

A Thrown Together Sheet Metal Finger Brake

By R.G. Sparber

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Background

A few weeks ago I attended our monthly Valley Metal Club² meeting. As usual, I was treated with an inspiring presentation about something new to me. In this case, it was Bill Townsend and Bret Chilcott talking about sheet metal bending. I was so inspired that I wanted to go out and buy a “3 in 1 sheet metal machine³” at Harbor Freight. Part of the talk was how to remanufacture this machine so it actually works well. Since Harbor Freight was near the meeting site, I decided to drop in and see what they were talking about. Besides the price, I was stopped by the size and weight of the machine. I would have to get rid of a machine or two in order to make room. It was time to start thinking about “plan B”: making my own finger brake.

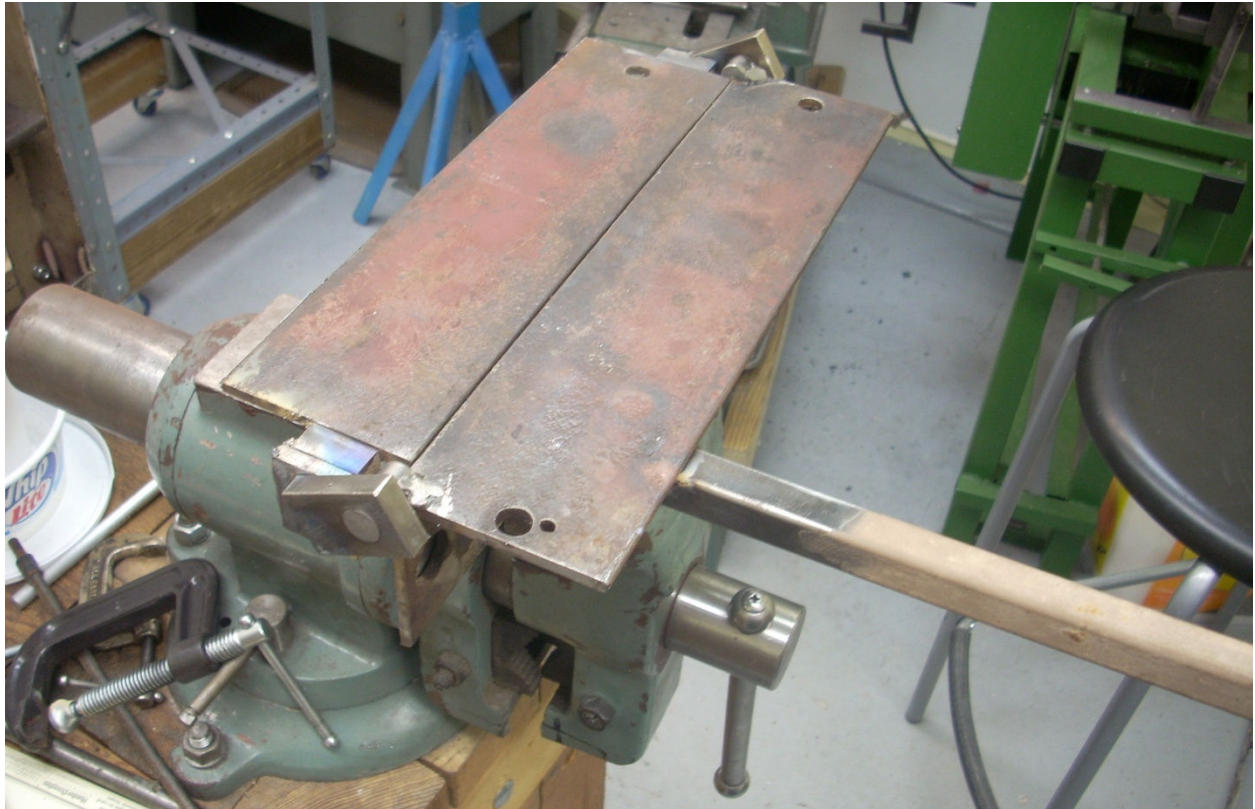
Most of the time, I enjoy making things with a fair amount of precision. This time I decided to see if I could make a usable machine with minimal planning and precision.

