THE AMAL GP2 CARBURETTER

as fitted to your

SPITFIRE Mk.II SPECIAL

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THE AMAL GP.2 CARBURETTER AS FITTED TO YOUR B.S.A. SPITFIRE MK. II

In choosing your B.S.A. Spitfire Mk. II you have shown your appreciation of the finer points in motor cycling and that you will settle for nothing but the best. Built into your machine is over 50 years of high quality motor cycle engineering and with proper care your Spitfire will give you a wonderful performance and make you the envy of all your enthusiastic friends. You will be anxious to see that nothing you may do will detract in anyway from the pleasure of owning the pride of the B.S.A. range.

Remember that the Spitfire engine is a further development of the world famous Lightning, a machine acknowledged in 1965 as the fastest motor cycle so far tested by America's Hot Rod Magazine. Wait until breaking in is completed and you sample the extra performance built into your machine since Hot Rod had the privilege of testing the standard model.

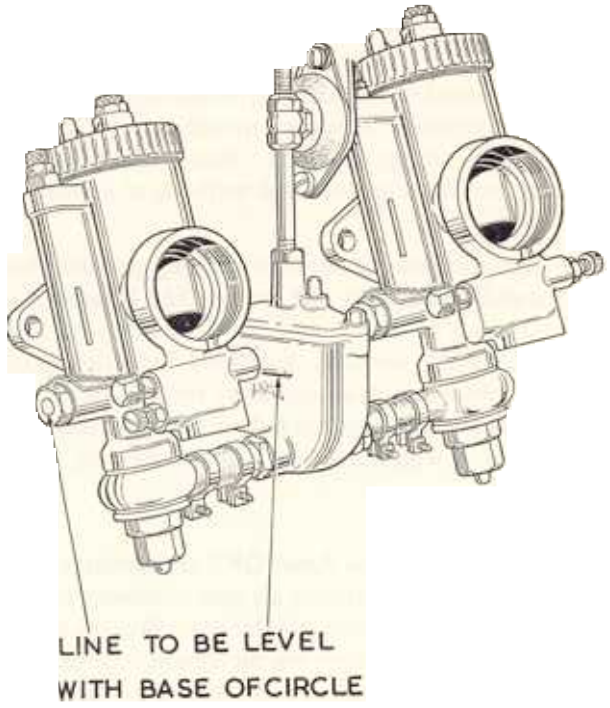
The achievement of the fantastic performance of which the Spitfire is capable is, however, entirely dependent upon careful adjustment of the variable settings provided. This booklet deals with just one instrument, its characteristics and methods of adjustment.

Top ranking athletes of our time can only give their best when their diet is carefully measured and the air they breathe is adequate for the requirements of their lungs. So it is with your Spitfire with its full race camshaft, carefully machined induction ports and combustion chambers and its compression ratio of 10.5 to 1. It will only work efficiently if its lungs are fed with exactly the right diet of gas and air. This is why B.S.A. has chosen the very best carburetters available.

It is the job of the two Amal GP.2 carburetters on your Spitfire to measure its diet of gas and air and to ensure that at no time is this diet allowed to become unbalanced. Because it is a delicate instrument designed to achieve the maximum possible performance of which your engine is capable, it is important that you should know something about the design of the GP.2 and the ways in which it can be adjusted to take advantage of unusual atmospheric or geographical conditions.

