

PROJECT – Nut Cracker

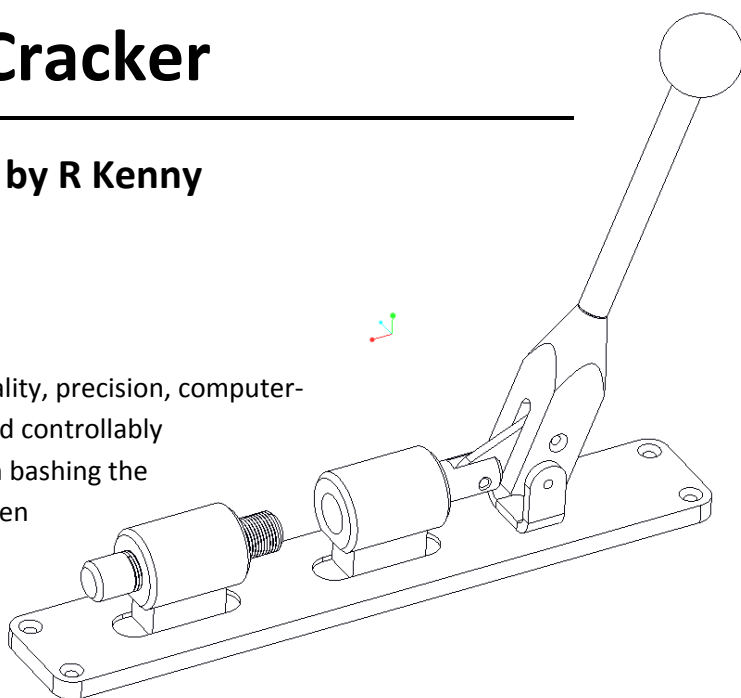
Adapted from a set of plans by R Kenny

Purpose....

In this project you will produce a high-quality, precision, computer-designed nut cracker capable of gently and controllably cracking the shells off of nuts (rather than bashing the entire works into a bazillion pieces and then you're not really sure if you're eating nut or shell. Yuck).

Preparation....

For this project you will need the following:



MATERIALS:

- | | | | |
|----------------|--------|-------------------|-------------|
| • 3/8" | ROUND | mild steel | 4" long |
| • 1/2" | ROUND | cold rolled steel | 4-1/2" long |
| • 1" | ROUND | cold rolled steel | 2-3/4" long |
| • 1" | ROUND | aluminum | 1" long |
| • 1/2 x 1/2" | SQUARE | mild steel | 2" long |
| • 3/4 x 3/4" | SQUARE | mild steel | 2-3/8" long |
| • 1/2 x 1/8" | FLAT | mild steel | 5" long |
| • 1-1/2 x 1/4" | FLAT | mild steel | 9" long |
| • 1/8" | ROUND | mild steel | 3" long |

TOOLS:

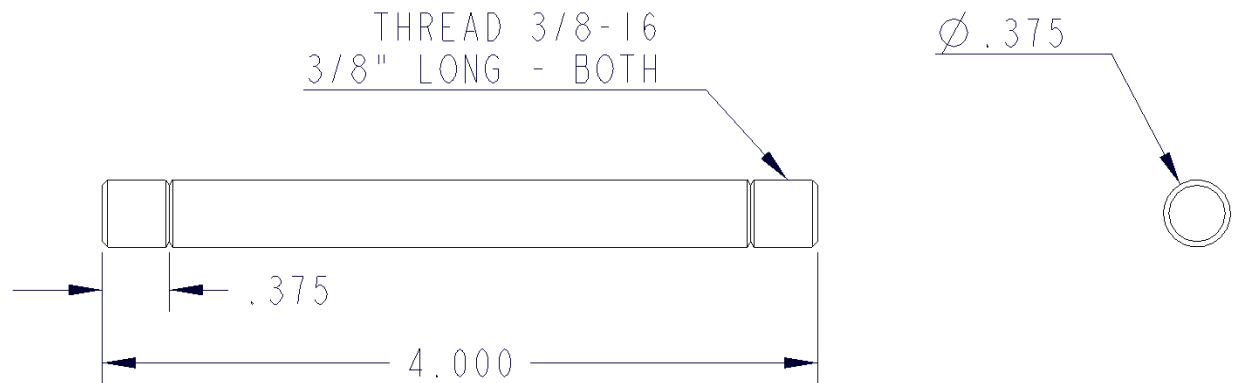
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|---|-------------------------------|
| • Scriber, ruler, machinist's square, and hacksaw | • Drill press |
| • File | • Ball-pien hammer |
| • Machine Lathe | • Bench vise |
| • Milling machine | • Buffing wheel |
| | • ARC, MIG, TIG or Gas welder |

The Procedure....

