SECTION 6C
REAR AXLE

CONTENTS OF THIS SECTION

CORVAIR—500, 700 AND 900 SERIES

INDEX

GENERAL DESCRIPTION

The "Corvair" rear axle is of the straddle mounted hypoid gear type which embodies a differential carrier mounted rigidly to the engine; no rear axle housing is used (figs. 1 and 2). Independently suspended axle shafts are attached to universal joints which, in turn, are splined into the differential side gears. Axle driving torque is transmitted by the lower control arms and lateral forces are absorbed by the wheel bearings and rubber bushings at the lower control arm attachment to the rear crossmember.

A hollow shaft is used with the drive pinion to permit passage of the engine output shaft forward to the

transmission. To permit the axial hole in the pinion shaft, the drive pinion and gear are two pieces coupled by a shrink fit. Currently, the pinion gear and shaft are serviced only as an assembly. The drive pinion shaft is directly connected to the transmission output member. Preloaded tapered roller bearings support the drive pinion at fore and aft locations in the differential carrier. The hypoid ring gear is bolted to the differential case which is mounted by preloaded tapered roller bearings on each side of the differential carrier.

Components of the differential assembly are conventional with the exception of the side gears which have integral elongated splined hubs which project to the outboard extremity of the differential case and cover to receive the axle shaft universal joints.

Axle ratios of 3.27-to-1 are used as standard with three speed, four speed and automatic transmissions through application of an eleven tooth pinion and 36 tooth ring gear. All transmissions can be used with the optional 3-55-to-1 ratio provided by a 9-32 tooth combination pinion and ring gear.

The speedometer drive gear is now pressed onto the drive pinion shaft as compared to the integral gear which was machined into the pinion shaft in 1960. Service replacement drive pinions will have the speedometer drive gear installed in production. The nylon driven gear is mounted in the differential carrier.

Rear axle assemblies used with three or four speed transmissions and those used with automatic transmissions have fundamental differences in lubrication, drive pinion design, and mounting hub provisions for the clutch release bearing or converter stator, respectively.

Lubricant requirements for the manual transmissions and rear axle are identical. Therefore, when this driveline is used, the lubricant, Multipurpose Lubricant SAE 80, cycles between the axle and transmission. Although the lubricant is common, individual filler plugs are provided in both the axle and transmission as a lubricant dam is formed between the two units which prohibits a common sump.

Automatic transmission rear axles are sealed to prevent axle lubricant from entering the transmission. The automatic transmission rear axle uses Multipurpose Lubricant SAE 80 whereas the automatic transmission requires Automatic Transmission Fluid, Type "A," common in most automatic transmissions.

Drive pinion design for the two rear axle assemblies varies mostly in overall length, splining for adaptation to the transmission, and sealing. The manual transmission axle pinion shaft extends forward only to the pinion bearing adjusting sleeve and is internally splined to receive the transmission output shaft. On automatic transmission versions, the pinion shaft extends forward beyond the pinion bearing adjusting sleeve and is externally splined to index with the transmission planetary carrier. A seal is mounted in the pinion bearing adjusting sleeve to prevent lubricant from transferring between the rear axle and automatic transmission.

Because of its location between the engine and transmission, the "Corvair" rear axle provides mounting elements usually incorporated on the transmission in conventional designs. On manual transmission models, the rear of the differential carrier mounts the shaft for the clutch release bearing whereas a stator shaft for the converter is carried by the automatic transmission rear axle. The clutch release bearing shaft has a lip seal in the inner diameter to prevent lubricant from flowing rearward onto the clutch. The stator shaft is externally splined and lip-type seals are used at the contact of the pinion shaft and the inside diameter of the stator shaft to prevent transfer of lubricants. A converter hub seal is mounted in the differential carrier adjacent to the stator shaft to prevent loss of automatic transmission fluid. Both the clutch release bearing shaft and the stator shaft use an "O" ring seal at their mating surface with the differential carrier.

PERIODIC MAINTENANCE

LUBRICANT

Differential Carrier

The rear axle lubricant should be checked each 1000 miles and replenished as necessary with Multi-purpose Lubricant SAE 80.

Axle lubricant should be drained and replaced at the end of the first 1000 miles to eliminate any loose material from the sump which results from "break-in." After the initial 1000 drain, axle lubricant should be changed seasonally or every 10,000 miles maximum.

CAUTION: Under no circumstances should lubricant containing active sulphur be used in the "Corvair" axle.

Universal Joints

Universal joints should be disassembled, inspected, and repacked every 25,000 miles or oftener unless under extreme dust conditions.

HUB NUTS

For safety's sake, the four wheel mounting nuts should be periodically checked for tightness.

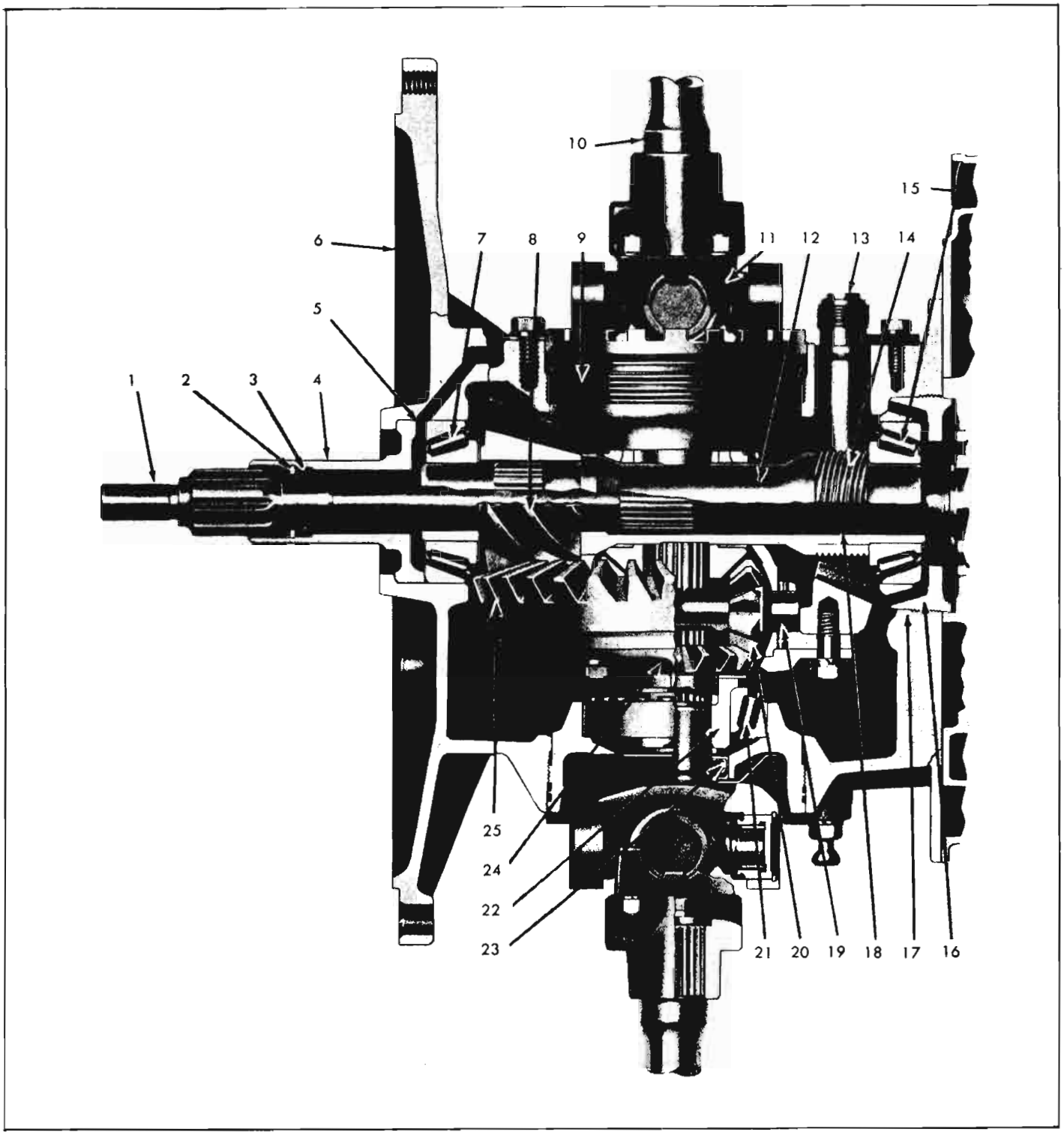

Fig. 6C-1—Manual Transmission Rear Axle—Sectional Plan View

1. Clutch Shaft (Transmission Input)
2. Washer
3. Clutch Release Bearing Shaft Inner Seal
4. Clutch Release Bearing Shaft
5. Clutch Release Bearing Shaft Outer Seal
6. Differential Carrier
7. Pinion Rear Bearing and Race
8. Pinion Gear
9. Differential Side Bearing Adjusting Sleeve
10. Axle Shaft
11. Universal Joint
12. Pinion Shaft
13. Speedometer Driven Gear Assembly
14. Speedometer Drive Gear (Integral with Pinion Shaft)
15. Pinion Front Bearing and Race
16. Pinion Bearing Adjusting Sleeve
17. Pinion Adjusting Sleeve Seal Ring
18. Transmission Output Shaft
19. Differential Pinion Gear Shaft
20. Differential Pinion Gear
21. Differential Side Bearing and Race
22. Differential Side Gear (Short)
23. Differential Side Bearing Adjusting Sleeve Seal
24. Differential Cover
25. Ring Gear

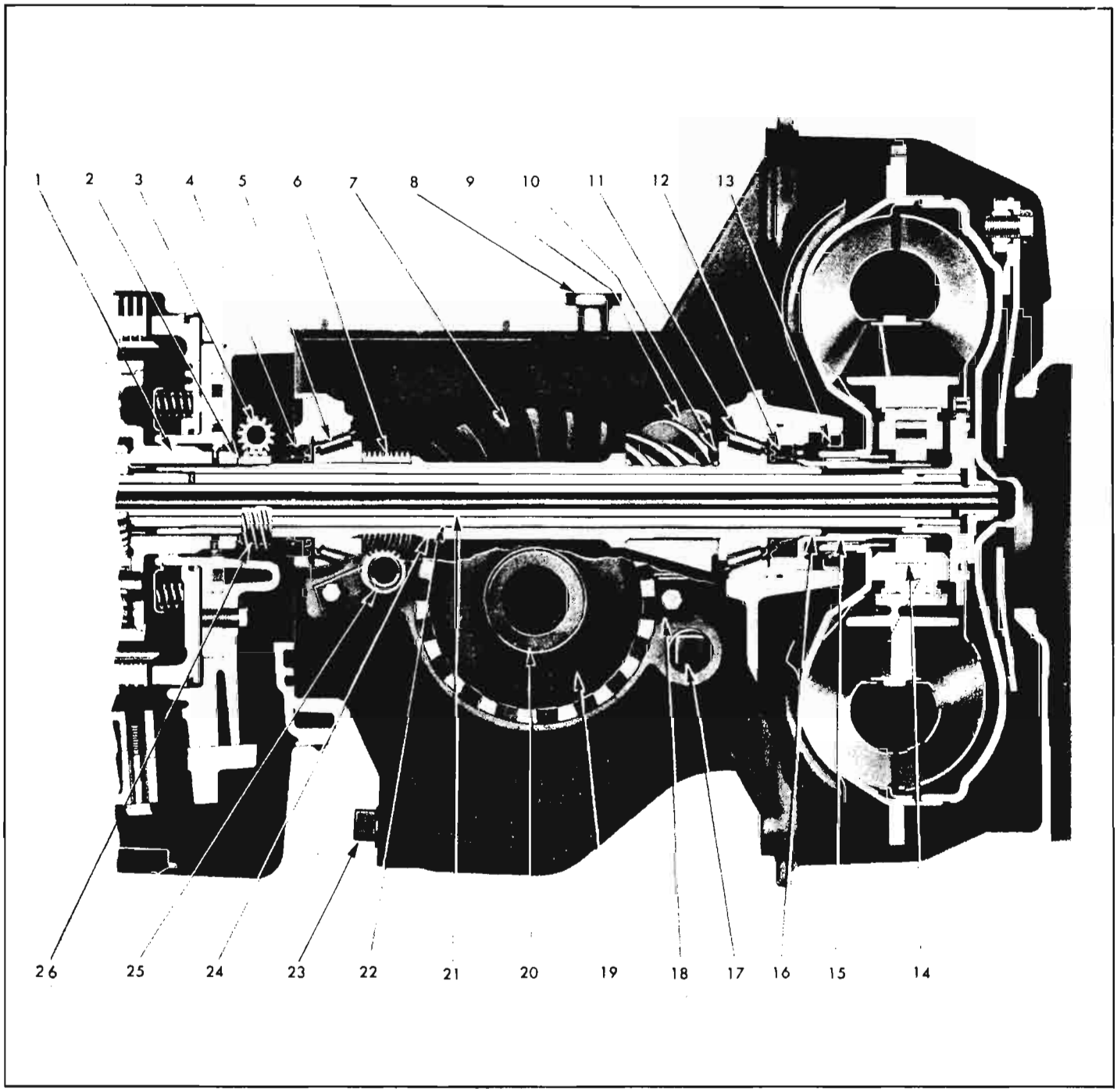

Fig. 6C-2—Automatic Transmission Rear Axle—Sectional Side View

1. Planet Carrier Hub (Transmission Output)
2. Rear Selective End Play Spacers
3. Governor Driven Gear
4. Pinion Shaft Front Seal
5. Pinion Front Bearing and Race
6. Speedometer Drive Gear
7. Ring Gear
8. Vent
9. Pinion Gear
10. Selective Pinion Depth Shim
11. Pinion Rear Bearing and Race
12. Pinian Shaft Rear Seal
13. Converter Hub Seal
14. Stator Assembly
15. Stotor Shaft
16. Pinion Shoft Seal Ring (Cast Iron)
17. Differential Carrier Filler Plug
18. Side Bearing Adjusting Sleeve Lock Tab
19. Side Bearing Adjusting Sleeve
20. Side Bearing Adjusting Sleeve Seal
21. Transmissian Front Pump Shaft
22. Transmission Turbine Shaft
23. Drain Plug
24. Pinion Shaft
25. Speedometer Driven Geor Assembly
26. Governor Drive Gear

SERVICE OPERATIONS

SERVICE REFERENCE GUIDE

Prior to starting any operation on the rear axle, check the following "Service Reference Guide" to prevent unnecessary removal of the power train from the vehicle.

The components marked *DIFFERENTIAL CARRIER IN VEHICLE* can be serviced with the rear axle main component, the differential carrier, in its installed position. Operations labeled *DIFFERENTIAL CARRIER REMOVED FROM VEHICLE* require that the power train (engine-axle-transmission) be removed from the vehicle, the transmission and axle removed from the engine, and then finally that the differential carrier be separated from the transmission in order for the repair operations to be performed.

Complete instructions for the removal, separation, assembly, and installation of the power train are carried in Section 6, "POWER TRAIN."

Differential Carrier in Vehicle

- Axle Shaft, Bearing Assembly, and Universal Joint
- Differential Side Bearing Adjusting Sleeve Seal
- Speedometer Driven Gear

Differential Carrier Removed from Vehicle

Service operations relative to all components not listed under *DIFFERENTIAL CARRIER INSTALLED IN VEHICLE* require the removal of the power train and separation of the differential carrier to perform.

DIFFERENTIAL CARRIER IN VEHICLE

AXLE SHAFT, BEARING, AND UNIVERSAL JOINT ASSEMBLY

Removal

1. Remove four nuts securing wheel and remove wheel and brake drum.
2. Remove four nuts securing axle bearing retainer to brake backing plate (fig. 6C-3). Nuts are accessible through hole in axle shaft flange.

