4

The fuel system

The fuel system consists of the carburetor, air cleaner assembly, fuel line, tank, and miscellaneous fittings. Optional elements include a fuel pump (which might be integral with the carburetor), shutoff valve, and filter.

How carburetors work

We think of an engine as a source of power. From the fuel system's point of view, the engine is a vacuum pump. The partial vacuum created by the piston during the intake stroke sets up a pressure differential across the carburetor. Air and fuel, impelled by atmospheric pressure, move through the instrument to equalize pressures.

Venturi & high-speed circuit

If you look through a carburetor, you'll see that the bore has an hourglass shape, with the necked-down portion located just upstream of the throttle plate. This area is known as the venturi. As much air leaves the carburetor as enters. Consequently, air velocity through the venturi must be greater than through the straight sections of the bore on either side of it. The increase in velocity is purchased at the expense of pressure.

Fuel, under atmospheric pressure, moves from the carburetor reservoir through the main jet and into the nozzle, which opens to the low-pressure, high-velocity zone created by the venturi. The jet can be fixed, as shown in Fig. 4-1A, or adjustable. In either case, the size of the jet orifice determines the strength of the mixture by regulating how much fuel passes into the venturi. The main air jet, more commonly known as the main air bleed,

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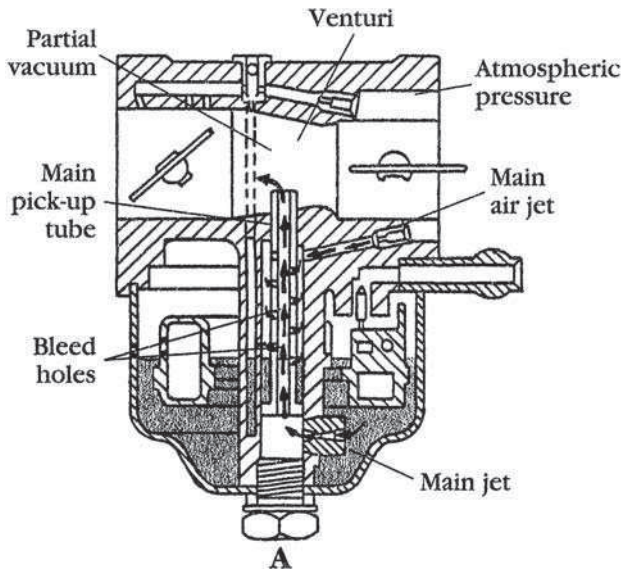

FIG. 4-1. *At wide throttle angles, fuel enters the venturi through the main pick-up tube, better known as the* high-speed nozzle. *(A) An air bleed ("main air jet") emulsifies the fuel, breaking it into droplets prior to discharge.* Briggs & Stratton Corp.

emulsifies the fuel before discharge, primarily to prevent siphoning. Collectively, these parts make up the high-speed circuit—high speed because the venturi works only so long as the throttle is open. Closing the throttle blocks air flow through the venturi and shuts down the fuel circuit.

Throttle & low-speed circuit

The throttle blade, or butterfly, controls engine speed by regulating the amount of fuel and air leaving the carburetor. It functions like a gate valve, opening for the engine to develop full power and almost completely blocking the bore at idle. The restriction generates a low-pressure zone downstream of the throttle blade, exactly as if it were a venturi. Fuel enters through a series of ports drilled in the carburetor bore. The port nearest the engine—known as the primary idle port—functions when the throttle blade is against its stop (Fig. 4-1B). As the throttle cracks open, one or more secondary ports are uncovered to ease the transition between idle and main venturi startup (Fig. 4-1C). The low-speed circuit also includes an air bleed.

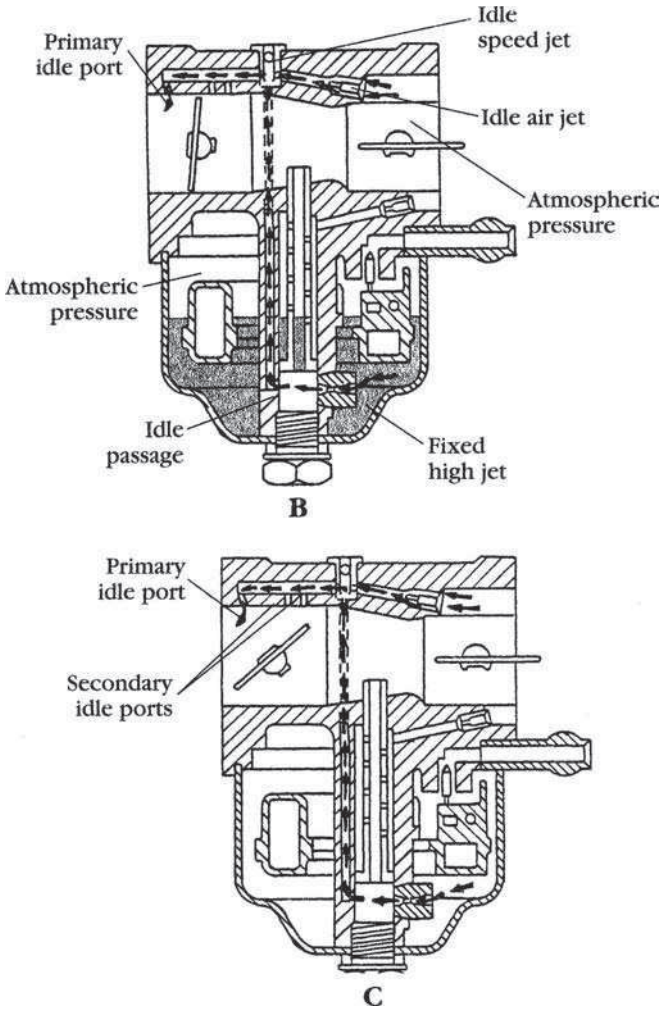

FIG. 4-1 (Cont.). *When the throttle blade is closed, the low-speed circuit discharges into the primary idle port. As the blade opens, it uncovers secondary idle ports (C). Wider throttle angles generate flow through the main jet.* Briggs & Stratton Corp.

Fuel inlet

Carburetors always include a mechanism for regulating the internal fuel level, independent of delivery pressure. Most Briggs type carburetors employ a float-actuated inlet valve, known as a *needle and seat* (Fig. 4-1D). When the reservoir is full, the float forces the needle against its seat, which cuts off

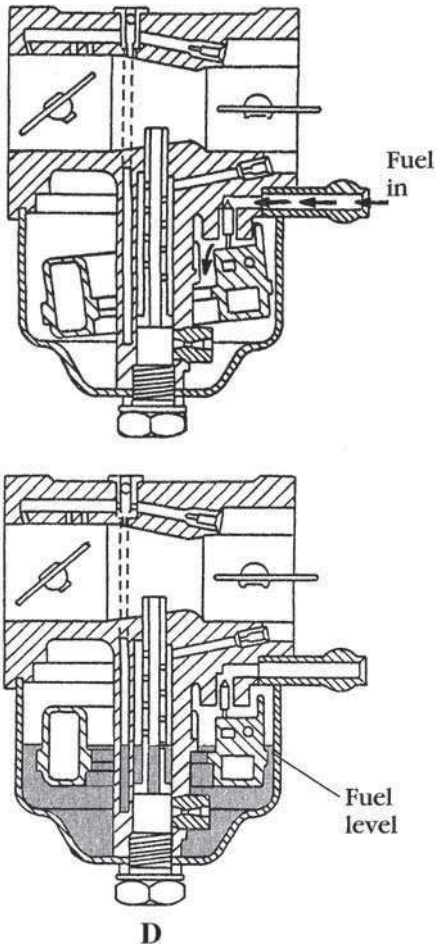

FIG. 4-1 (Cont.). *A float-operated inlet valve, or the needle and seat, maintains a constant fuel level in the instrument (D).* Briggs & Stratton Corp.

fuel delivery. As gasoline is consumed, the float drops, which releases the needle and opens the valve.

