SECTION 6-C
PROPELLER SHAFT

CONTENTS OF SECTION 6-C

6-7 DESCRIPTION OF PROPELLER SHAFT

The propeller shaft assembly consists of a front propeller shaft, a rear propeller shaft, a standard universal joint at each end, and a double type constant velocity universal joint in the center. See Figure 6-31. A center support bearing attaches the rear end of the front propeller shaft to the under side of the body. A splined front yoke on the front end of the rear propeller shaft extends into a splined coupling in the rear end of the front propeller shaft. This slip spline permits the slight lengthening and shortening of the propeller shaft required by the up and down movement of the rear axle assembly.

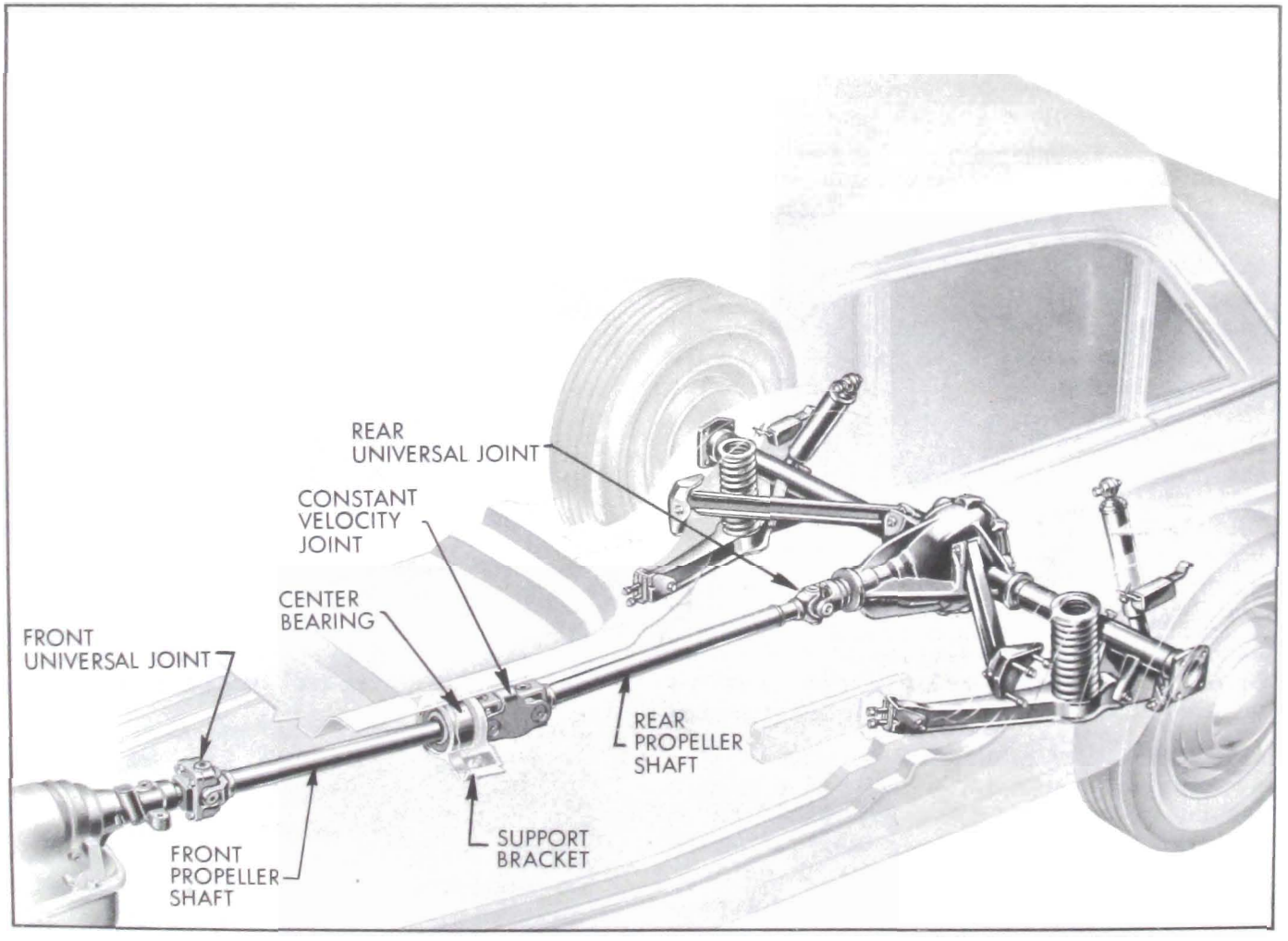


Figure 6-31—Propeller Shaft Assembly

The constant velocity universal joint is composed of two single joints connected with a special link yoke. A center ball and socket between the joints maintains the relative position of the two units. This center ball causes each of the two joints to operate through exactly one half of the complete angle between the front and rear propeller shaft. Because the two joint angles are the same, even though the usual universal joint fluctuation is present within the unit, the acceleration of the front joint is always neutralized by the deceleration of the rear joint, or vice versa. The end result is, the front and rear propeller shafts always turn at a constant velocity.

