BSA SERVICE SHEET No. 708

Reprinted June, 1960

All Models

CARBURATION. Monobloc and Separate Float Chamber Type

How the Carburettor Works

The function of the carburettor is to atomise the petrol and proportion it correctly with the air drawn in through the intake on the induction stroke. The action of the float and needle in the float chamber maintains the level of fuel at the needle jet, and when the engine is stopped and no further fuel is being used the needle valve cuts off the supply.

The twist grip controls, by means of a cable, the position of the throttle slide and the throttle needle and so governs the volume of mixture supplied to the engine.

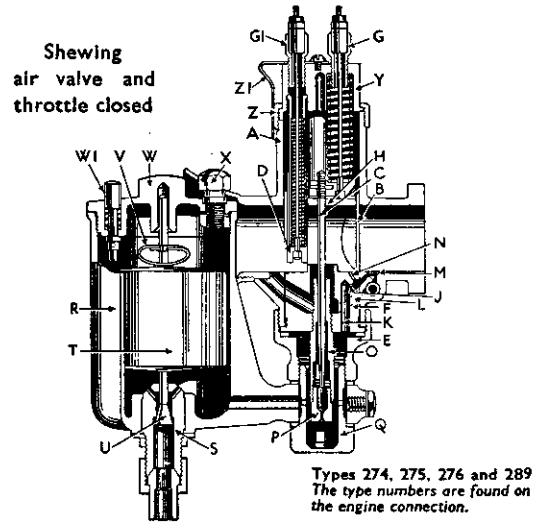
The mixture is correct at all throttle openings, if the carburettor is correctly tuned.

The opening of the throttle brings first into action the mixture supply from the pilot jet, then as it progressively opens, via the pilot by-pass the mixture is augmented from the needle jet. Up to three-quarter throttle this action is controlled by the tapered needle in the needle jet, and from three-quarters onwards the mixture is controlled by the main jet.

The pilot jet 'J', which in the older type of carburettor is embodied in the jet block, has been replaced in the Monobloc carburettor by a detachable jet (9) (Fig. X5) assembled in the carburettor body and sealed by a cover nut.

The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber and goes from there as a rich petrol/air mixture through the primary air choke into the main air choke.

Although the maintenance and tuning instruction contained in this Service Sheet apply equally well to the Monobloc and separate float chamber types of carburettor, the new instrument has been designed with a view to giving improved performance, and certain constructional changes have been made.



Types 274, 275, 276 and 289
The type numbers are found on the engine connection.

A. Mixing Chamber.
B. Throttle Valve.
C. Jet Needle and Clip above.
D. Air Valve.
E. Mixing Chamber Union Nut.
F. Jet Block.
G. Gl. Cable Adjusters.
H. Jet Block Barrel.
J. Pilot Jet.
K. Passage to Pilot.
L. Pilot Air Passage.
M. Pilot Mixture Outlet.
N. Pilot By-pass.
O. Needle Jet.
P. Main Jet.
Q. Float Chamber Holding Bolt.
R. Float Chamber.
S. Needle Valve Seating.
T. Float.
U. Float Needle Valve.
V. Float Needle Clip.
W. Float Chamber Cover.
Wl. Tickler.
X. Float Chamber Lock Screw
Y. Mixing Chamber Top Cap.
Z. Mixing Chamber Lock Ring.
Zl. Mixing Chamber Security Spring.

Fig. X4. A Sectioned illustration of needle jet carburettor

The float chamber is a drum-shaped reservoir, die cast in one piece with the mixing chamber. The material used being zinc-alloy. The float is designed to pivot instead of rising and falling, as in the separate float chamber type, and as it does so, it impinges on a nylon needle controlling the inflow of fuel.

Variations of up to 20° in the angle of the carburettor when fitted, do not affect the working of the float, therefore it lends itself to use for down draught carburation and is not so greatly effected by the degree of lean when cornering. Access to the float (Fig. X6) is gained by removing a plate held in place by three screws.

Compensation for over-rich mixture which results from snap throttle openings, is provided by bleed holes in the needle jet (Fig. X5). A compensatory air bleed is provided, this is the larger of the two holes at the mouth of the air intake, which leads to the space around the needle jet. (Fig. X5).

The pilot intake is the smaller of the two holes, and operates in conjunction with the detachable pilot jet. (Fig. X5). This pilot mixture is adjusted as before, by an adjusting screw. (Fig. 8a.)

Hints and Tips. Starting from Cold

Flood the carburettor by depressing the tickler and close the air control, set the ignition, say, half retarded. Then open the throttle about $\frac{1}{8}''$, then kick start. If the throttle is too far open, starting will be difficult.

