

## Making Good At Last

In case you are new to these articles the story has reached the point where an unexpected engine rebuild on a 1964 Mk2 Jaguar has at last reached the point where something could be built rather than dismantled.

It was a long wait for the call to tell me the machining work was done but eventually the day came to collect all the remaining parts and the reworked engine block to rebuild what would now be a 4.3 litre XK engine. There is something very pleasing about a collection of new parts it seems to me. Perhaps it's the promise of good things to come.

Readers of these articles may remember that the original engine suffered major damage as a result of contamination that entered the bores probably from the rebuilt cylinder head. After that fairly hard lesson this build was going to be meticulous in its attention to cleanliness. The first job then was to get the re-polished crankshaft on the bench and thoroughly clean the oil ways. Having been



acid dipped and pressure washed you could reasonably expect that nothing much would be needed but this wasn't the case. The Jaguar crankshaft like most others has a series of sludge traps in the big-ends and using small brass wire brushes and nylon bottle brushes these were thoroughly cleaned with brake cleaner. A surprising amount of muck came out of these oil ways underpinning the need to carry out your own cleaning even if your remanufactured components are listed as "ready to build".

Apparently oilways absorb the oil contaminants into the metal of the sludge traps over time which is why it takes strong solvents to deep clean them. I was also told that this is why rebuilt engines still cause new engine oil to discolour quickly after an oil change where this doesn't tend to happen with a brand new engine. This cleaning effort took several hours spread over three days because leaving the chemicals to soak the metal gave better results than just wiping out. It also seemed to be that Carburettor cleaner was more effective at removing the old oil residues. The only way to know if you are succeeding is to keep going at it until the paper towel or cloth comes out clean which eventually it does. You will probably also have alabaster white hands with not much in the way of nails as the various chemicals erode skin and keratin. I just told people it was a result of having been tortured which makes for good dinner table conversation! At the NEC Classic Car show a few years ago I saw what professional engine rebuilders and racing teams now use to clean components and assemblies. It is the equivalent of a giant dishwasher that works at high pressure and very high temperatures to achieve almost



sterile levels of cleanliness whatever the component. Whilst it was said to be very effective prices started at around £15,000 so probably not a DIY proposition. For the rest of us expect a very tedious few days but hopefully a good investment in time and effort.

Getting all the internals right matters but it also makes sense to get things like the engine block really clean on the outside as well. Apart from making the assembly process a lot more pleasant it makes it much easier to troubleshoot the oil leaks I anticipate when the whole thing is back together again. Not only was it cleaned but painted as well, though how long it will last is anyone's guess. With everything ready to assemble the engine build could start.

Whilst the engine was away the crank was machined to take a modern rubber rear seal rather than the rope seal that was standard for the original engine. The rope seal works on the principle that the crank had a scrolled groove machined into it which the rope seal contacts. As the engine rotates, the scroll catches oil attempting to pass the seal and because of the direction of the thread of the scroll pushes it back into the sump. This works fine whilst the engine is running but XK engines are notorious for leaking oil from the rear seal when parked and especially when parked facing uphill. Problem of the past now? We'll see. With the crank and thrust washers in, the main bearings torqued down and the oil pump assembly from an XJ6 fitted, the bottom end was just about complete. The sump doesn't go on until the timing case is assembled so it was the pistons next. A straight forward exercise which once the big ends were torqued down finally looks like an engine that might work. If you can turn the crank by hand with all six pistons moving properly and no unauthorised play, then it is a very good sign.

At this point the engine is spun over on the engine stand to turn it right side up. For reasons I've never understood these engine stands all seem to be supplied with a turning lever the length of a piece of spaghetti. I think it was Archimedes that said, Give me a place to stand and a lever long enough and I will move the world. Well readers who have stayed with me this far will know, I can take a hint! A meter long chrome steel tube (that once was a table leg) meant that I really could now rotate a Jag engine on my cheapo engine stand.



It was about now that I had to reorder the various gaskets that I had spoiled from the original cylinder head replacement so on the basis of, do what you can and don't worry about what you can't, focus turned to fitting the core plugs. These are the top hat sort that are an interference fit in the block aperture so need a little encouragement with a hammer to properly seat home. I once had a core plug part company with the engine on my first Mk2, typically somewhere bleak, on the M1 motorway. It was irritating to have to be recovered for the sake of something that cost about 10p. With that in mind the edges of the plugs were all liberally coated in Araldite. Some may see this as overkill and indeed may have sympathy for the poor so & so who has to get them out in the future but that will probably be me. You have to consider that access to core plugs once the engine is in the car is really difficult especially when you have to swing a hammer to knock them home. To have a car

immobilised is bad enough but dependent upon which one blows out can mean taking the engine out to fix it.....far too much work to just hope for the best.

