Mini Metal Lathe

by **Random_Canadian** on October 29, 2011

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Intro: Mini Metal Lathe

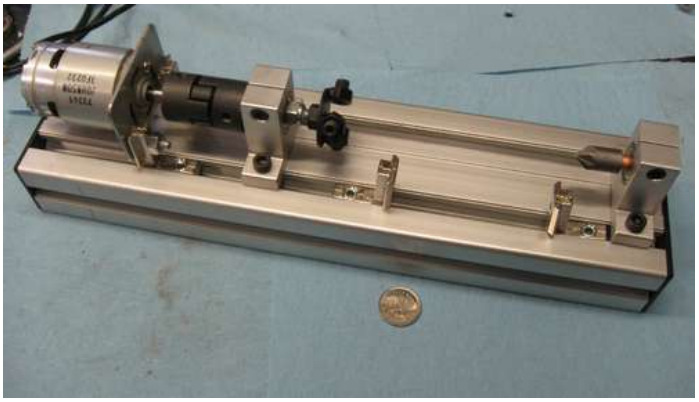
Hack a power drill into a mini metal lathe with precision speed control.

I used a couple of broken power tools for the drive components in this mini lathe.

It features a powerful motor and small size.

The speed control hack is shown in step 5.

The video shows a functional speed test of the lathe. There is a vibration from the motor coupling which is quite evident as the speed increases.



Step 1: Materials

There are some specialized items needed for this Instructable.

The base materials are from Bosch Rexroth. The extruded aluminum base, t-nuts, inside brackets, end caps are all Bosch Rexroth. The extruded member is 45X90 and 14 inches long.
The support blocks are from VXB.COM Part number

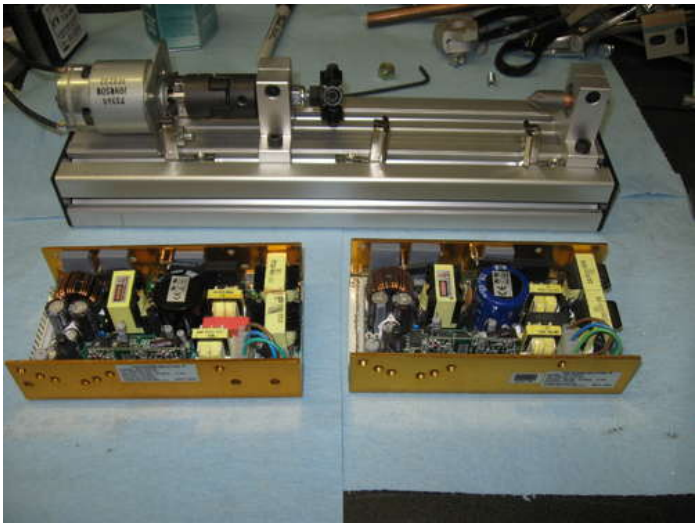
The Skate bearings are form VXB.COM Part Number 608ZZ. Yes I know that these are not taper bearings (ideal choice) but they do work for this application.

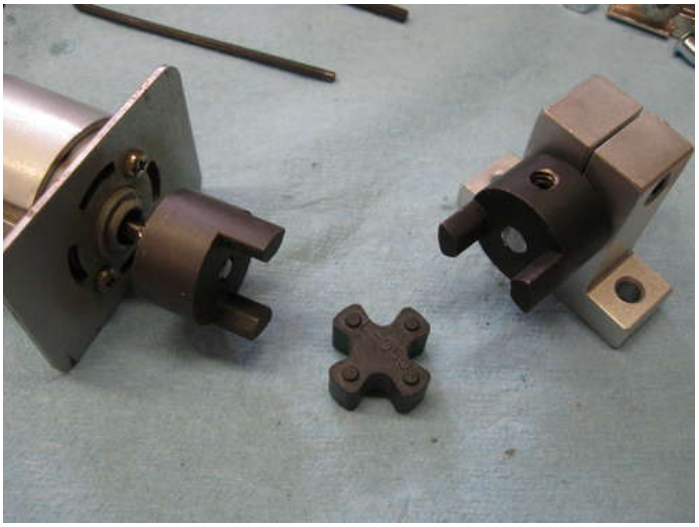
The flex motor couplings and rubber spider are from PrincessAuto.com

I used a 12V DC motor from a Black and Decker cordless weed trimmer

I used a variable speed switch from a Milwaukee 18V Li-Ion cordless drill

The rest of the materials are presented as needed in the instructions.





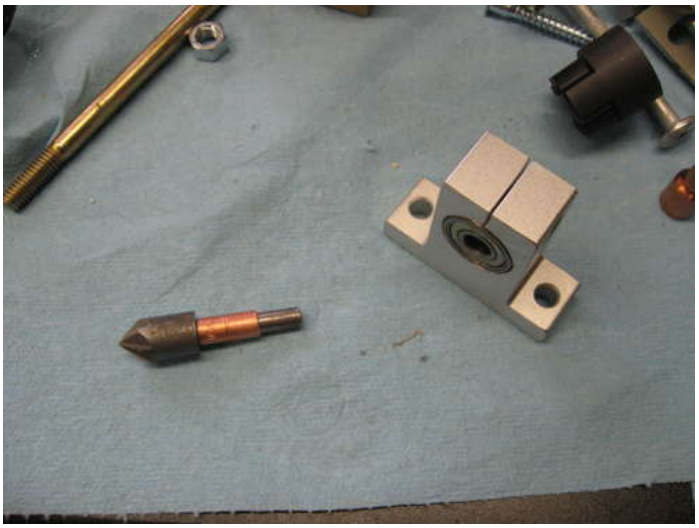
Step 2: Make the supports

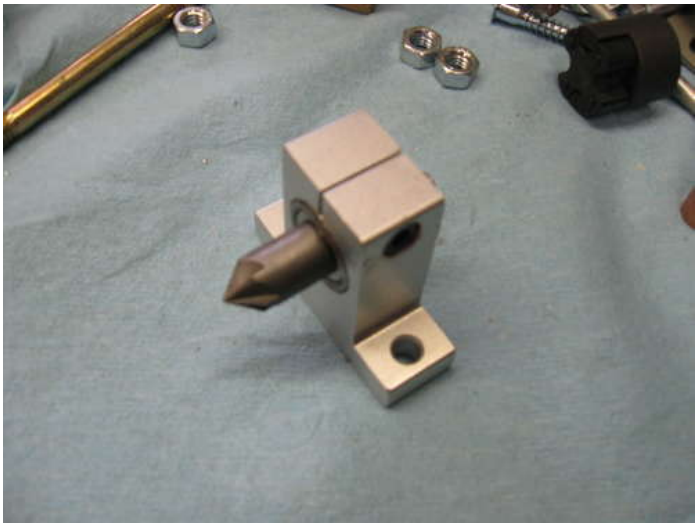
The shaft support blocks have an ID of ¾ inch, You will need to bore/Drill to 7/8 inch for the skate bearings. This was done gradually with increasing size drill bits and a hand drill.

