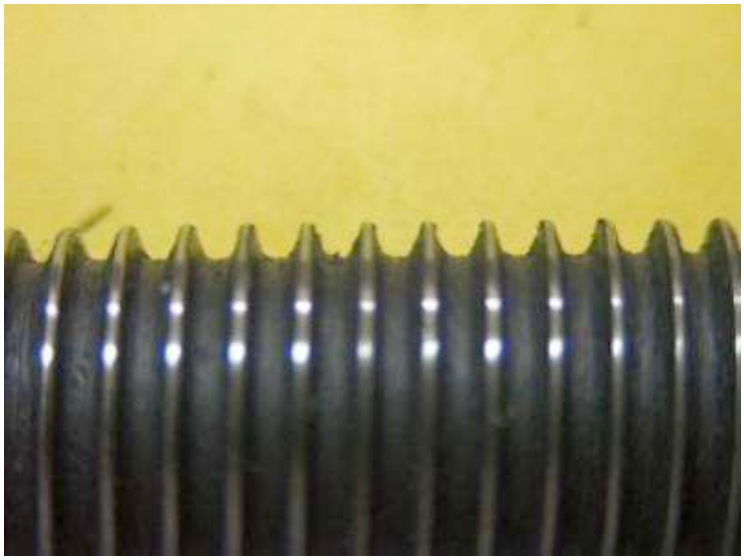
¾" Cross-slide leadscrew replacement

While restoring my Clausing 8520 mill, I decided I wanted to reduce the backlash in the cross-feed. I hadn't even pulled anything apart yet, but I knew the cross-feed handle spun one whole turn before the table moved, so that's .100" backlash. I pulled everything apart, and could see the actual wear on the leadscrew and nut. The acme threads on the ends were still robust, but the threads in the middle were so worn they looked like regular, 60 degree threads.



Also, the bronze table nut exhibited the same problem

I called Clausing, and they had the parts available, but it would cost close to $500. The bulk of this article will deal with how I replaced the leadscrew and nut using off-the-shelf parts from McMaster-Carr and a little effort for < $150.

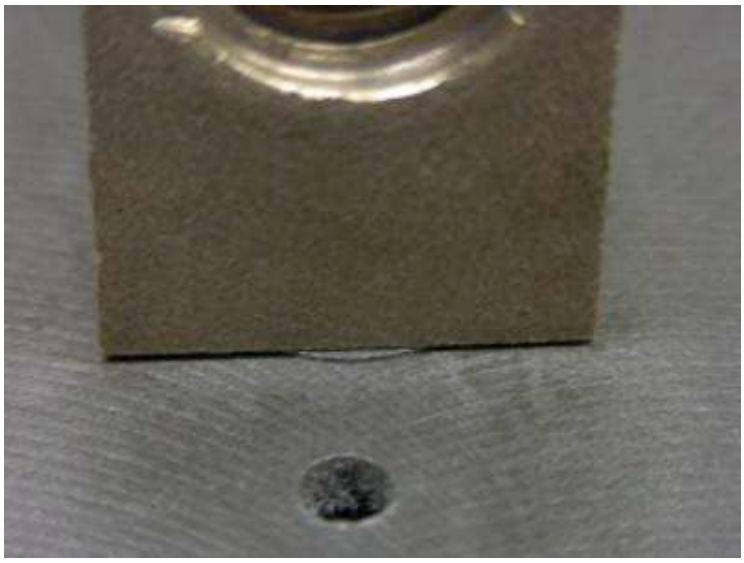
Parts

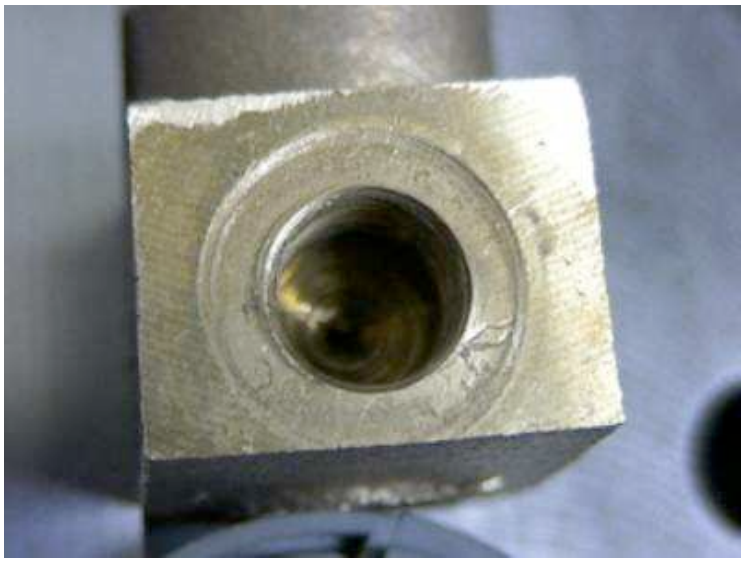
The original cross-slide leadscrew is 11/16" x 10 tpi L.H., and is about 12.5" long. I'll save you the phone calls – nobody sells stock 11/16" acme threaded rod. I wondered if a ¾" leadscrew would be possible, so I started measuring. My biggest concern was the hole in the knee, and it measured j-u-s-t large enough to accommodate the larger leadscrew. So, I got on the McMaster-Carr website and ordered the #99030A43 precision cold-rolled acme rod, and the #1343K236 bronze machinable nut. These components boast a 2C fit, which is a higher tolerance than the 2G 'general-purpose' fit.

