

Object: To remove all excessive clearances in the timing chest to include pinion to gear clearance, side slop in cams, idler gear and followers. To insure positive follower to cam relationship (in other words the followers must run dead center on the cam lobes and stay that way.) Remember: If there's room for something to bang around in--it will bang around!

Materials:

1. Good Cams--with bushes that fit the spindles .0005-.0015" New bushes can be found at a bearing supply house and center honed to size by any good machine shop.

2. Good Spindles--No ridges at all--no wear. I recommend G. Emmerich's spindles for reasons that will become obvious later.

3. A ROUND Idler Gear (Chicago Steel) or check yours. Aluminum is good too--but it must be no more than .002" out of round--and .002 is a bit much.

4. Good Followers--I'm convinced there is no such animal. But the followers must be re-ground true to the pivot hole. Also many followers have oversized or out of round spindle holes--throw 'em away!

5. One Piece Idler Boss--3/4 thousands--1 1/2 thousands clearance clearance between idler pinion and idler boss.

6. A Good 1/2 Time pinion Gear--The 1/2 Time Pinion comes in several over/under sizes...you won't know which size you need until you set up your cams & Idler Gear.

7. Three Packages of PSW Brand Arbor Shims in 3/8", 1/2" and 5/8" i.d.--Precision Steel Warehouse, Inc., 3500 N. Wolf Rd., Franklin Park, IL 60131. These are usually available at a good machine shop supply house. Make sure you buy the shims without the keyway notch. They come in packages of assorted thicknesses for about \$3.00 per package.

Procedure:

1. Start with the cams. Place cams on shafts with a washer under the spindle nut to take the place of the steady plate. The thickness of this washer is meaningless--what you want to discover is the side-to-side play of the camshaft with the E95 in place. You want to reproduce its actual running condition. (Here comes the scary part which I'm going to get flack about.)

There are two ways to get minimal side clearance. Shim the cam at the rear with the 1/2" arbor shims or move the spindle. If the side clearance is tight you have to draw the spindle out slightly which is done by putting large washers on the cam then using the spindle nut as a puller--works great. It's also a test for loose spindles which can be fixed well with Loctite. The reason I recommend George's camshaft spindles is because of the fact that they are very tough. I don't like to shim the camshaft if there is excessive side clearance--I assemble the cam as above--with the E95 thrust washer and a washer tightened down on the shoulder of the spindle and I hit the spindle with a hammer! (A Harley-Davidson type.) George Emmerich's spindles are so damn strong that we have done this without protecting the end of the spindle with no damage but, with stock spindles, build up a pile of washers (3/8") until an old nut threads on without exposing the end of the spindle--then hit the nut. The object here is to take the brunt of the blow from the threads to the shoulder of the spindle itself.

Now I'm going to hear how this method ruins the case-to-spindle press fit and all that. If you're really worried heat the case around the base of the spindle--but I don't recommend it because you can over-heat the spindle. Moving the spindle a few thousands in one direction or the other will not hurt anything.

Now that correct cam clearance has been obtained it's time to assemble the followers.

With the cams loose on their shafts (you have to be able to take them on/off the shafts) put one pair of followers on their spindles as described in the Vincent books--do the above thing to the follower spindles--put a temporary washer in place to act as the steady plate and tighten the follower spindle nuts down. (Remember that to remove and insert your rear intake follower your compression release rod must be removed). Slip cam on its spindle and, if your heads are off, look down through the push rod tube holes and see if or not your followers are running dead-center on your cam lobes. If the heads are on, you have to use a flashlight and lotsa neck bending to see around the camshaft gear. If I can't look down through the push-rod holes I judge the cam/follower relationship by lining up the edge of the follower with the edge of the cam lobe. It's helpful here to have a pointed rod to poke in there and actually feel for any over-lap one way or the other. The object here is to either add to the thickness of your ET98s or subtract from them to get your correct case-to-follower distance with perfect cam/follower alignment. This is where you use your assortment of 3/8" arbor shims. After you've established correct follower placement you must reassemble all the spacers ET99, ET99/1, ET99/2, etc. with the washer that acts as the steady plate--tighten the spindle nut and check side play. Remember now that the follower is spaced to the case and you mustn't change that spacing. All spacing for side thrust must be done on the outside (off-side) of the followers. If, after tightening the spindle nuts the follower is jammed you must take material off your long spacer (ET99,/1,/2) until the long spacer will turn with the nut tightened but having no side play. You don't want the longer spacer to drag, but you don't want side play either. If you do have side slop--you use your 3/8" arbor shims wherever they will fit on the spindle without fouling the camshaft gear wheel.

