

# ZENITH CARBURETOR SERVICE

## 20 and 23 Series Carburetors

*For Automatic Choke Service See Bulletin No. 173*

*For Gov-U-Retor Service See Bulletin No. 222*

To properly repair the Zenith 20 and 23 Series carburetor, we suggest the following routine:

1. For carburetors having a throttle cracker, remove the control rod.
2. (For 23BVC models) Remove vacuum line to automatic choke unit. (See special service bulletin for automatic choke unit.)
3. Remove cover assembly screws.
4. Raise cover slightly and loosen gasket from bowl assembly so you may—
5. Lift cover and gasket clear of bowl assembly without damaging float. (See Note on Back Page).
6. Remove pump lever nut and lockwasher (See 19 in Fig. 3) and loosen the lever. Remove bowl to barrel assembly screws and remove bowl from barrel and at the same time remove pump lever from the throttle shaft.
7. Remove pump link from pump rod. (20 and 21 in Fig. 3).
8. Remove venturi and bowl to barrel gasket.
9. Remove pump and pump rod assembly from the bowl. NOTE: If the pump rod sticks use a small flat file to remove burr at hole for pump lever connecting link.
10. Remove main jet adjustment (or lower plug as the case may be).
11. Remove main jet, using service tool C161-1. NOTE: The 20 Series main jet (2 in Fig. 1) holds the cap jet base, cap jet calibration and the cap jet tip in place in the carburetor as shown in Fig. 1.
12. (For 23 Series.) Remove cap jet base retainer (25 in Fig. 2) using service tool C161-1. NOTE: In the 23 Series the cap jet base retainer holds the cap jet base, cap jet calibration and cap jet tip in place. (Remove cap jet tip gasket with a piece of wire with small hook on the end.)
13. Remove compensator jet (3 in Fig. 1) and gasket.
14. Remove power jet valve (18) using service tool C161-25 to remove power jet (5) and copper gasket.
15. Remove idle jet (4) and idle adjusting screw and spring (16).

