

**LOOK
LISTEN
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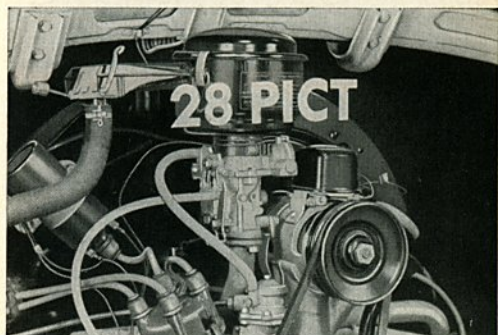


28 PICT CARBURETOR
VW Passenger Car

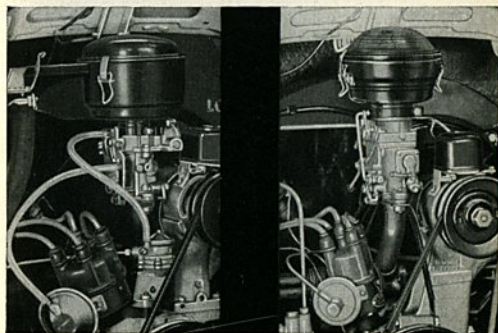
Slide Series № 11

28 P I C T C A R B U R E T O R

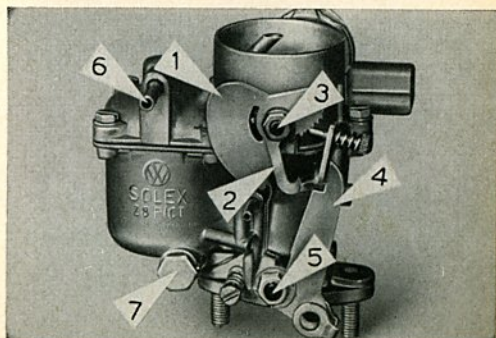
11/1 Today we are going to deal with the new 28 PICT carburetor. You will learn about the various parts, particularly the automatic choke, the function and adjustment of the carburetor and some tips for repair and installation. It is a down-draft carburetor with an intake pipe diameter of 28 mm and is used on the 40 bhp engine in the Passenger Car and Transporter.

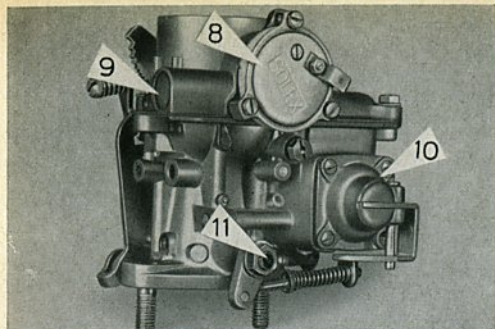


11/2 Here you see the new carburetor, on the left side, compared with 28 PCI model which was used previously. The main differences are the automatic choke, which works without the choke control cable, and the modified vacuum connection for the spark advance. A further new feature inside the carburetor is the power fuel system.

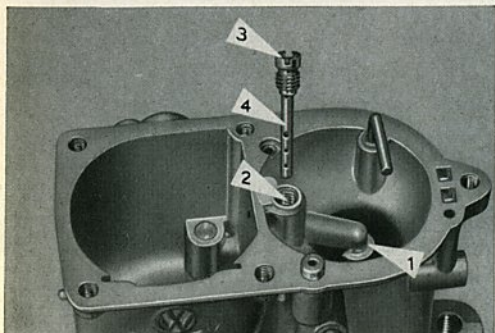


11/3 This is the left side of the carburetor. The parts marked are: 1 the fast idle cam which is shaped as a balance weight and 2 the operating lever which are both located on the choke valve shaft 3. Underneath 3 you can see the toothed edge of the fast idle cam in which the idle adjusting screw engages. The throttle valve lever 4 is located on the throttle valve shaft 5. The fuel flows through the inlet pipe 6 into the float bowl below. The main jet is screwed into main jet carrier 7, to the right of which you see the volume control screw.

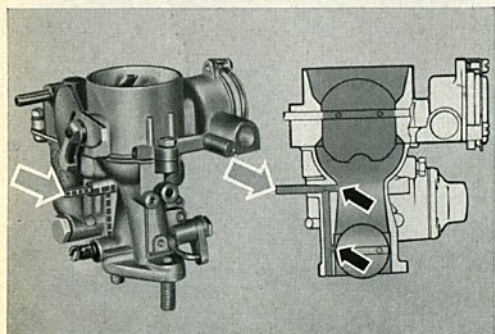




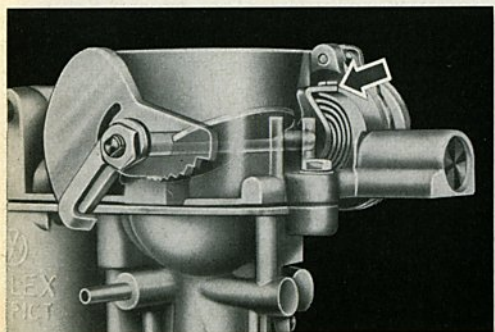
11/4 The right side shows: 8 the ceramic plate with cable connector secured to the upper part of the carburetor body by means of a retaining ring. Below it is the pilot jet. The vacuum piston works in the small cylinder 9 cast onto the side of the ceramic plate housing. The accelerator pump 10 is connected to the throttle valve shaft 11 by a rod.



