SECTION 4
AXLE, REAR

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

NOTES

AXLE, REAR

SERVICE STANDARDS

MODEL →	1-08AD 1-08AF 1-08AS	2-26AD 2-26AF 2-26AS	2-33AD 2-33AF 2-33AS	3-59AD 3-59AF 3-59AS	6-71AD 6-71AF 6-71AS	8-65AD 8-65AF 8-65AS	8-71AD 8-71AF 8-71AS	8-71AD-D 8-71AF-D 8-71AS-D
Single — Speed Reduction Axles .. .. TYPE	Semi-Floating Hypoid	Full Floating Hypoid	Full Floating Hypoid	Full Floating Spiral Bevel	Full Floating Hypoid	Full Floating Hypoid	Full Floating Hypoid	
RATIO	4.1-1	4.3-1	4.89-1	5.85-1	6.66-1	6.66-1	6.66-1	
Two-Speed Reduction Axles .. Type	—	—	—	—	* Full Floating Spiral Bevel	* Full Floating Spiral Bevel	* Full Floating Spiral Bevel	Full Floating Spiral Bevel
Ratios	—	—	—	—	6.14-1 8.54-1	6.14-1 8.54-1	6.14-1 8.54-1	6.14-1 8.54-1
Drive Gear Pinion Back Lash	.006" to .008"	.006" to .008"	.006" to .008"	.006" to .008"	.008" to .014"	.008" to .014"	.008" to .014"	.006" to .016"
Axle Shaft End Play	.003" to .008"	—	—	—	—	—	—	—
Drive Pinion Bearing Pre-load	15 to 20 in.-lbs	15 to 20 in.-lbs	15 to 20 in.-lbs	.002"	12 to 18 in.-lbs.	12 to 18 in.-lbs.	12 to 18 in.-lbs.	8 to 15 in.-lbs.
Type of Adjustment	Shims	Shims	Shims	Shims	Shims	Shims	Shims	Shims
Differential Side Gear and Pinion Clearance	.004" to .012"	.004" to .018"	.004" to .018"	.010" to .015"	.006" to .012"	.006" to .012"	.006" to .012"	.010" to .015"
Differential Side Bearing Spread	.010" to .012"	.010" to .012"	.010" to .012"	.010" to .012"	.002" to .005"	.002" to .005"	.002" to .005"	

*Optional Equipment.

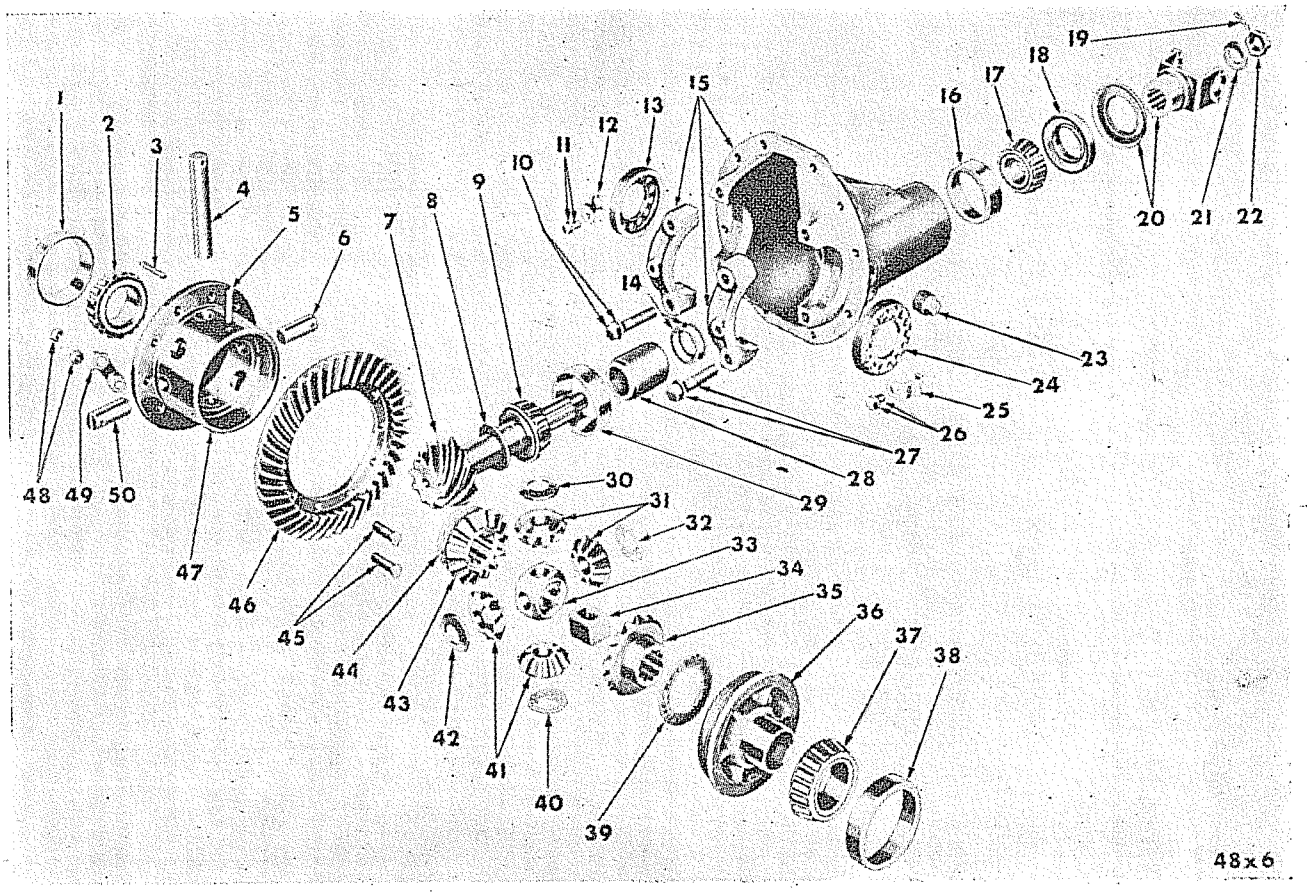


Fig. 1—Rear Axle Differential (Disassembled View) (1-08A).

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

AXLE, REAR

The rear axles (furnished as Standard or Special equipment) 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, and 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 in neutral position. Mark one of the rear tyres with chalk. Also place a chalk mark on the propellor shaft.

Roll the truck forward so the rear wheels make exactly one revolution. At the same time have a helper count accurately the number of revolutions of the propellor shaft, using the chalk mark as a guide. For example, if the propellor shaft makes $4\frac{3}{4}$ revolutions to one revolution of the rear wheels, the approximate gear ratio is 4·75 to 1.

TIGHTENING REFERENCE

PART NAME	TORQUE (Foot Pounds)
Rear axle shaft nut	142 minimum
Differential housing to axle housing 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

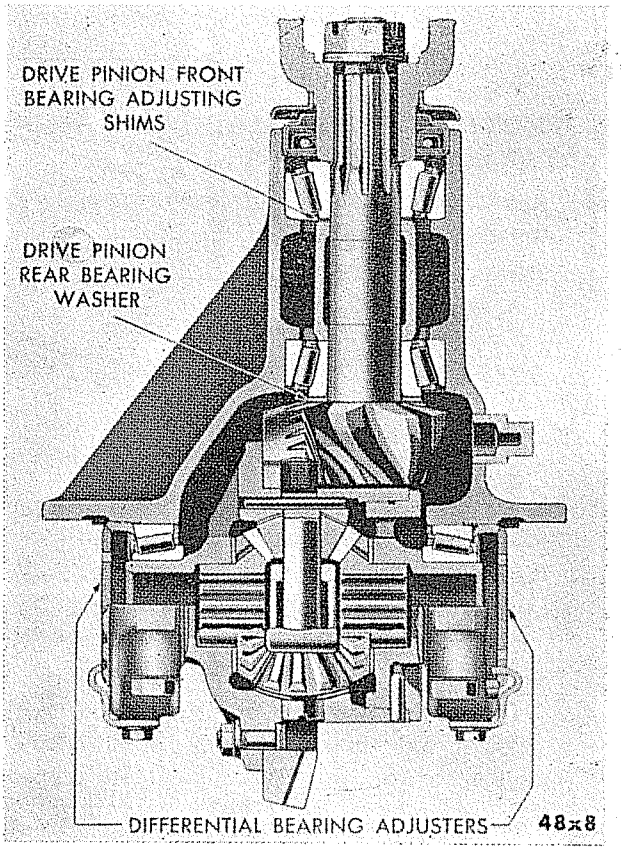


Fig. 2—Rear Axle Differential (Assembled View) 1-08A

SINGLE-SPEED HYPOID REAR AXLE (SEMI-FLOATING)

Model 1-08A

Refer to Figure 1

2. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT AND BEARING.

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

Caution.

Do not strike the end of the axle shaft to loosen the hub because of possible damage to axle roller bearings.

(2) Block 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 instal special sleeve C-757 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 the axle housing to maintain the central location of axle shafts and wheels. When a carrier axle shaft or bearing is 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, Figure 5.

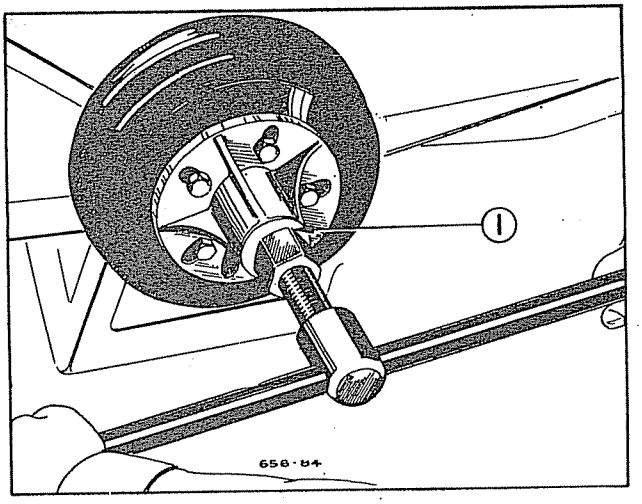


Fig. 3—Removing Rear Hub—Tool C-675.
1 — Hub Puller—C319

Caution.

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

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

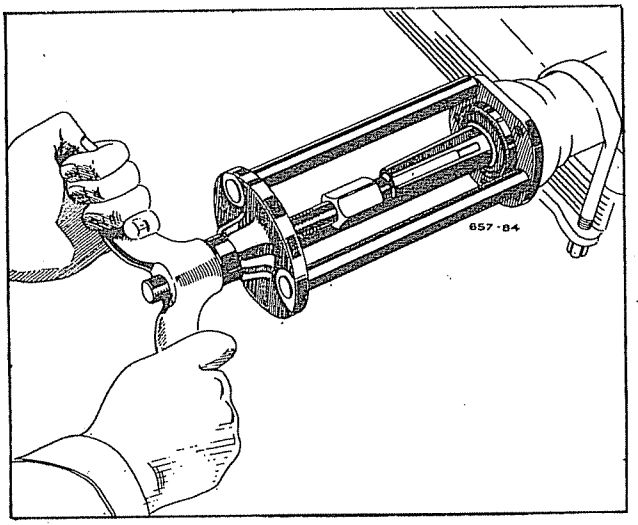


Fig. 4—Removing Axle Drive Shaft and Bearing—Tool C-158.

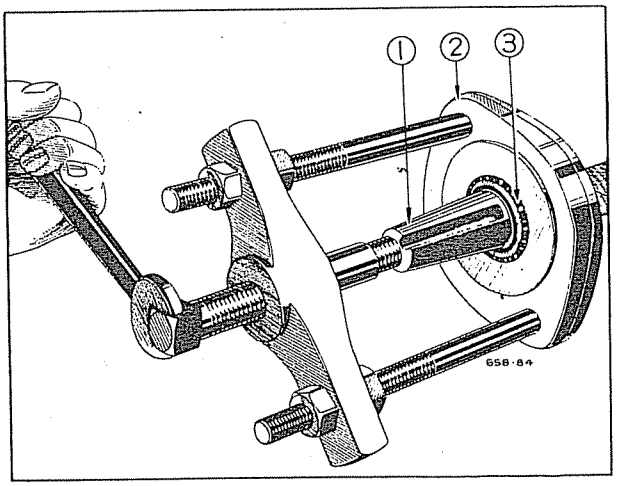


Fig. 5—Removing Bearing from Axle Drive Shaft.
1 — Axle drive shaft 2 — Tool C-293-D 3 — Bearing

(1) Drive out the old seal and remove the burrs from the support plate to prevent damaging new seal.

(2) Soak the new seal in thin oil for about 30 minutes. Then, work the leather until pliable by rolling it with a smooth bar (Figure 18).

Note: No preparation is required if a synthetic oil seal is used.

(3) Instal the seal in the brake support so that the the outside of the seal is towards the outside of the break support. Stake seal in 3 places.

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 brake line and bleed the brakes.

3. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY.

(1) Drain oil from differential.

(2) Remove both axle shafts.

(3) Disconnect rear universal joint and drop pellor shaft.

(4) Remove cap screw 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.

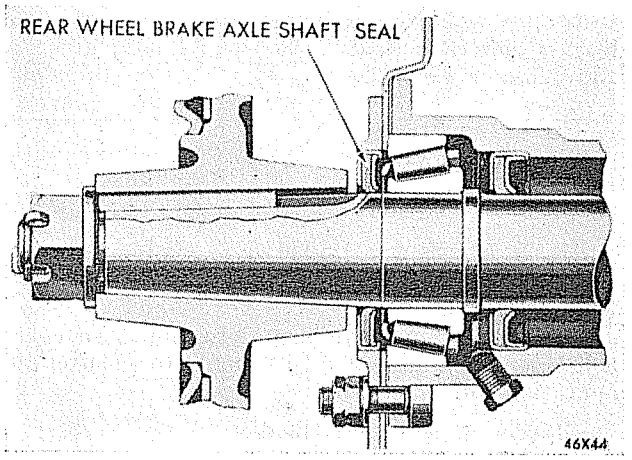


Fig. 6—Rear Wheel Bearing Outer Oil Seal.

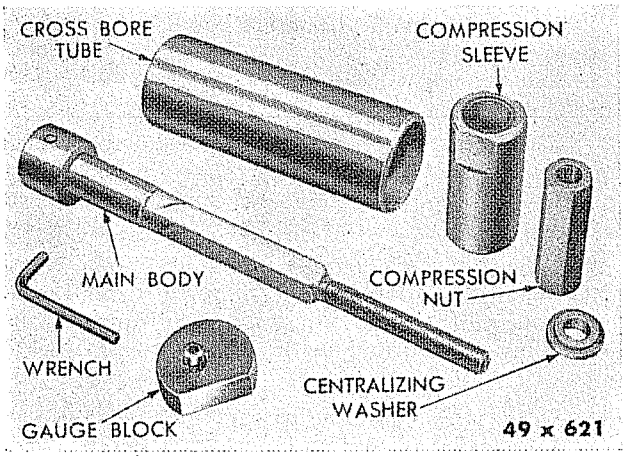


Fig. 7—Special Tool Set C-758-D.

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. (Figure 35).

(2) Loosen differential bearing cap screws, and then loosen bearing adjusters, as shown in Figure 35, to relieve load on bearings. Remove caps and bearing adjusters.

When installing differential on carrier, place bearing caps against bearings and instal 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 ring gear off.

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.

6. DISSASSEMBLY AND ASSEMBLY OF DIFFERENTIAL (RING GEAR REMOVED).

(1) Mount differential case ring gear flange in a heavy vice using copper jaws..

(2) Remove bearing from differential (case cap side only).

(3) Remove differential case cap locking pins by centre punching and drilling. Remove shells of pins left in holes, with a punch, as shown in Figure 32.

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

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

Keep flame moving to ensure even heating.

Try a piece of ordinary solder on case frame from time to time, and when solder just starts to melt (360°-400°F) the case is as hot as you can get it without damaging inside washers.

Remove cap, as shown in Figure 33, jar cover loose by means of a smart blow on wrench handle, using a heavy hammer. Then, quickly unscrew cap using wrench. The parts now should be immersed in oil to cool them for subsequent handling.

(1) Remove differential pinion shaft lock pins by driving them out of case with a hammer and punch (Figure 34).

