the diaphragm in a chain saw fuel pump. Pressure pulsations from the crankcase act on one side of the ring while a spring plus fixed air pressure, in an enclosed chamber, acts on the other side.

Crankcase pressure pushing against the ring and piston assembly forces the shaft of the piston into the oil inlet chamber in the housing. This action moves a small amount of oil past the spring-loaded ball valve into the cylinder assembly. As crankcase pressure turns to suction, the piston, aided by spring pressure and the fixed air pressure, moves away from the oil inlet chamber allowing the ball valve to close and trap the small amount of oil inside the cylinder assembly. On the next pressure stroke, more oil is forced past the ball valve by the piston shaft and this additional oil in turn forces some of the oil already in the cylinder out into the discharge line.

This operation is continuous while the engine is running, with one stroke of the automatic oiler piston for each stroke of the engine piston.

When the manual oiler is operated, the manual oiler pump forces oil into the inlet chamber, past the ball valve and through the outlet chamber into the discharge line. The manual oiler delivers a greater amount of oil on each stroke and overrides the automatic oiler. Because the manual oiler is a part of the closed oil supply system, operation of the automatic oiler draws oil through the manual oiler and into the automatic oiler.

REMOVAL AND DISASSEMBLY

The automatic oiler cylinder assembly (1, Figure 4-29) which contains the ball valve, can be removed without further disassembly of the saw. Turn the slotted head of the cylinder assembly counterclockwise to remove it from the tank. If required, the three "O" rings (2) can be removed from the cylinder assembly.

The piston assembly can be removed after the oil tank has been removed from the engine.

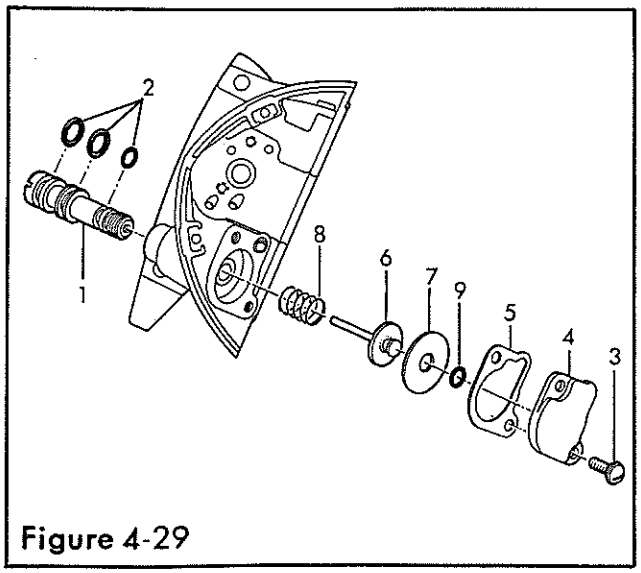


Figure 4-29

1. Remove the two screws (3) which attach the cap (4) to the housing and remove the cap. If the gasket (5) is damaged, remove it. Use care when removing the cap as the piston assembly is spring-loaded.

2. Remove the piston assembly (6) and piston ring (7) as a unit and remove the spring (8). Separate the piston assembly and piston ring by removing the "O" ring, (9).

SERVICE OF THE AUTOMATIC OILER

Servicing of the automatic oiler will consist mainly of seeing that the oil passages are clean and that the "O" rings are not flattened, cracked or otherwise damaged. When disassembled, check the piston shaft and the outer diameter of the piston ring for wear or damage.

When blowing out the oil passages, always disassemble the automatic and manual oilers first. Use low pressure (three to five pounds) air and blow in the direction the oil flows. When blowing out the cylinder assembly, blow only from the oil inlet side toward the discharge side. Soaking the cylinder assembly in gasoline or solvent prior to blowing it out with air will loosen impacted dirt. If the cylinder assembly cannot be cleaned, install a new cylinder assembly.

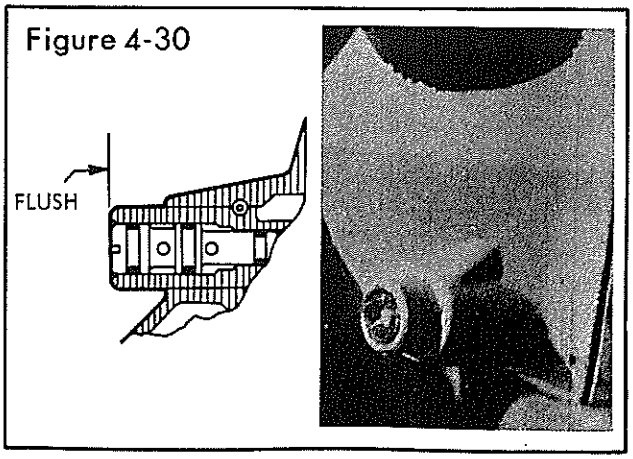
REASSEMBLY AND INSTALLATION

1. Coat the "O" rings (2, Figure 4-29) with SAE 30 motor oil and install them on the cylinder assembly (1). Place the piston ring (7) on the piston (6) and install the "O" ring (9). Coat the "O" ring, the shaft of the piston and the outer diameter of the piston ring with SAE 30 oil.

2. Install the cylinder assembly in the housing. Turn it in until the slotted head of the cylinder assembly is flush with the surface of the housing as in Figure 4-30.

3. Place the piston spring (8) over the housing. Carefully insert the assembled piston assembly, "O" ring and

Figure 4-30



piston ring into the housing making sure the shaft slides in and is spring returned in the cylinder assembly. The piston ring must be centered in the housing.