Table Nut

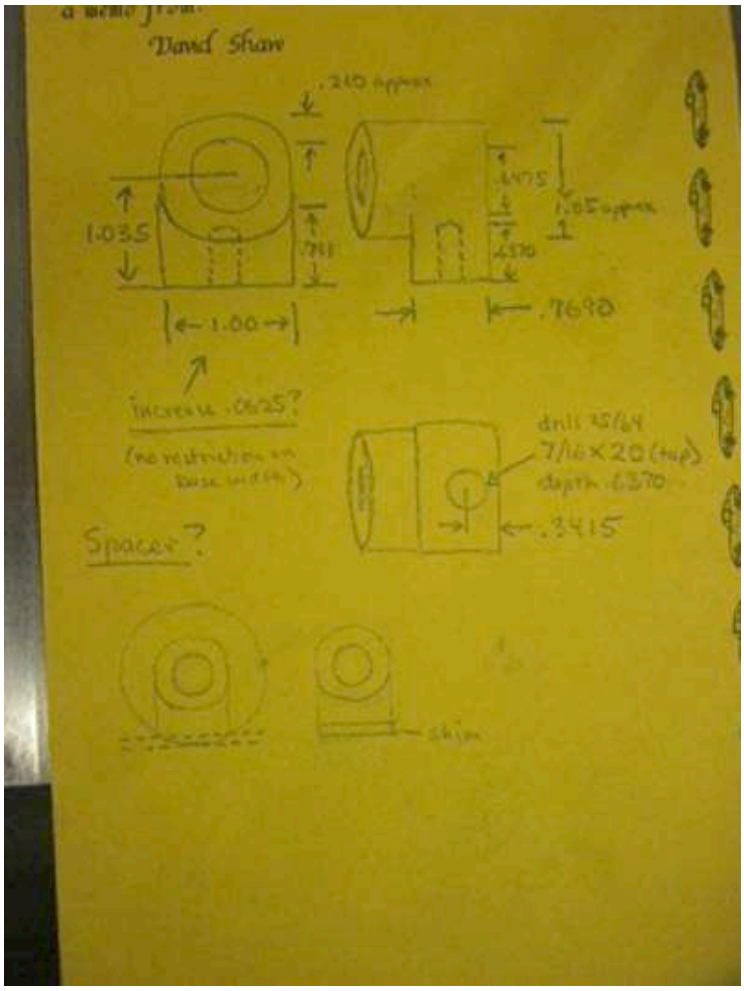
I started with the table nut, because I thought it was the more challenging component. Here's a look at the old nut next to the machinable nut.

My main concern was whether there would be enough material to mill a sufficient-sized flat to mount the nut without some hokey shimming strategy. The original part 'floats' on a couple of precision washers, which had imprinted themselves in the bottom of the bronze nut over 40 years which made measuring a challenge.