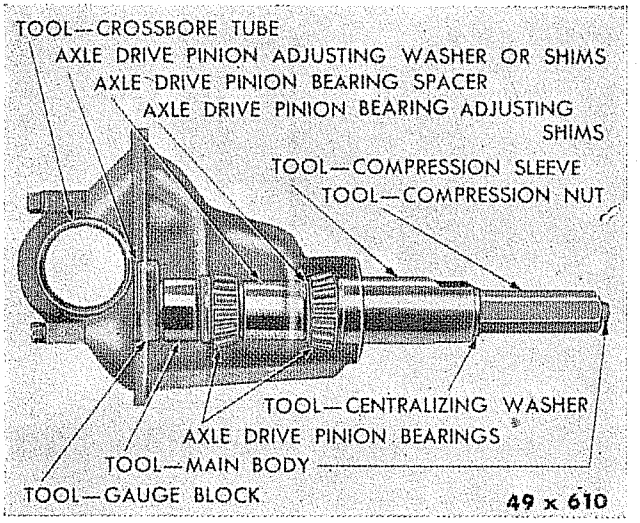


Fig. 8—Main Body, Bearings, Spacer and Shims Installed.

(2) Push differential pinion shaft out of differential case. The gears, thrust washers and axle shaft thrust block will then be loose and can be lifted out of case.

When assembling, coat parts with differential lubricant to facilitate holding them in place until thrust block and differential pinion shaft are installed.

Be sure to peen over outside edge of each hole to lock pin in place. Heat case as outlined, and instal case cap, tightening it rigidly. Drill new $\frac{1}{4}$ inch holes through cap and instal new (unused) locking pins.

(1) Instal ring gear, tighten attaching bolts and close locks around nuts.

(2) Instal 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 35.

(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 ensure proper seating of rollers, cups and adjusters.

Bearings that are installed without pre-loading, would allow the pinion to "walk" under operating loads. This causes a variation in the tooth contact pattern, results in excessive wear and scoring of gears, and is usually accompanied by noise.

Bearings that are compressed too tightly are apt to "burn up" under a driving load or the bearings may score or flake resulting in premature axle failure.

Add or remove bearing shims until correct pre-load is obtained. Bearing pre-load should give from 15 to 20 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, as shown in Figure 9.

7. REAR AXLE ADJUSTMENT. (Using Special tool C-758-D, see Figure 7).

Four main steps have been determined for correct ring gear and pinion adjustment, to ensure 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 labour incurred by the trial and error method.

(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, as shown in Figure 8.

(c) Place compressing sleeve, centralizing washer and compression nut over main body and tighten to 180 to 320 foot pounds, as shown in Figure 10.

(d) Remove torque wrench, and with a speed wrench, spin body to seat bearings.

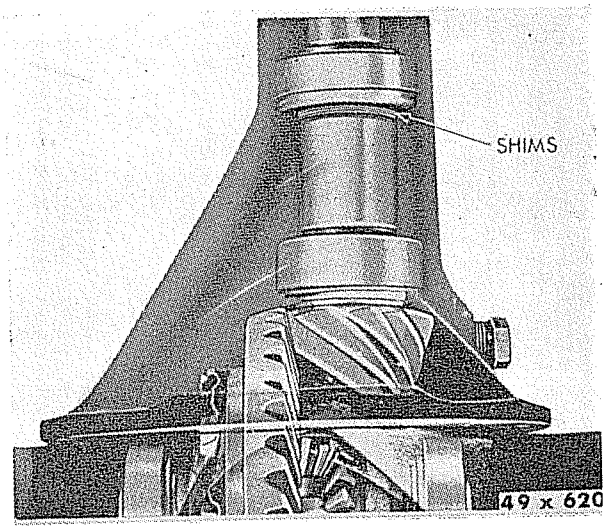


Fig. 9—Pinion Bearing Pre-Load.

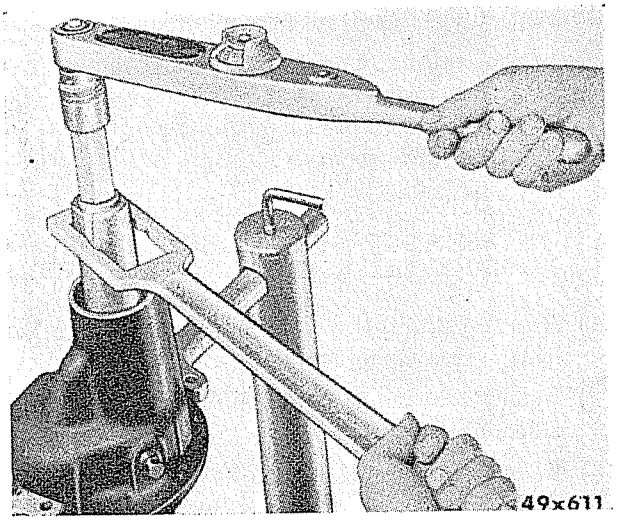


Fig. 10—Tightening Compression Nut with Foot—Pound Torque Wrench.

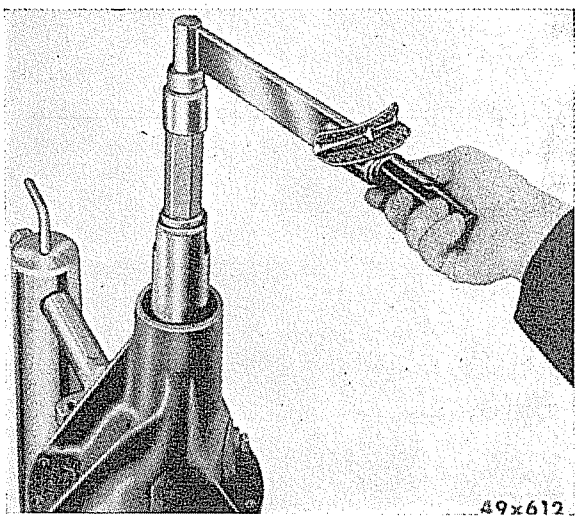


Fig. 11—Checking Torque Required to Turn Main Body.

(e) Use an inch-pound wrench to read the torque required to turn main body, as shown in Figure 11. Desired torque should be from 15 to 20 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 (Figure 12). (Gauge block takes place of drive pinion gear).

(b) Assemble cross bore gauge bar to carrier bearing supports (Figure 13). 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 14.

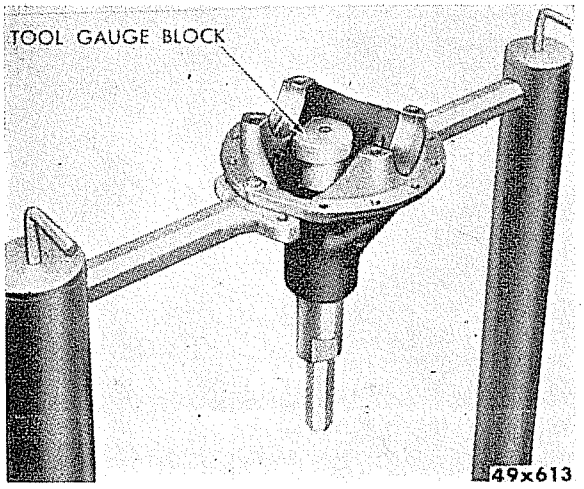


Fig. 12—Installing Gauge Block on Main Body.

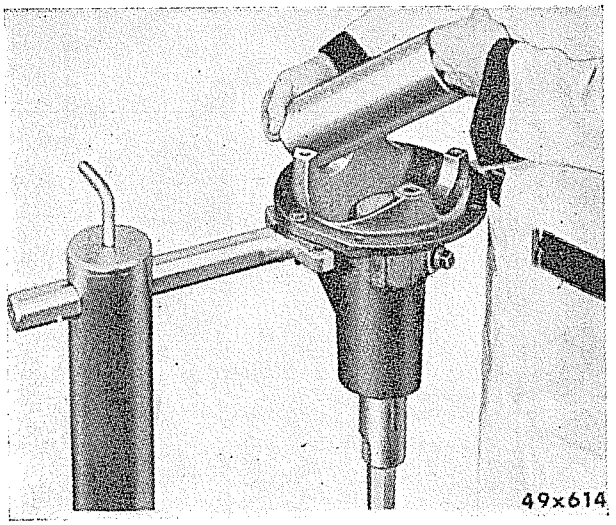


Fig. 13—Installing Cross Bore Gauge Bar.

(3) Differential Bearing Pre-load and Back-lash.

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.

(a) Place differential and ring gear assembly 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 about 85 to 90 foot-pounds, leaving top screws fairly loose. This holds bearing cups in line while moving ring gear.

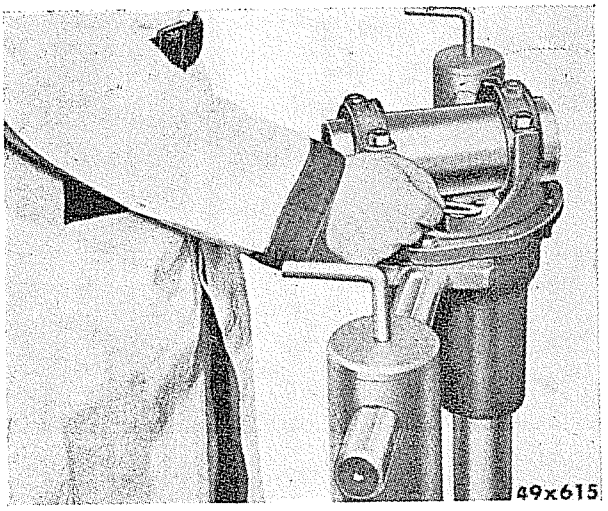


Fig. 14—Spacer Washer Thickness.

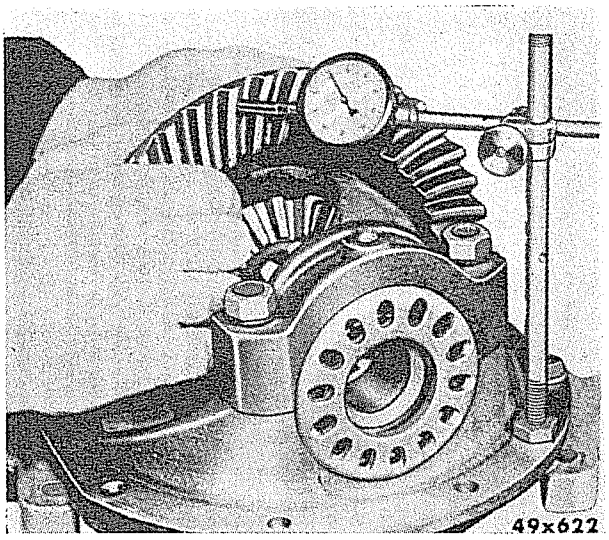


Fig. 15—Checking for Point of Least Backlash.

(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 15, find the point of least backlash on ring gear at 90° 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 16.

(h) Turn in adjusting nut on tooth side, until dial gauge shows .006 inch backlash, as shown in Figure 17. Lock adjusting nuts in place and tighten both top cap screws from 85 to 90 foot-pounds.

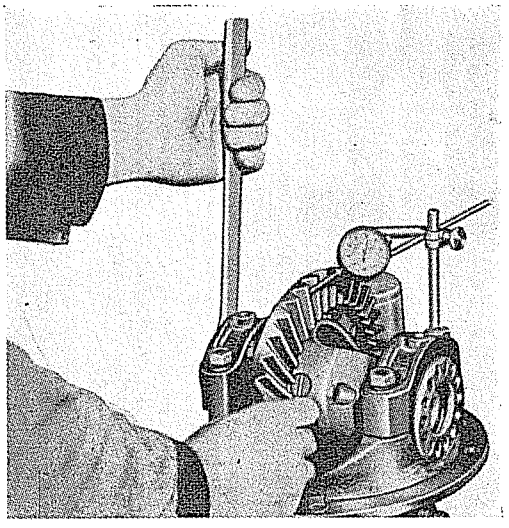


Fig. 16—Tightening Back Face Adjusting Nut.

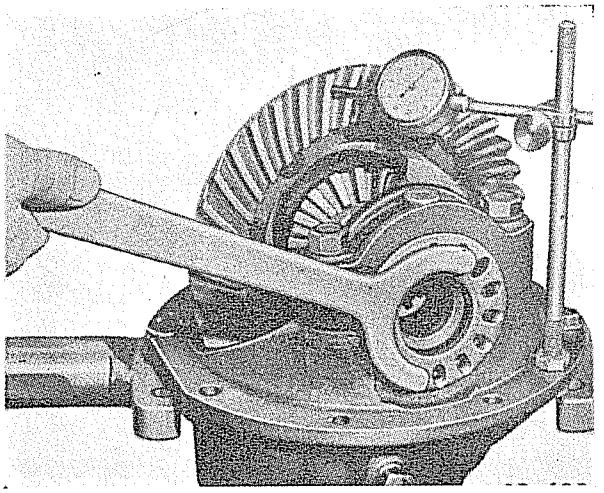


Fig. 17—Tightening Tooth-Side Adjusting Nut.

As a result of this method of adjustment, the bearing supports (carrier pedestals) have been spread and the differential bearings pre-loaded; and the backlash between ring gear and pinion set. To check tooth contact pattern, refer to Paragraph 45 of this section.

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 with a smooth bar, as shown in Figure 18, before installing.

Synthetic Seals.

Require no preparation other than the same care used in Leather Seal installation.

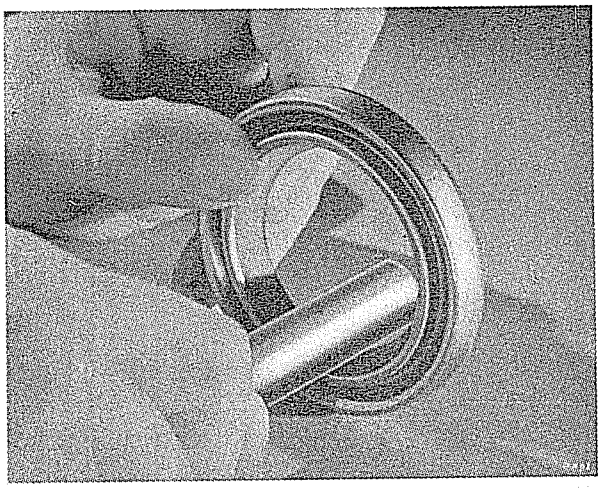


Fig. 18—Rolling Leather of Oil Seal.

ARC WELDING REAR AXLE HOUSING.

Arc welding of complete rear axle assemblies to repair leaking housing, covers, loose or broken spring seats and brake line clips has been common 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 pinion, as well as differential gears, will be damaged if conditions are just right for 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. Gas welding equipment should be used.

8. REAR AXLE HOUSING ALIGNMENT.

Rear axles housings may become bent, bowed or warped, and if such condition is not corrected, premature axle failure may result. Dissassemble axle assembly and check housing for horizontal and vertical alignment as described below:

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. (Figure 19).

Place square against machine surface of housing end flange and surface plate, as shown in Figure 20. 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.

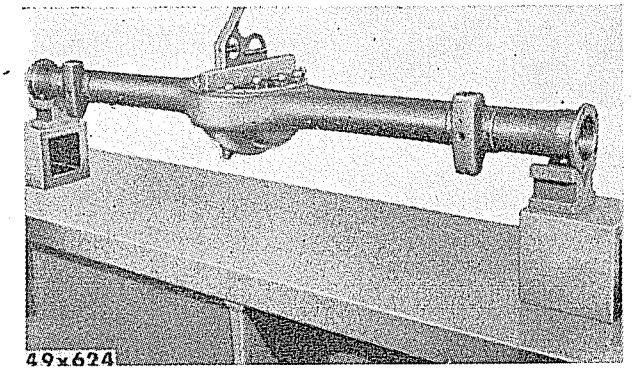


Fig. 19—Leveling Housing for Checking Alignment.

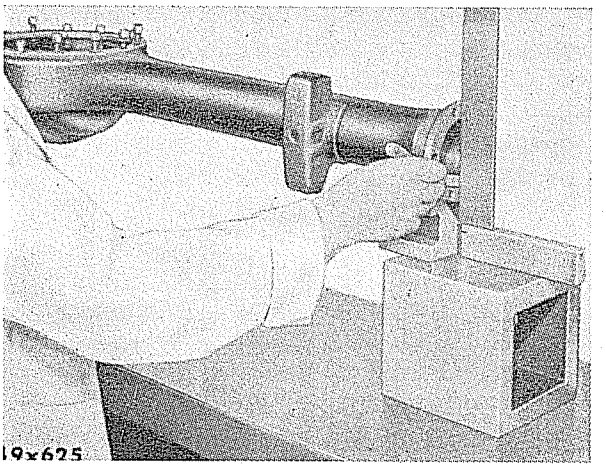


Fig. 20—Checking Horizontal Alignment.

Checking Axle Housing for Vertical Alignment.

