

DODGE TRUCK

B-4 SERIES

SHOP MANUAL

**MODELS: B-4-B, B-4-C, B-4-D, B-4-PW, B-4-DU, B-4-EU, B-4-F,
B-4-G, B-4-GA, B-4-H, B-4-HA, B-4-HM, B-4-HMA, B-4-J, B-4-JA,
B-4-JM, B-4-JMA, B-4-K, B-4-KA, B-4-KMA, B-4-R, B-4-RA, B-4-T,
B-4-TA, B-4-V, B-4-VA, B-4-Y, B-4-YA, B-4-YX**

SECTION 2

AXLE, REAR

**DODGE DIVISION
CHRYSLER CORPORATION
DETROIT 31, MICHIGAN**

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TIGHTENING REFERENCE

| <i>Part Name</i> | <i>Size (inch) and number of threads per inch</i> | <i>Torque (foot-pounds)</i> |
|--|---|-----------------------------|
| Except Tandem Axle Unit — | | |
| Rear axle shaft nut | — | 142 minimum |
| Differential housing to axle housing cap screw... | — | 25 to 30 |
| Differential housing to axle housing bolt and nut. | — | 40 to 45 |
| Rear axle drive gear bolt nut | — | 35 to 40 |
| Drive pinion shaft lock screw..... | — | 30 to 35 |
| Differential bearing cap screw | — | 85 to 90 |
| Differential bearing adjusting lock screw..... | — | 15 to 20 |
| Tandem Axle Unit — | | |
| Lower torque rod pin nuts — | | |
| Trunnion bracket end | 1 1/4 x 12 | 350 to 400 |
| Axle housing bracket end (small nut) | 1 x 14 | 350 to 400 |
| Axle housing torque rod end (large nut)..... | 1 1/4 x 12 | 350 to 400 |
| Upper torque rod pin nuts — | | |
| Axle housing bracket end | 1 x 14 | 200 to 300 |
| Trunnion bracket to frame support | | |
| bracket bolts | 5/8 x 18 | 225 minimum |
| Spring seat "U" bolts | 3/4 x 16 | 350 minimum |
| Spring seat clamp bolts | 7/8 x 14 | 300 minimum |

SERVICE STANDARDS (Continued)

| MODEL DESIGNATION → | B | C | D | PW | DU | EU | GA | HA, HMA | JA, KA, JMA, KMA | R, RA | T, TA, V, VA | Y, YA, YX |
|------------------------------------|-------|-------|-------|-------|-------|-------|--|--|--|----------------------|----------------------|----------------------|
| Two-Speed, Single-Reduction | | | | | | | | | | | | |
| Type | | | | | | | Full-Floating (Spiral Bevel) {5.83 to 1} {8.11 to 1} | Full-Floating (Spiral Bevel) {5.83 to 1} {8.11 to 1} | Full-Floating (Spiral Bevel) {5.83 to 1} {8.11 to 1} | ..... | ..... | ..... |
| Ratio | | | | | | | 6 | 6 | 6 | ..... | ..... | ..... |
| No. of pinion gear teeth | | | | | | | 6 | 6 | 6 | ..... | ..... | ..... |
| No. of ring gear teeth | | | | | | | 35 | 35 | 35 | ..... | ..... | ..... |
| Ratio | | | | | | | {6.33 to 1} {8.81 to 1} | {6.33 to 1} {8.81 to 1} | {6.33 to 1} {8.81 to 1} | ..... | ..... | ..... |
| No. of pinion gear teeth | | | | | | | 6 | 6 | 6 | ..... | ..... | ..... |
| No. of ring gear teeth | | | | | | | 38 | 38 | 38 | ..... | ..... | ..... |
| Ratio | | | | | | | | | {6.14 to 1} {8.54 to 1} | ..... | ..... | ..... |
| No. of pinion gear teeth | | | | | | | | | 7 | ..... | ..... | ..... |
| No. of ring gear teeth | | | | | | | | | 43 | ..... | ..... | ..... |
| Ratio | | | | | | | | | {6.5 to 1} {9.04 to 1} | ..... | ..... | ..... |
| No. of pinion gear teeth | | | | | | | | | 6 | ..... | ..... | ..... |
| No. of ring gear teeth | | | | | | | | | 46 | ..... | ..... | ..... |
| Two-Speed, Double-Reduction | | | | | | | | | | | | |
| Type | | | | | | | | | | Full-Floating Hypoid | Full-Floating Hypoid | Full-Floating Hypoid |

(Continued on page 8)

AXLE, REAR

The rear axles (furnished as standard or special equipment for Dodge trucks) are of different types. Each type is designed to do a specific type of work and is supplied only on certain models of trucks, as indicated in the headings of this section on the following pages.

1. DETERMINING REAR AXLE GEAR RATIO (ALL MODELS)

If the axle ratio of a truck is not known, the approximate ratio may be determined as follows:

Place the transmission gearshift lever in neutral position. Mark one of the rear tires with chalk. Also place a chalk mark on the propeller shaft.

Roll the truck forward so that the rear wheels make exactly one complete revolution. At the same time, have another mechanic count accurately the number of revolutions of the propeller shaft, using the chalk mark as a guide. For example, if the propeller shaft makes $4\frac{3}{4}$ revolutions to one revolution of the rear wheels, the approximate gear ratio is 4.75 to 1.

SINGLE-SPEED SINGLE-REDUCTION, SEMI-FLOATING, HYPOID REAR AXLE

(B-4-B, B-4-C) (FIGS. 1 AND 2)

2. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT AND BEARING

a. Removal

- (1) Remove wheel, hub and drum assembly, as shown in Figure 3.

CAUTION

Do not strike end of axle shaft to loosen hub. This precaution will prevent the axle roller bearings from becoming damaged.

- (2) Block the brake pedal so it cannot be depressed.
- (3) Disconnect the brake line from the upper wheel cylinder in back of the brake support.
- (4) Remove the rear axle drive shaft key and install special sleeve in the oil seal before removing the brake support from the axle shaft.

If shims are being removed from both ends of axle housing, each set should be kept separate and assembled to its respective end of axle housing to maintain the central location of axle shafts and wheels. When a carrier axle shaft or bearing is

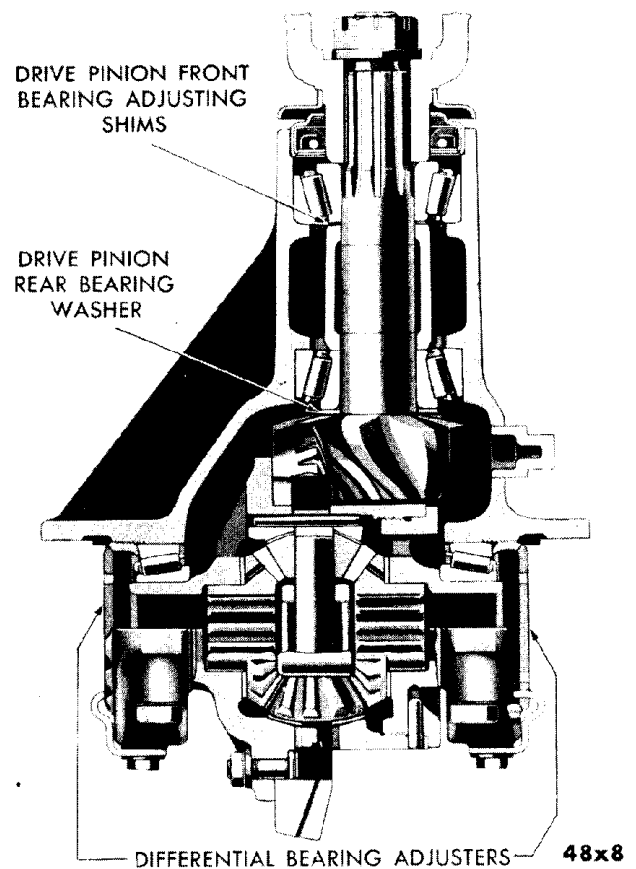
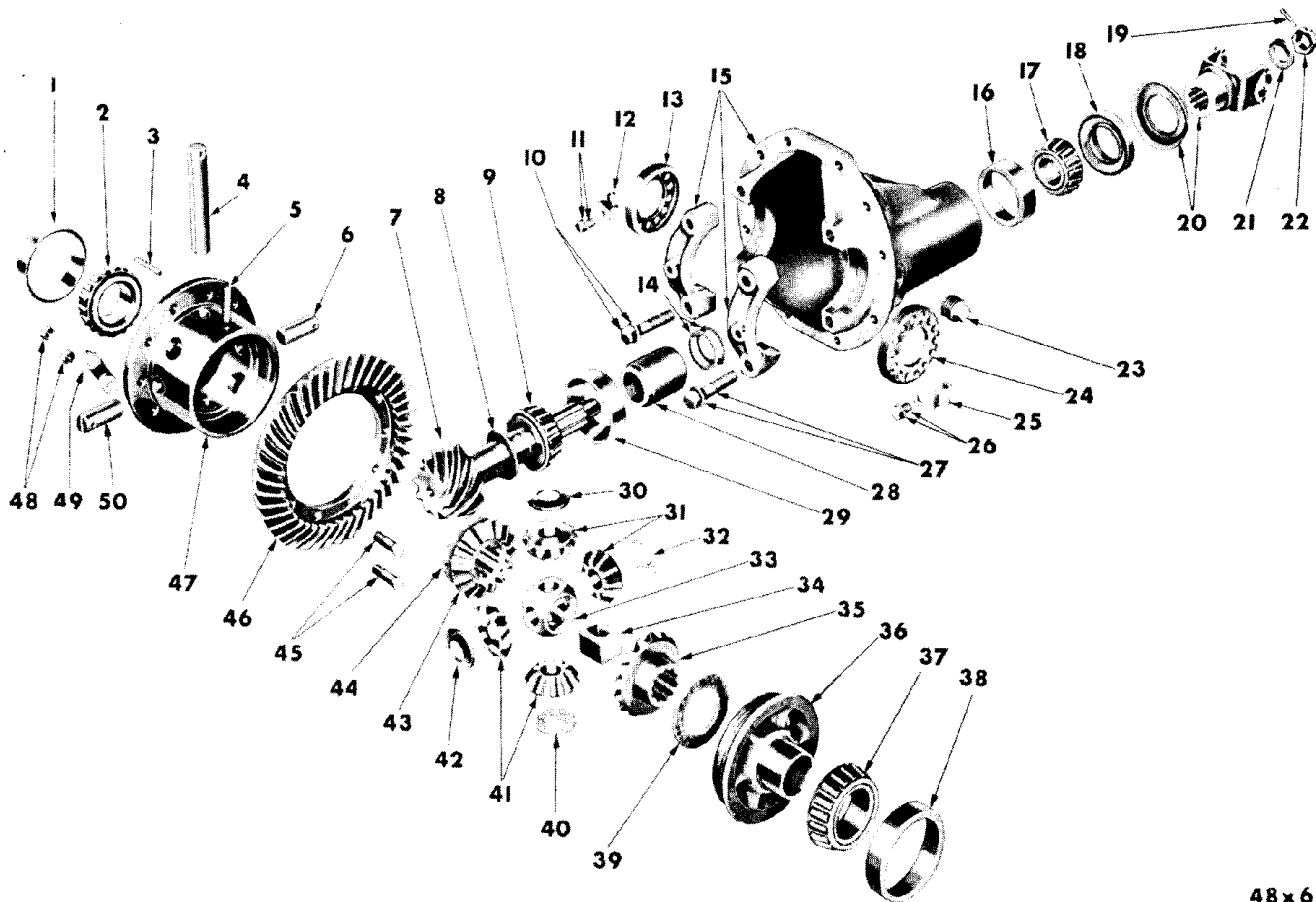


Fig. 1—Rear Axle Differential (Assembled View)
(B-4-B, B-4-C)



48x6

Fig. 2—Rear Axle Differential (Disassembled View) (B-4-B, B-4-C)

- | | |
|---|---|
| 1 — Differential bearing cup | 26 — Differential bearing adjuster lock screw and lock washer |
| 2 — Differential bearing cone and rollers | 27 — Differential bearing cap screw and lock washer |
| 3 — Differential pinion shaft lock (dowel) pin | 28 — Rear axle drive pinion bearing spacer |
| 4 — Differential pinion shaft—long | 29 — Rear axle drive pinion rear bearing cup |
| 5 — Differential case cap retainer pin | 30 — Differential pinion thrust washer |
| 6 — Differential pinion shaft—short | 31 — Differential pinions |
| 7 — Rear axle drive pinion | 32 — Differential pinion thrust washer |
| 8 — Rear axle drive pinion rear bearing washer | 33 — Differential pinion shaft block |
| 9 — Rear axle drive pinion rear bearing cone and rollers | 34 — Rear axle drive shaft thrust block |
| 10 — Differential bearing cap screw and lock washer | 35 — Differential side gear |
| 11 — Differential bearing adjuster lock screw and lock washer | 36 — Differential case cap |
| 12 — Differential bearing adjuster lock | 37 — Differential bearing cone and rollers |
| 13 — Differential bearing adjuster | 38 — Differential bearing cup |
| 14 — Rear axle drive pinion front bearing adjusting shims | 39 — Differential side gear thrust washer |
| 15 — Rear axle differential carrier and cap assembly | 40 — Differential pinion thrust washer |
| 16 — Rear axle drive pinion front bearing cup | 41 — Differential pinions |
| 17 — Rear axle drive pinion front bearing cone and rollers | 42 — Differential pinion thrust washer |
| 18 — Rear axle drive pinion bearing oil seal | 43 — Differential side gear |
| 19 — Rear axle drive pinion companion yoke nut cotter pin | 44 — Differential side gear thrust washer |
| 20 — Rear axle drive pinion companion yoke and oil seal guard | 45 — Rear axle drive gear bolts |
| 21 — Rear axle drive pinion companion yoke nut washer | 46 — Rear axle drive gear |
| 22 — Rear axle drive pinion companion yoke nut | 47 — Differential case |
| 23 — Differential carrier lubricant plug | 48 — Rear axle drive gear bolt nuts |
| 24 — Differential bearing adjuster | 49 — Rear axle drive gear bolt nut lock |
| 25 — Differential bearing adjuster lock | 50 — Differential pinion shaft — short |

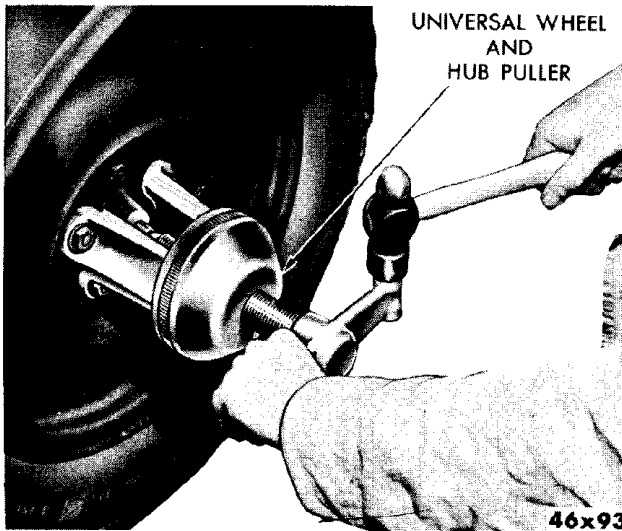


Fig. 3—Removing Rear Hub—Tool C-675

replaced, axle shaft end play should be checked and corrected.

- (5) Remove axle shaft and bearing, as shown in Figure 4.
- (6) Remove bearing from axle shaft (Fig. 5).

CAUTION

Remove the rear axle drive shaft inner oil seal. Drift C-201 may be used when installing new inner oil seal.

b. Removing Outer Oil Seal

Should it be necessary to replace the outer oil seal (Fig. 6), with the brake support removed, proceed as follows:

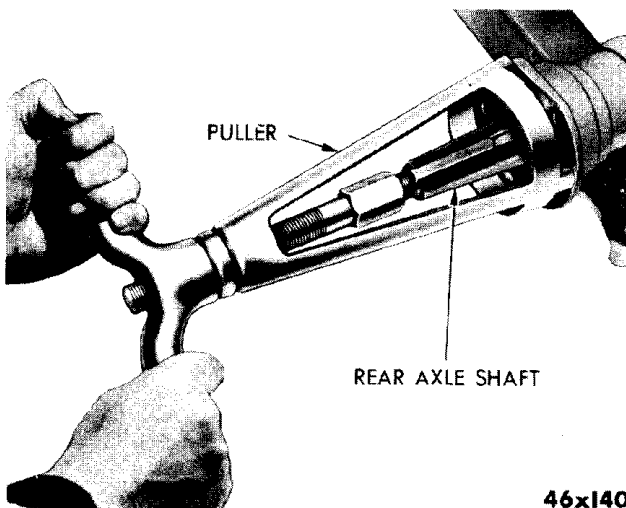


Fig. 4—Removing Axle Drive Shaft and Bearing—Tool C-499-A

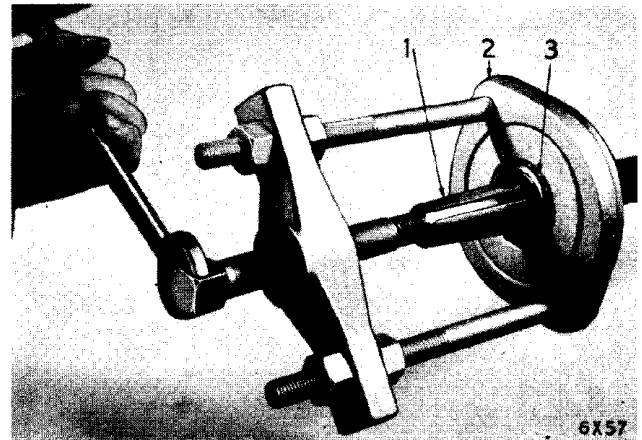


Fig. 5—Removing Bearing from Axle Drive Shaft

1 — Axle drive shaft 2 — Tool C-293-D 3 — Bearing

- (1) Drive out the old seal and remove the burrs from the support plate in order to prevent damaging the new seal.
- (2) Soak the new seal in thin oil for about 30 minutes. Then, work the leather until it is pliable by rolling it with a smooth bar.
- (3) Install the seal in the brake support so that the outside of the seal is toward the outside of the brake support. Stake seal in three places.

c. Installation

After installing the inner oil seal, drive shaft and bearing, care must be taken to prevent damaging the oil seal when installing the brake support plate. Connect the brake line and bleed the brakes.

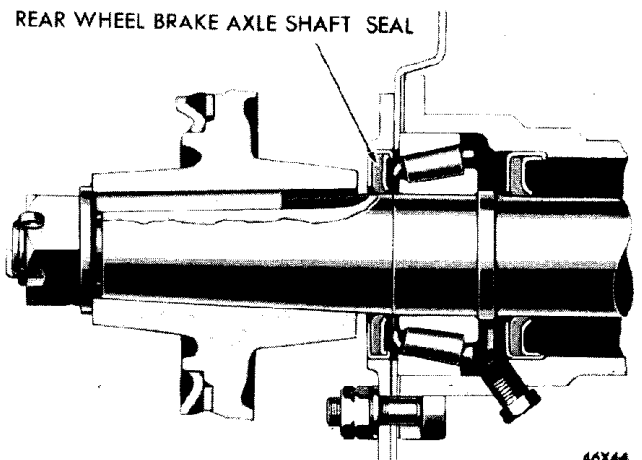


Fig. 6—Rear Wheel Bearing Outer Oil Seal

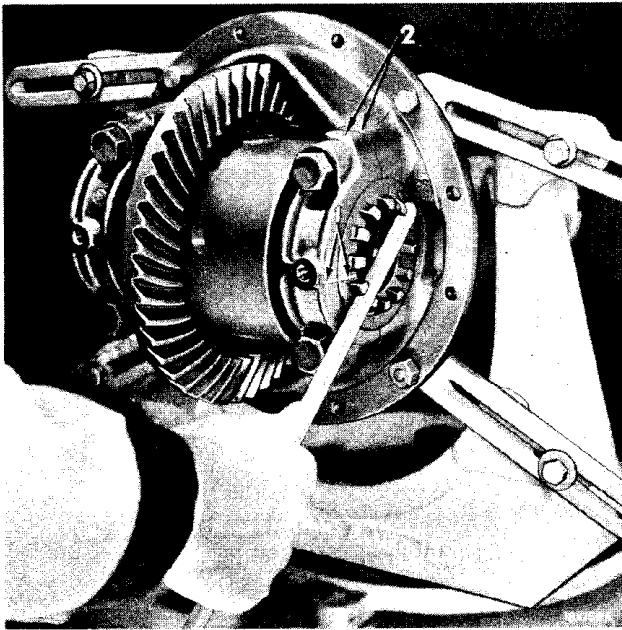


Fig. 7—Adjusting Differential Bearings

1 — Bearing adjuster marks

2 — Cap and carrier marks

3. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY

- (1) Drain oil from differential by removing two bottom cap screws that fasten carrier assembly to axle housing.
- (2) Remove both axle shafts.

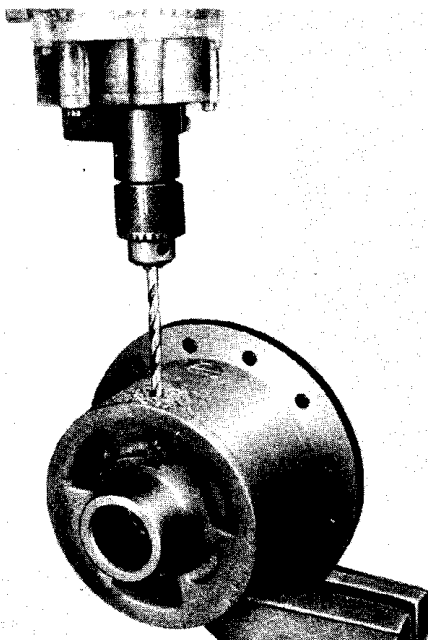


Fig. 8—Removing Differential Case Cap Locking Pins

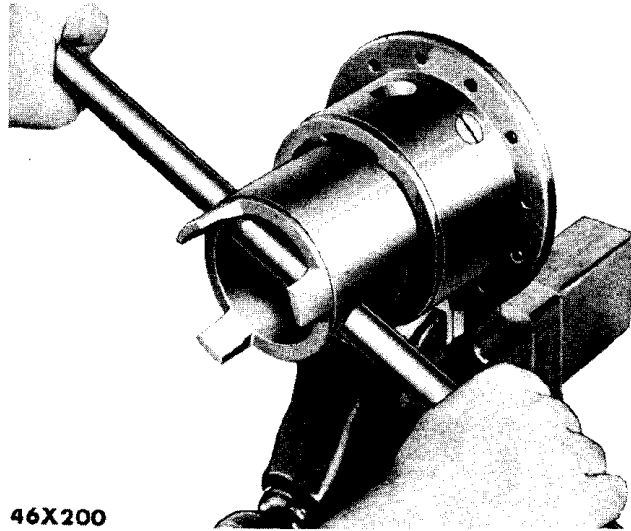


Fig. 9—Removing Differential Case Cap,
Tool DD-921

- (3) Disconnect rear universal joint and drop propeller shaft.
- (4) Remove remaining cap screws holding carrier assembly to axle housing and lift out differential carrier assembly.

When installing the differential carrier assembly, use a new gasket. Tighten the differential carrier to housing cap screws, as specified in the Service Standards.

4. REMOVAL AND INSTALLATION OF DIFFERENTIAL AND RING GEAR ASSEMBLY (CARRIER REMOVED)

- (1) Mount carrier assembly in stand and mark both differential bearing adjusters and caps to facilitate assembly.
- (2) Loosen differential bearing cap screws. Then, loosen bearing adjusters, as shown in Figure 7, to relieve load on bearings. Remove caps and bearing adjusters.

When installing differential on carrier, place bearing caps against bearings and install assembly in carrier.

5. REMOVAL AND INSTALLATION OF RING GEAR (DIFFERENTIAL REMOVED)

Remove nuts and bolts which attach ring gear to differential case and press off the ring gear.

When installing ring gear, be sure that the

holes in the ring gear are properly aligned with holes in differential case before pressing it on. Install bolts and nuts and tighten securely.

a. Disassembly of Differential (Ring Gear Removed)

- (1) Mount differential case ring gear flange in a heavy vise using copper jaws.
- (2) Remove bearing from differential (case cap side only).
- (3) Remove differential case cap locking pins by center punching and drilling (Fig. 8). Remove shells of pins left in holes with a punch.

Since the cap is a thousandth of an inch or more larger than the hole in the case into which it fits, the case must be expanded for removal of the cap. Otherwise, damage will result.

Heat the case (not the cap) by playing a torch around the outside of the case.

Keep the flame moving to assure even heating.

When heating, try a piece of ordinary solder on the case from time to time. When the solder just starts to melt (360 degrees F. to 400 degrees F.), the case is heated to the proper temperature. If the case is heated beyond this temperature, the inside washers may become damaged.

Remove the cap, as shown in Figure 9. To loosen the cover, strike the handle of the wrench with a heavy hammer. Then, with the wrench, quickly unscrew the cap. The parts should be immersed in oil to cool them for handling.

- (4) Remove differential pinion shaft lock pins by driving them out of case with a hammer and punch (Fig. 10).
- (5) Push the differential pinion shafts out of differential case. The gears, thrust washers and axle shaft thrust block will then be loose and can be lifted out of case.

b. Assembly of Differential (Ring Gear Removed)

When assembling, coat parts with differential lubricant to help hold them in place until thrust block and differential pinion shaft are installed. Be sure to peen over outside edge of each hole

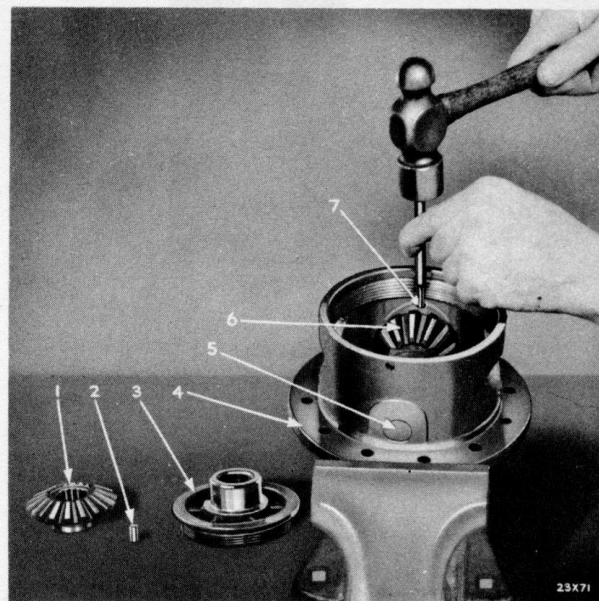


Fig. 10—Removing Differential Shaft Lock Pins

- 1 - Differential gear
- 2 - Differential gear case cap lock pin
- 3 - Differential case cap
- 4 - Differential case
- 5 - Differential pinion shaft
- 6 - Differential pinion
- 7 - Differential pinion shaft lock pin

to lock pin in place. Heat case, as outlined. Install case cap, tightening it rigidly. Drill new $\frac{1}{4}$ -inch holes through cap and install new locking pins.

- (1) Install ring gear, tighten attaching bolts and close locks around nuts.
- (2) Install differential assembly in carrier. Tighten cap screws sufficiently to hold caps in place.
- (3) Screw the differential bearing adjusters into place.
- (4) Set bearing adjuster on left-hand side to permit an approximate adjustment of clearance between ring gear and pinion. Then, tighten right-hand bearing adjusters with sufficient force to seat bearings in cups and cause a slight drag in bearing. This is called bearing pre-load. Tap bearing caps with a hammer while turning adjusters to insure proper seating of rollers, cups and adjusters.

Bearings that are installed without pre-loading, will allow the pinion to "walk" (Fig. 11) under operating loads. This causes a variation in the tooth contact pattern, and results in

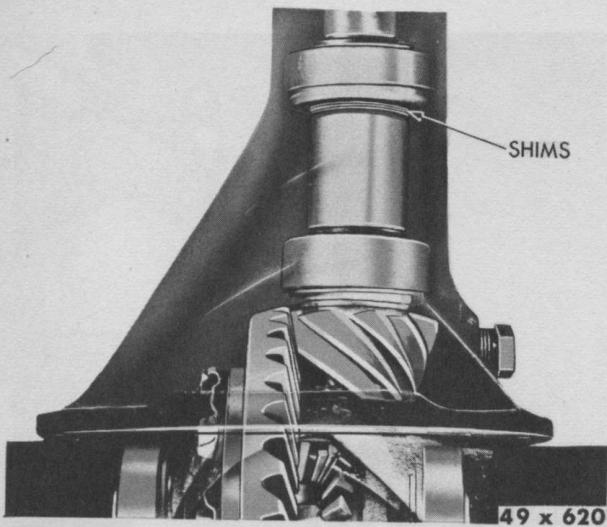


Fig. 11—Pinion Bearing Pre-Load

excessive wear, scoring of gears and noisy operation.

Bearings that are compressed too tightly are apt to “burn up” under a driving load. Or, the bearings may gall or flake, resulting in premature axle failure.

Add or remove bearing shims (Fig. 11) until correct pre-load is obtained. Bearing pre-load should give from 15 to 25 inch-pounds drag torque on the pinion shaft (without the oil seal) after tightening companion flange and nut to specified torque of 180 to 320 foot-pounds. Test bearing pre-load.

**6. REAR AXLE ADJUSTMENT
(USING SPECIAL TOOL C-758-D,
SEE FIGURE 12)**

Four main steps have been determined for cor-

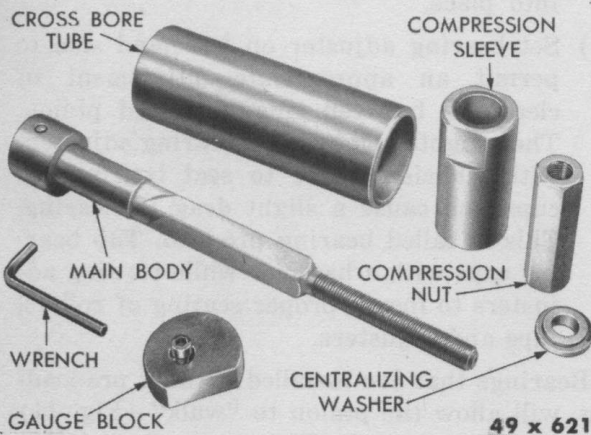


Fig. 12 — Special Tool Set, C-758-D

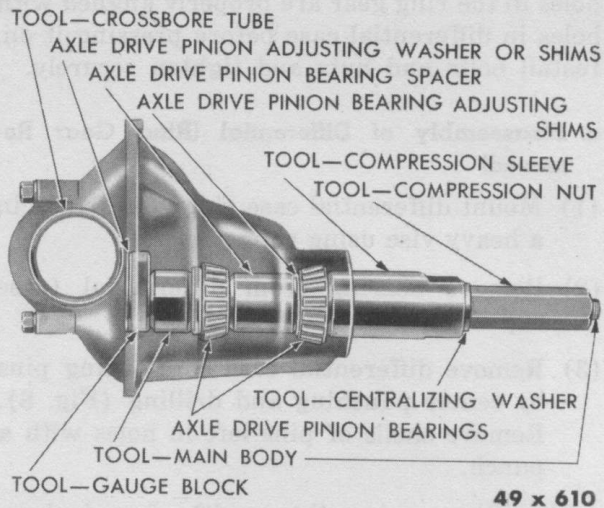


Fig. 13—Main Body, Bearings, Spacer and Shims Installed

rect ring gear and pinion adjustment, to insure quiet operation and long life:

- (1) Pinion Bearing Pre-load.
- (2) Pinion Setting.
- (3) Differential Bearing Pre-load.
- (4) Backlash Between Ring Gear and Pinion.

With the use of Special Tool C-758-D, items 1 and 2, pinion bearing pre-load and pinion setting, can be predetermined, thus saving considerable time and labor incurred in the old trial and error method.

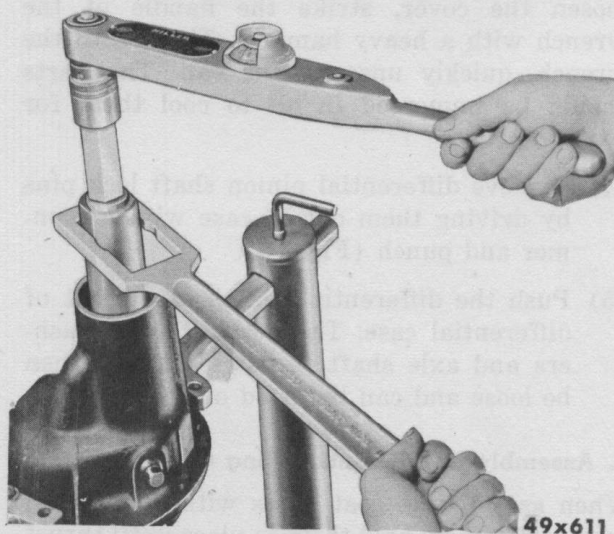


Fig. 14—Tightening Compression Nut with Foot-Pound Torque Wrench

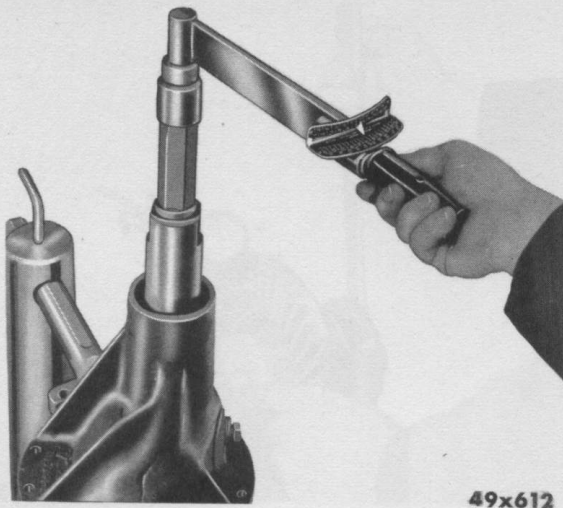


Fig. 15—Checking Torque Required to Turn Main Body

(1) Pinion Bearing Pre-load

- (a) With bearing cups in carrier housing, slide rear bearing and spacer over *main body* of tool and insert in carrier.
- (b) Slide adjusting shims and front bearing over *main body* (Fig. 13).
- (c) Place *compression sleeve, centralizing washer and compression nut* over *main body* and tighten to 180 to 320 foot-pounds, as shown in Figure 14.
- (d) Remove torque wrench, and with a speed wrench, spin *main body* to seat bearings.
- (e) Use an inch-pound wrench to read the torque required to turn *main body*, as shown in Figure 15. Desired torque should be from 15 to 25 inch-pounds. (It may be necessary to add or remove shims to obtain desired torque. In this case, loosen up the assembly and add or remove shims as required.)

(2) Pinion Setting

- (a) Place *gauge block* on top of *body* and tighten in place, as shown in Figure 16 (*gauge block* takes place of drive pinion gear).
- (b) Assemble *cross bore gauge bar* to carrier bearing supports, as shown in

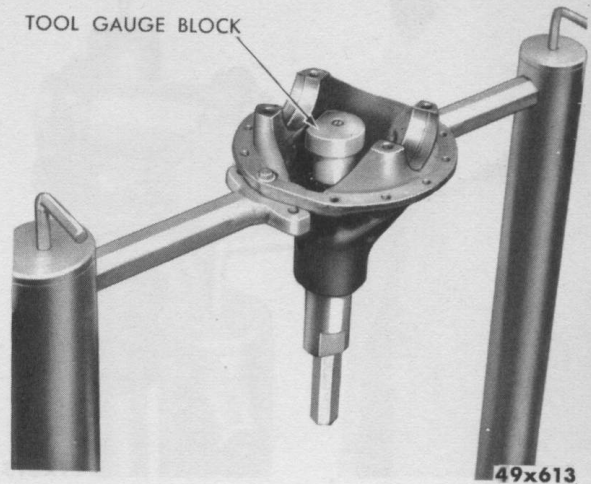


Fig. 16—Installing Gauge Block on Main Body

Figure 17. Tighten cap screws to hold bar in place.

- (c) The distance between *gauge block* and *cross bore gauge bar* determines thickness of spacer washer to be used, as shown in Figure 18.

(3) Differential Bearing Pre-load and Backlash

Differential bearing pre-load and backlash between ring gear and pinion are obtained after obtaining pinion bearing pre-load and pinion setting, as described above. Perform the operations as follows:

- (a) Place differential and ring gear assem-

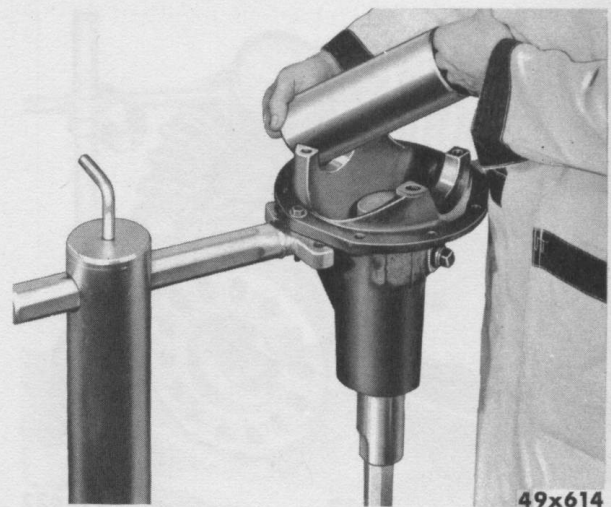


Fig. 17—Installing Cross Bore Gauge Bar

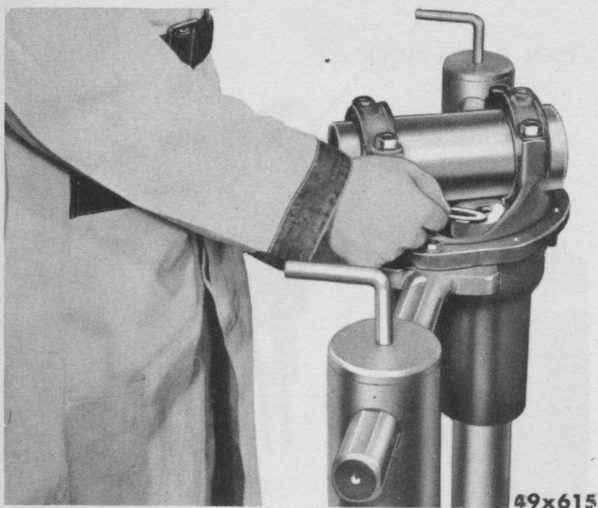


Fig. 18—Spacer Washer Thickness

bly on bearing supports and snug down the caps.

- (b) Check ring gear for runout, on the back face. Runout should be true within .004 inch.
- (c) Screw *out* bearing adjusting nut at the back face of ring gear, and screw *in* the opposite adjusting nut until ample backlash is obtained. This operation helps to align bearing cups.
- (d) Tighten lower cap screws from 85 to 90 foot-pounds, leaving the top screws fairly loose. This holds the bearing cups in-line while moving ring gear.