4. Install a new cover gasket (5) and the cap (4). Coat the two attaching screws (3) with Loctite and tighten them securely. As the cap is installed be certain it is flush with the gasket. If it can be rocked, the piston ring is most likely not centered and entering the housing correctly.

ADJUSTMENT OF THE AUTOMATIC OILER

The automatic oiler is designed to provide adequate chain oiling for most cutting conditions with the slotted head of the cylinder assembly flush with the surface of the housing (Figure 4-30). All adjustments of the automatic oiler should be made from this position.

To increase oil flow, turn the slotted head clockwise in 1/4 turn increments, checking the oil flow after each 1/4 turn. Do not turn the slotted head more than one and a half turns clockwise from the flush position. The one and a half turn will provide the maximum oil flow. Movement clockwise beyond this point will decrease the flow of oil and can cause damage to the automatic oiler parts.

Do not turn the slotted head counterclockwise from the flush position as this will reduce the flow of oil to a point at which the chain and bar will not be adequately lubricated and the chain and bar will be damaged.

The oil tank will require more frequent refilling if the oil flow is increased. Warn the operator of the saw that he should not wait for the fuel tank to become empty before refilling the oil tank. The operator must check the amount of oil in the tank frequently or else the tank will become empty and the chain and bar will be damaged.

Section Five - Trouble Shooting

OVERHAUL VS TROUBLE SHOOTING

Service shop work on chain saw engines will usually fall into one of two classifications: (a) Complete overhaul or (b) trouble shooting.

Complete overhaul means disassembly of all components and a thorough examination, testing, repair or parts replacement which can require several hours of shop work. The owner of the chain saw will ordinarily make allowance in his work schedule for the time loss involved. Trouble shooting on the other hand, is a type of shop work arising from one or more operating faults which may be diagnosed and corrected in relatively short time.

Whether the saw is in the shop for a complete overhaul or for trouble shooting, efficient shop service demands that the work be completed in the shortest time consistent with good quality. There will always be more urgency however, when trouble shooting only is involved and it is in this work that systematic methods will save time and reduce lost motion.

There are two methods or approaches to trouble shooting. The first is to solve the problem arising from a specific complaint and a known fault, such as the owner's remark that "the engine overheats", or that "it won't idle". Trouble shooting in this case could be termed "Trouble Shooting Specific Faults".

The second method is concerned with the location of a trouble which is not identified and there is no clue to the actual fault. In a case of this kind the complaint may be only that, "the engine won't run good", and the service man must then proceed to solve the problem by process of elimination. This might be termed "Trouble Shooting General Faults".

Both of these trouble shooting procedures are covered under separate headings on the pages that follow. They are treated in two sections with charts for easy reference to the most common troubles encountered in service shop work.

It should be noted that the complaints or faults in the charts are those most commonly found in service work, and present most of the problems to be solved in the shop. There are others, perhaps, that could be included, and it is suggested that when these are encountered, the information should be passed along for the benefit of others doing the same type of work.

On the pages immediately following, we have listed a number of engine faults with a trouble area and possible cause for each. Starting with the complaint as a guide, the service man can go to the most probable spot and, with reasonable certainty, arrive at a quick solution to the problem. This approach to trouble shooting however, will not be possible if there are no definite clues to the trouble or as may be the case frequently, there are several faults to be located.

Most chain saw engine faults can be traced to one or more of three related but individual areas as follows:

1. Those caused by mechanical malfunctions,

2. Those caused by one or more faulty elements in the ignition system.

3. Those found in the fuel system.

These three areas of trouble may be further divided into groups of more specific faults for individual examination. In this method of trouble shooting, the service man checks the areas of possible trouble in sequence and solves the problem by process of elimination.

An outline of trouble spots and the areas in which they may be found, is shown in the pages which follow. An acceptable procedure for general trouble shooting is also included. Experience has shown this procedure is effective in solving most of the problems encountered in trouble shooting. Some of the possible causes of trouble listed in this outline may be quite obvious from only a quick examination of the saw. Such things as a switch turned off, an empty fuel tank, or a disconnected spark plug can be spotted quickly. Always look the engine over carefully for any such obvious reason for malfunction.

Pull the starter rope through and try to start the engine if possible, then begin the check-out procedure. Also, don't forget to examine the chain. A dull or improperly sharpened chain can give the misleading impression of low power or other engine faults.

TROUBLE SHOOTING SPECIFIC FAULTS

FAULT	TROUBLE AREA	CAUSE
Engine Won't Start, Hard to Start, Cuts Out, Misfires	Fuel System	No fuel Wrong mixture Dirty or watered fuel Dirty or watersoaked filter (p. 15) Broken or plugged passages (p. 14) Plugged vents (p. 14) Cut or leaking fuel tank fitting (p. 15) Fuel Pump (p. 28) Diaphragm damaged Filter plugged Pulse passage plugged Carburetor (p. 28) Adjustment needle damaged or wrong adjustment (p. 30) Gaskets damaged Diaphragms damaged Inlet valve dirty
	Ignition System	Spark plug fouled, wrong gap, or insulation broken (p. 16) Wiring connections loose or insulation frayed Incorrect spark plug (p. 16) Switch grounding out (p. 25) Switch in "OFF" position Breaker points burned, dirty, wrong gap, or poor ground (p. 21) Incorrectly timed (p. 21) Lamination - wrong air gap (p. 24) Condenser faulty or poor ground (p. 24) Coil damaged (p. 22)
	Mechanical System	Cylinder cracked Crankcase screws loose (p. 40) Rings worn