Section X

STEERING

CONTENTS

MANUAL

CONSTANT CONTROL FULL TIME POWER STEERING

DATA AND SPECIFICATIONS

MODELS	LC-1	LC-2	LC-3	LY-1
Steering Type				
Manual	Worm and Three Tooth Roller	None	None	None
Power	Rack and Gear Sector, Recirculating Ball Nut			
Ratio				
Manual	20.4	....	....	None
Power	16.1	16.1	16.1	16.1
Turning Radius (Curb to Curb)	42.3	45.4	....	49.5
Number Wheel Turns				
Manual	5.6	....	....	....
Power	3.5	3.5	3.5	3.5
Tread—Front	61.0	61.0	61.2	61.9
Rear	59.7	59.7	60.0	62.4
Wheel Base	122.0	126.0	126.0	129.0

DATA AND SPECIFICATIONS (Cont'd)

MODELS	LC-1	LC-2	LC-3	LY-1
Camber				
Left	+ ¼ degree ± ¼ degree			
Right	0 degree ± ¼ degree			
	Preferred Left + ⅜ degree, Right 0 degree			
	Left ¼ degree to ½ degree algebraically greater than right			
*Caster				
Manual	− ¾ degree ± ¾ degree with Manual Steering			
Power	+ ¾ degree ± ¾ degree with Power Steering			
Toe-In (Outside Thread Inches)	1/8 ± 1/32 in. (1/8 in. Preferred)			
Toe-Out on Turns	21 degrees 45 minutes ± 1 degree (inner wheel when outer wheel is 20 degrees)			
Steering Axis Inclination at Camber (Degree)	5 to 7 degrees at 0 degree			
Steering Knuckle Type	Ball and Socket			
Front Wheel Bearing Type	Tapered Roller Bearing			
Inner Bearing Size	1.25	1.25	1.25	1.375
Outer Bearing Size	.75	.75	.75	.844
Spindle Thread Size	¾−16 (NF)			
Steering Linkage Type	Symmetric Idler Arm (Equal Length Tie Rods)			

*Caster should be equalized as near as possible on Left and Right wheel.

POWER STEERING PUMP SPECIFICATIONS

MODELS	Slipper Type	Sleeve Type
Fluid Capacity of Hydraulic System	64 Fluid ounces	64 Fluid ounces
Type of Fluid	Automatic Transmission Fluid (Type A)	
Maximum Pump Pressure	850 to 950 psi.	750 to 900 psi.
Maximum Fluid Flow at 3,000 R.P.M.	2.25 gal.	2.25 gal.
Maximum Pump Rotor Clearances	.001−.0015	.012
Flow Control Valve Spring		
Free Length	3.15	4.0 inches
Working Length	2.35	1.5 inches
Force at Working Length	16 ± .65 lb.	12.5 ± 1.25 lbs.

POWER STEERING PUMP SPECIFICATIONS (Cont'd)

MODELS	Slipper Type	Sleeve Type
Pressure Relief Valve Spring		
Free Length	.....	.825 inch
Working Length	.....	35/64 inch
Force at Working Length	.....	12.5 to 14 lbs.

SPECIAL TOOLS

MANUAL STEERING

Tool Number	Tool Name
C-3402	Pitman Arm Puller
C-3428	Steering Wheel Puller

CONSTANT CONTROL FULL TIME POWER STEERING

Tool Number	Tool Name
C-3106	Pliers—Snap Ring Bearing Retainer
C-3128	Pliers—Snap Ring
C-3211	Hose—High Pressure
C-3233	Driver—Shaft Bushing
C-3229	Pliers—Gear Shaft Adjusting Screw Snap Ring
C-3309B	Gauge—Pressure Check
C-3318	Hose—Low Pressure
C-3332	Remover—Gear Shaft Bearing
C-3333	Driver—Gear Shaft Bearing
C-3350	Remover and Installer—Gear Shaft Seal
C-3388	Hose—Coupling
C-3532	Adapters
C-3602	Fixture—Pump Assembly
C-3615	Puller—Steering Pump Pulley
C-3633	Nut Wrench—Gear Cross Shaft Retainer
C-3634	Adjusting Wrench—Gear Support Nut
C-3638	Seal Remover—Gear Worm Shaft
C-3640	Seal Driver—Pump Shaft
C-3642	Seal Puller—Pump
C-3643	Supporting Stand—Pump Shaft
C-3646	Puller—Steering Arm
C-3649	Aligning Tool—Gear Spacer to Housing
C-3650	Seal Driver—Gear Worm Shaft
C-3655	Remover—Hydraulic Steering Pump Flow Control Valve Bore Plug
C-760	Pliers—Snap Ring
MTU-36	One Ounce Pull Scale

TIGHTENING REFERENCE

MANUAL STEERING

	Foot-Pounds Torque
Steering Gear to Frame Bolt	50
Steering Gear Pitman Arm Nut	120
Steering Wheel Nut	40
Steering Knuckle Arm Bolt	50
Steering Linkage Ball Stud Nut	40
Idler Arm Bolt Bushing Nut	60
Tie Rod Clamp Bolt and Nut	150 In.-Pounds

CONSTANT CONTROL FULL TIME POWER STEERING

	Foot-Pounds Torque
Steering Wheel Nut	40
Steering Arm Nut	120
Steering Gear Housing to Frame Bolt	50
Steering Valve End Plug	50
Steering Valve Body Attaching Bolts	15
Steering Column Support Nut	150
Steering Gear Shaft Cover Nut	100
Steering Gear Shaft Adjusting Screw Lock Nut	50
Pressure Control Valve Body Screws	10

RESERVOIR

MODELS	Slipper Type		Sleeve Type	
	Thread Size	Foot-Pounds	Thread Size	Foot-Pounds
Reservoir Cover Bolt	5/16-18	15	1/4 x 20	10
Flow Spring Retainer Fitting	—	—	—	20
Bearing Cap to Body	—	—	—	25

PUMP

MODELS	Slipper Type		Sleeve Type	
			Thread Size	Foot-Pounds
Pump Assembly Bolt	—	—	5/16 x 18	15
Hose Connector Outlet	—	—	5/8 x 18	30
Flow Divider Valve Plug	—	—	7/8 x 14	20

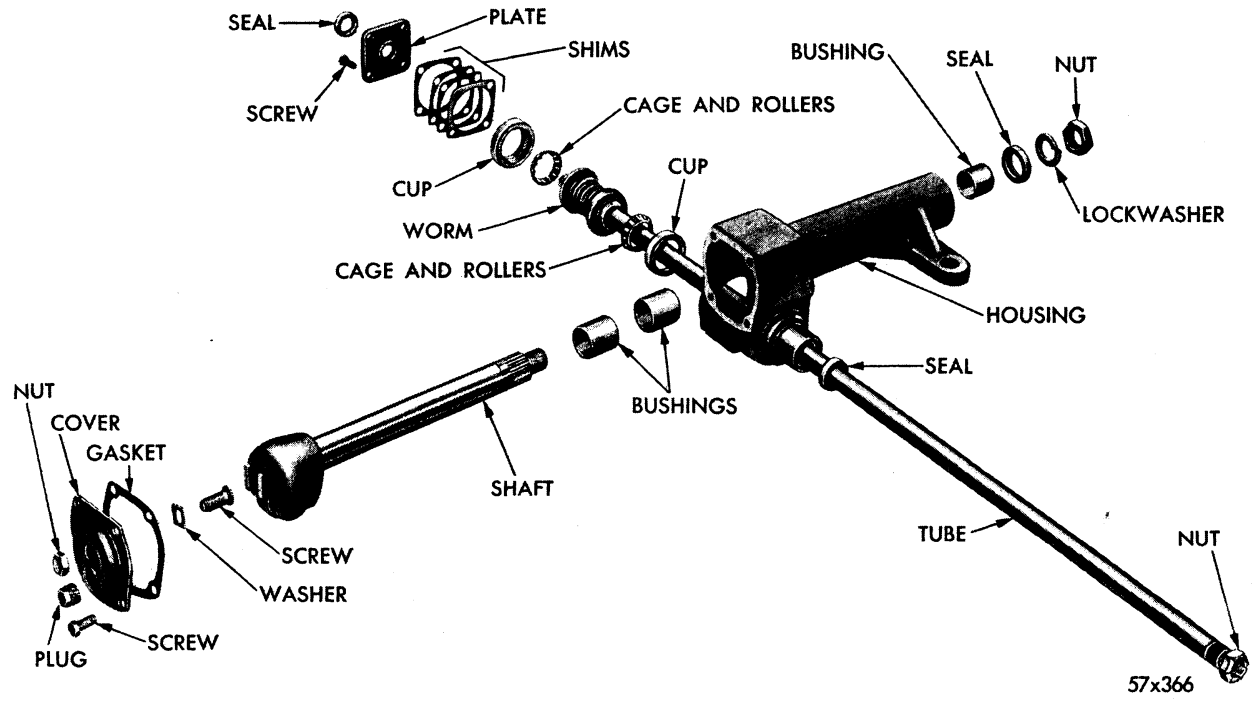

Fig. 1—Steering Gear Assembly (Disassembled View)

Section X
STEERING
MANUAL

A modified three-tooth roller and worm steering gear assembly (Fig. 1) is used in the Chrysler 1958 cars, equipped with manual steering. The steering gear is mounted inboard of the frame and can be serviced without removal from car.

The worm is integral with the steering tube and is supported at each end by tapered roller bearings. The worm bearing preload is adjusted by means of shims placed between housing and housing end cover. The steering gear shaft rotates in two bronze bushings pressed into the steering gear housing. The three-tooth roller on shaft is meshed with worm. When the steering wheel is turned, the worm rotates the steering gear shaft and roller, moving the steering gear arm, which is splined to end of shaft and held in place with a nut.

Backlash between steering gear shaft roller tooth and worm is controlled by an adjusting screw that is threaded through shaft and roller cover. The base end of adjusting screw is engaged in the hole in end of the steering gear shaft. Correct backlash can be obtained by turning adjusting screw in or out, as required.

The steering wheel and arm are splined to the steering tube and steering gear shaft, respectively. Both steering wheel and steering gear arm have master serrations to insure correct installation.

The high point is the point of least clearance between the worm and roller and is at midpoint of worm and roller travel.

NOTE: Proper steering gear adjustments influence the performance of the steering gear assembly. Care should be taken to accomplish proper shaft and worm high point setting since this adjustment limits the turning circle on each side of center.

1. REMOVAL OF STEERING WHEEL ASSEMBLY

Disconnect battery. Turn ornament counterclockwise and remove (Fig. 2). Disconnect wire from terminal, remove three screws, three bushings and remove horn ring (Fig. 3). Remove horn blowing contact ring switch from steering wheel hub. Loosen steering wheel nut three full turns and attach steering wheel puller Tool C-3428 and remove nut and steering wheel.

2. ASSEMBLY OF STEERING WHEEL ASSEMBLY

Attach steering wheel to hub and tighten nut.

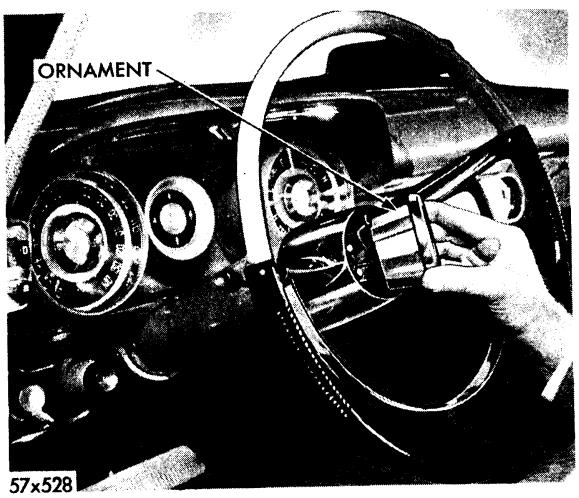

Fig. 2—Removing or Installing Steering Wheel Ornament

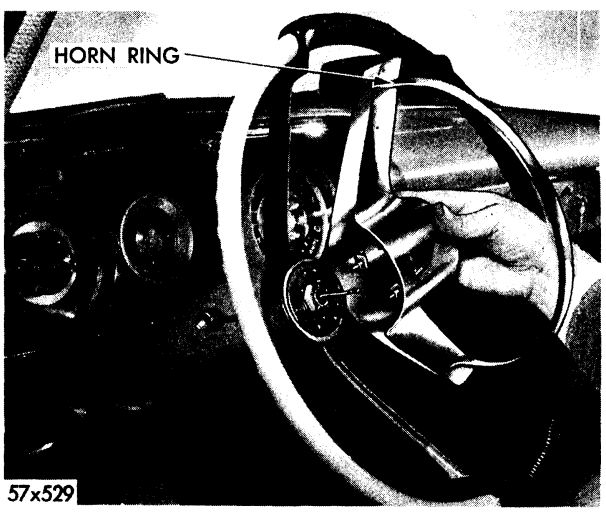

Fig. 3—Removing or Installing Steering Wheel Horn Ring

Install contact ring switch, connect wire to terminal. Install horn ring and tighten three screws. Turn ornament clockwise in hub. Reinstall battery cable.

3. REMOVAL OF MANUAL STEERING GEAR ASSEMBLY (Figs. 1, 2 and 3)

a. Removal (From Vehicle)

NOTE: It is not necessary to remove the steering column and mast assembly from car to service gear lower worm bearings and cross shaft assembly.

Disconnect the battery ground cable. Remove the steering wheel and disconnect the horn and turn signal wires at the instrument panel. Remove jacket tube clamp at the steering gear housing. Remove the steering jacket support clamp at the instrument panel. Remove the dust shield at the firewall. Remove the floor opening panel. Remove the steering gear arm with Tool C-3402. Remove the steering gear housing to frame bolts. Slide the steering gear jacket tube and remove control units rearward, through the drivers compartment as an assembly. Remove the brake pedal pad and remove gear from engine compartment side of firewall.

b. Disassembly Steering Gear Assembly (Fig. 1)

Remove gear shaft adjusting screw lock nut, shaft cover, and gasket, and steering gear shaft and roller tooth assembly. Remove gear shaft oil seal from housing. Remove cover and shims from bottom of housing. Remove steering tube and worm assembly, bearing cups and cages.

c. Reassemble Steering Gear Assembly (Fig. 1)

Clean all parts in a suitable solvent. Check all parts for wear.

NOTE: Assemble parts without lubrication. Lubrication should be done after adjustments are completed.

If either of the worm thrust roller bearings are damaged, replace both bearings. Use new oil seals. The steering gear housing and bushing assembly is serviced only as an assembly.

Insert worm and tube into housing with bearings and cups. Install shims and lower housing cover, making sure bearings are seated. When tightening cover, turn worm tube to be sure no bind exists. Final tightening of cover screws cause end play to disappear with torque of ⅜ to ¾ pound required to rotate the tube, when measured with the pull applied at rim of steering wheel. Add or remove shims in event a bind or excessive end play occurs. Shims are available in .003, .006, .011 and .025 inch.

Install gear shaft. Before installing cover, turn adjusting screw all the way out. Place steering wheel on tube and rotate steering wheel in one direction to the end of its travel. Rotate wheel in other direction to the end of its travel, counting the turns. Rotate wheel back ½ full number of turns. This is center of travel (high point). Turn adjusting screw (clockwise) until all end play in roller shaft is gone. Rotate wheel to one end of its travel and apply a spring scale of torque wrench. With pull applied at rim of steering wheel, tension should measure from 1 to 2 pounds. The greatest tension should be felt as the wheel is rotated past the center position (high point).

