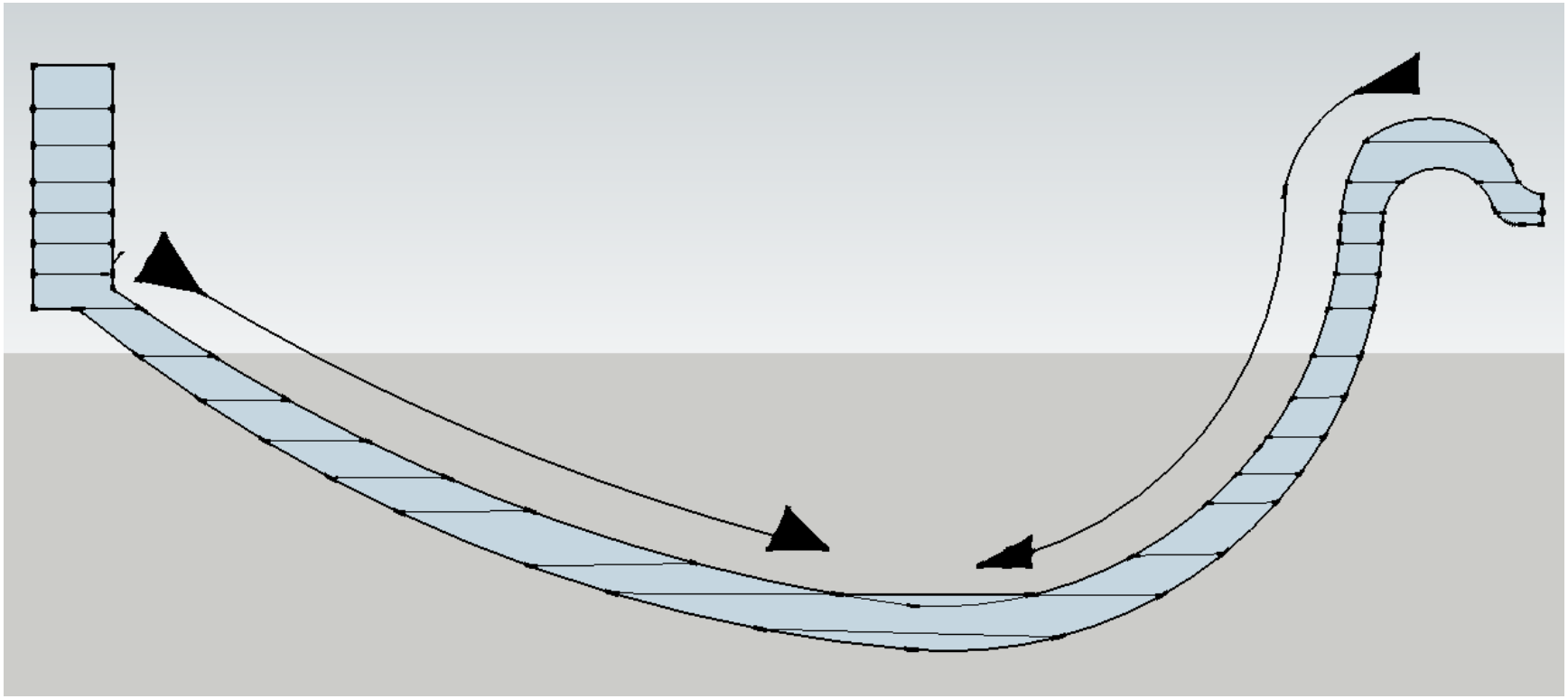
End Grain Hollowing

By: Lyndal Anthony

I do very large hollowing.
Be aware!
The larger the work piece, the difficulty and danger multiplies exponentially.

Be aware of the grain direction!
End grain hollowing is spindle turning.
Always go downhill.



Turning the outside is straight forward.

