REAR SUSPENSION

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The rear suspension is of the Hotchkiss drive type, utilizing a hypoid ring gear and pinoin set, semi-floating axle shafts, and semi-elliptical springs. The weight of the car is carried on the axle shafts through sealed ball bearings which require no periodic lubrication. Driving and braking torque is cushioned through the rear springs. Two static ground brushes are built into all rear axle assemblies to eliminate radio interference due to static electricity. A rubber bumper (Fig. 4-1) is attached to the underside of the body above the differential to prevent propeller shaft from striking against underside of body when the car is under fast acceleration or being driven over severe bumps. Rubber bumpers mounted on the axle housing, above each spring, bear against the frame to arrest motion of the rear suspension when springs are under extreme compression.

AXLE HOUSING

The "banjo" type rear axle housing is provided with a pressure vent by means of a hole drilled in the bolt which fastens the brake line "Tee" connector to the left side of the axle housing. A breather cap over the bolt head protects the vent from entrance of dirt and water.

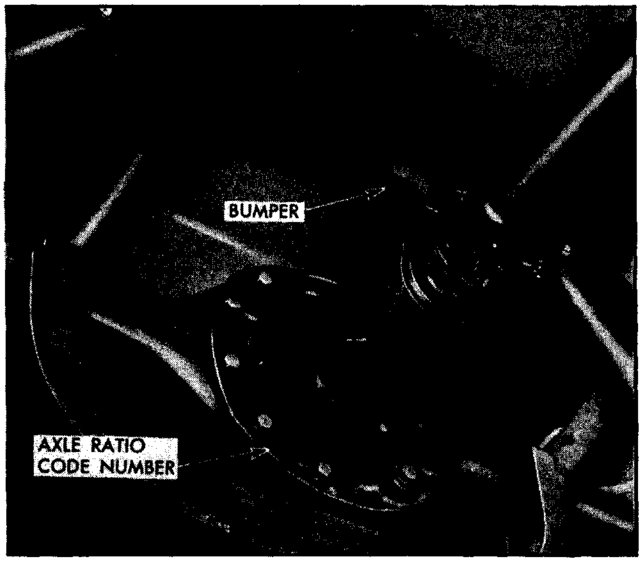

Fig. 4-1 Differential Bumper and Axle Ratio Code Number Location

REAR SPRINGS

The semi-elliptical car springs are mounted parallel to centerline of chassis to improve roll stability. Springs are bolted firmly to spring seats on the axle housing and pivoted at the ends by rubber bushings. Composition inserts are used between spring leaves. No lubrication of any kind is recommended or required on rear springs. Springs of different stiffness are used for various models because of differences in car weights and expected passenger loads.

AXLE RATIOS

Four axle ratios are available on 1955 models. The color marking on the ends of axle shafts and code number stamped on a pad on the differential carrier (Fig. 4-1) are given below for each axle ratio.

Designation	Ratio	Code No.	Color
HYDRA-MATIC			
Standard for 27 series exc. stn. wgn.	40:13 (3.08)	0	Yellow
Standard for stn. wgn.	42:13 (3.23)	9	Brown
Standard for 28 series	42:13 (3.23)	9	Brown
SYNCHRO-MESH			
Standard	40:11 (3.64)	6	Blue
Hills	39:10 (3.90)	4	Red

SHOCK ABSORBERS

Direct acting, sealed, and shielded shock absorbers are mounted at the front side of the axle housing. The upper ends are inclined toward the chassis center line to provide maximum stability.

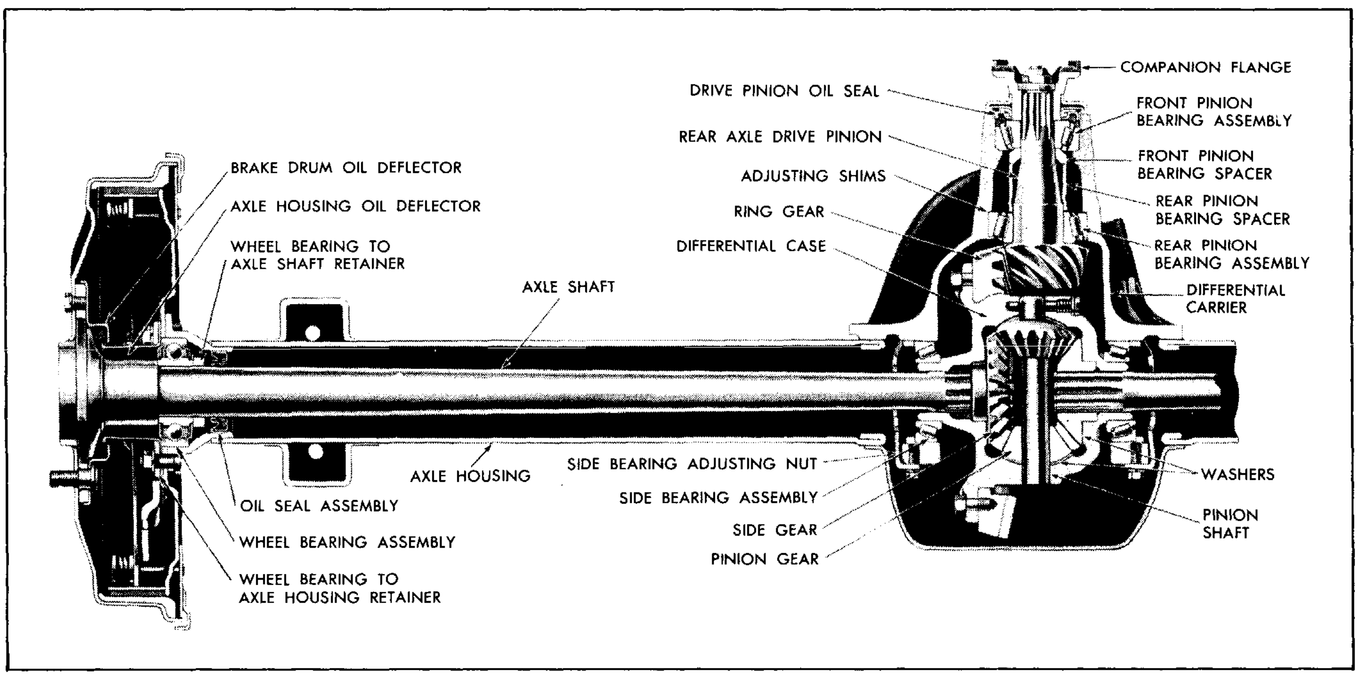

Fig. 4-2 Differential and Axle Housing—Cross Section

DIFFERENTIAL

The differential drive pinion is mounted on preloaded taper roller bearings (Fig. 4-2). The inner race of the rear bearing is a tight press fit on pinoin; the inner race of the front bearing is from a light press fit to a close sliding fit on pinion stem. The outer race of each bearing is pressed against a shoulder recessed in the carrier. Adjustment of the pinion along its axis is obtained by shims placed between the pinion rear bearing outer race and the shoulder. A splined companion flange is fastened to the pinion stem by a special self-locking nut which bears against a special washer. Tightening the pinion nut compresses a spacer which bears against inner race of front bearing. This spacer is used to preload pinion bearings and to prevent drive pinion from turning inside inner race of front bearing. NOTE: Early production differentials have a two-piece spacer which fits over pinion stem and bears against inner races of pinion bearings. Late production differentials have a one-piece spacer which fits over pinion stem and bears against a shoulder on drive pinion and inner race of front bearing (Fig. 4-3).

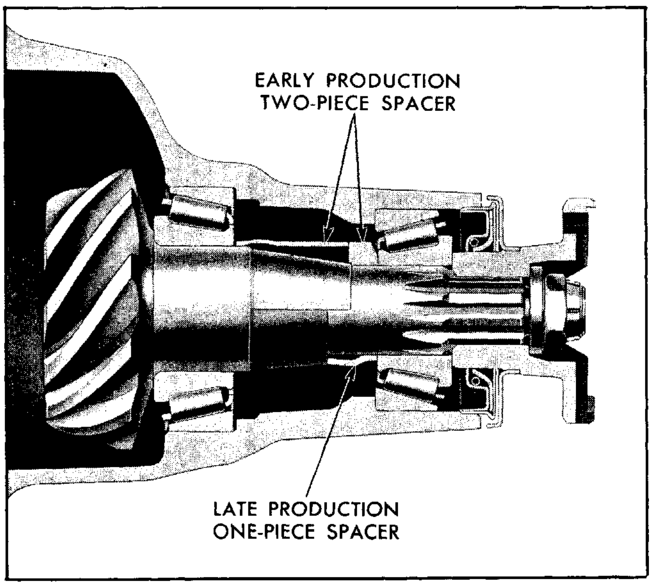

Fig. 4-3 Early and Late Production Pinion Bearing Spacers

The ring gear is fastened to the differential case by twelve special cap screws. The differential case is of one-piece construction open only at one side and is mounted on two tapered roller side bearings. Sideways adjustment of the ring gear with respect to the pinion and also side bearing preload adjustment are obtained by means of large diameter adjusting nuts which bear against the outer races of the side bearings.

The bevel pinions are carried on a solid cross shaft mounted and locked in the differential case. These pinions mesh with side gears which are splined to the axle shafts and run in counterbores in the case. Lubrication of the side gears in the counterbores is assured by two equally spaced holes in each gear which run from the gear face (between two teeth) to the thrust face on back of the gear. Pinions and side gears have thrust washers behind them to prevent scoring of thrust surfaces.

AXLE SHAFTS AND BEARINGS

The rear axle shafts are mounted on heavy duty sealed ball bearings which require no lubrication attention. Each bearing is pressed to a shoulder on the shaft and is held in place by a pressed-on retainer. A heavy retainer, which also clamps the brake backing plate to the axle housing, retains the bearing in the end of the housing. One of the nuts which secures the retainer and backing plate to the housing also holds the static ground brush in place. The brush contacts an oil guard attached to the axle shaft at the wheel flange.

PERODIC SERVICE

DIFFERENTIAL

See lubrication section.

AXLE BEARINGS

Lubricated and sealed at the factory and therefore require no servicing.

MINOR REPAIRS

COMPANION FLANGE—REMOVE AND REPLACE

NOTE: When replacing companion flange, it is important that new flange be properly installed to provide correct pinion bearing preload. The following procedure must be used to insure correct pinion bearing adjustment.

1. With rear wheels off the floor, turn rear wheels and rap brake backing plates with a soft hammer to ensure that brakes are free.

2. Turn down lock plates and remove four cap screws which hold rear universal joint to companion flange. Tap flanged bearings lightly with a soft hammer to disengage drive lugs if necessary. Use a piece of soft wire or heavy rubber band to hold flanged bearings onto journal to prevent loss of bearing rollers when joint is disconnected (Fig. 4-49).

3. Using inch-pound Torque Wrench KMO-652 with Adapter KMO-653 and socket placed over drive pinion nut, turn pinion two or three revolutions to ensure free movement, and then take a torque reading while rotating pinion to measure bearing preload (Fig. 4-4). Record reading. NOTE: Additional clearance to check preload can be obtained between differential and body by raising body a few inches by means of a jack or stand placed under frame rear cross member.

4. Hold companion flange with Holding Tool J-2933-A (Fig. 4-5) and remove drive pinion nut and washer using a heavy duty socket.

5. Remove companion flange using Puller J-962-A (Fig. 4-6).

6. Install new companion flange and install washer and nut. Hold companion flange with Holding Tool J-2933-A and tighten nut only a little at a time, stopping frequently to check preload (step 3). Tighten nut to reading noted in step 3, however, if reading obtained in step 3 was less than 10 lb. in., increase preload to 10-12 lb. in.

7. Connect universal joints. Use new lock plates and tighten U-joint to companion flange screws to 28-33 lb. ft. torque. Turn up lock plate ears against flats of heads.

PINION BEARING OIL SEAL—REMOVE AND REPLACE

NOTE: Since inspection of companion flange after removal may reveal damage to this part necessitating its replacement, preload reading of pinion bearings should be checked prior to removing flange so proper preload can be maintained should new flange be required. Follow steps 1, 2 and 3 of companion flange replacement procedure, page 4–3, then proceed as follows:

1. Mark position of drive pinion, companion flange, pinion nut and pinion stem since they will be reinstalled in exactly the same position, providing companion flange is not replaced.

2. Remove drive pinion nut and washer using Holding Tool J-2933-A (Fig. 4-5); remove companion flange, using Puller J-962-A (Fig. 4-6).

3. Remove oil seal by prying it out of carrier with a blunt tool applied between rim of retainer and front of carrier. CAUTION: Use care to keep dirt, dust, and other matter away from exposed pinion front bearing.

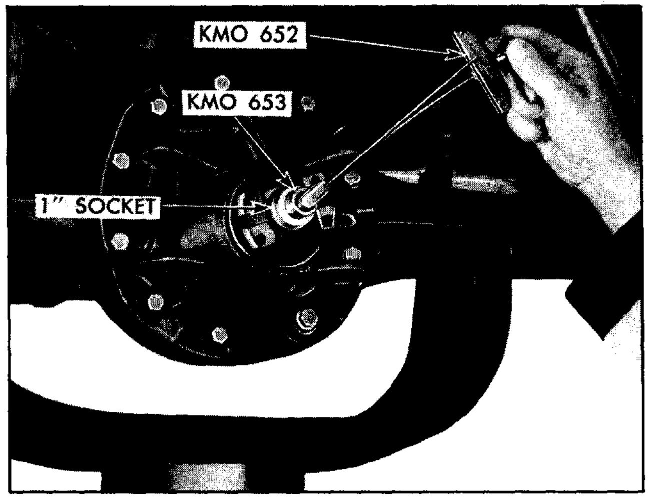

Fig. 4-4 Checking Pinion Bearing Preload With Torque Wrench KMO 652

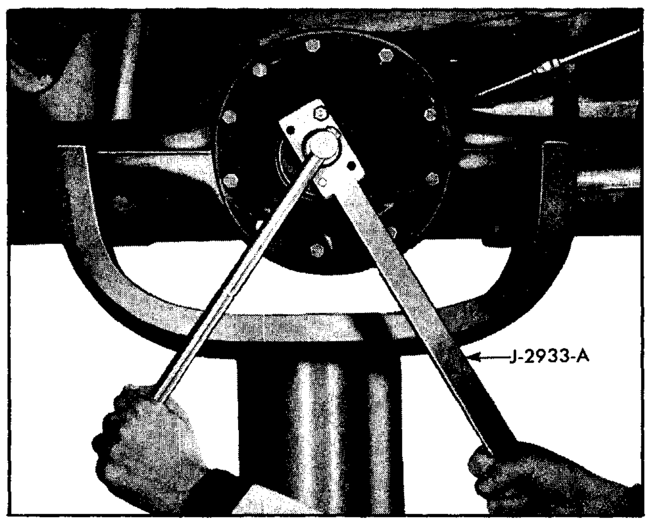

Fig. 4-5 Holding Companion Flange With Holding Tool J-2933-A

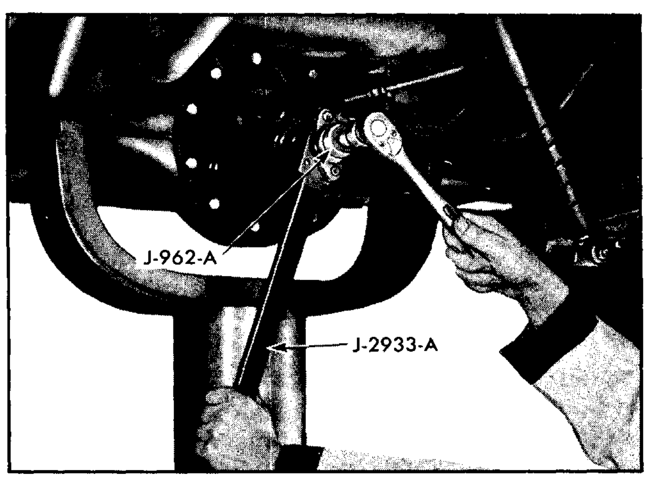

Fig. 4-6 Removing Companion Flange With Puller J-962-A

4. Oil lip of new seal and coat outer diameter of seal with Permatex No. 3 or similar compound. Install seal by tapping into place using Installing Plate J-2935 (Fig. 4-39).

5. Inspect companion flange. If it is nicked, scratched, burred, or rough so as to damage seal, hone carefully or install new flange following step 6 of companion flange replacement procedure.

6. If inspection shows original companion flange to be satisfactory, reinstall it and install washer and pinion nut. Tighten nut until it and companion flange are in SAME position noted in step 2 above. NOTE: Nut will turn relatively easy until original position is approached, at which point spacer begins to compress and bearings begin to preload causing sharp increase in effort required to turn nut. Stop turning nut and check position when this point is reached.

7. Connect rear universal joint. Use new lock plates and tighten U-joint to companion flange screws to 28-33 lb. ft. torque. Turn up lock plate ears against flats of heads.

AXLE SHAFT OIL SEAL—REMOVE AND REPLACE

1. Remove rear wheel. NOTE: It will be necessary to raise body away from axle housing to provide clearance to remove wheel.

2. Clean away all dirt from area where brake backing plate seats against flanged end of axle housing to prevent any possible entry of dirt into wheel bearing.

3. Remove brake drum.

4. Remove four nuts from bearing retainer bolts; remove static ground brush.

5. Remove axle shaft, using Puller J-942, if necessary (Fig. 4-7). Do not dislodge backing plate or brake pipe may be damaged.

6. Remove oil seal using Remover J-943 (Fig. 4-8).

7. Oil new seal leather and coat outside of seal retainer which seats in axle housing with Permatex No. 3 or similar compound. Be sure surface of axle shaft which contacts seal is smooth. If nicked or burred, hone carefully or replace axle shaft.

8. Install new seal using Installer J-5818 (Fig. 4-9).

9. Coat recess in axle housing, where bearing seats, with Lubriplate 110; coat gasket surfaces on backing plate and oil deflector with Permatex No. 3 or similar compound.

