SECTION 4

STEERING

CONTENTS OF THIS SECTION

STANDARD STEERING

INDEX

GENERAL DESCRIPTION

The regular production steering gear (fig. 1) is the recirculating ball type with a gear ratio of 24:1. This gear provides for ease of handling by having forces transmitted from worm to sector gear through ball bearings. The steering linkage (fig. 2) is of the relay type, with the pitman arm connected to a relay rod through an adjustable ball and socket joint. The relay rod is connected to an idler arm which in turn, is connected to a support bolted to the frame side rail opposite the steering gear. Pivoting at the connections at each end of the idler arm is accomplished in rubber insulated nylon bushings. Connecting the relay rod to the steering arms are two adjustable tie rods with self adjusting ball and socket type joints.

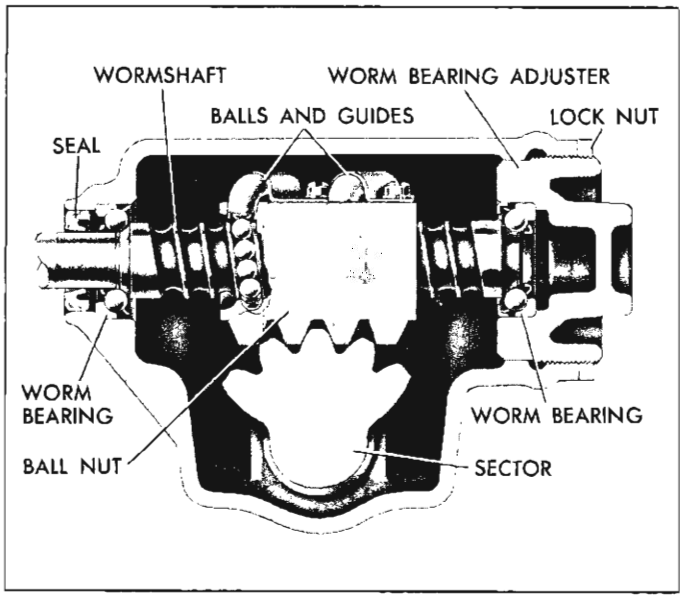

Fig. 1—Cross Section of Steering Gear

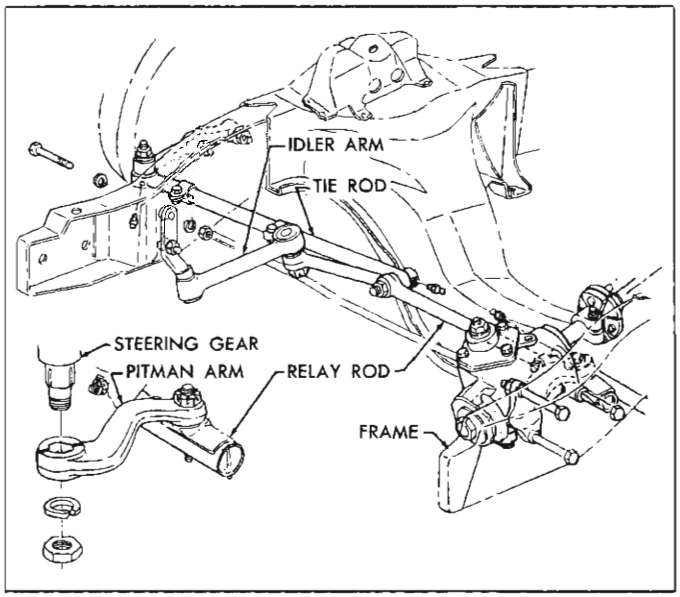

Fig. 2—Steering Linkage

MAINTENANCE AND ADJUSTMENTS

LUBRICATION

The steering gear is filled at the factory with a special all-season gear lubricant. Seasonal change of this lubricant is unnecessary and the housing should not be drained. The steering gear lubricant level should be checked every lubrication period (1000 miles). Whenever required, additions should be made using a lubricant which, at low temperatures, is fluid and will not "channel" or cause hard steering and which will provide satisfactory lubrication under extreme summer conditions. Steering gear lubricants are marketed by many oil companies.

The steering gear linkage should be lubricated every 1000 miles, with chassis lubricant. Lubrication points and additional information on the chassis lubricant to be used can be found in Section 2—General Lubrication.

ADJUSTMENTS

Steering Gear

Before any adjustments are made to the steering gear in an attempt to correct such conditions as shimmy, loose or hard steering and road shocks, a careful check should be made of front end alignment, shock absorbers, wheel balance and tire pressure for possible causes.

Correct adjustment of steering gear is very important. While there are but two adjustments to be made, the following procedure must be followed step-by-step in the order given.

1. Remove pitman arm nut and mark relation of pitman arm position to sector shaft. Remove pitman arm with Tool J-6632 as shown in Figure 3.
2. Loosen the pitman shaft lash adjuster screw lock nut and turn the adjuster screw a few turns in a counterclockwise direction (fig. 4). This removes the load imposed on the worm bearings by the close meshing of rack and sector teeth. Turn steering wheel gently in one direction until stopped by gear, then back away about one turn.

   CAUTION: Do not turn steering wheel hard against stops when steering relay rod is disconnected as damage to ball guides may result.

3. Using Tool J-0544 (fig. 5) measure pull at rim of wheel which is required to keep wheel in motion. This should be between 3/8 and 5/8 pounds.

   NOTE: When making this check, it is important that the centerline of the scale be kept at right angles to the wheel spoke.

   If the pull necessary to move the wheel does not lie between the limits given above, adjustment of worm bearings is necessary.
4. To adjust worm bearings, loosen worm bearing adjuster lock nut and turn worm bearing adjuster shown in Figure 4 until there is no perceptible end play in worm. Check pull at wheel rim, readjusting if necessary to obtain proper pull. Tighten lock nut and recheck pull. If the gear feels "lumpy" after adjustment of worm bearings, there is probably damage in the bearings due to severe

impact or to improper adjustment and the gear must be disassembled for replacement of damaged parts.

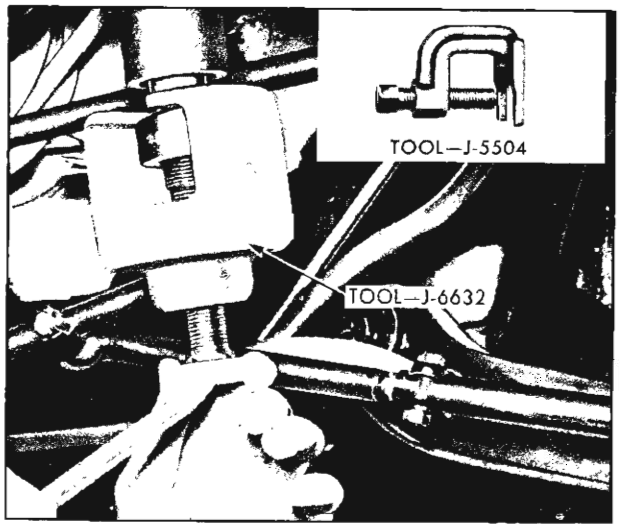

Fig. 3—Removing Pitman Arm

5. After proper adjustment of worm is obtained, and all mounting bolts securely tightened, adjust lash adjuster screw. First turn the steering wheel gently from one stop all the way to the other, carefully counting the total number of turns. Then turn wheel back exactly half way, to center position. Note position of mark on top of wormshaft just below the coupling clamp. This mark should be at top of shaft (fig. 4), at 12 o'clock position and in line with the saw cut at the coupling lower clamp. Turn lash adjuster screw clockwise to take out all lash in gear teeth, and tighten lock nut.

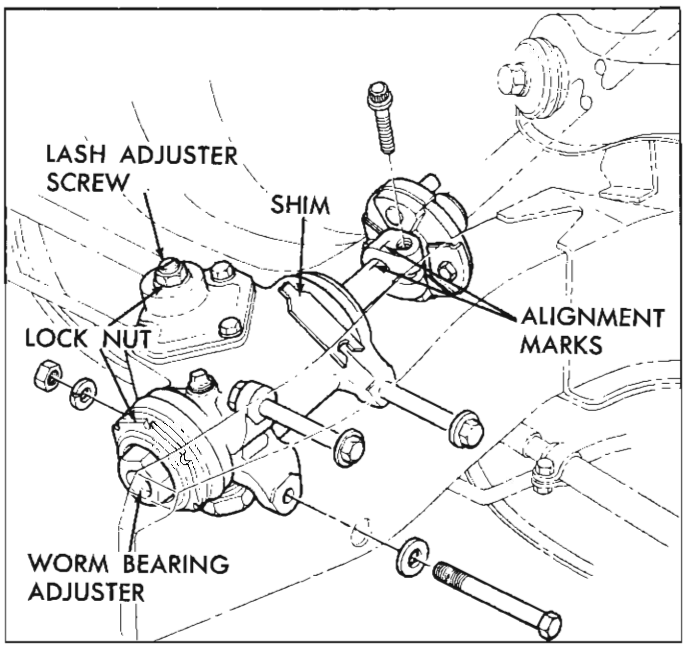

Fig. 4—Steering Gear Adjustment Points

Check pull at wheel rim with checking scale, taking highest reading of checking scale as wheel is turned through center position. This should be between ⅞ and 1½ pounds. Readjust if necessary to obtain proper pull.

NOTE: If 1½ pounds is exceeded, turn lash adjuster screw counter-clockwise, then come up on adjustment by turning the adjuster in a clockwise motion.

6. Tighten lock nut then recheck pull as it must lie between specified limits.
7. Reassemble pitman arm to sector shaft, lining up

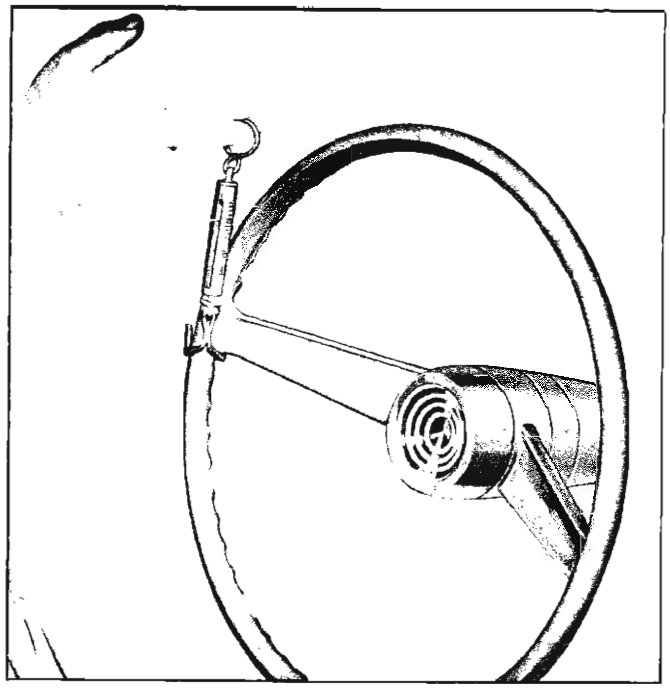

Fig. 5—Checking Adjustment with J-0554

marks made on disassembly. Torque nut to 100-150 ft. lbs.

Pitman Arm to Relay Rod Ball Joint

1. Remove cotter pin from end of relay rod, then using a drag link bit in end plug slot, tighten end plug until springs are compressed and plug bottoms (fig. 6).
2. Back off end plug ¾″ turn plus amount necessary to insert cotter pin, then insert pin.

Steering Wheel Alignment and High Point Centering

1. Set front wheels in straight ahead position. This can be checked by driving vehicle a short distance to determine steering wheel position at which vehicle follows a straight path.
2. With front wheels set straight ahead, check position of mark on wormshaft designating steering

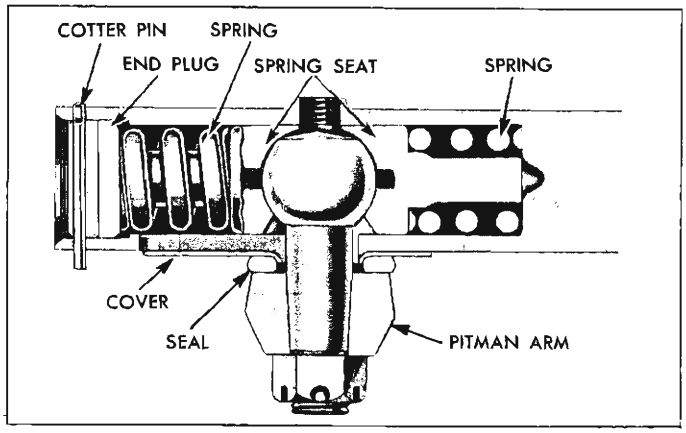

Fig. 6—Cross Section of Relay Rod Ball Joint

gear high point (fig. 4). This mark should be at the top side of the shaft at 12 o'clock position and lined up with the mark in the coupling lower clamp. If this alignment is correct, check the alignment of mark on upper end of intermediate shaft with saw cut in upper universal joint (fig. 7).

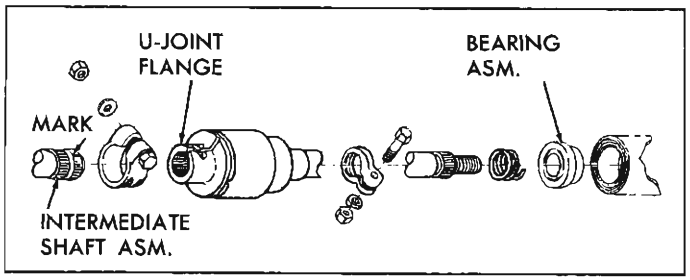

Fig. 7—Upper Shaft Alignment

Remove steering wheel, if necessary, and align wheel with mark on top of wormshaft (wheel should be set in straight ahead position). See Mast Jacket and Shifter Tube Removal for a description of the steering wheel removal operation.

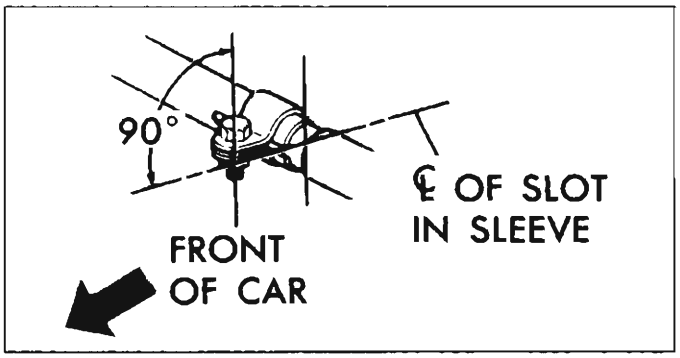

Fig. 8—Tie Rod Clamps

3. If gear has been moved off high point when setting wheels in straight ahead position, loosen adjusting sleeve clamps on both left and right hand tie rods (fig. 8), then turn each sleeve an equal amount in the same direction to bring gear back on high point.

