Fitting the Clapper To the Clapper Box

by R.G. Sparber

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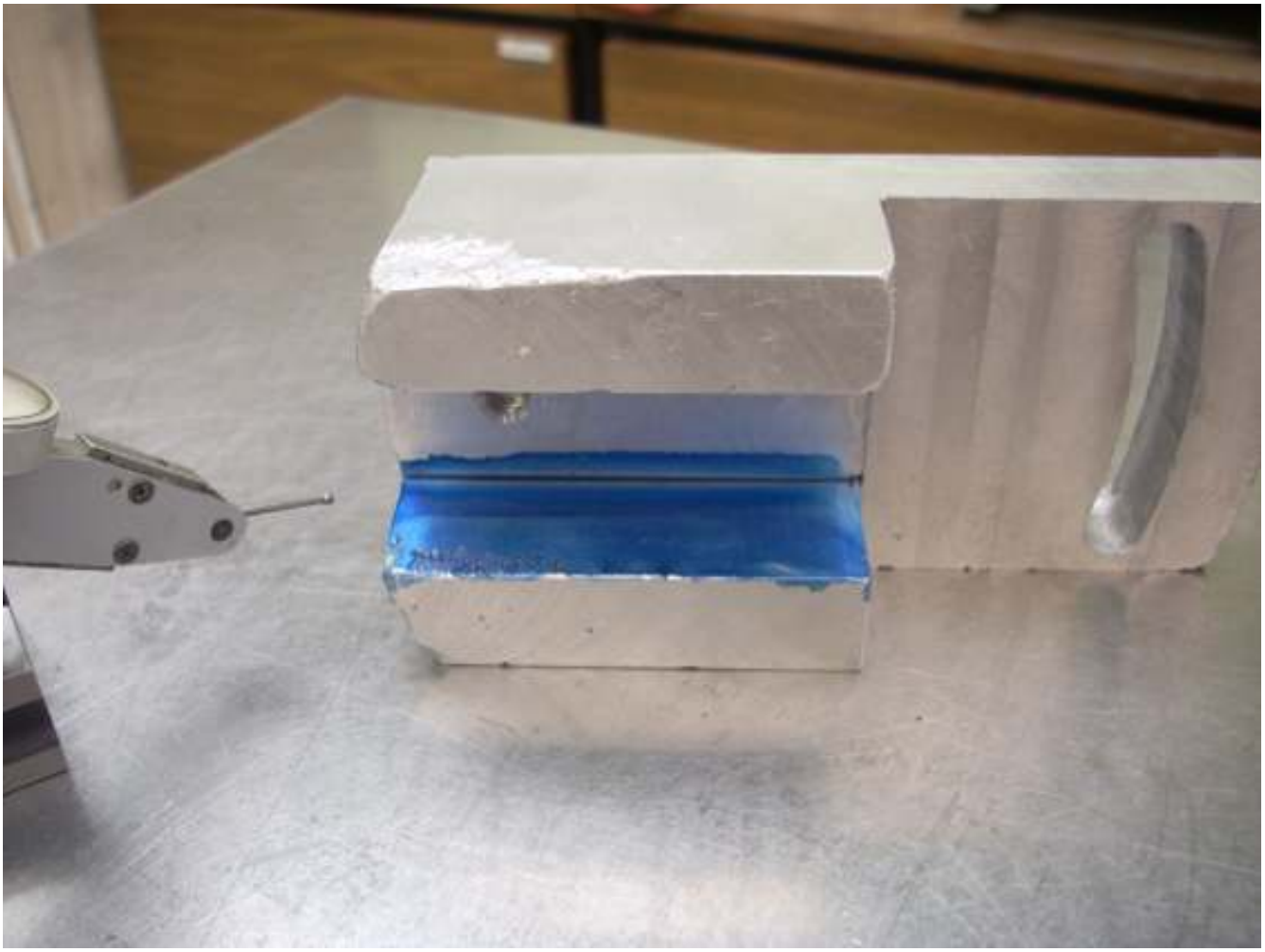
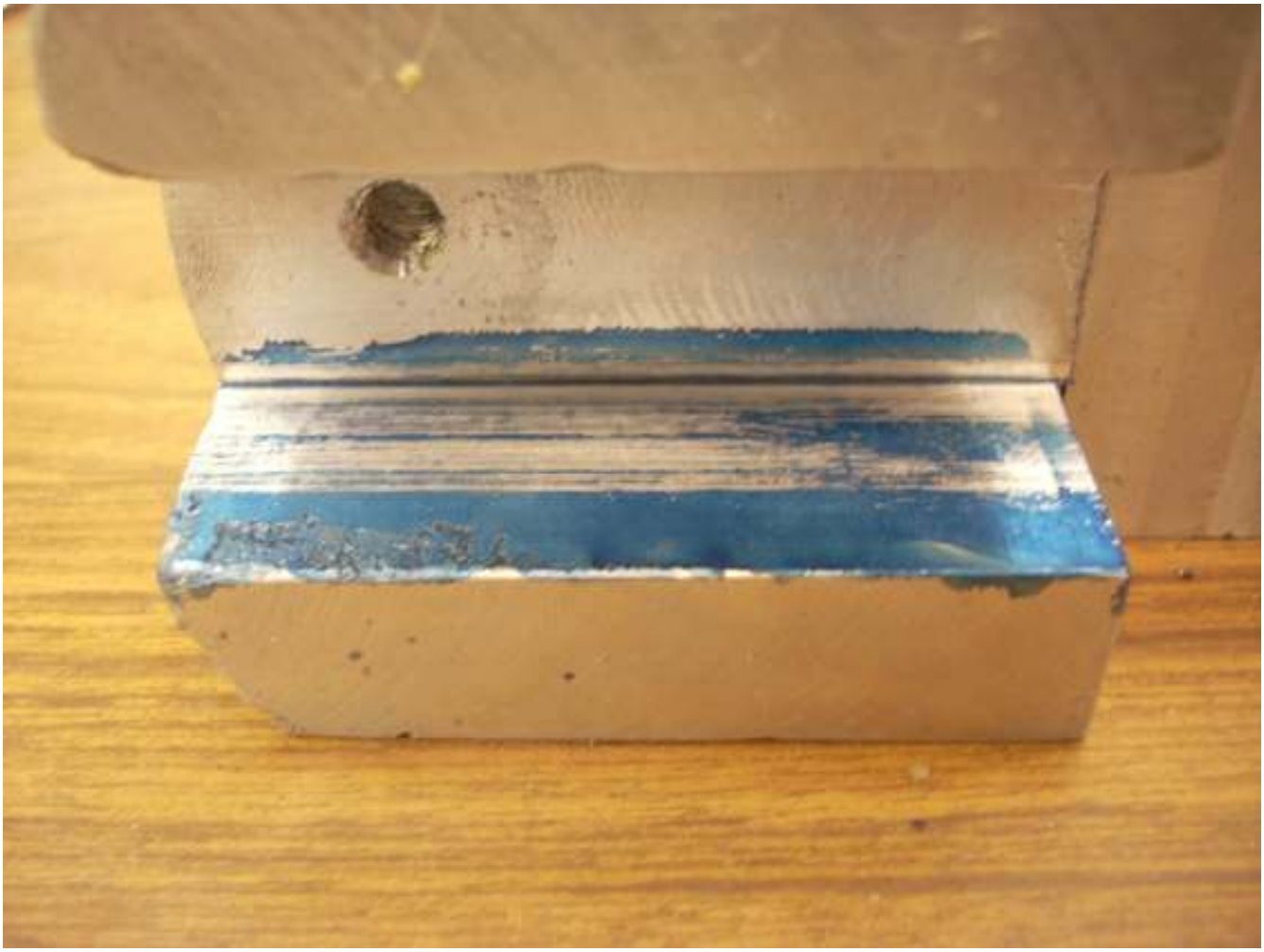
The quality of the cut made by my shaper will depend heavily on how well I fit the clapper to the clapper box. If it is a sloppy fit, the clapper will not be solidly supported so the cutter will chatter as it cuts. In the last article I discovered that my box sides were sloped and was asking around to find the best way to solve this problem. We are talking about a 0.001 5" difference between the top and bottom of the box.