Starting. Engine Hot

Do not flood the carburettor, but it may be found necessary with some engines to close the air lever, set the ignition to half-retarded, the throttle to $\frac{1}{8}''$ open and kick-start. If the carburettor has been flooded and won't start because the mixture is too rich—open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle $\frac{1}{8}''$ open, and air valve wide open. Generally speaking it is not advisable to flood at all when an engine is hot.

Starting, General

By experiment, find out if and when it is necessary to flood, also note the best position for the air lever and the throttle for the easiest starting. Excessive flooding, particularly when the engine is hot, will make starting more difficult. It is necessary only to raise the level of petrol in the float chamber, by depressing the tickler.

STARTING, SINGLE LEVER CARBURETTORS, OPEN THE THROTTLE VERY SLIGHTLY FROM THE IDLING POSITION AND FLOOD THE CARBURETTOR MORE OR LESS ACCORDING TO THE ENGINE BEING COLD OR HOT RESPECTIVELY.

SECTIONAL ILLUSTRATIONS OF CARBURETTORS. Types 375, 376 and 389

(MONOBLOC)

(FOR KEY TO DIAGRAM NUMBERS SEE BELOW.)

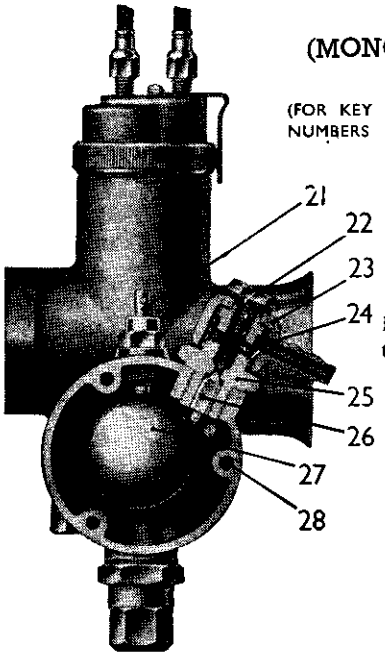


Fig. X6—Section through float chamber

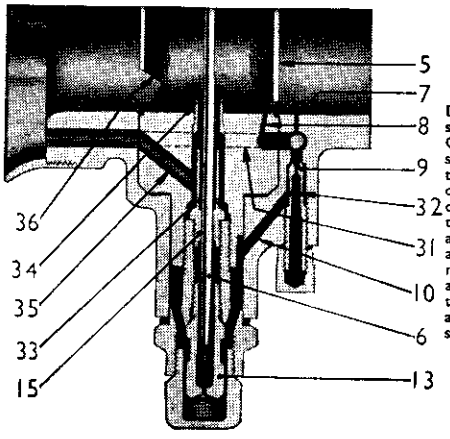


Fig. X5

Diagrammatic section of Carburettor showing only the lower half of the throttle chamber with the throttle a little open—and the internal primary air passages to the main jet and pilot system.

FOR KEY TO DIAGRAM NUMBERS SEE BELOW.

1. Mixing Chamber Top.
2. Mixing Chamber Cap.
3. Carburettor Body.
4. Jet Needle Clip.
5. Throttle Valve.
6. Jet Needle.
7. Pilot outlet.
8. Pilot by-pass.
9. Pilot Jet.
10. Petrol feed to pilot jet.
11. Pilot Jet Cover Nut.
12. Main Jet Cover.
13. Main Jet.
14. Jet Holder.
15. Needle Jet.
16. Jet Block.
17. Air Valve.
18. Mixing Chamber Cap Spring.
19. Cable Adjuster (Air).
20. Cable Adjuster (Throttle).
21. Tickler.
22. Banjo Bolt.
23. Banjo.
24. Filter Gauze.
25. Needle Seating.
26. Needle.
27. Float.
28. Side Cover Screws.
31. Air to pilot jet.
32. Feed holes in pilot jet.
33. Bleed holes in needle jet.
34. Primary Air Choke.
35. Primary air passage.
36. Throttle valve cutaway.

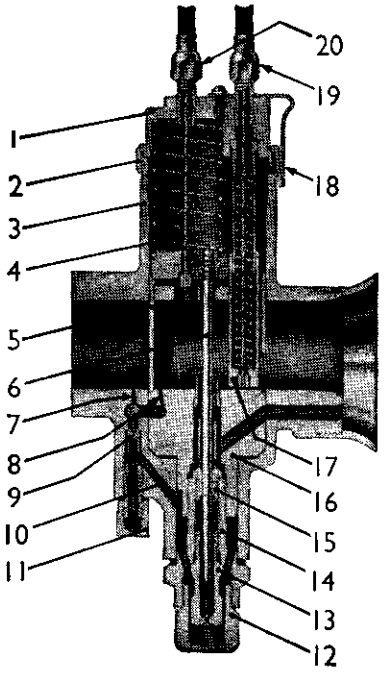


Fig. X7—Section through mixing chamber, showing air valve and throttle closed

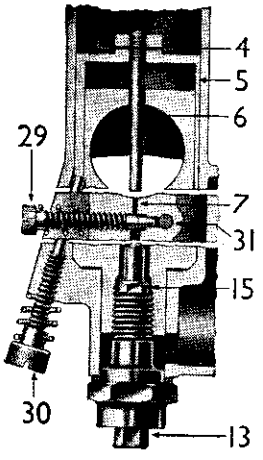


Fig. 8a

30 THROTTLE ADJUSTING SCREW

Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

29 PILOT AIR ADJUSTING SCREW

This screw regulates the strength of the mixture for 'idling' and for the initial opening of the throttle. The screw controls the depression on the pilot jet by metering the amount of air that mixes with the petrol.

