

# 4-SPEED 117MM TRANSMISSION

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## DISASSEMBLY OF TRANSMISSION

### Refer to Figures 7B-1L and 7B-2L

1. Mount transmission in suitable holding fixture and remove cap screws attaching transmission cover assembly to transmission case. If required, insert two 5/16 x 18 screws in cover flange threaded holes and turn evenly to raise cover dowel pins from case.

Move reverse shifter fork so that reverse idler gear is partially engaged before attempting to remove cover. Forks must be positioned so rear edge of the slot in the reverse fork is in line with the front edge of the slot in the forward forks as viewed through tower opening.

2. Place transmission in two gears at once to lock gears. Remove the universal joint flange nut, universal joint front flange and brake drum assembly.

On models equipped with 4-wheel drive transfer case, use Tool J-23070 to remove mainshaft rear lock nut (Fig. 7B-26L).

3. Remove parking brake and brake flange plate assembly on models equipped with propeller shaft parking brake. Refer to Section 5, Truck Service Manual.

4. Remove rear bearing retainer and gasket.

5. Slide speedometer drive gear off mainshaft.

6. Remove drive gear bearing retainers and gasket.

7. Remove countergear front bearing cap and gasket.

8. Pry countergear front bearing out by inserting a two-pronged puller J-28509 through the cast slots in case.

9. Remove countergear rear bearing retaining rings (snap ring) from shaft and bearing. Using Tool J-22832 and J-8433-1 remove countergear rear bearings (Fig. 7B-3L). This will allow countergear assembly to rest on bottom of case.

Make sure Tool J-22832 engages full circumference of groove in bearing to prevent tool damage.

10. Remove drive gear bearing outer race to case retaining ring.

11. Remove drive gear and bearing by tapping gently on bottom side of drive gear shaft and prying directly opposite against the case and bearing snap ring groove at the same time. Remove 4th gear synchronizer ring.

Index cut out section of drive gear in down position with countergear to obtain clearance for removing clutch gear.

12. Remove rear mainshaft bearing retainer ring (snap ring) and using Tool J-22832 and J-8433-1, remove bearing from case (Fig. 7B-4L). Slide 1st speed gear thrust washer off mainshaft.

13. Raise rear of mainshaft assembly and push rearward in case bore, then swing front end up and lift from case. Remove synchronizer cone from shaft.

14. Slide reverse idler gear rearward and move countergear rearward until front end is free of case, then lift to remove from case.

15. To remove reverse idler gear, drive reverse idler gear shaft out of case from front to rear using a drive. Remove reverse idler gear from case.

## SUBASSEMBLY OPERATIONS

### TRANSMISSION COVER

#### Disassembly (Fig. 7B-5L)

1. Using a small punch drive out pins retaining 1st-2nd and 3rd-4th shifter forks to shifter shafts and also drive out expansion plugs.

The pin retaining the third and fourth shifter fork to the shaft must be removed, and the shifter fork removed from the cover before the reverse shifter head pin can be removed.

2. With shifter shafts in neutral position, drive shafts out of cover and shifter forks.

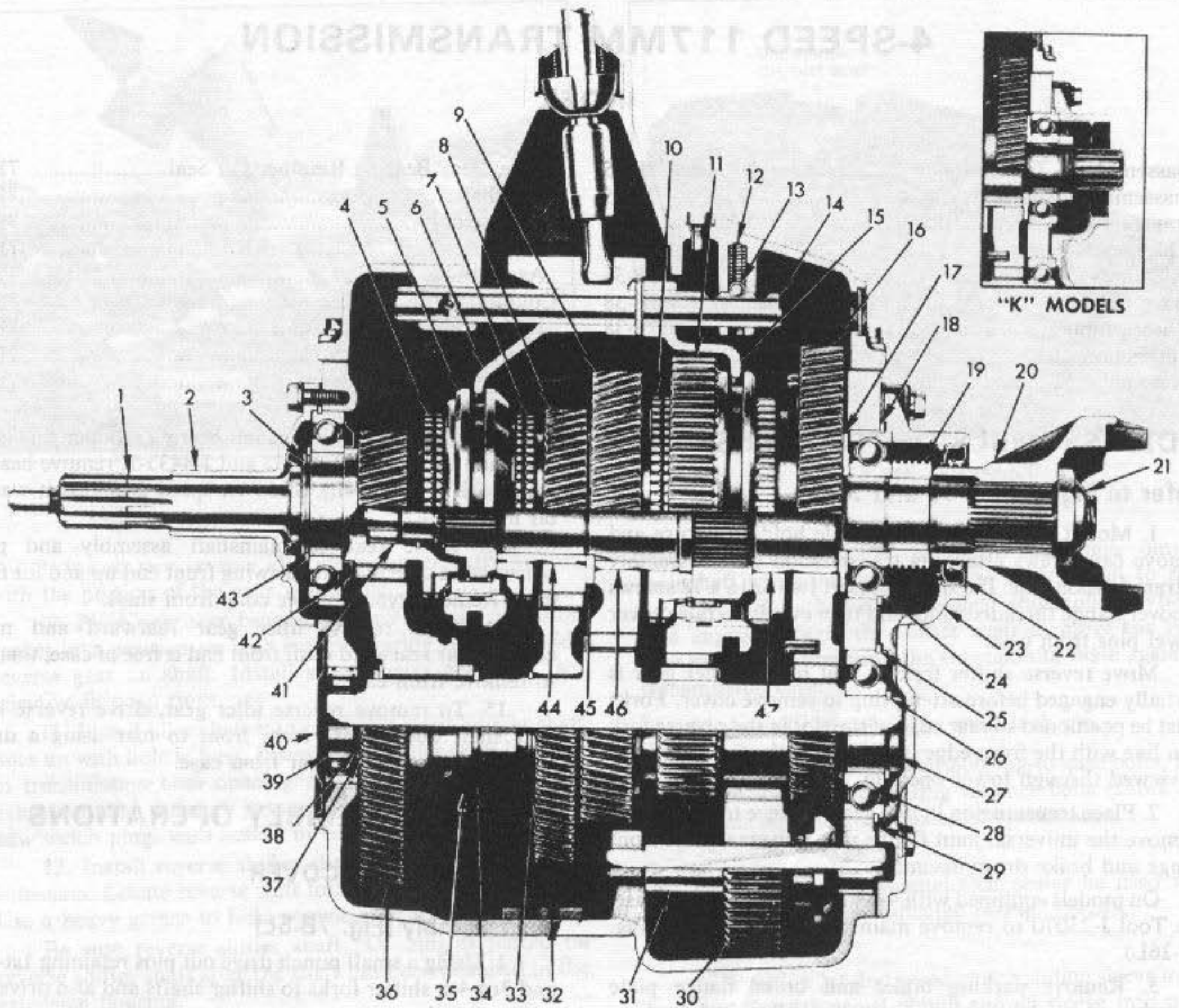
**NOTICE:** Exercise care so shaft detent balls, springs and innerlock pin located in the cover are not lost as the shifter shafts are removed.

3. Drive out pin holding reverse shifter head and drive out the shaft.

**NOTICE:** Exercise care during shaft removal since detent balls are under spring tension in the rear rail boss holes.

#### Assembly (Fig. 7B-6L)

1. In reassembling the transmission cover care must be used in installing the shifter shafts. They should be installed in the order shown in Fig. 7B-7L, namely, reverse, 3rd-4th, and 1st-2nd. Fig. 7B-6L illustrates the difference in the shafts.



- |  |                                    |                               |                                |
|--|------------------------------------|-------------------------------|--------------------------------|
| 1. Main Drive Gear                     | 11. Reverse Driven Gear            | 24. Mainshaft Rear Bearing    | 37. Thrust Washer              |
| 2. Drive Gear Bearing Retainer         | 12. Poppet Spring                  | 25. Rear Bearing Snap Ring    | 38. Snap Ring                  |
| 3. Snap Ring-Outer                     | 13. Poppet Ball                    | 26. Snap Ring                 | 39. Front Countershaft Bearing |
| 4. 3rd and 4th Synchronizer Ring       | 14. Shift Rail                     | 27. Countershaft              | 40. Countergear Front Cover    |
| 5. 3rd and 4th Synchronizer Collar     | 15. 1st and 2nd Shift Fork         | 28. Countershaft Rear Bearing | 41. Pilot Bearing Rollers      |
| 6. 3rd and 4th Shift Fork              | 16. 1st Speed Gear                 | 29. Bearing Snap Ring         | 42. Clutch Gear Oil Slinger    |
| 7. 3rd and 4th Speed Synchronizer Ring | 17. Thrust Washer                  | 30. Reverse Idler Gear        | 43. Snap Ring                  |
| 8. 3rd Speed Gear                      | 18. Bearing Snap Ring              | 31. Reverse Idler Shaft       | 44. 3rd Speed Gear Bushing     |
| 9. 2nd Speed Gear                      | 19. Speedometer Drive Gear         | 32. Case Magnet               | 45. Thrust Washer              |
| 10. 1st and 2nd Synchronizer Assembly  | 20. Output Yoke                    | 33. Snap Ring                 | 46. 2nd Speed Gear Bushing     |
|  | 21. Flange Nut                     | 34. Snap Ring                 | 47. 1st Speed Gear Bushing     |
|  | 22. Rear Bearing Retainer Oil Seal | 35. Spacer                    |                                |
|  | 23. Rear Bearing Retainer          | 36. Countergear               |                                |

Fig. 7B-1L-4-Speed 117mm Transmission Assembly--Cross Section

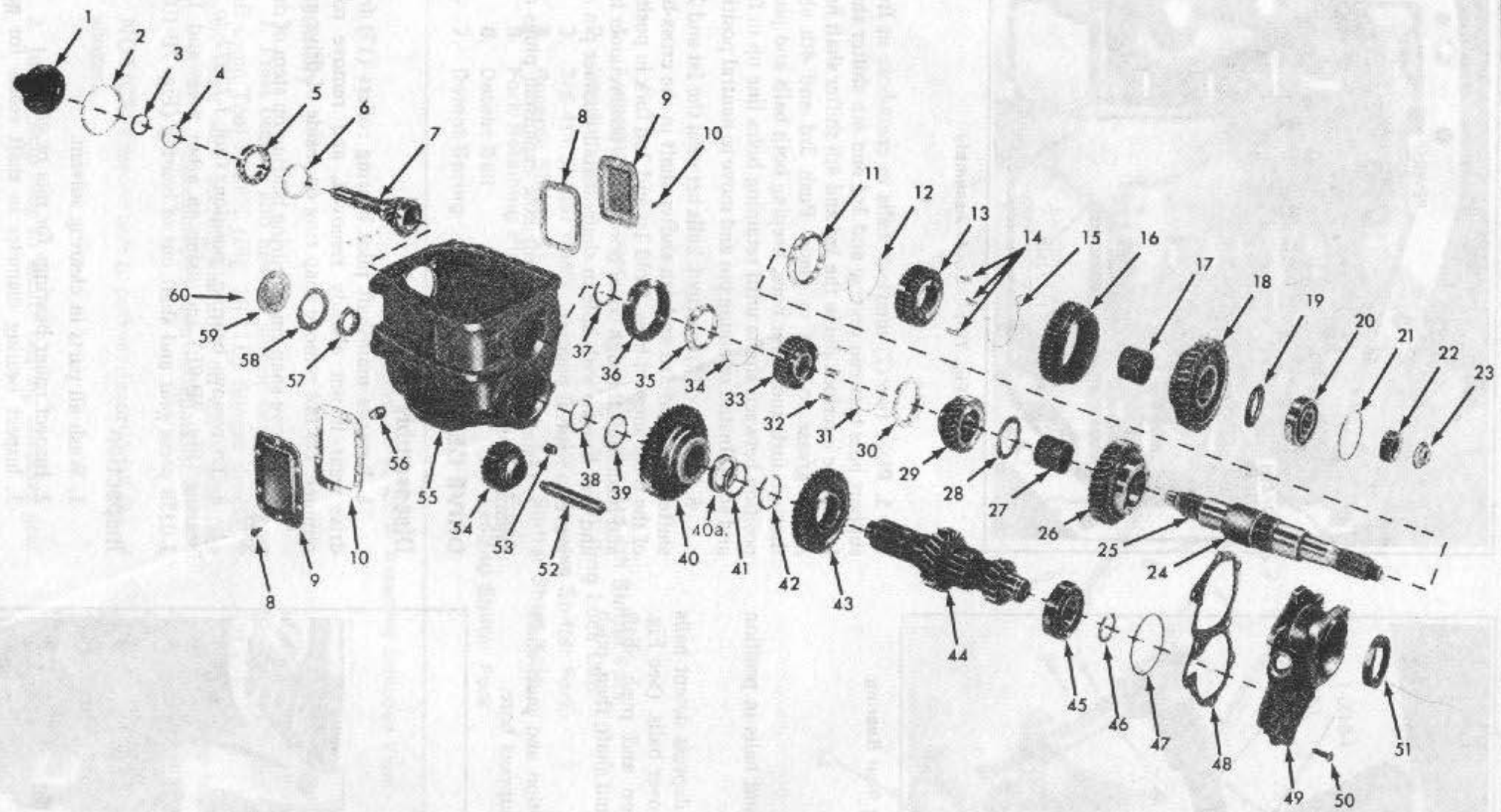


Fig. 7B-2L-4-Speed 117mm Transmission Exploded View

- |                                  |                                    |                                       |                              |                               |
|----------------------------------|------------------------------------|---------------------------------------|------------------------------|-------------------------------|
| 1. Drive Gear Bearing Retainer   | 13. 1st-2nd Speed Synchronizer Hub | 26. 2nd Speed Gear                    | 37. Snap Ring                | 48. Rear Retainer Gasket      |
| 2. Retainer Gasket               | 14. Synchronizer Keys              | 27. 3rd Gear Bushing                  | 38. Snap Ring                | 49. Rear Retainer             |
| 3. Lip Seal                      | 15. Synchronizer Spring            | 28. Thrust Washer                     | 39. Thrust Washer            | 50. Retainer Bolts            |
| 4. Snap Ring                     | 16. Reverse Driven Gear            | 29. 3rd Speed Gear                    | 40. Clutch Countergear       | 51. Retainer Lip Seal         |
| 5. Drive Gear Bearing            | 17. 1st Gear Bushing               | 30. 3rd Speed Blocker Ring            | 40a. Spacer                  | 52. Reverse Idler Shaft       |
| 6. Oil Slinger                   | 18. 1st Gear                       | 31. Synchronizer Spring               | 41. Snap Ring                | 53. Drain Plug                |
| 7. Drive Gear and Pilot Bearings | 19. Thrust Washer                  | 32. Synchronizer Keys                 | 42. Snap Ring                | 54. Reverse Idler Gear        |
| 8. Power Take-Off Cover Gasket   | 20. Rear Main Bearing              | 33. 3rd-4th Synchronizer Hub          | 43. 3rd Speed Countergear    | 55. Case                      |
| 9. Power Take-Off Cover          | 21. Bearing Snap Ring              | 34. Synchronizer Spring               | 44. Countergear Shaft        | 56. Fill Plug                 |
| 10. Retaining Screws             | 22. Speedometer Gear               | 35. 3rd-4th Speed Blocker Ring        | 45. Countergear Rear Bearing | 57. Countergear Front Bearing |
| 11. 1st-2nd Speed Blocker Ring   | 23. Rear Mainshaft Lock Nut        | 36. 3rd-4th Speed Synchronizer Sleeve | 46. Snap Ring                | 58. Gasket                    |
| 12. Synchronizer Spring          | 24. 2nd Speed Bushing (On Shaft)   |                                       | 47. Bearing Outer Snap Ring  | 59. Front Cover               |
|                                  | 25. Mainshaft                      |                                       |                              | 60. Cover Screws              |

