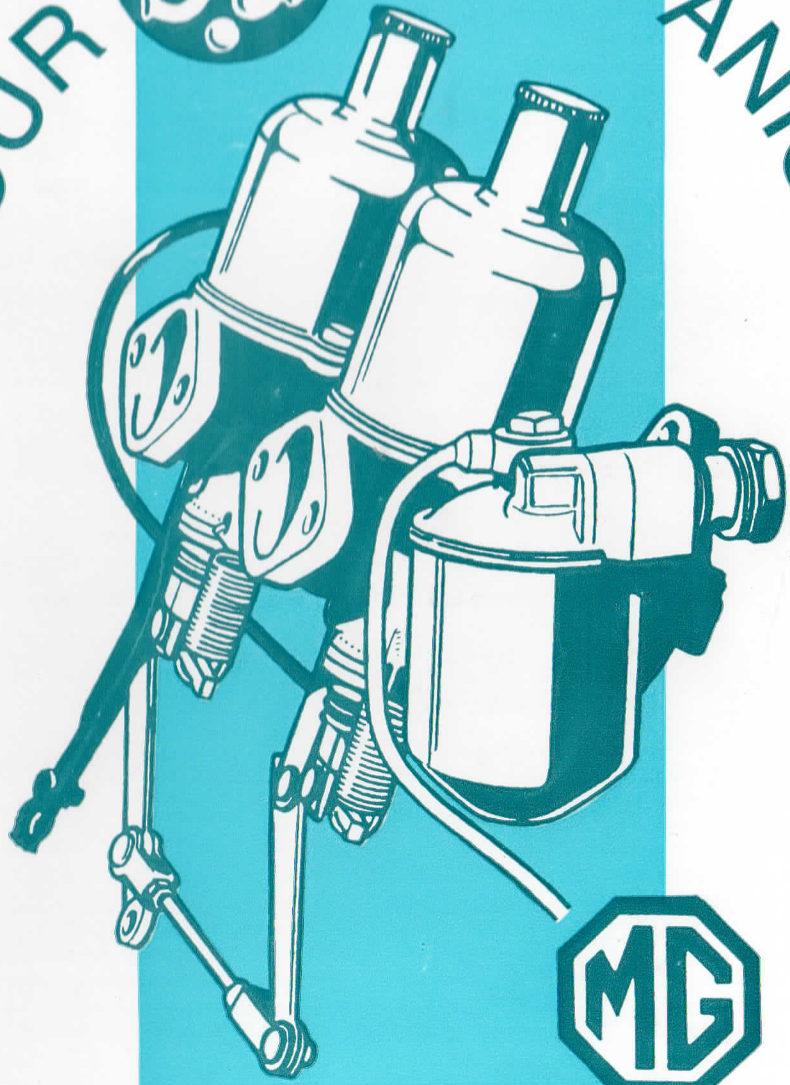
Printed by Panache Press, Arctic House, Howard Street, Burnley BB11 4PA. Tel. 01282 433321

# YOUR SU COMPANION



MG

## Hints and tips for M.G. owners

USEFUL ADDRESSES

The MG Octagon Car Club
Secretary
Harry Crutchley
Unit 1/2, Parchfields Enterprise Park
Parchfields Farm
Colton Road
Trent Valley
Rugeley
STAFFS
WS15 3HB

Tel 01889 574666
Fax 01889 574555

E-mail: harry@mgoctagoncarclub.com
Club Web Site: http://www.mgoctagoncarclub.com

For owners of pre-1956 MGs

Burlen Fuel Systems Ltd
Spitfire House
Castle Road
SALISBURY
Wiltshire SP1 3SA

Tel 01722 412500

For SU Carburetter and pump spares

Peter Jenniches
Weissdornpfad 21
D – 28355 Bremen
GERMANY

Tel 0421 255067

For Grose–Jet float valves

**FOREWORD**

These articles were written over a period of many years and appeared originally in the Octagon Car Club's monthly "Bulletin". Because the Club caters for owners of pre–1956 MGs only, the articles are confined to the types of SU carburetter (mainly 'H' series) fitted to those cars, but it is hoped that owners of other makes of car of the same era will find them useful.

When it comes to carburation, nothing is "set in concrete" and in preparing this booklet I have taken the opportunity to amend the text of some articles in the light of later experience and changing conditions.

Finally, if you find this collection of interest and assistance in dealing with problems, you have to thank my good friend Peter Jenniches who has badgered me for so long to produce it!

***Donald Jackson***

12 Carleton Avenue, Simonstone, Nr Burnley, Lancs. BB12 7JA

## KNOW YOUR CARBS

### 1. Part 1

An American magazine recently referred to the S.U. Carburetter as "that obsolete English plumbers' device" but I think they were really only wishing they could tune them properly! Ancient it may be, but it is still one of the simplest and most effective devices for providing an engine with its correct diet of air and fuel.

It is over 60 years since the brothers Skinner formed their Union and patented the S.U. Carburetter, and it remained uncopied for the full 50 years of the Patent before Stromberg were able to jump on the bandwagon. In those early days, the S.U. used a leather bellows instead of the present close fitting piston and dashpot, and the bellows were hand sewn by a lady as a part-time job, whilst her husband made every needle by hand on a watchmaker's lathe. Or so the story goes.... By coincidence, Stromberg more or less reverted to the original idea of a bellows for their current 'CD' carburetter only using a neoprene diaphragm instead of leather - due to the shortage of cows in the U.S.A. perhaps? (Well, they're not short of bull!)

Carburetters come in two kinds. Fixed choke types (e.g. Solex, Zenith, Carter and original Strombergs, Weber etc., etc.) and variable choke types, also referred to as 'Constant Vacuum' or 'Constant Draught' (hence C.D.), the S.U. being one of the latter. Fixed chokes suffer the disadvantage of being efficient at only one engine speed, and require all sorts of additional devices such as extra jets and accelerator pumps to make them acceptable over the whole operating range. Nevertheless, over the narrow engine speed range where they are efficient, they give better results than the S.U. type, which is why racing cars preferred them prior to the advent of direct injection. But for general all round performance, which most road cars are built for, the S.U. scores heavily.

Fortunately for me, MG have always used S.U.'s so I don't have to talk about all the rest.

S.U.'s come in three types, Horizontal, Down draught, and Semi-down draught. The only difference is in the angle of the float chamber, so that disposes of that. They also come in several sizes, and this is determined by the diameter of the piston at its smaller end, i.e. where the needle is fitted. The smallest size used now measures 1 1/8", so they call it an H1, the '1' being the number of '1/8ths' over 1 inch. An H2 measures, therefore, 1 1/4", and an H4 1 1/2". Confused? Well, wait for the rest of it. In the early days they used to make one measuring 1" only. This was called a "UBA", but I have forgotten what the letters stand for. The latest version of the S.U. has a redesigned jet, to obviate the old bug-bear of leaking gland washers, this is the HS type and there is also an 'interim' design with a diaphragm sealed jet, the HD type, but this proved too expensive to make, unfortunately, and is only found in the larger sizes.

Now, I'm not going to try and explain in detail how the thing works, because it's been done before many times, and you all know by now anyway, don't you? Suffice it to say that the piston rises and falls according to how much air is being demanded by the engine, and because the tapered needle is fixed to the piston this also rises and falls in the jet, (which is fixed for normal running) thereby allowing a proportionate amount of fuel to go through. The main thing to remember is that the drop in pressure over the jet remains at a constant figure (about 36" $H_2O$ for you technical types) at all times, unlike those other aforementioned types.

Next, we'll consider the problem of what requires replacing after dismantling, and points to watch on rebuilding them.

## 2. Part 11

The usual procedure when doing a 'Henry the Eighth' job on the engine, is to gingerly take the carbs off in a lump and stuff them under the bench – to be put back again in due course just as they were.

Whilst there are few parts to wear out, a good clean and re-build is still a good idea every now and then, and now's the time to do it. Dismantling is easy and there are no rules as to the order to take, but **do** take care when removing the dashpot and piston, to withdraw them straight from the jet assembly, so as not to bend the needle. Once bent, it cannot be straightened. Put all the parts as you dismantle them into good receptacles, so nothing gets lost, and then start the cleaning.

A wire brush disposes of the harder external deposits, and I find that a good scrub with a stiff paintbrush and 'Gunk' or similar agent, followed by a hot water bath, does the rest.

Now that you're feeling clean and comfortable, examine the parts for wear! Actually, you should know in advance what needs replacing, from the way it was running before you started. Did you have trouble with one or both carbs flooding? Have a look at the float needle – it will be ridged on its taper face. Was the tick-over still too rich even though the adjusting nuts were screwed right up. New jets, and possibly new needles as well, are a dead cert. The only other thing to cause concern may be the spindles. If they have worn badly, an inconsistent tick-over is likely, and the only answer is to fit new spindles and possibly re-bush the bodies as well.