Cable Controls

See that there is a minimum of backlash when the controls are set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjusters on the top of the carburettor. See that the throttle shuts down freely.

Petrol Feed

Verification. Detach petrol pipe union at the float chamber end; turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.) in the tank—so clean out the float chamber periodically till the trouble ceases. If the trouble persists the tank might be drained, swilled out, etc. Note that if the carburettor, either vertical or horizontal, is flooding with the engine stopped, the overflow from the main jet will not run into the engine but out of the carburettor through a hole at the base of the mixing chamber.

Fixing Carburettor and Air Leaks

Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe—check by means of oil placed around the joint, if there are leaks the oil will be sucked in, and eliminate by new washers and the equal tightening up of the flange nuts. Also in old machines look out for air leaks caused by a worn throttle or worn inlet valve guides.

Explosions in Exhaust

May be caused by too weak a pilot mixture when the throttle is closed or nearly closed—also, it may be caused by too rich a pilot mixture and an air leak in the exhaust system; the reason in either case is that the mixture has not fired in the cylinder and has fired in the hot silencer. If the explosion occurs when the throttle is fairly wide open the trouble will be ignition—not carburation.

Excessive Petrol Consumption

On a new machine may be due to flooding, caused by impurities from the petrol tank lodging on the float needle seat and so preventing its valve from closing. If the machine has had several years use, flooding may be caused by a worn float needle valve. Also excessive petrol consumption will be apparent if the throttle needle jet 'O' (Fig. X4), or (15) (Fig. X5) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be, then the only remedy is to get a new needle jet.

Air Filters

These may affect the jet setting, so if one is fitted afterwards to the carburettor the main jet may have to be smaller. If a carburettor is set with an air filter and the engine is run without it, take care not to overheat the engine due to too weak a mixture; testing with the air control will indicate if a larger main jet and higher needle position are required.

Faults

The trouble may not be carburation; if the trouble cannot be remedied by making mixtures richer or weaker with the air control, and you know the petrol feed is good and the carburettor is not flooding, the trouble is elsewhere.

Fault Finding

There are only TWO possible faults in carburation, either RICHNESS of mixture or WEAKNESS of mixture, so in case of trouble decide which is the cause, by:

1. Examining the petrol feed .. { Verify jets and passages are clear; Verify ample flow; Verify there is no flooding
2. Looking for air leaks .. { At the connection to the engine; Or due to leaky inlet valve stems
3. Defective or worn parts .. { As a slack throttle-worn needle jet; The mixing chamber union nut not tightened up, or loose jets

4. TESTING WITH THE AIR CONTROL to see if by richening the mixture the results are better or worse.

Indications of Richness	Indications of Weakness
Black smoke in exhaust.	Spitting in carburettor.
Petrol spraying out of carburettor.	Erratic slow running.
Four strokes, eight-stroking.	Overheating.
Two strokes, four-stroking.	Acceleration poor.
Heavy, lumpy running.	Engine goes better if: Throttle not wide open, or Air Control is partially closed.
Heavy petrol consumption.	? Has air cleaner been removed.
? If the jet block F is not tightened up by washer and nut E richness will be caused through leakage of petrol.	? Jets partially choked up.
? Air cleaner choked up.	Removing the silencer or running with a racing silencer requires a richer setting and large main jet.
? Needle jet worn large.	
Sparking plug sooty.	

Note

Verify correctness of fuel feed, stop air leaks, check over ignition and valve operation and timing. DECIDE BY TEST WHETHER RICHNESS OR WEAKNESS IS THE TROUBLE AND AT WHAT THROTTLE POSITION. See throttle opening diagrams, Fig. X6.

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Note

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Procedure

If at a particular throttle opening you partially close the air control, and the engine goes better, weakness is indicated; or on the other hand the running is worse, richness is indicated. THEN YOU PROCEED TO ADJUST THE APPROPRIATE PART AS INDICATED FOR THAT THROTTLE POSITION.

Fault at Throttle Positions indicated on Fig. X9

To Cure Richness		To Cure Weakness
Fit smaller main jet.	1st	Fit larger main jet.
Screw out pilot air screw.	2nd	Screw pilot air screw in.
Fit a throttle with larger cut-away.	3rd	Fit a throttle with smaller cut-away.
Lower needle one or two grooves.	4th	Raise needle one or two grooves.

