ZENITH 61 AND 161 SERIES CARBURETORS

OPERATION AND SERVICE

Figure 1

The Zenith 61 and 161 Series carburetors are of updraft single venturi design. They are made in 5/8" and 7/8" S.A.E. barrel sizes; with 5/8", 7/8", 1" and 1 1/4" S.A.E. flange sizes available. They are made with selective fuel inlet, with or without a back suction economizer and a main jet adjustment.

They are "balanced" and "sealed," and the semi-concentric fuel bowl allows operation to quite extreme angles without flooding or starving. This design makes them particularly adaptable to smaller farm tractors and a great variety of agricultural machines and industrial units.

MODEL DESIGNATION

Type—Updraft.

Material—Barrel and bowl castings, cast iron.

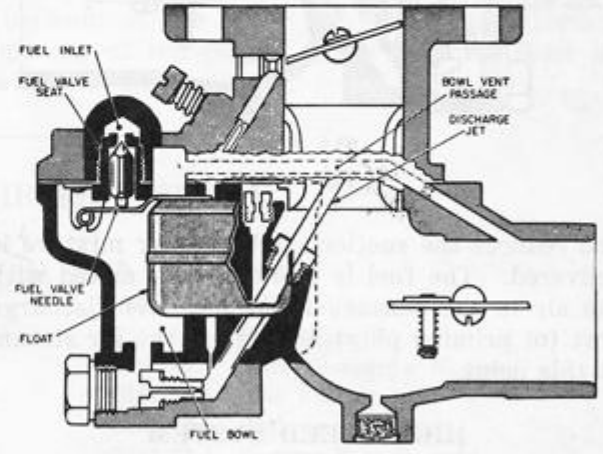
Styles—"A" Throttle and choke shafts parallel.
"D" Equipped with degasser assembly.
"E" Elbow air intake.
"J" Back-suction economizer.
"R" Built-in governor.
"S" Straight through air intake.
"X" Flange next size larger than standard.
"XX" Flange second size larger than standard.

Size Designation	Nominal Size	Throttle Bore Diameter	Flange Size S.A.E. Standard
5	5/8"	.787 or 25/32"	5/8"
7	7/8"	1.023 or 1 1/32"	7/8"
X7	7/8"	1.023 or 1 1/32"	1"
XX7	7/8"	1.023 or 1 1/32"	1 1/4"
8	1"	1.181 or 1 3/16"	1"

FUEL SUPPLY SYSTEM

The fuel supply system is made up of the threaded fuel inlet, the fuel valve seat, fuel valve, float and fuel bowl.

The fuel supply line is connected to the threaded inlet. The fuel travels through the fuel valve seat and passes around the fuel valve and into the fuel bowl. 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 but assumes an opening, regulated by the float, sufficient to maintain a proper level in the fuel chamber equal to the demand of the engine according to its speed and load.



FUEL SUPPLY SYSTEM

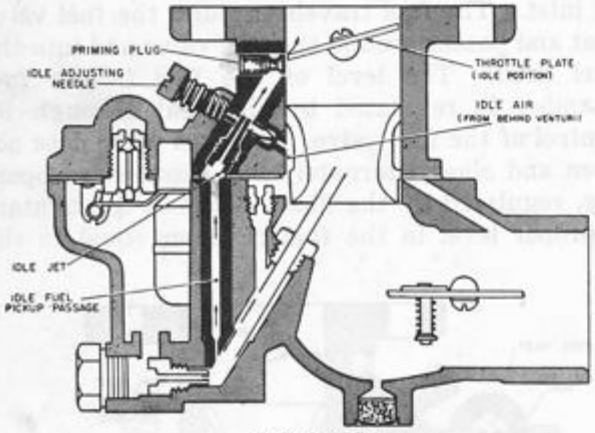
Figure 2

The inside bowl vent as illustrated by the passage originating in the air intake and continuing through to the fuel bowl, 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."

IDLE SYSTEM

The idle system consists of the idle discharge port, idle air passage, idle adjusting needle, idle jet, and fuel passage.

