

**SECTION 3-E  
ROCHESTER 2-BARREL CARBURETOR**

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**3-14 DESCRIPTION AND OPERATION OF ROCHESTER 2-BARREL CARBURETOR**

**a. General Description**

The Rochester Model 2GC carburetor used on all Series 4000-4100 engines is of the side bowl design. While not interchangeable, the carburetors used on automatic and standard transmission cars are basically the same, and the description and service operations are identical. The only difference is in some of the internal calibrations. The carburetor float bowl is located forward of the main bores of the carburetor. The carburetor is compact in design in that all of the fuel metering is centrally located. See Figure 3-15.

This carburetor uses a calibrated cluster

design, which places in a removable assembly, the main well tubes, idle tubes, mixture passages, air bleeds and pump jets. This cluster can easily be removed for cleaning and inspection purposes. The cluster fits on a flat portion of the carburetor bowl in front of the main venturi with a gasket underneath. See Figure 3-16. The idle and main well tubes are permanently installed in the cluster body by means of a precision pressed fit and, therefore, cannot be serviced separately. The main nozzles and idle tubes are suspended in the fuel in the main wells of the float bowl.

The main metering jets are of the fixed type. Metering calibration is accomplished through a system of calibrated air bleeds which give the correct air/fuel mixtures throughout all operational ranges.

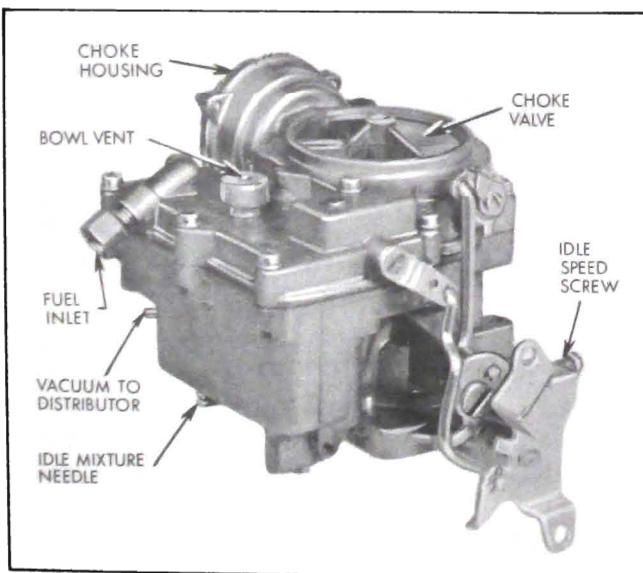


Figure 3-15—Rochester 2GC Carburetor Assembly

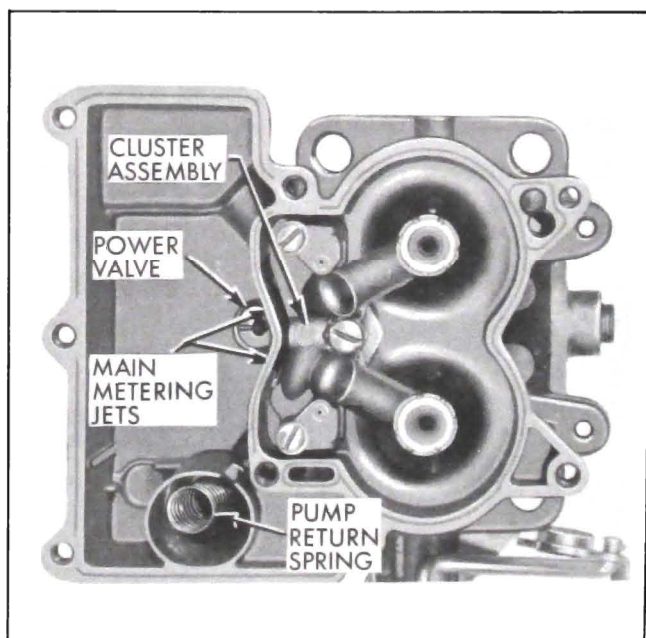


Figure 3-16—Main Body Parts

The Rochester Model 2GC carburetor employs the use of a vacuum operated power system for extra power when needed. Power mixtures are regulated by drop in engine manifold vacuum regardless of the degree of throttle opening. Thereby, additional fuel can be supplied for power mixtures according to the engine demands.

The pump system has a vented type pump plunger. This is accomplished by means of a vapor vent ball in the pump plunger head. By venting the pump plunger, any fuel vapors which form in the pump well are vented to the fuel bowl during "hot" engine operation. This insures that the pump well and passages will be primed with solid fuel at all times, thereby improving accelerator pump action.

The carburetor is internally vented through a hole in the air horn and is externally vented through a capped vent hole located in the center of the carburetor air horn just above the float bowl.

Adjustments have been made as simple as possible. They consist of idle, float, pump, fast idle and choke adjustments only.

Incorporated in the Rochester Model 2GC carburetor are six basic systems. They are Float, Low Speed, Main Metering, Power, Accelerating and Choke systems. The following explanation and illustrations show that each system operates to provide efficient carburetion through all operating conditions.

### b. Operation of Float System

The float system controls the level of the fuel in the carburetor fuel bowl. Fuel level is very important because it must be maintained to give proper metering through all operating ranges. Too low a fuel level can cause excessive leanness, resulting in flat spots and hesitation. Too high a fuel level may cause flooding or excessive richness, resulting in poor mileage.

