MODELS

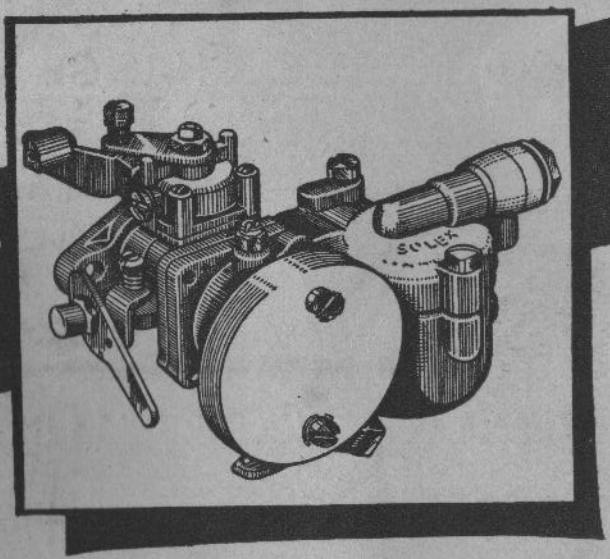
VB. HF. AND AH.

Self-Starting

SOLEX

CARBURETTOR

(BI-STARTER)



Descriptive Booklet

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The Self-Starting and Bi-Starter SOLEX CARBURETTORS

MODELS

VB. (Vertical) and

H.F. and AH. (Horizontal)

INSTRUCTION BOOKLET

Models VB. (Vertical) and
HF. and AH. (Horizontal)

Self-Starting & Bi-Starter SOLEX Carburettors

INSTRUCTIONS

FOR FITTING AND ADJUSTING

INDEX

N.B.—To ensure correct execution of orders, the letters and numbers stamped on the float chamber must be quoted, together with the make and year of manufacture of the vehicle.

PROGRESS

"ASSEMBLY 20" in the Solex Carburettor is the answer to improved engine efficiency demanding perfect carburation to cover every conceivable variation of engine "characteristic."

The term "Assembly 20" is general to describe the jet assembly in vertical and horizontal carburettors.

For purposes of identification, we designate this jet assembly in vertical carburettors as "Assembly 20," and in horizontal carburettors "Assembly 22."

A feature employed in Model AH is the Solex "Bi-Starter." It covers the case where it is desired to warm up the engine with the vehicle stationary, instead of driving away immediately after starting from cold, as advocated with the original "Self-Starting" Solex.

These new carburettors can be obtained through any garage, including the official Solex Service Stations, a list of which is given in the concluding pages of this Booklet.

SOLEX LTD.

WHAT THE SYMBOLS MEAN.

VBFD — **Self-Starting** vertical, starter on right looking at air intake.

VBFG — **Self-Starting** vertical, starter on left looking at air intake.

AHD/G — **Bi-Starter** horizontal with float chamber right (D) or left (G) looking at air intake.

DHF } — **Self-Starting** horizontal with float chamber right (D)
GHF } or left (G) looking at air intake.

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THE HORIZONTAL "ASSEMBLY 22"

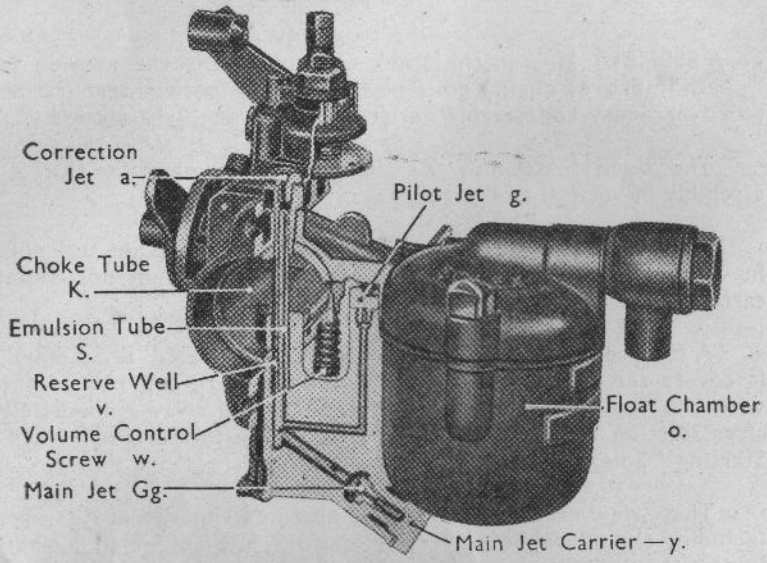


Fig. 1

ASSEMBLY 22.