Adjust bearing load by turning adjusting screw in or out. Install lock plate nut and steering gear arm. Fill gear housing with SAE 90 Gear Lubricant and check for leaks.

d. Installation (In Vehicle)

Install the steering column dust shield on column. Install the steering gear assembly from the engine side of fire wall. Install mounting bolts and attach nuts, tighten to 15 foot-pounds torque. Install the jacket tube clamp at the gear housing. Slide the steering gear jacket tube, and remove control assembly through the floor panel opening. Install the jacket support to dash bracket, align and tighten screws 50 inch-pounds torque. Tighten the steering gear housing to frame bolts 50 foot-pounds torque. Install the steering gear arm nut and washer and tighten 120 foot-pounds torque. Connect horn and turn signal wires at instrument panel. Install floor opening panel and dust shield. Install steering wheel, horn ring and ornament. Connect battery.

4. STEERING GEAR ALIGNMENT

A slight bind of the steering gear may be caused by shifting of body due to loosened bolts. Tighten body bolts. Loosen the steering gear at frame, and dash bracket to allow the

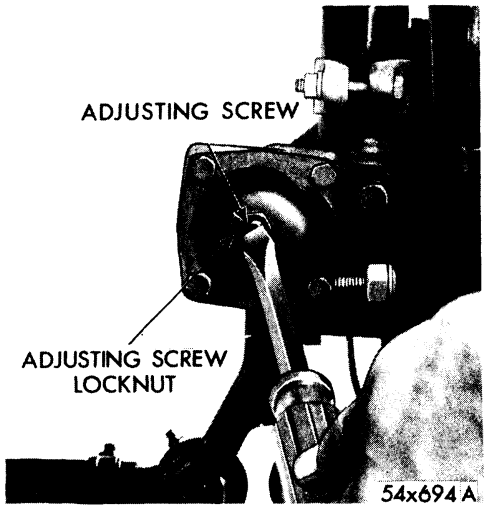

Fig. 4—Steering Gear Adjustments

steering gear to move in relation to the frame. Tighten mounting bolts 50 foot-pounds torque.

Position the center of steering column in center of the instrument panel. If this cannot be done by moving the frame bracket, add metal washer shims between frame and frame bracket to eliminate all bind.

5. ADJUSTMENT (In Car) (Fig. 4)

a. Adjusting Steering Tube Worm Bearings

Remove steering gear arm, drain the housing and disconnect horn wire at connector. Remove grease retainer cover at bottom of steering gear housing and remove necessary shims to eliminate excessive end play. Add shims of necessary thickness, to eliminate a binding condition. If any tightness exists, too many shims have been removed or the steering assembly is out of alignment. See "Steering Gear Alignment," Paragraph 4.

b. Adjustments of Roller Tooth and Worm (In Car)

Disconnect steering gear ar mat link. Rotate steering wheel to mid-position and check for backlash by attempting to move steering gear arm back and forth. If backlash exists, remove roller shaft adjustment screw locknut and tighten adjusting screw enough to eliminate free play. Be sure the roller shaft and worm do not bind. Check backlash again. Install adjusting screw locknut and steering gear arm.

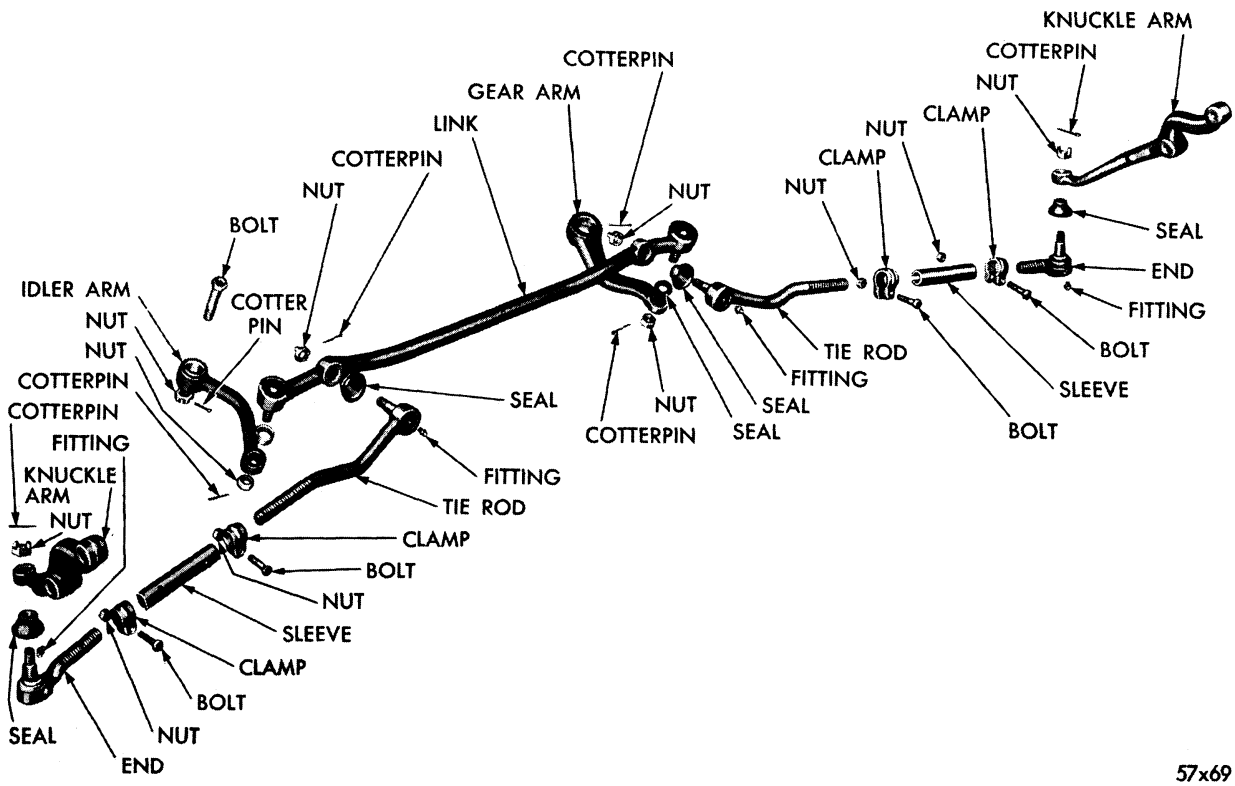

Fig. 5—Steering Gear Linkage

6. SERVICING THE IDLER ARM (Fig. 5)

The idler arm and bushing is serviced as an assembly. With wheels in straight-ahead position check opening of idler arm bracket (should be 2¼ inches). Install idler arm assembly. Apply lubriplate to support bolt. Tighten nut to 60 foot-pounds torque and install cotter pin.

7. STEERING KNUCKLE TIE RODS (Fig. 5)

a. Removal

NOTE: Tie rod end and bolt is serviced only as an assembly.

Loosen nut on rod ball and remove tie rod end with Tool C-3394. Insert leg of tool between the steering linkage knuckle arm and tie rod end. Turn puller screw against tie rod end nut, forcing tie rod end from the knuckle arm. Remove tie rod from center link by placing leg of puller between center link and tie rod end. Remove tie rod end assembly from tie rod by loosening clamps and unscrewing the rod end assembly.

b. Installation

NOTE: The clamping bolts must be beneath tie rods to prevent interference on turns. Check and adjust toe-in when new tie rods are installed.

When installing tie rod ends to the rod tube, be sure to thread the ends evenly on tube body to nominal length to obtain proper positioning of steering wheel.

8. ADJUSTMENT OF FRONT WHEEL BEARINGS

(Refer to Front Wheel Suspension, Section I)
Tighten the wheel bearing adjusting nut with an inch-pound torque wrench 90 inch-pounds while rotating the wheel. Position the nut lock, over the adjusting nut so the spindle cotter pin hole is in line with one set of the slots in the nut lock. Without removing the nut lock, back off the nut until the next set of slots are lined up with the spindle cotter pin hole. Insert and bend the cotter pin to secure the nut lock.

NOTE: This procedure should result in from .000 inch (no preload) to .003 inch bearing free play measured axially. It is important to remove any burrs or nicks on the spindle thread to insure accurate readings.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the direction switch.

CONSTANT CONTROL FULL TIME POWER STEERING

The Constant Control Full Time Power Steering is a completely new power steering gear system consisting of a hydraulic pressure pump a power steering gear and connecting hoses. The power steering gear (Figs. 6 and 7) consists of a gear housing, containing a gear shaft and sector gear, a power piston with gear teeth milled into the side of the piston is in constant mesh with the gear shaft sector teeth, a worm shaft connects the steering wheel to the power unit piston through a coupling. Figure 7 shows how the wormshaft is geared to the piston through recirculating ball contact. At the upper end of the piston, a flange carries the rubber "D" ring which separates the power chambers of the piston.

A steering gear valve lever upper end is fitted into a spool valve in the steering gear valve body and the bottom end into a radially drilled hole in the thrust bearing center race. The valve lever pivots in the bearing center race spacer. The spacer is compressed at its outer diameter between the steering gear cylinder head and the column jacket support, holding the spacer in a fixed position. The center thrust bearing race which tips the valve lever (which in turn actuates the steering valve) is held firmly against a shoulder on the wormshaft by two thrust bearings, bearing races and an adjusting nut. The center thrust bearing race is, in effect, clamped axially to the wormshaft and must therefore move with the wormshaft whenever the steering wheel is turned.

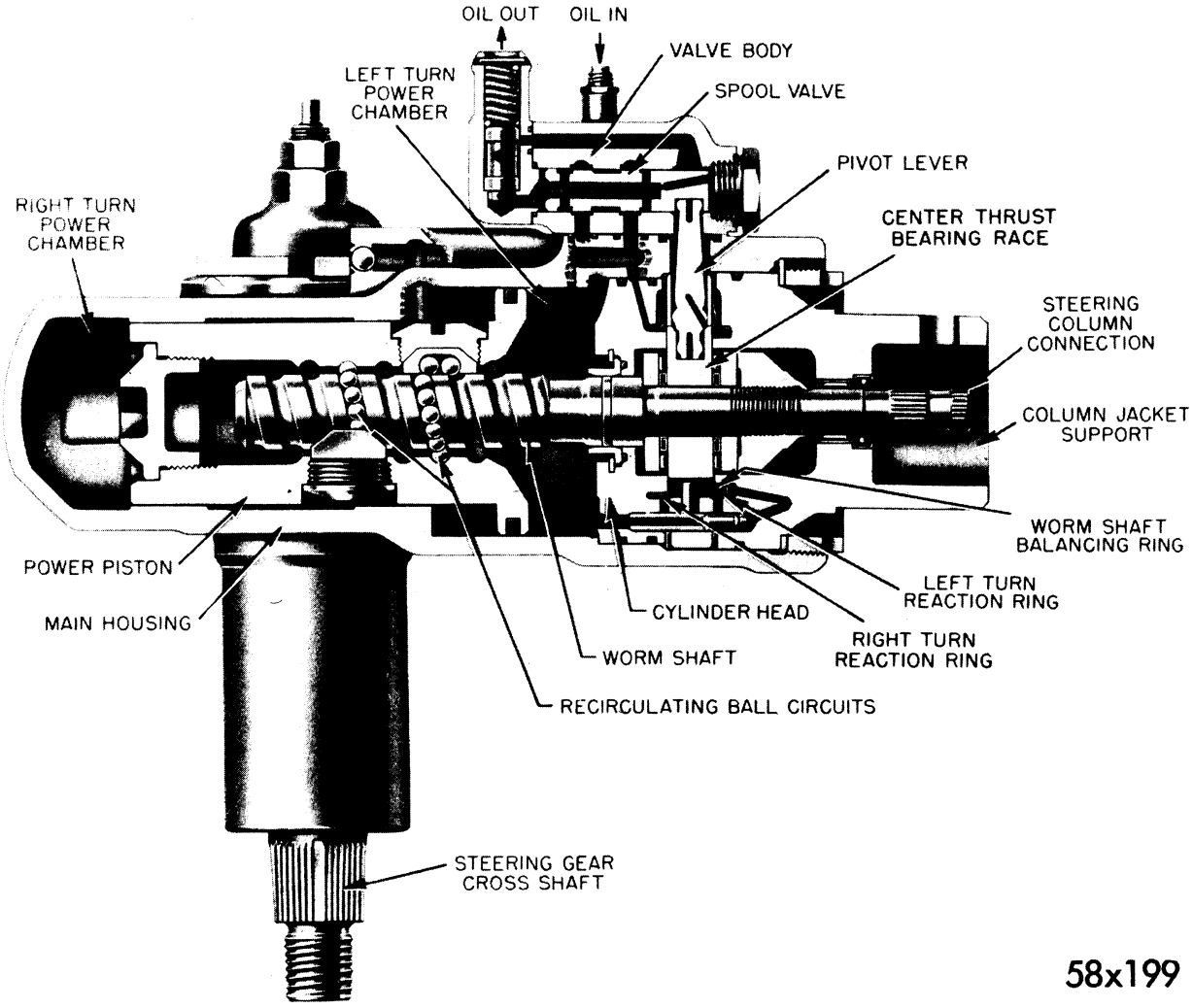

Fig. 6—Steering Gear (Sectional View)

In this description, the left end of the steering gear means the lower end, and the right end means the upper end of the steering gear. For simplicity, direction of flow will be described as flowing to left or flowing to right as shown in the following illustrations.

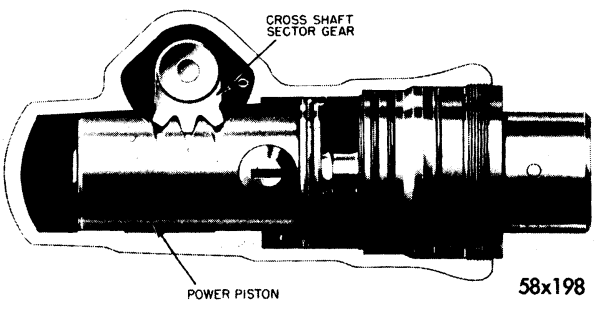

Fig. 7—Steering Gear Housing (Sectional View)

When the car is in the straight-ahead direction, the steering valve is in the neutral (center) position and oil flow through both of the grooves in the steering valve body is equal, since, in the neutral position, (Fig. 8), the two lands of the steering valve are centered in the grooves of the valve body. The left oil passage directs its oil where it contacts the right end of the power piston and across into the right reaction chamber. Part of this oil is forced around the grooves of the wormshaft, inside the piston and around the recirculating balls, to the hollow area between the left end of the wormshaft and the left end of the power piston. Pressure on end of wormshaft is bal-

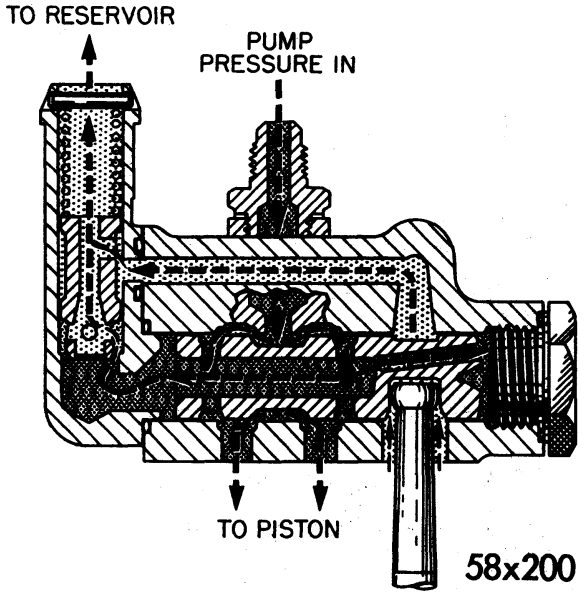

Fig. 8—Steering Gear Valve (Neutral Position)

anced by the pressure against the area of the wormshaft balancing ring.