Notes

It is not correct to cure a rich mixture at half throttle by fitting a smaller main jet because the main jet may be correct for power at full throttle: the proper thing to do is to lower the needle.

Information on throttle slides and needle position is given in paragraphs (f) and (e) respectively in the next section entitled TUNING.

Changing from standard petrols to special fuels

Such as alcohol mixtures will, with the same setting in the carburettor, certainly cause weakness of mixture and possible damage from overheating.

TUNING

(a) Figs. X8 and 8a are two diagrammatic sections of the carburettor to show:

1. The throttle stop screw.
2. The pilot air screw.

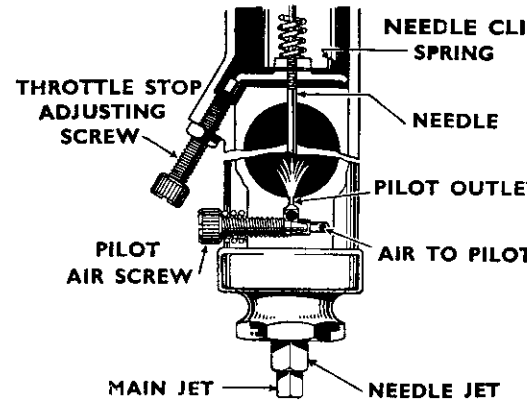


Fig. X8

(b) **Throttle stop screw**

Set this screw to prop the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(c) **Pilot air screw**

This screw regulates the strength of the mixture for 'idling' and for the initial opening of the throttle. The screw controls the suction on the pilot petrol jet by metering the amount of air that mixes with the petrol.

Note. The air for the pilot jet may be admitted internally or externally according to one or other of the designs, but there is no difference in tuning.

(d) **Main Jet**

The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike.

Never reamer a jet out, get another of the right size

The bigger the number the bigger the jet. Spare jets ARE SEALED.

To get at the main jet, undo the float chamber holding bolt Q (Fig. X4) or Main Jet Cover No. 12 (Fig. X7). The jet is screwed into the needle jet so if the jet is tight, hold the needle jet also carefully with a spanner whilst unscrewing the main jet.

(e) Needle and Needle Jet

The needle is attached to the throttle and being tapered either allows more or less petrol to pass through the needle jets as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The needle jet is of a defined size and is only altered from standard when using alcohol fuels.

The taper needle position in relation to the throttle opening can be set according to the mixture required by fixing it to the throttle with the needle clip spring in a certain groove (see illustration above), thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttle openings from quarter to three-quarter open (see illustration, Fig. X9).

(f) Throttle Valve Cut-away

The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cut-away is recorded by a number marked on the throttle, viz.: 6/3 means throttle type 6 with No. 3 cut-away; larger cut-aways, say 4 and 5, give weaker mixtures, and 2 and 1 richer mixtures.

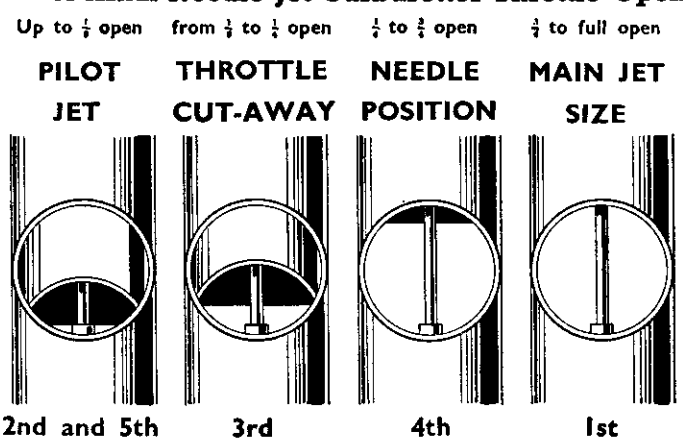
(g) Air Valve

Is used only for starting and running when cold, and for experimenting with, otherwise run with it wide open.

(h) Tickler

A small plunger located in the float chamber lid. When pressed down on the float, the needle valve is pushed off its seat and so 'flooding' is achieved. Flooding temporarily enriches the mixture until the level of the petrol subsides to normal.

Phases of Amal Needle Jet Carburettor Throttle Openings



SEQUENCE OF TUNING

Fig. X9

Sequence of Tuning

Tune up. In the following order only, by so doing you will not upset good results obtained.

Note. The carburettor is automatic throughout the throttle range—the air control should always be wide open except when used for starting or until the engine has warmed up. We assume normal petrols are used.

Read remarks on Fault Finding and Tuning for each tuning device and get the motor going perfectly on a quiet road with a slight up gradient so that on test the engine is pulling.