The center support bearing consists of a sealed bearing, the inner race of which is held against a shoulder at the rear end of the front propeller shaft by a lock nut. The center bearing outer race sets in a metal retainer which has a rubber support cushion bonded to it. The rubber cushion in turn rests in a support bracket which is bolted to the underside of the body. A slinger is pressed against the shoulder of the shaft ahead of the center bearing to prevent moisture and dirt from getting into the bearing. The lock nut which retains the center bearing in place also prevents the slip joint from separating. The seal which retains the lubricant in the slip spline is located inside the lock nut. See Figure 6-32.

The propeller shaft assembly requires very little periodic service. The center bearing is lubricated for life and requires no additional lubrication. The universal joints are all lubricated for life and cannot be lubricated while in the car. If a joint becomes worn or noisy, a service kit must be installed which consists of a spider complete with bearing assemblies and snap rings.

Front and rear propeller shafts will not be available separately, but only as a complete propeller shaft assembly; this is because the complete assembly must be given a careful rotating balance and this type of balancing equipment is not available in the field.

If any part of the propeller shaft requires repair, it is necessary to remove the complete propeller shaft assembly from the car. The assembly must be handled very carefully to avoid jamming or bending any of the parts.

If the car is to be undercoated, care must be taken to keep the propeller shaft completely free of undercoating material. Undercoating

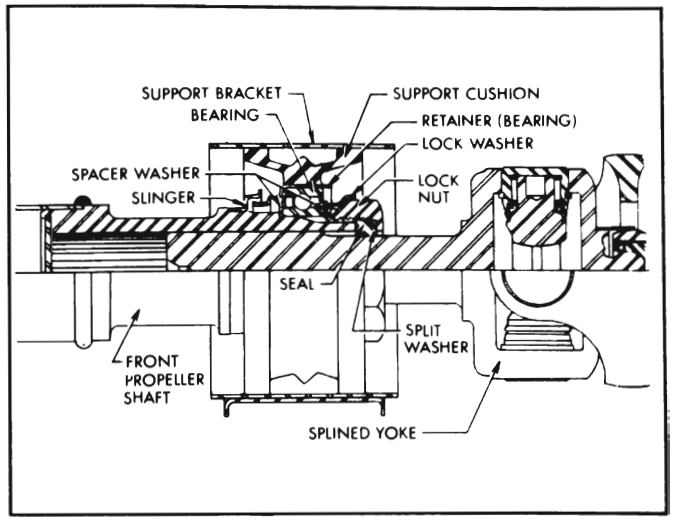


Figure 6-32—Center Support Bearing and Slip Spline

or any other material would upset the balance and might cause a serious vibration.

The center ball and socket cannot be lubricated in the car. Whenever the constant velocity universal joint is disassembled, however, the ball and socket must be lubricated with Multi-Purpose Grease EP No. 1 Grade.

The slip spline must also be lubricated with Multi-Purpose Grease EP No. 1 Grade every 10,000 miles, or after disconnecting the slip joint for any reason. To lubricate the spline, remove the plug and install a grease fitting. When grease appears at the slip joint nut, remove the fitting and reinstall the plug. The plug must be in place as lubricant would be thrown out through the fitting by centrifugal force at high speeds.

6-8 REMOVAL OF PROPELLER SHAFT

Before removing the propeller shaft, the complete drive train, including the front companion flange and the rear pinion flange, must be marked for reassembly in the same relative position. Unless correctly assembled, out-of-balance vibration may result. The propeller shaft must be removed as a complete assembly. The assembly must be supported during handling out of the car to avoid jamming or bending any of the parts.

1. At front companion flange, bend up lock plate tabs and remove U-bolt clamps from front universal joint. NOTE: If universal joint bearings are not retained on spider with a connecting strap, use tape or wire to secure bearings.

2. At rear pinion flange, bend up lock plate tabs and remove U-bolt clamps from rear universal joint. Support rear end of propeller shaft to avoid damage to constant velocity universal joint.

3. Remove center bearing support bracket bolts and lower complete propeller shaft assembly. Remove assembly to bench.

6-9 DISASSEMBLY OF PROPELLER SHAFT

For ease in handling and to help prevent damage to the constant velocity universal joint, the front and rear propeller shafts should be separated at the slip joint before any service operations are attempted.

a. Disassembly of Slip Joint

1. Pry up rim of lockwasher to disengage flats on bearing locknut. Loosen locknut until free of threads and slide locknut and seal against constant velocity joint. See Figure 6-33.

2. Slide rear propeller shaft from front propeller shaft, making certain that index spring wire in splines is not lost.

b. Removal and Installation of Center Bearing

1. Remove lockwasher and spacer washer from front propeller shaft.

2. Support front propeller shaft assembly under center bearing, retainer and bonded rubber. Drive propeller shaft down through center bearing using a soft hammer. NOTE: Support center bearing just outside of slinger so that slinger will remain on shaft when center bearing is removed.

3. To remove locknut from spline shaft, first remove grease seal and split washer.

c. Disassembly of Constant Velocity Universal Joint

All yokes must be marked before disassembly for reassembly in their original positions to maintain proper balance. Disassemble the rear section of the constant velocity joint first, then the forward section. Either section can be disassembled using the following procedure:

1. Remove snap rings from bearings using a punch.

2. Clamp rear propeller shaft yoke in a vise. Shaft must be supported horizontally and link yoke must be free to move vertically.

3. Using a pipe coupling or a similar tool having an inside diameter of about 1 1/8 inches, apply force on link yoke around bearing. See Figure 6-35. Drive link yoke downward until about 1/4 inch of bearing projects from yoke. CAUTION: Do not attempt to drive yoke down farther than ball and socket will allow easily. Extreme force will result in damage to the ball-socket assembly.