Fig. 1 illustrates the horizontal carburettor in section, exposing the Assembly 22.

It will be seen that the pilot jet "g" is situated in the position common to all Solex Carburettors, and that there is in fact, no change in this department.

Assembly 22 therefore covers only the new arrangement of the main supply, providing a mixture emulsified and "corrected" to suit individual engine requirements.

The main jet "Gg" is the calibrated member, through which the petrol passes from the float chamber, and is screwed into the jet carrier " y."

In the vertical section of the channel leading upwards from the main jet will be seen the emulsion tube " S," and screwed into the top thereof, the air correction jet " a."

It will be noted that there are a number of holes towards the bottom end of the emulsion tube, and that there is an annular space between it and the surrounding casting, forming a reserve well " v."

This annular space is filled with petrol to float chamber level.

As the throttle opens, air is drawn through the correction jet " a."

It passes down the emulsion tube " S," through the holes, and emulsifies the contents of the reserve well " v."

To ensure correct execution of orders, the letters and numbers stamped on the carburettor float chamber must be quoted.

The resultant emulsified mixture is drawn from the reserve well "v," and passes to the engine in increasing volume directly in proportion with the degree of throttle opening, its final atomization being effected by the high velocity air current passing through the choke tube "K."

The correction jet "a" is variable in tenths of a millimetre, and it is the selection of the size in relation to that of the main jet that determines the "correction" of the resultant mixture.

STARTING FROM COLD.

Those familiar with the original SELF-STARTING SOLEX will know that the method of procedure for starting from cold is as follows :

Pull dashboard knob fully out, switch on the ignition and press electric starter button. The engine starts immediately.

The car should then be driven straight off, and when the engine is warm, i.e., after a few hundred yards running, the dashboard knob must be pushed fully "home."

It must never be used or left in a half-way position.

These instructions are repeated here, for this type of Self-Starting Solex is still current. For a fully detailed explanation of this starting device see Fitting and Instruction Booklet on "The Self-Starting Solex Types HB., BF."

HOW TO OPERATE THE BI-STARTER

With the Bi-Starter Assembly, a slightly different procedure is adopted for starting and acceleration from cold.

It is designed to give :

1. A mixture that is richer proportionately as the temperature is lower, in order to ensure instantaneous starting from cold. (This of course, is a feature common with the original Self-Starting Solex, and is obtained by the same method).
2. A means of weakening off the mixture rapidly by pushing in the dashboard control approximately half-way as soon as the engine will "take it."

This additional feature is incorporated to meet the requirements of those who prefer to allow the engine to warm up with the vehicle stationary, rather than drive away immediately after starting, though we advocate that the procedure of driving away immediately after starting is adopted.

N.B.—It should be noted that as in the case with the original Self-Starting Solex, for absolute cold starting, the dashboard knob must be pulled out fully, and the throttle kept closed to the minimum idling position.