The following parts will be fabricated:

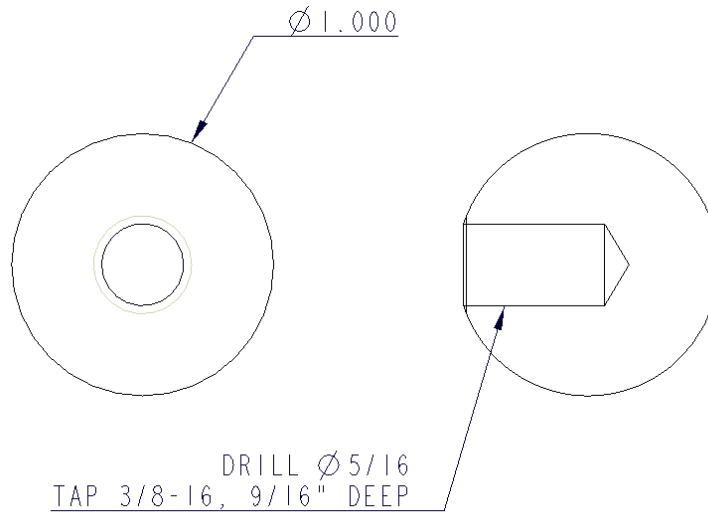
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|-----------|----------------------|---------------------|
| 1. Handle | 5. Link | 9. Piston |
| 2. Ball | 6. Support Block | 10. Adjusting Screw |
| 3. Block | 7. Piston Cylinder | 11. Base |
| 4. U-Clip | 8. Threaded Cylinder | |

PART 1 – The Handle

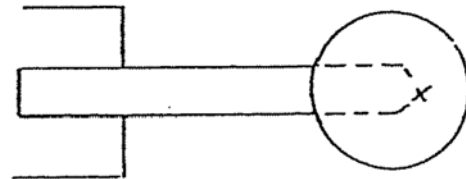
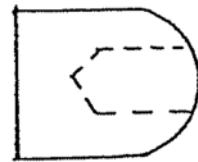


- CUT a 4" piece of 3/8" ROUND mild steel
- Use the LATHE to face off and chamfer both ends
- Using the LATHE TAILSTOCK with LIVE CENTER to support and hold true a 3/8-16 die, thread both ends of the material by turning the chuck **BY HAND (NO POWER!!!)**, taking up slack with the TAILSTOCK

