

# TEE-ONE TOPICS

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Number 83

March 2009



The rather naked front end of a '72 Shadow engine showing the very compact oil pump with its little drive gear, the protruding end of the crankshaft on which is the smaller of the two timing gears which in turn meshes with the larger timing gear which is bolted to the camshaft! The 'S' shaped pipe emerging from under the end of the crankshaft and slotting into the engine block carries the pump output into the galleries of the engine. The chain around the engine is to support it. To remove the lower half of the timing case the removable cross member has to come out which removes the front engine mount!

## A MYSTERIOUS CLICK

When you have been climbing under the front end of your car you will have noticed that the sump which contains the life blood of the engine is heavily stepped. The front end is very shallow and the rear comparatively deep. The shallow end is to accommodate the various bits of the steering anatomy which crisscross the front of the car between the wheels. Most designers place the oil pump at the rear end of the engine under the drive for the distributor where an extension from the drive gear on the latter drives the both it and the oil pump.



Have you ever wondered what holds that large pulley on down the bottom of the engine? Here is the answer shown in a strategically placed mirror. The lock plate, held on by 5 small bolts, secures the castellated nut. The bolts and the nut having been removed together with the locking plate, the pulley with a bit of wiggling will lift off. This is a fairly critical bit of the engine since the pulley plus the harmonic balancer behind it is a fair weight and if the crankshaft gets up some unsympathetic torsional vibration the nose of the shaft has been known to snap off.

As you know and as is clearly shown in the first picture the camshaft turns at exactly half the speed of the crankshaft. So if you want to ensure that when the engine is slowly ticking over there is more than adequate oil pressure you either increase the capacity of the pump or speed it up. So if you want to double the speed, drive the pump with the crankshaft! And that is what they did.



The lower pulley is off, the castellated nut (right handed) holding the adapter on the nose of the crankshaft has been removed as has the upper water pump pulley and the tensioner for the lower belts. Oh and the radiator has been extracted to give plenty of room.

There is simply not enough room down the back to put drive gears and pumps so the designers moved up the front. The pump does not need to be large and appropriately cut gears can handle the right angled worm drive required to power the unit. The

pickup also was but a little problem requiring a stout ample bore pipe from the pump to the rear of the engine where the usual screened pickup floats in the sea of oil you pour down the plug hole!



Getting there. The water pump housing which doubles as the top half of the timing gear case has been whipped off and a beautiful puller attached. This is a Factory supplied item worth every penny. One could move the Sydney Opera House across to Milson's Point with this tool!

The sharper reader will note in the leading picture that there appears to be no drive to the oil pump which is good because that is what these



We have arrived! The adapter has been extracted and the Woodruff key pushed out of the groove in the crankshaft which held the former in place. A second castellated nut (left hand thread) seen here idly resting on the nose of the crankshaft – that is the problem child! In this case it was not even finger tight. Behind it is the bearing washer against which the nut is tightened and behind that the two oil flingers. Behind that is the worm drive gear which is the thing that rattles! It also drives the oil pump.

Words are about. The pump bronze gear is driven by a steel gear which is keyed to the crankshaft. To stop the latter gear wandering up and down the nose of the crankshaft it is held in place by a castellated nut complete with a left hand thread which is tightened to some 340 pounds torque! This considerable tension is applied to the driving gear on the crankshaft through a bearing washer and two oil slingers. You will remember in the early cars there was no lip seal on the ends of the crank shaft, simply a reverse helix on the shaft, a very small clearance between the shaft and the hole in the crankcase and all this augmented by flingers to hurl any curious drops of oil that might want to get through to have a look at the world outside.

When the Shadow II with its reported 2000 improvements over earlier cars emerged, there we had seals and induction negative pressure applied to the crankcase lest some beautiful young mechanic (but in the weekend an idolised football star) inhaled fumes from the crank case and could not for the life of him kick the winning goal.



And here is the offending gear exposed with its castellated nut.

More likely it was the kith and kin of our friends who insisted on the natural debris from our bushland being left for the benefit



of the little things that play therein. Unfortunate about the immolated that perished as a result but that is politics and civilisation! So now that I have wasted your time recounting all this, what is the story?