Suction-lift carburetors draw from the tank through a pickup tube in a manner analogous to a flit gun (Fig. 4-2). A check valve prevents fuel from draining out of the tube during starting.

Cold start

With one or two exceptions, Briggs carburetors employ conventional choke valves to enrich the mixture during cold starts. The Walbro carburetor shown in Fig. 4-1A uses a pivoted choke disk. The Vacu-Jet in Fig. 4-2 has

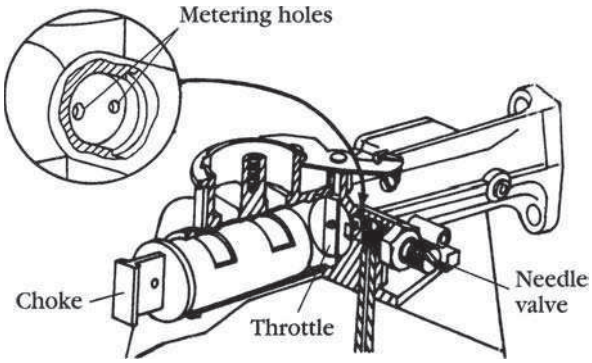

FIG. 4-2. *Vacu-Jets and their Pulsa-Jet cousins draw through a pickup tube that extends into the fuel tank. An internal check ball prevents fuel from running back out of the tube. Note the plug-type choke and single-adjustment needle that controls both low- and high-speed mixture strength.* Briggs & Stratton Corp.

an old-fashioned plug choke. In either case, closing the choke seals off the carburetor bore. The engine, in effect, pulls on a blind pipe. All jets flow in response to the low pressure.

Figure 4-3 illustrates the Briggs automatic choke found on Vacu- and Pulsa-Jet carburetors. A spring-loaded diaphragm holds the choke closed

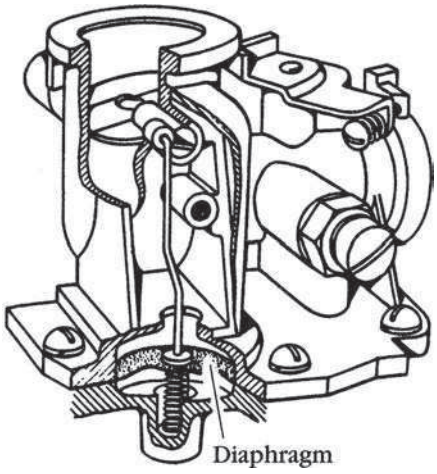

FIG. 4-3. *Some Vacu- and Pulsa-Jet carburetors are fitted with a vacuum-operated automatic choke. The choke butterfly should close when the engine is not running, flutter shut under sudden load and acceleration, and open at steady speed. Major causes of failure are a bent air cleaner stud, leaking diaphragm, and dirt in the butterfly pivots. The diaphragm chamber must be airtight.* Briggs & Stratton Corp.

during cranking. Upon starting, a manifold vacuum, acting on the underside of the diaphragm, overrides the spring to open the choke. The choke also operates as an enrichment valve should the engine falter under load; the loss of the manifold vacuum allows the choke to close.

Some automatic choke mechanisms are fitted with a bi-metallic helper spring. A tube connected to the breather assembly conducts warm air over the spring, which causes it to uncoil and open the choke independently of the vacuum signal acting on the choke diaphragm.

Pulsa-Prime nylon-bodied carburetors combine a fuel pickup tube with a primer pump. No choke is used. Pressing the primer bulb evacuates air from the pickup tube, which causes the level of fuel in it to rise.

External adjustments

Figure 4-4A illustrates a Flo-Jet carburetor with adjustable main and low-speed jets. Backing out the needle-tipped adjustment screws opens the jet orifices and enriches the mixture (Fig. 4-4B). Tightening the screws makes the mixture leaner by restricting the fuel flow through the jet. The idle-speed adjusting screw bears against the throttle stop to regulate idle rpm.

All Briggs carburetors have an idle speed adjusting screw. Most of the newer types dispense with one or both of the mixture-adjustment screws, as shown in Fig. 4-lA. Fixed-main and/ or low-speed jets should require no attention unless the calibration is upset by a change in altitude. An engine set up by the factory for sea-level operation will run rich in the rarefied air at high altitudes. Briggs can supply the correct jetting. A field fix that works on some B & S-supplied (and other) Walbro carburetors is to remove the air-bleed jet.

Initial mixture screw adjustment

As a rule of thumb, engines should start when the mixture-control screws are backed out $1^1/_4$ to $1^1/_2$ turns from lightly seated.

Caution: Use your thumb and index finger to seat the screws. Do not force the issue with a screwdriver. Adjustment screws that have been damaged by overtightening must be replaced if the engine is to run properly (Fig. 4-5).

Procedure

With a clean air filter in place, fully open choke, and fresh fuel in the tank, run the engine under moderate throttle for about five minutes to reach operating temperature. The tank should be about half full on engines equipped

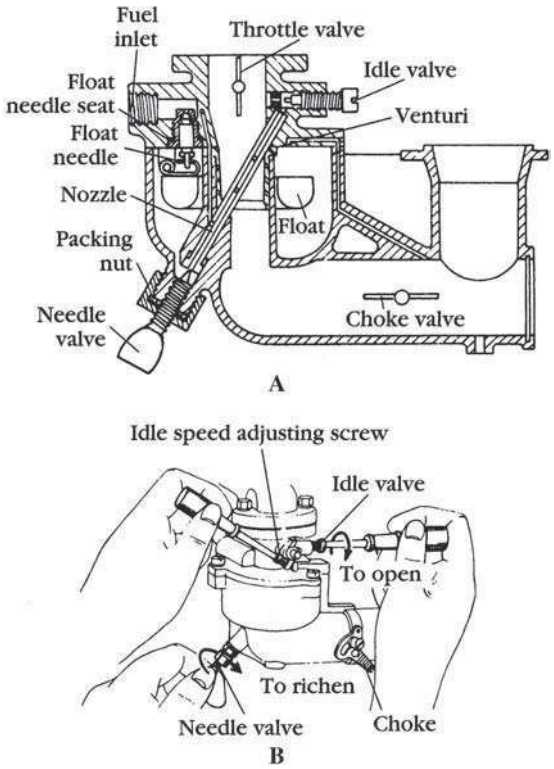

FIG. 4-4. *Two-piece Flo-Jet in sectional view (A). The part that Briggs calls a "needle valve" is better known as the main, or high-speed, mixture-control screw. The "idle valve" is the idle, or low-speed, mixture-control screw. The locations of these two mixture-control screws varies with carburetor type but the idle-mixture screw is always the one closer to the engine. Because these screws control fuel delivery, backing them out of their jets enriches the mixture (B). Occasionally, you might encounter a foreign or vintage American carburetor that employs adjustable air jets, distinguished by the rounded needle tips of the adjustment screws. Backing out an air screw leans the mixture.* Briggs & Stratton Corp.

