Concrete Metal Lathe

by **Confounded Machine** on April 3, 2016

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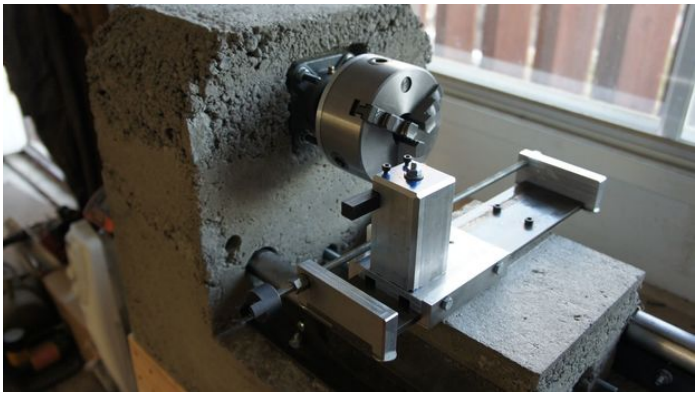
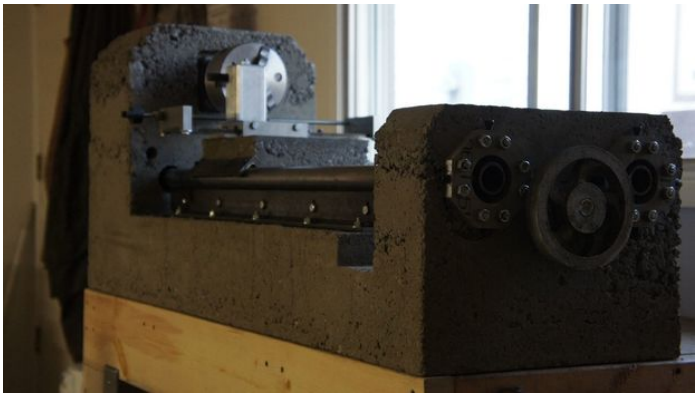
Author:Confounded Machine Confounded Machine
I'm a electronic engineering tech with massive love for DIY building, and tools that make tools.

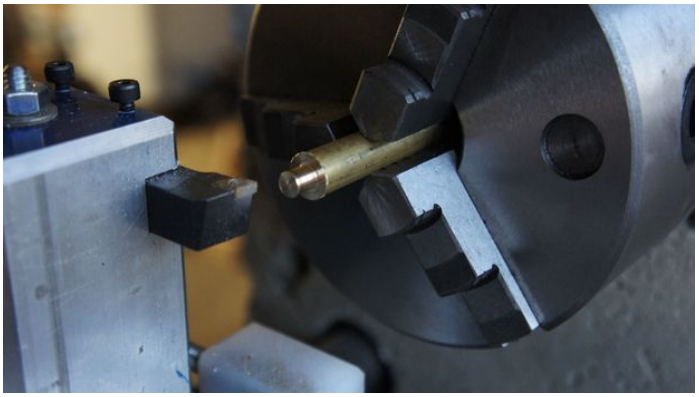
Intro: Concrete Metal Lathe

I've wanted a large CNC lathe for a long time...keep ingredient to that being a large lathe. Unfortunately most places that sell these lathes want a large sum of money in exchange. After some searching on the internet it turns out one could build a lathe from scratch using concrete and scraps of steel. This is the process of me building such a machine.

The final result is a machine that is far more precise then I initially imagined and a great machine to upgrade into my full fledged CNC metal turning monster!