The fuel for idle is supplied through the main jet to a well directly below the main discharge jet. The pick-up passage is connected to this well by a restricted drilling at the bottom of this passage. The fuel travels through this channel to the idle jet calibration. The air for the idle mixture originates back of (or from behind) the main venturi. The position of the idle adjusting needle in this passage controls the suction on the idle jet and thereby the idle mixture. Turning the needle in closer to its seat results in a greater suction with a smaller amount of air and therefore a richer mixture. Turning the needle out away from its seat increases the amount of air



IDLE SYSTEM

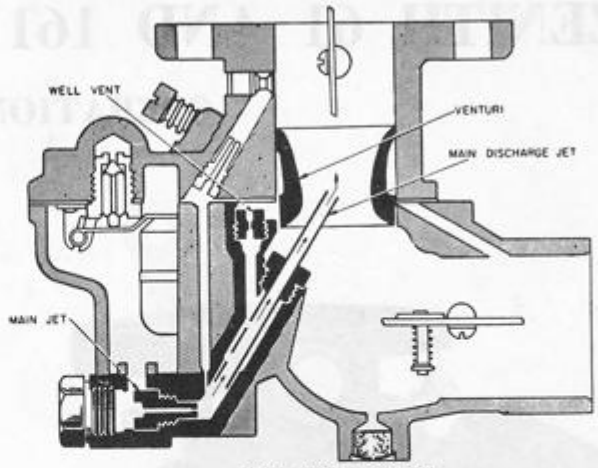
Figure 3

and reduces the suction, and a leaner mixture is delivered. The fuel is atomized and mixed with the air in the passage leading to the discharge port (or priming plug) and enters the air stream at this point.

HIGH SPEED SYSTEM

The high speed system controls the fuel mixture at part throttle speeds and at wide open throttle. This system consists of a **venturi,** controlling the maximum volume of air admitted into the engine; the **main jet,** which regulates the flow of fuel from the float chamber to the main discharge jet; the **well vent,** which maintains uniform mixture ratio under changing suction and engine speeds; and a **main discharge jet,** which delivers the fuel into the air stream.

The main jet controls the fuel delivery during the part throttle range from about one-quarter

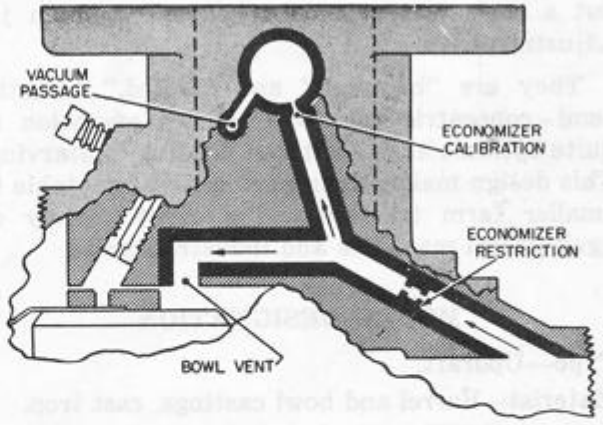


HIGH SPEED SYSTEM

Figure 4

to full throttle opening. To maintain a proper mixture ratio a small amount of air is admitted through the well vent into the discharge jet through the air bleed holes in the discharge jet at a point below the level of fuel in the metering well.

The passage of fuel through the high speed system is not a complicated process. The fuel flows from the fuel chamber through the main jet and into the main discharge jet where it is mixed with air admitted by the well vent, and the air-fuel mixture is then discharged into the air stream of the carburetor.



BACK SUCTION ECONOMIZER SYSTEM

Figure 5

ECONOMIZER SYSTEM

The economizer system consists of a "milled" slot in the throttle shaft, which acts as a valve to open or close the system; a vacuum passage from the throttle bore to the slot in the throttle

shaft; and a vacuum passage from the slot in the throttle shaft to the fuel bowl.

