The Lincoln / MERCURY Old Parts Store

INSTALLING A 1953-58 LINCOLN PULLEY DRIVEN POWER STEERING PUMP

VERY IMPORTANT!!!
READ BEFORE INSTALLATION!!!

Failure to read and follow these instructions will result in a damaged pump & voided warranty. It takes about 3 seconds to burn this pump out. Please, please read this!!!

GREAT CARE must be taken when you install a rebuilt power steering pump, so it is not damaged during the installation process. Several components make up the power steering system, and all must be in good working order, free of contaminants and leaks for the installation to be successful. Take the time to check your system thoroughly to insure success.

To remove the power steering pump

- Disconnect the battery;
- Loosen and Remove the Adjuster Bolt holding the power steering bracket
- Remove the fan belts;
- Remove the pressure and return lines (use care not to spill the power steering Fluid)
- While holding the pump remove the last bolt and remove the pump

Once the pump is removed, start your inspection.

- Check the lines both inside and outside for cracks, leaks, rot, blockage, stripped fittings. If the lines are original, the chances are that they suffer from all these problems and we strongly advise they be replaced.
- Open the fluid reservoir if there is no filler opening Replace the filter if available.;
- It makes great sense to replace all original hydraulic lines and filter, if possible.

Flushing the system

It is extremely important to flush the power steering system thoroughly in order to remove all contamination, particulates, and metals that have entered the system over the years. To do this requires putting the pressure side of the hose into a bucket of transmission fluid and an empty bucket on the return line so that you can flush your system properly. With the wheels of your car off the ground and your power steering pump removed, turn your steering wheel back and forth several times until no more old fluid and contaminants come out. Remember to have a container to catch the fluid. Dispose of the old fluid in a safe and responsible manner. When you're sure that the system has been flushed out completely, you're ready to install the rebuilt power steering pump.

Installing the rebuilt power steering pump

- Install the rebuilt power steering pump.
- Install a new pressure line, and a new return line. Make sure they are clamped securely;
- Install the pulley belts and tighten securely
- Add transmission fluid to the reservoir until full (approximately one quart);
- With the wheels still off the ground, turn the steering wheel back and forth several times and check and refill the reservoir level;
- Repeat this several times until you are sure that the system is full;
- Next, start the engine and run for approximately three to six seconds;
- Stop the engine, check fluid level again and top off the reservoir;
- Start the engine again for approximately ten to 15 seconds;
- Stop the engine, check levels, and refill as needed;
- Start the engine again and let it idle for several minutes, making sure that the wheels stay centered, and that they do not try and turn to one side or the other;
- Next, gently turn the steering wheel from left to right, being extremely careful not to lock the steering wheel in either direction for more than a fraction of a second;
- Stop the engine. Check the power steering fluid levels and fill as needed.
- Restart the engine and let it run for several minutes to give the system a chance to remove any air blockages that may occur. Turn off the engine, wait 5 to 10 minutes, put the car on the ground, and go for a ride.
- Pay attention to any unusual whining or groaning of the system. It could a sign of a problem.
- After you've taken your ride, let the car sit for a period of time. Then check for any leaks or drips under the engine.

