppet ball into hole in which poppet spring was placed. Depress ball and spring to allow rod to be pushed through, then slide rod through boss. Set first and second speed shift rod bracket lever shoe in place, and push shift rod through. Install set screws and wire in fork and bracket. Install interlock balls in housing between first and second, and third and fourth speed shift rods, two at rear and two at center of rods. Tilt housing slightly to help balls drop into place. Replace third and fourth speed shift rod, sliding rod into housing from the rear end. Insert poppet ball on top of spring in center of housing. Depress poppet ball and spring, and push shift rod through center boss approximately 3 inches. Install shift fork spacer and shift fork on rod with set screw hole toward front (fig. 131). Insert interlock pin in rod, and push the rod into housing to retain interlock pin (fig. 130). Install shift fork set screw and lock wire. Replace four interlock balls in housing between third and fourth, and reverse speed shift rods, two at center and two at rear end of housing. Assemble reverse shifting bracket with plunger and spring, and replace nut and cotter pin. Adjust plunger location with castellated nut so that plunger groove is in line with bracket ball hole. Replace reverse shift rod, placing upper reverse shift fork in position, and sliding reverse shift rod through rear end of housing and through fork. Insert poppet ball, and depress ball while sliding rod through boss. Place reverse shift rod bracket assembly in position, with relay lever shoe and reverse plunger ball in place; then push the shift rod through (fig. 127). Check to see that bracket slides easily on rod. Replace set screw and locking wire in fork. Replace three expansion plugs in front end of housing.

u. Assemble and Install Shifter Housing Cover. After installing shift lever pivot ball pins, replace transmission shift lever in shifter housing cover. Place support spring in cover with small end against the ball, and twist spring end under lug in cover. Install shift lever boot and ball. Install shifter housing cover on shifter housing, indexing shift lever with lugs in shifter fork brackets. Install four nuts and lock washers. Install transmission breather.

v. Install Transmission Shifter Housing on Transmission. Reach down into transmission and place lower reverse shift fork toward rear as far as it will go. Place reverse speed shift upper fork out against side of shifter housing. Install new gasket on transmission, then place shifter housing in position. Have shift forks and all gears in neutral position. Make sure that first and second

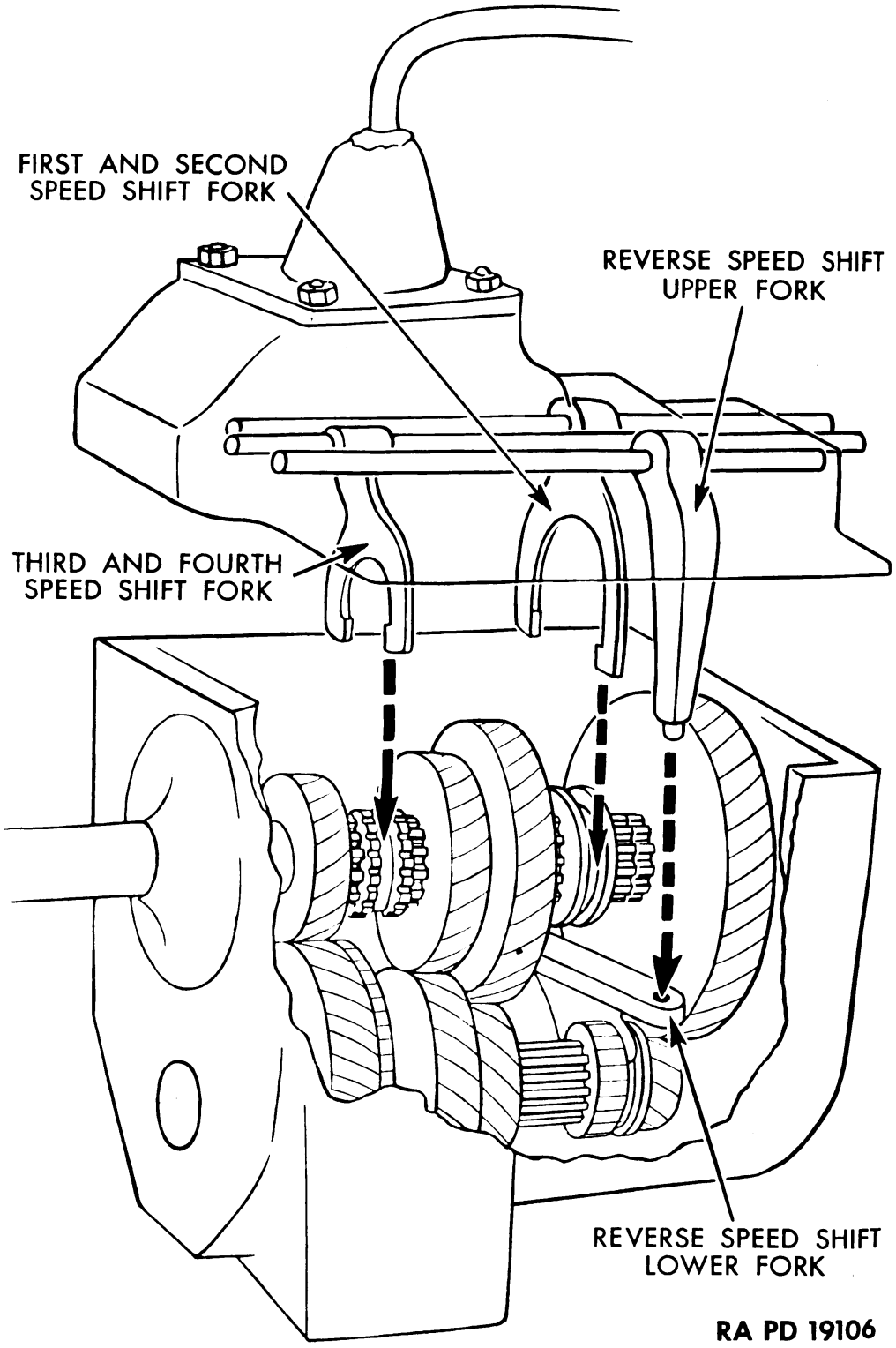


Figure 187 — Transmission Shifter Housing — Installation

speed shift fork lines up with clutch gear groove, that reverse speed shift upper fork end enters the hole in the reverse speed lower shift fork, and that third and fourth speed shift fork lines up with clutch gear (fig. 187). Reach in through the oil filler hole at left-hand side of transmission case with a finger, and make sure that upper shift fork end has entered hole in lower shift fork. Install seven cap screws and lock washers. Install shift rod cover plate and gasket, and install three cap screws and lock washers.

w. Install Transfer Case Control Shift Levers. Install transfer case under-drive shift lever, lever spacer, and front axle drive shift lever on shift lever shaft. Install washer, nut, and cotter pin. Install control lines to shift levers and to shift rods, and install clevis pins and cotter pins.

56. INSTALLATION.

a. Installation of the transmission and transfer case assembly is outlined in TM 9-707.

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

CHAPTER 5

POWER TRAIN (Cont'd)

Section VI

POWER TAKE-OFF

57. DESCRIPTION AND DATA.

a. Description (fig. 188). Winch-equipped half-track vehicles have a power take-off mounted at the left-hand side of the transmission case. Power is transmitted to the front-mounted winch through the winch drive propeller shaft. Engagement or disengagement of the power take-off is effected by means of a shift lever located in the driver's compartment. The weight of the power take-off is approximately 36 pounds.

b. Data.

Make	Spicer
Model	1934
Mounting	Transmission

58. REMOVAL.

a. Disconnect Winch Propeller Shaft at Power Take-off. Remove four cap screws, nuts, and lock washers from companion flange at power take-off. Lower propeller shaft rear end.

b. Disconnect Power Take-off Shift Lever at Shift Fork Rod. Remove cotter pin from yoke pin at shift lever connection with power take-off shift rod, and remove yoke pin and flat washers.

c. Remove Power Take-off from Transmission. Drain transmission lubricant. Remove six nuts and lock washers from screws holding power take-off unit to transmission case. Lower power take-off to floor.

59. CLEANING AND INSPECTION.

a. Cleaning. Following removal of the power take-off, the

POWER TAKE-OFF

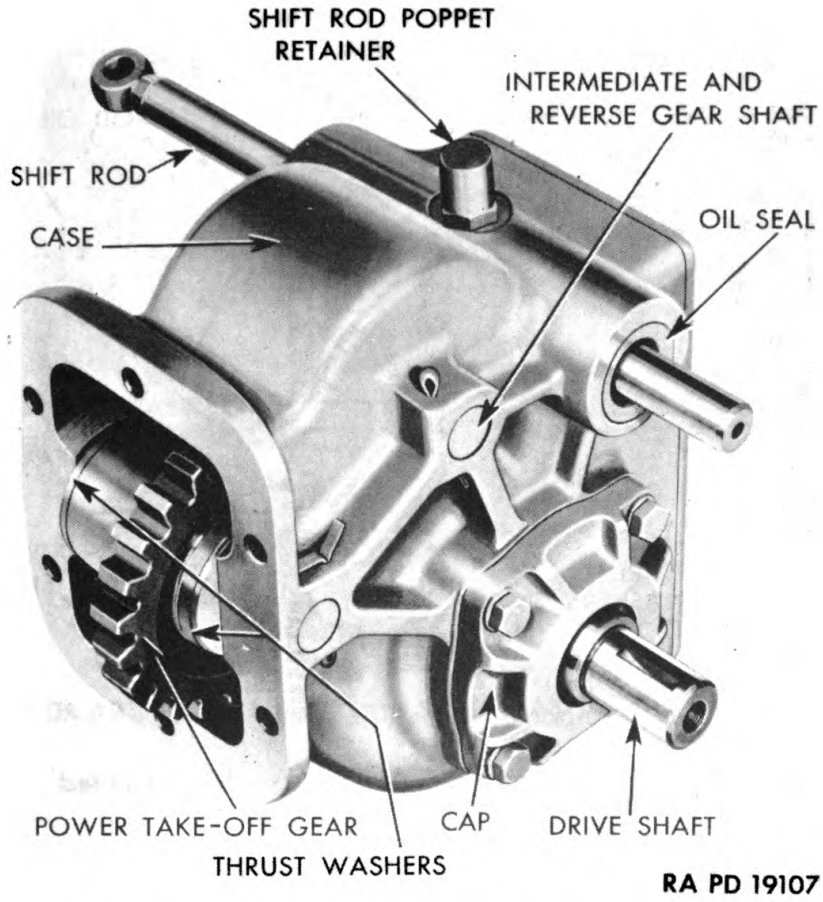


Figure 188 — Power Take-Off Assembly — Removed

assembly must be scrubbed clean in dry-cleaning solvent, or by use of a steam cleaner. All grease and oil must be removed, both externally and internally.

b. Inspection. Inspect power take-off assembly for loss of parts, damage to cover plate, or breakage of housing or mounting flange. Replace damaged parts.

60. DISASSEMBLY.

a. Remove Companion Flange. Remove set screw from companion flange, remove companion flange from shaft, and remove drive key from shaft.

b. Remove Cover. Remove six cap screws and lock washers from cover of power take-off (fig. 190). Lift off cover and gasket from housing (fig. 191).

c. Remove Power Take-off Shift Fork. Remove lock wire from shift fork set screws, and remove two set screws (fig. 192).

(*Continued on Page 173*)

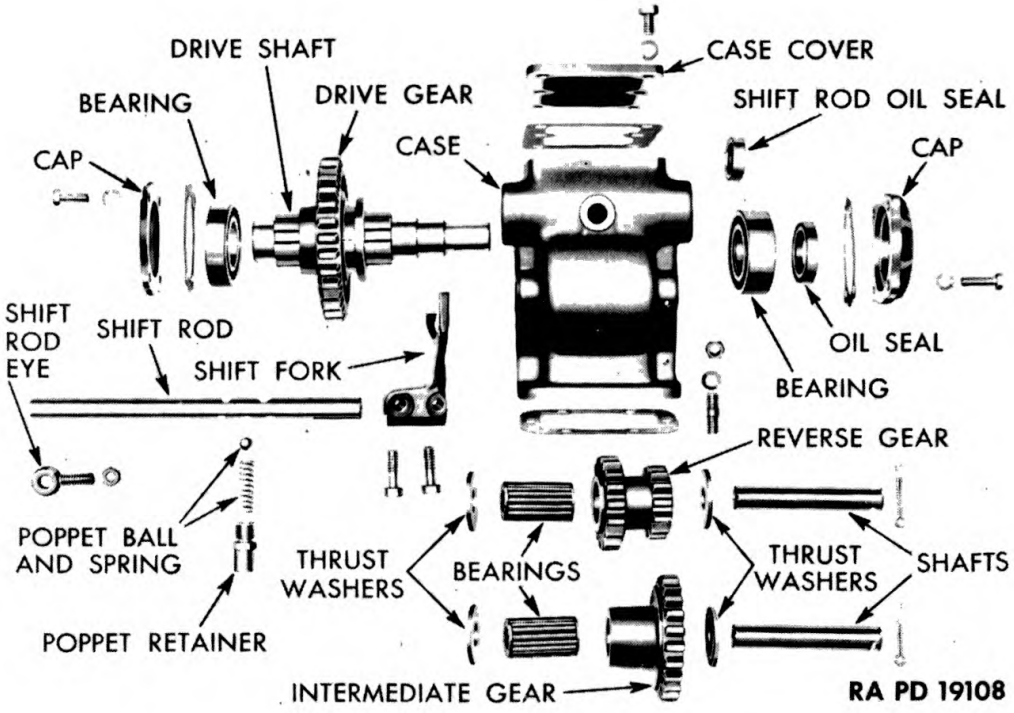


Figure 189 — Power Take-Off Assembly — Disassembled

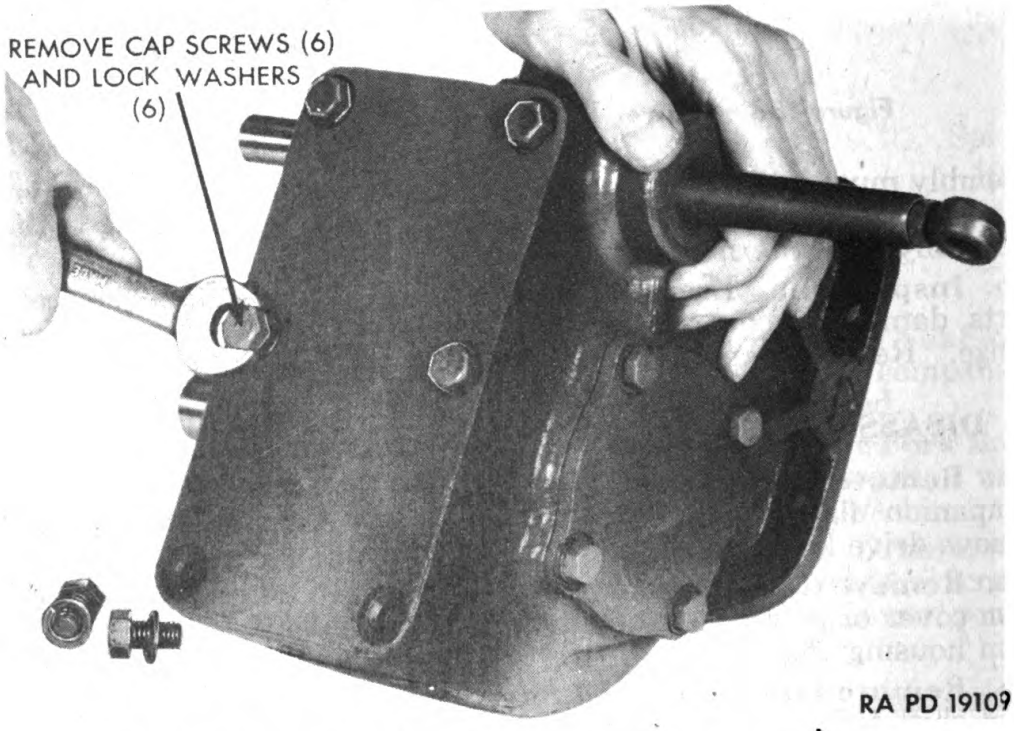
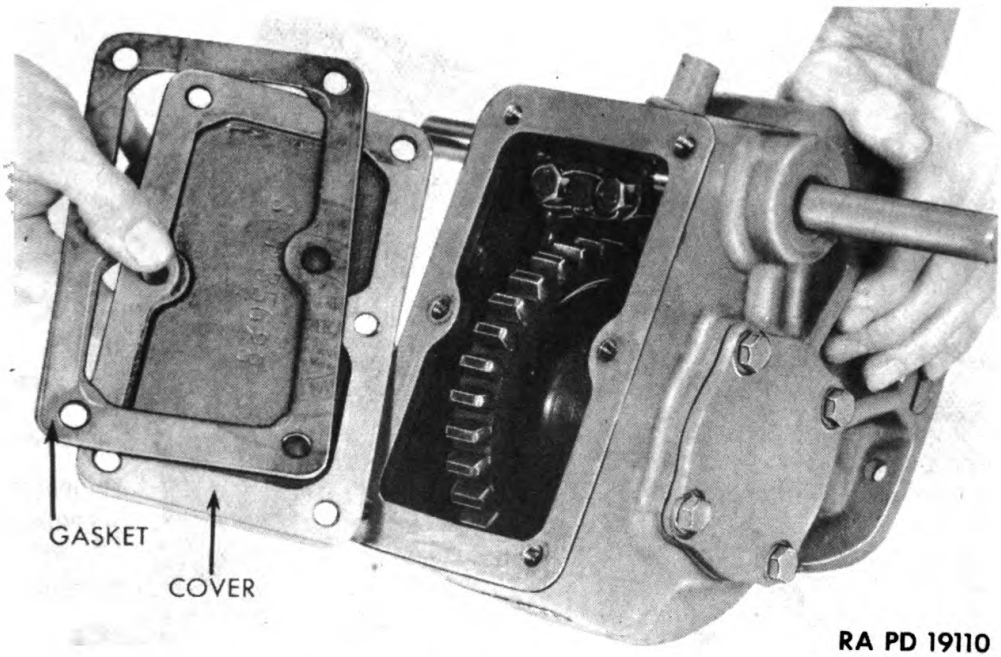