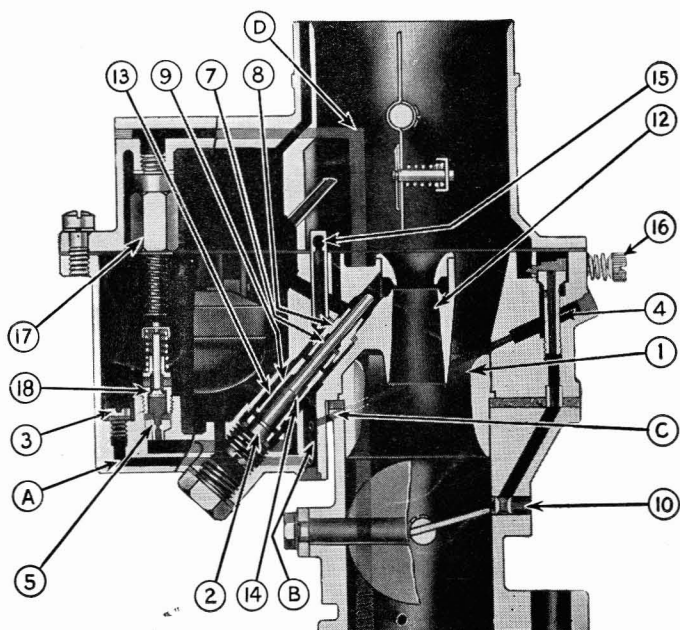


Figure 1

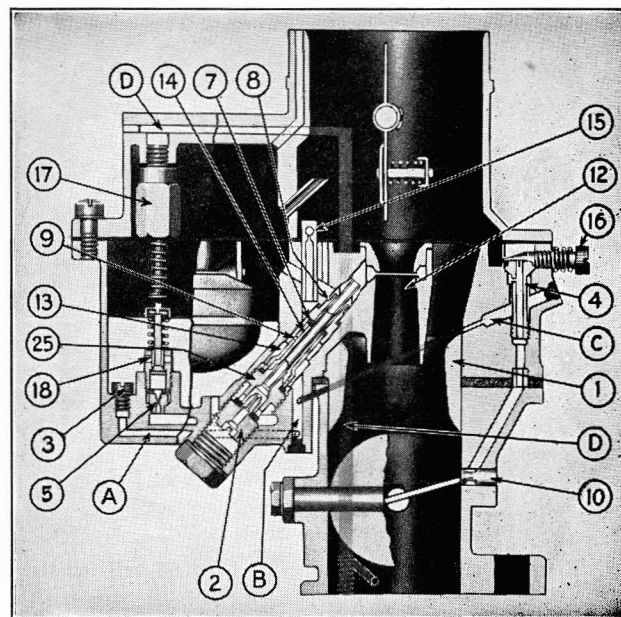


Figure 2

16. Remove channel screw and accelerator jet (6 in Fig. 3).
17. Remove pump check valve (22 in Fig. 3) using service tool C161-5 after first bending the retainer lugs with a small screw-driver and removing the valve disc.
18. Remove air vent check valve (24) using service tool C161-5. NOTE: The pump refill check valve (23) ball, weight and retainer will now fall out if bowl is turned upside down.

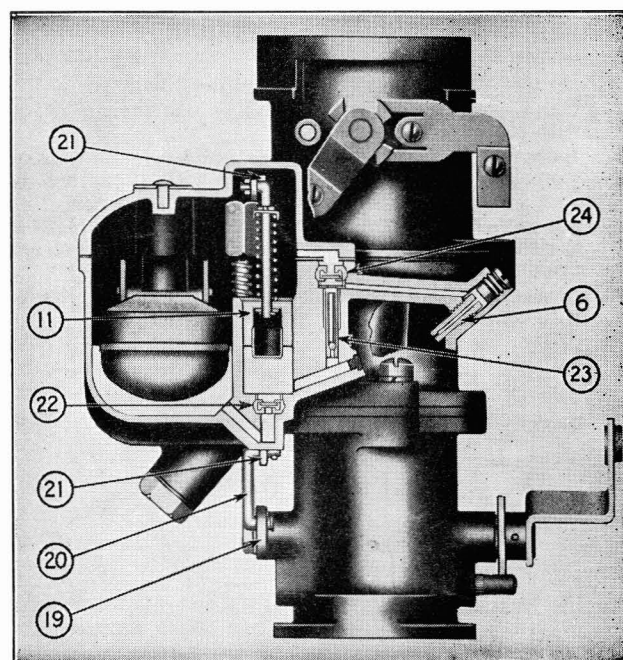


Figure 3

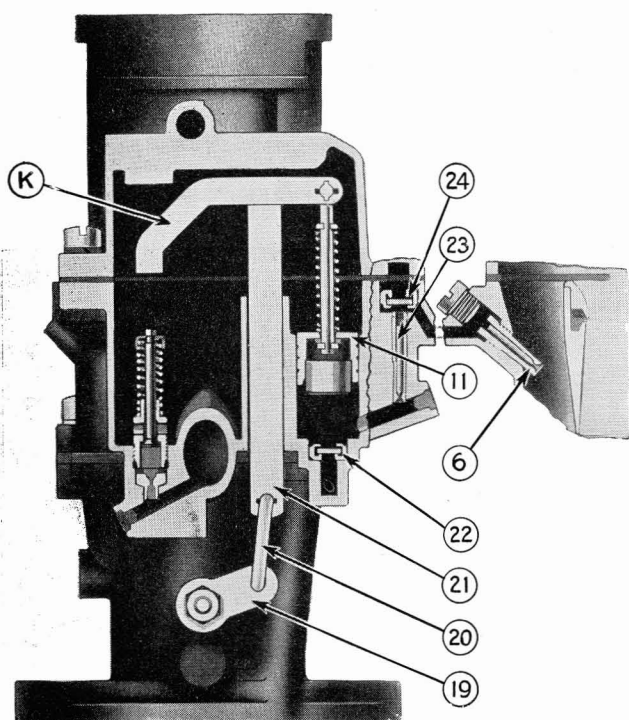


Figure 4

19. Remove lead channel plugs using a No. 46 drill and service tool C161-15.
20. Do not remove the following parts:
  - (a) Pump refill check valve seat (23 in Fig. 3).
  - (b) Well vent tube (15 in Fig. 2).
  - (c) Secondary venturi which is pressed into discharge nozzle (12).
  - (d) Idle channel bushing (located in channel below the idle jet (4)).
21. Clean all bowl channels with gasoline or other solvent but do not boil in a caustic solution. Blow out all channels with compressed air.
22. Remove float axle, float and fuel valve needle.
23. Remove fuel valve seat using service tool C161-85.
24. Remove power jet vacuum piston assembly (17 in Fig. 2), using a  $\frac{1}{16}$ " double hex thin type box wrench (C161-10).
25. Do not remove bowl vent tube or float hinge bracket.
26. Clean cover with gasoline and blow out vacuum channel with compressed air.
27. Insert C77-8 bowl vent tube, if required, into the bowl vent (top side) and tap firmly into place with a light hammer. (See Figure 5 and Note C on last page.)
28. See note A on last page, then remove throttle plate and shaft from throttle body as described. Do not disturb the priming hole plug (10 in Fig. 2).
29. Clean barrel with gasoline and blow through channels with compressed air.