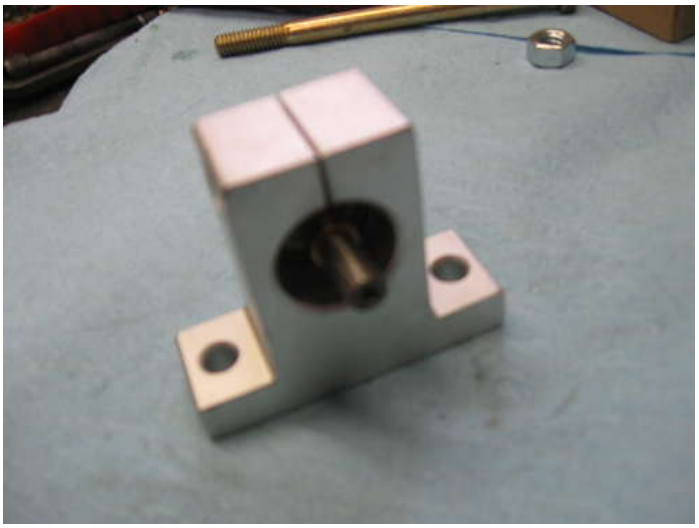
The bearings are set flush to one face of the blocks and tightened into place

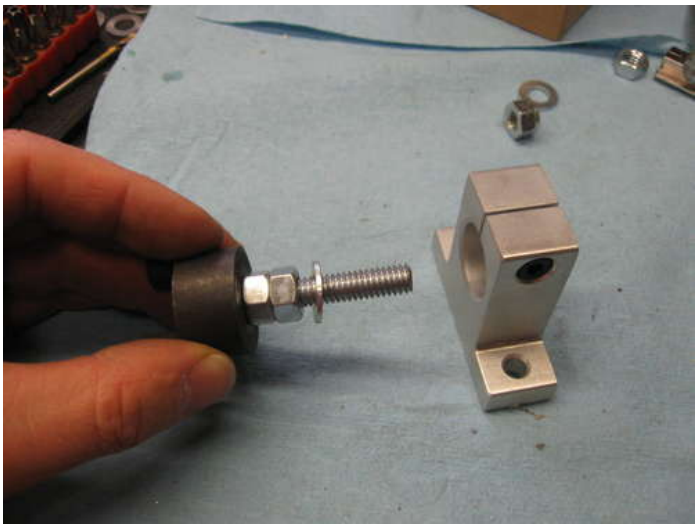
The tailpiece support is a ½ inch counter bore bit that will be running in reverse. The shaft on the bit is ¼ inch and a copper tubing adapter was used to increase the size to 5/16 inch for the inner race of the bearing. This is a friction fit shaft and you are done this piece.

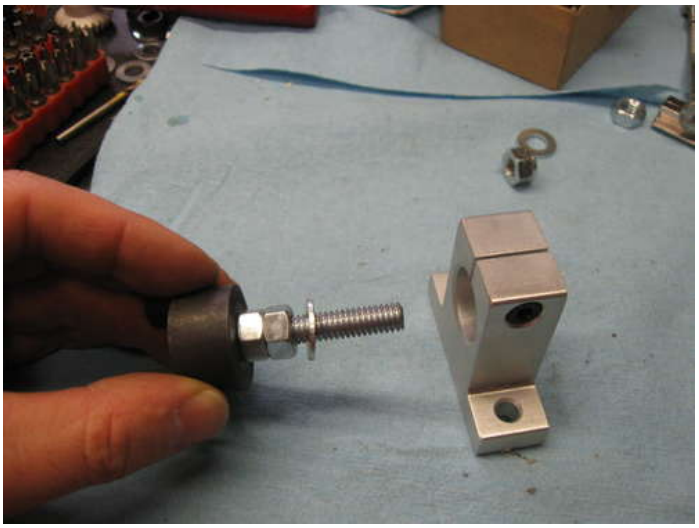
The drive side is a flex coupler mated to a 5/16 inch rod. The flex coupler was threaded to accept the rod then two hex nuts are placed on the shaft for spacing. You may need to add a spacer washed for clearance. The shaft is then fed through the bearing and the assembly is clamped down with a nylon lock nut. The assembly should be snug but not binding.