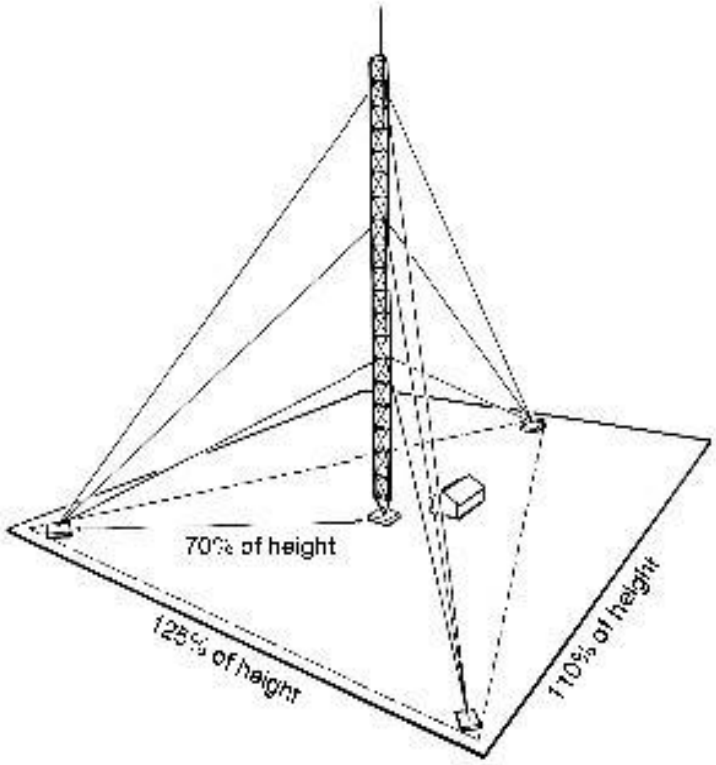
It is just spindle turning.

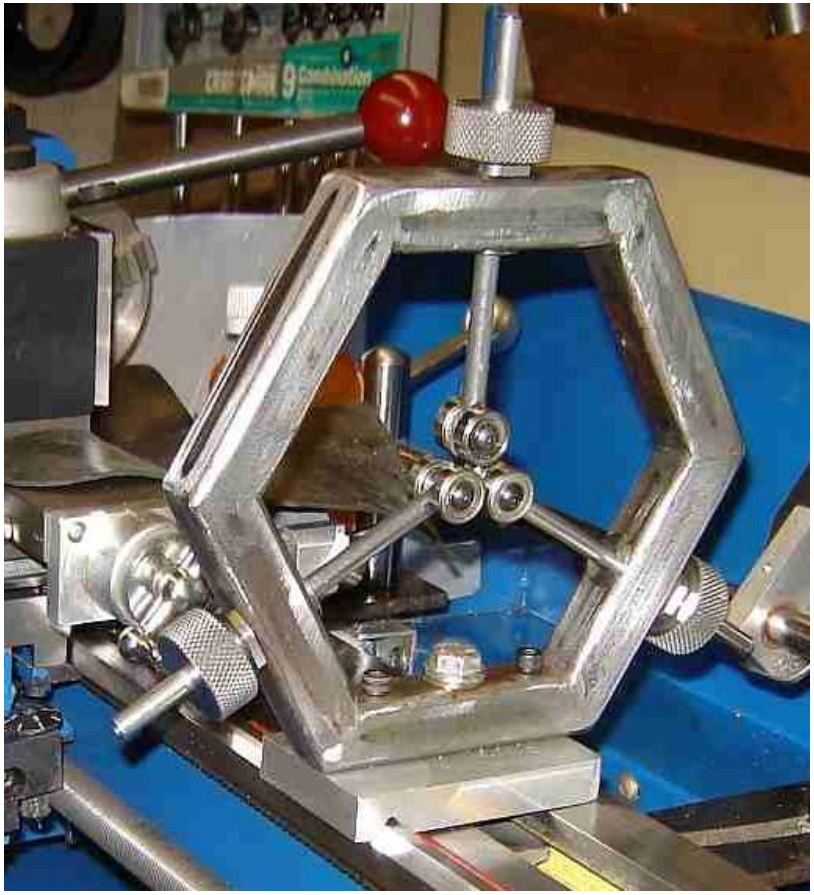
I turn a tenon /driver for the chuck.