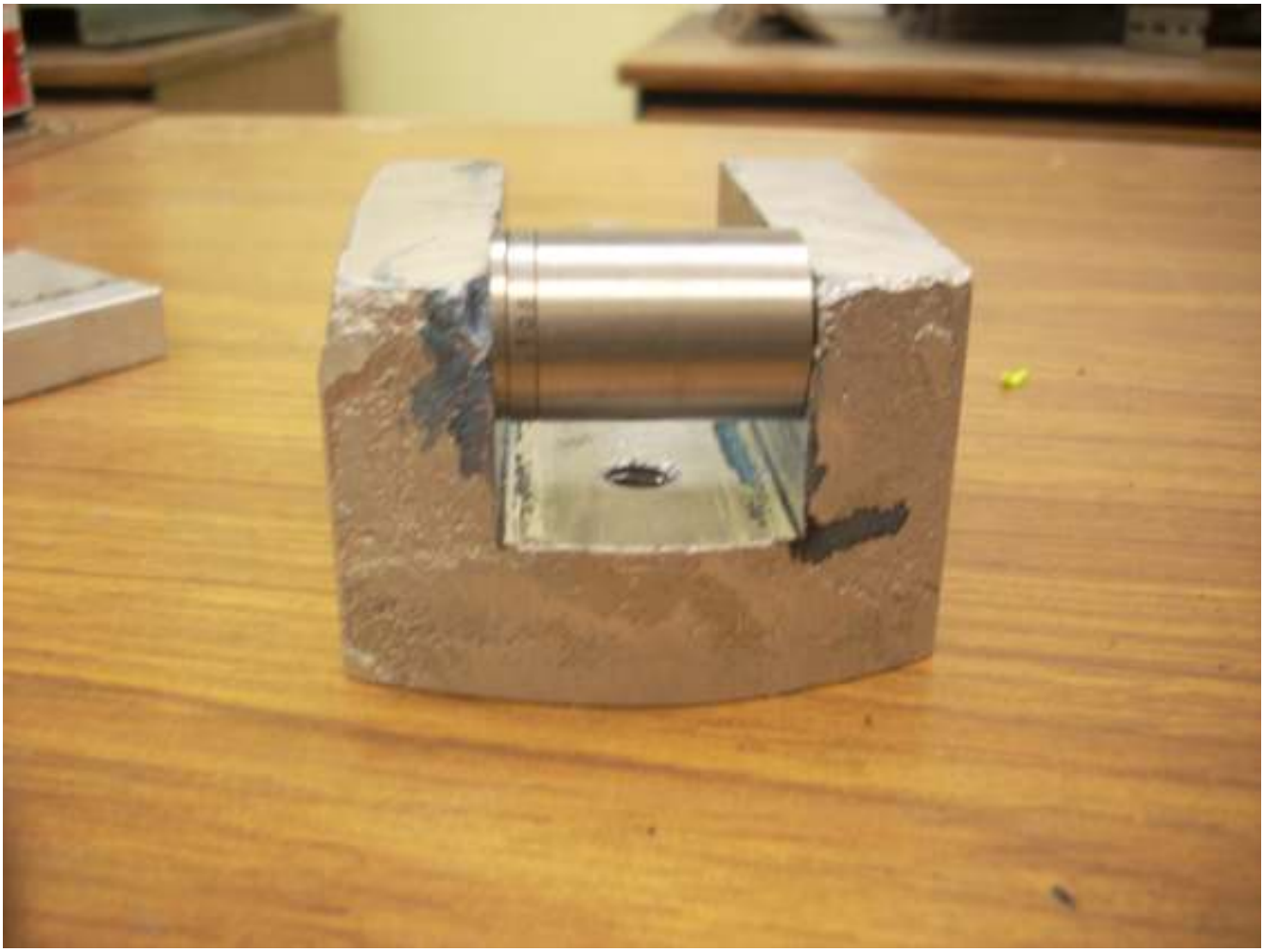
The approach I chose is simple and worked well. The surface to be cut is first blued.



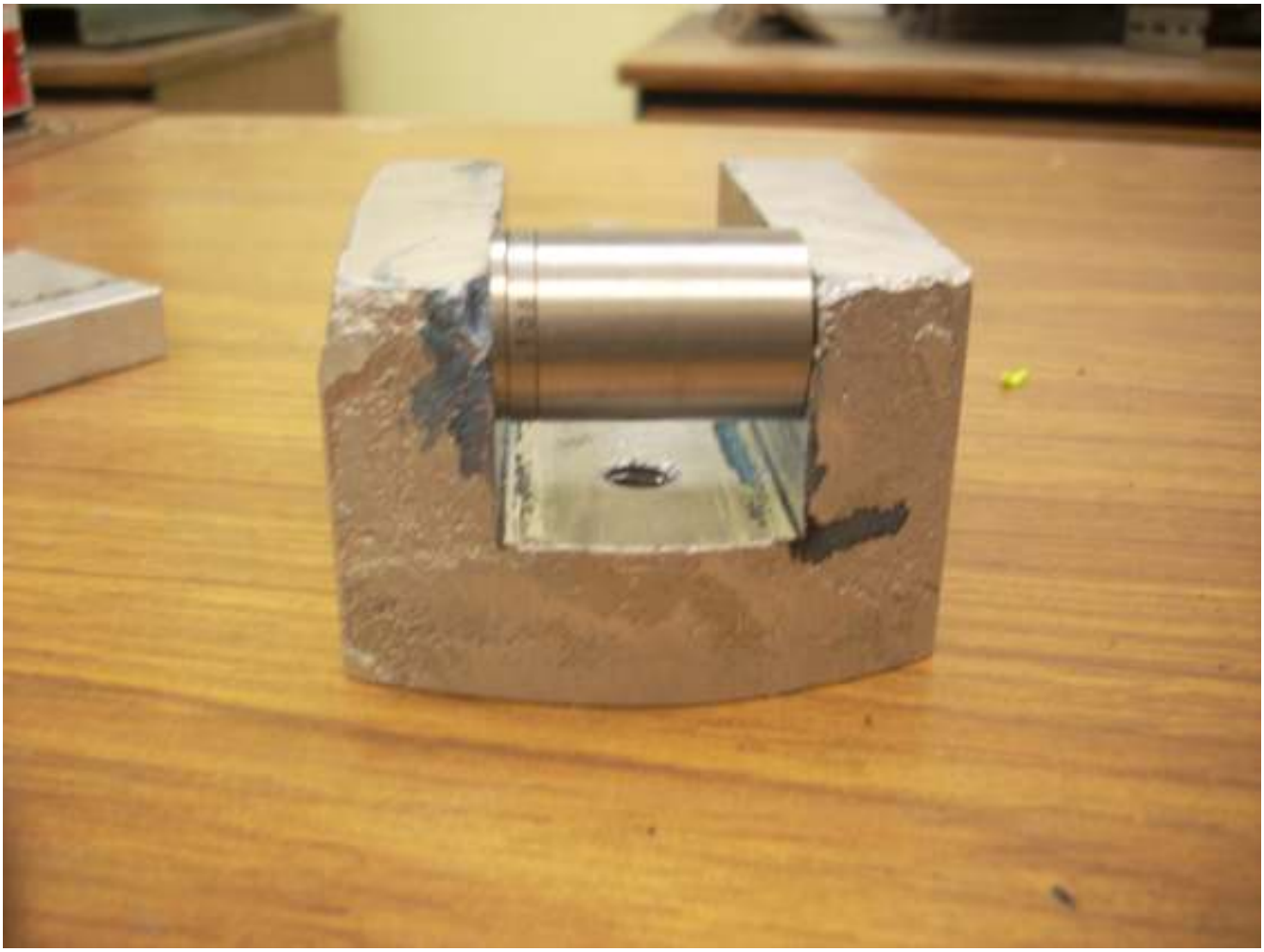
I use my DTI to find where metal must be removed. As expected, the bottom of the box is narrower than the top.