At the same time, oil from the right groove in the steering valve is directed to the left, through a galley, parallel to the wormshaft. This oil flows to the area to the left of the power piston flange. Part of this oil is then directed through the cylinder head into the left reaction chamber.

Forces exerted on the piston through oil pressure on its faces are completely balanced by two worm reaction rings. These are shown in cross section in Figure 9 on either side of the pivot lever through the center bearing race.

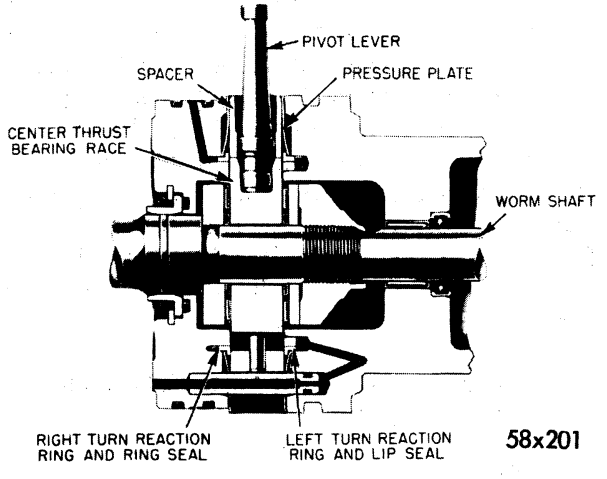

Fig. 9—Reaction Area

The reaction ring shown to the left of the center bearing race is fed oil from the right—turn power chamber oil galley through a drilled hole as shown in Figure 9.

When the driver makes a left turn, power is immediately provided by the unit to effect the turn. As the wormshaft rotates inside the power piston, the piston is prevented from instantly "climbing down" the wormshaft by the resisting forces which the steering linkage and wheels transmit to the steering gear crossshaft. Instead, the wormshaft is "drawn out" of the piston a very small amount (a few thousands of an inch). The center thrust bearing race, which is in effect clamped axially to the wormshaft, moves the same distance. The race thus tips the pivot lever and moves the spool valve to the left (down).

The oil flow diagram for a left turn is shown in Figure 10. Here it can be seen that as the left edges of the two lands on the valve approach the groove edges of the valve body, two things happen: First, flow to the right groove in the valve body is reduced. Secondly, the flow of oil to the left groove is increased because the opening is larger. Oil then flows from the power steering pump through the enlarged orifice and through the oil galley to the left turn power chamber of the piston. Since the supply of oil to the left side (right turn chamber) of the piston has been cut off by movement of the spool valve, a force unbalance on the

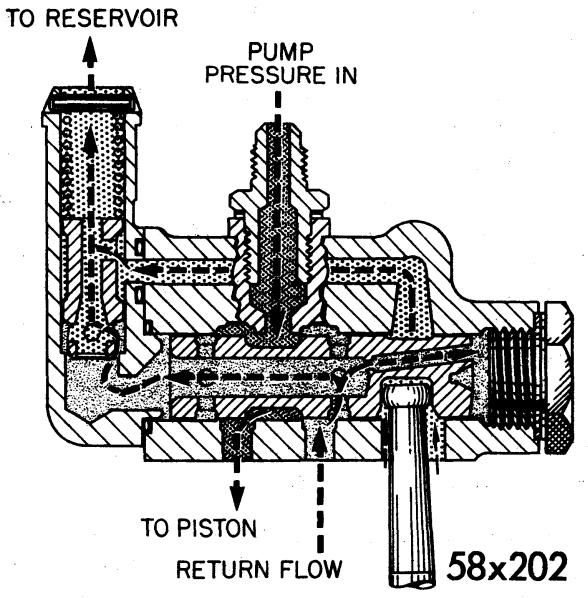

Fig. 10—Steering Gear Valve in Left Turn Position

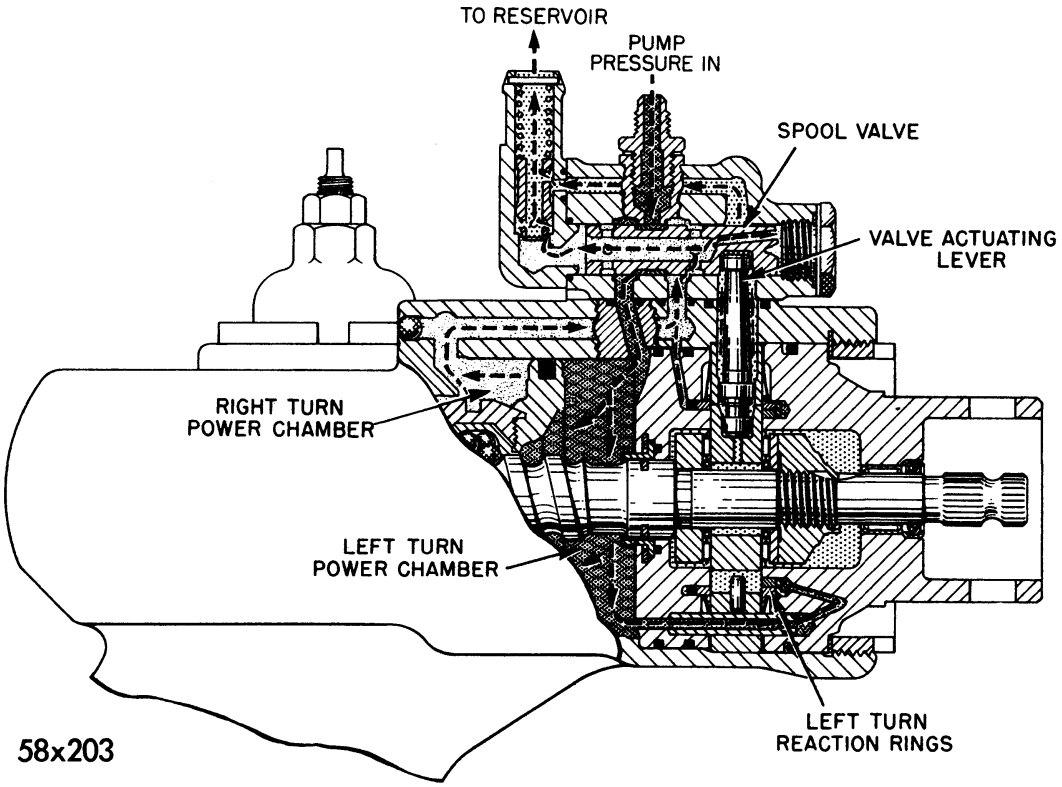

Fig. 11—Oil Flow (Left Turn Position)

piston exists, and it is pushed to the left. Its linear movement is translated into rotation of the cross-shaft sector gear (Fig. 7), and subsequently through the steering linkage to the front wheels.

This entire action takes place instantaneously whenever the steering wheel is turned to the left.

In the reaction area of the steering unit another action takes place simultaneously as the wheel is turned to the left (Fig. 11). The restraining force of the reaction spring must be overcome before the center race can move to the right. The force of the reaction spring provides positive returnability to the unit. At the instant when power assistance is no longer desired by the driver, the reaction spring and operating oil pressure move the race and spool valve back to the neutral position. Equal oil flow then is directed through the unit, and no power assist is provided.

The force of this reaction spring also contributes to increased on-center "feel". The "feel" is further provided by operating oil pressure which tends to return the center thrust bearing race to its neutral position. The driver feels this force on the reaction rings shown in Figure 6, as a force proportional to operating oil pressure. It causes the driver to exert a steering effort proportional to the total force required to turn the front wheels of the car. The force he actually exerts is only a small percentage of the total force that would be required to steer the car with a manual gear. If oil pressure is interrupted to the steering gear, it would operate with increased effort and there would be more steering wheel free play. Steering wheel movement by the driver will turn the wormshaft inside the power piston causing it to move right or left. The steering wheel movements will travel through the wormshaft and piston to turn the cross-shaft sector gear, and through the steering linkage to the front wheels. Complete steering control is retained by the driver if lack of power assist condition should ever arise.

9. REMOVING AND INSTALLING POWER STEERING UNIT

a. Removal

Disconnect battery ground cable. Disconnect

horn wire. Remove horn button and horn ring and disconnect horn wire. Remove steering wheel nut and pull steering wheel with Tool C-3428.

Disconnect the direction signal wires at connectors. Remove the jacket tube support bracket at instrument panel. Loosen the two bolts attaching the jacket tube to steering housing, push the jacket tube upward to expose the steering tube coupling pin and remove pin.

Remove cotter key and nut at the drag link to steering arm ball joint.

Disconnect the pressure and return hoses at steering gear. Fasten the disconnected ends of hoses above oil level in reservoir. Cap ends of hoses and fittings on steering gear.

Remove steering arm nut and washer at steering gear shaft. Slide Tool C-3646 (Fig. 12) up on steering arm and place shoe of puller behind steering arm. Tighten tool center screw against gear shaft will pull steering arm from shaft. Remove the gear housing to frame bolts and remove steering gear at engine compartment.

b. Installation

Enter steering gear through engine compartment and install attaching bolts and spherical washers. Tighten bolts finger tight only. Align the steering tube coupling with the steering column tube and install coupling pin, insulator and teflon inserts.

Slide the jacket tube down in position over the steering gear housing and tighten clamp bolts. Install jacket tube clamp at instrument

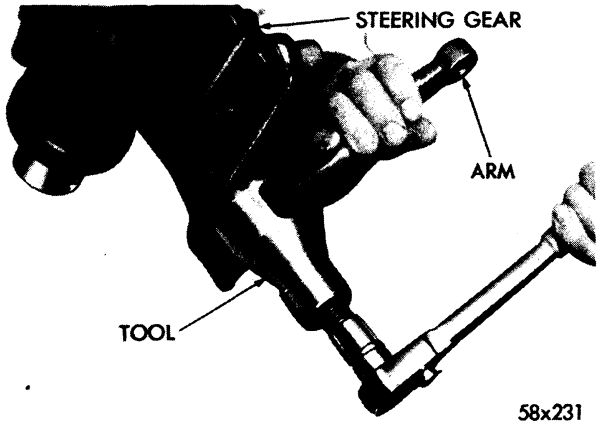

Fig. 12—Removing Steering Gear Arm with Puller C-3646

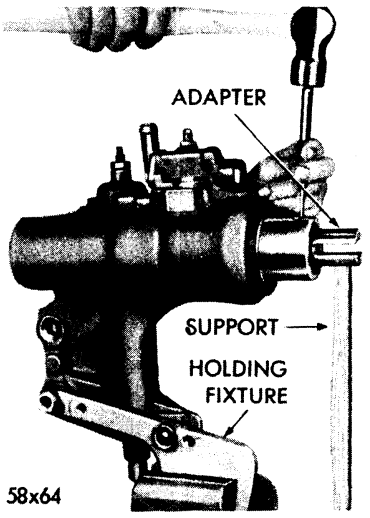

Fig. 13—Removing Coupling Pin

panel. (Do not tighten.) Connect direction signal wires at connectors. Install steering wheel and steering wheel nut. Tighten nut to 40 foot-pounds torque. Install horn wire, stationary plate, bushings, horn ring and attaching screws. Do not overtighten screws (horn ring must be free to flex.) Install steering wheel ornament.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the direction switch.

If distance between steering column jacket and steering wheel is more or less than ⅛ inch, adjust column jacket and tighten jacket clamp bolt.

Tighten the jacket to dash panel support bracket screws. Tighten the steering gear housing to frame attaching bolts to 50 foot-pounds torque. Install steering arm and tighten nut to 120 foot-pounds torque.

Connect the pressure and return hoses. Refill the reservoir and gear housing. Refer to Paragraph 19, "Final Adjustments".

10. DISASSEMBLY OF STEERING GEAR

NOTE: Prior to disassembly, clean the gear assembly thoroughly in a suitable solvent and install unit in holding fixture C-3323 (Fig. 13).

When disassembling, each part should be placed in a suitable solvent, washed, then dried by dry compressed air. Careful handling of parts must be exercised to avoid the occurence of nicks and burrs. Crocus cloth may be used to

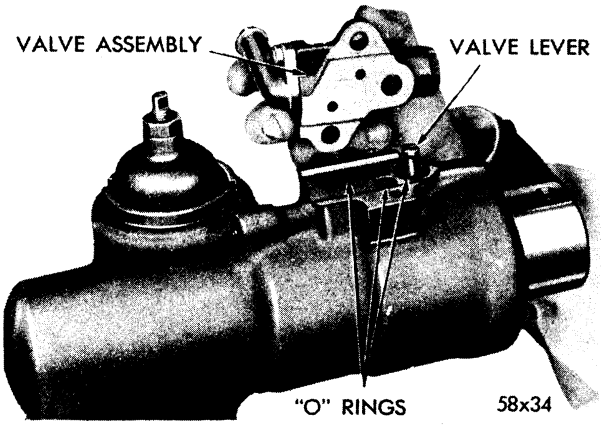

Fig. 14—Removing or Installing Valve Body Assembly

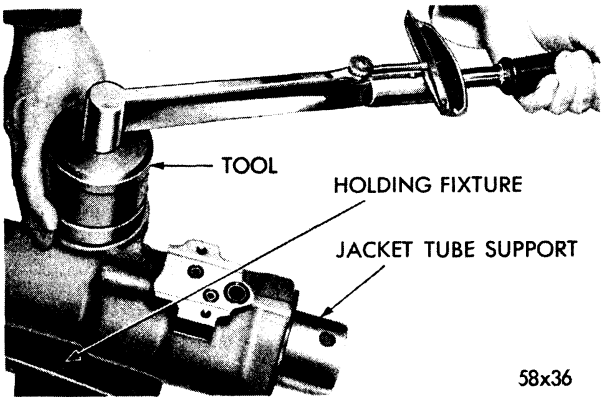

Fig. 16—Removing or Installing Gear Shaft Cover Nut with Tool C-3633

remove small nicks or burrs provided it is used carefully. When used on the steering gear valve, use extreme care not to round off the sharp edge portions of the two lands located between the valve drilled holes. The sharp edge portion of these two lands is vitally important to this type of valve.

Remove and discard all "O" seal rings and seals, using new ones lubricated with petrolatum when reassembling. To disassemble the power steering unit for repair or overhaul refer to Figure 6 then proceed as follows:

Drain the steering gear through the pressure and return connections by turning the steering tube coupling from one extreme of travel to the other.

Remove coupling pin (Fig. 13), and remove coupling.

NOTE: Support the coupling when driving the pin out to avoid damaging the bearings.

Remove the valve body housing attaching screws and remove valve body and the three "O" rings, (Fig. 14). Remove valve lever by prying under the spherical head (Fig. 15). **DO NOT USE PLIERS.**

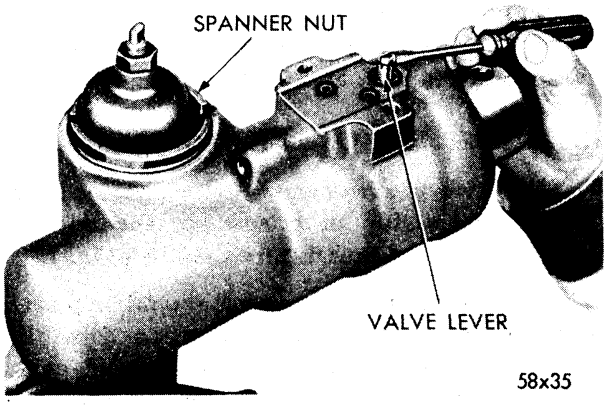

Fig. 15—Removing Valve Lever

CAUTION

Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

Loosen gear shaft adjusting screw locknut. Remove gear shaft cover nut with wrench Tool C-3633, (Fig. 16).

Rotate worm shaft to full right turn, then return worm shaft and piston to center of travel to remove gear shaft and cover as an assembly (Fig. 17).