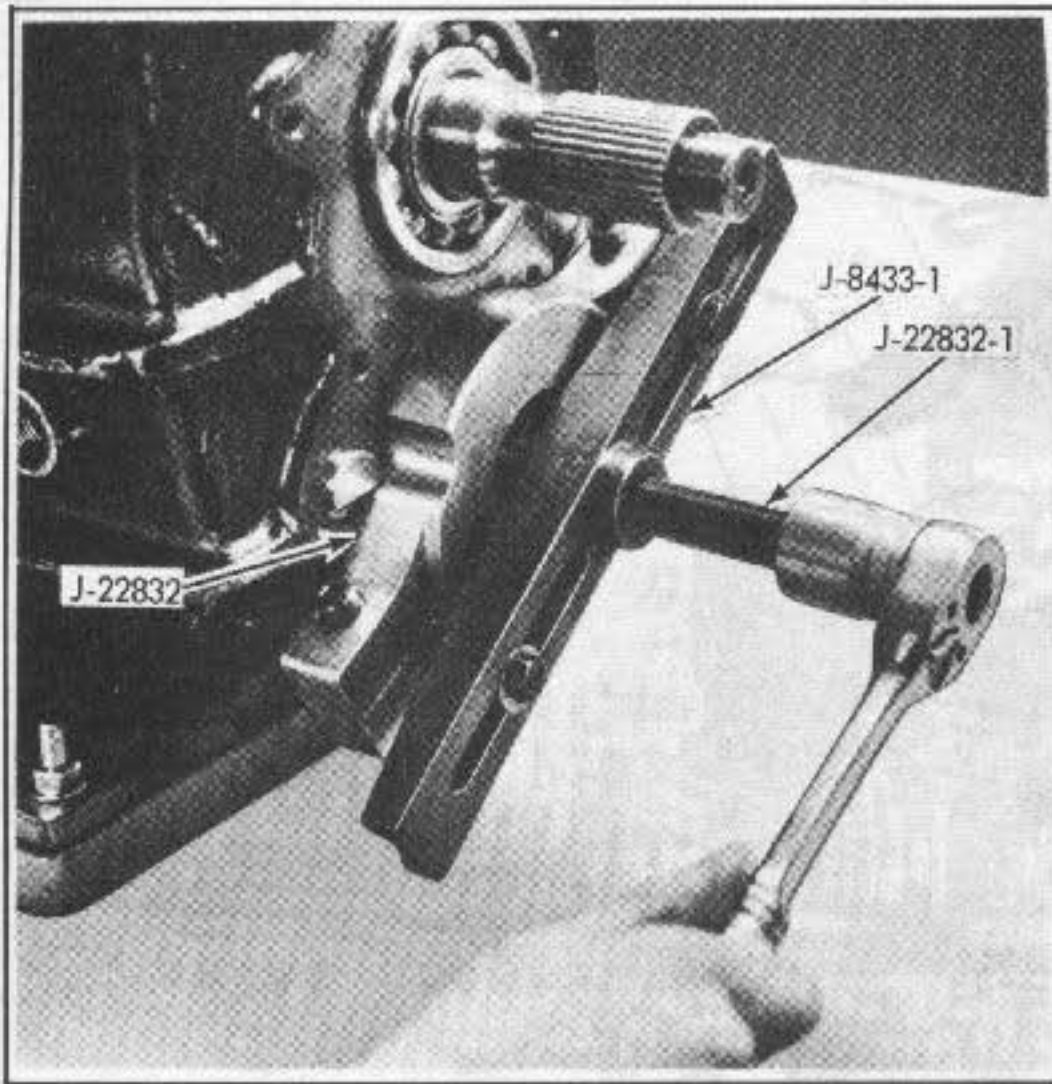


Fig. 7B-3L—Removing Countergear Rear Bearing

2. Place fork detent ball springs and balls in position in holes in cover.

3. Start shifter shafts into cover; depress detent balls with small punch and push shafts on over balls. (See Fig. 7B-7L). Hold reverse fork in position and push shaft through yoke. Install split pin in fork and shaft; then, push fork in neutral position.

4. Hold 3rd and 4th fork in position and push shaft through yoke, but not through front support bore.

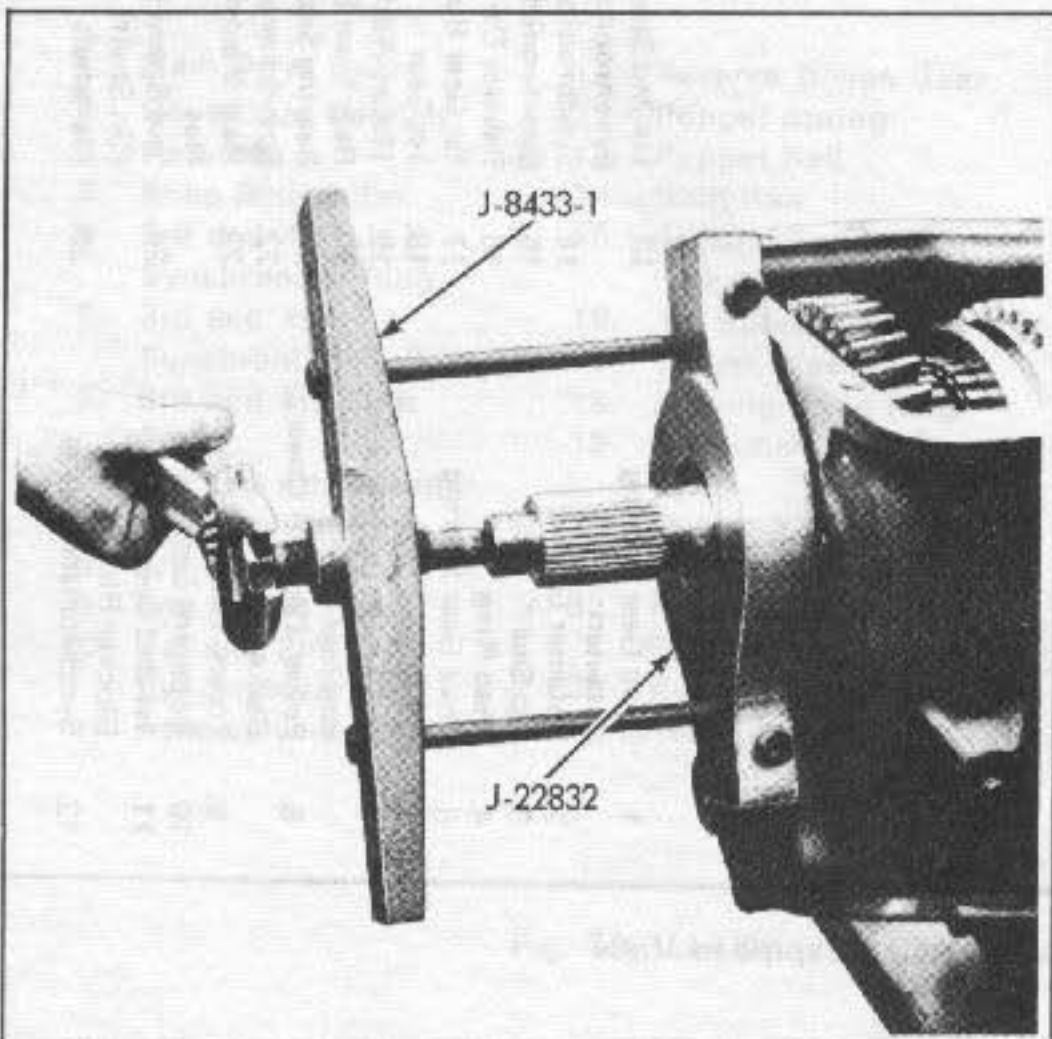


Fig. 7B-4L—Removing Mainshaft Rear Bearing

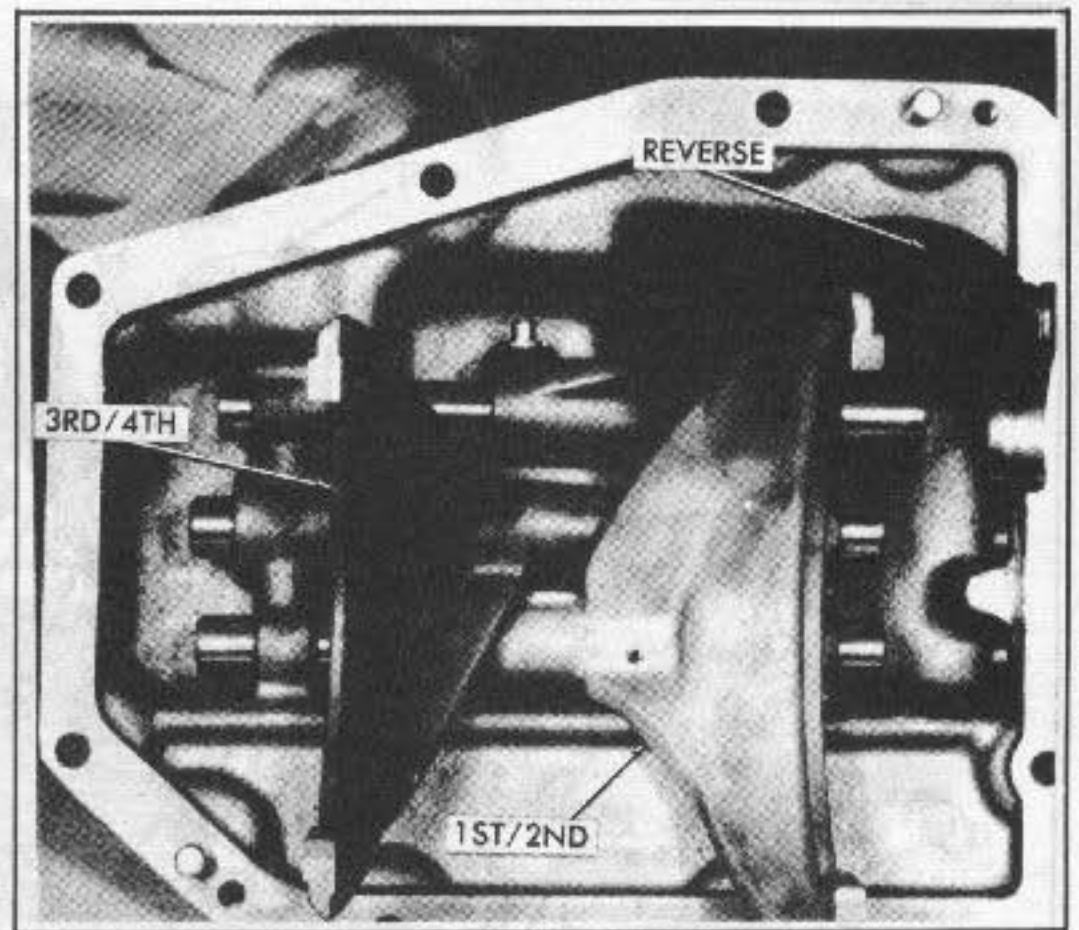


Fig. 7B-5L—Cover Assembly

5. Place two (2) interlock balls in cross-bore in front support boss between reverse and 3rd and 4th shifter shaft. Install the interlock pin in the 3rd and 4th shifter shaft hole. Apply grease to hold in place. Push 3rd and 4th shaft through fork and cover bore, keeping both balls and pin in position between shafts until retaining holes line up in fork and shaft. Install retaining pin and move to neutral position.

6. Place two (2) interlock balls between the 1st and 2nd shifter shaft and 3rd and 4th shifter shaft in the cross-bore of the front support boss. Hold 1st and 2nd fork in position and push shaft through cover bore in fork until retainer hole and fork line up with hole in shaft. Install retainer pin and move to neutral position.

7. Install new shifter shaft hole expansion plugs and expand in place.

## DRIVE GEAR (FIG. 7B-8L)

### Disassembly

1. Remove mainshaft pilot bearing rollers (17) from drive gear if not already removed, and remove roller retainer. Do not remove snap ring on inside of drive gear.

2. Remove snap ring securing bearing on stem of drive gear.

3. To remove bearing, position Tool J-22872 to the bearing (Fig. 7B-9L) and using an arbor press and Tool J-0358 press gear and shaft out of bearing (Fig. 7B-10L).

### Inspection

1. Wash all parts in clearing solvent.
2. Inspect roller bearings for pits or galling.
3. Inspect bearing diameter in shaft recess for galling.
4. Inspect gear teeth for excessive wear.
5. Inspect clutch shaft pilot for excessive wear.
6. Re-oil bearing, then rotate drive gear bearing slowly by hand and check for roughness.

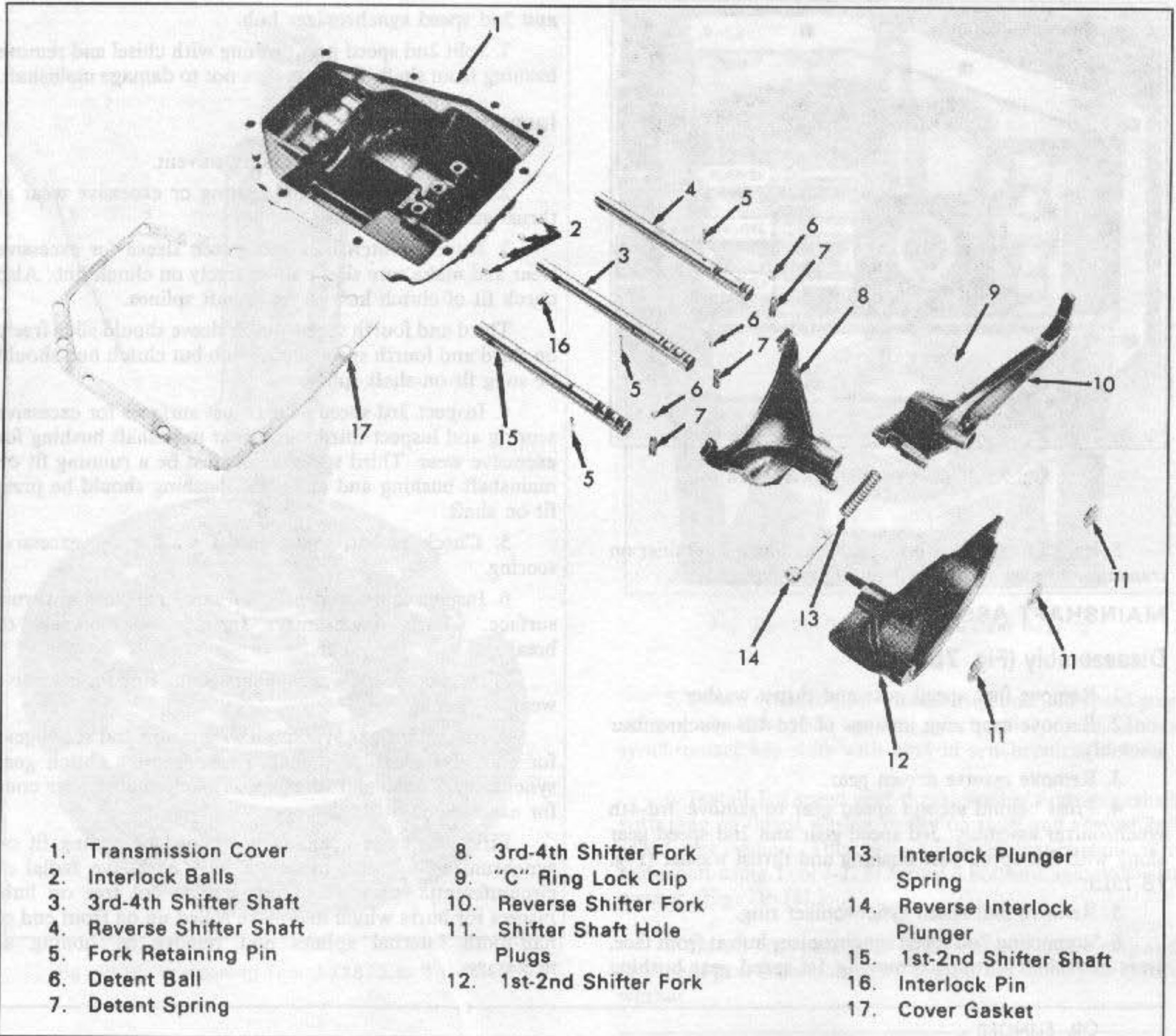


Fig. 7B-6L—Cover Assembly Exploded View

**Assembly**

1. Press bearing and new oil slinger onto drive gear shaft using Tool J-22872 (Fig. 7B-11L). Slinger should be located flush with bearing shoulder on drive gear. See Figure 7B-8L for direction of slinger installation.

