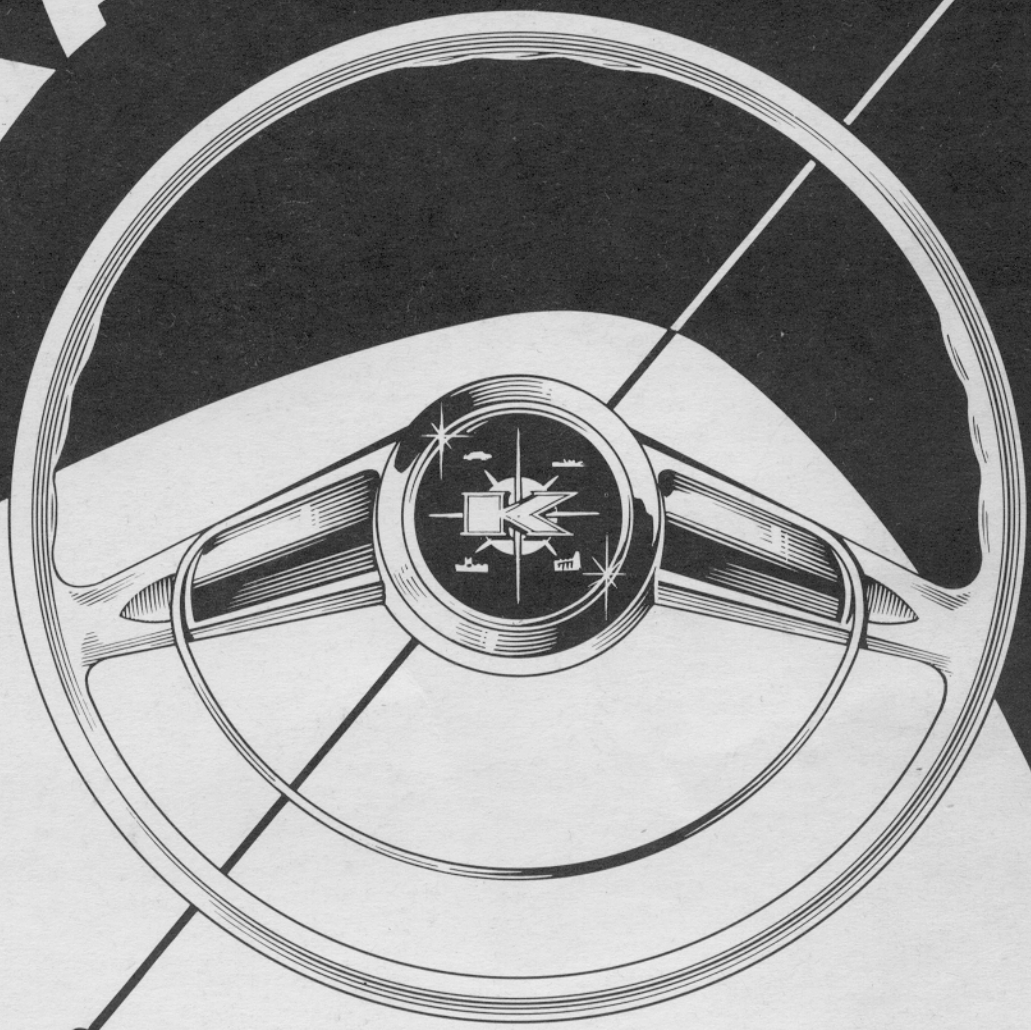
KAISER



POWER STEERING

KAISER APPROVED SERVICE FRAZER

KAISER-FRAZER SALES CORPORATION
WILLOW RUN, MICHIGAN, U.S.A.

INTRODUCTION

Information in this manual has been compiled for use by Kaiser-Frazer servicemen and mechanics to assist them in efficiently servicing and repairing the KAISER HYDRAULIC POWER STEERING system. This manual contains the description and operation of the system, testing methods, diagnosis procedures, repair procedures, and specifications.

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WARNING

Very high fluid pressures (up to 800 psi) are developed by the power steering pump. To prevent the possibility of bodily injury do not attempt such repairs as tightening hose connections when the engine is running and the power steering system is in operation.

If the steering system becomes inoperative due to loss of fluid, the pump belt should be disconnected to prevent damage to the pump.

GENERAL DESCRIPTION

Hydraulic power steering is available as special equipment on Kaiser vehicles. Kaiser power steering is designed to assist the driver, but still allow him to retain the "feel of the road." It will begin to provide assistance when steering effort reaches approximately a 4 pound pull at the rim of the steering wheel and will increase its assistance proportionally to the force necessary to turn the wheels. The maximum steering effort, which usually occurs when parking, will be about 10 pounds pull on the steering wheel. The steering effort when parking with conventional manual steering would be about 5 times greater.

In addition to the ease of parking, driver comfort on the highway is improved greatly by power steering. The intensity of road shocks normally encountered when travelling on rough roads is greatly reduced at the steering wheel after having passed through the hydraulic power link.

More important than easier steering, perhaps, are the safety features provided by Kaiser power steering. With an average light grip on the steering wheel, the driver will be able to maintain full control of the vehicle at all times. Even when unexpected things happen, such as a blowout, one front wheel hitting a deep snow drift, leaving the edge of the pavement, or striking a rut or some solid object, it will be a simple matter keeping the car straight on its course.

When the power steering system is not in operation (when engine is off or if power steering system fails), steering is accomplished manually. Manual operation of the power steering system will be somewhat more difficult than operation of the conventional manual steering system due to the increased overall steering ratio of the power system.

The Kaiser hydraulic power steering system consists of a hydraulic pump, a power link and interconnecting hoses (Fig. 1). The power link is a hydraulic cylinder and piston with a control valve at one end. It is an integral part of the steering linkage. A pitman arm from the conventional steering gear is at-

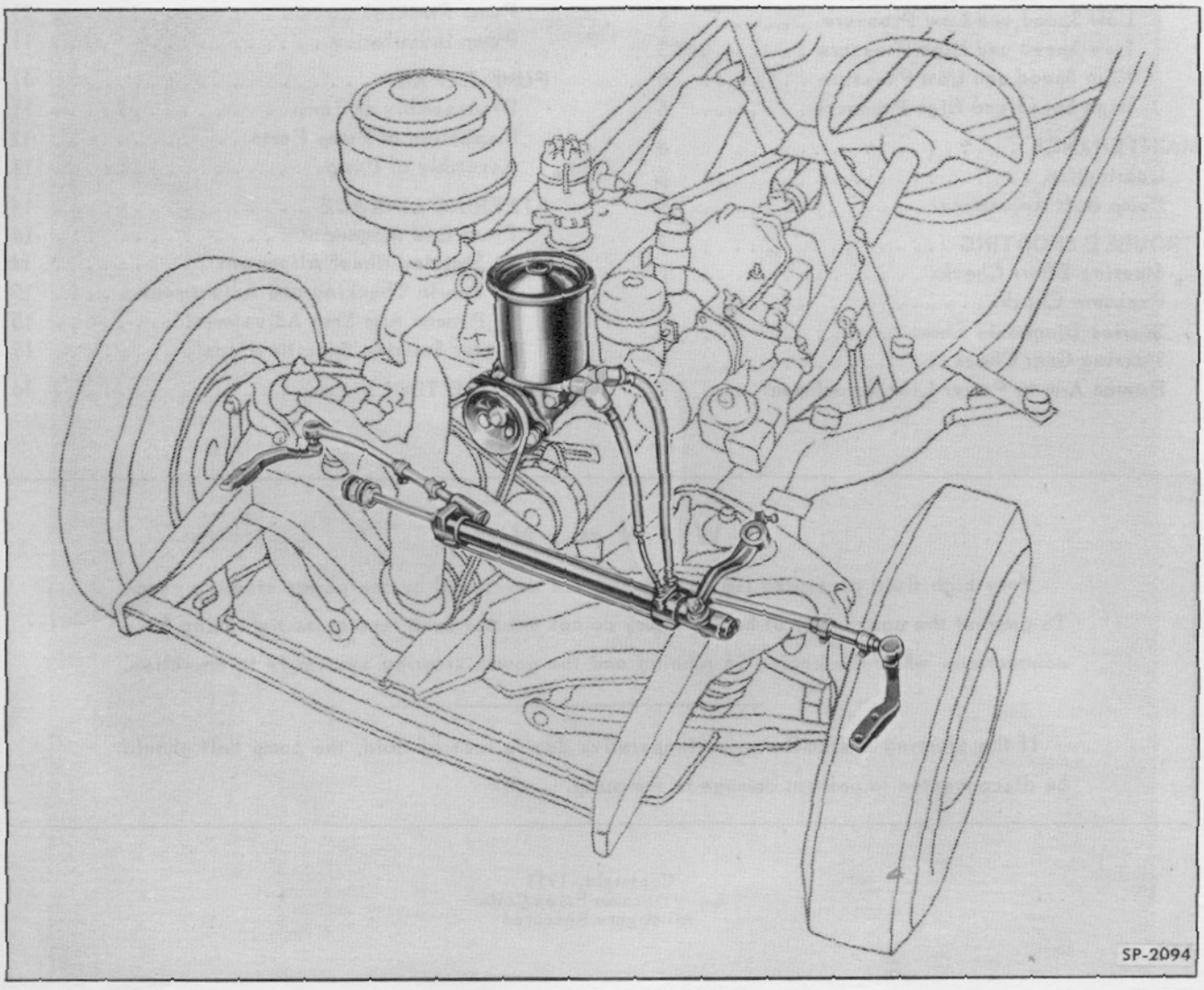

Fig. 1—Power Steering Installation

tached to a stud in the power link and two adjustable tie rods connect the power link to the steering knuckle arms. A modified gear type hydraulic pump and reservoir assembly is mounted on the engine (Fig. 1) and driven by a belt from the crankshaft pulley. A pressure hose and a return hose provide fluid passages between the pump and the power link. The pressure hose is an assembly of a large diameter upper hose and a small diameter lower hose with a built in restrictor to eliminate noise from harmonic vibrations. The return hose is a single piece hose and has larger fittings than the pressure hose.