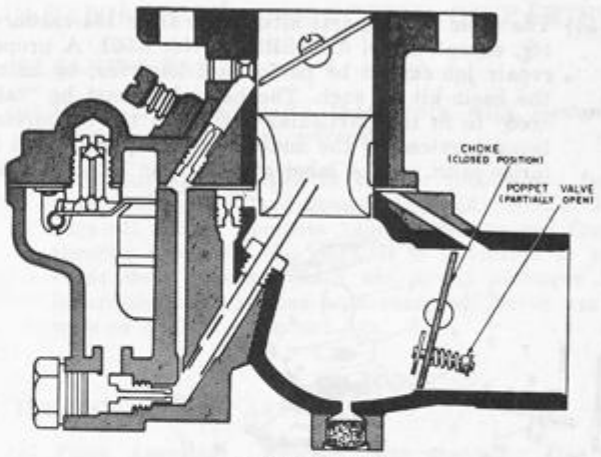
This system allows economical fuel mixture ratios for part throttle operation while still permitting the richer mixture ratios that are needed for full load operation.

The economizer system performs its function by establishing a "back suction" on the fuel in the fuel bowl during most of the part throttle range of operation. This "back suction" is created by manifold vacuum, through the channels connecting the throttle bore with the fuel bowl. This retards the flow of fuel through the metering systems and thus permits the carburetor to operate on leaner part throttle mixture ratios.

The rotation of the throttle shaft controls the economizer system. During part throttle operation from about one-quarter to three-quarters throttle, the passages are open and the pressure in the fuel bowl is lowered. This retards the flow through the main jet and a leaner mixture is supplied. On full throttle opening the passages are closed and the main jet flows to full capacity to supply the richer mixture required.

CHOKE SYSTEM

The choke system consists of a valve mounted on a shaft located in the air entrance and operated externally by a lever mounted on the shaft. The choke valve is used to restrict the air entering the carburetor. This increases the suction on the jets when starting the engine. The choke valve is of a "semi-automatic" type, having a poppet valve incorporated in its design, which is controlled by a spring.



CHOKE SYSTEM

Figure 6

The poppet valve opens automatically when the engine starts and admits air to avoid **over-choking** or **flooding** of the engine. The mixture required for starting is considerably richer than that needed to develop power at normal temperatures. As the engine fires and speed and suction are increased, the mixture ratio must be rapidly reduced. This change is accomplished through adjustment of the choke valve and the automatic opening of the poppet valve to admit more air when the engine fires.

SERVICE AND REPAIR PROCEDURE

A. IDENTIFY CARBURETOR

(a) Check the numbers on metal identification disc riveted to top of float bowl cover against carburetor outline specification chart. The inside number next to the rivet is the Zenith outline assembly number and the one next to the outer edge of the disc is the vehicle manufacturer's.

B. DISASSEMBLED VIEW

(a) The disassembled view will identify the various component parts and show their relation to assembly. Use the disassembled view with the identifying part numbers to identify and locate parts when performing the disassembly and reassembly operations.

C. SELECTION OF TOOLS AND REPAIR PARTS KIT

(a) The use of the proper Zenith tools and the proper repair parts kits is essential if the best service and repair procedure is to be preformed on the carburetor. The following list of Zenith special tools and general hand tools will best perform the service job.

(b) Zenith Special Tools

C161-1	Main Jet Wrench
C161-10	Plug Wrench
C161-25	Main Discharge Wrench
C161-71-1	Line Reamer
C161-72-1	Bushing Driver
C161-73-1	Counter Bore Reamer
C161-82	Fuel Valve Seat Wrench
C161-83	Main Jet Wrench

(c) General Hand Tools

7/16" Open End Wrench
1/2" Open End Wrench
1/4" Blade Screw Driver
Long Nosed Pliers
6" Depth Gage
1/4" Round File
Light Hammer
Long Rod or Punch

(d) The basic repair parts kit for the 61 or 161 carburetor, except model 61A8SRD, is No. K501. A proper repair job cannot be performed, however, by using the basic kit as such. The basic kit must be "tailored" to fit the particular outline of the carburetor being serviced by the addition of the parts listed in large print on the label of the basic kit container.

