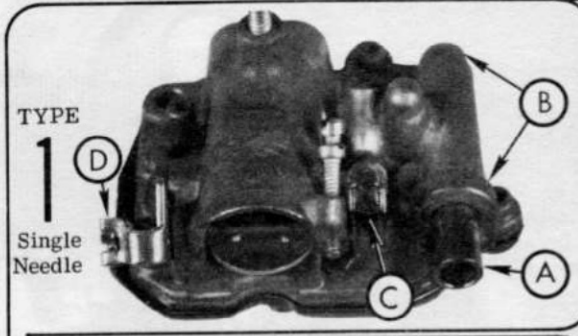
Single & Double Needle Carburetor Identification Table

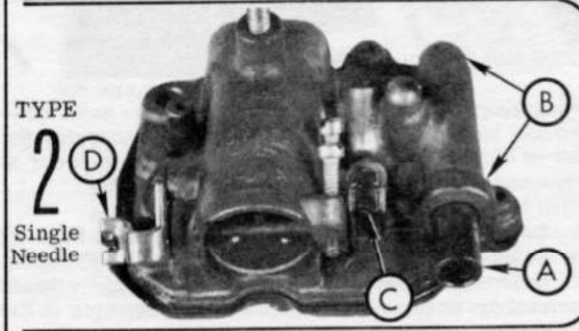


A. Primer piston held in cylinder by primer rod; "O" ring seated in cylinder.

B. Primer cylinder has one open end, one solid end.

C. Fuel metering needle threaded all the way to tip.

D. Idle governor on throttle shaft.

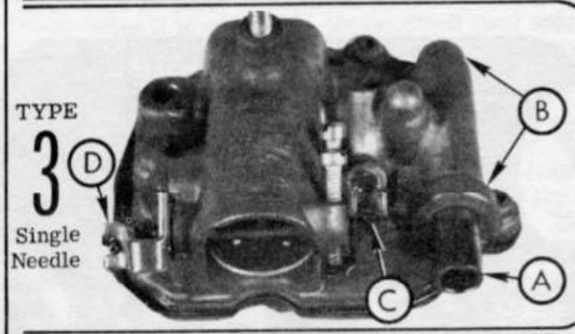


A. Primer piston held in cylinder by primer rod; "O" ring seated in cylinder.

B. Primer cylinder has one open end, one solid end.

C. Fuel metering needle not threaded all the way to tip.

D. Idle governor on throttle shaft.

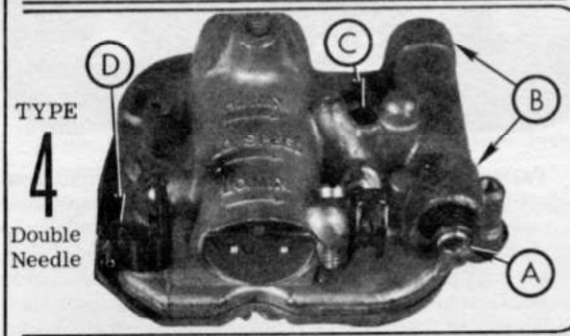


A. Primer piston held in cylinder by primer rod; Cup holds "O" ring in place.

B. Primer cylinder has one open end, one solid end.

C. Fuel metering needle not threaded to tip.

D. Idle governor on throttle shaft.

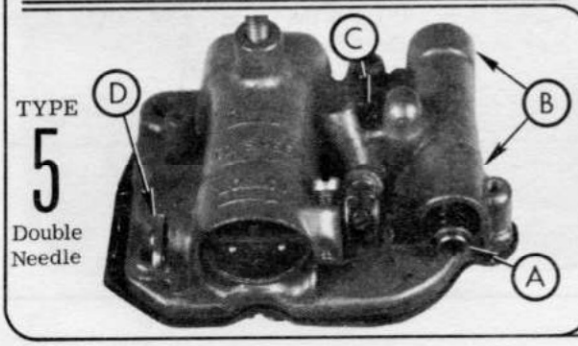


A. Primer piston spring held in by "C" ring on end of plunger.

B. Primer cylinder has one open end, one plugged end.

C. Vertical fuel adjusting needle.

D. Idle governor on throttle shaft.



A. Primer piston spring held in by "C" ring on end of plunger.

B. Primer cylinder has one open end, one plugged end.

C. Vertical fuel adjusting needle.

D. No idle governor on throttle shaft.

McCULLOCH SINGLE & DOUBLE NEEDLE CARBURETORS

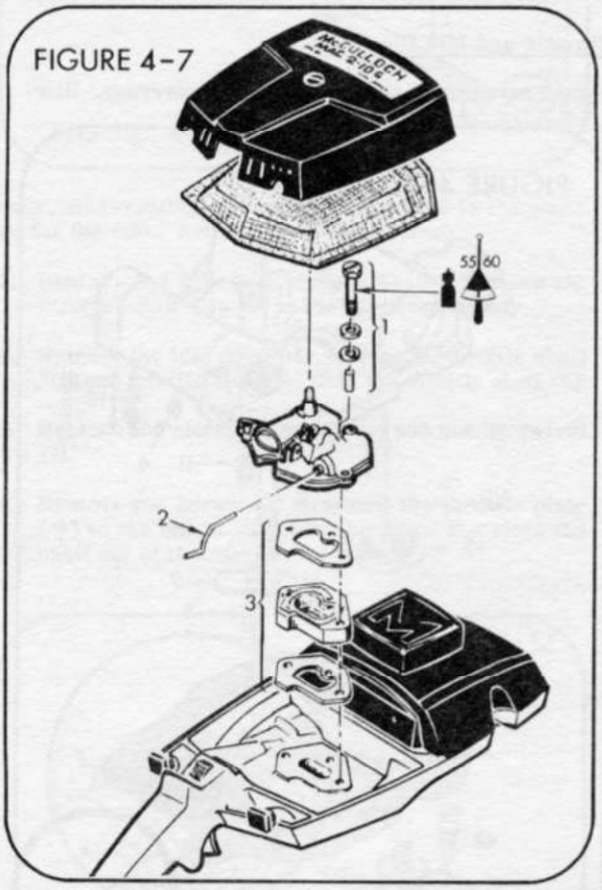
Five types of McCulloch single and double needle carburetors have been used in the saws covered in this shop manual. The carburetor types can be determined from the Single and Double Needle Carburetor Identification Table.