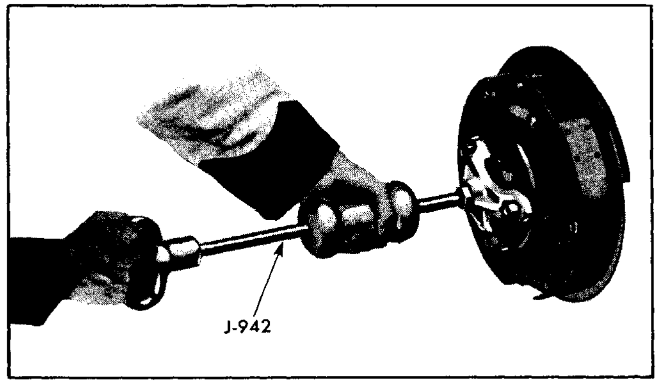

Fig. 4-7 Removing Axle Shaft With Puller J-942

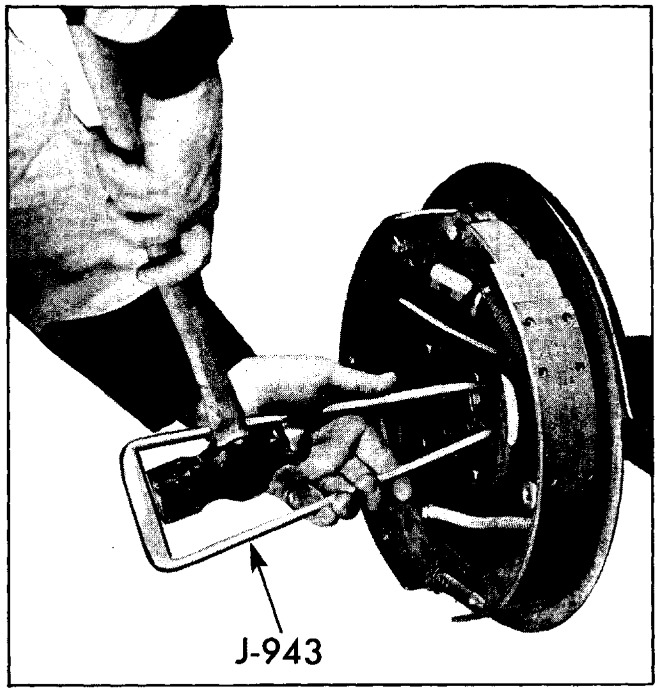

Fig. 4-8 Removing Oil Seal with Remover J-943

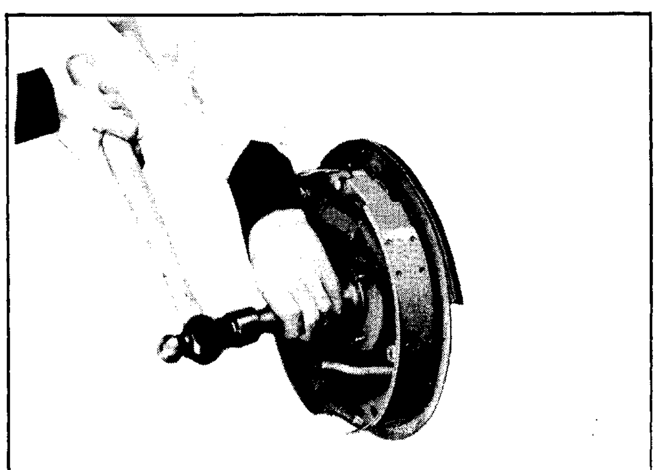

Fig. 4-9 Installing Oil Seal With Installer J-5818

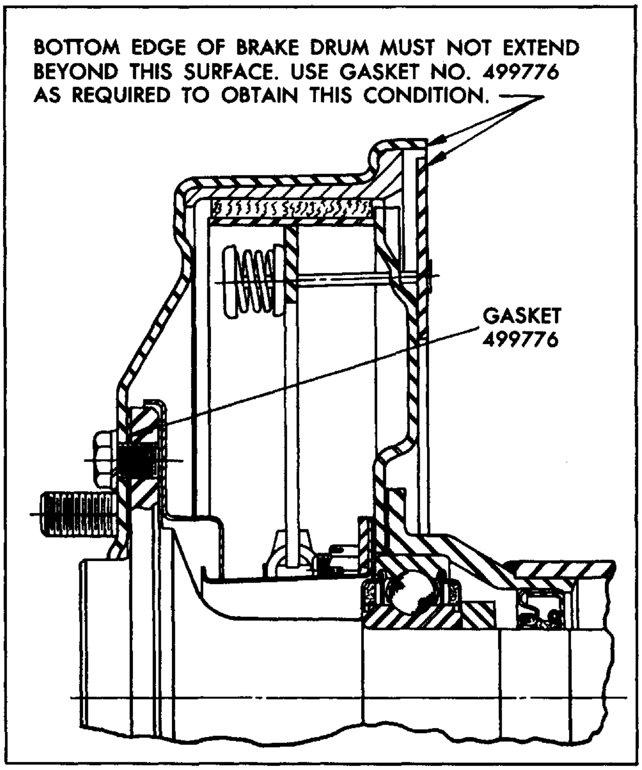

Fig. 4-10 Correct Alignment of Brake Drum Flange

10. Install axle shaft. If both seals have been replaced, shaft with left hand threads on wheel bolts must be on left side of car. CAUTION: Do not drag shaft on oil seal.

11. Position oil deflector gasket, oil deflector, and bearing retainer; install static ground brush and tighten self-locking bearing retainer nuts to 30-35 lb. ft. torque.

12. Install brake drum and wheel. NOTE: When installing brake drum, check to see that edge of drum flange is even with shield on the backing plate as shown in Fig. 4-10. If flange extends over shield, install sufficient gaskets between axle flange and drum to obtain correct alignment.

AXLE SHAFT OR SHAFT BEARING—REMOVE AND REPLACE

1. Remove axle shaft as outlined in steps 1 through 5 of preceding procedure.

2. Remove bearing retainer ring by carefully cutting it with a cold chisel as shown in Fig. 4-11. Do not cut into shaft with chisel. It is not necessary to cut entirely through retainer. If a new bearing is to be installed, unserviceable bearing and retainer may be pressed off shaft together. This must not be done if bearing is to be used again because of danger of brinelling bearing.

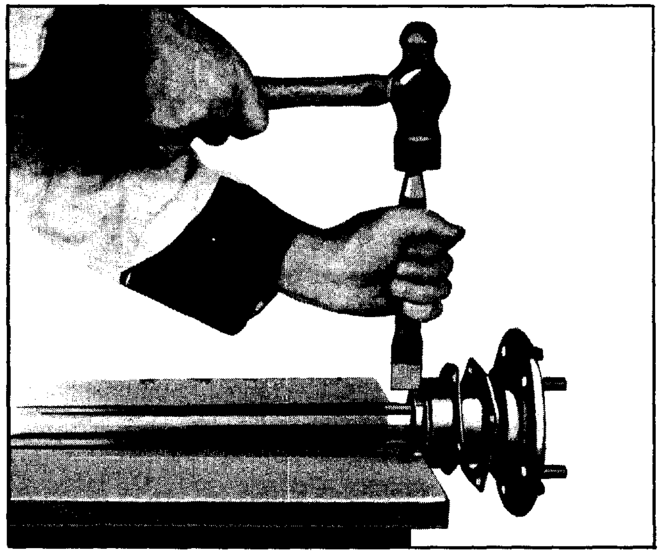

Fig. 4-11 Splitting Bearing Retainer Ring

3. With tool J-947-P engaging outer race of bearing and ring enclosing bearing (Fig. 4-12), press shaft from bearing in arbor press.

4. If removed, install oil deflector and bearing retainer plate on shaft. Install bearing on shaft using tool J-947-P to bear only on inner race and press bearing firmly against shoulder on shaft (Fig. 4-13).

5. Press a new bearing retainer ring in place firmly against bearing using tool J-947-P.

6. Before installing axle shaft, inspect oil seal in housing to be sure it is not damaged.

7. Install axle shaft as outlined in steps 8 through 11 of preceding procedure.

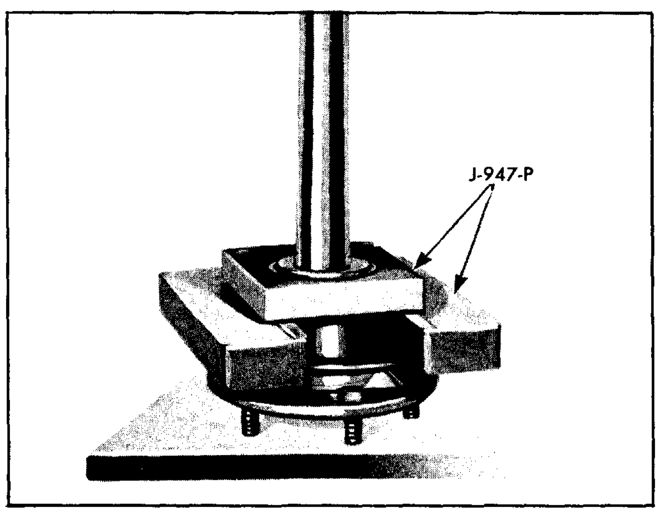

Fig. 4-12 Bearing Replacer Tool J-947-P in Place for Pressing Bearing Off Shaft

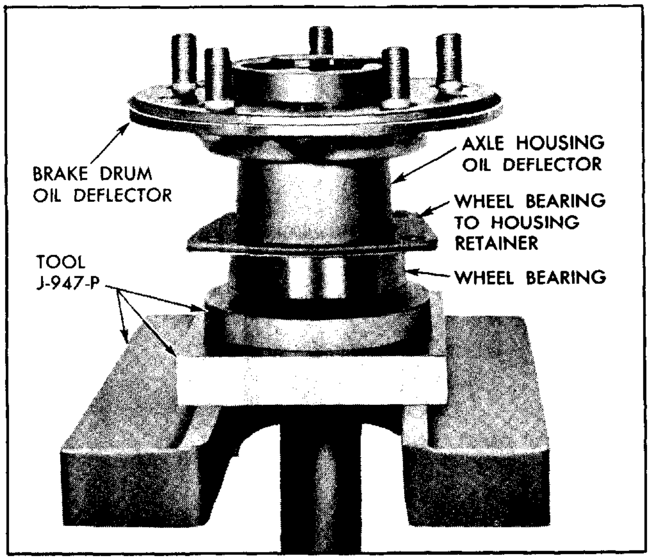

Fig. 4-13 Bearing Replacer Tool J-947 in Place for Pressing Bearing on Shaft

REMOVAL OF DIFFERENTIAL

1. Remove axle shafts as instructed in steps 1 through 5 under "Axle Shaft Oil Seal—Remove and Replace," page 4-5. CAUTION: Do not drag axle shaft on oil seal.

2. Disconnect propeller shaft as instructed in step 2 under "Companion Flange—Remove and Replace," page 4-3.

3. Thoroughly clean differential carrier and surrounding area of axle housing to avoid dirt entering housing or falling on the gears.

4. Drain oil by removing lower differential attaching screws.

5. Remove remaining differential attaching screws and remove carrier assembly from housing.

MAJOR REPAIR OF DIFFERENTIAL

BEARING FAILURE

Bearings fail by "lapping", "spalling" or "locking".

Lapping. Lapping is caused by fine particles of abrasive material such as scale, sand or emery which are circulated by oil and which cause wearing away of roller and race surfaces. Bearings which are worn loose but remain smooth without spalling or pitting are clear evidence of dirty oil.

Spalling. Spalling failure of bearings is caused by overload or faulty assembly. Bearings which failed by spalling have either flaked or pitted rollers or races. Faulty assembly consists of misalignment or cocking of bearings, or adjustments which are too tight.

Locking. Locking of bearings is caused by large particles of foreign material becoming wedged between rollers and race usually causing one of the races to turn. Preloading of taper roller bearings higher than specified can also cause locking of bearings.

PRE-REPAIR INVESTIGATION

NOTE: A close examination of the differential prior to disassembly will often reveal valuable information as to the extent and type of repairs or adjustments necessary. The information thus gained, coupled with the report of malfunctioning, will provide a basis for determining the degree of disassembly required. Since the frequent causes of axle noise are improper backlash or side bearing preload, or both, a few simple adjustments may be all that is necessary to correct a discrepancy.

Use care at all times to keep dirt and other foreign matter, such as grinder dust, soot, or sand, away from differential to prevent possibility of subsequent failure of differential.

1. Wash interior parts of assembly with cleaning fluid and mount in Carrier Fixture J-3289 (Fig. 4-14).

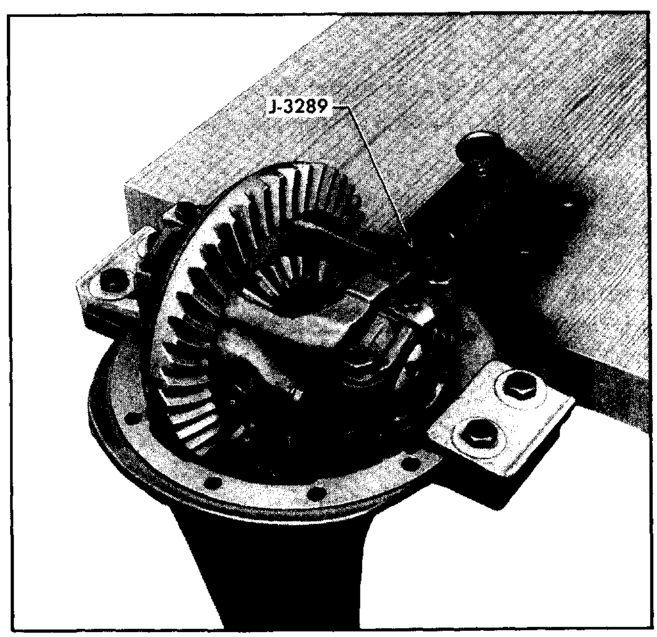

Fig. 4-14 Differential Mounted in Carrier Fixture J-3289

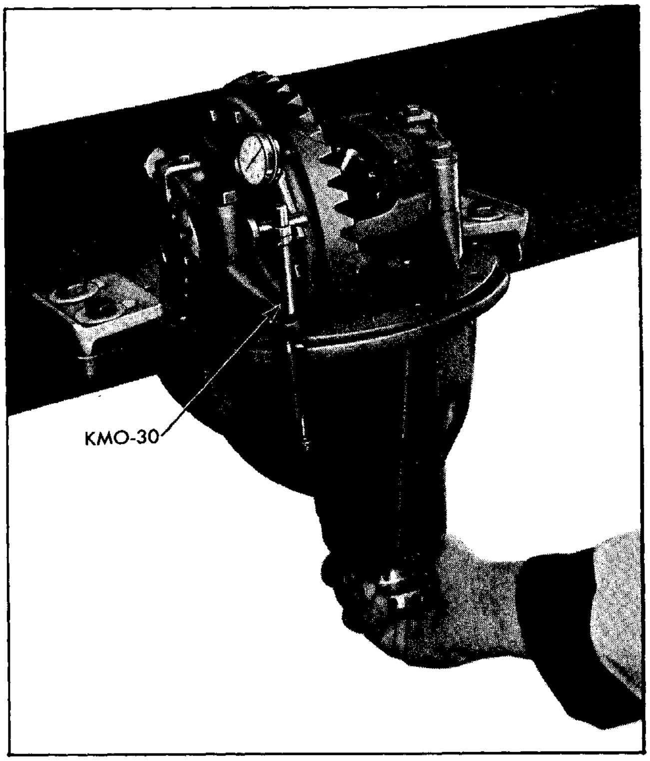

Fig. 4-15 Checking Ring Gear Run-out With KMO-30 Set

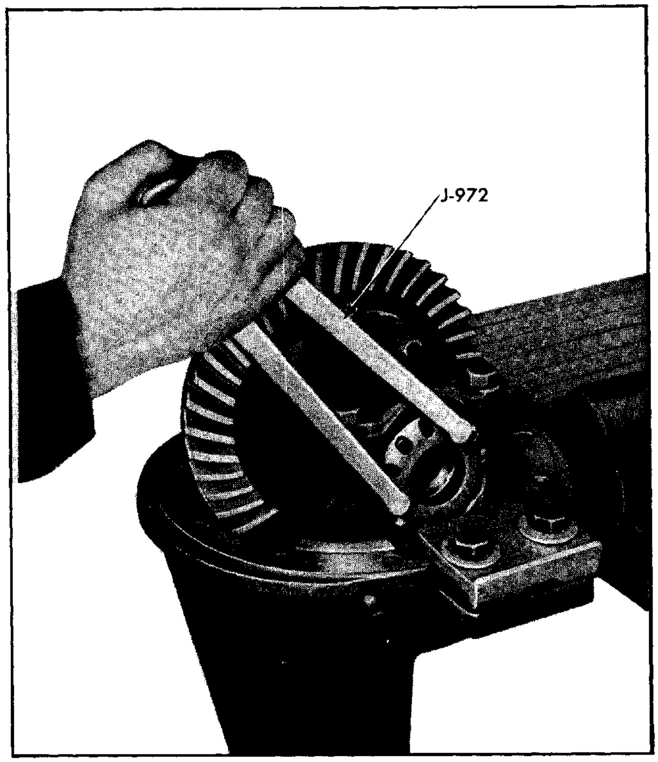

Fig. 4-16 Turning Adjusting Nuts With Wrench J-972

2. Mark pinion nut and end of pinion with a punch or other suitable means for reference purposes.

3. Check pinion nut for tightness (pinion bearing preload). If reading is less than 10-12 lb. in. increase preload reading to 10-12 lb. in. See instructions for checking preload and tightening pinion nut on page 4–17.

4. See that ring gear attaching screws are tightened evenly and alternately across the diameter to 55-60 lb. ft. torque.

5. Check ring gear runout using dial indicator on backside of ring gear (Fig. 4-15). Runout should not exceed .002″. Excessive runout could be the result of: warped ring gear or mounting flange on case, worn side bearings, misaligned carrier cross-bore, or burrs on case mounting flange or side bearing hubs.

6. Examine ring gear and pinion teeth for nicks or scoring. If no scoring is present, the gear and pinion should be checked for evidence of excessive wear. Any of these conditions will require replacement of ring gear and pinion set (page 4–21). Relatively new gears that are noisy due to improper tooth contact, but have not run long enough to damage the original lapped surfaces, can usually have the noise level reduced by correct adjustment to the point where it is not objectionable.

7. Check differential side bearing preload and backlash as described in following procedures.

8. Check ring and pinion gear tooth contact by red lead test as outlined on page 4–12.

DIFFERENTIAL SIDE BEARING PRELOAD ADJUSTMENT

1. Remove adjusting nut locks and mark adjusting nuts for lock location.

2. Loosen each bearing cap bolt, retighten a little more than finger tight, and tap caps lightly to assure freedom of bearings and nuts.

3. Back off right hand adjusting nut using Adjusting Wrench J-972 (Fig. 4-16) and watch outer race of side bearing to see if it turns with adjusting nut. (NOTE: The right hand adjusting nut is farthest from ring gear.) Race should turn with the nut, as nut is backed off, until nut is turned two to four notches (holes in adjusting nut); count notches from original mark to point where race stops turning to check original adjustment and retighten three to four notches.

4. Check backlash before retightening bearing cap bolts and installing nut locks.

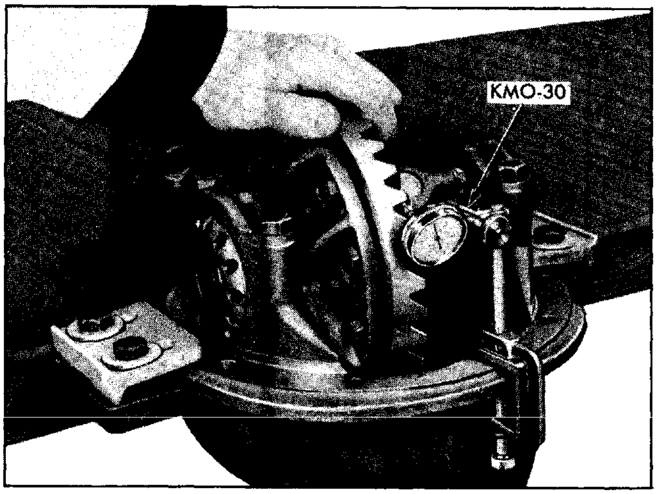

Fig. 4-17 Checking Backlash With Indicator KMO-30 Set

ADJUSTMENT OF BACKLASH

NOTE: Location of dial indicator should be at as much of a tangent to ring gear as possible when checking backlash. When rechecking backlash, after an adjustment has been made, indicator should be repositioned as nearly as possible in same position. Backlash readings will vary as much as .003" with various positions of indicator.