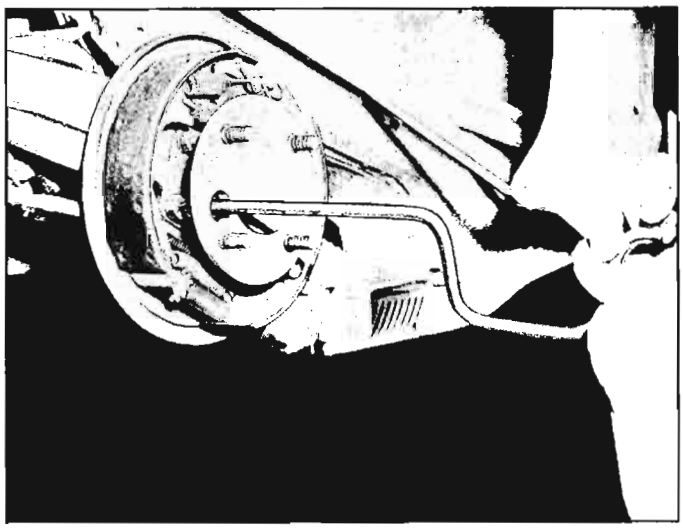

Fig. 6C-3—Removing Axle Bearing Retainer Nuts

3. Pull the brake backing plate outboard slightly then push it back onto the control arm studs to break away from the bearing retainer. The axle shaft can now be pulled outward sufficiently to free the U-joint splines from the side gears in the rear axle (fig. 6C-4).

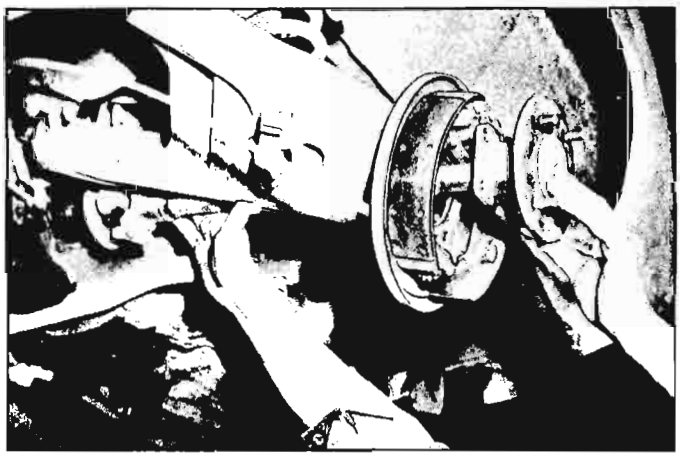

Fig. 6C-4—Disengaging U-Joint from Side Gear

4. Remove four nuts from U-bolts attaching U-joints to yoke on axle shaft and remove U-joint.
5. Remove capscrew, lockwasher, and flat washer, securing yoke to axle shaft (fig. 6C-5).

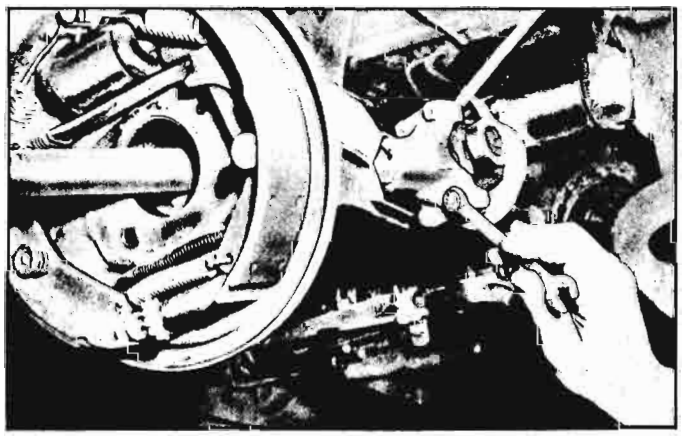

Fig. 6C-5—Removing U-Joint Clamp Nuts

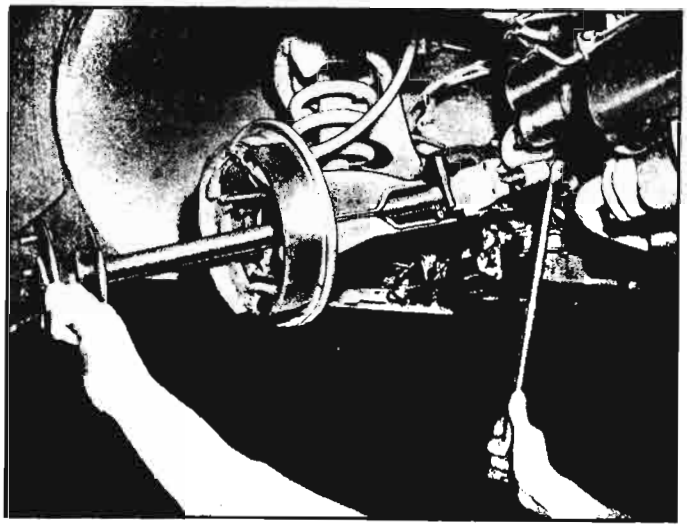

Fig. 6C-6—Removing U-Joint Yoke with J-5504

6. Remove the yoke from the axle shaft using J-5504 as illustrated (fig. 6C-6), then remove the axle shaft from the lower control arm.

Axle Shaft Bearing Replacement

1. Place axle shaft in a press with J-5741 puller plate (fig. 6C-7) **below** the puller ring (fig. 6C-8), then remove oil deflector, bearing, and puller ring. It should be noted that the reinforcing ribs of J-5741 should be upward for the removal operation.
2. To install the new bearing assembly, place a new puller ring, bearing assembly, and oil deflector on the axle shaft.
3. To prevent damaging the bearing assembly during installation of the new pieces, place the old puller ring saved in step 1 with its flat side **against** the bearing inner race and then press the puller ring and bearing assembly onto the axle using J-5741 as shown (fig. 6C-9). Remove old puller ring.
4. Install oil deflector (fig. 6C-8).

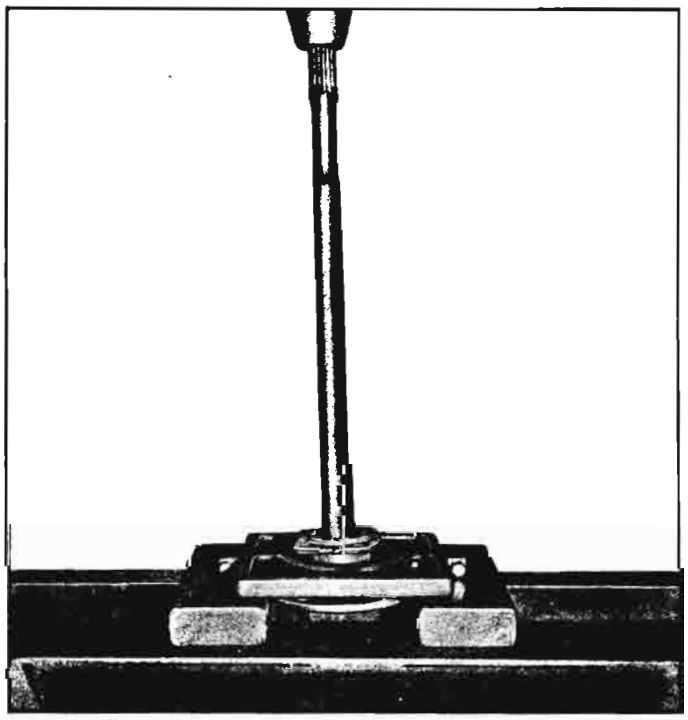

Fig. 6C-7—Removing Axle Bearing with J-5741

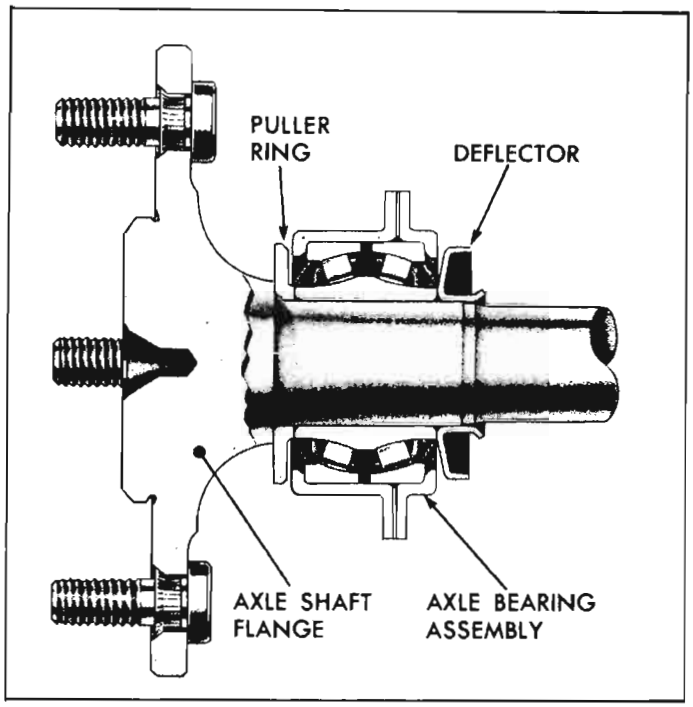

Fig. 6C-8—Axle Bearing—Sectional View

Universal Joint Overhaul

Universal joints should be disassembled, inspected and repacked every 25,000 miles.

1. Remove bearing lock ring from yoke.
2. Support shaft yoke in a bench vise.
3. Using soft drift and hammer, drive on one end of trunnion bearing just far enough to drive opposite bearing from yoke.
4. Support the other side of yoke in bench vise and drive other bearing out using brass drift on end of trunnion hub.

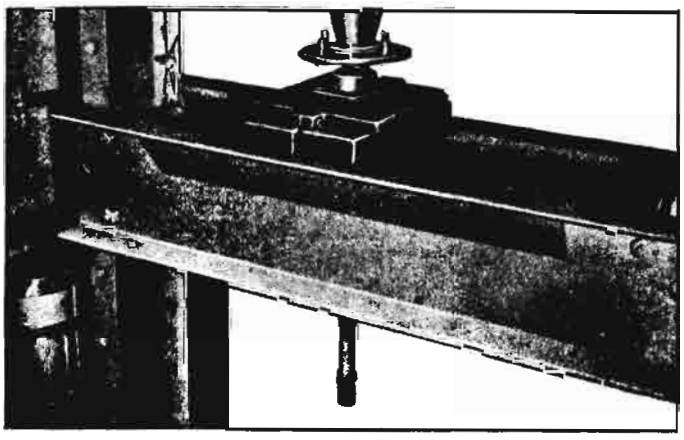

Fig. 6C-9—Installing Axle Bearing with J-5741

5. On other joints, remove trunnions from yokes in a similar manner.
6. Remove trunnion.
7. Clean and inspect bearings. Re-lubricate with a high-melting point wheel bearing type grease.
8. Replace trunnion and press new or relubricated bearings into yokes and over trunnion hubs far enough to install lock rings.
9. Hold trunnion in one hand and tap yoke lightly to seat bearings against lock rings.

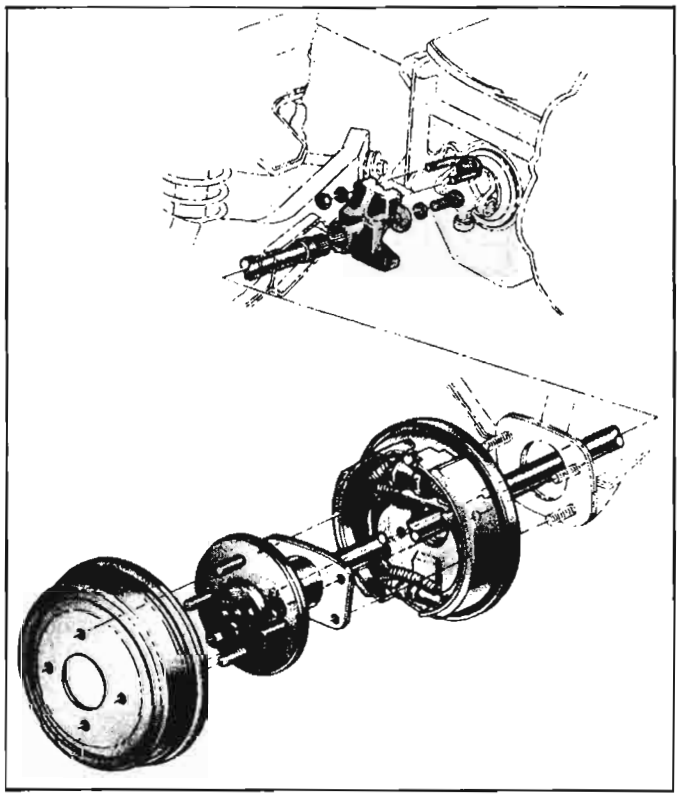

Fig. 6C-10—Axle Shaft Components—Exploded

NOTE: Figure 6C-10 shows axle component installation sequence.

Installation

1. Insert axle shaft through the lower control arm, then install U-joint yoke on splines of axle shaft. It may be necessary to lightly tap yoke onto splines if original pieces are being installed as illustrated (fig. 6C-11).

   NOTE: When assembling new pieces for the first time, it is good practice to assemble and disassemble the yoke to the axle shaft with a press to ease the assembly of the pieces in the vehicle.

   If yoke cannot be tapped onto axle shaft, install a 300M steel ⅜-16 x 1½ bolt and original flat washer in axle shaft and draw yoke onto shaft by tightening screw. When screw bottoms, replace 1½-inch bolt with 1-inch bolt and continue tightening until bolt bottoms. Then remove bolt and secure yoke to shaft with original bolt, flat washer, and lock washer.
2. Secure installation of U-joint flange to axle shaft with bolt, washer, and lock washer (fig. 6C-10).
3. Attach U-joint to yoke on axle shaft with U-bolts and nuts (fig. 6C-12).

   NOTE: Length of U-joint shafts vary; left is approximately one inch longer than the right.
4. With bearing retainer holes aligned with control arm studs, insert U-joint splines through seals in side bearing adjusting sleeves and index with splines of side gears.
5. Install four nuts to secure bearing retainer to brake backing plate via access hole in axle flange previously illustrated in Figure 6C-3. Tighten all nuts evenly and securely.
6. Position brake drum on control arm studs, install wheel, and secure wheel and drum with four wheel mounting bolts.

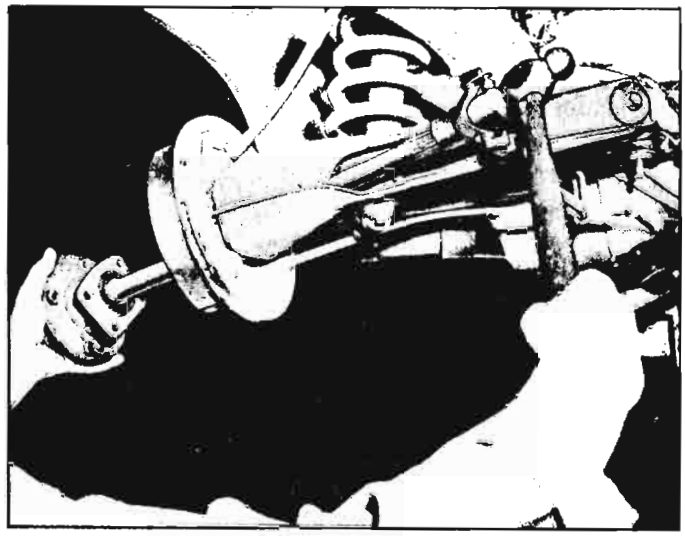

Fig. 6C-11—Installing U-Joint Yoke on Axle

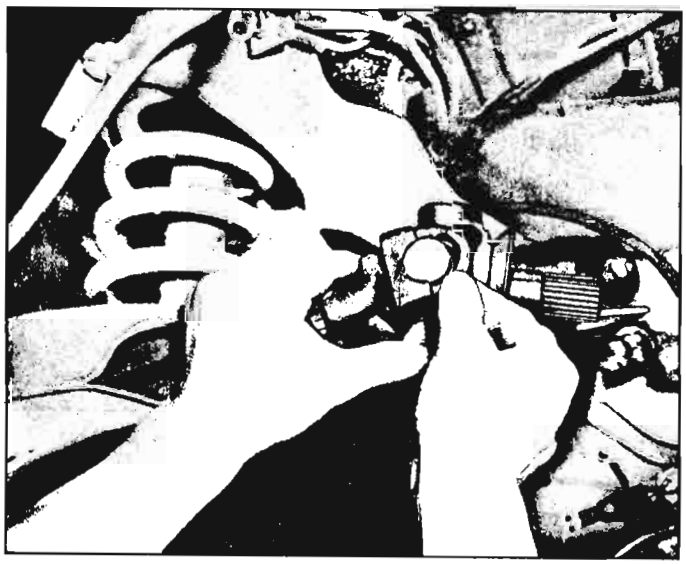

Fig. 6C-12—Installing U-Joint to Yoke on Axle Shaft

SIDE BEARING ADJUSTING SLEEVE SEAL REPLACEMENT

The side bearing adjusting sleeve seal may be replaced while installed in the vehicle as follows:

1. Remove the universal joint from the side bearing adjusting sleeve as described previously in this Section.
2. Pry out original seal, then install new seal using any flat object as a driver as the seal mounts flush. Seal lips must be inward.

