The Ram Clamp, Clamp Guide, and Bolt Fabrication

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The Ram Clamp

These parts are unusual in that no casting is involved. I followed Gingery's plans on the ram clamp except for three minor points.

The 1/2” cube used to space one end of the clamp was centered so as to avoid any chance of having it touch the bottom of the ram.

The connecting plate from ram clamp to link was specified as being made from two 1/4” thick plates. I used a single 1/2” plate.

And lastly, I have all bolts feeding in from the same side. This was not some brilliant design change, I just got carried away drilling and tapping until it was too late. No matter, it fit fine.

I chose to drill and tap both flanking 5/8” x 5/8” x 7” bars at the same time. First they were sawed and milled to length. Then I put them both in my vise. Clamps were added since one of the bars was probably held securely in the vise while the other bar was loose. The two side clamps insure all is secure. Actual hole location is not critical since I am match drilling.

I first center drilled, then drilled down through the top bar with the clearance drill. I then followed through the bottom bar with the tap drill. Sound backwards? In some circles this is the right drilling sequence. The idea is that the clearance drill forms the cone in the bottom of the hole to guide the tap drill. The alternative is to drill through both bars with the tap drill and then open out the top hole with the clearance drill. I'm sure there are people that will passionately argue both ways.

To tap the lower holes, I tried a trick mentioned on the web that seemed high risk. I put the 1/4-20 spiral point tap into my drill chuck. Power was applied until the tap was at full speed. Just as I cut power, I plunged the tap into the hole. The flywheel effect of the pulleys and motor drives the tap. Plenty of cutting oil was used. The result was surprisingly good. I went almost all the way through. The remainder of the thread was cut buy hand in my bench vise.

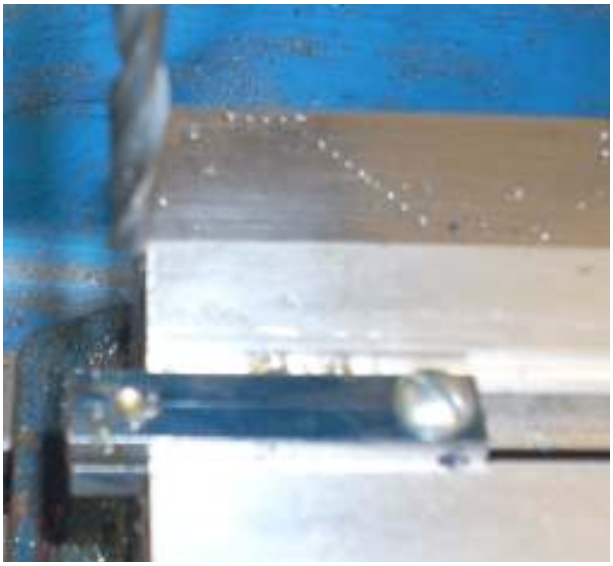
The holes were countersunk using the same flywheel trick. Here you see the last hole being cut.

After the side bars were machined, I fitted the link plate and match drilled clearance holes through it. Note that the first hole has a bolt through and it is fully tightened. When the second hole is drilled, it has to be a perfect fit. The final step was to drill the 1/4” hole in the link plate.

