SERVICE HARLEY-DAVIDSON BULLETIN

NO. 518 September 10, 1965

1966 SPORTSTER CARBURETOR SERVICE INFORMATION

DESCRIPTION (See Figure 1)

An all-new fuel system is used on 1966 XLH and XLCH models. It includes a Tillotson dual-venturi, diaphragm-type carburetor complete with an automatic economizer, positive-action acceleration pump, and a large capacity air cleaner.

The diaphragm carburetor does not have a bowl and float. The fuel inlet needle is operated through a compression-spring balanced lever that is controlled by the diaphragm to regulate the flow of fuel into the metering chamber. At any given time, there is only a very small quantity of fuel in the metering chamber, and the amount of fuel going into the carburetor metering chamber is exactly equal to the amount of fuel being used by the engine.

This type of fuel supply control operates at any tilt angle and is resistant to any vibration which could cause a poor fuel-air mixture or flooding.

A dual venturi, as used in this carburetor, multiplies the venturi pressure drop, and causes fine atomization of the fuel that is delivered from the main fuel nozzle so that the fuel reaches the manifold as a combustible fog, instead of a fluid stream. This gives the advantage of improved distribution and more thorough burning in the combustion chamber. The main benefit of this is increased power and economy.

The small primary venturi is offset to the bottom of the large secondary venturi where the main nozzle outlet protrudes from the metering chamber. This eliminates air-flow obstructing supports that are sometimes used to hold a small venturi in the center of the bore. The accelerating pump discharges into the small venturi to take advantage of the venturi pressure drop that breaks up the solid stream of accelerating-pump fuel into a fast-moving, well-atomized, rich-accelerating mixture.

The accelerating unit is a positive-acting plunger type pump that is connected to the throttle shaft through a cam lever. The pump plunger is a spring-loaded leather cup that operates in a smooth plastic cylinder, and draws its fuel directly from the metering chamber. The pump unit is quick acting enough to provide a little extra fuel for accelerating normally away from a stop sign, and of long enough duration to provide the heavy charge of fuel required for all-out open-throttle acceleration.

The automatic economizer is a hydraulically-operated enrichment valve that controls the main-nozzle fuel mixture at very low engine speeds. The valve opens an auxilliary fixed main jet as the venturi air flow decreases, allowing the fuel mixture to be maintained at a full-power richness. As the air flow through the carburetor increases, or as the engine speed increases, the valve closes to prevent an over-rich mixture at intermediate speeds.