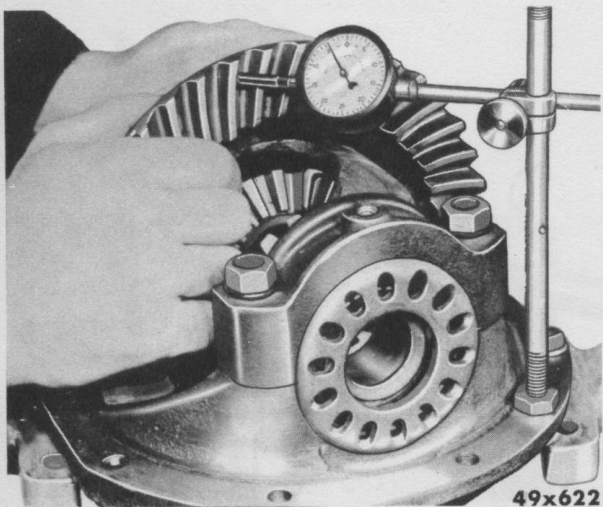


Fig. 19—Checking for Point of Least Backlash

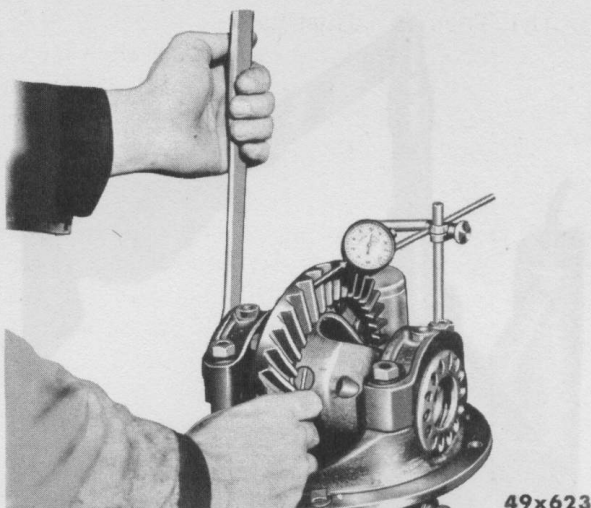


Fig. 20—Tightening Back Face Adjusting Nut

- (e) Now, screw *out* adjusting nut on tooth side of ring gear until nut clears bearing cup. Screw *in* opposite adjusting nut until there is only a little backlash. This ensures bearing cups of alignment for final adjustment.
- (f) Turn ring gear a few times by hand to seat bearing rollers. With a dial gauge, as shown in Figure 19, find the point of least backlash on ring gear at 90 degree intervals.
- (g) At the point of least backlash, screw in adjusting nut (at back face of ring gear) until .001 inch shows on gauge, as shown in Figure 20.

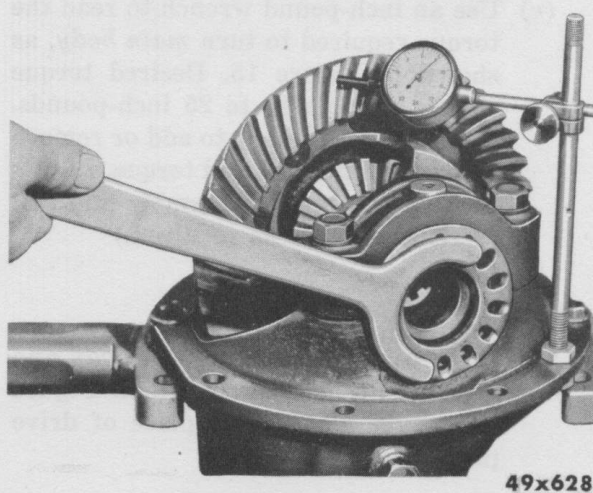


Fig. 21—Tightening Tooth-Side Adjusting Nut

- (h) Turn in adjusting nut on tooth side, until dial gauge shows .006 inch backlash, as shown in Figure 21. Lock adjusting nuts in place and tighten both top cap screws from 85 to 90 foot-pounds.

With this method of adjustment, the bearing supports (carrier pedestals) have been spread, the differential bearings pre-loaded and the backlash between ring gear and pinion set. To check tooth contact pattern, refer to Paragraph 79, of this Section.

7. PREPARATION AND INSTALLATION OF OIL SEALS.

Leather Seals

When installing new oil seals, care must be taken to make certain the leather is in good condition, soft and pliable. New seals should be soaked in thin oil for about 30 minutes. Then, "work" the leather by rolling it with a smooth bar (Fig. 22) before installing.

Synthetic Seals

Synthetic seals require no preparation other than the same care used in leather seal installation.

8. ARC WELDING THE REAR AXLE HOUSING

Arc welding of the complete rear axle assemblies to repair leaking housing, covers, loose or broken spring seats and brake line clips, has been common shop practice for some time. As a result of recent investigations, it has been definitely determined that arc welding should not be used for repairing the rear axle housing, unless axle is completely disassembled.

Tapered roller bearings, when adjusted for end play, must be rolled up against the cone thrust ledge and end play then measured. When not rotating, rollers slide down the cones, increasing end play approximately .005 inch at each bearing. Because of the taper of the rollers and cones, the gap between cone and rollers is greatly increased.

It is therefore possible for arcing electric current to jump the gap and damage bearings. The resulting damage is similar to brinelled bearing marks. Faces of the ring gear and pin-



Fig. 22—Rolling Leather of Oil Seal

ion, as well as differential gears, will be damaged if conditions are just right for existence of backlash gap on these parts.

Grounding of arc welding equipment is not effective in preventing damage. Service garages are, therefore, warned not to use arc welding equipment on rear axles, unless completely disassembled. Instead, gas welding equipment should be used.

9. REAR AXLE HOUSING ALIGNMENT

The rear axle housing may become bent, bowed or warped, and if such condition is not corrected, premature axle failure may result. To determine the condition of the axle housing, disassemble axle assembly and check housing for horizontal and vertical alignment, as described below:

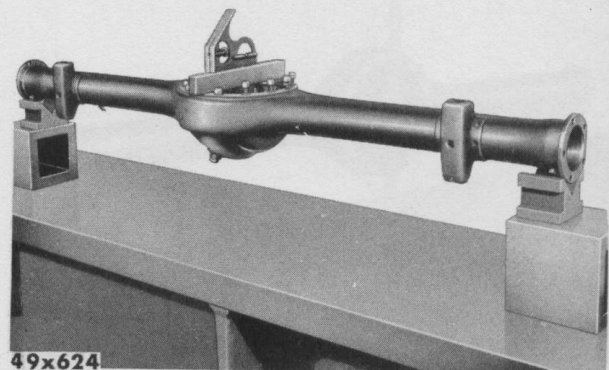
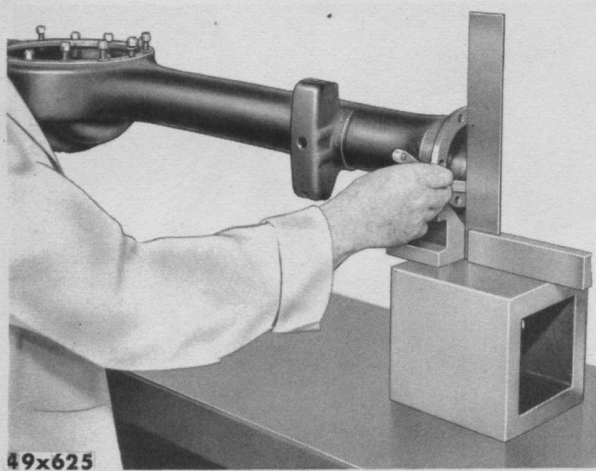


Fig. 23—Leveling Housing for Checking Alignment



49x625

Fig. 24—Checking Horizontal Alignment

Checking Axle Housing for Horizontal Alignment

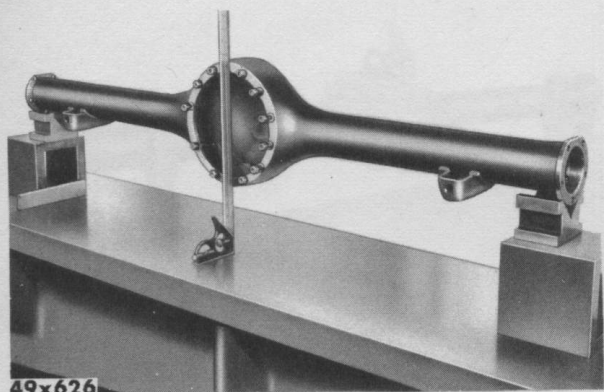
Place axle housing in "V" blocks on surface plate.

Turn housing until machined surface for carrier mounting is facing *UP* and is perfectly level, as shown in Figure 23.

Place square against machined surface of housing end flange and surface plate, as shown in Figure 24. Amount of housing misalignment will be indicated by the thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced.

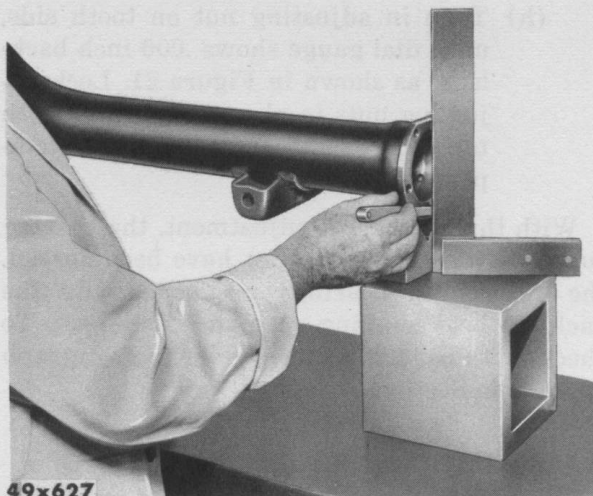
Checking Axle Housing for Vertical Alignment

With housing in "V" blocks, turn housing until machined surface for carrier mounting is in a squared vertical position, as shown in Figure 25.



49x626

Fig. 25—Squaring Axle for Vertical Alignment



49x627

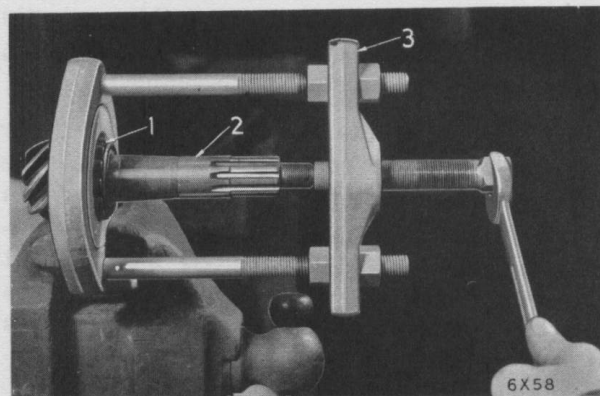
Fig. 26—Checking Vertical Alignment

Place square against machined surface of housing end flange and surface plate, as shown in Figure 26. Amount of housing misalignment will be indicated by the thickness of feeler gauge between square and end flange at top or bottom. A housing that checks more than .007 inch should be replaced.

To determine the amount that axle is misaligned, multiply the thickness of shim used by the ratio of 4.7 to 1.

10. REMOVAL AND INSTALLATION OF AXLE DRIVE PINION (DIFFERENTIAL REMOVED)

- (1) Remove drive pinion yoke. Pull drive pinion out through gear end of differential carrier, being careful not to lose shims be-



6X58

Fig. 27—Removing Bearing From Pinion Shaft

- 1 — Bearing
- 2 — Pinion
- 3 — Tool C-293-D

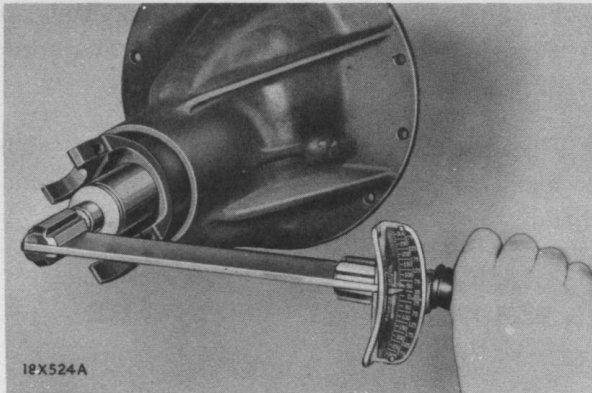


Fig. 28—Checking Drive Pinion Bearing Pre-Load

tween spacer on shaft and bearing next to yoke.

- (2) Remove pinion bearing, as shown in Figure 27.
- (3) Remove drive pinion oil seal from carrier.
- (4) Remove both pinion bearing cups from carrier assembly.

If the differential assembly is satisfactory and operates without objectionable noise before the unit was disassembled, the drive pinion may be assembled with original shims (or washer if used) behind rear bearing. If new parts were installed, or if adjustment was necessary, change these shims (or washer) until correct thickness is obtained to locate pinion properly with ring gear.

When reassembling, check bearing pre-load and correct if necessary, before installing oil seal. Install oil seal, yoke, washer and nut and tighten nut securely. Attach an inch-pound torque wrench (Fig. 28) on yoke nut and turn the drive pinion, noting amount of torque required. This should be from 10 to 15 inch-pounds. If pre-load is less than 10 inch-pounds, the shim is too thick. If pre-load is more than 15 inch-pounds, the shim is too thin.

Lubricate the bearings thoroughly with proper lubricant when assembling.

11. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

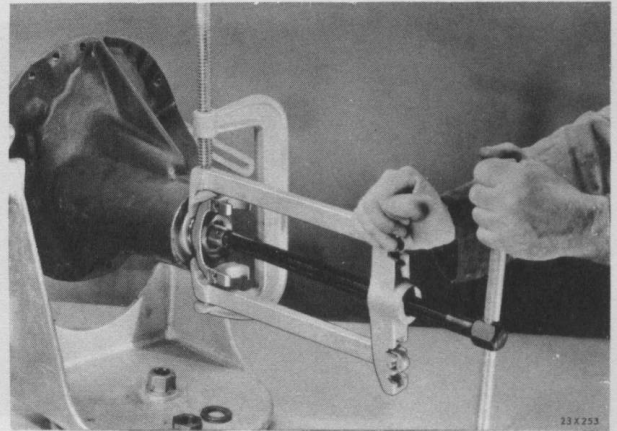


Fig. 29—Removing Drive Pinion Yoke

12. REPLACING DRIVE PINION BEARING OIL SEAL

The drive pinion bearing oil seal can be replaced without removing differential carrier assembly.

It is important that all dirt be removed before starting operation. Proceed as follows:

- (1) Disconnect the rear universal joint.
- (2) Remove the drive pinion yoke nut, washer, and remove yoke (Fig. 29).
- (3) Remove drive pinion bearing oil seal (Fig. 30).

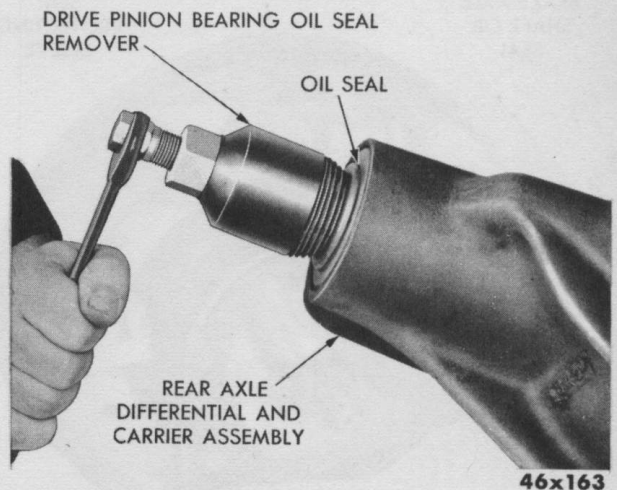


Fig. 30—Removing Drive Pinion Oil Seal From Carrier—Tool C-748

46x163

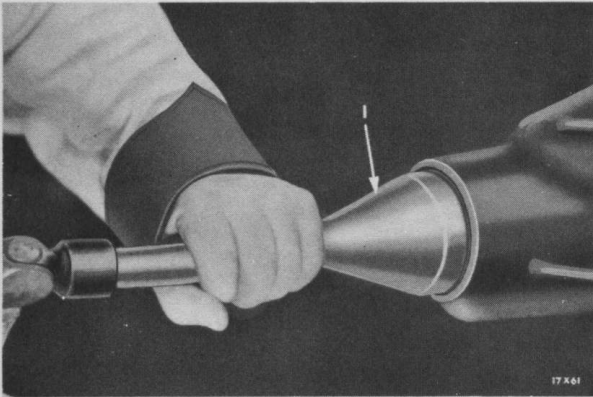


Fig. 31—Installing Drive Pinion Bearing Oil Seal

1 — Tool C-359

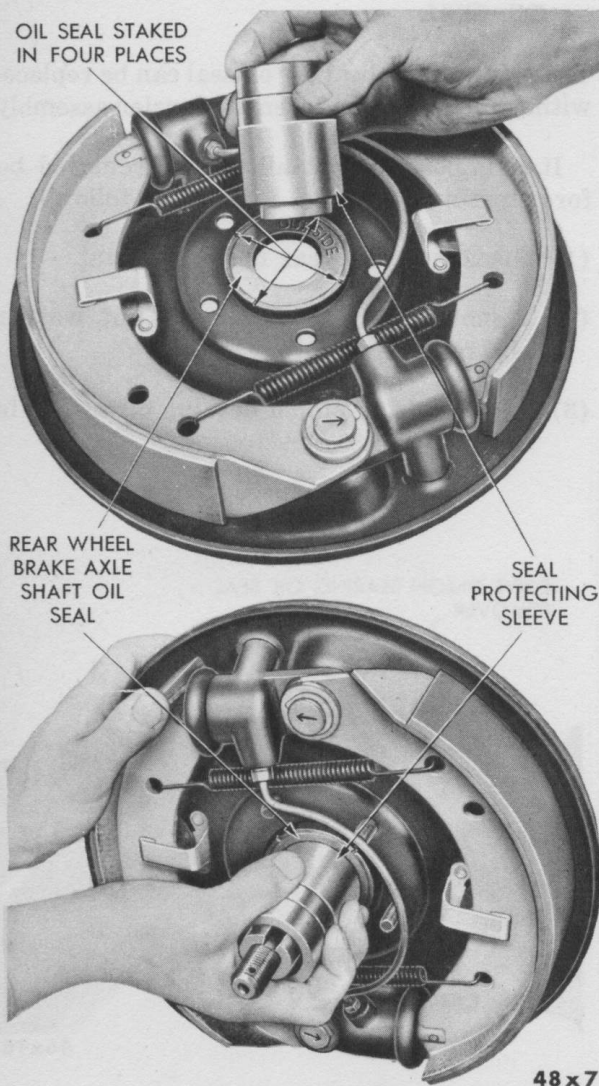


Fig. 32—Removing or Installing Brake Support

The new oil seal should be installed, as shown in Figure 31, so that it will be in tight contact with its seat.

When installing oil seal, care must be taken to make certain that the leather is in good condition.

13. REMOVING BROKEN END OF AXLE DRIVE SHAFT

Remove wheel, drum and axle drive shaft. If break is less than about 8 inches from inner end of shaft, it will be necessary to remove differential carrier assembly. If break is more than 8 inches from inner end of shaft, it will only be necessary to remove inner oil seal and snare inner end of axle drive shaft through housing with a wire loop.

14. ADJUSTING AXLE SHAFT END PLAY

Correct axle shaft end play is .003 to .008 inch. This end play is determined by an indicator installed on the axle shaft and brake support (hub and drum assembly removed). The total end play of the axle shaft will record on the gauge when the axle shaft is moved in and out.

If adjustment is necessary, proceed as follows:

- (1) Disconnect the brake line from the brake support.
- (2) Remove the nuts holding the brake support to the axle housing.
- (3) Remove axle shaft key. Install seal protecting sleeve (Fig. 32) to protect the seal from being damaged by the axle shaft keyway when removing the brake support.
- (4) Remove or install shims to obtain the required axle shaft end play.

15. SERVICE DIAGNOSIS

Refer to Paragraph 115 through 126.

SINGLE-SPEED, SINGLE-REDUCTION, FULL-FLOATING, HYPOID REAR AXLE

(B-4-D, B-4-PW, B-4-DU, B-4-EU) (FIGS. 36, 37, 38 AND 39)

16. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT

Remove axle drive shaft flange nuts and remove shaft, as shown in Figure 33.

When installing a new axle shaft, make sure the axle shaft flange fits tightly against the hub.

17. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY (EXCEPT B-4-DU, B-4-EU MODELS)

- (1) Drain differential lubricant.
- (2) Disconnect rear universal joint and drop the propeller shaft.
- (3) If the drive pinion is to be removed, remove the cotter pin and loosen the nut which holds the universal joint companion yoke. See Figure 34.
- (4) Remove both axle shafts.
- (5) Remove cap screws which hold the differential carrier assembly to the axle housing.
- (6) Remove differential carrier assembly, as shown in Figure 35.



Fig. 33—Removing Axle Drive Shaft
(Except B-4-DU, B-4-EU)

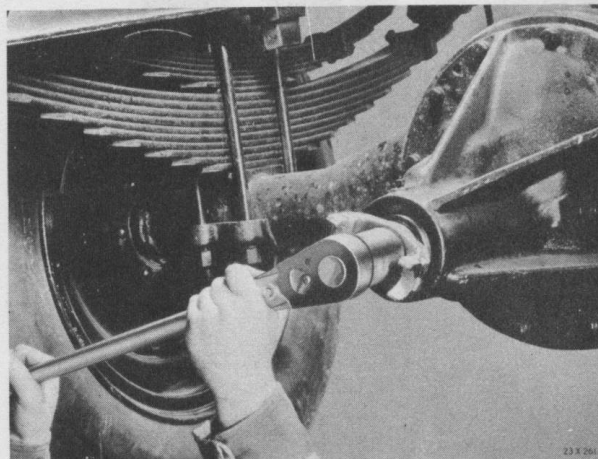


Fig. 34—Removing Drive Pinion Yoke Nut Before
Removing Differential Carrier Assembly
(Except B-4-DU, B-4-EU)

18. REMOVAL AND INSTALLATION OF DIFFERENTIAL AND RING GEAR ASSEMBLY (CARRIER REMOVED)

α. Removal

- (1) Mount carrier assembly in stand and mark

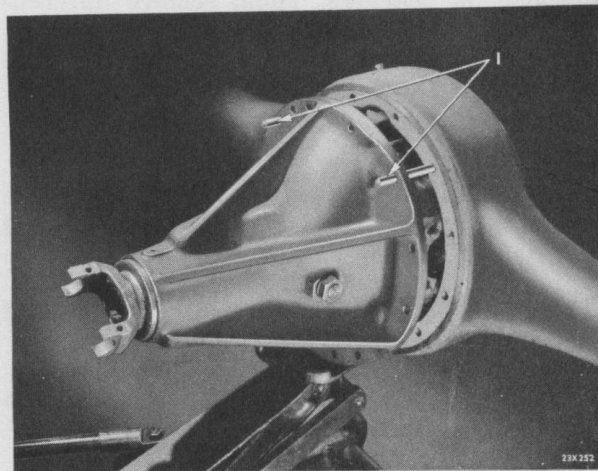


Fig. 35—Removing Differential Carrier Assembly
(Except B-4-DU, B-4-EU)

1 — Pilot studs

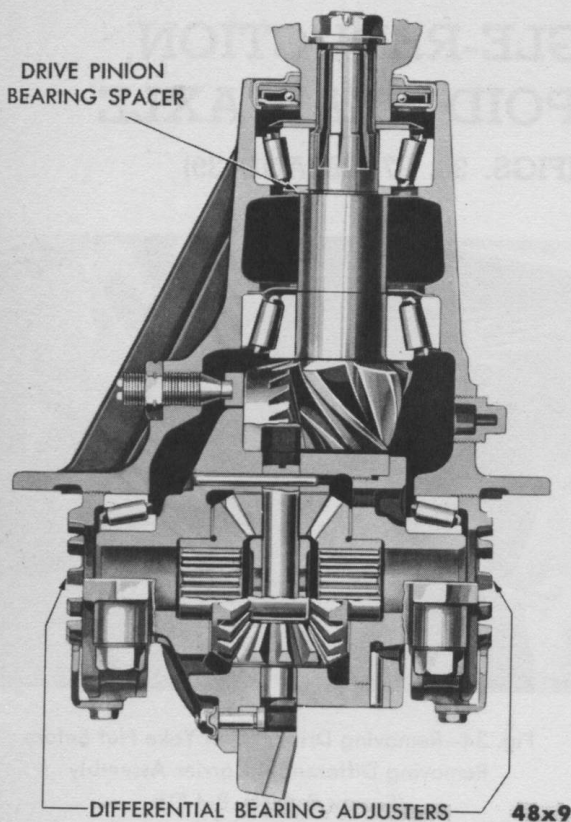


Fig. 36—Rear Axle Differential (Assembled View)
(B-4-D)

both differential bearing adjusters and caps to facilitate assembly.

- (2) Loosen differential bearing cap retaining screws and bearing adjusters to relieve load on bearings. Then, remove differential, caps, bearing adjusters and thrust pad.
- (3) Remove thrust pad screw.

b. Installation

When installing differential in carrier, place bearing adjusters against bearings and install caps.

- (1) Tighten cap screws just enough to hold caps in place.
- (2) Screw differential bearing adjusters into place, as shown in Figure 7.
- (3) Set bearing adjuster on left-hand side to permit an approximate adjustment of clearance between ring gear and drive pinion. Then, tighten right hand bearing ad-

justers with sufficient force to seat bearings in cups and cause a slight drag in bearing. Tap bearing caps with a hammer while turning adjusters to insure proper seating of rollers, cups and adjusters.

- (4) Remove carrier from stand and position with back face of ring gear upward.
- (5) Place thrust pad on rear face of ring gear and rotate gear until the hole in the thrust pad is aligned with the adjusting screw hole.
- (6) Install adjusting screw and lock nut and tighten screw sufficiently to locate thrust pad firmly against back face of ring gear.
Adjust thrust pad, as described in Paragraph 32.
- (7) Check backlash with a dial indicator.

Adjust backlash as specified in Service Standards. Move ring gear towards or away from pinion by turning both bearing adjusters an equal amount in same direction. When the differential bearing adjustment is changed, the drive gear and pinion tooth contact is also changed. Therefore, the two contacts should also be checked and corrected after adjusting the bearings.

After obtaining proper backlash, pre-load on differential bearings should be checked and adjusted if necessary.

To check pre-load, move ring gear back and forth with thumb and index finger—a slight drag should be felt in backlash. If adjustment is necessary, turn bearing adjusters in opposite directions the same amount to increase or decrease pre-load.

When backlash and pre-load have been adjusted, tighten bearing cap screws to proper torque. Refer to Service Standards.

19. REMOVAL AND INSTALLATION OF RING GEAR (DIFFERENTIAL REMOVED)

Remove the nuts and bolts which attach the ring gear to the differential case and press off the ring gear.

When installing the ring gear, be sure the holes in the ring gear are properly aligned with holes in differential case before pressing on. Install bolts and nuts and tighten securely.

**20. DISASSEMBLY AND ASSEMBLY OF
DIFFERENTIAL (RING GEAR REMOVED)
(FIGS. 36, 37, 38 AND 39)**

a. Disassembly

- (1) Mount differential case ring gear flange in a heavy vise, using copper jaws.
- (2) Remove bearing from differential case (cap side only).
- (3) Remove differential case cap locking pins (Fig. 8) by center punching and drilling. Remove shells of pins left in holes with a punch.

Since the cap is a thousandth or two larger than the hole in the case in which it fits, the case must be expanded for removal of the cap. Otherwise, damage will result.

Heat the case (not the cap) by playing the flame of a torch around the outside.

Keep the flame moving to assure even heating. Try a piece of ordinary solder on case from time to time and when solder just starts to melt (360-400 degrees F), case is heated to the temperature needed. *If case is heated beyond this temperature, the inside washers may become damaged.*

Remove the cap, as shown in Figure 9. To loosen the cover, strike the wrench handle with a heavy hammer. Then, quickly unscrew the cap with the wrench. The parts should now be immersed in oil to cool them for handling.

- (4) Remove differential pinion shaft locking pins by driving them out of case with a hammer and punch (Fig. 10).
- (5) Push differential pinion shafts out of differential case. The gears, thrust washers and axle shaft thrust block will then be loose and can be lifted out of case.

b. Assembly

When assembling, coat parts with differential lubricant to help hold them in place until thrust block and differential pinion shaft are installed. Be sure to peen over the outside edge of each hole to lock pin in place. Heat the case as recommended, install case cap, and tighten it rigidly. Drill new $\frac{1}{4}$ inch holes through cap and install *new* locking pins.

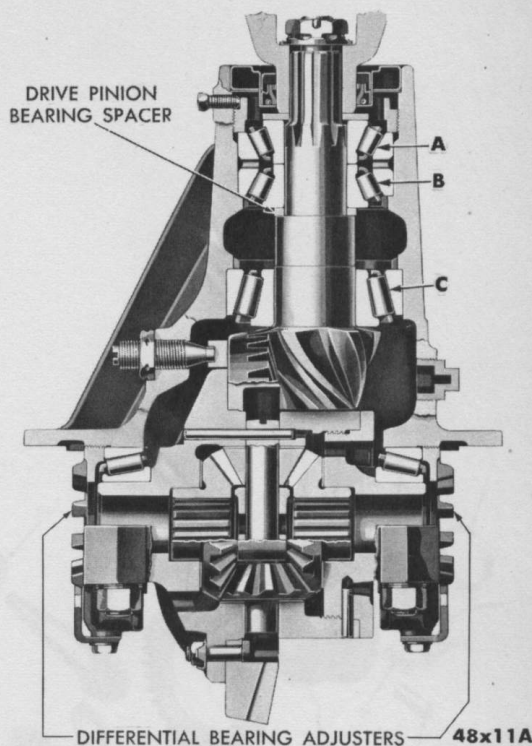
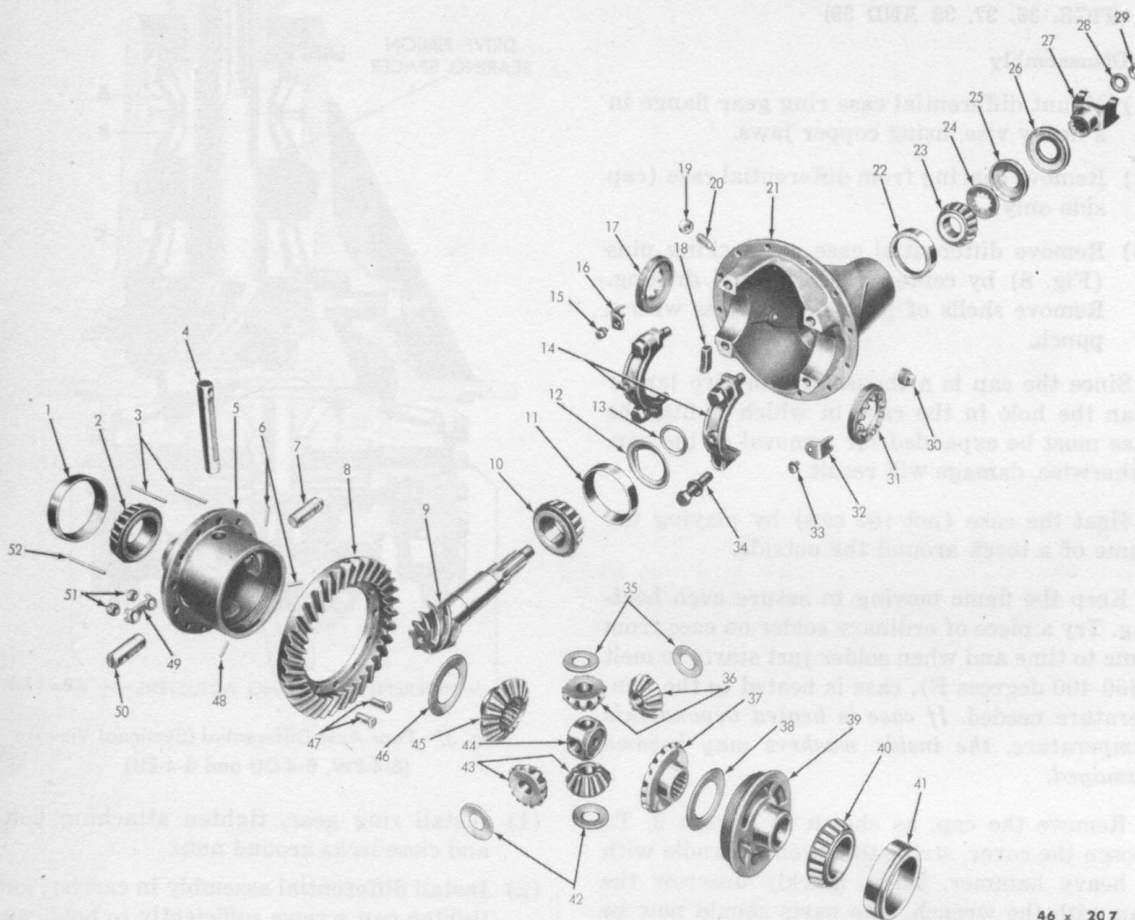


Fig. 37—Rear Axle Differential (Sectional View)
(B-4-PW, B-4-DU and B-4-EU)

- (1) Install ring gear, tighten attaching bolts and close locks around nuts.
- (2) Install differential assembly in carrier, and tighten cap screws sufficiently to hold caps in place.
- (3) Screw the differential bearing adjusters into place, as shown in Figure 7.
- (4) Set bearing adjuster on left-hand side to permit an approximate adjustment of clearance between ring gear and pinion. Then, tighten right-hand bearing adjusters with sufficient force to seat bearings in cups and cause a slight drag in bearing. Tap bearing caps with a hammer, while turning adjusters, to insure proper seating of rollers, cups and adjusters.
- (5) Check backlash with a dial indicator (Fig. 19).

**21. ADJUSTMENT OF RING GEAR
THRUST PAD**

The ring gear thrust pad (18, Fig. 38, and 29,



46 x 207

Fig. 38—Rear Axle Differential (Disassembled View) (B-4-D)

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 — Differential bearing cup 2 — Differential bearing cone 3 — Differential case pin 4 — Differential pinion shaft—long 5 — Differential case 6 — Differential pinion shaft lock pin 7 — Differential pinion shaft—short 8 — Drive gear 9 — Drive pinion 10 — Drive pinion bearing cone and roller—rear 11 — Drive pinion bearing cup—rear 12 — Drive pinion bearing oil baffle 13 — Drive pinion bearing spacer 14 — Differential carrier cap 15 — Differential bearing adjuster lock screw and lock washer ass'y 16 — Differential bearing adjuster lock 17 — Differential bearing adjuster 18 — Drive gear thrust pad 19 — Drive gear thrust screw lock nut 20 — Drive gear thrust screw 21 — Differential carrier 22 — Drive pinion bearing cup—front 23 — Drive pinion bearing cone—front 24 — Drive pinion bearing washer 25 — Drive pinion bearing oil slinger 26 — Drive pinion bearing oil seal 27 — Drive pinion companion yoke | <ul style="list-style-type: none"> 28 — Drive pinion companion yoke washer 29 — Drive pinion companion yoke nut 30 — Differential carrier plug 31 — Differential bearing adjuster 32 — Differential bearing adjuster lock 33 — Differential bearing adjuster lock screw and lock washer ass'y 34 — Differential carrier cap bolt 35 — Differential carrier cap bolt lock washer 36 — Differential pinion gear thrust washer 37 — Differential side gear 38 — Differential side gear thrust washer 39 — Differential case cap 40 — Differential bearing cone 41 — Differential bearing cup 42 — Differential pinion gear thrust washer 43 — Differential pinion gear 44 — Differential pinion shaft block 45 — Differential side gear 46 — Differential side gear thrust washer 47 — Drive gear bolt 48 — Differential pinion shaft lock pin 49 — Drive gear bolt nut lock 50 — Differential pinion shaft—short 51 — Drive gear bolt nut 52 — Differential case pinion |
|---|--|

Fig. 39) should have a slight clearance between the ring gear and pad. This clearance is obtained by turning the thrust pad adjusting screw tight, backing it off $\frac{1}{8}$ of a turn and locking the screw with the lock nut.

22. REMOVAL AND INSTALLATION OF AXLE DRIVE PINION (DIFFERENTIAL REMOVED)

a. B-4-D, B-4-DU and B-4-EU

- (1) Remove drive pinion yoke and pull drive pinion out through gear end of differential carrier.
- (2) Remove pinion bearing, as shown in Figure 27.
- (3) Remove drive pinion oil seal from carrier.
- (4) Remove both pinion bearing cups from carrier assembly.

When reassembling, the bearing pre-load should be checked before installing oil seal. Install yoke, washer and nut and tighten nut securely. Attach an inch-pound torque wrench (Fig. 28) on yoke nut and turn the drive pinion, noting amount of torque required. This should be from 10 to 15 inch-pounds. If pre-load is less than 10 inch-pounds, the spacer is too thick. If pre-load is over 15 inch-pounds, the spacer is too thin.

b. B-4-PW, B-4-DU and B-4-EU

- (1) Remove the drive pinion yoke cotter pin, nut and washer.
- (2) Remove the drive pinion yoke.
- (3) Pull out the pinion oil seal. (B-4-EU — Refer to Figures 108 and 109, pages 61 and 62.
- (4) Lift out the outer bearing washer.
- (5) Unscrew and remove the outer bearing retainer lock screw (20, Fig. 39) and the bearing retainer nut (24).
- (6) Pull the drive pinion out through the rear of the differential carrier. The bearing washer (23, Fig. 39) does not fit the pinion tightly and will drop into the carrier.
- (7) Remove the rear bearing cone from the pinion with a puller. The center and front bearing cones can be tapped off the pinion with a drift and hammer.

- (8) Drive the front bearing cup out of the front of the carrier with a drift and hammer.
- (9) Drive the rear bearing cup out of the rear of the carrier with a drift and hammer.

When assembling, note that the two front bearings have two cones and only one cup. The cup is marked with the letter "Y". This is etched in the end which must always be assembled toward the front end of the pinion shaft. The bearing to be used with the side of the double cup marked "Y" is also marked "Y" on its forward side. Be sure to assemble the bearings and cup correctly.

The companion yoke nut (27, Fig. 39) holds the entire group of bearings and spacers together on the drive pinion. Make sure it is tightened securely.

The front bearing retaining nut should be turned tightly against the front bearing. Make certain that the bearings are properly seated. Then, lock the retainer nut with the retainer lock screw (20, Fig. 39). Be certain that the oil seal is in good condition and that the drive pinion is free from burrs or dirt which would cause the seal to wear and result in leakage.

