DEPARTMENT OF THE ARMY
TECHNICAL MANUAL

DEPARTMENT OF THE AIR
FORCE TECHNICAL ORDER

TM 9-1804B
TO 19-75CAJ-2

POWER TRAIN BODY AND FRAME FOR ¼-TON 4 x 4 UTILITY TRUCK M38

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
JULY 1952

This manual is correct to 3 June 1952

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., *16 July 1952*

TM 9–1804B/TO 19–75CAJ–2 is published for the information and guidance of all concerned.

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For explanation of distribution formula, see SR 310–90–1.

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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information and guidance of personnel responsible for field and depot maintenance of this matériel. The instructions herein contain information on maintenance which is beyond the scope of the tools, equipment, or supplies normally available to using organizations. This manual does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operator's technical manuals (TM 9–804, TM 9–1804A, etc.).

b. This manual contains a description of and procedure for removal, disassembly, inspection, repair, rebuild, and assembly of the transmission, transfer, axles, body, and frame for the ¼-ton 4 x 4 utility truck M38 (fig. 1). The appendix contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the matériel.

c. This first edition manual is published in advance of complete technical review. Any errors or omissions will be brought to the attention of the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM-Pub.

2. Field and Depot Maintenance Allocation

These instructions for complete disassembly and rebuild are not to be construed as authority for the performance by field maintenance units of those functions which are restricted to depot shops and arsenals. In general, the prescribed maintenance responsibilities will reflect in the allocation of maintenance parts listed in the appropriate columns of the current ORD 8 SNL G–740. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair functions imperative. Supply of parts listed in the depot guide column of ORD 8 supply catalogs will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization. Those operations which can be performed as "emergency field maintenance" are specifically covered as such in this manual.

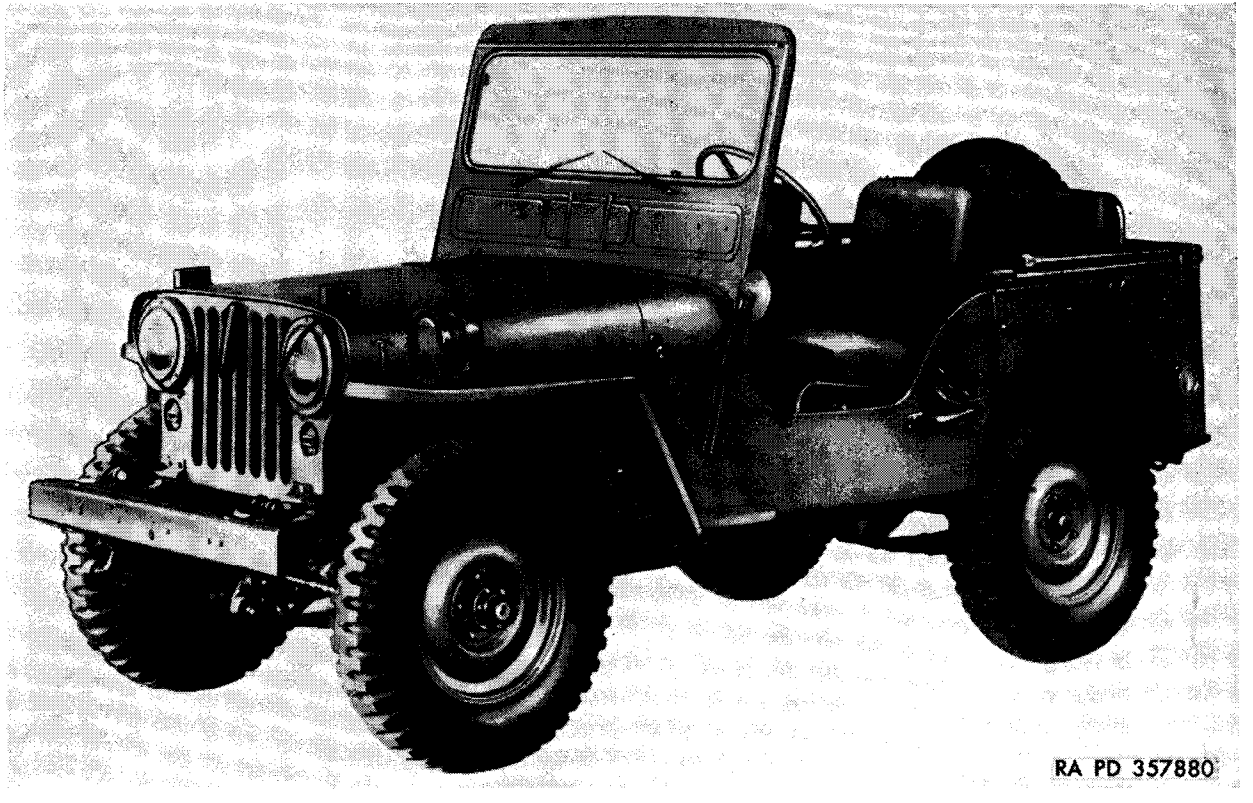


Figure 1. ¼-ton 4 x 4 utility truck M38—left-front view.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the quantity, and condition of matériel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of matériel in the hands of troops and for delivery of matériel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the matériel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units maintaining this equipment are listed in the appendix. For current and complete listing of all forms, refer to current SR 310–20–6. Additional forms applicable to the using personnel are listed in the operators manual.

c. Field Report of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in the SR 385–10–40 series of special regulations. These reports are required whenever accidents involving injury to personnel or damage to matériel occur.

d. Report of Unsatisfactory Equipment or Materials. Any suggestions for improvement in design and maintenance of equipment, safety and efficiency of operation, or pertaining to the application of prescribed petroleum fuels, lubricants, and/or preserving materials, will be reported through technical channels as prescribed in SR 700–45–5 to the Chief of Ordnance, Washington 25, D. C., ATTN: ORDFM, using DA Form 468, Unsatisfactory Equipment Report. Such suggestions are encouraged in order that other organizations may benefit.

Note. Do not report all failures that occur. Report only REPEATED or RECURRENT failures or malfunctions which indicate unsatisfactory design or material. However, reports will always be made in the event that exceptionally costly equipment is involved. See also SR 700–45–5 and the printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. General. This vehicle is a general purpose, personnel, or cargo carrier, especially designed for adaptation to general reconnaissance, communications, or other special duties. It is a four-wheel vehicle

with a four-wheel drive. A pintle is provided at the rear for towing purposes, as well as an electrical trailer connection. This vehicle is designed for short periods of underwater operation, by having the electrical units waterproofed and providing a venting system connected to the air cleaner.

b. Engine and Clutch. The engine is a conventional 4-cylinder, L-head, gasoline unit (fig. 3). To facilitate major repairs, the engine, transmission, transfer, and radiator are designed so that they may be removed from the vehicle as a unit. The clutch, located between the engine and transmission, is a single plate, automotive type, composed of two major units; the pressure plate assembly and the driven plate or disk. The controlled pressure of the driven plate against the flywheel provides a means of engaging and disengaging the engine power with the transmission.

c. Transmission. The transmission (fig. 2) is a selective, three-speed gear box with synchronized second and high speed gears It is part of the power plant unit (fig. 3) with the engine, clutch, transfer, and radiator. The gears are shifted by a shift lever extending out of the top of the gearshift control housing (fig. 30).

d. Transfer (fig. 2). The transfer is an auxiliary gear unit attached to the rear of the transmission. It is essentially a two-speed transmission providing an additional gear reduction for any selection of the transmission gears and, also, a means of engaging and disengaging power to the front axle. Selecting gear ratio is accomplished by two levers located to the right of the transmission gearshift lever.

e. Propeller Shafts (fig. 2). Two propeller shafts are used, one to drive each axle. Each shaft has a universal joint at each end and a splined slip joint at the end nearest the transfer. The propeller shaft connecting the transfer to the front axle has U-bolt type joints at both ends. The rear propeller shaft has a U-bolt type joint at the rear axle end and a snap-ring type at the transfer end.

f. Front Axle Assembly (fig. 2). The front axle assembly is of the full-floating type, inclosing a front wheel driving unit having a single-reduction two-pinion differential, and hypoid driving gear. The differential gear carrier housing is offset to the right so that the propeller shaft is located to the right of the engine for maximum ground clearance.

g. Rear Axle Assembly (fig. 2). The rear axle assembly is of the semifloating, single-reduction driving unit type with hypoid gears. The differential gear carrier housing is offset to the right so that the propeller shaft has a straight drive from the transfer.

h. Springs and Shock Absorbers (figs. 2, 90, 91, and 92). All four springs are semielliptic leaf type with double-wrapped eyes. Each spring has four clips which serve to hold the spring leaves in alinement

and hold the spring leaves together to take road rebound. Threaded U-bolt shackles mount the front end of the front springs and the rear end of the rear springs. Left-hand thread shackles and bushings are used in the spring eye of the left front and right rear springs. The left-hand thread shackles have a small forged bar on the lower shank and the left-hand thread bushings have a groove cut around the hexagon head. The rear end of the front springs and the front end of the rear springs are mounted with a pivot bolt. The shock absorbers are hydraulic cylinder, direct-acting, two-way control units, mounted in rubber bushings. These units are nonadjustable and nonrefillable.

i. Wheels and Tires. Two conventional disk type wheels are attached to the hub with five nuts. All wheels are interchangeable. Standard 7.00–16, 6-ply military tires are mounted on safety rims.

j. Steering Gear and Drag Link (fig. 24). The steering gear is of the conventional type, mounted on the left frame side member and connected to the bellcrank by a Pitman arm and drag link. It is of the cam and lever type with a variable-ratio cam. The steering wheel is a 3-spoke, safety type, with a 17¼-inch diameter. The drag link is the adjustable, ball-and-socket type.

k. Brake System (fig. 5). The service or foot brake system is of the hydraulic type with brakes in all four wheels. The parking brake is cable controlled and is mounted on the rear of the transfer. The service or foot brakes are of the two-shoe, double-anchor type. The brake pedal operates a piston in the brake master cyclinder to force brake fluid through the lines to the brake cylinder in the wheels. The brake fluid enters the wheel cylinders between two pistons of equal diameter, forcing them apart to force the brake shoes against the brake drums. Releasing the brake pedal permits the brake fluid to flow back through the lines to the brake master cylinder. The parking brake is designed for use while the vehicle is parked or as an emergency auxiliary brake. Pulling out on the parking brake lever in the driver's compartment draws a flexible cable through a conduit to actuate the brake shoes at the rear of the transfer.

l. Electrical System (fig. 6). Two 12-volt, lead and acid type batteries (fig. 12), connected in series, supplies 24-volt current for vehicle operation. The head lights, blackout driving light, blackout marker lights, and the stop and tail lights are waterproofed. The head lights and the blackout driving light is of the sealed beam type. This vehicle is equipped with a four-terminal trailer connection (fig. 17 and 18), located at the left rear of the vehicle. An auxiliary power receptacle (fig. 12) is located on the right fender and is used for charging the batteries from an external source to operate electrical components. The radio receptacle (fig. 14), located in the driver's compartment next to the passenger seat, provides power connection

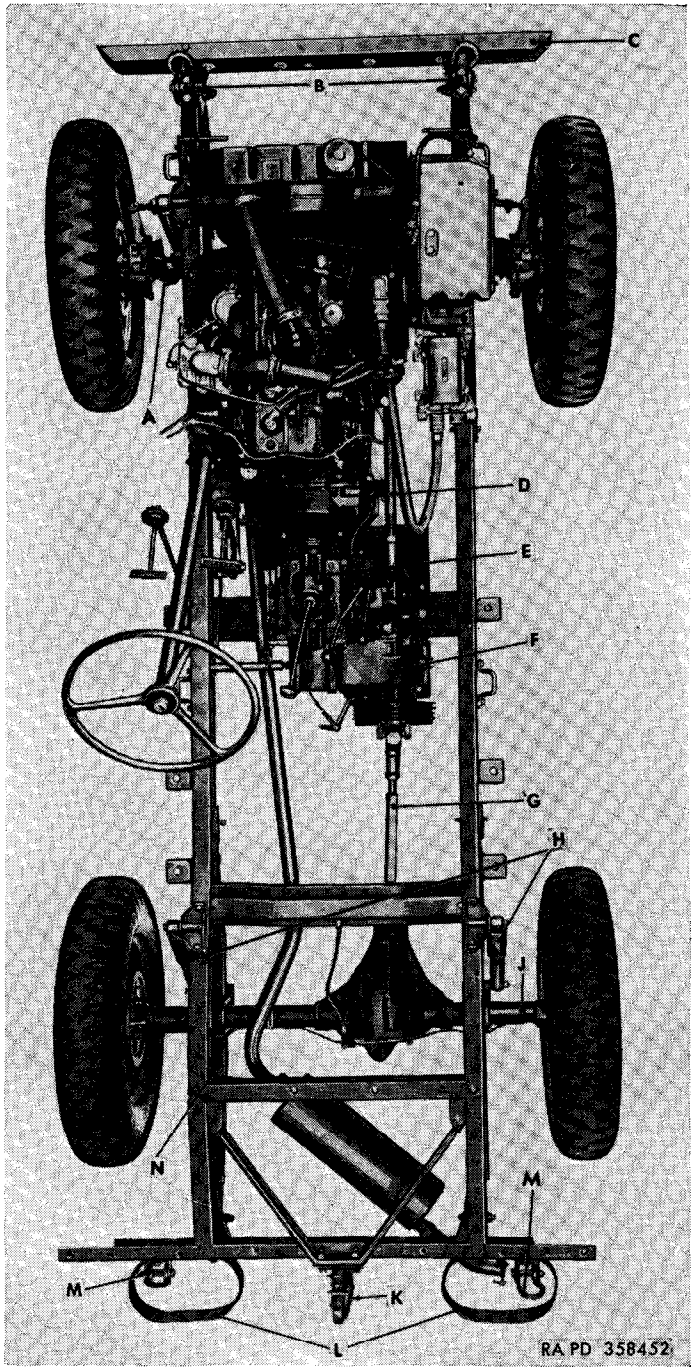


Figure 2. ¼-ton 4 x 4 utility truck M38—top view of chassis.

A—FRONT AXLE ASSEMBLY
B—FRONT LIFTING SHACKLES
C—FRONT BUMPER
D—FRONT PROPELLER SHAFT
E—TRANSMISSION
F—TRANSFER
G—REAR PROPELLER SHAFT
H—REAR SHOCK ABSORBERS
J—REAR AXLE ASSEMBLY
K—PINTLE HOOK
L—REAR BUMPERETTES
M—REAR LIFTING SHACKLES
N—REAR SPRING

Figure 2—Continued

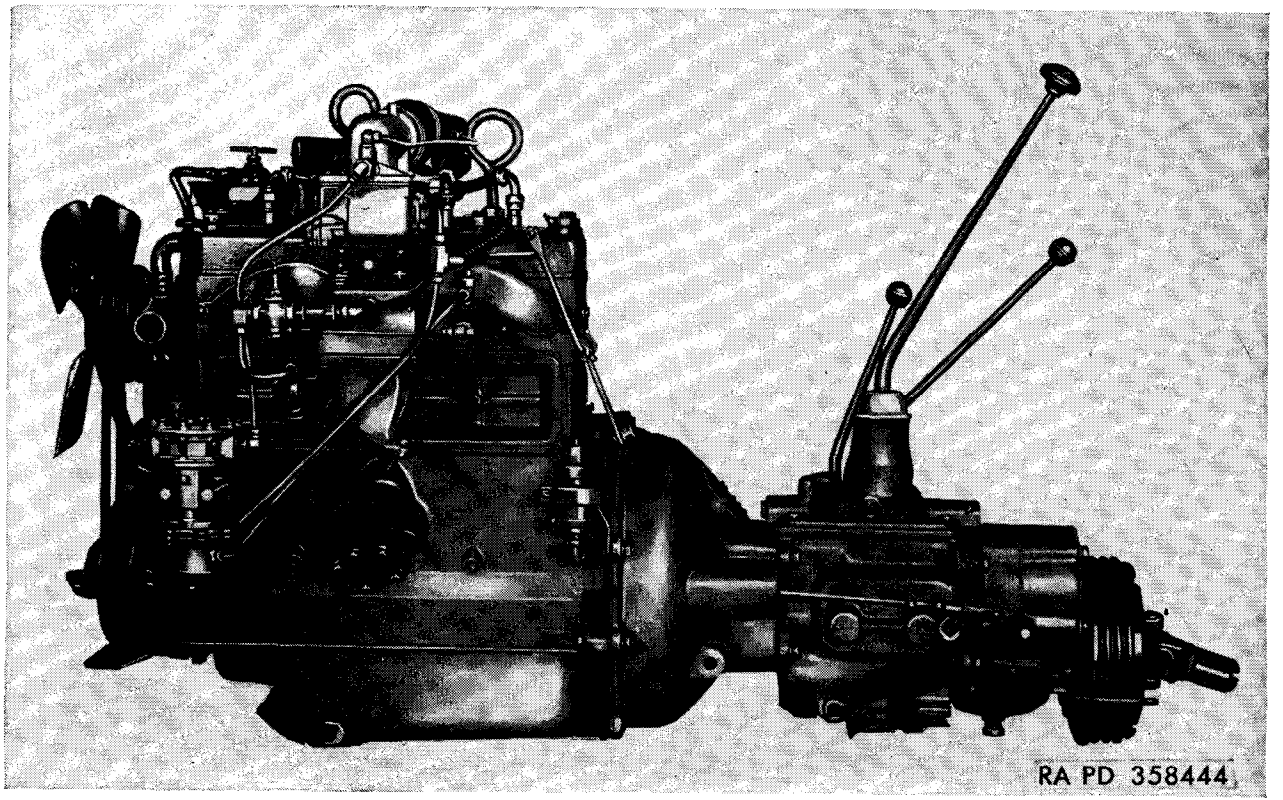


Figure 3. Power plant—left-side view.

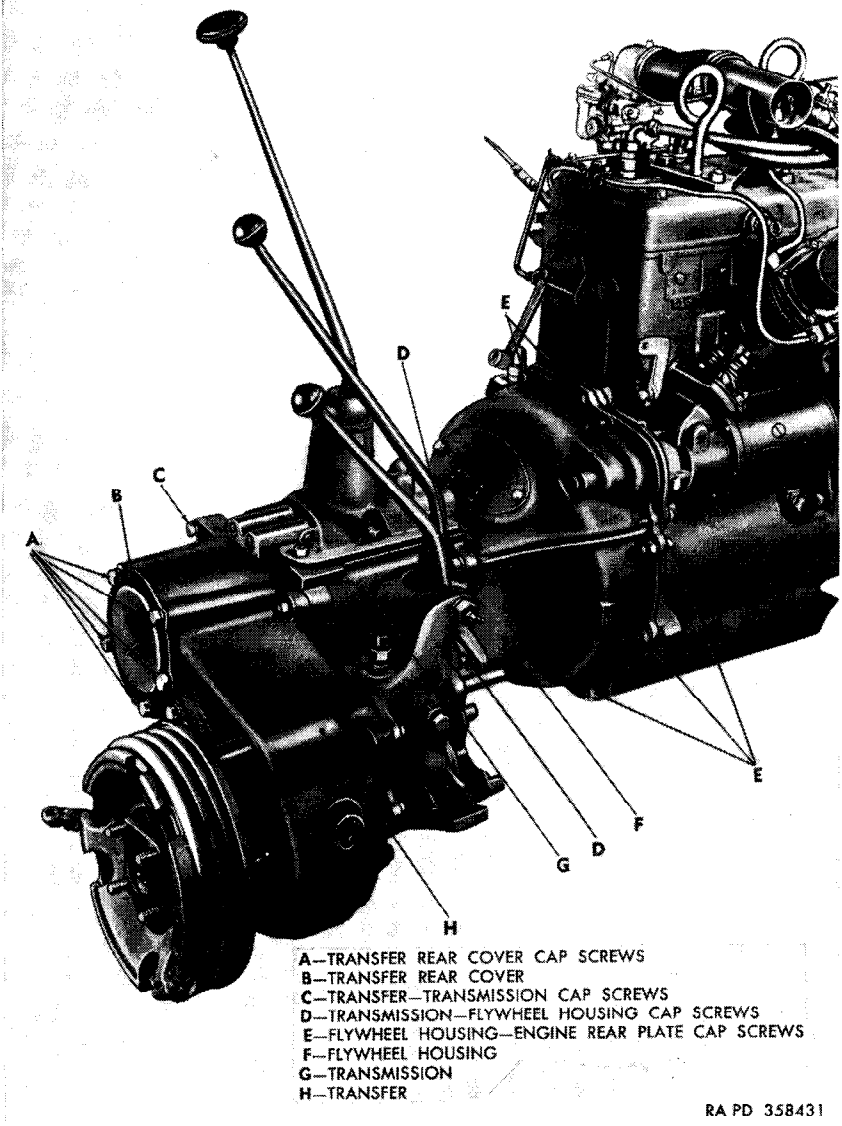


Figure 4. Power plant—right-rear view.

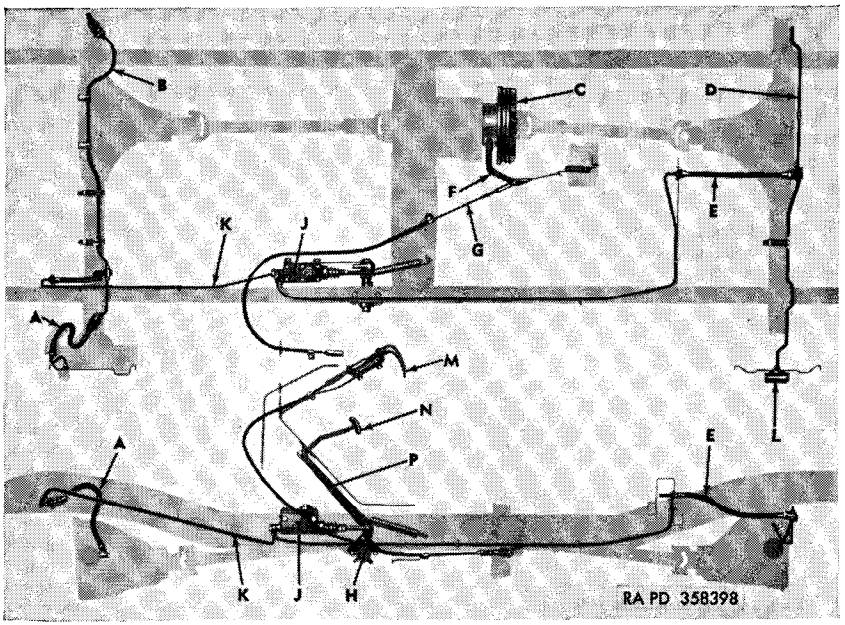


Figure 5. Brake system.

A—FRONT BRAKE TO AXLE ASSEMBLY
B—BRAKE AXLE TEE TO FRONT BRAKE LINE
C—PARKING BRAKE
D—BRAKE AXLE TEE TO RIGHT REAR WHEEL CYLINDER
E—REAR BRAKE AXLE TEE HOSE
F—PARKING BRAKE CABLE CRANK
G—PARKING BRAKE CABLE
H—BRAKE AND CLUTCH PEDAL SHAFT BRACKET
J—BRAKE MASTER CYLINDER
K—BRAKE MASTER CYLINDER TO FRONT BRAKE LINE
L—WHEEL BRAKE CYLINDER
M—PARKING BRAKE LEVER
N—BRAKE PEDAL PAD
P—BRAKE PEDAL

for the operation of a radio. Complete information on the electrical system is contained in TM 9–804.

m. Ventilating System. Operation of the vehicle underwater is made possible by waterproofing all parts or assemblies which are immediately affected by the entrance of water. The majority of these parts require venting to atmospheric pressure, either to operate or to prevent damage due to condensation. A series of ventilating tubes is provided for this purpose. The main vent and carburetor air intake is through a rubber tube clipped to a support which is mounted on the right side of the vehicle by the windshield. This rubber tube is attached to the air cleaner for underwater operation and serves as a "breather." Complete information on underwater ventilation is covered in TM 9–804.

n. Cooling System. The cooling system consists of the radiator with pressure type cap, water pump, fan, and thermostat. The system is sealed and operates under pressure when engine is warmed up.

The system features full length water jackets in the cylinder block and a bypass tube from the water pump to the cylinder head. There are two drain cocks for draining the cooling system. One is at the bottom of the radiator and one is on the right side center of the cylinder block. The thermostat is located in the water outlet elbow on the cylinder head. Complete information on the cooling system is contained in TM 9–804.

o. Body. The body (fig. 104) is of the open type. There are two individual tubular frame front seats and a rear seat. The tool box is under the passenger seat in front. The windshield is equipped with dual hand and vacuum operated windshield wipers and can be

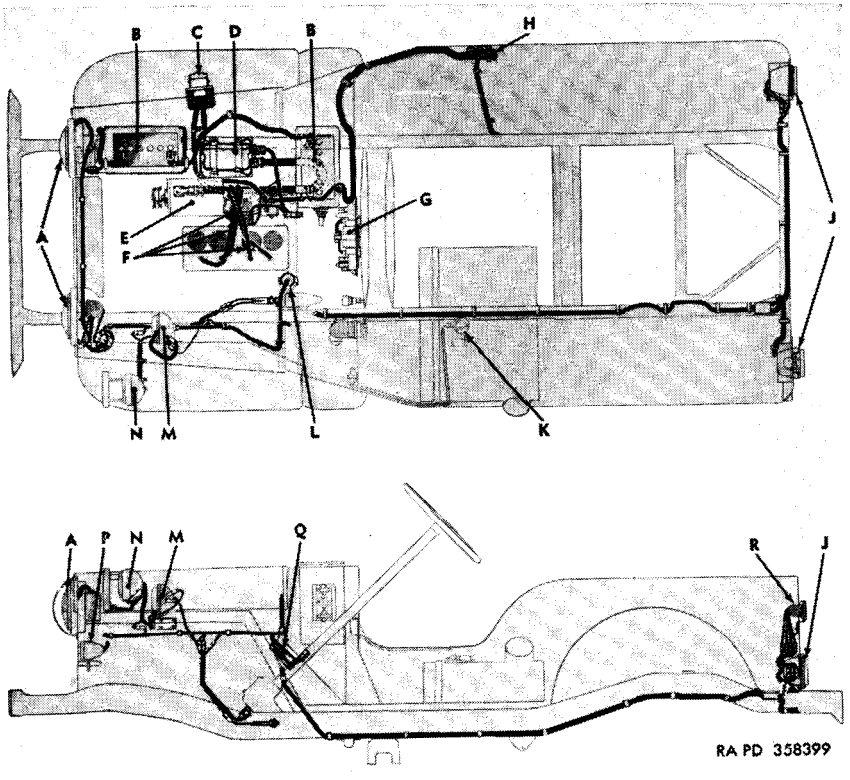


Figure 6. Electrical system.

A—HEAD LIGHTS
B—BATTERIES
C—SLAVE OUTLET RECEPTACLE
D—VOLTAGE REGULATOR
E—GENERATOR
F—IGNITION HARNESS
G—INSTRUMENT PANEL
H—RADIO OUTLET RECEPTACLE
J—TAIL LIGHTS
K—FUEL GAGE SENDING UNIT
L—ENGINE OIL PRESSURE SENDING UNIT
M—HORN
N—BLACKOUT DRIVING LIGHT
P—BLACKOUT MARKER LIGHT
Q—DIMMER SWITCH
R—TRAILER OUTLET RECEPTACLE

folded down for low silhouette. A rear view mirror is mounted on the left side of the body. A rifle holder (fig. 106) is mounted below the windshield inside the driver's compartment. A strap and sheath carry an axe and shovel on the right side of the body. The fuel tank (fig. 107) sets on the floor underneath the driver's seat and the tank is filled from an inlet pipe on the left side of the body. A fuel can carrier (fig. 103) and spare tire and wheel are mounted on a hinged tail gate at the rear of the body. A bumper (fig. 2) at the front, bumperettes (fig. 103) at the rear, and a radiator and head light guard in the front provide protection against damage. A pintle hook (fig. 103) and trailer receptacle at the rear of the body provide a means of hauling a towed load. Straps are provided in the rear compartment for securing the top and side curtains to the rear wheel housing. When the windshield is up and top and side curtains are on, the vehicle can be ventilated by means of a windshield ventilating cover (fig. 106) in the center of the windshield assembly.

p. Frame (fig. 109). The frame is constructed of heavy channel steel frame side members and cross members. Brackets and diagonal braces are used to maintain the proper longitudinal position of the frame side members relative to each other and at the same time, provide additional resistance to torsional strains.

5. Vehicle Nomenclature

In this manual, the terms "left" and "right" are given in relation to the driver sitting in the driver's seat facing the radiator. "Front" indicates radiator end of vehicle, "rear" indicates furthest part of vehicle behind radiator. The front of the transmission will be the end which is bolted to the engine on the input end. Right and left will be in relation to standing at the rear of the transmission looking forward. The rear of the transfer is the end which mounts the parking brake, while the front is the end which bolts to the transmission. Right and left will be identified by standing at the rear of the transfer looking forward.

6. Tabulated Data

TM 9–804 contains tabular data pertaining to general characteristics and performance of the vehicle and major components. TM 9–1804A contains tabular data pertaining to the engine and clutch. Detailed tabular data pertaining to individual components described in this manual are given in the paragraph covering each component.

CHAPTER 2

PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

7. General

Tools and equipment and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units and depot shops for maintaining, repairing, and/or rebuilding the matériel.

8. Parts

Maintenance parts are listed in Department of the Army Supply Catalog ORD 8 SNL G–740 which is the authority for requisitioning replacements. Parts not listed in the ORD 8 catalog, but required by depot shops in rebuilding operations may be requisitioned from the listing in the corresponding ORD 9 catalog and will be supplied if available. Requisitions for ORD 9 parts will contain a complete justification of requirements.

9. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this matériel are listed in ORD 6 SNL's J–8, section 13 J–9, section 1; J–10, sections 4 and 7, and are authorized for issue by T/A and T/O & E.

10. Special Tools and Equipment

The following tabulation contains only those special tools and equipment necessary to perform the operations described in this manual, is included for information only, and is not to be used as a basis for requisitions.

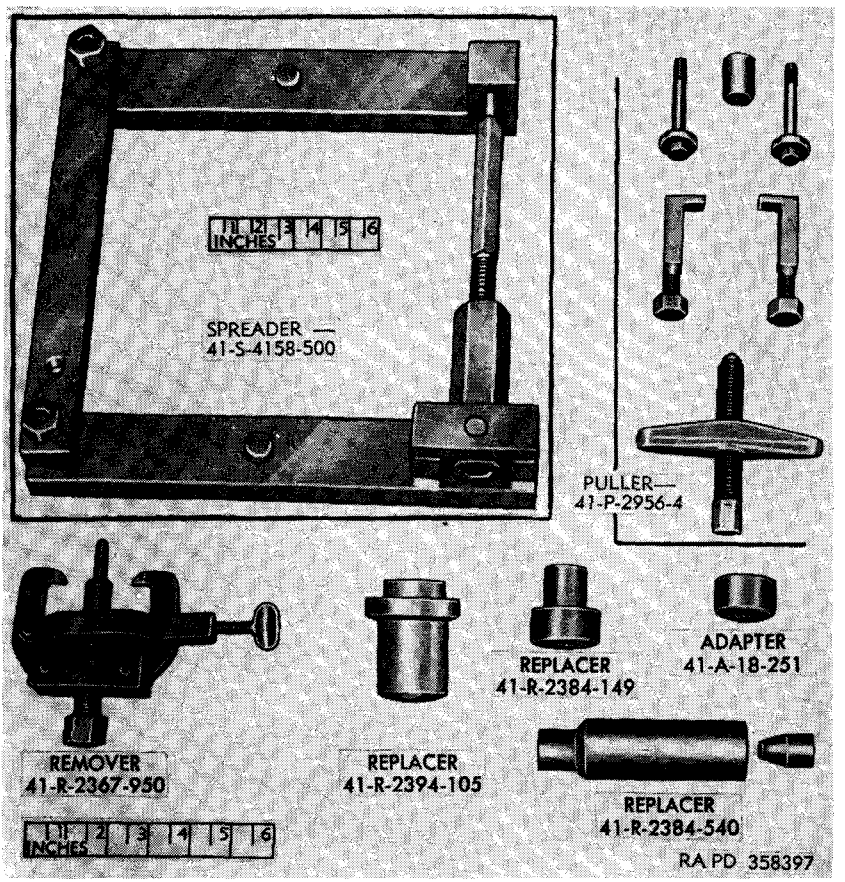


Figure 7. Special tools and equipment.

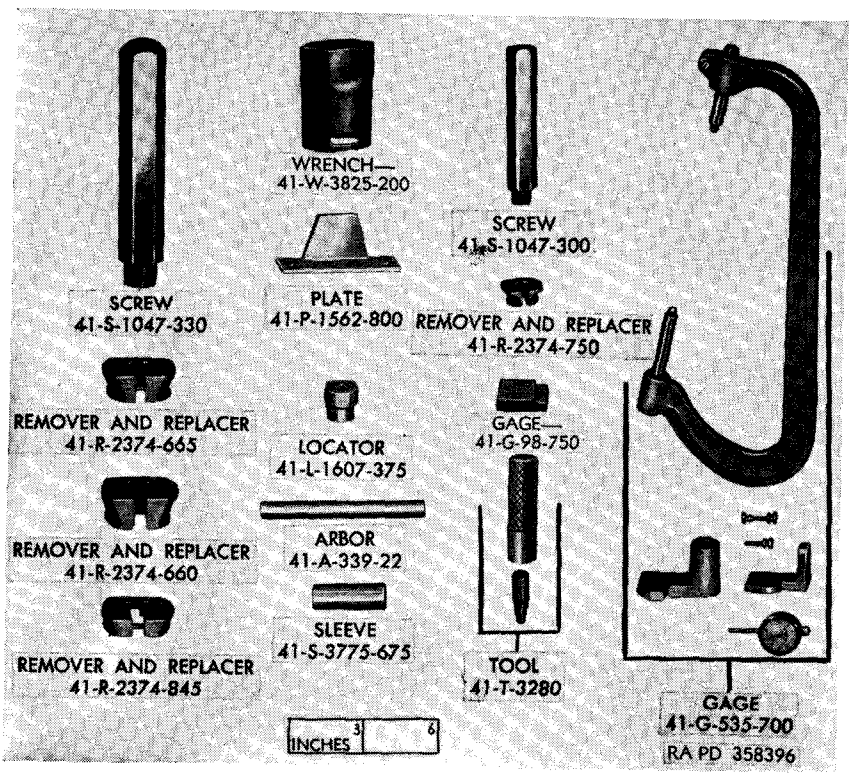


Figure 8. Special tools and equipment.

Table 1. Special Tools and Equipment for Field and Depot Maintenance

Item	Identifying No.	Reference		Use
		Fig.	Par.	
ADAPTER, puller, steering wheel, (used with Puller 41–P–2954).	41–A–18–251	7, 13	30	Removing steering wheel.
ARBOR, removing and replacing (countershaft transmission), diam 0.751 in, lgh 6.850 in.	41–A–339–22	8, 29	52, 56	Removing and replacing transmission countershaft without loss of bearing rollers.
GAGE SET, drive pinion setting, consisting of:	41–G–535–700	8, 78, 79	104	
GAGE, drive pinion setting	41–G–177–50	----------	104	Checking differential drive pinion setting.
GAGE, checking, drive pinion setting gage.	41–G–98–750	8, 77	104	
SPACER, drive pinion setting	41–S–3868–415	----------	----------	
LOCATOR, thrust washer intermediate shaft (transfer case).	41–L–1607–375	8, 45	72	Holding thriust washers in place in transfer.
PLATE (main shaft retaining, transmission).	41–P–1562–800	8	----------	Securing gears in transmission.
PULLER, crankshaft and camshaft timing gears.	41–P–2956–4	7, 55, 68	64, 89, 97	Removing front axle shaft driving flange. Removing rear companion flange. (Also used for removing timing gears).
REMOVER, bearing and drive pinion flange differential side.	41–R–2367–950	7, 67	96	Removing differential side bearings.
REMOVER, bearing cone, (front) main shaft.	41–R–2368–200	36	64	Removing transfer case front bearing cones.
REMOVER AND REPLACER, bearing cup (spindle pin) thd ¾ in–16NF–2 female.	41–R–2374–750	8, 74, 75	100	Removing kingpin bearing cups.

REMOVER AND REPLACER, bearing cup (drive pinion outer).	41–R–2374–665	8	100	Removing and replacing drive pinion outer bearing cup.
REMOVER AND REPLACER, bearing cup (drive pinion inner).	41–R–2374–660	8, 73	100	Removing and replacing drive pinion inner bearing cup.
REMOVER AND REPLACER, bearing cup (wheel), thd 1¼–12NF–2 female.	41–R–2374–845	8, 86	113	Removing and replacing wheel bearing cups.
REPLACER, bearing cone differential side.	41–R–2384–149	7, 80	105	Replacing differential side bearing cone, also used to replace axle shaft inner oil seals.
REPLACER, oil seal (transfer case)	41–R–2394–105	7, 47	68, 75	Replacing oil seals.
REPLACER, bearing cone and snap ring (transfer case).	41–R–2384–540	7, 42, 43	70	Replacing transfer case bearing cones, also to replace snap rings.
SCREW, remover and replacer (bearing sleeve), thd 1¼–12NF–2, lgh 9 in.	41–S–1047–330	8, 73, 86	113	Used with remover and replacer 41–R–2374–660, 41–R–2374–665, and 41–R–2374–845.
SCREW, remover and replacer (bearing cup), thd ¾ in–16NF–2, lgh 6 in.	41–S–1047–300	8, 74, 75	100	Used with remover and replacer 41–R–2374–750.
SLEEVE, needle bearing replacing (transmission counter shaft) ID 0.760 in, OD 1⅛ in, lgh 3 in.	41–S–3775–675	8, 32	56	Load bearing rollers in countershaft.
SPREADER, differential case carrier	41–S–4158–500	7, 59	92, 105	To spread differential case carrier to remove or install differential.
TOOL, oil seal assembly, shifter shaft	41–T–3280	8, 44		Install shifter shaft oil seals.
WRENCH, wheel bearing nut, single end tubular, hex, size of opng 2⅛ in, lgh 3.56 in.	41–W–3825–200	8, 56	89	To remove or install wheel bearing nut.

CHAPTER 3
TROUBLE SHOOTING

Section I. GENERAL

11. Purpose

Note. Information in this chapter is for use of ordnance maintenance personnel in conjunction with and as a supplement to the trouble-shooting section in the pertinent operator's manual. It provides the continuation of instructions where a remedy in the operator's manual refers to ordnance maintenance personnel for corrective action.

Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By carfeul inspection and trouble shooting, such damage and injury can be avoided and, in addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

12. General Instructions and Procedures

This chapter contains inspection and trouble-shooting procedures to be performed while a disabled component is still mounted in the vehicle and after it has been removed.

a. The inspections made while the component is mounted in the vehicle are for the most part visual and are to be performed before attempting to operate the vehicle. The object of these inspections is to avoid possible damage or injury and also to determine the condition of and, when possible, what is wrong with the defective component.

b. The trouble shooting performed while the component is mounted in the vehicle is that which is beyond the normal scope of the using organization. Check the trouble-shooting section of TM 9–804; then proceed as outlined in this chapter. These trouble-shooting operations are used to determine if the fault can be remedied without removing the component from the vehicle and, also, when subsequent removal is necessary, to indicate when repair can be made without complete disassembly of the component.

c. Inspection after the component is removed from the vehicle is performed to verify the diagnosis made when the component was in the vehicle, to uncover further defects, or to determine faults if the component alone is received by the ordnance establishment. This inspection is particularly important in the last case because it is often

the only means of determining the trouble without completely disassembling the component.

Section II. TRANSMISSION

13. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Leaks Oil.

(1) *Loose drain plug.* Tighten drain plug.

(2) *Damaged or improperly installed gaskets.* This will usually be indicated by lubricant leakage at points where the gearshift lever housing attaches to the transmission case, where the transmission is attached to the engine, and where the transfer attaches to the transmission. Remove and replace defective gaskets.

(3) *Damaged or improperly installed oil seals.* Remove and replace damaged oil seals.

(4) *Loose, missing, or stripped bolts or cap screws.* Examine and tighten all attaching cap screws and bolts. If a cap screw or bolt is missing, replace with a new one. If lubricant leaks after loose bolts and cap screws have been tightened, check for damaged gaskets or oil seals ((2) and (3) above).

(5) *Sand holes or cracks in transmission case or cover.* Wipe outside of transmission case and cover off with dry-cleaning solvent or volatile mineral spirits and check transmission case and cover for cracks or sand holes. Remove and replace transmission (TM9–804).

c. Transmission Gearshift Lever Loose or Sloppy.

(1) *Transmission gearshift lever housing loose.* Tighten housing cap screws securely.

(2) *Gearshift control housing cap loose.* Tighten cap securely.

(3) *Gearshift lever support spring broken or missing.* Remove control housing cap and examine support spring. If spring is missing, install new spring. If spring is weak or broken, replace with new spring.

(4) *Gearshift lever fulcrum ball pin sheared or missing.* Remove gearshift lever and examine ball pin. If pin is missing or sheared, install new pin.

(5) *Worn gearshift lever fulcrum ball.* Remove gearshift lever and examine fulcrum ball. If ball is loose or excessively worn (fits too deep in housing) install a new gearshift lever assembly.

(6) *Loose or damaged shifter shafts, shifter forks, or poppet balls or springs.* Remove and disassemble gearshift control housing and examine all parts. Replace all damaged or worn parts.

d. Gearshift Lever Stuck in Lower or Reverse Gear.

(1) *Bent low and reverse shifter shaft.* Remove and replace damaged shifter shaft.

(2) *Low and reverse sliding gear seized on main shaft.* Remove and replace damaged gear or main shaft.

(3) *Low and reverse sliding gear bent or shifted on sliding gear.* Remove and replace defective shifter fork or sliding gear.

e. Gearshift Lever Stuck in Second or High Gear.

(1) *Bent second and high shifter shaft.* Remove and replace damaged shifter shaft.

(2) *Defective second and high speed synchronizer assembly.* Remove and replace defective synchronizer assembly.

f. Gearshift Lever Will Not Move Into Any Gear Position or Is Difficult to Move.

(1) *Gears seized on shaft or not meshing properly.* Remove and replace damaged gears or shafts.

(2) *Hydraulic jam at ends of shifter shafts.* Remove shifter rail hole pipe plug and clean out oil bypass hole in control housing.

g. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 14.

14. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 13 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble shooting procedures.

b. Excessive Noise in Neutral.

(1) *Insufficient lubrication.* Lubricate as specified on LO 9–804.

(2) *Main shaft pilot bearing rollers broken or badly worn.* Remove and replace main shaft pilot bearing.

(3) *Countershaft or gear worn or sprung.* Remove and replace defective countershaft or gear.

(4) *Main shaft rear bearing assembly worn or rough.* Remove and replace defective bearing.

(5) *Reverse idler gear chipped or broken.* Remove and replace defective reverse idler gear.

(6) *Clutch not releasing fully causing intermittent but slight engagement of gears.* Check, adjust, or replace clutch assembly (TM 9–804).

(7) *Worn or inadequately lubricated parts in transfer.* If the above checks were made and difficulty was not corrected it may be due to difficulties in the transfer. See paragraph 15 and 16.

c. Excessive Noise in Gear.

(1) *Defective gears.* Any of the symptoms listed under "excessive noise in neutral" (*b.* above) will usually be more pronounced when the vehicle is driven in gear, especially at low road speeds. If the noise is limited to any one or more speeds, trace the defective gears under load, remove, and examine for damage.

(2) *Inadequate lubrication.* Lubricate transmission as prescribed on LO 9–804.

(3) *Main shaft front or rear bearings worn or damaged.* Remove and replace defective bearing assemblies.

(4) *Bent shifter fork.* This will cause improper engagement of gears. Remove control housing and replace defective shifter fork.

(5) *Noisy speedometer gears.* Remove and replace defective gears.

(6) *Worn, inadequately lubricated, or damaged parts in transfer.* If the above checks and tests fail to disclose the difficulty, the fault may be in the transfer. See paragraphs 15 and 16.

d. Oil Leakage. Refer to paragraph 13*b*.

e. Hard Shifting.

(1) *Insufficient or improper lubricant.* Drain and refill transmission with proper grade lubricant as prescribed on LO 9–804.

(2) *Clutch fails to release fully.* If a severe clashing of gears is encountered when an attempt is made to shift from neutral to low gear, the clutch is not fully releasing. Remove clutch and trouble shoot (TM 9–1804A).

(3) *Low and reverse or second and high speed gears not meshing properly.* Remove and replace defective gears.

(4) *Bent shifter shafts.* Remove control housing assembly and replace defective shifter shafts.

(5) *Bent shifter forks.* Remove control housing assembly and replace defective shifter forks.

(6) *Weak or broken shift rail poppet ball springs.* Remove control housing and replace defective poppet ball springs.

(7) *Second and high speed synchronizer defective.* Remove and replace defective synchronizer assembly.

(8) *Low and reverse slidng gear binding on main shaft.* Remove and replace defective gear on main shaft.

f. Gearshift Lever Sticks in Gear.

(1) *Clutch not releasing properly.* Remove clutch and trouble shoot (TM 9–1804A).

(2) *Low and reverse sliding gear binding on main shaft.* Remove and replace defective gear or main shaft.

(3) *Damaged second and high speed synchronizer assembly.* Remove and replace synchronizer assembly.

(4) *Damaged or bent shifter forks or shifter shafts.* Remove control housing and replace defective parts.

g. Slips Out of High Gear.

(1) *Transmission misalined with flywheel.* Remove and realine (TM 9–804).

(2) *Synchronizer sleeve gear teeth worn or tapered.* Remove and replace worn gear.

(3) *Damaged countershaft.* Remove and replace countershaft.

h. Slips Out of Second Gear.

(1) *Improper clearance between second speed gear and main shaft.* Remove and replace second speed gear or main shaft.

(2) *Worn or distorted teeth on second speed gear.* Remove and replace second speed gear.

(3) *Damaged countershaft.* Remove and replace countershaft.

i. Slips Out of First or Reverse.

(1) *Low and reverse sliding gear loose on main shaft splines.* Remove and replace defective main shaft or sliding gear.

(2) *Low and reverse sliding gear teeth worn or distorted.* Remove and replace sliding gear.

(3) *Excessive end play of countershaft in transmission case.* Remove and adjust countershaft thrust washers.

(4) *Reverse idler gear teeth worn or tapered.* Remove and replace defective idler gear.

(5) *Excessive end play of reverse idler gear in transmission case.* Remove and replace reverse idler gear.

(6) *Loose fit of bearings or bushings.* Remove and replace defective parts.

j. Noisy Bearings.

(1) *Clutch throwout bearing.* A high-pitched rubbing noise audible when slight pressure is exerted on clutch pedal, but not audible when clutch is fully engaged with the vehicle standing still. It indicates a defective clutch throwout bearing (TM 9–1804A).

(2) *Clutch pilot bearing.* A defective clutch pilot bearing will be indicated by a noise not quite as high-pitched as a throwout bearing noise, but audible when the clutch is fully disengaged (TM 9–1804A).

(3) *Input shaft bearing.* A noise audible in neutral with the clutch fully engaged and not audible when disengaged with

the vehicle standing still will indicate a defective input shaft bearing.

(4) *Main shaft rear bearing.* A noise audible and loudest when the vehicle is driven in low gear, but not audible when the gearshift lever is in neutral and the vehicle is standing still indicates a defective main shaft rear bearing.

Section III. TRANSFER

15. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Lubricant leakage.

(1) *Drain plugs loose.* Tighten all loose drain plugs.

(2) *Defective or improperly installed gaskets.* Wipe transfer off with dry-cleaning solvent or volatile mineral spirits and examine for leaks where transfer attaches to transmission, where output shaft front bearing cap attaches the transfer, and at all points where covers or plates are attached. Replace defective gasket.

(3) *Loose or missing cover or assembly mounting cap screws or bolts.* Check, tighten, or replace all cap screws or mounting bolts.

(4) *Defective oil seals.* If lubricant leakage is detected at either front or rear output shafts, the oil seals are usually at fault. Remove and replace defective oil seals.

c. Gearshift Lever Fails to Move to Direct or Underdrive.

(1) *Gears not meshing properly between transfer and transmission.* Remove and replace defective gears.

(2) *Bent or damaged shifter shafts.* Remove and replace shifter shafts.

(3) *Loose or damaged shifter forks.* Remove and replace defective shifter forks.

(4) *Damaged output clutch gear or gear shaft.* Remove and replace damaged gear or shaft.

(5) *Damaged or seized gears in transfer.* Remove and replace defective gears or shafts.

d. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 16.

16. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 15 do not reveal causes of failure and the vehicle is operable, then trouble shoot

it. Refer to paragraph 11 for the purpose and scope of these trouble shooting procedures.

b. Excessive Noise.

(1) *Inadequate lubricant.* Check and refill as prescribed on LO 9–804.

(2) *Damaged countershaft bearings.* Remove and replace defective bearings.

(3) *Damaged or seized output shaft bearings.* Remove and replace defective bearings.

(4) *Improperly meshed gears in transfer.* Remove and replace defective gears or shafts.

(5) *Teeth missing on gears.* Remove and examine all gears; replace defective gears.

c. Hard Shifting.

(1) *Gearshift lever ball scored.* Remove and replace defective parts.

(2) *Bent shifter forks.* Remove and replace defective shifter fork.

(3) *Bent shifter shafts.* Remove and replace defective shifter shafts.

(4) *Damaged output clutch gear or gear shaft.* Remove and replace defective gear or shaft.

(5) *Shifter shaft poppet balls or springs damaged or jammed.* Remove and replace damaged poppet balls or springs.

d. Slips Out of (High-Low) Gear.

(1) *Gearshift lever spring loose.* Tighten or replace spring.

(2) *Bent shifter fork.* Remove and replace defective shifter fork.

(3) *Shifter shaft poppet balls or springs damaged.* Remove and replace damaged poppet balls or springs.

e. Slips Out of Front Wheel Drive.

(1) *Gearshift lever spring loose or weak.* Tighten or replace gearshift lever spring.

(2) *Bent shifter fork.* Remove and replace defective shifter fork.

(3) *Shifter shaft poppet balls or springs damaged.* Remove and replace damaged poppet balls or springs.

Section IV. PROPELLER SHAFTS

17. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Front or Rear Propeller Shaft Loose When Shaken by Hand.

(1) *Damaged universal joint trunnion bearings.* Remove and replace damaged trunnion bearings.

(2) *Damaged or loose U bolts.* Tighten or replace damaged U bolts (TM 9–804).

(3) *Loose mounting cap screws at flanged yoke (rear propeller shaft).* Tighten loose cap screws.

(4) *Transfer rear companion flange nut loose.* Remove propeller shaft and tighten companion flange nut (TM 9–804).

(5) *Front propeller shaft to transfer yoke nut loose.* Remove propeller shaft and tighten yoke nut (TM 9–804).

(6) *Front and rear propeller shaft to front or rear axle yoke nuts loose.* Remove propeller shaft and tighten yoke nuts (TM 9–804).

c. Universal Joints Excessively Stiff.

(1) *Inadequate lubrication.* Lubricate universal joints and propeller shaft as specified on LO 9–804.

(2) *Bent propeller shaft.* Replace propeller shaft (TM 9–804).

(3) *Universal joint trunnion bearings seized.* Replace universal joint trunnion bearings.

(4) *Damaged propeller shaft splines.* Replace propeller shaft (TM 9–804).

d. Further Procedure. If these inspections do not disclose the faults, and the vehicle is operable, proceed as described in paragraph 18.

18. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 17 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble-shooting procedures.

b. Propeller Shaft Does Not Rotate.

(1) *Clutch slipping.* Adjust clutch if possible (TM 9–804). If this does not remedy the condition, remove and replace (TM 9–1804A).

(2) *Damaged main shaft.* Remove and replace transmission main shaft.

(3) *Transmission gear teeth stripped.* Remove, examine, and replace defective gears.

(4) *Transmission or transfer gearshift levers not engaged.* Engage transmission and transfer gearshift levers in desired gears (TM 9–804).

(5) *Stripped splines or universal joint yokes or companion flanges.* Remove and replace damaged yokes or flanges.

c. Excessive Vibration.

(1) *Inadequately lubricated propeller shafts or universal joints.* Lubricate universal joints and propeller shafts as prescribed on LO 9–804.

(2) *Bent propeller shaft.* Remove and replace propeller shaft (TM 9–804).
(3) *Worn or damaged universal joints.* Remove and rebuild universal joints.
(4) *Loose "U" bolts or companion flange cap screws.* Tighten or replace cap screws or "U" bolts.
(5) *Mud, paint, tar, or other obstructions on propeller shaft.* Clean all foreign material from propeller shaft.
(6) *Other causes of vibration.* For more complete propeller shaft and universal joint trouble shooting, refer to TM 9–804.

d. Backlash.
(1) *Worn or damaged universal joints.* Remove and rebuild universal joints.
(2) *Loose "U" bolts or companion flange cap screws.* Tighten or replace "U" bolts or cap screws.

Section V. FRONT AXLE

19. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

Note.—Where difficulty is experienced with front axle differential making the vehicle inoperative, remove the axle driving flanges. This will allow bringing vehicle in under its own power, without rotation of front differential. Be sure front axle drive shift lever is in forward or out position (TM 9–804).

b. Excessive Play at Front Wheels When Wheel Is Shaken by Hand.
(1) *Wheel mounting bolts loose.* Tighten bolts.
(2) *Front wheel bearings loose or damaged.* Adjust or replace front wheel bearings (TM 9–804).
(3) *Wheel bearing spindle bolts loose.* Remove wheel and tighten wheel bearing spindle bolts (TM 9–804).
(4) *Worn kingpin bearings.* Remove and replace kingpin bearings.
(5) *Loose or damaged steering knuckle flange caps.* Tighten or remove and replace caps.
(6) *Damaged or bent drag link.* Replace drag link (TM 9–804).
(7) *Damaged or bent tie rods.* Replace tie rods.
(8) *Improperly adjusted steering gear.* Adjust steering gear (TM 9–804).

c. Lubricant Leakage.
(1) *Gear carrier housing cover gasket damaged.* Remove and replace gasket.
(2) *Gear carrier housing cover attaching screws loose.* Tighten screws.
(3) *Drain plug loose.* Tighten drain plug.

(4) *Drive pinion oil seal damaged.* Replace oil seal.
(5) *Defective steering knuckle oil seal.* Replace defective oil seal.
(6) *Defective steering knuckle oil seal gasket.* Replace defective gasket.

d. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 20.

20. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 19 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble shooting procedures.

b. Vehicle Turns Hard.
(1) *Inadequate lubrication.* Lubricate front axle as prescribed on LO 9–804.
(2) *Improper steering adjustment.* Adjust steering (par. 136).
(3) *Seized kingpin bearings.* Remove and replace bearings.
(4) *Bent drag link or tie rods.* Remove and repair tie rods or drag links.

c. Low-Speed Shimmy.
(1) *Broken spring center bolt causing axle to shift.* Replace spring center bolt.
(2) *Steering system loose or worn.* Adjust or rebuild steering system.
(3) *Worn front wheel bearings.* Adjust or replace front wheel bearings (TM 9–804).
(4) *Worn kingpin bearings.* Remove and replace kingpin bearings.
(5) *Worn steering knuckle.* Remove and replace steering knuckle.
(6) *Twisted axle shafts.* Remove, repair, or replace axle shafts.

d. High-Speed Shimmy.
(1) *Check conditions under "low-speed shimmy."* The conditions applying under "low-speed shimmy" will often be encountered at higher road speeds but will not be quite as easily noticed. Subsequent slowing down of the vehicle will usually disclose shimmy.
(2) *Steering gear loose.* Tighten and adjust (par. 136).
(3) *Front springs settled or broken.* Repair or replace.
(4) *Broken front spring shackle.* Replace spring shackle (TM 9–804).
(5) *Broken front spring pivot bolt.* Remove and replace pivot bolt.

e. Front Axle Noisy on Pull.
(1) *Inadequate lubrication.* Lubricate front axle as prescribed on LO 9–804.

(2) *Pinion and drive gear adjusted too tight.* Adjust drive pinion and gear (par. 104).
(3) *Pinion bearings rough or damaged.* Remove and replace pinion bearings.
(4) *Damaged or broken teeth on pinion or drive gear.* Remove and replace defective drive gear or pinion.
(5) *Damaged or broken differential pinions or side gears.* Remove and replace defective pinions or side gears.
(6) *Damaged front axle universal joints.* Remove and replace universal joints or axle shafts.

f. Front Axle Noisy on Coast.
(1) *Excessive backlash at pinion and drive gear.* Check and adjust (par. 106).
(2) *End play in pinion.* Adjust (par. 104).

g. Front Axle Noisy on Coast and Pull.
(1) *Drive gear and pinion adjusted too tight.* Adjust (par. 104).
(2) *Drive pinion set too deep in drive gear.* Adjust (par. 104).
(3) *Drive pinion bearing loose or worn.* Adjust (par. 104) or replace pinion bearing.