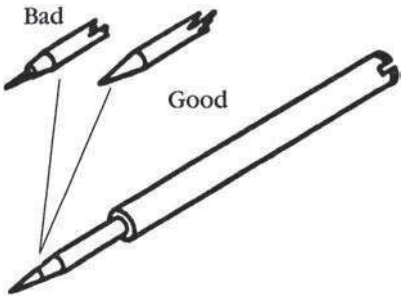

FIG. 4-5. *Bent or grooved adjustment needles must be replaced.* Briggs & Stratton Corp.

with Vacu-Jet carburetors to minimize the effects of fuel level on mixture strength. This requirement does not apply to other carburetors.

1. Run the engine at about three-quarters speed.
2. Back out the main mixture-control screw in small increments—no more than an eighth of a turn at a time. Pause after each adjustment for the effect to be felt. Stop when engine rpm drops and, using the screwdriver slot as reference, note the position of the screw at the rich limit.
3. Tighten the screw in increments as before. Stop when engine speed falters at the onset of lean roll, which represents the leanest mixture that supports combustion.
4. Open the adjustment screw to the midpoint between the onset of lean roll and the rich limit.
5. Close the throttle and adjust the idle mixture for the fastest idle. You need at least 1700 rpm.
6. Snap the throttle butterfly open with your finger. If the engine hesitates, back out the high-speed adjustment screw a sixteenth of a turn or so and repeat the experiment. Enriching the high-speed mixture usually calls for a slightly leaner idle mixture.

The adjustment always imposes some compromise between idle quality and high-speed responsiveness. This is especially true for Vacu- and Pulsa-Jet carburetors that regulate both mixtures with a single adjustment screw. Always err on the side of richness, and do not consider any carburetor adjustment final until proven under load.

Troubleshooting

Make the checks described in chapter 2 before assuming something has gone amiss with the fuel system. Of course, sludge in the tank or raw gasoline dribbling from the air horn are powerful arguments for immediate action.

No fuel delivery

The engine appears to develop compression and the carburetor is not obviously loose on its mountings. The spark-plug tip remains dry after prolonged cranking. When mixture screws are present, backing them out has no effect. An injection of carburetor cleaner through the spark-plug port brings the engine back to life, but only for a few seconds.

Tank-mounted, Vacu-Jet carburetors suffer total failure when the check ball in the fuel pipe sticks in the closed position, almost always as a result of stale gasoline. Its cousin, the Pulsa-Jet, quits when its fuel pump diaphragm stretches or ruptures. The high- and low-speed jets (actually discharge ports) in these carburetors do not often clog and hardly ever do so simultaneously.

Float-type carburetors are susceptible to blockages between the tank and carburetor-inlet fitting. Possibilities include a clogged tank screen, fuel-tank cutoff valve, or filter on engines so equipped. External and crossover Flo-Jet fuel pumps might also fail because of an internal malfunction or a vacuum leak. (Older engines sometimes used mechanical pumps, which are susceptible to diaphragm and check-valve failure.) Check fuel delivery by cracking the line at the carburetor inlet.

If no fuel is present, work backwards, connection by connection, to the tank.

Warning: Opening fuel lines is always hazardous and especially so if the engine must be cranked to activate a fuel pump. Make these determinations outdoors with the ignition switched off and the spark-plug lead solidly grounded.

If fuel appears at the carburetor inlet, it should also be inside the instrument. Remove the fuel bowl, which is secured by a central nut on the underside. The bowl should be full. If not, the problem is a stuck inlet needle, hung float, or clogged inlet screen (on units with this feature). Failure to transfer fuel out of the bowl suggests a clogged main jet, fuel-delivery nozzle, or loss of manifold vacuum.

Engine runs lean at full throttle

This fault will appear as loss of power, possible backfire as the throttle plate is suddenly opened, and a dead-white or bleached-brown spark-plug tip. The engine seems to run better when choked. Backing out the high-speed adjustment screw (when present) has no effect.

Begin by looking for air leaks downstream of the throttle plate. Focus on the carburetor mounting flange and cylinder head gasket. Lean running in a two-cycle engine is the classic symptom of crankshaft seal failure, but don't settle on this rather grim diagnosis until other possibilities have been eliminated.

Replace the optional fuel filter and open the line to verify that copious amounts of fuel are available at the carburetor inlet fitting. Note the preceding warning about ignition sparks and spilled gasoline. Finally, look for a stoppage in the high-speed circuit, which will usually be at the point of discharge.

Engine runs rich

A blackened spark plug, acrid, smoky exhaust, and loss of power suggest an overly rich mixture. It is assumed that turning the mixture adjustment screws (when present) has no effect and that the air filter has been cleaned or, if made of paper, replaced. The choke butterfly opens fully, as verified by visual inspection with the air cleaner removed.

In my experience, persistently rich mixtures are a problem almost entirely confined to float-type carburetors. Replace the needle and seat and set the float level to specification. If the difficulty persists, check for clogged air bleeds.

Briggs & Stratton Walbro carburetors use a replaceable high-speed air jet that might have been removed in an ill-advised attempt to richen the mixture.

Note: Fixed-jet carburetors require recalibration at high altitudes. Contact your dealer for recommended fuel and air jet sizes.

Carburetor floods

Long bouts of cranking with the choke closed will flood any carburetor, wet the bore, and spill fuel out of the air horn. Two-piece Flo-Jets flood quite easily.

Note: Carburetor flooding, characterized by fuel puddling in the bore, must be distinguished from external leaks. Fuel will cascade past a worn or twisted float-bowl gasket. Tank-mounted Vacu- and Pulsa-Jet carburetors might weep fuel at the tank interface because of cracks in the tank or a bad gasket. See the following "Removal and installation" section for additional information.

Failure of the inlet needle and seat or of the float mechanism produces spontaneous flooding in Flo-Jet and B & S Walbro carburetors. Needle-and-seat failures are usually attributable to wear, although dirt in the fuel supply can produce the same effect. Dirt-induced flooding might spontaneously cure itself, only to reappear as another particle becomes trapped between the needle and seat. Clean the fuel system and replace the needle and seat.

Float failures are usually of the obvious mechanical sort and correctable by cleaning.

Engine refuses to idle

Engines that operate under a constant-load regime might not have provision for idle. Once the engine starts, the governor raises engine speed to a preset rpm. This discussion applies to engines that left the factory with an idle capability and now refuse to exercise it.

Check for air leaks at the carburetor mounting flange, cylinder-head gasket, and at the throttle-shaft pivots. The latter source might not be significant but will allow abrasives to enter the engine. Other possibilities include:

- *Idle rpm set too high*. All Briggs & Stratton carburetors have an adjustable throttle stop in the form of a spring-loaded screw. Use a tachometer to adjust to the factory or equipment manufacturer's specification.
  Caution: Air-cooled, splash-lubricated engines do not idle in the automotive sense of the word. Speeds of 1700 rpm and more are the norm.
- *Maladjusted throttle cable.* Loosen the cable anchor and reposition the Bowden cable as necessary.
- *Binding throttle shaft or linkage.* New throttle shafts sometimes bind because of paint accumulations. Grass or other debris might limit the freedom of movement of the throttle-return mechanism.

- *Governor failure.* With the engine running and the throttle lever set on idle, gently try to close the throttle. Do not force the issue. If light finger pressure does not move the throttle against its stop, a possible governor malfunction is indicated for engines intended to run at variable speeds.
- *Clogged low-speed circuit.* Clean the carburetor.