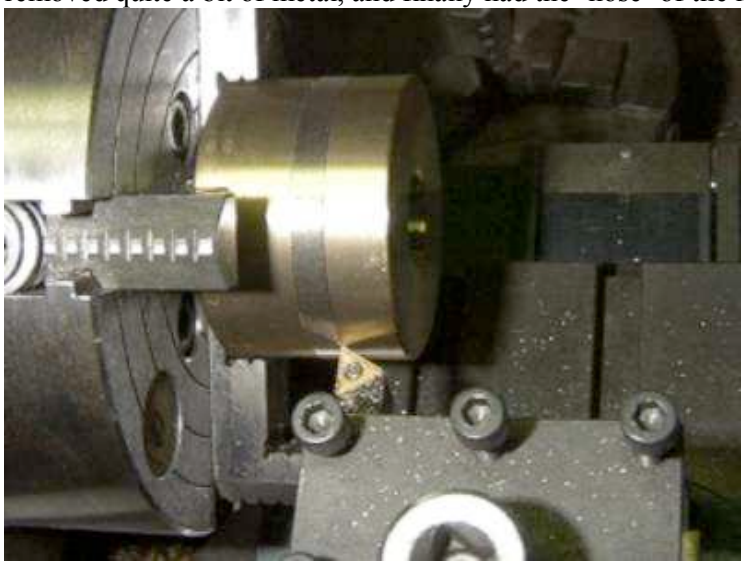


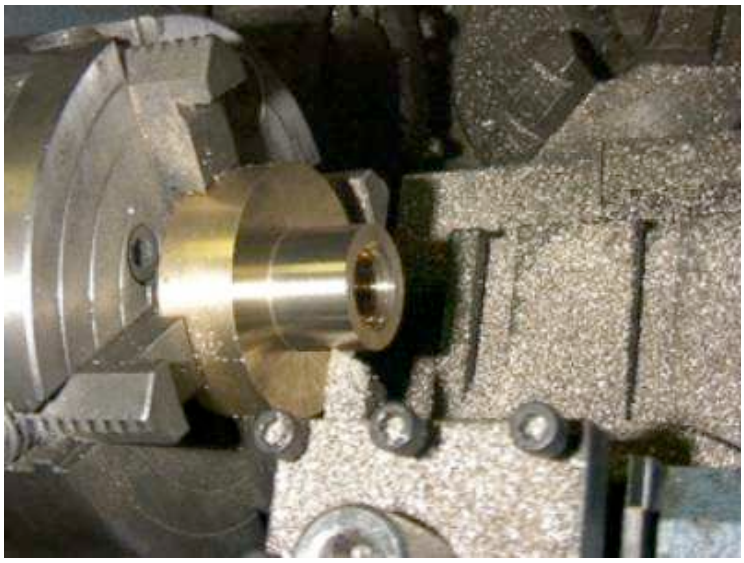


After several nights of measuring, drawing, and remeasuring, I was ready to start making the part. I've included my diagram of the part, but you'd probably want to make your own measurements just so I don't lie awake nights thinking about liability lawsuits.



I reversed the jaws in my 4-jaw, and mounted the workpiece. After indicating the piece in both axes, I began cutting. I removed quite a bit of metal, and finally had the 'nose' of the nut formed.