Section VI. REAR AXLE

21. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Lubricant Leakage.
(1) *Differential carrier cover gasket damaged.* Remove and replace cover gasket.
(2) *Drain plug loose.* Tighten drain plug.
(3) *Damaged grease protector gaskets.* Remove and replace gaskets.
(4) *Damaged drive pinion oil seal.* Remove and replace oil seal.

c. Rear Wheels Fail To Revolve With Vehicle Jacked Up.
(1) *Damaged or seized differential pinions and gears.* Remove and replace defective parts.
(2) *Broken axle shaft.* Replace axle shaft.
(3) *Damaged or seized pinion and drive gear.* Remove and replace defective parts.
(4) *Seized rear wheel bearings.* Replace rear wheel bearings (TM 9–804).

d. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 22.

22. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 21 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble-shooting procedures.

b. Rear Axle Noisy.

Note. Rear axle noise is usually apparent as a hum in moderate cases or as a growl in severe cases. Usually the tone of a rear axle noise changes when the vehicle is coasting from the noise noticed when the engine is driving the vehicle. Often a rear axle will be noisy when the engine is driving the vehicle while no noise will be heard coasting. Often times, difficulties with rear wheel bearings, universal joints, or tires are improperly diagnosed as rear axle and differential noise. The possibility of an incorrect diagnosis of these troubles is great and must not be disregarded when attempting a diagnosis and correction of rear axle noise.

(1) *Inadequate lubrication.* Lubricate rear axle as specified on LO 9–804.

(2) *Rear wheel bearings scored or rough.* Remove and replace damaged bearings (TM 9–804).

(3) *Drive gear and pinion not correctly adjusted to provide proper tooth contact.* Adjust to proper clearance (par. 104).

(4) *Drive gear and pinion not properly matched.* Remove and replace with proper parts.

(5) *Drive gear or pinion teeth worn or chipped.* Remove and replace defective parts.

(6) *Improper drive gear backlash* Adjust drive gear for proper backlash (par. 106).

(7) *Loose or worn differential bearings.* Adjust bearings if possible. If bearings are worn, replace.

(8) *Pitted or broken bearings.* Remove and replace.

c. Rear Axle Binds.

(1) *Damaged or seized differential gears and pinions.* Remove and replace defective parts.

(2) *Damaged or seized drive gear and pinion.* Remove and replace defective parts.

(3) *Broken axle shaft.* Remove and replace axle shaft.

Section VII. SPRINGS AND SHOCK ABSORBERS

23. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Vehicle Sags to One Side.

(1) *Broken or shifted springs.* Remove, repair, or replace defective springs.

(2) *Loose U bolts permitting spring leaves to slip.* Tighten and check to see if any damage has been caused (TM 9-804).

(3) *Broken spring center bolt.* Remove and replace center bolt.

(4) *Broken spring shackle.* Remove and replace spring shackle.

(5) *Broken spring pivot bolt.* Remove and replace pivot bolt.

c. Vehicle Sits High on One Side.

(1) *Springs shifted on axle.* Check and tighten U bolts (TM 9-804).

(2) *Improper spring installed.* Check and replace spring.

d. Further Procedure., If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 24.

24. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 23 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble shooting procedures.

b. Spring Sags or Bottoms.

(1) *Severe operating conditions or overloading.* Refer to operating procedures in TM 9–804.

(2) *Shock absorbers functioning improperly.* Remove and replace shock absorbers.

(3) *Broken spring leaves.* Remove and replace springs.

(4) *Broken spring shackle.* Remove and replace spring shackle.

(5) *Broken spring pivot bolt.* Remove and replace pivot bolt.

c. Unusual Spring Noises.

(1) *Loose U bolts permitting abnormal side movement of spring assembly.* Tighten and check to see if any damage has been caused (TM 9-804).

(2) *Frame out of line causing abnormal twist of springs.* If frame is bent vehicle should be stripped and frame replaced.

(3) *Worn bolts or bushings in spring shackle or bracket.* Remove and replace spring shackle.

(4) *Shock absorber loose at one end causing shock absorber to hit against frame, body, or springs.* Replace shock absorber.

d. Abnormal Spring Breakage.

(1) *Spring U bolts loose (breakage near center bolt).* Remove, replace, and secure U bolts.

(2) *Spring center bolt loose (breakage at center bolt).* Remove and replace spring, making sure center bolt is secure.

(3) *Tight spring shackle (breakage of main leaf near spring eye or breakage of spring eye).* Remove and replace spring.

Section VIII. STEERING

25. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the procedures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Steering Wheel Excessively Loose.

(1) *Improper steering gear adjustment.* Adjust steering gear.

(2) *Steering gear parts worn.* Remove and replace steering gear.

(3) *Tie rod or drag link ends worn.* Remove, repair, and/or replace.

(4) *Worn front axle parts.* Refer to paragraphs 19 and 20.

(5) *Steering wheel loose on tube.* Tighten steering wheel nut, or if examination discloses stripped serrations on steering wheel, replace steering wheel.

c. Steering Wheel Turns Excessively Hard.

(1) *Steering gear camshaft bearings seized.* Remove and replace bearing.

(2) *Tie rods or drag link bent.* Remove, repair, and/or replace defective parts.

(3) *Damaged parts in front axle.* Refer to paragraphs 19 and 20.

d. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 26.

26. Trouble Shooting Before Removal and During Operation

a. General. If the inspections outlined in paragraph 25 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble-shooting procedures.

b. Hard Steering. The same procedures would apply to hard steering when the vehicle is moving as they would when the vehicle is standing still (par. 25*b*).

c. Steering Loose. The same procedures would apply to loose steering when the vehicle is moving as they would when the vehicle is standing still (par. 25*a*).

d. Turning Radius Short on One Side.

(1) *Center bolt in front spring sheared.* Remove and replace center bolt.

(2) *Steering arm bent.* Remove, repair, and/or replace steering arm.

(3) *Tie rods or drag links bent.* Remove, repair, and/or replace damaged parts.

Section IX. WHEELS

27. Trouble Shooting Before Removal or Operation

a. General. Do not operate the vehicle prior to completing the prodecures given in this paragraph. Refer to paragraph 11 for the purpose of these inspections.

b. Front Tires Excessively or Abnormally Worn.

(1) *Tires run out from sprung wheel.* Remove wheel and replace (TM 9–804).

(2) *Incorrect front wheel camber.* Replace front axle assembly.

(3) *Front wheel brake drum "out-of-round."* Remove and replace brake drum (TM 9–804).

(4) *Tie rods bend causing front wheels to toe in or toe out.* Remove, repair, and/or replace tie rods.

(5) *Front springs loose or shifted.* Check springs and tighten "U" bolts.

(6) *Wheel loose on hub.* Tighten bolts.

c. Rear Tires Abnormally Worn.

(1) *Broken or sprung rear axle.* Repair or replace defective parts.

(2) *Distorted wheel.* Replace distorted wheel (TM 9–804).

(3) *Broken or shifted springs.* Examine and replace or repair defective parts.

d. Worn Tire Tread at Edges of Tires.

(1) *Improper front end alinement.* Aline front end (TM 9–804).

(2) *Bent steering knuckle or arm.* Remove and replace defective part.

(3) *Bent tie rods or drag link.* Remove, repair, and/or replace defective parts.

e. Further Procedure. If these inspections do not disclose the fault, and the vehicle is operable, proceed as described in paragraph 28.

28. Trouble Shooting Before Removal and During Operation

a. General. If the inspections, outlined in paragraph 27 do not reveal causes of failure and the vehicle is operable, then trouble shoot it. Refer to paragraph 11 for the purpose and scope of these trouble shooting procedures.

b. Front Wheels Wobble.

(1) *Improper front end alinement.* Aline the front end (TM 9–804).

(2) *Bent or loose tie rods.* Remove, replace, and/or repair the defective part.

(3) *Distorted front wheels.* Replace distorted wheel (TM 9–804).

(4) *Improperly adjusted or damaged front wheel bearings.* Adjust or replace front wheel bearings (TM 9–804).

(5) *Loose or damaged kingpins or worn kingpin bearings.* Replace defective kingpins or bearings.

c. Rear Wheels Wobble.

(1) *Distorted rear wheel.* Replace distorted wheel (TM 9–804).

(2) *Bent rear axle shaft.* Replace axle shaft.

(3) *Wheel hub nuts loose.* Tighten loose hub nuts (TM 9–804).

(4) *Damaged or improperly adjusted rear wheel bearings.* Adjust or replace rear wheel bearings (TM 9–804).

CHAPTER 4
REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

Section I. DISASSEMBLY OF VEHICLE INTO MAJOR COMPONENTS

Note.—This section contains information for the guidance of personnel performing major rebuild work on the ¼-Ton 4x4 utility truck M38. It provides an assembly line procedure for the disassembly of the vehicle into its major components. It designates what constitutes a major component, illustrates the points of connection between major components, and states briefly what must be done.

29. Remove Power Plant

Refer to TM 9–804 for proper procedure to remove power plant.

30. Remove Body

a. Remove Hood and Windshield. Remove the cap screws (fig. 9), flat washers, and lock washers securing the hood to cowl and remove

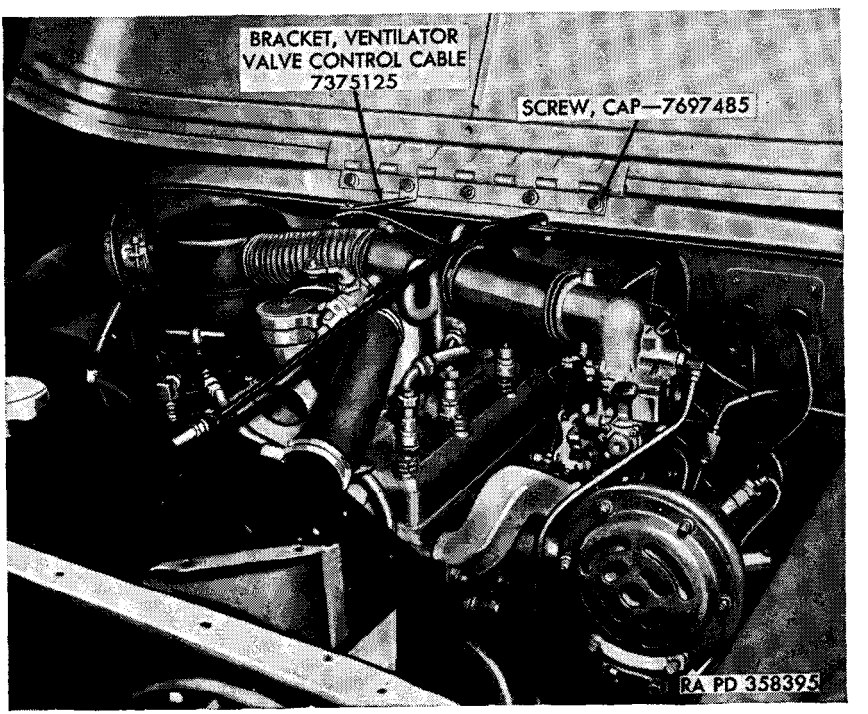


Figure 9. Engine compartment—left-front view.

hood and ventilator valve control cable bracket. Disconnect windshield wiper hose on left side of vehicle below windshield mounting bracket. Remove windshield pivot bolt (fig. 10), flat washer, and spring washer from each side and remove windshield assembly (fig. 11).

b. Remove Batteries (fig. 12). Remove battery positive cable connecting the two batteries. Remove battery ground cable on cowl battery. Remove wing nuts securing batteries and remove batteries.

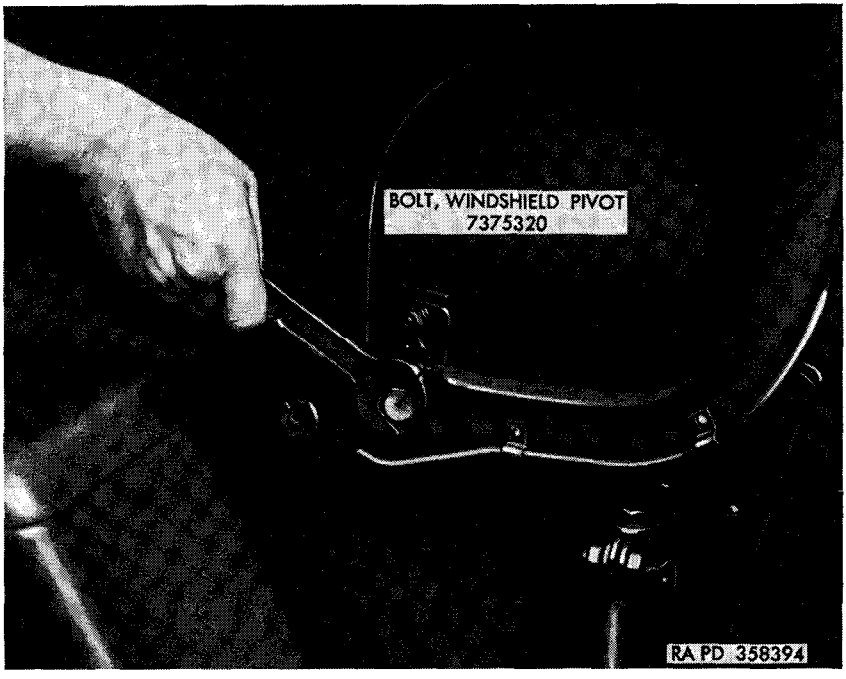


Figure 10. Removing windshield pivot bolt.

c. Remove Clutch and Brake Pedal Pads and Steering Wheel. Remove cap screw from clamp at bottom of clutch and brake pedals. Remove clutch and brake pedal pads, shank pads, shank pad springs, and washers. Remove horn button cap, horn switch push rod, horn retainer washer; remove the steering wheel nut securing the steering wheel. On some of the earlier models, not equipped with the new cap, remove the nut securing steering wheel; remove horn button, horn switch push rod, and spring. Using puller 41–P–2954 and adapter 41–A–18–251, remove steering wheel (fig. 13).

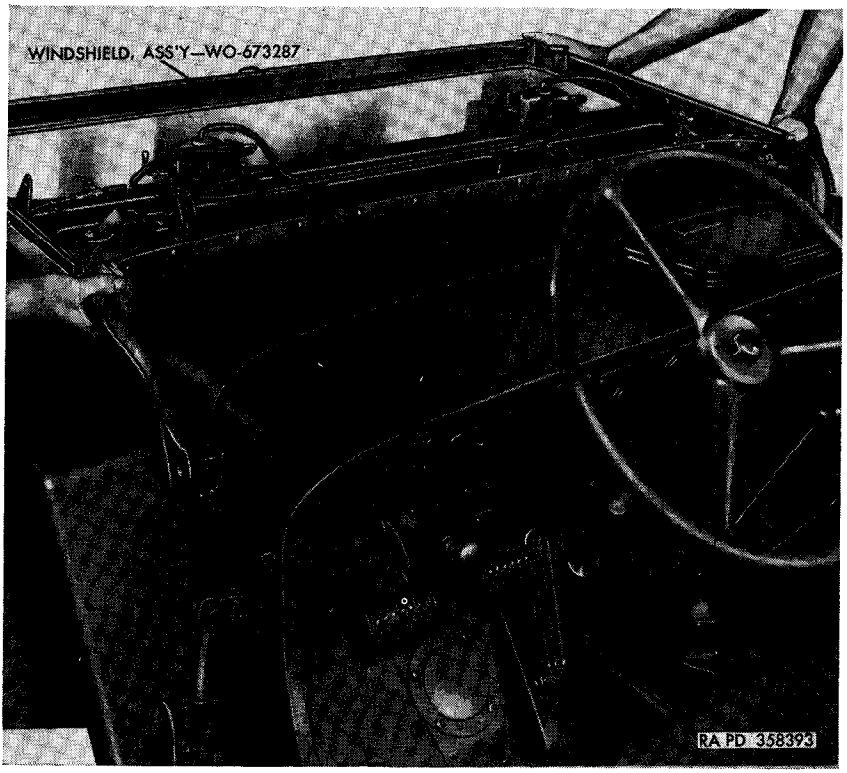


Figure 11. Removing windshield assembly.

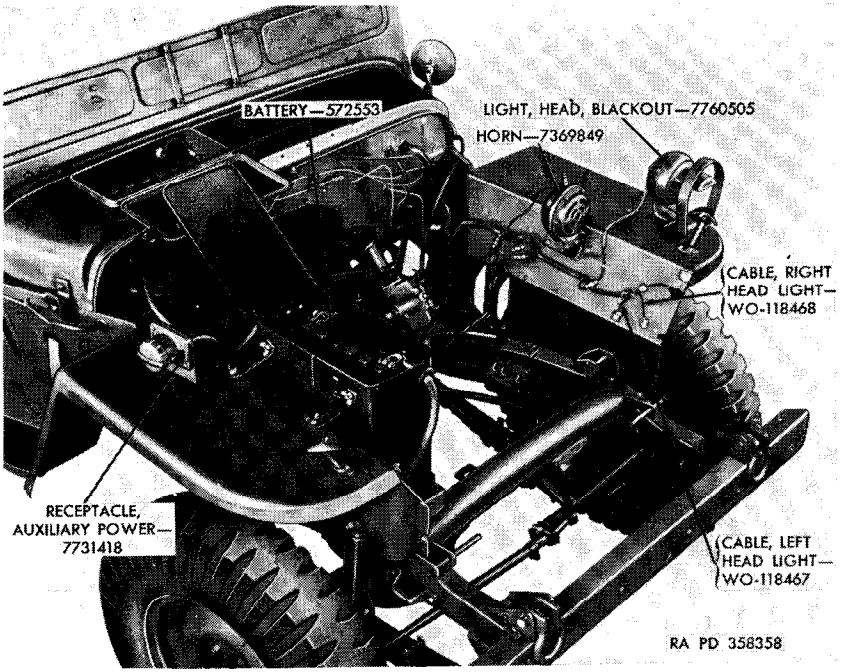


Figure 12. Batteries.

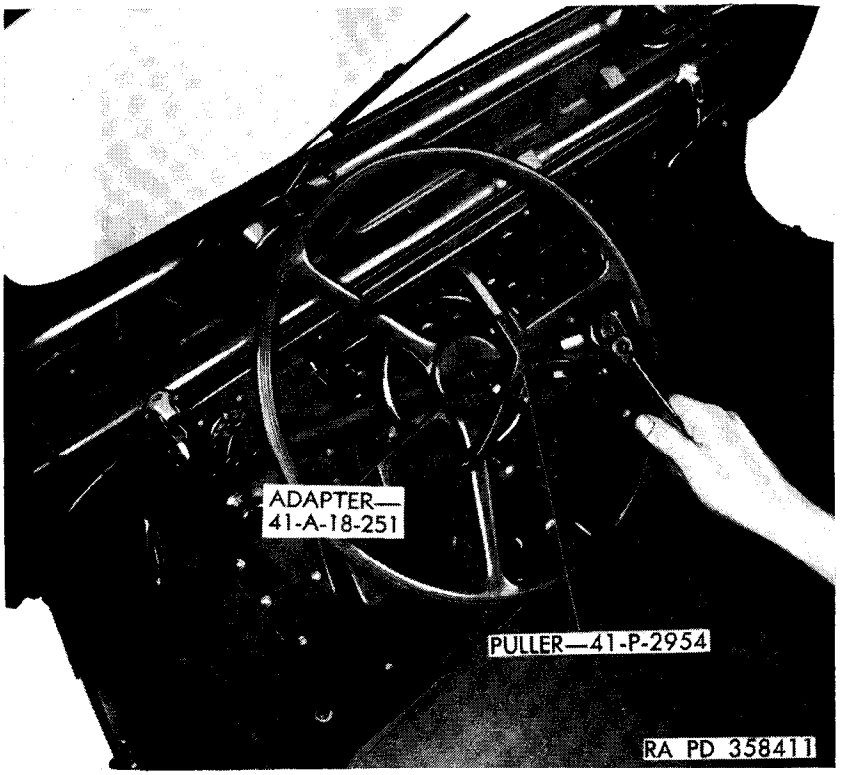


Figure 13. Removing steering wheel.

d. Remove Steering Wheel Jacket Mounting Clamp. Remove the two nuts, bolts, and lock washers securing the steering wheel jacket mounting clamp to dash; remove clamp and shims.

e. Remove Fenders.

(1) *Left fender.* Disconnect blackout head light at connector on fender. Disconnect horn wires at horn. Disconnect horn switch at connectors. Remove parking brake cable hold-down clip. Remove nut and bolt securing fuel line hold-down clip to engine compartment side of fender; remove clip. Remove remaining wiring harnesses from clips on fender. Remove three cap screws with internal-teeth lock washers and the nut, bolt, and lock washer, securing fender to body. Remove the two cap screws, lock washers, and flat washers securing the fender brace to the frame side member; remove the fender.

(2) *Right fender.* Remove the two wing nuts securing the battery box brackets to the fender. Remove the four bolts with internal-teeth lock washers and nuts securing the auxiliary power receptacle mounting bracket to the fender; remove the auxiliary power receptacle. Remove the hold-down clip on the fender securing the battery positive cable. Remove three cap screws with internal-teeth lock washers and the nut, bolt, and lock washer securing fender to body. Remove the two cap screws, lock washers, and flat washers securing the fender brace to the frame side member; remove the fender.

f. Remove Seats.

(1) *Driver's seat.* Remove the four cap screws with internal-teeth lock washers, securing the driver's seat; remove seat from vehicle.

(2) *Passenger seat* (fig. 14). Remove the two front seat pivot pins. Grasp passenger seat and pull forward until hinge pivot is free. Remove passenger seat from vehicle.

(3) *Rear seat.* Grasp bottom of rear seat frame and pull upward to release it from the rear seat frame spring retainer (fig. 15) on the right and left sides of the body. Remove nuts from the two internal-teeth lock washer screws securing the rear seat pivot tube retainer (fig. 16) to the basket on the right and left sides of the body. Remove screws and retainers and lift seat out of vehicle.

g. Remove Taillight and Trailer Receptacle Guard. Remove the two internal-teeth lock washer cap screws (fig. 17) and the two cap screws securing the taillight and trailer connection guard; remove the guard.

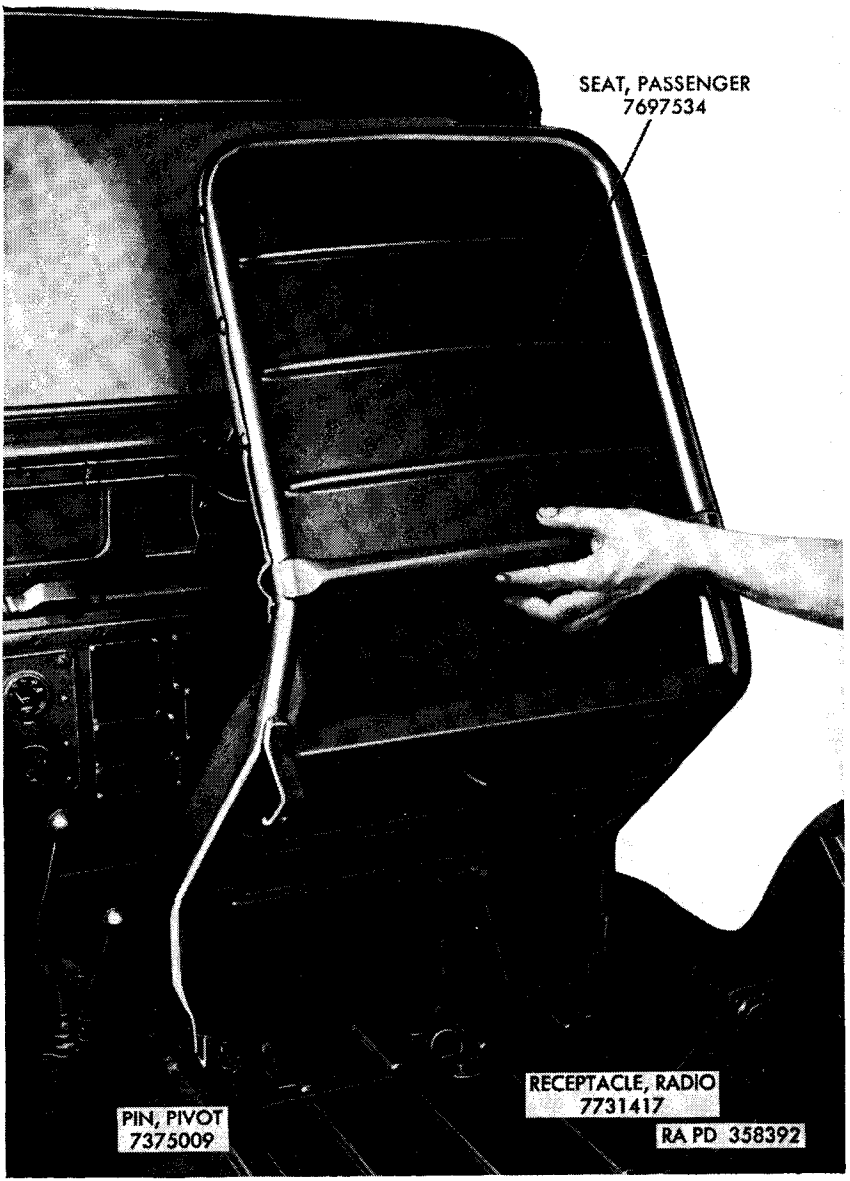


Figure 14. Removing passenger seat.

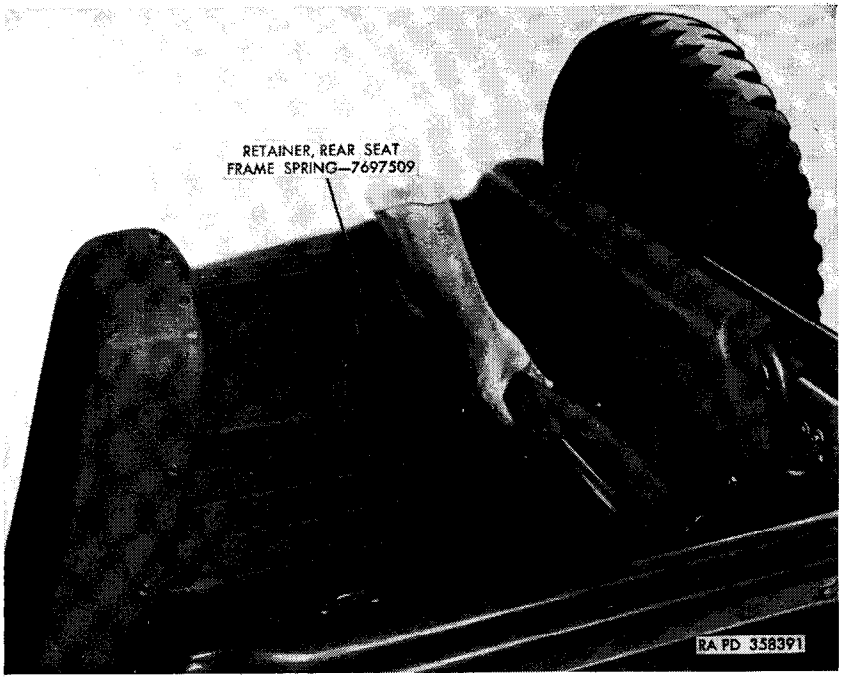


Figure 15. Folding rear seat.

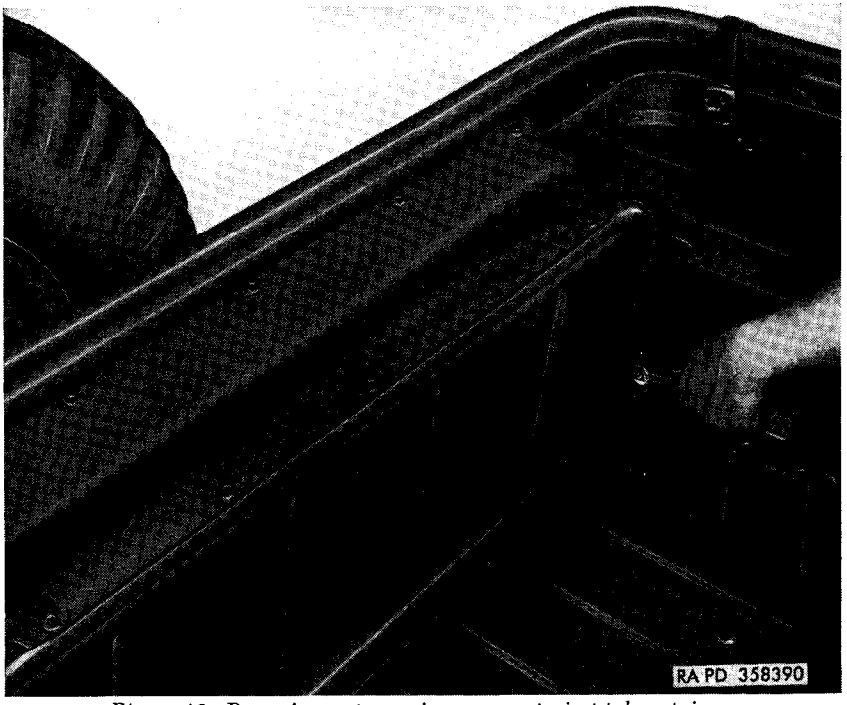


Figure 16. Removing nut securing rear seat pivot tube retainer.

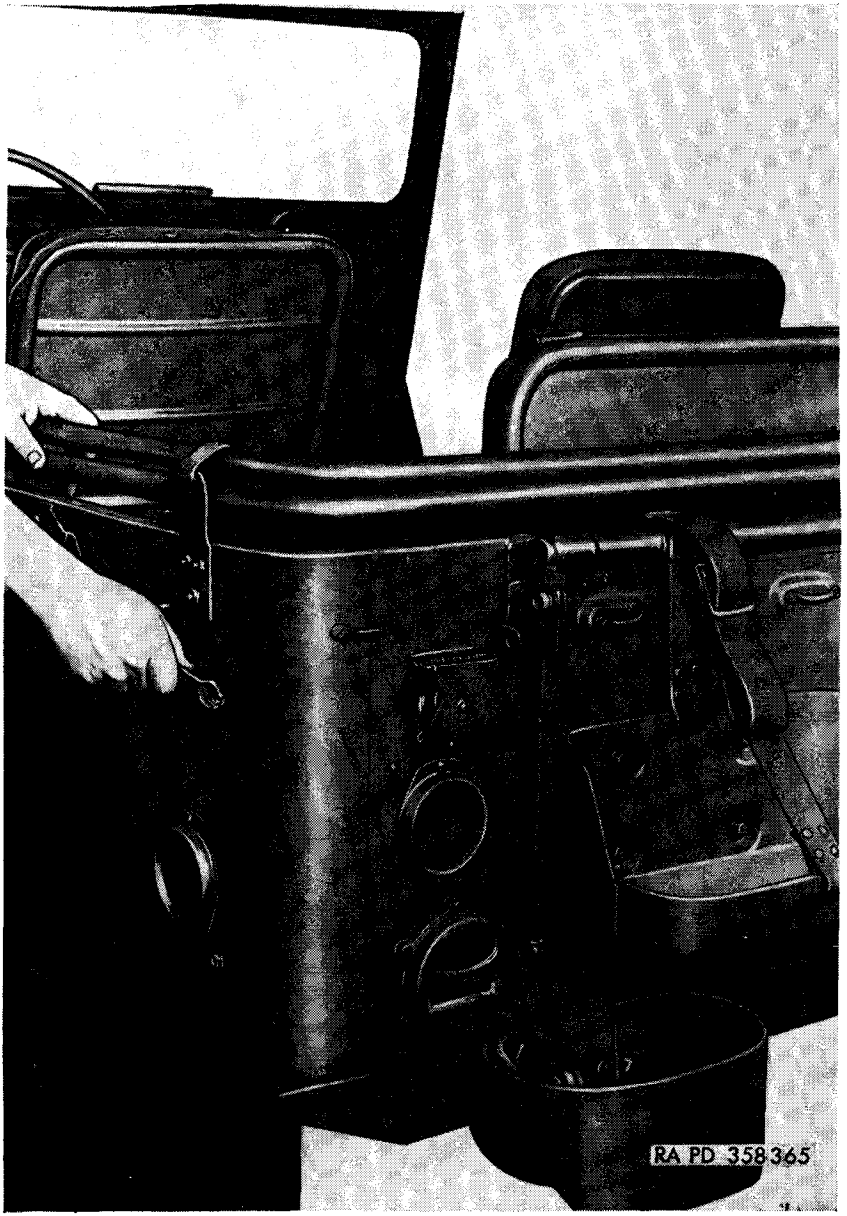


Figure 17. Removing screw securing taillight and trailer receptacle guard.

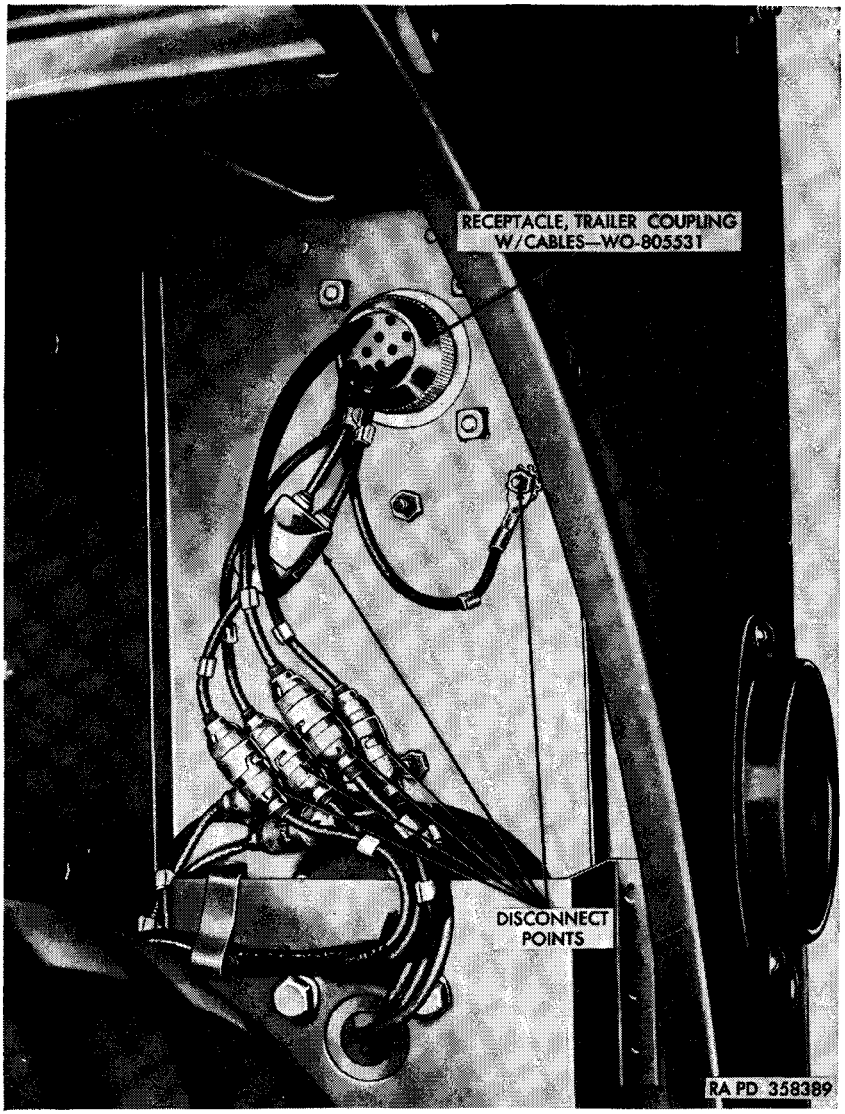


Figure 18. Trailer receptacle and left rear taillight disconnect point.

h. Disconnect Taillights and Trailer Coupling Receptacle With Cables (fig. 18). Disconnect the right taillight at the connectors. Disconnect the trailer receptacle and left taillight at the connectors.

i. Remove Body Bolts and Radio Receptacle Ground Cable. Remove the four bolts, nuts, and flat washers securing body to frame rear cross member. Remove the two nuts and lock washers, securing body to the pintle hook brace. Remove the remaining nuts and washers or

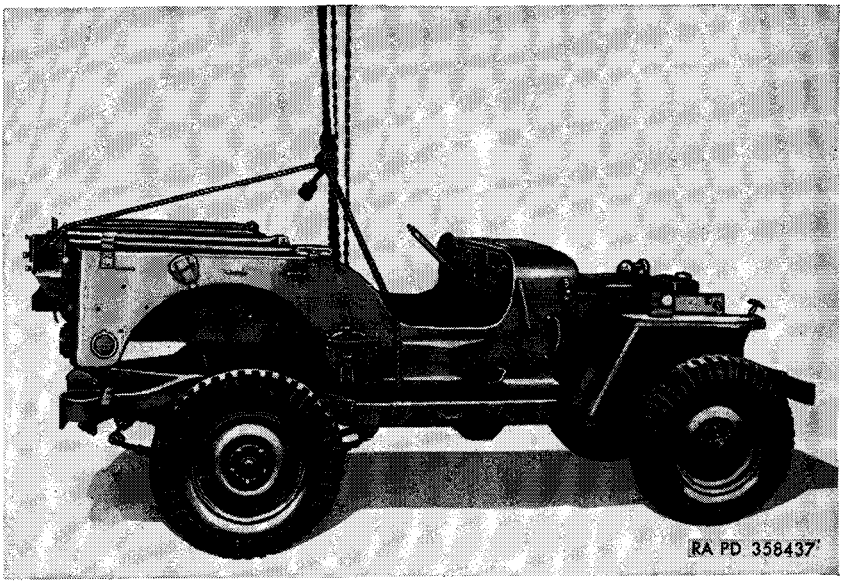


Figure 19. Removing body from frame.

cap screws and washers securing the body to brackets on the frame side members. Remove the nut, bolt, and external-teeth lock washer securing the radio receptacle ground cable to the right cross member; remove cable.

j. Remove Body (fig. 19). Thread a rope between the body and frame in line with the driver's seat, leaving enough rope extending on each side to make a three-way lifting sling. Insert a suitable lifting device into the sling and slowly raise the body off the frame. While raising the body, move it toward the rear of the frame, until the steering wheel jacket is clear of the body. Move chassis out of the way and lower body to truck or floor. Remove body shims from frame.

31. Remove Front Lifting Shackles and Bumper

Remove the two bolts, spacers, lock washers, and nuts securing each front lifting shackle bracket to the bumper and frame. Remove the shackles and brackets as an assembly. Remove the two nuts, bolts, and lock washers securing the underside of the front bumper to the frame side members. Remove the remaining two nuts, bolts, and lock washers from the front of the bumper; remove the bumper.

32. Remove Rear Lifting Shackles, Bumperettes, and Pintle Hook

Remove the two bolts, nuts, flat washers, lock washers, and spacers securing each rear lifting shackle bracket to the rear bumperette (fig.

20) and frame. Remove the shackles and brackets as an assembly. Remove the remaining two nuts, bolts, and lock washers securing the bumperettes; remove bumperettes from frame. Remove the four bolts, nuts, and lock washers securing pintle hook to pintle hook brace at rear of vehicle; remove pintle hook.

Figure 20. Removing rear bumperettes and lifting shackles.

33. Remove Exhaust Pipe
(fig. 21)

Remove clamps securing exhaust pipe at rear cross member and frame cross member; remove exhaust pipe.

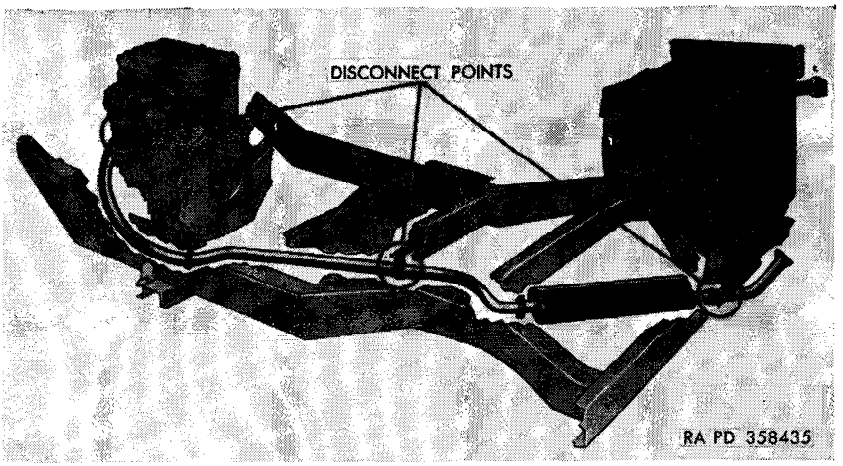


Figure 21. Exhaust pipe disconnect points.

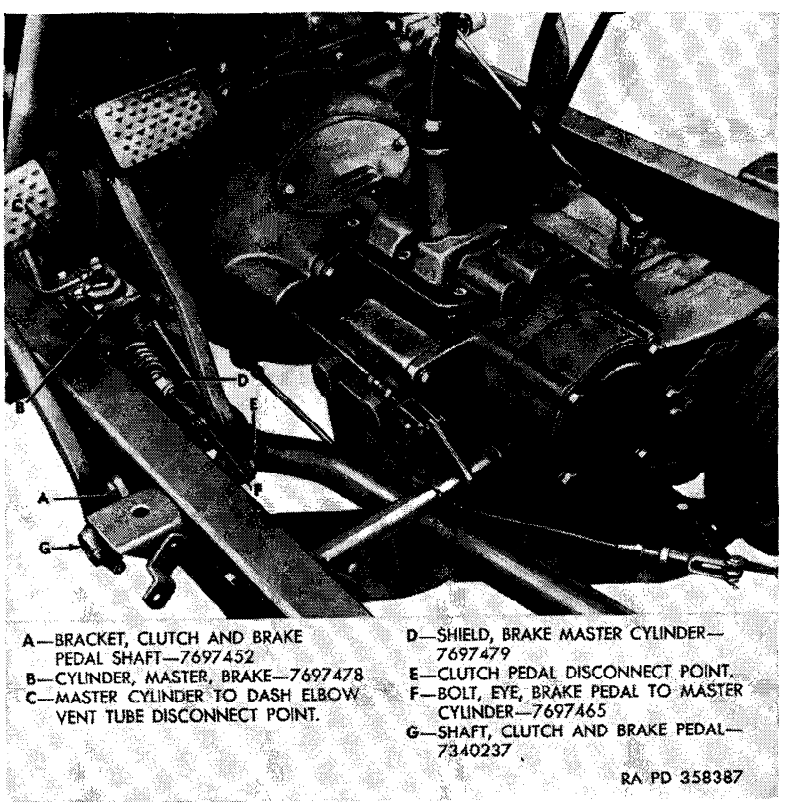


Figure 22. Left center view of chassis.

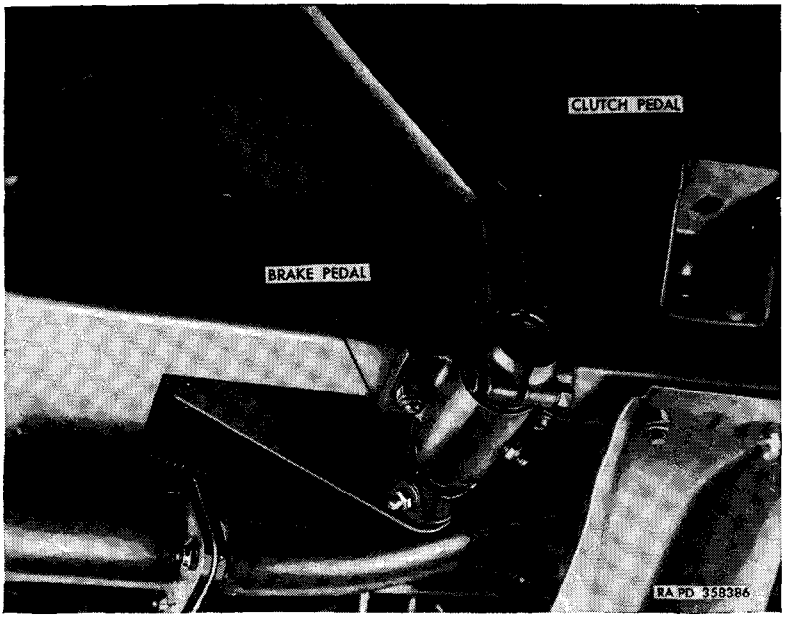


Figure 23. Clutch and brake pedal shaft assembly.

34. Remove Brake Master Cylinder, Clutch, and Brake Pedals

(fig. 22)

Disconnect brake master cylinder to dash elbow vent tube at brake master cylinder. Disconnect the two hydraulic brake tubes leading to the front and rear brakes at the brake master cylinder. Disconnect the stop light switch at the connectors in front of the brake master cylinder. Remove the brake and clutch retracting springs. Remove cotter pin securing brake master cylinder eye bolt at the brake pedal. Remove cotter pin securing clutch rod to shaft; remove rod. Remove the cotter pin securing the brake master cylinder shield to the brake and clutch pedal shaft. Remove the two cap screws and lock washers securing the brake master cylinder and shield to the frame. Remove shield and brake master cylinder. Remove brake pedal and eye bolt from shaft. Remove brake pedal. Remove the three nuts, bolts, and lock washers securing clutch and brake pedal shaft bracket to frame. Remove clutch pedal, shaft, and bracket as an assembly (fig. 23).

35. Remove Steering Gear

(fig. 24)

Remove cotter pin at Pitman arm end of drag link. Remove drag link ball seat adjusting plug. Lift drag link, drag link dust cover, and

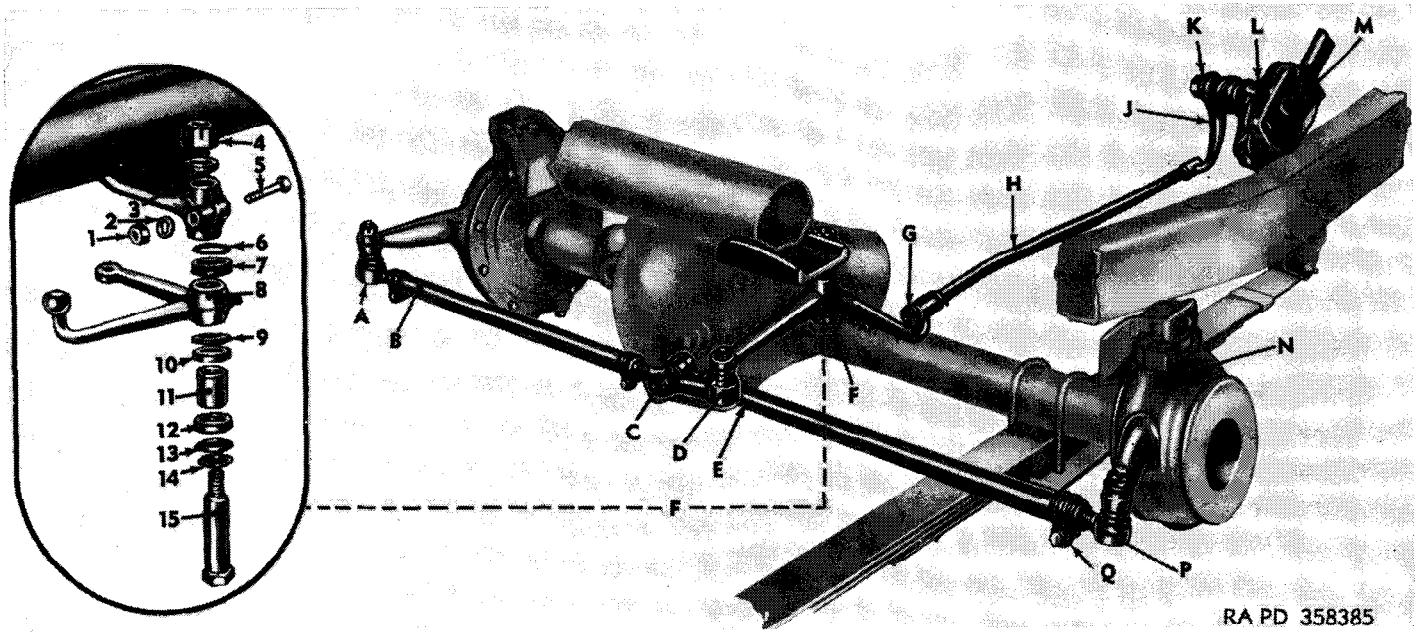


Figure 24. Steering system.

A—END, TIE ROD, RIGHT—WO-A-838

B—ROD, TIE, STEERING, RIGHT, ASSY—7375331

C—END, TIE ROD, RIGHT—WO-A-838

D—END, TIE ROD, LEFT THREAD ASSY—7375334

E—ROD, TIE, STEERING, LEFT, ASSY—7375332

F—BELLCRANK, STEERING, ASSY—7375138

1. NUT, HEX—7/16-IN-20NF—218585
2. WASHER, LOCK—7/16-IN—120383
3. WASHER, PLAIN — 21/32-IN—103345
4. NUT, LOCKING, HEX—5/8-IN—18-7375178
5. SCREW, CAP, 7/16 - IN - 20NF x 2½—106293
6. SPRING, TENSION, SEAL—7375177
7. SEAL, STEERING BELLCRANK BRACKET—7375180
8. BELLCRANK, STEERING—WO-647008
9. SEAL, BELLCRANK—7375181
10. BEARING, BELLCRANK—7375184
11. SPACER, BELLCRANK SHAFT INNER RACE—7375185
12. BEARING, BELLCRANK—7375184
13. SEAL, BELLCRANK—7375181
14. WASHER, PLAIN, 5/16-IN—131018
15. SHAFT, BELLCRANK—7375179

G—PLUG, DRAG LINK BALL SEAT SPRING—7036588

H—LINK, DRAG—7375182

J—ARM, PITMAN—7375393

K—NUT, JAM, HEX 7/16-20NF—124929

L—HOUSING, STEERING GEAR—7375344

M—SCREW, ADJUSTING, PITMAN ARM—WO-639118

N—KNUCKLE, STEERING, LEFT, W/ARM—7375046

P—END, TIE ROD, LEFT—7371107

Q—CLAMP, STEERING KNUCKLE TIE ROD—7375333

Figure 24—Continued.

drag link dust cover dust shield (fig. 102) from Pitman arm. Remove the three bolts, nuts, and external-teeth lock washers which secures the steering gear to frame; remove steering gear.

36. Remove Front Axle Assembly

Refer to TM 9–804 for correct removal procedure.

37. Rear Axle Assembly

Refer to TM 9–840 for correct removal procedure.

Section II. ASSEMBLY OF VEHICLE FROM MAJOR COMPONENTS

NOTE: This section provides an assembly line procedure for assembling the vehicle from its major components.

38. Install Rear Axle Assembly

Refer to TM 9-804 for rear axle assembly installation procedure.

39. Install Front Axle Assembly

Refer to TM 9-804 for front axle assembly installation procedure.

40. Install Steering Gear
(fig. 24)

Place the steering gear in position on the frame. Install the three bolts, external-teeth lock washers, and nuts securing steering gear to frame. Hold a new drag link dust cover and drag link dust cover dust shield (N and R, fig. 102), in place on the Pitman arm end of the drag link (fig. 25). Place the drag link on the Pitman arm, making sure the ball joint on the Pitman arm is seated between drag link ball seats (G and H, fig. 102). Screw the drag link ball seat adjusting plug (L, fig. 102) in firmly against the ball; then back the adjusting plug off one-half turn and install a cotter pin (M, fig. 102).

41. Install Brake Master Cylinder, Clutch and Brake Pedals

Install clutch and brake pedal shaft bracket (fig. 22) with clutch pedal and shaft attached, to the frame with three bolts, lock washers, and nuts. Connect clutch rod to shaft on clutch pedal and secure with a cotter pin. Slide brake pedal on shaft. Place brake master cylinder shield on clutch and brake pedal shaft and secure assembly with a cotter pin. Place brake master cylinder in place, holding

brake master cylinder in place with one hand, bring brake master cylinder shield up to proper position against brake master cylinder. Insert one cap screw and lock washer through brake master cylinder shield and brake master cylinder. Install remaining cap screw and lock washer. Connect brake master cylinder eye bolt to brake pedal

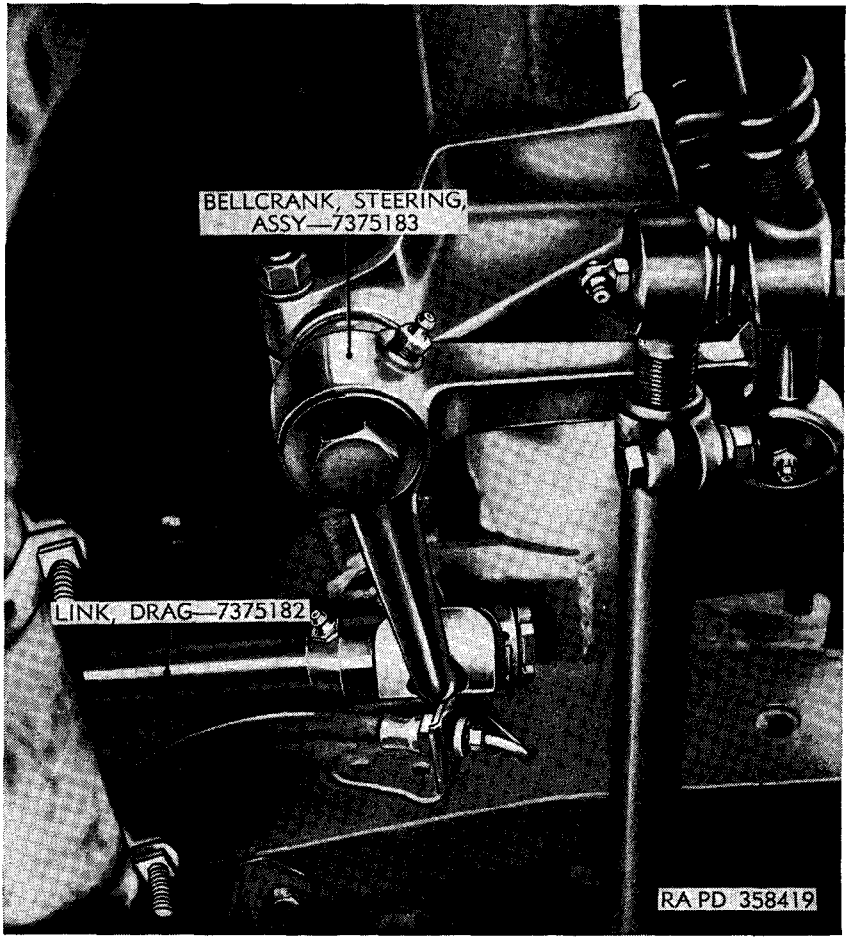


Figure 25. Bellcrank and drag link.

and secure with a cotter pin. Connect the brake and clutch retracting springs to the frame. Connect the front and rear hydraulic brake tubes to the brake master cylinder. Connect the brake master cylinder to dash elbow vent tube at the brake master cylinder. Bleed brakes as directed in TM 9-804.

42. Install Exhaust Pipe
(fig. 2)

Place exhaust pipe in position. Secure exhaust pipe to frame cross member and rear cross member by tightening clamps. Procedure for installing exhaust pipe to manifold is contained in TM 9-804.

43. Install Rear Lifting Shackles, Bumperettes, and Pintle Hook

Place pintle hook (fig. 2) in position on pintle hook brace at rear of vehicle, secure with four bolts, lock washers, and nuts. Place a rear lifting shackle and spacer in position on the bumperette. Line up the four holes in the bumperette with like holes in the body. Secure bumperette and lifting shackles with four bolts, lock washers, and nut.

44. Install Front Lifting Shackles and Front Bumper
(fig. 2)

Hold the front bumper in position and install two bolts, through the front of the bumper into the front of the frame side members. Secure these bolts with lock washers and nuts. Install the remaining two bolts, lock washers, and nuts securing the bottom of the front bumper to frame side members. Place the front lifting shackles in position; install spacer between shackle and top of frame side member. Secure with two bolts, lock washers, and nuts.

45. Install Body

a. Place Body in Position on Frame (fig. 19). Install a rope sling as prescribed for body removal in paragraph 30. Place the body shims on frame. Position the body over the chassis. Line up the steering wheel jacket with the hole provided in floor plate of body. Lower the body and, at the same time, roll the chassis under the body so as to follow the angle of the steering wheel jacket, until the body rests on the frame.

Caution: Use care that all body shims correspond with proper holes in body and frame.

b. Install Body Bolts and Radio Receptacle Ground Cable. Install the four bolts, lock washers, and nuts securing body to frame rear cross member, noting that shims are in place. Install the two lock washers and nuts securing the body to the pintle hook brace. Install the remaining nuts and washers or cap screws and washers securing body to brackets on the frame side members, noting that shims are in place. Secure radio receptacle ground cable to the right cross member with a bolt, external-teeth lock washer, and nut.

c. Connect Taillights and Trailer Connection. Connect the right taillight at connectors at right rear of body. Connect the trailer connection and left taillight at connectors at left rear of body.

d. Install Taillight Trailer Connection Guard. Place the taillight trailer connection in place under rear of body and secure with four internal-teeth lock washer cap screws.

e. Install Seats.