11/5 Here is the lower part of the carburetor body. On the left is the float chamber and on the right the venturi which is cast into the housing and cannot be replaced. In the center of the induction passage is the discharge arm 1 which is connected to the vertical drilling 2. The air correction jet 3 is screwed into this drilling and carries the pressed-in emulsion tube 4.

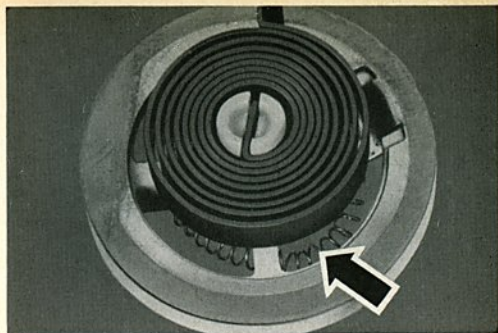


11/6 We have already mentioned the vacuum connection for the spark advance mechanism. Here you see the connection tube, indicated by the light shaded arrows. The vacuum is taken from the points shown by the black arrows in the cut-away view. The upper point is at the narrowest part of the venturi and the lower point is in the area where the throttle valve seats when closed.

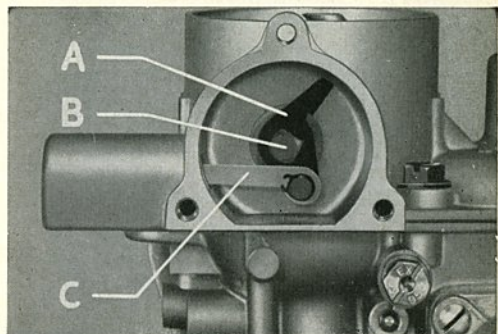


11/7 This sectional view shows parts of the automatic choke. The disc in the center is the choke valve which is mounted off center in the shaft so that the two parts are of unequal sizes. On the left is the operating lever which is fixed to the choke valve shaft and the freely pivoted fast idle cam. The lever on the right near the arrow is also fixed to the choke valve shaft. The arrow indicates the contact between this lever and the bi-metal spring which is bent to form a hook at the end.

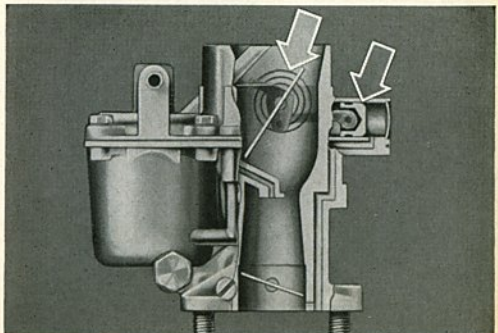
11/8 Here is the ceramic plate with the bi-metal spring and, behind it, the heater element which is indicated by the arrow. When heated, the bi-metal spring starts to curl up so that the hooked end moves in an anti-clockwise direction. The fast idle cam and the out of balance choke valve can then turn the choke valve shaft in the opening direction. When cold the spring tends to uncurl and the hook moves clockwise. The closing power of the spring increases and the movement is transferred to the choke valve shaft to close the choke valve.

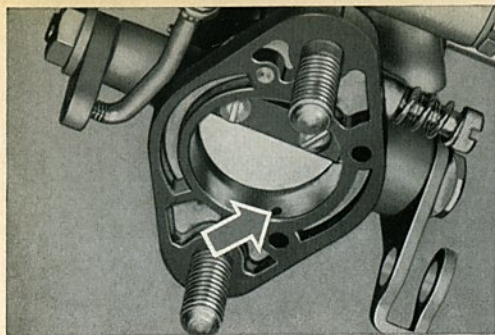


11/9 Here you see the bi-metal housing on the upper part of the carburetor. A is the lever which transfers the movement of the bi-metal spring to the choke valve shaft B. This lever has a small arm pointing downwards which is connected by the piston rod C to the vacuum piston in the cylinder on the left.

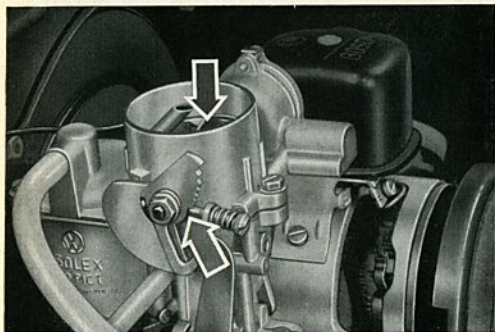


11/10 When the vacuum piston — indicated by the dark arrow on the right — slides outwards, it opens the choke valve against the tension of the bi-metal spring. A drilling in the carburetor body leads from the vacuum cylinder to below the throttle valve. The other arrow shows the position of the choke valve just before the piston reaches the outer end of its stroke. Behind the choke valve you can see the piston rod, the lever on the choke valve shaft and the bi-metal spring.

