Velocette MAC 350cc

The Re-Rebuild of KJ's MAC (Part Four)

From May 2023 onwards

As you can see from the photograph right, I've come-over-all-patriotic-like and have adorned my MAC with the Union Jack to celebrate the King's Coronation on 8th May 2023. Long Live The King!

"Hello" **if this is your first visit to my MAC-Blog, and/or** ***"Welcome back"*** **if you've visited before and are wanting to catch-up on my latest MAC escapades. I have owned this lovely little 1950's bike since 2017 and during that time I have had many, many interesting challenges as well as covering many, many enjoyable miles.**

After about a year into my ownership (& just over 1,500 plus miles on the clock) I had to strip the bike down and completely rebuild the engine & gearbox, as well as replacing / improving many other parts & fittings too. However, for the next five years I rode my little MAC at every opportunity and clocked-up a further 10,500 happy reliable miles. ALL was going really well until one day I noticed a problem with the oil feed to the rocker box (as seen through a clear plastic oil feed pipe from the top of the timing cover to the rocker box oil union), to my shock & horror there was no oil circulating.

I removed the timing cover to discover that the oil loss was due to a broken 'Cam Shaft Spindle Nut', the one that goes through the timing gears steady plate. This 'cracked nut' allowed the Cam Shaft Spindle to move itself inwards away from the timing case (enough for the Oil Quill to disengage from the Oil Feed Hole). As the oil quill was no longer firmly seated into the Timing Cover oil feed hole this caused a loss in vital oil pressure & flow. In other words, the oil was allowed to flow freely without restriction, causing said loss in pressure & delivery to the engine's vitals. Unfortunately, I'm not sure how many miles I did before this situation was discovered. Obviously, oil was still reaching the big-end and mains but at a much reduced amount & pressure. Not enough oil starvation to seize the engine, but enough to potentially cause damage to the bearings. I immediately replaced the damaged *Nut* and I rebuilt the timing-side. I put the MAC back on the road again (but at the time I did not fully appreciate the long-term damage this may have already caused). I carried-on using the MAC.

On my last ride-out in the Shropshire countryside I gave it a bit of *Stick* and lets just say that I couldn't get much more out of my little MAC when all of a sudden the engine developed a disturbing 'Rumble' from deep within the engine. I was about twenty miles away from home, so I duly slowed down to a more sensible speed and carefully nursed-it back as much as I could on my return homeward-journey.

Saturday 13th May 2023: Engine ‘out’ and full ‘strip-down’.

I’m pretty sure the earlier problem (lack of oil pressure) had contributed my latest engine ‘rumble’. But before taking the engine out of the frame I decided to check the crank ‘end-float’ (with DTI) which should have no pre-load / side-to-side movement (i.e. set at Zero).

I was able to move the crankshaft backwards and forwards by twelve and a half thou” (0.0125”).

As can be seen from the above photo (top left) the MAC is perched-on a scissor-type bike stand.

Because of the precariousness of the height and the balancing-act on this ‘Stand’ I have also got it suspended & secured using a chain-block & tackle from the roof beam above.

As usual, I have taken the sensible *Belt & Bracers* approach to bike support.

Upon dismantling the engine I discovered that both of the parallel roller main bearings had signs of wear, so I’m guessing that the Big End Bearings & B/E Crank Pin may also show signs of damage too. To add to the problems the timing-side main bearing had ‘spun’ on the main-shaft so that requires attention too. On Thursday 18th May 2023 I took my MAC ‘Crank’ into Alpha Bearings of Netherton, Dudley. Chris (who runs Alpha B) said he could sort-out the Crank and fit a new timing side main shaft “No problem at all, but it wasn’t going to be a cheap or a quick repair”. But he couldn’t give me a definite quote for this work until the whole lot had been stripped and inspected. At this stage I did not know that Alpha B was moving premises (which would present even further delays . . . but that is a whole other story).



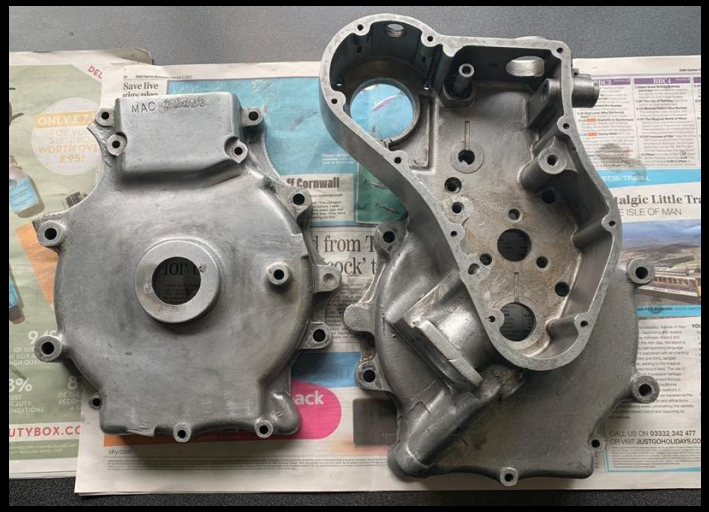




Now that the engine is out of the frame and totally dismantled (boxed-up ready for easy identification later) I can now start the process of cleaning & preparing parts ready for reconditioning & assembly. "Once more, unto the breach" as Shakespeare said, which always reminds me of that joke about the Stratford-upon-Avon Pub Barman who said to the drunken & noisy Shakespeare *"Yer Bard".*



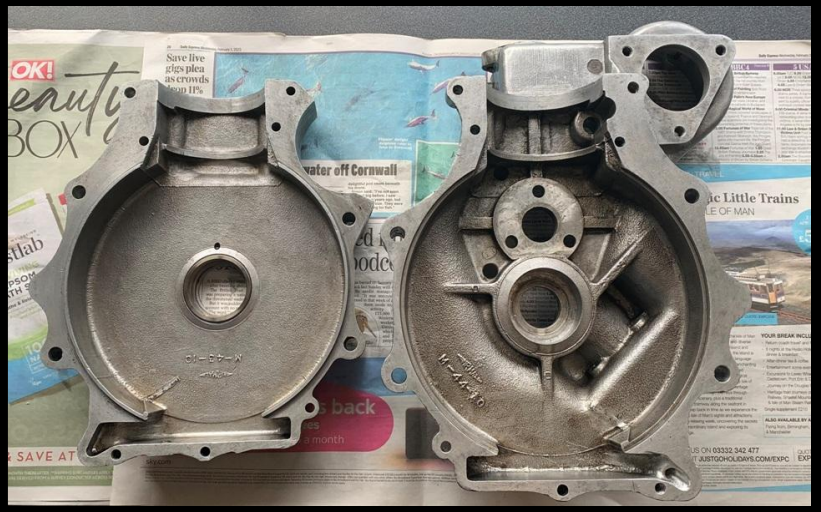
Now you must admit that these crankcases have cleaned-up really well. The secret of my success (re: engine cleaning) is first to degrease said parts using petrol, followed by a brisk stiff-brushing using engine cleaner (such as good-old-fashioned Gunk, elbow grease & a stiff brush). Then a good 30 minute soak in hot water & *Vanish* washing powder (Vanish is the active ingredient that does the trick). It should go without saying (but I will say it anyway) SAFETY FIRST: *Always* wear protective eye-wear/goggles & gloves when using compressed air. Always use compressed air in a carefully, controlled manner when blowing-out / cleaning-out oil-ways, internal threads & passageways, etc.