4. Rotate shaft 180 degrees and repeat steps 2 and 3.

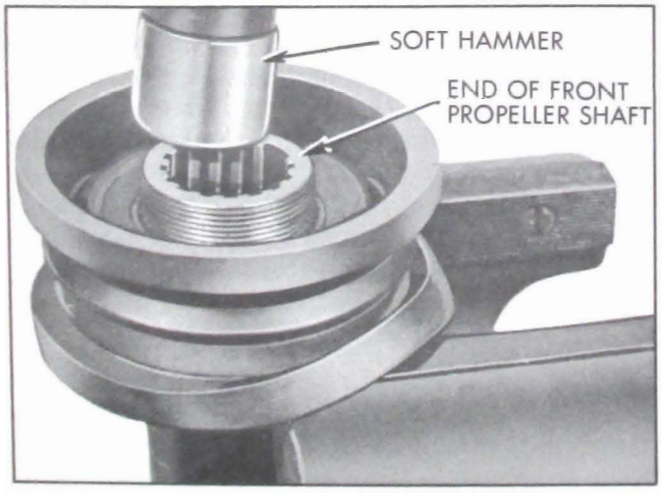


Figure 6-34—Removing Center Bearing

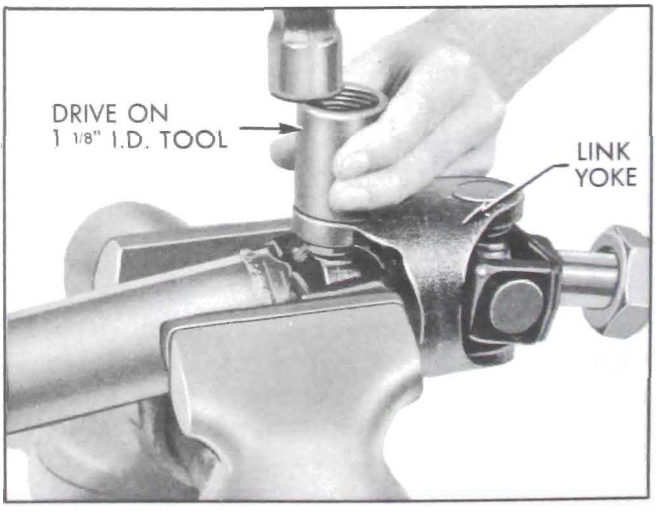


Figure 6-35—Driving Universal Joint Bearing from Link Yoke

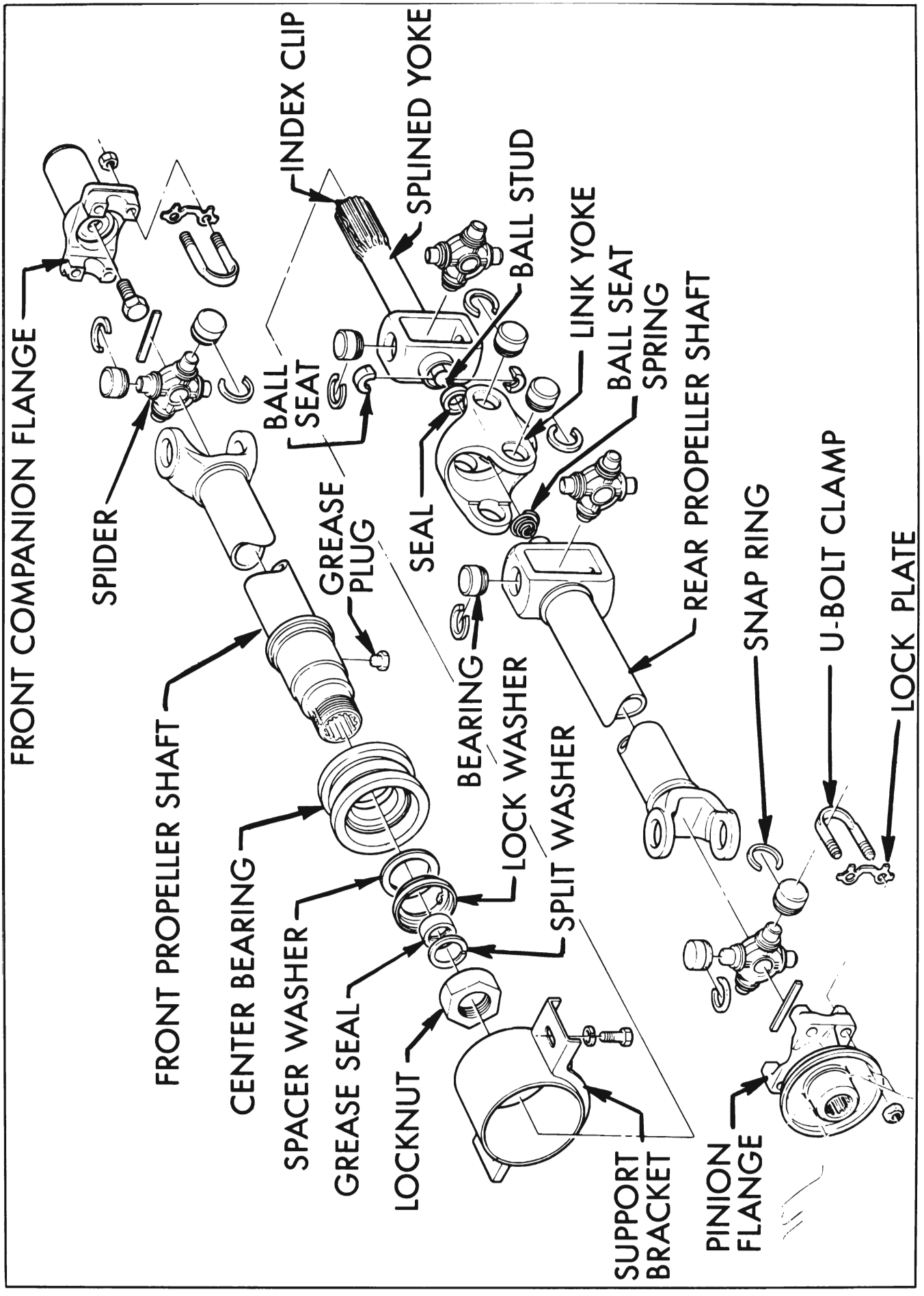


Figure 6-33—Propeller Shaft-Exploded

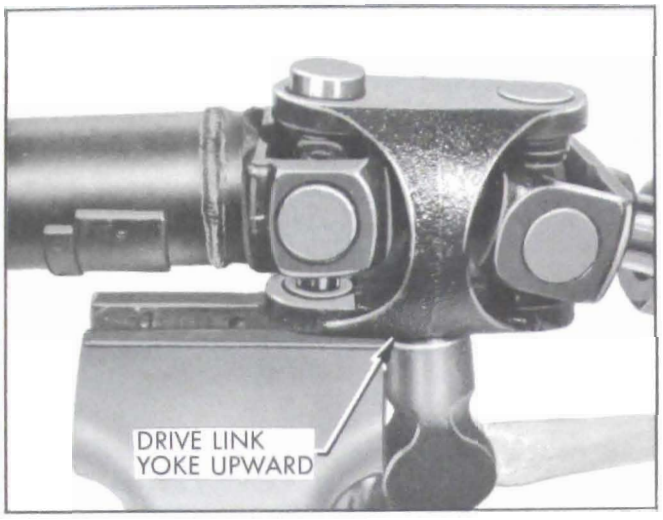


Figure 6-36—Removing Universal Joint Bearing

5. Clamp 1/4 inch projecting portion of either bearing in vise and remove bearing by driving link yoke upward. Remove other bearing using same method.

6. Separate spider, shaft yoke and shaft from link yoke.

7. To remove bearings from shaft yoke, clamp spider in vise with vise jaws bearing against ends of spider journals. Yoke must be free to move vertically between jaws of vise.

8. Using same bearing remover tool, apply force on shaft yoke around bearing. Drive yoke downward until bearing is free of yoke. See Figure 6-36.

9. Rotate shaft 180 degrees and repeat steps 7 and 8.

10. Disassemble forward section of constant velocity joint using same method as in steps 1 through 9. That is, drive link yoke down, pull bearings, and drive spline shaft yoke down to remove other two bearings.

d. Disassembly of Front and Rear Universal Joints

1. Remove snap rings from bearings using a punch.

2. Clamp spider in vise with jaws bearing against ends of bearings which are not retained in yoke. Yoke must be free to move vertically.