Shake the floats to make sure no liquid is inside them and discard them if they have leaked or are badly dented. Despite what the manuals say, you **can** clean the inside of the dashpots using something like metal polish, or even **very** fine 'wet and dry' paper soaked in metal polish, but don't overdo it. Wire-brush the grooves in the piston.

Throw away all the old fibre and cork washers, and renew them to avoid trouble later on. The new cork washers should be soaked in engine oil before fitting – this makes them more pliable and less likely to break.

Now the task of re-assembly. Start by fitting the dashpot and piston (complete with needle) to the carb body, screwing the two cheese-head screws down tight.

Put this on one side and refer to the sectional view of the jet assembly on the next page.



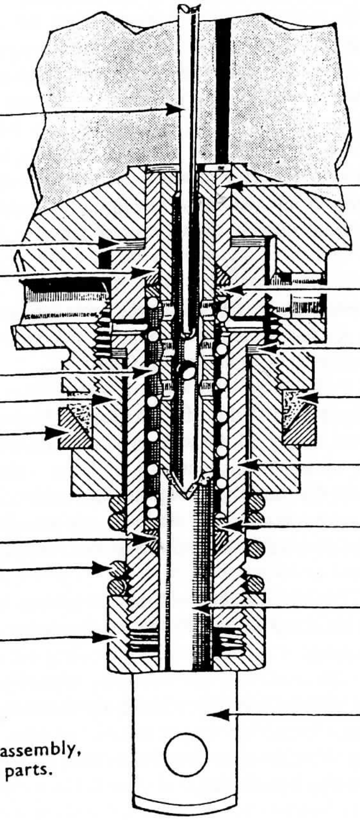



Fig. B.19.
An enlarged view of the jet assembly, showing its component parts.

First, take the jet bearing (bottom half) and slide on the very narrow copper washer. Drop this jet bearing into the large hexagon jet screw and then screw on the jet adjusting nut as far as it will go. Next take the jet and push it through the adjusting nut – you will now have half the jet sticking up through the jet bearing. Holding this assembly upright, push one of the cork gland washers over the jet and down to the bottom. Follow this up with one of the brass gland washers (inside bevel downwards) then the jet gland spring, the second gland washer (inside bevel upwards) and finally the second cork gland.

By this time you should have just about used up all the length of jet, in fact, if the last cork washer goes on easily without compressing the spring a little, it indicates that the spring is weak and it should be renewed or stretched. Now take the large (aluminium) bevelled washer and its cork gland, and place them in position over the jet screw.

The final part is something of a balancing act. Still holding the assembly upright, place the jet bearing (top half) on top of the jet and press down gently, compressing the spring, until it just grips. With a bit of luck it will stay in position on its own whilst you place the last copper washer on top.

All this lot is ready to feed over the carb needle and into the body. Always keeping the assembly upright and holding it by the large hexagon jet screw, push firmly upwards sufficiently to start the jet screw thread. Once started you can tighten up a little with a spanner and you can relax.

All that remains now is to 'centre' the jet, and this is the most important part of the whole job. The needle is fixed, but the jet has a certain amount of sideways tolerance, so it must be concentric with the needle before it is tightened up finally.

I find the easiest way is to fix a 7/16" 'whit' ring spanner in the vice, and use the carb as a spanner! Tighten the jet screw nearly all the way and then make sure the jet head is turned into the right position to line up eventually with the jet lever. Now tap the jet head gently on the bench, or something similar, and tighten up the jet screw fully. Again check that the jet head is lined up (it may have turned in the screwing up process) and see that the piston is absolutely free to rise and fall with no 'stickiness' at the bottom of its stroke.

If it tends to stick, however slightly, slacken off the jet–screw, 1/4 turn is ample, and try again, giving the jet head a little tap as before, and re–tighten. You may have to do this several times before you succeed.

Some carbs have springs inside the dashpot to make up the weight of the piston. These springs should be omitted whilst 'centering' the jet, and this enables you to check whether you have succeeded. Try turning the carb upside down and the piston should gently fall away from the jet, if it needs any help, it's sticking.

Once satisfied, you can remove the jet, unscrew the adjusting nut and fit the adjusting nut spring. Be sure to put the jet back the same way round as before and finally leave the adjusting nut screwed down about 8 'flats' from its uppermost position, somewhere near the right position for a start.

Re–assembling the float chambers, jet levers and other parts is straightforward and needs no describing here. However, do check that you have the correct washers on overflow pipes (serrated fibre one underneath, aluminium one on top), and that the float levers are set to give the correct petrol level. It's in the book!

The next part will deal with tuning and setting, and a few hints and tips on minor mods for those who wish to experiment.



## 3. Part III

In part II we left things at the stage where all is ready to bolt the carbs back onto the cylinder head, but before going on any further it is timely to consider the inlet manifold and cylinder head, just in case you are in the process of working on these as well.

Considerable improvement can be gained by carrying on where MG left off, as far as the ports are concerned. The standard cylinder head has quite good combustion chambers, but the inlet and exhaust ports are far from perfect. It may be laborious but get to work on these ports with rotary files, hand files and anything else you can lay your hands on and square them off. One method is to use a new manifold gasket and lay it on the head as a template and mark round each port with a sharp implement. The idea is to remove metal from the head to conform to this line. By repeating the process on the inlet and exhaust manifolds (which usually require less attention fortunately) you end up with matching ports when the parts are ultimately assembled.

Polishing of the ports is beneficial if you are looking for the ultimate power output, but not nearly so important as some people think. All the same, any large lumps of iron left in the casting process should certainly be removed.

Lining up of the manifold to the head is a means of ensuring equal distribution of the mixture to each cylinder. On TF models, another likely cause of bad distribution is the original 'offset' or 'angled' air cleaners. Although these are normally necessary to provide clearance at the bonnet side, there is a way round it. By halving the thickness of the insulating packing pieces fitted between the carbs and the inlet manifold, that little bit of extra room can be found to fit normal pancake air filters. However, don't do away with the insulation blocks altogether or you'll suffer the galloping Chinese Petrol surge in hot summer weather! If you get new 'Payen' insulating blocks you will find that these are conveniently made up of two pieces glued together, and can easily be separated with a sharp knife.

Alright, so now I can wave a magic wand and move ahead in time, some dozen or so man–hours, and midnight candles and assume that everything has been re–assembled, primed with oil, water and electrical charge, and the moment has come at last to press the button. If you have had the head off, or even more drastic surgery, there is little purpose in trying to accurately adjust the carbs at this stage. To get them finally adjusted you have to be dead accurate with tappet clearances and ignition timing, and these have to be left until such time as you have finally pulled the head down and let things settle. XPAG engines are particularly sensitive to ignition timing, and tappet clearances on the TF (at 012) should be adhered to. However, the TC and early TD with 019 clearances can be reduced to 016 without impairing the carburation, in the interests of quietness. If you are fortunate to have a Laystall head, the correct tappet setting on late TD and TF models is 008, set when the engine is stone cold.

The first time you run the engine, therefore, don't bother to more than roughly adjust the throttle stop screws, but once everything else has been checked and adjusted, you can get down to the final stage.

Much has been written about tuning carburetters, but at least Octagonists are fortunate in that the procedure described in the workshop manual is about the best there is. The main thing to remember is that you are making two distinct adjustments. The first is to ensure that each carburetter is 'open' by exactly the same amount, so that each feeds the same quantity of mixture to the engine. Once this has been achieved, the second adjustment is to ensure that the mixture strength going through each carb is exactly the same.

To adjust the throttle openings (in case you haven't been able to borrow that manual) use a piece of rubber tubing as if it were a stethoscope. With the air cleaners removed temporarily, you can **hear** the amount of mixture being passed through each carb in turn, by the intensity of the 'hiss'. You must be sure to position the tube in the same place in the mouth of each carb to get a fair comparison of course, but if you have a good 'ear' this is a most accurate way of doing it.

The second adjustment is to get the weakest possible setting of the jets consistent with an even tickover. Weaken off each jet in turn until the engine starts to falter – then go back one or two "flats" as necessary. To check that it isn't too rich, raise each piston in turn with a small screwdriver a matter of 1/8th" and see if the engine speed increases. If it does, weaken off one"flat" at a time until the same test causes the engine to falter. You should be able to achieve a perfectly even tickover and at the same time satisfy the above test. If you have fitted new jets or needles during overhaul, you will find that you will need to further weaken the setting after about 1000 miles, but eventually things will settle down.

One final tip – don't aim for an ultra low engine speed. About 750 – 900 r.p.m. on XPAG engines is right – anything lower than this is likely to reduce oil pressure on the timing chain tensioner to the detriment of the chain and also the valve timing – which upsets the carbs anyway.

Congratulations to those who have ploughed through these articles so far, and my sympathy to those who have actually had a go! The promised modifications will be dealt with in the next and final part of Know Your Carbs.

