

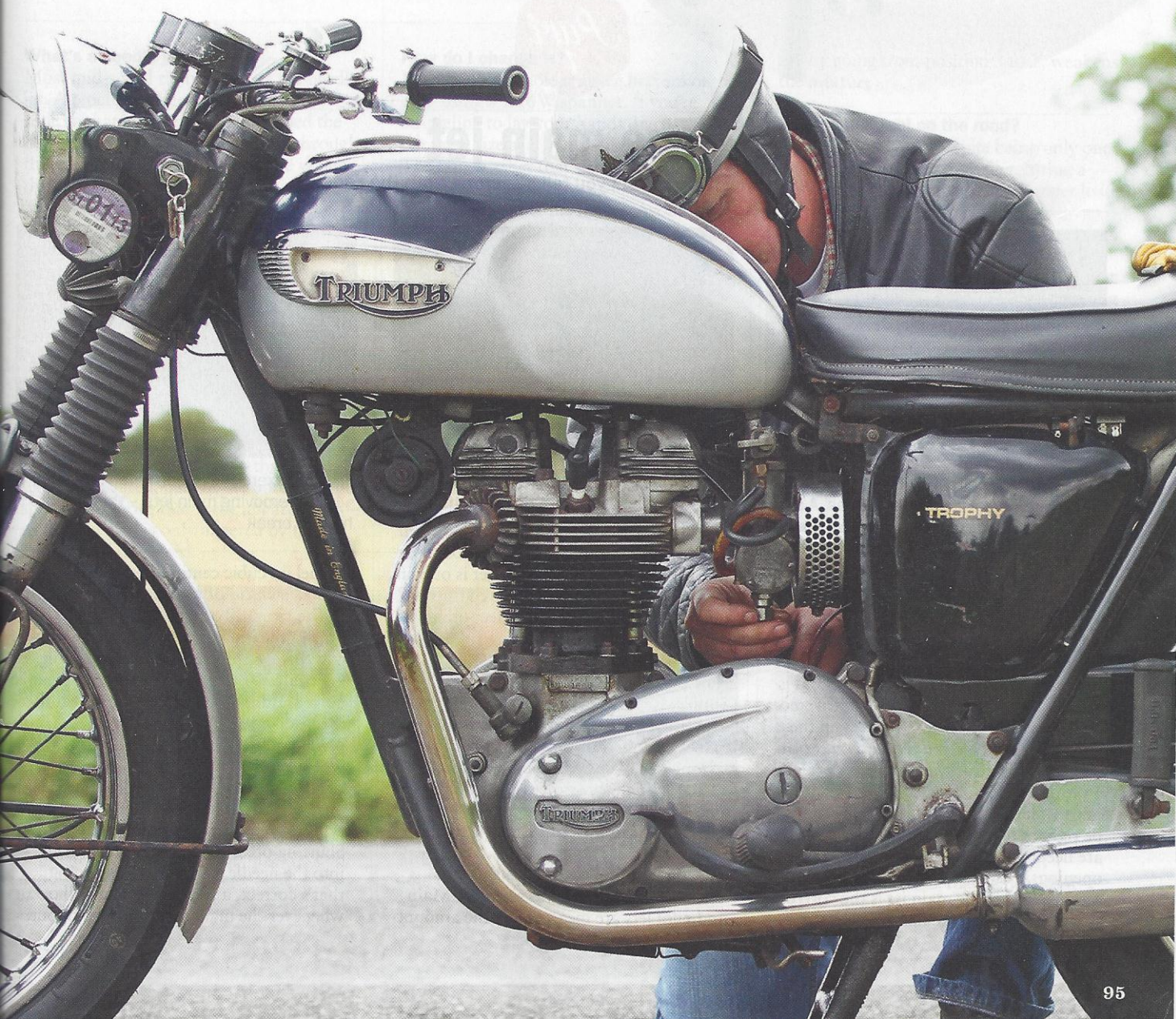
Tune your Amal carb

Why sit in the shed checking the colour of your sparkplugs when you can get your Amal-fuelled motorcycle running beautifully with a bit of road-testing and informed tweaking?

