SECTION XV
REAR AXLE

Description

The rear axle is a hypoid semi-floating type. The axle shafts are splined at the inner ends to fit in the differential side gears. The outer ends are tapered and provided with keyways for attaching the rear wheel hubs. Side thrust is transferred from one shaft to the other by means of a thrust block between the inner ends of the axle shafts. The shafts are supported on tapered roller bearings pressed on the axle shafts. The axle shaft bearing end play is adjusted by means of shims. The pinion shaft and differential carrier are carried on tapered roller bearings (see Fig. 1).

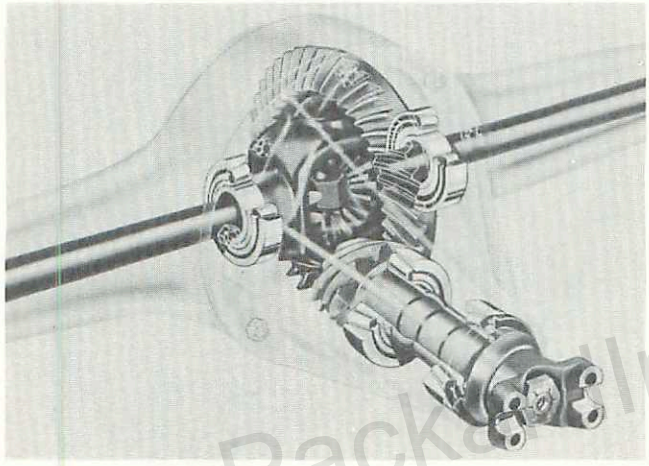

Figure 1—The Pinion Shaft and Differential Case are Carried on Tapered Roller Bearings

The differential carrier assembly can be removed as an assembly and serviced without removing the axle case from the car.

Axle ratios are stamped on the bottom of the carrier flange.

Axle Shaft

REMOVAL—On models equipped with Torsion-Level Suspension, make sure that the switch is off before attempting to raise the car.

Raise the rear of the car with a jack under the rear axle housing. Place stands at the frame near the torsion bar rear bracket. Lower the axle housing to remove the rear wheel shrouds and remove the rear wheels. Then raise the axle assembly and place the stands at the outer ends of the axle housing.

Remove the axle shaft cotter pin, nut, and washer. Remove the hub and drum assembly, using a puller (see Fig. 2). Do not use a knock-out type wheel puller. Remove the other hub and drum assembly in the same manner.

Disconnect the hydraulic brake line from the wheel cylinder. Remove the brake support plate retaining nuts

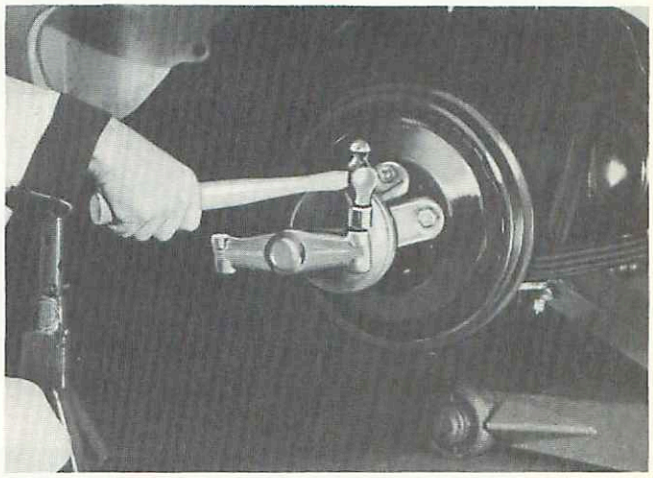

Figure 2—Removing the Rear Wheel Hub

and lock washers. Remove the seal guard, gasket, retainer, oil seal, support plate, and axle shaft bearing adjusting shims.

Using Puller J-2552 (see Fig. 3) remove the axle shaft. Both shafts are removed in the same manner.

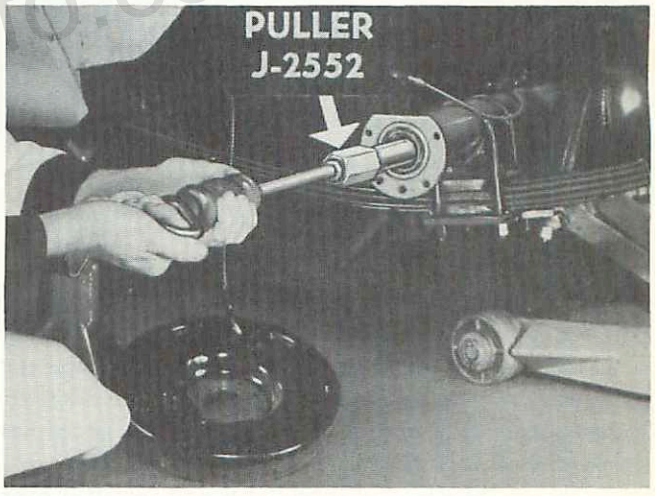

Figure 3—Removing the Rear Axle

If the axle shaft seal is in good condition and need not be replaced, do not allow the shaft to remain partially removed with the weight of the shaft on the seal or drag the shaft across the seal, since this practice will damage the seal.

The inner seal can be removed using Puller J-943-B.

INSTALLATION—Wipe the axle case shaft bearing flange to prevent dirt from contacting the shaft bearing during the shaft installation. Install a new axle shaft inner seal using Driver J-2554 (see Fig. 4).

Pack the shaft bearing with wheel bearing lubricant. Work the lubricant thoroughly under the roller cage and around the rollers (see Fig. 5), performing the opera-

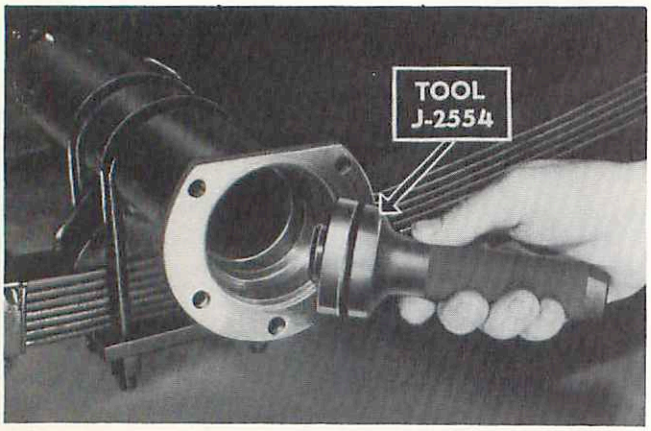

Figure 4—Installing the Axle Shaft Inner Oil Seal

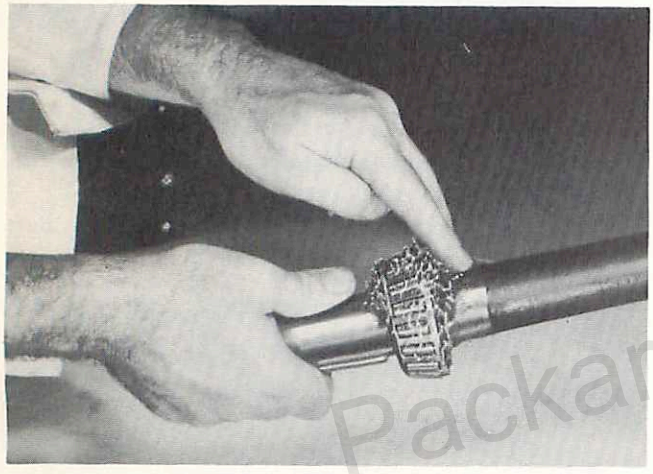

Figure 5—Packing the Axle Shaft Bearing With Grease

tion in the same manner as for the front wheel bearings. Do not apply extra lubricant on the shaft or in the case.

Insert the axle shaft in the housing and engage the end splines in the differential side gears. Slide the shaft into position. Be careful not to drag the shaft or splines across the oil seal.

Wipe the bearing cup thoroughly and install it over the bearing. Make sure the cup is fully seated and not cocked or wedged in the case. Position the shims on the flange and place the support plate over the shims. Assemble and install a new oil seal retainer gasket, new oil seal, seal retainer, seal guard gasket, and seal guard on the support plate. Install the support plate nuts and lock washers and gradually snug up all nuts. Then tighten the nuts evenly to 35 to 40 foot pounds torque.

Because there is a possibility of the axle shaft thrust block turning out of position, make frequent checks during the plate tightening, by pulling the shaft in and out to make sure that shaft end play exists.

Install both shafts in the same manner.

ADJUSTMENT—Install the Axle Shaft Remover J-2552 and bump the shaft back and forth several times to make sure that the shaft and bearings are seated. Remove the Shaft Remover and install the Checking Gauge.

With the axle shaft all the way in, turn the adjusting screw of the tool to bear against the support plate. Then pull the shaft outward to take up maximum end play. Check with a feeler gauge to determine the clearance between the end of the screw and the plate (see Fig. 6).

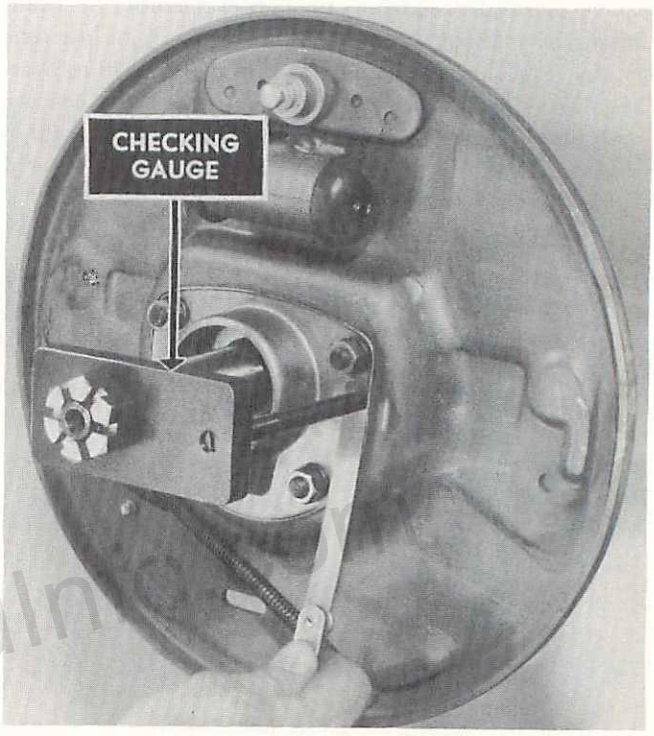

Figure 6—Checking the Axle Shaft End Play

The clearance should be .004″ to .007″. Shims are available in .005″, .007″, and .020″ thicknesses. Add or remove shims as required to obtain specified clearance.

End play of less than .050″ can be adjusted at one side only. Remove shims from both sides if the end play exceeds .050″ in order to keep the thrust block centralized.

Connect the brake hydraulic line to the brake cylinder on both sides. Thoroughly wipe all oil and grease from the tapered portion of the axle shaft and bore in the wheel hub. Install both hub and drum assemblies.

Install the shaft washer and nut, and tighten to 200 to 270 foot pounds torque. Install the cotter pin. Bleed both rear brake cylinders as outlined under Bleeding the System in the Brake Section.

Raise the rear axle and remove the stands from under the axle case. Place the stands under the frame. Lower the axle to permit the installation of the wheels. Then, raise the car and remove the stands from the rear of the frame.

Differential Carrier

REMOVAL—Remove the axle shafts as described under Axles Shafts—Removal.

On models equipped with either the 3-speed gear transmission or the overdrive, disconnect the propeller shaft at the rear axle yoke by removing the bearing U-bolt nuts and U bolts.

On the Twin Ultramatic Drive equipped cars, disconnect the propeller shaft at the rear flange by removing the universal joint bearing block cap screws.

Prop the propeller shaft up against the floor panel with a block of wood between the shaft and the frame X member. This will keep the propeller shaft out of the way. Remove the drain plug and drain the lubricant from the case. Install the plug securely after the lubricant has been drained.

Clean the carrier and rear axle case at the parting line of the carrier and case to prevent dirt from falling into the case when the carrier is removed. Remove the carrier-to-case stud nuts and remove the carrier from the case.

DISASSEMBLY—Remove the O-ring seal from the groove in the face of the carrier flange. Clean the interior of the carrier with clean solvent before disassembly. Do not clean the outside of the carrier until after disassembly. Cleaning the outside of the carrier at this time may result in dirt and grit getting into the bearings.

Place the differential carrier in a Differential Carrier Holder J-3289 (see Fig. 7). Inspect the ring gear. If

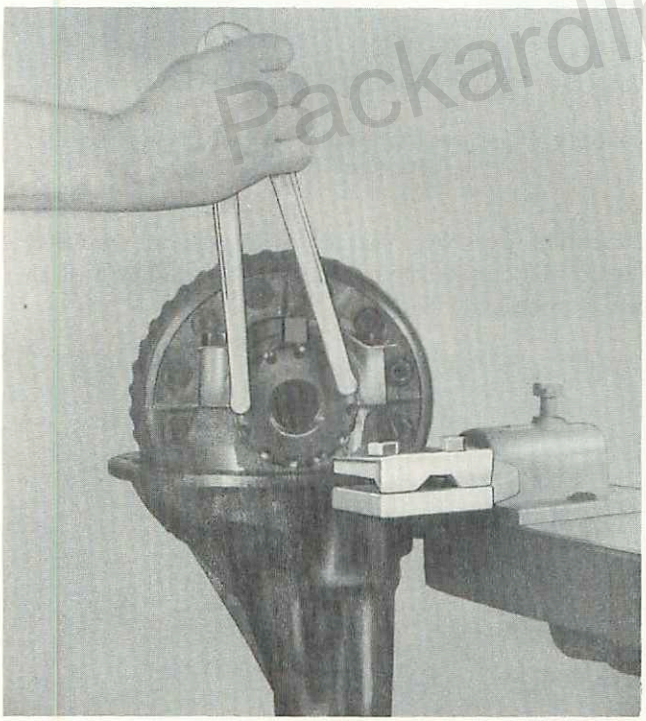

Figure 7—Differential in Holding Fixture

broken teeth are found or if there is any evidence of chips or particles having gone through the teeth, use a dial indicator against the back face of the ring gear and measure the runout of the differential case before disassembly. Install a new differential case if the runout exceeds .004".