Using the bluing as a guide, I gently used a clean file to remove most of the bluing in the area I want to reduce. The process takes around 0.000 5” of metal as it takes the bluing.

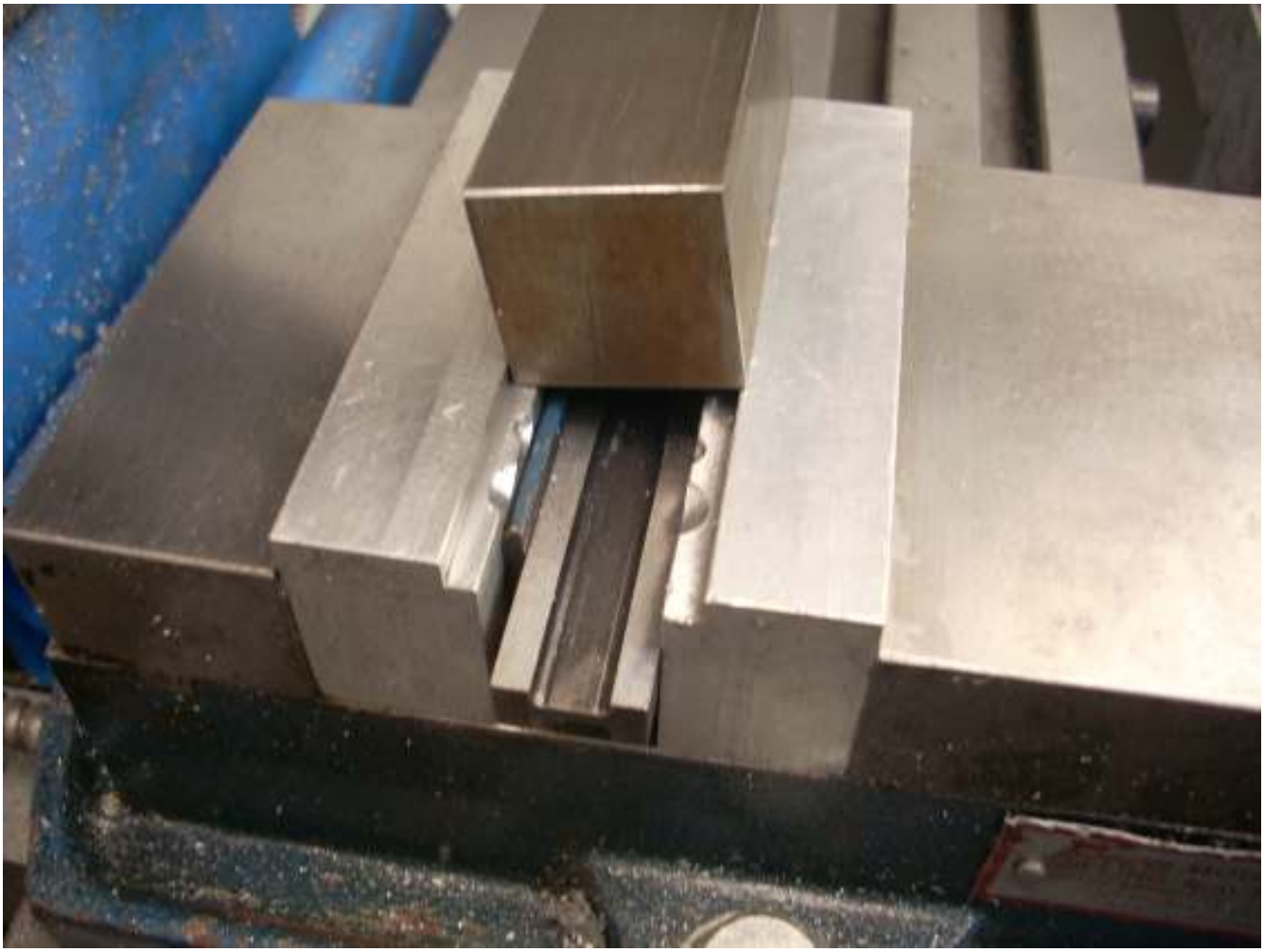


I used my spacer blocks to monitor my progress as I removed small amounts of aluminum from both sides of the box.