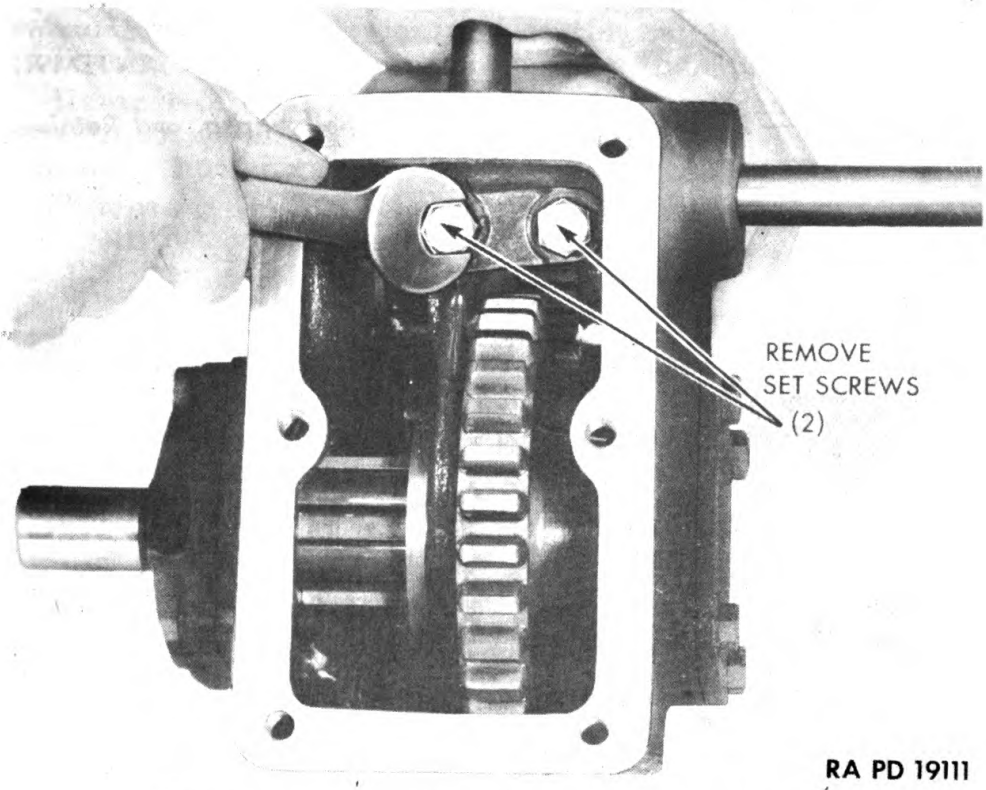
Figure 190 — Removing Power Take-Off Cover Cap Screws

POWER TAKE-OFF



RA PD 19110

Figure 191 — Removing Power Take-Off Cover and Gasket



RA PD 19111

Figure 192 — Removing Shift Fork Cap Screws

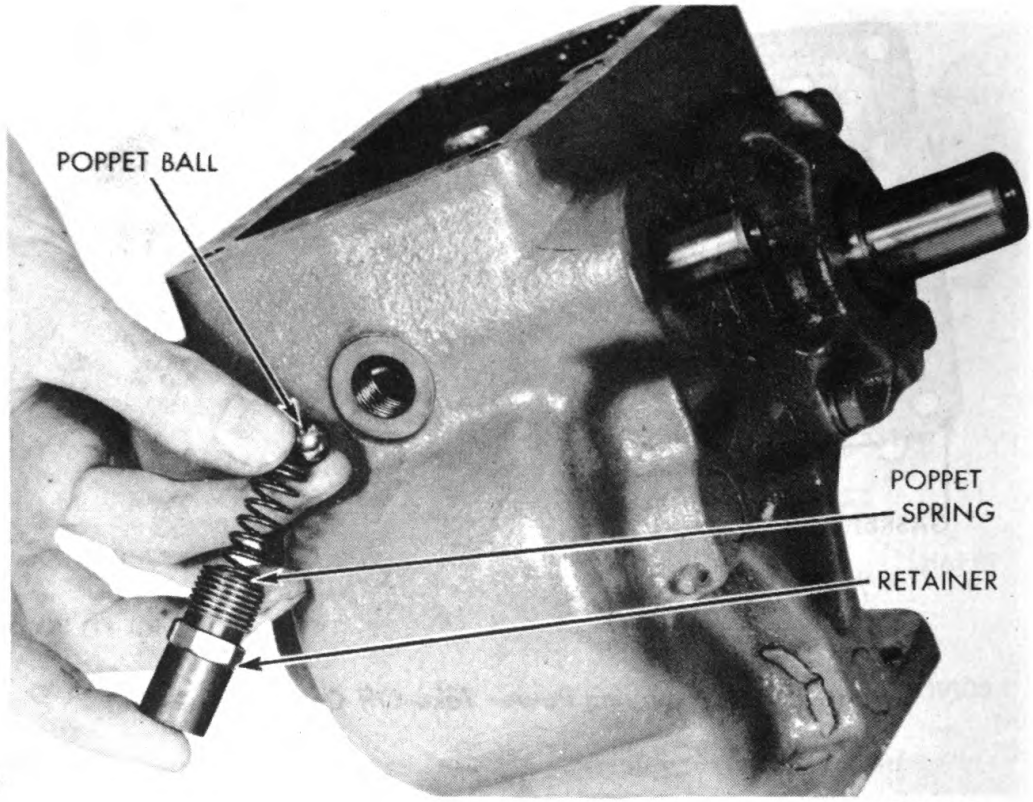


Figure 193 — Removing Shift Fork Poppet Ball, Spring, and Retainer

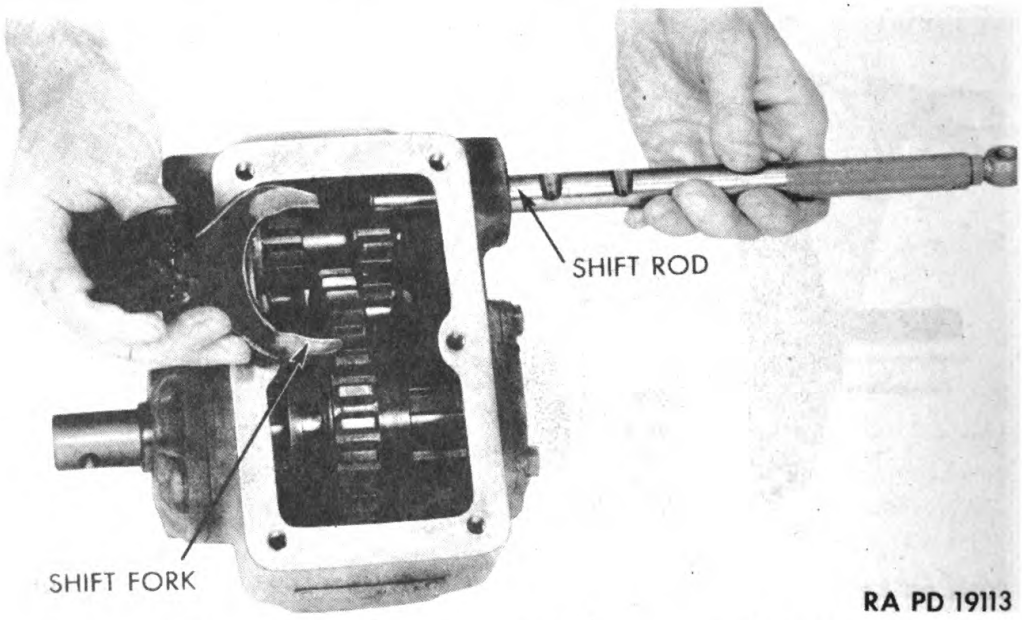


Figure 194 — Removing Shift Fork and Shift Rod

POWER TAKE-OFF

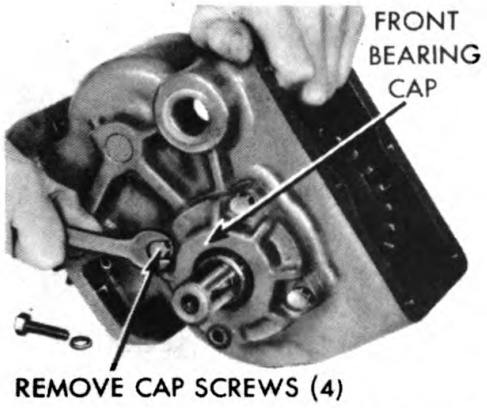


Figure 195 — Removing Front Bearing Cap and Cap Screws

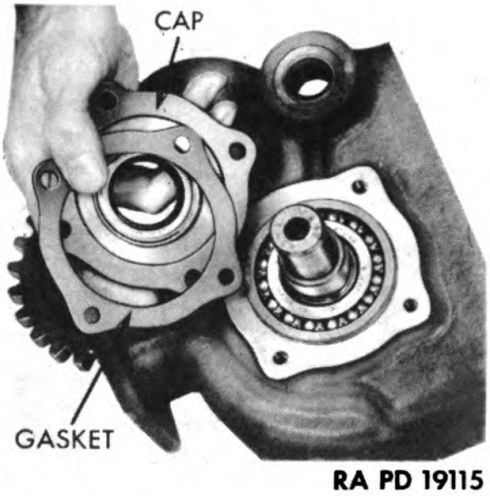


Figure 196 — Front Bearing Cap and Gasket — Removed

Remove shift fork poppet spring retainer from top of housing, and remove poppet spring and ball (fig. 193). Remove shift rod from shift fork, and remove fork and rod from power take-off (fig. 194).

d. Remove Mainshaft Front Bearing Cap. Remove four cap screws and lock washers from front bearing cap (fig. 195). Remove front bearing cap and gasket from housing (fig. 196).

e. Remove Mainshaft Rear Bearing Cap. Remove four cap screws and lock washers from rear bearing cap (fig. 197). Remove rear bearing cap and gasket from housing (fig. 198).

f. Remove Mainshaft. Drive mainshaft toward rear of case out of front bearing and out of main drive gear (fig. 199). Press bearing off from shaft.

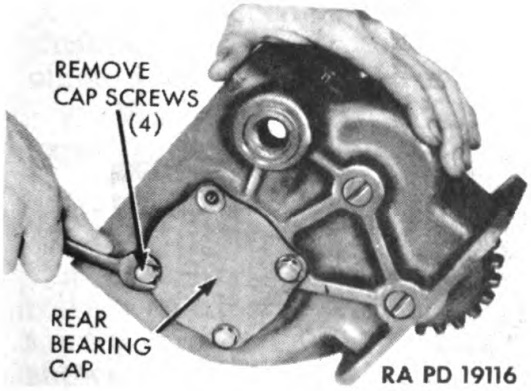


Figure 197 — Removing Rear Bearing Cap and Cap Screws

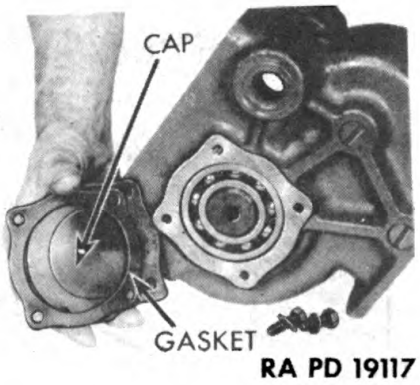


Figure 198 — Rear Bearing Cap and Gasket—Removed

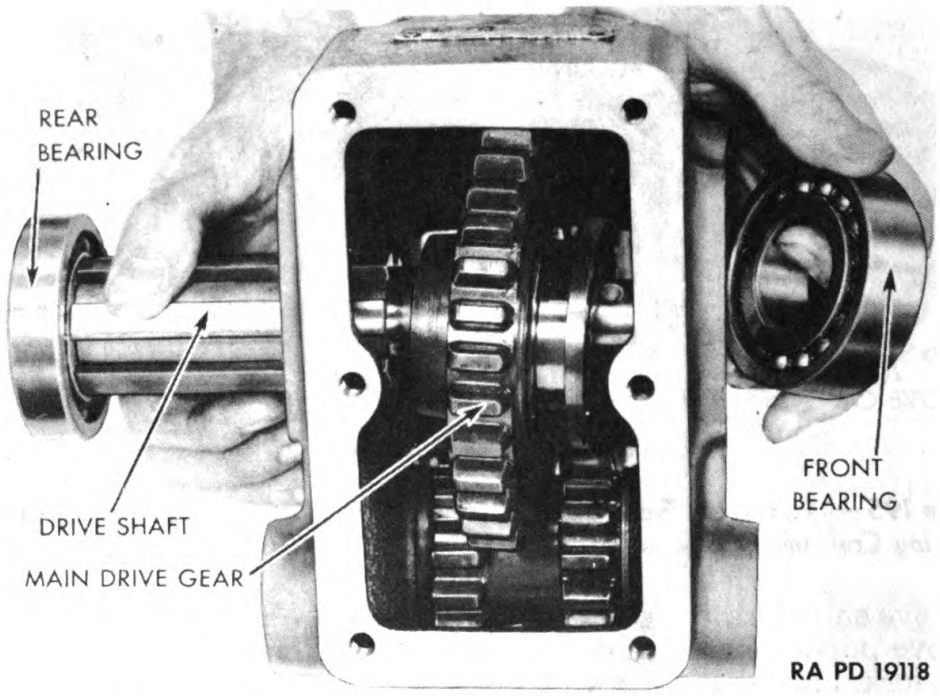


Figure 199 — Removing Power Take-Off Drive Shaft.

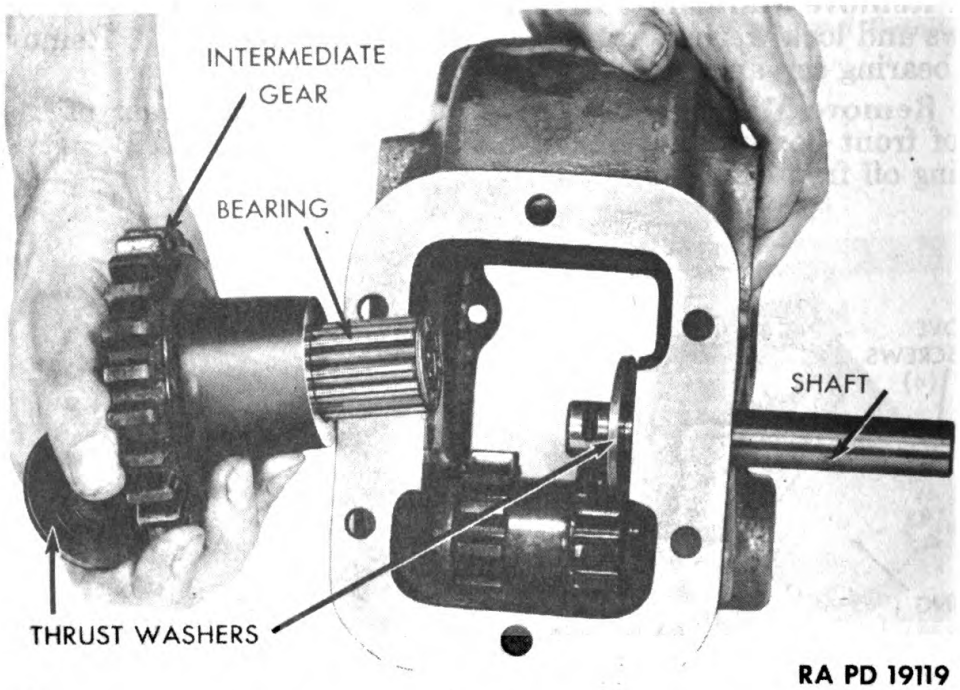


Figure 200 — Removing Intermediate Gear and Shaft

POWER TAKE-OFF

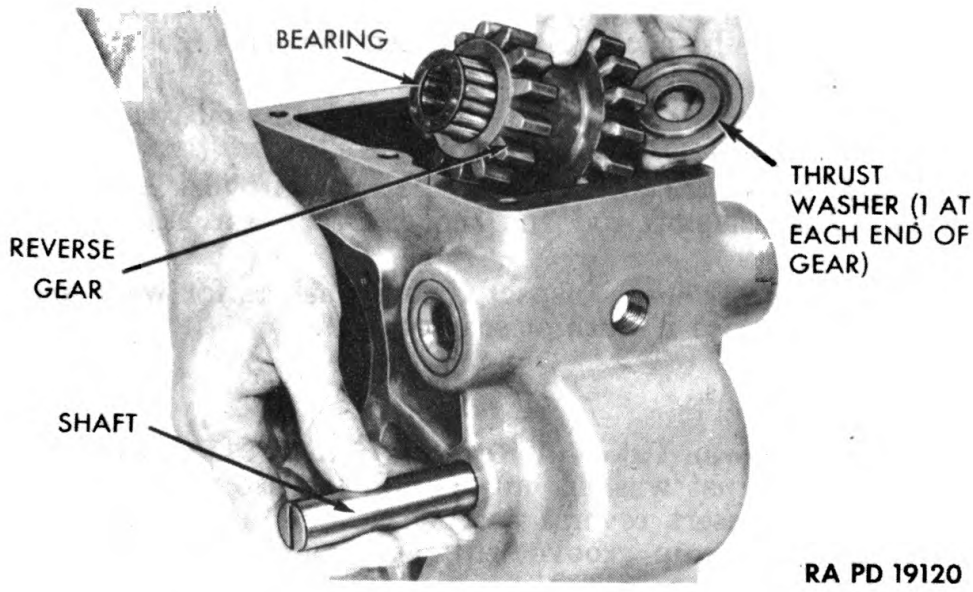


Figure 201 — Removing Reverse Gear and Shaft

g. Remove Power Take-off Intermediate Gear. Remove cotter pin from intermediate shaft. Push shaft out of housing, and remove the intermediate gear, bearing, and two thrust washers (fig. 200).

h. Remove Power Take-off Reverse Gear. Remove cotter pin from reverse shaft. Push shaft out of housing, and remove reverse gear, bearing, and two thrust washers from case (fig. 201).

61. CLEANING OF PARTS.

a. Bearings. Allow bearings to soak in dry-cleaning solvent to soften and loosen heavy grease particles. Slush bearings up and down in dry-cleaning solvent, while rotating bearings, to cause particles loosened to fall out. Jar against a wood block and repeat slushing process until bearings are clean. Coat bearings with light oil, and wrap in paper to await inspection.

b. Wash all other parts in dry-cleaning solvent, scrubbing to expedite process. Remove all grease, dirt, and oil.