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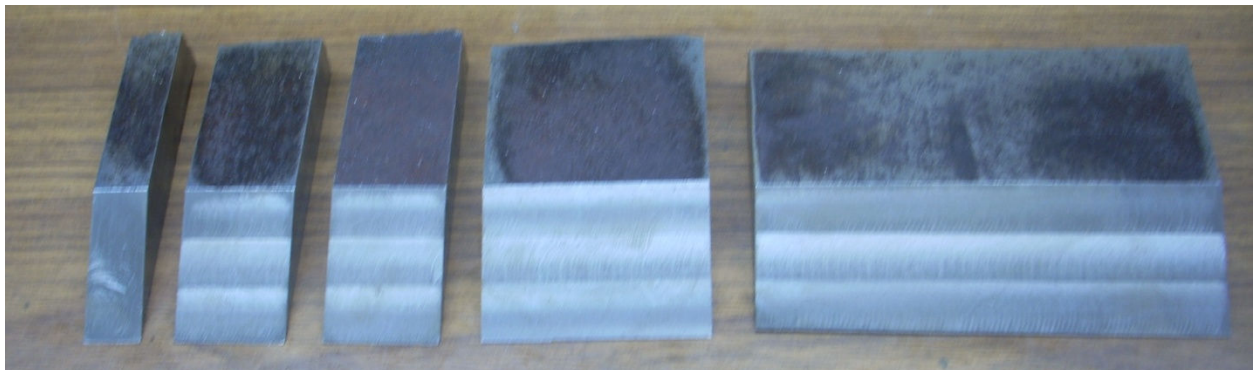
² The club is based in and around Phoenix, AZ. See <http://www.valley-metal.org/>

³ See <http://www.harborfreight.com/30-inch-shear-press-brake-and-slip-roll-5907.html>

The finished Machine



The brake is built from a length of 3/16" thick 3" x 3" angle which I found on the side of the road a few years ago. The handle came from a steel fence I wrecked out last year. All other bits were from my junk pile. No fasteners were used in this design. Although I do have a very nice stick welder that would be appropriate for this thickness of steel, I wanted to see if I could get away with my Harbor Freight MIG welder because it is so easy to set up and use.



I cut the fingers from a plate of $\frac{1}{2}$ " steel pulled from a scrap yard. It was bent but I was able to cut a 3" wide strip from it that was flat. You can't see it from this angle, but the back ends of these fingers were flame cut. The guy was in a big hurry. It may not look so good, but it will have no effect on how the brake works. My plan is to clamp one or more of these fingers down on the brake to bend any width from $\frac{1}{2}$ " up to $8\frac{1}{2}$ " in steps of $\frac{1}{2}$ ".

Focusing on What is Important

This brake cannot be completely slapped together. Two things have to be right. For starters, the two pieces of angle must be on the same plane when the brake is open. This is easy to do by clamping both angles to the same flat plate.

The second critical element is the hinge. If it is not set true, the movable part of the brake will bind up.

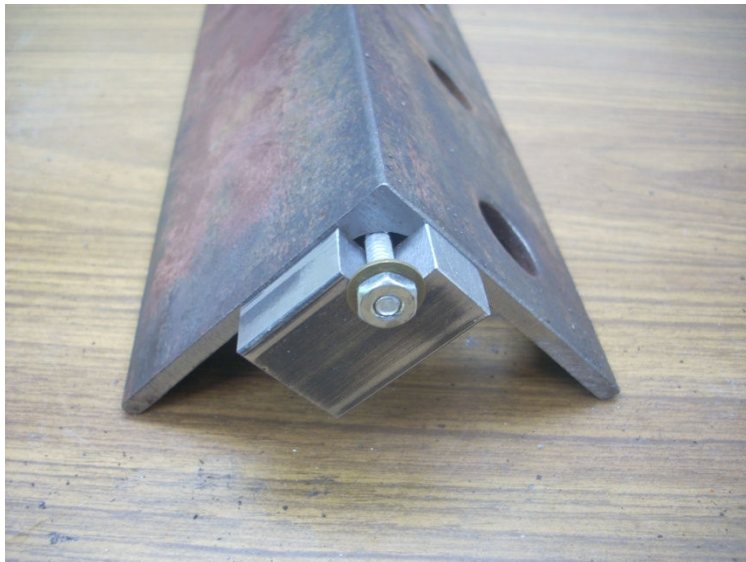


Alignment of the hinge was accomplished by putting the movable part of the table in my mill vise and machining a notch in each end that was 0.250" wide and 0.250" deep.