Fuel entering the carburetor must first pass through the inlet screen, by the inlet needle seat, then past the float needle, into the float bowl; flow continues until the fuel level raises the float to a position where it closes the float valve. As fuel is used from the carburetor bowl the float drops, moving the float needle off its seat and replenishing the fuel in the bowl, thereby keeping the fuel level constant. See Figure 3-17.

A float tang located at the rear of the float arm between the float hangers prevents the

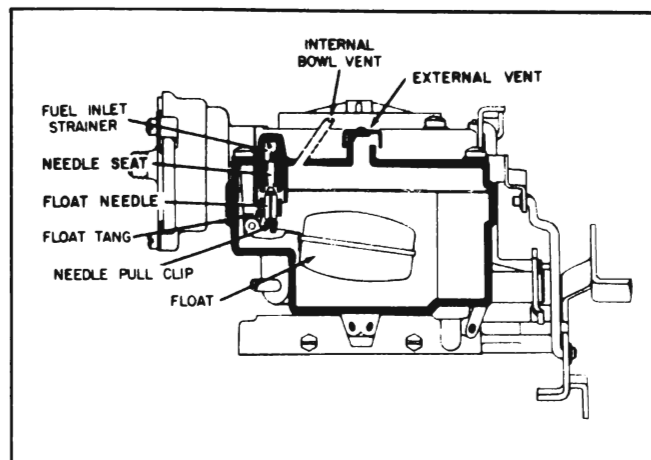


Figure 3-17—Float System

float assembly from moving too far downward, but allows the float assembly to move down far enough for maximum fuel flow into the carburetor bowl. A float needle pull clip connecting the float arm to the needle valve keeps the needle from sticking closed in the seat, which may be caused by dirt or gum formation.

### c. Operation of Idle (Low Speed) System

During engine idle operation, air flow through the carburetor venturi is very low and is not great enough to cause fuel to flow from the main discharge nozzles. Therefore, the idle system is used to provide the proper mixture ratios required during idle and low speed operation of the engine.

The idle system consists of the idle tubes, idle passages, idle air bleeds, idle adjustment needles, off-idle discharge slots and the idle adjusting needle holes.

In idle speed position, each throttle valve is slightly open, allowing a small amount of air to pass between the wall of the carburetor bore and the edge of the throttle valve. Since there is not enough air flow for venturi action, the fuel is made to flow by the application of vacuum (low pressure) directly through the idle system to the fuel in the carburetor bowl. See Figure 3-18.

Fuel from the float bowl passes through each main metering jet into the main well where it is metered by the orifice at the lower end of the idle tube. It then passes up the idle tube and is mixed with air at the top of the idle tube by two calibrated idle air bleeds. The air/fuel mixture then passes down through a calibrated restriction into a vertical passage past a third idle bleed to the idle port slot located just

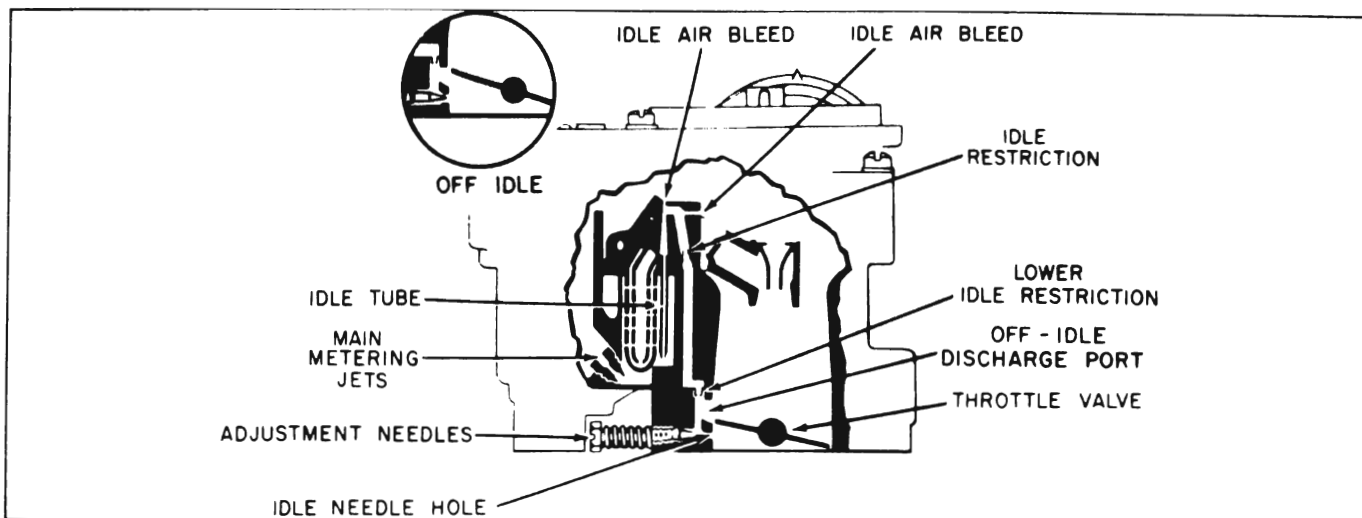


Figure 3-18—Low Speed System

above each throttle valve. Here the mixture is again bled with air and then moves down to the idle needle hole where it combines with air by-passing the slightly open throttle valve. The idle mixture needle controls the amount of fuel mixture which enters the carburetor bore at curb idle position of the throttle valve.