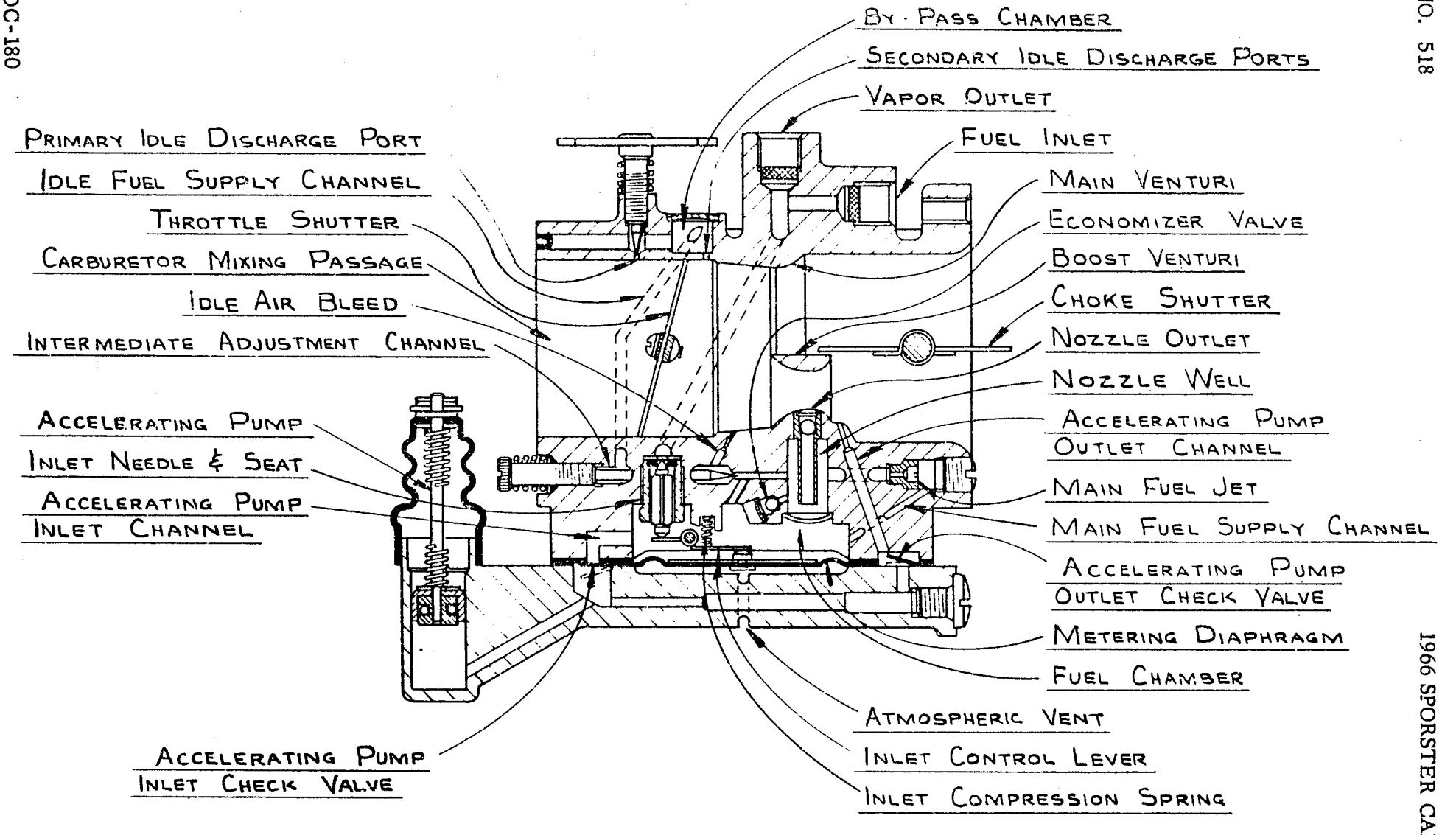


FIGURE 1 CARBURETOR CROSS SECTION-MODEL HD

OPERATION

1. Starting Operation (Figure 2)
Choke is in the closed position and the throttle in a slightly open position. As the engine is cranked, the entire metering system--idle, intermediate, and nozzle--is subjected to engine suction which is transmitted to the fuel chamber via the metering channels, creating a low pressure on the fuel side of the metering diaphragm. Atmospheric pressure from the atmospheric vent moves the metering diaphragm toward the inlet control lever to allow fuel to enter the carburetor through the inlet needle and seat. The fuel is then forced through the metering system, out into the carburetor mixing passage, and into the manifold and engine. When the engine fires and starts to run, the volume of air drawn through the carburetor increases, and the spring-loaded top half of the choke shutter opens to provide the additional air required by the engine, to prevent an over-rich mixture. The choke can then be moved to a half-open position for engine warm-up.

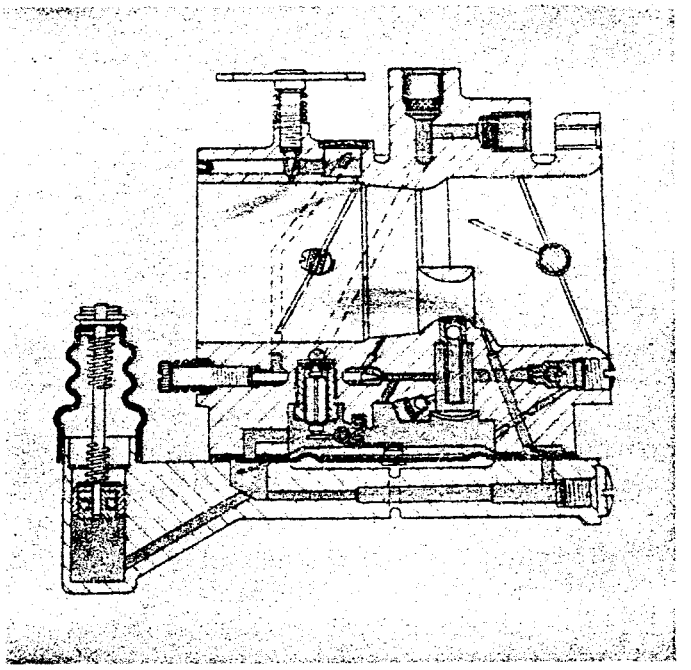


FIGURE 2 STARTING

During hot weather, or after an engine has been run long enough to reach stable operating temperatures, and then shut off for a short period of time, a small amount of fuel vapor may form in the fuel lines or in the fuel chamber of the carburetor. The vapor in the fuel lines will enter the fuel inlet and rise out of the vapor outlet, to be vented back into the fuel tank. The vapor that forms in the fuel chamber must escape through the metering system because there is no other vent to the fuel chamber. Starting a warm engine where vapor may be in the system, is most easily accomplished by placing the choke in the half-closed position, and starting as described above. The choke helps to get the vapor quickly out of the fuel system so that the fuel flowing through the carburetor and fuel line can cool the system to a normal temperature.

