

# DEALER TRAINING



## PARTS & SERVICE DIVISION

AID NO.: S1040

SUBJECT: CARBURETION

MODEL: ALL

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## P R E F A C E

The information contained in this booklet is provided as an easy reference guide for technicians. More detailed information is available in the appropriate Workshop Manual.

### HIGH ALTITUDE VEHICLES

VEHICLES SOLD IN HIGH ALTITUDE REGIONS MUST HAVE THE CO CHECKED WITH INFRARED EQUIPMENT AND, IF NECESSARY, THE MAIN METERING NEEDLE ADJUSTED TO BRING THE VEHICLE IN SPECIFICATION. THE JAGUAR XJ6L AND MGB REQUIRE FITMENT OF SPECIAL HIGH ALTITUDE NEEDLE(S), NEEDLE NUMBERS \_\_\_\_\_ AND 45M RESPECTIVELY, PRIOR TO THIS ADJUSTMENT. WHEN DESCENDING TO LOW ALTITUDES, THE CO MUST AGAIN BE CHECKED WITH INFRARED EQUIPMENT AND THE MAIN METERING NEEDLE ADJUSTED TO BRING THE VEHICLE INTO SPECIFICATION. THE XJ6L AND MGB MUST BE REFITTED WITH LOW ALTITUDE NEEDLE(S) BEFORE THE AFOREMENTIONED ADJUSTMENTS ARE CARRIED OUT. ALL ADJUSTMENTS MUST BE MADE BY MOVING THE MAIN METERING NEEDLE.

FOR DETAILS ON HOW TO ADJUST CARBURETORS, SEE PAGE 30 OF THIS TRAINING AID.

THESE INSTRUCTIONS APPLY TO FEDERAL SPECIFICATION CARS ONLY.

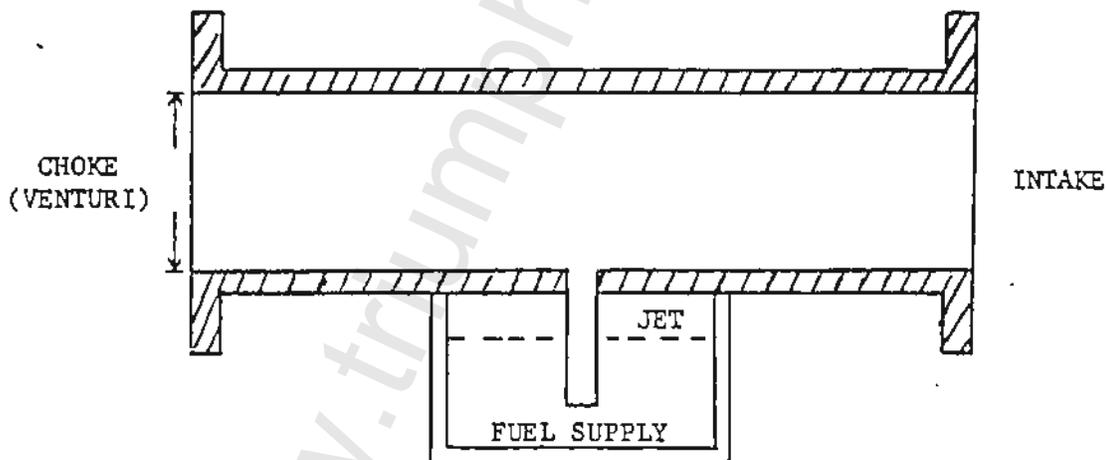
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## CARBURETION

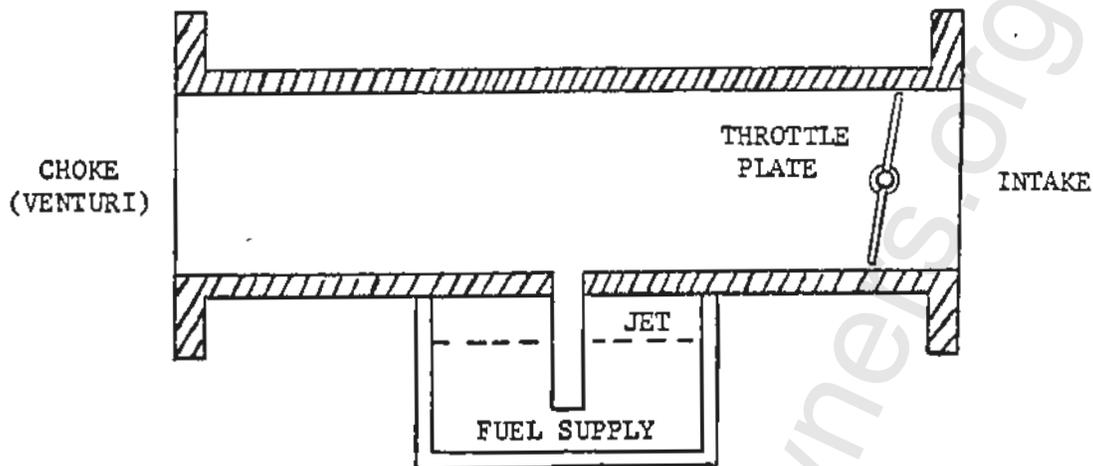
The Zenith Stromberg carburetor is a constant velocity variable choke (venturi) carburetor.

The variable choke (Venturi) allows an increase or decrease in choke (venturi) size depending upon throttle plate position. This variation of choke (venturi) size maintains a constant air velocity over the jet hence allowing a constant depression over the fuel supply at any throttle plate position.

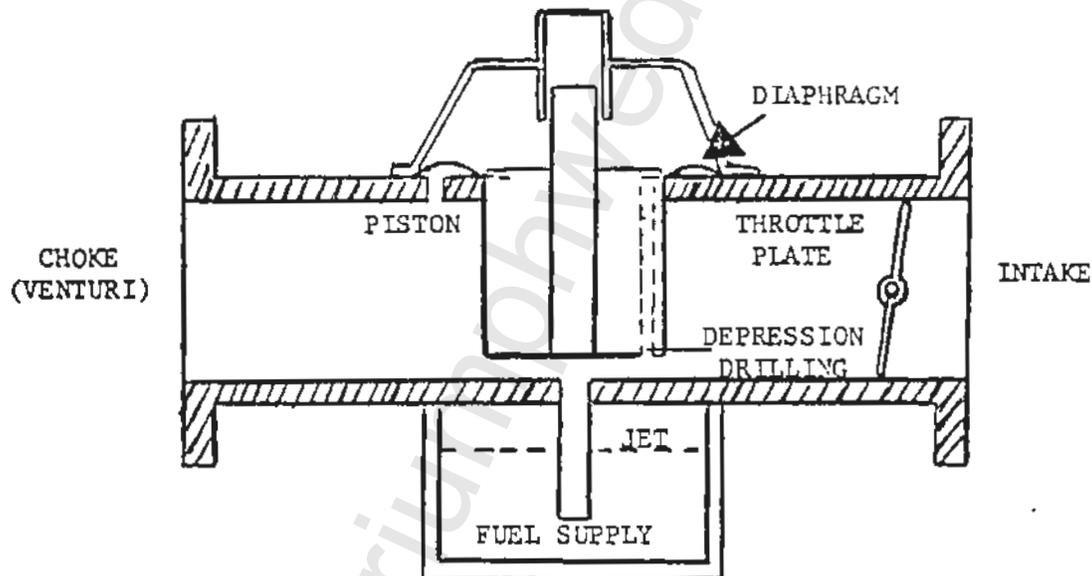
To achieve a variable choke (venturi), a diaphragm is fitted to a piston and the pressure above the diaphragm is lowered by the depression created in the carburetor low depression area by engine suction hence allowing atmospheric pressure to lift the piston. The underside of the diaphragm is vented to atmosphere.



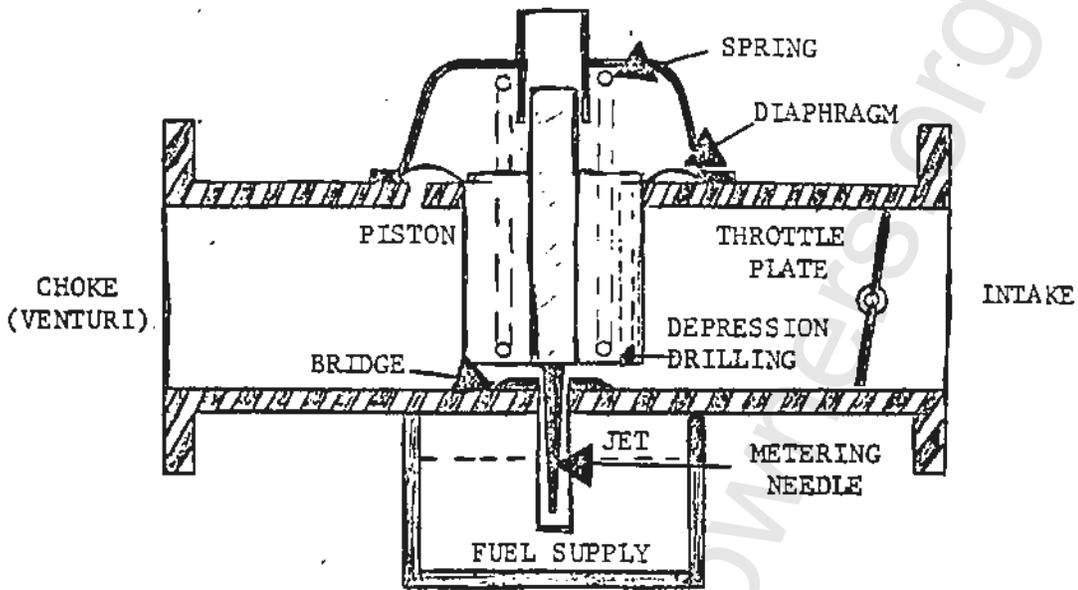
In theory, the diagram above depicts a simple carburetor suitable for running an engine at a fixed r.p.m. provided some auxiliary method for starting could provide sufficient air velocity to create a depression over the fuel supply to draw out the fuel to mix with the air. Unfortunately, this simple carburetor is unsuitable for automobile use where a wide range of revs. is desired.



By controlling the air velocity by means of a throttle plate, this carburetor could run an engine over a very limited r.p.m. range by varying the air velocity and thereby depression over the fuel supply. While an improvement, this is still not suitable for automobile use.

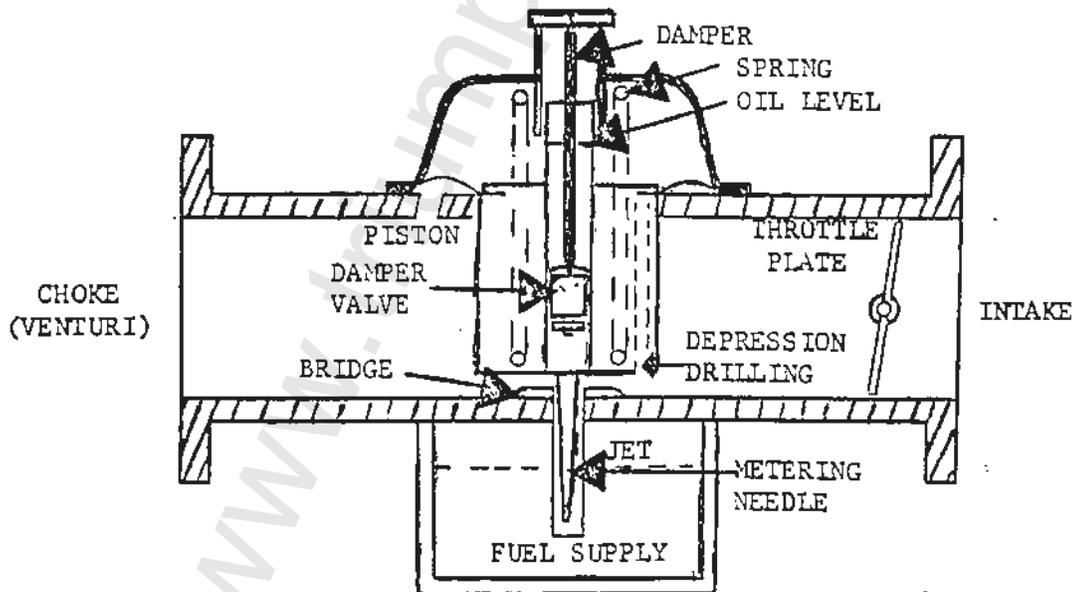


In addition to controlling the air velocity, we now control the choke (venturi) size which will provide a constant depression over the fuel supply. However, as the fuel supply relative to choke size and throttle plate position is not governed, the carburetor would be rich at the lower end and lean at the higher end although the r.p.m. range will be greatly increased.



By addition of a 'stepped tapered' fuel metering needle, the fuel can now be metered in relationship to the choke (venturi) size and throttle plate position. This, therefore, gives a basic carburetor with a wide range of r.p.m. suitable for automobile use.

Piston control is further refined by the addition of a weight/return spring. In addition, a bridge is built under the piston to create turbulence and better atomization.

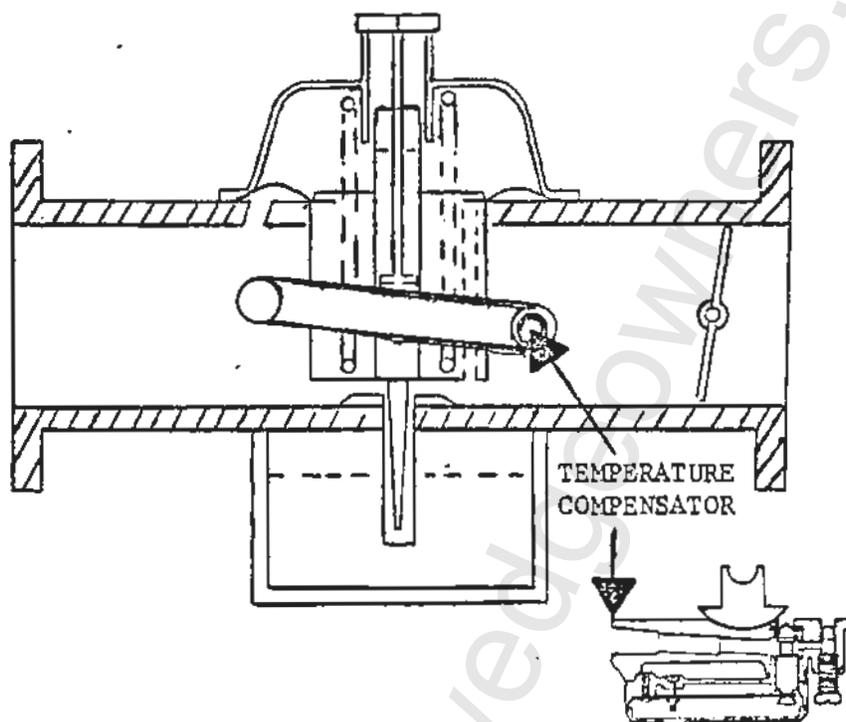


There is one exception where a constant depression over the jet is not

desired; this is acceleration. In this case, the throttle would be wide open and the piston should also move to a corresponding position to maintain a constant depression of the jet. This, however, would create a too lean condition for rapid acceleration. Therefore, the piston must be held down to increase the air velocity over the jet and hence pick up more fuel necessary under accelerating conditions. This is achieved by a damper which is a hydraulic device which limits initial piston movement to approximately .070" - .140" depending upon application. The piston then continues to move up forcing the oil in the piston rod to pass on the outside of the damper valve. When the throttle is released, the damper valve falls and allows rapid oil displacement and hence piston return.