Notice the driver on the foot end of the vase. It is small to aid in drying so it reduces the chance of cracking.
It is removed after the piece is complete.

Unless the vase/hollow form is real short, you need the support of a steady rest.

Just like a tall skinny tower needs support to stand up, long thin vessels need support while turning.



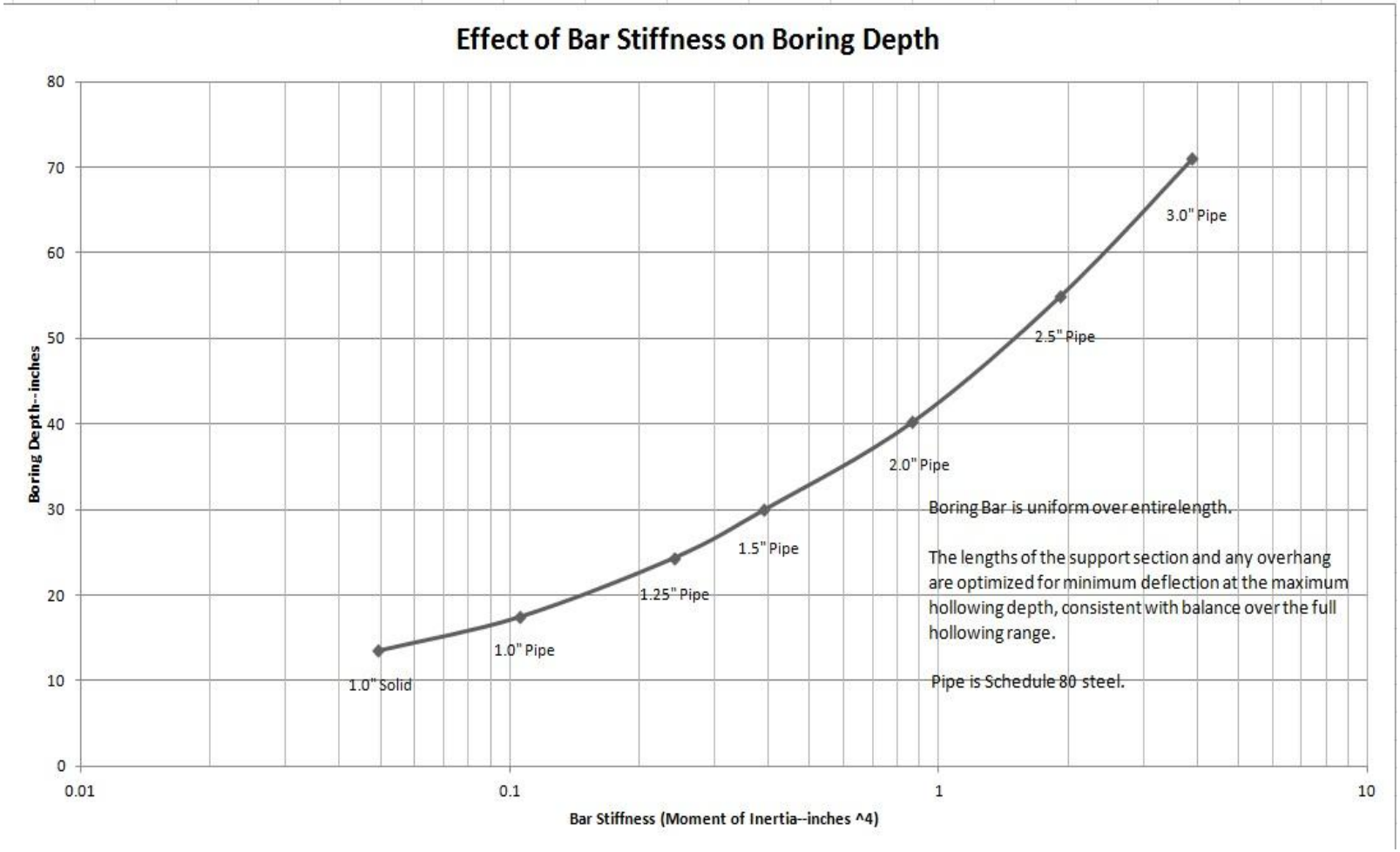


My boring bar of choice is a trap system.

I have no preference of boring bars. Steve Sinner, Lyle Jamison, Carter articulated systems, or any other hollowing system works fine.
If you have a system that you like, that is just fine.

The advantage of a captured, or trap, system is that the “twist” of the bar is controlled manually, is predictable and easy to use.