Mark the carrier side bearing caps, bearing adjusting nuts, and pedestals with punch marks. These marks will indicate the bearing cap location and approximate bearing adjustment during assembly.

Remove the bearing adjusting nut cotter pins. Turn down the tabs of the cap screw locks. Remove the carrier bearing cap screws. Hold the ring gear and differential case in place with one hand, and lightly tap the bearing caps loose with a hammer. Lift off the differential case, bearings, bearing cups, adjusting nuts, and caps. The bearing cap, bearing cup, and adjusting nut should be kept together to facilitate the side bearing adjustment during assembly.

Remove the ring gear-to-differential case cap screws. Tap the outside of the ring gear with a soft hammer to loosen it, and lift the gear from the case.

Drive out the differential pinion shaft lock pin using a pin punch and hammer (see Fig. 8). Then drive out the pinion shaft.

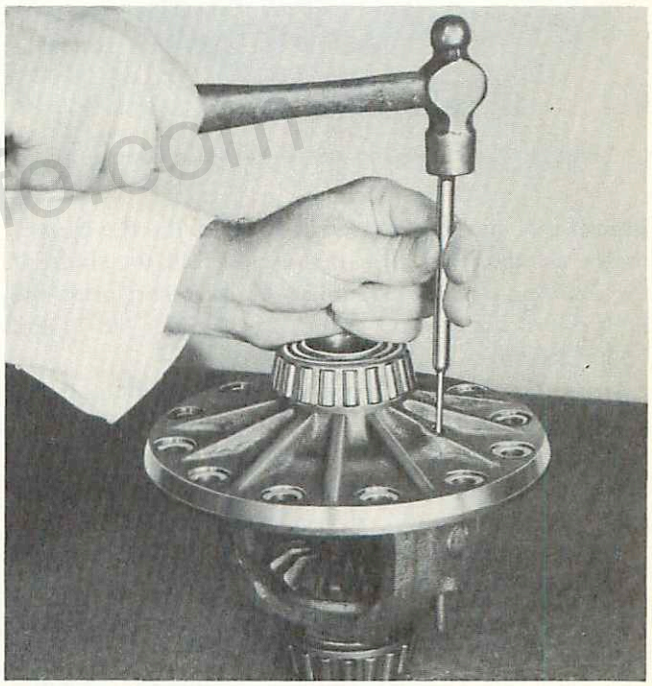

Figure 8—Driving Out the Lock Pin

Remove the differential pinions, pinion thrust washers, axle shaft thrust block, differential side gears, and thrust washers. If the differential bearings require replacement, remove the bearings using Puller J-3250 and Adapter J-3250-4 (see Fig. 9).

Remove the carrier from the holding fixture. While holding the universal joint flange in a vise or using Holding Tool PK-21, remove the flange nut using Socket Wrench J-5512. Then using a soft hammer, drive the universal joint flange off the pinion shaft.

Place the carrier back in the holding fixture. Drive the pinion out of the front bearing, using a soft hammer to prevent damage to the pinion threads. Also being

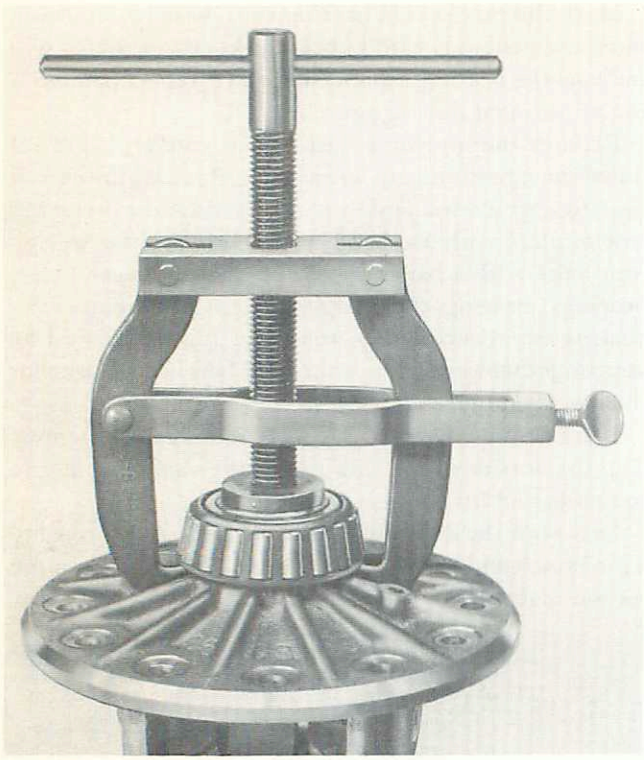

Figure 9—Removing the Differential Bearing

careful that the pinion gear does not strike the base of the carrier pedestal. Slip the sleeve from the shaft. If the shaft rear bearing requires replacement, press the shaft out of the bearing, using Plate Holder J-2574 and J-5508 Remover Plates (see Fig. 10).

Drive out the pinion front bearing and pinion oil seal using a brass drift.

Then, using Remover J-3235A and Handle J-872-5, drive the pinion front bearing cup out of the carrier (see Fig. 11).

Drive out the pinion rear bearing cup, using Remover J-5521 and Handle J-827-5 as shown in Fig. 12.

CLEANING and INSPECTION—Clean the differential case and all parts thoroughly. Dry all parts with compressed air. Do not permit the bearings to spin while drying them. Spinning may cause the bearings to score.

Inspect all gears for wear, scores, pits, chips, or improper tooth contact. Inspect the thrust surfaces of the differential pinions and side gears for scores or wear.

Inspect the ring gear and pinion. The ring gear and pinion are furnished only in matched sets and must be replaced as a set if either part requires replacement.

Inspect the differential case thrust surfaces for wear or scores. Inspect the ring gear mounting flange. All nicks and burrs should be removed.

Check the fit of the universal joint flange splines on the pinion splines. They should have a snug fit.

Inspect all bearings and cups for scores and pits; inspect bearing rollers for scores or flat spots.

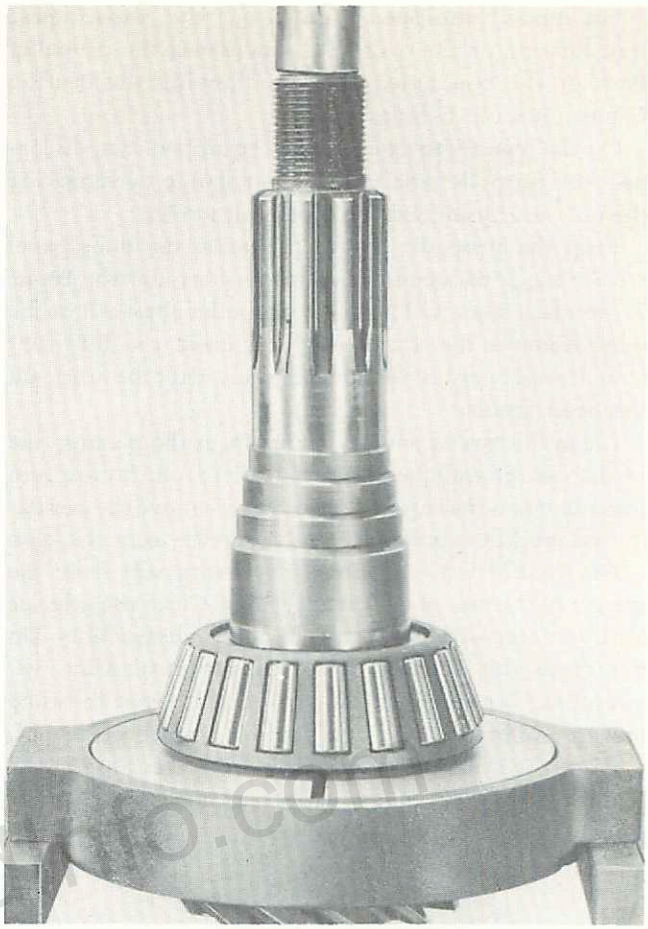

Figure 10—Special Tools Required For Removing the Rear Bearing

Clean the outside of the carrier in a separate container. Inspect the carrier for cracks and the condition of the carrier mounting flange.

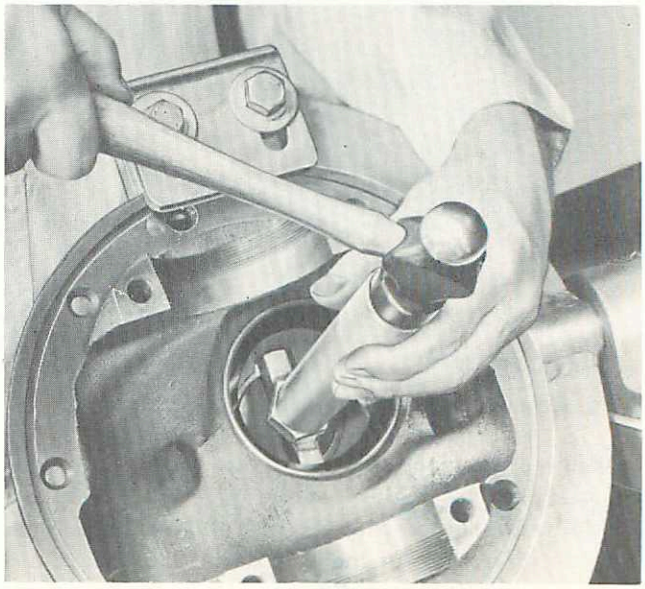

Figure 11—Driving Out the Front Bearing Cup

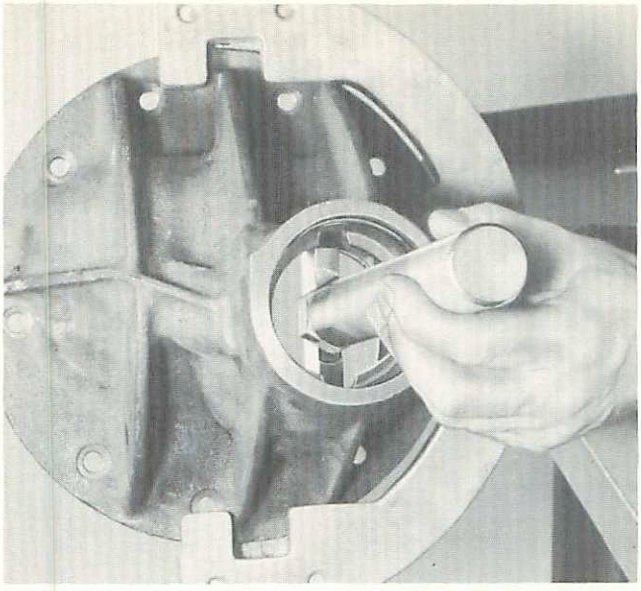

Figure 12—Driving Out the Rear Bearing Cup

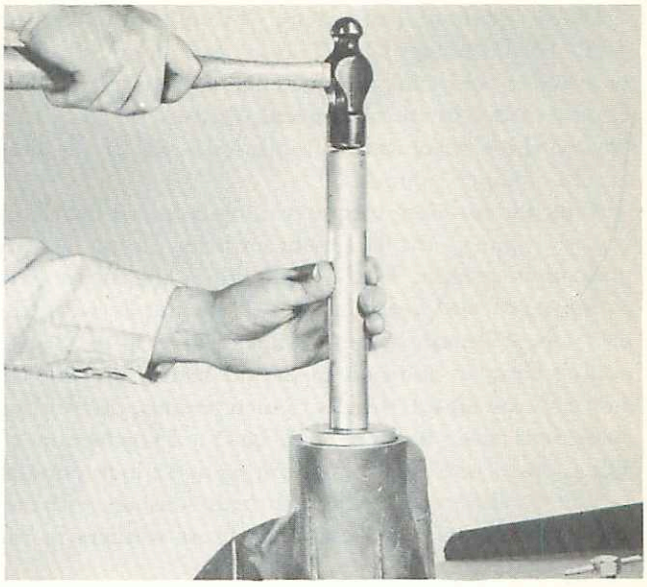

Figure 14—Installing the Front Bearing Cup

ASSEMBLY—Prior to installing gears, bearings, or other moving parts, lubricate all surfaces which are subject to friction. This will provide sufficient lubrication until the differential oil reaches these parts after the unit has been installed and put into operation.

Install the pinion rear bearing cup, using Installer J-3230-A and Driver Handle J-872-5 (see Fig. 13).

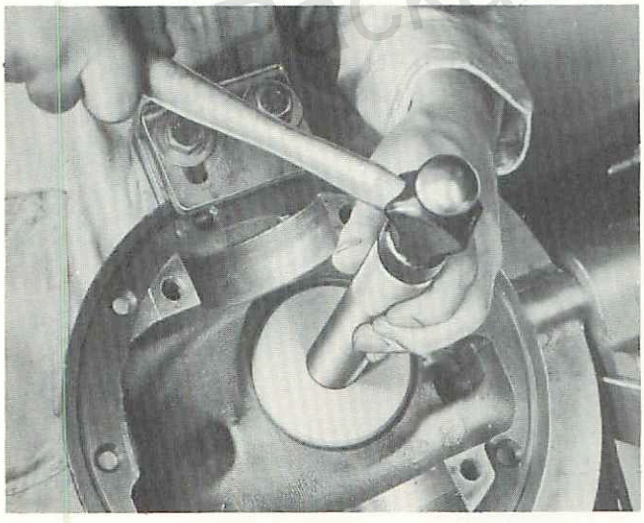

Figure 13—Installing the Rear Bearing Cup

Install the pinion front bearing cup, using Installer J-5506 and Driver Handle J-872-5 (see Fig. 14).

Press the pinion rear bearing on the pinion shaft until the inner race is fully seated against the pinion shoulder.

Slip the pinion bearing sleeve on the pinion shaft with the large diameter end toward the pinion rear bearing. Place the pinion and bearing assembly in the carrier. Then, while holding the pinion in position with the rear bearing seated in the cup, install the pinion front bearing and tap it into place on the pinion shaft against the sleeve.