3. Using a pipe coupling or a similar tool having an inside diameter of about 1 1/8 inches, apply force on yoke around bearing. Drive yoke downward until bearing is free of yoke and remove bearing.

4. Rotate shaft 180 degrees and repeat steps 2 and 3.

6-10 ASSEMBLY OF PROPELLER SHAFT

a. Assembly of Front and Rear Universal Joints

1. Position spider inside yoke with bearings retained by connector strap positioned for installation on companion flange.

2. Make sure other two bearings each have a full set of rollers (26) and that seal is in position. Start bearings straight in holes of yoke, then install bearings by pressing between jaws of a vise. While pressing bearings into position, move spider back-and-forth to make sure spider journals engage bearings squarely to avoid damage.

3. Fully install bearings and install snap rings.

b. Assembly of Constant Velocity Universal Joint

All yokes must be carefully assembled using the marks made before disassembly. Assemble the front section of the constant velocity first, then the rear section.

1. Position spider inside splined yoke.

2. Make sure bearings have a full set of rollers (26) and that seals are in position. Start bearings straight in holes of splined yoke, then install bearings by pressing between jaws of a vise. Make sure spider journals enter

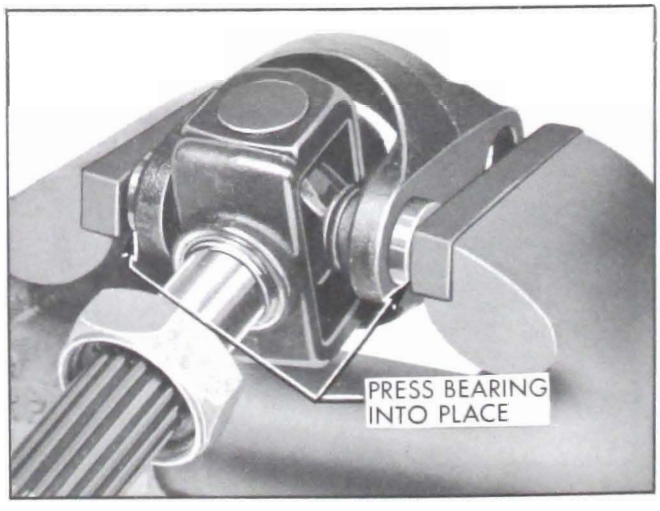


Figure 6-37—Installing Universal Joint Bearings

bearings squarely to avoid damage. See Figure 6-37.