Also necessary is a cold starting device normally referred to as a manual choke. This consists mainly of a disc with a series of small drillings which, when rotated, allows progressively more drillings to be open to fuel supply which is drawn into the low depression area of the carburetor.

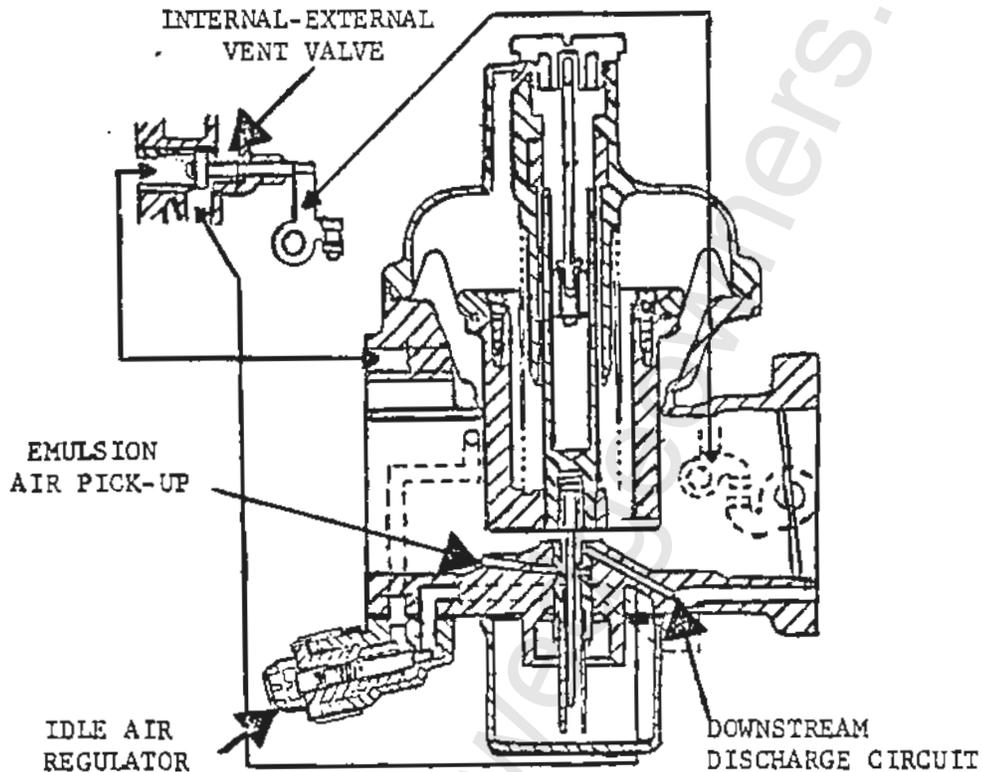
Federal Law applicable to vehicles produced after 1968 requires further refinements to control exhaust emissions to closer tolerances at idle and deceleration, the two conditions under which emissions are highest.



#### TEMPERATURE COMPENSATOR

To reduce emissions at idle, a temperature compensator is fitted. This is a tapered valve controlled by a temperature sensitive bi-metal strip designed to allow AIR to bypass the bridge and enter the carburetor in the low depression area. This weakens the depression which then allows the piston to fall slightly thereby cutting available fuel and creating a leaner mixture.

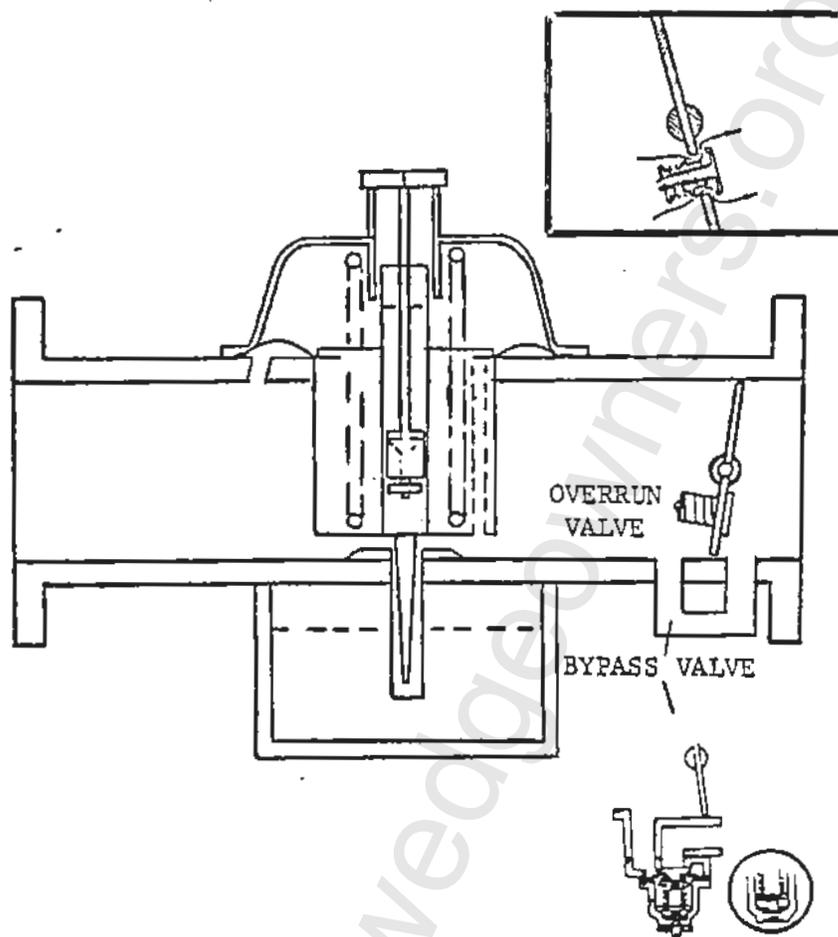
## IDLE/SLOW RUN EMULSION CIRCUITS



### CD4 CARBURETOR

The temperature compensator is replaced on some versions of the carburetor by a separate idle/slow speed circuit which discharges mixture downstream of the throttle plate - mixture flow, however, is still via the metering needle.

Also, there is an emulsion circuit for both idle and main fuel feeds which gives improved atomization and a decrease in sensitivity to fuel viscosity changes due to temperature variations. This system replaces the temperature compensator on some applications.



#### BYPASS VALVE OR OVERRUN VALVE

To control emissions on deceleration either a bypass valve or overrun valve is fitted. This device allows mixture to bypass the throttle plate to provide a combustible mixture when the throttle plate is suddenly closed. This prevents the fuel residue in the intake manifold from passing through the engine in its raw state. The valve is operated by high manifold vacuum present in the manifold when the throttle plate is suddenly closed.

This year all British Leyland models are fitted with Zenith Stromberg carburetors with the exception of Jaguar V12s. There are, however, variations on model to model application.

### VENT VALVE

On some versions there is a vent valve(s) which is operated by throttle position. These valves vent the float chambers to the charcoal canister when at idle and directly back into the air cleaner hence induction process with the throttle open. It is most important that these valves are correctly adjusted in order to allow correct function of the anti-run-on valve, if fitted.

### MANUAL CHOKE

Earlier carburetors had a manual choke. The extra fuel necessary to achieve a cold start is drawn from the float chamber through a series of drillings in a disc and enters the low depression area of the carburetor.

The amount of fuel available depends upon the position of the disc which is controlled by a manually operated cable. Fast idle is achieved by a fast idle cam and screw.

### AUTOMATIC CHOKE (BI-METAL SPRING TYPE)

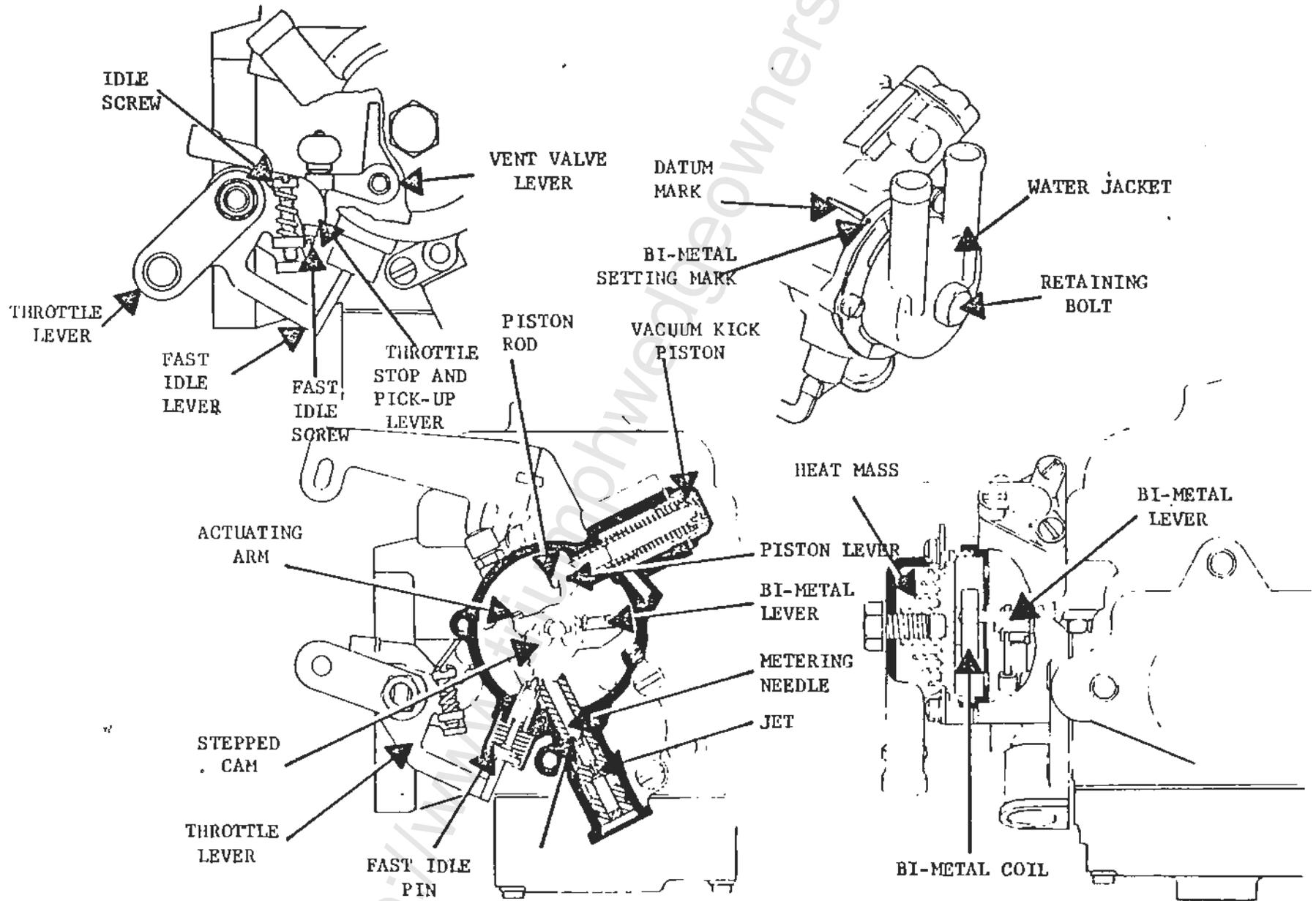
The extra fuel necessary for cold starting is delivered through a jet and needle assembly to the low depression area of the carburetor. The needle is connected by a lever on the actuating arm to a temperature sensitive bi-metal spring which is mounted on an aluminum block which forms an engine heated water jacket with the outer cap.

As water temperature increases the bi-metal spring moves the actuating arm in a counterclockwise direction which moves the metering needle down, leaning out fuel flow. When the engine is at operating temperature, a sealing ring on the base of the needle prevents further fuel flow.

Fast idle is obtained by a stepped cam mounted on the same pivot as the actuating arm and kept in contact with it by a torsion spring. The cam operates a pin which is connected to throttle by a lever. The steps on the cam give increases in throttle opening proportional to the position of the bi-metal spring and hence fuel enrichment. The pin takes a position on the cam depending on temperature and throttle opening.

A vacuum kick piston is connected to manifold vacuum by a passage in the carburetor. Prior to starting, no vacuum exists behind the piston and the piston return spring, forced by a lever, holds the needle actuating arm in a clockwise direction thus richening the mixture and opens the throttle. As soon as the engine is running, vacuum behind the piston moves the piston down the cylinder. The piston rod slot disengages from the actuating arm and the enrichment is then controlled by the bi-metal spring only.

Under hot engine conditions, the bi-metal spring overrides the piston spring preventing additional fuel delivery during hot starting.



AUTO-CHOKE

### AUTOMATIC CHOKE (WAX CAPSULE TYPE)

The automatic choke operates as a small constant depression carburetor. Increased air and fuel requirements are governed by a wax capsule which is sensitive to coolant temperature.

A reduction of coolant temperature opens a throttle valve which increases the fuel flow proportionally by moving a metering needle which is attached to the throttle valve. A depression is maintained in the mixing chamber by a spring loaded air valve which opens in proportion to air flow. The throttle valve and metering needle assembly move within a range at a particular temperature. The upper limit is the 'start' and the lower limit the 'run' position.