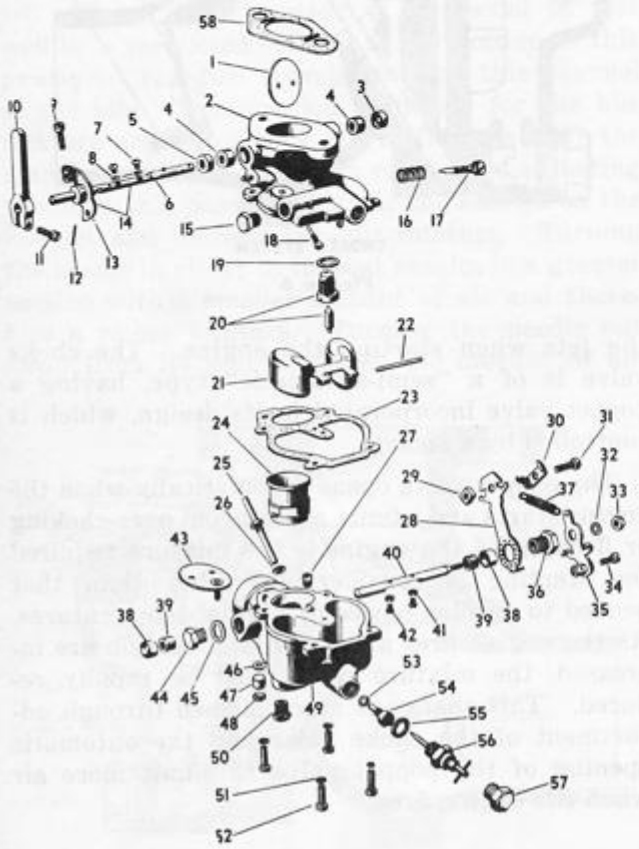


Figure 7

D. SEPARATE CARBURETOR BODIES

(a) Remove the hex plug or filter screen (15) from side of throttle body (2) using a 7/16" wrench.

(b) Remove the four assembly screws (52) and lockwashers (51) which attach the throttle body (2) to the fuel bowl (49) using a screwdriver.

(c) Separate the throttle body (2) from the fuel bowl assembly (49).

E. DISASSEMBLE THROTTLE BODY

(a) Remove float axle as follows:

(1) Press screwdriver against float axle (22) at slotted side of float hinge bracket and force through hinge bracket.

(2) Remove float axle (22) completely with fingers from opposite side and remove float (21)

(b) Remove fuel valve needle (20).

(c) Remove the assembly gasket (23) from the machined surface of the throttle body (2).

(d) Remove the venturi (24).

(e) Remove the fuel valve seat (20) and fibre washer (19) from machined surface of throttle body (2) using Zenith Tool No. C161-82.

(f) Remove the idle jet (18) from passage in machined surface of throttle body (2) near fuel valve seat (20) using a small screwdriver.

(g) Remove the idle adjusting needle (17) and friction spring (16) from the side of throttle body (2).

(h) Remove the throttle plate (1), screws (7), lockwashers (8), shaft and stop lever assembly (14), throttle clamp lever (10), as follows:

(1) Unscrew throttle stop screw (9) until threaded end is flush with lever (13).

(2) Make match marks with file on throttle body (2) and all levers to act as a guide to reassemble these parts in the same position as removed.

(3) Loosen throttle clamp lever screw (11) and remove lever (10) from shaft (14). NOTE: Some 161-J Series Carburetors have the throttle lever and the throttle stop lever riveted together. Omit Step No. (3) if this type lever is used.

(4) File off the riveted or peened end of the throttle plate screws (7).

NOTE: When such screws are riveted or peened the threaded end of the two screws must be filed flat before removal to avoid breakage or stripping of threads in the shaft. In some cases it may be necessary to use a small (¼") round file and cut slightly below the surface of the shaft because of a slight counter bore around the screw hole.

Be sure to avoid striking and cutting the side of the throttle body bore or the throttle plate when filing the screws.

(5) Remove the screws (7) and pull out the throttle plate (1).

(6) Remove the throttle shaft and stop lever assembly (14) from the throttle body (2).