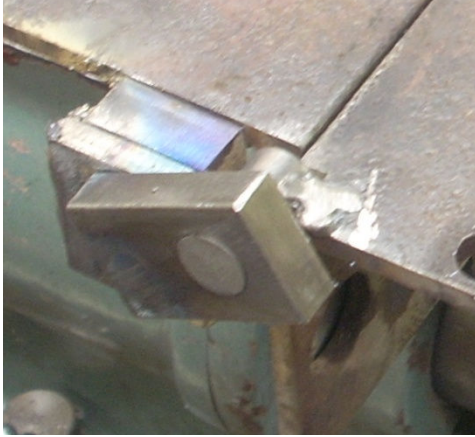


The resulting V accurately holds a short piece of $\frac{1}{2}$ " rod as shown above. The C clamp is needed until I can weld the rod in place.

Next I cut some blocks for the fixed part of the table. They had to be notched so weldment on the pivot rods would not hit them.



A length of threaded rod was used to hold these blocks in place until they could be welded. Note that the ends of the angle have been machined true. This is necessary in order to prevent binding of the hinge.



Here is a close up of the second hinge. I thought I had figured the width correctly but discovered that an additional $\frac{1}{4}$ " of width was needed on the fixed part of the table. Not a problem – just tacked on a scrap of steel.

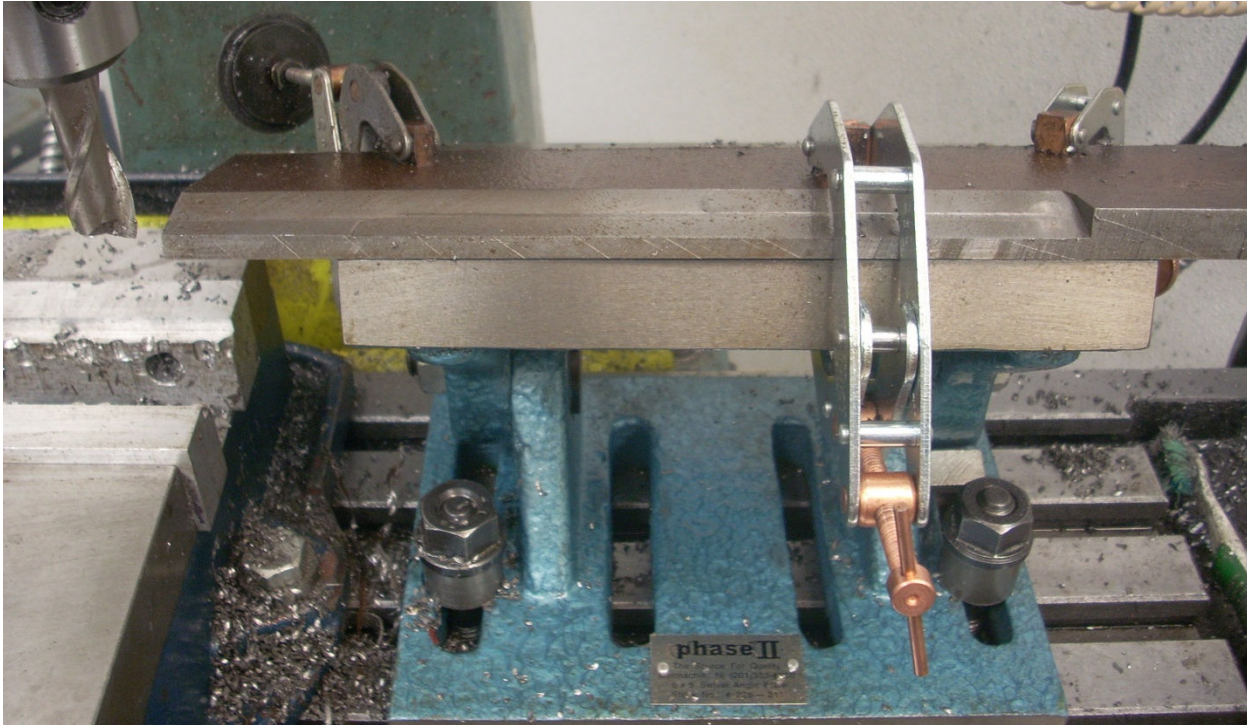
Now, we have the pivot pins aligned with the movable part of the table and pads ready to accept the pivot arms. I then took two blocks of steel and drilled the two holes a bit under $\frac{1}{2}$ ". I then reamed them to $\frac{1}{2}$ ". The pins are a nice sliding fit. It is just a matter of welding the two together. No binding.