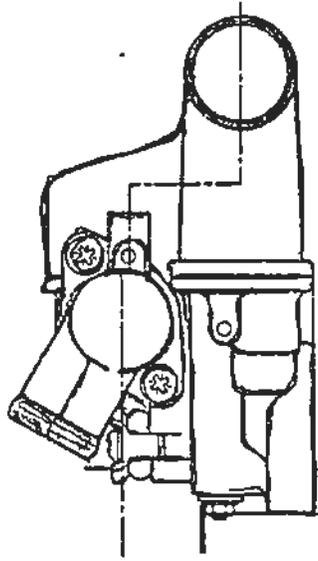
With the engine cranking and the throttle valve in the 'start' position, the depression in the mixing chamber draws fuel into the mixing chamber, past the throttle valve, and into the engine via the balance passage of the inlet manifold. As soon as the engine fires, the depression across the throttle valve is increased which draws the throttle into the 'run' position.

As the engine warms up, the wax capsule closes the throttle/metering needle assembly until the choke is fully closed and the engine is running on the main carburetors.

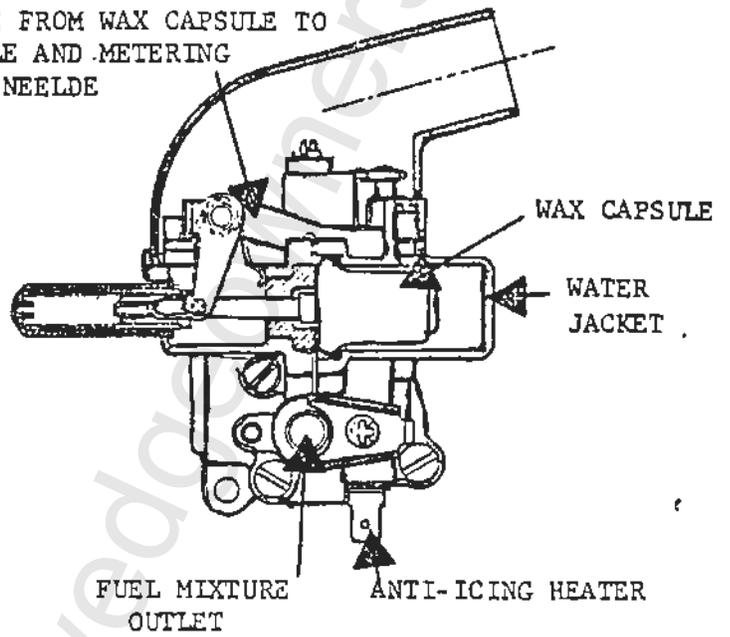
During acceleration, additional mixture is provided by increasing the load on the air valve thereby increasing the depression in the mixing chamber

and hence depression on the jet. This is achieved by a two stage air valve. The first stage, spring load on the underside of the air valve, permits the air valve to move proportionally to air flow. The guide for the air valve is moveable and the lower end is open to manifold vacuum. Under high vacuum conditions the guide is drawn into the lower position against a spring load. Under accelerating conditions, the vacuum is insufficient to act against the spring load and, therefore, moves into the upper position against the air valve applying additional spring load thereby increasing the depression in the mixing chamber.

- a. Fuel requirements are determined by the profile of the metering needle.
- b. Air flow requirements are determined by the profile of the throttle plug.



LINKAGE FROM WAX CAPSULE TO THROTTLE AND METERING NEEDLE

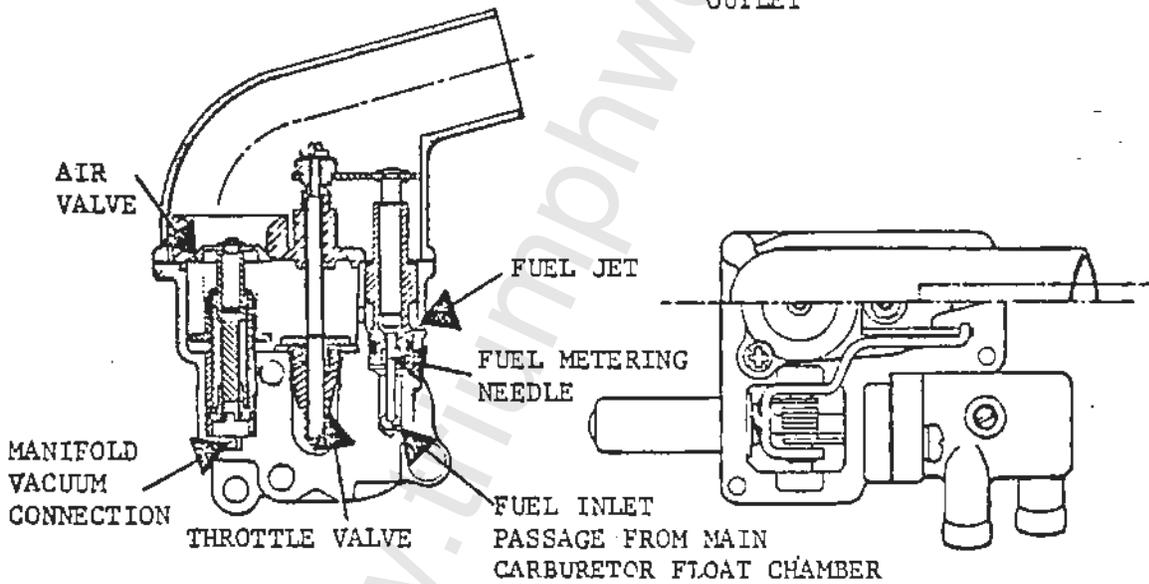


WAX CAPSULE

WATER JACKET

FUEL MIXTURE OUTLET

ANTI-ICING HEATER OUTLET



AIR VALVE

FUEL JET

FUEL METERING NEEDLE

MANIFOLD VACUUM CONNECTION

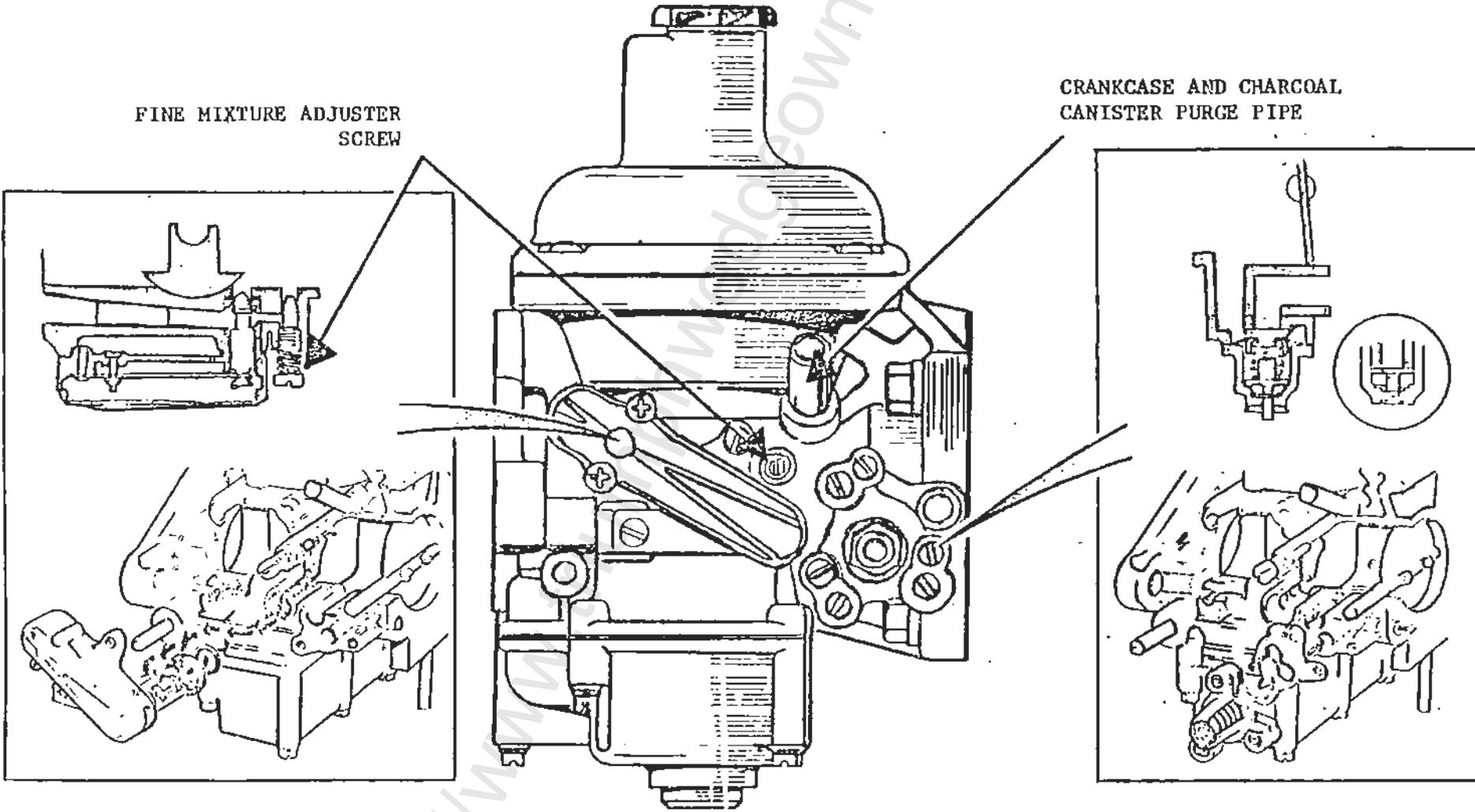
THROTTLE VALVE

FUEL INLET PASSAGE FROM MAIN CARBURETOR FLOAT CHAMBER

RIGHT SIDE TEMPERATURE COMPENSATOR

FINE MIXTURE ADJUSTER  
SCREW

CRANKCASE AND CHARCOAL  
CANISTER PURGE PIPE



TEMPERATURE COMPENSATOR

DECELERATION BY-PASS VALVE

CDSEV CARBURETOR



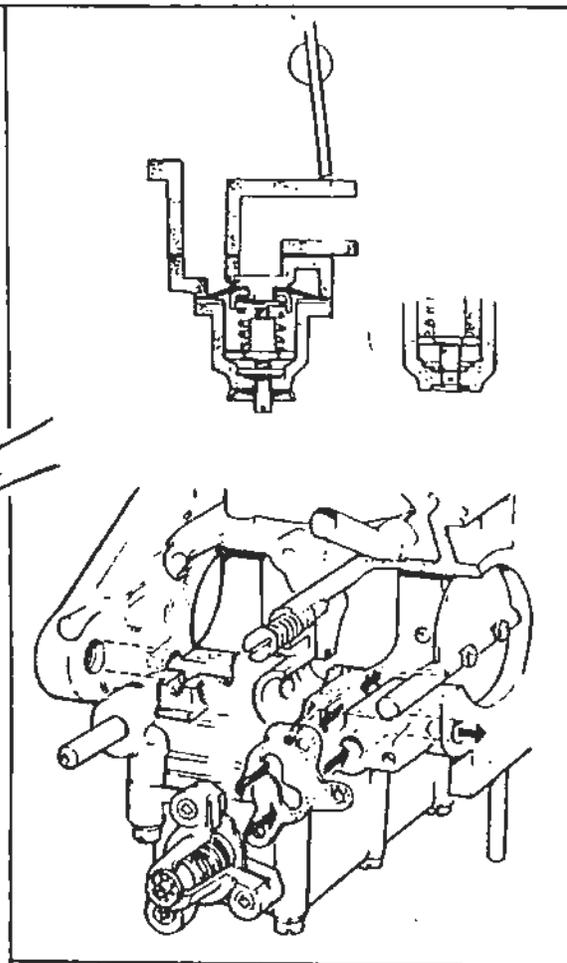
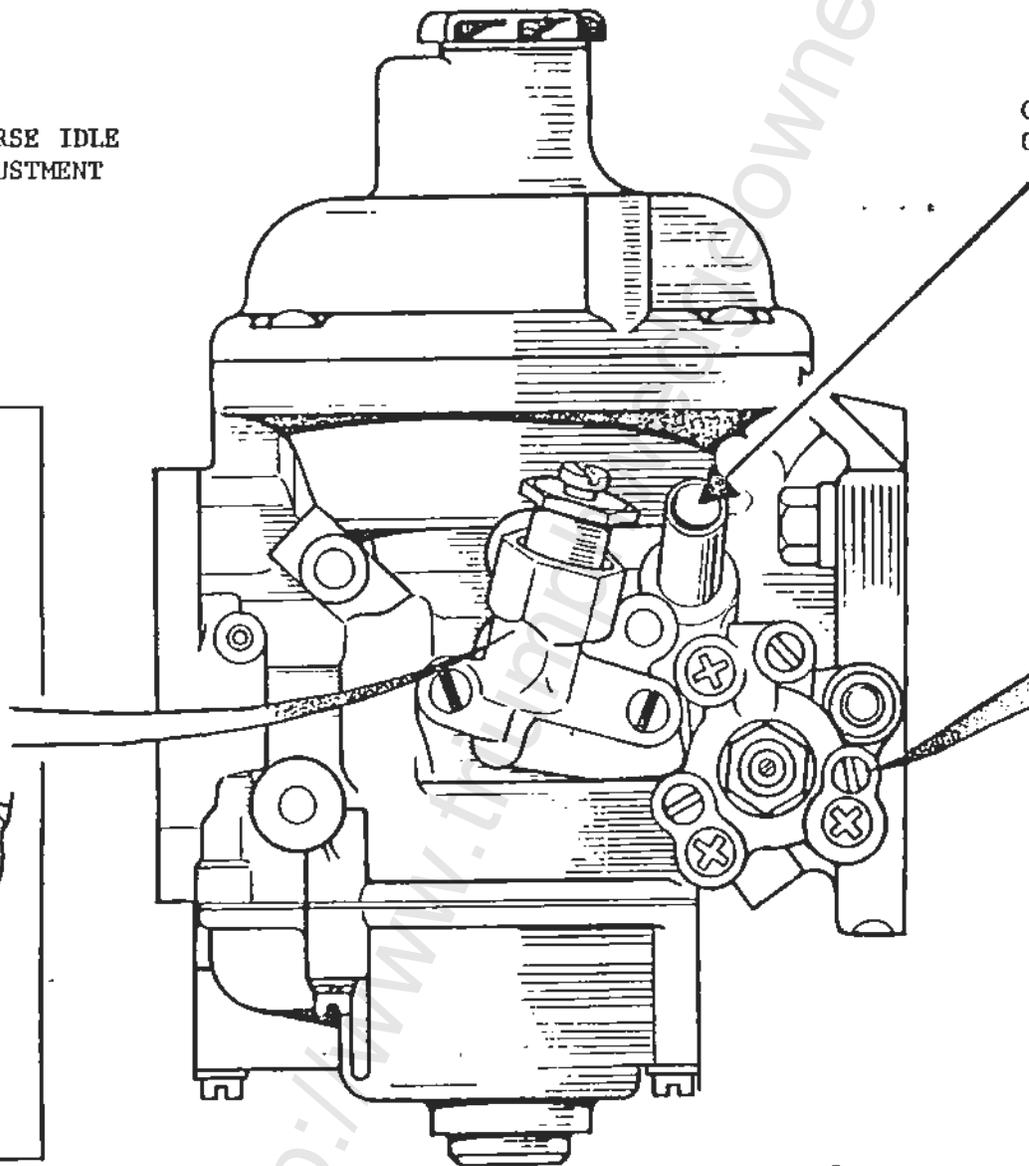
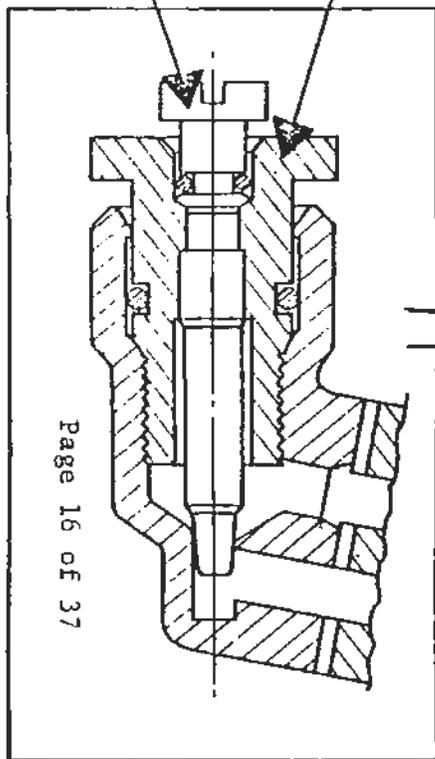
RIGHT SIDE/SLOW RUNNING CIRCUIT