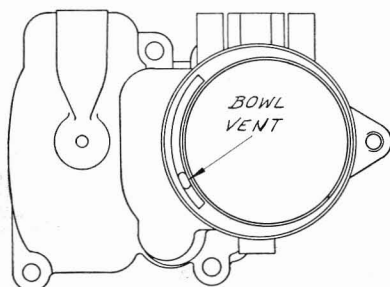


Figure 5

30. Examine bowl and cover for bent screw lugs. File lugs, if necessary, to permit full contact between bowl and cover as there must be no air leak when gasket is in place.
31. Refer to section titled "Parts to be Replaced" for list of parts which we recommend replacing when overhauling this type of carburetor.

#### REASSEMBLE CARBURETOR as follows:

1. Install lead channel plugs using service tool C161-19 and a light hammer.
2. Replace pump check valve assembly (22 in Fig. 3) using service tool C161-6. (For details of operation see Tool List.)
3. Place pump refill check ball on the seat (23, Fig. 3), place the weight on the ball and the retainer washer in position next, then
4. Replace the air vent check valve assembly (24, Fig. 3) using service tool C161-5. NOTE: This assembly is the same as the pump check valve assembly (22) but is installed with the opposite side up.
5. Replace accelerator jet (6) and channel screw.
6. Replace compensator jet (3 in Fig. 2) and gasket.
7. Replace power jet (5) with head up, followed by the copper gasket and the power jet valve. NOTE: Power jet valve should be firmly in place but not tight enough to crush the soft copper gasket. Use service tool C161-25.
8. Replace idle jet (4).
9. To install main jet, etc., proceed as follows:
 

**For 20 Series**—Place main jet gasket, cap jet base, with larger end down, cap jet calibration, cap jet tip and cap jet tip gasket in position on the main jet (in the order named). Hold the bowl upright and install the above group as one unit using service tool C161-1.

**For 23 Series**—Place gasket, cap jet base, cap jet calibration, cap jet tip and gasket in place (in order named) on the cap jet base retainer. Hold the bowl upright and install the group as one assembly using service tool C161-1. Then install main jet and gasket with same tool.
10. Install main jet adjustment (or lower plug) and gasket. Set main jet adjustment needle at one full turn open as a preliminary adjustment.
11. Install idling adjustment screw and spring (16) and adjust to one full turn open as a preliminary adjustment.
12. Install new pump assembly and pump rod (11 and 21).
13. Connect pump link and lever assembly inserting the link (20 in Fig. 3) from the bowl side of the pump rod.
14. Place venturi in position with the cut out section at the discharge arm (1 in Figure 2).
15. Place bowl to barrel gasket in position.
16. Replace throttle shaft assembly and install throttle plate using new throttle plate screws. (Refer again to note A.) Be sure throttle plate fits closely to barrel all the way around when the stop screw is backed out away from stop pin or the throttle advance lever removed. When the throttle plate is properly centered, hold in closed position while screws are tightened securely. Rivet the end of the screws slightly with a center punch, being careful not to bend the shaft.
17. Reset stop screw to hold throttle just slightly open. NOTE: Where throttle cracker is used, the position of the cam lever must be considered. In most cases this lever can be removed or installed without removing the throttle shaft assembly.
18. Attach bowl assembly to throttle body assembly, and install pump lever on throttle shaft at the same time.