1st Main Jet with throttle in position

Test the engine for full throttle; if when at full throttle, the power seems better with the throttle less than wide open or with the air valve closed slightly the main jet is too small. If the engine runs 'heavily' the main jet is too large. If testing for speed work note the jet size is rich enough to keep engine cool, and to verify this, examine the sparking plug by taking a fast run, declutching and stopping engine quickly. If the plug body at the end has a bright black appearance, the mixture is correct; if sooty, the mixture is rich; or if a dry grey colour, the mixture is too weak and a larger jet is necessary.

2nd Pilot Jet with throttle in positions 2 and 5

With engine idling too fast with the twist grip shut off and the throttle shut down on to the throttle stop screw, and ignition set for best slow running: (1) Loosen stop screw nut and screw down until engine runs slower and begins to falter, then screw the pilot air screw in or out to make engine run regularly and faster. (2) Now gently lower the throttle stop screw until the engine runs slower and just begins to falter, then lock the nut lightly and begin again to adjust the pilot air screw to get best slow running; if this second adjustment makes engine run too fast, go over the job again a third time. Finally, lock up tight the throttle stop screw nut without disturbing the screw's position.

3rd Throttle Cut-away with throttle in position

If, as you take off from the idling position, there is objectionable spitting from the carburettor, slightly richen the pilot mixture by screwing the air screw in about half a turn, but if this is not effective, screw it back again and fit a throttle with a smaller-cut-away. If the engine jerks under load at this throttle position and there is no spitting, either the throttle needle is much too high or a larger throttle cut-away is required to cure richness.

4th Needle with throttle in position 4

The needle controls a wide range of throttle opening and also the acceleration. Try the needle in as low a position as possible, viz., with the clip in a groove as near the end as possible; if acceleration is poor and with air valve partially closed the results are better, raise the needle by two grooves; if very much better try lowering needle by one groove and leave it where it is best.

Note. If mixture is still too rich with clip in groove No. 1 nearest the end—the Needle Jet probably wants replacement because of wear. The needle itself never wears out.

5th Finally go over the idling again for final touches.

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Service Dept., Waverley Works, Birmingham, 10
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ALL MODELS

CARBURATION AT HIGH ALTITUDES

The carburetter settings of all B.S.A. Motor Cycles are designed to give the best all round performance at altitudes of a few thousand feet.

At greater altitudes the air becomes rarefied with the result that the mixture is incorrect.

To overcome this difficulty it is necessary to reduce the size of the main jet, the reduction depending on the altitude at which the machine is mainly used.

The table below shows the percentage of reduction at given altitudes, but it must be emphasised that while the alteration to jet size will correct the mixture, it will not replace the lost power. This can only be corrected by "Blowing" or super-charging.

It may also be advisable to retune the carburetter for smaller throttle openings this should be done in accordance with Service Sheet 708.

Altitude.	Percentage of reduction in jet size.
3,000 feet	5%
6,000 feet	9%
9,000 feet	13%
12,000 feet	17%

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Service Dept., Waverley Works, Birmingham, 10.
(PRINTED IN ENGLAND)

BSA SERVICE SHEET No. 708C

Reprinted Jan., 1960

CARBURATION.

"D" Group Models.

A CARBURETTER WITH NEEDLE CONTROLLED SINGLE JET.

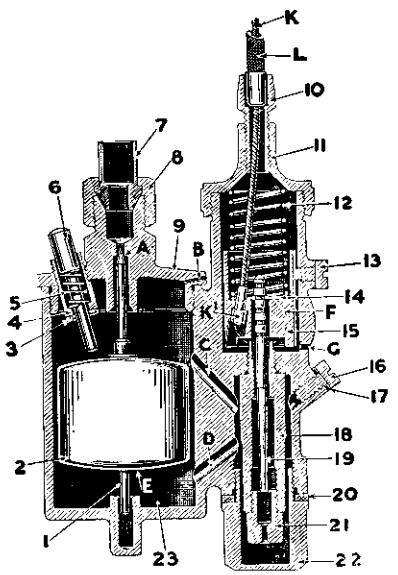

Fig. X13.

This sectioned diagram is taken through the centre of the mixing chamber and float chamber, showing the float and jet and throttle mechanism. The float and needle are shown as one piece as for types 259 and 261, but in type 223 the float needle (1) is separate from the float (2), but is attached thereto by a spring bow fastened to the float at the place marked (E). The cable (K) and its anchoring (K1) are diagrammatic as in practice the cable anchoring is in front of the jet.

HOW IT WORKS.

This Carburetter is designed to suit small engines and to eliminate any difficulty arising out of the use of very small jets. The control is automatic, the hand lever on the bar operating the throttle (15), which in its turn controls the mixture according to the engine speed.