**NOTICE:** Exercise care to prevent distortion of the oil slinger.

2. Install snap ring to secure bearing on drive gear shaft.

3. Install bearing retainer ring in groove on O.D. of bearing. The bearing must turn freely, after it is installed on the shaft.

4. Install snap ring on I.D. of mainshaft pilot bearing bore in clutch gear (if previously removed).

5. Apply a small amount of grease to bearing surface in shaft recess, install transmission mainshaft pilot roller bearings (17) and install roller bearing retainer (Fig. 7B-12L).

This roller bearing retainer holds bearing in position and in final transmission assembly is pushed forward into recess by mainshaft pilot.

**DRIVE GEAR BEARING RETAINER OIL SEAL**

**Replacement**

1. Remove retainer and oil seal assembly and gasket.

2. Pry oil seal out of retainer.

3. Install new seal on Tool J-22833 with lip of seal toward flange of tool.

4. Support front surface of retainer in press, start seal and tool in retainer bore and drive seal into retainer until flange of tool bottoms on retainer (Fig. 7B-13L).

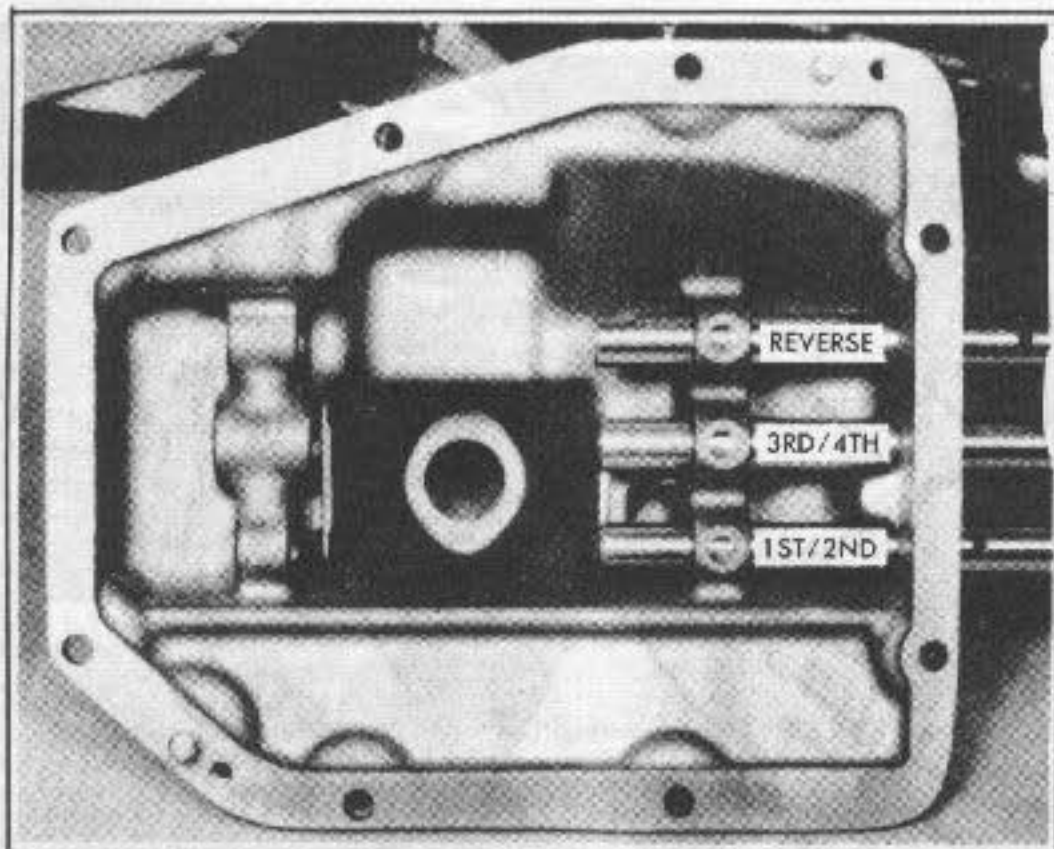


Fig. 7B-7L-Shifter Shaft Installation

5. Install new gasket on retainer and install retainer on transmission case (when assembling transmission).

## MAINSHAFT ASSEMBLY

### Disassembly (Fig. 7B-14L)

1. Remove first speed gear and thrust washer.
2. Remove snap ring in front of 3rd-4th synchronizer assembly.
3. Remove reverse driven gear.
4. Press behind second speed gear to remove 3rd-4th synchronizer assembly, 3rd speed gear and 2nd speed gear along with 3rd speed gear bushing and thrust washer (Fig. 7B-15L).
5. Remove 2nd speed synchronizer ring.
6. Supporting 2nd speed synchronizer hub at front face, press mainshaft through removing 1st speed gear bushing

and 2nd speed synchronizer hub.

7. Split 2nd speed gear bushing with chisel and remove bushing from shaft. Exercise care not to damage mainshaft.

### Inspection

1. Wash all parts in cleaning solvent.
2. Inspect mainshaft for scoring or excessive wear at thrust surfaces or splines.
3. Inspect clutch hub and clutch sleeve for excessive wear and make sure sleeve slides freely on clutch hub. Also check fit of clutch hub on mainshaft splines.

Third and fourth speed slutch sleeve should slide freely on third and fourth speed clutch hub but clutch hub should be snug fit on shaft splines.

4. Inspect 3rd speed gear thrust surfaces for excessive scoring and inspect third speed gear mainshaft bushing for excessive wear. Third speed gear must be a running fit on mainshaft bushing and mainshaft bushing should be press fit on shaft.

5. Check second speed thrust washer for excessive scoring.

6. Inspect 2nd speed gear for excessive wear at thrust surface. Check synchronizer springs for looseness or breakage.

7. Inspect second gear synchronizing ring for excessive wear.

8. Inspect bronze synchronizer cone on 2nd speed gear for excessive wear or damage. Also inspect clutch gear synchronizer cone and third speed gear synchronizer cone for excessive wear or damage.

First and reverse sliding gear must be sliding fit on synchronizer hub and must not have excessive radial or circumferential play. If sliding gear is not free on hub, inspect for burrs which may have rolled up on front end of half-tooth internal splines and remove by honing as necessary.

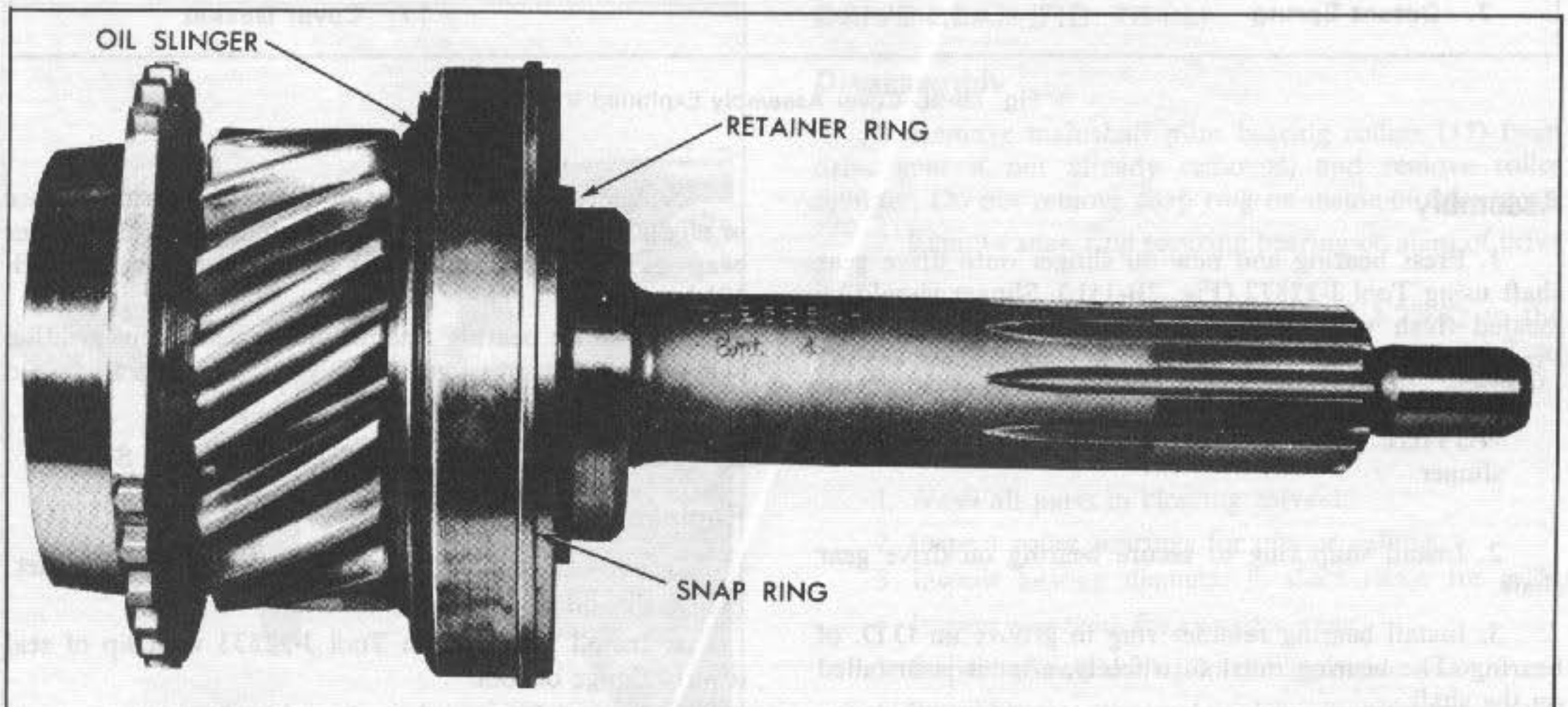


Fig. 7B-8L-Drive Gear Assembly

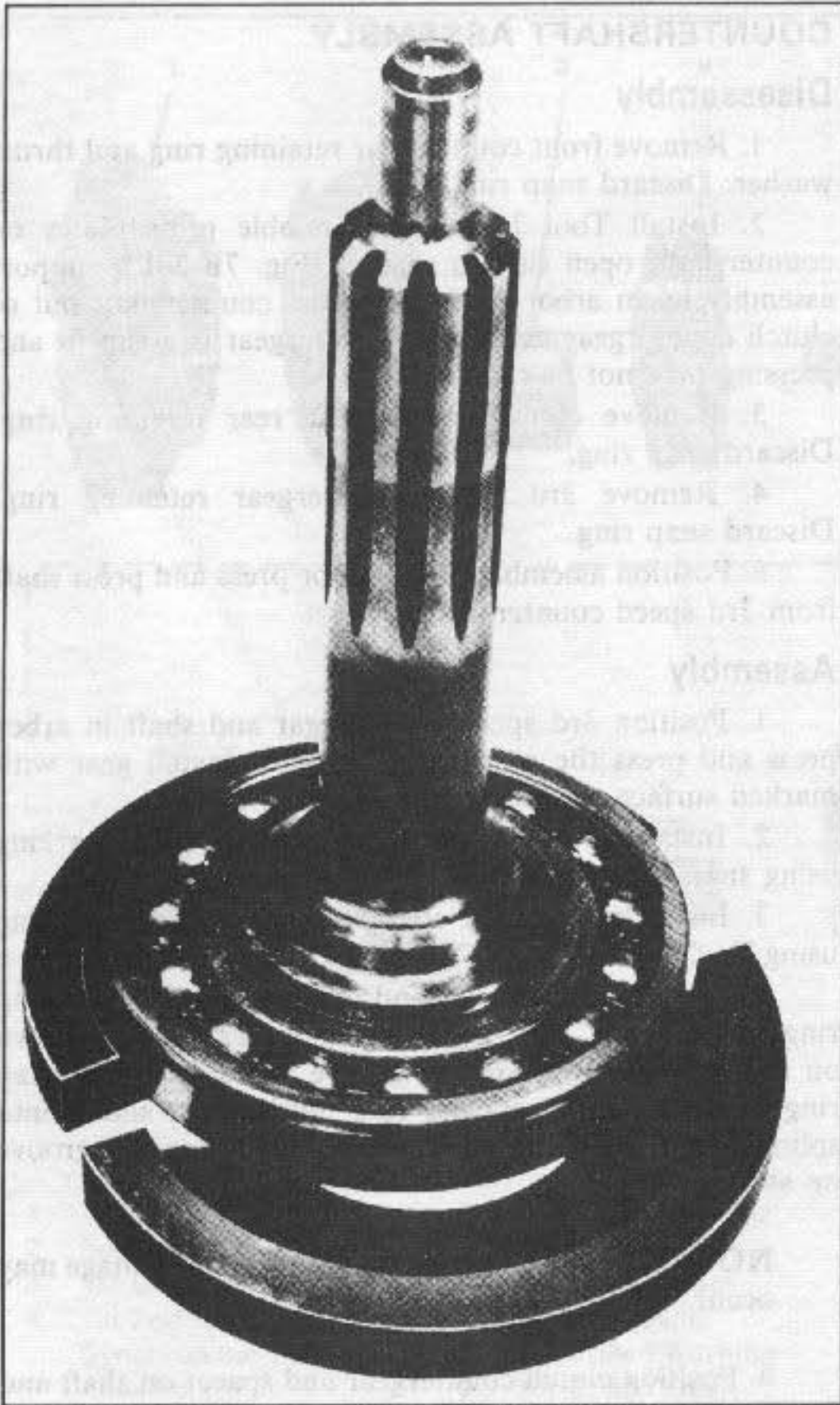


Fig. 7B-9L-Positioning Tool J-22872 to Drive Gear

9. Inspect all gear teeth for excessive wear.

**Assembly**

1. Using Tool J-22873 press 2nd speed bushing onto mainshaft until it bottoms against shoulder (Fig. 7B-16L).

Lubricate bushing with E.P. oil before pressing.

**NOTICE:** 1st, 2nd and 3rd speed gear bushings are sintered iron, exercise care when installing, or damage may occur.

2. Press 1st and 2nd speed synchronizer hub onto mainshaft until it bottoms against shoulder with annulus toward rear of shaft.