62. INSPECTION OF PARTS.

a. Bearings. Inspect all bearings for nicks or chips on balls or rollers, and inspect races. Spin bearings by hand, and if unusual sounds are noticed, investigate cause. Replace any bearings showing defects.

b. Gears. Inspect all gears for signs of tooth chipping or cracking, and inspect teeth for wear. If wear can be felt or cracks or pits are evident, replace gears.

c. Shafts. Inspect shafts for wear, and replace if wear can be felt.

d. Housing. Inspect housing for cracks, and if encountered, replace housing.

e. Oil Seals and Gaskets. All gaskets and oil seals must be replaced at each major repair or overhaul.

f. Shift Fork and Shift Rod. Inspect shift fork, and replace if worn. Inspect shift rod and rod end for wear, and replace if worn.

g. Thrust Washers. Inspect thrust washers for wear and for scoring, and replace if worn or scored.

63. ASSEMBLY.

a. Install Power Take-off Reverse Gear. Place reverse gear, bearing, and thrust washers in position in case with larger gear toward rear. Insert reverse gear shaft and, using screwdriver, turn shaft to line up groove with cotter pin hole. Insert new cotter pin.

b. Install Power Take-off Intermediate Gear. Plate intermediate gear, bearing, and two thrust washers in case with larger gear toward front, and insert shaft. Turn shaft so that groove will line up with cotter pin hole, and insert new cotter pin.

c. Install Main Drive Gear. Press bearing onto mainshaft. Place gear in housing with clutch collar toward front of case. Install front bearing in case.

d. Install Front and Rear Bearing Caps. Install new gasket, and install front bearing cap with new oil seal. Install four cap screws and lock washers. Install rear bearing cap and gasket, and four cap screws and lock washers.

e. Install Shift Fork and Shift Rod. Insert shift fork in case, placing fork over clutch collar with hub of fork toward rear. Insert shift rod from rear with side having two notches toward inside of case. Install two retainer cap screws and lock wire at shift fork.

f. Install Poppet Ball, Spring, and Retainer. Insert poppet ball, poppet spring, and retainer in case.

g. Install Cover Plate. Install new gasket on housing. Install cover plate and six cap screws and lock washers.

64. INSTALLATION.

a. Install Power Take-off at Transmission. Install new gasket on transmission, and mount power take-off in position. Install six nuts and lock washers on mounting screws.

b. Connect Winch Propeller Shaft. Install companion flange on drive shaft, after installing drive key, and install companion flange set screw. Connect companion flanges, and install four cap screws, nuts, and lock washers.

POWER TAKE-OFF

c. Connect Power Take-off Shift Lever. With shift lever in neutral position and centered in notch of lock plates, adjust length of shift fork rod end eye so that yoke pin will enter eye at shift lever end. Install yoke pin, flat washers, and new cotter pin.

d. Refill Transmission with Lubricant. Remove filler plug on side of transmission case, and fill housing to ½ inch below filler hole with universal gear oil. Replace filler plug.

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CHAPTER 5

POWER TRAIN (Cont'd)

Section VII

FITS AND TOLERANCES

65. FITS AND TOLERANCES.

a. Front Axle.

(1) SIDE GEARS.

Number used	2
Number of teeth	22
Number of splines	16
Maximum allowable run-out back of gear	0.002 to 0.004 in.
Maximum allowable run-out face of tooth	0.003 in.
Tooth contact	¾ toe bearing to full contact
Backlash with mating gears	0.000 to 0.008 in.

(2) SPIDER PINIONS

Number used	4
Number of teeth	12
Bore diameter	0.876 to 0.877 in.
Maximum allowable run-out back face of gear	0.002 in.
Tooth contact	¾ toe bearing to full contact
Backlash with mating gears	0.000 to 0.008 in.

(3) SPIDER.

Number of arms	4
Arm diameter	0.872 to 0.873 in.
Maximum allowable out-of-square of arms	0.002 in.
Spider bore diameter	1.760 to 1.765 in.

(4) SIDE GEAR THRUST WASHER.

Number used	2
Outer diameter	3⅞ in.
Inner diameter	2.387 to 2.397 in.
Thickness	0.0615 to 0.0635 in.
Must be flat within limits	0.010 to 0.025 in.
Depth of case hardening	0.006 to 0.010 in.

FITS AND TOLERANCES

(5) SPIDER GEAR THRUST WASHERS.

Number used	4
Outer diameter	2 in.
Bore diameter	0.885 to 0.895 in.
Thickness	0.0615 to 0.0635 in.
Depth of case hardening	0.006 to 0.010 in.

(6) BEVEL DRIVE PINION.

Number teeth	6
Type	Right-hand spiral
Allowable backlash	0.008 in.
Outer bearing diameter	1.751 to 1.752 in.
Inner bearing diameter	1.1815 to 1.1820 in.
Theoretical cone center	3.8127 in.
Maximum run-out of gear teeth	0.003 in.

(7) BEVEL DRIVE GEAR.

Number of teeth	43
Outer diameter	13.626 to 13.636 in.
Bore diameter	7.624 to 7.626 in.
Maximum allowable run-out—face of gear	0.005 in.

(8) PINION BEARING SPACER.

Number used	1
Thickness:	
A298438	0.513 to 0.514 in.
A298439	0.516 to 0.517 in.
A298440	0.519 to 0.520 in.
A298441	0.522 to 0.523 in.
A298442	0.525 to 0.526 in.
A298443	0.528 to 0.529 in.
A298444	0.531 to 0.532 in.
A298445	0.534 to 0.535 in.
A298446	0.537 to 0.538 in.
A298447	0.539 to 0.540 in.
A298448	0.540 to 0.541 in.
A298449	0.543 to 0.544 in.
Outer diameter	2¼ in.
Inner diameter	1.755 to 1.760 in.

(9) PINION BEARING CAGE SHIMS.

Number used	As required
Thickness:	
A298455	0.00275 to 0.00325 in.

Thickness—*Continued from Page 179.*

A298456	0.00275 to 0.00325 in.
A298457	0.00975 to 0.01025 in.
A298458	0.028 to 0.032 in.
Type	Steel
Outer diameter	6¾ in.
Inner diameter	4⅜ in.

(10) FRONT WHEEL SPINDLE BUSHINGS.

Number used	2
Outer diameter	2.1905 to 2.1920 in.
Inner diameter (finish)	1.891 to 1.893 in.
Inner diameter (rough)	1.865 to 1.870 in.

(11) FRONT AXLE UNIVERSAL JOINT THRUST WASHERS.

Number used	2
Outer diameter	3.001 to 3.002 in.
Inner diameter	2⅜ in.
Thickness	0.184 to 0.185 in.
Faces flat within	0.005 in.
Faces parallel within	0.004 in.
Material	Bronze

(12) TRUNNION BEARING SHIMS.

Number used	As required
Size	4⅛ x 4⅛ in.
Thickness:	
A298502	0.00175 to 0.00225 in.
A298503	0.00275 to 0.00325 in.
A298504	0.00975 to 0.01025 in.
A298505	0.029 to 0.033 in.
Material	Steel

(13) STEERING TIE ROD.

Tie rod pivot bolt diameter	0.7465 to 0.7475 in.
Tie rod bushings—ream diameter	0.748 to 0.749 in.

b. Rear Axle.

(1) SIDE GEARS.

Number used	2
Number of teeth	22
Maximum allowable run-out back of gear	0.002 to 0.004 in.
Maximum allowable run-out face of tooth	0.003 in.
Tooth contact	¾ toe bearing to full contact

FITS AND TOLERANCES

SIDE GEARS (*Continued*)

Backlash with mating gears . . . . . 0.000 to 0.008 in.

(2) SPIDER PINIONS.

Number used 4
Number of teeth 12
Bore diameter . . . . . 0.876 to 0.877 in.
Maximum allowable run-out back face of gear . . 0.002 to 0.004 in.
Tooth contact . . . . . ¾ toe bearing to full contact
Backlash with mating gears . . . . . 0.000 to 0.008 in.

(3) SPIDER.

Number of arms 4
Arm diameter . . . . . 0.872 to 0.873 in.
Maximum allowable out-of-square of arms . . . . . 0.002 in.
Spider bore diameter . . . . . 1.760 to 1.765 in.

(4) SIDE GEAR THRUST WASHERS.

Number used 2
Outer diameter . . . . . 3⅞ in.
Inner diameter . . . . . 2.387 to 2.397 in.
Thickness . . . . . 0.0615 to 0.0635 in.
Must be flat within . . . . . 0.010 to 0.025 in.
Depth of case hardening . . . . . 0.006 to 0.010 in.

(5) SPIDER GEAR THRUST WASHERS.

Number used 4
Outer diameter . . . . . 2 in.
Bore diameter . . . . . 0.885 to 0.895 in.
Thickness . . . . . 0.0615 to 0.0635 in.
Depth of case hardening . . . . . 0.006 to 0.010 in.

(6) BEVEL DRIVE PINION.

Number teeth 9
Type . . . . . Right-hand spiral
Allowable backlash . . . . . 0.008 to 0.010 in.
Outer bearing diameter . . . . . 1.751 to 1.752 in.
Inner bearing diameter . . . . . 1.815 to 1.820 in.
Theoretical cone center . . . . . 3.8125 in.
Maximum run-out of gear teeth . . . . . 0.003 in.

(7) AXLE SHAFT.

Number of splines 16
Diameter over splines . . . . . 1.870 to 1.880 in.
Length of splines . . . . . 2¼ in.

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

AXLE SHAFT—*Continued from Page 181.*

Length of shaft over-all	36 7/16 in.
Flange diameter	6.250 to 6.255 in.
Flange surface square with splines within	0.005 in.
Maximum allowable run-out in center portion of shaft	0.060 in.

c. Transmission.

(1) MAINSHAFT AND GEARS.

Clearance between:	
Mainshaft and clutch gear	0.002 to 0.006 in.
Mainshaft and first, second, and third speed gears	0.003 to 0.005 in.
Shift forks and clutch gear and collar	0.026 to 0.050 in.
Backlash:	
Clutch gear and collar	0.004 to 0.008 in.
First and second speed gears	0.006 to 0.010 in.
Third speed gear	0.004 to 0.007 in.
Main drive gear	0.004 to 0.007 in.
Mainshaft out of true, not over	0.002 in.
Main drive gear out of true, not over	0.002 in.
Third speed gear thrust washer thickness	0.144 to 0.149 in.
Second and third speed gear thrust washer thickness	0.174 to 0.179 in.
First speed gear thrust washer thickness	0.152 to 0.158 in.

(2) COUNTERSHAFT.

Clearance between shift fork and clutch gear	0.026 to 0.050 in.
Backlash of countershaft reverse speed clutch gear	0.004 to 0.008 in.
Countershaft out of true, not over	0.002 in.
Rear bearing thrust washer thickness	0.119 to 0.123 in.

(3) REVERSE IDLER.

Clearance between reverse idler gear bushing and shaft	0.003 to 0.008 in.
Backlash of reverse idler gear:	
Spur gear portion	0.008 to 0.012 in.
Helical gear portion	0.006 to 0.010 in.
Reverse idler gear thrust washer thickness	0.085 to 0.090 in.

(4) SHIFTER MECHANISM.

Poppet springs, first and second, and third and fourth speed shift rods:	
Free length	7/8 in.
Pressure at 45/64-in. length	18 lb

FITS AND TOLERANCES

Poppet spring, reverse shift rod:
- Free length ..... 13/16 in.
- Pressure at 23/32-in. length ..... 30 lb

Reverse shift bracket lock spring:
- Free length ..... 1 7/8 in.
- Pressure at 1 3/8-in. length ..... 38 lb
- Poppet and interlock balls ..... 3/8-in.
- Reverse shift bracket lock ball ..... 7/16-in.

d. Transfer Case.

(1) MAINSHAFT AND GEARS.

Clearance between shifter fork and clutch collar . . 0.058 to 0.075 in.
Backlash:
- Under-drive gear ..... 0.006 to 0.010 in.
- Direct and under-drive clutch collar ..... 0.004 to 0.008 in.
- Mainshaft out of true, not over ..... 0.002 in.
- Under-drive gear thrust washer thickness ..... 0.172 to 0.178 in.

(2) INTERMEDIATE SHAFT.

Backlash:
- Intermediate shaft gears ..... 0.006 to 0.010 in.
- Clutch collar ..... 0.004 to 0.008 in.

Under-drive gear inner diameter ..... 2.2505 to 2.2515 in.
Shaft diameter at needle bearings ..... 1.9990 to 1.9995 in.
Needle Bearings:
- Quantity 106
- Diameter ..... 0.1245 to 0.1250 in.
- Length ..... 1.125 in.

Bearing and shaft end-play adjustment ..... Shims
- Location of shims ..... Rear bearing cap
- Shim thickness:
  - B184288 ..... 0.003 in.
  - B184289 ..... 0.010 in.
  - B184290 ..... 0.031 in.
- Adjustment ..... No perceptible end play

Shaft out of line, not over ..... 0.002 in.

(3) FRONT DRIVE SHAFT.

Backlash:
- Front drive shaft gear ..... 0.006 to 0.010 in.
- Clutch collar ..... 0.004 to 0.008 in.

Front drive shaft gear inner diameter ..... 2.2505 to 2.2515 in.
Shaft diameter at needle bearings ..... 1.9995 to 2.0000 in.

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

FRONT DRIVE SHAFT—*Continued from Page 183.*

Needle bearings:
- Quantity . . . 106
- Diameter . . . 0.12450 to 0.12500 in.
- Length . . . 0.925 in.

Bearing and shaft end-play adjustment . . . Shims
- Location of shims . . . Rear bearing cap
- Shim thickness:
  - B184291 . . . 0.003 in.
  - B184292 . . . 0.010 in.
  - B184293 . . . 0.031 in.
- Adjustment . . . No perceptible end play

Thrust washer thickness . . . 0.187 to 0.190 in.

(4) SHIFTER MECHANISM.

Clearance, front drive shaft shift rod bushing . . 0.001 to 0.005 in.

Poppet springs:
- Free length . . . $1\frac{7}{32}$ in.
- Pressure at 1-in. length . . . 38 lb

Interlock bracket guide pin springs:
- Free length . . . 3 in.
- Pressure at $1\frac{3}{4}$-in. length . . . 3 lb
- Poppet balls . . . $\frac{7}{16}$-in.
- Rocker interlock ball . . . $\frac{5}{16}$-in.

e. Power Take-off.

(1) SPECIFICATIONS.

Make . . . Spicer

Model . . . 1934

Ratios:
- Reverse . . . 0.97:1.00
- Forward . . . 0.74:1.00

(2) DRIVE GEAR.

Number teeth . . . 31

Backlash of teeth with mating gear . . . 0.008 to 0.011 in.

Diameter bottom of splines . . . 1.750 to 1.751 in.

Diameter top of splines . . . 1.473 to 1.478 in.

(3) DRIVE GEAR SHAFT.

Length over-all . . . $7\frac{3}{4}$ in.

Diameter over splines . . . 1.7485 to 1.7490 in.

Diameter bottom of splines . . . 1.4355 to 1.4375 in.

FITS AND TOLERANCES

Diameter rear bearing . . . . . 1.3778 to 1.3782 in.
Diameter front bearing . . . . . 1.3778 to 1.3782 in.
Diameter seal surface . . . . . 1.247 to 1.251 in.
Diameter companion flange end . . . . . 0.997 to 0.998 in.

(4) INTERMEDIATE GEAR.

Number of teeth 23
Backlash of teeth with mating gear . . . . . 0.008 to 0.011 in.
Shaft bore diameter . . . . . 1.250 to 1.251 in.
Length over-all . . . . . 2.371 to 2.375 in.

(5) INTERMEDIATE GEAR SHAFT:

Length over-all . . . . . 4 7/8 in.
Diameter of shaft . . . . . 0.7495 to 0.7500 in.

(6) REVERSE IDLER GEAR.

Number of teeth . . . . . 13 and 17
Backlash of teeth with mating gears . . . . . 0.008 to 0.011 in.
Shaft bore diameter . . . . . 1.250 to 1.251 in.
Length over-all . . . . . 2.375 to 2.371 in.
End surfaces square with bore within . . . . . 0.002 in.

(7) REVERSE IDLER GEAR SHAFT.

Length over-all . . . . . 4 7/8 in.
Diameter of shaft . . . . . 0.7495 to 0.7500 in.

(8) BEARINGS.

Mainshaft front:
  Type . . . . . Double row ball
  Make and number ND-5207
  Shaft bore diameter . . . . . 1.3775 to 1.3780 in.
Mainshaft rear:
  Type . . . . . Single row ball
  Make and number ND-3207
  Shaft bore diameter . . . . . 1.3775 to 1.3780 in.
Reverse gear and intermediate gear:
  Type . . . . . Roller
  Make and number . . . . . Hyatt 94338
Thrust washers:
  Number used 4
  Outside diameter . . . . . 1 15/16 in.
  Inside diameter . . . . . 0.760 to 0.770 in.
  Thickness . . . . . 0.120 to 0.125 in.
  Must be flat within . . . . . 0.003 in.

ORDNANCE MAINTENANCE—POWER TRAIN,
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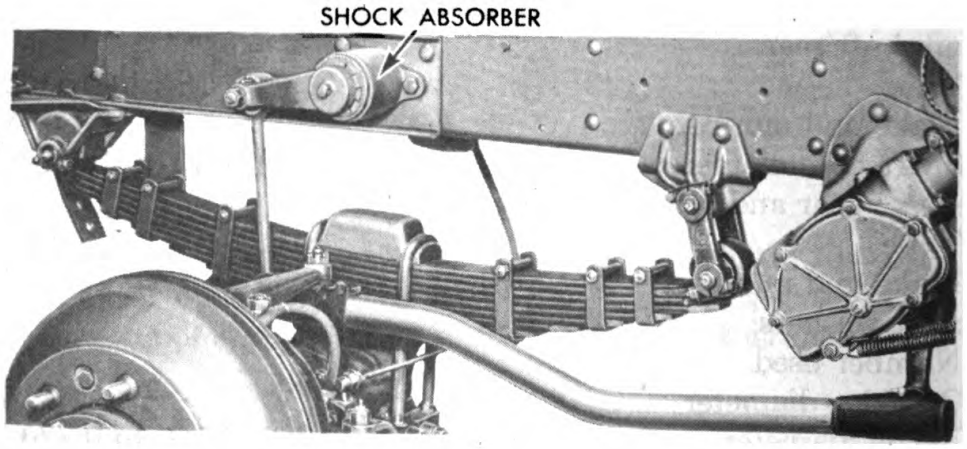
CHAPTER 6

SPRINGS

66. DESCRIPTION AND DATA (fig. 202).

a. Description. Two springs are used at the front axle. They are of the semi-elliptical type and are attached to the frame by means of a pin and bracket at the front end and a shackle and two shackle pins at the rear. U-bolts fasten the springs to the axle seats. They also serve to hold the spring bumper blocks, which are part of the U-bolt seats, in place at the center of the springs. Spring clips are provided, three at each end, to hold the spring leaves in position. These clips are riveted in place on their respective spring leaves. The first and second spring leaves are wrapped around the bushings at both ends to provide greater strength. A rebound plate is located on top of the main spring leaf and extends to within a short distance of each spring eye. This plate supports the main spring leaf on a sudden rebound flex and assists in preventing breakage to the main leaf.



