

SECTION 4

REAR SUSPENSION AND DRIVELINE

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REAR SUSPENSION

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GENERAL DESCRIPTION

The rear axle is attached to the frame through semi-elliptic leaf springs, 2 inches wide and 51 inches long. The springs have 4 channel type leaves each, with the top surface of each leaf shot-peened for long life. Each spring leaf is equipped with a full-length wax-impregnated fabric insert to assure uniform inter-leaf friction and quiet operation. Inlox type torsion rubber bushings are used to mount the springs to the frame at the front ends, through out-rigger mounted, bolted-on hangers. The springs are fastened to the axle housing at the spring seats through U-bolts. The spring rear shackles are rubber-mounted to the frame.

The direct, double-acting shock absorbers are rubber mounted at the top with the stem passing through slotted holes in the rear crossmember and eye-attached at the bottom to an anchor bolt on the rear spring U-bolt and shock absorber anchor plate.

Outrigger-mounted radius rods were incorporated in 1959, attaching to top of outer ends of axle housing at rear, and to frame 18¼ inches forward of axle housing at front.

In 1960 a stabilizer was introduced to control body roll and sway. The stabilizer ends are fastened to the spring U-bolt anchor plates, and the bar is fastened to frame brackets welded to the left and right frame side rails near the kick-up.

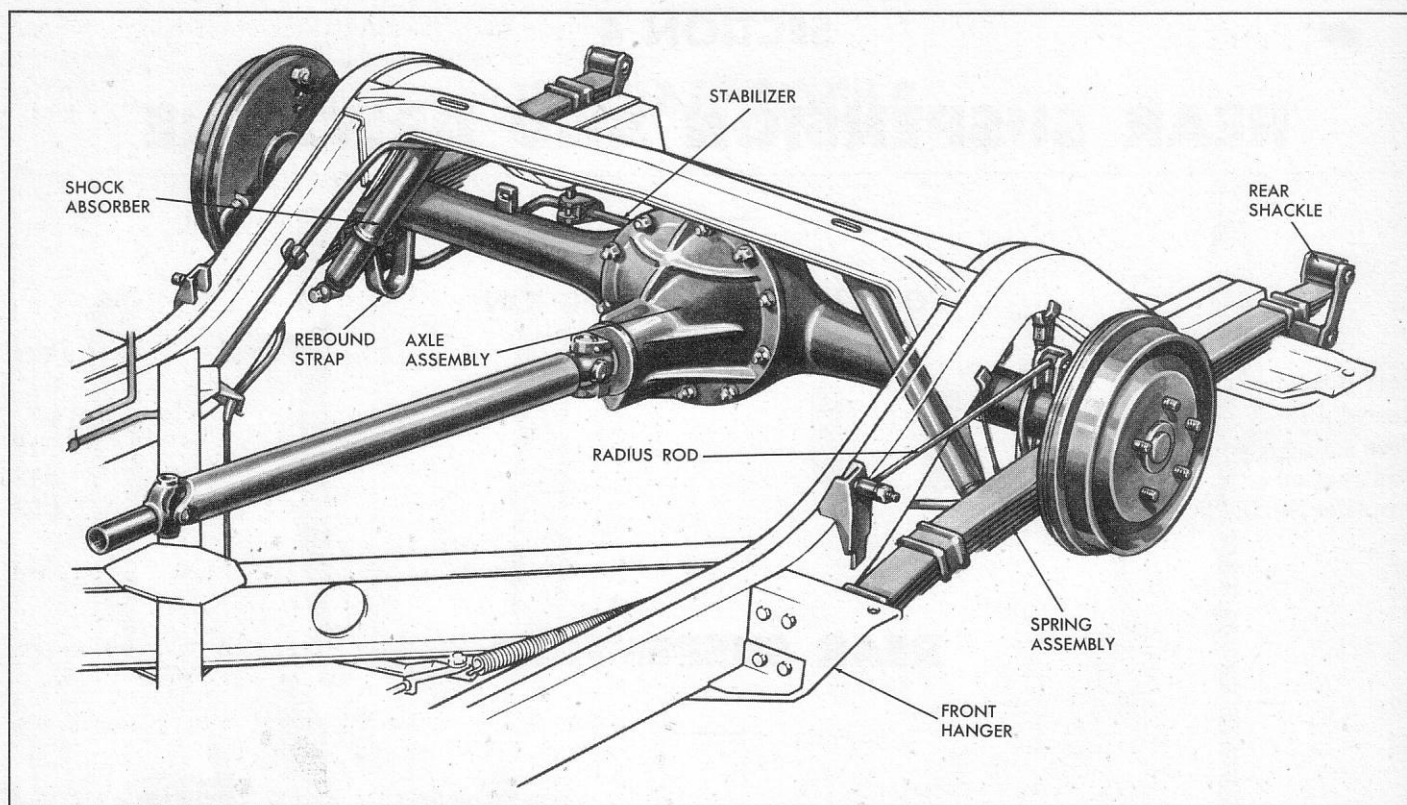


Fig. 1—Rear Suspension Components

MAINTENANCE AND ADJUSTMENTS

No periodic maintenance is required on rear springs other than an inspection of shackle nuts, bushing bolts, and U-bolts for tightness of installation. Severity of service dictates the frequency of these inspections.

The front rubber bushings and rear rubber bush-

shackles require no lubrication, as all movement is taken up in the rubber itself. The spring leaf inserts do not require service other than replacement when worn through.

SERVICE OPERATIONS

SHOCK ABSORBERS—FIGURE 2

Removal

1. Raise vehicle and locate shock upper stem at rear crossmember, and remove upper retainer nut, retainer and grommet.
2. Remove nut, lockwasher and retainer from shock absorber lower eye on spring U-bolt anchor plate.
3. Pull or drive lower shock absorber eye from anchor bolt and drop down to disengage upper stem from shock absorber crossmember.
4. Inspect all rubber grommets for wear and aging and replace where necessary.

Installation

1. Install rubber bushings in shock absorber eye and install lower grommet retainer and lower grommet to shock absorber upper stem.
2. Install lower eye on shock absorber anchor bolt while indexing upper stem through slotted hole in crossmember.
3. Install eye bushing retainer, lockwasher and nut to lower anchor bolt and torque 50-60 ft. lbs.
4. Install upper grommet, retainer and stem nut to upper stem, and torque 9-11 ft. lbs. Stake nut in place after torquing.

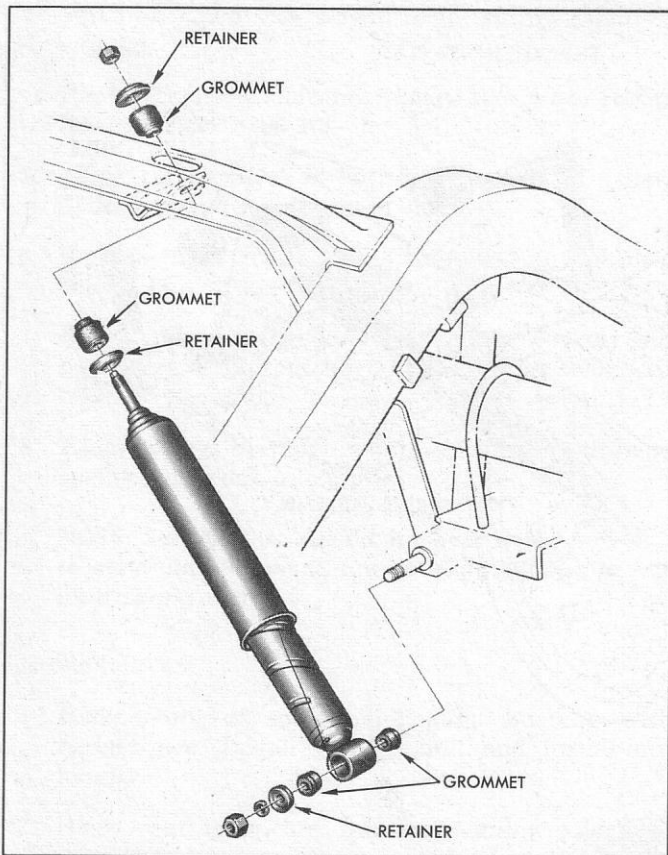


Fig. 2—Shock Absorber—Exploded View

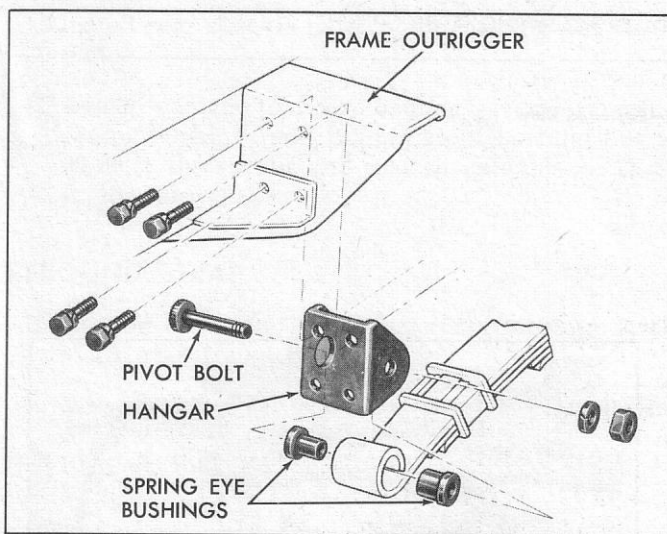


Fig. 3—Spring Front Hanger—Exploded View

SPRING FRONT HANGER—FIGURE 3

Removal—1953-1959

1. Raise vehicle and support body/frame and axle assembly to relieve spring tension.
2. Disconnect shock absorber lower eye from spring lower mounting plate.

3. Remove four bolts retaining front hanger assembly to frame outrigger.
4. Disconnect spring lower mounting plate and remove. Swing spring assembly down.
5. Remove spring eye pivot pin and hanger.
6. Press out front eye bushing with J-136. Figure 5 shows tool usage on bench.
7. Inspect pieces for aging, distortion or other signs of wear and replace where necessary.

Installation

1. Install eye bushing with J-136. Place flanged end of bushing on adapter plug and press into eye. Flange of bushing should bottom out on spring eye.
2. Install spring hanger and pivot pin. Tighten nut but do not torque at this time.
3. Raise spring and hanger assembly and bolt hanger to frame outrigger. Torque nuts 20-25 ft. lbs.
4. Raise spring mounting plate into position and torque U-bolt nuts 55-60 ft. lbs.
5. Install shock absorber eye to mounting plate and torque 50-60 ft. lbs.
6. Lower vehicle to floor, bounce several times and torque hanger pivot pin 60-90 ft. lbs.

Removal—1960-1962

These vehicles incorporate a stabilizer connected to the spring mounting plate. Before disconnecting plate, it will be necessary to disconnect stabilizer end from plate, and stabilizer bar from frame mounting bracket. *Stabilizer—1960-1962* outlines service procedure.

REAR SPRING, SHACKLE AND/OR BUSHINGS—FIGURE 4

Removal

1. Remove spring front hanger as outlined in Steps 1-5 under *Spring Front Hanger—Removal*.
2. Remove nuts from rear shackle pins and remove outer shackle plate.
3. Remove two outer bushings from shackle pins.
4. Remove inner shackle plate and bushings by prying shackle towards centerline of vehicle.
5. Drop spring assembly from under vehicle.

Inspection

Inspect rubber bushings for excessive wear or aging. Inspect shackle plates and hanger for cracks or distortion. Inspect spring leaves for damage and inserts for fraying or other signs of wear.

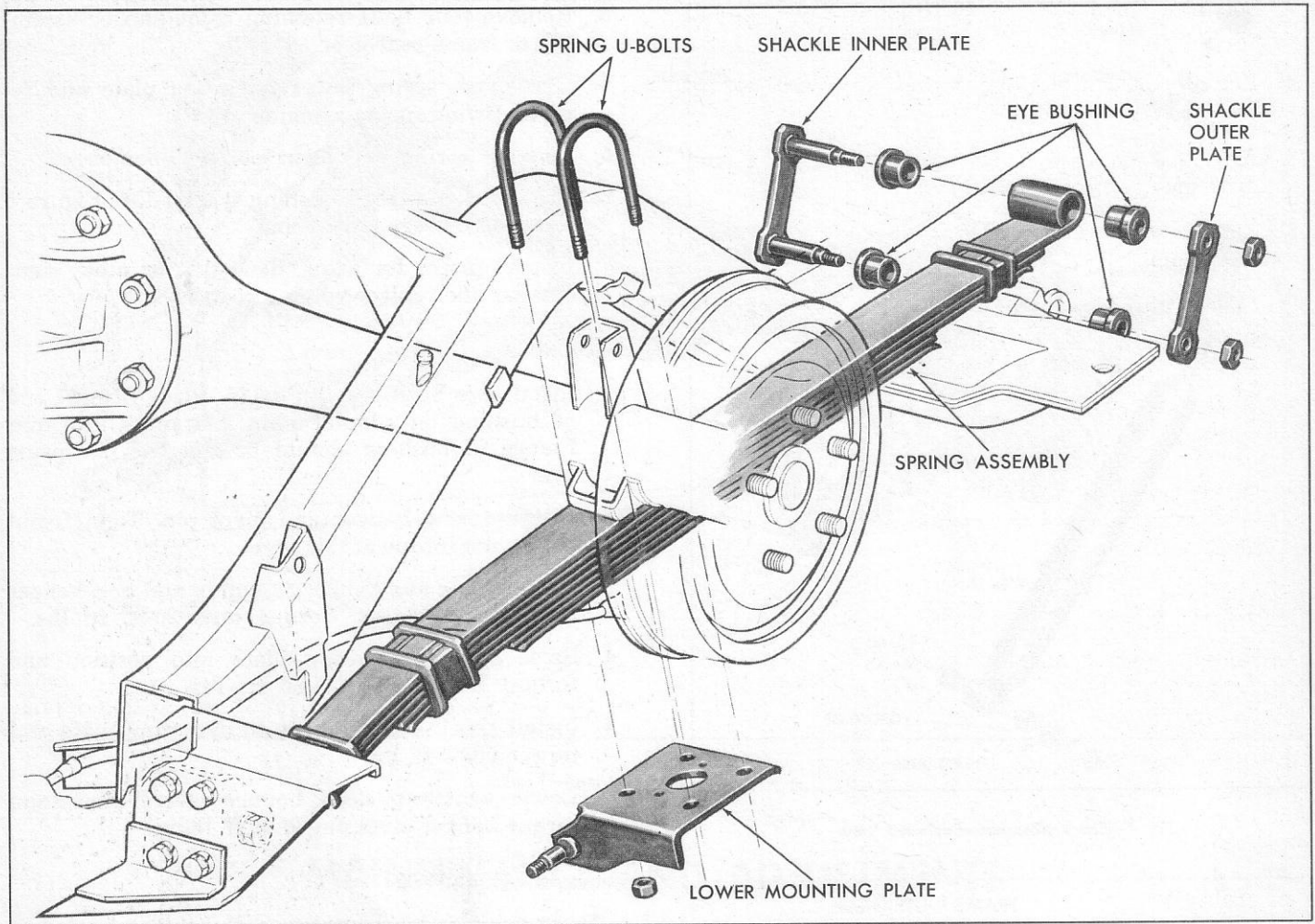


Fig. 4—Spring and Shackle—Exploded View

Repairs

Front Bushing Replacement

1. Place spring assembly in bench vise.
2. Install Tool J-136 in position (fig. 5) with adapter plug inside the bushing and pressure plate behind the spring eye.