It also stays on center lined up horizontally with the bed by the trap and tool rest.

What size of bar do you need?



The big problem with hollowing/boring, is the length of the boring bar “hanging” over the tool rest. The more overhang, the more leverage that the handle has to overcome and the more the bar will flex.

The deeper you hollow/bore, the bigger the bar has to be and the longer the handle end has to be to counter the leverage exerted on the bar.

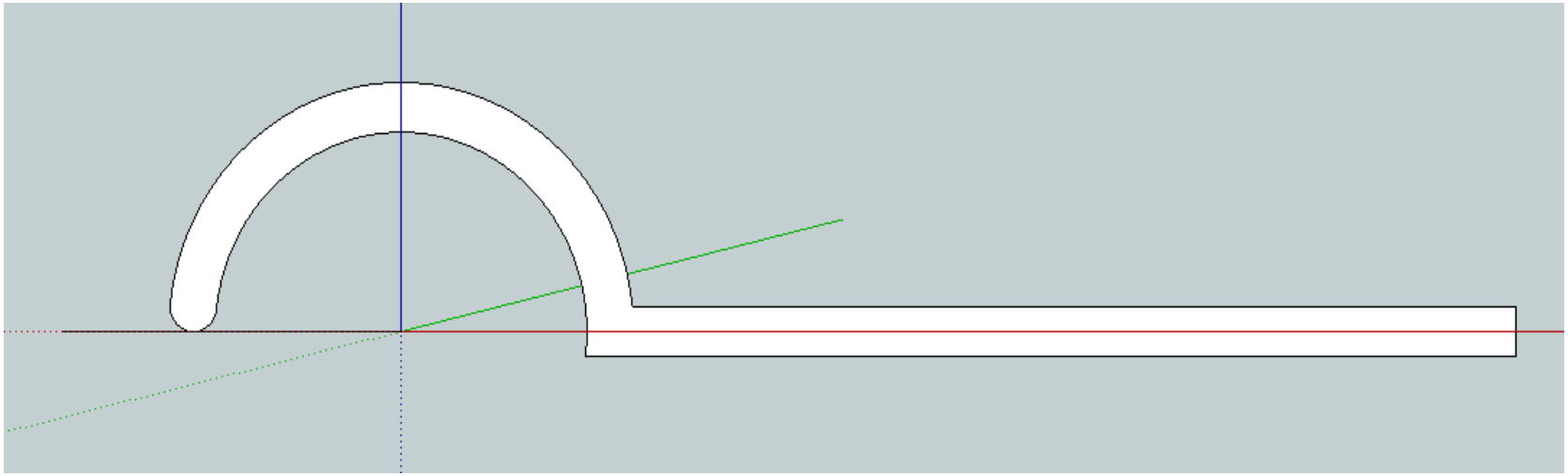
The bigger the cut/cutter, the more tool pressure is exerted on the bar causing it to flex. To reduce flex, you have to take a smaller/more shallow cut and/or have to use a smaller cutter.

