AUC9662
October 1961

THE H-TYPE CARBURETTER

AND

THE AUXILIARY ENRICHMENT CARBURETTER
(THERMO-CARBURETTER)

MANUFACTURED
by
THE S.U. CARBURETTER CO. LTD.
Proprietors: MORRIS MOTORS LTD.

WOOD LANE · ERDINGTON · BIRMINGHAM 24

TELEPHONE: ERDINGTON 7371 (7 lines) TELEGRAMS: CARBURFLEX BIRMINGHAM

DESCRIPTION

The S.U. Carburetter is of the automatically expanding choke type in which the size of the main air passage (or choke) over the jet, and the effective area of the jet, are variable, according to the degree of throttle opening used on the engine against the prevailing road load (which may differ widely from light cruising to heavy pulling).

This automatic regulation of the size of the choke over the complete throttle range gives an approximately constant air velocity over the jet (sometimes called a constant vacuum carburetter) which is sufficient to ensure good atomization at all speeds, making multiple jets unnecessary.

Therefore to serve the complete throttle range a single jet only is used, which is varied in effective area by a tapered fuel metering needle sliding into it, the exact profile of the 'taper' being altered to suit differing engines, running conditions, or climates. As the exact profile of this needle (identified by a type marking on the shank end) is only settled after long and expert tuning, it is generally inadvisable to change to an alternative type from the 'standard' tuning.

ADJUSTMENTS

(1) Needle-changing (for mixture ratio alteration)

If the general mixture strength is suspect, or simply being checked over, first remove the suction chamber and piston unit, and, after slackening off the needle clamping screw, extract the needle and check its identifying marking against the manufacturer's recommendation. When this has been satisfactorily settled, replace the needle (or its correct substitute) and lock it in the standard position, having the shoulder on the shank just flush with the end face of the piston.

If the mixture ratio for the general throttle range or a particular portion of it (**excluding** idling) appears unsatisfactory, and it has been checked that other factors such as defective ignition, sparking plugs, air leaks, or poor compressions, etc., are not the cause, then in rare cases a change of needle type may be beneficial, and the 'Needle Type/Car Model' Reference Folder No. AUC9603 should be consulted and the suggested alternative type obtained from the local agent; or write to us in case of any real difficulty, giving details of the performance.

The fitting of a fresh type of needle may, in the odd case, call for the recentring of the jet assembly, and this matter should be checked according to Section (4).

(2) Tuning—single-carburetter layout

As the needle size is determined during engine development, tuning of the carburetters is confined to correct idling setting.

Run the engine until it has attained its normal operating temperature, then close the throttle completely by unscrewing the throttle adjusting screw until the face of the screw just clears its stop. Open it by screwing down this screw one and a half turns.

Remove the piston and suction chamber, disconnect the mixture control wire, and screw the jet adjusting nut until the jet is flush with the bridge of the carburetter, or 'full up' if this position cannot be obtained. Replace the piston and suction chamber assembly, and check that the piston falls freely onto the bridge of the carburetter (by means of the piston lifting pin). Turn down the jet adjusting nut two complete turns (12 flats).

Restart the engine and adjust the throttle adjusting screw to give the desired idling speed as indicated by the glowing of the ignition warning light.

Turn the jet adjusting nut until the fastest idling speed is obtained consistent with even firing. During this adjustment it is necessary to ensure that the jet is pressed upwards and is in contact with its adjusting nut.

As the mixture is adjusted the engine will probably run faster; it may therefore be necessary to unscrew the throttle adjusting screw a little in order to reduce the speed.

Now check the mixture strength by lifting the carburetter piston (by means of the lift pin situated on the side of the carburetter body) by approximately $\frac{1}{32}$ in. (·75 mm.), when:

(*a*) If the engine speed increases and continues to run faster, this indicates that the mixture is too rich;

(*b*) If the engine speed immediately decreases, this indicates that the mixture is too weak;

(*c*) If the engine speed momentarily increases very slightly, this indicates that the mixture is correct.

When the mixture is correct the exhaust note should be regular and even. If it is irregular, with a splashy type of misfire and colourless exhaust, the mixture is too weak. If there is a regular or rhythmical type of misfire, together with a blackish exhaust, then the mixture is too rich.