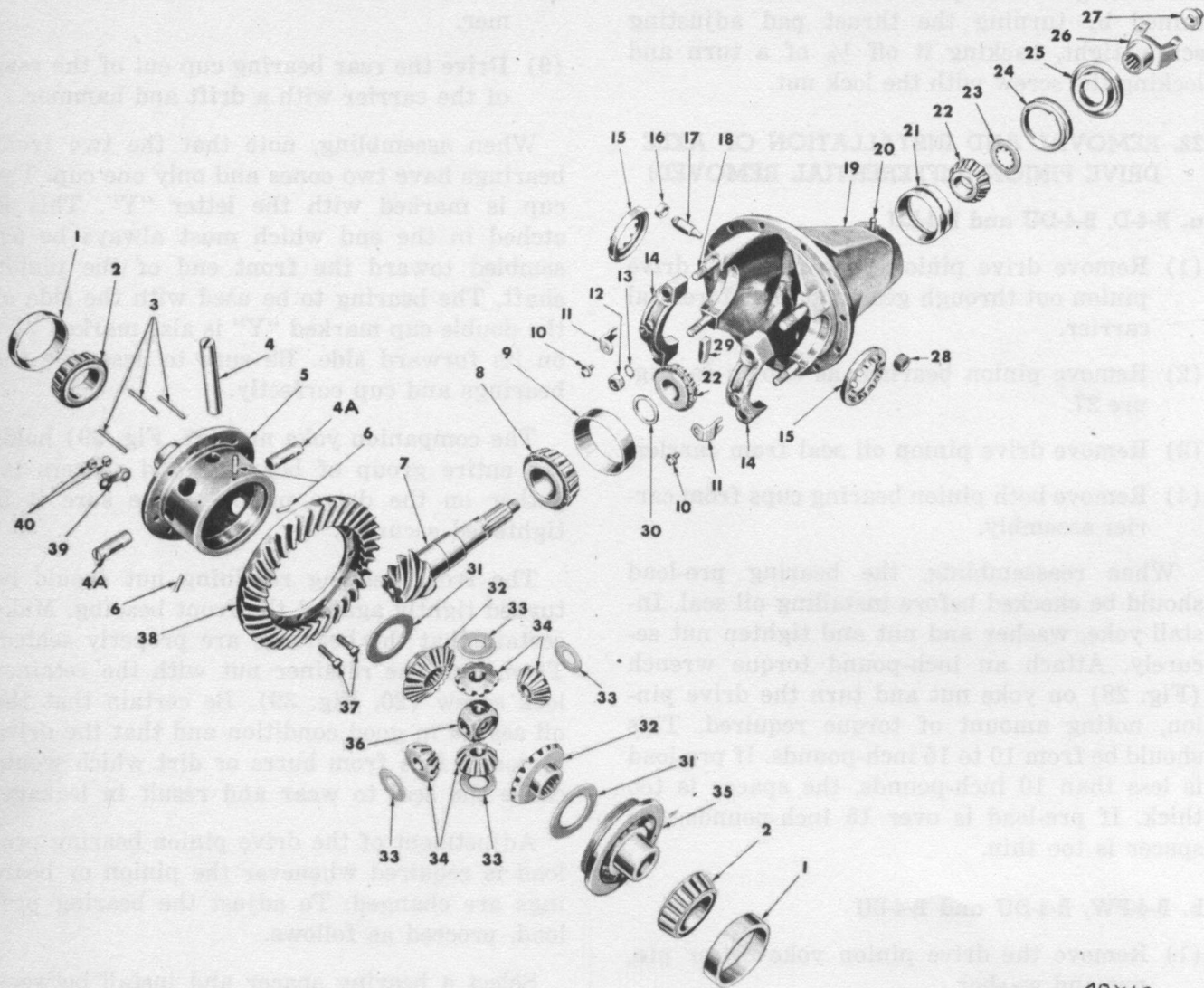
Adjustment of the drive pinion bearing pre-load is required whenever the pinion or bearings are changed. To adjust the bearing pre-load, proceed as follows.

Select a bearing spacer and install between the front bearings. Refer to Figure 39. The spacers are available in the following sizes:

| | | | |
|-----------|-----------|-----------|-----------|
| .1790 in. | .1830 in. | .1870 in. | .1910 in. |
| .1810 in. | .1850 in. | .1890 in. | .1930 in. |

This places the intermediate bearing (B, Fig. 37) out of contact. Then, check the torque of the bearings (A and C, Fig. 37) with an inch-pound torque wrench. This torque should be 35 to 70 inch-pounds—40 inch-pounds is preferred.

Then, disassemble the unit and install the same spacer in its correct location (Fig. 37). Lubricate all bearings and assembly, including the oil seal, and check with an inch-pound torque wrench. The reading should be 60 to 95 inch-pounds—70 to 80 inch-pounds is preferred. Be sure to take the reading after rotating the assembled bearings to insure that the bearings



48X10

Fig. 39—Rear Axle Differential (Disassembled View) (B-4-PW, B-4-DU, B-4-EU)

- | | |
|---|---|
| 1 — Differential bearing cup | 21 — Axle drive pinion outer bearing cup |
| 2 — Differential bearing cone and rollers | 22 — Axle drive pinion outer bearing cone and rollers |
| 3 — Differential pinion shaft lock (dowel) pin | 23 — Axle drive pinion outer bearing washer |
| 4 — Differential pinion shaft (long) | 24 — Axle drive pinion outer bearing retainer nut |
| 4A — Differential pinion shaft (short) | 25 — Axle drive pinion bearing oil seal |
| 5 — Differential case | 26 — Axle drive pinion companion yoke |
| 6 — Differential case cap retainer pins | 27 — Axle drive pinion companion yoke nut |
| 7 — Axle drive pinion | 28 — Differential carrier lubricant plug |
| 8 — Axle drive pinion inner bearing cone and rollers | 29 — Axle drive gear thrust pad |
| 9 — Axle drive pinion inner bearing cup | 30 — Axle drive pinion bearing spacer |
| 10 — Differential bearing adjuster lock screw and lock washer | 31 — Differential side gear thrust washer |
| 11 — Differential bearing adjuster lock | 32 — Differential side gear |
| 12 — Differential bearing cap stud nut lock washer | 33 — Differential pinion thrust washer |
| 14 — Differential bearing cap | 34 — Differential pinions |
| 15 — Differential bearing adjuster | 35 — Differential case cap |
| 16 — Axle drive gear thrust screw lock nut | 36 — Differential pinion shaft block |
| 17 — Axle drive gear thrust screw | 37 — Axle drive gear bolts |
| 18 — Differential bearing cap stud | 38 — Axle drive gear |
| 19 — Differential carrier | 39 — Axle drive gear bolt nut lock |
| 20 — Axle drive pinion outer bearing retainer nut lock screw | 40 — Axle drive gear bolt nuts |

are seating against the bearing cone rib. A false reading will result if this operation is omitted.

The drive pinion bearings cannot be used for pinion gear adjustment. Tooth contact can only be corrected by ring gear sidewise adjustment at the differential side bearings.

23. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

24. REPLACING DRIVE PINION BEARING OIL SEAL

The drive pinion bearing oil seal can be replaced without removing differential assembly.

It is important that all dirt be removed before starting operation. Proceed as follows:

- (1) Disconnect rear universal joint.
- (2) Remove drive pinion yoke nut, washer and yoke (Fig. 29).

- (3) Remove drive pinion bearing oil seal (Fig. 30).

The new oil seal should be installed, as shown in Figure 31, so that it will be in tight contact with its seat (B-4-EU—refer to Fig. 110, page 62.)

When installing oil seal, care must be taken to make certain that the leather is in good condition.

25. REMOVING BROKEN END OF AXLE DRIVE SHAFT

The end of a broken shaft will come out with the differential and carrier assembly, if the break is less than 8 inches from the inner end of the shaft. If the break is more than 8 inches from the inner end of the shaft, it will be necessary to snare the inner end with a wire loop through the housing.

26. SERVICE DIAGNOSIS

Refer to Paragraphs 115 through 126.

SINGLE-SPEED, SINGLE-REDUCTION, FULL-FLOATING, HYPOID REAR AXLE

(B-4-F, B-4-G, B-4-H, B-4-HM, B-4-J, B-4-JM, B-4-K)
(FIGS. 40 AND 41)

27. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT

Remove axle drive shaft flange nuts and pull out shaft, as shown in Figure 33. When installing a new axle shaft, make sure the axle shaft flange fits tightly against the hub.

28. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY

- (1) Drain differential lubricant.
- (2) Disconnect rear universal joint and drop the propeller shaft.
- (3) If the drive pinion is to be removed, remove the cotter pin and loosen the companion yoke nut.
- (4) Remove both axle shafts.

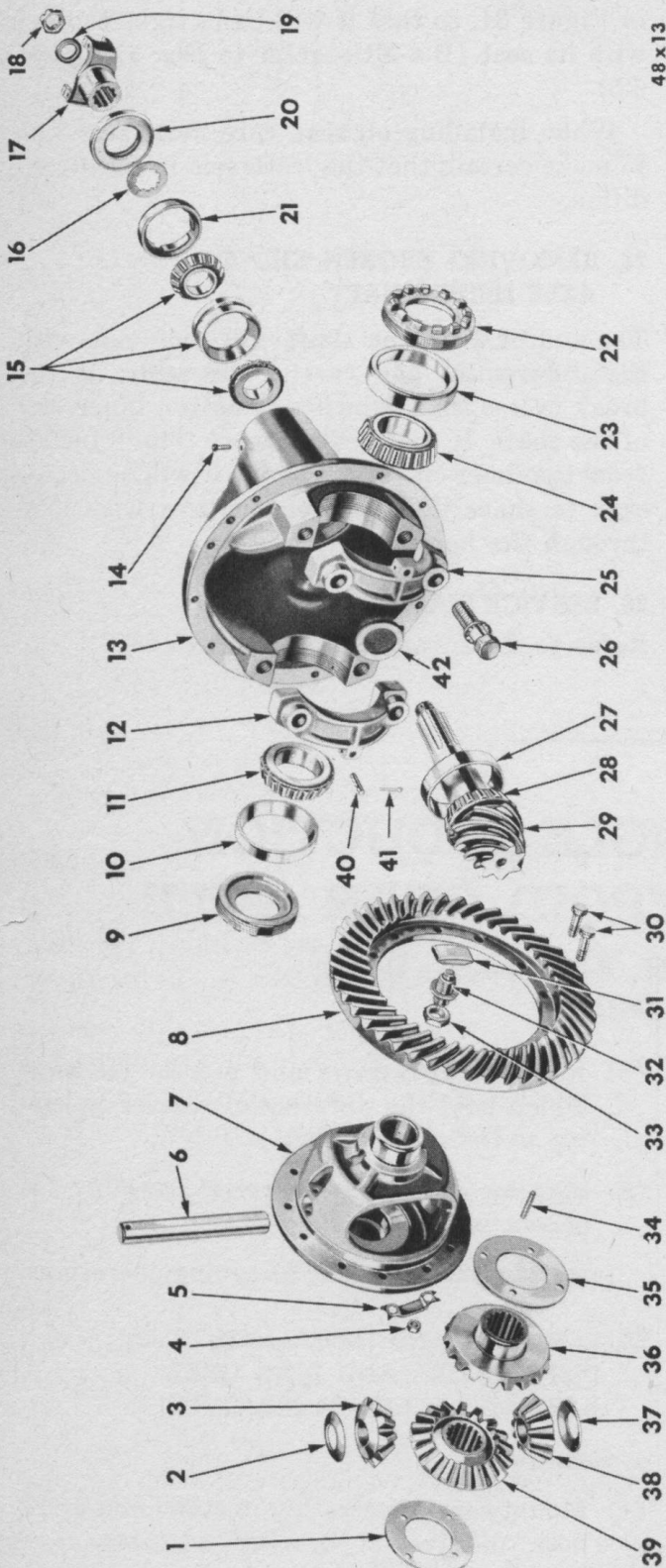
- (5) Remove cap screws and dowels (if any) which hold the differential carrier assembly to the axle housing.
- (6) Remove differential carrier assembly, as shown in Figure 35.

Install by reversing the foregoing operations.

29. REMOVAL AND INSTALLATION OF DIFFERENTIAL AND RING GEAR ASSEMBLY (CARRIER REMOVED)

a. Removal

- (1) Mount carrier assembly in stand and mark both differential bearing adjusters and caps to facilitate assembly.
- (2) Loosen differential bearing cap retaining screws and bearing adjusters to relieve



48 x 13

Fig. 40—Rear Axle Differential (Disassembled View)

- | | |
|---|--|
| 1 — Differential side gear thrust washer | 22 — Differential bearing adjuster |
| 2 — Differential pinion thrust washer | 23 — Differential bearing cup |
| 3 — Differential pinion | 24 — Differential bearing cone and rollers |
| 4 — Rear axle drive gear bolt nut | 25 — Differential bearing cap |
| 5 — Rear axle drive gear bolt nut lock | 26 — Differential bearing cap screw and lock washer |
| 6 — Differential pinion shaft | 27 — Rear axle drive pinion rear bearing cup |
| 7 — Differential case | 28 — Rear axle drive pinion rear bearing cone and rollers |
| 8 — Rear axle drive gear | 29 — Rear axle drive pinion |
| 9 — Differential bearing adjuster | 30 — Rear axle drive gear bolts |
| 10 — Differential bearing cup | 31 — Rear axle drive gear thrust screw pad |
| 11 — Differential bearing cone and rollers | 32 — Rear axle drive gear-thrust screw |
| 12 — Differential bearing cap | 33 — Rear axle drive gear thrust screw nut and lock washer |
| 13 — Differential carrier | 34 — Differential pinion shaft lock pin |
| 14 — Rear axle drive pinion front bearing retainer nut lock screw | 35 — Differential side gear thrust washer |
| 15 — Rear axle drive pinion front bearing assembly | 36 — Differential side gear |
| 16 — Rear axle drive pinion front bearing washer | 37 — Differential pinion thrust washer |
| 17 — Rear axle drive pinion companion yoke | 38 — Differential pinion |
| 18 — Rear axle drive pinion companion yoke nut | 39 — Differential side gear |
| 19 — Rear axle drive pinion companion yoke nut washer | 40 — Differential bearing adjuster lock pin |
| 20 — Rear axle drive pinion bearing oil seal | 41 — Differential bearing adjuster lock pin cotter pin |
| 21 — Rear axle drive pinion front bearing retainer nut | 42 — Rear axle drive pinion bearing spacer |

load on bearings. Then, remove caps and bearing adjusters.

b. Installation

When installing differential in carrier, place bearing adjusters against bearings and install caps.

- (1) Tighten cap screws sufficiently to hold caps in place.
- (2) Tighten ring gear attaching bolts and close locks around nuts, if the ring gear had been removed for any purpose.
- (3) Screw differential bearing adjusters into place, as shown in Figure 7.
- (4) Set bearing adjuster on left-hand side to permit an approximate adjustment of clearance between ring gear and pinion. Then, tighten right-hand bearing adjusters with sufficient force to seat bearings in cups and cause a slight drag in bearing. Tap bearing caps with a hammer (while turning adjusters) to insure proper seating of rollers, cups and adjusters.
- (5) Check backlash with a dial indicator (Fig. 19).

Adjust backlash, as specified in Service Standards. Move ring gear towards or away from pinion by turning bearing adjusters an equal amount in same direction. When the differential bearing adjustment is changed, the drive gear and pinion tooth contact is also changed. Therefore, the two contacts should also be checked and corrected after adjusting the bearings.

After obtaining proper backlash, pre-load on differential bearings should be checked and adjusted, if necessary.

To check pre-load, move ring gear back and forth with thumb and index finger. A slight drag should be felt in backlash. If adjustment is necessary, turn bearing adjusters in opposite directions the same amount to increase or decrease pre-load.

When backlash and pre-load have been adjusted, tighten bearing cap screws to proper torque. Refer to Service Standards.

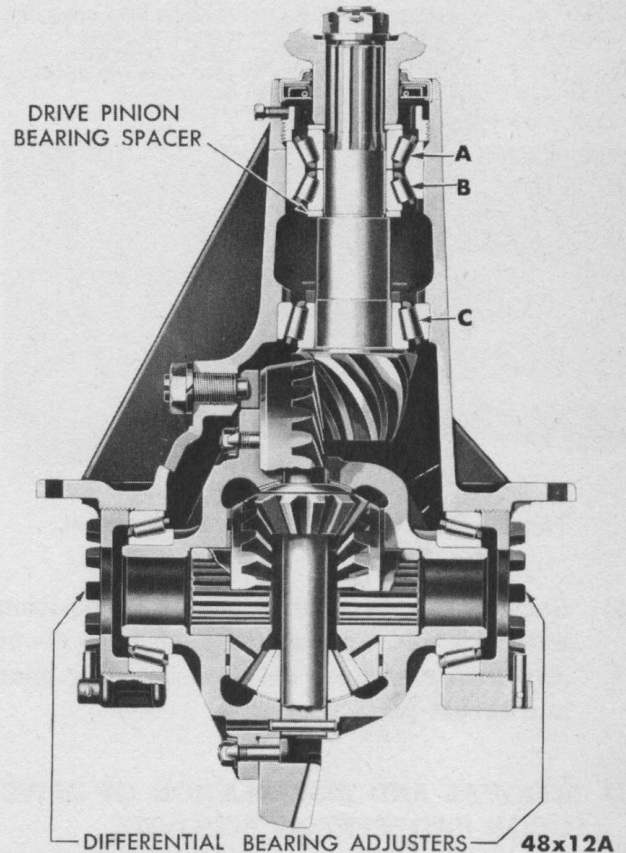


Fig. 41—Rear Axle Differential (Assembled View)

30. REMOVAL AND INSTALLATION OF RING GEAR (DIFFERENTIAL REMOVED)

Remove nuts and bolts which attach ring gear to differential case and press off the ring gear.

When installing ring gear, be sure holes in the ring gear are properly aligned with holes in differential case before pressing on. Install bolts and nuts and tighten securely.

31. DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL CASE (RING GEAR REMOVED)

Remove differential pinion gear shaft lock pin and pinion shaft. All differential parts will then be loose and can be lifted out of the differential case. Assemble in reverse order.

32. ADJUSTMENT OF RING GEAR THRUST PAD

- (1) Loosen lock nut.
- (2) Turn adjusting screw *in* until thrust pad strikes ring gear (Fig. 42).

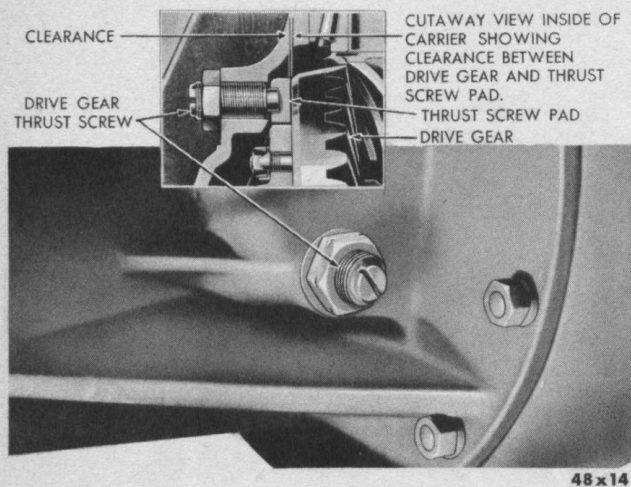


Fig. 42—Drive Gear Thrust Screw Adjustment

- (3) Back off $\frac{1}{8}$ turn and lock it in position with lock nut. This adjustment gives about .010 inch clearance between the ring gear and thrust pad.

33. REMOVAL AND INSTALLATION OF DRIVE PINION (DIFFERENTIAL REMOVED)

- (1) Remove the drive pinion yoke cotter pin, nut and washer.
- (2) Remove the drive pinion yoke.
- (3) Pull out the pinion oil seal.
- (4) Lift out the front bearing washer.

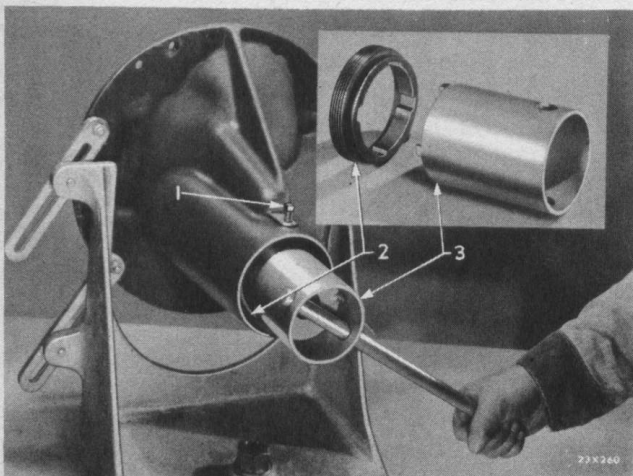


Fig. 43—Removing Pinion Bearing Retaining Nut

- 1 — Drive pinion front bearing retainer nut lock screw
- 2 — Drive pinion front bearing retaining nut
- 3 — Tool DD-809

- (5) Unscrew and remove the front bearing retainer lock screw (1, Fig. 43) and the bearing retainer nut (2).
- (6) Pull the drive pinion out through the rear of the differential carrier. The spacing washer does not fit the pinion tightly and will drop into the carrier.
- (7) Remove the rear bearing cone from the pinion by means of a puller. The center and front bearing cones can be tapped off the pinion with a drift and hammer.
- (8) Drive the front bearing cup out of the front of the carrier with a drift and hammer.
- (9) Drive the rear bearing cup out of the rear of the carrier with a drift and hammer.

When assembling, note that the two front bearings have two cones and only one cup. The cup is marked with the letter "Y" which is etched in the end. This must always be assembled toward the front end of the pinion shaft. The bearing to be used with the side of the double cap marked "Y" is also marked "Y" on its forward side. Be sure to assemble the bearings and cup correctly.

The companion yoke nut (18, Fig. 40) holds the entire group of bearings and spacers together on the drive pinion. Make sure it is tightened securely.

The front bearing retaining nut should be turned tightly against the front bearing. Make certain that the bearings are properly seated. Then, lock the retainer nut with the retainer lock screw (14, Fig. 40). Be certain that the oil seal is in good condition and that the drive pinion is free from burrs or dirt which would cause the seal to wear and result in leakage.

Adjustment of the drive pinion bearing preload is required whenever the pinion or bearings are changed. To adjust the bearing preload, proceed as follows:

Select a bearing spacer and install between the front bearings. Refer to Figure 40. The spacers are available in the following sizes:

| | | | |
|-----------|-----------|-----------|-----------|
| .1790 in. | .1830 in. | .1870 in. | .1910 in. |
| .1810 in. | .1850 in. | .1890 in. | .1930 in. |

This places the intermediate bearing (B, Fig. 41) out of contact. Then, check the torque of the bearings (A and C, Fig. 41) with an inch-

pound torque wrench. This torque should be 35 to 70 inch-pounds—40 inch-pounds is preferred.

Then, disassemble the unit and install the same spacer in its correct location (Fig. 41). Lubricate all bearings and assembly, including the oil seal, and check with an inch-pound torque wrench. The reading should be 60 to 95 inch-pounds—70 to 80 inch-pounds is preferred. Be sure to take the reading after rotating the assembled bearings to insure that the bearings are seating against the bearing cone rib. A false reading will result if this operation is omitted.

The drive pinion bearings cannot be used for pinion gear adjustment. Tooth contact can only be corrected by ring gear sidewise adjustment at the differential side bearings.

34. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

35. REPLACING DRIVE PINION BEARING OIL SEAL

Drive pinion oil seals can be replaced without removing the differential and carrier assembly.

CAUTION

All dirt should be removed before starting the operation.

- (1) Disconnect rear universal joint.
- (2) Remove drive pinion flange nut and flange.
- (3) Remove drive pinion oil seal.

The new oil seal should be installed with a pinion oil seal drift, so that it will be in tight contact with its seat.

When installing oil seals, care must be taken to make certain that the leather is in good condition—soft and pliable. New oil seals should be soaked in thin oil for about 30 minutes. Then, the leather should be worked by rolling the seal with pressure applied by a smooth bar before installing. Inspect the surface of the shaft or other part where contact is made with the leather to make certain that it is smooth. Roughness of the contact surface will cause rapid wear of the seal and will result in oil leakage.

36. REMOVING BROKEN END OF AXLE DRIVE SHAFT

The inner portion of a broken axle shaft will come out with the differential carrier assembly, if the break is less than 8 inches from the inner end of the shaft. If the break is more than 8 inches from the inner end of the shaft, it can be snared with a wire loop through the housing.

37. SERVICE DIAGNOSIS

Refer to Paragraphs 115 through 126.

SINGLE-SPEED, SINGLE-REDUCTION, FULL-FLOATING, HYPOID REAR AXLE

(B-4-R, B-4-T, B-4-V, B-4-Y) (FIG. 44)

38. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT

- (1) Remove axle shaft flange stud nuts and lock washers.
- (2) Rap axle shafts sharply in center of flange with heavy steel hammer to free dowels. Remove taper dowels and axle shafts.

CAUTION

Prying the shafts loose will damage the hubs and oil seals.

Install by reversing the foregoing operations.

39. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY (AXLE SHAFTS REMOVED)

a. Removal

- (1) Remove plug from bottom of axle housing and drain lubricant.
- (2) Disconnect universal at pinion shaft.
- (3) Remove carrier to housing stud nuts and

lock washers. Loosen two top nuts and leave the studs on to prevent carrier from falling.

- (4) Break carrier loose from axle housing with rawhide mallet.
- (5) Remove top nuts and washers and work carrier free, using puller screws in holes provided. A small pinch bar may be used to straighten the carrier in the housing bore. However, the end must be rounded to prevent indenting the carrier flange. A roller jack may be used to facilitate removal of carrier.

b. Installation

To install the differential carrier assembly, proceed as follows:

- (1) Install new gasket on axle housing flange.
- (2) Roll carrier into position on roller jack. Start carrier into housing with four flat washers and nuts equally spaced and tighten alternately to draw carrier squarely into the axle housing.

CAUTION

Driving carrier into the housing with a steel hammer will distort the carrier stud flange and result in oil leakage.

- (3) Install lock washers and stud nuts. Tighten to correct torque.
- (4) Connect universal at pinion shaft.
- (5) Install axle shafts.

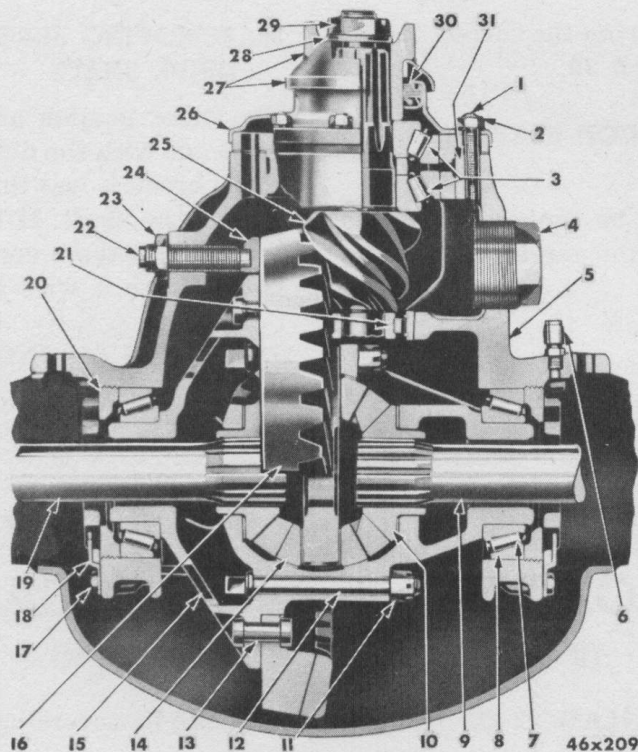


Fig. 44—Rear Axle Differential (Sectional View)

- 1 - Drive pinion front bearing cage stud
- 2 - Drive pinion front bearing cage stud nut
- 3 - Drive pinion front bearing cone
- 4 - Differential carrier inspection plug
- 5 - Differential carrier
- 6 - Differential carrier breather
- 7 - Differential bearing cone
- 8 - Differential bearing cup
- 9 - Drive shaft
- 10 - Differential side gear
- 11 - Differential case bolt nut
- 12 - Differential case bolt
- 13 - Drive gear rivet
- 14 - Differential pinion with bushing
- 15 - Differential case
- 16 - Drive gear

- 17 - Differential bearing adjusting nut lock screw
- 18 - Differential bearing adjusting nut lock
- 19 - Drive shaft
- 20 - Differential bearing adjusting nut
- 21 - Drive pinion bearing-rear
- 22 - Drive gear thrust block screw
- 23 - Drive gear thrust block screw nut
- 24 - Drive gear thrust block
- 25 - Drive pinion
- 26 - Drive pinion front bearing cover
- 27 - Drive pinion companion yoke
- 28 - Drive pinion companion yoke nut washer
- 29 - Drive pinion companion yoke nut
- 30 - Drive pinion front bearing oil seal
- 31 - Drive pinion front bearing cage and bearing cups

- (6) Fill axle housing to the correct level with recommended lubricant.
- (7) Jack up both rear wheels and operate vehicle in high transmission gear at approximately 25 to 30 miles per hour for five minutes to assure satisfactory lubrication of all parts of the carrier assembly.

CAUTION

Do not operate vehicle with one wheel jacked up. Operation in this manner will cause the differential spider to overheat and result in galling or shearing of the spider pins.

Both wheel brakes should be free to allow both wheels to rotate at approximately the same speed.

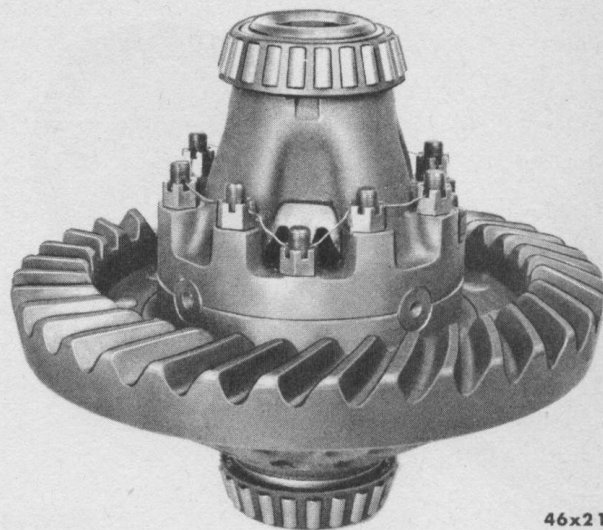
DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL (CARRIER REMOVED)

40. REMOVAL OF DIFFERENTIAL GEAR ASSEMBLY

- (1) Place carrier in suitable holding fixture.
- (2) Cut lock wire. Remove cap screws and adjusting nut locks.
- (3) Center punch one differential carrier leg and bearing cap to identify for properly reassembling.
- (4) Remove bearing cap stud nuts, bearing caps and adjusting nuts.
- (5) Loosen jam nut and back off thrust pad adjusting screw.
- (6) Lift out differential and gear assembly (Fig. 45).
- (7) Remove thrust pad from inside of carrier housing.

41. DISASSEMBLY OF DIFFERENTIAL CASE

- (1) If original identification marks are not clear, mark differential case halves with a punch or chisel so they can be correctly aligned when reassembling.



46x212

Fig. 45—Differential Gear Assembly Removed

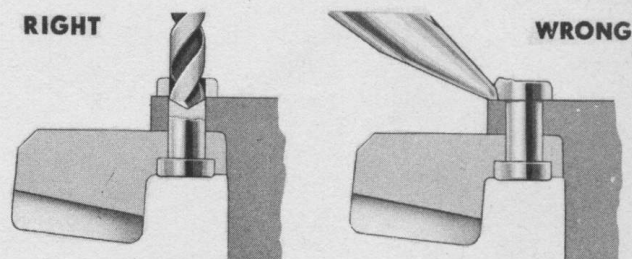
- (2) Cut lock wire, and remove bolts and separate case halves.
- (3) Remove spider, pinions, side gears and thrust washers.
- (4) Differential bearings can be removed with a suitable puller.

42. REMOVAL AND INSTALLATION OF RING GEAR (CARRIER REMOVED)

a. Removal

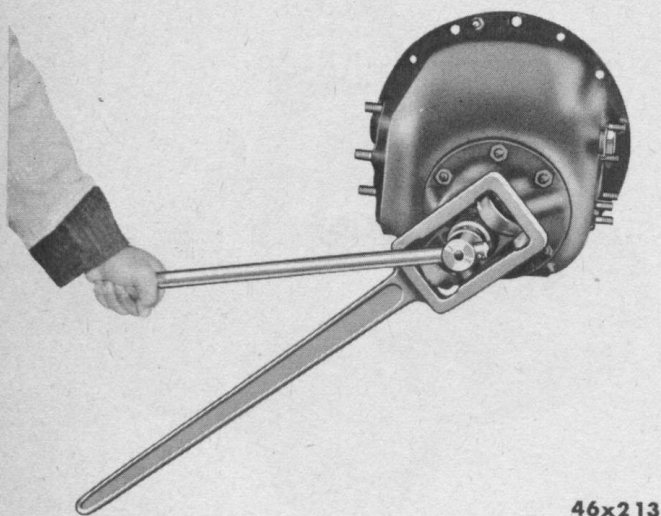
On B-4-R, B-4-T and B-4-Y models, the ring gear is riveted to the differential case half. To replace ring gear, proceed as follows:

- (1) Carefully center punch each rivet in the center of the head.



46x208

Fig. 46—Removing Ring Gear Rivets



46x213

Fig. 47—Removing or Installing Pinion Shaft Nut,
Tool DD-949

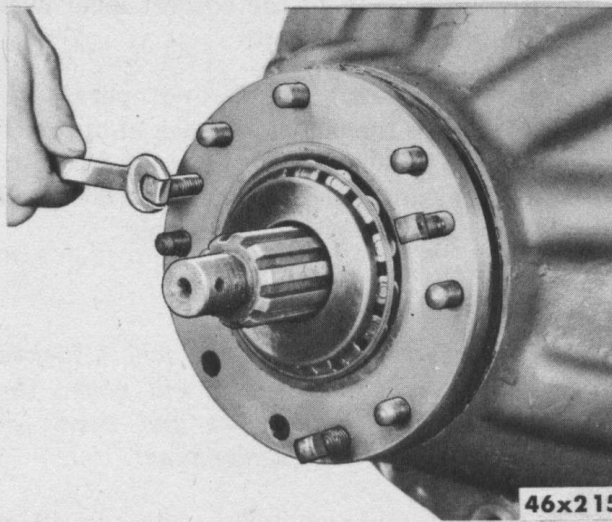
- (2) Use a drill $\frac{1}{32}$ inch larger than the body of the rivets to drill through the head. See Figure 46.
- (3) Press out the remainder of the rivets.

When installing ring gear, be sure that the holes in the ring gear and case half are properly aligned. By using the correct rivets and rivet set, the head being formed will be at least $\frac{1}{8}$ inch larger than the rivet hole. The rivet (when properly set) will be approximately the same height as the pre-formed head. The formed head should not



46x214

Fig. 48—Removing Yoke,
Tools DD-949 and DD-969



46x215

Fig. 49—Removing Bearing Cage Assembly, Using
Puller Screws

exceed $\frac{1}{16}$ inch less than the pre-formed head, as excessive pressure will cause distortion of the case holes and result in gear eccentricity.

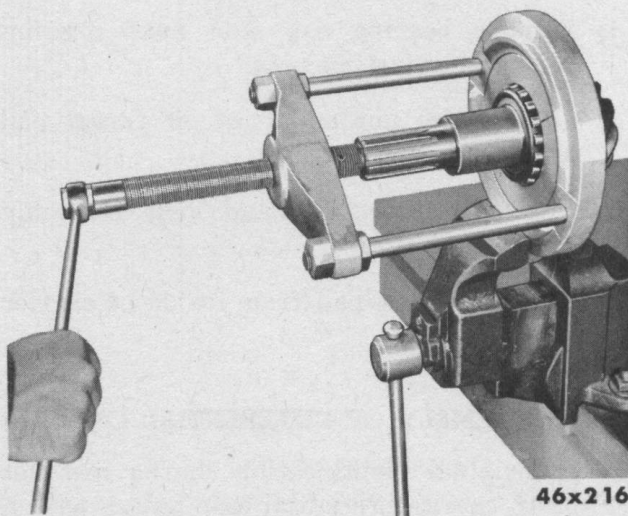
CAUTION

Rivets must not be heated. They should be set up cold.

On the B-4-V models, remove nuts and bolts which attach ring gear to differential case half and press off the ring gear.

b. Installation

When installing ring gear, be sure the holes



46x216

Fig. 50—Removing Pinion Inner Bearing,
Tool DD-914

in the ring gear are properly aligned with holes in differential case half before pressing on. Install bolts and nuts and tighten securely.

43. REMOVAL OF PINION AND CAGE ASSEMBLY

- (1) Hold yoke with suitable tool and remove pinion shaft nut and washer, as shown in Figure 47.
- (2) Remove yoke, as shown in Figure 48.

CAUTION

Driving off the yoke will cause runout.

- (3) Remove bearing cover and oil seal assembly.
- (4) Remove bearing cage, using puller screws in holes provided (Fig. 49).

CAUTION

The use of a pinch bar will damage the shims. Driving pinion from inner end with a drift will damage the bearing lock ring groove.

- (5) Wire shim pack together to facilitate adjustment when reassembling.

44. DISASSEMBLY OF PINION AND CAGE ASSEMBLY

- (1) Tap shaft out of cage with soft mallet or press shaft from cage.
- (2) Remove outer bearing from cage.
- (3) Remove spacer or spacer combination from pinion shaft.
- (4) If necessary, remove the drive pinion inner bearing, as shown in Figure 50. The rear bearing pilot may be removed, as shown in Figure 51.
- (5) Remove oil seal assembly from bearing cover.

45. ASSEMBLY OF PINION AND CAGE ASSEMBLY

- (1) Press drive pinion inner bearing (Fig. 52) and rear bearing pilot (Fig. 53) firmly against the pinion shoulders.
- (2) Install radial bearing lock ring and squeeze ring into pinion shaft groove with pliers.