   CAUTION: Turning the sleeves an unequal number of turns or in different directions will disturb the toe-in setting of the wheels.

4. Tighten all sleeve clamp bolts.

   CAUTION: Inner tie rod clamp bosses must be towards the front to 90° down to avoid stabilizer link bolt interference on all cars with stabilizer bar. For maximum clamping, bolts must be positioned at 90° to slot (fig. 8).

Toe-In Adjustment

A procedure for adjusting the steering linkage for proper toe-in setting is described in Section 3.

SERVICE OPERATIONS

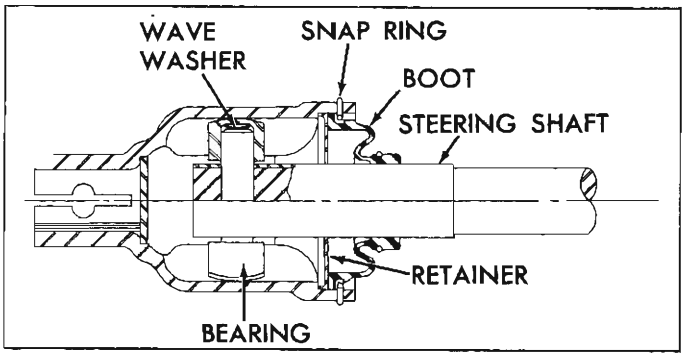

Fig. 9—Cross Section of Upper Coupling

UPPER STEERING COUPLING

Disassembly (fig. 9).

To remove upper coupling, the steering gear must be removed or the mast jacket assembly must be loosened and pulled up. Consult proper outline under *Service Operations* for either of these operations and proceed as follows:

1. Loosen clamp holding cover to intermediate shaft and remove cover from shaft.
2. Remove spring clip from cover and carefully remove cover from steering shaft. Use caution to avoid loss of small parts inside cover.

   NOTE: Use extreme caution to prevent damage to bearing surfaces of the pin.

3. Remove steering shaft pivot pin bearing blocks and wave washers.

Inspection

Carefully inspect all parts for signs of wear. If pivot pin in steering shaft is not serviceable, steering shaft

must be removed as outlined in this section and replaced with a new steering shaft-pin assembly.

Assembly (fig. 10)

1. Install cover on intermediate shaft, aligning slot in clamp with mark on shaft. Install clamp bolt and tighten.

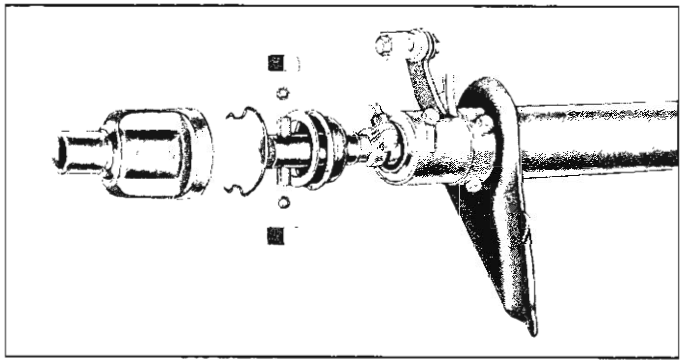

Fig. 10—Exploded View of Coupling

2. With steering shaft installed, place bearing blocks with wave washers in place over each end of pivot pin after first lubricating pin with chassis grease. Place retainer over end of shaft.
3. Lubricate inside of housing with chassis grease and carefully position over pivot pin.
4. Position retainer and boot in housing and install spring clip.
5. Install lower coupling on worm shaft, if removed; or position mast jacket assembly, if loosened, as outlined under *Service Operations*.

LOWER STEERING COUPLING

Removal

Before removing the lower steering coupling, either the steering gear must be lowered from its proper position or the mast jacket, upper steering gear shaft, coupling and intermediate shaft must be loosened and pulled upward far enough to permit the coupling to be removed from the worm shaft. The upper half of the coupling is an integral part of the intermediate shaft.

1. Remove bolt from coupling clamp.

   NOTE: This is a special bolt and will require a 12 pt. socket or box wrench.

2. Tap with a soft mallet to remove coupling from wormshaft. The coupling is splined to the steering wormshaft.
3. If coupling is to be disassembled, first scribe a mark as shown in Figure 11, then remove the two retaining nuts, bolts, reinforcements, and lockwashers. Separate the lower "split-clamp" and, remove the wafer type coupling and two locking pins.

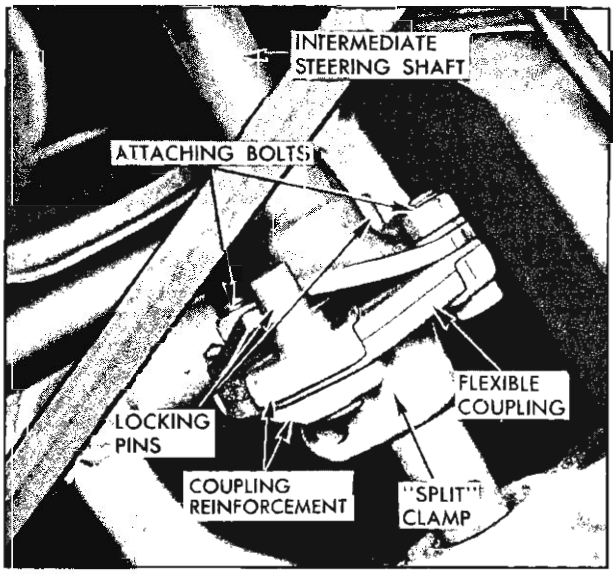

Fig. 11—Lower Steering Coupling

Installation

1. If disassembled, first set the flexible coupling in place then match up the scribe marks on the locking pins and retainer. Line up the upper coupling section with the bolt hole and install and tighten the attaching bolts, nuts, washers and retainers.
2. Align the scribe mark on the "split" clamp and the mark on the lower steering gear shaft and install the coupling.
3. Install the special bolt into the clamp and tighten to 20-25 ft. lbs. torque.

MAST JACKET (ALL)

Removal

1. Disconnect horn wire and direction signal harness (6 circuit connector) from mast jacket switch.
2. Remove steering wheel nut and washer from end of steering gear shaft, then using Tool J-2927,

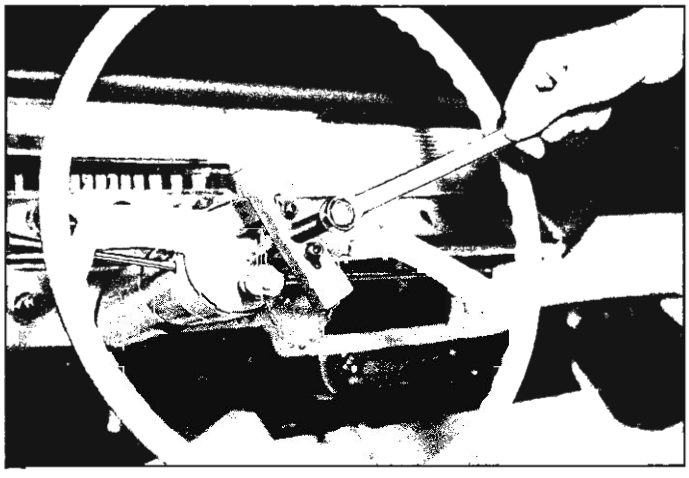

Fig. 12—Removing Steering Wheel

thread puller anchor screws into threaded holes provided in steering wheel hub. Turn center screw down against centering adapter (fig. 12) and force wheel from steering shaft. Remove bearing spacer from end of steering shaft.

3. Loosen instrument panel cover by removing retaining screws (fig. 13).

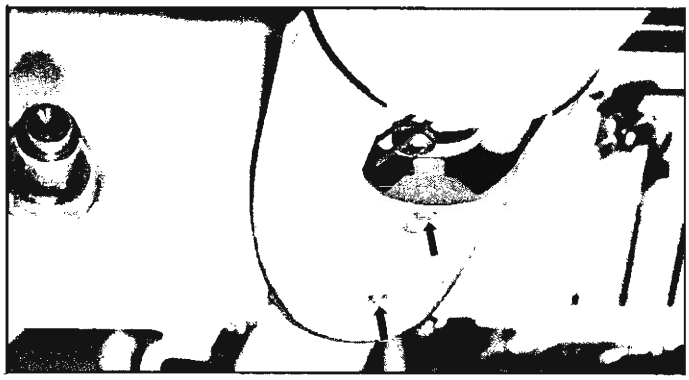

Fig. 13—Instrument Panel Cover Screws

4. Remove upper mast jacket clamp attaching bolt from dash bracket (fig. 14).
5. Loosen lower mast jacket clamp by fire wall.

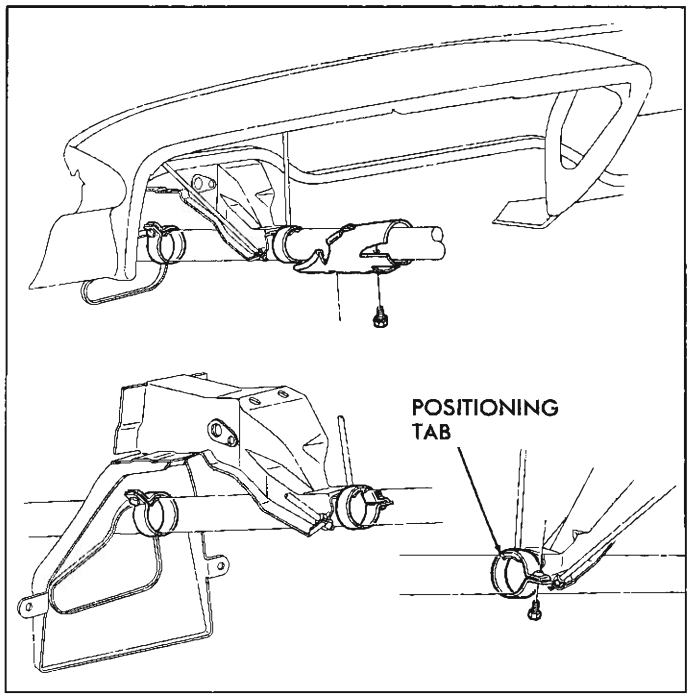

Fig. 14—Mast Jacket Clamps

6. Remove rubber toe pad covering the opening in the fire wall.
7. Remove shifter rods (two on 3-speed, one on automatic or none on 4-speed).
8. Protect the upholstering on the front seat from any damage. **Carefully** withdraw mast jacket rotating it so that the shift levers clear the opening in the fire wall.

Three-Speed Transmission Type

Disassembly (Fig. 15)

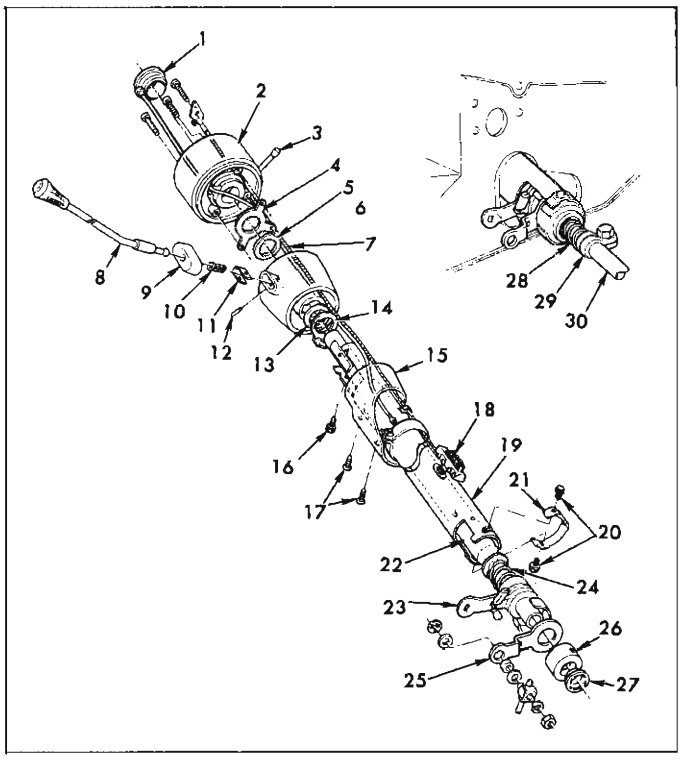

Fig. 15—Exploded View of Three Speed Mast Jacket

1. Horn Bushing Assembly
2. Directional Signal Housing
3. Directional Signal Lever
4. Locking Plate
5. Thrust Washer
6. Boden Cable
7. Selector Lever Support Housing
8. Selector Lever
9. Selector Lever Boot
10. Selector Lever Spring
11. Selector Lever Clip
12. Selector Lever Pin
13. Lower Thrust Washer
14. Upper Adjusting Ring
15. Instrument Panel Cover
16. Upper Adjusting Ring Screw
17. Instrument Panel Cover Screw
18. Direction Signal Switch
19. Mast Jacket
20. Lower Adjusting Ring Screws
21. Lower Adjusting Ring Retainer
22. Shifter Tube
23. Low-Reverse Lever
24. Return Spring
25. Second-High Lever
26. Lower Adjusting Ring
27. Lower Bearing Assembly
28. Lower Spring
29. Lower Spring Stop Clamp
30. Intermediate Steering Shaft

1. Remove direction signal switch and back up light switch (if installed) from the mast jacket assembly.
2. Slide rubber grommet back from lever support housing, drive out selector lever pivot pin and remove shift lever and anti-rattle spring (fig. 16).
3. Remove the three direction signal housing retaining screws indicated by arrows in Figure 17. It will be necessary to shift position of direction sig-

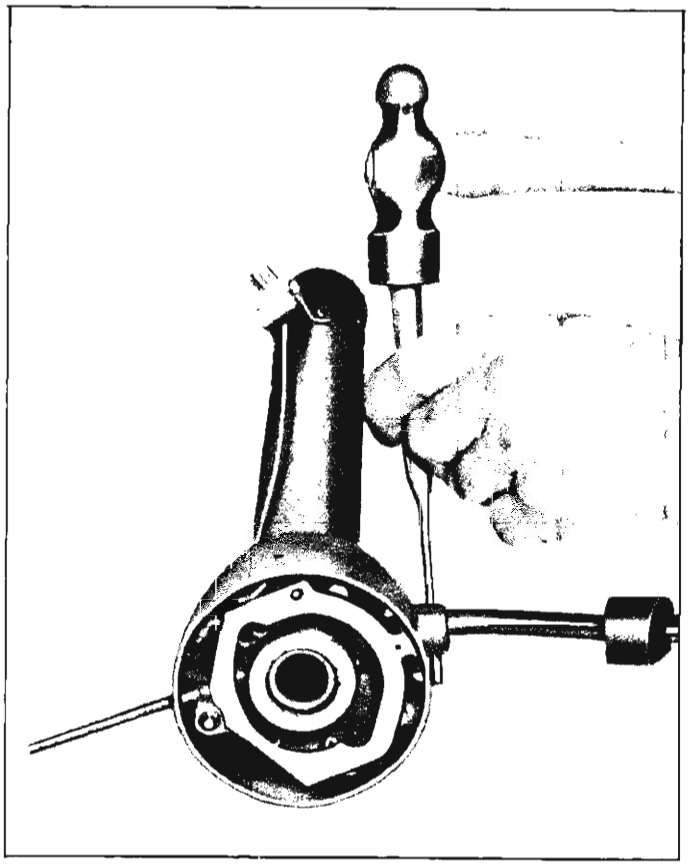

Fig. 16—Removing Pivot Pin

nal controls to gain access to the retaining screws. Disconnect "Boden" cable retaining clips. Withdirection signal housing and "Boden" cable.