As the throttle valve is opened further, more and more of the idle port slot is exposed to manifold vacuum. This slot supplies additional fuel mixture for off-idle engine requirements.

On all air conditioner equipped cars, a special thermostatic air valve is added in the hole in the rear side of the throttle body. This valve is designed to compensate for loss of engine RPM while idling under very hot operating conditions. When the under-hood temperature rises beyond a certain point, the calibrated thermostatic spring opens the valve. This al-

lows additional air to flow in below the throttle valves. At normal operating temperatures, the valve should be closed. The valve cannot be adjusted or repaired; therefore, a faulty valve must be replaced.

#### d. Operation of Main Metering (High Speed) System

As the throttle valve continues to open, the edge of the throttle valve is gradually moved away from the wall of the carburetor bore, reducing the vacuum so that the discharge of fuel mixture at the idle needle hole and off-idle port slot gradually diminishes.

With the increased throttle opening, there is increased velocity in the venturi system. This causes a drop in pressure in the large venturi which is increased many times in the small venturi. Since the low pressure (high vacuum)

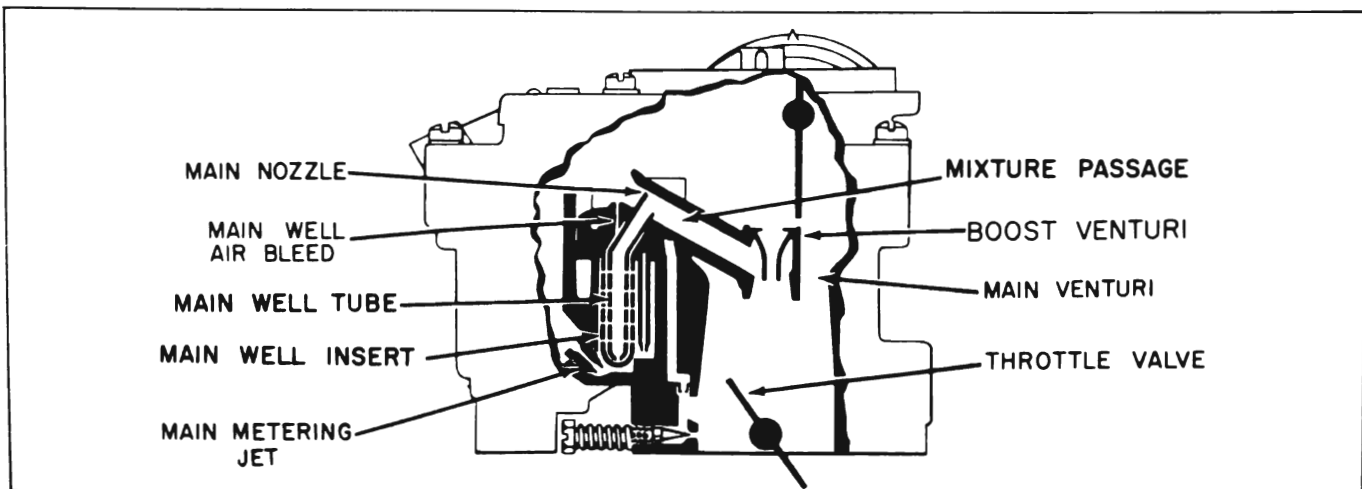


Figure 3-19—High Speed System

is now in the small venturi, fuel will flow in the following manner:

Fuel from the float bowl passes through the main metering jets into the main well and rises in the main well tubes. Air entering the main well through the main well bleeds is mixed with fuel through calibrated holes in the main well tube. The mixture then moves up and out of the discharge nozzle into a channel where more air is added. The mixture travels down through the channel to the small venturi where it is delivered to the air stream and then to the intake manifold. See Figure 3-19.

#### e. Operation of Power System

To achieve the proper mixtures required when more power is desired or for extreme high speed driving, a vacuum operated power piston in the air horn and a power valve located in the bottom of the float bowl are used. Through a connecting vacuum passage from the base of the carburetor to the power piston cylinder in the air horn, the power piston is exposed to manifold vacuum at all times. See Figure 3-20.

During idle and part throttle operation, the relatively high vacuum holds the power piston up against spring tension and the power valve remains closed.

Increase in engine load lowers the manifold vacuum. When it has dropped sufficiently the power piston spring overcomes the upward vacuum pull and the power piston moves downward, opening the power valve to allow additional fuel to flow through calibrated restrictions into the main well.

As the engine load decreases, the resulting

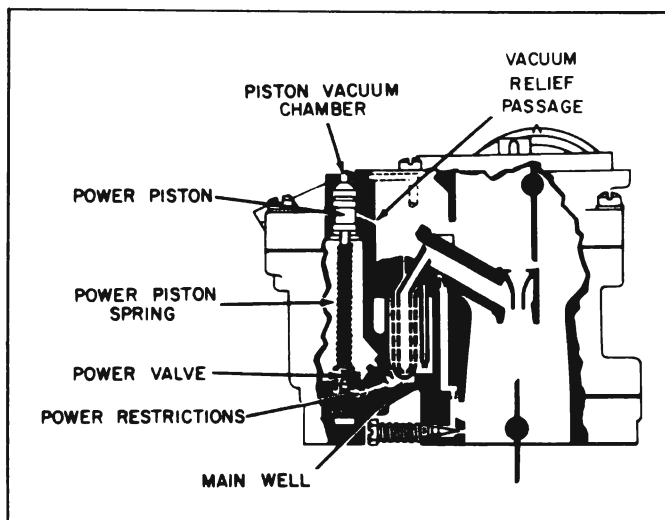


Figure 3-20—Power System

higher vacuum overcomes the spring tension on the power piston and raises the power piston closing the power valve.