## 4. Final Part

There are two schools of thought concerning modifications – some consider that any departure whatsoever from the original is sacrilege, others think nothing of chopping and changing, drilling and cutting, until not much of the original is left.

The sort of modifications proposed here satisfy three essential requirements:–

(1) The result of the modification represents an improvement on the original in the light of later knowledge and development.

(11) Any alteration made can be 'undone' and the car reverted to its original state if required.

(111) The modification is either completely invisible, or at least not patently obvious.

Probably more by accident than design, the internal contours of the S.U. cannot be improved



upon to any degree. The writer was once given the job of exploring ways of making improvements, and the only change that showed any advantage at all was the provision of a leading edge chamfer to the piston, to correspond to the similar chamfer of the jet bridge. Even this was of limited value, because the sole benefit was the admission of more air through the carburetter at maximum piston lift, an advantage only where the carburetter was on the small side for a given engine, and could not be changed.

Increasing the diameter of the air intake reduced the 'mixing' efficiency over the jet bridge, as did the addition of those nice polished 'trumpet' air intakes which the sporty boys favour so much.

The one major technical advance in the design of the S.U. was the provision of the piston damper. Introduced just before the war, it enabled a far greater 'mixture spread' to be achieved than hitherto. This term refers to the difference in fuel requirement of the engine under 'full load' and 'part load' conditions. At any given speed on full throttle, a far richer mixture is required than when maintaining that speed on part throttle. You could not always achieve both conditions exactly with one jet needle, so that the part throttle condition was generally left a bit rich, and sometimes the full load a bit weak – hence a 'flat spot' was noticeable on sudden acceleration.

The piston damper acts as an accelerator pump and provides a temporarily enriched mixture during acceleration, so that a needle can be selected to give the weakness required of the part throttle condition, without detriment to acceleration.

Pre–war cars can benefit from this by obtaining pistons with 'hollow rods' to replace the originals. The 'P' type piston part number is 3166 and it may still be possible to get a '3166' hollow rod piston from W.H.M. Burgess Limited, Brunel Road, Old Oak Common Lane, Acton, London W.3. (This was written in 1978 – This firm is no longer in business. You could try other SU distributors or agents). Similarly, the 'T.A.' piston part number is 3157 and all you need to do is stipulate 'hollow rod' for the manufacturers to identify what you require. Dampers can be obtained from any scrap yard (Minor 1000, 1100 etc., are all the same) and you are in business.

Then, all you have to do is change the needles to suit the new conditions. M.G. always followed a policy of carburating on the rich side, to give an additional measure of cooling to the valves, believing, quite reasonably, that their cars were going to be 'hammered' from the word go! Petrol was not as good in those pre–war days as it is now, so you will find that the official "weak" needle is rich enough, in some cases too rich. 'P' types should be O.K. with 'S' needles or M9, 'TA's with 'M7'.

'T.Cs' and 'T.Ds' already have dampers fitted, but the standard needle – ES – is far too rich, and the listed weak needle is not a good choice. With the standard compression ratio, EU needles are about right, but if you have raised the ratio to, say, 8:1:1: or higher, you may find EW more suitable. Raising the compression ratio automatically improves the thermal efficiency of an engine and less fuel will be required than before, so a stage weaker needle is called for.

The case of the 'T.F. 1250' is more complicated. In May 1953 the prototype 'T.F.' was delivered to S.U. for them to check the carburation. This car was already fitted with H.4 carbs and A1 needles.

First it was tested thoroughly, as it was, and then the results analysed. S.U. soon found that it was over-carburated – that is, the H.4s were too big for the potential of the engine. With the H.4s, it was found that, at full throttle at 70 mph, the piston lift was only half an inch – less than half of what it should be, and this despite the fact that lighter than usual piston springs had been fitted. This made needle selection virtually impossible and to get a reasonable fuel consumption, power at the lower speeds would have been sacrificed. At this stage, they fitted the more normal H.2s and ran the tests again. These gave much the same maximum power output, and eliminated the 'flat' spot at the lower speeds. Piston lift at 70 mph was 3/4". Specific fuel consumption figures given below, show how much more efficient the H.2s were :-

| Road speed under full load | Specific fuel consumption (Pints/BHP/Hour) | |
|---|---|---|
| mph | H4s | H2s |
| 10 | .85 | .82 |
| 20 | .78 | .69 |
| 30 | .75 | .70 |
| 40 | .76 | .63 |
| 50 | .75 | .70 |
| 60 | .82 | .72 |
| 70 | .88 | .84 |

You may wonder why the 'T.F.' finally went into production with H.4 carbs. It was said that M.G. felt that the selling point of "larger carburetters" for their new model was too important to dismiss, so they had to stay.

If you want to get better results from your 'T.F.', therefore, fit a pair of 'T.D.' carbs and EU needles!

The 'T.F. 1500' is a different matter; because of its increased capacity, H.4s are more acceptable, a point remarked on in many of the contemporary road tests. Your scribe hasn't had an opportunity to experiment with a 1500, so no more can be said at this time, but perhaps an owner might like to comment?

What sort of practical effect will these changes have? Well, better carburation at low engine speeds means greater flexibility and if you are not in a hurry, top gear can be used at much lower speeds. The weaker needles will also conserve your petrol at cruising speeds, as high as 4000 rpm, and average consumption figures of 38 mpg for 'P' types can be expected, 35mpg for 'T.As' and 'T.Cs', 32 mpg for 'T.Ds' and 35 – 38 mpg for 'T.Fs'. Of course, a lot depends on the usage – nothing but town and city driving will drop the figure by as much as 8 mpg, but if you think you are not getting what you should be, and you care to drop me a line, I would be pleased to help in any way I can.



To wind up this series, you may be interested to know how much of your engine's power output reaches the road. The following figures were taken from the roller dynamometer test of the 'T.F. 1250' with H.2 carbs.

These are full load (i.e. throttle wide open) figures in top gear:-

| | |
|---|---|
| 10mph | 5.2 BHP |
| 20mph | 11.0 BHP |
| 30mph | 17.4 BHP |
| 40mph | 24.0 BHP |
| 50mph | 29.9 BHP |
| 60mph | 33.1 BHP |
| 70mph | 34.0 BHP |
| 80mph | 34.2 BHP |

## 5. CARBURETTER TIPS

1. **Dampers:** Most post-war SU carburetters were fitted with 'dampers' – the plunger attached to the oil cap on top of the suction chamber. This is, in effect, the equivalent of an acceleration pump, and to work satisfactorily it is essential to fill the hollow rod of the piston with the correct grade of oil. This should ideally be a straight SAE 20 engine oil, but an SAE 30 will also serve, as will SAE 20–50 multigrade. An SAE 5 or 10–50 multigrade will not do, and thin cycle oil is no use at all and should only be used on pre-war types not having dampers.

2. **Overflow pipes** appeared just before the war and were fitted to cars where it was feared that flooding might spill neat petrol directly on to a red hot manifold. Unfortunately, it was later discovered that they caused more serious troubles than they were intended to cure – notably syphoning once a bit of flooding **did** occur, and it was common practice at S.U. to cut the pipes very short (say about 2–3 ins long) to cure this. They were discontinued as a standard fitment about 1960 for this reason.

3. **Folded couplings:** Those zig-zag couplings which look like a firework used to connect two carburetter spindles, are there to provide flexibility in the event of the spindles not being exactly in line. Just about everybody fits them neatly side by side with all the bolts lined up to make it look nice! However, if you think about it, each one is flexible in one direction only, and to provide **complete** flexibility they should be fitted at 90° to each other. Better still, of course, is to juggle about with the carburetter mountings to line the spindles up before tightening the mounting bolts.

4. **Running Economy**: Quite apart from the tuning and care of carburetters, there are many other ways of making the most of your precious petrol and generally making things last longer. When tearing along the motorway on the way to that meeting it is as well to remember that an engine is most efficient at the speed where the valve

timing gives maximum torque. In the case of the XPAG engine this occurs at about 3000 rpm, but if this is too slow for you then consider the next fact. All piston engines suffer a sudden and marked rise in piston and cylinder bore wear once a piston speed of 2500 ft per minute is reached. This is reached at 4000 rpm, so try to keep to this limit if the other is asking too much!

**6.** I was one of those fortunate enough to attend the Lake District weekend and enjoyed looking closely at the assembled MG's in a beautiful setting with perfect weather to boot!

Being especially interested in carburation, naturally I had a good look at those visible and noticed on one gleaming J2 that the suction chamber oil caps had no breather holes in them. Closer inspection revealed that the holes had been carefully soldered up and then highly polished.

The car was immaculate, but I bet it ran like, well... erratically, to say the least.

Those little holes are there to allow free movement of the piston rod, which would otherwise try to compress the air in the suction chamber, preventing proper 'lift'. They are not there, as I once saw in a magazine, to provide a means of oiling the piston rod!