With housing in "V" blocks, turn housing until machine surface for carrier mounting is in a squared vertical position, as shown in Figure 21.

Place square against machine surface of housing end flange and surface plate, as shown in Figure 22. Amount of housing misalignment will be indicated by the thickness of feeler at 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.

9. 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 between spacer on shaft and bearing next to yoke.

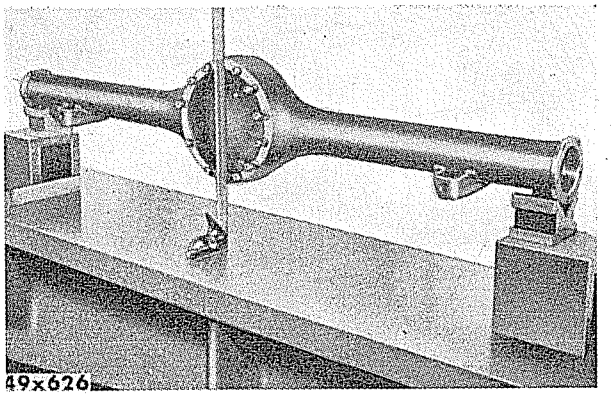


Fig. 21—Squaring Axle for Vertical Alignment.

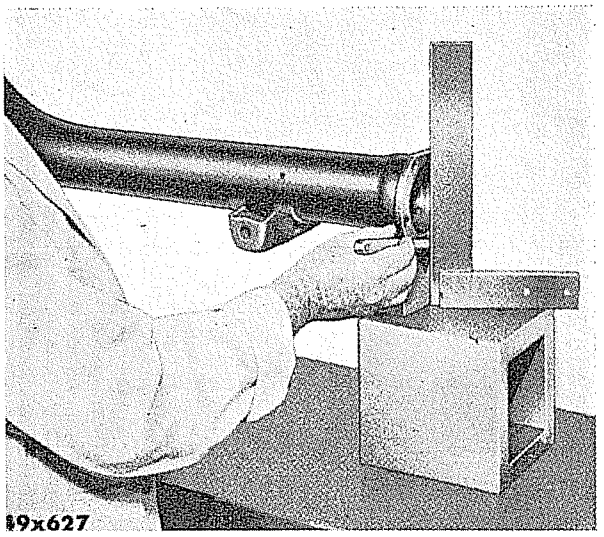


Fig. 22—Checking Vertical Alignment.

(2) Remove pinion bearing as shown in Figure 23.

(3) Remove drive pinion oil seal from carrier.

(4) Remove both pinion bearing cups from carrier assembly.

If differential assembly was satisfactory from a standpoint of noise before unit was disassembled, 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. See Paragraph 45.

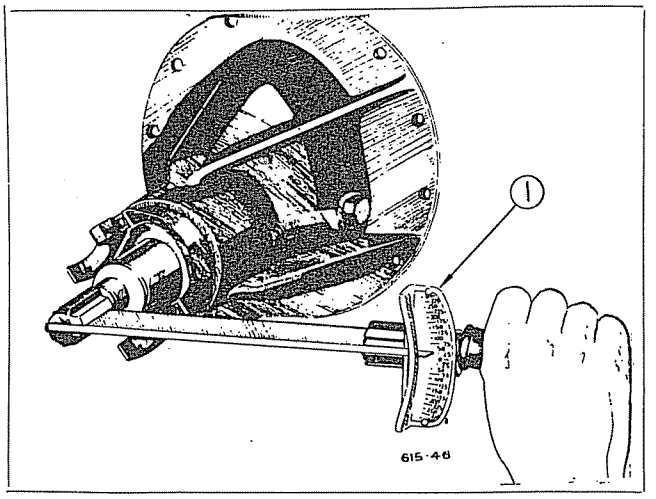


Fig. 24—Checking Drive Pinion Bearing Pre-Load.
1 — Torque wrench.

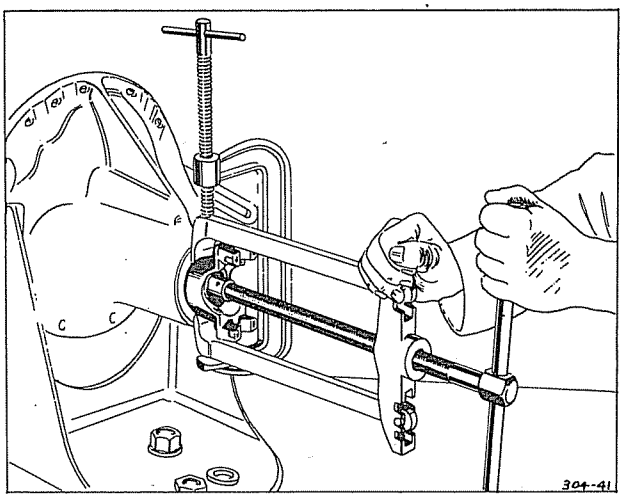


Fig. 25—Removing Drive Pinion Flange With Puller CM 549.

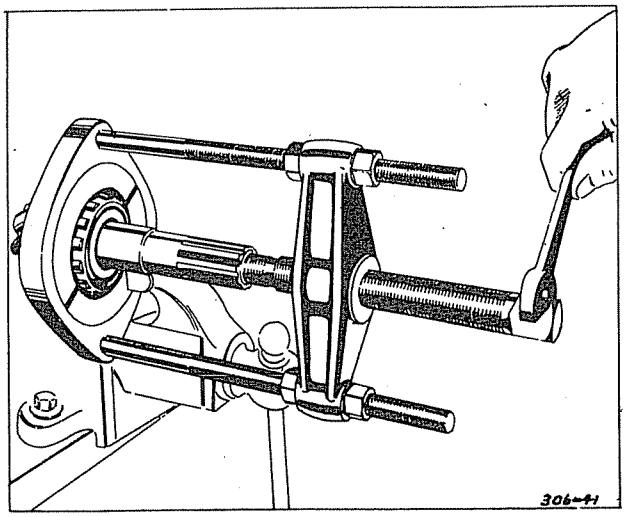


Fig. 23—Removing Drive Pinion Bearing With Tool C.293.

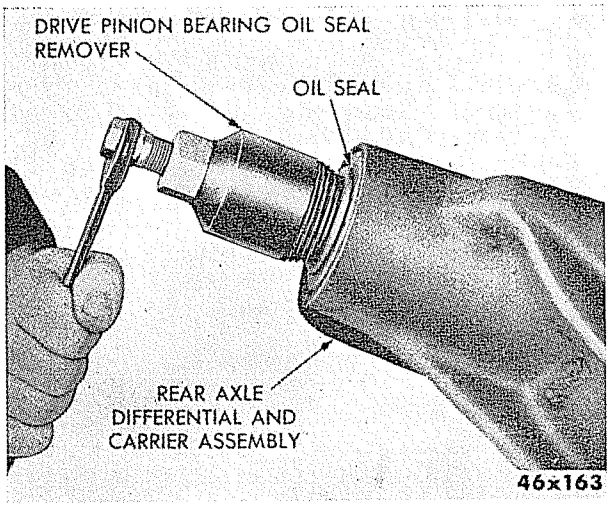


Fig. 26—Removing Oil Seal From Carrier—Tool C-748.

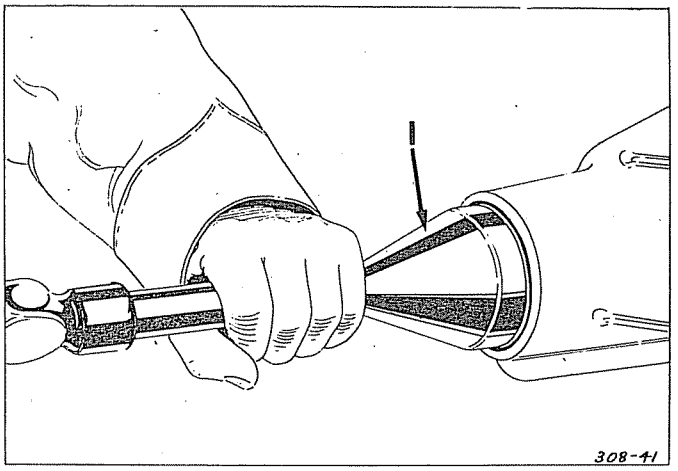


Fig. 27—Installing Drive Pinion Oil Seal.
1 — Tool C359

When reassembling, check bearing pre-load and correct if necessary, before installing oil seal. Instal oil seal, yoke washer and nut and tighten nut securely. Attach an inch-pound torque wrench (Figure 24) on yoke nut and turn the drive pinion, noting amount of torque required. This should be from 15 to 20 inch-pounds. If pre-load is less than 15 inch-pounds, the shim is too thick. If pre-load is over 20 inch-pounds the shim is too thin.

Thoroughly lubricate bearings with proper lubricant when assembling.

10. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT.

For proper method of securing the correct tooth contact, refer to Paragraph 45.

REPLACING DRIVE PINION OIL SEAL.

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

It is important that all dirt be removed before starting operation:

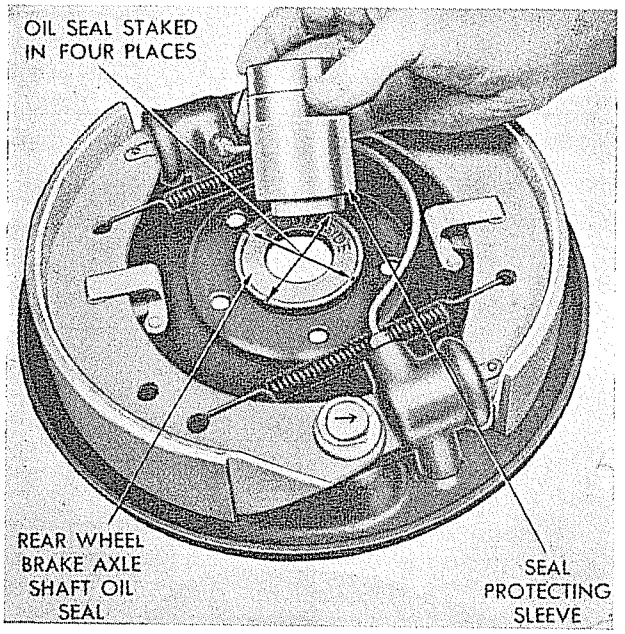
(1) Disconnect rear universal joint.

(2) Remove drive pinion yoke nut, washer, and remove yoke (Figure 25).

(3) Remove drive pinion bearing oil seal (Figure 26).

New oil seal should be installed, as shown in Figure 27, 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.



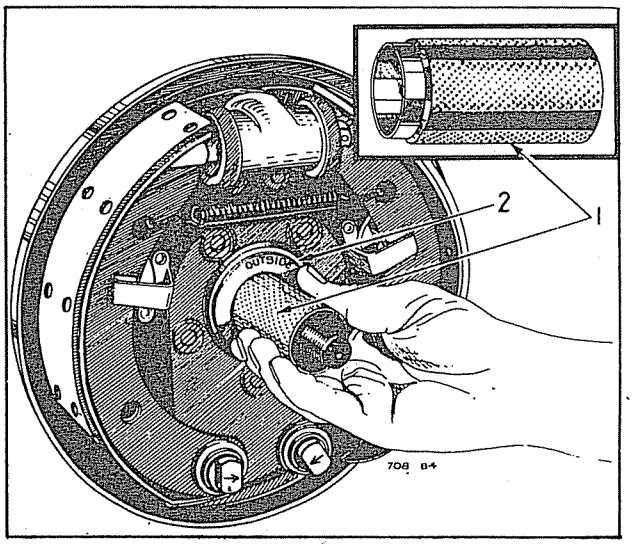


Fig. 28—Removing or Installing Brake Support.
1 — Seal protecting sleeve (Tool C757 2 — Axle shaft oil seal.

11. 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.

12. ADJUSTING AXLE SHAFT END PLAY.

Correct axle end play is .003 to .008 inch. This end play is determined by an indicator installed on

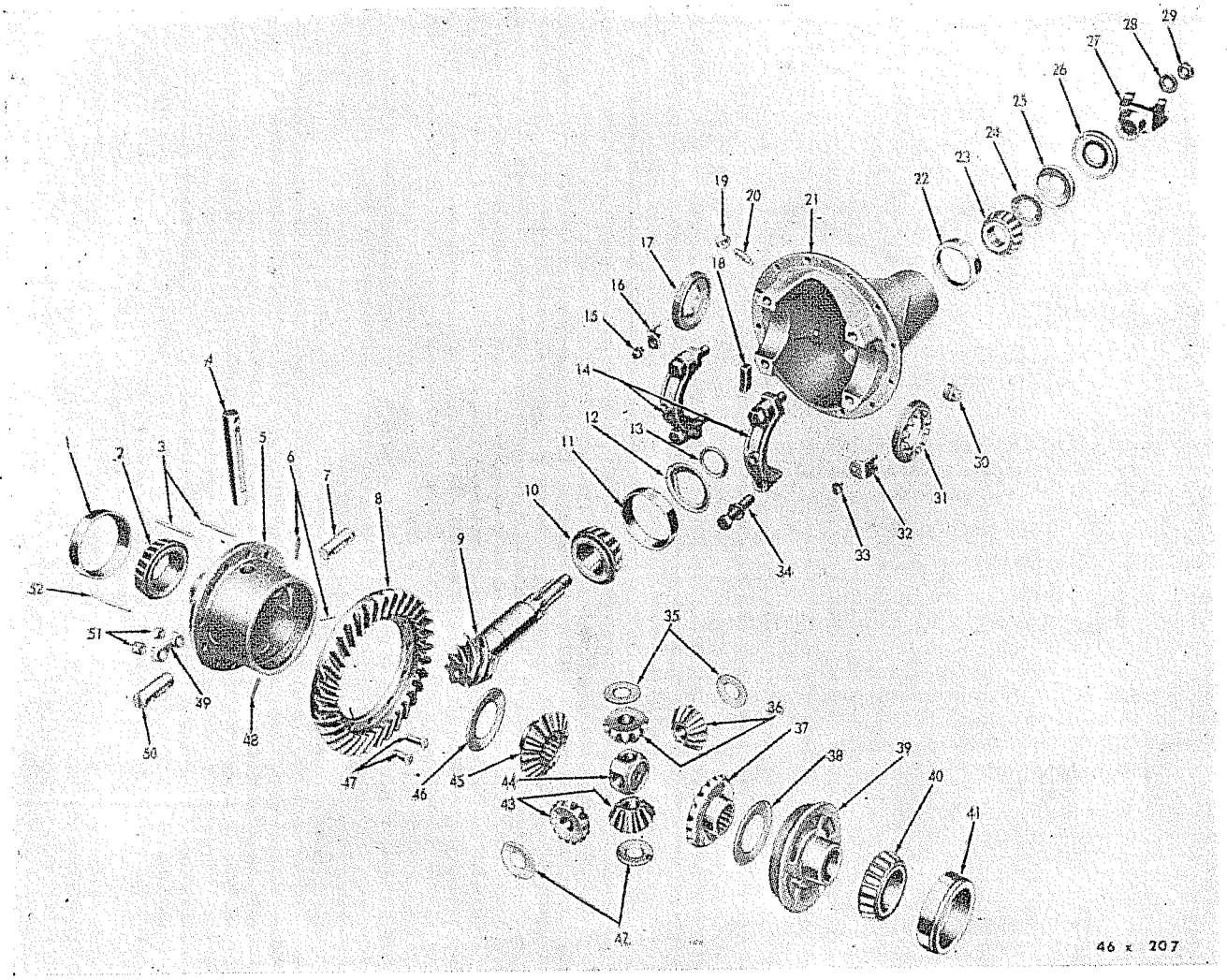


Fig. 29—Rear Axle Differential (Disassembled View) 2-26A, 2-33A.

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 assembly
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
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 assembly
34 — Differential carrier-cap bolt
Differential carrier cap bolt lock washer
35 — Differential pinion gear thrust washer
36 — Differential pinion gear
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

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. Instal seal protecting sleeve (Figure 28) to protect the seal from being damaged by the axle shaft keyway when removing the brake support.

(4) Remove or instal shims to obtain the required axle shaft end play.

13. SERVICE DIAGNOSIS.

Refer to Paragraphs 46 through 57.

SINGLE-SPEED HYPOID REAR AXLE

(FULL-FLOATING)

Model 2-26A, 2-33A

Refer Figures 29 and 31

14. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT.

(1) Remove axle drive shaft flange nuts and remove shaft, as shown in Figure 30.

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

REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY.

(1) Drain differential lubricant.

(2) Disconnect rear universal joint and drop the propellor 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.