Besides the exterior differences shown in the Identification Table, there are several interior differences. These will be covered in the text during portions of the disassembly, servicing and reassembly procedures where such information is applicable.

REMOVAL

McCulloch single and double needle carburetors are removed in the same manner. The air filter cover and air filter will first have to be removed from the airbox.

FIGURE 4-7



1. Disconnect the fuel hose from the fuel inlet on the carburetor.

2. Remove the screws, washers and spacers (1, Figure 4-7) attaching the carburetor to the airbox. Carefully lift off the carburetor and remove the primer rod (2) from the end of the primer plunger and primer button. The primer plunger of type 1, 2 and 3 carburetors is under spring pressure; do not let it jump out of the primer cylinder. Should it come free, lay it beside the carburetor on a clean surface.

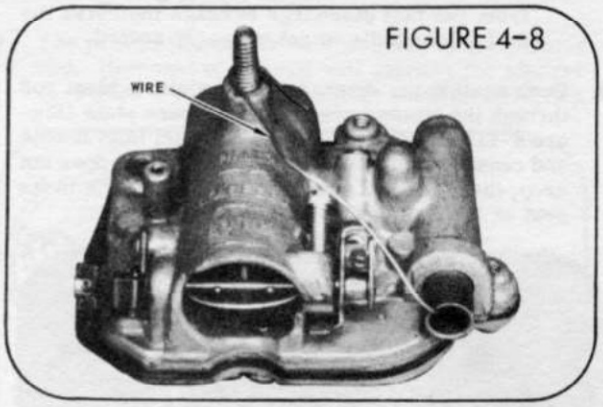
3. Remove the gaskets and insulator (3) from the airbox. Several different methods of installing the carburetor to the airbox were used. These ranged from a single gasket to two gaskets on either side of an insulator. Carefully remove these parts and lay them beside the carburetor on a clean surface.

CARBURETOR PRESSURE TEST

This test is performed with the carburetor removed from the airbox. Type 1, 2 and 3 carburetors must have the primer plunger wired to keep it inside its cylinder when pressure is applied. Hook the wire into the end of the plunger and catch the other end around the stud on top of the carburetor (Figure 4-8).

1. Fasten the carburetor base plate securely onto the carburetor body with two 10-24 screws and nuts. This will provide support behind the fuel inlet needle area which would otherwise be unsupported and could leak (Figure 4-9).

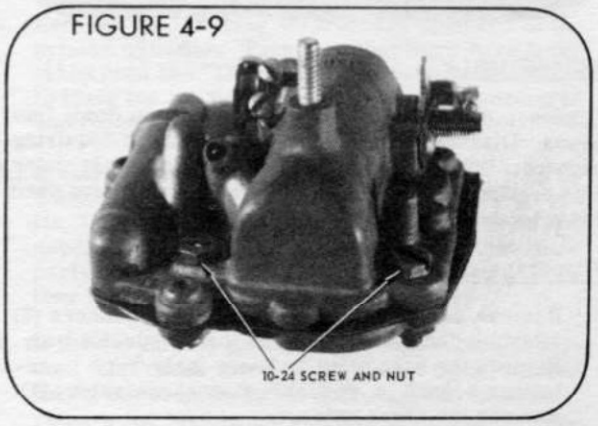
FIGURE 4-8



2. Connect Pressure Test Tool, P/N 62849, to the fuel inlet connection of the carburetor.

3. Pump pressure to 9 PSI. Close the shutoff valve. Submerge the carburetor in solvent or gasoline and watch for bubbles which will indicate the source of leakage.

FIGURE 4-9



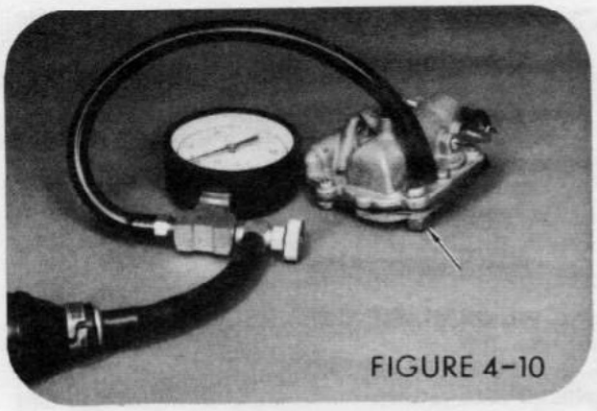


FIGURE 4-10

a. Leakage around the gasket area indicates a new diaphragm assembly is required.

b. Leakage around the primer discharge and around the primer piston indicates the need for new seals in the primer.

c. Leakage around the air orifice (Figure 4-10) or from the fuel discharge passage indicates the fuel inlet needle is not properly seated.

4. Push against the diaphragm plate with a blunt rod through the atmosphere hole in the base plate (Figure 4-11). This should unseat the fuel inlet needle and cause a drop in pressure. If pressure does not drop, the fuel inlet needle is probably stuck in its seat or the fuel passage is plugged.