Remember, the bigger you go, the smaller the cut you need to take! Reducing the size of cut reduces the leverage exerted on the boring bar.

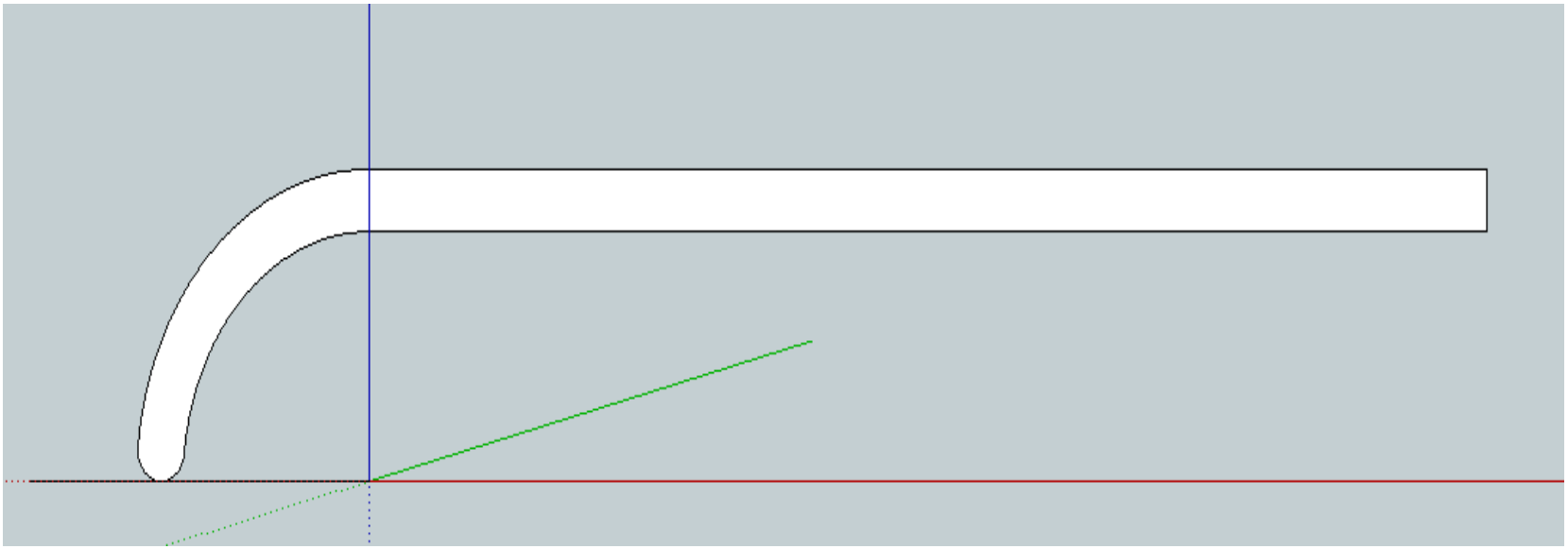
Not only does the boring bar need to be stiff, but the tool rest needs to be stiff too. All of the pressure that is exerted on the boring bar as well as the weight of the boring bar must be held by the tool rest.

If the tool rest flexes, the boring bar will flex changing the cut and inducing vibration.