(4) Remove both axle shafts.

(5) Remove cap screws which hold the differential carrier assembly to the axle housing.

(6) Remove differential and carrier assembly.

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

(1) Mount carrier in stand and mark both differential bearing adjusters and caps to facilitate assembly. (Figure 35).

(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.
When installing differential in carrier place bearing adjusters against bearing and instal caps.

(4) Tighten cap screws sufficiently to hold caps into place but not securely tight.

(5) Screw differential bearing into place, as shown in Figure 35.

(6) 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 adjuster with

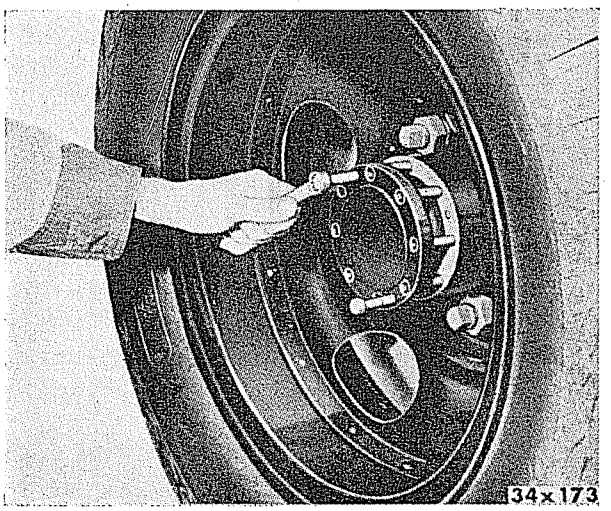


Fig. 30—Removing Axle Drive Shaft.

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

(7) Remove carrier from stand and position with back face of ring gear upwards.

(8) Place thrust pad on rear face of ring gear and rotate until the hole in the thrust pad is aligned with the adjusting screw hole.

(9) Instal adjusting screw and lock nut and tighten screw sufficiently to locate thrust pad firmly against back face of ring gear.

16. ADJUSTMENT OF RING GEAR THRUST PAD.

(1) Loosen lock nut.

(2) Turn adjusting screw 1N until thrust pad strikes ring gear.

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

(4) Check backlash with a dial indicator (Figure 15). Adjust backlash as specified in Service Standards. Move ring gear towards or away from pinion by turning both bearing adjusters an equal amount in the same direction. When the bearing differential adjustment is changed the drive gear and pinion tooth contact is also changed. Therefore, the two contacts should be checked and corrected after adjusting the bearings.

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

To check pre-load, move ring gear back and forth with the 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.

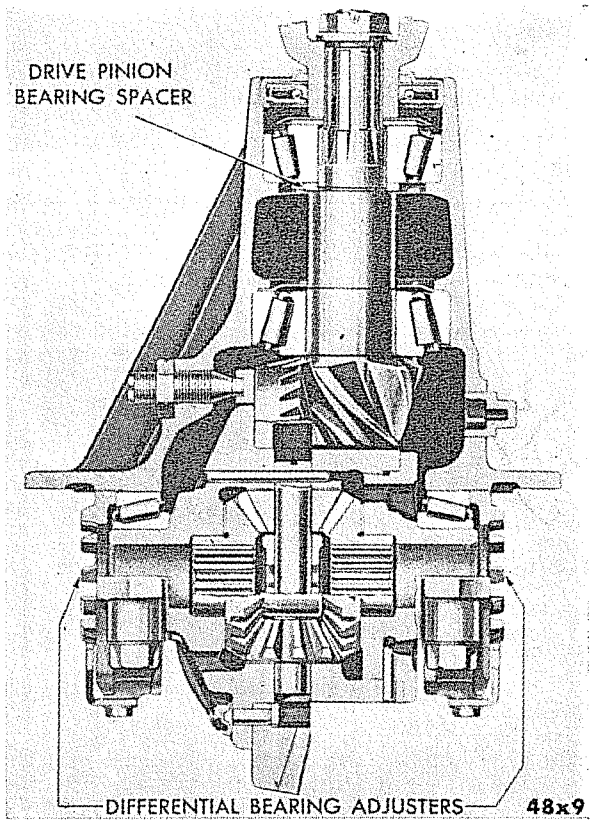
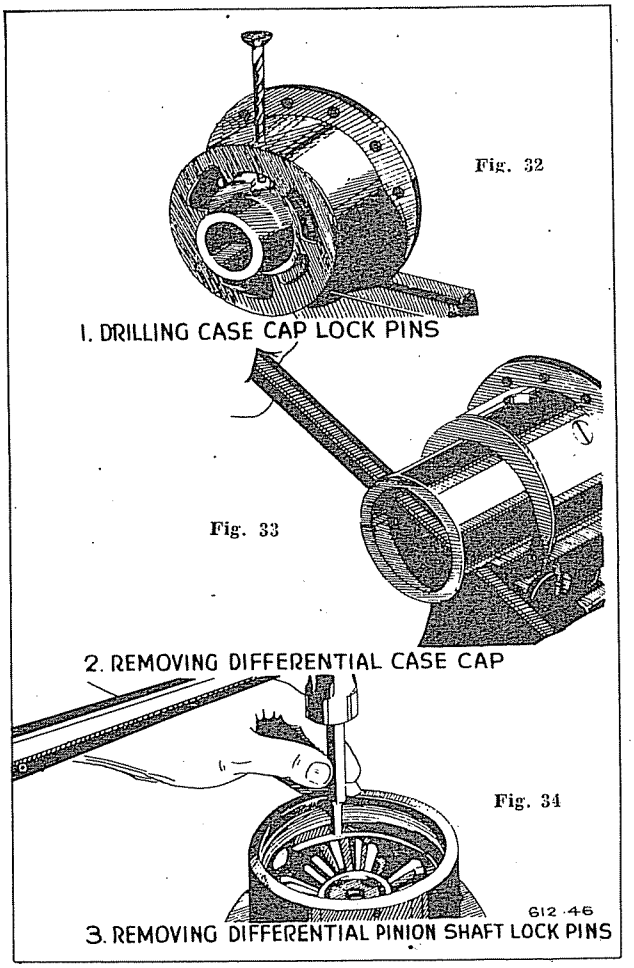


Fig. 31—Rear Axle Differential (Assembled View) 2-26A, 2-33A.

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

(1) Remove nuts and bolts which attach ring gear to differential case, press ring gear off.



Figs. 32, 33 and 34 show dismantling sequence for differential gear.

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

18. DISASSEMBLY AND ASSEMBLY OF DIFFERENTIAL (RING GEAR REMOVED). Refer Figures 29 and 31.

(1) Mount differential case ring gear flange in a heavy vice, using copper jaws.

(2) Remove bearing from differential case (cap side only).

(3) Remove differential case cap locking pins (Figure 32) by centre 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 into which it fits, the case must be expanded for removal of the cap, or damage will result.

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

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

Remove cap as shown in Figure 33. Jar cover loose with a smart blow on wrench handle, using a heavy hammer. Then, quickly unscrew cap using wrench. The parts now should be immersed in oil to cool them for subsequent handling.

(4) Remove differential pinion shafts locking pins by driving them out of case with a hammer and punch (Figure 34).

(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.

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

(1) Instal ring gear, tighten attaching bolts and close locks around nuts.

(2) Instal 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 35.

(4) Set bearing adjuster on left-hand side to permit an approximate adjustment of clearance between ring gear and pinion.

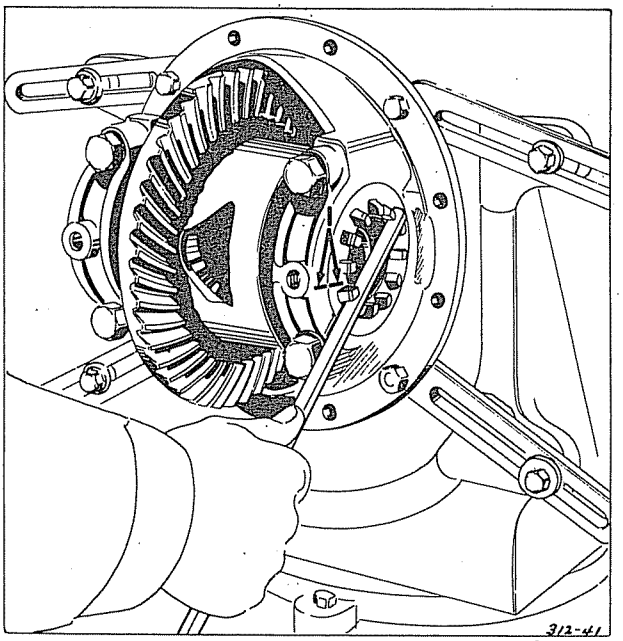


Fig. 35—Adjusting Differential Bearings.
1 — Bearing adjuster marks

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 ensure proper seating of rollers, cups and adjusters.

(5) Check backlash with a dial indicator (Figure 15).

19. ADJUSTMENT OF RING GEAR THRUST PAD.

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

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

(1) Remove drive pinion yoke and pull drive pinion out through gear end of differential carrier.

(2) Remove pinion bearing as shown in Figure 23.

(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. Instal yoke, washer and nut and tighten nut securely. Attach an inch-pound torque wrench (Figure 24) on yoke nut and turn drive pinion, noting the amount of torque required. This should be from 15 to 20 inch-pounds. If pre-load is less than 15 inch-pounds, the spacer is too thick. If pre-load is over 20 inch-pounds, the spacer is too thin.

SINGLE-SPEED SPIRAL BEVEL REAR AXLE

(FULL-FLOATING)

Model 3-59A

21. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT AND BEARINGS.

(1) Remove the axle drive flange nuts and withdraw the axle shafts. (Figure 30).

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

22. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY. (Refer Figure 36).

(1) Drain differential lubricant, drain plug situated at the lower off side of the differential carrier housing.

(2) Remove both axle shafts.

(3) Disconnect rear universal joint and drop propellor shaft.

(4) Remove set screws (2) which secure the differential carrier assembly to axle housing.

NOTE: One of these set screws is removed from the rear of the axle casing and the remainder are removed from the flange facing the propellor shaft.

(5) Remove the complete differential assembly from the axle housing.

(6) When installing the differential carrier assembly use a new gasket. Tighten the differential carrier to housing set screws as specified in the Service Standards.

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

(1) Bend back the ring gear thrust pad bolt lock washer and remove the thrust pad bolt (4). The ring gear thrust pad is of brass and if worn or grooved should be replaced when re-assembling.

(2) Remove the drive gear pinion by unscrewing and removing the set screws (5) and spring washers which secure the bearing cover to the differential carrier housing (3).

(3) Withdraw the pinion assembly complete with ball bearing assembly (16) and the inner race of the spigot roller bearing (7).

(4) Check marking on differential bearing caps and bearing adjusters to facilitate assembly.

(5) Bend back the lock washer and loosen the four nuts securing the differential bearing caps to

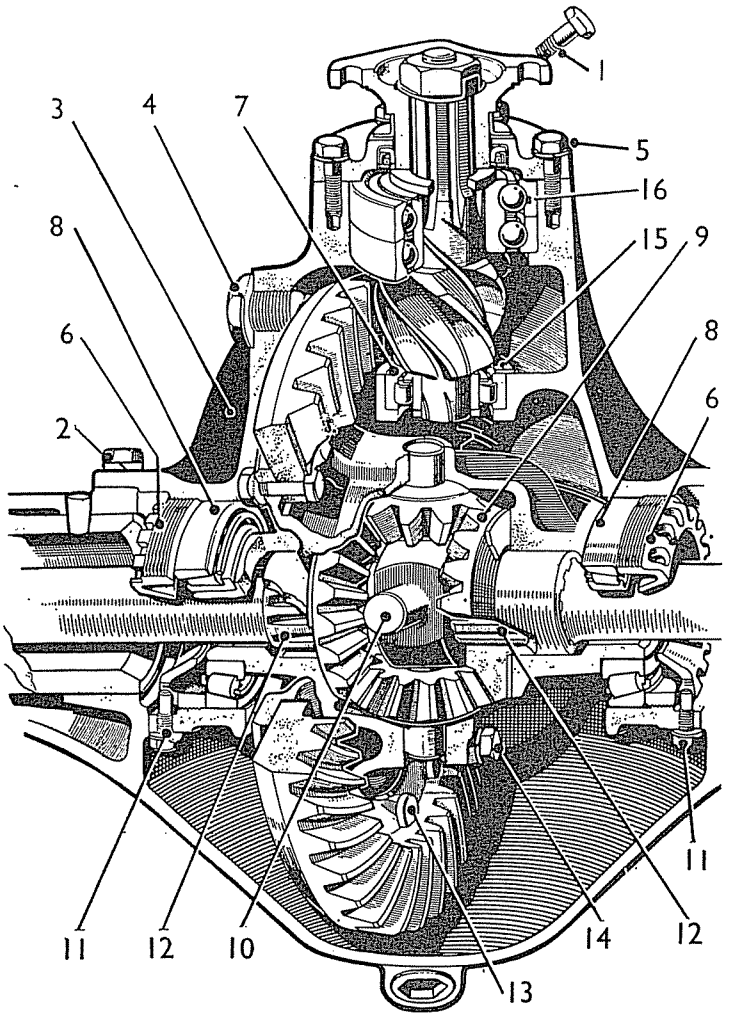


Fig. 36—Rear Axle Model. 3-59A.

1 — Propellor shaft flange bolt
2 — Differential carrier set screws
3 — Differential carrier housing
4 — Steady pad bolt
5 — Pinion bearing cover set screws
6 — Side bearing adjusting collars
7 — Spigot roller bearing
8 — Differential side bearing
9 — Differential side gears
10 — Differential spider
11 — Adjusting collar lock screws
12 — Axle shaft splines
13 — Crown wheel bolts
14 — Differential case bolts
15 — Spigot bearing locating plate
16 — Pinion bearing assembly

relieve the load on bearings. Remove caps and bearing adjusters.

(6) Remove ring gear complete with differential assembly and bearings.

(7) If it is necessary the spigot roller bearing (7) should be replaced at this stage.

(8) It is essential that the differential side bearings (8) should be a tight fit on the differential case and can be withdrawn with a suitable puller. If the bearings are found to be loose, a complete new differential case should be fitted.

(9) The two adjusting lock screws (11) must be removed from the bearing caps before the caps are refitted.

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

(1) Bend back the lock washers, remove the attaching nuts and bolts and press ring gear off.

When installing ring gear, be sure holes in ring gear are correctly aligned with holes in differential case, before pressing on. Instal new lock washer and instal bolts, tighten nuts securely and lock.

a. Disassembly and Assembly of Differential Case. (Ring Gear Removed).

(1) If original identification marks are not clear, mark differential case halves clearly to facilitate re-assembly.

(2) Bend back lock washers, remove the eight nuts and bolts (14) and separate case halves.

(3) Remove spider, pinions, side gears and thrust washers.

(4) Examine for wear the flat thrust washers behind the differential side gear (9) and the conical thrust washers behind the differential pinions, renew if found to be worn.

(5) To re-assemble, place the differential side gears (9) in the two halves of the differential case with the flat thrust washers behind. Assemble the differential pinions to the spider (10) with the conical thrust washers on the outside.

(6) Bring the two halves of the differential case together with the identification marks in line. Use new locking washers when bolting case together.

25. ASSEMBLY AND DISMANTLING OF PINION ASSEMBLY.

(1) Secure the pinion assembly by the coupling flange in a vice fitted with copper jaws.

(2) Bend back the tabs of lock washer and remove the nut from the end of the shaft.

(3) With a suitable extractor, withdraw the coupling flange and mud sling assembly off the the pinion shaft.

(4) Remove the double ball bearing with split outer race (16) by using a hammer and soft metal drift inserted between the teeth of the pinion and located on the back edge of the inner race.

(5) The inner race of the spigot roller bearing (7) can be removed with a hammer and soft drift after removing the retaining plate and screw. NOTE: When refitting retaining plate,, tighten screw securely and stake the plate into both ends of the screw slot, to prevent the screw turning and becoming loose.

(6) Reassemble the double ball bearing (16) pinion thrust washer, bearing cover with new oil seal fitted, coupling flange lock washer and nut. Tighten nut and secure with lock washer.

26. REAR AXLE ADJUSTMENT.

With the drive pinion installed, place the differential case complete with ring gear in the carrier housing (3) and remove the differential side bearing adjusting collar bolts (11) on the side bearing adjusting collars (6) and refit bearing caps in their original position.

(1) Mount the assembly securely to a bench or cradle.

At this stage the bearing caps must be loose while adjustments are being made to the bearing adjusters.

