Rich mixture?

General indications of an ultra-rich mixture are heavy, thumpy running, regular misfiring (eight stroking in the case of a four-stroke engine), black smoke at the exhaust, and soot on the plug. A weak mixture is apparent by spitting back through the carburettor, a tendency for the engine to knock readily, and by the plug showing signs of heat.

Choke check

Before altering carburettor settings, verify the correctness of the fuel feed, stop air leaks, check over ignition and valve operation and timing. Then, if at a particular throttle opening the choke is partially closed and the engine goes better, weakness is indicated; if the running is worse richness is indicated. 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.

Low speed richness

Too rich a mixture at low engine speeds can point to a loose pilot jet (this is a taper fit onto its seat). Any slackness will permit fuel to pass in addition to that governed by the actual jet. Don’t force it though; the jet should be tight, but no more than that.

Heavy fuel consumption

The last thing to suspect is the main jet because, if the correct jet was fitted initially, no amount of petrol flow will wear it larger. A gradual rise in consumption during average running would indicate a worn needle jet, enlarged by a sloppy throttle needle clip. The throttle needle is unlikely to wear though it may be bent. So, when replacing a needle jet change the needle clip at the same time, and check the needle for straightness by rolling it on a sheet of glass.

Slow tick-over

When adjusting the slow running mixture remember to finish the job by resetting the throttle stop. Although the setting for slow running affects the mixture strength only at low speeds, so much mileage is covered in towns that unnecessary pilot jet richness makes a big contribution to heavy fuel consumption.

Heady mixture

At high altitudes an engine will show signs of rich mixture, and the rarified air will result in loss of power. For normal mountain pass storming there is no need to make carburettor adjustments, and the power drop will not be enough to worry about, but these figures will be of interest to Alpine and Himalayan travellers

At 3000 ft the mixture should be about 5 per cent weaker than at sea level; at 6000 ft, about 9 per cent; and at 9000 ft, about 13 per cent.

Power loss is about 10 per cent at 3000 ft; 20 per cent at 6000 ft; and 30 per cent at 9000ft.

For Triumph TRW owners planning that lifetime trip to China, Her Majesty's User's Handbook gives a 22 per cent power loss at 5000 ft and 40 per cent at 10,000 ft. Hard luck!

Rule-of-thumb mixture guide

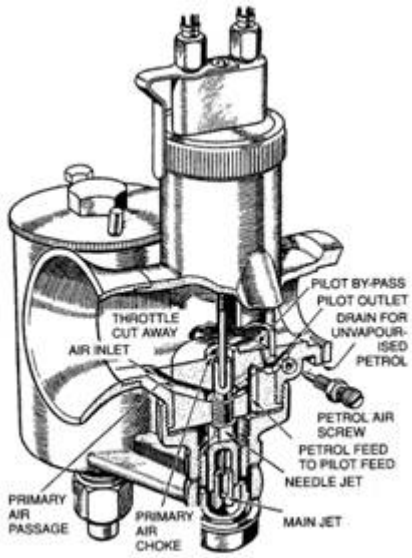
Heavy lumpy running with, usually, black smoke (not the blue of too much oil) from the exhaust, indicates richness. When the mixture is weak the running is erratic, and may be accompanied by spitting back through the carburettor. Another indication is firing in the silencer with the throttle closed and the engine on the over-run.

Spark plug test

When testing for mixture strengths at high speeds by judging the spark plug colour, don't come to a standstill with the engine running slowly or allow it to tick over. It is best to kill the engine on the ignition cutout, get into neutral, and coast in.

Twin mixture

Plug reading should only be treated as a rough guide as it can be misleading. For instance, by examining the plugs of a parallel twin it might appear that the right hand cylinder is running slightly richer than the left. On a twin carb engines this may be so – but there is another factor to be considered. On most twins the main oil feed to the crankshaft is from the timing side and, consequently, that cylinder is likely to get a shade more oil than the other. Therefore, the plug deposit is possibly the dark carbon of burnt oil rather than the soot of richness.