NOTE: One screw retains the direction signal "Boden" cable retaining bracket.

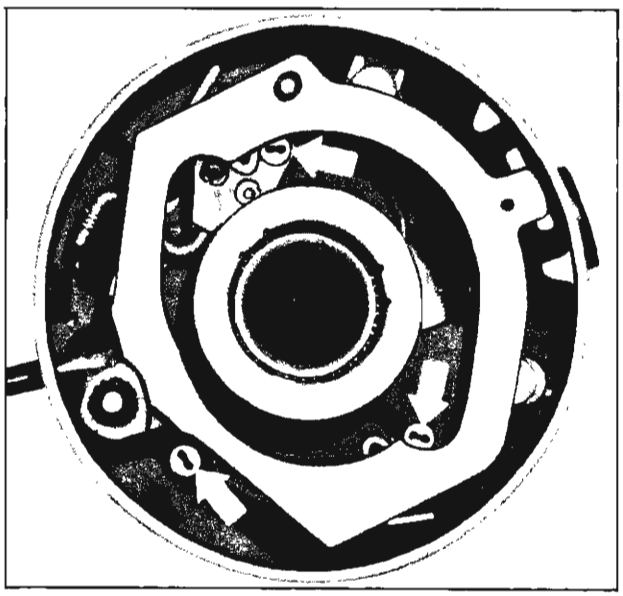

Fig. 17—Direction Signal Retaining Screws

4. Remove two screws from lower adjusting ring and remove ring, low and reverse shifter lever and spacer. Slide shifter tube downward (against spring tension) and remove locking plate and spacer from upper end of mast jacket.
5. Remove shifting lever housing. Remove instrument panel cover. Place mast jacket upright on floor while supporting it with two pieces of wood. Push down on second and third speed lever with foot and place block of wood on upper end of tube. Tap on block to remove tube (fig. 18). Withdraw tube from mast jacket assembly.

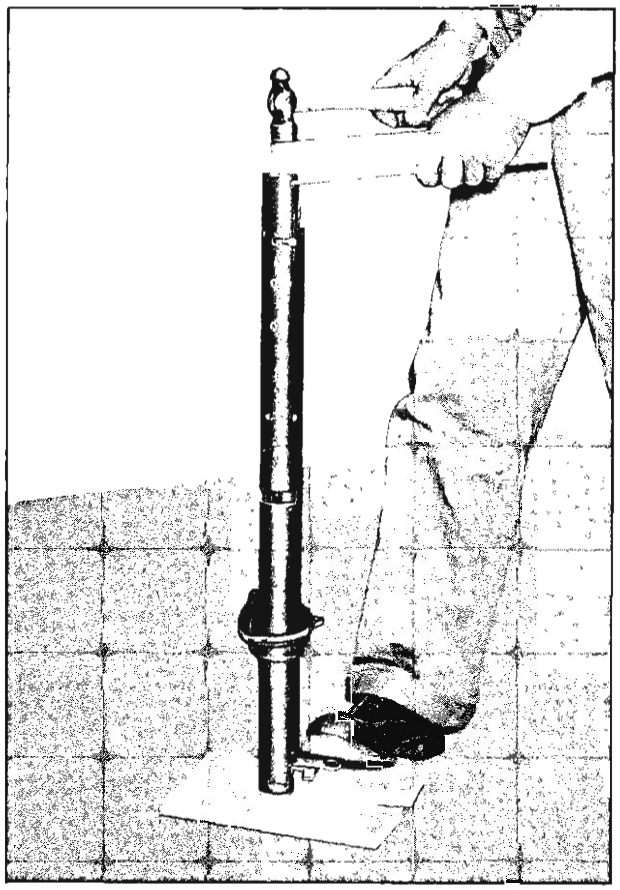

Fig. 18—Removing Shifter Tube

NOTE: In some tolerance stack-up cases it may be necessary to use a press as shown in Figure 19. Be careful not to damage shifter tube or mast jacket. If proper press is not available, use a flat nosed drift and tap shifter tube bearing through three tab openings.

6. Remove rubber dash boot from mast jacket.
7. Remove upper adjusting ring.

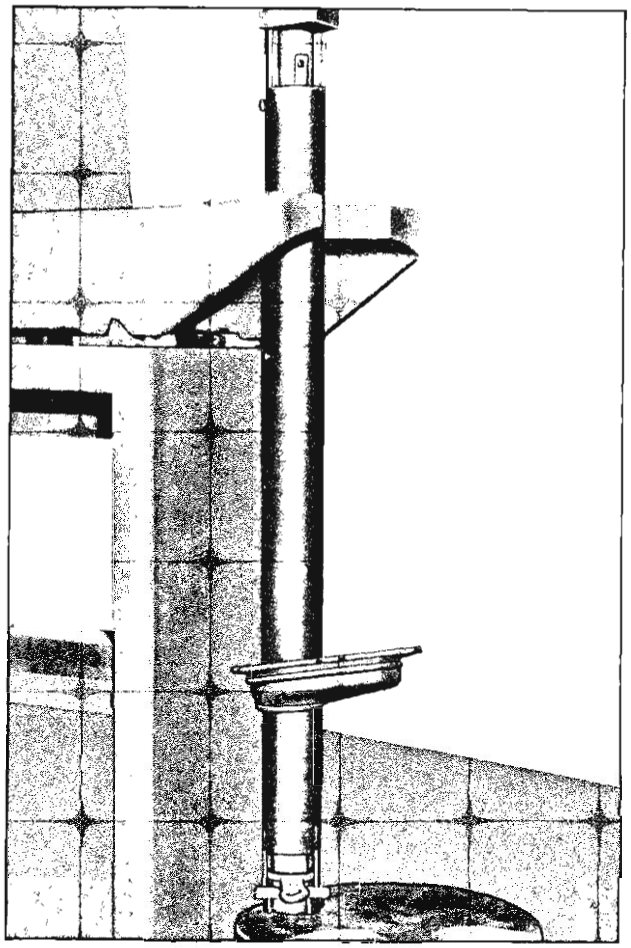

Fig. 19—Pressing Shifter Tube

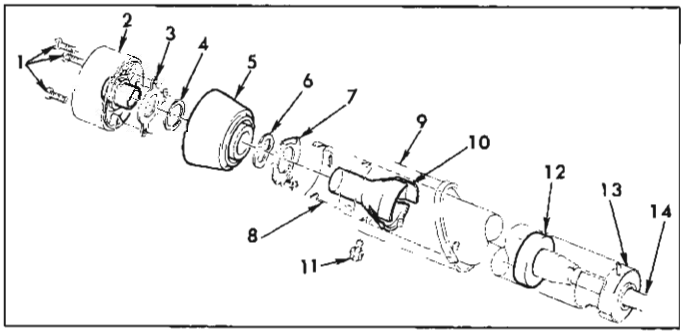

Fig. 20—Exploded View of Four Speed Mast Jacket

1. Locking Screws
2. Control Assembly
3. Filler Tube—Upper
4. Locking Plate
5. Control Lever Housing
6. Spring Washer
7. Upper Adjusting Ring
8. Mast Jacket
9. Instrument Panel Cover
10. Filler Tube—Lower
11. Adjusting Ring Screw
12. Seal
13. Lower Bearing Assembly
14. Steering Shaft

Four-Speed Transmission Type

Disassembly (Fig. 20)

1. Remove direction signal switch.
2. Remove lower adjusting ring and seal.
3. Remove dash boot and mast jacket clamp.
4. Remove instrument panel cover.
5. Remove the three direction signal housing retaining screws indicated by arrows in Figure 17. It will be necessary to shift position of direction signal controls to gain access to the retaining screws. Disconnect "Boden" cable retaining clips. Withdraw direction signal housing and "Boden" cable.

   NOTE: One screw retains the direction signal "Boden" cable retaining bracket.

6. Using a pair of pliers, pull out upper spacer (fig. 21). Remove locking plate shift lever support housing and upper adjusting ring.
7. Using a pair of pliers, remove lower spacer (fig. 22).

   NOTE: Due to manufacturing tolerances it may be necessary to use a long punch, or old shifter tube to tap out both spacers.

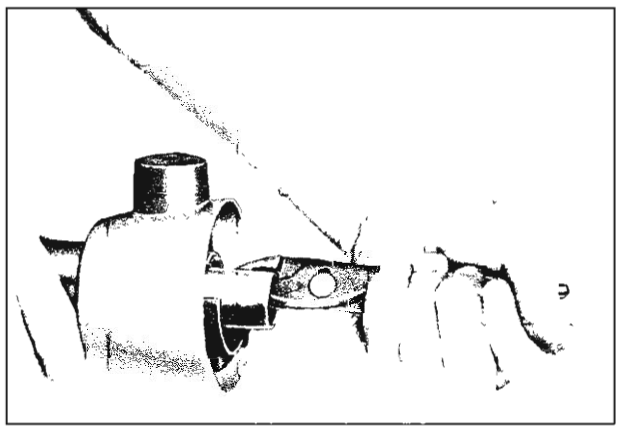

Fig. 21—Removing Upper Spacer

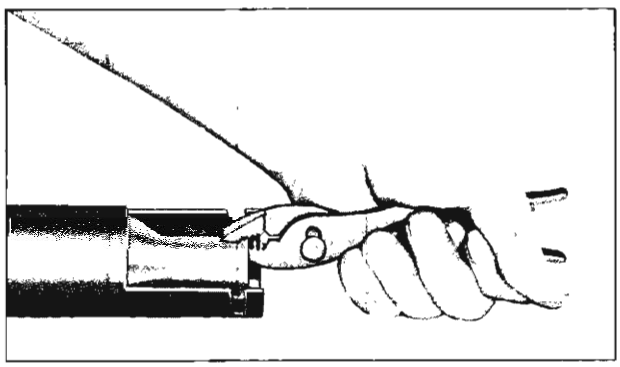

Fig. 22—Removing Lower Spacer

Automatic Transmission Type

Disassembly (Fig. 23)

1. Remove direction signal switch and safety switch from the mast jacket assembly.
2. Slide rubber grommet back from lever support

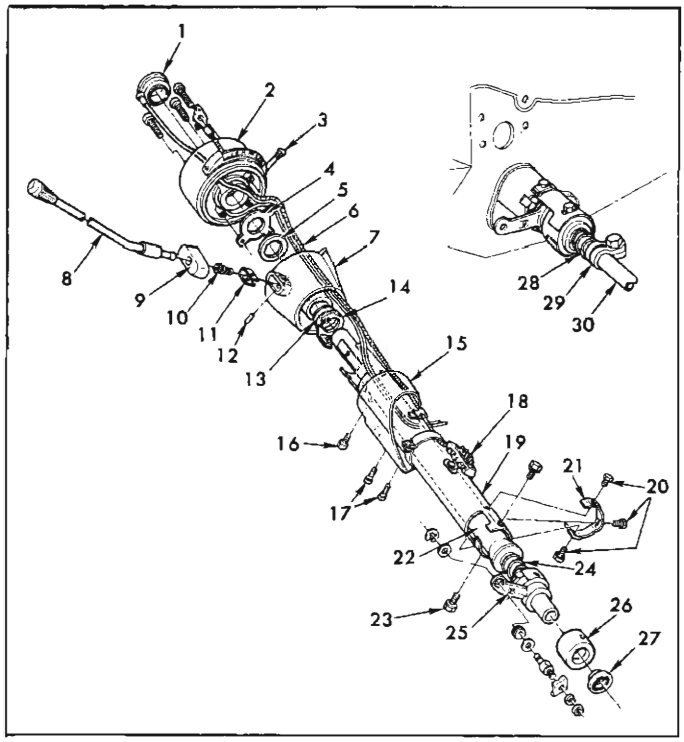

Fig. 23—Exploded View of Automatic Transmission Mast Jacket

1. Horn Bushing Assembly
2. Directional Signal Housing
3. Directional Signal Lever
4. Locking Plate
5. Thrust Washer
6. Boden Cable
7. Selector Lever Support Housing
8. Selector Lever
9. Selector Lever Boot
10. Selector Lever Spring
11. Selector Lever Clip
12. Selector Lever Pin
13. Lower Thrust Washer
14. Upper Adjusting Ring
15. Instrument Panel Cover
16. Upper Adjusting Ring Screw
17. Instrument Panel Cover Screw
18. Direction Signal Switch
19. Mast Jacket
20. Lever Stop Support Screws
21. Lever Stop Support Screw Retainer
22. Shifter Tube
23. Lower Adjusting Ring Screws
24. Return Spring
25. Shift Lever
26. Lower Adjusting Ring
27. Lower Bearing Assembly
28. Lower Spring
29. Lower Spring Stop Clamp
30. Intermediate Steering Shaft

housing, drive out selector lever pivot pin and remove shift lever and anti-rattle spring (fig. 16).

3. Remove the three direction signal housing retaining screw indicated by arrows in Figure 17. It will be necessary to shift position of direction signal controls to gain access to the retaining screws. Disconnect "Boden" cable retaining clips. Withdraw direction signal housing and "Boden" cable.

NOTE: One screw retains the direction signal "Boden" cable retaining bracket.