(1) *Install rear seat* (figs. 15 and 16). Place rear seat in position so the outer edges of the rear seat pivot tube rests in the brackets provided on right and left sides of body. Place the rear seat pivot tube retainers in place on top of pivot shafts and secure retainers with internal-teeth lock washer screws and nuts. Pull directly down on rear seat until seat frame engages in the rear seat frame spring retainers.

(2) *Install passenger seat* (fig. 14). Place seat in position to engage hinge pivot bracket on floor plate. Move seat backward to normal use position. Insert pivot pins.

(3) *Install driver's seat.* Place driver's seat in position in body to engage and line up with holes in floor of body. Install four cap screws with internal-teeth lock washers which secure seat to floor and tighten screws securely.

f. Install Fenders.

(1) *Right fender.* Working with an assistant, place right fender in position against the body. Install the two cap screws, lock washers, and flat washers securing the fender brace to the frame side member. Install the three cap screws, internal-teeth lock washers, and the nut and bolt securing the fender to the body. Place battery hold-down cable against the fender and place clip over cable; install cap screw, lock washer, and nut; then tighten securely. Position the auxiliary power receptacle on the fender and secure with four bolts, internal-teeth lock washers, and nuts. Tighten nuts securely. Place battery box brackets on fender and secure with two wing nuts.

(2) *Left fender.* Working with an assistant, place left fender in position. Install the two cap screws, lock washers, and flat washers securing the fender to the frame side member. Install the three cap screws with internal-teeth lock washers and the bolt, lock washer, and nut securing fender to body. Secure wiring harness to clips on fender. Install parking brake cable hold-down clip. Secure fuel line hold-down clip to engine compartment side of fender with bolt and nut. Connect horn switch at connector and horn wires to horn. Connect blackout headlight at connector.

g. Install Steering Wheel Jacket Mounting Clamp (fig. 11). Place shims inside of steering wheel jacket mounting clamp. Place clamp and shims in position and secure with two bolts, lock washers, and nuts.

h. Install Clutch and Brake Pedal Pads and Steering Wheel. Place shank pad spring, washer, and shank pad on clutch and brake pedals. Insert clutch and brake pedal pad into clamp on the bottom of clutch and brake pedal. Secure with cap screw. Insert horn switch push rod in center of steering wheel jacket, making sure it is properly seated against horn switch; this will be noted by rotating push rod until it seats in recess. Place steering wheel in position; tap lightly until properly seated. Insert horn button and spring. Secure with steering wheel nut.

i. Install Batteries (fig. 12). Place a battery in battery box on cowl. Place second battery in battery box in engine compartment. Secure batteries by tightening wing nuts. Install battery positive cable connecting the two batteries. Connect ground cable on cowl battery.

j. Install Hood and Windshield (figs. 9, 10, and 11). Working with an assistant, place windshield in position on body. Place a flat washer on the windshield pivot bolt; insert bolt through windshield frame on left side. Place a spring washer on pivot bolt; then tighten bolt. Repeat the same operation for other side of windshield. Connect windshield wiper hose on left side of windshield below windshield mounting bracket. Place hood in position. Secure right and left sides of hood with cap screw, flat washer, and lock washer. Install ventilator valve control bracket with cap screw, flat washer, and lock washer into the second hole from right side of hook. Install remaining cap screw, flat washers, and lock washers.

46. Install Power Plant

Refer to TM 9-804 for power plant installation procedure.

47. Final Operation and Adjustments of Power Plant Prior to Road Operation

Refer to TM 9-804 for final adjustments to power plant prior to road operation.

CHAPTER 5
TRANSMISSION

Section I. DESCRIPTION AND DATA

48. Description and Operation
(fig. 30)

The ¼-ton 4 x 4 utility truck M38 is equipped with a three-speed synchromesh type transmission that synchronizes second and high speed gear. The transmission is mounted on rubber at the frame center crossmember. The various gears in the transmission are selected by means of a gearshift lever that screws into the gearshift control housing (fig. 26).

49. Data

Manufacturer	Warner
Model	T–90
Type	synchromesh
Speeds:	
Forward	3
Reverse	1
Gear ratios:	
Low	2.798 to 1
Second	1.551 to 1
High	1.000 to 1
Reverse	3.798 to 1
Bearings type:	
Main shaft rear	ball
Main shaft pedal	roller
Countershaft gear	roller
Reverse idler gear	bushing

Section II. PREPARATION OF TRANSMISSION FOR REBUILD

50. Removal of Transmission and Transfer From Power Plant

Refer to TM 9–804 for removal procedure of transmission and transfer from power plant.

51. Removal of Transmission From Transfer

Refer to TM 9–804 for removal procedure of transmission from transfer.

52. Disassembly of Transmission Into Subassemblies

a. Remove Gearshift Control Housing (fig. 26). Remove the six lock washer screws (F) securing the gearshift contol housing (E) to the transmission case (P). Remove the gearshift control housing (E) and gearshift control housing gasket (N).

b. Remove Input Shaft Gear Bearing Retainer (fig. 27). Remove the three bearing retainer screws (A) and bearing retainer screw gaskets (B) securing the input shaft gear bearing retainer (C) to the transmission case. Slide the bearing retainer and input shaft gear bearing retainer oil seal (D) from the input shaft with integral gear (J). Slide the oil baffle (H) from input shaft.

c. Loosen Oil Collector (fig. 26). Remove the two socket-head cap screws (S) and gaskets, securing the oil collector (R) to inside of transmission case.

Note. Oil collector cannot be removed until countershaft gear is dropped. Do not use force.

d. Remove Idler Shaft and Countershaft Lock Plate (fig. 27). Drive out the idler shaft and countershaft lock plate (Y, fig. 27 and fig. 28), between the rear end of the countershaft and reverse idler gear shaft.

e. Remove Countershaft (fig. 29). Using arbor 41–A–339–22, drive the countershaft through the transmission case, from front to rear. After arbor is centered, countershaft gear will drop to the bottom of the transmission case. The arbor will remain in place to hold the 88 bearing rollers, washers, and spacer in place.

f. Remove Oil Collector. Working from the top of the transmission, remove the oil collector (R, fig. 26).

g. Remove Main Shaft (fig. 27).

Note. Remove the entire main shaft (P) as an assembly.

Support the second and high-speed synchronizer with blocking ring assembly (M), which is assembled inside second and high speed synchronizer sleeve (M–5), with one hand, and tap against the main shaft bearing adapter (S). Remove the adapter and main shaft rear bearing (T). With the adapter removed, the entire main shaft assembly may be removed through the adapter opening in the rear of the transmission case. Support the synchronizer to prevent its becoming disassembled and dropping.

Note. Use care not to dislodge the 14 main shaft pilot bearing rollers (K).

h. Remove Input Shaft (fig. 27). Remove the 14 main shaft pilot bearing rollers from the input shaft. Tap the input shaft with integral gear (J) and input shaft gear bearing (G) from the transmission case.

i. Remove Countershaft Gear (fig. 27). Lift the countershaft gear (FF) from the transmission case. Tip the countershaft on end and remove the 88 bearing rollers, washers, spacer, and arbor from the bore

of the countershaft gear. Remove the two countershaft rear steel thrust washers (AA) and one countershaft front bronze thrust washer (HH).

j. Remove Reverse Idler Gear (fig. 28). Using a suitable driver, drive reverse idler gear shaft through the reverse idler gear; remove gear and gear shaft.

53. Disassembly of Transmission Subassemblies

a. Disassemble Main Shaft (fig. 27). Remove the second and high speed synchronizer hub snap ring (L). Remove the two blocking rings and second and high speed synchronizer with blocking ring assembly (M) as a unit. Slide the second speed gear (N) and the low and reverse sliding gear (Q) from the main shaft (P). Using an arbor press, remove the main shaft rear bearing (T), and main shaft rear bearing spacer (R) from the main shaft (P).

b. Disassemble Synchronizer Assembly (fig. 27). Slide the second and high-speed synchronizer sleeve (M–5) off second and high-speed synchronizer hub (M–4); remove the three second and high-speed synchronizer shifting plates (M–3) and the two synchronizer springs (M–2).

c. Disassemble Input Shaft (fig. 27). Remove the input shaft bearing inner and outer snap rings (F and E) and press off the input shaft gear bearing (G).

d. Disassemble Gearshift Control Housing (fig. 26). Remove shifter fork pins (L) from the second and high speed shifter fork (M) and the low and reverse speed shifter fork (W). Remove the two ⅜-inch countersunk head pipe plugs (Y). Slide the second and high speed gears shifter shaft (J) from gearshift control housing and remove low and reverse speed shifter fork (W). Remove poppet ball (Z) and gearshift poppet ball spring (AA). Slide the low and reverse speed gears shifter shaft (K) from the gearshift control housing; remove second and high speed shifter fork (M). Remove poppet ball (Z) and poppet ball spring (AA). Remove gearshift rail hole expansion plugs (H).

Section III. CLEANING, INSPECTION, AND REPAIR

54. General

When disassembling any components, be sure that all machined surfaces are clean and that all foreign material, such as pieces of old gaskets, rust, etc., are removed with volatile mineral spirits or dry-cleaning solvent. Use care to remove all traces of old lubricant. Oil all bearings immediately after cleaning to prevent any corrosion to the highly polished surfaces.

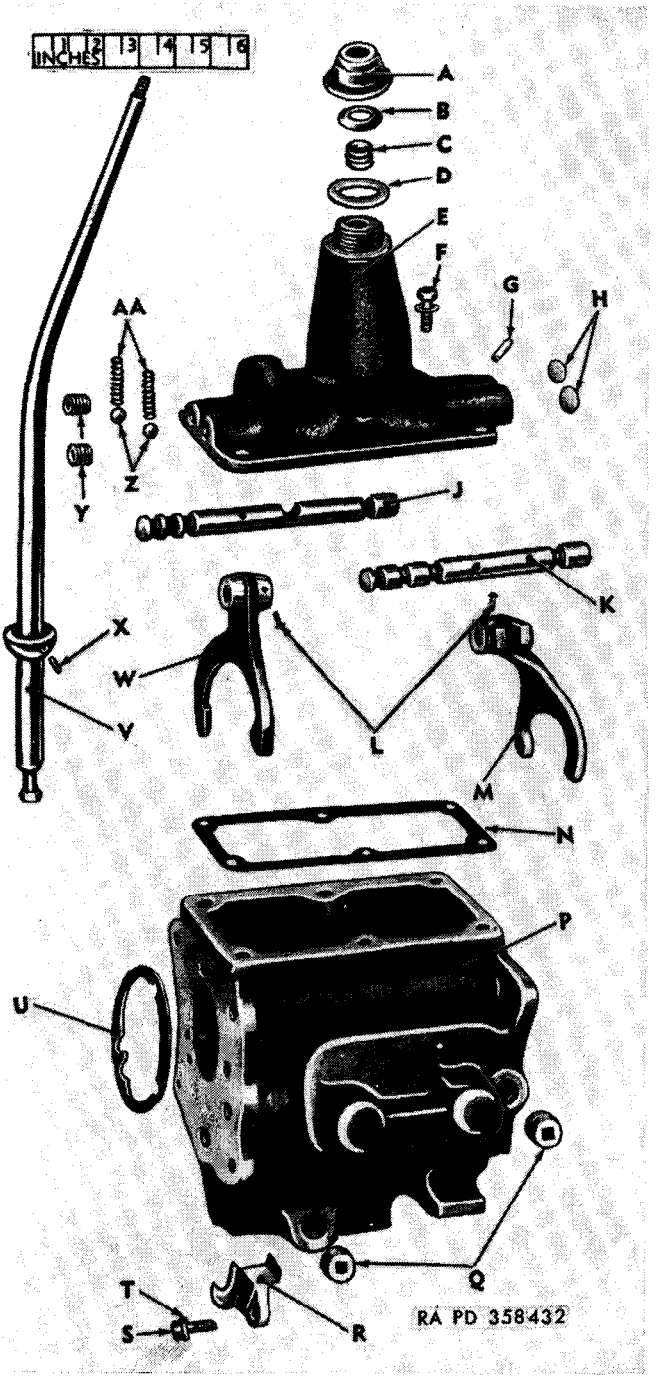


Figure 26. Transmission case and gearshift control housing—exploded view.

A—CAP, GEARSHIFT CONTROL HOUSING—WO-A1379
B—GASKET, GEARSHIFT CONTROL HOUSING CAP—7374976
C—SPRING, SUPPORT, GEARSHIFT LEVER—7374969
D—WASHER, GEARSHIFT LEVER SPRING SEAT—WO-635863
E—HOUSING, GEARSHIFT CONTROL—WO-801730
F—SCREW, INT TEETH LOCK WASHER—425337
G—PLUNGER, INTERLOCK, GEARSHIFT RAIL—7374972
H—PLUG, EXPANSION, GEARSHIFT RAIL HOLE—501592
J—SHAFT, SHIFTER, SECOND AND HIGH SPEED GEARS—7374970
K—SHAFT, SHIFTER, LOW AND REVERSE SPEED GEARS—7374971
L—PIN, SHIFTER FORK—7374978
M—FORK, SHIFTER, SECOND AND HIGH SPEED—7374979
N—GASKET, GEARSHIFT CONTROL HOUSING—7374977
P—CASE, TRANSMISSION—7372877
Q—PLUG, PIPE, CK-HD, ½ IN—7372879
R—COLLECTOR, OIL—7697420
S—SCREW, CAP, SOCKET-HD—571283
T—GASKET, 5/16 IN ID X ½ IN OD X 3/32 IN THK—WO-51875
U—GASKET, MAIN DRIVE GEAR BEARING RETAINER—WO-640422
V—LEVER, GEARSHIFT—7374974
W—FORK, SHIFTER, LOW AND REVERSE SPEED—7374980
X—PIN, GEARSHIFT LEVER FULCRUM BALL—WO-A1382
Y—PLUG, PIPE, CK-HD, ⅜ IN—113185
Z—BALL, POPPET—GM-104920
AA—SPRING, POPPET BALL—A276923

Figure 26—Continued

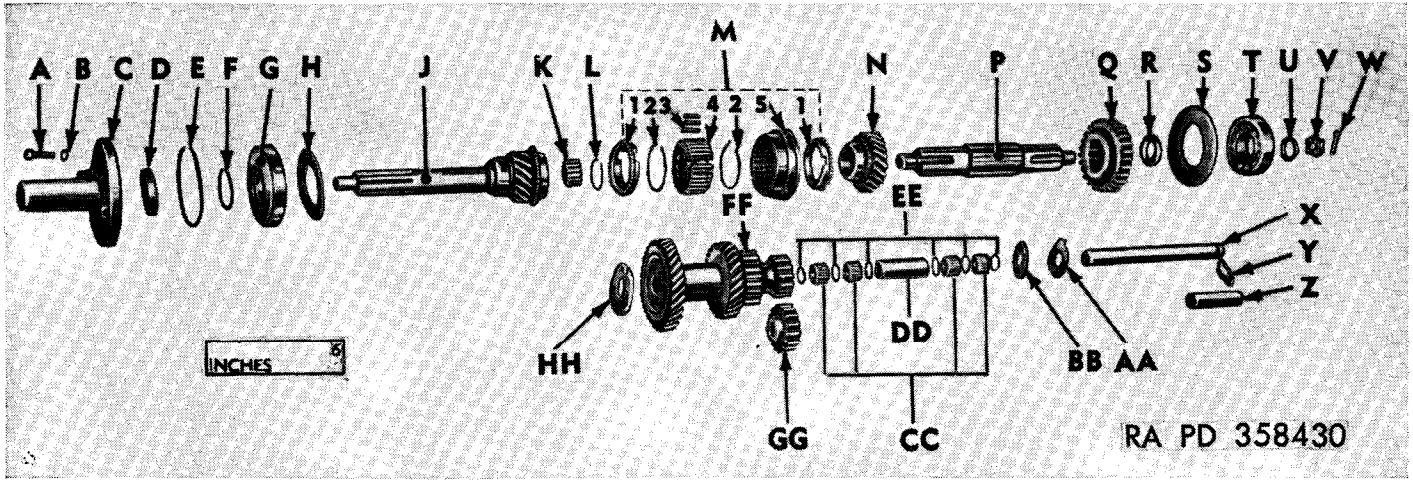


Figure 27. Transmission gears—exploded view.

A—SCREW, BEARING RETAINER—426892
B—GASKET, BEARING RETAINER SCREW—WO-51875
C—RETAINER, INPUT SHAFT GEAR BEARING—7697564
D—SEAL, OIL, INPUT SHAFT GEAR BEARING RETAINER—7697572
E—RING, SNAP, BEARING, OUTER—7697567
F—RING, SNAP, BEARING, INNER—7697568
G—BEARING, INPUT SHAFT GEAR—700763
H—BAFFLE, OIL—7697570
J—SHAFT, INPUT, W/INTEGRAL GEAR—7697566
K—ROLLER, MAIN SHAFT PILOT BEARING—7374997
L—RING, SNAP, SECOND AND HIGH SPEED SYNCHRONIZER HUB —7374996
M—SYNCHRONIZER, SECOND AND HIGH SPEED W/BLOCKING RING, ASSY—7374999
1. RING, BLOCKING, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640397
2. SPRING, SYNCHRONIZER—WO-640394
3. PLATE, SHIFTING, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640395
4. HUB, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640393
5. SLEEVE, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640396
N—GEAR, SECOND SPEED—7374994
P—SHAFT, MAIN—7374998
Q—GEAR, SLIDING, LOW AND REVERSE—7374995
R—SPACER, MAIN SHAFT REAR BEARING—7374992
S—ADAPTER, MAIN SHAFT BEARING—7374991
T—BEARING, MAIN SHAFT, REAR—700336
U—WASHER, MAIN SHAFT NUT—WO-1410
V—NUT, MAIN SHAFT—WO-A520
W—PIN, COTTER—103386
X—COUNTERSHAFT—7697421
Y PLATE, LOCK, IDLER SHAFT AND COUNTERSHAFT—7697424
Z—SHAFT, REVERSE IDLER GEAR—7697425
AA—WASHER, THRUST, COUNTERSHAFT, REAR (STEEL)—7697429
BB—WASHER, THRUST, COUNTERSHAFT, REAR (BRONZE)—7697547
CC—ROLLER, COUNTERSHAFT GEAR—7697545
DD—SPACER, COUNTERSHAFT GEAR BEARING—7372667
EE—WASHER, COUNTERSHAFT GEAR BEARING—7697427
FF—GEAR, COUNTERSHAFT—7697422
GG—GEAR, REVERSE IDLER—769423
HH—WASHER, THRUST, COUNTERSHAFT, FRONT (BRONZE)—7697428

Figvre 27—Continued

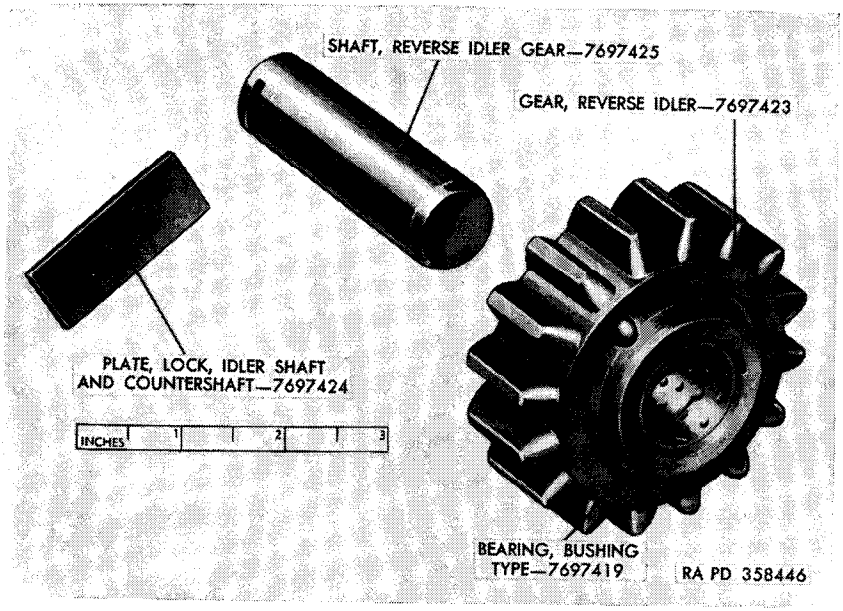


Figure 28. Reverse idler gear and components.

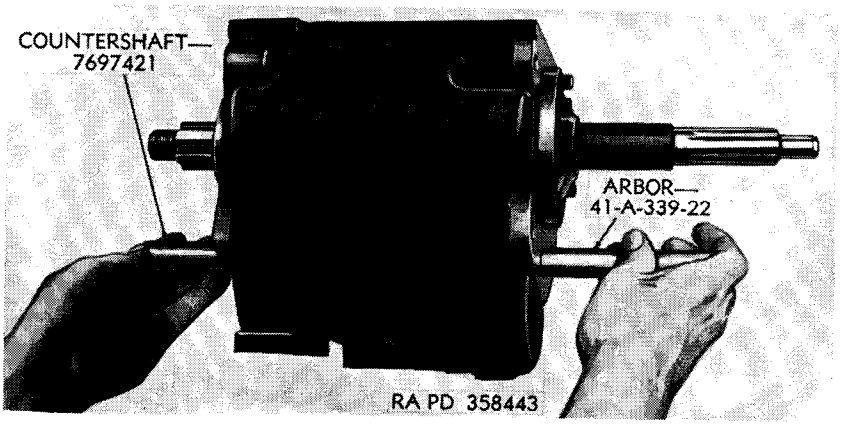


Figure 29. Removing countershaft from transmission.

55. Inspection and Repair

a. Transmission Case (fig. 26). Inspect the transmission case (P) and gearshift control housing (E) for cracks or damage of any kind. Any cracked or otherwise damaged units must be replaced.

b. Input Shaft (fig. 27). Replace the input shaft with integral gear (J) if the following conditions are apparent; broken teeth or excessive wear; pitted or twisted shaft; or discolored bearing surfaces due to overheating. Small nicks can be honed and then polished with a fine stone. Measure the main shaft pilot bearing roller (K) recess in the gear end of the shaft. If not conforming to repair and rebuild standards (par. 186), replace the input shaft with integral gear (J). Measure the pilot end of the input shaft. If not conforming to repair and rebuild standards (par. 186), replace the input shaft.

c. Main Shaft (fig. 27). A main shaft (P) excessively worn or with pitted or discolored bearing surfaces due to overheating, must be replaced. Measure the diameter of the pilot end of the main shaft. If not conforming to repair and rebuild standards (par. 186), replace the main shaft. Measure the diameter of the second speed gear (N). If not conforming to repair and rebuild standards (par. 186), replace the second speed gear.

d. Low and Reverse Sliding Gears (fig. 27). A low and reverse sliding gear (Q) with excessively worn teeth or splines, or with broken or clipped teeth, must be replaced. Slide the gear onto the main shaft (P). If the backlash between the gear and the main shaft is not within limits given in repair and rebuild standards (par. 186), either the gear or the main shaft, or both, must be replaced. A gear with small nicks can be honed and then polished with a fine stone.

e. Second Speed Gear (fig. 27).

(1) *Inspection.* A second speed gear (N) with excessively worn, broken or chipped teeth, or scored bearing surfaces, must be replaced. Measure the inside diameter of the gear. If this measurement does not conform to repair and rebuild standards (par. 186), replace the second speed gear bearing ((2) below). Small nicks in the gear can be honed and then polished with a fine stone.

(2) *Second speed gear bearing replacement.* Using an arbor press, remove the bearing from the second speed gear. Install new bearing and ream to size specified in repair and rebuild standards (par. 186).

f. Countershaft Gear (fig. 27). Replace countershaft gear (FF), if it is excessively worn, or if there are any broken or chipped teeth, or if it has pitted or discolored bearing surfaces due to overheating. Replace any broken or bent countershaft rear or front bronze thrust washers (BB and HH) or countershaft gear bearing spacer (DD). Replace

any countershaft gear rollers (CC) that have flat spots or that are discolored from overheating.

g. Reverse Idler Gear (fig. 28).

(1) *Inspection.* A reverse idler gear (GG, fig. 27) with excessively worn or broken teeth must be replaced. Small nicks can be honed and then polished with a fine stone. Measure the inside diameter of the reverse idler gear bearing. If not in conformance with repair and rebuild standards (par. 186), replace the bearing ((2) below).

(2) *Reverse idler gear bearing replacement.* Place the reverse idler gear in an arbor press. With a suitable remover, press the bearing out of the gear. Use a suitable driver to press a new bearing into the idler gear and ream to size specified in repair and rebuild standards (par. 186).

h. Reverse Idler Gear Shaft and Countershaft. A ridged, scored, or excessively worn reverse idler gear shaft or countershaft (X, fig. 27) must be replaced.

i. Synchronizer Assembly (fig. 27). Second and high speed synchronizer blocking rings (M–1) with worn, broken, or nicked teeth must be replaced. A second and high speed synchronizer hub (M–4) with excessively worn splines must be replaced. A second and high speed synchronizer sleeve (M–5) with broken, nicked, or worn teeth, or excessively worn splines must be replaced. Second and high speed synchronizer shifting plates (M–3) or synchronizer springs (M–2) that are broken or distorted must be replaced.

j. Main Shaft Pilot Bearing Rollers (fig. 27). Main shaft pilot bearing rollers (K) with flat spots, pitted or discolored surfaces, must be replaced.

k. Ball Bearings. Ball bearings with loose or discolored balls, pitted or cracked cones or cups must be replaced.

l. Countershaft Thrust Washers (fig. 27). Replace excessively worn or ridged countershaft rear (steel and bronze) or front (bronze) thrust washers (AA, BB, and HH).

m. Gearshift Control Housing Assembly (fig. 26). Replace the gearshift control housing (E) if it is cracked or has stripped threads. Replace the gearshift lever (V) if it is excessively worn or bent. Replace the gearshift control housing cap (A) if it is bent or has stripped threads. Replace the second and high speed gears shifter shaft (J) and second and high speed shifter fork (M) if they are excessively worn, or if they are bent or distorted. Replace the low and reverse speed gear shifter shaft (K) and low and reverse speed shifter fork (W) if they are excessively worn, or if they are bent or distorted. Replace the 3/8-inch countersunk head pipe plugs (Y) if the threads are stripped. Replace the gearshift lever support

spring (C) if it is cracked or distorted. Replace the poppet balls (Z) and poppet ball springs (AA) if they are worn, broken, or distorted.

Section IV. REBUILD OF TRANSMISSION

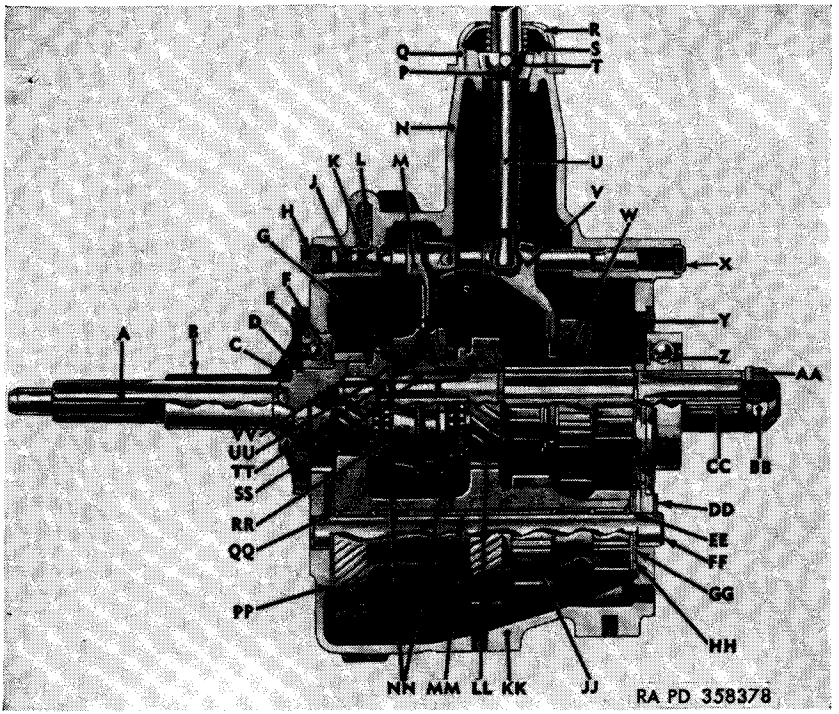
56. Assembly of Subassemblies

Note. Figure 30 shows proper sequence of assembly of subassemblies in the transmission.

a. Assemble Gearshift Control Housing (fig. 26). Install new gearshift rail hole expansion plugs (H) into shifter shaft holes in end of gearshift control housing (E). Insert poppet ball springs (AA) and poppet balls (Z) into gearshift control housing (E) while housing is placed upside down. Depress poppet ball (Z) and poppet ball spring (AA), and insert the low and reverse speed gears shifter shaft (K) into the gearshift control housing (E). Depress the other poppet ball (Z) and poppet ball spring; install the second and high speed gears shifter shaft (J) into the gearshift control housing (E). Install the second and high speed shifter fork (M) onto the second and high speed gears shifter shaft (J). Install the low and reverse speed shifter fork (W) onto the low and reverse speed gears shifter shaft (K). Secure both shifter forks onto the shifter shafts with shifter fork pins (L). Flange the ends of the gearshift fork pins with a center punch. Install ⅜-inch countersunk head pipe plugs (Y) in ends of gearshift control housing (E).

b. Assemble Input Shaft (fig. 27). Place a new input shaft gear bearing (G) on the input shaft with integral gear (J) from the pilot end of the input shaft. Press input shaft gear into position, using an arbor press. Install the inner and outer bearing snap rings (E and F).

c. Assemble Second and High Speed Synchronizer With Blocking Ring Assembly (M, fig. 27). Install the two synchronizer springs (M–2) in the second and high speed synchronizer hub (M–4) with the spring tension opposed. Place the lipped end of the synchronizer spring in the slot of the synchronizer hub and seat the synchronizer spring in the synchronizer hub. Turn the synchronizer hub around and make the same installation with the other synchronizer spring, starting with the same slot in the synchronizer hub as used for the first synchronizer spring. Install the three second and high speed synchronizer shifting plates (M–3), into the three slots in the second and high speed synchronizer hub (M–4) with the smooth sides of the shifting plates out. Hold the shifting plates in position and slip the second and high speed synchronizer sleeve (M–5) over the synchronizer hub with the long beveled edge of the synchronizer sleeve toward the long part of the synchronizer hub. Figure 31 shows the proper sequence of assembly for the second and high speed synchronizer assembly.



A—SHAFT, INPUT, W/INTEGRAL GEAR—7697566
B—RETAINER, INPUT SHAFT GEAR BEARING—7697564
C—SEAL, OIL, INPUT SHAFT GEAR BEARING RETAINER—7697572
D—RING, SNAP, BEARING, INNER—7697568
E—RING, SNAP, BEARING, OUTER—7697567
F—BEARING, INPUT SHAFT GEAR—700763
G—PLATE, SHIFTING, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640395
H—PLUG, PIPE, CK-HD, ⅜ IN—113185
J—SHAFT, SHIFTER, SECOND AND HIGH SPEED GEARS—7374970
K—BALL, POPPET—104920
L—SPRING, POPPET BALL—A276923
M—FORK, SHIFTER, SECOND AND HIGH SPEED—7374979
N—HOUSING, GEARSHIFT CONTROL—7065900
P—BALL, FULCRUM, GEARSHIFT LEVER—7032624
Q—CAP, GEARSHIFT CONTROL HOUSING—WO-A1379
R—WASHER, GEARSHIFT LEVER SPRING SEAT—WO-635863
S—SPRING, SUPPORT, GEARSHIFT LEVER—7374969
T—PIN, GEARSHIFT LEVER FULCRUM BALL—WO-A1382
U—LEVER, GEARSHIFT—7374974
V—FORK, SHIFTER, LOW AND REVERSE SPEED—7374980
W—GEAR, SLIDING, LOW AND REVERSE—7374995
X—PLUG, EXPANSION, GEAR SHIFT RAIL HOLE—501592
Y—ADAPTER, MAIN SHAFT BEARING—7374991
Z—BEARING, MAIN SHAFT, REAR—700336
AA—WASHER, MAIN SHAFT NUT—WO-1410
BB—NUT, MAIN SHAFT—WO-A520
CC—SHAFT, MAIN—7374998
DD—PLATE, LOCK, IDLER SHAFT AND COUNTERSHAFT—7697424
EE—WASHER, COUNTERSHAFT GEAR BEARING—7697427
FF—COUNTERSHAFT—7697421
GG—WASHER, THRUST, COUNTERSHAFT, REAR (STEEL)—7697429
HH—WASHER, THRUST, COUNTERSHAFT, REAR (BRONZE)—7697547
JJ—GEAR, COUNTERSHAFT—7697422
KK—CASE, TRANSMISSION—732877
LL—GEAR, SECOND SPEED—7374994
MM—SPACER, COUNTERSHAFT GEAR BEARING—7372667
NN—RING, BLOCKING, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640397
PP—WASHER, THRUST, COUNTERSHAFT, FRONT (BRONZE)—7697428
QQ—WASHER, COUNTERSHAFT GEAR BEARING—7697427
RR—SLEEVE, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640396
SS—HUB, SECOND AND HIGH SPEED SYNCHRONIZER—WO-640393
TT—SPRING, SYNCHRONIZER—WO-640394
UU—RING, SNAP, SECOND AND HIGH SPEED SYNCHRONIZER HUB—7374996
VV—ROLLER, MAIN SHAFT PILOT BEARING—7374997

Figure 30. Transmission—sectional view.

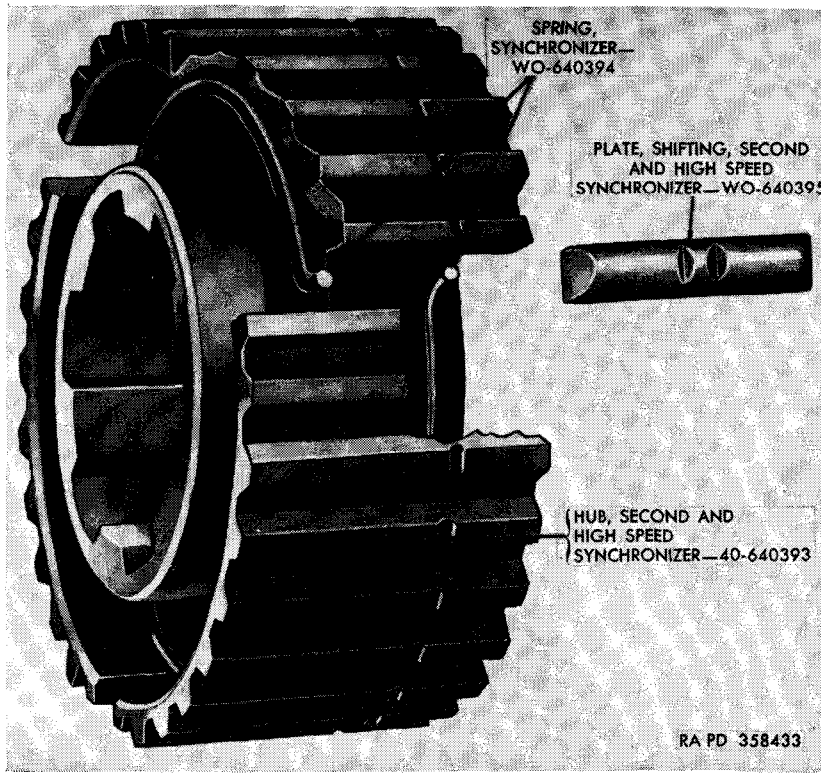


Figure 31. Second and high-speed synchronizer assembly sequence.

d. Assemble Main Shaft (fig. 27). Press a main shaft rear bearing spacer (R) and a main shaft rear bearing (T) onto the main shaft (P). Slide the low and reverse sliding gear (Q) onto the main shaft with the shifter fork channel toward the front. Slide the second speed gear (N) onto the main shaft with the tapered end away from the low and reverse sliding gear. Install a second and high speed synchronizer blocking ring (M–1) on the main shaft with the large surface against the second speed gear. Holding the second and high speed synchronizer assembly carefully to avoid disassembly, slide the synchronizer onto the shaft, followed by the other second and high speed synchronizer blocking ring.

e. Assemble Countershaft Gear (fig. 27). Lay the countershaft gear on a bench. Place the countershaft gear bearing spacer (DD) in the center of the countershaft gear. Insert arbor 41–A–339–22 (fig. 29) through the bore of the countershaft gear and gear spacer. Install a countershaft gear bearing washer (EE) and load a set of countershaft gear rollers (CC) at each end. Seat the rollers against the bearing washer, using countershaft roller sleeve 41–S–3775–675 (fig.

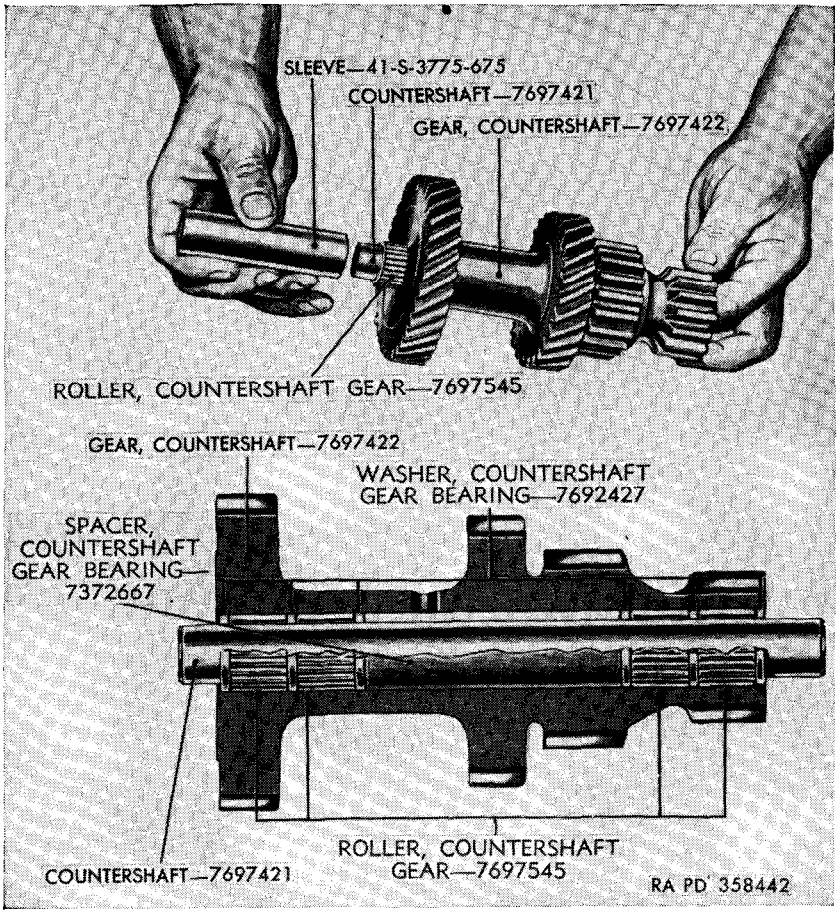


Figure 32. Seating countershaft gear rollers and washers, using sleeve 41–S–3775–675.

32). Install another countershaft gear bearing washer (EE) at each end, followed by another set of countershaft gear rollers, and finally, a third countershaft gear bearing washer (EE) at each end. Sequence of assembly of these parts is shown in figure 32.

57. Assembly of Transmission From Subassemblies

a. Install Reverse Idler Gear (fig. 27). Hold the reverse idler gear (GG) in position in the transmission case with the cone end of the hub toward the front.

Note. Position reverse idler gear shaft with slot at an angle to permit proper locking.

Push the reverse idler gear shaft into the case. Tap the shaft into the transmission case until approximately one-half inch of shaft

protrudes to allow proper seating of the idler shaft and countershaft lock plate (Y).

b. Install Oil Collector (fig. 26). Place oil collector (R) in transmission case and secure with 5/16–ID x 1/2–OD x 3/32-thick gaskets (T) and socket head cap screws (S).

c. Install Countershaft Gear (fig. 27).

Note. Coat all thrust washers with heavy grease before installing, so washers will not slip during installation of the countershaft gear.

Place the large bronze front countershaft thrust washer (HH) at the front of the transmission case with the lip of the washer seated in the slot on the case. Place the countershaft rear bronze thrust washer (BB) against the rear of the countershaft gear (FF). Place the countershaft rear steel thrust washer (AA) against the rear of the transmission case. Hold the countershaft gear in place and start the countershaft into a rear of the transmission case. Drive the countershaft through the transmission case and countershaft gear, driving out the arbor that secured the countershaft gear rollers, countershaft gear bearing spacers, and countershaft gear bearing washer.

Note. Make sure that thrust washers are in proper position.

Leave approximately one-half of an inch of the countershaft protruding. The countershaft gear, when installed in the transmission case, should have from 0.012- to 0.018-inch end play for lubrication. This clearance is obtained by selective thickness of the countershaft rear steel thrust washer (AA), which is available in thicknesses of 0.0555 and 0.625 inch. To measure the end play, place a feeler gage between countershaft rear steel or bronze thrust washers (AA) and (BB).

d. Install Input Shaft (fig. 27). Install the 14 input shaft gear bearings (G) in the recess at the gear end of input shaft.

Note. The last bearing to be installed should be placed in an endwise position for insertion. It is impossible to install the fourteenth bearing in the normal manner, and when the last bearing is placed in the endwise position, it forms a lock securing the additional bearings.

Place the input shaft in position through the smaller opening in the transmission case. Tap input shaft until outer bearing snap ring (E) rests against transmission case. Slide oil baffle and input shaft gear bearing retainer oil seal (D) and input shaft gear bearing retainer (C) onto input shaft. Install the three bearing retainer screws (A) and bearing retainer screw gaskets (B). Tighten the screws.

e. Install Main Shaft (fig. 27). Slide main shaft into transmission case through large opening at rear of transmission case.

Note. Make sure the loading edge of the main shaft rides in the 14 input shaft gear bearings in the input shaft recess.

Place the main shaft bearing adapter (S) in place at rear of transmis-

sion case. Tap adapter lightly intil it is seated firmly in transmission case. Install rear main shaft bearing (T) on main shaft (P) and tap bearing lightly until is it properly seated in the adapter. Secure the reverse idler gear shaft (Z) and countershaft (X) by tapping the idler gear shaft and countershaft lock plate (Y) in position in the slots in the ends of the idler gear shaft and countershaft.

f. Install Gearshift Control Housing (fig. 26). Place a new gearshift control housing gasket (N) on the top of the transmission case (P). Place gearshift control housing (E) on transmission case. Secure gearshift control housing to transmission case with six internal-teeth lock washer screws (F).

58. Assemble Transmission to Transfer

Refer to TM 9–804 for proper assembly procedure.

59. Assemble Transmission and Transfer to Engine

Refer to TM 9–804 for proper assembly procedure.

CHAPTER 6
TRANSFER

Section I. DESCRIPTION AND DATA

60. Description

The transfer (fig. 2) is located to the rear of the transmission. The transfer is essentially a two-speed transmission, providing two gear ratios and a means of distributing power from the transmission to the two axles.

61. Data

Manufacturer	Spicer
Model	18
Mounting	unit with transmission
Shift lever	floor
Ratio:	
High	1 to 1
Low	2.430 to 1
Bearings:	
Countershaft gear	2 rollers
Output shaft	2 tapered rollers

Section II. PREPARATION OF TRANSFER FOR REBUILD

62. Removal of Transmission and Transfer

Refer to TM 9–804 for correct removal procedure.

63. Removal of Transfer From Transmission

Refer to TM 9–804 for correct removal procedure.

64. Disassembly of Transfer Into Subassemblies

a. Remove Hand Brake Drum and Rear Companion Flange (fig. 33). Remove the cotter pin (A), ¾–20 NF–3 slotted nut (B), and ¾-inch flat washer (C) securing the rear companion flange (D) and parking brake drum (E). Using puller 41–P-2956–4, remove the companion flange and brake drum. Remove the four ⅜–24 NF–3 x 1⅜ bolts (MM), ⅜-inch lock washers (NN), and ⅜–24 NF–3 hex nuts (PP) securing rear companion flange (D) to parking brake drum (E) and remove rear companion flange.

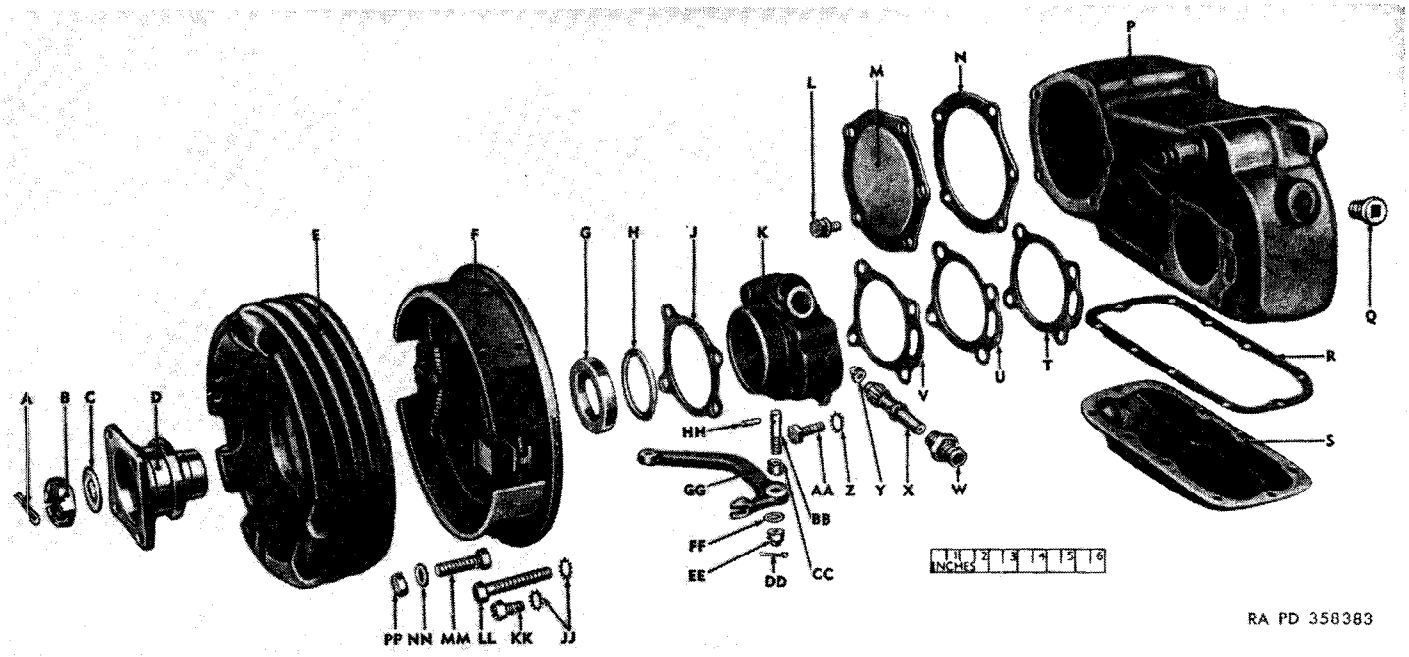
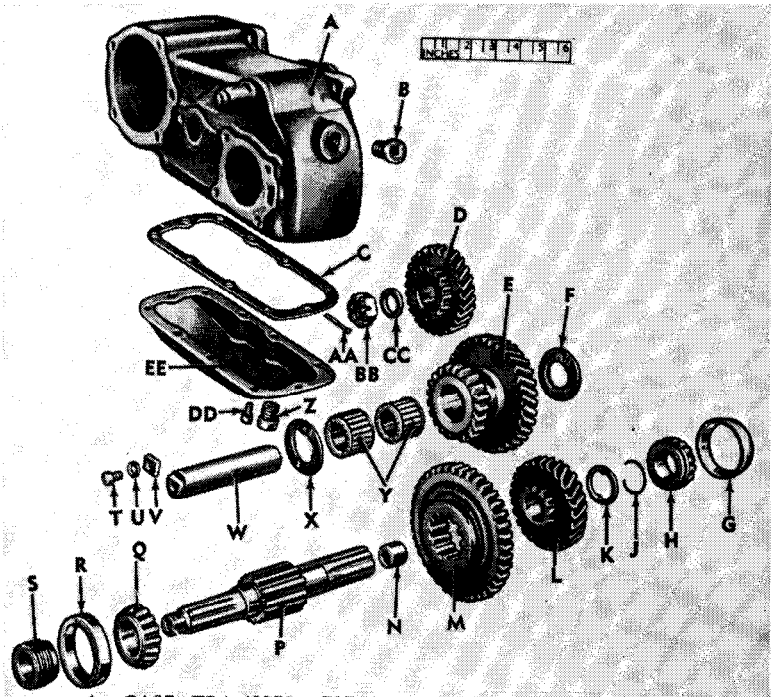


Figure 33. Transfer assembly—exploded view.

A—PIN, COTTER—120123
B—NUT, SLTD, ¾–20 NF–3—7696464
C—WASHER, FLAT, ¾-IN—7372868
D—FLANGE, COMPANION, REAR—7371099
E—DRUM, PARKING BRAKE—7371010
F—BRAKE, INTERNAL EXPANDING TYPE, PARKING—D72450
G—SEAL, OIL, OUTPUT SHAFT REAR BEARING CAP—500068
H—GASKET, OUTPUT SHAFT REAR BEARING CAP OIL SEAL—7373157
J—GASKET, BACKING PLATE—7539155
K—CAP, OUTPUT SHAFT REAR BEARING—7371373
L—SCREW, LOCK WASHER—443608
M—COVER, REAR—7369850
N—GASKET, REAR COVER—7373162
P—CASE—7375051
Q—PLUG, PIPE, CK-HD, ½-IN—7372879
R—GASKET, BOTTOM COVER 7375053
S—COVER, BOTTOM—7375052
T—SHIM, OUTPUT SHAFT REAR BEARING CAP (0.003-IN THK)—7373158
U—SHIM, OUTPUT SHAFT REAR BEARING CAP (0.010-IN THK)—7373159
V—SHIM, OUTPUT SHAFT REAR BEARING CAP (0.031-IN THK)—7373160
W—SLEEVE, SPEEDOMETER DRIVEN GEAR—7697552
X—GEAR, DRIVEN, SPEEDOMETER—7697553
Y—BEARING, SPEEDOMETER DRIVEN GEAR—7331509
Z—WASHER, LOCK, EXT-TEETH, ⅜-IN—7697469
AA—SCREW, CAP, ⅜–16 NC–3 x 1—180122
BB—STUD, ⅜–24NF–3—7371859
CC—BEARING, OPERATING LEVER—7697430
DD—PIN, COTTER—103373
EE—NUT, SLTD, ⅜–24NF–2—125348
FF—WASHER, PLAIN, 0.390 ID, ¾ OD, 0.062 THK—7371762
GG—LEVER, OPERATING—7697434
HH—PIN, OPERATING LEVER—112009
JJ—WASHER, LOCK, ⅜-IN—7697469
KK—SCREW, CAP, ⅜–16 NC–3 x ⅝—180118
LL—SCREW, CAP, ⅜–16 NC–3 x 2¼—180132
MM—BOLT, ⅜–24 NF–3 x 1⅜—7373177
NN—WASHER, LOCK, ⅜-IN—120382
PP—NUT, HEX, ⅜–24 NF–3—WO–636575

Figure 33—Continued



A—CASE, TRANSFER—7375051
B—PLUG, PIPE, CK-HD, 1/2 IN—7372879
C—GASKET, BOTTOM COVER—7375053
D—GEAR, INPUT—7375132
E—GEAR, COUNTERSHAFT—7375134
F—WASHER, THRUST, COUNTERSHAFT GEAR—7375135
G—CUP, OUTPUT SHAFT BEARING—706821
H—CONE, OUTPUT SHAFT BEARING—705399
J—RING, SNAP, OUTPUT SHAFT / THRUST WASHER—WO-A991
K—WASHER, THRUST, OUTPUT SHAFT—7371204
L—GEAR, OUTPUT SHAFT—7697467
M—GEAR, SLIDING, OUTPUT SHAFT—7697468
N—BEARING, PILOT, OUTPUT CLUTCH / GEAR SHAFT—7373115
P—SHAFT, OUTPUT—7036544
Q—CONE, OUTPUT SHAFT BEARING—705399
R—CUP, OUTPUT SHAFT BEARING—706821
S—GEAR, DRIVE, SPEEDOMETER—WO-A1511
T—SCREW, CAP, COUNTERSHAFT LOCK PLATE—180118
U—WASHER, LOCK, 3/8 IN—120382
V—PLATE, LOCK, COUNTERSHAFT—7371213
W—COUNTERSHAFT—7375133
X—WASHER, THRUST, COUNTERSHAFT GEAR—7375135
Y—BEARING, COUNTERSHAFT—708234
Z—PLUG, PIPE, CK-HD, 1/2 IN—7372879
AA—PIN, COTTER—103386
BB—NUT, 7/8-16NC-2—7743652
CC—WASHER, PLAIN, 29/32 ID x 1-9/16 OD / x 5/32 THK—7375131
DD—SCREW, LOCK WASHER—217233
EE—COVER, BOTTOM—7375052

Figure 34. Transfer case, gears, and shafts—exploded view.

b. Remove Parking Brake Assembly (fig. 33). Remove the four ⅜–16 NC–3 x 2¼ cap screws (LL) and ⅜-inch lock washers (JJ) securing parking brake drum (E) and internal expanding type parking brake (F) to output shaft rear bearing cap (K); remove hand brake assembly.

c. Remove Output Shaft Rear Bearing Cap (fig. 33). Remove the one remaining ⅜–16 NC–3 x ⅝ cap screw (KK) and ⅜-inch lock washer (JJ) securing the output shaft rear bearing cap (K) to the case (P); remove bearing cap. Remove the output shaft rear bearing cap shims (U and V), speedometer driven gear sleeve (W), and the speedometer driven gear (X).

Note. Use care not to lose or damage shims.

d. Remove Output Shaft Front Bearing Cap (fig. 35). Shift the front axle drive to the engaged position. Remove the shifter shaft poppet ball spring plugs (E and Y), shifter shaft poppet ball springs (F and Z), and shifter shaft poppet balls (G and AA) on both sides of the output shaft front bearing cap. Remove the five ⅜–16 NC–3 x 1 cap screws (DD) and ⅜-inch lock washers (EE) securing the output shaft front bearing cap to the transfer; remove output shaft front bearing cap (CC), output clutch gear shaft (JJ), output clutch gear (KK), output clutch gear shifter fork (B), output clutch gear fork shifter shaft (D), output clutch gear shaft bearing (GG), and the front propeller shaft to transfer yoke (S) as an assembly.

Note. Do not lose the gear shifter shaft interlock.

e. Remove the Bottom Cover and Countershaft Gear (fig. 34). Remove the 10 lock washer screws (DD) holding the bottom cover (EE) and bottom cover gasket (C) in place; remove cover and gasket. Remove the five lock washer screws (L, fig. 33) holding rear cover (M, fig. 33) and rear cover gasket (N, fig. 33) in place; remove cover and gasket. Remove the countershaft lock plate cap screw (T) and ⅜-inch lock washer (U); remove the countershaft lock plate (V). Using a brass drift, remove the countershaft (W) from the case.

Note. Drive the countershaft from front to rear, drive from side opposite lock plate. Drop the countershaft gear (E), countershaft bearings (Y), and countershaft gear thrust washers (F and X) to the bottom of the case.

f. Remove Output Shaft (fig. 34). Using remover 41–R–2368–200 (fig. 36), force the output shaft bearing cone (Q) from its seat on the output shaft (P). Remove the output shaft thrust washer snap ring (J) from the groove in the output shaft (fig. 37). Pull the output shaft out from the rear of the case. Remove the output shaft thrust washer (K), output shaft gear (L), and the output shaft sliding gear (M) from the case. The countershaft gear (E), countershaft bearings (Y), and countershaft gear thrust washers (F and X) can now be lifted from the case.