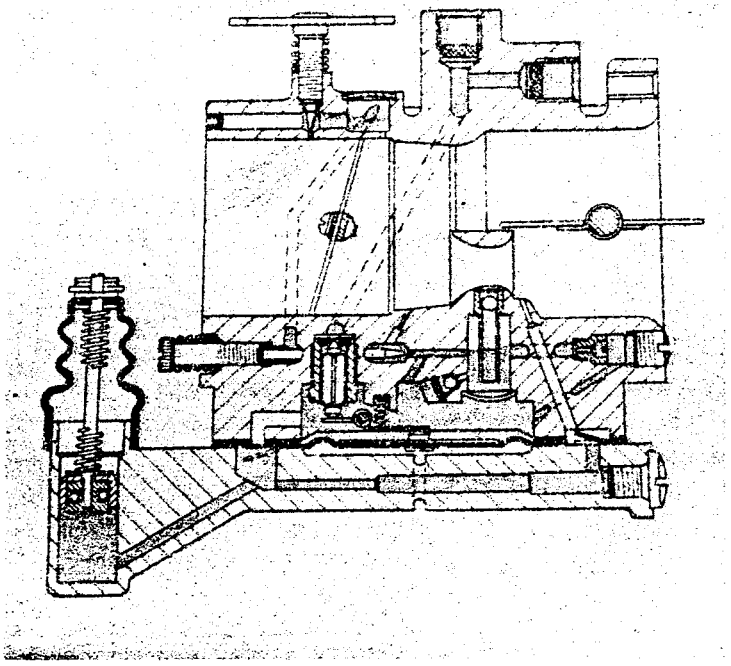


FIGURE 3 IDLE

Starting is always more easily accomplished using the choke--full choke for a cold engine, and half choke for a warm engine.

2. Idle Operation (Figure 3)
The throttle shutter is slightly open when the engine is idling and the carburetor mixing passage on the engine side of the throttle shutter is exposed to engine suction, while the mixing passage between the throttle shutter and the air cleaner is at nearly atmospheric pressure. The engine suction is transmitted through the primary idle discharge port to the fuel chamber side of the metering diaphragm via the bypass chamber, idle fuel supply channel, intermediate adjustment channel, nozzle well, main fuel jet, and main fuel supply channel, creating a sub-atmospheric pressure. in the fuel chamber. The metering diaphragm is forced upward by atmospheric pressure, moving the inlet control lever to overcome the inlet compression spring pressure, allowing fuel to enter the fuel chamber through the inlet needle and seat. The fuel flows through the main fuel supply, main fuel jet, nozzle well, intermediate adjustment channel, where it mixes with air from the idle air-bleed, idle fuel supply channel, to the bypass chamber, where it mixes with air from the secondary idle discharge ports, and on out into the carburetor mixing passage through the primary idle discharge port. The mixture of well-atomized fuel and air then travels through the manifold and into the engine combustion chamber.

