General Notes on Cylinder Overhaul

Franklin B8F & B9F engines

CYLINDER LINERS

/

The B8F and B9F cylinders appear to be basically the same and are interchangable between different engine blocks, as far as I have ever seen and heard.

Replacement of the removable, cast-iron liners is done in accordance with the overhaul manual method of heating to 650 F. But, there are several things which the overhaul manual doesn't mention which can be important in getting the job done.

The new liner is supposed to be from 12 to 17 thousands of an inch oversize, in relation to the cylinder bore diameter of the empty, cold aluminum cylinder in which it is to be installed, if it is to be within factory specification size. I generally shoot for 13 thousands because I have found it to be too difficult to insert the larger-than-13-thousands-diameter-liners without chancing getting them stuck during the insertion process. (If they do get caught, it takes a lot higher temp than the usual 650°F to get them loose again.)

Don't make the mistake of assumeing that your cylinders are at the factory-standard inside diameter. I have come across a number of factory-made oversize cylinder bores. So, always measure the inside bore of the empty, cold cylinder before ordering, making, or installing replacement liners.

The usual I.D. of the cyl. bore is : 5.125". Thus, you will need liners that are at least 5.137" O.D. to fit in Factory Standard Size Cylinders, and additional diameter to make up for any overbored cyl. diameter increases.

It is important to remember, diameter of the last inch of the cyl liner, the inch that sticks out of the cyl, needs to have it's outside diameter limited to about 1.142" which represents the maximum .017" "squeeze" of the liner in the cyl. If this isn't kept in mind, the completed assembly may not fit in the machined recess of the cylinder block.

The above paragraph applies to both the stepped and straight type liners, with the exception of the diameter increase that forms the step itself.

In regard to the two types of liners, the stepped came later. Amongst other things, it was found that in overheating conditions the straight liners came loose and, in at least two cases, slipped to the point of causing or letting a piston ring catch on top of the liner. This stopped the engines abruptly, to say the least! This particular problem also contributed to abandonment of the McCllough Supercharger, "Super 260 Seabee", by Sentas at Detroit. "Too much heat to keep the liners in place", he told me, in 1970 or thereabouts.

I will still make straight liners to your specs., but won't put them in my own equipment and further would strongly discourage anyone from using them for the above mentioned reasons.

Another problem arises with the straight liners when they are being bored to finish size. The pins thru their walls, which are supposed to keep them from moving, cause some tearing of the boreing equipment because of different hardness of the different metals involved. Because the stepped liners aren't pinned, they are a lot easier to bore to finish size.

I find that the use of a special collar of steel which locks on to the last inch of the liner is a great help in extracting and inserting liners, even the liners that are a little "sticky" in these operations. On the straight liners, the collar makes certain of getting exactly one inch of liner outside the cyl during assembly procedures.

P.

The stepped liner type automatically will stop at the one inch mark during assembly of liner to cylinder, but cylinders must be filed FLAT at their bases and then slightly chamfered at the lip so as to avoid having the cyl liner "hang-up" just before "bottoming-out" against the cyl base. A weight should be set on top of the liner of the cooling cyl so as to avoid having the liner creep out during the cooling period just after assembly of liner and cylinder.

Later, after the assembly has cooled, check the fit of the cylinder to the block to make certain that the liner is not causing any interference between the block and the aluminum part of the cyl assy., and is not resting on the step recessed in the block. Because the cyl must rest it's base to the block face, any interference of the liner to block recess or diameter intereference between liner and block cannot be permitted. Use any appropriate methods, such as slight filing off the outer end of the liner or re-heating and pressing the liner into the cyl slightly deeper, or both. (Liners are to be bored and honed to 5.000" to 5,001" after being inserted the correct distance into the cyl.)

INSTRUCTIONS AND WARNINGS

PISTON RING INSTALLATIONS

1. These rings have been individually inspected to be certain that the end gap will be sufficiently open and free from the possibility of binding from heat expansion. In a standard 5" bore they will no tighter than .019 and no looser than .024 inches at room temp. Each .001" difference in bore diameter will make about .003" difference in the end gap. (As rings are run and broken in, you will find the end gaps increasing quite a bit. I have seen them open up over .020" in a short time. It doesn't seem to have any bad effecttthough, and seems to be nothing to be concerned about.)

2. These rings are about .007 thicker, face to back dimension, than the stock Franklin compression rings, so be sure that the ring lands are clean and that the rings fit freely in each land, all the way around. Checking this is something that should have been done, no matter what rings you used.

3. Rings with inside bevel or ½ keystone are installed with bevel towards top of piston

4. Minimum end gap with these rings is to be .004 per inch of cylinder diameter

5. The compression rings mike out the same as the Franklin, .093".

6. The Oil rings are about .010" thicker, face to back, than the single piece Franklins, but the clean piston land has plenty of extra room for this increase.