NOTE: End of bushing with flange on outer shell must be toward pressure or end plate of tool.

3. Turn center screw clockwise to remove the bushings.
4. Place large or flanged end of bushing on adapter slug and start bushing into spring front eye. Install Tool J-136 and turn center screw counter-clockwise to force bushing into spring. Flange of bushing should bottom on spring eye.

Spring Leaf Replacement

1. Place spring assembly in a bench vise and remove spring clips.

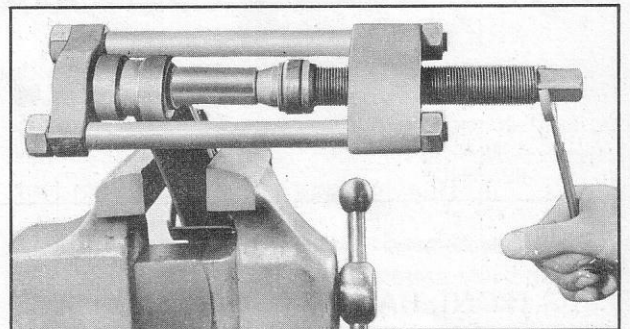


Fig. 5—Removing Spring Front Bushing

2. Position spring in vise jaws, compressing leaves at center, next to center bolt.
3. File peened end of center bolt and remove center

bolt nut. Open vise slowly to let spring assembly expand.

4. Replace broken leaf and replace any worn spring leaf inserts.
5. Align center holes in spring by means of a long drift and compress leaves in vise.
6. Remove drift from center hole and install new center bolt.
7. Install nut on center bolt and tighten securely and peen end of bolt to keep nut from loosening. If necessary, cut bolt to leave $\frac{3}{16}$ " for peening.
8. Align springs by tapping with a hammer and bend spring clips back into place.

NOTE: Spring clips should be bent sufficiently to maintain alignment, but not tight enough to bind spring action.

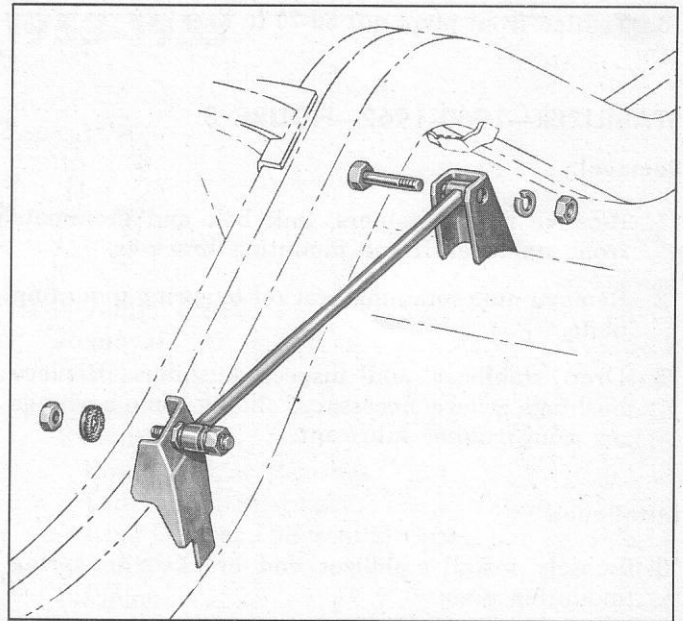


Fig. 6—Radius Rod—Exploded View

Installation

1. Raise front of spring and align bushing with hanger eye. Install through-bolt and install nut loosely.
2. Raise rear of spring, indexing center bolt head with hole in spring seat on axle. Install U-bolts, shock absorber anchor plate and U-bolt nuts. Tighten to 55-60 ft. lbs. torque.
3. Install rear shackle inner plate, bushing and outer plate.
4. Lower vehicle to floor, bounce several times to center bushings and tighten front bushing nut to 60-90 ft. lbs. torque and rear shackle nuts to 25-30 ft. lbs. torque.

REBOUND STRAP

1. Cut or drill out rivets fastening rebound strap loops over frame brackets.
2. Remove rebound strap loop plates and install new strap using $\frac{1}{4}$ inch bolts and nuts, and tighten to 10-12 ft. lbs.

RADIUS ROD—1959-1962—FIGURE 6

Removal

1. Remove nut, lockwasher and rod pivot bolt from axle housing bracket at rear, and remove nut and lockwasher from mounting stud at frame bracket.
2. Remove rod and inspect bushings for excessive wear. Inspect rod for twisting or bending. Inspect front mounting stud and replace if necessary, tightening nut to 95-125 ft. lbs.

Repairs—Bushing Replacement

1. Center bushing over J-7877-2 support and press or drive bushing from rod using J-7877-1 remover with handle J-7079-2 (fig. 7).

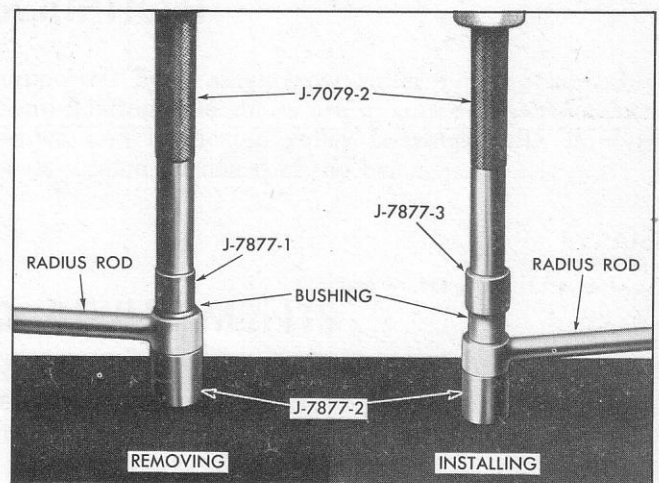


Fig. 7—Replacing Radius Rod Bushing

2. With rod end centered over J-7877-2 support, press or drive replacement bushing into rod using J-7877-3 installer with handle J-7079-2 (fig. 7). J-7877-3 should bottom out on rod when bushing is fully installed.

Installation

1. Replace radius rod over front mounting stud and install lockwasher and nut.
2. Insert rear pivot bolt through rear eye and torque 50-70 ft. lbs.

3. Tighten front pivot nut 50-70 ft. lbs.

STABILIZER—1960-1962—FIGURE 8

Removal

1. Remove nuts, retainers, link bolt and grommets from stabilizer frame mounting brackets.
2. Remove nuts retaining bracket to spring mounting plate.
3. Drop stabilizer and inspect bushings. Replace bushings where necessary, sliding new bushings on using rubber lubricant.

Installation

1. Loosely install stabilizer end brackets to spring mounting plate.
2. Install stabilizer to frame brackets, tightening to 9-12 ft. lbs.
3. Tighten end brackets to 9-12 ft. lbs.

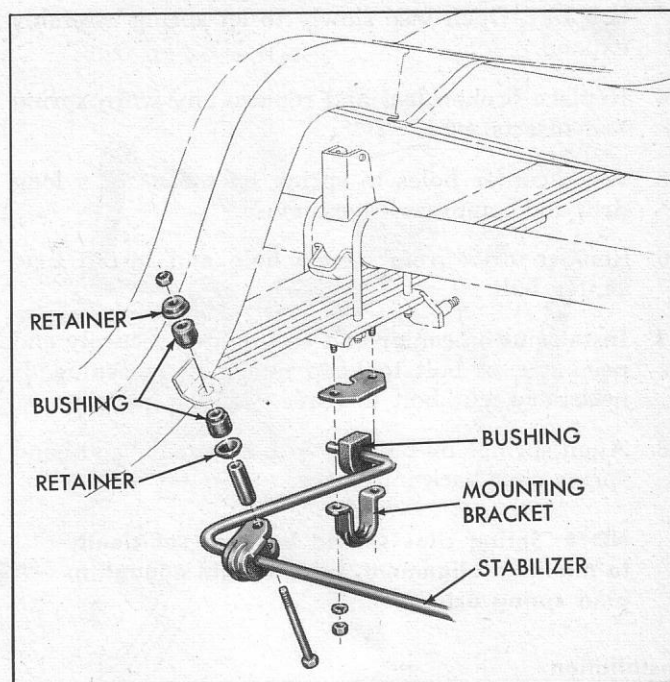


Fig. 8—Stabilizer—Exploded View

REAR AXLE 1953-1955

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GENERAL DESCRIPTION

The Corvette rear axle is a semi-floating, Hotchkiss drive type with hypoid gears, mounted in a stamped steel banjo type housing with removable rear cover (fig. 9). The overhung drive pinion is supported at the front by a double row ball bearing, while the rear is

supported by a single row roller bearing assembly. Semi-floating axle shafts are mounted in permanently sealed and lubricated roller bearings, with lip type seals located outboard of the bearings.

MAINTENANCE AND ADJUSTMENTS

Lubricant

Periodically check lubricant level and refill if neces-

sary to filler plug height with good quality hypoid gear lubricant. Refer to *Section 0* for draining intervals.

SERVICE OPERATIONS

AXLE SHAFT

Removal

1. Remove wheel.
2. Remove two stamped brake drum retaining nuts (zipon type) from the two hub bolts.
3. Remove brake drum from axle shaft.
4. Install wheel cylinder clamp on brake wheel cylinder.

5. Drain lubricant from differential and remove housing cover.
6. Remove the differential pinion shaft lock screw, the differential pinion shaft, axle shaft spacer and differential pinions (fig. 10).
7. Push axle shafts in toward the center of the axle and remove "C" washers from inner ends of the axle shafts.
8. Remove shafts from axle housing.

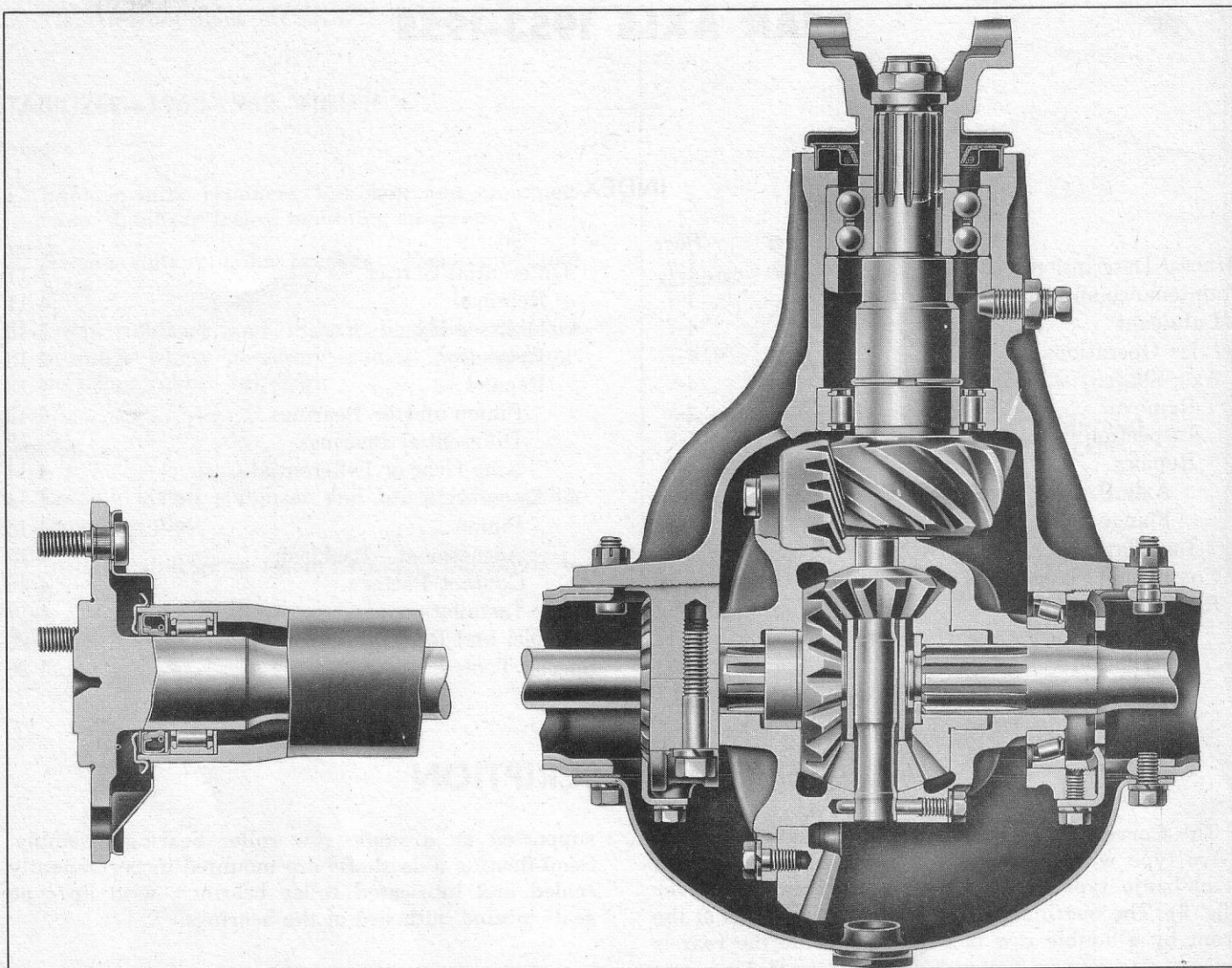


Fig. 9—1953-1955 Axle Assembly—Cross-Section

Inspection

1. Inspect axle shaft bearing for excessive wear or cracking.
2. Inspect axle shaft lip seal for wear or leaking.

Repairs

Axle Bearing and/or Seal

1. Insert special bearing puller J-1436 and remove bearing, bearing retainer and oil seal (fig. 11).
2. Inspect bore and dress out the old seal stake points to prevent damage to the new seal when installed.
3. Using bearing and retainer replacer J-8209 (fig. 12) place oil seal, bearing and inside bearing retainer on tool in that order.
4. Place a light coat of Permatex on the O.D. of oil

seal to assure proper sealing of oil seal in housing bore.

