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## PERFORMANCE CAMSHAFT EXCHANGE

(The cams in this article were fitted to an Indian Bullet, but similar instructions apply to the British built Bullets)

Remove exhaust system

Remove the 10 screws from the timing cover, and the centre oil feed bolt.

Remove the timing cover, a bit of gentle persuasion may be needed to break the seal. You will need a container to catch the oil. To prevent possible damage to the oil pump worm and spindle turn the engine backwards, by means of the rear wheel whilst removing the first 1/4" of the timing cover. This will help disengage the worm from the spindle.

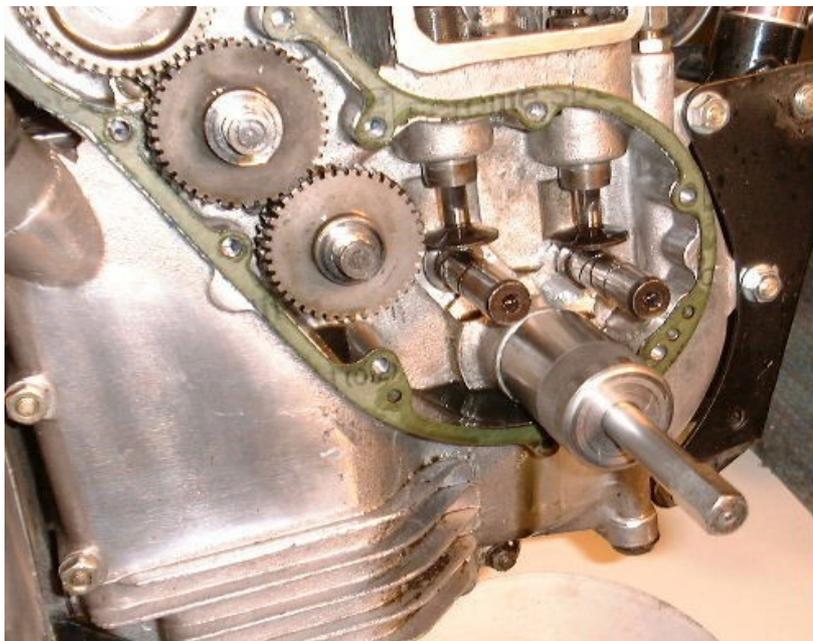
Turn the engine to top dead centre on the firing stroke, this will ensure that there is no load on the cams and also leave the timing pinion in the correct position for timing the new cams.

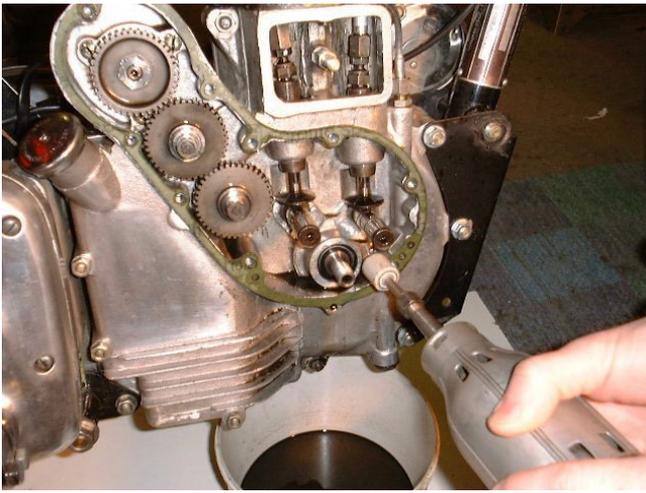
Remove the tappet cover and slacken off the adjustment on the pushrods.

Remove the oil pump worm (end of crankshaft), there is a special tool, part 2006 available for this, although it is possible to use a modified open-ended 19mm spanner. [Please note this is a LEFT-hand thread.](#)

