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ZENITH 28 AND 228 SERIES CARBURETORS

OPERATION AND SERVICE

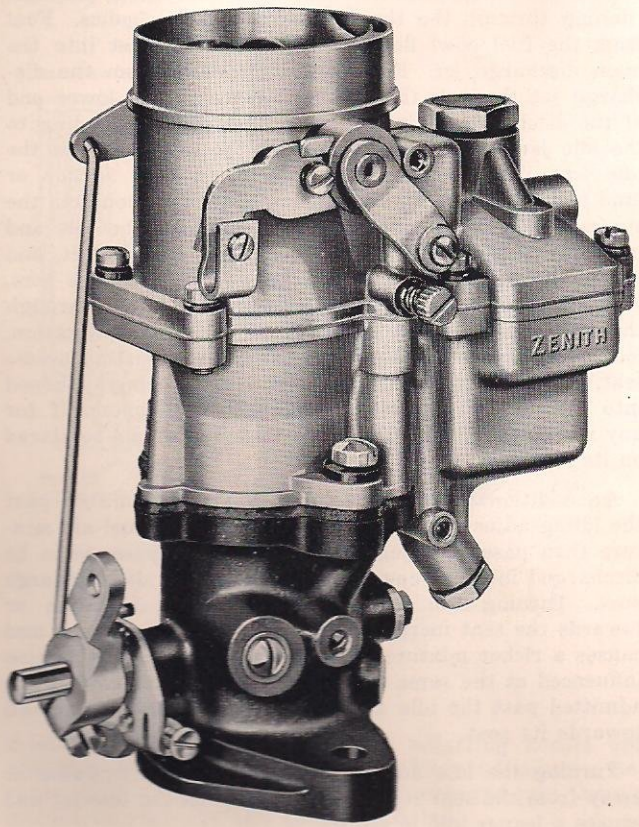

Figure 1

The Zenith 28 and 228 Series carburetors are downdraft units incorporating both primary and secondary venturi. The upper, pressed in section of the secondary venturi is sometimes referred to as the discharge nozzle.

Balanced construction is also used, which is a method of venting the fuel bowl to maintain proper air fuel mixtures even though the air cleaner may become restricted. This balancing is frequently referred to as an "inside bowl vent." A completely sealed bowl cover is essential in this type construction. Six assembly screws assure this permanent seal.

A mechanically operated accelerating pump is used. The power jet or economizer system is controlled by engine manifold vacuum.

MODEL IDENTIFICATION

Type—Single downdraft.

Material—Air intake and fuel bowl—diecast.
Throttle body—cast iron.

Styles—28A—Throttle and choke shafts parallel.
28B—Throttle and choke shafts crossed.

Letter Designation:

P—Packing or bushing in shaft holes.

V—Vacuum operated power jet valve.

X—Flange next size larger than standard.

C—Automatic choke.

D—Equipped with degasser.

R—Built-in governor.

Size Designation	Nominal Size	Throttle Bore Diameter	Flange Size S.A.E. Std.
X 9	1 1/8"	1 5/16"	1 1/4"
10	1 1/4"	1 7/16"	1 1/4"
11	1 3/8"	1 9/16"	1 1/4"
X11	1 3/8"	1 9/16"	1 1/2"
12	1 1/2"	1 11/16"	1 1/2"

The 228 Series carburetor is a modification of the 28 Series to use a two-hole idle system, and may be identified by the location of the idling adjusting needle in the throttle body.

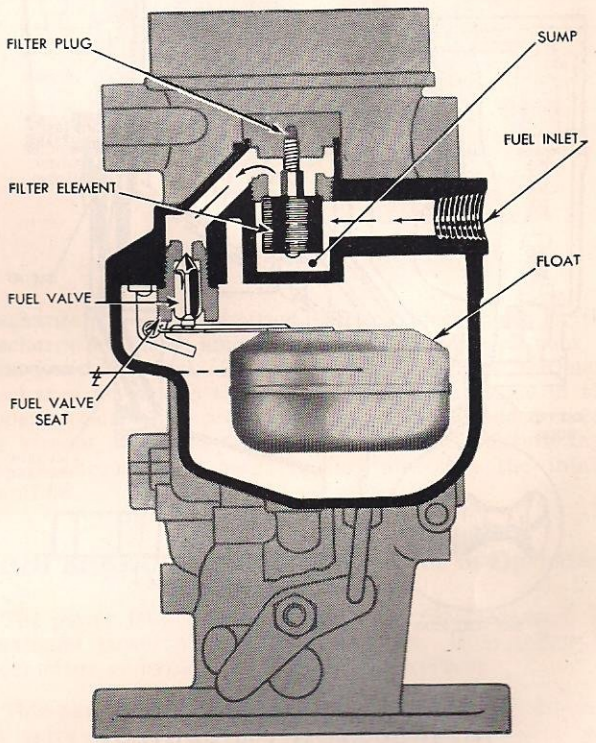

Figure 2

FUEL SUPPLY SYSTEM

The fuel supply system consists of the threaded fuel inlet connection, filter element, fuel valve seat, fuel valve, float, and fuel chamber.

The fuel supply line is connected to the threaded inlet. Gasoline passes through this connection into the filter sump and then through the filter element. The filter element (as incorporated in some of the assemblies of this

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type carburetor) is attached to the filter plug, identified by the 13/16" hexagon nut directly above the inlet connection. The element is removed with this plug. This fine edge type filter element is extremely efficient and because of this must be removed and properly cleaned at regular intervals to prevent dirt accumulation from restricting the flow of fuel. The cleaning interval depends on the cleanliness of the fuel used and also of the entire system of the vehicle involved. A complete Zenith Fuel Filter installed ahead of the carburetor will allow easier inspection and cleaning. Never remove the filter element in the carburetor unless a Zenith Filter is provided to assure a clean fuel supply.

After passing the filter, the clean fuel travels through the fuel valve seat and passes the fuel valve and into the fuel chamber. The level of the fuel in the fuel chamber is regulated by the float through its control of the fuel valve. The fuel valve does not open and close alternately. It assumes a more or less fixed opening, as regulated by the float, sufficient to maintain a proper level in the fuel chamber equal to the fuel demand of the engine according to its speed and load.