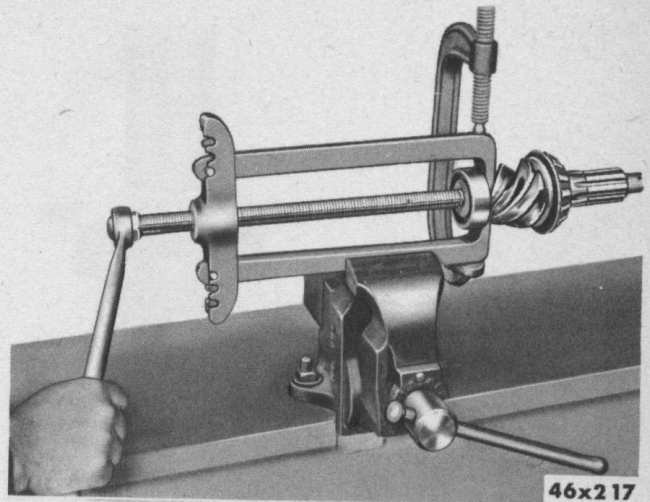


Fig. 51—Removing Rear Drive Pinion Bearing Pilot—Tool C-549

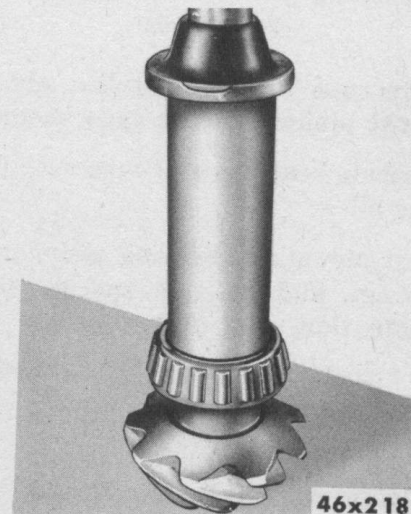


Fig. 52—Installing Pinion Inner Bearing, Tools DD-955, DD-956 or DD-957

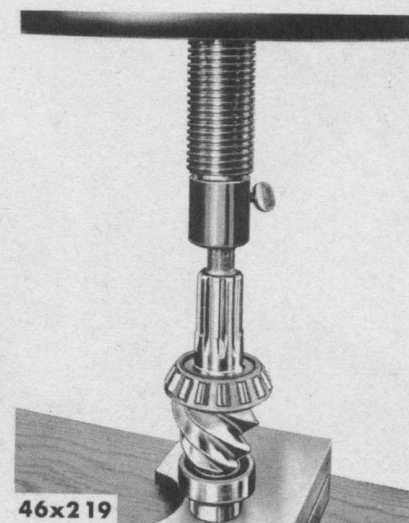


Fig. 53—Installing Rear Pinion Bearing Pilot—Tool DD-950

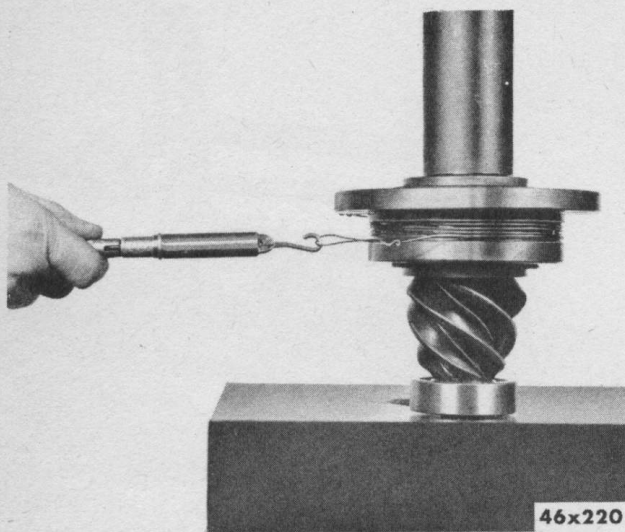


Fig. 54—Checking Pinion Bearing Pre-Load With Inch-Pound Scale

- (3) If new cups are to be installed, press firmly against pinion bearing cage shoulders.
- (4) Lubricate bearings and cups with light machine oil.
- (5) Insert pinion and bearing assembly in pinion cage and position spacer, or spacer combination, over pinion shaft.
- (6) Press front bearing firmly against spacer.
- (7) Rotate cage several revolutions to assure normal bearing contact.
- (8) While in press under pressure, check bearing pre-load torque. Wrap soft wire around



Fig. 55—Installing Pinion Oil Seal in Retainer, Tool DD-951 or DD-954

cage and pull on horizontal line with pound scale (Fig. 54). If a press is not available, the pinion nut may be tightened to the correct torque. Then, check the pre-load.

The correct pressures and torque for checking pinion bearing pre-load are as follows:

| <i>Pinion Shaft Thread Size</i> | <i>Required Pressure To Obtain Correct Pre-load</i> | <i>Required Torque To Obtain Correct Pre-load</i> |
|---------------------------------|---|---|
| 1 in. x 20 | 25,000 lbs. | 300-400 ft. lbs. |
| 1¼ in. x 18 | 50,000 lbs. | 700-900 ft. lbs. |
| 1½ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1½ in. x 18 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1¾ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |

Use rotating torque, not starting torque.

Example: Assuming pinion cage diameter to be 6 inches, the radius would be 3 inches and 5 pounds pull would equal 15 inch-pound pre-load torque.

If rotating torque is not within 12 to 18 inch-pounds, use thinner spacer to increase pre-load, or thick spacer to decrease pre-load.

- (9) Lubricate pinion shaft oil seal and cover outer edge of seal body with a non-hardening sealing compound. Press seal against cover shoulder with seal driver (Fig. 55).
- (10) Install new gasket and bearing cover.
- (11) Press yoke against forward bearing and install washer and pinion shaft nut.
- (12) Tighten to the correct torque and install cotter key. Do not back off nut to align cotter key holes.

46. INSTALLATION OF PINION AND CAGE ASSEMBLY

- (1) Install new gasket over housing to cage studs.
- (2) Install ORIGINAL shim pack over gasket.
- (3) Position pinion and cage assembly over studs and tap into position with soft mallet.
- (4) Install lock washers and stud nuts. Tighten to the correct torque.

47. ASSEMBLY OF DIFFERENTIAL CASE

- (1) Lubricate differential case inner walls and all component parts with axle lubricant.
- (2) Place spider with pinions and thrust washers in position. See Figure 56.

- (3) Install component side gears and thrust washer.
- (4) Align mating marks, position component case half and draw assembly together with four bolts.
- (5) Check assembly for free rotation of differential gear and correct if necessary.
- (6) Install remaining bolts, tighten to the correct torque and install lock wire.
- (7) If bearings are to be replaced, press squarely and firmly on differential case halves.

48. INSTALLATION OF DIFFERENTIAL ASSEMBLY

- (1) Lubricate differential bearings and cups with axle lubricant.
- (2) Place cups over bearings and position assembly in carrier housing.
- (3) Insert bearing adjusting nuts and turn hand tight against bearing cups.
- (4) Install bearing caps in the correct location as marked and tap lightly into position.

CAUTION

If bearing caps do not position properly, adjusting nuts may be cross-threaded. Remove caps and reposition the adjusting nuts. Forcing caps into position will result in serious damage to the carrier housing or bearing caps.

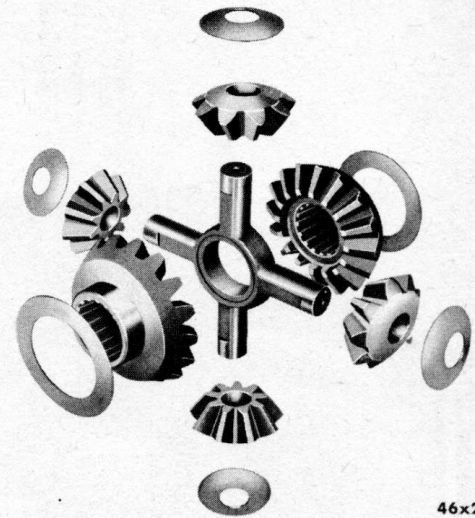
- (5) Install flat washers where used and stud nuts. Tighten nuts snugly.

49. ADJUSTING DIFFERENTIAL BEARING PRE-LOAD

- (1) Using dial indicator at back face of gear, loosen the bearing adjusting nut on the side opposite gear sufficiently to notice end play on the indicator. See Figure 57.
- (2) Tighten the same adjusting nut sufficiently to obtain zero end play.
- (3) Check gear for runout.

NOTE

If runout exceeds .008 inch, remove differential and check for cause.



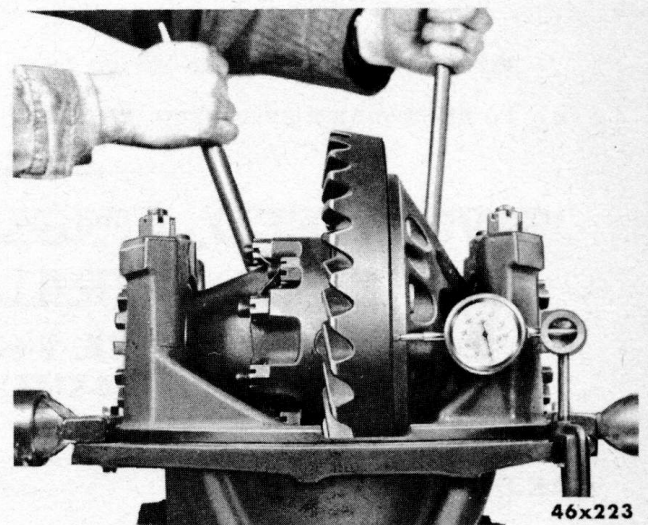
46x222

Fig. 56—Differential Pinion and Side Gear Assembly

- (4) Tighten adjusting nuts one notch each from zero end play to pre-load differential bearings.
- (5) Tighten bearing cap stud nuts or cap screws to the correct torque.
- (6) Install adjusting ring locks and cap screws. Tighten to the correct torque and install lock wire.

50. ADJUSTING GEAR LASH

- (1) If the gear set has been renewed, check gear lash with dial indicator and adjust to obtain .008 to .012 inch lash.
 - (a) To move pinion toward gear, remove



46x223

Fig. 57—Adjusting Differential Bearing Pre-Load

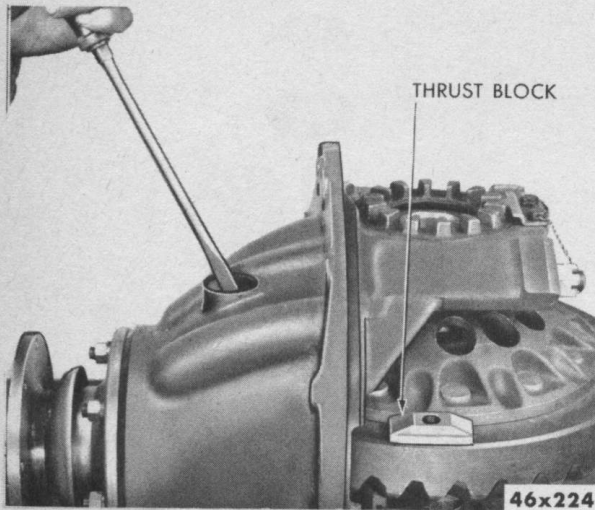


Fig. 58—Installing Thrust Pad

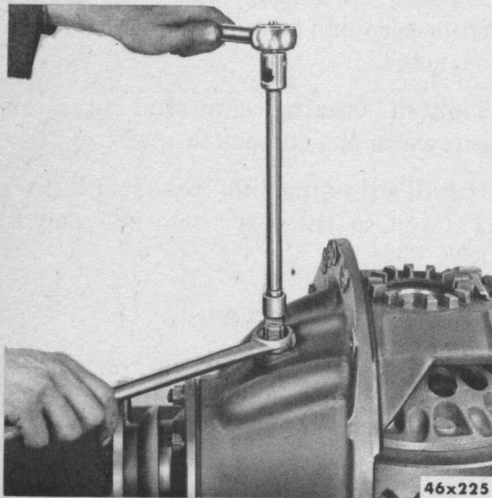


Fig. 59—Adjusting Thrust Pad

shims from pack under pinion cage.

(b) To move pinion away from gear, add

shims to pack under pinion cage.

(c) To move ring gear, tighten or loosen differential bearing adjusting nuts as required.

(2) When correct gear lash is obtained, check and adjust as necessary to obtain the correct tooth contact.

51. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

52. INSTALLATION AND ADJUSTMENT OF RING GEAR THRUST PAD

- (1) Remove carrier from stand and position with back face of bevel gear upward.
- (2) Remove adjusting screw and lock nut.
- (3) Place thrust pad on rear face of bevel gear and rotate gear until the hole in the thrust pad is aligned with the adjusting screw hole. See Figure 58.
- (4) Install adjusting screw and lock nut. Tighten adjusting screw sufficiently to locate thrust pad firmly against back face of bevel gear (Fig. 59).
- (5) To secure the correct adjustment of .010 to .015 inch clearance, back off adjusting screw $\frac{1}{4}$ turn and lock securely with nut.
- (6) Recheck to assure minimum clearance of .010 inch during full rotation of bevel gear.

53. SERVICE DIAGNOSIS

Refer to Paragraphs 115 through 126.

TWO-SPEED, SINGLE-REDUCTION, FULL-FLOATING, SPIRAL BEVEL REAR AXLE

(B-4-GA, B-4-HA, B-4-HMA, B-4-JA, B-4-JMA,
B-4-KA, B-4-KMA) (FIGS. 60 AND 62)

54. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT

(1) Remove axle drive shaft flange screws or studs.

(2) Pull out shaft.

When installing an axle shaft, make sure that the axle shaft flange fits tightly against the hub. Foreign matter in the bolt holes will cause

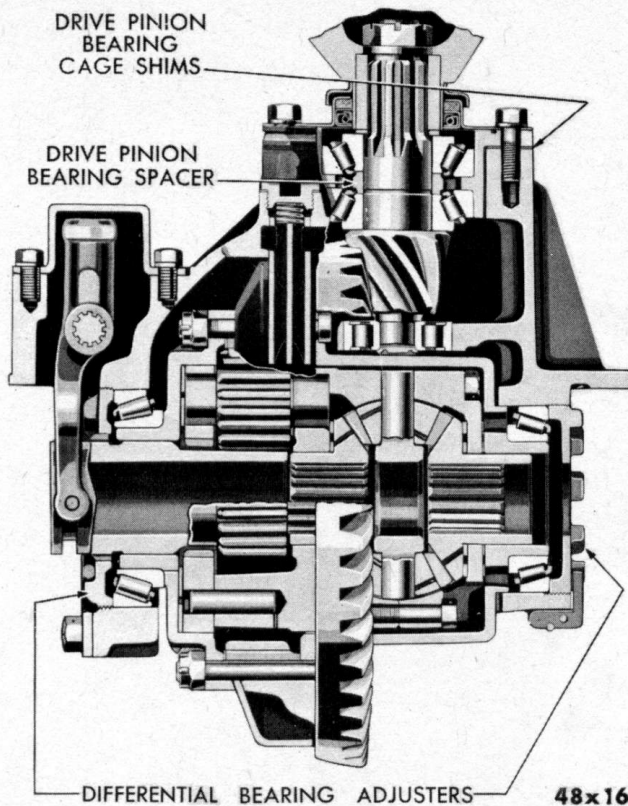


Fig. 60—Rear Axle Differential, Two-Speed Spiral Bevel
(Assembled View)

the cap screws to bottom and prevent the axle shaft flange from being drawn up against the hub.

55. REMOVING BROKEN END OF AXLE DRIVE SHAFT

The inner end of a broken axle shaft may be removed by pushing it out through the outer end of the axle housing with a smaller diameter shaft or rod. The outer end of the broken shaft and the shaft on the opposite side should be removed in order to push out the broken piece.

56. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY

- (1) Drain lubricant from housing.
- (2) Disconnect rear universal joint.
- (3) If the drive pinion is to be removed from case, remove the cotter pin and loosen the nut which holds the universal joint companion yoke.
- (4) Remove both axle shafts.
- (5) Disconnect shift rod from lever on carrier.

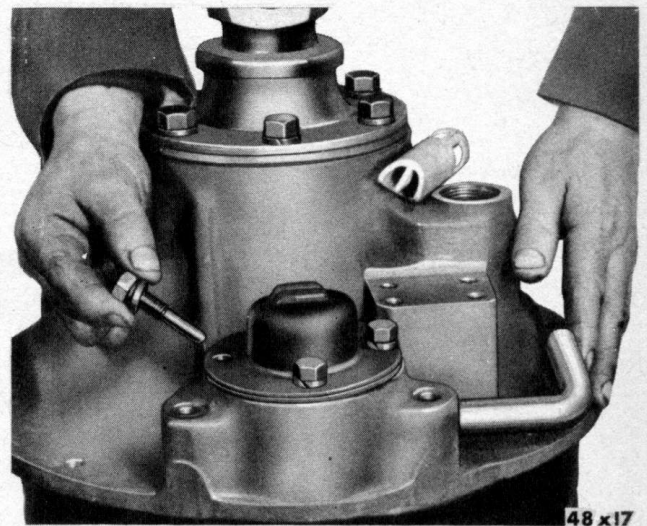


Fig. 61—Removing Shift Fork Cover

- (6) Remove differential to carrier stud nuts and remove carrier assembly.

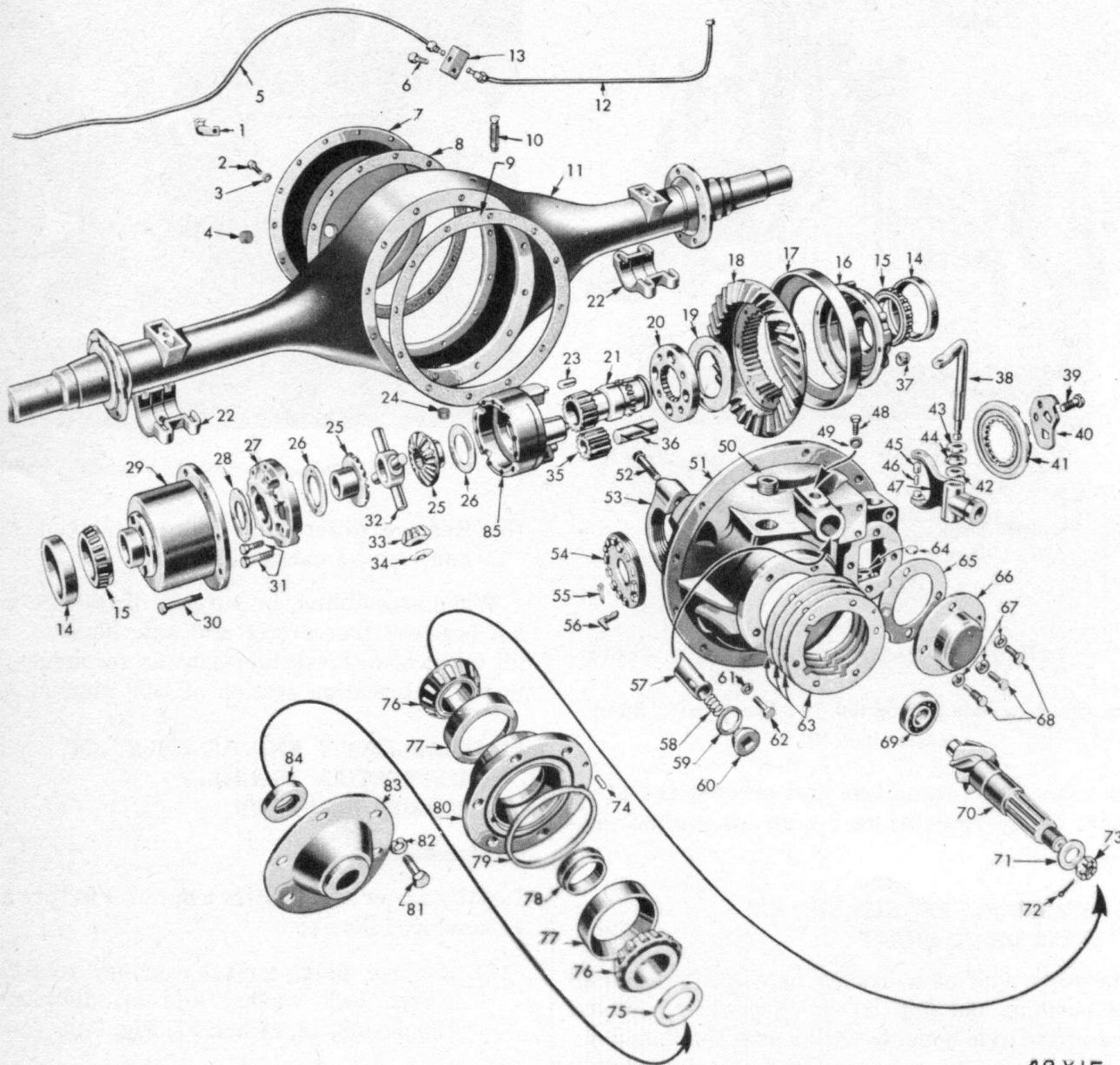
When assembling, be sure to install the gasket between the carrier and axle housing. Refill with clean, fresh lubricant as recommended in the Lubrication section of this manual.

57. DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL ASSEMBLY (CARRIER REMOVED)

a. Disassembly

Install carrier assembly in a suitable fixture and proceed as follows:

- (1) Remove plug, gasket, spring, retaining screw, lock washer and oil distributor (60, 59, 58, 48, 49 and 57, Fig. 62).
- (2) Remove cap screws in shift fork cover, noting special screw in off-center hole. See Figure 61. Lift off shift fork cover and gasket.
- (3) Pull out shift fork shaft. Then, the shift fork may be slipped from the sliding clutch gear and removed through the back of the differential carrier (Fig. 63).
- (4) Slip out sliding clutch gear (21, Fig. 62).
- (5) Mark right-hand differential bearing adjuster with center punch to identify for proper reassembly.
- (6) Remove differential carrier bearing cap bolt lock wires on both right and left-



48 X 15

Fig. 62—Rear Axle, Two-Speed Spiral Bevel (Disassembled View)

- | | |
|---|---|
| <p>1 — Brake tube clip 2 — Axle housing cover cap screw 3 — Axle housing cover cap screw lock washer 4 — Axle housing cover filler plug 5 — Axle brake tube 6 — Axle brake tube anchor cap screw 7 — Axle housing cover 8 — Axle housing cover gasket 9 — Differential carrier to housing gasket 10 — Axle housing breather 11 — Axle housing 12 — Axle brake tube 13 — Axle brake tube anchor 14 — Differential bearing cup 15 — Differential bearing cone and rollers 16 — Differential gear support case—left 17 — Differential oil collector drum 18 — Axle drive gear</p> | <p>19 — High speed clutch plate thrust washer 20 — High speed clutch plate 21 — Sliding clutch gear 22 — Rear spring clip plate 23 — High speed clutch plate dowel 24 — Axle housing drain plug 25 — Differential side gear—right 26 — Differential side gear thrust washer 27 — Differential case—right 28 — Gear support case thrust washer—right 29 — Gear support case—right 30 — Gear support case bolt 31 — Differential case screws 32 — Differential spider 33 — Differential pinion 34 — Differential pinion thrust washer 35 — Idler pinion</p> |
|---|---|

(Continued on page 41)

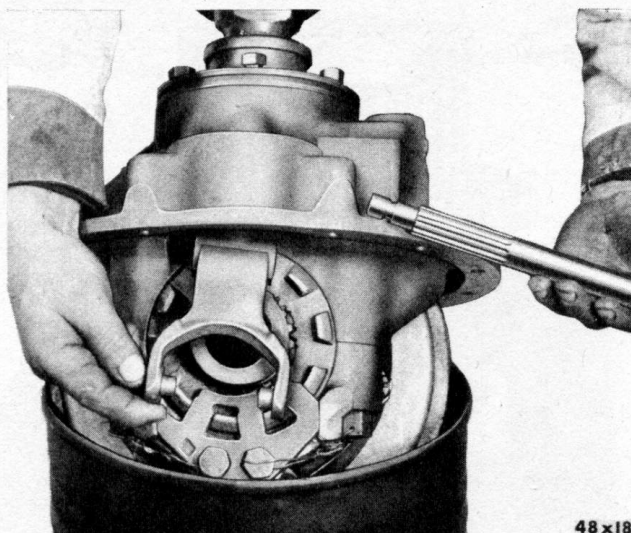


Fig. 63—Removing or Installing Shift Fork and Shaft

hand sides. Loosen cap bolts only. Take off right-hand bearing adjuster lock and adjuster.

- (7) Remove left-hand differential bearing cap, adjuster and lock as an assembly (Fig. 64) to assure correct positioning of gear on assembly.

(When reassembling hold adjuster and bearing cap up away from threads in bore of carrier until cap bolts are started. Drop cap and then the threads of the adjuster and those in the carrier will mesh freely.)

- (8) After removing bearing caps, tip up the left-hand end of the planetary unit and lift out, as shown in Figure 65.
- (9) Remove pinion bearing cage cap screw.

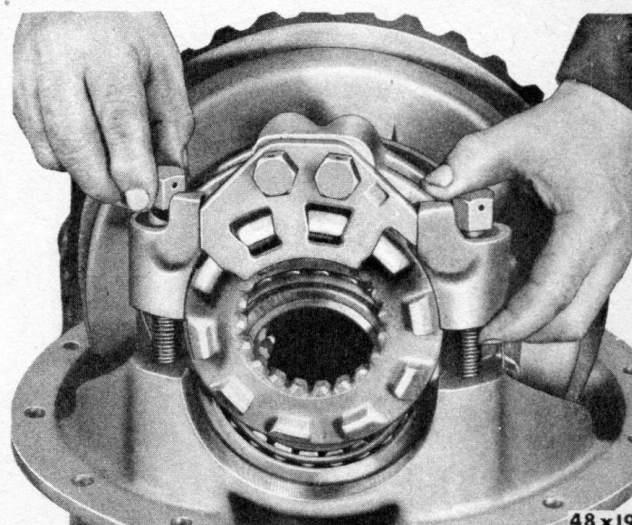


Fig. 64—Removing or Installing Bearing Cap, Adjuster and Lock Assembly

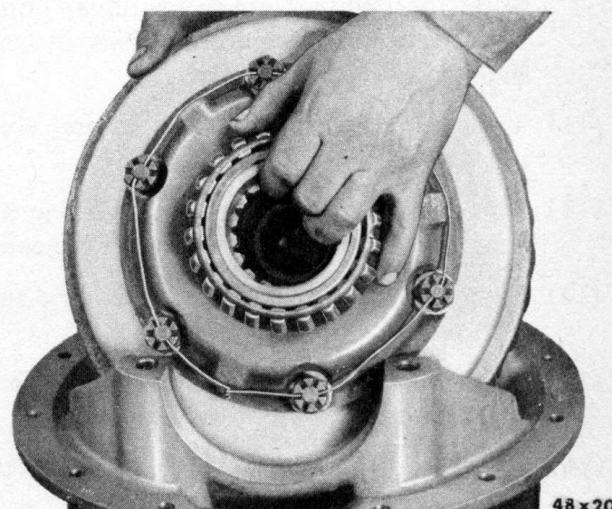


Fig. 65—Removing Differential from Carrier

Fig. 62—Rear Axle, Two-Speed Spiral Bevel (Disassembled View)

(Continued from page 40)

- | | |
|---|--|
| 36 - Idler pinion pin | 61 - Differential carrier to axle housing screw lock washer |
| 37 - Differential gear support case bolt nut | 62 - Differential carrier to axle housing screw |
| 38 - Sliding clutch shaft | 63 - Axle drive pinion bearing cage shims |
| 39 - Differential bearing adjuster lock cap screw | 64 - Sliding clutch shaft expansion plug |
| 40 - Differential bearing adjuster lock-left | 65 - Sliding clutch shifter fork hole cover gasket |
| 41 - Differential bearing adjuster-left | 66 - Sliding clutch shifter fork hole cover |
| 42 - Sliding clutch shaft felt washer | 67 - Sliding clutch shifter fork hole cover screw lock washers |
| 43 - Sliding clutch shaft felt washer retainer | 68 - Sliding clutch shifter fork hole cover screws |
| 44 - Sliding clutch shaft dust seal | 69 - Axle drive pinion bearing-inner |
| 45 - Sliding clutch shifter fork roller | 70 - Axle drive pinion |
| 46 - Sliding clutch shifter fork roller pin | 71 - Axle drive pinion companion yoke nut washer |
| 47 - Sliding clutch shifter fork | 72 - Axle drive pinion companion yoke nut cotter pin |
| 48 - Differential carrier oil distributor retaining screw | 73 - Axle drive pinion companion yoke nut |
| 49 - Differential carrier oil distributor retaining screw lock washer | 74 - Axle drive pinion bearing cage dowel pin |
| 50 - Differential carrier peep hole plug | 75 - Axle drive pinion bearing washer |
| 51 - Differential carrier | 76 - Axle drive pinion bearing cone and rollers-outer |
| 52 - Differential bearing cap screw | 77 - Axle drive pinion bearing cup-outer |
| 53 - Differential bearing cap | 78 - Axle drive pinion bearing spacer |
| 54 - Differential bearing adjuster-right | 79 - Axle drive pinion bearing cage oil seal |
| 55 - Differential bearing adjuster lock cotter pin | 80 - Axle drive pinion bearing cage |
| 56 - Differential bearing adjuster lock | 81 - Axle drive pinion bearing cage screw |
| 57 - Differential carrier oil distributor | 82 - Axle drive pinion bearing cage screw lock washer |
| 58 - Differential carrier oil distributor spring | 83 - Axle drive pinion oil seal retainer |
| 59 - Differential carrier oil distributor gasket | 84 - Axle drive pinion oil seal |
| 60 - Differential carrier oil distributor plug | |

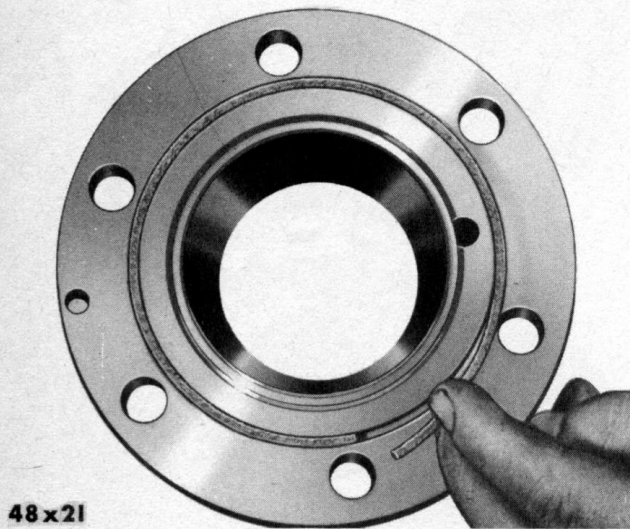


Fig. 66—Replacing Pinion Cage Cork

- (10) Use ball peen hammer to drive out bevel pinion assembly. Note shims under pinion bearing cage. Check for end play in bearings before disassembly.
- (11) Take out cotter pin, loosen pinion shaft nut and slide off companion yoke.
- (12) Lift off pinion bearing cage, bearing and washer. Slip off pinion bearing spacer.
- (13) Remove rear pinion bearing, using a suitable puller.
- (14) Remove pinion cage cork (Fig. 66). Cork must be replaced before assembling.
- (15) Install differential assembly in a vise,

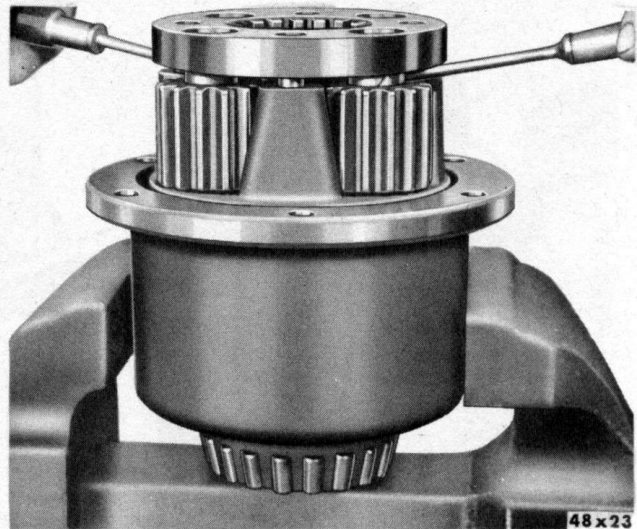


Fig. 68—Removing High Speed Clutch Plate

- gear side down. Remove lock wire from support case bolts and remove the bolts.
- (16) Tap alternately on opposite sides of the ring gear with the head of a rawhide mallet until the gear is free from flange on support case (Fig. 67). When reassembling, use two bolts to assure proper alignment of bolt holes.
- (17) Lift off left half of support case, thrust washer and ring gear.
- (18) Pry off high speed clutch plate and take out idler pinions and pins. See Figure 68.
- (19) Lift out entire differential assembly and support case thrust washer (Fig. 69).

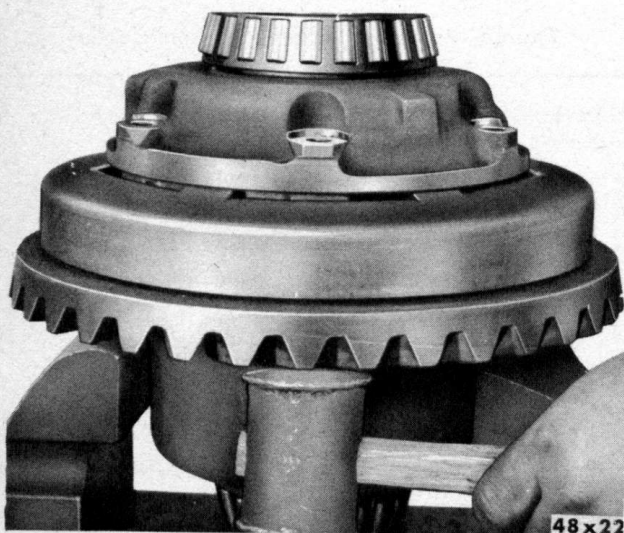


Fig. 67—Removing Ring Gear

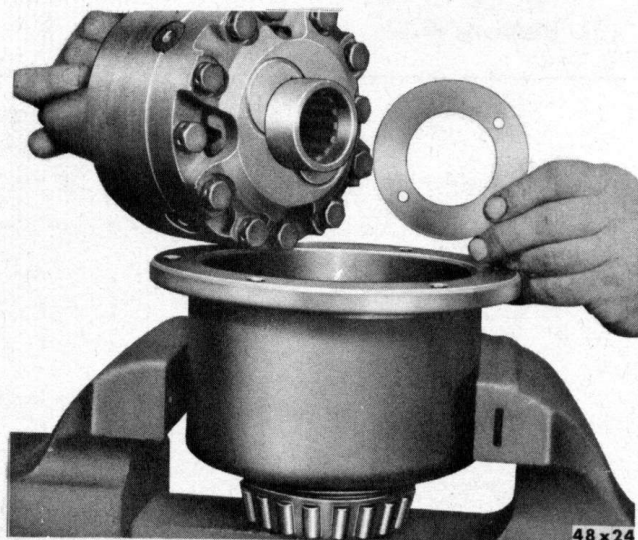


Fig. 69—Removing Differential and Thrust Washer

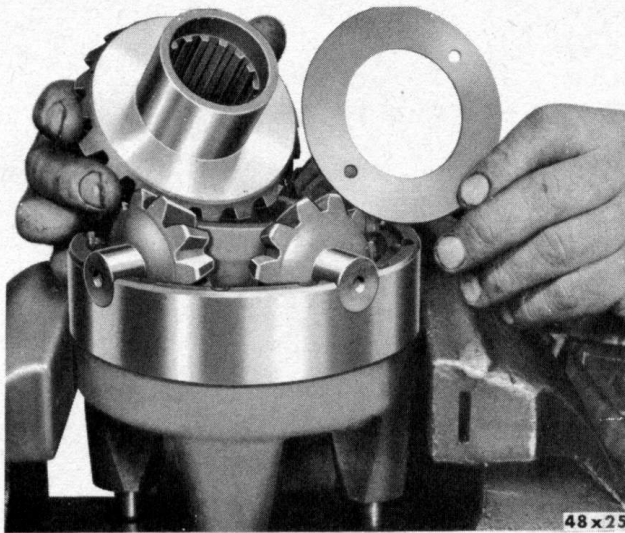


Fig. 70—Removing Thrust Washer from Side Gear

- (20) Remove differential case bolts after removing lock wire and separate differential case halves.
- (21) Remove thrust washer from long hub of differential side gear (Fig. 70).

NOTE

Chamfered side of washer is against back face of gear.

- (22) Pull out spider and differential side pinion, *noting thrust washers* behind pinions. Remove short hub side gear and remove thrust washer.
- (23) Remove differential bearing cones by striking inner race on alternate sides through holes provided. Refer to Figure 71.

b. Assembly

When assembling, note the following important steps:

- (1) When assembling the differential unit, lubricate both sides of all thrust washers.

NOTE

Chamfered sides of washers must be against back face of side gears.

- (2) When assembling the planetary unit, lubricate both sides of thrust washers and cover idler pinion pins with lubricant. *Cham-*

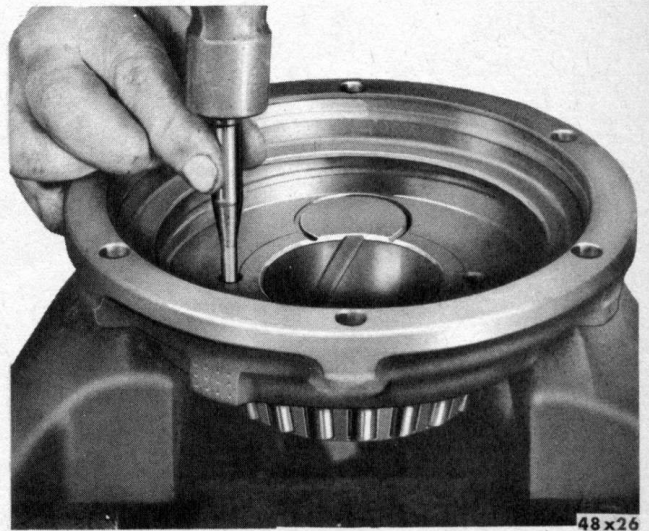
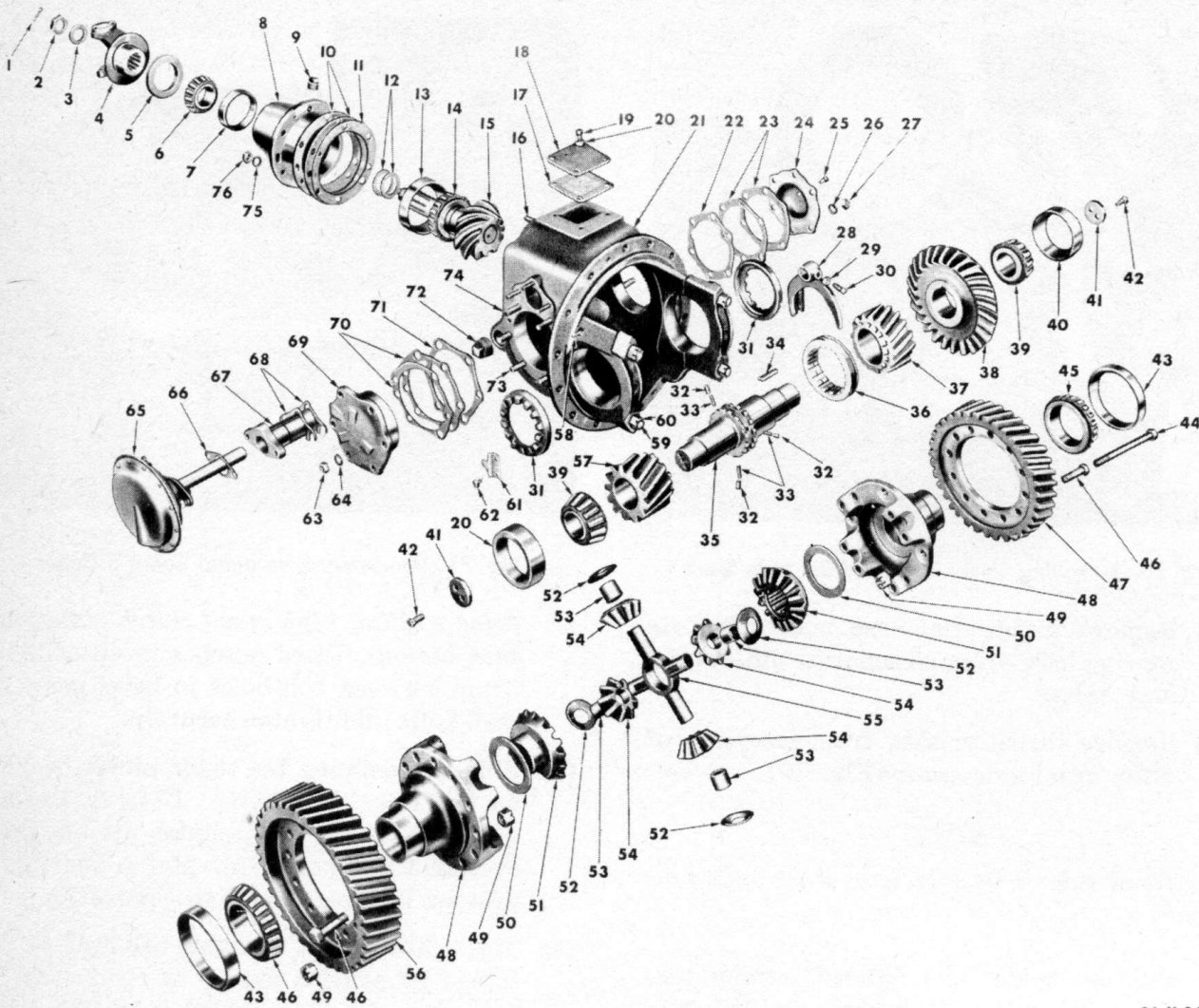


Fig. 71—Removing Differential Bearing Cones

- fered teeth on high speed clutch plate must face pinions.* Place notches in oil collector drum between bolt holes in bevel gear. Install bolts and tighten securely.
- (3) When assembling the inner pinion bearing on the B-4-GA, B-4-HA, B-4-JA, B-4-KA and B-4-RA Models, stake pinion shaft over in four spots after pinion bearing is pressed in place. Refer to Figure 72.
 - (4) The pinion shaft bearing pre-load is obtained by using a spacer of correct thickness between the bearing inner races.



