

SERVICE MANUAL

SECTION XV REAR AXLE



Packard Motor Car Company
Detroit 32, Michigan

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SECTION XV

REAR AXLE

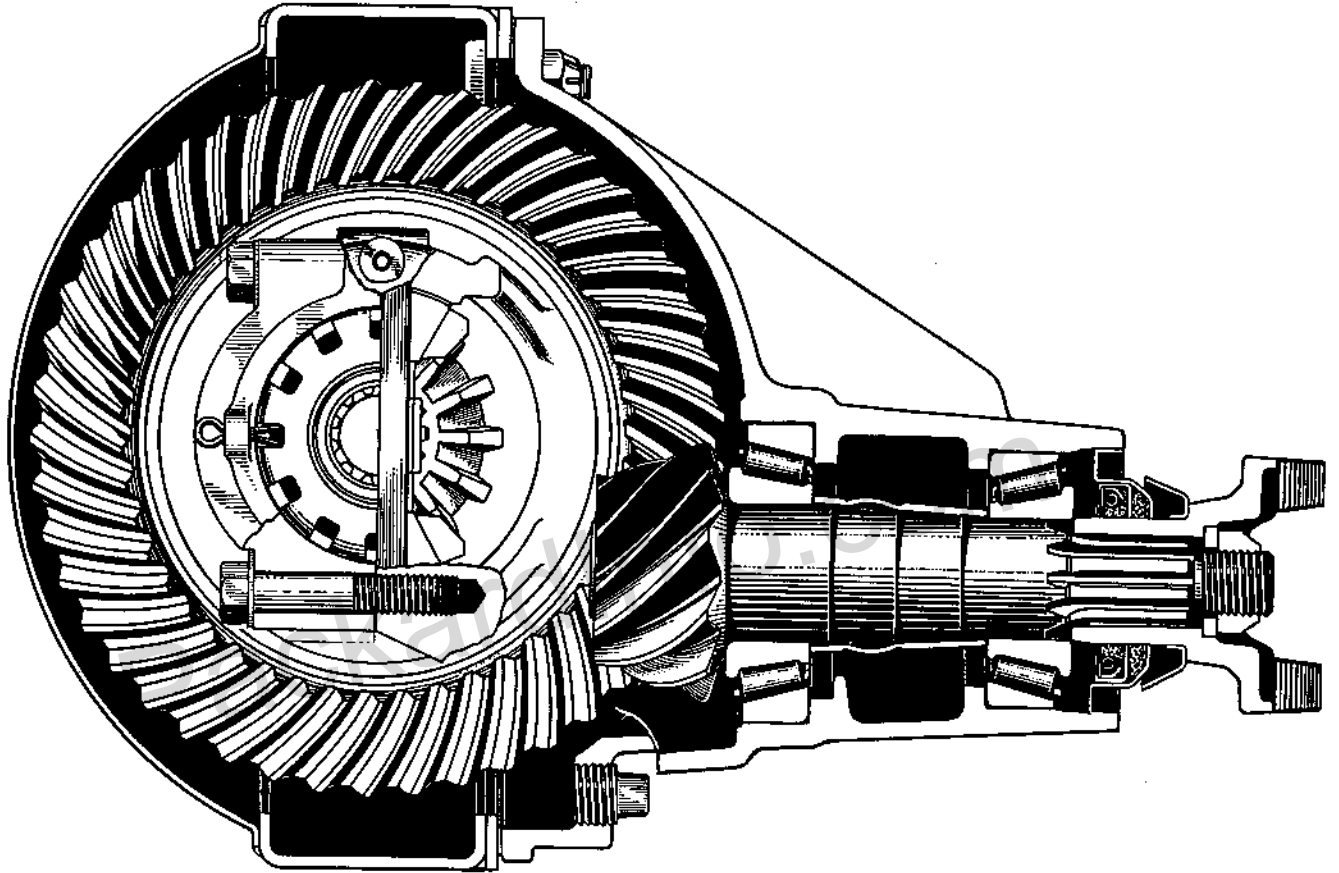


Figure 1—Cross Section of the Rear Axle

Description

The Packard rear axle is a hypoid semi-floating type. The pinion shaft and differential case are carried in tapered roller bearings. The new rear axle housing has been redesigned to accommodate the new, wider spring brackets. Axle ratios are stamped on the bottom of the carrier flange.

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 axle shafts are supported on tapered roller bearings pressed on the axle shafts. The axle shaft bearing end play is adjustable by means of shims.

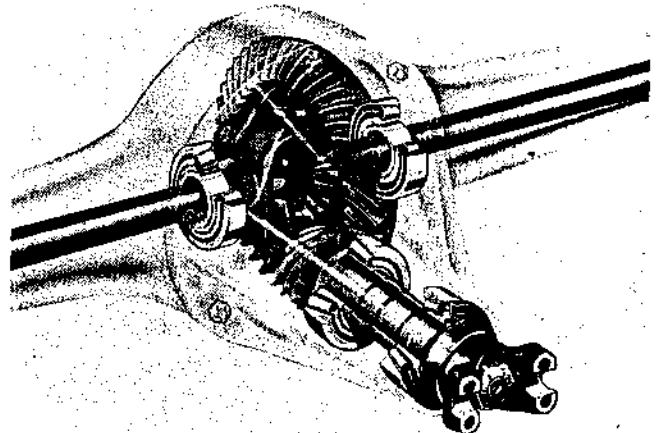


Figure 2—The Pinion Shaft and Differential Case are Carried on Tapered Roller Bearings

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DISASSEMBLY

Axle Shaft Removal

Raise the rear end of the car using a floor jack, and place a stand under each side of the frame near the rear spring front bolt and hanger. Allow the rear axle case (housing) to lower until the tires almost touch the floor. Remove the rear wheel shrouds. Remove the rear wheel from the hub and drum. Raise the rear axle case and place stands under the case near the outer ends.

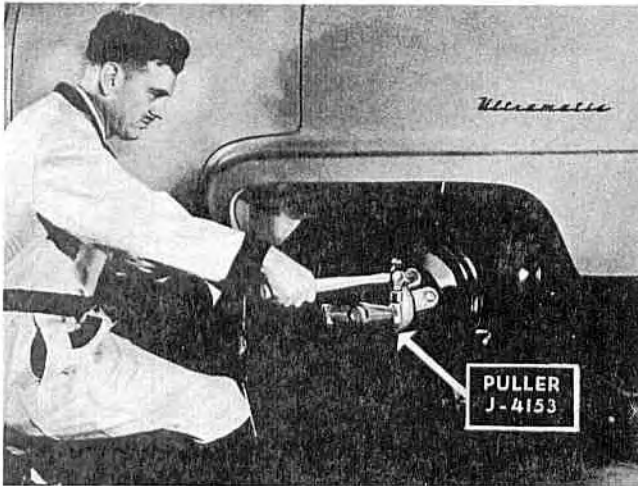


Figure 3—Removing the Rear Wheel Hub

Remove the axle shaft cotter pin, nut, and washer. Remove the hub and drum assembly, using puller J-4153. Do not use a knock-out type of wheel puller. Remove the other wheel, hub, and drum in the same manner.

Disconnect the hydraulic brake line from the brake wheel cylinder. Remove the brake support attaching nuts and lock washers. Remove the seal guard, gasket, retainer, oil seal, brake support, and axle shaft bearing adjusting shims.

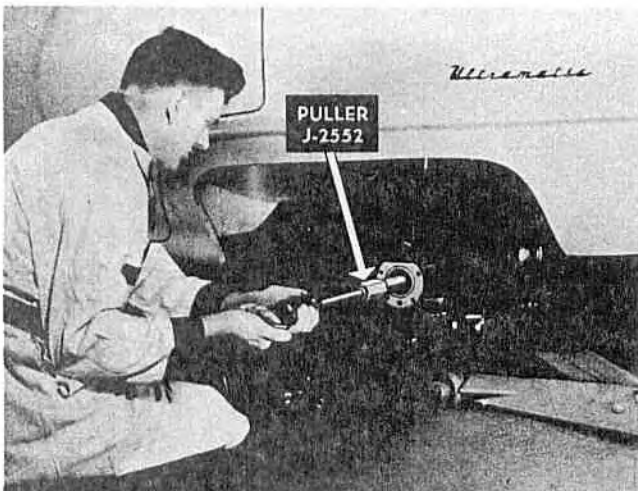


Figure 4—Removing the Rear Axle

Remove the axle shaft and bearing, using puller J-2552. The other axle shaft may be removed in the same manner.

Caution: Be careful that the axle shaft splines do not damage the inner seal as it is removed. Do not allow the axle shaft to remain partially removed, as the weight of the axle will damage the inner seal.

If the inner seal is leaking, worn, or damaged, it may be removed using puller J-943-B.

Carrier Removal

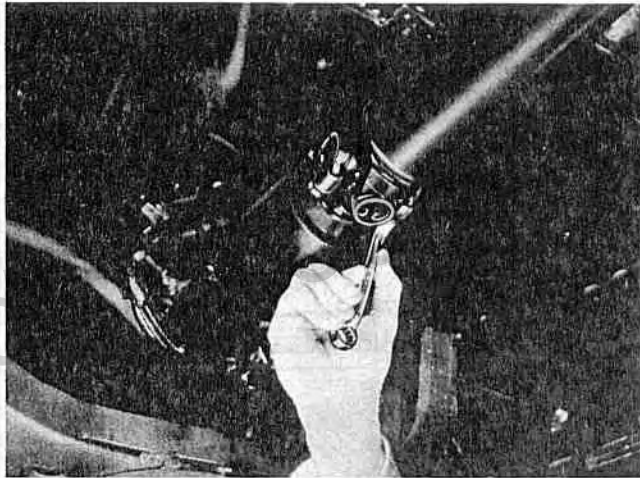


Figure 5—Disconnecting the Propeller Shaft

Disconnect the propeller shaft at the rear universal joint by removing the screw and lock plates. Wire the two free bearings of the universal joint together so they will not fall off when the joint is disconnected from the flange. On Ultramatic Drive equipped cars, the universal joint is disconnected by removing the bearings and cross from the yoke on the differential pinion shaft.