Only H4 carbs, as fitted to TF's, have 'sealed' caps, and then only because the breathing is achieved internally through a drilling back to the area above the piston in the suction chamber.

Whilst on this subject, a great number of owners seem in some doubt as to the correct oil to use for this purpose. Early carburetters, without dampers, should be lubricated with a thin (cycle) oil, but later models with dampers, call for an engine oil of not less than SAE 20 viscosity. The damper serves as a form of accelerator pump, and the oil viscosity is important.

**7.** More than once I have been asked to advise on a peculiar fault – the engine will start up alright but peters out after a short time, but then takes off again without warning, only to peter out again etc. etc.

No, not the fuel pump this time (although it might have been) but simply the fitment of incorrect washers on the overflow pipe banjo.

The float chamber must be vented to the atmosphere in one way or another and where overflow pipes are fitted, air can circulate through the two slots in the lid centre boss and pass through to the banjo by virtue of the extra clearance provided between the underface of the banjo and its fixing bolts (Note that the banjo can only be fitted one way up). If a plain fibre washer, which is a close fit on the bolt, is used, it will effectively seal off this deliberate clearance and all sorts of unpleasant things result. The correct washer is an internally serrated one, with a plain aluminium washer on top of the banjo and below the hexagon head of the fixing bolt.



**8.** In these days of high fuel costs – and particularly if you use your MG as everyday transport – you may be asking yourself whether you are using more petrol than you need to even if the engine appears to be running perfectly. In other words, how do you know, with an S.U., when the jet and /or needle needs replacing?

That's not such a silly question as you might think! First you have to understand that the correct amount of fuel metered to the engine is governed by the relative positions of the jet (adjustable) and the needle (fixed). For practical reasons this adjustment can only be accurately measured in the 'idling' condition and once this is done, you have automatically determined the fuel flow for all other load and speed conditions.

Provided that you have the correct needle for your car, that is fine. But all things are subject to wear and tear and the jet and needle are not exempt, despite the fact that there is no physical contact between them. Even petrol can wear away the surfaces and erosion takes place due to the high velocity as it passes through the jet and past the needle.

Such erosion can be compensated for by periodic re–adjustment of the jet, as necessary, to restore the correct idling condition, but there is more erosion of the needle at normal cruising speeds than takes place when idling, so despite the fact that you have restored the idling setting you may well still be running richer than you need when driving along normally.

By the time you have run out of adjustment of the jet, it is a safe bet that the needle will have become well worn and be in need of replacement as well. It is important to remember this, because you can often restore the correct idling mixture by merely renewing the jet, which tends to wear rather more quickly than the needle, but you won't necessarily get back to the original petrol consumption.

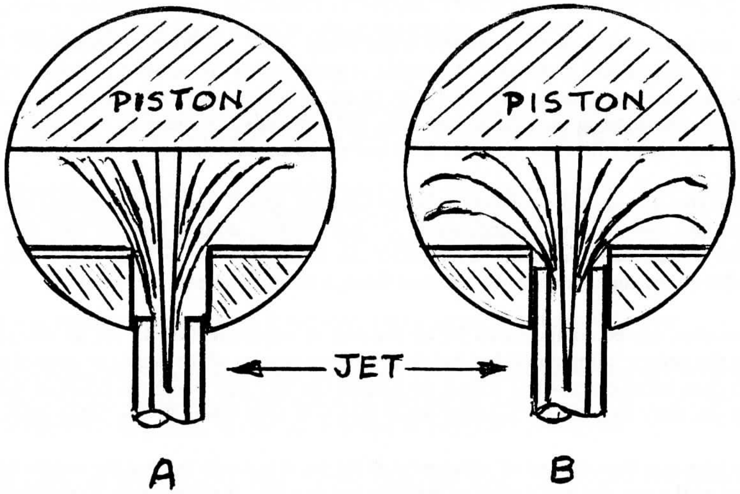
In the next article I will suggest ways and means of setting up the jet and needle so as to get the very best efficiency from your carb.

**9.** When doing a carburetter overhaul and particularly when fitting a new jet and needle, you could spend a little extra time profitably in ensuring that the jet ends up in its most efficient position.

If you follow all the written instructions on jet and needle assembly, you will certainly achieve a satisfactory result, in that you will be left with plenty of jet adjustment, up and down, not only to obtain the correct 'idle' setting when everything is new, but also to compensate for jet wear for many miles to come.

However, it is a fact that the lower the jet lies in the carburetter body, the worse is the mixture 'spread' across the bridge of the carburetter. Good 'mixing' of the fuel and air in the carburetter is one of the most important factors in fuel efficiency and an extra mile or two per gallon can be gained by attention to detail.

The two illustrations, hopefully, indicate the fuel pattern as it leaves the jet area (a) with the jet low down and (b) high up in the body.




Due to its design, the carb orifice is not an ideal shape, particularly under conditions of low piston lift. Some air gets in at the extreme edges without picking up its ration of fuel. (which is why an S.U. is not particularly good when it comes to cold starting). As you can see from the illustration (b) positioning of the jet as high as possible will throw fuel out sideways more effectively, which does a lot to improve matters.

Somehow we want to obtain the correct idling mixture with the jet almost, but not quite, at the end of its adjustment.

The first alteration you can make is to recess the needle in the piston 1/16", instead of having the shoulder 'flush' as the text book tells you. Also check that the float levels are not set too low - 7/16" absolute maximum on T2 lids (3/8" on T1s).

Having done this, now run the engine and adjust for correct idle as usual. Instead of the jet being set down 8 - 10 "flats", which would be normal with new parts, you should find you have reduced this by half, to 4 or 5 flats - still plenty for future adjustment. 2 or 3 flats would be even better of course, but eventually you would have to reposition the needle in the piston to restore the range of adjustment to the jet.

Incidentally, raising the fuel level, and the jet, both improve cold starting. When you pull the choke cable you will be moving the jet further than before, giving an even richer mixture which will help in this direction.

**10**. Owners of early cars sometimes complain of difficulty in obtaining a slow and consistent tick-over, despite having renewed spindles and throttle discs. In fact, they are often worse off than they were before!



This could be due to the fact that their carburetters are made of the zinc-based alloy used by S.U. in the thirties and forties. This material was beautiful to machine, but is most unstable where heat is concerned. With a two bolt mounting flange in contact with a soft gasket, residual heat from the inlet manifold allows the flange to 'bow', eventually causing an air leak midway between the bolts. At first this can be cured by further tightening of the bolts, but it only aggravates the condition and eventually you have to file the flange flat again.

Unfortunately, if you look closely you will find that the bore of the carburetter has become oval and a gap exists at the edges of the disc where it sits in the spindle.

In fact the whole bore of the carburetter has been distorted and a new disc is often a worse fit than the old one!

The only cure is to somehow resleeve the carburetter body and start again, or preferably obtain a later pair of carb bodies made out of die-cast aluminium which is unaffected in this way.

If you do have zinc-based alloy carbs, once you have got the flange perfectly flat again, use the thinnest possible gasket material when bolting them to the manifold, to reduce the tendency to distort in the future.

## 11. Piston Springs

Pre-war and early post war S.U. carburetters employed pistons designed to a specific weight to achieve the desired manifold depression (12-13" H2°). Some were made of brass (absolutely ideal, but terribly expensive), others of zinc based alloy (the rods used to come loose!) and last of all light aluminium alloy with a cast iron insert (perhaps satisfactory).

However, the relentless search for reducing costs led to a rationalisation of production whereby all the pistons were made to a standard light weight and the differences achieved by adding various return springs.

Springs are made in the following 'weights' and identification is by means of a splash of paint at one end.

2.5oz - light blue, length 2.635 ins
4.5oz - red, length 2.625 ins
8oz - yellow, length 2.75 ins
12oz - green, length 3.00 ins

There are more, but not of concern to MG owners.

It is important to use the correct springs for your particular engine, otherwise overall performance will suffer. The trouble is, after a few years use, the paint on the end coils either disappears altogether or assumes an entirely new shade!

H2 carbs (TD, Y, YB) require red springs and H4's as fitted to the TF were fitted with light blue springs. One way of checking is to place the piston, spring and suction chamber (less the needle) on an accurate kitchen scale, noting the total weight. Next, assemble the parts, place upright on the scales, and press the suction chamber down gently so as to load the spring. The difference between the two weights should give a good indication as to the strength of the spring.

If in any doubt, it is advisable to renew the springs and be sure, because some previous owner may have stretched, shortened or otherwise abused them and they are not an expensive item.

Part Nos are : red – AUC 4387; light blue – AUC 4587; green – AUC 1170. (Note: the pre–war SA, fitted with two D3 downdraught carbs, requires green springs, which of course have to provide all the weight).