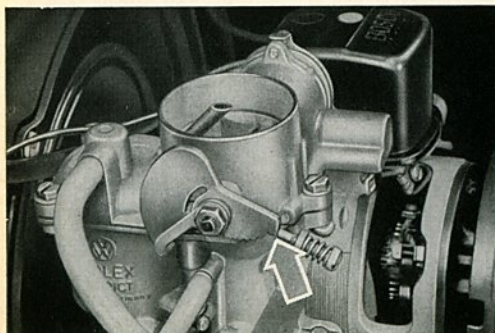




11/11 Here is a view of the throttle valve as seen from underneath the carburetor. The arrow points to the end of the drilling which leads from here to the cylinder for the vacuum piston. As the engine speed increases the growing demand for air creates a depression or partial vacuum below the throttle valve which enables the piston to move outwards. This ensures that the choke valve is opened against the bi-metal spring tension and the mixture weakened appropriately as the engine speed increases.

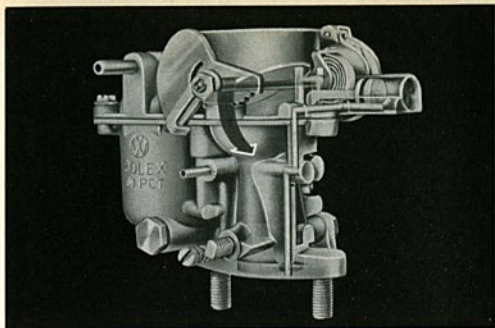


11/12 You are now familiar with the most important parts of the new carburetor and we shall go on to see how these parts work. When the engine is switched off after a run, the operating lever and fast idle cam are in the position shown here. The light arrow shows the idle adjusting screw engaged in the lowest step of the fast idle cam. The choke valve, indicated by the dark arrow, is fully open. The engine and the bi-metal spring then slowly cool down to the air temperature. The colder it is, the stronger the closing effort of the spring will be. It tries to close the choke valve but cannot do so because the idle adjusting screw is holding it open.

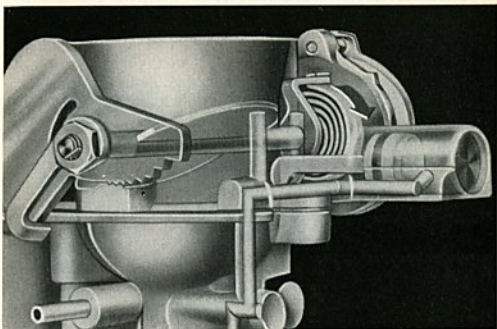


11/13 The Instruction Manual states: When starting a cold engine at temperatures below 0° C, the accelerator pedal must be fully depressed once and then released. Here you see the reason for this statement. The idle adjusting screw has released the fast idle cam, the bi-metal spring has closed the choke and the operating lever has turned to the position shown. The arrow points to the idle adjusting screw which is now resting on the highest step on the cam. The depressing of the accelerator is, therefore, very important as it enables the choke to close and give the cold engine the necessary rich mixture.

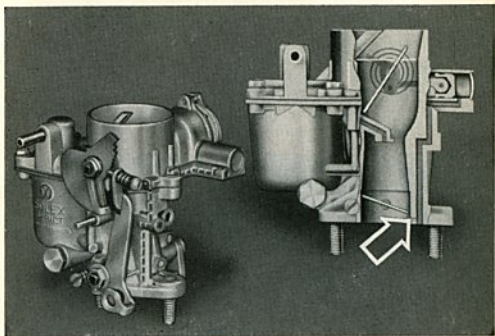
11/14 The air required for the mixture when starting is drawn in past the closed choke valve. On the carburetors used previously a poppet valve was fitted in the choke valve for this purpose. On this carburetor the choke valve flutters under the influence of two opposing forces when the engine is started. The first force is the vacuum in the carburetor and it tends to open the choke valve in the direction of the arrow.



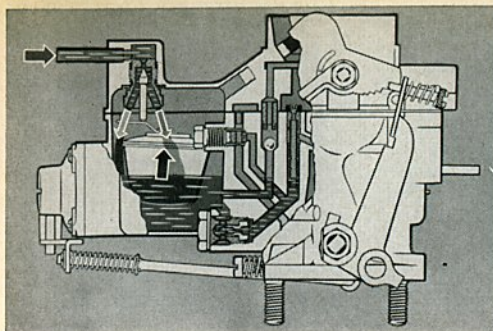
11/15 The other force is the tension of the bi-metal spring which tends to close the choke valve as shown by the arrow. This fluttering motion only takes place in the first few seconds when starting a cold engine. As soon as the ignition is switched on, the heater element also receives current and starts to warm up. With the increasing heat, the bi-metal spring loses tension and the choke valve commences to open. The weight of the off center choke valve and the fast idle cam also help in the opening direction. As long as the engine is cold, however, the choke remains closed enough to give an adequately rich mixture.



