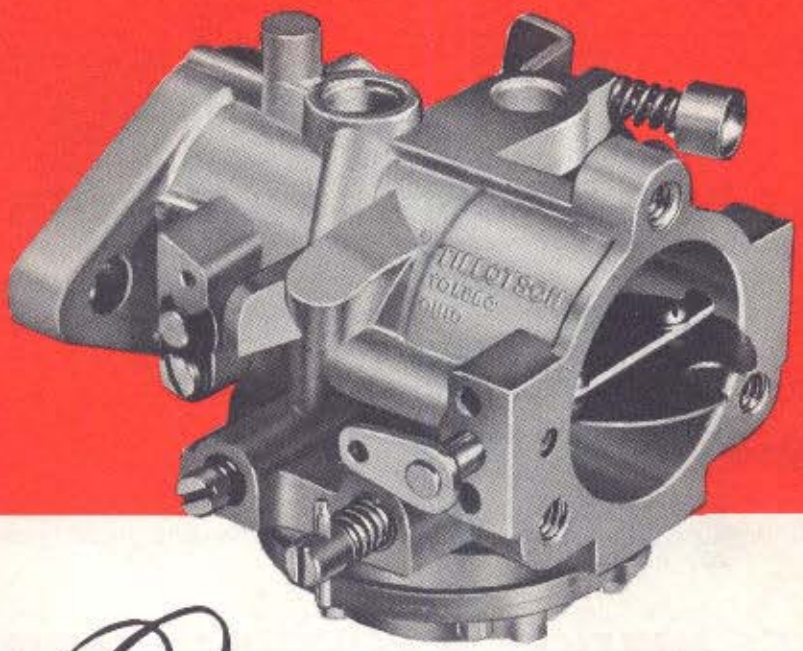
Tillotson ®
CARBURETORS
and
FUEL & STRAINERS

HR SERIES *Carburetor*



Introduction

The design and fuel requirements of the compact engines in the medium horsepower range resulted in the HR Series carburetor, developed by the Tillotson engineers to match your engine and produce maximum performance.

The HR Series, like the HL Series carburetors, are diaphragm-controlled metering systems to insure carburetion at extreme angles and rough unit operation. In the HR Series there is a primary venturi and a secondary venturi. This combination is used (as in automobile carburetors) to insure proper atomization of fuel with the larger venturi's volume of air at all engine speeds and loading demands. The HR carburetor is compact, containing a carburetor, fuel pump, and fuel filter in one unit.

The HR carburetor is dependable and trouble free if care in maintenance and correct servicing is applied. The steps required to adjust, inspect, and repair the carburetor are presented in the following pages. The schematic illustration, chart, and parts nomenclature are an aid to understanding the operation of the carburetor, and are primarily for servicing personnel.

If further data is required, please contact

TILLOTSON MANUFACTURING CO. Parts & Service Division
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HR SERIES

CONSTRUCTION DATA AND CHART

ADJUSTMENT INSTRUCTIONS

To properly adjust the carburetor for best performance, the engine must be thoroughly warm.

INITIAL ADJUSTMENTS:

To start a cold engine, first close by turning clockwise both idle and high speed mixture screws.

DO NOT FORCE MIXTURE SCREWS INTO THEIR SEATS!

Open high speed mixture screw counterclockwise approximately one and one-quarter (1-1/4) turns. Open idle mixture screw three-quarter (3/4) turn. Back idle-speed regulating screw off its contact with the throttle stop lever, then turn it inward one or two full turns so as to open the throttle shutter slightly.

Close choke shutter, and partly open throttle shutter (1/4 open). Lightly engage and firmly pull the starting cord until engine fires. Open the choke shutter enough to allow the engine to idle. DO NOT RACE A COLD ENGINE. Then as the engine warms up, fully open the choke shutter. Adjust the idle-mixture screw until the engine fires steady. Too rich on the idle setting will cause the engine to fire on every other revolution, and very uneven. Too lean on the idle setting will disturb smooth idle, and result in poor part-throttle operation (pinging and backfire with lack of acceleration). Set engine idling speed in accordance with the engine manufacturer's specifications when the engine is warm, by adjusting the idle-speed screw only.