Prop the propeller shaft up against the floor with a block of wood under it at the frame "X" member. This will keep the propeller shaft out of the way. Remove the drain plug and drain the lubricant in a clean container. Install the drain plug after the lubricant has drained.

Clean the carrier and rear axle case around the area of the carrier gasket, to prevent dirt from falling in when the carrier is removed. Remove the carrier attaching nuts.

Remove the carrier from the rear axle case. Remove the gasket. The rear axle case may be removed, if necessary, by removing the brake lines from the case and

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removing the spring "U" bolts and nuts. Clean the interior of the carrier with a clean solvent before disassembly. *Do not* clean the outside of the carrier until after disassembly.

Carrier Disassembly

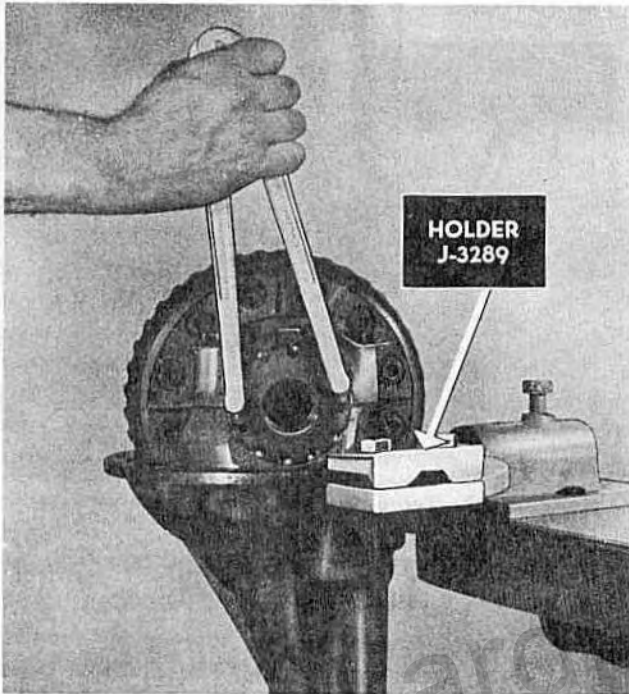


Figure 6—Carrier Supported in Holder J-3289

Place the differential carrier in a differential carrier holder J-3289, or securely clamp the carrier mounting flange in a soft jawed vise. If broken teeth are found or if there is any evidence of chips or particles going through the teeth, use a dial indicator against the back side of the ring gear to measure the run-out of the differential case before disassembly. Install a new differential case if the run-out exceeds the limits.

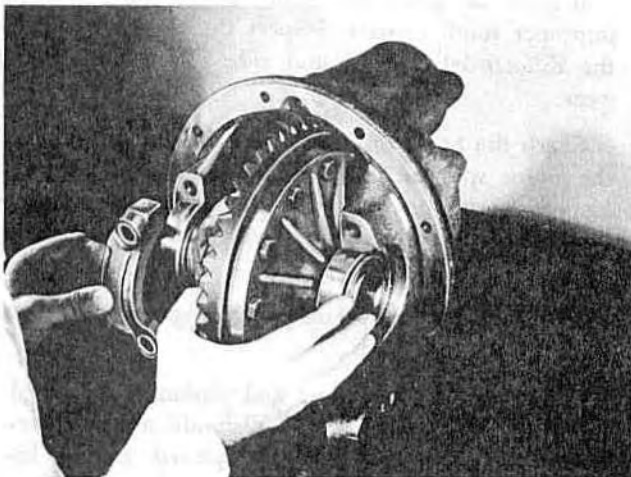


Figure 7—Lifting Off the Differential Case, Bearings, and Caps

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

Remove the carrier bearing cap screws. Hold the ring gear and differential case in place with one hand, and tap the bearing caps loose by eight sharp blows with a hammer. Lift off the differential case, bearings, bearing cups, adjusting nuts, and caps as shown in figure 7. The bearing cap, bearing cup, and adjusting nut may be kept together until assembly. This will assist the serviceman in obtaining the approximate side-bearing adjustment during assembly.

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

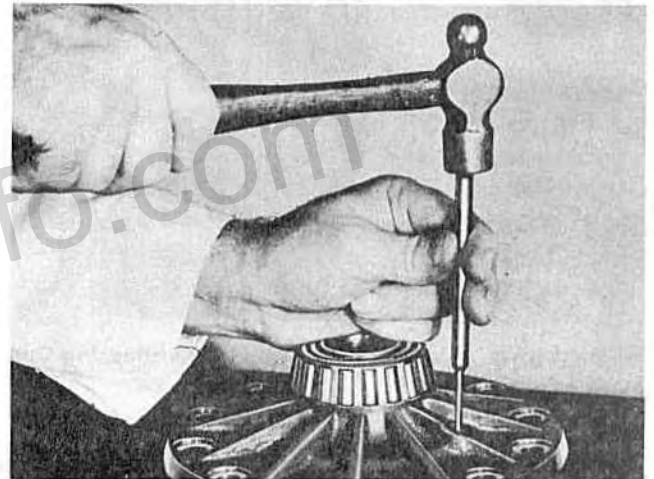


Figure 8—Driving Out the Pinion Shaft Lockpin

Drive out the differential pinion shaft lock pin, using a pin punch and hammer. Drive out the pinion shaft.

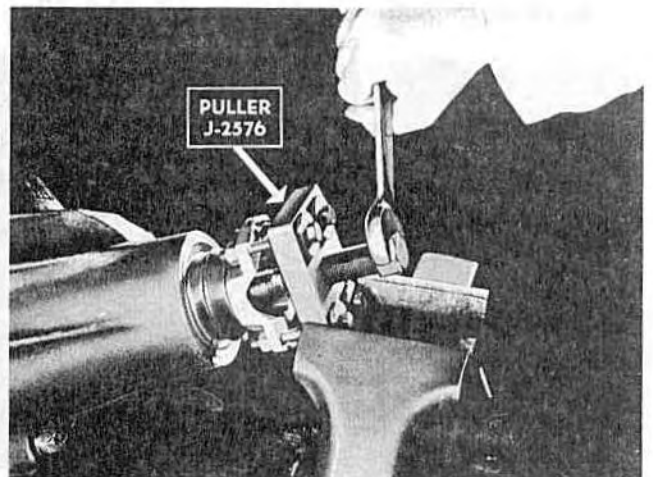


Figure 9—Removing the Differential Universal Joint Flange

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Remove the differential pinions, pinion thrust washers, axle shaft thrust block, and spacers, differential side gears and thrust washers. The differential side bearings may be removed if necessary, using puller J-3250.

Remove the universal joint flange nut using socket wrench J-2571-A while holding the flange from turning, using flange holding tool J-2659. On Ultramatic Drive equipped cars, remove the flange using puller J-2576. The universal joint yoke may be held by using a large, adjustable wrench. The yoke may be pulled from the pinion shaft using puller J-3250.

Drive out the pinion, sleeve, and rear bearing using a

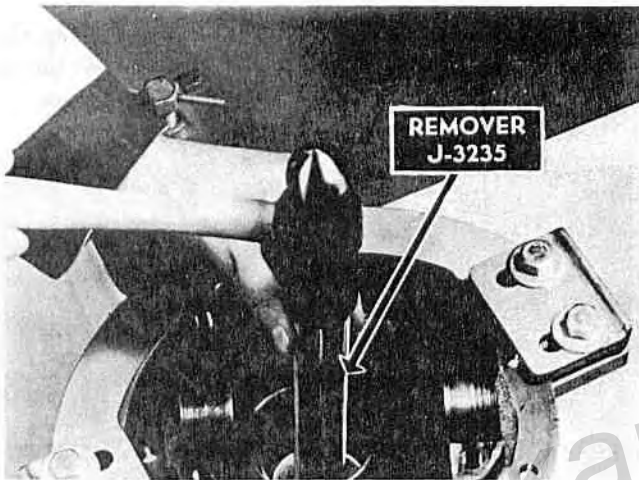


Figure 10—Removing the Pinion Front Bearing Cup

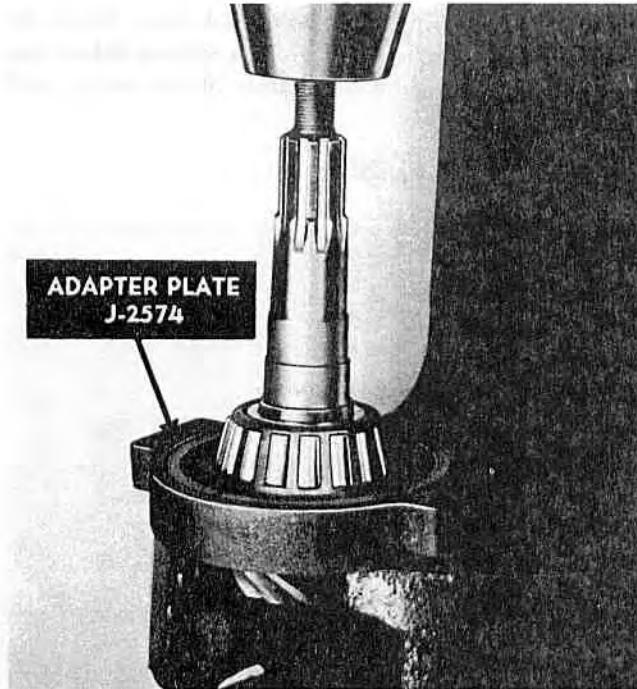


Figure 11—Removing the Pinion Rear Bearing

soft hammer. Drive out the pinion oil seal and front bearing using a soft driver.

Remove the pinion bearing cups using removers J-3235 (rear) and J-2644 (front). The pinion rear bearing may be removed by using a press and adapter plate, J-2574.

CLEANING AND INSPECTION

Clean all the differential parts by washing them in clean, unleaded gasoline, kerosene, or carbon tetrachloride. Dry all parts with clean, compressed air.

Caution: Do not let the bearings spin while dry-



Figure 12—Checking the Fit of the Differential Case Side Bearings

ing them. Spinning may cause dry bearings to score. Clean the outside of the carrier in a separate cleaner.

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.

Check the fit of the universal joint flange splines on the pinion splines. They should have a snug sliding fit. Inspect the pinion shaft threads, and, if damaged, the threads should be cleaned up with a die and a new nut used on reassembly.