Here is the finished brake. A small block has been welded to the vertical part of the fixed table. The block is held in my bench vise so there is no need to make a support for it.

Machining the Fingers

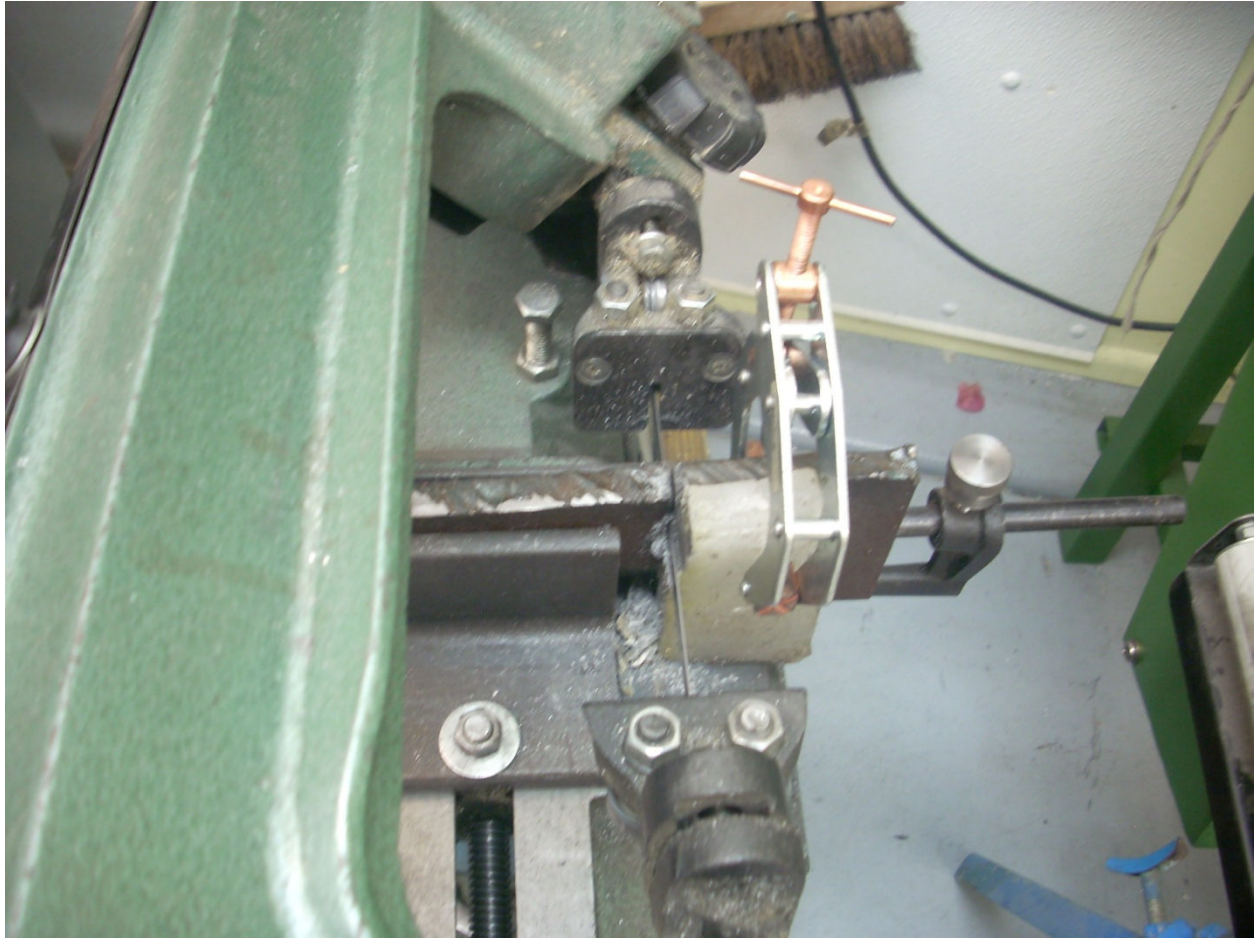
The next step was to make the fingers. I set my angle table to about 20° and then



