

MINI-LATHE KNURLING TOOL

Cutting and assembly details

Machinists should familiarize themselves with the contents of this section before jumping in to the drawings. Many details are described here due to lack of space on drawings.

BILL OF MATERIALS

½" X ¾" x 10" cold rolled steel (CRS)
1.5" square CRS, ¾" thick
3/16" W-1 drill rod, 3 ¾" long
3/8" W-1 drill rod, 6" long
2-3/16" flat washers
4-7/32" E-clips
1- Century C-672 spring
1-10-32 X ¾" socket head cap screw

This project requires both mini-lathe and mini-mill. Adjuster pivot slots are best cut with a 3/8" ball end mill. Absent that, they can be cut with a 3/8" drill bit by clamping the two arm units together in a milling vise with the pivot slot centers facing each other and drilling straight through centered on the mating point of the two pieces.

Note that the drawings for the arms are shown as reverse pairs. The top arm is shown from the top while the bottom arm is shown from the bottom. This is because the pivot slots are cut on the top of the top arm and the bottom of the bottom arm. When the arms are placed in the proper install position, the insets at the knurl mount ends will be on the same side of the tool although they appear to be reversed in the drawings.

The finish on all CRS pieces is black oxide. If you do not have a black oxide kit, Birchwood-Casey Super Blue gun bluing will do a nice job. It is usually available at Wal-Mart. Do not use it on the drill rod pieces. They do not require any finishing.

The heads of the knurl axles are cut to a "D" shape to prevent them from turning. When inserted, the flats contact the edge of the milled inset as a turn stop. This is necessary to prevent wearing of the arms. A great deal of pressure is exerted on the axles during normal operation. For this same reason, the axles are hardened hence the W-1 drill rod. To harden them, heat to a dull red with a torch and drop into water after all shaping operations are completed. If not properly hardened, they will wear rapidly. The knurls are extremely hard. The axles should be lightly greased with white lithium grease. Check often and add grease if not uniformly wet. Only the axles need to be hardened. It is not necessary for the hinge pins or draw rod. If the pins wear excessively, make a new pair and heat to cherry red before going into the water.

When assembling the draw rod, screw its short threaded end into the bottom pivot bar and tighten into the end of the threads with pliers or vice grips. Coming loose while operating could cause damage and personal harm.

The mount bar is cut down to 3/8" along its clamping surface because that is the largest cutting tool clamp mount I use. You can adjust this cut as necessary to suit your own needs if different from mine, but 3/8 seems to be a nice universal fit.

The actual knurling wheels are $\frac{3}{4}$ " diameter by $\frac{3}{8}$ " thick knurls with $\frac{1}{4}$ " holes. They are readily available from Littlemachineshop.com or [Enco Manufacturing \(use-enco.com\)](http://Enco Manufacturing (use-enco.com)) for about \$6 a pair. I find that small, medium, large and straight sets will handle almost everything. The straight knurls are best when knurling a rod to fatten it prior to pressing into a hole.