As the final bits and pieces arrived the rest of the build followed the workshop manual directions to the letter. The build part of this project was really enjoyable though I have to say I never want to have to clean all those bits and pieces again. The last part of the build was the one that gave me the most trepidation, fitting the 3.4 head to the 4.2 block. I must have held the new cylinder head gasket against the engine and the head a dozen times looking for any mismatch in oilways, waterways and bores. With nothing to indicate a potential problem, the head was heaved onto the cylinder head studs and lowered onto the block .....but then it wasn't. It wouldn't drop down and was jamming towards the back and about 4 inches down the studs. Now the cylinder head complete is a pretty heavy bit of kit and I didn't want to damage the machined face so everything had to be handled with great care. It was really hard to see why the head was jamming but it did appear to be towards the back and on the inlet side. Gentle tapping with a rubber mallet had done no good and after the last time the head was fitted I wanted to be absolutely certain nothing was falling into the bores. Eventually it was clearly not going to happen so with help from my son we lifted the head off again to try to see what was fouling what.

We looked, we examined, we measured, poked and prodded. We ran a spare stud through every stud hole on the cylinder head with no resistance at all. Eventually, the Eureka moment. That stud



looks a bit fat at the top!! And it was. When we put the Vernier on the stud it had a collar radius that was twenty eight thou greater than all the other studs. It seems obvious from the picture but without a standard stud next to it for comparison you really wouldn't see the difference. I have no idea where it came from or what it was intended for but replacement with the spare stud solved the

problem and the head dropped on perfectly.

This felt like a real milestone moment as we now had an engine that looked like an engine. The cams were coupled up and valve timing checked for correct orientation with the distributor. This was an important bit. It is very easy to set the cams 180 degrees out so the spark goes to the wrong cylinder when you eventually try to start the engine. (Ask me how I know this!!). What did emerge was that though the valve timing was 100% correct, the distributor rotor was not pointing at what on a Jag engine is referred to as the No6 cylinder spark plug lead. For whatever reason, Jaguar engineers numbered the cylinders with No1 at the back of the engine. This often leads the unwary to set the firing order incorrectly resulting in a very unhappy engine if it starts at all. Having met this problem before I was aware that distributors can be incorrectly built (even direct from Lucas). There are two solutions, one being to recalculate the firing order based on reversing the Jaguar specified cylinder order or rebuild the distributor to set the correct orientation of the rotor arm with the drive from the crank shaft. Knowing the drive orientation was correct according to the Jaguar Service manual I opted to rebuild the distributor.

Have I mentioned before how much I like bench work? To be sat down, in the warm, with components held in the vice makes for properly civilised mechanicking. Stripping a Lucas distributor is reasonably straight forward though putting it back together can present some challenges. A photographic record of the strip down will really help with the rebuild if you are not familiar with

these devices. The end game is to take the distributor down to the weights at the bottom of the rotating centre shaft and turn the pedestal that supports them through one hundred and eighty degrees in relation to the centre shaft. This means that when built up again and with the rotor attached, the distributor will point to and correctly fire No6 cylinder at the standard firing point. Most importantly, from my point of view, the engine is once more entirely correct to the original factory specification (give or take a 4.2 block and 3.4 cylinder head) which means if you want to upgrade to electronic ignition it is a straight forward substitution. It also helps if you want to enable professionals to work on the car in future if they don't have to waste time working out oddities. With the distributor refitted and yes, definitely pointing to No6, the static timing had to be set. This is simple enough if you can see the timing marks, which is where I got an unplanned benefit from all that cleaning. I COULD see the timing marks.....clearly. With a chain wrench on the front pulley it was easy to set the eight degrees before Top Dead Centre which was definitely accurate because the pointer was positioned before the sump was fitted so the connecting rod was absolutely at the mid-point of its top throw. Setting the timing now is quite pleasurable because the distributor is so easy to get to when the engine is out of the car. The important thing to remember is not to overtighten the clamping bolt when you are all set because getting it loosened off again once the engine is back in the car is a whole lot more difficult with the limited access.

The new XJ6 spec leads were added and configured to the standard firing order and plugs fitted to keep the bores free of contaminants. I gave all the bores a good squirt of WD40 too just in case any damp got in.



All that remains now is to fix the clutch, check the gearbox and overdrive, fit them to the engine, put the powertrain in the car, fit the new front suspension and steering, connect it all up and drive off into the sunset. In the words of a famous Meerkat.....Simples!