The Link

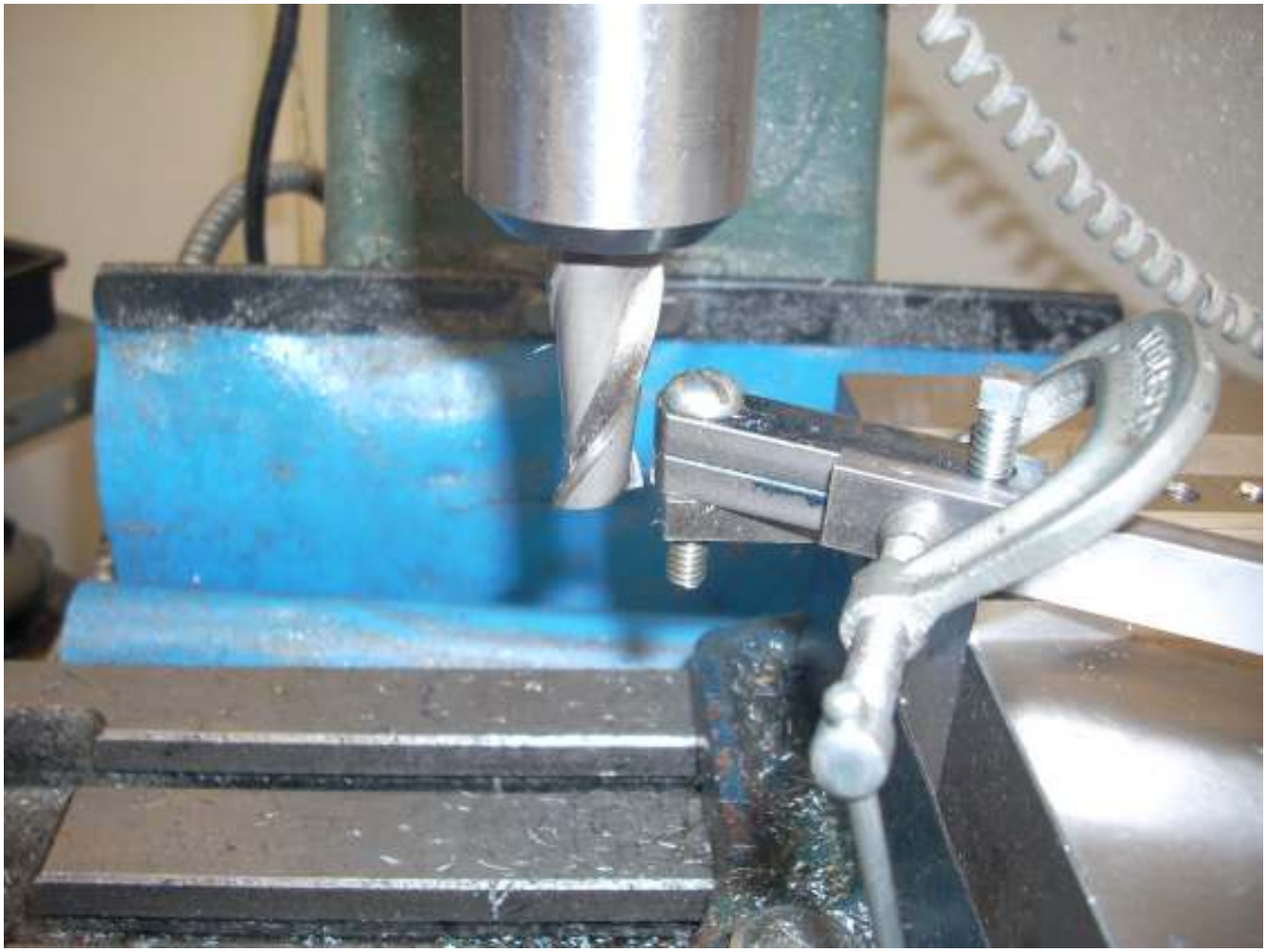
As with the ram clamp, I first cut the two parts on the saw but did not mill them to finished length since they will later be rounded on the ends. Here you see the first hole being drilled. The top link was drilled for clearance, the bottom hole for tapping.

I then ran the tap using the flywheel trick. It went all the way through without any fuss. I would not try this with a hand tap but the spiral point taps are designed to run under power. Chips are ejected out the bottom of the hole.