Lubricate the felt of the pinion oil seal, apply Perfect Seal or its equivalent to the outside surface, and drive it into place using Installer J-3244 (see Fig. 15). Coat the

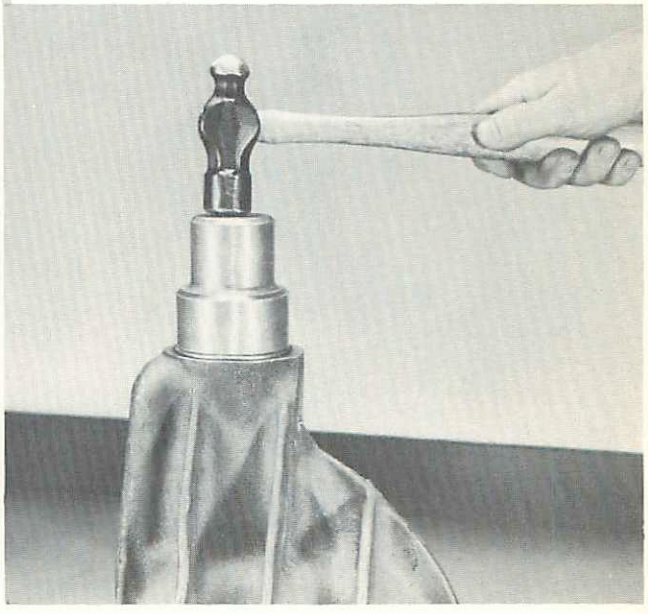

Figure 15—Driving the Seal Into Place

splines of the pinion shaft with Lubriplate. Install the universal joint flange and dust shield, flange washer, and nut.

Place the assembly so that the universal joint flange is locked in a vise or use Holding Tool PK-21 and tighten the flange nut with Socket J-5512 as much as possible without starting to collapse the sleeve. A definite increase in turning effort is required to buckle the sleeve.

Using Preload Indicating Wrench and Adapter J-2571-B and Socket J-5512, notice the amount of torque required to rotate the pinion. This indicates the amount of drag caused by the pinion seal. Measure the drag after two or three revolutions. Replace the seal if the drag exceeds 15 inch pounds.

After the seal drag torque reading is determined, continue tightening the flange nut until the pinion bearing preload is correct. While tightening, the sleeve will collapse but will keep the proper spacing between the bearings. Tighten the pinion nut to give 30 to 38 inch pounds drag in addition to the oil seal drag. (For example, if the oil seal drag is 15 inch pounds, the reading on the indicating wrench should be 45 to 53 inch pounds.) The total torque must be within 35 to 55 inch pounds.

Coat the differential side gear thrust washers with cup grease and install the gears and thrust washers in the differential case.

Coat the differential pinion thrust washers with cup grease and stick them to the outer (thrust) end of the pinions. Place the pinions in mesh with the side gears opposite each other and rotate the side gears with the pinions until the bores of the pinions line up with the pin bore in the differential case (see Fig. 16).

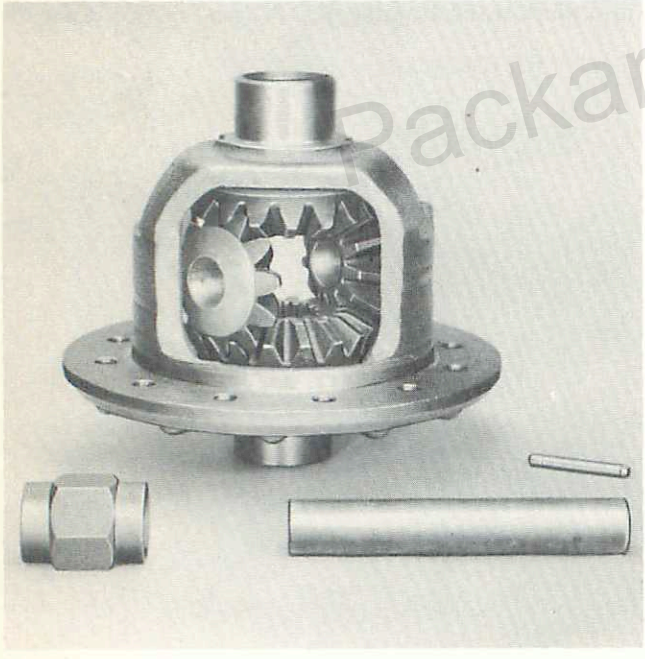

Figure 16—Pinion Gears in Position

Start the pinion shaft into the differential case so the lock pin hole will align with the lock pin hole in the case. As the pinion shaft is pushed into the case, install the thrust block. Push the pinion shaft in until the lock pin hole registers with the lock pin hole in the case.

Measure the end play of each side gear using a feeler gauge (see Fig. 17). The end play should be .0015″ to .003″. If the end play is not within these limits, it will

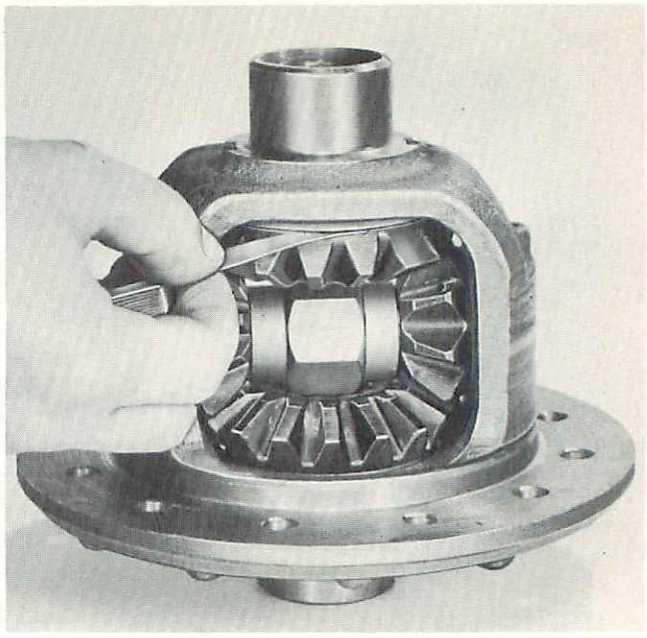

Figure 17—Checking the Side Gear End Play

be necessary to remove the side gear thrust washers and replace them with thrust washers of the correct thickness. The washers are available in .031″, .036″, .041″, and .046″ thicknesses. When proper end play is obtained and the pinion shaft is installed, drive in the lock pin and stake the edge of the lock pin hole in the case.

Install the ring gear on the differential case, after making sure that the back face of the ring gear and the mating face of the case flange are free from dirt and

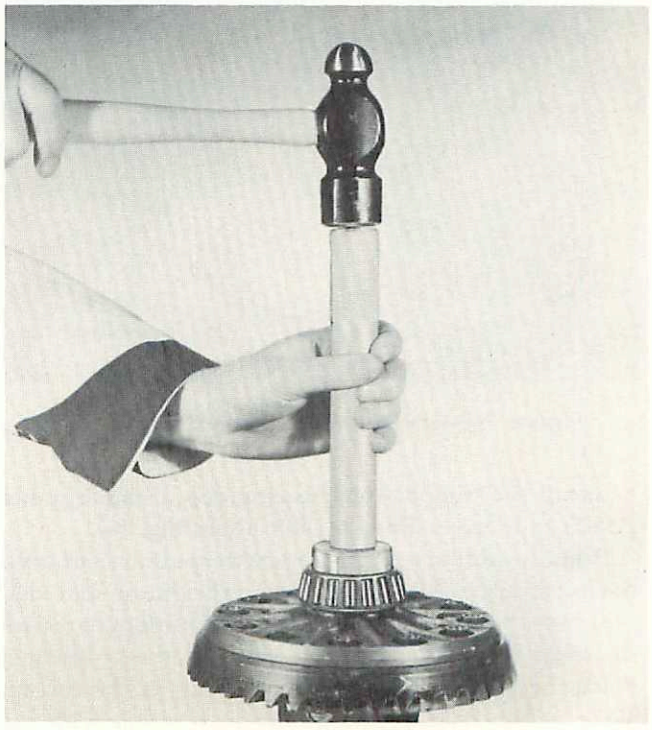

Figure 18—Installing a Differential Bearing

burrs. Install the ring gear cap screws and tighten them evenly to 50 to 55 foot pounds torque.

Install the differential side bearings using Bearing Installer J-5507 and Driving Handle J-872-5 (see Fig. 18). Lubricate the bearings and place the bearing cups on the bearings.

Place the differential case assembly in the carrier, install the side bearing adjusting nuts, and turn the nuts a few turns to be sure they are properly started in the threads. Install the bearing caps so that the cap screw holes line up with the carrier. Install and tighten the cap screws just enough to hold the adjusting nuts in place and also permit them to be turned so that the gear lash and bearing preload can be adjusted.

Temporarily adjust the ring gear-to-pinion lash to approximately .010″.

The differential side bearing preload is determined by measuring the spread of the carrier pedestals, using a large outside calipers and a .010″ feeler gauge.

Back off the side bearing adjusting nut on the ring gear (left) side one full turn so that a little end play can be felt in the differential case. Place the calipers and the .010″ feeler gauge on the pedestals as shown in Fig.19,

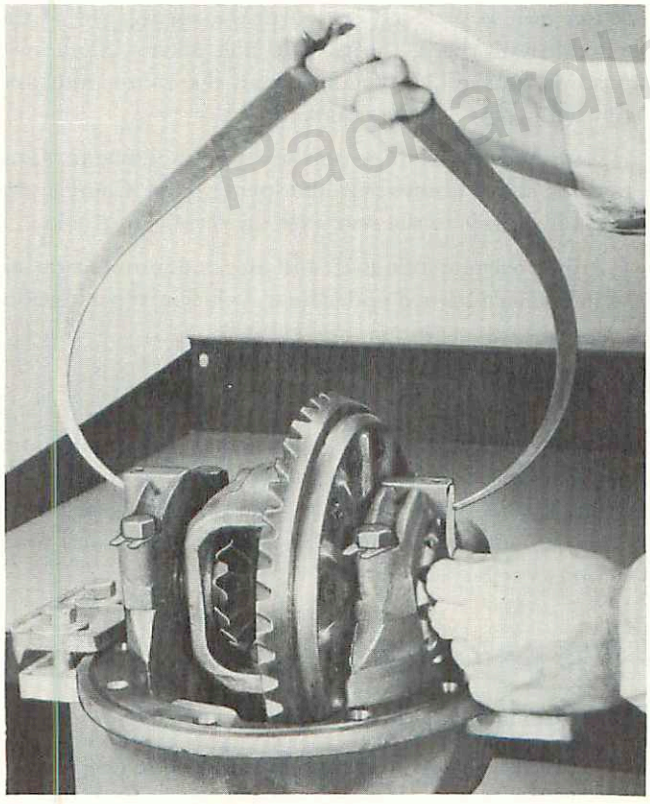

Figure 19—Checking Side Bearing Preload

adjust the caliper so that the jaws contact the feeler gauge and the opposite boss as shown. Lock the calipers to maintain the setting.

Tighten the side bearing adjusting nut on the ring gear side one full turn to bring it back to the position it was in before the caliper setting was made.

Then tighten the (right) adjusting nut opposite the ring gear side until the caliper jaws just contact both cap bosses without the feeler gauge.

After setting the pedestal spread to .010″, rotate the ring gear several revolutions, then recheck the pedestal spread to see if there is any loss of spread due to the seating of the bearing rollers in the cups. If any of the spread has been lost, repeat the setting procedure to obtain the .010″ spread.

The ring gear-to-pinion lash is measured by mounting a dial indicator on the carrier flange with the indicator plunger against the ring gear tooth (see Fig. 20). The

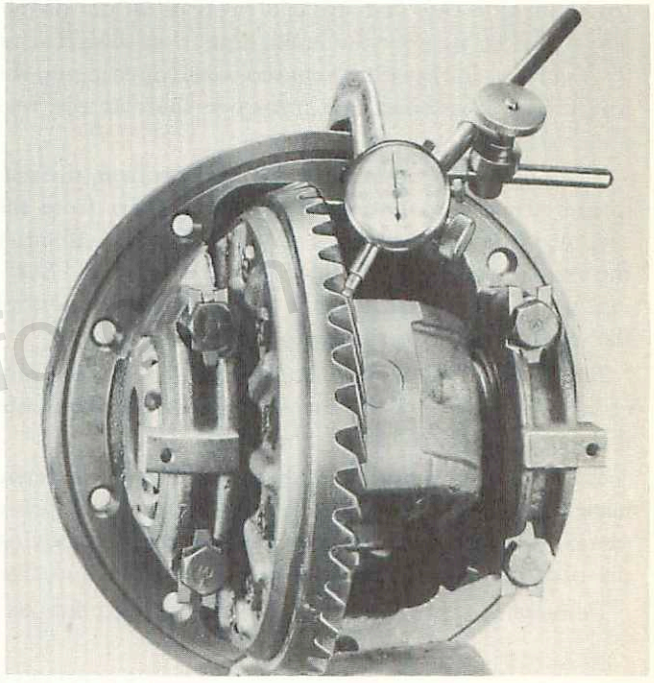

Figure 20—Checking Ring Gear to Pinion Lash

ring gear-to-pinion lash should be .004″—.008″. The lash may be reduced by moving the ring gear nearer the pinion or may be increased by moving the ring gear away from the pinion. Movement of the ring gear is obtained by turning both side bearing adjusting nuts the same amount in the same direction without disturbing the side bearing preload. The adjusting nuts may be turned, using Differential Side Bearing Adjuster J-3232. Tightening one adjusting nut one notch and loosening the other one notch will change the gear lash approximately .004″.

Tighten the side bearing cap bolts, recheck the gear lash, bend the lock plate over, and install the side bearing adjusting nut cotter pins.

Install a new carrier sealing ring in the groove of the carrier flange, holding it in place with heavy grease. Install the plastic seals on the carrier studs. Place the carrier assembly in the case and on the carrier studs. In-

stall and tighten the carrier nuts to 35 to 40 foot pounds torque.

Tighten the pedestal set screw to 25 to 35 inch pounds. Then, hold the set screw with the Allen wrench to prevent over-tightening, and tighten the lock nut.

Axle Case (Housing) Assembly

REMOVAL—*Equipped With Torsion-Level Suspension*—On models equipped with Torsion-Level Suspension, it is necessary to disconnect and unload the torsion bars as described in the Suspension and Steering Section.

Remove the wheel hubs. Disconnect the brake lines at the wheel cylinders. Remove the brake support plates from the axle case and suspend them in an out-of-the-way position. Remove the brake pipe from the axle case by removing the breather vent screw and opening up the line clips. Disconnect the propeller shaft at the rear universal joint.