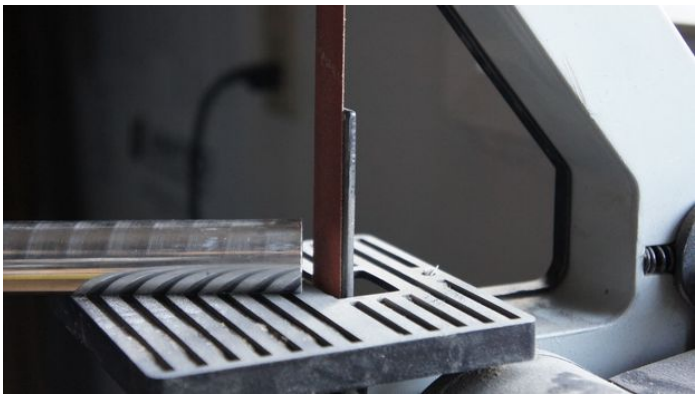


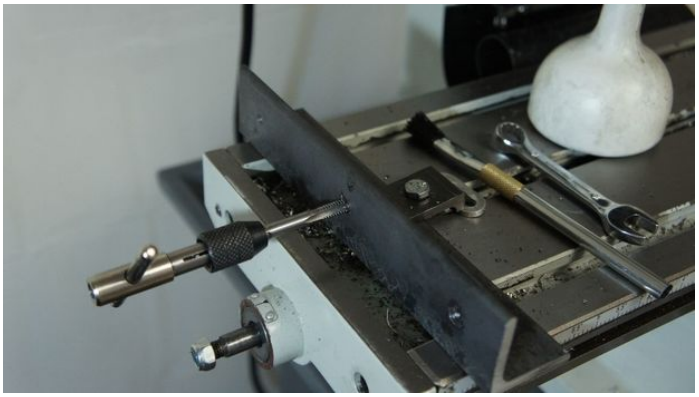
Step 1: The Concrete Form

Video uploading, online April 4, 8:00AM MST

The first thing to do was cut a mold and pour the lathe's main form. The form is a simple shape that could easily be cut with a table saw, or a skill saw for that manner but as I have access to a large format CNC machine I decided to design the mold in CAD and cut all the required parts.

With the metal parts embedded into the concrete I installed the main bearing mount as well as the CNC cut pipe holders. Once again this is a part that was going to be simple off cuts of angle iron but access to my little CNC let me get fancy. This is the modification that will allow for continuous adjustment as the concrete slowly shrinks over time.





Step 2: Moving the Beast

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I started casting the lathe when the weather in the garage was still dropping below freezing the odd night. I decided to cast the concrete in the basement and then figure out how to move it after...which was silly.

Moving a 500lbs of concrete up a flight of stairs is NOT easy. However people build spaceships and go to space so I figured I should be able to make this happen. After a few hours, copious use of ropes and pulleys and a few extra nicks in the walls I had the lathe up into the garage.

I added some extra bracing to my work bench in the garage and once again used a combination of bricks, jacks, and car tires to eventually lift the beast up onto its new home.

Step 3: Casting the Carriage

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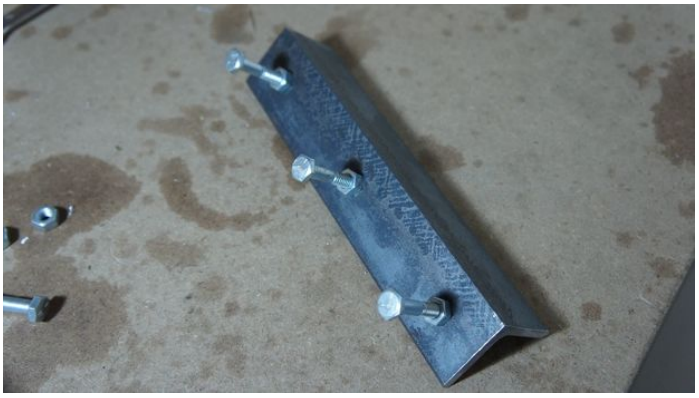
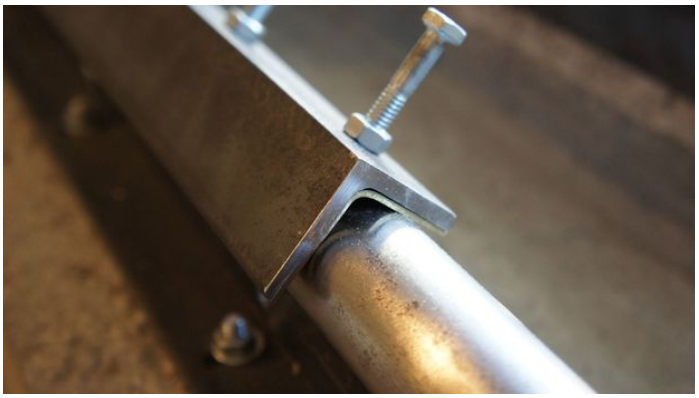
With the weather warmer I was able to finish the carriage casting in the garage. This time I made the forms using the table saw and some scraps of wood. The metal elements were placed into the concrete while everything was still setting up.

Brass was bent into crude angles to function as wear strips for the bottom of the (heavy) carriage. At this point I could dial in a more accurate alignment of everything and start actual work on making the lathe function.