CAUTION

There will be a discharge of oil when shaft and cover are pulled from housing.

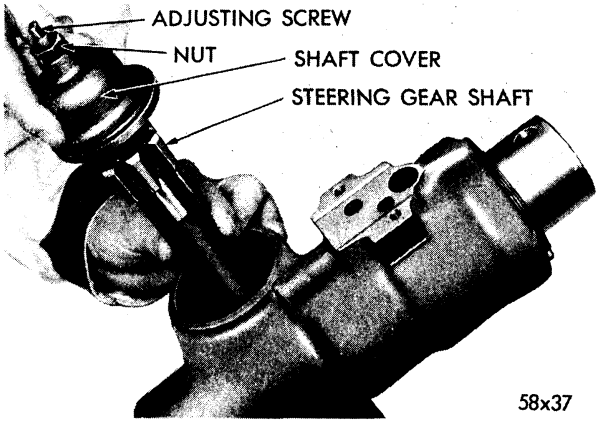

Fig. 17—Removing or Installing Gear Shaft and Cover Assembly

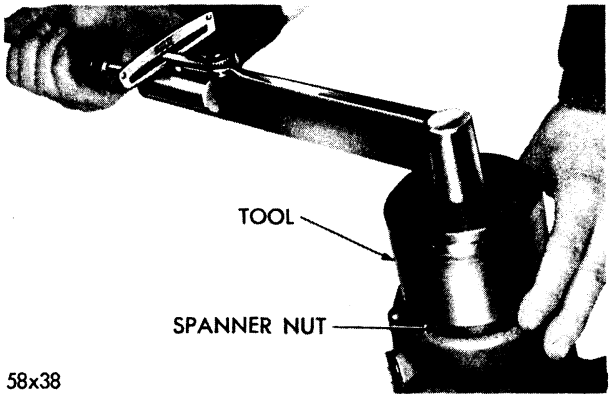

Fig. 18—Removing Steering Column Support Nut with Tool C-3634

Remove the steering column support nut with Tool C-3634 (Fig. 18), and remove tanged washer.

NOTE: Turn worm shaft to full right position to compress parts and back off as necessary to align holes in column support and worm shaft.

Enter a piece of drill rod or suitable drift through the holes in jacket support and worm shaft to keep the parts from turning and carefully remove the power train as a complete assembly (Fig. 19).

CAUTION

Oil will be expelled when the power train is being removed.

Remove steering gear housing from vise.

11. DISASSEMBLY OF POWER TRAIN

Place power train in a vise equipped with soft jaw protectors to avoid damaging the piston assembly.

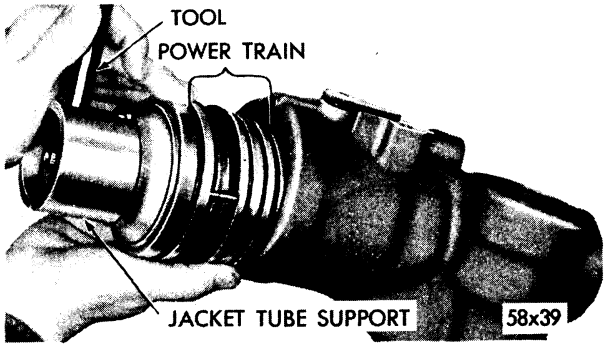

Fig. 19—Removing or Installing Power Train

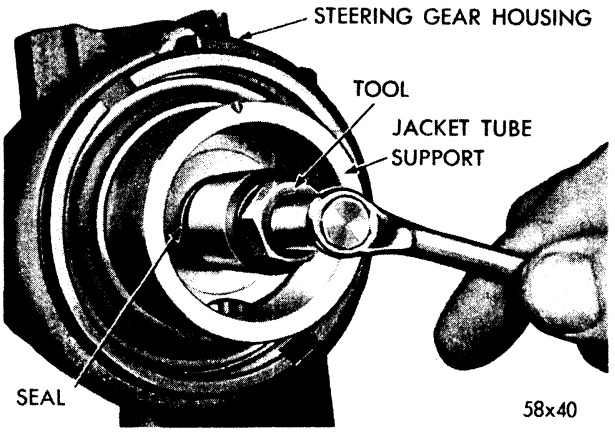

Fig. 20—Removing Worm Shaft Upper Oil Seal with Tool C-3638

CAUTION

Do not turn worm shaft more than one-half turn during disassembly.

Remove column jacket support assembly, reaction spring, reaction ring, and spacer, ferrule "O" ring center, and bearing spacer.

Hold the worm shaft from turning, then turn nut slightly to left to shear the staked portion of the nut and carefully pick out locking portion of the bearing adjusting nut out of the notch in the worm shaft.

CAUTION

Be sure staked portion is removed from slot of worm shaft to avoid damaging worm shaft threads.

Remove thrust bearing nut, upper thrust bearing race (thin), upper thrust bearing, center bearing race, lower thrust bearing, lower

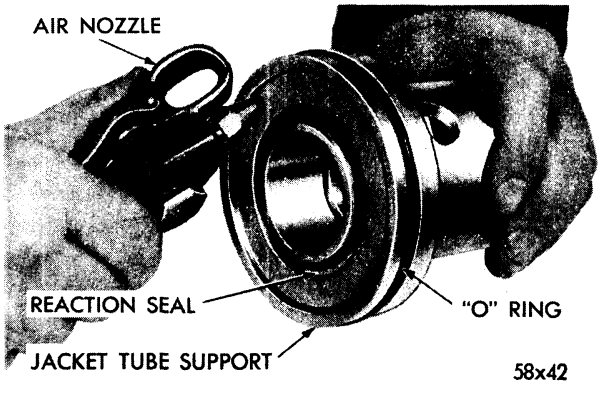

Fig. 21—Removing Reaction Seal from Jacket Support

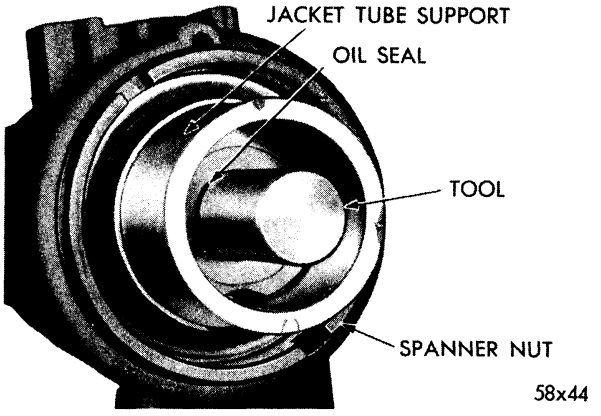

Fig. 22—Installing Worm Shaft Upper Oil Seal with Tool C-3650

thrust bearing race (thick), lower reaction ring and lower reaction spring.

Remove cylinder head assembly.

NOTE: The worm and piston assembly is furnished as a complete assembly only.

12. COLUMN JACKET SUPPORT ASSEMBLY

a. Disassembly

Remove worm shaft upper oil seal with puller Tool C-3638 (Fig. 20).

NOTE: Column jacket support and wormshaft upper bearing are serviced as an assembly.

Remove large "O" ring from groove in jacket support. Remove reaction seal from groove in face of jacket support by blowing air pressure into the ferrule chamber (Fig. 21). Inspect grooves for burrs. Make sure passage from ferrule chamber to upper reaction chamber is unobstructed.

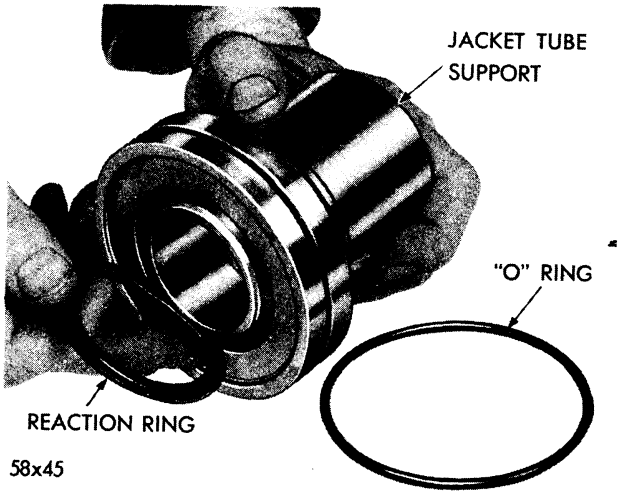

Fig. 23—Installing Reaction Seal into Jack Support

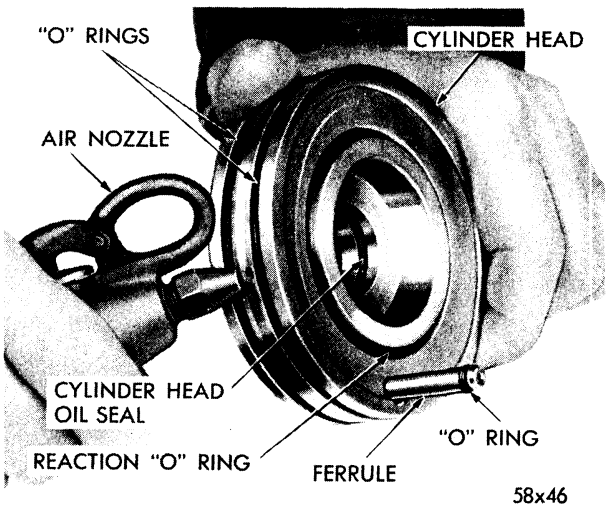

Fig. 24—Removing Reaction Ring from Cylinder Head

b. Reassembly

Install worm shaft upper oil seal with sealing lip toward bearing (Fig. 22). Use Tool C-3650 and drive seal until tool bottoms on casting to obtain proper compression on rubber seal. Lubricate reaction seal and install in groove in face of column jacket support with flat side of seal out (Fig. 23).

13. CYLINDER HEAD

a. Disassembly

Remove the two "O" rings in the two outer grooves in the cylinder head. Remove the lower

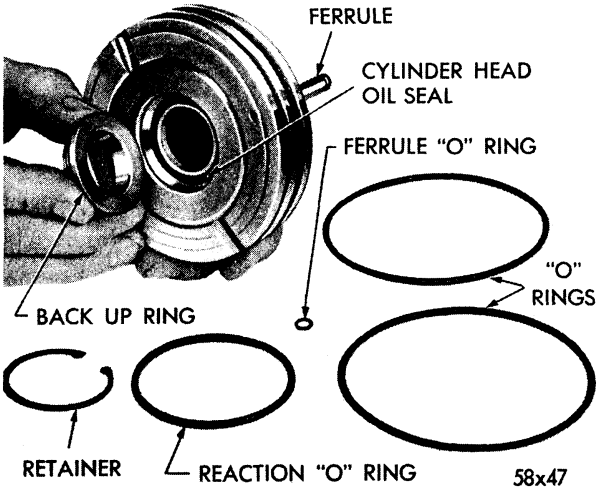

Fig. 25—Removing Cylinder Head Seal

reaction "O" ring in groove in face of cylinder head with air pressure into oil hole located in groove between the two "O" ring grooves (Fig. 24). Inspect the worm shaft seal in the cylinder head counterbore for possible damage, replace cylinder head seal if necessary (Fig. 25). Check oil passage in ferrule for obstruction. Check lands of cylinder head for burrs.

b. Reassembly

Lubricate the two large "O" rings and install in grooves on cylinder head. Install the lower reaction seal in groove in face of cylinder head. The small "O" ring for the ferrule groove should be installed after worm shaft bearing preload has been established otherwise "O" ring will be damaged by the reaction springs.

14. STEERING VALVE ASSEMBLY (Fig. 20)

a. Disassembly

Compress pressure control valve spring and remove spring retainer pin, spring and pressure control valve piston. Remove the two screws attaching the pressure control valve body to the steering valve and remove valve body. Carefully shake out the valve piston.

NOTE: If steering valve or valve housing is damaged, it will be necessary to replace the complete valve assembly. DO NOT remove the valve and plug unless inspection indicates a leak at the seal.

b. Reassembly

If steering valve was removed from valve housing, install the valve in the valve housing so that the valve lever hole is aligned with the steering gear valve lever opening in the bottom of the valve housing. Valve must fit smoothly in housing without sticking or binding. If valve end plug had been removed, install new seal and tighten plug to 50 foot-pounds torque.

Lubricate pressure control valve piston and slide it into the pressure control valve body (nose end first) (Fig. 26). Install the pressure control valve spring on top of the valve piston. Compress spring and install the spring retainer pin through both holes at top of pressure control valve body. Assemble pressure control valve body to main valve with the two attaching screws. Tighten screws to 10 foot-pounds torque. Install new copper sealing gasket and fitting in threaded hole on top of valve body. Tighten to 30 foot-pounds torque.

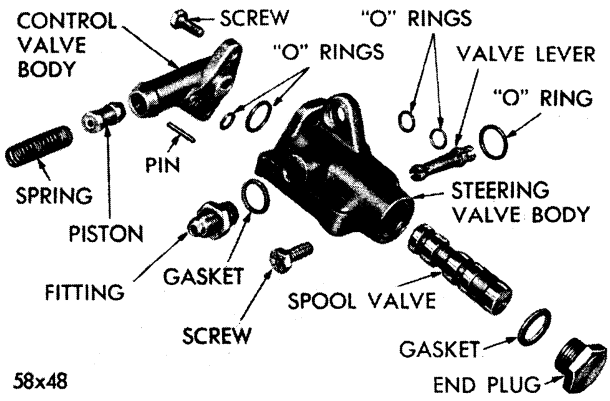

Fig. 26—Control Valve (Disassembled)

15. GEAR SHAFT

a. Disassembly

Remove gear shaft adjusting screw lock nut and unscrew cover from adjusting screw. Remove screw and washer from "T" slot in end of gear shaft. Remove small "O" ring from top of cover and large "O" ring from base of cover.

NOTE: The gear shaft cover and bearing are serviced only as an assembly.

b. Reassembly

Place adjusting screw washer over adjusting screw and slide both into the "T" slot of gear shaft. Screw cover onto the adjusting screw until gear shaft bottoms in cover. Lubricate a new small "O" ring and install it over the adjusting screw into position at top of gear shaft cover. Install adjusting screw lock nut on adjusting screw but do not tighten. Lubricate a new large "O" ring and "O" ring groove heavily with petrolatum. Install "O" ring in groove on lower face of gear cover.

16. STEERING GEAR HOUSING

a. Disassembly

NOTE: Steering gear housing with inner and outer gear shaft needle bearings is serviced as an assembly.

Attach steering gear housing on holding fixture Tool C-3323 and install holding fixture in a

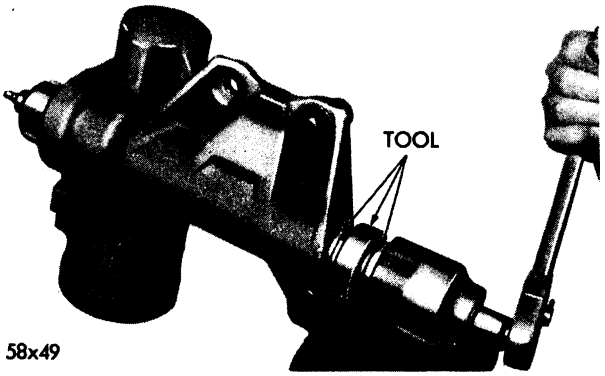

Fig. 27—Removing Gear Shaft Oil Seal

vise. Remove oil seal snap ring with pliers Tool C-760. Remove seal back-up washer. Remove the gear shaft oil seal with adapter SP-3056 and Tool C-3350 as follows: Slide the threaded portion of adapter SP-3056 over end of gear shaft and install the threaded nut section of Tool C-3350 on the shaft (Fig. 27). Maintain pressure on adapter SP-3056 with nut of Tool C-3350 while turning adapter SP-3056, forcing it into seal, until it has bottomed in the seal. Apply the two half rings and retainer over both portions of tool. As hexagon nut is removed from the shaft the seal will be pulled from the housing.