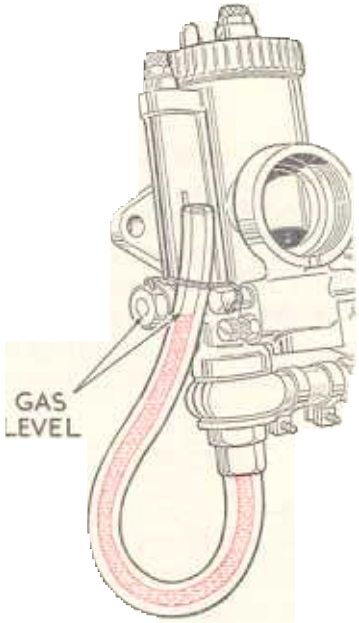
Design Features

Fuel for the Twin GP.2 carburetters on your Spitfire is fed from the gas tank to a remotely mounted float chamber between the two instruments. You will see that the mounting of this float chamber is flexible. This is because its job of controlling the level of gas in relation to the carburetter jets is an essential element in the correct functioning of the system and the float chamber must be protected from the possible harmful effects of vibration at very high engine speeds. The position of the float chamber relative to the two carburetters is adjustable by means of the rod on which it is suspended from its top mounting. The gas level in the chamber is indicated by a raised line on the outside of the body and in positioning the float chamber this line should be on a level with the lowest point of a circular scribed mark on the carburetter air jet plugs. The following illustration will make this clear to you and you will probably notice that with the float chamber in this position the short pipes connecting it with each of the Twin carburetters are straight.



Float chamber level.

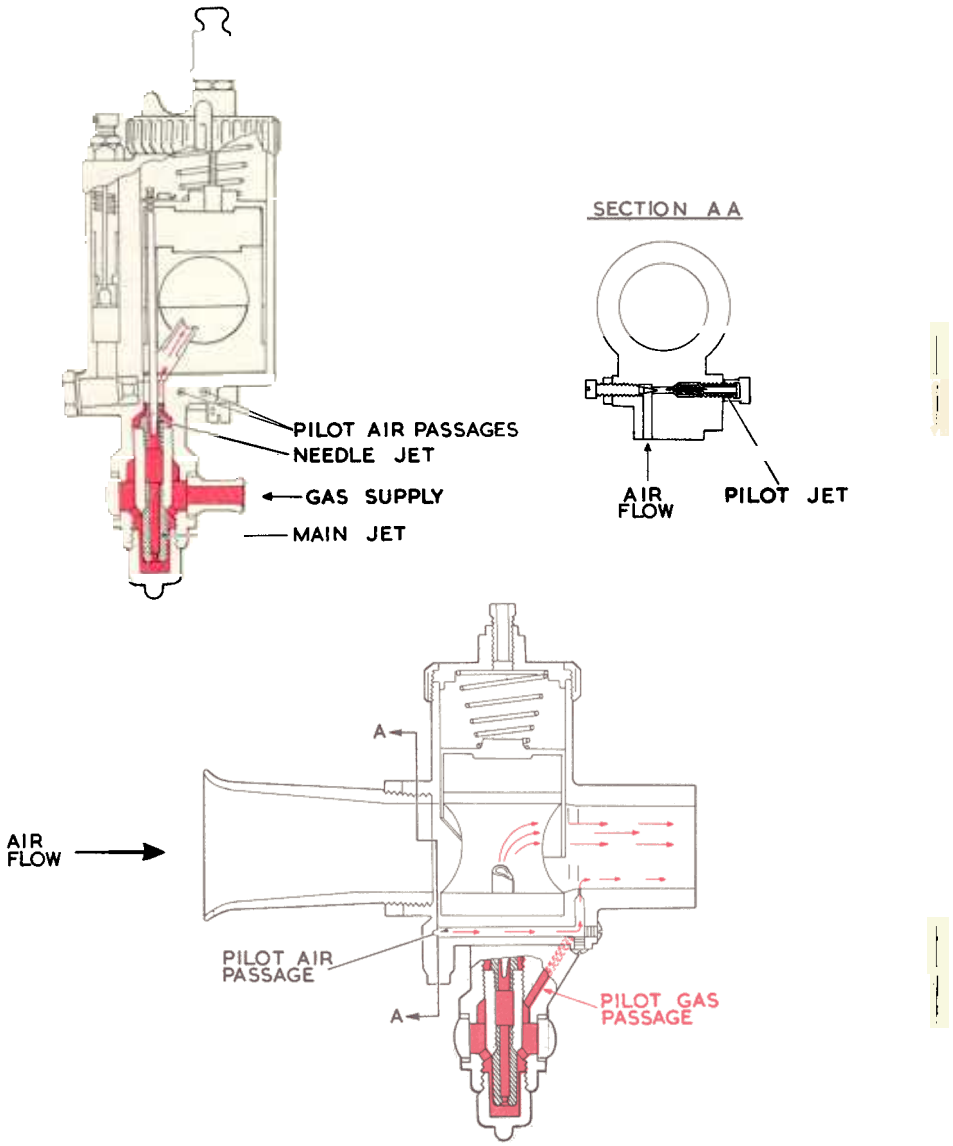
Normally it will not be necessary to do anything more than make a visual check of the float chamber level which is correctly set at the Factory. If, however, the instruments have been disturbed and you feel that you would like to make a more positive check then a transparent flexible pipe fitted to the bottom jet plug of each of the carburetters and looped in the way shown in the illustration will give you a very fine check which is, of course, beyond question. The level of the gas in the flexible pipe should again be the same as the bottom of the circle on the air jet plug.