ASSEMBLY

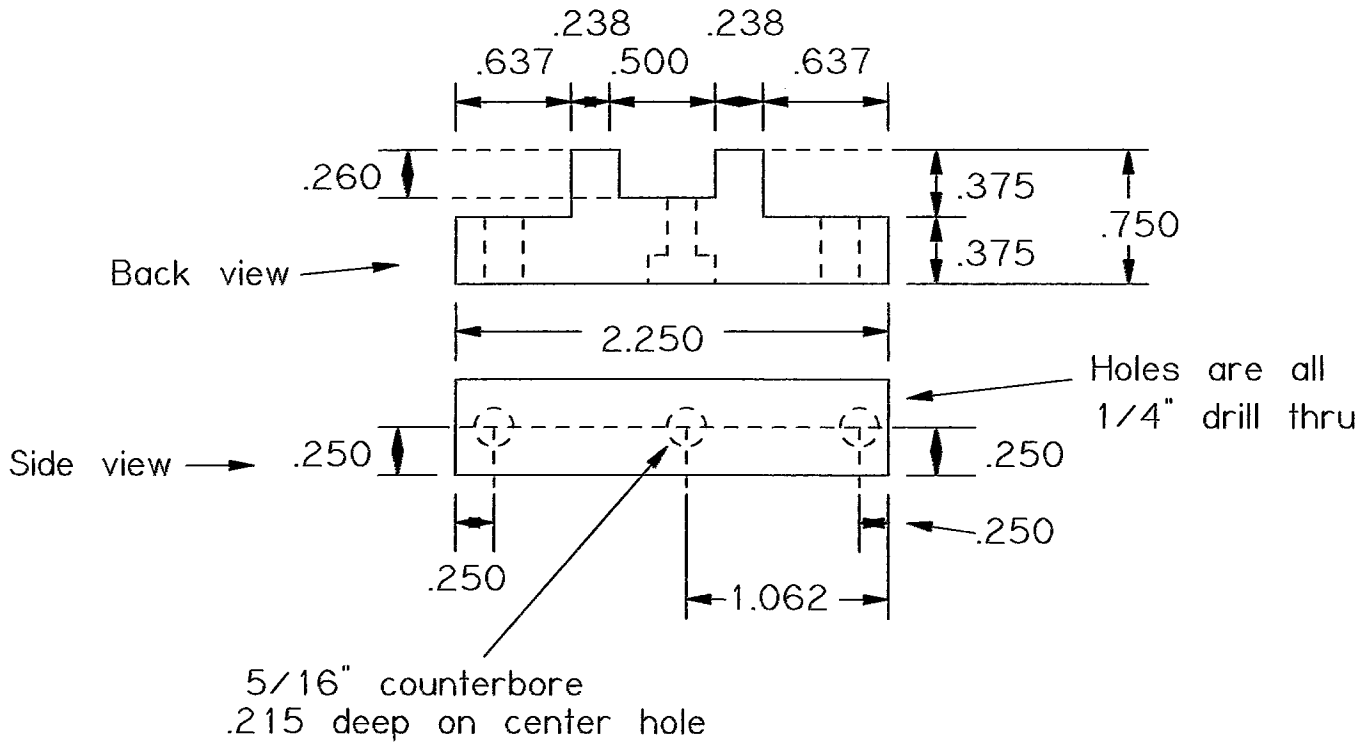
Refer to the last page of the drawings while reading this section.

Fit the mount bar into the $\frac{1}{2}$ " slot across the spine piece in a manner that lines up the holes and fasten with the socket head cap screw. Drop the fork of the arms over the end of the spine in such a manner that the round bottom slots face away from center. Put a hinge pin through each and snap an E-clip into the groove on the end of each pin. If you have done this correctly you can pick up the mount bar with your right hand and see the spine mounted to the left and the arms going forward away from you. There will be a round bottom slot on top of the top arm and one on the bottom of the bottom arm. Screw the draw rod into the bottom pivot, as above, and guide it up through the bottom rod slot. Place a flat washer on top of the slot then the spring and another flat washer. Now guide up through the top arm slot. Drop the top pivot over the rod into the round groove and screw down the knob. All that is left is to clamp the mount bar into a cutting tool holder on the lathe and tighten the knurls onto a rod that is to be knurled.

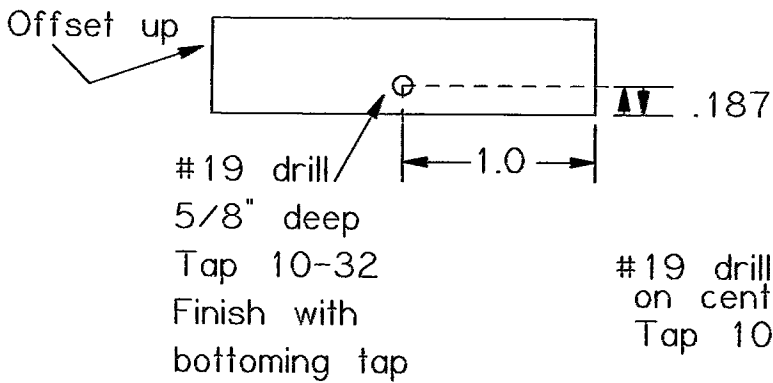
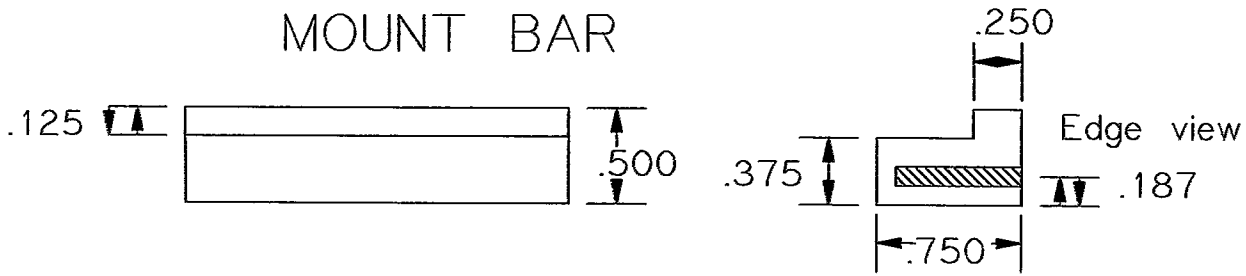
KNURLING