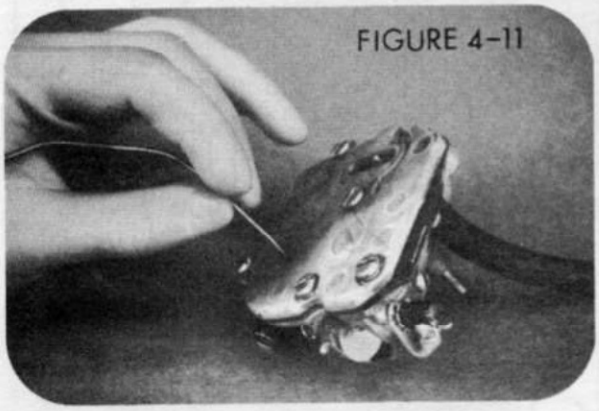


FIGURE 4-11

DISASSEMBLY

Disassembly of the carburetor is broken down into areas. Disassemble only that area or areas requiring service. Disassembly of the primer comes last under this heading because of the differences in primers used between the various carburetor types.

Diaphragm and Inlet Valve

1. Remove screws (1, Figure 4-12) and washers (2) attaching the base plate (3) to the carburetor body. Remove the base plate. Some early Type 1 carburetors have a phenolic disc check valve (4). Remove the check valve.

2. Carefully lift off the diaphragm assembly (5) and remove the primer inlet check valve (6).

3. Type 4 and 5 carburetors have either a ball, seat and duckbill valve, or a ball, seat and "O" ring or a ball and seat in the discharge line from the primer. These parts act as a resistance valve during the priming operation. As long as air bleeds through these valves, resistance is very slight. However, when fuel reaches the valves, it cannot escape as easily as the air escaped and resistance developes. This resistance tells the operator that the fuel lines are filled. Carefully remove the parts of this valve and place them in a clean container so they will not be lost.

4. Remove the screw (7) attaching the inlet lever pin (8) to the carburetor body. Remove the inlet lever pin, lever (9), spring (10) and inlet needle (11).

5. Remove the filter (12) from the carburetor body.

Throttle and Idle Governor

Type 5 carburetors do not have an idle governor. How-

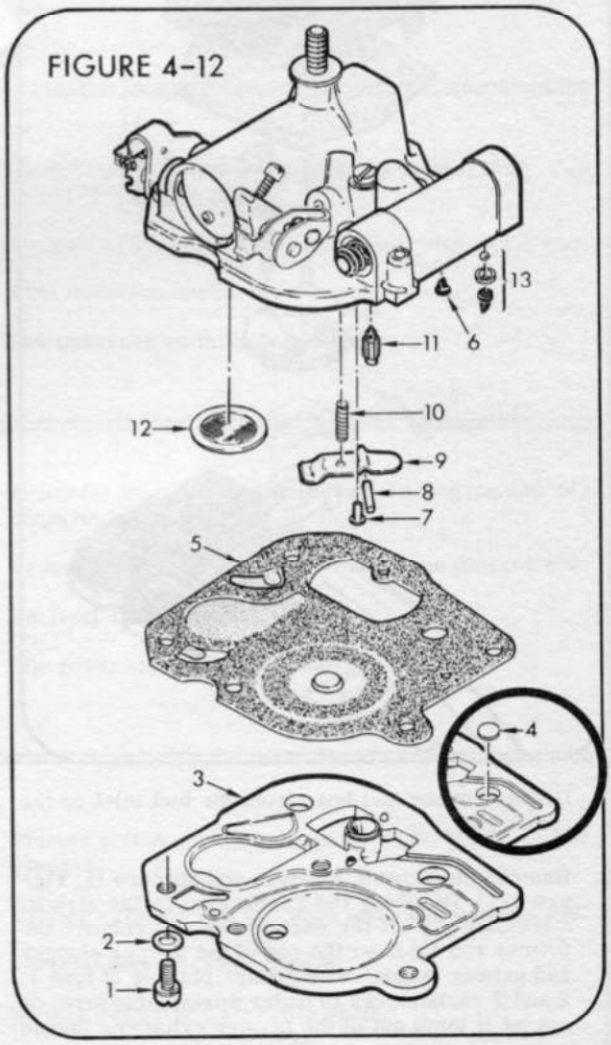


FIGURE 4-12

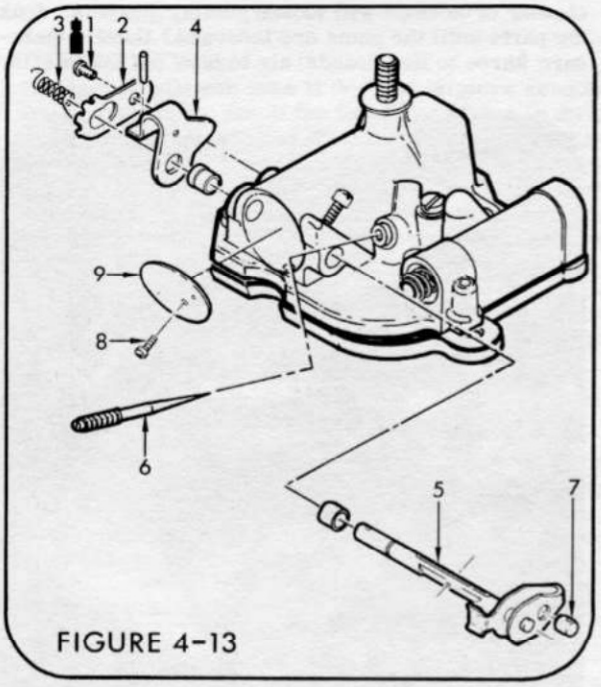


FIGURE 4-13

ever, disassembly of the Type 5 throttle is the same as for the other four types of carburetors.

1. Remove the screw (1, Figure 4-13) attaching the throttle shaft clip (2) to the carburetor body.

2. Remove the idle governor spring (3), throttle shaft clip and throttle lever (4) from the throttle shaft (5).

3. Remove the metering needle (6) and needle swivel (7).

4. Remove the screw (8) attaching the throttle plate (9) to the shaft. Remove the plate and slide the shaft out of the carburetor body.

