TEE-ONE TOPICS

Issue 87 July, 2009

NOT EVERY CLOUD HAS A SILVER LINING

The Factory clung to drum brakes until the first Silver Shadow made its debut in 1966. Unlike disc brakes, drum brakes do require maintenance – mainly cleaning and adjustment. Most owners would be aware of the method of adjusting the rear brakes on their Cloud or Bentley by simply screwing an adjuster on the backing plate at the end of the axle. That the rear brakes need adjustment becomes fairly obvious when you start kneecapping yourself

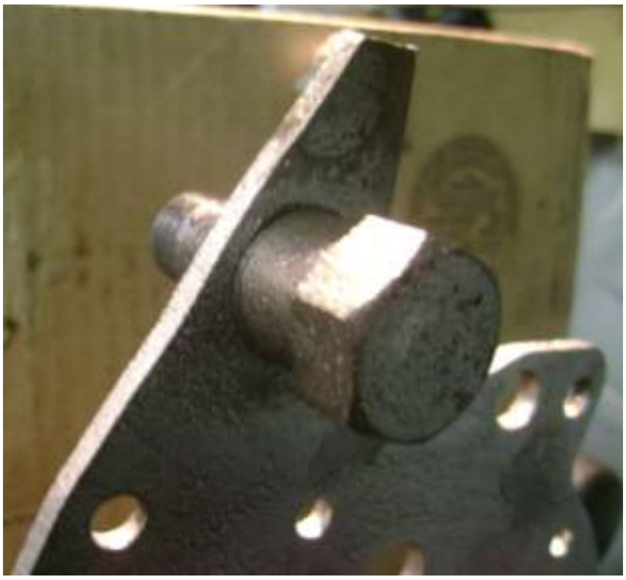
Here we have the complete brake assembly from the left front wheel of a veteran S2. Purists will note that the brake linings have been bonded to the shoes rather than riveted. There have been isolated instances of linings having parted company with their shoes but in my experience this has been largely precipitated by trying to run brakes with grossly over-ground drums. The shake back stops referred to in the text are seen at 9 o'clock and 3 o'clock. Note the pull back springs which anchor the swivel end of the shoe to the fulcrum point at the back of each wheel cylinder. The silver coloured plate with projections is the mounting plate for the front brakes. The wheel cylinders are held to the plate by two bolts, a very large stepped bolt and a small steadying bolt. The round object below the large anchor bolt, is the pin on which the shoe pivots.

on the parking brake handle as you get out of the car. The rear brakes on these cars are both hydraulic and mechanical. The latter system is actually the mechanism to apply the parking brake but through linkages is connected to the brake pedal. This is why when you are maneuvering in a tight place you have to push quite hard to stop the car, since you are only using the brake shoes in the rear brake drums and remember that the car has to move a small distance to actuate the servo.

The front brakes are not adjustable but lining wear is compensated by a simple and quite old system devised by Lockheed. Brakes shoes are mounted on swivel posts on a sturdy backing plate bolted securely to the stub axle. The shoes are pulled away from the drums by a powerful spring – one per shoe.

At left is one of the wheel cylinders having its 'mounting slot' cleaned with some steel wool. The two large holes admit the large mounting bolt and the pivot pin. The two smaller holes are the inlet for the brake fluid and the other (the upper one) the bleeder screw.

Pulling the shoe back pushes the wheel cylinder piston into the wheel cylinder forcing the brake fluid back to the two reservoirs bolted to the right hand valance of the engine compartment, which you keep an eye on from time to time. By the time the wheel cylinder piston has been pushed right to the base of the cylinder the clearance between the brake shoe lining and the inside of the brake drum would be several millimeters. While this may be great for free running of the wheel, when you need to stop, the master cylinder has to push a lot of fluid through those lines to get the shoes to contact the drums.



Here we have the large wheel cylinder mounting bolt being fitted to the mounting plate. With neglect these various components crud up and become very difficult to fit. The pointy bit slides into the slot in the wheel cylinder and engages a slot in the fulcrum pin.
Pure Roycery!

The master cylinders in fact are quite incapable of delivering that amount of fluid in one pedal application so you would have no hydraulic brakes until you applied the pedal several times to move the shoes a bit at a time!