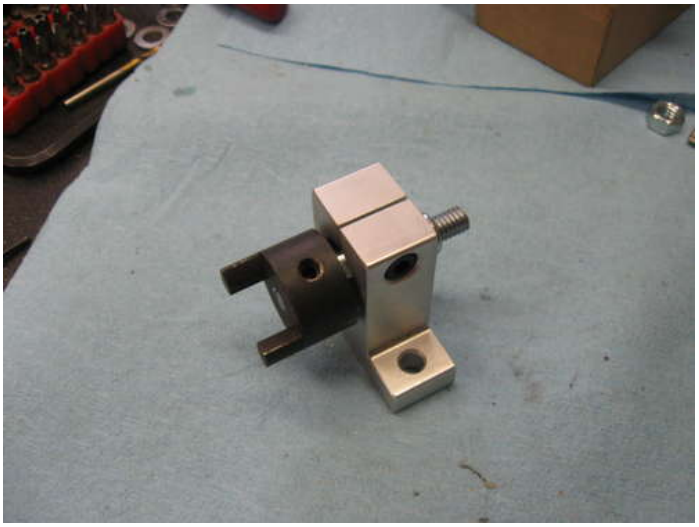


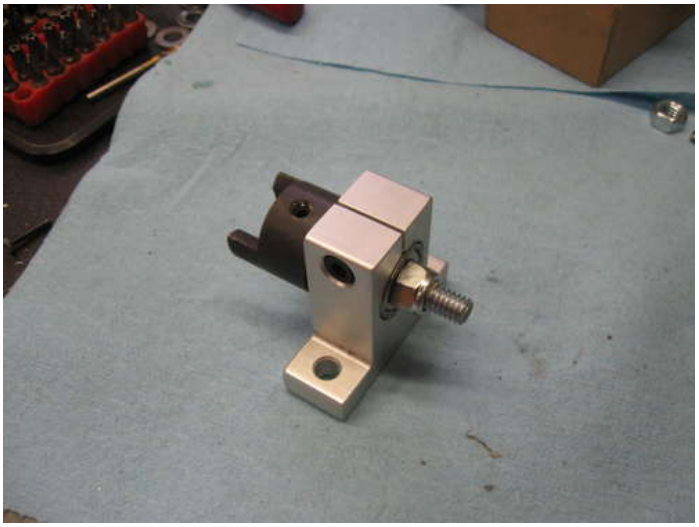












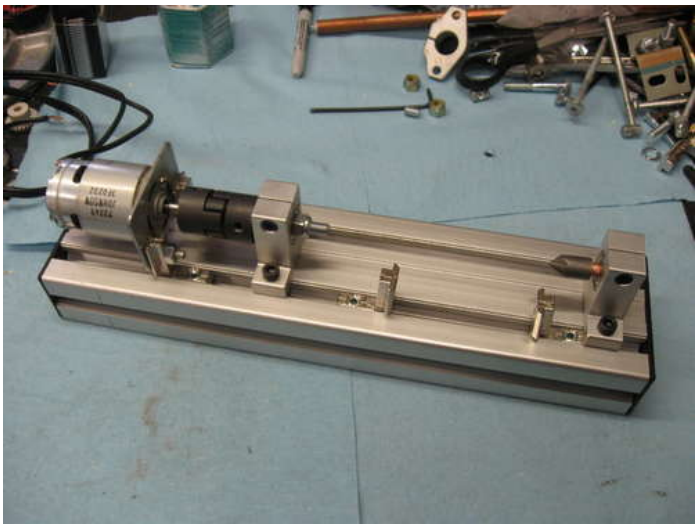
Step 3: Assemble the lathe

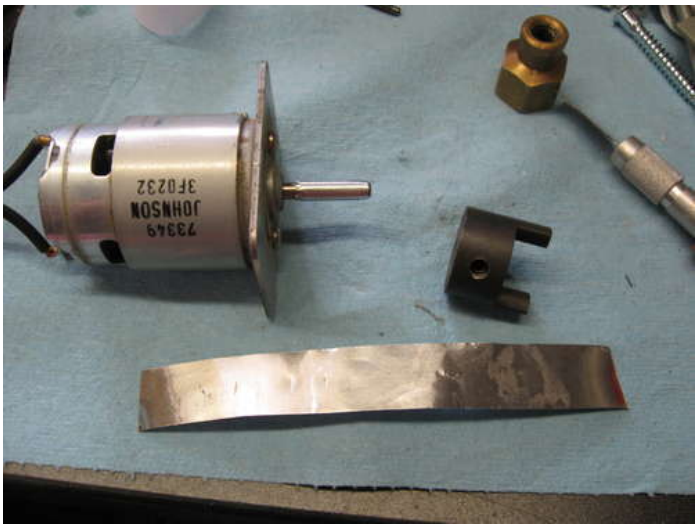
Install 2 inside supports and set the drive side bearing side on the base. This is to mark the position of the drive motor. I used 10-24 counter bore screws to allow for minor adjustment instead of the metric bolts needed for attachment of the angle supports.

The motor mount was marked and drilled with a 3/8 inch hole then fastened loosely to the inner angle supports.The motor shaft was smaller than the drive coupler so I had to build up the shaft diameter with aluminum foil tape. The drive spider is now installed and the drive bearing assembly is placed then tightened securely. The motor is aligned and fastened securely.
Place the tailpiece support and snug the bolts into place.

I placed 2 additional angle supports between the bearing blocks for use as a tool rest.

You can finish the base with end caps if you desire.

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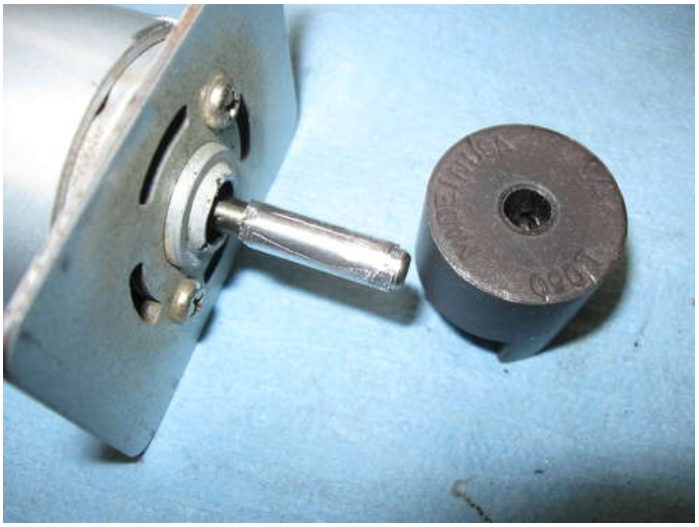

