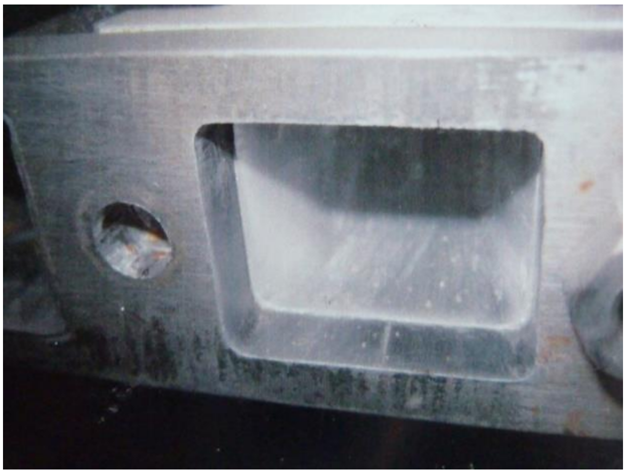
Austin Seven Engine
Part 4 – Carburettors, manifolds, clutch and fan spindle

This is the next in a series of five A7 engine re-build articles to appear in the HA7C newsletter *Crankhandle*.

Previously
- Part 1 - Nov 2018 - Crankcase
- Part 2 – Jan 2019 – Crankshaft, main bearings, conrods and flywheel
- Part 3 – Mar 2019 - Cylinder block, pistons & head

Please remember that these notes are definitely not an attempt to say *'this is what should be done'*, they are simply an account of my approach.

Carburettors and manifolds
I have personal experience of a variety of different carburettor & manifold combinations on both standard and mildly tuned road-going Austin Seven engines and my findings are summarised in the following notes. However, I do not include details of the selection, adjustment and maintenance of specific carburettors, because there is already a wealth of information available and indeed whole books written on the subject.



Smooth passage through manifolds

In my experience it pays to ensure that manifold passageways are generally smooth with no sharp steps or corners. It can sometimes be useful to remember our basic fluid mechanics theory here, that tells us sudden enlargements are a greater source of friction loss than sudden contractions of similar proportions. An interesting fact and perhaps somewhat counter-intuitive.

It is often necessary to remove material to achieve reasonably smooth passageways and this can be achieved with small grind stones in a hand-held drill or 'Dremel' style flexible drive. It is also important to remember that gaskets might need trimming to ensure they don't interfere with the smooth flow of gas.

I believe the inlet tract is more important than the exhaust and I am not convinced that a polished finish is necessary in a touring engine. The photo shows a reasonably smooth gas flow path in a current A7 engine that performs remarkably well.

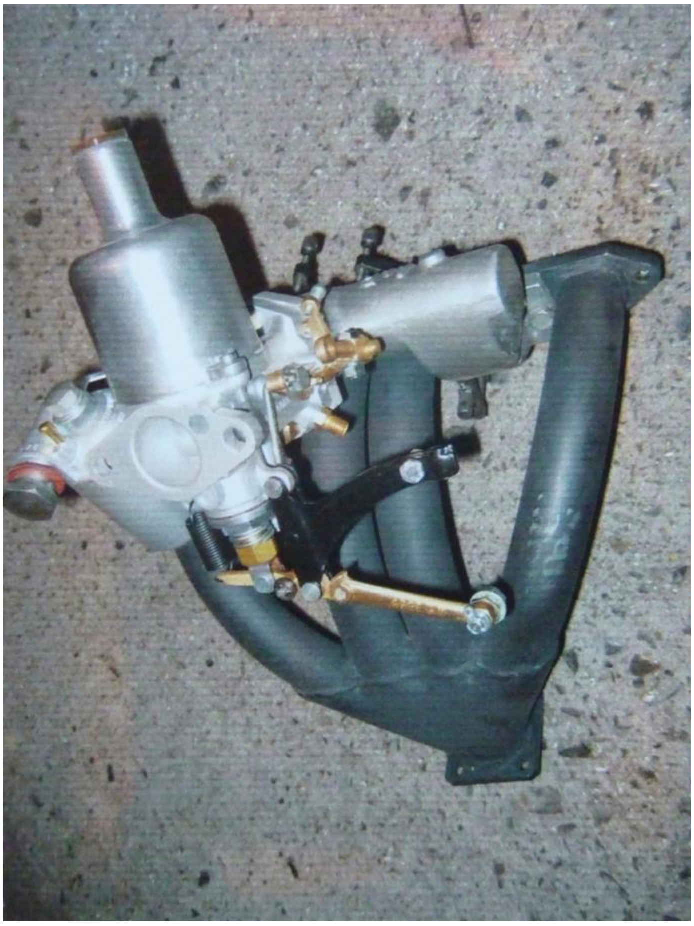
Many Chummy owners claim surprisingly good performance with the Updraft 22FZ Zenith carburettor in conjunction with standard early Austin cast-iron and alloy manifolds. However, I believe this might have more to do with the light weight of these cars, than efficient breathing of the engine, because the gas path is unarguably torturous.