SPEEDOMETER DRIVEN GEAR ASSEMBLY REPLACEMENT

Disconnect the speedometer cable from the driven gear assembly, remove bolt securing locking tabs, and remove driven gear assembly from carrier. Install new unit in reverse order.

DIFFERENTIAL CARRIER—REMOVAL AND INSTALLATION FROM VEHICLE

For removal and installation procedures for the differential carrier refer to Section 6, "Power Train."

DIFFERENTIAL CARRIER REMOVED FROM VEHICLE

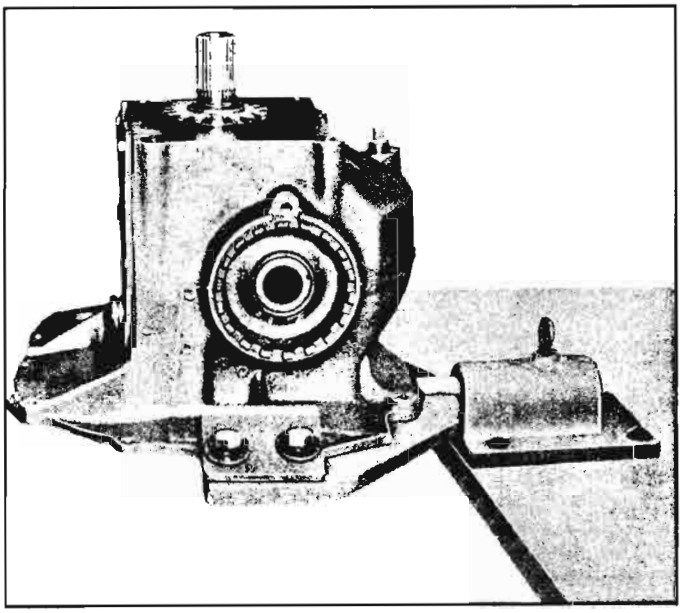

Fig. 6C-13—Differential Carrier in J-3289-01 Fixture

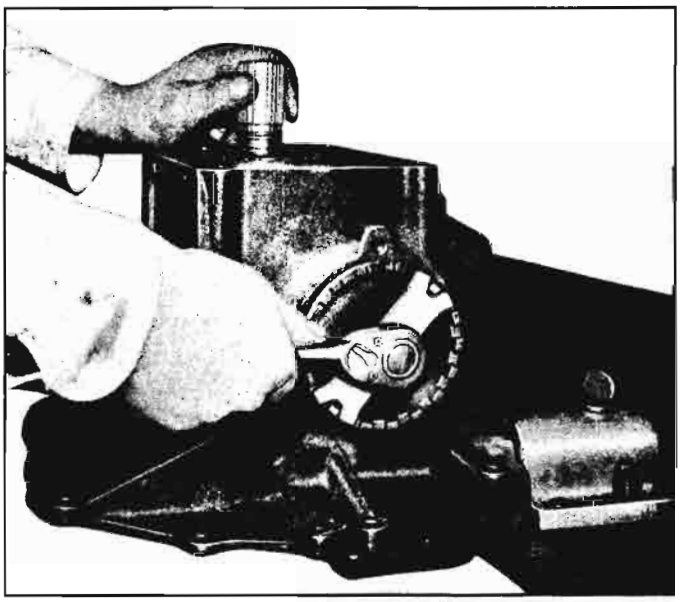

Fig. 6C-14—Removing Side Bearing Adjusting Sleeve with J-8342

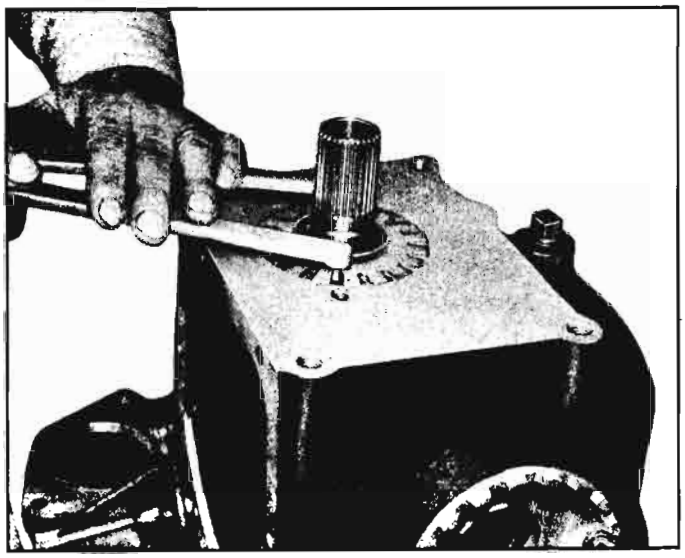

Fig. 6C-15—Removing Pinion Adjusting Sleeve with J-972

DIFFERENTIAL CARRIER DISASSEMBLY

1. If the differential carrier has not been drained, remove the drain plug.
2. Mount differential carrier in holding fixture J-3289-01 as illustrated in Figure 6C-13.
3. Loosen locking tab and remove speedometer driven gear assembly.
4. Remove six bolts and external tooth lockwashers attaching the cover to the differential carrier. Remove cover and gasket.
5. Remove cap screw securing locking tab to differential side gear adjusting sleeves and then remove adjusting sleeve using J-8342 (fig. 6C-14).
6. To remove pinion adjusting sleeve, first remove locking tab and then unscrew the adjusting sleeve using J-972 as illustrated (fig. 6C-15).
7. Remove pinion drive gear with bearings attached by lifting upward and then removing through the cover hole (fig. 6C-16).
8. Remove differential assembly from carrier by shifting differential to one side of carrier and then turning 90° in order to remove via the cover hole in the carrier. This completes usual disassembly operations.

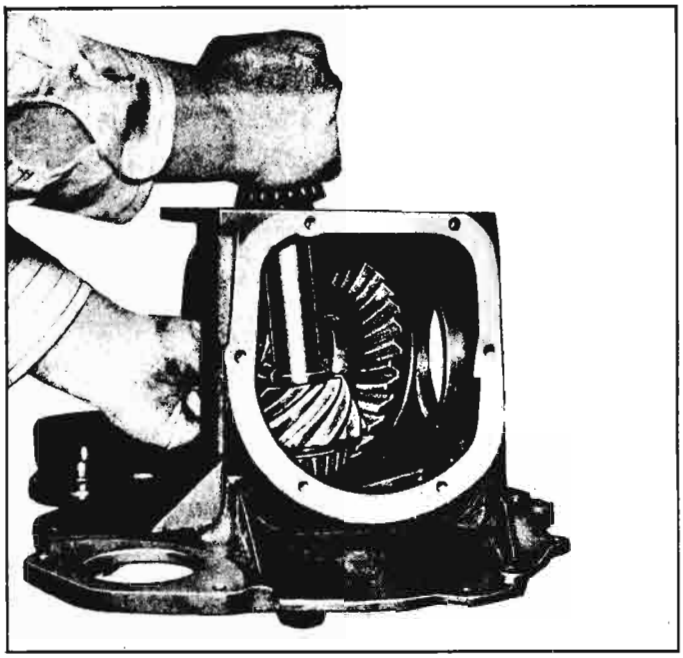

Fig. 6C-16—Removing Pinion From Carrier

Inspection

Refer to figure 6C-17.

1. Inspect all bearing cups, races and rollers for scoring, chipping or evidence of excessive wear. Inspect large end of rollers for wear. This is where wear is most evident on taper roller bearings.

   NOTE: The rear axle pinion bearings are of the pre-loaded type, and the natural wear pattern is a frosted condition with occasional slight scratches on races or rollers. This does not indicate a defective bearing.

2. On automatic transmission axles, inspect oil seal in stator support and at converter hub for evidence of wear or damage.
3. Inspect pinion splines (internal or external) for evidence of excessive wear.
4. Inspect ring gear and pinion teeth for scoring, cracking or chipping.
5. Check fit of differential side gears in case.
6. Check fit of side gear and U-joint shaft splines.
7. Inspect differential pinion shaft for scoring or evidence of excessive wear.
8. Inspect differential carrier for cracks or crossed threads.

Repairs—Manual and Automatic Transmission Axles

The following repair operations apply to both manual and automatic transmission differential carriers.

Those repairs to components peculiar only to the manual transmission carrier or automatic transmission differential carrier follow.

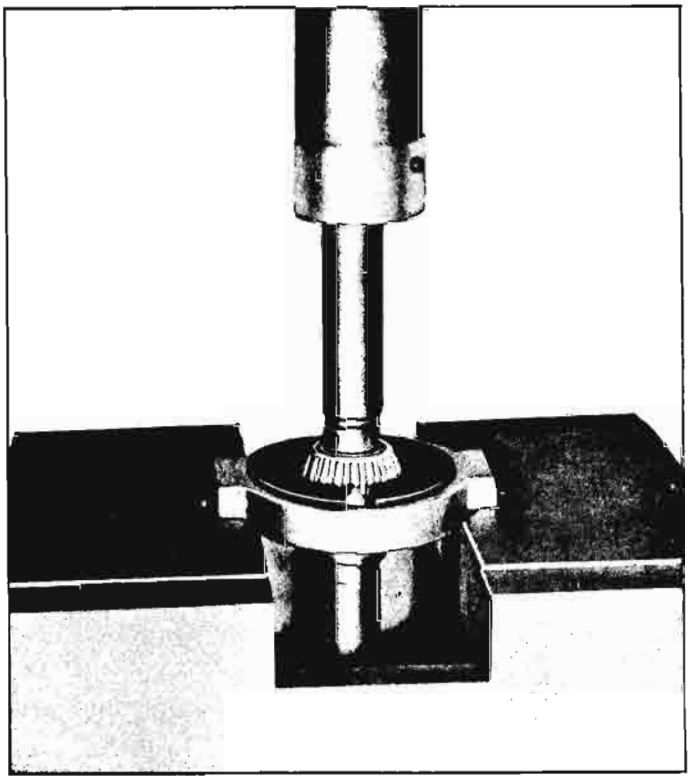

Fig. 6C-18—Removing Pinion Bearings with J-8331 Plates and J-358-1 Holder

Pinion and/or Bearing Replacement Including Pinion Depth Shim Determination

If for any reason it is necessary to replace pinion bearings and/or the ring gear and pinion, it is necessary to re-establish the pinion mounting distance as described herein.

1. To remove the pinion front and rear bearings place the pinion in a press and using J-8331 puller plate in conjunction with J-358-1 holder, press bearings from pinion (fig. 6C-18). It will be noted that shim(s) are used between the pinion rear bearing and pinion.
2. To determine the shim thickness to be used between pinion rear bearing and pinion gear, proceed as follows:

   a. With the differential carrier mounted as illustrated in Figure 6C-19, place pinion rear bearing to be used in assembly in carrier and rotate several times to be sure the bearing is seated.

   b. Insert adapter plug J-6266-25 into bore of stator shaft or clutch bearing shaft, then place gauge plate J-6266-5 on rear bearing and insert clamp bolt thru gauge plate and adapter plug holes and lightly tighten nut.

      Holding adapter plug J-6266-25, shift gauge plate fore and aft and then side-to-side to "feel" when clamp screw is as nearly perfectly centered in the adapter plug bore as possible.

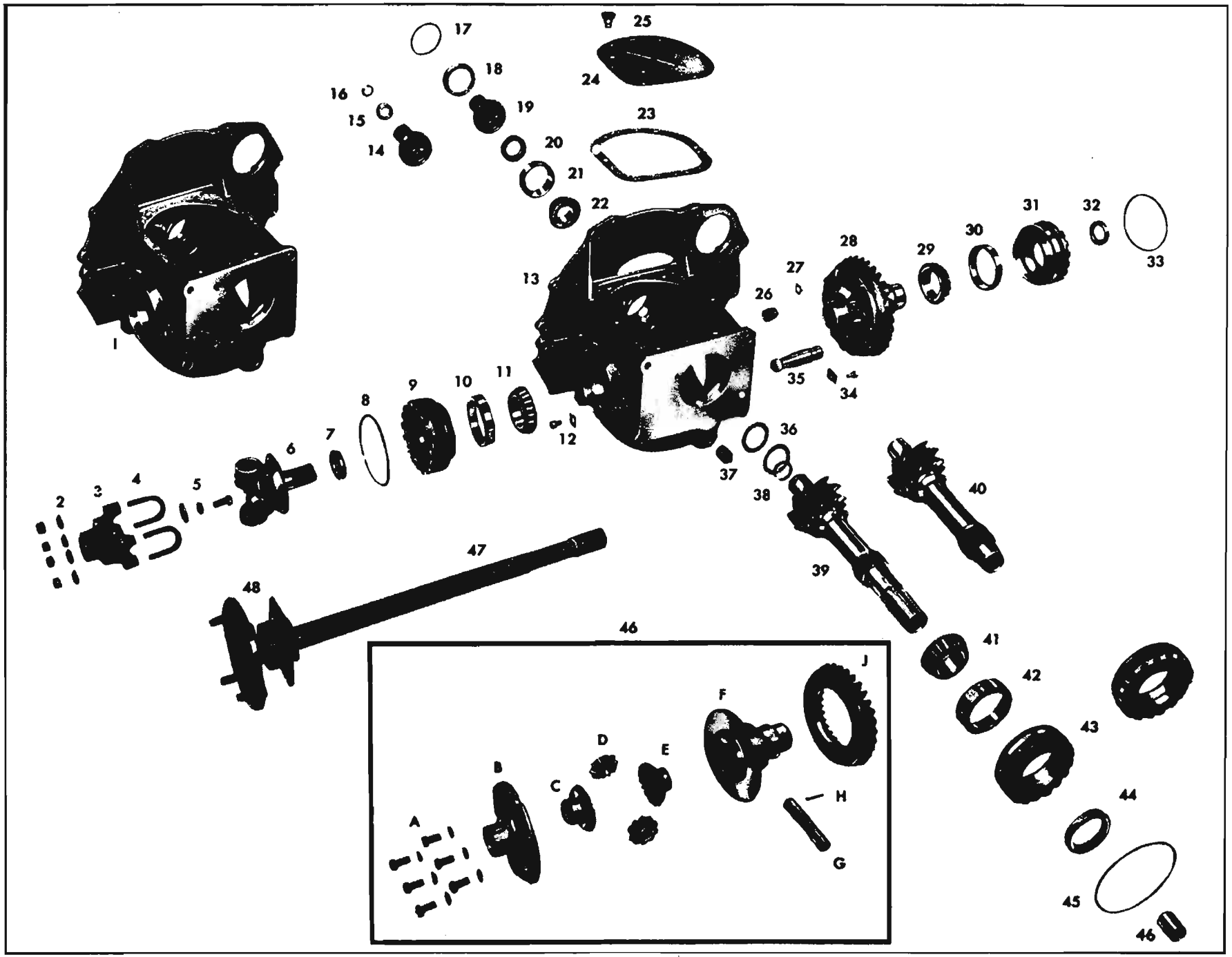

Fig. 6C-17—Differential Carrier—Exploded View

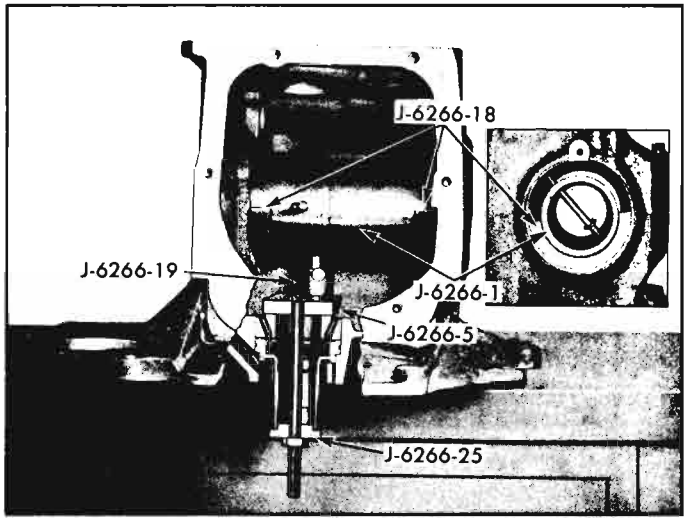

Fig. 6C-19—Pinion Depth Shim Selection Gauges—Installed Views

When this position is achieved, tighten clamp nut to six ft. lbs.