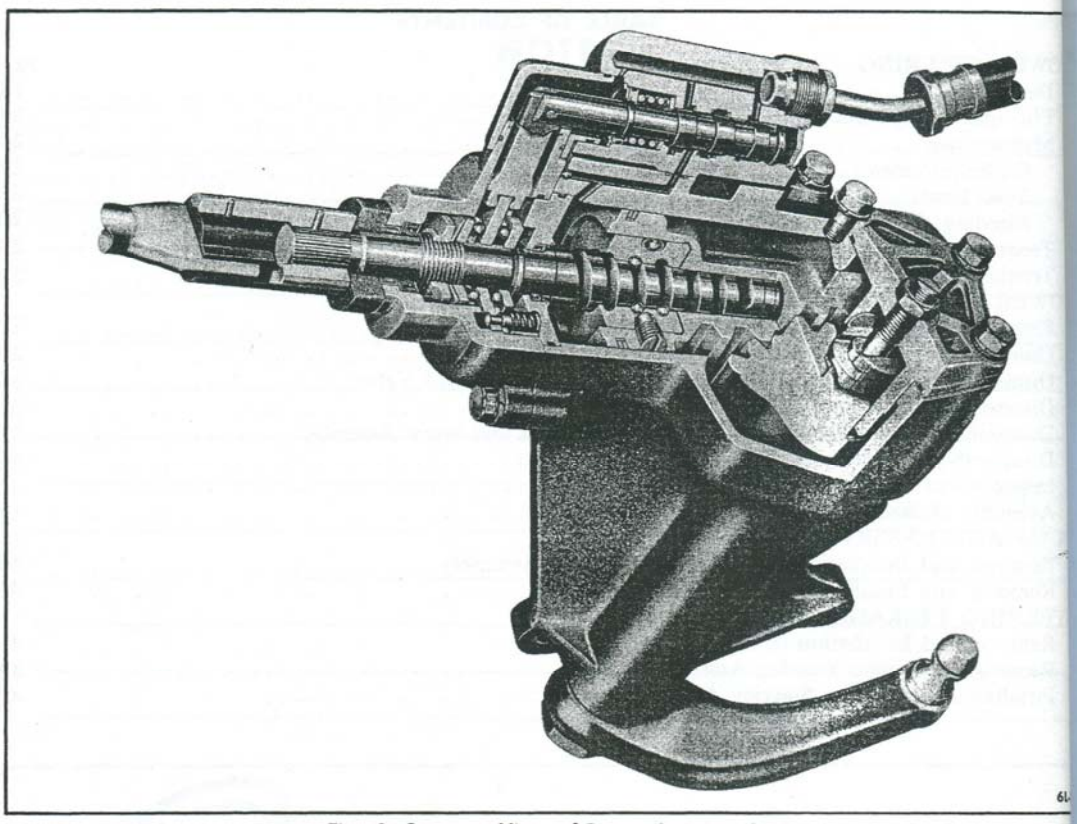

Fig. 2—Cutaway View of Power Steering Gear

POWER STEERING DESCRIPTION

The power steering mechanism is a new "In-Line" type of hydraulic system. This system furnishes power to reduce the amount of turning effort required at the steering wheel. It also reduces road shock or "wheel fight." Figure 1 shows the power steering unit installed in the car.

The effort required for normal straight ahead driving, when the power steering is in operation, is approximately 1½ pounds pull at the rim of the steering wheel, to keep the car under control on a smooth straight highway. To park the car, 3½ to 4½ pounds pull is required. As a turn is completed and the steering wheel is allowed to recover from the turn, the front wheels will return to the straight ahead position.

A hydraulic pump driven by a belt from the engine, supplies the assisting power for the steering unit. When the engine is not operating, or when any part of the power mechanism is inoperative, steering is entirely manual and the effort required at the steering wheel is slightly greater than t of the conventional steering gear.

This "In-Line" power steering mechanism is c posed of (1) A rack, piston, worm and ball assembly which is meshed to the gear on the st ing sector shaft. See figure 2. (2) A hydraulic va which is mounted on the top outside of the g housing parallel with the steering shaft, is opera through an actuating lever, by the motion of steering shaft. See figure 2. (3) A hydraulic pu driven by a belt from the engine and an oil reser which is attached to the pump. (4) Connect pipes and hoses.

The "In-Line" type of power steering mechan as illustrated in figure 2, is designed with the st ing shaft, worm and ball nut, power piston and r and the power cylinder all in line. With the hydra valve mounted on the top side of the gear hous it makes possible internal oil passages betw the valve and cylinder, thus eliminating all exte lines and hoses except the pressure and ret hoses between the pump and valve.

The power cylinder is an integral part of the gear housing. The piston is the double acting type in that oil pressure may be applied to either side of the piston. The piston which includes the power rack is meshed to the sector gear on the pitman shaft.