(2) Check ring gear for run out on the back face of ring gear with a dial indicator. Run out should not exceed .002 inch.

(3) Slacken both bearing adjusters (6) until there is noticeable end play. Strike the tooth side of the ring gear with a hide mallet to ensure that the outer cup of the bearing adjuster on the back face of the ring gear is hard up against its bearing adjuster.

(4) Screw in the bearing adjuster (6) at the back face side of the crown wheel until the back lash between the ring gear and pinion gear teeth is approximately correct.

(5) Screw in the bearing adjuster (6) on the teeth side of the ring gear to a point, that if tightened up one further notch all clearance in the side bearings is removed.

(6) Tighten the side bearing cap nuts to ensure that the clearance is still present.

(7) Slacken the cap nuts and screw the bearing adjusters in one notch.

(8) Tighten the bearing cap nuts and check that all bearing clearance has been removed.

(9) Loosen the bearing cap nuts again and screw the bearing adjusters in one further notch.

(10) Tighten the bearing cap nuts and secure with lock washers.

NOTE: During the above adjustments to the differential bearings, the ring gear should be struck on both sides with a hide mallet to ensure the outer bearings are seated hard against the differential bearing adjusters.

As a result of this method of adjustment, there is no slack on the side bearings, instead there is a SLIGHT PRE-LOAD ON THE BEARINGS.

27. DIFFERENTIAL BACKLASH.

(1) Loosen top nuts of bearing caps, leaving bottom nuts tight. This holds side bearings in line while moving ring gear.

(2) Adjust ring gear by means of the bearing adjusters.

(3) Adjust so that the backlash between the ring gear and pinion is .006 inch.

(4) When making adjustment, care must be taken to move bearing adjusters the same number of notches in the same direction, in order to maintain the bearing adjustment previously made.

(5) Backlash should be checked with a dial indicator suitably mounted, and may vary between a tolerance of .006 inch to .008 inch.

(6) Lock bearing adjusting bolts in on both sides and tighten top cap screws, bearing cap screws, as specified in the Service Standards.

28. ADJUSTMENT OF RING GEAR THRUST PAD.

The ring gear thrust pad should have a slight clearance between the ring gear and the pad. The thrust pad bolt (4) can be adjusted by means of shims under the bolt head. The clearance between the thrust pad and the ring gear is ·010 inch to ·012 inch.

29. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT.

For proper method of securing the correct tooth contact, refer to Paragraph 45.

30. ADJUSTING REAR HUB BEARINGS.

(1) Raise the rear axle by means of a jack until rear wheel is clear of the ground.

(2) Unscrew axle shaft flange nuts and withdraw the axle shaft.

(3) Remove the oil seal and bend back the tabs of the lock washer.

(4) Rotate the wheel and tighten the inner bearing nut slowly until a slight drag is felt, then slacken the nut off $\frac{1}{8}$ of a turn.

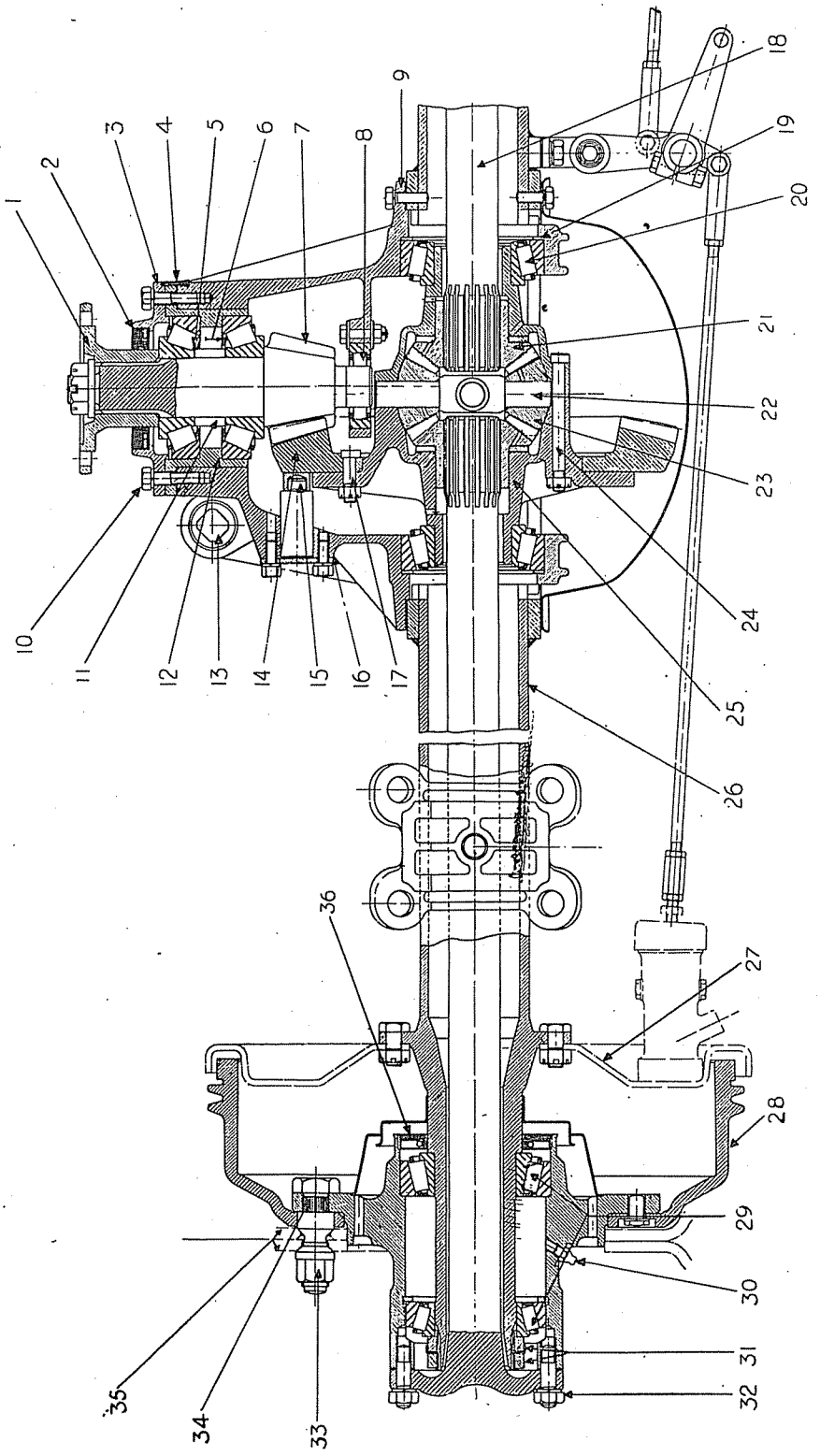
(5) This adjustment should enable the wheel to rotate freely without play.

(6) Fit new lock washer, replace the lock nut and tighten securely, taking care not to turn the adjusting nut.

(7) Secure in position by bending over lock washer in two separate positions on the adjusting and lock nut.

(8) Replace oil seal and gasket, refit axle shaft and securely tighten the retaining nuts.

SINGLE-SPEED HYPOID REAR AXLE
(FULL-FLOATING)
Model 6-71A, 8-65A, 8-71A



1 — Pinion shaft flange
2 — Pinion shaft oil seal
3 — Pinion shaft oil seal housing
4 — Pinion adjusting shims
5 — Pinion bearing adjusting shims
6 — Pinion bearings
7 — Pinion
8 — Pinion straddle bearing
9 — Differential carrier housing
10 — Pinion carrier housing set screw
11 — Pinion bearing spacer
12 — Pinion bearing housing
13 — Oil level and filler plug
14 — Ring gear
15 — Ring gear thrust pad
16 — Thrust pad adjusting shims
17 — Ring gear bolt
18 — Axle shaft
19 — Side bearing shim rings
20 — Differential side bearing
21 — Differential side gear
22 — Differential spider
23 — Differential pinion
24 — Differential casing bolt
25 — Differential casing
26 — Axle tube
27 — Brake shoe support plate
28 — Brake drum
29 — Hub bearings
30 — Hub bearings grease nipple
31 — Hub bearing adjusting and lock nuts
32 — Axle shaft flange nut
33 — Wheel nut
34 — Wheel stud
35 — Wheels
36 — Hub oil seal

Fig. 37—Rear Axle.

SINGLE-SPEED HYPOID REAR AXLE

(FULL-FLOATING)

Models 6-71A, 8-65A, 8-71A

Refer Figure 37

31. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT.

(1) Remove the axle shaft flange nuts (32) and withdraw axle shafts (18).

When refitting axle shaft make sure axle shaft flange fits tightly against the hub.

32. REMOVAL OF DIFFERENTIAL CARRIER ASSEMBLY.

(1) Drain oil from differential casing by removing the drain plug situated at the lower centre of the axle casing.

(2) Remove both axle shafts.

(3) Disconnect the rear end of propellor shaft joint from the differential pinion shaft flange (1).

(4) Remove set screws which secure the differential carrier housing (9) to the axle casing, also the set screws securing the inspection cover.

(5) Remove the cover and remove the differential and carrier assembly from the axle casing.

33. REMOVAL OF DIFFERENTIAL AND RING GEAR.

(1) Remove ring gear thrust pad (15) by unscrewing four set screws.

(2) Mount carrier assembly in stand, mark both differential bearing shim rings and caps to facilitate assembly.

(3) Remove differential bearing cap retaining screws.

(4) The ring gear (14) complete with differential casing (25) can then be withdrawn from carrier housing (9).

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

(1) Bend back lock washers, remove attaching nuts and bolts, press ring gear off.

When installing ring gear, be sure holes in ring gear are correctly aligned with holes in differential case before pressing on. Instal new lock washers and instal bolts, tighten nuts securely and lock.

Disassembly and Assembly of Differential Case (Ring Gear Removed).

(1) If original identification marks are not clear, mark differential case clearly to facilitate reassembly.

(2) Remove differential casing cotter pins and nuts and withdraw the bolts (24) and separate the case halves.

(3) Remove the spider (22) pinions (23) and side gears (21).

(4) Excessive play between the side gears and pinions can be corrected by replacing the thrust washers fitted behind the side gears.

To re-assemble, place thrust washer and side gears in the case halves of the differential. Assemble the differential pinions to the spider. Bring the case halves of the differential together ensuring the identification marks on the casing coincide.

35. ASSEMBLING AND DISMANTLING DRIVE PINION. (DIFFERENTIAL REMOVED).

(1) Remove the pinion drive cotter pin nut and washer.

(2) Pull off drive pinion flange (1).

(3) Lift off the oil seal (2) and housing (3) and press the pinion (7) out through the pinion bearing (6).

(4) Care should be taken of the shims (5) which are installed between the pinion bearing spacer (11) and the rear bearing, as these are used to pre-load the pinion bearing.

(5) Assemble the drive pinion and bearings in the reverse order.

36. REAR AXLE ADJUSTMENT.

With the drive pinion installed, assemble the differential and ring gear complete into the carrier housing.

(1) Instal side bearing shim ring (19) of a thickness to provide between ·008 inch to ·014 inch ring gear and pinion clearance or backlash.

(2) Check clearance with a dial indicator and if not within the tolerance, move the differential assembly to the right or left as required, by changing the shim rings to the desired thickness.

(3) Assemble the side bearing caps to their original position and securely tighten attaching bolts.

(4) Refit the ring gear thrust pad, adjust by means of shims (16) so that the clearance between the thrust pad and the ring gear face is ·002 inch to ·005 inch.

Drive Gear Pinion Pre-Load.

During this operation it is advisable to fit the oil seal (2) in the housing AFTER the pinion bearing adjustments have been made, due to drag on the oil seal.

(1) Use an inch-pound wrench to read the torque to determine the pinion bearing tension. Desired torque should be from 12 to 18 inch-pounds.

(2) Remove shims (5) to increase and add shims to reduce the bearing tension.

(3) Assemble oil seal, making sure it is in good condition and that the surface of the propellor shaft is free from burrs or foreign matter that could cause premature wear and consequent oil leaks

(4) Instal the complete pinion assembly into the differential carrier housing (9), shims (4) should be fitted between the pinion bearing housing (12) and the differential carrier housing (9), to obtain correct meshing between teeth of ring gear and pinion.
Refer Paragraph 45 for method of securing correct tooth contact.

37. ADJUSTING REAR HUB BEARINGS.

(1) Raise the rear axle by means of a jack until rear wheel is clear of the ground.

(2) Unscrew the axle shaft flange nuts (32) and withdraw the axle shaft.

(3) Release the lock washer from the hub bearing, adjusting and lock nuts (31). Unscrew lock nut and remove the washer.

(4) Rotate the wheel and tighten the inner bearing nut slowly until a slight drag is felt, then slacken the nut off $\frac{1}{8}$ of a turn.

(5) This adjustment should enable the wheel to rotate freely without play.

(6) Refit new lock washer, replace lock nut and tighten securely.

(7) Instal the axle shaft and securely tighten retaining nuts.

TWO SPEED SPIRAL BEVEL REAR AXLE

(FULL-FLOATING)

Model 8-71A-D

NOTE: THIS SECTION ALSO APPLIES TO MODELS 6-71A, 8-65A, 8-71A, fitted with two-speed Spiral Bevel Rear Axle as special equipment.
Refer to Figure 38.

38. REMOVAL AND INSTALLATION OF AXLE DRIVE SHAFT.

(1) Remove axle drive flange nuts.

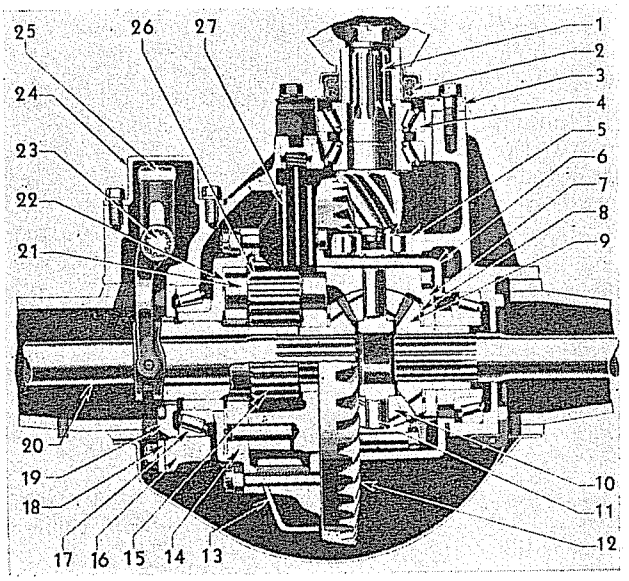
(2) Pull out shaft.

When installing an axle shaft, be sure that the axle shaft flange fits tightly against the hub. Foreign matter and burrs will prevent the axle shaft flange from being drawn up against the hub.

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 rod. The outer end of the broken shaft and the shaft on the opposite side should, of course, be removed in order to push out the broken piece.

1 — Bevel drive pinion
2 — Pinion oil seal
3 — Pinion-bearing cage
4 — Pinion bearing (taper)
5 — Pilot pinion bearing (roller)
6 — Support case
7 — Differential case
8 — Side gear thrust washer
9 — Differential side gear
10 — Differential side pinion
11 — Differential spider
12 — Bevel drive ring gear
13 — Oil collector drum
14 — High speed clutch plate
15 — Sliding clutch gear



16 — Differential carrier bearing cap
17 — Differential bearing
18 — Differential bearing adjuster lock
19 — Differential bearing adjuster
20 — Axle shaft
21 — Idler pinion pin
22 — Support case thrust washer
23 — Shift fork shaft
24 — Shift fork cover
25 — Shift fork
26 — Idler pinion
27 — Oil distributor (scoop)

Fig. 38—Key to Identification of Parts.

39. REMOVAL AND INSTALLATION OF DIFFERENTIAL CARRIER ASSEMBLY.

(1) Drain lubricant from housing by removing plug from bottom of axle housing.

(2) Disconnect rear universal joint.

(3) Remove both axle shafts.

(4) Remove carrier to housing cap screws and washers and remove carrier assembly.

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

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

Instal carrier assembly in a suitable fixture and proceed as follows: refer Figure 38.

(1) Remove differential carrier oil distributor plug washer spring cap screw, lock washer and oil distributor (27).

(2) Remove the two shift housing to carrier stud nuts and lock washers. Pull off shift unit assembly. (Figure 39).

NOTE.—In re-assembling, the swivel block must fit into the shift fork.

(3) Pull out shift fork shaft. The shift fork may then be slipped from the sliding clutch gear and removed through the back of the differential carrier. (Figure 40).

(4) Slip out sliding clutch gear (15) Figure 38.