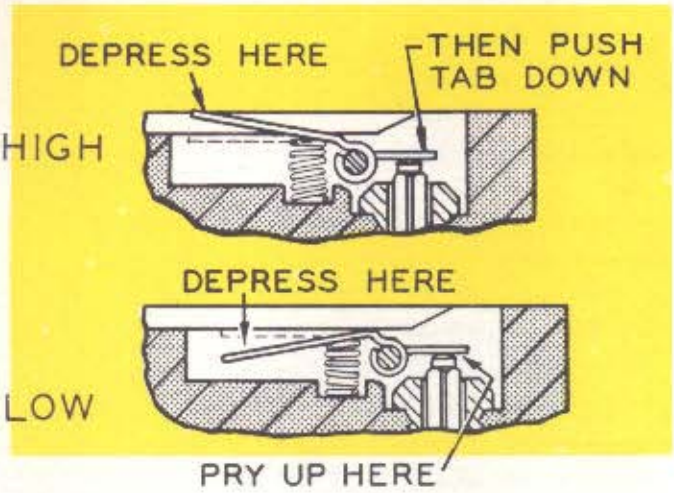
The high-speed adjustment must be determined at open throttle under full load when the engine is at operating temperature. Manipulate the high-speed mixture screw in or out until the best power is attained. Too lean a mixture will expose pinging, overheating, and backfiring. Too rich a mixture will cause lost power and excessive smoking.

Once the above adjustments are made, the process need not be repeated at each cold start except for closing the choke and partly opening the throttle shutter.

To start a warm engine, it should only be necessary to pull the starting cord. Do not open the throttle unless it is determined that the engine is flooded.

(If the engine fails to start, see the Trouble Data Section.)

8 The inlet control lever must be adjusted flush or level with the fuel-chamber floor. Gage the setting with any suitable straight edge at the tip of the lever where it contacts the metering diaphragm rivet.



To attain the proper lever setting, you should insert the tip of a screwdriver under the inlet tip of the lever and bend it up or down to correct the setting. Do not force the lever into the inlet needle. This will cause the needle to stick, and may damage the insert.

9 Remove and inspect the points of both the high-speed and idle mixture screws for damage. Notice the idle-mixture screw point has the step design to minimize point and casting damage. Through misuse either mixture screw point may be bent, extruded from being forced into the casting seat, or possibly broken off in the casting. If either mixture screw is damaged, be sure to inspect the condition of the casting. If the adjustment seats are mutilated, a new body casting is required.

Forcing the mixture screws into the casting will not cure any carburetor problem. If the adjustment does not respond, you have trouble elsewhere--locate and fix it.

10 The idle bypass ports and main nozzle ball-check valve are sealed from the metering chamber by welch plugs. It is seldom necessary to remove either of these plugs because there is no wear factor in either section; and any dirt that may accumulate can be blown out with compressed air through the mixture screw holes into the throttle bore. If for some reason you must remove the welch plug, they should be drilled. Use about a 1/8-inch diameter drill to just break through the plug metal. Pry the plugs out with the tip of a punch. Do not drive the punch into the welch plug because you may damage the parts underneath. A mistake now will ruin the casting.

Inspect the idle bypass holes to insure they are not plugged. Do not push drills or wires into the metering holes. This will disturb the carburetor performance. Blow plugged holes clear with compressed air only.

Remove the main nozzle ball-check assembly with a screwdriver of proper blade width. If this ball check is defective, the engine will not idle unless the high-speed mixture screw is shut off, or there will be no high-speed performance with the high-speed mixture screw adjusted at 1-1/4 turns open. If the part is suspected, replace it.

11 Install a new welch plug by placing it in the casting shoulder, convexed side up. Then flatten to a tight fit with a 5/16" diameter flat-end tool. A leak around the welch plug would expose the condition of over-rich running, even with the mixture screw closed.