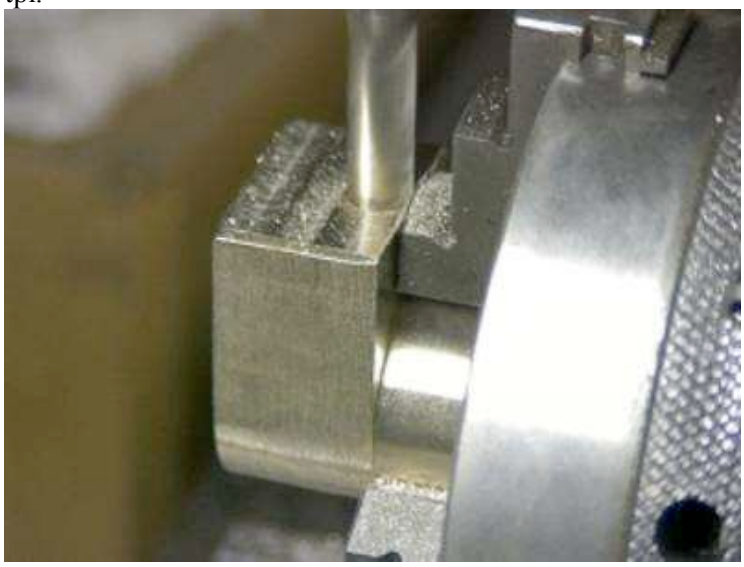


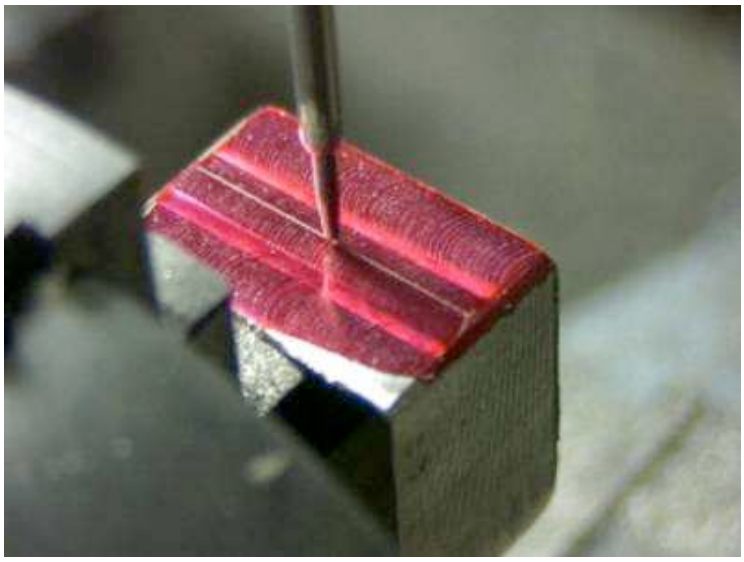


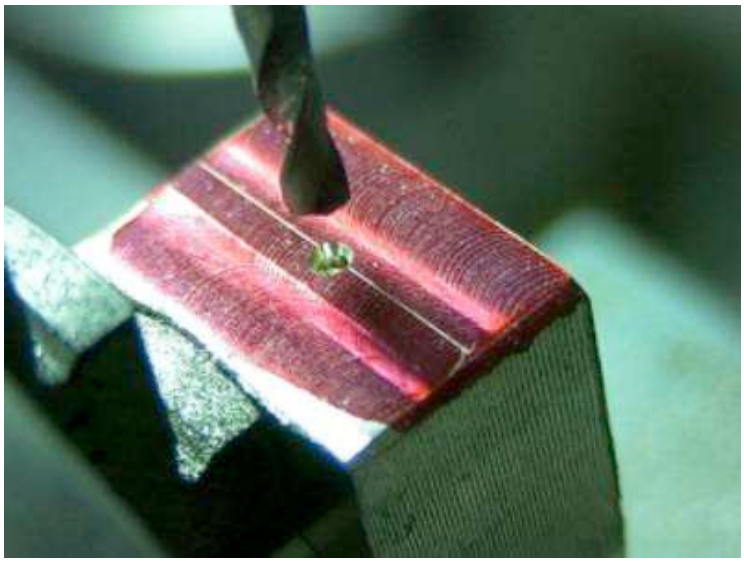
I removed the workpiece, and mounted it on my horizontal bandsaw for rough shaping of the ‘foot’.

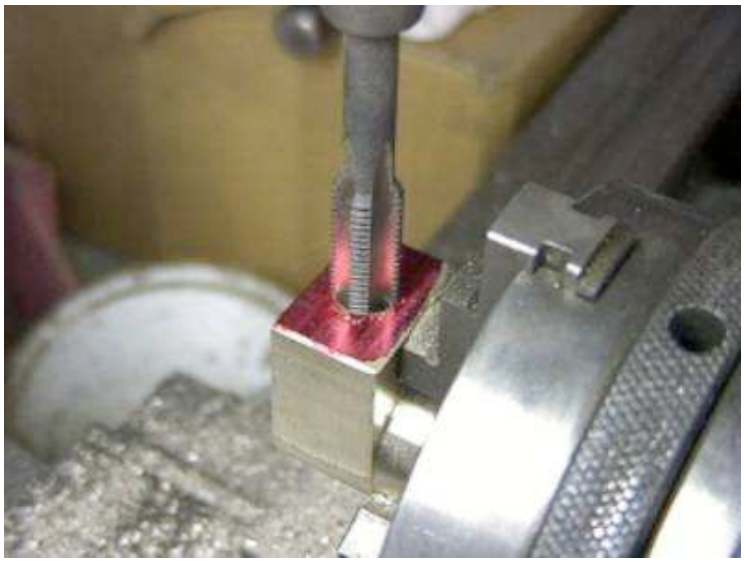
After a couple of passes on the bandsaw, it was beginning to take shape.

I ground on the nut a little to round things out, then mounted it upside-down in my rotary chuck to begin milling the flat that will mate to the saddle. After completion, I prepared for drilling, then center drilled, then tapped with a 7/16” x 20 tpi.