Step 4: Cross Slide Addition

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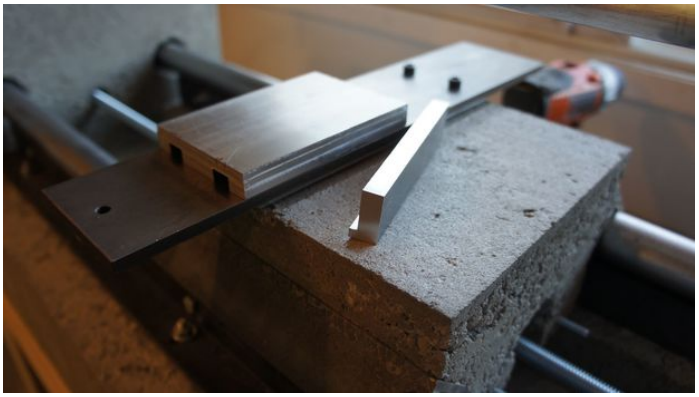
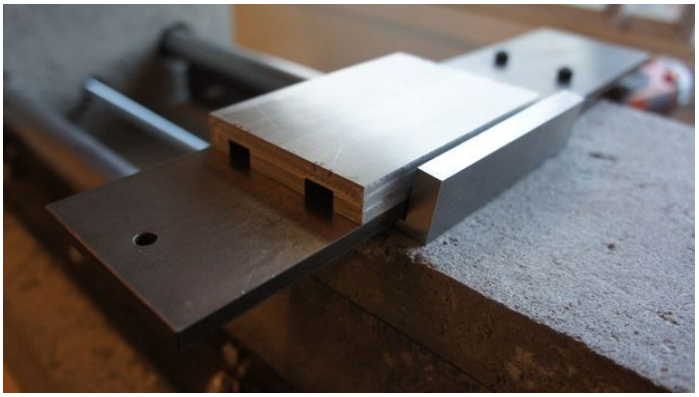
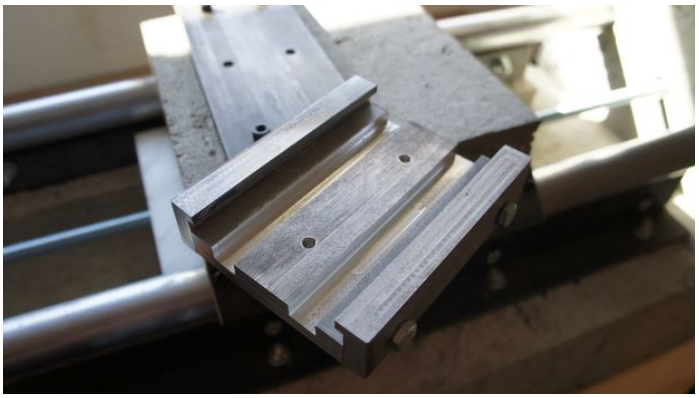
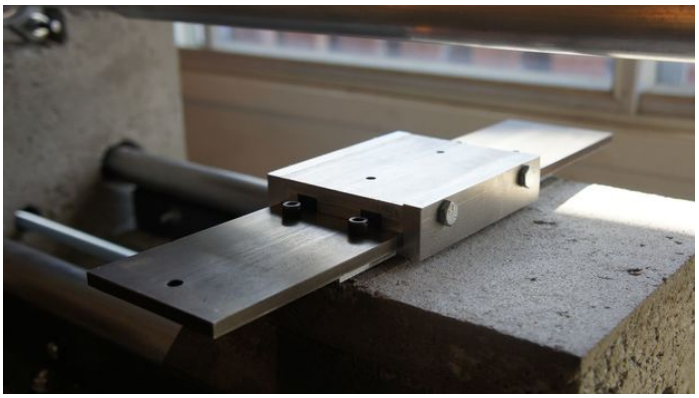
After installing the lead screw for the carriage I moved onto building the cross slide. I have a milling machine so I was able to make a cross slide out of blocks of aluminum, this could easily have been made with a hacksaw, file and drill as I mention in the video...after this machine my hack sawing skills have definitely leveled up.