Then disconnect the rear stabilizer bars from the rear torque arms. Disconnect the shock absorbers from the rear torque arm and shock absorber bracket. Remove the axle housing U-bolt nuts. Slip the bracket and bushings off the U bolts. Lower the torque arms down out of the way, then lower and remove the axle assembly.

Equipped With Spring Suspension—Follow the procedure described under Rear Axle Shaft—Removal, but it is not necessary to remove the shafts.

Disconnect the propeller shaft at the rear universal joint. Disconnect the shock absorber from the spring plate. Remove the brake pipe from the case by removing the breather vent screw and opening up the line clip.

Remove the spring U-bolt nuts and spring plate. Remove the U bolts. Raise the axle enough to disengage the spring center bolt from the mounting pad. Then shift the case to one side so that the one end clears the spring and can be lowered. Then shift the assembly in the other direction and remove it from the car.

INSTALLATION—*Equipped With Torsion-Level Suspension*—Lift the axle assembly and shift it as necessary to align the mounting pads with the torque arms. Make sure the bushings are aligned and slip the U bolts into position. Install the lower bushings, torque arm and shock absorber bracket, and U-bolt nuts. Connect the shock absorbers and the stabilizer bars.

Connect the propeller shaft to the rear axle universal joint yoke. Install the brake pipe on the axle housing. Install the brake support plate and adjust the axle shaft end play. Connect the brake lines to the wheel cylinder. Install the wheel hubs.

Then, load and connect the torsion bars as described in the Suspension and Steering section.

Bleed the rear wheel cylinder as outlined under Bleeding the System in the Brake section.

Equipped With Spring Suspension—Position the axle assembly on the springs, making sure that the spring center bolt is properly seated in the spring pad of the axle. Install the U bolts. Slip the spring plate into position on the U bolts and install the U-bolt nuts and tighten to 45-52 foot pounds torque.

Install the brake pipe on the assembly housing. Connect the shock absorber to the spring plate. Connect the propeller shaft to the rear axle universal joint yoke.

Adjust the rear axle shaft end play and complete the installation as outlined under Rear Axle Shaft Installation.

TROUBLE SHOOTING

Rear axle noise is usually apparent as a hum in moderate cases or as a growl in severe cases. Very often a rear axle which is noisy when the engine is driving the car, will be quiet when the car is coasting or vice-versa.

Difficulties with rear wheel bearings, universal joints, the exhaust system, or tire noise are often improperly diagnosed as rear axle noise. The possibility of an incorrect diagnosis of these difficulties is great and must not be disregarded.

CONTINUOUS HUM—PULL OR COAST

Causes

1. Rough tire tread.
2. Insufficient lubricant in rear axle case.
3. Improper grade of lubricant.
4. Axle shaft bearings pitted, scored, or worn.
5. Ring gear and pinion worn, scored, or chipped.
6. Ring gear and pinion improperly adjusted.
7. Insufficient preload on pinion bearings.
8. Insufficient preload on differential side bearings.
9. Pinion bearings or differential side bearings pitted, scored, or worn.
10. Ring gear and pinion not matched.
11. Noisy muffler—noise can be duplicated with car standing still by accelerating and decelerating engine.

HUM ON COAST

Causes

1. Axle shaft bearings pitted, scored, or worn.
2. Improper preload on pinion bearings.
3. Ring gear and pinion worn, scored, or chipped.

HUM ON PULL

Causes

1. Insufficient lubricant in axle case.
2. Improper grade of lubricant in the axle case.
3. Improper ring gear-to-pinion mesh.
4. Worn pinion bearings or out of adjustment.
5. Scored gears.

INTERMITTENT HUM

Causes

1. Dirt or chips between ring gear and differential case.
2. Differential case sprung or cracked.
3. Warped or sprung ring gear.
4. Ring gear retaining screws unevenly tightened.
5. Loose, worn, scored, or broken differential side bearings.

NOISY ON TURNS

Causes

1. Differential pinions or side gears chipped, scored, or worn.
2. Differential case, side gears, and thrust washers worn, scored, or rough.
3. Differential pinions tight on pinion shaft.
4. Excessive backlash between differential pinions and side gears.

KNOCKS IN AXLE

Causes

1. Pitted, chipped, or scored axle shaft bearings or cups.
2. Pitted, chipped, or scored differential side bearings or pinion bearings.
3. Chipped ring gear or pinion, or chips lodged between teeth.

EXCESSIVE BACKLASH

Causes

1. Engine performance rough.
2. Clutch driven plate loose on clutch shaft.
3. Excessive play in transmission on overdrive gears and shafts.
4. Worn or loose universal joints.
5. Wheel hubs loose on axle shafts.
6. Excessive clearance between ring gear and pinion.
7. Ring gear retaining screws loose.
8. Worn or loose differential pinions and side gears.

OIL LEAKS

Causes

1. Loss at axle shafts.
   a) Lubricant level too high.
   b) Oil seal worn or damaged.
   c) Wheel hub or shaft oil seal surface rough.
   d) Excessive axle shaft end play.
   e) Axle case breather vent plugged.
2. Loss at pinion shaft.
   a) Lubricant level too high.
   b) Pinion oil seal worn or damaged.
   c) Universal joint flange hub rough, scored, or damaged.
   d) Axle case breather vent plugged.
3. Loss at carrier flange.
   a) Loose carrier-to-case screws.
   b) Damaged carrier flange O-ring seal.
   c) Damaged or burred carrier flange or case face.
   d) Cracked axle case.

NOTES

REAR AXLE
56TH SERIES SUPPLEMENT

Description

The new Packard rear axle is of the hypoid type with semi-floating design axle shafts. The inner ends of the axle shafts are supported by, and splined to, the differential side gears. The outer ends of the axle shafts rotate in sealed ball bearings. Axle shaft end play adjustment is not required. Specific end play is established by manufacturing tolerances. The outer end of the shafts incorporate integral flanges to which the rear hub and drum and the rear wheels are attached.

The hypoid ring gear and the drive pinion are positioned and adjusted by means of shims of various thicknesses.

Tapered roller bearings support the differential carrier and gear assembly and two tapered roller bearings are used with the drive pinion.

The rear axle housing and tube assembly has a removable cover plate thereby permitting the removal and installation of the differential carrier assembly and the drive pinion through the rear of the housing.

Rear Wheel Bearing Replacement

Raise the rear of the car and remove the wheel hub shell cover and the rear wheel. Remove the spring type retaining nuts from the wheel bolts and remove the drum.

Line up the hole in the axle shaft flange with one of the retaining nuts that hold the brake backing plate to the axle housing and remove the nut. See figure 21. Rotate the axle shaft and repeat this operation until the four nuts are removed.

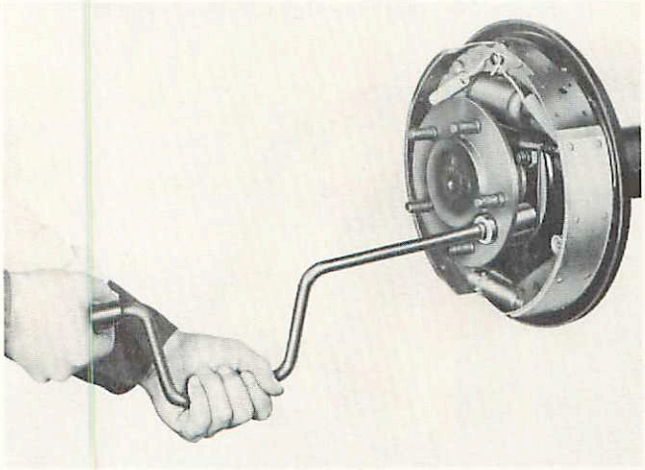

Figure 21—Remove Retaining Nuts

Pull the axle shaft and the bearing assembly part way out of the housing and then install two of the backing plate retaining nuts to temporarily hold the backing plate in place. Remove the axle shaft from the housing.

NOTE: When removing the shaft, care should be exercised so as not to damage the oil seal if the seal does not require replacement.

If the axle shaft oil seal is to be replaced, remove the seal using Oil Seal Remover J-943-B as shown in figure 22.

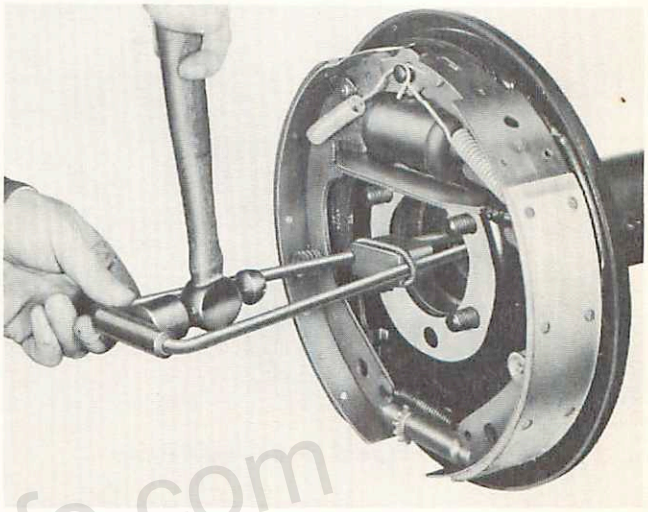

Figure 22—Removing the Oil Seal

Install a new seal using Oil Seal Driver J-2554 as shown in figure 23.

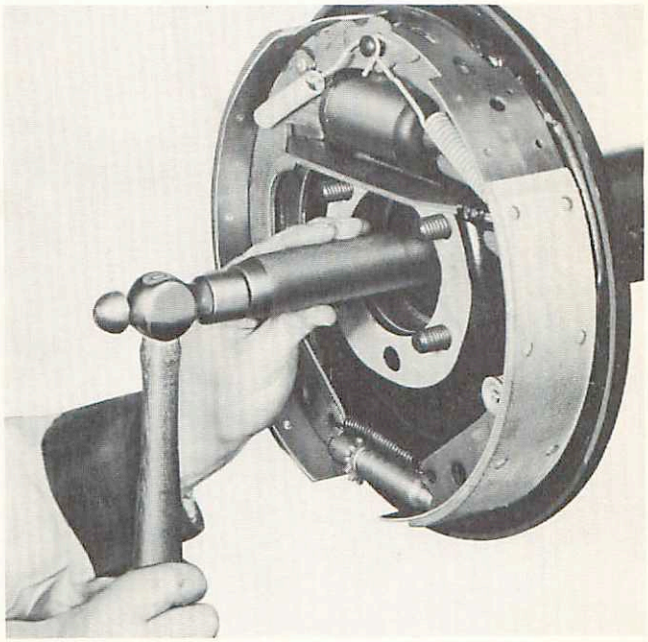

Figure 23—Installing the Oil Seal

To replace the wheel bearing, clamp the axle shaft in a vise and then sharply strike the bearing retainer

using a hammer and chisel as shown in figure 24. Rotate the shaft in the vise and repeat this operation three or four times. This will expand the bearing retainer ring on the shaft and it then can be slid from the shaft.

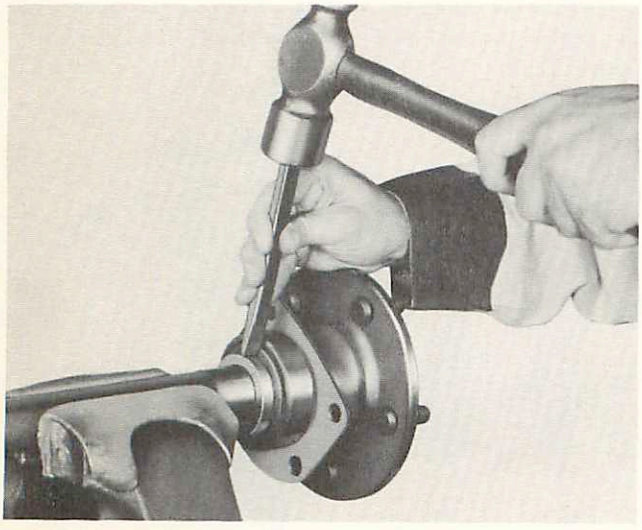

Figure 24—Expand the Bearing Retainer

Remove the wheel bearing using Wheel Bearing Replacer J-6378, as shown in figure 25, and then slide the bearing retainer off the shaft.

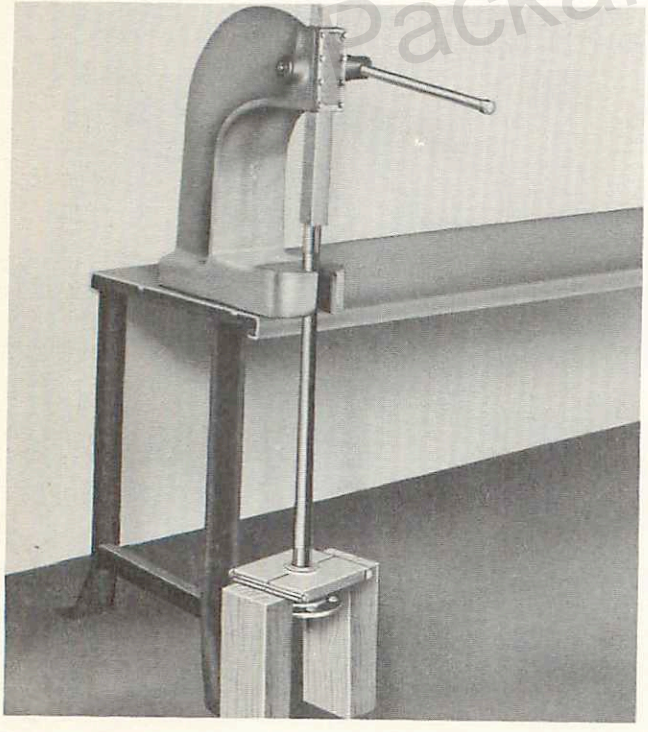

Figure 25—Removing the Wheel Bearing

To install the wheel bearing, place the collar J-6379 in the replacer J-6378 as shown in figure 26. Slide the bearing retainer plate on the axle shaft and press the shaft into the new bearing. See figure 27. Use the same tools to press a bearing retaining ring on the shaft. See figure 28.

NOTE: Do not attempt to press on both the wheel bearing and the wheel bearing retaining ring in the same operation.

Remove the two nuts which are temporarily holding the brake backing plate to the axle housing and then replace the two gaskets on either side of the support plate. Position the backing plate on the bolts.