milled a bevel. Here you see the cut about half way through. I'm using 3 clamps but still don't feel that this is strong enough for serious hogging. Instead I took only 0.05" per pass. Sure it took a while but at least it stayed put. I moved the



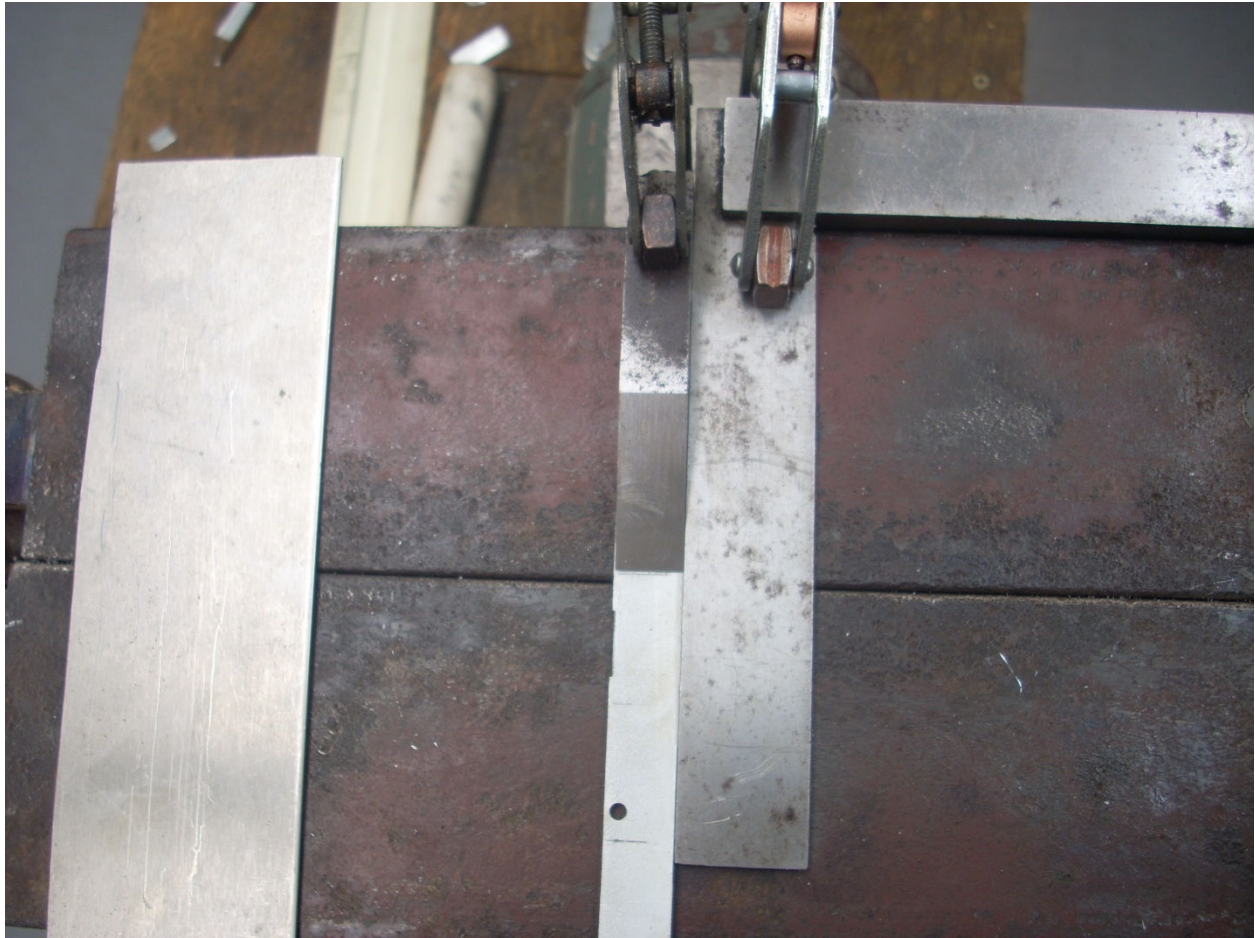
front clamp as needed to let the cutter pass. I was unable to mill all the way to the right end due to limitations in my X axis. I could have removed my vise and had room to shift the assembly over but that seemed like a lot of work.