S1040

COARSE IDLE  
ADJUSTMENT

FINE IDLE  
ADJUSTMENT

CRANKCASE AND CHARCOAL  
CANISTER PURGE PIPE

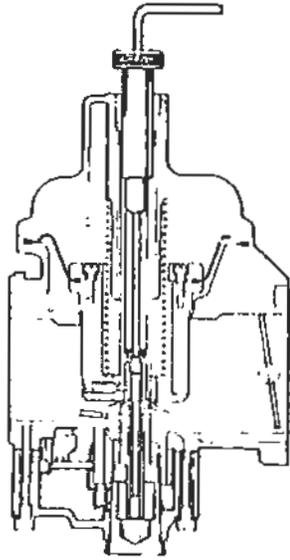


CD4 CARBURETOR

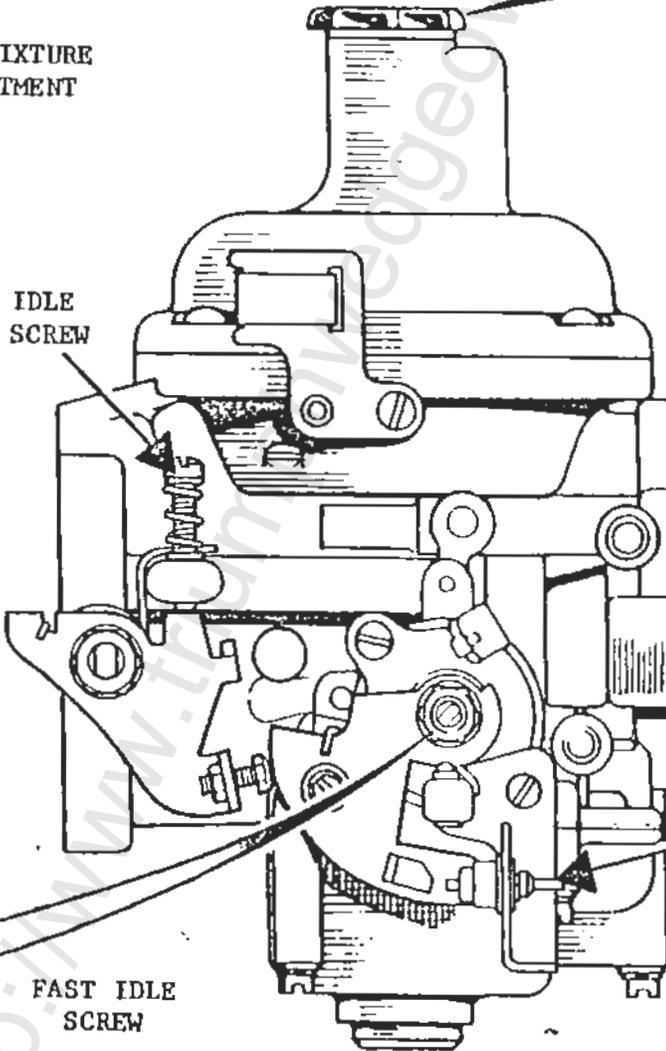
DECCELERATION BY-PASS VALVE

LEFT SIDE MANUAL CHOKE

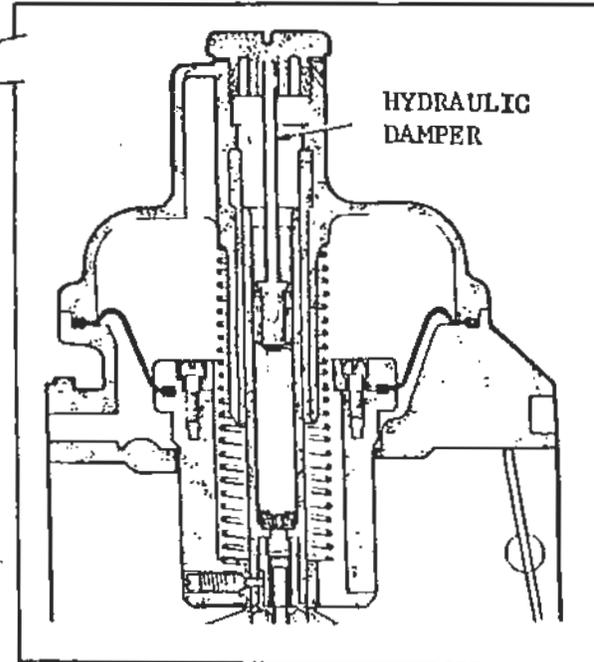
MAIN MIXTURE  
ADJUSTMENT



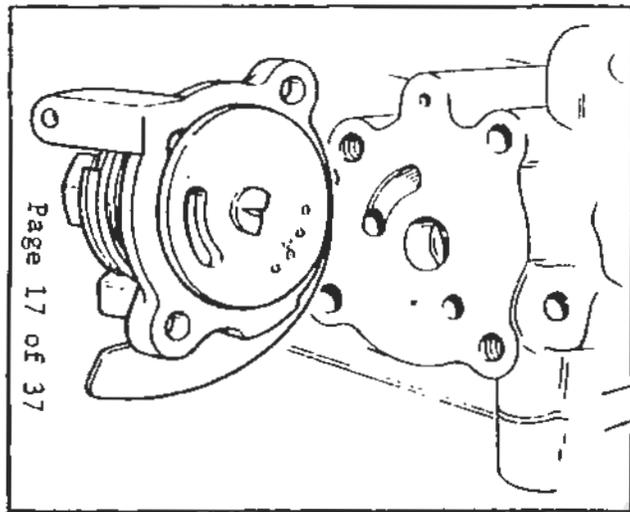
IDLE  
SCREW



HYDRAULIC  
DAMPER



EGR CUT-OUT VALVE



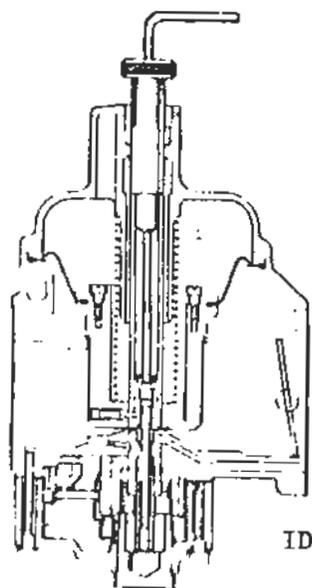
CHOKE

FAST IDLE  
SCREW

CD4 CARBURETOR

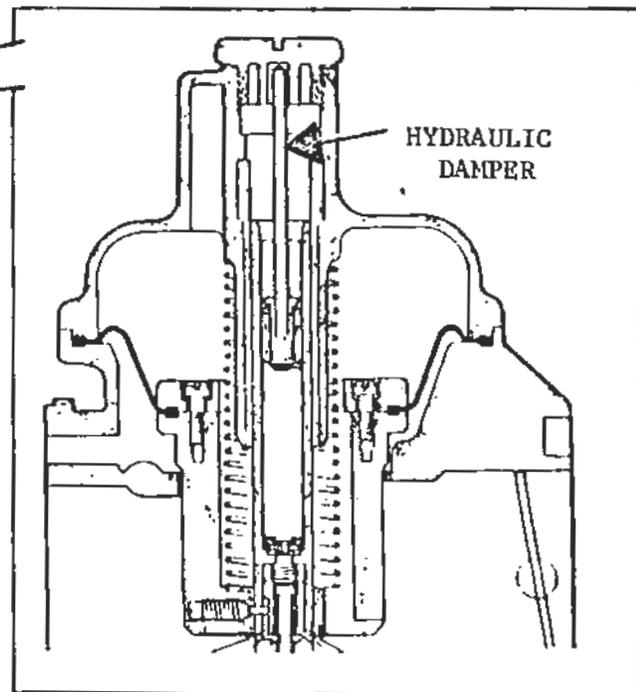
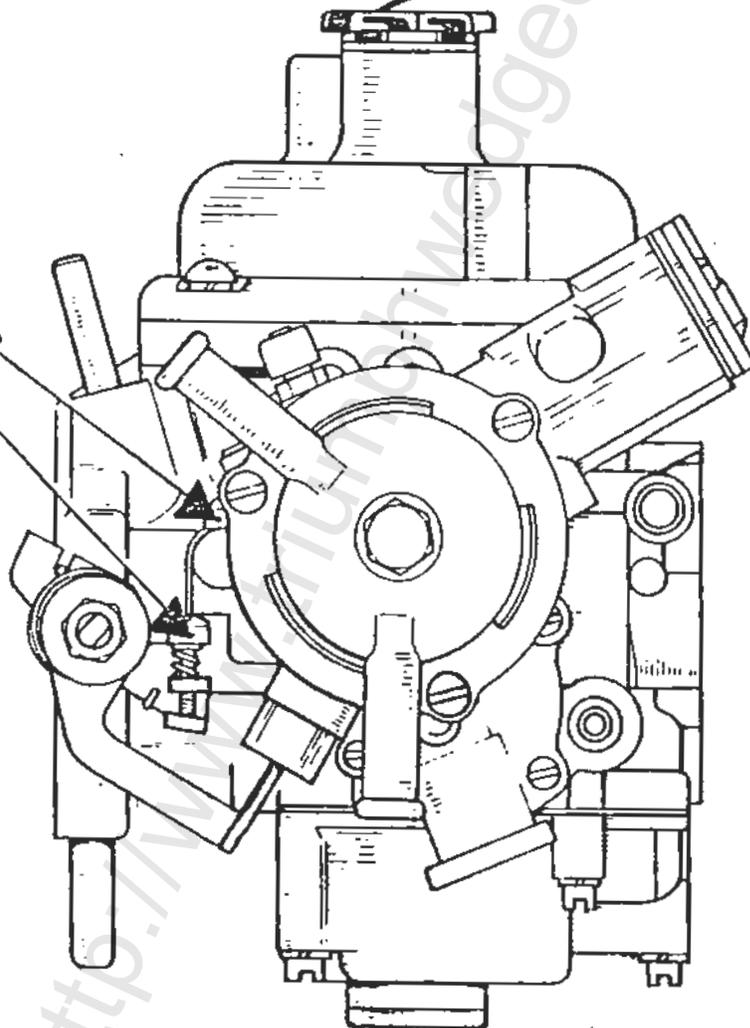
LEFT SIDE AUTOMATIC CHOKE