12 Clean all parts before assembly. Do not force the construction; do not force the mixture screws. Be certain the main diaphragm gasket, main diaphragm, and center cover casting are fitted over the three locating pins cast in the rim of the main body; also locate the fuel pump gasket, pulsing diaphragm, valve diaphragm, lower valve casting and filter assembly on their locating pins, cast in the exposed rim of the center cover casting. Tighten evenly the six retaining screws, to insure a complete seal of the casting separations.

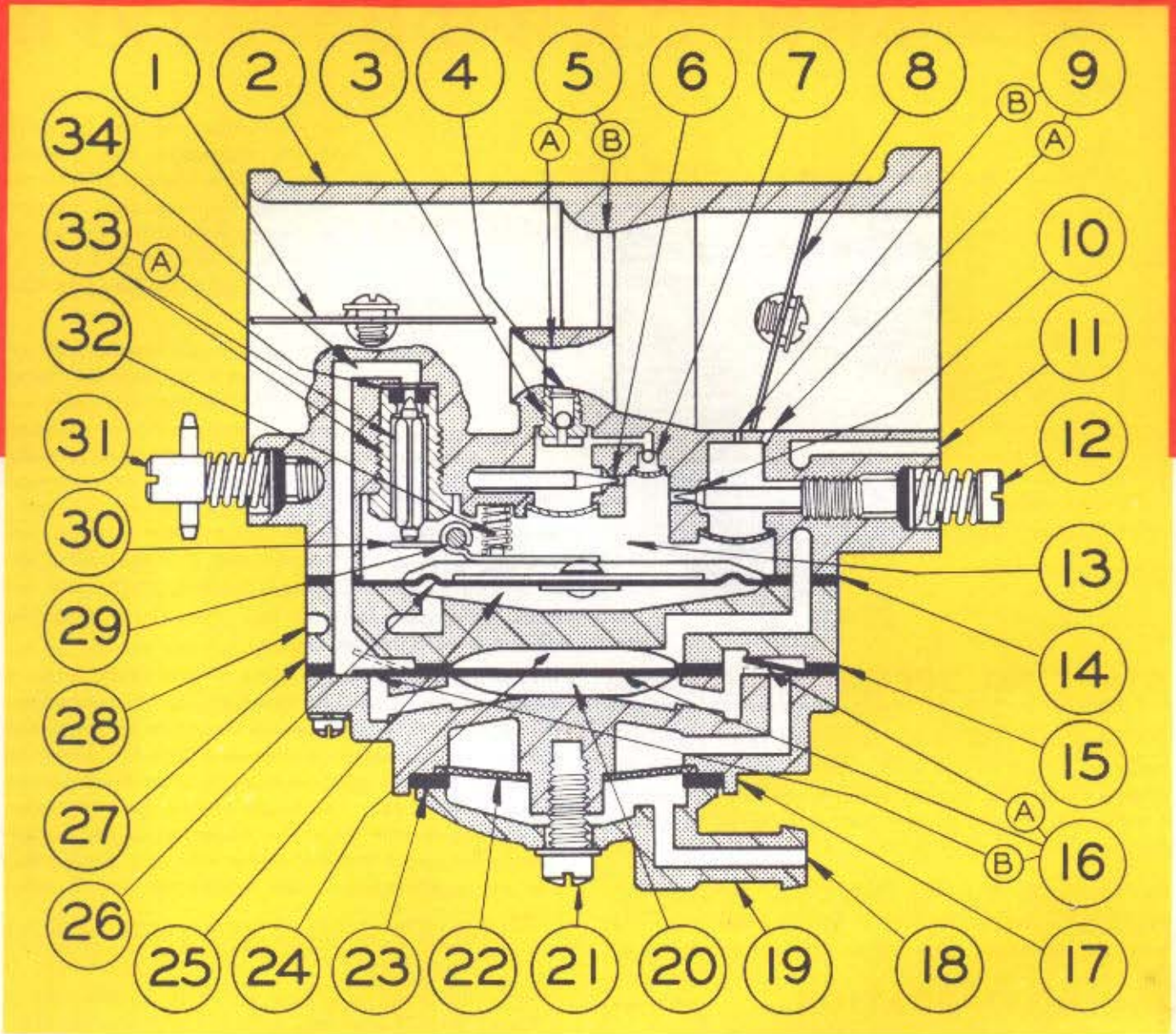
13 If equipment is available, it is advisable to pressure test the completed carburetor through the fuel-inlet connector. The carburetor should hold 3 pounds pressure. If pressure fails to hold, submerge the entire carburetor in fluid, locate the lead by tracing the bubbles, and correct the flaw.