3. Fully install bearings and install snap rings.

4. Position splined yoke and spider inside link yoke.

5. Make sure bearings have a full set of rollers and that seals are in position. Start bearings straight in holes of link yoke, then install bearings by pressing between jaws of a vise. Make sure spider journals enter bearings squarely.

6. Fully install bearings and install snap rings.

7. Position spider inside rear propeller shaft yoke.

8. Start bearings straight in yoke, then install bearings by pressing between jaws of a vise.

9. Fully install bearings and install snap rings.

10. Lubricate ball and socket with a high grade of extreme pressure grease. Position spider of rear propeller shaft assembly in link yoke. Engage socket with ball of splined yoke assembly. CAUTION: Make sure all marks made before disassembly are properly aligned.

11. Start bearings straight in link yoke, then install bearings by pressing between jaws of a vise. Push spring-loaded ball-socket assembly together to make sure spider journals enter bearings squarely to avoid damage.

12. Fully install bearings and install snap rings.

c. Assembly of Slip Joint

1. Make sure locknut, seal and split washer are in place on smooth part of spline shaft. Make sure that index spring wire is in place in splines. Make sure that spacer washer and large lockwasher are in place on rear end of front propeller shaft.

2. Align index spring with missing internal spline in rear end of front propeller shaft and slide slip joint together. See Figure 6-38.

3. Install locknut and tighten securely.

4. Bend in rim of lockwasher to engage flat of locknut firmly.

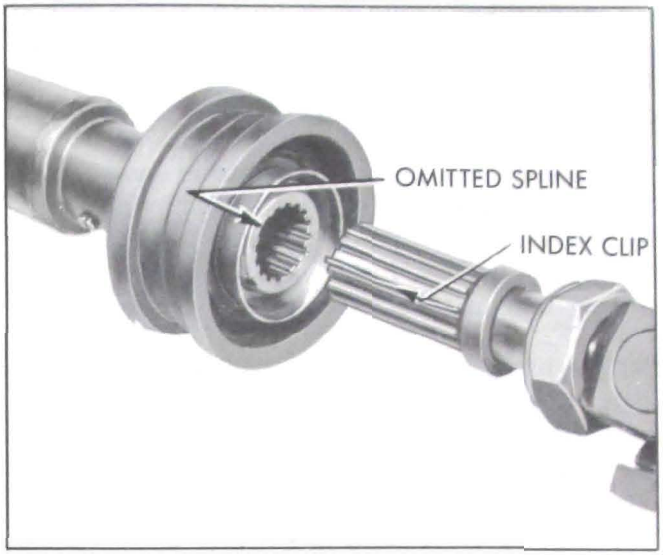


Figure 6-38—Assembling Slip Joint

6-11 INSTALLATION OF PROPELLER SHAFT

The propeller shaft must be supported carefully during handling to avoid jamming or bending any of the parts.

1. Support propeller shaft assembly in position and install center bearing support bracket and bolts.

2. Make sure rear universal joint mark is aligned with pinion flange mark, then install U-bolts, lock plates and nuts. Torque nuts evenly to 15 ft. lbs. and bend lock plate tabs against nuts. CAUTION: U-bolt nuts must be torqued as specified, as overtightening will distort bearings and cause early failure.

3. Make sure front universal joint mark is aligned with front companion flange mark, then install U-bolts, lock plates and nuts. Torque nuts evenly to 15 ft. lbs. and bend lock plate tabs against nuts.

4. Lubricate slip spline by removing plug and installing a grease fitting. Fill with Multi-Purpose Grease EP No. 1 Grade, then remove fitting and reinstall plug.

6-12 ADJUSTMENT OF REAR UNIVERSAL JOINT ANGLE

When torque is transmitted through any ordinary universal joint, the driven yoke fluctuates slightly in speed. In other words, although the driving yoke rotates at a constant speed, the driven yoke speeds-up and slows-down twice

per revolution. This fluctuation of the driven yoke is in direct proportion to the angle through which the universal joint is operating; the greater the angle, the greater the fluctuation.

Whenever two universal joints are used, this fluctuation effect can be eliminated by staggering the joints so that the two driving yokes are 90^{o} apart provided the two joints are transmitting torque through the same angle.

Therefore, when two universal joints are used, the angles through which they operate must be very nearly the same. This allows the alternate acceleration and deceleration of one joint to be offset by the alternate deceleration and acceleration of the second joint. When the two joints do not run at approximately the same angle, operation is rough and an objectionable vibration is produced.

In addition, universal joints are designed to operate safely and efficiently within certain angles. If the designed angle is exceeded, the joint may be broken or otherwise damaged.

The front universal joint angle is actually the angle between the engine-transmission centerline and the front propeller shaft. This angle is determined by the design of the body assembly. Since this angle is not liable to change with use, no means is now provided for adjusting the front joint angle.

The center constant velocity universal joint, just as the name implies, transmits at a constant velocity regardless of the angle through which it is operating. Therefore, no means is provided or needed for adjusting the constant velocity joint.