A new exhaust pipe is used on Hydra-Matic equipped vehicles to provide clearance for the new linkage. A larger diameter sway bar is installed to offset body and frame sway which tends to be more pronounced with power steering because of the quicker steering response.

POWER LINK

The power link is installed as part of the relay type steering linkage (see Fig. 2), serving as a drag link.

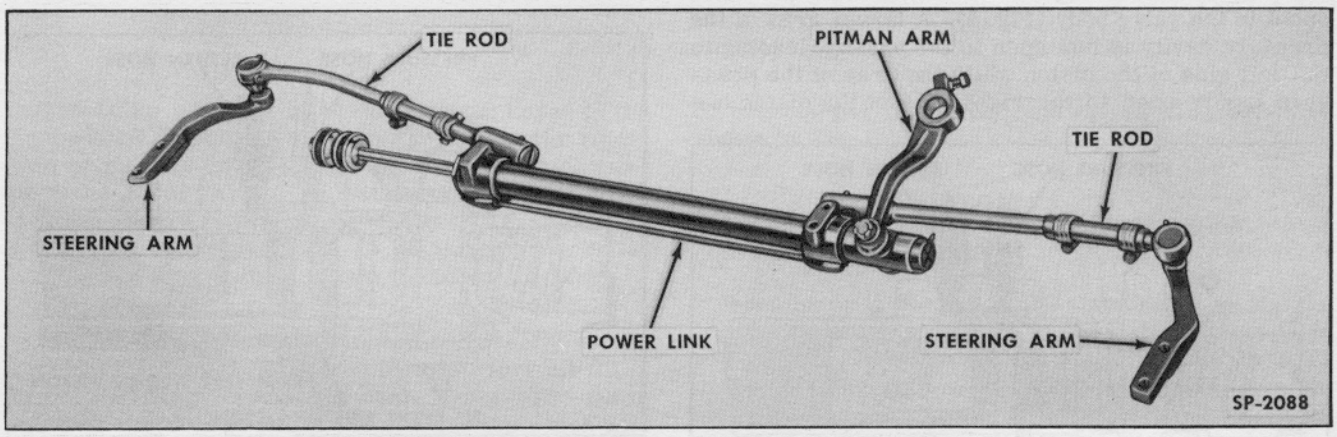

Fig. 2–Power Link

Installation of the power steering system on 1953 Kaiser vehicles involved several small changes in the vehicle. The water pump body was changed to accommodate a bracket for mounting the hydraulic pump. Additional pulleys installed on the present crankshaft pulley and water pump pulley are used for the pump drive belt. To gain clearance for the drive belt, the radiator was moved forward approximately 5/8 inch by changing the shroud panel and radiator attachment and adding spacers between the radiator and radiator cradle. A new radiator inlet hose is also used.

The center point steering linkage used with the manual steering system is replaced by a relay type linkage composed of new steering knuckle arms, tie rods, pitman arm and the power link. The power link piston rod is attached at one end to a bracket on the frame. Adjustable stops (one on pitman arm and one on frame) control the amount of pitman arm travel.

The piston rod of the double acting power link (Fig. 3) is attached to a bracket on the right frame side rail, thereby causing the cylinder to move when hydraulic pressure is applied on either side of the piston. The tie rods are connected to ball studs which are firmly attached to the cylinder.

The control valve body is an integral part of the power link and moves with the power link cylinder. It is located on the end opposite the piston rod. A precision spool type valve is centered in the valve body by springs at either end. A stud, attached to the pitman arm, extends through the valve body and can be moved in either direction to change the position of the valve spool.

Neutral Position

When force is not being applied to the steering wheel, the valve spool remains centered in the valve

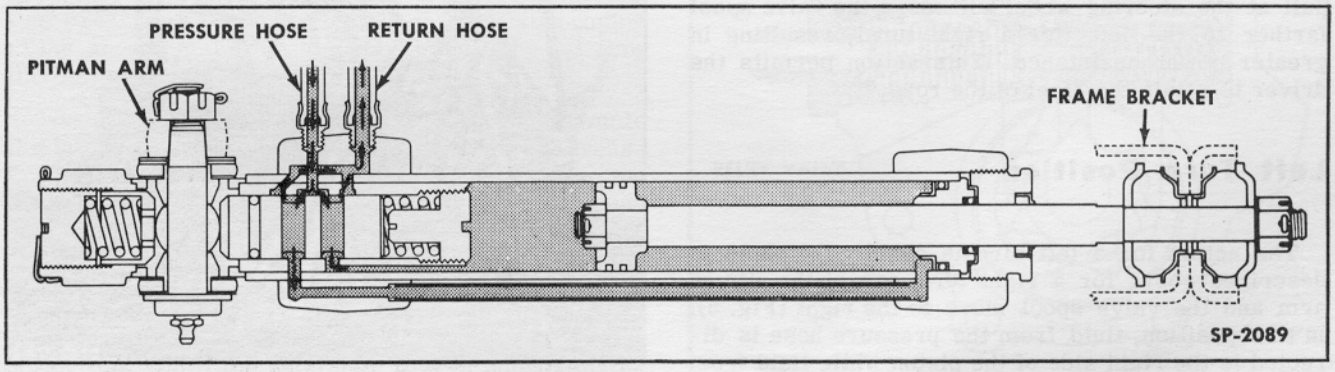

Fig. 3–Power Link - Cross Section (Neutral Position)

body as shown in Fig. 3. With the valve spool in this neutral position, fluid from the pump flowing through the pressure hose enters the valve body and is bypassed to the return hose back to the pump reservoir. Equal force is exerted on each side of the piston, thereby holding the cylinder stationary.

Right Turn Position

When the steering wheel is turned for a right turn, the pitman arm swings to the left, moving the valve spool in the valve body (Fig. 4). A larger area of the pressure cavity is now open to the passage leading to the left side of the piston while the area of the pressure cavity open to the right side of the piston has

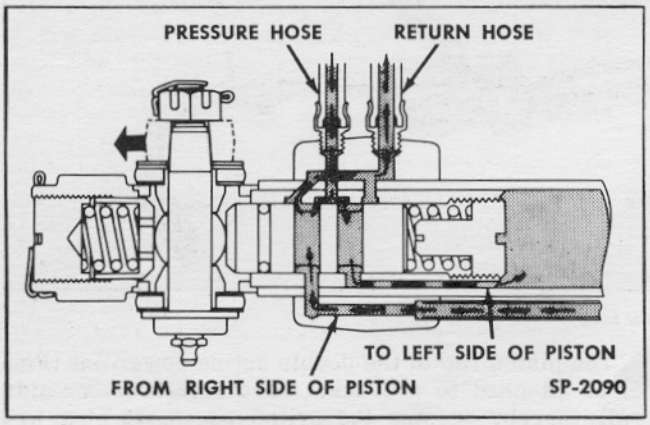

Fig. 4—Power Link - Cross Section (Right Turn)

been reduced. At the same time, the return passage for the left side of the piston has been blocked off by the valve spool and the return passage for the right side of the piston has been opened. This results in a greater force on the left side of the piston and moves the cylinder to turn the front wheels to the right.

As soon as the driver stops turning the steering wheel, the valve spool is returned to its neutral position by the springs in the valve body and power assistance is stopped.

Notice that the difference in the area of the pressure cavity open to the left side of the piston as compared to the right side of the piston is dependent upon the pull on the steering wheel. A greater amount of pull at the steering wheel will move the valve spool farther to the left (for a right turn), resulting in greater power assistance. This action permits the driver to retain the "feel of the road."

Left Turn Position

The action for a left turn is exactly the same as described above for a right turn, except the pitman arm and the valve spool move to the right (Fig. 5). In this position, fluid from the pressure hose is directed to the right side of the piston while fluid from the left side is allowed to enter the return hose and the cylinder will move to turn the front wheels to the left.

Steering Without Power Assist

When the pump is not supplying fluid pressure, steering is accomplished entirely by manual effort. When the steering wheel is turned, the pitman arm will move the power link by manual force. Due to the arrangement of the pressure and return cavities in the valve body, fluid cannot be trapped in the cylinder to resist movement.

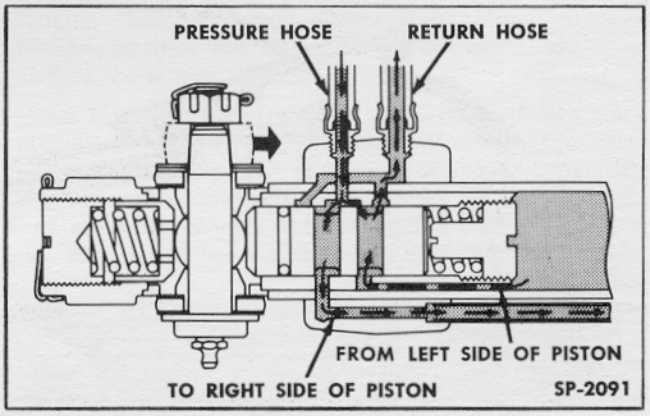

Fig. 5—Power Link - Cross Section (Left Turn)

Steering without power assist will be somewhat more difficult than steering with a conventional manual type steering system due to the decreased steering ratio of the power steering linkage.

POWER STEERING PUMP

The power steering pump is a positive displacement modified gear type pump mounted on the engine in position to be driven by a belt from the crankshaft pulley (Fig. 6).