A 2-stage power valve is used. In the first stage, fuel is metered by the valve itself. This stage is used for light power loads. On heavy power loads the valve is fully opened to the second stage, and in this location the power valve allows the fuel to be metered by the power restrictions in the fuel channel located in the bottom of the fuel bowl.

It will be noted that the power piston cavity in the carburetor air horn is connected to the main air flow passage by a vacuum relief passage. It is the purpose of this passage to prevent the transfer of vacuum acting on the piston from acting also on the top of the fuel in the float bowl. Any leakage of air past the upper grooves of the piston will be compensated for by this relief passage and will not affect carburetor metering.

#### f. Operation of Accelerating System

When the throttle valve is opened rapidly, the air flow and manifold vacuum change almost instantaneously, while the heavier fuel tends to lag behind causing a momentary leanness. The accelerator pump provides the fuel necessary for smooth operation on rapid acceleration.

Fuel for acceleration is supplied by a double-spring loaded pump plunger. The top and bottom springs combine to move the plunger so that a smooth, sustained charge of fuel is delivered for acceleration.

Fuel is drawn into the pump well through the slot in the pump well and by the check ball in the pump plunger head on the intake stroke of the pump plunger (upward stroke). See Figure 3-21.

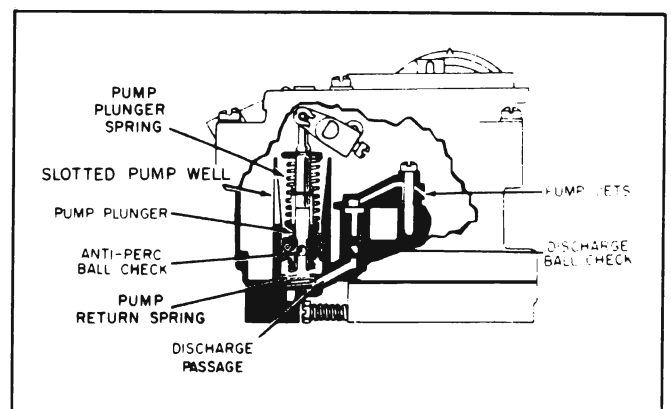


Figure 3-21—Accelerating Pump System

Downward motion of the pump plunger seats the check ball in the pump plunger and forces the fuel through the discharge passage where it unseats the pump discharge ball and then passes on through to the pump jets where it sprays into the venturi.

The ball check located in the pump plunger head serves as a vapor vent for the pump well. Without this vent, vapor pressure in the pump well might force fuel from the pump system into the engine manifold causing hard starting when the engine is hot.

There is an inner hole in the pump lever to provide a leaner pump adjustment for extreme temperature conditions. This inner hole should be used only when high temperature stumble indicates a too rich pump setting.

The pump discharge ball check in the accelerator pump passage prevents any pullover or discharge of fuel from the pump nozzles when the accelerator pump is inoperative.

### **g. Operation of Choke System**

The choke system is composed of a thermostatic coil, vacuum choke piston, offset choke valve, fast idle cam and choke linkage. Its operation is controlled by a combination of intake manifold vacuum, the offset choke valve, atmospheric temperature and exhaust manifold heat. See Figure 3-22.

The choke thermostatic coil is calibrated to hold the choke valve closed when the engine is cold. When the engine is started, air velocity against the offset choke valve causes the valve to open slightly against the torque of the thermostatic coil. In addition, intake manifold vacuum applied to the choke piston through the vacuum passage tends to open the choke valve. Vacuum pull on the choke piston is offset by

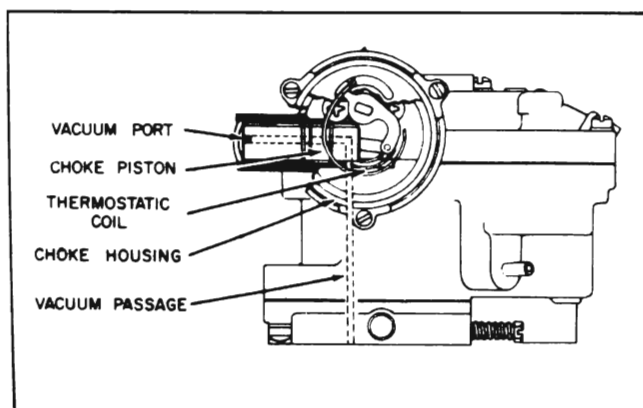


Figure 3-22—Choke System

the tension of the thermostatic coil. As the engine warms up, heated air is drawn into the choke housing through the choke heat tube through a passage in the choke housing. As the engine temperature increases, it causes the thermostatic coil to relax its tension, which together with vacuum pull on the choke piston and air flow against the offset choke valve causes the choke valve to open gradually until the engine is thoroughly warmed up, at which point the choke valve is fully opened.

A mechanical choke unloader is incorporated to open the choke valve slightly when the engine is cold. The choke unloader provides a means for opening the choke valve to correct any loading condition encountered during cold starting.