My experience is that a side-draft 26VA Zenith mounted on the Ruby type standard Austin cast iron manifold does offer a slight increase in power. This is especially noticeable if the narrow throat of the inlet is opened up from the standard 0.75" Dia, to say 0.95" Dia and the internal corners nicely rounded.

However, I have a personal preference for SU Carburettors. They seem to suit Austin Sevens rather well, are often easier to set-up and being based on a variable jet principle, they enable any slight blockage to be easily overcome by tugging briefly on the choke. Back in the Sixties, many A7s sported twin SU carburettors but unless you plan to de-siamese your inlet ports, it now seems widely accepted that a single instrument will be more effective and of course a good deal easier to set-up. Whilst on the subject of jet blockage, I always employ a fuel filter. My preferred type has a fine brass mesh above a small glass bowl in which I often find small amounts of debris which are easily removed. One purchase of petrol in rural France on the 2017 Eurotour caused the glass bowl to become completely full of fine grit particles but happily, nothing reached the float chamber.

So what size and configuration of SU carburettor do I favour? Well, I have had good results with a 1.00" Dia (measured at the butterfly) horizontal sidedraft SU fitted to the standard Ruby style inlet/exhaust manifold; which seemed to give a further improvement in performance over the 26VA Zenith on the same manifold.

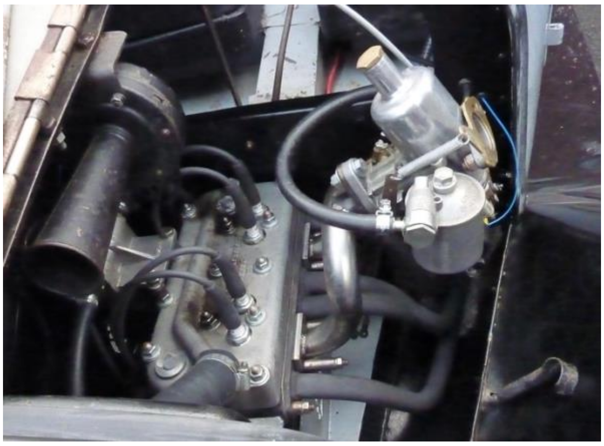
However, a more tasty option is a 30° 1.125" Type H1 SU mounted on an ALR (or similar) alloy inlet manifold with 30° flange, in conjunction with an 'bunch of bananas' steel exhaust manifold such as the one shown here made by Ian Bancroft.



Typical sporty manifold & carb' arrangement

This combination has worked extremely well for me for some years but fitting it in-place is not entirely straightforward. Firstly, there is no room for the centre manifold stud, so this must be blanked-off, which means the other studs need to be in really good shape. I have previously mentioned that Sir Herbert's offerings seem a little frail at ¼" Dia. so I always make mine $^{9}/_{32}$" Dia.