CAUTION: Be careful that no sealing material gets on the leather lip of oil seal.

5. Start the bearing into the axle housing and tap tool with hammer and seat parts.
6. Remove special tool and stake oil seal in place

Axle Flange Bolts

1. Install gasket to hub aligning the center hole of the three holes closest together with the notch in the hub.

NOTE: Apply sealer to both sides of gasket and oil deflector.

2. Install oil deflector over gasket aligning oil pocket with notch in the hub.

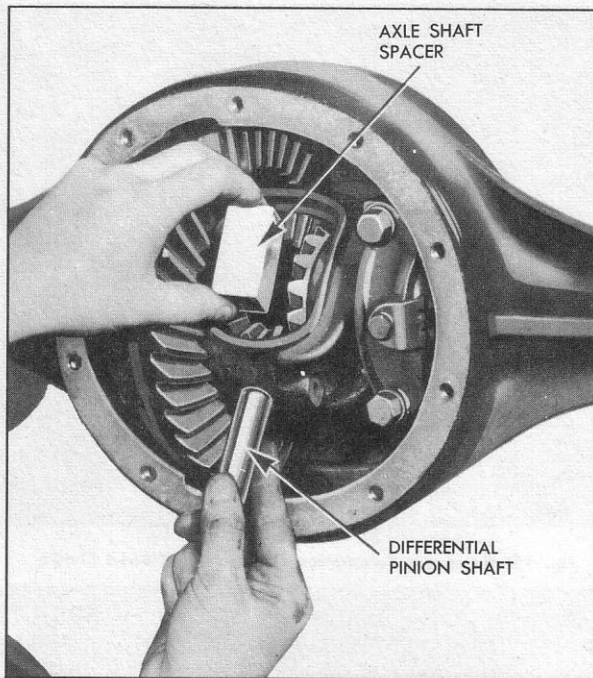


Fig. 10—Removing Axle Shaft Spacer

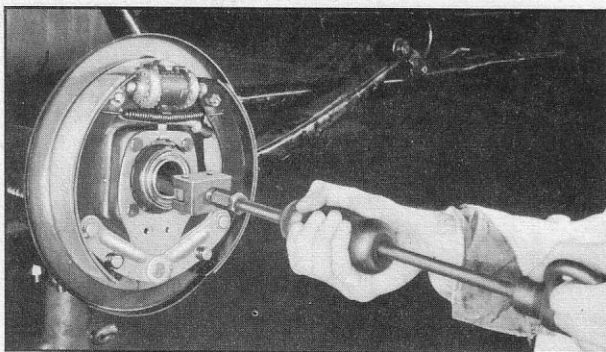


Fig. 11—Removing Axle Shaft Bearing and Seal

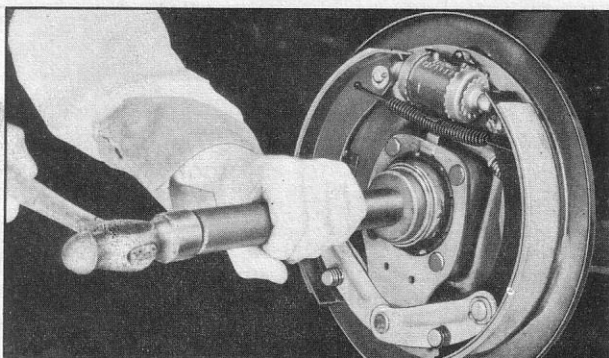


Fig. 12—Installing Axle Shaft Bearing and Oil Seal

3. Insert six special bolts and force heads down to the deflector.
4. Peen end of shoulder on bolts into countersink around bolt holes in the flange, using anvil and hub bolt peening tool J-554 (fig. 13).

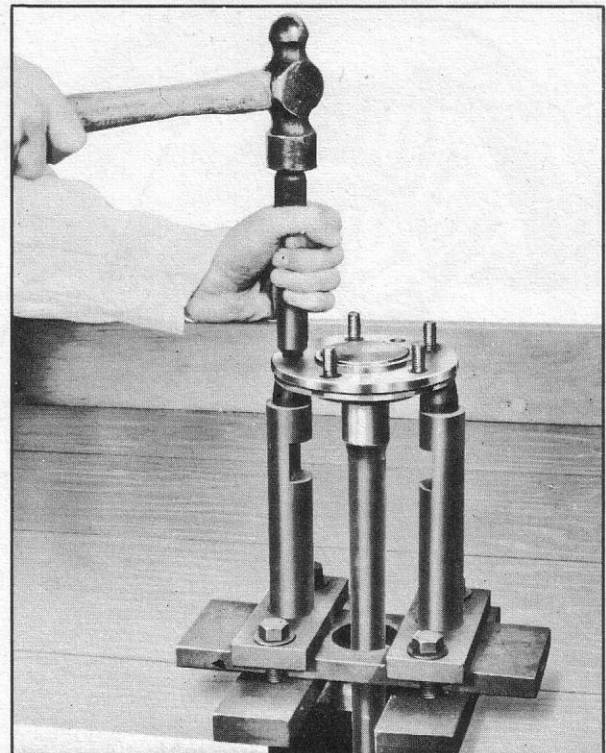


Fig. 13—Peening Flange Bolts

Axle Shaft Installation

1. Slide axle shaft into housing.

CAUTION: Exercise care that splines on end of shaft do not cut leather oil seal and that they engage with splines of differential side gears.

2. Replace "C" washers on inner ends of shaft.
3. Pry shafts apart so that "C" washers are seated in counterbore in differential side gears, and install differential pinions.

CAUTION: Exercise care to avoid scratching or damaging inner ends of shaft.

4. Select axle shaft spacer to give free fit to .014" maximum clearance between ends of axle shaft and the spacer (fig. 14).

NOTE: There are four sizes of axle shaft spacers available as follows:

Narrow1.011"-1.013" wide across ground surfaces
Medium1.018"-1.021" wide across ground surfaces
Wide1.033"-1.035" wide across ground surfaces

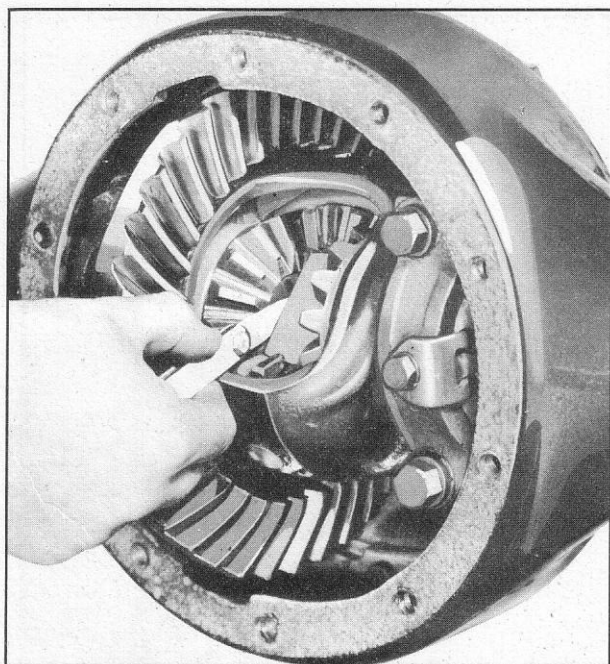


Fig. 14—Checking Axle Shaft and Spacer Clearance

5. Install spacer in place and assemble pinion shaft, locking in place with special screw using lock-washer under head.
6. Replace axle housing cover using new gasket and refill differential.
7. Remove wheel cylinder clamp.
8. Replace brake drum and two brake drum retaining nuts.

CAUTION: Make sure lug in web section of drum is aligned and extends into drain hole in axle shaft flange.

9. Replace wheel.

COMPANION FLANGE, OIL DEFLECTOR AND/OR OIL SEAL REPLACEMENT

1. Raise one rear corner of vehicle off floor and place jack stand under vehicle body at jack point.

NOTE: This is to lock one rear wheel and obtain differential to body clearance. If operation is to be performed on a hoist, support body on stand jacks, allow axle to drop for clearance and expand brake shoes on one wheel to lock wheel.

2. Check free wheel for freedom of rotation.
3. Separate rear universal joint, tape trunnion bearings to joint and support rear of propeller shaft.
4. Holding drive flange with Tool J-8614-1 or J-2637 remove companion flange nut and special washer (fig. 15). Discard nut.

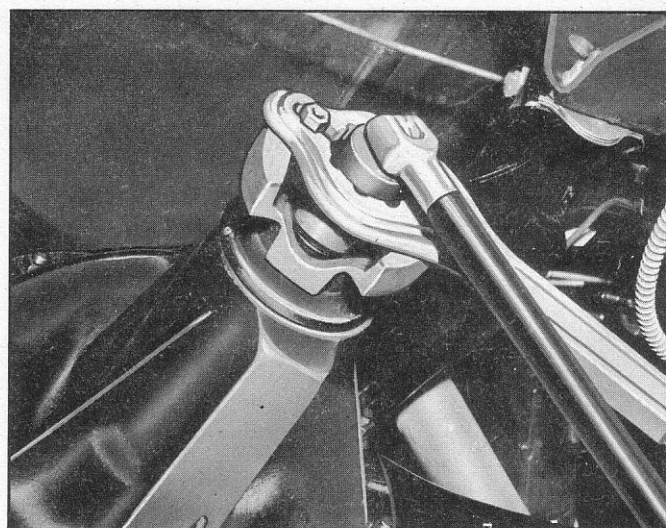


Fig. 15—Removing Companion Flange Nut—J-8614 Shown

5. Remove drive flange using Tool J-8614-1-2 or J-2637 (fig. 16). Pry old oil seal out, using a screw-driver or hammer and chisel.

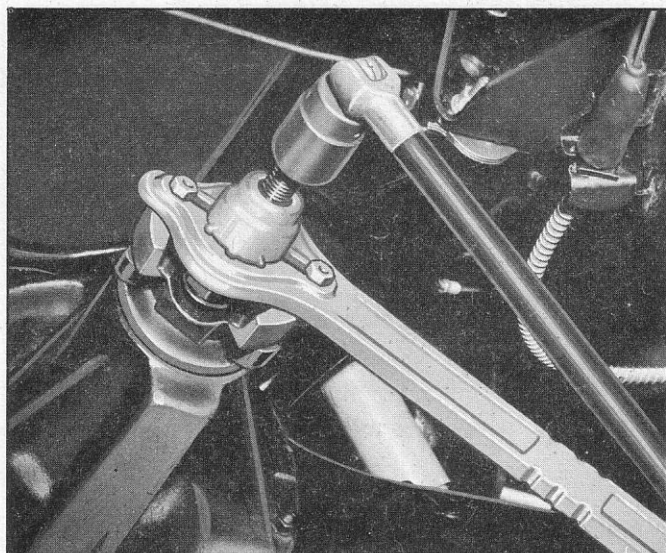


Fig. 16—Removing Companion Flange—J-8614 Shown

6. Inspect drive flange for smooth oil seal surface or worn drive splines. Replace if necessary.
7. If old deflector is damaged, install new deflector using suitable pipe or J-5749 (fig. 17).
8. Soak new seal in light engine oil for 10 minutes before installation, wipe O.D. of seal and coat with sealer. Install new seal using J-5154.
9. Install drive flange. If flange does not go on shaft easily, pull flange on shaft using J-8614 or J-2637 (fig. 18). Tool J-5780 is threaded onto pinion shaft and large nut tightened to pull flange on shaft. Remove tool and install special washer and new pinion shaft nut. Torque 150-190 ft. lbs.