Safety Lecture Over.

Come on . . .
You must admit these crankcase halves have cleaned-up really well.

And, as it happens I also managed to locate another set of spare MAC crankcases, purchased via VOC Fishtail magazine as a possible replacement to the original worn 'cases' (i.e. bearing housing wear).



If you look closely enough at the photo (on right) you can see the *'score marks'* on the 'Rollers'.

I thought that I might get away with the drive side roller bearing. But . . . on closer inspection I could feel that both bearings felt dodgy and more than likely to be as bad as each other. So I purchased two new main bearings anyway; one roller-bearing for the drive-side crankshaft and one ball-bearing for the timing-side to fit onto the new timing-side crankshaft.
For reference: Two new main bearings cost two hundred & thirty four pounds (& eighty pence).

As explained above . . . I entrusted my crankshaft work to Alpha Bearings and was expecting to pay around five or six hundred quid for this job because of the extra work on the main shaft.

I phoned Alpha Bearing a couple of days later (22nd May 2023) to find out costs & timescale for my job. "Unfortunately, I still cannot give a definate quote or timescale because it isn't a straightforward repair" Chris said "because the mainshaft has to be *made & ground* accordingly to suit my new bearing *(as supplied by me)* and the job will be ready when its ready".
He continued; "Give me a call in a couple of weeks time for a progress report / update". It was during one of these 21 phone calls I made that I was informed 'they' had now moved premises and this was adding to the overall delay. There followed a whole five months of 'delay' reasons & excuses.

Old Main Roller Bearing

Photo left: is the Hoffman Roller bearing that I fitted to the Timing side crank (instead of a Ball Bearing).
On inspection there's a very slight 'picking-up-feel' so I'm replacing it with a Ball Bearing.

New Roller Main Bearing to be fitted.

Photos left & right: show the new main bearings purchased from Vintage Bearings.
Roller Bearing for Drive side & a Ball Bearing for the Timing side.

New Timing-side Ball Bearing.

This is where the saga rather gets stretched-out . . . Loads of excuses, so, LONG STORY SHORT . . . I eventually got my crank back on Wednesday 17th October 2023 (five months later) at a cost of £1,050 .00 plus 20% VAT (yes ! £1,260.00) to get my repaired crank back.

Chris (Alpha B) said he had given me a good deal, taking into account my patience / long wait and had not charged me for all of the materials used . . . (?). He said that they had done a first class quality repair to my crank and to remember the Rolls Royce quote that *"quality is remembered long after the price is forgotten . . ."*. What won't be forgotton by me is the Trauma associated with the inconvenience, waiting time & cost - no matter how long the 'fecker lasts'. The term 'caveat emptor' springs to mind, although lots of other *'terms'* abound.

I would be interested to find out what other people are being charged for similar single-cylinder crank jobs and especially Velocette engine big-end crankshaft repairs? As well has finding out other peoples views are on this matter, or is it just me? At the moment I still feel that I've been professionally mugged (or am I just being niaive? about the cost of things nowadays ???). Or Is it *'cuz I'* is getting old & cranky (excuse the pun). I have shortened this story somewhat (from when I first posted this blog) and have taken out most of my ranting & raving.

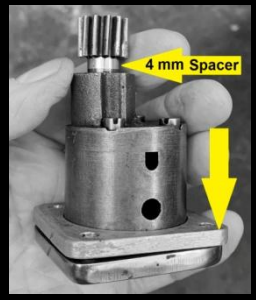
"Time is a great healer" so they say ! *"Trauma is often remembered long after the repair has been paid for"*. Well, that's what I say !

14th November 2023: The build continues. I'm still using the Venom Oil Pump that I fitted to the MAC a few years ago. Cleaned-up obviously !

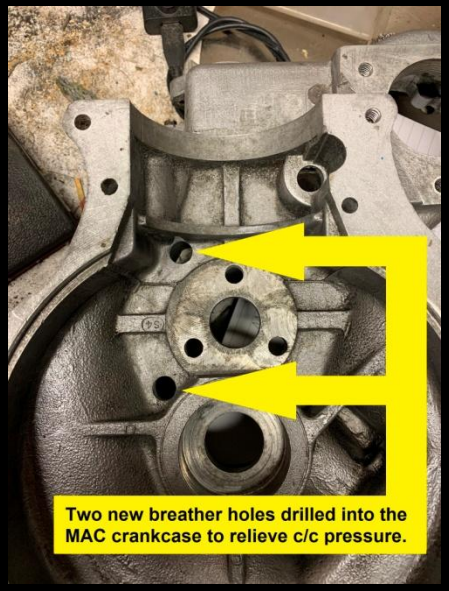








First two photos above show the new 4mm spacer for the Oil Pump. I've already done this oil pump modification to the Venom oil pump. The reason for this 'mod' is to raise the pump driven gear (upwards) to allow more contact area with the *driving* worm-gear. The last photo (above far right) shows the newly-made 4mm spacer in place (top yellow arrow) and the original 'riser-base-plate' I made ages ago, because the MAC oil pump is shorter than the Venom oil pump. This plate allows the oil-ways to line-up with the holes in the crankcase pump body.



The first two photos on the left show where I've drilled two *half-inch* holes in the crankcase (see yellow arrows).

I've done this is to help relieve the internal crankcase pressure.

The photo on the right shows 'My Method' for checking the crankcase to crankshaft end float (which on the MAC 350cc engine should be set at 'Zero' end float). Look at the 'Gap'.