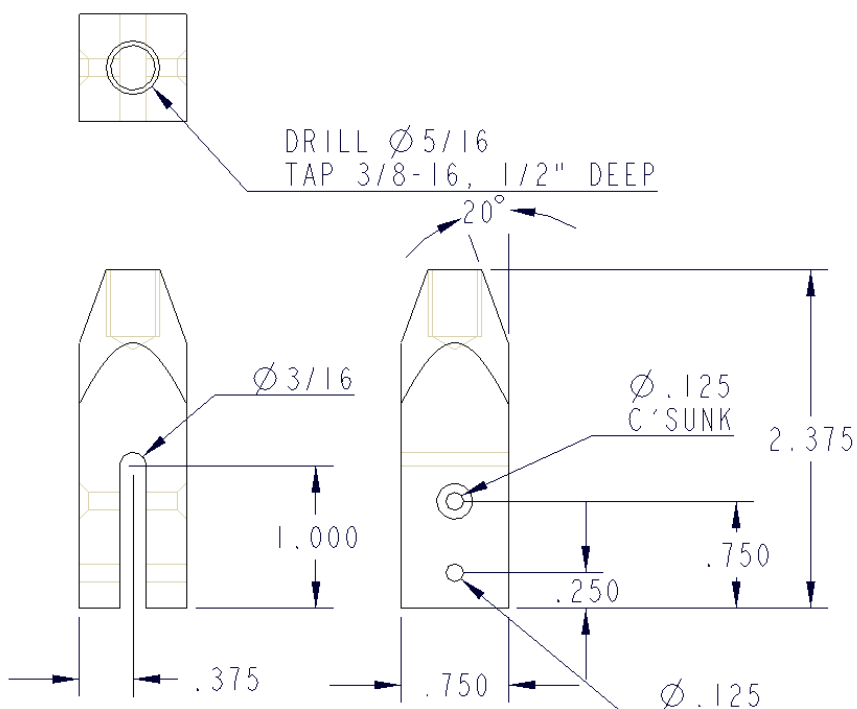
PART 2 – The Ball



- Use a HACKSAW to cut 1" ALUMINUM ROUND to a length of 1"
- Use the LATHE to FACE one end
- Use the LATHE to center drill the faced end
- Use the LATHE to drill 5/16" to a depth of 9/16"
- Turn the drilled end to a semi-circle
- Use the TAILSTOCK to help center a 3/8-16 TAP and **WITHOUT POWER** start threading the hole (finish in a vise)
- Thread the ball onto the HANDLE you made previously, and hold HANDLE in lathe chuck
- Turn the other end into a semi-circle
- Use a FILE and SANDPAPER to smooth
- Use the BUFFING WHEEL to polish

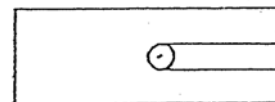


- Use a SCRIBER to draw an X corner-to-corner to help center the work in the chuck.

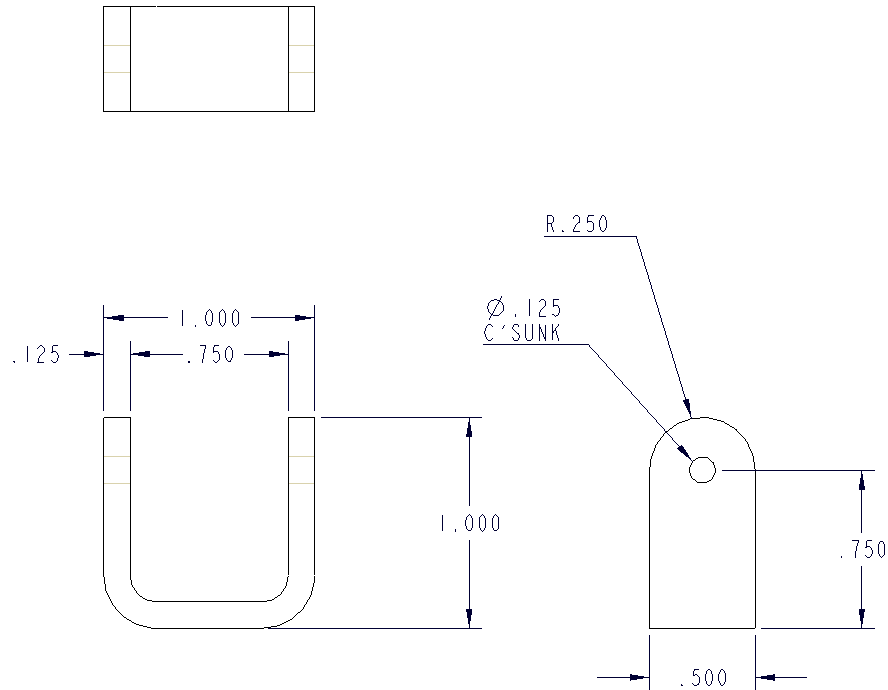


- DO NOT REMOVE FROM THE CHUCK YET – YOU WANT TO TAPER NEXT!

- Set the compound rest to 20° and machine the taper off the drilled end.
- Use the TAILSTOCK to help center a 3/8-16 TAP, and **WITHOUT POWER**, start threading the hole (finish in a vise).
- Layout, and punch all holes
- Use a DRILL PRESS to drill the two 1/8" holes all the way through. Countersink the upper one.
- Use a DRILL PRESS to drill the 3/16" hole for the end of the milled slot.
- Use a MILLING MACHINE to cut the 3/16" slot – be gentle, the cutters are \$35 each!

