
NOT FOR THE FAINT OF HEART

Last issue I bemused you with our efforts to extract the engine from a 1972 Silver Shadow. Since writing I have had a couple of mild remonstrance's from I suspect some of the old gang whose credo was along the lines of 'these cars should only be worked on by fully Factory trained operatives'. These people now realise that the supply of these legendry mechanics is drying up very quickly and that it is they that need to get their hands dirty, to read the books, ask the questions and share their experiences if our cars are to survive.

To do this requires time and money. The former is the difficult one in today's hectic life and for a family, dad's passion is often not sympathetically viewed when the gate is off its hinges and the drain needs unblocking. Yet somehow the enthusiast copes in the environment in which he lives, adjusting his passion to the prevailing demands on his time.

Well all this was put to one side by my critics when they chided me for getting into the complexities of overhauling the legendry vee eight motor. They wouldn't for a moment contemplate such a task!!! They don't need to. I hope recording my adventures will be some assurance to those who would tackle such a job and for everyone else, other than the cucumber sandwich munchers, who truly love the mechanisms of their car they will enjoy getting to know the more private parts of our hobby!

So where were we? The sub frame with the engine was clear of the body of the car and with some juggling the engine was separated from the frame and the transmission separated from the engine! A word of warning here. It is very tempting to start dismantling as you go. This is usually the death knell for the car – it will never go back together. It will all become too much, you will lose parts, lose interest and find something far more interesting in a bottle, a book, or next door! So I concentrated on the engine which was the original catalyst for this exercise.



Well here is our engine minus exhaust manifolds which if you look down the side of your engine are pretty close to the body sides. The transmission has been removed which explains the tilt of what is left. Previously you have seen the torque converter mounting. One point to watch is when removing the transmission, ensure that the converter stays with it. It is not difficult to overlook this and have the unit pull out from the gearbox as well as away from the drive plate on the engine and then drop on the ground. Crying after such events is perfectly reasonable!



Times have a 'changed since the old days of enormous flywheels with shrunk on starter ring gears. Last issue showed this drive plate but here we can see the ring gear which is bolted to the rear of the plate – so much simpler. Of course ring gears now last forever because we now have pre-engaged starters that quietly thread the little starter pinion into the ring gear before belting it with Mr. Lucas' fury! Before, it was wind up and crash!!! The old ring gears would always wear off their teeth in three places on the old six cylinder

engine since that was where the engine always stopped. You would press the starter and there would be a whirr but no engine turning. The solution was everybody out, put the car in top gear and rock it to turn the engine around to a spot where the ring gear was intact. Now that was romantic motoring! The little disc riveted to the drive plate in the picture is to balance the assembly. The dear old sixes were balanced as a unit and when the Hydramatic fluid flywheel as distinct from the torque converter was bolted on you needed to be sure of balance.



By now all the induction gear is off the top of the engine and the front crankshaft pulleys and bits have been removed. The lower half of the timing case has been removed and inverted for your inspection. In the top left hand dirty corner is a rubber plug. This ingenious bit pushes the oil pump delivery pipe into the gallery leading to the oil filter and then to the big time stuff. If you leave that plug out a lot of

oil pressure will be lost and any gauge will show a widely fluctuating pressure reading.



At left the engine still with its heads on, starter and exhaust manifolds removed. The front mounted oil pump can be seen above the camshaft gear although the driving gear for the pump has been removed from the camshaft.

The small oil pump gear which is bronze is driven by a steel worm gear. Later cars reversed the design fitting a bronze worm gear and a steel oil pump gear. Some brilliant people have actually changed the bronze pump gear for steel so that

you have steel driving steel which is a perfect recipe for destruction. The bronze pump gears are available after market.