Removal & installation

The carburetor bolts to the engine block or makes a slip-fit connection, sealed by an O-ring, with the fuel-inlet pipe. The fuel supply must be shut off on gravity-fed systems, either with the valve provided or by inserting a plug into the carburetor end of the flexible fuel hose.

Warning: Some gasoline will be spilled. Work outside in an area remote from possible ignition sources.

The governor mechanism must be disengaged from the throttle arm without doing violence to the associated springs and wire links. Some springs have open-ended loops and can be easily disengaged with long-nosed pliers. Others incorporate double-ended loops that come off and go on in a manner reminiscent of the "twisted-nail" puzzle.

Note the lay of the spring and, if there is any possibility of confusion, mark the attachment holes.

Wire links remain connected until the carburetor is detached from the engine. While holding the carburetor in one hand, twist and rotate it out of engagement with the links, being careful not to bend the wires in the process.

Four, and on one model five, screws secure Vacu- and Pulsa-Jet carburetors to the fuel tank. Automatic-choke models used on 920000, 940000, 110900, and 111900 engines have one of the screws hidden under the choke butterfly. Inspect the tank interface for cracks (in which case, the tank must be replaced) and for low spots that might cause fuel or vacuum leaks (Fig. 4-6). This problem is serious enough for the factory to supply a Pulsa-Jet tank repair kit (PN 391413).

Assembly is the reverse of disassembly. Always use new gaskets mated against clean flange surfaces.

Warning: Briggs & Stratton engines built before the early 1970s (the factory spokesperson contacted could not be more specific about the date) used asbestos gaskets. Soak the area with oil and remove gasket material with a single-edged razor blade and dispose of the shards safely. Do not use a wire wheel or any other method that might create dust.

Make up the links first, then secure the carburetor to the engine. Connect the springs last.

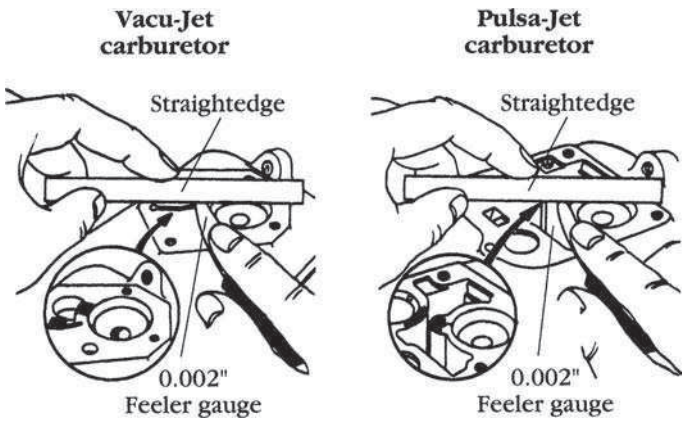

FIG. 4-6. *Vacu-Jet and Pulsa-Jet tank flanges are crucial. Hairline cracks or low spots leak fuel. A low spot in the shaded area shown, denies vacuum to the Pulsa-Jet fuel pump.* Briggs & Stratton Corp.

Automatic choke Most late-production Vacu- and Pulsa-Jet carburetors are equipped with a type of automatic choke unique to Briggs & Stratton. The choke valve is normally closed by a spring and pulled open by a manifold vacuum acting on a large diaphragm.

The choke butterfly should snap closed when the engine stops and open as soon as it starts. If should also flutter in response to changes in the manifold vacuum under severe loads. In this function, the automatic choke acts as an enrichment device.

Spring length is critical:

Application	Spring free length
Vacu-Jet	$^{15}/_{16}$–1 in.
Pulsa-Jet	$1\,^{1}/_{8}$–$1\,^{7}/_{32}$ in.
Engine models 11090 & 11190	$1\,^{15}/_{16}$–$1\,^{3}/_{8}$ in.

To assemble:

1. If a new diaphragm is being installed, attach the spring as shown in Fig. 4-7.
2. Invert the carburetor and guide the spring/link assembly into its recess (Fig. 4-8).
3. Turn the assembly over and start the mounting screws, turning them just far enough for purchase.
4. Depress the choke butterfly with one finger and attach the actuating link (Fig. 4-9). This action preloads the diaphragm spring.

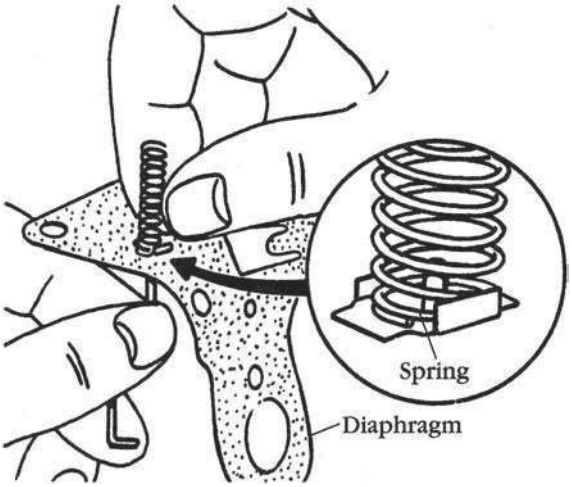

FIG. 4-7. *Attach the choke link to the diaphragm as shown.* Briggs & Stratton Corp.

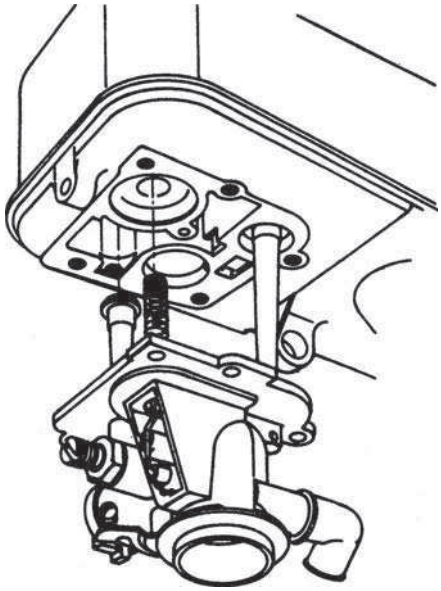

FIG. 4-8. *With the parts inverted, mate the carburetor to the tank. Turn the assembly over and lightly start the hold-down screws. The parts must be free to move relative to each other.* Briggs & Stratton Corp.

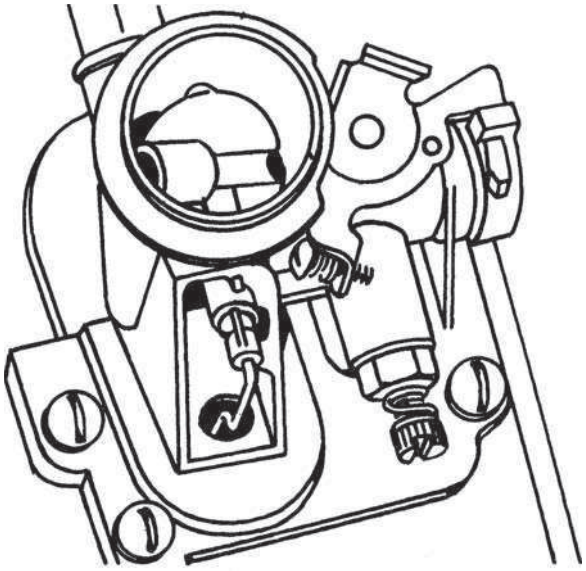

FIG. 4-9. *Complete the assembly while holding the choke closed.* Briggs & Stratton Corp.