Plastic tube.

There is no point in endeavouring to tune a carburetter, the float chamber of which is inaccurately set.

From the centre float chamber gas is fed to each of the carburetters through short flexible plastic pipes to a union surrounding the jet block. From here it is metered through a series of jets before being fed to the engine by a pilot bleed system or through the main spray tube where it mixes with a carefully controlled volume of air and is fed to the combustion chambers as a fully atomised highly combustible mixture. These jets and the important air passages are indicated in the following illustration, and a few moments spent in studying this illustration will clearly show their positions and the route taken by the gas and air on its way to the combustion chamber.



Carburetter.

The effect of one of the jets—called the needle jet—is controlled by a tapered needle passing through its centre. As the throttle is opened or closed this needle moves relative to its surrounding jet and allows more or less gas to flow through the spray tube to the choke. Since the tapered needle is located on the side of the throttle slide which controls the amount of air fed to the engine you will see that it is a relatively simple matter to ensure that the relationship between these two important controls is just right for the job they have to do. The way in which this is done is described in the tuning sequences which follow. Fitting the metering needle on the side of the throttle valve and leaving an unrestricted bore at full throttle is one of the ways in which maximum performance is obtained from the GP.2 carburetter.

The purpose of the air bleed jet, not found on standard Amal carburetters, is to primarily atomise the fuel leaving the needle jet before it reaches the spray tube and the heart of the choke. In addition to the throttle twist grip which raises and lowers the throttle slide the GP.2 is also provided with a handlebar lever control for the slide which governs the primary air supply. This slide should be open at all times except for cold starting or when being used for the tuning experiments described on later pages.