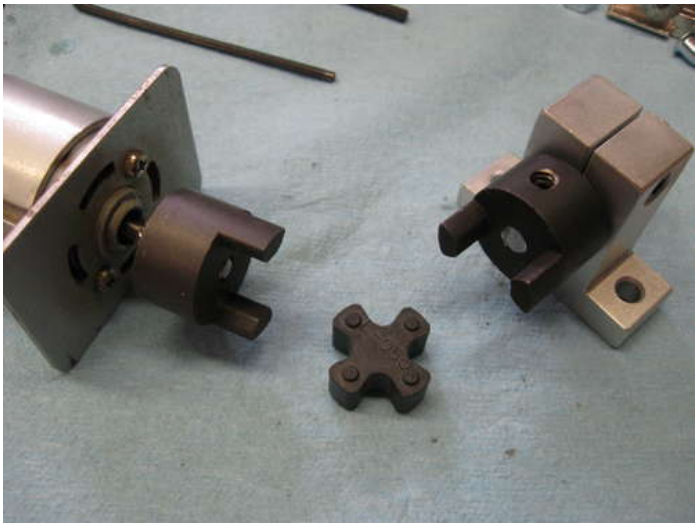

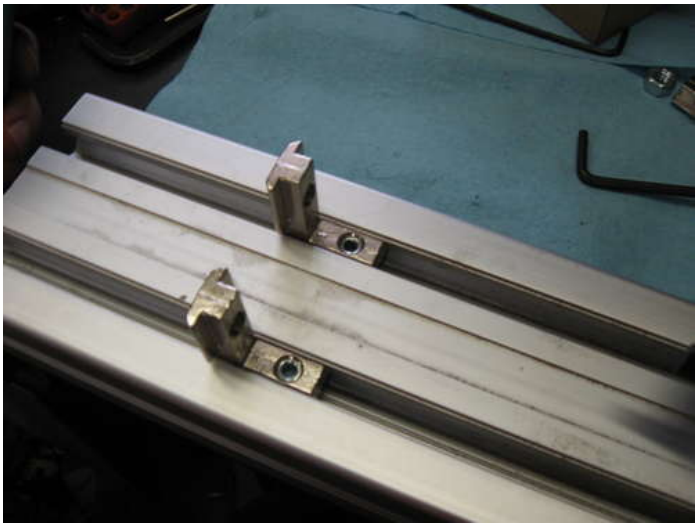

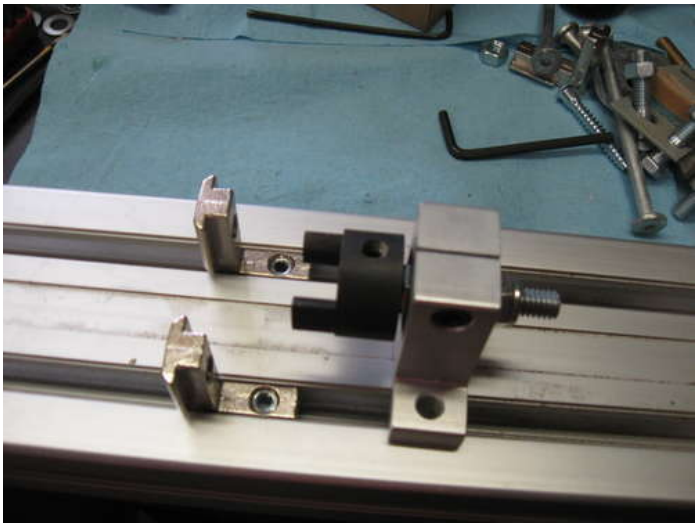

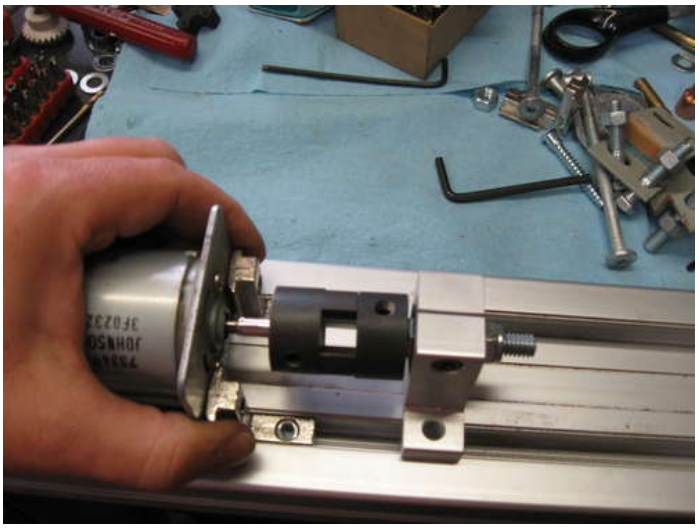

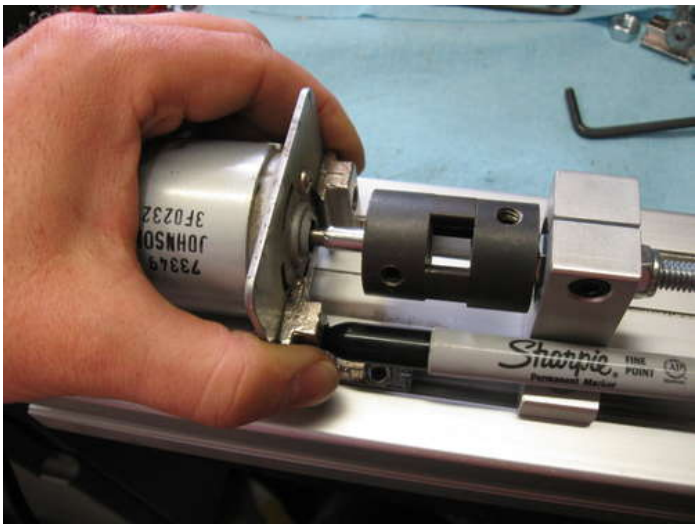

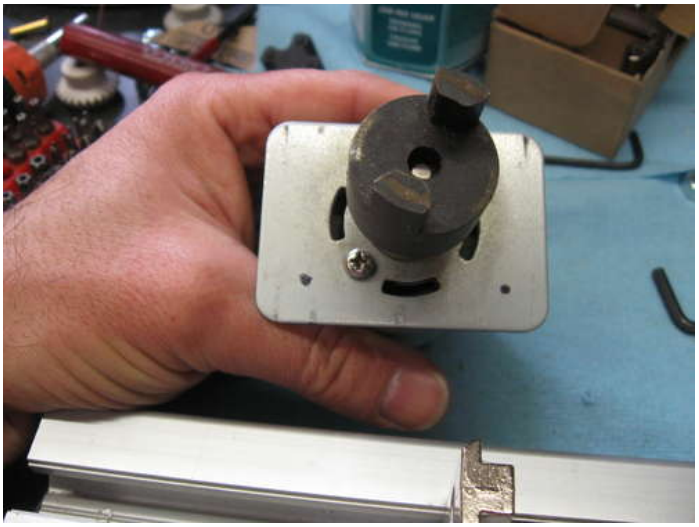

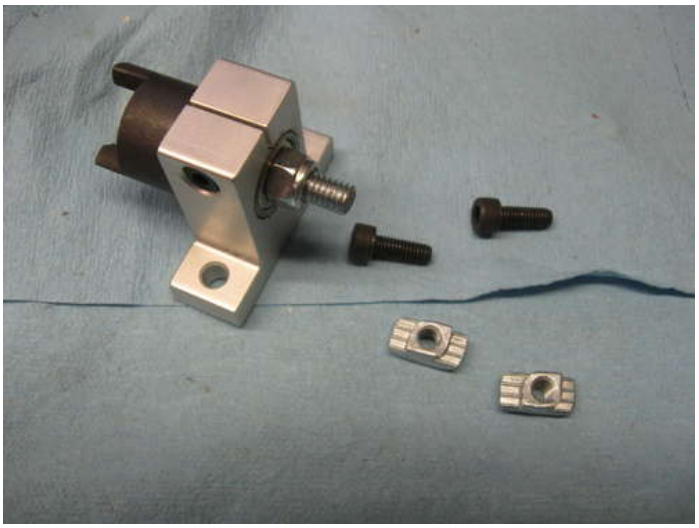


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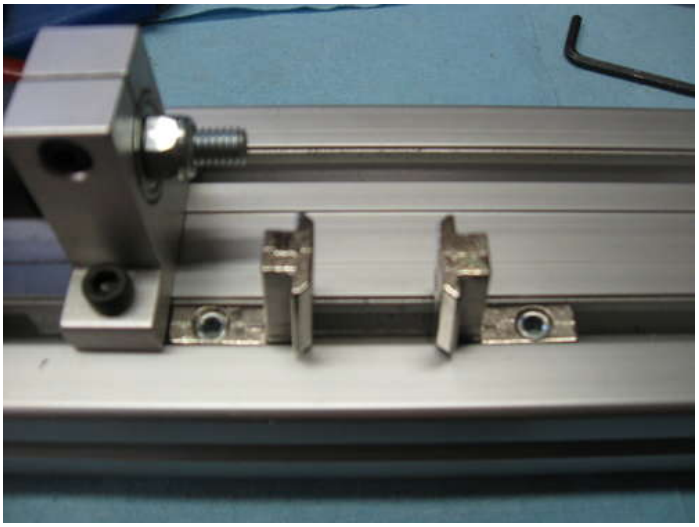
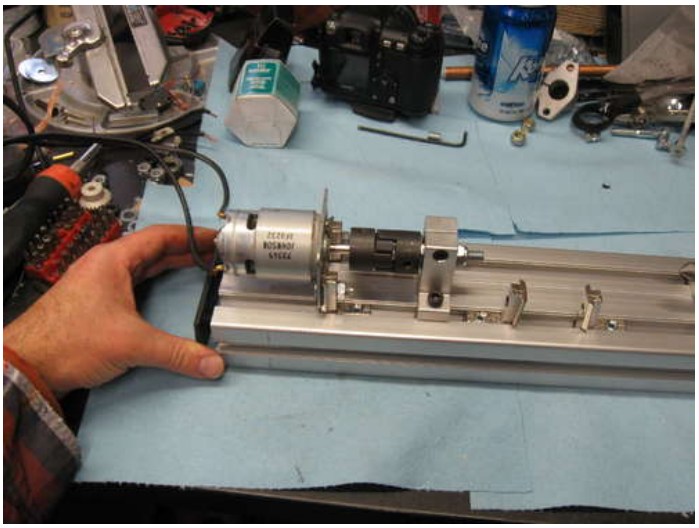




Step 4: Make a 3 Jaw Chuck

Now is the time to make a 3-Jaw Chuck a 4 Jaw Chuck is shown in my pocket lathe Instructable. You will need to know how to braze or weld.

Begin by selecting a ¼ inch fender washer. This is the base plate for the chuck. You will now need a 5/16 inch nut and a set screw that is ½ inch long. Place the set screw into the nut so that the bevel is protruding enough to center the nut in the ¼ inch hole of the fender washer. The nut should sit flat on the washer and not move about the hole. Braze the nut in place. The remove the set screw and flip the assembly over.

Place a ½ inch hex nut in the exact center of the washer and equally space three 5/16 hex nuts around the perimeter of the ½ inch hex nut.

Braze the 5/16 inch hex nuts in place and remove the ½ inch hex nut. Remove any slag with a wire brush and finish as desired. I chose to prime and paint flat black.

Install the three 5/16 inch ½ inch long set screws and you now have a 3-Jaw chuck. You might want to use a thread locker on the set screws. Be sure to completely tighten the screws before you use the chuck. This lathe will throw materials at a high velocity under full speed. Play safe...