SOLEX CARBURETTOR TYPE VB

SECTION DIAGRAM

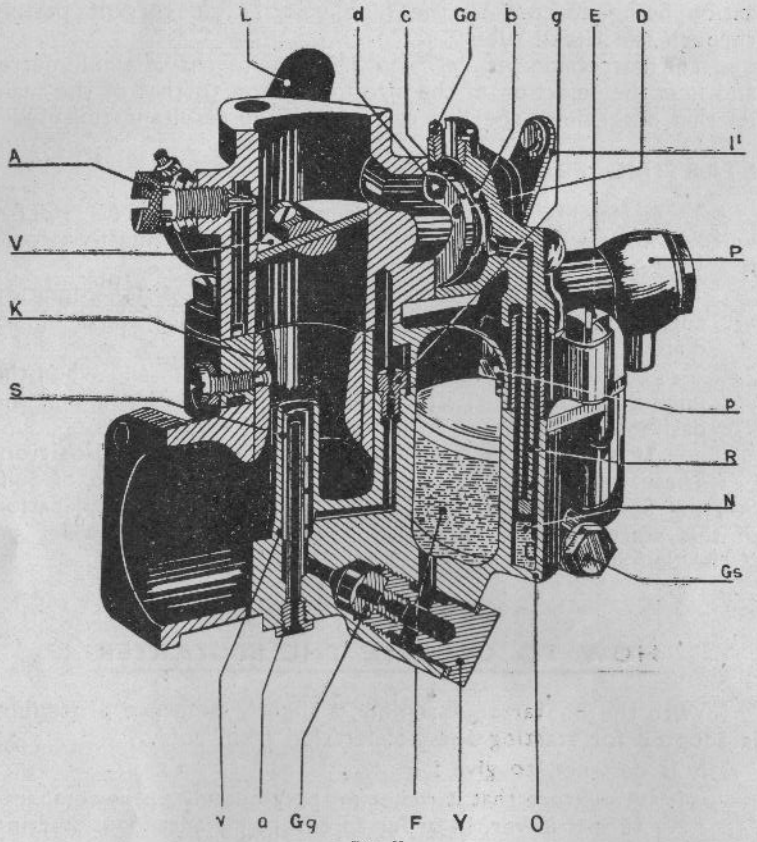


Fig. II

A	Volume control screw.	**O**	Float chamber.	**q**	Pilot jet.
V	Throttle.	**Gs**	Starter petrol jet.	**Ga**	Starter air jet.
K	Choke tube.	**N**	Starter well.	**c**	Disc valve.
S	Emulsion tube.	**R**	Starter dip tube.	**L**	Throttle lever.
v	Reserve well.	**p**	Needle valve.	**b**	Starter mixing chamber.
a	Air correction jet.	**P**	Swivel union (petrol pipe).	**d**	Disc-valve hole (primary).
Gq	Main jet.	**I'**	Starter lever.	**D**	Disc-valve hole (secondary).
F	Float.	**E**	Dismounting bolt.		
Y	Main jet carrier.				

We draw special attention, however, to the fact that with the "Bi-Starter" it is only necessary to pull out the control **half-way,** i.e., to the bi-starter position, when the engine is partially warm.

Thus there are three stages in the use of the latest Solex starting device :

(*a*) Dashboard knob pulled fully out to start.

To ensure correct execution of orders, the letters and numbers stamped on the carburettor float chamber must be quoted.

(*b*) Dashboard knob pushed in half-way as soon as possible. This stage can be effected whilst driving away.

(*c*) Dashboard knob pushed fully "home" after driving approximately half a mile, i.e., when the engine is warm.

Under no circumstances should the dashboard control be used for starting when the engine is hot.

Careful attention to these details will ensure permanent satisfaction at minimum cost in petrol and engine wear and tear.

HOW THE BI-STARTER FUNCTIONS

Fig. II shows a section of a Bi-Starter carburettor from which the action of the starting device can be easily followed.

On pulling the dashboard knob the lever (l¹) moves to the position shown, and the valve-disc "c" rotates until the hole "d" registers with the channel entering the throttle chamber immediately above the butterfly.

Turning the engine at once produces a suction on this channel, which lifts the petrol from the well "N" via the dip-tube "R" into the mixing chamber "b" immediately behind the valve-disc "c".

Here it meets a high velocity air stream entering the mixing chamber, via the air jet "Ga" so that an atomised mixture of petrol and air is drawn into the cylinders, when an immediate start is obtained.

It will be seen that the petrol jet "Gs" governs the supply of petrol to the well "N" by gravity flow, the well itself being open to the atmosphere.

Whilst, therefore, there is direct suction on the air supply via the air jet "Ga" only a constant quantity of petrol as governed by the size of the petrol jet "Gs" can be drawn from the well " N."