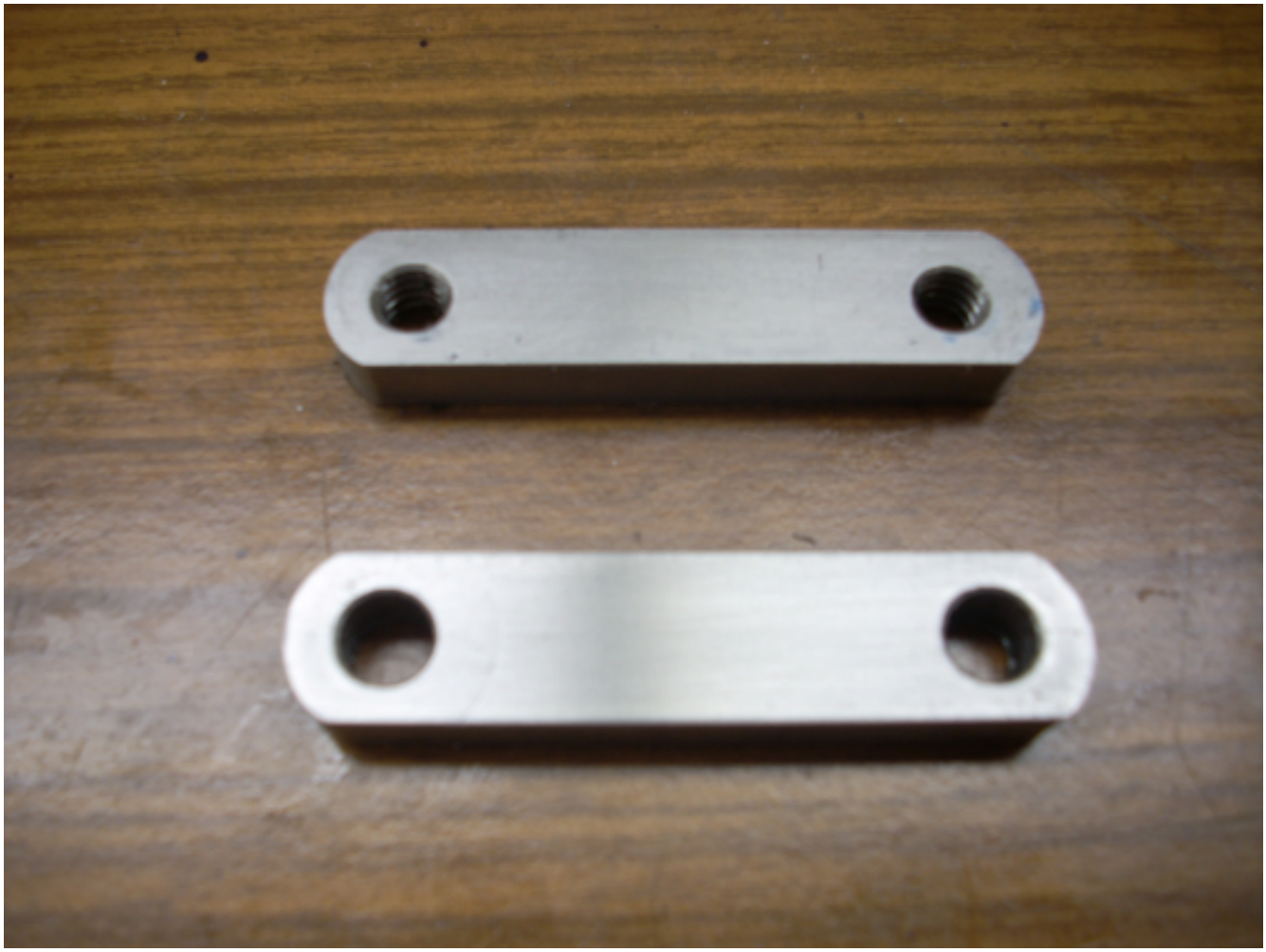


After running a screw through the first threaded hole, I center drilled the second hole. Clearance drill, center drill, tap. Nothing new here.

This was fun. I ran screws through both holes and then screwed one end to a threaded bar. The bar is clamped into my vise. The cutter was run into the end of the bar to cut the finished over all length and zero was set on the X axis. I then backed the cutter away such that it did not touch the corner of the link as it was swung out 45 degrees.