6. We guanantee nothing but your money back if you return the rings in new condition. However, our experience with these rings indicate that your oil consumption should go down to practically nothing. From the very first hour of use, in an engine that was not with new liners, to about 20 hours, I used a quart of oil, part of which went to replace leakage. If you should experience high consumption after a very short break in period, I would think the problem would be in out-of-round cylinders, valve guide problems, or possibly sticking rings because of improper cleaning of lands. These rings are the best I have heard of, to date.

Let us know how your consumption changed with these. We do like to hear from you.

Thanks,

7. On Oil rings, locate spiral rails about one inch, right and left of the spacer gap. Top and bottom of the spacer, of course.

Rings with in
or ½ keystor
stalled with
wards top of p
Minimum en
.004 per inch c
diameter.

FLEX-VENT OIL RING

Place spacer in groove with ends over solid portion of groove bottom. Or if spacer has tab on inside—place with tab into slot in bottom

The purpose of this sheet is to try to tell you of a method of aligning the crankshaft to the propeller shaft. And following that, the alignment of the crankcase to the prop shaft housing.

Why bother? The engine manual says that the prop shaft can be installed if the face is within .002 " of square with the axis of the shaft. Doesn't seem like much to worry about, does it? The mating flange is about 24 inches from the outer bearing, and is about 4½" in diameter, a ratio of 5.5:1. This works out to .002"to.011". This means that if the flanges are at the permissible factory limits, the bearing end is .011" off center, swinging around in a circle that is actually .022" greater diameter than the actual diameter of the shaft at the outer bearing race.

Now, eleven thousanths of an inch doesn't seem like much to be concerned about, but if you were to take a crankshaft-tailshaft and set it up in a crankcase, with the tailshaft housing removed, and hang a bucket out on the end of the prop shaft, the amount of weight in the bucket that will deflect that shaft the full .011" will amaze you. All that weight translates into force on the tail shaft bearing, the tailshaft housing, the main bearings, and last but certainly not least, the mating surface between crankshaft and tailshaft. (The gent out in Couer D'Aline, Idaho who sold Dick Bach that BEE, told me he had a fatigue failure of that flange on one of his engines. You will better understand when I mention that I have seen one shaft that measured .065" extra swing diameter at outer end. Every one that I have checked was well over the limits, but usually only in the .030" range.)

O.K., there might be something to this after all, but how shall we check it out and then fix it?

To start, assume an engine block with main bearings and crankshaft installed. Camshaft in, and every thing torqued to approximate final tightness. The propshaft torqued to the crankshaft, and the propshaft housing left off.

The above assembly (which I will call the block, for convenience,) should be placed on a bench where the tailshaft (T.S.) can hang out free of the bench so you can freely install and remove the TS housing, as necessary.

Now, install, <u>without gasket</u>, the TS housing. Leave the <u>outer bearing out</u> of it, so the prop shaft (PS) doesn't touch it. Torque the entire series of nuts that hold the housing to the crankcase.

The first thing we must do now is learn how much runout will be from the main bearing clearances, so that we can allow for this when we are making later measurements. With the block sitting normally on the bench, and the TS housing hanging out in space, clamp a dial indicator onto the outer end of the TS housing and let its finger touch the TS on top at the 12 O'clock position. This will measure vertical displacement in normal engine position. Now rotate the crankshaft to find the point of lowest dial reading. Mark this point with a masking tape arrow or grease pencil and keep track of it. (Will call this the Origin point.) Then, rotate to find the greatest dial reading. Mark this and keep track of it in the same manner. One half of the difference between high and low readings will be the amount of TS runout. (Not important here, but gives you your first hint of how much off the shaft is.)
(Do all of your rotating of the crankshaft only in one direction and from the fan end, without touching the prop shaft end or you will not get accurate readings.)

Make a sketch like a clock face and write on it the 12 O'clock dial ind.-Origin reading.

Without disturbing the dial ind., rotate the crankcase 180 degrees to an upside-down position, so that the block is sitting on its' top rail.

Rotate the prop shaft again and stop at the Origin. Note the dial ind. reading. (this is your 6 O'clock reading) The difference between the 12 O'clock and the 6 O'clock Origin reading is the result of the main bearing clearances plus slight gravity effect on the unsupported outer end of the prop shaft. Write down these readings and make note of the difference; ½ the difference is the theoretical vertical center point of a perfectly aligned shaft. (keep this in mind as you are finishing up the job.)

Having avoided disturbing the dial ind. since the first 12 O'clock reading, turn the engine block over again and repeat the 12 O'clock dial reading. If it is still the same as it was when you first recorded it, the results of all the readings are accurate. If significantly different readings show up, try again until you get a repeatable set of readings.