Step 5: Make the speed control

I highly recommend a speed control for this motor. It rotates insanely fast and if operated without a guard will represent a safety hazard.

You will need the trigger assembly from a cordless power tool. Preferably not a Li-Ion type as these can be fiddly to work with due to the safety circuitry inside of the switch.

I used some scrap materials to quickly put together a clamping mechanism as shown, in a pinch a c-clamp will work for this.

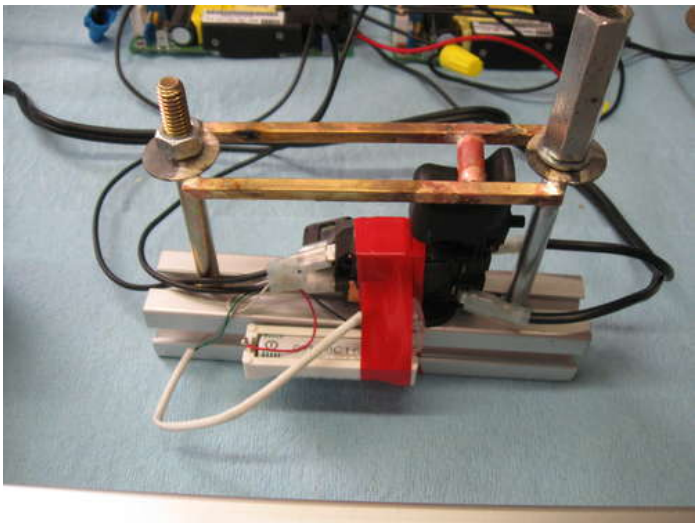
The drill that I used had a blown motor but the switch was still good. Since this was a Li-Ion type tool there is control circuitry in the switch. The fine wires shown on the inside of the larger wires are for that control circuitry. I placed the battery mating plug onto the battery and determined that the control circuit is 3.6V in reverse polarity. That means that you will need a small Li-Ion battery connected red to negative and black to positive for this switch to work. The switch is hand held and squeezed to adjust power as needed.

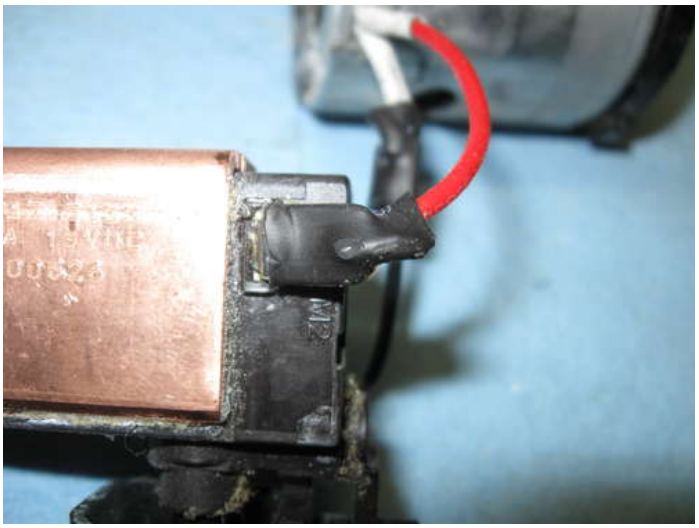
The switch has a direction lever and if your motor is running clockwise the chuck will not stay on the threaded shaft so reversing the direction will correct this. Run the motor so that the chuck is tightened onto the shaft by rotational force.