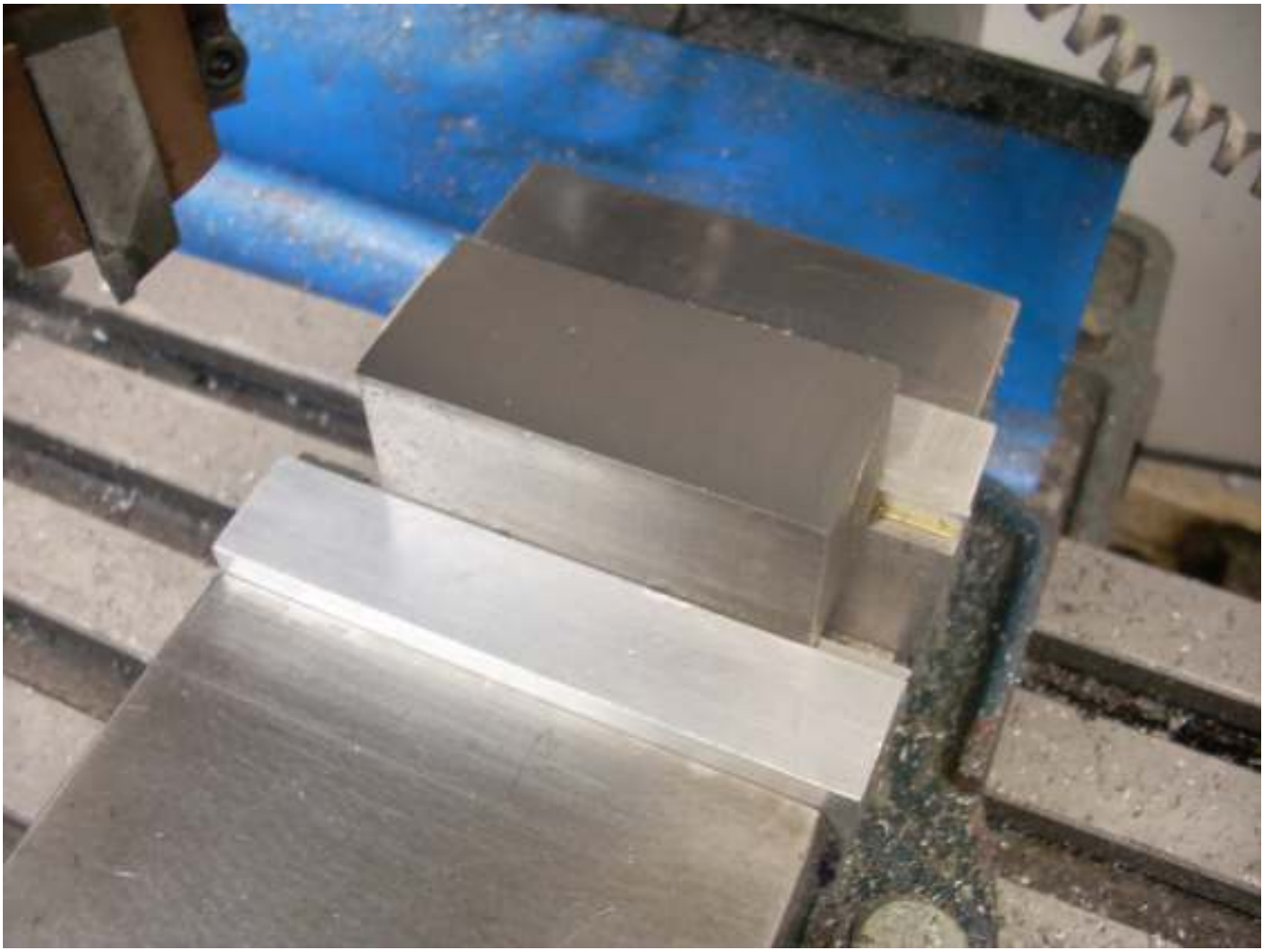
In the end I was able to remove most of the taper. The final fit must wait until I have made the clapper.

I chose to make my clapper out of steel rather than cast aluminum. This will make it more difficult to cut the tapered pivot pin but should provide more support to the shaper's cutter.



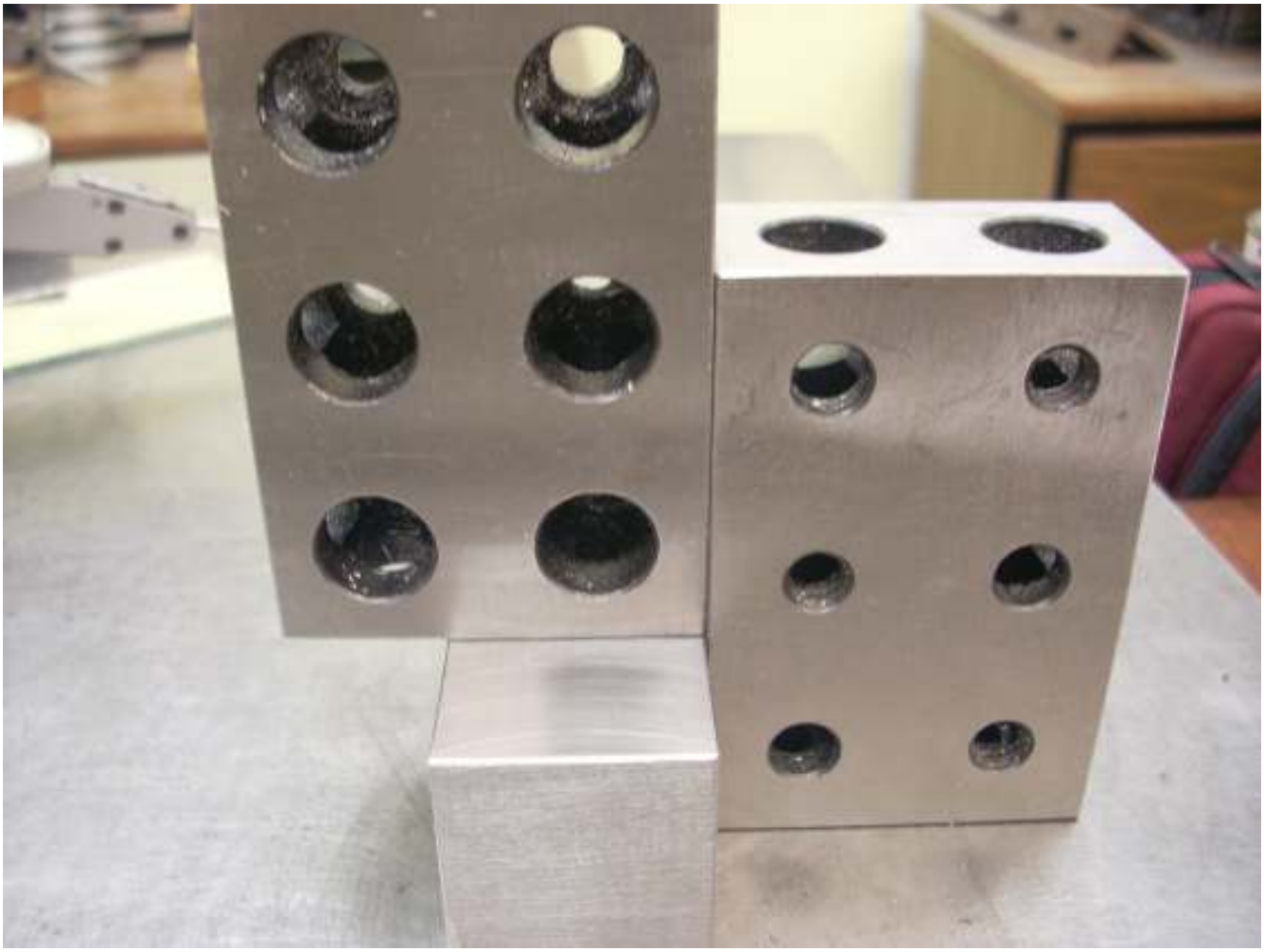
After sawing off a block of 12L14 steel, it was time to cut fresh surfaces on my soft jaws. The jaws are clamped to packing such that the jaws are about as far apart as they will be with the block in place. This step minimizes any error along the vise ways.

I then took a light cut across the sides and bottom of the steps and did my best to remove every tiny bit of swarf.