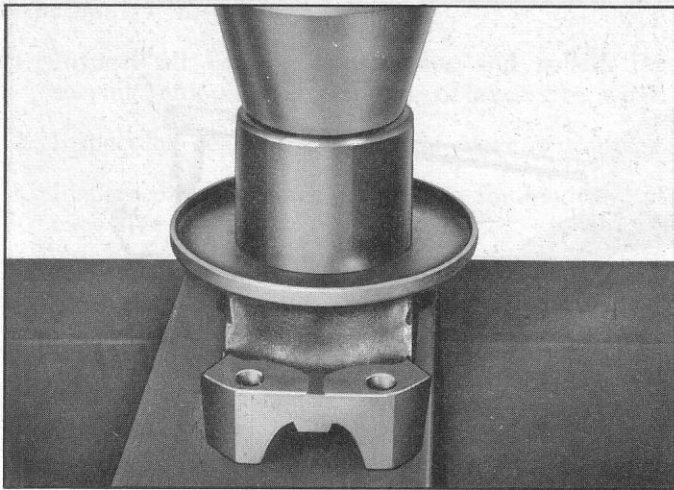


Fig. 17—Installing New Oil Deflector

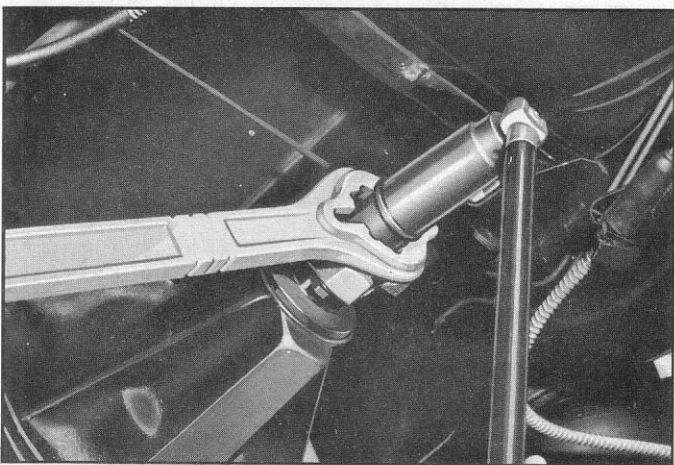


Fig. 18—Installing Companion Flange—J-8614 Shown

10. Readjust brake if expanded above.
11. Lower vehicle to floor and test for leaks or noise.

REAR AXLE ASSEMBLY

Removal

1. Raise vehicle from floor and drain oil.
NOTE: 1962 vehicles have no drain plug and can be drained by partially removing carrier assembly.
2. Remove rear wheels and brake drums.
3. Install wheel cylinder clamps on brake wheel cylinders.
4. Disconnect hand brake cables from cross shaft lever.
5. Remove brake cables from cable clamp on frame side member.
6. Disconnect hydraulic brake line connection at rear axle housing.

7. Disconnect propeller shaft at carrier and pull out of transmission.
8. Disconnect shock absorber from rear spring "U" bolt and shock absorber anchor bolt plate.
9. Remove spring "U" bolts and plate.
10. Disconnect spring shackles and drop springs.
11. Place axle assembly in axle stand.

Installation

1. Roll axle assembly under vehicle and raise into position.
2. Raise axle assembly and re-install rear spring shackles.
3. Replace rear spring "U" bolt and shock absorber anchor bolt plate, install "U" bolts and tighten securely.
4. Replace shock absorber eye to bolt on anchor plate.
5. Connect hydraulic brake line to connector at rear axle housing. Install and connect propeller shaft.
6. Remove wheel cylinder clamps and install brake drums and rear wheels.
7. Connect hand brake cables to cross-shaft lever and to bracket on frame side member and adjust. See Brake Section.
8. Lower vehicle to floor.
9. Bleed brake lines at all four wheels. See Brake Section.

DIFFERENTIAL CARRIER

Removal

1. Raise vehicle and drain oil from carrier assembly.
2. Remove rear cover.
3. Remove axle shafts and differential gears as outlined under Axle Shaft—Removal.
4. Disconnect propeller shaft at companion flange and slide out of transmission.
5. Remove nuts securing carrier to axle housing mounting studs and pull carrier from housing.

Disassembly

1. Mount carrier assembly in a bench vise or in Tool J-3289.
2. Mark bearing caps and carrier for reassembly in same position. Remove differential adjusting nut locks and bearing cap bolts.
3. Remove bearing caps and adjusting nuts by tapping on cap bosses.

CAUTION: Do not use screwdriver to pry cap off as this may damage machined face of cap.

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4. Remove differential assembly from carrier.
5. Remove differential pinion shaft lock screw and lockwasher and differential pinion shaft from differential case.
6. Remove differential pinion and side gears.
7. Hold companion flange from turning by installing Tool J-8614-1 or J-2637 and remove propeller shaft pinion flange nut and washer (fig. 19). Remove flange by using Tool J-8614-2 or J-2637, bolted to flange with holding tool in place (fig. 20).
8. Remove three tapered set screws retaining front pinion bearing.
9. Remove pinion from carrier by tapping on front end with a soft faced hammer.
10. Press front bearing from pinion using pinion bearing remover J-996 (fig. 21).
11. Remove rear bearing lock ring and rear bearing from pinion shaft (fig. 22).

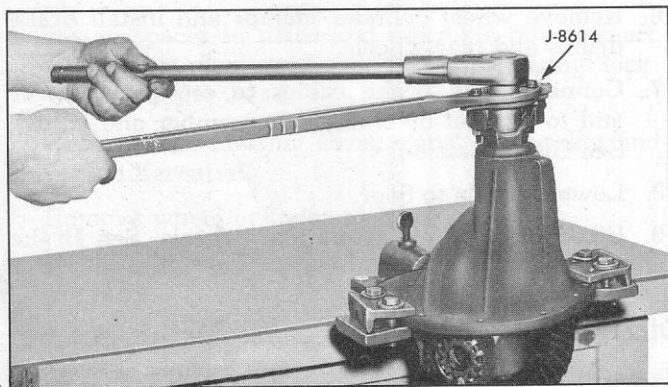


Fig. 19—Removing Companion Flange Nut

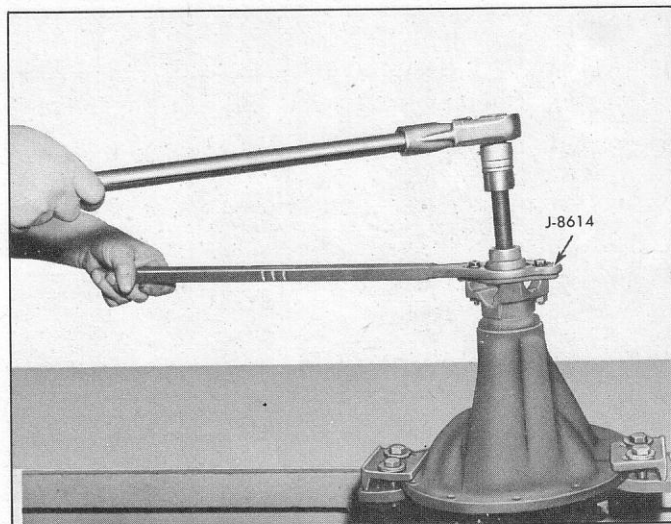


Fig. 20—Removing Companion Flange

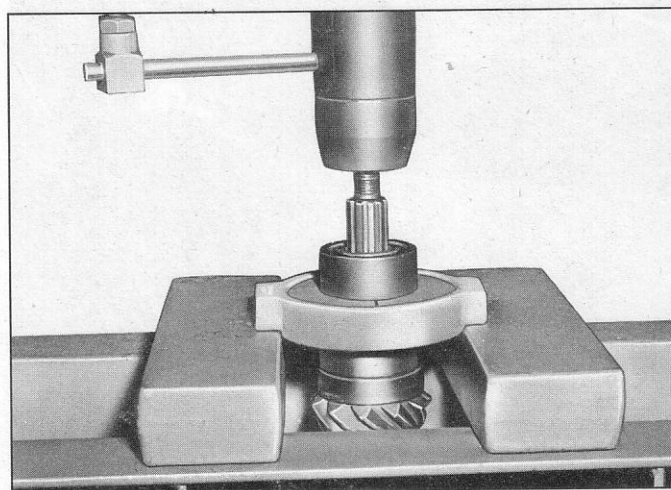


Fig. 21—Removing Front Pinion Bearing

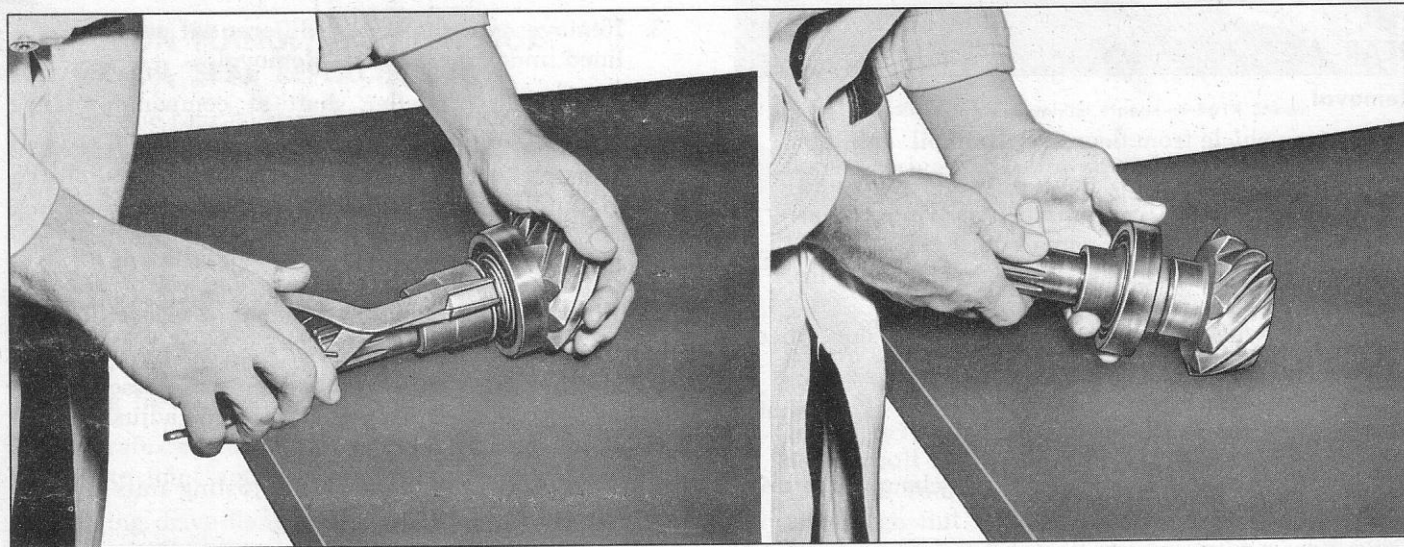


Fig. 22—Removing Rear Pinion Bearing

Inspection

1. Inspect all bearing cups, races and rollers for scoring, chipping or evidence of excessive wear.
2. Inspect oil seal for evidence of wear or damage.
3. Inspect pinion splines and flange for evidence of excessive wear.
4. Inspect ring gear and pinion teeth for scoring, cracking or chipping.
5. Inspect differential case for cracks or scores on side gear and pinion gear thrust faces.
6. Check fit of differential gears in case.
7. Check fit of side gear and axle shaft splines.
8. Inspect differential pinion shaft for scoring or evidence of excessive wear.
9. Inspect differential carrier for cracks or crossed threads on differential bearings caps and bosses.

Repairs

Pinion and/or Bearings

1. Install rear pinion bearing on pinion shaft and lock in place with lock ring.
2. Coat beveled surface of pinion bearing lock sleeve with rear axle lubricant and install on shaft with beveled edge toward the pinion.
3. Press front (double ball) bearing on shaft (fig. 23).

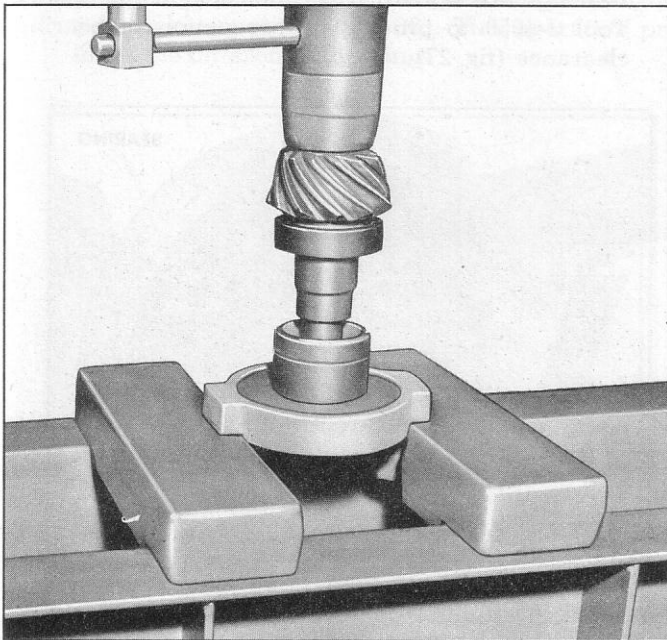


Fig. 23—Installing Front Pinion Bearing

NOTE: When assembling either of the "W" type pinion bearings, Part No. 954533, New Departure ND5306 or ND5306-W, on the pinion shaft, the bearing should be assembled with the loading slot toward the pinion. This places the thrust occurring during drive on the side of the double row bearing that does not contain the loading slot. Favoring of the bearing in this manner provides for better over-all bearing performance and greater life.

The older type bearing, Part No. 954395, should be installed with the loading slot away from pinion as the contours of the inner and outer races are in a position reversed to the new type bearing.

Differential Bearings

1. Install differential bearing puller J-8107 making sure puller legs are fitted securely in notches in case and retaining yoke tight.
2. Tighten puller screw and remove bearing (fig. 24).

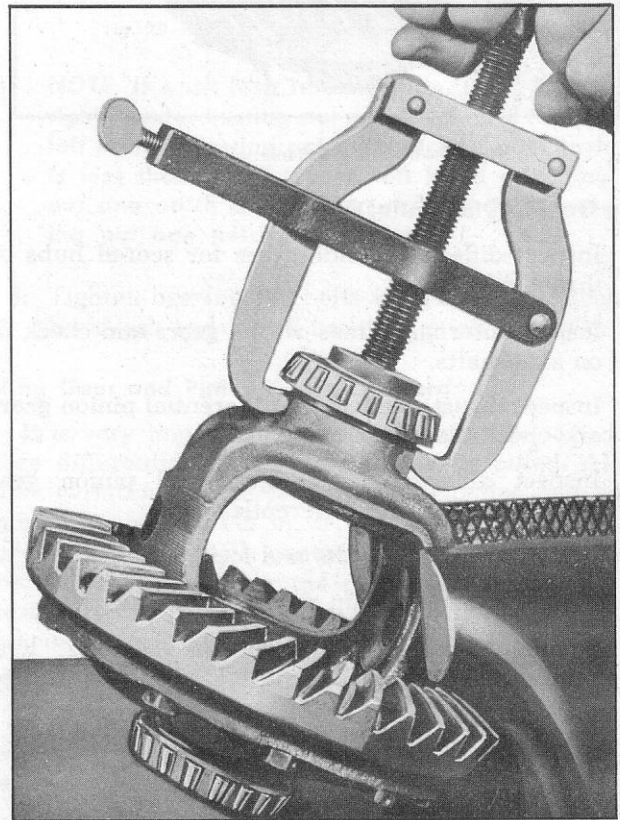


Fig. 24—Removing Differential Bearing

3. Replace bearing by placing on hub with the thick side of inner race toward case.
4. Drive bearing in place with differential side bearing replacer J-994 (fig. 25).