The heads can be a problem for removal fortunately this engine seems to have had a sedate life and been well maintained. The nuts and special washers all came off and a slight tug got them this far. Some years ago I tried the same approach with a very early Shadow. In the end we had the car suspended by the head and it would not budge and apparently never did? Discreet pullers have now been designed which apparently have overcome

the problem. The advice I have received has been to treat these units with great care. Do not fling them into the local fixit station for a quick head job because invariably they will shave it and there is very little to play with. Furthermore the head being shaved brings the rocker arm shaft closer to the cam shaft which can upset the lift performance of the cam followers. There is also the problem that the heads have to match the inlet manifolds – have I passed the message?



The heads are off, the oil pump removed from its mount at bottom left as has the pickup stirrup which is bolted to the crankcase on the lower side further along. I have been asked whether I will convert the sealing arrangements for the ends of the crankshaft to match the

later cars. The answer is no because it is a lot of very specialized work and very expensive. The throwers on the shaft work very effectively unless the main bearings are really very worn or the sump is over full!



The cam shaft seemed to be the next logical bit to remove. An old hand pointed out that if I did not remove the bits at the back before I put the block on the engine stand I would be up for some keyhole surgery! This explains the block hanging in chains. The camshaft it held in position at the front end but before it can be removed the distributor drive gear at the rear has to be removed. And here is the latter! The helical gear to the right runs on a shaft that can be seen when the distributor is removed. Note that the rear bearing 'catcher' has been removed. Apparently experience suggests that these two joints be sealed with a good quality gasket cement and not use a gasket as the latter tend to weep.



Here the distributor drive gear has been removed exposing the rearmost bearing of the cam shaft. Note that the shaft actually runs in the block and does not have separate bearings. To the left of the shaft is one of two Welch plugs blanking off the rear of the two main oil galleries that run the length of the engine. The other one is behind the distributor gear.



The crankshaft has been removed with the respective bearing shells and the eight bolts securing the camshaft gear are being removed. These do not have lock plates or washers under the heads. The hole near the gear on the lower side is the input point from the oil pump.



This neat little pipe is fed from the main oil gallery and squirts adequate oil onto the camshaft gear. Note again that the camshaft gear is aluminium driven by a steel gear on the crankshaft. The hole to the left is another view of the oil pump input to the block (the block here is upside down).



Here is the camshaft thrust plate and cover for the two main oil galleries. The small pipe jet for the camshaft gears is part of the assembly. Below, the camshaft gear has been removed and the camshaft is ready for extraction. The recess surrounding the gear ends in two holes. These are the ends of the main oil galleries that feed the main bearings and thence the big ends.





The moment of truth has arrived. The cylinder liners have to come out to clean out the water passages and replace the liner seals – all three of them.



It is essential that the whole block is heated. Not having the prescribed hot air oven to raise a temperature of 150 degrees C, I settled for 80 degrees C by putting a 2,400 watt radiator under the block with a fire blanket and an old army blanket to keep the heat in. This took about 4 hours.

Apocryphal accounts of blocks cracking, liners jamming, pullers breaking, abound! Fortunately again this car has been well maintained and the task was not difficult. A very stout puller has to be made up some indication of the pressure required is illustrated by the extractor thread.



It is important that a liner is not pulled that is not supported by a block end and/or another liner! This is because the webs at the bottom of the liners are the weakest part of the casting, it is also the point where most of the detritus from the cooling system collects and sticks to the bottom of the liner. Pulling this past a seal may be just too much for the casting.

The base plate for the puller needs to have the side cut off to accommodate the main bearing webs. The maker of this puller thoughtfully milled a groove into the plate to hold the nut from turning.



The puller pulling! Note that liners are inserted either side. This was a bit of an embuggerance in that while the block was hot I pulled numbers two and four on both sides and let the block cool. The liners were then cleaned up, the old seals removed and the bulk of the muck in the web area and the top of the block cleaned out. The liners when cleaned were stored in the deep freeze. The next day the block was re-heated and the frozen liners dropped into their cleaned places. They went in under their own weight! But within a minute were locked solid having expanded. With liners two and four in place the process could be repeated for the other four units. The white lines on the liner tops surround the etched number of the liner relative to the block. The etch is quite faint and the lines helped to find them. Below one of the liners as pulled, the spanner used to do the pulling and the clean block minus liner to show the seal grooves.