RA PD 18501

Figure 202 — Front Spring and Shock Absorber — Installed

SPRINGS

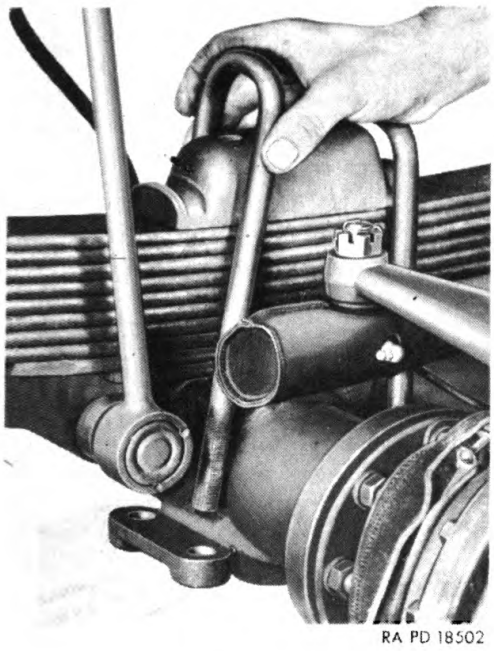


Figure 203 — Removing Front Spring U-Bolt

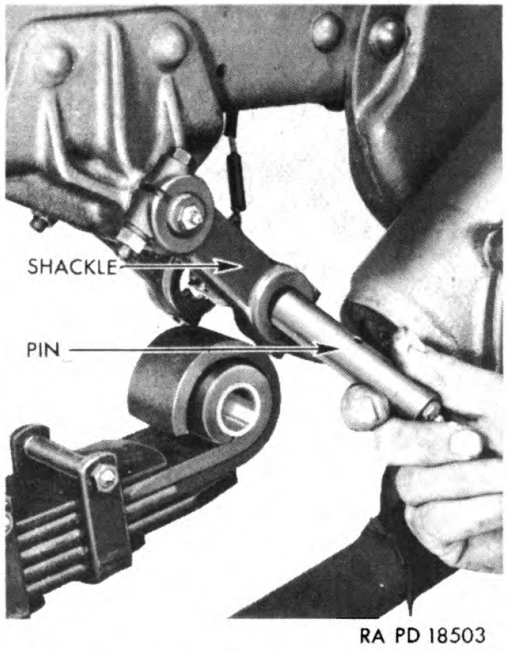


Figure 204 — Removing Rear Shackle Pin

b. Data.

Number of leaves	9
Thickness	3/8 in.
Width	2 1/4 in.
Length of main leaf (flat)	49 3/4 in.
Free opening	3 1/4 in.
Bushing inside diameter (front and rear)	0.874 to 0.878 in.
Weight of spring	72 lb

67. REMOVAL.

a. Remove U-bolt nuts and lock washers, and remove U-bolt seat together with U-bolts (fig. 203).

b. Raise vehicle with jacks and blocks at frame rail to remove all weight from springs.

c. Remove rear shackle spring pin retainer bolt nuts and lock washers, and remove bolts. Remove pin from shackle (fig. 204).

d. Remove front spring pin retainer bolt nut and lock washer. Remove spring pin (fig. 205).

e. Remove spring by lifting from its seat on the axle (fig. 206).

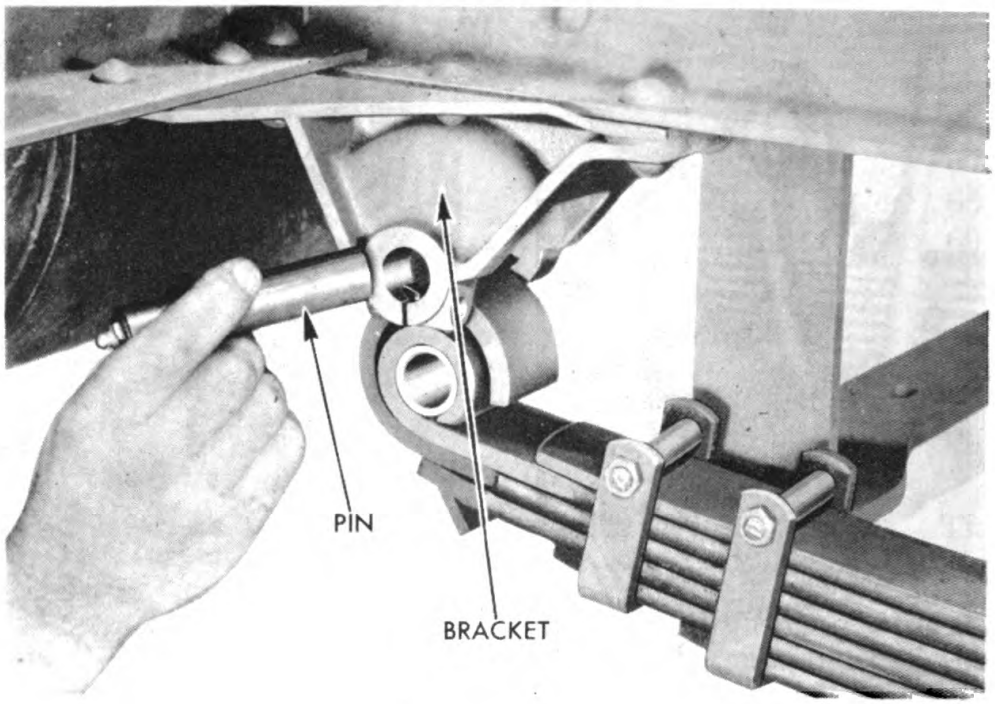


Figure 205 — Removing Front Spring Pin

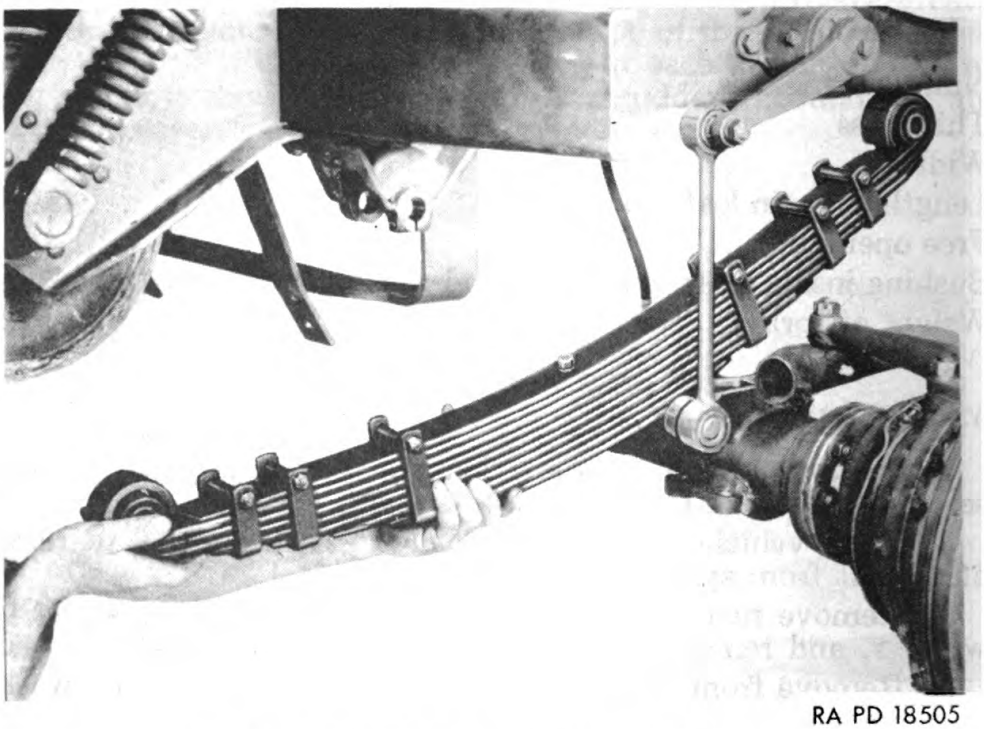


Figure 206 — Removing Front Spring

SPRINGS

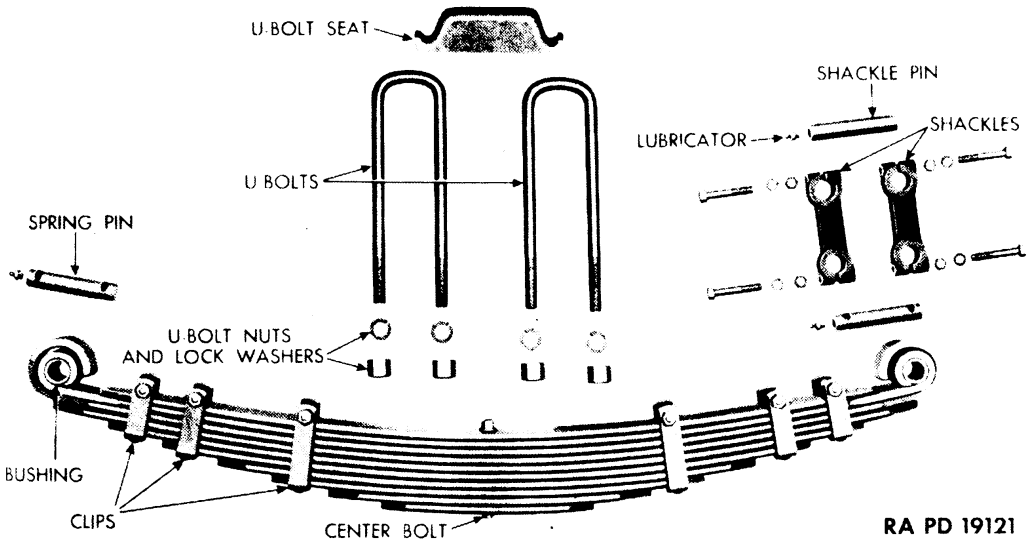


Figure 207 — Front Spring, Bolts, and Shackles — Disassembled

68. CLEANING AND INSPECTION.

a. Cleaning. Wash dirt from spring with water. Oil and grease must be removed by scrubbing with dry-cleaning solvent.

b. Inspection. Check U-bolts for breakage, thread wear, or damage. Check shackle pins for wear, breakage, and plugged lubricant passages. Replace broken or worn pins, and clean out any plugged lubrication passages. Inspect spring for broken leaves. Check for lost or loose retainer clips. Inspect spring-eye bushings for wear. Check for broken center bolt. Replace damaged or missing parts.

69. DISASSEMBLY (fig. 207).

a. Remove Spring-eye Bushings. Press bushings out of spring eyes.

b. Disassemble Spring Leaves. Remove spring clip bolts, nuts, and spacers. Remove center bolt, and separate leaves. The clips come away with the leaves to which they are riveted.

c. Remove Clips from Leaves. If it is necessary to replace clips or the leaves to which they are riveted, cut rivets holding clips to leaves, and remove clips.

70. CLEANING OF PARTS.

a. Cleaning. Clean all parts with dry-cleaning solvent. Use a brush to scrub off oil and grease.

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

71. INSPECTION OF PARTS.

a. Spring Leaves. Check spring leaves for cracks or breaks. Check for leaves that have taken a permanent set. These should be replaced with new leaves.

b. Spring Clips. Check spring leaves with attached clips. See that clips are securely riveted in place.

72. ASSEMBLY.

a. Assemble Spring Clips. If spring clips have been removed, reassemble clips on spring leaves in their correct positions. Rivet clips to leaves, and smooth down inner ends of rivets.

b. Install Spring-eye Bushings. Press in new spring-eye bushings, and ream to 0.874 to 0.0878 inch.

c. Lubricate Spring Leaves. Coat spring leaves with graphite grease.

d. Assemble Spring Leaves. Stack leaves together in their correct order, and install new center bolt and nut. Install bolts, spacers, and nuts in clips, and tighten.

73. INSTALLATION.

a. Install Spring. Place spring assembly on axle seat, and install front spring pin and pin retainer bolt with nut and lock washer.

b. Install Shackle Pin. Drive shackle pin into spring-eye, and install retainer bolts, lock washers, and nuts.

c. Install U-Bolts. Place U-bolt seat on top center of spring, and straddle seat and spring with U-bolts, which then pass down through the spring seat holes on the axle. Install U-bolt lock washers and nuts, and tighten securely.

d. Lower Vehicle. Lower jack and remove blocks.

e. NOTE: *With vehicle under full load, retighten spring U-bolt nuts, using a wrench having at least 18 inches leverage. Recheck tightness at end of each 50 miles of operation until the U-bolt nuts show no further signs of looseness.*

CHAPTER 7

STEERING GEAR AND DRAG LINK

Section I

STEERING GEAR

74. DESCRIPTION AND DATA (fig. 208).

a. Description. The steering gear of this vehicle is of cam and

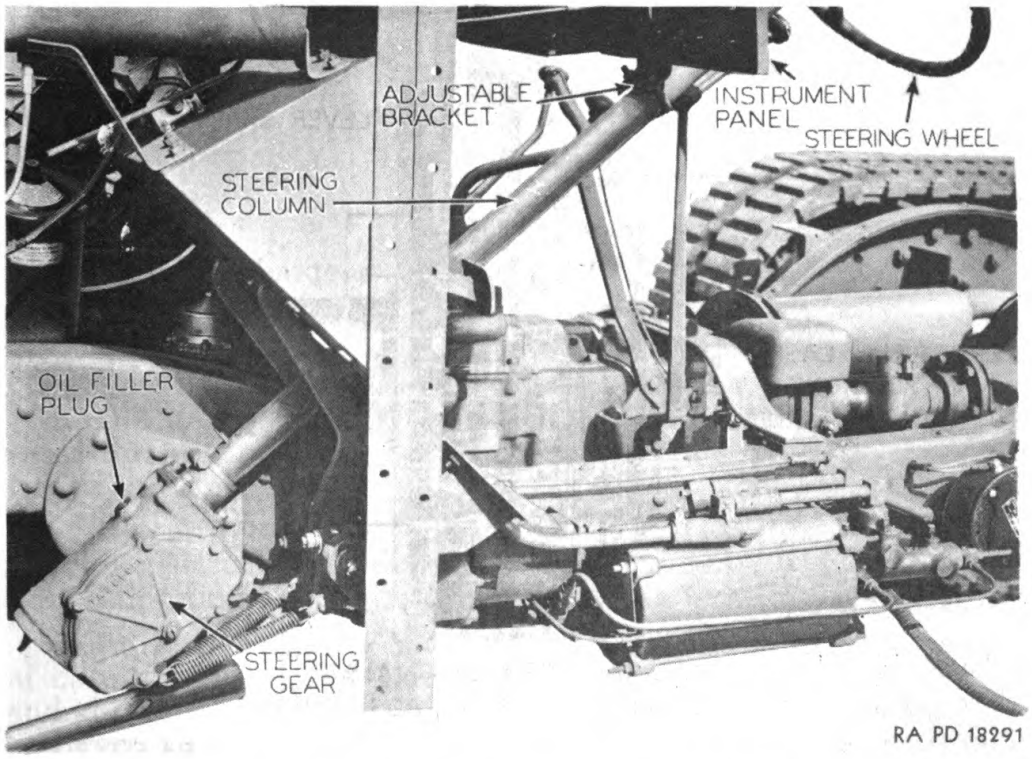


Figure 208 — Steering Gear — Installed

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

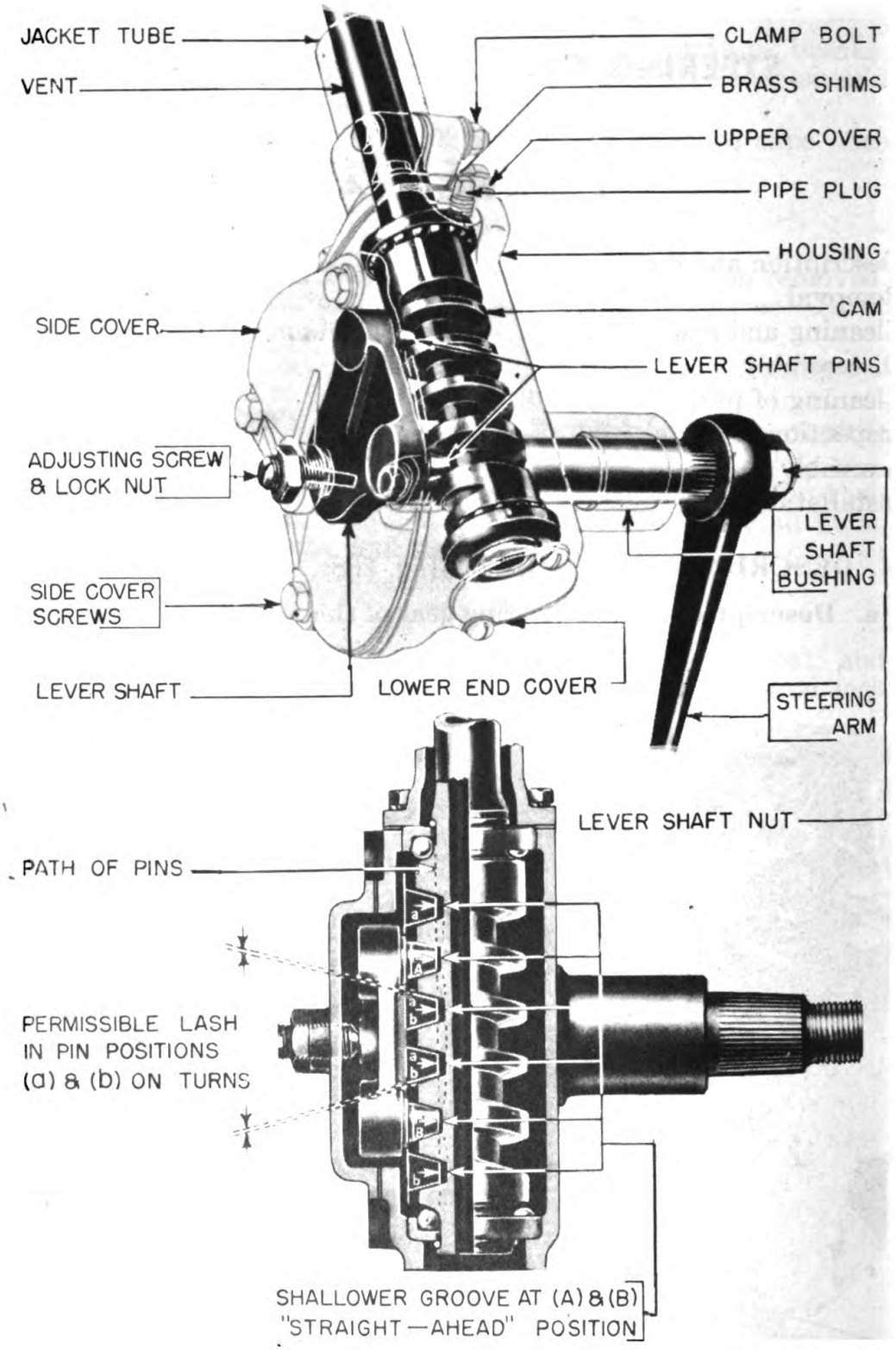


Figure 209 — Steering Gear — Sectional Views

STEERING GEAR

twin lever, semi-reversible type. The assembly is bracket-mounted to the chassis left-hand frame side rail, and the column is supported at the instrument panel extension.