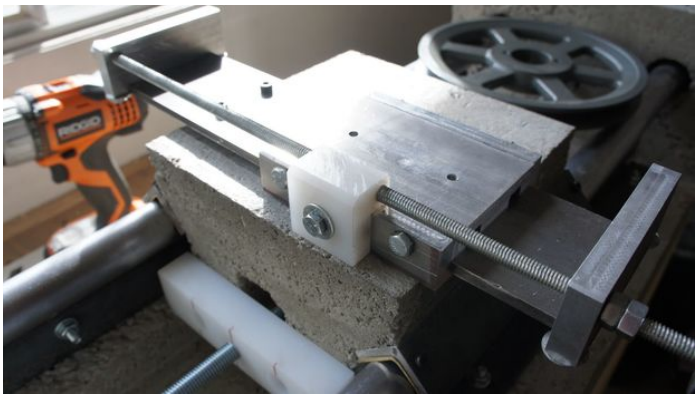
I used UHMW for lead screw nuts. I have used this plastic in the past on an old CNC machine and find they maintain a very low backlash drive for a long long time.

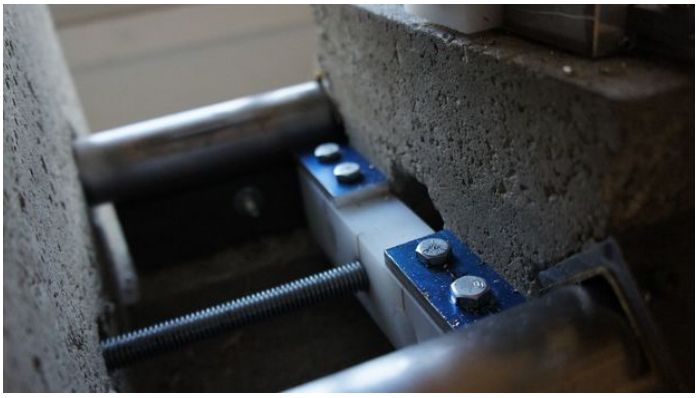


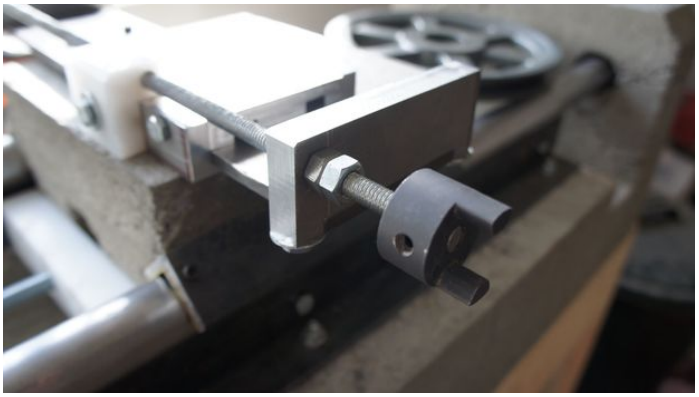












Step 5: Pulleys for turning

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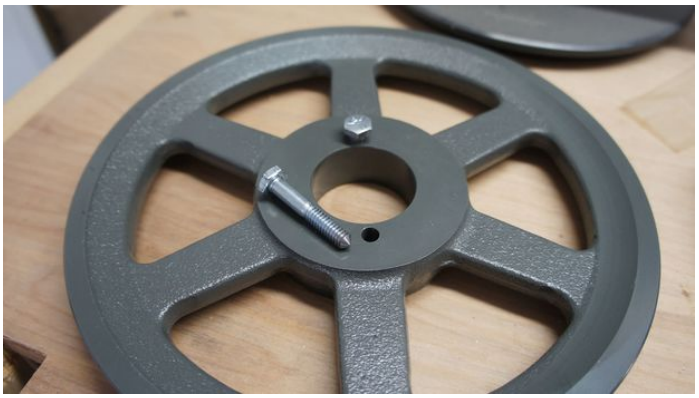
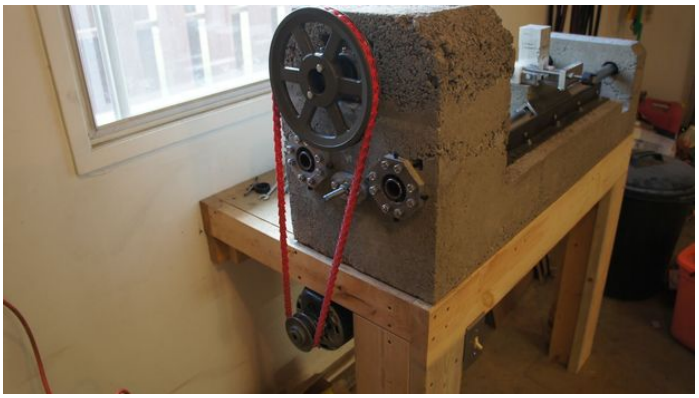
Now this would be a pretty poor functioning lathe if it didn't spin. In this step I took an off the shelf shaft, err....the big black thing in the picture. I took that black thing and drilled and tapped a couple holes corresponding to the holes in the pulley. From there I could bolt everything together and have a reliable way to transmit power to the chuck.