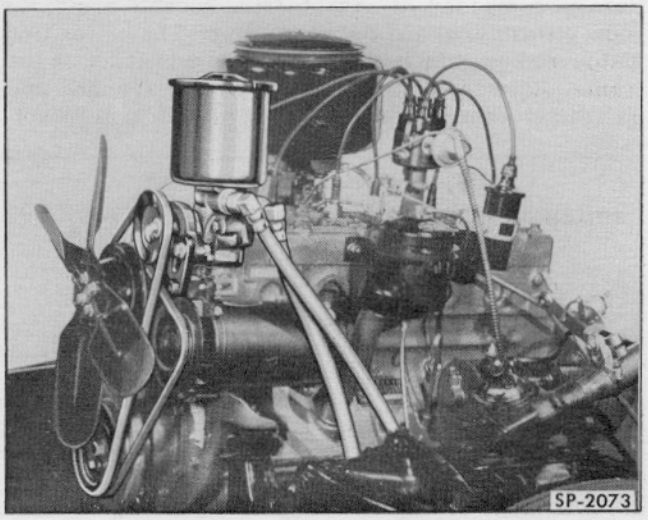

Fig. 6—Power Steering Pump - Mounted

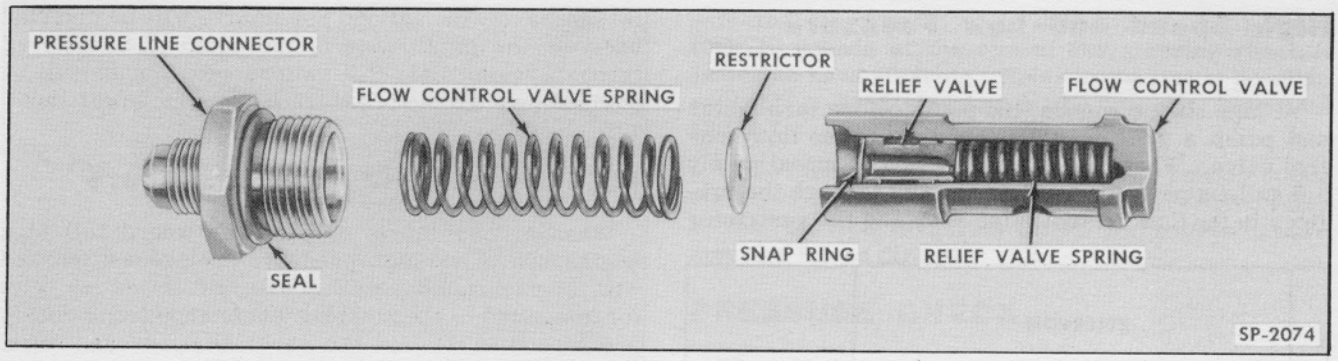

Fig. 7–Relief and Flow Control Valve

The pump consists of an inner rotor, keyed to the pump shaft, which drives a free turning outer rotor. The pump body is designed with cavities which connect the reservoir to the intake side of the rotors. Another cavity from the output side of the rotors allows fluid, under pressure, to go through the relief and flow control valve and into the pressure line.

Fluid returning to the pump goes directly to the reservoir where it is filtered by a full flow oil filter before starting through its cycle again. The filter has a spring loaded relief valve at the top which will open under approximately 10 psi pressure in the return line to allow hydraulic fluid to by-pass the filter. This feature is important for the few seconds during a cold weather start when the hydraulic oil is more viscous than usual and may not flow through the filter easily.

A combination spring loaded pressure relief and flow control valve (Fig. 7) in the pump body limit both the maximum fluid pressure and the volume of fluid being pumped through the pressure line to the power steering unit. The pressure relief and flow control valve are serviced as an assembly, therefore they should not be disassembled. However, the operation of both valves under different pumping conditions is explained in the following paragraphs.

Low Speed and Low Pressure

When the pump is operating at low speed and the line pressure is low (a normal condition with engine idling and no force on steering wheel) the oil flow through the pump is shown in Fig. 8.

The oil flows from the reservoir into the pump to the intake side of the rotors. Oil enters the increasing pockets between the rotors and is moved to the output side where the pockets become smaller and force oil out under pressure to the flow control valve. Oil enters the flow control valve through small holes on each side of the valve and passes through the center of the springs, pressure relief valve, and flow restrictor to enter the pressure line leading to the power link. Until the maximum flow of approximately 1.9 gallons per minute or the maximum pressure of 500-800 psi is attained, the valves will remain as shown in Fig. 8.

Low Speed and High Pressure

When force is applied to the steering wheel and the front wheels resist turning (a normal condition when wheels are turned in against a curb), fluid pressure in the steering system will increase to maximum. In order to prevent damage to hoses or power steering parts, a spring loaded pressure relief valve located inside the flow control valve will open (Fig. 9) and allow oil to return to the pump inlet cavity when pressure reaches 500 - 800 psi maximum. The relief valve is designed with a larger outside diameter on one end, therefore a larger area upon which the fluid can exert a force. Whenever this force is great enough to overcome the pressure relief valve spring, the relief valve opens.

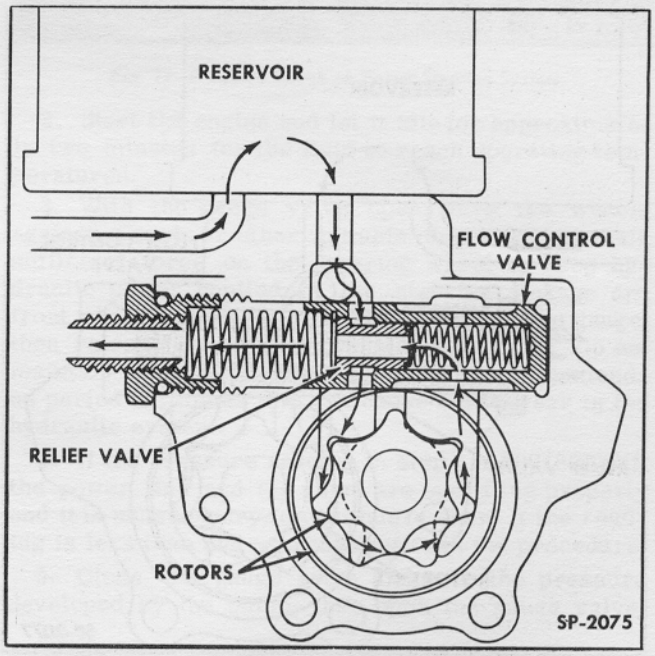

Fig. 8–Pump Oil Flow - Low Speed - Low Pressure

High Speed and Low Pressure

At high engine speeds, the pump rotors turn faster and pump a greater volume of fluid to the flow control valve. When this volume exceeds approximately 1.9 gallons per minute, fluid flowing through the orifices in the flow control valve body and the restrictor

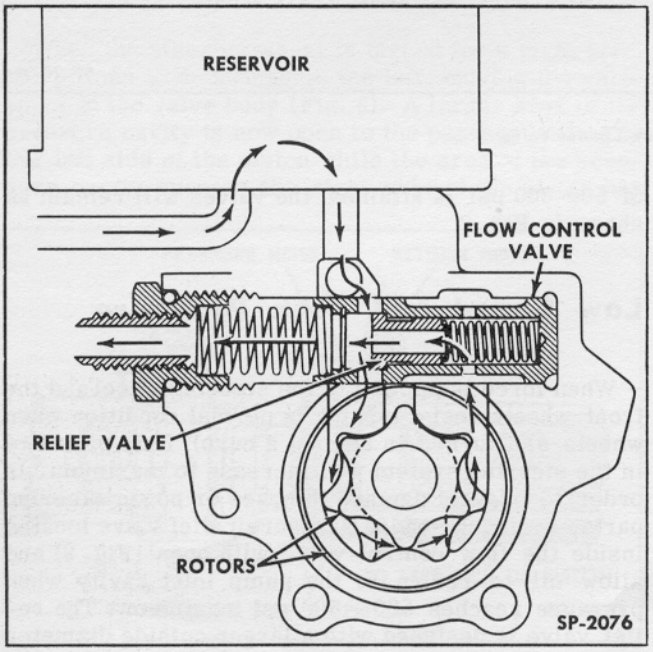

Fig. 9–Pump Oil Flow-Low Speed-High Pressure

develops sufficient force to compress the flow control valve spring. This moves the flow control valve opening the pressure cavity directly to the flow by-pass area as shown in Fig. 10. In this position, all fluid

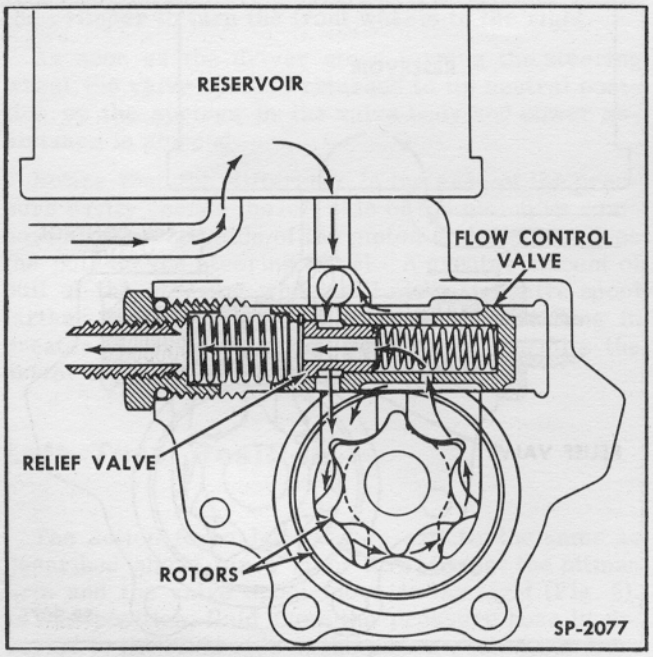

Fig. 10–Pump Oil Flow-High Speed-Low Pressure

in excess of 1.9 gallons per minute will be diverted back to the intake side of the pump to be pumped through again. Only 1.9 gallons per minute will be pumped through the pressure link to the power link.

High Speed and High Pressure

When a condition is encountered where both high engine speed and high pressure are present (parked with engine running well above idle speed and with force applied to the steering wheel when front wheels are turned in against the curb), the pressure relief valve and the flow control valve will both open. The principle of operation for each valve has been explained in the preceding paragraphs.