At left poking the Welch plugs out at the other end of the block with a steel rod. This enables the galleries to be thoroughly cleaned particularly after machining. The picture below is taken at the other end showing the brush as it emerged from what was purported to be a clean engine!

Incidentally these are NOT Welch plugs as some would have it! Mr. Welch an American invented the Welch plugs to seal holes left in castings to get the sand moulds out!

The original arrangement was some sort of screw in plug. On an occasion Mr. Welch had one of the screwed in types blow out and solved the immediate problem of keeping the coolant in the block by fitting a coin in the hole and belting it with a hammer! Below is the other end of the brush. Clearly more cleaning is required!



The late Geoffrey Boscoe my best friend from school over 50 years ago bought a brand new Austin A90. A nice well finished 6 cylinder car. I was driving it around the back blocks of the Botanical Gardens near Hobart Tasmania when there was a resounding bang akin to a rock thrown in the engine compartment. Fortunately I stopped raised the bonnet and here was a prodigious stream from the side of the engine. A Welch plug had blown out. Holden six cylinder engines blew the odd one and there



were some small ones behind the exhaust manifold which were usually removed to clean the cylinder head. The hapless enthusiast would throw the engine together and when filling the cooling system discover a number of water spouts from around the manifold. Nobody told him that the Welch plugs had been removed!

At left the handle end of the gallery brush. This is a particularly effective innovation, a specially made nylon brush half inch in

diameter. Here it was being pushed through the block after its first professional cleaning. One of the vexing tasks in this exercise has been getting the cylinder block clean! The deposits from the coolant and exhaust carbon etc are easily scraped but the basic frum that coated the inside was impervious to high pressure water, solvents and brushing. The only solvents that seemed to work were all purpose thinners and carburetor cleaner. The commercial baths used by engine cleaners seem to do a reasonable job although I had to have two goes at it. This was because the block as blocks go is much larger than most if not all other vee eights! The baths are not immersion instead they work like a dishwasher with pumped solvents and detergents raining down and squirting up from rotating sprays. In the end I fear I will have to go over the block carefully to see that the job has been done and probably apply some old-fashioned elbow grease!



This is view of the bottom end of the liner where it pokes through the bottom of the block. The liner is actually slightly larger than the hole so grips it somewhat tightly and explains why the block needs to be heated to get the things out safely. When the engine is hot the fit must be not quite so tight because if the lower of the two seals at the bottom of the liner has had it, oil from the whirling crankshaft will find its way through the gap and leak out of the weep hole!

Can I pop in a fatherly note here? This whole exercise was born out of necessity otherwise I would have not attempted it. My motivation was generated not only by circumstance but by the fact that I have an S2 Bentley engine begging to be overhauled and I thought this would be good practice! Should there be readers tempted to take on the task, be particularly conservative in pulling the liners. My Bentley has had some pints of WD40 sitting at the

bottom of the block for years and will also be subjected to dry ice and much heat if there is the smallest resistance.



This is the view when you pull a liner. A bit of the top liner seal can be seen at about 4 o'clock. The dark area at the bottom is the crankcase between the two bottom seals. Both seals at the bottom are the same composition yet the lower one has to cope with hot oil and the upper one with hot coolant. The lower one usually gives out first and the weep holes weep. The triangular opening near the bottom on the right hand side is the passage for coolant to circulate between the cylinders. The lower half of the adjacent liner can be seen through the hole. Also can be seen a shard of corrosive deposit that has dropped down. This is the sort of item that constricts cooling.