In previous models to keep the shoes fairly close to the drums, each one had an adjuster with which you could inch up the shoes until they were just clear of the friction surface. All this required maintenance. In the Cloud the Lockheed system relied on the shoe return spring being just strong enough to pull the shoes away from the drums against the resistance of the oil returning to the reservoir. This was not very satisfactory particularly where the car was driven on rough roads. The shaking and bouncing of the wheel and brakes, tended to shake the shoes back even further and the hapless driver needing the brakes would find very little there!

At left is an over-flashed picture of the pivot pin having been pressed out of the back of the wheel cylinder. This took some tons to move after much soaking in WD40 and applications of heat! The crud in the hole can be seen clearly.

A strong note of caution. The mounting 'projection' with the split has little strength laterally so if you need to press the pin out, a suitable tight fitting plate in the slot while pushing will prevent subsequent heart ache. The best plate of course is the backing plate. Note the slot in the pin which engages the 'horn' of the mounting plate. In this example the pin was frozen in the back of the cylinder and obviously had been during the last overhaul. Unless the pin is free to rotate albeit slightly the brakes cannot centralize properly.

The solution was to fit friction stops to the webs of the shoes. The pistons in the wheel cylinders are quite capable of overcoming the friction of these 'shake back stops' as well as the individual return springs when the brakes are applied. When the brake pedal is released the return springs are just strong enough to overcome some friction in the shake back stops moving the shoes and pushing the wheel cylinder pistons back slightly so that the shoes finish up very lightly touching the drums. The next brake application repeats the process but the shoes have merely thousandths of an inch to travel to do their job!

And here is the job in progress. As always with amateurs, supporting jigs and pressing arbors need to be improvised. In using the backing plate to support the back of the cylinder don't make the mistake of pushing it too far in lest you engage the slot in the pivot pin. In such a case the earth will move before that pin!!!

The six large holes in the mounting plate are for the very stout bolts to mount the assembly to the stub axle.

So having got the cylinders freed up and cleaned and if necessary sleeved if corroded and mounted them with seals springs and spreaders on the mounting plate you can turn your attention to the brake shoes.

Here the rivet holes are a reminder not to pull the drums off when the concours judges are in the neighborhood! The strut at the top of the shoe in the picture needs to have the clevis removed, cleaned and generally tarted up and refitted with a new split pin.

In the middle of the shoe is the shake back stop which consists of a special bolt with a large head which is on the underside of the shoe web as you are looking at it. Then comes the first friction washer, the edge of which can just be seen and then having poked the bolt through the web the second washer is fitted followed by a spring, a chamfered washer and a 7/16th inch nut.

There is no adjustment. The nut is screwed down as far as it will go. What is not seen is the hole in the web in which this assembly slides which is quite large allowing the shoe to do its job and centralize in the drum.

Not infrequently the web where the washers sit in the picture is cracked. This seems to be the result again of running these brakes on oversized drums. The pistons in the cylinders keep pushing, the shoes are worn beyond their limit and the steady posts that these shake back stops sit on can't travel outward any further so the web cracks!

Getting the nut on that shake back stop bolt is not the easiest as it involves a partial compression of the shake back spring. This is one way to do it. A socket is placed under the stop bolt head. A 'slave' nut is placed in the socket wrench and the wrench and ratchet hand wheel is placed over the head of the shake back bolt thread. The slave nut stops the second nut from simply idling away on top of the bolt. The hand wheel tool is not necessary but is easy to lean on while turning! The web slot that the shake back stop slides in can be seen peeking out to the left!

This is the last step to get the shoe ready to install. The spring balance needs to have a range to 50 lbs. The shoe is clamped so that the web slot is horizontal and the spring balance is pulled in the same plane as the slot. The reading when the shake back stop assembly just starts to move should be 20 – 30 lbs. Obviously no lubricant is used in this area. If the reading is too high it may help to polish the web where the washers slide. Sometimes with bonding linings, a finish is applied which will throw the setting. If the reading is too low and these springs do sag, borrow or buy a good spring and have your local spring maker cobble some up for you and your mate who has a similar car!

Meanwhile on the other side – the backing plate which really does little else but keep road muck out, has been fitted. The main mounting plate can be seen in the middle. This is sealed originally with paper gaskets between the backing plate and mounting plate. The delivery pipes for the brake fluid are connected together with new flexible hoses and new retaining bolts and washers. The ends of the posts on which the shake back stops sit on can be seen at 8 o'clock and 2 o'clock complete with lock nuts. When removing or fitting the brake shoes it is well to remove these posts to avoid bending them. It is also a good idea to clean them and check for previous damage. The posts have a secondary function in that screwing them in and out pushes the shoe away and towards the backing plate. This allows you to set the surface of the shoe parallel to the axis of the stub axle and the inner surface of the drum. When this is done the hole is covered by a dust cover.