4. Remove two screws from the lower adjusting ring. Remove three screws from the mast jacket clamping ring (fig. 11). Slide shifter tube downward (against spring tension) and remove locking plate and spacer from upper end of mast jacket.
5. Remove shift lever support housing. Remove instrument panel cover. Withdraw shifter tube from mast jacket. (See operation 5 under *"3 Speed Transmission Type."*

NOTE: Do not hammer on selector (detent) plate during removal of shifter tube as this plate could bend.

6. Remove felt seal from shifter tube.
7. Remove rubber dash boot from mast jacket.
8. Remove upper adjusting ring (fig. 24).

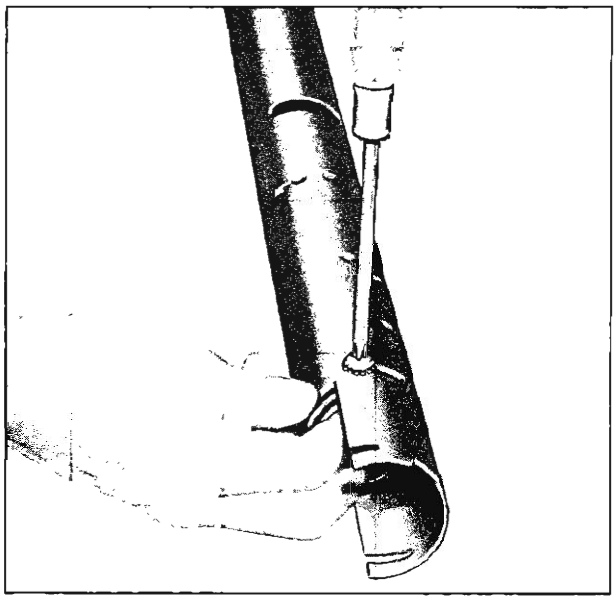

Fig. 24—Removing Upper Adjusting Ring

CLEANING AND INSPECTION (ALL)

1. Clean all metal parts in cleaning solvent and dry them with compressed air.
2. Inspect transmission control lever housing for burrs, scratches and wear.

NOTE: The clearance is critical between the shifter tube assembly and the lever support housing. There must be no interference between these two working parts (on the three-speed transmission models) and any excessive clearance must be corrected by the installation of new parts.

3. Inspect steering shaft bearing in direction signal housing. The bearing may be replaced by prying out of position and installing a new bearing and horn wire assembly.
4. Inspect direction signal wiring connections and switch.
5. Check direction signal lever for smoothness of operation and freedom from bind. Replace defective parts.
6. Inspect shifter levers and shifter tube assembly (if so equipped) for worn or damaged parts. The shifter tube assembly must be replaced as a unit in event of worn or damaged component parts.

7. Shifter tube (when used) must rotate and slide freely in bearing.

NOTE: The shifter tube assembly on the three-speed transmission models consists of the shifter tube, second and third shift lever, shifter tube relay lever, shifter tube bearing, keys, felt seal, washers, and spring. No shifter tube is used on vehicles equipped with four-speed transmission.

Three-Speed Transmission Type

Assembly

1. Install rubber dash boot, as shown in Figure 25, and mast jacket mounting clamps.

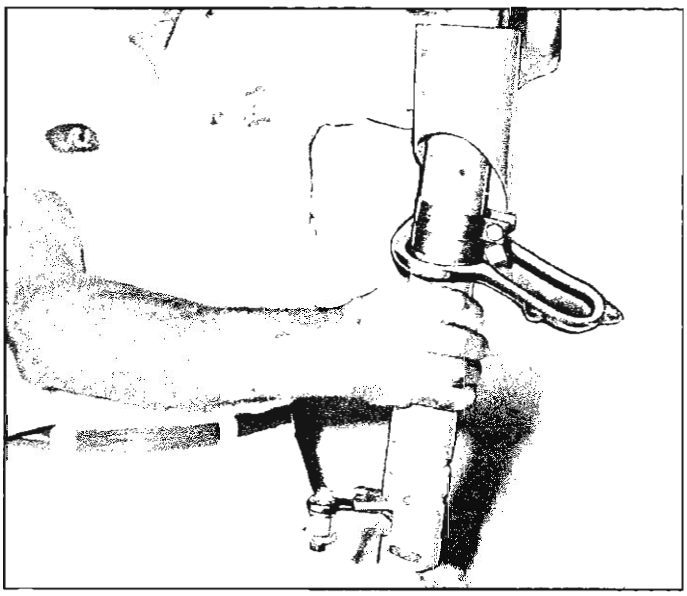

Fig. 25—Mast Jacket Clamps and Boot Installed

2. With attaching screw, loosely install upper adjusting ring (fig. 26).

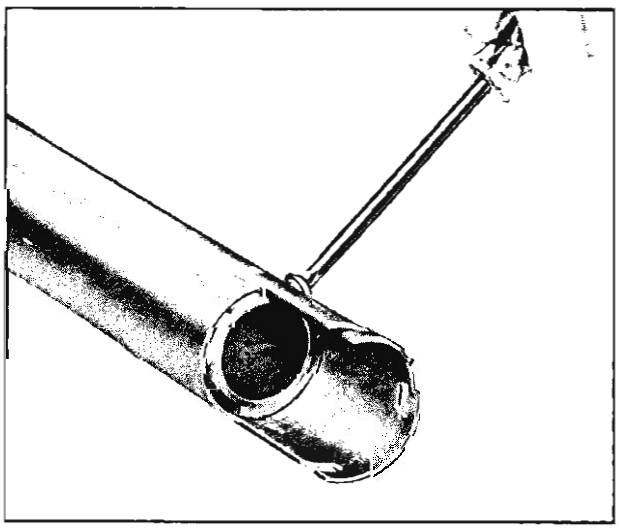

Fig. 26—Installing Upper Adjusting Ring

3. Generously lubriplate all keys and small diameter ends of the shifter tube.
4. Place felt seal on shifter tube. Push in place up to the spring.
5. Place shifter tube in mast jacket being careful not to tear felt seal.
6. Temporarily install spacer, low and reverse shifter lever and lower adjusting ring as shown in Figure 27. Place a block of wood on top of adjusting ring

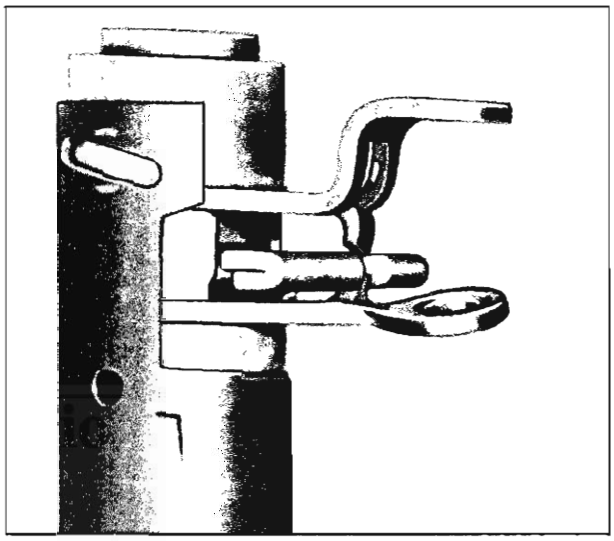

Fig. 27—Temporary Installation of Low-Reverse Lever and Spacer

and tap until shifting tube bottoms (fig. 28). Remove spacer, low and reverse shifter lever and adjusting ring.

NOTE: Bearing must be seated against the three locating tabs (fig. 29).

7. Place instrument panel cover onto mast jacket.
8. Lubriplate inner diameter of shifter lever support housing and install on upper end of mast jacket assembly, fitting keyway in housing over key on shifter tube. Depress shifter tube against spring tension and install locking plate and flat washer (spacer). Be certain to engage tang of locking plate into slot in mast jacket (fig. 30).

NOTE: Be certain to install locking plate properly (fig. 31) or attaching screws for direction signal housing will not line up properly.

9. Lubriplate and install spacer, low and reverse shifter lever (tang on lever must be towards top of mast jacket) and adjusting ring.
10. Install lower adjusting ring attaching screws. Do not tighten.

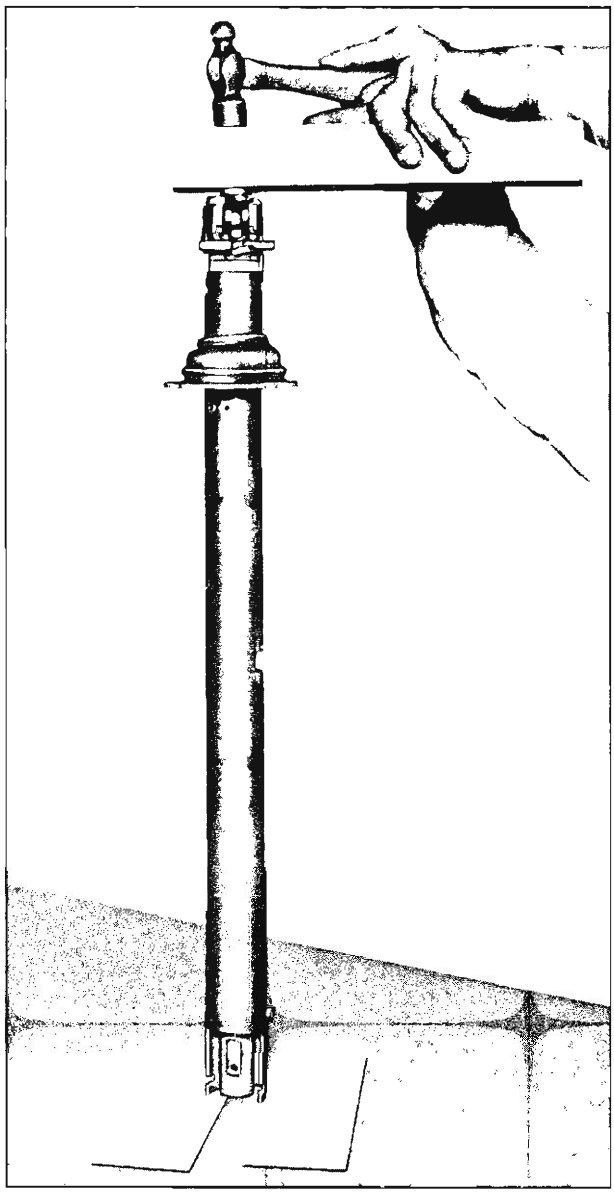

Fig. 28—Installing Shifter Tube

11. Carefully feed "Boden" cable from the direction signal housing through the gear shift lever support housing and secure in retaining clips in mast jacket. Install direction signal housing aligning tang on housing with slot in mast jacket.
12. Secure the three clutch head screws to the locking plate.
13. Rotate lower adjusting ring until there is .005" maximum end play (with no binding) between adjusting ring and first and reverse shifter lever as shown in Figure 32. Tighten attaching screws.
14. Install anti-rattle spring on end of selector lever and install into selector lever support housing. Secure lever with "roll pin." Push rubber boot into housing.

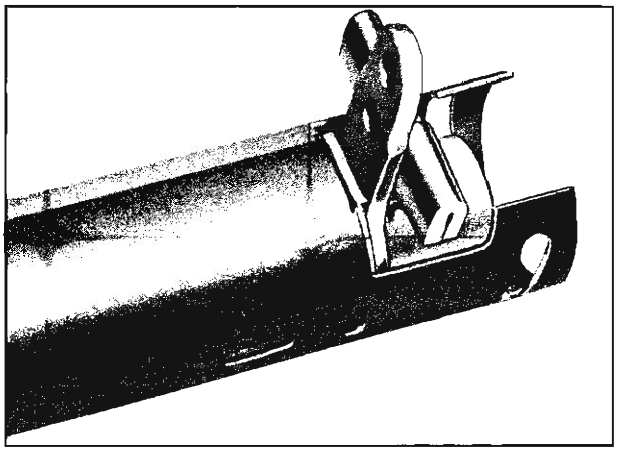

Fig. 29—Proper Position of Shifter Tube Bearing

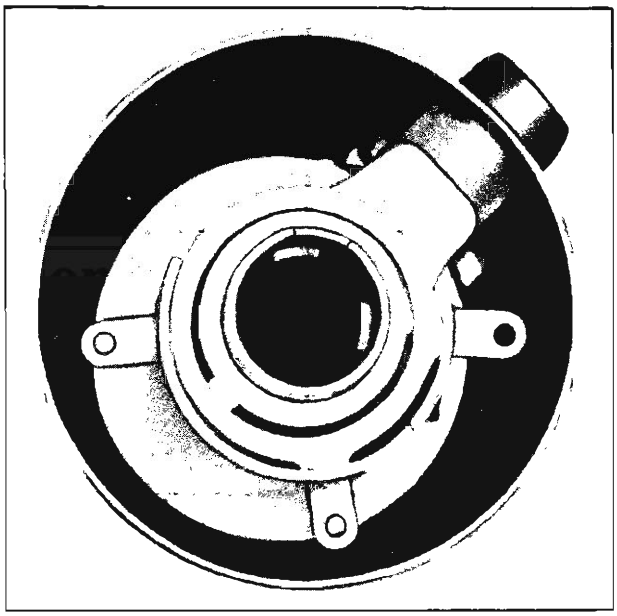

Fig. 30—Locking Plate Installed

15. Move upper adjusting ring in slot until tight and back off only enough to allow lever support housing to rotate freely. This can be done by rotating adjusting ring and screws (fig. 33). (Counterclockwise motion as viewed from top of mast jacket assembly will decrease end play. Clockwise motion will increase end play.)
16. Install direction signal "Boden" cable into direction signal switch and clamp as shown in Figure 34.

    NOTE: This is a self adjusting switch. The "Boden" cable wire will automatically position itself when the direction signals are used.

17. Install back up light switch if so equipped.

    NOTE: When installing back up light switch, selector lever must be in low gear position tang on shifter tube as shown in Figure 35.