b. Construction (fig. 209). The cam is integrally welded to the steering wheel tube and is mounted between two ball bearings. The bearings are adjustable by means of shims between the housing and upper cover. The steering wheel tube is encased and supported by the outer jacket. Both studs of the twin lever engage the cam for normal straight-ahead driving but, as the steering action moves away from the normal driving position, only one of the studs contacts the cam. The pitch of the cam is not constant, being less at the center than at the ends. This provides a variable gear ratio between the straight-ahead and the turning positions. The purpose of this construction is to obtain a higher gear reduction for the normal, or straight-ahead driving position, resulting in road shock reduction, easier steering, and more freedom from wandering. The lower gear reduction at the turning range provides quicker and easier steering on the turns. The cam groove is ground slightly higher in the normal straight-ahead range to provide closer adjustment between the studs and cam. Adjustment of cam and lever stud clearance is controlled by an adjusting screw mounted in the housing side cover. The lever shaft is mounted in two steel-backed bushings in the housing. The steering arm is attached to the tapered and splined end of the lever shaft and held in place by a lock nut and lock washer. An oil seal is installed in the outer end of the housing bore.

c. Data.

Make	Ross
Model	TA-26
Type	Cam and twin lever
Ratio	23.4:19.5:23.4
Steering wheel diameter	18 in.

75. REMOVAL.

a. Disconnect Brake and Clutch Pedal Springs From Steering Housing. Unhook springs from fastening at lower portion of steering gear housing.

b. Disconnect Drag Link at Steering Gear Arm. Remove steering gear drag link end boot. Remove cotter pin, and unscrew drag link adjusting plug. Disconnect drag link from steering arm.

c. Remove Steering Wheel. Disconnect horn cable terminal at base of steering gear housing. To remove horn button, depress and rotate ⅙ turn to the left. Remove horn button base plate, and remove plate and horn cable. Remove steering wheel nut and lock washer. Remove steering wheel, using a puller and adapter for post (fig. 210).

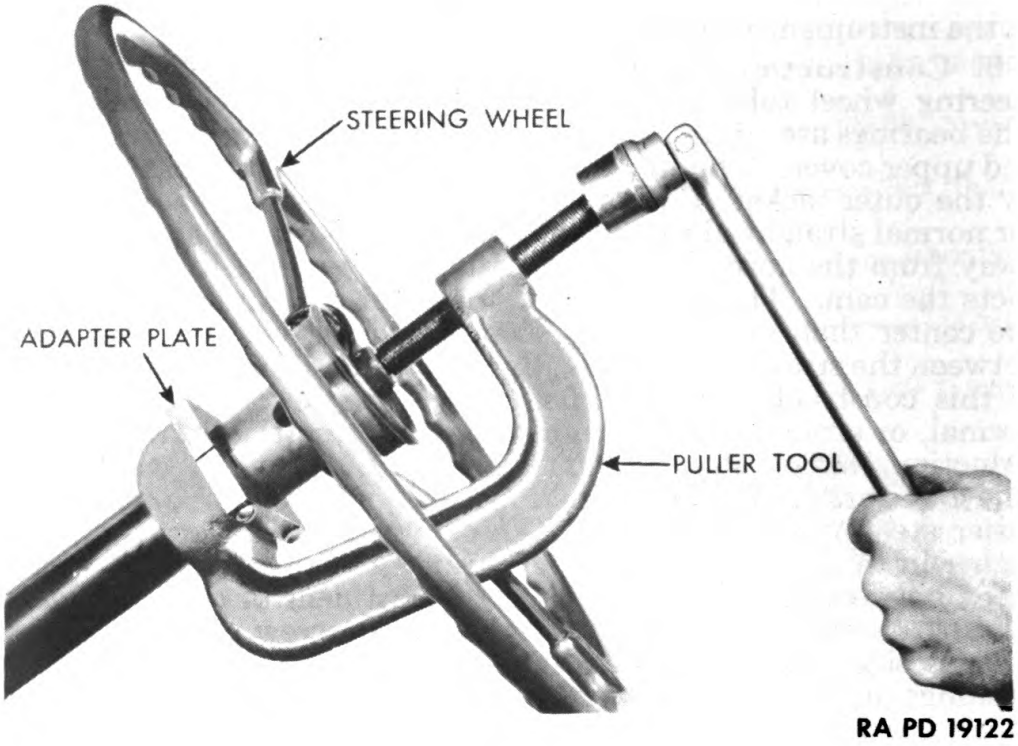


Figure 210 — Removing Steering Wheel

d. Disconnect Steering Column at Instrument Panel (fig. 211). Remove nuts and lock washers from U-bolt at instrument panel. Remove U-bolt.

e. Remove Lock Torque Bolt (fig. 212). Remove lock torque bolt and washer at steering gear frame bracket.

f. Remove Frame Bracket Cap and Steering Gear (fig. 213). Remove two nuts and washers from steering gear frame bracket clamp. Remove cap, and lower steering gear assembly to floor. CAUTION: *Be careful not to bend or damage steering column tube.*

76. CLEANING AND INSPECTION.

a. Cleaning. The steering gear must be cleaned by scrubbing with dry-cleaning solvent.

b. Inspection. Inspect steering housing for cracks. Inspect for loss of cover and side plate cap screws. Inspect jacket tube for bends or cracks. Inspect splines of lever shaft for wear or for twist. Inspect steering arm for spline wear indicating looseness and for wear of steering arm ball. Replace missing or damaged parts.

77. DISASSEMBLY.

a. Remove Steering Arm (If on Assembly). Mount steering

STEERING GEAR

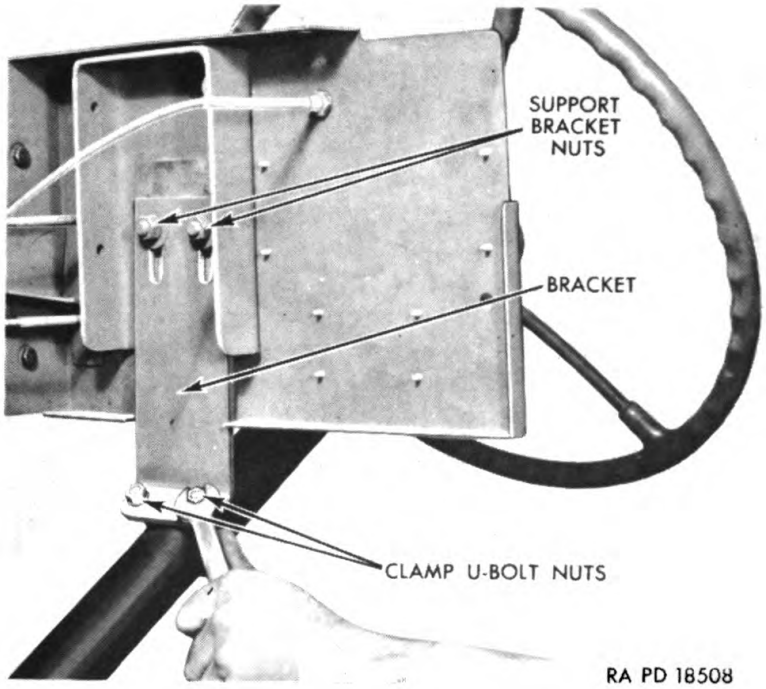


Figure 211 — Removing Steering Gear Column Tube Support

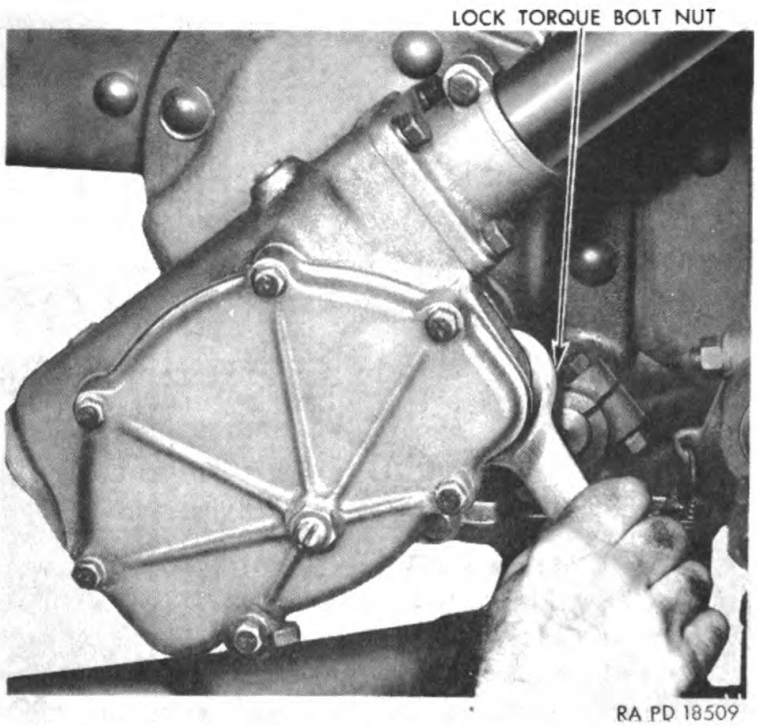


Figure 212 — Loosening Lock Torque Bolt at Frame

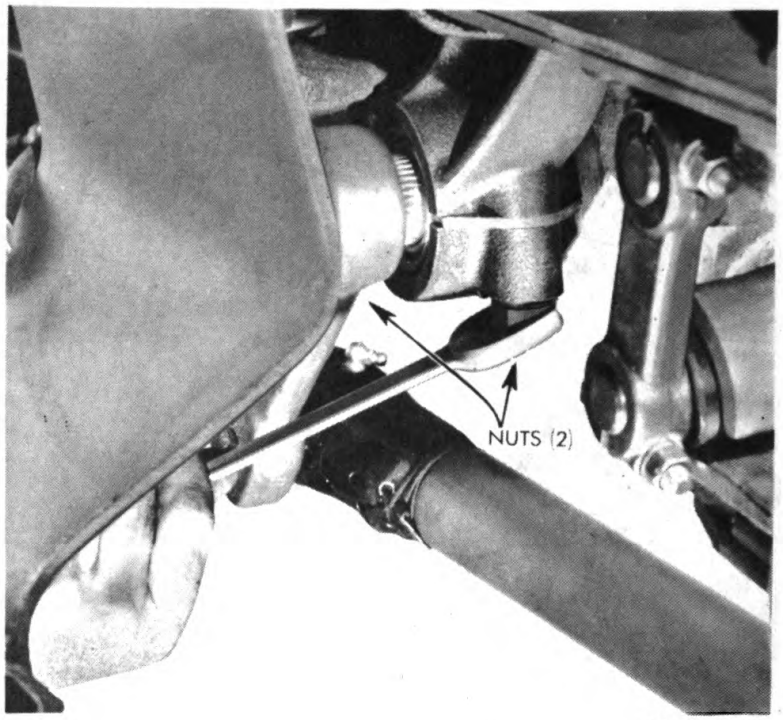


Figure 213 — Loosening Frame Bracket Clamp Bolt Nuts

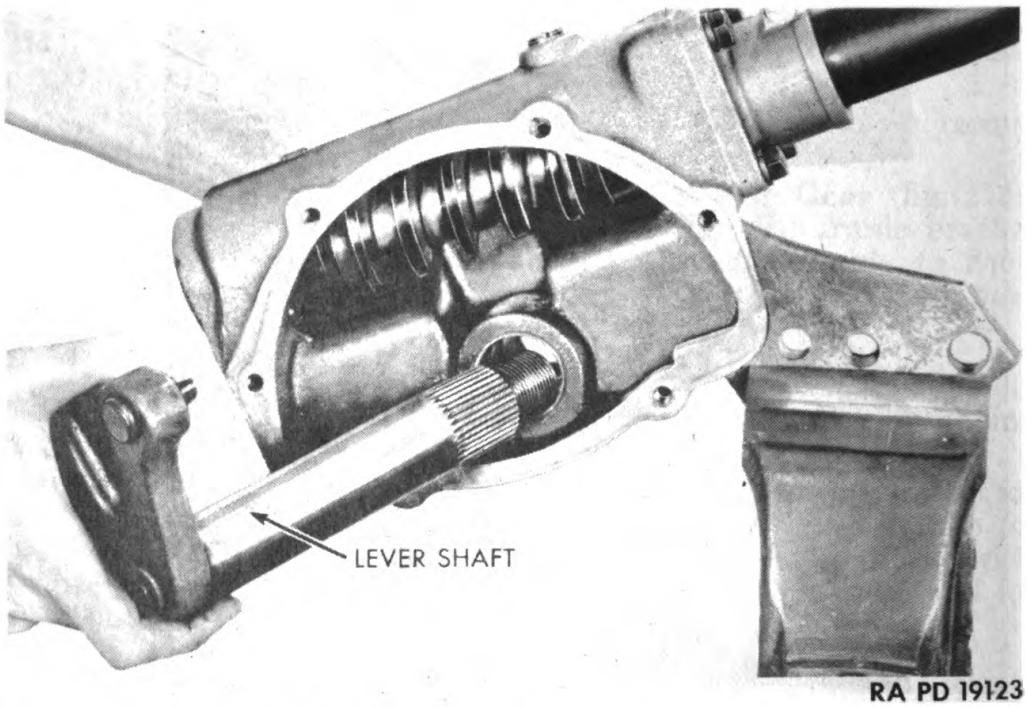


Figure 214 — Removing Steering Gear Lever Shaft

gear on support bracket in a vise. Remove steering arm, using a puller.

b. Remove Steering Wheel (If on Assembly). Depress horn button, and rotate ⅙ turn to remove button and parts. Remove screws from base plate, and lift out plate and horn wire. Remove steering wheel nut. Using puller, remove steering wheel. Remove steering wheel key.

c. Remove Housing Side Cover, Gasket, and Lever Shaft. Remove six cap screws and lock washers from side cover. Remove cover and gasket. Remove lever shaft from steering gear (fig. 214).

d. Remove Jacket Tube and Housing Upper Cover. Remove four cap screws and lock washers from housing upper cover. Lift off jacket tube and housing upper cover together with shims. Remove bearing from jacket tube upper end. The housing upper cover can now be driven off the jacket tube, if there is necessity for inspection.

e. Remove Steering Tube and Cam. Lift steering tube and cam with upper and lower bearings out of housing (fig. 215).

f. Remove Bearings from Cam. Use screwdriver to remove bearing retaining snap ring from below lower bearing. Remove bearing ball cup and 14 balls. Repeat operation at upper bearing (fig. 216).

g. Remove Lower End Cover and Oil Seal Tube. Tap tube on top with lead hammer to remove tube, and lower cover from steering housing (fig. 217).

h. Remove Oil Seal From Housing. Drive out oil seal from steering gear housing.

78. CLEANING OF PARTS.

a. Wash Parts in Dry-cleaning Solvent. Following disassembly, all parts must be washed in dry-cleaning solvent. Scrubbing with a brush will expedite process.