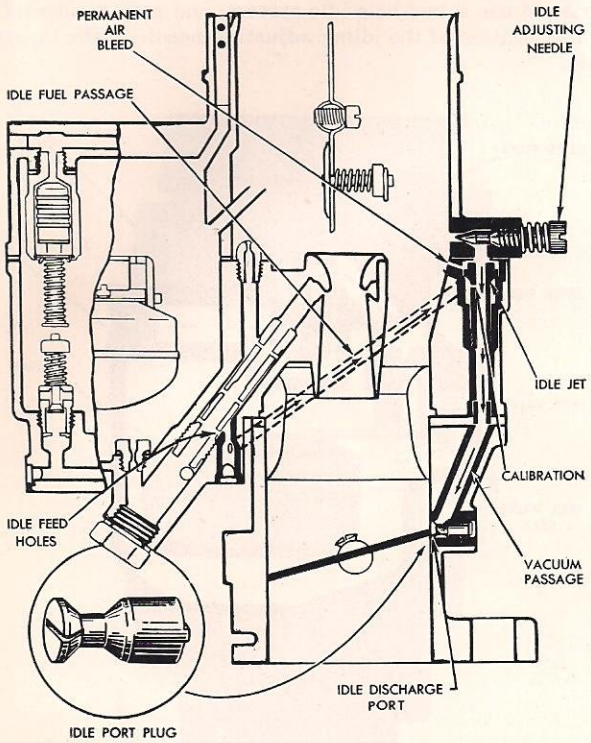

Figure 3

IDLE SYSTEM (28 SERIES)

The idle system supplies fuel to run the engine at curb idle and also at slow speeds until sufficient velocity is built up in the main venturi to operate the main jet system.

This system consists of the idle discharge port, the idle jet, a passage or channel between the jet and the discharge port, an idle air intake passage, idle air adjusting needle, plus a fixed air bleed to the air intake passage.

Note: The idle discharge port on the Zenith 28 Series is formed by a small brass plug called the priming plug. This plug is pressed into the throttle body in direct relation to the position of the throttle plate when the plate is **completely** closed.

At idling speeds of the engine, the throttle plate is slightly advanced from a completely closed position. This leaves about one-half of the area of the idle discharge port open to the suction in the engine manifold. This suction is transmitted to the idle jet through a passage, running through the throttle and fuel bowl bodies. Fuel from the fuel bowl flows through the main jet into the main discharge jet. Fuel for idling flows from the discharge jet through the idle feed holes in the lower end of the discharge jet into the idle fuel passage leading to the idle jet. It is metered through the calibration in the idle jet. The main discharge jet has a solid section or land just above the idle feed holes. This land contacts the surface of the metering well and separates the idle and main jet fuel supply. As the fuel leaves the idle jet, and enters the vacuum passage leading to the discharge port, it is mixed with air admitted from the air intake through the permanent idle air bleed. This air bleed calibration, located in the fuel bowl just below the idle adjusting needle seat, is to prevent the fuel in the bowl from being syphoned into the intake manifold through the idle system if for any reason the idle adjusting needle screw should be placed on its seat.

An additional variable volume of air is admitted past the idling adjusting needle and its seat. The fuel-air mixture then passes through the idle vacuum passage to be discharged into the engine manifold at the idle discharge port. Turning the idle adjusting needle clockwise or **towards** the seat increases the suction on the idle jet and causes a richer mixture. The idle air fuel mixture is also influenced at the same time by the reduced volume of air admitted past the idle adjusting needle when it is turned towards its seat.

Turning the idle adjusting needle counter-clockwise or **away** from the seat reduces the suction on the idle jet and causes a leaner idle mixture.

As the throttle plate is opened wider, the idle system gradually ceases to function. The delivery of fuel through the **high speed system increases** as the throttle plate is advanced. Although the delivery of fuel through the idle system diminishes as the throttle plate approaches the wide open position, it continues to deliver a small volume of fuel contributing to the fuel delivered by the high speed system. It cannot be said that the idle system ceases to deliver fuel entirely at wide open throttle, but it must be made clear that the amount of fuel delivered from the idle system at wide open throttle is so small as to be relatively unimportant.

IDLE SYSTEM (228 SERIES)

This special idle system identifies the Zenith 228 Series carburetor, and is the only departure from the regular 28 Series. It is referred to as a two-hole idle system. The idle **fuel-air** mixture is discharged into the air stream of the carburetor through two calibrated holes located in the throttle body. The location of these holes is in direct relation to and is determined by the position of the throttle plate when completely closed.

The idle fuel supply for this series is identical to the regular 28 Series as described under idle system (28 Series).

The discharge of the idle **fuel-mixture** into the air stream is controlled directly by the idling adjusting needle

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located in the throttle body at the lower idle discharge hole.

Turning the idle adjusting needle **in (clockwise)** creates a leaner idle fuel mixture because less of the fuel mixture is discharged into the air-stream through the idle

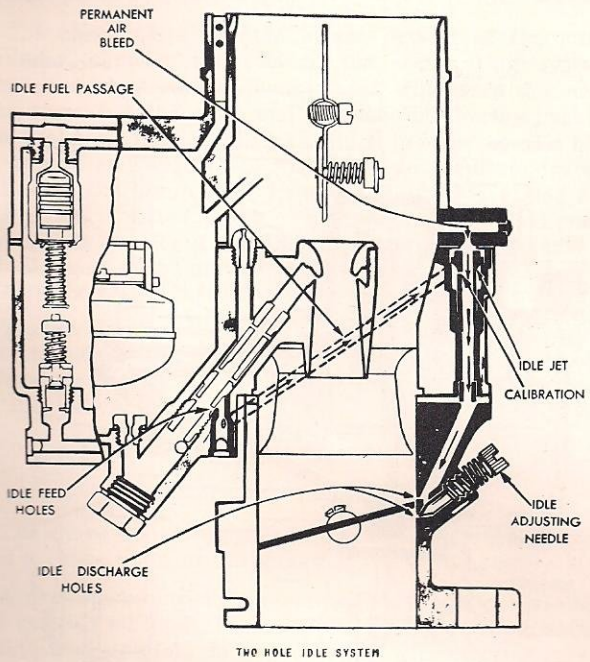

Figure 4

discharge hole. Turning the idle adjusting needle **out (counter-clockwise)** creates a richer idle fuel-mixture, because more of the fuel mixture is discharged into the air stream through the idle discharge hole.

The fuel is metered by the idle jet and is mixed with air admitted by the fixed idle air bleed located in the air intake of the carburetor. This fixed air bleed meters air directly into the idle jet where it mixes with the fuel metered through the idle jet calibration. This idle fuel **mixture** is drawn down the idle mixture passage, and its discharge into the air stream is controlled by the idling adjusting needle.