Slide the axle shaft into the housing exercising care not to damage the seal with the shaft splines. Engage the shaft splines with the splines in the differential side gear.

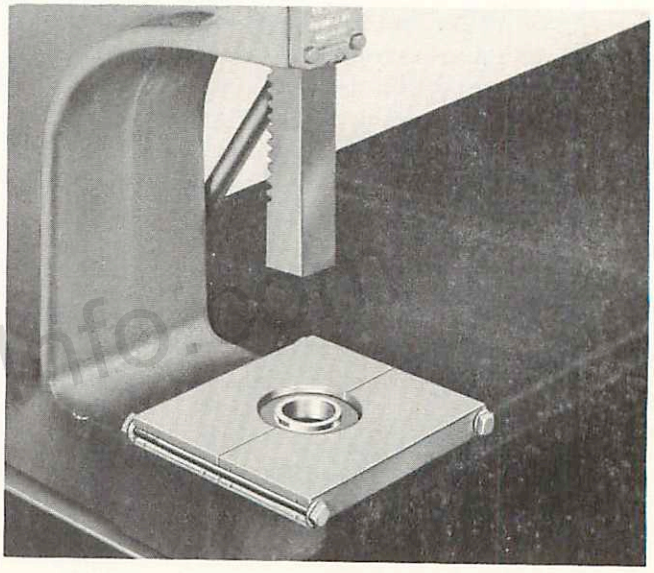

Figure 26—Note the Collar in the Replacer

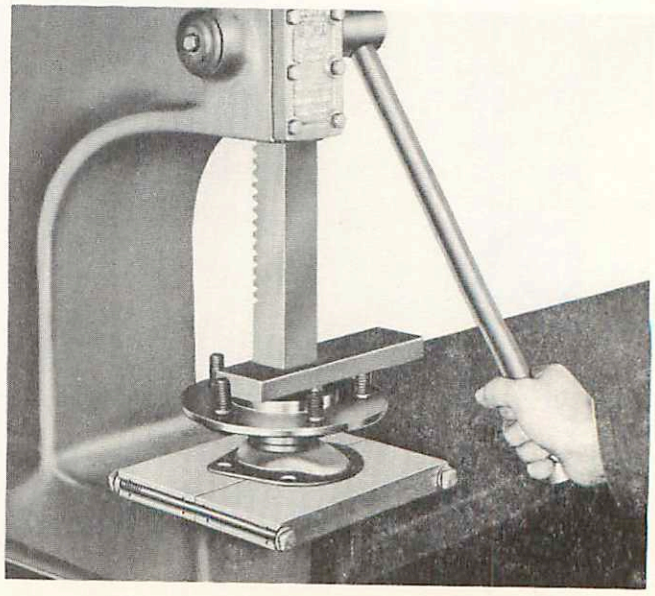

Figure 27—Installing Wheel Bearing

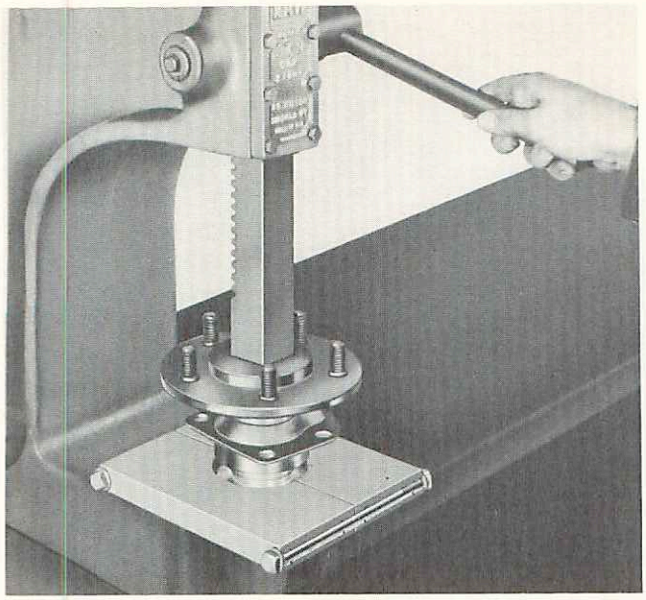

Figure 28—Installing Bearing Retaining Ring

Place the bearing retainer plate in position, install the four retaining nuts and torque tighten the nuts to 50 to 70 foot pounds.

Install the brake drum and the spring type retainers and then install the wheel and the hub shell cover.

Rear Axle Removal

Lift rear of car with chain hoists until wheels are clear of floor and then place chassis support stands under the frame side rails.

Disconnect the propeller shaft at the rear.

Drain the rear axle lubricant by removing the drain plug in bottom of the housing and tube assembly.

Using a floor jack under the center of the axle housing, raise the axle slightly to take the load off the shock absorbers.

If the car is equipped with Torsion-Level Suspension, place blocks or support stands under the support arms behind the rear links.

Disconnect the lower ends of the shock absorbers.

Disconnect the lower ends of the rear stabilizer rods and wire them to the frame cross channel. Figure 29 shows the Support Arm Positioning Tool J-6386. Attach the tool to the stabilizer rod anchor pins and add the stabilizer rod retaining nuts and washers. Turn the tool turnbuckle to take up slack in the tool.

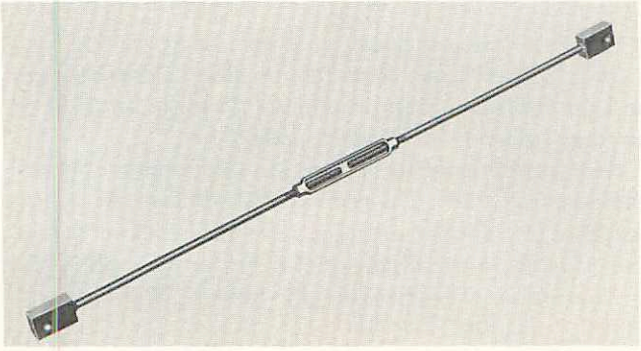

Figure 29—Support Arm Positioning Tool

Disconnect the brake tubes from the wheel cylinders.

Remove the hub shell covers and the rear wheels. Remove the spring type retaining nuts from the wheel bolts and remove the drum.

Line up the hole in the axle shaft flange with one of the retaining nuts that hold the brake backing plate to the axle housing and remove the nut. Rotate the axle shaft and repeat this operation to remove the remaining nuts.

Remove the axle shaft and bearing assemblies and place the backing plates on the floor.

Remove the rear axle U-bolts.

Raise the axle with the floor jack, move the jack and axle over to either side as far as the jack will permit and then pull the axle off the jack and out the side.

The unit may be installed by reversing the removal procedure.

Removal of Differential Carrier and Pinion

Place the rear axle assembly in a suitable holding fixture, as shown in figure 30, with the differential cover facing upward. Thoroughly clean the cover and surrounding area removing all dirt, accumulated

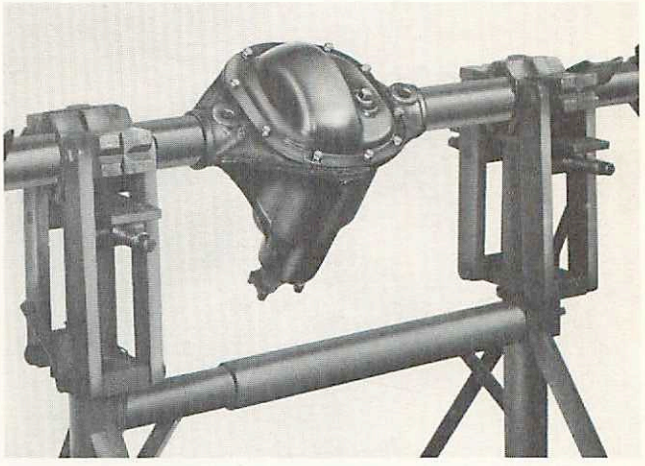

Figure 30—Axle Assembly in Holding Fixture

grease, etc. Refer to figure 31 and note the metal tag beneath one of the cover cap screws. This tag is stamped to indicate the number of teeth in the ring gear and pinion assembly and by dividing the larger number (ring gear teeth) by the smaller number (pinion teeth) the axle ratio can be determined. Thus, a 46-13 tag denotes a 3.54:1 axle ratio; a 43-15 tag denotes a 2.87:1 axle ratio, etc.

Remove the differential cover and gasket and then clean all internal parts with solvent and allow to drain.

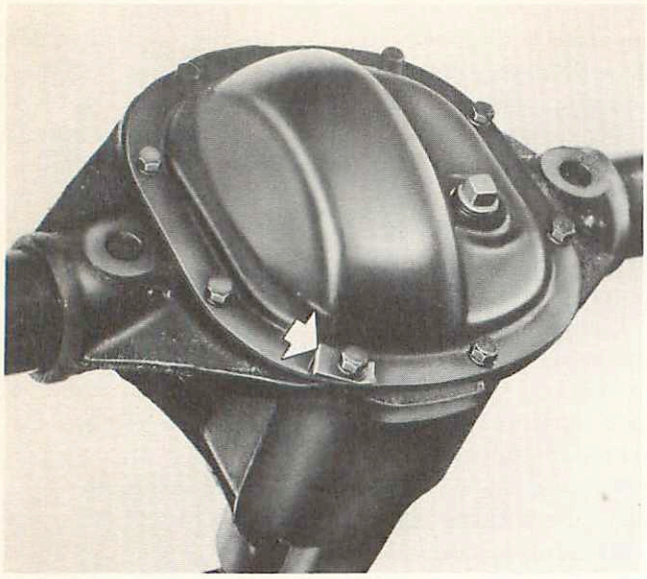

Figure 31—Note the Axle Ratio Tag

Check the ring gear back face for runout with a dial indicator as shown in figure 32. The total runout reading should not be more than .006". Runout in excess of this amount may be caused by runout in the gear, a loose ring gear, or sprung differential housing assembly.

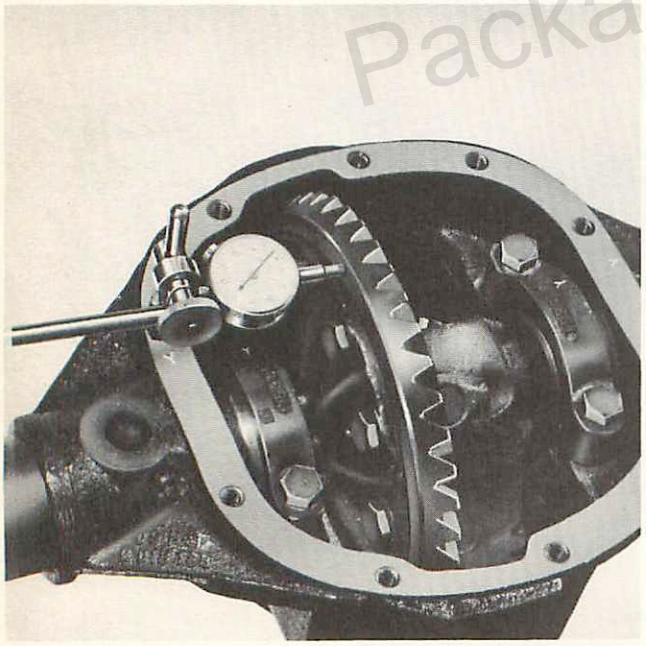

Figure 32—Checking Ring Gear for Runout

Remove the differential carrier bearing caps noting that each is marked and that there is a corresponding mark on the rear cover gasket surface of the housing. See figure 33. When reinstalling the caps, the positions of these numerals or letters must correspond.

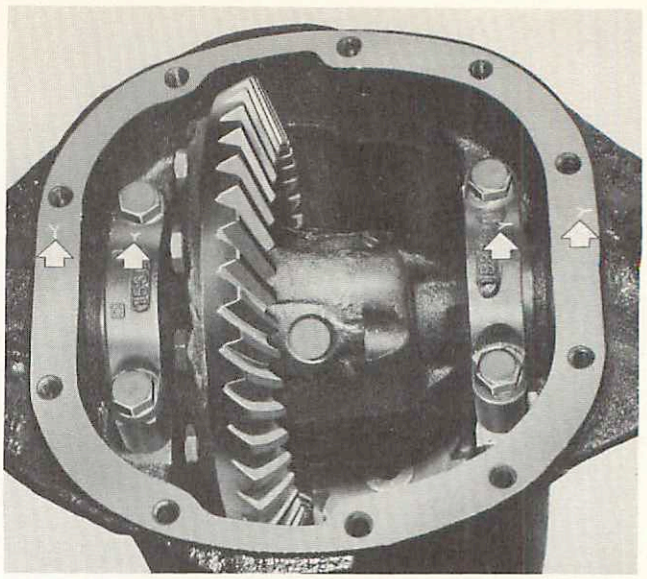

Figure 33—Note the Stamped Letters

Attach the Differential Housing Spreader J-5231 making sure the tool hold down clamp screws are tight. See figure 34.

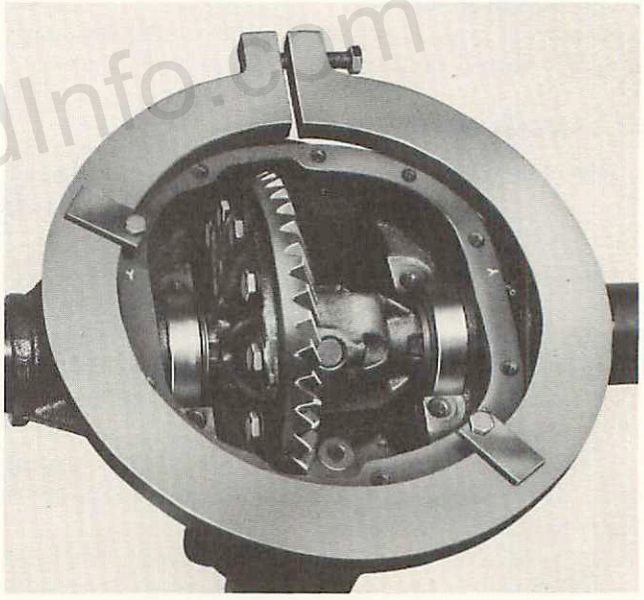

Figure 34—Differential Housing Spreader Installed

Attach a dial indicator, as shown in figure 35, with a long bolt or cap screw in one side of the housing and the indicator stem in contact with the housing or another bolt on the opposite side.