I used fancy link belt as I figured I wouldn't be able to bolt a pulley onto a shaft by eye all that accurately but it turns out that I hit the mark perfectly and the pulley runs extremely true. None the less link belt is wonderful stuff if you can tolerate the cost.

The motor is nothing more then a 1/2HP furnace motor which works surprisingly well! The pulley ratio gives me 300-400 RPM at the spindle which suits me well for the screw pitch of this machine.





Step 6: Tool post and 3 jaw

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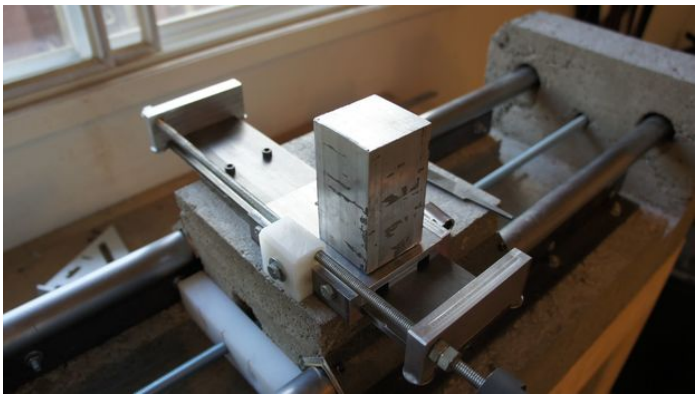
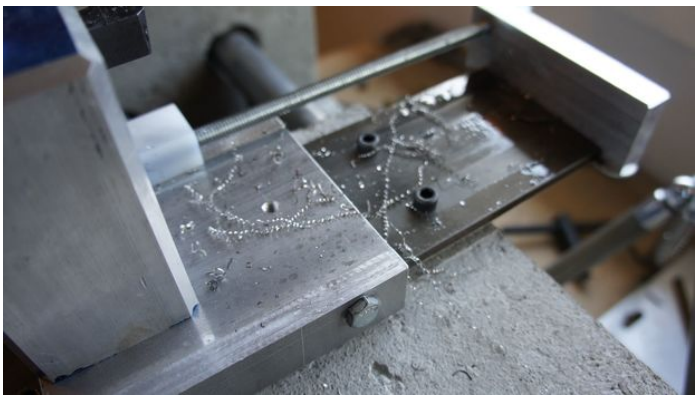
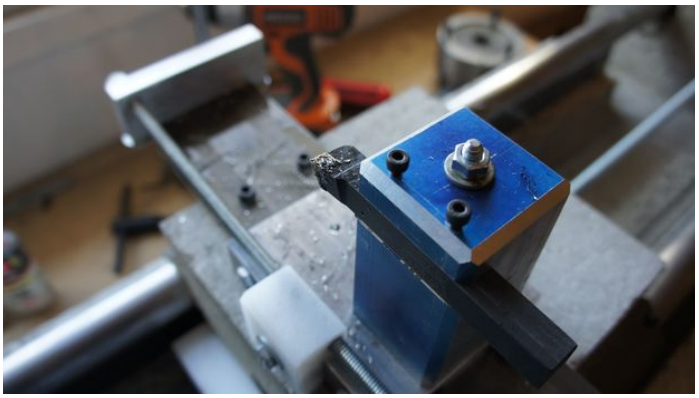
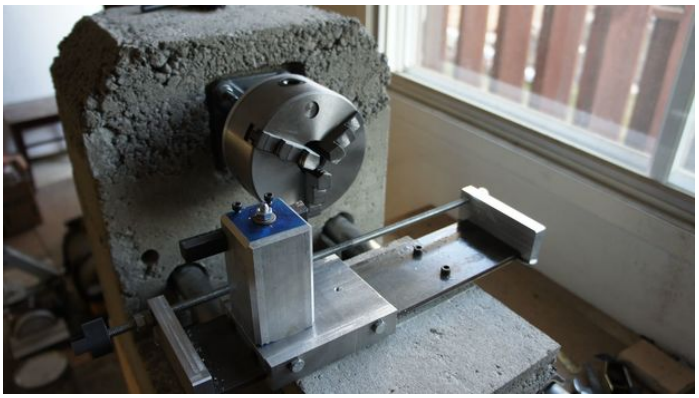
Once the spindle was able to run under its own power I decided to tackle the tool post. With this built I could now start using the lathe to help built itself. First I found center on the main shaft, made note of that height and milled up a solid block of aluminum to hold a tool at that height. Once again there is 1000's of ways to do this, I built it this way to suits my needs with the material and tools I had on hand.