If the parts do not come up to inspection standards, replace with new parts.

Caution: The ring gear and pinion is furnished as a matched set only. They should not be interchanged, nor just one gear replaced. Always install a new set, because they are run-in on lapping machines as a matched set.

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Inspect the condition of all bearings and cups for scores, flat spots, chipped, fractured, or worn surfaces. Check the fit of the differential side bearings on the differential case. Check the fit of the axle shaft bearings on the axle shaft. The bearings should have a snug drive fit. If the bearing inner race fits loosely on the shaft, install a new bearing. If a new bearing fits loosely on the shaft or case, a new shaft or case should be installed. If the bearings and cups do not come up to inspection standards, install new bearings and cups. Always use a new cup with a new bearing.

Inspect the condition of the carrier mounting flange. Be sure there are no nicks or burrs on the flange surface. Dress the surface with a clean mill file if necessary to provide a smooth contact surface against the gasket. Inspect the condition of the differential case thrust surfaces for excessive wear and scores. Inspect the ring gear mounting flange. All nicks, burrs, and foreign matter should be removed.

Always use new oil seals, gaskets, locks, and pinion shaft sleeves on reassembly.

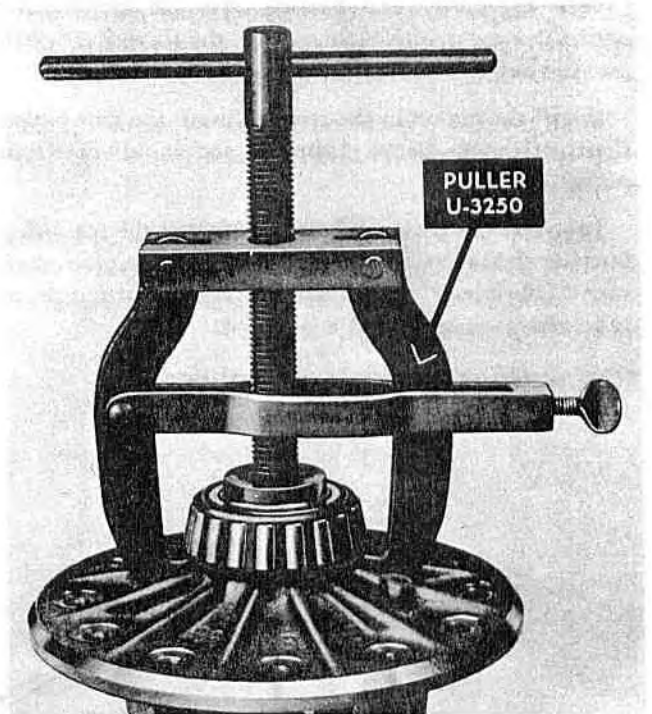


Figure 13—Removing the Differential Side Bearing

ASSEMBLY

After all the differential parts are cleaned, inspected, and new parts obtained, the carrier may be assembled.

Pinion Installation

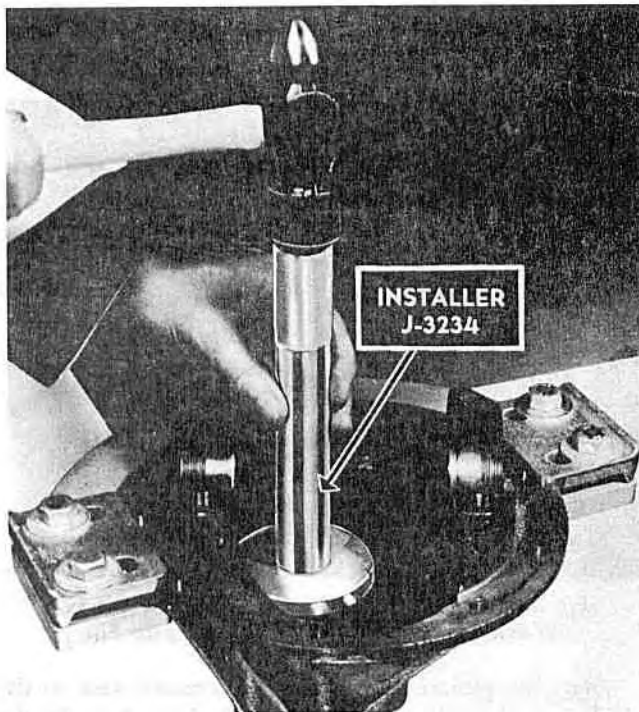


Figure 14—Installing the Pinion Rear Bearing Cup



Figure 15—Installing the Pinion Front Bearing Cup

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Press the pinion rear bearing onto the pinion shaft until the inner race is tight against the shoulder. Lubricate the bearing with clean engine oil.

Install the pinion in the carrier. Install the new pinion shaft collapsible sleeve. Lubricate and install the front pinion bearing.

Lubricate the pinion oil seal and install the seal using installer J-3244. Coat the splines of the pinion shaft with "Lubriplate." Install the universal joint flange, or yoke, flange washer, and a new nut.

Pinion Bearing Preload Adjustment

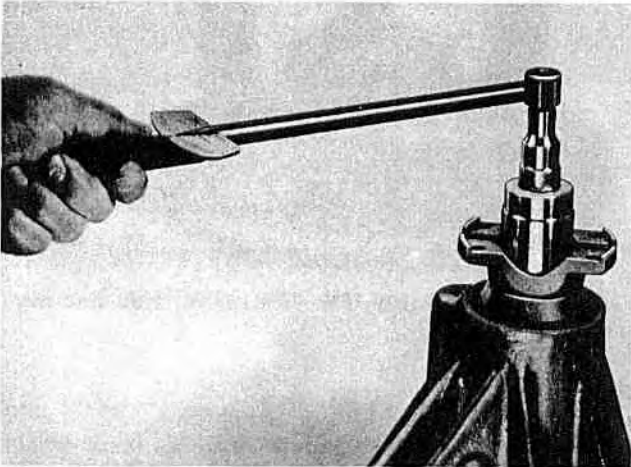


Figure 16—Checking the Pinion Bearing Preload

Tighten the universal joint flange nut finger tight. Using preload indicating wrench and adapter J-2571-B and socket J-2571-A, notice the amount of torque required to rotate the pinion. This indicates the amount of drag caused by the pinion oil seal.

Using the flange holding tool J-2659 and socket and wrench J-2571-A, tighten the universal joint flange nut until the correct bearing preload is obtained. When the pinion bearing preload is correct, the amount of torque reading on the preload indicating wrench will read $2\frac{1}{2}$ to 3 foot-pounds *plus* the amount of torque that was required to overcome the oil seal drag. (For example, if the oil seal drag was 2 foot-pounds, the reading on the indicating wrench should be $4\frac{1}{2}$ to 5 foot-pounds.)

If the old pinion bearing sleeve is re-used, all that is necessary is to tighten the flange nut until the correct torque reading is obtained. If a new pinion bearing sleeve has been installed, it will be necessary to collapse the sleeve to obtain the correct bearing preload. This is accomplished by tightening the flange nut until the torque required to tighten the nut suddenly drops. Then tighten the nut until correct preload is obtained.

Differential Assembly

Install the differential side bearings using differential

side bearing installer J-3248. Install the differential side gear thrust washers on the hubs of the side gears. Stick them in place with clean cup grease. Install the differential side gears and thrust washers in the case.



Figure 17—Installing the Differential Side Bearing

Coat the cupped side of the differential pinion thrust washers with clean 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 bore in the pinions lines up with the pin bore in the differential case.

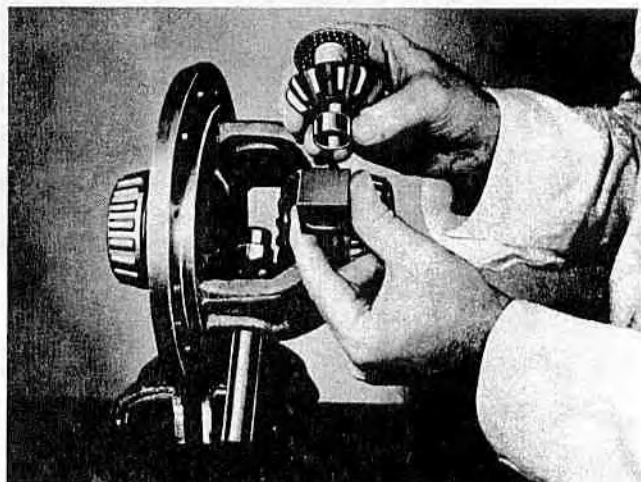


Figure 18—Installing the Differential Pinions, Washers, Spacers, Thrust Block, and Pin

Start the pinion pin into the differential case so the lockpin hole will align with the lockpin hole in the case. As the pinion pin is pushed into the case, install

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one thrust block spacer. Then install the thrust block so the elongation of the hole will be toward the side gears. Install the other thrust block spacer, and push the pinion pin all the way in until the lockpin hole registers with the lockpin hole in the case.



Figure 19—Measuring the End Play of the Differential Side Gears

Measure the end play of each side gear using a feeler gauge. The end play should be .002 inch to .005 inch. If the end play is not within these limits, it will be necessary to remove the side gear thrust washers and replace them with thrust washers of the correct thickness. The side gear thrust washers are available in .031 inch, .036 inch, .041 inch, and .046 inch thicknesses. When proper end play is obtained and the pinion pin is installed, drive in the lockpin and stake the edge of the lockpin hole in the case.

Ring Gear Installation

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 differential case flange are free from dirt and burrs. Install the ring gear attaching cap screws

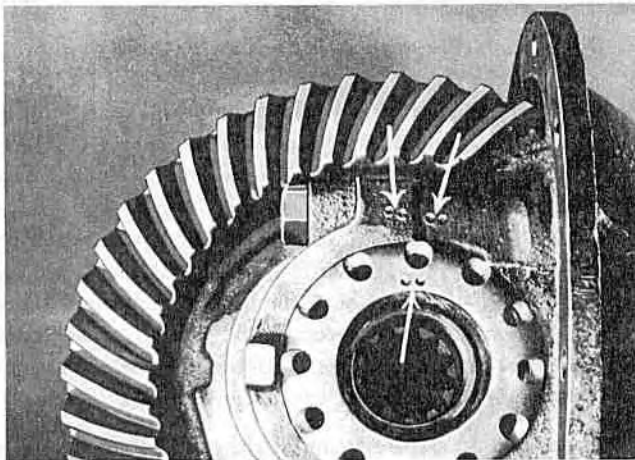


Figure 20—The Differential Bearing Caps and Adjusting Nuts in Proper Position

and tighten evenly. Torque tighten to 50 to 55 foot-pounds.