Note that in this type of idle system the **idling adjusting needle controls** the **amount** of the idle fuel mixture that is discharged into the air stream.

HIGH SPEED SYSTEM

The high-speed system consists of a primary venturi, a secondary venturi, a main jet, a well vent, and a discharge jet. This system controls the mixture at part throttle cruising speed.

The main jet controls the fuel during the cruising range from about one-quarter to three-quarter throttle opening. To maintain a proper mixture ratio a small amount of air is admitted through the well vent or high speed bleeder. Air bleed holes are located in the **upper section** of the discharge jet at a point below the level of fuel in the jet. Introducing air into the discharge jet below the level of fuel, reduces the surface tension of the fuel and helps fuel flow at low suction. This bleed also restricts fuel flow through the main jet under high suctions.

The main discharge jet is designed with a ring land just above the **lower bleed holes.** The ring land contacts the surface of the discharge jet passage and separates the idle fuel supply from the high speed system. When the throttle plate is opened to a point just above the idle position, enough air passes through the carburetor to lower the pressure at the discharge nozzle. The float chamber is open to atmospheric pressure; consequently, the greater pressure in the float chamber will cause the fuel to flow from the fuel bowl through the main jet into the main

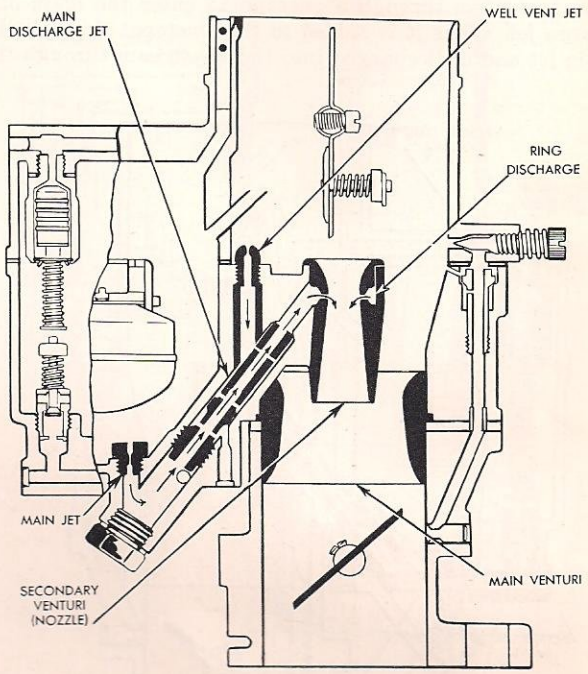

Figure 5

discharge jet. Air admitted through bleed holes in the discharge jet, in an amount measured by the well vent, is mixed with the fuel. This mixture of fuel from the main discharge jet passes through the discharge nozzle in the upper section of the secondary venturi and is added to the air stream in the secondary venturi. This mixture then passes through the main venturi and into the intake manifold.

HIGH SPEED SYSTEM—Power Jet in Operation

The power jet controls the additional fuel necessary for maximum power at wide open throttle. It is called an economizer or bypass jet in some carburetors.

This part of the high speed system consists of a power jet valve and a vacuum controlled piston assembly for operating it. The power jet valve is opened by the vacuum operated piston when the throttle is from three-quarters to wide open. This makes it possible to run on a lean and economical mixture at normal cruising speeds without sacrificing maximum power.

The vacuum in the intake manifold at idling speed is approximately 19" to 20" of mercury. When the throttle is opened quickly the vacuum may drop below 2" of mercury. The vacuum piston assembly is connected to the intake manifold through passages running from the top of the cylinder through the castings to the point indicated by the letter "B". Thus, the vacuum existing in the intake

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manifold is used to operate the power jet system. The vacuum piston assembly is held in a raised position whenever the manifold vacuum is greater than 6" of mercury. Quick throttle openings, which will cause the manifold vacuum to drop below 6" of mercury, allow the tension of the spring of the vacuum piston assembly to force the piston downward opening the power jet valve.

The open power jet valve allows fuel to flow from the fuel bowl through the power jet valve assembly at a rate determined by the calibration in the bottom of the valve. This fuel flows through a passage to enter the main discharge jet. Thus it is **Added** to that metered through the main jet and is discharged into the air stream through the

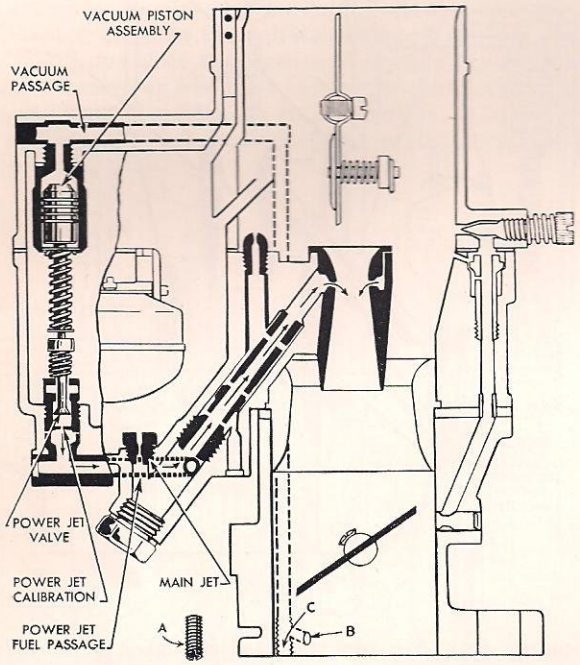

Figure 6

discharge nozzle. Whenever the manifold vacuum drops below 6" of mercury, this extra fuel supply is instantly available. Whenever the manifold vacuum builds up above 6" of mercury this extra fuel supply is cut off.

This entire system functions automatically with the load on the engine. The manifold vacuum is determined by the engine speeds and the amount of throttle opening.

Special Note: When a speed governor is used, it is installed between the carburetor and the intake manifold. It is still necessary to use the suction in the **intake manifold** to control the power jet valve. The partially closed governor throttle will result in a higher suction in the manifold than that which exists between the governor and carburetor throttle plates. The power jet system is so arranged that the passages to the vacuum piston assembly can be by-passed around the governor throttle to use the vacuum in the intake manifold to operate the power jet system. This is accomplished by installing a hollow by-pass screw "A" in the threaded end of the vacuum passage in the flange of the carburetor "C." The screw will shut off the short passage "B" from the vacuum passage. The **hollow** screw will leave a vertical vacuum passage "C" through to the face of the flange. Most speed governors are designed with a vacuum channel in the governor body that will line up with the passage in the carburetor flange. A special flange gasket cut out to permit connecting the passage in the carburetor flange to that in the governor body, **must** be used used when making the carburetor-governor installation. This makes direct connection from the intake manifold to the vacuum piston for power jet control.