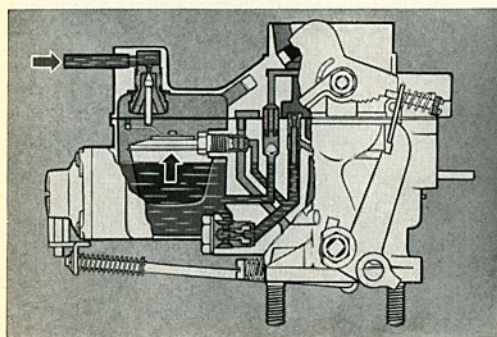
11/16 It is also equally important that the mixture is weakened as the engine speed increases. To do this the choke has to be opened. When the vehicle is driven off as soon as the engine starts, the bi-metal spring has not had sufficient time to warm up and open the choke very far. Under these conditions the mixture would be too rich. The rising engine speed creates a high vacuum below the throttle valve at the point indicated by the arrow and this enables the vacuum piston to be moved outwards. The drilling for the vacuum is shown by the dotted line on the carburetor on the left. The movement of the piston is



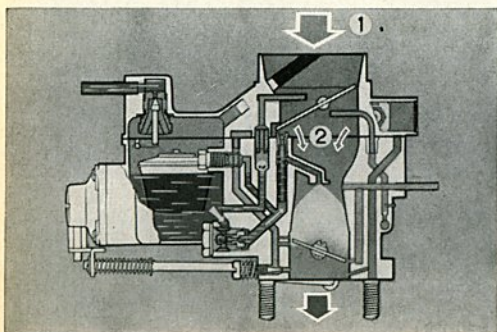
transmitted to the choke valve shaft by the piston rod and the lever. The choke opens and increases the proportion of air in the mixture so that it automatically becomes weaker.



11/17 The fuel — show by the darker shade — comes from the fuel pump, enters the carburetor on the left as shown and flows through the float needle valve into the float chamber. When the fuel level is low, the float needle is in the lower position and the valve is open. The black arrow indicates the upward movement of the float.

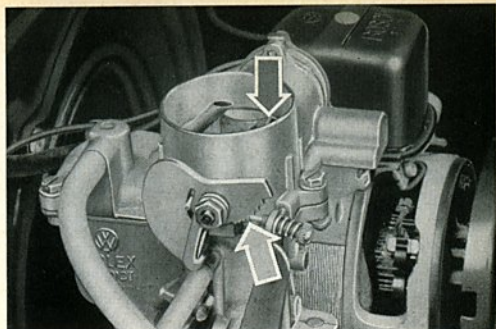


11/18 When the fuel reaches a certain level, the float closes the needle valve and the delivery of fuel stops. The small arm on the float forms a lever to increase the closing pressure. The fuel then flows through the main jet and into the other passages. The drilling on the right leads through the emulsion tube to the discharge arm. The one above it, with the ball valve, belongs to the power fuel system and the one on the left to the idling system.

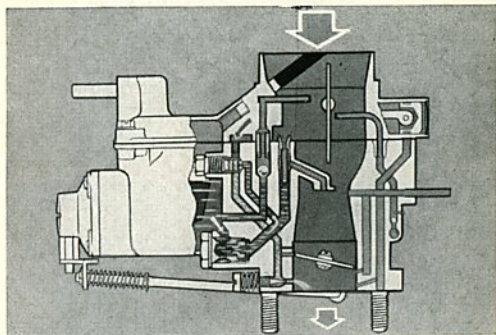


11/19 We now return to the starting procedure. The air is drawn in as shown by the arrows at 1 and 2 and accelerated below the choke valve by the venturi. This creates a depression or vacuum. The fuel flows through the main jet to the emulsion tube and is drawn out of the discharge arm by the induced air to form the mixture.

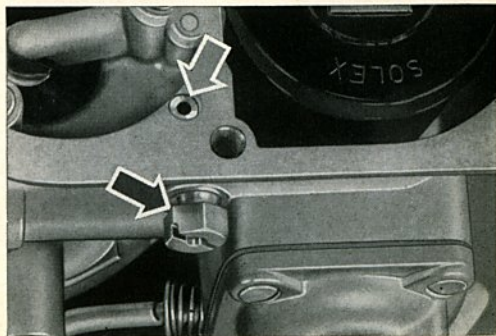
11/20 As long as the choke is not fully open the engine runs at an increased idling speed. This is an advantage as the engine does not run smoothly when cold and could stall when the accelerator pedal is released. The idling speed drops as the opening angle of the choke valve increases. The operating lever moves down at the same time and the fast idle cam follows it when the accelerator pedal is depressed. When the pedal is released, the idle adjusting screw engages a lower step on the cam as shown by the light arrow. The dark arrow points to the half open choke valve. After about 3 or 4 minutes, the hook-shaped end of the bi-metal spring has moved so far under the influence of the warmth from the heater element that the choke valve shaft is free and the choke fully open.

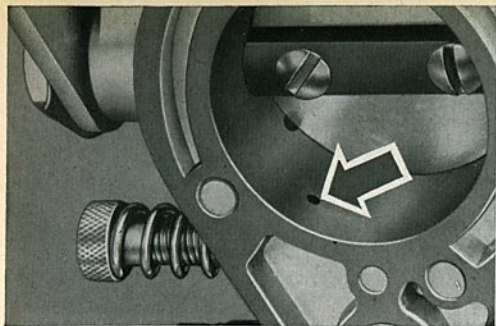


11/21 When the throttle is only slightly open the speed of the induced air is reduced and the vacuum in the venturi is too low to draw fuel out of the discharge arm. The carburetor then automatically changes over to the idling system. The fuel flows through the main jet into the inclined passage, and then to the left as shown by the white arrow, up to the pilot jet. Air is drawn in through the drilling above this jet as shown by the small arrow. The drilling from the jet goes down past the volume control screw into the induction tube below the throttle valve. The high vacuum existing here draws fuel and air through the pilot jet into the idling passage.