I made an 'end plate' out of 13mm duralumin that is drilled to fit onto the outer timing cover 'face'. The gap is then measured with feeler gauges between the end of the crankshaft & the 13mm flat plate. I also used this method to sort the Venom pre-load. (Hence, the writing on the Plate: Venom Crank Tool).

The first thing to do is to assemble the crank into the crankcases using some 'test bearings' (that is a set of bearings that have been specially ground-down so that they fit the crankcases (without having to heat the crankcases up each time). This helps facilitate the fitting & testing of the correct end-float shims much easier.

First 2 photos (right centre) show the gap being checked with feeler gauges to find the starting position (i.e. the gap between the end of the crankshaft and the 13mm alloy plate). The trick is then to lift the crankcase up & down to find the *remaining* actual 'gap' (again using feeler gauges) which amounts to the size of the shims needed.

It helps to clamp the drive-side crankshaft into 'soft-jaws' of a bench vice, remembering to rest the end of the crankshaft on a piece of wood (so as not to damage the end of the crankshaft on the metal base of the Vice).

The remaining photos on this page show me 'chasing' the threads in the crankcase ensuring all of the threads are clean & ready for the rest of the re-build. Last photo shows the much better *Venom* oil pump fitted with spacer.

The photograph on the left shows me identifying the 'gap' between the Timing Pinion and the face of the Main Bearing. I assumed that the Pinion fitted tightly against the Main Bearing: BUT it doesn't !

I noticed this 'Gap' (photo left) when I dismantled the engine ready for the crankshaft repair. And because the original Main Bearing had 'spun' in the crankcase housing, I noticed the crank was able to be moved backwards and forwards by 0.0125" (see page two at the start of this blog), but at that stage didn't understand the reason. I thought that maybe it was because I had used Roller Bearings on both sides, allowing the crankshaft to 'float' from side to side. But that was not the cause of this 'end-float'.

Well, upon further inspection, I discovered that this movement was due to this 'Gap' between the Timing Pinion & the Main Bearing face (which coincidentally was 0.0125"). I wonder if anyone else has discovered this anomaly.

My solution; is to make a steel shim, that will fit between these two components thereby removing this 'Gap' once & for all.

The photo above: shows me sorting-out a new woodruff key to fit the 'Slot" in the crankshaft that drives the bottom Timing Pinion. Fortunately for me I found several woodruff keys in my stores that I could easily modify.

(The four photos above) show the Flywheel assembly all wrapped-up nicely in a polythene bag (sellotaped firmly in place) to ensure no dust, dirt or metal swarf / filings get anywhere near my new Big End Bearings. I also wrapped blue electrical tape around the end of the shaft to minimise the chance of me damaging the new crankshaft whilst *'Filing-down'* the new "Woodruff Key".

The last two photos (above right) show the finished / reshaped Woodruff Key and the Timing Pinion *'slotted-in-place'* ready for the next stage of the rebuild. All I have to do now is *'Turn'* a new steel *'Shim'* to go behind the pinion.

See below . . .

***"No Thanks"* to Alpha B for loosing the original woodruff key, and/or for not even supplying me with a replacement 'Key' especially as they had to *'Grind a New Keyway"* into the new shaft that was specially made from scratch by them !**
But Anywhooo (as the Americans say) ! Once more I find myself wittering-on (yet again) about my flywheel / crankshaft repair.

"Trauma is often remembered long after the repair has been paid for". Well, that's what I say !

2023 Christmas Eve (photos below) **A bit of 'Lathe therapy' in between Mince Pies & Eggnog; New Spacer made to fit between the crankshaft & timing pinion.**







2023 MERRY CHRISTMAS EVERYONE . . .

& A HAPPY NEW 2024 TO EVERYONE

The four photos below are from Thursday 4th January 2024

Photo right: Applying Hylomar Gasket Seal to the crankcase faces prior to joining both crankcase halves together.

I also 'Set' the Camshaft end-float to 0.002" (half a Thou" over the recommended 0.0015" listed in the Manual, but that is close enough for me). All this was done before the crankshaft was installed into the crankcases (& bolted-up) . . . . just in case further adjustment was needed re: Cam Shaft end-float & intermediate gear adjustment accounted for.



Monday 8th January 2024: The first three photos (above left) show the 'Crankcase Stud(s)' being fitted. Copper-Slip grease applied to these studs so they are less likely to 'seize-up' and to make it easier to remove on future engine strip-downs.

The fourth photo above shows a 'Before' & 'After' example of the Cylinder Holding Down Studs & Nuts; i.e. one rusty & dirty stud and one cleaned-up version. As can be seen, they have cleaned-up really well.

The final photo from above is of the MAC Alloy Cylinder Barrel. AKA an ALFIN barrel (serial No.) Hence, mine is an Ali-Barrelled MAC.

The photo above shows the Oil Pump cap-headed screws 'Lock Wired' in place. This is a bit of an over-kill, as these rarely come undone in service, but . . . I do love using my lock-wire pliers ☺

The photo on the immediate left shows my modified Timing Gear Steady Plate. I reshaped the (original) ROUND HOLE, to more of a Pear-shape, which allows the Intermediate Gear to be adjusted without the need to remove ***'this'*** steady plate. ALL three ***intermediate gear*** fixing 'bolts' can be tightened without the need to remove this steady plate. I think it a reasonable solution (not to everyone's liking though!).

Also; The Manual instructs the mechanic / engineer to remove this plate, when setting-up the Valve Timing, in order to disconnect one Push Rod, whilst setting the Valve Timing on the other Valve (and vice versa). This is to alleviate BOTH valve springs 'fighting' against one-another. But, when turning the crankshaft to check said valve timing (without this steady plate being in place) I believe there may be enough of a strain placed upon the Camshaft and Cam Followers Shaft to cause a slight deflection in these shafts, which may (or may not?) show up on a Dial Test Indicator and give a slightly false reading. I might be wrong, but I prefer to have the steady plate firmly bolted down for this process.

Someone said; "it's gonna be a *Pelican Spend". "What does that mean"?* I foolishly asked, "You know" they said "it's gonna have a HUGE BILL".

Monday 22nd January 2024: I started to put more of the engine bits together . . . despite the freezing cold and effects of 80mph Storm Isha.




New piston rings fitted, new gudgeon pin 'Circlips' fitted to the piston and the barrel & cylinder head refitted ready to set the Valve Timing. Unfortunately, the valve timing marks on the 'timing gears' no longer line-up correctly with the correct position of the crankshaft / mainshaft to camshaft configuration due to the newly fitted 'Main Shaft' being fitted in a slightly different location in the Flywheel to the original one.