It is also worth mentioning that it is only the TF that employs light blue springs – all other H4 carbs use 'red'. This is because the TF is seriously over carburated with 1 1/2" carbs, and there was insufficient piston lift with red springs to enable accurate calibration of the needle.

**12. S.U. Dampers and other Topics**

In reply to a recent query, there was a limited number of 'hollow rod' pistons made for the early 1" carbs, which would fit the P/PB models, and I used them on my PA very successfully. Unfortunately, I cannot remember whether they were actually fitted to any production cars, or whether they remained "experimental only". Certainly I have only seen them rarely.

The damper is, in effect, an accelerator pump, and enables a greater mixture 'spread' to be achieved, i.e., weaker on part throttle without having to go too weak on full throttle. For a given size the piston weight was always intended to be more or less constant. Early pistons were made of brass (beautiful, but increasingly expensive), or heavy aluminium. Then they moved to light alloy with a cast iron insert (cheaper in material cost, but an extra production process). Finally, a light aluminium casting with a spring to bring the effective weight up to a desired figure. The weight of the piston determines the manifold depression – approximately 12" WG at full throttle, for best results with an S.U. carburetter.

**13.** Judging by the number of queries I have been getting in recent months, more and more MG owners are finding that their cars are running too rich, despite having attended to all the mechanical conditions which could affect the issue. The most common complaint is with the XPAG engine and I have no doubt, from my own experience, that the original recommended standard needle (ES) is far too rich.

Why should this be so – what has changed since the 1940s and 50s when these cars were built? Well, you have to remember that in those days it was deliberate MG policy to err on the side of 'richness' rather than run the risk of having holes burned in pistons due to a weak mixture – I'm sure they believed that their cars would be driven hard by over–enthusiastic young men too impatient to run them in properly. They could get away with this policy



because in those days the cost of petrol was not so important as it is today and 'miles per gallon' was of little interest.

However, what has changed considerably is the fuel. If we have a petroleum expert among our members, it would be very interesting to hear from him how present day fuels compare with those of the early post–war years, but in any case I suspect the calorific value has risen considerably. All of which means that if our cars were to be put back into production today, S.U. would be recommending very much 'weaker' needles than were originally fitted.

So, let us look at the prospect of doing a bit of correction work for ourselves. Of course, you could change to the recommended 'weak' needle for your car, but here you have to exercise some care. It is not generally realised that the so–called weak needle was determined by S.U. as a correction factor for high altitude and not for fuel economy, so it starts off by providing only a slightly weaker mixture at low revs and gets progressively weaker towards maximum revs, which is not necessarily what we require. Had you fitted the 'weak' needle in your car 35 years ago, you would simply have lost power, particularly at the higher revs, albeit with some gain in fuel consumption. Whilst today's conditions suggest that you would not lose out at the top end, the 'weak' needle might not provide sufficient difference at the lower revs where it is most important for overall fuel economy.

Indeed, the recommended weak needle for the TC and TD (AP) actually goes richer at low revs before it starts to weaken off further up the range, so I would not recommend you try this at all.

Incidentally, whilst I can understand that people living in the Alps would benefit from the weak needle setting, I cannot imagine who would need the 'rich' needles – apart from those in the habit of driving round the Dead Sea!

Shown below is a chart covering the most common MG models, listing the standard and weak needles together with a suggested even weaker needle if you find you need to go a stage further. Note that in the case of the TC and TD I have substituted EU for the official AP, and for the TF I have made no further recommendation as this model has other problems which makes fine tuning virtually impossible.

If your car is not shown and you would like similar information, please drop me a line.

| MODEL | STANDARD | WEAK | WEAKER |
|---|---|---|---|
| J2 | 1 | M5 | AC |
| P,PB | M6 | S | M9 |
| TA | AC | S | EW |
| TC,TD | ES | EU | EW |
| TF | GJ | GL | - |

**14.** A letter in the December Issue refers to a problem which other members have reported in recent months, namely that they have run out of adjustment on the mixture control and still the idling mixture is too rich. The obvious conclusion is that either the needles or the jets – or both – are worn to the point where they need renewing, but there have been some cases reported to me recently where this persists even with new needles and jets. I can only think that the tolerances allowed in the manufacture of these parts are more generous than they used to be, because I have had no problems where I have used needles and jets from old stock.

The suggestion that the needles are dropped 1 mm (or even 2mm if necessary) to restore some idling adjustment is quite in order and although it will affect the whole range, I doubt that it will be noticeable as far as performance is concerned. One or two 'flats' of the adjustment nut has a greater effect on the idling mixture than the rest of the range.

In any case, it should be noted that if the problem with achieving a weak enough idling mixture is due to a jet which is a little oversize, rather than a needle which is undersize at that point, then the corrective procedure of dropping the needle slightly will not result in a weaker mixture throughout the range than you would expect from any given needle.

The choice of an alternative needle for the TF 1250 is restricted because of the second size reading of .084" which was originally chosen to get a **rich** enough idling condition, the problem being that H4 carburetters are really too big for the size of engine and with light blue (2 1/2 oz) springs there is not much vacuum at the jet bridge when idling. There is far more choice of needles having the first two readings .089", .085", which would certainly allow for plenty of adjustment and the only needle I can find which would, theoretically, equate to GL is QW. However, I must emphasise that I have never tried this in practice. It is very difficult to be accurate by calculation when the maximum piston lift is only 5/8" under full load!

**15.** Flooding carburetters seem to be high on the list of problems experienced by Members and perhaps it would be helpful to look at the possible causes and cures.

First of all, how to check whether the problem exists on your car. Remove the suction chambers and pistons complete, taking care to note which way round they were fitted so that you can ensure they go back the same way. Take care not to bend the needles! Dry off any surplus petrol which may have formed on top of the jet bridge and then turn the ignition on.

After the pump has stopped ticking, you should be able to see the petrol level stabilise at about 1/4" below the jet bridge (pulling the choke knob out and dropping the jets will help). Leave the ignition on a while – say about a minute – during which time the pump may 'tick' a couple of times, but if all is well the petrol level will not rise any more and start to overflow the jet bridge.

Incidentally, the fact that the pump has an occasional 'tick' even when there is no evidence of flooding, doesn't necessarily mean that you have a leak elsewhere in the system – it is simply petrol leaking back into the tank past the inlet valve. A typical time is once every 30 seconds but anything more frequent than every 10 seconds suggests that the pump needs attention.

If you find that you **do** have rising damp in the carburetter, there are several possible causes you can look at.



Obviously, the most likely cause is that the float needle and seat has worn to the point of needing replacement. The old original s/steel needles gave a good service life but eventually a ridge begins to form on the face of the needle and the contact surface area becomes greater. As the pressure that the float can exert on the needle is constant, the needle is eventually unable to resist the petrol pump pressure and maintain a sealed shut-off condition. High pressure pumps, as fitted to TF models, operate at 3–4 psi (compared to 1 1/2 psi of low pressure pumps) so the float needle condition becomes more critical on these cars. If the needle is heavily ridged, it needs replacing.

Another cause is incorrect setting of the float lever. To determine the correct level use a 3/8" dia. bar between the fork and the lid edges in the case of the small (T1) float chambers (P & J models for example) and a 7/16" dia bar for larger (T2) float chambers (all T types), but it is also important to check that the lever is perfectly free on its hinge pin – any tightness there can lead to flooding.

Less obvious and so easily overlooked, is the overflow pipe assembly. It is essential that the float lid is well vented to the atmosphere. If you use long overflow pipes, use nothing less than 3/16" tubing and make sure that there are no kinks or restrictions in them. Don't block them up with excess metal polish either, which happened to one of our members!

Check that the banjo is fitted the right way up – large diameter hole against the lid, small diameter uppermost. Use only the correct 'serrated' fibre washer between banjo and lid, as a plain washer could effectively seal the whole assembly. These points may seem elementary, but I have experienced them all.

On the question of the most suitable replacement float needle and seat, the viton–tipped 'Speedwell' type mentioned by David De Saxe in the May bulletin looks to be a promising option, but the only examples I have seen appear to have a small maximum flow capacity, equivalent to the original S.U. 'T1' size and might prove incapable of delivering enough fuel for a larger engine and larger carburetters. However I am currently testing some American made float valves, 'the Grose–jet', kindly supplied by our own Peter Jenniches, which are of an entirely different design and which are looking very promising indeed. More about this later.

**16.** In view of recent interest concerning flooding and alternative types of float needles, I have run some tests which may be of interest.

There are two basic requirements which the float needle(s) must meet. First, it must be capable of reliably shutting off the fuel supply from the pump when required to do so. Second, it must be capable of delivering fuel to the jet, up to the maximum required by the engine, without significantly lowering the fuel level in the float chamber.