The full power control of the mixture is by the main jet (Fig. 21) feeding the engine through a needle-jet (Fig. 18), in which there is a needle (Fig. 19) The taper on the needle controls the mixture at lesser throttle openings, and the position of the taper in the needle jet, providing a means for richening or weakening the mixture at various throttle positions. The needle is located in the throttle (Fig. 19) by a circular spring clip (Fig. 14) held down by the throttle spring (Fig. 12) and the needle itself is positioned by the particular groove that the clip (Fig. 14) is fixed to.

For idling, the fuel supply is controlled by the parallel portion of the needle (Fig. 19) entering the bore of the needle jet (Fig. 18), the difference in diameter being the jet orifice, which is small —although in case of obstruction or gumming up due to the petrol and oil system, it can be instantly cleared by opening the throttle.

The petrol feed is into the top of the float chamber (Fig. 7) where constant levels are maintained, and the petrol at these levels flows to the main jet (Fig. 21) through a passage D, and air locks are liberated through the passage C, back into the float chamber at the top.

The jets (Figs. 21 and 18) can be got at by undoing jet plug (Fig. 22). The throttle (Fig. 15) and adjustable needle (Fig. 19) can be removed by unscrewing the mixing chamber top (Fig. 11). The throttle is guided by screw (Fig. 13) working in a groove in the throttle, and the slot in the throttle itself enables the cable K to be quickly detached.

The intake of the carburetter may have an air strainer and a strangler for closing off the air only for starting when cold.

CARBURETTER WITH NEEDLE CONTROLLED SINGLE JET.

Names of Parts.

1. Float Needle.
2. Float.
3. Tickler Cotter.
4. Tickler Bush.
5. Tickler Spring.
6. Tickler.
7. Petrol Pipe Union Nipple.
8. Petrol Pipe Union Nut.
9. Float Chamber Cover.
10. Cable Adjuster.
11. Mixing Chamber Top.
12. Throttle Spring.
13. Throttle Valve Location Screw.
14. Jet Needle Clip.
15. Throttle Valve.
16. Feed Hole Screw.
17. Feed Hole Washer.
18. Needle Jet.
19. Jet Needle.
20. Jet Plug Washer.
21. Main Jet.
22. Jet Plug.
23. Float Chamber.

A. Petrol Feed Needle Seat.
B. Air Vent Hole in Float Chamber Cover.
C. Air Release Passage from 1st Chamber into Float Chamber.
D. Petrol Feed Passage from Float Chamber to Main Jet (21).
E. The illustration shows the float and needle as one piece, but if the needle is separate, the float has a spring bow at this point to hold the needle in a groove.
F. The choke bore of the Carburetter, the size of which is specified according to engine size and maximum revs.
G. Drain hole from mixing chamber to liberate any excess petrol due to flooding.
H. Guide groove in the throttle to prevent incorrect assembly.
J. Cutaway of the throttle. There are various cutaways, which are numbered and marked on the bottom of the throttle. The cutaway affects the mixture up to half throttle position.
K. Throttle Cable.
K1. Throttle Cable Nipple.
L. Throttle Cable Outer Cover.

GENERAL MAINTENANCE INSTRUCTIONS.

Keep the float chamber free from impurities, which are the commonest cause of flooding. Otherwise, if flooding takes place, remove the petrol pipe connection from the lid and clean out all the passages. See that the float needle is not bent, nor the float petrol logged. If the needle seating is at fault, rub the needle lightly in by twisting it between the finger and thumb. (Never use any grinding compound.) If the needle itself has a deep groove in it on the taper end, a new needle and float may be necessary. When replacing the float chamber lid, first see that the blunt end of the float needle is in the guide hole at the bottom of the float chamber, and then guide the lid over the taper end of the needle before screwing down. Also see that the tickler works freely and springs back, and that the air hole in the rim of the lid is clear.

If the carburetter is ever removed from the induction pipe, see that it is pushed right home on to the pipe, before locking the ring clip. Never fit the carburetter to a pipe on which it is slack, nor ever drive it in to a tight one. A carburetter should be a good push fit on to the inlet pipe, and should be pushed on true with a screwing motion after having put a little oil on the pipe.

Keep the air intake or gauze free from obstruction and see that the air strangler, if of the knife type fitted into the intake of a carburetter, remains firmly open when opened. If it is inclined to be slack, bend it slightly to stiffen the movement.

If the throttle should become slack after years of use, it should be replaced, otherwise the slow running may be interfered with. Also, if a throttle has become badly worn, it may be advisable also to replace the needle-jet, as this might wear slightly large in diameter through the movement of the needle in the same, thus causing a richer mixture than necessary.

Also bad petrol consumption will be apparent if the throttle needle-jet (Fig. 18) has worn; it may be remedied or improved by lowering the needle in the throttle, but if it cannot be—then the only remedy is to get a new needle-jet.