Carrier Assembly

Lubricate the differential side bearings with engine oil. Place the outer bearing cups, bearing caps, and adjusting nuts over their respective differential side bearings. Be sure the punch-marked nuts are in their proper position as to left and right, and in relation to the punch-marked caps as shown in figure 20.

Install the differential assembly into the carrier. Install the carrier cap attaching cap screws and lock plates. Tighten the cap screws tight enough to hold the bearing adjusting nuts in the threads, but still permit them to be turned so the bearing preload may be adjusted.

Measure the ring gear run-out, using a dial indicator. The run-out must not exceed .004 inch. If the run-out is excessive, disassemble and inspect for burrs, chips, or dirt between the ring gear and differential case flange.

Differential Side Bearing Preload

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

Remove the adjusting nut locking cotter pins. Back off both side bearing adjusting nuts to obtain a slight end play in the differential bearings. Tighten the left adjusting nut until approximately .005 inch backlash is obtained between the ring gear and pinion gear teeth.

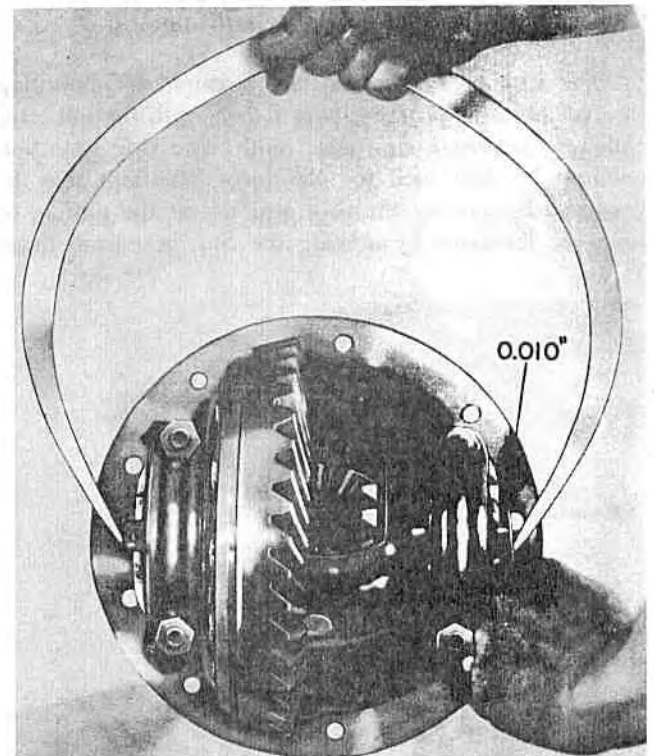


Figure 21—Measuring the Differential Side Bearing Preload

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Tighten the right adjusting nut until the side bearing end play is just taken up.

Using a large outside caliper and a .010 inch feeler gauge, measure the distance from the machined boss of one side bearing cap to the boss of the other cap. Set the caliper with the .010 feeler gauge being held between one boss and the caliper jaw. See figure 21. Lock the caliper in this position.

Remove the feeler gauge and tighten the right side bearing adjusting nut until the caliper jaws will just contact both cap bosses without the feeler gauge.

Ring Gear Lash Adjustment

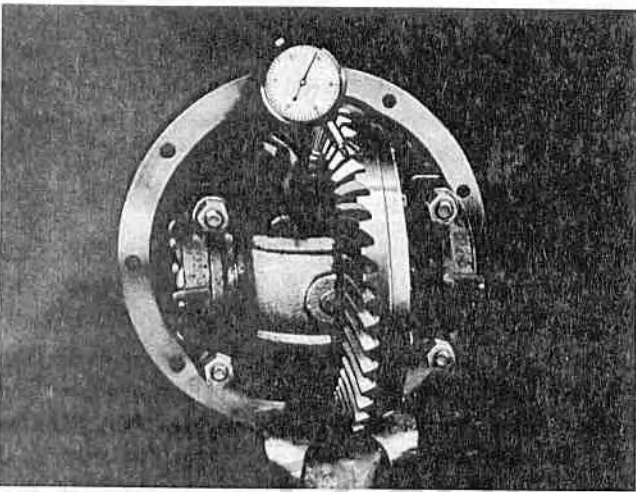


Figure 22—Measuring the Ring Gear to Pinion Backlash with an Indicator

The ring gear lash may be measured by mounting a dial indicator on the carrier flange, with the indicator plunger against a ring gear tooth. The ring gear lash should be .004 inch to .006 inch. The lash may be reduced by moving the ring gear nearer the pinion, or may be increased by moving the ring gear away from

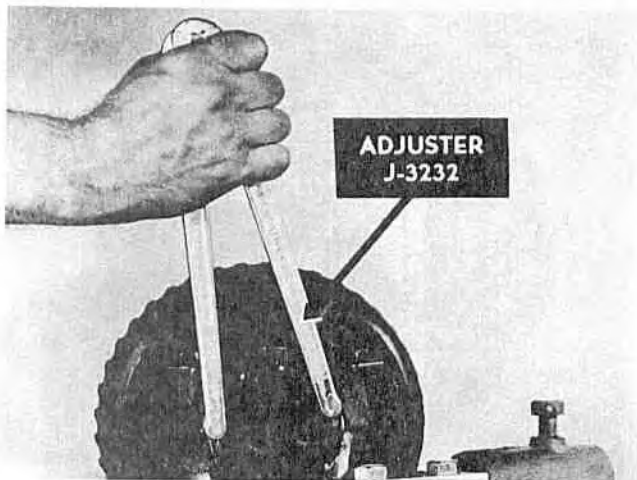


Figure 23—Adjusting the Differential Side Bearings

the pinion. Movement of the ring gear may be 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 the differential side bearing adjuster J-3232.

Note: Tightening one adjusting nut one notch and loosening the other one notch will change the backlash approximately .004 inch.

Tighten the carrier cap bolts and bend over the lock plates. Install the bearing adjusting nut cotter pins.

Carrier Installation

Note: To avoid fracturing the thrust block during the axle shaft installation, with the resulting possibility of rear end failure, care must be exercised in positioning the thrust block so that the polished faces of the block are toward the outer ends of the rear axle case. Packing heavy grease around the thrust block will prevent it from turning while the carrier assembly is being installed.

Remove the old carrier to housing gasket, clean and inspect the housing gasket face for damage that would affect the proper sealing of the gasket.

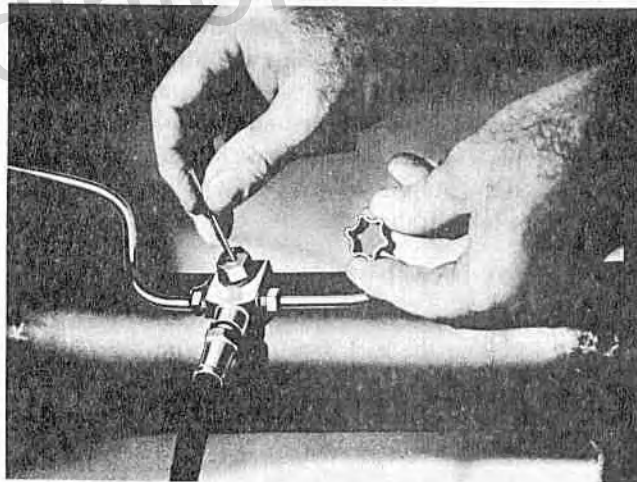


Figure 24—Cleaning the Vent in the Vent Screw

Clean the vent cap and the vent screw, which hold the brake tube junction to the axle housing at the left side of the housing. Many oil leaks at axle shafts and around differential pinion seals have been due to an excessive build-up of pressure in the housing caused by this vent being plugged with road dirt. Always remove the cap, and either remove the screw completely and clean, or work a wire through the drilled center hole in the vent screw while it is attached to the housing. See figure 24. Install the cap after cleaning.

Make certain before installing the carrier in the axle housing that the housing has been thoroughly cleaned internally, especially if the removed carrier has had

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gears or bearings that failed in operation and caused chips or grindings to settle in the housing. Remove all traces of cleaner and foreign matter with wiping cloths. Otherwise, a perfect reconditioning job or a new unit may be totally ruined due to the lack of sufficient attention to this cleaning operation.

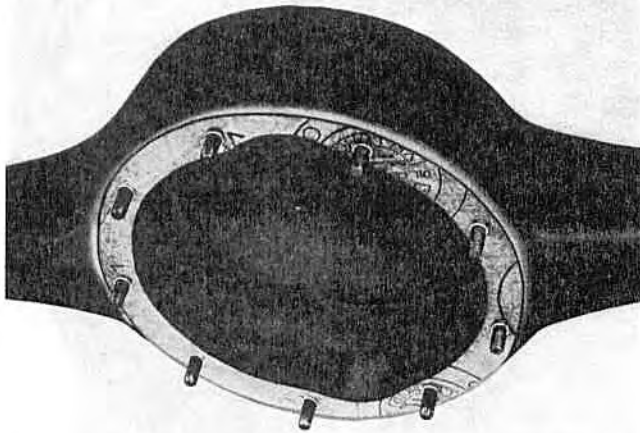


Figure 25—A New Carrier Gasket and Stud Gaskets in Place

Install a new carrier to housing gasket, and stud gaskets. Install the carrier in the rear axle housing. Be careful to avoid tearing or injuring the gasket with the ring gear or other protruding parts.



Figure 26—Torque Tighten the Carrier to Axle Housing Nuts

Install the carrier attaching nuts. Torque tighten to 35 to 40 foot-pounds. Do not use lock washers with self-locking nuts.

Remove the propeller shaft prop from the frame "X" member and remove the wire or tape from the rear universal joint bearings. Assemble the rear joint to the differential flange, using new lock plates under the screws. Tighten the screws and bend over the locking tabs.

Fill the differential with the proper amount (level with the bottom of the filler plug) of the recommended grade of hypoid lubricant and reinstall the filler plug.