(5) Mark right hand differential bearing adjuster with centre punch to identify for re-assembly.

(6) Remove differential carrier cap bolt, lock wires on both right and left hand sides. Loosen cap bolts only, take off right hand bearing adjuster lock and cotter pin.

(7) Remove left hand differential bearing cap adjusters and lock as an assembly to assure correct positioning of gear on assembly. (When re-assembling 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. (Figure 41).

(8) After removing bearing caps, tip up the left hand end of planetary unit and lift out as shown in Figure 42.

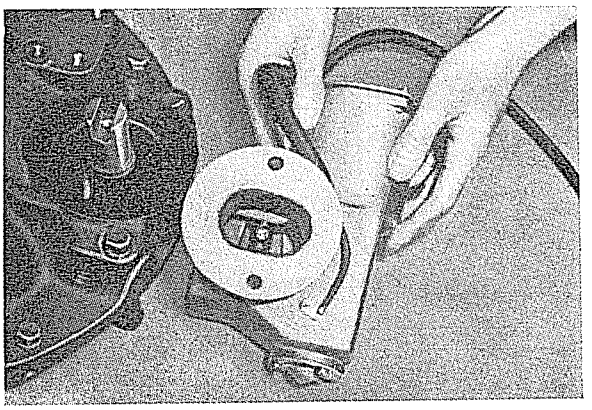


Fig. 39—Shift Unit Assembly.

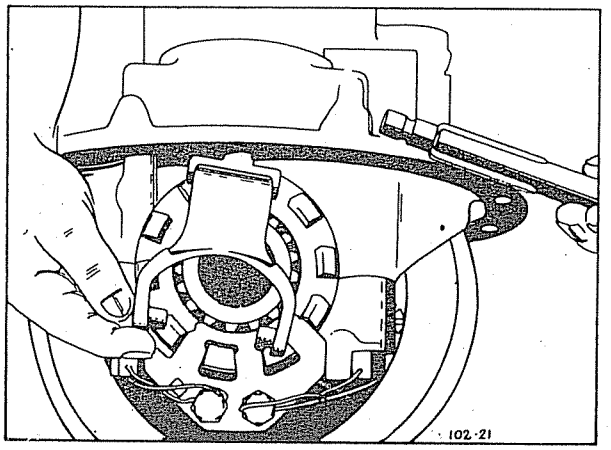


Fig. 40—Removing or Installing Shift Fork and Shaft.

(9) Remove pinion bearing cage cap screws.

(10) Use ball peen hammer to drive out bevel pinion assembly. Note shims under pinion bearing cage.
Check for end play in bearing 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 or by inserting a soft drift between the pinion teeth and tapping off with a hammer.

(14) Remove pinion bearing cone and washer from cage assembly. Take out pinion bearing cage cork (Figure 43). Cork must be replaced before assembling.

(15) Instal differential assembly in a vice, gear side down. Remove lock wires from support case bolts and remove the bolts.

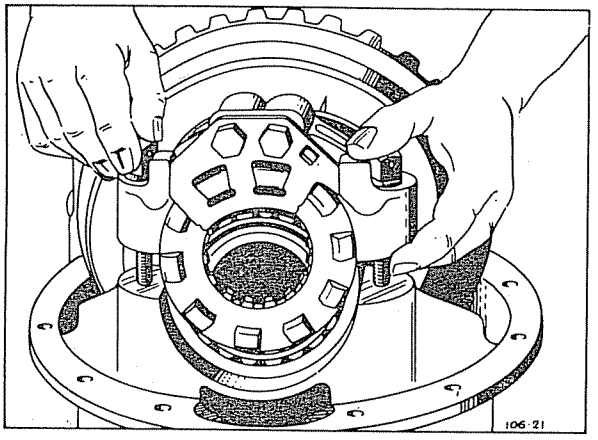


Fig. 41—Removing or Installing Bearing Cap, Adjuster and Lock Assembly.

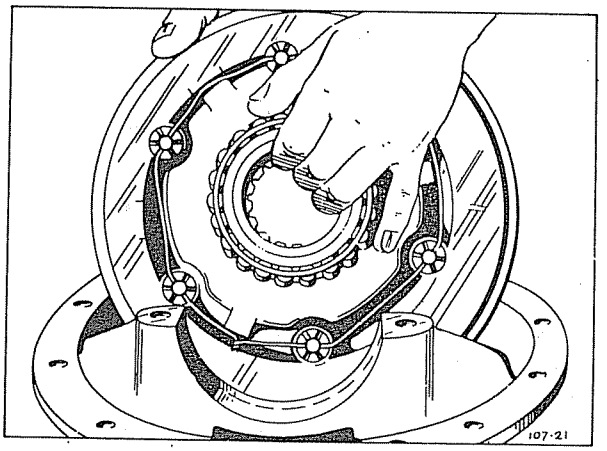


Fig. 42—Removing Differential from Carrier.

(16) Tap alternately on opposite sides of ring with head of raw hide mallet until the gear is free of flange on support case (Figure 44). When reassembling use two bolts to ensure proper line up of bolt holes.

(17) Lift off left hand of support case and oil drum. Lift off thrust washer and ring gear.

(18) Pry off high speed clutch plate, and take out idler pinions and pins (Figure 45).

(19) Lift out entire differential assembly and support case thrust washer (Figure 46).

(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 (Figure 47).

(22) Pull out spider and differential side pinions, noting thrust washers behind pinions. Remove short hub side gear and remove thrust washer.

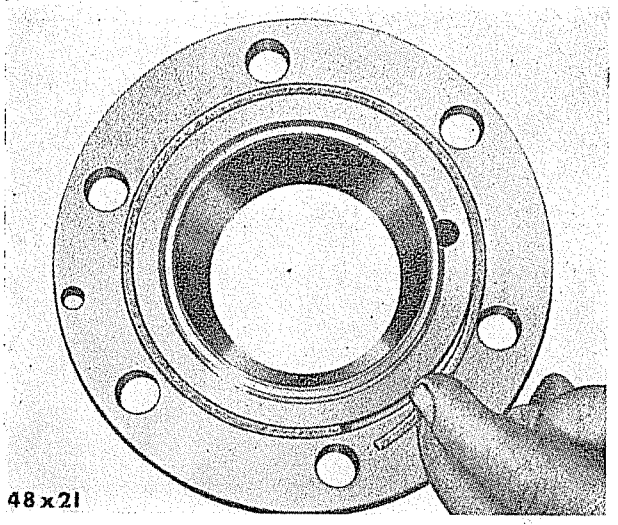


Fig. 43—Replacing Pinion Cage Cork.

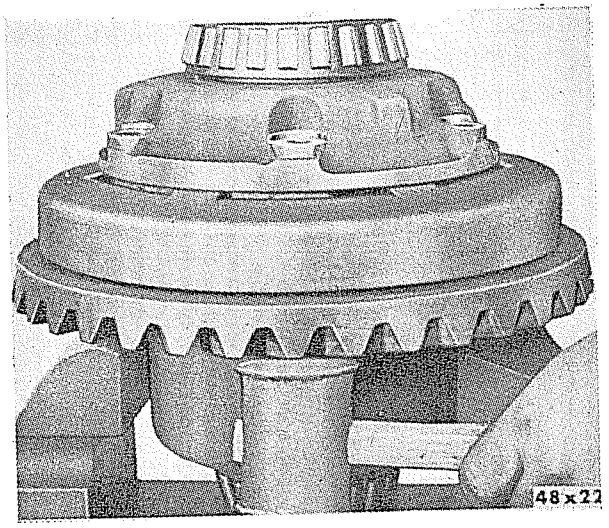


Fig. 44—Removing Ring Gear.

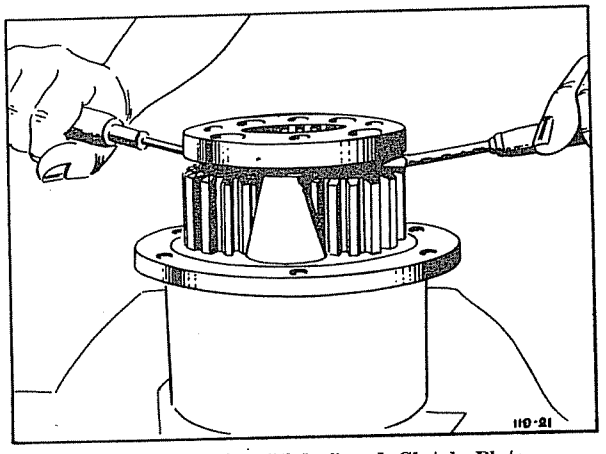


Fig. 45—Removing High Speed Clutch Plate.

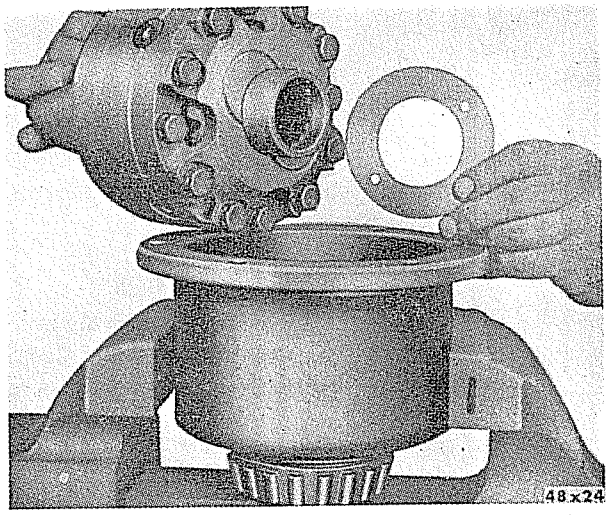


Fig. 46—Removing Differential and Thrust Washer.

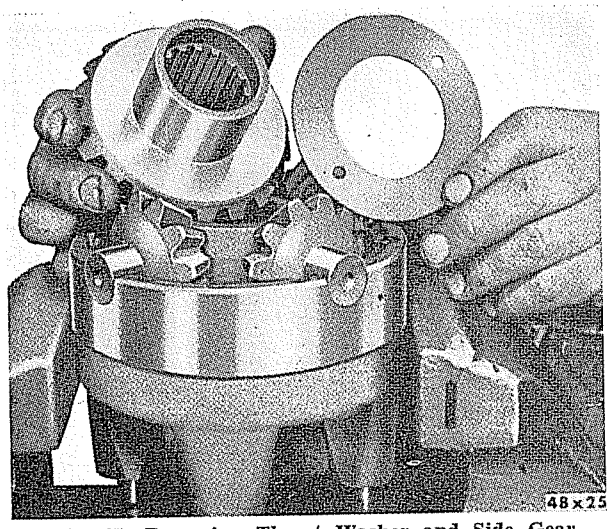


Fig. 47—Removing Thrust Washer and Side Gear.

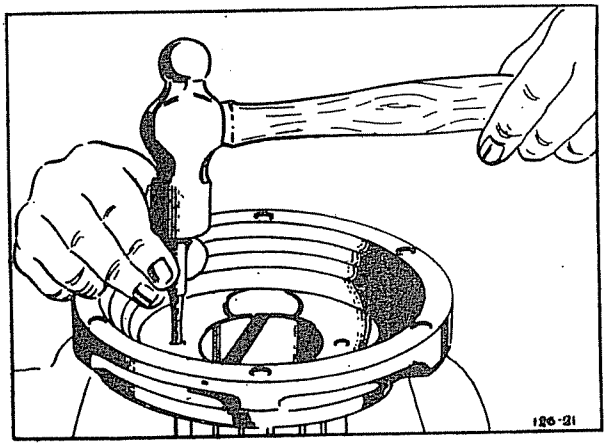


Fig. 48—Removing Differential Bearing Cones.

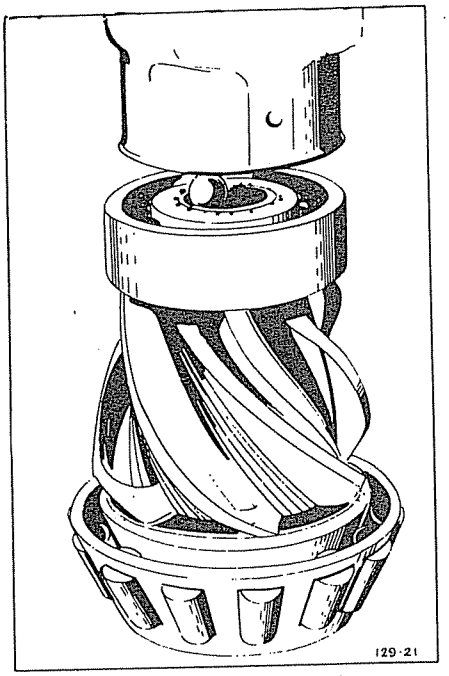


Fig. 49—Staking Pinion Shaft Using a Ball Bearing.

(23) Remove differential bearing cones by striking inner race on alternate sides through holes provided. Refer to Figure 48.

When assembling, note the following important steps.

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

(2) When assembling the planetary unit, lubricate both sides of thrust washers and cover idler pinion pins with lubricant. **Chamfered teeth on high speed clutch plate must face pinions.** Place notches in oil collection drum between bolt holes in bevel gear. Instal bolts and tighten securely and fasten lock wire.

(3) When assembling the inner bearing stake pinion shaft over in 4 spots after pinion bearing is pressed into place. (Figure 49).

PINION SHAFT BEARING ADJUSTMENT.

To determine the proper pre-load on the bearing, re-assemble the pinion assembly bearings, bearing cage, spacer, companion yoke and nut. **In determining pre-load omit oil seal and retainer.** Hold the companion yoke in a vice to tighten the nut. Nuts should be tightened equal to the following torque settings.

200 to 250 ft-lb. where thread is 1″ or smaller.

300 to 400 ft-lb. where thread is 1¼″.

600 to 900 ft-lb. where thread is 1½″ and larger.

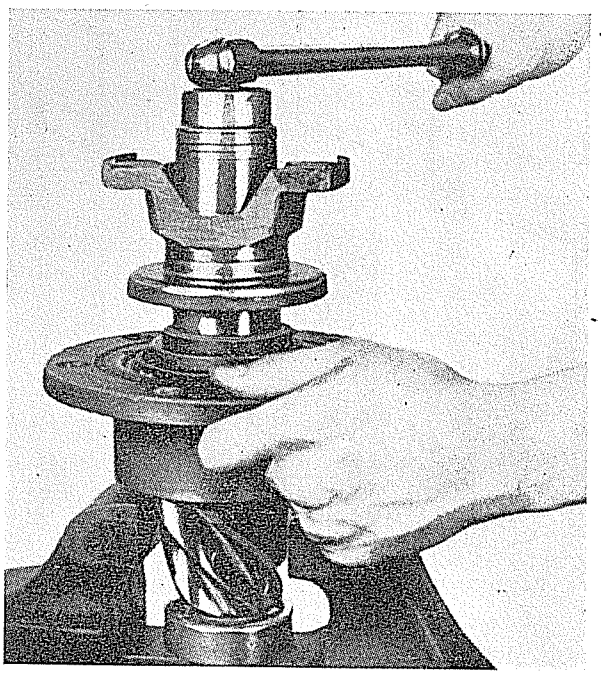


Fig. 50

The bearing cage should be rotated by hand while tightening nut, see Figure 50. With the pinion held stationary, a noticeable drag should be obtained. The desired pre-load should be 8 to 15 inch-pounds of torque.

After assembly of differential is complete, adjust ring gear and pinion as described in Paragraph 45.

41. OPERATION AND MAINTENANCE OF ELECTRIC SHIFT AS FITTED TO MODEL 8-71A-D AND MODELS 6-71A, 8-65A, 8-71A, EQUIPPED WITH TWO SPEED SPIRAL BEVEL REAR AXLE.

The Control Switch.

The switch with which the operator controls the axle is located on the transmission gear shift lever. The control switch has two positions — up and down. Three wires are connected to the switch.

When the button is down, the battery wire is connected to wire C, Figure 53, leading to the other field of the axle shift motor and also to the speedometer adaptor.

The control switch is connected to the harness or wiring system by plugging into the three pronged connector which is part of the harness. The switch is removable by slipping the rubber boot up the knob and pulling apart.

The Speedometer Adaptor. (Figure 51).

The purpose of the electrically operated speedometer adaptor is that this part "changes gear" in the speedometer drive at the same time as the axle shift diaphragm changes gear ratio in the driving axle, thus ensuring accurate speedometer readings.