79. INSPECTION OF PARTS (figs. 218 to 220).

a. Inspect steering lever shaft for wear of studs, wear of shaft at bearing surfaces, and for wear or twist in splines. Replace steering lever shaft if worn or damaged.

b. Inspect cam for wear. If worn, replace cam and tube. Inspect tube for alinement and replace if bent. Inspect bearing ball cups at top and bottom of cam for wear or roughness, and replace cam and tube if damaged. Check tube for damaged threads at steering wheel end, and repair if burred.

c. Examine all 28 bearing balls for signs of chipping or cracking. If defective bearings are found, replace complete set of bearings.

d. Inspect steering housing for cracks, also for warpage at cover plate surfaces, and smooth off. Check housing side cover

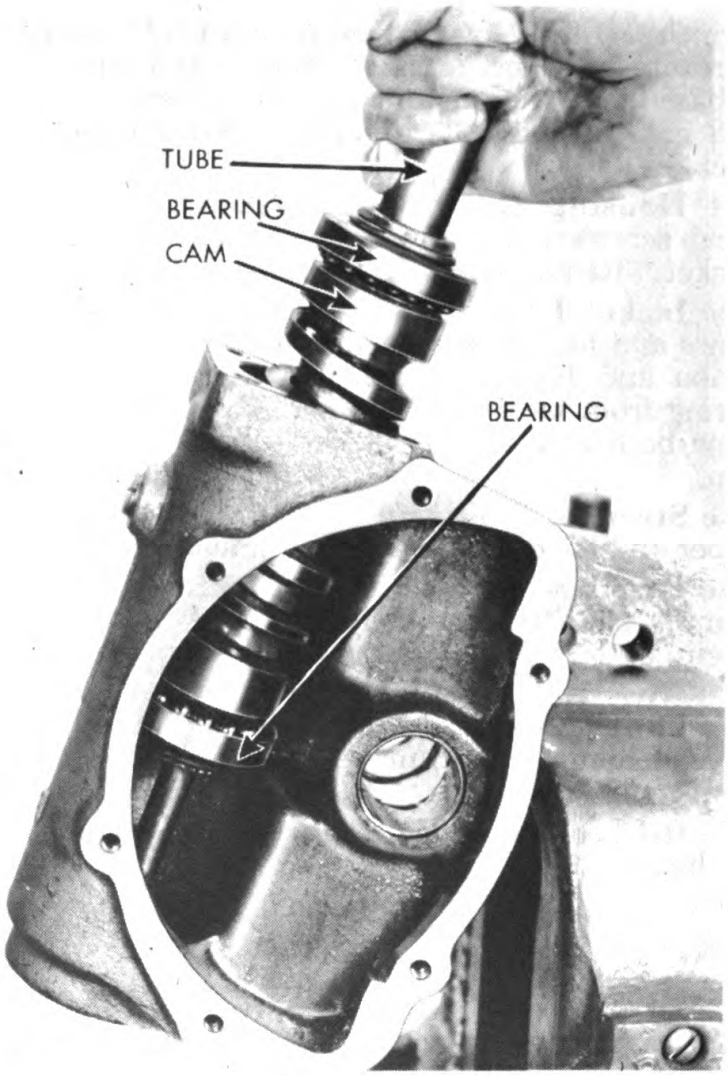


Figure 215 — Removing Steering Gear Tube and Cam

plate for warpage or cracks. If not severely warped, resurface. Replace plate if cracked or broken.

e. Inspect housing bushings for wear or damage. If in worn condition, remove old bushings and install new bushings in housing. Line-ream new bushings to provide clearance of 0.0005 in. Install new oil seal.

80. ASSEMBLY.

a. Assemble Bearings to Cam. Install 14 balls and upper bearing cup in position on cam, and install snap ring. Repeat procedure at lower end of cam.

STEERING GEAR

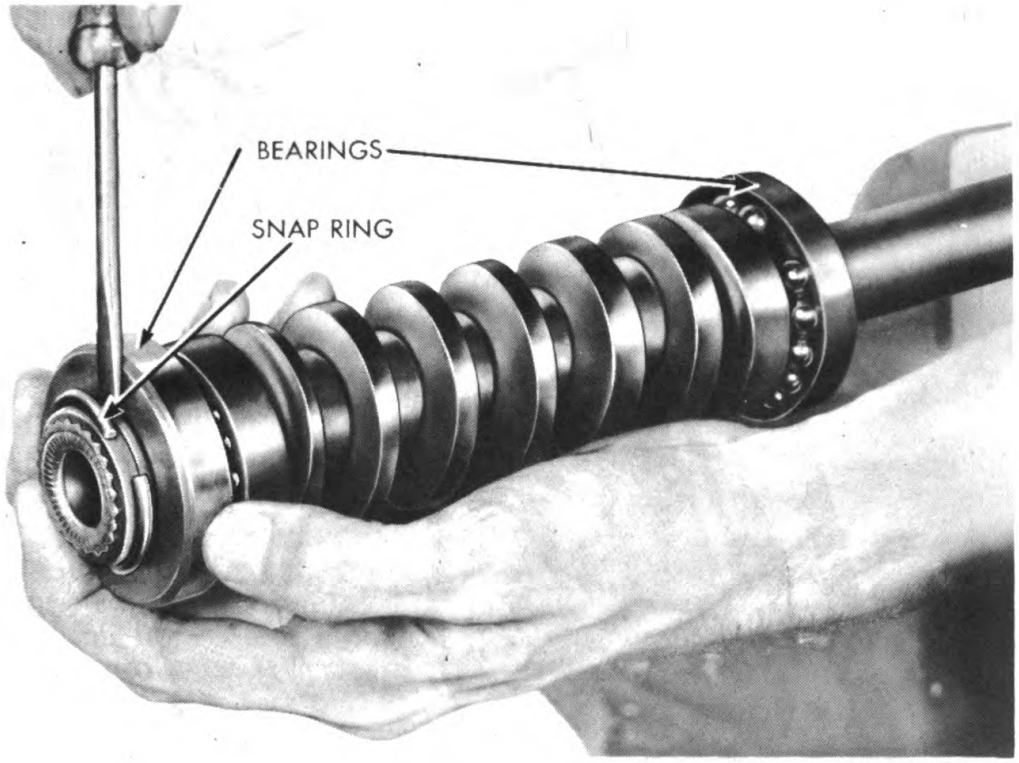


Figure 216 — Removing Steering Gear Tube Bearing

b. Assemble Steering Housing. Insert lower end cover and oil seal tube in housing. Expand cover into bushing.

c. Assemble and Install Jacket Tube Upper Bearing. Place new jacket tube bearing in position, and press into jacket tube end.

d. Install Steering Tube and Cam. Place steering tube and cam into housing, and install upper cover with jacket tube and shims. Place steering wheel key in steering tube, and mount steering wheel temporarily. Adjust to a barely perceptible drag, but allow the steering wheel to turn freely, with the thumb and forefinger lightly gripping the rim. To adjust, loosen the upper cover cap screws, and raise cover to permit removal of shims. Remove shims as required, then replace cover cap screws.

e. Install Lever Shaft. Coat lever shaft with heavy oil and place in housing, meshing lever studs with cam. After unscrewing the adjusting screw, place side cover gasket and side cover plate on housing, and install six cap screws and lock washers.

f. Adjust Lever Shaft Stud Backlash in Cam Groove. Turn steering tube from one extreme to the other, counting the number of revolutions. Locate tube at half of this total number. This will place lever in straight-ahead or mid-position. The groove is purposely cut shallower, therefore narrower, in the mid-position range of travel of each stud, to provide closer adjustment where

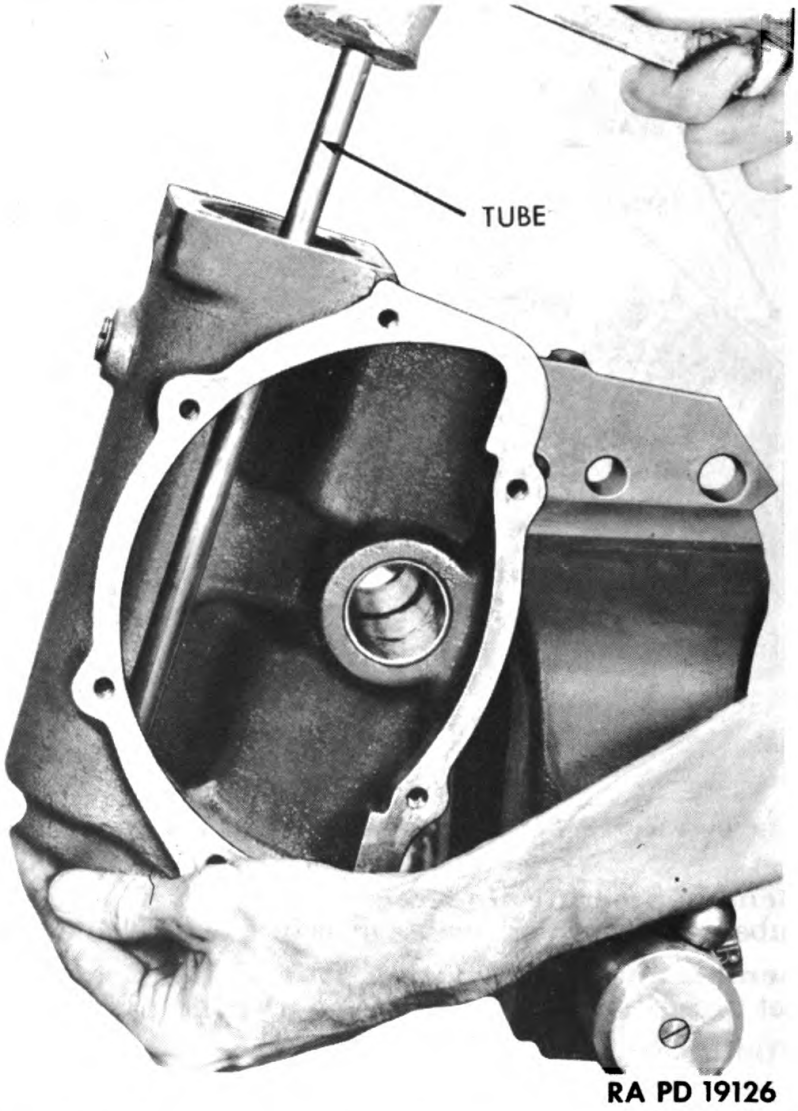


Figure 217 — Removing Lower End Cover and Oil Seal Tube

the usual straight-ahead driving action takes place. It also makes this close adjustment possible after normal wear occurs without causing a bind elsewhere. To adjust, tighten the side cover adjusting screw until there is a very slight drag through the mid-position while turning the steering wheel slowly from one extreme position to the other (fig. 221). Tighten the lock nut to hold adjustment. Remove steering wheel, which was mounted temporarily.

g. Install Steering Wheel. NOTE: *Omit this step if steering gear is to be installed in vehicle immediately.* Place spring seat on top of jacket tube bearing, and place spring on top of flange. Install steering wheel on tube with steering gear located in mid-position. Be sure steering wheel key is in place, and install nut securely. Feed horn wire down through tube, and fasten base plate

STEERING GEAR

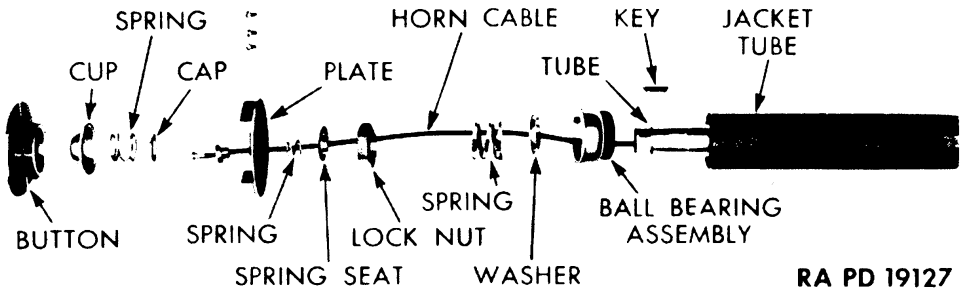


Figure 218 — Steering Gear, Upper Section — Disassembled

with screws. Install horn button parts, depress button, and turn $\frac{1}{6}$ turn to the right.

h. Install Steering Arm. Steering lever is punch-marked on its end and steering arm is punch-marked on its face. These two punch marks must line up. Install steering arm on splines, and tighten lock nut and washer securely. Do not hammer steering arm onto lever shaft.

81. INSTALLATION.

a. Install Steering Gear in Vehicle. Raise steering gear to position in vehicle. Install bracket clamp cap, nuts, and lock washers. Do not tighten nuts. Install lock torque bolt, but do not tighten. Install U-bolt and nuts at instrument panel, but do not tighten nuts.

b. Position Steering Gear. Hold steering gear assembly in normal position at frame and instrument panel, and tighten steering gear housing clamp nuts. Tighten lock torque bolt, and tighten U-bolt nuts at instrument panel.

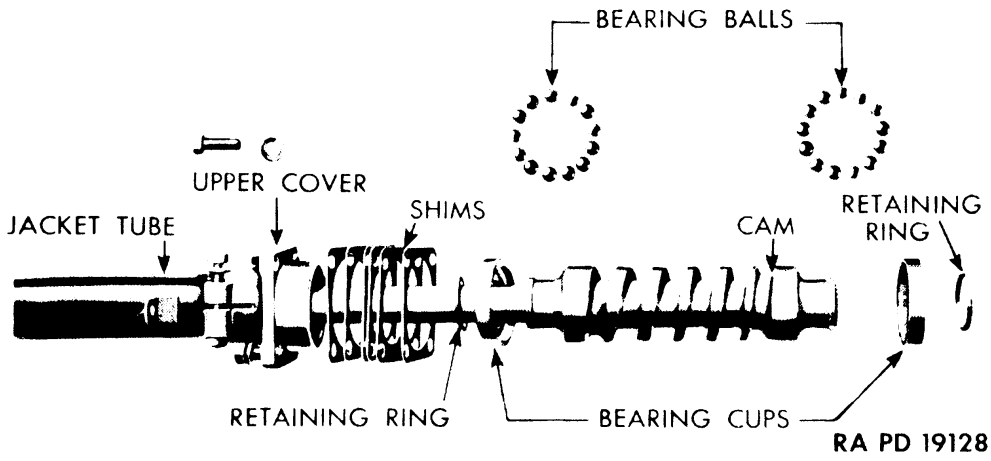


Figure 219 — Steering Gear, Tube and Cam — Disassembled

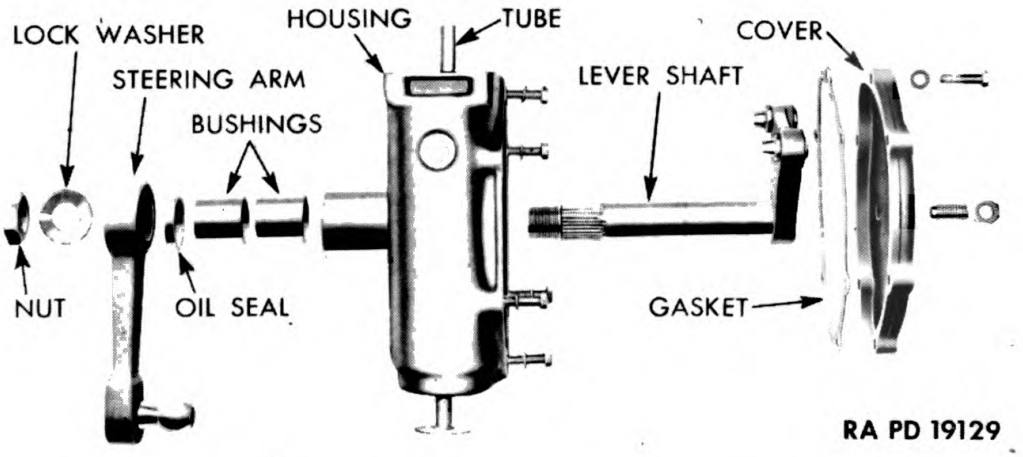


Figure 220 — Steering Gear, Lever Shaft, and Arm — Disassembled

c. Install Steering Wheel. Place spring seat on top of jacket tube bearing, and place spring on top of flange. Install steering wheel on tube with steering gear located in mid-position. Be sure steering wheel key is in place, and install nut securely. Feed horn wire down through tube, and fasten base plate with screws. Install horn button parts, depress horn button, and turn $\frac{1}{6}$ turn to the

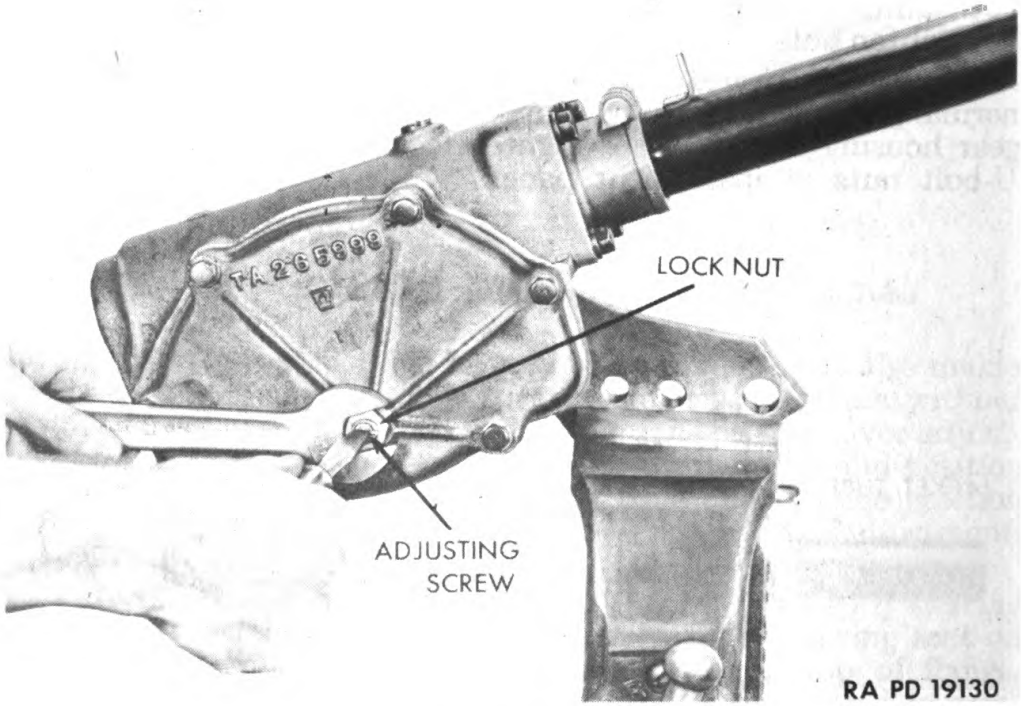


Figure 221 — Adjusting Steering Gear Lever Shaft

STEERING GEAR

right. Release pressure. Connect horn cable at base of steering gear housing.

d. Install Drag Link. Have ball seats, spring seats, and springs in proper relation, and install outer end ball seats, spring seats, and springs.

e. Adjust Drag Link Ends. Tighten end plugs securely and back off approximately ⅛ turn, or to nearest cotter pin hole. Install new cotter pin, and install drag link end boot.

f. Lubricate Steering Gear. Remove filler screw from housing, and fill housing with universal gear lubricant until lubricant runs out of vent hole in jacket tube. Reinstall filler screw.

CHAPTER 7

STEERING GEAR AND DRAG LINK (Cont'd)

Section II

DRAG LINK

82. DESCRIPTION AND DATA.

a. Description (fig. 222). The steering gear connecting rod or drag link is of tubular type with adjustable spring-loaded ball sockets. At the axle end, the spring is between the ball seat and the end plug. At the steering gear end of the drag link, the spring is between the ball seat and the front of the drag link. Each drag link end is covered by a protective boot.

b. Data.