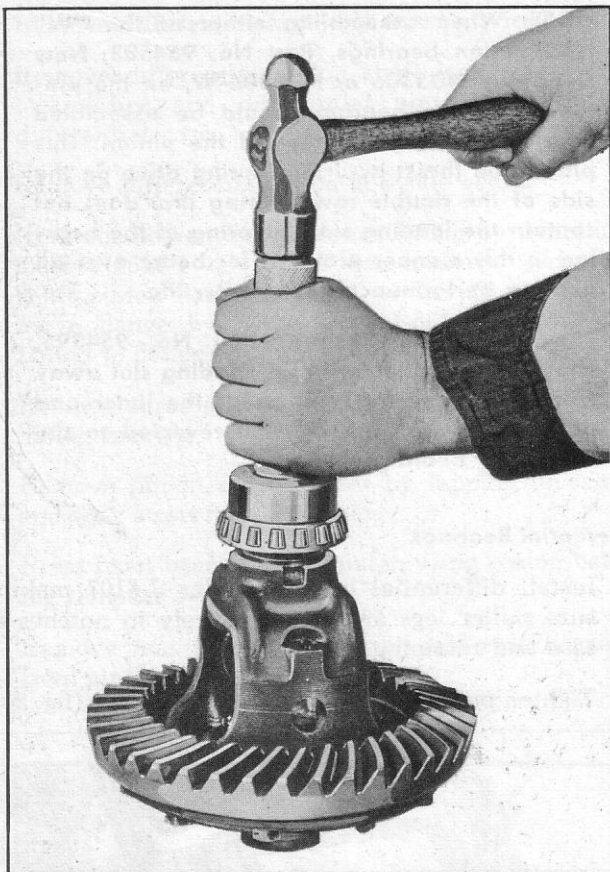


Fig. 25—Installing Differential Bearing

Ring Gear or Differential Case

1. Inspect differential side gears for scored hubs or thrust surfaces.
2. Inspect internal splines of side gears and check fit on axle shafts.
3. Inspect thrust surfaces on differential pinion gears and check their fit on pinion shaft.
4. Inspect differential side gear and pinion gear thrust faces in the differential case.
5. Remove ring gear bolts and lockwashers.
6. With soft hammer tap ring gear off the case.
7. Install guide pins made from $\frac{3}{8}$ "-24 x $1\frac{1}{2}$ " long capscrews with heads cut off and ends slotted (fig. 26) to new ring gear.
8. Make sure back face of ring gear and face of case are free of dirt and burrs and slip gear over pilot diameter of the case.
9. Install every other ring gear bolt and lockwasher, then draw them up evenly and snugly so that ring gear face is flush with face of case.
10. Remove guide pins and install remaining bolts.

NOTE: All bolts should be tightened to 40-60 ft. lbs.

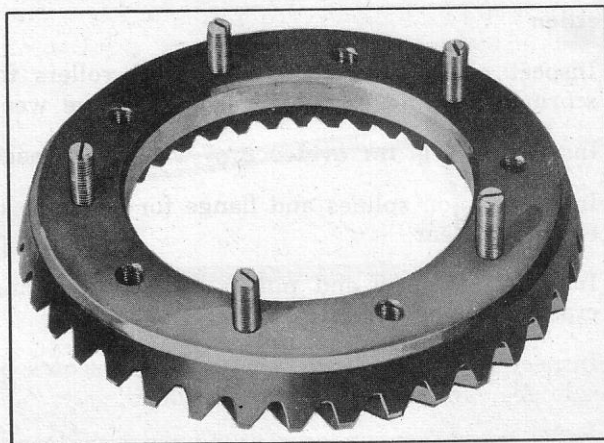


Fig. 26—Guide Pins in Ring Gear

11. Install differential carrier into axle housing and check runout of rear face of ring gear. This runout not to exceed .0035".

Assembly

Pinion

1. If original ring gear and pinion or pinion bearings are to be used, replace the same thickness shim in front pinion bearing counterbore.
2. If new gear set or new pinion bearings are to be used, one .018" shim should be used as a baseline setting.

NOTE: Make sure shim, when installed, is flat in the counterbore and not cocked.

3. Install pinion assembly, driving it down until bearings are seated in the housing, using spacer Tool J-4050 to provide proper pinion to bearing clearance (fig. 27).

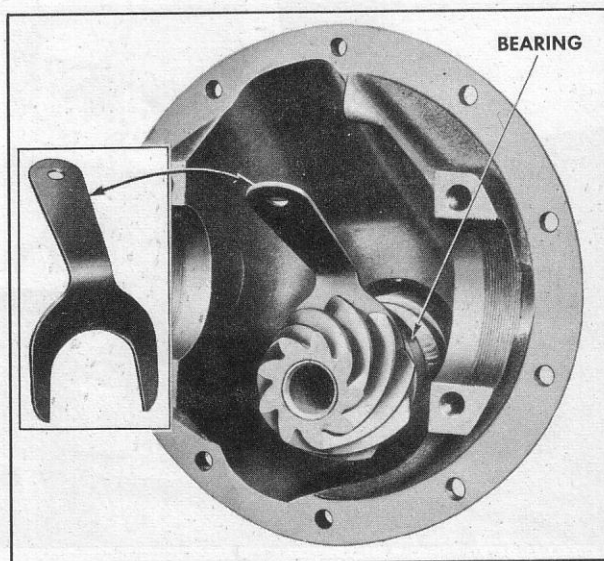


Fig. 27—Checking Pinion to Bearing Clearance

4. Check through the bearing lock screw holes in carrier to make sure lock sleeve is in position against back of front pinion bearing.
5. Install three tapered lock screws and draw them down evenly and tightly, then tighten lock screw nuts.
6. Install differential assembly in the carrier and install adjusting nuts.

CAUTION: Carefully slide adjusting nuts alongside the bearing so that threads on nuts fit into threads in carrier.

7. Install bearing caps aligning marks on cap with marks on carrier.
8. Install and tighten cap screws until lockwashers just flatten out.

Adjustment—Backlash

1. Loosen right hand adjusting nut and tighten left hand adjusting nut using differential adjusting wrench J-972 while turning ring gear. Continue tightening left hand nut until all lash is removed, then back off the left hand nut one notch to a locking position.
 2. Tighten right hand nut to force left bearing firmly into contact with left adjusting nut. Then loosen the right nut and again tighten snugly against the bearing.
- NOTE:** This position may be easily determined as the nut comes to a definite stop.
3. Tighten right hand nut a minimum of one additional notch to maximum of two notches further to a locking position (fig. 28). This operation preloads the differential bearings.

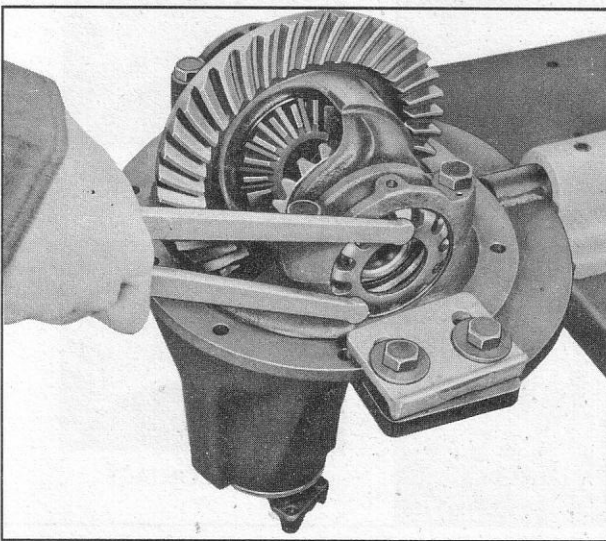


Fig. 28—Adjusting Ring Gear and Pinion

4. Mount a dial indicator on the carrier and check the back lash (fig. 29), between the ring gear and pinion. The back lash should be from .005"-.008".

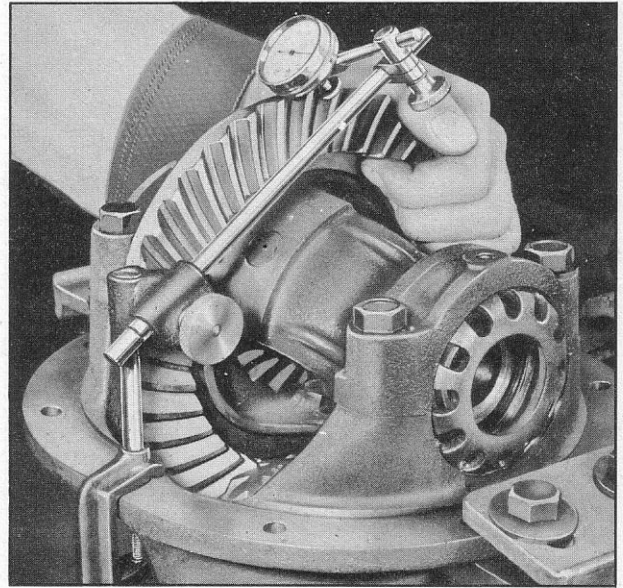


Fig. 29—Checking Ring Gear and Pinion Backlash

NOTE: If back lash is more than .008" loosen right hand adjusting nut one notch and tighten left hand adjusting nut one notch. If back lash is less than .005" loosen left hand adjusting nut one notch and tighten right hand adjusting nut one notch.

5. Tighten bearing cap bolts to 65-80 ft. lbs. Recheck back lash and install both adjusting nut locks.

Ring Gear and Pinion Contact Pattern

It is very important that tooth contact be tested before differential carrier assembly is installed. Allowable variations in the carrier or rear pinion may cause pinion to be too far in or out even when shimmed properly. Thus, tooth contact must be tested and corrected as necessary or the gears may be noisy. This test may be performed as follows with the carrier assembly mounted in the holding fixture.

1. Thoroughly clean the ring gear and pinion teeth.
2. Paint ring gear teeth lightly and evenly with red lead and oil of a suitable consistency to produce a contact pattern.
3. Place a 1 1/8" deep socket on the companion flange nut and grasp firmly with a cloth to form a friction brake.
4. Using a 3/16" box wrench on the ring gear bolts, rock the ring gear back and forth, shifting bolt heads to develop a contact pattern on the teeth of the ring gear (fig. 30).

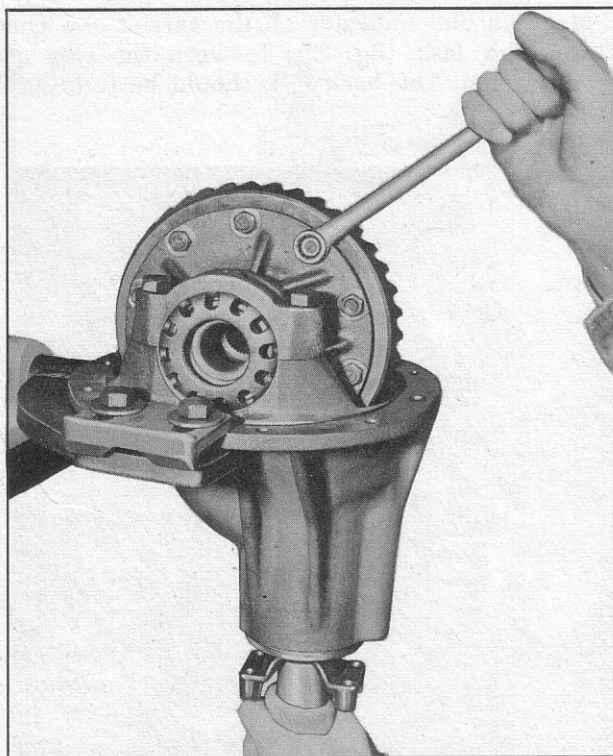


Fig. 30—Developing Tooth Pattern

Inspect the contact pattern produced by the above procedure. Figure 31 shows the terminology used in analyzing contact patterns.

The large end of the tooth is called the "heel" and the small end the "toe." Also, the top of the tooth, which is the part above the pitch line, is called the "face," while the part below the pitch line is called the "flank." The space between the meshed teeth is referred to as "backlash."

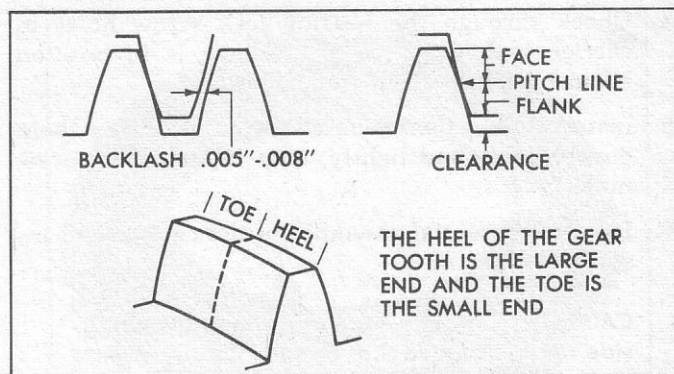


Fig. 31—Gear Tooth Nomenclature

Figure 32 shows correct and incorrect contact patterns. For illustrative purposes, "coast" side of gear contact is shown. Drive and coast side of gear teeth will have identical contact patterns.

Tooth pattern "A" provides the ideal bearing for quietness and long life. If the pattern shows a toe contact "B," it indicates not enough backlash. To correct, move the ring gear away from the pinion by loosening left-hand differential adjusting nut and tightening right-hand adjusting nut.

NOTE: Make adjustment one notch at a time, repeat check with red lead and continue adjustment until tooth contact appears as in "A." Backlash must remain within limits.

If the pattern shows a heel contact "C," it indicates too much backlash. Make correction as for "B," however, loosen right hand differential adjusting nut and tighten left hand adjusting nut to move ring gear toward pinion. Backlash must remain within limits.