14 The fuel-pump pulse hole in the carburetor flange must align with the pulse hole on the engine flange. Both of these channels must be clean, and the flange-gasket hole must be in line to insure proper pump performance.

15 The throttle-shutter edges are not cut square with the face of the shutter, but are die cut at an angle so that the shutter will close tightly in the throttle bore when the idle-speed screw is backed out entirely. It is possible that the shutter can be assembled into the carburetor backwards, and the result will be a poor fit and an uncontrollable idle speed. When the shutter is installed correctly and with the idle-speed screw backed away from the throttle lever, hold the carburetor up against a light source, and check for shutter alignment. The shutter may be rotated slightly in the throttle bore to correct slight gaps before the shutter screws are tightened. Make sure the shutter screws are tight.

This completes the procedure required to replace the parts supplied in the Tillotson Service Repair Kit.

• • • See the following pages for operational trouble and remedy data.



HR SERIES CARBURETOR NOMENCLATURE

1. CHOKE SHUTTER
2. BODY
3. MAIN FUEL CHECK VALVE
4. MAIN FUEL DISCHARGE PORT
5A. PRIMARY VENTURI
5B. SECONDARY VENTURI
6. HIGH SPEED MIXTURE ORIFICE
7. POWER VALVE
8. THROTTLE SHUTTER
9A. PRIMARY IDLE DISCHARGE PORT
9B. SECONDARY IDLE DISCHARGE PORT
10. IDLE MIXTURE ORIFICE
11. IMPULSE PORT
12. IDLE MIXTURE SCREW
13. METERING CHAMBER
14. DIAPHRAGM GASKET
15. FUEL PUMP GASKET
16. FUEL PUMP DIAPHRAGM
16A. PUMP DIAPHRAGM INLET VALVE
16B. PUMP DIAPHRAGM OUTLET VALVE
17. FUEL PUMP COVER
18. FUEL INLET
19. STRAINER COVER
20. FUEL CHAMBER
21. STRAINER COVER RETAINING SCREW
22. FUEL STRAINER SCREEN
23. STRAINER COVER GASKET
24. PULSE CHAMBER
25. ATMOSPHERIC CHAMBER
26. DIAPHRAGM
27. DIAPHRAGM COVER
28. ATMOSPHERIC VENT
29. FULCRUM PIN
30. INLET CONTROL LEVER
31. HIGH SPEED MIXTURE SCREW
32. INLET TENSION SPRING
33. INLET NEEDLE & SEAT
33A. INLET SEAT GASKET
34. FUEL INLET SUPPLY CHANNEL

SEE FOLLOWING PAGES FOR OPERATIONAL DATA

SERVICE DATA

HOW TO DISASSEMBLE FOR CLEANING AND REPAIR

The Model HR carburetor should be cleaned and inspected at regular intervals, depending on service conditions.

The entire carburetor, before disassembly, should be cleaned by flushing with fuel, and blown dry with compressed air. The carburetor should then be inspected for cracks in the casting, bent or broken shafts, loose levers or swivels, and stripped threads, before being opened.

Select a clean area in which to work, because the dirt and carelessness are the cause of most carburetor trouble.

1 The idle-speed screw, washer, and tension spring should be in good order. Inspect the casting for thread damage. In the event the casting is stripped of threads, repair by inserting an 8-32 Heli-coil 3/16" long.