1. Check backlash between ring gear and pinion using indicator set KMO-30 (Fig. 4-17). Backlash should be between .003" and .012", checked at two or more equally spaced points around ring gear. If backlash is outside limits, it will be necessary to move gear away from the pinion to increase backlash or toward pinion to decrease it. To change backlash, move adjusting nuts in same direction one notch at a time until correct backlash is obtained; that is if left nut is backed off one notch, the right nut must be tightened one notch.

2. Tighten bearing cap screws to 70-75 lb. ft. torque. Tap screws with steel hammer while tightening to ensure caps seating properly and a correct torque reading.

GENERAL INFORMATION ON TOOTH CONTACT PATTERN

GEAR TOOTH NOMENCLATURE

Tooth contact pattern is revealed by observing teeth on ring gear after conducting a red lead test (page 4–12). The teeth on the ring gear (and drive pinion) are helically cut, therefore the teeth are curved and larger at one end. The side of the ring

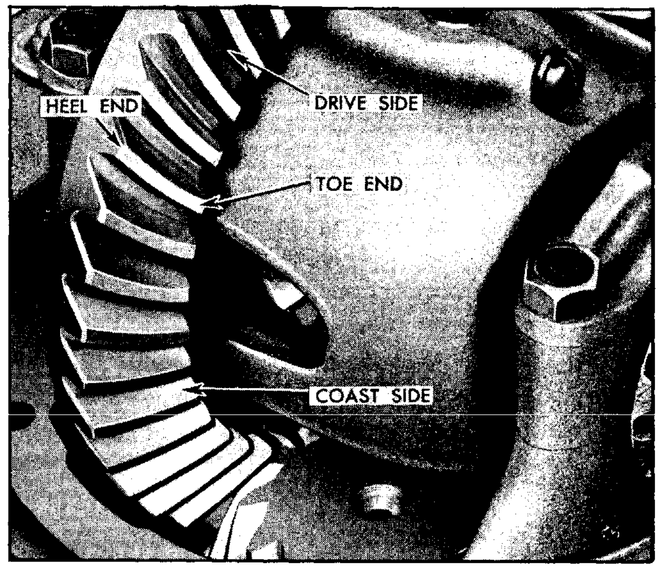

Fig. 4-18 Nomenclature of Ring Gear Teeth

gear tooth which curves outward, or is convex, is referred to as the "drive" side; concave side is "coast" side. The end of the tooth nearest center of ring gear is referred to as the "toe" end; end of tooth farthest away from center is "heel" end. Toe end of tooth is smaller than heel end. Nomenclature of ring gear teeth is shown in Fig. 4-18.

DESIRED TOOTH CONTACT PATTERN

The desired tooth contact pattern (Fig. 4-19) is one which starts near toe end of tooth and extends along toward, but not to heel of tooth. The pattern on coast may be, and usually is nearer top of tooth. This pattern has a large contacting area, centered between top and bottom of tooth, and should result in minimum noise during operation. (All gear trains produce a certain amount of noise.)

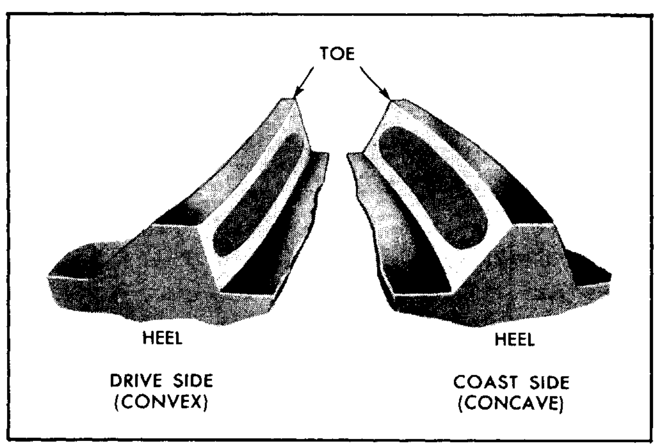

Fig. 4-19 Desired Tooth Contact Pattern

ADJUSTMENTS AFFECTING TOOTH CONTACT

Four adjustments can be made which will affect tooth contact pattern: side bearing preload, drive pinion bearing preload, backlash, and position of drive pinion in carrier. The effects of bearing preloads are not readily apparent on (hand loaded) red lead tests; however, these adjustments should be within specifications before proceding with backlash and drive pinion adjustments.

Backlash is adjusted by means of the side bearing adjusting nuts which move the entire case and ring gear assembly closer to or farther from drive pinion. (The adjusting nuts are also used to set side bearing preload.)

The position of the drive pinion is adjusted by increasing or decreasing the shim pack between a shoulder recessed in the carrier and the outer race of the pinion rear bearing. The shim pack is used in the differential to compensate for manufacturing tolerances. Increasing shim pack thickness will move pinion closer to centerline of ring gear (Fig. 4-20). Decreasing shim pack thickness will move pinion farther away from centerline of ring gear.

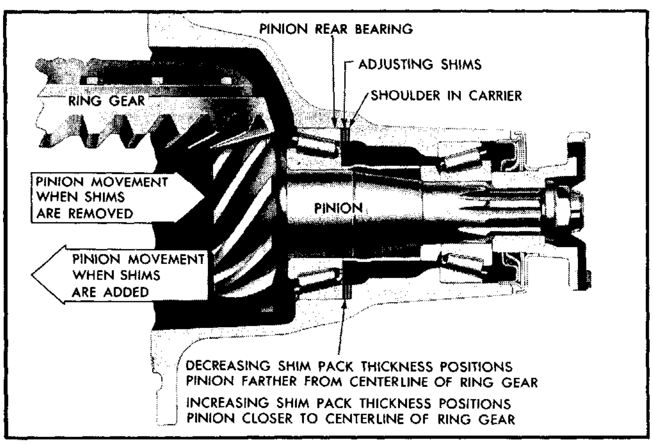

Fig. 4-20 Effects of Shim Pack Thickness on Pinion Position

EFFECTS OF BACKLASH ON TOOTH PATTERN

NOTE: The terms "excess" and "insufficient" refer to settings which are greater than .012″ or less than .003″ as specified. With respect to tooth contact patterns, "excess" refers to backlash which, although less than .012″, is more than necessary to provide desired pattern. Similarly, "insufficient" refers to backlash which, although .003″ or more, is less than necessary to provide desired pattern.

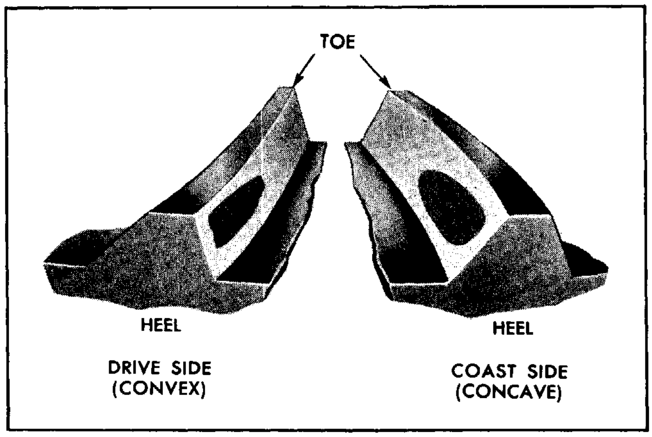

Fig. 4-21 Tooth Pattern When Backlash is Excessive

Excess backlash, provided pinion is properly positioned, will give a pattern on heel of tooth on both drive and coast sides (Fig. 4-21). Decreasing backlash by moving case and ring gear assembly closer to pinion will cause pattern to move toward toe end of tooth on both drive and coast sides.

Insufficient backlash, provided pinion is properly positioned, will give a pattern on toe of tooth on both drive and coast sides (Fig. 4-22). Increasing backlash will cause pattern to move toward heel end of tooth on both drive and coast sides.

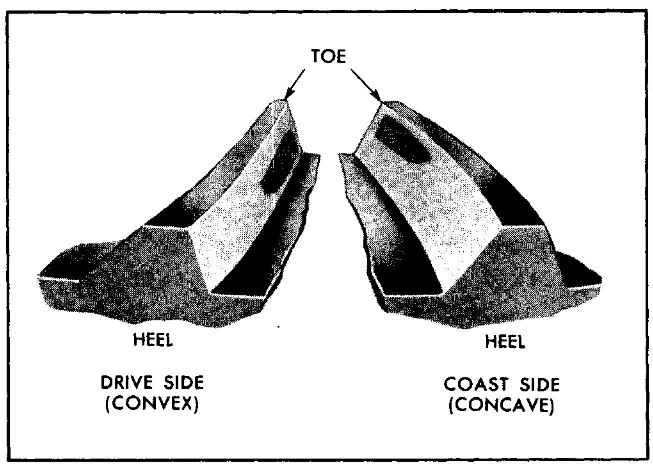

Fig. 4-22 Tooth Pattern When Backlash is Insufficient

EFFECTS OF PINION POSITION ON TOOTH PATTERN

When drive pinion is too far away from centerline of ring gear, the pattern will be a high heel contact on drive side and a high toe contact on coast side

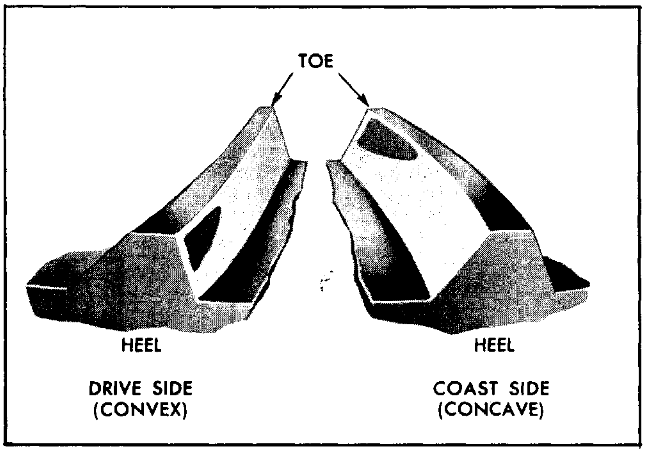

Fig. 4-23 Tooth Pattern When Pinion is Too Far Away From Ring Gear

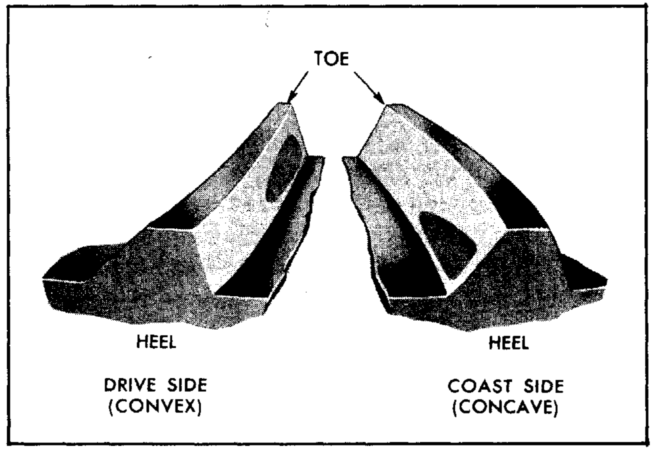

Fig. 4-25 Tooth Pattern When Pinion Is Too Close To Ring Gear

(Fig. 4-23), provided backlash is within specifications of .003″ to .012″. Moving pinion closer to centerline of ring gear by increasing shim pack thickness will cause the high heel contact on drive side to lower and move toward toe; the high toe contact on coast side will lower and move toward heel (Fig. 4-24).

When pinion is too close to ring gear the pattern will be a low toe contact on drive side, and a low heel contact on coast (Fig. 4-25), provided backlash is within specifications of .003″ to .012″. Moving pinion farther away from ring gear by decreasing shim pack thickness will cause the low toe contact on drive side to raise and move toward heel; the low heel contact on coast will raise and move toward toe (Fig. 4-26).

EFFECTS OF INCREASING LOAD ON TOOTH CONTACT PATTERN

When "load" on ring and pinion gear is increased, such as when car is accelerated from standstill or from normal drive, the tooth contact will tend to spread out, and under very heavy load will extend from near toe to near heel. The entire contact also tends to shift toward heel under increasingly heavier loads and will become somewhat broader with respect to tops and bottoms of teeth. The patterns obtained by red lead test, dependent upon degree of "loading", approximate a normal light load.

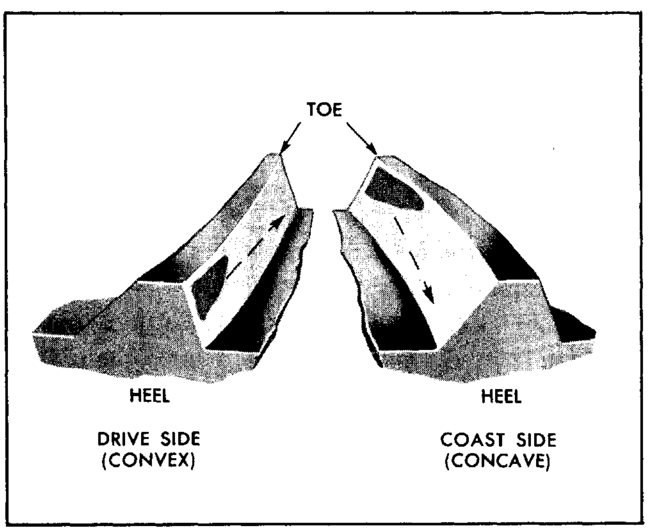

Fig. 4-24 Direction of Movement of Tooth Contacts When Shim Pack Thickness Is Increased

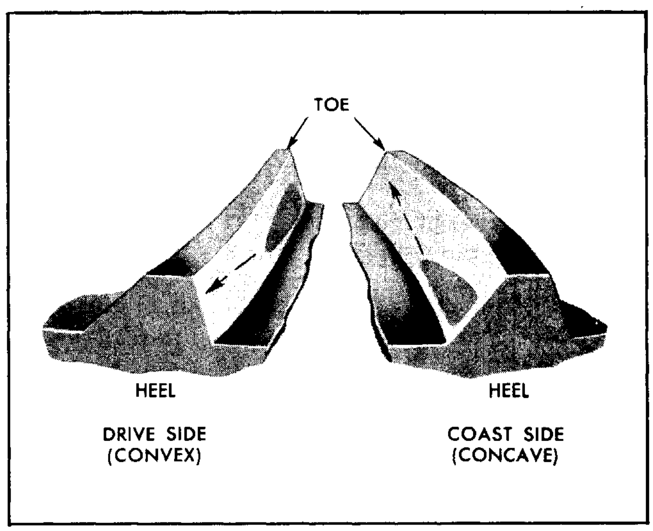

Fig. 4-26 Direction of Movement of Tooth Contacts When Shim Pack Thickness Is Decreased

RED LEAD TEST

NOTE: It is very important that tooth contact be tested before differential carrier assembly is disassembled and before it is installed. Allowable variations in the carrier or pinion rear bearing may cause pinion to be too far away from, or close to ring gear even when shimmed according to chart on page 4-21. Thus, tooth contact must be tested and corrected if necessary or the gears may be noisy. To make this test, proceed as follows:

1. Tighten bearing cap screws to 70-75 lb. ft. torque. NOTE: Tap heads of screw intermittently while tightening to ensure proper seating of caps and sufficient tightness.

2. Remove differential pinion shaft lock screw, pinion shaft, pinion gears, side gears, and thrust washers.

3. Install a companion flange shipping cover or improvised brake drum on the companion flange.

4. Mix a small amount of powdered red lead with a drop of engine oil and apply the heavy paste to all ring gear teeth using a medium stiff brush. (NOTE: Powdered red lead, available from paint manufacturers and suppliers, has proven the most satisfactory for checking tooth pattern.) A very small quantity of paste should be used. When properly used, area of pinion tooth contact will be visible when hand load is applied.

5. Insert a 3/4" diameter bar into pinion shaft holes in differential case. Load gear set by using left hand (protected by a cloth) as a brake on flange shipping cover while right hand is rocking the ring gear back and forth several times with a grip on the bar about 16" from the case (Fig. 4-27). A pattern should be impressed on all ring gear teeth. A test made without loading the gears will not give a satisfactory pattern.

6. Observe pattern on ring gear teeth and compare with Figs. 4-19, -21, -22, -23, and -25.

ADJUSTING TOOTH CONTACT BY CHANGING BACKLASH

NOTE: In many cases the tooth contact pattern may not look exactly like those illustrated in Figs. 4-19, -21, -22, -23, and -25. In such case, try adjusting backlash to several different values, from minimum to maximum, testing tooth contact after each adjustment. By this means a pattern should be found which will look similar to one of those illustrated in the above figures. Correction can then be made by changing backlash or pinion position as may be required.

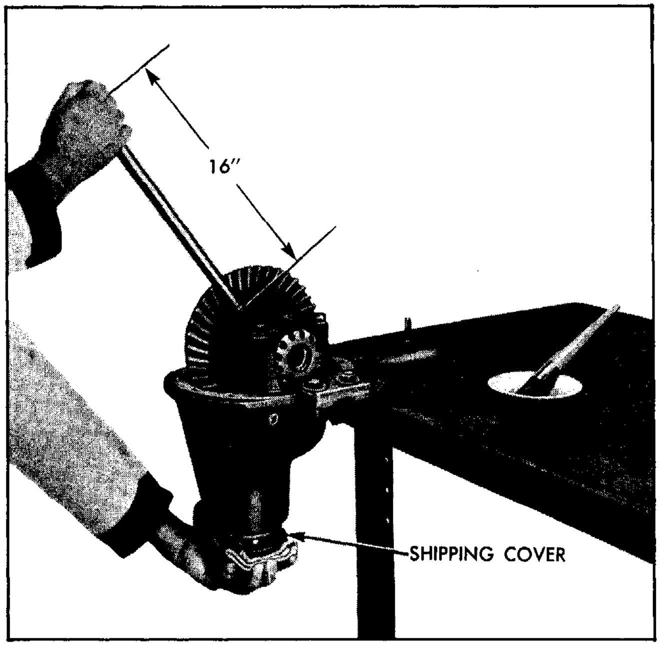

Fig. 4-27 Checking Tooth Contact Pattern—Red Lead Test

If red lead test produces a tooth pattern on heel of tooth, similar to that in Fig. 4-21, backlash is excessive. To correct this condition proceed as follows:

1. Loosen bearing cap screws and retighten slightly more than finger tight.

2. Back off right hand adjusting nut (Fig. 4-16) one notch and tighten left hand adjusting nut one notch (each notch of adjustment will change backlash .003"-.004"). CAUTION: Do not decrease backlash below minimum specification of .003". Tap each bearing cap and rock case to ensure proper seating of bearings.

3. Tighten bearing cap screws to 70-75 lb. ft. torque. NOTE: Tap heads of screws intermittently while tightening to ensure proper seating of caps and sufficient tightness.

4. Recheck backlash.

5. Recheck tooth contact pattern by red lead test. NOTE: Repaint all teeth with red lead.

6. Repeat adjustments one notch at a time, rechecking pattern by red lead test to determine whether backlash will give correct pattern. CAUTION: Do not reduce backlash below minimum specification of .003". If backlash adjustment does not give desired pattern, pinion position will have to be adjusted (page 4-21).