To prevent stalling during the warm-up period, it is necessary to run the engine at a slightly higher idle speed than for a warm engine. This is accomplished by steps on the fast idle cam. The fast idle cam is in turn linked to the choke valve shaft by the choke rod, choke trip lever and choke lever and collar assembly. This holds the throttle valves open sufficiently during the warm-up period to give increased idle RPM until the choke valve moves to the fully open position and the engine is thoroughly warmed up.

## **3-15 DISASSEMBLY, CLEANING AND INSPECTION OF ROCHESTER 2-BARREL CARBURETOR**

### **a. Removal of Air Horn**

1. Mount carburetor on proper holding fixture.
2. Remove three retainer screws and retainers from choke cover. Remove cover, gasket and inside baffle plate.
3. Remove pump rod by removing upper and lower retaining clips.
4. Remove trip lever screw and trip lever from end of choke shaft. Remove fast idle cam screw. Then remove choke lever, choke rod and fast idle cam as an assembly.
5. Remove air horn attaching screws and carefully remove air horn assembly from float bowl by lifting gently upward.

### **b. Disassembly of Air Horn**

1. Place air horn assembly inverted on bench. Remove float hinge pin and lift float

assembly from cover. Remove float needle from float. Remove float needle seat, fibre gasket and needle seat screen.

2. Remove power piston by depressing shaft and allowing spring to snap repeatedly, thus forcing power piston retaining washer from casting.

**NOTE:** If heavy staking is encountered, remove staking from around power piston retaining washer.

3. Remove retainer on end of pump plunger shaft, then remove plunger assembly from pump arm. Remove pump lever and shaft assembly by loosening set screw on inner arm and removing outer lever and shaft.

4. Remove air horn gasket.

5. Remove 2 choke valve retaining screws and remove choke valve from choke shaft. Rotate choke shaft to free choke piston from choke housing, then remove choke piston and choke shaft from air horn.

6. Remove 2 choke housing attaching screws. Remove choke housing and gasket from air horn.

### **c. Disassembly of Float Bowl**

1. Remove pump plunger return spring from pump well.

**NOTE:** There is no inlet check ball or screen because all fuel for the accelerating system enters through the slot in the pump well.

2. Remove main metering jets.

3. Remove power valve and fibre gasket.

4. Remove three venturi cluster attaching screws and remove cluster and gasket. Center cluster screw has smooth shank and fibre gasket for accelerator pump fuel by-pass. Remove two main well inserts.

5. Using a pair of long nose pliers, remove pump discharge ball spring T-shaped retainer. Then remove pump discharge spring and steel discharge ball.

6. Invert carburetor and remove three throttle body to bowl attaching screws. Remove throttle body and throttle body to bowl gasket.

### **d. Disassembly of Throttle Body**

1. Remove idle mixture adjusting needles and springs.

No further disassembly of the throttle body is needed. The throttle valves should never be

removed as the idle and spark holes are drilled in direct relation to the location of the throttle valves and shaft. Removal of the throttle valves will upset this location. The throttle body assembly is only serviced as a complete unit with throttle valves intact.

### **e. Cleaning and Inspection**

Dirt, gum, water or carbon contamination in or on the exterior moving parts of a carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Thoroughly clean carburetor castings and metal parts in carburetor cleaning solvent.

**CAUTION:** Pump plunger or any fiber or rubber parts should never be immersed in carburetor cleaner. Wash pump plunger in clean solvent.

2. Blow out all passages in the castings with compressed air and blow off all parts until they are dry. Make sure all jets and passages are clean. Do not use wires or drills for cleaning fuel passages or air bleeds.

3. Check all parts for wear. If wear is noted, defective parts must be replaced. Note especially the following:

(a) Check float needle and seat for wear. If wear is noted, the assembly must be replaced.

(b) Check float hinge pin for wear and float for dents or distortion. Check float for fuel leaks by shaking.

(c) Check throttle and choke shaft bores for wear and out of round.

(d) Inspect idle mixture adjusting needles for burrs or grooves. Such a condition requires replacement.

(e) Inspect pump plunger leather; replace if damaged, worn, or hard.

(f) Inspect pump well in bowl for wear or scoring.

4. Check filter screens for dirt or lint. Clean, and if they are distorted or remain plugged, replace.

5. If for any reason, parts have become loose or damaged in the cluster casting, the cluster assembly must be replaced.

6. It is recommended that new gaskets be



used whenever the carburetor is disassembled or overhauled.

### **3-16 ASSEMBLY OF ROCHESTER 2-BARREL CARBURETOR**

#### **a. Assembly of Throttle Body**

1. Screw idle mixture adjusting needles and springs into the throttle body until finger tight. Back out screw 1-1/2 turns as a preliminary idle adjustment.

**CAUTION:** Do not force idle needle against its seat or damage may result.

2. Invert float bowl assembly and place the new throttle body gasket on bowl. Install throttle body on bowl using three screws and lockwashers. Tighten securely.

#### **b. Assembly of Float Bowl**

1. Drop steel pump discharge check ball into discharge hole. Install pump discharge spring and T-shaped retainer, staking in place. **NOTE:** Top of retainer must be flush with flat of bowl casting.

2. Install two main well inserts. Install venturi cluster with gasket. Install venturi cluster screws and tighten evenly and securely. Make sure center screw is fitted with fibre gasket and special smooth shank screw is used.

3. Install two main metering jets, power valve gasket and power valve.

4. Insert pump return spring and center in well by pressing downward with finger.

#### **c. Assembly of Air Horn**

1. Place new choke housing gasket in position on choke housing and install choke housing using two Phillips head attaching screws.