CAUTION: It is imperative that the gauge plate hole be accurately centered in the rear bearing bore before the clamp nut is tightened, as mis-positioning can cause the bearing to cock and invalidate the gauging procedure.

c. Place gauge cylinder adapter, J-6266-18 in unthreaded portion of side bearing adjusting sleeve bore, and then insert gauge cylinder J-6266-01 in adapter with plunger and mounting post horizontal. Oscillate gauge body to insure that the adapter crescents and body are fully seated in the side bearing bores.

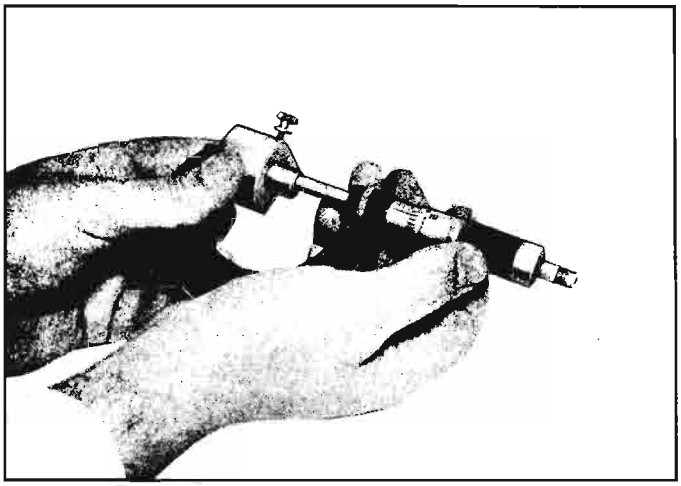

Fig. 6C-20—Measuring Gauge J-6266-19 with Micrometer

d. Place gauge J-6266-19 on gauge plate so that it is centered beneath the gauge body. Loosen clamping screw in gauge and slide plunger back and forth slightly so that it is exactly centered between the low point of the gauge cylinder and the gauge plate. When this position is obtained, tighten screw in plunger and remove plunger.

e. Using a 2″ micrometer, measure the gauge plunger and record this reading (fig. 6C-20).

f. Check the pinion marking stamped indelibly on the rear face of the pinion gear and the gauge plunger measurement obtained in Step e. with the following chart.

For example, assume that the gauge reading is 1.255″ and the pinion marking is 15″. Reading from the 1.255 gauge indication cited in the example hori-

1. Differential Carrier (3-Speed)
2. U-Bolt Nuts and Lockwashers
3. U-Joint Yoke
4. U-Bolts
5. Yoke Attaching Parts
6. U-Joint Assembly
7. Side Bearing Adjusting Sleeve Seal
8. Side Bearing Adjusting Sleeve Seal Ring
9. Side Bearing Adjusting Sleeve
10. Side Bearing Race
11. Side Bearing
12. Adjusting Sleeve Lock Tab and Bolt
13. Differential Carrier (Auto. Trans.)
14. Clutch Release Bearing Shaft (3-Speed only)
15. Clutch Release Bearing Shaft Seal (3-Speed only)
16. Split Ring (3-Speed only)
17. Seal Ring
18. Converter Hub Seal (Auto. Trans. only)
19. Stator Shaft (Auto. Trans. only)
20. Pinion Rear Seal (Auto. Trans. only)
21. Pinion Rear Bearing Race
22. Pinion Rear Bearing
23. Cover Gasket
24. Carrier Cover
25. Vent
26. Filler Plug
27. Adjusting Sleeve Lock Tab
28. Differential Assembly
29. Side Bearing
30. Side Bearing Race
31. Side Bearing Adjusting Sleeve
32. Side Bearing Adjusting Sleeve Seal
33. Side Bearing Adjusting Sleeve Seal Ring
34. Speedometer Gear Lock Tab and Bolt
35. Speedometer Driven Gear Assembly
36. Selective Pinion Depth Shims
37. Drain Plug
38. Pinion Shaft Seal Ring (Auto. Trans. only)
39. Pinion (Auto. Trans. only) and Speedometer Drive Gear
40. Pinion (3-Speed only) and Speedometer Drive Gear
41. Pinion Front Bearing
42. Pinion Front Bearing Race
43. Pinion Adjusting Sleeve
    a. Auto. Trans. Type
    b. Manual Trans. Type
44. Pinion Front Seal (Auto. Trans. only)
45. Pinion Adjusting Sleeve Seal Ring
46. Pinion Shaft Bushing (Auto. Trans. only)
47. Differential Components
    A. Ring Gear Bolts and Lock Washers
    B. Differential Cover
    C. Short Side Gear
    D. Pinion Gears
    E. Long Side Gear
    F. Differential Case
    G. Pinion Gear Shaft
    H. Retaining Pin
    J. Ring Gear
48. Axle Shaft
49. Axle Bearing Assembly

"CORVAIR" PINION DEPTH SHIM USEAGE CHART

Micrometer Reading	Pinion Marking										
	10	11	12	13	14	15	16	17	18	19	20
1.250	6	6	9	9	9	12	12	12	15	15	15
1.251	6	9	9	9	12	12	12	15	15	15	18
1.252	9	9	9	12	12	12	15	15	15	18	18
1.253	9	9	12	12	12	15	15	15	18	18	18
1.254	9	12	12	12	15	15	15	18	18	18	15+6
1.255	12	12	12	15	15	15	18	18	18	15+6	15+6
1.256	12	12	15	15	15	18	18	18	15+6	15+6	15+6
1.257	12	15	15	15	18	18	18	15+6	15+6	15+6	18+6
1.258	15	15	15	18	18	18	15+6	15+6	15+6	18+6	18+6
1.259	15	15	18	18	18	15+6	15+6	15+6	18+6	18+6	18+6
1.260	15	18	18	18	15+6	15+6	15+6	18+6	18+6	18+6	18+9
1.261	18	18	18	15+6	15+6	15+6	18+6	18+6	18+6	18+9	18+9

zontally to the pinion marking columns "15" is found the indication "15." This indicates that for this particular pinion and gauge indication one .015" shim should be installed between the pinion rear bearing and pinion gear. Accordingly, if the gauge indication were the same but the pinion marking was "19," the chart lists "15+6" therefore one .015" shim and one .006" shim should be installed. In the chart, the decimal and zeros usually preceding the thousandths have been omitted.

SHIM(S) TO BE INSTALLED

Identification Notches	Shim Thickness	Chart Indication
NONE	.006"	6
1	.009"	9
2	.012"	12
3	.015"	15
4	.018"	18

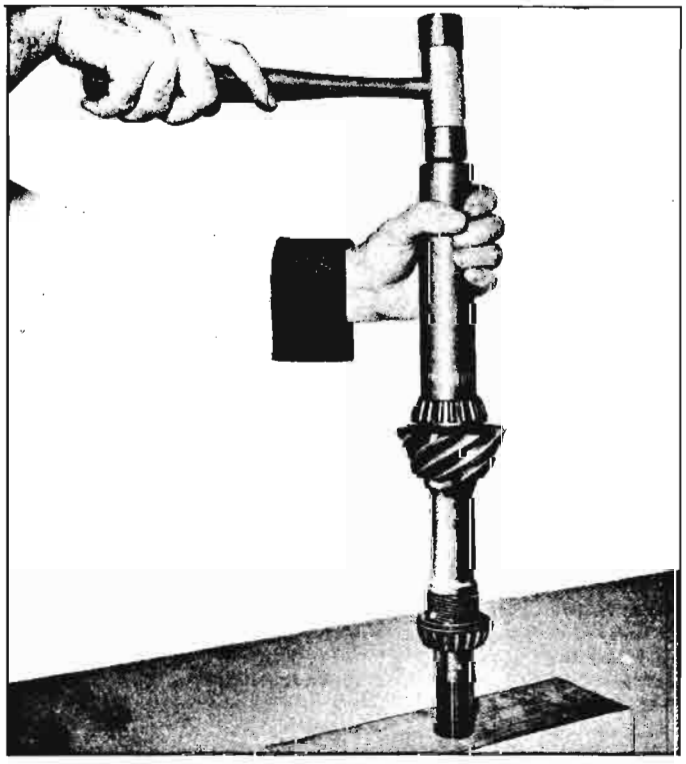

Fig. 6C-21—Installing Pinion Rear Bearings with J-5590

3. Assemble shim(s) selected in Step 2f on rear face of pinion gear, then install pinion rear bearing using J-5590 as illustrated in Figure 6C-21. Install pinion front bearing in the same manner.

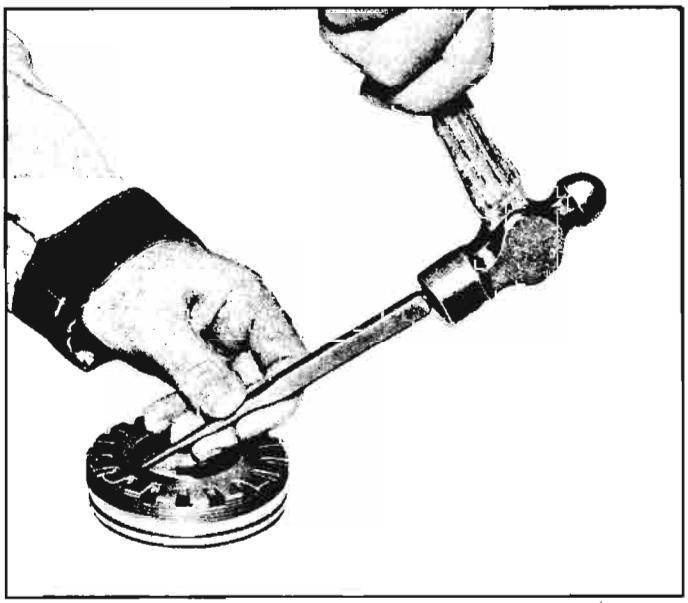

Fig. 6C-22—Removing Pinion Front Bearing Race from Pinion Adjusting Sleeve

Pinion Front Bearing Race Replacement

1. Remove old race with a punch as illustrated (fig. 6C-22). On automatic transmission models, it is necessary to remove the seal.
2. Install new race in pinion adjusting sleeve using J-7137 driver and J-7079-2 handle (fig. 6C-23).

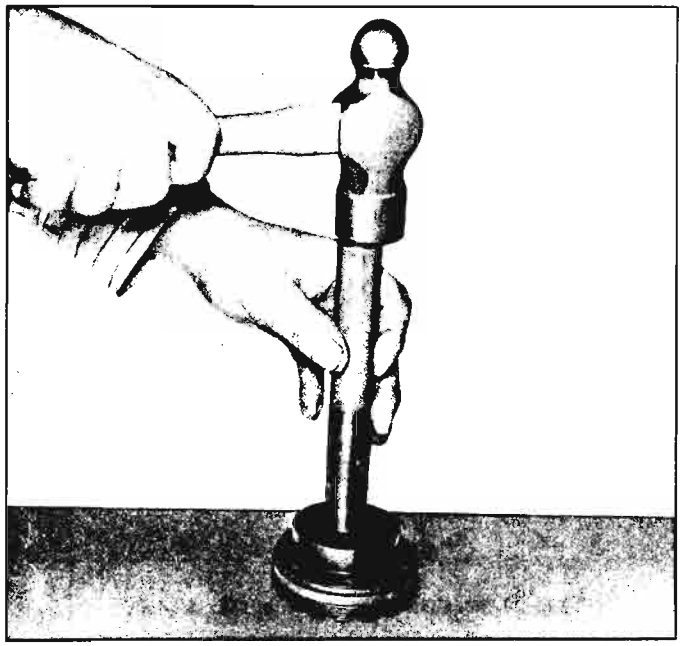

Fig. 6C-23—Installing Bearing Race in Pinion Adjusting Sleeve with J-7137 Driver and J-7079-2 Handle

3. On automatic transmission units, install new seal with J-8340 (fig. 6C-24).

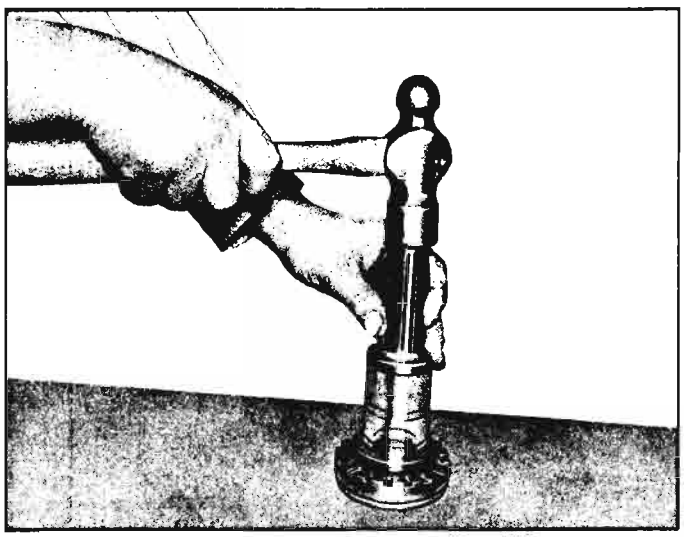

Fig. 6C-24—Installing Pinion Front Oil Seal—Automatic Transmissions Only

Side Bearing Adjusting Sleeve Seal Replacement

Pry out old seal, then install new seal with lips inward using any flat object as a driver.

Side Bearing Adjusting Sleeve Bearing Race Replacement

1. Punch mark the side bearing adjusting sleeve at two places $\frac{9}{16}$ of an inch outboard from the seal bore 180-degrees apart (fig. 6C-25).

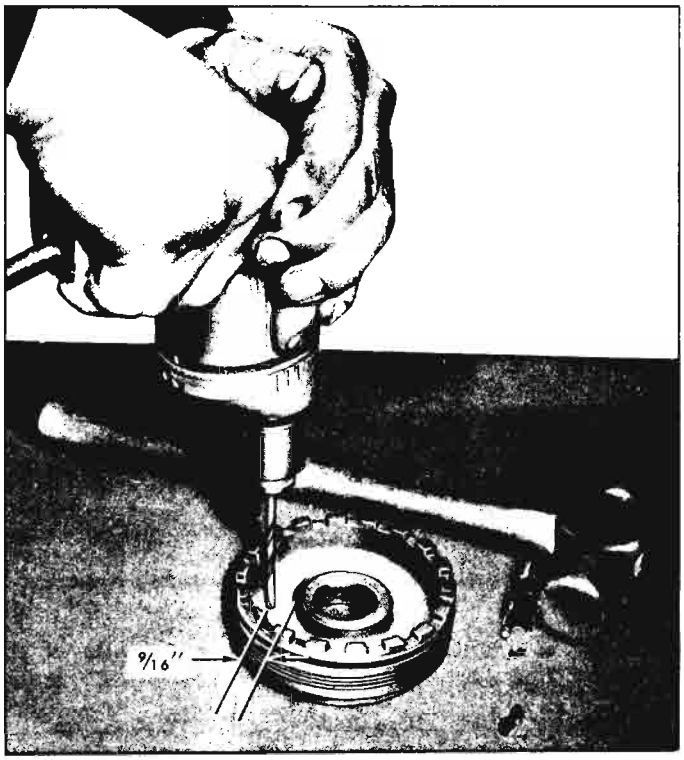

Fig. 6C-25—Drilling Side Bearing Adjusting Sleeves for Race Removal

2. Using a $\frac{3}{16}$" or smaller drill, drill through the adjusting sleeve at the punch mark locations until the drill is stopped by the bearing race.