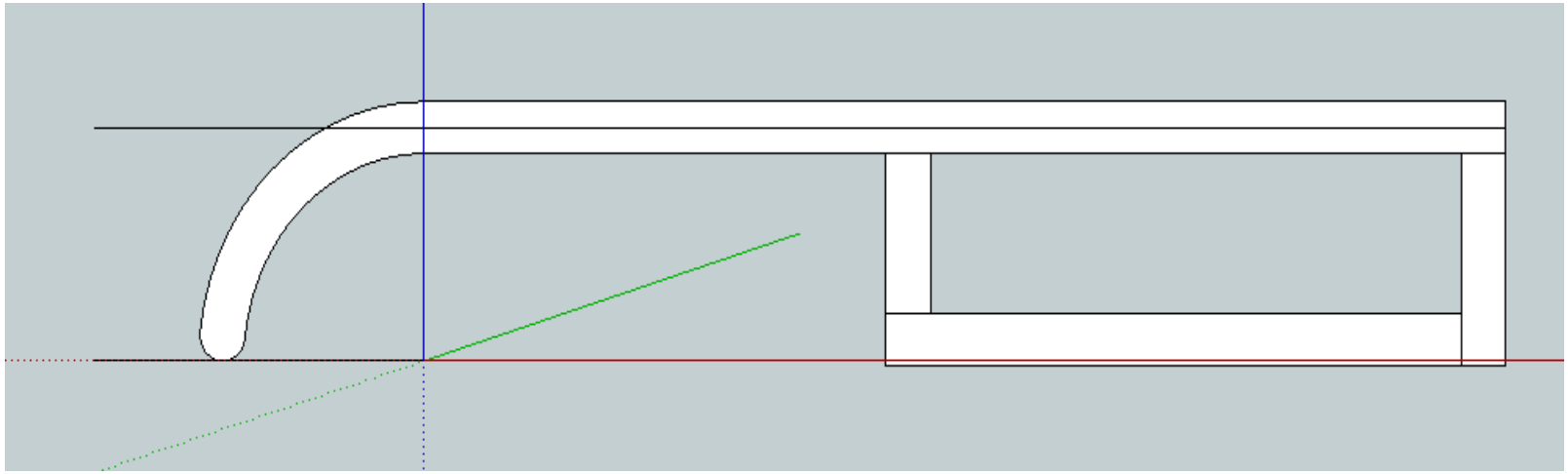
When boring, you have to be aware of how the cutting edge is exerting force on the tool. With a swan neck tool, the cutting edge has to be in line with the handle center line or you turn the tool into a crank. In addition to have the force trying to lift the handle, you will induce a twisting force making the tool even harder to control.



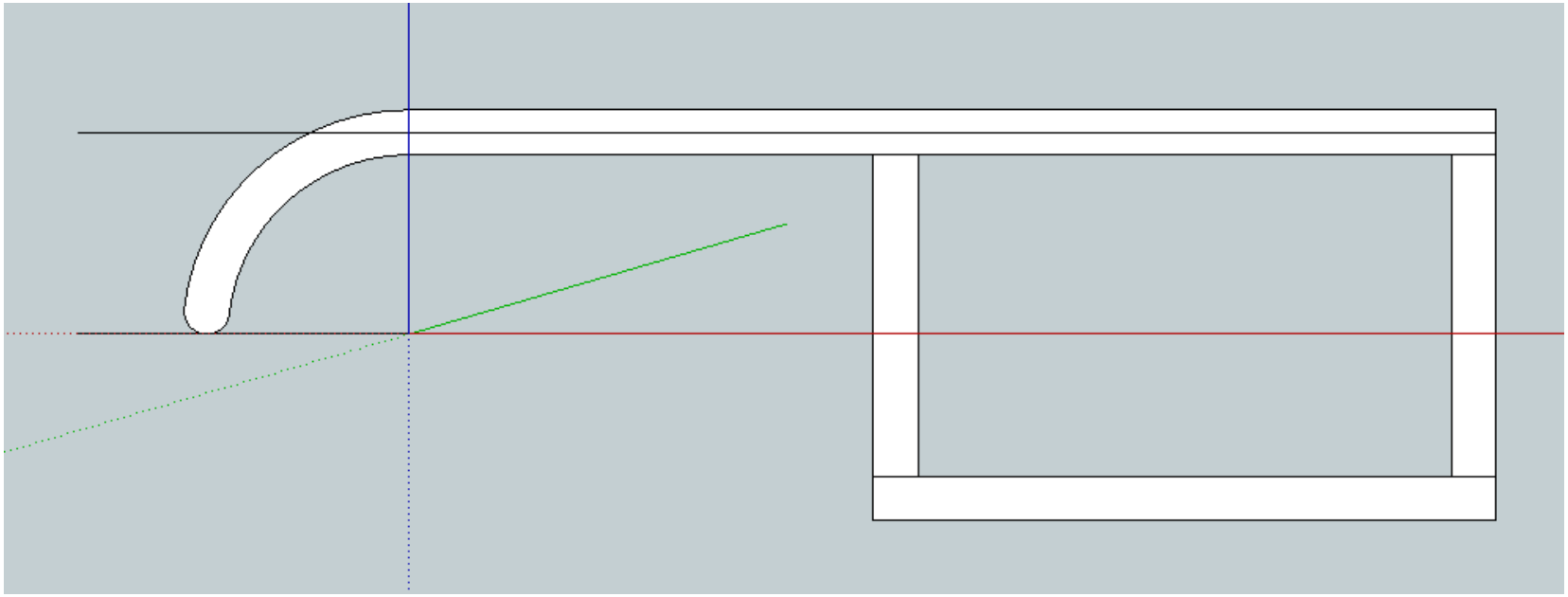
This tool is just a crank. It will be impossible to control.