The knurls should be clamped down as near to center of the work as possible. This can be adjusted a bit while running by use of the cross slide. It will probably take more pressure than you think. Do not expect to run the lathe very fast while using. Best results will probably be had in the 2 to 10 RPM range. A long knurl can be made by engaging the lead screw. If it is very long the end of the work will need to be supported with a center. The work will flex and cause the knurls to pop off the work area if unsupported unless the work is fairly large diameter. Knurling hard steel such as drill rod will take a lot of pressure and will work better if the work is lightly lubed with cutting oil. Aluminum works best if the knurler is chased with an air hose to keep the resulting dust from packing back into the new grooves. It doesn't take much air pressure. Brass is, by far, the nicest metal to knurl and requires little help although I usually do follow with air.

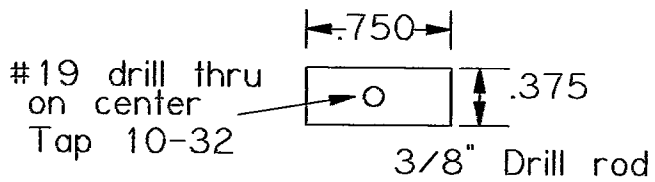
SPINE



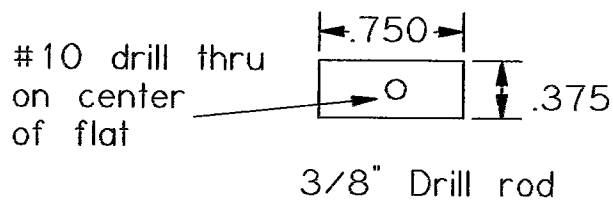
MOUNT BAR



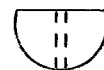
Bottom Pivot



Top Pivot



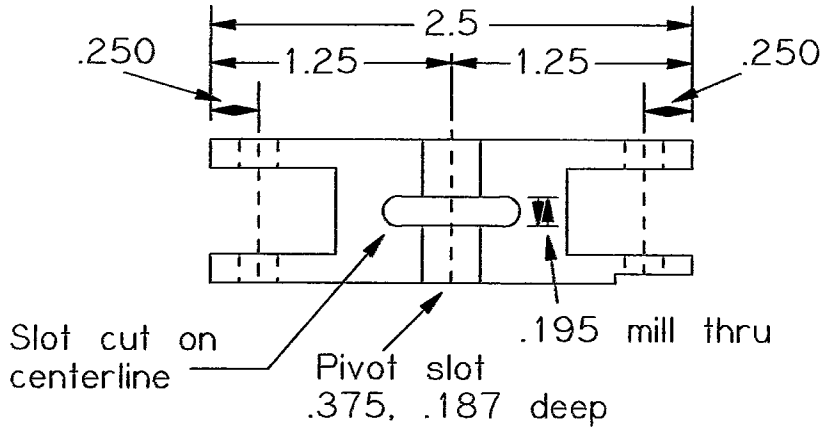
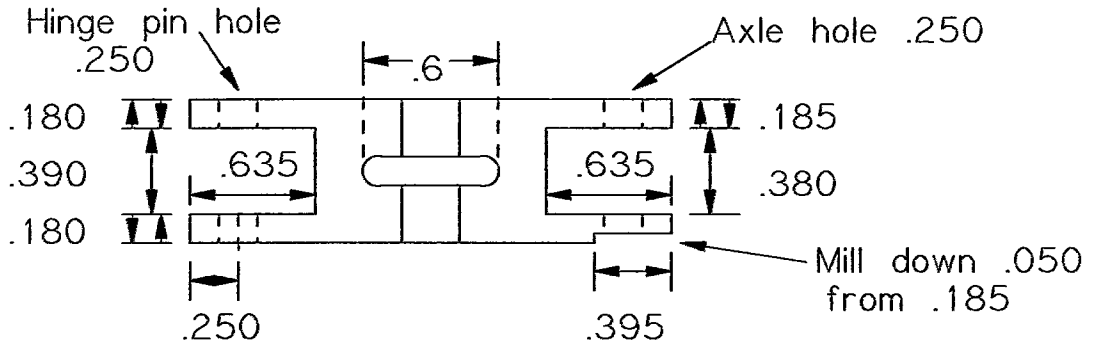
Mill flat across top, .100 down from outer edge.