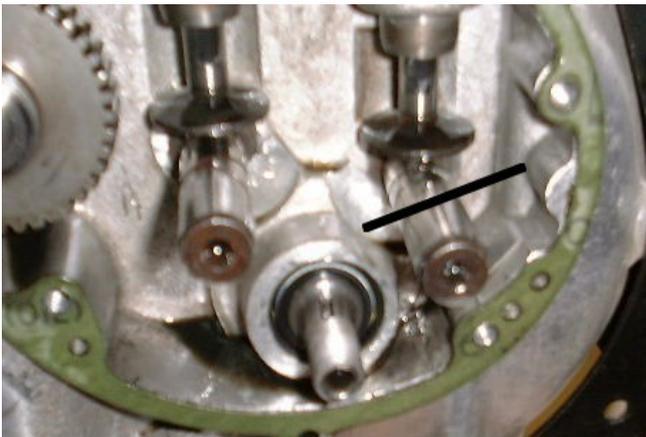
Remove both camshafts and shims, if fitted, these will simply slide off their spindles, (unless you have Samrat adjustable cam spindles, where the cap head Allen screws will need to be removed). From this point, do not let the crankshaft or the distributor pinion move, as this will result in having to re-time the ignition from scratch.

Remove the small timing pinion (immediately behind the oil pump worm). This would normally need the use of special tool 2013 or 98001. [\(see photo on right\)](#) Be careful not to lose the small key.





Fit the camshafts one at a time and check for clearance. There should be at least 0.020" clearance between the lobe and the alloy housing. I have found that crankcases vary, and although it would be unusual to need to modify the clearance for the inlet cam, it is normal to grind part of the crankcase to give the desired clearance for the exhaust cam. I normally use a high-speed grindette for this, although a small rotary file on an electric drill will suffice. (This job will be made easier if the cam spindle is removed. Special tool 98002). Gentle grind away the alloy where needed. This will normally be on the housing surrounding the crank timing shaft, (see two photos on left) but you must check all areas. Also due to the tolerances in crankcase machining please check the clearance between the cam follower head and the cam gear wheel. Use the shims included with the performance cams to place on the cam spindle before fitting the cam to give a clearance of at least 0.005".

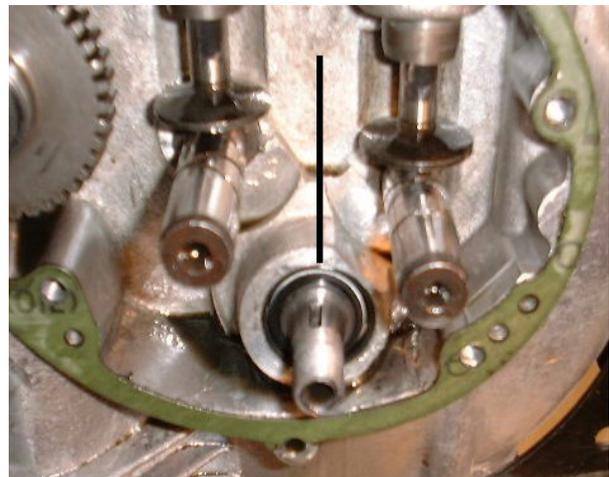


Thoroughly clean the crankcases and remove any traces of gasket from the timing cover. Now would be a good time to check and replace the timing side neoprene seal, (part 141545) (see

photo below) fitted to the 500 and 535 models. This seal fits with the closed side facing into the crankshaft. (If you are having wet sumping problems, this seal may be a contributing factor).

Please ensure that the cam spindles and cam followers are in good condition as any wear in these components will transfer to the new cams reducing their life span. It would be wise to replace the cam followers at the same time as the cams.

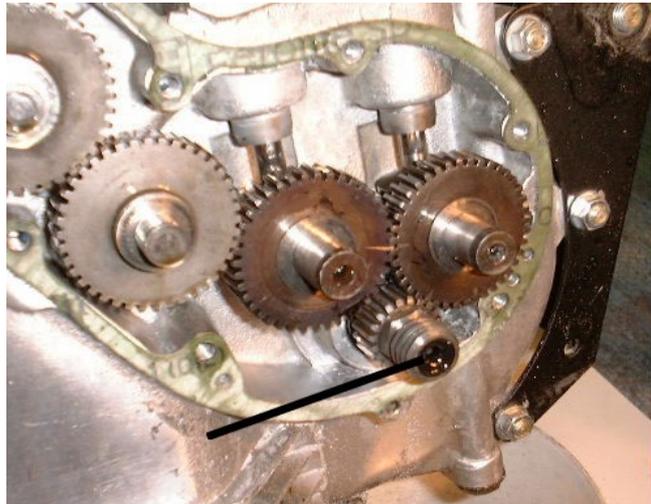
Refit the timing pinion and key, giving the pinion a gentle (nothing more!) tap to help secure it to its taper.