NOTE: Inspect the steering housing gear shaft needle bearings for broken or rough needles.

b. Reassembly

Install gear shaft oil seal in gear housing (lip of seal toward needle bearing) using Adapter Tool SP-3052 and Tool C-3350 (Fig. 28). Place adapter against seal and the tool nut on the threaded end of gear shaft. Tighten tool nut until adapter shoulder contacts housing (Fig. 29). Install oil seal back-up washer, and snap ring.

CAUTION

Make sure snap ring is properly seated in groove.

17. ASSEMBLY OF POWER TRAIN

Refer to Figure 30 and proceed as follows: Place piston assembly on work bench in a vertical position (worm shaft up). Slide cylinder head assembly (with ferrule up) on worm shaft and against piston flange.

NOTE: Enter cylinder and seal over work shaft seal ring, making sure gap on worm shaft ring is closed to avoid breaking the ring.

Lubricate and install in the following order. Lower thrust bearing race (thick), lower thrust bearing, lower reaction spring over ferrule, lower reaction ring (with flange up so that the ring protrudes through the reaction spring), center bearing race indexing control lever hole with hole in center bearing race (Fig. 9). Install outer spacer, upper thrust bearing, upper thrust bearing race (thin) and a new worm shaft thrust bearing nut. Tighten nut as follows: Turn worm shaft counterclockwise one-half turn and hold worm shaft in this position while tightening nut to 10 foot-pounds torque.

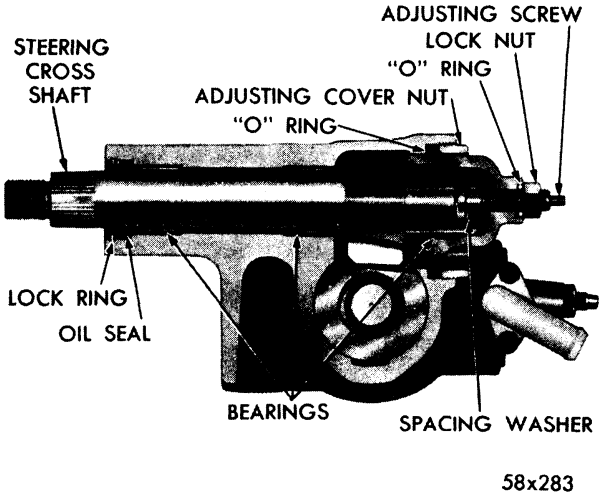

Fig. 28—Steering Gear Housing (Sectional View)

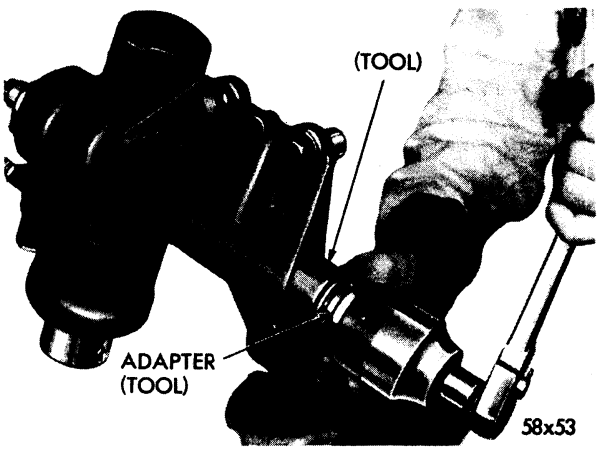

Fig. 29—Installing Gear Shaft Oil Seal

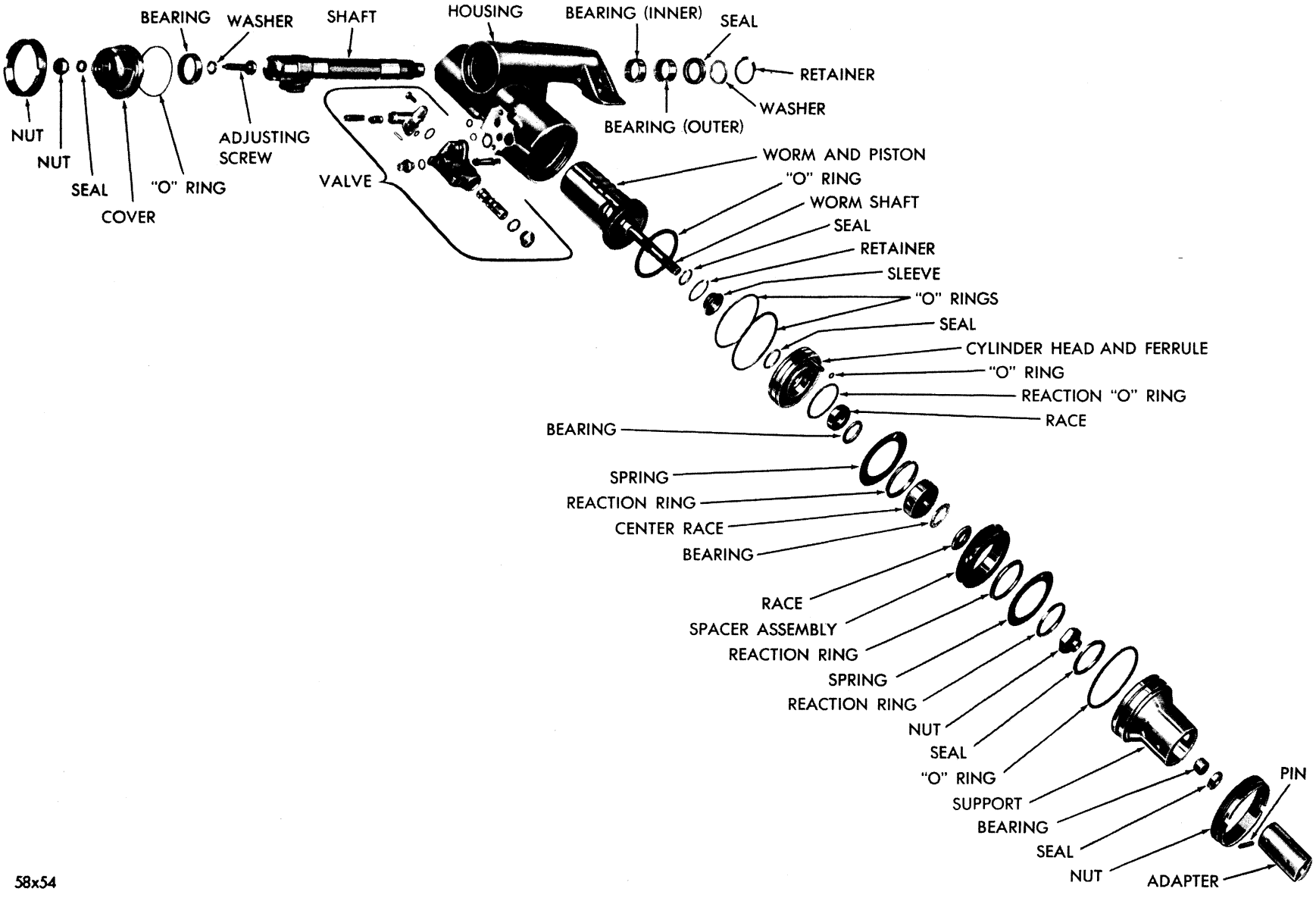

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Fig. 30—Steering Gear (Disassembled View)

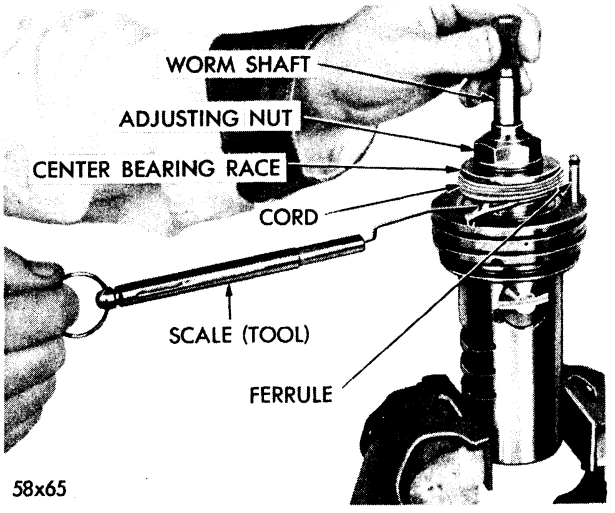

Fig. 31—Checking Center Bearing Race Preload

CAUTION

If worm shaft is turned more than one-half turn, the cylinder head seal will clear the oil ring on the worm shaft. Always check position of worm shaft oil ring before bottoming cylinder head against worm piston shoulder to avoid damaging oil ring.

Rotate the worm center bearing race several turns to position all parts, then loosen adjusting nut. Retighten the worm bearing adjusting nut to give a bearing torque of 8-16 ounces. Check torque by placing several rounds of cord around the center bearing race. Make a loop in one end of cord and hook the loop of distributor breaker arm spring scale, Tool MTU-36 in the cord loop (Fig. 31). Pulling on the cord will cause the bearing race to rotate.

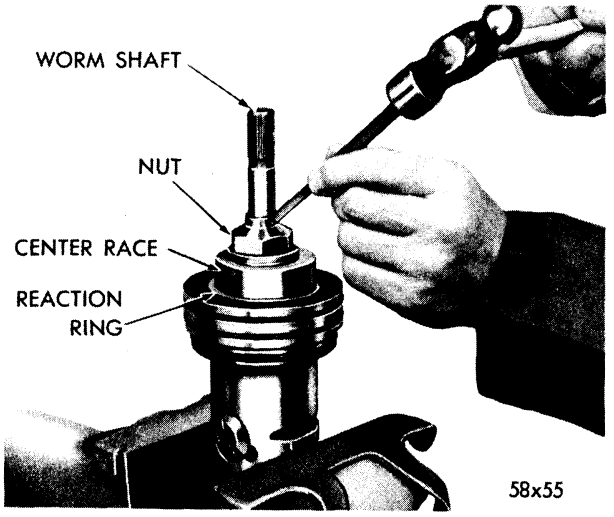

Fig. 32—Locking Worm Shaft Bearing Adjusting Nut

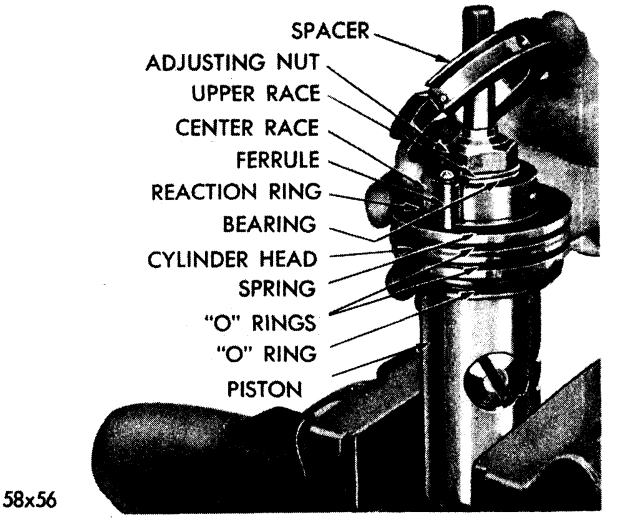

Fig. 33—Aligning Center Bearing Spacer

If adjusting nut is tightened properly, reading on scale should be 8 to 16 ounces. Depress flange of adjusting nut into the depression in worm shaft to lock securely (Fig. 32).

CAUTION

Use a chisel with a large radius on the ends to avoid completely shearing the metal.

IMPORTANT

The torque of 8-16 inch ounces must remain after the adjusting nut is securely locked.

Install center bearing spacer over center bearing race to engage dowel pin with slot in center bearing race (Fig. 33).

NOTE: Make sure that valve lever hole in center bearing race and center spacer are aligned.

Place inner and outer reaction rings over center spacer and install upper reaction spring with cylinder head ferrule through hole in spring. Install a new "O" ring in ferrule groove. Place lubricant in small bore of column jacket support (for cylinder head ferrule). Install the jacket support over the worm shaft carefully engaging the cylinder head ferrule and "O" ring making sure reaction rings enter groove in jacket support.

Align parts on power train so that valve lever hole in center bearing spacer is 90 degrees counter-clockwise from piston rack teeth and lock all parts to the worm shaft by entering a drill rod or suitable drift through jacket support and worm shaft holes.

18. REASSEMBLY OF STEERING GEAR

With steering gear housing in holding fixture Tool C-3323 in approximate car position; lubricate bore of housing with petrolatum and carefully install power train assembly (Fig. 19), with center bearing spacer valve lever hole in "UP" position to line up with control valve lever clearance hole in the steering gear housing.

NOTE: Place an .0015 inch feeler stock to cover the aligning notch in the steering gear housing to protect the "O" ring seals when installing the gear train.

CAUTION

Make sure cylinder head is bottomed on housing shoulder (Fig. 7). Do not remove power train locking pin (Fig. 19) until all parts are positioned in steering gear housing.

Align valve lever hole in center bearing spacer exactly with clearance hole in housing with aligning Tool C-3649 (Fig. 34). **Tool should not be removed until spanner nut is securely tightened.**

Install column support spanner nut, and tighten to 150 foot-pounds torque with Tool C-3634 (Fig. 18).

Set piston at center of travel and install gear shaft and cover assembly so that sector teeth index with piston rack teeth. Make sure "O" ring is positioned in face of cover, (Fig. 6).

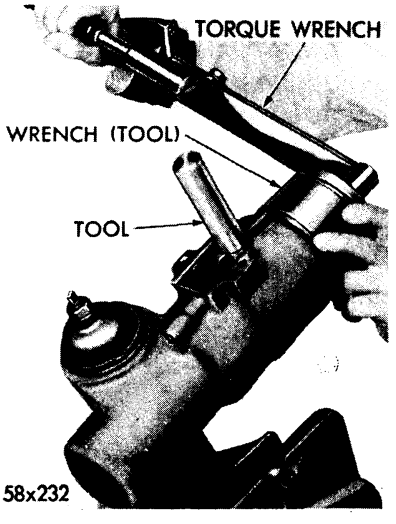

Fig. 34—Alignment of Bearing Spacer and Center Bearing Race with Aligning Tool C-3649

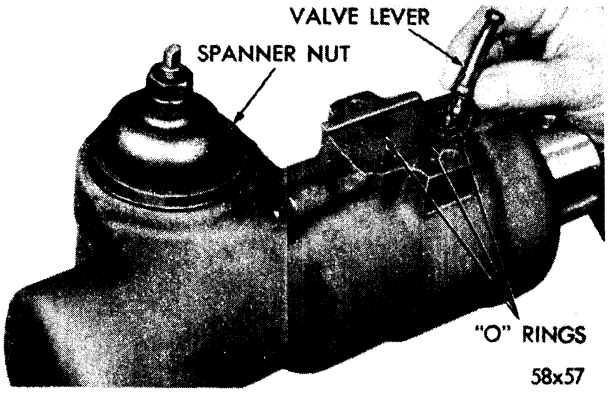

Fig. 35—Installing Valve Lever

Install cover spanner nut and tighten to 100 foot-pounds torque with Tool C-3633 (Fig. 16). Install valve lever (double bearing end first) into center bearing spacer through hole in steering housing so that slots in the valve lever are parallel to worm shaft in order to engage the anti-rotation pin in center bearing race (Fig. 35).