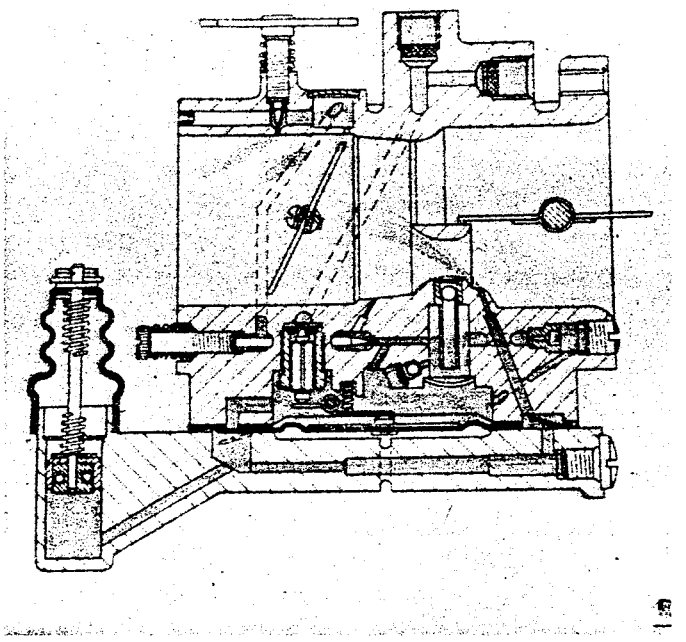


FIGURE 4 ACCELERATING

3. Acceleration (Figure 4)
Acceleration is accomplished by the use of a positive-action accelerating pump that is actuated from the throttle shaft by a cam lever. The pump cylinder is filled when the pump is raised to the top of its stroke. Fuel is drawn from the fuel chamber, through the accelerating pump inlet channel, past the inlet check valve. The outlet check valve is closed to prevent air from being drawn into the accelerating pump system. As the accelerating pump is depressed, the pressure of the fuel closes the inlet check valve, the fuel flows through the pump channels, past the outlet check valve, through the accelerating pump outlet channel, and through the boost venturi into carburetor mixing passage.

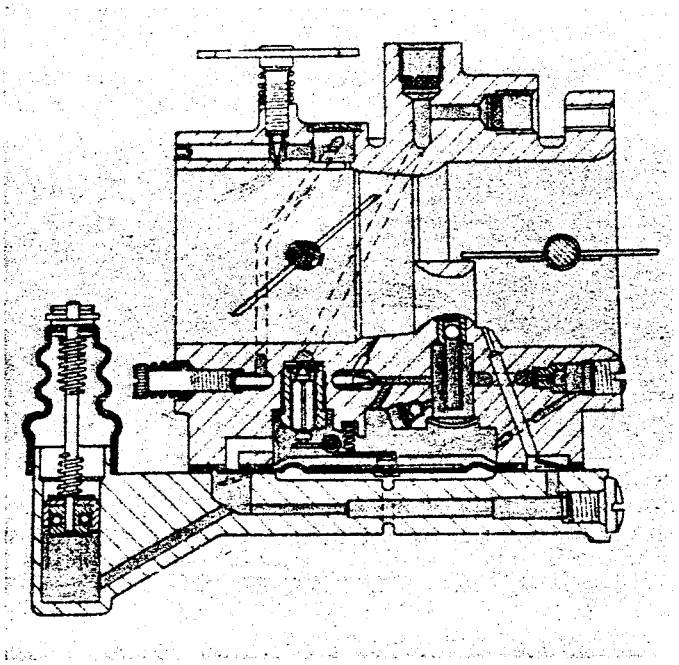


FIGURE 5 INTERMEDIATE SPEED

4. Intermediate or Cruise Operation (Figure 5)
Fuel is delivered into the carburetor as described in idle operation, and the same fuel channels are in use. As the throttle shutter opens to increase

engine speed, the secondary idle discharge ports are exposed to engine suction, and fuel is delivered from both the primary and secondary idle discharge ports to supply the additional fuel demanded by the engine. As the throttle shutter is opened farther, the air velocity through the boost venturi increases, creating a low pressure area at the nozzle outlet. Fuel flows from the fuel chamber through the nozzle outlet via the nozzle well, main fuel jet, main fuel supply channel, and economizer valve when the pressure at the nozzle outlet is less than the pressure in the fuel chamber. At the idle and lower intermediate speeds, the check ball in the economizer valve is away from the valve seat, allowing free flow from the fuel chamber through the economizer valve to the nozzle well and nozzle outlet. Fuel flow from the primary and secondary idle ports decreases as fuel flow from the nozzle outlet increases.

5. High-speed Operation (Figure 6)
Fuel flow from the nozzle outlet increases as the shutter is opened past the intermediate position to the fully-open position. The fuel is delivered through the nozzle outlet from the fuel chamber via the main fuel supply channel and the main fuel jet. The increased pressure difference between the small venturi and the metering chamber, plus the force of fuel flowing through the economizer valve, causes the check ball to seat, stopping the flow of fuel from this part of the main metering system. This gives increased economy at high speeds. The diaphragm action and the method of fuel delivery to the fuel chamber is the same as previously described.