This boring bar has had an “outrigger” added which make the “handle” much wider dispersing the cutting force across a wider area which allows the cutting force to be on the center line anywhere across the width of the handle.



If the “outrigger” is even wider, the cutting edge is moved even closer to the handle center line.



The width of the “outrigger” and “trap” will limit the horizontal motion of the boring bar. An articulated boring bar may have more movement, but the standard trap can be remounted in different locations for the desired movement.

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The ratio is the physics principle of leverage. If the estimated force exerted on the cutter is 40 lbs, then if the overhang is six inches at the cutter, then it will take 40 lbs of downward force with a 6 inch long handle to counter that force!

Generally, it should only take about 2 or 3 lbs. of force to guide a turning tool. In order to counter that same 40 lb. with a 6 inch overhang, the handle again will have to be 48” long and will require only 5 lbs of leverage force to counter the force on the cutter! The handle will probably weigh 5 lbs. so the force will probably be neutral.

In order to be comfortable turning you need to work with a light force on the handle like about 2 or 3 lbs. That is why you need such a long tool handle.

With a captive system, the cutting force is transferred to a rear “handle end” of the captive tool rest which is bolted to the rear of the lathe, or a HEAVY outboard toolrest. With this setup, the lathe itself easily counters the massive force, it also locates the bar horizontally, so all you have to do is guide the bar laterally and the bar stays on center of the work piece.

You have to have a hole to start with unless your bar is perfectly aligned on the center line. (Lots of luck there!)

First, drill a clearance hole.

Sounds easy, right? But drills want to follow the path of least resistance.

Use the shortest, stiffest drill you can find.

Depending on how deep you drill, you may have to stop and hollow (open up the hole) for drill bit clearance.

This is also the chance to try and re-center the drill hole.

I like the Rolly Munro Hollower for a couple reasons.

First, it has a carbide cutter which is supplied by Mike Hunter. Carbide lasts far longer than high speed steel, which is vital when it takes several hours to hollow a large vase.

Second, the Rolly Munro hollower is articulated, so you can change the shape/angle to get around corners or you can use it straight for small holes.

When rough hollowing, you can use any style of tool that works for you. It doesn't matter because you are just removing material.

Scrapers create more sawdust type shavings, whereas the Rolly Munro creates curly shavings.

The downside of the Rolly Munro is that it has a clamp over the top of the cutter which limits the depth of cut so the cutter doesn't self-feed or dig in.

The problem with the top clamp is that it can clog on some wood making it very difficult to use. A carbide scraper doesn’t clog, period.

To finish turn the inside to get a smoother cut, I use a Rolly Munro high speed steel shear scraper.