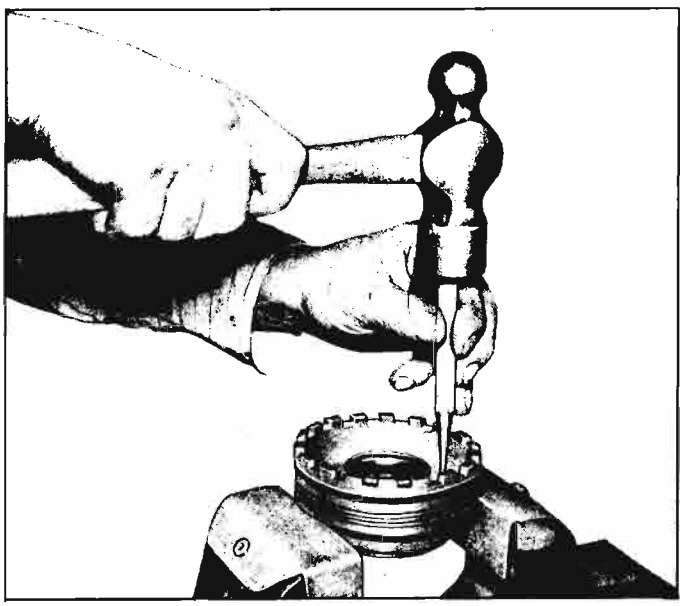

Fig. 6C-26—Removing Side Bearing Race

3. Drive out the bearing race using a small pin punch as illustrated in Figure 6C-26.
4. Install new bearing race in adjusting sleeve using J-8148 (J-270-14) or a suitable flat plate as a driver. Drive bearing race until it is flush (fig. 6C-27).

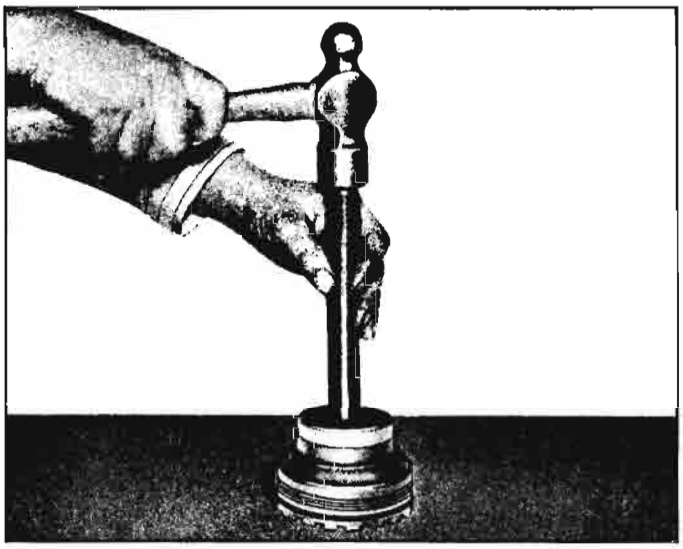

Fig. 6C-27—Installing Side Bearing Race in Adjusting Sleeve with J-8148 (J-270-14)

5. Seal the drilled holes by using lead balls of at least .225" diameter as illustrated (fig. 6C-28). Balls of this type are commercially available for carburetor repair kits.

Fig. 6C-28—Sealing Drilled Holes in Adjusting Sleeve with Lead Balls

Ring Gear Replacement, Side Bearing Replacement and Differential Overhaul

Disassembly

1. If replacement is necessary, remove differential side bearing(s) with J-7112 puller and J-8107-2 pilot as shown (fig. 6C-29).

   NOTE: Bearing and bearing race should be replaced as set only.

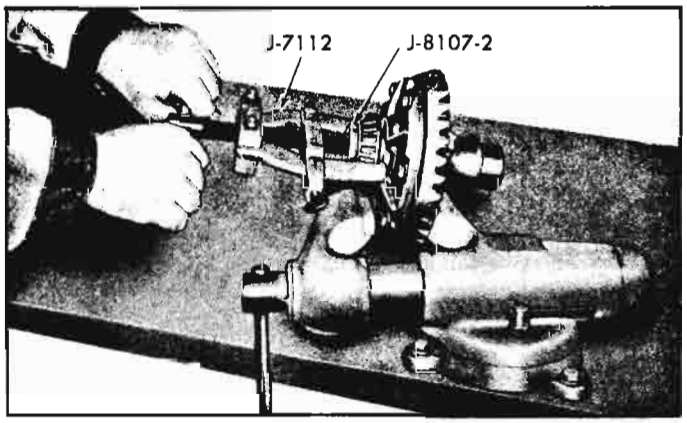

Fig. 6C-29—Removing Differential Side Bearings

2. Remove six bolts and lockwashers securing ring gear and differential cover to differential case, then remove cover, side gear (fig. 6C-30), and side gear thrust washer.
3. To remove ring gear from differential case, tap

Fig. 6C-30—Removing Side Gear

edges of ring gear with a soft hammer. If only ring gear replacement is required no further disassembly is needed.

4. To remove the differential pinions, drive out the roll pin securing the differential pinion shaft to the differential case (fig. 6C-31). Then tap pinion shaft out of case and remove pinion gears, thrust washers, and remaining side gear with its thrust washer to complete disassembly of differential assembly.

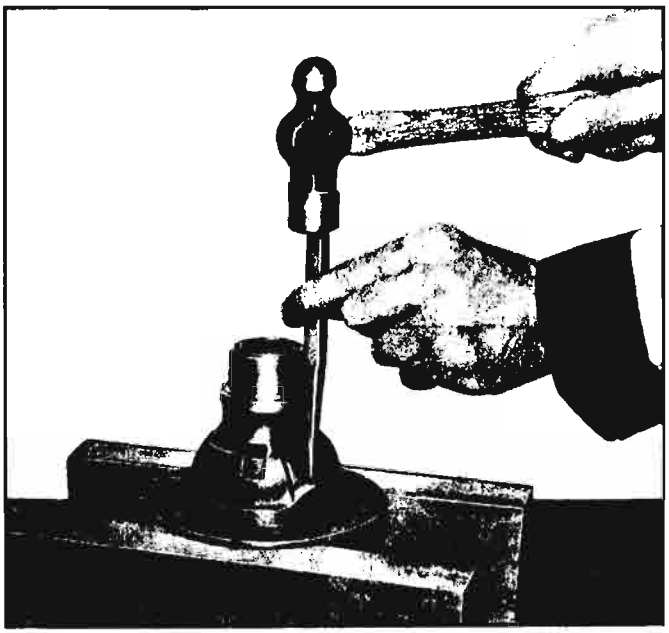

Fig. 6C-31—Removing Pinion Gear Shaft Pin

Inspection

Refer to figure 6C-32.

1. Inspect differential case and cover for cracks. Be especially careful to check the case and cover for flatness and the ring gear mounting punch of the differential case.
2. Inspect the side gears for their fit into the differential case and cover respectively. Also check side gears for evidence of spline damage and broken, scored or worn gear teeth.
3. Inspect pinion gears for cracked or chipped teeth and check their fit on the pinion shaft.
4. Replace any or all of the above parts as deemed necessary by inspection.
5. Inspect side gear and pinion thrust washers for serviceability. Replace as necessary.

Assembly

1. If side bearings require replacement, install new side bearings with J-8359 (fig. 6C-33), on case and/or cover.
2. Place side gear (fig. 6C-34) and thrust washer in differential case, position two pinion gears and thrust washers, and insert pinion gear shaft through case and pinion gears.
3. Position pinion shaft so a flat surface is upward and install drive pin (fig. 6C-35) through shaft.

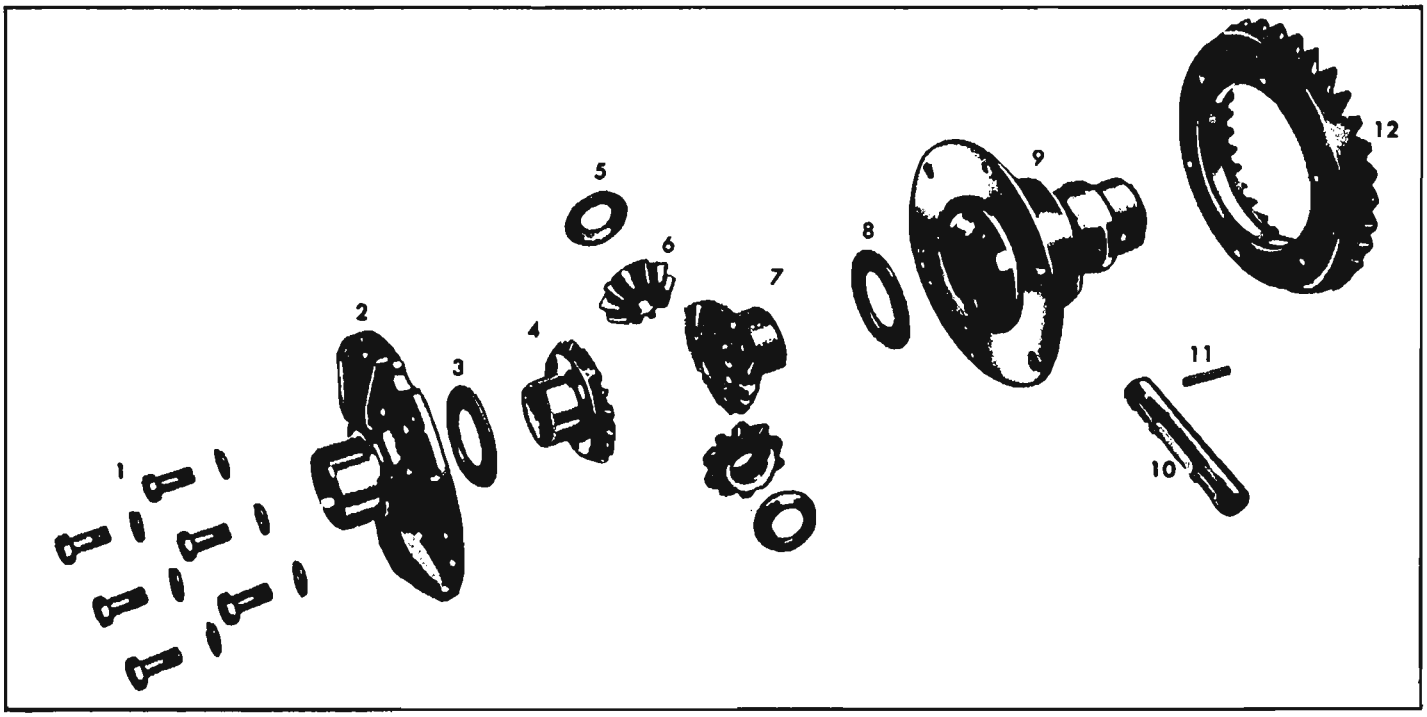

Fig. 6C-32—Differential Assembly—Exploded View

1. Ring Gear Mounting Bolts and Lock Washers
2. Differential Cover
3. Side Gear Thrust Washer
4. Side Gear
5. Pinion Gear Thrust Washers
6. Pinion Gears
7. Side Gear
8. Side Gear Thrust Washer
9. Differential Case
10. Pinion Shaft
11. Pinion Shaft Retaining Pin
12. Ring Gear

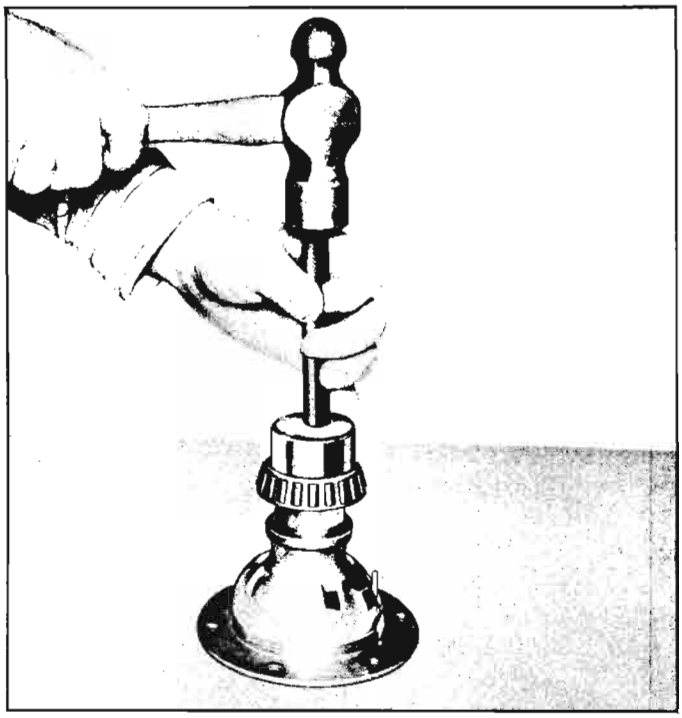

Fig. 6C-33—Installing Differential Side Bearing with J-8359 and J-7079-2 Handle

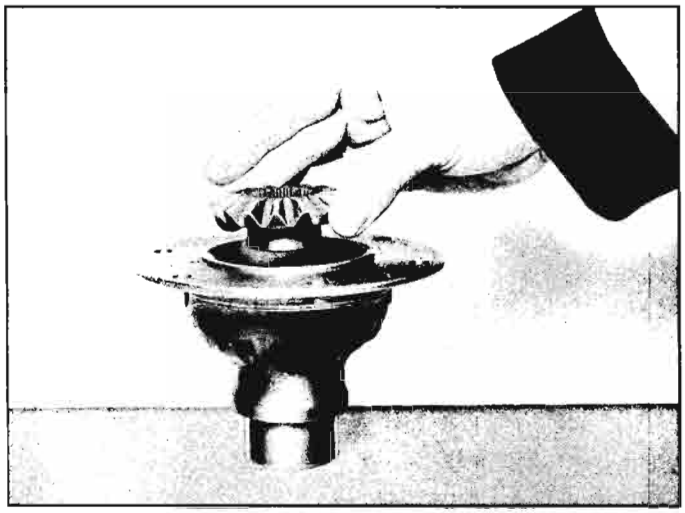

Fig. 6C-34—Installing Side Gear in Differential Case

4. Position side gear with thrust washer installed on its hub on pinions and place differential cover on case. Align punch (fig. 6C-36) marks on edges of differential carrier and cover.
5. Install two guide pins (improvised) in ring gear and tap ring gear with a plastic hammer as required to seat ring gear. Remove guide pins and install bolts and lockwashers. Then tighten all bolts to 40-60 ft. lbs. in an alternate pattern (fig. 6C-37).

Repairs—Manual Transmission Axles Only

The following procedures apply only to rear axles used in conjunction with the manual transmissions as the components involved are peculiar to those axles.

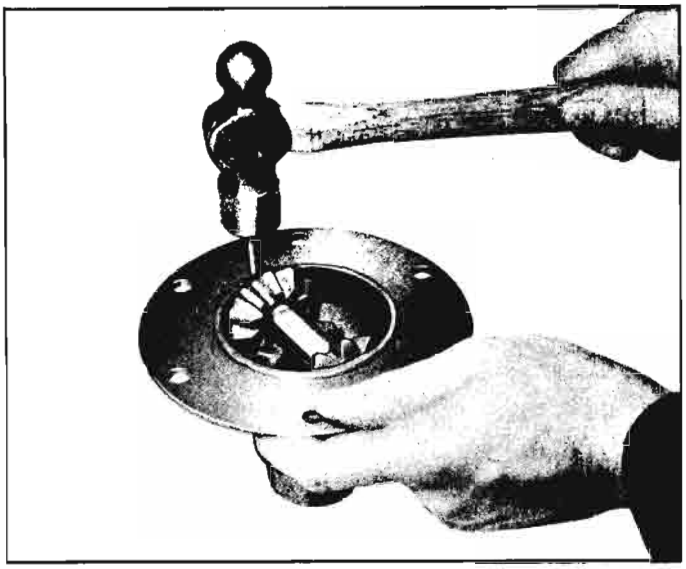

Fig. 6C-35—Installing Pinion Shaft Pin

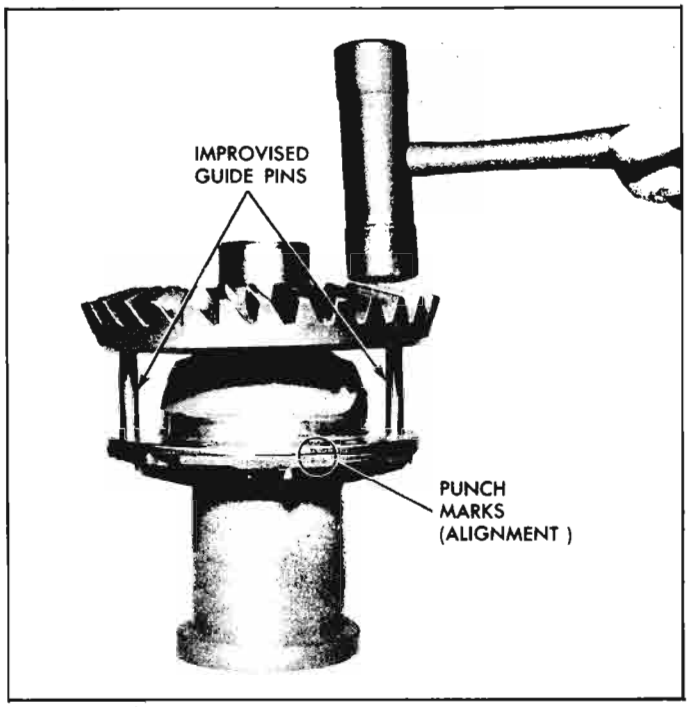

Fig. 6C-36—Installing Ring Gear on Differential Case & Cover Using Improvised Guide Pins

Clutch Release Bearing Shaft Seal Replacement

1. Remove split ring and old seal from clutch release bearing shaft by prying out with a punch or similar object.
2. Install new seal, open side inward, in shaft using a suitable socket (approximately ¾") and socket extension (fig. 6C-38). Drive seal until it bottoms, then install split ring in clutch release bearing shaft.