Amal carburettors

Amal Carburettors are straightforward, workmanlike instruments, which can be readily adjusted to obtain fuel economy.

Instructions for tuning the Type 276 also apply to the later Monobloc and Concentric. The basic difference between these three designs is the position of the float chamber. In normal circumstances it will be found that the best all round settings for performance are those recommended by the manufacturers of a machine, with the idling individually adjusted to suit a particular engine by means of the pilot air screw and the throttle stop screw.

Amal Type 276 carburettor

The Amal Type 276 was a prewar design with a separate float chamber. The main jet screws into the bottom of the needle jet. It is calibrated to indicate the number of cubic centimetres of petrol that will flow through the orifice under given conditions in one minute. A jet

stamped with the number 140 will pass 140 cc, and it follows that the smaller the number the smaller the jet and vice versa.

Remote floats on Amal carburettors

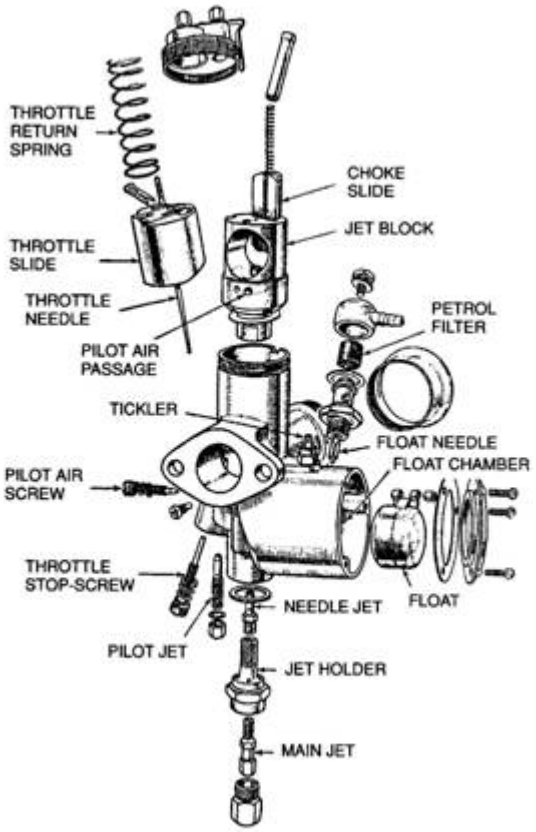
Remote float Amal carburettors could be supplied with one of three thicknesses of mixing chamber union nuts. They were usually supplied with the middle one. The thinner one would have the effect of raising the level of the float chamber, providing a greater reserve of fuel for snap throttle openings or for hilly work, such as in trials. Finer adjustments can be obtained by using varying thicknesses of fibre washer inside the nut.

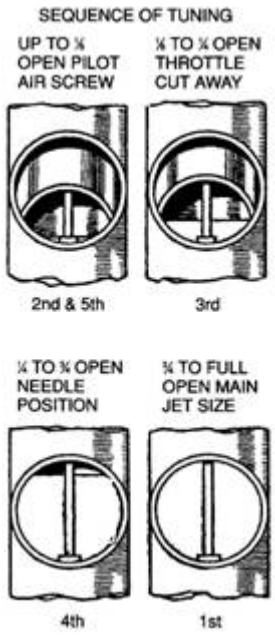
Stuck lids

Stubborn remote float chamber lids can be removed by using a leather strap and a pair of pincers as a makeshift gentle pipe wrench.

Amal Monobloc carburettor

This exploded diagram, of the Monobloc, introduced in 1955, clearly indicates its constructional features. The float chamber is now part of the main body of the carburettor; instead of being separate. The main and needle jets screw into the ends of the jet holder. The pilot jet is detachable, and the throttle slide is guided internally on the jet block.