7. If correct contact pattern is obtained, proceed as follows:

a. Examine differential pinions and side gears for scoring, chipping or other signs of wear on teeth, and thrust surfaces of side gear hubs.

b. Inspect pinion shaft for unusual wear. Blackened surfaces are caused by hypoid lubricant and are not harmful.

c. Inspect pinion and side gear thrust washers for damage.

d. Inspect differential case for cracks or other damage. See that surfaces which thrust washers bear against are not badly worn or scored. Fit side gears into place in case counterbores to check for excessive radial looseness indicating excessive wear. Wear is also indicated by a ridge at the edge of counterbores which can be felt with fingers when gears are removed. Case must be replaced if counterbores indicate excessive wear (over .006"). See page 4–19 for replacement of case.

e. Install side gears and thrust washers, pinions and thrust washers, pinion shaft, pinion shaft lock screw and lockwasher. Oil parts with hypoid lubricant before installing.

f. Check tightness of bearing cap screws (70 to 75 lb. ft. torque).

g. Install adjusting nut locks.

h. Reinstall differential carrier in housing as instructed on page 4–22.

i. Road test.

CORRECTION FOR INSUFFICIENT BACKLASH

If red lead test produces a tooth pattern on toe of tooth, similar to that in Fig. 4-22, backlash is insufficient. This type of pattern may be the result of carrying adjustment for backlash, described above, too far. Follow preceding procedure (reversing backlash instructions, step 2) to determine if increasing backlash will produce desired pattern. Do not exceed maximum backlash specification of .012". NOTE: On very high mileage gear sets, where a definite wear pattern has been established, it is permissible to exceed .012" backlash if so doing will give desired pattern. It is important, however, that backlash not be exceded except on very high mileage gear sets.

If backlash adjustment does not give desired pattern, pinion position will have to be adjusted (page 4–21). If correct pattern is obtained, proceed with step 7 of preceding procedure.

ADJUSTING TOOTH CONTACT BY CHANGING PINION POSITION

Should differential side bearing preload correction or backlash adjustment fail to give correct tooth contacts or if axle is still too noisy, pinion adjustment by reshimming is necessary. Examine gear tooth contacts after adjusting backlash to best condition (red lead test) and compare with Fig. 4-23 and Fig. 4-25. NOTE: Changing position of drive pinion will cause a change in backlash if case is replaced in same position in carrier crossbore as it was before pinion was shimmed. For example, if backlash is .006" and pinion is shimmed from .010" to .013" and case is replaced in same position in carrier crossbore, backlash will decrease to less than .006". Since there is only one combination of shim thickness and backlash (that is, pinion position and case position) which will give correct pattern, it will be necessary to adjust backlash to several values and check pattern after each adjustment in order to obtain correct pattern or to determine if a different shim thickness is required to obtain correct pattern.

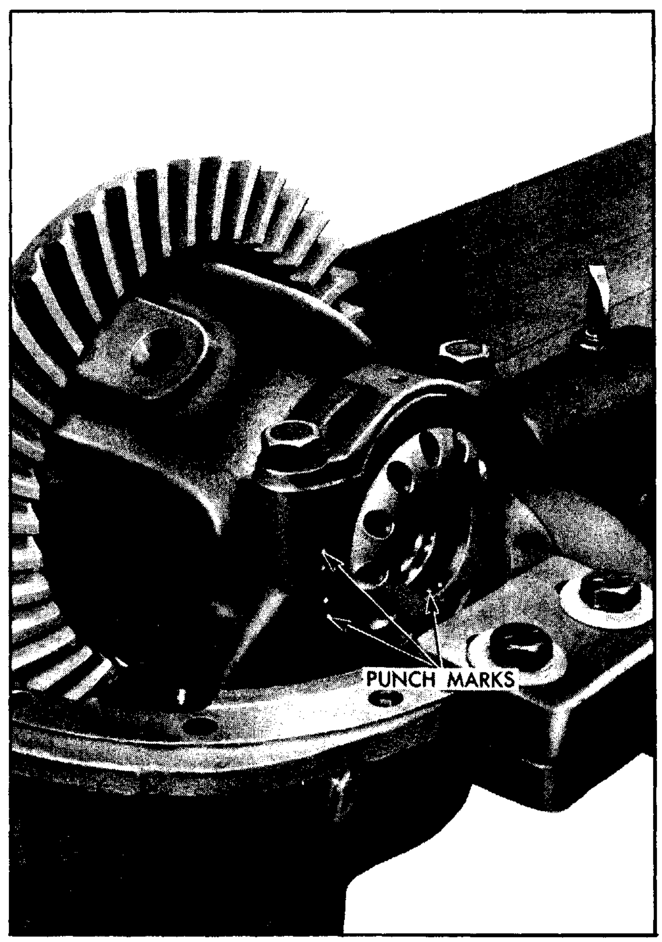

Fig. 4-28 Bearing Cap and Adjusting Nut Marked For Side Location

CORRECTION FOR PINION ADJUSTMENT TOO FAR AWAY FROM CENTERLINE OF RING GEAR

If there is insufficient shim thickness back of pinion rear bearing outer race, contact between gear teeth will be similar to that shown in Fig. 4-23. Note that tooth contact is on heel of drive side and high, and on toe of coast and high. To remedy this condition, proceed as follows:

1. Mark bearing caps and adjusting nuts by some suitable method such as punch marks to distinguish right from left so they can be replaced on correct sides (Fig. 4-28).

2. Loosen bearing cap screws and back off on left adjusting nut to relieve side bearing preload.

3. Remove bearing caps, adjusting nuts, and case and ring gear assembly. NOTE: Keep side bearing outer races with side bearings so these mating parts can be correctly replaced during build-up.

4. Oil pinion bearings with hypoid lubricant and turn pinion several revolutions. If pinion turns smoothly, a visual inspection of the pinion bearings, after pinion has been removed, will be sufficient. If roughness is detected when turning pinion, pinion bearings should be carefully inspected to determine whether a change is necessary.

5. Remove drive pinion nut and washer using heavy duty socket and Holding Tool J-2933-A (Fig. 4-29).

6. Remove companion flange using Puller J-962-A and Holding Tool J-2933-A (Fig. 4-30).

7. Carefully remove pinion from carrier so as not to injure threads or oil seal. If pinion stem does not slide freely from front bearing, temporarily reinstall pinion nut and lightly tap pinion out of bearing with a soft faced hammer. If necessary, use an arbor press to press pinion through bearing. (Use washer and nut on pinion stem to keep pinion from dropping.)

8. Remove spacer and spacer washer, if washer was installed.

9. Remove pinion oil seal from bore in carrier using screw driver applied to rim of retainer.

10. Lift front bearing inner race and roller assembly from carrier.

11. Wash front bearing inner race in cleaning fluid and examine for damaged rollers or pitted inner race. Clean outer race in carrier and examine for failure. Place inner race in outer race and turn while pressing. If bearing turns smoothly and had no visual defects, do not remove outer race from carrier. If bearing is to be replaced, press outer race from carrier using Remover J-2938 and Handle J-2940 (Fig. 4-31).

12. Without removing rear bearing from pinion, wash inner race and roller assembly in cleaning fluid and examine for failure. Clean rear bearing outer race and examine visually for failure. Place drive pinion, with rear bearing inner race and roller assembly installed, in outer bearing race in carrier; rotate pinion while pressing on bearing (Fig. 4-32). If bearing turns smoothly and has no visual defects, do not remove inner race and roller assembly from pinion.

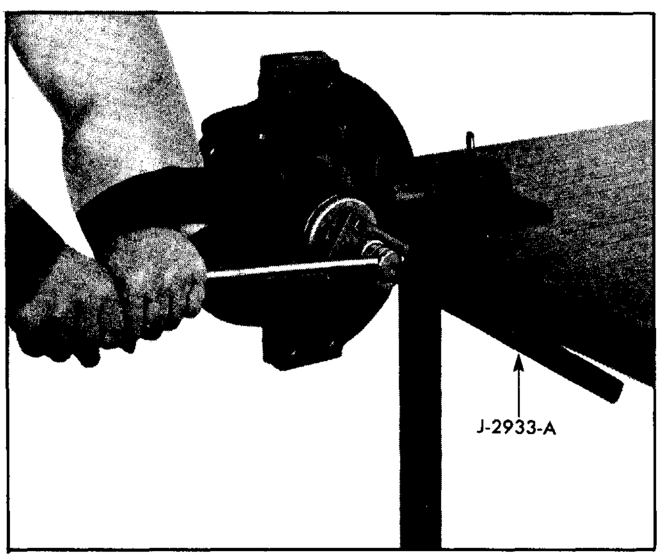

Fig. 4-29 Holding Companion Flange With Holding Tool J-2933-A

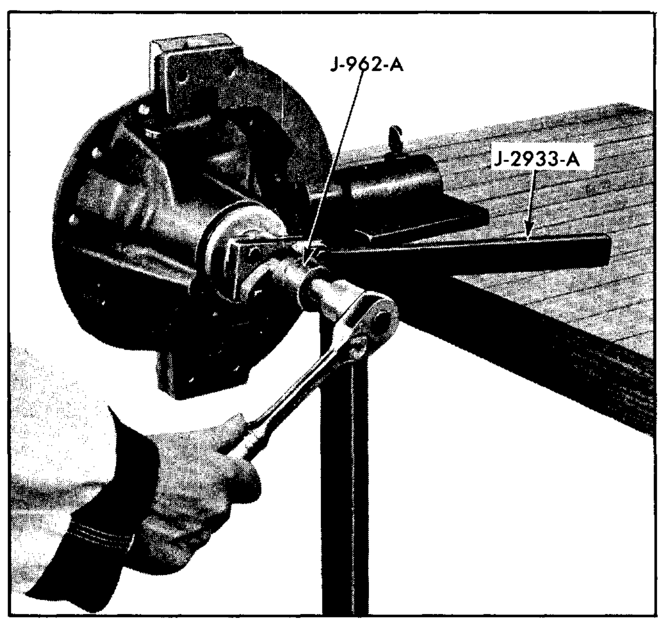

Fig. 4-30 Removing Companion Flange With Puller J-962-A

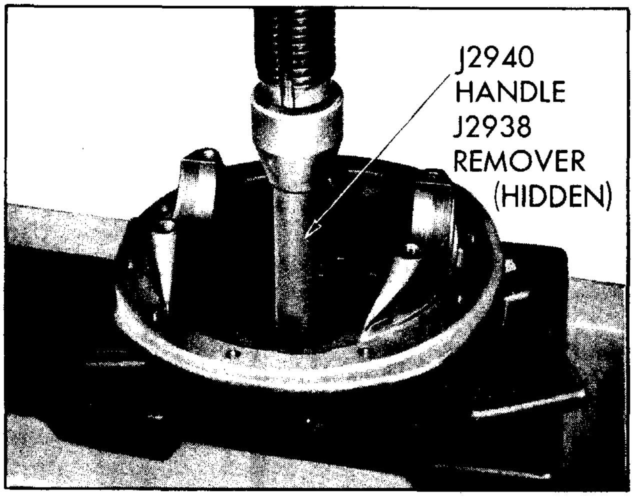

Fig. 4-31 Removing Front Bearing Outer Race With Remover J-2938 and Handle J-2940

13. If pinion rear bearing is to be replaced, slip the two sections of Remover Plates J-2934 between bearing and pinion and place in Holder J-358-1 (Fig. 4-33). Press pinion from bearing. NOTE: Flat sides of remover plates should be placed against bearing; concave sides against Holder J-358-1.

14. Press pinion rear bearing outer race from carrier using Remover J-2936-A and Handle J-2940 (Fig. 4-34). Use care to prevent race from dropping and causing possible damage to race. Remove pinion adjusting shims from carrier.

15. Thoroughly clean and inspect carrier. Ensure that passages in carrier are clear. Inspect carrier for cracks or other damage. Inspect threads in pedestals and caps to ensure that differential bearing adjusting nuts will turn freely. Carefully inspect pinion bore and shoulder against which pinion bearing race seats to ensure they are free of burrs, nicks, or material which would prevent proper seating of bearing race.

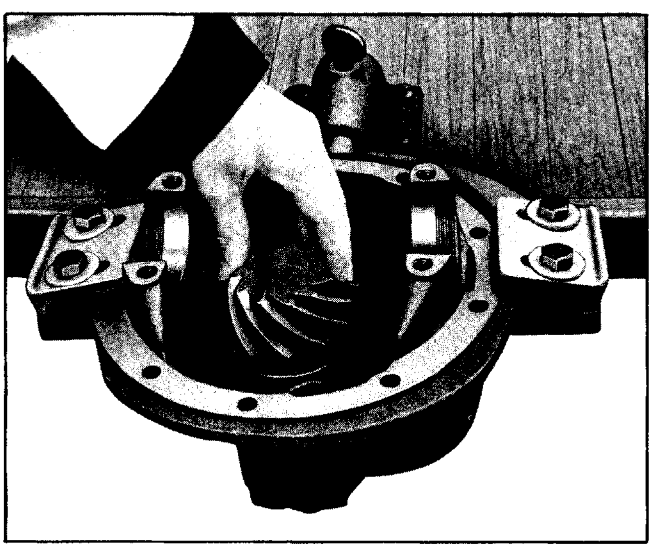

Fig. 4-32 Checking Rear Bearing For Roughness

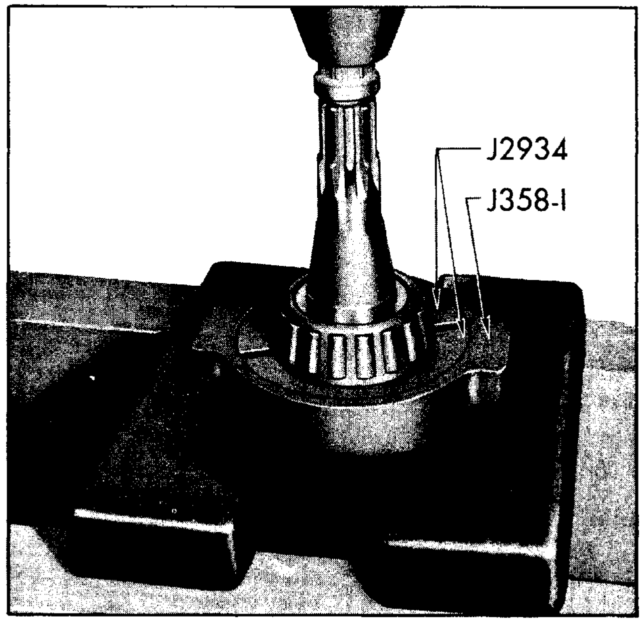

Fig. 4-33 Removing Bearing With Plates J-2934 and Holder J-358-1

16. Clean pinion adjusting shims and measure total thickness with micrometer. Increase by adding or exchanging shims to secure .002" to .003" greater total thickness. See Pontiac Master Parts Catalog (Group 5.460) for shims which are available in thicknesses of .002", .003", .004", .005", and .010". Always measure shims being used to determine exact size.

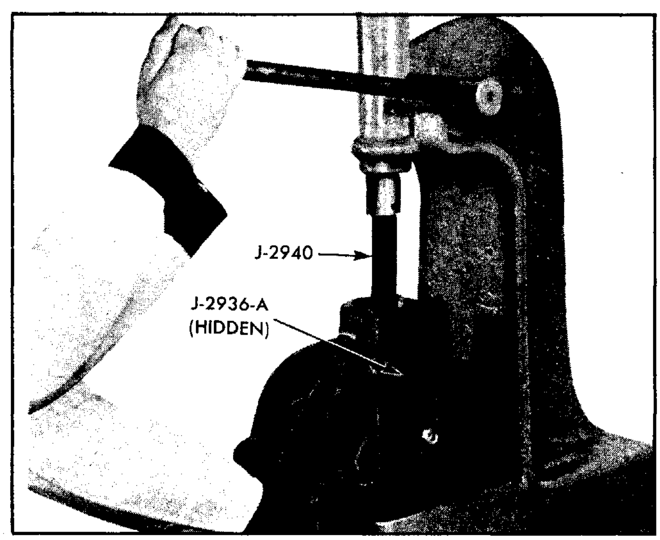

Fig. 4-34 Removing Rear Bearing Outer Race With Remover J-2936-A and Handle J-2940

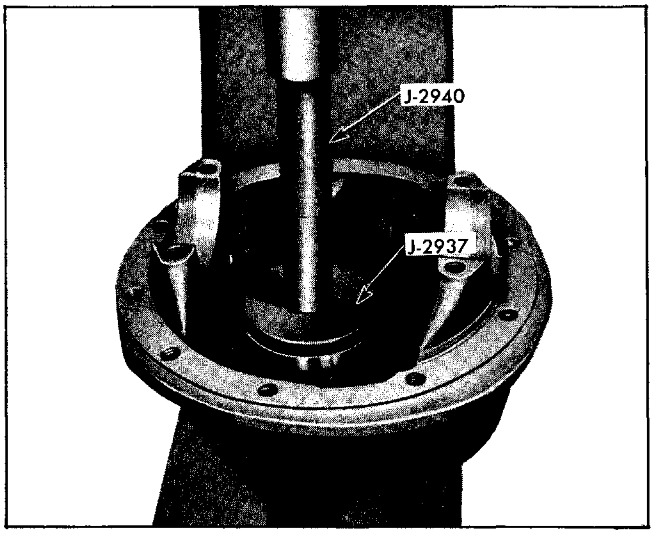

Fig. 4-35 Installing Rear Bearing Outer Race With Installer J-2937 and Handle J-2940

17. Place pinion adjusting shims against shoulder in carrier; press rear bearing outer race against shims and shoulder using Installer J-2937 and Handle J-2940 (Fig. 4-35).

18. If pinion front bearing was removed, press outer race firmly into place against shoulder in carrier using Installer J-2939 (Fig. 4-36) and Handle J-2940 if required.

19. If rear bearing inner race and roller assembly was removed, replace assembly by pressing firmly in place against shoulder of pinion using Installer Plate J-2935 and Holder J-358-1 (Fig. 4-37).

20. Place new spacer over pinion. NOTE: Late production differentials have a one-piece spacer (see page 4-3 and Fig. 4-3) which is not serviced. Use new two-piece spacer for replacement of one-piece or two-piece spacer.

21. Oil rear bearing with hypoid lubricant and position pinion in carrier.

22. Oil pinion front bearing and roller assembly with hypoid lubricant and install on pinion stem. If bearing is tight on pinion, press bearing on with arbor press using an old bearing spacer placed on bearing inner race (Fig. 4-38). CAUTION: Do not take up all end play of pinion or bearing spacer will not be effective.

23. Inspect pinion oil seal for damage. If seal retainer does not appear bent and leather is not damaged, seal may be reused. Coat outside surface of seal retainer with Permatex No. 3 or similar compound. Install seal by tapping into place using Installer Plate J-2935 against face of seal (Fig. 4-39). NOTE: Placing carrier so pinion is horizontal will reduce possibility of pinion falling out when seal is being tapped into place.