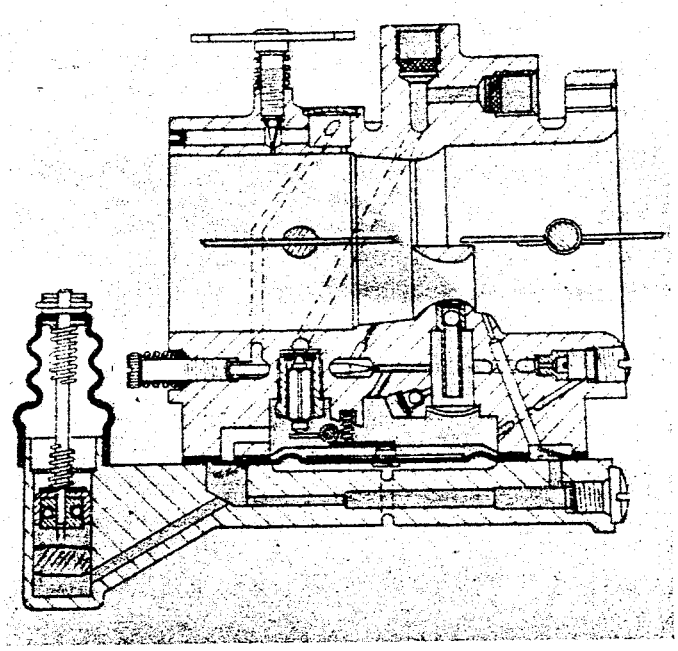


FIGURE 6 HIGH SPEED

CARBURETOR ADJUSTMENTS (See Figure 7)

The carburetor, once properly adjusted, requires little if any readjustment. It should not be necessary to adjust the low speed needle (1) more than 1/8 turn and the intermediate speed needle (2) more than 1/4 turn, richer or leaner, to correct the mixture for a change in weather conditions. Do not continually tamper with carburetor adjustments. If engine does not start and run right, first look for trouble elsewhere, before checking carburetor.

Both the intermediate speed needle and low speed needle turn inward (to right) to make mixture leaner at the respective speeds for which they adjust. Backing them out (to left) makes mixture richer. Closed throttle idling speed of engine is adjusted with idle speed stop screw (3).

A carburetor that is badly out of adjustment may be readjusted as follows:

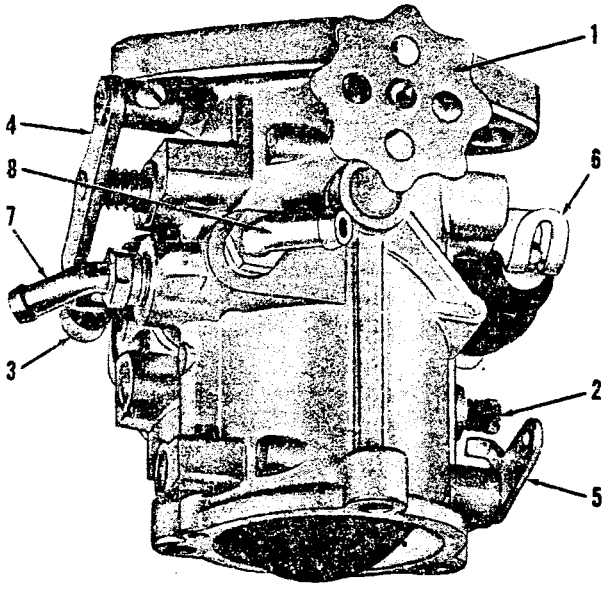
1. Make sure carburetor control wire is adjusted so throttle lever (4) fully closes and opens with handlebar grip movement.

2. Turn both the low speed needle (1) and the intermediate speed needle (2) all the way in (to right). Do not close off either needle too tightly or damage to needle and seat may result.

3. Back up (to left) both needles about 7/8 turn. With needles in this position, engine will start, but low speed mixture will probably be too rich.

4. Start the engine and after it has reached operating temperature and the choke has been moved to the open position, adjust throttle control to idle speed.

5. Turn low speed needle (1) in (to right) slowly until mixture becomes so lean that engine misses and is inclined to stop; then, slowly back needle out (to left) until engine hits regularly with engine running at idle speed. Starting and all around carburetion will be better with low speed adjustment slightly rich, rather than as lean as it can be made.



1. Low Speed Needle
2. Intermediate Speed Needle
3. Throttle Stop Screw
4. Throttle Lever
5. Choke Lever
6. Accelerating Pump
7. Inlet Fitting
8. Vent Fitting

FIGURE 7 ADJUSTMENTS

6. Adjust throttle lever stop screw (3) as necessary, to make engine idle at proper speed with throttle fully closed. Turn screw to right to make engine idle faster and to left to make engine idle slower. Do not idle an engine at the slowest possible speed because an extremely slow idling adjustment causes hard starting. Changing the idle speed with throttle stop screw is likely to change the low speed mixture slightly. It will, therefore, be necessary to again check and correct low speed needle adjustment by the same procedure followed in making the initial adjustment.