If the pattern shows a high face contact "D," it in-

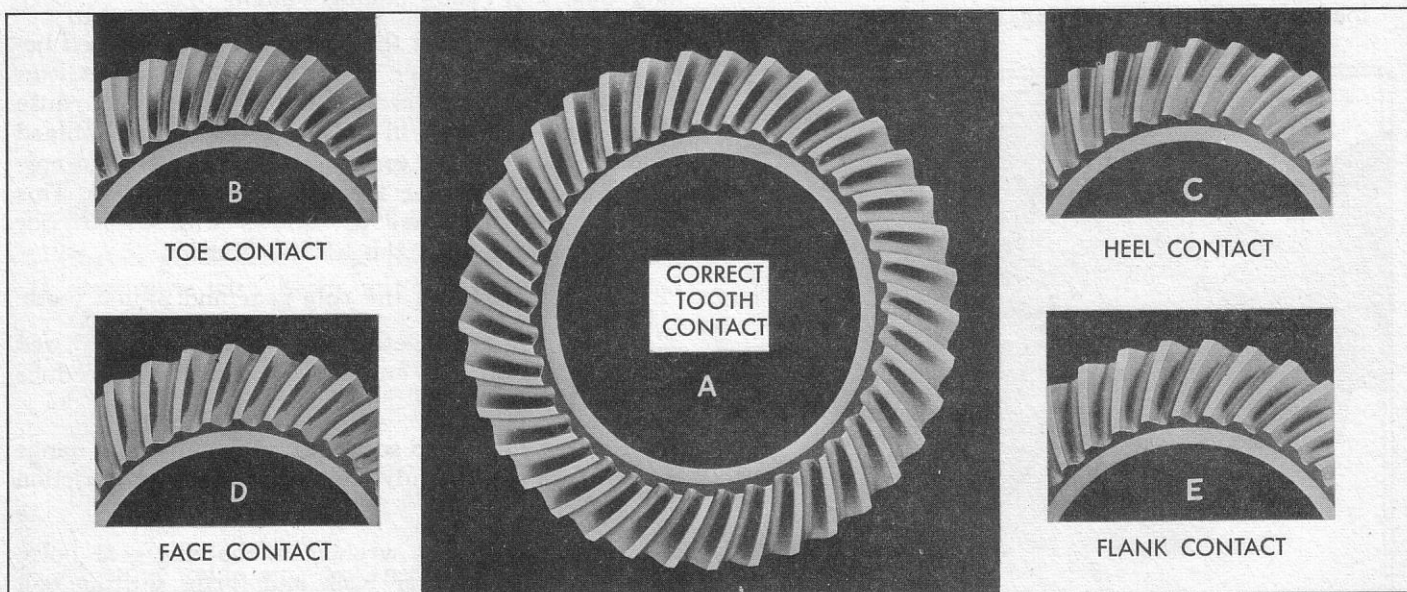


Fig. 32—Gear Teeth Contact Patterns

icates that the pinion is too far out, that is too far toward the front of the car.

To correct a pattern such as in "D," it will be necessary to install a thicker pinion shim. A .003" thicker shim is recommended as a starting point. Continued changes may be necessary to obtain the correct setting.

If the pattern shows a flank contact "E," it indicates that the pinion is in too far. To correct, replace the pinion shim with one .003" thinner and recheck contact pattern. Other changes may be necessary to obtain the correct pattern.

In making pinion adjustments, be sure backlash is correct before retesting with red lead for tooth pattern. Moving the pinion in reduces backlash and moving it out increases it.

NOTE: When proper tooth contact is obtained, wipe red lead from gears and carrier with cloth moistened in clean solvent.

Pour a liberal quantity of rear axle lubricant on gear and bearing and turn gears to work lubricant into all surfaces.

Installation

1. Clean out axle housing and cover and place new gasket over carrier mounting bolts.
2. Assemble differential carrier assembly to axle housing, install lockwashers and nuts and tighten securely.
3. Lubricate hubs of differential side gears with hypoid lubricant and install them into differential case.
4. Install axle shafts, making sure the longer shaft is used on the right hand side and install "C" shaped axle shaft locks.
5. Spread shafts to make sure that the shafts, locks and differential side gears are in positive contact.
6. Install axle shaft spacer in place and assemble pinion shaft and lockscrew.
7. Replace rear cover using new gasket and refill differential to filler hole level.
8. Replace brake drum and wheels, propeller shaft and lower vehicle. Road test for noise and operation.

REAR AXLE 1956-1962

GENERAL DESCRIPTION

The design and service operations of the 1956-1962 Corvette carrier assembly are the same as outlined in the 1961 Passenger Car Shop Manual, Section 5,

Page 1-16. For removal of the rear axle assembly from the vehicle, refer to *Rear Axle 1953-1955*, preceding sub-section.

POSITRACTION

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GENERAL DESCRIPTION

The Positraction unit used on the 1957-1962 Corvettes is a multi-plate, four pinion unit which provides controlled driving power to the wheel with best

traction. Two types of plate stack-up were used: 1957 through early 1960, four-plate; late 1960 through 1962, five-plate with Belleville.

SERVICE OPERATIONS

Removal

Refer to the 1961 Passenger Shop Manual, Section 5-7 for carrier removal.

Disassembly

Before disassembly, check the clearance between the pinion mate shaft "V" and the cam surface in the case. This must be done using shim stock or feeler gauges under both sides of the "V" on both ends of the pinion mate shaft at the same time. Note that this involves placing feeler gauges at four positions (Fig. 34). As closely as possible, the same thickness feeler gauge must be used at all four positions. The clearance of the maximum feeler thickness at each of the four positions on original 1957 to 1959 units without Belleville plate should not exceed .015" (Fig. 35). Both pinion mate shafts must be checked in this manner.

NOTE: On 1957 to 1959 units with Belleville conversion, and on all 1960 units, there should be no clearance (metal to metal).

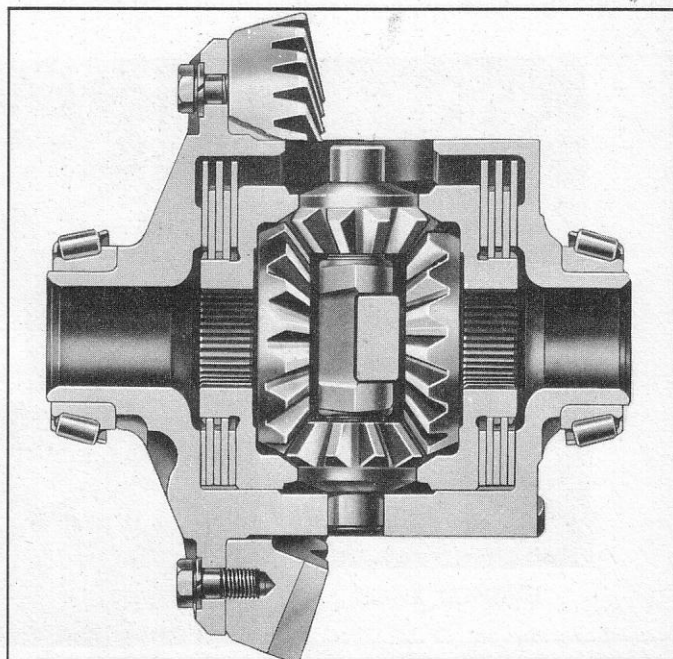


Fig. 33—Positraction Differential—Cross-Section—1960-1962



Fig. 34—Checking Shaft and Ramp Clearance

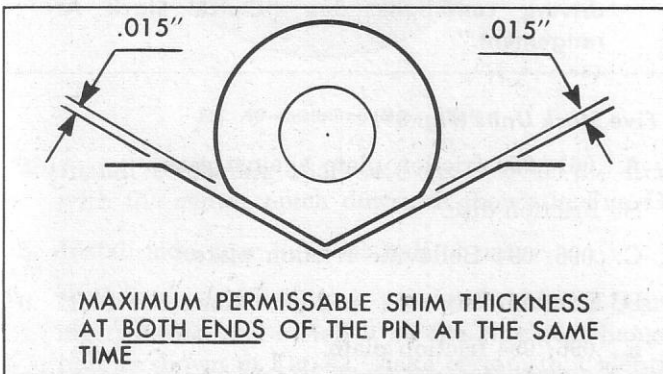


Fig. 35—Pinion Shaft Clearance

If a clearance of more than .015" on 1957, 1958 and 1959 units without Belleville (dished) plate, or zero on converted and 1960 units is found, the unit should be disassembled as follows:

NOTE: If clearance is found to be excessive on the 1957 to 1959 original units, installation of the Belleville plate conversion is suggested.

1. Check that the differential case halves are marked with a number or letter to aid aligning the case when assembling. If not, scribe an alignment mark as shown in Fig. 36.
2. With unit on bench, remove eight bolts securing the end case to the ring gear case.

NOTE: Bolts used to assemble 1960 units with the number 22159X or 22158X stamped on end case are left hand thread. All others are right hand.

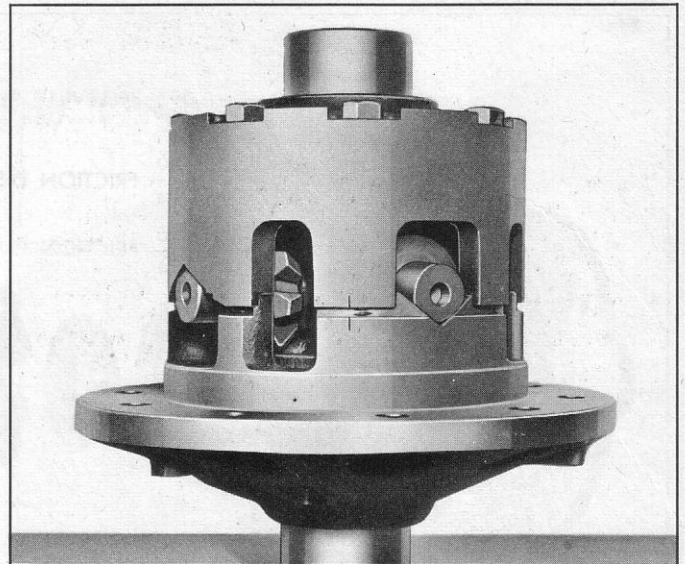


Fig. 36—Differential Case Alignment Marks

3. Remove end case.
4. Remove clutch plates from side gear retainer and note the relation of these clutch plates.
5. Remove side gear retainer and side gear.
6. Remove pinion mate shafts and gears.
7. Remove remaining side gear, side gear retainer and clutch plates.

Cleaning and Inspection

All parts, before reassembly, must be clean and free from all foreign substance. All parts must be inspected. See that there are no worn, cracked or distorted clutch plates. All parts must be free of nicks, burrs, or any imperfections that will reduce the efficiency of operation of this unit. Lubricate all parts before assembly, using the special lubricant.

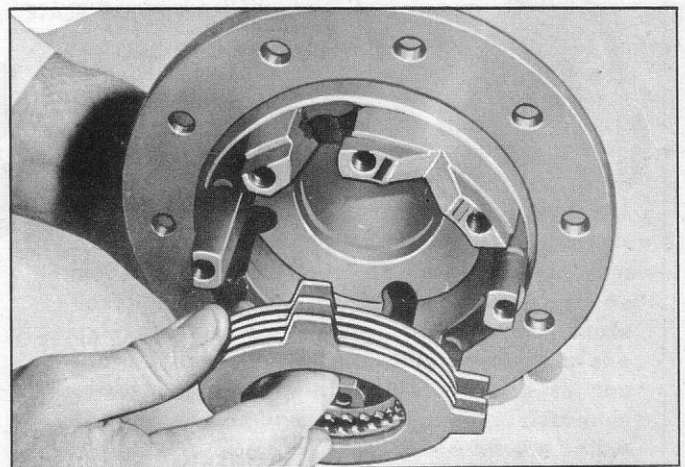


Fig. 37—Installing Clutch Plates

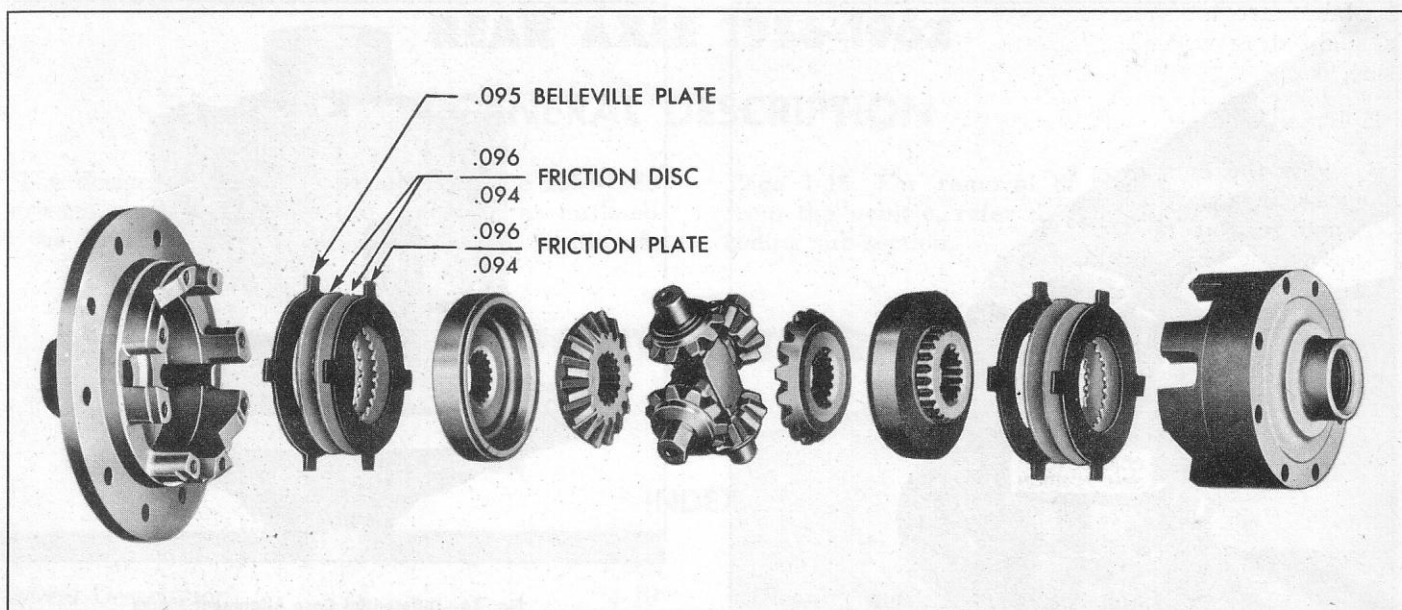


Fig. 38—Four Stack Plate Arrangement

Assembly

1. Hold ring gear half of case on its side, Fig. 37. Install side gear retainer and clutch plates as follows.

NOTE: Clutch stack may be varied for certain driving conditions. See "Clutch Stack Arrangement."