(i) Remove the throttle shaft packing (4) and packing retainer (5) from the throttle body shaft holes as follows:

(1) Screw a 5/16" fine thread taper tap into packing retainer (5) until it is firmly seated.

(2) Insert long punch or rod through opposite shaft hole and drive punch against the end of the tap until retainer (5) is free of the body. (Repeat operation for other packing and retainer.)

NOTE: **Do not disassemble the throttle plate (1), throttle shaft and stop lever assembly (14), throttle packing (4), and packing retainer (5) from the throttle body (2) unless the throttle shaft is bent or otherwise damaged or unless there is damage to any of the other component parts of the throttle assembly.**

F. DISSASEMBLE FUEL BOWL BODY

(a) Remove the main jet adjusting needle assembly (56) and fibre washer (55) from bottom of fuel bowl body (49) using a ½" wrench.

NOTE: Some models will have a ½" plug (hex) in place of the adjustment.

(b) Remove the drain plug (hex) (50) from outside bottom of fuel bowl (49), using Zenith Tool No. C161-10.

(c) Remove main jet (54) and fibre washer (53) from threaded passage in bottom side of fuel bowl (49) with Zenith Tool No. C161-1.

(d) Remove main discharge jet (25) and fibre washer (26) from center of large opening in machined surface of fuel bowl (49) with Zenith Tool No. C161-25.

(e) Remove well vent jet (27) from center of large opening in machined surface of the fuel bowl (49) with a small screwdriver.

(f) Disassemble choke as follows:

(1) Remove the bracket spring (37) from the choke lever (35) and choke bracket (28).

(2) Make match marks with a file on air shutter bracket (28), air intake body (49) and lever (35) to act as a guide to reassemble these parts in the same position as removed.

(3) Remove the choke shaft nut (33) and lockwasher (32) using Zenith Tool No. C161-25.

(4) Remove the choke lever (35).

(5) Remove the choke bracket screw (36) using a ½" open end wrench and remove choke bracket (28).

(6) Remove the shaft hole plug (44) and fibre washer (45) using a ½" open end wrench.

(7) Remove the choke plate screws (42) and lockwashers (41) and remove the choke shaft (40) and choke plate (43).

NOTE: Some models of the Zenith 161-J Series carburetor employs choke shaft packing washers (39) and packing washer retainers (38) in the choke shaft holes around the choke shaft. The disassembly of these packing washers and retainers should be performed in the same manner as the disassembly of the throttle shaft packing washers and retainers which is described in detail in the disassembly of the throttle body.

NOTE: Do not disassemble the choke assembly bracket (28), lever (35), shaft (40) and plate (43) unless there is damage to any one of the above mentioned parts or damage to any of the other component parts of the choke assembly.

CLEANING AND INSPECTION OF 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 and fuel bowl casting (49) and throttle body (2). **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 that 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 (21) if loaded with gasoline, damaged, or if float axle bearing is worn excessively. Inspect top side of float lever for wear where it contacts fuel valve needle. **NOTE:** Such wear can affect the float level.

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

(c) **Fuel Valve Seat and Needle Assembly.** Always replace fuel valve seat and needle (20) because both parts wear and may cause improper float level.

(d) **Idling Adjusting Needle and Spring.** Inspect point of needle (17). This must be smooth and free of ridges.

(e) **Throttle Plate.** Inspect plate (1) for burrs or damaged edges. Never clean a throttle plate with a buffing wheel or sharp instrument.

(f) **Choke Plate (43).** Inspect for bends, burrs or damaged edges.

(g) **Choke Shaft.** Check bearing surfaces for wear; see that shaft (40) is straight.

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

(i) **Throttle Shaft.** Replace if throttle shaft (6) shows evidence of wear on the bearing surfaces.

(j) **Check Specifications.** Use the outline specification chart and verify the correctness of the following parts. Numbers shown on chart will be found on parts. The following calibrated parts should be checked: **Venturi, Main Jet, Discharge Jet, Well Vent Jet, Idling Jet** and **Fuel Valve Seat.**

REASSEMBLY

A. FUEL BOWL BODY

(a) **Choke Assembly**

(1) Install the two choke shaft packings (39) and retainers (38) in fuel bowl body (49) as follows. Use bushing driver tool Zenith C161-72-1.