Axle Shaft Installation

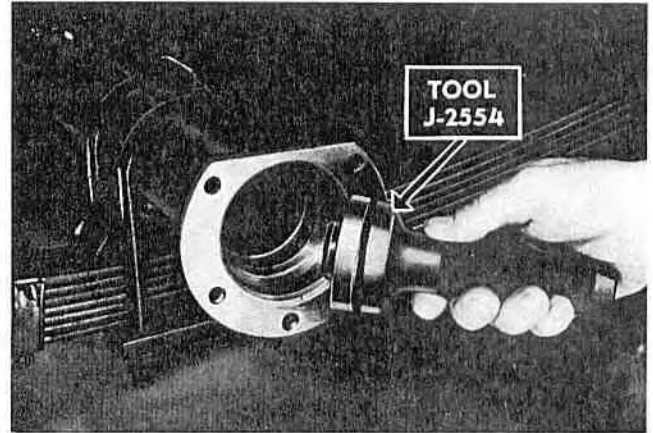


Figure 27—Installing the Axle Shaft Inner Oil Seal

Wipe the axle housing axle shaft bearing flange and the brake support plate free of road dirt to prevent any dirt from contacting the axle shaft bearing during installation. Install a new axle shaft inner oil seal using tool J-2554 by placing the seal on the pilot end of driver and driving it into position. See figure 27.

Pack the axle shaft bearing with 2 ounces of number 3 fibre grease. Work the grease thoroughly under the roller cage and around the rollers, performing the operation the same as on front wheel bearings. See figure 28. Do not apply the extra grease on the axle shaft or in the housing when installing the shaft.

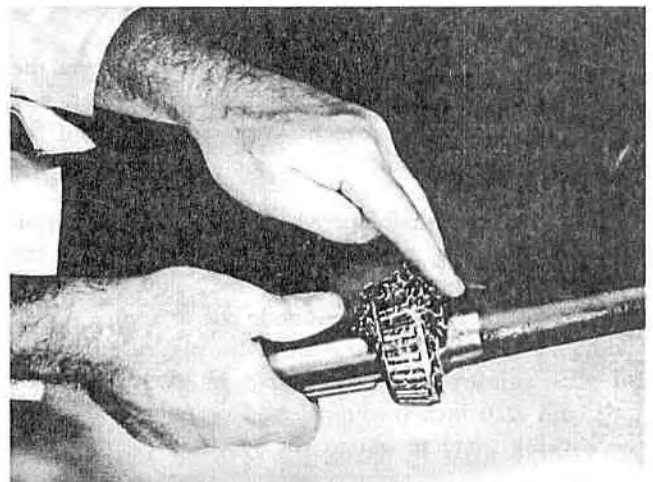


Figure 28—Packing the Axle Shaft Bearing with Grease

Install the axle shaft in the axle housing and mesh the end splines in the differential gear. Slide the shaft into place. Be careful not to drag the shaft across the oil seal during the axle installation.

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Install the axle shaft bearing cup and shims, having previously wiped the shims free of dirt. Make sure cup does not cock or wedge itself in the housing, or backing plate will become bent when tightened.

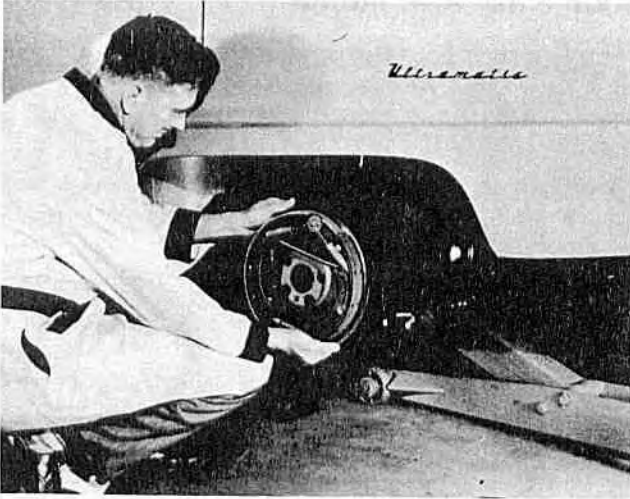


Figure 29—Installing the Brake Support Plate

Install the brake support plate, new oil seal retainer gasket, new oil seal, oil seal retainer, new seal guard gasket, and seal guard. Install the nuts and lock washers, and gradually snug up all nuts before final tightening. Torque tighten to 35 to 40 foot-pounds.

Due to the possibility of the axle shaft thrust block rotating out of proper position in the differential, make frequent checks during the support blade tightening by pulling the axle shaft in and out to see that the axle shaft has sufficient end play. Install the other axle shaft in the same manner.

Axle Shaft Adjustment

Attach the axle shaft remover J-2552 and bump the shaft back and forth several times to seat the shaft and bearings in place. Remove the remover and install the checking gauge J-2560.

With the axle shaft forced in toward the differential, turn the long adjusting screw to bear against the backing plate, and then pull the shaft outward. Check with the feeler gauge to determine the clearance, which should be .004 inch to .007 inch. See figure 30. Shims for this adjustment are available in .005 inch, .007 inch, and .020 inch thickness. Add or remove shims at the backing plate to obtain the specified clearance.

End play of less than .050 inch can be adjusted at one side only. Remove shims from both sides if end

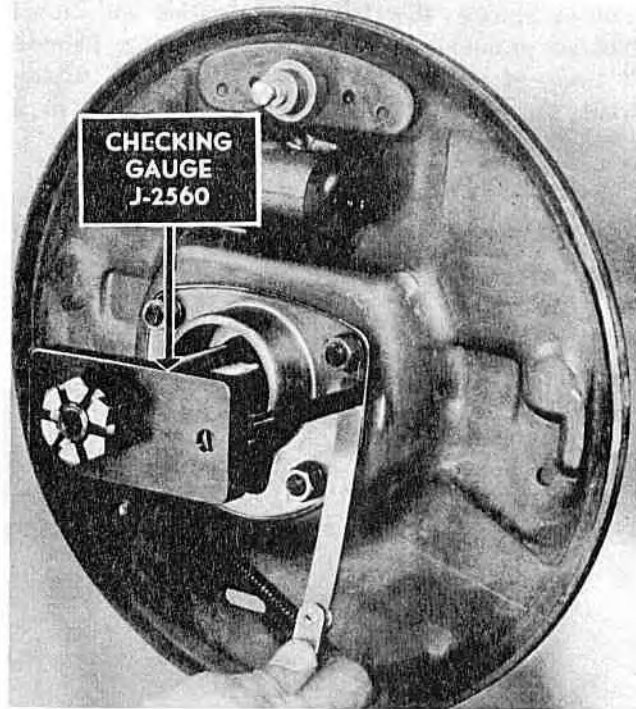


Figure 30—Checking the Axle Shaft End Play

play exceeds .050 inch in order to keep the thrust lock 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 brake drum and hub assemblies.

Install the axle shaft washers and nuts and torque tighten to 200 to 270 foot-pounds. Install and bend the cotter pin. Bleed both the rear brake cylinders and fill the master cylinder. Raise the rear axle and place the stands under the frame. Lower the rear axle and install the rear wheels, hub caps, and fender shrouds.

Raise the rear axle and remove the car from the stands. After completion of the road testing for differential performance, reinspect the differential for possible oil leaks and correct if necessary.

Rear Axle Lubricants

It is suggested that whenever a differential carrier is replaced or when a new ring gear and pinion are installed that a break-in oil be used. It is not necessary to drain the lubricant after the break-in period, and regular SAE 90 hypoid gear oil may be added to maintain the proper oil level. This lubricant is available in 2-quart cans under Packard part number 410707.

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TROUBLE SHOOTING AND CORRECTIVE MEASURES

CONDITION	POSSIBLE CAUSE	CORRECTION
1. Continuous hum. Does not change on pull or coast.	(a) Rough tire tread.	(a) Inspect the tires carefully. Install new tires if necessary.
	(b) Insufficient lubricant in the rear axle case.	(b) Check the lubricant level. Add necessary lubricant.
	(c) Improper grade of lubricant in the rear axle case.	(c) Drain the rear axle. Fill with proper grade of hypoid lubricant.
	(d) Axle shaft bearings pitted, scored, or worn.	(d) Remove and inspect the axle shaft bearings and cups. Install new bearings and cups if necessary.
	(e) Ring gear and pinion worn, scored, or chipped.	(e) Remove the carrier, disassemble and inspect the ring gear and pinion. Recondition the carrier.
	(f) Ring gear and pinion improperly adjusted.	(f) Remove the carrier. Adjust the ring gear and pinion properly.
	(g) Insufficient preload on the pinion bearings.	(g) Adjust the pinion preload properly.
	(h) Insufficient preload on the differential side bearings.	(h) Remove the carrier. Adjust the differential side bearing preload.
	(i) Pinion bearings or differential side bearings pitted, scored, or worn.	(i) Recondition the carrier. Inspect the bearings. Install new bearings and cups.
	(j) Ring gear and pinion not matched. This is generally a condition which arises after a rear axle reconditioning.	(j) Recondition the carrier. Install a matched set of ring gear and pinion.
	(k) Noisy muffler. Muffler noise can be duplicated, by accelerating and decelerating the engine with the car standing still.	(k) Check the muffler and exhaust system for noise. Install a new muffler if necessary.
2. Hum on coast.	(a) Axle shaft bearings pitted, scored, or worn.	(a) Remove and inspect the axle shaft bearings and cups. Install new bearings and cups if necessary.
	(b) Improper preload on the pinion bearings.	(b) Adjust the pinion preload properly.
	(c) Ring gear and pinion worn, scored, or chipped.	(c) Remove the carrier, disassemble and inspect the ring gear and pinion. Recondition the carrier.
3. Hum with the engine pulling.	(a) Insufficient lubricant in the rear axle case.	(a) Check the lubricant level. Add necessary lubricant.
	(b) Improper grade of lubricant in the rear axle case.	(b) Drain the rear axle case. Fill with proper grade of hypoid lubricant.