What should be regarded as 'significant' is difficult to say, but if one accepts that the carburetter needle (not the float needle) was determined in conjunction with the fuel flow provided by the original type S.U. needle and seat, then that must be regarded as satisfactory. In other words, the chosen needle size would have taken into account, and compensated for, any drop in fuel level under conditions of high load and maximum speed.

For the purpose of these tests a T2 float lid was fed by a standard 'L' type pump (operating at 1 1/2 P.S.I.) thence through a flow meter, and provision was made to measure the 'drop' of the float lever at the point where contact is made with the float.

Three tests were made with each example :-

1. The float lever drop required to permit the maximum capability of the pump, viz, 10glns/hr.

11. The drop required to achieve a flow rate of 2glns/hr, (which would be required by a car travelling at 60 m.p.h. with a petrol consumption of 30mpg.)

111. Shut-off capability. This test was not valid for the four S.U. types tested, because none of them was new, but as we all know they can be very troublesome in this respect so there was no real need to subject them to this test.

The two remaining types **were** new however and both were consistently good – the Grose jet particularly requiring **very** little pressure to seal off completely.

The types tested were :-

a. S.U. T1 original design. For float chambers of 1 3/4" diameter. Steel needle in brass seat. Identified by single groove machined around the seat hexagon.

b. S.U. T2 original design. For float chambers of 2" diameter. Steel needle, brass seat. Identified by two grooves.

c. S.U. T1 later type, spring loaded, steel tipped nylon needle. Identification – no grooves around the brass seat.

d. S.U. T2 later type – as above, but with single groove around the seat.

e. Speedwell Viton tipped needle and brass seat.

f. Grose jet type SU 301/099 – double stainless steel ball valve, sealed unit assembly.

As might be expected, the two S.U. 'T1' types, old and new, and the two 'T2' types, gave virtually identical results, so they are not shown separately on the table. Neither the Speedwell nor the Grose-jet would deliver the full 10 glns/hr. of the pump, but it would take a **very** thirsty MG to need such an amount so it is probably academic anyway – especially where there are two carburetters fitted.

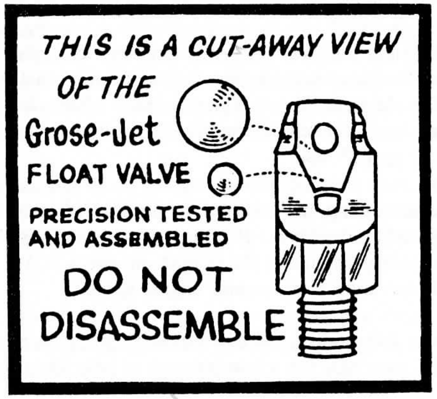
However, I would suggest that the Speedwell example would not be desirable on an MG single carburetter installation (Y types) particularly with a supercharger, where a fuel level drop of 1/8" would occur under quite modest load conditions and significantly more under hard acceleration.

The Grose-jet provided the minimum drop in fuel level for all practical purposes and is also



extremely efficient at shutting off completely – something I can vouch for because I have been using them all summer on my own car. Its design is quite different from the conventional needle and seat as the illustration shows.

I obtained mine by courtesy of our continental correspondent, Peter Jenniches, who is the European Distributor for Grose-jets which are actually of American origin and plans are afoot for their availability here.




**The Grose-Jet Float Valve is simply constructed**

The Grose-jet consists merely of a metal body and two metal balls so assembled that the larger ball presses the smaller one against an opening in the valve seat to effect perfect closure.

| FLOAT LEVEL DROP | | | |
|---|---|---|---|
| | TYPE | @10 GLNS.HR | @2 GLNS/HR |
| 1 | SU'TI' | .25 INS | .10 INS |
| 2 | SU'T2' | .20 INS | .06 INS |
| 3 | SPEEDWELL | .05 INS (MAX 5 GLNS/HR) | .125 INS |
| 4 | GROSE-JET | .125 INS (MAX 7 GLNS/HR) | .04 INS |

NB. IT IS NOT CLAIMED THAT THESE FIGURES ARE 100% ACCURATE

## 17. Petrol pump hints and tips

Just about every aspect of S.U. carburetters has been covered at one time or another in the Octagon bulletin, so for a change I thought I'd write a few words about petrol pumps. Judging by those pumps sent to me for overhaul, quite a number of members are using – or attempting to use – a type of pump unsuitable for their particular car. This is not really surprising – some of the variations look identical and no doubt many have been picked up at autojumbles and the like, where the vendor has no idea what they were originally fitted to.

The main problem is distinguishing between high pressure and low pressure pumps. The former is intended to be fitted low down on the chassis frame, usually at the rear of the car and below the fuel level in the tank. It is designed to have a high delivery capability, lifting the fuel up to the carburetters as much as four feet if required, but will not lift fuel on the suction side as readily as an L.P. one.

Conversely, a low pressure pump has exactly the reverse characteristics and is usually mounted near to, and at carburetter level. If either type of pump is mounted in its reverse location (e.g. a high pressure pump under the bonnet on, say a TC) it may deliver fuel, but it is likely to cause fuel starvation at maximum engine speeds.

If you are uncertain about the pump fitted to your MG, or if you are on the lookout for a bargain at an autojumble, then here are a few pointers to help identify the various types.

First of all, there just may be the original aluminium 'tag' located by two of the coil housing screws, on which is stamped the S.U. specification number. Not many survive the ravages of time – and overhaul, because they are seldom replaced – but it is worth mentioning. As far as MG models are concerned, all LP pumps were AUA 25 and this covers every Octagonal MG except the TF, which uses an HP pump. The original TF specification was AUA 54, but more of this later. You may find your under–bonnet LP pump carries the specification number AUA 66, in which case you need not worry, because this was the Morris Minor version, which is identical except for the delivery pipe connection and easily converted to the MG type.

About 20% of the pumps sent to me started out in life on a Morris Minor – a ready source of spares!

However, it is rare for these tags to survive, so what else should you look for? The most obvious difference (between HP and LP) is in the cap, or end cover. All HP pumps incorporate a condenser, which needs more room to house it under the cover, so there is an extra 'hump' alongside the terminal post. All LP pumps had a flat end cover, but even so be careful – make sure it is 12v and not 6v. The voltage is usually moulded into the cap, and in addition 12v were always black and 6v brown.

But what if the end cover is missing, as is so often the case at autojumbles or scrapyards? The next thing to look for is the earth terminal screw. This is to be found on the rim of the coil housing where the six fixing screws are located. If it is an LP pump, the screw size is 2BA, like the fixing screws; the HP pump uses a smaller 4BA screw. Very early coil assemblies didn't have an earth screw terminal 'built in' to the casting, as it were, but relied



on an extended stud which was fitted in place of one of the fixing screws. To the best of my knowledge, these were prior to the introduction of HP pumps, so they will be 'LP', but of course we still have the problem of voltage to consider – remember, we are assuming the end cover is missing.

At one time, in fact when the pumps were new, there was no problem because the wiring insulation visible under the end cover was coloured red to denote 12v and green for 6v. Unfortunately, with the passage of time, the red turns to a dark brown, and the green turns to – dark brown! Sometimes a little scraping of the fibres shows up the true colours underneath, but it isn't reliable. The only remaining solution is to separate the coil housing from the pump body, remove the diaphragm assembly by unscrewing it from the points, and have a look at the brass end plate which supports the diaphragm return spring. This should have PT 1687 stamped on it if it is a 12v coil, and PT 1686 for a 6v.

Probably when the production of 6v pumps ceased (for new cars, at least) all S.U. pumps went on to black plastic insulation, there being no need to differentiate between two voltages. At the same time, for reasons unknown to me, S.U. ceased stamping a part number on the brass plate.

So, by using some, or all of the pointers mentioned so far, you should be able to distinguish between a low pressure and a high pressure pump and establish that it is a 12v, not a 6v version.

The 'earth screw' method is pretty reliable on its own, but there are other differences which are internal and not so easy to see, but it is worth mentioning at this point that because of these differences the diaphragms of LP & HP pumps are not interchangeable.

All rules have to have an exception, and the exception to the earth screw rule is to be found in the TF pump, AUA 54. This is a high pressure pump but uses a 2BA earth screw, but it is fairly easily recognised by virtue of the fact that the coil housing is 1/2" longer than all the others (2 3/4" as against 2 1/4"). This pump was only in production for a short time, being superseded by the shorter type HP pump as fitted to MGAs and many other BMC cars of that era. Because of the small number produced, the factory now no longer produces replacement diaphragms, so TF owners would be wise to look for the later version when contemplating a replacement. They can be fitted without any modification.

Finally, a question I am often asked is 'When were brass bodied pumps fitted and is there a difference?' The answer is that at some time in 1948 the factory changed over from brass to die cast aluminium for the bodies. They are entirely interchangeable, and they didn't even bother to change the specification number.

## 18. S.U. Fuel pumps – Modern Technology to the rescue?

Originally, S.U. pumps could be relied upon to give many miles of trouble–free service, but, as we all know, times change and I'm sure many will agree that the contact points can be troublesome.