MAINTENANCE

The fluid level in the pump reservoir should be checked every 2,000 miles and maintained to the indicated level near the top of the reservoir. Always check for leaks before adding any fluid to the system. Use only Automatic Transmission Fluid (type A) from containers bearing the marking "AQ-ATF" followed by a number. Total capacity of the system is 3 pints.

CAUTION: Always wipe dirt from cover before removing to check fluid level. If excessive dirt has settled around air vent in center of cover, remove cover, wash with solvent and thoroughly dry. Check position of cover gasket before installing cover.

LUBRICATION

Proper lubrication of the steering gear and front suspension and correct alignment of the front end are very important on vehicles equipped with power steering.

Lubrication of the steering gear and tie rods remains the same as specified for manual steering linkage. Two fittings on each tie rod and one fitting in the pitman arm stud at the power link must be lubricated with chassis lubricant every 1,000 miles (see Fig. 21). The idler lever and drag link (3 fittings) shown in the present lubrication charts are not used in power steering linkage.

PUMP BELT ADJUSTMENT

The power steering pump belt must be checked frequently and adjusted whenever necessary to prevent noise and slippage of the belt.

To adjust the belt tension, loosen the pump mounting bolts and pivot the pump upward to take up slack. At proper tension, the belt should not deflect more than 1/4 inch when thumb pressure is exerted midway between the power steering pump and water pump pulleys as shown in Fig. 11.

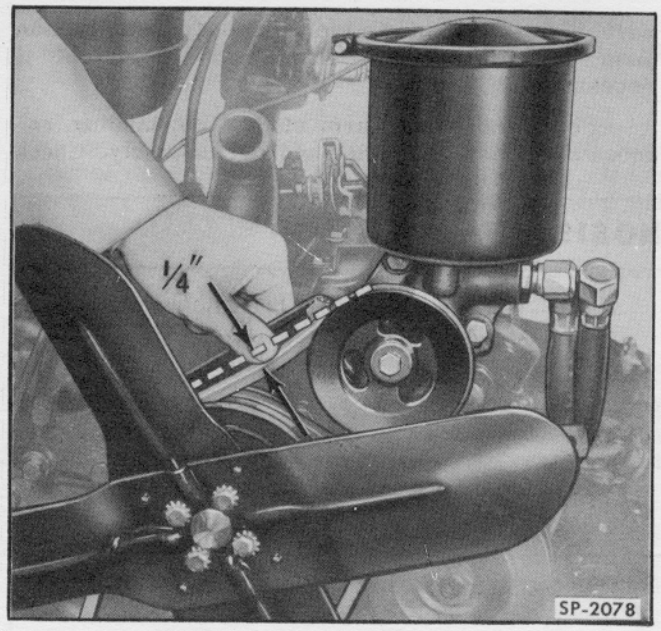

Fig. 11—Adjusting Pump Belt Tension

TROUBLE SHOOTING

Trouble shooting on the power steering system is relatively easy provided the description and operation of the pump and the power link are understood. Another important factor in trouble shooting on this system is to make a thorough diagnosis before condemning the hydraulic units as faulty.

In addition to checking the steering effort (see "Steering Effort Check"), power steering operation should be checked under actual operating conditions. A good testing procedure is to drive the vehicle 15 or 20 MPH and make several turns in each direction. After each turn, the steering wheel should return to center without aid from the driver. The steering should hold reasonably well to the straight ahead position whenever the driver releases the steering wheel.

In many instances, the cause of improper power steering will be readily apparent to the mechanic after studying this manual. When the cause of trouble is not known, the "Service Diagnosis Chart" should be referred to and the items listed for the particular symptoms encountered should be checked, starting with the easier operations first, until the trouble is found.

STEERING EFFORT CHECK

The steering effort required to turn the wheels can be measured by attaching Spring Scale C-690 to the spoke near the rim of the steering wheel. With the engine running at idle speed (425 to 450 RPM with Hydra-Matic in neutral) and the front wheels on a dry, smooth concrete floor, or smooth steel plates, a 4-10 pound pull should be sufficient to turn the steering wheel one full turn in either direction from center.

If the steering effort in both directions is more than 10 pounds at the rim of the steering wheel, it indicates hard steering. Refer to the list of possible causes for hard steering in the "Service Diagnosis Chart."

If the steering effort is more than 10 pounds in one direction and very low in the other direction, refer to the "Service Diagnosis Chart" for causes of hard steering in one direction only.

PRESSURE CHECK

When the power steering system does not furnish proper assistance on turns, and the simpler checks have been made (see "Service Diagnosis Chart"), a pressure check may be necessary to determine if the pump or the power link is causing the trouble. Proceed as follows:

1. With the engine off, install Pressure Gauge KF-151 in the pressure line at the pump as shown in Fig. 12. Turn the gauge valve to the open position.

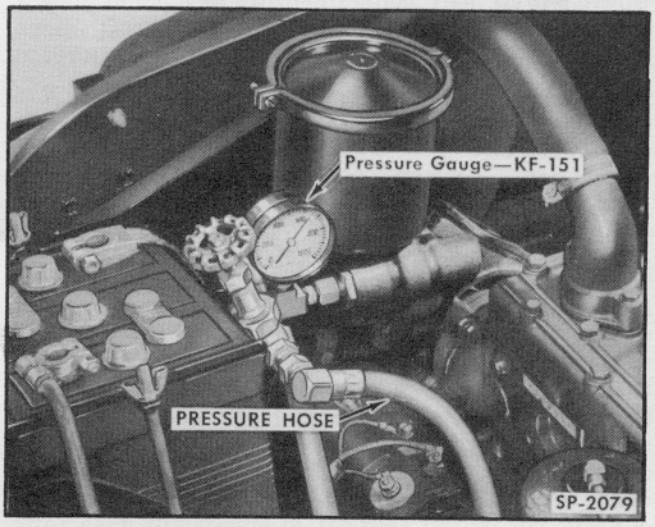

Fig. 12—Pressure Check on Power Steering System

2. Start the engine and let it idle for approximately two minutes for the fluid to reach operating temperatures.

3. With the gauge valve open, turn the wheels against a curb or other suitable object and maintain sufficient force on the steering wheel to keep hydraulic power applied to the steering linkage and front wheels. Note the pressure shown on the gauge, then release the steering wheel. CAUTION: Do not maintain force on the steering wheel for any extended period of time as this can cause undue wear in the hydraulic system.

4. If the pressure reading in step 3 is 500-800 psi, the power link and the pump are operating properly and it is unnecessary to continue further. If the reading is less than 500 psi, continue with the procedure.

5. Close the gauge valve and note the pressure developed by the pump, then open the gauge valve.

CAUTION: Do not leave gauge valve closed for more than three or four seconds.

6. If the pressure reading in step 5 increased to 500-800 psi, the pump is delivering sufficient pressure and the fault is in the power link. Proceed as follows to correct the power link:

a) Check the pitman arm and stud to make sure it does not bind on the valve body (see "Pitman Arm to Power Link Attachment"). Correct if necessary.

b) If the pitman arm stud is not binding, remove the power link piston and rod assembly. Check

SERVICE DIAGNOSIS CHART

Symptom—HARD STEERING IN BOTH DIRECTIONS

Possible Cause:	*Remedy:*
1. Leak in steering system.	Correct leak, fill reservoir to proper level.
2. Pump belt slipping or broken.	Install new belt, tighten.
3. Fluid level low.	Check for leak, fill reservoir to proper level.
4. Steering gear and linkage not lubricated.	Lubricate properly.
5. Tire pressure too low.	Inflate to proper pressure.
6. Pitman arm and stud binding on power link.	See "Pitman Arm to Power Link Attachment."
7. Bend in power link piston rod.	Replace piston and rod.
8. Low pump pressure (see "Pressure Check").	
a) Relief and flow control valve unit stuck.	Remove and clean.
b) Flow control valve spring weak or broken.	Replace spring.
c) Relief valve spring weak or broken.	Replace relief and flow control valve unit.
d) Rotors not turning.	Replace inner rotor drive key.
e) Rotors worn.	Replace both rotors.
f) Pump body or cover worn.	Replace body or cover.
9. Loss of pressure in power link (see "Pressure Check").	
a) Internal fluid leak past piston.	Replace power link piston and rod.
b) Internal leak past valve.	Replace power link.
10. Insufficient fluid flow in system.	
a) Flow restrictor plugged.	Remove and clean or replace restrictor.
b) Hoses plugged or restricted.	Replace hoses.
11. Bind in steering column or gear.	See "Steering Gear Check."
12. Improper front end alignment.	Align front end.
13. Valve in power link misaligned or sticking.	See "Power Link Adjustment."

Symptom—SMALLER TURNING RADIUS IN ONE DIRECTION

1. Pitman arm stops not adjusted properly.	Adjust pitman arm stops.

Symptom—HYDRAULIC FLUID LEAKS (locations)

1. At hose fittings.	Replace hose fittings.
2. At pump body.	Remove pump, disassemble and replace seals and gaskets.
3. Around piston rod on power link.	Replace piston rod guide. (Replace piston rod if it is scored or rough.)
4. At valve end of power link.	Replace power link.

Symptom—HARD STEERING IN ONE DIRECTION ONLY.

Possible Cause:	*Remedy:*
1. Tire pressure too low.	Inflate to proper pressure.
2. Bend in power link piston rod.	Replace piston rod.
3. Bind in steering column or gear.	See "Steering Gear Check."
4. Improper front end alignment.	Align front end.
5. Valve in power link misaligned or sticking.	See "Power Link Adjustment."

Symptom—VEHICLE ATTEMPTS TO TURN UNLESS FORCE IS APPLIED TO HOLD STEERING WHEEL

1. Tire pressure uneven.	Inflate to proper pressure.
2. Pitman arm and stud binding on power link.	See "Pitman Arm to Power Link Attachment."
3. Valve in power link misaligned or sticking.	See "Power Link Adjustment."

Symptom—POOR RECOVERY ON TURNS.