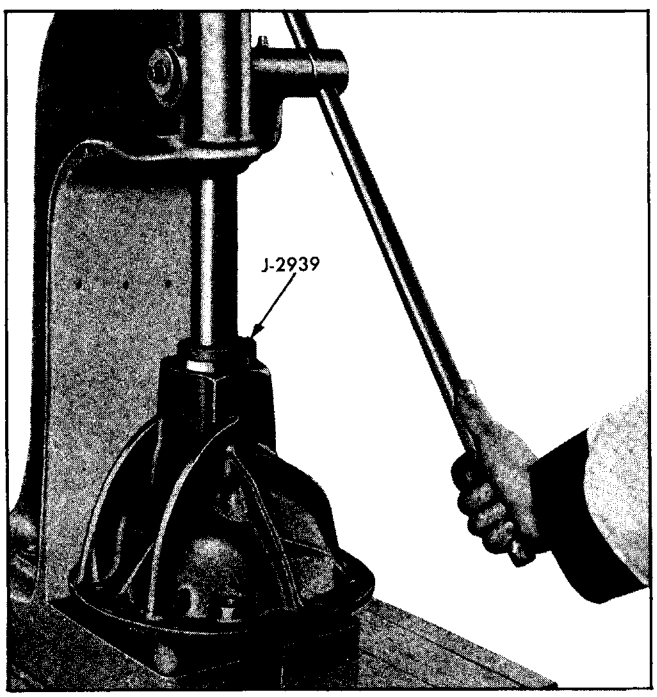

Fig. 4-36 Installing Front Bearing Outer Race With Installer J-2939

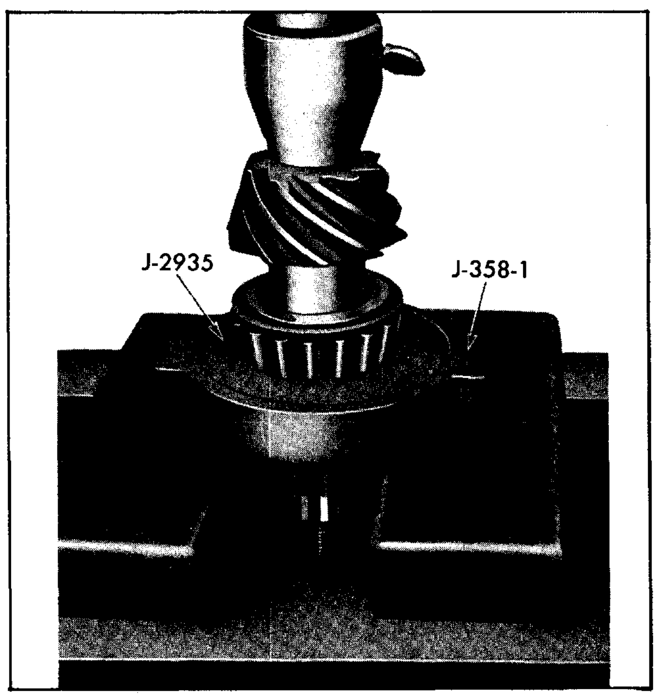

Fig. 4-37 Installing Rear Bearing With Installer J-2935 and Holder J-358-1

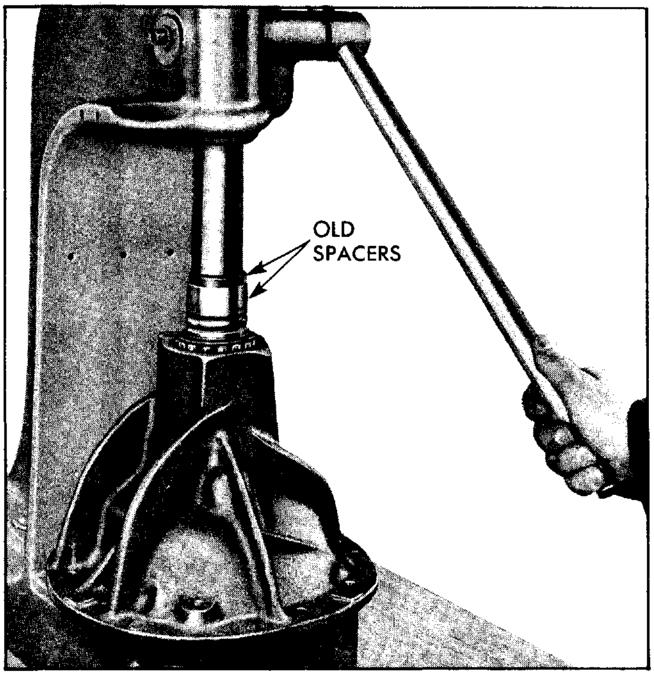

Fig. 4-38 Installing Pinion Front Bearing

24. Examine surface of companion flange for defects which may cause oil leak. Small scratches and nicks will cause leaks and can usually be satisfactorily removed with No. 00 sandpaper or by honing. When new flange is to be installed it should be carefully cleaned and inspected. Oil leather of seal and place flange on pinion spline.

25. Oil threads of pinion nut and face of washer. Install washer and nut.

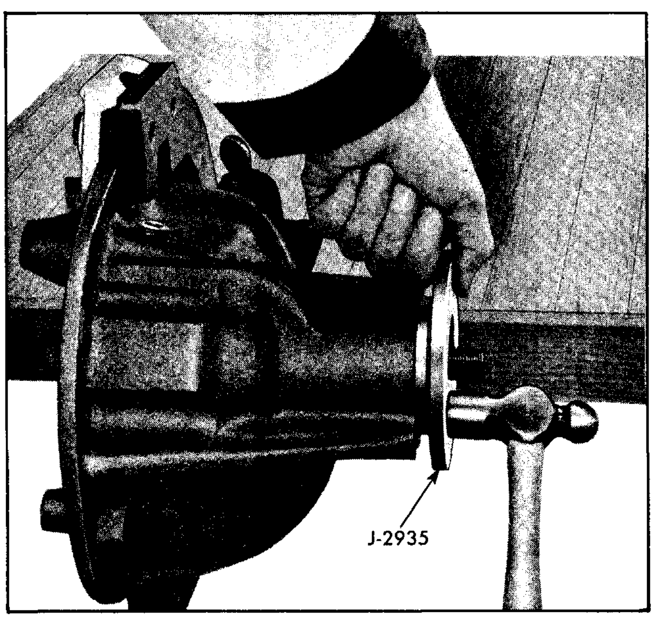

Fig. 4-39 Installing Pinion Oil Seal

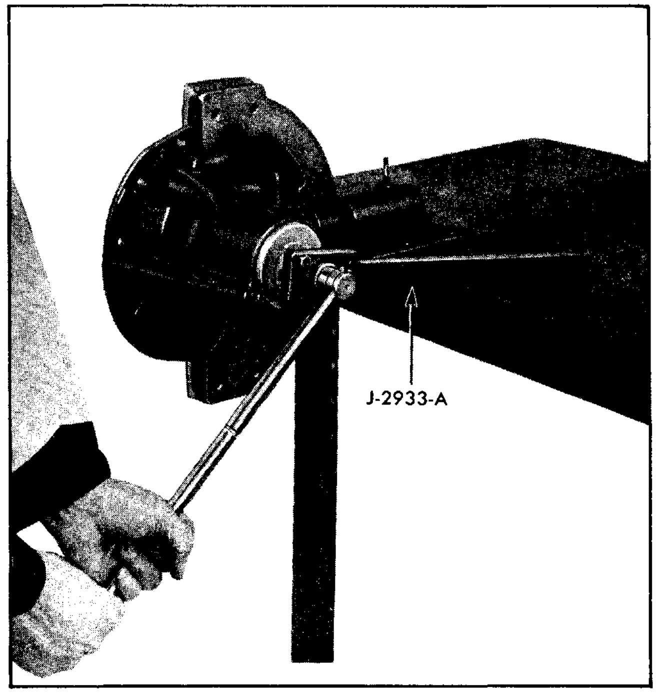

Fig. 4-40 Tightening Drive Pinion Nut

26. Position assembly as shown in Fig. 4-40 and tighten nut only enough to remove most of end play, using Flange Holding Tool J-2933-A and heavy duty socket.

27. Continue to tighten the nut a little at a time, stopping frequently to turn the pinion several revolutions to seat rollers and to check turning effort with inch-pound Torque Wrench KMO 652 (Fig. 4-41) or J-5853.

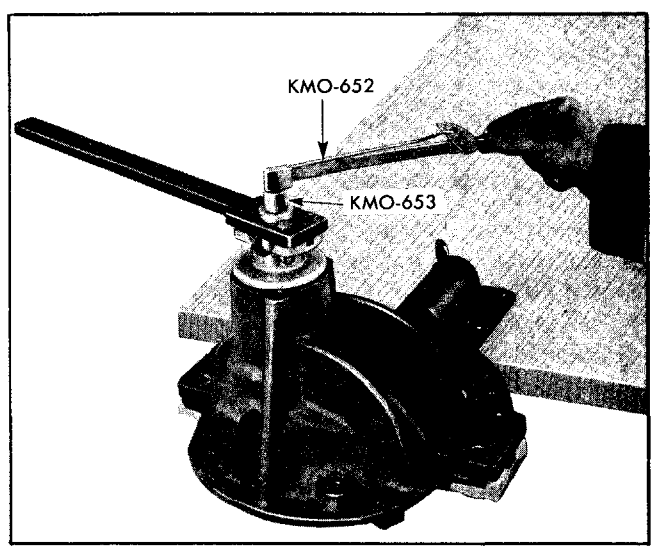

Fig. 4-41 Checking Pinion Bearing Preload With KMO-652

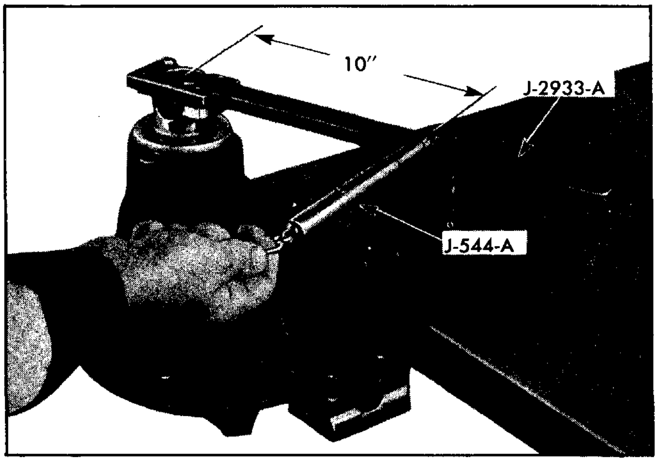

Fig. 4-42 Checking Pinion Bearing Preload With Scale J-544-A

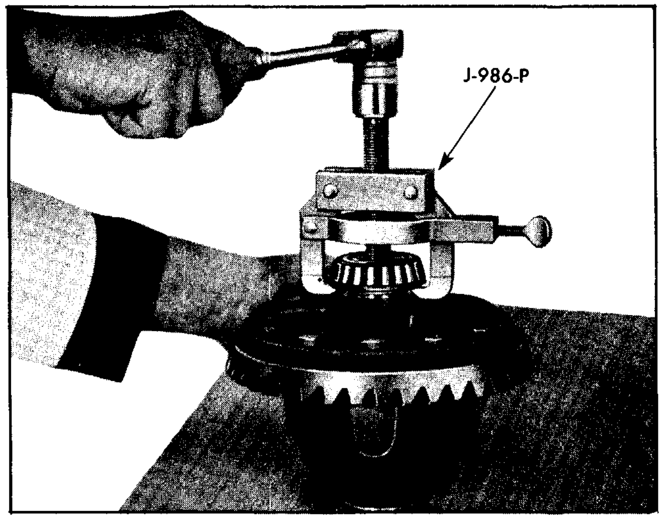

Fig. 4-43 Removing Side Bearing With Puller J-986-P

Repeat until torque required to keep pinion turning is 10 to 12 pound-inches for bearings that have had several thousand miles of use and 27 to 37 pound-inches for new bearings. If torque required to keep pinion turning exceeds 12 pound-inches for old bearings or 37 pound-inches for new bearings, it will be necessary to remove pinion and replace bearing spacer with a new part. CAUTION: Extreme care must be used in tightening pinion nut to preload the bearings correctly. Incorrect preload may result in bearing failure. Never back off nut to reduce preload—replace spacer.

NOTE: Torque measurement may be taken using steering gear adjusting spring scale J-544-A hooked to Holding Tool J-2933-A at a point 10" from pinion shaft center (Fig. 4-42). Reading in pounds times 10 will give pound-inches; thus three pounds on spring scale will indicate thirty pound-inches. Readings between pound graduations must be read in tenths rather than in ounces, for example, 3 pounds 8 ounces is read 3.5 pounds or 35 pound-inches.

28. Inspect differential side bearings for visible defects on rollers and in outer races. Press outer race onto roller and cone assembly. Apply hand load and turn slowly. If bearing outer race turns smoothly and no visible defects were found, bearing is probably good to reuse. Inspect fit of inner races on case hubs by prying against shoulders at puller recesses. Bearing inner races must be tight on case hubs. If either bearing is loose on case, the case must be replaced (page 4–19).

If bearing inspection indicates that bearing should be replaced, proceed as follows:

a. Remove side bearing from case using Remover J-986-P (Fig. 4-43). Hooks of puller must be placed in recesses in differential case.

b. Install bearing by pressing or driving inner race onto case using Installer J-941 (Fig. 4-44). Press only on inner race or bearing will be damaged.

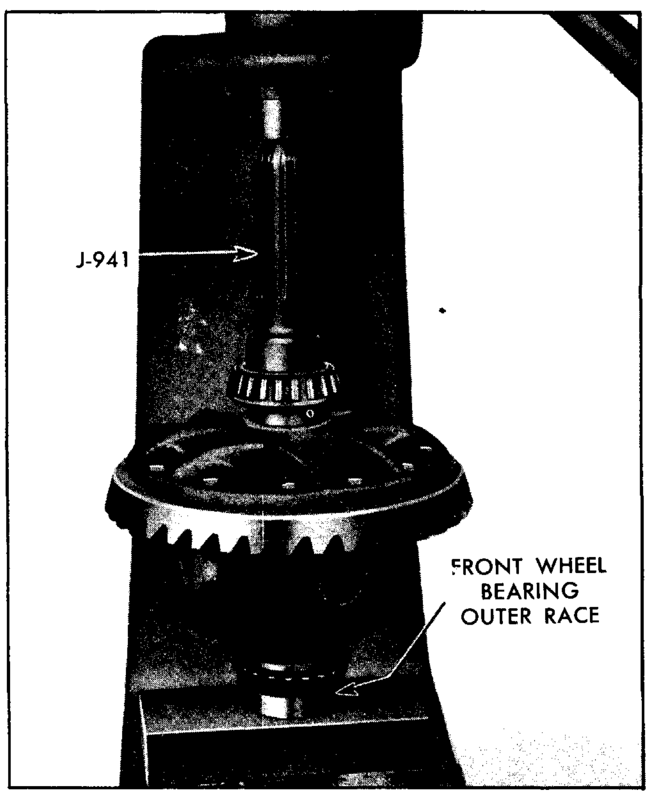

Fig. 4-44 Installing Side Bearings With Installer J-941

Support other side bearing by inner race by means of a front wheel bearing outer race or other suitable means. NOTE: Inner race must be press fit on hub. If not, try a new bearing and if still loose install new case (page 4–19).

29. Wipe oil off drive pinion teeth to prevent red lead from "running" during red lead test. Clean and inspect machined surfaces of pedestal; apply thin film of oil to surfaces.

30. Hold outer races squarely on side bearing rollers, install case and ring gear assembly in carrier, positioning ring gear against pinion.

31. Place adjusting nuts (on correct sides as indicated by marks) into threads of pedestals and squarely against outer races.

32. Install bearing caps and cap screws making certain that threads in caps match those in adjusting nuts. Tighten cap screws slightly more than finger tight.

33. Adjust side bearing preload as follows:

a. Tighten right adjusting nut, backing off left nut if necessary, to bring adjusting nuts in full contact with outer races and to provide a slight amount of backlash. When turning nuts keep nuts in contact with races to maintain a slight amount of preload on side bearings.

b. Tighten left nut, backing off on right nut, if necessary, but keeping nuts against races to maintain preload while rocking case until backlash has just been eliminated. If left nut is not in a locking position when backlash has been eliminated, back off to nearest locking position.

c. Back off right nut to ensure that nut and outer race do not turn together. Retighten right nut until outer race just starts to turn with nut; mark this point on adjusting nut.

d. Tighten right nut one notch, tap each bearing cap, and rock ring gear.

34. Repeat above step until right nut has been tightened a total of three to four notches to properly seat bearings and correctly preload bearings.

35. Check backlash as described on page 4–12.

36. Tighten bearing cap screws to 70-75 lb. ft. torque. Tap each bearing cap several times with hammer while tightening to ensure proper seating of caps.

37. Check tooth contact pattern by performing red lead test (page 4–12). Adjust backlash to several different values to obtain correct pattern and to determine whether further shimming is necessary. If additional shimming is necessary, repeat foregoing steps, as may apply, to increase shim pack thickness.

38. When proper tooth contact pattern has been obtained, install adjusting nut locks, install differential side gears and pinions with thrust washers after oiling with hypoid lubricant, differential pinion shaft and shaft lock screw.

39. Install differential carrier assembly in housing as instructed on page 4–22 and road test.

CORRECTION FOR PINION ADJUSTMENT TOO CLOSE TO CENTERLINE OF RING GEAR

If there is too much shim thickness back of pinion rear bearing outer race, contact between gear teeth will be similar to that shown in Fig. 4-25. Note that tooth contact is low on toe of drive side and low on heel of coast side. To remedy this condition follow the procedure on page 4–19, "Correction For Pinion Adjustment Too Far Away From Centerline of Ring Gear," except that shim thickness should be reduced .002″ to .003″ at a time to obtain correct pattern.

DIFFERENTIAL CASE— REMOVE AND REPLACE

NOTE: Two cases are serviced. The gear ratio determines which should be used. Refer to Pontiac Master Parts Catalog, Group 5.510.

1. If not previously done, mark right and left bearing caps and adjusting nuts (Fig. 4-28); remove adjusting nut locks.

2. Loosen bearing cap screws and back off on left adjusting nut to relieve side bearing preload.

3. Remove bearing caps and adjusting nuts; remove case and ring gear assembly. NOTE: Keep side bearing outer races with side bearings so these mating parts can be correctly replaced during build-up.

4. Remove side bearings using Puller J-986-P (Fig. 4-43). CAUTION: Be sure ends of puller arms are in recesses in sides of hub and fully against inner race of bearing.