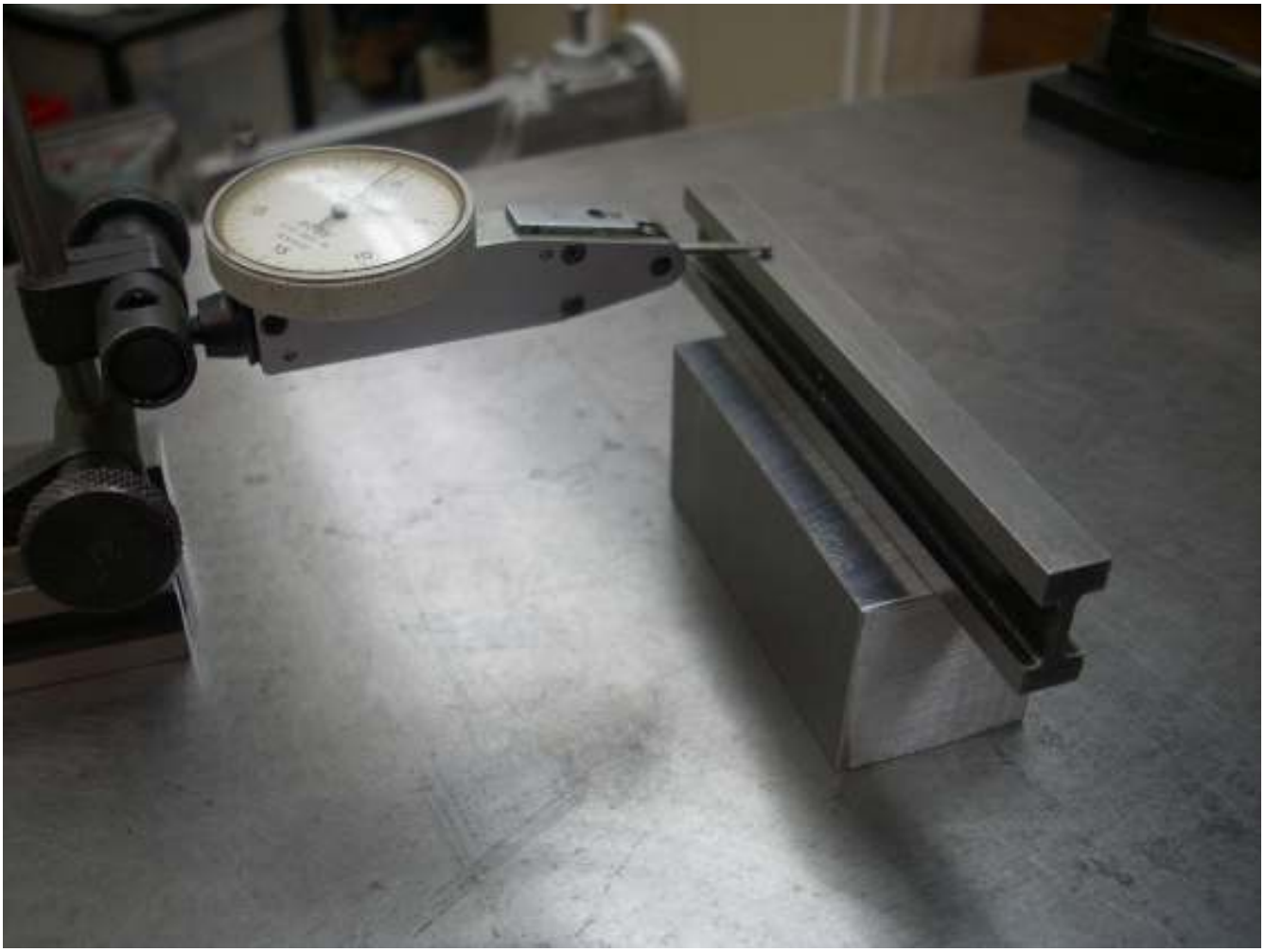


The block is now clamped and ready to be squared up. The top face is shell milled using plenty of cutting oil. The 12L14 contains lead which is a nice lubricant but I figure a little bit of oil can't hurt.

The procedure for squaring up the block consists of cutting the top face to a depth of 0.015”. The block is deburred and the soft jaws cleaned. Then the cut face is set vertically up against the fixed soft jaw and clamped by the vise. The second face is then machined. Again the block is removed, deburred, and the fresh cut surface placed vertically against the clean fixed soft jaw. When all four faces have been cut, it is time to test the block for accuracy. By taking the same amount from each face, I hope to minimize any warping of the block.

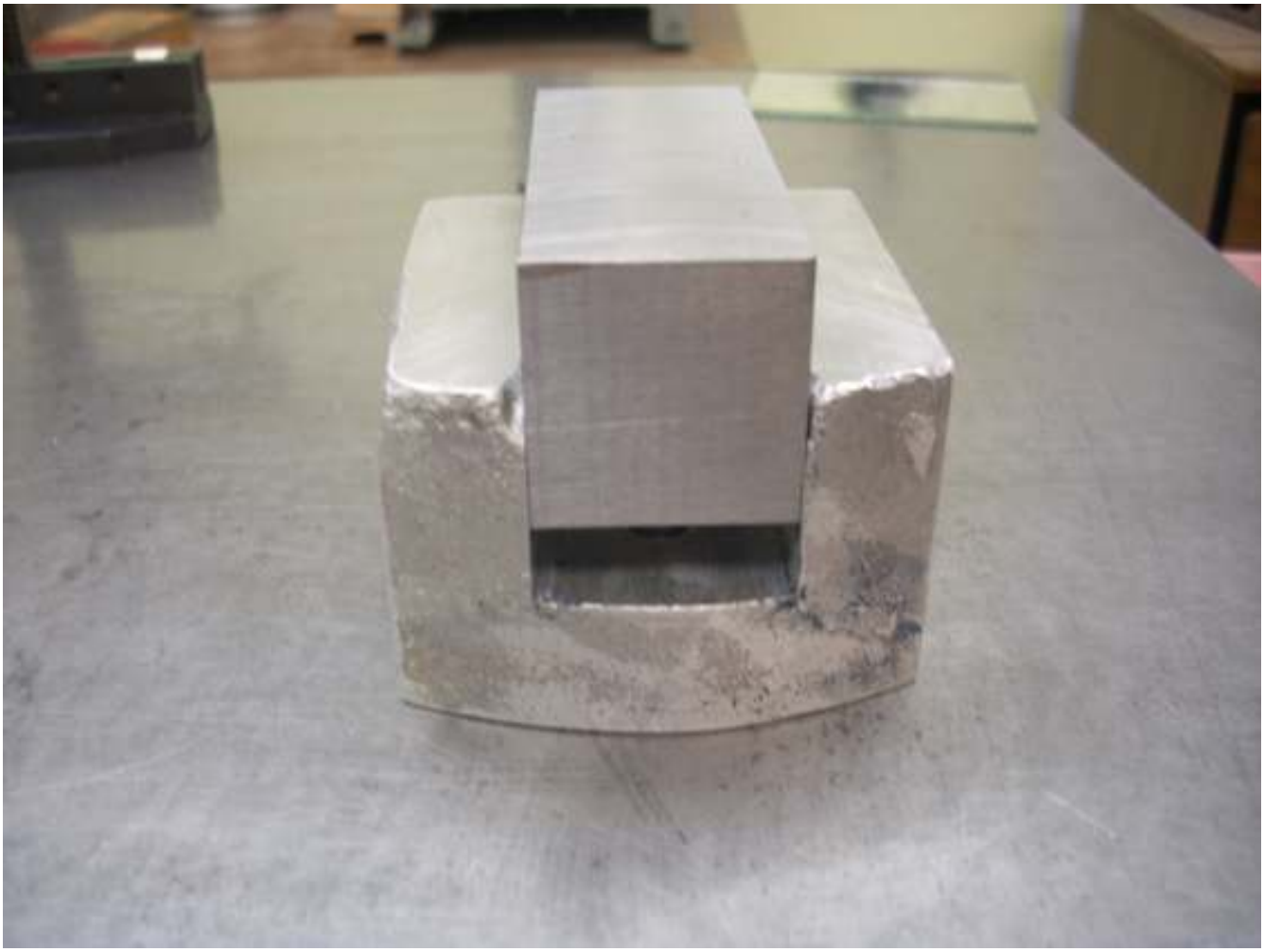


To test for squareness, I used two precision 1-2-3 blocks and looked for light between the 3 blocks. All was nice and tight so my block is reasonably square between the top face and the right face. The block was rotated 180° and the diagonally opposite corner was tested. It looked just as good.