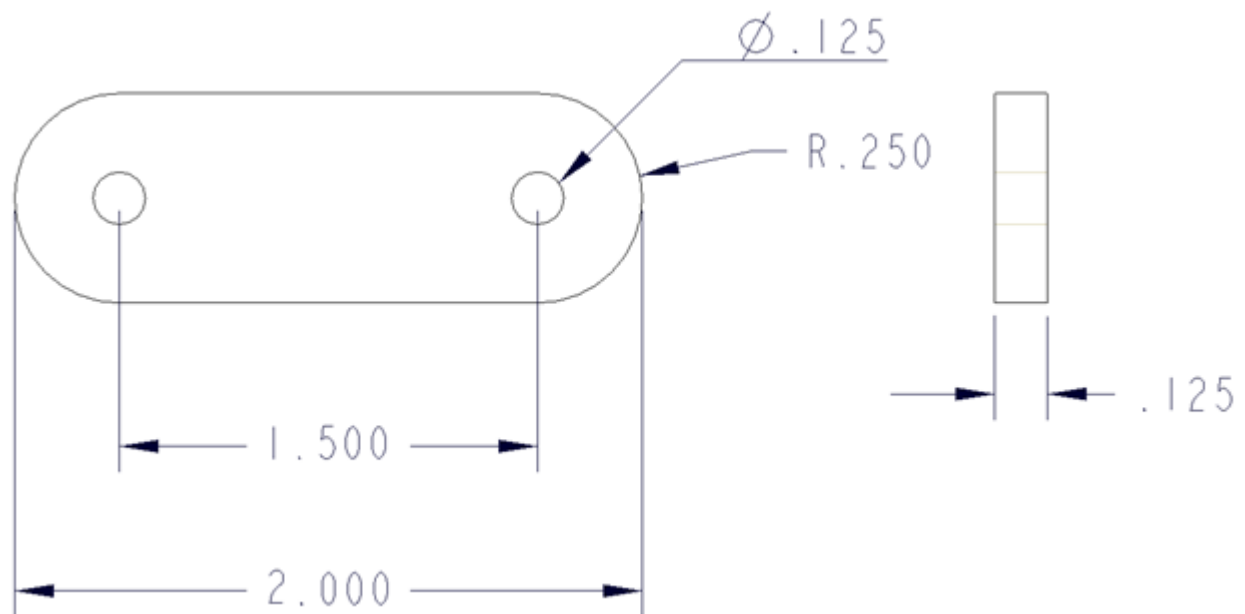


PART 4 – U-Clip



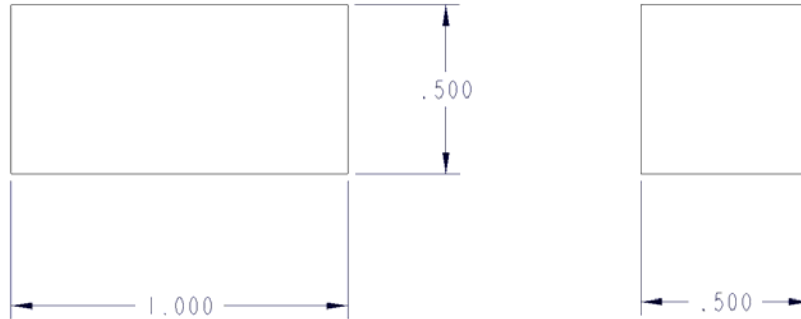
- Use a HACKSAW to cut a piece of 1/2" x 1/8" flat to a length of 3"
- Use a FILE to remove mill scale and draw file all surfaces
- Mark each bend lines 1/2" away from CENTER
- Bend the ends to 90°, tweak with pliers in a vise until they are parallel
- Layout, punch and drill the 1/8" holes, straight through, at the same time, so they are parallel with the bottom
- Countersink the holes
- Use a FILE to round off the ends of the legs