3. Install 1st and 2nd synchronizer keys and springs (if previously removed).

4. Using Tool J-22873 press 1st speed gear bushing onto mainshaft until it bottoms against hub (Fig. 7B-17L). Lubricate all bushings with E.P. oil before installation of gears.

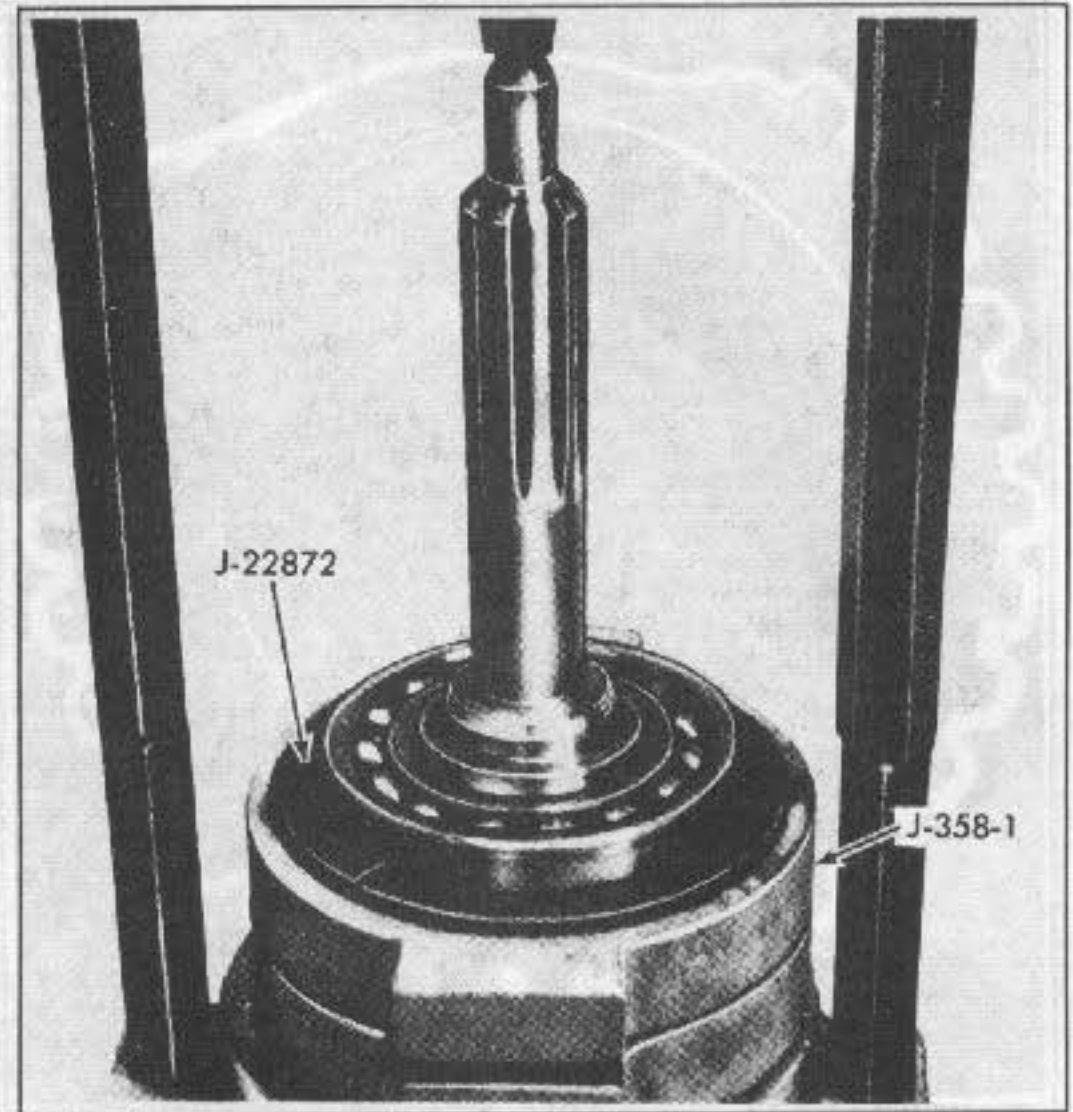


Fig. 7B-10L-Removing Drive Gear Bearing

5. Install synchronizer blocker ring and 2nd speed gear onto mainshaft and against synchronizer hub. Index synchronizer key slots with keys in synchronizer hub.

6. Install 3rd speed gear thrust washer onto mainshaft with tang on thrust washer in slot on shaft and against 2nd speed gear bushing. Then press 3rd speed gear bushing onto mainshaft using Tool J-22875 until it bottoms against thrust washer (Fig. 7B-18L).

7. Install 3rd speed gear synchronizer blocker ring and 3rd speed gear onto mainshaft, against 3rd speed gear thrust washer.

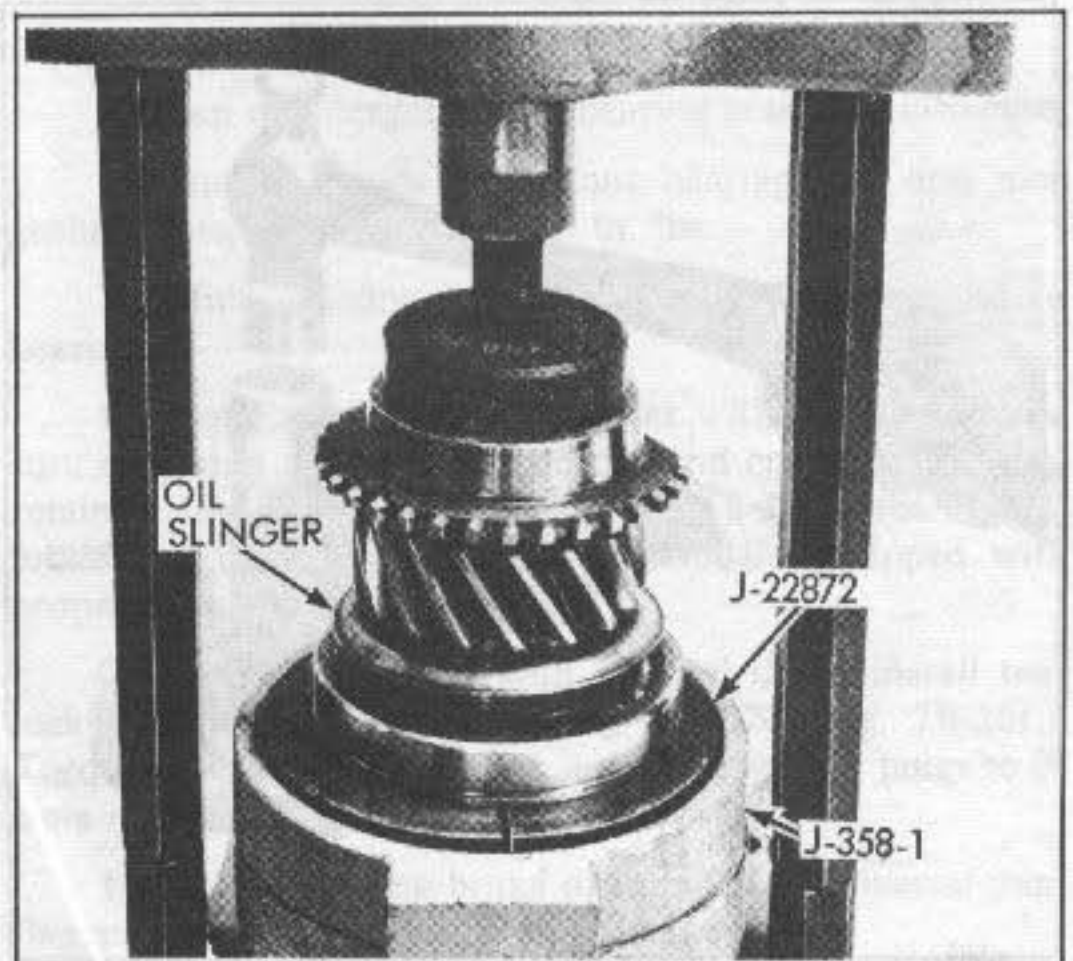


Fig. 7B-11L-Replacing Drive Gear Bearing

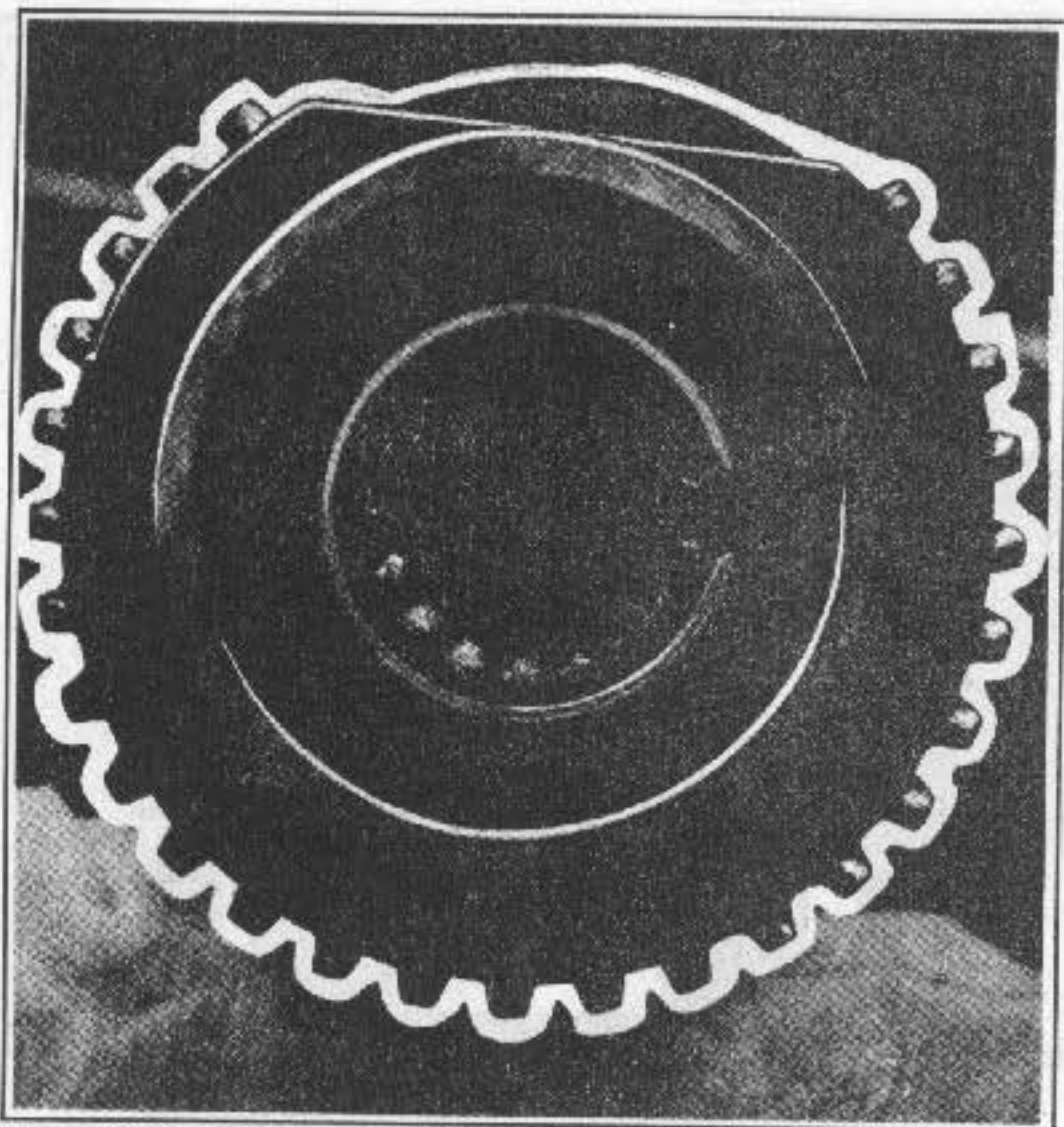


Fig. 7B-12L—Pilot Roller Bearing Installed

8. Index synchronizer ring key slots with synchronizer assembly keys and press 3rd and 4th synchronizer assembly onto mainshaft using Tool J-22875 and against 3rd speed gear bushing thrust face toward 3rd speed gear (Fig. 7B-19L). Retain synchronizer assembly with snap ring.

9. Install reverse driven gear with fork groove toward rear.

10. Install 1st speed gear onto mainshaft and against 1st and 2nd synchronizer hub. Install 1st speed gear thrust washer.

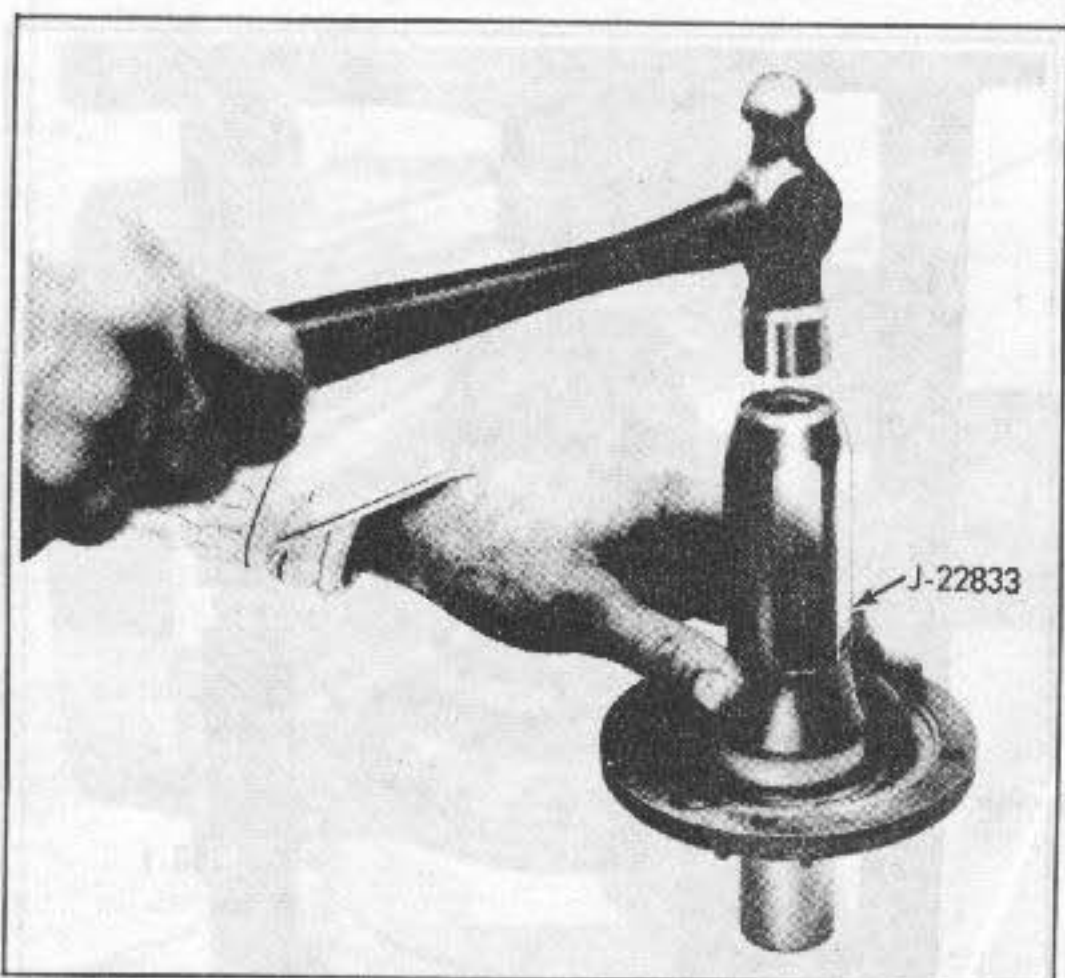


Fig. 7B-13L—Installing Bearing Retainer Oil Seal

## COUNTERSHAFT ASSEMBLY

### Disassembly

1. Remove front countergear retaining ring and thrust washer. Discard snap ring.

2. Install Tool J-22832 or suitable press plates on countershaft, open side to spacer, (Fig. 7B-20L); support assembly in an arbor press and press countershaft out of clutch countergear assembly. Countergear is a slip fit and pressing may not be required.