In other words . . . none of the timing 'marks' on the gears line-up as they once did. Fortunately for me, I am able to set the valve timing without these 'Marks' using a combination of crank fitted timing disk (a degree disk) and dial test indicator fitted to the head to check when each valve is actuated by the camshaft. As stated earlier, it is highly recommended to set one valve at-a-time whilst the other valve is disengaged (or rather no pushrod fitted) and vica versa.

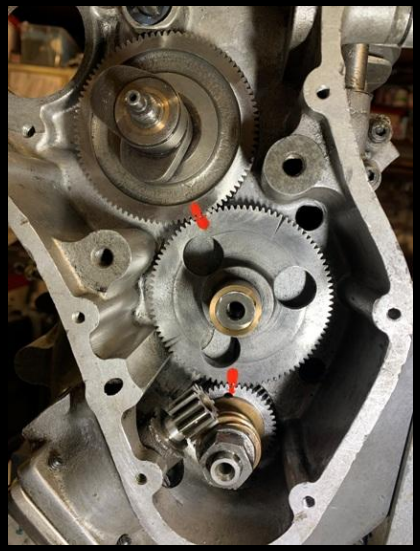
As the 'Cam Lobes' are fixed in relation to each other (i.e. joined together as part of the same casting). In other words they cannot be moved independent of each other. Therefore, valve timing is rather a compromise trying to get the valves to open & close as near as possible to the Velocette recommended valve timings. Such compromise is often associated with excess wear on cam or follower ramps, not to mention variations in grinding, or even variations in 'cam profiles (i.e. different models e.g. M17/5, M17/7 or M17/8 for instance), hence the compromise needed.

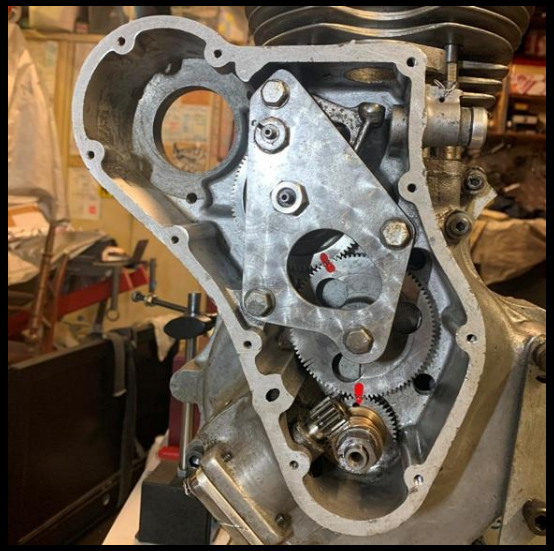
10th February 2024; Well ! I'm blaming the weather & recent cold-snap that has kept me out of the garage, so haven't managed to get any more work done (since 23rd Jan) until now. Today I started work on the Valve timing, before which I did a fair bit of detailed research via VOC Fishtail magazines. I then made a couple of brackets to hold two dial gauges. One for checking TDC (via the top of the piston) to set the Timing Disk to read 'zero' and the other dti to check the valve lift on & off the cam. The idea being that a dti reading is more accurate than 'Feeler Guages'.

The photos on the next page show the results of my labours.

(First photo below Left) I've adapted an old spark plug – drilled-out to accept a short plunger that rests on the top of the piston. The dial guage (dti No.1) rests on the top of the plunger (via the home-made dti bracket) and as the crankshaft is carefully rotated the piston rises and falls steadily to identify exactly where Top Dead Centre is. The middle photo (below) shows the Timing Disk set at 'Zero' to indicate TDC. The 3rd photo (far right below) shows my second home-made bracket with a dial gauge fitted that rests on top of the pushrod to check the lift & fall of the cam.

As stated before, when checking the valve timing it is sptrongly advised by Velocette (in their little Red Book) that only one pushrod is fitted during this process and to record the 'opening & closing of that valve, before changing over pushrods, to check the 'opening & closing of the other valve.

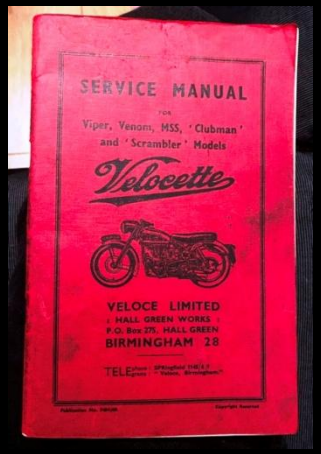




The two end photos (above right) show the new valve timing marks (painted red) set at TDC.

I've included the old settings used from the Velocette Service Manual (aka) the 'Red Book' (right) when I first fitted the M17/8 Camshaft & MAS118 long-cam-followers to my MAC (as recommended by several well respected Velocette-Sages & Gurus at that time).

I then religeously followed the steps listed on the chart (right) with the tappet clearances set at .052" & .053" respectively and set the valve timing exactly as per the chart (right).
(See Part Two of my MAC-Blog which confirms the settings & procedure used).



however, that there will be an increase in mechanical noise.

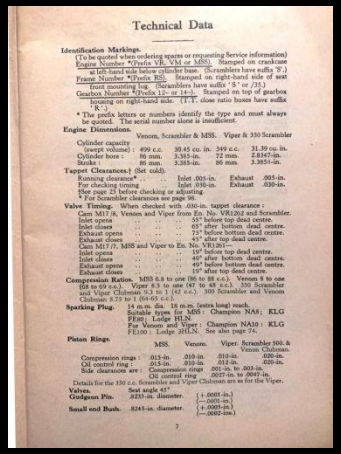
Valve timing is checked with clearances differing from those used for running—See page 26. It is not possible to check timing accurately with both push-rods in place. Remove the inlet push rod whilst checking the exhaust timing and vice-versa. Greater accuracy of reading is obtainable by using .052-in. exhaust clearance, and .053-in. inlet clearance for checking, when the following diagram is obtained :

Inlet opens 45 degrees B.T.D.C.
Inlet closes 55 degrees A.B.D.C.
Exhaust opens 65 degrees B.B.D.C.
Exhaust closes 35 degrees A.T.D.C.

Do not forget to reset to running clearances after checking. These can be increased to .006-in. inlet and .008-in. exhaust for prolonged speed work.