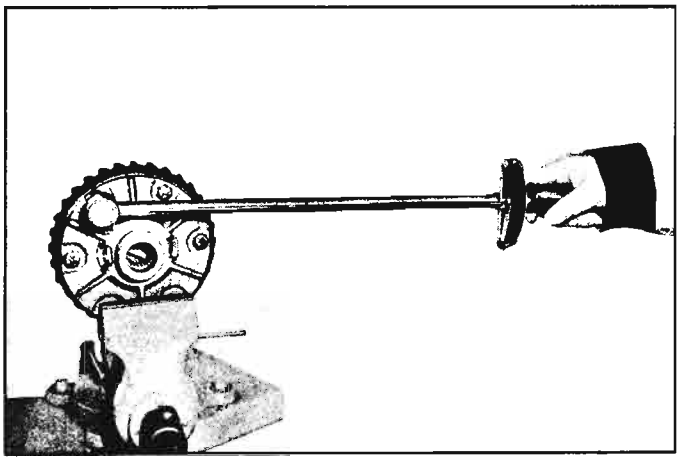

Fig. 6C-37—Measuring Ring Gear Bolt Torque

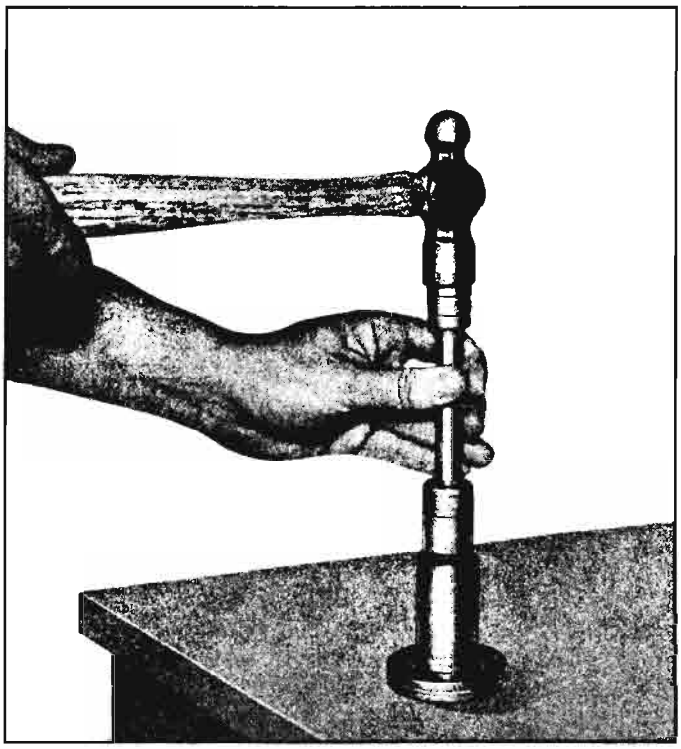

Fig. 6C-38—Installing Clutch Release Bearing Shaft Seal with ¾" Socket

Clutch Release Bearing Shaft and/or Pinion Rear Bearing Race Replacement

1. Place the differential carrier in an arbor press and press out both clutch release bearing shaft and pinion rear bearing race.
2. If a new clutch bearing release shaft is being installed first install the inner seal as previously described. Install a new seal ring in groove on outer diameter of bearing shaft and lubricate with petroleum jelly.
3. Support differential carrier only on boss at clutch release bearing location with a cylinder, such as J-971, then place bearing race on clutch release bearing shaft and press both into differential carrier using J-7137. Press until cup is flush with adjacent surface inside carrier.

Repairs—Automatic Transmission Rear Axles Only

The following procedures apply only to rear axles used in conjunction with automatic transmissions as the components involved are peculiar to those rear axles.

Pinion Shaft Front Oil Seal and/or Converter Hub Oil Seal Replacement

The pinion shaft front oil seal and converter hub oil seal are located diametrically opposite fore and aft respectively in the differential carrier.

However, their removal and installation is basically the same and the same tool, J-8340, is used to drive the seal in both locations. J-8340 is specifically designed to install the pinion front seal as this seal fits into the inner diameter of the tool for installation to a prescribed depth which is provided by a stop on the tool. When used to install the coverter hub seal, the stop surface of J-8340 is used to drive the seal, as this seal is mounted flush.

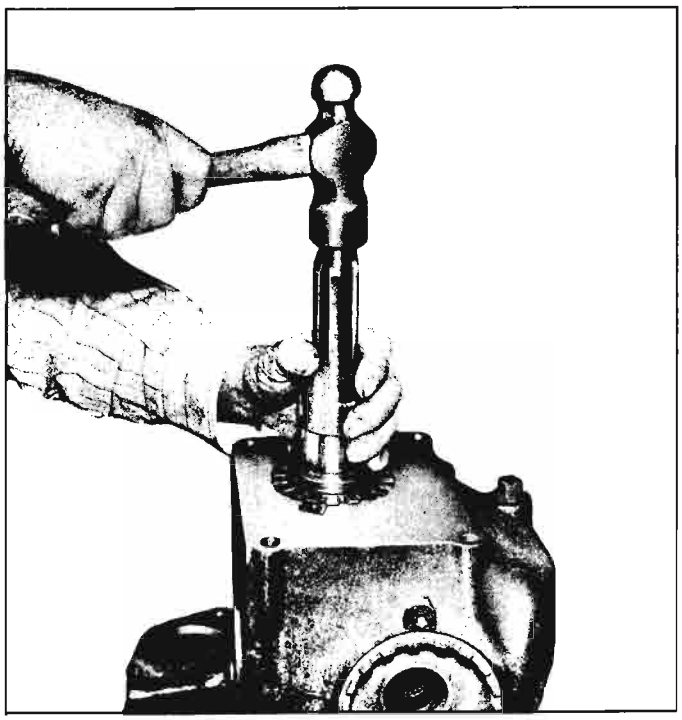

Fig. 6C-39—Installing Pinion Shaft Front Seal with J-8340

1. Remove the old seal by prying out with a punch or similar tool.
2. Coat outer diameter of seal with non-hardening sealer, then install new seal using J-8340 as illustrated (fig. 6C-39 and 40).

Pinion Shaft Rear Oil Seal Replacement

1. Drive out old seal with a pin punch inserted through access holes in stator shaft (fig. 6C-41).

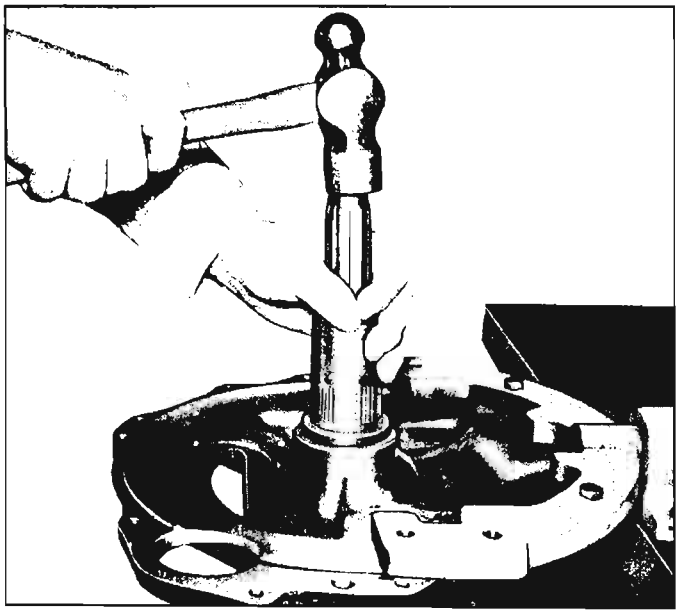

Fig. 6C-40—Installing Converter Hub Seal with J-8340

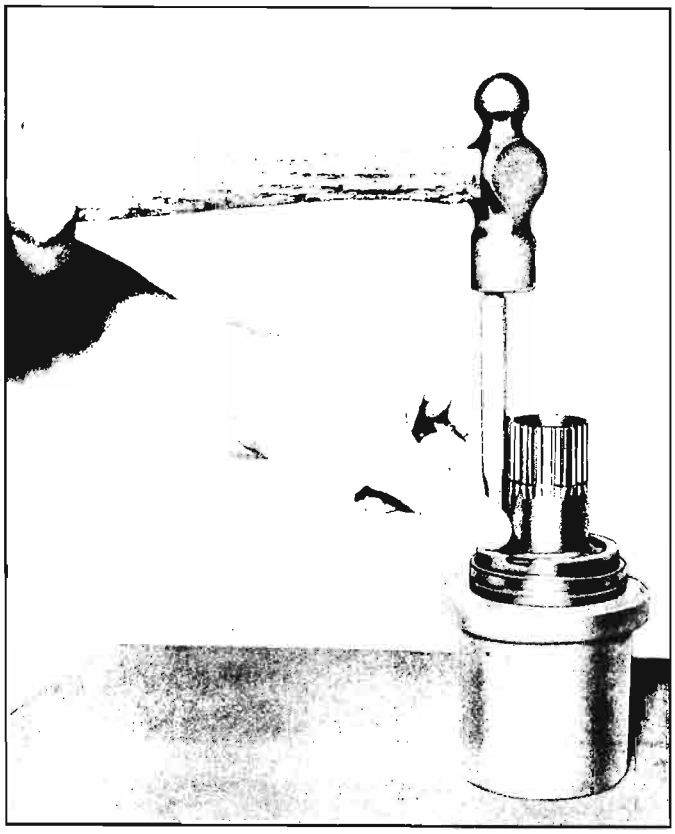

Fig. 6C-41—Removing Pinion Rear Oil Seal from Stator Shaft

2. Install new seal using J-8448-1 as illustrated (fig. 6C-42). Press seal until it bottoms.

Pinion Shaft Bushing Replacement

1. Remove old bushing from inside diameter of pinion shaft using a chisel or other suitable tool. Exercise care not to damage bushing mating surface in pinion shaft during removal.

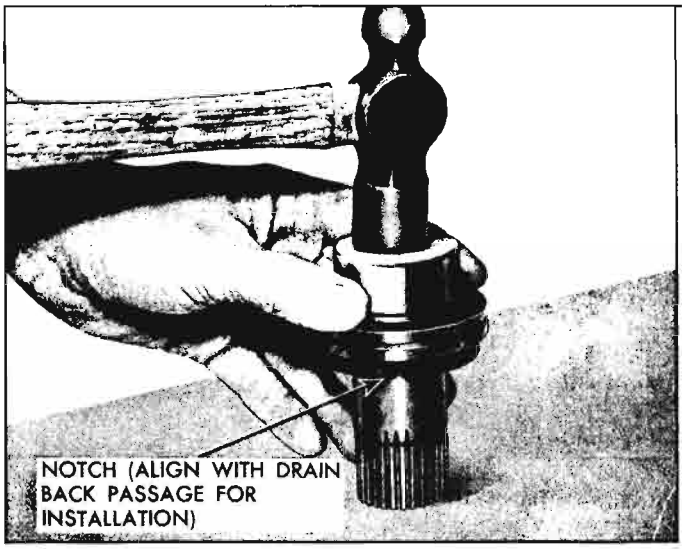

Fig. 6C-42—Installing Pinion Rear Oil Seal in Stator Shaft with J-8448-1

2. Install new bushing with J-8333 as shown (fig. 6C-43). A stop is provided on the tool to press the bushing to the prescribed depth.

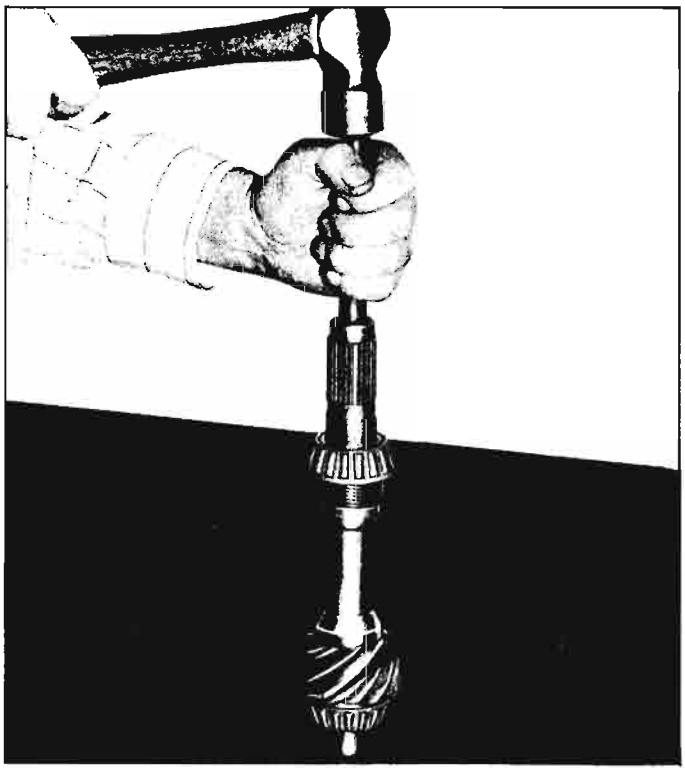

Fig. 6C-43—Installing Pinion Shaft Bushing with J-8333

Stator Shaft and/or Pinion Rear Bearing Race Replacement

1. Remove stator shaft and pinion bearing cup from carrier by placing carrier in a press and pressing

downward on end of stator shaft as illustrated (fig. 6C-44). Replace stator shaft and/or bearing cup as required.

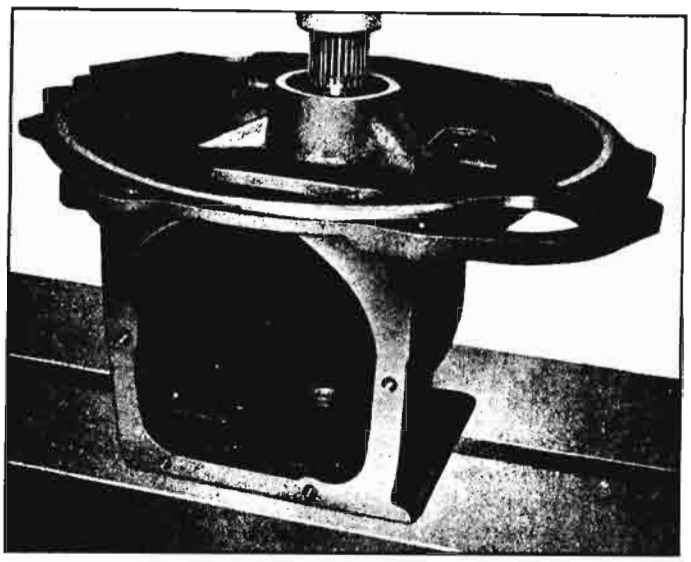

Fig. 6C-44—Pressing Stator Shaft and Pinion Rear Bearing Race from Carrier

2. Install seal ring in groove on outside diameter of stator shaft and lubricate with petroleum jelly.
3. It a new stator shaft is being installed, it will be necessary to install a new pinion rear oil seal as previously described.