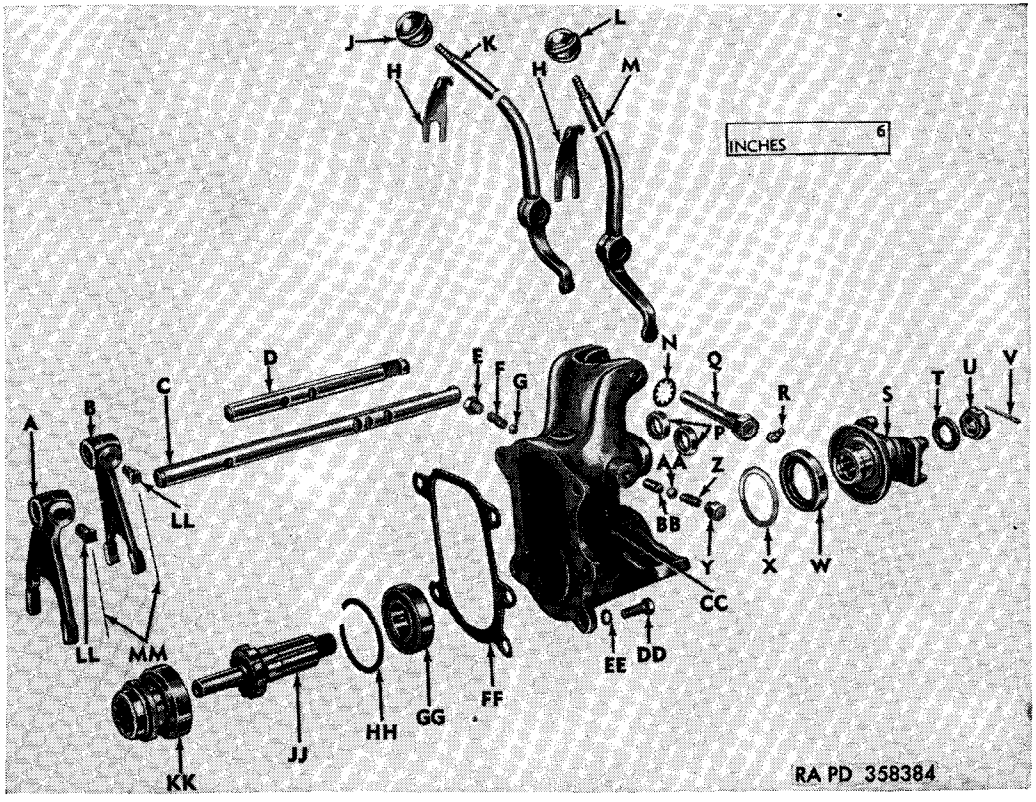


Figure 35. Output shaft front bearing cap assy—exploded view.

A—FORK, SHIFTER, OUTPUT SHAFT SLIDING GEAR—WO-A959
B—FORK, SHIFTER, OUTPUT CLUTCH GEAR—WO-A960
C—SHAFT, SHIFTER, OUTPUT SHAFT SLIDING GEAR FORK—WO-A1504
D—SHAFT, SHIFTER, OUTPUT CLUTCH GEAR FORK—WO-A962
E—PLUG, SHIFTER SHAFT POPPET BALL SPRING—WO-A967
F—SPRING, SHIFTER SHAFT POPPET BALL—A214784
G—BALL, POPPET, SHIFTER SHAFT—104920
H—SPRING, GEARSHIFT LEVER—7374968
J—KNOB, GEARSHIFT LEVER—7374975
K—LEVER, GEARSHIFT, DIRECT AND UNDERDRIVE—7697470
L—KNOB, GEARSHIFT LEVER—7374975
M—LEVER, GEARSHIFT, FRONT WHEEL DRIVE—7374966
N—WASHER, LOCK, INT-TEETH, PIVOT PIN—180566
P—SEAL, OIL, SHIFTER SHAFT—500007
Q—PIN, PIVOT, GEARSHIFT LEVER—7374967
R—FITTING, LUBR, GEARSHIFT LEVER PIVOT PIN—45-F-406-150
S—YOKE, FRONT PROPELLER SHAFT TO TRANSFER—7371208
T—WASHER, PLAIN, ¾ IN—7372868
U—NUT, ¾-20NF-3—7696464
V—PIN, COTTER—120123
W—SEAL, OIL, OUTPUT SHAFT FRONT BEARING CAP—500068
X—GASKET, OUTPUT SHAFT FRONT BEARING CAP OIL SEAL—WO-A1134
Y—PLUG, SHIFTER SHAFT POPPET BALL SPRING—WO-A967
Z—SPRING, SHIFTER SHAFT POPPET BALL—A214784
AA—BALL, POPPET, SHIFTER SHAFT—104920
BB—INTERLOCK, GEAR SHIFTER SHAFT—WO-A965
CC—CAP, OUTPUT SHAFT FRONT BEARING—7374990
DD—SCREW, CAP, ⅜-16NC-3 x 1—180122
EE—WASHER, LOCK, ⅜ IN—7697469
FF—GASKET, OUTPUT SHAFT FRONT BEARING CAP—WO-A957
GG—BEARING, OUTPUT CLUTCH GEAR SHAFT—700079
HH—RING, SNAP, OUTPUT CLUTCH GEAR SHAFT BEARING—WO-A976
JJ—SHAFT, OUTPUT CLUTCH GEAR—WO-A975
KK—GEAR, OUTPUT CLUTCH—7371212
LL—SCREW, SET, SHIFTER FORK—5214776
MM—WIRE, SHIFTER FORK SET SCREW—22-W-1631-110

Figure 35—Continued

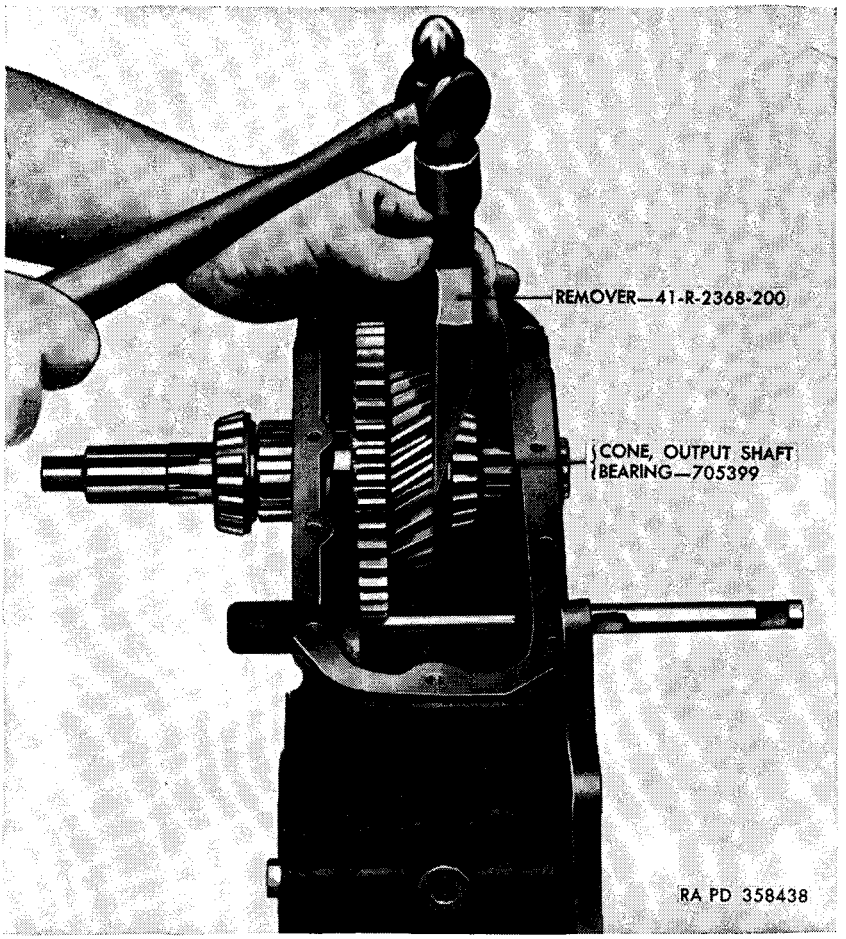


Figure 36. Removing output shaft bearing cone.

g. Remove Sliding Gear Fork and Shifter Shaft (fig. 35). Remove the shifter fork set screw wire (MM) and unloosen shifter fork set screw (LL). Slide the output shaft sliding gear fork shifter shaft (C) from case and remove the output shaft sliding gear shifter fork (A).

65. Disassembly of Subassemblies

a. Disassemble the Output Shaft Front Bearing Cap (fig. 35). Remove the cotter pin (V), ¾–20NF–3 nut (U), and ¾-inch plain washer (T) that secure the output clutch gear shaft (JJ) to front propeller shaft to transfer yoke (S); remove the yoke. Remove output clutch gear (KK), output clutch gear fork shifter shaft (D), and output clutch gear shifter fork (B). Tap lightly on the end of the output

clutch gear shaft (JJ) and remove shaft. Remove the output clutch gear shaft bearing snap ring (HH) and tap the output clutch gear shaft bearing (GG) from the front bearing cap. Pry the two shifter shaft oil seals (fig. 38) from the output shaft front bearing cap. Using a brass drift, tap the output shaft front bearing cap oil seal (W) and output shaft front bearing cap oil seal gasket (X) out of the output shaft front bearing cap (fig. 38).

b. Disassemble Output Shaft Rear Bearing Cap (fig. 33). Remove the speedometer driven gear sleeve (W) and the speedometer driven gear (X). Remove the cotter pin (DD) and ⅜–24NF–2 slotted nut (EE) retaining the operating lever (GG) to the ⅜–24NF–3 stud (BB). Remove the 0.370 ID, ¾ OD, 0.062 thick plain washer (FF) and the operating lever (GG) from the ⅜–24NF–3 stud (BB). Using a thin-nosed drift, drive the operating lever pin (HH) out and remove the ⅜–24NF–3 stud (BB). Pry the rear bearing cap output shaft oil seal (G) and the output shaft rear bearing cap oil seal gasket (H) from the bearing cap. Using extractor 41–E–568, remove the speedometer drive gear bearing (Y); if extractor is not available, pry the bearing out.

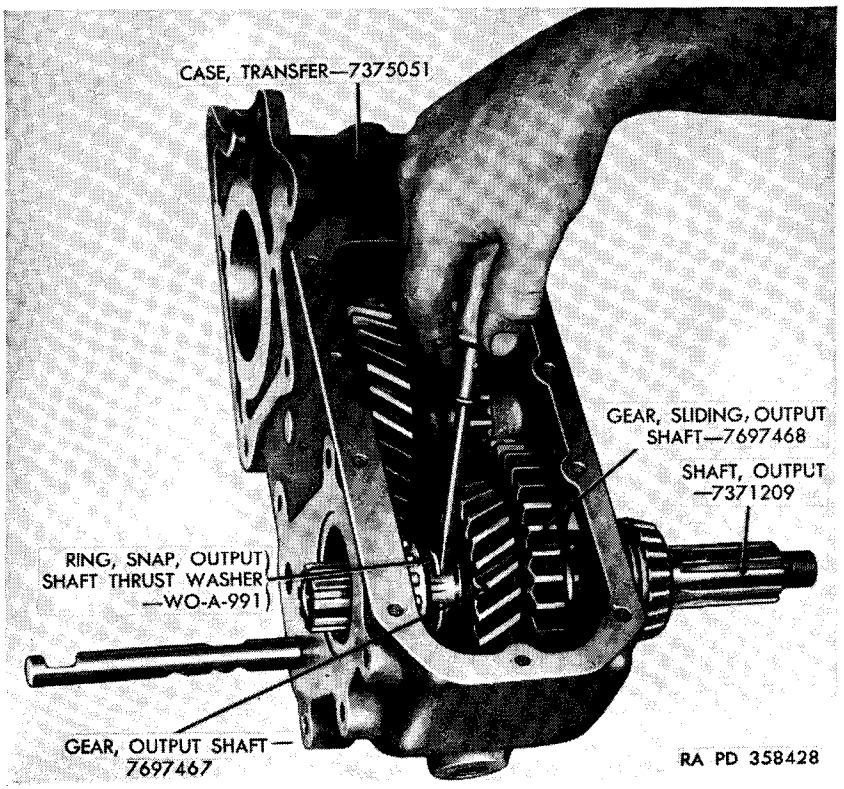


Figure 37. Removing output shaft thrust washer snap ring.

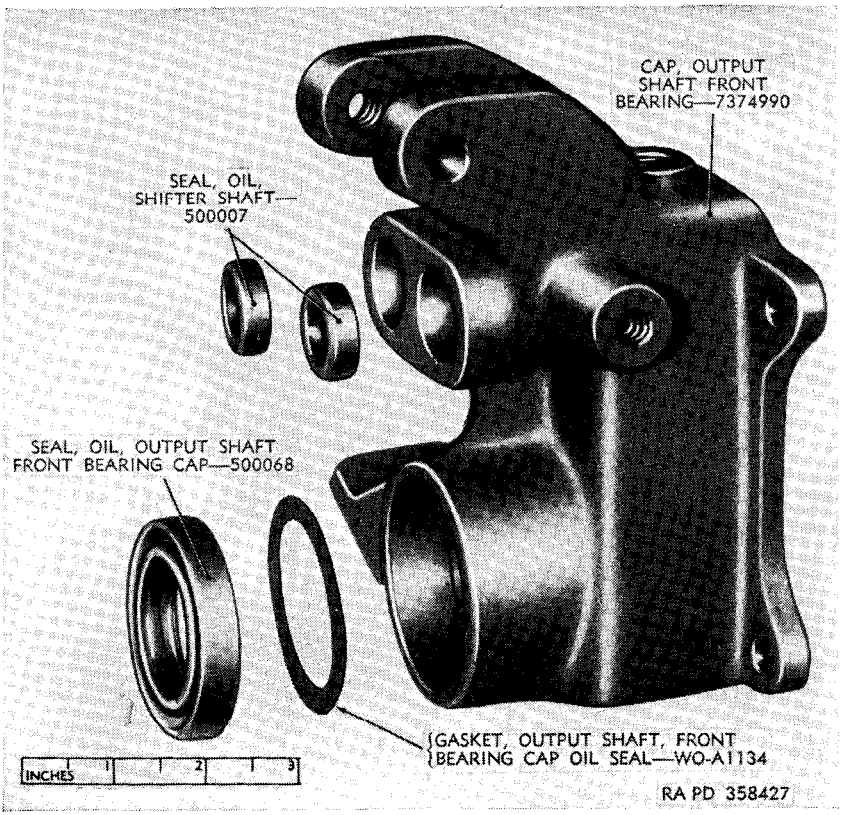


Figure 38. Output shaft front bearing cap—exploded view.

Section III. CLEANING, INSPECTION, AND REPAIR

66. Cleaning

Clean all parts thoroughly in dry-cleaning solvent or volatile mineral spirits. Clean the bearings by rotating them well-immersed in cleaning fluid until all trace of lubricant has been removed. Oil the bearings immediately to prevent corrosion of the highly polished surface.

67. Inspection

a. Transfer Case (fig. 33). Inspect the transfer case for cracks or any other form of damage. Inspect the bottom and rear covers to see if they are bent or otherwise damaged. Strip all of the old gasket material from the covers and from the case where the covers touch.

b. Output Shaft Front Bearing Cap Assembly (fig. 35).

(1) *Output shaft front bearing cap.* Replace the output shaft front bearing cap (CC) if it is cracked or otherwise damaged.

Output shaft front bearing cap oil seal (W), output shaft front bearing cap oil seal gasket (X), and the shifter shaft oil seals (P) must always be replaced (par. 70).

(2) *Shifter shafts and shifter forks.* Replace the output shaft sliding gear fork shifter shaft (C) and output clutch gear fork shifter shaft (D) if bent or otherwise damaged. Replace the output shaft sliding gear shifter fork (A) and output clutch gear shifter fork (B) if they have stripped set screw threads or if the forks are bent, cracked, or otherwise damaged.

(3) *Output clutch gear shaft and output clutch gear.* Replace the output clutch gear shaft (JJ) if the splines or gear teeth are worn or chipped, or if output clutch gear (KK) has any missing teeth. Check the diameter of the pilot end of the output clutch gear shaft. If the diameter does not meet repair and rebuild standards (par. 187), replace the shaft. Replace the output clutch gear (KK) if it is worn or has any broken teeth or if otherwise damaged.

(4) *Output clutch gear shaft bearing.* If the output clutch gear shaft bearing (GG) shows evidence of loose or discolored roller balls, or has pitted or cracked races, it must be replaced. Replace bent, broken, or distorted output clutch gear shaft bearing snap ring (HH).

(5) *Shift lever assembly.* Replace the direct and underdrive gearshift levers (K) and front wheel drive gearshift lever (M) if found to be bent or otherwise damaged. Replace the gearshift lever springs (H) if bent or cracked. Measure the diameter of the gearshift lever pivot pin (Q); if not in conformance with repair and rebuild standards (par. 187), replace the pivot pin.

(6) *Front propeller shaft to transfer yoke.* Replace the front propeller shaft to transfer yoke (S) if found to be bent, cracked, or otherwise damaged. Replace the yoke if the splines are chipped or broken.

c. *Output Shaft Rear Bearing Cap Assembly* (fig. 33).

(1) *Output shaft rear bearing cap.* Replace the output shaft rear bearing cap (K) if it is cracked or otherwise damaged. Output shaft rear bearing cap oil seal (G) must always be replaced. Remove all particles of the backing plate gasket (J).

(2) *Brake operating lever.* Replace the operating lever (GG) if it is bent or otherwise damaged. Replace the operating lever bearing (CC), if it is worn. Replace the ⅜–24NF–3 stud (BB) if it is bent or has damaged threads.

(3) *Speedometer driven gear.* Replace the speedometer driven gear (X) if the teeth are chipped or broken. Replace the speedometer driven gear sleeve (W) if it is bent, cracked, or has damaged threads. Replace the speedometer driven gear bearing (Y) if it is excessively worn. Remove bearing with a suitable extractor. Replace as outlined in paragraph 69.

d. Transfer Case (fig. 33). Replace the case (P) if it is cracked or otherwise damaged. Make sure all particles of the bottom cover gasket (R) and the rear cover gasket (N) have been removed. Replace the rear cover (M) and the bottom cover (S) if they are cracked, distorted, or otherwise damaged. Replace the ½-inch countersunk-head pipe plug (Q) if threads are damaged. Replace any bent or damaged output shaft rear bearing cap shims (T, U, and V). Replace the input gear (D, fig. 34) if it has broken or chipped teeth.

e. Rear Companion Flange and Brake Drum (fig. 33). Replace the rear companion flange (D) if it is bent, cracked, or if splines are damaged. Replace the parking brake drum (E) if it is worn or bent.

f. Countershaft Gear Assembly (fig. 34). Replace the countershaft gear (E) if excessively worn, or if any teeth are damaged. Replace the countershaft gear thrust washers (F and X) if not conforming to repair and rebuild standards (par. 187). Replace the countershaft (W) if not conforming to repair and rebuild standards (par. 187). Replace the countershaft bearings (Y) if the rollers are scored or have flat spots.

g. Output Shaft Assembly (fig. 34). Replace the output shaft (P) if the splines are worn. Small nicks can be removed by honing and then polishing with a fine stone. Measure the inside diameter of the output clutch gear shaft pilot bearing (N). If not in conformance with repair and rebuild standards (par. 187), replace (par. 70). Replace the output shaft gear (L) or the output shaft sliding gear (M) if they are worn or have damaged teeth. Measure the thickness of the output shaft thrust washer (K), if not in conformance with repair and rebuild standards (par. 187), replace (par. 70). Replace the output shaft bearing cones (H and Q) if they are scored or have flat spots (par. 70). Replace the output shaft bearing cups (G and R) if they are pitted or scored. Replace the speedometer drive gear (S) if it is cracked or has damaged threads.

Section IV. ASSEMBLY OF SUBASSEMBLIES

68. Assemble Output Shaft Front Bearing Cap
(fig. 35)

a. Install Bearing, Clutch Gear, and Shaft. Install the output clutch gear shaft bearing (GG) and secure with output clutch gear shaft bearing snap ring (HH). Insert the output clutch gear shaft (JJ) into the output clutch gear shaft bearing from the inside of the output shaft front bearing cap (CC). Insert the output clutch gear fork shifter shaft (D) in through the outer side of the output shaft front bearing cap (CC). Place the output clutch gear shifter fork (B) and the output clutch gear (KK) in position. Slide the output clutch gear shifter fork (B) on the output clutch gear fork shifter shaft (D) and the output clutch gear (KK) onto the output clutch gear shaft (JJ) together. Install the shifter fork set screw (LL) in the shifter fork and secure with shifter fork set screw wire (MM). Install the output shaft front bearing cap oil seal gasket (X) and the output shaft front bearing cap oil seal (W) using replacer 41–R–2394–105. Slide the front propeller shaft to transfer yoke (S) onto the output clutch gear shaft (JJ). Secure with ¾-inch plain washer (T), ¾–20NF–3 nut (U) and cotter pin (V). Lay output shaft front bearing assembly to one side.

b. Install Output Shaft Sliding Gear Shifter Fork and Shaft. Insert the output shaft sliding gear fork shifter shaft (C) into the case and through the output shaft sliding gear shifter fork (A). Secure the fork to the shaft with shifter fork set screw (LL) and secure the set screw with shifter fork set screw wire (MM).

69. Assemble Output Shaft Rear Bearing Cap

a. Install Speedometer Driven Gear Bearing (fig. 33). If speedometer driven gear bearing (Y) is being replaced, place the bearing in position in case and seat with brass drift.

b. Install Speedometer Driven Gear and Speedometer Driven Gear Sleeve (fig. 33). Place the speedometer driven gear (X) in the output shaft rear bearing cap (K). Install speedometer driven gear sleeve (W), but do not tighten, or a final seating or driven gear must be made after installation of speedometer driven gear (X) (par. 73).

c. Install Brake Operating Lever Assembly. (fig. 33). Install the 3/8–24NF–3 stud (BB) into the output shaft rear bearing cap and secure with operating lever pin (HH). Using a suitable driver, install an operating lever bearing (CC) into the operating lever (GG). Slide operating lever onto operating lever stud (BB) and secure with 0.370 ID, 3/4 OD, 0.062 thick washer (FF), plain 3/8–24NF–2 slotted nut (EE), and cotter pin (DD).

Section V. ASSEMBLY OF TRANSFER

70. Install Output Shaft in Transfer Case

a. Install Output Clutch Gear Shaft Pilot Bearing. If replacement of bearing is not required, proceed as in *b* below. If it is necessary to replace the output clutch gear shaft pilot bearing (N, fig. 34), proceed as follows: Place the output shaft (fig. 39) in a vice equipped with protectors with the pilot end up. Seat an output clutch gear shaft pilot bearing in the pilot-end of the output shaft. Using a ⅝- to ¾-inch collar and mandrel found in driver 41–D–2869, seat the pilot bearing until the top of the pilot bearing is nine-sixteenths of an inch from the top of the bore in the output shaft (fig. 40). Ream to repair and rebuild standards (par. 187).

b. Install Output Shaft (fig. 34). Press the output shaft bearing

Figure 39. Replacing output clutch gear shaft pilot bearing.

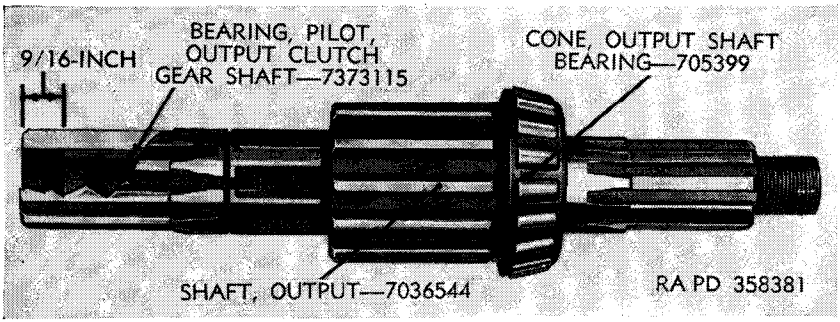


Figure 40. Proper position of output clutch gear shaft pilot bearing.

cone (Q) onto the output shaft (P, fig. 34 and fig. 41). Place the output shaft sliding gear (M) in the transfer case (A) with the output shaft sliding gear shifter fork (A, fig. 35), in the channel on the output shaft sliding gear. Place the output shaft gear (L) in the transfer case (A) with the shoulder of the output shaft gear facing the output shaft sliding gear. Insert the output shaft (P) into the transfer case (A) and through the gears. Slide the output shaft thrust washer (K) onto the output shaft. Slide thimble of replacer 41–R–2384 over end of output shaft and place output shaft thrust washer snap ring (J, fig. 34 and fig. 42) over small end of thimble. Install driven end of replacer 41–R–2384–540 over end of thimble until it contacts snap ring. Then push snap ring over thimble and onto shaft to secure the thrust washer and gear. Slide the output shaft bearing cone (H) onto the output shaft and using replacer 41–R–2384–540, tap the output shaft bearing cone (fig. 43) snug against the snap ring. Tap the output shaft bearing cup (G) into the transfer case (A) until the bearing cup is slightly below being flush with the case. Tap the output shaft bearing cup (R) into the transfer case (A) until the bearing cup is approximately ⅛ inch above machined surface of the case.

71. Install Output Shaft Front Bearing Cap
(fig. 35)

Place a new output shaft front bearing cap gasket (FF) in position on the case. Place the gear shifter shaft interlock (BB) in the interlock opening in the output shaft front bearing cap (CC). Slide the output shaft front bearing cap on the output shaft sliding gear fork shifter shaft (C), being careful not to damage the output shaft front bearing cap oil seal (W). Install the five ⅜–16NC–3 x 1 cap screws (DD) and ⅜-inch lock washers (EE), securing the output shaft front bearing cap to the case. Install the shifter shaft poppet balls (G

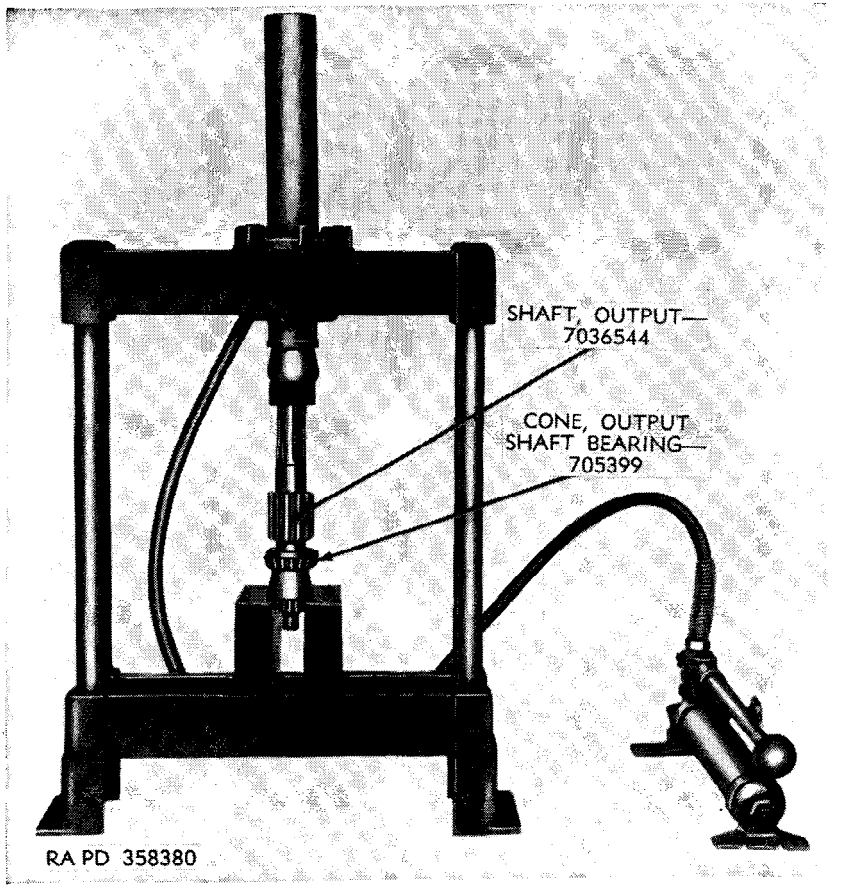


Figure 41. Installing roller bearing on output shaft.

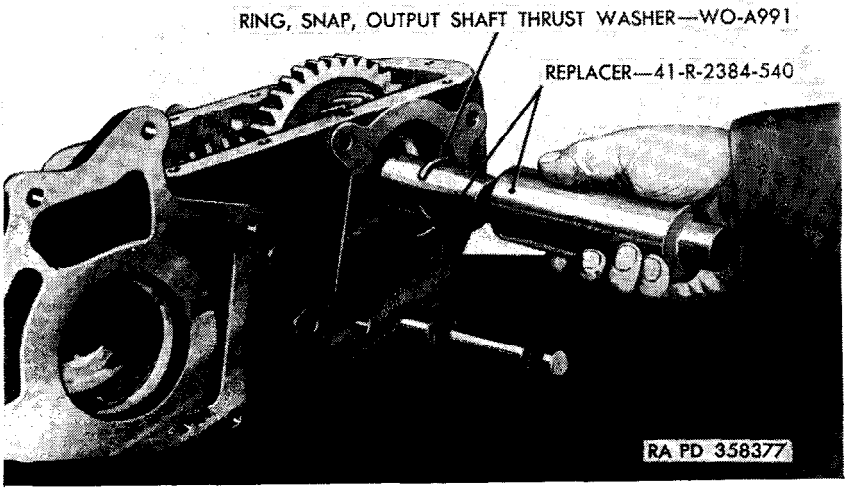


Figure 42. Installing output shaft thrust washer snap ring.

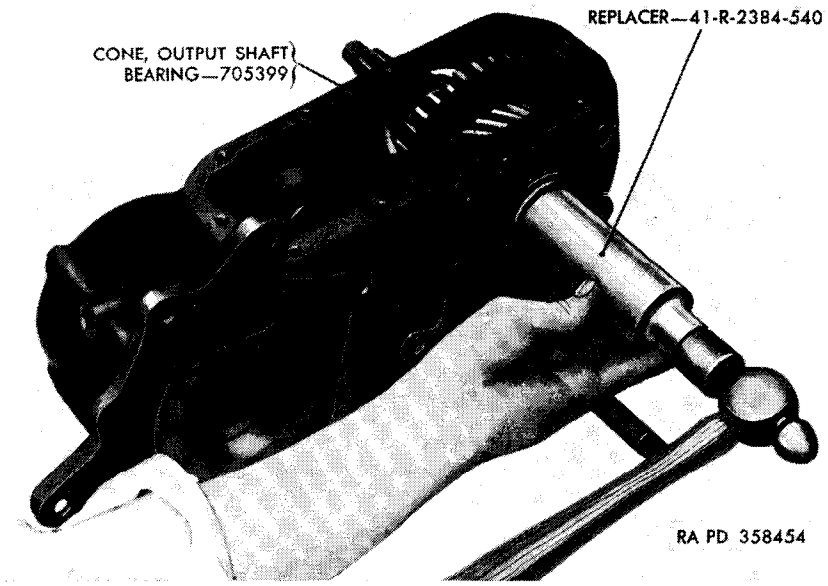


Figure 43. Installing output shaft front roller bearing.

and AA), shifter shaft poppet ball springs (F and Z), and the shifter shaft poppet ball spring plugs (E and Y) on each side of the output shaft front bearing cap.

Note. Direct and underdrive gearshift lever (K), front wheel drive gearshift lever (M), and gearshift lever springs (H and L) installation instructions are contained in TM 9–804.

72. Install Countershaft Gear Assembly

(fig. 34)

Insert the two countershaft bearings (Y) into the bore of the countershaft gear (E). Apply a thick coat of grease to countershaft gear thrust washer (F) and place in position. Start the countershaft (W) through the transfer case (A) enough to hold the countershaft gear thrust washer from slipping. Apply a thick coat of grease to the other countershaft gear thrust washer (X) and place in position. Insert locator 41–L–1607–375 (fig. 45), through the countershaft opening in the case, being careful to note that countershaft gear thrust washer (X) is over the locator. Place the countershaft gear with countershaft bearings between the two countershaft gear thrust washers. Tap the countershaft through the countershaft gear and opposite side of the case, removing the locator. Install the countershaft lock plate (V), the ⅜-inch lock washer (U) and countershaft lock plate cap screw (T), securing the countershaft lock plate.

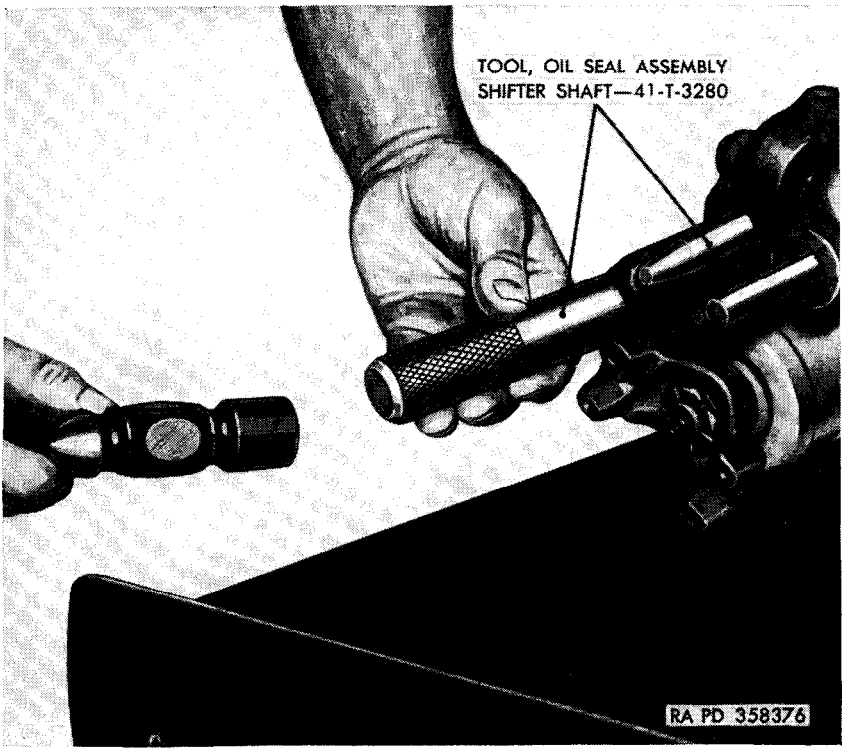


Figure 44. Installing shifter shaft oil seals.

73. Install Output Shaft Rear Bearing Cap and Parking Brake Assembly

(fig. 33)

Slide the speedometer drive gear (S, fig. 34) onto the output shaft (P, fig. 34). Install the output shaft rear bearing cap (K) and output shaft rear bearing cap shims (T, U, and V). Secure output shaft rear bearing cap with ⅜–16NC–3 x 1 cap screws (AA) and ⅜-inch lock washers (Z). Place the backing plate gasket (J) in position. Slide the internal expanding type parking brake (E) onto the output shaft rear bearing cap. Secure the parking brake assembly and output shaft rear bearing cap with ⅜–16NC–3 x ⅝ and ⅜–16NC–3 x 2¼ cap screws (KK and LL) and ⅜–inch lock washers (JJ).

Note. Be sure output shaft rear bearing cap shims have not slipped out of place and that cap screws are seated properly.

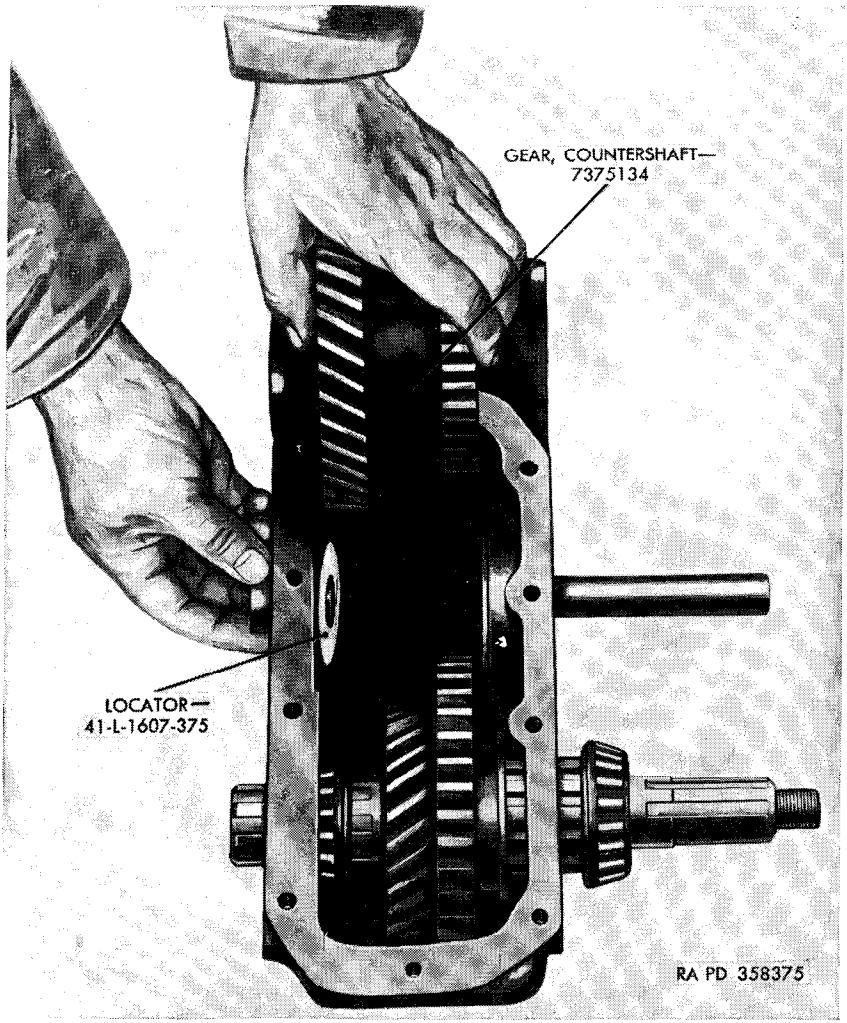


Figure 45. Installing countershaft thrust washer locator.

74. Adjust Output Shaft End Play

Note. When the output shaft rear bearing cap is installed, check the end play (fig. 46) of the output shaft. This determines the adjustment of the output shaft bearings.

The output shaft should have from 0.004- to 0.008-inch end play. Adjustment is made by removing or adding shims referred to in paragraph 73. These shims are supplied in 0.003-, 0.010-, and 0.031-inch thickness. To check the end play of the output shaft, place transfer on a level bench and block it so it cannot move. Assemble dial indicator 41–I–100 and clamp to bench (fig. 46). Place a screw driver between the output shaft gear and case to act as a lever and move output shaft to check end play.

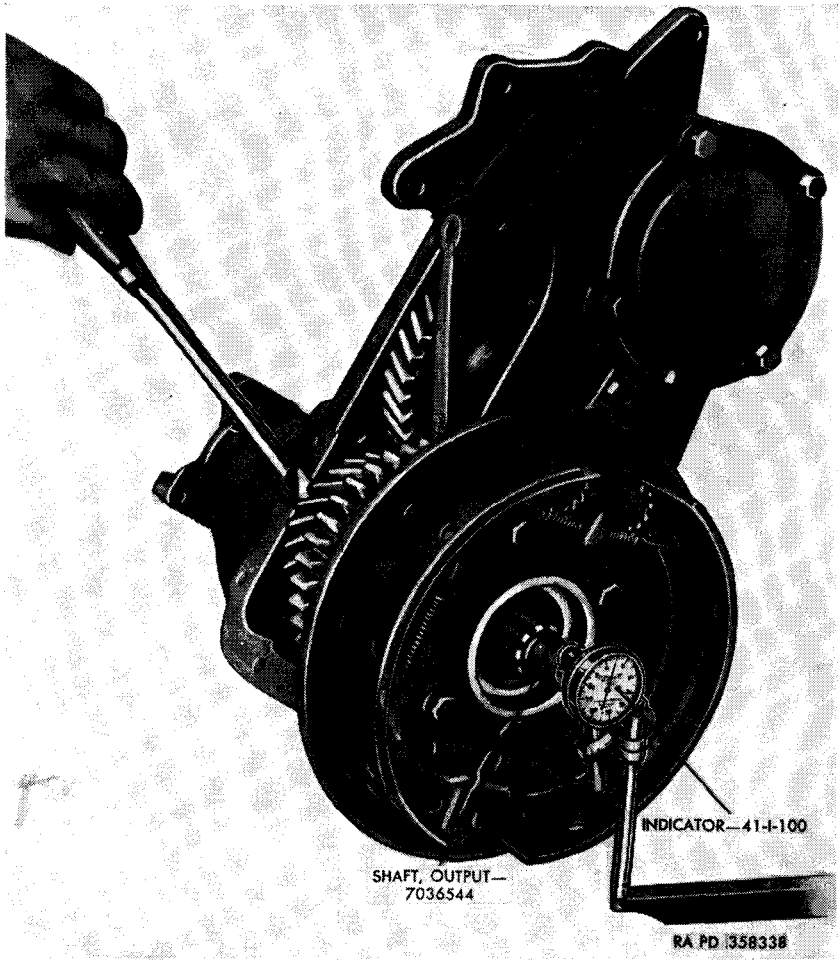


Figure 46. Checking output shaft end play.

75. Install Output Shaft Rear Bearing Cap Oil Seal and Gasket (fig. 33)

Place a new output shaft rear bearing cap oil seal gasket (H) in place on the output shaft rear bearing cap (K). Using replacer 41–R–2394–105 (fig. 47), install a new output shaft rear bearing cap oil seal (G) in the output shaft rear bearing cap. Install rear companion flange (D), ¾-inch flat washer (C), ¾–20NF–3 slotted nut (B) and cotter pin (A).

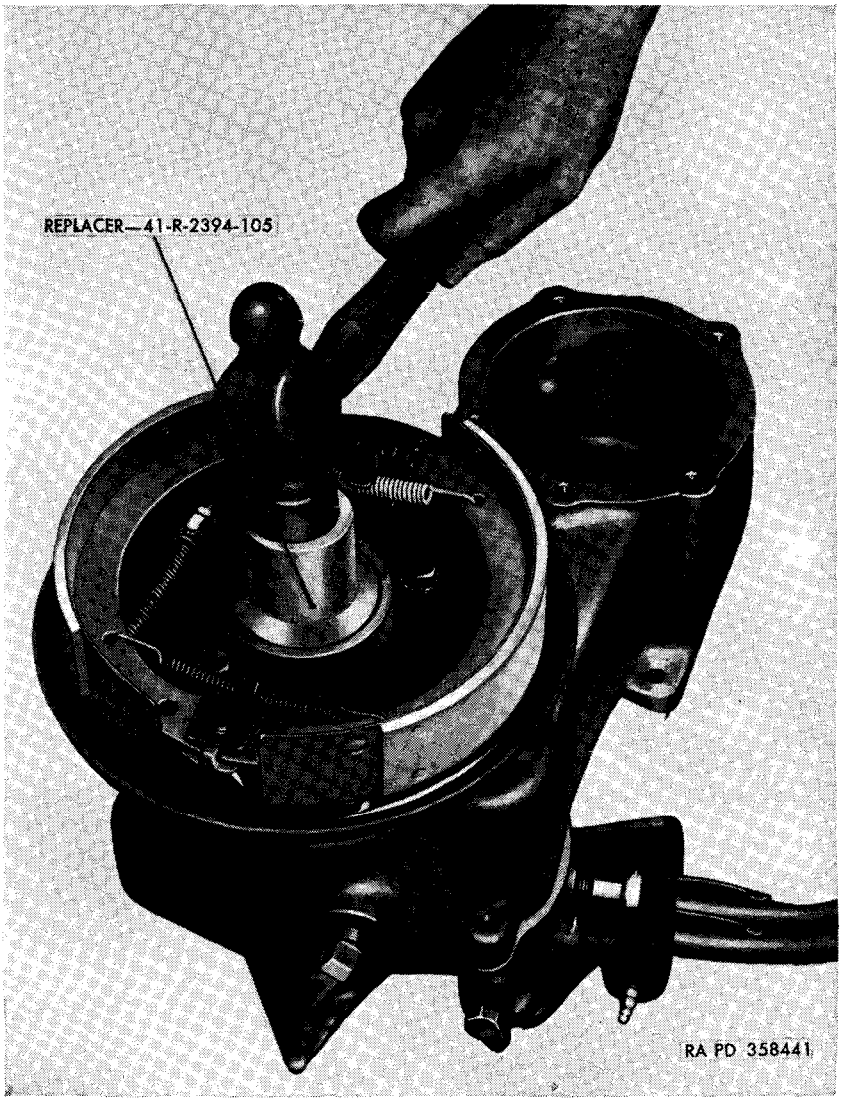


Figure 47. Installing output shaft rear bearing cap oil seal.

76. Install Bottom Cover on Transfer

(fig. 33)

Place a new bottom cover gasket (R) in position on the case (P). Place the bottom cover (S) on top of bottom cover gasket, making sure the bottom cover gasket is covered by the bottom cover. Install 10 lock washer screws (DD, fig. 34) to secure bottom cover to case.

77. Install Input Gear and Rear Cover

The input gear (D, fig. 34), rear cover (M, fig. 33), and rear cover gasket (N, fig. 33) are installed at the time transfer is installed to the transmission. This installation procedure is contained in TM 9–804.

CHAPTER 7
PROPELLER SHAFTS

Section I. DESCRIPTION AND DATA

78. Description

The power from the transfer is carried through two propeller shafts (figs. 48 and 49). One propeller shaft connects to the front of the transfer and runs to the front axle, and the second connects to the rear of the transfer and runs to the rear axle. Each propeller shaft is equipped with two universal joints. One end of each propeller shaft is equipped with a splined slip joint to allow for variations in distance between the transfer and axle units due to spring action.

Note. The slip joint is marked with an arrow on the spline shaft and on the sleeve yoke; these arrows must always be alined.

The front propeller shaft is equipped with U bolt type universal joints at both ends. With this type joint a U bolt fits over two of the universal joint bearings and bolts to either the transfer or front axle yoke. The rear propeller shaft is equipped with a U bolt type joint at the rear axle end and a snap ring joint at the transfer end. With this propeller shaft the U bolt at the rear axle universal joint end connects in the same manner as the front propeller shaft universal joints, but the snap ring universal joint at the transfer is equipped with a flange yoke which bolts directly to the transfer companion flange.

79. Data

Manufacturer	Spicer
Type joints:	
Front	U bolt
Rear	snap ring and U bolt
Bearings	needle roller

Section II. REBUILD OF PROPELLER SHAFTS

80. Removal

For complete removal information on both front and rear propeller shafts, refer to TM 9–804.

81. Disassembly

a. Front Propeller Shaft (fig. 49).

(1) *Remove journal bearings from free ends of journal.* After the bearing U bolts (S and U) are disconnected and the propeller shaft is removed from the vehicle (par. 80), the only remaining item which holds the universal joint bearings at each end of the universal joint journal is a bearing tie bar (T and V), which is tack-welded to the side of each universal joint bearing (B and M). Cut this tie bar in half and remove the universal joint bearing (B and M), journal gaskets (C and N), and gasket retainers (D) from the universal joint journal (E and P) at either end of the propeller shaft.

(2) *Remove universal joint journal from sleeve yoke* (fig. 50). Drive lightly on the end of a universal joint bearing until the opposite universal joint bearing is pushed out of the sleeve yoke flange. Turn the yoke assembly over in the vise and drive the first universal joint bearing back out of its lug, by driving on the exposed end of the universal joint journal. Use a brass drift with a flat face about $\frac{1}{32}$ inch smaller in diameter than the hole in the sliding yoke; otherwise there is danger of damaging the universal joint bearing. Repeat this operation for the other two universal joint bearings; then lift out the universal joint journal, sliding it to one side and tilting it over the top of the yoke.

(3) *Remove sleeve yoke from front propeller shaft tube.* Unscrew the dust cap (K). Slide the sleeve yoke assembly (G) off the front propeller shaft tube. Remove the dust cap and split cork packing washer (H) from the front propeller shaft tube.

b. Rear Propeller Shaft (*fig. 48*).

(1) *Remove bearing snap rings from yoke on transfer end.* Place the propeller shaft in a vise and remove the bearing snap rings (B) that secure the universal joint bearings (C) in the rear propeller shaft tube assembly (M) with a pair of pliers. If the bearing snap ring does not snap out of the groove, tap the end of the universal joint bearing lightly. This will relieve the pressure against the bearing snap ring.

(2) *Remove universal joint bearings on rear axle end.* Refer to *a*(1) above.

(3) *Remove universal joint journal from sleeve yoke* (fig. 50). Refer to *a*(2) above.

(4) *Remove sleeve yoke from shaft* (fig. 49). Refer to *a*(3) above.

82. Cleaning, Inspection, and Repair

Clean all parts thoroughly with dry-cleaning solvent or volatile mineral spirits. Inspect the propeller shafts for cracks, broken welds, scored universal joint bearing surfaces, or bent propeller shafts. Parts with any of these faults must be replaced. Inspect the sleeve yoke for worn splines, worn bearing surfaces and bearings, and plugged lubricant fittings. Check the diameter of the machined surface of the universal joint journals. If the diameter is less than 0.595 inch, replace the universal joint journal. Replace all journal gaskets regardless of their condition.

83. Assembly

a. Front Propeller Shaft (fig. 49).

(1) *Install sleeve yoke on shaft.* Place propeller shaft tube in a vise. Slide the dust cap (K) on the propeller shaft tube. Place a new split cork packing washer (H) and sleeve yoke steel washer (J) in the dust cap. Slide the sleeve yoke assembly (G) on the propeller shaft tube splines, being sure that the sleeve yoke on the propeller shaft tube is in the same angle as the yoke at the opposite end of the propeller shaft tube. Thread the dust cap onto the sleeve yoke.

(2) *Install universal joint journal in sleeve yoke* (fig. 49). Install the universal joint journal assembly (E) in either the sleeve yoke assembly (G) or the propeller shaft tube yoke at the opposite end. Tap one universal joint bearing (B), journal gasket (C), and gasket retainer (D) approximately one-quarter of an inch into the sleeve yoke. Place the other universal joint bearing and journal gasket into the opposite side of sleeve yoke and tap until top of the universal joint bearing is in line with the bearing snap ring groove. Install the bearing snap ring (A) in this side. Then tap opposite universal joint bearing in place and install bearing snap ring.

Note. This procedure applies to either end of the front propeller shaft.

(3) *Install universal joint bearing on free end of universal joint journal.* Place universal joint bearing (B), journal gasket (C), and gasket retainer (D) on both ends of universal joint journal. Position bearing tie bar (V) across both universal joint bearings and tack weld in place.

b. Rear Propeller Shaft (fig. 48).

(1) *Install sleeve yoke on propeller shaft tube.* Refer to *a*(1) above.

(2) *Install universal joint journal in yoke on rear axle end of propeller shaft tube.* Install the universal joint journal (T) in

the yoke. Tap one universal joint bearing (C), journal gasket (Q), and gasket retainer (R) approximately one-quarter of an inch into the yoke. Place the other universal joint bearing, journal gasket, and gasket retainer into the opposite side of the yoke and tap until top of the universal joint bearing is in line with the bearing snap ring groove. Install the bearing snap ring (N) in this side. Then tap opposite universal joint bearing in place, and install bearing snap ring.

(3) *Install universal joint bearing on free end of universal joint journal at rear axle end of propeller shaft tube.* Refer to *a*(3) above.

(4) *Install universal joint journal in rear propeller shaft flange yoke.* Insert the universal joint journal assembly (G) into the rear propeller shaft flange yoke (A). Place the journal gasket (D), gasket retainer (E), and universal joint bearing (C) in flange yoke and tap onto universal joint journal. Tap the universal joint bearing approximately one-quarter of an inch into the rear propeller shaft flange yoke (A), using a brass drift approximately one-thirty-second of an inch smaller than the hole in the flange yoke. Tap the opposite universal joint bearing and journal gasket in the opposite side of the flange yoke until the top of the universal joint bearing is in line with the bearing snap ring groove; install bearing snap ring (B). Tap opposite universal joint bearing into flange yoke; install bearing snap ring.

(5) *Install rear propeller shaft flange yoke assembly in sleeve yoke.* Insert the flange yoke assembly in the sleeve yoke assembly (H) so that universal joint journals are in holes in sleeve yoke. Install journal gasket (D) and universal joint bearing (C) in one end of sleeve yoke assembly (H) and tap universal joint bearing approximately one-quarter of an inch into sleeve yoke assembly (H). Place universal joint bearing in opposite side of sleeve yoke and tap this bearing until the top of the bearing is in line with the bearing snap ring groove, install the bearing snap ring (B). Tap other universal joint bearing down and install bearing snap ring.

84. Installation

For complete informationon both front and rear propeller shafts, refer to TM 9–804.

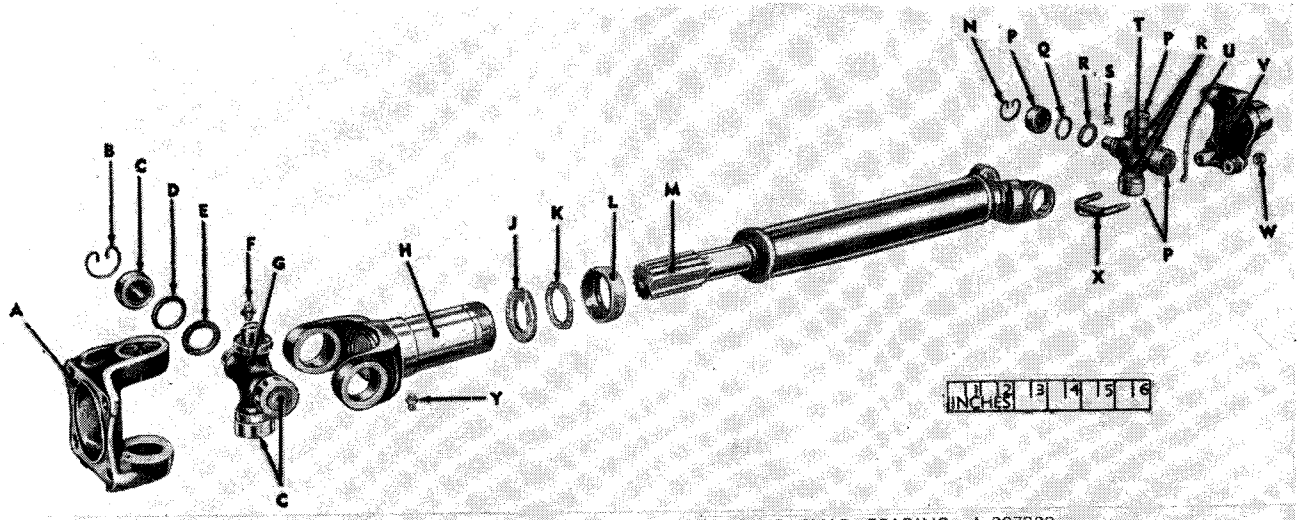


Figure 48. Rear propeller shaft (snap-ring type)—exploded view.

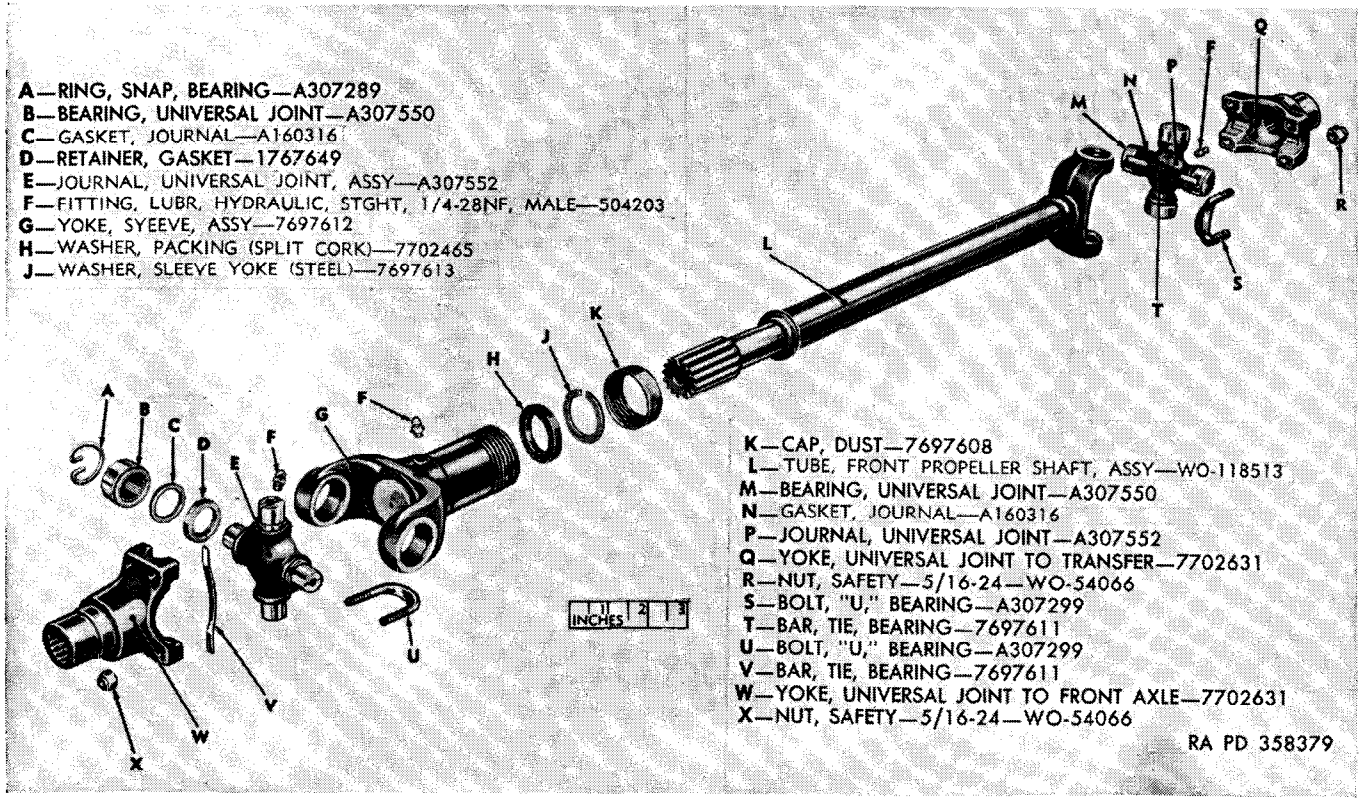


Figure 49. Front propeller shaft (U *bolt type*)*—exploded view.*

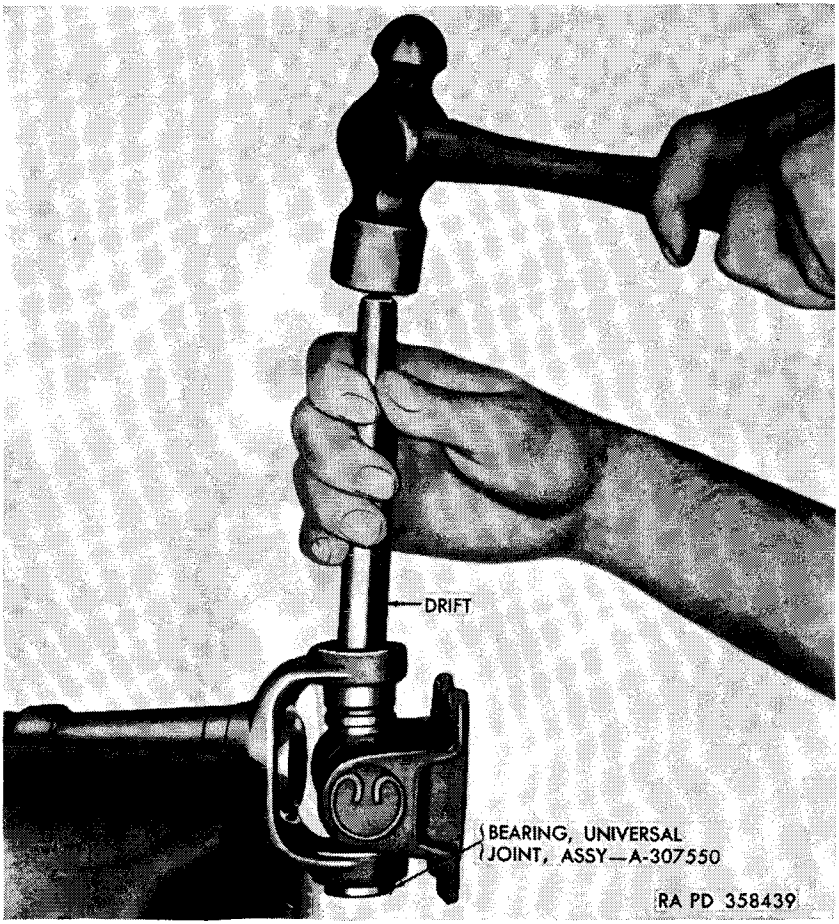


Figure 50. Removing universal joint bearing.