Release the holding fixture jaws or clamps. Spread the housing .020". Do not exceed this limit as it may result in permanent damage. It is necessary to spread the housing as the differential bearings have an initial preload (side press between the housing and bearing) of .005" to .009".

Pry the carrier assembly loose with large screwdrivers or bars and lift it out of the housing.

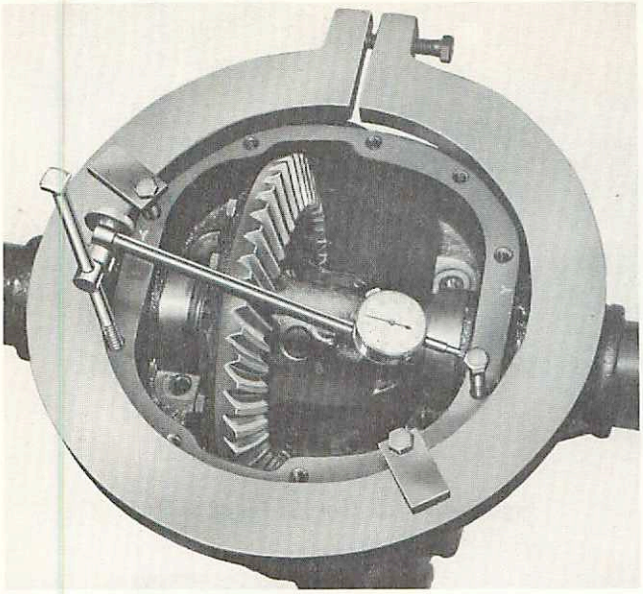

Figure 35—Use Dial Indicator when Spreading Housing

NOTE: Pry out the assembly as straight up as possible using leverage against the housing to prevent damage.

Remove the cups from the differential side bearings. If the bearing cones and cups are not worn or damaged and are to be re-assembled, make certain that each mating cup and cone are paired together.

Remove the side bearings using Differential Side Bearing Puller J-3250 and plug detail J-3250-4. See figure 36. When pulling the bearings, make certain that the jaws of the puller are located in the cast recesses of the carrier so as not to pull on the bearing cage.

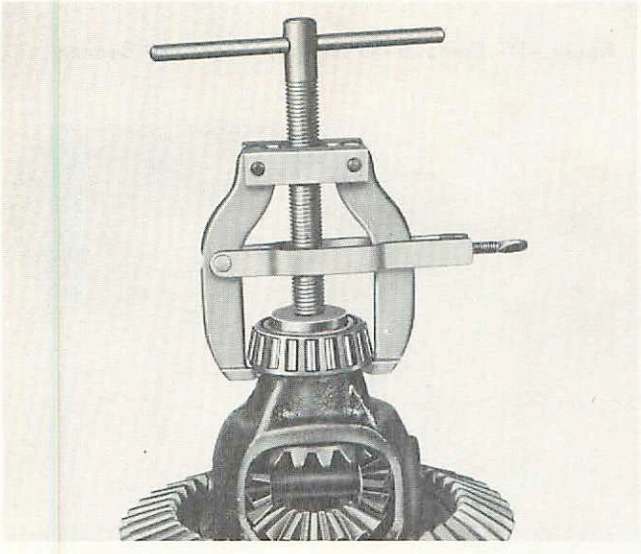

Figure 36—Removing Differential Side Bearing

Refer to figure 37 and note the shims used with each side bearing. If the ring gear and pinion do not require replacement, keep each shim pack with its respective side bearing cone and cup.

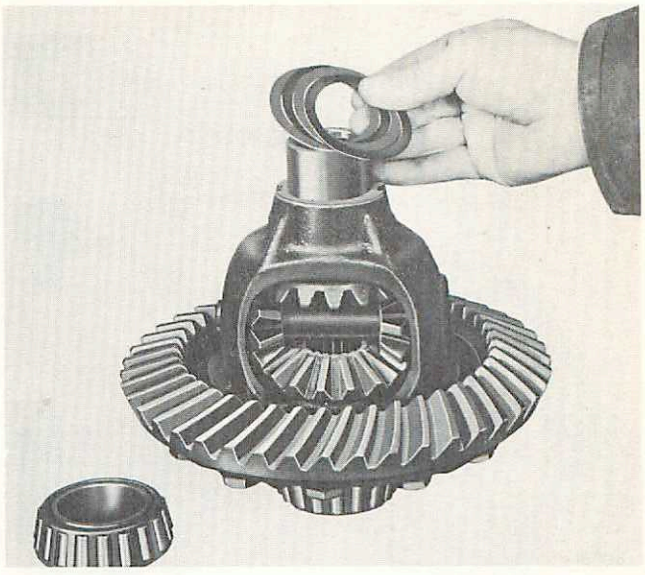

Figure 37—Note the Adjusting Shims

Remove the ring gear retaining screws and the ring gear. Drive out the differential pinion shaft lock pin as shown in figure 38. Drive out the pinion shaft and then remove the pinions and thrust washers (one back of each pinion). Remove the differential gears and thrust washers (one back of each gear).

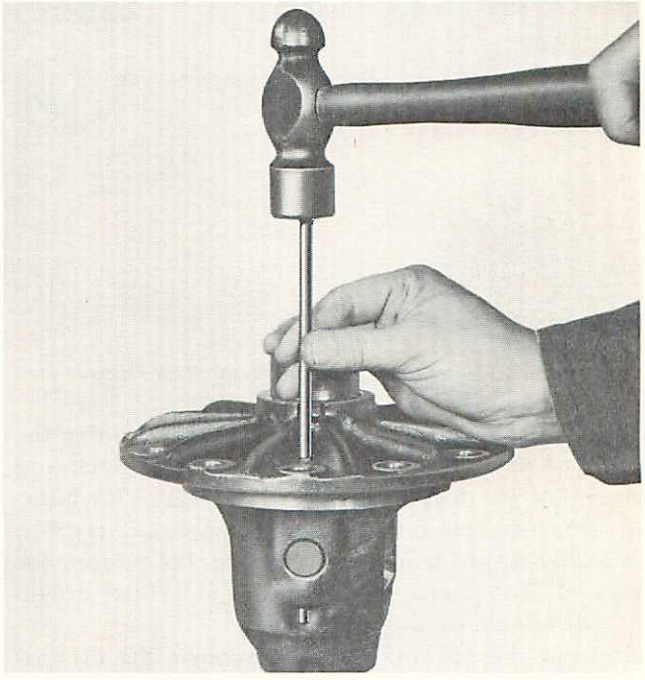

Figure 38—Drive Out the Lock Pin

Remove the differential housing spreader and then rotate the housing in the holding fixture so that the pinion drive shaft is vertical. Remove the universal

joint flange retaining nut while holding the flange with Universal Joint Flange Holding Tool J-6371. See figure 39.

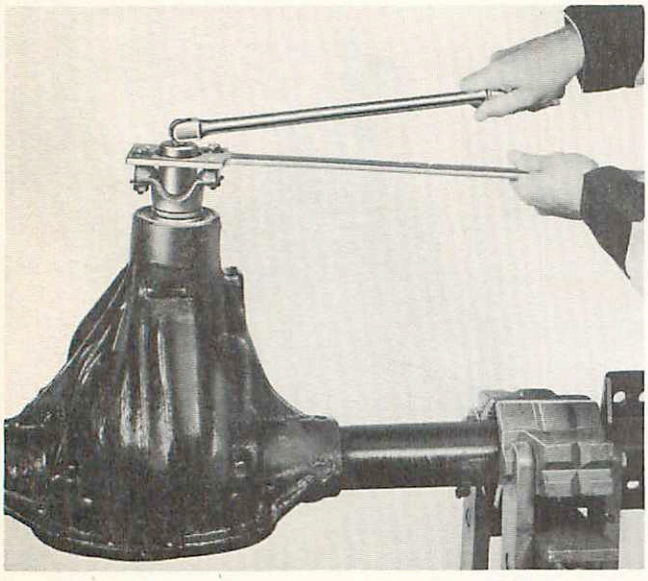

Figure 39—Removing the Flange Retaining Nut

Pull the flange using the holding tool and Universal Joint Flange Puller J-2576. See figure 40.

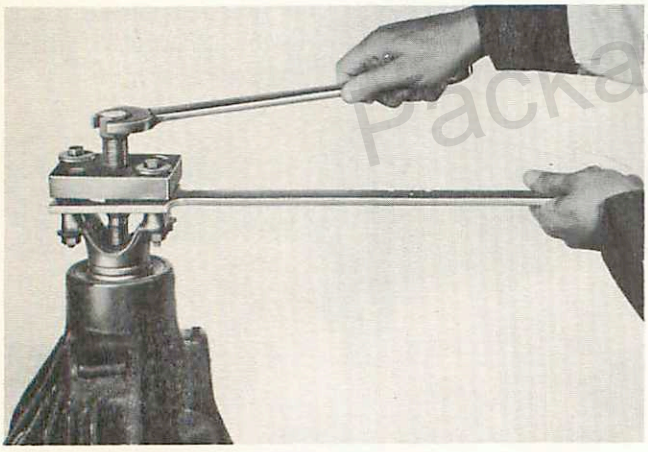

Figure 40—Removing the Universal Joint Flange

Rotate the housing in the holding fixture so that the pinion shaft is horizontal. Using a fiber block and hammer, drive the pinion toward the rear of the housing. After the pinion has moved approximately ½", use a fiber-tipped hammer and tap out the pinion. See figure 41. The pinion shaft rear cone and roller assembly will remain on the pinion shaft.

Pry out the oil seal and then remove the oil seal gasket, slinger and bearing cone. See figure 42. Remove the adjusting shim pack and keep the shims intact with the cone and roller assembly. See figure 43.

Rotate the housing in the holding fixture and, using a long brass drift, drive the front bearing cup out of the housing. See figure 44.

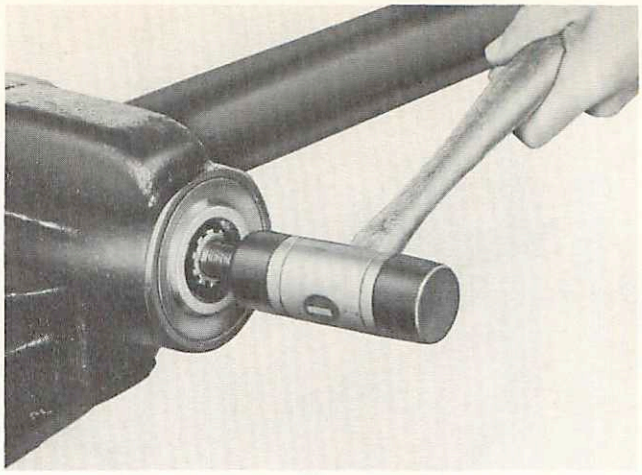

Figure 41—Tap Out the Pinion Shaft

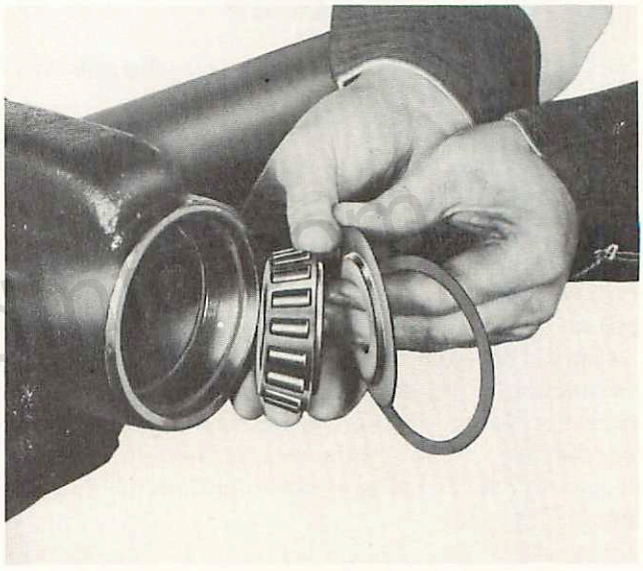

Figure 42—Remove the Gasket, Slinger and Bearing

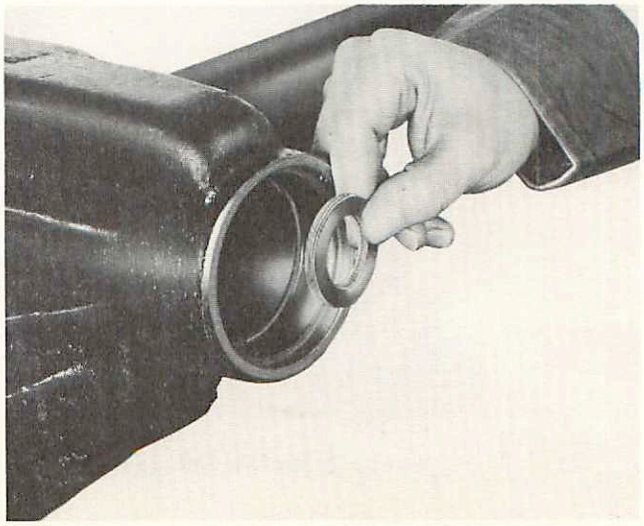

Figure 43—Lift Out the Adjusting Shim Pack

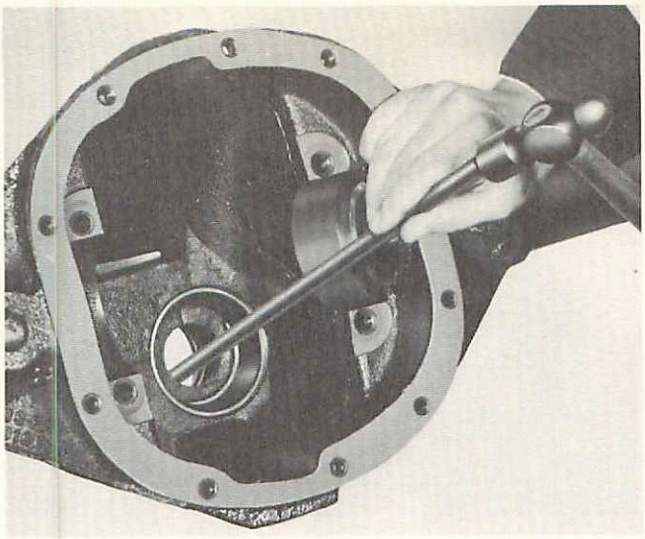

Figure 44—Drive Out the Front Bearing Cup

Install the Rear Pinion Bearing Cup Remover details J-6367. See figure 45. Using Axle Shaft Puller

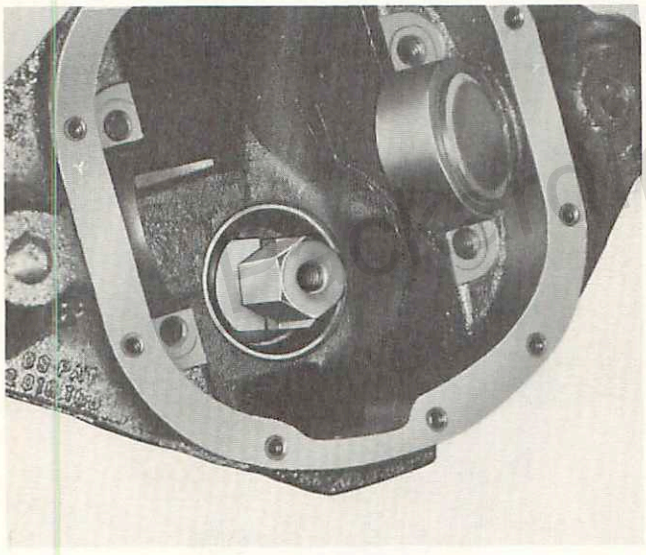

Figure 45—Rear Bearing Cup Remover Details

J-2654A, remove the bearing cup. See figure 46. Remove the adjusting shim pack and keep the shims intact with the bearing cup. See figure 47.