Access to several of the manifold nuts is also severely restricted with this particular exhaust arrangement, which makes the length of the studs somewhat critical. Even then, there is insufficient clearance to accommodate a conventional socket for tightening the nuts. So, I have resorted to an old box spanner with some material ground-off its outer surface. Clearly, for structural reasons, it is important not to overdo this grinding or let it get too hot which would destroy its temper. Happily, old box spanners are often made of excellent steel and my ground-down version has lasted many years.



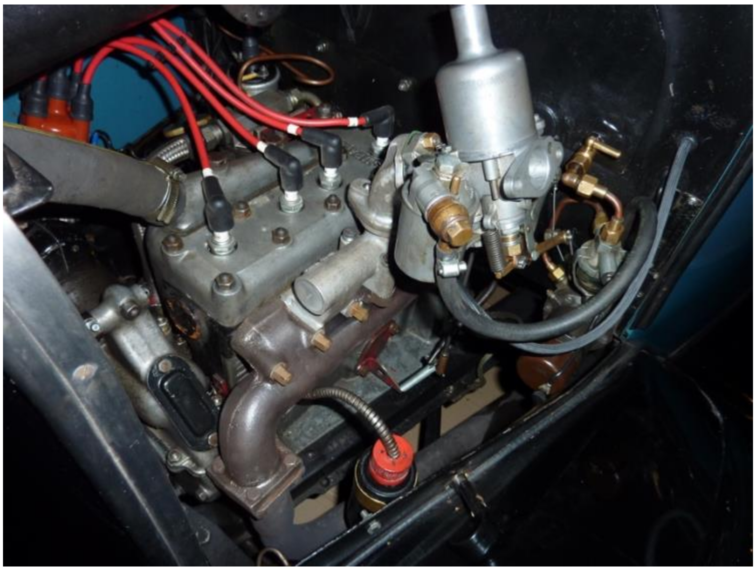
Swept exhaust on a powerful HA7C Chummy

Box saloons (and I guess Rubies) have plenty of room to accommodate a 'bunch of bananas' exhaust manifold but with a 'Chummy' it is more of a squeeze. An easier option in this case, is a swept four branch exhaust manifold such as that supplied by Pigsty Racing and a fine example can be seen in the photo on the left of one of our Club cars.

Clearly, with sports exhaust manifolds you have to make your own arrangements for connecting the exhaust pipe because standard exhausts will not fit directly. Actually, I have found that they sometimes don't fit terribly well even in unmodified cars.

Another interesting option is a Nippy manifold. Interesting, firstly because it will accommodate a standard exhaust downpipe and secondly because it seems surprisingly efficient. This efficiency might derive from a masterpiece of theoretical Longbridge calculation but some argue it is more likely a happy accident of design. Never mind, it works really well.

Unfortunately, the correct Nippy downdraft Zenith carburettor (the 30 VE1) has become an endangered species, the last one I saw for sale about five years ago was severely damaged and still had an asking price of well over £200. However, several other similar Zeniths make excellent substitutes and often come-up for sale at reasonable prices. There is also plenty of available information on suitable choke and jet sizes.



For those of us that prefer a variable jet in our carburettors, it is fairly straightforward to fit a 30 degree aluminium adaptor to a Nippy manifold as shown in the photo. Standard adapters are available but the ones I have seen are designed to take a 1.25" HS2 SU, which I believe might be slightly too big for my road engines.

However, with a little ingenuity, these adapters can be modified to take a 1.125" H1 SU and I am currently enjoying excellent results with this configuration. As a point of interest I am currently using a GG needle which seems about right.

The photo also shows my oil catch tank. The valve chest cover breather holes are blanked-off and an adapter connects (via a length of old outer speedo cable) to an old Brasso tin that has a ring of small holes in its lid. It works surprisingly well.

Since this photo was taken, I have added a short home-made inlet trumpet, fitted with a coarse gauze to prevent any unwanted large lumps of grit from entering the engine. It seemed a good idea and there is just enough room under the bonnet - but it has had no noticeable effect on performance. At some stage I propose to experiment with some form of air-cleaner cum silencer but for the moment, I shall continue to enjoy the noisy roar of the engine, especially noticeable on wide throttle openings.