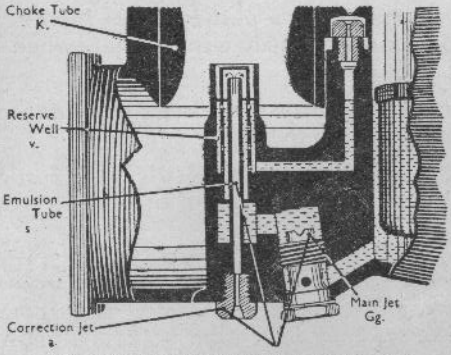
It will be observed that within a few seconds of starting, the engine speeds up to approximately four or five times normal idling speed, and it will be obvious from the last paragraph that it does so on a **decreasingly** rich mixture, since direct suction on the air jet "Ga" inspires more and more air in direct proportion to the rise of engine speed, for admixture with the constant quantity of petrol from the well " N."

Nevertheless, to cater for cases where it is desired to leave the engine running on the Solex "starter" until well warmed up, the following provision is made to weaken the mixture still further.

Below the mixing chamber of the starting device, but not shown in the diagram, is a ball-spring in contact with an internal cam connected with the lever " l¹."

By pushing back the lever " l¹ " approximately half-way, the ball rises and resists the motion of the cam, thus indicating when the second position bringing the hole "D" in line with the entry channel, is reached.

Fig. III. *Section of a Vertical Carburettor with "Assembly 20"*



CORRECTION JET, EMULSION TUBE AND MAIN JET COMPRISING ASSEMBLY 20

It will be seen that in this position the volume of mixture is at once reduced, thus rendering over prolonged action of the starting device harmless.

HOW TO ADJUST THE STARTER

The Self-Starting and Bi-Starter Solex are supplied to manufacturers and to replace other makes of carburetters or older Solex models with air and petrol jets selected to suit the engines to which the carburetters are to be fitted.

Occasionally, however, particularly in the case of replacements, a change in the carburation may be necessary to secure perfection of performance.

It is very seldom that the air jet need be altered and we confine our advice therefore to the possible change that may be needed to the petrol jet.

1. If within a few seconds of starting, the engine "hunts," the petrol jet "Gs" is too large. One size smaller usually corrects this.
2. If the engine responds immediately to the use of the electric starter button, but does not continue to run, the petrol jet "Gs" **may** be too small, and a larger one should be tried.

Before adopting this expedient, however, read carefully the following notes, for herein there is a much more likely solution to such a difficulty.

N.B.—With both "Self-Starting" and "Bi-Starter" Solex it should be noted that **the accelerator pedal must not be touched when starting the engine from cold.** It is essential that the throttle be kept closed to the minimum idling position, for othewise an easy start cannot be obtained.

To ensure correct execution of orders, the letters and numbers stamped on the carburettor float chamber must be quoted.

A difficulty arises in this connection with those cars which are fitted with starter motors combined with the throttle pedal. In such cases the linkage must be adjusted so that when the pedal is depressed, the motor will operate with the throttle still in the closed position.

FAILURE

Cause and Remedy

Failure to secure satisfactory results if the above instructions are properly observed is impossible with an engine in proper mechanical order always assuming of course, that the fitting has been properly carried out, particular attention having been paid to the correct operation of the "Starter" lever. Remember, its "travel" must be complete and from stop limit to stop limit in the fully out and fully home position of the dashboard knob.

There are, however, so many slight engine irregularities that may affect the perfect functioning of the "Starter"—and for that matter, of the main carburettor, that we will proceed to enumerate the most common.

Revolutions necessary to start.

An engine in first class condition mechanically, will start when revolved at as low a speed as 60 r.p.m. BUT every adjustment must be perfect ignition (including plugs, and the gaps at their electrode extremeties), valves, compression, battery voltage —etc., etc.

In practice, an engine that may be described as "in fairly good order" will start at about 80 to 100 r.p.m.—a little higher if it is a very small engine.

A well-charged battery is capable of turning an engine over easily at these speeds, but much depends upon the nature of the engine oil used.