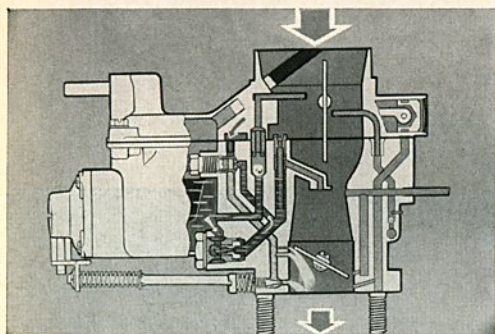


11/22 Here we have the lower part of the carburetor body. In the upper left corner you will recognise the discharge arm, to the right the float and below this the accelerator pump. The light arrow points to the pilot air drilling and the dark arrow to the pilot jet. This is where the air and fuel are combined to produce the idling mixture —

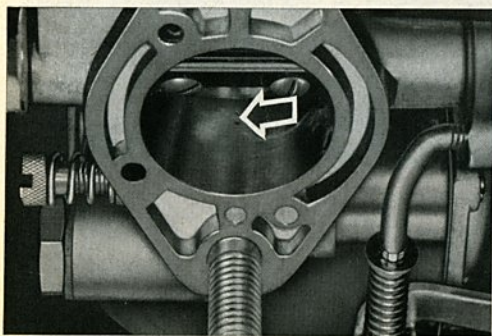




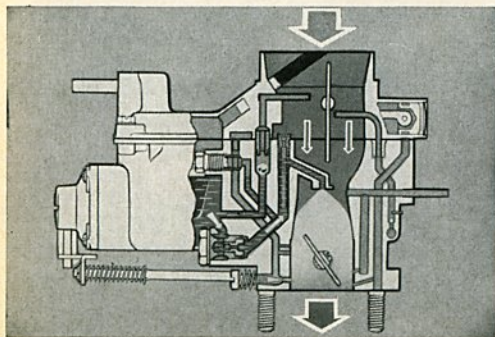
11/23 which comes out through the idle port — indicated by the arrow — below the throttle valve. On the left is the volume control screw and spring. This screw is turned to control the amount of idling mixture.



11/24 To increase the engine speed, more fuel is required. A slight pressure on the accelerator opens the throttle a little wider. The transfer from idling to normal running is taken care of by two small drillings known as by-pass ports. They are located to the left of the throttle valve and connected to the idling passage. They provide the engine with an additional supply of idling mixture.

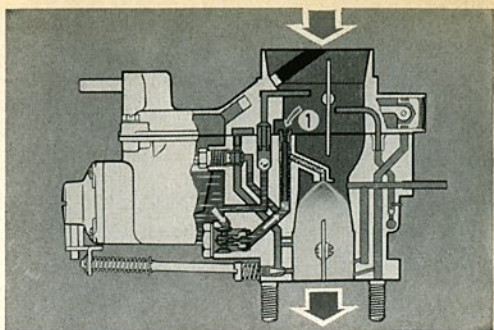


11/25 The arrow is pointing to the by-pass ports which are about level with the edge of the throttle valve when it is closed. The idle port is on the left slightly more to the front. Take care that these small holes are always clean and undamaged.

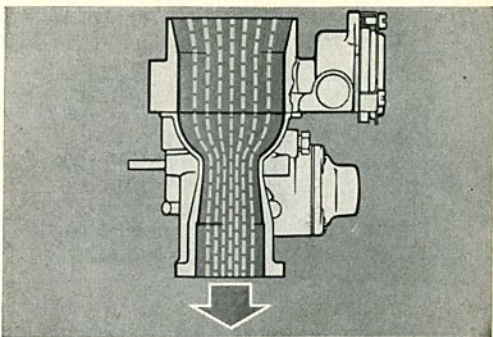


11/26 As the engine speed increases, the carburetor operation becomes normal. The fuel flows through the main jet up to the emulsion tube on the right. The fuel level is the same in the float chamber and the emulsion tube. The speed of the induced air now draws the fuel out of the discharge arm and the two combine to provide the mixture.

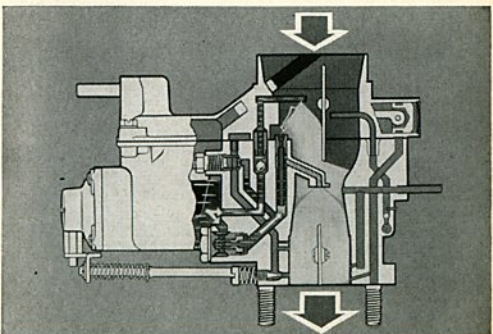
11/27 As the engine speed increases further the engine needs more air and fuel and the result is that the fuel level in the emulsion tube drops. The air correction jet now comes into operation and admits an extra supply of air as shown by the arrow 1. This air mixes with the fuel coming from the main jet through the small holes in the emulsion tube. This ensures that the composition of the fuel air mixture remains fairly constant over the whole engine speed range. The choke and throttle valves are now fully open.