The unit is mounted below the speedometer head and is driven by a flexible cable from the rear of the transmission. The adaptor is controlled by the unit on the rear axle in such a way that at the instant the axle gear ratio changes from high to low gear, a solenoid is energised and brings into operation an epicyclic gear in the adaptor. When the axle is changed from low to high gear the epicyclic gear is locked solid and the drive through the adaptor becomes direct.

If the speedometer change does not function simultaneously with the change in axle ratio then all terminal points must be checked when the engine is running at approximately 1000 R.P.M. with cut out operating. If there is no current at any of the

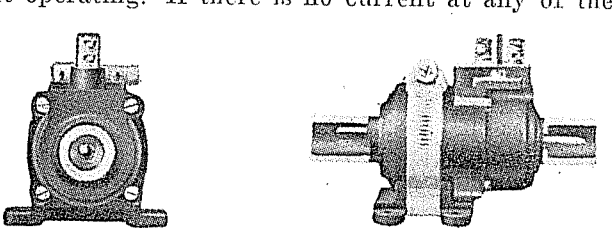


Fig. 51

IDENTIFICATION OF PARTS BY NUMBERS

1. Screw with lockwasher (motor cover to housing).
2. Elastic stop nut (motor to cover).
3. Motor cover cable clip.
4. Motor support and cover.
5. Motor support and cover gasket.
6. Electric motor assembly.
7. Electric motor grommet.
8. Shift motor housing.
9. Jam nut (automatic switch terminal — outside).
10. Fibre washer (automatic switch terminal — outside).
11. Bushing (automatic switch terminal hole in housing).
12. Bearing with snap ring.
13. Bearing lock nut.
14. Bearing cover gasket.
15. Bearing cover.
16. Screw with lockwasher (bearing cover to housing).
17. Automatic switch, terminal screws, and base gasket assembly.
18. Flat head screw (automatic switch to housing — inside).
19. Elastic stop nut (automatic switch terminals — inside).
20. Drive screw assembly.
21. Spring winding and shift fork actuating lever shaft.
22. Shift fork actuating lever assembly.
23. Tension spring.
24. Spring winding lever assembly.
25. Shift housing cover gasket.
26. Shift housing cover.
27. $\frac{1}{8}$ pipe plug.
28. Screw with lock washer (shift housing cover to housing).

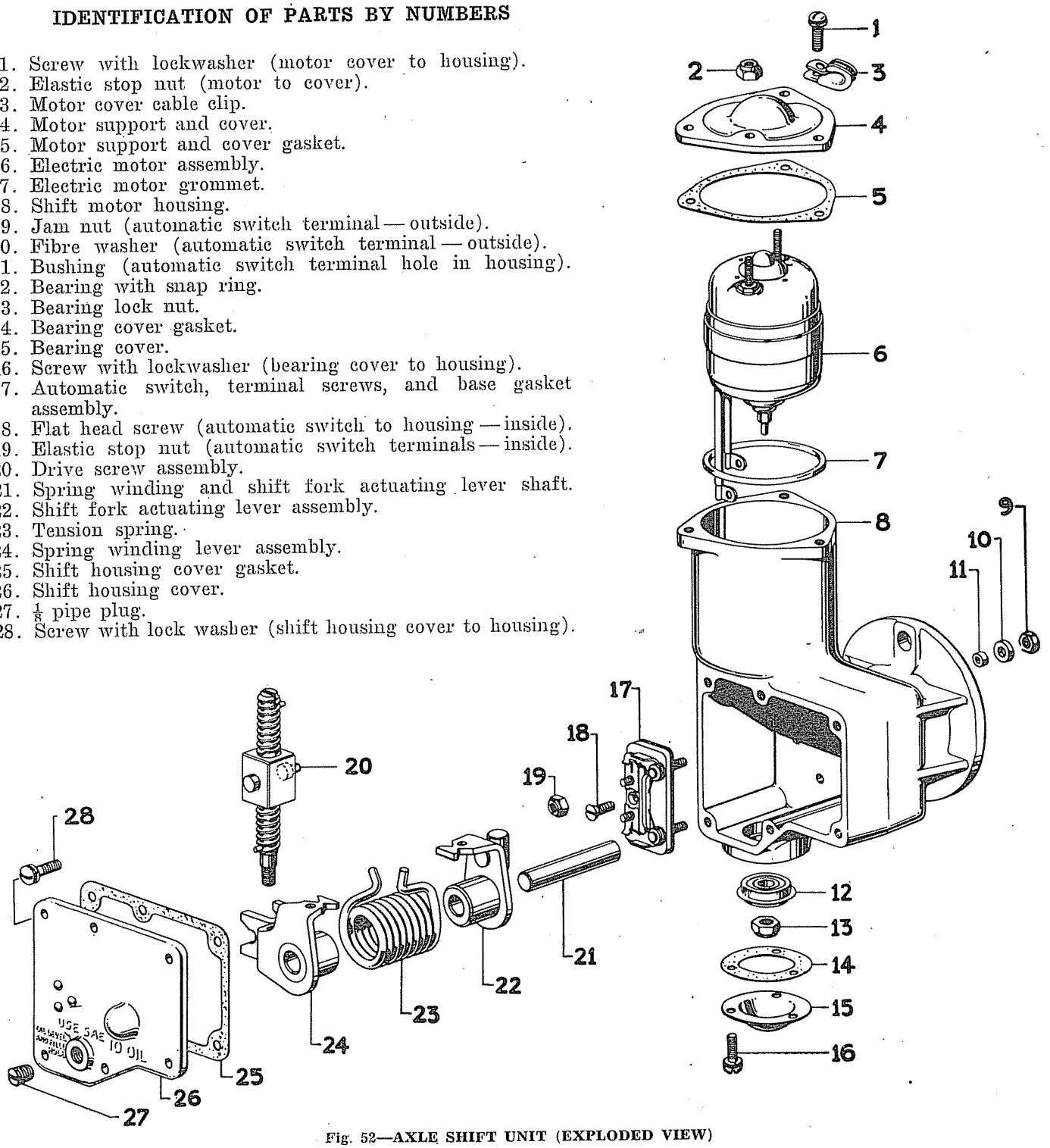


Fig. 52—AXLE SHIFT UNIT (EXPLODED VIEW)

points the vehicle electrical equipment should be checked.

Having made certain that no fault exists up to the speedometer adaptor, the faults must be either in the adaptor itself or the speedometer head.

If it is found the adaptor is at fault this unit will have to be replaced as a unit. The adaptor needs no periodical maintenance as it is a self-contained unit lubricated for life.

WIRING SYSTEM.

The wiring system as shown in Figure 53 has four terminals. Two of them, B and C in a double line run to the axle shift unit on the axle. Of these the longer **Red** wire is connected to the bottom terminal, and the shorter **Black** wire is connected to the top terminal. The short single **Black** wire C is connected to the speedometer adaptor and the **Green** wire A is connected to the circuit breaker. Wire D connects the copper stud of the circuit breaker to the control boards. The circuit breaker protects the system in the advent of a short circuit. Should a short circuit occur, it will open the circuit until the trouble has been located and corrected.

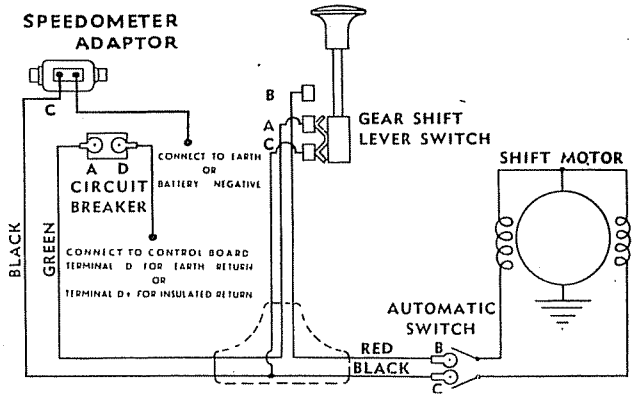


Fig. 53

AXLE SHIFT UNIT DESCRIPTION.

This unit shifts the axle into high or low range. Figure 54 shows the axle shift unit in the high range of the axle. In this position wire B, Figure 53, carries the current to one field of the motor (6) Figure 52 so that the armature and drive screw (20) turn in a clockwise direction and move the nut down. When the nut has travelled a sufficient distance to wind the spring (23) a contact bumper on the nut breaks an electrical connection on the automotive switch (17) so that the motor is no longer energised and the armature stops rotating.

To make sure the nut cannot travel back on the screw due to vibration, a ball screw detent spring mounted on the cover (26) holds the nut at the end of its travel on the screw. The nut moves the spring winding lever (24) down, which, pivoting on the

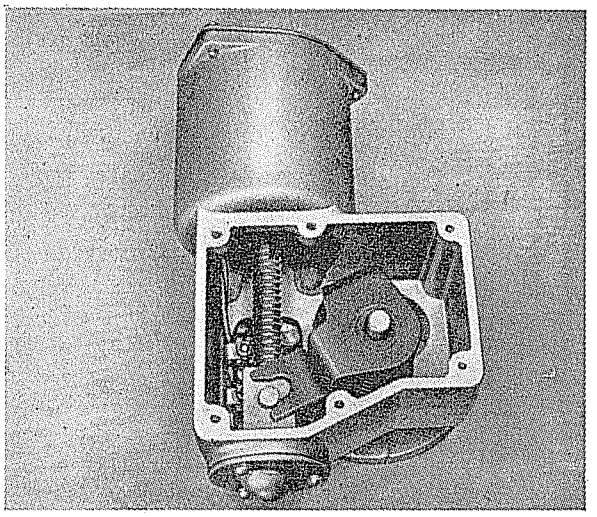


Fig. 54

pin (21) winds the tension spring (23) for high. Thus an increased load is put on the spring, and in this position the axle is ready to snap into the high speed ratio as soon as the load on the axle gears is relieved.

The tension spring is assembled in the unit so that it is under 45 to 65 pounds pressure.

When the spring winding lever is moved so that the spring is wound, the pressure of the spring is raised to 90 to 135 pounds. Pressure depending on the axle size.

This additional means is used to shift the axle, and when the shift is completed the ends of the spring come together, leaving the original tension of 45 to 65 pounds on the spring. This pre-load tension holds the axle in either gear.

SHIFT TO LOW RANGE.

When the button is pushed down, the motor is energised so that the screw moves counter clockwise and the nut travels to the top, winding the spring for a shift to low in the same manner as before. See Figure 55.

42. DISASSEMBLY AND ASSEMBLY OF AXLE SHIFT UNIT.

(1) Remove the two shift housing to carrier stud nuts and lock washers.

(2) Pull off the shift unit assembly. In re-assembling the swivel block must fit into the shift fork, see Figure 39.

(3) Remove the lock nuts and two wires. In re-assembling, the long or red wire goes to the bottom terminal.

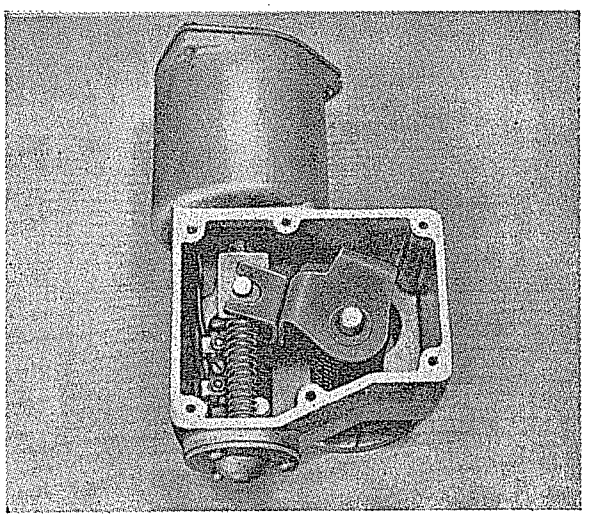


Fig. 55

(4) Remove the front cover and drain lubricant.

(5) After removing the front cover, nut will be at either top or bottom, depending upon the position in which the shift button was last left, see Figures 54 and 55.

(6) By turning drive screw run nut from either top or bottom position to the centre of the screw, Figure 56.

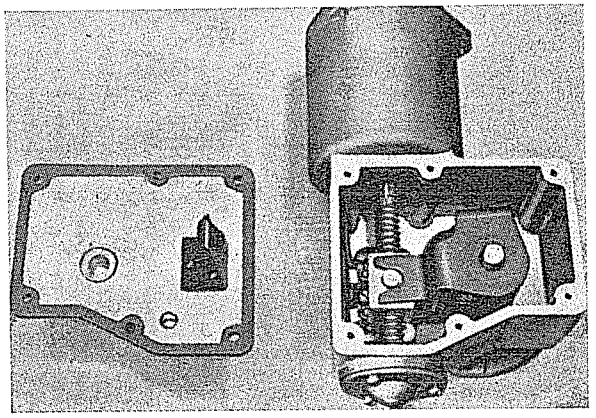


Fig. 56

NOTE.—This step is essential to prevent damage to the drive nut contact bumper and is also necessary in assembling.

(7) Remove lever assemblies and spring by pulling out pin (Figure 57). In re-assembling, care must be taken that the contact bumper on nut is **towards** the switch.

(8) Remove drive screw bearing cover on bottom and push down on screw assembly until bearing is free from housing. Insert screw driver in drive slot of screw and remove bearing retainer nut and bearing (Figure 58).

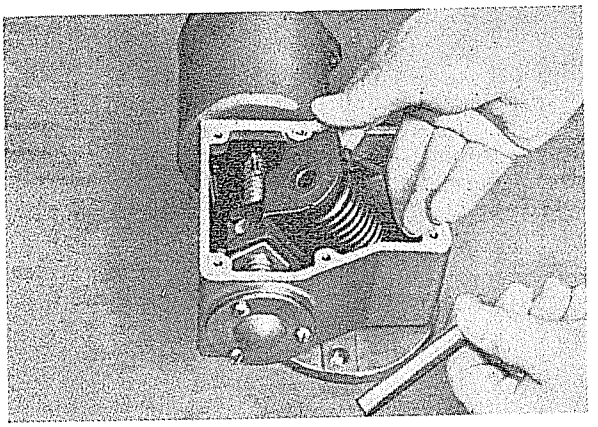


Fig. 57

(9) Remove the two lock nuts from switch terminals and pull off motor wires.

(10) Remove the three motor cover screws and pull out motor with cover.

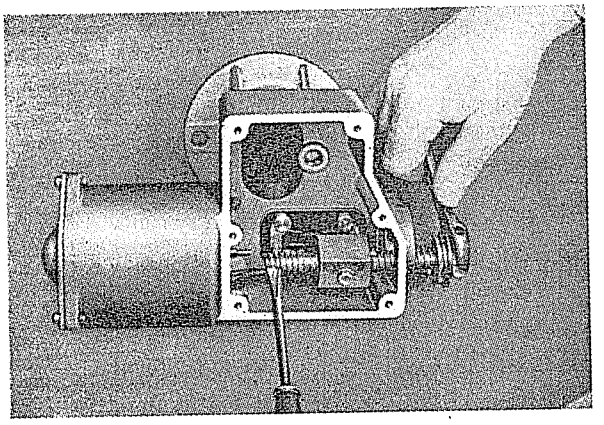


Fig. 58.

(11) Remove jam nuts and fibre washers from the back side of the housing and unscrew switch centre screw. Pull out automatic switch assembly.

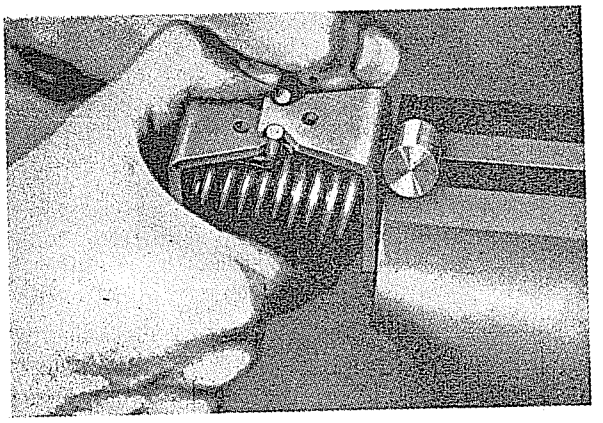


Fig. 59

(12) Mount in vice carefully as shown in Figure 59. Turn spring winding lever clockwise and pull.

CAUTION: Do not disassemble this assembly until necessary to replace one of the parts.

(13) When assembling, carefully locate parts as shown in Figure 60 then turn clockwise until end of spring is passed shift fork actuating lever. (This will pre-load springs) and push.

When re-assembling, wash all parts EXCEPT THE MOTOR in cleaning solvent.

CAUTION: Re-assemble only clean parts free of dirt and grit.