The rear universal joint angle is carefully adjusted at the factory using shims between the forward ends of the lower control arms and the body. These shims cause the rear axle housing to rotate, thereby changing the angle of the drive pinion in relation to the angle of the rear propeller shaft. If, for any reason, this original factory setting is changed, roughness and objectionable vibration could result. Therefore, if there is a severe rear end collision, or if the axle housing or any control arms are replaced, the rear universal joint angle should be checked and corrected if necessary.

Since it is very difficult to measure rear universal joint angle using a bubble protractor, a simple method has been developed using a spring-loaded steel cable stretched between the front of the chassis and the rear axle carrier. When the rear universal joint angle is adjusted correctly, this steel cable will clear the underside of the pinion flange by a definite amount. Therefore, if this single direct measurement is within specified limits, the rear universal joint angle is correct; if this measurement is out of limits, the joint angle is not correct.

Rear universal joint angle is checked using Alignment Set J-8973. This set also contains two pieces, J-8973-22 and J-8973-23 which are used for front end alignment only.

The spacer blocks in the set are designed to raise the rear of the car above normal trim height. Use of these blocks makes sure that the rear universal joint angle will be checked at a predetermined trim height. These blocks must be used since rear universal joint reading varies at different trim heights and the only reference dimension given is for the particular height block supplied.

The front end of the cable is equipped with two attaching brackets so that the cable may be used on all series 1961 Buicks. The rear end of the cable has stops attached at various points to allow the cable to be placed in tension on all wheelbase Buicks.

Check and adjust rear universal joint angle using the following procedure:

1. Raise rear of car and insert blocks so slot straddles rubber bumper. Hold the blocks up against the bumper mounting straps and allow car to settle until axle housing contacts blocks. NOTE: Two different height blocks are used on 4000-4100 Series: J-8973-20 for Estate Wagons, and J-8973-21 for Sedans.

2. Remove differential cover bolt on each side of lowest cover bolt. Using these two cover bolts, attach rear bracket J-8973-16 so lower slotted portion of bracket is vertical. Tighten bolts to hold bracket securely in place.

3. Engage front attaching bracket J-8973-13 in front cross member assembly using hole immediately to rear of front mount. Hook slot of bracket into rear of hole. See Figure 6-39.

4. Place Engine Height Rod J-8973-3 (notched end down) through round hole in front cross member assembly so upper end of pin bears

