

Ask Ronny

by Ronny Shaver @ Ronny's Garage

Answering Your Questions About Classic Car Care Service And Restoration

Published January 15, 2014

Why Does My Silver Cloud II Engine Smoke and Knock Badly?

Part 1

by Ronny Shaver

I recently had a customer purchase a 1960 Silver Cloud II that looks pretty good. The paint and interior looked presentable, driver quality. The car ran great and brakes work properly, the transmission even shifted properly (unusual). But.....the tailpipe spewed blue smoke and the engine made some severe knocking noises. Not good. After removing the cylinder heads, oil pan and piston-rod assemblies I found multiple causes for noise and smoke. I will address the "lower-end" causes in this article and "upper-end" causes in next month's article.

Let's start with a little background on the Silver Cloud II/ Bentley S2 engines. They were the first production V8 engines and had some issues that were sorted out in the later Cloud III/ S3 models. The camshafts wore prematurely and the pistons made excessive slapping noise (for Rolls-Royce standards). The piston noise was improved in later models by offsetting the wrist-pin instead of having it dead-center in the piston. They also increased the size of the wrist-pin. So some of you may be wondering what I mean by slapping noise and what is a wrist-pin?

Slapping noises (or knocking) from pistons are caused by the piston cocking (or rocking) in the cylinder during the firing stroke. When the fuel and air is ignited under compression, the piston reacts to the explosion by twisting or shifting on the wrist-pin in the cylinder. For example, take your hand and make a fist, then pivot your fist at your wrist, now imagine your fist is the piston and wrist is the "wrist-pin". The piston and rod work the same way. Now stick your fist into a cylinder (coffee can or cardboard tube) and move it in and out of the cylinder rocking it back and forth. That is the same motion in the engine. If the cylinder is tighter or fist is bigger, it is harder to rock back and forth. This rocking back and forth is what makes the piston slapping noise.

Why do pistons slap? The main cause is excessive clearance between the piston (fist) and cylinder (coffee can). The proper Rolls-Royce clearance between the piston and cylinder is .0012" to .0018" when cold, a normal piece of paper is about double that. Once the piston heats up to normal temperature this clearance should be closer to zero. I bet you are wondering how much clearance is excessive, I have found that pistons measured more than .002" or two thousandths of an inch undersize will make noise in a good cylinder, especially when the engine is cold. Borderline pistons will be noisy when cold and will be quieter when warmed-up.

What determines a good cylinder? Cylinders are 4.100 inches inside diameter and should be perfectly straight and round from top to bottom. Cylinders will wear with mileage and develop a "ridge" near the top and become tapered wider towards the bottom. They will also become "egg" shaped or "oval". The oval condition can be caused by normal wear and also by corrosion build-up between the cylinder and engine block. Ridges are caused by the piston rings at top dead center which is where the piston stops going up and begins going down. The rings wear a shoulder into the cylinder all the way around this spot. Maximum permissible taper (widening of cylinder from top to bottom) is .004" and ovality "egg shaping" is .003".

If you are still wondering about the wrist-pin re-location good for you! By offsetting the piston on the rod, the rocking motion is lessened because the force is slightly shifted off center on the piston so the piston lies more flat to one wall of the cylinder during firing.