By taking .02” cuts and having a 12” lever arm clamped to the links, I was able to freehand round the ends.



The results don't look so bad. This is typical for me. My best looking parts are hidden deep inside my projects. All of my screw-ups are on the outside.

As mentioned in the previous article, my top pivot point on the yoke had a 3/4” bore. I turned a cylinder from 12L14 with a 1/4” ID. You see it here on the link stud.

Rather than mess with cap screws, I threaded lengths of 12L14 rod. Both ends of each rod were threaded. Red Loctite© was used to secure the studs to the threaded link plus used to secure the 3/4” cylinder to the stud. I want the cylinder to move relative to the bronze bearing, not relative to the stud.

I'm not sure why Gingery permits steel on steel between the ram clamp block and the link stud but I did not question it. If there is a problem, I can always add a bronze bearing later.

Here you see the link loosely assembled. The nylon insert nuts should keep things together yet be easy to remove if there is a problem.

The Clamp Guide

I almost made the clamp guide as per the plans. The front hole was drilled and tapped to secure the guide to the bottom of the ram plate. However, the rear hole was drilled for clearance through the ram plate and right through the ram casting. More on that later.

In this front view of the ram guides, note the 1/8” thick brass gib inside the black circle. This gib shifts the ram and its plate off center to the left.

As best as I can figure from Gingery's plans, he wants the yoke centered in the column. At the very least, this permits it to cleanly pass through the front column casting.

So we end up with a minor problem – the ram is off centered while the yoke is centered. My only choice was to offset the clamp guide by 1/16” of an inch. Didn't seem like a lot.

The clamp guide has been screwed to the ram plate. A trial fitting set the exact orientation of the guide. I then carefully transferred the ram to the mill and set it up on angle plates. This insures that the hole will be perpendicular to the ram plate. After this picture was taken, I added a hold down clamp to be extra sure that the ram plate was securely sitting on the angle plates.

To recap, the clamp guide is positioned to insure that the yoke is centered in the column. The ram plate has been set up so the clearance hole about to be drilled will be perpendicular to the ram plate. What could go wrong?

The answer can be seen here. I broke out of the casting a little bit at the end of the hole. Some of this is due to the taper of the vertical support. What puzzles me is that I only shifted the center by 1/16” yet you can see that the hole is off by more like 3/16”. Functionally, this will work. But like I said before, my screw-ups always end up in the most visible place. In hindsight, I could have added a bit more meat to the ram pattern in this area.

The Bolt

Gingery calls this “the bolt” but it is really the clamp guide clamp. I guess I now see why he just called it the bolt. Anyway, I departed from his design and like the result.

I machined a piece of 3/8” x 1” bar stock to a length equal to the width of the clamp. The sides are milled down 0.1” resulting in the center portion being raised up 0.1”. The hole is tapped 3/8 -16.

The “bolt” fits in just below the clamp guide. The raised center section prevents it from turning. Gee, this almost looks like a ***real*** machine!

A length of threaded rod runs through the hole in the ram. Here you see the rod before it is trimmed. I am also showing you the pretty side of the ram.

Here is the messed up side. You can see the side of the hole just breaking through at the top.

After the threaded rod was cut to size, I used red Loctite to secure it to the “bolt”.

I found a very nice closed top nut in my junk drawer. Should work fine. It only takes a quarter turn of the nut to lock the clamp to the ram. It is a simple matter to loosen this nut, set the position of the ram, and tighten. The nut is a 7/16” just like the bolt head that acts as the pinion and the bolt that locks the tool head in place. I like having a minimum of wrenches around a machine.

What Next?

After calibrating the yoke, I'll start on the feed crank. The casting is done so I will be able to work entirely in my air conditioned shop. It is 110° F outside and my foundry clothes would not make me any cooler. No doubt I will be firing up my foundry when it *really* gets hot outside.

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