Check and set contact breaker point gap before timing the ignition. When checking see that all backlash is taken out of the gears. Correct setting is 38 degrees before T.D.C. fully advanced.

However . . . this time, I took advice from yet another source who suggested that I should have used the measurements & settings listed on page 7 of the little 'Red Book'. This clearly contradicts the information printed on page 102 of the very same Book ??? Confused Yet ! Well, I am at least. So I not only set the valve timing as out-lined on page 7 (this time) but also took the advice of using a DTI directly off each Pushrod (in turn) instead of using Feeler Guages on the adjustable tappets to check the 0.030" gap needed (this time trusting the dial guage instead of the *Feelers).*



Technical Data

Identification Markings.
(To be quoted when ordering spares or requesting Service information)
Engine Number *(Prefix VR, VM or MS). Stamped on crankcase at left-hand side below cylinder base. (Scramblers have suffix 'S'.)
Frame Number *(Prefix RC). Stamped on right-hand side of seat front mounting lug. (Scramblers have suffix 'S' or /3S.)
Gearbox Number *(Prefix 12- or 14-). Stamped on top of gearbox housing on right-hand side. (T.T. close ratio boxes have suffix 'R'.)
* The prefix letters or numbers identify the type and must always be quoted. The serial number alone is insufficient.

Engine Dimensions.

	Venom, Scrambler & MSS.	Viper & 350 Scrambler
Cylinder capacity (swept volume) :	499 c.c. 30.45 cu. in.	349 c.c. 31.39 cu. in.
Cylinder bore :	86 mm. 3.385-in.	72 mm. 2.8347-in.
Stroke :	86 mm. 3.385-in.	86 mm. 3.3854-in.

Tappet Clearances (Set cold).
Running clearance* ... Inlet .005-in. Exhaust .005-in.
For checking timing ... Inlet .030-in. Exhaust .030-in.
(See page 25 before checking or adjusting.
* For Scrambler clearances see page 98.

Valve Timing. When checked with .030-in. tappet clearance :
Cam M17/8, Venom and Viper from En. No. VR1262 and Scrambler.
Inlet opens ... 55° before top dead centre.
Inlet closes ... 65° after bottom dead centre.
Exhaust opens ... 75° before bottom dead centre.
Exhaust closes ... 45° after top dead centre.
Cam M17/7, MSS and Viper to En. No. VR1261—
Inlet opens ... 19° before top dead centre.
Inlet closes ... 49° after bottom dead centre.
Exhaust opens ... 49° before bottom dead centre.
Exhaust closes ... 19° after top dead centre.

Compression Ratios. MSS 6.8 to one (86 to 88 c.c.). Venom 8 to one (68 to 69 c.c.). Viper 8.5 to one (47 to 48 c.c.). 350 Scrambler and Viper Clubman 8.5 to 1 (64-65 c.c.).

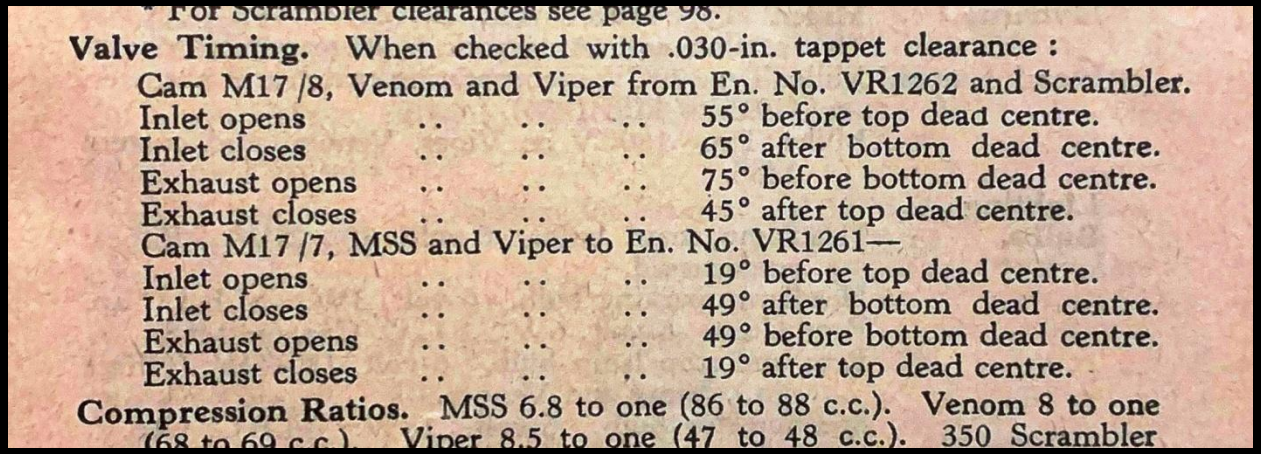
Sparking Plug. 18 m.m. dia. 18 m.m. (extra long) reach.
Suitable types for MSS : Champion N.A8; KLG FE80; Lodge 1H.N.
For Venom and Viper : Champion NA10 : KLG FE100 : Lodge 1H.LN. See also page 74.

Piston Rings.

	MSS.	Venom.	Viper. Scrambler 500. & Venom Clubman.
Compression rings :	.015-in.	.010-in.	.010-in. .020-in.
Oil control ring *	.015-in.	.010-in.	.015-in. .020-in.
Side clearances are :	Compression rings	.001-in. to .003-in.	
	Oil control ring	.0027-in. to .0047-in.	

Details for the 350 c.c. Scrambler and Viper Clubman are as for the Viper.

Valves. Seat angle 45°.
Gudgeon Pin. .8235-in. diameter. (+.0001-in.) (—.0001-in.)
Small end Bush. .8245-in. diameter. (+.0005-in.) (—.0002-in.)



* For Scrambler clearances see page 98.

Valve Timing. When checked with .030-in. tappet clearance :

Cam M17/8, Venom and Viper from En. No. VR1262 and Scrambler.

Inlet opens	.. .. ..	55° before top dead centre.
Inlet closes	.. .. ..	65° after bottom dead centre.
Exhaust opens	.. .. ..	75° before bottom dead centre.
Exhaust closes	.. .. ..	45° after top dead centre.

Cam M17/7, MSS and Viper to En. No. VR1261—

Inlet opens	.. .. ..	19° before top dead centre.
Inlet closes	.. .. ..	49° after bottom dead centre.
Exhaust opens	.. .. ..	49° before bottom dead centre.
Exhaust closes	.. .. ..	19° after top dead centre.