2 The fuel inlet and filter cover are removed by taking out the one center screw. Remove the filter cover, the cover gasket, and the filter screen. When removing the filter element, keep the outside out if possible, so that it can be replaced in the same position that it had originally. This will prevent small particles that might not be removed in cleaning from being carried through the carburetor as the fuel flows through in service. The screen should be cleaned by flushing with fuel or solvent, and blowing with compressed air. It is advisable to replace the gasket when the filter screen is serviced. Any leak in this area will render the carburetor useless. Flush all dirt from the plastic cover before assembly.

3 Remove the 6 body screws and the fuel pump body. The pump diaphragms are to be flat and free of holes in the pulsing and valve-port sections. It is most important that the fuel-pump diaphragms be assembled in correct order. The gasket should be located on the center-plate alignment pins, then the black rubber pulsing diaphragm, then the tan plastic valving diaphragm, and last the lower valve port and filter casting.

CAUTION:

Some solvents (even so-called carburetor cleaners) have a damaging effect on the synthetic rubber parts used in carburetors. It is best to use a petroleum product for cleaning. Do not use alcohol, acetone, lacquer thinner, benzol, or any solvent with a blend of these ingredients, unless the rubber parts and gaskets are removed. If you are in doubt about your solvent, test a used part in it, and observe the reaction.

4 Remove the center cover casting, the metering diaphragm, and diaphragm gasket. Inspect the diaphragm for holes, tears, and imperfections.

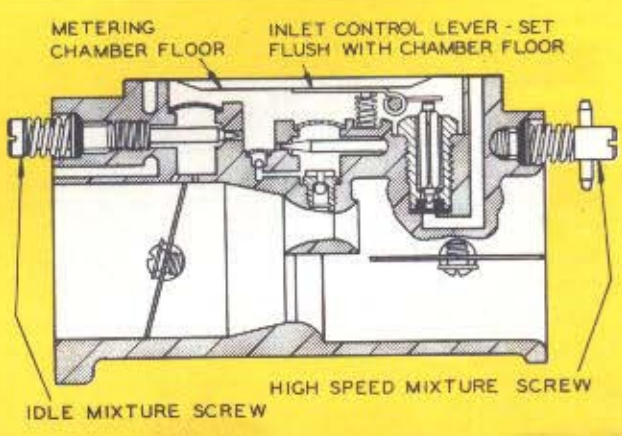
5 Remove the fulcrum pin and lever from the body casting by placing your finger over the inlet-control lever, to prevent the assembly from shooting out of the body and getting lost or damaged. The control lever must move freely on the fulcrum pin. To test for freedom, insert the fulcrum pin into the lever and rotate the pin. The lever should slide on the pin from its own weight. If there is a catch or a binding, replace the defective part.

6 Handle the inlet spring carefully. Do not stretch this spring or in any way change its compression characteristics. If in doubt about its conditions, replace it. The spring rests in the well of the metering body and locates on the dimple of the inlet-control lever.

7 Remove the inlet needle, inlet-seat assembly and the seat gasket. The inlet-seat assembly removal requires a 5/16-of-an-inch thin-wall socket and a suitable wrench.

The inlet-seat assembly consists of a brass cage and a rubber insert for the inlet-needle seat. The insert goes into the cage only one correct way. Looking at the insert, one side is flat and smooth; the other side has a ridge or rim molded around the outside edge. This ridge is to be assembled away from the inlet-needle point.