CHAPTER 8
FRONT AXLE

Section I. DESCRIPTION AND DATA

85. Description

The front axle (fig. 51) is a live driving unit with hypoid-type driving gears and spherical steering knuckles mounted on king pins attached to steering knuckle caps, which ride on tapered king pin bearings. The drive is of the full floating type, through axle shafts built integrally with constant velocity universal joints which revolve in the steering knuckles. The steering knuckles are connected by tie rods that are mounted on ball and socket connections. The tie rods are adjustable to secure proper toe-in of the front wheels. Caster and camber of the front wheels are built into the axle and cannot be changed.

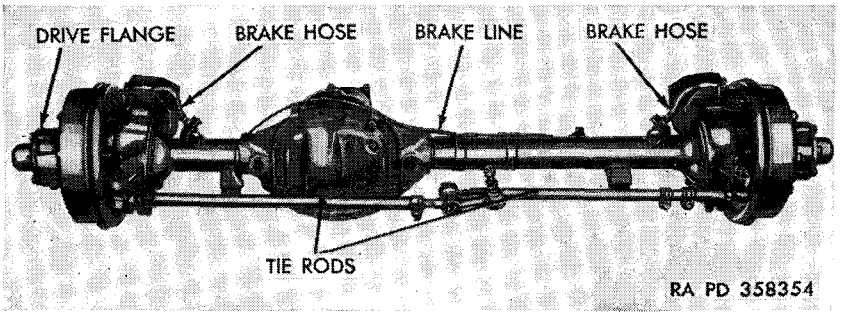


Figure 51. Front axle assembly.

86. Differences in Axle Shafts

a. General. Two type of universal joints have been used in the axle shafts on this vehicle: Bendix (fig. 52) and Rzeppa (fig. 53). The basic function is identical with minor differences given in *b* and *c* below. Axles using the different type universal joints are readily identified by a tag attached to the spindle housing.

b. Bendix (fig. 52). The end play of the Bendix joint and the axle shaft is predetermined in manufacture by the position and flange thickness of the wheel bearing spindle bearing (P) and the wheel spindle bearing thrust washer (M). These parts are so positioned, and of the correct thickness, to provide a satisfactory end play of the axle shaft and also to allow the center point of the universal

joint to rotate at the center line of the kingpins (J). The wheel bearing spindle bearing (P) requires no reaming as it is so designed that when it is pressed into the spindle, it will be compressed to provide the correct running clearance.

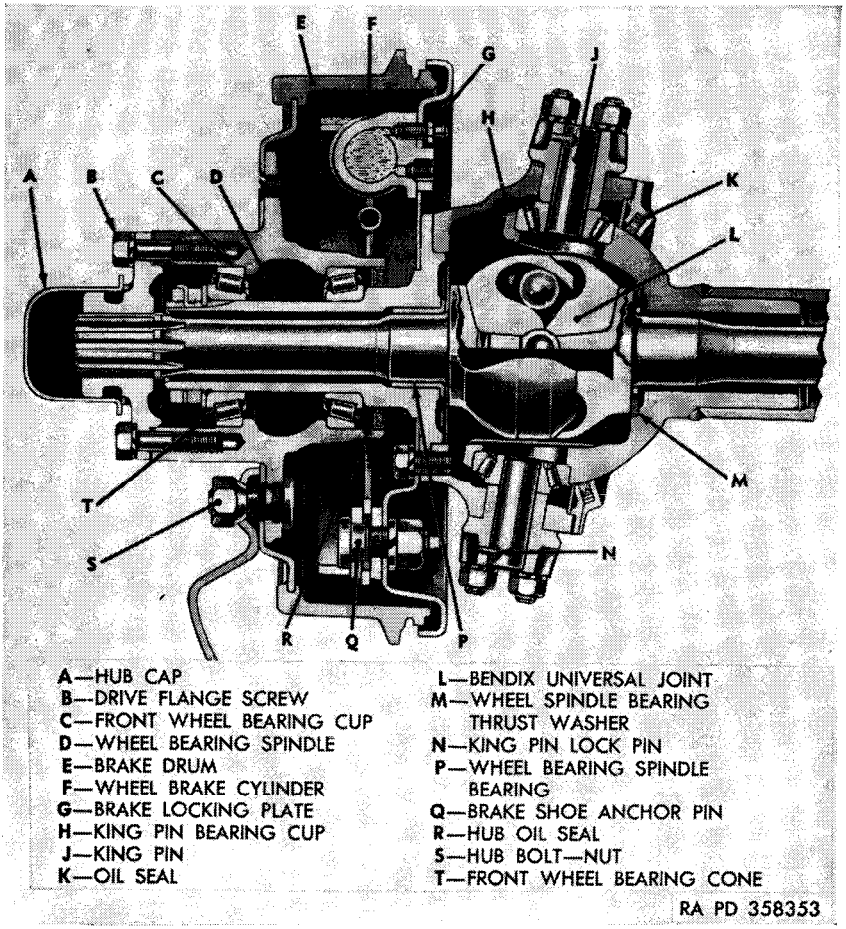


Figure 52. Front axle with Bendix universal joint.

c. Rzeppa (fig. 53). The end play of the Rzeppa joint axle shaft is also predetermined in manufacture by the position and thickness of the wheel bearing spindle bearing (D) and by using a snap ring (B) at the outer end of the axle shaft. The wheel spindle bearing thrust washer (H) is not effective for use with the Rzeppa shaft, but is placed in all gear carrier housing tubes so that both types of axle shafts may be used. The snap ring (B) and wheel bearing spindle (D) are so positioned, and of the correct thickness, to provide a

satisfactory end-play of the axle shaft and to allow the center point of the universal joint to rotate at the center line of the king pins (G). The wheel bearing spindle bearing (D) requires no reaming as it is so designed that when it is pressed into the spindle, it will be compressed to provide the correct running clearance.

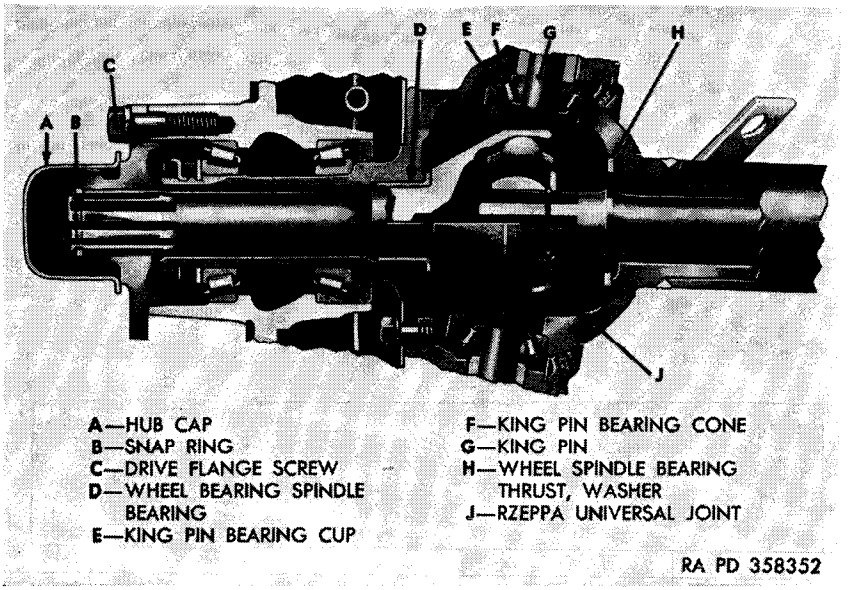


Figure 53. Front axle with Rzeppa universal joint.

87. Data

Lubricant capacity	1¼ qts
Manufacturer	Spicer
Model	25
Ratio	5.38 to 1
Type	full-floating
Universal joints manufacturer	Bendix or Rzeppa

Section II. DISASSEMBLY OF FRONT AXLE

88. General

Disassembly instructions contained in this chapter are based on the prior removal of the front axle from the vehicle and removal of brake lines, etc., from axle, as outlined in TM 9–804. Several of these operations can be made with the front axle installed in the vehicle; however, it is recommended that the front axle be removed prior to the start of repair or rebuild for most efficient operation.

89. Remove Axle Shaft Assembly

a. Remove Hub Cap. Pry hub cap (A, fig. 54) off with a screw driver.

b. Remove Snap Ring.

Note. This operation only pertains to axle shafts equipped with Rzeppa universal joints.

Remove snap ring (B, fig. 54) with suitable remover.

c. Remove Driving Flange (fig. 54). Remove cap screws (Z) and lock washers (Y) securing front axle drive flange (C). Remove the front axle drive flange using puller 41–P–2956–4 (fig. 55) and discard the drive flange axle shaft gasket (D).

d. Remove Hub and Drum Assembly (fig. 54). Using wrench 41–W–3825–200 (fig. 56), remove the front axle wheel bearing nut (E). Bend the lip back and remove front axle wheel bearing lock washer (F). Remove front axle wheel bearing nut (G) and front axle wheel bearing lock washer (H). Shake brake drum (L) and wheel hub (M) off; remove front wheel bearing cones and cups (J, K, N, and P).

e. Remove Brake Assembly and Wheel Bearing Spindle (fig. 54). Remove remaining cap screws and lock washers securing brake backing plate assembly (R) and wheel bearing spindle (S). Remove brake backing plate and wheel bearing spindle.

f. Remove Axle Shaft Assembly (fig. 54). Pull right axle shaft (T) directly out of right steering knuckle (U).

g. Remove Opposite Axle Shaft Assembly. Follow instructions given in *a* through *f* above for removal of opposite axle shaft assembly.

90. Remove Tie Rods

(fig. 70)

Remove the cotter pins (F), tie rod end nuts (E), tie rod end springs (D), and grease retaining cover (C) that secure the tie rod ends (B and P) to the steering knuckle arms. Remove the cotter pin (F), tie rod end nut (E), tie rod end springs (D), and grease retaining cover (C) securing left-hand thread tie-rod end (B) to the steering bell-crank; remove the tie rods.

91. Remove Steering Knuckles

(fig. 57)

Remove the four cap screws (BB) and ⅜-inch lock washers (AA); remove the lower steering knuckle flange cap (Z) with king pin attached. Remove the four cap screws (F) and ⅜-inch lock washers (E). Remove the brake hose guard (D), upper steering knuckle flange cap (C) with king pin attached, and king pin bearing shim (W).

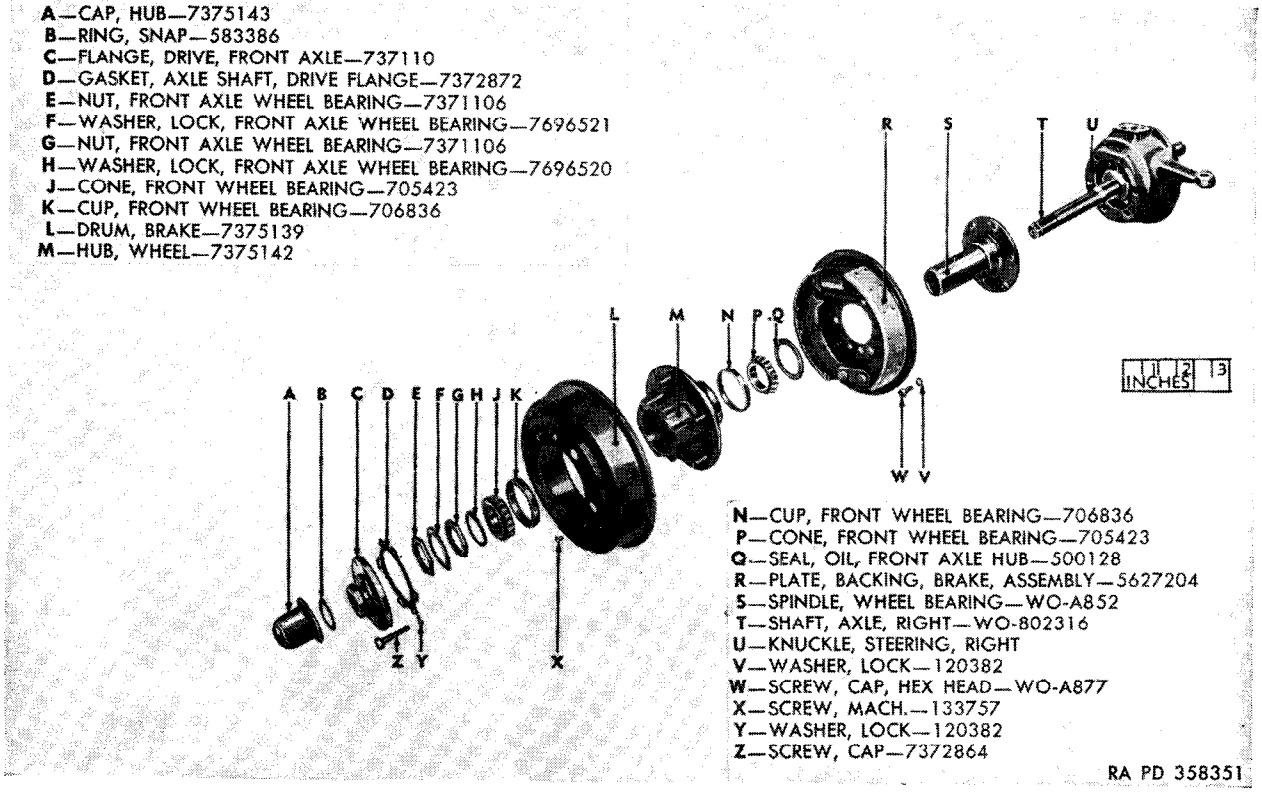


Figure 54. Right front axle shaft—exploded view.

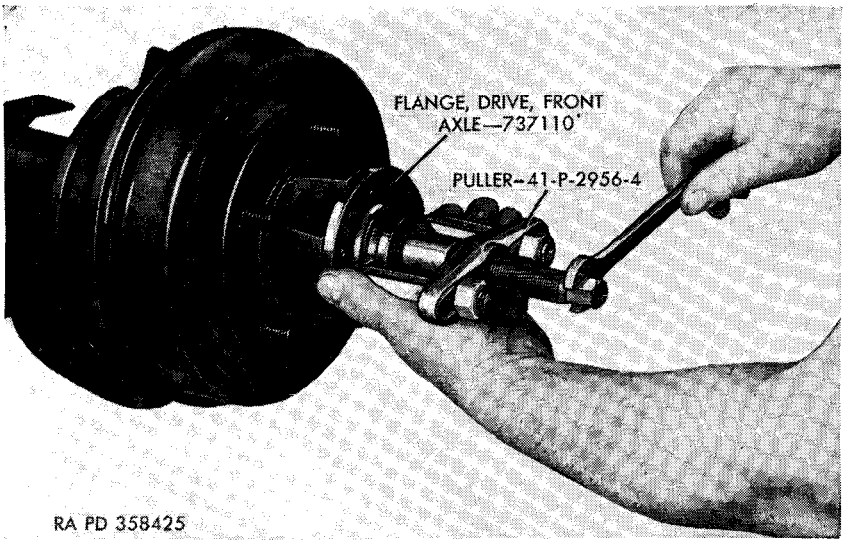


Figure 55. Removing front axle shaft driving flange.

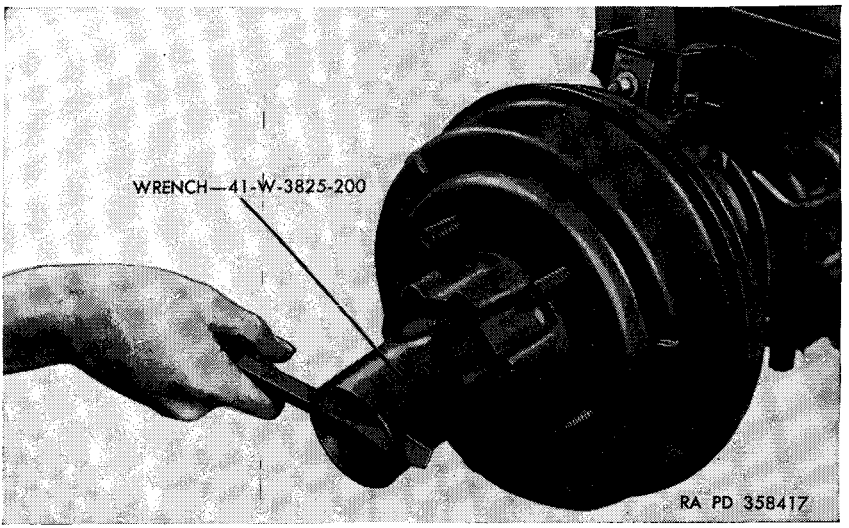


Figure 56. Removing front axle wheel bearing nut.

Remove the eight lock washer screws securing the two halves of the steering knuckle oil seal retainer (U and K); remove the steering knuckle oil seals (R and H), steering knuckle oil seal springs (S and J), and steering knuckle oil seal gasket (X). Remove the right steering knuckle (Y) from the tube end of the gear carrier housing with tube assembly (L).

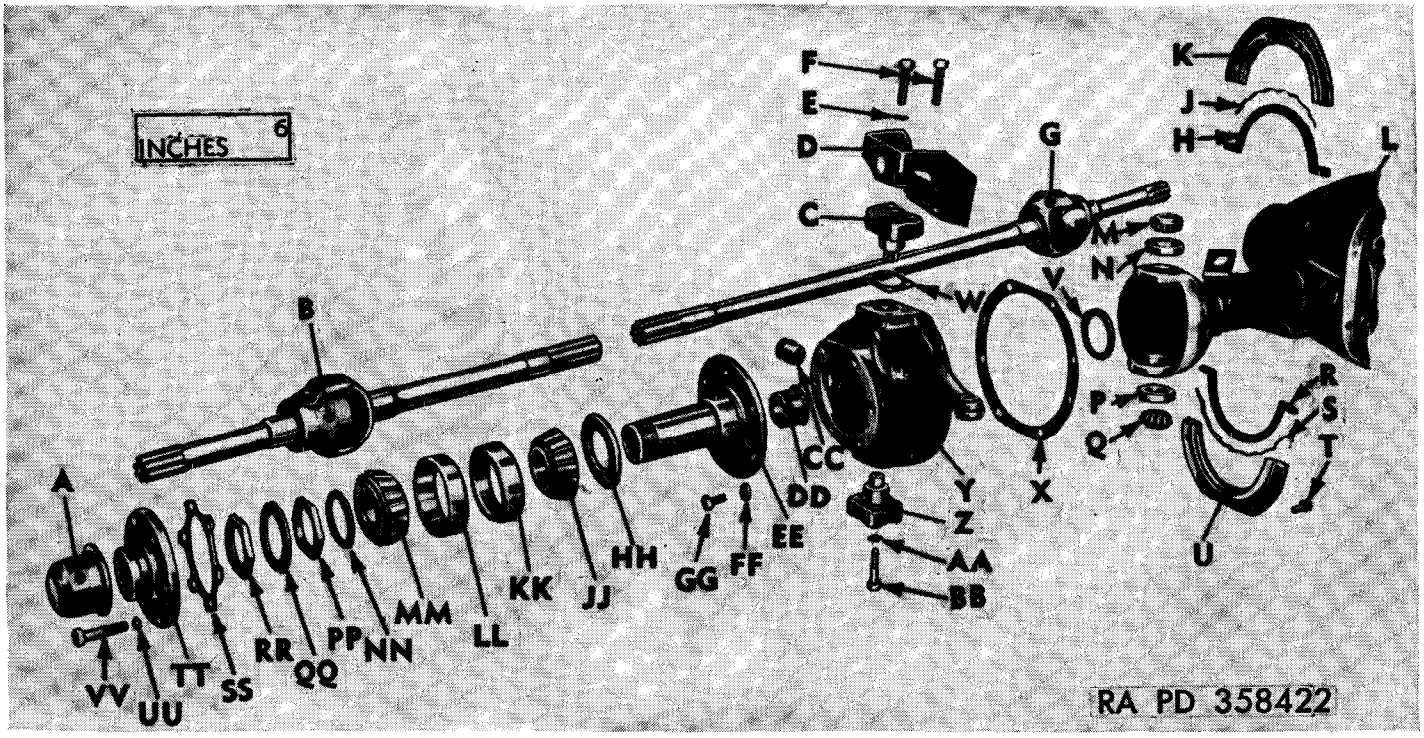


Figure 57. Front axle shaft—partially exploded view.

A—CAP, HUB—7375143
B—SHAFT, AXLE, RIGHT—7351403
C—CAP, STEERING KNUCKLE FLANGE—7371108
D—GUARD, BRAKE HOSE—7032625
E—WASHER, LOCK, ⅜ IN—120382
F—SCREW, CAP—181645
G—SHAFT, AXLE, LEFT—7351404
H—SEAL, OIL, STEERING KNUCKLE—SP-18593
J—SPRING, STEERING KNUCKLE OIL SEAL—7032628
K—RETAINER, STEERING KNUCKLE OIL SEAL—WO-A814
L—HOUSING, GEAR CARRIER, W/TUBE ASSY—7348602
M—CONE, KING PIN BEARING—705381
N—CUP, KING PIN BEARING—706813
P—CUP, KING PIN BEARING—706813
Q—CONE, KING PIN BEARING—705381
R—SEAL, OIL, STEERING KNUCKLE—SP-18593
S—SPRING, STEERING KNUCKLE OIL SEAL—7032628
T—SCREW, LOCK-WASHER—WO-802498
U—RETAINER, STEERING KNUCKLE OIL SEAL—WO-A814
V—WASHER, THRUST, UNIVERSAL JOINT—7372870
W—SHIM, KING PIN BEARING—7371105
X—GASKET, STEERING KNUCKLE OIL SEAL—WO-A820
Y—KNUCKLE, STEERING, RIGHT—7375047
Z—CAP, STEERING KNUCKLE FLANGE—7371108
AA—WASHER, LOCK, ⅜ IN—120382
BB—SCREW, CAP—181643
CC—PLUG, STEERING KNUCKLE OIL FILLING OPENING—7372879
DD—BEARING, WHEEL BEARING SPINDLE—7375045
EE—SPINDLE, WHEEL BEARING—WO-A852
FF—WASHER, LOCK ¾ IN—120382
GG—BOLT, HEX-HEAD, ¾ IN—WO-A877
HH—SEAL, OIL, FRONT AXLE HUB—500128
JJ—CONE, FRONT WHEEL BEARING—705423
KK—CUP, FRONT WHEEL BEARING—706836
LL—CUP, FRONT WHEEL BEARING—706836
MM—CONE, FRONT WHEEL BEARING—705423
NN—WASHER, LOCK, FRONT AXLE WHEEL BEARING—7696520
PP—NUT, FRONT AXLE WHEEL BEARING—7371106
QQ—WASHER, LOCK, FRONT AXLE WHEEL BEARING—7696521
RR—NUT, FRONT AXLE WHEEL BEARING—7371106
SS—GASKET, FRONT AXLE DRIVE FLANGE—7372872
TT—FLANGE, DRIVE, FRONT AXLE—7371110
UU—WASHER, LOCK, ⅜ IN—120382
VV—SCREW, CAP, ⅜ IN—7372864

Figure 57—Continued

92. Remove Differential Gear Case
(fig. 58)

Remove the ten lock-washer screws (H) securing the gear carrier housing cover (F). Remove the gear carrier housing cover (F) and housing cover gasket (D). Discard the old gasket. Remove the two case bearing cap screws (K) from the case bearing cap (C) at each end of the differential gears; remove the case bearing caps. Place differential case carrier spreader 41–S–4158–500 (fig. 59) in position on the gear carrier housing. Spread the gear carrier housing enough to provide adequate clearance and remove the front axle differential case. Install the case bearing caps in the gear carrier housing, noting the bearing cap markings to assure correct location.

93. Disassemble Axle Shaft Assembly With Bendix Universal Joint

It is not necessary to disassemble the axle shaft assembly (fig. 60) unless check for excessive play or backlash (*b* below) indicates wear which may require replacement of parts or further inspection (par. 99*d*(1)). If necessary to disassemble, proceed as outlined below.

a. Clean Axle Shaft Assembly. Clean the entire axle shaft assembly in volatile mineral spirits or dry-cleaning solvent. Pay particular attention to removing all grease from the universal joint area for ease of disassembly.

b. Check Universal Joint for Backlash or Play. To determine if excessive play or backlash exists in the universal joint, place assembly in vise in a vertical position, with outer shaft up and vise jaws gripping inner shaft just below the universal joint. Use soft metal or wooden protectors in jaws of vise. Firmly push down on outer shaft so it rests on center ball, and at the same time, attempt to twist the joint in both directions. If any backlash or play is found, oversize universal joint balls should be installed at time of assembly (par. 112).

c. Remove Universal Joint Groove Pin (fig. 61). Place the axle shaft in a vise equipped with protectors and with a long-nosed drift, remove the universal joint groove pin from the universal joint. Remove the axle shaft from vise.

d. Dislodge Center Ball Pin. After removing universal joint groove pin (*c* above), hold the axle shaft assembly in a vertical position and bounce on a block of wood until the universal joint center ball pin (F, fig. 60) drops clear of the universal joint center ball (E, fig. 60).

e. Remove Universal Joint Balls (fig. 62). Place the axle shaft with the outer end in a vise. Bend the axle shaft so the universal joint center ball (E, fig. 60) can be rotated until the grooved surface of the ball is facing the first universal joint outer ball (C, fig. 60) that is to

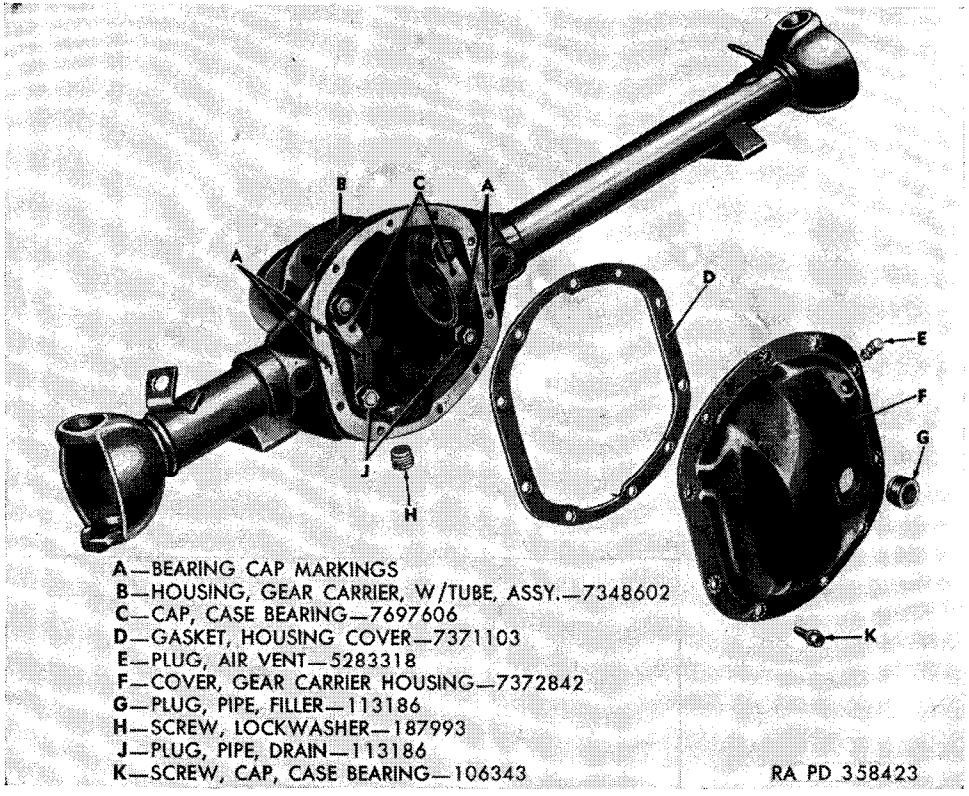


Figure 58. Differential gear carrier housing—partially exploded view.

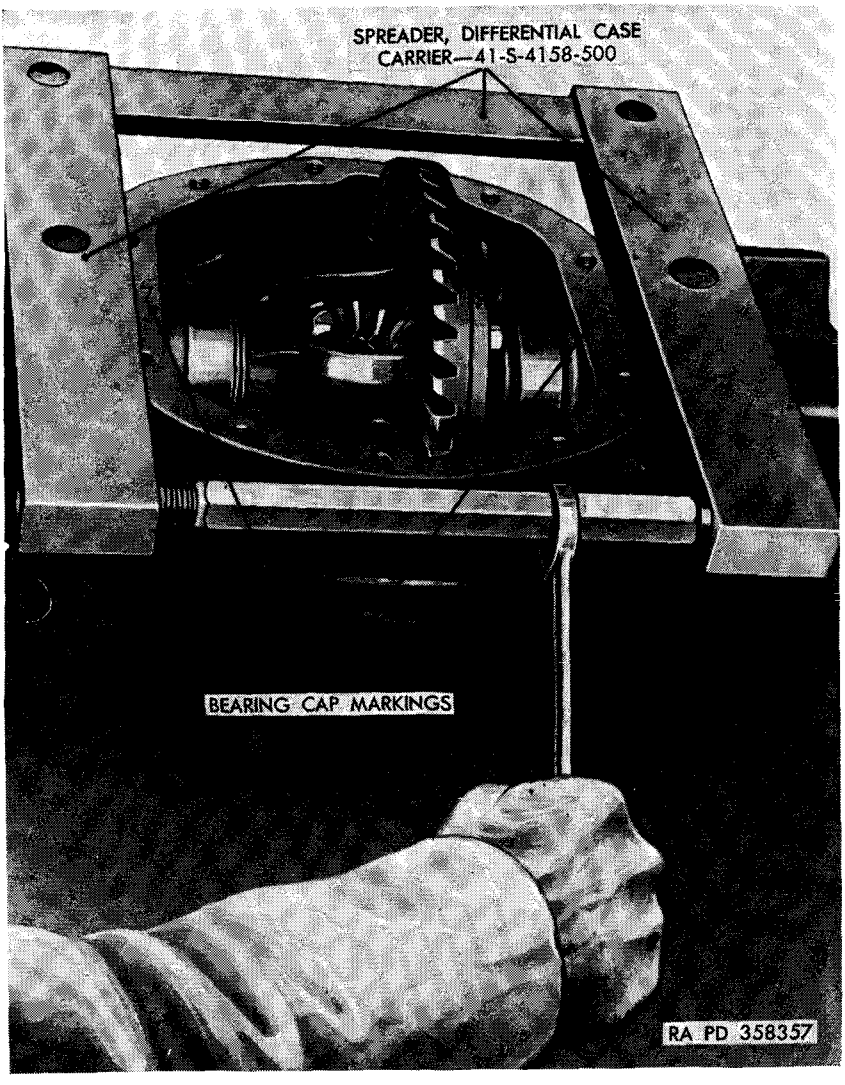


Figure 59. Removing differential case from carrier housing.

be removed. Holding the axle shaft in a bent position, raise the axle shaft until the first universal joint outer ball to be removed slides into into the groove of the universal joint center ball, and remove the universal joint outer ball The remaining universal joint outer balls can now be removed and the axle shafts separated. Tap the short end of axle shaft to remove universal joint groove pin.

94. Disassemble Axle Shaft Assembly With Rzeppa Universal Joint

It is not necessary to disassemble the axle shaft assembly (fig. 60) unless check for excessive play or backlash (*b* below) indicates wear which may require replacement of parts or further inspection (par. 112). If necessary to disassemble, proceed as outlined below:

a. Clean Axle Shaft Assembly. Clean the entire axle shaft assembly in volatile mineral spirits or dry-cleaning solvent. Pay particular attention to removing all grease from the universal joint area for ease of disassembly.

b. Check Universal Joint for Backlash or End Play. To determine if excessive backlash or end play exist in the universal joint, place assembly in vise in a vertical position, with outer shaft up, and vise jaws gripping inner shaft just below the universal joint. Use soft metal or wooden protectors in jaws of vise. Firmly press down on outer shaft and attempt to twist the universal joint in both directions. If any backlash or end play is evident, defective parts must be replaced (par. 112).

c. Remove Inner Axle Shaft (fig. 60). Remove the three flat-headed universal joint retainer screws (N) that secure the universal joint inner shaft retainer (L) to the universal joint race (H). Slide the inner axle shaft (M) out of the universal joint cage (J).

d. Remove Universal Joint Balls From Universal Joint Cage (fig. 63). Tilt the universal joint cage in the axle shaft up until the opposite side of the universal joint cage is out of the outer shaft. It may be necessary to use a brass drift and hammer to tilt the universal joint cage. Use a screw driver to pry the universal joint balls out of the universal joint cage. Repeat the operation until all of the balls are removed.

e. Remove Cage and Inner Race From Axle Shaft (fig. 63). Turn the universal joint cage in the axle shaft cup in line with the two larger elongated holes between the two bosses in the axle shaft. Lift the universal joint cage and universal joint race from the axle shaft cup.

f. Separate Universal Joint Race From Universal Joint Cage (fig. 64). Turn the universal joint race in the universal joint cage so that one of the bosses on the universal joint race can be dropped into one of the

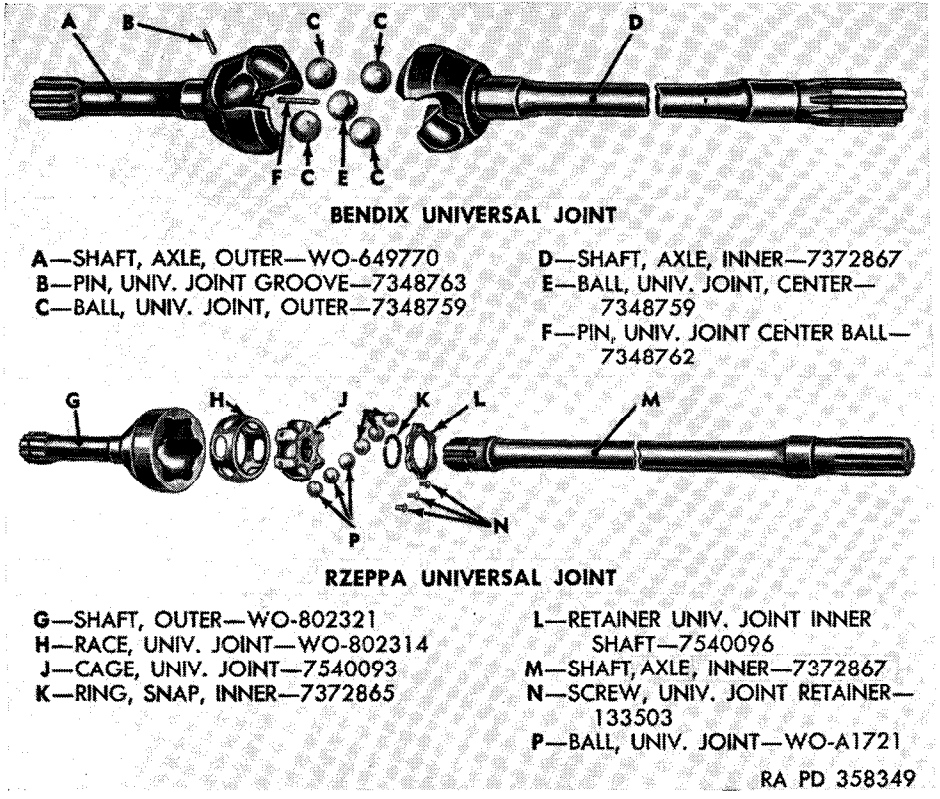


Figure 60. Front axle shafts—exploded view.

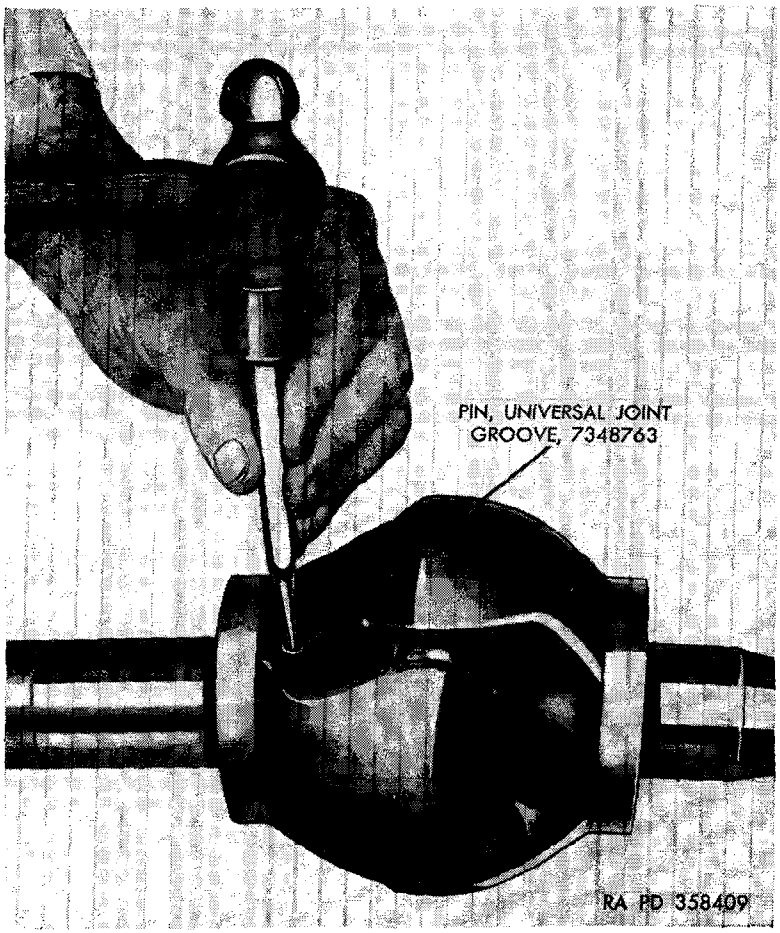


Figure 61. Removing Bendix universal joint groove pin.

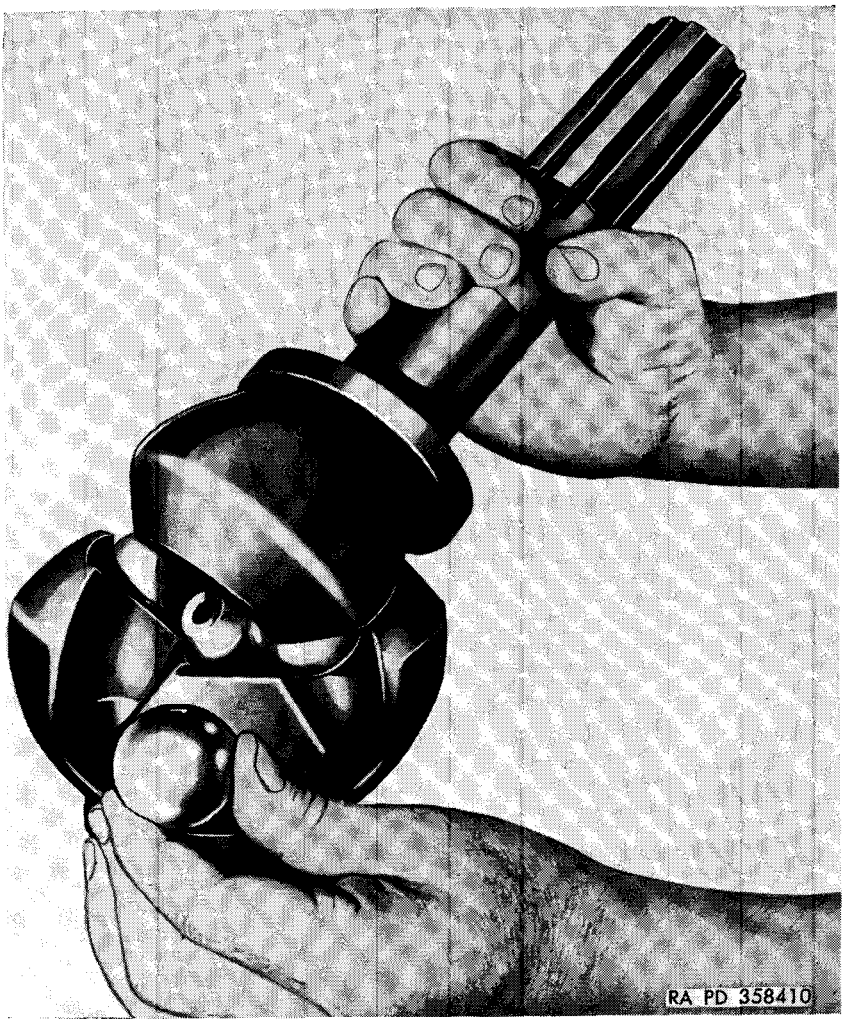


Figure 62. Removing Bendix universal joint balls.

two elongated holes in the universal joint cage. Separate the universal joint race from the universal joint cage.

95. Disassembly of Tie Rod Assembly

Disassemble the tie rods (fig. 70) (par. 100*f*) only if inspection (par. 99*c*) indicates such action is necessary.

96. Disassemble Differential Case

a. Remove Differential Bevel Pinions and Side Gears (fig. 65). Place the differential case assembly in a vise equipped with soft-metal or

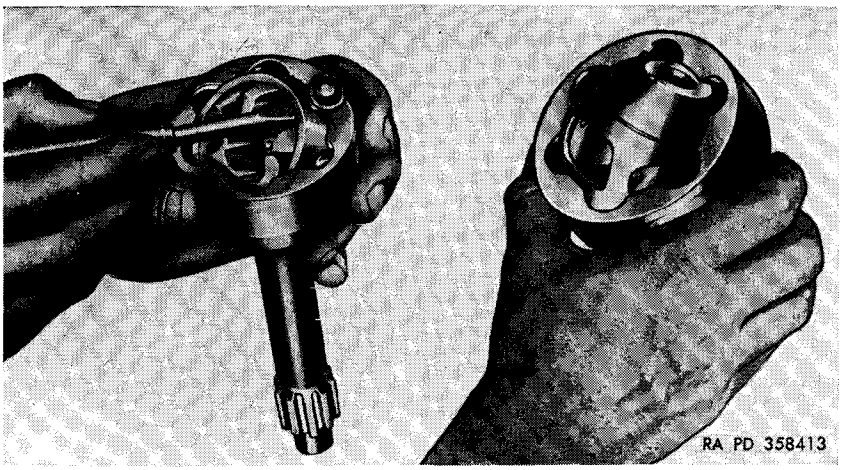


Figure 63. Removing Rzeppa universal joint balls.

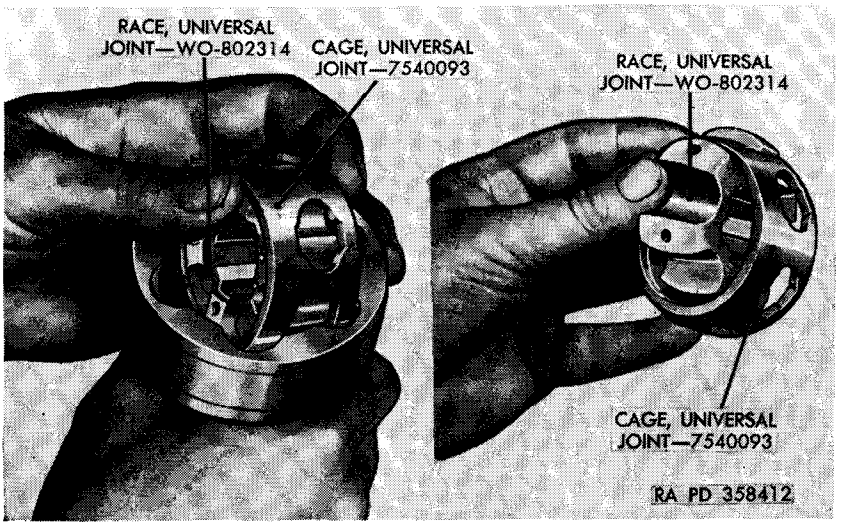


Figure 64. Separating Rzeppa universal joint race from universal joint cage.

wooden jaw protectors. Using a long-nosed drift, drive the pinion shaft locking pin (L) out of the differential case (fig. 66). Tap the differential pinion shaft (J) from the differential case with a brass drift and hammer. Remove the two bevel pinions (W–2), differential pinion thrust washers (V and Y), the two side gears (W–1), and side gear thrust washers (U and X) from the differential case.

b. Remove Drive Gear From Differential Case (fig. 65). Bend the ears of the drive gear screw lock plates (H) off the axle drive gear screws (G). Remove the axle drive gear screws (G) that secure the

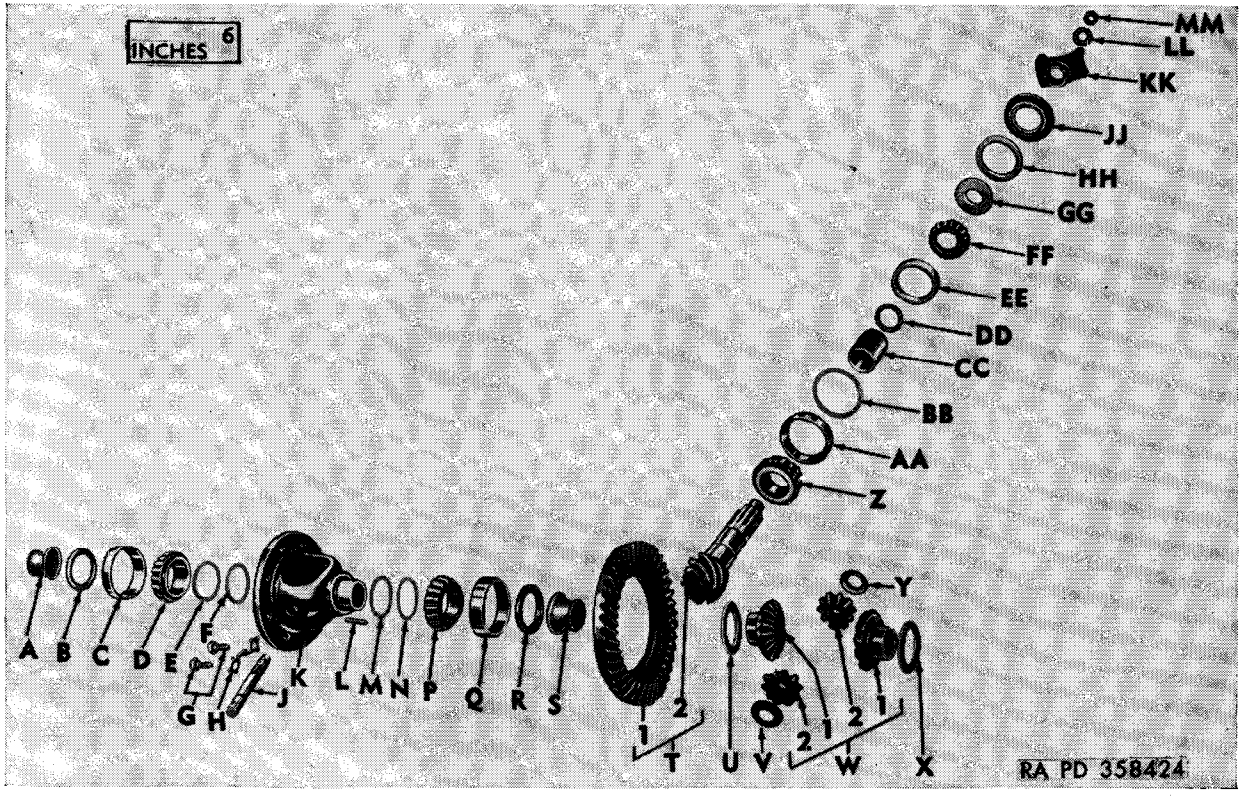


Figure 65. Differential assembly—exploded view.

A—GUIDE, AXLE SHAFT—7372869
B—SEAL, OIL, AXLE SHAFT, OUTER—500034
C—CUP, BEARING, DIFFERENTIAL CASE—706849
D—CONE, BEARING, DIFFERENTIAL CASE—705438
E—SHIM, BEARING, CASE (0.003 INCH THICK)—7372843
F—SHIM, BEARING, CASE (0.005 INCH THICK)—7372844
G—SCREW, AXLE DRIVE GEAR—7372863
H—PLATE, LOCK, DRIVE GEAR SCREW—7372857
J—SHAFT, DIFFERENTIAL PINION—7372856
K—CASE, DIFFERENTIAL—7372854
L—PIN, LOCKING, PINION SHAFT—7372858
M—SHIM, BEARING, CASE (0.010 INCH THICK)—7372845
N—SHIM, BEARING, CASE (0.030 INCH THICK)—7372846
P—CONE, BEARING, DIFFERENTIAL CASE—705438
Q—CUP, BEARING, DIFFERENTIAL CASE—706849
R—SEAL, OIL, AXLE SHAFT, OUTER—500034
S—GUIDE, AXLE SHAFT—7372869
T—GEAR, W/PINION, SET—WO-801926
1. GEAR, DRIVE (43 TEETH)—WO-640699
2. PINION, DRIVE (8 TEETH)—WO-801927
U—WASHER, THRUST, SIDE GEAR—WO-A795
V—WASHER, THRUST, DIFFERENTIAL PINION—7371102
W—GEAR, SIDE, W/PINION, SET—WO-644148
1. GEAR, SIDE—WO-644141
2. PINION, BEVEL—WO-644142
X—WASHER, THRUST, SIDE GEAR—WO-A795
Y—WASHER, THRUST, DIFFERENTIAL PINION—7371102
Z—CONE, BEARING, DRIVE PINION INNER—705478
AA—CUP, BEARING, DRIVE PINION INNER—706877
BB—SHIM, DRIVE PINION BEARING (LARGE)—WO-639969
CC—SPACER, DRIVE PINION BEARING—7371101
DD—SHIM, DRIVE PINION BEARING (SMALL)—WO-639972
EE—CUP, BEARING, DRIVE PINION OUTER—707063
FF—CONE, BEARING, DRIVE PINION OUTER—705271
GG—SLINGER, OIL, DRIVE PINION BEARING—WO-636566
HH—GASKET, DRIVE PINION OIL SEAL—7372855
JJ—SEAL, OIL, DRIVE PINION—500071
KK—YOKE, PROPELLER SHAFT TO AXLE—WO-A1445
LL—WASHER, FLAT, ¾ IN—7372868
MM—NUT, HEX, ¾ IN—7032635

Figure 65– Continued

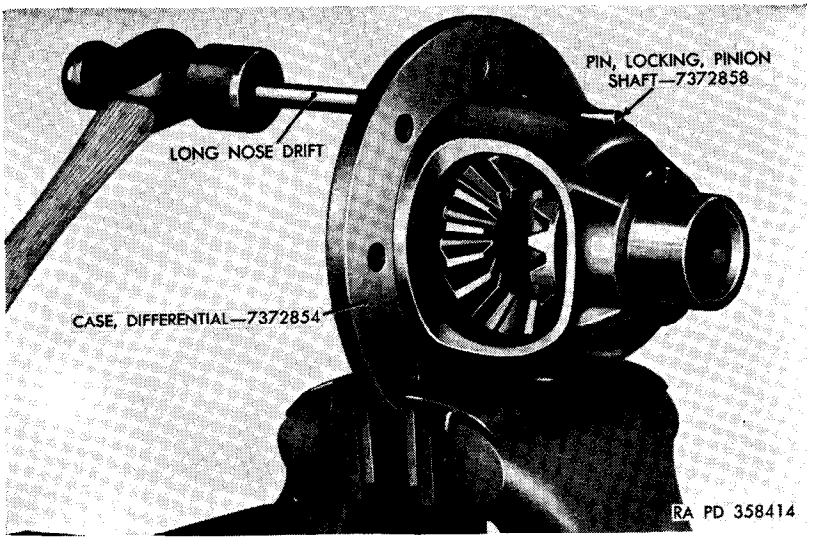


Figure 66. Removing pinion shaft locking pin.

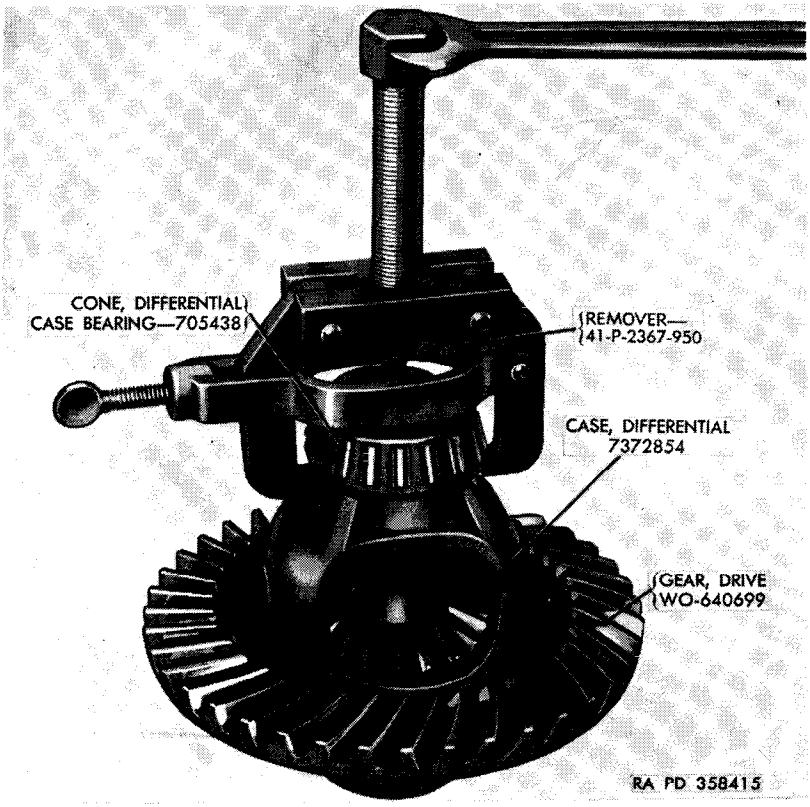


Figure 67. Removing differential case bearing cone from differential case.