The Woodruff Key was invented in 1888 by a Mr Woodruff of Connecticut USA! As you will see this one with the worm gear whacking back and forth against it had worn a fair bit away! A new key was \$2.00 – a pleasant surprise.

Well, the nut comes loose!

My mentors tell me it only happens with engines are put together by amateurs who don't realise how tight 340lbs torque actually is!



Before you start writing in to join the fan club, the object of the photo was to highlight the problem of achieving 340 ft lbs of torque on a left-handed nut! Obviously I could not apply 340 lbs on the end of a 12" spanner even if I was able to hang on it. So a multiplier was required, one of my trusty jack handles. The second problem was that the tension wrenches that will handle this torques will not do it anticlockwise! One that will is available at some \$1400!

The symptom of a loose nut is a click usually. But initially the sound is, as one practitioner described it, like a seminal siren. I think that sound is generated by the steel flingers slipping on the nut and gear but eventually after you have replaced everything but the whisky in the decanters, you will find the siren-like noise has given away to a very pronounced albeit light knock.

There is no cure other than ripping the front off the engine and tightening the nut!



And at the lower end.... The serrated tube spanner again is a Factory bit well worth the money. Some Clubs dare I mention it actually purchase these sort of tools (and reverse acting tension wrenches) and hold them in stock for use by their members.

## SOME WORDS ON GEARS

Gears are a good example of the challenge of engineering design. Some gears are simple, inexpensive and easy to manufacture and assemble but have a number of limitations relating to noise, wear, gear ratio, backlash, smoothness and flexibility (e.g. the angle between the shafts). Eliminating each of these limitations adds cost whether it is time, money or complications such as higher levels of maintenance. The engineer should select a gear design that meets the requirement at the lowest total cost of ownership (engineering in a nutshell).

A simple example on a car is the difference in quality between the top gear and reverse gear in a gearbox. The reverse gear is a cheap noisy gear (we have all heard them whine) because it probably does 10 hours work in 20 years. The top gear, in contrast, is the highest quality gear because it does perhaps 5000 hours in 20 years.

The basic gear is called a spur gear. Teeth at 90 degrees and shafts parallel. It doesn't generate thrust but it is noisy and prone to wear because the whole tooth is engaged and disengaged at the same time by the opposing tooth.



## REPLACING SHOCK DAMPERS ON SY OR SZ CARS

It is often amazing how long shock absorbers will keep trying to do their job before something goes so wrong they cannot be ignored. The telescopic dampers on Rolls-Royce and Bentley cars are no different to those on any other cars except for their mounting points and that makes it necessary to have special runs and up goes the price! At the time of writing you should be able to buy units for an average of about \$700 a corner as a friend describes their location.



If you buy 'genuine' you get a much nicer package. The front units require a very substantial sleeve that slips over the body of the shock absorber and it is on this that the weight of the car rests. They also require a rubber boot to provide some protection to the exposed shaft between the shock absorber body and the upper mount.

Here are four brand new 'bare' Boge shock absorbers. The mounting rubbers for either end shown here are extra but are propriety items.

Unless your car has been used for the Peking to Paris Rally every few years it is very likely that the rubber boot originally fitted to the unit will still be intact and quite easy to restore with a good scrub and dosing with the propriety tonic 'Amoral'. The sleeve however is a different matter. You undoubtedly can buy these separately although they are probably priced to discourage thrift merchants like yourself. The alternative is to remove the ones still stuck to the old shocks. If you come from one of the delightful lands of snow and salt I



would forget any aspirations to recover these sleeves. They will have melded into the body of the shock absorber never to be separated!

At left is the old shock absorber complete with sleeve. They were truly wedded!

Otherwise assuming you can get to a press you may be able to push the body of the shock absorber out of the sleeve. This is not easy. Because most presses don't have a two foot travel you will need to release the gas from the unit then pump out the oil therein. The gas is removed by inverting the shock absorber and drilling a very small hole in the body. Before doing so wrap a cloth around the unit and drill through it since the pressure of the gas is considerable. Just a case of Gently Bentley! When the gas has exited take the unit to your receptacle for waste oil and slowly pump the oil out. This allows you to push the push rod or plunger right into the body of the shock absorber. With a bit of improvisation the rod can then be pushed further into the body and the ledge of the sleeve supported in the press. When the inner end of the push rod reaches the bottom of the body, continued pressing should move the body downwards and through the sleeve until the latter is released.