(2) Assemble packing (39) and retainer (38) and place completed assembly on bushing driver tool with packing facing small end of tool.

(3) Insert small end of tool into choke shaft hole, start retainer (38) into counter bore in body (49) and lightly drive retainer (38) into body (49) until it is flush with machined surface.

(4) Insert choke shaft (40) into air intake (49).

(5) Insert choke plate (43) into air intake (49).

NOTE: Be sure the choke plate (43) is located in the same position in the air intake (49) as regards the poppet valve as when it was disassembled.

(6) Install choke plate screws (42) and lockwashers (41) using a small screwdriver.

(7) Install the shaft hole plug (44) and fibre washer (45) and tighten using a ½" open end wrench.

(8) Place the choke bracket (28) against the boss on the air intake (49) and install the choke bracket screw (36) and tighten with a ½" open end wrench.

(9) Place the choke lever (35) on the choke shaft (40) and tighten with the choke shaft nut (33) using Zenith Tool No. C161-25.

(10) Attach the choke lever spring (37) to the choke bracket (28) and the choke lever (35).

NOTE: Use the "Match Marks" put on the choke lever (35), choke bracket (28) and air intake body (49) during disassembly to properly align the choke assembly during reassembly.

(b) Install main discharge jet (25) and fibre washer (26) in fuel bowl (49) and tighten firmly with Zenith Tool No. C161-25.

(c) Install well vent jet (27) in fuel bowl (49) and tighten with a small screwdriver.

(d) Install main jet (54) and fibre washer (53) in large threaded passage beneath the fuel bowl (49) using Zenith Tool No. C161-1.

(e) Install the drain plug (hex) in threaded passage bottom of fuel bowl using Zenith C161-10 wrench.

(f) Install main jet adjustment (56) or ½" hex plug (57) as the case may be.

B. THROTTLE BODY

NOTE: Any throttle body of a Zenith 161 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 engine, for the throttle plate will not be correctly located in reference to the idle discharge port, and also it is possible for additional air to 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 throttle shaft bushings in the Zenith 161 Series carburetor.

(a) Install throttle shaft bushings as follows:

NOTE: To properly rebush the throttle body of the Zenith 161 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 bushing. Counterbore reamer No. C161-73-1, line reamer No. C161-71-1, and bushing driver No. C161-72-1 are used. The bushing itself is CR9-13. After the new throttle shaft bushing is in place it will be necessary to redrill the economizer restriction located in the cover and the channel from the throttle body bore into the throttle shaft hole.

To obtain the correct drill sizes for this operation consult the specification card covering the particular outline in question. To drill the channel from the throttle body bore into the throttle shaft hole it will be necessary to remove the brass channel plug in the throttle body. This can be drilled out using a 3/32" drill and a new "oversize" plug (No. CR137-10) should be installed after the drilling operation is completed.

The throttle body should not be rebushed if the extent of wear of the throttle body and shaft does not warrant it. However, if the wear is severe enough to warrant a rebushing job the following procedure should be followed:

(1) Place a suitable center in the drill press bed With one throttle shaft hole on this center bring the spindle down until the counterbore reamer contacts the opposite shaft hole. The reamer in this instance 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. This will give you the approximate setting of the spindle travel.

(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) And this 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 counterbore the hole.

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

(8) Then line ream the inside diameter as the final machining operation.
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 the two new throttle shaft packings (4) and retainers (5) in throttle body (2) as follows: Use bushing driver tool Zenith C161-72-1.

(1) Assemble packing (4) and retainer (5) and place completed assembly on bushing driver tool with packing facing small end of tool.

(2) Insert small end of tool into throttle shaft hole, start retainer (5) into counter-bore in body (2) and lightly drive retainer (5) into body (2) until it is flush with machined surface. NOTE: The packing retainer (5) must be flush with machined surface or slightly below to avoid striking throttle lever (13).