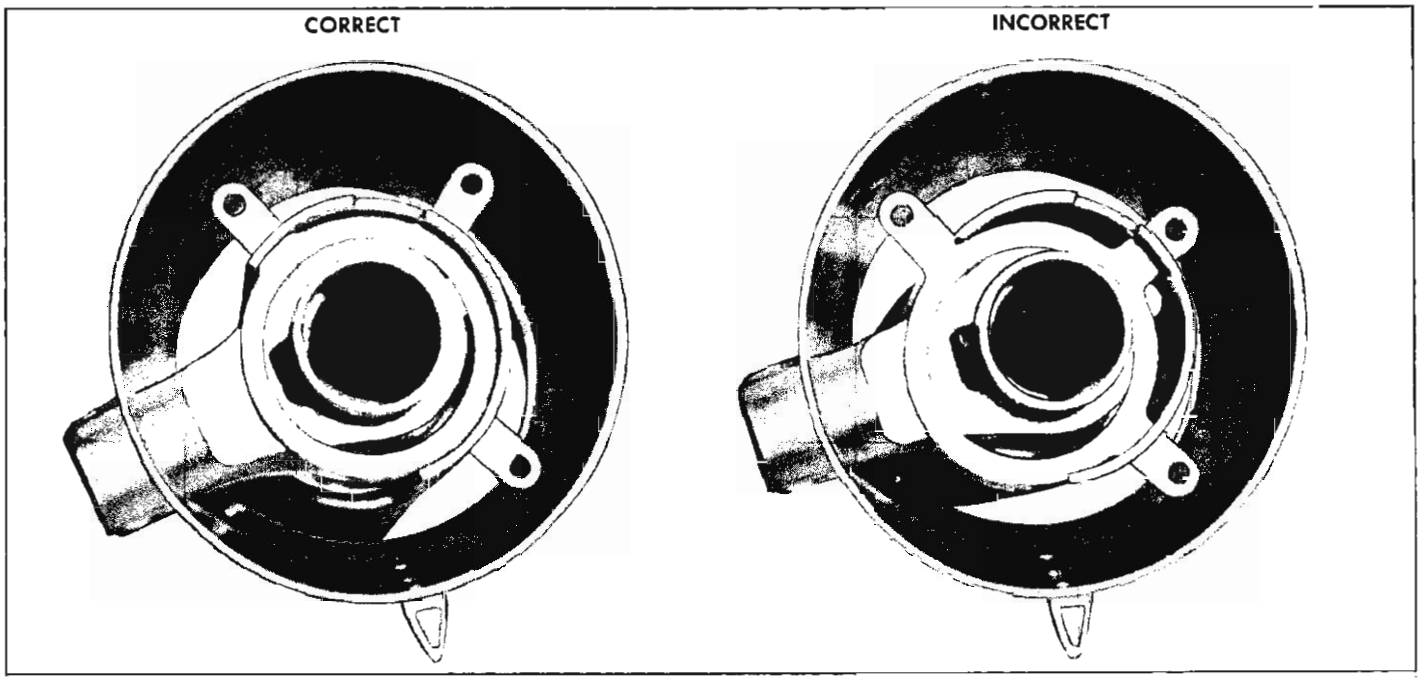

Fig. 31—Correct Lock Plate Position

Four-Speed Transmission Type

Assembly

1. Install lower spacer.

   NOTE: Short tang of spacer must be installed on side of mast jacket with "cutout" for upper adjusting ring attaching screw (fig. 4-36). DO NOT fully bottom on internal stop.

2. Install upper adjusting ring. Leave loose for final adjustment after installation in vehicle.
3. Install selector lever support housing.
4. Install lock plate (fig. 30).
5. Install upper spacer.

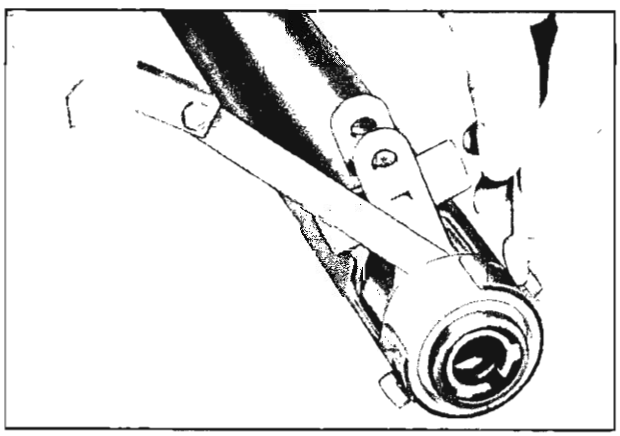

Fig. 32—Checking Adjusting Ring Clearance

NOTE: This spacer is tapered at one end. The small diameter end should be placed into the lever support housing and will be a relatively loose fit.

6. Tap upper spacer into housing until there is .580" ($^{37}/_{64}$") clearance between top edge of spacer and

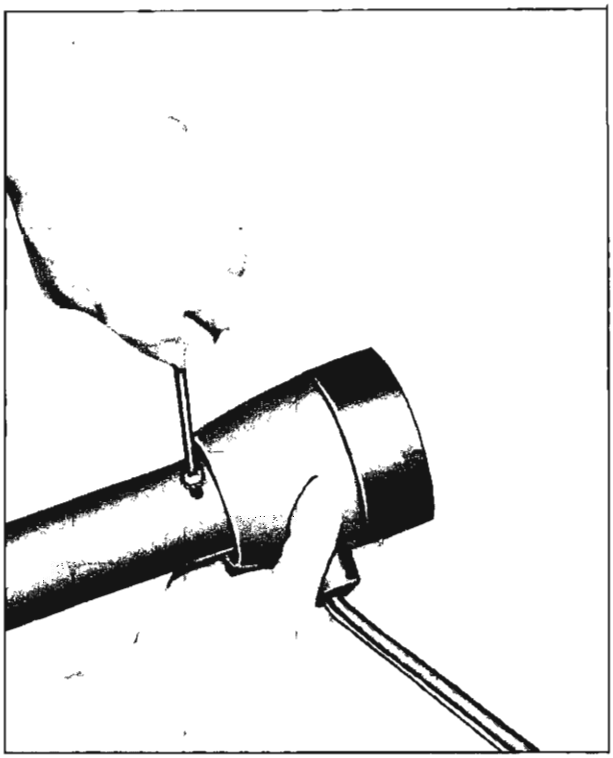

Fig. 33—Adjusting Upper Ring

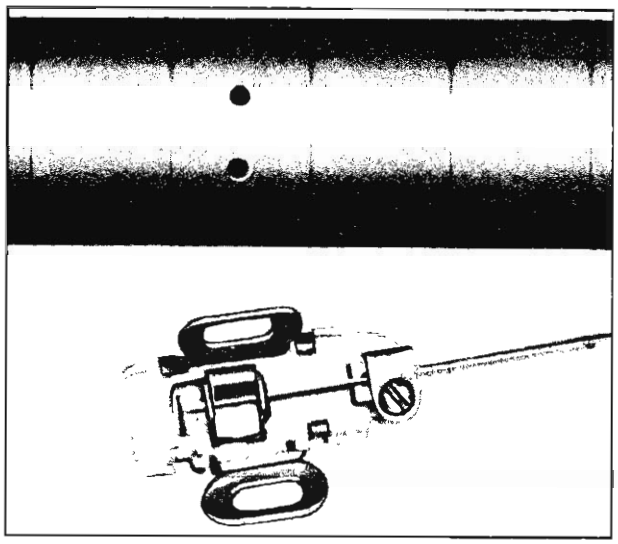

Fig. 34—Direction Signal Switch

machined surface of lever support housing (fig. 37).

7. Install small flat spacer washer and direction signal housing. Feed direction signal wire through lever support housing. Install rubber boot over end of selector lever housing, if removed.
8. Install felt seal and lower adjusting ring into bottom of mast jacket.
9. Install instrument panel cover and dash boot.
10. Install and attach direction signal switch.

NOTE: This is a self adjusting switch. The "Boden" cable wire will automatically position itself when the direction signals are used.

Automatic Transmission Type

Assembly

1. Install rubber dash boot, as shown in Figure 25, and mounting clamps (2).

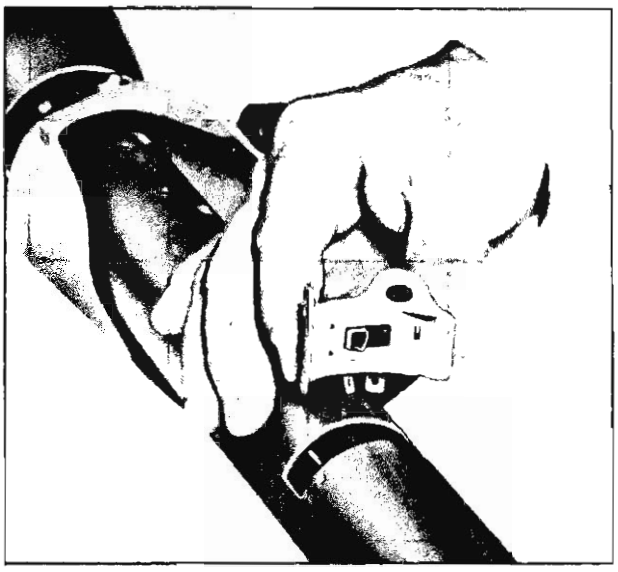

Fig. 35—Back Up Light Switch

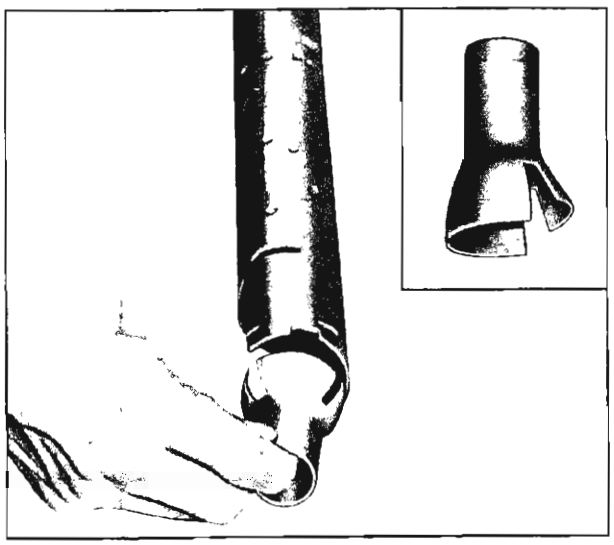

Fig. 36—Installing Spacer

2. With attaching screw loosely install upper adjusting ring (fig. 26).
3. Generously lubriplate all keys and small diameter ends of the shifter tube.
4. Place felt seal on shifter tube. Push in place up to the spring.
5. Place shifter tube in mast jacket being careful not to tear felt seal.
6. Install instrument panel lower bezel to mast jacket but do not tighten.

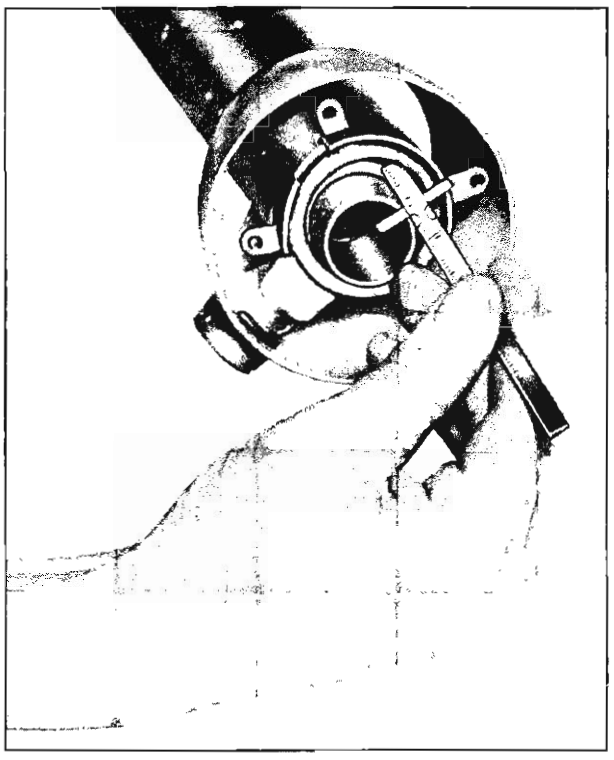

Fig. 37—Checking Upper Spacer Clearance

7. Align three holes in selector (detent) plate with three holes in bottom of mast jacket. Install clamping ring and align these three holes and install the three bolts. Do not tighten.
8. Lubriplate inner diameter of shift lever support housing and install on upper end of mast jacket assembly, fitting keyway in housing over key on shifter tube. Depress shifter tube against spring tension and install locking plate and flat washer (spacer). Be certain to engage center tang of locking plate into slot in mast jacket.

   NOTE: Be certain to install locking plate properly (fig. 31) or attaching screws for direction signal housing will not line up properly.

9. Install adjusting ring.
10. Install lower adjusting ring attaching screws. Do not tighten.
11. Carefully feed "Boden" cable from the direction signal housing through the gear shift lever support housing. Install direction signal housing aligning tang on housing with slot in mast jacket and secure cable in attaching clips on mast jacket.
12. Secure the three clutch head screws to the locking plate.
13. Install anti-rattle spring on end of selector lever and install into selector lever support housing. Secure lever with "roll pin." Push rubber boot into place.
14. Install direction signal "Boden" cable into direction signal switch and clamp as shown in Figure 34.

    NOTE: This is a self-adjusting switch. The "Boden" cable wire will automatically position itself when the direction signals are used.

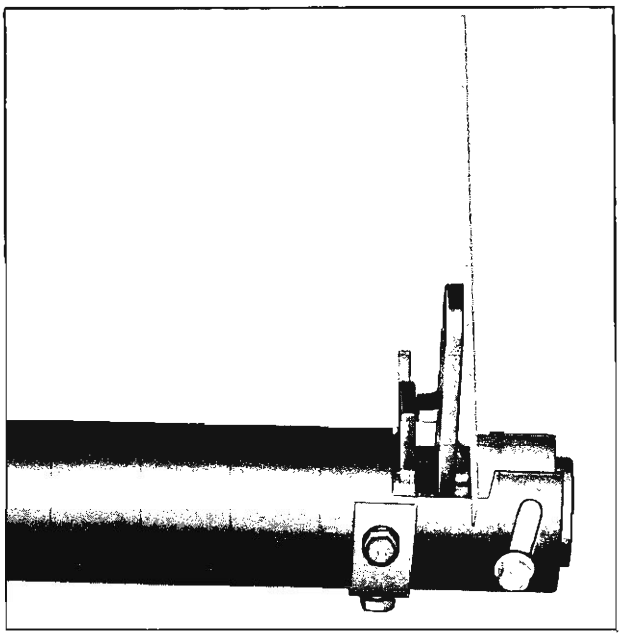

Fig. 38—Checking Lower Adjusting Ring Clearance

15. Rotate upper adjusting ring until tight and back-off only enough to allow lever support housing to rotate freely. This can be done by rotating adjusting ring and screw (fig. 33). (Counterclockwise motion as viewed from top of mast jacket assembly will decrease end play. Clockwise rotation will increase end play.)
16. Rotate lower selector (detent) plate as necessary to align pointer with transmission quadrant (at upper end, align in Drive (D) position). Tighten three screws.
17. Position tang on shift lever on ear of detent plate, rotate adjusting ring until there is .060" end play between adjusting ring and shift lever as shown in Figure 38.
18. Install safety switch and position so that transmission will only start in Park (P) or Neutral (N).