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TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
	(c) Improper pinion bearing preload.	(c) Adjust the pinion bearing preload.
	(d) Improper ring gear to pinion mesh.	(d) Remove the carrier. Adjust the ring gear and pinion mesh.
4. Intermittent hum. Ring gear does not run true.	(a) Dirt or chips between ring gear and differential case.	(a) Remove and disassemble the carrier. Clean up and true up the ring gear and case mating surfaces.
	(b) Differential case sprung or cracked.	(b) Recondition the carrier. Install a new differential case.
	(c) Warped or sprung ring gear.	(c) Recondition the carrier. Measure the ring gear runout. Install a new ring gear and pinion.
	(d) Ring gear attaching cap screws unevenly tightened.	(d) Disassemble the carrier. Torque tighten the ring gear cap screws. Assemble and adjust the ring gear and pinion mesh.
	(e) Loose, worn, scored, or broken differential side bearings.	(e) Recondition the carrier. Install new differential side bearings and cups.
5. Rear axle noisy on turns only.	(a) Differential pinions or side gears chipped, scored, or worn.	(a) Recondition the carrier. Install new differential pinions, side gears, and thrust washers.
	(b) Differential case, side gears, and thrust washers worn, scored, or rough.	(b) Recondition the carrier. Install a new differential case, side gears, or thrust washers if necessary.
	(c) Differential pinions tighten on pinion pin.	(c) Recondition the carrier. Free up the pinions on the pin or install new parts.
	(d) Excessive backlash between differential pinions and side gears.	(d) Recondition the carrier. Install new differential pinions, side gears, and thrust washers if necessary.
6. Knocks in the rear axle.	(a) Pitted, chipped, or scored axle shaft bearings and cups.	(a) Remove the axle shaft. Install a new bearing and cup if necessary.
	(b) Pitted, chipped, or scored differential side bearings or pinion bearings.	(b) Recondition the carrier. Inspect all bearings. Install new bearings if necessary.
	(c) Chipped ring gear or pinion, or chips, lodged between teeth.	(c) Recondition the carrier. Inspect ring gear and pinion. Install a new ring gear and pinion if necessary.

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TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
7. Excessive backlash.	(a) Engine performance rough.	(a) Tune the engine properly.
	(b) Clutch driven plate loose on clutch shaft.	(b) Disassemble the clutch. Check clearance of driven plate splines. Install new plate if necessary. Install a new transmission clutch shaft if necessary.
	(c) Excessive play in transmission or overdrive gears and shafts.	(c) Recondition the transmission and overdrive. Replace any parts that do not come up to inspection standards.
	(d) Worn or loose universal joints or flanges.	(d) Tighten universal joint flanges or recondition the universal joints.
	(e) Wheel hubs loose on axle shafts.	(e) Tighten axle shaft nuts, and wheel hub bolts.
	(f) Excessive clearance between ring gear and pinion.	(f) Recondition the carrier. Adjust ring gear and pinion mesh.
	(g) Ring gear attaching cap screws loose.	(g) Recondition the carrier. Tighten the ring gear attaching cap screws.
	(h) Worn or loose differential pinions and side gears.	(h) Recondition the carrier. Install new differential pinions, side gears, and washers.
8. Oil leaks at the axle shafts.	(a) Lubricant level too high in the rear axle case.	(a) Drain down the lubricant to the proper level.
	(b) Axle shaft oil seal worn or damaged.	(b) Install new axle shaft oil seals.
	(c) Axle shaft or wheel hub oil seal surface rough.	(c) Smooth up seal surface by polishing with sand paper. Or install a new axle shaft or wheel hub if seal surface has a worn groove.
	(d) Excessive axle shaft end play.	(d) Adjust the axle shaft end play properly.
	(e) Rear axle case breather vent plugged.	(e) Clean out the rear axle case breather vent.
9. Oil leaks at the pinion shaft.	(a) Lubricant level too high in the rear axle case.	(a) Drain down the lubricant to the proper level.
	(b) Pinion oil seal worn or damaged.	(b) Install a new pinion oil seal.

REAR AXLE

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
9. Oil leaks at the pinion shaft (Continued)	(c) Universal joint flange hub is rough, scored, or damaged.	(c) Install a new universal joint flange.
	(d) Rear axle case breather vent plugged.	(d) Install a new rear axle case breather vent.
10. Oil leaks at the carrier flange.	(a) Loose filler or drain plug.	(a) Tighten the filler and drain plugs.
	(b) Loose carrier to axle case attaching nuts.	(b) Tighten the carrier attaching nuts.
	(c) Damaged carrier flange gasket.	(c) Install a new carrier gasket.
	(d) Damaged or burred carrier flange.	(d) Clean up and smooth up carrier flange. If the flange cannot be repaired satisfactorily, install a new carrier case.
	(e) Damaged or burred rear axle case at the carrier mounting face.	(e) Clean up and smooth up mounting face. If the face cannot be repaired, install a new rear axle case.
	(f) Cracked rear axle case.	(f) Weld the rear axle case or install a new case.
11. Tire wear excessive and uneven on rear wheels.	(a) Broken spring center bolt.	(a) Install new spring center bolt. Align the axle.
	(b) Bent or sprung rear axle case.	(b) Install a new rear axle case.

26TH SERIES REAR AXLE

Description

The 26th Series rear axle is similar in design to previous axles but is improved by sturdier construction to take care of the increased torque loads.

To be brief, some of the changes incorporated in the unit are as follows: Larger axle shafts and larger bearings; the load angle of the driving pinion shaft bearings has been increased; the carrier flange has been increased in thickness and reinforcement ribs relocated; the housing outer end flanges are new and heavier; the gears are larger with increased bearing surface; new carrier pedestal set screws are used; the pinion pin has been increased in diameter; the new thrust block is hexagon shaped and longer and a new neoprene rubber oil seal is used.

Differential Disassembly

Before disassembling the differential unit, the differential assembly and the inside of the carrier should be carefully washed with kerosene and blown dry with compressed air. (Cleaning the outside of the carrier at this time may result in dirt and grit getting into the bearings of the differential assembly.)

Place the differential carrier in a differential carrier holder J-3289, Fig. 31. If broken teeth are found or if there is any evidence of chips or particles going through the teeth, use a dial indicator against the back side of

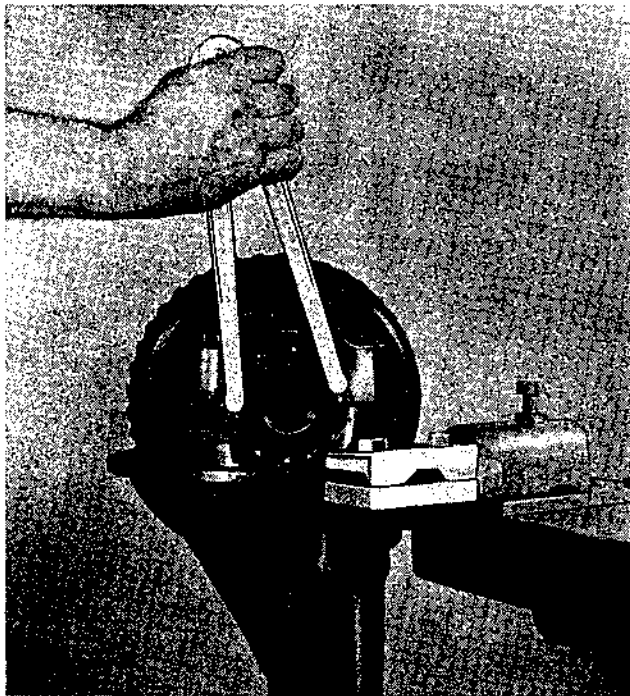


Figure 31—Differential in Holding Fixture

the ring gear to measure the run-out of the differential case before disassembly. Install a new differential case if the run-out 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 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 until assembly. This will assist the serviceman in obtaining the approximate side-bearing adjustment during assembly.

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

Drive out the differential pinion shaft lock pin, using a pin punch and hammer, Fig. 32. Drive out the pinion shaft.

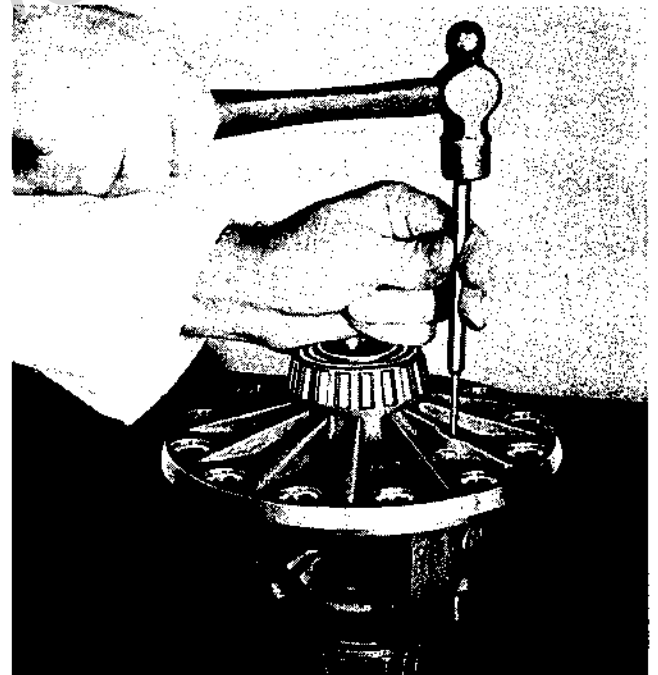


Figure 32—Driving Out the Lock Pin

Remove the differential pinions, pinion thrust washers, axle shaft thrust block, differential side gears and thrust washers.

While holding the universal joint flange in a vise, remove the flange nut using socket wrench J-5512.

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26TH SERIES REAR AXLE

Using a soft hammer, drive the universal joint flange off of the pinion shaft.

Drive out the pinion, sleeve and rear bearing using a soft hammer. Be careful that the pinion gear does not strike the base of the carrier pedestal. Drive out the front pinion bearing and pinion oil seal using a soft driver.

Drive out the front pinion bearing cup using remover J-3235A and driver handle J-872-5 as shown in Fig. 33.