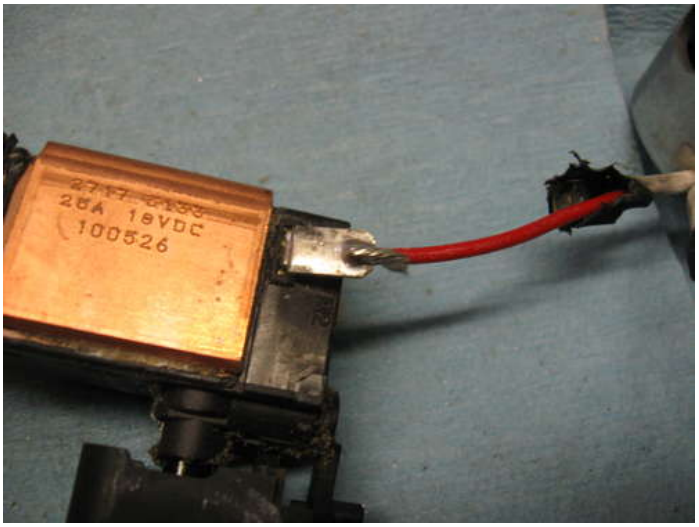
I put a quick jig together to allow for setting the speed at a desired level then having your hands free. I used a small section of the Bosch tubing and some 5/6 inch bolts. The switch was taped to the tubing and a lever was brazed together from scrap pieces. The adjustment is accomplished with a 5/6 inch threaded rod joiner, Tightening the joiner squeezes the trigger and increases the motor speed while loosening the joiner releases the trigger and the speed reduces. With no tension on the trigger the power stops.

Previously I hacked a motion sensor for a switch, the main control board had a 3.6 Li-Ion cell as a backup source. I used this to trick the switch into working. Now when the power supply is attached the switch gives variable power to the motor to control the speed.

The power supply inlet wires go to the bottom of the trigger as do the control circuitry wires. The motor is directly connected to the terminals at the top of the trigger.



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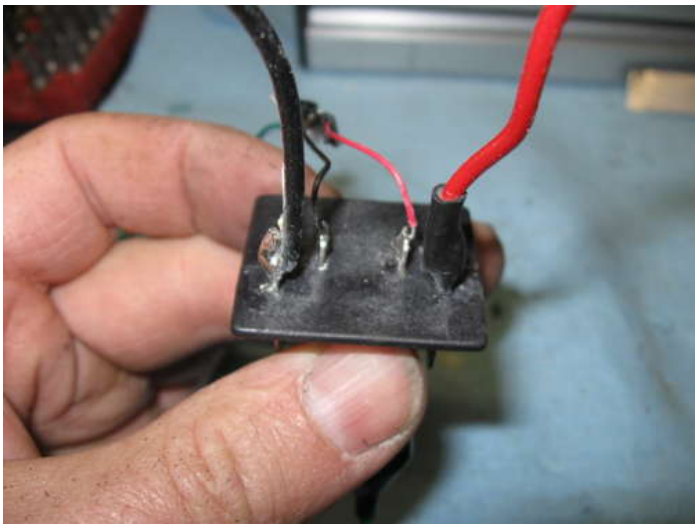


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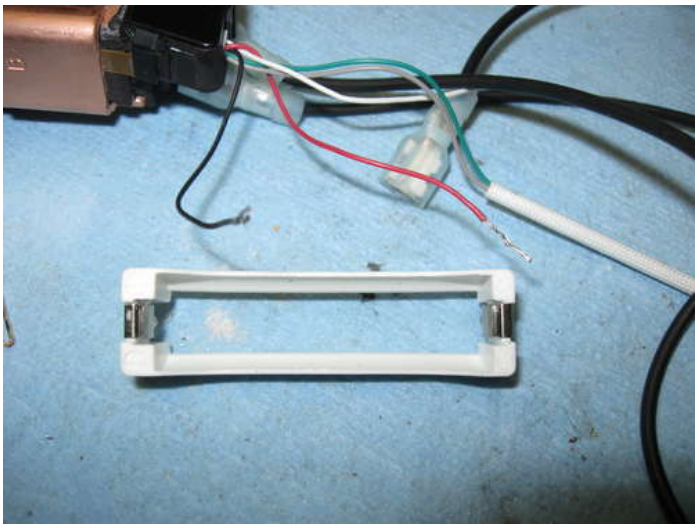


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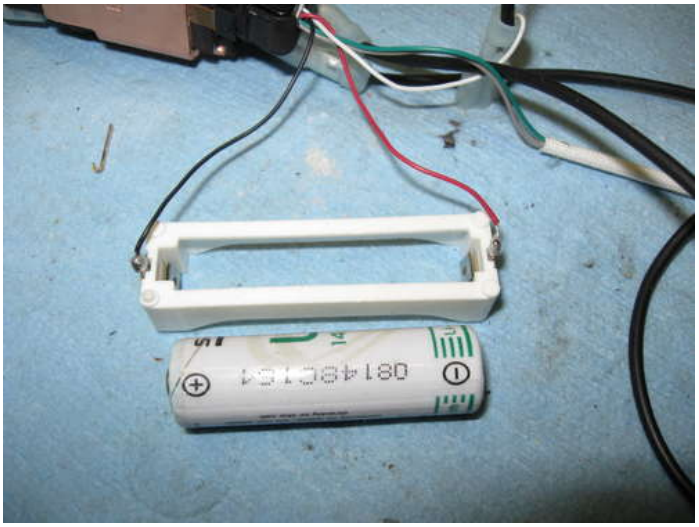

