

Machining The Ram (con't) and Ram Cap

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Today I finished machining the ram and machined the ram cap. I got to use all of my new techniques and they worked very well.

The Ram

I start by placing my soft blocks. They are clamped to the table roughly where they will



best support the ram casting. The end mill is then used to take a light cut on the horizontal and vertical surfaces. This insures that the casting will be parallel to the table and parallel to the X axis. It is essential that all surfaces are free of swarf.

The casting is now placed onto the blocks with the bottom reference plane squarely on the horizontal faces of the blocks and the crank side vertical reference plane squarely on the vertical lip of the block. It is then a simple matter to clamp it down taking care not to over tighten the clamps and distort the casting.



I then side milled the back end of the ram just to clean it up.



The ram cap pocket is done next. I would prefer to not side mill the vertical part of the pocket but don't see any choice. By making repeated passes without advancing the table, I will be able to remove essentially all cutter flexure.



The vertical surface is now done. I could switch to my shell mill for the horizontal surface but it is so small, I will just do it with the end mill.





It only took a few minutes to finish the job.

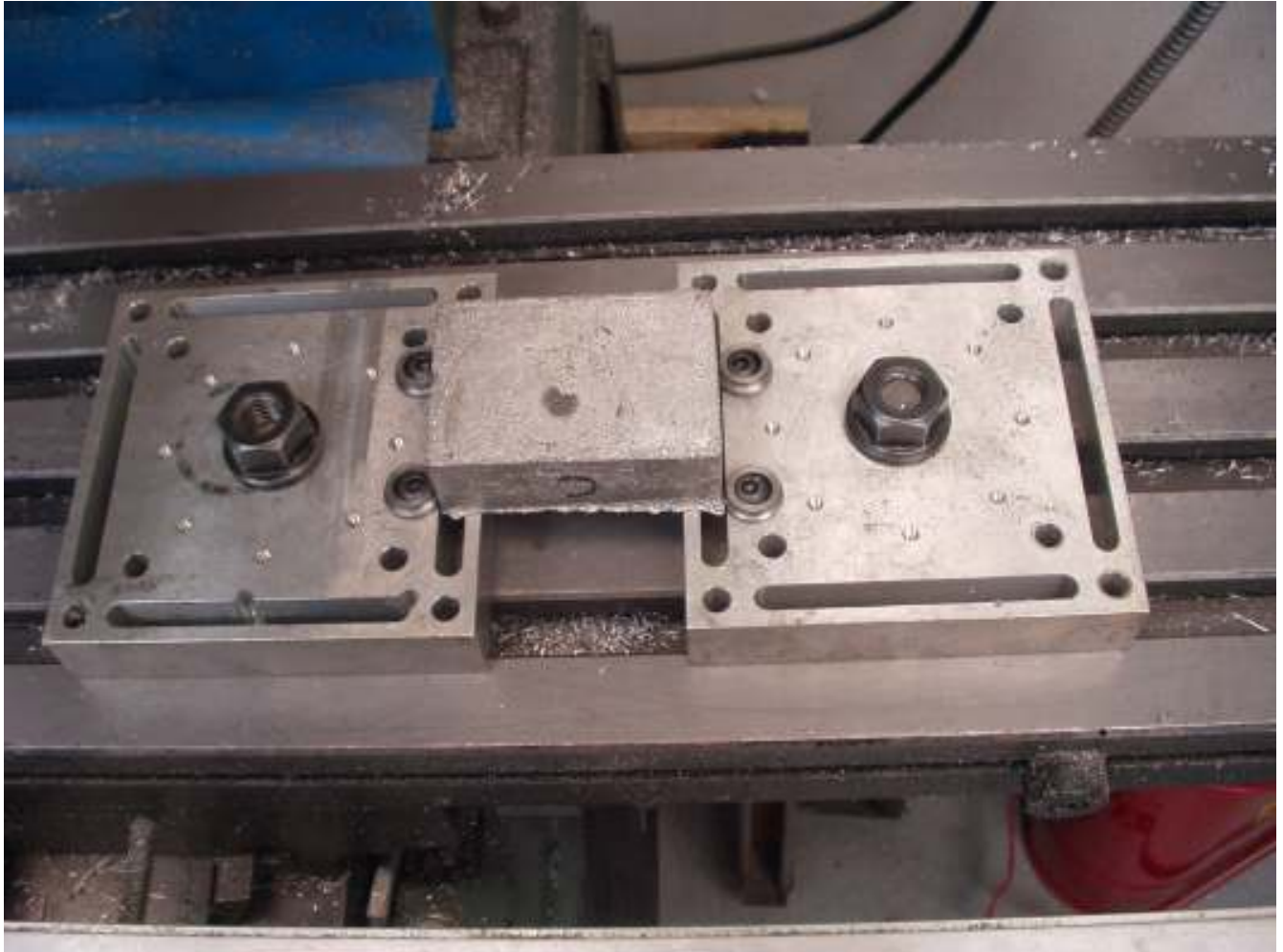
Machining the Cap



The cap was a very simple casting presented in an earlier diary entry. To jazz it up a little, I used a rubber bumper to form the land where the pivot screw will go.