The Influence of the Oil.

All oils increase in viscosity as the exterior tempereture falls. Consequently, considerable resistance is offered to a turning engine, particularly when the temperature falls to or below, freezing point.

Therefore, in winter, it is advisable to "free" the engine first by giving it a few turns by hand, before employing the aid of the batteries, and *before* operating the Solex Starter.

Make sure that you are using the correct type of oil for your engine, and during the winter, always the thinnest with which you can get good results, for much damage can be done to your cylinder bores during the first ten minutes by using a viscous oil that will not "fling" readily.

Internal Frictional Resistance.

There must necessarily be some frictional resistance in the working of an internal combustion engine.

A new engine is nearly always more difficult to "turn over" than an old one.

At the same time, the gear box often with a thick lubricant, also offers considerable resistance, and therefore when starting a "stiff" engine, it is a good plan to push out the clutch, when it will be found that the engine can be turned much more readily.

Battery.

To have the battery fully charged is, of course, of primary importance.

A fully charged battery will obviously turn the engine over much more rapidly than one which is half discharged.

Here again temperature has its influence. The lower the temperature, the lower the power of even a fully charged battery. Beware, therefore, of neglecting your battery in cold weather.

Valves.

It is not an infrequent occurrence in very cold weather for the valves to stick, due to various causes, such as congealed oil, variation in expansion coefficients, weak valve springs, etc.

A sticking valve will, of course, affect starting and should be borne in mind as an item for examination, if difficulty in starting occurs. It can always be detected by an interrupted hiss.

Engine Efficiency.

Under this heading, from the purely mechanical standpoint comes the question of induction leakages—a bad stumbling block to easy starting.

The points to check are as follows :

Valves (as above). If in good working order, ascertain that there is no leakage at the guides. Worn valve stems and guides (inlet) are a most frequent cause of bad starting and poor idling.

Carburettor and induction pipe joints must, of course, be tight.

Compression should be tested, for where this can leak outwards, air can, of course, leak inwards, and so upset the starting and idling mixture.

All these items have the greatest ill effects when the engine is turning slowly, *i.e.*, when you are endeavouring to start it, so that it is important to maintain the engine in good order to safeguard against starting troubles.

Ignition.

The battery is, of course, the primary consideration. A voltmeter will show you its condition, and is a good investment. No matter how precise your mixture, a weak spark may fail to ignite it, and if the battery is not fully charged complete failure of the spark at the plug points may occur. If you have magneto ignition, then this should throw a strong blue spark from the end of the leads to an "earth"—at least $\frac{1}{8}$-in. in length.

An item frequently overlooked is the fact that with coil ignition and a low battery, or defective starter motor, the whole of the electrical energy may be absorbed in turning the engine, leaving none available for spark production at the plug points. Thus a complete failure to start.

Be sure that the plugs are clean and the points correctly adjusted. The normal gap is as follows :

For battery ignition	.....	25 thous.
For magneto ignition	.....	20 thous.

N.B. Very modern cars are fitted with coils having considerable voltage. In such cases the electrode gaps should be wider than above mentioned, and the directions given in the maker's brochure carefully followed (average 40 thous.).

See that your ignition is properly timed. Especially in the case of old engines which may have been "overhauled" by someone of inexperience, the ignition may be timed too late.

Condensation.

We give this a separate heading for it is often overlooked.

In cold weather, water condensation will sometimes occur on the plug points, so causing complete spark failure. This very often occurs with too "cool" plugs, particularly with mica insulators.

Fuel.

There are now very many varying grades of fuel on the market. Whilst a No. 1 spirit in all well-known makes could be accepted as beyond reproach, there are a number of low grades of obscure origin which are not at all suitable for general use.

For starting purposes, specific gravity is no guide to quality. A fuel must contain a *good proportion of volatile products*, or starting trouble is certain.

Petrol Pipe Obstruction.

Dirt or water in the petrol tank will find its way eventually to the petrol pipe, and a definite obstruction may result. Shortage of petrol has frequently been traced to pieces of packing material having become lodged in the petrol pipe.