5. Tighten the mounting screws, running them down incrementally in an X-pattern. Spring preload should lightly tip the choke over center, toward the closed position. Install the link cover and gasket.

If the choke remains closed after the engine starts, the problem can usually be traced to insufficient spring preload. Too much spring preload will hold the choke open, regardless of the strength of the vacuum signal. Fuel or oil in the diaphragm chamber has the same effect. Other possibilities include carbon/varnish deposits on the butterfly pivots or a bent air-cleaner stud. If the stud is bent, replace it, rather than attempting a repair that might compromise the air cleaner-to-carburetor seal.

Pulsa-Jet tank diaphragm Pulsa-Jet carburetors include a fuel pump, which is actuated by a vacuum diaphragm. Side-mounted diaphragms are discussed in an upcoming section titled "Vacu-Jet & Pulsa-Jet." The tank-mounted diaphragm (Fig. 4-10), used on one version of this carburetor, concerns us here.

Figure 4-6 illustrates the places where vacuum leaks typically develop at the tank interface. Figure 4-10 shows the sequence of assembly. Note that the spring rests collar down on the top of the diaphragm and not in the tank cavity.

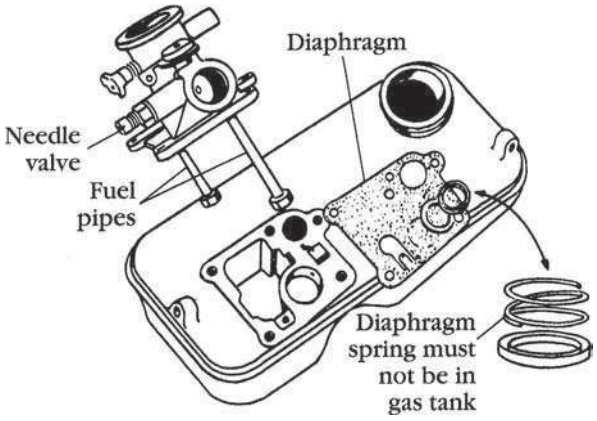

FIG. 4-10. *Pulsa-Jet diaphragms install on the tank followed by the wear collar and Spring.* Briggs & Stratton Corp.

Repair & cleaning

Carburetors do not wear out in the accepted sense of the term. Most failures are associated with "soft" parts, such as inlet needles and seats, diaphragms, and gaskets. After long service, the throttle shaft bearings might develop enough play to justify replacement, when such repairs are possible.

Light varnish deposits respond to lacquer thinner and compressed air. Heavier deposits can be removed with Gunk Carburetor Cleaner, which as these products go, appears to be fairly benign. But no chemical cleaner, however aggressive, can undo the effects of water-induced corrosion. White powdery deposits and leached castings mean that the carburetor should be discarded. Sometimes you can get a water-damaged carburetor to work, but it will never be quite right.

Strip off nonmetallic parts, including gaskets, O-rings, elastomer inlet seats, and diaphragms. Leave nylon butterflies in place, since a short exposure to Gunk does not seem to hurt. Nylon-bodied carburetors can also be cleaned, provided immersion is limited to five minutes or so.

As you clean and repair, don't disturb the following items:

- The throttle and choke butterfly valves.
- The Vacu- and Pulsa-Jet pickup tubes (unless for replacement).
- Any part that resists ordinary methods of disassembly. Threaded, as opposed to permanently installed pressed- fitted parts, have provisions for screwdriver or wrench purchase. But forced removal might do more damage than carburetor cleaner can correct.
- Expansion plugs (unless loose or leaking). Briggs & Stratton carburetor overhaul kits include expansion plugs. If you opt to replace these

items, install them with a flat- nosed punch (a piece of wood will do) sized to the plug's outside diameter (OD). Seal by running a bead of fingernail polish over the joint after installation.

Carburetor service by model

Depending on displacement, market, and vintage, Briggs & Stratton engines employ any of five basic carburetor types. Each type includes subvariants and most have undergone running production changes, which are keyed to the engine build date.

Two-piece Flo-Jet

Small, medium, and large two-piece Flo-Jets are the only up-draft carburetors in the Briggs line. Figure 4-4A shows the parts layout common to all three models.

Needle & seat Extract the elastomer seat by threading a self-tapping screw into the fuel orifice (Fig. 4-11). Press in a replacement seat—PN 230996 for gravity feed, PN 231019 for applications with a fuel pump—flush with the casting. Viton-tipped needles can be reused, if not obviously worn.

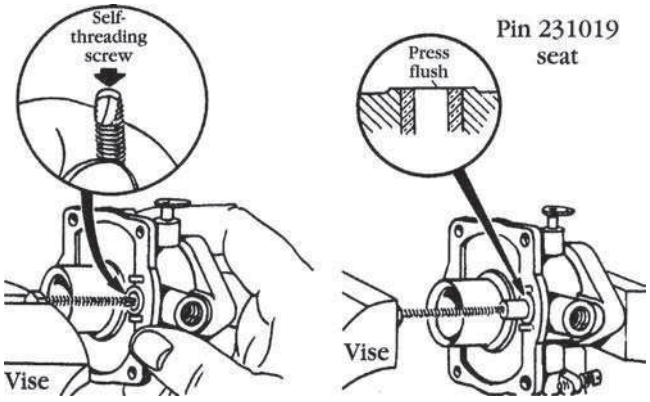

FIG. 4-11. *Briggs & Stratton uses elastomer inlet seats, which are extracted with a self-tapping screw and pressed into place using the original seat as a buffer. In the case of the one-piece Flo-Jet, the seat should be flush with the raised casting lip.*

Float setting When inverted and assembled without a bowl-cover gasket, the float should rest level with the casting (Fig. 4-12). Adjust float height by bending the tang with long-nosed pliers. Figure 4-13 illustrates the proper orientation of the needle clip for this and other carburetors that employ the device.

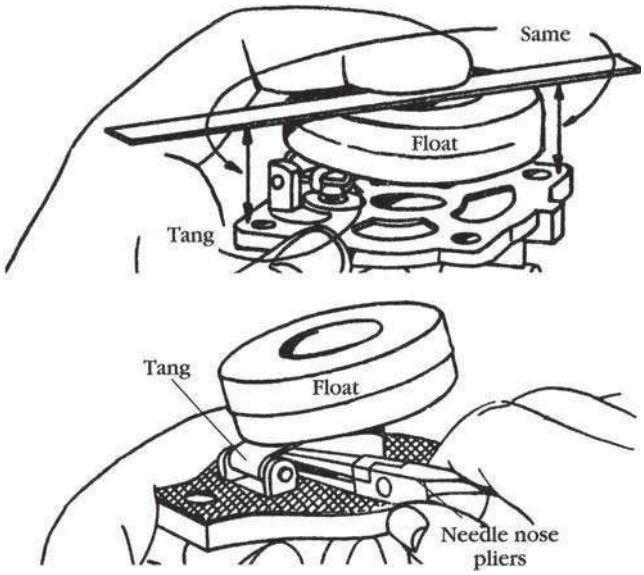

FIG. 4-12. *The float should be level with the (gasketless) casting for Flo-Jet and all other Briggs carburetors. Adjust by bending the tang without applying force to the needle.*

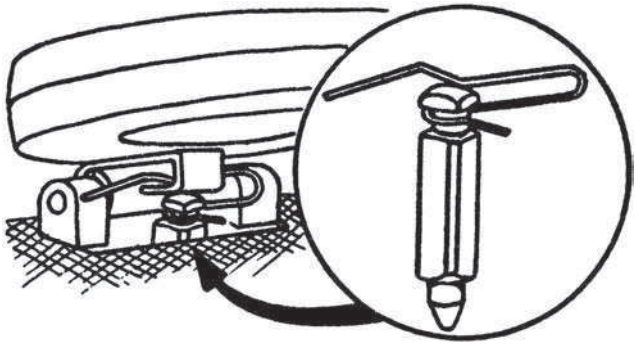

FIG. 4-13. *Install needle spring as shown for all applications.* Briggs & Stratton Corp.