Compression Ratios. MSS 6.8 to one (86 to 88 c.c.). Venom 8 to one (68 to 69 c.c.). Viper 8.5 to one (47 to 48 c.c.). 350 Scrambler

Because the Cams Lobes are fixed-in-place, there is no way to adjust or change the dwell, angles or timing independant of each other.
Therefore the actual *setting-up* of the valve timing is a definate compromise.
It's been suggested it is better to get the inlet closing & exhaust opening as close as possible as recommended on page 7 of the Red Book.

After quite a bit of *Faffing-around* removing and refitting the intermediate gear 'on & off' (and 'on & off' again, etc) I managed to get the ACTUAL TIMING set as follows: Inlet opening 61 ° btdc, Inlet closing 66 ° abdc, Exhaust opening 76 ° bbdc, Exhaust closing 52 ° atdc. Perfect I thought.

So . . . as can be seen from the above 'compromise' I managed to get the Inlet Closing & the Exhaust Opening to within one degree of the recommended settings. Hopefully (fingers crossed) 'THIS" version of Valve Timing will be better than I achieved before. But as always in these matters – "The proof of the pudding is in the eating" as my old Gran would say ! BUT, it feels a bit like "the Blind leading the Blind" regarding valve timing, especially when there is so much variation of opinion, coupled with confusing contradictions as listed in the very same little Red Book issued by Velocette (back in the day . . . as they say). I am STILL unsure abouth the whole cam timing situation, so I've deided to do a bit more reading and research before completing the final 'setting'.

Wednesday 6th March 2024: WELL ! After all of the above procrastinating & *faffin'n'fartin about with the whole valve timing fiasco,* I carried-out a lot more research and after much consideration I restarted the valve timing – yet again ! But this time, I decided to *'map-out the results'* of said Timing on graph paper (using better measuring equipment & methods) with the hope this newly plotted graph will help me make a decision on the final settings of my MAC valve timing.

I used a more accurate Degree Timing Disk this time, with the central arbour made in aluminium on the Myford lathe. The disk then fitted concentrically to the arbour to ensure greater accuracy. Much more accurate than what I used previously.

I then borrowed a long-reach Dial Gauge (dti from Rick, my Velo Mentor) and I also read loads of old Velocette Owners Club (VOC) Fishtail magazines (also provided by Rick). These articles not only clouded the water even further, but now I can say with great authority that ALL of this has made it as *"Clear as Mud to a blind badger".*
The more I read and delved deeper into this subject, the more contradiction I found ! And, the more confusing it all gets.

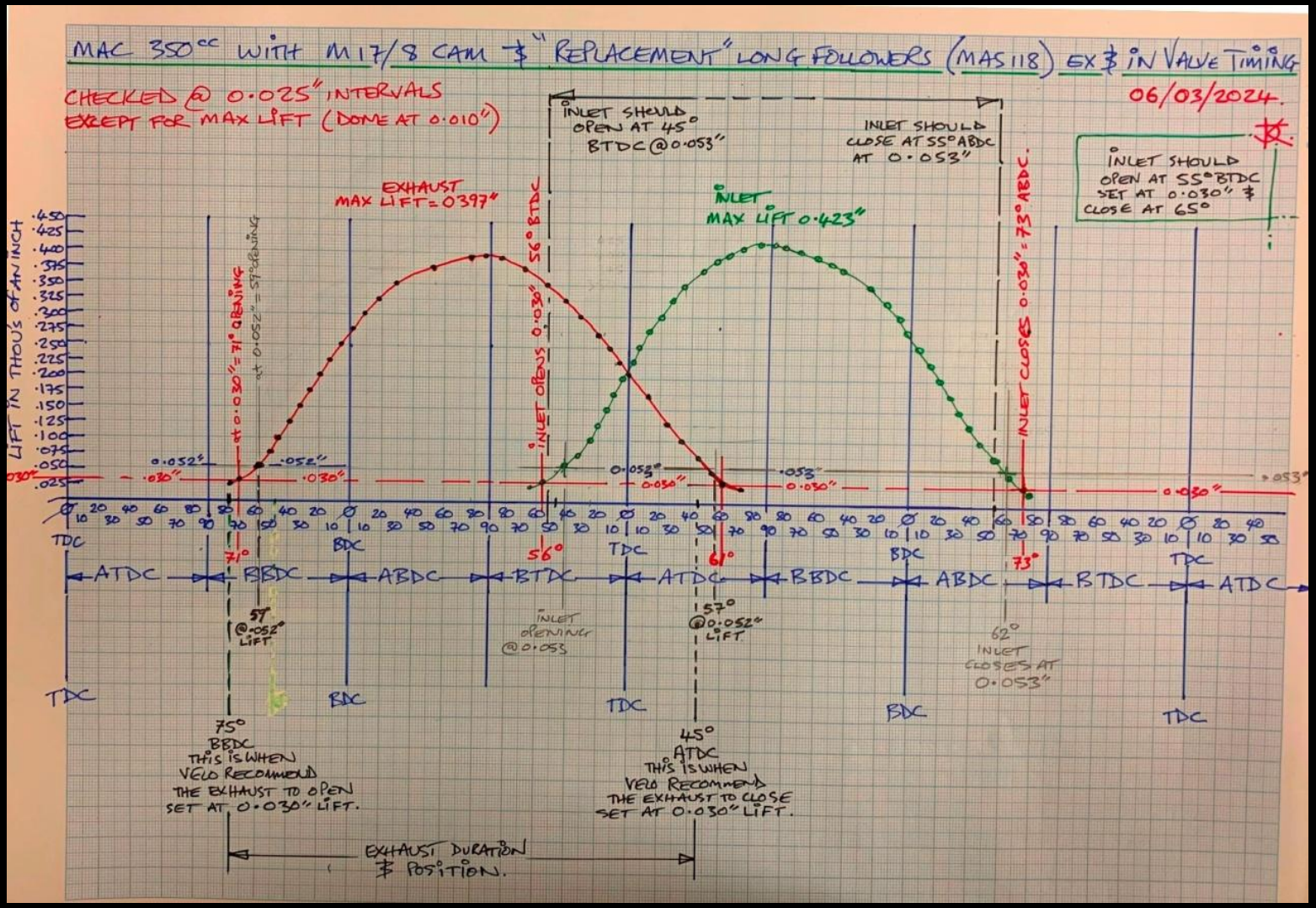
Rick & I (helped & encouraged along the way by my best mate and business partner Debz) set about recording the passage of time & lift of these M17/8 Cams as they 'roll' through their four-stroke journey. Debz then found a crack in one of my MAS118 cam followers (which I totally *'Missed').* Well spotted Debz.
Fortunately . . . I have a spare couple of cam followers to use.