PART 5 – Link



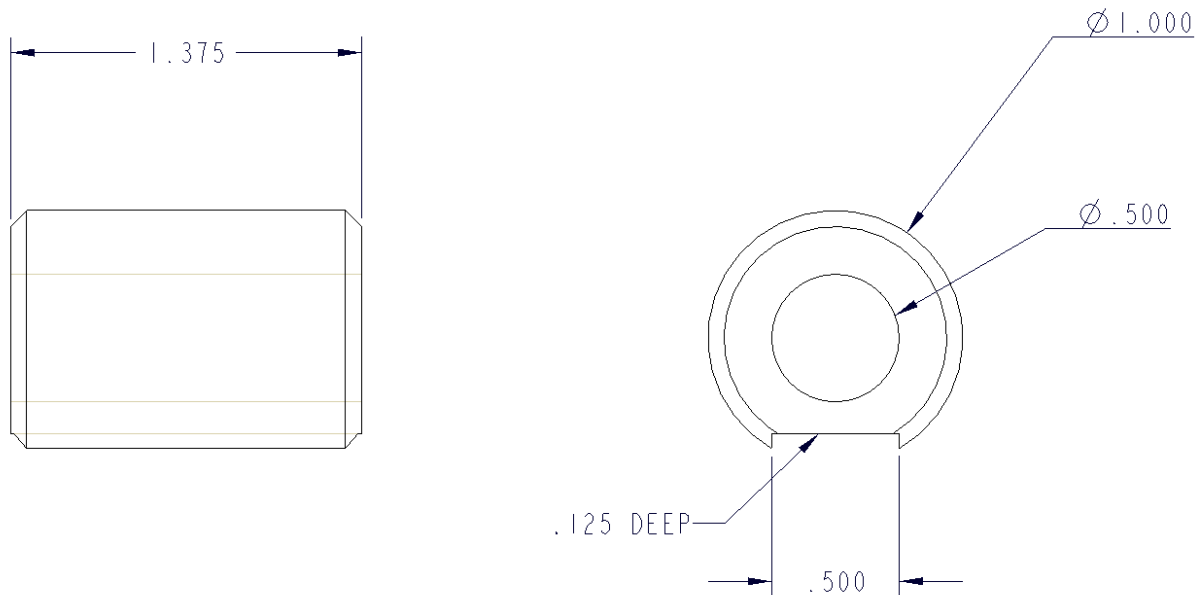
- Use a HACKSAW to cut a piece of 1/2" x 1/8" flat bar to 2" long
- Use a FILE to remove mill scale and draw file all surfaces
- Layout, punch and drill the 1/8" holes
- Use a FILE to round both ends and finish all surfaces

PART 6 – Support Blocks



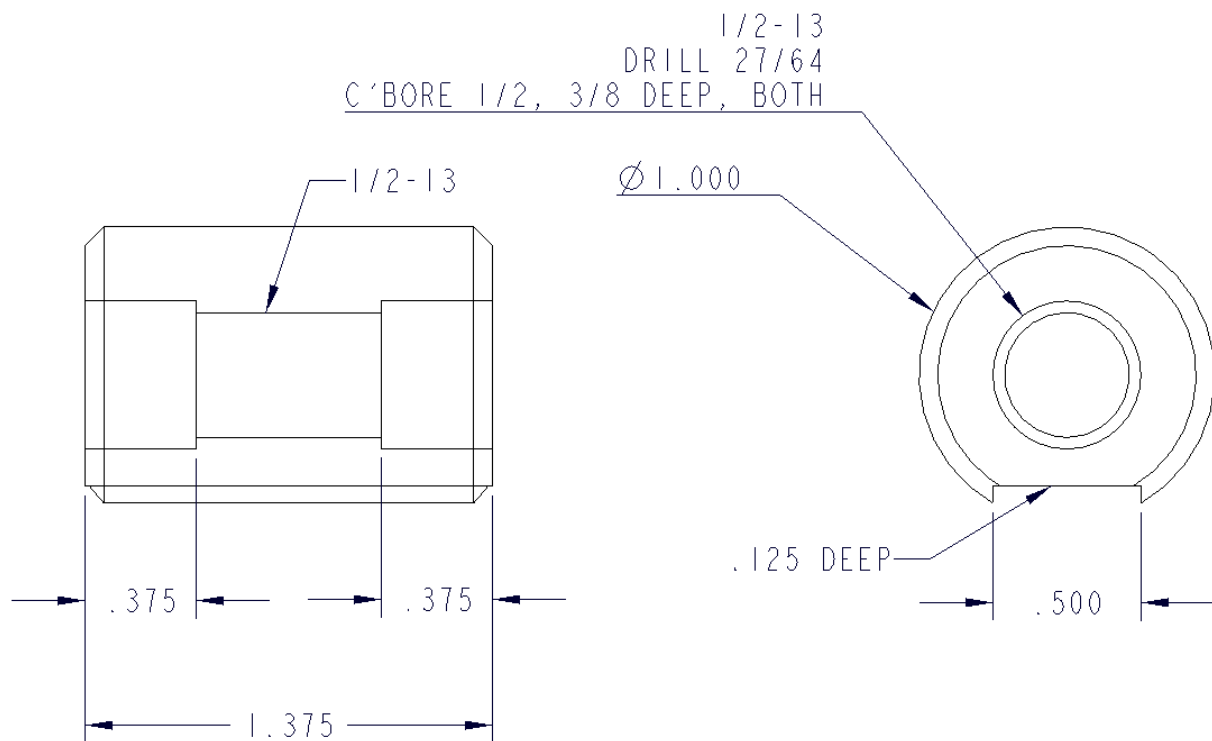
- Use a HACKSAW to cut two pieces of 1/2" x 1/2" to 1" long, each.
- Use a FILE to remove all mill scale and drawfile all surfaces.
- Bask in the simplicity of this component. You did make two, didn't you?