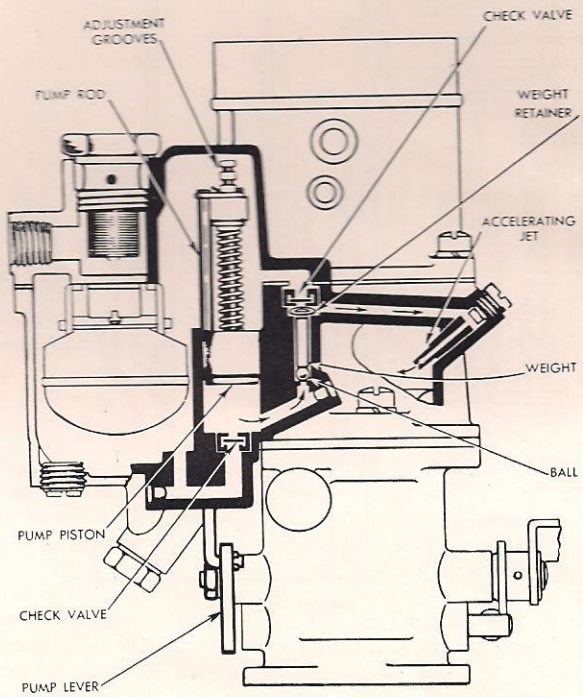

Figure 7

ACCELERATING PUMP SYSTEM

The accelerating pump controls the amount of fuel that is discharged into the air stream on sudden throttle openings. When the throttle is opened suddenly, air rushes through the carburetor into the intake manifold and to the engine. This air is lighter than the liquid fuel and gets into motion more quickly. That means that the air reaches the cylinders of the engine before the first charge of fuel supplied by the high speed system. A lean mixture would result momentarily in this case, and to counteract the condition, additional fuel must be supplied instantly. The supply of that extra fuel is the job of the accelerating pump system.

The accelerating system consists of the pump assembly, accelerating jet, intake check valve, air check valve, and three parts making up the refill check. The pump is mechanically operated, through linkage, by the movement of the throttle shaft. The pump assembly controls the **amount** of fuel that is delivered to the accelerating jet. This amount may be varied by adjusting the stroke of the pump assembly. Such adjustment is made possible by three adjustment grooves located on the upper end of the pump rod. The pump is assembled with a hair pin cotter at this point. When the cotterpin is placed in the bottom groove, it allows a full stroke of the pump piston in the pump cylinder. When the cotterpin is placed in the center groove, it allows a three-quarter stroke; and when placed in the top groove, a half stroke of the pump. The full stroke pump gives the larger volume of gasoline.

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A spring is used between the pump piston and the pump rod to offset any pressure built up on the down stroke of the piston. The pump piston contacts the fuel in an enclosed cylinder and since fuel is a liquid and non-compressable, some relief of the back pressure against the pump piston and pump rod must be provided; otherwise, a bent pump rod, linkage, or lever would result.

The check valve, located in the bottom of the pump cylinder, supplies the fuel to the accelerating system. Any pressure from the pump piston will cause the small disc to seat in the valve and prevent fuel flowing back to the fuel bowl. The refill check which is made up of a ball, a weight, and a retainer washer, is to facilitate instant filling of the pump well when the throttle is closed and the piston is raised in the pump cylinder. The final check valve is to provide a break in the accelerating channel to admit air after the pump charge is dissipated. This avoids syphoning action through the accelerating system.

The accelerating jet meters fuel directly into the main air stream of the carburetor. The calibration in the accelerating jet controls the rate of flow and not the amount of fuel delivered.

CHOKE SYSTEM

The choke system consists of a choke shaft, choke lever, and a choke plate in the intake of the carburetor.

A choke is required for starting cold engines. Gasoline, the same as all fluids, has a definite boiling or vaporization point. The manifold on a cold engine will vaporize only a small fraction of the total quantity of gasoline in the normal input volume in standard fuel-air ratio. It is necessary, therefore, to introduce a large volume of gasoline so that a sufficient amount of the so-called light ends will vaporize to create a combustible mixture in the cylinders. The choke plate when closed creates an extremely high suction on all fuel systems in the carburetor and thereby causes delivery of this extra supply of fuel. This is the complete primary function of the choke.

As soon as the engine starts it is necessary to relieve this high suction quickly. This may be accomplished by several types of relief devices. The type illustrated is the poppet valve in the choke plate.

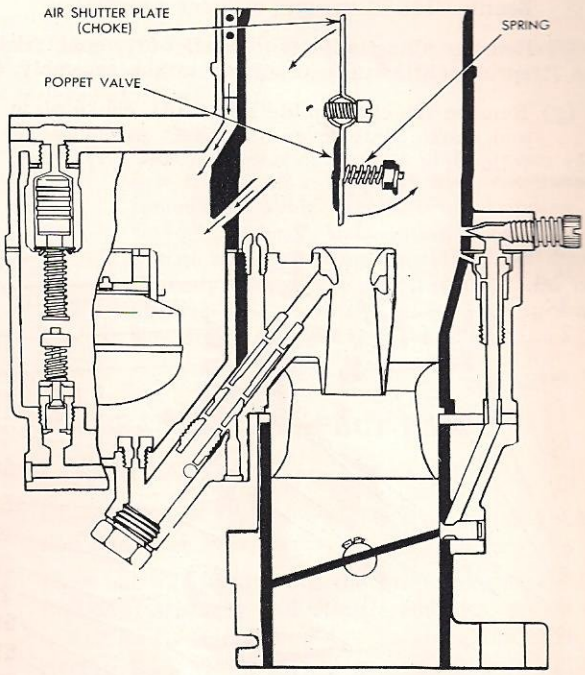

Figure 8

SERVICE AND REPAIR PROCEDURE

IDENTIFY CARBURETOR—Check the numbers on metal identification disc pinned to top of float bowl cover against carburetor outline specification chart. The inside number, next to the pin, is the Zenith outline assembly number, and the one next to the outer edge of the disc is the vehicle manufacturer's.