The hydraulic control valve is composed of a housing and valve spool, and is an open center type 3-way valve. The spool is held in neutral position by a spring located in the valve reaction chamber plus the centering springs on the thrust bearing. There is a second spool, located in the center of the main valve spool, to control the maximum pressure that may be built in the reaction chamber, and thereby limits the effort at the steering wheel to four pounds maximum when parking. There is a ball check which allows oil to circulate in the system without overflowing the reservoir in case of pump failure.

The oil pump is the Eaton rotor type, and is mounted to the engine water pump housing. This pump consist of a drive rotor meshed with a driven rotor which is offset from the shaft. As these parts rotate, the pockets formed between them increase and then decrease to propel the oil from the intake to the pressure ports of the pump. The pump intake port is connected through drilled passages with the oil reservoir tank, which is secured to the top of the pump assembly. See figure 3. The oil after it leaves the pump flows through the flow control and pressure relief valves and the pressure hose to the control valve on the steering gear.

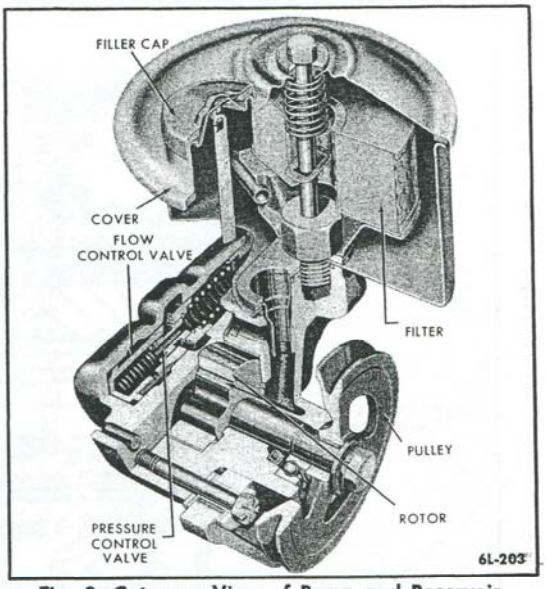

Fig. 3—Cutaway View of Pump and Reservoir

PRINCIPLES OF OPERATION

When the power unit is not assisting in the steering effort, the valve spool is in neutral position. Figure 4 shows the passage that supplies oil to the valve assembly, and the return passages to the reservoir and pump. It is noted that the oil flows