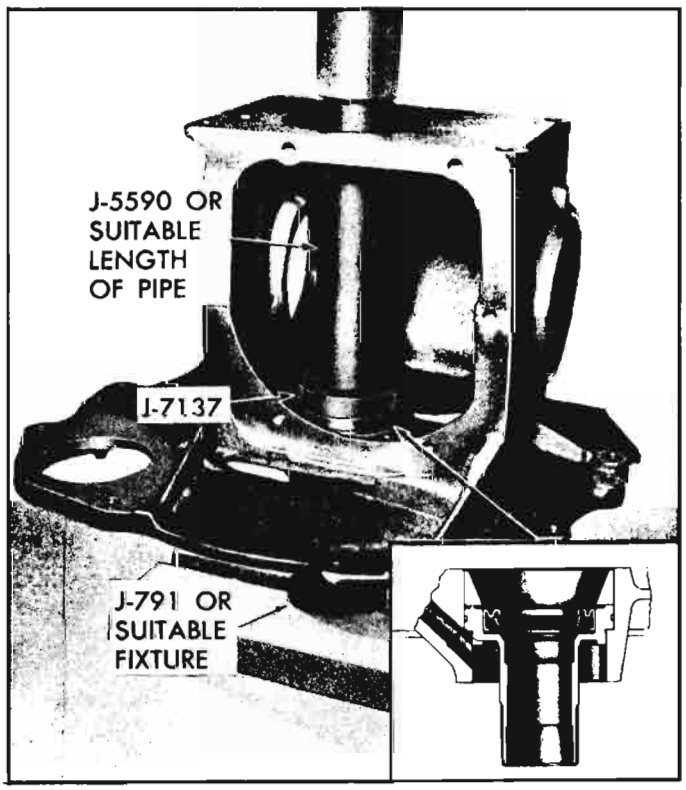

Fig. 6C-45—Installing Stator Shaft and Pinion Rear Bearing Race

4. Align notch in stator shaft (Fig. 6C-42) with drain back passage boss in differential carrier. Place bearing race on stator shaft and press race and stator shaft into housing carrier using J-7137 (fig. 6C-45).

CAUTION: Carrier must be supported only at the stator shaft boss for this operation. If available, J-971 may be used for the bottom support.

ASSEMBLY OF DIFFERENTIAL CARRIER

1. Mount differential carrier in J-3289-01 holding fixture (fig. 6C-46).

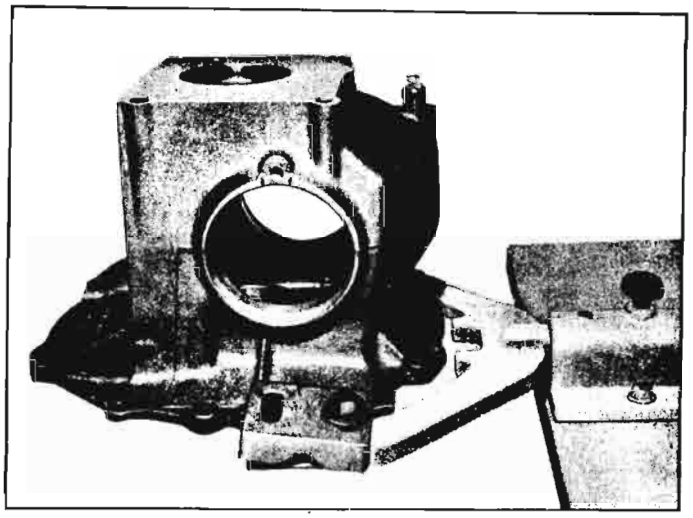

Fig. 6C-46—Differential Carrier Installed in J-3289 Holding Fixture

2. Insert differential assembly into carrier with side bearing cones installed on differential hubs.
3. While differential is loose in the carrier, insert pinion into carrier through the cover hole (fig. 6C-47). Then engage pinion with ring gear and carefully position pinion rear bearing in race. On automatic transmission models, care must be exercised not to damage the seal at this location when the pinion is installed.
4. Install new "O" ring seals in side bearing adjusting sleeves, then loosely install adjusting sleeves in carrier with differential side bearings positioned in sleeves.
5. On automatic transmission models, install a new "O" ring in pinion adjusting sleeve, position pinion so that its front bearing will pick up the bearing race in the adjusting sleeve, and then loosely install pinion adjusting sleeve in carrier. Exercise care not to damage seal lips when inserting pinion shaft over adjusting sleeve on automatic transmission axles.
6. Tighten both side bearing adjusting sleeves and the pinion adjusting sleeve to the point of contact between bearings and races. As this point, there should be no preload on any of the bearings and ring gear to pinion backlash should be just enough

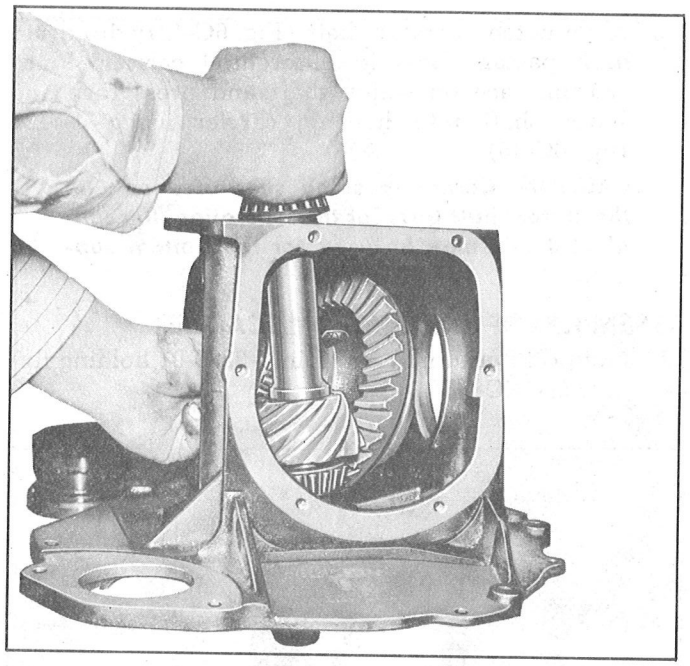

Fig. 6C-47—Installing Pinion in Differential Carrier

so that the pinion and differential can be rotated easily and smoothly. The assembly is now ready for ring gear and pinion adjustment.

RING GEAR AND PINION BEARING ADJUSTMENT

Once the differential carrier is assembled, the differential side bearings and pinion bearings must be adjusted and preloaded for quiet operation as follows:

NOTE: Lubricate bearings with axle lubricant prior to adjustment.

1. Tighten right side bearing adjusting sleeve while rocking the differential assembly with one hand until there is zero backlash between the ring gear and pinion (fig. 6C-48). Mark this point with a crayon or pencil, then backoff adjusting sleeve three to four full notches to eliminate "O" ring wind-up. Retighten adjusting sleeve to one notch loose from the zero backlash crayon or pencil mark.
2. Tighten the left side bearing adjusting nut while chucking the differential laterally until all lash is eliminated.
   Mark both the adjusting sleeve and carrier, then back-off sleeve three to four full notches to release any "O" ring wind-up, then retighten adjusting sleeve until marks realign plus a minimum of two additional notches and a maximum of three additional notches to align the sleeve notches for locking tab installation. This operation preloads the differential bearings.

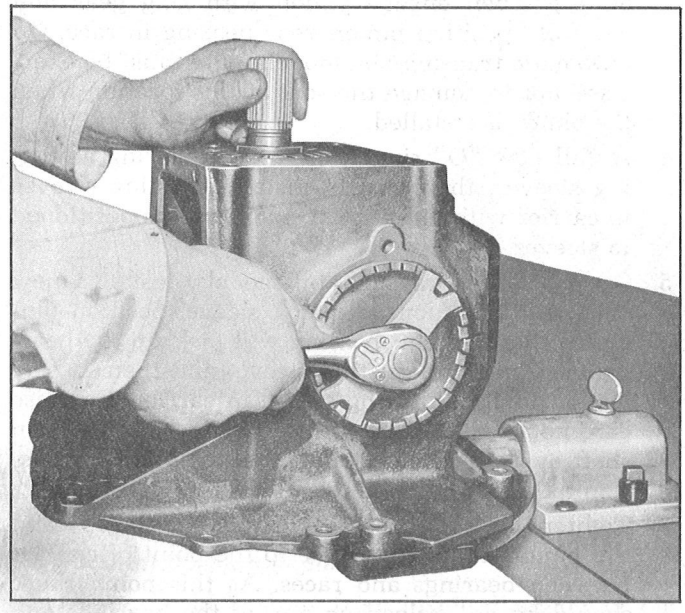

Fig. 6C-48—Tightening Side Bearing Adjusting Sleeve with J-8342

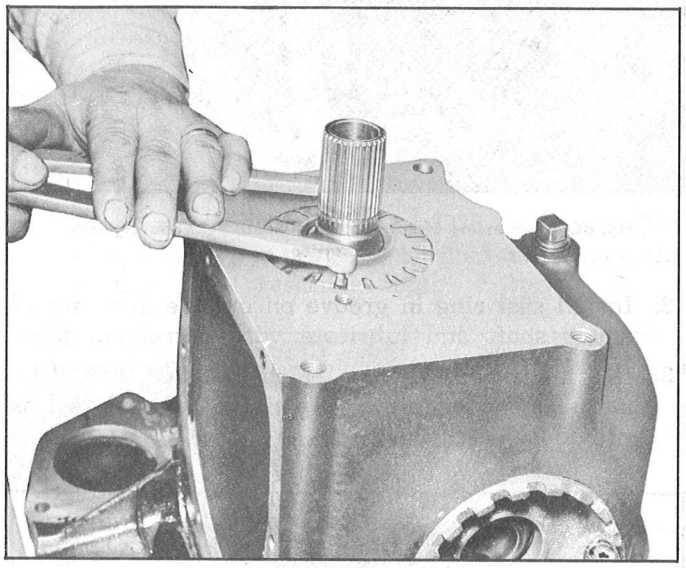

Fig. 6C-49—Tightening Pinion Bearing Adjusting Sleeve with J-972

3. Install differential side bearing adjusting sleeve locking tabs to prevent loss of adjustment.
4. Tighten pinion bearing adjusting sleeve with J-972 (fig. 6C-49) until the pinion bearings are carried into contact with their races, then back-off pinion adjusting sleeve slightly to eliminate any pinion bearing preload. At this point, measure the turning torque created by the side bearing preload at the pinion using J-8362 adapter and an inch pound torque wrench such as J-5853. Record this reading (example, 8 in.-lbs.). Then further tighten the pinion bearing adjusting sleeve to increase the initial turning torque by 4-6 inch-pounds with used bearings or 9-11 inch-pounds with new bearings. Using the 8 inch-pound initial turning torque from our example, the final total turning torque measured at the pinion (fig. 6C-50) would be 12-14 inch-pounds with used bearings or 17-19 inch-pounds with new bearings.
5. When pinion bearing adjustment is satisfactory, install pinion adjusting sleeve locking tab.
6. Engage speedometer driven gear with gear on pinion shaft, then secure driven gear assembly in carrier by tightening locking tab.

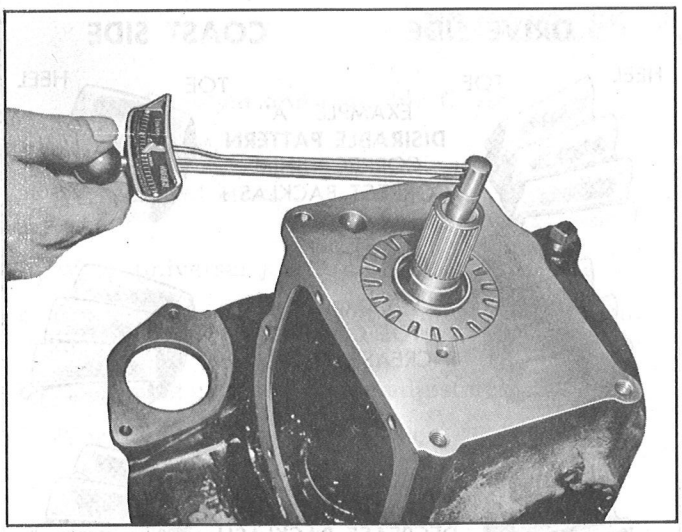

Fig. 6C-50—Measuring Pinion Turning Torque Using J-8362 Adapter and Torque Wrench J-5853

RING GEAR-TO-PINION BACKLASH ADJUSTMENT

To check ring gear-to-pinion backlash mount a dial indicator on the differential carrier and position the indicator tip against the back of one of the ring gear teeth. Move the ring gear to either end of its lash range, zero the dial indicator, then oscillate the ring gear back and forth the extent of its lash and note indicator reading (fig. 6C-51). Properly adjusted, the reading should indicate .003″ to .010″ backlash (.005″-.008″ preferred).

To reduce backlash, ring gear and differential must be moved to the left (toward the pinion). Conversely, to increase backlash, the ring gear and differential must be moved to the right (away from the pinion). During any readjustment which may be required to obtain proper backlash, be sure to move side bearing adjusting sleeves a like number of notches to insure maintaining side bearing preload. For example, if the backlash indicated was .003 too high, loosen the left hand adjusting sleeve one notch and tighten the right hand adjusting sleeve one notch.

NOTE: Turning one notch on the adjusting sleeve changes backlash approximately .003″. Adjustments of one-half notch (.0015″ backlash) can be made if desired by installing the locking tab reversed.

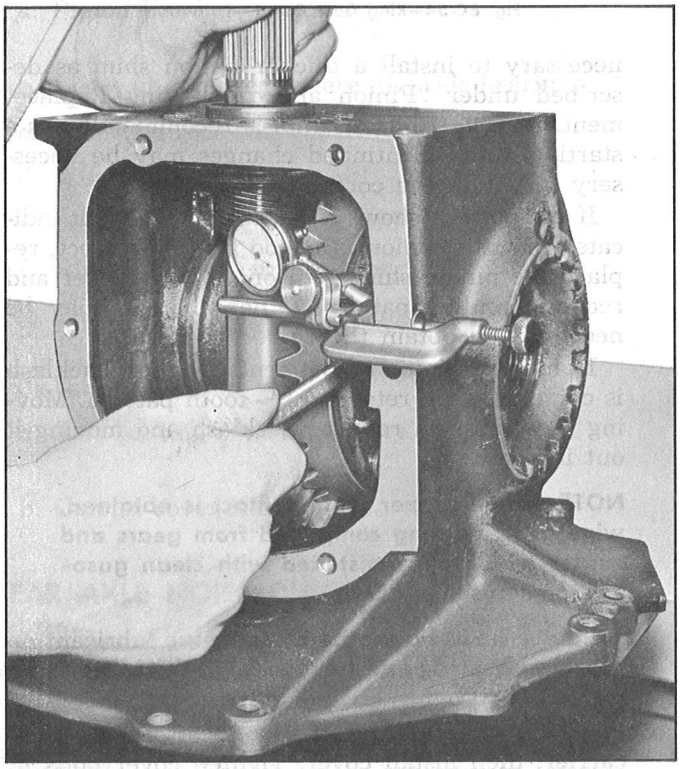

Fig. 6C-51—Measuring Ring Gear-to-Pinion Backlash with J-8001 (KMO 30)

RING GEAR AND PINION CONTACT PATTERN

Upon completion of the ring gear-to-pinion backlash adjustment previously described, a check of the gear teeth contact pattern should be made to insure gear life and minimize bearing noise from the carrier.

1. Thoroughly clean the ring gear and pinion teeth with solvent and air-dry.
2. Paint ring gear teeth only with a light and even coating of a mixture of iron oxide gear marking compound and axle lubricant of a suitable consistency to produce a contact pattern on the pinion gear.