Lay the block on left side (or right side, it doesn't matter.) and clamp the dial ind. on the right side of housing so that the finger touches the PS (prop shaft) at the 3 O'clock position. Rotate a turn or two and stop the prop shaft with the Origin mark at the 3 O'clock spot near the dial ind. finger.

Go thru the whole routine again, just as you just did in rotating block from top to bottom, only going from side to side instead. Write down all readings and make a diagram sketch to keep things clear in your mind as you work on this.

Now that you have the vertical and horizontal readings, along with the main bearing clearance allowance (effects) we are ready to go to work.

Block in normal upright position, Dial ind. on housing, finger touching PS at 12 O'clock position: Rotate shaft a couple of times, stopping at Origin. Record dial reading. Continue rotating shaft and observe dial needle maximum movement. Record. Mark point of max. deflection on shaft with masking tape or pencil. Difference between readings, divided by 2, is the amount of shaft off-center deflection.

Assume .065" difference, Divide by 2, so actual deflection is .0325". To bring the deflection to zero, we have to shave the flange of the Prop shaft .0325"/5.5", which equals .0059".

Carefully note the point of maximum deflection and make sure it is marked on the PS so you won't lose it while working on it. You will now remove the PS housing and disconnect the TS from the CS.

Take a 1 inch micrometer and carefully record the thickness of each bolt boss to machined surface on the flange of the PS. (You might also write them on pieces of masking tape next to each boss for easy reference.)

The .0059" of flange material has to be removed from the side of the flange that is where you got minimum deflection. I used a small piece of finished steel plate, 3/4"X 4"X6", for a grinding plate. Using wet-or-dry sandpaper and light oil, and tons of elbow grease. Also used a small steel block to rough it in, using same technique. Check the flange thicknesses from time to time, with the micrometer. When you start getting close to what you want, from time to time reassemble the whole thing, dial and all, and check your progress. As you start zeroing in on the final stages, do not forget to make adjustments, and allowances for the main bearing clearance effect on the readings. (I find it difficult to make a much clearer explanation, but if you got this far, you are probably a good enough mechanic to make sense out of what I am writing. If not, I am as near as your telephone.) 312-758-1622

After you have gotten the alignment as near to the zero point as you can, or are satisfied with, torque the tail shaft to the crankshaft for the last time and install the cotter pins.

You are now ready to check the tailshaft housing alignment and correct it.