Caution: Do not make the float height adjustment by pressing the float against the needle.

Casting distortion Overtightening the hold-down screws distorts the bowl-cover casting. Assemble without a gasket, and check with a 0.002-in. feeler gauge (Fig. 4-14). If the blade enters, remove the cover and straighten the "ears" with light hammer taps.

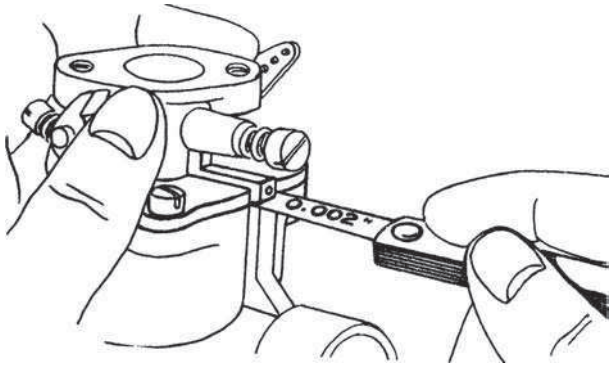

FIG. 4-14. *The two-piece Flo-Jet bowl-cover casting (or "throttle body") is a fragile casting, easily warped by over tightening. Allowable distortion is <0.002 in., as measured with a 0.5-in.-wide feeler gauge. If the gap is excessive, turn the casting over and, using a small hammer, tap the corners back into alignment.* Briggs & Stratton Corp.

Throttle shaft/bearing replacement Follow this procedure:

1. Using a 1/8-in. punch, drive out the roll pin that secures the throttle lever to its shaft.
2. Scribe marks on the throttle blade and carburetor body as assembly references.
3. Remove the two small screws that secure the throttle butterfly to the shaft.
4. Remove the butterfly and shaft.
5. Extract the shaft bushings with a 1/4-in. tap.
6. Press in new bushings to original depth.
7. Install a new throttle shaft and throttle butterfly with scribe marks indexed. Coat the butterfly screw threads with Loc-tite. Start the screws, but do not tighten.
8. Close the butterfly to center it in the carburetor bore and tighten the screws. Verify that the butterfly swings through its full arc without interference. Complete the assembly.

One-piece Flo-Jet

Briggs manufactures one-piece Flo-Jets in two sizes. The small version carries its main jet in the float bowl (Fig. 4-15A). The large model employs a remotely located main jet, supplied through a removable nozzle (Fig. 4-15B).

Needle & seat Service as described for the two-piece Flo-Jet (Fig. 4-11). Note that the replacement seat must be dead flush with the casting.

Float setting Adjust as described for the two-piece Flo-Jet. When inverted, the float should rest level with the carburetor body (Fig. 4-12).

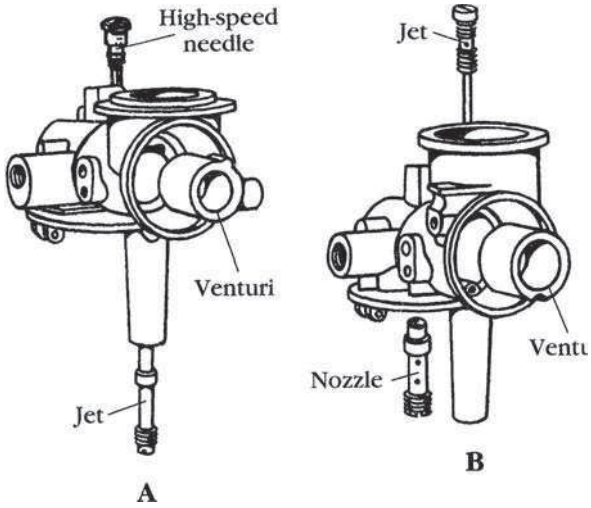

FIG. 4-15. *Small (A) and large (B) one-piece Flo-Jets with float bowls removed. The large model has its high-speed mixture screw under the float bowl.* Briggs & Stratton Corp.

Crossover Flo-Jet

Figure 4-16 is a sectional view of the crossover Flo-Jet, as used on horizontal-crankshaft Model 253400 and 255400 engines. This carburetor includes a vacuum-operated fuel pump, illustrated in the next drawing.

Needle and seat renewal and float adjustment procedures are as described for the two-piece Flo-Jet. Figure 4-17 illustrates the assembly sequence for

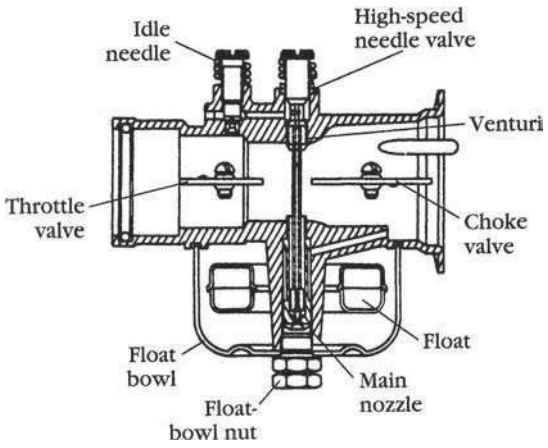

FIG. 4-16. *Crossover one-piece Flo-Jet adjusts from the top.* Briggs & Stratton Corp.

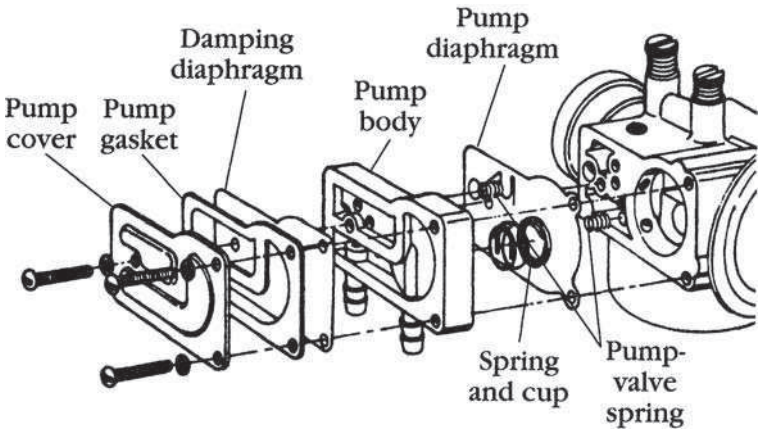

FIG. 4-17. *Briggs supplies replacement diaphragms singly or as part of the crossover Flo-Jet rebuild kit. Assemble dry, without sealant.*

the double-diaphragm fuel pump, normally serviced with a rebuild kit that contains springs and "soft" parts.