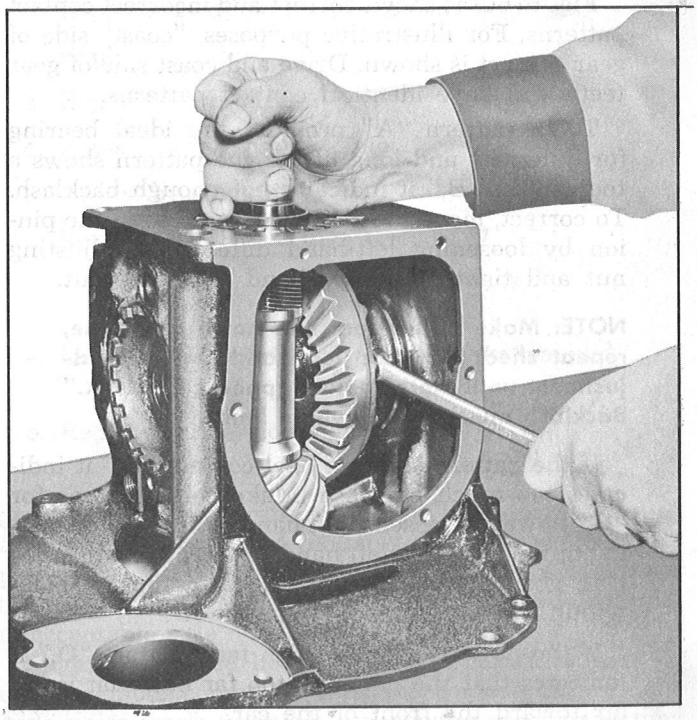

Fig. 6C-52—Developing Contact Pattern

3. While firmly holding the pinion with a rag to form a friction brake, turn the ring gear back and forth with a wrench (fig. 6C-52) on the ring gear mounting bolts until a definite contact pattern is formed on the pinion.
4. Inspect the contact pattern produced and analyze the results relative to the following data. Figure 6C-53 provides gear tooth nomenclature and figure 6C-54 illustrates the various contact patterns which may be experienced.

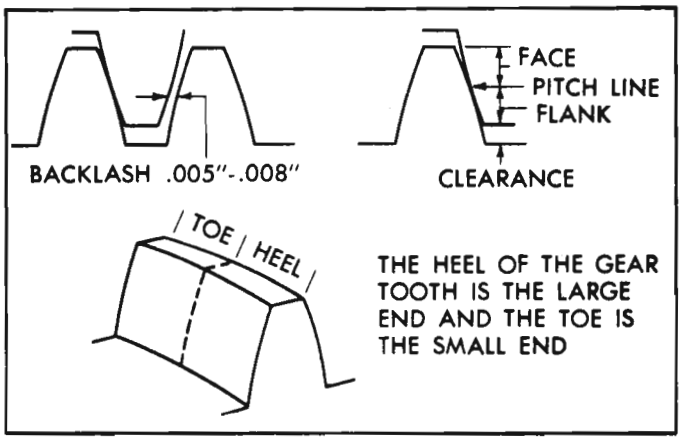

Fig. 6C-53—Gear Tooth Nomenclature

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."

Figure 6C-54 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 indicates 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

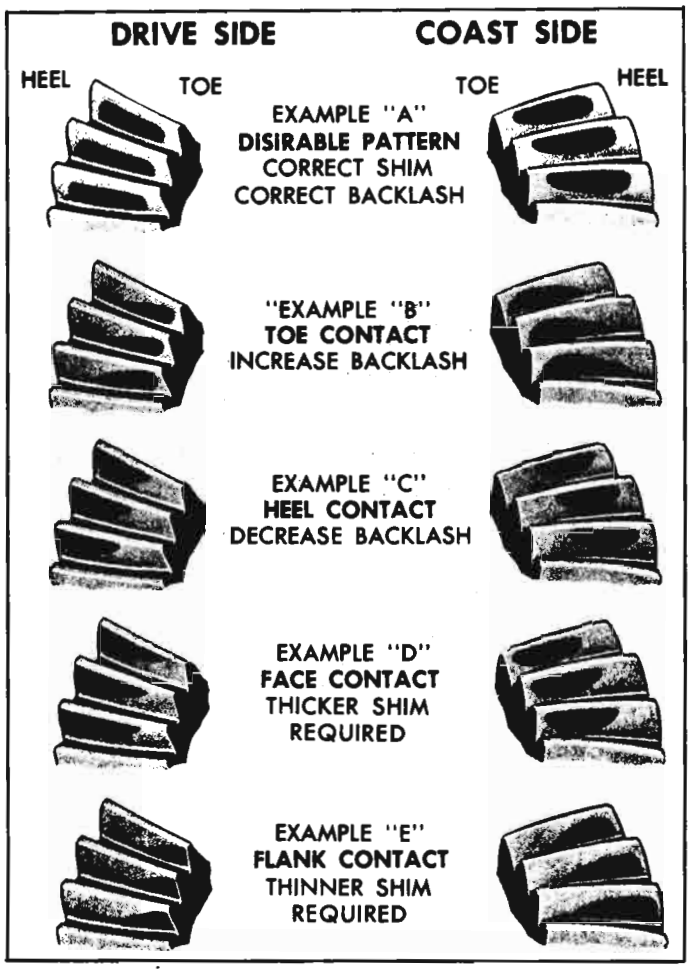

Fig. 6C-54—Ring Gear Contact Patterns

necessary to install a thicker pinion shim as described under "Pinion and/or Bearing Replacement." 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 for tooth pattern. Moving the pinion in reduces backlash and moving it out increases it.

NOTE: When proper tooth contact is obtained, wipe gear marking compound from gears and carrier with cloth moistened with clean gasoline or kerosene.

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

5. Place a new differential carrier cover gasket on the carrier, then install cover. Tighten cover bolts to 11-19 ft. lbs.
6. Fill differential carrier with three pints lubricant.

TROUBLES AND REMEDIES

Symptom and Probable Cause	Probable Remedy
Excessive Backlash	
a. Loose wheel bolts.	a. Tighten nuts securely. Make sure the tapered end of nut is toward wheel.
b. Worn universal joint.	b. Replace or overhaul joint.
c. Loose transmission output member engagement, to pinion splines.	c. Replace worn parts.
d. Loose ring gear and pinion adjustment.	d. Adjust ring gear and pinion.
e. Worn differential gears or case.	e. Replace worn parts.
f. Worn axle shaft or differential gear splines.	f. Replace worn parts.
Klunking Noise in Axle or Vehicle Weight Shifts From Side to Side on Turns	
a. Excessive end play in axle shafts.	a. Replace axle shaft bearings and/or retainer.
Axle Noise on Drive and/or Coast	
a. Improper ring gear and pinion adjustment.	a. Readjust ring gear and pinion.
b. Pinion bearings rough.	b. Replace bearing and readjust ring gear and pinion.
c. Excessive end play in pinion.	c. Adjust pinion bearings or replace bearings.
Axle Noisy on Both Drive and Coast	
a. Pinion bearings rough.	a. Replace bearings and adjust ring gear and pinion.
b. Loose or damaged differential side bearings.	b. Replace or adjust differential side bearings.
c. Damaged axle shaft bearing.	c. Replace bearing.
d. Worn universal joint.	d. Replace worn parts.
e. Badly worn ring gear or pinion teeth.	e. Replace ring gear and pinion.
f. Pinion too deep in ring gear.	f. Adjust by shimming.
g. Loose or worn wheel bearings.	g. Replace wheel bearings.
Axle Lubricant Leaks	
a. Side bearing adjusting sleeve seals leaking.	a. Replace side bearing adjusting sleeve seal and "O" ring.
b. Carrier cover leaks.	b. Replace carrier cover gasket.

REAR AXLE NOISE DIAGNOSIS

Mechanical failures of the rear axle are relatively simple to locate and correct. Noise in a rear axle is a little more difficult to diagnose and repair. One of the most essential parts of rear axle service is proper diagnosis.

One of the cardinal points of axle noise diagnosis is the fact that all rear axles are noisy to a certain degree. The action of transmitting the high engine torque through a 90° turn and reducing propeller shaft speed produces noise in rear axles. This point establishes the need for a line between normal and abnormal or unacceptable axle noises.

Slight axle noise heard only at a certain speed or under remote conditions must be considered normal. Axle noise tends to "peak" at varying speeds and the noise is in no way indicative of trouble in the axle.

If noise is present in an objectionable form, loud or at all speeds, an effort should be made to isolate the noise as being in one particular unit of the vehicle. Axle noise is often confused with other noises such as tire noise, transmission noise, engine noise, and universal joint noise. Isolation of the noise as in any one unit requires skill and experience. An attempt to eliminate a slight noise may baffle even the best of diagnosticians. Such practices as raising tire pressure to eliminate tire noise, listening for the noise at varying speeds and on drive, float and coast, and under proper highway conditions, turning the steering wheel from left to right to detect wheel bearing noise, will aid even the beginner in detecting alleged axle noises. Axle noises fall into two categories, gear noise and bearing noise.

Gear Noise

Abnormal gear noise can be recognized since it produces a cycling pitch and will be very pronounced in the speed range at which it occurs, appearing under either "drive," "float" or "coast" conditions. Gear noise tends to peak in a narrow speed range or ranges, while bearing noise will tend to remain constant in pitch. Abnormal gear noise is rare and usually originates from the scoring of the ring gear and pinion teeth as a result of insufficient or improper lubricant in new assemblies. Side gears rarely give trouble as they are used only when the rear wheels travel at different speeds.

Bearing Noise

Defective bearings will always produce a rough whine that is constant in pitch and usually most noticeable under "drive" conditions. This fact will allow you to distinguish between bearing noise and gear noise.

1. Pinion bearing noise resulting from a bearing failure can be identified by a constant rough sound. Pinion bearings are rotating at a higher speed than differential side bearings or axle shaft bearings. This particular noise can be picked up best by testing the car on a smooth road (black top). However, care should be taken not to confuse tire noise with bearing or gear noise. If any doubt exists, tire treads should be examined for irregularities that would produce such noise.
2. Wheel bearing noise may be confused with rear axle noise. To differentiate between wheel bearings and rear axle, drive the vehicle on a smooth road at medium-low speed. With traffic permitting, turn the vehicle sharply right and left. If noise is caused by wheel bearings, it will increase in the turns because of the side loading. If noise cannot be isolated to front or rear wheel bearings, inspection will be necessary.
3. Side bearings will produce a constant rough noise of a slower nature than pinion bearings. Side bearing noise will not fluctuate in the above wheel bearing test.

SPECIFICATIONS

Refer to Section 12 for all rear axle specifications.

SPECIAL TOOLS

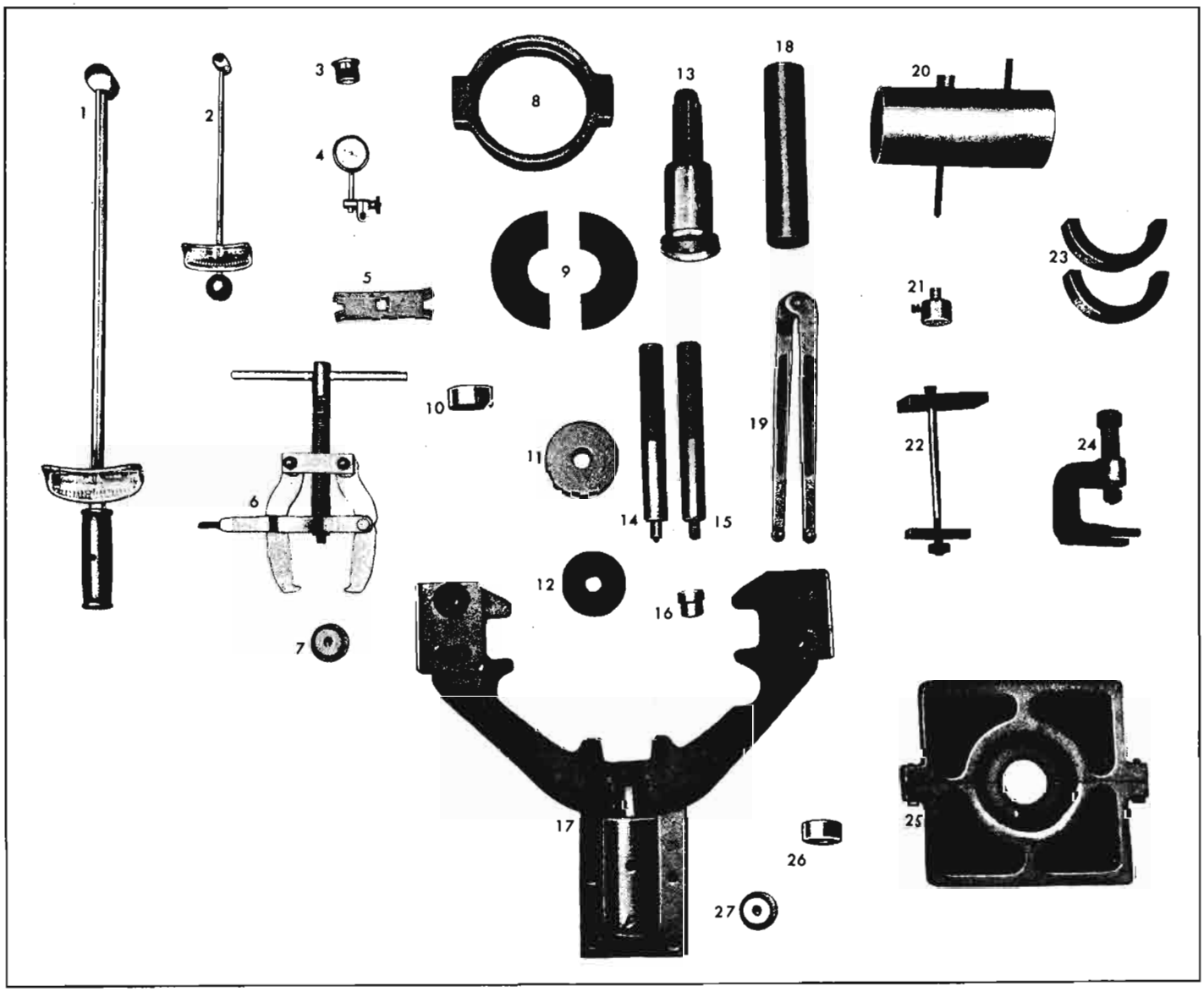

Fig. 6C-55—Rear Axle Special Tools

1.	J-1264	0-200 Ft. Lb. Torque Wrench	
2.	J-5853	0-50 In. Lb. Torque Wrench	
3.	J-8362	Pinian Turning Adapter	
4.	J-8001 (KMO-30)	Diol Indicotor Set	
5.	J-8342	Differential Side Bearing Adjusting Sleeve Wrench	
6.	J-7112	Differential Side Bearing Puller	
7.	J-8107-2	Differential Side Bearing Puller Pilot Adapter	
8.	J-0358-1	Press Plate Holder	
9.	J-8331	Pinion Bearing Remover Plates	
10.	J-8448-1*	Pinion Shaft Rear Oil Seal Installer	
11.	J-8148 (J-270-14)	Side Bearing Race Installer	
12.	J-7137	Pinion Rear Bearing Race Installer	
13.	J-8340*	Pinion Adjusting Sleeve and Converter Hub Seal Installer	
14.	J-7079-32	Driver Handle (insert type)	
15.	J-8092	Driver Handle (threaded type)	
16.	J-8333*	Pinian Shaft Bushing Installer	
17.	J-3289	Differential Carrier Holding Fixture	
18.	J-5590	Pinion Shaft Bearing Installer	
19.	J-0972	Pinion Adjusting Sleeve Wrench	
20.	J-6266-1	Pinian Depth Setting Gauge Cylinder	
21.	J-6266-19	Pinion Depth Setting Gauge Plunger	
22.	J-6266-5	Pinion Depth Setting Gauge Plate	
23.	J-6266-18	Pinion Depth Setting Gauge Cylinder Adapters	
24.	J-5504	Universal Joint Yoke Puller	
25.	J-5741	Axle Bearing Press Plate	
26.	J-8359	Differential Side Bearing Installer	
27.	J-6266-25	Pinion Depth Setting Gauge Pilot	

*Tool required only for operations on automotic transmission axle.

CORVAIR 95 AND GREENBRIER—1200 SERIES

The differential carrier assemblies used on Corvair 1200 Series vehicles are identical to those used on Corvair Passenger Cars with the exception of gear ratios. Because of the heavier vehicle and greater load carrying potential, the standard ratio is 3.89:1 with three speed and Powerglide transmissions.

When the four speed transmission option is elected, a rear axle ratio of 3.27:1 is used. Reduced rear axle ratio is possible with a four speed transmission as the transmission gear ratios are increased to provide torque multiplication in the three reduction gears. This same ratio can be obtained optionally with three speed in combination with a three speed or Powerglide transmission.

Rear axle bearings used in 1200 Series vehicles are of the tapered roller type for increased durability. Two tapered roller bearings are mounted back to back and caged within a sheet metal retainer, however, this difference in design does not affect service procedures relative to the axle shafts or bearings.