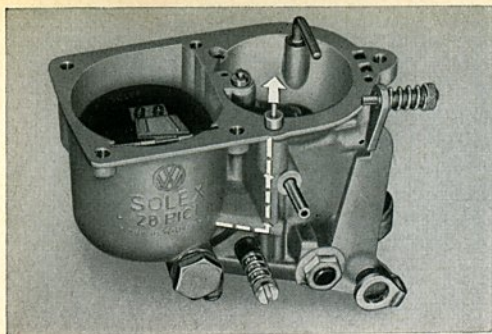


11/28 Just a few words on the principles and operations of the venturi. As you know, every induction stroke of the engine creates a depression in the intake manifold. This depression, which varies in extent according to engine speed, causes air to be drawn through the carburetor. The internal diameter of the venturi is reduced considerably in the center, as shown in the picture, and this speeds up the air as it enters. This increased air speed is essential in order to draw the fuel out of the emulsion tube and through the discharge arm.

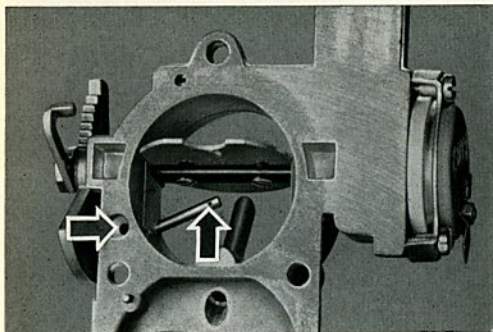


11/29 The power fuel system on the 28 PICT carburetor is a new innovation which comes into operation only under high speed and full load conditions. The discharge opening is in an area of reduced depression and is connected by a tube to the center drilling which is fitted with a ball valve. At high speeds and full loads the depression around the discharge opening increases to such an extent that the ball is lifted. The fuel is then free and flows directly from the float chamber into the center drilling as shown by the white arrow. The fuel supply from the emulsion tube remains the same as for normal operation.

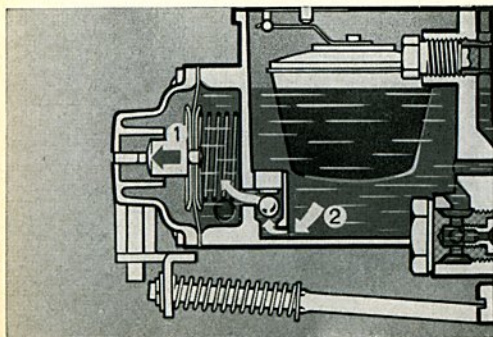




11/30 The dotted line shows the path of the fuel from the float chamber up through the carburetor housing. The ball valve is in the upper half of the vertical drilling. The carburetors for the Karmann Ghia and Transporter engines are not fitted with the ball valve because the suspended type oil bath air cleaner alters the induction conditions at the choke valve.

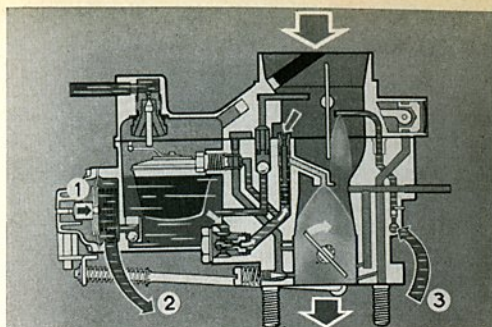


11/31 This is a picture of the upper part of the carburetor body as seen from underneath. The left arrow points to the drilling for the power fuel system which leads up to the right angled tube. The arrow in the center shows the discharge hole.

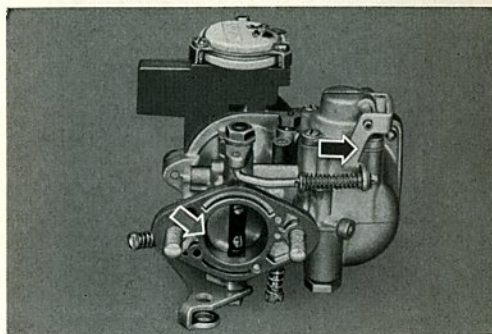


11/32 The accelerator pump works in the same way as on the 28 PCI carburetor. The pump is screwed to a housing near the float chamber. The suction stroke takes place just before the throttle valve closes as the pump spring forces the diaphragm outwards in the direction of arrow 1. This draws fuel via the ball valve into the pump chamber as shown by the arrow at 2. On the delivery stroke the fuel is pumped out of the chamber via the dark colored drilling shown below the pump spring.

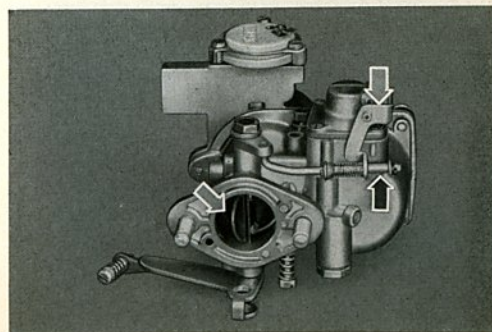
11/33 The delivery stroke commences when the closed throttle is opened. The diaphragm is pushed inwards by the connecting rod and pump lever as indicated by arrow 1. The ball valve closes the passage to the float chamber and the fuel flows out of the pump chamber as shown by arrow 2 via a horizontal drilling which turns upwards above the throttle valve shaft at the point shown by the curved arrow 3 on the right. Just above this point is a second ball valve which is lifted by the fuel as it passes on to the discharge tube below the choke valve and into the mixing chamber. The additional fuel richens the normal mixture and guarantees rapid acceleration and a smooth transfer.