Diameter of tube	1¾ in.
Wall thickness	¼ in.
Length, over all	29 5/16 in.
Lubrication	One fitting each end

83. REMOVAL.

a. Remove boot from each end of drag link, and remove cotter pins. Remove plugs at each end of drag link. From front end, remove ball seat, and from rear end, remove spring seat, spring, and ball seat. Remove drag link from steering arm balls at front axle and at steering gear.

84. CLEANING OF PARTS.

a. Following removal, all parts must be washed in dry-cleaning solvent. Scrubbing with a brush will expedite process.

85. INSPECTION OF PARTS.

a. Check for weak or broken springs, and replace if damaged. Check for broken or worn ball seats, and replace if unserviceable. Check tube for cracks or bent condition, and replace the tube if damaged.

DRAG LINK

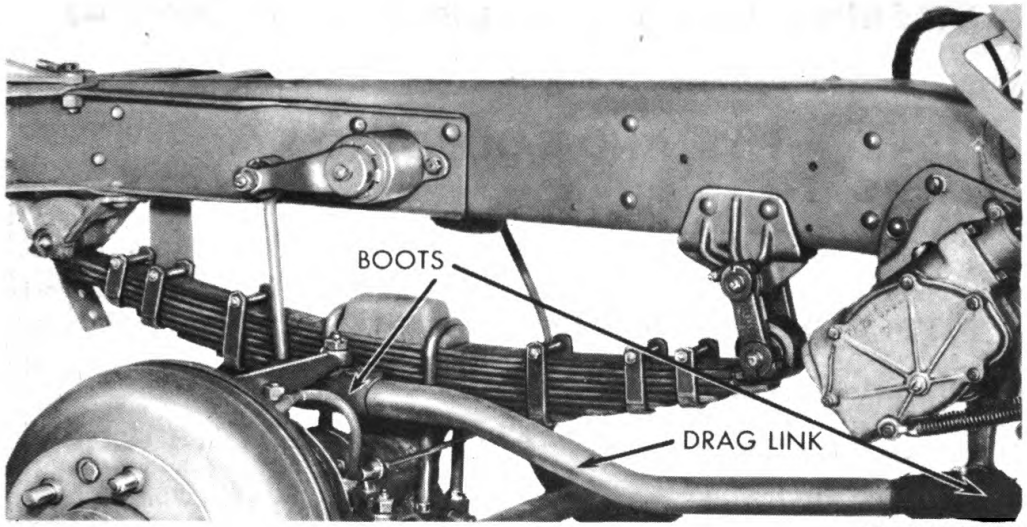


Figure 222 — Steering Gear Drag Link — Installed

86. INSTALLATION (fig. 223).

a. Connect Drag Link. Have ball seats, spring seats, and springs in proper relation. Install drag link on steering arm balls at steering gear and front axle. Place outer end ball seats, spring seats, and springs in position, and install plugs.

b. Adjust Drag Link Ends. Tighten end plugs securely, then back off ⅛ turn or to nearest cotter pin hole. Install new cotter pins. Install drag link boots.

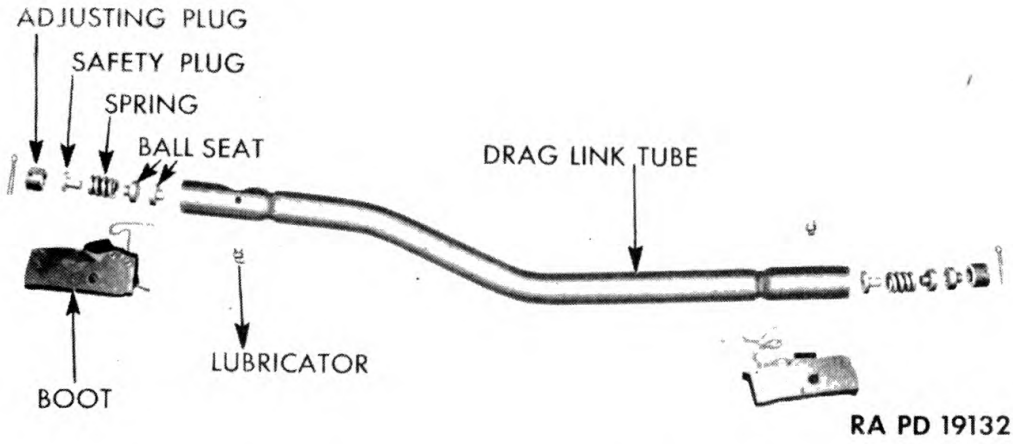


Figure 223 — Steering Gear Drag Link — Disassembled

CHAPTER 7

STEERING GEAR AND DRAG LINK (Cont'd)

Section III

FITS AND TOLERANCES

87. FITS AND TOLERANCES.

a. Steering Gear.

(1) CAM AND TUBE.

Length over-all . . . . . 49 3/16 in.
Tube diameter . . . . . 1 in.
Maximum allowable run-out at upper end bearing . . . . . 0.010 in.

(2) LEVER SHAFT.

Diameter of shaft . . . . . 1.3725 to 1.3735 in.
Shaft length . . . . . 6 1/2 in.
Thrust screw surface must be concentric with shaft within 0.020 in.

(3) HOUSING.

Bushing bore . . . . . 1.498 to 1.500 in.
Seal bore . . . . . 1.824 to 1.826 in.

(4) BUSHINGS.

Number used 2
Outside diameter . . . . . 1.501 to 1.502 in.
Inside diameter . . . . . 1.374 to 1.375 in.
Length . . . . . 1.480 to 1.500 in.

b. Drag Link.

Make . . . . . Columbus Auto Parts
Manufacturer's model H-9239
Length center to center . . . . . 29 5/16 in.
Wall thickness . . . . . 1/4 in.
Outside diameter of tube . . . . . 1 3/4 in.
Springs:
Number used 2
Free length . . . . . 1 9/32 in.
Compressed length . . . . . 1 1/8 in. at 392 to 478 lb pressure

CHAPTER 8

WINCH

88. DESCRIPTION AND DATA.

a. Description (figs. 224 and 225). The Tulsa Model 18-G front-mounted winch is a worm gear driven unit operated from a power take-off at the transmission. The power take-off is controlled by a shift lever located in the driver's compartment. The winch consists of drive gears and worm, shaft, cable drum, and operating control clutch which are all assembled between two side rails.

b. Data.

Make	Tulsa
Model	18-G
Ratio	30:1
Location	Front-mounted
Weight (approx.)	420 lb
Capacity on first layer of cable	10,000 lb

89. REMOVAL.

a. Remove Winch From Vehicle. Remove eight winch frame angle to frame support mounting bolts, nuts, and lock washers, two at each end of each angle. Remove shear pin from winch drive shaft universal joint hub, and slip hub off from worm shaft. Using sling and hoist, lift winch from position.

90. CLEANING AND INSPECTION.

a. Cleaning. Remove dirt from the winch by washing with water. Remove oil or grease deposits by scrubbing with dry-cleaning solvent.

b. Inspection. Inspect winch mounting bolts and winch side rail bolts for damaged threads. Replace if damaged. Examine jaw clutch for wear or breakage. Inspect drag brake for wear or loss of lining, and for wear or loss of pivot pins. Replace damaged

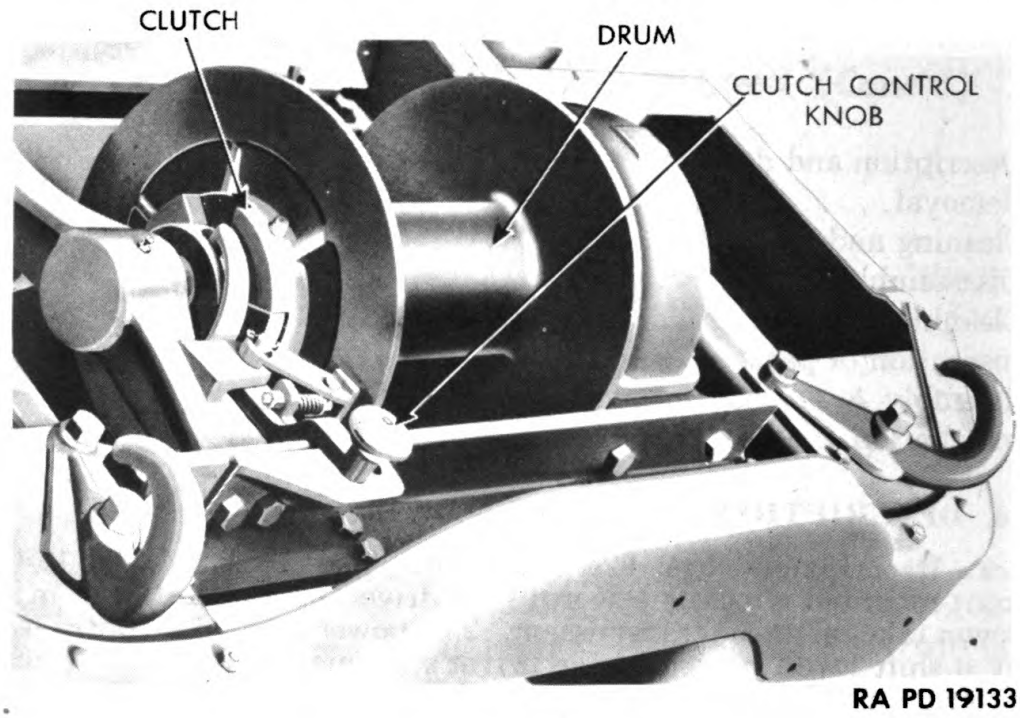


Figure 224 — Winch — Installed

or missing parts. Check gear case and worm housings for loss of bolts or for breakage of castings, and replace if necessary. Examine drum flanges for fractures, and inspect cable guide for looseness or loss of bolts. Replace or tighten.

91. DISASSEMBLY.

a. Drain Lubricant. Remove worm housing drain plug, and drain lubricant.

b. Remove Gear Case Cover. Remove eight cap screws, nuts, and lock washers from gear case cover. Remove cover and gasket.

c. Remove Shaft End Bracket and Jaw Clutch. Remove two bolts, nuts, and lock washers from each end of end bracket at side rails. Remove end bracket and jaw throw-out clutch mechanism from end of shaft.

d. Disassemble Jaw Clutch. Remove jaw clutch from clutch lever fork. Remove cotter pin from jaw clutch lever pin, and remove pin. Remove two nuts from drum brake adjusting pin, and remove spring. Remove clutch brake shoe.

e. Remove Drum and Shaft. Lift winch drum and shaft out of gear case and side rails.

f. Disassemble Drum and Shaft. Slide shaft bearing off shaft, being careful not to lose locating dowel pin. Remove eight bolts, nuts, and lock washers from gear, and remove gear from hub.

WINCH

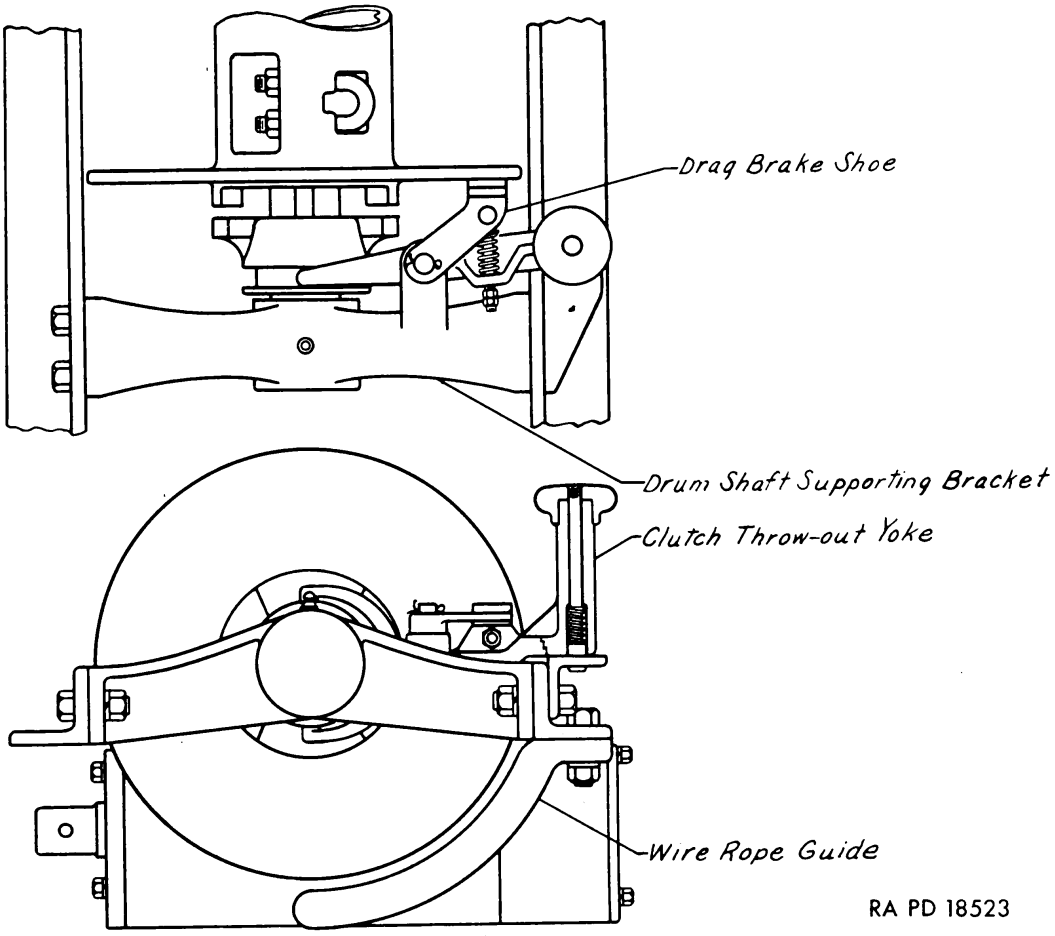


Figure 225 — Winch Drum Clutch and Drag Brake

Remove pin from hub and shaft, and remove gear hub. Remove two drive keys. Remove inner bearing and locating dowel pin. At jaw clutch end of shaft, remove two drive keys from shaft, and remove collar. Remove shaft from drum.

g. Remove Winch Brake Shoes and Drum. Remove eight cap screws and lock washers from winch worm brake housing cap, and remove cap. Lift two brake shoes from brake drum. Straighten tangs on lock washer under nut, and remove nut. Use puller, with screws in tapped holes in drum, and remove brake drum. Remove drive key from worm shaft.

h. Remove Worm. Remove six cap screws and lock washers from rear worm bearing cap, and remove cap and gasket. Drive worm gear and bearing out of gear case, toward rear, and press rear bearing from worm gear.

i. Remove Worm Front Bearing. Remove six cap screws and washers from brake housing, and remove housing and gasket. Drive oil seal from housing, and drive worm bearing from worm housing.