Clutch

The benefits of even a slightly sporting engine will obviously be lost if the clutch is in poor shape. Therefore unless the linings are obviously fairly new, I invariably replace them when building an engine. Austin Seven clutch linings are not wildly expensive, they are dead easy to fit and it gives enormous peace of mind. Similarly, a set of new clutch springs is also a good idea if yours look a bit compressed compared to new ones which are typically 1.375" long. Incidentally, although some people recommend them - I have never felt the need for double clutch springs, even with fairly pokey engines. Maybe clutch slip is more frequently caused by oil sneaking into the clutch?

The above photos show a new clutch lining fitted to a flywheel. I use a mild steel 'dolly' of rivet head diameter held in the vice to support the lining side of the rivet and prop the flywheel in a horizontal position. I then use a lathe 'dead centre' to initially spread the hollow copper rivet before widening them a little further with the ball-pein end of a small hammer then finally spread it just enough to hold things firmly together. A similar approach is followed to re-line the pressure-plate.

A smooth operating clutch also requires the pillars, clutch levers and pivot pins to be in reasonable condition. New replacement items are available, mostly at reasonable prices except that a set of three levers will set you back approaching £30. No wonder it's common to apply weld to the worn faces and then file them to shape. Play in the lever pivots can sometimes simply be removed by replacing worn pins with lengths of 5/16" silver steel. Some books suggest removing wear with oversize pivot pins and reaming the pillars but this will do your reamer no favours because the pillars are hardened steel, therefore new items might be a better option. Woodrow tells us the pivot pins should be a press fit in the levers but I have found that this is not always the case.

Austin's recommended practice of bending the levers for adjustment, really does not appeal to me. I strongly favour the well established approach of drilling and tapping the clutch cover plate at the pivot points to take suitable (flat fronted) hex' drive grub screws. This approach is described very clearly in Woodrow (A4-26) and enables precise adjustment of the levers. Incidentally, a tiny amount of low strength thread-lock seems to prevent these screws from moving in service, whilst still allowing adjustment.

Fan spindle

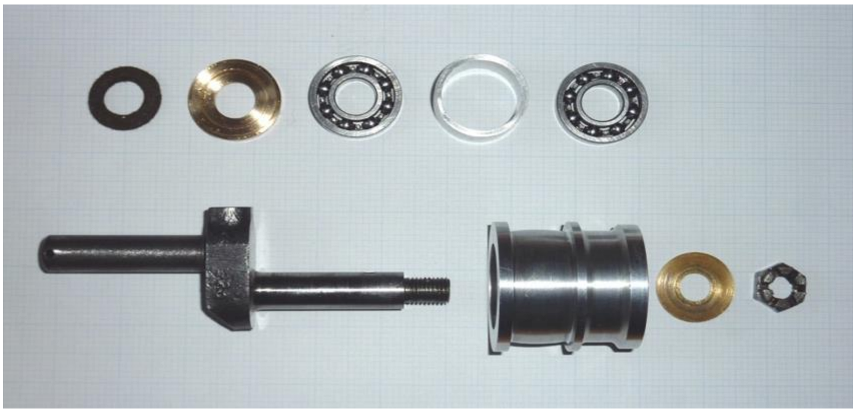
An interesting article on the (excellent) Cornwall A7 Club Website suggests that many of us might be driving around with our fan-belts too tight. The suggestion being that a tight belt will try to climb-up the flange rather than sit nicely on the peak of the convex pulley where it should be. Mine has definitely shown this tendency for some time and causes one side of the belt to wear rather too quickly. I therefore experimented with a much slacker belt and noticed an immediate improvement in its alignment without any noticeable loss of traction to drive the fan which might otherwise cause overheating.

I recently detected some unwanted play in the top (fan) pulley and decided it was probably time to fit new brass bushes. For some time the fan belt had been inclined to sit against the pulley flange causing that edge of the fan belt to fray. I have also noticed that the fan assembly is inclined to deliver spots of grease in all directions when the engine is running.