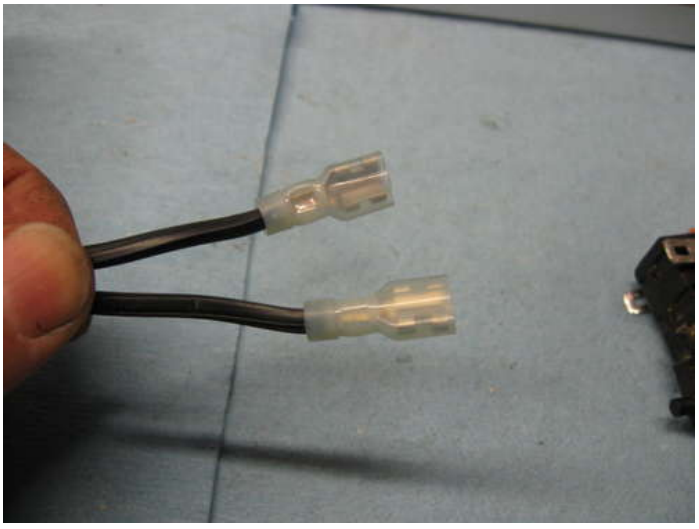

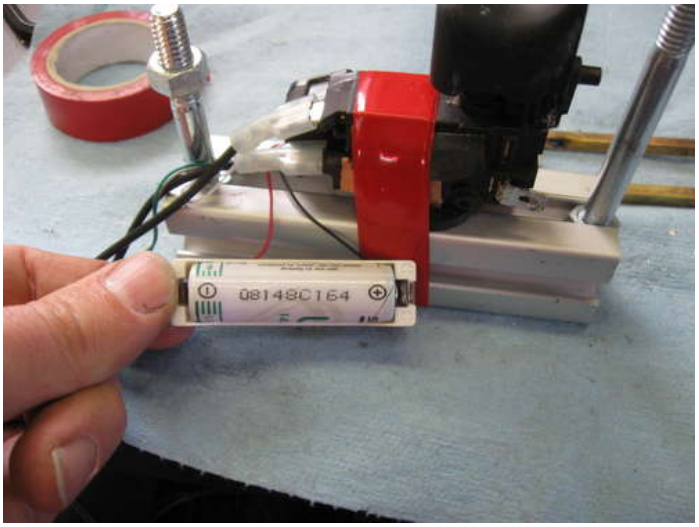
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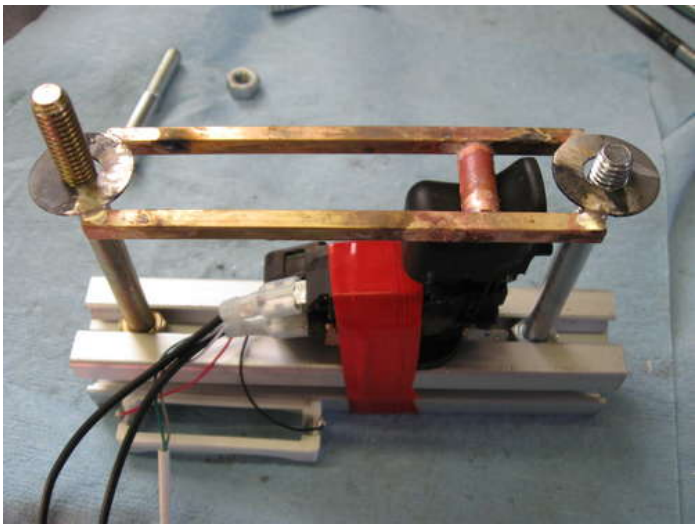
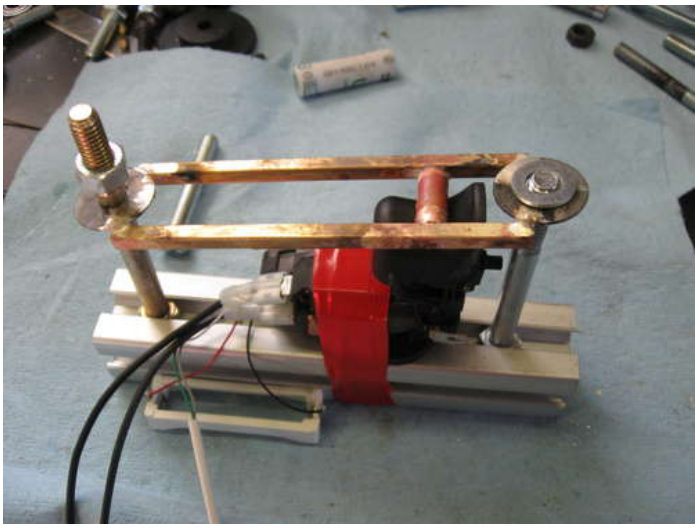
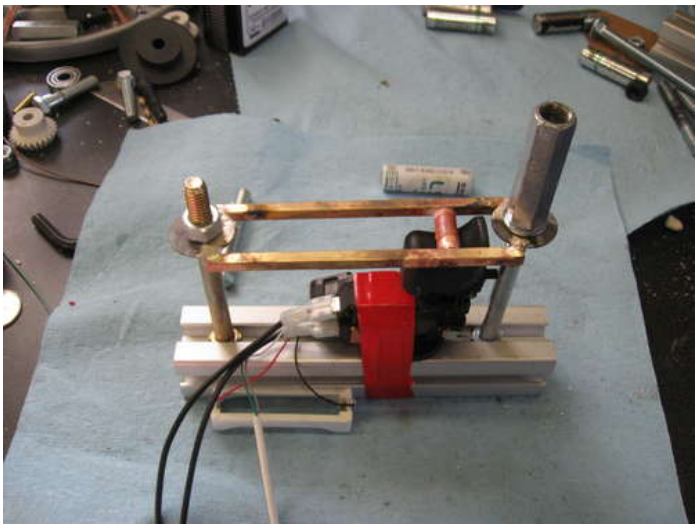
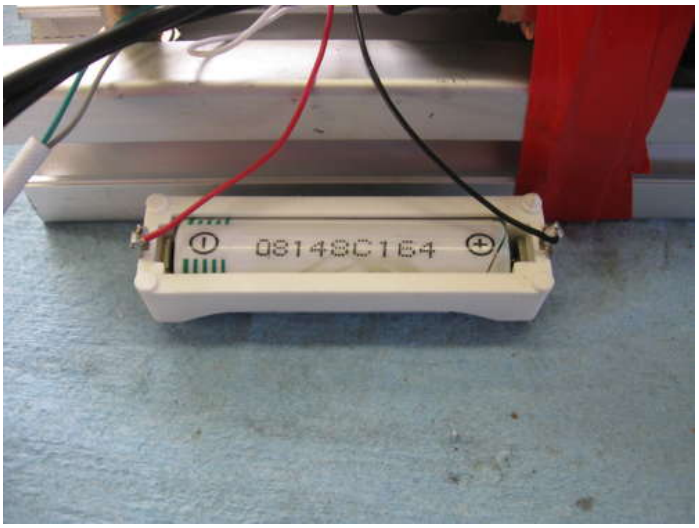
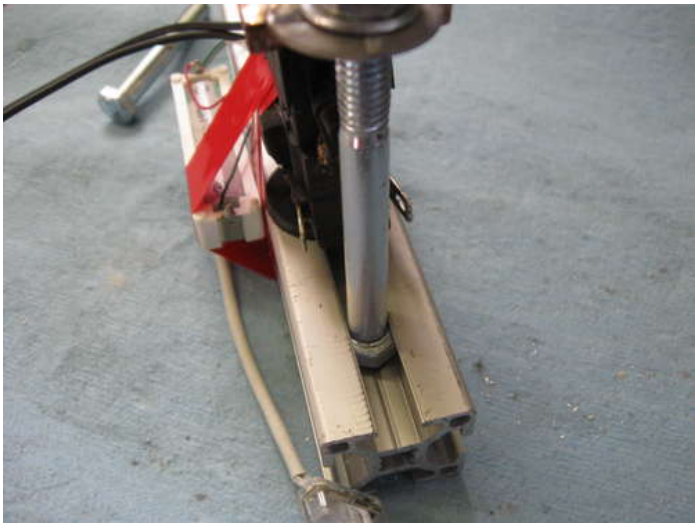
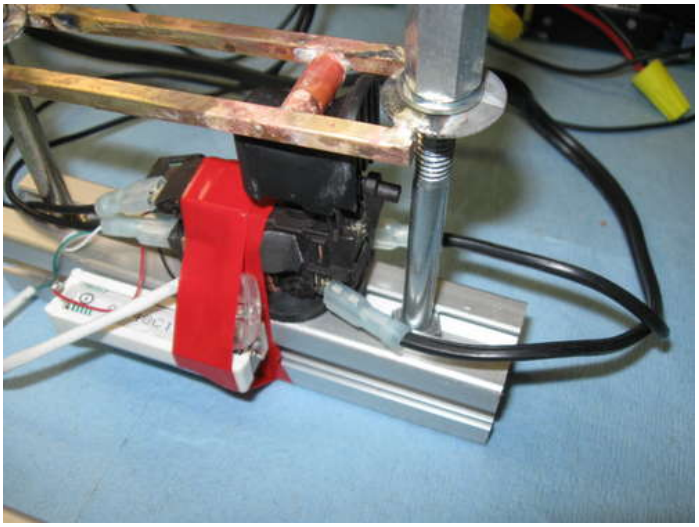