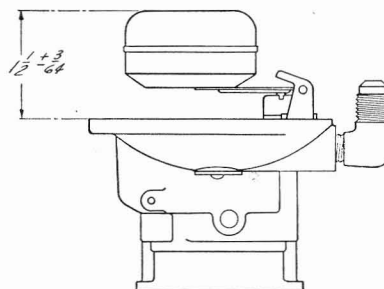


Figure 6

19. Install new power jet vacuum cylinder assembly and gasket in cover assembly, using C161-10 service tool (17 in Figure 2).
20. Install new fuel valve seat and gasket using service tool C161-85.
21. Install new fuel valve, float and axle. Be sure the float moves freely on the axle.
22. Hold cover assembly upside down and observe position of float with relation to the cover. To obtain correct fuel level, measurements should be as shown in Figure 6.
23. Place new cover gasket in position on the cover and hold in position while cover is placed on the bowl.
24. Start all cover screws (with lockwashers) and then tighten down evenly until all are snug, but not tight enough to bend the lugs.
25. For carburetors having throttle cracker, connect throttle cracker control rod. NOTE: The position of throttle cracker lever on the air shutter shaft should be adjusted so that opening the throttle wide open while holding the air shutter closed will open the air shutter just far enough to insert a No. 26 drill between the upper lip of the air shutter and the air intake body.
26. If carburetor is to be used with a speed governor be sure vacuum channel screw is in place in the barrel flange. (C161-28 service tool is recommended.)

#### SERVICE TOOLS RECOMMENDED FOR THE 20 AND 23 SERIES ARE AS FOLLOWS:

(See Form 2021-C for Prices, etc.)

- |         |  |
|---------|--|
| C161-1  | Main jet wrench.                                   |
| C161-5  | Air vent check valve tool—to remove or to install. |
| C161-6  | Pump check valve tool—to install.                  |
| C161-10 | Vacuum cylinder wrench.                            |
| C161-15 | Lead channel plug extractor.                       |
| C161-19 | Channel plug punch.                                |
| C161-25 | Power jet valve wrench.                            |
| C161-85 | Fuel valve seat wrench.                            |

**NOTE: C161-5 AIR VENT CHECK VALVE** tool is used as follows:

Insert the tapered thread end into the air vent check valve body and screw down (anti-clockwise) until the tool is firmly fastened into the body. Then raise the sliding weight up sharply against the stop bar a few times to remove the check valve assembly.

One end of the stop bar of C161-5 tool is machined to fit the air vent check valve body and is used to install the air vent check valve assembly by lightly hammering the end of the tool to drive the assembly down as far as the tool will permit.

**C161-6 PUMP CHECK VALVE TOOL** is used as follows:

- (a) Place the tool upright in a vise, gripping the tool at the flattened part of the tool.
- (b) Place check valve assembly in position in the end of the tool.
- (c) Place the bowl upside down with the pump cylinder fitting over the tool and check valve.
- (d) Strike the bottom of the bowl with a wood or rawhide mallet, at a point directly over the inverted pump cylinder, to drive the check valve to place.

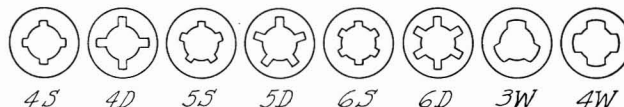
#### PARTS TO BE REPLACED

In most cases the following parts should be replaced when overhauling this type of carburetor:

All gaskets (gasket set C181-1 includes them); C81-1 fuel valve and seat (size #35 is suitable for settings up to a #29 venturi in an 11 size, #40 seat for #30 venturi and up to 11 size, and #45 seat for all 12 size carburetors); C85-1 float assembly; C120-4 float axle; For 20 Series use C51-1 main jet and C50-2 cap jet base (see note below); For 23 Series use C51-10 main jet, C61-9 cap jet base retainer and C50-5 cap jet base; C58-1 cap jet calibration; C52-1 compensator jet; C56-1 idling jet; C53-1 power jet; C35-3x3 accelerating pump assembly; C33-1 pump rod for carburetor with vacuum power jet or C33-2 pump rod for mechanical power jet as shown in Fig. 4; T82-3 pump refill check ball; C120-12 pump refill check ball weight; C135-2 retainer washer; CR41-1 check valve assembly (2 required); CR137-37 lead shot channel plug (6 required); C91-1 or C91-2 vacuum cylinder assembly; (see note below); C136-3 throttle

plate screw (2 required); NOTE: There are four cap jet bases used in the 20 Series, as follows: C50-1 marked #1, C50-2 marked #2, C50-3 marked #3, and C50-6 which is marked #1, as it has the same capacity as C50-1 but has more drilled holes. There are two cap jet bases used in the 23 Series as follows: C50-4 marked #1, and C50-5 marked #4. The number marked on each indicated the well capacity, #1 being the largest capacity and #4 the smallest. As illustrated in Figures 1 and 2, the cap jet base for the 20 Series is longer than the cap jet base for the 23 Series.