The exploded view (figure 9) will identify the various component parts and show their relation to the assembly. Use this figure and legend to identify and locate parts when performing the disassembly and reassembly operations which follow.

REPAIR KIT—The basic repair parts kit for the 28 series carburetor is K509, and for the 228 series carburetor K745. A proper repair job **cannot** be performed, however, by using only the basic kit as such. The basic kit must be "tailored" to fit the particular outline assembly number of the carburetor being serviced by the addition of the parts listed in large print on the label of the basic kit container.

DISASSEMBLY

A. REMOVE AIR INTAKE BODY

(a) Remove the large hex plug (13) and fibre washer (14) from top of the air intake assembly (1) using a 13/16″ wrench.

(b) Remove the six screws (22) and lockwashers (23) which attach the air intake assembly (1) to fuel bowl assembly.

(c) Raise the air intake assembly (1) slightly and loosen gasket from the fuel bowl assembly and lift the air intake (1) with gasket clear of the bowl. Avoid damage to the float (19).

B. DISASSEMBLE AIR INTAKE BODY

(a) Remove gasket from air intake assembly (1).

(b) Remove float axle (20) as follows:

(1) Press screwdriver against float axle (20) at slotted side of float hinge bracket and force through hinge bracket.

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(2) Remove float axle (20) completely with fingers from opposite side and remove float (19).

(c) Remove fuel valve needle (59).

(d) Remove fuel valve seat (59) and fibre washer (60) from the air intake assembly (1) with Zenith C161-85 fuel valve seat wrench.

(e) Remove vacuum cylinder assembly (17) and fibre washer (18) from air intake assembly (1) with Zenith C161-10 vacuum cylinder wrench.

(f) Remove idling adjusting needle (11) and friction spring (12) from side of air intake assembly (1).

(g) Remove the choke plate screw (5), choke plate (4) and choke plate lever and shaft assembly (2) as follows:

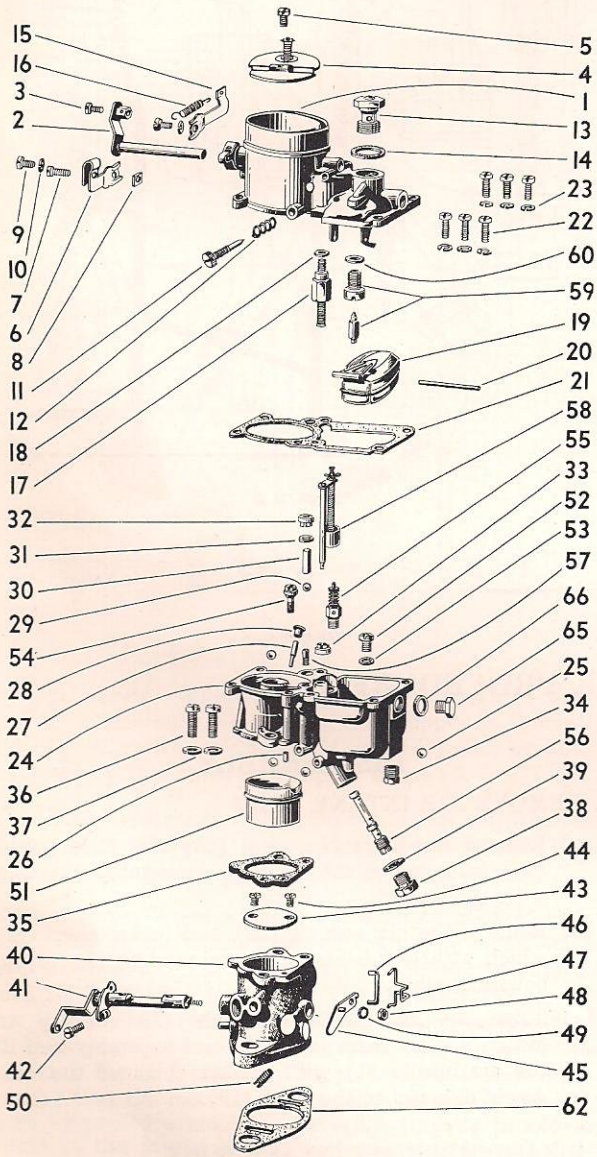

Figure 9

NOTE: In some models of the Zenith 28 series the threaded end of the air shutter screw or screws is riveted to prevent it from coming loose. It must be filed flat before removal to avoid breakage or stripping of threads in shaft.

(1) File off riveted end of the choke plate screw (5).

(2) Remove choke plate screw (5).

(3) Pull out the choke plate shaft and lever assembly (2), and choke plate (4).

(4) Remove the air shutter bracket (15).

NOTE: This bracket can be assembled in two positions. To insure correct reassembly place a mark on the air intake assembly on the side from which the bracket was removed.

C. SEPARATE FUEL BOWL AND THROTTLE BODY

(a) Remove the lower hex plug (38) and fibre washer (39) from bottom of fuel bowl assembly (24) using a ½" wrench.

(b) Remove the accelerating pump link retainer (47) and remove pump link (46).

(c) Remove the accelerating pump and rod as an assembly from the pump cylinder.

NOTE: It may be necessary first to file burrs off rough spots from sides of pump rod at the hole for the link.

(d) Remove the two screws (36) and lockwashers (37) which attach the fuel bowl assembly (24) to throttle body (40) using a screwdriver.

(e) Separate the fuel bowl assembly (24) from the throttle body (40).

(f) Remove the venturi (51) and gasket (35).

D. DISASSEMBLE FUEL BOWL

(a) Remove idling jet (54) from the top surface of fuel bowl assembly (24), using a screwdriver.

(b) Remove well vent jet (57) from top surface of fuel bowl assembly (24) with Zenith C161-80 well vent wrench.

(c) Remove the main jet (52) and fibre washer (53) from inside bottom of the fuel bowl (24) using a screwdriver.

NOTE: In those models of this series that have a main jet adjustment, there will be **no main jet located inside the fuel bowl.** Instead, the main jet calibration will be in the end of the adjustment assembly.

(d) Remove power jet valve assembly (55) from inside bottom of fuel bowl with Zenith C161-9 power jet valve wrench.

(e) Remove the main discharge jet (56) from the passage in the outside bottom of fuel bowl assembly (24) with Zenith C161-1 main jet wrench.

(f) Remove the check valves from fuel bowl as follows:

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(1) Turn back the "ears" of the **pump check valve** (33) located in pump cylinder with a small screwdriver. Turn the fuel bowl over and allow the check valve disc to fall out.