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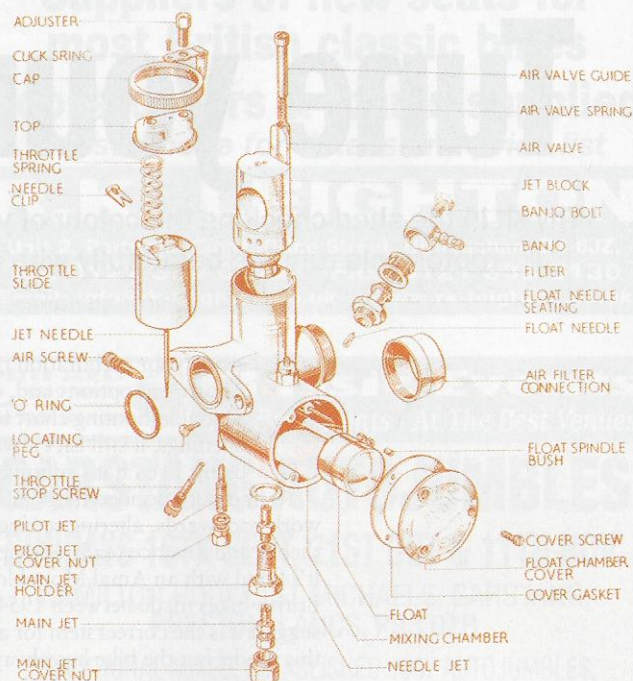
Getting your carburation right can be confusing. There are plenty of adjustment options and, while almost every bike manual worth its salt has a troubleshooting chart telling you which jets refer to what throttle openings, it still isn't always clear what's needed when your bike is running badly. Even if it's running okay, might there yet be room for improvement?

To find out I decided the solution might be to take a bike that's running well and work backwards, altering settings to see what effects were created and whether theory and practice really add up. The bike is my 1967-ish 650cc Triumph Trophy. It's fitted with an Amal Monobloc carburettor, a type fitted almost universally to British bikes made between 1954 and 1967. The identifying numbers on the carb suggest it is the correct item for a Police-spec Trophy, so it's not exactly right for this model but the bike has always been an excellent runner and is easy to start.





Part
1



The main jet

The big one, but how can you tell it's wrong from the saddle?



1 You can't play around with main jet sizes if you don't have any alternatives. A set of jets is worth picking up at an autojumble



2 Swapping main jets is as simple as removing the cap nut on the bottom of the carburettor...



3 ...but exercise caution when securing and removing main jets – they're not hard to break

What's a main jet?

Dip a tube in water and blow across the top and a spray of water should be drawn up and out of the end. That's how a carburettor works. The main jet represents the diameter of the tube and is what meters the amount of fuel delivered. The size needs to be set so that with the throttle fully open, the right amount of fuel can pass through to give the correct 15 to 1 mixture of fuel and air. But unfortunately the proportion will only be right at that opening, so other jets are needed to cover the other throttle openings. For this reason the only way to assess whether the main jet is the correct size is to ride the bike flat out with the

throttle wide open. The main jet is only in play over the last eighth of the twistgrip's movement although it can affect other settings if it is wildly wrong.

How do I change it?

Simple. Remove the cap nut on the very bottom of the carburettor. You need a 5/16W spanner for the cap and a 7/16W spanner to hold the jet block it screws into.

The jet is the brass hexagon poking out. A 2BA spanner will remove it but be careful – it can break if overtightened.

How does it feel on the road?

The Trophy main jet was size 310. Main and pilot jets are measured in the amount

of fuel (in cubic centimetres) they can pass at a given head of pressure in one minute.