Install valve body on housing making sure that the valve lever enters the hole in the piston (Fig. 14). Be sure "O" ring seals are in place. Tighten valve mounting screws to 30 inch pounds torque.

19. FINAL TEST, ADJUSTMENTS AND SPECIFICATIONS

Remove oil reservoir cover and fill reservoir to level mark. Connect test hoses C-3211 and C-3318 with proper adaptors to hydraulic pump on car with pressure gauge C-3309B installed between pump and steering gear to register pressures. Start engine and operate at idle to bring steering gear to normal operating temperature. Expel all air from the unit by turning steering wheel several times to the right and then to the left. Refill reservoir before proceeding with the following test and adjustments.

a. Turn the gear shaft adjusting screw outward through the gear shaft cover to assure no mesh adjustment preload for this phase of the test. See Paragraph 15, "Assembly of Gear Shaft." Tighten steering valve body attaching screws to 7 foot-pounds torque. Apply oil pressure to complete unit and position steering valve by tapping lightly on one of the pressure control valve screws or on valve end plug to position valve, (up or down) on steering hous-

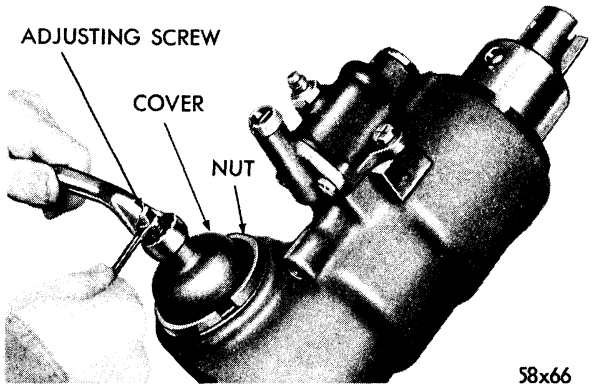

Fig. 36—Adjusting Gear Shaft Adjusting Screw

ing to give equal gear shaft torque (within 5 foot-pounds torque not to exceed 20 foot-pounds in either direction) when gear shaft is slowly turned. Perform this operation carefully to prevent a lockup in the steering gear. After valve body is located tighten attaching screws to 15 foot-pounds torque.

b. With the gear shaft on center, tighten the gear shaft adjusting screw until backlash just disappears. Tighten 1¼ turn from this position and while holding adjusting screw in this position tighten lock nut.

c. Turn off hydraulic power to unit. Operate unit manually for minimum of 180° from center in each direction, measured at worm shaft. Turn on hydraulic power to unit. Operate unit through a minimum of one complete cycle (complete rotational travel of worm shaft from one extreme of travel to the other extreme and then back). Operate unit through another cycle, this time holding unit at extreme travel in each direction while watching the oil pressure gauge. The gauge reading should be equal in each direction. If not, it indicates excessive internal leakage in the unit.

CAUTION

Holding the worm shaft at either extreme position for more than a few seconds will abnormally increase the oil temperature and cause undue oil pump wear.

With oil temperature between 150° F. and 170° F., checked with thermometer in the reservoir, the oil pressure should be 850 to 950 psi. for satisfactory power steering operation.

d. With gear shaft on center plus or minus 2 degrees, readjust the gear shaft backlash. This will require loosening the adjusting screw until backlash is evident. Then retighten adjusting screw until backlash just disappears. Continue to tighten for ⅜ to ½ turn from this position and tighten lock nut to 50 foot-pounds torque to maintain this setting, (Fig. 36).

e. Starting from a point at least one full turn of the worm shaft either side of center, the torque at the gear shaft required to turn the unit through center at 2 rpm in each direction shall not exceed 20 foot-pounds or vary more than 5 foot-pounds from left to right. Position steering valve to obtain equal torque and tighten valve body attaching screws to 15 foot-pounds torque to maintain this setting.

f. With the unit under power, but with no load, the torque required to rotate the worm shaft through an included angle of 180° (90° either side of center) shall be 5-9 inch-pounds. Disconnect test equipment and mounting fixture. Place steering gear worm at center of travel and install worm connector. Install unit in car. See Paragraph 9(b).

SLEEVE TYPE POWER STEERING PUMP

20. REMOVAL AND INSTALLATION (Fig. 37)

a. Removal

NOTE: Whenever the pump is drained or removed for servicing the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid Type "A" oil.

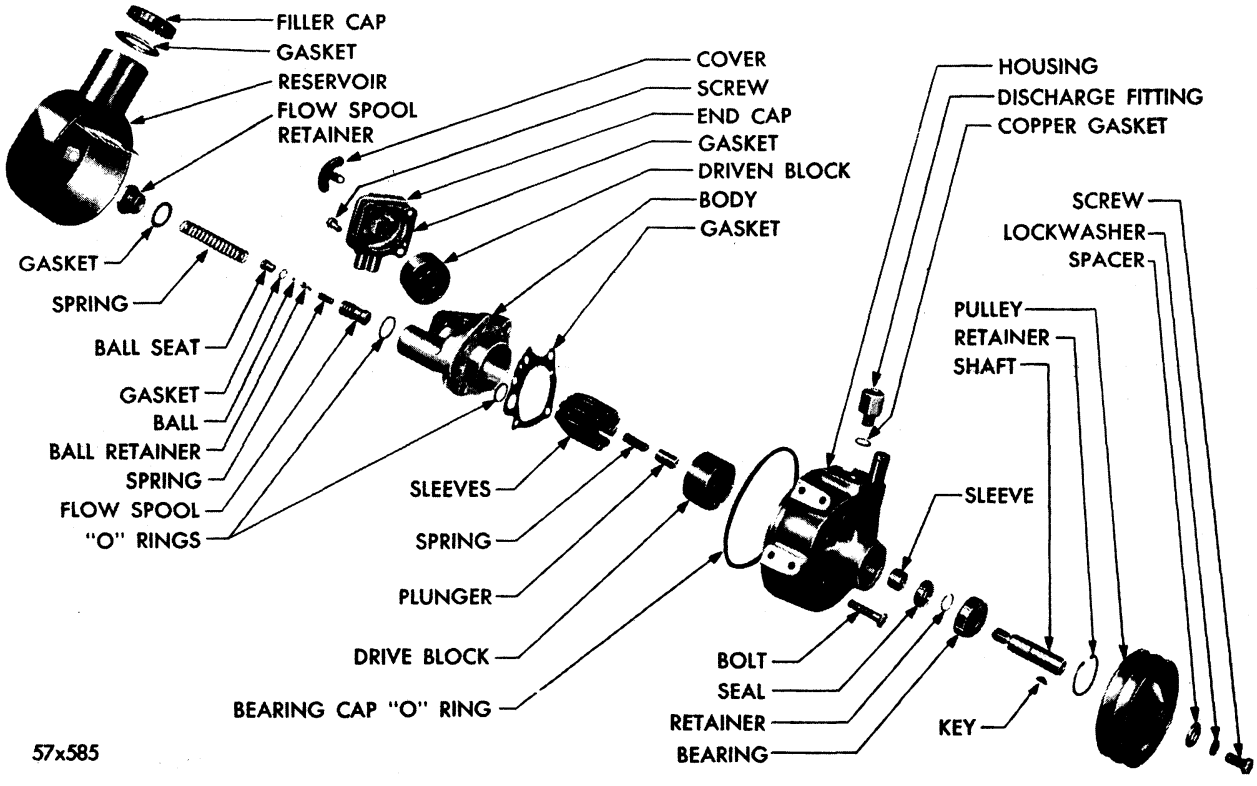

Fig. 37—Power Steering Oil Pump (Disassembled View) (Thompson Pump)

CAUTION

The oil level should never be allowed to fall below the baffle of the reservoir.

Remove hose clamp and hose from discharge outlets, (Fig. 38). Loosen bracket fan belt adjusting screw and remove fan belts. Remove pump.

Fig. 38—Sleeve Type Power Steering Pump Installed

b. Disassembly

Do not disassemble the hydraulic pump in dirty surroundings or on a dirty work bench. Use clean paper on bench. After the pump has been disassembled, place the parts in a suitable cleaning solvent; clean and protect from dirt and grit. Drain oil from pump and reservoir. Cap discharge and return line fittings with

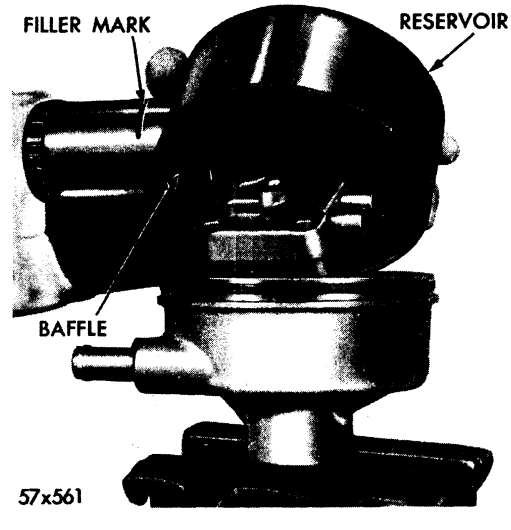

Fig. 39—Removing or Installing Power Steering Pump Reservoir

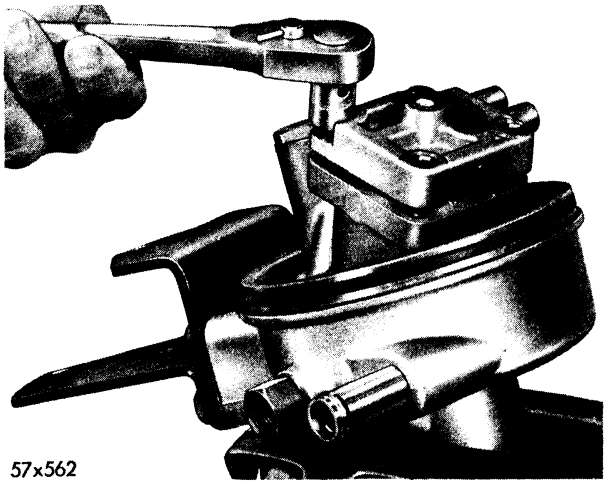

Fig. 40—Removing or Installing Inlet Cap Bolts

protective closures to exclude dirt from pump. Thoroughly clean exterior of pump. Mount pump in vise. Remove cap screw and reservoir. (Fig. 39). Loosen four cap screws at the inlet end cap (Fig. 40). Remove flow valve spring retainer fitting.

CAUTION

Flow and plunger spring are under pressure. Use care when removing cap and retainer to prevent spring and fitting from escaping due to spring force. Remove flow valve and spring. Remove and disassemble both end caps from inlet cap body and pump housing (Figs. 40 and 41). Plunger spring will tend to push the cylinder blocks out of body. Use care when disassembling.

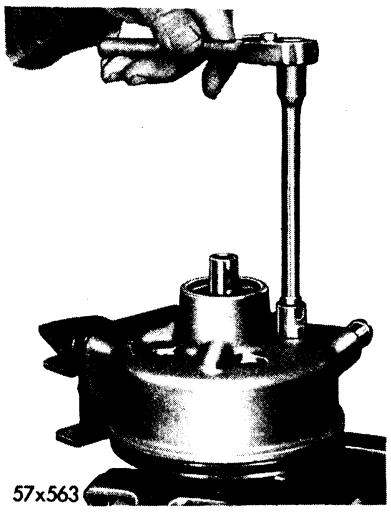

Fig. 41—Removing or Installing Pump Body from Housing

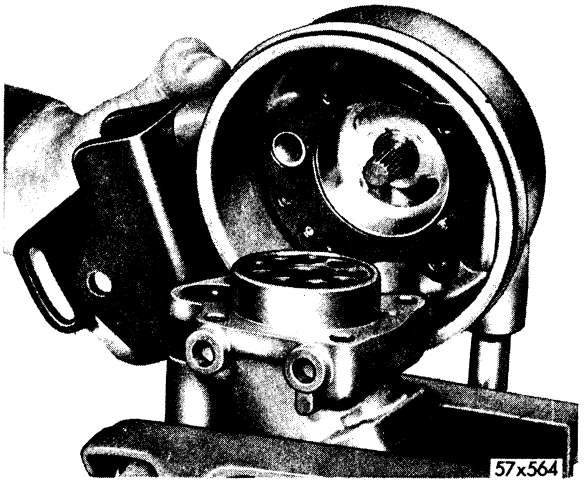

Fig. 42—Removing or Installing Housing from Pump Body

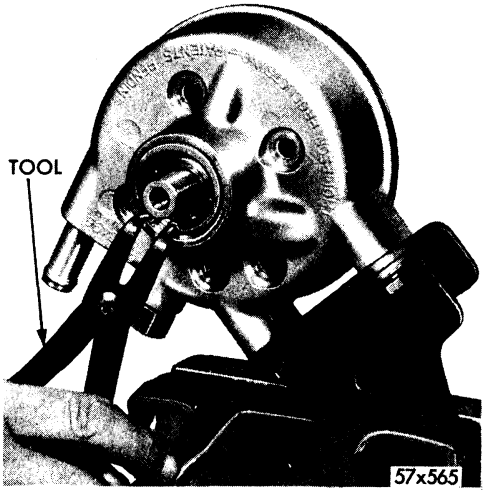

Fig. 43—Removing or Installing Snap Ring Bearing Retainer (Tool C-3106)

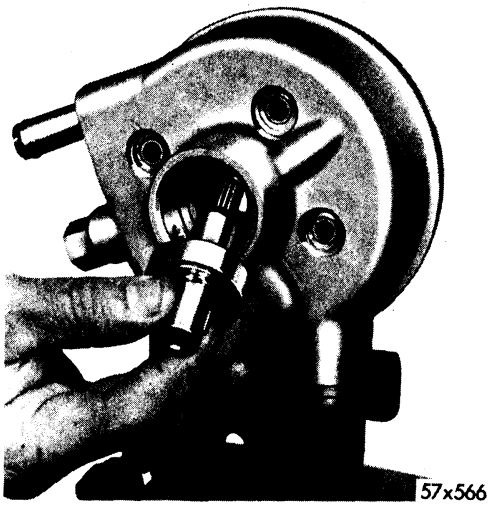

Fig. 44—Removing or Installing Shaft and Bearing

The cylinder blocks will push out of body slightly due to pressure of plunger spring between blocks. Remove cylinder drive blocks and nine sleeves from pump body (Fig. 42), as well as cylinder plunger spring. Remove ball bearing retainer ring from housing, using snap ring pliers Tool C-3106 (Fig. 43). Remove shaft and bearing (Fig. 44).

21. CLEANING AND INSPECTION

Wipe bearing and shaft assembly with clean, lint free cloths. Do not soak in cleaning solvent; the lubricants sealed into the ball bearing may become diluted by the solvent.

Inspect shaft for wear and check the ball bearing for roughness or noisy operation. If bearing must be replaced, remove shaft key, press bearing from shaft away from splined or serrated end of shaft. Examine retaining ring groove in housing, replace worn or distorted parts. If ball bearing is to be replaced, support bearing on inner bearing race and press shaft through bearing until retaining ring stops against inner race of bearing. The retaining ring must always be located between the bearing and splined or serrated end of pump shaft.

Check fit of sleeves in cylinder block bores. Sleeves must slide freely. Examine mating surfaces of sleeves and bores. Heavy scoring, if present, can impair pumping efficiency; cylinder blocks showing such scoring should be replaced. Hairline marking seen on sleeves are normal. Sleeves bearing such marks need not be replaced.

Examine flow valve spool and valve liner. Slight hair line scratches are permissible. Burrs from heavy gouges or scratches which may cause the flow spool to stick must be removed. This may be done by polishing with a smooth stone.

CAUTION

Do not break the sharp edges of the spool or liner.