Fortunately, these notes deal with conditions that seldom arise, but it is hoped that the readers of this booklet may find a solution when, as does sometime happen, there seems to be no obvious explanation of starting failure.

In case of difficulty which you cannot overcoem, consult the list of official Solex Service Stations at the end of the booklet. One of them may be quite close at hand, and able to help you.

ADJUSTMENT OF THE ASSEMBLY 20 and 22
TYPES VB, HF, and AH

Describing the functioning and tuning of the main carburettor, **independently of the Starting Device.**

Both horizontal and vertical carburettors are easily dismounted for cleaning the interior.

Reference to Fig. II will show the dismounting bolt "E." There are two of these, and their removal will allow the base of the carburettor to be withdrawn when access is obtained to float chamber and needle valve.

The pilot jet also, it will be seen, can be easily removed by means of a screw-driver for cleaning purposes, and in very many cases the main jet carrier and main jet, also the air correction jet can be detached without dismounting the float chamber.

Carburettors are supplied to motor manufacturers with a setting determined as the result of considerable experimental work on the bench and on the road, and it may be accepted that it is very seldom indeed that the "standard" setting can be improved upon.

Nevertheless, it must be agreed that every engine has its individual characteristic, and it does sometimes happen that after careful "running in" the main jet can be reduced one size with advantage, and a little adjustment may be needed to the pilot jet mixture.

To fit a smaller main jet is obviously an easy procedure, but since the idling adjustment involves two operations, the method is explained in detail as follows :

SLOW RUNNING ADJUSTMENT

The idling or pilot jet "g" provides the necessary output for idling.

The volume control screw "A" regulates the richness of the idling mixture. By turning it in an **anti-clockwise** direction, enrichment takes place up to the limit of the pilot jet output, and conversely, by clockwise rotation, the output is weakened.

Examination of the abutment plate on which is mounted the throttle lever, will reveal a spring loaded screw which regulates the idling speed of the engine.

It actually limits the closing of the throttle, and thus fixes the idling speed. By screwing in this part the engine speed will rise, and *vice versa*.

Poverty of mixture is recognised by the irregular behaviour of the engine, and tendency to stall. Over-richness will cause the engine to "hunt" and tend to stall when the "hunt" becomes excessive.

In order to perfect the slow-running, adjust first the screw on the abutment plate so as to fix approximately the engine speed.

Then experiment with the volume control screw "A" until even running is obtained.

As this operation will generally alter the speed, it will be seen that finally a nice adjustment of both the screw on the abutment plate and the volume control screw "A" will determine the results.

Note that in Fig. 1 the volume control screw is marked "w."

N.B.—Do not make the mistake of trying to adjust the idling to too slow a speed. Modern engines with substantial valve overlap, light fly-wheels and mounted on rubber frame blocks, do not permit the clock-like tickover of earlier days to be obtained.

About 500 r.p.m. is the normal idling speed of to-day.

MAKE ALL ADJUSTMENTS TO IDLING SPEED WITH A HOT ENGINE.

ADJUSTMENT FOR GENERAL RUNNING

With carburettors supplied as replacements for older Solex or other makes of carburettor, it must be borne in mind that in such instances the instrument must be tuned to suit an engine whose characteristic may be considerably altered by wear and tear.

Thus, whilst we issue the carburettors with a "standard" setting, it follows that a little experiment may be necessary on occasion to secure maximum results.

To determine what change from "standard" is necessary, it must be understood exactly how correction of main jet output is effected.

The following details will be more easily grasped by reference to Fig. III illustrating the Assembly 20 in a vertical carburettor.

When the engine is at rest, the assembly is filled with petrol to a position closely approaching the top of reserve well "v" but directly the throttle opens and creates a draught in the choke tube "K" two things happen.

The petrol output from below increases in virtue of the rising depression in the choke tube waist, and if not corrected would do so by a gradually rising curve. In other words, it would become automatically richer as the speed rose. It is therefore the function of the emulsion tube "S" to adjust this mixture to the needs of the engine, and it is done by varying the size of the correction jet "a."