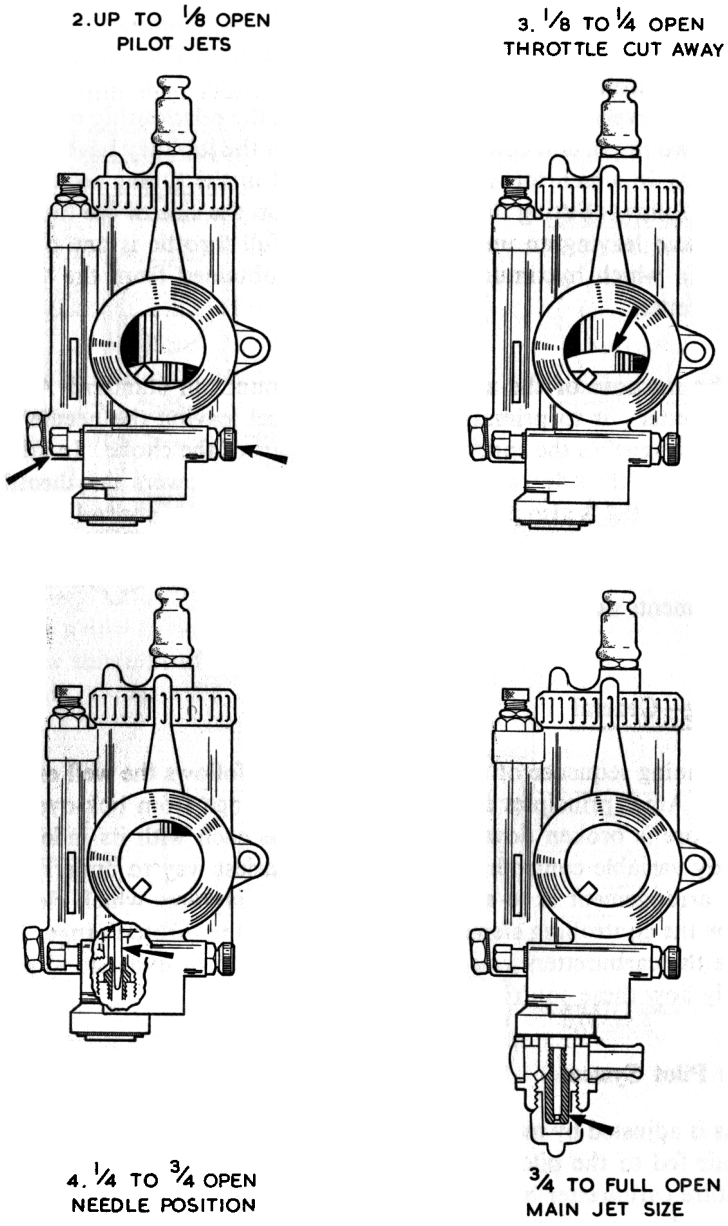
Tuning—General

The tuning sequence of the GP.2 carburetter follows the well established Amal principles in that the throttle range from tick-over to full bore is broken down into four sections each with its independently variable controlling element. The easiest way to understand this arrangement is to study the following diagrams which clearly show the controlling element for each part of the throttle range. To tune the carburetters you will, however, require to understand precisely how these controls are adjusted.

The Pilot System

This is adjusted by means of a pilot air screw controlling the amount of air fed to the pilot system and by a detachable pilot jet. Your Spitfire carburetter has been calibrated at the Factory and you will not under any circumstances require to change the pilot jet. You may, however, require to adjust the air supply to the primary system and how to do this is described more fully later on.

TUNING SEQUENCE



Throttle positions.

The Throttle Cut-away

This influences the speed of air over the spray tube and controls the mixture at small throttle openings. Here again the correct throttle slide has been fitted by the Factory and it is extremely unlikely that you will require to alter this at anytime. If for unusual circumstances such as constant operation of the machine at very high altitude it is necessary to change the throttle cut-away then this must be done by replacing the throttle slide. Slides are available with a range of cut-aways designed to richen or weaken the mixture. That fitted as standard to your Spitfire is a No. 5½ cut-away; to richen the mixture you would require a smaller number whilst to weaken it you would require a higher number.

The Needle Jet

As the throttle is further opened the effects of the throttle cut-away diminish and the effects of the needle within the needle jet become more important. Your Spitfire is fitted as standard with a 107 needle jet and a standard GP needle.

You will not require to interchange these parts but it may be necessary for you to alter the position of the needle within the throttle slide. This has the effect of increasing or reducing the amount of gas mixed with a given amount of air over the range of throttle openings controlled by the needle. To allow more gas to be mixed with a given volume of air the needle must be raised within the throttle slide whilst to reduce the amount of gas it must be lowered. This is a very simple adjustment described fully in the tuning sequence.

The Main Jet

This controls the mixture supply to the engine from approximately three-quarters open to full throttle. It is only variable by inter-changing main jets and your Spitfire is fitted with a No. 260 main jet which will never require reducing. It may be necessary under certain circumstances, and to obtain the very maximum performance of which the engine is capable, to replace this 260 jet by a 270 or 280 depending on conditions. The way in which it should be decided whether or not to attempt tuning by replacement of the main jet is described in the tuning sequence section.

Tuning Sequence

The correct sequence of tuning is as follows:—

(1) main jet size
(2) pilot adjustment
(3) throttle valve cut-away
(4) needle position

Main Jet Size

The ideal jet is the smallest size which gives the greatest maximum speed, always remembering the need to ensure that the engine does not overheat. There is very little danager of this with your Spitfire since the 260 main jet fitted as standard at the Factory gives an accurate gas supply for all normal conditions.

It will never be so far away from that which is ideal as to be likely to cause any serious problems.

If you feel that you may gain some advantage in absolute maximum speed by fitting a larger jet then you will need to accurately check the performance of the machine over a measured distance stepping up the main jet size progressively from 260 to 270, 280 and so on. It would be extremely unusual for you to require a main jet size in excess of 280.