MAST JACKET INSTALLATION (ALL)

1. Protect upholstery on front seat from damage. **Carefully** feed mast jacket assembly down over upper steering shaft rotating it so that the shift levers pass through the opening in the dash.
2. Engage tang on mast jacket support (fig. 39) and

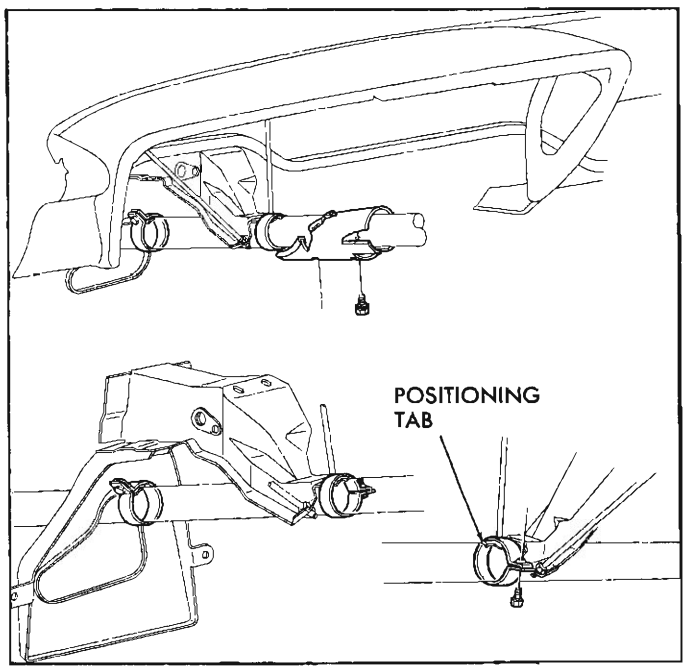

Fig. 39—Installing Mast Jacket

position clamps as shown; install clamp bolts and tighten. Slide mast jacket cover into position and secure with screws.

3. Install shifter rods (if so equipped). The 3-speed rod adjustment is outlined in Section 12.
4. Install rubber toe pad covering opening in fire wall.

5. Install steering wheel spacer, horn bushing and steering wheel, aligning mark on steering shaft with mark on wheel hub. Torque steering wheel nut to 35-40 ft. lbs. (fig. 40).

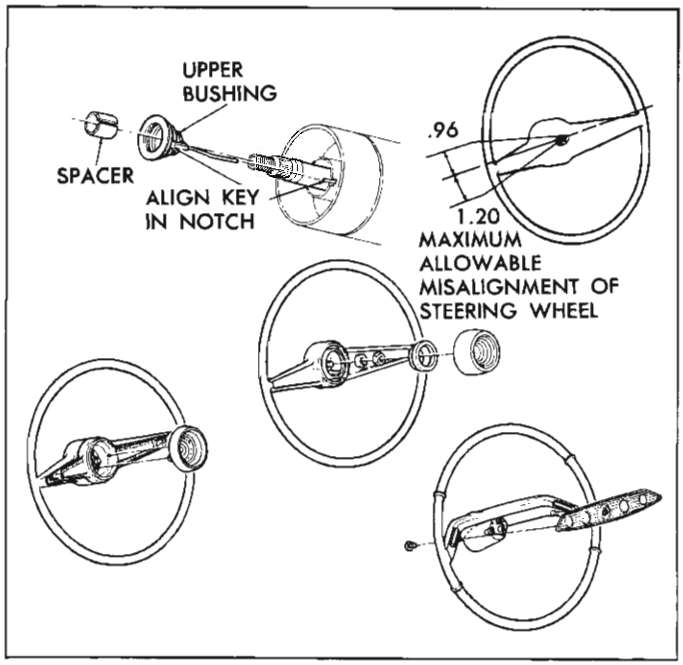

Fig. 40—Steering Wheel Installation

6. Connect horn wire and direction signal wire to switch on mast jacket.

INSTALLATION ADJUSTMENTS (ALL)

1. Adjust lower spring stop (above coupling) as follows:
   a. Loosen lower spring stop clamp (fig. 41).

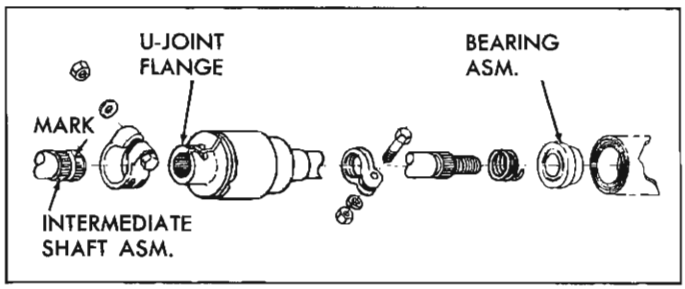

Fig. 41—Coupling and Stop Clamp Assembly

   b. Using suitable tool, force clamp and spring away from coupling .010" from solid height of spring.
   c. Tighten clamp bolt while holding clamp in this position.
2. Move upper adjusting ring screw up ramp slot until tight and back-off only enough to allow lever support housing to rotate freely (fig. 42).

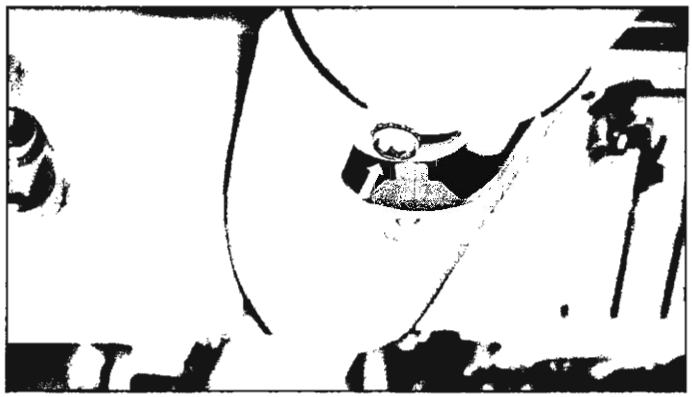

Fig. 42—Upper Adjusting Ring Screw

3. Adjust instrument panel lower cover to give .060" clearance between the cover and the selector lever housing.
4. Adjust safety switch (back up light switch if three speed) as outlined previously.

STEERING GEAR

Removal

1. Place car on suitable hoist or jackstand and disconnect pitman arm from pitman arm shaft, using Tool J-6632 (or Tool J-5504) (fig. 43).

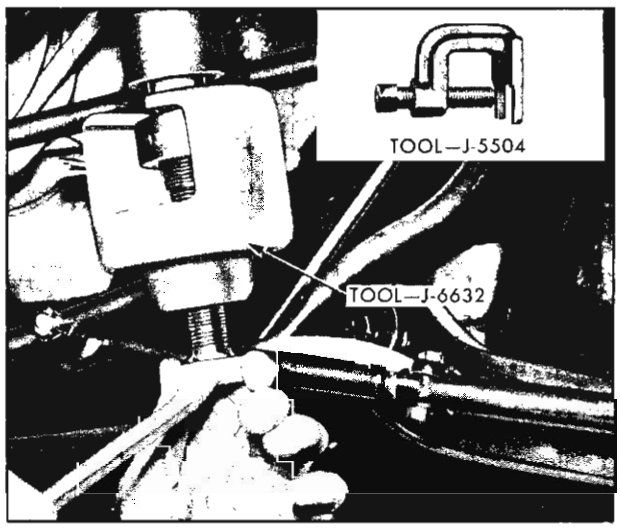

Fig. 43—Removing Pitman Arm

2. Remove seven front splash pan attaching bolts and remove pan.
3. Remove nuts and lockwashers from steering gear to frame bolts and remove bolts, shims where installed and steering gear.
4. Separate steering gear from intermediate shaft by loosening clamp bottom lower universal joint and spreading clamp slightly.
   Remove all mounting bolts and remove steering gear from car.

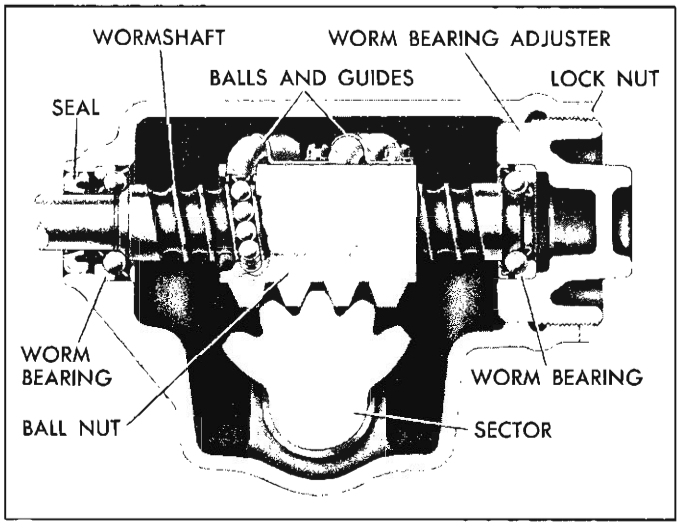

Fig. 44—Cross Section of Steering Gear

Disassembly (Fig. 4-44)

As with any ball bearing unit the steering gear parts must be kept free of dirt. Clean paper or rags should be spread on the bench before starting disassembly of the steering gear. Refer to Figure 11.

1. Loosen lock nut on end of sector shaft and turn the lash adjuster a few turns counterclockwise. This will remove the load from the worm bearings caused by the close meshing of the rack and sector teeth.
2. Loosen the lock nut on the worm bearing adjuster and turn the adjuster counterclockwise a few turns.
3. Place a pan under the assembly to catch the lubricant and remove the three bolts and washers attaching side cover to housing.
4. Pull the side cover with the sector and shaft from the housing (fig. 45).

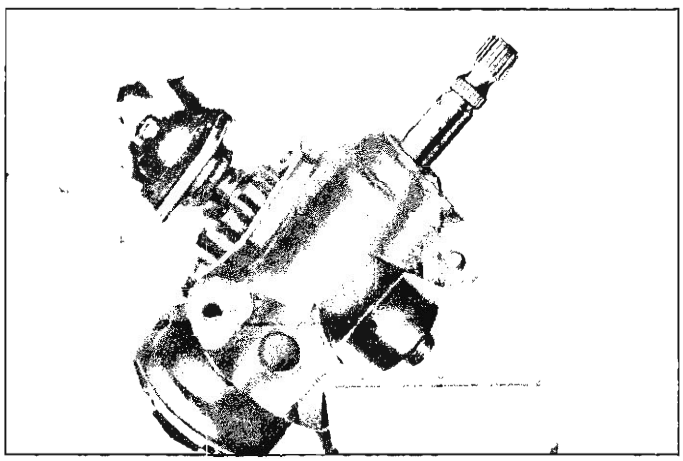

Fig. 45—Removing Sector Shaft

NOTE: If the sector does not clear the opening in the housing easily, turn the wormshaft by hand until the sector will pass through the opening in the housing.

5. Remove the worm bearing adjuster, adjuster lock nut and lower ball bearing from housing.
6. Draw wormshaft and nut assembly from housing (fig. 46). Remove upper ball bearing.

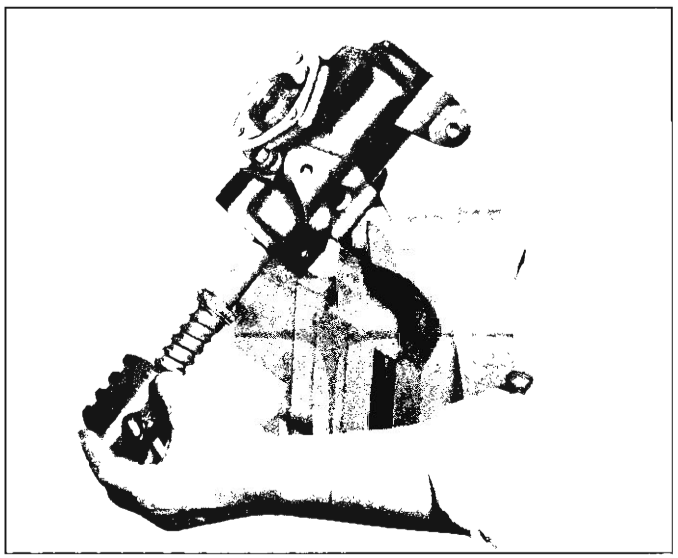

Fig. 46—Removing Wormshaft and Ball Nut

CAUTION: Use care that the ball nut does not run down to either end of the worm. Damage will be done to the ends of the ball guides if the nut is allowed to rotate until stopped at the end of the worm.

7. Remove lock nut from lash adjuster and unscrew adjuster from side cover by turning adjuster clockwise. Slide adjuster and shim out of slot in end of sector shaft.
8. Remove sector shaft packing retainer; then remove and discard sector shaft packing.

Ball Nut Disassembly

As a rule, disassembly of the ball bearing nut will not be necessary if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

1. Remove screw and clamp retaining ball guides in nut. Draw guides out of nut.
2. Turn the nut upside down and rotate the wormshaft back and forth until all the balls have dropped out of the nut into a clean pan. With the balls removed the nut can be pulled endwise off the worm.

Inspection

With the steering gear completely disassembled,

wash all parts in cleaning solvent. Dry them thoroughly with clean rags. With a magnifying glass inspect the ball bearings, bearing cups, worm and nut grooves and the surface of all balls for signs of indentation. Also check for any signs of chipping or breakdown of the surface.

Any parts that show signs of damage should be replaced. Balls must be replaced with genuine Chevrolet parts made according to specifications for this steering gear. No non-genuine balls should be used regardless of grade or quality.

Inspect wormshaft seal for defects.

Inspect the sector shaft for wear and check the fit of the shaft in the housing bushings.

Inspect the fit of the pilot on the end of the sector shaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed.

Check ball guides for damage at ends where they deflect or pick the balls from the helical path. Any damaged guides should be replaced.

Check steering gear wormshaft assembly for bent or damaged shaft. Never attempt to salvage starting parts by welding or straightening.