TRACING FAULTS. ASSUMING ENGINE IN GOOD ORDER AND EXHAUST SYSTEM NOT CHOKED.

1. Assure yourself of ample petrol supply, good compression, clean sparking plug and good spark at the points. Also rectify if flooding and verify complete closing and opening of throttle and air strangler, and that the air intake gauze or filter are clean.

2. Verify carburetter to be clean internally and that jet and passages are clear and that there is no air leak at the fitting of the carburetter to the engine. Also verify that main jet and needle-jet are screwed up firmly.

3. When the above points are in order, there are only two possible faults in carburation—either the mixture is RICH or WEAK, and *you must determine which of the two is causing inefficient running, and at what throttle opening,* so that the carburetter can be tuned correctly. Indications are as follows:—

For Richness.	For Weakness.
Black sooty smoke in exhaust.	"Spitting" in the carburetter.
Petrol spraying out of carburetter.	Erratic slow running.
Two-stroke engine "four-stroking."	Poor acceleration.
Heavy petrol consumption.	Engine runs better at less than full throttle opening.
Sparking plug sooty.	Overheating.
Heavy lumpy running.	Sparking plug dry grey colour around the points.
Four-stroke engines "eight-stroking."	

4. Some causes for above producing:—

Richness.	Weakness.
Punctured float or bent float needle.	Air leaks.
Tickler stuck down.	Petrol supply or jet partially choked.
Needle (19) raised too much.	Too small main jet (21).
Main jet (21) too large or not screwed up.	Needle (19) in top low position.
In old machines, needle-jet (18) worn.	Air gauze or filter been removed.
Air filter choked.	Using petrol with water in it.

5. If engine "idles" better after tickling the float and gives better power with air shutter partially closed, the mixture is weak.

   Idling better with petrol turned off temporarily and no suspicion of spitting when opening throttle quickly when engine is cold—the mixture is Rich.

6. Trouble at half to full throttle is most likely to be connected with the main jet (21) supply. Trouble at quarter to three-quarters throttle opening will be due to needle position. If the power is good, at full throttle, very poor acceleration is the effect of too low a needle position, which can be remedied. Bad slow running will probably be due to air leaks.

HOW TO TUNE UP. (READ PARTS TO TUNE UP WITH)

1. Generally speaking : for power at full throttle the main jet is selected and at other lower throttle positions, the needle is either raised or lowered to richen or weaken the mixture.

2. To tune up precisely throughout the throttle range imagine four throttle positions:—

   *Throttle slightly open as for idling.

   **Throttle about quarter open as for running light.

   ***Throttle from one-quarter to three-quarters open as for general running.

   ****Throttle three-quarter to wide open as for full power.

3. From the preceding paragraph start tuning in this order, having read "Parts to tune up with" and with the engine warmed up:—

   1st. **** Use the smallest main jet (21) that will give full power when running under load on the level If the engine runs slightly better with the throttle not quite wide open, the jet is either just right for economy or on the small side.

   2nd. *** Set the needle (19) position as low as possible in relation to good acceleration and running at half throttle—"spitting" in the carburetter on acceleration means the needle is too low, so try a groove higher.

   3rd ** & *. If the idling mixture at * and the take off at ** are weak—the engine spitting and fading out—use a smaller cutaway throttle, or if the engine runs lumpily on a rich mixture use a larger cutaway.

   4th. Finally, if any alteration has been made to the throttle cutaway it may be necessary to alter the needle position again: putting in a throttle of a smaller cutaway may require the needle lowering by a groove and alternatively a larger cutaway may necessitate raising the needle.

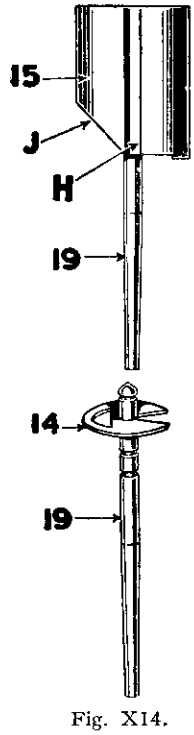

Fig. X14.

PARTS TO TUNE UP WITH.

Main Jet (Fig. 21) with seal. This jet does not control the slow running mixture, but it controls the maximum supply of petrol from half to full throttle positions. This jet is interchangeable with other larger Amal carburetters except for the number stamped on it, which indicates the amount of petrol that will flow through. The bigger the number the bigger the jet, and numbers go up and down in fives. Example, 20, 25, 30, etc. These jets should never be reamed out—the seal on the jet you may purchase is a guarantee of its size.

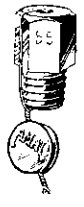
Fig. X15.

Throttle (15). This part is controlled from the handlebar, and from the shut-off to full-open position progressively increases the amount of gas taken into the engine. The slope at J is called the cutaway, and its number is stamped on the bottom. Throttles can be had with different cutaways—the bigger the cutaway and number the weaker the mixture for idling and up to half throttle positions and vice versa. The throttle holds the needle of the needle-jet.