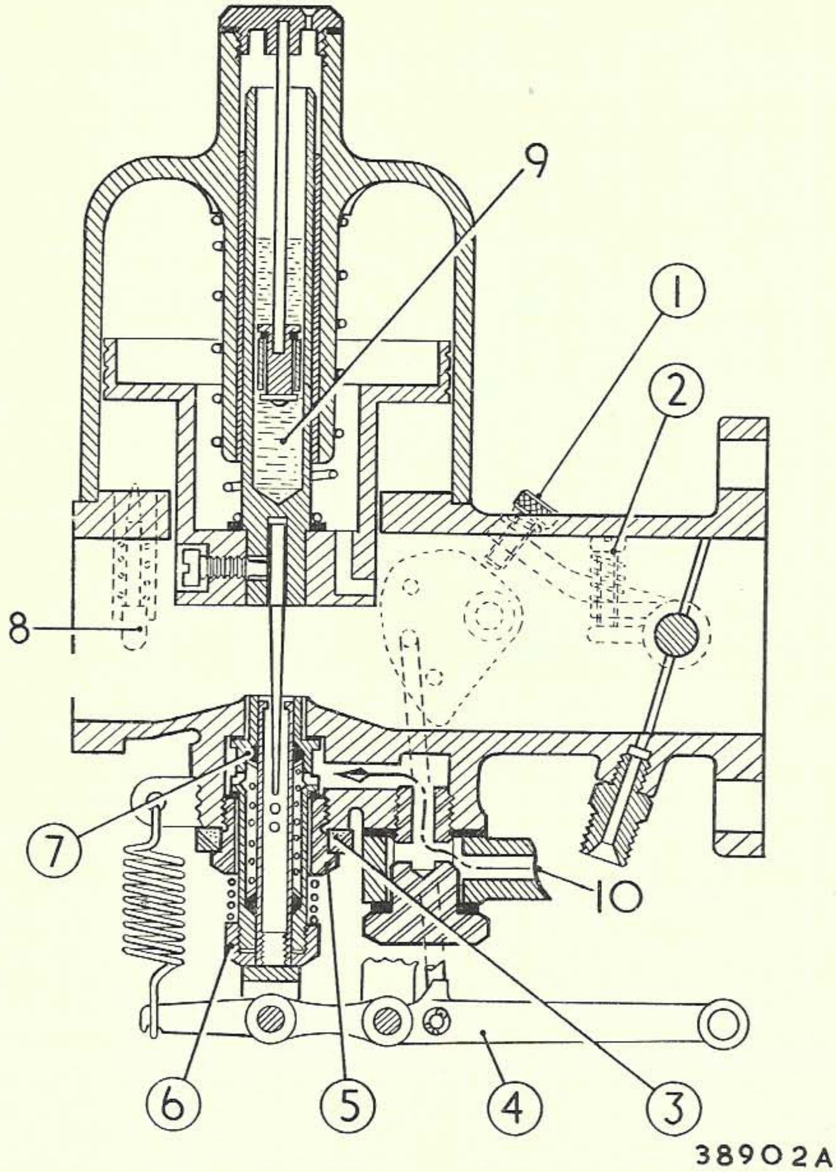
Reconnect the mixture control wire with approximately $\frac{1}{16}$ in. (1·6 mm.) free movement before it starts to pull on the jet lever.

Set the mixture control knob on the dash panel to its maximum movement (about $\frac{5}{8}$ in. or 16 mm.) without moving the carburetter jet and adjust the fast-idle cam screw to give an engine speed of about 1,000 r.p.m. (when hot).

(3) Tuning—multi-carburetter layout

Multi-carburetter installations cannot be successfully tuned unless the general engine conditions (such items as tappet clearances and compressions) and the ignition system are in a satisfactory state; also, on the carburetters themselves the cleanliness of the suction piston units—see Section (6)—and the centring of the jets—see Section (4)—should be checked.

As the needle size is determined during engine



1. Jet/throttle interconnection adjusting screw.
2. Throttle adjusting screw.
3. Sealing cork.
4. Jet lever.
5. Locking screw.
6. Jet adjusting screw.
7. Jet gland.
8. Piston lifting pin.
9. Oil well.
10. Fuel feed from float-chamber.

development, tuning of the carburetters is confined to correct idling setting.