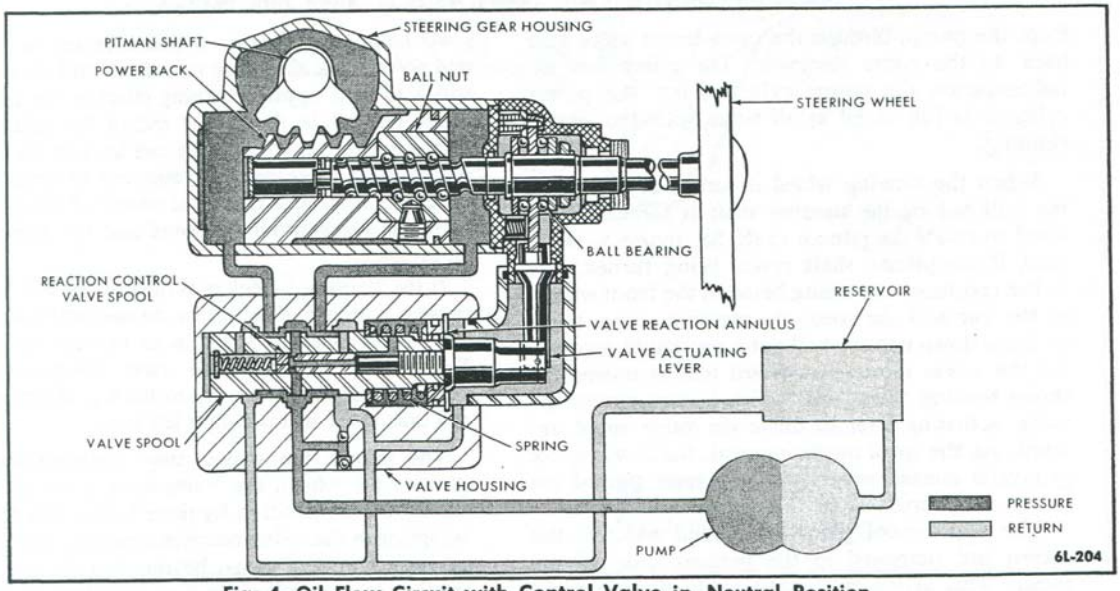

Fig. 4—Oil Flow Circuit with Control Valve in Neutral Position

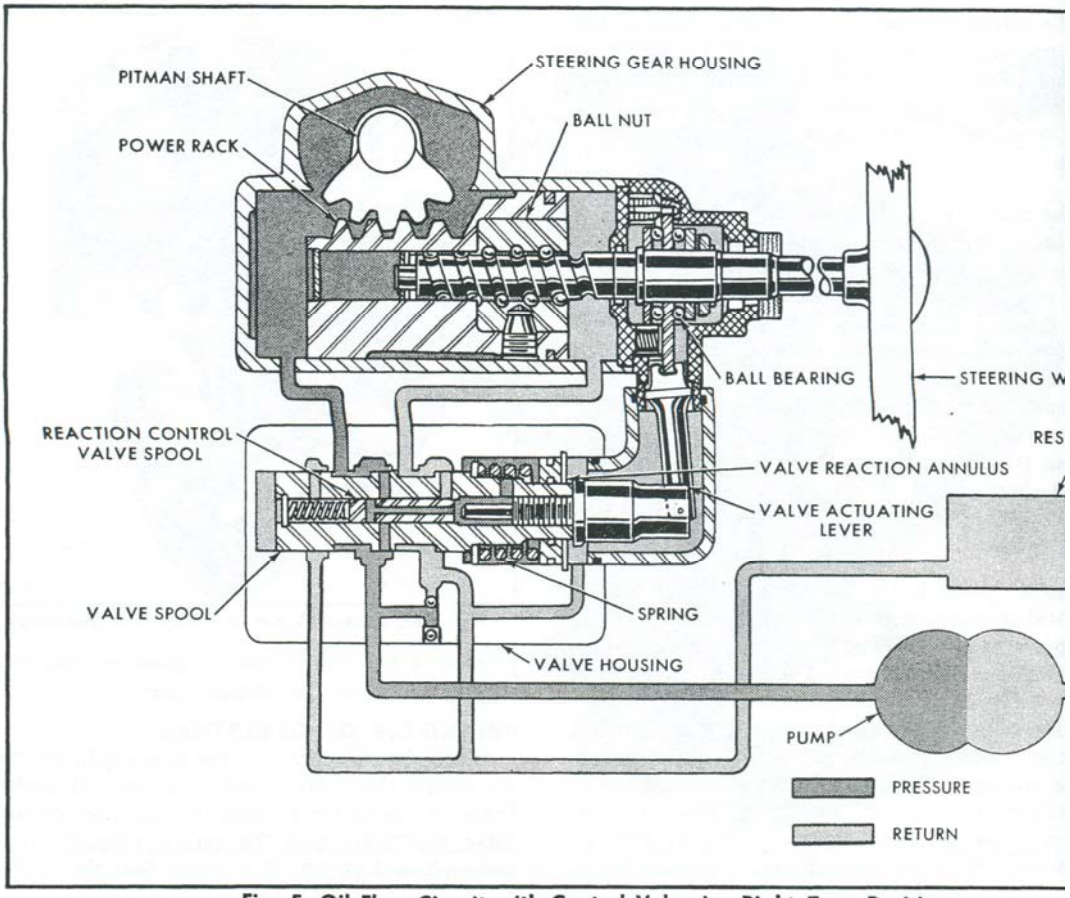

Fig. 5—Oil Flow Circuit with Control Valve in Right Turn Position

from the pump, through the open-center valve and back to the pump reservoir. The pump has no influence on the power cylinder, but the power cylinder is full of oil at all times with the engine running.