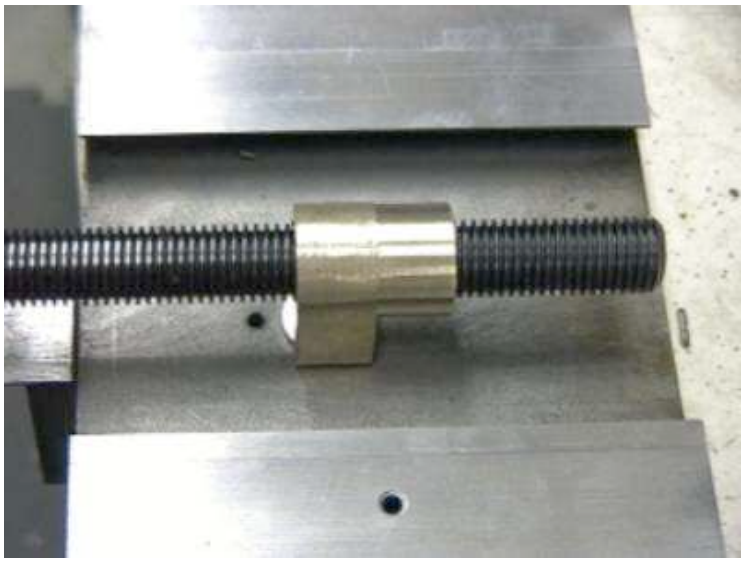




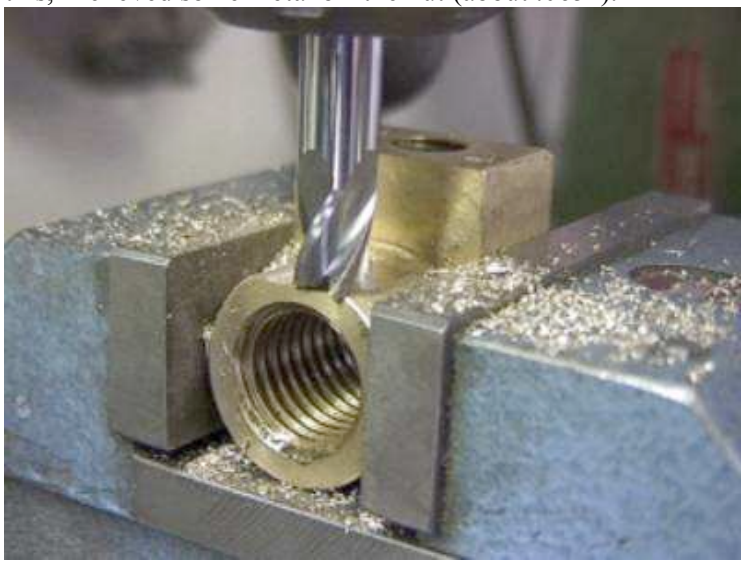




Here's a picture of the finished nut and mounted to the saddle.

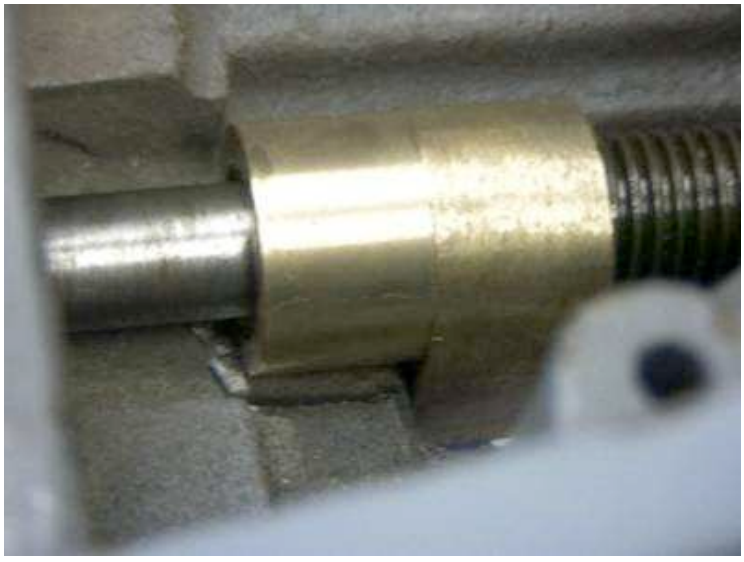


However, I was to learn later that I had one more machining operation before I was finished. Due to the increased diameter of the screw, the 'nose' interfered with the knee when extended furthest away from the column. To rectify this, I relieved some metal off the nut (about .065").



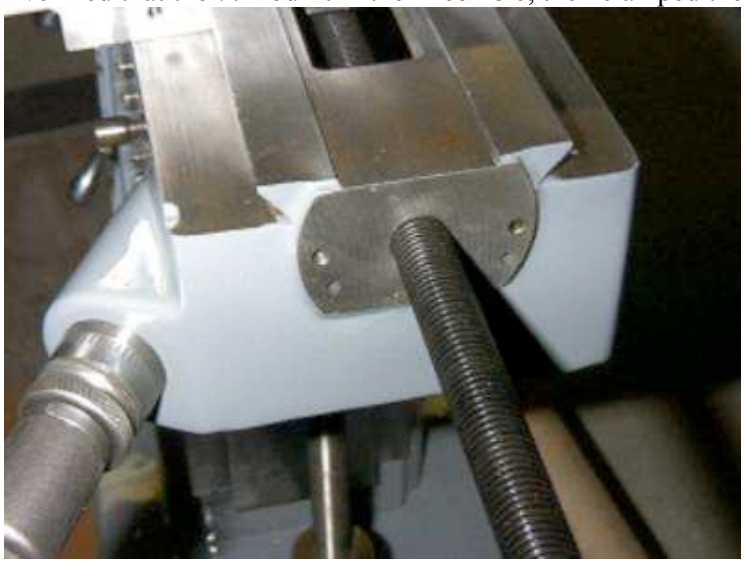
Also, I relieved some metal off the knee itself using a small die grinder. This picture is taken with the knee removed and turned upside-down on my workbench, with the knee ways towards me. You don't have to remove much metal; just

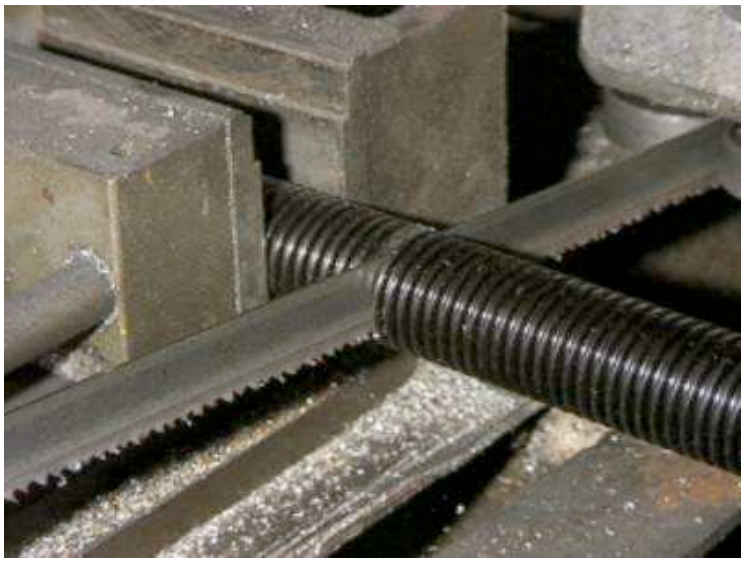
enough to provide clearance. One last picture is included to show how it all fits together when completed but I'm getting ahead of myself.