(c) Install the throttle shaft and stop lever assembly (14), throttle plate (1), screws (7) and lockwashers (8) as follows:

(1) Insert the throttle shaft and stop lever assembly (14) in throttle body (2).

(2) Rotate throttle shaft (6) to wide open position, insert throttle plate (1) and rotate to closed position holding the plate in position with fingers.

(3) Start throttle plate screws (7) and lockwashers (8) and tighten with small screwdriver, being sure that the throttle plate (1) is properly centered in the throttle body bore.

NOTE: The screw holes in the throttle plate are off center. Start the side of the throttle plate with the shortest distance between the screw holes and beveled edge into the shaft first. The throttle plates are made with two opposite edges beveled to fit the throttle body bore when the plate is closed. The throttle plate will not close tightly if installed upside down. To properly center the plate in the throttle body bore, the screws should be started in the shaft and then with the plate closed, it should be tapped on the mounting flange side. Pressure on the plate must be maintained with the finger until the screws are tightened. When properly installed, the side of the throttle plate **farthest away from the mounting flange** will be aligned with the idle port when the plate is closed.

(d) Install throttle clamp lever in same position as removed. Refer to match marks placed on lever and throttle body during disassembly step.

(e) Install idle adjusting needle (17) and friction spring (16) in threaded passage on side of throttle body (2). Seat lightly with screwdriver and back out 1¼ full turns.

(f) Install idle jet (18) in counter-bored passage in machined surface.

(g) Install fuel valve seat (20) and fibre washer (19) using Zenith Tool No. C161-82.

(h) Place new throttle body to fuel bowl gasket (23) on machined surface of fuel bowl cover (2).

(i) Install fuel valve needle (20) in seat (20) followed by float (21) and float axle (22).

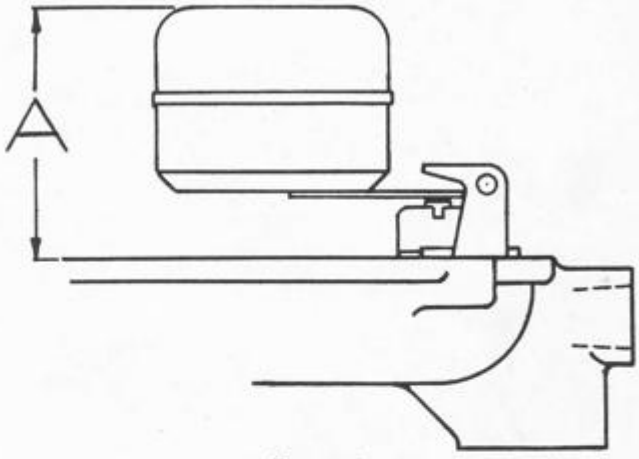


Figure 8

The "A" dimension should be 1 5/32" plus or minus 3/64".

(j) **Float Level.** Check position of float assembly for correct measurement to obtain proper float level using a depth gage. Obtain float setting measurement from outline specification chart. **NOTE: Do not bend, twist or apply pressure** on the float bodies.

(1) With bowl cover assembly (2) in an inverted position, viewed from free end of float (21) the float bodies must be centered and at right angles to the machined surface. The float setting is measured from the machined surface (no gasket) of cover to top side of float bodies at highest point.

(2) **Bending Float Lever.** To increase or decrease distance between float body and machined surface use long nosed pliers and bend lever close to float body. **NOTE:** Replace with new float if position is off more than 1/16".

(k) Insert venturi (24) in throttle body bore, large opening first.

C. ASSEMBLE CARBURETOR BODIES

(a) Assemble the two completed bodies (2 and 49) and four screws (52) and lockwashers (51) and tighten screws evenly and firmly.

(b) Install the hex plug or filter screen (15) in threaded passage in throttle body (2). (C161-10 wrench.)

(c) Hold the throttle lever (13) in a closed position and turn the throttle stop screw (9) in until it just contacts the stop on body (2), then turn screw (9) in 1½ additional turns.

ZENITH CARBURETOR DIVISION

696 HART AVENUE — DETROIT 14, MICHIGAN

AVIATION CORPORATION

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