Briggs & Stratton Walbro

The factory appears to be slowly phasing out the Flo-Jet series in favor of highly modified Walbro carburetors. Engines in the 9-to 13-cubic-in. range use variants of the small series Walbro, recognized by its angular appearance and removable air bleed jet, mounted just aft of the air cleaner. The removable main jet nozzle has been omitted, together with replaceable throttle-shaft bushings and other niceties associated with earlier designs. Most small Walbros have a fixed-main jet and an adjustable low-speed jet, but there are exceptions. Some carburetors, as shown in Fig. 4-18, employ fixed jets for both circuits. Carburetors used on 120000 engines are completely adjustable.

The large B & S Walbro, fitted to 19-, 25-, and 28-CID vertical shaft engines, employs an external air bleed jet, which is located next to the idle mixture screw, and a removable main nozzle, which is accessed from the float bowl. Fixed-main jets are the norm.

Aside from the nozzle detail, service procedures are similar for the small and large versions of the carburetor.

Inlet seat Fish out the elastomer seat with a hooked wire and install the replacement to cavity depth (Fig. 4-19) using a flat punch sized to seat OD.

Float Float pins might include an antirotation feature in the form of flats milled on one end. Drive out the pin from the unmarked end and assemble with

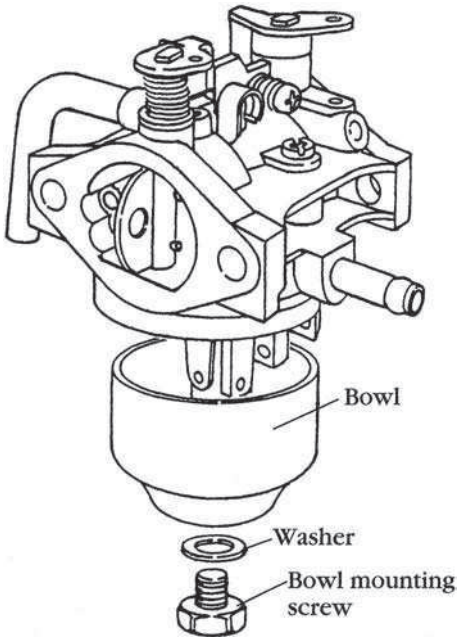

FIG. 4-18. *Because of emission regulations, nonadjustable carburetors are becoming the norm. The L.-shaped tube on the left vents the float bowl.* Briggs & Stratton Corp.

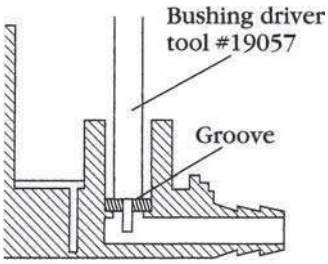

FIG. 4-19. *Press the fuel-inlet seat home with the grooved side of the seat down, toward the incoming fuel stream. A flat punch, sized to seat OD, can be used in lieu of the factory tool shown.*

the pin flats aligned to corresponding flats on the pivot bearing (Fig. 4-20). A spring clip ties the needle to the float (Fig. 4-21). Float height is fixed by needle and seat geometry and should not be tampered with in the field.

Vacu-Jet & Pulsa-Jet

Figure 4-2 illustrates the Vacu-Jet mechanism, which is distinguished by a single pickup tube and tandem discharge ports controlled by flow through a single jet. Figure 4-22 shows the three basic forms of this carburetor.

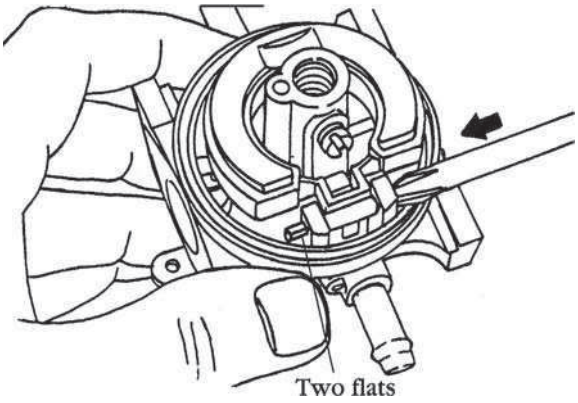

FIG. 4-20. *Flats are provided on some float pins, apparently to prevent hanger wear. Extract from the flattened end and install with flats properly indexed.* Briggs & Stratton Corp.

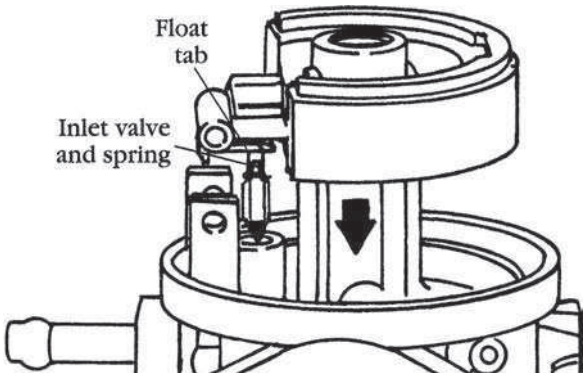

FIG. 4-21. *Install the float with the needle assembled to its clip. Do not tamper with the float tang.* Briggs & Stratton Corp.

The Pulsa-Jet derives from the Vacu-Jet and in its various permutations uses many of the same parts. The distinction between the two is that the Pulsa-Jet feeds from a reservoir in the top of the fuel tank, which it replenishes with a vacuum-powered fuel pump (Fig. 4-23). Pulsa-Jets have two pickup tubes. The longer one transfers fuel from the tank to the reservoir; the shorter tube draws from the reservoir into the carburetor. This arrangement isolates the carburetor from changes in the level of fuel in the tank. Vacu-Jets lean out as the tank depletes.

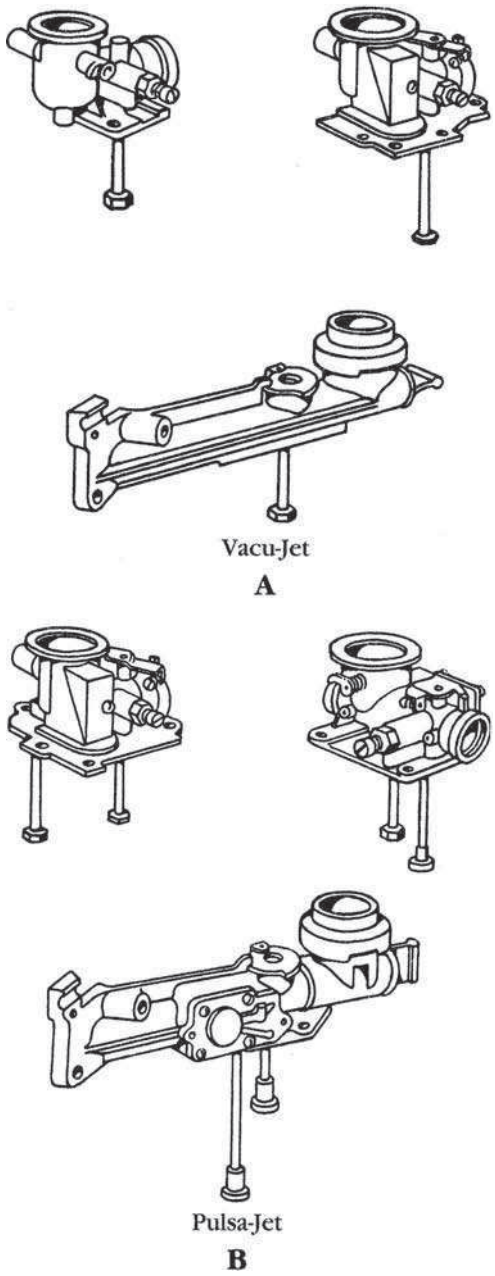

FIG. 4-22. *Vacu-Jet (A) and Pulsa-Jet (B) variations.* Briggs & Stratton Corp.