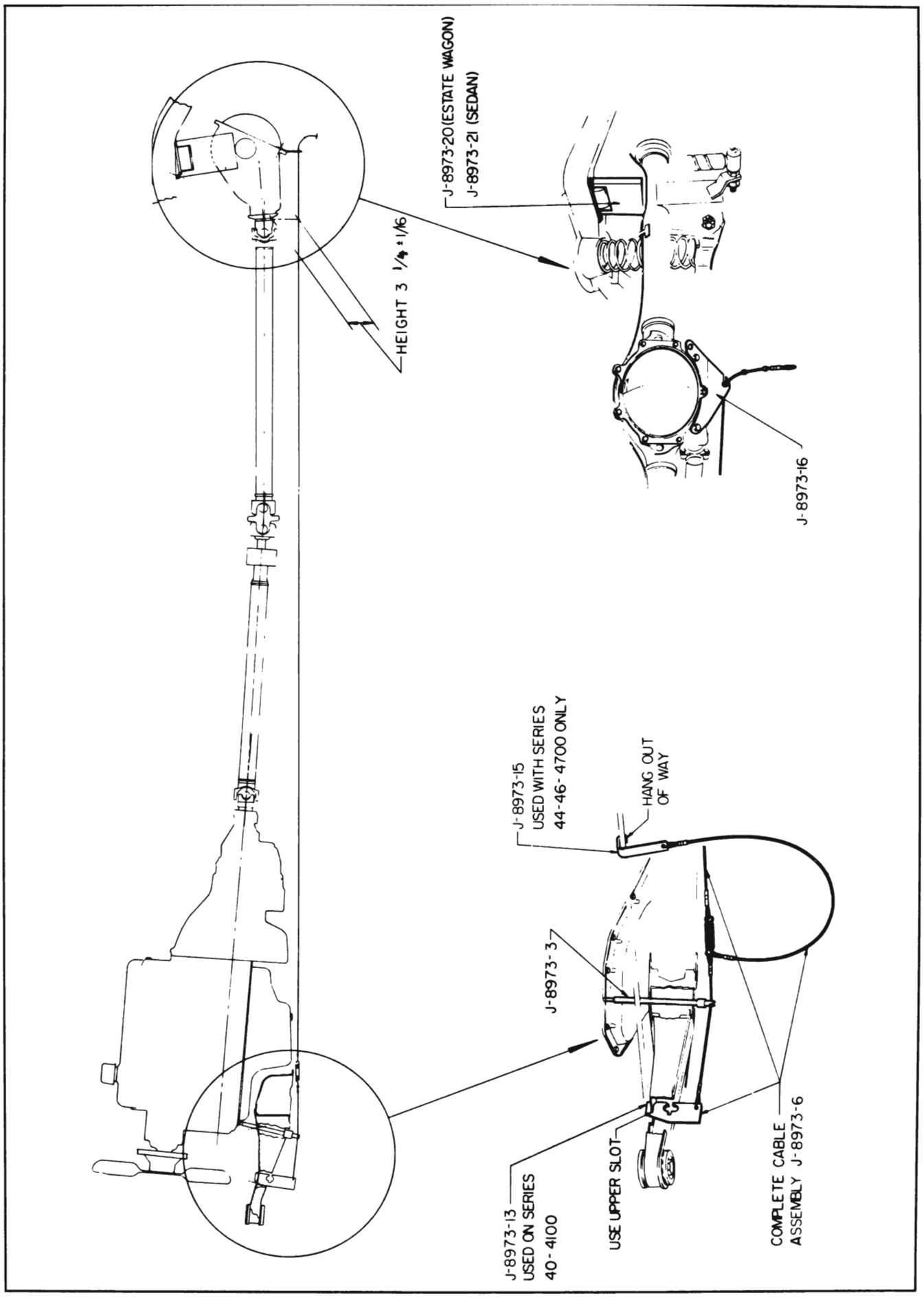


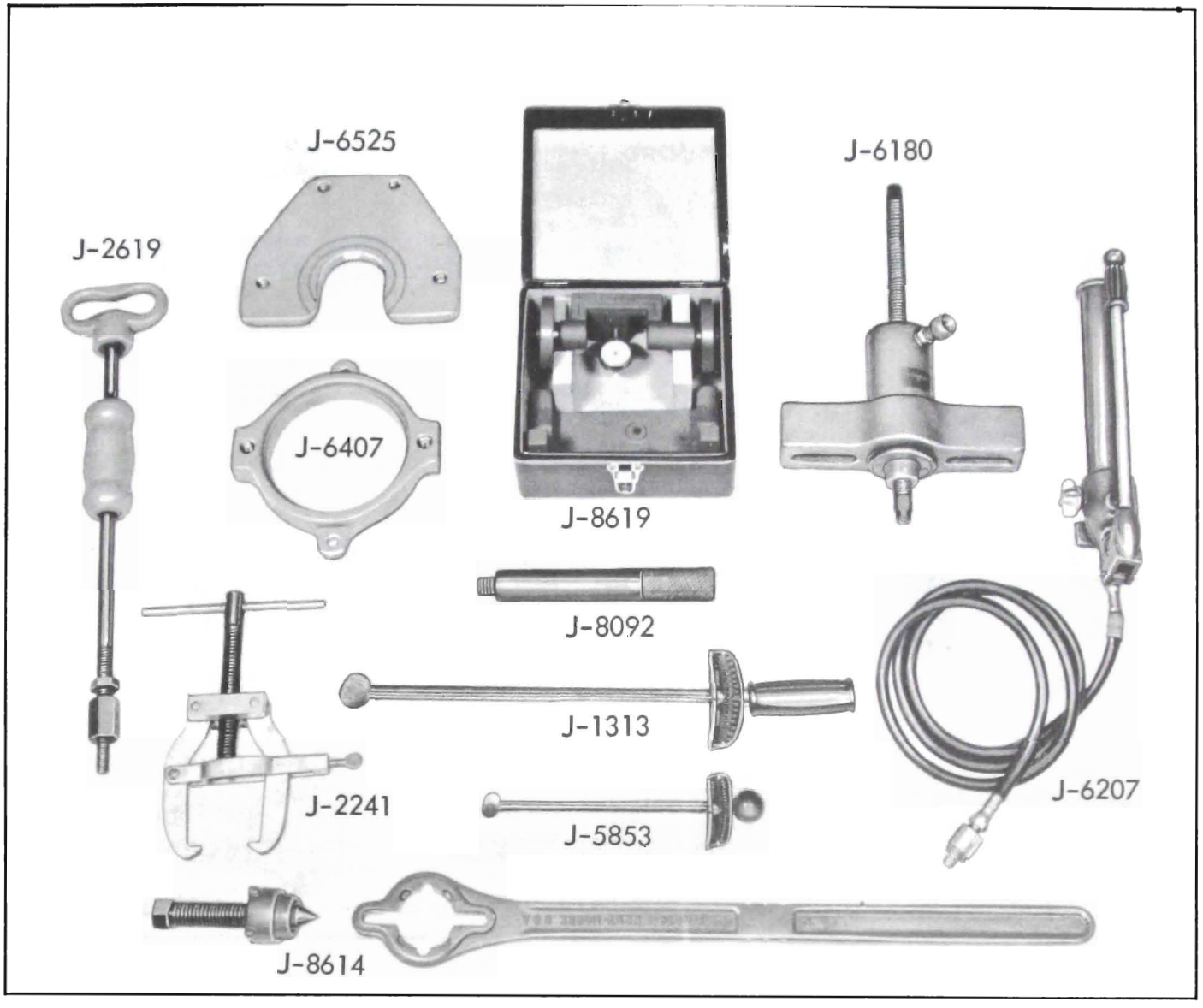
Figure 6-39—Checking Rear Universal Joint Angle

against engine oil pan between two front oil pan bolts. Place cable in notch of height rod, pull cable tight and hook into rear bracket so one of stops on cable is to rear of bracket slot.

5. Measure perpendicular distance from cable to machined surface immediately in front of slinger, on rear pinion flange. This distance should be 3 1/4 ± 1/16.

6. If distance measured in Step 5 is not within specifications, shims must be added or subtracted between lower control arm forward mounting brackets and underbody side rail. See Figure 6-31. Shims must be removed or added in equal amounts on both sides.