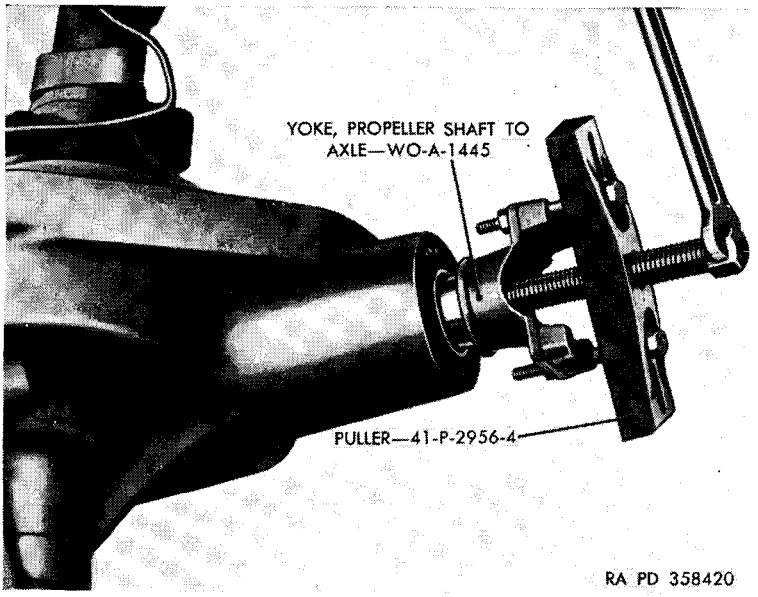


Figure 68. Removing propeller shaft to axle yoke.

drive gear (T–1) to the differential case (K); remove the drive gear (T–1).

c. Remove Bearing Cones From Differential Case (fig. 67). Place the differential case in a vise. Using remover 41–R–2367–950, remove the differential case bearing cones (D and P, fig. 65) from each end of the differential case. Remove the case bearing shims (E, F, M, and N, fig. 65), noting the thickness of those removed from each end.

97. Remove Drive Pinion

Remove the ¾-inch hex nut (MM) and ¾-inch flat washer (LL) securing the propeller shaft to axle yoke (KK) to the drive pinion (T–2). Using puller 41–P–2956–4, remove the propeller shaft to axle yoke (fig. 68). Using a brass drift and hammer, drive the drive pinion out of the axle housing (fig. 69). Remove the small drive pinion bearing shim (DD) and drive pinion bearing spacer (CC) from the drive pinion, noting the thickness of bearing shims removed.

Section III. CLEANING, INSPECTION, AND REPAIR

98. Cleaning

a. Gear Carrier Housing, Steering Knuckles, and Cover (figs. 57 and 58). Clean gear carrier housing, steering knuckles, and cover in volatile mineral spirits or dry-cleaning solvent. Use a suitable

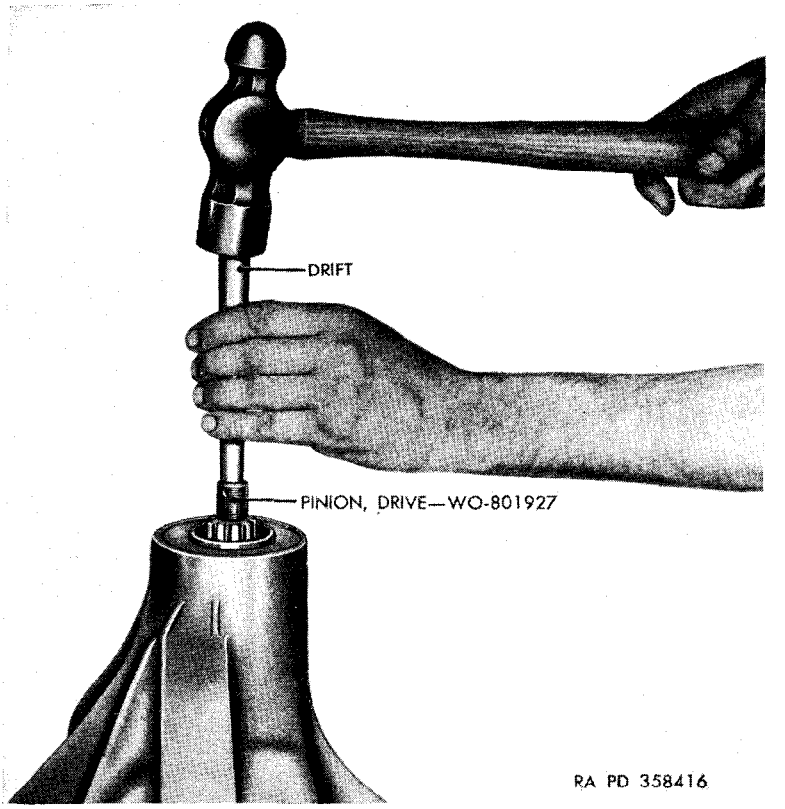


Figure 69. Removing drive pinion from axle housing.

scraper to remove all trace of the old housing cover gasket. If steam is available, steam clean the entire assembly and dry with compressed air.

b. Wheel Bearing Cones. Clean all wheel bearing cones in volatile mineral spirits or dry-cleaning solvent. Rotate the bearings while immersed in the cleaner until all trace of lubricant has been removed. Dry the bearings thoroughly with compressed air. Put a light coating of oil on the bearing cones to prevent corrosion of the highly polished surfaces unless they are to be used immediately.

c. Axle Shaft Assembly.

(1) *Axle shaft assembly with Bendix universal joint* (fig. 60). Clean the entire assembly in volatile mineral spirits or dry-cleaning solvent. Make sure all grease or dirt has been removed from the axle shaft splines, that all universal joint balls are cleaned, and that the universal joint center ball and universal joint groove pin recess are free of foreign matter.

(2) *Axle shaft assembly with Rzeppa universal joint* (fig. 60). Clean the entire assembly in volatile mineral spirits or dry-cleaning solvent. Make sure that the universal joint cage, universal joint race, and universal joint balls are clean.

d. Differential Case (fig. 65). Immerse differential case and component parts in volatile mineral spirits or dry-cleaning solvent. Be sure all dirt and grease have been removed from the pinion shaft locking pin (L) and pinion shaft grooves. Treat all bearing cones as outlined in paragraph 98*b*.

e. Miscellaneous. Parts not mentioned in the preceding instructions do not require special attention, but should be properly prepared for inspection and repair or assembly.

99. Inspection

a. Gear Carrier Housing. Replace the gear carrier housing with tube assembly (L, fig. 57) if it is bent, has any broken welds, cracks, or if the threads are damaged in the filler plug hole or air vent plug hole. Kingpin bearing cones (M and Q, fig. 57) and kingpin bearing cups (N and P, fig. 57) that are pitted, corroded, or discolored due to overheating must be replaced (par. 100). Replace the outer axle shaft oil seals (B and R, fig. 65) in the gear carrier housing regardless of their condition (par. 106). Replace the steering knuckle stop bolt if damaged. Drive pinion inner and outer bearing cups (AA and EE, fig. 65) that are pitted, corroded, or discolored due to overheating must be replaced (par. 100). Replace universal joint thrust washers (V, fig. 57) if defective (par. 100).

b. Steering Knuckle Assembly (fig. 57). If the steering arm is bent and cannot be straightened or the right steering knuckle (Y) is cracked, replace with a new steering knuckle (par 100). Replace the steering knuckle if the filler hole threads are damaged. Replace the wheel bearing spindle (EE) if it has damaged threads or grooved bearing surfaces. If the inner diameter of the wheel bearing spindle bearing (DD) does not meet repair and rebuild standards (par. 189), replace the bearing (par. 100*b*). If the kingpins attached to the steering knuckle flange caps (C and Z) are worn, replace the caps (par. 109).

c. Tie Rods and Bellcrank (fig. 70). Replace (par. 100) the left-hand thread tie-rod end (B) and tie-rod end (P) if bent or damaged or if sockets are loose. Replace the needle roller bearing in the bellcrank if they are loose or excessively worn (par. 100*f*).

d. Axle shaft assembly.

(1) *Bendix* (fig. 60). Replace the inner axle shaft (D) if it is bent, has worn splines, or worn universal joint ball surfaces.

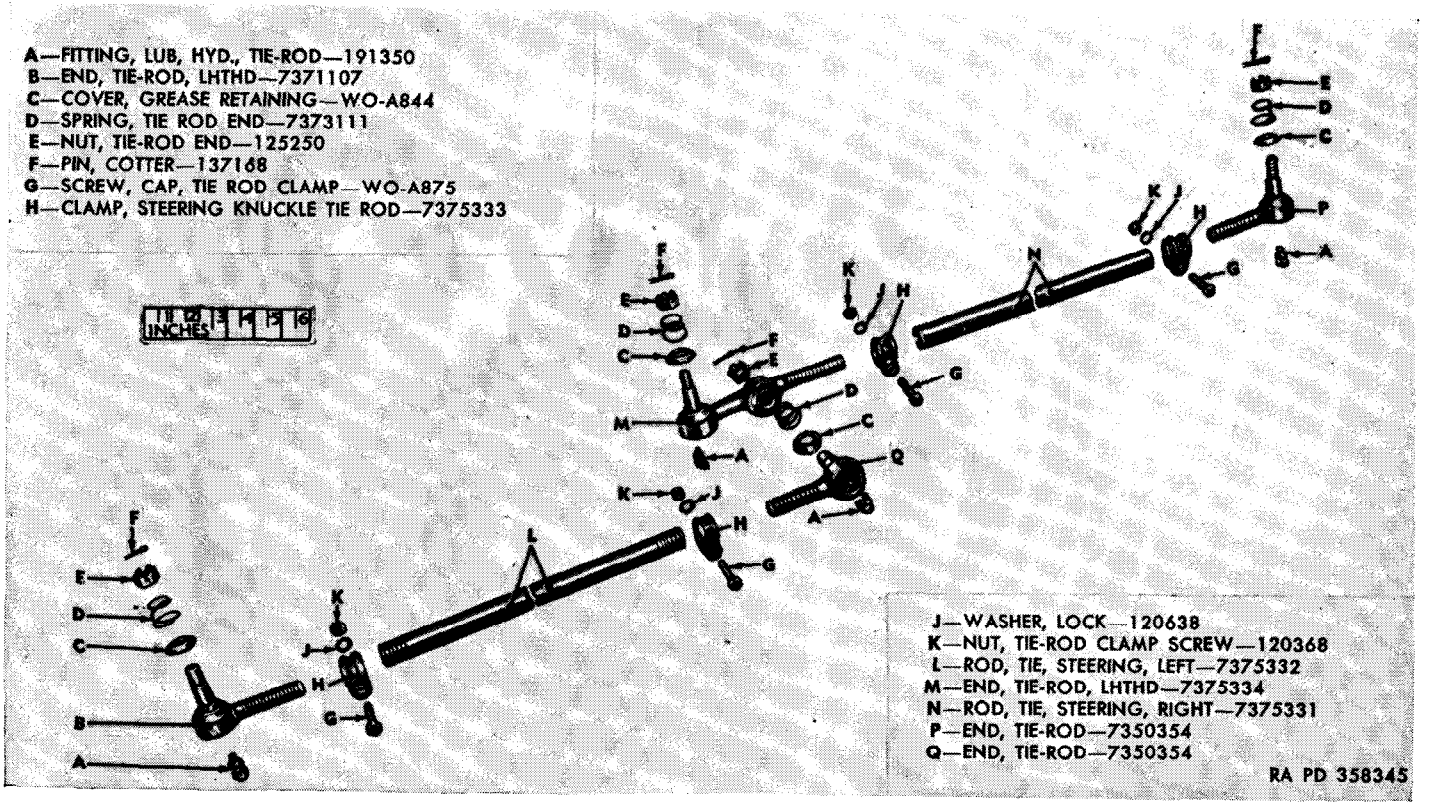


Figure 70. Tie Rods—exploded view.

Replace the outer axle shaft (A) if it is bent, has worn splines, or worn universal joint ball surfaces. Small nicks or scratches can be removed with a fine stone. Replace outer universal joint balls (C) if they are excessively worn or have any flat spots. Remove universal joint groove pin (B) and universal joint center ball pin (F) if defective. Preliminary inspections are contained in paragraph 93.

(2) *Rzeppa* (fig. 60). Replace the inner axle shaft (M) if it is bent or has worn splines. Using a new side gear (W–1, fig. 65) as a gage, slip it on the inner axle shaft and check the backlash. If the backlash is more than 0.005 inch, replace the outer and inner axle shaft (A or D). Replace the outer axle shaft if it has worn splines or nicked universal joint ball bearing surfaces. Small nicks or scratches can be removed with a fine stone. Replace outer universal joint balls (C) that have flat spots. Replace the universal joint cage (J) or universal joint race (H) if defective.

e. Differential Assembly (fig. 65).

(1) *Drive pinion assembly.* Drive pinion inner and outer bearing cones (Z and FF), and drive pinion inner and outer bearing cups (AA and EE) that are pitted, corroded, or discolored due to overheating must be replaced (par. 100). Replace the drive pinion (T–2) if it has worn or broken teeth.

Note. The drive gear and the drive pinion assembly are furnished in matched sets and if either is found to be defective, both must be replaced.

Small nicks can be removed from the drive pinion and drive gear with a fine stone.

(2) *Differential case assembly.* Replace differential case bearing cones (D and P) and differential case bearing cups (C and Q) that are pitted, corroded, or discolored due to overheating (pars. 102 and 105). Replace defective differential pinion shaft (J) and pinion shaft locking pin (L) (par. 105). Check side gears (W–1) for cracked or damaged splines or teeth. Replace the side gear thrust washers (U and X) if found defective (par. 105). Replace defective case bearing shims (E, F, M, and N) (par. 104).

(3) *Miscellaneous.* Any parts that are not specifically covered above, but show evidence of being worn or otherwise defective, should be replaced.

100. Repair and Replace

a. Front Wheel Bearing Cup (K and N, fig. 54) Replacement. Refer to TM 9–804 for replacement procedure.

b. Wheel Bearing Spindle Bearing Replacement. If inspection (par. 99*b*), indicates replacement of the wheel bearing spindle bearing (DD, fig. 57) is required, remove the old bearing with a center punch (fig. 71). To install a new bearing, use a suitable driver and press in place (fig. 72).

Note. Reaming of bearing is not required (par. 86).

c. Drive Pinion Bearing Cup Replacement (fig. 73). Remove the drive pinion inner and outer bearing cups (AA and EE, fig. 65), using remover and replacer 41–R–2374–660 for inner drive pinion bearing cup and remover and replacer 41–R–2374–665 for outer drive pinion cup. To install new drive pinion bearing cups, use appropriate remover and replacer. Place the original thickness of large and small drive pinion bearing shims (BB and DD, fig. 65) between the drive pinion bearing cups and axle housing. Tap the drive pinion bearing cups lightly around the entire circumference until flush with the shoulder in axle housing.

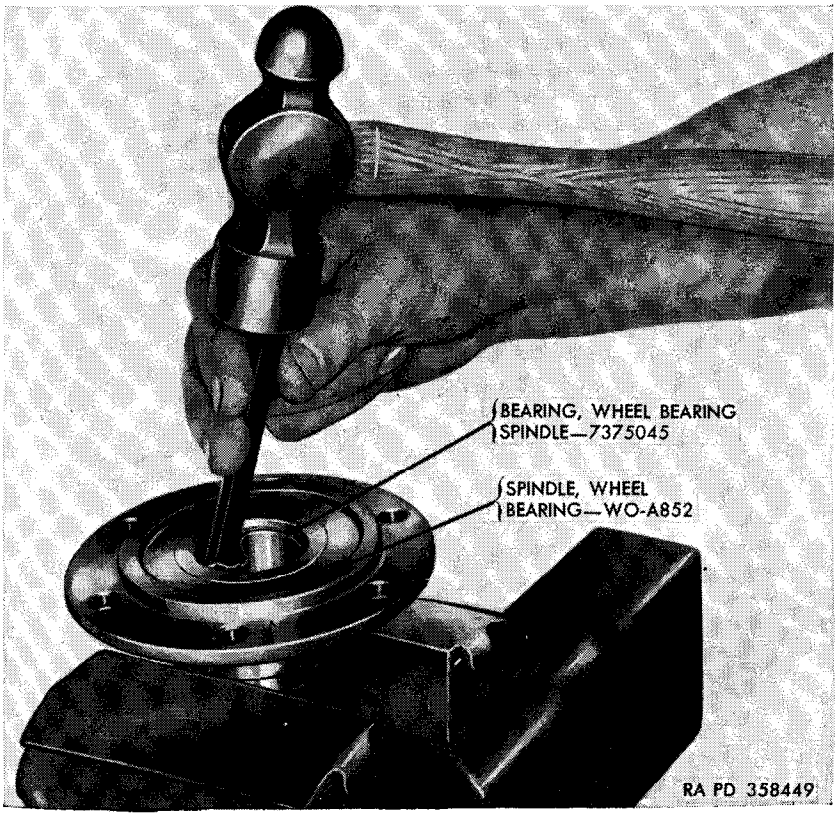


Figure 71. Removing wheel bearing spindle bearing.

d. King Pin Bearing Cup Replacement. Working through one of the king pin bearing cups (N and P, fig. 57) and using remover and replacer 41–R–2374–750 and screw 41–S–1047–300, remove the opposite king pin bearing cup (fig. 74). Turn the gear carrier housing over and remove the other king pin bearing cup. To install new king pin bearing cups, place the king pin bearing cup in position and, using the same remover and replacer, seat cup until it is flush with the shoulder (fig. 75).

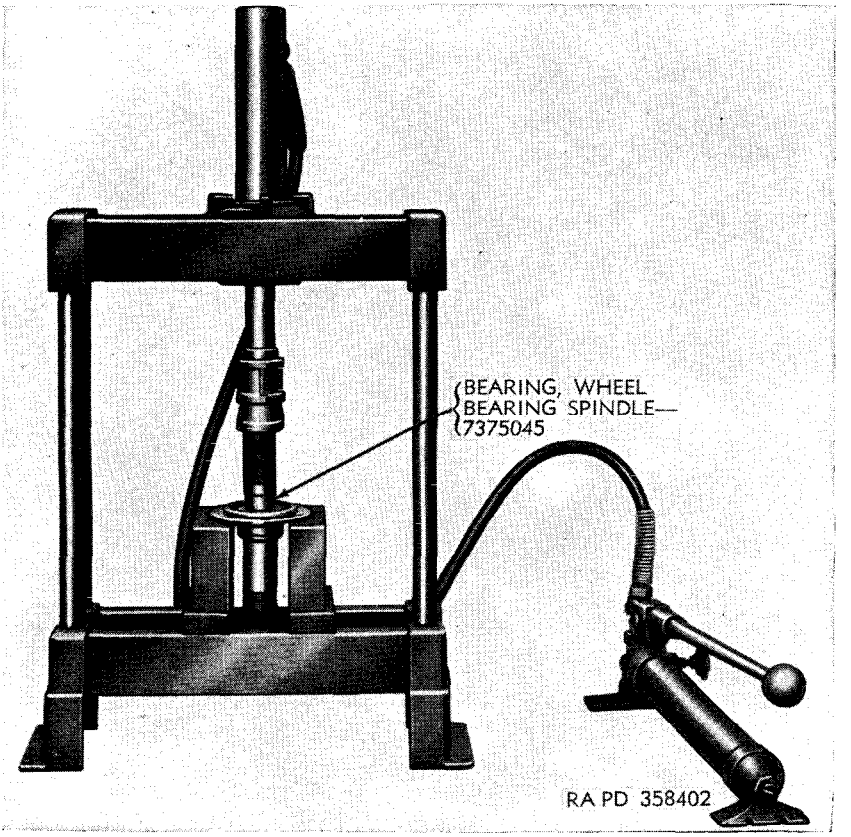


Figure 72. Replacing wheel bearing spindle bearing.

e. Universal Joint Thrust Washer Replacement. If inspection (par. 99) indicates replacement of universal joint thrust washer (V, fig. 57) is required, remove the universal joint thrust washer with a screwdriver. To replace universal joint thrust washer, place washer in position and, using a brass drift, tap washer in place until it is seated against the shoulder in the gear carrier housing tube. Stake washer with punch to avoid shifting.

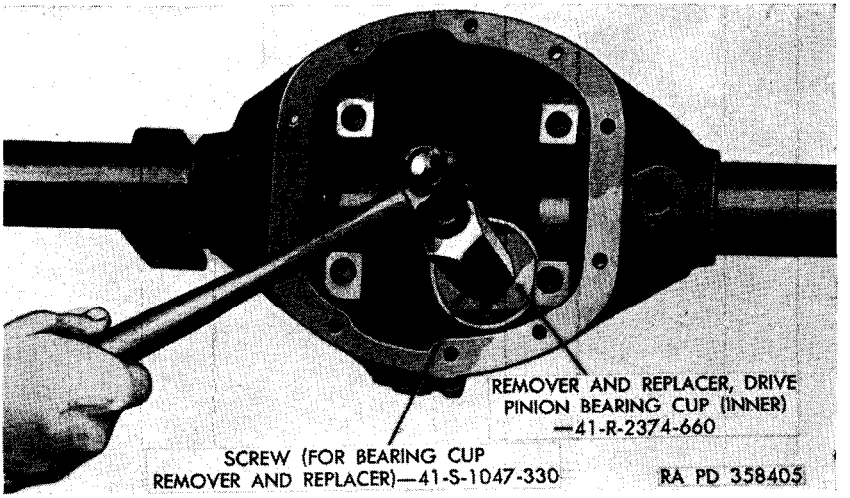


Figure 73. Replacing drive pinion inner bearing cup.

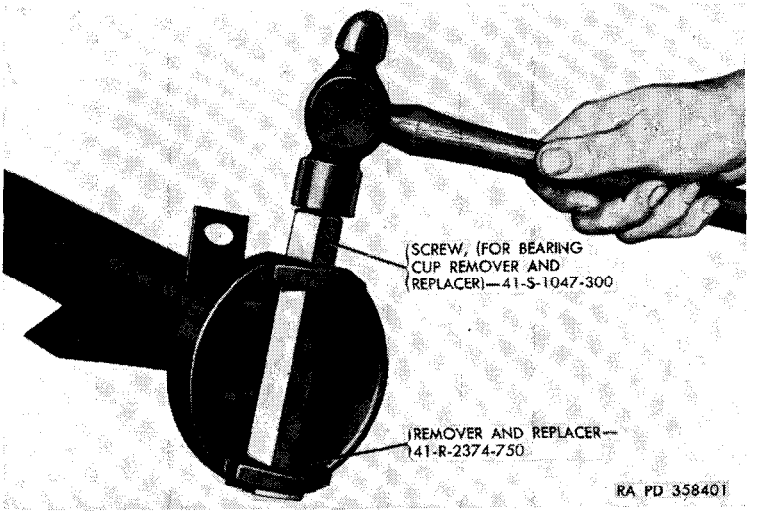


Figure 74. Removing king pin bearing cup.

f. Tie Rod and Bellcrank Replacement.

(1) *Tie-rod end replacement* (fig. 70). If inspection (par. 99*c*) indicates tie-rod end replacement is required, loosen the steering knuckle tie-rod clamps (H) at both ends of the tie rod; remove the tie-rod ends. To install new tie-rod ends, place the tie-rod clamps on the tie rods; install tie-rod ends and tighten clamps.

(2) *Bellcrank bearing replacement* (fig. 24). If inspection (par. 99*c*) indicates replacement of bellcrank bearings is needed,

Figure 75. Installing king pin bearing cup.

place the bellcrank in a vise with soft metal or wooden protected jaws. Using a suitable driver, drive the two sets of bellcrank bearings (F–10 and F–12) from the bellcrank. To install new bearings, press one set of bearings in the bellcrank about one-sixteenth of an inch below the shoulder of the bellcrank. Turn bellcrank over and repeat the operation for the other bearing.

Section IV. ASSEMBLY OF FRONT AXLE

101. General

Extreme care must be used in all phases of the assembly operation to insure proper performance of the vehicle after assembly. A few general rules follow.

a. Cleanliness is essential in all assembly operations. Dirt and dust,

even in the smallest quantities, have an abrasive action. Be sure parts have been cleaned as specified and are kept in such condition.

b. Coat all gear teeth, bearings, pinions, and shafts with universal gear lubricant (GO) before assembly to insure lubrication of the parts when first put into operation.

c. Always use new gaskets on joints which hold oil. Always install new oil seals and handle the seals with care when installing.

d. Be sure all nuts and bolts are secured with either lock washers, cotter pins, or locking wires when their use is specified.

102. Install Drive Pinion Inner Bearing Cone

Press the drive pinion inner bearing cone (Z, fig. 65) on the drive pinion (fig. 76), using an arbor press. Make sure the bearing cone is seated against the shoulder of the drive gear when installed.

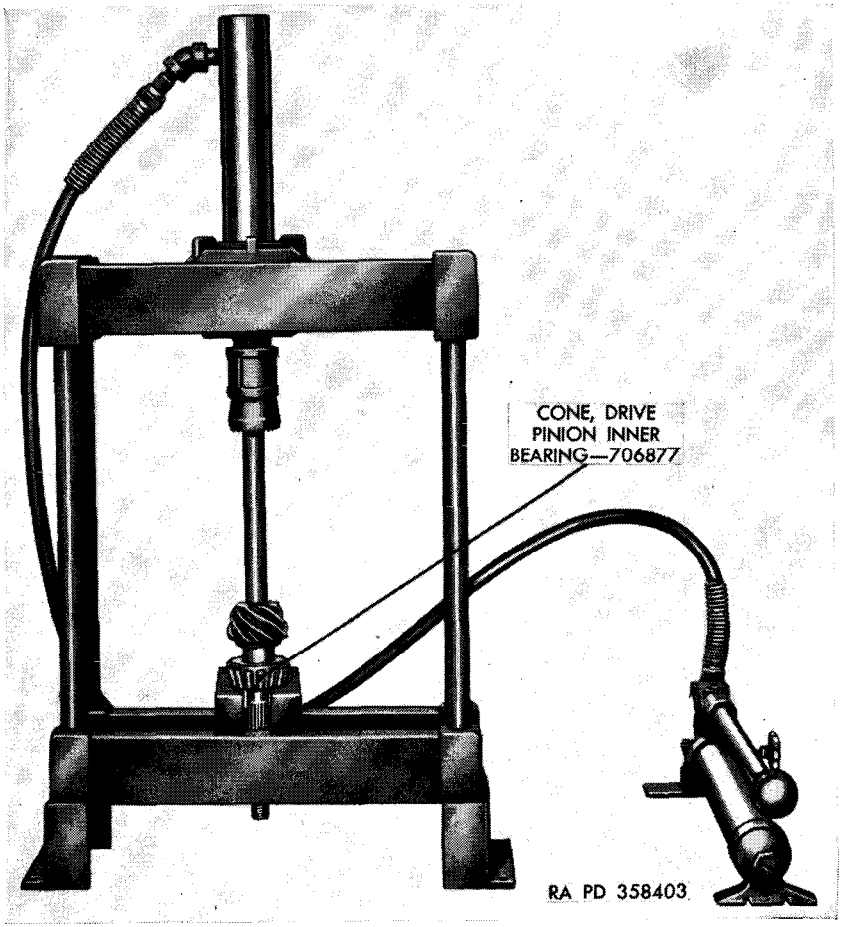


Figure 76. Installing drive pinion inner bearing cone on drive pinion

103. Install Drive Pinion

(fig. 65)

Place large drive pinion bearing shim (BB) in carrier housing and seat drive pinion inner bearing cup (AA) in place. Seat drive pinion outer bearing cup (EE) in opposite end of carrier housing. Slide drive pinion (T–2) into axle housing until drive pinion inner bearing cone (Z) rests in drive pinion inner bearing cup (AA). Slide drive pinion bearing spacer (CC) onto drive pinion, followed by small drive pinion bearing shim (DD). Using a suitable driver, drive the drive pinion outer bearing cone (FF) in place. Slide the drive pinion bearing oil slinger (GG) onto the drive pinion. Slide the propeller shaft to axle yoke (KK) onto the drive pinion and secure with ¾-inch flat washer (LL) and ¾-inch hex nut (MM).

Note. Do not install the drive pinion oil seal gasket (HH) and drive pinion oil seal (JJ) until pinion bearing has been adjusted (par. 104).

104. Adjust Drive Pinion

The drive pinion setting gage 41–G–177–50 is equipped with a dial indicator that measures the distance from the finished surface on the head of the drive pinion to the center line of the differential case bearing bore. By establishing this distance, the correct amount of shims to be installed or removed may be determined to correctly position the drive pinion. As an associate item to this gage, a checking gage 41–G–98–750 is used to set the pinion setting gage to the standard or theoretical dimension between the face of the drive pinion and the center line of the differential case bearing. All drive pinions are marked, on the polished head, with a dimension indicating the proper number of thousandths of an inch that they must be adjusted, either plus or minus, from standard. The correct position of the pinion-thickness of shim packs may be easily established.

a. Adjust Pinion Setting Gage to Checking Gage.

Note. When using the setting gage, the indicating mark on the drive pinions must be considered. A drive pinion marked +0.003 inch means that the drive pinion must be adjusted 0.003 inch farther away from the differential case bearing center line than standard; a −0.003 inch indicates 0.003 inch closer to the center line.

Set the dial indicator (fig. 77) on the checking gage "D" surface. The checking gage "E" surface is used when adjusting a rear axle. Set the dial indicator and gage, and set the dial bezel to position the hand at zero with one-half turn tension on the gage pin. This sets the dial to register at zero when mounted in the axle when the distance between the finished head of a standard pinion and the center of the differential carrier is spanned.

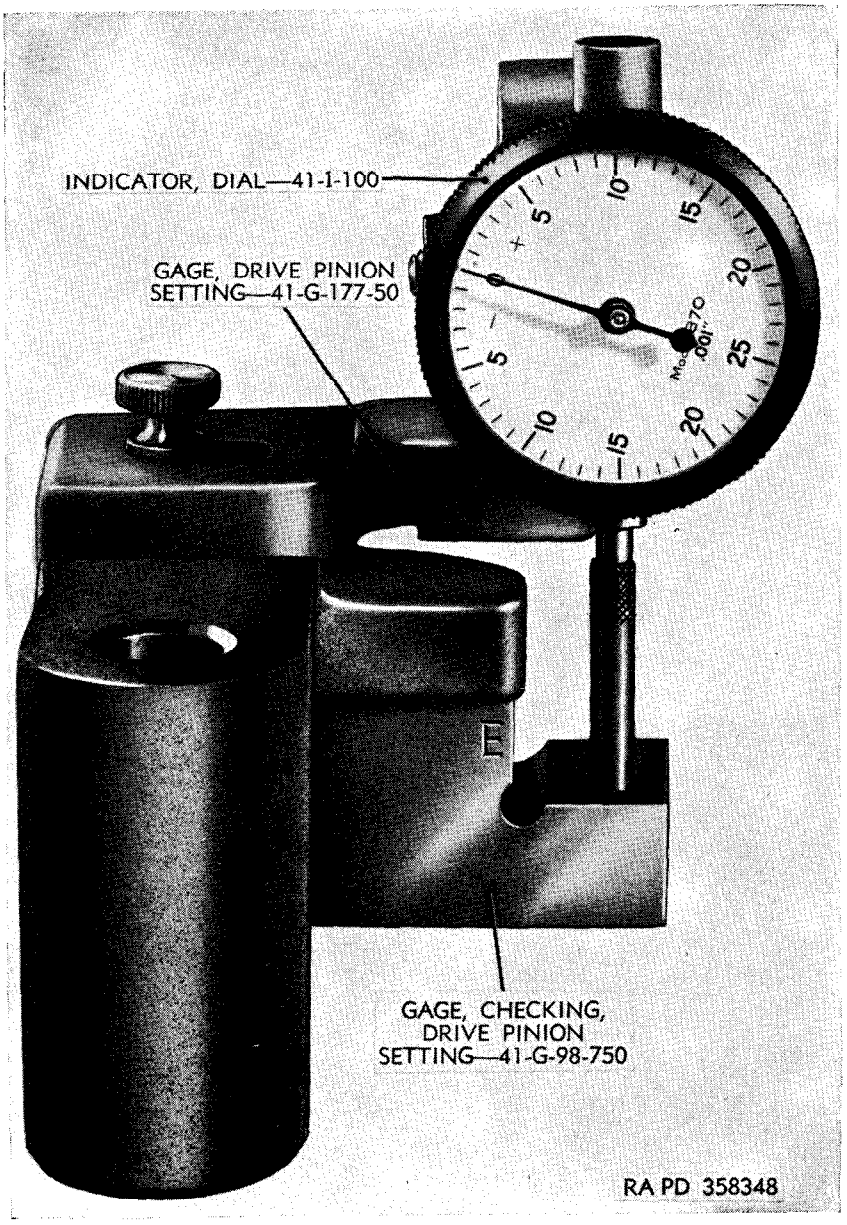


Figure 77. Adjusting pinion setting gage to checking gage.

Caution: After setting the dial, use care not to jar or turn the bezel so as to disturb the setting.

b. Seat Drive Pinion Setting Gage To Pinion (fig. 78). Assemble the dial indicator (A) to the C clamp of gage set 41–G–535–700 by

slipping the dial gage support (M) over the gage stationary guide pin (N). Hold the dial indicator and the large end of the C clamp in one hand and position it over the drive pinion (C), and press the gage adjustable guide pin (H) at the small end of the C clamp, into the threaded end of the drive pinion lathe center and lock it into position with the gage adjustable guide pin lock (G).

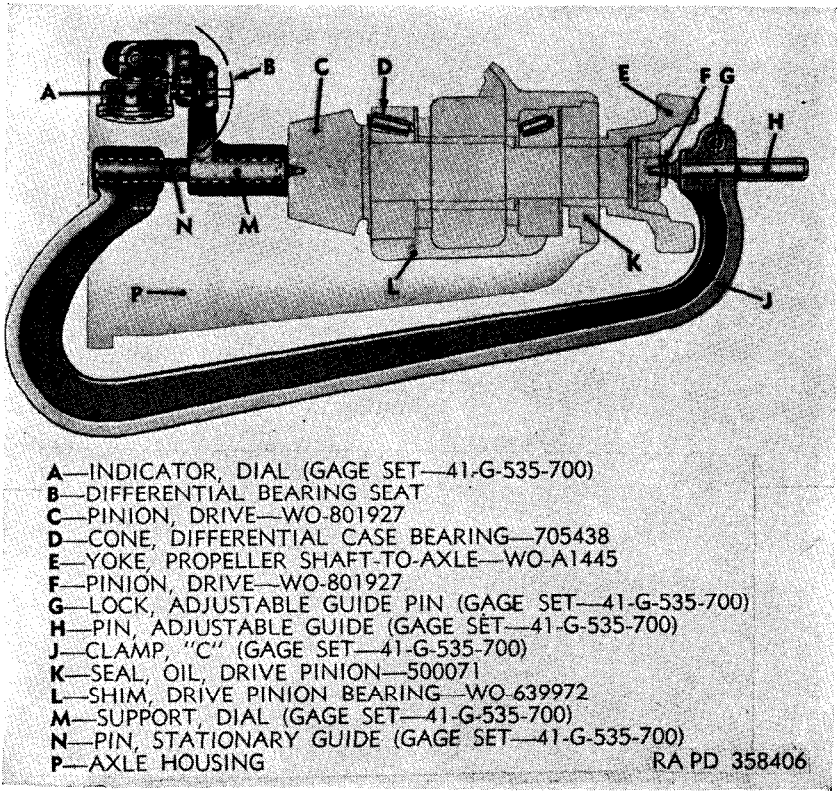


Figure 78. Seating drive pinion setting gage set 41–G–535–700.

c. Final Check of Pinion. With the C clamp correctly seated in the drive pinion lathe center and the dial indicator contact point bearing against the differential case side bearing bore (fig. 79), hold the dial indicator (A, fig. 78) against the drive pinion. Swing the dial indicator back and forth across the bearing bore and watch the dial indicator reading. The lowest reading indicates the center of the bearing bore. If the shim pack is of the correct thickness, the indicator reading will be the same as the etched markings on the drive pinion head. For example, if the drive pinion is marked +3, the dial should indicate +0.003 inch. If the drive pinion is marked −3, the

dial should indicate —0.003 inch. Should the dial reading fail to agree with the marking on the drive pinion head, note the difference and a corresponding amount of shims should be added or removed to secure the correct adjustment. This will be indicated when the reading on the dial indicator and pinion marking agree.

Note. Check the adjustment if any shim changes are made and be sure to set the dial to the correct face of the checking gage. After the pinion has been correctly located, check it for bearing preload. The pinion should turn with a slight drag and without end play. To secure this adjustment, add or replace shims back of the front bearing cup.

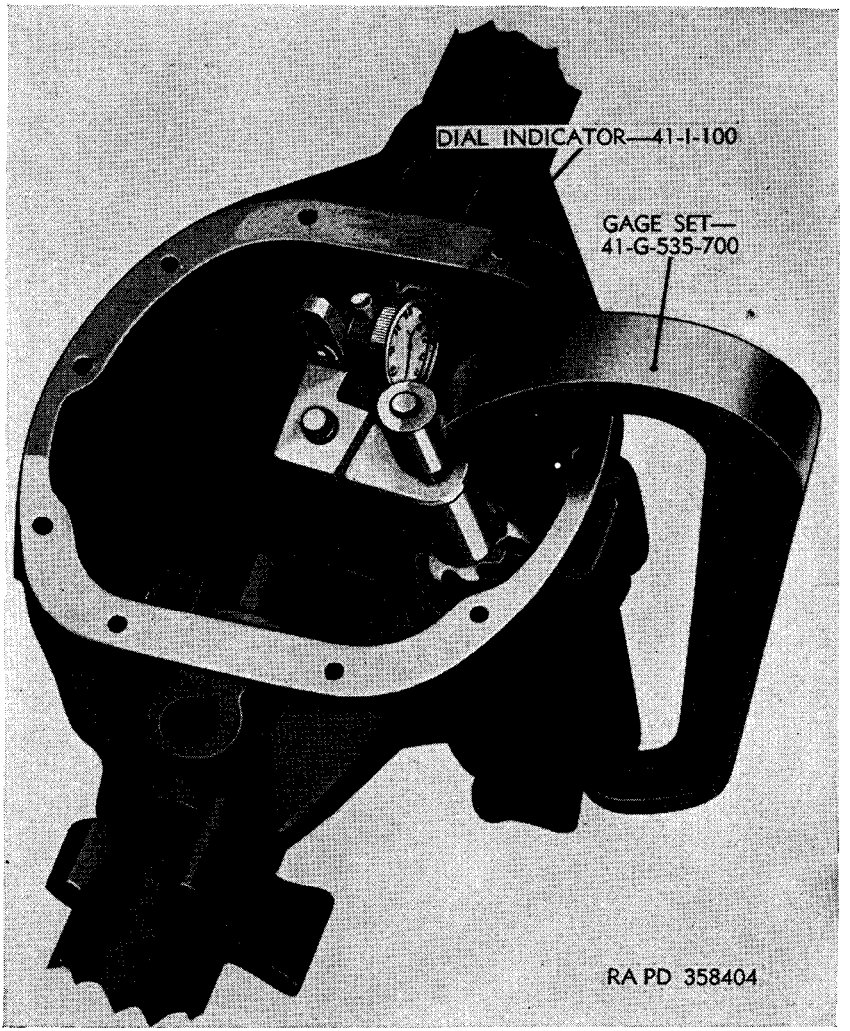


Figure 79. Checking pinion in differential housing with gage set 41–G–535–700.

105. Install and Adjust Differential Case

a. Install Gears In Differential Case (fig. 65). Place the side gear thrust washers (U and X) on the two side gears (W–1). Place the side gears in the differential case (K). Place the two differential pinion thrust washers (V and Y) and bevel pinions (W–2) in the differential case. Install the differential pinion shaft (J). Install the pinion shaft locking pin (L) in the differential case and stake the pinion shaft locking pin to prevent it from coming out.

b. Install Differential Drive Gear (fig. 65). Place the drive gear (T–1) in position on the differential case (K). Install the drive gear screw lock plates (H) and axle drive gear screws (G) that secure the drive gear to the differential case. Tighten the axle drive gear screws to 40 to 50 pound-feet torque. Bend the ears of the drive gear screw lock plates on the axle drive gear screws.

c. Install Axle Shaft Guides and Outer Oil Seals (fig. 65). Using a suitable driver, install an axle shaft guide (A) in the differential case (K) followed by an outer axle shaft oil seal (B). Install axle shaft guide (S) and outer axle shaft oil seal (R) in opposite side of differential case (K).

d. Adjust Differential Case Bearing Cones (fig. 65). The adjustment of the differential case bearing cones (D and P) is maintained by the use of case bearing shims (E, F, M, and N) placed between the differential case and differential case bearing cones with an 0.008-inch pinch fit when assembled in gear carrier housing. Install the differential case bearing cones without shims, using replacer 41–R–2384–149, (fig. 80). Place the differential case in the gear carrier differential case housing with differential case bearing cups (C and Q) and force to one side. Check the clearance between the differential case bearing cup and the differential case with a feeler gage (fig. 81). After the clearance has been determined, add 0.008 inch, which will give the proper thickness of case bearing shims required. Remove the differential case bearing cones and install equal thickness of case bearing shims (E, F, M, and N) on each side; install the differential case bearing cones.

e. Install Differential Case in Carrier Housing. If spreader 41–S–4158–500 is not available to spread carrier (par. 92), the assembly may be installed by tilting the differential case bearing cups (C and Q, fig. 65) slightly when the differential case is placed in the carrier housing; then tapped lightly with a rubber mallet (fig. 82).

Caution: When installing the differential case assembly in the carrier housing, be sure the drive gear teeth mesh with the drive pinion teeth before tapping the bearings into place.

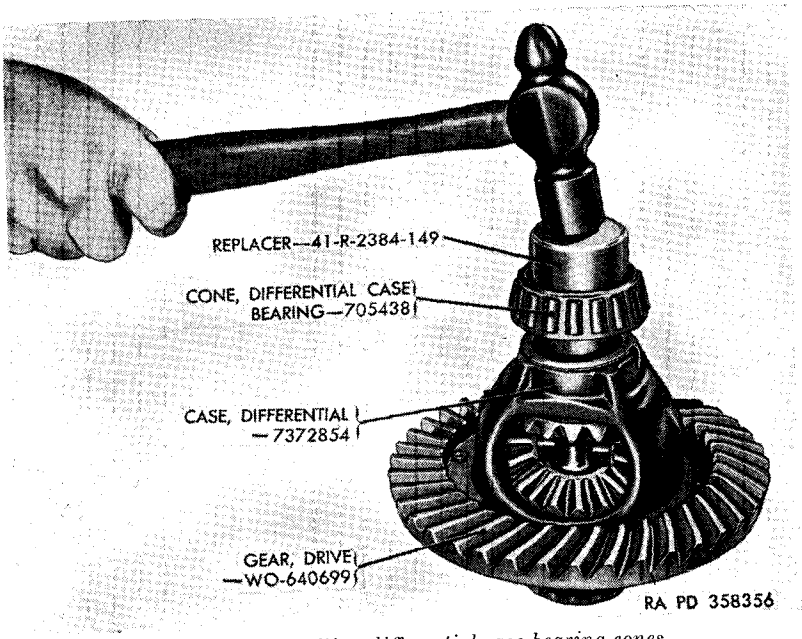


Figure 80. Installing differential case bearing cones.

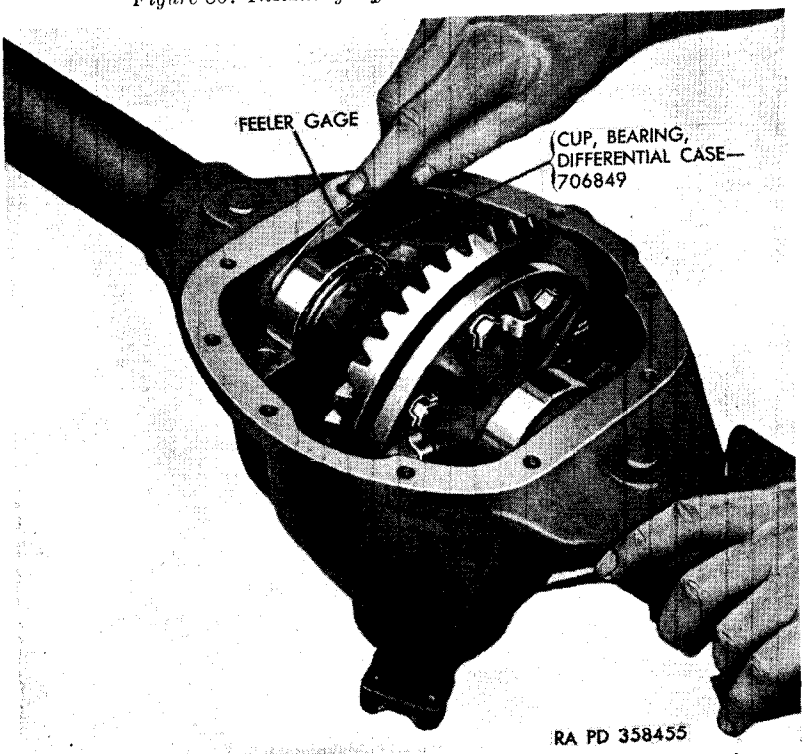


Figure 81. Checking clearance between bearing cup and carrier.

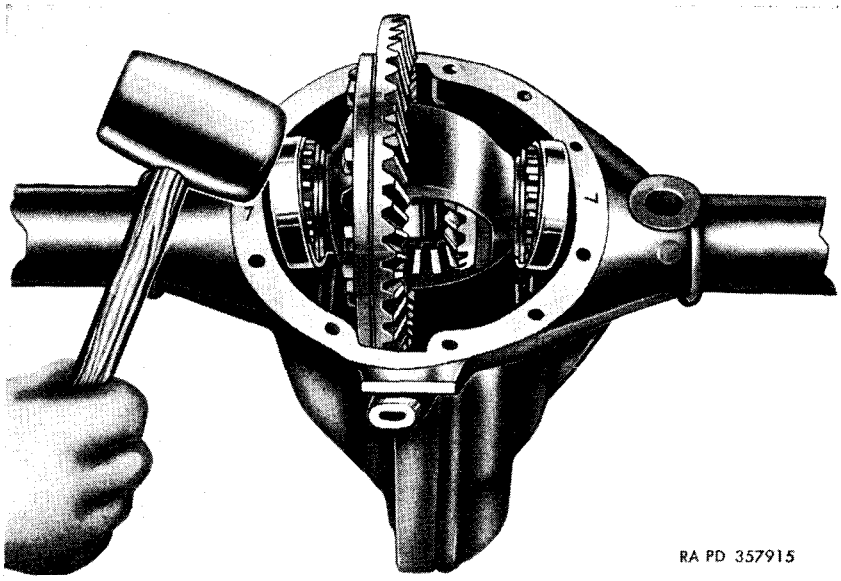


Figure 82. Installing differential case in carrier housing.

f. Install Case Bearings Caps (fig. 58). After the differential case bearing cups are placed firmly in place (*e* above) in the carrier housing, install the case bearings caps. It is important that the caps be installed in the same position from which they were removed (par. 92). Each cap should be installed so the numeral corresponds with the numeral on the housing. Tighten caps from 38 to 42 pound-feet torque reading.

106. Tests and Adjustments

a. Check Blacklash. Install a dial indicator 41–I–100 (fig. 83) on the carrier housing so that the dial indicator contact point is resting on the surface of a drive gear tooth. Rotate the drive gear back and forth to determine the backlash. If the backlash registered on the indicator is less than 0.005 inch or more than 0.007 inch, remove the differential case from the carrier housing (par. 92). If the backlash is more than 0.007 inch, the drive gear must be brought closer to the drive pinion. If the backlash is less than 0.005 inch, the drive gear must be moved away from the drive pinion. This is accomplished by removing case bearing shims equal to the error in backlach from the drive flange side of the differential case and adding them to the other side. After changing position of the case bearing shims, install the differential case bearing cones on the differential case. Install the differential case assembly (par 105) in the carrier housing and check the backlash.

b. Check Drive Gear Run-Out. Install a dial indicator 41–I–100 (fig. 84) on the differential case carrier housing so that the indicator contact point is resting on the flat side of the drive gear. As the drive gear is turned by hand, check reading of the dial indicator. A total indicator reading in excess of 0.003 inch indicates a warped or nicked differential case or an improperly installed drive gear. In either case, remove the differential case (par. 92) from the carrier housing and

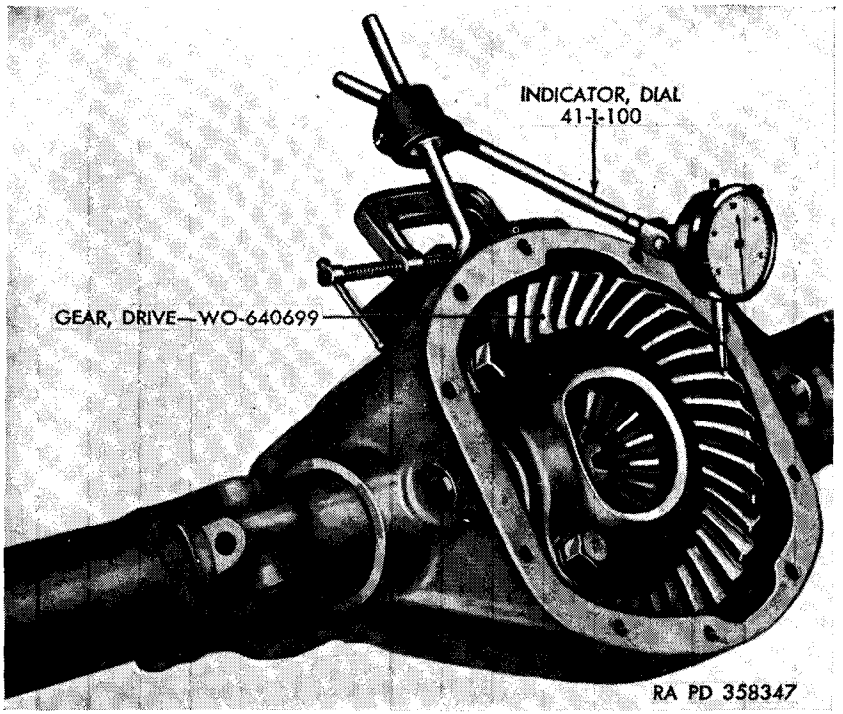


Figure 83. Checking backlash of drive gear with indicator 41–I–100.

the drive gear from the differential case (par. 96). Check the surface of the differential case and drive gear for chips or small nicks, which may have occurred during assembly; the small nicks can usually be removed with a fine stone. Check the flange on the differential case by placing a piece of metal known to be true at various points and positions around the flange to see that flange is not warped or sprung. Install the differential case assembly (par. 105) in the carrier housing and check the drive gear run-out.

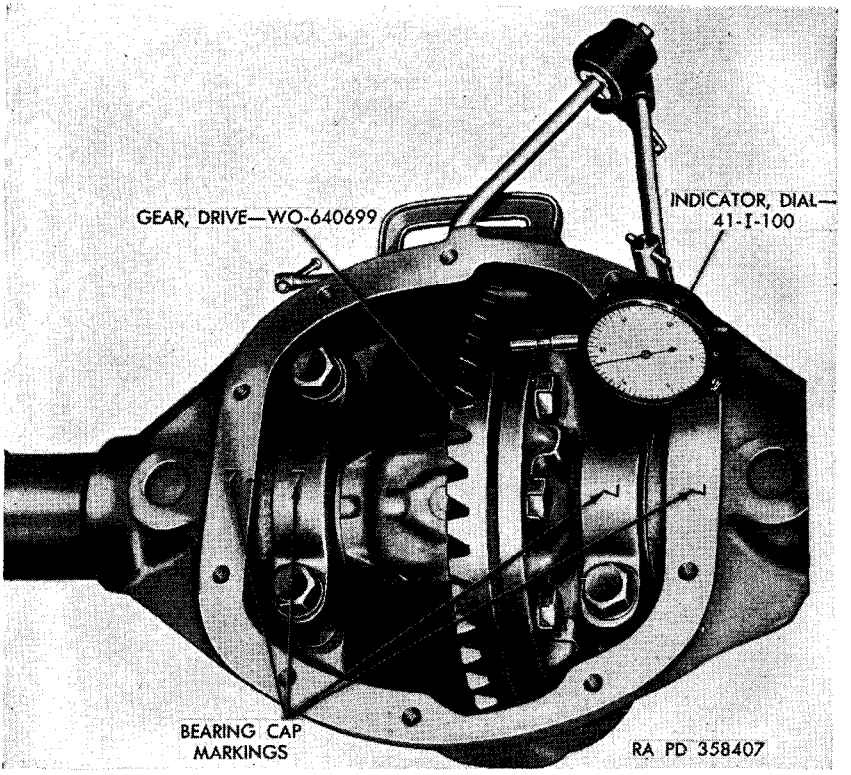


Figure 84. Checking drive gear run-out using dial indicator 41–I–100.

107. Install Drive Pinion Oil Seal and Propeller Shaft to Axle Yoke

(fig. 65)

After the differential case has been installed in the carrier housing and adjusted (pars. 102 through 106), remove the propeller shaft to axle yoke (KK). Install a drive pinion oil seal gasket (HH) and using a suitable replacer, install a new drive pinion oil seal (JJ). Install the propeller shaft to axle yoke and secure with ¾-inch flat washer (LL) and ¾-inch hex nut (MM).

108. Install Differential Gear Carrier Housing Cover

(fig. 58)

Place a new housing cover gasket and housing cover in position on the gear carrier housing and secure with the lock washer cap screws.

109. Install Steering Knuckle
(fig. 57)

If new kingpin bearing cups are required, refer to paragraph 100. Dip the two kingpin bearing cones (M and Q) in grease. Place the kingpin bearing cones in the kingpin bearing cups (N and P) on the end of the gear carrier housing with tube assembly (L). Place the right steering knuckle (Y) on the gear carrier housing tube with the steering knuckle oil filling opening plug (CC) toward the rear of the vehicle. Install the lower steering knuckle flange cap (Z) and secure with four ⅜-inch lock washers (AA) and cap screws (BB). Install one each of the 0.003-, 0.005-, 0.010-, and 0.030-inch kingpin bearing shims (W) over the studs on the upper stearing knuckle flange cap (C). Install brake hose guard (D) and secure with four ⅜-inch lock washers (E) and cap screws (F).

110. Adjust Steering Knuckle

Check the tension of the kingpin bearings by hooking a checking scale in the tie-rod socket hole in the steering arm. The load should be 6 to 9 pounds (3 to 5 lb-ft torque) without the steering knuckle oil seal assembly in position. Proper tension can be obtained by adding or removing shims.

111. Install Steering Knuckle Oil Seal Assembly
(fig. 57)

Place a steering knuckle oil seal spring (J) in the U part of the steering knuckle oil seal retainer (K). Press a new steering knuckle oil seal (H) over the steering knuckle oil seal spring. Repeat for lower half. Place entire assembly in place and secure with the eight lock washer screws (T).

112. Assemble Axle Shafts

Axle shafts with two types of universal joints, Bendix (fig. 52) and Rzeppa (fig. 53), are used in this vehicle. Assembly procedures for the two types are given in *a* and *b* below.

a. Bendix (fig. 60). Place the outer axle shaft (A) with the outer end in a vise equipped with soft metal or wooden protected jaws. Insert the universal joint center ball pin (F) in the hole of the axle shaft knuckle (fig. 85). Place the universal joint center ball (E) in its race on the center ball pin hole. Arrange the universal joint center ball so the grooved side of the universal joint center ball is away from the universal joint center ball pin hole. Insert the remaining universal joint outer balls (C) in their races. Arrange the

universal joint center ball so the grooved side is in line with the race of the last universal joint ball to be inserted; drop the universal joint ball in its race. Rotate the universal joint center ball in its race until the hole in the ball is in line with the universal joint center ball pin. Remove the assembly from the vise. Turn the assembly over so the universal joint center ball pin may drop in the hole of the universal joint center ball. Install the universal joint groove pin (B) and stake the pin to prevent it from coming out.

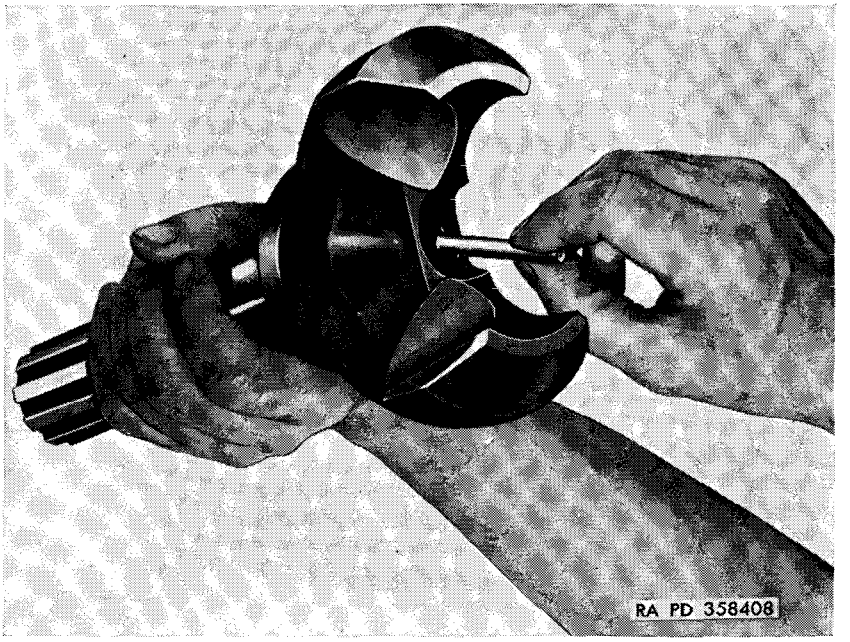


Figure 85. Installing Bendix universal joint center ball pin.

b. Rzeppa (fig. 60). Hold the universal joint cage (J) in a horizontal position and hold the universal joint race (H) in a vertical position (fig. 64). Insert the universal joint race in the universal joint cage, dropping one of the race bosses into one of the larger elongated holes. When the universal joint race is entered in the universal joint cage, turn the race so that it is entirely in the cage. Line up the two larger elongated holes with the bosses on the axle shaft (fig. 63). Slide the universal joint cage in the axle shaft. Till the universal joint cage so a universal joint ball can be inserted in the elongated hole (fig. 63). After the universal joint ball is in position, push the universal joint cage down until the opposite side of the cage is exposed. Insert another universal joint ball in the elongated hole on the universal joint cage and push the cage down. Repeat

the operation until all of the universal joint balls are in the universal joint cage. Insert the universal joint inner shaft retainer (L) on the axle shaft; secure the retainer with the axle shaft inner snap ring (K). Insert the inner axle shaft (M) in the outer shaft (G). Install the three flat head universal joint retainer screws (N) securing the universal joint inner shaft retainer.