2. Assemble choke piston to choke shaft and link assembly, retaining with piston pin. Piston pin hole in side of choke piston should face towards air horn. Install choke shaft and piston assembly into air horn, rotating choke piston clockwise until it enters choke piston bore in choke housing.

3. Install choke valve on choke shaft so that letters "RP" will face upward in finished carburetor. Install two choke valve screws but do not tighten securely until choke valve is centered.

4. Install choke lever, trip lever and retaining screw. Center choke valve on choke shaft by holding choke valve closed tightly while sliding choke shaft back-and-forth. Then with choke shaft in center of endwise travel, tighten choke valve screws and stake lightly in place. Choke should be perfectly free in all positions.

5. Install outer pump lever and shaft assembly into air horn with lever toward choke shaft. Install inner pump arm with plunger hole inward and tighten set screw.

6. Attach pump plunger assembly to inner arm with pump shaft offset pointing inward and install retainer.

7. Install screen on float needle seat and assemble float needle seat, screen and gasket to air horn. Tighten needle seat securely using a wide bladed screwdriver.

8. Install power piston into vacuum cavity. Lightly stake piston retainer washer in place. Piston should travel freely in cavity.

9. Install air horn gasket on air horn, fitting gasket over guide pin.

10. Attach needle to float. Carefully position float and insert float hinge pin.

11. Adjust Float Level. With air horn assembly inverted, position Float Level Gauge (1-17/64") of Gauge Set J-9161 over float so it rests against pump side of power piston shaft, with outer leg in line with center of float. Bend float arm as required to adjust float level. See Figure 3-23.

12. Adjust Float Drop. With air horn assembly held upright, measure distance from gasket to bottom of float pontoon at outer end using Float Drop Gauge (1-29/32") as shown.

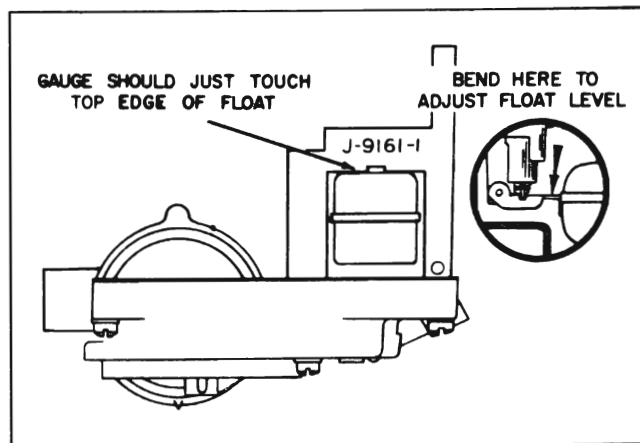


Figure 3-23—Float Level Adjustment

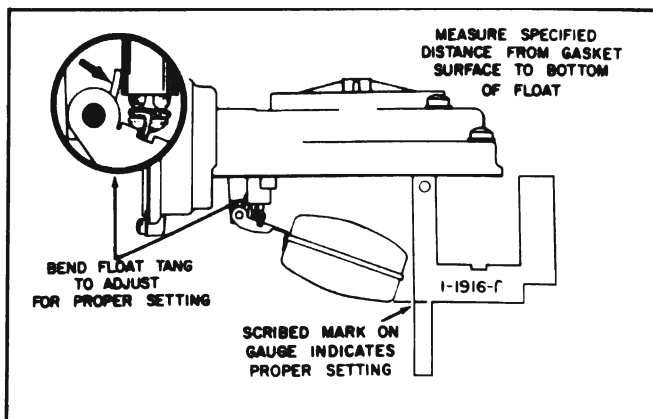


Figure 3-24—Float Drop Adjustment

Bend float tang as required to adjust float drop. See Figure 3-24.

13. Carefully place air horn assembly on float bowl, making certain that the pump plunger is positioned and will move freely. Lower cover gently straight down, then install air horn to float bowl attaching screws. Tighten evenly and securely. **NOTE:** Longer air horn screw goes in top of pump housing.

14. Place choke baffle plate inside choke housing. Place choke cover gasket in position and install choke cover. Rotate choke cover counterclockwise until index mark on cover is at center index point and choke valve is just closed. Attach three choke cover retainers and screws to choke housing and tighten securely.

15. Install choke rod into choke lever and fast idle cam. Install fast idle cam screw and tighten securely. See Figure 3-25 for proper installation.

16. Install accelerator pump rod in outer hole and install retainers. **NOTE:** Inner hole should be used only when high temperature stumble indicates a too rich pump setting.

### 3-17 EXTERNAL ADJUSTMENT OF ROCHESTER 2-BARREL CARBURETOR

All adjustments on the carburetor except for the float adjustments are made externally. For float level and float drop adjustments, see Steps 11 and 12 above.