S1040



MAIN MIXTURE  
ADJUSTMENT

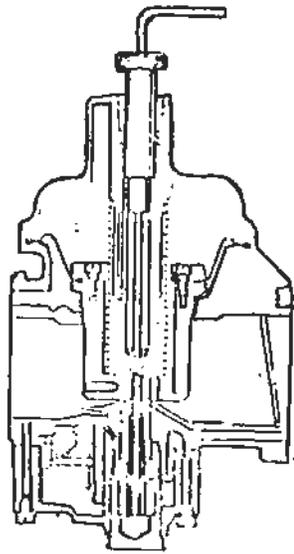
IDLE STOP  
IDLE SCREW



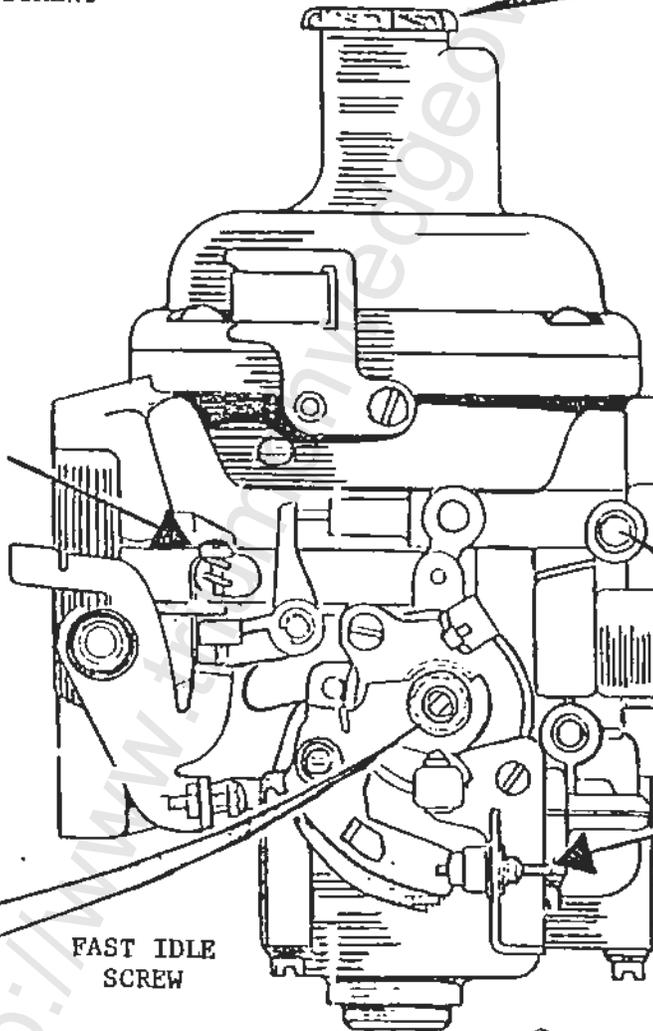
HYDRAULIC  
DAMPER

LEFT SIDE WITH VENT VALVE

MAIN MIXTURE  
ADJUSTMENT

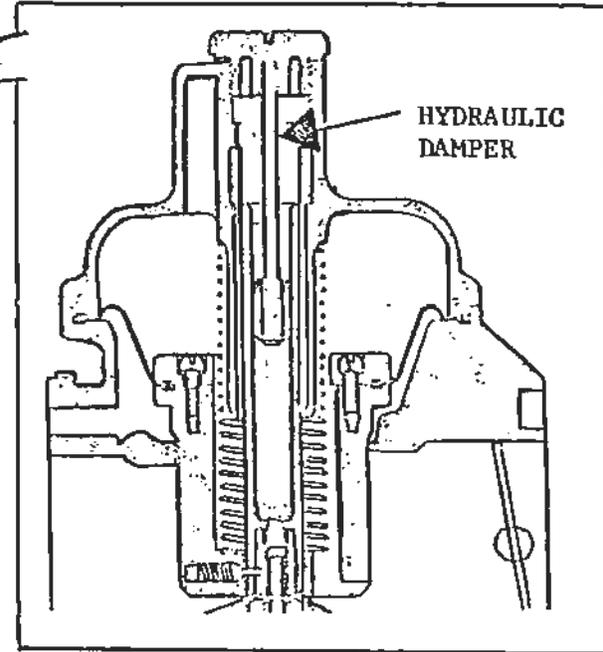


IDLE  
SCREW

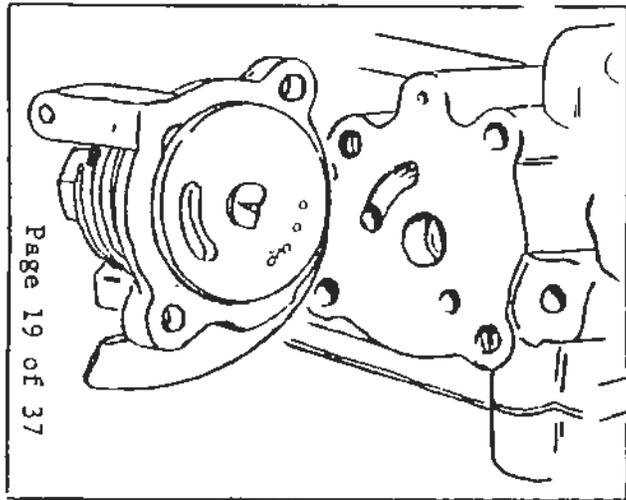


FAST IDLE  
SCREW

EGR  
CUT-OUT  
VALVE

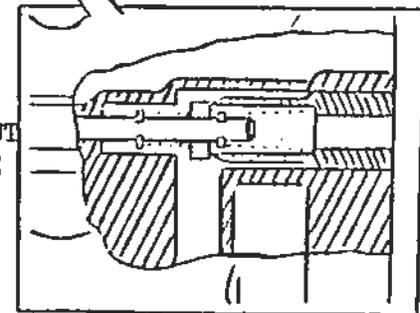


HYDRAULIC  
DAMPER



CHOKE

CDSEV CARBURETOR

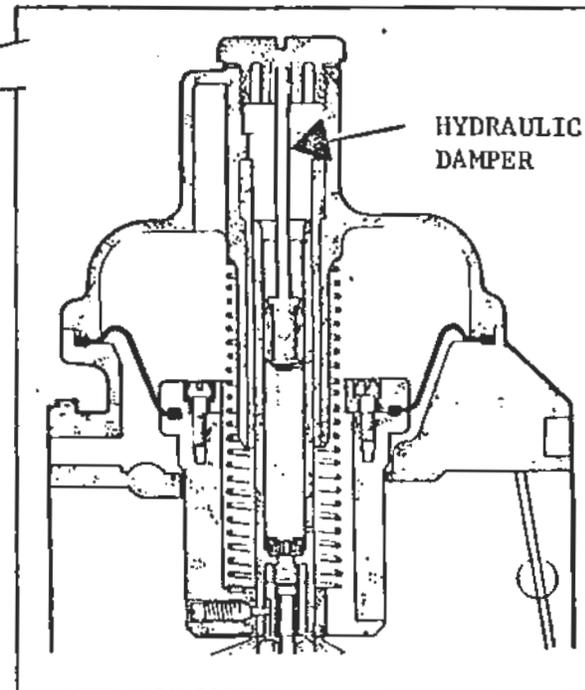
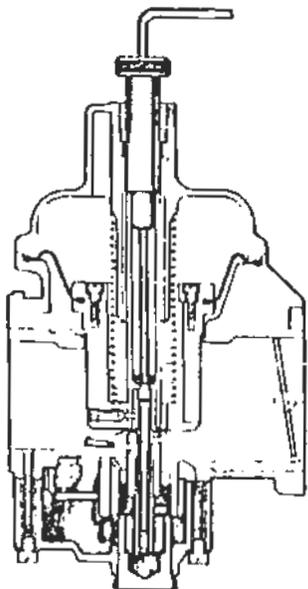


VENT VALVE

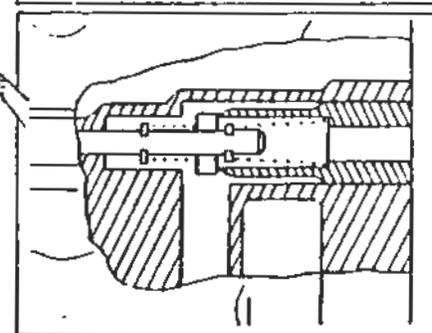
LEFT SIDE AUTOMATIC CHOKE AND VENT VALVE