When the steering wheel is turned to the right, the ball nut on the steering shaft is forced downward to rotate the pitman shaft. See figure 5. However, if the pitman shaft resists being turned, due to the resistance to turning between the front wheels of the car and the road, the steering worm tends to screw down into the ball nut a very slight amount. As the worm moves downward it also moves the thrust bearing downward, which in turn causes the valve actuating lever to move the valve spool upward. As the spool moves upward, the lower spool groove is opened wider to the pressure side of the pump and narrowed to the return.

The upper spool groove is opened wider to the return but narrowed to the pressure side of the pump. This action causes the oil to flow into the lower half of the pressure cylinder forcing and power rack assembly upward toward which in turn applies turning effort to t shaft. The oil in the upper end of the forced out through the valve and back to reservoir. The greater the resistance to t tween the road and the front wheels of t more the valve spool is moved and the oil pressure.

If the steering wheel is turned to the l cause a similar action but in the opposite moving the steering shaft in an upward This causes the valve to move down channel hydraulic pressure to the top of and thus assist in making a left turn.

The instant the driver stops applyin effort to the wheel, the valve spool is fo into its neutral position by three forces: T ing spring in the valve reaction chamber, ing springs on the thrust bearing and the reaction in the valve reaction chamber.

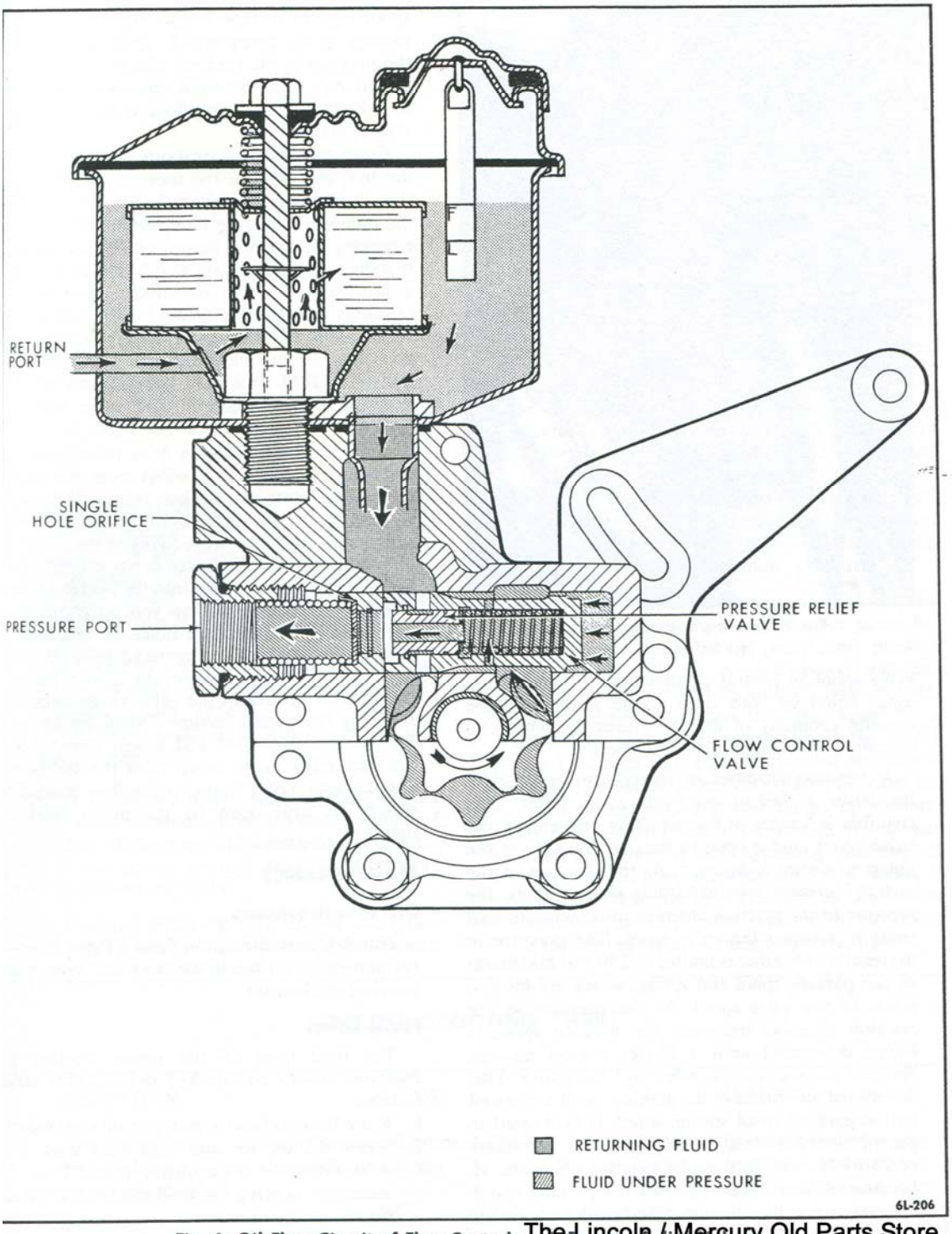

Fig. 6—Oil Flow Circuit of Flow Control and Pressure Relief Valves

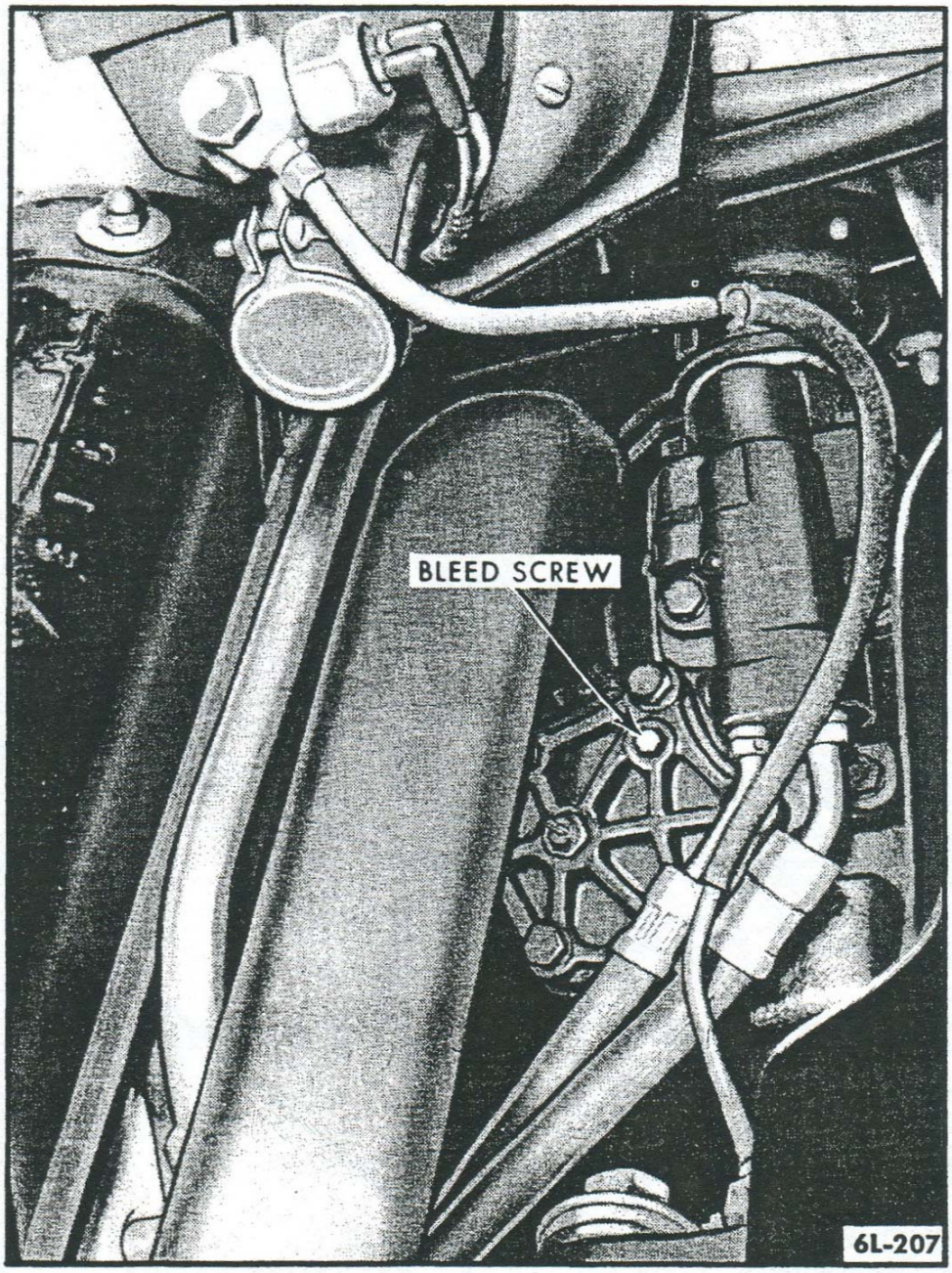

Fig. 7—Steering Gear Bleed Screw on Side Cover

Bleeding the System

If air becomes trapped in the system due to low oil level in the pump reservoir or due to disassembly of the gear, this air must be bled out of the gear. To bleed the system proceed as follows:

1. Fill pump reservoir to proper level.
2. Loosen bleed screw in side cover. See figure 7.
3. Start engine.
4. Turn steering wheel through its entire travel two or three times allowing air in system to escape.
5. Tighten bleed screw and recheck fluid level.

TROUBLE DIAGNOSIS

The operation of the power steering system depends upon proper tension of the oil pump belt and the fluid level in the reservoir. When operation of the power steering is unsatisfactory, before any attempt is made to perform any test, the following checks should be made:

1. Check the tension of the oil pump belt by depressing it in the center. Deflection should be approximately 1/4 inch with a 5 to 7 pound force. A slotted hole in the pump support bracket provides a means of adjusting the belt tension.
2. Check fluid in reservoir. If fluid is low, bring up to full mark on dipstick, using automatic transmission fluid "Type A."
3. Check for oil leaks at all power steering and pump connections.

Before testing the power steering unit, be sure that the wheel alignment, pressure and condition of tires and shock absorbers are satisfactory. To determine if the power steering unit is functioning properly proceed as follows:

1. Set the hand brake, start the engine and rotate the steering wheel to the left and right to warm up the oil. DO NOT turn the wheel to the limit of its travel, as it would place an unnecessary strain on the entire system. Hook a pull scale to the rim of the steering wheel and measure the pull it takes to turn the wheel, first to the left and then to the right. If the pull on the wheel is between 3½ to 4½ pounds, on a dry floor, the unit is working properly. If not working properly check the hydraulic pressure.

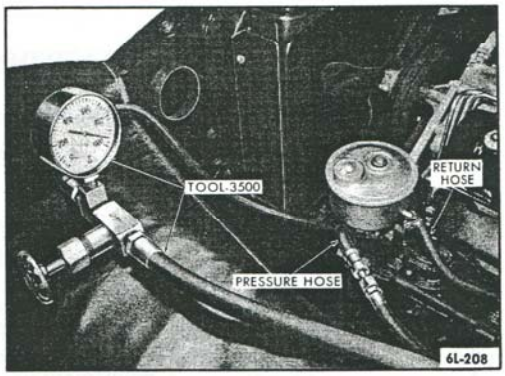

Fig. 8—Checking Hydraulic Pressure with Tool 3500

2. To check the hydraulic pressure, remove pressure hose from pump, and connect gauge between pressure fitting on pump and pressure hose that leads from pump to power unit. See figure 8. Let engine idle until oil reaches operating temperature, then turn the wheel for a full right or full left turn. The gauge should read between 925 and 975 pounds per square inch. If pressure is less than 925 PSI, close the valve at the gauge and note the pump pressure. If it is low with the valve closed, it indicates that the pump is not operating properly. If the pressure goes up, with the valve closed, it indicates that the low pressure in the system must be due to internal leakage in the power unit, providing all connections are tight.

TROUBLE SHOOTING CHART

CONDITION	CAUSE	REMEDY
1. Hard steering while driving (straight ahead).	(a) Steering adjustment tight, or linkage binding.	(a) Check adjustment by dropping pitman arm from gear or disconnect linkage from pitman arm ball.