(2) Insert the tapered thread end of check valve tool, Zenith C161-5, into check valve (33) and screw down, counterclockwise, until tool is firmly fastened into the check valve body (33). Then raise the sliding weight up sharply against the stop bar a few times to remove the check valve body (33).

(3) Remove the **air vent check valve** (32) from passage in top surface of fuel bowl (24) by inserting the tapered thread end of check valve tool, Zenith C161-5, into check valve (32) and screw down, counterclockwise, until tool is firmly fastened into valve.

(4) Raise the sliding weight up sharply against the stop bar a few times to remove the check valve.

NOTE: There are three parts in the passage under the air vent check valve (32). These are the pump refill check valve ball (29), weight (30), and retainer washer (31). Turn fuel bowl (24) over and allow these parts to fall into hand.

NOTE: Do not attempt to remove idle channel bushing (26) or nozzle bushing as these parts are pressed in at the factory and need not be removed to service the carburetor.

(g) Removing the Channel Plugs.

(1) Remove the four lead channel plugs and the accelerating jet channel plug (28) by first making a center-punch mark in center of each plug.

NOTE: In some models, the accelerating jet channel plug (28) is drilled at the factory to receive a plug extractor.

(2) Drill a #46 hole in center of plug.

NOTE: Be careful to drill only **through** the plug to avoid damage to casting.

(3) Insert tapered thread end of plug extractor tool, Zenith C161-21, into holes just drilled and screw down, counterclockwise, until tool is firmly fastened into plug. Then strike opposite end of tool sharply with light hammer drawing plugs out of casting.

NOTE: The threaded tip of the extractor tool can easily break off unless the casting and tool is held firmly and the extractor driven away from casting without tipping. Use plug extractor, Zenith C161-15, for the accelerating jet channel plug (28).

(4) Remove corrosion, dirt or gum from the four passages the lead channel plugs were just removed from, using ⅛" drill with the cutting tip ground blunt to avoid damaging the casting.

(5) Clean fuel bowl thoroughly with cleaning solution and rinse in solvent.

(6) Blow out all passages in the fuel bowl assembly and throttle body. It is advisable to reverse flow of compressed air in all passages to insure all dirt has been removed.

E. DISASSEMBLE THROTTLE BODY

(a) Remove pump lever assembly nut (48), lockwasher (49) and pump lever (45) with Zenith C161-25 wrench.

(b) Remove the two throttle plate screws (44) and remove the throttle plate (43) and throttle shaft and lever assembly (41).

NOTE: Threaded ends of throttle plate screws (44) are riveted and must be filed flat before removal to avoid breakage or stripping of threads in shaft. Use caution in this operation to avoid scarring the side of the throttle body bore or the throttle plate. **Do not** attempt to remove the idle port plug from side of throttle body.

CLEAN AND INSPECT PARTS

A. CLEANING PARTS

(a) Clean all metal parts thoroughly with cleaning solution and rinse in solvent.

(b) Blow out all passages in the air intake assembly, fuel bowl assembly and throttle body.

NOTE: Be sure all carbon deposits have been removed from throttle bore and idle port. It is advisable to reverse flow of compressed air in all passages to insure all dirt has been removed. Never use a wire or drill to clean out jets.

B. INSPECTION OF PARTS

(a) **Float Assembly.** Replace float assembly (19) if loaded with gasoline, damaged or if float axle bearing is worn excessively. Inspect top side of float hinge for wear where it contacts fuel valve needle.

(b) **Float Axle.** Replace if any wear can be visually detected on the bearing surface.

(c) **Fuel Valve Seat and Needle Assembly.** Replace fuel valve seat and needle (59) because both parts wear and may cause improper float level.

(d) **Idling Adjusting Needle and Spring.** Inspect point of needle (11). This must be smooth and free of ridges.

(e) **Throttle Plate.** Inspect plate (43) for burrs or damaged edges. Never clean a throttle plate with a buffing wheel or a sharp instrument.

(f) **Throttle Shaft and Lever.** Replace shaft and lever assembly (41) if the shaft is badly worn or if lever is loose on shaft.

(g) **Accelerating Pump and Rod Assembly.** Examine for wear of pump piston, rod and pump link hole. Replace with a complete assembly (58).

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(h) **Power Jet Valve.** Replace this part (55) because extent of wear cannot be determined by visual inspection.

(i) **Vacuum Cylinder Assembly.** Replace this part (17) because extent of wear cannot be determined by visual inspection. Worn cylinders result in poor idling and power jet action.

(j) **Pump Lever.** Inspect lever (45) for wear in pump link hole.

(k) **Air Shutter Assembly.** Inspect for bends, burrs, or damaged edges. See that poppet valve is in good condition and works freely.

(l) **Air Shutter Shaft and Lever Assembly.** Check bearing surfaces for wear; see that shaft is straight and that lever is tight on shaft.

(m) **Pump Check Valve and Air Vent Check Valve.** Replace these parts (32 and 33) because they have been damaged in removal.

(n) **Air Intake Assembly.** Inspect machined surfaces of air intake (1) for dents, warpage, or other damage. Air cleaner must fit tight or otherwise dirt will get into engine at this point.

(o) **Fuel Bowl.** Examine for loose discharge nozzle bushing. Examine inside bottom of bowl and all passages for evidence of corrosion (metallic oxides) or gum deposits.

(p) **Gaskets.** Replace all gaskets and fibre washers every time the carburetor is disassembled.

(q) **Check Specifications.** Use Outline Specification Chart and verify correctness of the following parts. Size numbers, shown on Chart, will be found stamped on parts. Be sure carburetor number and number on chart compare.

(r) The following parts should be checked:

Venturi, Main Jet, Idle Jet, Power Jet Valve, Accelerating Jet, Main Discharge Jet, Well Vent, and Fuel Valve Seat.

REASSEMBLY

A. ASSEMBLE PARTS TO AIR INTAKE BODY

(a) Install air shutter bracket (15), screw and lockwasher, in the same position on air intake (1) it was in before removal.

NOTE: Refer to marks placed on air intake (1) during disassembly.

(b) Place choke plate (4) in air intake assembly (1) with poppet valve toward gasket surface.

NOTE: Some models of the Zenith 28 Series carburetors utilize methods of choke plate relief other than the poppet valve. Examples of these are a spring loaded choke or a drilled hole in the choke plate. When such models are being serviced, the service procedure will have to be adapted to that particular carburetor. But, in no case should any difficulties arise in servicing such carburetors.