The main jet is supposed to take effect only in the last eighth of throttle opening and this was borne out. Even dropping as far as a 250 made no obvious difference to normal riding but pinking set in at full throttle. Similarly, raising the size to 350 made no difference until full throttle when the engine felt slightly off-song. Closing the throttle slightly from wide open gave a slight power increase, a typical symptom of a main jet problem. Shutting off slightly puts the carb back into the needle jet range so, assuming that's correct, a power increase will occur whenever the main jet is far enough out.

Part 2

Needle jet and needle height

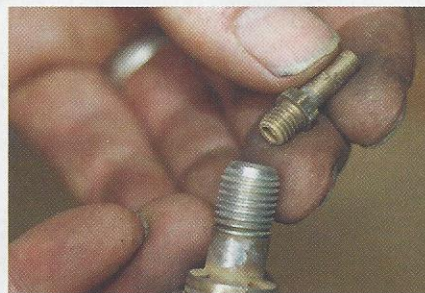
The needle jet controls the fuelling most of the time, so it pays to get it right



1 A selection of needle jets, ready to be screwed in to deliberately screw up the Trophy's lovely fuelling...



2 Whipping out the needle jet holder at the bottom of the carb to reveal the needle jet itself



3 Alternative needle jet sizes are simply screwed into the holder. Now, how will different size jets feel on the road?

What's a needle jet?

Most mid-speed riding involves the needle jet. A tapered needle is attached to the slide so that as the throttle is opened the needle jet opens, letting more fuel through the jet. The needle position can be varied through five positions on an Amal Monobloc, allowing more or less fuel through the jet for a given air supply. Additionally the jet size itself can be altered by swapping the jet, increasing or decreasing petrol supply across the board. The jets for a Monobloc are Imperially calibrated in bore diameter, so a .106 is 0.106in or 106 thou. Needles come in different lengths identified by a letter stamped above the clip grooves. 'C' is for the 376 carb, 'D' is longer and for the larger 389. When the throttle is wide open the needle is clear of the jet – that is the tightest, metered, part of the bore, not the spray tube above that is the apparent top – so that the fuel is only metered by the main jet, as discussed.

How do I change it?

Remove the jet holder at the bottom of the carb using a 7/16W spanner. If you're struggling to lay your hands on one, this is the same size as a 14mm plug spanner. The fibre washer that seals the jet holder may need replacing if it's looking tired.

A 2 BA spanner fits the jet. Avoid overtightening the jet holder, which causes distortion. Jets without a cross-drilled hole are identified by a letter T.

How do I change the needle height?

Unscrew the carb top ring. These threads are easily crossed and stripped so take care when you're replacing them. Wedging the locking clip out of the way makes life easier. After breaking your thumbnail, use a screwdriver blade to remove the needle clip that secures the needle. Make a note of which groove it's fitted into.

There are five grooves, the top is no. 1; most but not all carbs use no.3. For reference dropping the needle into the jet –

say by going from position 3 to 2, weakens the mixture

How does it feel on the road?

Standard is a .106. Despite being only one thousandth of an inch smaller, fitting a .105 created noticeable pinking under load and made starting more difficult.

Moving the needle to its weakest setting, the top groove, didn't have as much effect on performance as expected on the level or under load, though a snap throttle opening provoked pinking. In the economy-minded 1950s smaller jets were recommended to save petrol and it looks like this would work on a carefully ridden bike – but the weakness would cause overheating problems if the bike was ridden harder.

Raising the needle to the richest, bottom, groove created a noticeable flat spot and the odd misfire in the midrange. This was only obvious at cruising speeds but would increase fuel consumption as this is the most used carburettor range.