3. Remove clutch countergear rear retaining ring. Discard snap ring.

4. Remove 3rd speed countergear retaining ring. Discard snap ring.

5. Position assembly on an arbor press and press shaft from 3rd speed countergear.

### Assembly

1. Position 3rd speed countergear and shaft in arbor press and press the gear onto the shaft. Install gear with marked surface toward front of shaft.

2. Install new 3rd speed countergear retaining ring using snap ring pliers.

3. Install new clutch countergear rear retaining ring using Tool J-22830, J-22873 and snap ring pliers as follows:

Install Tool J-22830 on end of shaft and position snap ring on Tool (Fig. 7B-21L). Using Tool J-22873, push down on snap ring until it engages groove on shaft. Using snap ring pliers, carefully expand ring until it just slides onto splines, then push ring down shaft until it engages groove on shaft.

**NOTICE:** Do not over stress snap ring or damage may occur.

4. Position clutch countergear and spacer on shaft and press countergear onto shaft against snap ring using Tool J-22873, (Fig. 7B-22L). Countergear is a slip fit and pressing may not be required.

5. Install clutch countergear thrust washer and front retaining ring using Tool J-22830 and J-22873 (Fig. 7B-21L).

**NOTICE:** Do not over stress snap ring, or damage may occur. Ring should be tight in groove without side play.

## ASSEMBLY OF TRANSMISSION

1. Lower the countergear into the case until it rests on bottoms of case.

2. Place reverse idler gear in transmission case with gear teeth toward the front. Install idler gear shaft from rear to front, being careful to have slot in end of shaft in facing down. Shaft slot face must be at least flush with case.

3. Install mainshaft assembly into case with rear of shaft protruding out rear bearing hole in case. Position Tool J-22874 in clutch gear case opening and engaging front mainshaft (Fig. 7B-23L). Rotate case onto front end.

Install 1st speed gear thrust washer on shaft, if not previously installed.

4. Install snap ring on bearing O.D. and position rear mainshaft bearing on shaft. Using Tool J-22874-1 drive bearing onto shaft and into case (Fig. 7B-23L). Rotate case



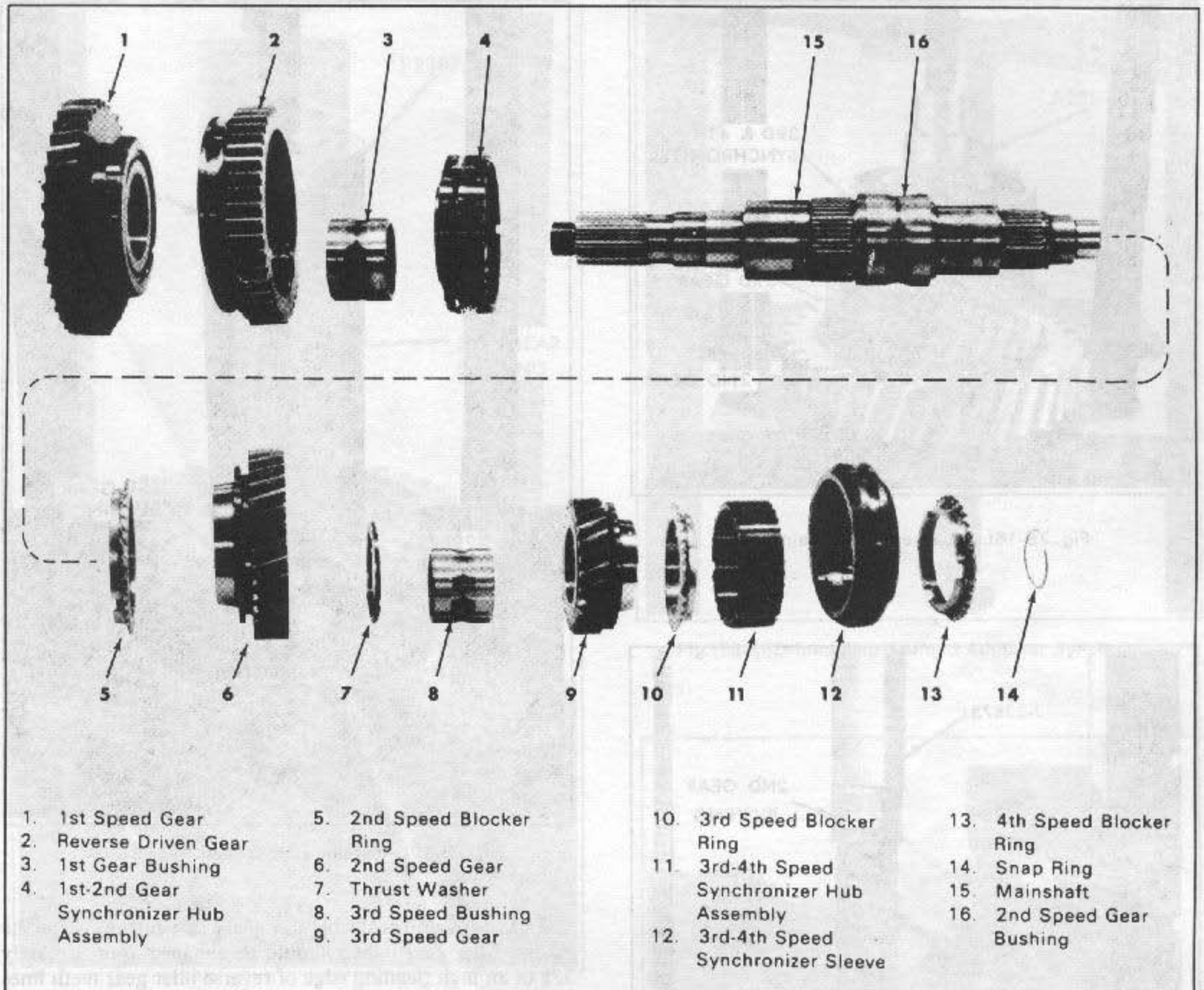


Fig. 7B-14L—Mainshaft Assembly Exploded View

and remove Tool J-22874-5.

5. Install synchronizer cone on pilot end of mainshaft and slide rearward to clutch hub. Make sure three cut out sections of 4th speed synchronizer cone align with three clutch keys in clutch assembly.

6. Install snap ring on drive gear bearing O.D. Index cut out portion of drive gear teeth to obtain clearance over countershaft drive gear teeth, and install clutch gear assembly onto case. Raise mainshaft to get clutch gear started and tap bearing outer race with plastic tip hammer.

7. Install drive gear bearing retainer using a new gasket. Install bolts and tighten to 15-18 ft. lbs.

8. Install appropriate tool in countergear front bearing opening in case to support countergear and rotate case onto front end. (Fig. 7B-24L).

9. Install snap ring on countergear rear bearing O.D. position, bearing on countergear and using Tool J-22874-1, drive bearing into place (Fig. 7B-25L). Rotate case, install snap ring on countershaft at rear bearing and then remove Tool J-22874-1.

10. Tap countergear front bearing assembly into case.

11. Install countergear front bearing cap and new gasket. Torque screws to 20-30 in. lbs.

12. Slide speedometer drive gear over mainshaft to bearing.

13. Install rear bearing retainer with new gasket. Be sure snap ring ends are in lube slot and cut out in bearing retainer. Install bolts and tighten to 15-18 ft. lbs. Install brake backing plate assembly on models equipped with propeller shaft brake.

On models equipped with 4-wheel drive, install rear lock nut and washer using Tool J-23070 (Fig. 7B-26L). Torque lock nut to 120 ft. lbs. and bend washer tangs to fit slots in nut.