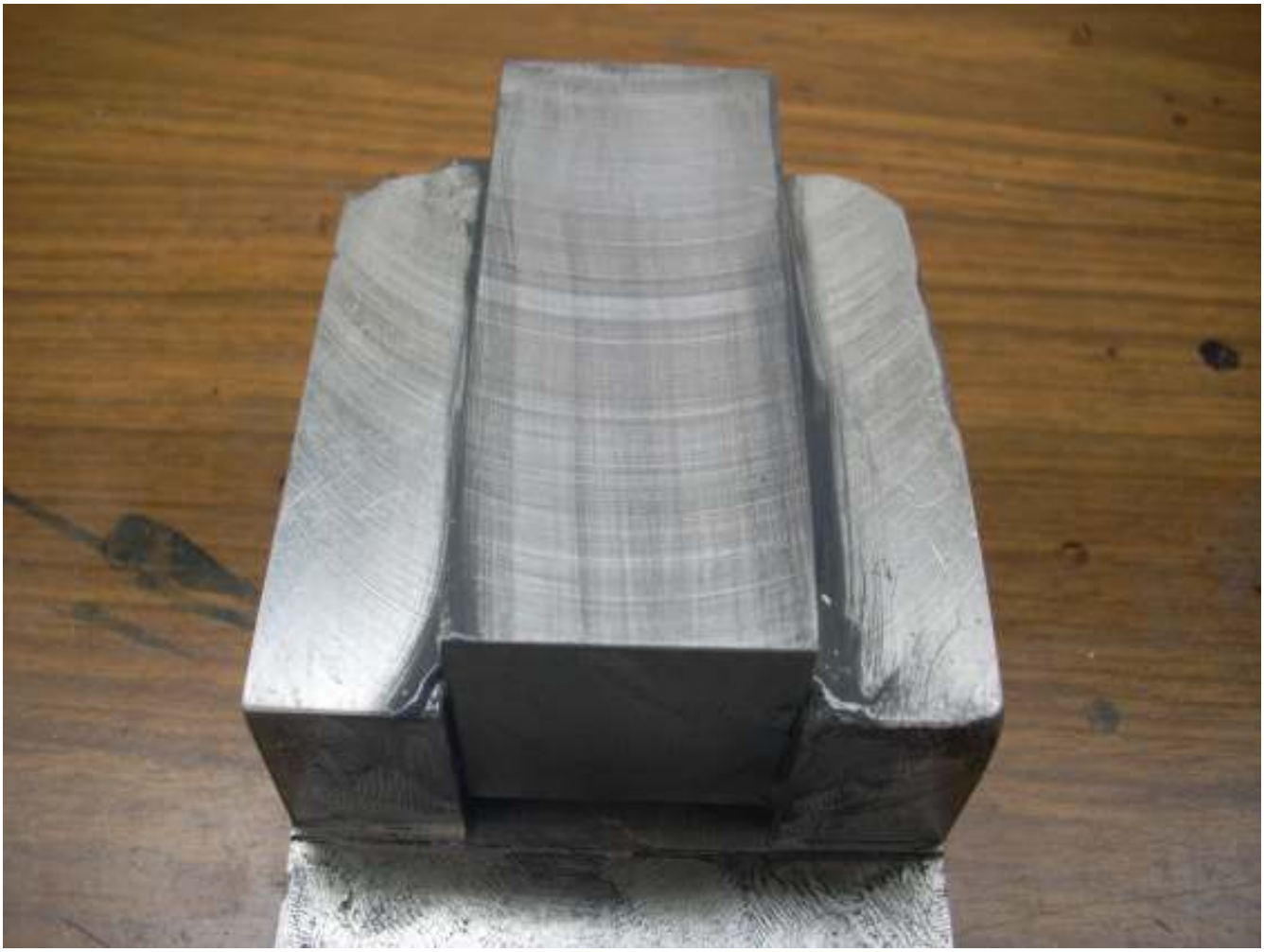
Next I wanted to verify that opposite faces are parallel. The DTI is run on the parallel so I don't get a bumpy ride on the relatively rough finish of the block. These sensitive DTIs sure do make me look bad. Anyway, I saw less than 0.000 5” of variation from one end of the block to the other. The block was rotated 90° and the test repeated and passed.

The block went back into the vise. This time I cut the width to match the box. I really don't care what the width of the block is but do care that it fits. To this end, I zeroed my digital caliper to the width of the box at the top of the slot. As I machined the block's width, I could tell when I arrived at a good fit to the box.