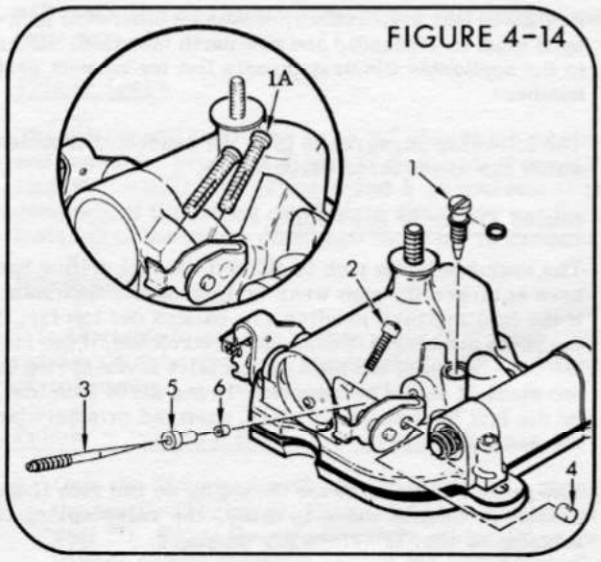


FIGURE 4-14

Fuel Mixture and Idle Speed Screws and Fuel Orifice

Type 1, 2 and 3 single needle carburetors have a slanted high speed mixture screw. Type 4 and 5 double needle carburetors have a high speed screw that is vertical to the carburetor base.

In all five types, the high speed screw (1 and 1A, Figure 4-14), the idle screw (2) and idle mixture metering needle (3) can be unscrewed from the carburetor body without previously removing other parts. Remove the needle swivel (4) so that it does not get lost.

The air orifice (5) can be removed with an "easy-out". It is not recommended that the fuel orifice (6) be removed; if it is damaged, install a new carburetor body.

Primer - Type 1, 2 and 3 Carburetors

The primers used on Type 1, 2 and 3 carburetors are the same except that Type 3 has a cup to hold the large "O" ring in place at the open end of the primer cylinder.

The following steps assume that the carburetor has been removed from the airbox.

1. The primer plunger is held in place by the primer rod. Removal of the rod will release the plunger (1, Figure 4-15) and probably the plunger spring (2).

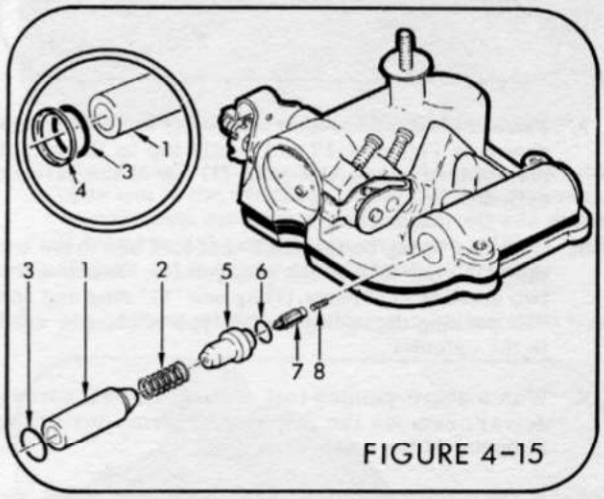


FIGURE 4-15

2. Remove the "O" ring (3) from the open end of the primer cylinder. Type 3 carburetors have a cup (4) to hold the "O" ring in place. It is advisable to leave the cup in place unless the cup is damaged and requires removal.

3. It may be necessary to tap the carburetor body on a solid surface to jar loose the primer seat (5) and its "O" ring (6), the primer needle valve (7) and the needle spring (8). It is also possible that these parts will come out with the primer plunger. If they do, remove them from the plunger.

4. If the carburetor base plate (3, Fig. 4-12) and primer inlet check valve (6) have not been removed during disassembly for the diaphragm and inlet valve, remove the screws and washers attaching the base

to the carburetor and remove the base plate, diaphragm assembly and the primer inlet valve.

Primer - Type 4 and 5 Carburetors

The primer plunger in these two types of carburetors is removed through the "plugged" end of the prime cylinder.

1. Remove the spring retaining ring (1, Figure 4-16) and the spring (2). The spring is under pressure; do not let it fly free when you take off the retaining ring. Do not lose the retaining ring. Remove the plug retainer (3) from the other end of the cylinder.

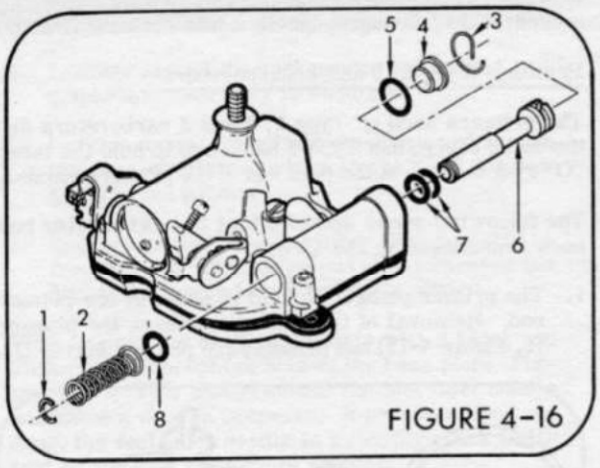


FIGURE 4-16

2. Place a blunt-end tool on the end of the plunger as shown in Figure 4-17 and gently tap on the end of the tool to drive the plug (4) out of the primer cylinder.

3. Continue to tap on the blunt-end tool and drive out the "O" ring (5) and the plunger (6). Remove the two smaller "O" rings (7) or one "O" ring and one "V" packing depending on the type of plunger used in the cylinder.

4. With a sharp-pointed tool or a very small screwdriver, remove the "O" ring (8) from inside the midpoint of the cylinder.