Four Stack Units With Belleville Plate (Fig. 38)

- A. Belleville type (dished) plate, positioned so concave side rests against case.
- B. Two internally splined plates.
- C. Eared clutch plate (flat plate) against side gear ring.

Five Stack Units (Fig. 39)

- A. .061/.059 friction plate against case.
- B. Friction disc.
- C. .096/.094 Belleville friction plate.
- D. Friction disc.
- E. .096/.094 friction plate.

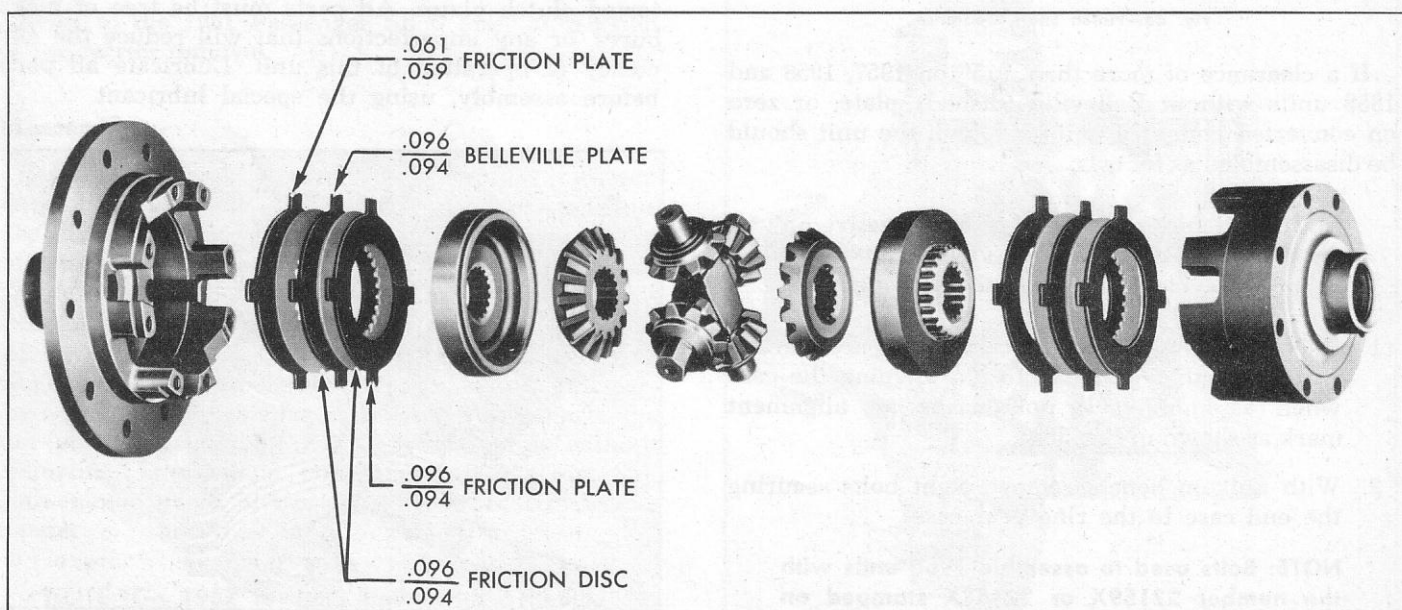


Fig. 39—Five Stack Plate Arrangement

Make sure the side gear retainer will rotate with a slight drag when in the case. Repeat for opposite side.

2. Install side gear on ring gear case half.
3. With the ring gear case half of the differential case in a vertical position, install one mate shaft and gears as shown in Fig. 40. Make certain that notch in shaft is up, and shaft is 90° from "V" notches in case.

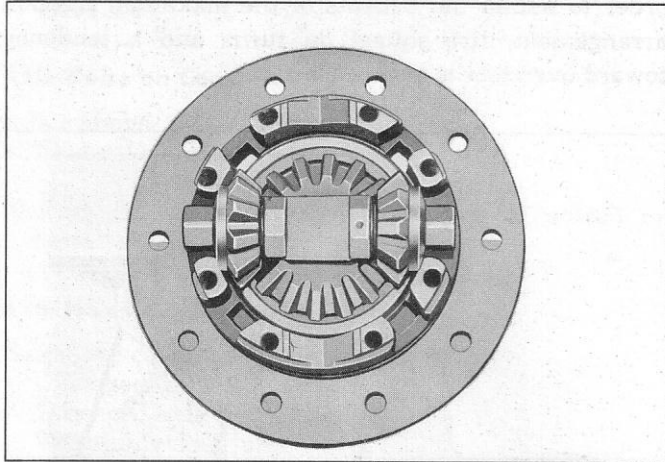


Fig. 40—Installing Mate Shaft

4. Install remaining shaft and gears over the first with the center notch down, as shown in Fig. 41.
5. Install side gear in other half of case.
6. Hold the remaining end case through the bearing trunnion and install it on the ring gear flange half as shown in Fig. 42. Make certain that identification marks are in alignment.
7. Tighten eight attaching bolts evenly to 35-45 foot-pounds torque to avoid distortion to case assembly. On some units, it will be necessary to turn bolts until bolt head flats are tangent to O.D. of case (Fig. 34) in order to install ring gear.
8. Check the clearance between each pinion mate shaft and the "V" of the case as follows:

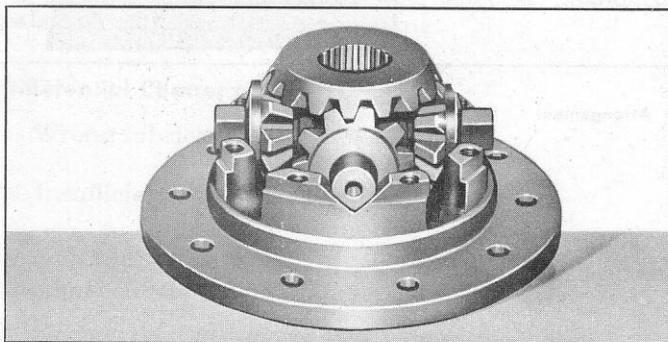


Fig. 41—Pinion and Side Gear Installation

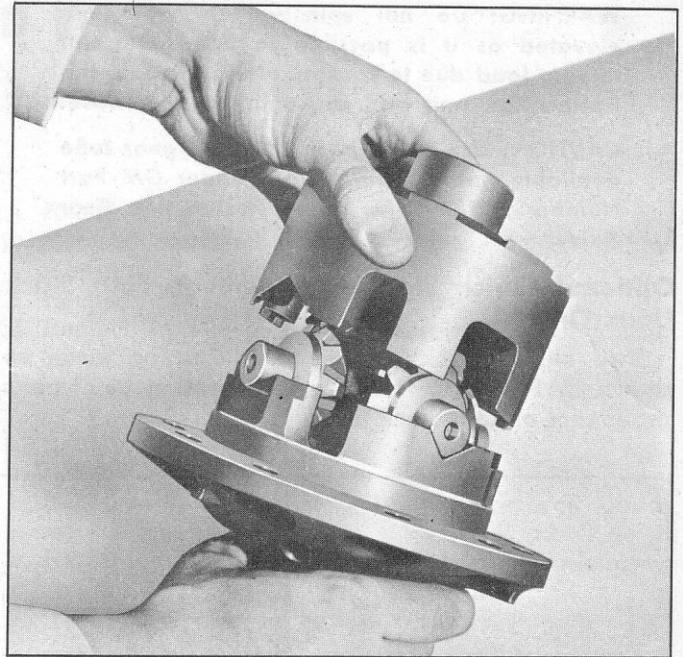


Fig. 42—Installing Differential Case Cover

Converted units and 1960 production units require a "no clearance" metal to metal contact between mate shafts and case "V" notches.

If clearance exists in these units, disassemble and check friction plates and discs for correct thickness and position. Also examine cases and internally splined drums for excessive wear.

9. Check for clutch plate freedom on each side by using a discarded and cut-off axle shaft. The shaft should turn firmly but should not lock.

Installation

1. Install the Positraction differential with the ring gear and bearings assembled as outlined in Section 5 of the 1961 Manual.
2. Use the same instructions and specifications for ring gear bolts, bearing cap bolts, backlash, and bearing preload as used for the standard differential.
3. Install axle shafts.

NOTE: Make sure the spline end of the axle shaft does not interfere with the pinion mate shafts. This is best determined by measurement. Use a steel tape, and with the aid of a flashlight, measure from the bottom of the axle shaft bearing bore to the pinion mate shafts. Then measure the axle shafts from the corresponding point of the bearing to the end of the spline. The minimum clearance required is $\frac{1}{8}$ of an inch. Grind off the spline end of the axle shaft if it is too long. Check the other axle shaft in the same manner.

WARNING: Do not spin wheels with one elevated as it is possible to have sufficient driving load due to friction, etc. to actuate the Positraction unit and cause the car to move.

CAUTION: Use only Special Hypoid gear lube available through parts stock under GM Part Number 3758791 for filling Positraction Rear Axles.

Optional Clutch Stack Arrangement—Four Stack Units Only

Two clutch stack arrangements can be made as shown in Fig. 43 to tailor axle operation to owner's preference on four stack units.

For general service, the arrangement used in production, with the two internally splined plates placed between the externally tapered plate and the Belleville plate (Belleville plate against case), provides ample traction. In cases where the owner desires maximum traction for off-highway operation or heavy duty operation, the clutch plates should be stacked alternately starting with an internally splined friction disc against the differential case, followed by the Belleville plate. However, owners should be cautioned that in order to obtain the benefits of the maximum traction arrangement, tire squeal on turns and a tendency toward oversteer is to be expected.

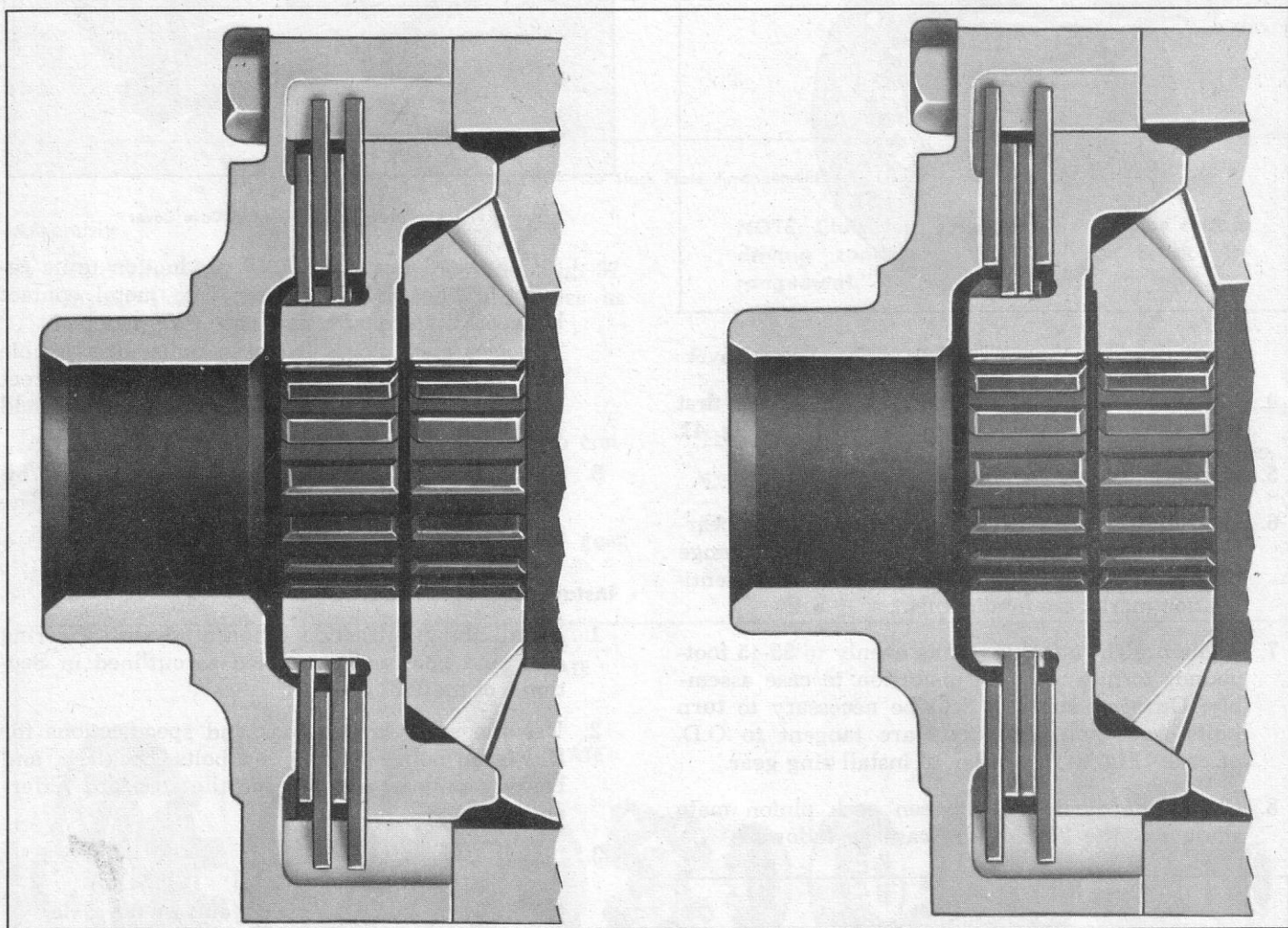


Fig. 43—Clutch Stack Arrangement

TROUBLES AND REMEDIES

Complaint & Probable Cause

Probable Remedy

Axle Noise on Drive

- a. Ring gear and pinion backlash improperly adjusted.
- b. Pinion bearings damaged.
- c. Pinion mounting distance off.
- d. Ring gear and pinion badly worn or scored on drive side.