Leadscrew

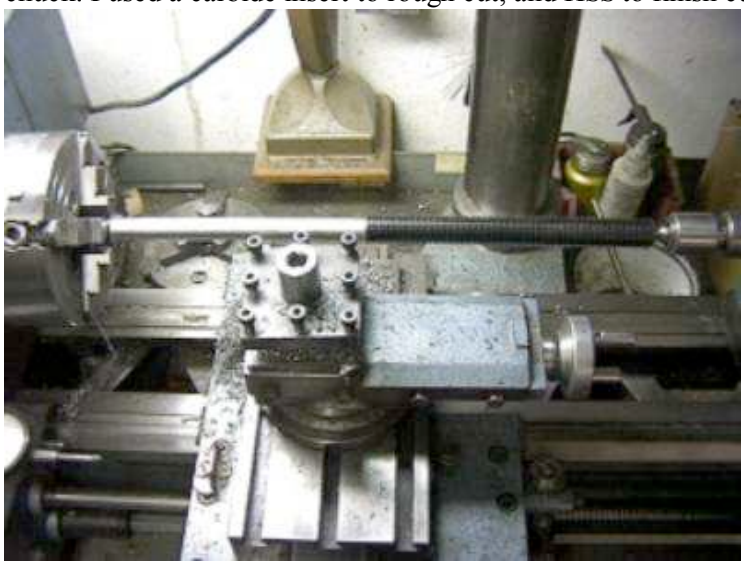
I verified that the ¾" rod fit in the knee hole, then clamped the leadscrew in my bandsaw and cut off about 16".

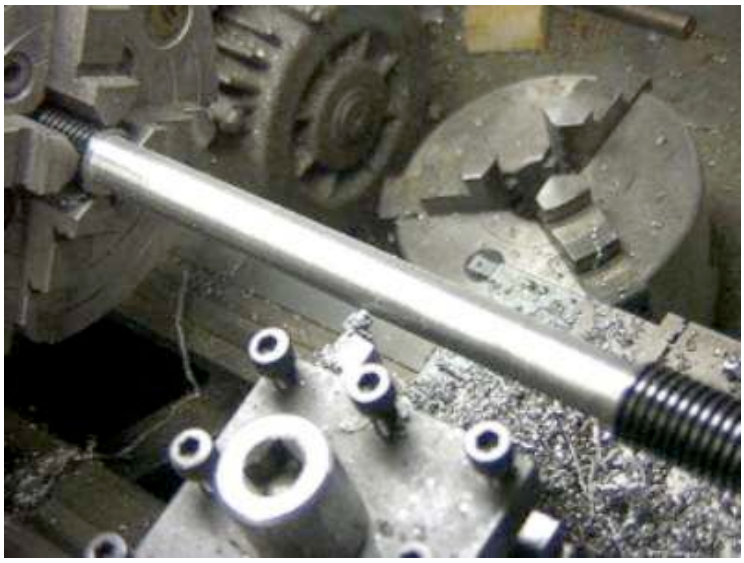




Basically, I used the old leadscrew as my template for the replacement. I placed the rod in my 4-jaw with a couple of inches protruding so I could center drill for the tailstock.

I placed an old feeler gauge between the dial indicator and the rod to center the work in the chuck, then drilled the 60 degree tailstock hole. I loosened the chuck, and mounted the rod on a live center, and re-indicated the other end in the chuck. I used a carbide insert to rough cut, and HSS to finish cut the work.

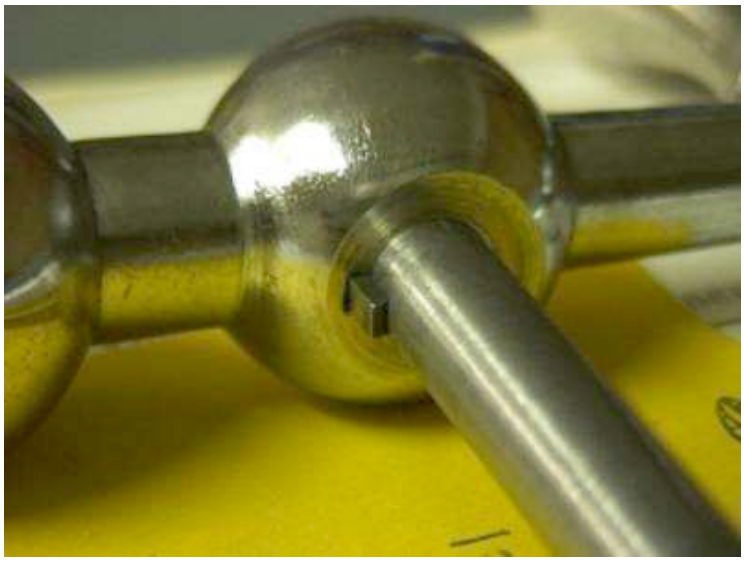




I paid extra attention to the surfaces where I would press-fit the bearings, because they have to be spot-on.