Remove the air cleaners and run the engine until it has attained its normal operating temperature.

Slacken one of the clamping bolts on the throttle spindle connection. Close both throttles fully by unscrewing the throttle adjusting screw, and then open both by screwing down the idling adjustment screws one and a half turns.

Remove the piston and suction chambers, disconnect the jet control linkage by removing one or, in the case of triple carburetters, two of the forked swivel pins. Screw the jet adjusting nuts until each jet is flush with the bridge of its carburetter, or as near to this as possible (all jets being in the same relative position to the bridge of their respective carburetters). Replace the piston and suction chamber assemblies and check that the pistons fall freely onto the bridge of the carburetters (by means of the piston lifting pins). Turn down the jet adjusting nuts two complete turns (12 flats).

Restart the engine and adjust the throttle adjusting screws to give the desired idling speed (as indicated by the glowing of the ignition warning light) by moving each throttle adjusting screw an equal amount. By listening to the hiss in the intakes adjust the throttle adjusting screws until the intensity of the hiss is similar on both intakes. This will synchronize the throttles.

When this is satisfactory the mixture should be adjusted by screwing both the jet adjusting nuts up or down by the same amount until the fastest idling speed is obtained consistent with even firing. During this adjustment it is necessary to ensure that the jets are pressed upwards to ensure that they are in contact with the adjusting nuts.

As the mixture is adjusted the engine will probably run faster, and it may therefore be necessary to unscrew the throttle adjusting screws a little, each by the same amount, to reduce the speed.

Now check the mixture strength by lifting the piston off the front carburetter by approximately $\frac{1}{32}$ in. (·75 mm.), when:

- (*a*) If the engine speed increases, this indicates that the mixture strength of the front carburetter is too rich;
- (*b*) If the engine speed immediately decreases, this indicates that the mixture strength of the front carburetter is too weak;
- (*c*) If the engine speed momentarily increases very slightly, then the mixture strength of the front carburetter is correct.

Repeat the operation at the rear carburetter and, after adjustment, re-check the front carburetter, since the two carburetters are interdependent.

When the mixture is correct the exhaust note should be regular and even. If it is irregular, with a splashy type of misfire and colourless exhaust, the mixture is too weak. If there is a regular or rhythmical type of misfire in the exhaust beat, together with a blackish exhaust, then the mixture is too rich. The throttle spindle interconnection clamping bolts on the couplings should now be tightened.

Reconnect the jet control linkage and wire with approximately $\frac{1}{16}$ in. (1·6 mm.) free movement before it starts to pull on the jet levers.

Set the mixture control knob on the dash panel to its maximum movement without moving the carburetter jets (about $\frac{5}{8}$ in. or 16 mm.) and adjust the fast-idle cam screws to give an engine speed of about 1,000 r.p.m. (when hot).

Make sure that the jet is hard up against the bottom face of the adjusting nut after any movement of the latter, and also check the same point when reconnecting the link rod between the jet units, as it may be necessary to lengthen or shorten this linkage so that the clevis pin can be inserted easily when the jets are in the correct hard-up position.

Although it is advisable, before the actual start of the tuning operation, to check that the jet adjusting nuts are all screwed the same amount downwards from the topmost position, later, when a satisfactory setting for each nut has been found giving a correct slow run, it may be that this finalized position is not exactly similar for each nut; that is, one may be two turns down and another two and a half turns down.

This apparent discrepancy is well within normal variation, and even on new carburetters may be as much as one full turn, depending on such factors as exactly similar positioning of each jet needle in the piston, etc. On older carburetters, where there is also the influencing factor of unequal wear on individual parts, then the variation in jet unit position may be greater, and up to two full turns down.

(4) Jet-centring

When the suction piston is lifted by hand (engine not running) is should fall freely and hit the inside 'jet bridge' with a soft, metallic click—that is, with the jet adjusting nut (6) in its topmost position. (On older carburetters the piston may be lifted by poking upwards through one of the air vents in the suction chamber mounting flange a wire nail or length of stiff wire, but on recent carburetters there is a small spring-loaded pin under the suction chamber mounting flange which, when pressed upwards, lifts the piston.)

If this click is not audible, but is so when the test is repeated with the jet in the fully lowered position, then the jet unit requires recentring on the needle, as described below.