Refit the exhaust cam, lining up the 2 dots with the dots on the timing pinion.

Refit the inlet cam with the single dot lining up with the single dot on the exhaust cam. See photo on left.

Inspect the seal in the end of the oil pump worm. **See photo on right** If this is cork replace with a new one. If this is the later type with a bonded-in neoprene seal, check to make sure that the seal is a reasonably tight fit on the shaft of the oil feed plug. If in doubt replace it, as this controls the oil supply to the big end. Also check the condition of the worm and the mating spindle in the timing cover. If all is satisfactory replace the worm and lock up tightly. **\*\*Please note that the oil pump spindle should rotate with reasonable thumb pressure with the oil pumps fitted. Hard to turn spindles will cause un-due wear to the worm and spindle with potentially catastrophic results\*\***



Adjust the pushrods to give zero clearance, **unless the specific instructions supplied with the cams list otherwise**. The inlet should be just free to spin, whilst giving very slightly more on the exhaust. (Yes zero! The more clearance you give here the noisier the top end will be. But be-warned not enough and you are liable to burn out the valves and seats). Getting the correct adjustment is tricky, but you soon get the feel for it once you have done this a few times. Make sure the lock nut is tight. Turn the engine over a few times, bring to top dead centre again and check the pushrod clearances just to be sure.

Before fitting the timing cover, as with the original equipment cams, it is not necessary but preferred that the end float between the cam and timing cover is adjusted to 0.005" - 0.010". This is done with the standard shim(s) (part number 112078). This will help prevent excessive gear train noise. Later timing cover gaskets are thicker and better than the earlier gaskets, and may require more shimming.

Fit the timing cover gasket to the crankcase with a small amount of sealant (I use Blue Hylomar or Wellseal on one side only). Then refit the timing cover, turning the engine over a little by means of the kick-start to help the worm engage on the spindle. Refit the 10 screws with new washers under the heads.

Refit the tappet cover  
Refit the exhaust system  
Check oil level

The new cams may have altered the ignition timing; this should be checked in your own preferred way (Timing disc, top dead centre tool etc). However this should be close enough to start and warm up the bike, and if you are like me, you may prefer to alter the timing by ear. Re-check the oil level as some of this oil will be consumed filling the timing cover

Things to check:

In a standard engine the standard clearances are acceptable, but if you have modified any internals please check the following clearances:

Clearance between the piston and Inlet valve minimum of 0.060"

Clearance between the piston and Exhaust valve minimum of 0.080"

Clearance between the Inlet valve guide and spring retaining top collar minimum of 0.060"

Clearance between the Exhaust valve guide and spring retaining top collar minimum of 0.100"

Make sure that the valve springs are unlikely to get coil bound. We suggest using our special competition valve spring set, part number VS420A if you have the steel top collars fitted.

The following supplement was kindly sent to us by one of our customers, Mr Claude Heffner

### Measuring Performance Cam Clearance

It is recommended that there be a .020 clearance between the cams and the case. Here is a method to measure this clearance during the fitting of the cams.

It is assumed that both cam spindles have been removed as fitting the cams with them in would be most difficult to the point of being impractical.

#### Step 1



Procure a new replacement cam spindle **BEFORE** proceeding. Place one of the cam spindles in a vise and use emery cloth tape to reduce the diameter of the case end enough to where the spindle will be a tight slip fit into the case. This is so you can push it in and take it out for measuring purposes.

#### Step 2



Measure the cam at its widest point and note the figure.

#### Step 3



Start wrapping electrical tape around the cam. Start in the middle between the high and low points of the cam and always end a wrap there. This will insure that the same number of layers of tape exists on both ends of the cam. Put as many layers of tape on as is needed to achieve a measurement between the high and low points of the cam that is equal to the figure obtained in step 2 + .040 (+ .002/ - 0). This will give you a .020 (+ .001/ - 0) layer of tape on the high point of the cam.

#### Step 4



Push in the modified cam spindle and trial fit the cam. Note where the cam lobe is hitting the case. Remove the cam and spindle and grind a little where it was hitting. Repeat this step until the cam rotates freely throughout its entire 360 degrees of travel.