#### a. Pump Rod Adjustment

Back out idle stop screw and completely close throttle valve in bore. With pump rod in

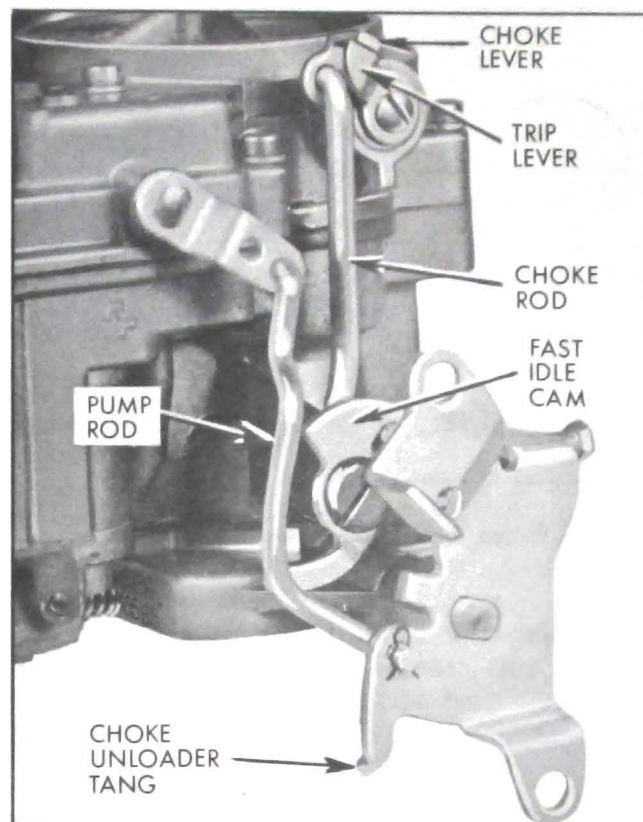


Figure 3-25—Choke Linkage

outer hole, place Pump Gauge (1-3/32") of Gauge Set J-9161 across top of carburetor air horn, as shown, with leg pointing downwards toward top of pump rod. Lower edge of gauge leg should just touch top of pump rod. Bend pump rod as required to obtain the proper setting using Tool J-4552. See Figure 3-26.

#### b. Automatic Choke Adjustment

Loosen three choke cover retaining screws

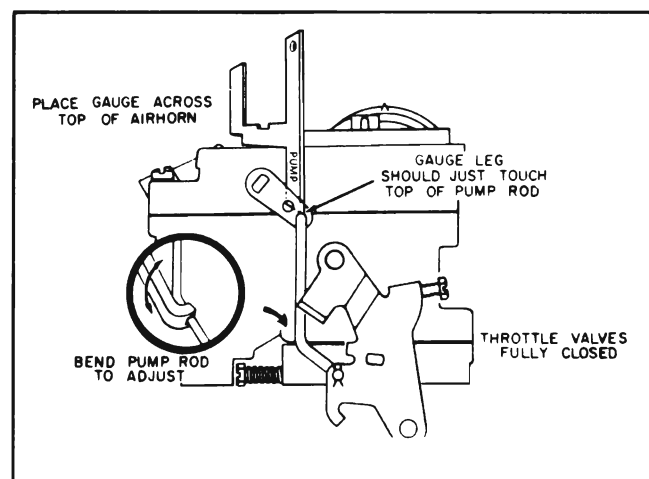


Figure 3-26—Pump Rod Adjustment



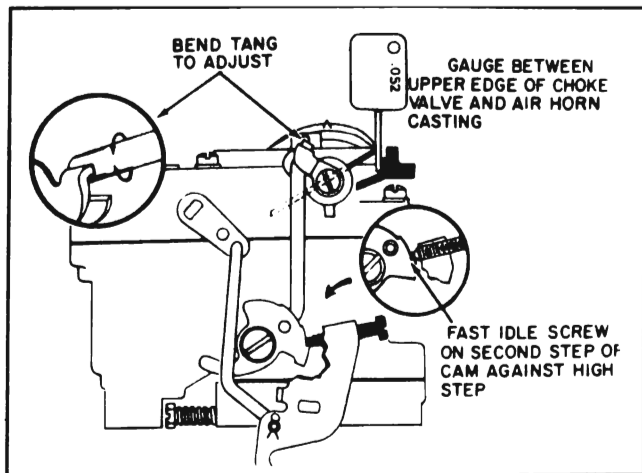


Figure 3-27—Choke Rod Adjustment

and rotate the choke cover counterclockwise against coil tension until choke valve begins to close. Continue rotating cover until index mark is in line with index point on choke housing.

### c. Choke Rod Adjustment

Turn idle stop screw into the normal idle position (normal idle position would be with the idle stop screw turned in approximately 1-1/2 turns against the fast idle cam with the choke valve held fully open). Place idle stop screw on second step of fast idle cam against shoulder of high step. Wire end of .052" Gauge should just go between upper edge of choke valve and wall of air horn. Bend tang on choke lever to obtain correct choke rod setting. See Figure 3-27.

### d. Choke Unloader Adjustment

With throttle valves held wide open, choke valve should open just enough to admit small end of .157" Gauge, between upper edge of