1. Tire pressure too low.	Inflate to proper pressure.
2. Pitman arm and stud binding on power link.	See "Pitman Arm to Power Link Attachment."
3. Bind in steering column or gear.	See "Steering Gear Check."
4. Bind in steering knuckles. (Remove wheel and check fit of steering knuckles on king pin with spring scale - see Shop Manual.)	Check king pin and bushings, shim properly.
5. Bend in power link piston rod.	Replace piston rod.
6. Improper front end alignment.	Align front end.
7. Valve in power link misaligned or sticking.	See "Power Link Adjustment."

Symptom—NOISE

1. Pump belt tension incorrect.	Adjust belt tension.
2. Low fluid level.	Check for leak, fill reservoir to proper level.
3. Pump drive pulley retaining bolt loose.	Tighten to proper torque.
4. Pump drive pulley key does not fit.	Replace key or shaft.
5. Pump shaft bearing worn.	Replace ball bearing.
6. Bushings worn in pump body or cover.	Replace pump body or cover.
7. Restricted air vent in reservoir cover.	Remove cover and clean.
8. Dirt and sludge in pump.	Disassemble pump and clean. Drain system and refill with clean fluid.
9. Pitman arm stud loose.	Tighten nut on pitman arm stud. Check steering operation.
10. Tie rod clamps tightened in wrong position.	Loosen clamps and retighten with bolts in a vertical position at rear of tie rods.
11. Power link bracket on frame hitting lower suspension arm.	Move bracket rearward.
12. Noise in power link valve.	Replace power link.

the piston and rings and replace if necessary. Make another pressure check and, if the pressure is still low, replace the power link.

7. If the pressure reading in step 5 did not increase to 500-800 psi, replace the relief and flow control valve unit and the flow control spring. If the pressure is still low, the pump must be removed and overhauled (see "Pump Repair").

8. If the pressure reading ever exceeds 800 psi, replace the relief and flow control valve unit.

STEERING GEAR CHECK

Steering column misalignment or improper steering gear adjustments can cause a bind at the gear which will not allow the power link to operate properly and may cause hard steering or poor recovery after turns.

The correct procedures for aligning the steering column and making steering gear adjustments are given in detail in the Shop Manual and Shop Manual Supplement. The adjustments should be made to the minimum limits; that is a 1/4 pound pull on the steering wheel for worm bearing adjustment and 1 pound pull for worm to roller backlash adjustment.

PITMAN ARM TO POWER LINK ATTACHMENT

The pitman arm attaches to a stud which extends through the valve portion of the power link. When the pitman arm is drawn down on the stud properly and the attaching nut is tightened to 55-65 foot-pounds torque (using a torque wrench), the pitman arm and stud should fit snug on the power link, however, they should not fit so tightly that they bind on the power link. It is essential that the pitman arm and stud are able to move a few thousandths sideways to operate the power link valve.

If the pitman arm and stud are drawn down too tightly on the power link, the steering effort will increase and the wheels will not return properly after a turn. In such a case, it may be necessary to disengage the pitman arm from the stud and remove one of the two metal washers on the stud between the upper rubber cushion and the pitman arm. If this does not correct the condition, it may be necessary to replace the stud and/or the pitman arm.

POWER LINK REPLACEMENT

Before the power link is replaced, proper checks must be performed to eliminate the possibility of other items causing steering difficulty (see "Service Diagnosis Chart"). When it is finally determined that the valve portion of the power link is at fault and cannot be corrected by adjusting as detailed under "Power Link Adjustment", the complete assembly should be replaced. Proceed as follows:

1. Raise vehicle on a hoist. Remove cotter pins and back out plugs in ends of tie rods to disconnect tie rods from ball studs on power link.

2. Disconnect hoses at power link, after noting the position of the hose connectors so they can be replaced in the same position. Cap hose ends and install plugs in power link to keep dirt out and to prevent fluid from draining out.

3. Remove cotter pin and nut attaching pitman arm to stud in power link. Tap on side of pitman arm with a hammer to loosen stud. Do not pry between pitman arm and valve as this may damage the washers on the stud.

4. Remove cotter pin, nut, retainers and insulator from end of piston rod to disconnect piston rod from frame bracket and remove power link.

5. Install a new power link by reversing the above procedure. Make certain dirt does not enter fluid lines while installing unit. Use a torque wrench to tighten pitman arm stud nut to 55-65 foot-pounds. Install tie rods to power link, turn plugs in tight, then back out 1/4 to 1/2 turn.

6. Fill pump reservoir, start engine and turn wheels in each direction to stops, then fill reservoir again. Check operation of power steering system and carefully inspect all connections for leaks.

7. Check and adjust front wheel toe-in and steering wheel alignment if the tie rod length was disturbed during the above procedure.

POWER LINK ADJUSTMENT

When it has been determined that the valve spool in the power link is not adjusted properly, it will be possible to make the adjustment in most cases by changing the position of the plug in the valve end of the power link. The plug can be turned in or out, as required, 1/6 turn at a time. In no case, should it be necessary to turn it a total of more than 1/2 turn to correct the adjustment. A road test should be made after each adjustment of the plug to find out how the adjustment affects the steering action.

One or more of the following symptoms will be apparent during a road test indicating the direction plug must be turned.

Turn plug IN when:	Turn plug OUT when:
a) Left turn is too hard.	a) Right turn is too hard.
b) Right turn is too easy.	b) Left turn is too easy.
c) Poor recovery after right turns; good recovery after left turns.	c) Poor recovery after left turns; good recovery after right turns.
d) Vehicle tends to wander to the right.	d) Vehicle tends to wander to the left.

The procedure for adjusting the power link valve is as follows:

1. Scribe a mark on the plug in the valve end of the power link to indicate the original position of the plug.

2. Remove cotter pin and turn plug in or out 1/6 of a turn (as determined by the symptoms above). If plug is held by a wire and lead seal, remove seal and after adjustment, replace with cotter pin.

3. Road test the vehicle.

4. If steering action improved but is still not correct, turn the plug an additional 1/6 turn, then road

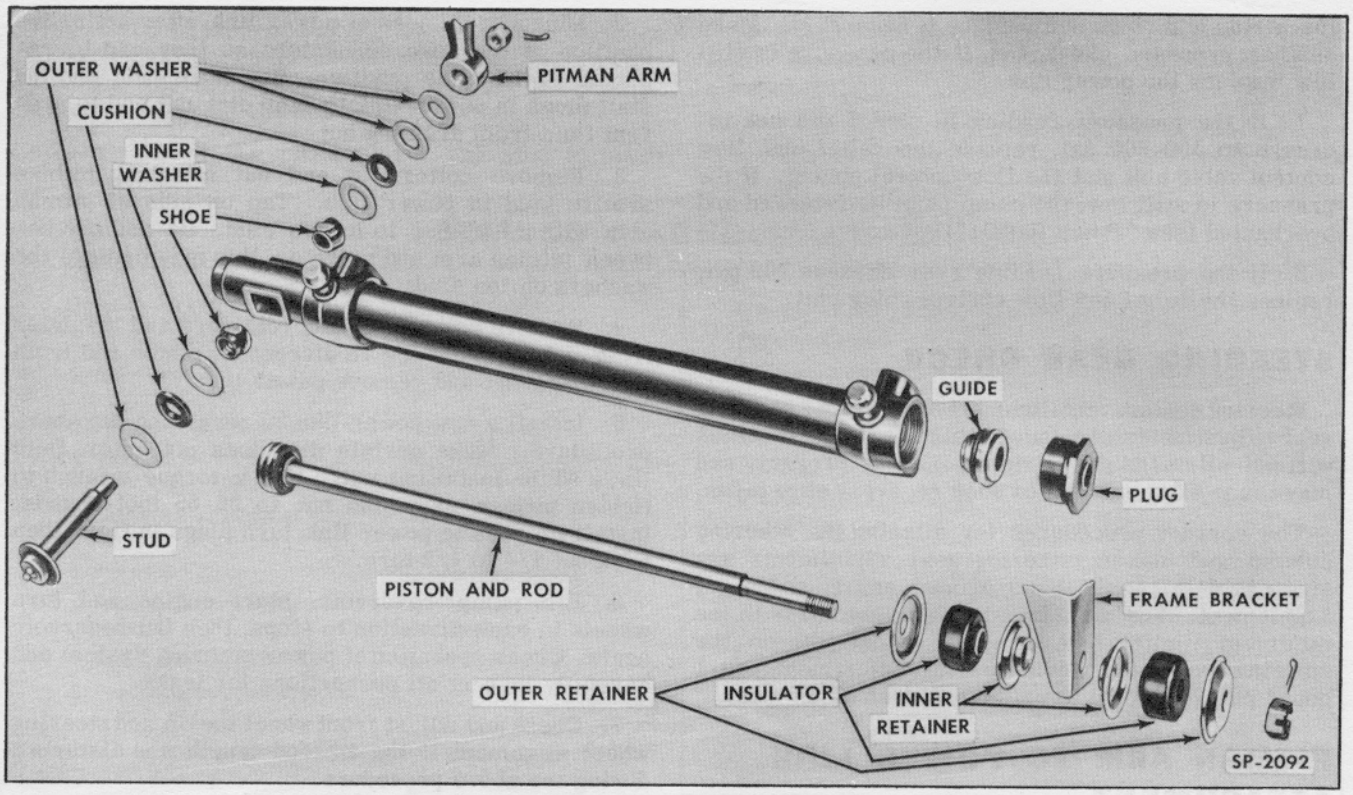

Fig. 13–Power Link-Exploded View

test the vehicle. If necessary, the plug can once more be turned an additional 1/6 turn.

5. When steering action is proper, install cotter pin to lock the position of the plug in the power link. If steering action is still not correct after the plug has been moved 1/2 of a full turn, replace power link.

POWER LINK REPAIR

Parts of the power link such as the pitman arm stud, washers, cushions, shoes, the piston and rod, rod guide and seals, rod plug, or power link to frame bracket attaching parts (see Fig. 13) may be replaced when necessary.

The spool valve springs and component parts inside the power link valve body are selectively fitted at the time of manufacture. These parts are not to be removed or replaced.