MEANWHILE/…..

Back to the Shadow engine! Some baffled reader wrote to point out that the 'puller' pictured above is so long that it precludes pulling probably any of the liners in situe – there simply would not be room in the engine compartment. Very observant. The Factory tool which can be purchased is about a third the height of this one. Since the days of pulling liners in situ are most likely over, the maker of this tool gave himself enough 'height' to allow for the occasional liner that has more barnacles on it than the Titanic. These challengers will fight the puller to the last inch – hence the length. In an ideal engine, once the bottom of the liner gets above the two lower seals the whole thing can usually be lifted out!

As you will have read in the workshop manual the liners when installed have to sit about .002" above the surface of the block. When the head is installed with a new gasket this provides enough 'crush' to seal things up! To achieve this dimension the Factory had the facility of a stack of liners which through the vagaries of manufacture all differed slightly. But there is a further embuggerance. The recess into which the lip of the liner sits, whilst being beautifully machined sometimes slightly distorts, also, the actual hole in the block that the lip sits in can also distort. Both situations can be rectified with a bit of expert machining at a good engine shop.

As we all know while the bore of the liners are round the pistons are not, they are oval. Not by much mind you but the designers of these incredible old inventions have to stand multiple canon-like smacks on the head plus changes of direction and speed many many times a second. There is also the small matter of an inferno impinging on the crown of the piston. The heat buildup in the unit has to be dissipated with great speed or the whole thing will melt. The grooves that the rings sit in have to somehow hold them so that they don't flap up and down; neither can they, through expansion, grip the rings and stop them performing their compression retaining and oil scraping function. One other thing, heating the piston up expands it; a clear candidate for seizure in the bore. To overcome this, the greater diameter of the oval piston is across the thrust faces which are at right angles to the crankshaft and if you look at the picture you will see where the resulting wear takes place on the unit as a result.

As I write I am waiting anxiously for the return of the liners from RA Chapman in Melbourne. The experts there decided to replace two of them with used items which apparently quite usually, have barely discernable wear. One of the originals had a damaged lip and the other still had evidence of the piston grabbing which started this whole exercise. When they arrive I will heat the bock again and try the 'protrusion' of all the liners again and be ready to find that the replacement liners do not meet the required measurement. If this happens they get pulled out again and be sent off for a bit of gentle grinding to reduce their height.

The pistons had their rings removed so that I could check their clearance in the liners. There are two methods of doing this, by micrometer or with a feeler gauge. I chose the latter but managed to get feeler gauge strips some 10" long which are available from most engineering shops. This established that the pistons had about .001' more clearance than Mr. Royce envisaged. In the 'good old days' there were processes of 'enlarging' slightly worn pistons by actually expanding them. This was done by pelting shot at the inside skirt, a process known as Koetherising (sp) or by Knurlsizing (sp) where a heavy knurl was scored onto the thrust side of the piston to take up the slack. Enquiries about either of these processes resulted in brochures being handed to me for various homes for the aged!!!

Here we have the piston nice and clean showing its circlip ready for removal. One of the nice touches in manufacture is that the piston is stamped with its bore number and grade, the gudgeon pin has the bore number on it and the connecting rod AND cap have the bore number on them!

Apparently the newest solution is to coat the piston with Teflon, the stuff of non-stick fry pans! How durable this will be I have yet to experience but after much Googling I think mild piston slap will not be a problem. For all this to happen, the pistons had to be detached from the connecting rods. The practice here differs from maker to maker but for the Shadow the gudgeon pin is retained in the piston by expanding circlips.

A view of the underside and the holes in the piston bosses to admit oil to lubricate a very hot gudgeon in an even hotter piston

There is a variety of piston used depending on the time of manufacture and the intended country of delivery, the main difference being pistons with either three or four rings. This car enjoyed three ring grooves and the good book assured me that the gudgeon pins would simply push out after removing the circlips. The four ring pistons apparently do have to be heated to extract the pins. Well after nearly forty years they did need a little encouragement to desert their snug fitting holes!