It may be helpful to understand that the complete jet unit, clamped in position by lock screw (5), is held in a clearance bore that permits a limited amount of radial float prior to being locked. Therefore if this lock screw is slackened away half a turn, and then the needle and piston are lowered fully, the jet unit will concentrically locate itself around the needle, and can then be locked in that position.

The procedure for recentring is as follows:

(*a*) Remove the pivot pin holding the jet lever to the jet head, and also, if necessary, the lower end of the link rod connecting the jet lever to the throttle, and swing the linkage well to one side.

(*b*) Withdraw the jet and unscrew the jet adjusting nut, removing its lock spring, which should be placed on one side. Replace the adjusting nut, which should be screwed right up to its topmost position, replace the jet, and see that the slot in the head lies in the same angular position as when assembled on the jet lever, marking with a pencil the one face adjacent to the air inlet.

(*c*) Slacken off the large jet locking screw (which locks the whole jet unit in position) until the bottom half jet bearing is just free to rotate by finger pressure.

(*d*) With the damper or oil cap removed, and using a pencil on top of the piston rod, gently press the piston and needle down onto the jet bridge.

(*e*) Tighten the jet locking screw, observing that the jet head is still in its correct angular position.

(*f*) Lift the piston and check, that it falls freely and evenly, hitting the jet bridge with a soft, metallic click. Then fully lower the jet and re-check to see if there is any difference in the sound of the impact, and if there is and the second test produces a sharper impact sound, the centring operation will have to be repeated until successful.

(*g*) In the occasional obstinate case the jet adjusting nut (as well as its lock spring) should be temporarily removed to enable the jet to reach a higher position and make the centring effect more positive, the nut and lock spring being replaced after the successful conclusion of the operation. Do not forget to refill the damper reservoir in the piston—see Section (5)—as may be necessary.

(5) Refilling oil damper reservoir in piston rod

This needs topping up periodically, about every 3,000 miles, with thin engine oil grade S.A.E. 20 (but no thicker than S.A.E. 30), and this operation is not at all critical; simply unscrew and remove the damper unit and then pour sufficient oil into the hollow piston rod to within about $\frac{1}{2}$ in. (12·7 mm.) from the top of the rod, and then rescrew the plunger unit back into position. Incidentally, the function of this piston damper unit is to provide an appropriate degree of enrichment for acceleration, and it also improves cold starting and drivability from cold.

(6) Cleaning of suction chamber and piston

This should be done at approximate intervals of every 12,000 miles for horizontal and semi-downdraught carburetters, and every three months for fully downdraught carburetters. After detaching the unit, clean the main inside bore of the suction chamber and the two outside diameters of the piston with a rag moistened in petrol and then reassemble in a dry and clean condition with a few spots of thin oil on the piston rod **only.** Do not forget to refill the damper reservoir after this operation if that component is used.

(7) Float-chamber fuel level

The fuel level on an S.U. is not critical, and need not be treated with meticulous accuracy.

A simple mechanical check can be made, and this consists of sliding a certain diameter of check rod between the lid face and the inside curve of the forked end of the hinged lever when the needle valve is in the 'shut-off' position. The size of this rod for both the $1\frac{7}{8}$ in. (48 mm.) outside dia. smaller float-chamber and the larger one of $2\frac{1}{8}$ in. (54 mm.) outside dia. is $\frac{7}{16}$ in. (11·2 mm.).

If the hinged lever fails to conform within $\frac{1}{32}$ in. (·75 mm.) of this check figure it must be carefully bent, at the start of the fork section, in the necessary direction for correction, taking care to keep both prongs of the fork level with each other.

It must be emphasized that it is not advisable to alter the fuel level unless there is trouble with flooding; and although too high a level can cause slow flooding, particularly when a car is left ticking over on a steep drive, it should be remembered that flooding can also be caused by grit in the fuel jamming open the needle valve, or excessive engine vibration, or a porous float.