I modified the bracket to fit the long reach dial gauge (borrowed from Rick) and used a spring and an elastic band (attached to the pushrod (to aid & retain the pushrod in the correct position with a downwards 'push' securing the pushrod in the cup of the cam follower). And then with a bunch of different coloured pens & graph paper . . . I plotted the rise & fall of each cam against the 'degrees' as shown on the timing disk.
The chart below (next page) shows the travel, duration and lift *(measured in 'good old fashioned' imperial 'thousandths of an inch')* of the M17/8 cams (with long followers fitted (MAS118).

The finished 'Graph' (below) was somehow supposed to help me understand this very complex subject which is akin to understanding the dark arts and alchemy, or understanding the intricasies and mysteries of the female species. Or even . . . understanding why people believe the internal combustion engine is the true cause of global warming ? With all of this in mind: I've tried at least five variations and combinations of timing positions and 'Mapped-them' (using two different M17/8 cams & two different pairs of long cam followers) all of which gave slightly different readings. So . . . even though I'm still confused, I have nevertheles explored several options leading to the following compromise.

(see below chart).

Of all of the 'timings' that I did, I eventually chose the one listed below. On previous *'graphs'* I managed to get the Inlet Closing and the Exhaust Opening very close (within a couple of degrees) BUT, the 'Down-side' was the Inlet Opening was way too 'Advanced'. I read (in several of the VOC magazine articles) that this advanced Inlet Valve Timing would be easier for starting, but would be detrimental to the engine performance as revs increased and was likely to cause 'Pinking' under load (similar to having the Ignition Timing too advanced). So, I made the decision to move the timing gears by one tooth, giving a difference of 8 degrees, which in turn retarded the opening of the inlet Valve. This is the 'Compromise' that I've gone for. Only time will tell . . . if I have made the right decision !



Another important issue illustrated in the attached graph is the valve 'over-lap' where the valves opening & closing point crosses the 360 degree point (or rather right through the Top Dead Centre line) which was also one of the criteria mentioned in several articles. On previously plotted 'timings' this so-called 'over-lap' crossed each other by many degrees in advance of the 360 degree point.

My final timing settings that I ended up using are as follows (all set at 0.030" lift)

Inlet opens 56 degrees BTDC
Inlet closes 73 degrees ABDC
Ex. Opens at 71 degrees BBDC
Ex. closes at 61 degrees ATDC

So, although the inlet closing & exhaust opening is now 'out' of sinc with my earlier (thoughts and) settings . . . the new Inlet Opening is now within one degree of that listed on page 7 of the Velo Red Book and the valve 'cross-over' now looks right.

Which valve timing is correct ??

Some of you may be thinking . . . "He really does have too much time on his hands".
Or; "He needs to get out more". Or some such thing. Well ! You are probably right !

The nut that fits onto the camshaft (1st photo below left) needed turning-down on the Lathe to get it 'Flush' with the timing case 'Base' to enable the timing cover to fit properly (where the nut & oil quill fits into the oil hole in the timing cover) this was checked with a straight edge (i.e. a steel Rule placed across the 'faces'). The 3rd photo below shows the frame with oil tank removed. And the end photo; shows my rubber mountied oil tank.



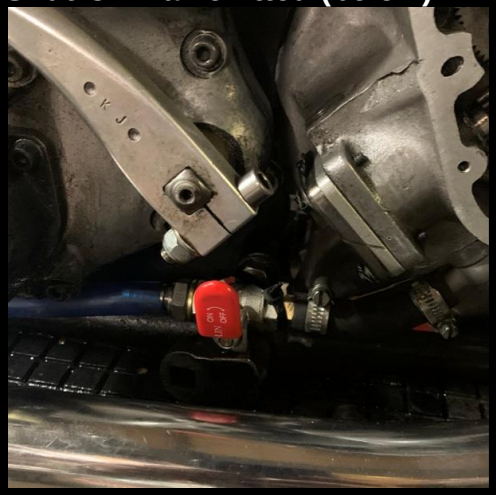
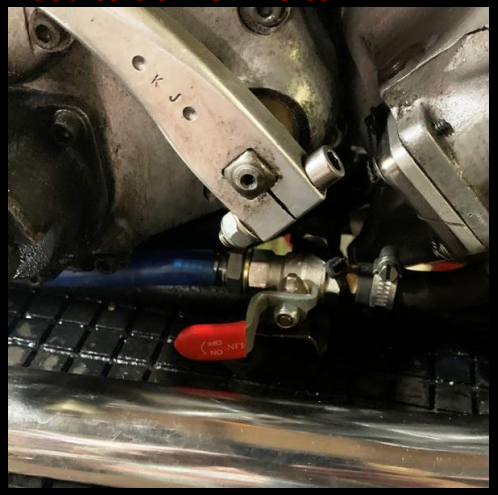

I removed the oil tank to thoroughly clean it out ready to accept new clean engine oil for my clean rebuilt engine. I also removed and discarded the original oil ball valve assembly / oil check-valve (ball & spring anti-sumping mechanism) as well as discarding the old oil pipes & fittings to make sure there is no possibility of old oil contamination going around my newly rebuilt engine. Yep! New oil pipes & fittings and my home-made 'in-line' brass oil filter. YES! I know the 'holes' are quite big, but don't forget that the return oil is being filtered now by a remote 'spin-off' canister oil filter (which will be changed regularly every 1,000 miles when the engine oil is also changed). I am now convinced that the original ball valve and very fine (clogged) oil filter may have also been a contributing factor to my main bearings 'failure'. I believe that oil flow was restricted by the ball & spring valve, so I decided to replace it with a new 'On-Off' Shut-Off Oil Control Valve (instead of the Velo anti-sump ball valve & spring system).

All I need to do NOW is to REMEMBER to turn the Oil Tap 'ON' BEFORE starting the Engine !



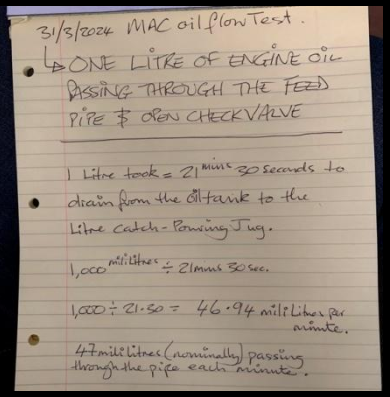

The first three photos (above left) shows just how clean my tank is now, also the 3rd photo shows the square inspection panel that I fitted a couple of years ago (which came in very handy during the oil tank cleaning duties). The 4th photo (above right) shows the old ball valve assembly with guaze filter and the final photo (far right) shows my new in-tank / in-line oil filter (made of brass plate, soldered in-place and cross-drilled).