S1040

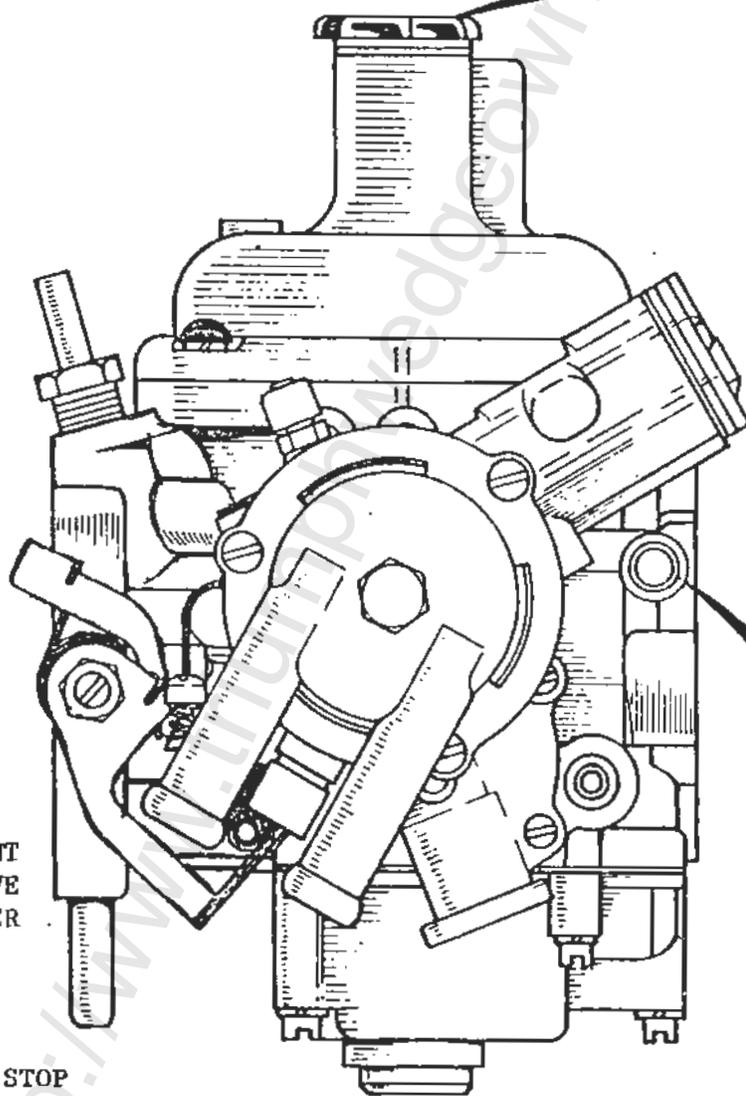
MAIN MIXTURE  
ADJUSTMENT



HYDRAULIC  
DAMPER



VENT VALVE



CD4VT 175 CARBURETOR

THROTTLE  
LEVER

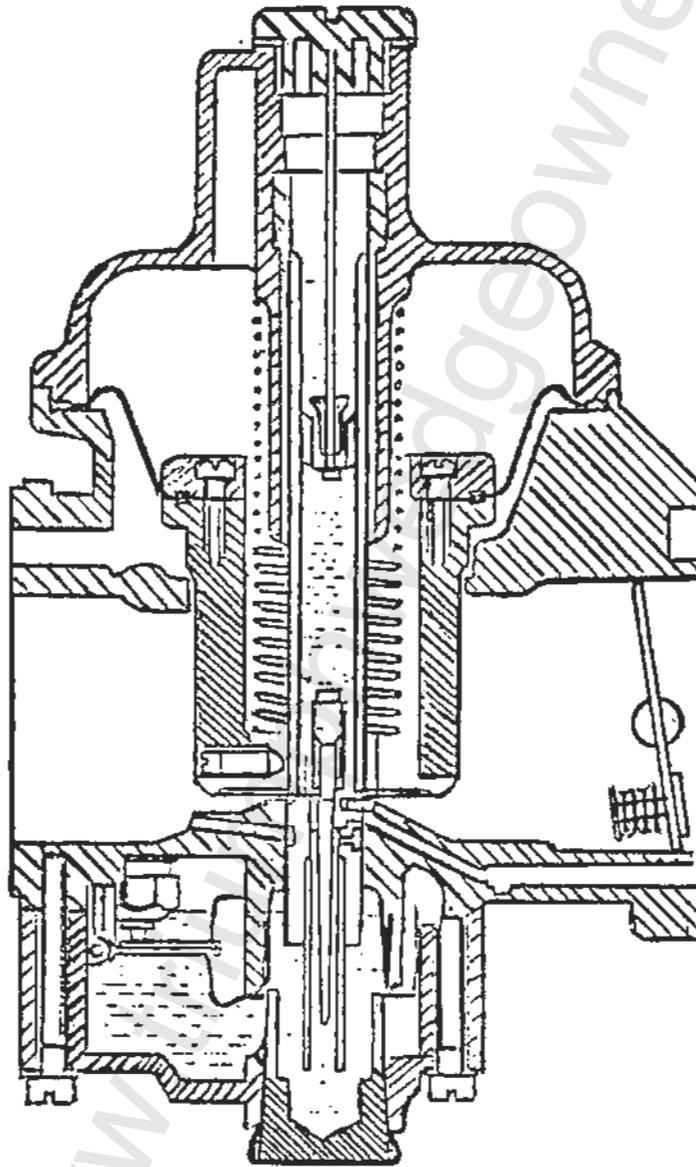
FAST IDLE  
LEVER

FAST IDLE SCREW

THROTTLE STOP  
AND PICK-UP LEVER

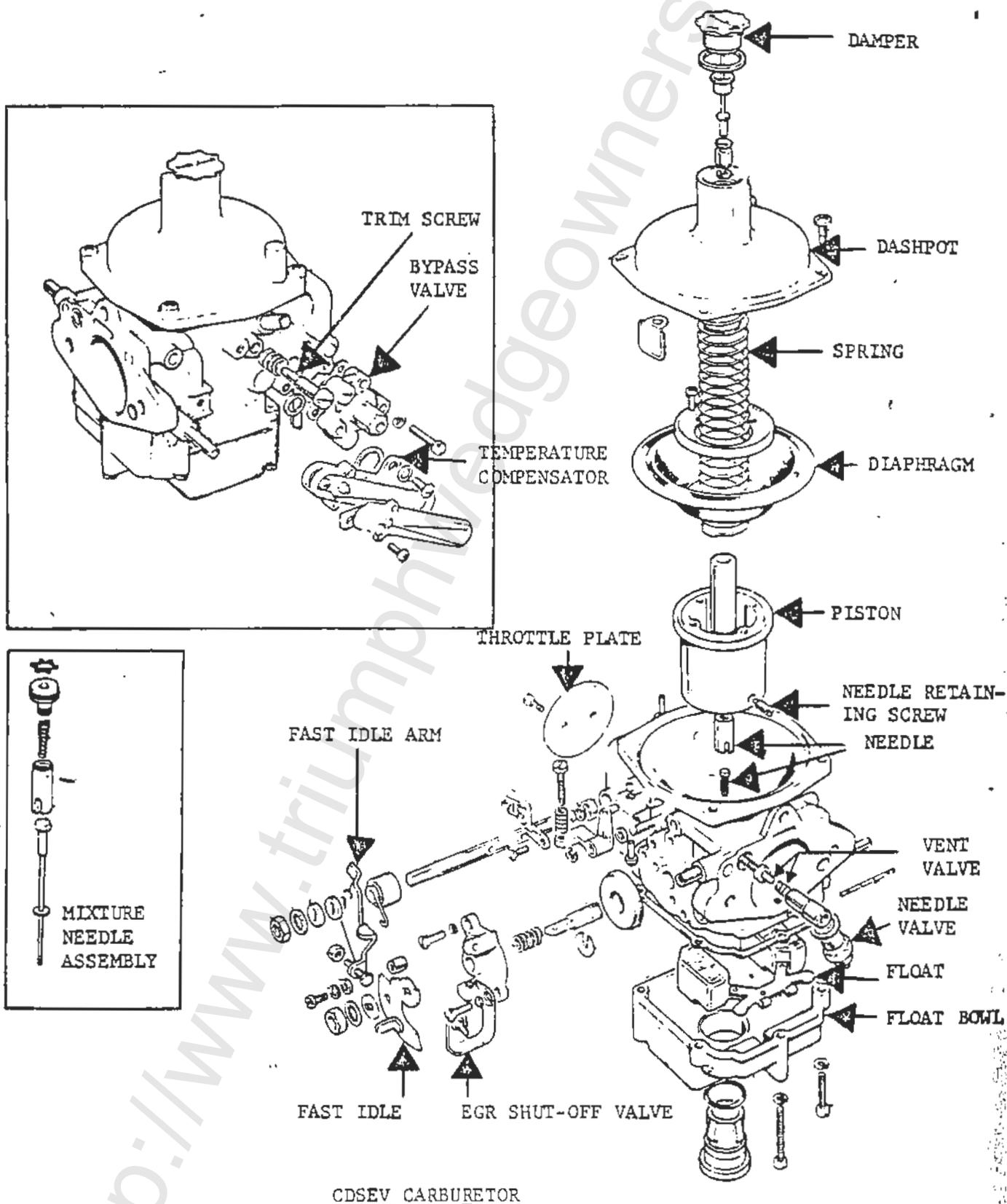
VENT  
VALVE  
LEVER

CROSS SECTION SLOW RUNNING CIRCUIT

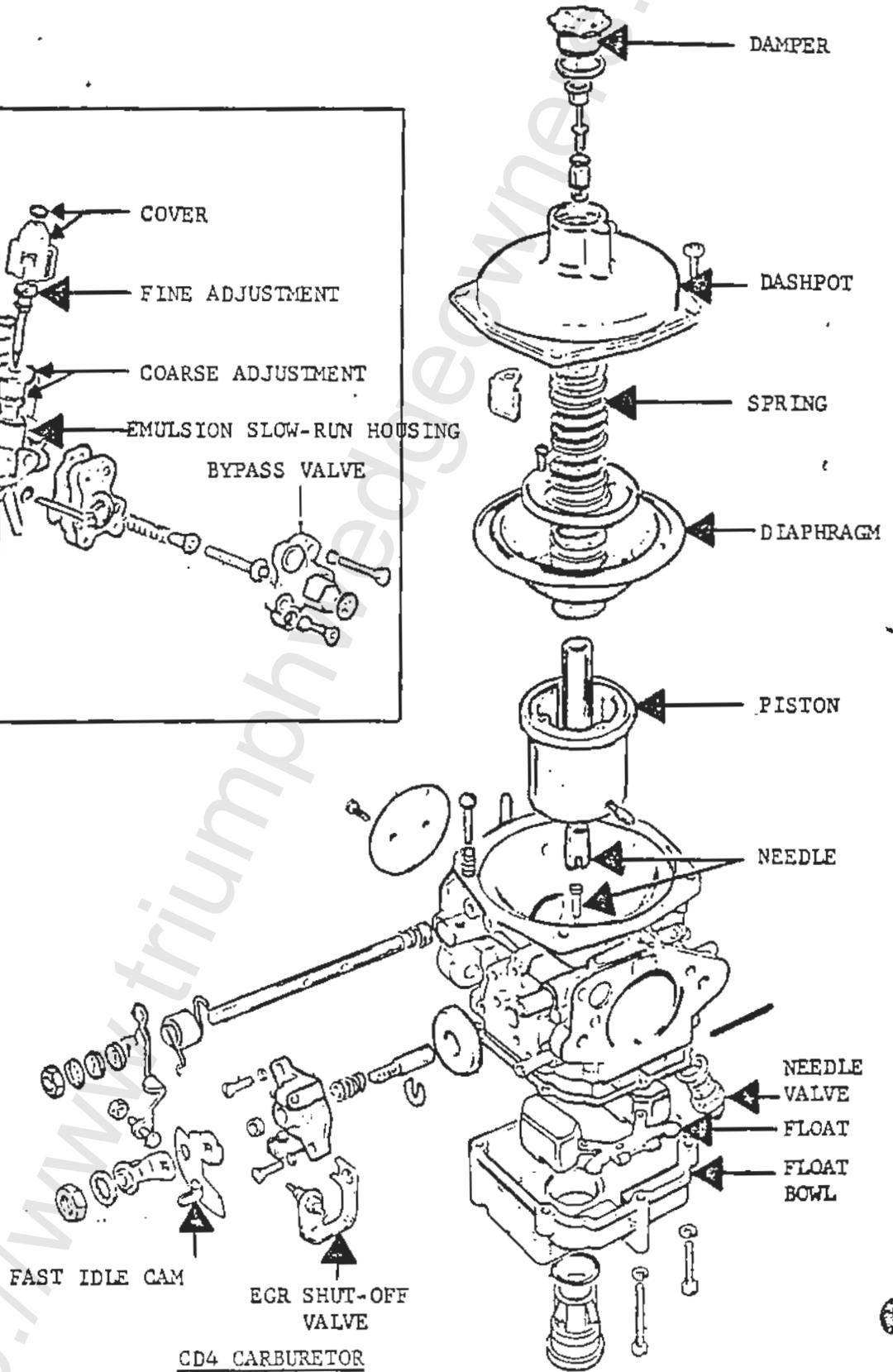
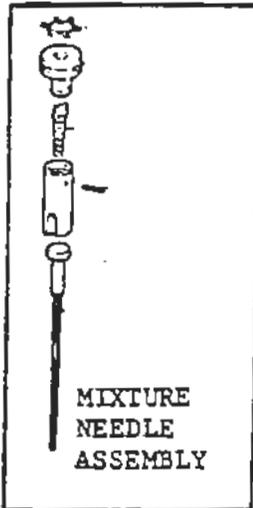
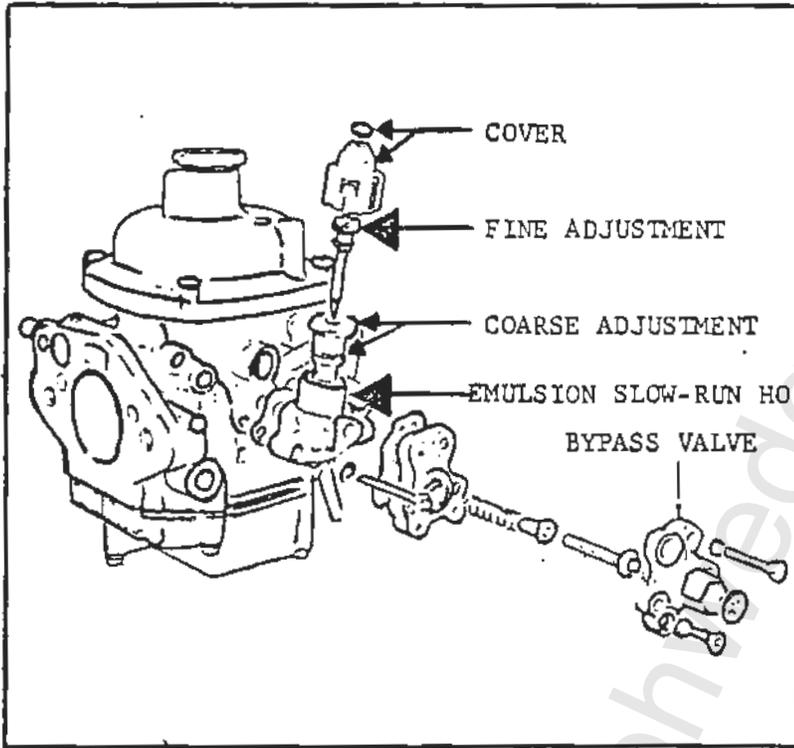