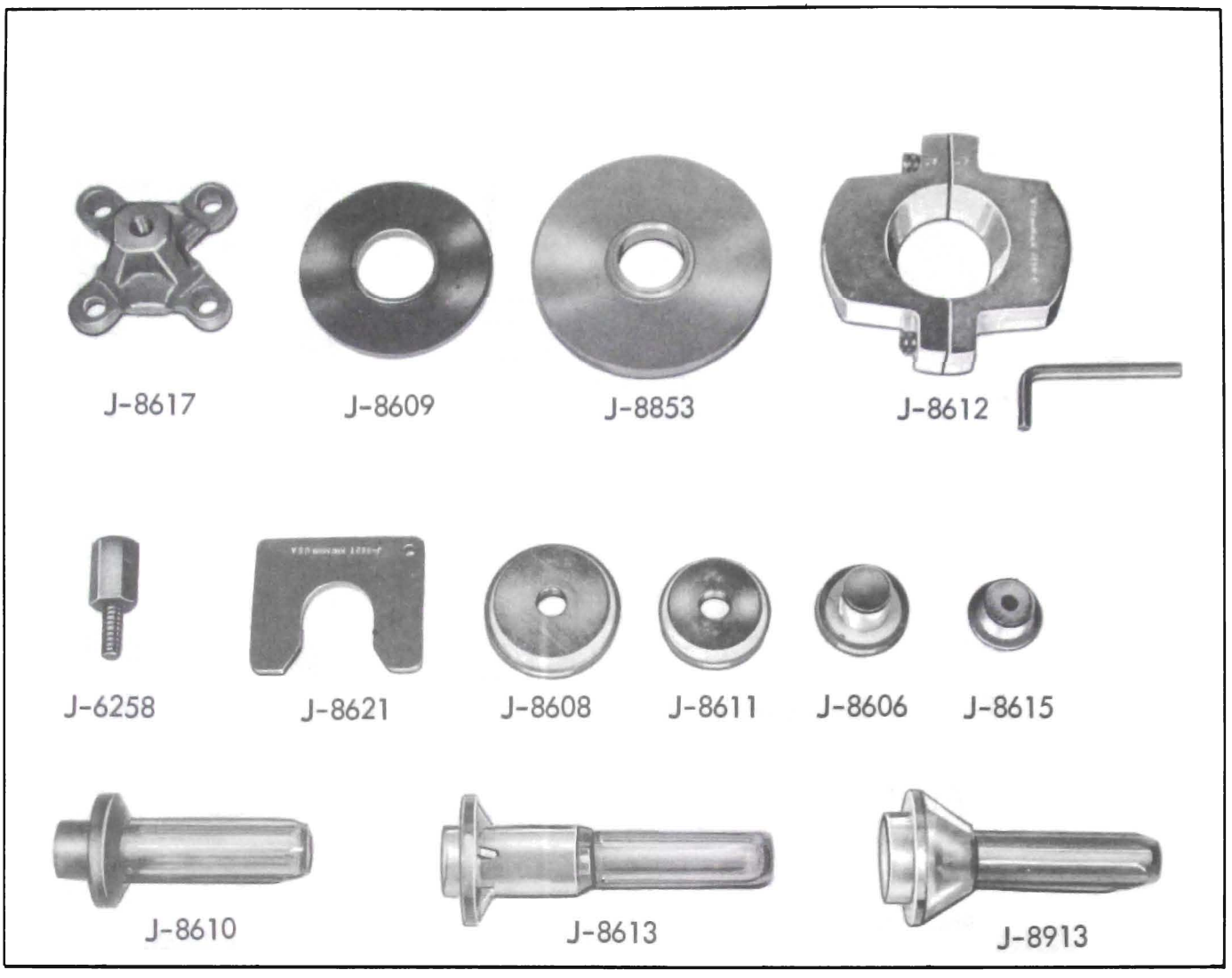
7. Remove height rod, cable, bracket and spacer blocks. Reinstall differential cover bolts.



REAR AXLE TOOLS

J-1313	Torque Wrench (0 - 150 ft. lb.)
J-2241	Side Carrier Bearing Puller
J-2619	Slide Hammer
J-5853	Torque Wrench (0 100 in. lb.)
J-6180	12 Ton Power Ram
J-6207	Hydraulic Pump
J 6407	Press Plate Holder
J-6525	Axle Shaft Bearing Remover
J-8092	Driver Handle
J-8614	Companion Flange Holder and Puller
J-8619	Pinion Setting Gauge

Figure 6-40—Rear Axle Special Tools (Group 1)



REAR AXLE TOOLS (GROUP 2)

J-6258 Ram Screw Adapter
J-8606 Differential Side Bearing Installer
J-8608 Rear Pinion Bearing and Race Installer
J-8609 Rear Pinion Bearing Installer
J-8610 Axle Shaft Seal Installer
J-8611 Front Pinion Bearing Outer Race Installer
J-8612 Rear Pinion Bearing Remover
J-8613 Pinion Oil Seal Installer
J-8615 Side Bearing Puller Support
J-8617 Axle Shaft Remover
J-8621 Axle Shaft Bearing Puller Plate
J-8853 Axle Shaft Retainer and Ring Installer
J-8913 Pinion Oil Seal Installer

Figure 6-41—Rear Axle Special Tools (Group 2)