I extended the 'free' (non-machined) end of the leadscrew about 1/2" just because there was room. Also, I left a couple extra threads on the machined end. Basically, the new nut is about ¼" longer than the old, and I wanted to make sure I engaged all the threads wherever possible. I used a 1/8" keyway cutter for the new woodruff key.

Finally, I used a die to form the 3/8” x 20 tpi threads (ran the die to the appropriate depth, then turned it over and ran it again to cut good threads for the entire length.)



Reassembly

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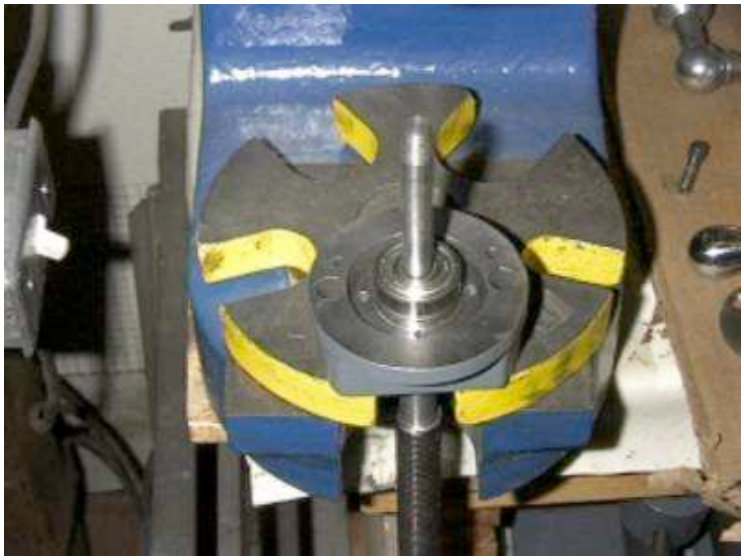
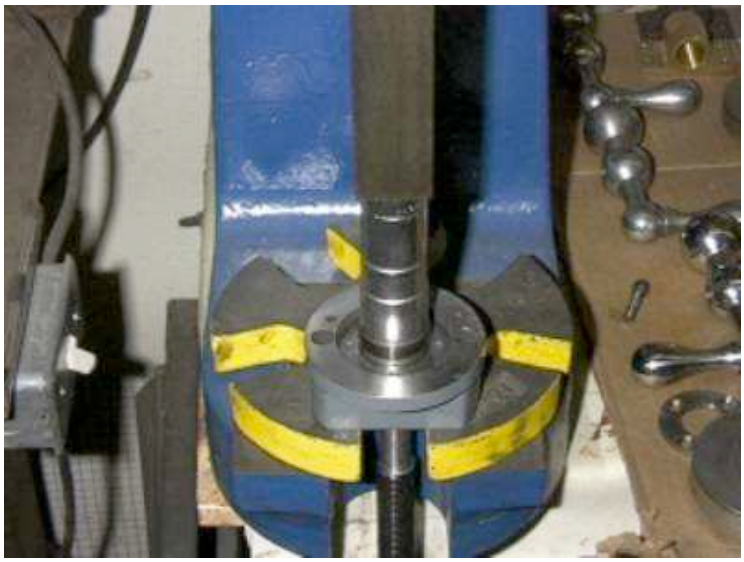
The screw just fit in my arbor press, which simplified things.

I suppose you could carefully hammer the bearings in place with wood blocks, but I'd be very careful. Start the rod into the first bearing, then carefully seat against the shoulder. Add the thin washer, then start the second bearing and seat against the first.

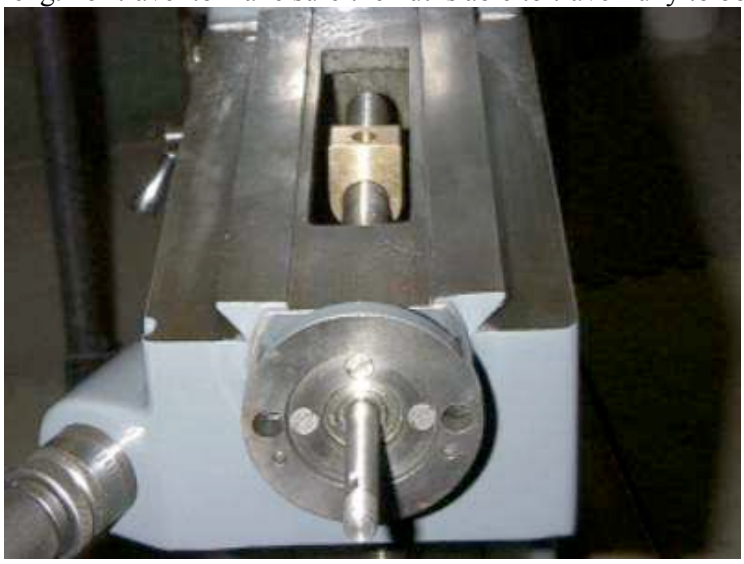
Insert the spring clip into the housing, and press the rod with both bushings into the housing. Thank goodness for ½"