14. Install parking brake drum and/or universal joint flange. Apply light coat of oil to seal surface.

15. Lock transmission in two gears at once. Install universal joint flange locknut and tighten to 90-120 ft. lbs.

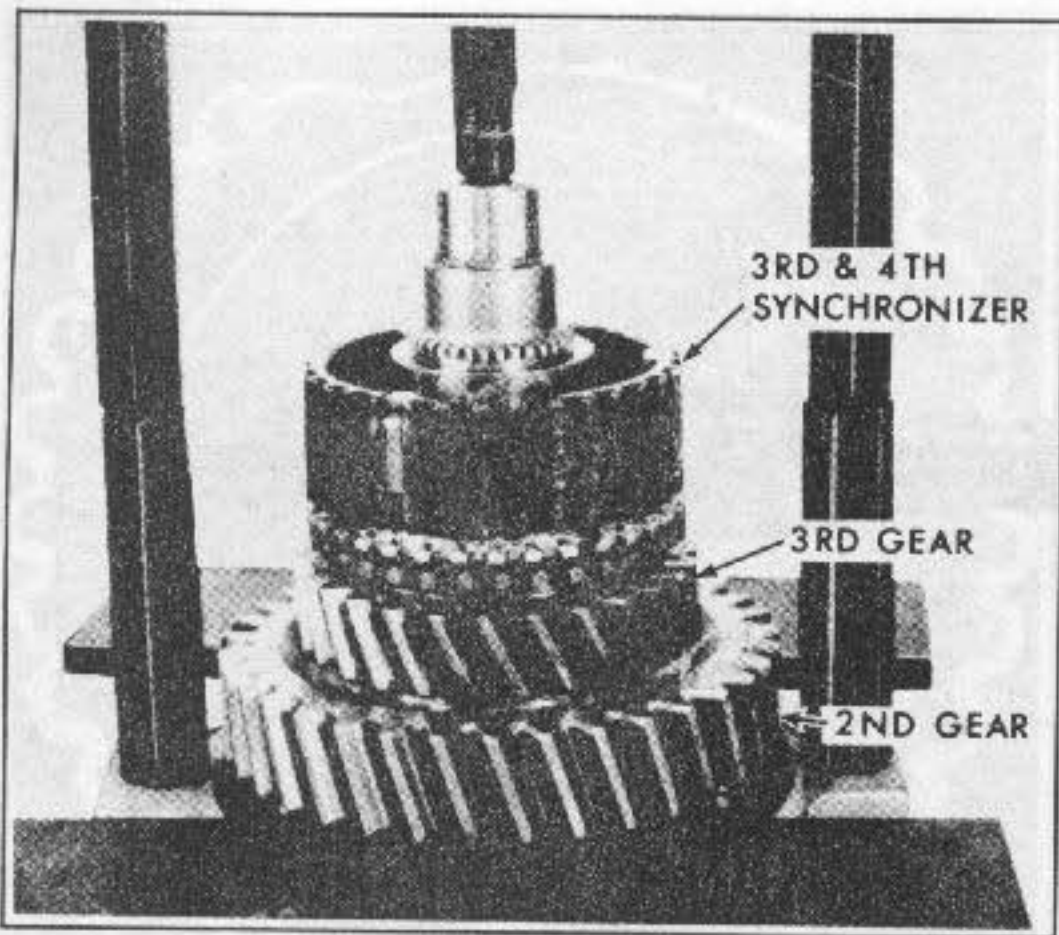


Fig. 7B-15L-Disassembly of Mainshaft

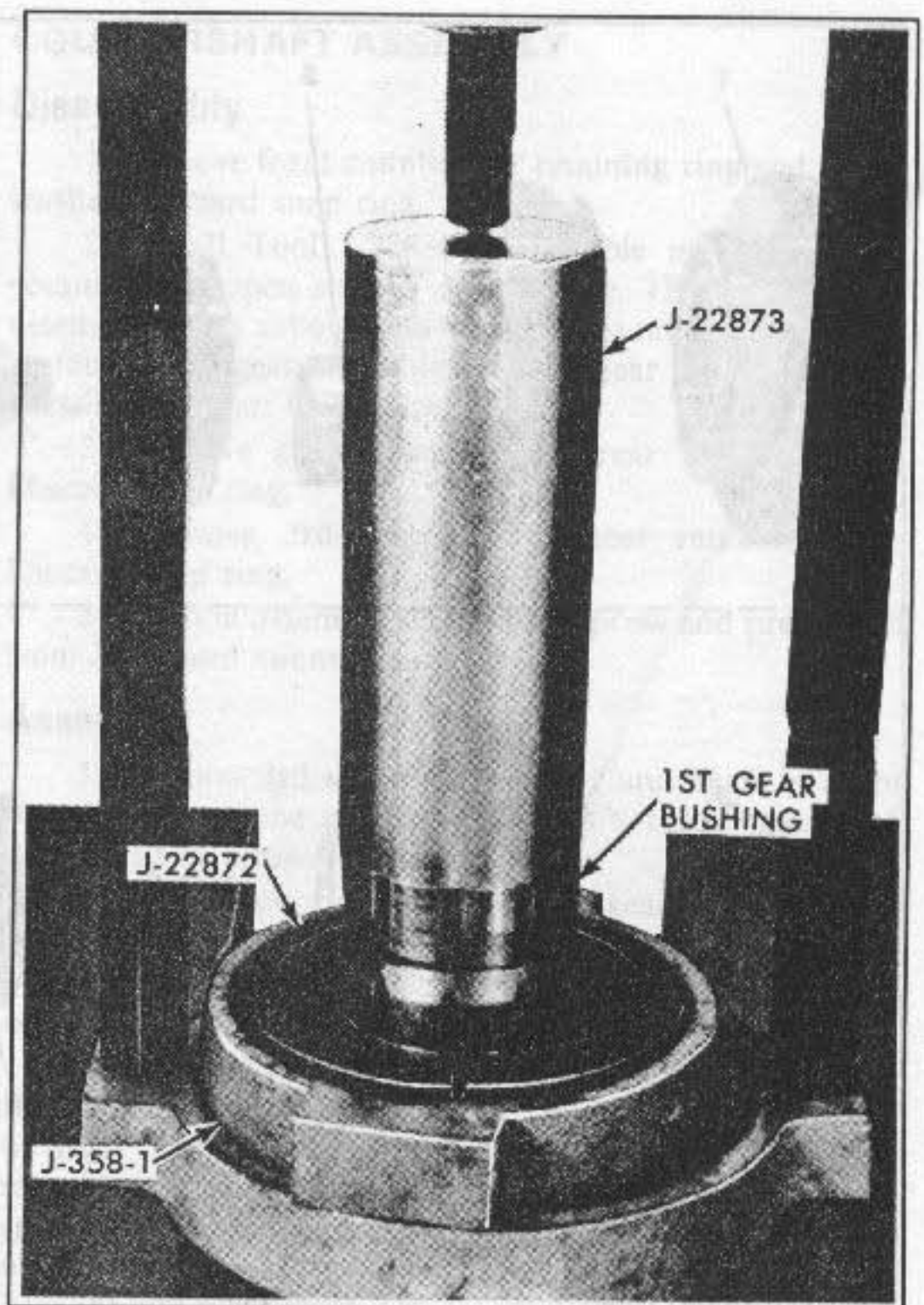


Fig. 7B-17L-Installing 3rd Speed Gear Bushing

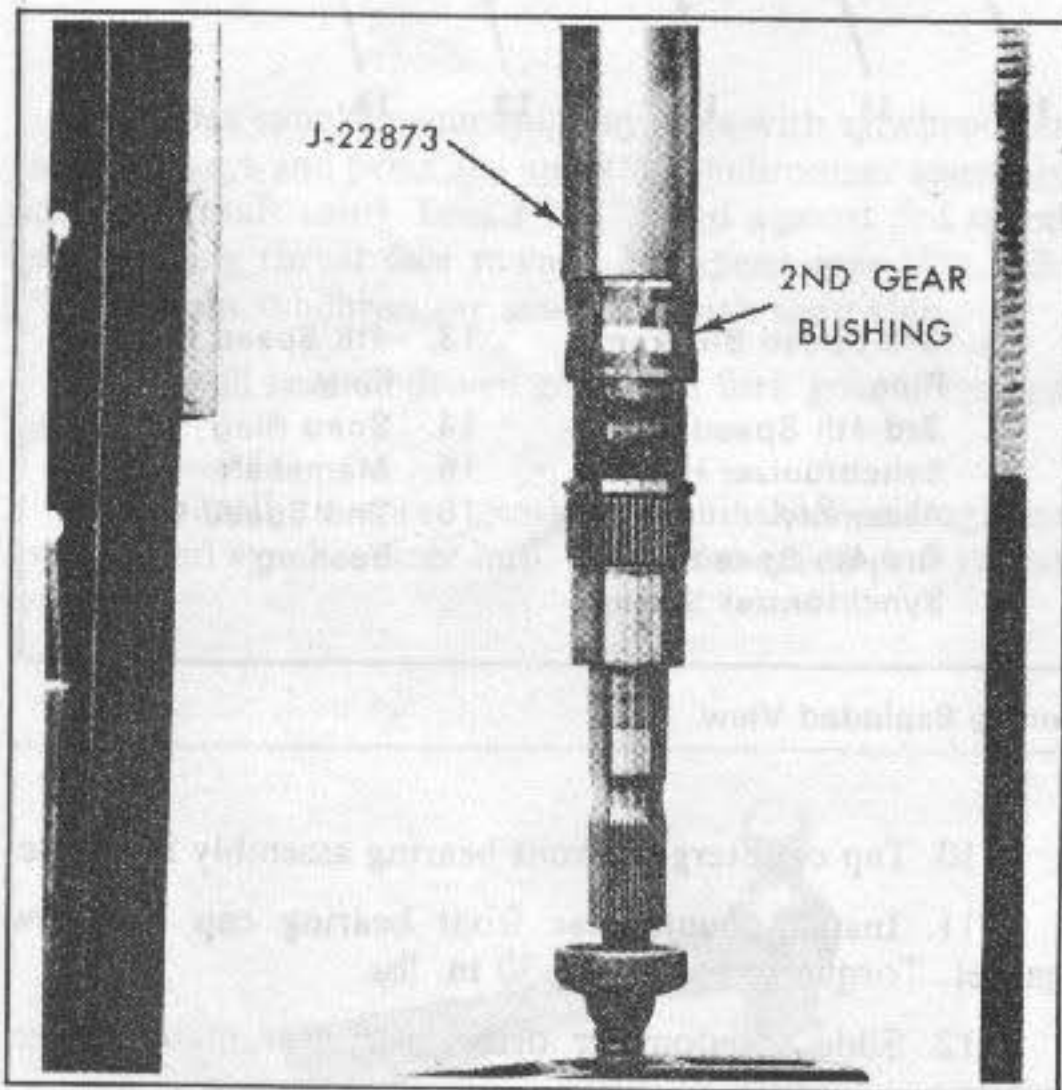


Fig. 7B-16L-Installing 2nd Speed Gear Bushing

16. Move all transmission gears to neutral except the reverse idler gear which should be engaged approximately 3/8 of an inch (leading edge of reverse idler gear teeth lines up with the front edge of the 1st speed gear). Install cover assembly with new gasket to transmission case. Shifting forks must slide into their proper positions on clutch sleeves and reverse idler gear. Forks must be positioned as in removal.

17. Install cover attaching bolts and torque to 20-25 ft. lbs.

b 18. Using Tool J-8109, replace gearshift lever and check operation of transmission.