5. Remove pinion shaft lock screw, pinion shaft, pinion gears, side gears and thrust washers.

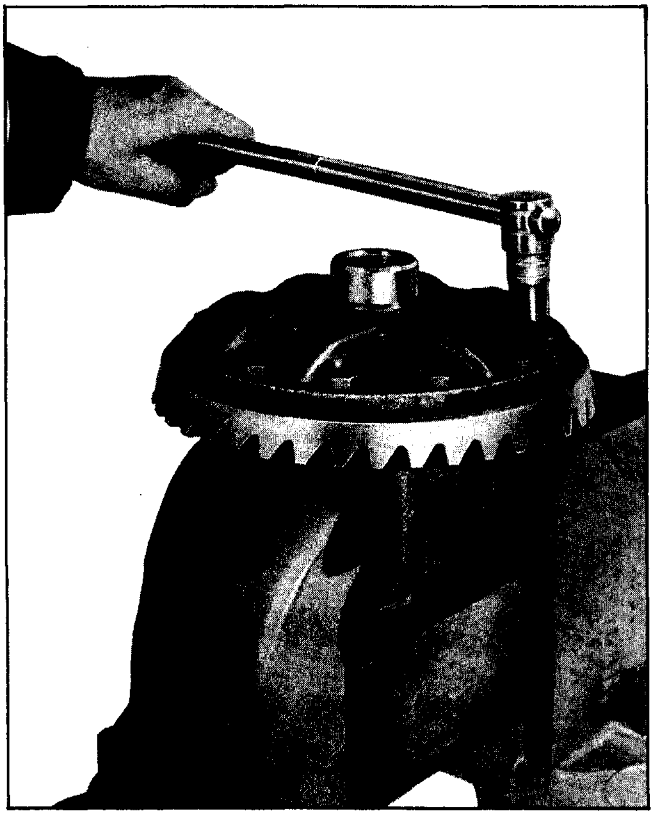

Fig. 4-45 Removing Ring Gear From Case

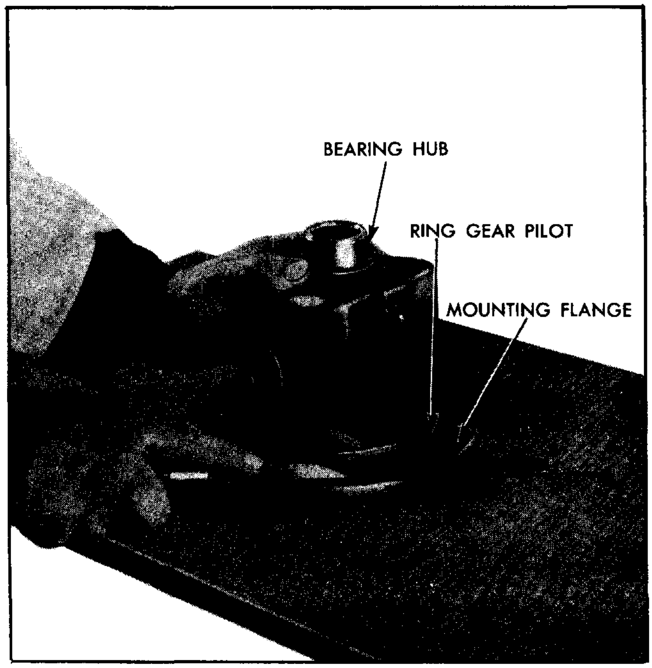

Fig. 4-46 Removing Burrs and Nicks From Mounting Flange

6. Remove ring gear. NOTE: If case is clamped in vise (Fig. 4-45), it should be positioned so jaws of vise are at 90° to pinion shaft holes.

7. Thoroughly clean new case in suitable cleaning solvent.

8. Inspect case, paying particular attention to ring gear mounting flange, ring gear pilot, and side bearing hubs. Remove nicks or burrs with mill file (Fig. 4-46).

9. Inspect side gears, pinion gears, thrust washers and pinion shaft for excessive wear. Check fit of side gears in counterbores of case. If excessive radial looseness (.006" or more) is evident, it will be necessary to replace side gear or case. Replace parts as necessary, coat with hypoid lubricant, and install in case.

10. Clean ring gear. Inspect back of ring gear for any adhering material which may affect runout.

11. Position ring gear on case and check fit of gear on flange and pilot. CAUTION: Do not use hammer to force ring gear on case.

12. Install ring gear attaching screws. Tighten all screws evenly to 55-60 lb. ft. torque. NOTE: Tighten screws finger tight, then tighten evenly and alternately across the diameter in progressive stages of tighness until final torque is reached.

13. Visually inspect side bearings for wear and replace if necessary. Install inner race and roller assemblies on hubs using Installer J-941 (Fig. 4-44). After bearing has been installed on one side, it should be supported by the inner race by some suitable means such as an outer race from a front wheel bearing, when bearing on other side is being installed. NOTE: After bearings have been installed, inspect fit of inner races on case hubs by prying against shoulders at puller recesses. Bearing inner races must be tight on case hubs; if loose, replace with new bearing or, if necessary, new case.

14. Install case and ring gear assembly as outlined in steps 30-39, page 4-19 and check runout of ring gear.

RING GEAR AND PINION SET OR CARRIER—REMOVE AND REPLACE

NOTE: Ring gear and pinion sets are matched in sets at the factory and are serviced only in sets. Never attempt to replace either a ring gear or pinion without its mating member. Use lubricant supplied with new gear set. Failure to do so may result in differential failure. Differential parts are given a heavy coating of protective compound before packaging. Thoroughly clean off coating before using parts.

1. Disassemble differential following procedure on page 4–14 under "Correction For Pinion Adjustment Too Far Away From Ring Gear," steps 1 through 15, as may apply.

2. If gear set is being replaced follow steps 6, 10, 11, and 12 under "Differential Case – Remove and Replace," page 4–19. NOTE: Inspect back of ring gear to ensure that inner diameter has a chamfer. If no chamfer is present, ring gear will not fit properly over pilot nor will it seat properly on flange of case. If ring gear is not chamfered, select another matched gear set from stock which is satisfactory.

3. If carrier is being replaced, thoroughly clean and inspect carrier, paying particular attention to machined surfaces in bearing caps and pedestals. Remove burrs with curved mill file and stone. Ensure that caps seat squarely on pedestals; use mill file lightly to remove nicks and burrs.

4. When replacing either gear set or carrier, refer to pinion and carrier markings (Fig. 4-47) and chart (Fig. 4-48) for correct shims to be installed. Differential carriers are marked on the face of the flange (Fig. 4-47) to indicate the number of thousandths "deep" (D) or "shallow" (S) the shoulder for the rear bearing outer race happens to be. Carriers marked "D" require more shims than those marked "O" or "S". The pinion is marked on the end with a number indicating thousandths in shims from basic setting to put it in correct position with "O" carrier. Pinions which are not marked are "O" or basic. Thus, a pinion marked +2 would require a .002" added shim for an "O" carrier. NOTE: Letters and symbols are also stamped on pinions during inspection at the factory. Do not mistake inspector's marks for numbers which indicate pinion variations from standard size.

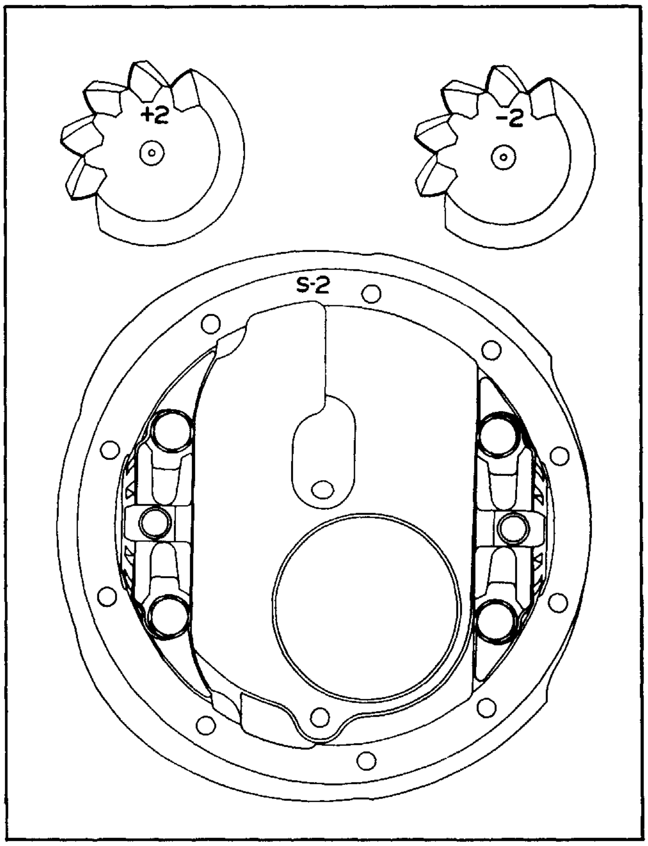

Fig. 4-47 Differential Carrier and Drive Pinion Depth Markings

509263—.002 SHIM—PLAIN
509264—.003 SHIM—BLUE, 1 hole, or 1 notch
509265—.004 SHIM—COPPER, 2 holes, or 2 notches
509266—.005 SHIM—PLAIN
509267—.010 SHIM—PLAIN

Use these shims in combinations to get required thickness as shown below.

Carrier Depth Marking		PINION MARKING								
		Minus					Plus			
		−4	−3	−2	−1	0	+1	+2	+3	+4
5.570	S-5		.002	.003	.004	.005	.006	.007	.008	.009
5.571	S-4	.002	.003	.004	.005	.006	.007	.008	.009	.010
5.572	S-3	.003	.004	.005	.006	.007	.008	.009	.010	.011
5.573	S-2	.004	.005	.006	.007	.008	.009	.010	.011	.012
5.574	S-1	.005	.006	.007	.008	.009	.010	.011	.012	.013
5.575	0	.006	.007	.008	.009	.010	.011	.012	.013	.014
5.576	D-1	.007	.008	.009	.010	.011	.012	.013	.014	.015
5.577	D-2	.008	.009	.010	.011	.012	.013	.014	.015	.016
5.578	D-3	.009	.010	.011	.012	.013	.014	.015	.016	.017
5.579	D-4	.010	.011	.012	.013	.014	.015	.016	.017	.018
5.580	D-5	.011	.012	.013	.014	.015	.016	.017	.018	.019

Fig. 4-48 Differential Drive Pinion Shim Chart

To use shim chart (Fig. 4-48) read marking on pinion and carrier (Fig. 4-47). In the table, read to the right from the carrier marking and down from the pinion marking; the intersection of the carrier line and the pinion column shows the correct total shim thickness to be used. As an example; with markings of S-2 and +1, the correct shim thickness is .009″ while the S-2 and −2 markings shown would be .006″.

See Pontiac Master Parts Catalog (Group 5.460) for shims available in thicknesses of .002″, .003″, .004″, .005″ and .010″. Always measure total shims being used to ensure correct thickness. This method of determining shims thickness (and setting of correct backlash) must be checked by red lead test (page 4–12) and corrected when proper tooth contacts are not obtained.

5. Assemble differential following procedure on page 4–14 under "Correction For Pinion Adjustment Too Far Away From Ring Gear," steps 16 through 39, as may apply. NOTE: Tooth contact must be checked by red lead test (page 4–12) before installing differential in car.

INSTALLATION OF DIFFERENTIAL

1. Thoroughly wash interior of axle housing with cleaning fluid. Clean surface of housing contacting carrier gasket and install new gasket.

2. Install carrier in housing. Tighten cap screws evenly and securely.

3. Install axle shafts, rear axle bearing retainers, brake drums and wheels as instructed in steps 8–11 on pages 4–5 and 4–6.

4. Connect rear universal joint to companion flange, using new lock plates under cap screws. Tighten screws to 28-33 lb. ft. torque. Ensure that ears of lock plates are bent up against heads of screws.

5. Fill axle housing to filler plug level with recommended hypoid lubricant. NOTE: Use lubricant supplied with new gear set if these parts were replaced.

6. Road test for noise.

TROUBLE DIAGNOSIS AND TESTING—DIFFERENTIAL

Many noises reported as coming from the differential actually result from other sources such as tires on certain road surfaces, body drumming, muffler roar, transmission rear bearing, wheel bearing, Hydra-Matic transmission rear oil pump, engine fan, intake silencer, etc. A careful check should be made to ensure that noise is in the differential before disassembling. It should be remembered that rear axle gears, like any other mechanical device, are not absolutely quiet and should be accepted as being commercially quiet unless some abnormal noise is present. NOTE: On early production 1955 cars, commercially acceptable axle noise may be transmitted from frame to body on sedans and station wagons through number four body bolt and on convertible and catalina coupes through number five body bolt (Fig. 1-3). These bolts have been found to be unnecessary and their removal will reduce transmission of axle noise. Removal of the bolts and insulators should be done prior to noise diagnosis. It is important that a check also be made to ensure that the floor of body is not in metallic contact with frame.

To make a systematic check for differential noise under standard conditions observe the following:

a. Select a level tarvia or asphalt road to reduce tire noise and body drumming.

b. Drive car far enough to thoroughly warm up rear axle lubricant.

c. If noise is present, note speed at which it occurs. With car standing and clutch disengaged, or Hydra-Matic in neutral, accelerate engine to approximate speed where noise was noticed to determine if it is caused by exhaust or muffler roar or other engine condition. Repeat while engaging and disengaging clutch, transmission in neutral, to see if noise is in transmission. (Transmission rear bearing noise can be isolated only by removing propeller shaft and operating transmission in "high".) See 1955 Hydra-Matic Transmission Manual (page 129) on distinguishing between Hydra-Hatic transmission and differential noises.

d. Distinguish between tire noise and differential noise by noting if noise varies with various speeds, sudden acceleration and deceleration; exhaust and axle noise show variations under these conditions while tire noise remains constant and is more pronounced at speeds of 20 to 30 miles per hour. Further check for tire noise by driving car over smooth pavements or dirt roads (not gravel) with tires at normal pressure. If noise is caused by tires, it will noticeably change or disappear and reappear with changes in road surface.

e. Rear spring rubber bushings dampen out rear axle noise when correctly installed. Check to see that no metallic contact exists between the springs and brackets or shackles. Metal to metal contact at those points may result in "telegraphing" of road noise and normal axle noise which would not be objectionable if dampened by bushings.

NOISE ON DRIVE

Drive noise is most pronounced on constant acceleration through the range of 15 to 60 miles per hour.

CAUSE	REMEDY
Bad differential bearings. NOTE: If worn, rough, or loose, will aggravate drive noise. Will be noticed as a heavy, irregular drive noise.	Check and replace bearings, if worn.
Pinion too far away from ring gear. NOTE: Heavy drive noise due to heel contact on drive side of ring gear teeth (Fig. 4-23).	Move contact toward toe and lower on tooth on drive side (Fig. 4-24) by increasing shim thickness .002″ to .003″ at a time to obtain correct contact. It is sometimes necessary to increase backlash if pinion has been moved .006″. In this case proper side bearing preload (3 to 4 notches tight, must be maintained. Carrying this adjustment of pinion too far may bring in float noise.
Failed Synchro-Mesh transmission rear ball bearing. NOTE: This will give noise similar to that produced by axle.	Check and replace transmission bearings, if worn.

NOISE ON FLOAT

Float noise is most pronounced while holding speed constant at three-mile intervals between 15 to 60 miles per hour.

CAUSE	REMEDY
Improper pinion bearing preload.	If gears were originally quiet and became noisy in 1,000 to 3,000 miles, try tightening companion flange nut about 1/12 (1/2 flat) turn and recheck for noise. If this re-preloading of the pinion bearings does not correct the complaint, a major repair is necessary.
Insufficient backlash. NOTE: Float noise due to toe contact on drive side of ring gear teeth (Fig. 4-22).	Increase backlash slightly. Do not exceed maximum specification of .012″. Be sure proper side bearing preload (3-4 notches tight) is maintained.
Pinion too close to ring gear. NOTE: Float noise due to toe contact on drive side of ring gear teeth (Fig. 4-25).	Move pinion away from centerline of ring gear by decreasing shim pack thickness .002″ to .003″ at a time which will move contact toward heel on drive side of ring gear teeth (Fig. 4-26). NOTE: Decreasing shim thickness too much may bring in heavy drive noise.
Bad differential bearings. NOTE: If worn, rough, or loose, will aggravate float noise. Will be noticed as a heavy, irregular noise.	Check and replace bearings.

NOISE ON COAST

Coast noise is pronounced on deceleration by allowing car to coast from 60 miles per hour through 15 miles per hour with throttle closed, clutch engaged, and in high gear (Hydra-Matic in DR range).

CAUSE	REMEDY
Improper pinion bearing preload.	If gears were originally quiet and became noisy in 1,000 to 3,000 miles, try tightening companion flange nut about 1/12 turn (1/2 flat) and recheck for noise. If this re-preloading of pinion bearings does not correct complaint, backlash or pinion position requires adjusting.
Excess backlash. NOTE: Coast noise due to heel contact on coast side of ring gear teeth (Fig. 4-21).	Decrease backlash slightly. Do not decrease below minimum specification of .003″. Be sure proper side bearing preload (3-4 notches tight) is maintained.
Pinion too close to ring gear. NOTE: Coast noise due to heel contact on coast side of ring gear teeth (Fig. 4-25).	Move pinion away from centerline of ring gear by decreasing shim pack thickness .002″ to .003″ at a time which will move contact toward toe on coast side of ring gear teeth (Fig. 4-26). NOTE: Decreasing shim thickness too much may bring in heavy drive noise.
Insufficient preload on differential side bearings.	Adjust side bearing preload to 3-4 notches tight; check backlash.
Bad differential bearings. NOTE: If worn, rough, or loose, will aggravate coast noise. Will be noticed as a very rough and irregular coast noise.	Check and replace bearings.

NOISE BETWEEN FLOATING AND COASTING

This noise is usually heard just as accelerator is being released or when going downhill at constant speed where engine is still pulling slightly, but operation has not reached "coast."

CAUSE	REMEDY
Insufficient pinion bearing preload.	Tighten pinion nut 1/12 turn (1/2 flat) and recheck for noise.
Ring gear has excessive run-out or rough ring and pinion gears.	Replace ring and pinion gears.

KNOCK AT LOW SPEEDS

CAUSE	REMEDY
Dry or worn universal joints.	Repack or replace universal joints.
Side gear hub counterbore in case worn oversize.	If case counterbore is worn, replace case and side gears.

DRIVE LINE SNAP

CAUSE	REMEDY
Loose companion flange. NOTE: Snapping noise or "ping" on sudden start either forward or reverse.	Remove companion flange, turn 180°, apply white lead and oil to spline and reinstall flange. Check to see that pinion nut is tightened to original position to correctly preload pinion bearings.

BACKLASH CLUNK

CAUSE	REMEDY
Excessive clearance between axle shaft splines and differential side gears.	Select close fitting side gears or replace axle shaft if spline is worn.
Excess backlash between differential side and pinion gears.	Check for wear of thrust surfaces in differential case and of thrust washers. Replace worn parts as necessary.
Excess backlash between pinion and ring gear. NOTE: May give pronounced "clunking" noise when a torque reversal takes place (taking foot off accelerator suddenly) at low speed with clutch engaged in high gear (or Hydra-Matic in DR range); may also give gear noise if condition has been allowed to exist long enough to wear gears.	Check and adjust backlash. Replace ring gear and pinion if excessively worn.
Thrust washers behind side gears missing.	Insert missing thrust washer or washers.

PROPELLER SHAFT—DESCRIPTION

The propeller shaft is of tubular construction with a needle bearing universal joint at each end. The rear joint attaches to the differential companion flange by means of flanged bearings which are held securely in place by cap screws. The front joint attaches to the output shaft of the transmission by means of a splined yoke which permits fore and aft movement of the propeller shaft when rear axle assembly moves up and down. This splined connection is lubricated from the transmission. An oil seal pressed into the transmission rear bearing retainer protects it from dust and loss of lubricant. On Synchro-Mesh equipped cars the front yoke is carried by two bushings in the transmission rear bearing retainer (Fig. 7-1). Additional protection of the spline and seal is provided on Synchro-Mesh cars by a splash shield which extends back from the transmission a short distance.