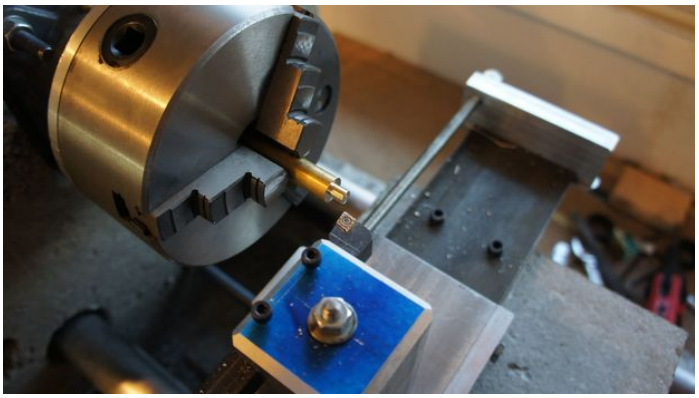
A backing plate was cut, trued up on the spindle and shaped to attach the 3 jaw chuck. I goofed slightly on this part and ended up over cutting the alignment plate for the spindle. I will remake this part in the future from thicker aluminum plate as it seems the 1/4" is a little small for holding the chuck perfectly true (can be seen in the video while turning the brass).











Step 7: Final thoughts

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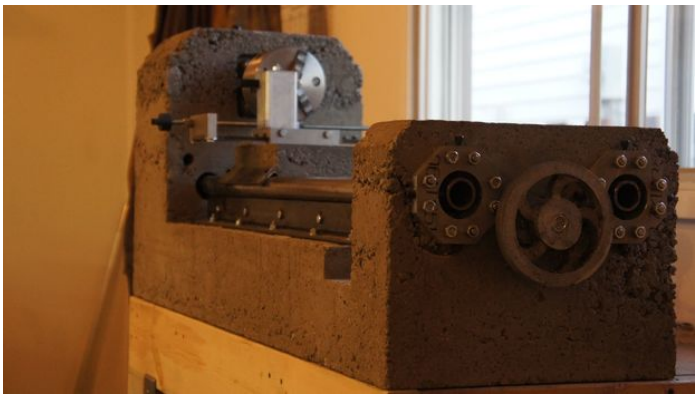
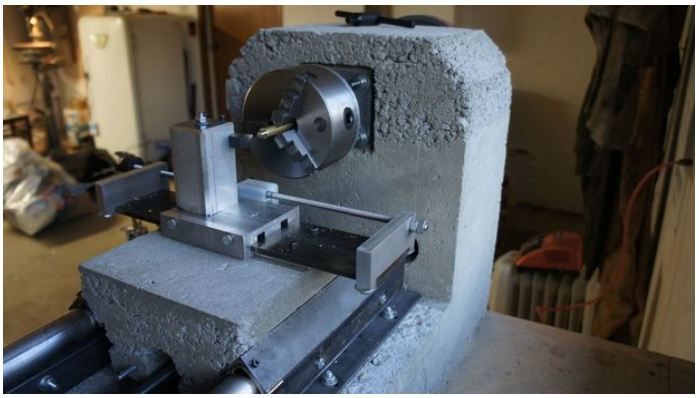
I am very very impressed with the results this machine has been cranking out! I still have to go thru the process of perfectly aligning the ways (over the entire length) lapping the slides, rebuilding the chuck plate, casting/turning hand wheels and possibly building some way covers to protect the exposed lead screws but already its a great machine to use!

The standard threaded rods I have used on this machine mean the hand wheels feed in and out exactly opposite to what I am used to...but that will only be a factor while this machine sits in full manual mode, as I mentioned earlier the next step is to convert this creature over to full CNC control, stay tuned and thanks for watching!

-Curt





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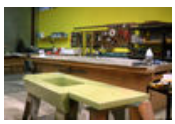

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