Figure 48 shows the Pinion Rear Bearing Replacer J-6369, installed on the bearing, and Holder J-6395. Press the shaft out of the bearing using an arbor press.

Assembly of Differential Carrier and Pinion

Install the differential side gears and thrust washers, differential pinions and thrust washers, lubricating all parts with differential lubricant. Install the differential pinion shaft, drive in the pinion shaft lock pin and peen enough case metal over the top of the pin to lock it in place.

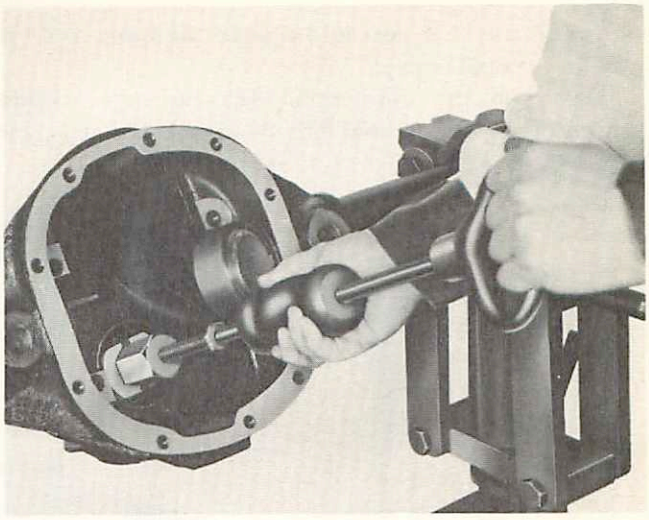

Figure 46—Removing the Rear Bearing Cup

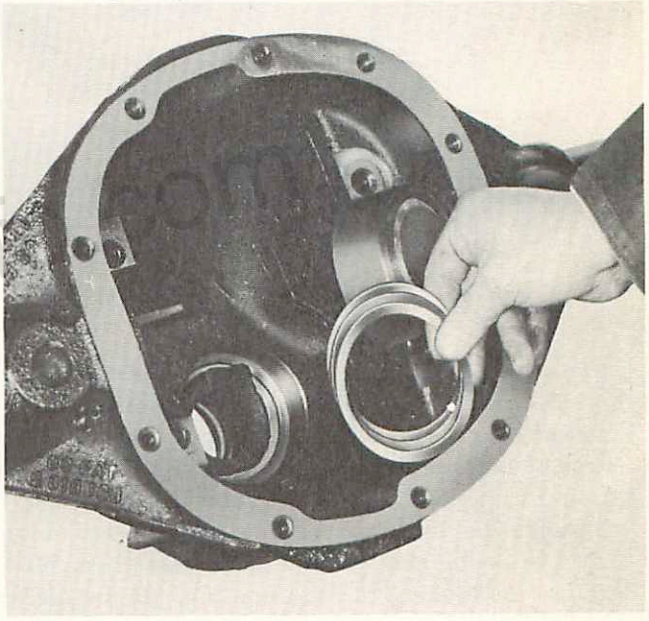

Figure 47—Remove the Adjusting Shim Pack

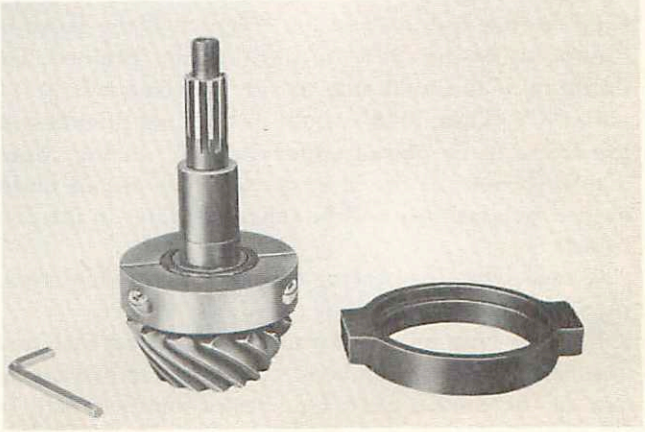

Figure 48—Pinion Rear Bearing Replacer Installed

Install the ring gear and tighten the bolts to 45 to 65 foot pounds torque.

Drive on the differential side bearings without shims, using Differential Side Bearing Installer J-3248 and Driver Handle J-872-5. See figure 49.

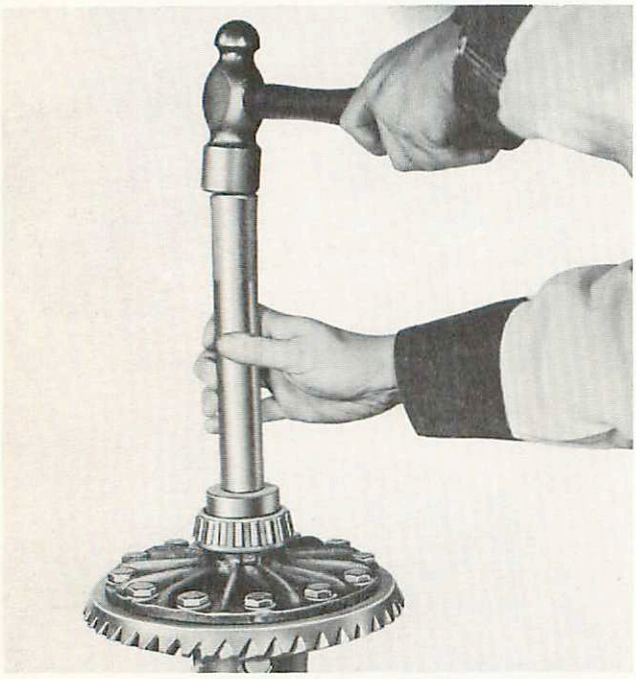

Figure 49—Driving On the Side Bearing

Place the bearing cups on the roller assemblies and then place the carrier assembly in the housing. Install the bearing caps in their correct positions with the letters or numbers on the caps matching those on the housing flange and tighten the bolts finger-tight.

Mount a dial indicator with the contact stem on the back face of the ring gear. With a screwdriver blade between the bearing cup and housing, pry the carrier assembly as far as possible to one side of the housing. See figure 50. Set the dial indicator at "0." Pry the carrier assembly as far as possible to the opposite side of the housing and make a note of the indicator reading. To this reading add .007″ which is the mean or mid-point of the .005″ to .009″ initial preload. For example, if the total side to side movement is .068″, add .007″. Thus, .075″ would be the total thickness of the shims to be placed under the side bearing cones. The thickness of the shim pack to be placed under each cone assembly will be calculated later in the procedure.

Remove the side bearing caps and the carrier assembly from the housing.

If a new ring gear and pinion set is being installed, note the figures or numbers etched or stamped on the face of the pinion gear. One set of numbers will be found on both the end of the pinion and on the ring gear which identifies these parts as being a matched

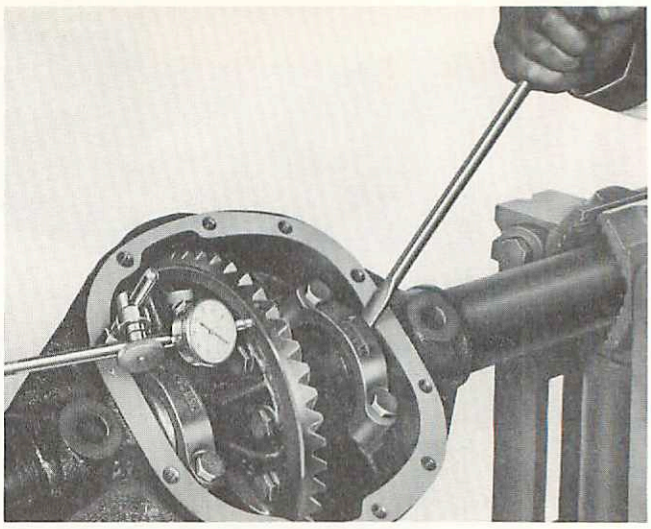

Figure 50—Checking Total Side Movement

set. Other figures are for manufacturing purposes only. Another number will be one with a "+" or "−" before it or, if not a "+" or "−", the number will be "0". See figure 51. This figure indicates the variation from the nominal distance between the front of the

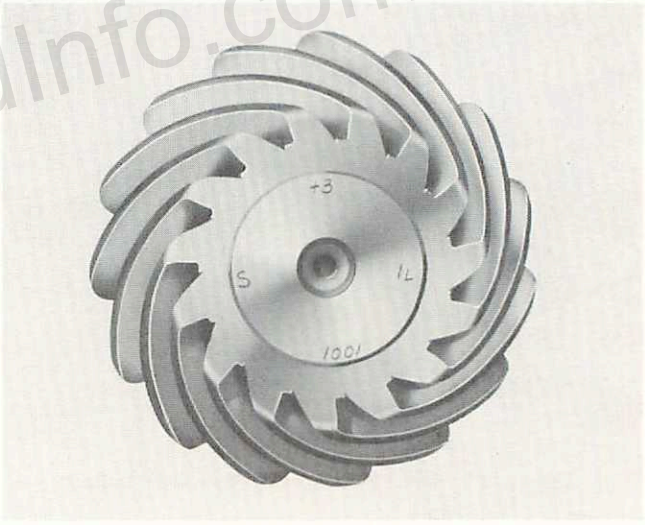

Figure 51—Note the Pinion Markings

pinion and the center line of the carrier. This number must be positively identified before continuing with the assembly procedure. For example, if a pinion marked +2 was originally installed with a shim pack measuring .035″ thick and the new pinion is marked −1, the shim pack should be increased .003″ to bring the new pinion to its correct position. The new shim pack should therefore be .038″ thick. Shims are available in thicknesses of .003″, .005″ and .010″.

Press a new rear pinion bearing cone assembly on the shaft using the Replacer J-6369 and Holder J-6395. See figure 52.

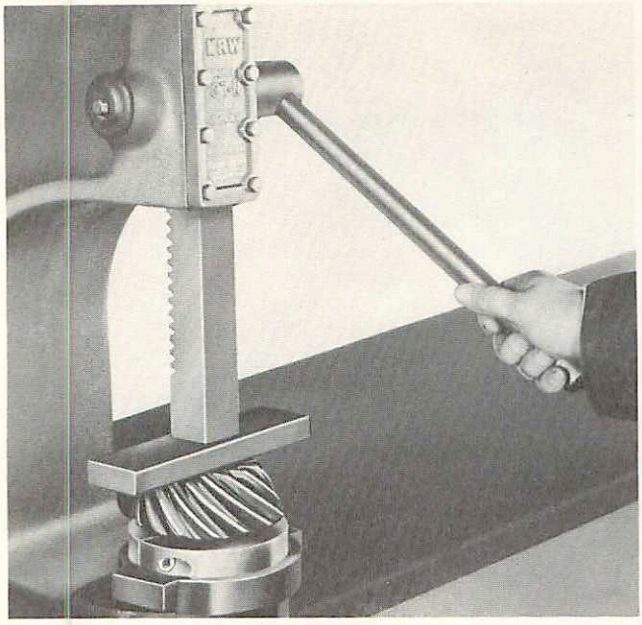

Figure 52—Installing Pinion Rear Bearing

Install the pinion rear bearing cup in the housing, using Pinion Bearing Cup Installer J-3234 and Driver Handle J-872-5, placing shims between the cup and housing. See figure 53. The thickness of the shim pack is determined by the shims removed during disassembly and the etched marking on the end of the pinion.

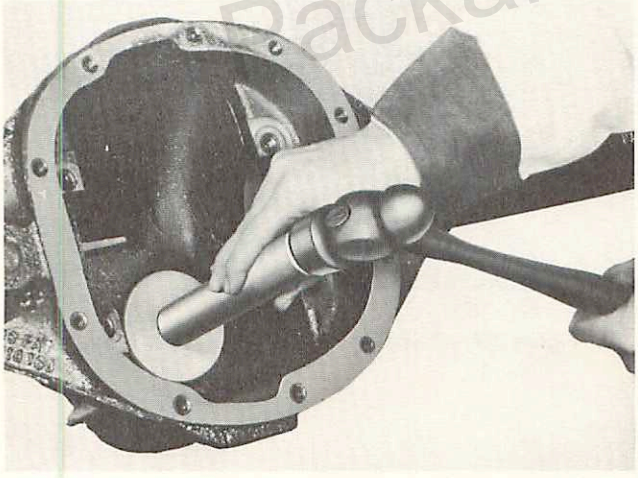

Figure 53—Installing Pinion Rear Bearing Cup

Install the pinion front bearing cup using Pinion Bearing Cup Installer J-6368 and Handle J-872-5. See figure 54. Place the pinion in the housing.

Place the discs J-6381-1 of the Pinion Setting Gauge J-6381 on the gauge arbor and install the discs and arbor in the differential bearing bores of the axle housing. Install the bearing caps and tighten the cap screws. Place the gauge block on the pinion, holding the block against the pinion with the clamp bar and screw. See figure 55.