(8) Jet gland replacement

If persistent slow leakage is observed at the base of the jet unit (a mere surface dampness can generally be disregarded) it is probable that the two small cork jet glands (7) and the large sealing cork (3) require replacement. Careful study of the illustration should enable this replacement to be made without difficulty. The jet lever (4) should first be detached from the jet head, the locking screw (5) removed, when the entire jet unit can be withdrawn. After refitting, complete with the new glands, the whole unit must be correctly centred on the tapered needle as described in Section (4)—**this is most important.**

(9) Adjustment of jet and throttle interconnection

With the cam-type jet and throttle interconnection, shown dotted, or its preceding rocker type, the outer adjusting screw (1) should be about $\frac{1}{64}$ in. (·4 mm.) away (thickness of visiting card) from the cam face or rocker face when the engine is warm and idling on a closed throttle; with the rocker type this figure should not be exceeded, but with the cam type a larger gap can be used if desired. If the jet adjusting nut is altered in position substantially, then screw (1) may also need a suitable readjustment.

(10) Additional weakening device

On the majority of S.U. installations a reasonably wide 'mixture spread' is obtained automatically, giving the necessary richer mixture when the engine is pulling hard compared with the weaker mixture required for light-load cruising. However, this spread obtained with the standard instrument is not enough for all installations, and some engines benefit by the fitting of an additional 'weakening device' fitted to the top of the float-chamber lid, which has the effect of further weakening the light-load cruising mixture. This weakening device activates from a throttle edge hole which, under cruising conditions only, puts a limited depression over the top of the fuel in the float-chamber; this in turn slows down the discharge from the main jet. This device contains no moving or adjustable parts and normally should need no servicing. The device is not usually applicable to cars other than the manufacturers' original equipment as the tuning difficulties involved are complex and can only be settled at the same time as the tuning of the main carburetter.

(11) Effect of altitude and climatic extremes on standard tuning

The standard tuning employs a jet needle broadly suitable for temperate climates from sea-level up to 6,000 ft. (1829 m.). Above that altitude it may be necessary, depending on extremes of climatic heat and humidity, to use a weaker tuning.

The factors of altitude, extreme climatic heat, and humidity each tend to demand a weaker tuning, and a combination of any of these factors would naturally emphasize this demand. This is a situation which cannot be met by a hard-and fast factory recommendation owing to the wide variations in the conditions existing, and in such cases the owner will have to do a little experimenting with alternative weaker needles until one which is satisfactory is found.

If the carburetter is fitted with a spring-loaded suction piston the necessary weakening may be effected by changing to a weaker type of spring, or even discarding the spring itself and running without one.

AUXILIARY ENRICHMENT CARBURETTER (THERMO-CARBURETTER)

DESCRIPTION

On certain installations an electrically operated auxiliary carburetter is used in conjunction with a single or a multiple installation of S.U. carburetters. This may be controlled either by a thermostatically or manually operated switch.

In all cases where this additional starting device is employed the more usual means of manually withdrawing the jet for enrichment is, of course, omitted. The device is diagrammatically illustrated on the opposite page.

Before considering the construction and operation of the additional apparatus involved reference may first be made to the diagram showing the somewhat simplified construction of the main carburetter jet. It will, of course, be realized that it is still necessary, in the case of the main jet of the carburetter, to provide facilities for centring as referred to in Section (4). Similarly, provision must also be made for some degree of vertical adjustment of the jet in order to achieve the correct idling mixture strength.

Reference to the diagram will show that the general construction of this jet, which is mounted within a pair of jet bearings, follows closely the design of that described previously. The jet does not emerge from the lower jet bearing but terminates in a flange (50) which forms the lower abutment for the loading spring.

Thus the jet is urged downwards by the load of the gland spring, the lower face of the flanged end (50) coming into contact with the adjusting screw (51). A cap nut (52) encloses the adjusting screw (51), which, when tightened in position, seals the bottom of the lower jet bush against leakage of fuel which would otherwise occur down the thread of the adjusting screw.