Fig. 72—Staking Pinion Shaft, Using Ball Bearing



46 X 26 2

Fig. 73—Rear Axle, Double-Reduction, Two-Speed (Disassembled View)

- | | |
|--|--|
| 1 — Companion yoke nut cotter pin | 39 — Spiral pinion bearing cone |
| 2 — Companion yoke nut | 40 — Spiral pinion bearing cup |
| 3 — Companion yoke nut washer | 41 — Spiral pinion bearing cone washer |
| 4 — Companion yoke | 42 — Spiral pinion bearing cone washer screw |
| 5 — Drive pinion front bearing oil seal | 43 — Differential bearing cup |
| 6 — Drive pinion front bearing cone | 44 — Differential drive gear bolt—long |
| 7 — Drive pinion front bearing cup | 45 — Differential bearing cone |
| 8 — Drive pinion carrier | 46 — Differential drive gear bolt—short |
| 9 — Drive pinion carrier plug | 47 — Differential drive gear—high speed |
| 10 — Drive pinion carrier shims | 48 — Differential case |
| 11 — Drive pinion carrier gasket | 49 — Differential drive gear bolt nut |
| 12 — Drive pinion bearing spacer | 50 — Differential side gear thrust washer |
| 13 — Drive pinion rear bearing cup | 51 — Differential side gear |
| 14 — Drive pinion rear bearing cone | 52 — Differential pinion thrust washer |
| 15 — Drive pinion | 53 — Differential pinion bushing |
| 16 — Drive pinion carrier stud | 54 — Differential pinion |
| 17 — Differential carrier inspection cover plate | 55 — Differential spider |
| 18 — Differential carrier inspection cover | 56 — Differential drive gear—low speed |
| 19 — Differential carrier inspection cover screw | 57 — Low speed spiral pinion |
| 20 — Differential carrier inspection cover screw washer | 58 — Differential carrier cap stud pin |
| 21 — Differential carrier | 59 — Differential carrier cap stud nut |
| 22 — Differential spiral pinion shaft bearing retainer gasket | 60 — Differential bearing adjusting nut lock |
| 23 — Differential spiral pinion shaft bearing retainer shims | 61 — Differential bearing adjusting nut lock screw |
| 24 — Differential spiral pinion shaft bearing retainer | 62 — Spiral pinion bearing cage and nut |
| 25 — Differential carrier breather | 63 — Spiral pinion bearing cage stud nut washer |
| 26 — Differential spiral pinion shaft retainer stud nut washer | 64 — Shift diaphragm |
| 27 — Differential spiral pinion shaft retainer stud nut | 65 — Shift diaphragm gasket |
| 28 — Shift fork | 66 — Shift diaphragm sleeve |
| 29 — Shift fork screw nut | 67 — Shift diaphragm spacer |
| 30 — Shift fork screw | 68 — Spiral pinion bearing cage |
| 31 — Differential bearing adjusting nut | 69 — Spiral pinion bearing cage shims |
| 32 — Spiral pinion shift collar lock plunger | 70 — Spiral pinion bearing cage gasket |
| 33 — Spiral pinion shift collar lock plunger spring | 71 — Differential carrier plug |
| 34 — Spiral pinion drive gear key | 72 — Differential carrier plug |
| 35 — Differential spiral pinion shaft | 73 — Spiral pinion bearing cage stud |
| 36 — Spiral pinion shift collar | 74 — Shift diaphragm sleeve stud |
| 37 — High speed spiral pinion | 75 — Drive pinion carrier stud nut washer |
| 38 — Spiral pinion drive gear | 76 — Drive pinion carrier stud nut |

There are 12 spacers (each of a different thickness) available for this purpose. Place the pinion and bearings in position using original spacer, provided the pinion did not have perceptible end movement before disassembly. Then, assemble yoke washer and yoke. Tighten retaining nut securely.

There should be no *end play and bearings should* roll freely. If correction is necessary, select proper size spacer to obtain desired pre-load.

After assembly of differential is complete, adjust ring gear and pinion.

TWO-SPEED, DOUBLE-REDUCTION, FULL-FLOATING, HYPOID REAR AXLE

(B-4-RA, B-4-TA, B-4-VA, B-4-YA) (FIGS. 73 AND 74)

58. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT

- (1) Remove the axle shaft flange stud nuts and lock washers. Rap axle shaft sharply in the center of the flange to free the dowels.
- (2) Remove taper dowels and axle shaft.

CAUTION

Prying the shaft loose will damage the hub and oil seal.

To install, reverse the foregoing operations.

59. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY (AXLE SHAFTS REMOVED)

a. Removal

- (1) Remove plug from bottom of axle housing and drain lubricant.
- (2) Disconnect vacuum line from power actuated shift unit.
- (3) Disconnect universal joint at pinion shaft.
- (4) Remove carrier to housing stud nuts and washers. Leave two top nuts partially loose to prevent carrier from falling.
- (5) Break carrier loose from axle housing with rawhide mallet and remove taper dowels. *Taper dowels must be removed.* If necessary, back out studs as required.
- (6) Place roller jack under carrier, remove top nuts and work carrier free, using puller screws in holes provided. A small pinch bar

may be used to straighten the carrier in the housing bore. However, the end must be rounded to prevent indenting the carrier flange.

b. Installation

To securely install the differential carrier, proceed as follows:

- (1) Install new gasket on axle housing flange.
- (2) Roll carrier into position on roller jack. Start carrier into housing with four flat washers and nuts equally spaced. Do not drive carrier into housing with a steel hammer at the carrier stud flange. The flange may easily be distorted and cause severe oil leakage.
- (3) Install lock washers and stud nuts on any studs under carrier housing off-sets. It is impossible to start these nuts after carrier is drawn into housing.

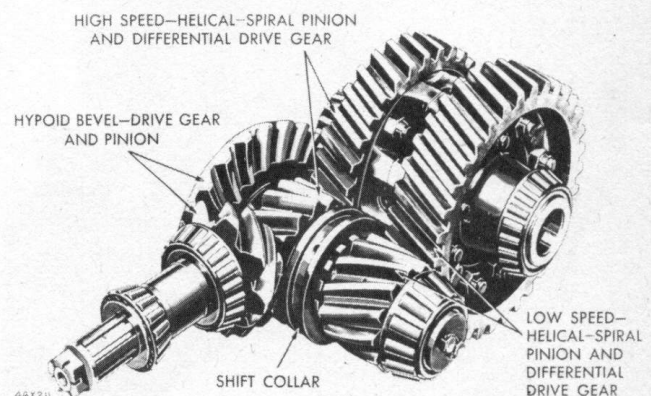


Fig. 74—Double-Reduction, Two-Speed Train

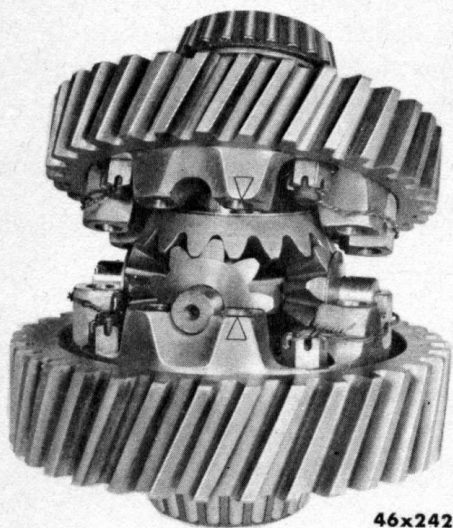


Fig. 75—Differential Case Mating Marks

- (4) Tighten the four nuts over flat washers, alternately, to draw carrier squarely into axle housing.
- (5) Remove nuts and flat washers. Install taper dowels, lock washers and stud nuts. Tighten to correct torque.
- (6) Connect universal at pinion shaft.
- (7) Connect vacuum line to power actuated shift.
- (8) Install axle shafts.

60. LUBRICATION

- (1) Remove pipe plug in pinion cage and add one pint of recommended lubricant.

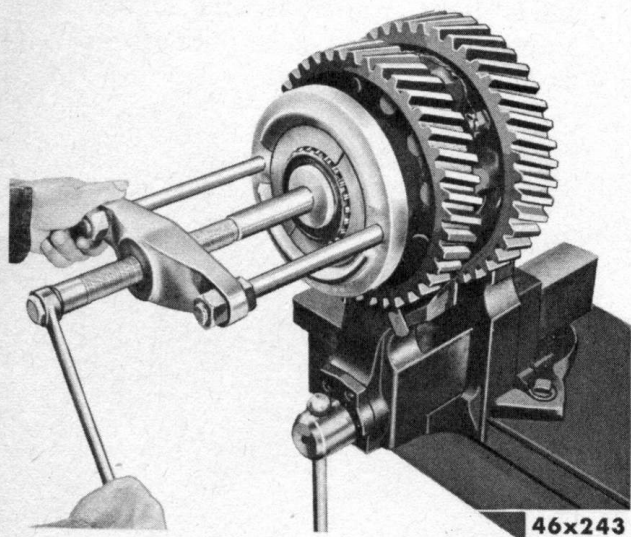


Fig. 76—Removing Cross Shaft Bearings, Tool DD-914

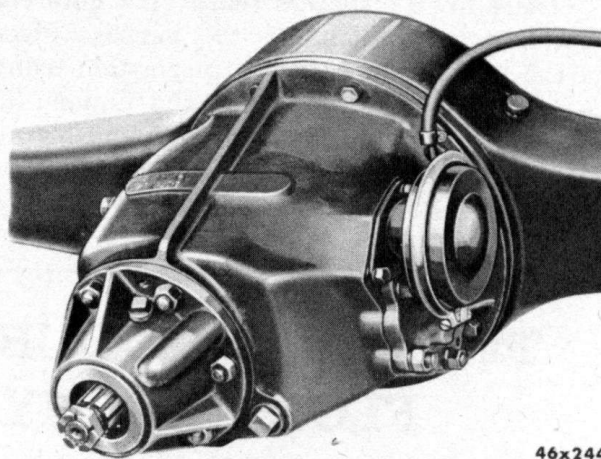


Fig. 77—Power Shift Unit, Side Mounted Type
(B-4-TA and B-4-YA)

- (2) Fill axle housing to the correct level with proper lubricant. Refer to Lubrication section.
- (3) Lubricate universal joint.
- (4) Jack up both rear wheels and operate vehicle in high transmission gear at approximately 25 to 30 miles per hour for five minutes in order to assure satisfactory lubrication of all parts of the carrier assembly.

CAUTION

Do not operate vehicle with one wheel jacked up. Operation in this manner will cause the differential spider to overheat and result in galling or shearing of the spider pins.

Both rear wheel brakes should be free to allow both wheels to rotate at approximately the same speed.

DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL (CARRIER REMOVED)

61. REMOVAL OF DIFFERENTIAL AND GEAR ASSEMBLY

- (1) Place carrier in a suitable holding fixture.
- (2) Remove lock wire, cap screws and adjusting nut locks.
- (3) Center punch one differential carrier leg

and bearing cap to identify for proper re-assembly.

- (4) Remove bearing cap stud nuts, bearing caps and adjusting nuts.
- (5) Lift out differential and gear assembly.

62. DISASSEMBLY OF DIFFERENTIAL CASE AND GEAR ASSEMBLY

- (1) If original identification marks are not clear, center punch case halves for correct alignment when reassembling (Fig. 75).
- (2) Remove lock wire, long bolts and separate case halves.
- (3) Remove spider, pinions, side gears and thrust washers.
- (4) Remove short bolts and separate gears from case.
- (5) If necessary, remove cross shaft bearings, as shown in Figure 76.

63. REMOVAL OF PINION AND CAGE ASSEMBLY

- (1) Remove pinion cage stud nuts and lock washers and lift out cage assembly.

NOTE

If cage is not free, tap loose, using soft drift on inner face of pinion, or use puller screws in holes provided.

- (2) Wire shim pack together to keep intact in order to facilitate adjustment when reassembling.

64. DISASSEMBLY OF PINION AND CAGE ASSEMBLY

- (1) Place pinion cage over carrier studs. Hold yoke and remove pinion shaft nut.
- (2) Remove yoke from pinion shaft.
- (3) Press pinion shaft out of cage.
- (4) Remove adjusting spacers or shims.
- (5) If necessary, replace the pinion or rear bearing.
- (6) Press front bearing and pinion shaft oil seal from cage.

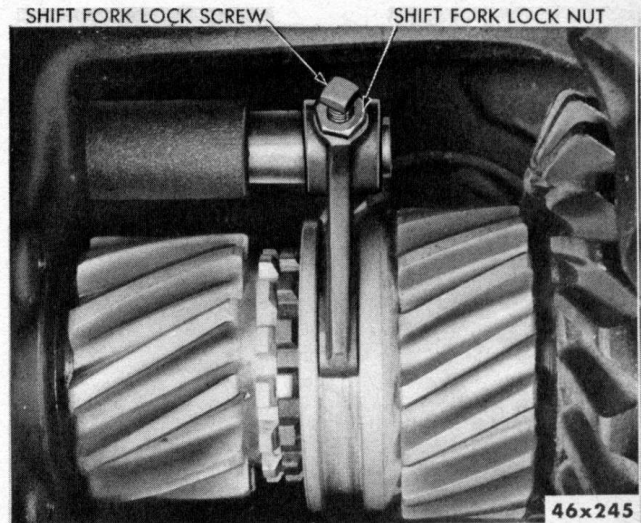


Fig. 78—Assembled View of Cross Shaft and Shift Fork

- (7) Remove the two bearing cups from pinion cage.

65. REMOVAL OF POWER SHIFT UNIT

a. Side Mounted Type (Fig. 77)

- (1) Loosen lock nut on shift fork lock screw and remove screw and nut (Fig. 78).
- (2) Remove the two shift unit stud nuts and lock washers.
- (3) Remove the shift unit and shaft assembly and lift out shift fork.
- (4) Remove third nut and lock washer. Tap sleeve and bushing assembly from carrier with a soft mallet.

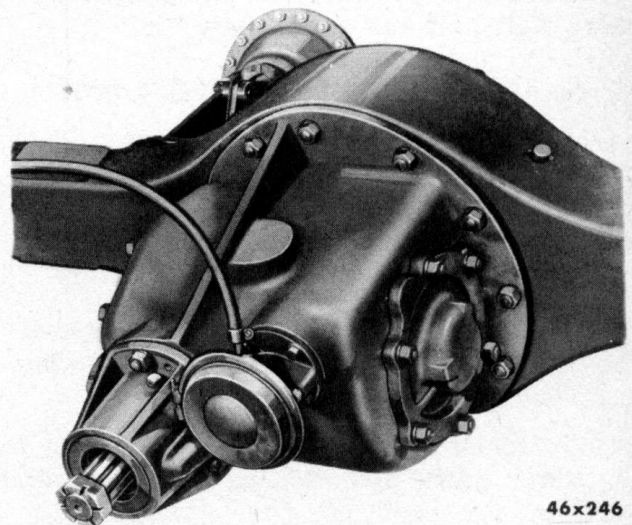


Fig. 79—Power Shift Unit, Front Mounted Type

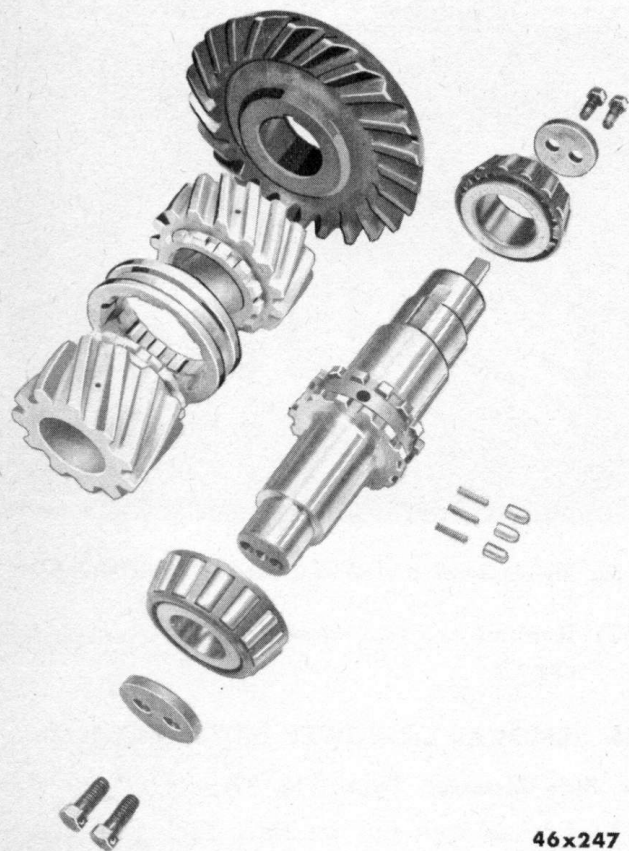


Fig. 80—Cross Shaft Assembly, Showing Bearing Retaining Plates

CAUTION

Avoid the use of a steel hammer or drift in order to prevent distortion of the sleeve bore.

b. Front Mounted Type (Fig. 79)

Remove four cap screws and lock washers. Remove shift unit and guard assembly.

66. DISASSEMBLY OF POWER SHIFT UNIT

- (1) Remove bolts from vacuum chamber flange.
- (2) Remove vacuum chamber front half.
- (3) Slip thin open end wrench through spring and hold lock nut on shaft.
- (4) Remove nut on end of shaft and remove diaphragm, plates, spring and vacuum chamber rear half.
- (5) To remove push rod, remove lock ring in shift shaft and remove push rod and spring assembly.
- (6) Remove lock nut, adjusting nut spacer

washer, spring, sleeve, and washer from push rod.

67. REMOVAL OF CROSS SHAFT ASSEMBLY

- (1) Remove stud nuts and lock washers from cross shaft bearing cage (side opposite bevel gear).
- (2) Force off bearing cage with a small pinch bar between the back of the bevel gear and the carrier housing. Puller screw holes are also provided.
- (3) Wire shim pack together. The shim pack should remain intact in order to facilitate adjustment when reassembling.
- (4) Thread out cross shaft assembly.
- (5) On power activated shift, front mounting, perform the following operations:
 - (a) Remove set screw holding shift fork on shift shaft.
 - (b) Slide out shift shaft and remove shift fork from inside housing.

68. DISASSEMBLY OF CROSS SHAFT ASSEMBLY

Cross shaft bearings are retained by plates and cap screws which are lock wired.

- (1) Remove lock wire, cap screws and retaining plates.
- (2) Press cross shaft from bevel gear and bearing (Fig. 80).

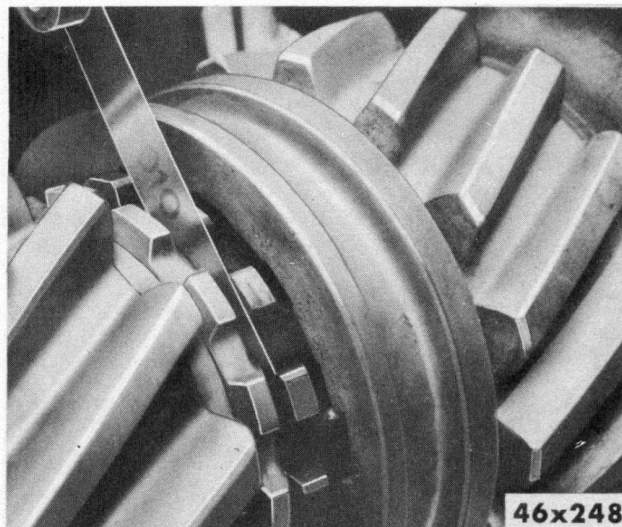


Fig. 81—Checking Cross Shaft Spur Pinion End Play

- (3) Lift off fast speed spur pinion and remove shift collar poppets and springs.
- (4) Replace shift collar and press cross shaft from slow speed spur pinion and bearing.
- (5) If necessary, replace the cross shaft bearing cups. Wire shim pack together to facilitate adjustment on reassembling.

69. ASSEMBLY OF CROSS SHAFT ASSEMBLY

- (1) Lubricate the inner bearing surfaces on the fast and slow speed spur pinions with axle lubricant.
- (2) Position fast speed spur pinion on the cross shaft with the splined teeth toward the cross shaft splines (Fig. 80).
- (3) Install key and start cross shaft and pinion in bevel gear in line with keyway.
- (4) Press cross shaft squarely into bevel gear. Gear must be firmly against the cross shaft shoulder.

To facilitate installation, bevel gear may be heated in oil from 200 degrees to 250 degrees F.

- (5) Press bearing firmly against bevel gear using suitable sleeve.
- (6) Check pinion end play with feeler gauge to assure a clearance of at least .010 inch. Normal end play will be from .015 inch minimum to .030 inch maximum (Fig. 81).
- (7) Install poppets and springs and coat with axle lubricant.
- (8) Align all three tapered shift collar splines with poppets and position with *wide* shift collar splines toward the bevel gear.

NOTE

Due to tooth spacing, some shift collars can be assembled in one position only.

- (9) Install slow speed spur pinion on cross shaft with splines toward cross shaft splines.
- (10) Press cross shaft bearing squarely and firmly against the cross shaft shoulder, using suitable sleeve.
- (11) Check slow speed spur pinion end play.

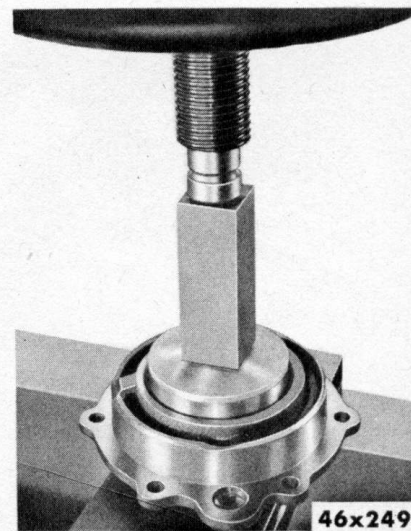


Fig. 82—Installing Bearing Cup in Differential Cross Shaft Cap—Tool DD-966

It must check to minimum of .010 inch (Fig. 81).

- (12) Install bearing retaining plates. Tighten cap screws to the correct torque and install lock wire.
- (13) If new bearing cups are to be installed (Fig. 82) cage and housing must be clean and cups must be pressed squarely and firmly against the shoulders.

70. INSTALLATION OF CROSS SHAFT ASSEMBLY

- (1) Lubricate cross shaft bearings and cups with light machine oil.
- (2) If the bearing cover (bevel gear side) has been removed, replace using new gasket under original shim pack. Tighten stud nuts to the correct torque.

If cover has not been removed, retighten stud nuts to the correct torque.

- (3) Ease cross shaft assembly past differential bearing supports and position in bearing cup.
- (4) On power actuated shift (front mounting type) position shift fork. Align lock screw hole and install shift shaft. Tighten lock screw firmly and tighten lock nut.
- (5) Install new gasket under original shim pack and start bearing cage (side opposite bevel gear) in housing.

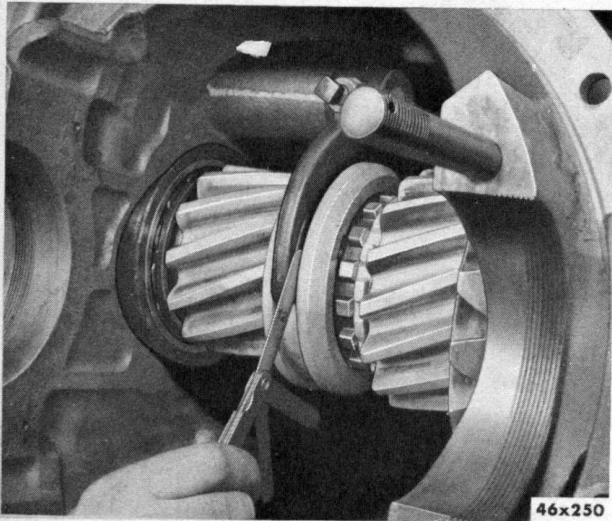


Fig. 83—Checking Clearance of Shift Fork in Shift Collar

- (6) Tap bearing cage into position with soft mallet. Install lock washers and stud nuts and tighten to the correct torque.

NOTE

Always rotate cross shaft and gear assembly several revolutions before checking pre-load in order to assure normal bearing contact.

- (7) Check cross shaft bearing pre-load torque. Lock slow speed spur pinion and cross shaft with shift collar. Wrap soft wire around the pinion and pull on a horizontal line with pound scale.

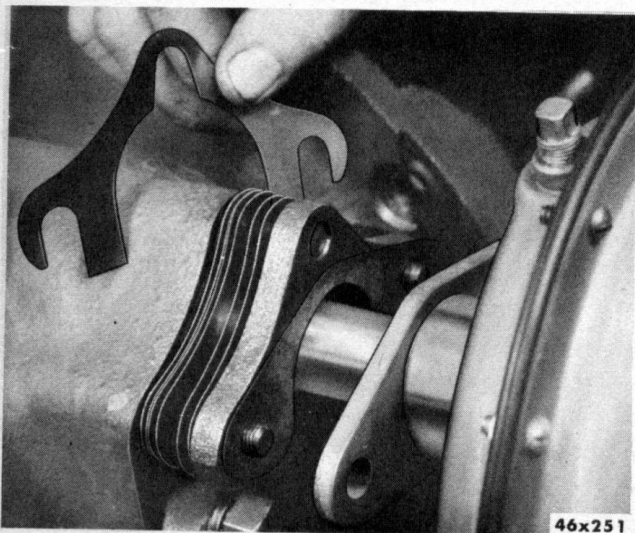


Fig. 84—Adjusting Shift Fork Clearance

Example: Assuming the spur pinion diameter to be 4 inches, the radius would be 2 inches, and an 8-pound pull on the scale would equal 16 inch-pound bearing pre-load torque.

Use rotating torque (not starting torque).

- (8) To obtain the correct pre-load torque of 12 to 18 inch-pounds, add or remove shims from pack under bearing cage (side opposite bevel gear).

71. ASSEMBLY OF POWER SHIFT UNIT

- (1) Assemble washer, sleeve, spring, spacer and adjusting nut on push rod. Compress spring with adjusting nut until back face of front washer is $1\frac{7}{32}$ inch from end of spacer under spring. Install lock nut and tighten.
- (2) Install push rod assembly into shift shaft and insert lock ring in groove.
- (3) Install rear half of vacuum chamber.
- (4) Install spring, diaphragm retaining plate and diaphragm on push rod and tighten outer nut securely while holding lock nut under diaphragm.
- (5) Position front half of vacuum chamber and install bolts through flange and tighten.

72. INSTALLATION OF POWER SHIFT UNIT

α. Side Mounted Type

- (1) Tap shift unit sleeve and bushing assembly into carrier housing over original shim pack. Install lock washer and stud nut and tighten to the correct torque.
- (2) Install new shift unit mounting flange gasket.
- (3) Hold shift fork in position. Align lock screw holes in shift shaft and slide shift unit and shaft assembly into position.
- (4) Tighten lock screw securely and tighten lock nut.
- (5) Install lock washers and stud nuts and tighten to the correct torque.
- (6) Check clearance of shift fork coined faces in shift collar with a feeler gauge (Fig. 83).

The clearance should be not less than .010 inch minimum on each side of the fork in both the fast and slow speed positions.

NOTE

When checking shift fork clearance in shift collar, the shift collar must be flush with the end face of the spur pinion in both fast and slow speed positions.

Add or remove shims from pack under sleeve to obtain the correct adjustment (Fig. 84).

- (7) Check operation of shift unit with air or vacuum, depending on the type of unit. Ten pounds of air may be used to check the vacuum type unit by applying it to opposite sides of diaphragm, using vent opening on single line shift unit.

b. Front Mounted Type

- (1) Check bellcrank and remove any scores at ball operating end faces.
- (2) Place both the shift fork and collar and the shift unit in the slow speed position. Both must be in the same position in order to install the shift unit.
- (3) Install new gasket and position shift unit with the bellcrank in the slot in the shift shaft. Install lock washers and cap screws and tighten to the correct torque.
- (4) Adjust Allen screws in top of carrier housing in order to allow shift collar to engage the splined teeth on both the fast and slow speed spur pinions (Fig. 85).

NOTE

If the shift collar will not engage the fast speed pinion, back off the Allen screw on the fast speed side until the correct shift collar travel is obtained. Adjust Allen screws on the slow speed side to obtain the correct engagement of the shift collar and slow speed pinion.

- (5) Check clearance of shift fork coined faces in the shift collar with a feeler gauge (Fig. 83).

The clearance must not be less than .010 inch minimum on each side of the shift

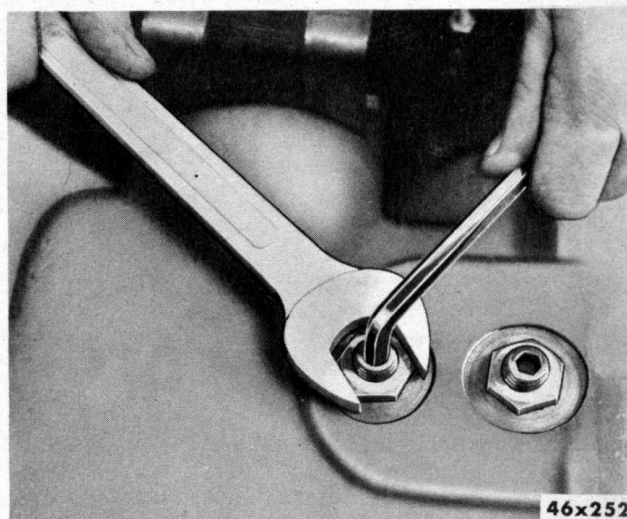


Fig. 85—Adjusting Shift Collar (Front Mounted Shift Unit)

fork in both the fast and slow speed positions.

NOTE

When checking shift fork clearance in shift collar, the shift collar must be flush with the end face of the spur pinion in both the fast and slow speed positions.

- (6) Check operation of the shift unit with either air or vacuum, depending on the type of unit. Ten pounds of air may be used to check the vacuum type unit.

73. ASSEMBLY OF PINION AND CAGE ASSEMBLY

- (1) Press rear bearing squarely and firmly against pinion shaft shoulder.
- (2) Press bearing cups squarely and firmly against pinion cage shoulder.
- (3) Lubricate bearing and cups with light machine oil.
- (4) Insert pinion and bearing assembly in pinion cage.
- (5) Install selective spacer over pinion shaft with the bevel side toward the pinion shaft shoulder.
- (6) Press front bearing squarely and firmly against the selective spacer with a suitable sleeve.

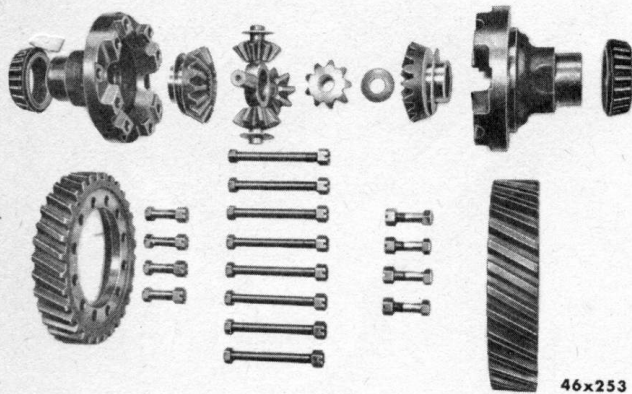


Fig. 86—Differential and Spur Gears (Disassembled)

- (7) Rotate cage several revolutions to assure normal bearing contact.
- (8) While in press under pressure, check pinion bearing pre-load torque. Wrap soft wire around pinion cage and pull on horizontal line with a pound scale.

If a press is not available, the pinion nut may be tightened to the correct torque and the pre-load checked.

The correct pressures, or torque for checking pinion bearing pre-load, are as follows:

| Pinion Shaft Thread Size | Required Pressure To Obtain Correct Pre-load | Required Torque To Obtain Correct Pre-load |
|-----------------------------|--|--|
| 1 in. x 20 | 25,000 lbs. | 300-400 ft. lbs. |
| 1¼ in. x 18 | 50,000 lbs. | 700-900 ft. lbs. |
| 1½ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1½ in. x 18 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1¾ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |

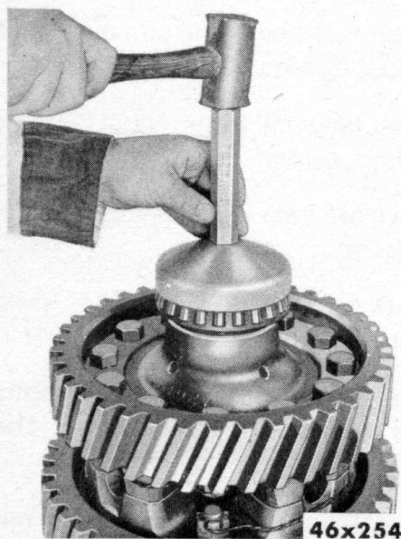


Fig. 87—Installing Differential Case Side Bearings

Example: Assuming pinion cage diameter to be 6 inches, the radius would be 3 inches, and 6 pounds pull on scale would equal 18 inch-pounds bearing pre-load torque.

Use rotating torque (not starting torque).

If rotating torque is not within 12 to 18 inch-pounds, use thinner spacer to increase bearing pre-load or thicker spacer to decrease bearing pre-load.

- (9) Lubricate pinion shaft oil seal. With a suitable sleeve, press seal firmly against bearing cage shoulder.
- (10) Reinstall yoke. Tighten pinion shaft nut to the correct torque.

74. INSTALLATION OF PINION AND CAGE ASSEMBLY

NOTE

The oil passage holes in the carrier housing, gasket, shim pack and pinion bearing cage, must be aligned.

- (1) Install new gasket over housing to cage studs.
- (2) Install original shim pack over gasket.
- (3) Install pinion cage assembly, lock washers and stud nuts. Tighten to the correct torque.
- (4) If bevel gear set has been renewed, check gear lash with dial indicator, and adjust to obtain .006 to .012 inch lash.
 - (a) To move pinion toward bevel gear, remove shims from pack under pinion cage.
 - (b) To move pinion away from bevel gear, add shims to pack under pinion cage.
 - (c) To move bevel gear away from pinion, remove shims from pack under cross shaft bearing cage (side opposite bevel gear) and add shims of equal thickness to pack under cross shaft bearing cover (bevel gear side). Shims should be transposed in this

manner in order to maintain the established pre-load.

- (d) To move bevel gear toward pinion, remove shims from pack under cross shaft bearing cover (bevel gear side) and add shims of equal thickness to pack under cross shaft bearing cage (side opposite bevel gear). Shims should be transposed in this manner in order to maintain the established pre-load.
- (5) When correct gear lash is obtained, check and adjust (as necessary) to obtain correct tooth contact.

75. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

76. ASSEMBLY OF DIFFERENTIAL AND SPUR GEAR ASSEMBLY

- (1) Join fast and slow speed spur gears to their respective case halves with bolts and tighten nuts to the correct torque. See Figure 86.

NOTE

When new spur gears or a new differential case is installed, the differential case holes must be line-reamed with the gear in order to assemble, using correct size bolts.

- (2) Lubricate differential case inner walls and all component parts with axle lubricant.
- (3) Install thrust washer and side gear in one of the case halves. Place spider with pinion and thrust washers in position. Install component side gear and thrust washer.
- (4) Align mating marks, position component case half and draw assembly together with four long bolts or cap screws, equally spaced.
- (5) Check assembly for free rotation of differential gears and correct if necessary.
- (6) Install remaining bolts or cap screws and tighten to the correct torque.

- (7) Install lock wire.
- (8) Press differential bearings squarely and firmly on differential case halves (Fig. 87).

77. INSTALLATION OF DIFFERENTIAL AND SPUR GEAR ASSEMBLY

- (1) Lubricate differential bearings and cups with axle lubricant.
- (2) Place cups over bearings and position assembly in carrier housing.
- (3) Insert bearing adjustment nuts and turn hand-tight against bearing cups.
- (4) Start bearing caps in the correct location as marked and tap lightly in position.

NOTE

If bearing caps do not position properly, the adjusting nuts are cross-threaded. Remove caps and reposition the adjusting nuts. Forcing caps into position will result in serious damage to carrier housing.

- (5) Install flat washers, where used, and stud nuts.
- (6) Tighten snugly, and then back off nuts sufficiently to turn bearing adjusting nuts.
- (7) Align spur gear with spur pinions by moving differential assembly with adjusting nuts.
- (8) Using dial indicator at side face of spur gear, adjust differential assembly to zero end play in the differential bearings.
- (9) Rotate assembly several revolutions to assure normal bearing contact.
- (10) Readjust differential assembly to zero end play.
- (11) Check fast and slow speed spur gears for runout with a dial indicator. If runout exceeds .008 inch, remove differential assembly and check for cause.
- (12) Tighten adjusting nuts one notch each from zero end play to secure the correct differential bearing pre-load.
- (13) Check differential and spur gear assembly to be certain there is no interference be-

tween the differential spur gears and the shift collar faces. When correctly located, there will be approximately $\frac{1}{16}$ inch clearance between the spur gears and the shift collar faces in both the fast and slow speed positions. Any interference will result in improper shifting and damage to component parts.

- (14) Tighten bearing cap stud nuts to the correct torque.
- (15) Install adjusting nut locks and cap screws. Tighten to the correct torque and install lock wire.

78. SERVICE DIAGNOSIS

Refer to Paragraphs 115 through 123.