5. If the carburetor base plate (3, Figure 4-12) and primer inlet (6) and primer discharge valves (13) have not been removed during disassembly of the diaphragm and inlet valve, remove the screws and washers attaching the base to the carburetor and remove the base plate, diaphragm assembly, and primer inlet and discharge valves. Three types of discharge valves have been used in these two types of carburetors. Keep the parts of the discharge valve together and do not lose them.

CLEANING

Carburetor parts can be cleaned with solvent, gasoline or a commercial carburetor cleaner. Carburetor cleaner or acetone will loosen gummy deposits. Soak the parts until the gums are loosened. Use low pressure (three to five pounds) air to blow out the interior

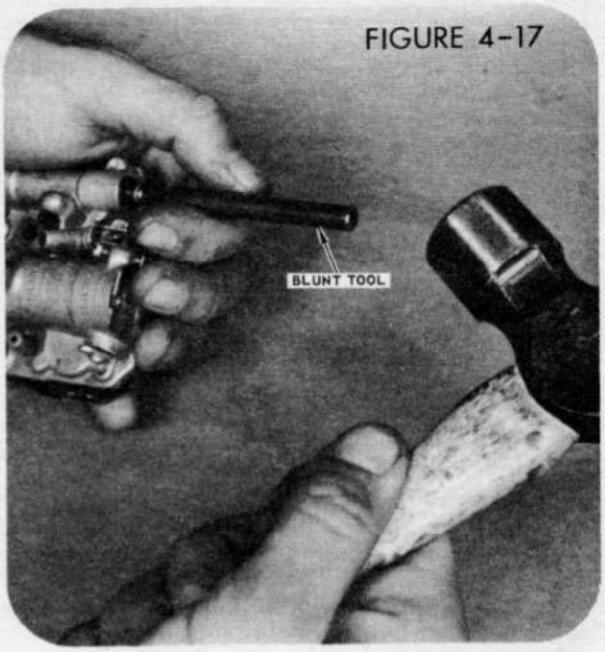


FIGURE 4-17

passages of the carburetor. Never try to blow out passages unless the carburetor is disassembled.

SERVICING SINGLE AND DOUBLE NEEDLE CARBURETORS

Any parts that are cracked, broken or otherwise damaged must be discarded and new parts installed. Refer to the applicable illustrated parts list for correct part numbers.

The following paragraphs give the causes of troubles which can affect these carburetors.

Engine Floods or Runs Rich

The engine will run rich or flood if the fuel orifice has been enlarged through wear or improper adjustment, if the fuel mixture needles are backed out too far, if the pump diaphragm is damaged or stretched, if the fuel inlet lever is set too high or the inlet lever spring is too short (it should be between 5/16 and 21/64 inch long) or the fuel inlet needle is dirty, damaged or otherwise not seating properly.

The primer can also cause the engine to run rich if the discharge needle valve is dirty, the valve spring is missing or the "O" rings are damaged.

Engine Runs Lean

The engine will run lean if the fuel mixture needles are screwed in too far, if the fuel filter screen is dirty or loose and interfering with movement of the diaphragm, if the pump portion of the diaphragm is damaged, if the fuel inlet lever is set too low or the inlet lever spring is stretched, if the base plate screws are loose or air is leaking into the crankcase passed the carburetor mounting gasket.

Additional causes for the engine running lean are a damaged or dirty fuel hose and air leaks around the crankshaft seals in the crankcase.

Engine Won't Idle Properly

The engine won't idle properly if the fuel mixture needles are improperly adjusted, if the fuel metering orifice is worn or elongated, if the primer "O" rings, valves, etc., are leaking fuel or if the idle governor is not properly adjusted.

Carburetor Hard to Adjust

A damaged low mixture needle on Type 1, 2 and 3 carburetors and damaged fuel mixture needles on Type 4 and 5 carburetors will make the carburetor hard to adjust. If a new low mixture needle on all five types of carburetors does not cure the hard-to-adjust condition when the carburetor adjustment is made, install a new carburetor body since it is probable that the fuel orifice is damaged.

Difficulty in Adjusting Idle Speed

This can be caused by an improperly adjusted idle governor.

Primer Will Not Prime Engine

The primer will not prime the engine if the inlet check valve is defective or damaged or the primer "O" rings are damaged. A dirt-clogged primer discharge valve will make it hard to prime the engine and can prevent priming.

Primer Leaks

The primer will leak if the large "O" ring at the primer rod end of the primer cylinder is damaged, if the "O" ring at the plug end (Type 4 and 5 carburetors) is damaged, if the wrong diaphragm assembly has been installed or the proper diaphragm assembly is damaged.

REASSEMBLY

It is advisable to use new rubber parts ("O" rings, "V" packing, diaphragm, etc.) when reassembling these carburetors.

Primer - Type 1, 2 and 3 Carburetors

1. Coat the "O" rings with SAE 30 motor oil. Mount the small "O" ring (6, Figure 4-15) on the primer seat (5). Place the primer needle spring (8) on the primer needle valve (7). Place the primer needle valve in the primer seat and insert the assembly of the spring, valve, seat and "O" ring into the plunger cylinder.

2. Place the large "O" ring (3) in the groove just inside the open end of the plunger cylinder. Insert the plunger spring (2) and plunger. Lock the plunger into the cylinder with a piece of wire bent to hold it in place (Figure 4-18).