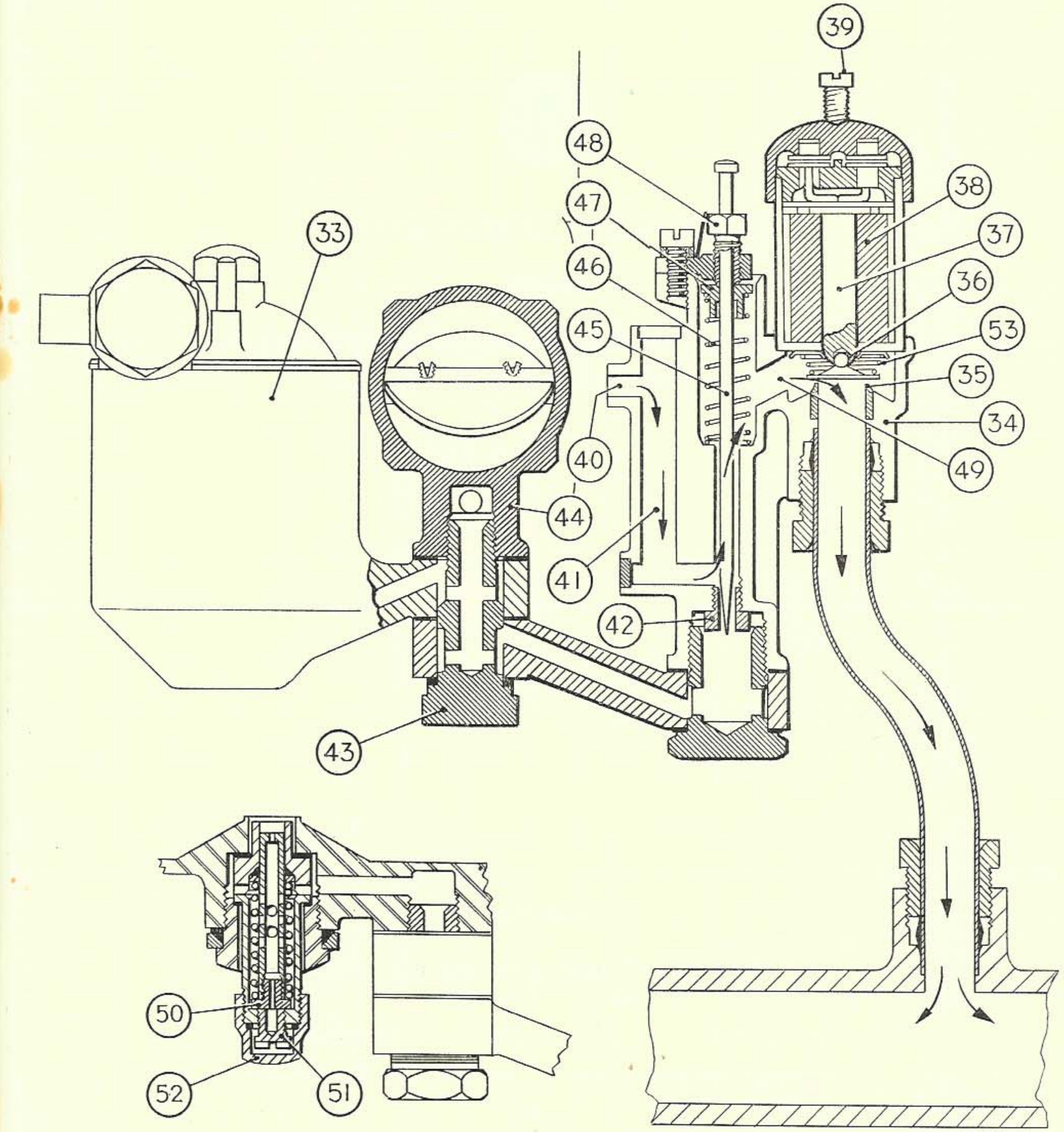
The process of adjustment for idling differs, however, from that formerly described in that the operation is performed by rotation of the slotted head of the screw (51). The general procedure for this adjustment is, of course, similar to that given for the normal sliding type of jet, with the exception that the cap nut (52) must first be removed and the jet adjusted with a coin in the slot in the head of the adjusting screw (51). During this process of adjustment some slight leakage of fuel may occur, but it will, of course, cease as soon as the cap nut (52) is replaced.

The enrichment apparatus for starting is, in effect, an auxiliary carburetting system. The main body casting (34) containing a solenoid-operated valve and fuel metering system is illustrated as a separate unit attached by means of a ducted mounting arm to the base of the main carburetter fuel inlet.

The auxiliary carburetter forms, therefore, a separate unit additional to the normal float-chamber retained by the hollow cross-drilled bolt (43). In certain cases, however, the casting (34) is formed integrally with the main float-chamber body (33), drawing its fuel supply directly therefrom.