REPLACEMENT OF PITMAN ARM STUD

Occasionally it may become necessary to replace the pitman arm stud or the washers, cushions and shoes on the stud. These parts can be replaced with the power link installed in the vehicle as follows:

1. Raise vehicle on a hoist. Remove cotter pin and nut attaching pitman arm to stud in power link. Tap on side of pitman arm with a hammer to loosen stud. Do not pry between pitman arm and valve as this may damage the washers on the stud.

2. Pull stud out of valve body. Washers, cushions and shoes are then removed as loose parts.

3. Obtain a pitman arm stud kit and assemble the parts in their correct order as shown in Fig. 13.

4. Install nut and cotter pin attaching stud to pitman arm. Tighten nut to 55-65 foot-pounds torque. (See "Pitman Arm to Power Link Attachment" for details on this fit.)

5. Lubricate the pitman arm stud, then drive vehicle to check steering.

REPLACEMENT OF PISTON AND SEALS

Whenever such difficulties as a leak around the piston rod, excessive pressure loss past the piston, or damaged rod are encountered, the necessary parts can be replaced as follows:

1. Raise vehicle on a hoist and disconnect power link piston rod from frame bracket.

2. Unscrew plug from end of cylinder and pull on piston rod to remove piston, rod guide and plug.

3. Inspect parts carefully for damage or wear. If either of the two seals in the rod guide are damaged, replace the guide. If the piston rings are worn excessively or broken, or if the piston rod is rough or damaged, replace the piston and rod assembly.

4. Insert piston in power link cylinder by rotating carefully to avoid damage to the piston rings.

5. Slide rod guide in against shoulder in cylinder.

6. Install plug and tighten.

7. Assemble piston rod to frame bracket with retainers and insulators in proper position (see Fig. 13) and tighten nut to 18-23 foot-pounds torque. Install cotter pin.

8. Start the engine and turn wheels in each direction several times. Check for leaks and fill pump reservoir to proper level.

PUMP REPLACEMENT

The pump and reservoir assembly can be replaced as a unit if so desired, or the complete assembly can be removed from the vehicle and repaired on the bench after proper tests have been made to definitely determine the pump is at fault.

PUMP REMOVAL

The pump and reservoir assembly can be removed from the vehicle by the following procedure:

1. Cover the generator to protect it from accidental spillage of power steering fluid.

2. Disconnect hoses from pump and install caps on pump connectors, then pour out oil after pump is removed from vehicle. Support the hoses to prevent drainage of steering unit, by tying in an upright position. Cover hose ends to prevent dirt from entering.

3. Remove pump pulley attaching bolt and washer.

4. Loosen two bolts attaching pump to mounting bracket.

5. Remove pump belt and slide pump pulley and key off pump drive shaft.

6. Remove two pump mounting bolts and remove pump and reservoir assembly.

PUMP INSTALLATION

The pump and reservoir assembly can be installed to the vehicle as follows:

1. Position pump assembly on mounting bracket and install two attaching bolts and nuts. Do not tighten attaching bolts.

2. Slide pump pulley and key onto pump drive shaft and install attaching bolt and washer. Tighten pump pulley attaching bolt to 8-12 foot-pounds torque.

3. Install pump belt over pulley.

4. Adjust pump belt tension as described under "Pump Belt Adjustment" in this manual.

5. Connect hoses to pump and tighten hose fittings. Fittings should be in approximately the same position they were in originally, otherwise the hoses may rub against parts in the engine compartment.

6. Fill pump reservoir to within one inch from top. Start engine and turn wheels each way to maximum position several times to purge air from the system then refill reservoir to proper level. Always use new, clean Automatic Transmission Fluid (Type A) marked "AQ-ATF" followed by a number.

7. Install reservoir cover, gasket and clamping ring.

8. Carefully check all connections for leaks.

PUMP REPAIR

The filter, reservoir, reservoir to pump seals, hose connectors and seals, and the relief and flow control valve unit can be removed and inspected or replaced without removing the pump assembly from the vehicle. The pump body, rotors, shaft, or bearings, however, cannot be replaced unless the pump assembly has been removed from the vehicle.

The procedures below are for a complete disassembly, inspection and assembly of the pump. Normally, only certain portions of the procedure will be necessary, depending on which parts are to be replaced.

DISASSEMBLY OF PUMP

After the pump is removed from the vehicle and the exterior is cleaned, it can be disassembled as follows (see Fig. 14):

1. With reservoir cover, gasket and clamping ring removed, the filter retainer and filter can be removed.

2. Remove filter stud and two reservoir to pump attaching screws and remove reservoir.

3. Remove two large and two small O-ring seals from top of pump body.

4. Remove pressure hose connector, spring, restrictor, and relief and flow control valve unit from pump cover. Do not disassemble the relief and flow control valve unit. If defective, it must be replaced as an assembly.

5. Remove return hose connector and gasket from pump body only to replace connector or gasket.

6. Remove the pump body to cover screws and remove cover carefully to prevent rotors from dropping off shaft. Remove large body to cover gasket and small O-ring seal.

7. Remove rotors by turning pump body over and rotating shaft so rotors will fall free. NOTE: Use care to avoid damaging rotors or bushing in body (for outer rotor). Keep both rotors in same relative position so they can be installed properly.

8. Remove rotor drive pin from shaft.

9. Remove bearing snap ring from pump body using Snap Ring Pliers C-760 (Fig. 15).

10. Remove shaft and bearing assembly from

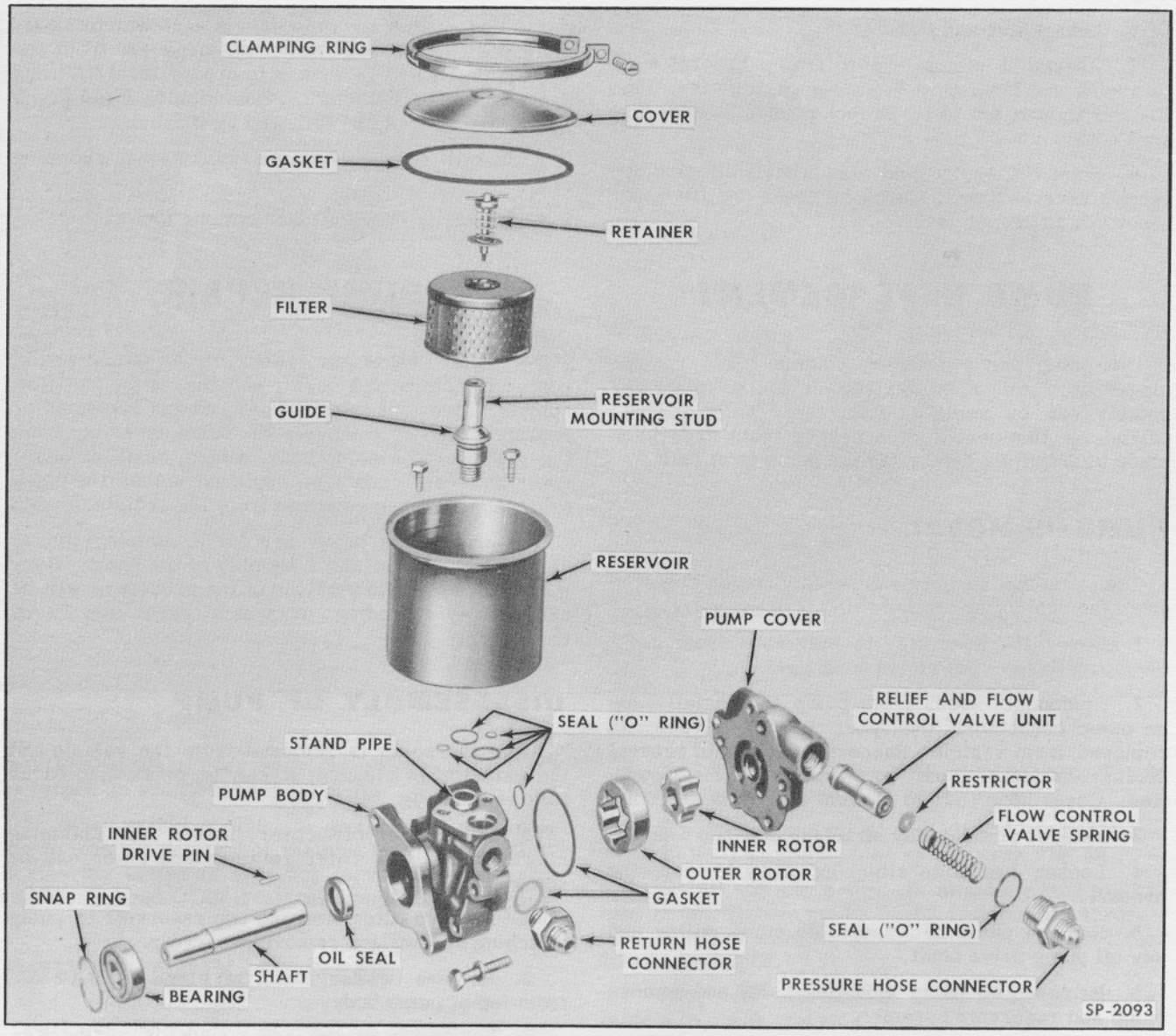

Fig. 14–Power Steering Pump - Exploded View

pump body. If necessary, tap end of shaft lightly to remove.

11. If pump shaft or pump shaft bearing needs to be replaced, press out shaft on an arbor press, supporting inner race of bearing.

12. If pump shaft oil seal needs to be replaced, remove it from pump body with a suitable tool. Use care not to damage bushing in pump body.

INSPECTION OF PUMP PARTS

After the pump is disassembled, wash all parts in suitable cleaning solvent and inspect for damage or wear. Discard all gaskets and seals as new parts should be used to protect against any possible leakage. Proceed with the following checks:

1. Place rotors in pocket of pump body and check clearance between rotors using a feeler gauge (Fig. 16). If clearance exceeds .008 inch, replace both rotors (rotors are serviced in sets only).