Here I am slicing up the beveled plate into fingers. You can see the flame cut edge of the plate. The block of paraffin wax is placed such that the blade cuts it before entering the plate. The wax works well as a cutting lubricant and doesn't make the mess of oil. As each finger is cut, I cleaned it up on my belt sander.

I started by cutting the $\frac{1}{2}$ " wide finger and then moved on to the wider fingers. In this way I didn't end up trying to clamp a short length of plate in order to cut the $\frac{1}{2}$ " finger. Instead the last cut was the 4" wide finger which was easy to clamp.

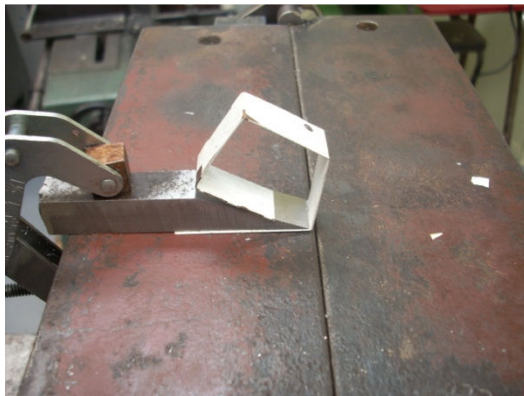
Time to try out the finger brake.



I have clamped a square to the fixed table. To its left is my $\frac{1}{2}$ " wide finger which is holding down a strip of $\frac{1}{2}$ " sheet metal. The finger is back from the pivot line by the thickness of that stainless steel plate that you see all the way to the left.



I lifted the movable table and now have my first 90° bend. Note that I have avoided a fancy finger clamp. I plan to just clamp each finger individually.





Not bad for a first try.

I was going to add a section on the theory of bending sheet metal but found an excellent article in Wikipedia:

http://en.wikipedia.org/wiki/Bending_%28metalworking%29

The key thing to realize is that the finger clamping the sheet metal is defining one tangent of an arc that will be created as you lift the movable table. As the arc is formed, it draws material from the unclamped sheet metal. The surface of the movable table defines the second tangent of this arc. This is all spelled out nicely under the heading of Bending Allowance in the above article.

My First Real Project

One of the things made at the club meeting was a fastener sorting tray. I really liked the idea so decided to try and make one.



The inside of this tray is 5" so I used my 1" and 4" fingers for those bends. The open space flanking these fingers is room for the adjacent sides of the tray. One source for more information on how to use a finger brake is YouTube.com. Just search for "finger brake metal bending".



The diagonal crease was formed on my small vise mounted V brake.

Conclusion

Using scrap metal and very little planning, I have built a serviceable small finger brake. Alignment was accomplished primarily by milling two “V”s in the movable table and all other parts referenced them. The result is a pivot that does not bind.

I can bend any width from ½” to 8½” in ½” steps. Maybe now I can stop buying small project boxes and make my own.

Acknowledgements

I wish to thank Bill Townsend and Bret Chilcott for opening my eyes to sheet metal bending. Thanks to my faithful friend Larry Gill who is one tough editor.

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