For one thing, they don't like being inactive for long periods – the contact surfaces oxidise, forming an insulating film. Nowadays most Octagon MGs are only occasionally used and some endure long periods laid up, with the result that the pump fails to operate when needed. Incidentally, if you are in the habit of carrying a spare pump, try to remember to exercise it every three months or so by running it 'dry' for just a few seconds.

The second problem is that pumps produced in recent years tend to 'arc' badly at the points, which leads to early failure. When undertaking overhauls, more often than not I have to take additional steps to cure this shortcoming.

If you have been plagued by these problems, you will be interested to know that the points' assembly can be eliminated entirely by conversion to electronic switching. Such a conversion is being offered by **Autoflux Electronic Fuel Pumps, Higher Derricombe, Two Watersfoot, Liskeard, Cornwall PL14 6HS** at a cost of £35 plus £2 p & p.

Consisting of a circular printed circuit board designed to fit on top of the existing pedestal, together with a modified throw-over rocker assembly, switching of the pump is achieved by an infra-red optical sensor. The mechanical points are thereby eliminated, rather like electronic ignition kits get rid of the distributor points.

To find out just how effective this product is and what difficulties, if any, there are in carrying out the instructions, I converted a 12v pump and then subjected it to the normal original factory tests. To coin a phrase, I used a pump which I had fully reconditioned and tested earlier so that I had a bench mark against which I could make proper comparisons. As it turned out, this was a wise move because it is required, as part of the conversion procedure, that the coil housing be separated from the valve body casting and the diaphragm has to be removed. This inevitably leads to replacement of gaskets, maybe even the diaphragm, so it would be desirable to plan a full overhaul of the pump at the same time.

The fitting instructions provided are clear and detailed, though they could be improved on. There are a couple of delicate soldering jobs involved but otherwise assembly is straight forward, especially if you have had some previous experience of S.U. pump overhaul.

As with the standard points setup, minor adjustments were needed, once on the test rig, to obtain optimum performance, but the converted pump operated as well as before though it was a little noisier – this is inevitable because there is no longer a spring blade contact to 'soften' contact of the rocking lever with the pedestal bridge.

As I am not an electronics engineer, I am not in a position to judge whether there is £35 worth of gadgetry in the conversion, but it is very well made and presented and gives every appearance of a high quality product.

What is more to the point is whether the shortcomings of the standard points' assembly can persuade you to spend this sort of money to overcome them – it has to be up to the individual.



## 19. Technical Tips

Look after your throttle spindles! It is very creditable that new spindles can still be obtained for our types of S.U. carbs after so many years, even though they have increased in price by about 300% in the last 12 months! Anything that can be done to prolong their life is obviously worthwhile and one of the main causes of wear is the misuse of the concentric throttle spindle return springs, where fitted.

The purpose of these springs is to shut down the carburetters in the event of the accelerator pedal linkage becoming accidentally disconnected from the carbs, and they should be adjusted so that they **just** close the throttles (with linkage disconnected) and no more. If you think about it, all the time you are driving the car, the throttle lever is working against these springs putting side loads on the carburetter spindles and their bearing surfaces.

I have seen many MGs where the separate return spring on the accelerator arm has been discarded and the carburetter springs have been tensioned to provide **all** the return spring force required. This is a recipe for rapid spindle and bearing wear. Rather than this, it would be better to increase the tension on the accelerator arm spring and dispense with the carburetter concentric springs altogether!

## 20. (a) The suction chamber assembly

Whenever the subject of overhauling S.U. carburetters is raised, the more obvious points such as spindle wear, jets, needles (and choice of) and leaks in general are quite understandably given priority. What is rarely mentioned is the suction chamber and piston assembly and yet you'd be surprised how much these components affect the overall performance.

To appreciate this it helps to understand a little of how it works. The piston assembly, although in one piece, is in two diameters. The smaller fits neatly into the carburetter 'choke' area and the larger is a very close fit in the suction chamber. A hole drilled in the small piston is positioned on the inlet manifold side of the jet bridge and consequently senses the pressure at this point (always negative pressure, or 'suction'). This hole communicates with the area **above** the large diameter piston, and because this is a close fit in the suction chamber a vacuum is created there which tries to lift the piston. The underside of the large piston is vented to atmosphere, or the air cleaner. However there is an opposing negative pressure on the underside of the small piston, but because of its larger area, the forces acting on the large piston are greater and the piston will lift until things balance out. The net result of this arrangement is a constant velocity of air over the jet bridge, regardless of throttle opening, maintaining a constant negative pressure at the jet bridge of approximately 36ins. $H_2O$

### (b) Piston Clearance

The fit of the large piston in the suction chamber is very critical. There must be no physical contact, but too much clearance will allow air to be drawn in and reduce the vacuum being produced in the upper chamber. Fortunately it is easy to check this clearance by using the 'drop' test, without having to resort to the use of micrometers and feeler-gauges.

It is advisable, but not essential, to remove the needle. Ensure both suction chamber and piston are spotlessly clean. Don't use harsh abrasives which might remove metal and further increase clearances! Lubricate the piston rod with the lightest of oils – WD 40 or equivalent is ideal – because you want no friction at this point. Now, with the piston fully home in the suction chamber, turn them upside down. Grip the piston by its small diameter putting your thumb over the suction hole to blank it off, and let the suction chamber fall freely off the piston noting how long it takes – don't forget to catch it as it drops off!

A new piston and suction chamber will take about 5 seconds/inch on this test, but 3 to 4 seconds is quite normal and acceptable. Anything less than 3 seconds and you ought to start looking for replacements. Where two or more carburetters are fitted it goes without saying that they should be closely matched.

### (c) Piston Weights

The weight of the piston affects carburation in two ways. The heavier the piston, the less it will rise in the suction chamber resulting in a higher velocity of air over the jet bridge with a consequent drop in pressure at the jet. This is good for atomization of the fuel and aids complete combustion in the cylinder head, but because an I.C. engine runs on air, restricting the amount it can breathe means a loss of potential power.

Of course, **some** restriction is unavoidable, because you need to maintain a vacuum at the jet to lift the petrol. On the other hand, too light a piston will result in poor mixing of the fuel/air mixture with a power loss just as great as that caused by restricting the air.

Compromise is the order of the day and the optimum result is obtained with a manifold depression of approximately 12ins $H_2O$ on full load.

All these factors are taken into account when determining the specification for any particular engine, but matters can slip a little with the passage of time. For example TB, TC and TD models originally used brass pistons (3370) which weighed 8 1/2 oz. These gave a manifold depression averaging 13ins $H_2O$. When brass became very expensive in the post-war years, it was decided to replace them with a light aluminum piston (3171) weighing 4oz, plus a spring, nominally 4 1/2oz, to make up the required 8 1/2oz. Unfortunately, even though the longest possible spring was employed it resulted in an effective piston weight of 8 1/2oz when the piston was at rest on the jet bridge but rising to 10 1/2 oz when fully compressed. This not only restricts engine breathing but also makes for a progressively rich mixture. As many T types are now using these later pistons and springs you may like to experiment with the kitchen scales and shorten the springs to effect a compromise. (I have lightened the springs on my own car to give 7oz at rest and 8 1/2oz at maximum lift, with beneficial results.)

**N.B. The above remarks do not apply to TF models fitted with H4 carburetters.**

### (d) Dampers

The hydraulic damper was introduced to provide an equivalent to the accelerator pump found on fixed choke carburetters. It is simply an oil damped valve which slows down the rise of



the piston when you stamp on the accelerator pedal. This causes an increase in air velocity over the jet and enrichment of the mixture, eliminating any tendency to 'flat spot'. The effect is momentary and under all other running conditions the damper has no great effect.

A lot has been written about the correct oil to use, but it isn't critical. At the time of introduction there was no multigrade engine oil and a 'straight' SAE 20 engine oil was deemed to be about right. As this was readily available at the time, nobody queried it. Today, you can use any type of oil with a similar viscosity – automatic transmission fluid is popular – and even using a 20/50 multigrate will not have a noticeably detrimental effect. However don't go to extremes – cycle oil is too thin and SAE 90 gear oil too thick (yes, it has been used!)

The oil also lubricates the piston rod of course but this is hardly an arduous duty and any oil selected will suffice.

## QUESTIONS AND ANSWERS

### 21. Question

I've spent all yesterday fiddling with the S.U.s on my PA (a pleasant task!). However, even with the jets right up it seems to be still slightly rich and idles at about 1,200, nothing less. The needles are M6 which I think are the recommended ones.

Also, despite putting new seals and washers on, there is still a slight seepage of petrol from around the base of the jet – not enough to actually drip, but sufficient to make the spring and nut appear damp. What's wrong or much more likely, what am I doing wrong?