113. Install Axle Shaft Assembly

Following instructions pertain to axle shafts having either Bendix or Rzeppa type universal joints with the exception of *d* below, which applies to the Rzeppa type universal joint only.

a. Install Axle Shaft. Slide axle shaft into the tube end of the gear carrier housing.

WARNING: Use extreme care in this operation to avoid damage to the inner oil seal and axle shaft guides.

Turn axle shaft until the splines engage in the differential side gears.

b. Install Wheel Bearing Spindle and Brake Backing Plate Assembly (fig. 54). If a new wheel bearing spindle (EE, fig. 57) is being installed, refer to paragraph 100. Slide the wheel bearing spindle (S) on right axle shaft (T). Place the brake backing plate assembly (R) on the wheel bearing spindle (S) with the brake wheel cylinder toward the top of the brake backing plate assembly. Line up the holes in the brake backing plate assembly and wheel bearing spindle with the right steering knuckle (U). Install the six hex-head cap screws (W) and lock washers (V) that secure them to the steering knuckle.

c. Assemble Wheel Hub and Brake Drum (fig. 54). Place brake drum (L) over studs on wheel hub (M) and secure with five nuts.

d. Install Wheel Hub and Brake Drum (fig. 54). Place the front wheel bearing cup (N) and front wheel bearing cone (P) together; then drive into rear of wheel hub (M) with remover and replacer 41–R–2374–845 and screw 41–S–1047–330. Using same replacer and screw, drive new front axle hub oil seal (Q) into wheel hub (M) on top of the bearing assembly. Turn wheel hub and brake drum assembly over and drive front wheel bearing cup (K) into wheel hub with replacer 41–R–2374–845 and screw 41–S–1047–330 (fig. 86).

Note. Before pressing bearings into place in wheel hub they should be packed with specific lubricant as outlined in TM 9–804.

Install front wheel bearing cone (J) into bearing cup in wheel hub. Insert the wheel hub and brake drum assembly on the wheel bearing spindle (S). Install front axle wheel bearing lock washer (F and H) and front axle wheel bearing nuts (E and G). Adjust wheel bearings and install front axle drive flange (C) (TM 9–804).

Figure 86. Installing front wheel outer bearing cup with replacer 41–R–2374–845

e. Install Rzeppa Snap Ring.

Note. This paragraph applies to front axles equipped with Rzeppa type universal joints only.

Install snap ring (B, fig. 54) in groove on end of axle shaft.

f. Install Hub Cap. Tap hub cap (A, fig. 54) in place with a soft hammer.

g. Install Opposite Axle Shaft Assembly. Follow instructions given in *a* through *f* above for installation of opposite axle shaft assembly.

h. Lubricate. Refer to the lubrication order in TM 9–804 for lubrication instructions.

114. Install Tie Rod

(fig. 70)

Install left hand thread tie-rod end (M) to steering bellcrank with grease retaining cover (C) and tie-rod end spring (D) and secure with tie-rod end nut (E) and cotter pin (F). Insert the tie-rod end studs

into the steering knuckle arms with grease retaining cover (C) and tie-rod end spring (D) and secure with tie-rod end nuts (E) and cotter pins (F).

115. Wheel Alinement

a. Caster and Camber. The caster and camber are established at the time of manufacture and cannot be altered by any adjustment.

b. Toe-In. Refer to TM 9–804 for toe-in adjustment procedure.

CHAPTER 9
REAR AXLE

Section I. DESCRIPTION AND DATA

116. Description

The rear axle (fig. 87) is of the semifloating, single reduction driving unit type, with hypoid gears. The differential carrier housing is offset to the right so that the propeller shaft has a straight drive from the transfer. A cover is used on the rear of the differential housing to permit inspection and cleaning.

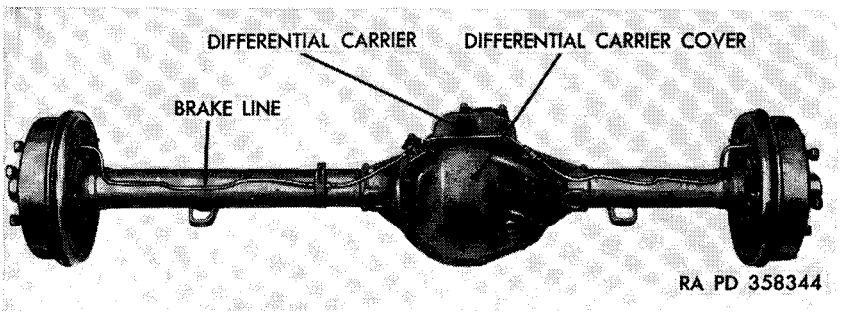


Figure 87. Rear axle.

117. Data

Drive gear ratio	5.38 to 1
Lubricant capacity	1¼ qt
Manufacturer	Spicer
Model	44–2

Section II. DISASSEMBLY OF REAR AXLE

118. General

a. The following procedures are based on the assumption that the rear axle assembly is removed from vehicle as a unit; including springs, spring clips, and brake hoses following procedure as outlined in TM 9–804.

b. Before disassembly, inspect the rear axle assembly thoroughly for lubricant leakage. Make a note of all points of leakage for later reference. Thoroughly clean assembly before starting disassembly

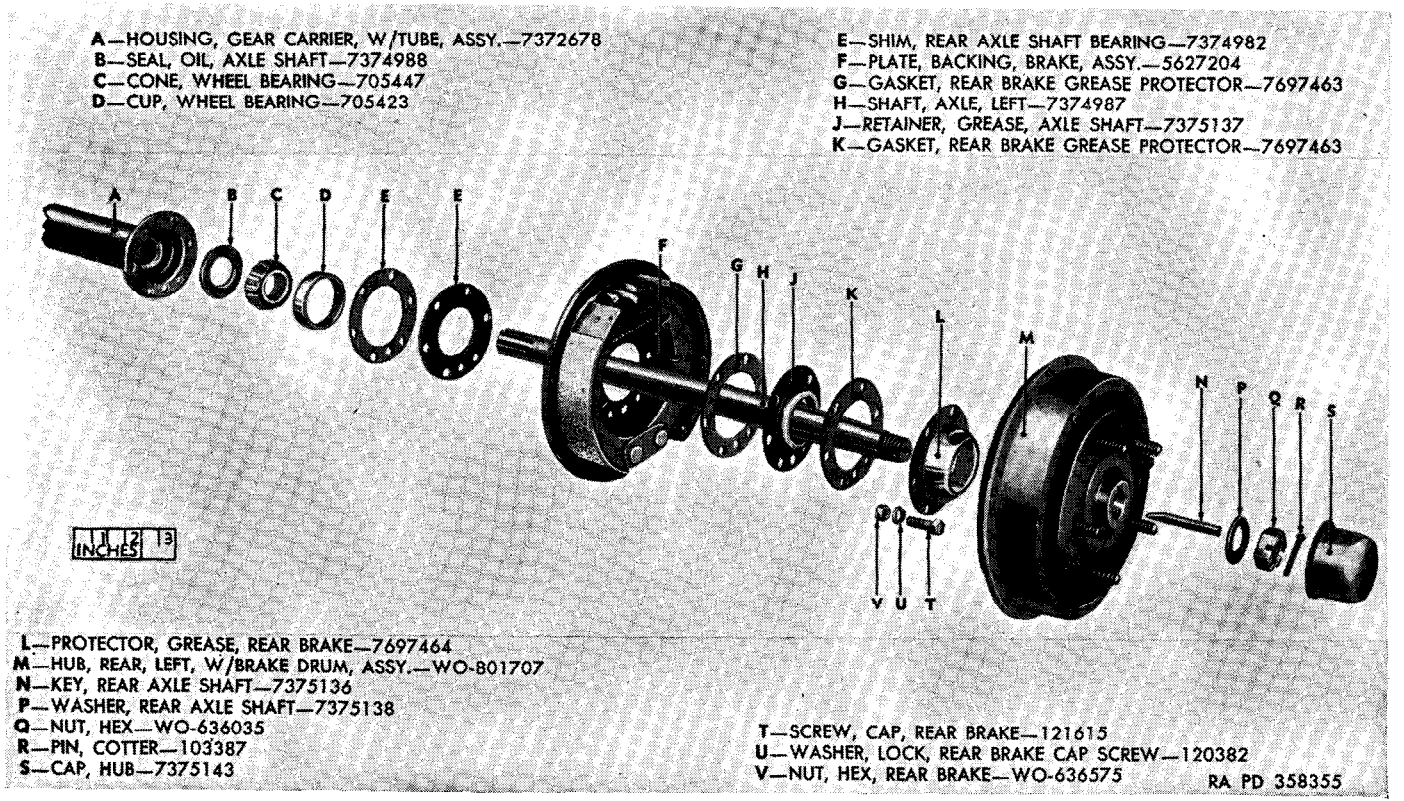


Figure 88. Left rear axle shaft—exploded view.

procedure to prevent dirt and grit from getting into bearings during removal.

119. Remove Axle Shaft Assembly

(fig. 88)

Rear axle shaft removal instructions are contained in TM 9–804.

120. Remove Differential Gear Case

(fig. 58)

Removal instructions for the rear axle differential case are identical for the removal of the front axle differential gear case (par. 92).

121. Disassemble Differential Case

Same instructions apply as for rear axle (par. 96).

122. Remove Drive Pinion

Same instructions apply as for rear axle (par. 97).

Section III. CLEANING, INSPECTION, AND REPAIR

123. Cleaning

Cleaning instructions contained in paragraph 98, also apply to the rear axle.

124. Inspection

Inspection procedures for front axle (par. 99), also apply to rear axle.

Section IV. ASSEMBLY OF REAR AXLE

125. General

Preliminary instructions (par. 101), also apply to assembly of rear axle.

126. Install Drive Pinion Inner Bearing Cone

Installation instructions (par. 102), also apply to rear axle drive pinion bearing cone.

127. Install Drive Pinion

Installation instructions (par. 103), also apply for installation of rear axle drive pinion.

128. Adjust Drive Pinion

The front and rear axle drive pinion adjustments are identical with the following exception: surface "E" of the checking gage is used for rear axles, whereas surface "D" is used for front axle (par. 104).

129. Install and Adjust Differential Case

Installation and adjustment instructions for front axle (par. 105), also apply to rear axle differential case.

130. Tests and Adjustments

Tests and adjustments for front axle (par. 106), also apply to rear axle.

131. Install Drive Pinion Oil Seal and Propeller Shaft to Axle Yoke

Installation instructions (par. 107), also apply to rear axle.

132. Install Differential Gear Carrier Housing Cover

Installation instructions (par. 108), also apply to rear axle.

133. Install Axle Shaft Assembly

Rear axle shaft assembly installation instructions are contained in TM 9–804.

134. Lubricate

Replenish the lubricant as outlined in TM 9–804.

CHAPTER 10
SPRINGS AND SHOCK ABSORBERS

Section I. DESCRIPTION AND DATA

135. Description

All springs are semielliptic leaf type, with double-wrapped eyes. Each spring has four spring clips (figs. 89 and 90) which serve to hold the leaves in alinement and hold the leaves together to take road rebound. Threaded "U" bolt shackles (figs. 91 and 92) mount the front end of the front springs and the rear end of the rear springs. Left-handed thread shackles and bushings are used in the spring eye of the left front and right rear springs. These shackles have a small forged bar on the lower shank and the bushings have a groove cut around the hexagon head. A $\frac{7}{16}$-inch pivot bolt (figs. 91 and 92) is used to mount the rear end of the front springs and the front end of the rear springs to the bracket on the frame. The shock absorbers are hydraulic cylinder, direct acting, two-way control units mounted in rubber bushings. These units are nonadjustable, nonrefillable, and are not designed for rebuild.

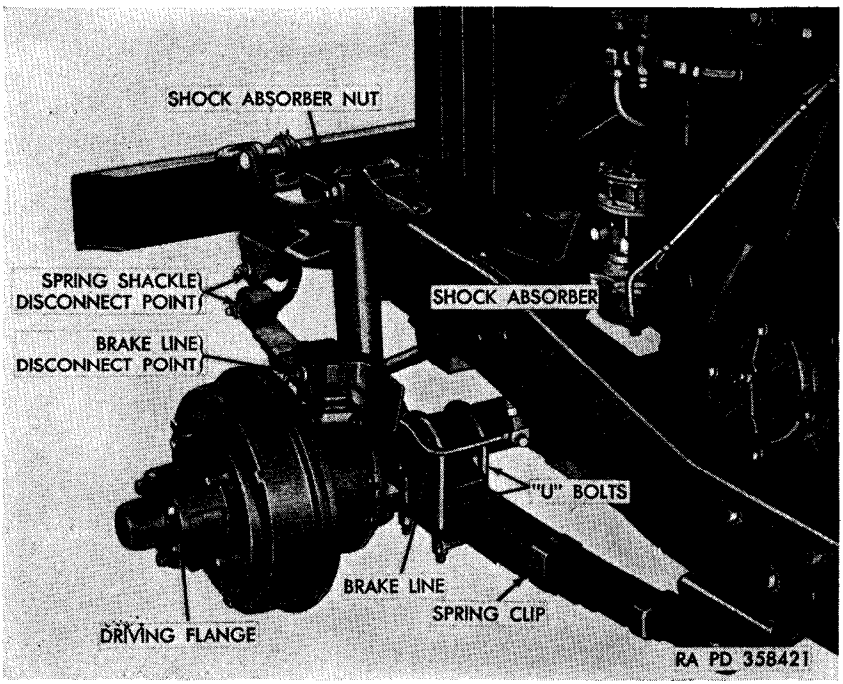


Figure 89. Front suspension—left side.

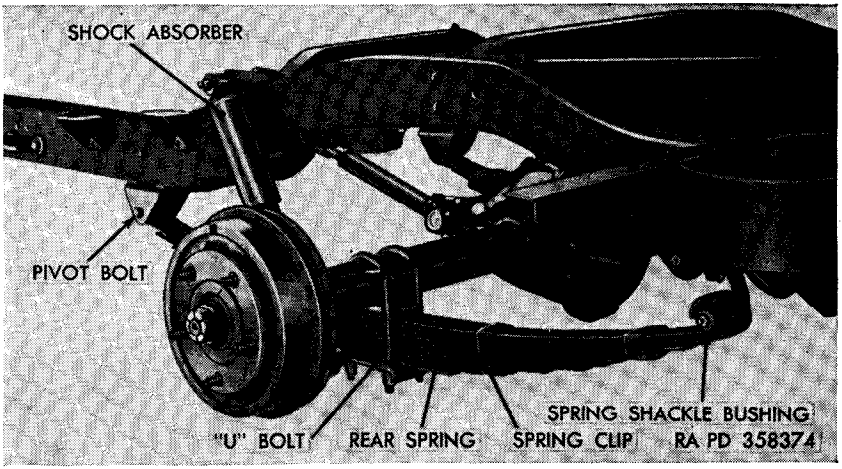


Figure 90. Rear spring.

136. Data

Front spring:	
Type	semielliptic
Length (center to center of eye)	36¼ in
Width	1¾ in
Number of leaves	10
Spring clips	4
Spring bolt eye to center bolt	18⅛ in
Camber under 650 lb	⅜ in
Rear eye	bushing
Rear spring:	
Type	semielliptic
Length (center to center of eye)	42 in
Width	1¾ in
Number of leaves	11
Spring clips	4
Spring bolt eye to center bolt	21 in
Camber under 800 lb	⅝ in
Front eye	bushing
Shock absorbers:	
Type	hydraulic
Action	double
Length—compressed:	
Front	10 15/16 in
Rear	10 15/16 in
Length—extended:	
Front	17 7/16 in
Rear	17 7/16 in
Adjustable	no
Refillable	no
Mounting	rubber bushing

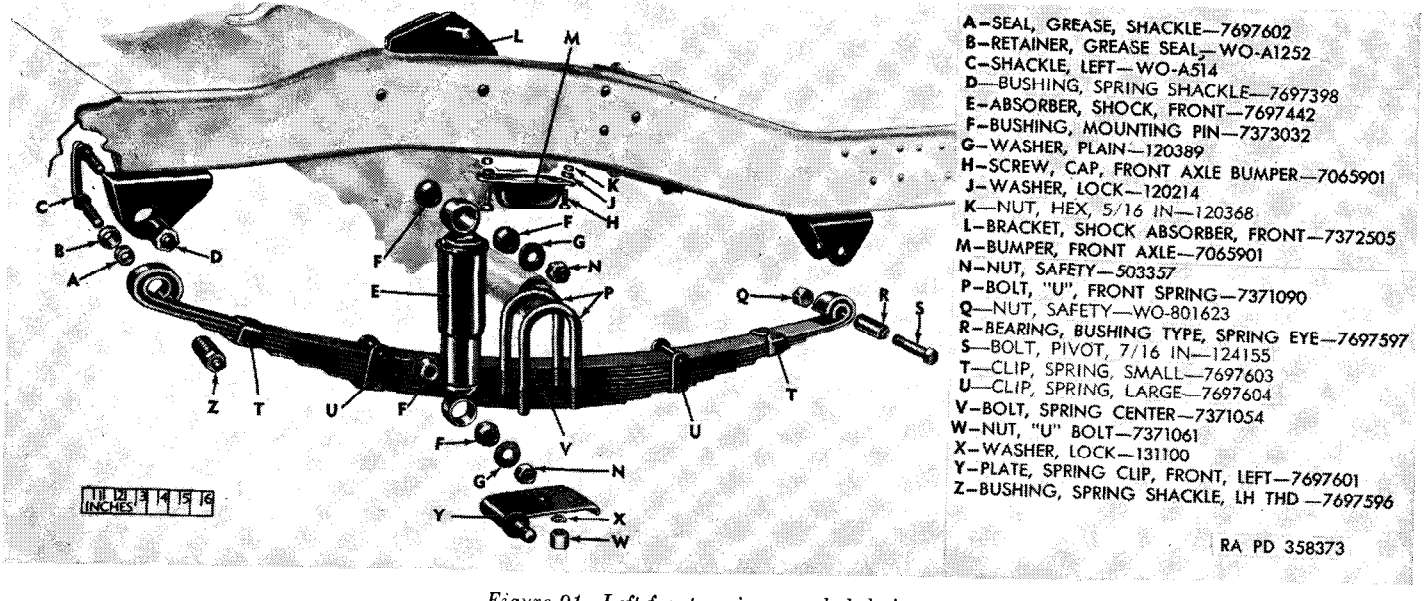


Figure 91. Left-front spring—exploded view.

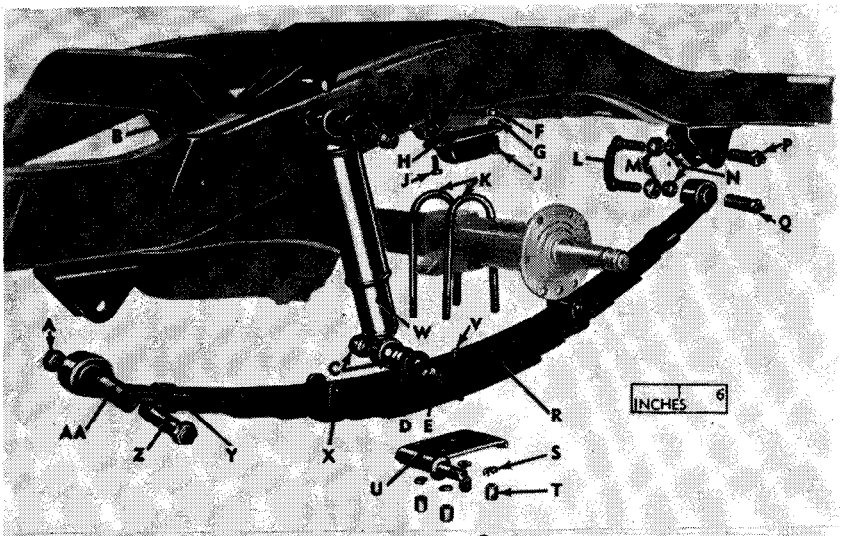


Figure 92. Left-rear spring—exploded view.

Section II. REBUILD PROCEDURE

137. Remove Assemblies

a. Remove Springs. Refer to TM 9–804 for removal procedure for front and rear springs.

b. Remove Shock Absorbers. Refer to TM 9–804 for removal procedures for front and rear shock absorbers.

138. Rebuild of Springs

a. Cleaning. Clean all parts in dry-cleaning solvent or volatile mineral spirits.

b. Inspection. Replace spring leaves or spring clips that are cracked or bent (*c* below). Replace spring shackles or spring shackle U bolts that are bent or otherwise damaged (TM 9–804). Replace the pivot bolt or bearings if they are not within limits specified in repair and rebuild standards (par. 191).

c. Spring Eye Bearing Replacement. Place the spring in a press, and with a suitable driver, press out the spring eye bushing type bearing (R, fig. 91; AA, fig. 92). Using the driver, press a new spring eye bearing into the spring.

d. Remove Spring Leaves. Remove the nut and bolt from the two large spring clips (U, fig. 91; X, fig. 92); bend the edges back on the two small spring clips (T, fig. 91; Y, fig. 92) and remove the spring clips. Install a C clamp next to the spring center bolt (V, fig. 91) to hold the tension of the spring leaves while removing spring center bolt. Remove the spring center bolt (V, fig. 91). Remove the C clamp and separate the spring leaves. Replace the damaged or broken spring leaves.

e. Assembly Spring. Place the spring leaves on the spring center bolt (V, fig. 91), starting with the shortest leaf. Pull the spring leaves together in a vise or a suitable press and install the nut on the spring center bolt. Install the four spring clips.

139. Cleaning and Inspection of Shock Absorbers

a. Cleaning. Wash the shock absorbers in dry-cleaning solvent or volatile mineral spirits.

Note. Do not place the rubber shock absorber mounting pin bushings in cleaning fluid.

b. Inspection. Replace the shock absorber if it is cracked, excessively worn, or is leaking fluid. Replace the rubber bushings if they are excessively worn.

Note. No attempt has been made to give rebuild procedures for shock absorbers. In the event of shock absorber failure, replace with a new unit and dispose of used units as directed by proper authority.

140. Install Assemblies

a. Install Springs. Refer to TM 9–804 for installation procedure for front and rear springs.

b. Install Shock Absorbers. Refer to TM 9–804 for installation procedure for front or rear shock absorbers.

CHAPTER 11
STEERING GEAR AND DRAG LINK

Section I. DESCRIPTION AND DATA

141. Description

The Ross Model T–12 steering gear (figs. 93 and 94) is of the cam and twin pin lever, variable ratio type. The steering gear Pitman arm shaft is serrated for attachment of the Pitman arm (fig. 95); the steering wheel is serrated for attachment to the worm shaft. The steering wheel is of the safety type, having three spokes and is 17¼-inches in diameter. The drag link is of the adjustable ball and socket type. Two types of horn buttons are used. On early production vehicles, the horn control consisted of a button and spring which, when pressed, depressed the horn switch push rod (figs. 94 and 96). On later vehicles, a waterproof cap was fitted over the steering wheel nut. This cap, when pressed, depressed a retainer which in turn depressed the horn switch push rod (figs. 94 and 97).

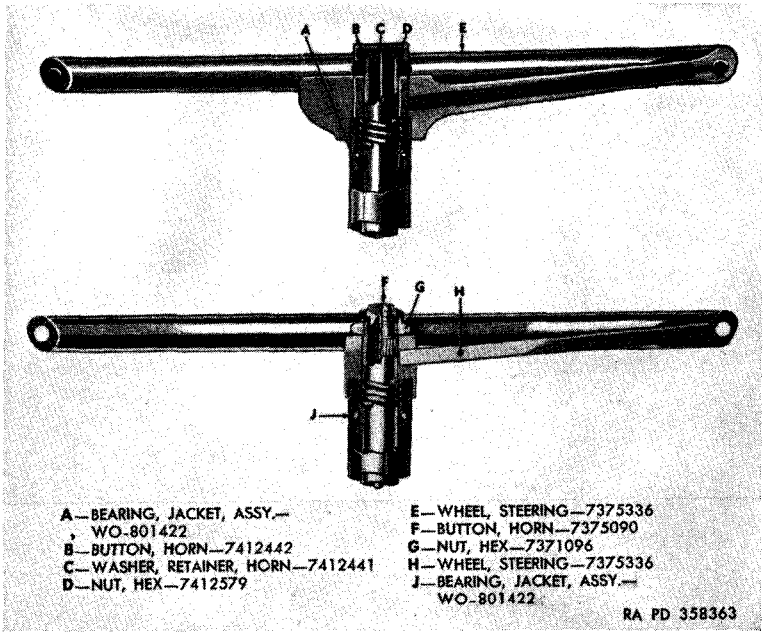


Figure 93. Steering wheel and horn button assembly—sectional view—both types.

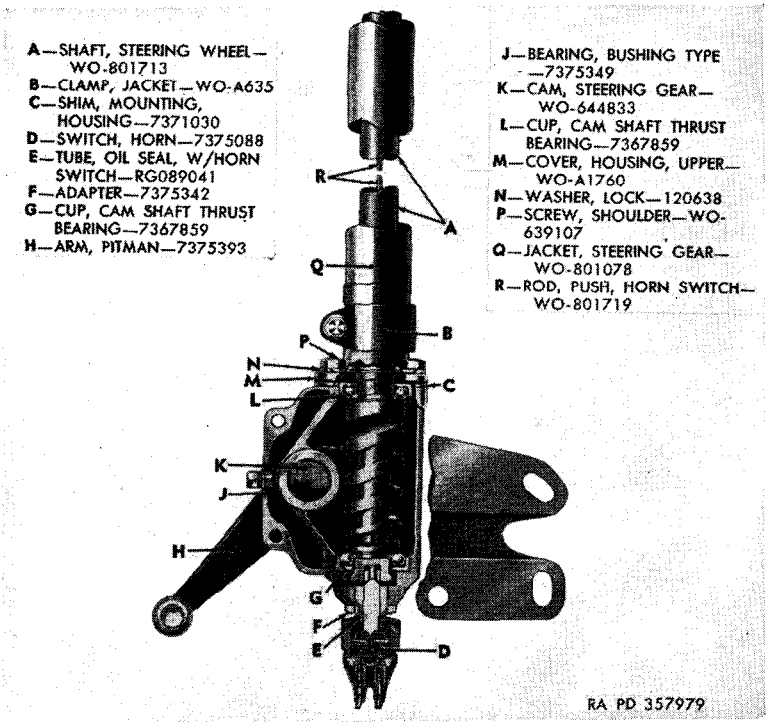


Figure 94. Steering gear assembly—sectional view.

142. Data

Steering gear:	
Manufacturer	Ross
Model	T–12
Ratio (variable)	15.4, 13.5 :15.4
Type	cam and twin pin lever
Wheel (safety type)	17¼-in diam
Bearings:	
Cam:	
Upper	ball
Lower	ball
Sector shaft	bushing
Steering column, upper	ball
Sector shaft:	
Clearance to bushing	0.0005 to 0.0025 in
End play	0.000 in
Lash at cam (straight ahead)	slight drag
Steering geometry:	
Camber	1½ deg
Caster	3 deg
Kingpin inclination	7½ deg
Toe-in	3/64—3/32 in
Turning radius	18 ft

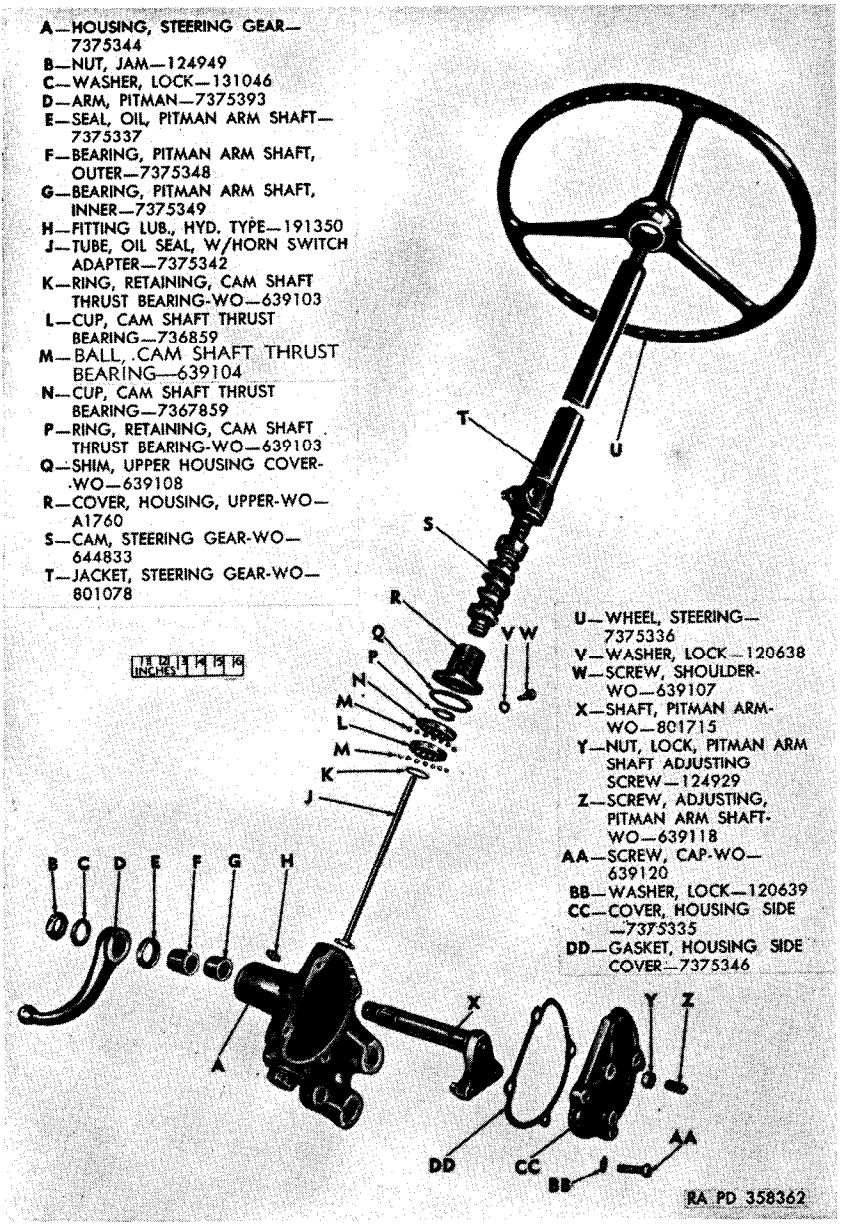


Figure 95. Steering gear—exploded view.

Section II. REBUILD OF STEERING GEAR

143. Remove Steering Gear and Drag Link

Refer to paragraph 35.

144. Disassembly of Steering Gear

(fig. 94)

a. Remove Horn Switch. Remove horn switch (D) by unscrewing switch from housing.

b. Remove Jacket. Remove jacket clamp (B) and remove jacket and jacket bearing assembly (A or J, fig. 93).

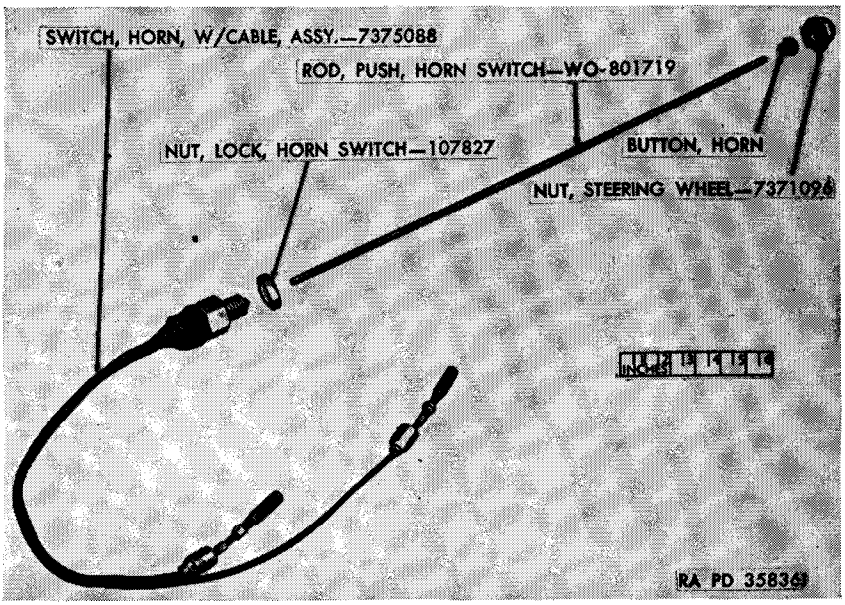


Figure 96. Horn controls—exploded view—early type.

c. Remove Steering Gear Pitman Arm Shaft (fig. 95). Loosen Pitman arm shaft adjusting screw lock nut (Y) and unscrew Pitman arm shaft adjusting screw (Z) to loosen Pitman arm shaft (X). Remove the four cap screws (AA) and lock washers (BB) securing the housing side cover (CC); remove the housing side cover and housing side cover gasket (DD).

d. Remove Steering Gear Cam (fig. 94). Remove the three shoulder screws (P), lock washers (N), and flat washers securing the upper housing cover (M); remove cover and housing mounting shim (C). Remove the steering gear cam (K), steering wheel shaft (A), upper cam shaft thrust bearing cup (L), and cam shaft thrust bearing balls (M, fig. 95).

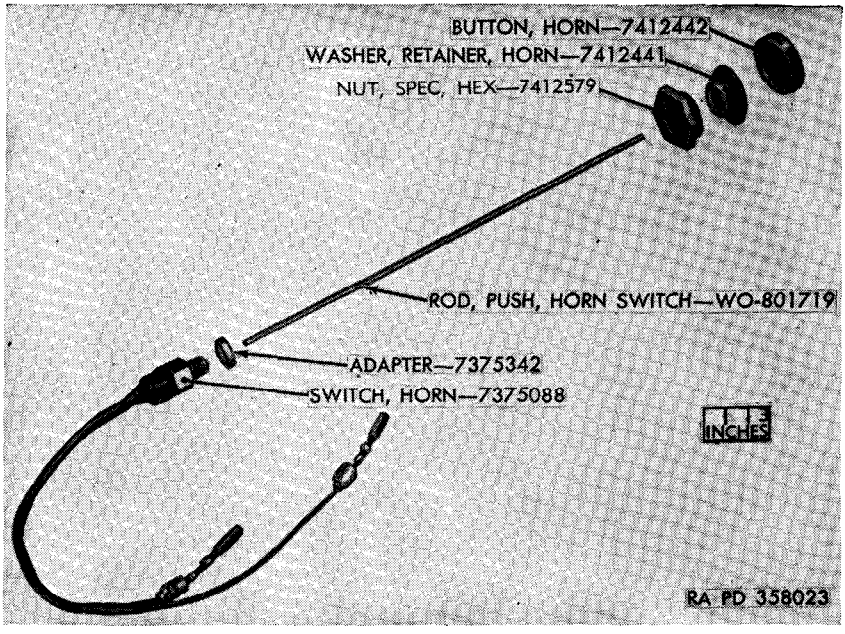


Figure 97. Horn controls—exploded view—late type.

Caution: When removing steering gear cam (K), make sure no cam shaft thrust bearing balls are lost as these balls are loose and will readily fall out if pressure is not kept on the cam shaft thrust bearing cup.

Remove 11 cam shaft thrust bearing balls (M, fig. 95) from the cam shaft thrust bearing cup (G) in the lower part of the steering gear housing; then remove the cam shaft thrust bearing cup.

145. Cleaning, Inspection, and Repair of Steering Gear

a. Cleaning and Inspection. Clean all parts thoroughly in volatile mineral spirits or dry-cleaning solvent. Replace a steering gear housing assembly or housing side cover that is bent or cracked. Replace the inner and outer Pitman arm shaft bearings in the steering gear housing (*b* below) if worn larger than specified in repair and rebuild standards (par. 192). Replace steering gear cam assembly if the cam is excessively worn, ridged, scored, or chipped. Replace a worn, pitted, or cracked bearing cam shaft thrust bearing cup. Replace a Pitman arm shaft assembly that has flat spots on the tapered studs or that has chipped studs. Replace oil seal tube with horn switch adapter if defective. Replace cam shaft thrust bearing balls that are chipped or have flat spots.

b. Replace Inner and Outer Pitman Arm Shaft Bearings. Remove

the Pitman arm shaft oil seal (E, fig. 95) with a small punch. Drive a small punch between the steering gear housing (fig. 98) and the joints in the Pitman arm shaft bearing until the ends of the bearings overlap. Tap the Pitman arm shaft bearings out of the steering gear housing. Install a new Pitman arm shaft oil seal. Press the outer Pitman arm shaft bearing (fig. 99) into the steering gear housing, until it is flush with the Pitman arm shaft oil seal shoulder in the steering gear housing. Press the inner Pitman arm shaft bearing into the steering gear housing. Ream the Pitman arm shaft bearings to dimensions listed in the repair and rebuild standards (par. 192) with reamer 41–R–2276–840 (fig. 100).

146. Assembly of Steering Gear

a. Install Steering Gear Cam (fig. 95). Place lower cam shaft thrust bearing cup (L) in bottom of steering gear housing (A) and place eleven cam shaft thrust bearing balls (M) in cup. Insert steering gear cam (S) in steering gear housing from top and seat in cam shaft thrust bearing assembly at bottom of steering gear housing. Place 11 cam shaft thrust bearing balls (M) around upper shoulder of steering gear cam (S). Install upper cam shaft thrust bearing cup (N) over cam shaft thrust bearing balls and install cam shaft thrust bearing retaining ring (P) over cam shaft thrust bearing. Place upper housing cover shims (Q) on steering gear housing and install upper housing cover (R) on steering gear housing. Install lock washer (V) and shoulder screw

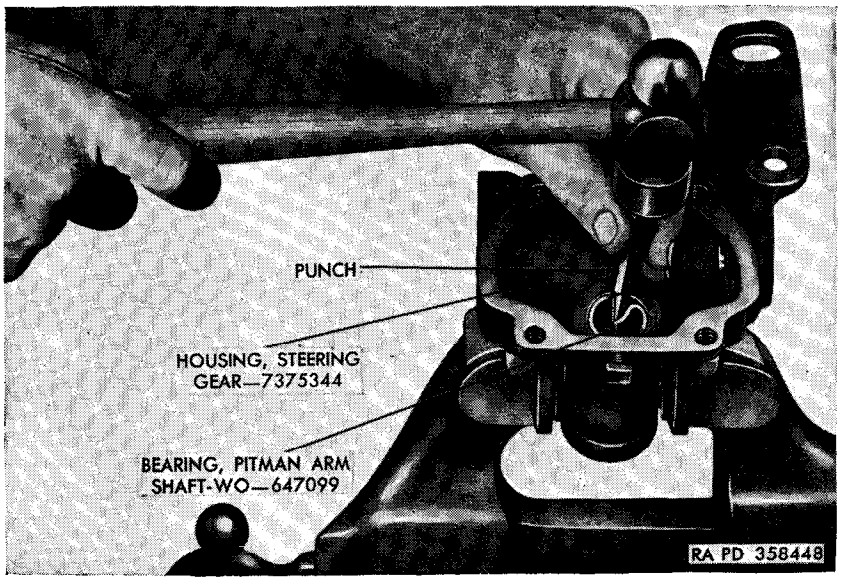


Figure 98. Removing steering gear housing bearing.

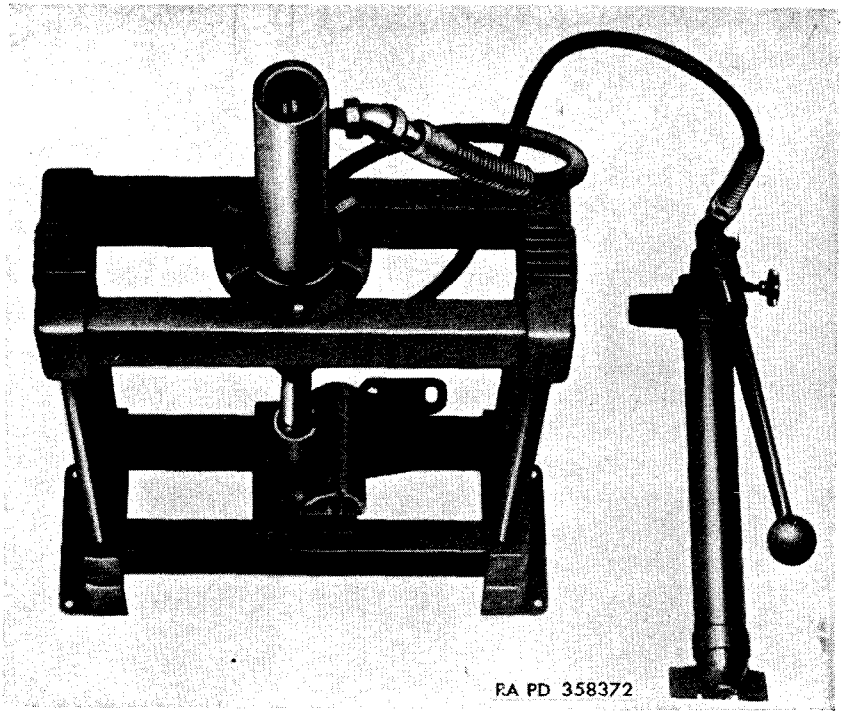


Figure 99. Installing Pitman shaft bearing.

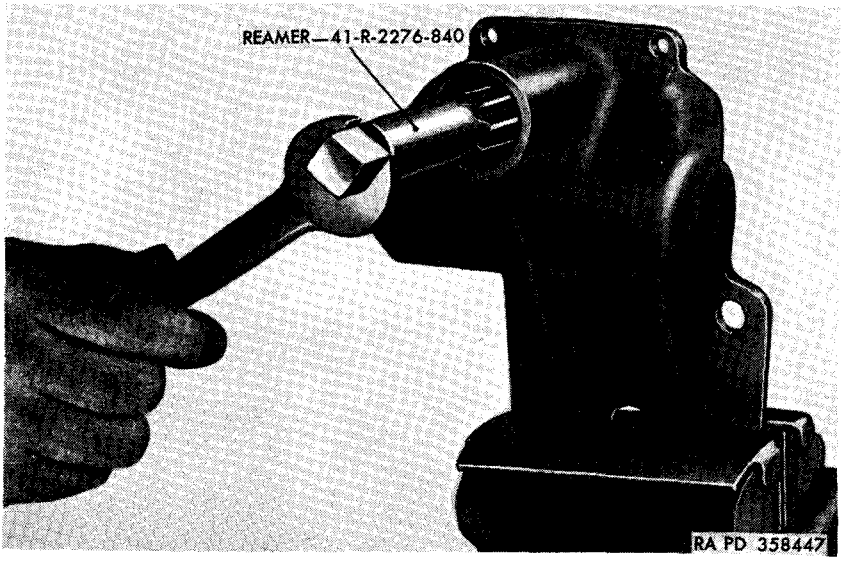


Figure 100. Reaming Steering gear housing bearing with reamer 41–R–2276–840.

(W) to retain upper housing cover. Turn cam shaft by hand; if cam shaft is too tight, upper housing cover shims must be added; if too loose, shims must be removed. The correct adjustment is when the shaft turns freely but has no end play. These upper housing cover shims are supplied in 0.002-, 0.003-, and 0.010-inch thickness.

b. Install Steering Gear Pitman Arm Shaft (fig. 95). Slide the Pitman arm shaft (X) into the steering gear housing, making sure the tapered studs engage in the steering gear cam.

c. Install Housing Side Cover On Steering Gear Housing (fig. 95). Install a new housing side cover gasket (DD) and housing side cover (CC) on the steering gear housing (A). Install the Pitman arm shaft adjusting screw (Z) and Pitman arm shaft adjusting screw lock nut (Y) in the housing side cover (fig. 101). Turn the Pitman arm shaft

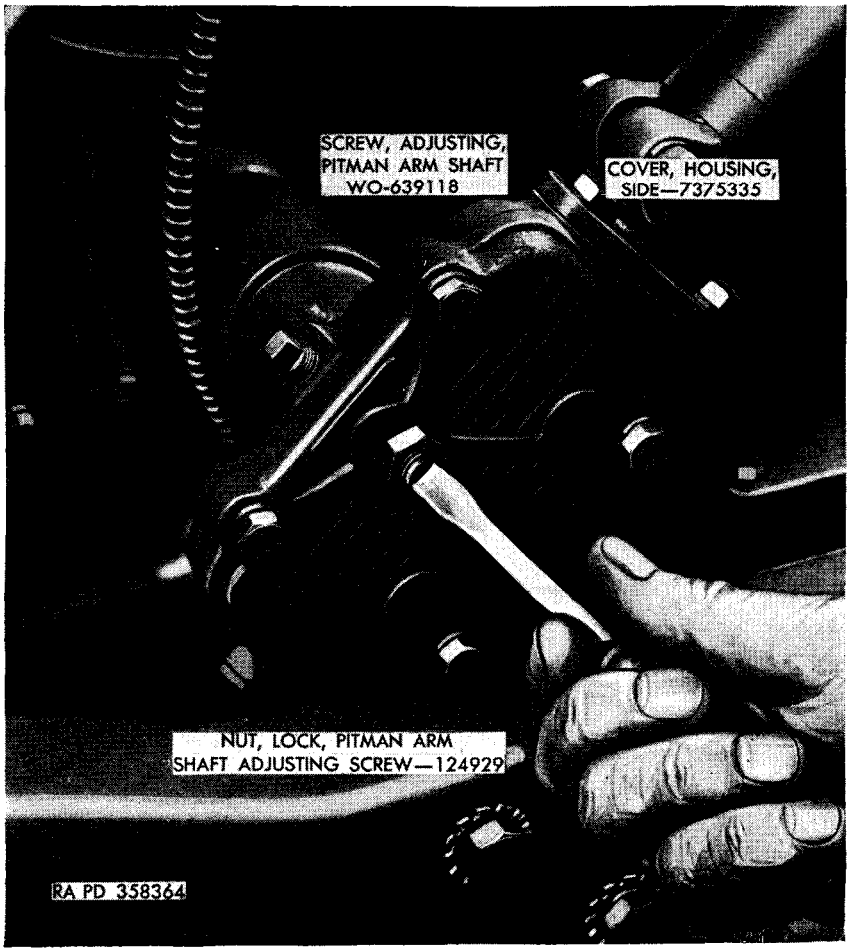


Figure 101. Adjusting Pitman arm shaft.

counterclockwise until it cannot be turned any farther. Turn the Pitman arm shaft clockwise until it cannot be turned any farther, counting the complete and part revolutions of the Pitman arm shaft; then turn it counterclockwise, half the number of turns previously made. This will center the Pitman arm shaft. Turn the Pitman arm shaft adjusting screw (Z) until a slight drag on the Pitman arm shaft can be felt at this point. Tighten the Pitman arm shaft adjusting screw lock nut (Y).

d. Install Horn Switch. Screw horn switch (D, fig. 94) in place on bottom of steering gear housing.

e. Install Steering Gear Jacket On Shaft (fig. 94). Slide steering gear jacket (Q) on from top of assembly and secure with jacket clamp (B).

147. Installation of Steering Gear Assembly

a. Install Steering Gear. Refer to paragraph 40.

b. Install Pitman Arm. Refer to TM 9–804 for Pitman arm installation procedure.

c. Connect Drag Link. Refer to paragraph 40.

d. Install Steering Wheel. Refer to TM 9–804 for steering wheel installation procedure.

e. Lubricate. Refer to TM 9–804 for lubrication instructions.

Section III. REBUILD OF DRAG LINK

148. Remove Drag Link

Refer to paragraph 35.

149. Disassembly of Drag Link

(fig. 102).

Remove the drag link dust cover dust shields (P and R) and drag link dust covers (N and S). Remove cotter pins (A and M). Remove the large and small drag link ball seat adjusting plugs (B and L), drag link ball seats (C, G, and H), drag link ball seat springs (D and J), and the drag link ball seat spring plugs (E and K). Remove the hydraulic-type lubrication fittings (T and Q).

150. Cleaning and Repair of Drag Link

Clean all parts thoroughly in dry-cleaning solvent or volatile mineral spirits. Straighten or replace the drag link if it is bent. Replace all damaged lubrication fittings and clean all fittings that are clogged. Replace excessively worn adjusting plugs or broken springs. Replace

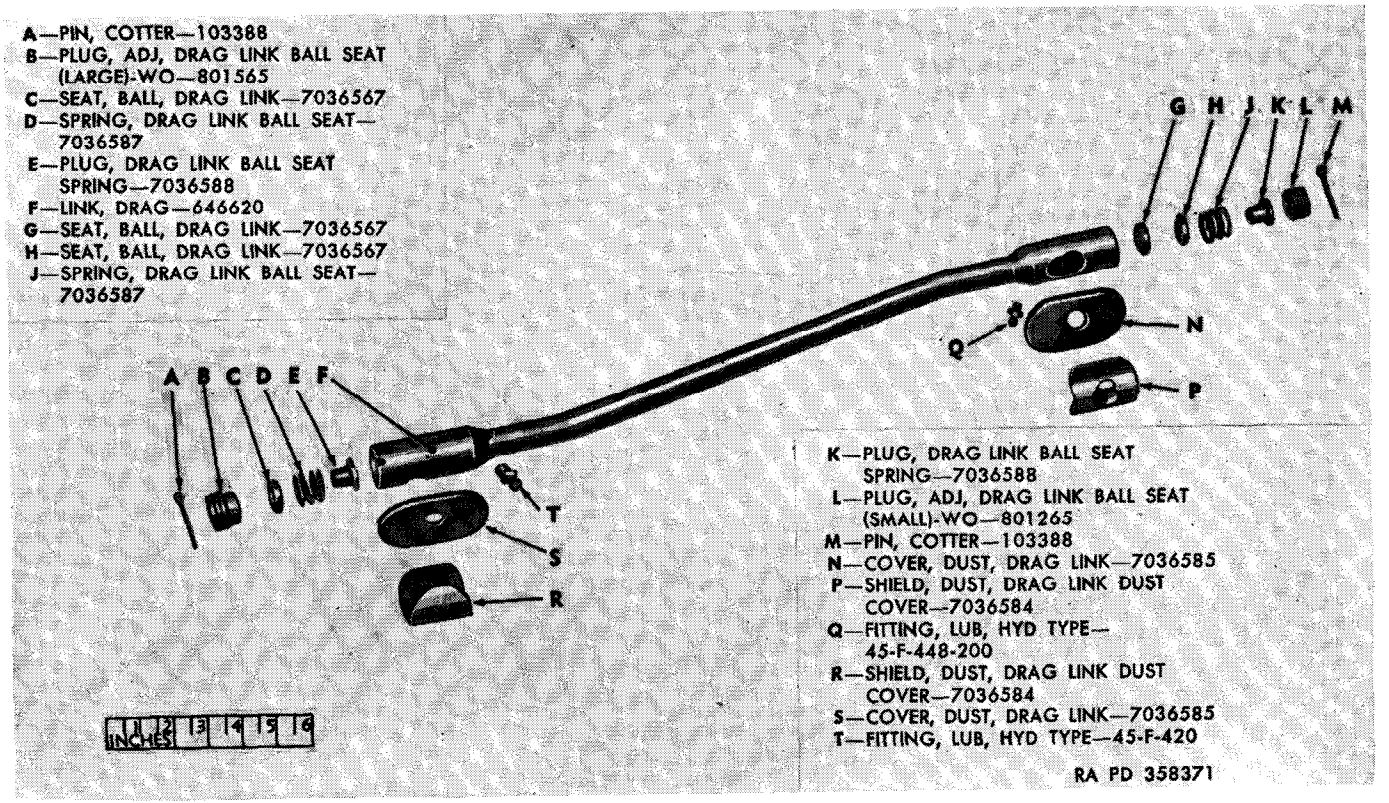


Figure 102. Drag link assembly—exploded view.

ball seats that are excessively worn. Replace damaged dust covers or dust cover shields.

151. Assemble Drag Link

(fig. 102)

Install hydraulic-type lubrication fittings (T and Q). Place a drag link ball seat spring plug (E), drag link ball seat springs (D), and a drag link ball seat (C) in the front end of the drag link. Screw the larger drag link ball seat adjusting plug (B) approximately three or four turns in the front end of the drag link. Place drag link ball seats (G and H), drag link ball seat spring (J), and drag link ball seat spring plug (K) in the rear end of the drag link. Screw the smaller drag link ball seat adjusting plug (L) approximately three or four turns in the drag link.

Note: Do not install cotter pins (A and M) until drag link is attached to vehicle.

Install drag link dust covers (N and S) and drag link dust cover dust shields (P and R).

152. Installation of Drag Link

(fig. 25)

Refer to paragraph 40 for installation procedure.

CHAPTER 12
BODY

Section I. DESCRIPTION

153. Body

a. General. The body is of all steel construction with mounting that provides a secure attachment to the frame. All major panels are of No 18 gage steel. All open edges of the panels are turned under, reinforced, and flanged to provide added strength. These panels are seamed and welded together. The body is insulated from the frame with insulator shims placed between the body and frame, and held in position by the body bolts. Paragraph 30 contains body removal instructions and paragraph 45 contains installation instructions.

b. Exterior of Body (fig. 103). The exterior of the vehicle has a fuel can carrier (S) and spare wheel carrier (K) mounted on the rear of a hinged tail gate (P). A gas cap guard (A), top bow retaining brackets, right and left door rod retainers, folding windshield, reflectors, footman loops, rear view mirrors, trailer receptacle, and an axe and shovel bracket are also mounted on the exterior of the vehicle.

c. Interior of Body (figs. 103 and 104). The interior of the body contains two tubular frame front seats and a rear seat, a tool compartment located under the right front seat, a fuel tank located under the driver's seat, an instrument cluster, and a fuel primer pump is located on the dash. A rifle holder is mounted on the lower panel of the windshield and a radio receptacle is located to the right of the right front seat. Ignition and light switches are located on the dash.