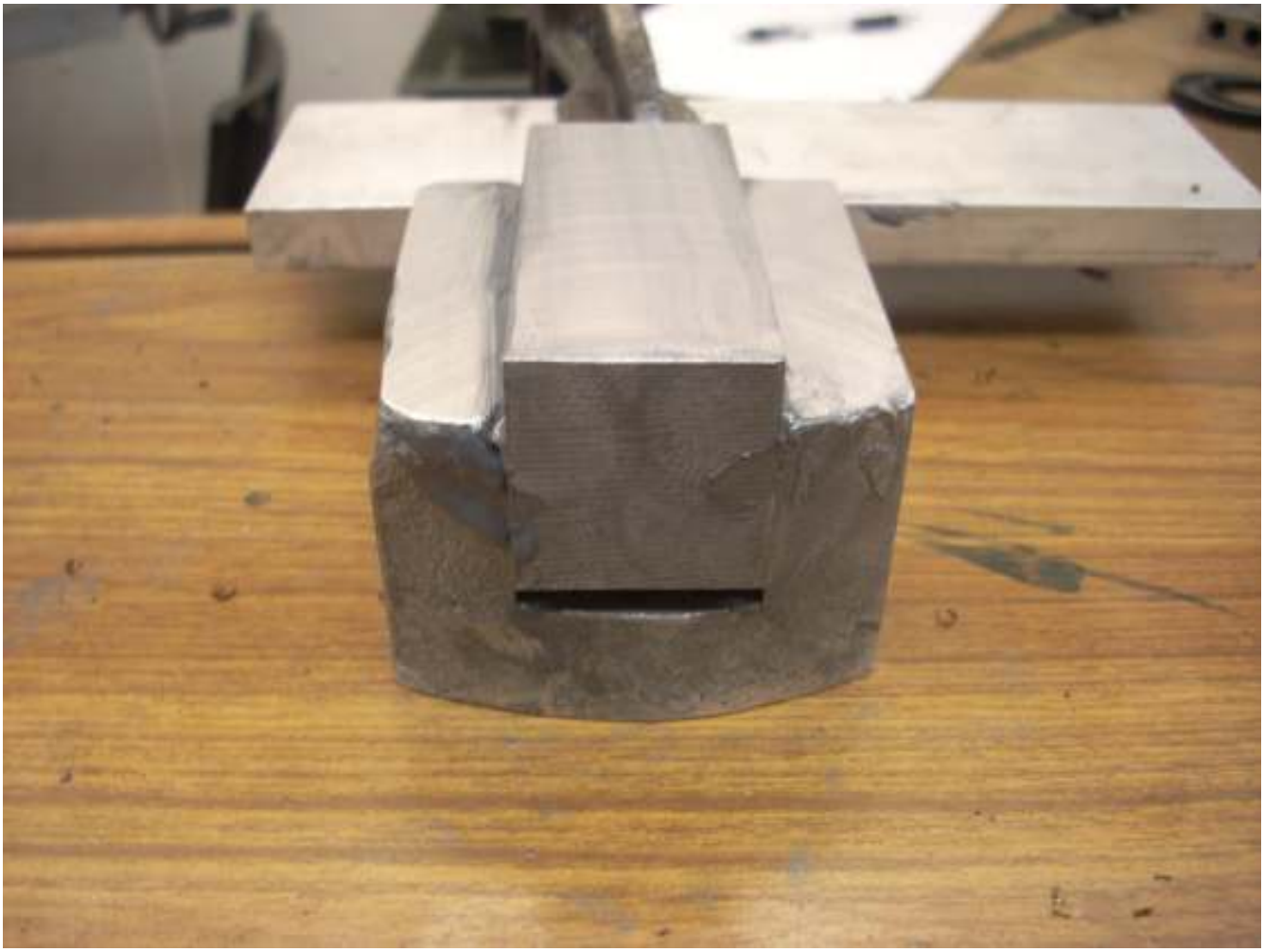


It doesn't take much taper in the box to prevent the clapper from dropping all the way down. If I had cut the clapper to match the top width of the box, it would have been much higher in the slot. Oh well. My machines and my skills certainly have their limitations. At least I can get a great fit for the bottom half of the box.

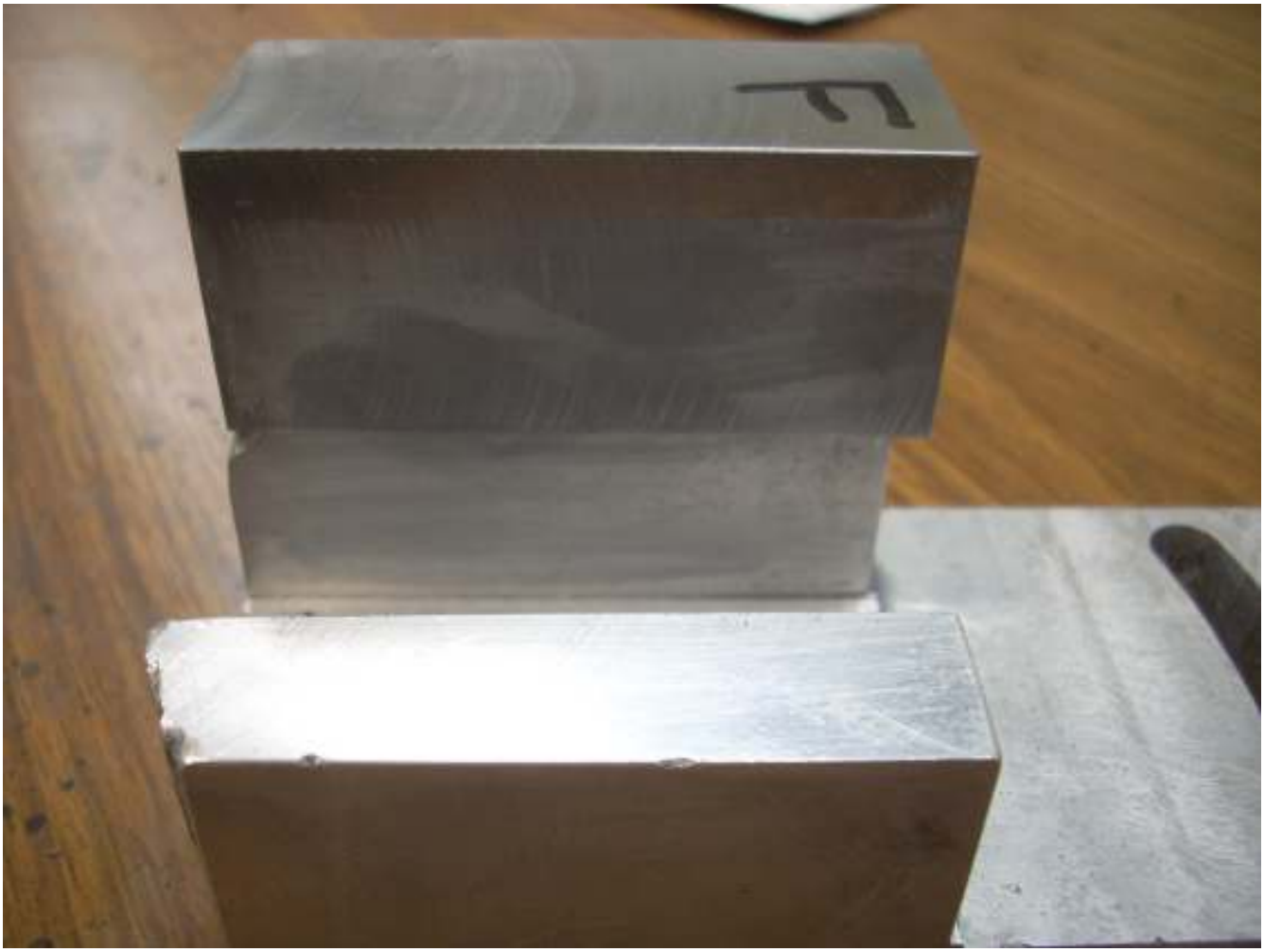
In order to get this last tiny bit of aluminum exactly the right width, I decided to put 600 grit lapping compound on the steel block and use it to remove some of the aluminum box.