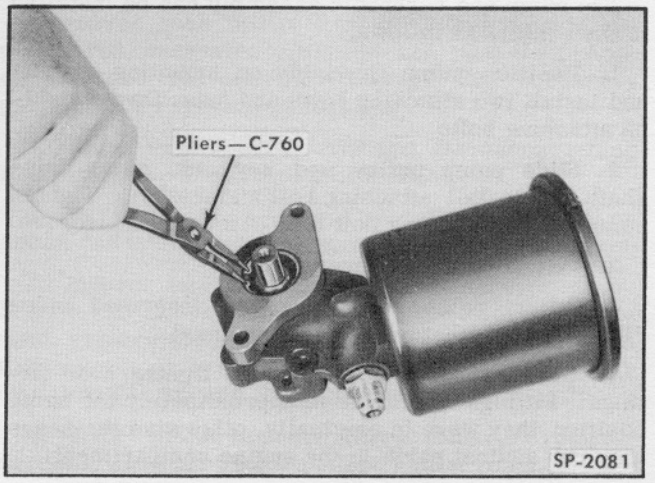

Fig. 15–Removing Bearing Snap Ring

2. Using a feeler gauge, check clearance between outer rotor and bushing in pump body (Fig. 17). If clearance exceeds .006 inch, replace pump body.

3. Place a straight edge across pump body (Fig. 18) and use a feeler gauge to check side clearance of rotors. If clearance exceeds .0025 inch, replace pump body.

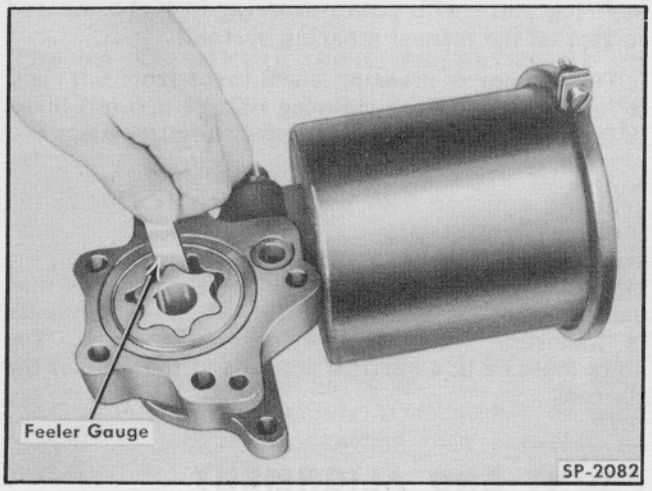

Fig. 16–Checking Clearance Between Rotors

4. Inspect shaft bushings in pump body and pump cover and the bushing in pocket of pump body (for outer rotor). If surfaces are scored or show evidence of excessive wear, replace pump body assembly and/or pump cover assembly.

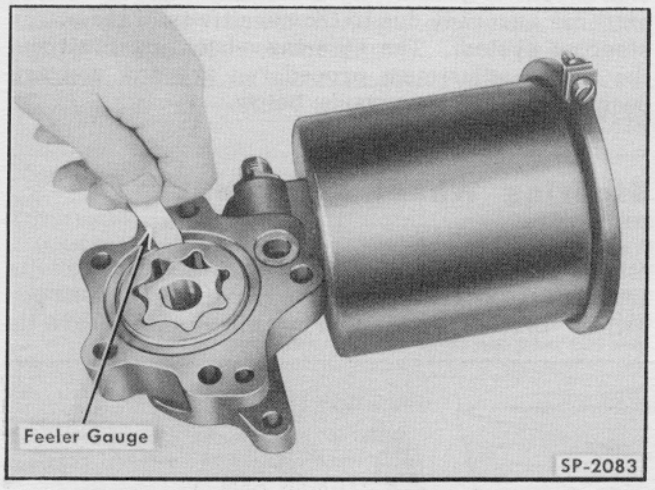

Fig. 17–Checking Clearance Between Rotor and Bushing

5. Carefully check relief and flow control valve unit for wear. Make sure relief valve is not sticking. Remove any burrs using crocus cloth.

ASSEMBLY OF PUMP

Before assembling pump, make sure all parts are clean and free from lint. All parts should be prelubricated with Automatic Transmission Fluid (type A). Always use new gaskets and seals to protect against any possible leakage. Proceed as follows:

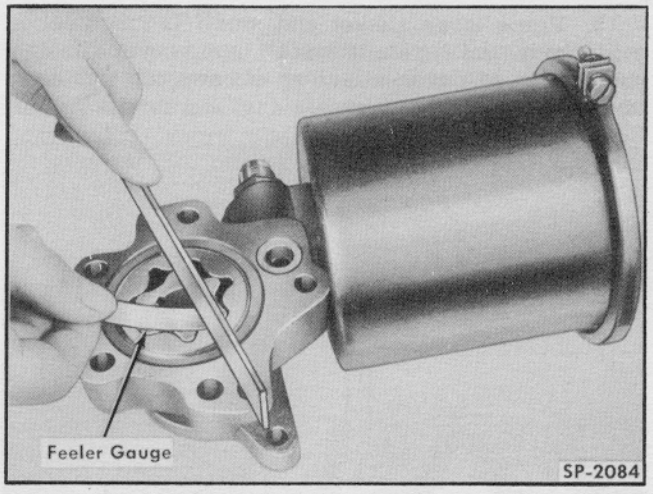

Fig. 18–Checking Rotor Side Clearance

1. If old seal was removed, wet lip of new pump shaft oil seal in automatic transmission fluid and install in pump body with lip toward rotor pocket using Oil Seal Driver C-3230 (Fig. 19). Press seal in solidly, but do not squash.

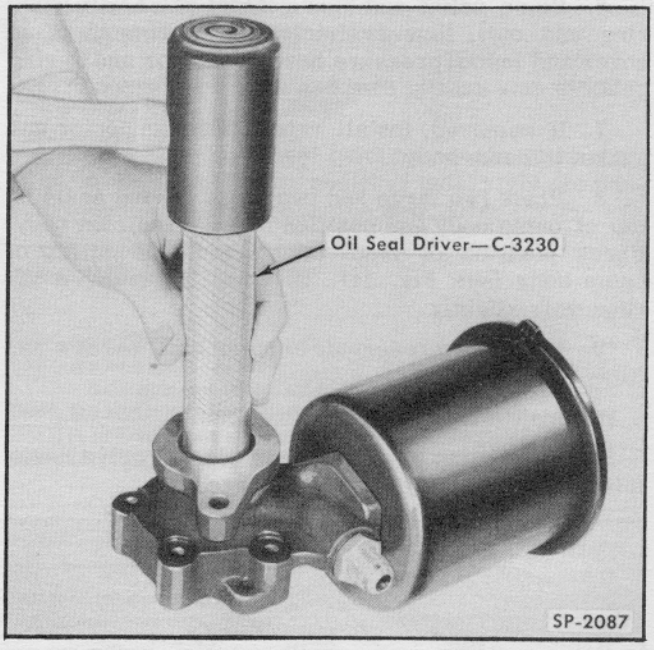

Fig. 19–Installing Pump Shaft Oil Seal

2. If removed, install pump shaft bearing on shaft using an arbor press (Fig. 20). Support inner race of bearing while pressing to prevent damage to bearing. Bearing should be pressed on until it bottoms against shoulder on shaft.

3. Install shaft and bearing assembly in pump body using care not to damage oil seal. Install bearing snap ring using Snap Ring Pliers C-760.

4. Install inner rotor drive pin in pump shaft

groove and install inner and outer rotors. Make sure both rotors are in the same relative position as before disassembly.

5. Place large gasket and small O-ring seal on pump body and carefully install pump cover. Install pump body to cover attaching screws and tighten to 30-35 foot-pounds torque.

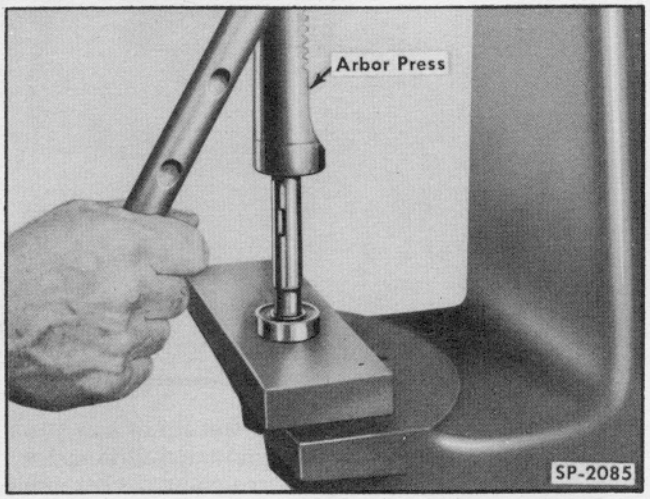

Fig. 20—Installing Pump Shaft Bearing

6. Place relief and flow control valve unit (snap ring end out), flow restrictor and spring in pump cover and install pressure hose connector and O-ring seal.

7. If removed, install return hose connector and gasket to pump body.

8. Place two large and two small O-ring seals on top of pump body and position oil reservoir on body. Check position of small inlet stand pipe on top of pump body (see Fig. 14). It should extend into the reservoir slightly.

9. Install two reservoir to pump body screws and filter stud.

10. Install filter and filter retainer.

11. Turn pump shaft by hand at least twelve revolutions to make certain it turns freely.

STEERING LINKAGE

A relay type steering linkage (Fig. 21) is used on Kaiser vehicles equipped with power steering instead of the center point linkage used with conventional manual steering. The same steering gear (18.2:1 ratio) is used in both linkages, however the overall steering ratio with power steering is 15:1 compared to 25:1 on the manual steering system.

The number of steering wheel turns from full right to full left with power steering linkage is 3 full turns (5 full turns on manual steering system).