When you look at this lineup you sympathise with mechanics having to overhaul the later 12 cylinder motors!

Of course you have been wondering about the origin of 'gudgeon'. Apparently it derives from Old French *Gojon* meaning pivot! The Americans use the term wrist pin!! Rolls-Royces do not have wrist pins!!

I don't think 'Home Beautiful' had this in mind when they voted our kitchen as 'Kitchen of the Year' (the date is obscure!). Gently heating the piston which being aluminium expands faster than the steel gudgeon piston. Of course the circlips have been removed before this culinary step. I found that heating the thing until I could just not stand to touch it, seemed to do the trick.

Extracting the circlip. Not the lowest grove the oil ring groove, this had to be widened to accommodate after market rings which are considered by some to be superior to the originals, which to be fair were made and designed with the technology of 35 years ago!

The one concern I had during this whole exercise was getting bits back where they came from. The careful etching of the critical parts greatly aided this but even then you need to be aware that some things can go in to other things opposite to the way they did originally. The placement of the gudgeon pins is an example. Coming from a worn engine it is even more important that they finish up with the same ends running in the same piston bosses.

←

And here is a very special tool. The requirement was to support the piston while the gudgeon pin was pushed/pressed/bashed out without distorting the piston! Complicated cradles were planned but a solid pine block with a large hole bored through it did the job. Here the piston has been removed and the gudgeon pin waiting to be collected. I noted that the etching on the end of the pin was always facing the same side as the etching on the end of the connecting rod!

→

A light tap with a brass drift persuaded the veteran pins to slide out. Note the depression in the crown of the piston. This was one of a number of variations to cope with apart from government regulations, the abysmal quality of fuel at the time of manufacture. This is a 'low' compression engine. The high compression piston was sans depression. The glass case is not standard but beautifully supported the big end of the connecting rod during the operation. The half moon slices are to accommodate the overhead valves as they lunge in and out of their seats!

↑

And here they are all lined up like kids for their daily mouthful of Saunders Malt Extract (remember?). These rods have a frightening task just staying in one piece so they are made, balanced and inspected with great care. The bolts are equally critical and if there is the slightest doubt about one it must be replaced. The carnage that follows the breakage of one of these little bits is heart rending!

FOR SALE

For those that use the internet a lot you will be aware of the wonderful opportunities to acquire vast sums of money by helping distressed gentlemen located on the African continent. Because I am old and senile I am always too slow to get my bank account details to these people so that they can transfer their problem funds to me by the quickest method.

Well recently I missed out again, this time it was the opportunity to purchase the above S3 Mulliner bodied Continental Bentley for the very good price of $10,000 Australian. The car was advertised in a well regarded web site specializing in do-it-yourself car selling, a few weeks ago. Apparently owned by an Australian ex-patriot lady now resident in Spain, she found that having got the car there it was not suitable for Spanish Roads.

You will recall her grandmother whose Rolls-Royce broke an axle while touring in that country during the early thirties and the embarrassing contretemps that followed with the Factory who she claims repaired the car in situ by technicians who travelled to her side but then denied ever having anything to do with the car. The old lady when she died many years ago although quite infirm had been seen from time to time lying on a rug under her car gazing uncomprehending at the immaculate rear axle assembly and wondering whether senility had set in sooner that she would have preferred.

Well back to the daughter. The price was confirmed, the quality of the car was undoubted. All that was needed was to send the money and make arrangements for the car to be shipped to Australia. Once again I missed out.

Clearly the car had been restored although looking at the fuse box cover and the iconic junction box above it is surprising that the restorer had not heard of the use of judicious buffing and good old Brasso to return the items to their pristine state. For those that don't have one of these cars, the small round black painted object immediately below the slanting stay rod, is a vacuum servo for the water tap for the heating system. The Factory used these originally on the S1 (sic) cars. When the vee eight was born electric actuators did the job far more efficiently even if a bit noisily. The vacuum systems had a strange quirk. If the engine was heavily loaded such as on a steep climb with a fully loaded car and the throttle was much opened the vacuum would drop off and all the little spring loaded heating bits would slam shut. The older set among my readers will recall the vacuum wipers on early Holdens which would simply stop on a steep hill. The same car but much later model used vacuum for heating flaps and the same problem would occur there. Let's enjoy the interior of this car we seem to have missed!