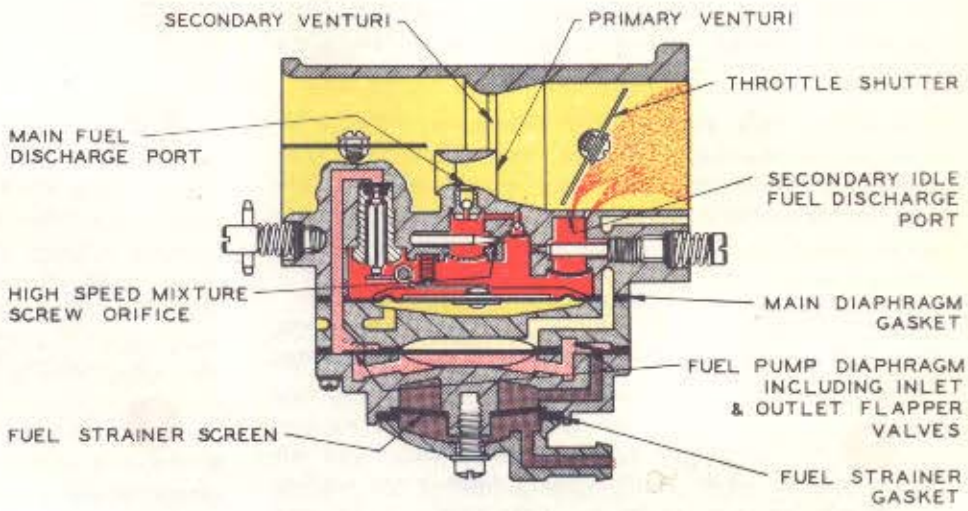
The inlet needles and seats are matched and tested for leaks at the factory; and the parts should not be interchanged--they must be kept in matched sets. When installing the insert cage into the carburetor body, use a new gasket, and snug the cage into the casting. Do not force the cage, as you may strip the threads or distort the insert. Use a torque wrench to apply 25 to 30 inch-pounds pressure. The needle and seat assembly must be clean to insure proper performance.



OPERATIONAL DATA

INTERMEDIATE OPERATION

Fuel is delivered into and through the carburetor in the same manner as when the engine is idling. However, as the throttle opens and engine speed increases, more fuel is demanded for the quantity of air used, and is supplied to the engine by valving in the secondary idle discharge port located in the path of the shutter advance.



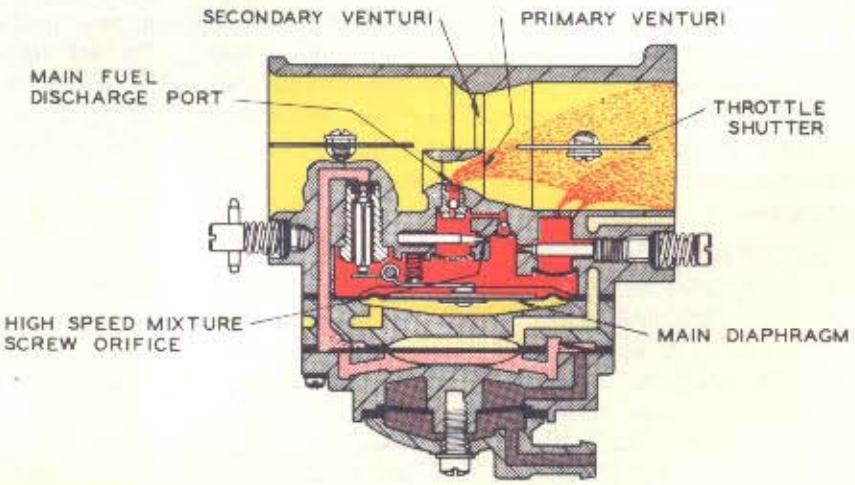
As the throttle shutter continues to open and engine speed increases, the velocity of air through the venturi creates a low-pressure area at the primary venturi throat, and diminishes the suction on the engine side of the throttle shutter. When the pressure at the venturi throat is less than that existing within the main-diaphragm fuel chamber, fuel is then drawn up through the high-speed mixture orifice and out the main fuel discharge port, to be mixed with air and enter the engine.

HIGH SPEED OPERATION

As the throttle shutter progressively opens from intermediate position to full open position, the air velocity through the venturi increases, and fuel is metered up through the high-speed mixture orifice, and out the main fuel discharge valve in accordance with the power requirements of the engine. The action of the metering diaphragm is the same as previously described, with suction values created by the air velocity at all engine speeds operating the diaphragm, to allow fuel used to be replenished in the fuel chamber.