The bigger the correction jet, the greater is the volume and velocity of correctional air which passes vertically upwards and out into the annulus or reserve well "v."

Here it meets with the petrol which it emulsifies, and reduces the mixture strength by a curve which runs in direct opposition to the rising curve of an uncorrected output, in virtue partly of its relieving progressively the air depression, and partly on account of the mechanically obstructive effects which it exercises on the petrol flow.

The main virtue, however, of this layout is that, whereas by ordinary correctional means the whole of the curve is affected, the opposite directions which the fuel and air respectively follow in "Assembly 20" have the effect of making each member—*i.e.*, the main jet and the correction jet more or less independent within its own particular sphere of operation.

Thus, if we want a rich area at the lower part of the curve, we increase the main jet size without touching the correction jet.

If, on the other hand, we wish only to cut down, or increase the mixture strength at the top of the curve without interfering with the bottom end, we increase or decrease the size of the correction jet, which gives us the required results without altering the low speed mixture.

By this means, therefore, a particularly flexible method of control is obtained, and facilities are thereby given for adjusting correctly the carburation, for engines having unusual characteristics which are apt to be outside of the range of ordinary methods of carburation correction.

To give a practical illustration, let us assume we are carburetting an engine which normally takes a standard combination of

25	120	240
(choke tube)	(main jet)	(correction jet)

It may be found in a particular instance that all round results are good, but for bottom end performance, main jet 120 is unnecessarily large, for fitment of size 115 gives equally good results from the point of view of acceleration and flexibility.

With main jet 115, however, we note that there is a falling off in power and speed at major throttle openings, indicating of course an insufficiently rich mixture.

In such a case, reduction of the correction jet to size 220 or 200 will almost certainly give the desired results, with obviously greater economy, since a smaller main jet is now in use.

To take an opposite example :

Suppose we are catering for an engine normally requiring a setting of

25	115	240
(choke tube)	(main jet)	(correction jet)

It is found in this instance that acceleration is poor—there may even be a definite "flat spot", but all round performance apart from this defect is satisfactory.

We require obviously therefore a richer "bottom end" mixture, so we substitute main jet size 120.

Results are now satisfactory, but we find petrol consumption has suffered particularly at high speed running.

This means that the "top end" mixture is now too rich.

Raise the size of the correction jet to 260 or 280 and satisfactory results will be immediately forthcoming.

It will be seen from these examples that "Assembly 20" is easily handled, and that refined carburation is speedily obtained with a minimum of trouble and time.

ALL ADJUSTMENTS TO THE IDLING AND MAIN MIXTURES MUST BE CARRIED OUT WHEN THE ENGINE IS AT NORMAL WORKING TEMPERATURE.

WE PARTICULARLY WARN USERS AGAINST EVER ATTEMPTING TO REAM JETS.

GENERAL NOTES

During cold weather when the engine has remained at rest for a lengthy period, it is advisable to give it a few turns by hand to break the oil film **before switching on the ignition and before pulling out the dashboard knob of the Solex starting device.**

The majority of motors are fitted with a petrol pump. In that case after a long period of disuse the following may occur :

For the first few revolutions of the engine there may be no sign of starting. Then a few late explosions, and prolonged action of the starter motor will be required before normal firing takes place.

This is occasioned by the inability of the pump to supply the required amount of petrol to the carburettor.

It is well, therefore, under such conditions, to make use of the priming device, if such is fitted to the pump to fill the carburettor float chamber before attempting to start the engine.

Similarly, if the car has been standing for some time, say two or three days, the petrol in the float chamber may have become stale. Difficult starting may result during cold weather, but it is well therefore to pump in a fresh supply before attempting to start the engine.

DIAGNOSIS OF RESULTS

There is never any question of definite failure with the Solex carburettor. It is simply a matter of finding the mistake either of fitting or adjustment.

It is well always to approach this diagnosis systematically and avoid doing more than one thing at a time, for in that case it is impossible to ascertain from the eventual results, which was the successful factor.

To ensure correct execution of orders, the letters and numbers stamped on the carburettor float chamber must be quoted.

To be continued .....