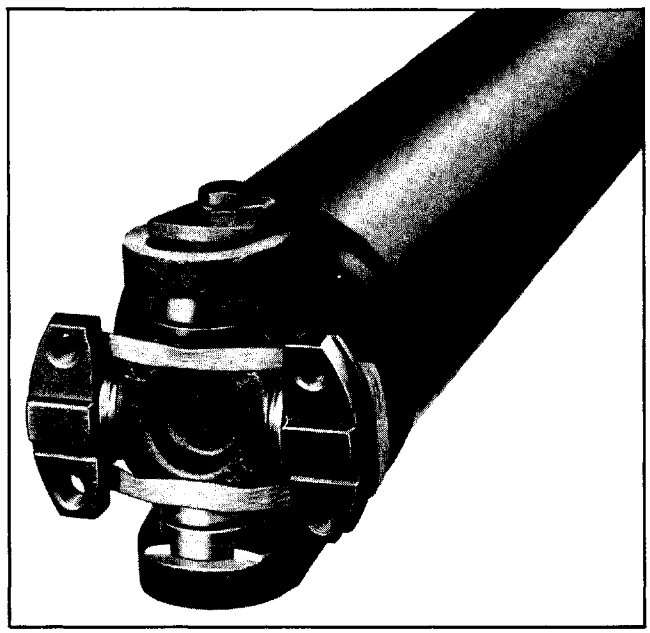

Fig. 4-49 Flanged Bearing Held in Place By Rubber Band

PERIODIC SERVICE

Universal joints should be lubricated every 25,000 miles. To lubricate joints they must be completely disassembled (page 4–26) and packed with high melting point wheel bearing lubricant.

REMOVAL OF PROPELLER SHAFT

1. Loosen and remove four screws which hold rear universal joint to companion flange. Tap flanged bearing lightly with a soft hammer, if necessary, to disengage drive lugs. Use a piece of soft wire or a heavy rubber band to hold flanged bearings onto journal and to prevent loss of needle bearings when rear joint is disconnected (Fig. 4-49).

2. Remove propeller shaft by sliding shaft rearward to disengage front yoke from transmission output shaft.

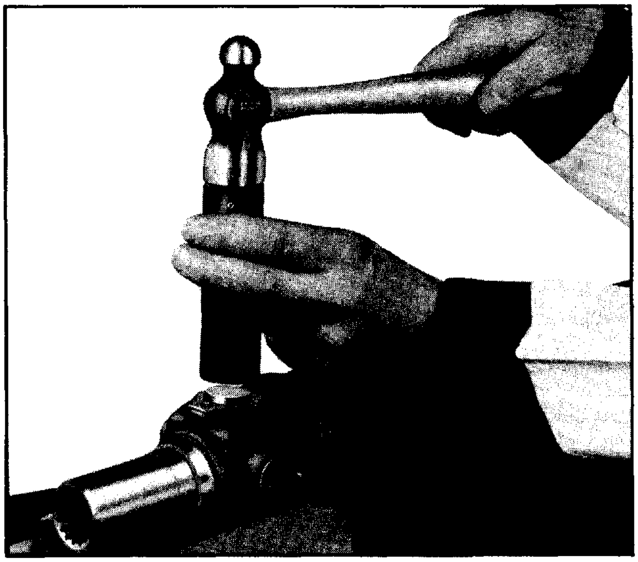

Fig. 4-50 Removing Bearing From Splined Yoke Member

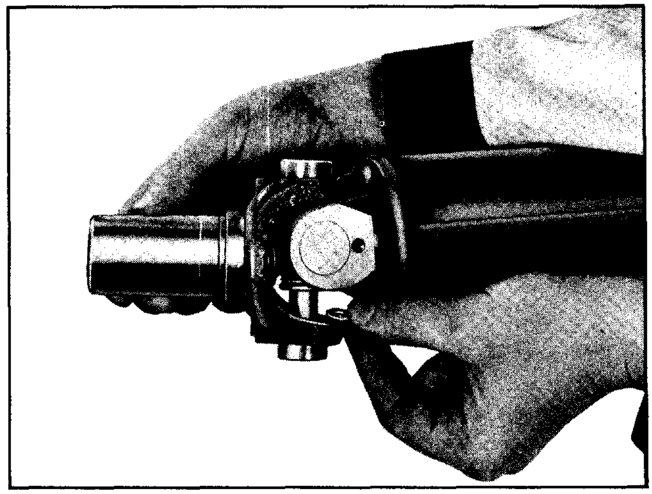

Fig. 4-51 Placing Washers Inside Bearing of Splined Yoke Member

DISASSEMBLY OF PROPELLER SHAFT

NOTE: When removing bearings from universal joint yokes, use extreme care so as not to lose needle rollers from bearings.

FRONT UNIVERSAL JOINT—DISASSEMBLE

1. Bend tab of screw lock away from head of each cap screw; remove all screws and bearing retainer plates.

2. Remove bearings from splined yoke member as follows:

a. Lay or clamp end of shaft in vise so fixed yoke member welded to tube bears against vise. (Do not lay or clamp tubular member in vise.) Shaft should be horizontal and splined yoke member must be free to move vertically between jaws of vise.

b. Using a piece of pipe or similar tool with diameter sufficiently large to encircle bearing (slightly larger than one inch), apply force on yoke around bearing (Fig. 4-50). This will drive yoke down causing journal assembly (spider) to force bearing partially out of yoke.

c. Rotate shaft 180° and repeat above step to partially remove opposite bearing.

d. With yoke down as far as possible, place three or four flat washers (½" O.D.) inside lower bearing (Fig. 4-51). NOTE: Total thickness of washers should be ⅛" - 3/16".

e. Rotate shaft 180° and again apply force around bearing in which washers were installed. This will completely remove bearing from yoke.

f. Remove splined yoke member from journal.

g. Remove remaining bearing from splined yoke member using brass drift.

3. Remove bearings and journal (spider) from yoke member which is welded to tubular shaft as follows:

a. With yoke member clamped or supported in vise, drive bearing out as far as possible using drift applied to center part of journal (Fig. 4-52).

b. Rotate shaft 180° and drive opposite bearing out as far as possible using drift in same manner as in above step.

c. Hold journal up and install three or four small flat washers (Fig. 4-53). Lower journal onto washers and drive bearing out using drift applied to journal.

d. Remove journal from yoke.

e. Remove remaining bearing using brass drift.

REAR UNIVERSAL JOINT—DISASSEMBLE

1. Remove wire or rubber band placed around rear U-joint flanged bearings, remove bearings and cork washers.

2. Bend tabs of lock plates away from heads of cap screws; remove cap screws and lock plates from yoke.

3. Remove bearings from yoke as described for front universal joint, step 3.

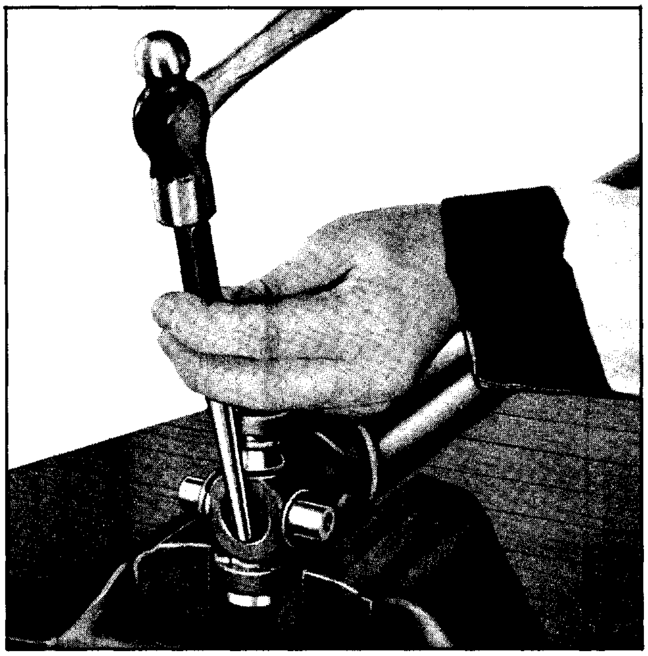

Fig. 4-52 Removing Bearing From Fixed Yoke Member

Fig. 4-53 Placing Washers Inside Bearing of Fixed Yoke Member

CLEANING AND INSPECTION

1. Wash all parts thoroughly in cleaning fluid. Probe holes in ends of journals to remove any hardened grease.

2. Inspect roller bearing surfaces of journals, inner bearing surfaces of outer races, and rollers for wear, scores, flat spots, or other damage.

3. Inspect cork washers and journal dust shields for wear or injury. Replace if necessary. Cork washers should be flexible; if brittle or hard, replace with new washers.

4. Inspect bearing retainer plates, screw locks, and cap screws to ensure that they are not damaged.

ASSEMBLY OF PROPELLER SHAFT

FRONT UNIVERSAL JOINT—ASSEMBLE

1. Repack roller bearings with high melting point wheel bearing lubricant.

2. Install bearing journal and bearings in fixed yoke member as follows:

a. Press cork washer into position in recess of bearing and install bearing about one quarter way in on one side of fixed yoke using soft faced hammer.

b. Position journal, with dust shields installed, between arms of yoke and place journal in partially installed bearing. NOTE: Journal assembly must be installed so locating lugs are facing toward propeller shaft (Fig. 4-54).

c. Hold journal in place and complete installing bearing.

d. Install opposite bearing, with cork washer in place, ensuring that bearing rollers do not bind on journal. Check movement of journal in bearings for smoothness.

3. Install splined yoke member onto journal as follows:

a. Press cork washer into bearing and start bearing into place in splined yoke member with a soft faced hammer.

b. Position yoke over journal so arm of journal seats in bearing. Support yoke on opposite side and complete installation of bearing.

c. Press cork washer in place in remaining bearing and install bearing, ensuring that bearing rollers do not jam on journal. Check for free movement of universal joint.

4. Install bearing retainer plates, using new screw locks under cap screws. Bend tab of lock against flat of head. NOTE: Always use alloy steel cap screws, never ordinary soft steel screws, to retain plates.

REAR UNIVERSAL JOINT—ASSEMBLE

1. Install journal in yoke following procedure for front universal joint, steps 1, 2, and 4.

2. Place flanged bearings onto journal and retain in place with rubber band or wire (Fig. 4-49).

INSTALLATION OF PROPELLER SHAFT

1. Inspect outer diameter of splined yoke to ensure that it is not burred so as to damage seal. Apply engine oil to spline and slide propeller shaft front joint onto the transmission output shaft.

2. Connect rear universal joint to companion flange, using new lock plate under cap screws. Tighten screws to 28-33 lb. ft. torque. Ensure that ears of lock plates are bent up against heads of screws.

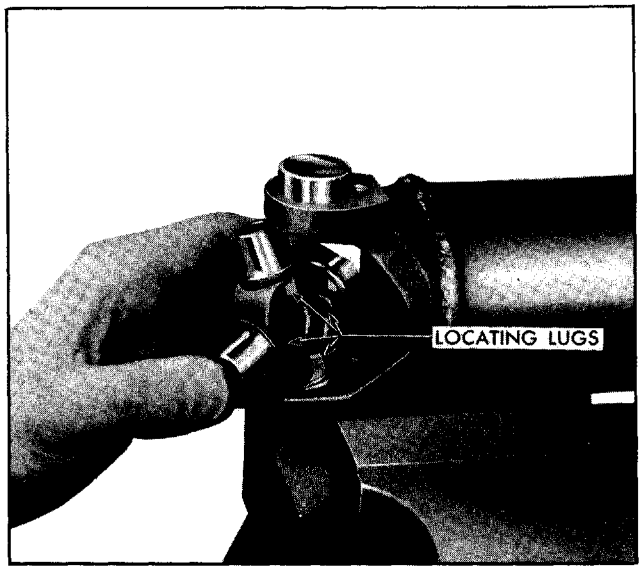

Fig. 4-54 Correct Installation of Journal in Yoke

TROUBLE DIAGNOSIS AND TESTING—PROPELLER SHAFT

OIL LEAK AT FRONT YOKE

CAUSE	REMEDY
Rough outside surface on splined yoke or defective transmission rear oil seal. An occasional drop of oil dripping from the splined yoke is normal and requires no correction.	Replace seal if cut by burrs on yoke. Replace yoke if outside surface is rough and burred badly. Minor burrs can be smoothed by careful use of crocus cloth or honing with a fine stone.

KNOCK IN DRIVE LINE

CAUSE	REMEDY
Worn universal joints. NOTE: "Clunking" noise when car is operated under "floating" condition at approximately 10 MPH in high gear.	Disassemble universal joints, inspect and replace worn parts.

PROPELLER SHAFT VIBRATION

CAUSE	REMEDY
Propeller shaft out of balance. NOTE: Vibration which comes in at a definite speed while car is moving. Check by driving car at speed above which vibration comes in, shutting off engine and coasting in neutral down through speed where vibration came in when operating car. If vibration comes in at same speed when coasting, it is probably caused by propeller shaft.	Replace propeller shaft and repeat test. NOTE: Tires may give a vibration at certain high speeds which could be mistaken for propeller shaft vibration. By inflating tires above normal pressure and retesting, it may be possible to distinguish tire noise from propeller shaft vibration. See page 10-6 on "Testing For Tire Noises."

REAR SPRINGS AND SHOCK ABSORBERS

DESCRIPTION

Rear Springs are equipped with composition inserts between spring leaves (Fig. 4-55). The inserts are held in place between spring leaves by two projections on the bottom of each insert which fit into holes near the ends of spring leaves. The use of these inserts eliminates the need for spring covers and lubrication of rear springs. The springs are mounted parallel to the center line of chassis. To accommodate parallel mounting, the front hangers are located on the outside of the frame members and the spring seats on the axle housing are installed parallel to the center line of the chassis.

The springs are bolted to the spring seats on the axle housing and are pivoted at the ends through rubber bushings installed in the ends of the springs. These rubber bushings prevent the transmission of road noise and provide constant low friction pivots requiring no lubrication.

Direct, double action shock absorbers are mounted in front of the axle to provide sway control as well as ride control. The front of the shock absorber is protected from damage by a stone shield welded to the reservoir. Shock absorbers are of sealed construction and require no servicing.

PERIODIC SERVICE

No periodic service is required on rear springs or shock absorbers. Spring leaves, inserts, rubber mounting bushings for springs and shock absorbers should never be lubricated. To do so may result in subsequent squeaks and will cause dirt and grit to accumulate which will accelerate wear.

MINOR REPAIRS

REAR SHACKLE PINS AND BUSHINGS— REMOVE AND REPLACE

REMOVE

1. Disconnect lower end of shock absorber from spring clip plate.

2. Raise car to take load off rear spring and remove bolt which draws shackle links together. Make sure weight is off spring so end of spring will not fly upward when shackle is removed.

3. With a sharp blow of a hammer, remove shackle links from pins.

4. Pull upper pin and bushing assembly from frame using Rear Support Front and Rear Bushing Remover and Replacer, J-4161-A, as follows:

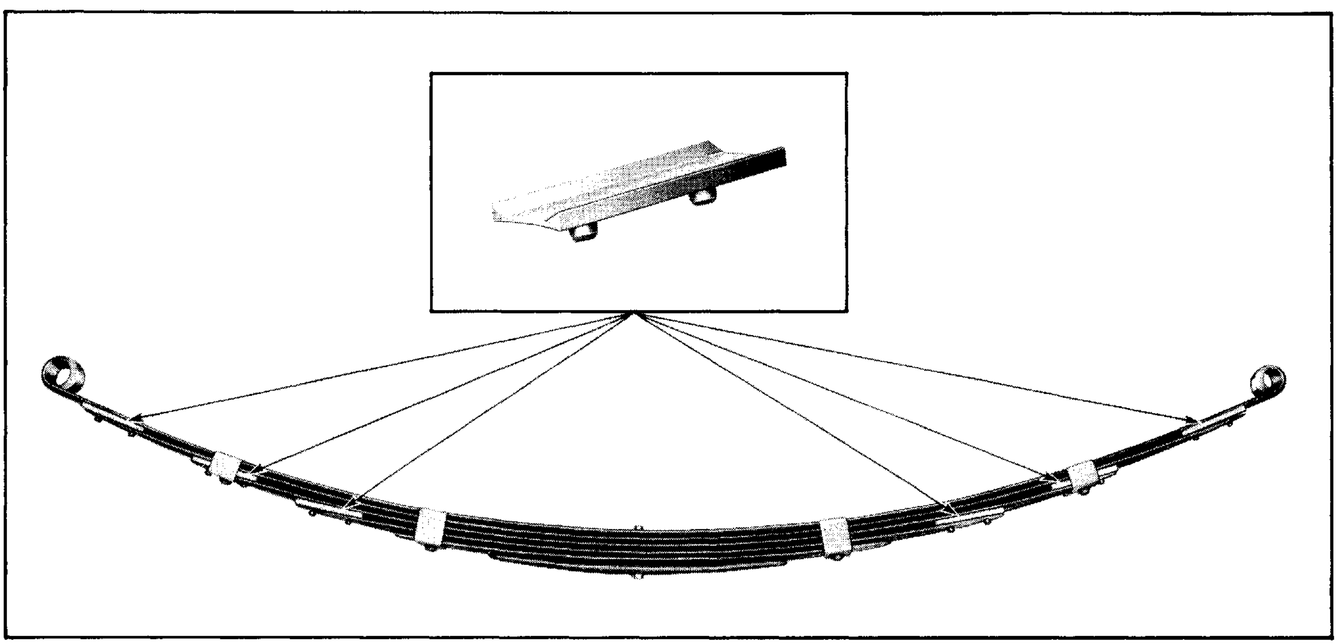

Fig. 4-55 Rear Spring Construction (Star Chief Catalina Shown)

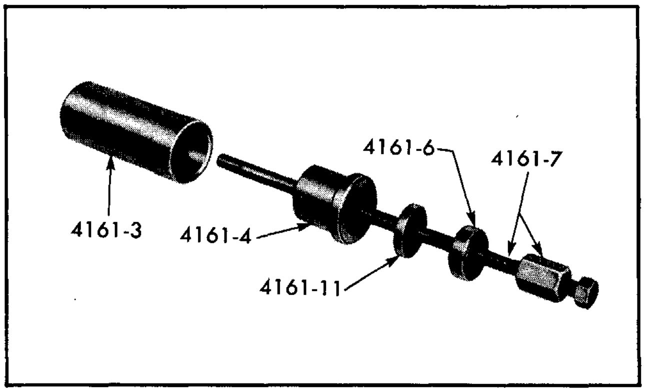

Fig. 4-56 Component Parts of Bushing Replacer Tool J-4161-A

a. Oil threads and insert screw and nut assembly 4161-7 through thrust bearing 4161-6, washer 4161-11, flanged adapter 4161-4, and large sleeve 4161-3 (Fig. 4-56).

b. Position pilot 4161-12 over bushing and outside of frame; insert threaded end of screw through bushing and turn small knurled adapter 4161-1 onto threaded end of screw.

c. With all parts of tool properly positioned, turn hex nut of 4161-7 (Fig. 4-57) until bushing is pulled out of frame into sleeve of tool.