Your front exhaust follower is a special case due to its cute location. You do same as above--the trick here is to "glue" your arbor shims to each side of the depression in the case with "assembly lube" or light grease. This holds the shims in place while you carefully insert the follower between them and insert the ET30/3 spindle snug it down and check side slop--KEEP GOING UNTIL YOU GET IT RIGHT--NO SIDE PLAY WITH THE FOLLOWER DEAD CENTER ON THE CAM LOBE.

FITTING IDLER GEAR

With cams and followers in place check fit/side play of large idler--you want to shim this (if necessary) to run true with the cam gears. Fit idler boss in place--run the 3- $\frac{1}{4}$ " nuts and washers down snug--just so you can barely move the idler boss up, down and around. (That's why the holes in the idler boss are oversize.) Slip the idler gear into place--without $\frac{1}{2}$ time pinion in place. Move the idler pinion up until there is 0 (ZERO) backlash between it and the cam gears. Tighten the three idler boss hold-down nuts. Check for zero backlash by holding the idler tight and trying to rotate the cam gears back/forth. If there is any back/forth play you must loosen the idler boss and correct it. When this is done rotate the idler gear. THERE SHOULD BE NO TIGHT SPOTS DURING 360° ROTATION. If there is, the idler is a bit out of round and you must re-adjust the idler boss to allow for the high spot; Dig?

When the large idler is fitted to your satisfaction, slip it off the shaft. Install the half time pinion on the main shaft. Re-install the large idler. If you can't get it on, the $\frac{1}{2}$ time pinion is too big and you need a smaller size. If it goes on and there is play between it and the $\frac{1}{2}$ time pinion, it may be too small, you need a bigger $\frac{1}{2}$ time pinion. You want ZERO to .002" clearance between the idler and the $\frac{1}{2}$ time pinion. .002 backlash is almost unnoticable. It would be nice to have an assortment of over and under-size $\frac{1}{2}$ time pinions at this point. Good Luck.

A good trick is to remove one large idler boss hold down nut at a time (so you won't lose adjustment) and apply Loctite and re-fit it. I don't believe in punch locking; it ruins parts and makes taking things apart hard. Loctite works! Believe in it.

Now, with everything in its place, fit the steady plate--after you've lined up your timing marks of course. Use loctite here instead of punches and folding washers. Don't loctite the four oil-feed shaft nuts--they are self locking and won't unscrew anyway.

Another problem you run into with punch locked studs is the fact that many times the stud comes out of the case instead of the nut coming off the stud. If this occurs, take the stud out of the case, hold it in a vise or vise-grips on the unthreaded portion and take the nut off. Dress the punch damage with a file, make sure the nut will start on easily. Now put it back into the case with Loctite "Stud & Bearing Mount" (part#2226)...it's red. Use loctite spray primer to clean the threads. This is much stronger than the loctite (blue) that you use on nuts. This way the nut will always release leaving the stud in the case where it oughta be. DON'T PUNCH LOCK, DAMNIT.

I have never written directions before so I may have over-looked something--my hand is tired--[what about me, mate? (the typist)] and so's my head. [Just like Gumby of Monty Python, "My brain hurts!"] But the general idea is there. And nothing can replace care/patience. I suggest everyone read Zen and the Art of Motorcycle Maintenance, it's more important than any Vincent manual--read it!

... "Rip".

WHAT IS A MOTORCYCLIST?

(From Motorcycle Sport magazine)

A motorcyclist is a very human being. Though frequently a source of wonderment to his fellow men, he is so easily understood if only it can be remembered that he eats, sleeps, thinks, talks and on every occasion rides motorcycles. He comes from every walk of life and you will find him among the ranks of engineers, clerks, electricians, farmers, soldiers--yes, apprentice and foreman, junior and executive. Whatever his job and however it may control his mode of life, he is never happier than when wearing an old sports jacket and a disgraceful pair of flannels--or maybe just an overall--crouched by, lying beneath, hanging over, tinkering with or just plain cleaning the apple of his eye--the motor currently the pride of his stable.

Sportsmen the world over admire him; wives are often affected with his enthusiasm; the public tolerate him and small boys worship him.

He likes accessory shops, motorcycle showrooms, reading Motor Cycling, collecting catalogues, club nights, talking shop, arguing technicalities, the Motor Cycle Show, and riding in or just watching races, trials, scrambles and grass track meetings. He doesn't go much for the more popular pastimes favoured by his fellow men, such as dancing, the theatre, the cinema (unless it happens to be showing the film of TT), and he usually finds his own sport so all-absorbing, the other sports either don't exist for him or come a very poor second.