1 To get at the needle you'll need to first get in by removing the top ring and cap, exposing the...



2 ...spring slide and needle retaining clip. Before you remove the latter, make a note of which groove it's in



3 Now try another needle height. Dropping the needle into the jet weakens the mixture, raising richens it

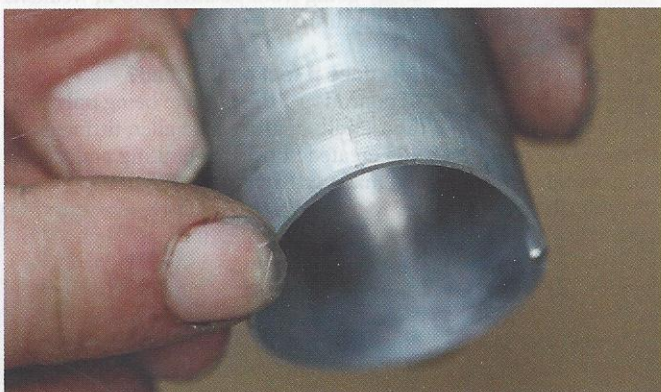
Part 3

The slide cutaway

If starting and acceleration are on the slide when you're riding in traffic you may need a different slide cutaway



1 The carburettor size and slide cutaway are stamped on the top. Quite logically '389 3' means a '3' cutaway for type 389 carb



2 This number 3 slide should have a cutaway $\frac{3}{16}$ in high at its peak. It's worth checking old slides in case they've been modified. When fitting, be sure to locate the guide strip on the inside diameter with the corresponding notch in the jet block

What's the slide cutaway?

The cutaway is the arch on the air intake side. It's height compared to the base level on its engine side reduces the draw on the main jet, so a higher cutaway weakens the mixture. The cutaway on an Amal carb is measured in sixteenths of an inch so a number 4 would measure $\frac{1}{4}$ inch at its highest point. Half sizes are available ($\frac{1}{32}$ in). The standard size on the TR6 is $3\frac{1}{2}$.

How do I change it?

You can increase cutaway by grinding back (see CB Sept p87) but you can't reduce it that way and it's easier to buy a different size.

How does it feel on the road?

Richening to a number 3 slide created a flat spot when pulling away and at traffic filtering speeds but didn't affect anything else. Weakening to a number 4 replaced the flat spot with pinking under acceleration and made starting more erratic. Both conditions worsened with a number 5 cutaway, which caused pinking when pulling away and sometimes called for the carb to be flooded ('tickled') for starting, even when hot.

Part 4

The pilot jet

Tickover as erratic as a cheap watch?
Look to your pilot jet



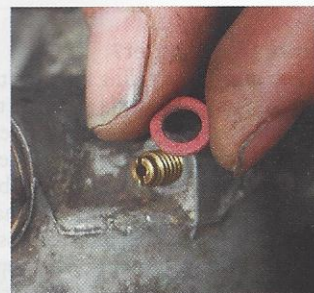
1 To access the jet, remove the chrome-plated cap nut using a 1/8W spanner. The jet may come out with it but should stay in the carb



2 There's a screwdriver slot in the end for removal and replacement. Make sure you use a well-fitting screwdriver as the slot is easy to chew up



3 Size is stamped on the shank. Witness marks show that the jet's tapered nose has properly sealed in the hole



4 Screw the jet home and nip it to seat the taper. Fit a new fibre washer if necessary and replace the plated cap nut

What's a pilot jet?

The pilot system only operates with a closed throttle, so it's independent of the other settings. Fuel is metered by a removable jet on the monobloc, like the main jet, graduated in cc's of flow per minute. Air enters through holes in the intake end of the carb, travelling through drillings to a tapered air screw, which is adjustable to match the fuel supply. Wind the adjuster gently home until it bottoms and then back off one and a half turns to start tuning. If the screw needle setting is wildly off this point, a different jet is needed.

How do I change it?

Simply remove the cap nut (1/8W spanner) and unscrew.

How does it feel on the road?

The TR6 uses a 25 jet. Fitting a 15 on my Trophy made it impossible to start, whether the throttle was open or closed or the carburettor manually flooded, regardless of air screw setting. Clearly an open throttle doesn't override the pilot system, which remains essential to the starting process.