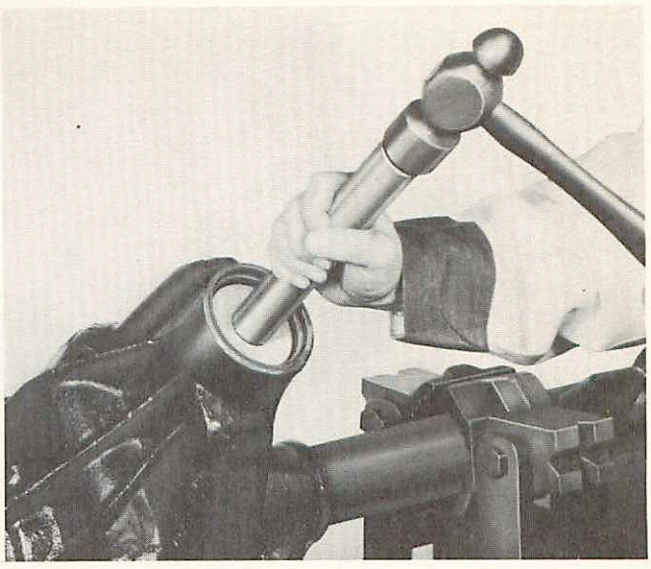

Figure 54—Installing Pinion Front Bearing Cup

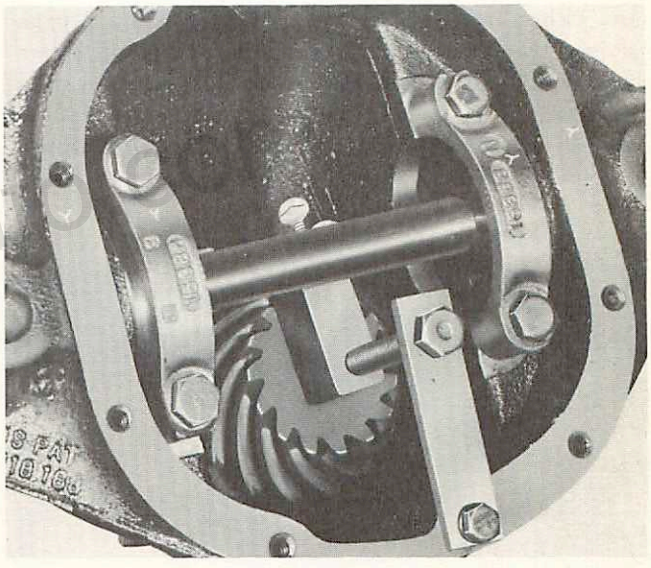

Figure 55—Pinion Setting Gauge Installed

With the gauge block in position, loosen the thumb screw in the end of the gauge block and move the plunger out of the block until the plunger head contacts the gauge arbor. Lock the plunger by tightening the thumb screw, using care not to disturb the plunger position.

Back off the clamp screw holding the gauge block and remove the block. Using a two to three inch micrometer, measure the distance from the end of the anvil to the top of the plunger head as shown in figure 56. This measurement represents the distance from the rear face of the pinion to the center line of the rear axle. This measurement should be 2.625″ for models 5640 and 5660 and should be 2.688″ for models 5680.

If the micrometer reading shows that the pinions setting is incorrect (more than .002″ plus or minus

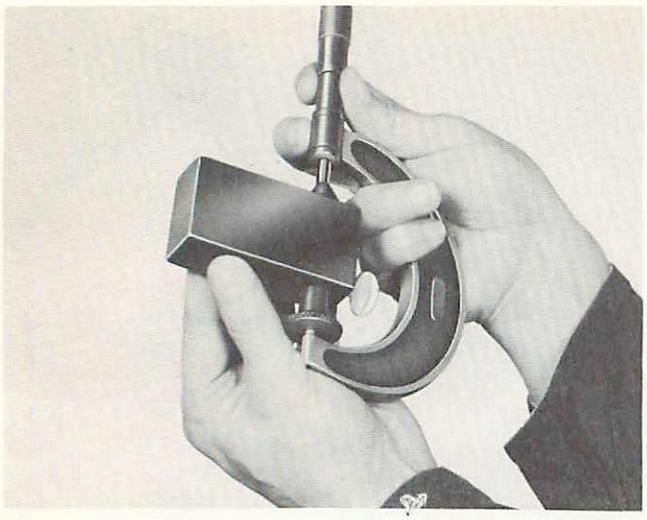

Figure 56—Measure the Gauge Block Setting

than the figures given) shims equalling the difference must either be added or taken from the shim pack between the rear bearing cup and the housing. When changing the shim pack thickness, measure each shim separately.

Install the shims which originally had been removed from the front of the shaft. See figure 57.

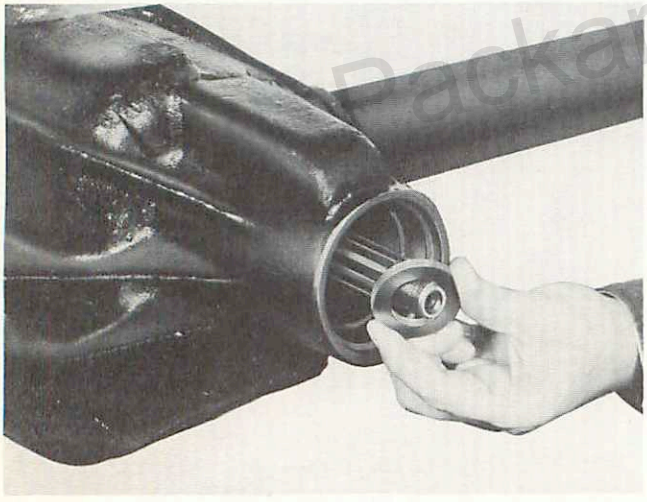

Figure 57—Install the Adjusting Shim Pack

Press on the front bearing cone and roller assembly using Flange and Pinion Bearing Pusher J-2204B. See figure 58.

Press on the universal joint flange using details of J-2204B. See figure 59.

Install the flange retaining nut and washer and tighten the nut to 200 to 220 foot-pounds torque.

Using a spring scale with Holding Tool J-6371, check the torque required to turn the pinion. See figure 60. The starting torque should be disregarded and the turning torque should be from 10 to 20 inch-

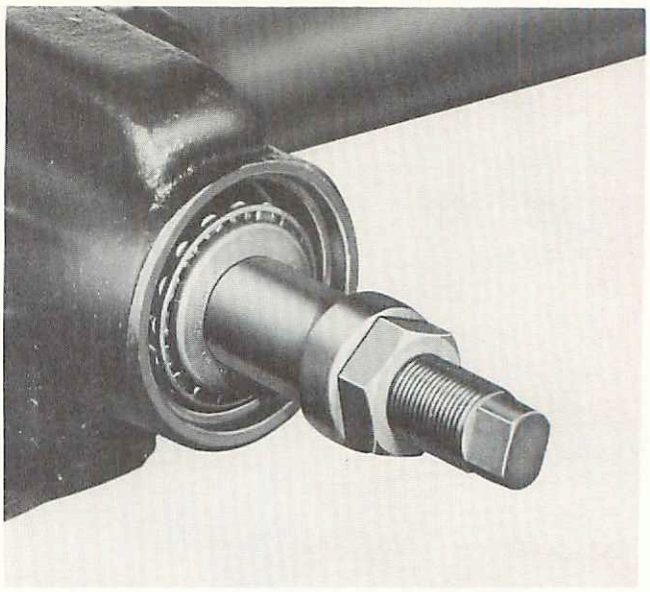

Figure 58—Install the Pinion Front Bearing

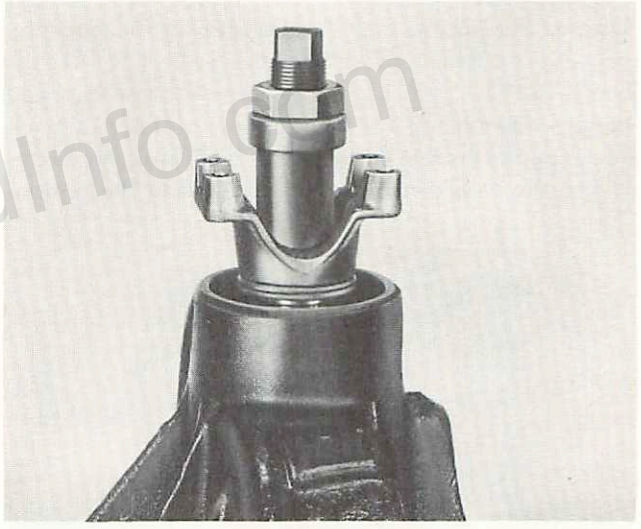

Figure 59—Press On the Universal Joint Flange

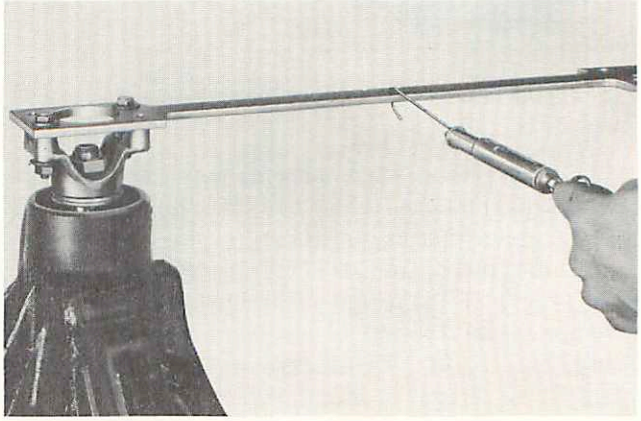

Figure 60—Check the Turning Torque

pounds. If more or less, shims should be added or taken from the front shim pack. Shims in thicknesses of .003″, .005″, .010″ and .030″ are available.

When the proper torque is obtained, remove the flange retaining nut and washer and pull off the flange.

Install the oil slinger and the seal gasket and then install a new seal using Pinion Oil Seal Installer J-6380. See figure 61.

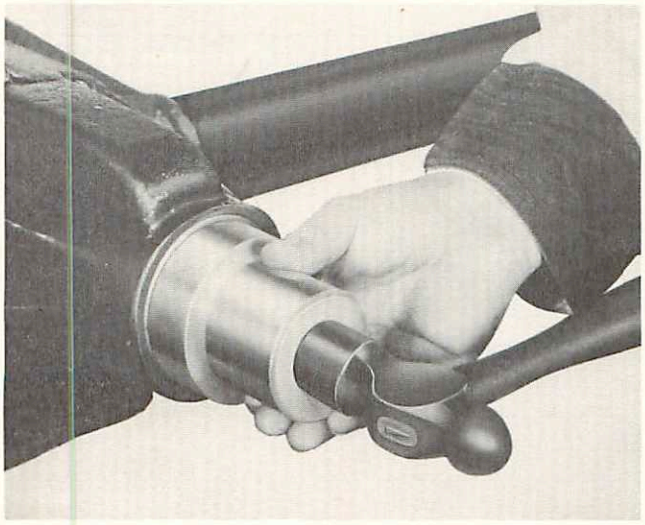

Figure 61—Installing Pinion Oil Seal

Install the flange and the washer and retaining nut and tighten the retaining nut to 200 to 220 foot-pounds torque.

Place the carrier assembly, side bearing cups included, in the axle housing. Place the bearing caps in their proper positions and tighten the bolts finger-tight.

Set up a dial indicator with the contact stem on the back of the ring gear. With a screwdriver pry the differential case and ring gear against the pinion and set the indicator at "0". Pry the case and ring gear away from the pinion and note the indicator reading. From this reading subtract .004″ (which is between the backlash limits of .003″ and .006″) for gear clearance. This figure determines the thickness of the shim pack to be used on the ring gear side of the carrier. The balance of the shims will be placed on the opposite side of the carrier. For example, if the indicator reading was .036″ when the ring gear was moved away from the pinion and .004″ is deducted, thickness of the shim pack to be placed behind the side bearing cone on the ring gear side of the carrier would be .032″. Subtract .032″ from the total side to side clearance previously checked to determine the thickness of the shim pack to be placed behind the bearing cone on the side opposite the ring gear. To use the example previously cited, if the total side to side clearance measured .075″ the thickness of the shim pack on the ring gear side would be .032″ and thickness of the shim pack opposite the ring gear would be .043″.

Remove the side bearing caps and then remove the carrier assembly along with the side bearing cups. Remove the side bearings, install shims as indicated in the previous paragraph and then reinstall the bearings.

Install the Spreader J-5231 on the housing and spread the housing (not over .020″) to permit installing the carrier assembly in the housing. Install the side bearing caps matching the marks on the caps with those on the housing flange. Remove the spreader. Coat the threads of the cap retaining bolts with sealing compound and tighten the retaining bolts to 70 to 90 foot-pounds torque.

Set up the dial indicator with the contact stem on a tooth of the ring gear and check the backlash between the ring gear and pinion. See figure 62. Check the

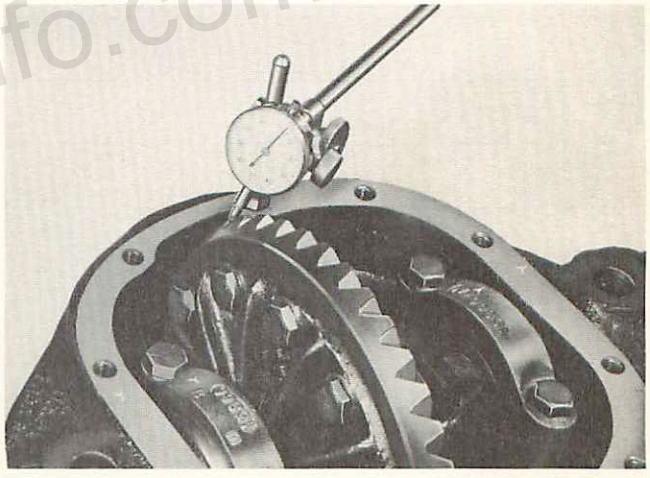

Figure 62—Checking Ring Gear Backlash

backlash at four equally spaced points around the ring gear. Backlash should be held between .003″ and .006″ and should not vary more than .002″ between the positions checked.

Install a new gasket and the differential cover with the gear identification tag beneath one of the cap screws. Torque the cap screws to 15 to 25 foot-pounds.

NOTES