ADJUSTMENTS

79. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

Checking tooth contact is accomplished by means of oiled red lead applied lightly to the gear teeth (Fig. 88). When the pinion is rotated, the red lead is squeezed away by the contact of the teeth, leaving bare areas which are the exact size, shape and location of the contact.

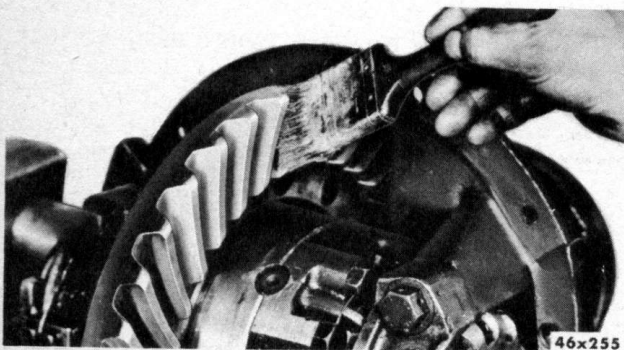


Fig. 88—Applying Oiled Red Lead to Section of Ring Gear Teeth

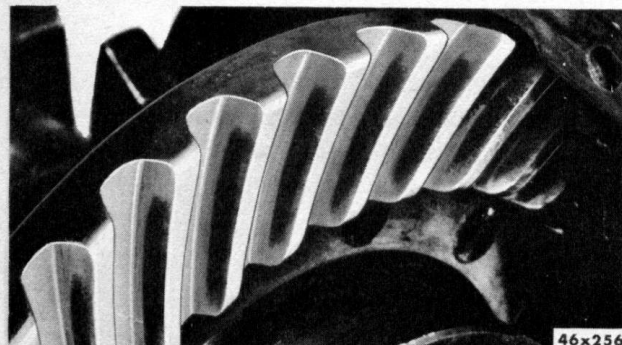
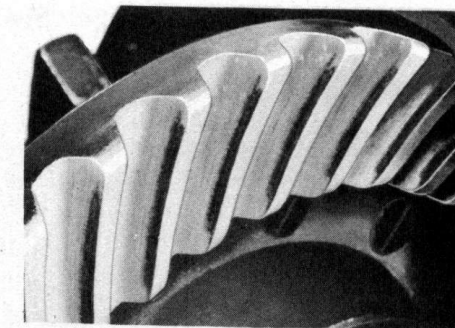


Fig. 89—Red Lead Indicating Correct Tooth Contact

Sharper impressions may be obtained by applying a small amount of resistance to the gear with a flat steel bar, using a wrench to rotate the pinion. When making adjustments, check the drive side of the gear teeth. Coast side contact should be automatically correct when drive side contact is correct. As a rule, coating about twelve teeth is sufficient for checking purposes.

With adjustments properly made, the correct tooth contacts (Fig. 89) will be secured. The area of contact starts near the toe of the gear

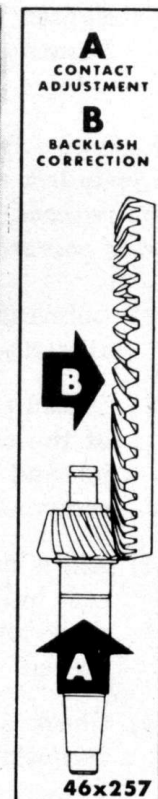


Fig. 90—Incorrect High Narrow Tooth Contact

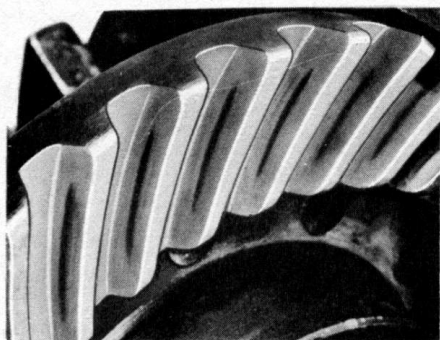


Fig. 91—Incorrect Low Narrow Tooth Contact

and extends about 80 per cent of the tooth length. This adjustment results in a quiet running gear and pinion set, because the load is distributed over the teeth within the proper area.

If gears are allowed to operate with an adjustment of the type shown in Figure 90, noise, galling and rolling over the top edges of the teeth, will result. To obtain correct contact, move pinion toward gear to lower the contact area to the proper location. This adjustment will decrease backlash between pinion and gear teeth, which may then be corrected by moving gear away from pinion. Backlash of .006 to .012 inch is correct.

If gears are allowed to operate with an adjustment of the type illustrated in Figure 91, galling, noise and grooving of teeth will result. To obtain correct contact, move pinion away from gear to raise the contact area to the proper location. Correct backlash of .006 to .012 inch may be obtained by moving gear toward pinion.

If gears are allowed to operate with an adjustment of the type shown in Figure 92, chip-

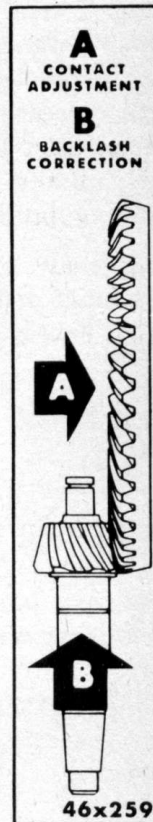
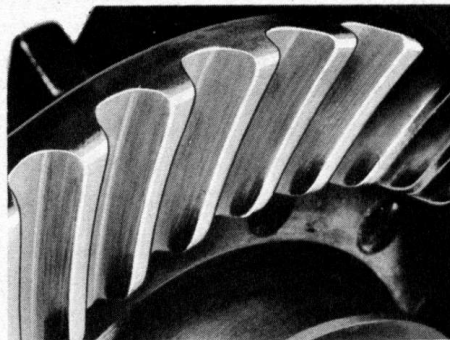


Fig. 92—Incorrect Short Toe Contact

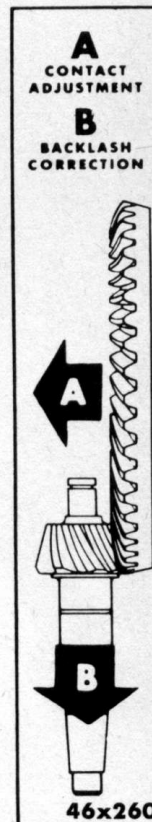
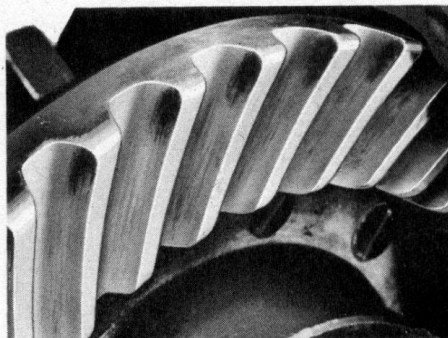


Fig. 93—Incorrect Short Heel Contact

ping at tooth edges and excessive wear, due to small contact area, will result. To obtain correct contact, move gear away from pinion. This will increase the lengthwise contact and move the contact toward heel of tooth. Correct backlash of .006 to .012 inch may be obtained by moving pinion toward gear.

If gears are allowed to operate with an adjustment of the type shown in Figure 93, chipping, excessive wear and noise, will result. To

obtain correct contact, move gear toward pinion to increase the lengthwise contact and move the contact toward toe. Correct backlash of .006 to .012 inch can be obtained by moving pinion away from gear.

NOTE

Several adjustments of both pinion and gear may be necessary before correct contact and backlash are secured.

ROUTE VAN REAR AXLE SERVICE

80. DESCRIPTION

The rear axle construction on the Route Van is somewhat different from the conventional type.

The differential is mounted between two support arms, which are mounted to the frame cross members (Fig. 94). Between the differential and each rear wheel is a drive shaft with

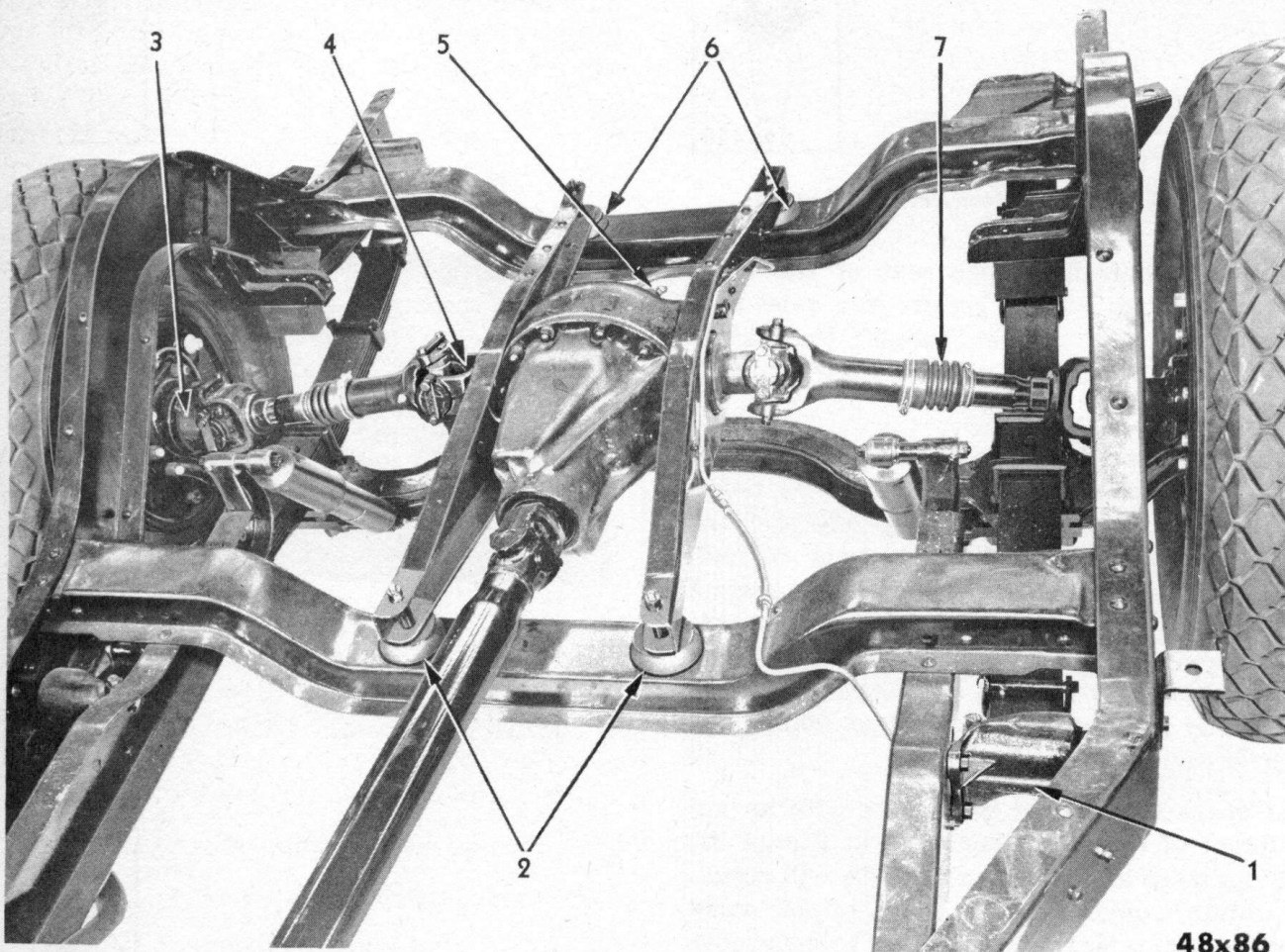


Fig. 94—Rear Axle Construction

- 1 — Rear spring front bracket
- 2 — Support arm front insulators
- 3 — Wheel drive shaft yoke
- 4 — Differential drive shaft yoke

- 5 — Differential carrier housing vent
- 6 — Support arm rear insulators
- 7 — Drive Shaft boot

48x86

two universal joints. One universal joint is attached to a short shaft in the differential. The other universal joint is attached to a short shaft in the rear wheel spindle. One universal joint yoke on each side of the differential is splined to the drive shaft to form a telescoping joint in order to permit the differential to move up and down, due to springing of the truck. The differential used on the B-4-DU corresponds to that used on the B-4-D, and the differential on the B-4-EU corresponds to that used on the B-4-PW trucks.

81. REMOVAL AND INSTALLATION OF DIFFERENTIAL (FIG. 94)

- (1) Disconnect the three universal joints at the differential—one in the propeller shaft and two in the drive shafts.
- (2) Remove the four support arm mounting bolts and disconnect the brake line clips from the left support arm.
- (3) Disconnect brake line junction from support arm.
- (4) Remove the four rubber insulators (2 and 6, Fig. 94).
- (5) Remove the differential and support arms as a unit, by sliding them to the rear and tilting the support arms down under the cross member (Fig. 95).

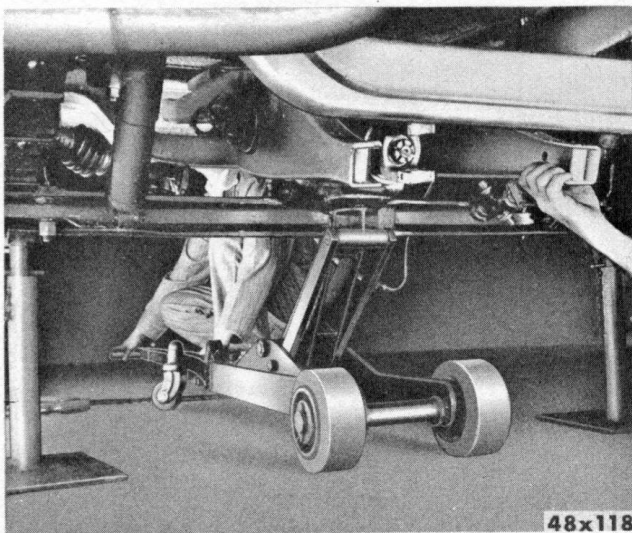


Fig. 95—Removing Carrier and Housing Assembly from Frame

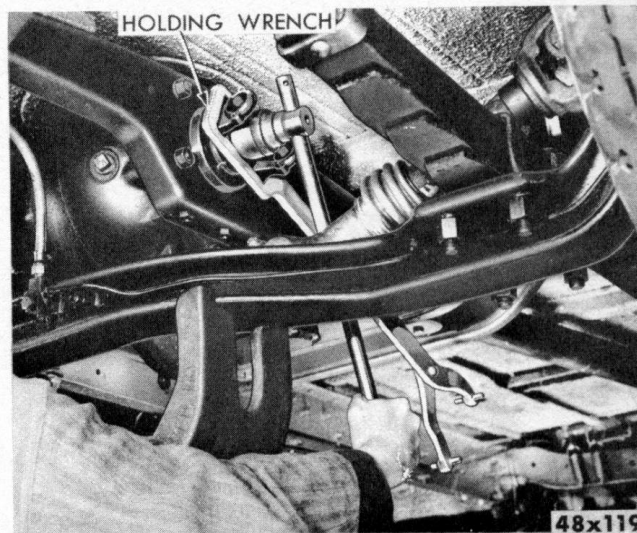


Fig. 96—Removing Differential Drive Shaft Yoke Nut

When installing the differential, place the unit on the jack and roll it under the truck. Lift it up with the jack so that the rear ends of the support arms will slide above the rear cross member (jack it up high enough to roll it forward and place the front ends of the support arms over the forward cross member). Install the insulator mountings and tighten the nuts down until the top washer is tight against the spacer bushing. Install the brake line bracket and place the brake line in the clips provided.

82. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER (CARRIER HOUSING REMOVED)

a. Removal

- (1) Remove differential drive shaft yoke nut and yoke (Fig. 96).
- (2) Remove differential drive shaft bearing retainer.
- (3) Remove differential drive shafts (no tool is necessary). Sometimes the shafts will bind. If such is the case, loosen carrier retainer nuts and remove the shafts.
- (4) Remove the two support arms.
- (5) Remove carrier retainer nuts.
- (6) Lift carrier out of housing.

b. Installation

CAUTION

Before installing the differential drive shaft

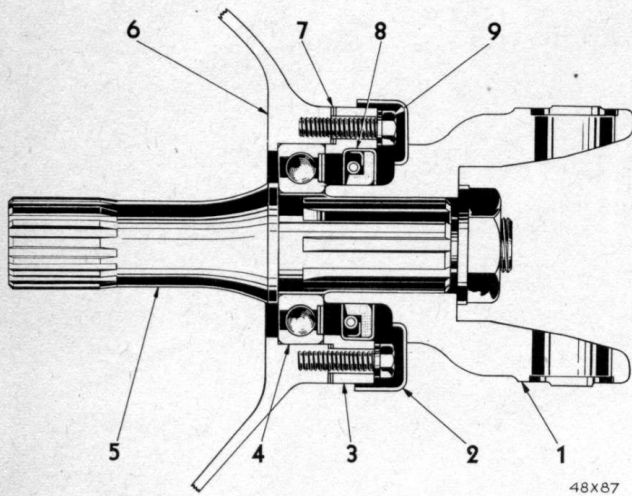


Fig. 97—Differential Drive Shaft Arrangement

- 1 — Differential drive shaft yoke
- 2 — Dust cover
- 3 — Differential drive shaft bearing retainer
- 4 — Differential drive shaft bearing
- 5 — Differential drive shaft
- 6 — Carrier housing
- 7 — Bearing retainer shims
- 8 — Oil seal
- 9 — Bearing retainer bolt

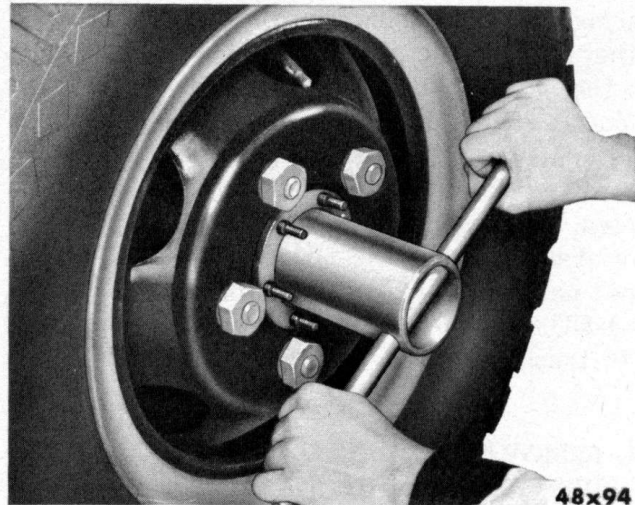


Fig. 99—Removing Rear Wheel Bearing Adjusting Nut (Tool DD-824)

83. REMOVAL OF DIFFERENTIAL DRIVE SHAFT ASSEMBLY (FIG. 97)

- (1) Using universal joint spanner wrench DD-949, hold the yoke while removing the nut from shaft.
- (2) With puller DD-1000, pull the yoke from the differential drive shaft.
- (3) Remove screws that hold bearing retainer and remove retainer.
- (4) Remove the shims between the retainer and carrier housing. Shaft and bearing can now be removed by hand.

84. ADJUSTMENT OF DIFFERENTIAL DRIVE SHAFT BEARING (FIG. 97)

To determine the correct adjustment of the differential drive shaft bearing, refer to Figure 97 and proceed as follows:

- (1) With the yoke (1), oil seal (8), retainer bolts (9), retainer (3) and drive shaft (5) and bearing (4) removed, carefully clean the bearing bore in the differential carrier housing to remove all dirt and nicks.
- (2) Push the shaft and bearing into place in the differential carrier housing.
- (3) Set the bearing retainer (3) in place and hold it firmly by hand.
- (4) With a feeler gauge, measure the clearance between the retainer (3) and the face of the housing.

bearing, remove all burrs from edge of bearing seat.

When installing the differential carrier, start it into the carrier housing with four flat washers and nuts, equally spaced. Tighten alternately to draw carrier squarely into housing. Service procedures and adjustments for this differential are the same as those for the conventional single-speed truck axle.

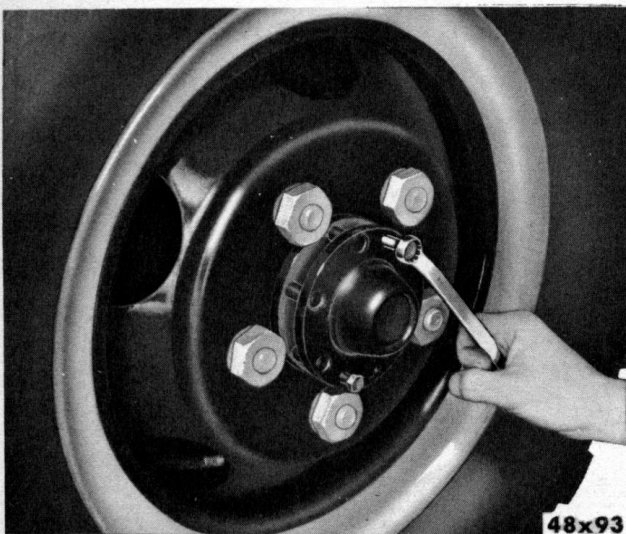


Fig. 98—Removing Drive Flange

- (5) By adding .003 to .005 inch to the actual clearance, the proper thickness shim pack is easily determined. Shims come in three sizes: .015, .020 and .025 inch.
- (6) When the correct shims thickness is determined, reassemble the drive shaft (5) and bearing (4), shims (7), retainer (3), retainer bolts (9), oil seal (8) and yoke (1).
- (7) With the bearing adjusted properly, the drive shaft (5) will have no end play and the bearing will not be pre-loaded, since the .003 to .005 inch clearance will be taken up when the shims are compressed by tightening down the retainer bolts.

85. REMOVAL OF REAR WHEEL HUB AND BRAKE SUPPORT PLATE

- (1) Remove drive flange retainer nuts.
- (2) Remove drive flange from hub by placing two bolts in the holes provided and turning inward until flange breaks loose. Refer to Figure 98.
- (3) Remove rear wheel bearing lock nut, using Tool DD-824.
- (4) Remove rear wheel bearing adjusting nut lock.
- (5) Remove rear wheel bearing adjusting nut (Fig. 99), using Tool DD-824.
- (6) Remove wheel assembly, being careful not to damage bearings.
- (7) Disconnect brake line from wheel cylinder.
- (8) Remove brake support plate retainer bolts and plate can be lifted off.

When replacing the wheel, care should be taken to avoid damaging the axle-spindle-threads. Lubricate the wheel bearings and bleed the brake lines.

86. REMOVAL OF REAR-AXLE-TO-WHEEL DRIVE SHAFT

Disconnect the two universal joints, one at each end of the drive shaft, and remove shaft.

If disassembly of the axle-to-wheel drive shaft is necessary, remove the rubber boot and pull the splined shaft out of the yoke.

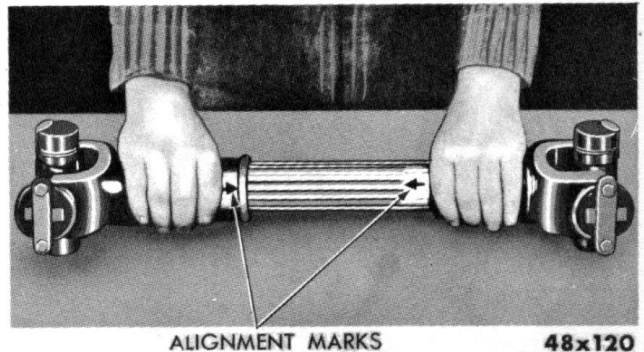


Fig. 100—Arrows on Yoke and Shaft Properly Aligned

CAUTION

When assembling the rear-axle-to-wheel drive shaft, care should be exercised in the alignment of the yokes. Two arrows are provided (one on the shaft and one on the yoke) for proper parallel alignment of the yokes. When properly aligned, the two arrows will be in line (Fig. 100).

When assembling the rear-axle-to-wheel drive shaft, the universal joints should be well lubricated. A grease fitting on the rear-axle-to-wheel drive shaft allows proper lubrication of the splines.

87. REMOVAL AND INSTALLATION OF REAR AXLE SPINDLE SUBASSEMBLY (FIG. 101)

- (1) Remove wheel and drum.

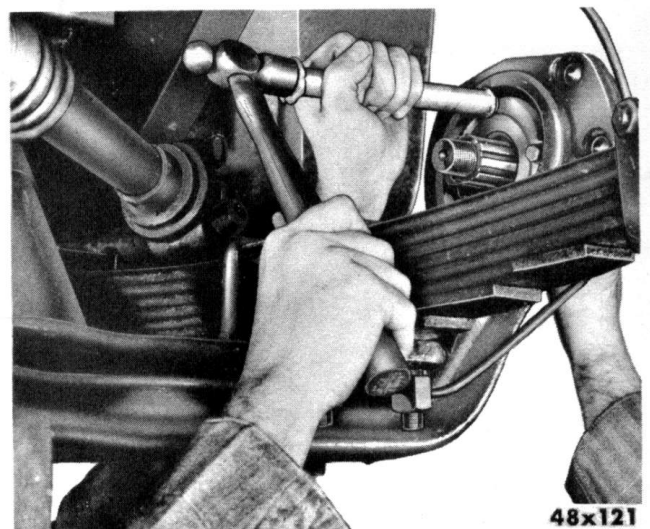
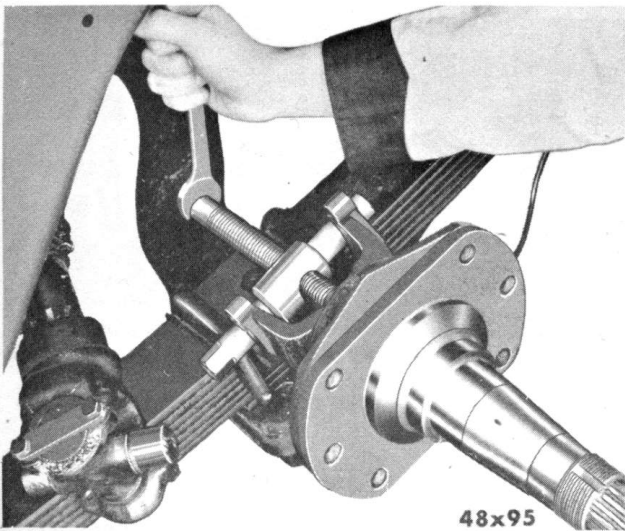


Fig. 101—Removing Rear Axle Spindle Subassembly



102—Removing Rear Wheel Drive Shaft Yoke
(Tool DD-1000)

- (2) Disconnect axle-to-wheel drive shaft.
- (3) Remove wheel-drive-shaft yoke.
- (4) Tap the heads of the bearing retainer bolts, using a brass drift and hammer. Be sure to move around the retainer to prevent cocking the spindle in the I-beam.

When installing the spindle, place it in position and use the brake support plate bolts to align it properly.

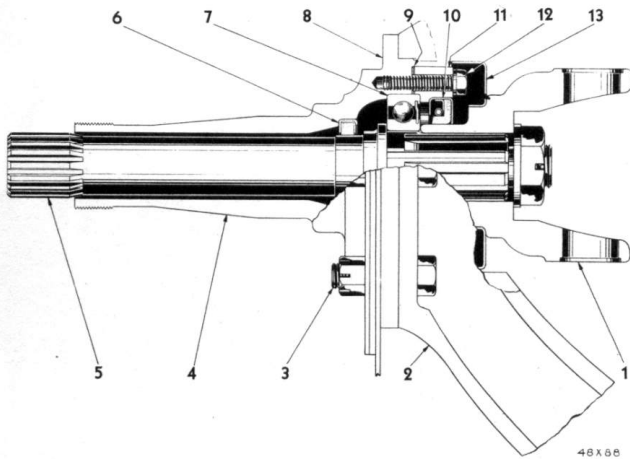


Fig. 103—Sectional View of Rear Wheel Drive Shaft Arrangement

- | | |
|-------------------------------|----------------------------|
| 1 — Wheel drive shaft yoke | 8 — Spindle flange |
| 2 — Rear axle I-Beam | 9 — Bearing retainer shims |
| 3 — Rear axle I-Beam bolt | 10 — Large oil seal |
| 4 — Rear axle wheel spindle | 11 — Bearing retainer |
| 5 — Wheel drive shaft | 12 — Bearing retainer bolt |
| 6 — Small oil seal | 13 — Dust cover |
| 7 — Wheel drive shaft bearing | |

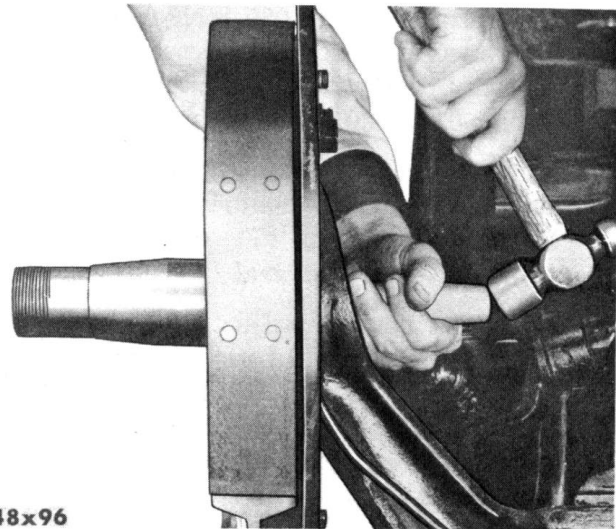


Fig. 104—Installing Rear Wheel Drive Shaft Small Seal
(Tool DD-1126)

88. REMOVAL AND INSTALLATION OF REAR WHEEL DRIVE-SHAFT-YOKE AND SHAFT

- (1) Disconnect lower universal joint.
- (2) Remove yoke retaining nut.
- (3) Install tool DD-1000 and remove yoke (Fig. 102).
- (4) Remove bearing retainer and shaft will slide out.

Before installing the drive shaft yoke and

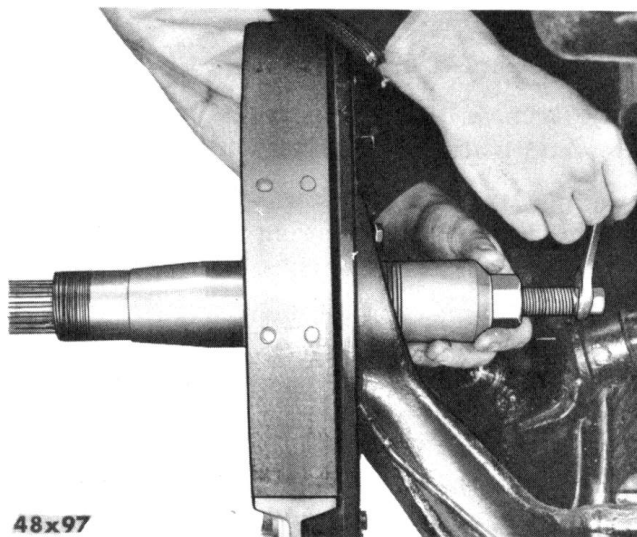


Fig. 105—Removing Rear Wheel Drive Shaft Large Seal
(Tool DD-1135)

shaft, the bearing should be well lubricated with proper lubricant.

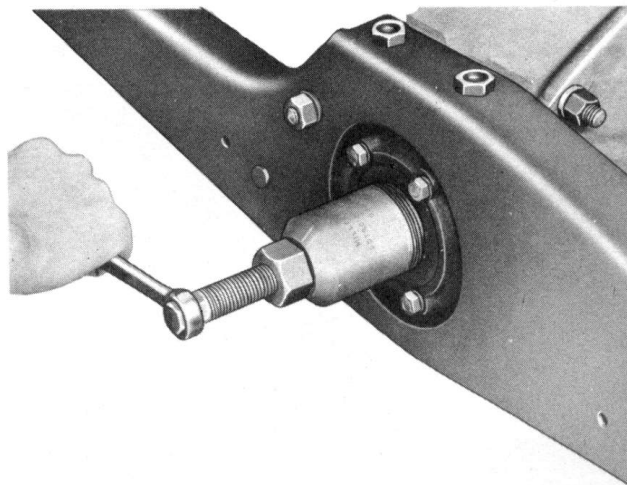
89. ADJUSTMENT OF WHEEL-DRIVE-SHAFT BEARING (FIG. 103)

To determine the proper shim thickness for correct wheel-drive-shaft bearing adjustment, the following procedure can be used:

- (1) Remove the spindle subassembly.
- (2) With the large oil seal (10), retainer bolts (12) and retainer (11) removed, insert the shaft and bearing into place in the spindle (4).
- (3) Place the bearing retainer (11) and large oil seal (10) in position against the spindle flange, holding it by hand.
- (4) Add shims (9) until .003 to .005 inch clearance can be measured in several places with feeler stock between the retainer (11) and spindle flange (8). Hold retainer against shims by hand with bearing tight against its seat. Shims come in three sizes: .015, .020 and .025 inch. Before assembling the unit, pack the bearing, and the space between the bearing and small oil seal, with short fibre wheel bearing lubricant.
- (5) With correct shim thickness determined, reassemble the small oil seal (6), drive shaft and bearing (5 and 7), shims (9), retainer (11), large oil seal (10) and yoke (1).

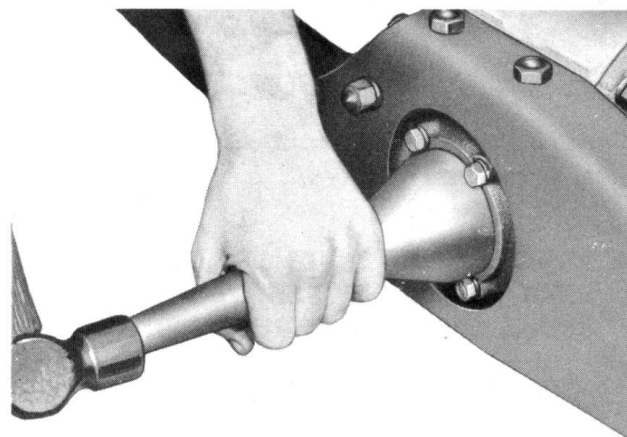
A second method for adjusting the wheel-drive-shaft bearing can be performed without removing the spindle subassembly. This method is as follows:

With the yoke (1), large oil seal (10), retainer (11) and drive shaft (5) removed, press the drive shaft bearing (7) off the shaft (5). Insert the bearing into the spindle (tight against its seat) and place the bearing retainer in position, holding it tight against the bearing by hand. Add shims until .003 to .005 inch clearance can be measured between the inner diameter of the bearing retainer and the bearing. This determines the proper clearance between the bearing and the bearing retainer.



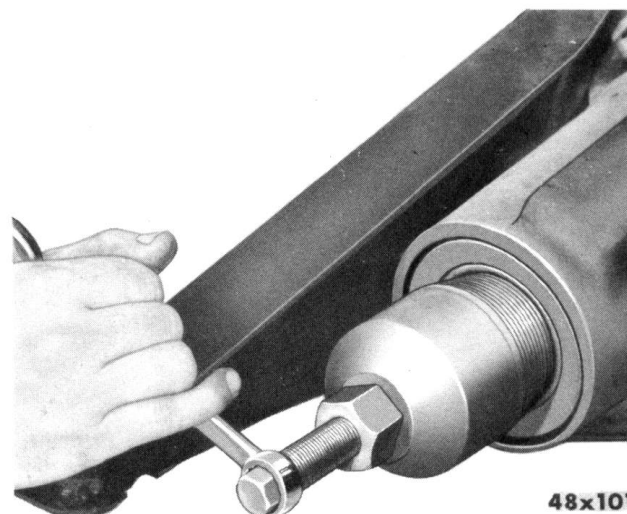
48x98

Fig. 106—Removing Differential Drive Shaft Oil Seal (Tool DD-1135)



48x99

Fig. 107—Installing Differential Drive Shaft Oil Seal (Tool C-359)



48x101

Fig. 108—Removing Rear Axle Pinion Oil Seal (B-4-EU) (Inner Section) (Tool C-1117)

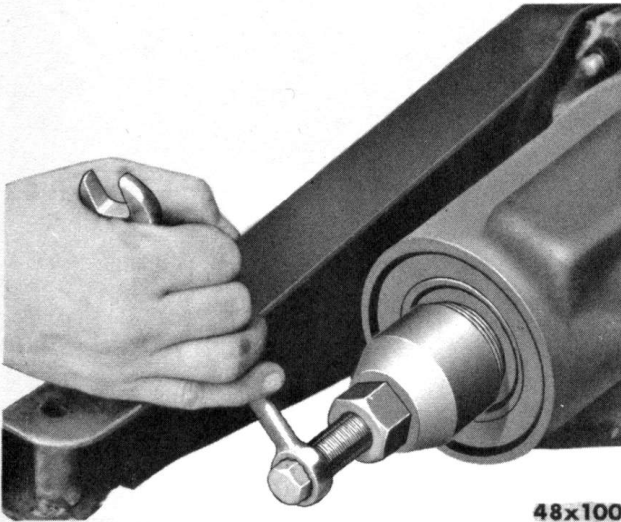


Fig. 109—Removing Rear Axle Pinion Oil Seal (B-4-EU)
(Outer Section) (Tool C-748)

CAUTION

When installing the shaft, be careful not to damage the inner oil seal.

**90. REMOVAL AND INSTALLATION OF
REAR WHEEL DRIVE SHAFT
SMALL SEAL (SHAFT REMOVED)**

- (1) Pry out with long bar or any other suitable tool.

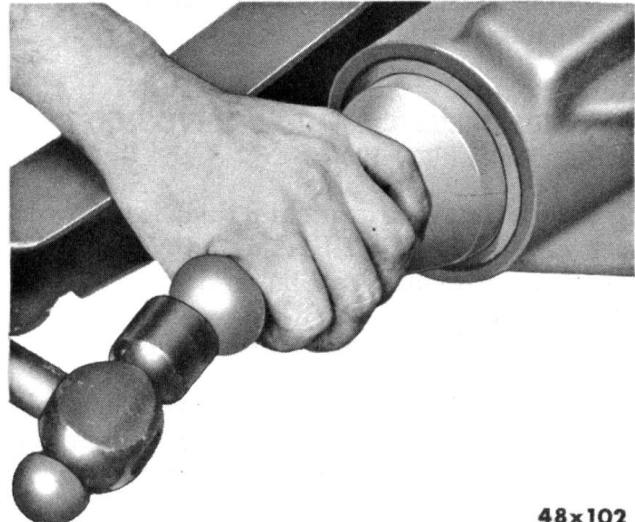


Fig. 110—Installing Rear Axle Pinion Oil Seal (B-4-EU)
(Tool DD-855)

- (2) Install proper seal, using Tool DD-1126 (Fig. 104).

**91. REMOVAL AND INSTALLATION OF
REAR WHEEL DRIVE SHAFT
LARGE SEAL**

- (1) Using Tool DD-1135, remove oil seal, as shown in Figures 105 and 106.
- (2) Install new seal, using Tool C-359 (Fig. 107).