(c) Insert shaft and lever assembly (2).

(d) Close choke plate (4) and observe that poppet valve spring faces air entrance.

(e) With choke plate (4) closed, align hole in shaft (2) with hole in plate (4), with lever pointing toward bracket (15).

(f) Center the choke plate in a closed position and tighten screw (5).

NOTE: **Do not attempt to rivet threaded end of screw.**

(g) Install idling adjusting needle (11) and spring (12).

(h) Install vacuum cylinder assembly (17) and new fibre washer (18) in air intake assembly (1) with Zenith C161-10 wrench.

(i) Install new fuel valve seat (59) and fibre washer (60) with Zenith C161-85 fuel valve seat wrench.

(j) Install fuel valve needle (59) in seat (59), followed by float (19) and float axle (20).

NOTE: Insert tapered end of float axle (20) into float bracket on side opposite slot and push through the other side. Press float axle (20) into slotted side until the axle is centered in bracket.

(k) Set float level to specifications using a 6″ standard depth gage.

NOTE: **Do not bend, twist** or **apply pressure** on the float body (19). With air intake assembly (1) in inverted position viewed from free end of float, float body (19) should be centered and at right angle to bowl cover. The float setting is measured from the machined surface of air intake assembly to top side of float body at highest point. Obtain correct float position specifications from Outline Specification Chart. The standard setting for most Zenith 28 Series is 1½″ + — 1/32″. To increase or decrease distances between float and the machined surface of air intake use long-nosed pliers and bend float lever close to the float body.

B. ASSEMBLE PARTS IN FUEL BOWL

(a) Drive each of the four lead channel plugs into channels until plug heads are flush with surface of the casting. Use Tool C161-19.

NOTE: Only one or two light blows are required to seal lead plug in channel. Avoid driving lead plug in too deep for otherwise plug may block off other fuel passages.

(b) Install accelerating jet channel plug (28) and drive in place with hammer.

(c) Install new accelerating pump check valve (33) in bottom of the pump cylinder with Zenith C161-53 check valve tool as follows:

(1) Place check valve (33) on the formed end of tool and press firmly into counter bore.

NOTE: Both check valves are identical.

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(2) Turn fuel bowl assembly (24) **upside down.** Start check valve tool into pump cylinder with the guide bar in the pump rod passage and press hard to start check valve (33) into its seat.

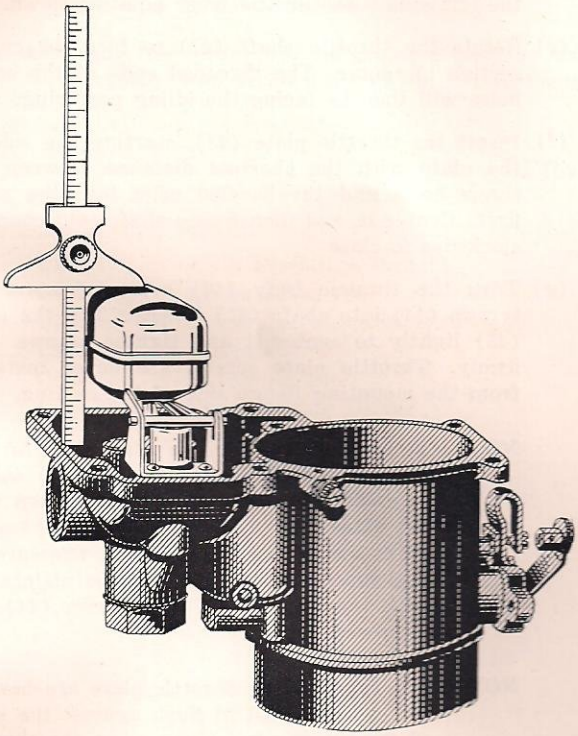

Figure 10

(3) Turn fuel bowl assembly (24) over, hold firmly in hand and drive check valve into its seat with a few sharp blows using a light hammer. Be sure that check valve bottoms completely.

(d) Install idling jet (54) in top surface of fuel bowl (no gasket is used).

(e) Install pump refill check valve ball (29), weight (30), retainer washer (31) and air vent check valve (32) as follows:

(1) Drop steel ball (29) into vertical passage next to accelerating jet (27) in top surface of fuel bowl assembly (24).

(2) Drop square weight (30) on top of ball (29).

(3) Place brass retainer washer (31) in check valve counterbore on top of weight (30).

(4) Start air vent check valve (32) evenly into counter bore on top of retainer washer (31) with fingers. Flat head of valve must face top surface of fuel bowl casting.

(5) Fit the machined end of the stop bar, Zenith C161-5 check valve tool into valve (32) and lightly drive check valve (32) into place as far as the tool will permit.

NOTE: Check valve (32) must seat evenly and should not be cocked at an angle.

(f) Install main jet (52) and fibre washer (53) in bottom of fuel bowl (24) and seat firmly with light screwdriver.

NOTE: The models of this series that use a high speed adjustment will not have a main jet in the fuel bowl. Instead, the main jet calibration will be found in the high speed adjustment assembly.

(g) Install power jet valve assembly (55) with Zenith C161-9 power jet valve wrench. (No gasket.)

(h) Install main discharge jet (56) into passage in outside bottom of fuel bowl (24) with Zenith C161-1 main jet wrench.

(i) Install lower plug (38) and fibre washer (39) in passage on outside bottom of fuel bowl (24), using a ½" wrench.

(j) Install well vent jet (57) in top surface of fuel bowl assembly (24) with Zenith C161-80 well vent wrench. (No gasket.)

NOTE: If a high speed adjustment is used, install it at this time.

(k) Install accelerating pump piston and rod assembly (58) into pump cylinder.

NOTE: Hair pin cotter should be in same groove as when removed.

(l) The pump guide rod has three grooves at the upper end to determine the length of the pump stroke. The pump is assembled with the hair pin cotter in the uppermost groove when a half stroke is required; in the second groove for a three-quarter stroke and in the bottom groove for a full stroke.

C. CHECK ACTION OF PUMP

(a) Check action of accelerating pump as follows:

(1) Fill carburetor bowl (24) with gasoline.

(2) Force pump piston (58) downward in pump cylinder and note if air vent check valve (32) leaks.

(3) Repeat this operation noting if pump check (33) leaks allowing gasoline to be forced back into fuel bowl through channel leading from bottom of pump cylinder back into bowl.

(4) Repeat this operation and observe the discharge of fuel at accelerating jet (27).