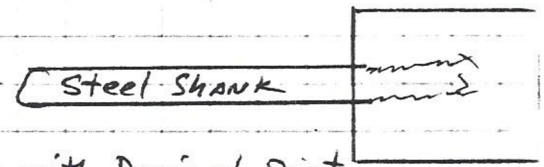
Oct 10, 1988 P.S

Directions For Re-Facing Rocker Arm Pads

GEORGE POMEROY
1860 Reichert Ave.
Sauk Village, IL 60411

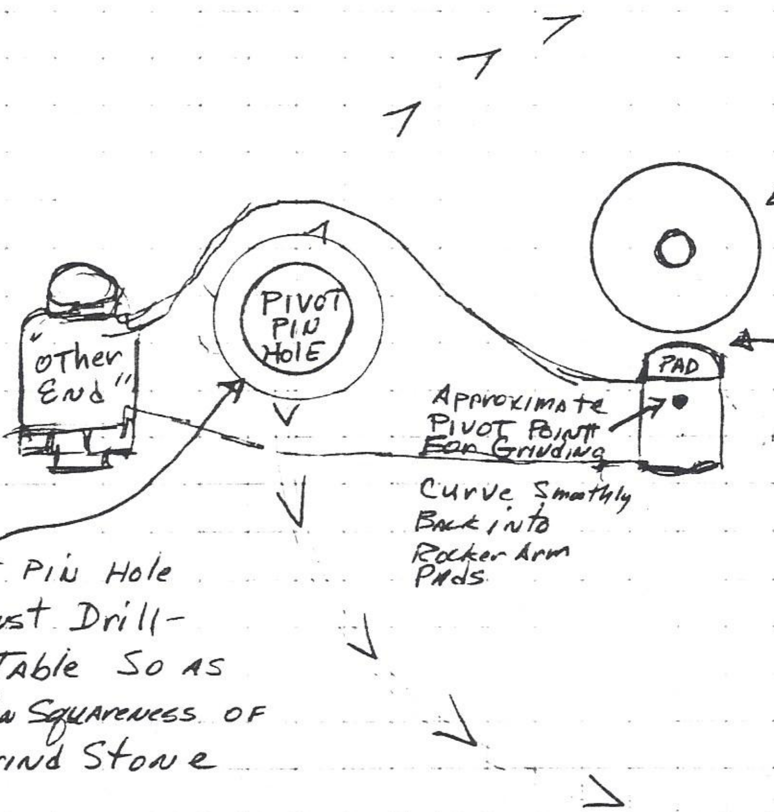
A. Obtain Drill Press

B. Obtain High Speed, <u>Fine</u> Grinding Stone
About 3/4" To 7/8" Dia. Stone



C. Chuck up Grinding Stone in Lathe & Trim with Diamond Point or Trim Stone to Get A Clean, Square, Centered Face –

D. Put Stone in drillpress & Lower to Just Above Drill press table. (or below table if Center hole Allows For it.



Fine Grit. High Speed Grind Stone with 1/4" Steel Shank

① Hold this Pad Lightly Against Grind Stone with Fingers & or thumb while Pivoting other end of Rocker Arm Far Enough To Grind Pad Surface From one Edge to the other.

② Hold Pivot Pin Hole Down Against Drill-Press-~~Tab~~ Table So as to maintain Squareness of Pad To Grind Stone

③ Holding Pressure between Pad & Grindstone, Swing "other end" Back & Forth as indicated by Arrow heads ARC at Pivot Pin Hole. Stop Grinding when you have Ground ~~the Flat Spots~~ The high Parts of the Pad Face To blend into a Curved Face without Flat Spots – (A Certain Amount of Finess is not a bad thing to have, in doing This Job – A Regular Full Swing From one Side of Pad to the other Seems to work best.

Note: Don't Forget to Re Dress the Grind Stone From Time To time –

Oct 11, 1988 P5

GEORGE POMEROY
1860 Raichert Ave.
Brook Village, IL 604??

Floyd,

I am going to mention How I would go About installing The Guides –

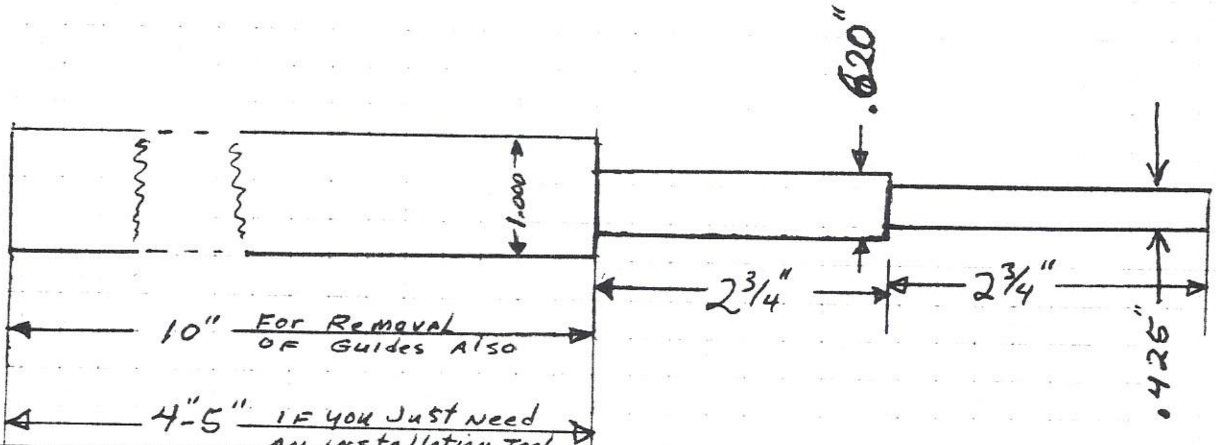
1. Mark Them with Correct Cyl Number – (Black Marker Pen)
2. Mark Cyl with Number on top – Near hole –
3. Coat Valve guide with thin Layer of Never Seize –
4. Put Guides in a Freezer – Cool To Zero or Less –
5. Heat Cyls to 650°F For 2 hours – (Electric Oven) (watch that Liners dont Fall out – they will be Loose)

* (WARNING: Liners without Step on Last inch, bottom end, must not bear the Hammering Directly *

6. Take Hot Cyl & Set on Floor, Opening Down.
7. Take Correct Guide From Freezer, Place on Mandril & Line up with Hole & insert quickly – Using mandril & medium weight (24–36 oz. Hammer) Hammer To Seat Guides down to their Shoulders
8. Set 30–40 Lbs on top of Cylinders till they cool off. (To Keep Liners From Creeping out)

Details of Mandril For Putting Guides in & out

Make From Steel Rod – 1" diameter or There about –



9. After Cyls Cool – Finish Ream Guide on Drill press, Turning Reamer dead Slow, or by hand, To Finish size of .4365". This will Give about .003" clearance between Valve Stem & Guide.

* Cyls with Straight Sided Liners may have Liner Lock Pins Sheared by Hammering in Guides. Support such Cyls at base on 1" High Blocks or R...