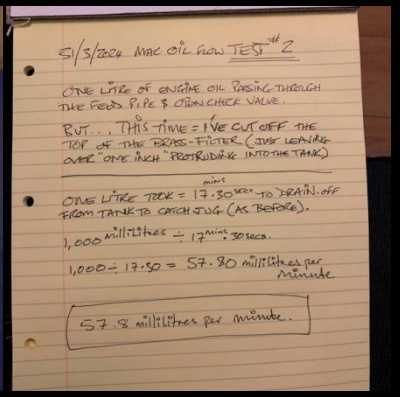
Shut-Off Valve fitted (below). **All I need to do NOW is to REMEMBER to turn on the Oil Tap BEFORE starting the Engine !**

I carried-out several 'Gravity Feed Oil Flow Tests' on my new engine oil delivery system (aka. new shut-off engine oil valve & brass filter) measuring oil-flow using a stop-watch to see how long it takes to drain the oil tank into a One Litre Jug and then 'Record' the RESULTS.

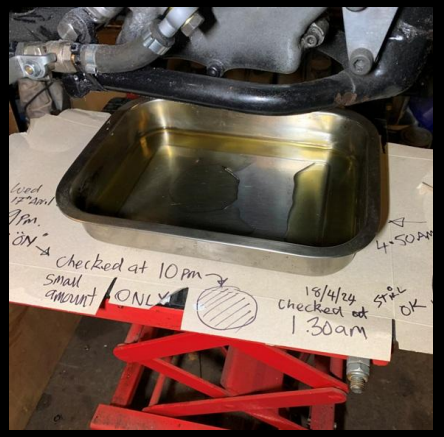
The initial 'Flow' was much slower that I expected so I tried several modifications to try and optimise said flow. On a PLUS side; my oil will be circulating through a Canister Oil Filter anyway which "*should" (in theory at least)* filter most (if not all) contaminants & metalic particules, etc.



The other thing to consider is that when the engine actually starts, oil is delivered to the engine under 'Pressure' (and not just through gravity feed, even though Gravity no doubt Helps). But my feelings on this matter are . . . If I can increase the oil flow in anyway it has got to be of benefit (providing that I remember to turn-on the Tap of course !). The other proven FACT is that using a large bore 'On/Off' Oil Tap will undoubtably increase oil flow (immediately the Tap is turne "ON"). It does not rely of a full pipe of oil (unlike the original Velo design that requires a full pipe of oil for the ball valve to work properly. For instance; should there be an 'Air-lock' in the oil pipe, the Velo anti-sump valve system litterally stops supplying oil. There-in lies just one of the problems with the old Velo valve. When it works well = no problem. But if the pipe is disturbed, or the oil drains out of the pipe (i.e. air-lock) then the ball bearing (inside the spring loaded valve) just wll not allow oil to flow.

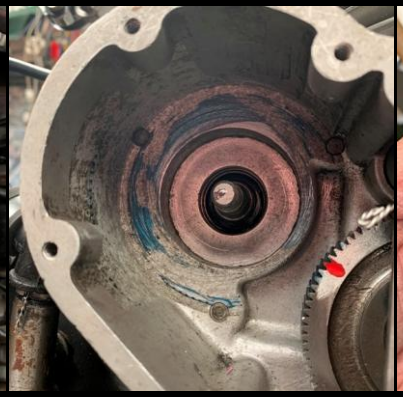
The new return oil pipe 'Route' (above) and the new Banjo Fitting that I had to 'make' (as the old one routed the pipe downwards and at a funny-angle. Also with the new oil shut-off tap is fitted, there was now little room for the return pipe to fit in the original place. So . . . I decided to 're-route' my new return pipe and fit it in this new position as this is the least conveluted route for the return oil pipe to take. Yes I Know, all you traditionalist velo fellos will frown at this method, but it tale one third less pipe and is definitely the shortest and most direct route.



Yet another oil related experiment . . . I decided to remove the engine drain plug and turn the oil tap on to see how much oil 'flowed' past the oil pump . . . or, in other words, if I left the oil tap in the 'On' position, how long would it take for the engine to 'Sump Oil' (i.e. fill up with oil from the open tap)???? 1st photo (above left) shows a very small pool of oil after just one hour. Photo 2 after four & a half hours. Photo 3 after 8 hours 50 minutes and photo 4 (above far right) taken after 24 hours. The result being = One *Gill* of oil collected in the stainles steel catch tray after 24 hours. So what this means is that on a ride-out, it will be okay for me to leave the oil tap 'On' without causing the engine to 'Sump' oil . . . and if I can leave the oil tap 'On' I won't be able to forget to turn the oil tap back on (e.g. after a couple of hours stop for coffee & a chat – on route, etc).

P.S. Note to Self . . . Please REMEMBER to 'TURN-ON' the flippin' Oil Tap BEFORE starting the Engine in the first place !

(1st photo below) When I tried to fit the magneto and drive gear (when setting-up the ignition timing) I could not get the drive gear to tighten-up on the magneto tapered shaft. My initial thought was that the 'Taper' needed to be 'Lapped-in' (using fine engine grinding paste & parrafin, similar to when lapping valves in). However, after completing the lapping procedure, the gear still would not tighten-up? Photos 2 & 3 show the casing and the gear with engineers blue – showing that the gear & case was in-contact – and therefore, the gear wasn't being allowed to locate properly onto the magneto 'Taper'. Photo 4 (below) shows the gear after removing metal from the back of the gear (using my trusty Myford Lathe), allowing sufficient clearance for the timing gear to fit perfectly onto the magneto shaft.


The end photograph (top right) shows yet another home-made tool, this time to relaese the timing gear from the now very effective 'Taper' in order for me to set the ignition timing to the required 38 degrees before top dead centre setting (as per the Velo Red Book). My home-made gear extractor tool came in really handy as I had to put on and take off again this gear several times before finally getting the ignition timing 'Spot-on'.



Photo above (left) shows my battery (now rubber mounted) under the seat. Photo 2: The ignition coil bracket is also rubber mounted now.