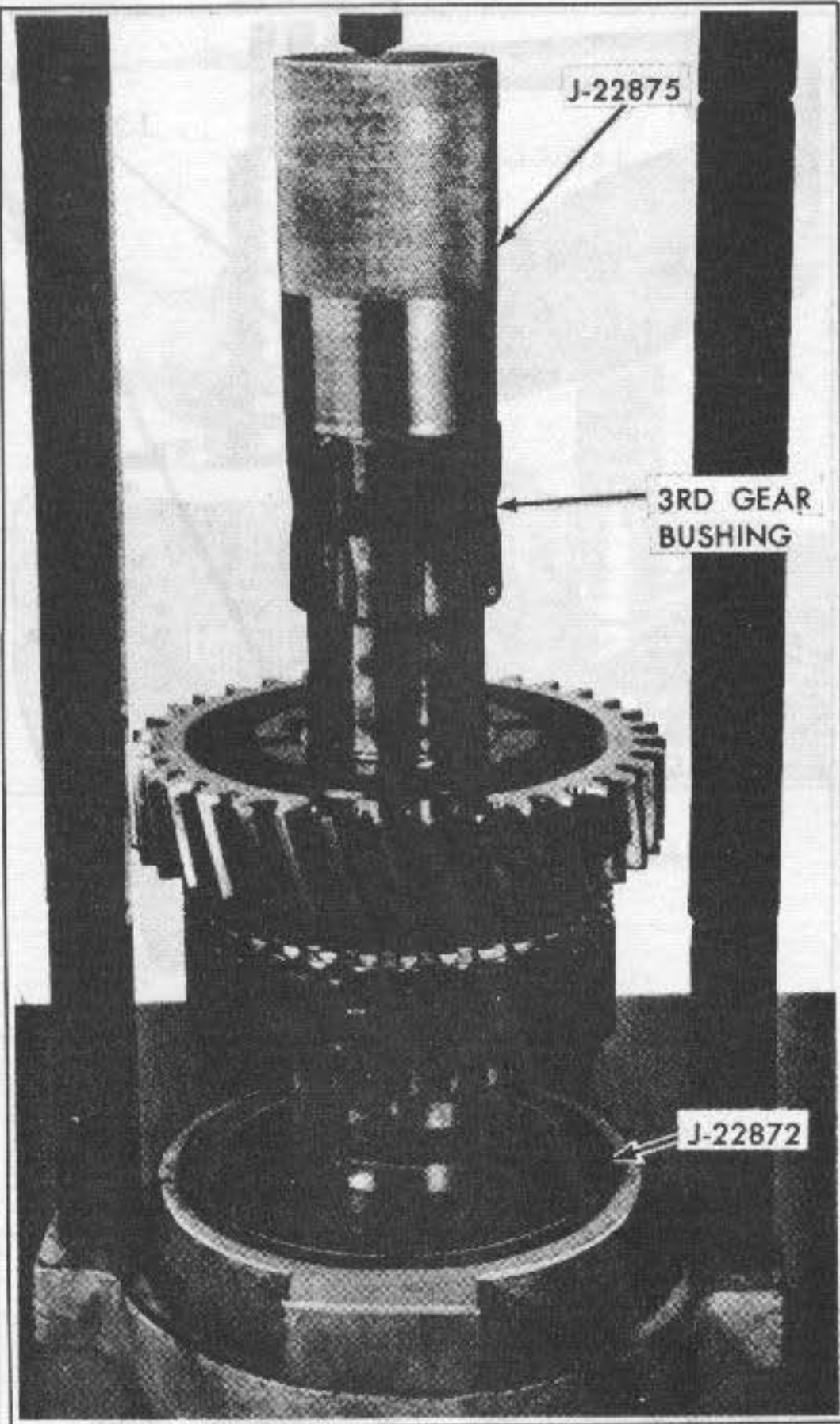


Fig. 7B-18L-Installing 3rd Speed Gear Bushing

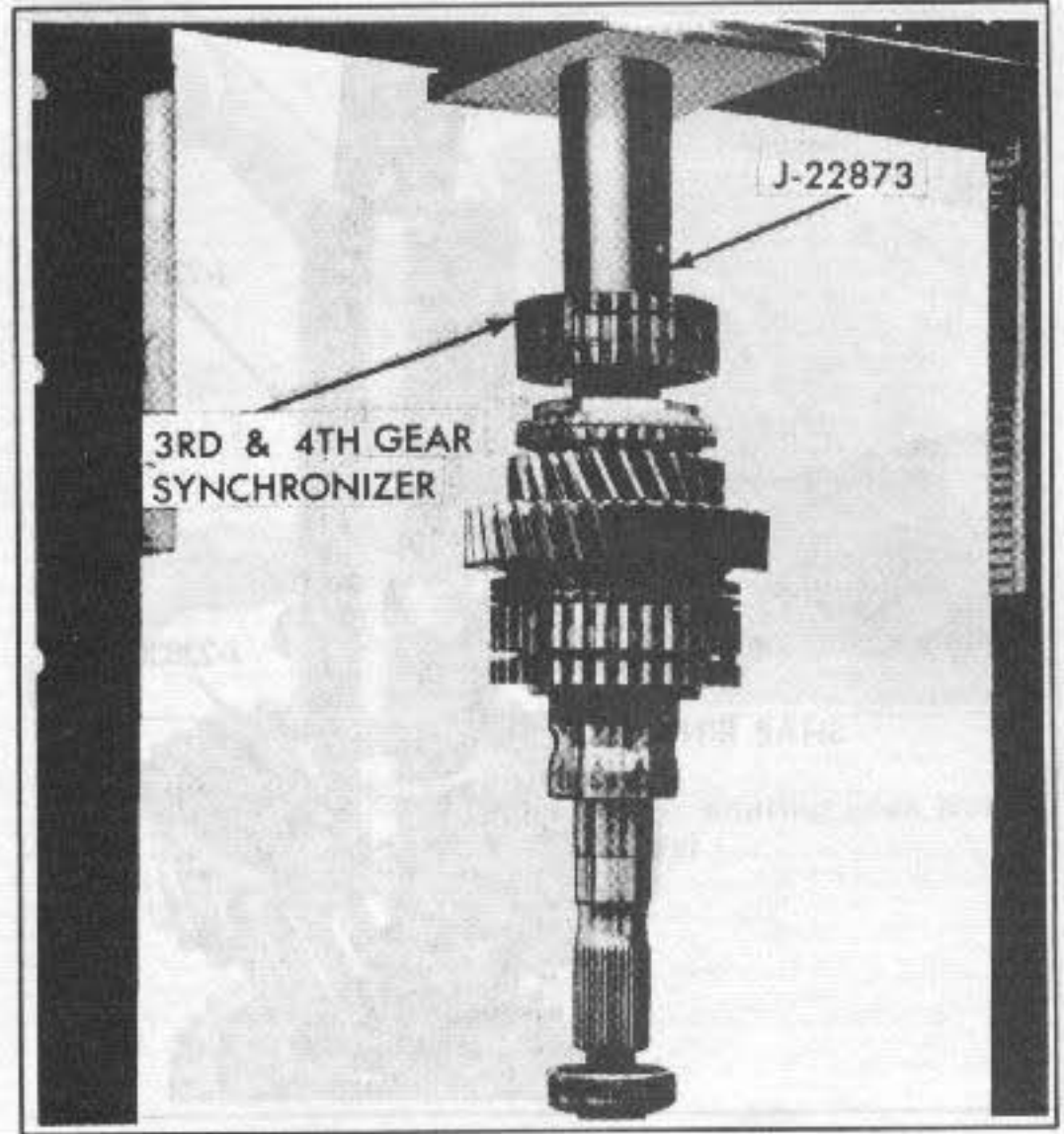


Fig. 7B-19L-Installing 3rd and 4th Gear Synchronizer

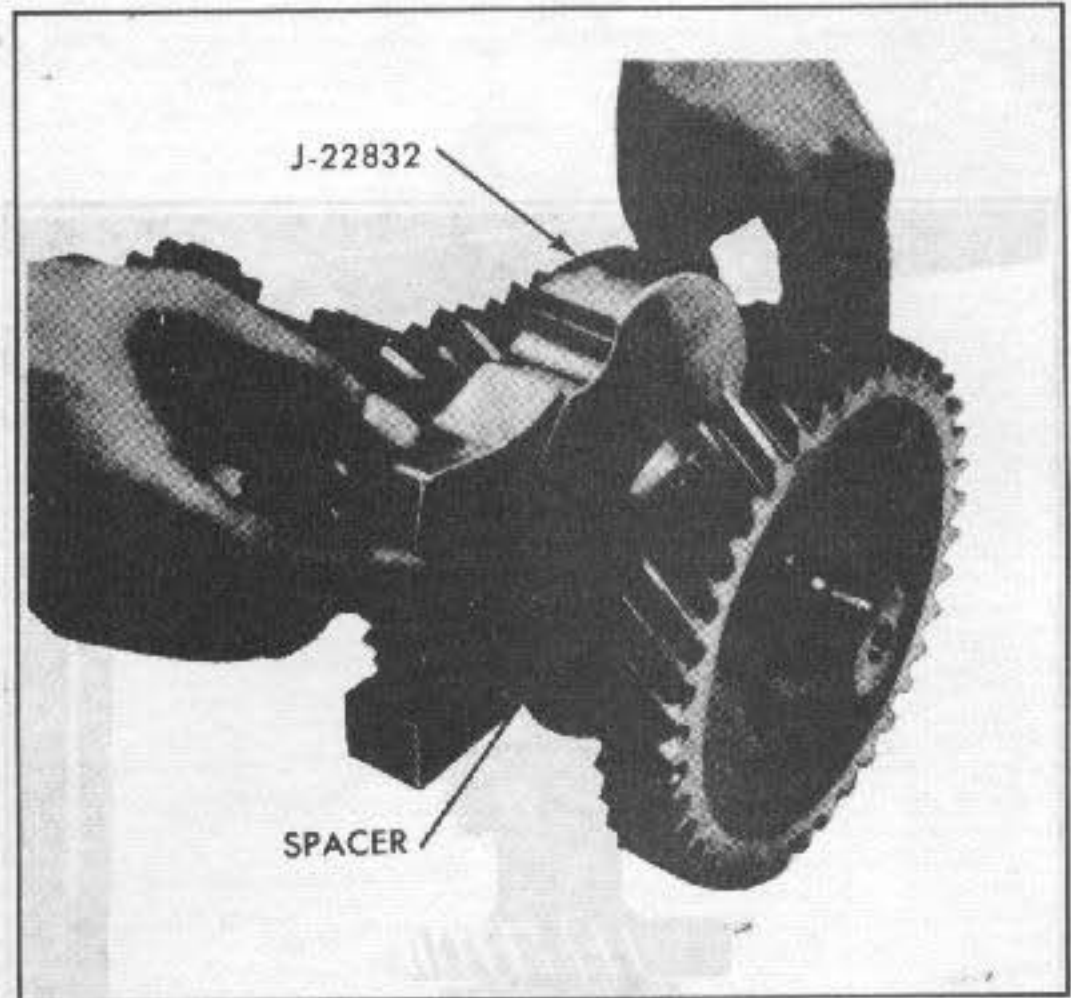


Fig. 7B-20L-Positioning Tool J-22832 on Countershaft

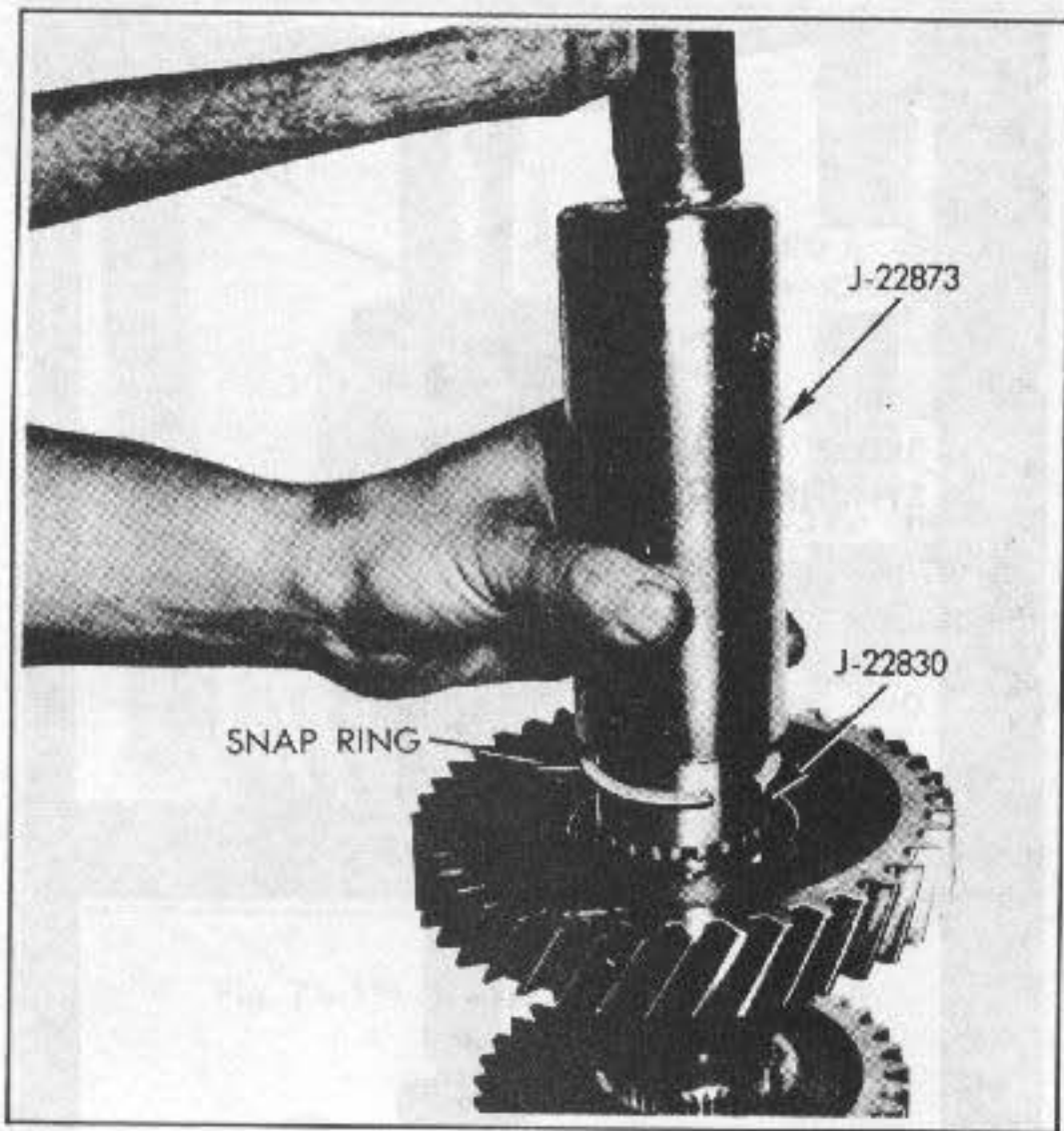


Fig. 7B-21L--Installing Counter Gear Snap Ring

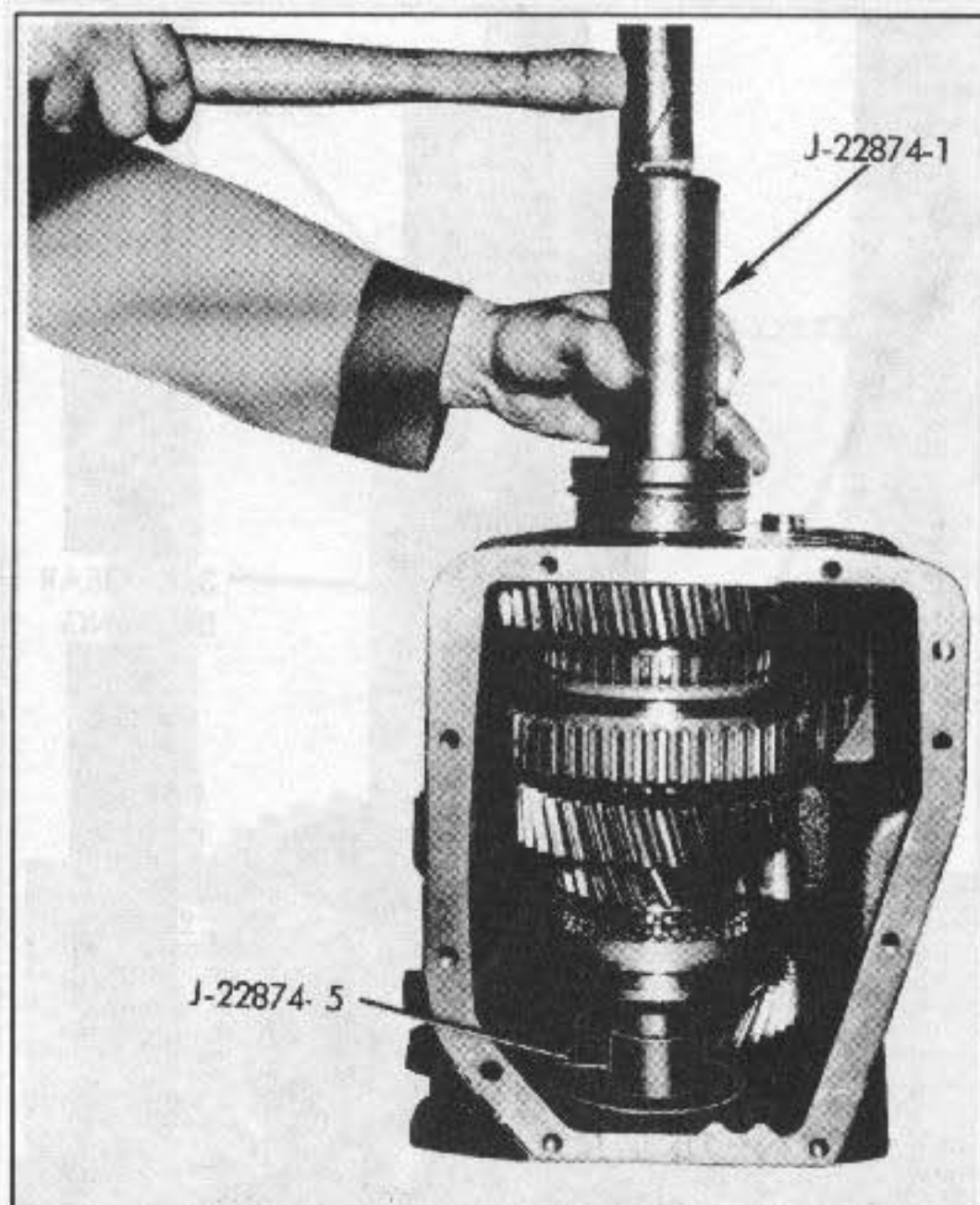


Fig. 7B-23L--Installing Mainshaft Rear Bearing

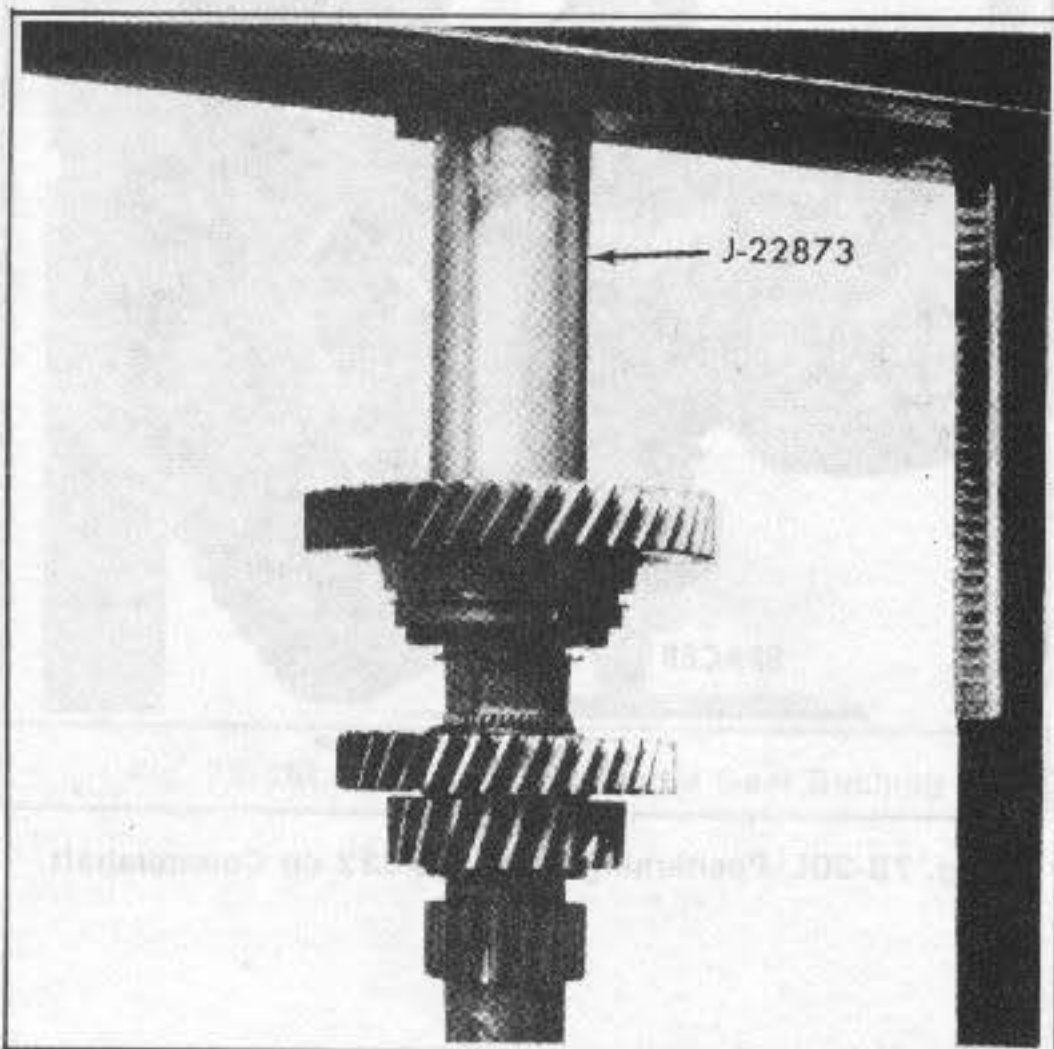


Fig. 7B-22L--Installing Clutch Countergear

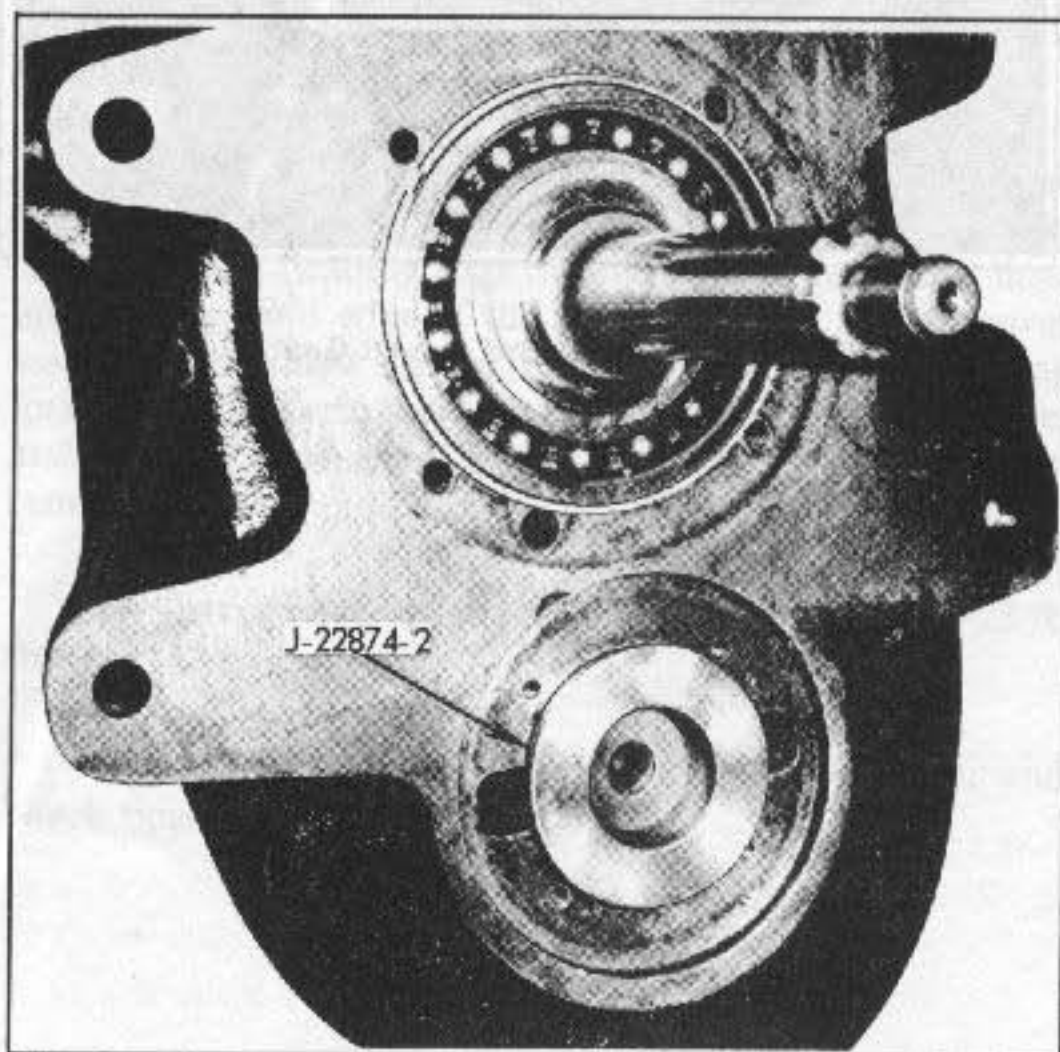


Fig. 7B-24L--Countergear Front Support Tool

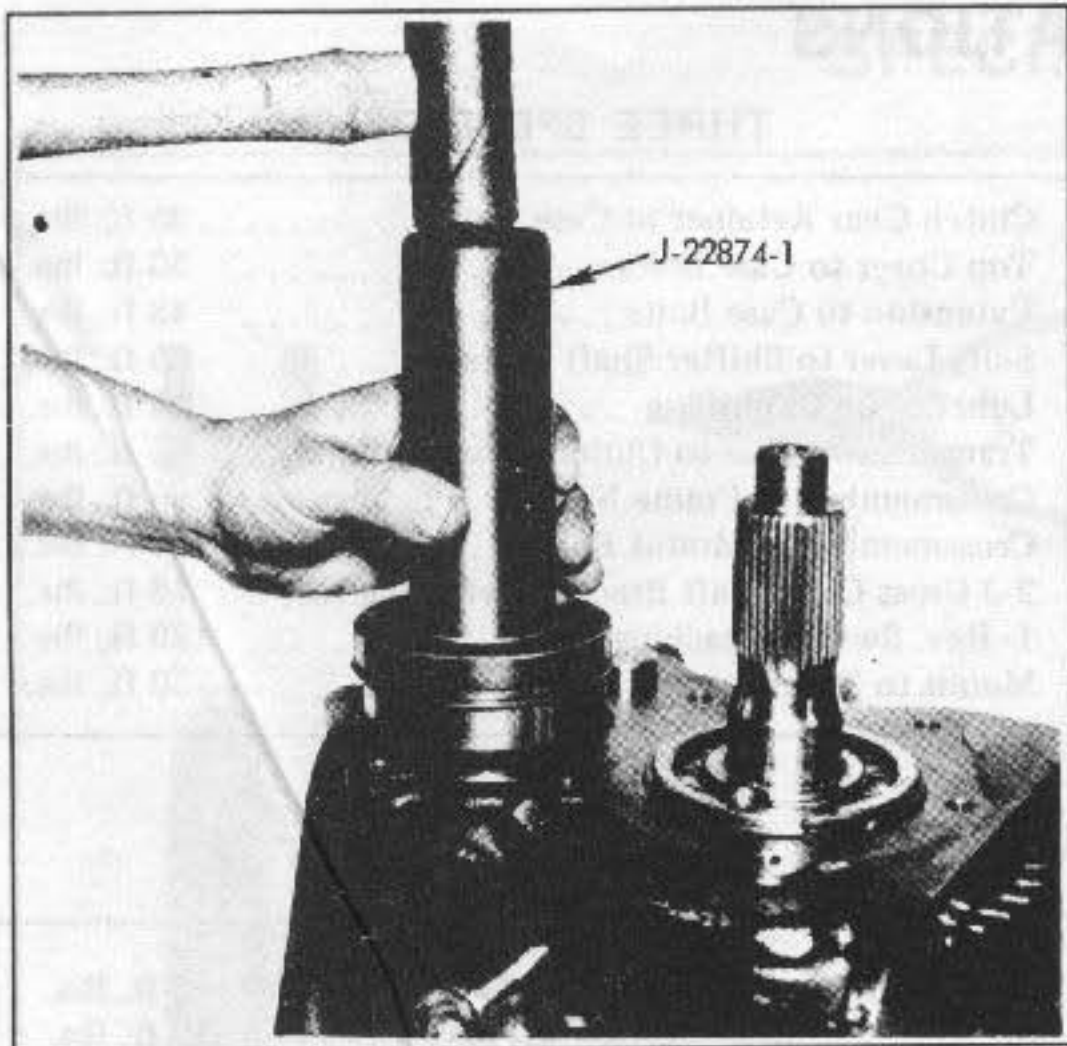


Fig. 7B-25L-Installing Countergear Rear Bearing

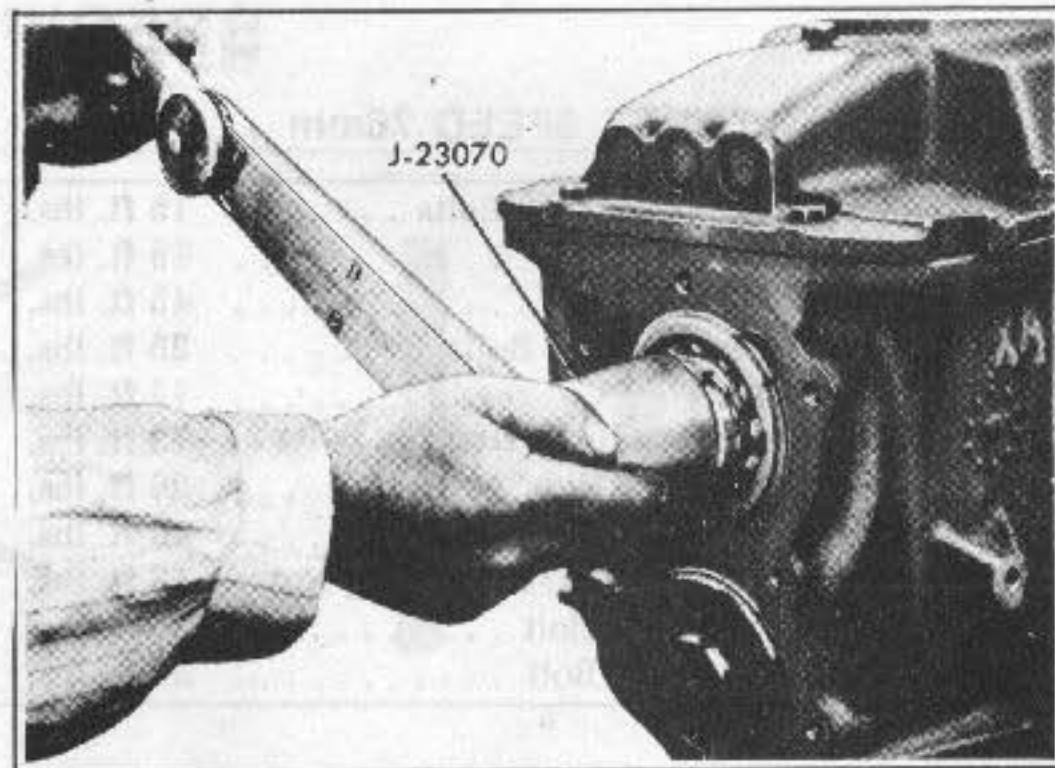
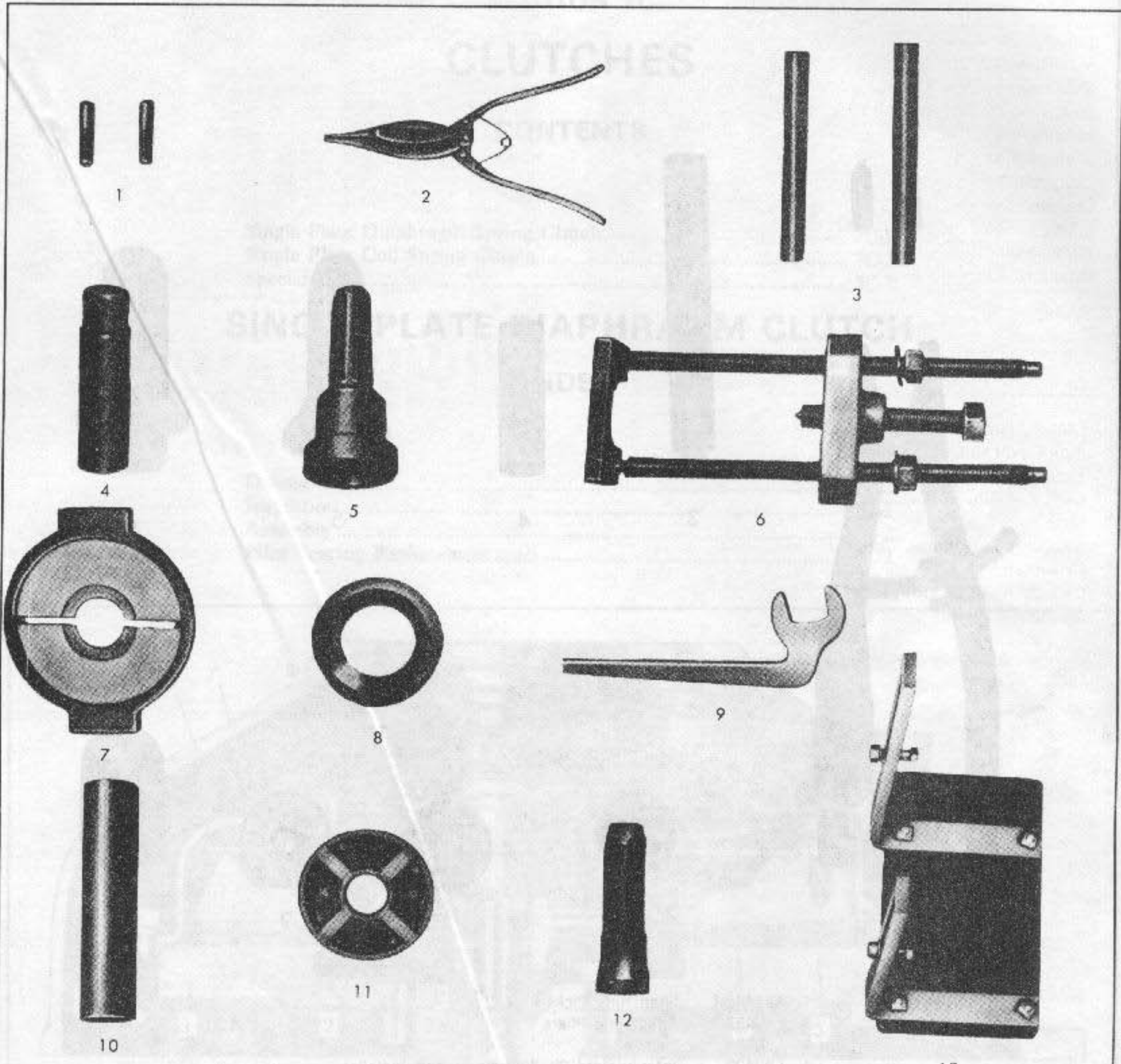


Fig. 7B-26L-Installing Mainshaft Rear Bearing Lock Nut (4-Wheel Drive only)

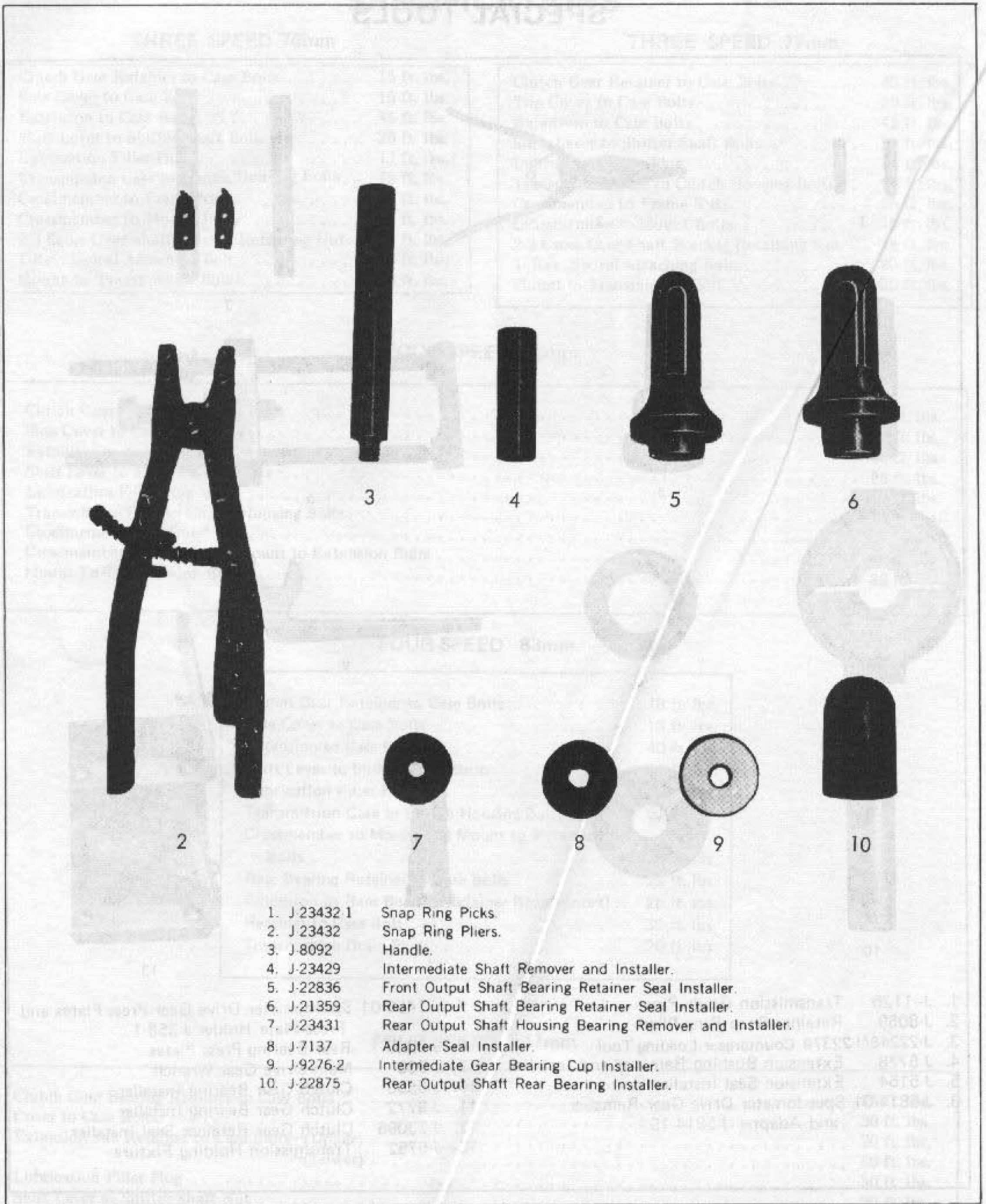


# SPECIAL TOOLS



- |                    |  |              |  |
|--------------------|--|--------------|--|
| 1. J-1126          | Transmission Guide Pins                              | 7. J-1453-01 | Speedometer Drive Gear Press Plates and Press Plate Holder J-358-1 |
| 2. J-8059          | Retainer Snap Ring Pliers                            | 8. J-2228    | Rear Bearing Press Plates  |