- a. Readjust backlash.
- b. Replace damaged pinion bearings, recheck pinion mounting distance.
- c. Recheck pinion mounting distance.
- d. Replace hypoid gear set, recheck pinion mounting distance.

Axle Noise on Coast

- a. b, c above.
- a. Excessive end play in pinion.
- b. Ring gear and pinion badly worn or scored on coast side.

- a, b, c above.
- a. Replace damaged pinion bearing, recheck pinion mounting distance.
- b. Replace hypoid gear set, recheck pinion mounting distance.

Axle Noise on Drive and Coast

See above causes.

- a. Damaged differential bearings.
- b. Damaged axle shaft bearings.
- c. Worn universal joint.
- d. Ring gear loose on differential case.

Correct as noted above.

- a. Replace damaged bearing.
- b. Replace damaged bearing.
- c. Repair universal joint.
- d. Replace and torque ring gear bolts.

Axle Noise on Turns.

- a. Damaged differential gears.
- b. Damaged axle shaft bearings.

- a. Inspect and replace differential gears.
- b. Replace damaged bearings.

Excessive Backlash in Drive Train

- a. Loose wheel hub nuts.
- b. Worn universal joints.
- c. Damaged or loose companion flange splines.
- d. Excessive hypoid backlash.
- e. Excessively worn differential gears and/or case.
- f. Worn or damaged axle shaft or differential side gear splines.

- a. Retighten or replace as necessary.
- b. Overhaul defective universal joint.
- c. Replace companion flange, check pinion splines.
- d. Readjust backlash or replace gear set if damaged.
- e. Replace damaged gears and/or case.
- f. Replace as necessary.

Positraction

Trouble diagnosis and remedies pertaining to Positraction equipped axles are the same as standard axles in addition to the following:

Differential Chatter on Turns

- a. Wrong lubricant.
- b. Insufficient clutch pack clearance.

- a. Clean carrier and refill with recommended Positraction lubricant.
- b. Check clutch plates for proper arrangement and stack-up.

Improper Traction Under One-Wheel Slip Conditions

- a. No traction on excessively slippery surface.
- b. No traction on moderately slippery surface.

- a. Lightly apply hand brake.
- b. Inspect clutch plates for damage or excessive wear.

PROPELLER SHAFT AND UNIVERSAL JOINTS

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GENERAL DESCRIPTION

The one-piece propeller shaft contains two exposed cardon type universal joints equipped with lubrication fittings. Driveline angles are not adjustable as the

pinion angle is determined by the spring pad location on the axle housing, and no provisions are necessary for adjustments.

MAINTENANCE AND ADJUSTMENTS

UNIVERSAL JOINTS

The two universal joint trunnions incorporate lubrication fittings for regular servicing. Refer to Lubrica-

tion—Section 0 for service periodic maintenance information.

SERVICE OPERATIONS

PROPELLER SHAFTS

Removal

1. Raise vehicle and disconnect the rear universal joint by removing trunnion bearing U-bolts. Tape bearing cups to trunnion to prevent dropping and loss of bearing rollers.
2. Withdraw propeller shaft front yoke from transmission by moving propeller shaft rearward and to the left, passing it under the axle housing. Watch for oil leakage from transmission output shaft housing.

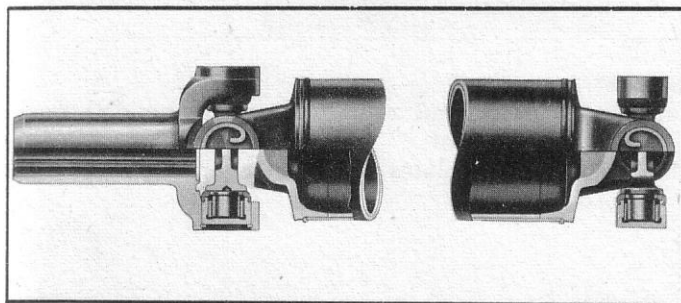


Fig. 44—Propeller Shaft—Cross-Section

Repairs

1. Remove bearing lockring from trunnion yoke.

NOTE: Locking type snapping pliers may be used to better retain snapping during removal.

2. Support trunnion yoke on a piece of 1¼" pipe on arbor press bed.
3. Using suitable socket or rod, press trunnion down far enough to drive opposite bearing cup from yoke (fig. 45).
4. Remove trunnion and press other bearing cup from yoke, being careful not to drop cup or lose bearing rollers.
5. Remove trunnion and yoke from other joint in a similar manner.
6. Clean and inspect bearing rollers and trunnion. Relubricate with an extreme pressure lithium soap grease.
7. Partially install one bearing cup into yoke. Place trunnion in yoke and into bearing cup. Install other bearing cup and press both bearing cups

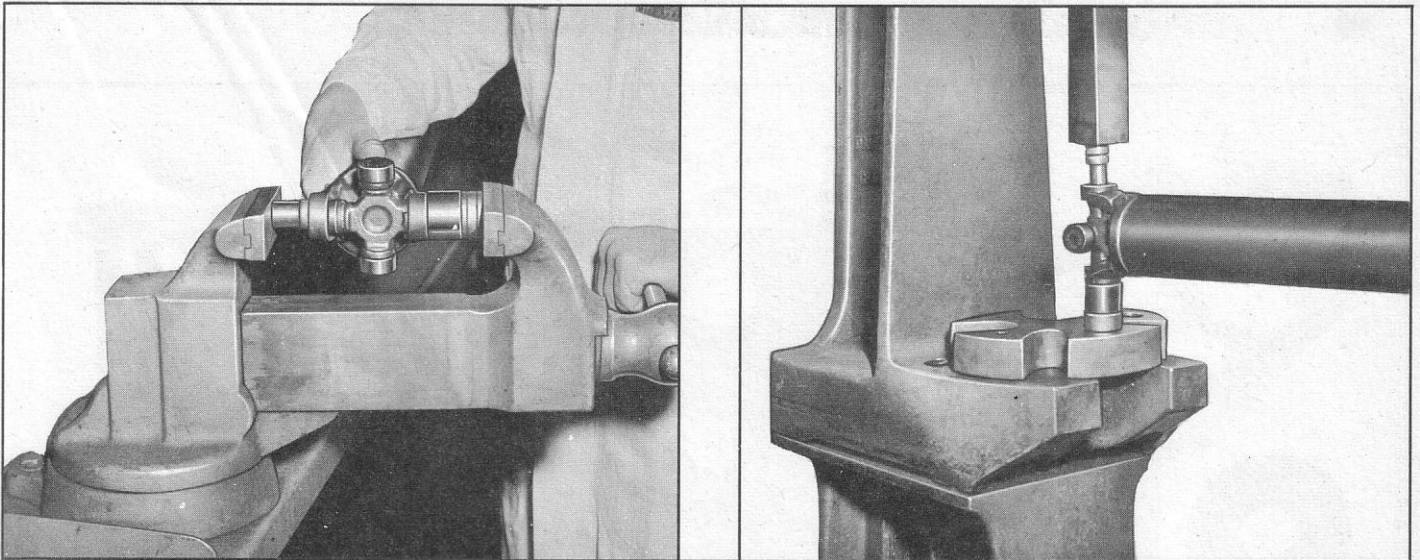


Fig. 45—Removing Bearing Cup

into yoke, being careful to keep trunnion aligned in bearing cups (fig. 46).

8. Press bearing cups far enough to install lockrings, and install lockrings.

NOTE: Due to the length of the propeller shaft it may be more convenient, if necessary, to use a bench vise for removal and installation, instead of an arbor press. In this case, proceed with disassembly and assembly procedure as with an arbor press.

Installation

1. Inspect yoke seal in the transmission and replace, if necessary, as described in the transmission section.
2. Insert propeller shaft front yoke into transmission.
3. Connect the rear universal joint by installing U-bolt clamps over bearing trunnions, and torque 15-20 ft. lbs.
4. Lower vehicle and road check.

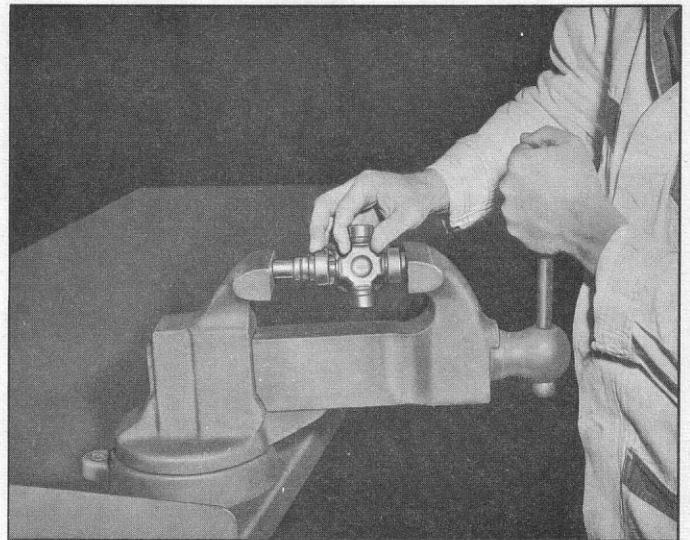


Fig. 46—Installing Bearing Cups and Trunnion—Vise

SPECIAL TOOLS

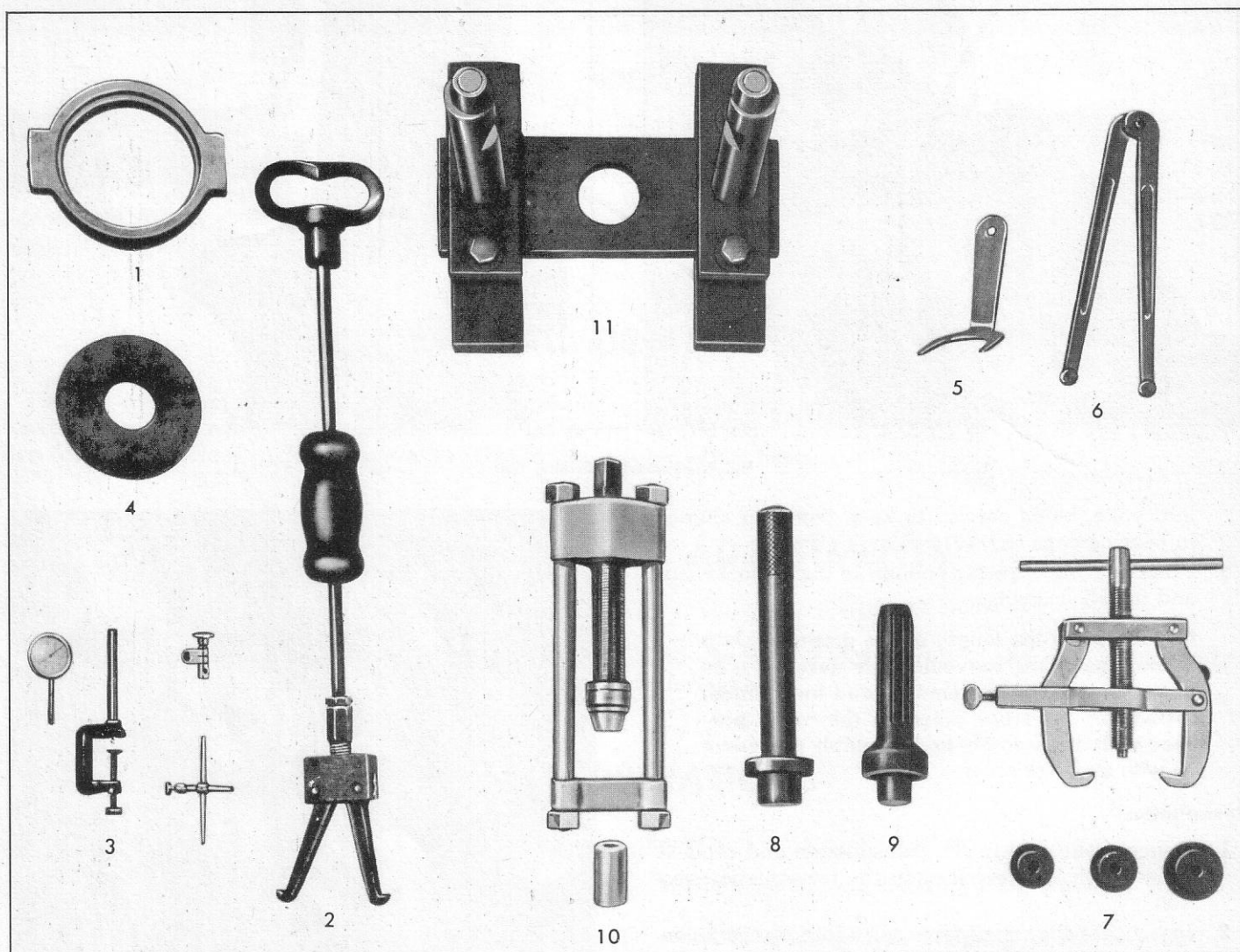


Fig. 47—Rear Suspension and Drive Line Tools

1. Plate Holder—J-358
2. Rear Axle Shaft Bearing and Oil Seal Remover—J-1436
3. Dial Indicator and Attachments—J-8001
4. Pinion Outer Bearing Remover—J-996
5. Pinion Shaft Rear Bearing Spacer—J-4050
6. Differential Adjusting Wrench—J-972

7. Differential Side Bearing Puller Set—J-8107
8. Differential Side Bearing Replacer—J-994
9. Axle Shaft Bearing and Oil Seal Replacer J-8209 and Handle—J-872-5
10. Rear Spring Front Bushing Remover and Installer—J-136-A
11. Hub Bolt Peening Tool and Anvil—J-554