And at the left we have the heart of the engine, the crankshaft, which is all the average man can lift. The semi-circular throes are bolted on which is not usual practice. The early cars had integrally cast weights. The only but vital maintenance here assuming the journals and main bearing surfaces are not badly worn or damaged is to clean out the sludge traps. Despite the best of filters a mélange of very fine particles of carbon, metal and general muck circulates in the oil and the designers decided to use the centrifuge effect of the whirling crankshaft to extract the stuff. This accumulates in special chambers in the shaft which may be accessed through holes suitably plugged and sealed.



Here is a sludge trap opened which requires a pair of contracting needle nose circlip removers and a small bolt to act as a puller. At lower left this is typical of what you will find. The main pressure oil comes down from the main two galleries that run the length of the block then through drilling to the saddles that the main bearings sit in, through the bearing shells and through the holes drilled in the crankshaft journals. These go direct to the

sludge traps and the 'clean' oil then squirts out holes opposite to the sludge to lubricate the big end bearings.



The 'plugs for the traps have a simple 'O' ring around them to keep the seal. When replacing the seal it is a good idea to replace the circlips as well – after all they have been 'accumulating' for nearly 40 years!

ANYTHING ELSE HAPPENING?

Well I have been trying to sleep during some of the dark hours, I caught a cold that threatened to turn me inside out but I survived and sadly I can't bore you with details of swine 'flu. I can't make up my mind which mob got the better deal, the pharmaceutical people or the media with this pandemic!

I may have mentioned that I tried to use the Spur as a battering ram on a Celica driven by an innocent lady who stopped when I started. The Celica had a small dent in the beaver panel under the rear bumper, the Spur looked very sorry for itself. I have been recalling stories of past accidents and the boasts of how such and such car had nary a scratch but the other thing

was a complete write off. There are variations of this scene. Fortunately our technical minders have now designed our car so that a relatively minor bang and you finish up with a neatly parceled car with the body intact and the entire mechanism neatly folded up underneath! The impact of the Spur was on the front left hand corner and the main load was taken by the bumper bar. These are fabricated in very thick aluminium in a box section shape covered in front with pretty rubber and strips of anodized metal and a polished stainless steel fillet on the top. The bumper went under the valance of the front mudguard collecting the surround of the electric fans which in turn punched a hole in the air conditioning condenser and that in turn punched a hole in the radiator. The fog light, grille, headlight and parker

were untouched except that the impact loosened the guts of the headlight!



By mutual arrangement with a very helpful smash repair shop with whom I have dealt with a number of times in matters Rolls-Royce, I was able to go there and pull the car to pieces. For those that can do this it means that the little gimjaw that gets broken and lost can be identified and replaced. It also means you can have a really good look at what damage has occurred. So cocky with confidence I sailed through the dismantling and for curiosity got

my torch to have a good look down the side of the engine. Sure enough there was the telltale bulge in the side box section that carries the front of the car.

While throwing myself around on the floor with anguish one of the panel beaters had a look and assured me that that little bulge will 'fly' out when he gets to it! I stopped throwing myself and relaxed. The area that has distorted is designed to do just that and I mentioned this with a photo in the last issue. Often someone buys a car and wonders why they have trouble with wheel alignments, handling and sub-frame mounts. Often it is this very area that is found to be kinked and not repaired after a relatively small bingle! Next step is jousting with the assessor!



Meanwhile I have disabled a well used but pretty S2 so that I can see where things go for my car. But then I noticed that the car had a slightly strange gait and I pulled the whole front suspension out. One shock absorber (sorry shock damper) was kaput since it not only had no oil in it but had a liberal dose of water to cool it. The other shock was worn but recoverable unlike the first one so the owner bought a 'reconditioned' unit from a well known second hand bits supplier in the UK. For

those that have this task, TK Motors in Moss Vale have the expertise and parts to restore these units. Prudence suggested that they also check the 'reconditioned' one while we waited for machining for the other. It turned out that the 'reconditioning' consisted of throwing a coat of paint over it!! Caveat emptor as Nero used to say!!