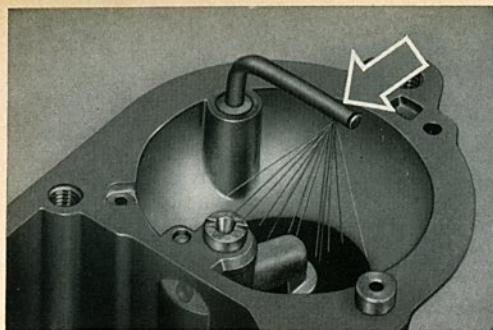


11/34 The accelerator pump enriches the mixture until the throttle valve is opened as far as shown here by the light arrow. The connecting rod is attached to the arm on the throttle valve shaft and is fitted with a spring. The black arrow points to the pump lever. When the throttle is opened the connecting rod is moved towards the accelerator pump and the spring gradually compressed. The spring pressure moves the pump lever and the diaphragm against the tension of the pump spring and the fuel is forced from the pump chamber to the discharge tube.

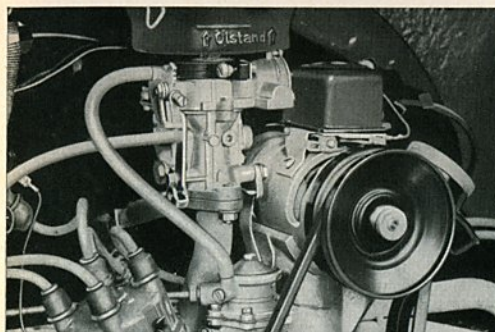


11/35 As the throttle opens further, as shown by the left arrow, the connecting rod slides through the pump lever. The black arrow indicates this movement. The compressed spring holds the pump lever, shown by the third arrow, and the diaphragm in the depressed position. When the throttle is almost closed, the connecting rod releases the pump lever, a new suction stroke takes place and the pump fills with fuel again. It will be seen that the accelerator pump only works in the low and medium speed ranges.



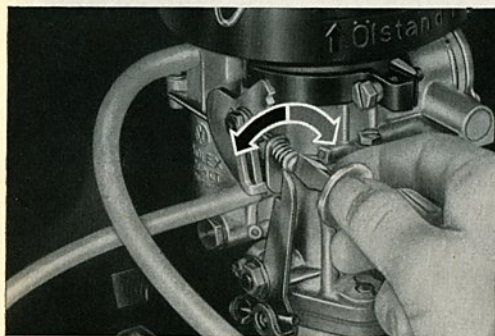


11/36 Here you see the venturi in the lower part of the carburetor with the arrow indicating the discharge tube. The size of the hole is calculated so that the fuel spray continues as long as possible and is directed straight into the mixing chamber.

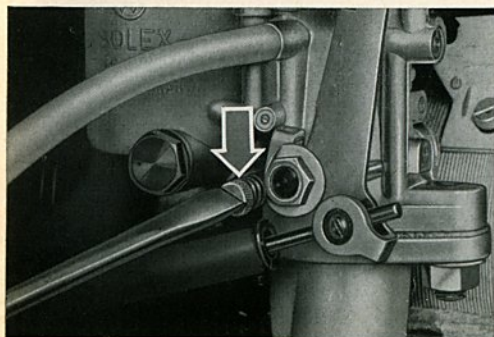


11/37 And now to the idling adjustment.

Correct idling adjustment is of particular importance. If the idling speed is too high or the mixture too rich, the fuel consumption will be affected.



11/38 If the idle adjusting screw is turned to the right, as shown by the right-hand arrow, the speed increases. Turning to the left reduces the speed.



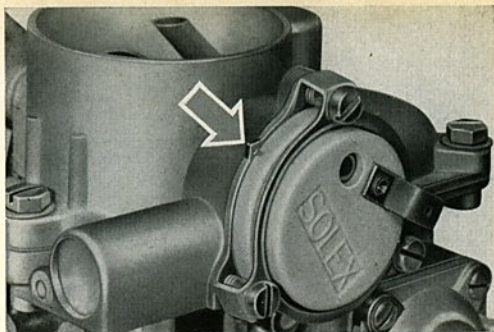
11/39 Now adjust the volume control screw in the normal manner:

Turn the screw slowly to right until the engine speed starts to drop.

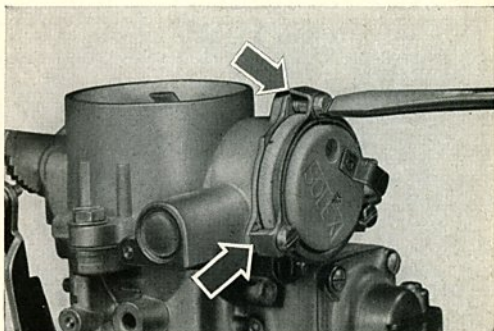
Then turn to the left $\frac{1}{4}$ to $\frac{1}{3}$ of a turn.