The following sketches show the various **CAP JET CALIBRATIONS** used in both the 20 and 23 Series. They are shown in order according to capacity starting with the smallest size (4S) at the left.



The **ACCELERATING PUMP** is supplied as a complete assembly only. There are three different springs and three spacers in use, as follows:

- C35-1x1—has the weakest spring tension and the shortest spacer (full stroke).  
 C35-2x1—has the medium spring and the full stroke spacer.  
 C35-2x3—has the medium spring and the  $\frac{3}{4}$  stroke spacer.  
 C35-3x3—has the strongest spring and the  $\frac{3}{4}$  stroke spacer.  
 C35-7x3—is a special assembly the same as C35-2x3 except the spacer has a small bypass hole drilled in it to cut down the volume of the pump discharge.

**FOR SERVICE REQUIREMENTS** we recommend carrying C35-2x1 and C35-3x3 pump assemblies in stock as these two will cover most installations.

There are four **PUMP LEVER AND LINK ASSEMBLIES** used on the 20 and 23 Series, as follows: (See Note F.)

- C31-1 —is the short lever. (See 19 in Figure 4).  
 C31-6 —is the longer lever.  
 C31-10—is a short pump lever with an extra arm to operate a vacuum spark control transfer valve on a speed governor installation.  
 C31-7 —also has the extra arm like C31-10 but the pump lever is longer (same length as C31-6).

It is usually advisable to replace the pump lever and link assembly when overhauling the carburetor and we recommend replacing with same type as was removed in each case.

There are two **VACUUM CYLINDER ASSEMBLIES** for 20 and 23 Series having vacuum power jet control. They are C91-1 and C91-2. C91-2 has the stronger spring and as a means of easy identification will have on future production a square head on the pin instead of the present round one. The stronger spring is made of yellow brass while the weaker is bronze. These cylinder assemblies are about  $\frac{1}{8}$ " SHORTER than C91-3 and D9183 which are used in the IN180 Series and must not be interchanged. It is advisable to replace the vacuum cylinder assembly when overhauling the carburetor. Be sure same type is used.

There are four **POWER JET VALVE ASSEMBLIES** for the 20 and 23 Series as follows:

- C97-1—Vacuum power jet valve (not calibrated).  
 C97-6—Vacuum power jet valve (calibrated).  
 C97-8—Mechanical power jet valve (not calibrated).  
 C97-9—Mechanical power jet valve (calibrated).

The first two (C97-1 and C97-6) are used only with vacuum cylinder assemblies C91-1 or C91-2 and pump rod C33-1, while the last two (C97-8 and C97-9) are used with C33-2 pump rod for mechanical operation of power jet (See Fig. 4) in which case, the vacuum cylinder assembly is omitted and the channel plugged with C138-5 channel screw and gasket. (See Note D.)

**FOR SERVICE REQUIREMENTS** we recommend the following throttle shafts and shaft and lever assemblies:

- C23-29—Shaft for 9 size carburetor having the throttle lever and stop under the bowl.



- C23-21—Shaft for 9 size with throttle and stop opposite to the bowl.
- C23-42—Shaft for 10, 11 and 12 sizes with throttle lever and stop under the bowl.
- C23-1 —Shaft for 10, 11 and 12 sizes with throttle lever and stop opposite to the bowl.
- C29-20—Shaft, throttle lever, stop and pump link assembly for 9 size carburetor having the lever, etc., under the bowl.
- C29-21—Shaft, stop lever, pump lever and link assembly for 9 size with throttle lever and stop opposite bowl. (Requires C24-45x4 clamp type throttle lever and T8S10-9 clamp screw.)
- C29-19—Shaft, throttle lever, stop and pump link assembly for 10, 11 and 12 sizes having the throttle lever and stop under the bowl.
- C29-22—Shaft, stop lever, pump lever and link assembly for 10, 11 and 12 sizes with throttle lever and stop opposite the bowl. (Requires C24-45x4 clamp lever and T8S10-9 clamp screw.)

(See Note F)

The **THROTTLE PLATES** used are as follows:

- C21-6 —for the 12 size carburetor.
- C21-1 —for the 11 size carburetor.
- C21-14—for the 10 size carburetor.
- C21-7 —for the 9 size carburetor.
- C21-11—A special for the 9 size having a milled off section at the vacuum spark control drilling.