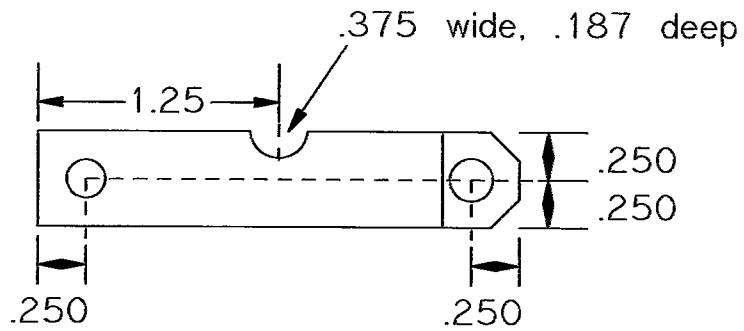
End View

LOWER ARM

Bottom view



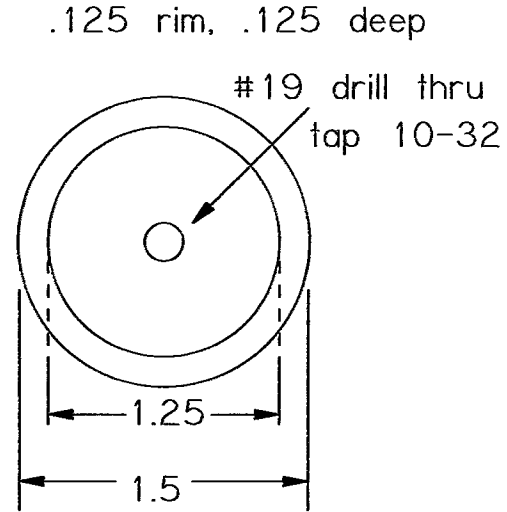
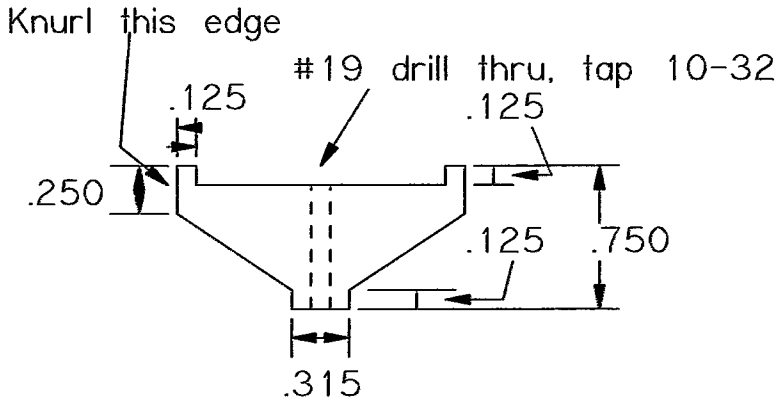
Side View



Arm turned up for detail. It is turned over for installation.