FUEL PUMP OPERATION

The movement of the pump diaphragm draws fuel into the carburetor through valves. Movement is caused by pulsations from the engine base acting on the pump diaphragm. Fuel quantity is supplied by engine revolutions.



SUPPLY FUEL

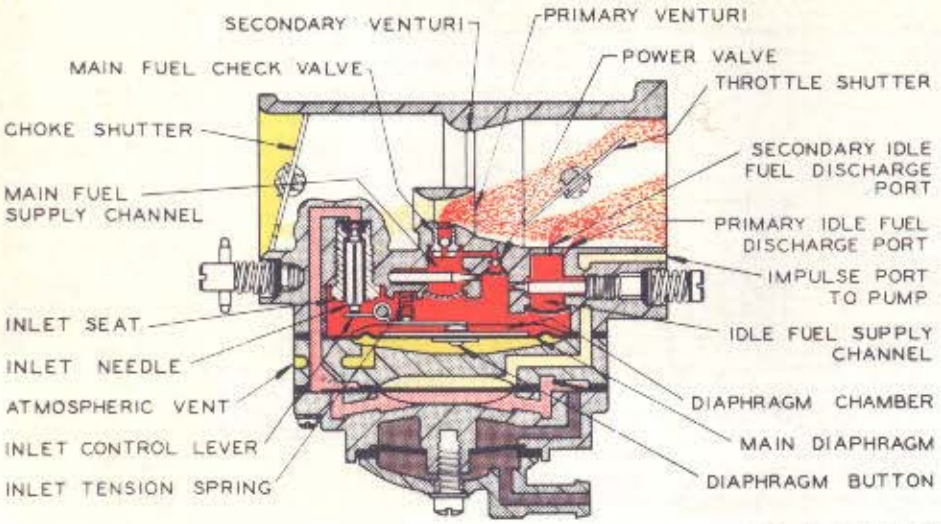
FUEL UNDER PRESSURE

FUEL UNDER VACUUM

ATMOSPHERIC AIR

PUMP IMPULSE AIR

HR CARBURETOR



engine suction will be transmitted to the diaphragm fuel chamber through both primary and secondary idle discharge ports, as well as the main fuel discharge port, creating a low-pressure area on the fuel side of the metering diaphragm.

Atmospheric air pressure on the vented side of the main diaphragm will force the diaphragm onto the inlet control lever, overcoming the inlet tension spring pressure, permitting fuel to enter through the inlet seat, from the fuel-pump section, then into the fuel chamber side of the metering diaphragm, up through the idle and main fuel-supply orifices and channels, and out the discharge ports to the engine.

STARTING OPERATION (choke)

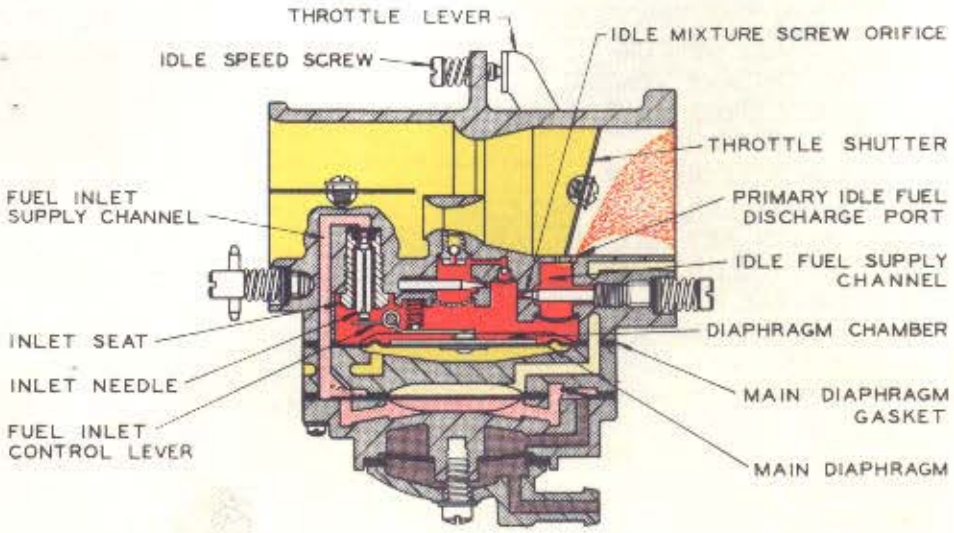
The function of the choke is to subject the entire metering system of the carburetor to the high vacuum generated by the engine suction, and in turn supply a very rich mixture of fuel that is required to start a cold engine.