NOTE: This check should always be made.

D. ASSEMBLE PARTS TO THROTTLE BODY

NOTE: Any throttle body of a Zenith 28 Series carburetor can have throttle shaft bushings installed to return it to factory specifications as regards fit of the throttle shaft. If the fit of the throttle shaft is sloppy in the throttle body and it is desired to use the same throttle body for reassembly of the carburetor, then, it is absolutely necessary to install throttle shaft bushings. A poorly fitting throttle shaft upsets idling of the

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engine. The throttle plate will not be correctly located in relation to the idle discharge port. Additional air will be admitted into the throttle body around the shaft which will also tend to upset the idle.

The following procedure should be adhered to to properly install the throttle shaft bushings in the Zenith 28 Series carburetor.

(a) Install throttle shaft bushings as follows:

NOTE: To properly rebush the throttle body of the Zenith 28 Series carburetor, it is absolutely necessary to have available the proper counterbore reamer and line reamer and the bushing driver tool needed to install the new bushings. Counterbore reamer No. C161-73-2, shaft line reamer No. C161-71-3 and bushing driver No. C161-72-3 are used. The bushings are C9-56 (long shaft boss) and C9-55 (short shaft boss).

(1) Place a suitable centering cone in the bed of a drill press. With one throttle shaft hole on this center bring the spindle down until the counterbore reamer contacts the opposite shaft hole. The reamer is of a diameter to result in a press fit for the outside diameter of the throttle shaft bushing.

(2) With the casting still in place as described in the above paragraph, set the stop on the press to the length of the bushing.

NOTE: Check that the proper length bushing is being used for the particular shaft hole being counterbored.

(3) The hole is then counterbored to accommodate the bushing.

(4) A throttle shaft bushing is driven into place using the proper bushing driver tool.

(5) The bushing is then reamed with the line reamer. Use the opposite shaft hole as a "pilot" to align the line reamer in the bushing.

(6) Now turn the casting over and prepare the opposite hole to take the bushing. It will be necessary to reset the stops on the spindle again as described before. Then counter-bore the hole.

(7) Drive the second throttle shaft bushing into position.

(8) Then line ream the inside diameter as the final machining operation. Pilot line reamer from side opposite bushing that is being reamed. The casting is now ready for reassembly.

NOTE: A lathe may be substituted for the drill press in performing the counter-boring and line reaming operations.

(b) Install throttle shaft and lever assembly (41) and throttle plate (43) in throttle body (40).

NOTE: Any deviation from the following instructions will result in poor idle and low speed performance. Use **new screws** and **do not** attempt to rivet threaded ends. (A drop of shellac may be placed upon them.)

(c) Back out throttle stop screw (42) in throttle lever (41). Place the throttle body assembly (40) on bench with mounting flange up and facing the idling port plug on the inside of the throttle body bore.

(d) Insert throttle shaft and lever assembly (41) from the left side with throttle lever pointing down.

(e) Rotate the throttle shaft (41) to face the cutout section in center. The threaded ends of the screw holes will then be facing the idling port plug.

(f) Insert the throttle plate (43), starting the side of the plate with the shortest distance between the screw holes and the beveled edge into the shaft first. Center it, and then rotate shaft (41) counterclockwise to close.

(g) Turn the throttle body (40) over and start the screws (44) into shaft (41) loosely. Tap the plate (43) lightly to center it and tighten screws (44) firmly. Throttle plate screws are **never** installed from the mounting flange side of the casting.

NOTE: To properly center the plate (43) in the throttle body bore, the screws (44) should be started in the shaft (41) and then with the plate (43) closed, it should be tapped on the mounting flange side. Pressure on the throttle plate (43) must be maintained with the finger until the screws (44) are tightened.

NOTE: The edges of the throttle plate are beveled so that they will fit flush against the sides of the throttle body bore when the throttle plate is closed. If the throttle plate is not installed correctly, it will not close flush with the sides of the throttle body bore.

E. ASSEMBLE CARBURETOR BODIES

(a) Place venturi (51) in position in fuel bowl assembly (34).

NOTE: The notch in the venturi (51) fits over the discharge arm of the fuel bowl assembly (24).

(b) Place throttle body to fuel bowl gasket (35) in position around venturi (51).

NOTE: One hole in this gasket is reinforced with a metal ring. The idle channel bushing (26) in fuel bowl assembly (24) should pass through this ring.

(c) Install pump lever (45), lockwasher (49) and nut (48) with Zenith C161-25 wrench.

NOTE: Pump lever (45) should be mounted on throttle shaft (41) so pump link hole will be under pump rod, and lever (45) pointing upward when throttle is closed.

(d) Assemble the throttle body (40) to the fuel bowl assembly (24).

(e) Install pump lever link (46), inserting long end of the link into pump rod and install pump link retainer (47). Short end of link is installed in pump lever; long end in pump rod.

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(f) Place gasket on air intake (1), assemble same to fuel bowl (24) with six screws (22) and lockwashers (23). Tighten assembly screws (22) evenly and firmly.

(g) Install large hex plug (13) in top of fuel bowl cover. Tighten with 13/16" open end wrench.

(h) Hold throttle lever (41) in a closed position and turn throttle stop screw (42) in until it just contacts stop on body (40), then turn screw in 1½ additional turns.

(i) Check power jet vacuum passage in face of mounting flange for ⅛" x 40 threaded hollow vacuum passage screw (50). Screw should be in this passage whenever a speed governor is used on the engine. Screw should never be used if no speed governor is used. Always use a slotted gasket (62) when screw is used.

SERVICE TOOLS

SPECIAL ZENITH TOOLS

C161-1	Main Discharge Wrench
C161-5	Check Valve Tool
C161-9	Power Jet Valve Wrench
C161-10	Wrench
C161-15	Extractor Tool
C161-19	Channel Plug Driver
C161-21	Extractor Tool
C161-25	Wrench
C161-53	Check Valve Tool
C161-80	Well Vent Wrench
C161-85	Fuel Valve Seat Wrench
C161-71-3	Shaft Line Reamer
C161-72-3	Bushing Driver
C161-73-2	Counter Bore Reamer

GENERAL HAND TOOLS

13/16" Open End Wrench
1/2" Open End Wrench
1/4" Blade Screw Driver
1/8" Blade Screw Driver
Long Nosed Pliers
6" Depth Gage
1/4" Round File
Light Hammer
1/8" Blunt End Drill

ZENITH CARBURETOR DIVISION

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