Having decided upon the jet which gives you the maximum performance it is wise to check to ensure that the operating conditions within the cylinders are correct. To do this take the machine up to maximum speed and hold this for as long as possible before instantly closing the throttle, pulling in the clutch and stopping the engine. Coast to a halt and examine the plugs. They should show a smooth black appearance on the plug bottom and the centre insulation should retain its natural colour. If the mixture is too rich a sooty deposit will form on the bottom of the plugs and if it is too weak the end of the plugs will appear to be white. This condition of weakness, if extreme, may lead to serious mechanical trouble if the machine is ridden for prolonged periods with this main jet fitted.

Never try to carry out main jet tuning on a public highway!

Pilot Adjustment

Before attempting to set the pilot air adjuster you should ensure that the engine is at its normal running temperature, otherwise a faulty adjustment is possible. This could upset the correct selection of the throttle valve. Unlike standard Amal carburetters the GP.2 instruments have no positive throttle slide stops and the limit of travel on the throttle slides is controlled only by the cable and the carburetter body. Before doing any pilot adjustment ensure that the throttle slides both begin to lift at the same time when the twist grip is turned. If one slide starts to open before the other you will be able to correct this by simple adjustment of the cable on top of the carburetter bodies.

Start the engine and set the throttle by means of the twist grip until an engine speed of approximately 1,000 r.p.m. shows on the tachometer. Detach one of the plug leads and then adjust the pilot air adjuster which is rotated clockwise to richen the mixture and anti-clockwise to weaken it, until the adjustment giving the highest r.p.m. reading on the tachometer without moving the twist grip is achieved. Screw the adjuster inwards until fractional reduction in engine speed occurs. Replace the first plug lead detached and remove the other from the cylinder which has already been adjusted, repeat the pilot adjustment on this cylinder and reconnect the second plug lead. This should now give you satisfactory engine idling. As you become more expert you will find it possible to tune the GP.2 carburetters with both cylinders working. Try it—the sequence of adjustment is the same.

Throttle Cut-away

Having set the pilot adjuster, open the throttle progressively and notice the position where, if at all, the exhaust note becomes irregular. If this happens leave the throttle open at this position and close the air lever slightly. This will indicate whether the spot is rich or weak because if it is weak closing the air slides slightly will correct it. If it is a rich spot it will only get worse.

Correct a weak spot by fitting throttle slides with a smaller cut-away number and a rich spot by throttle slides with a higher cut-away number.

With the careful calibration that has been done on the instruments fitted to your Spitfire it is unlikely that you will find a need for change but it is as well that you should know what to do in case you either live or ride in an area where there are some unusual conditions which make the standard setting unacceptable.

Jet Needle Position

Tuning the pilot adjustment and throttle cut-away will effect the carburation up to somewhere over quarter-throttle and after this the jet needle becomes the most important aspect of further tuning. You will remember that earlier in this booklet you learnt that the jet needle is suspended in the throttle valve and, therefore, the two can be accurately inter-related to control mixture at medium openings. You should test for rich or weak spots in exactly the same way as you did for that part of the range which is controlled by the throttle cut-away and if you find a spot at which the carburation is not acceptable to you then you should use the air control lever to decide whether

this is because the mixture is rich or weak. Correcting a rich or weak mixture at this point in the range is a simple matter as it only means detaching the top of the carburetter body and raising the throttle slide until the top of the needle can be seen. When you have done this you will notice that the needle is held in position by a small brass clip which locates in one of five notches on the needle. At the Factory we set this needle with the clip in the second notch from the top but if for some reason you wish to richen the mixture you should raise this first to the third notch and possibly even to the fourth notch noting the results. It is extremely unlikely that you will find it necessary to weaken the mixture and we strongly recommend that you should not do so without a great deal of thought and expert opinion.

With the GP.2 instruments properly calibrated you will get from your machine the acceleration, performance and reliability which were your aim when you made the purchase. Please remember that just because your machine is fitted with a racing-type carburetter there is no advantage to be gained in normal circumstances by the use of special racing fuels. Use of these fuels in the carburetter as calibrated at the Factory will lead to serious engine damage and if you intend to enter your machine for competitions where such fuels would give you an advantage your attention is drawn to a Service Sheet No. A5065 available from your B.S.A. dealer. Alcohol fuels require drastic increases in jet sizes and cannot be accommodated by simple adjustment of the standard carburetter specification.

Good Luck and Good Riding on your Spitfire