If the engine now runs too fast, the idle adjusting screw should be adjusted again. The adjustment is correct if the engine does not stall when the throttle is opened and closed suddenly with the clutch pedal depressed.

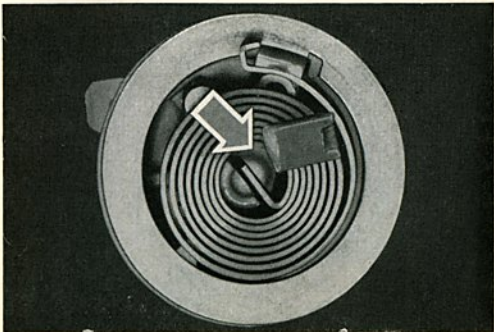
11/40 There is also something to adjust on the ceramic plate of the automatic choke. The arrow points to the marks: A paint mark on the ceramic plate and a small lug on the housing. These marks must always be properly aligned when installing the ceramic plate as otherwise the operation of the bi-metal spring will be influenced.

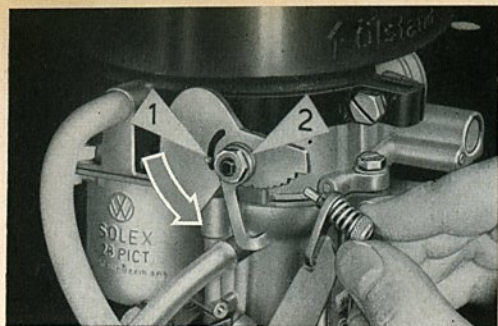


11/41 Here are a few important points: It is essential that the heater element and bi-metal spring of the automatic choke work properly. When installing the ceramic plate and retaining ring, take care that the lugs do not bend when the screws are tightened as shown by the upper arrow. If this happens, the screws are liable to work loose and allow the ceramic plate to turn so that setting of the bi-metal spring is disturbed. Damaged retainer rings should be replaced by the new type with reinforced lugs. As a temporary measure the lugs can be straightened so that they are at right angles to the carburetor body as shown by the lower arrow.

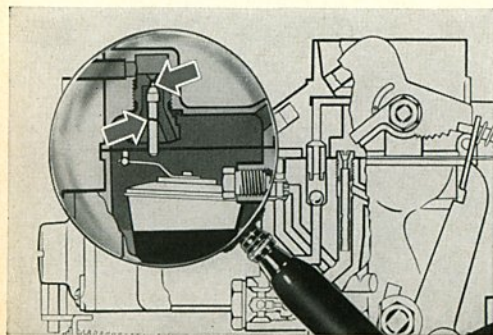


11/42 Here is a ceramic plate with a damaged center boss. The bi-metal spring can move out of its central position and this affects the opening and closing of the choke valve. In this case a new part has to be installed. At the outer edge of the ceramic plate is a copper ring which provides the ground connection between the cable terminal and the carburetor body. This ring is essential to the trouble-free functioning of the automatic choke and should be kept clean and free of grease.



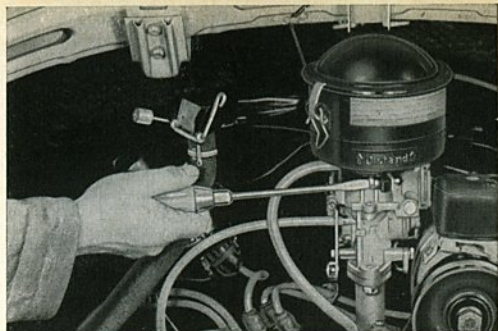


11/43 This picture shows that the fast idle cam is sticking and has not followed the operating lever in the direction of the arrow even though the throttle lever is lifted clear. When this happens, the engine will continue to run at a fast idle speed when the accelerator pedal is released and this will in turn cause an increase in fuel consumption. This is caused by: The pin 1 jamming in the curved slot in the cam or 2 the cam sticking on the choke valve shaft due to corrosion, dirt or lack of lubrication. It is usually sufficient to lubricate the bearing with a few drops of anti corrosion oil and rotate the cam back and forth several times.



11/44 If the float needle valve does not function properly the defects show in different ways. If a particle of dirt lodges at the points shown by the arrows, the float needle will stick. In this picture the valve has not opened and the flow of fuel has stopped. The results are: Lack of fuel, poor engine performance — engine cuts out. For the same reason, however, the needle can stick in the lower position so that the needle valve does not close at all and the engine receives more fuel than it requires. This results in increased fuel consumption and the excess fuel often causes oil dilution. The remedy is to remove the needle valve and clean it carefully with compressed air or to replace it with a new part.

11/45 When installing the oil bath air cleaner, do not overtighten the clamp screw as this can distort the walls of the carburetor so that the choke valve shaft becomes tight in its bearings. The clamp should be located slightly to the right of the vehicle centerline so that the cleaner does not contact the fan housing.



11/46 An intimate knowledge of the individual parts and of the functioning of the carburetor are not essential for everyday repair work. A theoretical knowledge of the various systems will, however, enable you to locate defects and their causes easily and accurately and to carry out the necessary repair in a skilled and successful manner.