CD5T 175 CARBURETOR

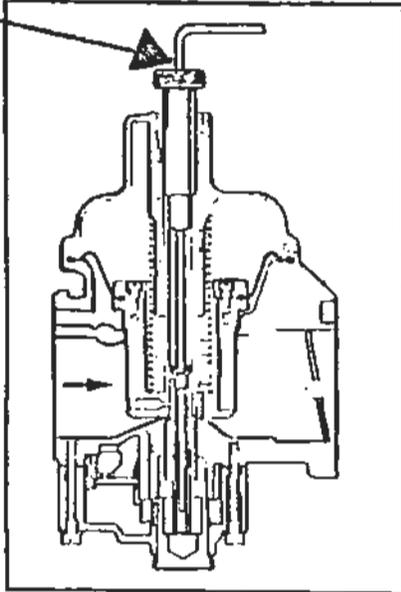
EXPLODED VIEW  
TYPICAL SPECIFICATION  
TEMPERATURE COMPENSATOR  
MANUAL CHOKE



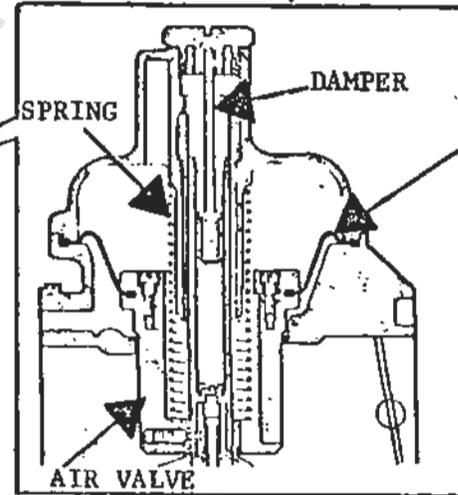
EXPLODED VIEW  
TYPICAL SPECIFICATION  
IDLE SLOW RUN CIRCUIT  
MANUAL CHOKE



ADJUSTING TOOL



MAIN MIXTURE ADJUSTMENT

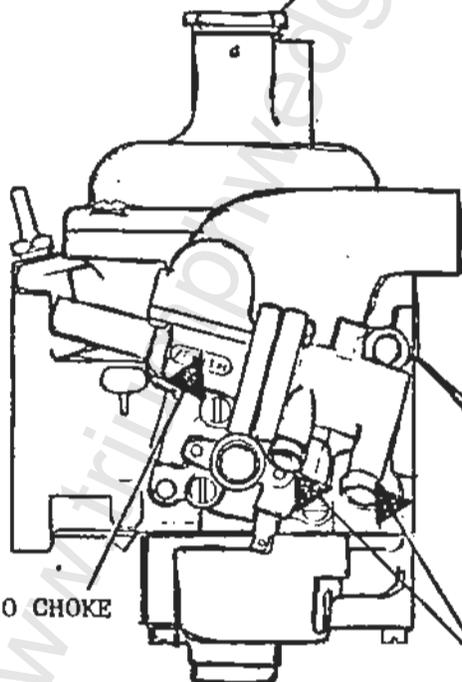


SPRING

DAMPER

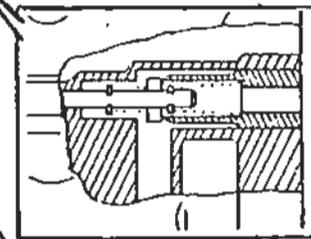
DIAPHRAGM

AIR VALVE



AUTO CHOKE

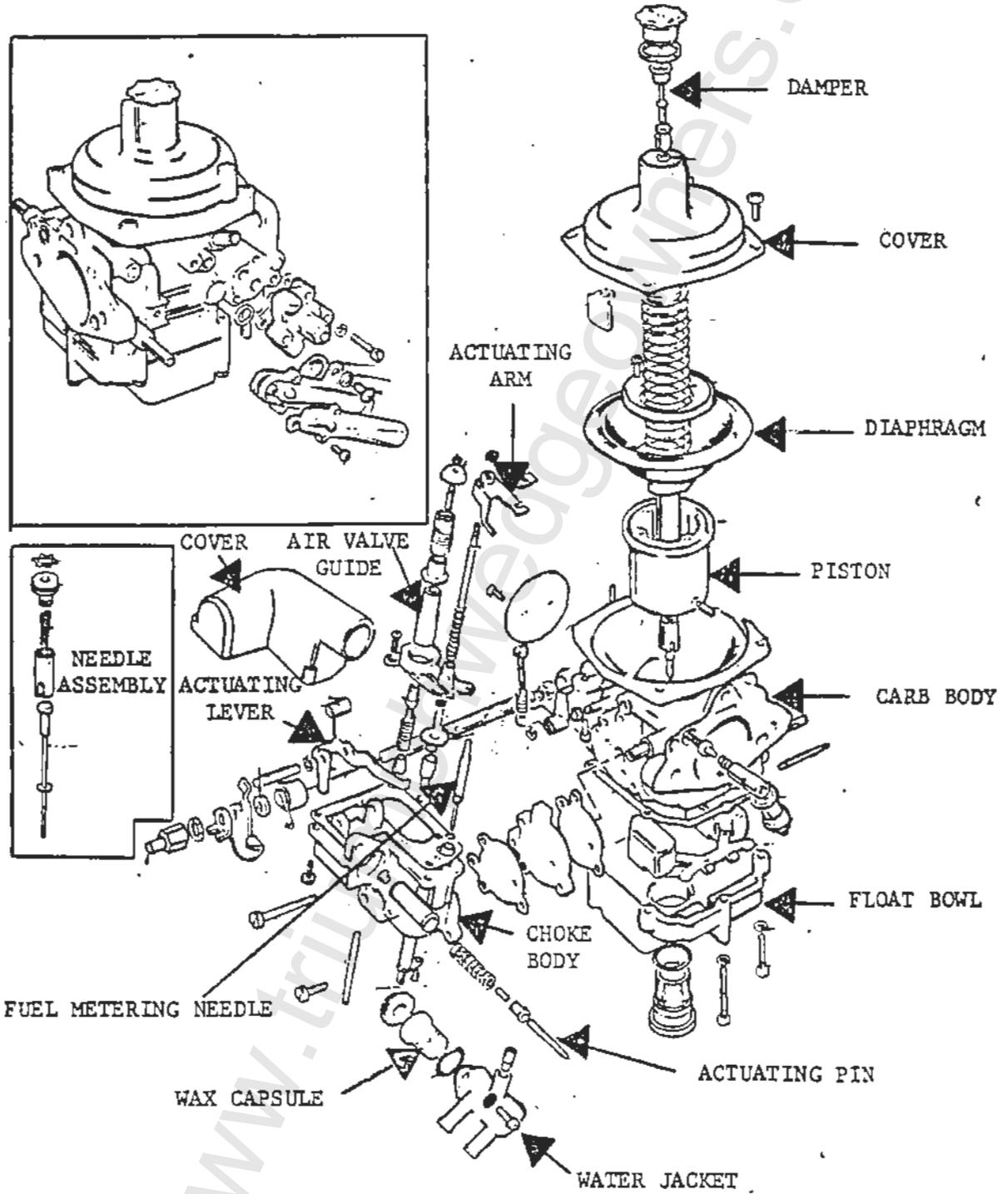
VENT VALVE



WATER INLET & OUTLET

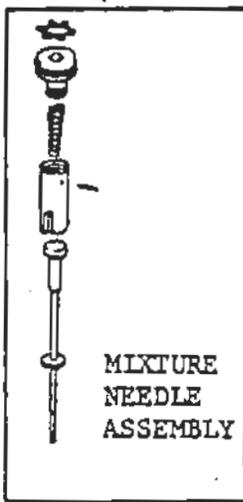
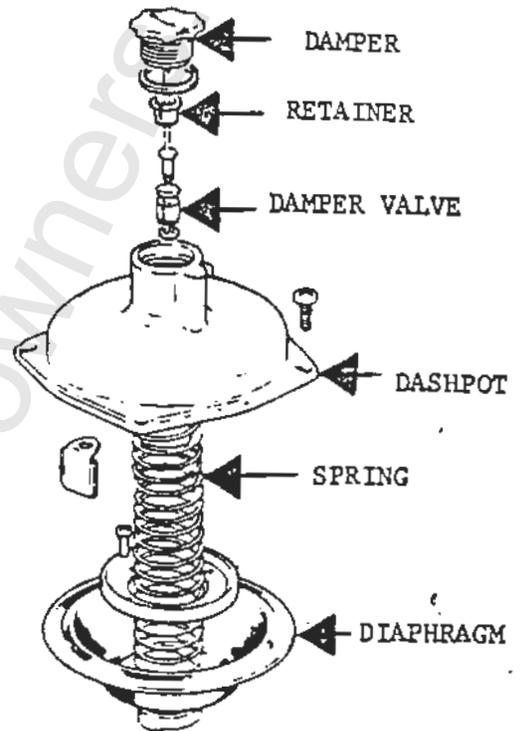
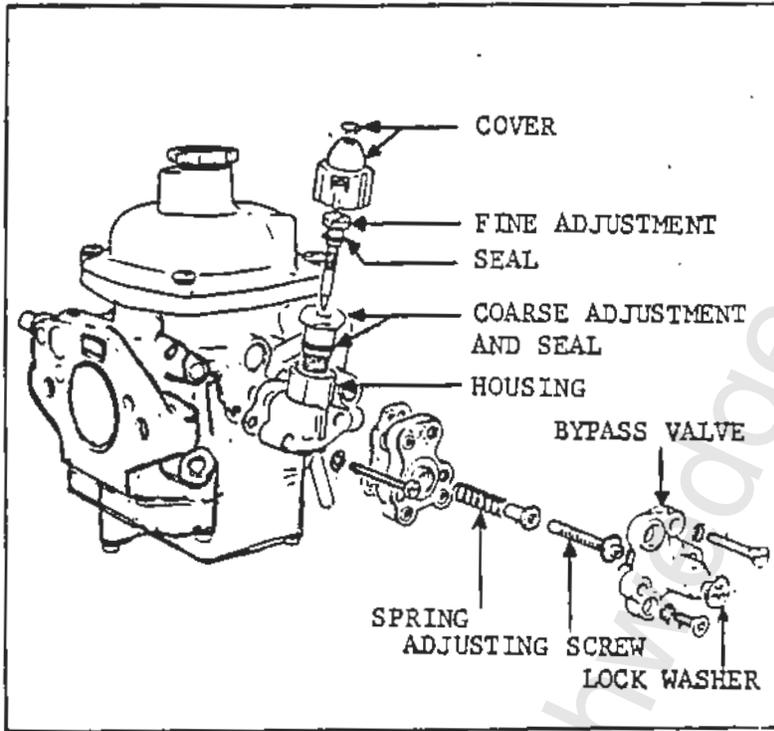
CD FEVX 175 CARBURETTER

EXPLODED VIEW

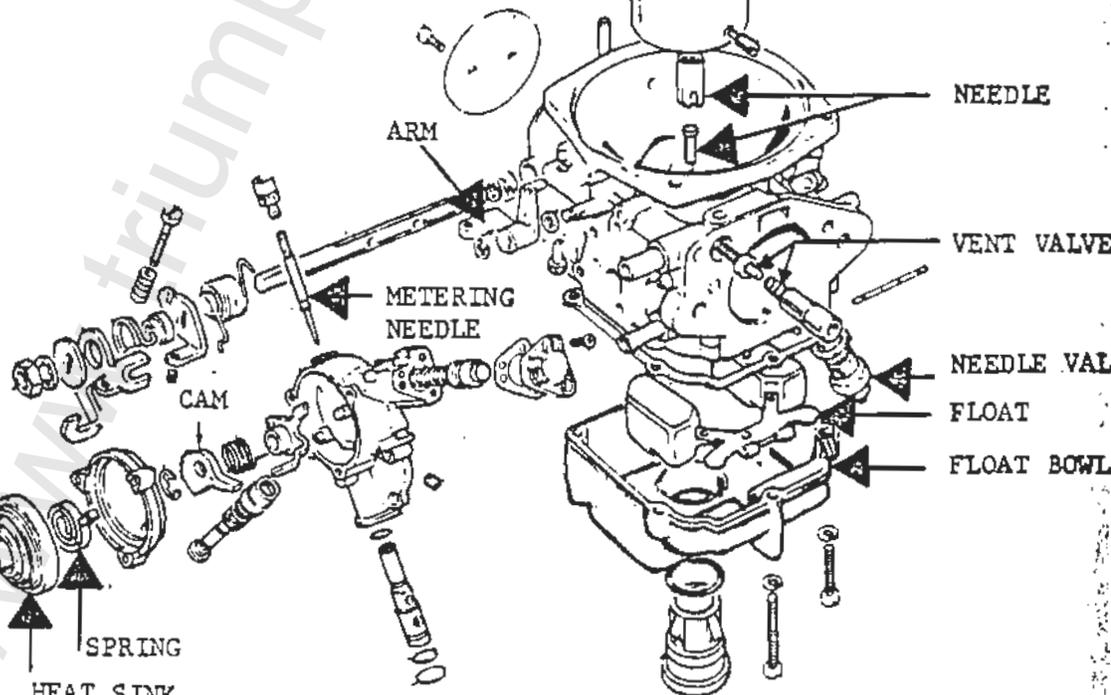
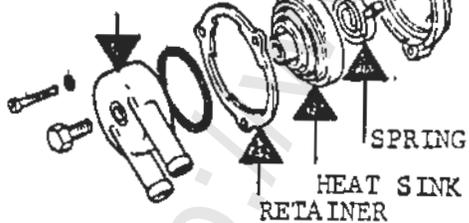


CD FEVX 175 CARBURETOR

EXPLODED VIEW  
TYPICAL SPECIFICATION  
IDLE SLOW RUN CIRCUIT  
AUTOMATIC CHOKE



WATER JACKET



CD4VT CARBURETOR

#### ITEMS THAT MUST NOT BE CHANGED IN SERVICE

1. The jet assembly
2. The piston (air valve)
3. The depression chamber cover
4. The type of Metering Needle (except if instructed for High Altitude operation)

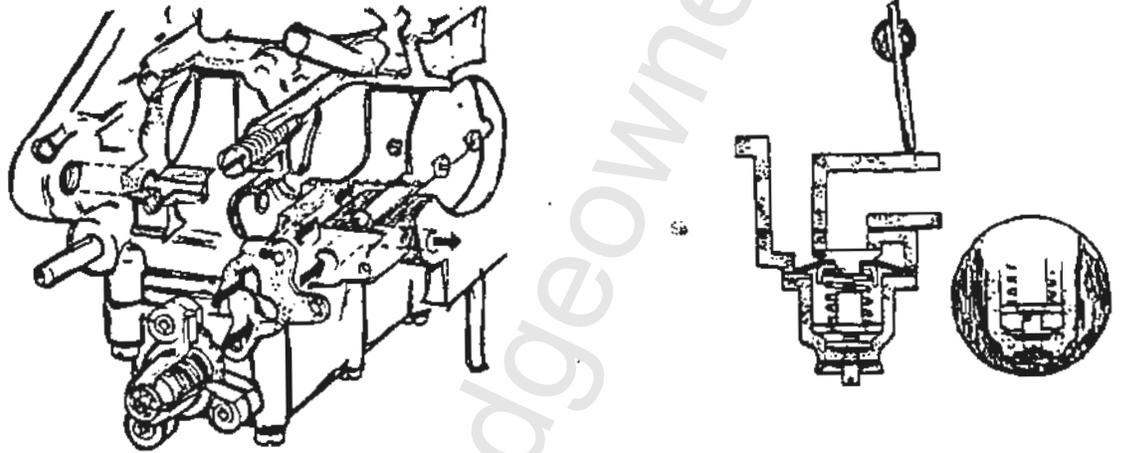
If any of the above items require changing, the sub-assemblies or the complete carburetor must be renewed. In the case of the metering needle, it is permissible to replace the needle providing the procedure for its installation is carefully followed.

#### BYPASS VALVE ADJUSTMENT (WHERE APPLICABLE)

1. Bring engine to normal operating temperature.
2. Remove vacuum pipe from distributor and plug.
3. If bypass valve is floating, the engine speed will rise abruptly to 2000-2500 r.p.m.
4. If the valve is operating correctly, the engine r.p.m. will rise to 1300 r.p.m.
5. \*If adjustment is necessary, screw bypass valve clockwise until engine speed increases abruptly to 2000-2500 r.p.m. or the floating condition. Turn the screw counterclockwise until the r.p.m. just returns to 1300 r.p.m.
6. Depress throttle and release. Engine should drop to approximately 1300 r.p.m. Adjust as necessary to achieve this condition.

\* On vehicles equipped with twin carburetors, before any adjustment can be made, one bypass valve must be shut off by turning the adjustment screw fully counterclockwise.

7. Turn the adjuster screw a further half turn counterclockwise. Reconnect the vacuum pipe.



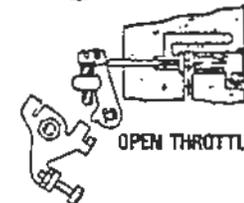
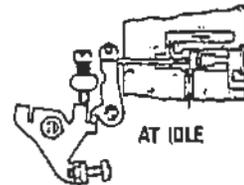
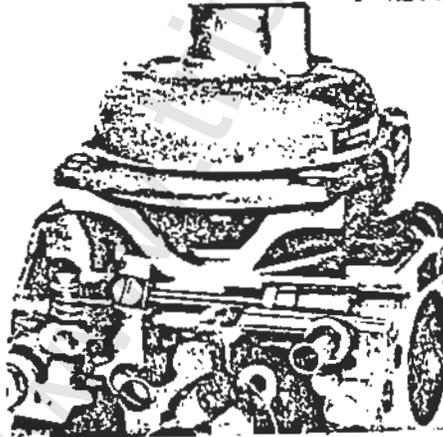
#### VENT VALVE ADJUSTMENT

NOTE: It is most important that the vent valve is correctly set on each carburetor otherwise the operation of the anti-run-on valve may be affected.

1. Before any adjustment of the vent valves takes place, it is essential that the engine idle speed is as specified.
2. Stop the engine and remove the existing vent valve tubing from the carburetor(s).
3. Attach a separate piece of tubing to the vent valve tube on the body of the carburetor.
4. Blow through the tube and at the same time operate the lever operating the vent valve on the side of the carburetor.
5. By operating the lever, a sudden restriction can be felt while blowing down the tube. This will allow the mechanic to 'feel' the valve oper-

ating.

6. Release the lever and allow the mechanism to return to the condition when at engine idle.
7. Blow through the tube again and if no restriction is apparent, the vent valve is in a satisfactory position. If, however, a restriction is felt, turn the adjustment screw counterclockwise until the restriction just disappears. The valve is now correctly set.



Certain vehicles require that the mixture needle be changed when the vehicle is operated at high altitude.

#### PROCEDURE

1. Remove damper and dashpot.
2. Remove air valve complete with diaphragm and mixture needle.
3. Loosen mixture needle fixing screw.
4. Utilizing the mixture needle special adjusting tool, remove the mixture needle by turning the inner tool counterclockwise. Fit the high altitude needle by turning the inner tool clockwise until the needle shoulder is flush with air valve base. Tighten lock screw.
5. Reassemble components to carburetor and adjust the mixture by moving the mixture needle only, until the specified CO reading is obtained.
6. For more detailed instructions on tuning, see the tune-up instructions.

#### TUNING

##### IDLE ADJUSTMENT

1. Remove air cleaner.
2. Ensure choke is off and fast idle cam is not in contact with adjustment screw.
3. Bring engine to normal operating temperature.
4. Disconnect interconnecting links (twin carburetor applications).
5. Check carburetor air flow is equal. Adjust idle screws as necessary.
6. Tighten interconnecting link - clamp screw. Recheck air flow at each carburetor.
7. Set idle to specification ensuring equal air flow at each carburetor.

8. Refit air cleaner.
9. Disconnect air pump outlet hose from pump plug hose. (Do not restrict pump flow.) \* On MGB, disconnect carburetor vent line.
10. Using approved infrared analyser, insert probe into tail pipe as far as possible.
11. Check CO reading against that listed on vehicle emission control decal.

#### FINE MIXTURE ADJUSTMENT

12. If not with specifications, adjust fine mixture adjustment trim screw, (clockwise - richens).

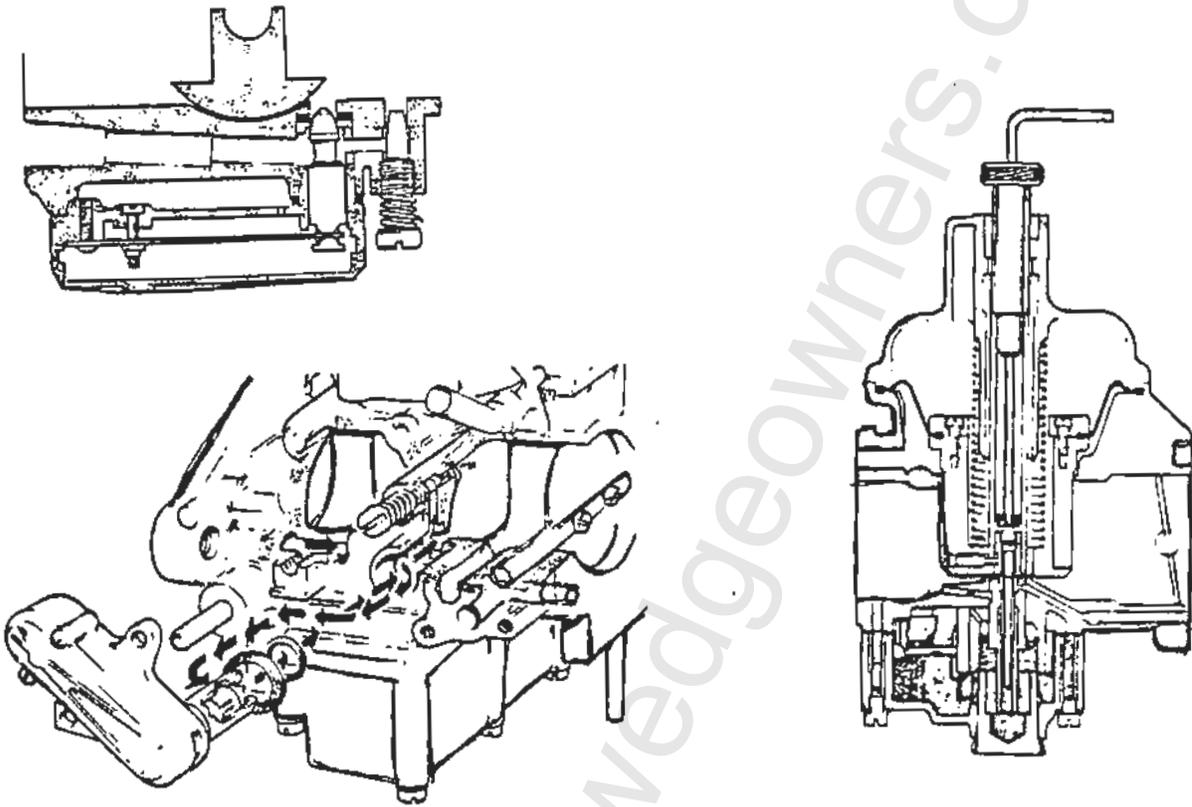
#### MIXTURE NEEDLE ADJUSTMENT

13. If still not within specifications, adjust mixture needle with special tool. (On twin carburetor applications turn each needle an equal amount.) - Clockwise to richen, counterclockwise to lean.
14. Top up dampers and hold engine r.p.m. at 2000 r.p.m. for one minute.
15. Recheck CO readings.