7. Check intermediate speed adjustment, after low speed adjustments have been completed. Run motorcycle on the road at 35 miles per hour. Best all around engine performance can usually be found with the intermediate speed needle (2) set from 3/4 to 7/8 turns open.

8. Changing either mixture setting also affects the other setting to some degree. Therefore, it will be necessary to recheck the low speed mixture after the intermediate mixture final setting is obtained.

TROUBLE SHOOTING (See Figure 8)

The following symptoms and possible causes with corrective service can be used as a guide in servicing the Model HD carburetor.

A. Idle System
   1. Idle operation too lean.
      (a) Dirt in idle fuel channels - Blow out with compressed air.
      (b) Intermediate Adjustment (35) closed or adjusted too lean - Readjust.
      (c) Welch Plug (6) or Channel Plugs (5) missing or not tightly sealed - Re-seat or replace plugs.
      (d) Nozzle Check Valve (41) not sealing - Blow out with compressed air, or replace.

   2. Idle operation too rich.
      (a) Carburetor flooding - See Item E below.
      (b) Idle Adjustment Screw (24) point damaged - Replace the adjustment.
      (c) Idle Adjustment hole damaged, forced oversize, or casting cracked in the idle port area - Replace carburetor.

B. Intermediate System
   1. Lean operation at steady speeds between 15 and 65 m. p. h.
      (a) Intermediate Adjustment (35) adjusted too lean - Readjust.
      (b) Dirt in intermediate fuel ports or supply channels - Remove Welch Plug (6) and Channel Plugs (5) and blow out with compressed air.
      (c) Welch Plug (6) or Channel Plugs (5) not tightly sealed - Re-seat or replace plugs.
      (d) Nozzle Check Valve (41) not sealing - Blow out with compressed air, or replace.
      (e) Intermediate Adjustment Packing (36) missing or damaged - Replace.
      (f) Economizer Check Ball (22) stuck closed - Remove Welch Plug (8) and Check Ball (22) and blow out channel with compressed air.

   2. Rich operation at steady speeds between 15 and 65 m. p. h.
      (a) Intermediate Adjustment (35) adjusted too rich - Readjust.
      (b) Fixed Main Jet (39) not tightly in place or missing - Seat firmly, or replace jet.
      (c) Carburetor flooding - See Item E below.
      (d) Nozzle Check-Valve Welch Plug (6) not tightly sealed - Re-seat or replace.
      (e) Choke valve partially closed - See that Choke Friction Spring (10) and Choke Friction Ball (9) are correctly assembled.

C. Nozzle System

1. Lean operation at speeds above 60 m. p. h.
   (a) Dirt in nozzle system - Remove main fuel jet Plug Screw (40) and blow channels out with compressed air.
   (b) Main Fuel jet (39) too small or damaged - Replace.
   (c) Main Fuel Jet Plug Screw (40) not tightly sealed - Tighten to stop air leak.
   (d) Nozzle Check Valve (41) damaged - Replace.
   (e) Nozzle Check Valve (41) not seated correctly in casting - Re-seat flush with nozzle-well surface.

2. Rich operation at speeds above 60 m. p. h.
   (a) Fixed Main Jet (39) not tightly in place or missing - Seat firmly or replace.
   (b) Carburetor flooding - See Item E below.
   (c) Economizer Check Ball (22) not seating - Remove Welch Plug (8) and Check Ball (22) and blow channel out with compressed air.

D. Accelerating Pump System

1. Lean acceleration
   (a) Dirt in acceleration fuel channels - blow out all channels in Diaphragm Cover (18) and the accelerating pump discharge channel in the body casting.
   (b) Incorrect carburetion adjustment - readjust Idle (24) and Intermediate Adjustments (35).
   (c) Accelerator Pump Assembly (1) damaged or worn - Replace assembly.
   (d) Diaphragm Cover Plug Screw (19) loose or missing - Tighten or replace.
   (e) Diaphragm (17) flap check valves damaged or worn - Replace diaphragm.
   (f) Economizer Check Ball (22) stuck closed - Remove Welch Plug (8) and Check Ball (22) and blow channel clean with compressed air.

E. Carburetor Flooding

1. Dirt in Inlet Needle and Seat Assembly (32) - Remove and clean, or replace.
2. Inlet Seat Gasket (33) missing or damaged - Replace.
3. Inlet Control Lever (29) not correctly adjusted - Readjust lever flush with metering chamber wall.
4. Diaphragm (17) incorrectly installed - Replace or correct installation.
5. Inlet Control Lever Pin (30) loose or not correctly installed - Tighten Retaining Screw (31) and correct installation.
6. Inlet Control Lever (29) tight on Lever Pin (30) - Replace damaged part, or clean dirt from these parts.
7. Inlet Needle or Seat (32) damaged or worn - replace the assembly.