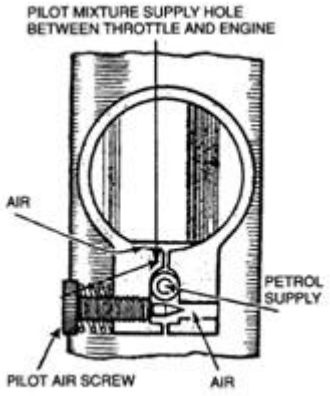




Amal mixture strength

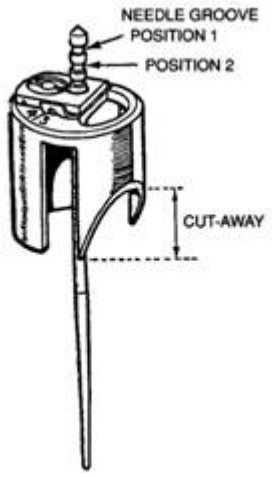
It is important to remember the influence that each variable has on the mixture. If one has constantly in mind that (a) the pilot air screw controls the mixture up to 1/8 throttle opening, (b) the throttle cutaway from ¾ to 1/4, (c) the throttle needle from 14 to ¾, and (d) the main jet from ¾ to full throttle, the effect of changes from standard settings can be anticipated fairly accurately. Further, it is a simple matter to decide where to start in altering carburettor settings.

To take an extreme case, it is a waste of time fitting a smaller main jet if economy at 30 mph is required. At that speed the throttle is less than a quarter open and the major influence on mixture strength comes from the throttle cutaway. It should not be inferred from the Amal instructions that mixture control by pilot air screw, throttle valve cutaway, throttle needle position and main jet takes place in clear-cut stages. It does not. There is a certain amount of overlap, and it will be found, for instance, that an over-rich pilot air-screw setting will cause a measure of heavy fuel consumption, though the machine may be driven for long periods on half throttle. However, these stages of mixture control are the key to the methods used in tuning.



Satisfactory idling on an Amal

At its business end the pilot air screw is tapered. Turning the screw clockwise brings the taper closer into the air orifice and gives a richer slow-running mixture; turning the screw in the other direction weakens the mixture. When making this adjustment the best results are achieved by coordinating the throttle stop setting. The only point to watch is that there is enough slack in the cable to allow the throttle valve to seat on the head of the stop screw. Further, it must be remembered that satisfactory idling will never be obtained if there are air leaks between the carburettor and the combustion chamber, or if there are ignition faults. Once the desired tick over has been obtained, the slack in the cable can be taken up by means of the adjuster in the outer casing or at the top of the carburettor.



Amal throttle valve markings

Throttle valves are identified by markings such as 6/59, 5/5 and so on. The first figure identifies the type of valve with its type of carburettor. The second figure gives the depth of the cutaway in 1/16 ths of an inch. Thus, a 6/5 valve has a 5/16 in. cutaway, and a 6/4 valve has a ¼ in. cutaway. The deeper the cutaway the weaker will be the mixture.

Amal - weaker or richer?

The final adjustment in the sequence is that of the throttle needle position. Needles are tapered and have five notches at the top end. The needle operates in the needle jet through which the fuel passes up into the mixing chamber. A spring clip

located in the notch selected attaches the needle to the throttle valve, and the needle thus moves up and down with the throttle. Putting the clip in a notch nearer the top of the needle lowers the needle relative to the throttle and results in a weaker mixture. Raising the needle has the reverse effect.

Tuning twin engines with twin carburettors - setting the valves:

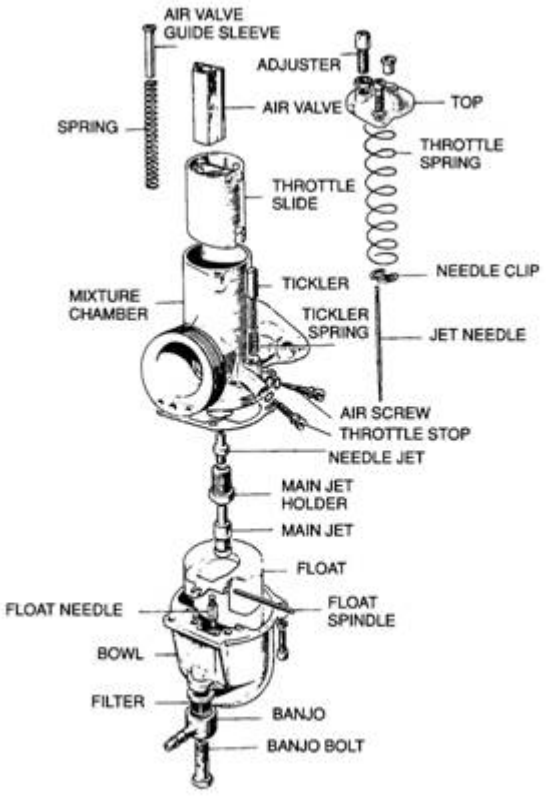
First of all, slacken the throttle stop screw valves and put the twistgrip in the shut-off position to allow the throttle to shut off. There should be a slight backlash in the cables, which can be obtained by screwing in the cable adjusting screws on top of the carburettor. Then, with the handlebars in the normal position, and with the throttles closed, adjust the cable adjusting screws so that on the slightest opening of the twistgrip, both throttle valves begin to open simultaneously.

To make an exact check on the simultaneous throttle opening, wait until all other adjustments have been made. Then, shut the twistgrip back so that the throttles are resting on the throttle stop screws. Insert the fingers into the air intakes and press them on the throttles; with the other hand gently open the twistgrip and feel that the throttles lift off their stops at the same time.

Tuning twin engines with twin carburettors —running adjustments

Main jet sizes are selected by checking the effect of the mixture on the spark plugs after taking a run at full throttle over a straight piece of road, preferably under load. You don't need to be in top gear. The smallest pair of jets that give the best maximum speed is usually correct, provided that the plugs do not show any signs of excessive heat. It might be that for really critical tuning one carburettor will require a slightly different jet size from the other.

Slow running



For slow running, set the twistgrip to make the engine run slowly but just faster than at tickover. Then gently screw in the throttle stops to just hold the valves in that position, and return the twistgrip into the shut position, leaving the engine running on the throttle stops. The next thing to do is to set each carburettor to obtain the idling by screwing down the throttle stop screws and adjusting the pilot air screws accordingly.

Pilot jet

Regarding the setting of the pilot jets, a fairly satisfactory method is to detach one spark plug lead, and set the pilot air adjusting screw on the other cylinder as a single unit, reversing the process for the other cylinder. It may be found that when both leads are connected to the spark plugs, the engine runs slightly

quicker than desirable, in which case a slight readjustment of the throttle stop screws will put this right. It is important that the speed of idling on both cylinders is approximately the same, as this will either make or mar the smoothness of the get-away on the initial opening of the throttle.

Regarding the lower end of the throttle range, which is always the more difficult to set, one can only take excessive pains to make quite sure that the control cables are perfectly adjusted, without any excessive backlash or difference in the amount of backlash between one carburettor and another. Otherwise one throttle slide will be out of phase with the other, resulting in lumpy running. It is essential with twin carburettor that the throttle slides are a good fit in the bodies, and also that there is no suspicion of air leaks at either of the flange attachments to the cylinder.

Amal Concentric

The sketch shows the Amal Mk. 1 concentric carburettor which is ideal for a twin set-up. Earlier Monoblocs had their float chambers mounted on one side, which either made them awkward to adjust when paired, or more costly to manufacture when handed. The Concentric overcame these problems by positioning the float chamber underneath the body of the carburettor.

Twin carburettor tuning – the Douglas way

A Douglas owner found this method quite satisfactory for setting up his machine's twin carburettors in 1951.

The Douglas is put on the center stand with the rear wheel clear of the ground. The engine is started and allowed to warm up for a few minutes. One of the gears is then engaged (usually 2nd gear), the throttle opened a certain amount, and a note made of the speedometer reading with one plug disconnected. Without altering the throttle position, I replace the disconnected plug cap and remove the other one; the speedometer reading should be the same. If not, the required adjustments are made. This process can be repeated for various throttle settings except for very slow running. A good tick-over can be adjusted with both pots firing.