### Answer

You have three problems, two of which could be related. Before doing anything about the lack of jet adjustment you should try to get the idling speed down to something nearer 600–700. This is not going to be easy, because the trouble is probably due to distortion of the carburetter body. Your carbs are made of zinc alloy which is very prone to warping with heat variation and you will find the bore, where the throttle disc is seated, is now oval instead of round. A 1" reamer might improve matters, but be very careful – replacement discs are expensive. The object is to get the disc to seat all round so that virtually no light can be seen through it when in the closed position.

Once the above condition has been achieved, you might find you can adjust the mixture correctly, but if not it is permissable to 'drop' the needle in the piston by, say, 1/16". I am assuming that you have a correct petrol level in the float chambers and that the float needles and seats are not leaking.

Lastly, in your case leakage from the jets is most likely due to not having soaked the cork gland washers in oil for at least 24 hours before fitting. If they are genuine S.U. parts, they are black in colour and are supplied dry. Stored cork washers should be kept in oil and the two copper washers used in the jet assembly should be renewed if they have been in service for any length of time.

**22. Question**

I have a J2 and a Morris Minor and both use the S.U. petrol pump. I'd like to keep a spare for use in either car as needed, could the same pump be used for this purpose?

**Answer**

Yes, the same pump would be suitable for both cars – they are virtually identical. The Minor specification is AUA 66, but the **only** difference between this and the AUA 25 used on the J2 is in the outlet pipe union. This is threaded on AUA 25 and a spigot on AUA 66. You can obtain an adapter which screws on to the AUA 25 connector which converts it to a spigot. This obviates having to disturb the outlet union proper, which is not only fitted tightly but also retains all the pump valves, which have been known to get lost in the long grass when doing emergency repairs! Incidentally, S.U. petrol pumps, except the modern H.P. units fitted to MGBs onwards, are not 'polarity conscious', so there is no worry on that score.

**23. Question**

Why do some carburetter pistons incorporate springs and others do not?

**Answer**

The weight of the piston plays an important part in achieving the correct depression over the jet. Before the war, most pistons were made of zinc or aluminium alloys or brass in a variety of weights to suit horizontal and semi–down–draught installations. A light weight aluminium piston plus a spring was used on down–draught carburetters (e.g. MG SA) because the piston lies in a horizontal position thus making a spring an essential component.

After the war, brass became very expensive and the idea of using a lightweight aluminium piston and spring had economic advantages. One piston for each size of carb could be used for a variety of applications by using springs of differing strengths. These changes occurred in the 1950's and TD's, for example, were probably set up to use one or the other type of piston during its production run.

**24. Question**

The engine tends to run very hot despite clean waterways and radiator core and despite what I believe to be accurate timing. I think it may be something to do with the petrol/air mixture. Am I right?

**Answer**

Although it is true to say that a very weak mixture would result in a rise in temperature in the cylinder head, a correctly functioning cooling system should be quite capable of handling it. Check the plugs – if they are white, the mixture is too weak, but I would be surprised if this is the case. If your car has a slatted radiator grill, you should check that the slats are



angled to permit the maximum flow of air through to the radiator.

**25. Question**

I plan to re–jet and needle the S.U. carbs, on my TC. The engine currently fitted is a Morris Motors replacement engine bored out to +.040 but the block is an XPJM (not XPAG as originally fitted). The XPJM block is from the Morris 10/4 Series M which was a 1140cc. unit. I understand that the factory did sometimes use these blocks when reconditioning engines for the TC MG. In view of the reduced cc's will the jets and needles supplied for a standard XPAG 1250cc. engine in the TC be O.K? Can I tune the carbs in the normal way (i.e. by screwing up the jets one flat at a time)?

**Answer**

There should be no problem using standard TC carbs on this engine, but the reduced cubic capacity and lower compression ratio will obviously result in a reduced power output compared with the XPAG engine. This, in turn, requires weaker needles and on the basis that you have to start somewhere, I would suggest using EW initially, but be prepared to experiment further. Follow normal tuning procedures. **Don't** change the jets unless you know they are worn out. The tolerances on new jets are not good and you could be worse off!

**26. Question**

I notice that some carburetters employ 'tickler' pins but not others. What is their purpose?

**Answer**

The S.U. carburetter – particularly types prior to the more modern 'HS' series – suffered from poor cold starting because dropping the jet by 1/2" or so didn't really give a rich enough mixture at cranking speeds. The tickler pin, spring loaded upwards, is used to push the float down before trying to start the engine but with the petrol pump switched on. A couple of seconds is enough to 'flood' the carburetter and provide that extra richness. They were fitted to MG cars, mostly at the factory's request.

Due to vibration the return springs on these pins are prone to wear away and in extreme cases the pin ends up actually resting on the float, causing flooding problems. It is worth checking this from time to time – if you can pull the pin upwards, you need to replace the spring.

**27. Question**

The last few degrees of movement to fully close the carbs to idle takes an undue amount of effort, too great for the throttle return spring. Having tried opening and closing the carbs by hand with the linkage disconnected there is a clear point just before closing where it seems to stiffen up.

**Answer**

I can think of four separate reasons which could account for this problem but from experience I would suspect a combination of two or more is likely.

They are :–

1. Excessive wear in the spindles and/or body.
2. End thrust on the spindles due to maladjustment of the concentric springs.
3. Maladjustment of the throttle discs in the spindles.
4. Distortion of the carb body.

If there is excessive wear in the spindles, the throttle disc(s) foul the body on the side before they reach the shut–off position. In effect, the spindle is 'up' on one side and 'down' on the other instead of being horizontal. The disc, which is a fairly close fit, cannot adjust to this.

In addition to their primary function of returning the spindles to the closed position, the concentric springs also, unfortunately, exert an end thrust on the spindle because of the wind–up effect. This can, again, cause the side of the disc to foul the body if the springs are not set up very carefully.

The two screws securing the discs to the spindles allow for quite a lot of adjustment of the two components relative to each other. If the screws have been tightened whilst the throttle stop adjusting screw is bearing on the carb body, it may be that the disc will foul the body on one side when the adjusting screw is unscrewed completely.

The original carb body casting number is 3478 and the early examples were made of zinc based alloy which was prone to distortion due to temperature variation. Later ones were cast in aluminium (as well as later variations; eg 6070, 6080, which superseded 3478) and these do not distort.

I can see no alternative other than to remove the carbs and check them on the bench. Body distortion will show up as a bowed mounting flange and you will find the other possible faults easy to check. I think you will find the main culprit is excessive play in the spindles.

**28. Question**

The points on my petrol pump are just about worn out and need replacing. It looks easy enough to change the spring blade part but how do you get at the other 'rocking lever' half?

**Answer**

It is possible after removing the two securing screws and releasing the pedestal, to remove the hinge pin and unscrew the rocking lever from the diaphragm spindle. Unfortunately you don't gain much from this because when fitting the new points you have to separate the pump at the diaphragm joint in order to reset the diaphragm. This setting is very critical and can't be guessed at by screwing the new points back on to the diaphragm and hoping for the best. It is better to follow the procedures laid down in the workshop manual, but be warned – you



will end up doing a complete overhaul!

**29. Question**

How do you know when the carburetter spindles need replacing?

**Answer**

Unlike a fixed–choke carburetter, the S.U. design permits quite generous spindle clearances without having a great effect on mixture. In fact, there is .002" clearance allowance from new which is provided to absorb distortion caused by variation in heat under running conditions. The first sign that excessive wear has taken place is when you have to increase the tension of the accelerator return spring to maintain the tick–over speed or you have to 'stab' at the pedal to get it back to idling speed. This is due to the spindles tilting slightly and trapping the discs in the body before they have closed properly.

**30. Question**

I picked up an early Morris Minor carburetter from an autojumble which looks to be the same size as those fitted to my TD. Is it suitable and what changes would I have to make?

**Answer**

Yes it would be suitable – or at least all but the float chamber. The extra hole in the air cleaner flange is a breather to the underside of the piston – this should be blanked off at the flange face, but a substitute hole needs to be drilled downwards to atmosphere. If you remove the suction chamber and piston, you will see the piston lifting pin on the left hand side. Drill a 3/16" hole downwards through the body on the right hand side corresponding to this pin. On top of the body, between the mounting flange and the suction chamber, is another small hole which provides anchorage for a support strap on the Morris. Blank this off with a 3/16" whit screw. The ignition suction advance boss also needs blanking off with a 1/4" BSF grub screw.

The choke/accelerator link fitted to the TD front carb is on the left hand side, whereas it is drilled and tapped for the right hand side on the Morris. The thread size is OBA and you will need to blank off the original hole and drill and tap the other side accordingly.

The spindle and throttle stops will have to be changed. New spindles are still available, but not the stops, which you can use again. The suction chamber, piston and spring are correct, but the float chamber is cranked for 30° downdraught whereas the MG is at 20°.

INDEX