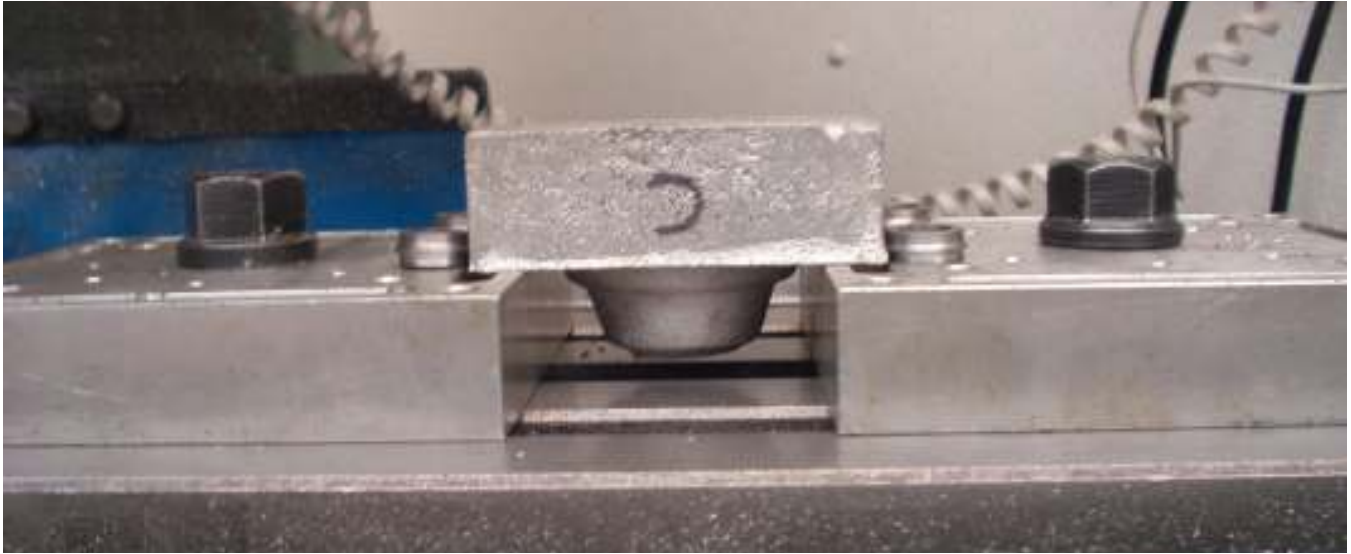
After sawing off the sprue, I constructed this fixture to hold the cap with full access to the cap's bottom surface.

Brian Lamb of the Valleymetal Club suggested this scheme. No big surprise – it worked great! Thanks Brian. A full description of how to make this fixture is presented in the machining part of my web site. I'll just give you the high points here.



This fixture consists of two scrap blocks of 1" thick aluminum. Each has a 1/2" diameter hole in the center to accept a hold down stud and nut. No big deal there. The interesting part relates to those 4 small screws and washers.

Each screw is a 1/4-20 x 1" button head. They have been turned on my lathe with an offset of about 50 thou so the head is an eccentric. The washer is actually a cup. The outside has been turned to form a sharp edge in the middle. The through hole is about 60 thou over a normal clearance hole.



You can better see these screws with their funky shaped washer in this picture. To clamp the casting, I start by tightening the left hold down bolt. The casting was then checked for flatness and found to be rather square so I did not bother with a 3 point support. The screws on the left are turned so their washers are retracted as much as possible from the casting. This means that the lobes point to the left. I then turned the two screws on the right block so their lobes pointed to the right. The right block was then pushed against the casting. Since the casting is not perfectly square, the right block ended up being slightly out of square with respect to the X axis. I then turned the screws on the left and right blocks.

Two forces come into play here. The eccentric action of each screw forces the cutting edge of its washer into the casting while the screw's threads pull the washer down. Even though the contact area is very small, the holding power is amazingly good.



Since I never used this fixture before, I took only a 5 thou cut with my shell mill and I stood as far away from the action as possible. It turned out that 5 thou was enough to fully cut the surface so I'm done. Nothing shifted. It took me about 3 hours to build the fixture including the screws and funky washers. The actual cut of the casting took about one minutes. Such is machining.

With the bottom surface cut, I am ready to use another technique from Brian Lamb. A 1-2-3 block is clamped to the table and the castings bottom is clamped to it. I set the top face roughly parallel with the table using a level. Two C-clamps secure the castings. A quick pass with the shell mill and I'm done.



The last machining step was to put the cap down on the table and clean up the top in preparation for the pivot screw and the 4 bolts.



The front will be squared up on the lathe and the sides are not critical. Cap and its pocket are a very nice fit. I see no light between the surfaces.

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