Insert flow valve in valve body. (Fig. 45). By means of a pencil or other such rod which will not mar the internal diameter of valve liner, move flow spool back and forth to inspect. On each pass, rotate spool slightly. The spool must slide freely. If spool sticks or drags,

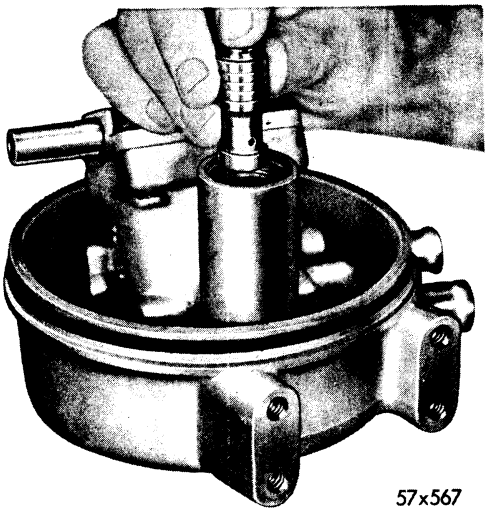

Fig. 45—Checking Flow Valve in Housing

remove it from liner. Remove dirt, nicks, and burrs, using above caution and check by repeating above procedure.

Examine shaft seal in bearing cap. If worn or damaged, replace seal.

NOTE: The lips of seal must point toward the casting. Examine running surface of bearing cap and inlet end cap. If heavy scratches or gouging are present or if port edges are damaged, the part should be replaced.

Press seal in until the shoulder stops against the bearing cap casting. Care must be used to see that seal is properly aligned. This operation should be performed on an arbor press.

Check the pressure relief valve. The pressure relief valve is located in flow valve spool. (Fig.

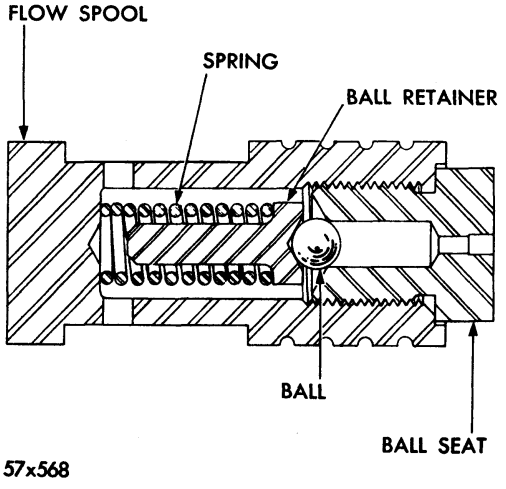

Fig. 46—Flow Valve Spool

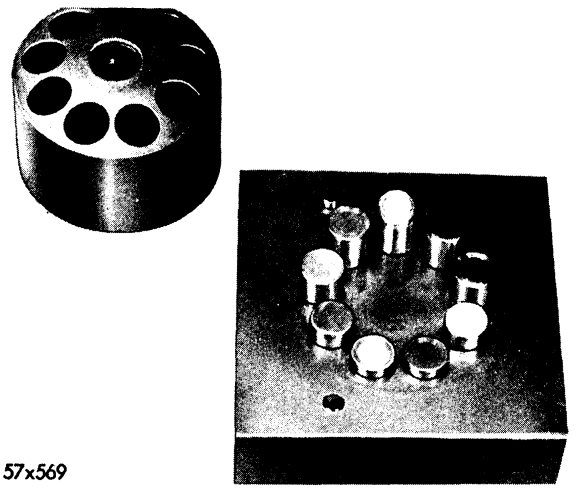

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Fig. 47—Drive Block Assembling Fixture

46). The valve must not leak at any pressure below 750 psi. and must open completely at 900 psi. Evidence of leakage will be seen at small holes in the side of flow spool. If relief valve leaks, disassemble by removing valve seat for dirt or nicks. Clean all valve parts and reassemble, replacing valve seat if nicked or damaged. Check the pressure again. If the pressure still falls below the minimum requirement, disassemble the valve again and replace the pressure relief spring or place a $\frac{1}{32}$ inch washer between spring and ball retainer. To correct pressures exceeding the maximum requirement, remove valve seat and place a $\frac{1}{32}$ inch washer between valve seat and the flow spool body.

Examine the pump body for signs of unusual wear or damage. Small scratches or burrs can be removed with fine emery paper. If body is scored or damaged, a new pump body should be used.

22. ASSEMBLY OF POWER STEERING PUMP

Clean parts thoroughly and assemble pump in a clean work place.

Press drive shaft and bearing sub-assembly into bearing cap. Check rotation of shaft to make certain shaft turns freely. Use a sleeve which bears on outer race of ball bearing, and press the sub-assembly in place.

CAUTION

Make certain that the shaft bearing and sub-assembly are properly aligned, otherwise the shaft may push sleeve bearing out of bearing cap or may scratch or mar the inside diameter of sleeve bearing.

Use an assembly fixture, Tool C-3602 as shown in Figure 47 and place driven cylinder block (without spline or serration) on assembly fixture. Lubricate (SAE 10W) and insert plunger spring, plunger, and seven sleeves in drive block, as shown in Figure 48. Place the pump body, square end down, over the cylinder drive block, and fixture locating pins; use a pointed probe to align the sleeves to a uniform spacing and install the two other remaining sleeves. Position the drive splined block with serration over the sleeves. Sighting thru the bores in the drive block for alignment, lower the cylinder block until it engages the two sleeves in the forward position. Again use

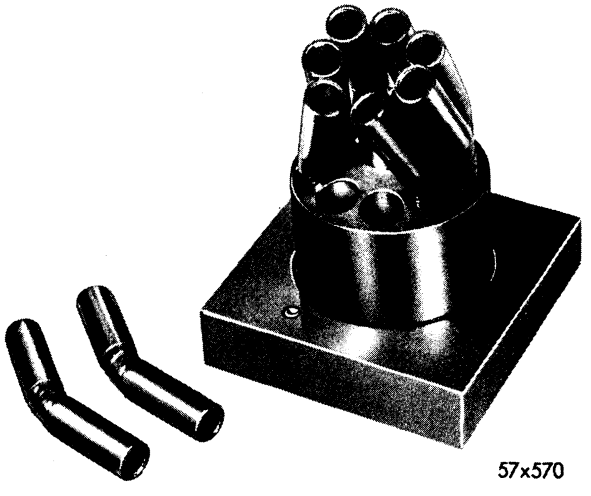

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Fig. 48—Assembling Sleeves in Drive Cylinder

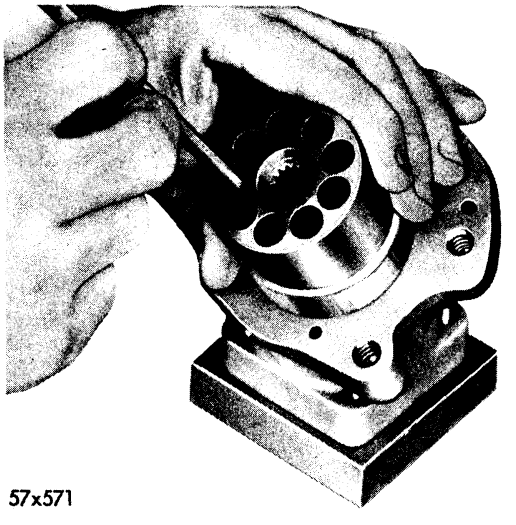

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Fig. 49—Installing Drive Block

pointed probe slightly smaller in diameter than the sleeve bores, Figure 49., correct the alignment of sleeves in the 5 and 7 o'clock position at the same time guiding cylinder block downward. Continue this procedure to the 4 and 8 o'clock positions until all of the sleeves are aligned and engaged; the block may then be pushed in all the way.

CAUTION

Do not force the cylinder block forcibly in place; proper alignment of the block and sleeves will allow the block to be pushed easily into place without excessive pressure. Tighten body to housing.

Remove body and cylinder block assembly from fixture, using care to see that blocks are not forced out of body by plunger spring. Assemble a new end cap gasket on pump body. Install end cap on body, tighten cap screws finger tight.

Insert a new "O" ring in counterbore at the flow valve liner in body. Install a new bearing cap gasket, assemble the bearing cap to the body.

NOTE: It may be necessary to exert hand pressure on the bearing cap to get drive block down into body after bearing cap is seated.

Tighten five cap screws finger tight. Grip end of pump shaft in a vise and rotate pump. The pump should rotate freely without binding. After making sure pump rotates freely tighten cap screws uniformly to 25 foot-pounds torque. Check pump again for rotation. Mount pump in a vise in a vertical position, gripping on the bearing hub. Install the flow valve spool with the $\frac{3}{16}$ land down. Place flow valve spring on top of flow spool. Replace "O" ring on flow spring retainer fitting. Compress flow spring with fitting, and screw fitting into place. Tighten to 20 foot-pounds torque.

Install and align a new reservoir "O" ring on bearing cap. Lubricate "O" ring for ease in assembling reservoir. Align reservoir so that the indentation on back will mate with angular boss on suction end cap.

NOTE: Reservoir alignment may be achieved by sighting thru the 9/32 inch hole in the back of the reservoir. Push the reservoir into place applying force around its outside diameter.

Replace the copper gasket between the head of the $\frac{1}{4}$ inch hex head cap screw and the back of reservoir. Tighten the $\frac{1}{4}$ inch cap screw to 15 foot-pounds torque.

CAUTION

Do not attempt to align or pull the reservoir into place on the angular boss with the $\frac{1}{4}$ inch cap screw.

Install shaft key, and pulley. Tighten pulley attaching bolt to 20 foot-pounds torque. Refill pump with Automatic Transmission Fluid Type "A" oil. Tighten fan belt as outlined in Accessory Belt Drives Section IV.

SLIPPER TYPE POWER STEERING PUMP

The slipper-type power steering oil pump is a positive displacement pump, bracket-mounted to the engine water pump housing, and belt-driven by the engine fan pulley.

Elimination of pulsation in oil flow is achieved by the cam surface of the pressed-in insert which evens out oil flow through the pump. Recirculation of oil from rotor outlet to rotor inlet results in a reduction of torque required to drive the pump and thus reduces the amount of engine horsepower necessary to drive the pump.

23. OPERATION

In operation, the slippers, shown in Figure 50, push the oil through the pump. Continuous slipper contact is assured by the spring loaded slippers against the eccentric inside diameter and by centrifugal force at higher speeds.

The amount of output flow from the pump

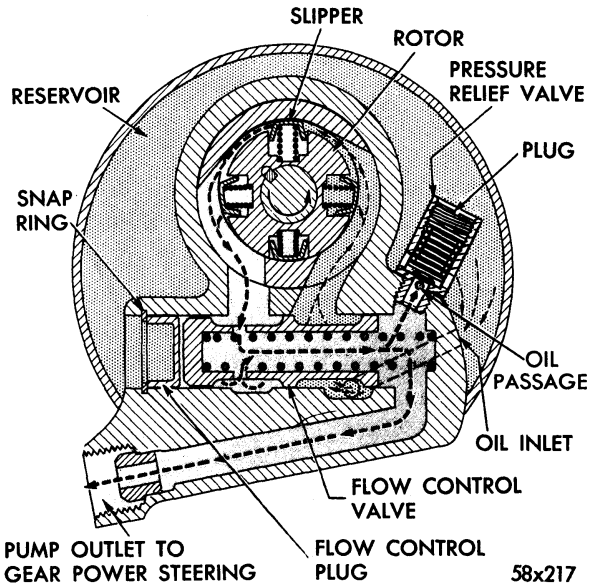

Fig. 50—Slipper Type Power Steering Pump

is limited by the flow control valve. As oil flows from the rotor outlet, it passes through orifices in the flow control valve on its way to the pump outlet and the power steering gear. Flow through the orifice causes a pressure differential to exist across the valve from the closed end to the open end. The higher pressure oil outside the valve is exposed to the left end of the valve. The difference in pressure forces the flow control valve to the right a sufficient amount to cause the center valve land to expose the inlet port allowing recirculation of oil from the rotor outlet, back to the rotor inlet. This action takes place when oil flow reaches approximately two gallons per minute.

Maximum oil pressure in the unit is limited to 850-950 psi. by the pressure relief valve. When pressure in the unit reaches this amount, it overcomes the force of the spring on the relief valve, forcing the valve plunger off its seat and allowing the oil to flow through the opening around the plunger. Openings in the pressure relief valve body return the oil to the reservoir.

a. Removal

Relieve tension and remove fan belt. Place a suitable container under the pump. Disconnect the pressure and return hoses, cap the hoses and keep the ends high to prevent loss of fluid in the power steering unit.

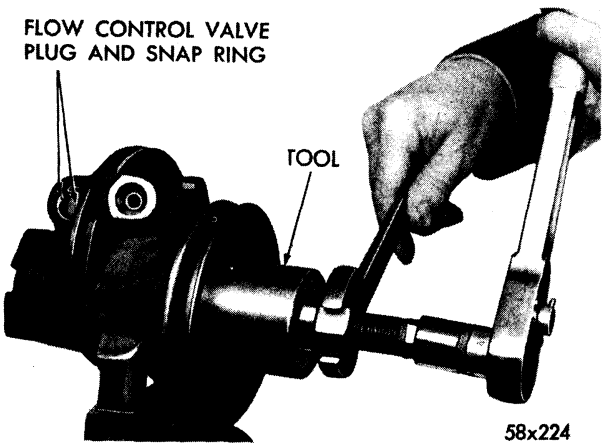

Fig. 51—Removing Pump Pulley

Remove the screws attaching the pump brackets to the water pump housing.

Clean all exterior surfaces of the pump before starting disassembly.

b. Disassembly

Remove filler cap and dipstick assembly. Drain reservoir and pump. Remove the front and rear brackets from the pump reservoir and pump. Carefully pry the reservoir from the pump. Reinstall the front bracket to the pump to be used as a holding fixture.

CAUTION

Use spacer washers between pump body and bracket to make sure bolts do not bottom in pump housing.

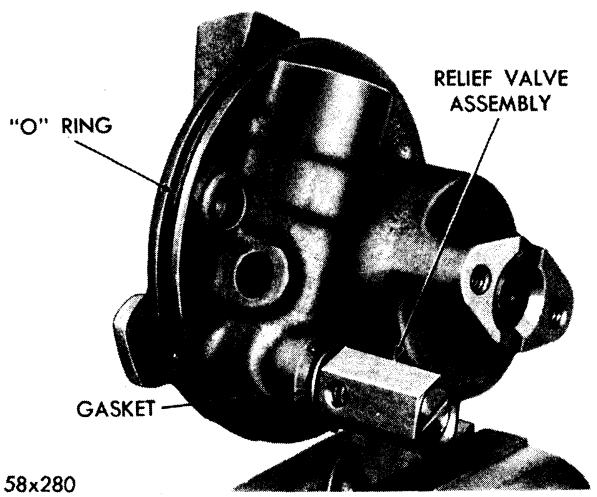

Fig. 52—Removing Relief Valve

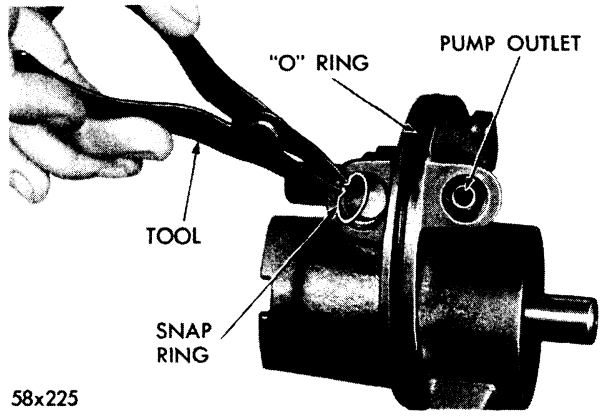

Fig. 53—Removing Flow Control Valve Plug Snap Ring

Install pulley removing Tool C-3615 (Fig. 51) by engaging the two half collars under the pulley hub flange (tapered ends toward pulley) and the flat ends of the collars engaging the collar locking the retainer of the puller screw. Install the collar sleeve to hold the collars and screw in position. While holding locknut, turn center screw to remove pulley.