At left is the new shock absorber with the sleeve extracted from the old one you can only see the bottom flange, sitting on top is the spring support every time you rip the wheel off to give the suspension a good hose off! The more alert will notice one of three holes drilled in the spring support which should be kept open with a wire or equivalent these allow any accumulation of moisture to drain away rather than rot the spring support!!!

Alternatively you get the genuine items complete with new sleeves, new rubber convoluted boots and probably new gaskets designed to be sandwiched under the top plate of the front suspension. But then you will pay about \$300 dollars for these bits. It's up to you!



This not terribly clear picture shows the new shock absorber with the recovered sleeve and sitting on the latter's ledge are semi-circular wedges of varying thicknesses to lift the spring support to the correct height so that the car's suspension is at its optimum height!

Below is a picture of the spring seat in place. The lower sleeve is covering the height shims or wedges and retaining them at the same time. On top of the seat is the 'top hat' for this model ('72) which insulates the suspension to some extent from road noise. It is made of canvas reinforced rubber which is a bit firm but very wear resistant. If you want to really tart up the system get the newer version of these 'top hats' which come in a comparatively soft rubber and hopefully give better noise insulation and perhaps a better ride!





Ah you don't see this too often. Here we have the cover off, the spring out and the shock absorber in! Somewhere in previous issues I have pointed out the refinement used on the latter SZ cars of bolting the top plate down with fibre washers under the steel washers!



You have seen all this before. For the love of God and in the interests of the car and probably also your head, do not attempt removal of the front springs without careful planning and consideration of equipment. Note the high tensile four rods holding the upper cross piece, the two throw 6 ton jack and the support piece under the jack for starters. The spring top plate is almost like a rolled up magazine when it is under spring pressure!



Here is a rubber sleeve 35 years old cleaned and bathed in Armorall and looking like new. The modern version is more efficient but that is a decision you will have to make. The other component not as yet mentioned is the bottom swivel on which the shock absorber sits. This is identical in general design to the lower steering swivel for each wheel. It also happens to be identical to the suspension swivel of an Austin 1800!

When renewing or removing the front shock absorbers these swivels should be unscrewed, cleaned, regreased and tightened down so that the protruding bolt seen here can just be knocked askew with the palm of your hand without incurring the services of a surgeon! This adjustment is achieved by removing shims from within the joint. If they are too loose they will rattle!



If ET is a mate of yours get him around to help put these 1/4" bolts in to hold down the top plate while the jack is well pumped down to hold it in place. You will drop the washer and nuts at least four times before you get the knack of it. Unless .....



Unless you bend up a spanner like this and .....use it like it is being used in the top picture. The nut is held in place with a little strip of plastic from one of those bubble pop packing sheets. When you have satiated your bubble popping, tear off a bit to adequately cover the 'nut hole' on the spanner and force the nut into it. Carefully place your washers on top and carefully guide it under the lip of the spring pot. Bet Rolls-Royce didn't think of that one.



If you are going to replace the rear shocks life can be (maybe) a little easier. The top of the shock is mounted on the rear spring carrier. To get this far however requires removal of the height suspension ram. Removal of this is covered previously.



At right is the ram lying on the boor floor having been unbolted and unscrewed. The problem is that often the ram has not been moved since it was installed and as the charming operator who did that did not use any anti-corrosive grease the task, to understate the problem, is difficult. In this case the ram had been out some little time before and all was right in the world!



Here is a cockroach's eye view of the top of the spring support with the ram removed and the top nuts, distance piece and rubber mount removed. Note the anti-seize grease from previous installations!



Here is the bottom of the shock absorber – familiar to all. The mount at the bottom is identical to the one at the top but far more accessible. Having threaded the top mount through the hole in the body, the bottom almost gets there but usually needs the prudent use of a small jack to get the cup plate into position.



The new unit with new rubbers and the mounting cap installed ready to poke up the centre of the rear spring. Note that Corniches have a very conventional shock absorber mounted external to the spring prompted by the body design. Below is the shock absorber being threaded up the spring. The car of course needs to be fairly high to 'get it in'.





Note that the threaded extension on the top of the rear shock absorber is a size larger than the one on the bottom unlike the front units.

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