NOTE: Do not allow engine to idle for longer than three minutes without clearing out the system by holding throttle at 2000 r.p.m. for one minute.

All CO readings should be taken from the tail pipe except Jaguar V12's where sampling points are provided in the air injection rails. Also the Air Injection System must be disconnected whenever CO readings are being taken.

At Port of Entry locations, California specification vehicles must be checked with the Air Injection System functioning. Dealer testing will still be performed as described above.



#### FAST IDLE ADJUSTMENT (MANUAL CHOKE)

1. Ensure choke cable is correctly adjusted.
2. Pull choke cable out 1/4" to engage fast idle cams in ball locators.
3. Adjust fast idle screws to specification. (Ensure equal air flow through each carburetor, twin carburetor applications.)
4. Push choke control off.

## AUTOMATIC CHOKE (BI-METALLIC SPRING TYPE)

### CHECK AND ADJUST

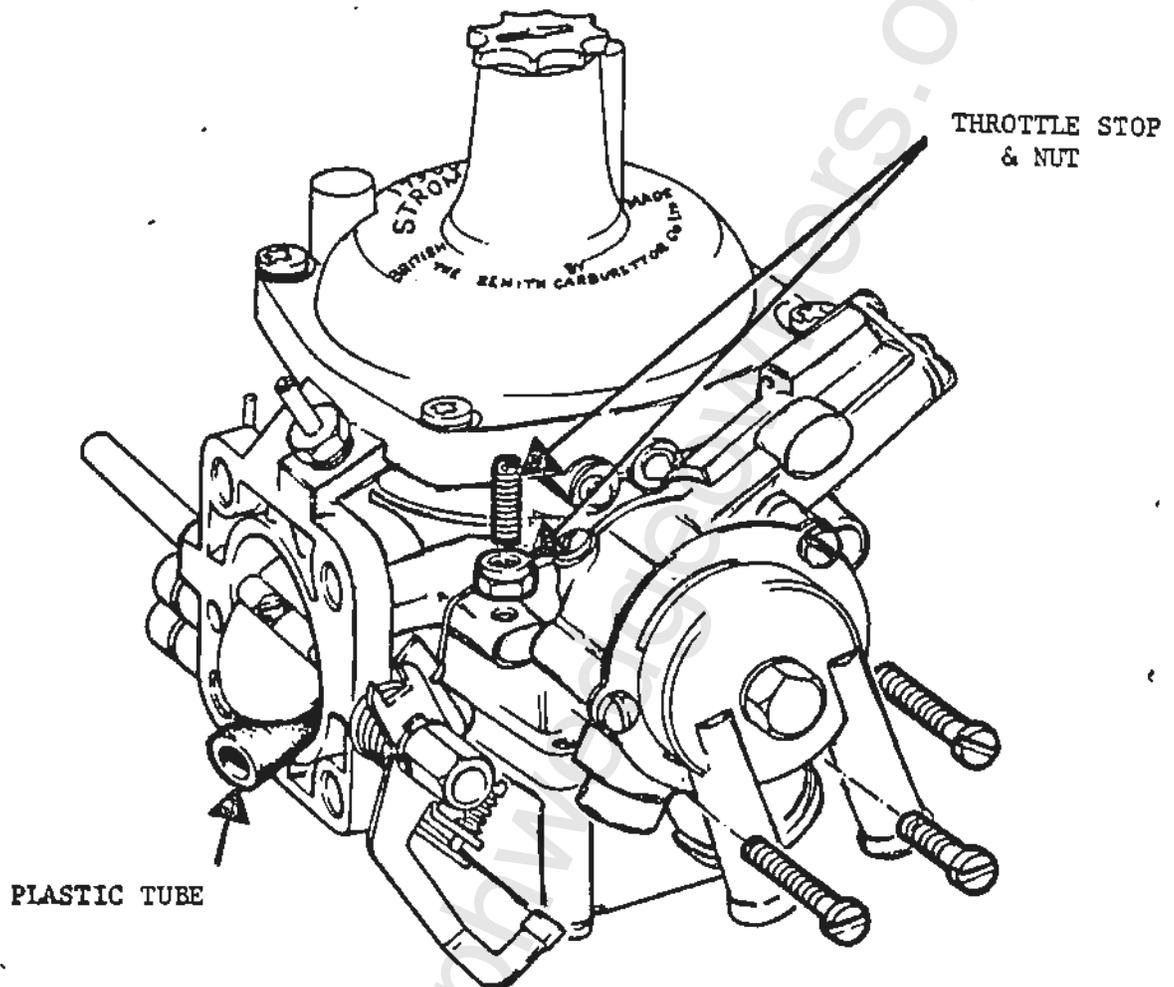
NOTE: Prior to removal of a suspect choke unit, the following checks should be carried out on the vehicle:

1. Check alignment of datum mark on side of heat mass with datum mark on choke unit body.
2. Open throttle and check that head of fast idle pin is flush with outer edge of guard.
3. Check three screws securing choke unit to carburetor body for tightness 40 - 45 lb/in.

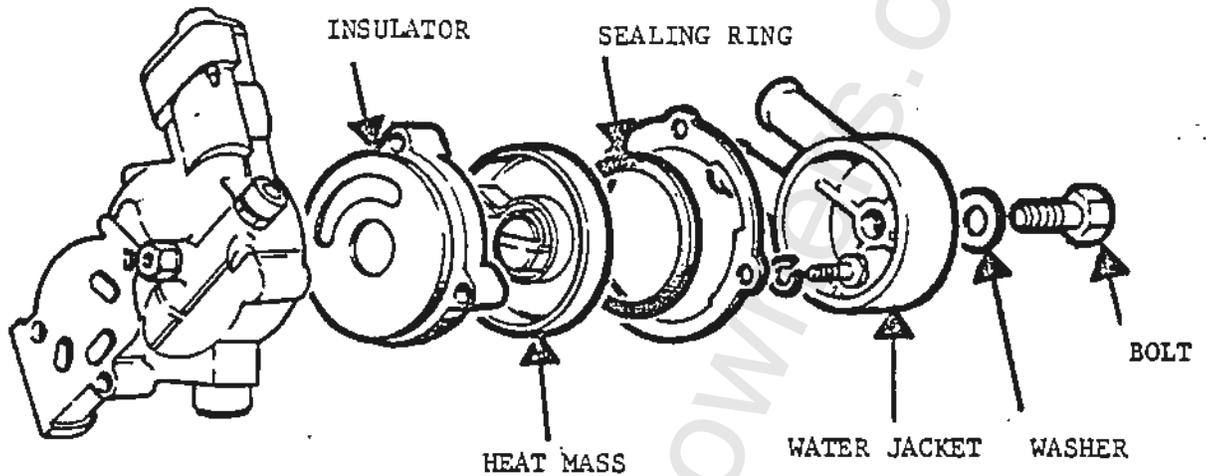
### REMOVE AND REFIT

#### Removing

1. Remove carburetor(s) from engine.
2. Open throttle and prevent from closing with suitable temporary stop (piece of plastic tube or soft wood) in throttle bore.
3. Remove three screws securing choke unit to carburetor body. Remove choke unit and gasket - discard gasket.
4. Remove throttle stop screw and locknut.



5. Clean face of carburetor to which choke unit is fitted.
6. Remove central bolt, washer, water jacket and sealing ring from choke unit.
7. Remove three screws and washers securing clamp ring to choke unit - lift off clamp ring.
8. Carefully remove finned aluminum heat mass ensuring temperature sensitive coil attached is not strained.
9. Remove heat insulator.

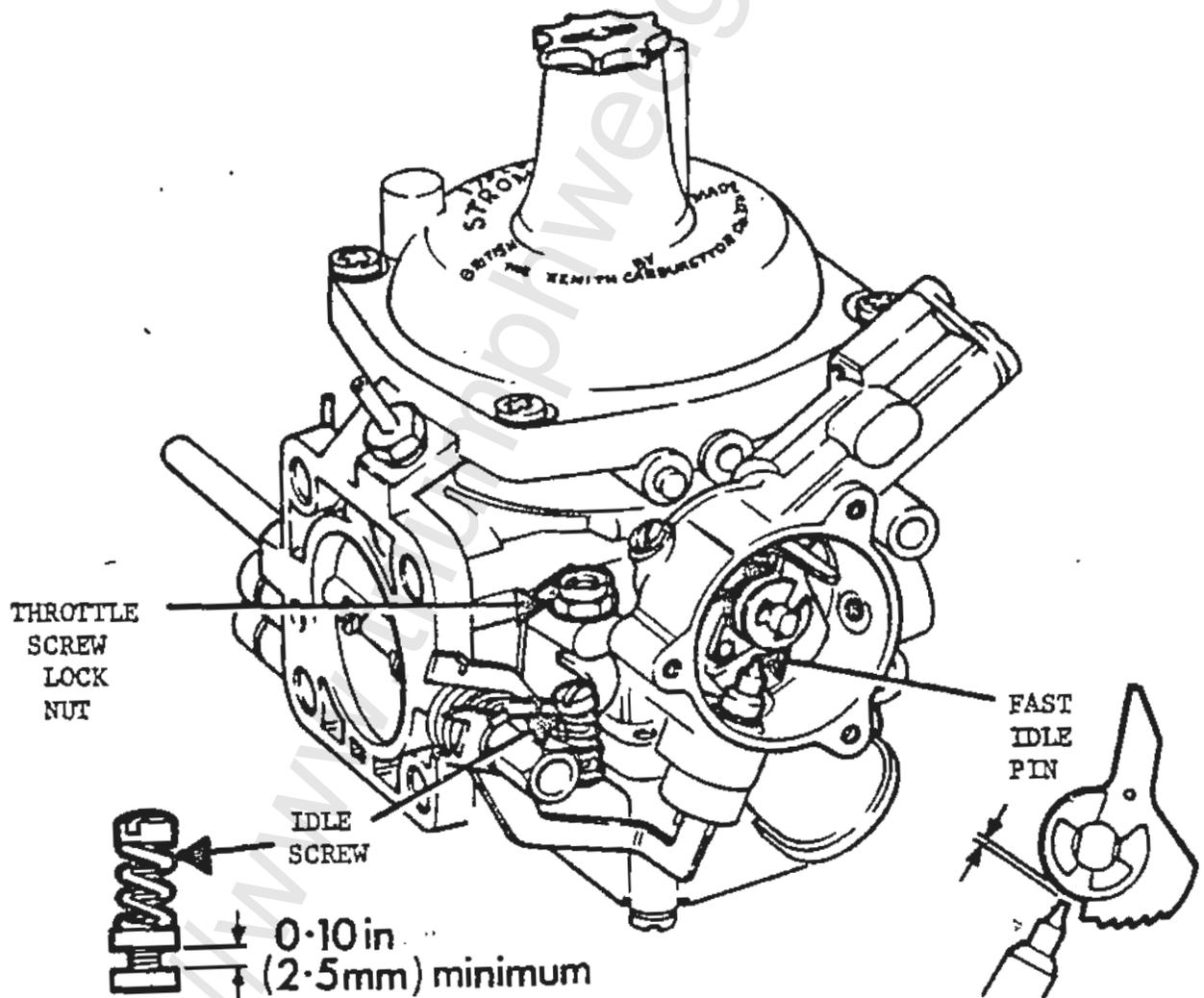


### Refitting

10. Fit new gasket to carburetor. Do not use sealing compound.
11. Fit choke unit to carburetor tightening the three screws progressively and evenly to a torque of 40 - 45 lb/in.
12. Fit throttle stop screw and locknut.
13. Check clearance between fast idle pin and base circle of cam is as follows:  
  
Open throttle and remove temporary stop. Allow throttle to close normally. Screw down idle speed screw until the clearance between the lugs is 0.10 in. minimum. Lightly rotate thermostat lever with finger in an anticlockwise direction to the fully 'off' position.
14. If necessary, adjust throttle stop screw until correct clearance is obtained. Using the nut, lock the throttle stop screw securely and recheck the clearance as detailed above.
15. Replace heat insulator with thermostat arm protruding through slot provided.

16. Replace finned aluminum heat mass ensuring proper engagement of thermostat arm with rectangular loop of temperature sensitive coil. To check engagement, rotate heat mass  $30^{\circ}$  to  $40^{\circ}$  only in both directions. In each case the unit should spring back to its original position.

**CAUTION:** On no account should the heat mass be rotated more than  $30^{\circ}$  to  $40^{\circ}$  as the coil could be permanently damaged.



17. Replace clamp ring and three screws and washers. Do not tighten.
18. Rotate heat mass in anticlockwise direction until index mark on outer edge is aligned with datum mark on body of choke unit.
19. Hold heat mass with index mark correctly aligned and tighten three screws securing clamp plate to a torque of 8 - 10 lb/in.
20. Replace sealing ring and water jacket ensuring that water pipe connections are correctly positioned.
21. Replace central bolt and aluminum washer and tighten to a torque of 65 - 75 lb/in.
22. Reset idle speed screw.
23. Repeat on other carburetor if fitted.
24. Refit carburetor(s) to engine as detailed in Workshop Manual.