PART 7 – Piston Cylinder



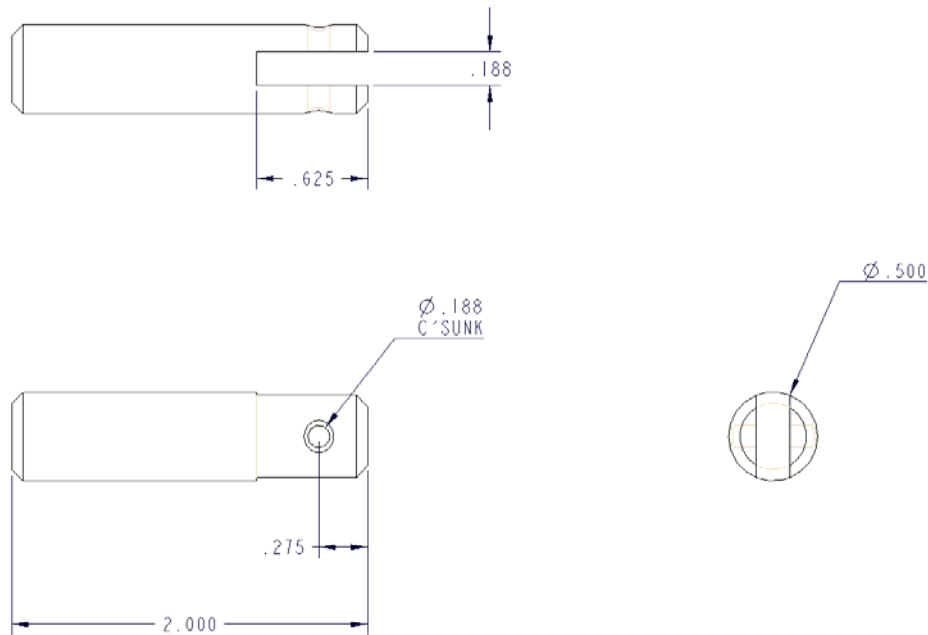
- Use a HACKSAW to cut a piece of 1" Round to 1-3/8" long.
- Use a LATHE to face off both ends, and CHAMFER the edges.
- Use a LATHE to center drill, pilot drill, and finish drill all the way through the center.
- Use a MILLING MACHINE to machine a slot, CENTERED, for the FULL-LENGTH, 1/8" deep.