NOTE: Make sure the two half collars fully engage the pulley hub and the collar locking retainer before applying pressure to the end of the pump shaft.

Remove the relief valve assembly and gasket (Fig. 52).

NOTE: Relief valve is serviced only as an assembly.

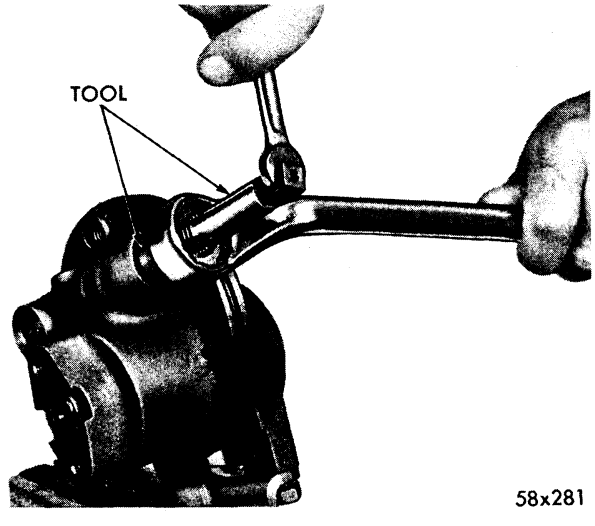

Fig. 54—Removing Flow Control Valve Plug with Tool C-3655

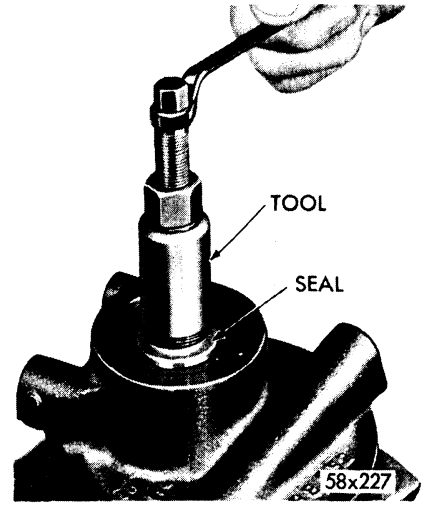

Fig. 55—Removing Pump Oil Seal

If there was evidence of a malfunction in the flow control valve, remove the flow control valve plug snap ring with snap ring pliers C-3229 (Fig. 53). Remove the flow control valve plug by threading a tap Tool C-3655 into the plug, as shown in Figure 54. With the tap securely threaded in plug, install tool spacer and nut over tap. Tightening nut while holding tap from turning will force the plug from the housing bore.

CAUTION

The flow control valve is spring-loaded and care should be used when removing the plug.

Thread the puller portion of Tool C-3642 into oil seal far enough to engage the metal portion

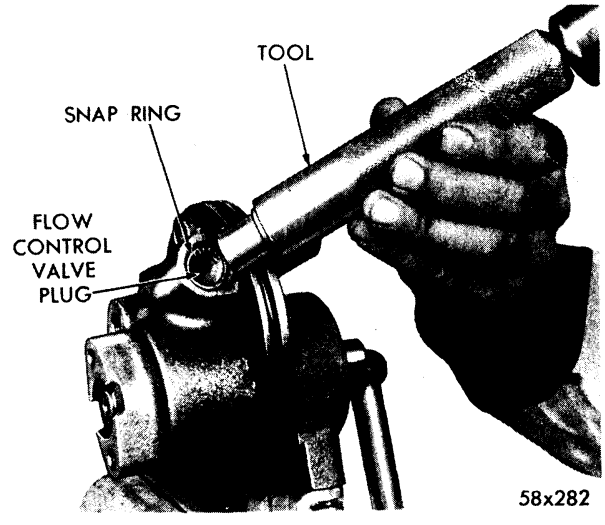

Fig. 56—Installing Flow Control Valve Plug

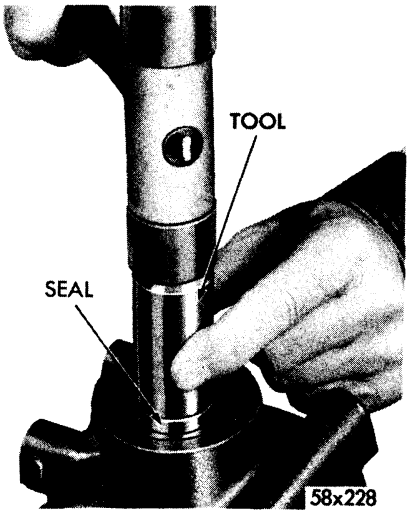

Fig. 57—Installing Pump Oil Seal

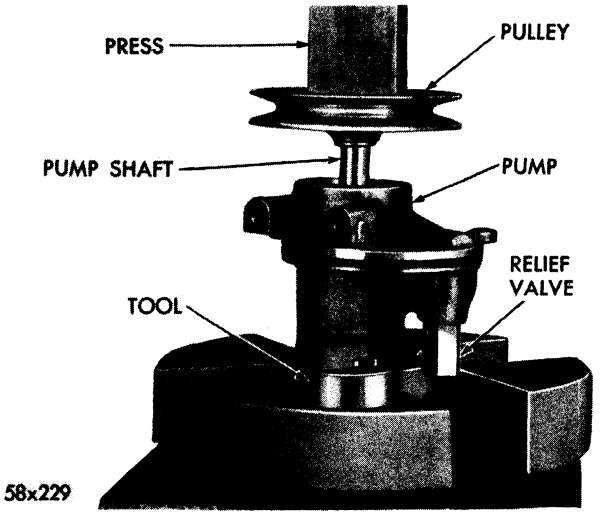

Fig. 58—Installing Pump Pulley

of the seal, (Fig. 55). Turning puller center screw while holding puller body will force the seal from the pump insert.

NOTE: Further disassembly of the pump is not recommended as component parts of the pump other than the reservoir, "O" ring and relief valve are not serviced separately.

24. CLEANING AND INSPECTION

Clean all parts thoroughly in a clean solvent, discard body to reservoir "O" ring and pump shaft oil seal. Check flow control valve and bore for burrs and scratches.

NOTE: Valve must operate freely in bore. Small scratches can be carefully removed with crocus cloth. Do not round off the square edges as they are vitally important to this type of valve.

The housing bore for the flow control valve should not be honed or machined. If the bore is scratched or worn, the pump should be replaced.

25. ASSEMBLY

Install flow control valve spring, valve and new valve plug and snap ring. Drive valve plug with Tool C-3233 (Fig. 56) far enough into bore to install snap ring, then drive snap ring and plug with Tool C-3233 until snap ring seats in its groove in housing bore. Install relief valve and gasket assembly.

Install oil seal with Tool C-3640. Lip of seal must face toward pump body and top of seal must be flush with front insert (Fig. 57).

Support pump body in holding fixture Tool C-3643 (Fig. 58) so that the pressure will be absorbed by the lower end of the pump shaft. Install pulley with a heavy duty arbor press. Pulley hub must be flush with end of shaft.

CAUTION

Pump must be supported in a manner in which all pressing force will be applied to the shaft only, otherwise pump body and rotor will be damaged.

Lubricate large "O" ring and install in outer groove in pump body. Install reservoir gasket, reservoir and reservoir attaching screws. Tighten screws to 10 foot-pounds torque. Install pump brackets.

26. INSTALLATION

Position pump on engine and install and tighten attaching bolts securely. Connect the pressure and return hoses. Tighten the drive belt as outlined under "Accessory Belt Drives", Section IV.

Fill reservoir to the full mark with Automatic Transmission Fluid Type "A".

SERVICE DIAGNOSIS (MANUAL)

27. EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL

a. Steering gear adjusted too loosely or badly worn.

b. Steering linkage loose or worn.

c. Front Wheel bearings improperly adjusted.

d. Steering gear arm loose on steering gear shaft. Check damage to roller shaft and steering gear arm.

e. Steering gear housing attaching bolts loose.

f. Steering arms loose on anchor bolts.

28. HARD STEERING

a. Low or uneven tire pressure.

b. Insufficient lubricant in the steering gear housing.

c. Steering gear adjusted too tightly.

d. Front wheels out of line.

e. Steering column out of line.

CONSTANT CONTROL FULL TIME POWER STEERING

29. HARD STEERING

a. Tires not properly inflated.

b. Low oil level (usually accompanied by pump noise).

c. Loose pump belt.

d. Oil on pump belts.

e. Steering linkage needs lubrication.

f. Power steering pump output low.

g. Steering gear malfunction.

1) Cross shaft adjustment too tight.

2) Pressure control valve stuck in closed position.

3) External oil leakage at the following points:

Lower sector shaft oil seal. Sector shaft adjusting screw seal. Sector shaft cover "O" ring seal. Valve housing-to-gear housing "O" rings.

4) Defective or damaged valve lever. If pressure gauge will build up to 850 to 950 psi., check the following points:

Defective or damaged gear shaft bearings.

Dirt or chips in steering gear.

Damaged column support worm shaft bearings.

Damaged thrust bearings or excessive preload adjustment.

Rough, hard to turn worm and piston assembly.

5) Excessive internal leakage. If pressure gauge will not build up to 850 to 950 psi., check the following points:

Cylinder head "O" rings.

Cylinder head reaction seal.

Cylinder head worm shaft oil seal assembly.

Column support-to-ferrule "O" ring seal.

Column support reaction seal.

Cylinder head "O" rings.

30. POOR RECOVERY FROM TURNS

a. Tires not properly inflated.

b. Steering linkage binding.

c. Improper wheel alignment.

d. Damaged or defective steering tube bearing.

e. Steering wheel column jacket and steering unit not properly aligned.

f. Steering gear malfunctions.

1) Improper cross shaft mesh adjustment.

2) Pressure control valve piston stuck in open position.

3) If car is self-steering or leads to either side, see "Self-Steering" or "Leads to Either Side."

4) Column support spanner nut loose.

5) Defective or damaged valve lever.

6) Improper worm thrust bearing adjustment.

7) Burrs or nicks in reaction ring grooves in cylinder head or column support.

8) Defective or damaged cylinder head worm shaft seal ring.

9) Dirt or chips in steering gear unit.

10) Rough or catchy worm and piston assembly.

31. SELF-STEERING OR LEADS TO EITHER SIDE

a. Tires not properly inflated.

b. Improper wheel alignment.

c. Steering wheel off center when car is traveling straight ahead.

d. Valve body out of adjustment.

Steering to the left—Move steering valve housing down on steering housing.

Steering to the right—Move steering valve housing up on steering housing.

e. Valve lever damaged.

f. Column support spanner nut loose.

32. TEMPORARY INCREASE IN EFFORT WHEN TURNING STEERING WHEEL TO RIGHT OR LEFT

a. Low oil level.

b. Loose pump belt.

c. Oil on pump belts.

d. Binding steering linkage.

e. Engine idle to slow.

f. Defective power steering pump.

g. Air in system. (Work steering wheel from right to left until air is expelled).

h. Gear Malfunction.

1) External leakage. See Paragraph 29, (g).

2) Improper cross shaft adjustment.

3) Excessive internal leakage. See Paragraph 29, (5).

33. EXCESSIVE STEERING WHEEL FREE-PLAY

a. Improper cross shaft adjustment.

b. Column support spanner nut loose.

c. Improper worm thrust bearing adjustment.

34. LACK OF ASSISTANCE—One Direction

Oil leaking past worm shaft cast iron oil seal ring or ferrule "O" ring.

Both Directions

a. Broken "D" ring on worm piston.

b. Piston end plug loose.

c. Reaction seal missing.

d. Pump belt slipping.

e. Pump output low.

35. NOISES

a. Buzzing noise in neutral, stop when steering wheel is turned—sticking pressure control valve.

b. Noisy power pump.

c. Damaged hydraulic lines.

d. Pressure control valve sticking.

e. Improper sector shaft mesh adjustment.

f. Air in system.

SLEEVE TYPE POWER STEERING PUMP

36. PUMP NOT PRIMING

a. Weak or broken plunger spring (compressed to a height of $^{61}/_{64}$ inch, the spring should exert a force of 29.7 to 36.3 pounds when compressed).

b. Flow valve stuck in open position. Check for dirt or burrs on flow spool or in valve liner.

37. REDUCED OR NO FLOW

a. Flow valve stuck in open position—check for dirt or burrs on flow spool or in valve liner.

b. Relief valve leaking—check for dirt or nicks on relief valve seat.

c. Weak or broken relief valve spring—when compressed to a height of $^{35}/_{64}$ inch, the spring should exert a force of 12.5 to 14 pounds when compressed.

d. Flow valve spring retainer loose, torque to mximum specifications.

e. Cap screws on either end of pump loose—torque to indicated specifications.

f. Weak or broken flow valve spring—when compressed to a height of 1½ inch, the spring should exert a force of 11.25 to 13.75 pounds when compressed.

38. LOW SHUT-OFF OR RELIEF PRESSURE

a. Weak or broken relief valve spring—replace.

b. Leak in relief valve—check for dirt or nicks on relief valve seat.

c. Flow valve stuck in open position—check for dirt or burrs on flow spool or in flow valve liner.

d. Cap screws on either end of pump loose—torque to indicated specifictions.

39. PUMP NOISE

a. Check oil level in reservoir—oil level should be up to mark on filler neck when pump is at 175° F.

b. Air in steering system—check all connections to make certain that they are tight.

c. Discharge and return line hoses—the hoses must not touch any part of the body or frame except where they are attached to the pump or steering column.

d. Loose pulley.

e. Water in oil.

40. HARD OR JERKY STEERING TOWARD END OF FULL LEFT OR RIGHT TURN

Loose drive belt—tighten drive belts to specified torque.

41. OIL LEVEL IN THE RESERVOIR

The following precautions should be observed for best performance of the sleeve-type power steering pump.

The oil level in reservoir will vary according to the operating temperature. The normal operating temperature of the pump is approximately 175° F. At this temperature, the oil should be up to the oil level mark on the filler neck. At 70° F. the oil will be approximately 3¼ inches from top of the filler neck.

NOTE: The oil level should never be allowed to fall below the baffle in the reservoir.

Automatic Transmission Fluid Type "A" is used in the steering system; however, S.A.E. 10W may be used to bring the oil level to the proper place if the level is low. If the steering system is drained, it should be filled with transmission fluid. The pump must be full before the engine is started. After starting the engine, add sufficient oil to make-up for the pump consumption to bring oil up to operating level.

42. BELT TENSION

The belt tension may be checked by applying torque wrench to the bolt which holds the pulley in place. Turning in the direction which will tighten the bolt, the torque should be 20 foot-pounds.

SLIPPER TYPE POWER STEERING PUMP

43. LEAKS

a. Pressure and return hose connections and fittings.

b. Reservoir to-pump-body "O" ring or mounting screws.

c. Drive shaft oil seal.

44. NOISE

a. Improper oil level.

b. Reservoir air vent plugged.

c. Air in system.

d. Dirt in pump.

e. Pump bushings, shaft, slippers, rotor worn, or damaged.

45. LOW OIL PUMP PRESSURE

a. Pump drive belt or pulley loose.

b. Low oil level in reservoir.

c. Pressure relief valve spring weak, or valve stuck in open position.

d. Flow control valve stuck or a broken flow control valve spring.

e. Worn pump rotor, slippers or broken and distorted springs.