The **MAIN VENTURI** part numbers are as follows:

- C38-3—for the 9 size carburetor.
- C38-7—for the 10 size.
- C38-1—for the 11 and 12 sizes.

**NOTE A:** The location of the priming hole plug in relation to the throttle plate is extremely important for uniform idling and part throttle operation. To maintain a uniform relation between the priming hole plug and the throttle plate, our factory assembles the throttle shaft and plate in the throttle body before drilling the body for the priming hole plug, locating the hole in a definite relation to the throttle plate in each case. It is readily apparent from the above that throttle plates and throttle bodies cannot be interchanged indiscriminately. When it becomes necessary to replace the throttle shaft or throttle plate, we suggest the following routine:

1. Unscrew the throttle stop screw (or remove throttle advance lever) to permit complete closing of the throttle plate.
2. Hold throttle in tightly closed position and mark the inside of the throttle body close to the throttle plate with a steel scriber.
3. Using this scribed line as a guide, replace the throttle shaft or plate. If new plate used shows a noticeable variation from old one, select another new plate to get one that fits very close to the scribed line when installed.

4. If throttle body has to be replaced, we recommend obtaining a complete throttle body assembly including shaft, plate, priming hole plug, etc., built to the outline number which appears on the identification tag on bowl cover.

**NOTE B:** A round aluminum identification tag riveted to the carburetor bowl cover specifies the assembly outline number to which the carburetor was originally built. When ordering special parts such as the throttle bodies, throttle lever and stop lever assemblies, etc., be sure to specify outline number of the carburetor to prevent errors in selecting parts required.

**NOTE C:** C77-8, Bowl Vent Tube, was designed to prevent dirt from defective Air Cleaners entering the Bowl through the Bowl Vent. Its use is recommended where there is a possibility of trouble from this source.

**NOTE D:** The Mechanical Power Jet Valves, C97-8 and C97-9, have longer stems than the Vacuum Power Jet Valves, C97-1 and C97-6. These Valves should not be confused with C97-13, C97-14, D8038 or D8752, which are used only in IN180 Series, as described in Service Bulletin No. 161. The IN180 Series Power Jet Valves are the same diameter, but the body is about  $\frac{1}{8}$ " longer than the body of the 20 and 23 Series Valves, which makes the assemblies longer in each case also.

**NOTE E:** Before removing bowl to barrel assembly screws examine under the bowl to determine if the upper edge of the barrel strikes the bowl at the point where the idling cross channel (C in Fig. 2) joins the compensator channel (B in Fig. 2).

Proceed with instruction item No. 6, then if necessary file off about  $\frac{1}{32}$ " of metal from the edge of the barrel to obtain necessary clearance between the bowl and the barrel. An air leak at this point seriously effects the idling characteristics of the carburetor.

**NOTE F:** Models 23BV10D, O-9690; 23BV10CD, O-9691; 23BV11D, O-9669; 23BV11CD, O-9678; 23BV12D, O-9692 and 23BV12CD, O-9693 which are machined for Type B or Type C Leibing Degasser Units, require a  $\frac{3}{16}$ " Throttle Shaft and a thin Throttle Plate which cannot be used on other 23 series models.

The parts required are as follows:

C23-163 Throttle Shaft (part of C29-262 Throttle Shaft and Stop Lever Assembly) and C31-29 Pump Lever and Link Assembly for 10 and 11 sizes.

C23-299 Throttle Shaft (part of C29-271 Throttle Shaft and Stop Lever Assembly) and C31-13A Pump Lever and Link Assembly for the 12 size.

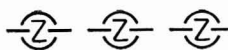
C21-123 Throttle Plate for 10 size with Degasser machining.

C21-103 Throttle Plate for 11 size with Degasser machining.

C21-97 Throttle Plate for 12 size with Degasser machining.

C136-15 Throttle Plate Screw (2 required) for all above models.

C33-18 Pump Rod Assembly for 12 size (O-9692, 9693).



## ZENITH CARBURETOR DIVISION

696 HART AVENUE



DETROIT 14, MICHIGAN

*Manufacturers of Zenith Carburetors and Filters*

July, 1947

THIS SUPERSEDES BULLETIN No. 163-C OF DECEMBER, 1940

Printed in U. S. A.