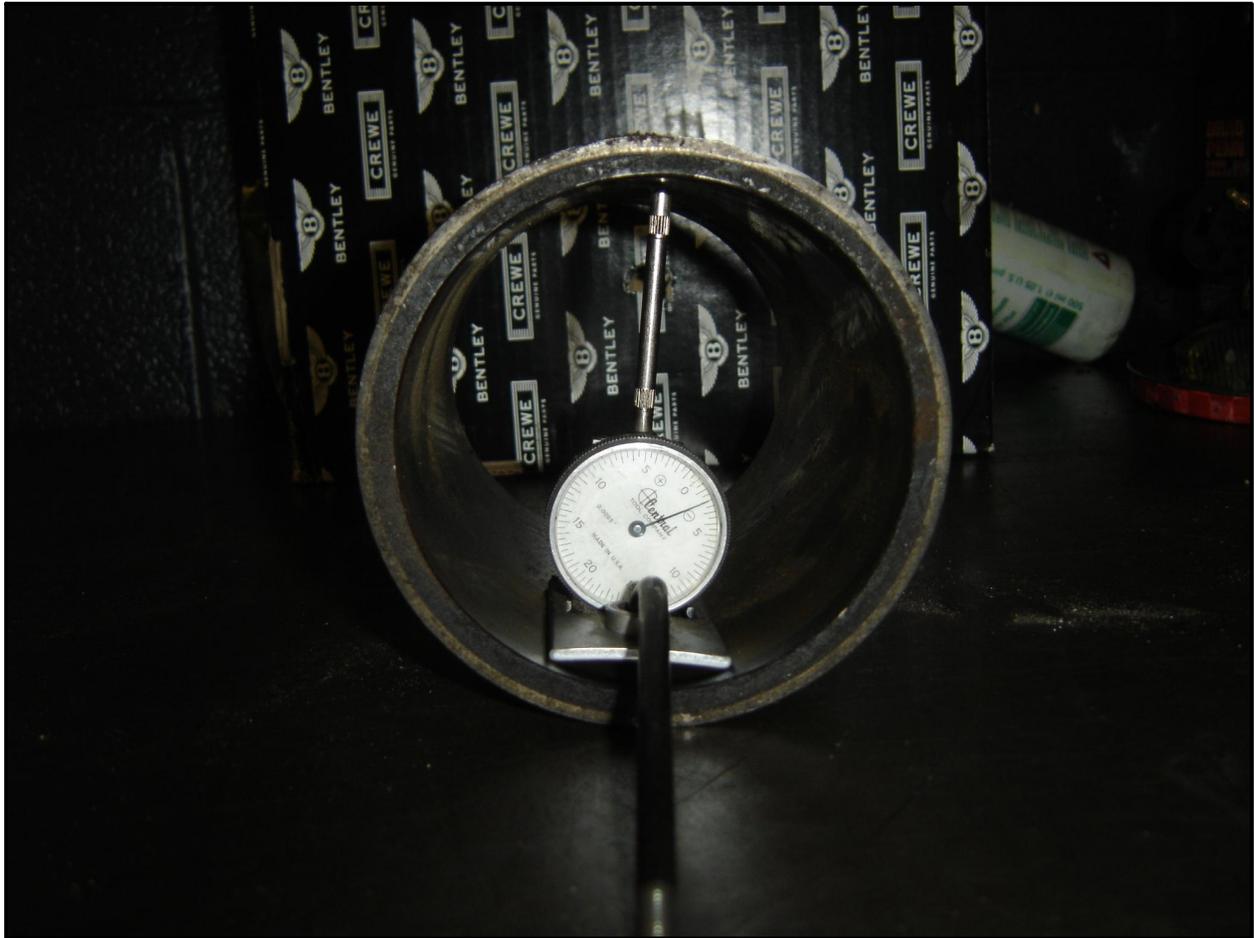
Now back to the Silver Cloud II with smoking and knocking issues. Once all the pistons were removed I measured the pistons and the "skirt" or bottom end. See photo below.

Five of the pistons measured .004" undersized (bad) and three were .0018" undersized (ok). If you take a look at the rings you can see that the top three look bigger than the piston and stick out while the bottom one looks flush with the piston. The rings are the horizontal bars above the wrist-pin (round shaft through center of piston) with the second one showing its gap.



Now we can discuss the "bottom-end" cause for smoking. The rings are metal seals that slide up and down the cylinders and separate the compressed fuel/air mixture and the engine crankcase oil. They are springy and are squeezed between the grooves in the piston and the cylinder wall under tension. The top rings are compression rings and the lower rings are oil rings. The compression rings hold compression in the combustion chamber and the oil rings keep the oil down in the crankcase. Now look at that oil ring (bottom) and note that since it isn't springing out it won't keep the engine oil down and is allowing it to be burned and sent out the tail-pipe as blue smoke. Ahah a "smoking" gun! This condition can be caused by just wear or in this case the car had set for so many years that they became "stuck" in the groove.

To measure the taper and ovality of a cylinder a dial bore gauge is used. I have used a used cylinder already removed from an engine for an example. See the photo.



The dial indicates in $\frac{1}{2}$ thousandths of an inch increments and the shaft coming out of the top moves up and down to measure differences in diameter. The indicator is pushed up and down the cylinder to measure the differences in diameter. This measures taper and is run through vertically as shown. To measure ovality the indicator is rotated in a circle at different levels going down the cylinder. This will give the "egg" shape measurements. All the cylinders had from .004" to .007" taper and from .002" to .007" ovality so all new cylinders will be installed.

The bad news for this owner is the cost of these repairs. New Rolls-Royce pistons run on average \$600 to \$700 each and the cylinders about \$400 not including the labor to remove and install. Once these repairs are completed the owner can enjoy many years of smoke free and quiet running which should justify the cost.

Thank you for the questions and keep them coming. Please send your questions to Ronny at ronnyshaver@ronnysgarage.com.

Happy Motoring!
Ronny