As the engine is pulled through with the choke in closed position and the throttle shutter opened slightly, the choke shutter has a hole or port in it to mix a slight amount of air with the fuel, to aid combustion. The engine will not continue to run with the choke closed. Therefore, it is necessary that the choke be advanced near the open position in order to allow the engine to warm up. The length of time spent in warming the engine with the choke operation is only necessary to the extent that the engine will idle, accelerate, and run satisfactorily under wide-open throttle conditions.

IDLING OPERATION

The engine idle speed is regulated by the throttle shutter allowing a slight amount of air to pass through the throttle bore, and fuel is drawn through the primary idle-fuel discharge port located on the high vacuum side of the shutter. The quantity of fuel drawn into the engine is regulated by the idle mixture screw. The amount of air supplied to the engine is regulated by the idle speed screw advancing the shutter angle.

The demand for idle fuel is sensed by the vacuum acting on the metering diaphragm, depressing the inlet control lever, overcoming inlet tension spring pressure, and permitting fuel to enter the metering chamber, to replace the fuel that is discharged into the engine. The ball check in the main nozzle is drawn onto its seat to seal the metering chamber against air entering the metering chamber and disturbing the vacuum acting on the diaphragm.



TROUBLE DATA

TROUBLE	POSSIBLE CAUSE	REMEDY
CARBURETOR FLOODS	Dirt or foreign particles preventing inlet needle from seating.	Remove, clean, and replace
	Stuck inlet lever	Replace
	Spring not seated on lever dimple.	Reinstall
	Diaphragm improperly installed.	Correct or replace
	Plugged air filter or faulty choke stop allowing choke to drop closed.	Clear or replace
	Fuel-tank pressure buildup.	Check tank vent
	Inlet lever adjusted too high.	Correct adjustment flush with chamber floor.
ENGINE WILL NOT ACCELERATE	Idle mixture too lean.	Readjust
	Low inlet lever setting.	Adjust flush with chamber floor
	Carburetor loose on manifold.	Tighten
	Diaphragm cover plate loose.	Tighten
	Diaphragm gasket leaking.	Replace
	Fuel channels plugged.	Clear channels
	No fuel.	Replenish
ENGINE WILL NOT IDLE	Incorrect adjustment.	Adjust
	Channels clogged.	Clear
	Inlet lever set incorrectly.	Set flush with chamber floor
	Sticking inlet needle or lever.	Replace
	Pump pulse hole not aligned with flange hole.	Align
	Throttle shutter cocked in throttle bore, causing fast idle.	Reset
	Faulty nozzle check cage.	Replace
	Welch plug does not seal.	Replace
	Diaphragm vent plugged.	Clear
	Tank vent not operating.	Repair
ENGINE RUNS OUT LEAN	Frozen fuel in the line.	Thaw line
	Leak in fuel system from tank to pump.	Replace line
	Pump pulse hole plugged, or not aligned with engine pulse hole.	Clear
	Pump valve flippers damaged or bent off ports.	Replace
	Dirty inlet screen.	Clean
	Clogged fuel channels.	Clear
	Incorrect inlet lever adjustment.	Set lever flush with chamber floor
	Low fuel supply.	Replenish
CARBURETOR RUNS RICH WITH MIXTURE SCREW SHUT OFF	Welch plugs not sealing.	Replace
	Ruptured pump diaphragm.	Replace

NOTE: - Turn mixture screws carefully . . . DO NOT FORCE MIXTURE SCREWS INTO SEATS.

IF TROUBLE PERSISTS, CHECK ENGINE DATA

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