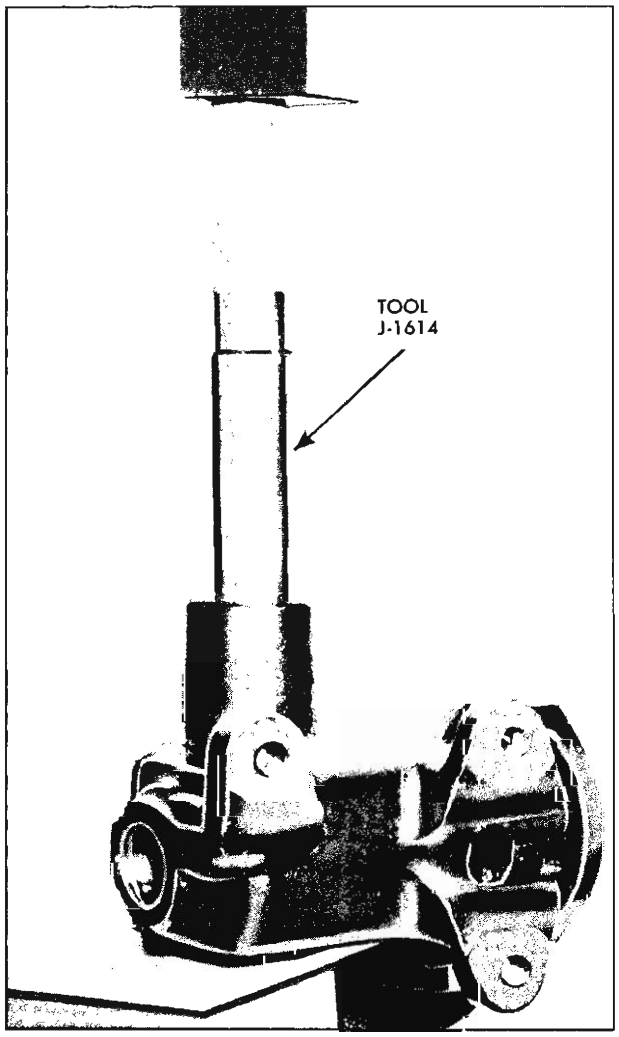

Fig. 47—Pressing Sector Shaft Bushing

Repairs

Sector Shaft Bushing Replacement

1. Support steering gear housing in an arbor press and press sector shaft bushing from housing with Tool J-1614, inserted from lower end of housing as shown (fig. 47).
2. Press new bushing into position using the same sector shaft bushing driver as used for removal.

NOTE: Service bushings are diamond bored to size and require no further reaming.

Wormshaft Seal Replacement

If the wormshaft seal indicates need of replacement, it should be removed and a new seal pressed into position in the housing. A suitable socket pressing on outer diameter of seal may be used.

NOTE: Care should be taken to insure that seal is not assembled in a cocked position.

Side Cover Bushing Replacement

The entire side cover assembly, including bushing, is serviced as a unit and should be replaced where it is desired to replace the bushing.

Sector Shaft Seal Replacement

The sector shaft seal must be replaced each time a defective packing is indicated or the steering gear is disassembled. This operation is similar to *Wormshaft Seal Replacement.*

Wormshaft Bearing Cup Replacement

1. Remove wormshaft bearing cups using Tool J-5822 with Tool J-2654 (fig. 48).
2. Press new bearing cups into position using Tool J-5755 (fig. 49).

Ball Nut Assembly

1. Place the wormshaft flat on the bench and slip the nut over the worm with the ball guide holes up

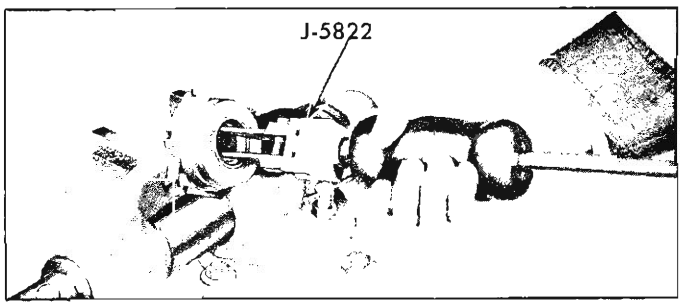

Fig. 48—Removing Wormshaft Bearing Cup

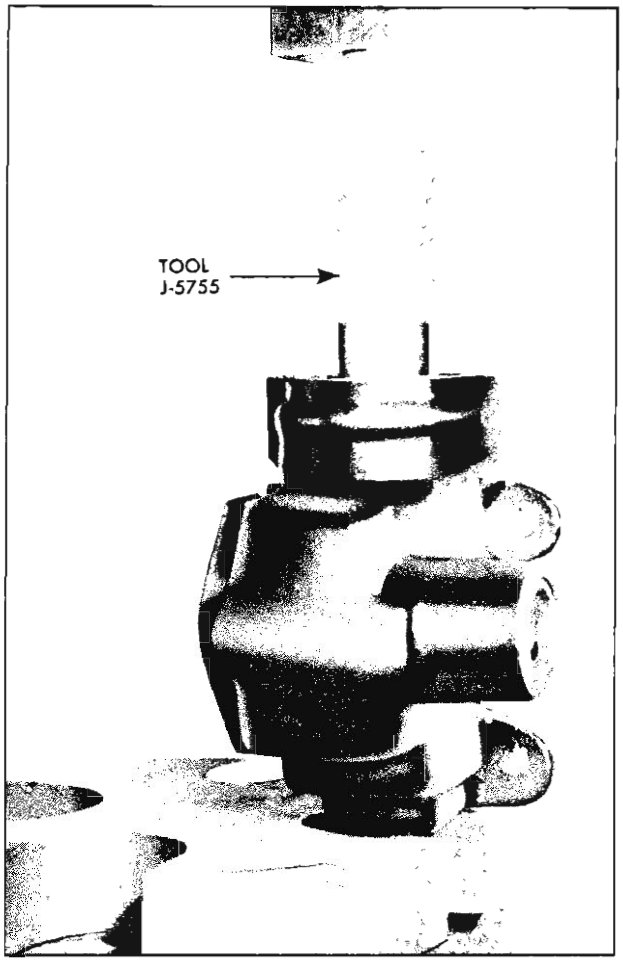

Fig. 49—Pressing Bearing Cap

and the shallow end of the rack teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.

2. Count 27 balls into a suitable container. This is the proper number of balls for half of the circuit. Place these balls into one of the guide holes while turning the worm gradually away from that hole. Continue until ball circuit is full from bottom of one guide hole to bottom of the other or until stopped by reaching the end of the worm.

NOTE: In cases where the balls are stopped by the end of the worm, hold down those balls already dropped into the nut with the blunt end of a clean rod or punch (fig. 50) and turn the worm in the reverse direction a few turns. The filling of the circuit can then be continued. It may be necessary to work the worm back and forth, holding the balls down first in one hole then the other, to close up the spaces between the balls and fill the circuit completely and solidly.

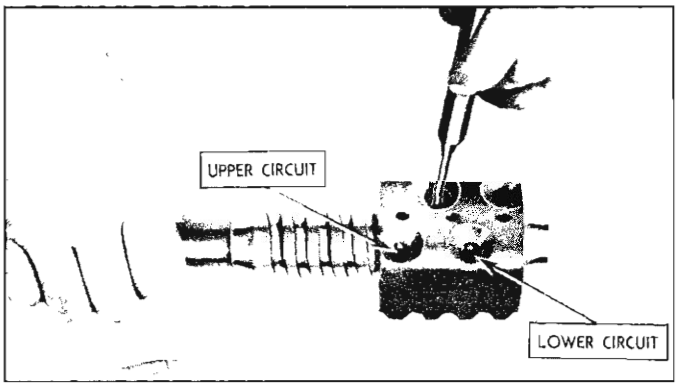

Fig. 50—Filling Ball Circuits

3. Lay one-half of the ball guide, groove up, on the bench and place the remaining balls from the count container in it (fig. 51).

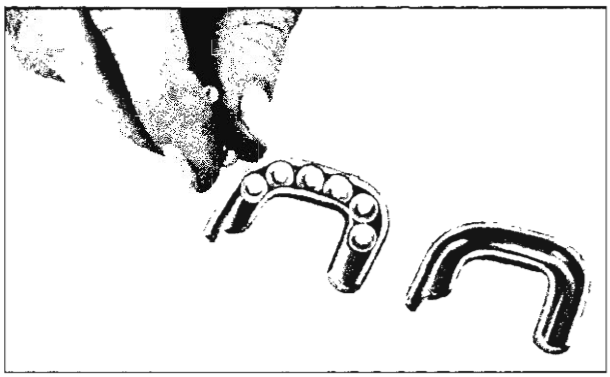

Fig. 51—Filling Ball Guides

4. Close this half of guide with the other half. Hold the two halves together and plug each open end with petroleum jelly so balls will not drop out while installing guide.
5. Push the guide into the guide holes of the nut (fig. 52). This completes one circuit of balls. If the guide does not push all the way down easily, tap it lightly into place with the wooden handle of a screwdriver.

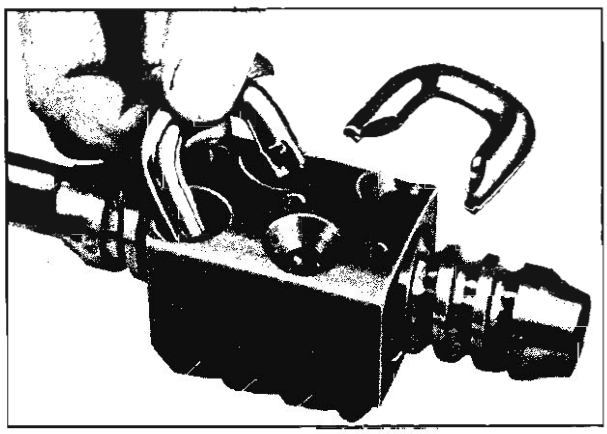

Fig. 52—Installing Ball Guides

6. Fill second ball circuit in the same manner.
7. Assemble the ball guide clamp to the nut, being sure to use a lock washer under the clamp screw, then tighten the screw securely.

Check the assembly by rotating the nut on the worm to see that it moves freely. Do not rotate the nut to the end of the worm threads as this may damage the ball guides. If there is any "stickiness" in the motion of the nut, some slight damage to the ends of the ball guides or to other gear components may have been overlooked.

Steering Gear Assembly (fig. 53)

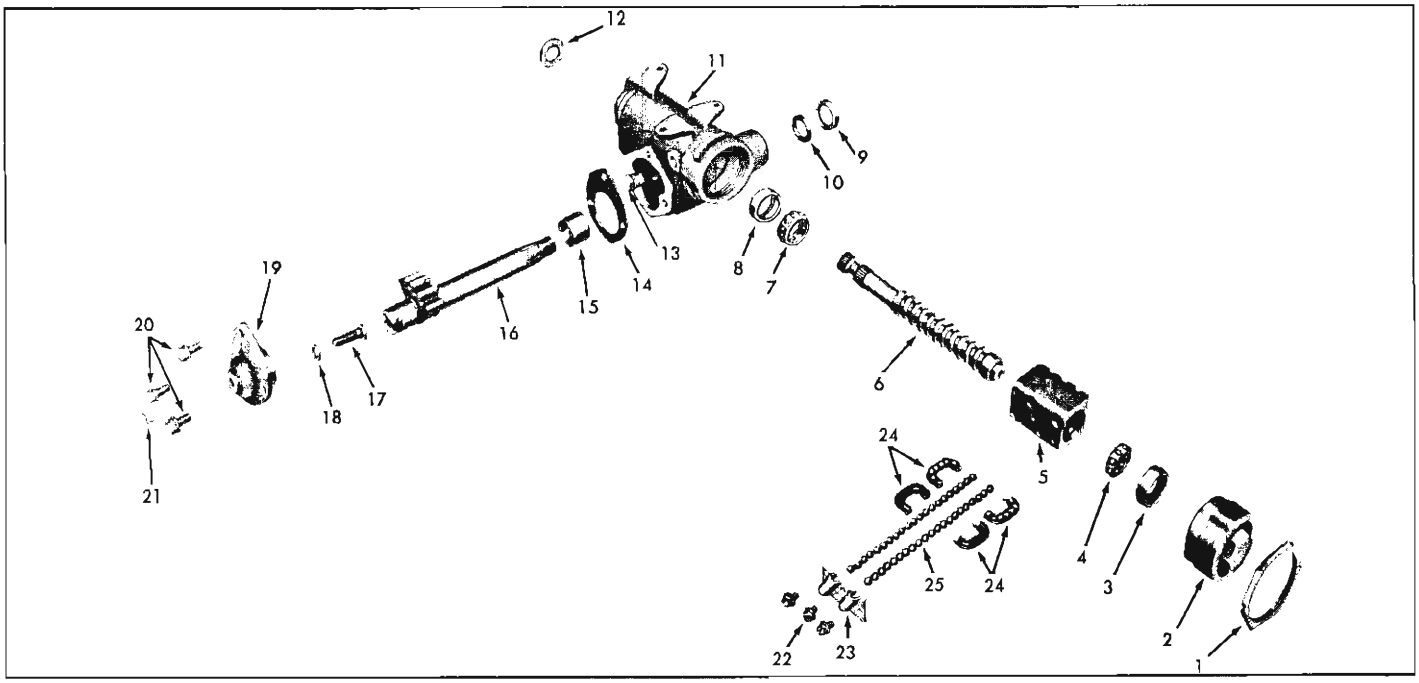

Fig. 53—Exploded View of Steering Gear

1. Worm Bearing Adjuster Lock Nut
2. Worm Bearing Adjuster
3. Lower Worm Bearing Cup
4. Lower Ball Bearing
5. Ball Nut
6. Wormshaft
7. Upper Ball Bearing
8. Upper Worm Bearing Cup
9. Packing Retainer
10. Packing
11. Housing
12. Seal
13. Filler Plug
14. Gasket
15. Sector Shaft Bushing
16. Sector and Shaft
17. Lash Adjuster
18. Lash Adjust Shim
19. Housing Side Cover and Bushing Assembly
20. Side Cover Bolts
21. Lash Adjuster Lock Nut
22. Ball Guide Clamp Screw
23. Ball Guide Clamp
24. Ball Guides
25. Balls

After a major service overhaul where all of the original factory installed lubricant has been washed out of the steering gear assembly, the threads of the adjuster, side cover bolts and lash adjuster should be coated with a suitable non-drying, oil resistant sealing compound such as Permatex No. 2. This is to prevent leakage of gear lubricant from the steering gear assembly. The compound should not be applied to female threads and extreme care should be exercised in applying this compound to the bearing adjuster, as the compound must be kept away from the wormshaft bearing. Also apply grease to the worm bearings, pitman shaft bushings, and ball nut teeth.