Fuel is supplied in either case to the base of the jet (42), which is obstructed to a greater or lesser degree by the tapered slidable needle (45).

When the device is in action air is drawn from atmosphere through the air intake (40) and thence through the passage (41), being carburetted with fuel as it passes the jet (42). The mixture is thence carried upwards past the shank of the needle (45) through the passage (49) and so past the aperture provided between the valve (36) and its seating (35). From here it passes directly to the induction manifold through the external feed pipe shown.



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The device is brought into action by energizing the winding of the solenoid (38) from the terminal screws (39). The centrally located iron core (37) is thus raised magnetically, carrying with it the ball-jointed disc valve (36) against the load of the small conical spring (53) and thus uncovering the aperture provided by the seating (35).

Considering the function of the slidable needle (45), it will be seen that this is loaded upwards in its open position by means of the light compression spring (46), which abuts against a disc (47) attached to the shank of the needle. The needle continues upwards through the vertically adjustable stop (48) in which it is slidably mounted and it finally terminates in an enlarged head.

Depression within the space surrounding the spring (46) is directly derived from that prevailing in the induction tract, and this exerts a downward force upon the disc (47), which is provided with an adequate clearance with its surrounding bore. This tends to overcome the load of the spring (46) and to move the needle downwards, thus increasing the obstruction afforded by the tapered section which enters the jet (42).

The purpose of this device is to provide two widely different degrees of enrichment, the one corresponding to idling or light cruising conditions and the other to conditions of open throttle or full-power operation. In effect, under the former conditions the high induction depression prevailing will cause the disc (47) to be drawn downwards, drawing the tapered needle into the jet (42), while under the latter, the lower depression existing in the induction tract, will permit the collar to maintain its upward position with the needle withdrawing from the jet.

The tuning elements concerned in this device are the size and degree of taper of the lower end of the needle (45), the diameter of the disc (47), the load provided by the spring (46), and the degree of movement permitted to the needle assembly, as determined by the adjustment of the stop (48).

In most installations the solenoid (38) is energized by means of a thermostatically operated switch housed within the cylinder head water jacket. This is generally arranged to bring the apparatus into action at temperatures below about 30–35° C. (86–95° F.) In some instances, however, a manual switch is provided, and in such cases a warning light is generally provided to indicate to the driver that the apparatus is in operation.

TUNING AND ADJUSTMENT

It will, of course, be understood that the normal adjustment to the main carburetter or carburetters, as detailed in Sections (2) and (3) must be performed with the engine at its normal running temperature before any attempt is made to tune the auxiliary enenrichment device.

As it can generally be assumed that the tapered form of the needle (45), the strength of the spring (46), and the diameter of the disc (47) have already been appropriately chosen, tuning is generally confined to the adjustment of the stop screw (48). It will be appreciated that the main purpose of this adjustment is to limit the downward movement of the needle, the head of which abuts against the upper surface of the stop screw at the lower extremity of its travel. The final downward movement of this needle determines, as has been described, the degree of enrichment provided under idling conditions with the auxiliary enrichment carburetter in operation.

An appropriate guide to its correct adjustment in this respect is provided by energizing the solenoid when the engine has already attained its normal running temperature. The stop screw (48) should then be so adjusted that the mixture is distinctly although not excessively rich—that is to say, until the exhaust gases are seen to be discernibly black in colour, but just short of the point where the engine commences to run with noticeable irregularity.

Anti-clockwise rotation of the stop screw will, of course, raise the needle under these conditions, and increase the mixture strength, while rotation in the opposite direction will have the opposite effect. In order to energize the solenoid under conditions when the thermostatic switch will normally have broken the circuit, it is merely necessary to short-circuit the terminal of the thermostatic switch directly to earth or, if this is not readily accessible, to make a connection between the appropriate terminal of the pair (39) to earth by means of a separate wire. In cases where a manual switch is provided no difficulty, of course, arises in bringing the auxiliary enrichment carburetter into action under any condition of engine temperature.

Information on the adjustment of other types of carburetter is contained in the following leaflets:

H type	AUC9612
HD type	AUC9622A
HD type with auxiliary enrichment ...	AUC9663
HS type	AUC9661

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