TANDEM AXLE ASSEMBLY (FIG. 114)

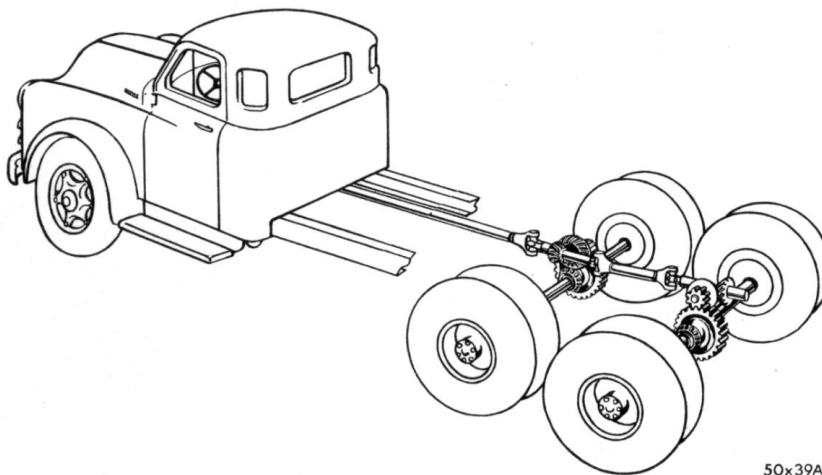


Fig. 111—Double-Reduction, Straight-Through Drive

92. DOUBLE-REDUCTION, STRAIGHT-THROUGH DRIVE

The "through" drive arrangement (Fig. 111) provides a direct drive to the rearward rear axle through the use of the forward rear axle. Refer to the illustration. This type axle is designed to carry maximum loads equally distributed between the two rear axle units.

The load is equalized by full floating springs which oscillate on a center member. This also aids in reducing frame lift and shock on the vehicle, cargo, and load. Traverse movement of the axles is prevented by spring striker plates mounted on the axle housings. Driving and braking forces are transmitted to the chassis by a parallel "torque rod system." This also maintains the correct vertical position of the drive units.

The driving units are the "top" mounted, spur gear type. Refer to Figure 112.

The pinion and its bearings are assembled in a housing or "pinion cage." This cage is a separate unit and can be readily removed from the carrier housing for adjustment or repair. However, since special tools are required to make proper adjustments or repairs, it is recommended that the work be performed by your authorized Dodge dealer.

93. REMOVAL AND INSTALLATION OF TANDEM AXLE ASSEMBLY (FRONT OR REAR)

a. Removal

- (1) Jack up frame to relieve the spring load on the axles.

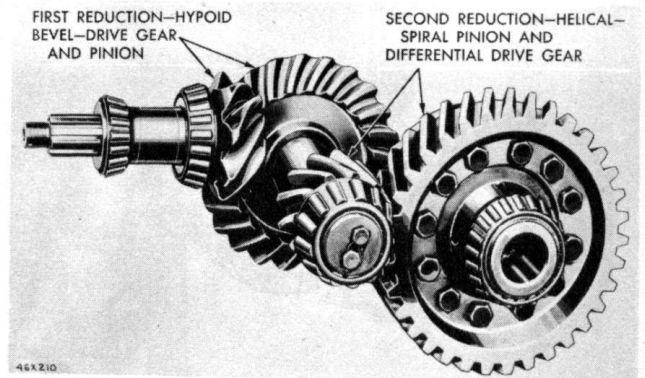
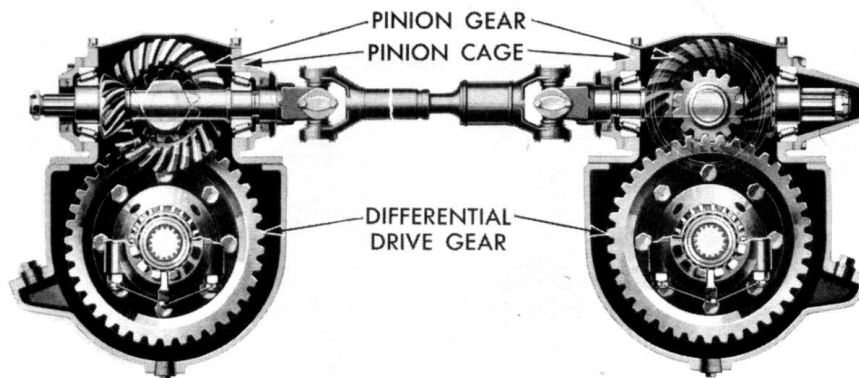


Fig. 113—Double Reduction Gear Train

- (2) Place a roller jack under the axle assembly to be removed.
- (3) Disconnect the air lines at the brake diaphragms.
- (4) Remove propeller shaft.
- (5) Remove the wheel and tire assemblies (when removing the forward axle only).
- (6) Disconnect upper and lower torque rods at the axle end, as described in Paragraphs 111 and 112.
- (7) Roll the axle assembly out from underneath the vehicle.

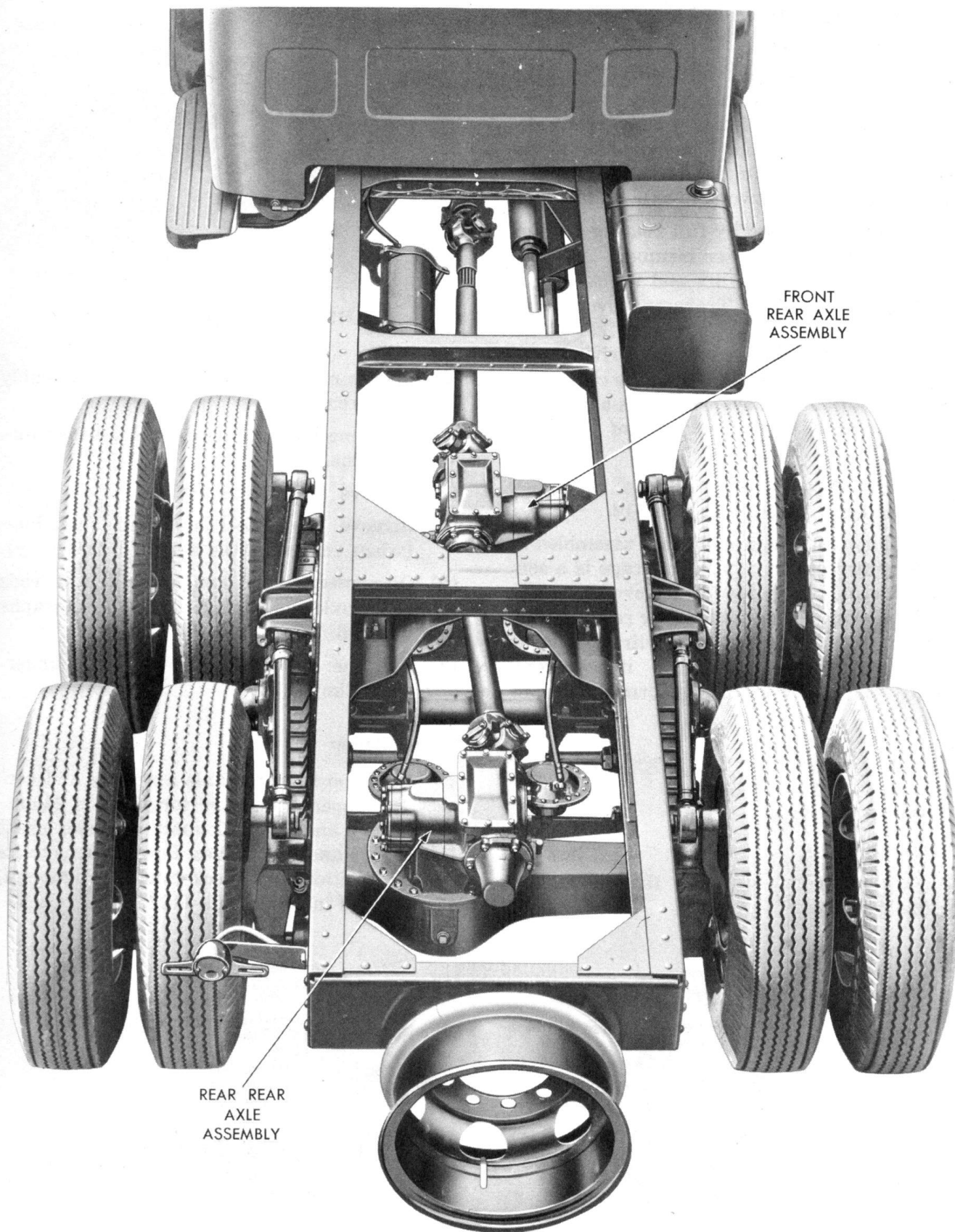
b. Installation

To install, position the axle assembly and connect the upper and lower torque rods (Paragraphs 111 and 112). Connect propeller shaft (or shafts) and brake lines. Lower frame to its normal position and check tandem alignment, as described in Paragraph 110.



50x40

Fig. 112—Top Mounted Spur Gear Unit (Sectional View)



REAR REAR
AXLE
ASSEMBLY

FRONT
REAR AXLE
ASSEMBLY

52x405

Fig. 114—Tandem Axle Assembly (B-4-YX Only)

94. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY (AXLE SHAFTS REMOVED) (FIGS. 113 AND 116)

a. Removal

- (1) Remove plug from bottom of axle housing and drain lubricant.
- (2) Disconnect universal at pinion shaft.
- (3) Remove carrier to housing stud nuts and lock washers. Loosen two top nuts and leave on the studs to prevent carrier from falling.
- (4) Break carrier loose from axle housing with a rawhide mallet and remove taper dowels. *Dowels must be removed.* If necessary, back out studs as required.
- (5) Place roller jack under carrier. Remove top nuts and washers and work carrier free, using puller screws in holes provided. A small pinch bar may be used to straighten the carrier in the housing bore. However, the end must be rounded to prevent indenting the carrier flange.

b. Installation

To install the differential carrier securely in the axle housing, proceed as follows:

- (1) Install new gasket on axle housing flange.
- (2) Roll carrier into position on roller jack. Start carrier into housing with four flat washers and nuts (equally spaced).

CAUTION

Do not drive carrier into housing with a steel hammer at the carrier stud flange. The flange may easily be distorted and cause severe oil leakage.

- (3) Install lock washers and stud nuts on any studs under carrier housing off-sets. It is impossible to start these nuts after carrier is drawn into housing.
- (4) Tighten the four nuts over flat washers alternately to draw carrier squarely into axle housing.

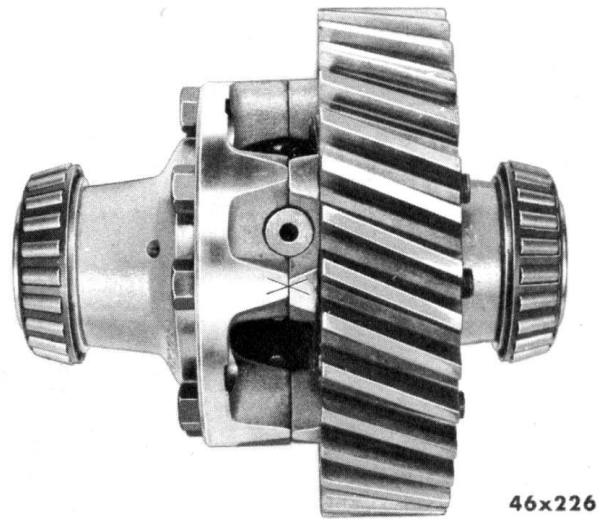


Fig. 115—Differential Drive Gear (Removed)

- (5) Remove nuts and flat washers. Install taper dowels, lock washers and stud nuts. Tighten to the correct torque.
- (6) Connect universal at pinion shaft.
- (7) Install axle shafts.

95. LUBRICATION

- (1) Remove pipe plug at pinion cage and add one pint of specified lubricant.
- (2) Fill axle housing to the correct level with specified lubricant. See Lubrication section.
- (3) Lubricate universal joint.
- (4) Jack up both rear wheels and operate vehicle in high transmission gear at approximately 25 to 30 miles per hour for five minutes to assure satisfactory lubrication of all parts of the carrier assembly.

CAUTION

Do not operate vehicle with one wheel jacked up. Operation in this manner will cause the differential spider to overheat and result in galling or shearing of the spider pins.

Both rear wheel brakes should be free to allow both wheels to rotate at approximately the same speed.

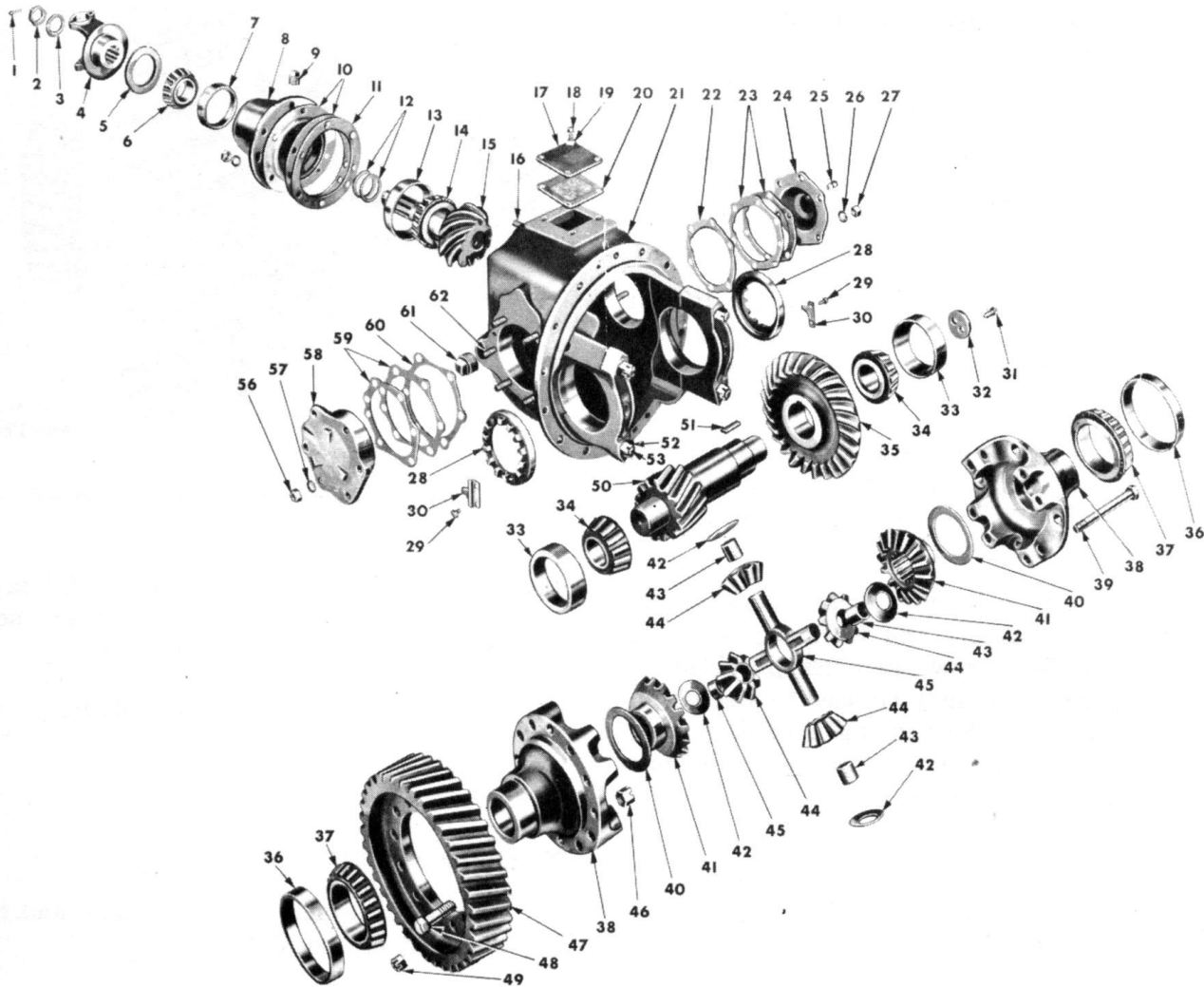


Fig. 116—Rear Axle, Double-Reduction, Single-Speed

- | | |
|---|---|
| 1 — Companion yoke nut cotter pin | 31 — Spiral pinion bearing cone washer screw |
| 2 — Companion yoke nut | 32 — Spiral pinion bearing cone washer |
| 3 — Companion yoke nut washer | 33 — Spiral pinion bearing cup |
| 4 — Companion yoke | 34 — Spiral pinion bearing cone |
| 5 — Drive pinion front bearing oil seal | 35 — Spiral pinion drive gear (first reduction) |
| 6 — Drive pinion front bearing cone | 36 — Differential bearing cup |
| 7 — Drive pinion front bearing cup | 37 — Differential bearing cone |
| 8 — Drive pinion carrier | 38 — Differential case |
| 9 — Drive pinion carrier plug | 39 — Differential drive gear bolt—long |
| 10 — Drive pinion carrier shims | 40 — Differential side gear thrust washer |
| 11 — Drive pinion carrier gasket | 41 — Differential side gear |
| 12 — Drive pinion carrier spacer | 42 — Differential pinion thrust washer |
| 13 — Drive pinion rear bearing cup | 43 — Differential pinion bushing |
| 14 — Drive pinion rear bearing cup | 44 — Differential pinion |
| 15 — Drive pinion (first reduction) | 45 — Differential spider |
| 16 — Drive pinion carrier stud | 46 — Differential drive gear bolt nut |
| 17 — Differential carrier inspection hole cover | 47 — Differential drive gear (second reduction) |
| 18 — Differential carrier inspection hole cover bolt | 48 — Differential drive gear bolt—short |
| 19 — Differential carrier inspection hole cover bolt washer | 49 — Differential drive gear bolt nut |
| 20 — Differential carrier inspection hole cover gasket | 50 — Spiral pinion (second reduction) |
| 21 — Differential carrier | 51 — Spiral pinion drive gear key |
| 22 — Spiral bearing retainer gasket | 52 — Differential carrier cap stud nut |
| 23 — Spiral pinion bearing retainer shims | 53 — Differential carrier cap stud |
| 24 — Spiral pinion bearing retainer | 56 — Spiral pinion bearing cage stud nut |
| 25 — Differential carrier breather | 57 — Spiral pinion bearing stud nut washer |
| 26 — Spiral pinion bearing retainer stud nut washer | 58 — Spiral pinion bearing case |
| 27 — Spiral pinion bearing retainer stud nut | 59 — Spiral pinion bearing cage shims |
| 28 — Differential bearing adjusting nut | 60 — Spiral pinion bearing cage gasket |
| 29 — Differential bearing adjusting nut lock screw | 61 — Differential carrier plug |
| 30 — Differential bearing adjusting nut lock | 62 — Spiral pinion bearing cage stud |

DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL (CARRIER REMOVED)

96. REMOVAL OF DIFFERENTIAL AND GEAR ASSEMBLY

- (1) Place carrier in a suitable holding fixture.
- (2) Cut lock wire. Remove cap screw and adjusting nut locks.
- (3) Center punch one differential carrier leg and bearing cap to identify for proper re-assembly.
- (4) Remove bearing cap stud nuts, bearing caps and adjusting nuts.
- (5) Lift out differential drive gear assembly (Fig. 115).

97. DISASSEMBLY OF DIFFERENTIAL CASE AND GEAR ASSEMBLY

- (1) If original identification marks are not clear, center punch case halves for correct alignment when reassembling.
- (2) Cut lock wire, remove long bolts and separate case halves.
- (3) Remove spider, pinion, side gears and thrust washers.
- (4) Remove short bolts and separate gears from case half.
- (5) Remove differential bearings, if necessary.

98. REMOVAL OF PINION AND CAGE ASSEMBLY

- (1) Remove pinion cage stud nuts and lock washers and lift out cage assembly.

NOTE

If cage is not free, tap loose, using soft drift on inner face of pinion, or use puller screws in holes provided.

- (2) Wire shim pack together to keep intact in order to facilitate adjustment on reassembly.

99. DISASSEMBLY OF PINION AND CAGE ASSEMBLY

- (1) Place pinion cage over carrier studs. Hold yoke and remove pinion shaft nut.

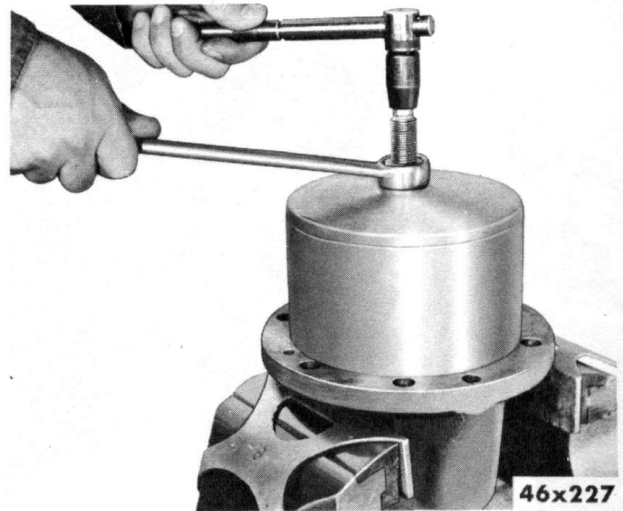


Fig. 117—Removing Pinion Bearing Cups from Cage, Tool DD-966

- (2) Remove yoke from pinion shaft, as shown in Figure 48.
- (3) Press pinion shaft out of cage.
- (4) Remove adjusting spacers or shims.
- (5) If necessary to remove the pinion rear bearing, refer to Figure 50.
- (6) Press front bearing and pinion shaft oil seal from cage.
- (7) Remove the two bearing cups from pinion cage, as shown in Figure 117.

On assemblies where a bearing cover is used, remove seal assembly from cover.

100. REMOVAL OF CROSS SHAFT ASSEMBLY

- (1) Remove stud nuts and lock washers from cross shaft bearing cage (side opposite bevel gear).
- (2) Force off bearing cage with a small pinch bar between the back of the gear and the carrier housing (Fig. 118). Puller screw holes are also provided.
- (3) Wire shim pack together. The shim pack should remain intact to facilitate adjustment when reassembling.

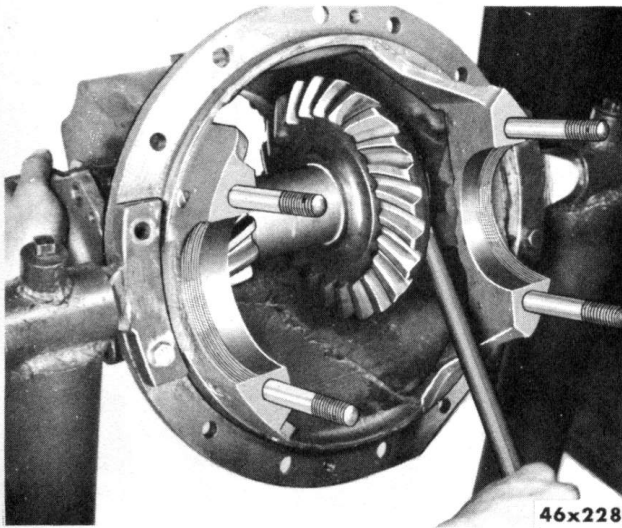


Fig. 118—Removing Cross Shaft Bearing Cage

- (4) Thread out cross shaft assembly (Fig. 119).

101. DISASSEMBLY OF CROSS SHAFT ASSEMBLY

- (1) Cut lock wire, remove cap screws and bearing plate from gear end of cross shaft.
- (2) Press shaft from gear and bearing (Fig. 120).
- (3) If necessary to replace bearing, remove bearing from opposite end of cross shaft.

NOTE

Handle bearings with care. If dropped, bearings or cage may be damaged.

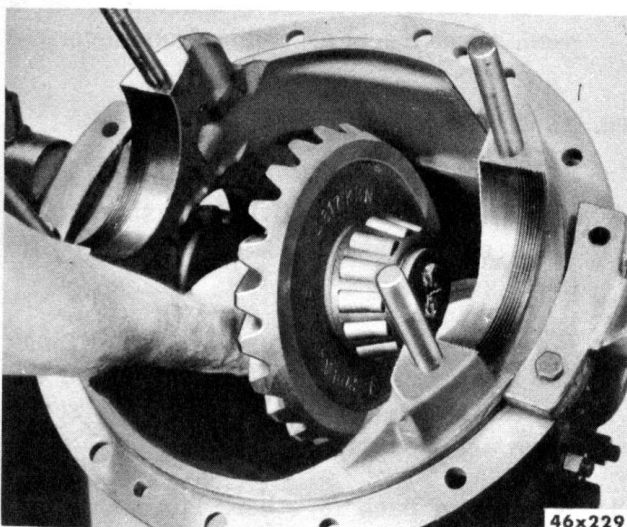


Fig. 119—Removing Cross Shaft Assembly

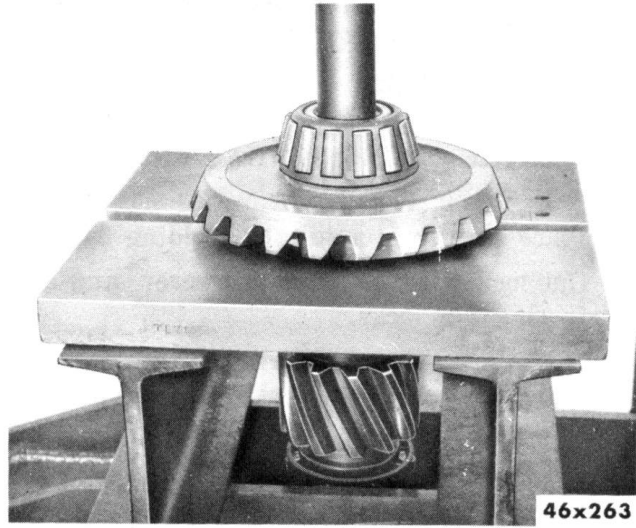


Fig. 120—Removing Ring Gear and Bearing

- (4) If necessary to replace bearing cups, remove cross shaft bearing cover (bevel gear side). Wire shim pack together to keep intact to facilitate adjustment when reassembling.
- (5) Remove cups with suitable puller, as shown in Figure 121.

102. ASSEMBLY OF CROSS SHAFT ASSEMBLY (FIG. 123)

- (1) Insert key and start shaft into bevel gear in line with keyway or splines.
- (2) Press shaft squarely into bevel gear. Gear

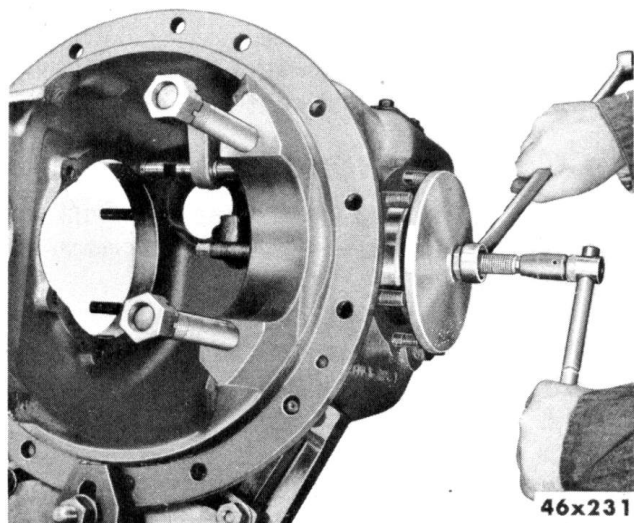


Fig. 121—Removing Differential Cross Shaft Cap Bearing Cup—Tool DD-967

must be pressed firmly against cross shaft shoulder. Install cap screws where used.

NOTE

To facilitate installation, the bevel gear may be heated in oil from 200 degrees to 250 degrees F.

- (3) Press bearing firmly against the cross shaft shoulder on spur gear end.
- (4) Press bearing firmly against the bevel gear, using a suitable sleeve.
- (5) Install bearing retaining plate and cap screws on bevel gear end. Tighten to correct torque and lock with soft wire.

103. INSTALLATION OF CROSS SHAFT ASSEMBLY

- (1) Lubricate cross shaft bearings and cups with *light machine oil*.
- (2) If bearing cover (bevel gear side) has been removed, install new gasket under original shim pack. Tighten stud nuts to the correct torque.
- (3) Ease cross shaft assembly past differential bearing supports and position in bearing cup (Fig. 122).
- (4) Install new gasket under original shim pack and start cross shaft bearing cage into carrier housing.
- (5) Tap cage into position with soft mallet. Install lock washers and stud nuts and tighten to the correct torque.
- (6) Rotate assembly several revolutions before checking bearing pre-load in order to assure full bearing contact.
- (7) Check cross shaft bearing pre-load torque. Wrap soft wire around pinion and pull on a horizontal line with pounds scale (Fig. 124).

Example: Assuming spur gear diameter to be 4 inches, the radius would equal 2 inches, and 8 pounds pull on the scale would equal 16 inch-pounds bearing pre-load torque.

Use rotating (not starting) torque.

- (8) To obtain the correct pre-load torque of

12 to 18 inch-pounds, add or remove shims from under bearing cage (side opposite bevel gear).

104. ASSEMBLY OF PINION AND CAGE ASSEMBLY (FIG. 125)

- (1) Press rear bearing squarely and firmly

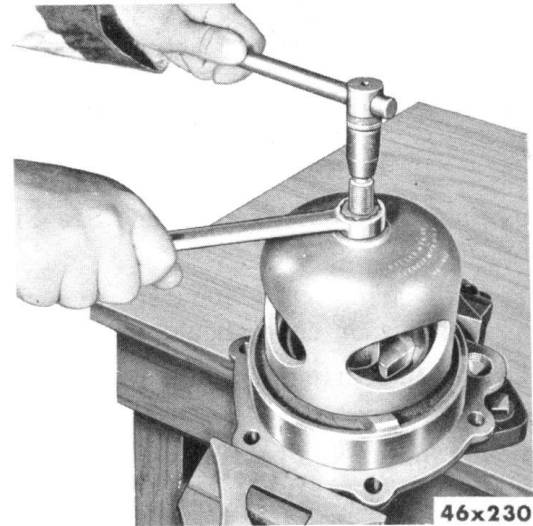


Fig. 122—Installing Differential Cross Shaft Cap Bearing Cup—Tool DD-966

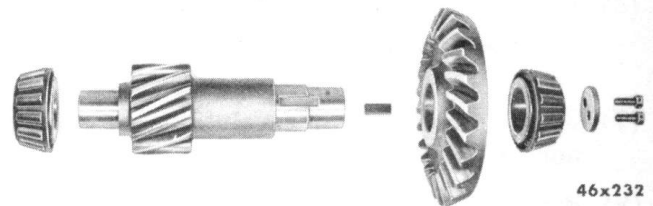


Fig. 123—Cross Shaft Assembly (Disassembled)

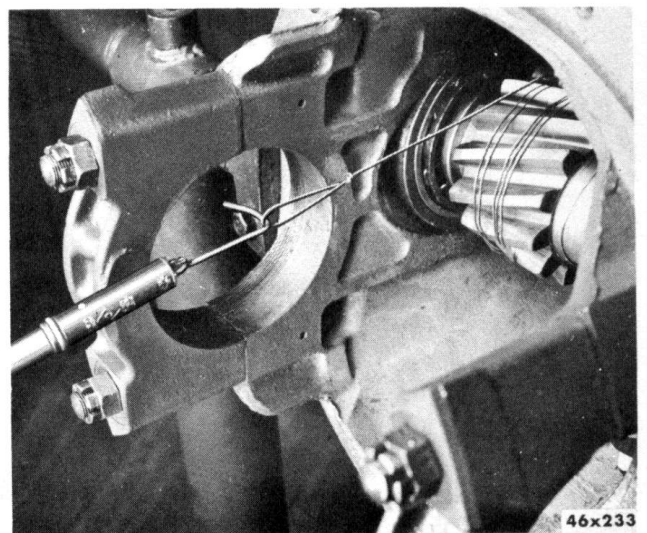
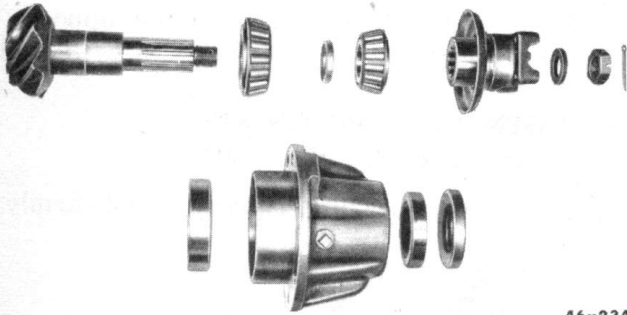


Fig. 124—Checking Cross Shaft Bearing Pre-Load

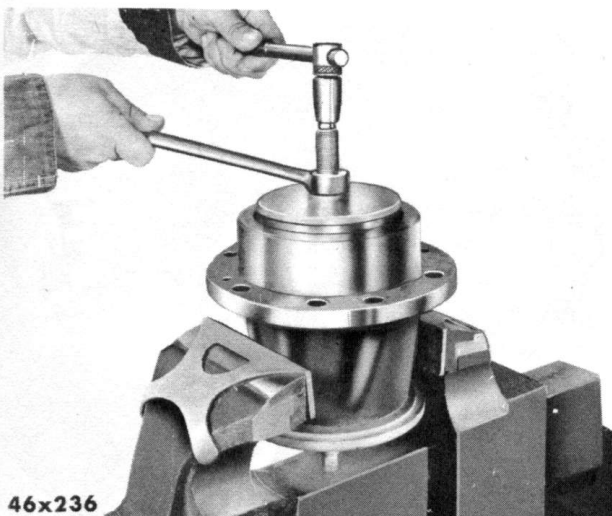


46x234

Fig. 125—Bevel Pinion and Cage Assembly
(Disassembled)

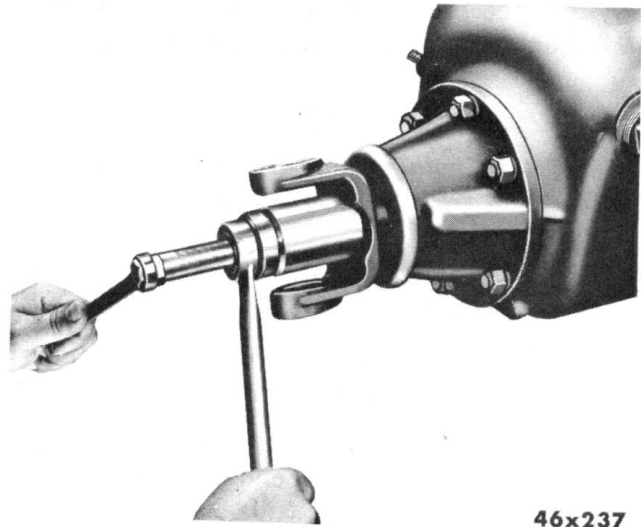
against pinion shaft shoulder. See Figure 52.

- (2) Press bearing cups squarely and firmly against pinion cage shoulders (Fig. 126).
- (3) Lubricate bearing and cups with light machine oil.
- (4) Insert pinion and bearing assembly in pinion cage.
- (5) Install selective spacer over pinion shaft with the bevel side toward the pinion shaft shoulder.
- (6) Press front bearing squarely and firmly against the selective spacer with a suitable sleeve.
- (7) Rotate cage several revolutions to assure normal bearing contact.
- (8) While in press under pressure, check pin-



46x236

Fig. 126—Installing Pinion Bearing Cups in Pinion Cage,
Tool DD-966



46x237

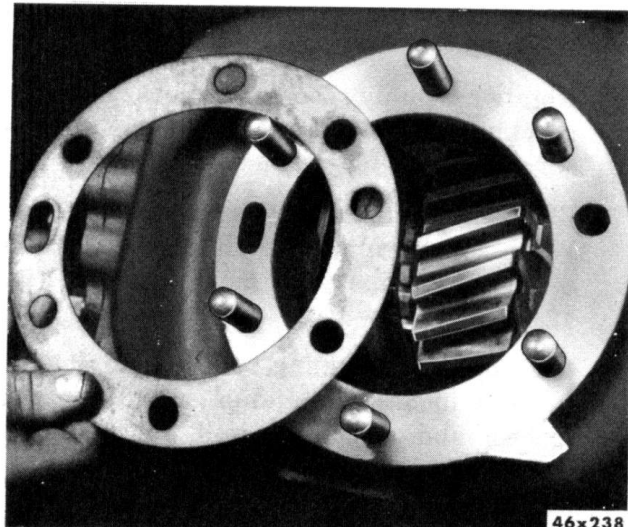
Fig. 127—Installing Universal Joint Yoke,
Tool DD-969

ion bearing pre-load torque (Fig. 54). Wrap soft wire around pinion cage and pull on horizontal line with a pound scale.

If a press is not available, the pre-load may be checked with yoke installed. Tighten the nut to the correct torque.

The correct pressures or torques for checking pinion bearing pre-loads are as follows:

| Pinion Shaft Thread Size | Required Pressure To Obtain Correct Pre-load | Required Torque To Obtain Correct Pre-load |
|-----------------------------|--|--|
| | 1 in. x 20 | 25,000 lbs. |
| 1¼ in. x 18 | 50,000 lbs. | 700-900 ft. lbs. |
| 1½ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1½ in. x 18 | 50,000 lbs. | 800-1100 ft. lbs. |
| 1¾ in. x 12 | 50,000 lbs. | 800-1100 ft. lbs. |



46x238

Fig. 128—Installing Pinion Cage to Carrier Housing
Gasket

Example: Assuming pinion cage diameter to be 6 inches, the radius would be 3 inches, and 6 pounds pull on the scale would equal 18 inch-pounds bearing pre-load torque.

Use rotating (not starting) torque. If rotating torque is not within 12 to 18 inch-pounds, use thinner spacer to increase bearing pre-load or thicker spacer to decrease bearing pre-load.

- (9) Lubricate pinion shaft oil seal. Coat outer edge of seal body with non-hardening sealing compound and press seal firmly against cage or cover shoulder. Install bearing cover when used with cap screws.
- (10) Reinstall yoke (Fig. 127). Tighten pinion shaft nut to the correct torque.

105. INSTALLATION OF PINION AND CAGE ASSEMBLY

NOTE

The oil passage holes in the carrier housing, gasket, shim pack and pinion bearing cage, must be aligned.

- (1) Install new gasket over carrier housing to cage studs (Fig. 128).
- (2) Install original shim pack over gasket.
- (3) Install pinion cage assembly, lock washers and stud nuts. Tighten to the correct torque.
- (4) If bevel gear set has been renewed, check gear lash with dial indicator (Fig. 129) and adjust to obtain .006 to .012 inch lash.
 - (a) To move pinion toward bevel gear, remove shims from pack under pinion cage.
 - (b) To move pinion away from bevel gear, add shims to pack under pinion cage.
 - (c) To move bevel gear away from pinion, remove shims from pack under cross shaft bearing cage (side opposite bevel gear) and add shims of equal thickness to pack under cross shaft bearing cover (bevel gear side). Shims should be transposed in this manner in order to maintain the established pre-load.
 - (d) To move bevel gear toward pinion, remove shims from pack under cross

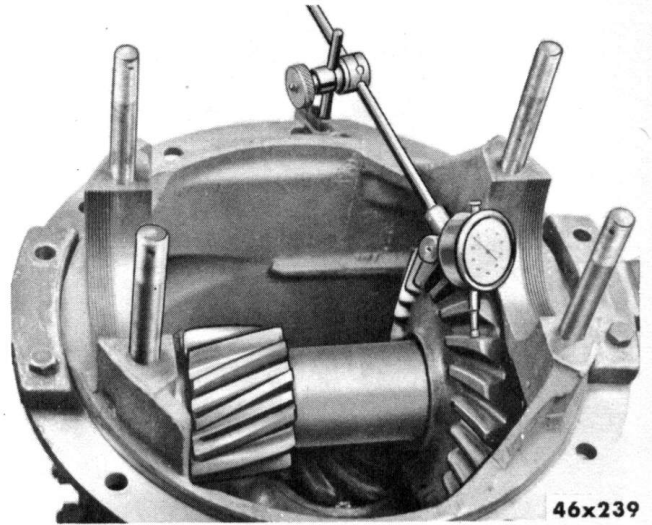


Fig. 129—Dial Indicator Used to Determine Gear Lash

shaft bearing cover (bevel gear side) and add shims of equal thickness to pack under cross shaft bearing cage (side opposite bevel gear). Shims should be transposed in this manner in order to maintain the established pre-load.