PART 8 – Threaded Cylinder



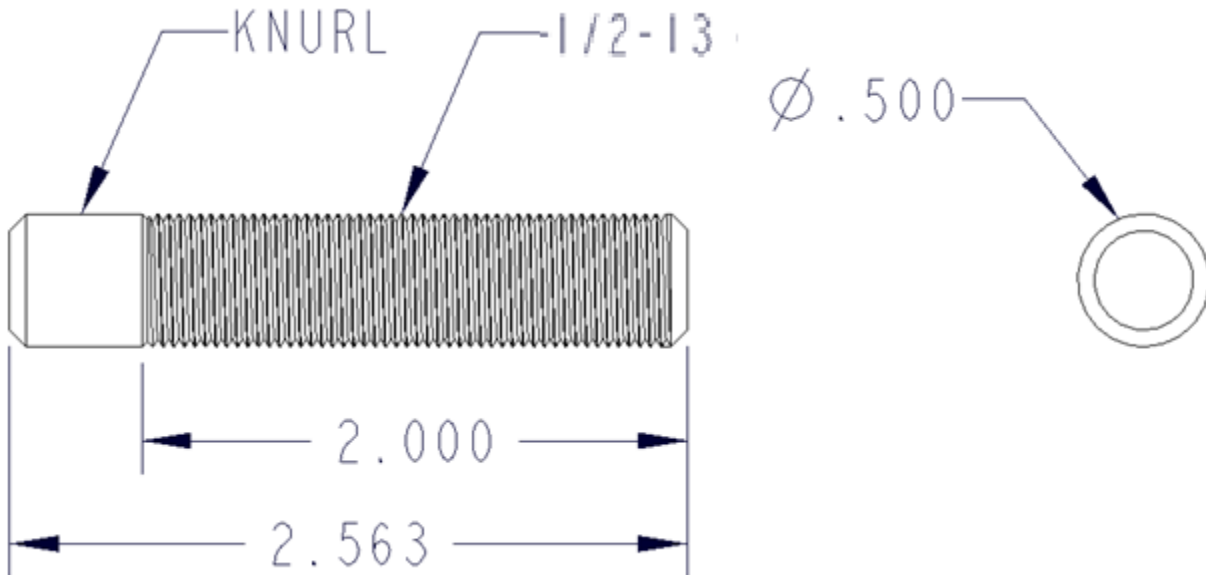
- Use a HACKSAW to cut a piece of 1" Round to 1-3/8" long.
- Use a LATHE to face off both ends, and CHAMFER the edges.
- Use a LATHE to center drill, pilot drill, and drill 27/64" all the way through the center.
- Use a LATHE to COUNTER-BORE both ends with a 1/2" drill, 3/8" deep.
- Use the TAILSTOCK to help center a 1/2-13 TAP, and **WITHOUT POWER**, start threading the hole (finish in a vise).
- Use a MILLING MACHINE to machine a slot, CENTERED, for the FULL-LENGTH, 1/8" deep.

PART 9 – Piston



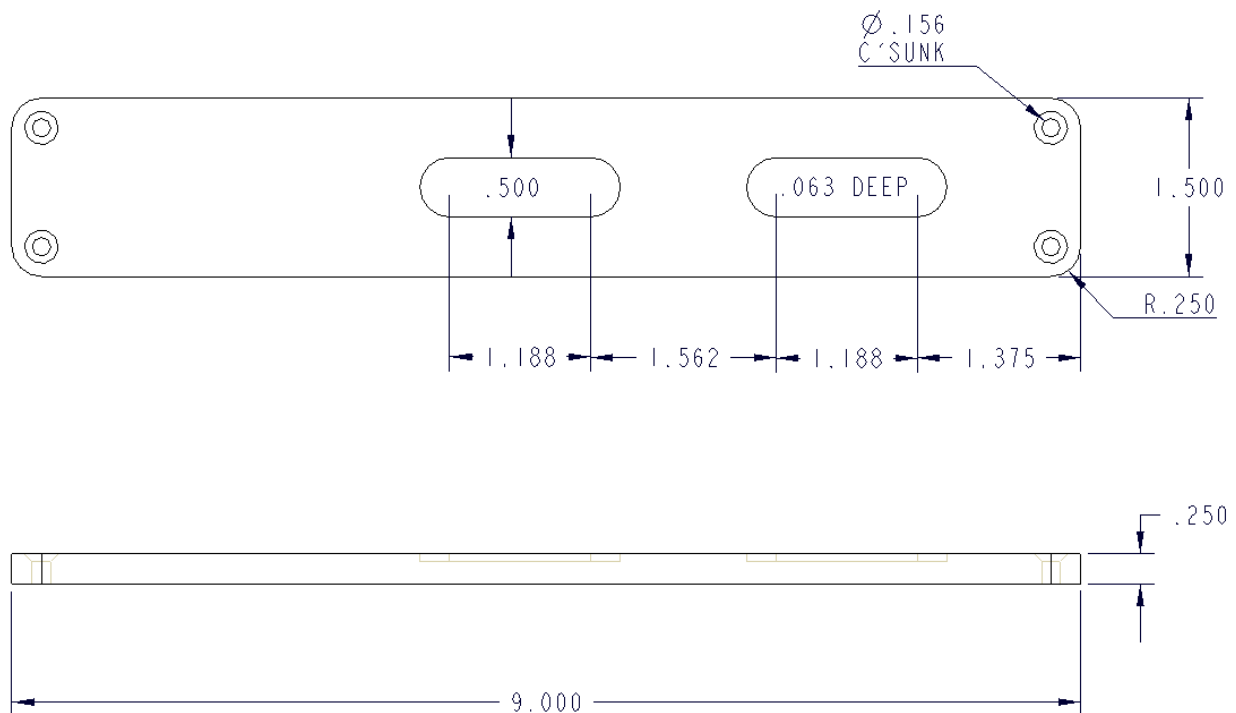
- Use a HACKSAW to cut a piece of 1/2" ROUND to 2" long.
- Use the LATHE to face off and chamfer both ends.
- Machine the non-slotted end slightly concave (this holds the nut better).
- Use a DRILL PRESS to drill the 1/8" hole, and countersink both sides.
- Use the MILLING MACHINE to mill a 3/16" slot, 5/8" deep. Only the bravest of the brave would use a HACKSAW for this.
- Use a FILE to remove any BURRS or sharp edges.