5. Pull lower pin and bushing assembly from spring eye using set J-4161-A as follows:

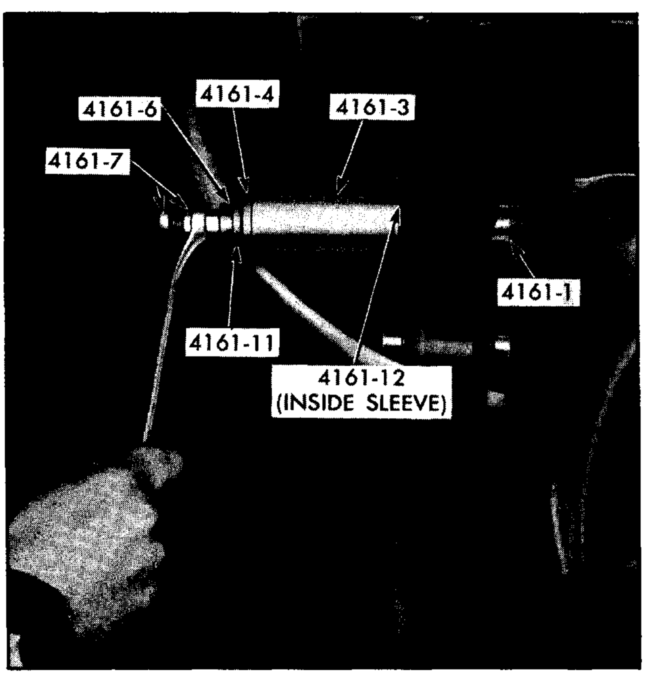

Fig. 4-57 Bushing Replacer Tool J-4161-A Positioned For Removal of Rear Bushing

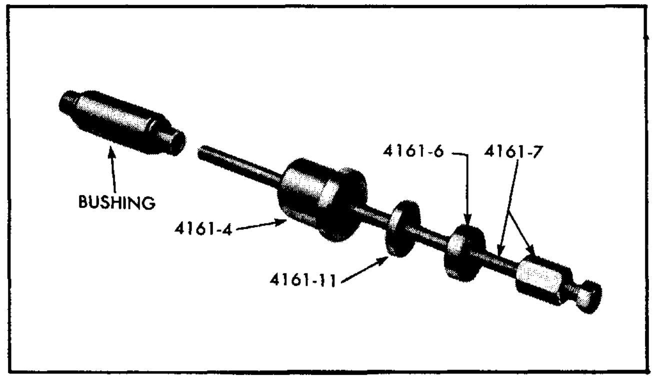

Fig. 4-58 Rear Bushing and Components of Replacer Tool J-4161-A

a. Oil threads and insert screw and nut assembly 4161-7 through thrust bearing 4161-6, washer 4161-11, flanged adapter 4161-4, and large sleeve 4161-3 (Fig. 4-56); then slip small sleeve 4161-10 into large sleeve.

b. Place pilot 4161-12 over spring bushing, insert threaded end of bolt through spring bushing, and turn small knurled adapter 4161-1 onto threaded end of screw.

c. Turn hex nut of screw and nut assembly 4161-7 until bushing is pulled from spring eye into sleeve of tool.

REPLACE

1. To install new bushing assembly in frame proceed as follows using set J-4161-A:

a. Oil threads and insert screw and nut assembly 4161-7 through thrust bearing 4161-6, washer 4161-11, flanged adapter 4161-4, and new bushing assembly (Fig. 4-58).

b. Insert threaded end of screw through hole in frame hanger and turn adapter 4161-2 onto threaded end of screw.

c. Center bushing on one side and adapter 4161-2 on oposite side of hole in spring hanger; turn hex nut of 4161-7 (Fig. 4-59) until bushing is forced into place so bushing pin projects equally on each side of frame hanger.

2. To install new rear bushing assembly in spring eye proceed as follows using set J-4161-A:

a. Oil threads and insert draw bolt 4161-5 with hex nut 4161-7 through thrust bearing 4161-6, washer 4161-11, flanged adapter 4161-4, and new spring bushing assembly (Fig. 4-58).

b. Insert threaded end of screw through spring eye and turn adapter 4161-2 onto threaded end of bolt.

c. Center bushing on one side of spring eye and adapter 4161-2 on opposite side of spring eye; turn hex nut 4161-7 until bushing is forced into place so bushing pin projects equally on each side of spring eye.

3. Install shackle links on taper of pins and insert shackle bolt with head toward inside of car. Install shackle bolt lockwasher and nut. Draw links lightly onto pin tapers seeing that links draw up evenly on all four tapered pins.

4. Lower car so as to have weight of car on springs before final tightening of shackle link bolt. This allows rubber to assume a neutral and unstrained position.

5. Strike each end of each shackle link a sharp blow with hammer to ensure seating on tapers and tighten shackle bolt to 15-20 lb. ft. torque.

6. Connect shock absorber to spring clip plate. Tighten mounting bolt nut to 50-55 lb. ft. torque.

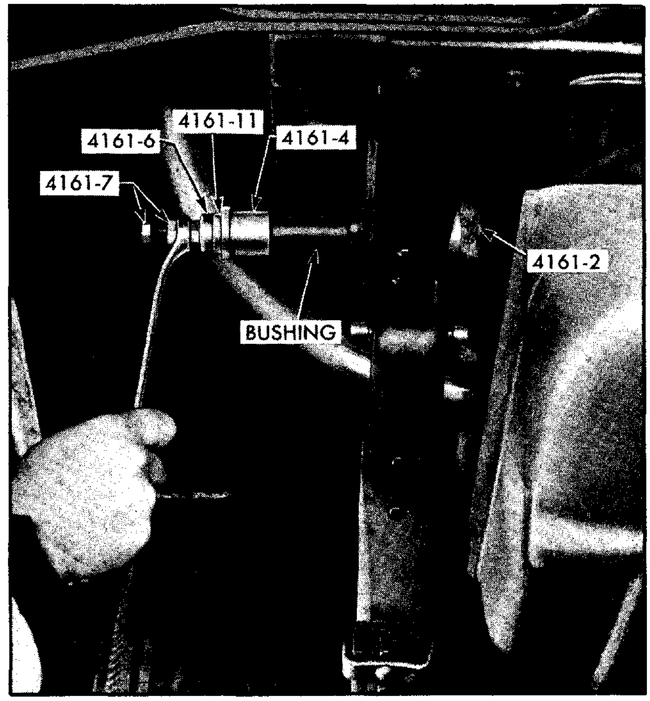

Fig. 4-59 Bushing Replacer Tool J-4161-A Positioned For Installation of Rear Bushing

REAR SPRING FRONT BUSHING— REMOVE AND REPLACE

REMOVE

1. Disconnect shock absorber lower eye from spring clip plate.

2. Raise car to unload rear springs.

3. Remove spring front bolt.

4. Pull spring front bushing using Rear Spring Front and Rear Bushing Remover and Replacer, J-4161-A, as follows:

a. Oil threads and insert screw and nut assembly 4161-7 through thrust bearing 4161-6, washer 4161-11, flanged adapter 4161-4, and large sleeve 4161-3 (Fig. 4-56).

b. Insert threaded end of screw through spring front bushing, and turn adapter 4161-8 onto threaded end of bolt.

c. Turn hex nut of 4161-7 until bushing is pulled into sleeve and out of spring eye. CAUTION: *Ensure that adapter 4161-8 does not "hang-up" on spring eye when nut of assembly 4161-7 is turned. If adapter does not pass freely through spring eye, screw will break; since the parts are under a stress, personal injury may result.*

REPLACE

1. To install new bushing in spring eye proceed as follows using set J-4161-A:

a. Oil threads and insert screw and nut assembly 4161-7 through thrust bearing 4161-6, washer 4161-11, adapter 4161-9, and new spring bushing assembly.

b. Pass threaded end of screw through spring front eye and turn adapter 4161-2 onto threaded end of bolt.

c. Center bushing on one side of spring eye and adapter 4161-2 on opposite side of spring eye; turn hex nut of 4161-7 until bushing is forced into place so it projects equally on each side of spring eye.

2. Install front spring bolt through frame hanger and spring bushing (bolt head toward inside of car). Tighten self-locking nut only finger tight at this time.

3. Lower car so as to have weight of car on springs before tightening spring bolt.

4. Tighten self-locking nut on spring bolt to 60-65 lb. ft. torque. NOTE: If bushing is not sufficiently tight in frame bracket, squeaking may result.

5. Connect shock absorber to spring clip plate. Tighten mounting nut to 50-55 lb. ft. torque.

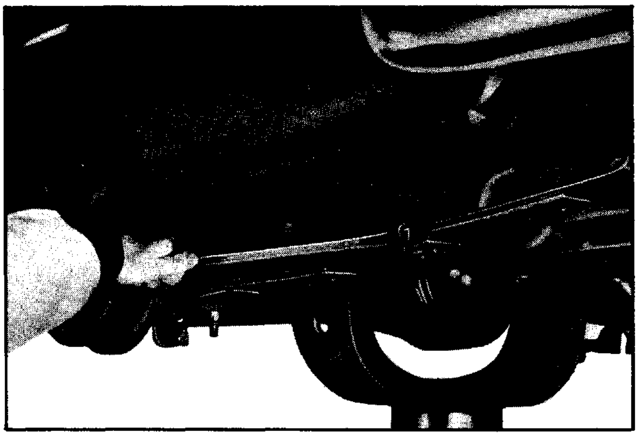

Fig. 4-60 Bending Spring Clips

REAR SPRING INSERTS—REMOVE AND REPLACE

1. Raise rear of car by jacking under differential and remove wheel.

2. Bend spring clips outward (Fig. 4-60). NOTE: Do not bend clips by prying against ends from top of spring. To do so may cause breakage.

3. Support frame by some suitable means and lower rear axle to relieve load from spring leaves.

4. Remove and replace each insert as follows:

a. Use cold chisel or similar tool to separate spring leaves and remove old insert.

b. Clean surfaces of spring leaves to remove any rust or foreign matter.

c. Place new insert between leaves ensuring that projections in insert are through holes in spring leaf.

5. Raise rear axle by jacking against differential to compress springs; bend spring clips around spring leaves. A "C" clamp or battery pliers may be used to advantage to bend clips. NOTE: Clips should not contact edges of leaves nor top of main leaf. A clearance between leaves and clip is necessary to avoid squeaks, however, clearance should never be more than .060" ($\frac{1}{16}$").

6. Replace wheel and lower car.

REAR SPRING ASSEMBLY—REMOVE AND REPLACE

NOTE: When rear springs seem to have sagged, they may be checked by measuring as shown in Fig. 4-61. This measurement should be the same on both sides and indicate no spring sag when compared to a standard car. (Make sure cars being compared have similar loads, i.e., load in trunk, heavy accessories, mud, etc.)

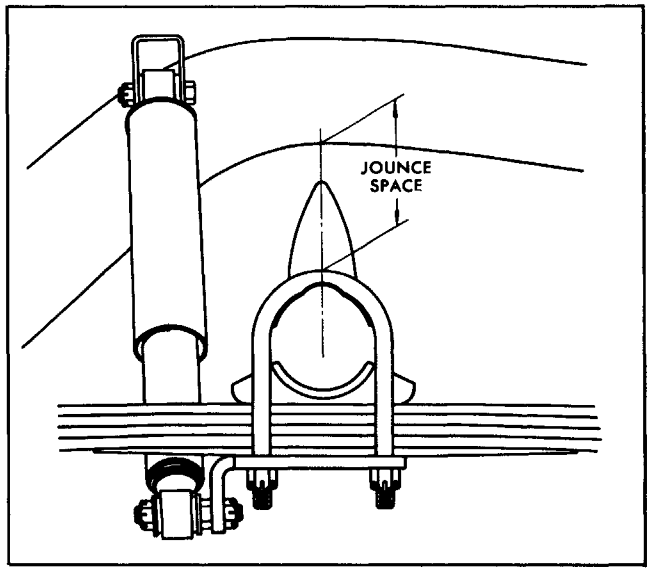

Fig. 4-61 Rear Suspension Jounce Space Measurement

REMOVE

1. Raise car.

2. Disconnect shock absorber from spring clip plate.

3. Support car by some suitable means and lower rear axle assembly to relieve load from springs.

4. Remove rear shackle bolt and links.

5. Remove four nuts holding spring clip plate in position.

6. Swing spring down from seat on axle.

7. Remove spring front bolt and remove spring.

REPLACE

1. Position spring front eye in frame hanger and install bolt with head toward inside of car. Tighten self-locking nut finger tight at this time.

2. Position spring against seat on axle housing.

3. Install spring clip plate and U-bolt nuts. Turn nuts up finger tight at this time to hold spring against seat on axle housing.

4. Assemble rear spring shackle to spring and frame, but do not tighten shackle bolt completely at this time.

5. Tighten U-bolt nuts to 60-65 lb. ft. torque.

6. Raise rear axle assembly and tighten shackle bolts, with weight of car on springs to 15-20 lb. ft. torque.

7. Tighten spring front bolt to 60-65 lb. ft. torque. NOTE: If front bushing is not sufficiently tight in frame bracket, squeaking may result.

8. Connect shock absorber to clip plate and tighten nut of mounting bolt to 50-55 lb. ft. torque.

REAR SHOCK ABSORBER—REMOVE AND REPLACE

1. Remove nuts from upper and lower shock absorber mounting bolts and remove shock absorber.

2. Clean and inspect rubber grommets. If grommets appear deteriorated, spongy, or have taken a "set", discard defective grommets and replace with new parts.

3. Install shock absorber, making sure rubber grommets are in place.

SPECIFICATIONS

REAR AXLE

Type	Semi-floating
Type of drive	Hotchkiss
Drive—Final	Hypoid Gear
Lubricant capacity	3¼ pints
Lubricant	See Lubrication Section
Lubricant level	Bottom of filler plug hole
Rear wheel tread	59″
Road clearance (rear axle)	7$^{11}/_{16}$″

RING AND PINION GEAR

Backlash	.003″-.012″
Ring gear runout maximum	.002″
Ratios	See page 4–1

PROPELLER SHAFT

Length center to center	
27 series	61$^{13}/_{16}$″
28 series	63$^{13}/_{16}$″
Outside diameter	3″

REAR SPRINGS

Length	
27 series	58″
28 series	60″
Width	2″
Number of leaves	
27 series	
All models, exc. taxi, police cars and cust. station wagon	5
Taxi, police cars and custom station wagon	6
28 series	
All models	6

SHOCK ABSORBERS

Collapsed length (measured to center of eyes)	Approx. 12$^{7}/_{16}$″
Extended length (measured to center of eyes)	Approx. 20⅛″

TORQUE SPECIFICATIONS

	Lb. Ft. Torque
Ring Gear to Case Screws	55-60
Bearing Cap Screws	70-75
Shock Absorber to Frame Nut	50-55
Shock Absorber to Anchor Nut	50-55

	Lb. Ft. Torque
Spring Front Bolt to Frame	60-65
Spring Rear Shackle Bolt	15-20
Universal Joint to Companion Flange	28-33
Spring U-bolts	60-65
Brake Assembly to Axle Housing Bolt	30-35

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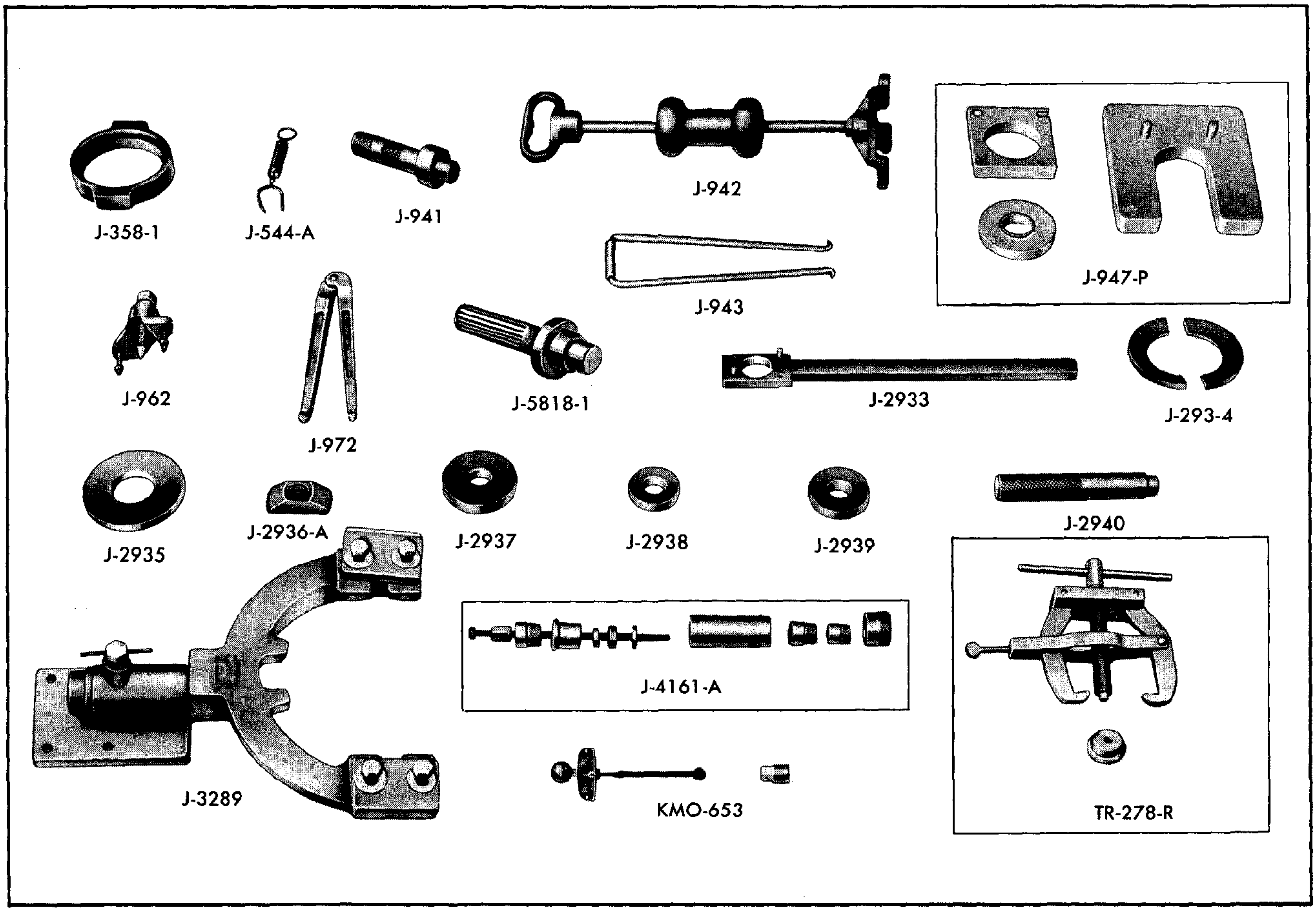

SPECIAL TOOLS—REAR SUSPENSION

J-358-1	Press Plate Holder (for J-2934 and J-2935)
J-941	Differential Side Bearing Replacer
J-942	Rear Axle Shaft and Bearng Puller
J-943	Rear Axle Oil Sealer Remover
J-544-A	Tension Checking Scale (Differential Bearing Preload)
J-947-P	Rear Axle Bearing Remover and Replacing Tool Set
J-962	U-Joint Companion Flange Puller
J-972	Differential Adjusting Wrench
J-2933	Companion Flange Holding Tool
J-2934	Rear Pinion Bearing Remover Plates
J-2935	Rear Pinion Bearing Installing Plate
J-2936-A	Rear Pinion Bearing Race Remover
J-2937	Rear Pinion Bearing Race Installer
J-2938	Front Pinion Bearing Remover
J-2939	Front Pinion Bearing Race Installer
J-2940	Pinion Bearing Remover and Installer Handle
J-3289	Differential Carrier Holding Fixture
J-4161-A	Rear Spring Bushing Remover and Replacer
J-5818-1	Rear Axle Bearing and Oil Seal Replacer
KMO-652	Tension Wrench (0-50 in lbs. with ⅜" sq. drive)
KMO-653	Adapter (For ⅜" drive KMO-652 Wrench)
TR-278-R	Differential Side Bearing Puller

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