The tie rods, steering arms and pitman arm on vehicles equipped with power steering cannot be interchanged with similar parts from the manual steering system. On the power steering system, the right and left tie rods are not interchangeable with each other. The position of the tie rod clamp bolts is important to avoid interference on turns. The bolts must be in a vertical position at the rear of the tie rods.

FRONT END ALIGNMENT

The caster and camber adjustment procedures on a vehicle equipped with power steering remain the same as with the manual system (fully detailed in the Shop Manual) however, the caster should be set at $+1/2^{o}$ to obtain satisfactory steering. The toe-out on turns with the new linkage has changed also (see chart). All front end adjustments must be set with extreme accuracy due to the sensitivity of the power steering system. The steering wheel alignment and the toe-in adjustment procedures are new and are described in the paragraphs below.

Steering Wheel Alignment

The steering gear should be in the center of its travel with the front wheels in the straight ahead position. Likewise, the steering wheel should have its

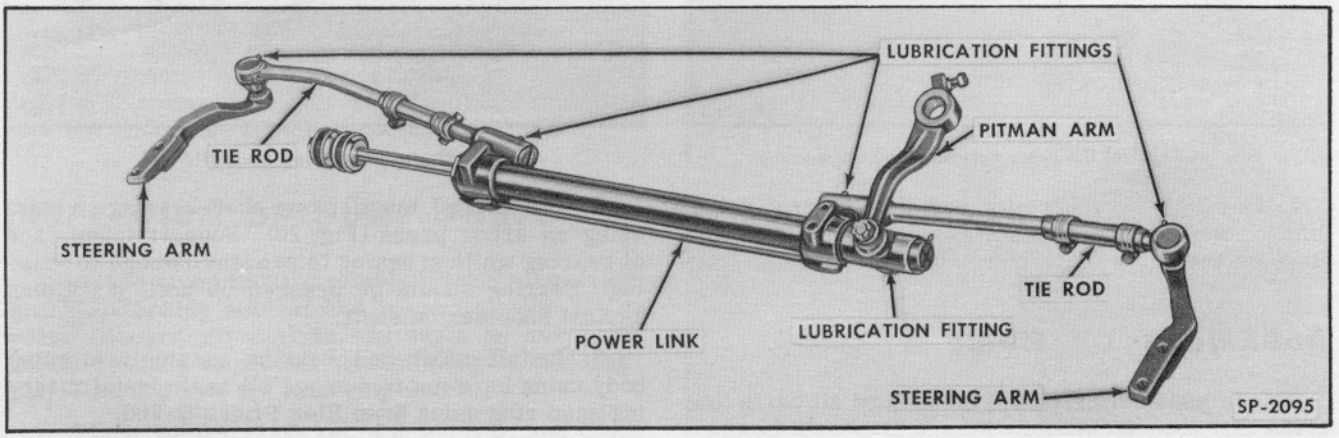

Fig. 21—Steering Linkage for Power Steering

spokes in the horizontal position when the steering gear is centered. If the steering wheel spokes are not in a horizontal position when the vehicle is driven straight ahead, the tie rods should be adjusted by shortening one and lengthening the other until the steering wheel is in proper position. The front wheel toe-in setting should then be checked and adjusted if necessary as described below.

Toe-in Checking and Adjustment

Toe-in is the difference in distance between the extreme front and rear of front tires at spindle height. If the rear of the tires is farther apart than the front, the wheels toe-in: If the front of the tires is farther apart than the rear, the wheels toe-out. A slight toe-in will help prevent steering wander.

Check and adjust as follows:

1. Place Toe-In Checking Board DD-398 on a level floor, about three feet ahead of one of the front wheels. Pull vehicle slowly from center of front bumper to keep from exerting side pressure on front wheels.

2. As the front wheel passes over center of board, observe indicator on board. Movement of indicator outward shows toe-in, while indicator movement inward shows toe-out. TOTAL TOE-IN OF 1/8 INCH IS REQUIRED (1/16 inch measured at each wheel).

3. Check position of steering wheel. The spokes should be in a horizontal position after vehicle is pulled straight ahead. If not, the adjustment described in "Steering Wheel Alignment" must be made before the toe-in adjustment.

4. Check opposite front wheel in same manner. If the two readings differ, a variation in caster or camber is indicated. This should be corrected before toe-in is adjusted.

5. To adjust toe-in, shorten or lengthen steering tie rods. Loosen the two clamps on the tie rod adjusting sleeve and turn sleeve to adjust rod length as required. Tighten clamps to lock the adjustment. Make sure the clamp bolts are in a vertical position at the rear of the tie rods to avoid interference with other parts on turns.

6. After tie rod adjustment, the toe-in should be rechecked to be sure it is correct.

7. Adjust pitman arm stops as described below.

Pitman Arm Stop Adjustment

On all but a few early vehicles equipped with power steering, stops are provided to limit the travel of the pitman arm. This is necessary to prevent the steering arms from resting against the lower suspension arm when the wheels are turned to full right or left. Adjustable stops are located on the pitman arm and on a bracket on the frame side rail. Whenever the toe-in adjustment is made or any part of the steering linkage is disturbed, the pitman arm stops should be adjusted as follows:

1. Loosen lock nuts and turn pitman arm stops in a few turns.

2. Turn steering wheel (without power assistance) to maximum right turn position until right steering arm touches lower suspension arm outer pivot.

POWER STEERING SPECIFICATIONS

GENERAL SPECIFICATIONS

Fluid capacity of system	3 pints
Type of fluid	Automatic Transmission Fluid (Type A)
Maximum pump pressure	500-800 psi
Maximum fluid flow	1.9 gal./minute
Pump belt adjustment	1/4" belt deflection under thumb pressure exerted midway between pulleys on power steering pump and on water pump.
Maximum pump rotor clearances:	
Between rotor lobes	.008"
Between outer rotor and bushing	.006"
End clearance (between rotors and face of body)	.0025"
Flow Control spring:	
Free length	2.13"
Working length	1.20"
Force at working length	14 lbs. ±1-1/2 lbs.
Front End Alignment:	
Caster	0^0 to $+1^0$, $+1/2^0$ preferred
Camber	0^0 to $+3/4^0$, $+1/2^0$ preferred
King pin inclination	$4\text{-}3/4^0$ to $5\text{-}1/2^0$, 5^0 preferred
Toe-in	1/8"
Toe-out on Right Turn	Inside Wheel 20^0, Outside Wheel $17\text{-}1/2^0$
Toe-out on Left Turn	Inside Wheel 20^0, Outside Wheel $18\text{-}1/2^0$
Turning diameter	38'
Turns of steering wheel from full right to full left (steering linkage connected)	3 full turns
Steering gear ratio	18.2:1
Overall steering ratio	15:1
Steering gear worm bearing adjustment:	1/4 to 3/4 lb. pull at rim (1/4 lb. preferred) to move steering wheel with gear 1/8 turn from full right or left.
Steering gear worm to roller backlash adjustment:	1 to 2 lbs. pull at rim (1 lb. preferred) to move steering wheel through center (straight ahead) position.
Steering effort (see "Steering Effort Check"):	4-10 lb. pull at rim to move steering wheel 1 full turn in either direction

TORQUE SPECIFICATIONS

	Foot-Pounds
Pump pulley bolt	8-12
Pump pulley (on water pump) bolts	8-12
Pump pulley (on crankshaft) bolts	18-23
Pump mounting bolts	12-15
Pump mounting bracket bolts	8-10
Pump body to cover bolts	30-35
Pump reservoir to pump body bolts	18-23
Pump reservoir mounting stud	30-35
Steering arm to knuckle bolts	35-40
Pitman arm to shaft nut	100-120
Pitman arm stud nut	55-65
Power link piston rod nut	18-23
Power link bracket to frame bolts	18-23
Tie rod clamp bolts	6-10
Tie rod to steering arm nuts	25-30
Tie rod to power link:	Screw end plug in tight, then back off 1/4 to 1/2 turn.

3. Turn adjusting screw in frame bracket out against pitman arm until steering arm is moved approximately 1/8 inch away from lower suspension arm outer pivot. Tighten lock nut.

4. Repeat this operation for a full left turn, adjusting the stop screw in the pitman arm.

SERVICE TOOLS

The relative simplicity of the Kaiser power steering system makes it easy to repair with a minimum number of service tools. The tools (shown in Fig. 22) are as follows:

C-690 - Spring Scale

KF-151 - Pressure Checking Gauge

C-760 - Snap Ring Pliers (#3 Tru-arc)

C-3230 - Oil Seal Driver

The C-690 Spring Scale is currently required for piston fitting. The KF-151 Pressure Checking Gauge is necessary to quickly determine if the power steering pump or the power link are defective hydraulically. The C-760 Snap Ring Pliers and C-3230 Oil Seal Driver will simplify pump disassembly and assembly, and assure satisfactory repairs.

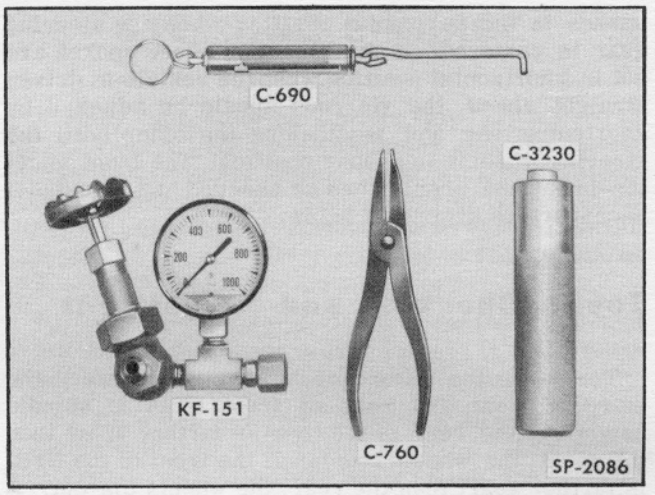

Fig. 22– Special Power Steering Service Tools

The power link piston and pitman arm stud and their component parts can be replaced without the use of special tools.

NOTES

7.5 M—May, 1953 Form X-19535 Printed in U.S.A.