Needle (19) for Needle-Jet (Fig. 18). This works up and down with the throttle and the taper end goes into the needle-jet, so controlling the amount of petrol at different throttle openings. Its position in the throttle and of its taper in the needle-jet is therefore affected by which groove the clip No. 14 is fixed in: the extreme end groove is No. 1, giving the lowest position and the weakest mixture and vice versa, raising the needle richens the mixture. The spring clip (Fig. 14) can be sprung off and on.
The illustration shows clip 14 *in position* 2.

Needle-Jet (Fig. 18), see section. The standard jet is not marked in any way, but can be had in other sized bores on request, which are marked accordingly. If the mixture gets rich at half throttle when the machine is old this needle-jet has probably worn large and should be replaced. (Extreme weakness when idling may be corrected by a larger bore needle-jet, which can be obtained on special application.)

For Tuning with engine running, but cycle stationary.

Air Shutter on the intake of the carburetter. This is to be closed only for starting from cold to reduce the amount of air and to increase the suction on the jet. When tuning, however, the shutter might be used experimentally to indicate if richening the mixture improves matters.

Tickler (Fig. 6), see section. This is for pressing down the float needle off its seat to allow more petrol to come into the float chamber and so raise the petrol level, and consequently richening the mixture.

NOTE. For idling, if excessive richness cannot be cured by a larger cutaway nor will the throttle opening range allow a lower needle position—then change the needle jet for a new one, as the old one may be worn. If weakness prevents idling and cannot be cured by a smaller cutaway throttle and a raised needle position, use a larger bore needle-jet, which will have its bore marked on it.

GENERAL HINTS AND TIPS.

Starting from Cold. Flood the Carburetter by depressing the tickler momentarily three or four times and close the air strangler; set the ignition, say half retarded, then shut the throttle and open it a little, about one-eighth open; then kick-start.

When started, gradually open the throttle to make the engine run faster and when the engine is warmed up, close down again and open the strangler. Should the engine falter either tickle the float chamber again or partially close the strangler until the engine is warm enough to stand the strangler being opened fully.

Starting with Engine Hot. Do not flood the Carburetter nor close the air strangler; set the ignition and close the throttle, then, open it again about one-eighth of its movement and kick-start. If the engine does not start at once, flood slightly or close the strangler and try again. After starting, open the strangler but if this should cause the engine to falter and not respond to opening the throttle, flood the carburetter momentarily.

Starting Generally. Find out by experiment if and how much it is necessary to flood and also the best position for the air strangler on the Carburetter intake.

Usually for easy starting a small throttle opening is desirable and the best position is accompanied by a sucking noise when the engine is being turned over. If this noise cannot be heard, the throttle is probably too wide open and there is, consequently, insufficient "pull" on the starting system.

Given a good engine and a fat spark at the plug, if the engine will not start, the mixture is either too rich or too weak.

Over-richness of the mixture, especially with petroil lubrication, may be caused by overflooding or by the machine being left with the petrol tap turned on and the float chamber flooding. To clear this over-richness open the throttle wide, also the strangler, and turn the engine over several times, then close the throttle and start again. If the engine does not start at once, the sparking plug points may have become damp or oiled up, so remove the plug and dry the points, and whilst it is out, swing the engine over several times before replacing it; then try again without flooding and with strangler open.

Cable Control. See that there is a minimum of backlash when the control is set back and that any movement of the handlebar does not cause the throttle to open; this is done by the adjuster on the top of the carburetter. *See that the throttle shuts down freely.*

Petrol Feed, verification. Detach petrol pipe union at the float chamber end; turn on petrol tap momentarily and see that fuel gushes out. Avoid petrol pipes with vertical loops as they cause air locks. Flooding may be due to a worn or bent needle or a leaky float, but nearly all flooding with new machines is due to impurities (grit, fluff, etc.) in the tank—so clean out the float chamber periodically till the trouble ceases. If the trouble persists, the tank might be drained, swilled out, etc.

Fixing Carburetter and Air Leaks. Erratic slow running is often caused by air leaks, so verify there are none at the point of attachment to the cylinder or inlet pipe—check by means of an oil can and eliminate Also in old machines look out for air leaks caused by a worn throttle (or worn inlet valve guides if a 4-stroke. engine).

Bad Petrol Consumption of a new machine may be due to flooding caused by impurities from the petrol tank lodging on the float needle seat and so prevent its valve from closing. If the machine has had several years' use, flooding may be caused by a worn float needle valve.

Faults. Read Tracing Faults. The trouble may not be carburation; if the trouble cannot be remedied by making mixture richer or weaker and you know the petrol feed is good and the carburetter is not flooding, the trouble is elsewhere.

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