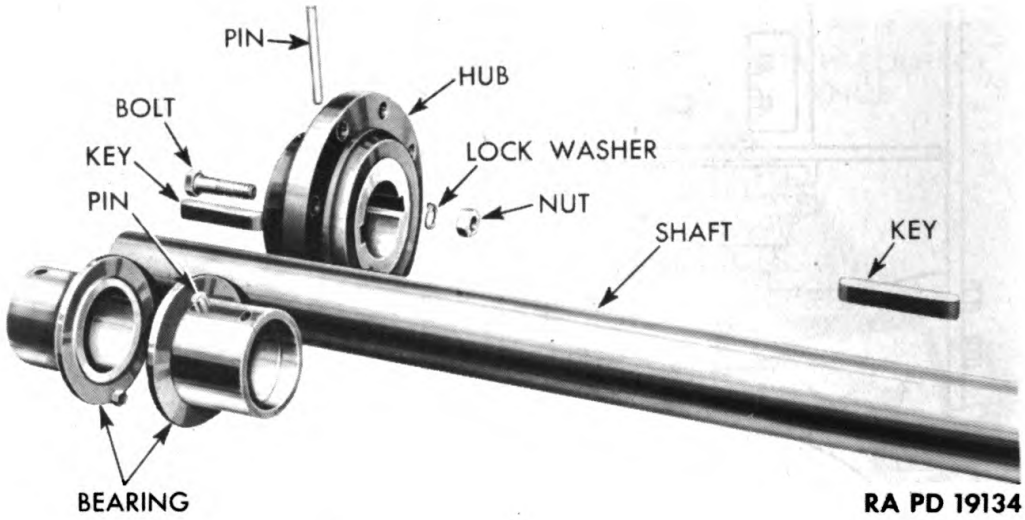


Figure 226 — Winch Drum Shaft and Worm Gear Hub — Disassembled

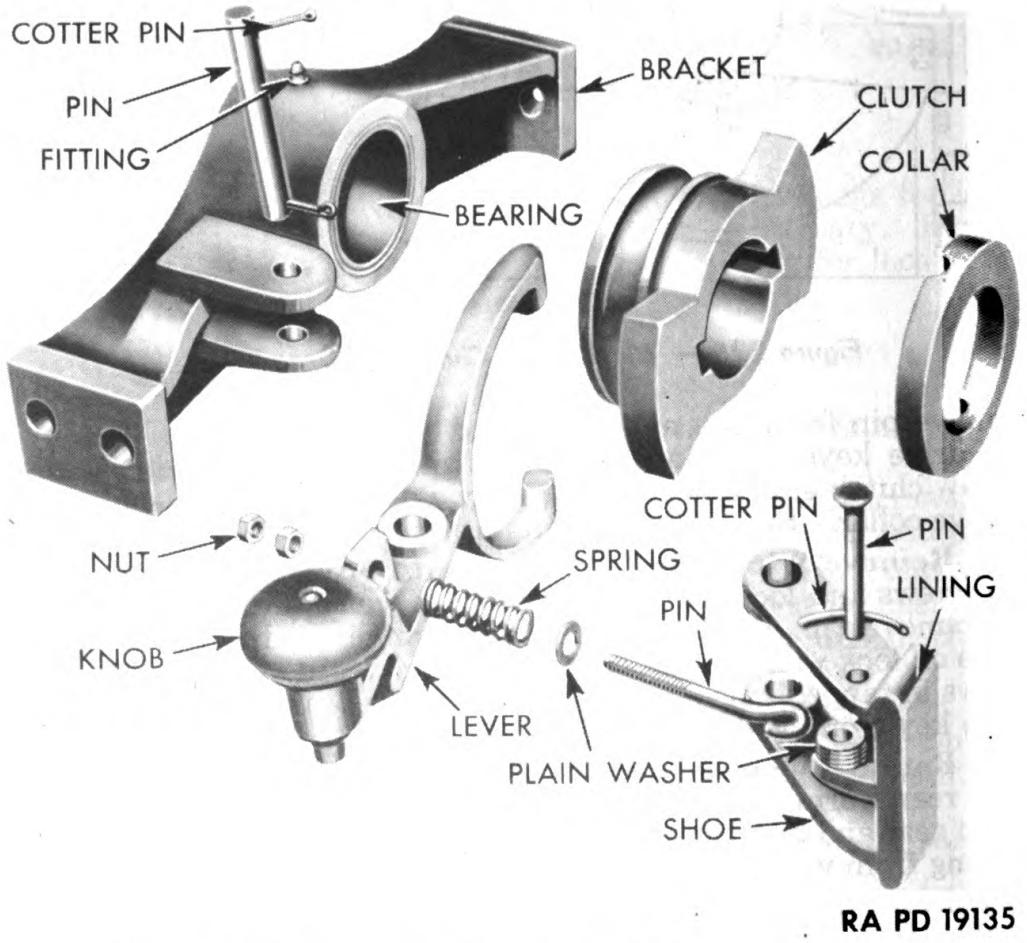


Figure 227 — Winch End Bracket and Clutch — Disassembled

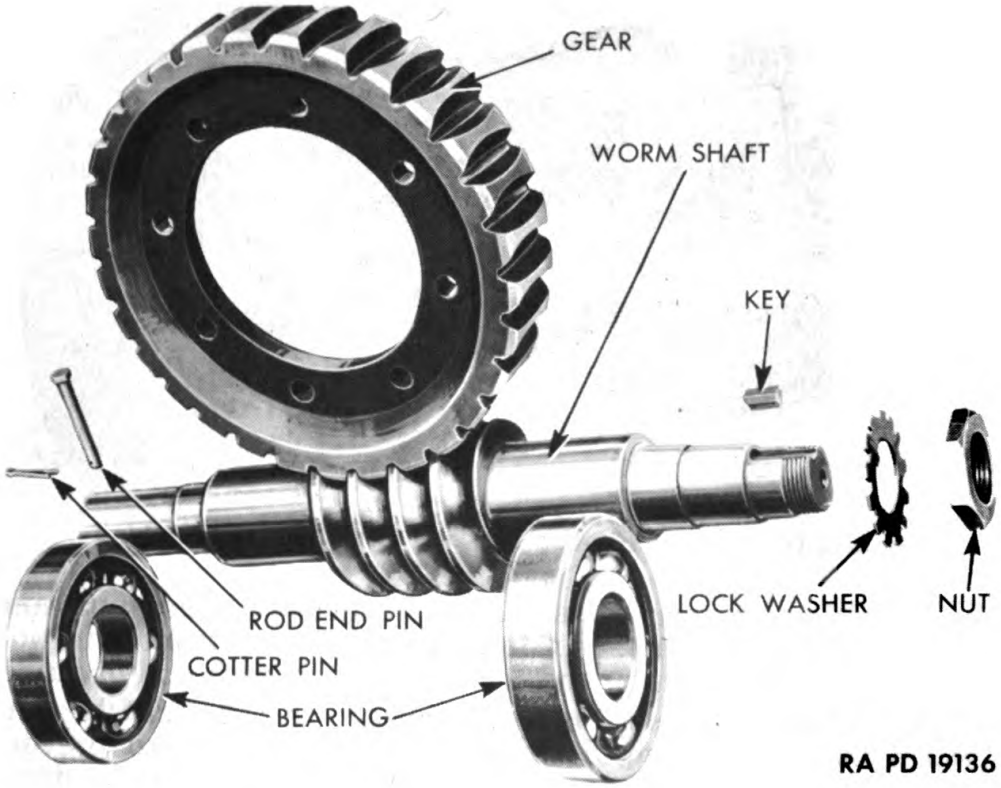


Figure 228 — Winch Worm Shaft, Gear, and Bearings — Disassembled

j. Remove Winch Side Rails From Worm Housing. Remove two bolts, nuts, and lock washers from each end of cable guide, and remove cable guide. Remove two bolts, nuts, and lock washers from each side rail at worm housing, and remove side rails.

92. CLEANING OF PARTS.

a. Following disassembly, all parts must be scrubbed clean in dry-cleaning solvent.

93. INSPECTION OF PARTS.

a. Inspect bearings for wear or damage, and replace if necessary. Examine worm and gear for wear or damage, and replace if damaged. Inspect brake shoes for lining wear, loose or broken springs, or for thrust plate wear. Replace lining if worn. If shoe or component parts are worn, replace shoe. Inspect gear carrier bolts for distortion and wear, and replace if necessary.

94. ASSEMBLY (figs. 226 to 231).

a. Assemble Winch Side Rails to Worm Housing. Place side

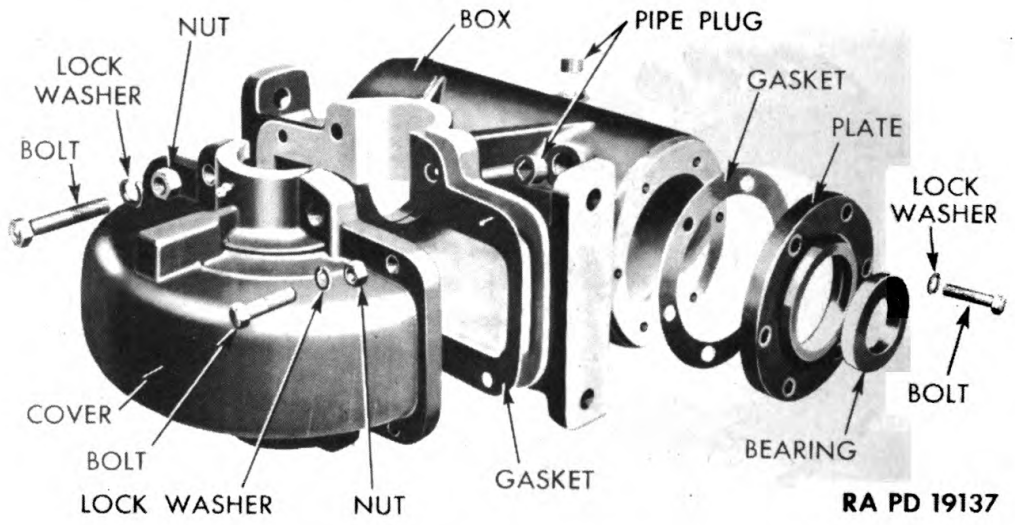


Figure 229 — Winch Housing Box and Cover — Disassembled

rails in position on worm housing, and install two bolts, nuts, and lock washers in each rail. Install cable guide at front side rail, and install two bolts, nuts, and lock washers at each end of guide.

b. Install Worm Gear Front Bearing. Install front bearing in worm housing. Using a thimble or other means to prevent damage to inner surface of seal, install new oil seal in brake drum housing. Place brake drum housing and gasket in position on front of worm housing, and install six cap screws and lock washers.

c. Install Worm Gear. Press rear bearing onto worm shaft. Install worm and bearing in housing and into front bearing. Install new oil seal in worm housing rear cap. Place worm rear bearing cap

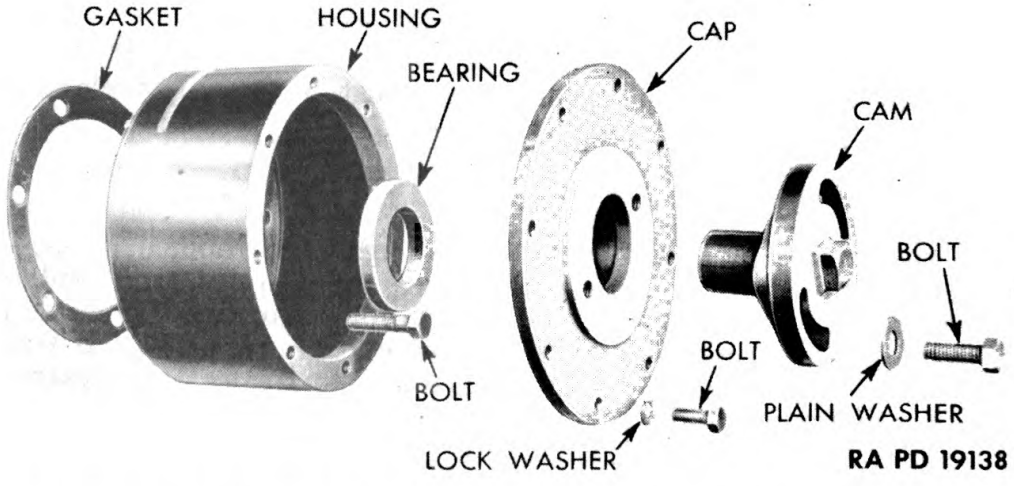


Figure 230 — Winch Worm Box Cover and Housing — Disassembled

WINCH

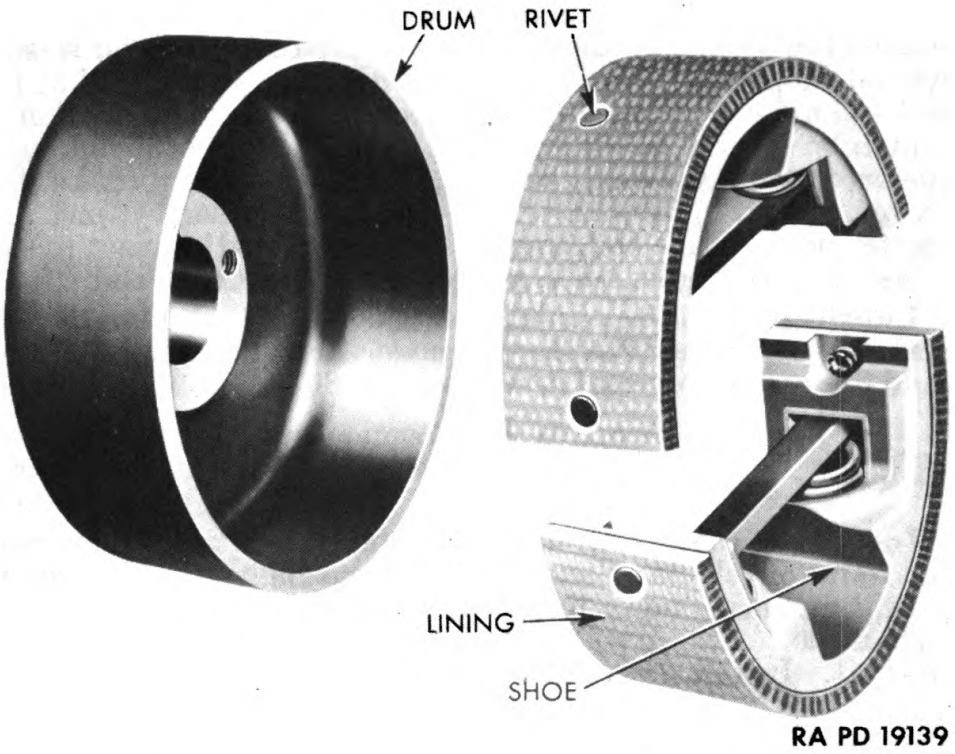


Figure 231 — Winch Worm Brake Drum and Shoe — Disassembled

and gasket on housing, and install six cap screws and lock washers.

d. Install Worm Brake. After installing drive key in shaft, install brake drum over worm shaft. Install lock washer and nut. Tighten securely and bend tang on lock washer. Place two brake shoes in position in brake drum. Place housing cap with brake cam in position, and install eight cap screws and lock washers. If new lining has been used on brake shoes, place pointer of cam over fourth notch on cap, and tighten two cam cap screws and washers.

e. Assemble Drum and Shaft. Place two drive keys in slots in shaft at gear end. Install gear hub on shaft with long end of hub out. Install eight bolts, nuts, and lock washers. Tighten securely and peen bolt ends. Place inner bearing on shaft with flange against gear hub. Insert shaft through drum, install collar on shaft with notches to outside, and install two drive keys in shaft. Place clutch over end of shaft. Place outer bearing on shaft flange toward hub at gear end.

f. Install Shaft and Drum Assembly in Side Rails and on Worm Housing. Lift shaft and drum, and place in position. Turn bearings so that dowel holes are upward. Insert dowel pins in bearings. Install worm gear cap and gasket, and install eight cap screws.

g. Assemble Clutch Brake. Start the ¼-inch smooth pin

through outside leg of drum brake shoe. Hold the ¼-inch eye bolt so that pin goes through the eye and then through inside bracket on brake shoe. Insert cotter pin. Place ¼-inch flat washer on eye bolt, followed by coil spring. With drum brake held at the inside bend of lever, place end of eye bolt through small bracket of the clutch lever, and install two nuts. Place lever between double tongue extending from shaft bracket, hold legs of drum brake shoe and lever, engage fork with clutch collar, and insert ½-inch pin and cotter pins. Place end bracket over shaft, and connect to side rails, installing two bolts, nuts, and lock washers at each end.

h. Lubricate Winch. Lubricate winch shaft at fittings with general purpose grease No. 1. Remove worm housing filler plug, and add 8 pints of universal gear lubricant 80 or 90. Replace filler plug.

95. INSTALLATION.

a. Install Winch. Lift winch with hoist, and guide into position on frame of vehicle. Secure winch frame angle to frame support with eight mounting bolts, lock washers, and nuts, two at each end of each angle. Install winch drive shaft universal joint hub on worm shaft. Install shear pin in hub, and install cotter pin.

CHAPTER 9

SPECIAL TOOLS

96. GENERAL.

a. Second echelon common tools are listed in SNL N-19. Second echelon special tools to be used with this vehicle are listed in the OSP&E of SNL G-147.

b. Ordnance maintenance tool sets are listed in SNL N-21. Special tools for Ordnance maintenance of this vehicle are listed in SNL G-27.

97. SPECIAL TOOLS

a. The special tools needed to maintain the components covered by this manual are listed below:

Special Tool	Manufacturer's Number	Federal Stock Number
Compressor, bogie volute spring	.....	41-C-2559-50
Handle, 1 in. dia. hd., 10 in. lg., for removers and replacers	J-1660-1	41-H-1074
Remover and replacer, bushing, front axle wheel spindle and front axle trunnion yoke (use w/41-H-1074)	J-3755-1	41-R-2375-520
Remover and replacer, bushing, front axle wheel spindle and front axle trunnion yoke housing (use w/-41-H-1074)	J-3755-2	41-R-2375-525
Remover, bearing, tapered, axle drive pinion (use w/41-P-2905-60)	J-3770-2	41-R-2367-95
Remover, bearing, roller, axle drive pin (use w/41-P-2905-60)	J-3770-1	41-R-2367-90
Replacer, bearing, clutch pilot and drive sprocket axle pinion	TEC-50-8	41-R-2380-450
Replacer, bearing cup, drive sprocket, inner	J-3773	41-R-2384-840
Replacer, bearing cup, drive sprocket, outer	J-3772	41-R-2384-842
Replacer, bearing cup, inner and outer front wheel (use w/41-H-1074)	J-3760	41-R-2384

(*Continued on Page 216*)

ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

Special Tool	Manufacturer's Number	Federal Stock Number
Replacer, bearing, diff. side (use w/-41-H-1074)	TEC-27728	41-R-2381-95
Replacer, bearing, steering knuckle trunnion	J-3753	41-R-2382-925
Replacer, oil seal, front axle trunnion housing (use w/41-H-1074)	TEC-27727	41-R-2392-650
Replacer, oil seal, pinion bearing cage (use w/41-H-1074)	TEC-27731	41-R-2393-350
Wrench, wheel bearing nut, 3 5/16 in. and 3 9/16 in. openings	TEC-27730	41-W-3825-35

REFERENCES

STANDARD NOMENCLATURE LISTS.

Half-track vehicles (International Harvester Co.) Car, half-track, M9A1 Carrier, personnel, half-track, M5 Carrier, personnel, half-track, M5A1 Carriage, motor, multiple gun, M14 Carriage, motor, multiple gun, M17	SNL G-147
Cleaning, preserving and lubricating materials; recoil fluids, special oils, and miscellaneous related items	SNL K-1
Soldering, brazing, and welding materials, gases, and related items	SNL K-2
Tools, maintenance, for repair of automotive vehicles	SNL G-27
Tool sets, motor transport	SNL N-19
Tool sets, for ordnance service command, automotive shops	SNL N-30
Current Standard Nomenclature Lists are listed above. An up-to-date list of SNL's is maintained in the "Index to Ordnance Publications"	OFSB 1-1

EXPLANATORY PUBLICATIONS.

Military motor vehicles	AR 850-15
List of publications for training	FM 21-6

Related Technical Manuals.

Basic half-track vehicles (IHC) (Personnel carrier M5, car M9A1, multiple gun motor carriage M14, and similar IHC vehicles)	TM 9-707
Ordnance maintenance: Engine and engine accessories for basic half - track vehicle (International Harvester)	TM 9-1707A
Ordnance maintenance: Vacuum power brake systems (Bendix-Westinghouse)	TM 9-1827B
Standard military motor vehicles	TM 9-2800
Ordnance maintenance: Hydraulic brake system (Wagner)	TM 9-1827C

Automotive Materiel.

Automotive electricity	TM 10-580
Electrical fundamentals	TM 1-455
The motor vehicle	TM 10-510

Care and Preservation.

Automotive lubrication	TM 10-540

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ORDNANCE MAINTENANCE—POWER TRAIN, BODY, AND CHASSIS FOR BASIC HALF-TRACK VEHICLE (IHC)

Care and Preservation—*Continued from Page 217.*

Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department	TM 9-850
Explosives and demolitions	FM 5-25
Motor transport inspections	TM 10-545
Product guide	OFSB 6-2

Decontamination.

Chemical decontamination materials and equipment	TM 3-220
Decontamination of armored force vehicles	FM 17-59
Defense against chemical attack	FM 21-40
Military chemistry and chemical agents	TM 3-215

Maintenance and Repair.

Automotive power transmission units	TM 10-585
Motor vehicle inspections and preventive maintenance services	TM 9-2810
Sheet metal work, body, fender, and radiator repairs	TM 10-450

Storage and Shipment.

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
Ordnance field service storage and shipment chart—group G major items	OSSC-G

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