- (5) When correct gear lash is obtained, check and adjust as necessary to obtain correct tooth contact. Refer to Paragraph 79.

106. ASSEMBLY OF DIFFERENTIAL AND SPUR GEAR ASSEMBLY (FIG. 130)

NOTE

When a new spur gear or a new differential case is installed, the differential case holes must be line-reamed with the gear in order to assemble using correct size bolts.

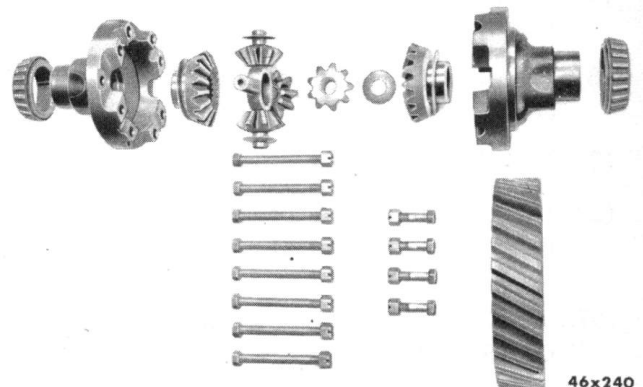


Fig. 130—Differential and Spur Gear (Disassembled)

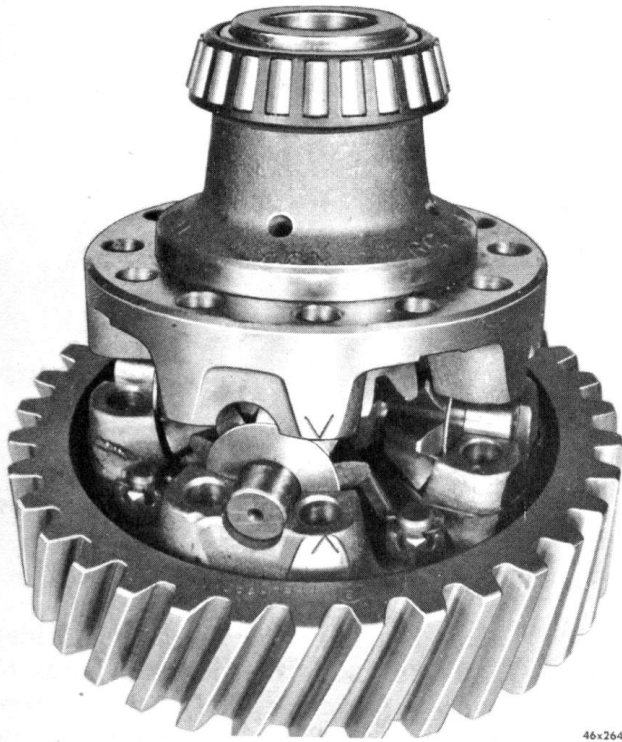


Fig. 131—Aligning Differential Mating Marks

- (1) Join spur gear to either differential case half with short bolts.
- (2) Lubricate differential case inner walls and all component parts with axle lubricant.
- (3) Install thrust washer and side gear in one of the case halves. Place spider with pinions and thrust washers in position. Install component side gear and thrust washer.
- (4) Align mating marks (Fig. 131), position component case half and draw assembly together with four long bolts (equally spaced).
- (5) Check assembly for free rotation of differential gears and correct if necessary.
- (6) Install remaining bolts and tighten to the correct torque.
- (7) Install lock wire.
- (8) Press differential bearings squarely and firmly on differential case halves.

107. INSTALLATION OF DIFFERENTIAL AND GEAR ASSEMBLY

- (1) Lubricate differential bearings and cups with axle lubricant.

- (2) Place cups over bearings and position assembly in carrier housing.
- (3) Insert bearing adjusting nuts and turn hand-tight against bearing cups.
- (4) Start bearing caps in the correct location as marked and tap lightly into position.

NOTE

If bearing caps do not position properly, adjusting nuts are cross-threaded. Remove caps and reposition the adjusting nuts. Forcing caps into position will result in serious damage to carrier housing.

- (5) Install flat washers (where used) and stud nuts.
- (6) Tighten snugly. Then, back off nuts sufficiently to turn bearing adjusting nuts.
- (7) Align spur gear with spur pinion by moving differential assembly with adjusting nuts.
- (8) Using dial indicator at side face of spur gear (Fig. 132), adjust differential assembly to zero end play in the differential bearings.
- (9) Rotate assembly several revolutions to assure normal bearing contact.
- (10) Recheck differential end play and readjust to zero if necessary.

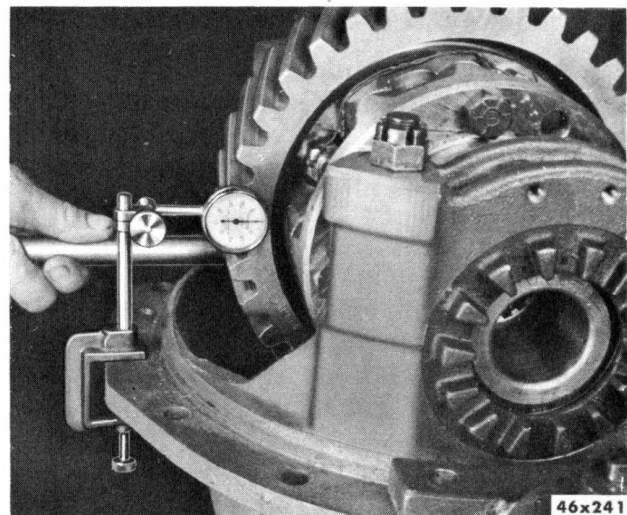


Fig. 132—Checking Spur Gear and Differential Assembly End Play

- (11) Check spur gear for runout with dial indicator. If runout exceeds .008 inch, remove differential assembly and check for cause.
- (12) Tighten adjusting nuts one notch each from zero end play in order to secure the correct differential bearing pre-load.
- (13) Tighten bearing cap stud nuts to the correct torque.
- (14) Install adjusting nut locks and cap screws. Tighten to the correct torque and install lock wire.

108. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT

For proper method of securing the correct tooth contact, refer to Paragraph 79.

109. SERVICE DIAGNOSIS

Refer to Paragraphs 115 through 126.

110. TANDEM ALIGNMENT

Correct tandem alignment is essential for satisfactory performance and maximum tire wear.

a. Aligning Lower Torque Rods for Parallel Alignment

To check and correct tandem alignment, proceed as follows:

- (1) Place the vehicle on a level floor and inflate all tires to the proper pressure.
- (2) Attach a straight edge to the frame, as shown in Figure 133. Make certain that it is square with the frame.
- (3) Using a plumb bob and gauge, as shown in Figure 133, mark the floor at points 1, 2, 3 and 4. Repeat this operation on the opposite side of the vehicle. The difference in measurements between the two sides of the vehicle should not exceed "A" $\frac{1}{16}$ inch, "B" $\frac{1}{8}$ inch, "C" $\frac{1}{8}$ inch and "D" $\frac{1}{4}$ inch.

If the axles are not within the allowable tolerance, the length of all lower torque rods should be checked.

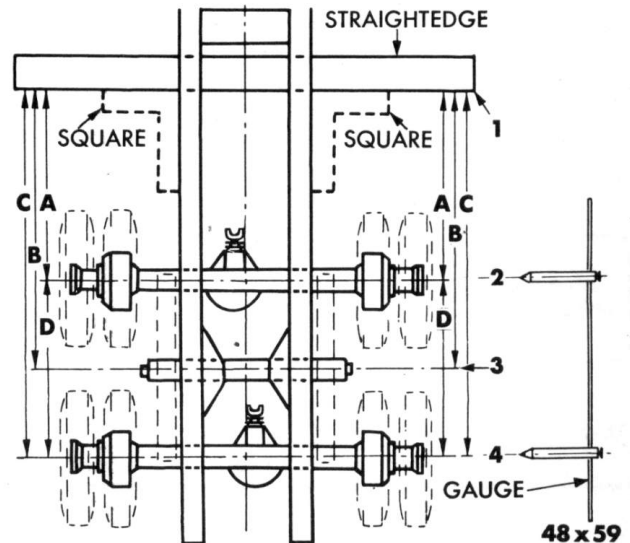


Fig. 133—Method for Checking Tandem Alignment (Typical View)

The difference in length of the two lower torque rods on either the forward or rear axles should not exceed $\frac{1}{16}$ inch. However, in certain instances, it may be necessary to use rods of slightly different lengths in order to align either of the two axles.

Misalignment, in some cases, can be corrected by transposing the torque rods. If satisfactory results cannot be obtained in this manner, it will be necessary to install one or more new torque rods of the correct length.

b. Adjusting Upper Torque Rods for Proper Universal Joint Flange Alignment

The angularity of the propeller shaft flanges is determined by the angle at which the engine is mounted in the chassis. Since the transmission is secured to the engine at the same angle as the engine, the universal joint flanges at the transmission and the front axle of the tandem axle unit are parallel with one another. In practically all instances, flange alignment can be checked, starting at the rear of the torque divider and working back, as outlined in the following steps:

- (1) Remove the propeller shaft between the transmission and front rear axle.
- (2) Remove the propeller shaft between the pillow block of the rear rear axle.

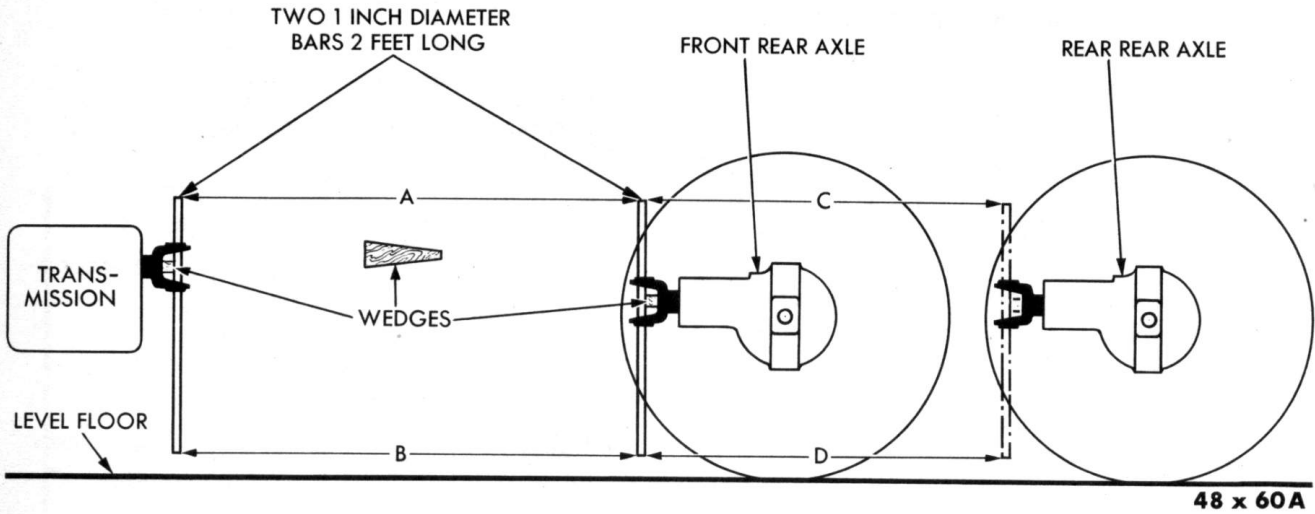


Fig. 134—Method of Checking Parallel Alignment of Universal Joint Yokes

- (3) With the propeller shafts removed, place a 1-inch bar exactly two feet long through the pin holes of each yoke, as shown in Figure 134. The bars should be extended the same distance above the floor.
- (4) With each bar properly installed, as shown

in Figure 134, drive a wedge between the yokes and the bar to hold the bar firmly and squarely against the shaft side of the hole.

- (5) Turn the yokes so that the extended bars are straight down.

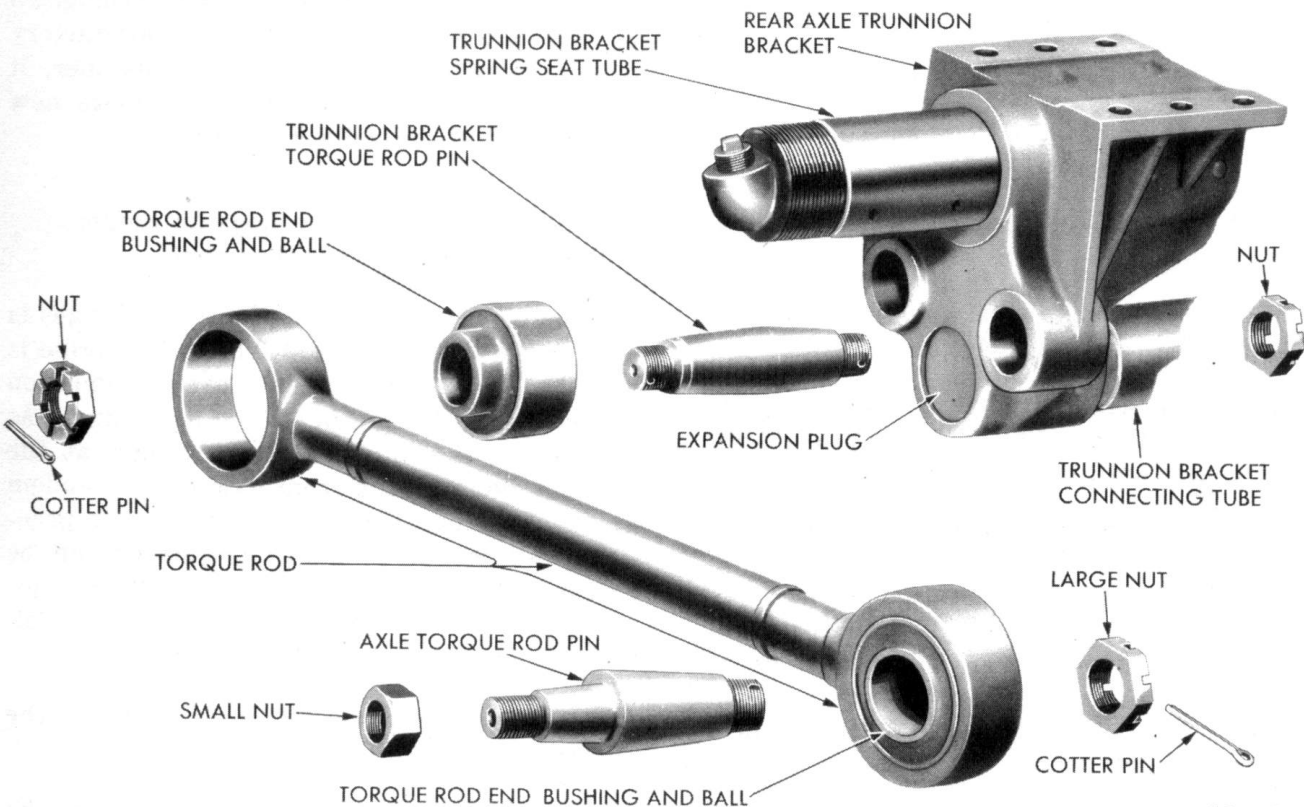


Fig. 135—Axle, Lower Torque Rod (Disassembled)

- (6) Measure the distance between the top of the bars at "A" and again at the bottom at "B". These measurements should be the same and should never differ more than $\frac{3}{16}$ inch. Should the difference in measurements be greater than $\frac{3}{16}$ inch, adjust the front upper torque rods until the measurements are within the allowable tolerance.

Next, measure the distance between "C" and "D" as described in steps (5) and (6). Should the difference in measurements be greater than $\frac{3}{16}$ inch, adjust the upper rear torque rods until the measurements are within the allowable tolerance.

- (7) Reinstall universal joints.

CAUTION

It should be noted that arrows are stamped on the splined end of each propeller shaft (one on the male end and the other on the female end). These arrows must be lined up exactly. One spline off either way may cause excessive vibration and universal joint failures.

111. REMOVAL AND INSTALLATION OF LOWER TORQUE RODS (FIG. 135)

a. Removal (Trunnion Bracket End)

- (1) Jack the frame up just enough to relieve the spring load.
- (2) Remove outer trunnion bracket torque rod pin nut.
- (3) Install a suitable puller, as shown in Figure 136 and remove the torque rod.

b. Removal (Axle Housing End)

- (1) Remove the small torque rod pin nut from the axle housing bracket side of the pin.
- (2) Install a suitable fork type tapered wedge, as shown in Figure 136, drive the wedge in between the lower bracket and the shoulder of the pin until the pin and the torque rod can be removed as one unit.

c. Removal of Lower Torque Rod End Bushing and Ball

- (1) Place a suitable sleeve over the outer edge of the metal portion of the bushing and press out bushing.

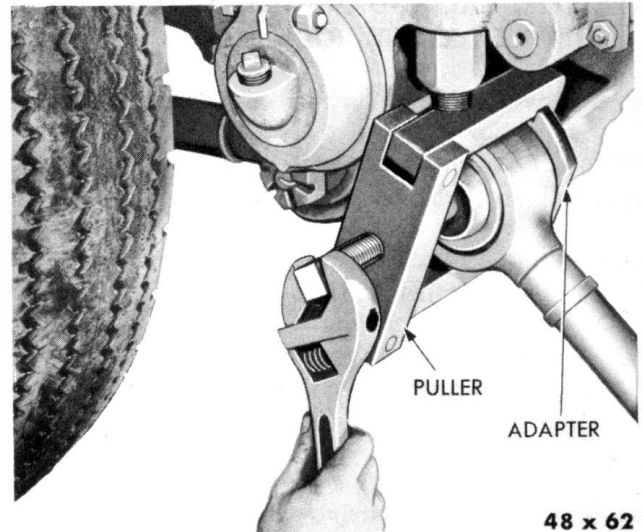


Fig. 136—Removing Lower Torque Rod from Trunnion Bracket—Puller DD-1090

- (2) Repeat the preceding operation to remove the end bushing and pin from the opposite end of the torque rod. To remove the pin from the bushing, straddle the inner metal edge of the bushing and press the pin out.

Should it be necessary to replace the trunnion bracket pin, remove the inner nut and drive the pin out.

d. Installation

- (1) Insert pin in trunnion bracket and install inner nut. Tighten nut to the specified torque. Refer to the Tightening Reference.
- (2) Install torque rod and bushings in the same manner as when removed. Refer to paragraph *c* step (1). Be certain that the taper in the bushings coincides with the taper of the pins.
- (3) Insert pin in the axle housing end of the torque rod and install nut.
- (4) Position torque rod on trunnion bracket pin, and insert the pin on the opposite end of the torque rod in the axle housing bracket.
- (5) Install both pin nuts and tighten to the specified torque. Refer to the Tightening Reference.

112. REMOVAL AND INSTALLATION OF UPPER TORQUE RODS (FIG. 137)

a. Removal (Frame Torque Rod Bracket End)

With the frame raised sufficiently to relieve the spring load, proceed as follows:

- (1) Remove nut, lock washer and pin key. Refer to Figure 137.
- (2) Remove the torque rod pin cap screw and install a suitable puller, as shown in Figure 138, and remove the pin.

b. Removal (Axle Housing End)

- (1) Remove the wheel and tire assemblies if necessary and remove nut and washer from the axle housing bracket end of the torque rod pin.
- (2) Insert a suitable fork type tapered wedge between the housing bracket and the shoulder of the pin and remove the torque rod and pin assembly, as shown in Figure 139.

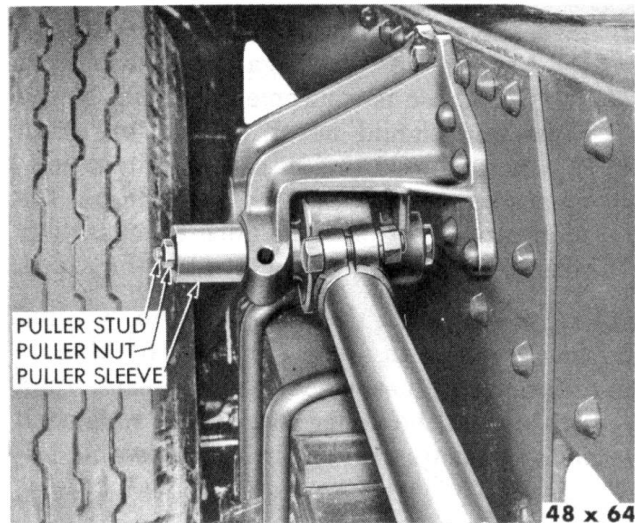


Fig. 138—Removing Frame Bracket Upper Torque Rod Pin—Puller DD-1094

c. Removal of Upper Torque Rod End Bushings and Ball

For removal of the lower torque rod end bushings, refer to Paragraph 111.

d. Installation

If the upper torque rod end bushings were re-

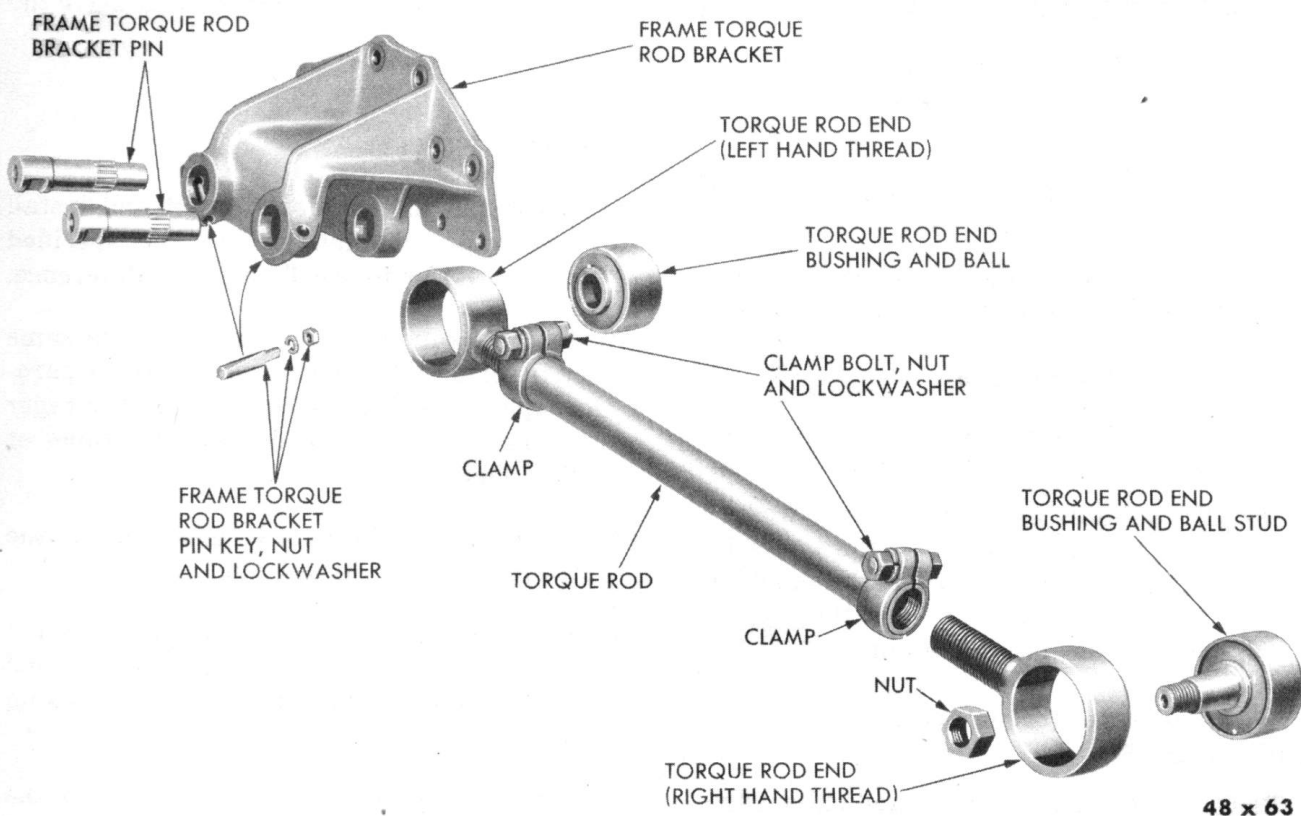


Fig. 137—Axle, Upper Torque Rod (Disassembled)

moved for any reason, replace them with new ones. Install end bushings in the same manner as when removed.

- (1) Position the torque rod in the upper frame bracket and insert pin. Be certain that the serrations on the pin are properly aligned with the end bushing serrations.
- (2) Install pin cap screws, bracket pin key, lock washer and nut.
- (3) Insert the pin located in the opposite end of the torque rod, in the axle housing bracket. Install lock washer and tighten to the specified torque. Refer to the Tightening Reference.
- (4) Install wheels, if removed and lower the jack.

113. REMOVAL AND INSTALLATION OF SPRING

a. Removal

The spring is mounted on the trunnion bracket spring seat and is secured to the seat by two "U" bolts and two clamp bracket bolts. Either end of spring is positioned through a bracket mounted on the axle housing.

To replace the spring, proceed as follows:

- (1) Jack up the frame enough to remove the rear axle upper and lower torque rods.
- (2) Disconnect the air brake lines from the rear axle housing and the propeller shaft. Roll the rear axle assembly back out of the way.
- (3) Remove the two spring "U" bolts and loosen the two bracket clamp bolts.
- (4) Raise the spring assembly out of the trunnion bracket spring seat and pull out towards the rear of the vehicle.

b. Installation

- (1) Install spring assembly in a like manner as when removed.
- (2) Install "U" bolts and roll rear axle back into position, guiding the rear end of the spring into position at the same time.
- (3) Install upper and lower torque rods and tighten nuts to the specified torque.

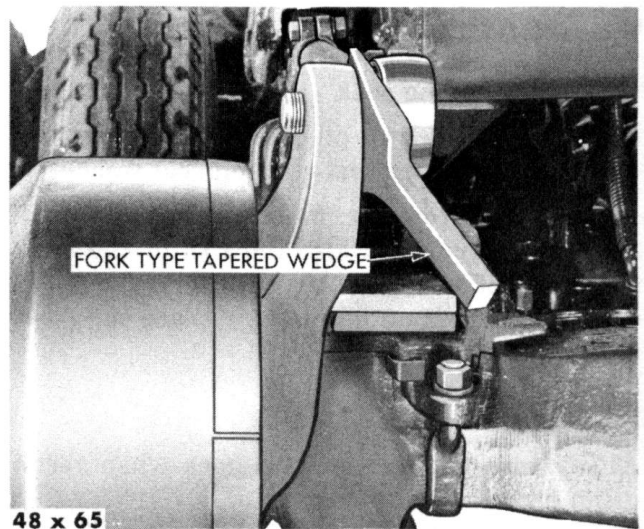


Fig. 139—Removing Upper Torque Rod (Axle Housing End) Fork, DD-1091

- (4) Install air brake lines and propeller shaft.
- (5) Lower jack, tighten securely the "U" bolts and spring seat clamp bolts.

114. REMOVAL AND INSTALLATION OF TRUNNION BRACKET SPRING SEAT ASSEMBLY

a. Removal

- (1) Remove spring assembly as described in Paragraph 113.
- (2) Remove trunnion bracket spring seat adjusting nut clamp bolt and lock plate (Fig. 140).

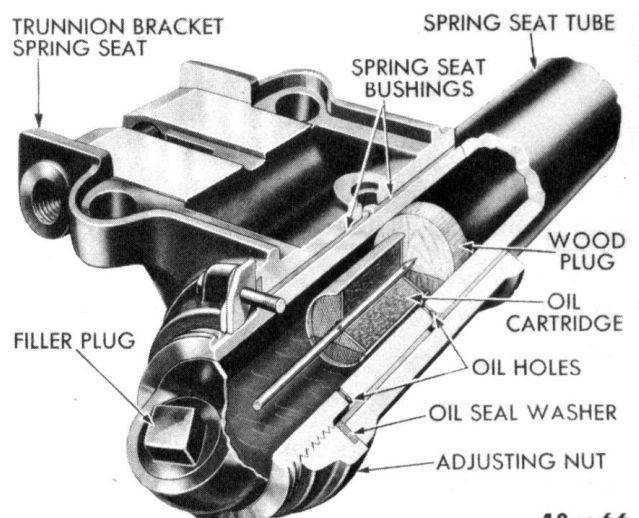


Fig. 140—Trunnion Bracket Spring Seat Assembly (Cutaway View)

- (3) Remove spring seat tube adjusting nut and the adjusting nut oil seal washer and slide off the spring seat.
- (4) Remove the two oil seal retainer washers and the spring seat tube oil seal washer.

Using a micrometer, measure the O.D. of the spring seat tube and also the I.D. of the trunnion bracket spring seat bushings. If the difference is in excess of .025 inch, replace the bushings.

b. Installation

Always use new oil seal washers when reconditioning the spring seat.

- (1) Install the two oil seal retainer washers and oil seal.
- (2) Install the trunnion bracket spring seat.

- (3) Install the adjusting nut oil seal washer and adjusting nut.
- (4) Install spring assembly as described in Paragraph 113.
- (5) Tighten the spring seat tube adjusting nut firmly to compress the packing.
- (6) Align split in the spring seat tube adjusting nut with tube slot. Insert lock, install clamp bolt, lock washer and nut and tighten securely.

Normally, this will allow clearance between the trunnion bracket spring seat and the trunnion bracket. Therefore, it is advisable after 3000 to 5000 miles, to readjust as required to permit free rotation with the minimum of end play.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES — REMEDIES

115. REAR WHEEL NOISE

Possible Causes

- a. Wheel loose on axle shaft.
- b. Worn drum or axle shaft keyways.
- c. Wheel hub bolts loose.
- d. Insufficient bearing lubrication.
- e. Scored wheel bearing cup or cone.
- f. Defective, brinelled wheel bearing.
- g. Excessive axle shaft end play.

Remedies

- a. Check keyways for possible damage; re-set drum and tighten nut to specified torque.
- b. If keyways in hub and axle shaft show excessive wear and damage, replace hub and axle shaft.
- c. Tighten loose wheel hub bolts.
- d. Check bearings for possible damage and replace if necessary. Refer to Lubrication section for proper lubrication.
- e. Check rear wheel bearings. If scored or worn, replace.

f. Defective or brinelled bearings must be replaced. Check rear axle shaft end play.

g. Readjust axle shaft end play.

116. REAR AXLE DRIVE SHAFT NOISY

Possible Causes

- a. Misaligned axle housing.
- b. Bent or sprung axle shaft.
- c. End play in drive pinion bearings.
- d. Excessive gear lash between ring gear and pinion.
- e. Improper adjustment of drive pinion shaft bearings.
- f. Loose drive pinion companion flange nut.
- g. Improper wheel bearing adjustment.
- h. Scuffed gear tooth contact surfaces.

Remedies

- a. Inspect rear axle housing alignment. Correct as necessary.
- b. Replace bent or sprung axle shaft.
- c. Refer to Pinion Bearing Pre-Load, Paragraph 6 in this section.

d. Check adjustment of ring gear and pinion. Correct as necessary.

e. Adjust pinion bearings.

f. Tighten drive pinion flange nut to specified torque of 180 to 320 foot-pounds.

g. Check axle shaft end play. Readjust as necessary.

h. If necessary, replace scuffed gears. For Correct Tooth Contact, refer to Paragraph 79 in this section.

117. REAR AXLE DRIVE SHAFT BREAKAGE

Possible Causes

- a. Improperly adjusted wheel bearings.
- b. Misaligned axle housing.
- c. Vehicle overloaded.
- d. Abnormal clutch operation.
- e. Grabbing clutch.
- f. Normal fatigue.

Remedies

a. Replace broken shaft and readjust end play.

b. Replace broken shaft after correcting rear axle housing alignment.

c. Replace broken shaft. Avoid excessive weight on truck.

d. Replace broken shaft after checking for other possible causes. Avoid erratic use of clutch.

e. Replace broken shaft. Inspect clutch and make necessary repairs or adjustments.

f. Replace broken shaft. Inspect to determine causes of fatigue.

118. DIFFERENTIAL CASE BREAKAGE

Possible Causes

- a. Improper adjustment of differential bearings.
- b. Excessive ring gear clearance.
- c. Vehicle overloaded.

d. Erratic clutch operation.

Remedies

a. Replace broken case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings.

b. Replace broken case; examine gears and bearings for possible damage. At reassembly, adjust ring gear and pinion backlash.

c. Replace broken case; examine gears and bearings for possible damage. Avoid excessive weight on truck.

d. Replace broken case. After checking for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.

119. DIFFERENTIAL SIDE GEAR BROKEN AT HUB

Possible Causes

- a. Excessive axle housing deflection.
- b. Misaligned or bent axle shaft.
- c. Worn thrust washers.

Remedies

a. Replace damaged gears. Examine other gears and bearings for possible damage. Check rear axle housing alignment.

b. Replace damaged gears. Check axle shafts for alignment. Examine other gears and bearings for possible damage.

c. Replace damaged gears. Examine other gears and bearings for possible damage. Replace thrust washers that are badly worn.

120. SCORING OF DIFFERENTIAL GEARS

Possible Causes

- a. Insufficient lubrication.
- b. Improper grade of lubricant.
- c. Excessive spinning of one wheel.
- d. Excessive loads.

Remedies

a. Replace scored gears. Scoring marks on the pressure face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. *Scored gears should be replaced.* Fill rear axle to required capacity with proper lubricant. See Lubrication section.

b. Replace scored gears. Inspect all gears and bearings for possible damage. Clean out and refill axle to required capacity with proper lubricant. See Lubrication section.

c. Replace scored gears. Inspect all gears, pinion bores and shaft for scoring, or bearings for possible damage. Service as necessary.

d. Replace scored gears. Inspect all gears, bearings, pinion bores and shaft for scoring or possible damage. Avoid excessive weight on truck.

121. TOOTH BREAKAGE (RING GEAR AND PINION)*Possible Causes*

- a. Overloading.
- b. Erratic clutch operation.
- c. Ice-spotted pavements.
- d. Normal fatigue.
- e. Improper adjustment.

Remedies

a. Replace Gears. Examine other gears and bearings for possible damage. Replace parts as needed. Avoid overloading of truck.

b. Replace gears, and examine remaining parts for possible damage. Avoid erratic clutch operation.

c. Replace gears. Examine remaining parts for possible damage. Replace parts as required.

d. Replace gears. Examine broken parts to determine cause of normal fatigue.

e. Replace gears. Examine other parts for possible damage. Make sure ring gear and pinion backlash is correct.

122. REAR AXLE NOISE

Rear axle noises are generally divided into three groups:

(1) *Gear Noise on Pull*—If the noise is of heavy pitch and increases as the car speed is increased, it is an indication of scored teeth due to loss of lubricant, incorrect mesh of teeth or use of wrong type of lubricant.

(2) *Gear Noise on Coast*—If noise is heavy and irregular, it is an indication of scored teeth, and has resulted from excessive end play in pinion bearings or from incorrect adjustments.

(3) *Bearing Noise on Pull or Coast*—This noise indicates that the rear pinion bearings are chipped, cracked, scored, badly worn, or loose, or that the pinion is improperly positioned. Bearings that are badly worn or broken will produce a gravelly, rough, grating sound that may change slightly in volume as speed changes.

Possible Causes

- a. Insufficient lubricant.
- b. Improper ring gear and pinion adjustment.
- c. Unmatched ring gear and pinion.
- d. Worn teeth on ring gear or pinion.
- e. Loose drive pinion bearings.
- f. Loose differential gear bearings.
- g. Misaligned or sprung ring gear.
- h. Loose carrier housing bolts.

Remedies

a. Refill rear axle with correct amount of the proper lubricant. See Lubrication section. Also check for leaks and correct as necessary.

b. Check ring gear and pinion tooth contact.

c. Remove unmatched ring gear and pinion. Replace with a new matched gear and pinion set.

d. Check teeth on ring gear and pinion for contact. If necessary, replace with new matched set.

e. Adjust drive pinion bearings.

f. Adjust differential gear bearings.

g. Check ring gear for runout.

h. Tighten carrier housing nuts to required torque. See Service Standards. Also, check for oil leaks and correct as necessary.

123. KNOCKS

Check for defective bearings, chipped gear teeth or metal chips lodged between differential ring gear and pinion. If knocks occur only when axle gears are set in slow speed, inspect planetary gears for chipped teeth or foreign particles.

124. BACKLASH

Before checking rear axle for excessive backlash, make certain that all other causes of backlash have been eliminated. These causes include :

- (1) Engine not operating properly. The engine must be properly tuned up.
- (2) Clutch disc loose on clutch shaft.
- (3) Excessive play in transmission gears.
- (4) Universal joints worn or flanges loose on shaft.

Also, check rear axle for :

- (1) Axle drive shaft flanges loose on hubs.
- (2) Excessive clearance between differential ring gear and pinion.

125. LOSS OF LUBRICANT

Possible Causes

- a.* Lubricant level too high.
- b.* Worn axle shaft oil seals.
- c.* Cracked rear axle housing.
- d.* Worn drive pinion oil seal.
- e.* Scored and worn companion flange.

Remedies

a. Drain excess lubricant by removing filler plug and allow lubricant to level at lower edge of filler plug hole.

b. Replace worn oil seals with new ones. Prepare new seals before replacement.

c. Refer to Arc Welding Rear Axle Housing, Paragraph 8, in this section.

d. Replace worn drive pinion oil seal with a new one. Prepare new oil seal before replacement.

e. Replace worn or scored companion flange and oil seal. Prepare new oil seal before replacement.

126. OVERHEATING OF UNIT

Possible Causes

- a.* Lubricant level too low.
- b.* Incorrect grade of lubricant.
- c.* Bearings adjusted too tightly.
- d.* Excessive wear in gears.
- e.* Insufficient ring gear in pinion clearance.

Remedies

a. Refill rear axle.

b. Drain, flush and refill rear axle with correct amount of the proper lubricant. See Lubrication section.

c. Readjust bearings.

d. Check gears for excessive wear or scoring. Replace as necessary.

e. Readjust ring gear and pinion backlash and check gears for possible scoring.

REPORT

TO THE SERVICE MANAGER:

If you have had a condition not covered in this Manual, we would appreciate your advising us, (1) The type of condition, (2) The possible cause or causes, (3) Your remedy for the condition that existed.

The information you supply will be of considerable help to us in preparing future editions of this Manual.

Mail to the Dodge Division, Chrysler Corporation, Attention: Service Department, Detroit 31, Michigan.

Please Print or Use Typewriter

(Be As Brief As Possible)

1. CONDITION: _____

2. POSSIBLE CAUSE OR CAUSES: _____

3. REMEDY: _____

Dealer _____

City _____ State _____

TEAR ALONG DOTTED LINE