| 3. J-22246/J-22379 | Countergear Loading Tool                             | 9. J-933     | Main Drive Gear Wrench   |
| 4. J-5778          | Extension Bushing Remover and Installer              | 10. J-5590   | Clutch Gear Bearing Installer                                      |
| 5. J-5154          | Extension Seal Installer                             | 11. J-9772   | Clutch Gear Bearing Installer                                      |
| 6. J-5814-01       | Speedometer Drive Gear Remover and Adapter J-5814-15 | 12. J-23096  | Clutch Gear Retainer Seal Installer                                |
|                    |  | 13. J-5752   | Transmission Holding Fixture                                       |

Manual Transmission Special Tools (Except 4-Speed, 117mm)



- 1. J-23432-1 Snap Ring Picks.
- 2. J-23432 Snap Ring Pliers.
- 3. J-8092 Handle.
- 4. J-23429 Intermediate Shaft Remover and Installer.
- 5. J-22836 Front Output Shaft Bearing Retainer Seal Installer.
- 6. J-21359 Rear Output Shaft Bearing Retainer Seal Installer.
- 7. J-23431 Rear Output Shaft Housing Bearing Remover and Installer.
- 8. J-7137 Adapter Seal Installer.
- 9. J-9276-2 Intermediate Gear Bearing Cup Installer.
- 10. J-22875 Rear Output Shaft Rear Bearing Installer.

4-Speed, 117mm, Transmission Special Tools