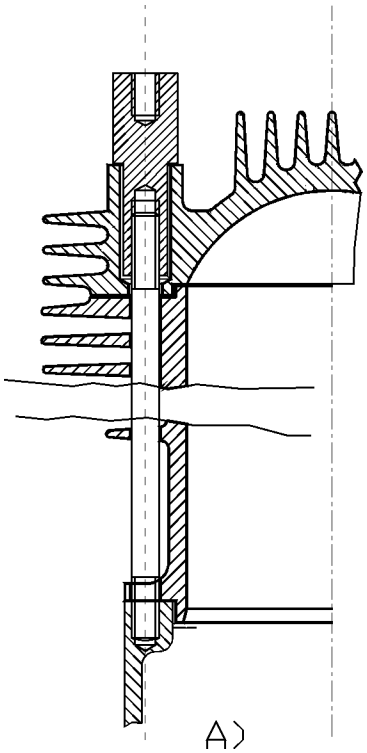
A few things to consider when rebuilding a 680 o.h.v.engine

Having rebuilt KP4753, my 1929 680 o.h.v., and having tried it on the road for a few hundred miles now I think I can dare to describe a few aspects of the engine rebuild:

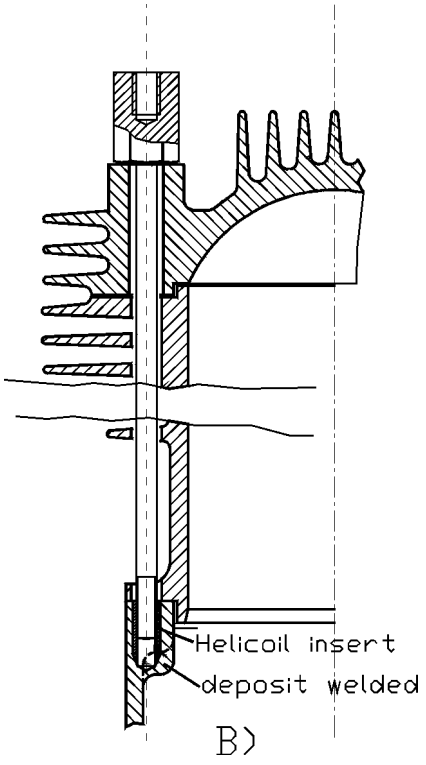
1.) Through bolt conversion.

As I have seen different pictures of disaster and heard a few tales of woe I think trough-bolting this engine is a must for peace of mind. The method suggested by G. Fitzpatrick (in Bill Gibbards 'bible') has certainly stood the test of time. It's only drawback is that you can no longer take the heads off without removing the engine from the frame as there is not enough room to lift the heads clear of the studs. Using bolts tightened down into the crankcase instead of studs would wear out the threads in the crankcase very rapidly. I can only see 2 solutions:



A.) Using relatively short studs that reach up just ½" or 1" above the cylinder barrel in conjunction with long sleeve nuts to tighten down the heads. This means boring out the stud holes in the (irreplacable) heads to at least ½" dia. to accommodate the sleeve nuts. Has anybody tried this yet?

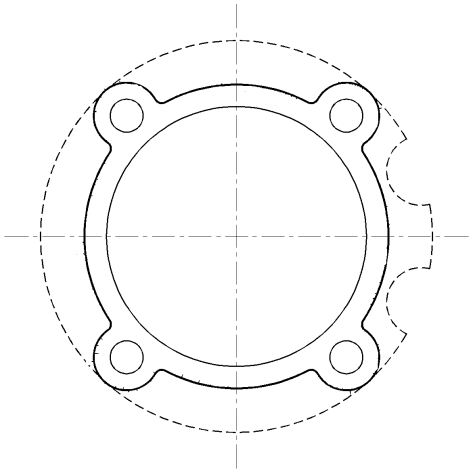
B.) Helicoil inserts in the crankcase. Unfortunately there is not enough meat to use 3/8" bolts with helicoils, so you have to go down to 5/16" bolt dia.



I have chosen the latter option, as I feel it means the least amount of irreversible alterations. I used high tensile (10.9 = 65 ton/sq.in) bolts. This is a grade of material which you can still machine and cut a thread to the upper end to add a head suiting your needs (but you need a good HSS die). The corresponding Helicoil is about 3/8" in outer dia. As you need some thread length in the Helicoil I had 4 spots welded into the inside of the crankcase in the places where the threads tend to break through. Thus I got about ½" thread depth. From stress calculations I found these bolts have to be tightended about ¼ ... $^1/_3$

turn from hand tight to achieve the right pre-tension.

When looking at these calculations for a second time, they did also show me why my head gaskets leaked on the first trial runs! You simply do not get enough pressure stress on the solid copper gasket to make it yield and thus give a good seal (yes I have annealed it...). The problem was cured by reducing the width of the seal to about 6mm, see sketch. I think this should also be useful on engines with normal barrel mounting. I have done 600 miles now since the conversion and things are still fine.



2.) Pistons

I have found a relatively inexpensive and very good replacement piston for this engine. It comes from the quite common Fiat/Alfa Romeo/Autobianchi 999cc 4 cyl. FIRE engine (no, this is not an especially hot one, to my knowledge FIRE stands for Fiat Research, it was a low-emission engine development project). I obtained it from our German aftermarket manu-facturer Kolbenschmidt (KS) where it is available in 3 sizes: 70.0, 70.4 and 70.6 mm under part Nos 94348600, 620 and 630 respectively and costs about 25 £ each. It has a flat top and a comp. height of 33.85mm which will give 1:6.7 compression in a standard engine. The gudgeon pin is 18.0mm dia., so the small end needs boring out a little. The only trouble is that this piston has no circlip grooves, so you have to use end pads or shorten the pins and cut your own grooves (which I did on mine).

These pistons run on an incredible 1 thou clearance in the (albeit water cooled) FIRE engine, as they have a cast-in steel contracting ring for low expansion. I chose to use 3.2 thou on my engine and have not had any troubles so far. I am still going a bit easy, but after a short outing I had last autumn together with a friend riding his well-sorted 1939 1000cc Square Four my friend admitted he had to use full throttle on quite a few occasions and had still had a hard time keeping pace!

3.) Spark plugs

I run the pistons with the oil scraper rings removed, thus the rear plug tends to oil up if too high a heat range is used. I have now settled for a Bosch W7DC in the front and W8DC in the rear head. These are long reach (3/4") plugs with a 14mm thread, used with an adaptor.

Maybe I will put the scraper ring back in, at least on the rear pot.

4.) Gearing

I have geared the bike to give 1:4.0 in top gear. This means 1:10.6 in first, as I use a CR gear cluster. In spite of this, getting away on a hill is not a problem, and the engine does not revv itself to death if I cruise at 70 mph.

I hope the above is of some help when deciding on similar problems.

Best wishes
Wilfried