The throttle opens the needle jet but at kick-over speeds lifting the slide reduces suction at the jet, so the effect is to further weaken the mixture. Increasing the pilot size to a 30 unexpectedly improved both pick up and low-speed running, smoothing the interface between the pilot and slide cutaway. Burbling along in top is now a joy, so the 30 jet can stay.

Trouble shooting

Your tool roll's packed and the sun's out. Time for a diagnostic ride

"Nine out of ten carburettor problems are ignition" runs the old saying. It's worth bearing in mind that your carb may not be the problem. Worn inlet valve guides draw air from the rocker box to weaken the mixture, poor starting can be a compression issue, pinking or lacklustre performance may be due to incorrect ignition timing or spark plug grade and ignition faults are usually the cause of misfires. As a rule of thumb, assuming the spark plug is clean, weak mixtures are more likely to cause starting problems than rich, while a rich mixture tends to manifest itself on the road in the form of flat, lumpy and sluggish running.

Tickover is poor

If the bike isn't happy idling the problem will almost certainly be the pilot system (Part 4). If the air screw needs to be screwed fully in the jet may be too small or blocked. If it's fully out the jet may be too large, not seating properly on its taper or its airways may be blocked.

Bike doesn't want to start

Probably a weak slide cutaway or the pilot jet is too small (see Parts 3 & 4). If when the bike starts it also has a poor tickover or throttle pick-up, these two areas are almost certainly the issue.

Misfire at low speeds

This symptom, or a flatspot when pulling away, might be caused by too low a slide cutaway (Part 4). If the engine spits back or cuts out pulling away, that would suggest a weak mixture or too high a cutaway.

Rough under acceleration

Most likely to be due to the needle jet range but may involve the main jet and slide cutaway. Weakness will be revealed by pinking, especially if the throttle is snapped open quickly. Richness is harder to spot but at worst will cause misfiring and will be revealed by sooty plugs.

Rough high speed running

The main jet only comes into effect at full throttle so most high speed riding is still done in the needle jet, not the main jet, range. Do a plug chop. To check plug colour you need a long and nicely under-populated straight road to get the engine revving out properly at full throttle. Also bear in mind that while a rich mix can cause sooty plugs and misfires, it can work in reverse; an ignition related misfire may leave un-burnt fuel in the combustion chamber, causing the plugs to soot. Either way, adjusting the main jet size will only yield an improvement to high-speed, open-throttle running.

Give your Monobloc a health check

SLIDE AND BORE CONDITION

Most old carbs run unfiltered and inevitably the slide and bore wear. Sometimes a new slide will redeem the problem but, because the slide and bore are both made from the same soft alloy, wear is spread between the two. A specialist like Martin Bratby (01543 572583) can re-bore the carb body and fit an oversize brass sleeve to remedy this. The sleeve reduces future body wear as abrasive particles are more likely to stick to the soft aluminium than to the brass. Typically, if tickover drops away when you put light pressure on the throttle, slide and body wear are the cause.

FLANGE AIR LEAKS

Over-tightening the carburettor mounting bolts can lead to the mounting flange warping, especially if a thick gasket or soft insulator washer is used. This creates an air leak, encouraging owners to tighten the nuts still further. Ultimately the distortion causes the slide to stick in the body. Check the flange for truth with a steel ruler and, if necessary, flatten it on an oil stone or using wet and dry paper on a sheet of glass. Excess flattening will reduce the depth of the O-ring groove, making the O-ring effectively too thick, leading to further strain. If in doubt, leave it out and use a paper gasket.

OTHER ISSUES

Owners often remove the choke assembly from the carb, but it's important to block the hole in the carb top or it'll create another air leak. Amal originally supplied small screw-in blanking plugs but you can use a nut and bolt – just make sure it can't come undone and fall into the carburettor.