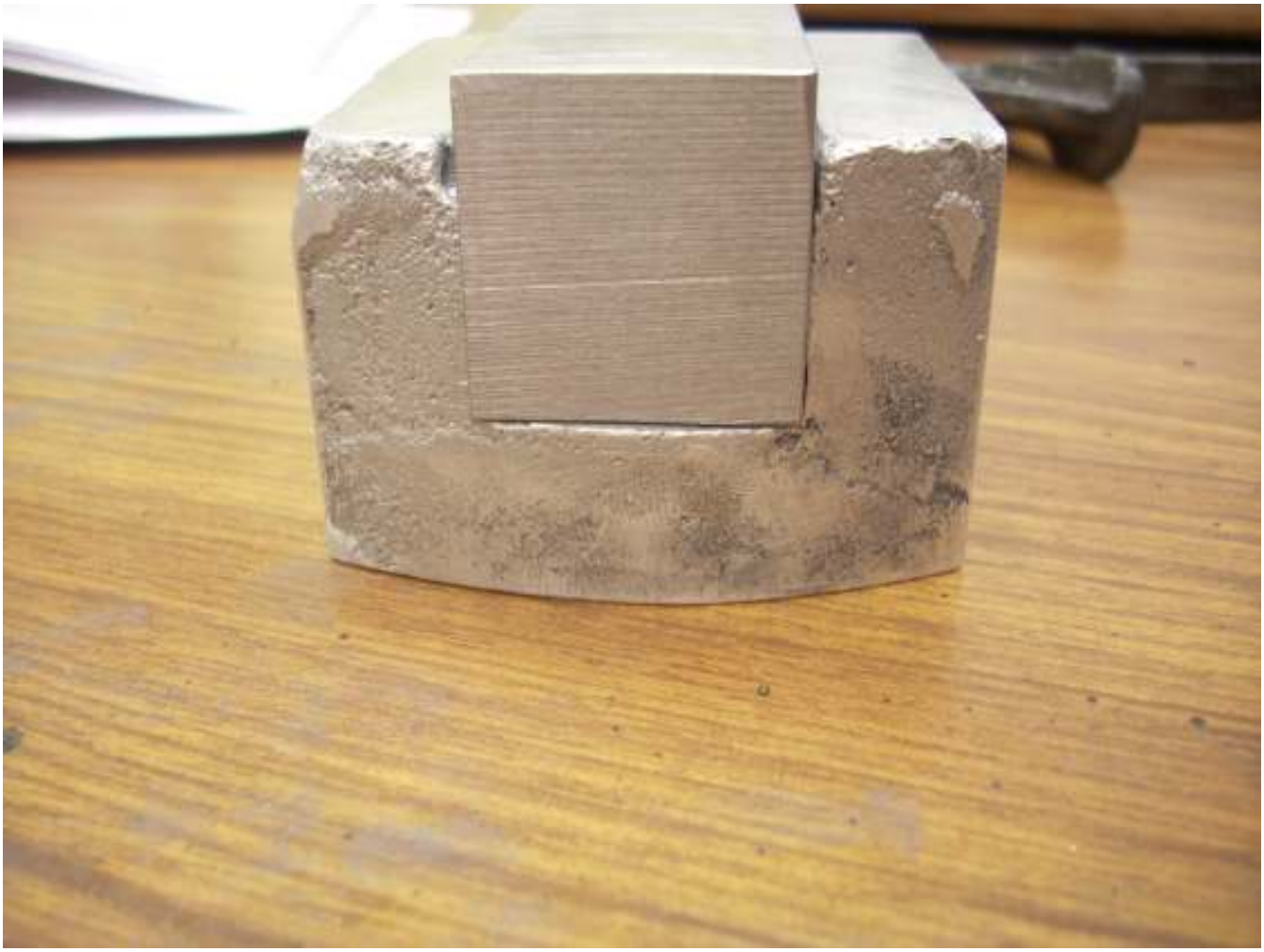
It took some time moving the clapper back and forth, but it slowly removed aluminum and the block sank into the box.



Just a little bit more and I'm done.

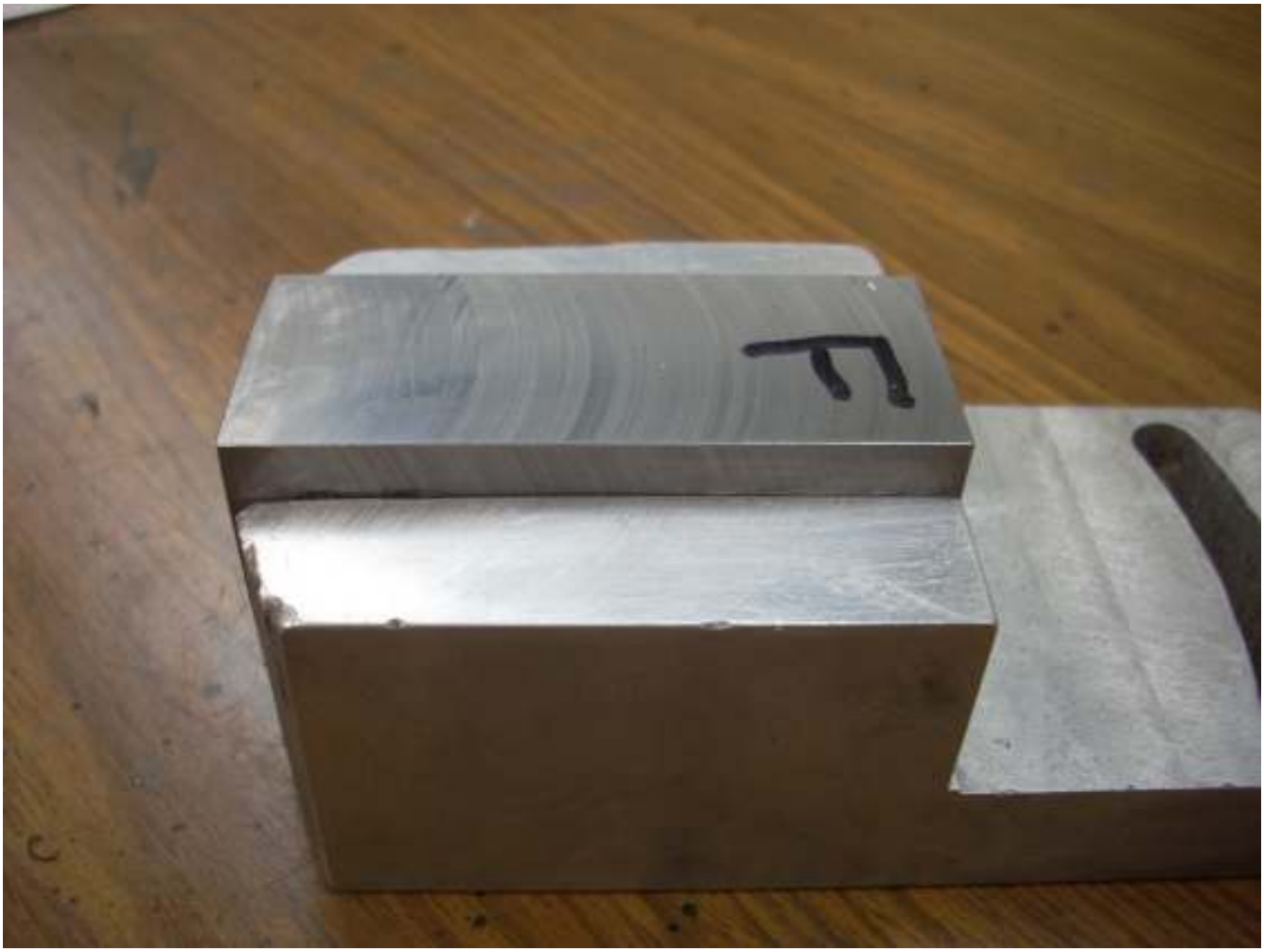


Here you can see the lapped aluminum inside the box. The 12L14 also looks a bit smoother.



You may recall that before lapping the block went in half way. This tells me that the top half of the box is slightly wider than the block. The bottom half of the box is now a snug sliding fit to the box.

I took a piece of 0.001” cigarette paper and placed it between the clapper and the box. As expected, the clapper only went in about half way on the right. The fact that the clapper went into the box a bit more on the left says that that end is a little wider.



When the clapper is in the bottom of the box, I can't see any light between the two and it sure does feel snug. The clapper is not perfectly square because if I put it in the box upside down, it does not fit. We are talking about an out of square condition of less than 0.000 5”.

That is all I did this afternoon. My next task will be to cut the thickness of the clapper so it is even with the top of the box and then add a radius to the top back corner so the clapper can swing out of the box.

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