PART 10 – Adjusting Screw



- Use a HACKSAW to cut a piece of 1/2" ROUND to 2-9/16" long.
- Use a LATHE to face and chamfer both ends.
- Machine one end slightly concave (this holds the nut better).
- Use the TAILSTOCK to help center a 1/2-13 Die, and **WITHOUT POWER**, start threading the concave end (finish in a vise).
- Place the now threaded end in the LATHE CHUCK, extending JUST ENOUGH to knurl 9/16" of the un-threaded end – use motor oil (green can), SLOW lathe speed, and pressure.
- If the chuck damaged the threads at all, chase them with the die again.

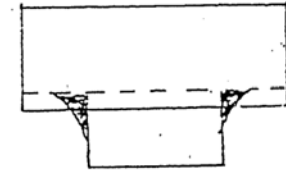
PART 11 – Base



- Use a HACKSAW to cut a piece of 1-1/2 x 1/4" FLAT to 9" long.
- Use a FILE to remove all MILLSALE and draw file all surfaces.
- Layout, and center punch the four holes.
- Use the center punch mark location to help scribe the rounded corners.
- Drill and countersink all four holes.
- Round off the corners.
- Layout the slots on one side.
- Use a MILLING MACHINE to machine the 1/2" slots, 1/16" deep.

ASSEMBLY

- Weld a SUPPORT BLOCK to the bottom of both CYLINDERS:
- Check that both the piston and the ADJUSTING SCREW and PISTON still fit through their respective cylinders before welding to base (chase with TAP, or DRILL before final welding).
- Only the coolest of the cool would drill 3/8" holes through the slots in the base, and PLUG WELD the CYLINDERS/SUPPORT-BLOCKS from the underside, so the welds would be invisible. For the rest of us mortals, weld them to the base at the ROUNDED ENDS of the slot.
- Use a HACKSAW to cut pieces of 1/8" ROD to attach the PISTON to the LINK and the LINK to the BLOCK and the BLOCK to the U-Clip. You will want them to protrude about 1/8" so you can peen the ends into the COUNTERSUNK holes.
- Use a BALL-PIEN HAMMER to pien the ends of the 1/8" rod – not too tight, if it doesn't move, it's not going to work well, is it???
- Trial fit everything, and weld the U-CLIP to the base in a location that works nicely. TEST FIT – TEST FIT – TEST FIT – TEST FIT. It's easier to change things before they are welded. Ask the coolest of the cool how they welded their U-Clips to the base.



(According to my computer design, the U-Clip will be about 6-3/4" from the end – let me know where yours ended up working best. "Design" doesn't always work in the "real world").