154. Associated Parts of Body

a. Windshield (fig. 104). The windshield assembly is of the folding type, constructed of tubular steel. It is equipped with dual vacuum and hand-operated windshield wipers. A single windshield glass is mounted in a rubber weather strip and locked in place with a rubber locking strip. It is not necessary to remove the windshield assembly from the vehicle to replace the glass.

b. Seat Frame Assemblies (fig. 103). Two tubular front and one tubular rear seats provide seating space for four people. The driver seat frame is secured to the body by four cap screws. The front passenger seat is secured with two hinge pins; the rear seat by a pivot tube secured to each side of the body. Both front and rear seats are replaceable and repairable. Removal instructions are contained in

paragraph 30 and installation instructions are contained in paragraph 45.

c. Instrument Cluster. The instrument cluster is located in the center of the dash and contains a fuel gage, charge indicator, oil pressure gage, panel lights, speedometer, high-beam indicator light, temperature gage, resistors and a circuit breaker, junction block, and

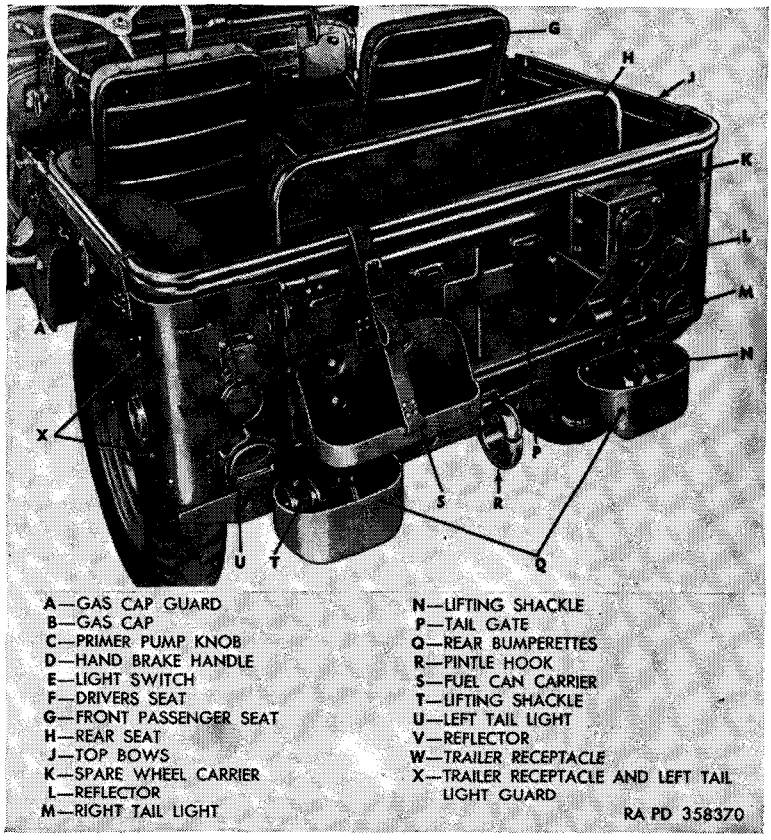


Figure 103. Body—left rear view.

primary terminals. Removal and installation instructions of the instrument cluster and its components are covered in TM 9–804.

d. Top, Doors, and Curtains. The doors, top and side, and rear curtains are made of canvas. The top is secured to the vehicle by mounting on tubular top bows and to the windshield assembly. Side curtains have snap-button type fasteners and hold-down straps. The doors are mounted on steel rods and door retainers. The doors, side curtains, and rear curtains are equipped with Vinyl windows. The doors are latch-locking type with a zipper opening on the driver's

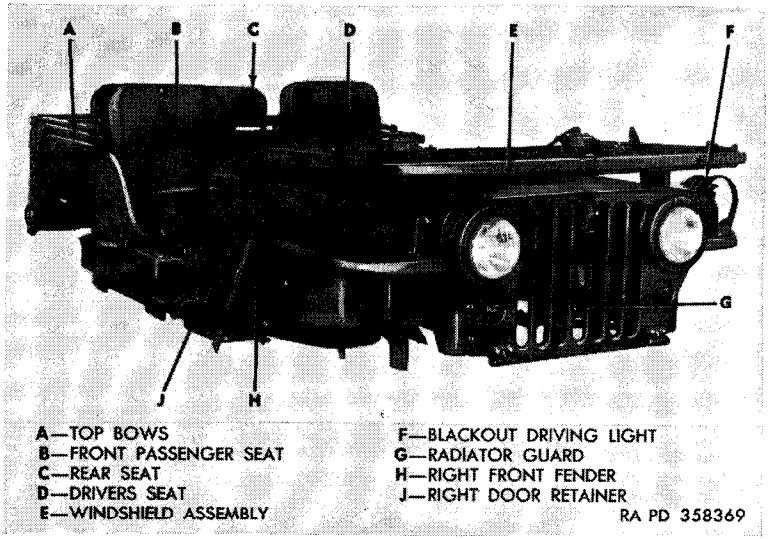


Figure 104. Body—right front view.

side for hand signals. Removal and installation instructions are contained in TM 9–804.

e. Tail Gate (fig. 103). A removable tail gate is hinged to the rear of the body and has an extra fuel can carrier and a spare wheel carrier mounted on the outside. Removal instructions are contained in paragraph 158.

f. Fuel Tank (fig. 105). A 13-gallon fuel tank is mounted directly under the driver's seat on the floor of the body. This fuel tank is

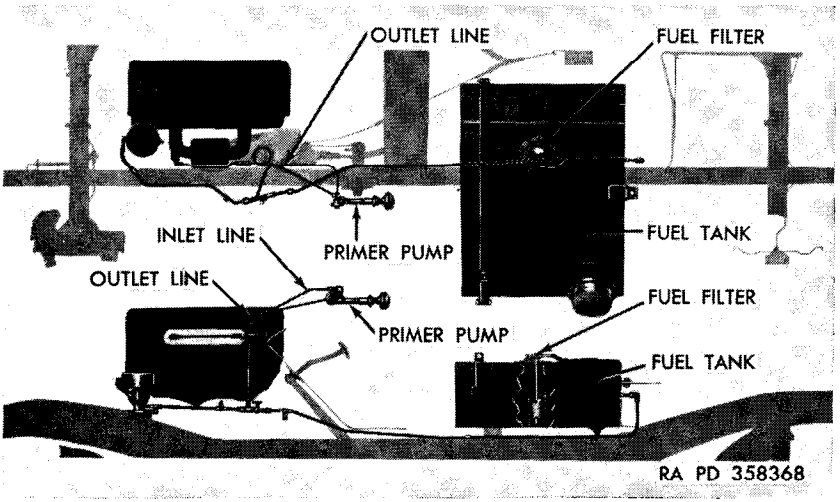


Figure 105. Primer pump system.

held in place by two straps and contains a fuel gage sending unit and a filter element. Installation and removal instructions are contained in TM 9–804.

g. Primer Pump (fig. 105). The primer pump is of the piston and cylinder type mounted on the left side of the dash, and is used to supply an extra amount of fuel directly into the intake manifold when cold weather makes normal starting process difficult. Removal and installation instructions are contained in paragraph 168.

Section II. REMOVAL OF ASSOCIATED PARTS

155. General

Paragraph 30 contains removal instructions for the windshield, front and rear seats, hood, fenders, and trailer receptacle.

Note. The extent of disassembly of body associated parts should be controlled by the extent of damage to the individual part found after inspection.

156. Instrument Cluster

Removal instructions are contained in TM 9–804.

157. Top, Doors, and Curtains

Removal instructions are contained in TM 9–804.

158. Tail Gate Assembly

Remove the nut, bolt, two flat washers, and lock washers securing each side of tail gate. Lay tail gate down until hinge pins on tail gate are alined with slots in hinge on body; remove tail gate.

159. Fuel Tank

Removal instructions are contained in TM 9–804.

160. Primer Pump

(fig. 108)

Remove inlet nut assembly from inlet connector (R). Remove outlet connector nut from outlet connector (BB). Loosen barrel cap (M) and barrel cap nut (N) holding primer pump assembly to instrument panel. Pull plunger stem knob (A) and plunger stem (D) from primer pump body with barrel assembly (P).

Section III. REBUILD OF BODY

161. Body

a. Cleaning. Clean grease and dirt from all parts of the body with volatile mineral spirits or dry-cleaning solvent. If steam is available, steam cleaning in addition to the above procedure is recommended to remove heavy accumulation of grease. After thorough cleaning, remove excess cleaning solvent with cold water.

b. Inspection. Inspect the body for damage. If body is so badly damaged that normal body straightening will not be effective, damaged panels or sections must be replaced (*c* below). Inspect brackets, footman loops, door retainers, reflectors, and gas cap guard. Replace defective parts.

c. Repair. The extent of repairs to the body is limited to straightening damaged parts with body repair tools, cutting the damaged panels from the body, and replacing with new panels. After damaged panels have been repaired or replaced, sandpaper body and repaint.

162. Windshield

a. Cleaning. Clean windshield assembly with volatile mineral spirits or dry-cleaning solvent.

b. Inspection. Inspect the windshield for broken or cracked glass. See that windshield does not leak around rubber weather strip or the or the locking strip. Inspect brackets, clips, and ventilator cover for damage. Replace defective parts.

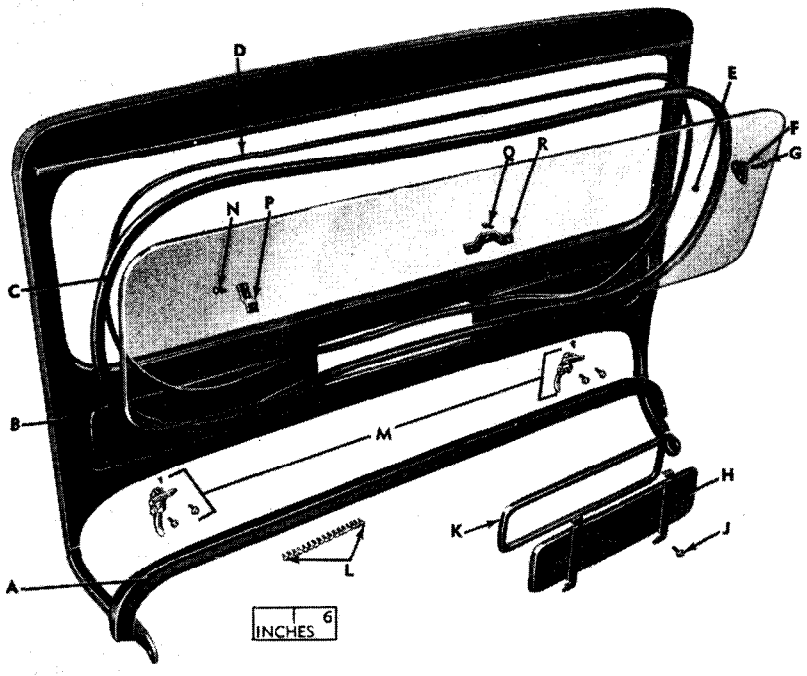
c. Repair (fig. 106). Repair of windshield is limited to: replacement of broken or cracked glass, replacement or repair of bent or distorted windshield frame, ventilator cover, clips, or brackets. Remove the rubber locking strip (D) with a screwdriver and remove windshield glass (E) and glass weatherstrip (C). Place glass weatherstrip around a new windshield glass, place in windshield frame; secure with rubber locking strip.

163. Driver's, Passenger, and Rear Seat Assemblies

a. General. Removal of seats is covered in paragraph 30. Installation of seats is covered in paragraph 45. Installation and removal instructions for seat cushions and backs is contained in TM 9–804.

b. Cleaning. Seat frames should be cleaned in volatile mineral spirits or dry-cleaning solvent. Dirty cushions or backs can be cleaned with soap and water.

c. Inspection. Inspect seats for cracked or bent metal parts. Inspect cushions and backs for rips or tears.



A—WEATHERSTRIP, WINDSHIELD-TO-COWL—7375397
B—FRAME, WINDSHIELD ASSY—7375311
C—WEATHERSTRIP, GLASS—7375396
D—STRIP, LOCKING, RUBBER—7375316
E—GLASS, WINDSHIELD—WO-670911
F—BRACKET, MOUNTING, RIFLE HOLDER, END—7375161
G—SCREW, W/LOCKWASHER—WO-673606
H—COVER, VENTILATING, WINDSHIELD—7375318
J—SCREW, INT-TEETH LOCKWASHER—7375319
K—WEATHERSTRIP, WINDSHIELD VENTILATING COVER—735394
L—SCREW, TOPPING, WINDSHIELD-TO-COWL WEATHERSTRIP—145193
M—CLAMP, WINDSHIELD, ASSY—7375361
N—SCREW, W/EXT-TEETH LOCKWASHER—7697440
P—BRACKET, MOUNTING, RIFLE HOLDER, RIGHT—7375160
Q—SCREW, W/EXT TEETH LOCKWASHER—7697440
R—BRACKET, MOUNTING, RIFLE HOLDER, LEFT—7375159

RA PD 358367

Figure 106. Windshield—exploded view.

d. Repair. Broken or cracked seat frames can be welded. Torn cushions or backs can be sewed.

164. Instrument Cluster

Removal and installation instructions for instrument cluster and its components are covered in TM 9–804.

165. Top, Doors, and Curtains

a. General. Removal and installation procedure for the top, doors, and curtains is contained in TM 9–804.

b. Cleaning. Clean the canvas parts with soap and water. The windows should always be cleaned with a wet cloth, as dry wiping tends to damage the Vinyl surface of the windows.

Warning: Do not use any type of cleaning solvent on the windows, as cleaning solvents soften the Vinyl surface, causing windows to have a milky discoloration.

c. Inspection and Repair. Inspect canvas items for rips or tears. Sew or replace. Inspect metal rods for bends or breaks; repair or replace. Inspect windows for cracks or discoloration. Replace, if found defective.

166. Tail Gate Assembly

a. Disassembly. Remove the four nuts, screws, and spacers securing the spare fuel can carrier and remove carrier. Remove the six nuts and screws with lock washers securing the spare wheel carrier and remove the carrier. Remove the screws attaching the two reflectors; remove reflectors.

b. Cleaning. Clean all parts in volatile mineral spirits or dry-cleaning solvent.

c. Inspection and Repair. Inspect tail gate and carriers for cracks or other forms of damage. Repair or replace defective parts. Replace broken reflectors.

d. Assembly. Place the spare fuel can carrier in position. Install the spacers between the carrier and tail gate; secure with four screws and nuts. Place the spare wheel carrier in place and secure with six screws with lock washers and nuts. Install the new reflectors with two screws.

167. Fuel Tank

(fig. 107)

Warning: An empty fuel tank is far more dangerous than a full tank, due to the retention of explosive or inflammable fumes. Before any attempt is made to repair the fuel tank, be sure it is devoid of all fumes.

a. Cleaning. Steam clean the fuel tank inside and out.

b. Disassembly (fig. 107). Remove filler neck with strainer (A), fuel tank filler neck grommet (E), and fuel tank filler cap (C). Remove the five screws and sealing washers securing the fuel gage sending unit (F) to the fuel tank; remove fuel gage sending unit and fuel gage sending unit gasket (G). Remove the 12 screws and sealing washers securing cover plate with filter bracket assembly (H) to fuel tank Q); remove fuel tank filter cover plate and cover plate gasket (M). Remove fuel tank drain plug (P) from bottom of fuel tank (Q).

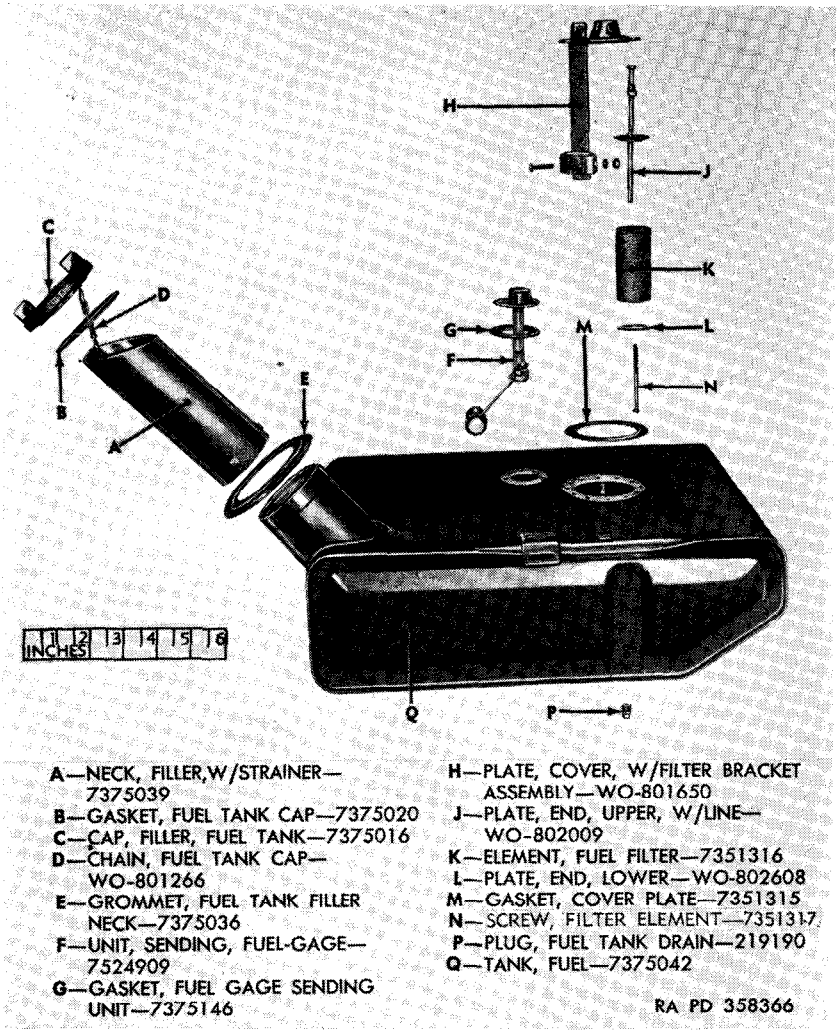


Figure 107. Fuel tank—exploded view.

c. Inspection and Repair. Inspect fuel tank for cracks and seam breaks; repair by welding. Inspect fuel gage sending unit assembly and fuel filter assembly; if found defective, replace with new assemblies. Replace fuel tank drain plug if threads are stripped. Replace fuel tank filler neck if damaged.

d. Assemble Fuel Tank (fig. 107). Install a new fuel tank filler neck grommet (E), filler neck with strainer (A), and fuel tank filler cap (C). Place a new fuel gage sending unit gasket (G) in position. Insert fuel gage sending unit (F) into fuel tank (Q). Aline holes and secure with five cap screws and sealing washers. Place a new cover

plate gasket (M) in position on fuel tank and install the cover plate with filter bracket assembly (H). Secure cover plate assembly with 12 screws and sealing washers.

168. Primer Pump

a. Disassembly (fig. 108). During removal operations, the knob and plunger assembly will be separated from the pump body. Remove upper and lower plunger stem nuts (K and L). Lift off plunger stem cup washer (J) and plunger stem cup (H). Remove plunger stem knob (A) and lift off lock washer (B), packing nut (C), two packing rings (E and G), and plunger stem packing (F). Remove diaphragm cap (S) from base of primer pump body with barrel assembly (P) and lift out diaphragm spring (T), diaphragm guide (U), diaphragm (V), outlet screen (W), and diaphragm cap gasket (X). Remove outlet check valve plug (Y), from end of primer pump body and lift out the outlet check valve ball sping (Z) and check valve ball (AA). Remove inlet connector (R) from pipe elbow (Q) and remove pipe elbow. Remove outlet connector (BB) from primer pump body.

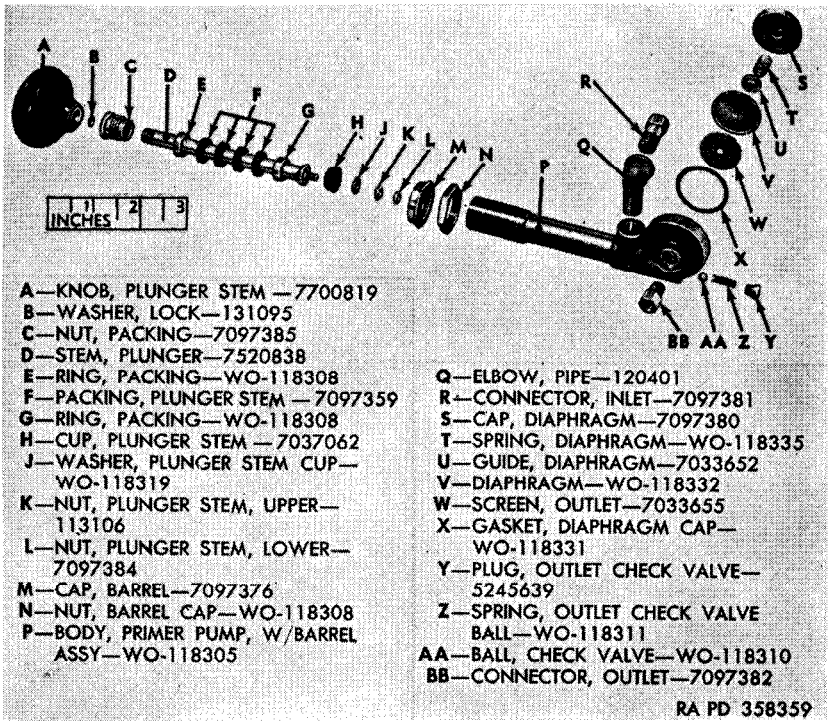


Figure 108. Primer pump—exploded view.

b. Cleaning, Inspection, and Repair. Clean all metal parts in volatile mineral spirits or dry-cleaning solvent. Clean all dirt from outlet screen. Inspect stem and body for damage. Check packing for signs of wear or hardening. Check diaphragm for cracks or other signs of wear. Check plunger stem cup for wear or damage. Replace defective parts.

c. Assembly (fig. 108). Place outlet connector (BB) in opening near end of primer pump body. Place check valve ball (AA), outlet check valve ball spring (Z), and install outlet check valve plug (Y). Place a new diaphragm cap gasket (X), outlet screen (W), diaphragm (V), diaphragm guide (U), diaphragm spring (T), and install diaphragm cap (S). Place packing ring (G) on threaded end of plunger stem (D), followed by four pieces of plunger stem packing (F), a second packing ring (E), and packing nut (C). Place lock washer (B) on plunger stem and secure with plunger stem knob (A). Place the plunger stem cup (H) on the opposite end of plunger stem, followed by a plunger stem cup washer (J) and upper and lower plunger stem nuts (K and L). Place barrel cap nut (N) over threaded end of primer pump body with barrel assembly (P), and barrel cap (M) over bottom of plunger stem assembly. Install pipe elbow (Q) in primer body and inlet connector (R) into pipe elbow.

Section IV. INSTALLATION OF ASSOCIATED PARTS

169. General

Paragraph 45 contains installation instructions for the windshield, front and rear seats, hood, fenders, and trailer receptacle.

170. Primer Pump

Connect inlet and outlet lines. Place pump body assembly in rear of instrument panel and position threaded end in opening of panel. Insert plunger through front of instrument panel into pump body.

Note. Be careful not to damage the plunger stem cups or plunger stem packing.

Tighten barrel cap and barrel cap nut.

171. Install Fuel Tank

Refer to TM 9–804 for fuel tank installation procedure.

172. Tail Gate Assembly

Place tail gate in position on hinges and secure with bolt, two flat washers, lock washer, and nut on each side.

173. Top, Doors, and Curtains

Refer to TM 9–804 for top, doors, and curtain installation procedure.

174. Instrument Cluster

Refer to TM 9–804 for instrument cluster installation procedure.

CHAPTER 13
FRAME

Section I. DESCRIPTION AND DATA

175. Description

The frame is the structural center of the vehicle. In addition to carrying the load, it provides and maintains correct relationship between other units to assure their normal functioning. It is constructed of heavy channel steel side and cross members. Brackets and diagonal braces are used to maintain the proper longitudinal positions of the side members, relative to each other and, at the same time, provide additional resistance to torsional strain. A pintle hook with safety chain eye bolts is mounted on the rear frame cross member for towing trailed loads. Lifting shackles are mounted on the front and rear of the frame for lifting purposes.

176. Data

Material	SAE 950
Depth (max)	4.186 in
Thickness	0.083 to 0.093 in
Flange width	1¾ in
Length	122¾ in
Width:	
Front	29¼ in
Rear	29¼ in
Number of cross members	5 with "K" member at rear
Weight	140 lb
Wheelbase	80 in
Tread:	
Front	48¼ in
Rear	48¼ in

Section II. REMOVAL OF ASSOCIATED PARTS

177. General

Many times improper steering geometry or improper axle alinement gives the same vehicle operation action as if the vehicle had been in an accident that caused the frame to be distorted. In order that unnecessary work will not be performed, it is recommended the frame inspection (par. 178), be performed prior to disassembly of the vehicle for apparent frame repairs.

178. Inspection Before Removal

Position the vehicle on a clean, level floor or on some other clean level space. Attach a plumb bob to the grease fittings at the forward ends of the front spring shackle brackets. Mark the spot at which the plumb bob point rests. Attach the plumb bob to the grease fittings at the rear of the rear spring shackle brackets and mark this spot. Move the vehicle off the markings. Measuring from the markings, compare the distance between the front shackle and the rear shackle on the one side of the vehicle with the same measurement on the opposite side of the vehicle, and compare the diagonal distance between each of the front shackles and the rear shackles on the opposite side of the vehicle. Differences of more than one-quarter of an inch in these measurements indicate a definite frame misalinement that must be corrected. If these comparative measurements are the same within one-quarter of an inch, the frame is not misalined.

179. Removal of Associated Parts From Frame

a. Remove Batteries. Refer to TM 9–804 for removal procedure.

b. Remove Power Plant. Refer to TM 9–804 for removal procedure.

c. Remove Body and Fenders. Body and fender removal instructions are contained in paragraph 30.

d. Remove Exhaust Pipe. Refer to paragraph 33 for removal procedure.

e. Remove Front Bumpers, Rear Bumperettes, and Lifting Hooks. Refer to paragraphs 31 and 32 for removal procedure.

f. Remove Steering Gear Assembly. Refer to paragraph 35 for removal procedure.

g. Remove Clutch and Brake Pedals. Refer to paragraph 34 for removal procedure.

h. Remove Brake Master Cylinder. Refer to paragraph 34 for removal procedure.

i. Remove Front Axle. Refer to TM 9–804 for removal procedure.

j. Remove Rear Axle. Refer to TM 9–804 for removal procedure.

Section III. INSPECTION AND REPAIR

180. Inspection

a. Frame Dimensions (fig. 109). To supply as much information as possible to aid in checking frames or to repair damage due to accidents, the main measurements of the frame are given in this paragraph. The over-all length of the frame is 122¾ inches. The width measured between the outside faces of the frame side members is 29¼ inches. Distance "L" to "N" indicates the correct distance of 38¾ inches

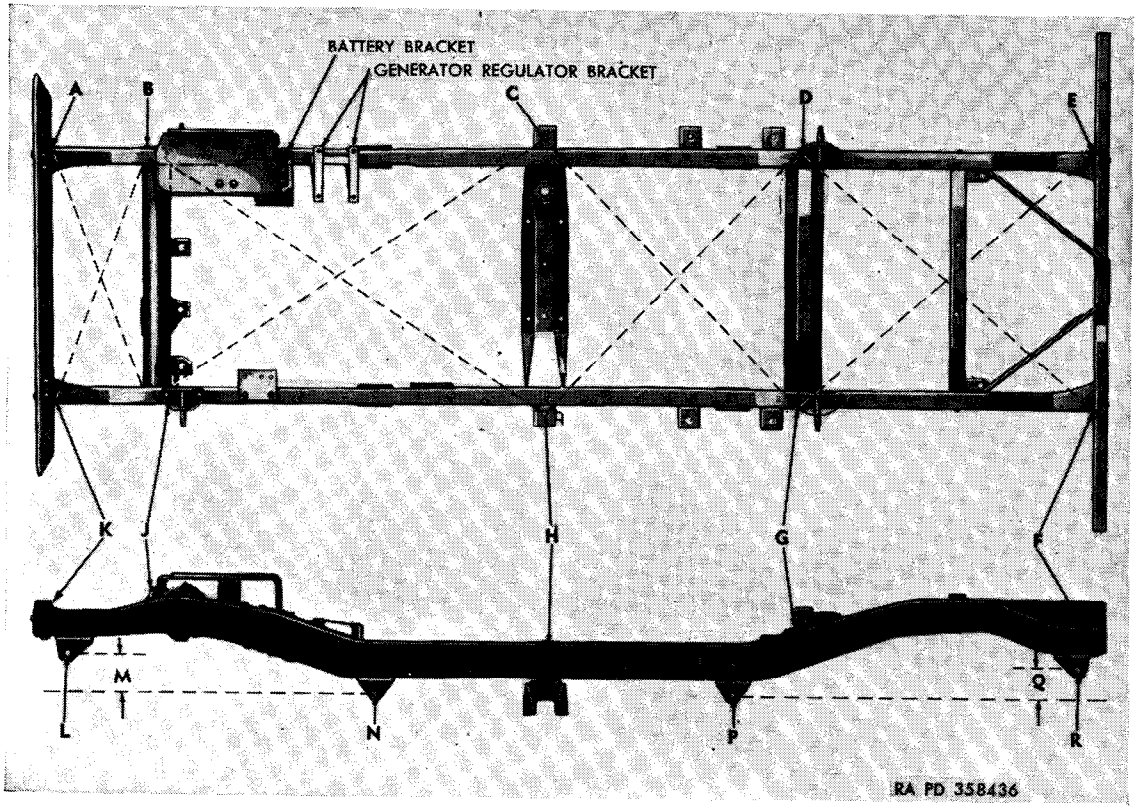


Figure 109. Frame—top and side view.

between the center of the front spring pivot bolt to the center of the front spring shackle bolt. Distance "P" to "R" indicates the correct distance of 40 1/16 inches between the center of the rear spring pivot bolt to the center of the rear spring shackle bolt. Due to the flare-up of the ends of the frame, the center of the shackle bushing hole at the front end "L" should be 4 5/32 inches higher "M" than the center of the pivot bolt hole "N." The rear spring shackle bushing hole "R" should be 3 3/32 inches higher "Q" than the center of the pivot bolt hole "P."

b. Check Frame Alinement (fig. 109). The extent of the misalinement of the frame can be determined by taking measurements at the various points. Measure the distance from points "A" to "J" and from "B" to "K." The difference between these two measurements should not be more than one-eighth of an inch. Measure the distance from points "B" to "H" and "C" to "J." The difference between these two measurements should not be more than one-eighth of an inch. Measure the distance from points "D" to "H" and "C" to "G." The difference between these two measurements should not be more than one-eighth of an inch. Measure the distance between points "D" to "F" and "E" to "G." The difference between these two measurements should not be more than one-eighth of an inch.

181. Repair

a. Frame Alinement. If the frame is found to be out of alinement and cannot be corrected by straightening, remove the distorted section by cutting and replace the damaged section by welding a new section in place.

b. Repair Loose Rivets and Brackets (fig. 109). Replace all rivets that are loose or missing. Replace any damaged body brackets. Replace the battery bracket or voltage regulator brackets if they are damaged or bent beyond repair on the frame.

Section IV. INSTALLATION OF ASSOCIATED PARTS

182. Installation of Parts and Assemblies

a. Install Rear Axle. Refer to TM 9–804 for installation procedure.

b. Install Front Axle. Refer to TM 9–804 for installation procedure.

c. Install Brake Master Cylinder. Refer to paragraph 41 for installation procedure.

d. Install Clutch and Brake Pedals. Refer to paragraph 41 for installation procedure.

e. Install Steering Gear Assembly. Refer to paragraph 40 for installation procedure.

f. Install Exhaust Pipe. Refer to paragraph 42 for installation procedure.

g. Install Front Bumper, Rear Bumperettes, and Lifting Hooks. Refer to paragraphs 43 and 44 for installation procedure.

h. Install Power Plant. Refer to TM 9–804 for installation procedure.

i. Install Body and Fenders. Body and fender installation instructions are contained in paragraph 45.

183. Lubrication and Cooling System Services

Refer to TM 9–804 for proper lubrication and cooling system services.

CHAPTER 14

REPAIR AND REBUILD STANDARDS

184. General

The repair and rebuilt standards included herein give the minimum, maximum, and key clearances of new or rebuilt parts as well as wear limits, which indicate that point to which a part or parts may be worn before replacement, in order to receive maximum service with minimum replacement. Normally, all parts which have not been worn beyond the dimensions shown in the "Wear limits" column or damaged from corrosion will be approved for service. An asterisk (*) in the "Wear limits" column indicates that the part or parts should be replaced when worn beyond the limits given in the "Sizes and fits of new parts" column.

185. Torque Wrench Specifications

Fig. No.	*Ref. letter*	*Location*	*Torque (ft-lb)*
88	T	Front and rear spring U bolt nuts	50 to 55
88	Q	Spring pivot bolt nuts	50 to 55
58	B	Differential case bearing cap nut	38 to 42

186. Transmission

a. Input Shaft (par. 55).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
110	A	Diameter of input shaft pilot bearing roller recess	1.2002–1.2007	1. 2057
110	B	Diameter of pilot end of input shaft	0.627–0.628	0. 622
110	C	Diameter of input shaft pilot bearing roller	0.2180–0.2182	(*)
110	D	Inside diameter of input shaft gear bearing.	1.5743–1.5748	(*)

b. Main Shaft (par. 55).

Fig. No.	*Ref. letter*	*Point of measurement*	*Sizes and fits of new parts*	*Wear limits*
110	E	Diameter of pilot end of main shaft	0.7627–0.7632	(*)
111	A	Backlash between low and reverse-sliding gear and main shaft.	0.003–0.016	(*)
110	F	Inside diameter of second speed gear	1.4925–1.4935	(*)

c. Reverse Idler Gear (par. 55).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
112	A	Inside diameter of reverse idler gear bearing.	0.742–0.744	
112	B	Ream size of reverse idler gear bearing	0.7563–0.7570	
112	C	Diameter of reverse idler gear shaft	0.7570–0.7575	

d. Countershaft Gear (par. 55).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
113	A	Countershaft gear end play	0.012–0.018	
112	D	Diameter of countershaft gear bearing rollers.	0.1248–0.1250	(*)
112	E	Thickness of countershaft gear bearing thrust washers.	0. 0555–0. 0625	

187. Transfer

a. Output Shaft Front Bearing Cap (pars. 67 and 70).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
114	A	Outside diameter of pivot pin	0.497–0.500	(*)
114	B–C	Clearance between output clutch gear and shaft.	0.001–0.002	0.005
114	D	Front propeller shaft to transfer yoke: Spline width	0.111–0.1125	0.096
114	E	OD	1.2475–1.2480	1. 2455

b. Output Shaft Rear Bearing Cap (par. 67).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
115	A	Inside diameter of speedometer drive gear bearing.	0.2530–0.2550	0. 2580
115	B	Outside diamater of pilot end of speedometer driven gear.	0.246–0.248	0. 244
115	C	Inside diameter of brake operating lever bearing.	0.376–0.380	0.385
115	D	Outside diameter of brake operating lever stud.	0.374–0.375	(*)
115	E	Thickness of rear bearing cap shims	0.003, 0.010, and 0.031.	

c. Countershaft Gear (par. 67).

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
116	A	Diameter of countershaft	1.1255–1.1260	1. 1235
116	B	Inside diameter of countershaft gear	1.6255–1.6265	1. 6275

d. Output Shaft (par. 67).

116	D	Inside diameter of output clutch gear shaft pilot bearing	0.626–0.627	(*)
116	C	Outside diameter of output clutch gear shaft pilot bearing	0.752–0.753	(*)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
117	A–B	Clearance between inside diameter sliding gear and outside diameter of output shaft	0.001–0.002	0. 005
117	C–E	Clearance between inside diameter output shaft gear and outside diameter of output shaft	0.001–0.002	0. 005
117	D	Output shaft end-play	0.004–0.008	------

188. Propeller Shafts

(par. 83)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
118	A	Clearance of universal joint bearings in sleeve-yoke holes	0.001–0.002	0. 007
118	B	Diameter of universal joint bearing surface	0.5955–0.5960	0. 5975
118	C	Clearance of sleeve-yoke splines to tube splines	0.002–0.004	0. 010

189. Front Axle

(par. 99)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
119	A	Clearance between pinion gears and pinion shaft	0.0024–0.0039	0. 0069
80		Clearance between bearing cups and carrier	0.008	(*)
81		Differential drive gear backlash	0.005–0.007	(*)
82		Differential drive gear run-out	Excess of 0.003	(*)

190. Rear Axle

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
119	A	Clearance between pinion gears and pinion shaft	0.0024–0.0039	0. 0069
80		Clearance between side gears and differential case	Total 0.008	(*)
81		Differential drive gear backlash	0.005–0.007	(*)
82		Differential drive gear run-out	Excess of 0.003	(*)

191. Springs

(par. 137)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
119	B	Diameter of pivot bolts	0.4355–0.4375	(*)
119	C	Diameter of spring-eye bearing	0.860–0.875	(*)
119	D	Diameter of spring shackle bearings	0.845–0.855	(*)

192. Steering Gear and Drag Link
(par. 145)

Fig. No.	Ref. letter	Point of measurement	Sizes and fits of new parts	Wear limits
119	E	Diameter of steering gear housing bushing type bearings:		
		Inner	0.937–0.938	(*)
		Outer	0.937–0.938	(*)

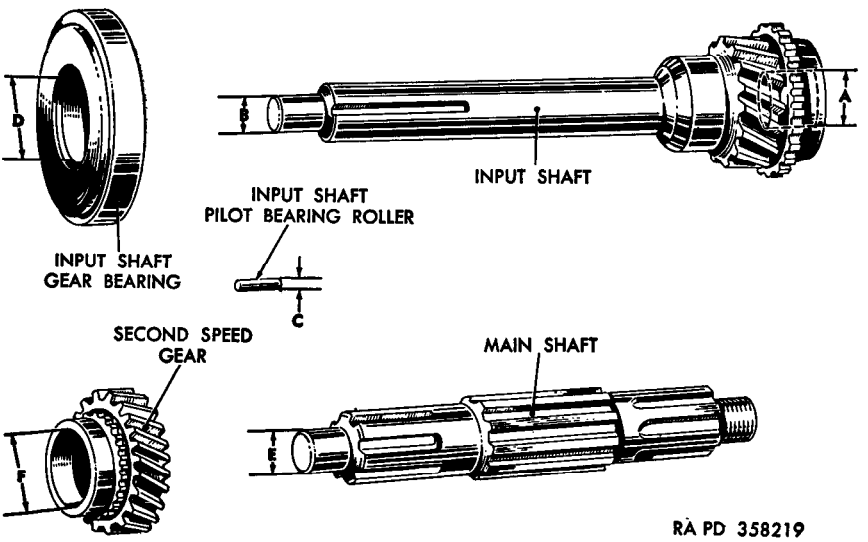


Figure 110. Repair and rebuild measuring points.

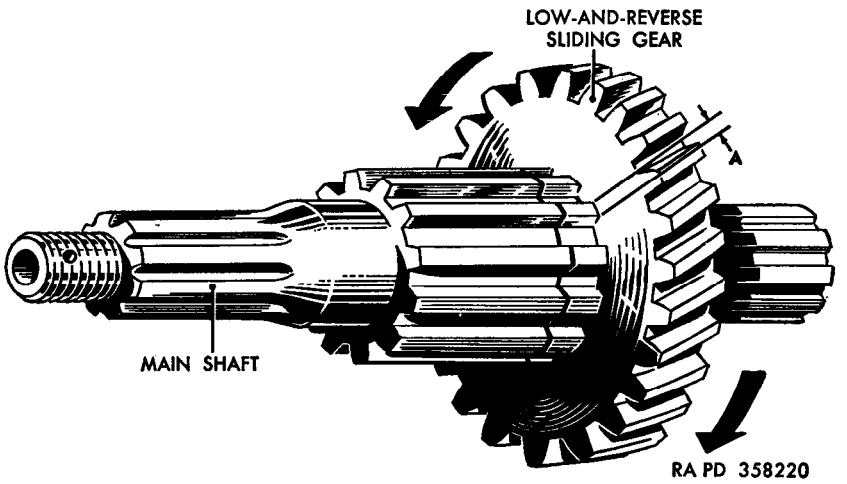


Figure 111. Measurement of backlash between low-and-reverse sliding gear and mainshaft.

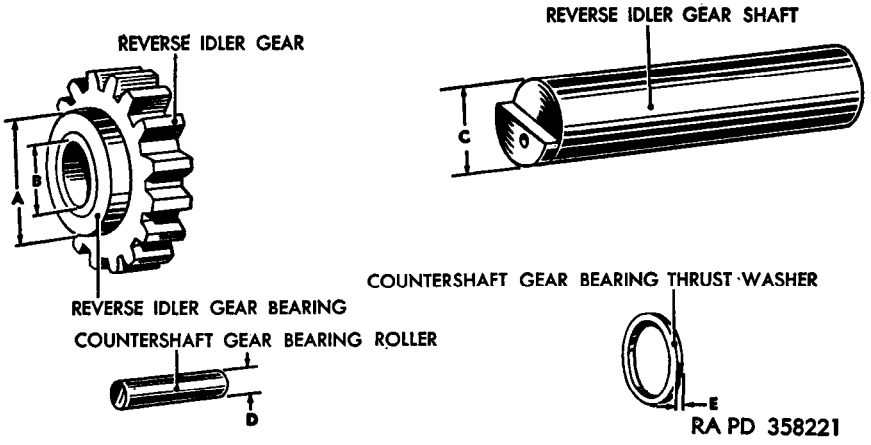


Figure 112. Repair and rebuild measuring points.

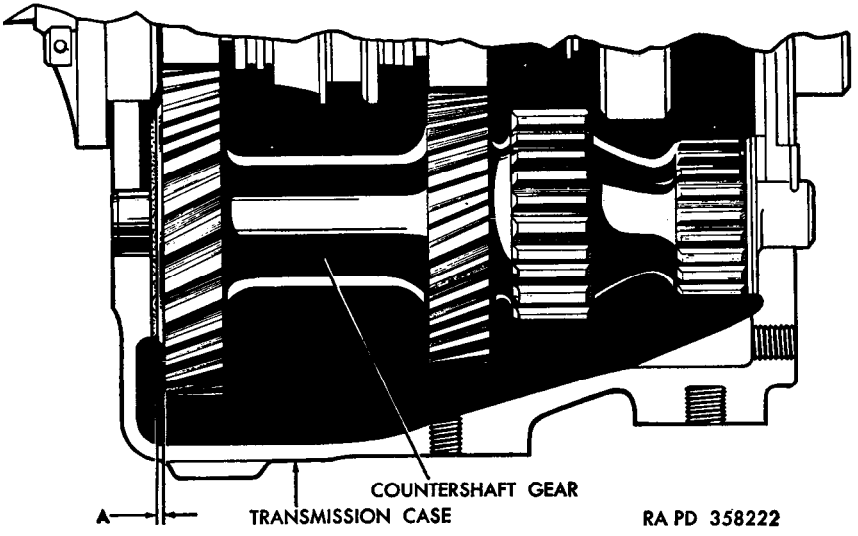


Figure 113. End play measurement between countershaft gear and transmission case.

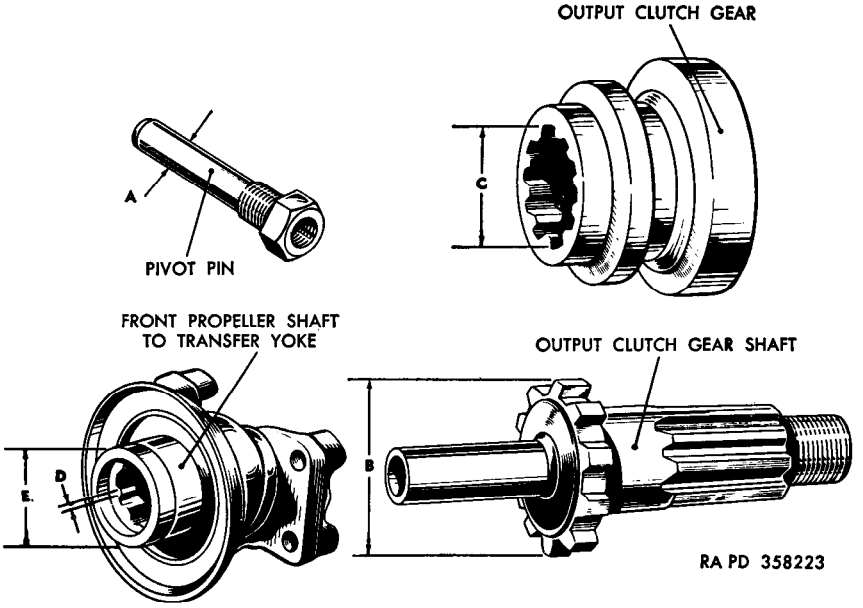


Figure 114. Repair and rebuild measuring points.

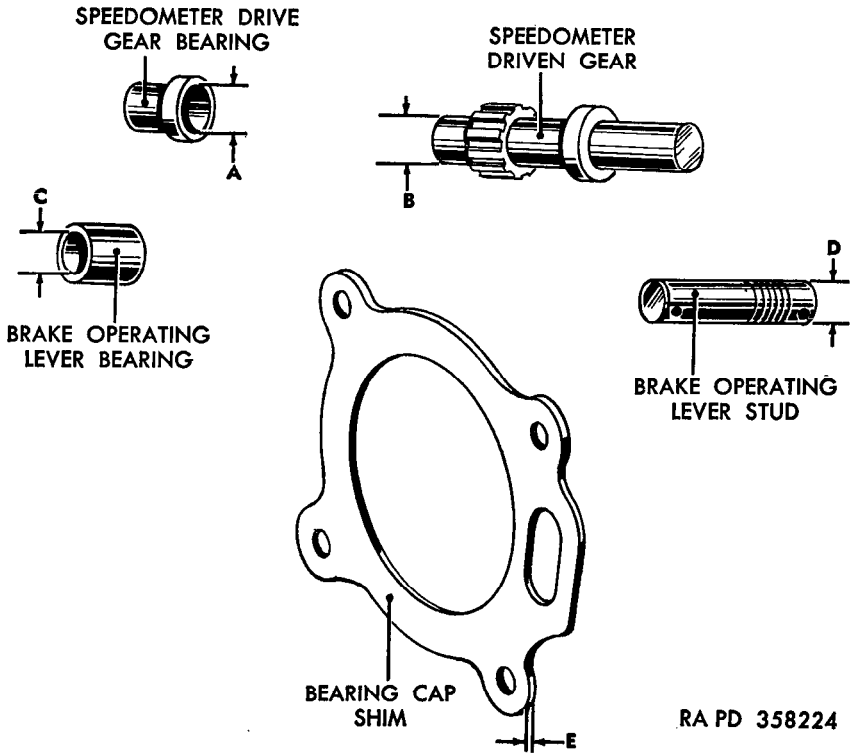


Figure 115. Repair and rebuild measuring points.

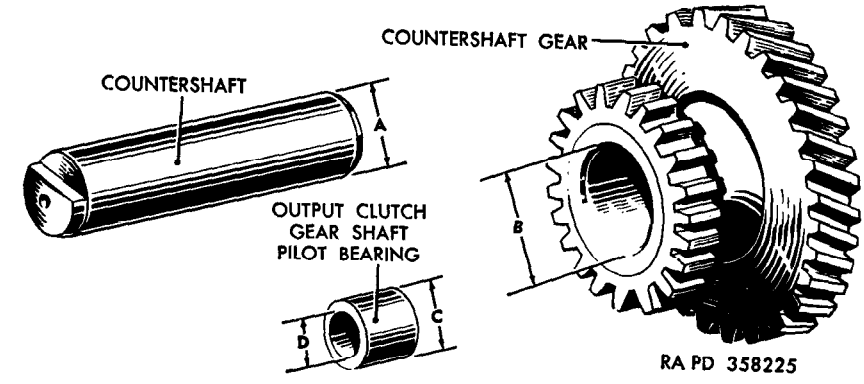


Figure 116. Repair and rebuild measuring points.

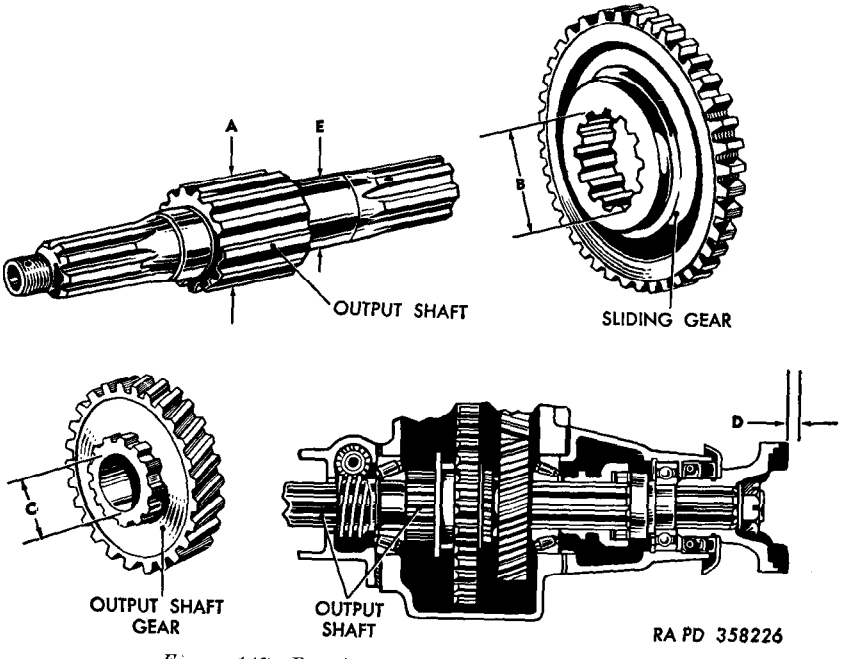


Figure 117 Repair and rebuild measuring points.

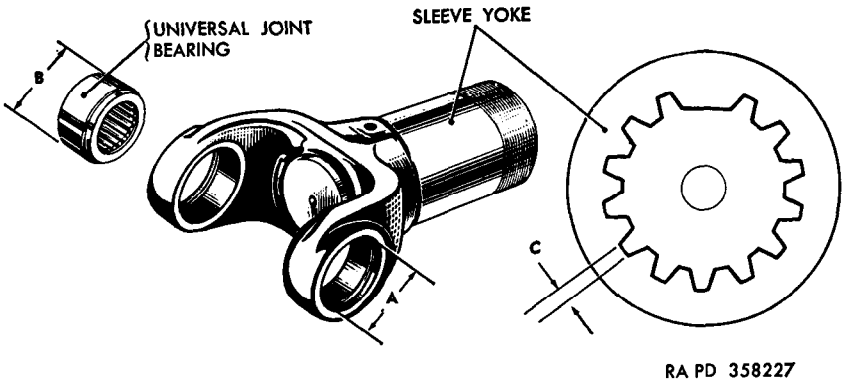


Figure 118. Repair and rebuild measuring points.

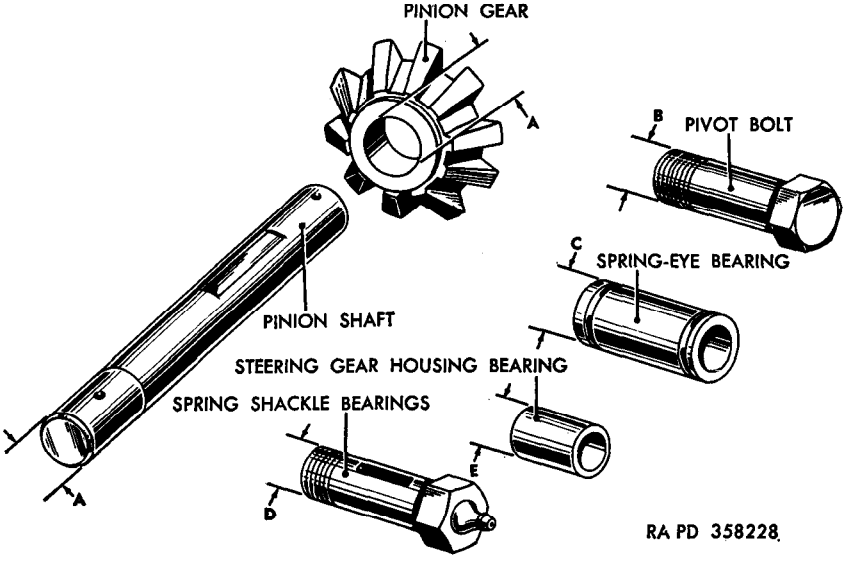


Figure 119. Repair and rebuild measuring points.

APPENDIX

REFERENCES

1. Publication Indexes

The following publication indexes and lists of current issue should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to matériel covered in this manual:

Index of Administrative Publications	SR 310–20–5
Index of Army Motion Pictures and Film Strips and Kinescope Recordings	SR 110–1–1
Index of Training Publications	SR 310–20–3
Index of Blank Forms and Army Personnel Classification Tests	SR 310–20–6
Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment	SR 310–20–4
Introduction and Index (supply catalogs)	ORD 1
Military Training Aids	FM 21–8
Ordnance Major Items and Combinations and Pertinent Publications	SB 9–1

2. Supply Catalogs

The following catalogs of the Department of the Army Supply Catalog pertain to this matériel:

a. Destruction to Prevent Enemy Use.

Land Mines and Fuzes, Demolition Material, and Ammunition for Simulated Artillery and Grenade Fire	ORD 11 SNL R–7

b. Repair and Rebuild.

Antifriction Bearings and Related Items	ORD 5 SNL H–12
Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials	ODR 3 SNL K–1
Electrical Fittings	ORD 5 SNL H–4
Items of Soldering, Metallizing, Brazing, and Welding Materials: Gases and Related Items	ORD 3 SNL K–2

Lubricating Equipment, Accessories, and Related Dispensers---- ORD (*) SNL K-3
Lubricating Fittings, Oil Filters, and Oil Filter Elements---- ORD 5 SNL H-16
Major Items and Major Combinations of Group G---- ORD 3 SNL G-1
Miscellaneous Hardware---- ORD 5 SNL H-2
Oil Seals---- ORD 5 SNL H-13
Ordnance Maintenance Sets---- ORD 6 SNL N-21
Pipe and Hose Fittings---- ORD 5 SNL H-6
Shop Set, Auto Fuel and Electrical System, Field Maintenance---- ORD 6 SNL J-8, Sec. 12
Shop Set, Headquarters and Service Company, Depot Maintenance, Automotive or Armament---- ORD 6 SNL J-9, Sec. 2
Shop Set, Maintenance (Field), Automotive- ORD 6 SNL J-8, Sec. 13
Shop Set, Power Train Rebuilt Company (Automotive), Depot Maintenance---- ORD 6 SNL J-9, Sec. 1
Shop Set, Welding Field Maintenance---- ORD 6 SNL J-8, Sec. 8
Standard Hardware---- ORD 5 SNL H-1
Tool Set, Auto Fuel and Electrical System Repairman (MOS 3912)---- ORD 6 SNL J-10, Sec. 8
Tool Set, General Mechanic's---- ORD 6 SNL J-10, Sec. 4
Tool Set, Maintenance (Field), Motor Vehicle Assembly Company---- ORD 6 SNL J-8, Sec. 7
Tool Set, Metal Body Repairman (MOS 040 or 201)---- ORD 6 SNL J-10, Sec. 7
Tool Set, Mobile Arc Welder---- ORD 6 SNL J-8, Sec. 11

c. Vehicle.

Truck, ¼-Ton, 4 x 4, Utility M38---- ORD (*) SNL 40

3. Forms

The following forms are applicable to this matériel:

DA Form 9-68, Spot Check Inspection Report for Wheeled and Half-Track Vehicles
WD AGO Form 9-71, Locator and Inventory Control Card
WD AGO Form 9-72, Ordnance Stock Record Card
WD AGO Form 9-76, Request for Work Order
WD AGO Form 9-77, Job Order Register
WD AGO Form 9-78, Job Order
DA AGO Form 9-79, Parts Requisition
WD AGO Form 9-80, Job Order File

(*) See ORD 1 for published catalogs of the ordnance section of the Department of the Army Supply Catalog.

WD AGO Form 9–81, Exchange Part of Unit Identification Tag
DA Form 461, Preventive Maintenance Service and Inspection for Wheeled and Half-Track Vehicles
DA Form 461–5, Limited Technical Inspection
DA Form 468, Unsatisfactory Equipment Report
DA AGO Form 478, MWO and Major Unit Assembly Replacement Record and Organizational Equipment File
WD AGO Form 856, Work Order
WD AGO Form 866, Consolidation of Parts
WD AGO Form 867, Status of Modification Work Order
DD Form 6, Report of Damaged or Improper Shipment

4. Other Publications

The following publications contain information pertinent to this matériel and associated equipment.

a. Camouflage.

Camouflage, Basic Principles	FM 5–20
Camouflage of Vehicles	FM 5–20B

b. Decontamination.

Decontamination	TM 3–220
Decontamination of Armored Force Vehicles	FM 17–59
Defense Against Chemical Attack	FM 21–40

c. Destruction to Prevent Enemy Use.

Explosives and Demolitions	FM 5–25
Ordnance Service in the Field	FM 9–5

d. General.

Cooling Systems: Vehicles and Powered Ground Equipment	TM 9–2858
Fuels and Carburetion	TM 10–550
Inspection of Ordnance Matériel in the Hands of Troops	TM 9–1100
Lubrication Order	LO 9–804
Military Vehicles	TM 9–2800
Motor Vehicles	AR 700–105
Ordnance Service in the Field	FM 9–5
Precautions in Handling Gasoline	AR 850–20
Principles of Automotive Vehicles	TM 9–2700
Reports of Accident Experience	SR 385–10–40
Storage Batteries, Lead-Acid Type	TM 9–2857
Supplies and Equipment: Unsatisfactory Equipment Report	SR 700–45–5

e. Repair and Rebuild.

Abrasives, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Matériel	TM 9–850

g. Shipment and Standby or Long-Term Storage.

Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Packaging and Shipping (Posts, Camps, and Stations)	TM 9–2854
Marking and Packing of Supplies and Equipment: Marking of Oversea Supply	SR 746–30–5
Military Standard—Marking of Shipments	MIL–STD–129[1]
Ordnance Storage and Shipment Chart—Group G	TB 9–OSSC–G
Preparation of Unboxed Ordnance Matériel for Shipment	SB 9–4
Preservation, Packaging, and Packing of Military Supplies and Equipment	TM 38–230
Protection of Ordnance General Supplies in Open Storage	TB ORD 379
Shipment of Supplies and Equipment: Report of Damaged or Improper Shipment	SR 745–45–5
Standards for Oversea Shipment and Domestic Issue of Ordnance Matériel Other than Ammunition and Army Aircraft	TB ORD 385
Storage, Inspection, and Issue of Unboxed Serviceable Vehicles; Preparation of Unserviceable Vehicles for Storage and Deprocessing of Matériel Prior to Operation	SB 9–63

[1] Copies may be obtained from Aberdeen Proving Ground, Aberdeen, Md.

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