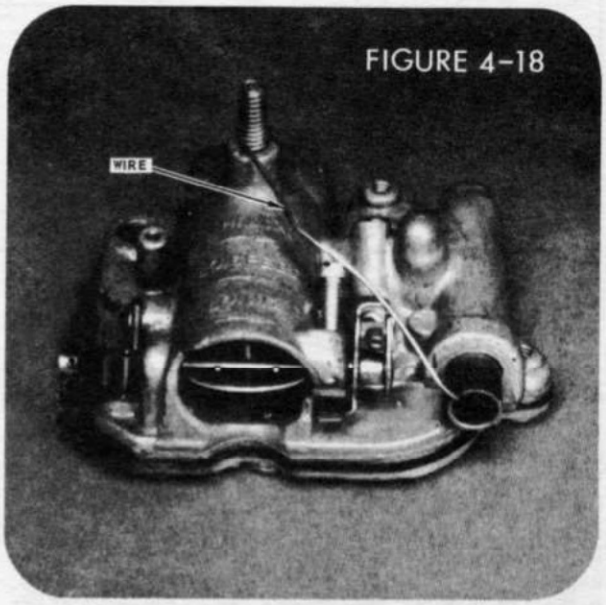


FIGURE 4-18

Type 3 carburetors have a cup (4) pressed into the open end of the cylinder. If the cup was removed, coat the new cup with SAE 30 motor oil and press it into the cylinder for a distance of 5/64 inch (Figure 4-19) before installing the "O" ring.

3. The primer inlet check valve can be installed now

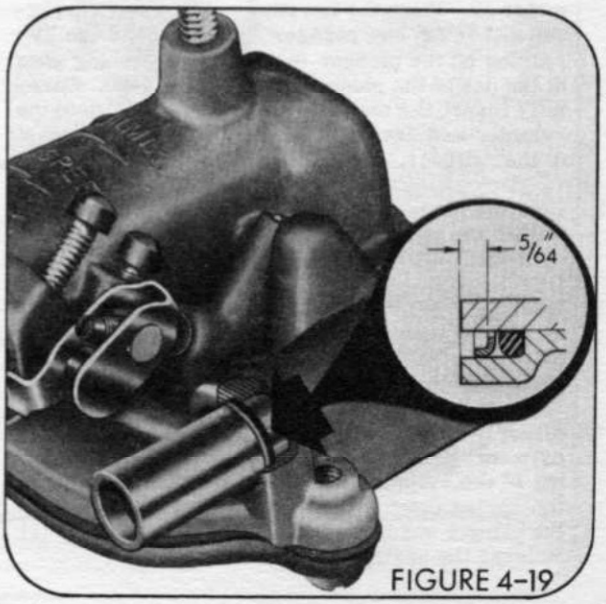


FIGURE 4-19

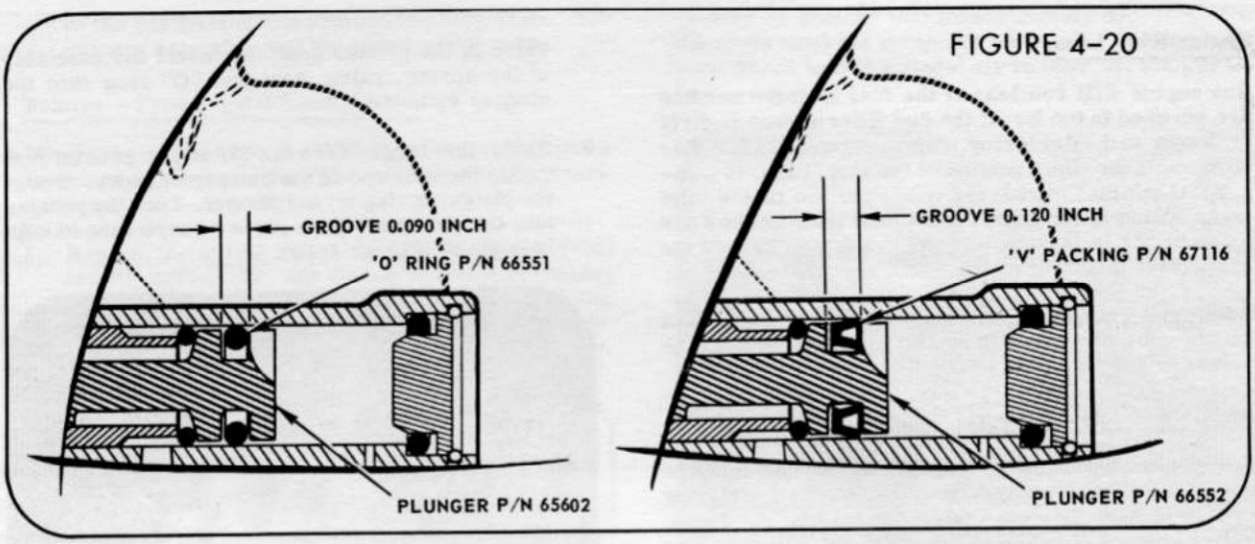


FIGURE 4-20

or just before installing the carburetor base plate after installing the inlet control valve and its associated parts.

Primer - Type 4 and 5 Carburetors

Two types of plungers have been used in these two types of carburetors. The first plunger has a 3/32-inch "O" ring groove at the pumping end of the plunger and the second has a 1/8-inch "O" ring groove (Figure 4-20). Measure the groove to determine which plunger you have. For installation on the 3/32-inch "O" ring groove, use "O" ring, P/N 66551. Use "V" packing, P/N 67116, in the 1/8-inch "O" ring groove. Some plungers of the second type were manufactured with a thicker "O" ring instead of the "V" packing. Use the "V" packing to replace the thicker "O" ring. Do not use the "V" packing to replace the thinner "O" ring. If a new plunger is to be installed, use plunger, P/N 66552, and "V" packing, P/N 67116.

1. Coat the "O" rings and "V" packing with SAE 30 motor oil. Place the two plunger "O" rings (7, Figure 4-16) or one plunger "O" ring and the "V" packing on the plunger (6). The "V" packing goes at the end of the plunger as in Figure 4-20. Carefully insert the medium size "O" ring (8) into the cylinder and seat it in the groove at the midpoint of the cylinder.