Step 6: Test the power and lathe

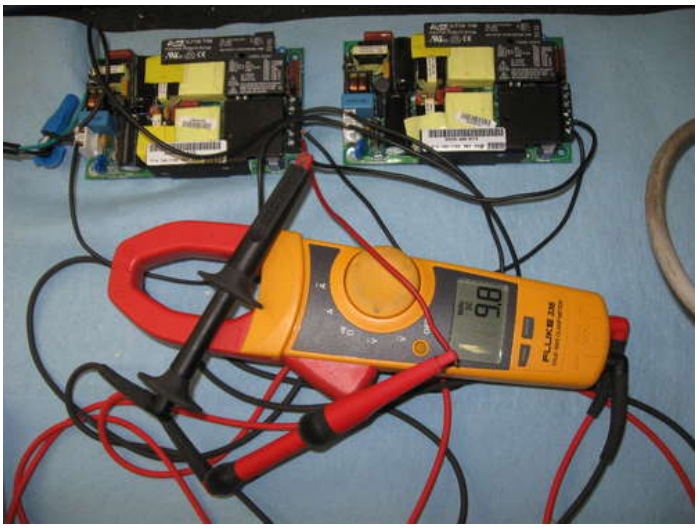
I wanted to use a 12V supply for this project but needed one that was in excess of 10A. I connected two 5Volt supplies in series to accomplish this. The supplies allow for adjustment in output VIA a small pot. I got 11V with what I had. Yes it will run on the battery but only for about 20 minutes of continuous use will deplete it.

You might want to place a safety guard over the rotating motor and shafts for safety.

I used metal files and HSS cutting tools to work the aluminum. This was done at a fairly low speed dry. The tool rest in from of the workpiece is a 1/4-20 bolt.

The motor coupling that I used was horribly our of balance and I had to clamp the lathe to the workbench with a C-Clamp.

I am currently working on a better tool holder for more accurate cuts.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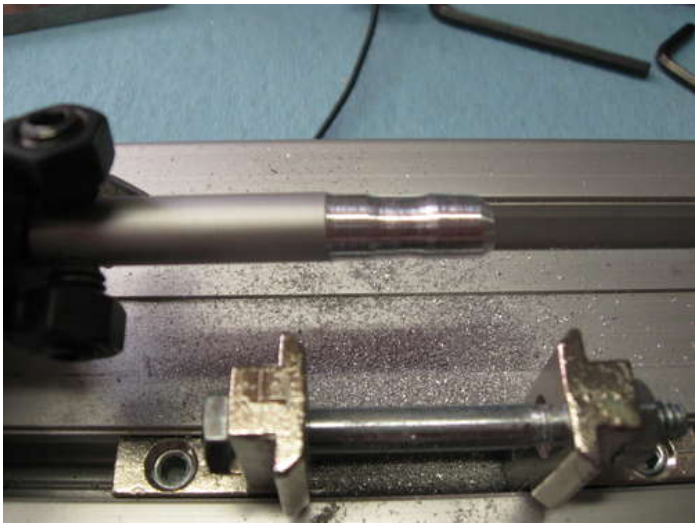

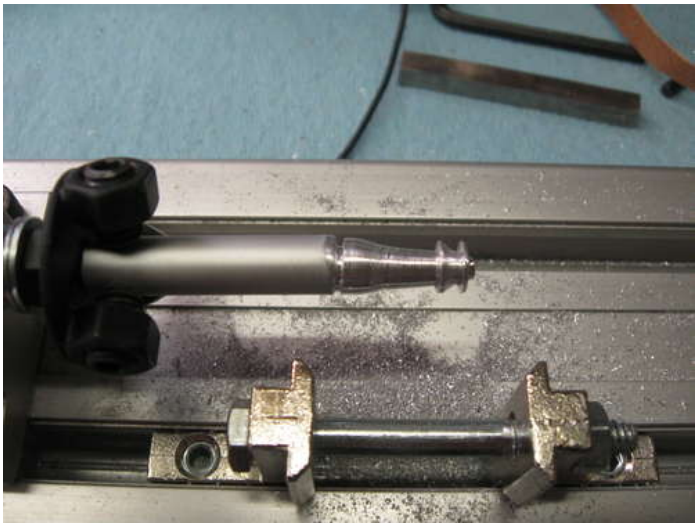

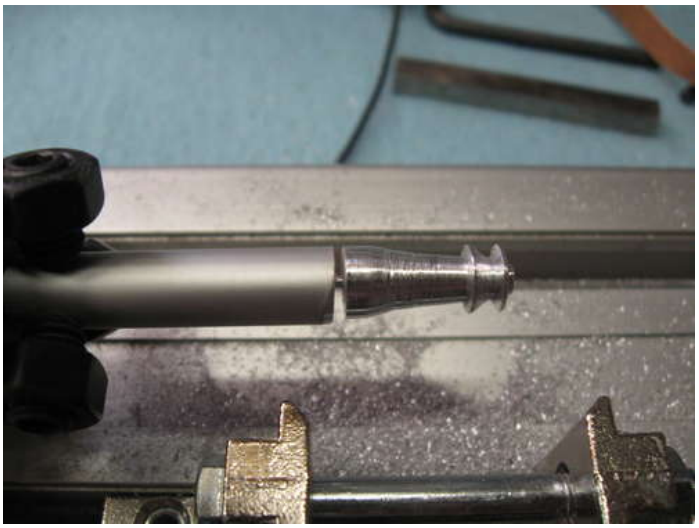

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