It seemed logical that the worn bushes probably caused misalignment of the pulley which in-turn led to the worn fan-belt but the reason for loosing grease was less clear.

A recent article in the 'Grey mag' mentioned the use of 'proper' ball races in a fan pulley and this aroused my interest. A quick rummage in by box of bearings soon yielded a pair of imperial ball races 1/4" wide, ½" bore and 1.00" outside diameter. I also found a suitable chunk of aluminium, and set about designing a new pulley.

Whilst measuring the Austin spindle, I noticed the drilling (for conveying grease) had been made from the front and left unplugged. This obviously lets grease reach the back of the fan, which being only a gentle push fit on the front boss of the pulley – seemed to be a likely source of the escaping grease. So, I decided to plug the front of this hole but not so far back as the radial drilling that feeds the bearings. The spindle is hardened on its outer surface but soft enough in the centre to carefully enlarge the hole to say 5/32" Dia and tap 2BA with a relatively low percentage engagement to avoid breaking the tap. Next, after degreasing everything, a 2BA screw was secured in position with Loctite and cut-off flush at the front end when cured. Finally, the cross-drilling for the nut split pin was restored.



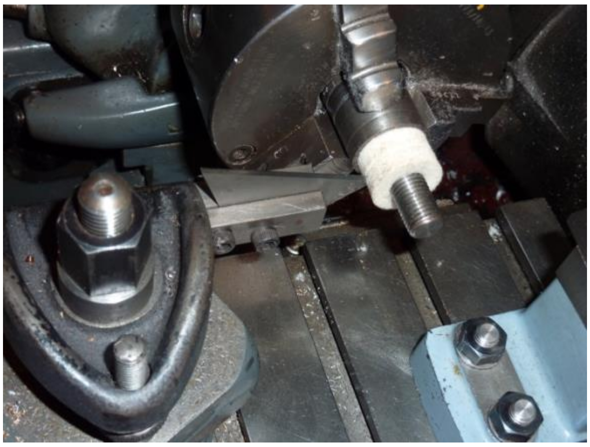
Spindle & components ready for assembly

The new pulley design was very straightforward and based on positioning the two ball-races as far apart as possible. The Austin felt seal housing was replicated by a light press fit brass bush to hold everything together. Finally, the bearings are separated by a simple alloy spacer.

The bearings were an easy push fit on the spindle and in the new alloy pulley, so, a spot of thread-lock was used to secure everything in position, obviously taking great care to avoid getting any on the bearing tracks.

The replacement felt seals that I have encountered are far too wide at about ½"and need to be cut-down to a thickness of around $^{1}/_{4}$" which means you can keep the remainder as a spare. Cutting can of course be achieved with the kitchen carving knife but a more accurate approach, is to hold the felt seal on a 3/8" mandrel in the lathe and cut it with a Stanley knife blade held in a simple clamp tool as shown in the following photo.

If you run the lathe at top speed and advance the cut very gently, the seal will only need to be a firm push-fit on the mandrel for it to remain in place whilst cutting.



Finally, everything was sparingly greased and adjusted to ensure a light compression of the felt seal. The pull of the fan exerts a gentle forward axial load when running, that seems to hold the steel insert against the brass washer at the front sufficiently well to prevent the loss of grease. This spindle has now done well over a thousand miles, spins very freely with no play and seems just fine. The relatively loose belt sits nicely in the centre of the pulleys and the former source of grease spray has been completely cured. Projects like this probably suggest that I have too much time on my hands, nevertheless it was an interesting exercise and quite rewarding.

Fuel pump

I personally favour the use of an SU electric fuel pump and therefore blank-off the aperture for the original mechanical pump on the near-side of the crankcase. A neat blanking plate can very quickly be sawn, filed and drilled from an offcut of 1/8" steel and it is an ideal opportunity to add a bracket to carry the bottom-end of a second throttle return spring as shown in the photo.

The next and final instalment (Part 5) will discuss how I assemble an engine.

……… Spanner