2. Coat the plunger with SAE 30 motor oil and slide it into the cylinder through the plug end of the cylinder.

3. Insert the "O" ring (5) into the cylinder and make sure it is seated against the shoulder inside the cylinder. Then install the plug (4) and lock it in place with the plug retainer (3).

4. Insert the spring (2) into the primer rod end of the cylinder. Grasp the end of the plunger and draw it out of the cylinder as far as you can. Now press the spring down into the cylinder without moving the plunger and install the spring retaining clip (1). Release the spring.

5. Installation of the primer discharge and primer inlet valve is covered in the paragraphs below headed Diaphragm and Inlet Valve.

Fuel Mixture and Idle Speed Screws and Fuel Orifice

Install the high speed screw (1 and 1A, Figure 4-14) and the idle screw (2) carefully until they bottom and then back them off one full turn each. Place the needle swivel (4) in the throttle shaft assembly and install the idle mixture metering needle (3). Carefully screw in the metering needle until it bottoms and then back it out one full turn. These screw and needle positions are not adjustment positions; they are positions to be used to protect the screw and needle tips from damage. For adjustment of the carburetor, see Single and Double Needle Carburetor Adjustment on page 4-12.

Throttle and Idle Governor

Type 5 carburetors do not have an idle governor. Installation of the throttle assembly is the same as for the carburetors of the other four types.

1. Slide the throttle shaft (5, Figure 4-13) into the carburetor body. Place the throttle plate (10) on the shaft with the indentations toward the top of the carburetor and on the downstream side of the plate and install the attaching screw (9). Make sure the throttle plate closes and that the shaft moves easily in the body and then tighten the screw securely.

2. Place the needle swivel (8) in the shaft assembly and install the metering needle. Carefully turn the needle in until it bottoms and then back it out one full turn.

3. Place the throttle shaft lever (4), throttle shaft clip (2) and idle governor spring (3) on the throttle shaft.

4. Coat the throttle shaft clip screw (1) with Loctite and install the clip on the side of the carburetor body. Tighten the screw securely.

PRIMER DISCHARGE VALVE TABLE - Type 4 and 5 Carburetors

Configuration		Diaphragm Assembly	Carburetor Body Cavity
X	Duckbill Valve, P/N 63041	67357	Deep
Y	"O" Ring, P/N 106136	67357	Deep
Z	Neither	67357	Shallow

Diaphragm and Inlet Valve

1. Place the filter (12, Figure 4-12) in the carburetor body. Put the inlet needle (11) on its seat in the body. Place the spring (10) on the lever (9) and the lever on the needle and install the inlet lever pin (8) with the attaching screw (7). Tighten the screw securely.

2. Measure the distance between the lever and the flat surface of the carburetor body with the inlet needle against its seat. The lever should be 0.018 to 0.028 inch below the flat surface of the body (Figure 4-21).

3. Type 4 and 5 carburetors have a primer discharge valve. Three different configurations of valves (Figure 4-22) and two different carburetor bodies were used.

   Configuration X uses a ball and a seat and duckbill valve, P/N 63041. It requires diaphragm assembly, P/N 67357.

   Configuration Y uses a ball, seat and "O" ring, P/N 106136. It must be used only with diaphragm assembly, P/N 67357, which has a 1/4-inch diameter hole under the "O" ring.

   Configuration Z uses only the ball and seat. It must be used with diaphragm assembly, P/N 67357. It should only be used in a carburetor body with a shallow valve cavity. Do not attempt to use configuration Z in a carburetor body with a deep valve cavity.

   All three configurations use the same ball and seat. The "O" ring and the duckbill valve are interchangeable provided the correct diaphragm is used. Follow the coupling in the table for the correct part numbers to use in each of the three configurations.

   Install the proper primer discharge valve in accordance with the above.

4. Place the proper diaphragm assembly (5, Fig. 4-12) on the carburetor body. Some early Type 1 carburetors have a phenolic disc check valve (4) which must be installed. Place the base plate (3) on the diaphragm assembly and install it with screws (1) and washers (2). Tighten the screws securely.