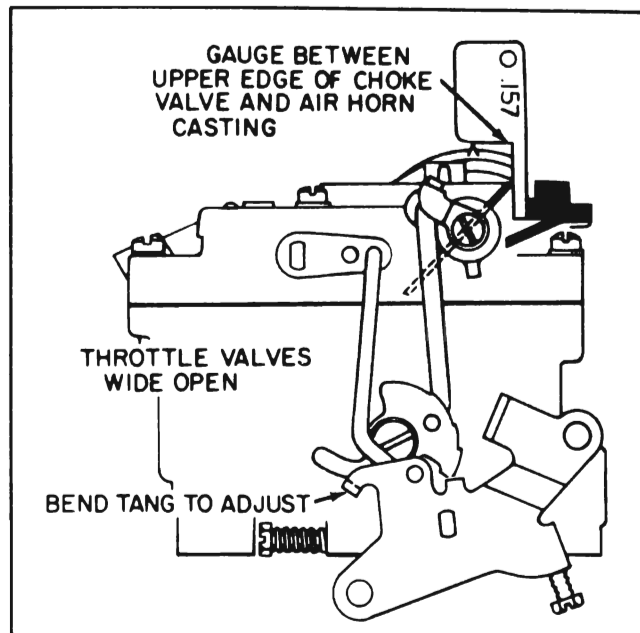


Figure 3-28—Choke Unloader Adjustment

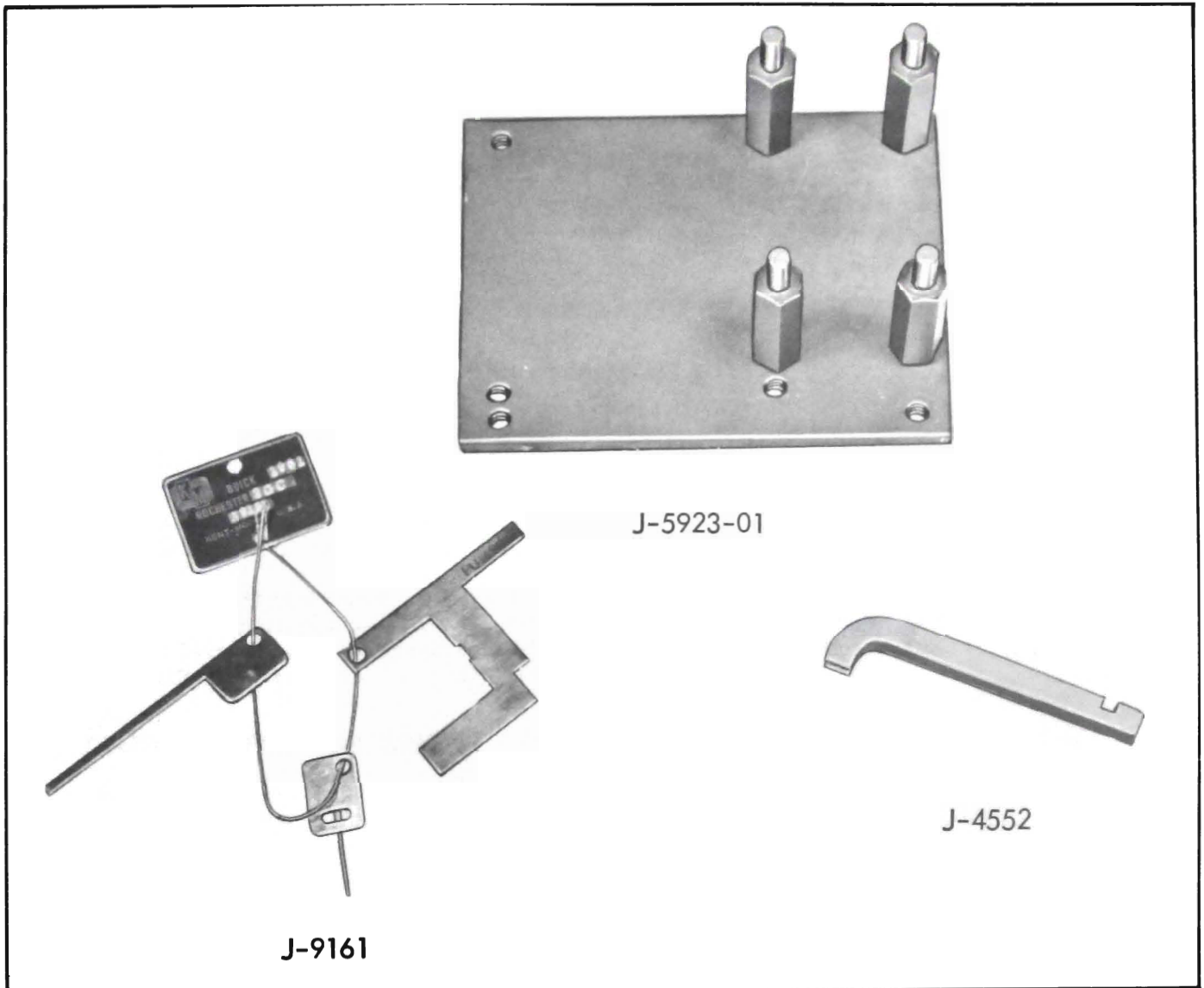
choke valve and inner air horn wall. Bend unloader tang on throttle lever to obtain proper clearance. See Figure 3-28.

### e. Slow Idle Adjustment

Adjust slow idle to 525 RPM on a standard car or 575 RPM on an air conditioner car. When engine is at normal operating temperature, adjust idle mixture needle screws; re-adjust idle speed to 525 RPM if necessary. See paragraph 3-8.

### f. Fast Idle Adjustment

A fast idle speed adjustment is not required because fast idle is controlled by the throttle stop screw. If the idle speed is correctly set and the choke rod properly adjusted, the proper fast idle will be maintained.



**FUEL AND EXHAUST TOOLS**

- J-4552      Bending Tool
- J-5923-01    Carburetor Holding Stand
- J-9161      Carburetor Chain Gauge - Rochester 2GC

Figure 3-29—Fuel and Exhaust Special Tools