1. With wormshaft seal, bushings and bearing cups installed and ball nut assembly installed on wormshaft, slip upper ball bearing over wormshaft and insert wormshaft and nut assembly into housing, feeding end of shaft through upper ball bearing cup and seal.
2. Place ball bearing in adjuster cup, press stamped retainer into place using a socket of suitable size, and install adjuster and lock nut in lower end of housing.
3. Assemble the lash adjuster with shim in the slot in the end of sector shaft. Check the end clearance which should not be greater than .002" (fig. 54). For the purpose of adjusting this end clearance, a steering gear lash adjuster shim unit is available. It contains four shims—.063", .065", .067" and .069" thick.

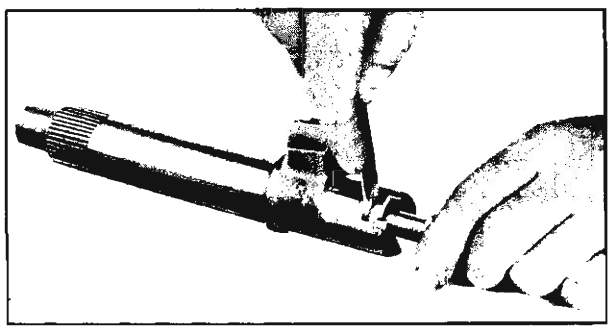

Fig. 54—Checking Sector Shaft End Clearance

4. After lash adjuster and clearance has been adjusted, start sector shaft pilot into bushing in side

cover. Then, using a screwdriver, through the hole in cover, turn lash adjuster in a counterclockwise direction to pull sector shaft pilot into its bushing as far as it will go.

5. Rotate wormshaft by hand until ball nut is about in the center of travel. This is to make sure that the rack and sector will engage properly with center tooth of the sector entering center tooth space of the nut.
6. Place a new gasket on side cover, then push side cover assembly including sector shaft into place After making sure there is some lash between rack and sector teeth, assemble and tighten side cover bolts.

Adjustment on Bench

1. Tighten the worm bearing adjuster until all wormshaft end play has been removed. Then tighten the lock nut.
2. Install the steering wheel on the wormshaft temporarily. Carefully turn the steering wheel all the way in one direction and then turn back about one turn.

   NOTE: Use care when placing steering wheel on lower steering shaft. Tap in place lightly. DO NOT FORCE.

3. Using Tool J-0544 at right angles to one spoke at wheel rim, measure the pull required to keep the wheel in motion. This should be between ⅜ and ⅝ pounds. If necessary, adjust the worm bearing adjuster until proper pull is obtained.
4. Turn the steering wheel from one stop all the way to the other, counting the number of turns. Then turn the wheel back exactly half the number of turns to the center position and mark the wheel at the top.
5. Turn the sector lash adjuster screw (fig. 4) clockwise to remove all lash between rack and sector teeth. Tighten the locknut.

   NOTE: Be sure adjustment is not changed while tightening the lock nut.

6. Using Tool J-0544 check pull at rim of steering wheel. Take highest reading on scale as wheel is pulled through center position. This should be between ⅞ and 1½ pounds.
7. If necessary, readjust lash adjuster screw to obtain proper pull. Tighten lock nut to 10-15 ft. lbs. torque and again check pull.
8. Fill the assembly with steering gear lubricant to the level of the filler plug hole and replace filler plug.

STEERING LINKAGE (FIG. 55)

Tie Rods

There are two tie rods used on all model passenger cars. Each tie rod is of three piece construction, consisting of the tie rod and two tie rod end assemblies. The ends are threaded into the rod and locked with clamps. Right and left hand threads are provided to facilitate toe-in adjustment and steering gear centering.

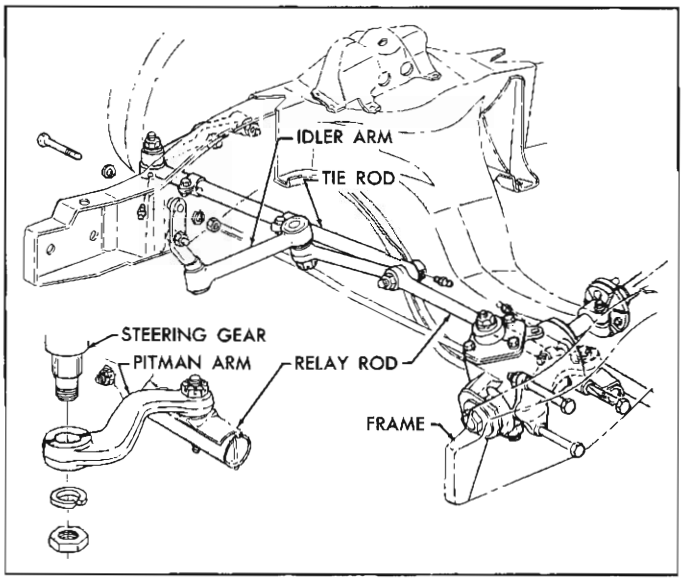

Fig. 55—Steering Linkage

The tie rod ends are self adjusting for wear and require no attention in service other than periodic lubrication and occasional inspection to see that ball studs are tight. Replacement of tie rod ends should be made when excessive up and down motion is evident or if any lost motion or end play at ball end of stud exists.

Removal

1. Remove cotter pins from ball studs and remove castellated nuts.

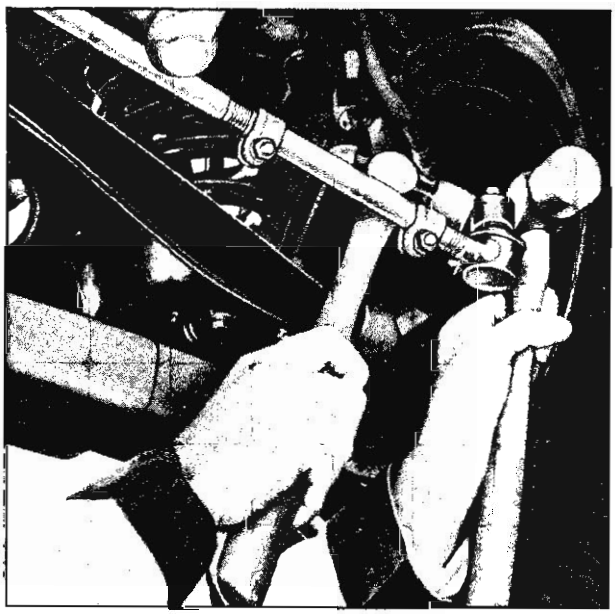

Fig. 56—Freeing Ball Stud

2. To remove outer ball stud, tap on steering arm at tie rod end with a hammer while using a heavy hammer or similar tool as a backing (fig. 56). If necessary pull downward on tie rod to remove from steering arm.
3. Remove inner ball stud from relay rod using same procedure as described in Step 2.
4. To remove tie rod ends from tie rods loose clamp bolts and unscrew end assemblies.

Installation

1. If the tie rod ends were removed, install ends on tie rod making sure both ends are threaded an equal distance from the tie rod.
2. Make sure that threads on ball studs and in ball stud nuts are perfectly clean and smooth. Install neoprene seals on ball studs.

   NOTE: If threads are not clean and smooth, ball studs may turn in tie rod ends when attempting to tighten nut.

3. Install ball studs in steering arms and relay rod.
4. Install ball stud nut, tighten securely and install cotter pins. Lubricate tie rod ends.
5. Adjust toe-in as described in Section 3.

   NOTE: Before locking clamp bolts on the rods, make sure that the tie rod ends are in alignment with their ball studs (each ball joint is in the center of its travel). If the tie rod is not in alignment with the studs, binding will result. Also, be certain inner tie rod clamp is pointed forward and downward to prevent stabilizer link bolt interference on turns (fig. 57).

Relay Rod

Removal

1. Remove inner ends of tie rods from relay rod as described under Tie Rod—Removal.
2. Remove cotter pin from end of relay rod at pitman arm ball stud attachment.

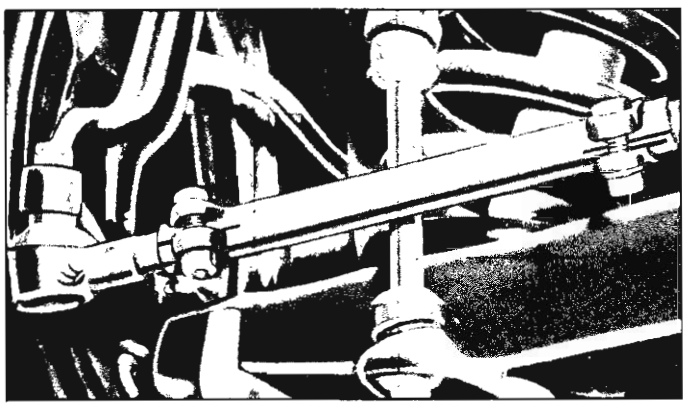

Fig. 57—Tie Rod Clamp Position

3. Using a drag link bit, remove end plug from socket and remove spring seat from relay rod (fig. 58).

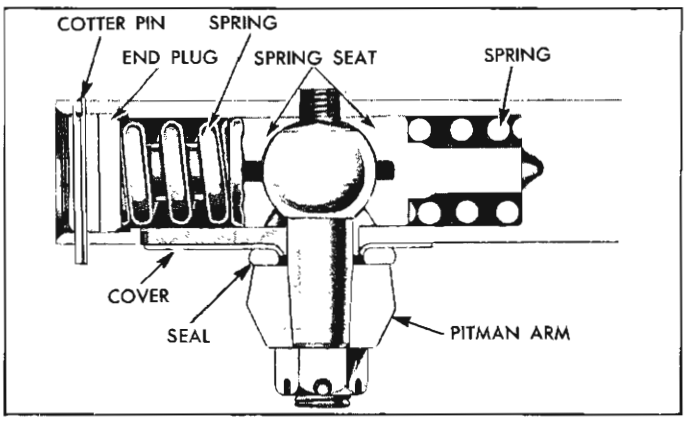

Fig. 58—Cross Section of Relay Rod Ball Joint

4. Detach relay rod from pitman arm. Remove inner ball seat, and spring from relay rod. Shift steering linkage as required to free pitman arm from relay rod.
5. Remove cotter key and nut from idler arm and remove relay rod from idler arm.

Cleaning and Inspection

Remove accumulated grease and dirt from assembly and inspect for damage or excessive wear.

Repairs

Pitman arm ball seats may be replaced if inspection shows necessity.

Installation

1. Place relay rod on idler arm stud, making certain idler stud seal is in place, then install and tighten nut to 45 ft. lbs. Advance nut just enough to align castellation with cotter pin hole and install pin.
2. Install new seal and cover over ball at end of pitman arm.
3. Install inner spring seat and spring to relay rod.
4. Raise end of rod and install on pitman arm.
5. Install spring seat, spring, and end plug.
6. Tighten end plug until springs are compressed and plugs bottom, then back off ¾ turn plug amount necessary to insert cotter pin. Insert cotter pin to lock adjustment.
7. Install tie rod ends to relay rod as previously described under Tie Rods.
8. Lubricate tie rod ends and pitman arm to relay rod ball joint.
9. Adjust toe-in (see Section 3) and align steering wheel as described previously in this section under Steering Wheel Alignment and High Point Centering.

Idler Arm

Removal

1. Remove cotter pins and nuts from ends of idler arm and remove relay rod from idler arm, using method outlined in step two of Tie Rod Removal. *Do not hammer on idler arm assembly.*
2. Remove idler arm from frame.

Cleaning and Inspection

Remove stud seals and accumulated grease and dirt from assembly and inspect for damage or excessive wear. The studs must turn smoothly, without restriction. A grating noise indicates dirt within unit.

Set idler arm in bench vise. Attach nut on ball stud until it bottoms on threads and by turning nut with a torque wrench, note readings. If less than 1 ft. lb. is required to turn stud, or more than 10 ft. lbs. are required to turn stud, studs are too loose or too tight and entire idler arm must be replaced.

Installation

1. Position idler arm on frame and install mounting bolts; tightening nuts to 25-35 ft. lbs.
2. Install relay rod to idler arm, making certain seal is on stud, and install and tighten nut to 45 ft. lbs.
3. Install cotter key and secure.

TROUBLES AND REMEDIES

Symptom and Probable Cause	Probable Remedy
Hard Steering	
a. Lack of lubrication.	a. Lubricate steering gear, tie rod ends, steering relay rod ball joints and steering knuckle joints. Replace or repair part if not corrected by lubrication (Sect. 4).
b. Turn signal housing rubbing steering wheel.	b. Adjust to proper clearance (Sect. 4).
c. Underinflated tires.	c. Inflate tires to recommended pressure (Sect. 1).
d. Improper worm bearing and/or high spot preload adjustment.	d. Adjust according to instructions (Sect. 4).
e. Interference between steering shaft and mast jacket assembly caused by misalignment, bent steering shaft, or damaged parts within the mast jacket assembly.	e. Adjust or replace parts as required (Sect. 4).
f. Incorrect front suspension alignment.	f. Adjust to specifications (Sect. 3).
Loose Steering	
a. Improper worm bearing and/or high spot preload adjustment.	a. Adjust according to instructions (Sect. 4).
b. Defective front wheel bearings.	b. Adjust or replace as required (Sect. 3).
c. Worn steering knuckle ball joints.	c. Replace steering knuckle ball joints (Sect. 3).
d. Worn pitman shaft bushings.	d. Replace bushings (Sect. 4).
e. Worn steering linkage components.	e. Replace worn parts as required (Sect. 4).
f. Gear assembly loose on body member.	f. Tighten bolts to proper torque (Sect. 4).
Shimmy	
a. Unbalanced front wheels.	a. Balance wheel assemblies (Sect. 3).
b. Faulty front wheel bearings.	b. Adjust or replace as required (Sect. 3).
c. Loose wheel nuts.	c. Tighten to proper torque (Sect. 3).
d. Defective front brakes.	d. Repair as required (Sect. 5).
e. Worn tie rod end or steering connecting rod end.	e. Inspect and repair as required (Sect. 4).
Road Wander	
a. Underinflated tires.	a. Inflate to recommended pressures (Sect. 1).
b. Improper worm bearing and/or high spot pre-load adjustment.	b. Adjust to proper specifications (Sect. 4).
c. Defective front wheel bearings.	c. adjust or replace as required (Sect. 3).
d. Worn tie rod or steering connecting rod ends.	d. Inspect and repair as required (Sect. 4).

SPECIFICATIONS

For Steering Specifications, See Section 16