The cutter is mounted at a 45 degree angle and since it is high speed steel, it requires more frequent sharpening, but since it is used just for the finish cut, that is not a problem.

Out of balance work piece.

When you do very large work, safety has to be absolute.

Think of how an out of balance work piece can make a small lathe walk around. Now multiply that exponentially.

I make my lathe's stance wider by adding a wider base to the legs.

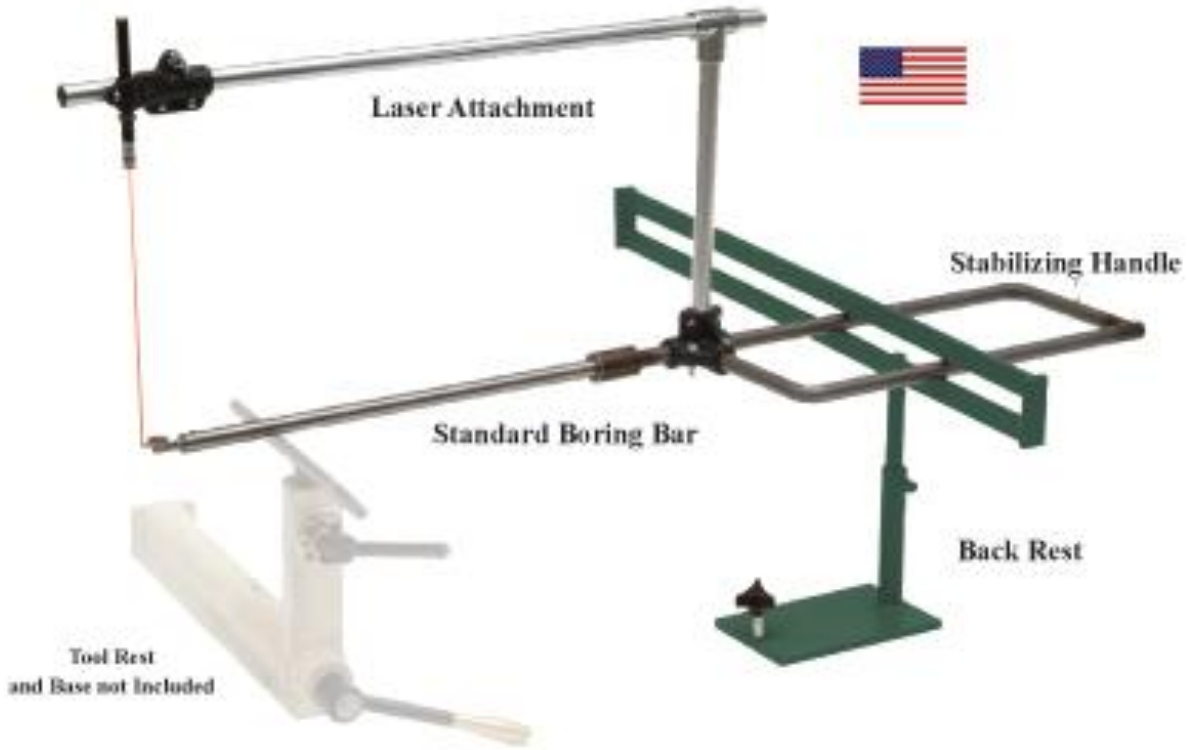
Since the heavy work piece makes the load top heavy, I widen the feet to help compensate.
But, what about adding weight or bolting the lathe to the floor?

I listened to one theory that I agree with. If you bolt the lathe to the floor and the bolts fail, the failure will be spectacular as well as deadly!

Engineers design bridges to flex. It they are too stiff, the break! If they flex, they simply move with the flow.

My answer? I turn the RPM's down when the lathe starts to wiggle. This is interesting since I am known for being a fast turner……..

I sometimes use the pistol laser method for hollowing as shown on this Lyle Jamieson Hollowing system..



I now like using an endoscope/laptop system for hollowing.
See: Trent Bosch Visualizer.