F. General Operation

1. Lean operation in all speed ranges.
   (a) Filter Screens (23) plugged or dirty - Clean or replace.
   (b) Inlet Control Lever (29) incorrectly adjusted - Readjust lever flush with wall of metering chamber.
   (c) Diaphragm Cover Plate (18) loose - Tighten six Screws (20).
   (d) Air leak in metering system - All channel plugs, plug screws, and lead plugs to be tightly sealed.
   (e) Inlet Tension Spring (34) stretched or damaged - Replace.

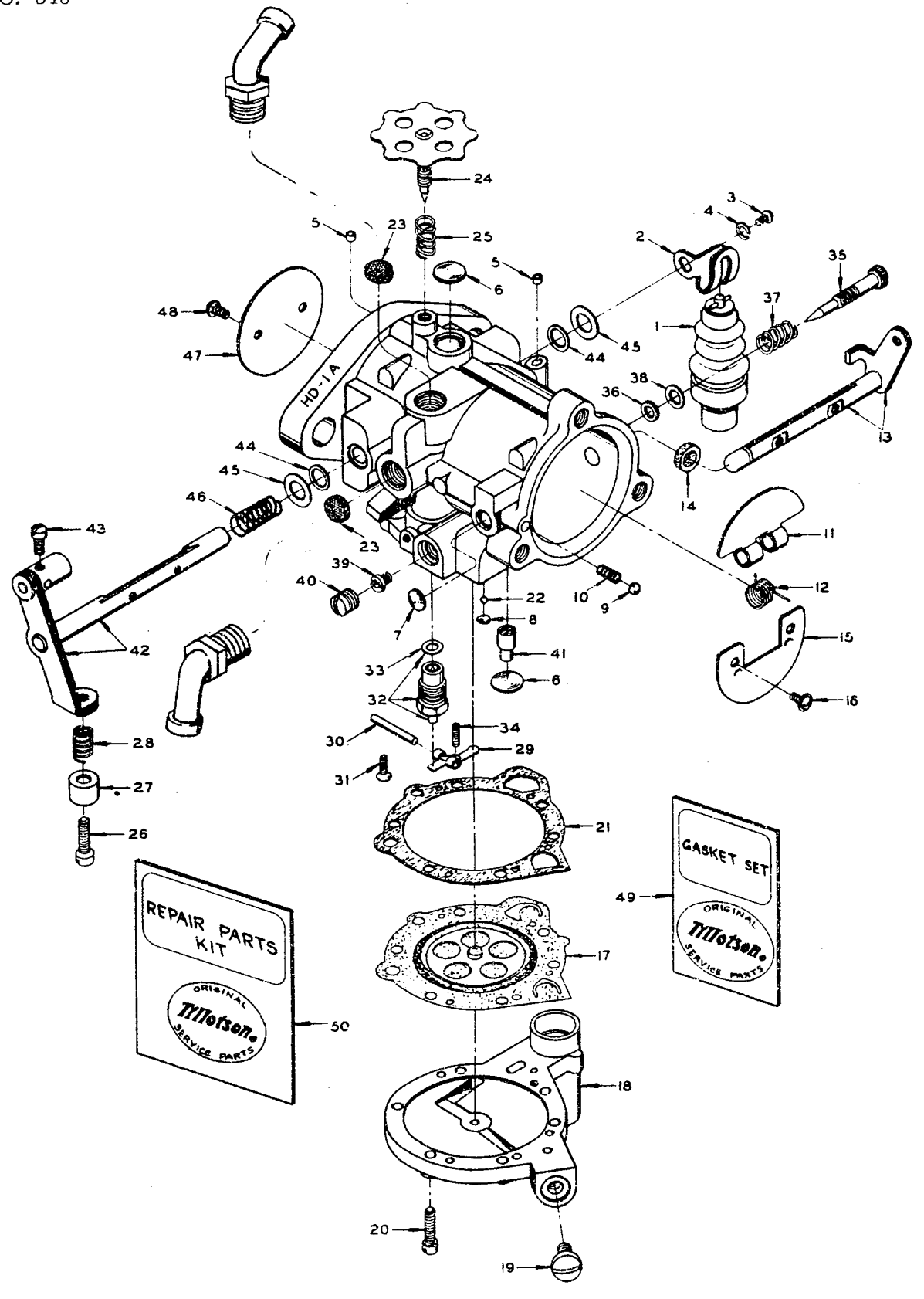


FIGURE 8 CARBURETOR EXPLODED VIEW-MODEL HD

2. Rich operation in all speed ranges.
   (a) Carburetor flooding - See E above.
   (b) Choke valve not staying fully open - See that Choke Friction Spring (10) and Friction Ball (9) are assembled correctly.
   (c) Inlet Control Lever (29) incorrectly adjusted - Readjust lever flush with wall of metering chamber.