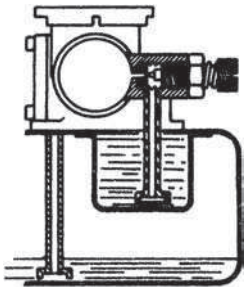

FIG. 4-23. *Three pulls of the starter cord should pump enough fuel into the Pulsa-jet reservoir to start the engine. Once it starts, the reservoir remains full to a level defined by a spill port. Thus, the internal fuel level of the carburetor is independent of the level of fuel in the tank. According to Briggs & Stratton, a Pulsa-jet-equipped engine develops as much power as one supplied by a more expensive float-type carburetor.*

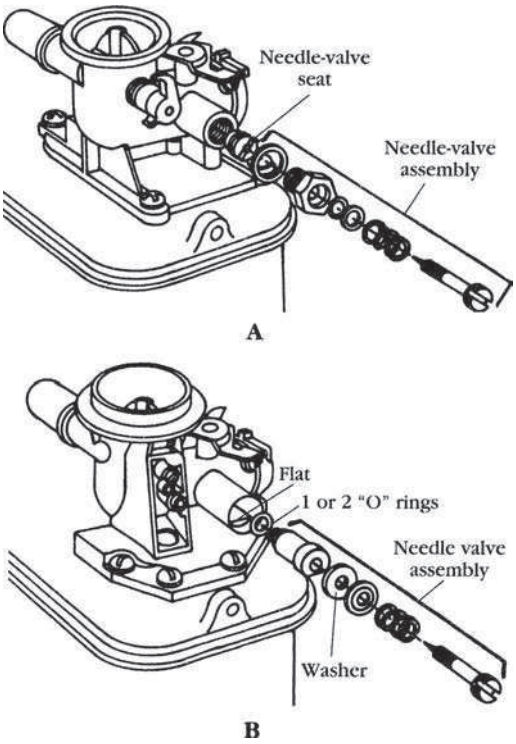

FIG. 4-24. *Two needle valve assemblies are used, one primarily associated with zinc carburetors (A); the other is used on all nylon-bodied models (B).* Briggs & Stratton Corp.

Figure 4-24 illustrates major Pulsa-Jet variations that closely track those of the Vacu-Jet. Most service information applies to both types.

Needle-valve assembly Sealing the needle valve, or mixture-adjustment screw, involves some fairly complex engineering. Figure 4-25A shows the

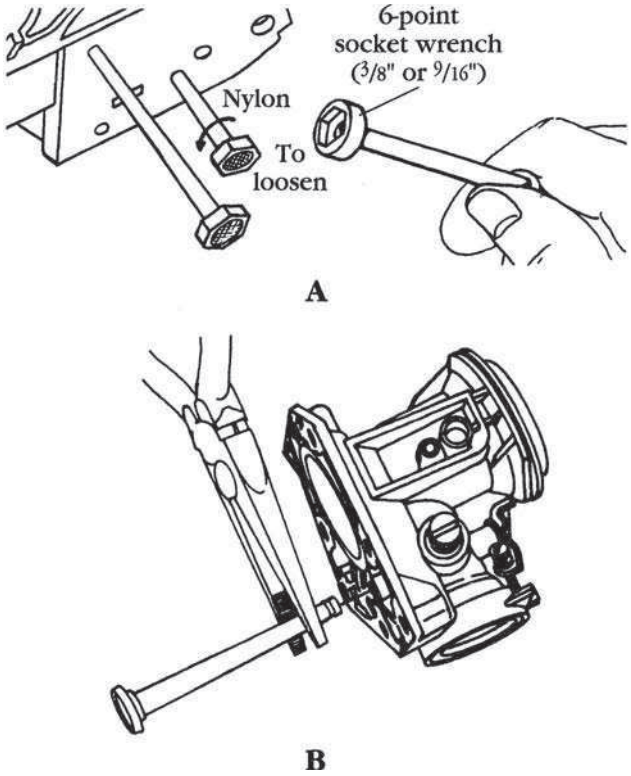

FIG. 4-25. *Fuel pipes twist in and out of metallic carburetor castings (A). Pipes for nylon carburetors incorporate a snap lock (B).* Briggs & Stratton Corp.

arrangement of washers and O-rings generally found on pot-metal Vacu-and Pulsa-Jets. Figure 4-25B illustrates the arrangement always used on nylon carburetors and sometimes on the zinc models. The needle is quite vulnerable to damage from overtightening.

Pickup tubes Vacu-Jet fuel pickup tubes are fitted with a check ball, which tends to stick in the closed position. Because the ball and, on later models, the tube itself are made of nylon, more than a few minutes in carburetor cleaner is all that can be tolerated. As an emergency repair, you can free the ball by gently inserting a fine wire through the screen in the base of the tube. Eventually the assembly will have to be replaced.

Fuel pickup tubes supplied with zinc carburetors twist off and on. Tubes used with nylon carburetors snap in and out, an operation that can require considerable force (Fig. 4-25).

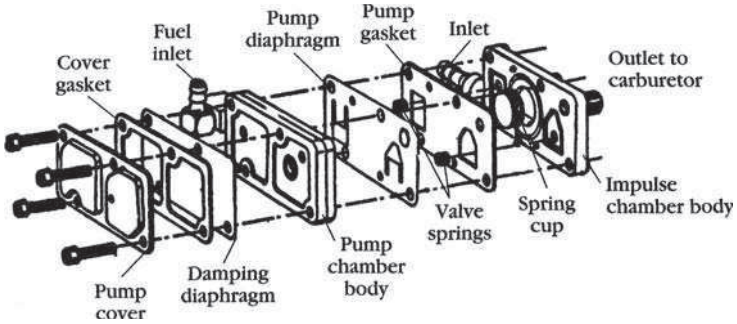

FIG. 4-26. *Diaphragm-type fuel pump.* Briggs & Stratton Corp.

Pulsa-Jet pump diaphragm The side-mounted diaphragm is shown in Fig. 4-26. The tank-mounted version, used with "bobtail" carburetors, is illustrated in Fig. 4-10. In either case, replace the diaphragm whenever the carburetor is serviced.

Fuel pump

Some engines are equipped with stand-alone versions of the crossover Flo-Jet pump. Fuel enters by gravity and leaves under pressure generated by a pulse-activated diaphragm. Replace the pump diaphragm as a routine part of fuel-system service.

Air filters

Briggs & Stratton supplies a variety of standard and optional air filters, which use foam or paper elements in combination with foam precleaners or "socks" (Fig. 4-27). The foam in early production filters tolerated kerosene and other petroleum-based solvents; the foam used on later designs does not. Wash all filter elements in warm water and nonsudsing detergent to avoid confusion and ruined filters. Rinse in the reverse direction of air flow until the water runs clear. Towel off the excess water and oil the element, kneading it as shown in Fig. 4-28. Foam elements should be reoiled as needed and whenever an engine that has been out of service for more than a few days is started. Oil tends to migrate out of the foam.

Pleated-paper elements, of whatever vintage, must not be exposed to oil or petroleum solvents. Some tolerate water. Wash in water and detergent. Allow the element to dry and the pores to shrink before installing. Do not blow out these fragile elements with compressed air.