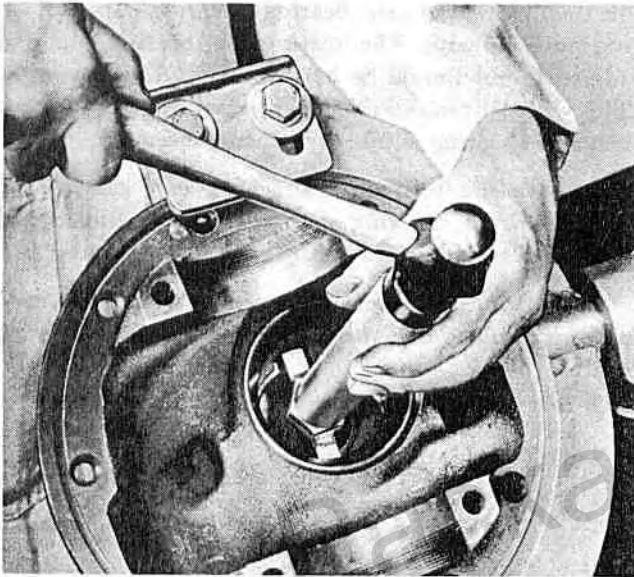


Figure 33—Driving Out the Front Bearing Cup

Drive out the rear pinion bearing cup using remover J-5521 and driver handle J-872-5 as shown in Fig. 34.

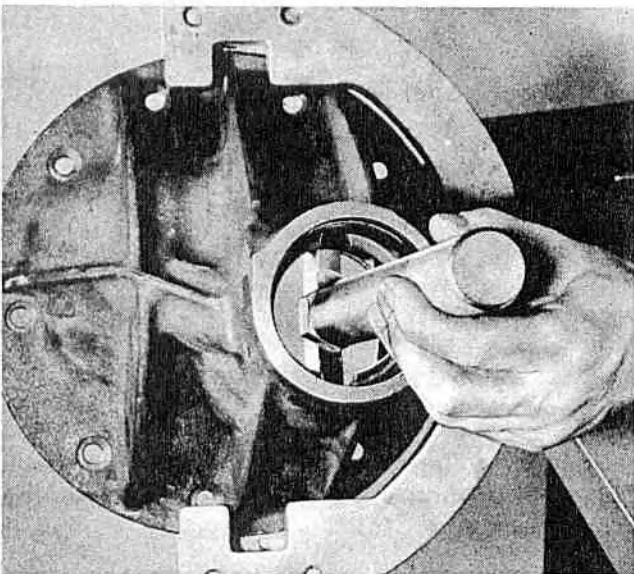


Figure 34—Driving Out the Rear Bearing Cup

Cleaning and Inspection

Clean the differential case and all of the parts thoroughly.

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.

Note: The ring gear and pinion are matched and must be replaced as a pair if either part requires replacement.

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

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

If the pinion shaft rear bearing requires replacement, press it off in an arbor press using plate holder J-2574 and J-5508 remover plates, Fig. 35.

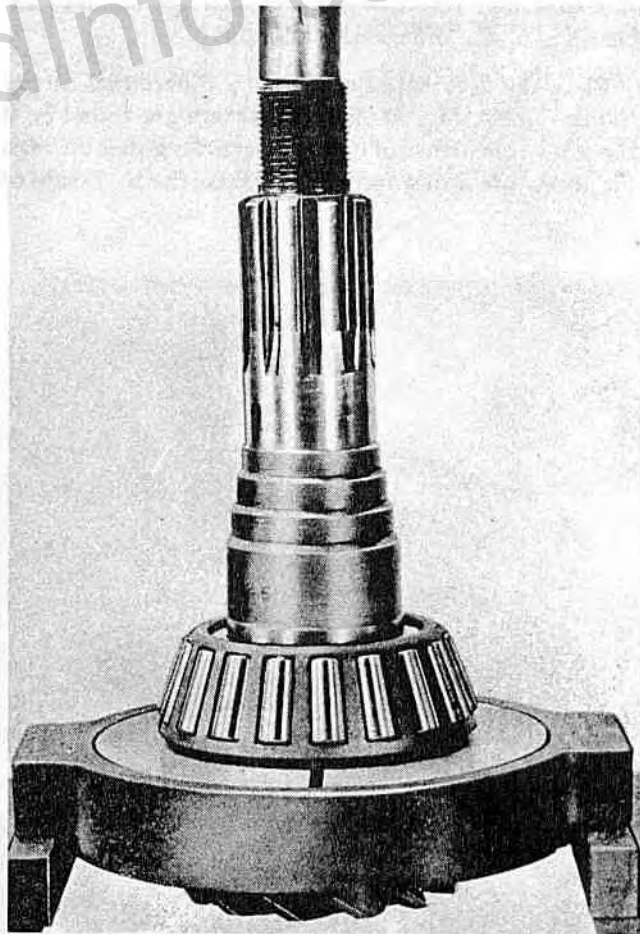


Figure 35—Special Tools Required for Removing the Rear Bearing

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If the differential bearings require replacement, remove the bearings using puller J-3250 and adapter J-3250-4, Fig. 36.

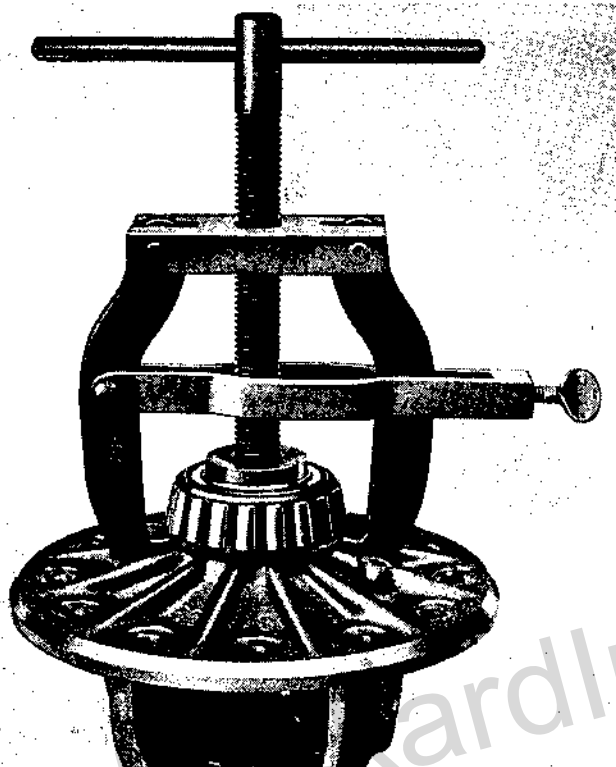


Figure 36—Removing the Differential Bearing

Differential Assembly

Prior to installing gears, bearings, or other moving parts, it is advisable to lubricate all surfaces which are subject to friction. This will provide sufficient lubrication until such time as the differential oil reaches these parts after the unit has been installed and the car driven.

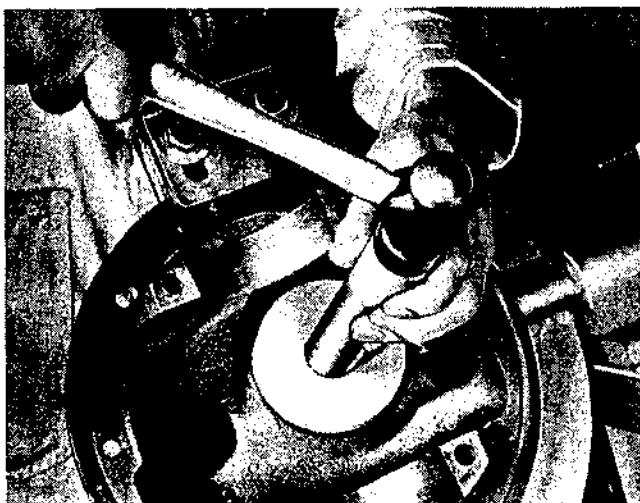


Figure 37—Installing the Rear Bearing Cup

Install the pinion rear bearing cup using installer J-3230-A and driver handle J-872-5, Fig. 37.

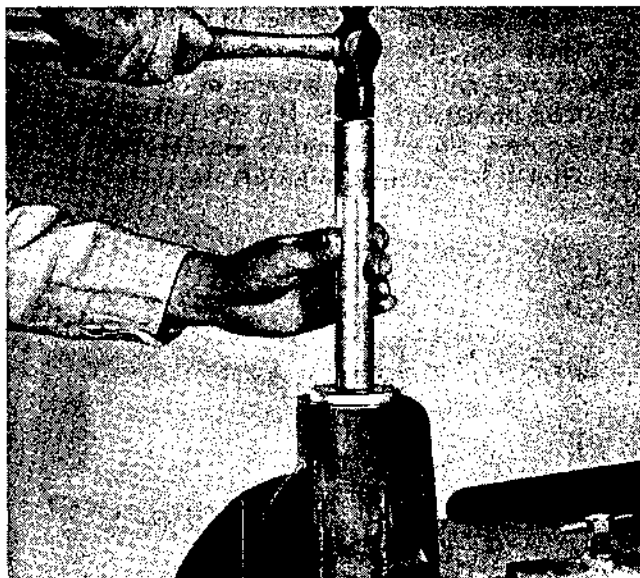


Figure 38—Installing the Front Bearing Cup

Install the pinion front bearing cup using installer J-5506 and driver handle J-872-5, Fig. 38.

Press the pinion rear bearing onto the pinion shaft until the inner race is tight against the shoulder.

Install the pinion bearing sleeve on the pinion shaft with its largest diameter end toward the pinion rear bearing. Install these parts in the carrier. While holding them in place, install the pinion front bearing and tap it into place on the pinion shaft.