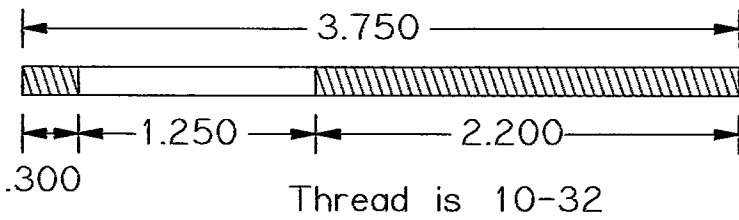
SMALL PARTS

Tension Knob

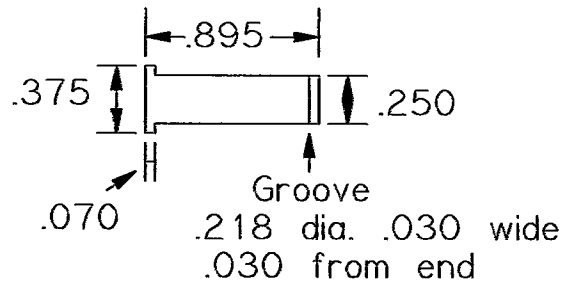


Draw Rod

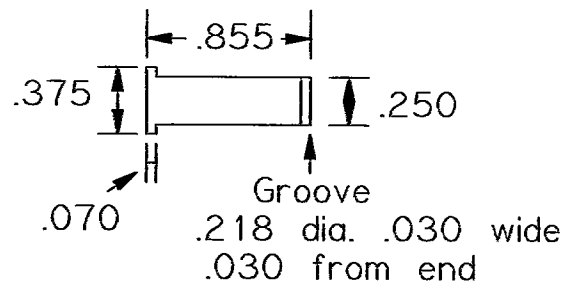
3/16" drill rod



Hinge Pin

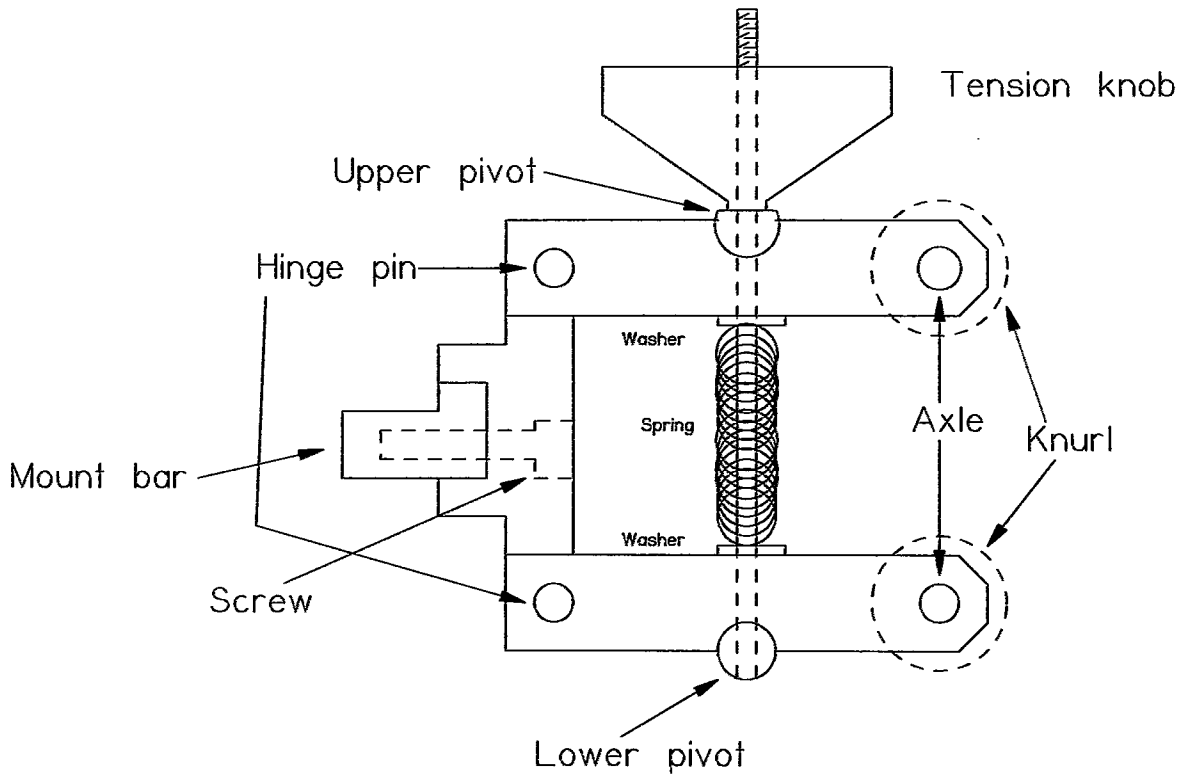


Axle



Mill off .045 from side of each head creating a D shaped flat (axles only)

ASSEMBLY



Hinge pins and axles have $7/32$ " e-clip snapped into groove at end of each on this side. "D" heads of axles are on other side of arms.