Note: All gaskets, rubber gaskets, seals and plastic cover should be removed and only metal parts cleaned in Gunk Hydroseal cleaning solution.

SERVICING CARBURETOR (See Figure 8)

Remove fuel line and vent hose fittings. Remove screens (23) with bent wire. Clean.

Replace if bent or damaged.

Remove Idle (24) and Cruise (35) Fuel Adjustments, and inspect parts for wear and damage.

Remove two Throttle Shutter Screws (48) and the Throttle Shutter (47). The sides of the shutter are tapered 15° to conform to the throttle bore. Observe the direction of this taper and the position of the shutter so that it can be reassembled later in the correct position.

Remove the accelerating-pump-lever Retaining Screw (3) and pull the Throttle-shaft Assembly (42) out of the carburetor body. Remove Compression Spring (46), Washers, (45), and Shaft Dust Seals (44). Examine these parts for wear and damage.

Remove six Screw and Washers (20) and the Accelerating Pump body (18).

Remove Accelerating Pump Plunger Assembly (1).

Remove Channel Plug Screw (19).

Examine pump body casting for breaks and cracks.

Remove Metering Diaphragm (17), and inspect for holes, a loose plate, or damage to the check-valve flaps.

Remove Metering-diaphragm Gasket (21). Note that the gasket is assembled next to the body casting.

Remove fulcrum-pin Retaining Screw (31), Fulcrum Pin (30), Inlet Control Lever (29), and Metering Spring (34). Examine these parts for wear. The inlet control lever must rotate freely on the fulcrum pin. The spring should not be stretched or distorted.

Remove the Inlet Needle (32). Inspect the cone point for wear and scratches. Inspect the lever contact end for burrs and wear.

Remove the Inlet Seat and cage assembly (32), using a 3/8" thin wall hex socket wrench. Note the position of the inlet seat insert with the contoured side toward the outside of the cage and the smooth side toward the inside of the cage.

Remove the Inlet Seat Gasket (33), using a small tap or bent wire.

Remove Plug Screw (40).

Remove Fixed Main Jet (39).

Remove Main-nozzle Welch Plug (6) by drilling 1/8" diameter hole off center and just breaking through the welch plug. Do not drill deeper than the welch plug because this would probably damage the nozzle assembly. Pry out the welch plug with a small punch, being careful not to damage the casting counterbore edges around the plug.

Remove Idle-port Welch Plug (6), using the same procedure described above.

Remove Welch Plug (8) and Economizer Check Ball (22). Pry out the welch plug carefully, using a small punch.

Remove two Choke-shutter Screws (16) and the bottom half of the Choke Shutter (15).

Pull the Choke-shaft assembly (13) out of the body. This will release the top half of the Choke Shutter (11), the Spring (12), the Choke Friction Ball (9), and Friction Ball Spring (10).

Remove the Choke-shaft Dust Seal (14).

The carburetor body can be cleaned in commercial carburetor solvent such as Hydroseal to remove varnish from the channels and metering chamber. All channels and orifices in the carburetor and pump-body castings should be cleaned with compressed air. DO NOT use wires or drills to clean small holes. These might cause burrs or change the size of the holes.

Make certain that all parts are kept clean during reassembly. Do not use cloths to wipe or dry parts. Lint or threads can easily block small orifices. Welch plugs should be seated with a flat-end punch of a slightly smaller diameter than the welch plug. The seated plug should be flat, not concave, to assure a tight fit around the circumference.

The Metering Spring (34) should be seated into the counterbore in the body casting, and located on the protrusion on the Inlet Control Lever (29). The lever should be adjusted flush with the floor of the metering chamber by bending diaphragm end of lever as necessary.

Two torque values are important: (1) the Inlet Seat Assembly (32) should be tightened to 40-45 inch pounds; and (2) the Accelerating-pump Channel Plug (19) should be tightened to 23-28 inch pounds.

HARLEY-DAVIDSON MOTOR CO.