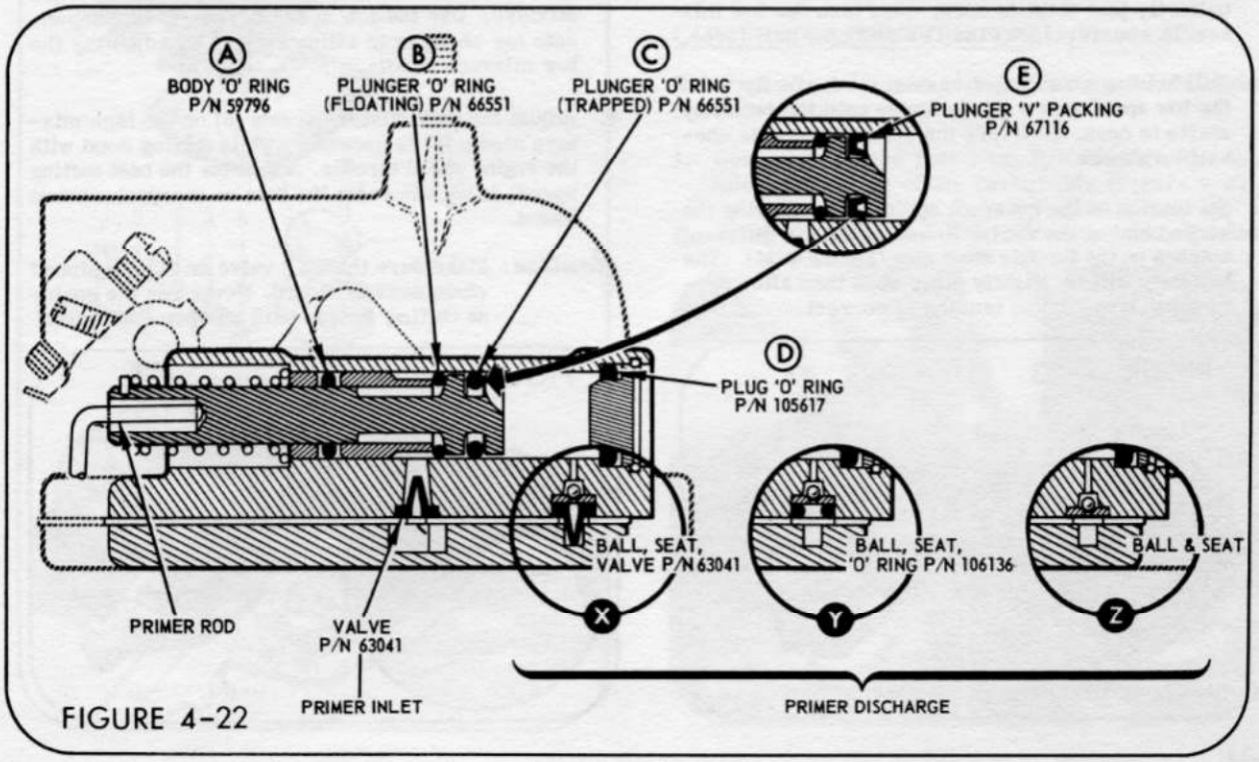


FIGURE 4-22

5. Pressure test the carburetor in accordance with the procedure on page 4-3.

INSTALLATION

1. Make sure the gaskets and insulator are undamaged. Replace any damaged parts with new ones. Refer to the applicable illustrated parts list for correct part numbers.

2. Put a small dab of any adhesive on the gaskets and insulator to hold them in place and put them in the airbox making sure that the pulsation passage through the gaskets and insulator lines up with the pulsation passage hole in the bottom of the airbox.

3. Place the carburetor in the airbox. Connect the throttle rod to the throttle lever. Set the end of the primer rod in the end of the primer plunger.

4. Coat the attaching screws with Loctite and install the carburetor with the screws, washers and spacers. Tighten the screws to a torque value of 55 to 60 inch pounds.

5. Attach the end of the fuel hose to the carburetor fuel inlet.

SINGLE AND DOUBLE NEEDLE CARBURETOR ADJUSTMENT

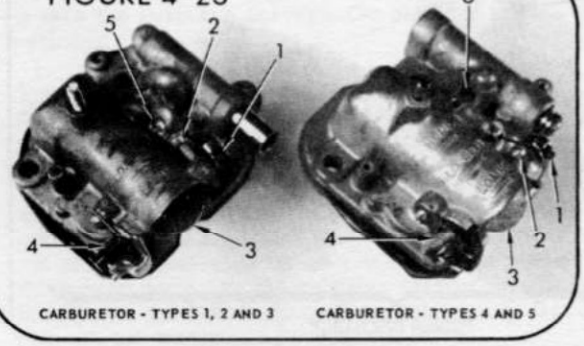
1. Turn the low mix needle (1, Figure 4-23) counterclockwise two or three turns. Turn the low speed screw (2) counterclockwise until the butterfly (3) will fully close.

2. Hold one finger against the butterfly and turn the low mix needle (1) clockwise until you can feel the butterfly just start to open. Now turn the low mix needle counterclockwise two and one-half turns.

3. Still holding your finger against the butterfly, turn the low speed screw (2) clockwise until the butterfly starts to open. Now turn the screw clockwise one-half turn more.

4. Set tension on the governor spring (4) by moving the hooked end of the spring to any of the six different notches on the throttle shaft clip (Figure 4-24). The butterfly will be slightly more open than after performing step 3 when tension is correct.

FIGURE 4-23



CARBURETOR - TYPES 1, 2 AND 3 CARBURETOR - TYPES 4 AND 5

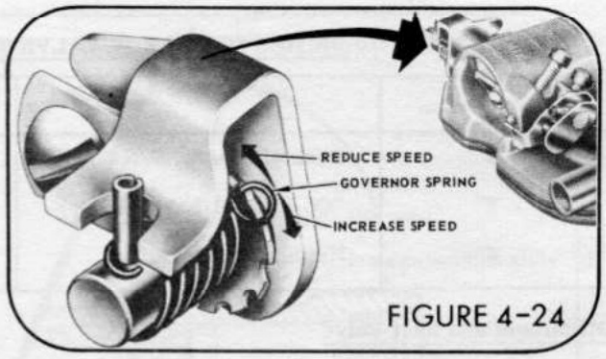


FIGURE 4-24

5. Adjust the high speed mix.

   a. Type 1, 2 and 3 carburetors. Pull the throttle trigger all the way back to wide open position. Adjust the high mixture screw (5) as necessary until the butterfly is flat out as at (a) in Figure 4-25. Now turn the high mixture screw clockwise just enough to reach position (b) in Figure 4-25.

   b. Type 4 and 5 carburetors. Turn the high mixture needle (6) clockwise until resistance is felt and then stop turning. Additional clockwise turning can damage the needle seat. Now turn the high mixture needle counterclockwise 1-1/2 turns.

6. Start the engine and let it warm up.

7. Adjust the low mixture needle (1, Figure 4-23) for smooth acceleration and for even idle operation in all positions. Turn the needle clockwise for a leaner mixture and counterclockwise for a richer mixture. Use the low speed screw (2) to compensate for changes in idling caused by adjusting the low mixture needle.

8. Adjust the high mixture screw (5) or the high mixture needle (6) as necessary while cutting wood with the engine at full throttle. Adjust for the best cutting speed; do not adjust for the best or sharpest exhaust sound.

Caution: Make sure the DSP valve on DSP equipped chain saws is closed. Never run the engine at cutting speeds with an open DSP valve!

FIGURE 4-25