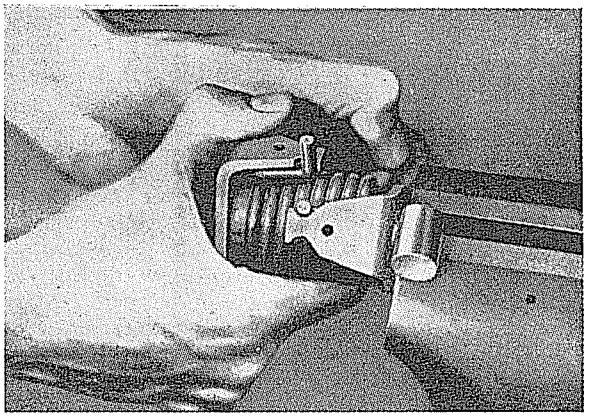


Fig. 60

43. TESTING AND SERVICE INSTRUCTIONS

If the electric shift should fail to operate properly, the trouble should first be located. A very handy tool for this is a test light, consisting of a 12 volt light bulb, with two wires a few feet long and small battery clips on the ends. Refer now to the wiring diagram, Figure 53 and first connect the test light to Point (D) on the circuit breaker and connect the other wire from the test light to earth. Turn on ignition switch, or accessory switch in the case of a diesel, and the light should show. If it fails to light at this point there is poor connection or broken wire between the ignition switch and circuit breaker. Next connect test light to Point (A) on the circuit breaker, Figure 53, and again the light should show. If it fails to show immediately, watch the light carefully and listen to the circuit breaker for a minute to see if it is flashing off and on. The light should stay on continuously at this point. If it flashes off and on, or you hear the breaker clicking, it indicates that too much current is flowing and the circuit breaker is opening. This is due either to a short circuit, or the motor in the shift unit not being free to turn. To determine which of these it is, remove the two wires (B) and (C) from the axle shift unit and recheck. If the light still flashes off and on or you still hear the breaker clicking, it is due to a short in the harness, but if the light now stays on continuously, the trouble is in the shift unit.

If there is no light at all at this point and the circuit breaker cannot be heard clicking, disconnect the green wire from terminal (A) Figure 53, and again clip the test light to terminal (A) post on the circuit breaker. If the light fails to show here and did show on terminal (D) the circuit breaker is faulty and should be replaced.

If the test light glowed normally at point (A), next remove the two wires (B) and (C) from the axle shift unit and connect a test light wire to one of these wires and the other test light wire to earth. The red shift unit wire should light the light only in HIGH GEAR or UP position on the gear shift lever switch and the black wire should light the light only in the LOW GEAR or DOWN position of the gear shift lever switch. If the light fails to flow in either of the above tests, it indicates a broken circuit in the harness or gear shift lever switch. If both wires light the test light in one position of the gear shift lever switch, it indicates a short circuit in the harness or gear shift lever switch.

Next connect the test light to the speedometer adaptor terminal (C) and earth. Here the light should glow in the LOW GEAR or DOWN position of the gear shift lever switch only. If it fails to glow, it indicates a broken circuit in the harness or gear shift lever switch.

These checks above will quickly locate the trouble. When checking the harness for short or open circuits, watch for broken insulation and DO NOT OVERLOOK THE GEAR SHIFT LEVER SWITCH which can best be tested by substituting a new one in its place.

If the vehicle shifts normally but the speedometer adaptor fails to operate properly, make the above check with the test light to see if it is getting current in the low range, and if it is, replace the adaptor.

When the trouble has been traced to the shift unit, disassemble as shown under disassembly and inspect the parts carefully. All parts can be washed in cleaning solvent EXCEPT THE MOTOR.

When inspecting the parts, most failures would be readily apparent; however, a few assemblies should be checked as follows:

AUTOMATIC SWITCH.

The automatic switch (17) Figure 52 (serviced only as an assembly) should have clean, free moving points which close firmly under spring tension.

DRIVE SCREW.

The drive screw (20) Figure 52 (serviced only as an assembly) should turn freely by rotating the screw while holding the nut. When the nut gets to the end of the screw, the screw can continue to turn but the nut should not jam or run off the end. By turning the screw in the opposite direction, the nut will go to the other end and stop as before, while the screw can continue to be turned. The fibre bumper in the nut should be a tight press fit. BE SURE IN ASSEMBLY THAT THIS FIBRE BUMPER IS IN TOWARD THE SWITCH.

MOTOR.

The motor (6) Figure 52 (serviced only as an assembly) is reversible so that with the motor housing connected to one battery terminal and either one of the two motor wires connected to the other battery terminal, the motor will run in one direction. With the other motor wire connected to the battery, the motor will run in the opposite direction.

The motor has a stall torque of approximately 6 inch-pounds. The way to check this motor is to put a small crescent wrench on the rectangular drive on the armature shaft. Hold the wrench in one hand, hold the motor itself firmly in the other hand or in

a vice, and then connect one motor housing to the other battery terminal. The wrench should then tend to turn with a torque or pull of about 6 inch-pounds.

Allow the wrench to turn VERY SLOWLY, making sure that this pull or torque is present the FULL 360° turn of the wrench. If one armature winding of the motor is burned out, this torque will disappear for a small part of the 360°. While making this test, care should be taken not to overheat the motor. This motor is lubricated and sealed for life.

RUBBER DIAPHRAGM.

The rubber diaphragm between the shift unit and the carrier assembly, which can be seen in Figure 39, should be in good condition and a tight fit over the shift fork. This diaphragm seals off axle lubrication from the shift unit.

NOTE: During re-assembly, extreme care should be taken not to allow any dirt to enter the axle shift unit.

For correct positioning of diaphragm, refer to lettering printed on its face.

44. SHIFTING INSTRUCTIONS FOR TWO SPEED AXLE ELECTRIC SHIFT.

To shift into low speed ratio:

(1) Keep accelerator pedal down, push button down.

(2) To complete shift, disengage and re-engage clutch as QUICKLY as possible, HOLDING ACCELERATOR PEDAL DOWN: or release and re-open accelerator as quickly as possible.

To shift into high speed ratio:

(1) Keep accelerator pedal down, pull button up.

(2) To complete shift, RELEASE ACCELERATOR and PAUSE until shift is completed.

SPLIT SHIFTING.

To shift to next higher gear in the transmission and at the same time from high to low speed axle—make the transmission shift in the usual way, and just before engaging clutch push button down.

To shift to next lower gear in the transmission and at the same time from low to high speed axle—pull the button up, then complete the transmission shift in the usual way.

IMPORTANT.

(1) Always keep accelerator down when control button is moved, except when split shifting to low speed ratio.

(2) For best results start loaded trucks in low speed ratio.

ADJUSTMENTS

45. GEAR ADJUSTMENT FOR CORRECT TOOTH CONTACT.

Checking tooth contact is accomplished by means of oiled red lead applied lightly to the gear teeth (Figure 61). When the pinion is rotated, the red lead is squeezed away from the contact of the teeth, leaving bare areas the exact size, shape and location of the contact.

With adjustments properly made, the correct tooth contacts (Figure 62) will be secured. The area of contact starts near the toe of the gear and extends about 80% of the tooth length. This adjustment results in a quiet running gear and pinion set, which, because the load is distributed over the teeth within the proper area, will deliver all the long service built into it.

If gears are allowed to operate with an adjustment of this kind (Figure 63) 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 be corrected by moving gear away from pinion. Refer to Service Standars for correct backlash.

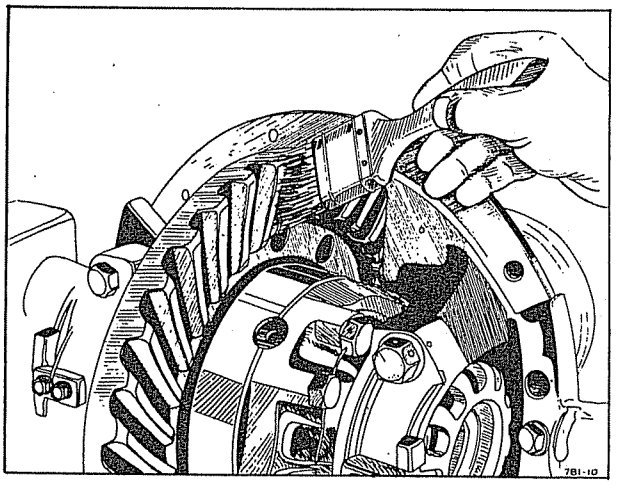


Fig. 61—Applying Oiled Red Lead to Section of Ring Gear Teeth.

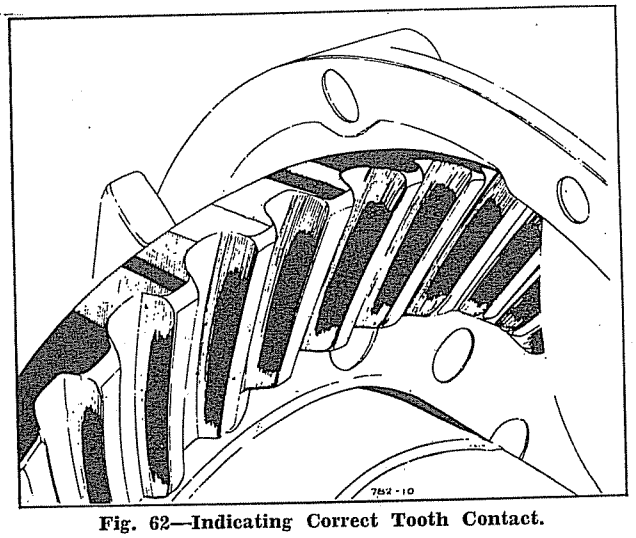


Fig. 62—Indicating Correct Tooth Contact.

Sharper impressions may be obtained by applying a small amount of resistance to the gear with a flat bar and 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.

If gears are allowed to operate with an adjustment of the type illustrated in Figure 64, 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 (Refer Service Standards) may be obtained by moving gear toward pinion.

If gears are allowed to operate with an adjustment of the type shown in Figure 65, chipping 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 (Refer Service Standards) may be obtained by moving pinion toward gear.

If gears are allowed to operate with an adjustment of the type shown in Figure 66, chipping, excessive wear and noise will result. To obtain correct contact, move gear towards pinion to increase the lengthwise contact, and move the contact towards toe. Correct backlash (refer Service Standards) 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.

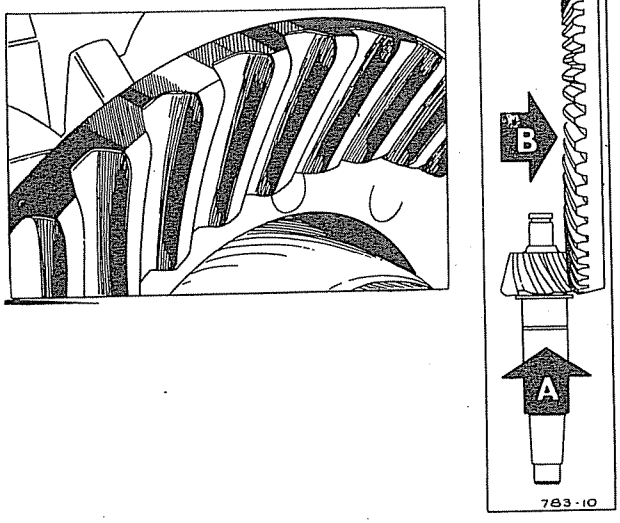


Fig. 63—Incorrect High Narrow Tooth Contact.

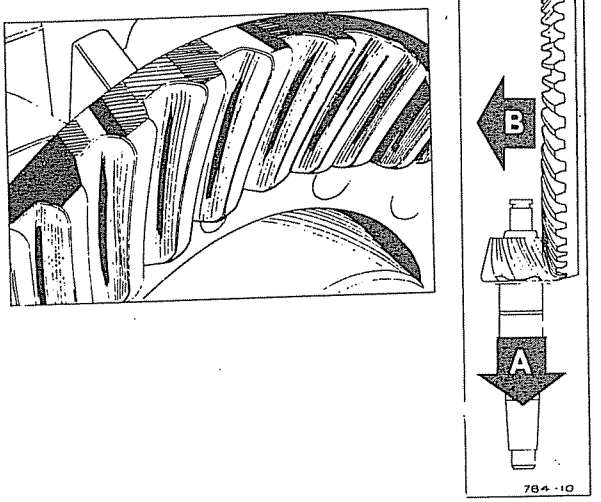


Fig. 64—Incorrect Low Narrow Tooth Contact.

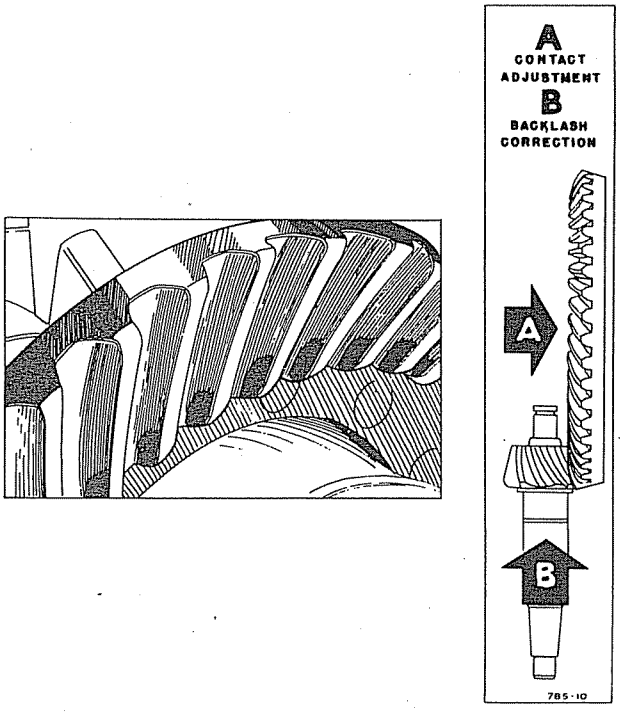


Fig. 65—Incorrect Short Toe Contact.

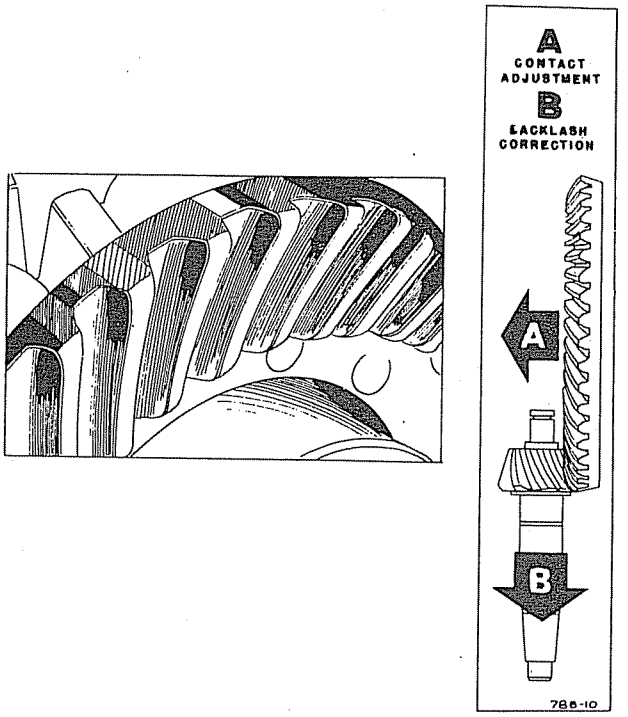


Fig. 66—Incorrect Short Heel Contact.

SERVICE DIAGNOSIS

Conditions — Possible Causes — Remedies

46. 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; reset 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 bearing 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.

47. 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 7 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. Re-adjust as necessary.

(h) If necessary, replace scuffed gears. For correct tooth contact, refer to Paragraph 45 in this section.

48. 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 re-adjust 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 cause of fatigue.

49. 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 excess 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.

50. 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.

51. 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.

52. 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 or normal fatigue.

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

53. REAR AXLE NOISE.

Rear axle noises are generally divided into three groups:

(1) **Gear Noise on Pull**—If the noise is a 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 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 or 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.

54. 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.

55. BACKLASH.

Before checking a rear axle for excessive backlash, make certain that all other causes of backlash have been eliminated, including:

(1) Engine tune-up; engine must be properly tuned.

(2) Clutch disc loose on clutch shaft.

(3) Excessive play in transmission gears.

(4) Universal joints worn or flanges loose on shaft.

Check rear axle for:

(1) Axle drive shaft flanges loose on hubs.

(2) Excessive clearance between differential ring gear and pinion.

56. 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 7 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.

57. 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 to 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.

NOTES

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