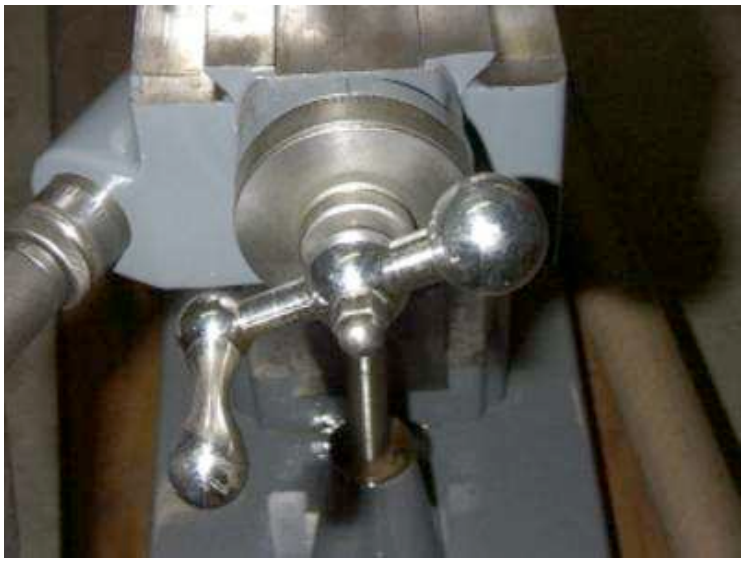
sockets!





You can, now, screw down the retainer. Attach the whole assembly back into the knee. Actually, before you tighten, you'll want to liberally coat the leadscrew with Vactra 2, and run the nut onto the screw. Screw back and forth the full length of travel to make sure the nut is able to travel fully to both ends.





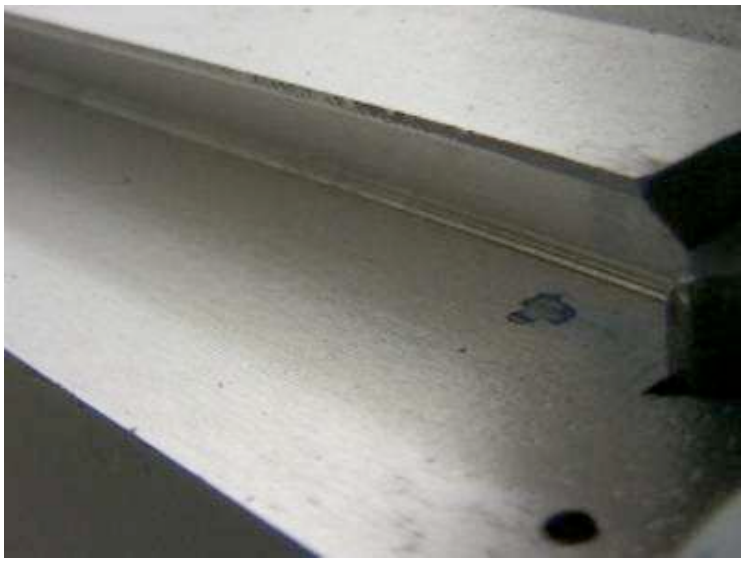
If you have problems at the furthest point from the column, you might need to relieve a little more metal from the knee. After you're satisfied, you can add the dial, handle, and nut.

Shims

You should be able to slide the saddle onto the knee at this point. With some careful measuring, calculate the shim thickness needed to attach the new nut to the saddle. If set at the proper height, the leadscrew should 'float' in the nut. This is an art, but it helped me to align the hole in the saddle with the hole in the nut, and visually inspect the gap between. This might take several tries to come up with the right combination of washers, but the result should allow the saddle to move in and out smoothly for the full range of travel. At this point, I was able to measure .002" backlash, which I felt was inherent in the 2C fit between leadscrew and nut. I hope your efforts yield results as good if not better.

Ways

Lesson learned! I finished the above, but that only half-solved the problem. If the screw was that worn, it made sense that the ways would be horribly worn, too. Thus, I only had about 2.5" of travel in the middle, but the gib tightened up on either end. If loosened the gib, then the table rattled and shook in the middle. The only solution was a trip to Schaffer Grinding in Montebello. I brought them the knee, and they reground the top table ways. Made a world of difference. Now, it's smooth and tight the whole length of travel.

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