Lubricate the pinion oil seal and drive it into place using installer J-3244, Fig. 39. Coat the splines of the

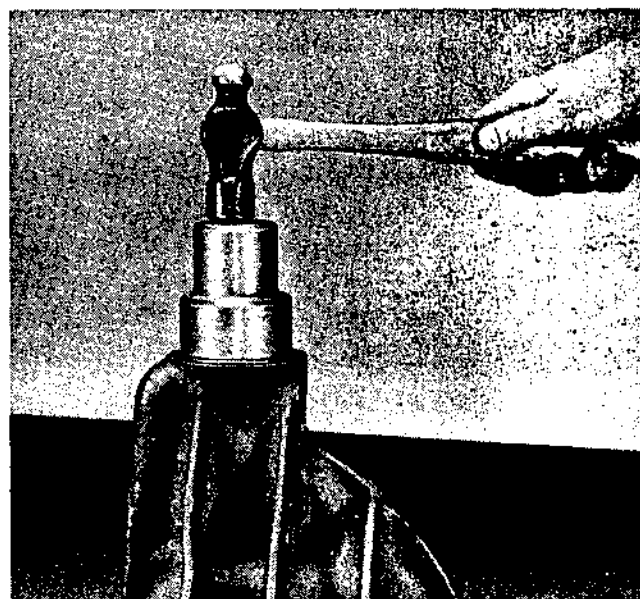


Figure 39—Driving the Seal into Place

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

Lock the universal joint flange in a vise and tighten the flange nut with socket J-5512 and a long handle wrench until only a slight amount of end play can be felt in the pinion shaft. Note: If a new collapsible sleeve is being used, a great amount of turning effort on the wrench will be required to buckle the sleeve, Fig. 40.

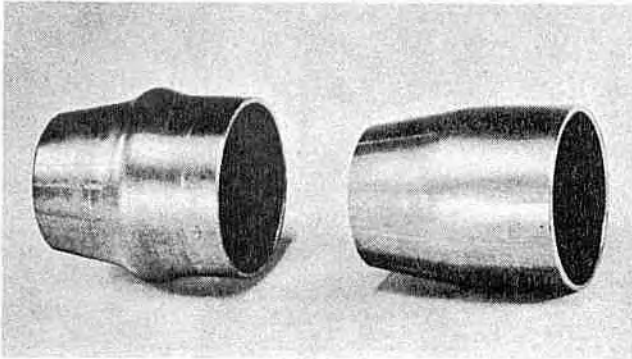


Figure 40—Note the Buckled Sleeve

Using preload indicating wrench and adapter J-2571-B and socket J-5512, notice the amount of torque required to rotate the pinion, Fig. 41. This indicates the amount of drag caused by the pinion seal.

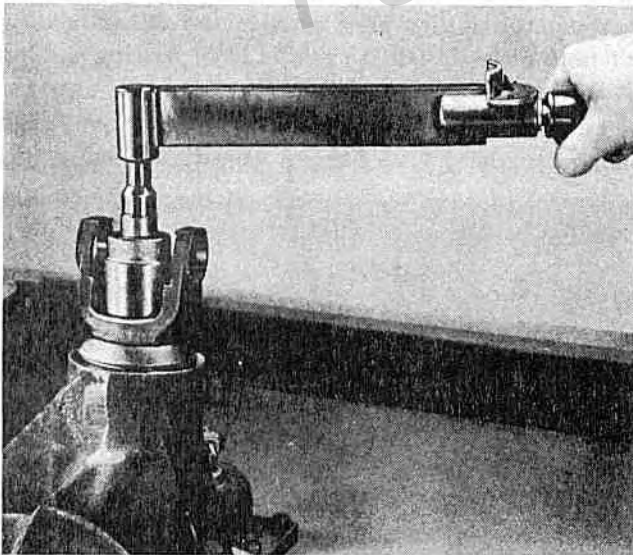


Figure 41—Checking Seal Drag

After the seal drag torque reading is obtained, continue tightening the flange nut until pinion bearing preload is correct, the amount of torque reading on the preload indicating wrench will read 3 to 3¼ foot pounds plus the amount of torque that was required to overcome the oil seal drag. (For example, if the oil seal

drag was 2 foot pounds, the reading on the indicating wrench should be 5 to 5¼ foot pounds.)

Install the differential side bearings using bearing installer J-5507 and driving handle J-872-5, Fig. 42.



Figure 42—Installing a Differential Bearing

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

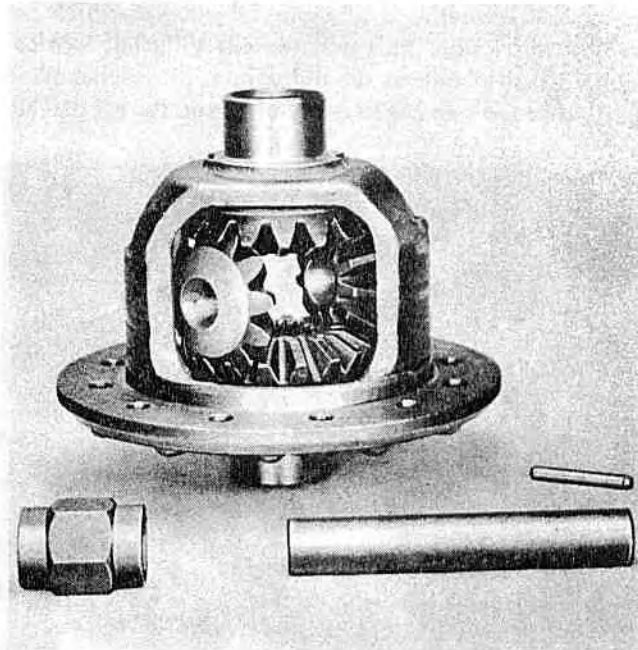


Figure 43—Pinion Gears in Position

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With cup grease, coat the differential pinion thrust washers 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, Fig. 43.

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

Measure the end play of each side gear using a feeler gauge, Fig. 44. The end play should be .0015" to .003".

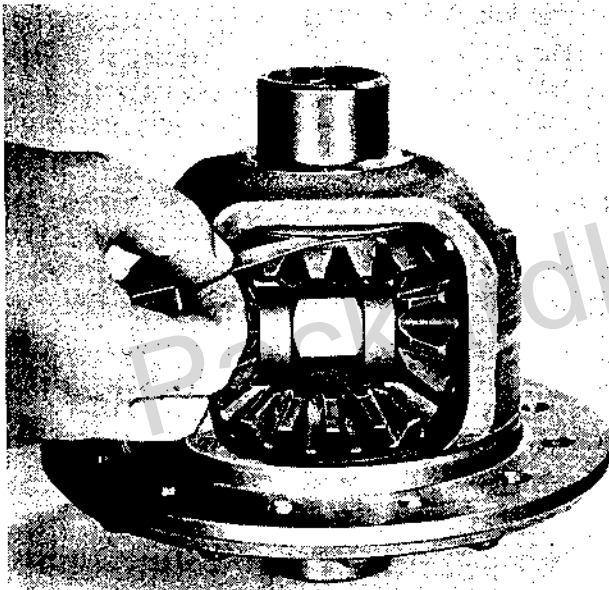


Figure 44—Checking Side Gear End Play

If the end play is not within these limits, it will be necessary to remove the side gear thrust washers, and replace them with thrust washers of the correct thickness. The side gear thrust washers are available in .031 inch, .036 inch, .041 inch and .046 inch thickness. When proper end play is obtained and the pinion pin is installed, drive in the lockpin and stake the edge of the lockpin 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 differential case flange are free from dirt and burrs. Install the ring gear cap screws and tighten evenly. Torque tighten to 50 to 55 foot pounds.

Lubricate the differential side bearings and place the bearing cups on the bearings.

Place the differential case assembly into the carrier, install the side bearing adjusting nuts in place and turn the adjusting nuts a few turns to be sure they are in the threads properly. Install the bearing caps so that the cap screw holes line up with the carrier, install and tighten the cap screws tight enough to hold the adjusting nuts in place, but still 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 inch.

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

Back off the side bearing adjusting nut on the ring gear side one full turn so that a little end play can be felt in the differential case. Place the caliper and a .010" feeler gauge on the pedestals as shown in Fig. 45, adjust



Figure 45—Checking Side Bearing Preload

the caliper so that its jaws contact the feeler gauge and the opposite boss as shown. Lock the caliper so its adjustment will not be disturbed.

Tighten the side bearing adjusting nut on the ring gear side the full turn that it was previously backed off. Tighten the side bearing adjusting nut opposite from the ring gear side until the caliper jaws will just contact both cap bosses without the feeler gauge.

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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 seating the bearing rollers in the cups. If any spread has been lost, it will require resetting the side bearing adjusting nuts again to obtain the .010" spread.

The ring gear to pinion lash may be measured by mounting a dial indicator, Fig. 46, on the carrier flange,

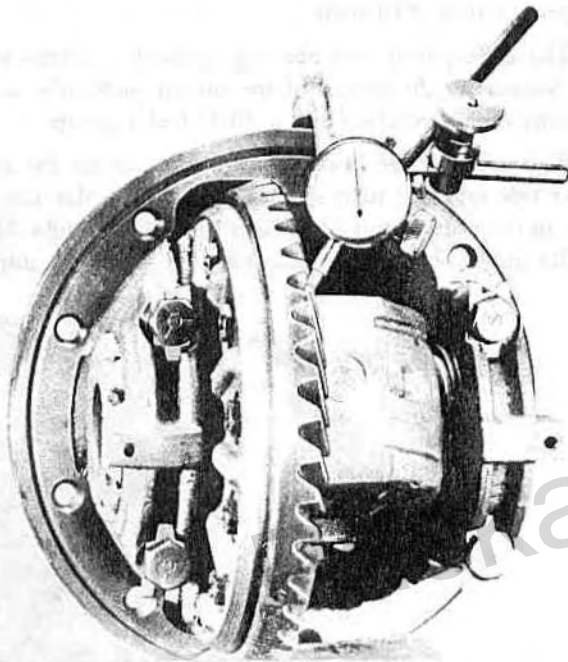


Figure 46—Checking Ring Gear to Pinion Lash

with the indicator plunger against a ring gear tooth. The ring gear to pinion lash should be .004 to .008 inch. 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 may be 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 the differential side bearing adjuster J-3232 as shown in Fig. 31.

Note: 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 gear lash, bend over the lock plates and install the side bearing adjusting nut cotter pins.

Install a new carrier sealing ring holding it in place with heavy fibre grease, install the plastic seals on the carrier studs and install the carrier in the axle housing and tighten all the carrier nuts.

Early rear axles with two pedestal set screws—torque tighten the pedestal set screws to 2 foot pounds (24 in. lbs.). Set screws must be held with an Allen wrench to prevent overtightening while tightening the lock nuts.

Late rear axles with one pedestal set screw—torque tighten the one pedestal set screw 2 to 3 foot pounds (25 to 35 in. lbs.). Set screw must be held with an Allen wrench to prevent overtightening while tightening the lock nut.