

Forming A Hook For a Strap, Version 1.2

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My goal was to take 0.144 inches in diameter steel wire and form it into hooks for some 1 inch wide woven strap.

The challenge is that this wire does not bend easily with pliers². It can be clamped in a vise and whacked with a hammer to form a right angle.



But beyond making a single bend, the task quickly creates a dizzying array of scrap.

I found some very nice ideas involving single bends of heavy wire but my skill was not up to the task of attaining accurate results. I, therefore, turned to making a custom mandrel.

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² I could have heated it with a torch to make bending far easier but still don't have the skill to make free-hand precise bends.



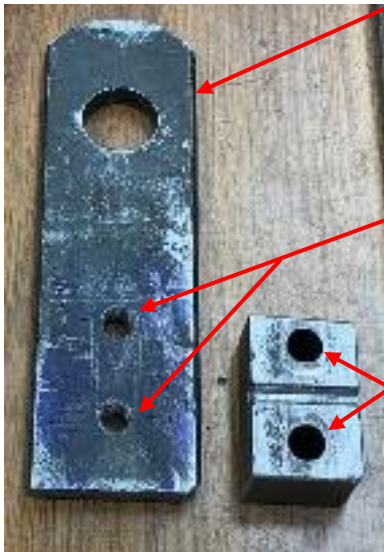
Here is the entire sets of parts.
Dead blow hammer so wire is not dented.
The mandrel.
The clamping block.
And a few odd bits to make it all work.



The clamping block has a tunnel across its face to secure the wire.



This was done on my drill press by clamping the stock plus some scrap of the same material face to face³. Then I drilled a 9/64 inch through hole at the interface. It is essential that the top surfaces are flush or it can snap off the end of the drill. I used a spotting drill to ensure that the 9/64 inch drill would not walk.



The mandrel is a piece of cold-rolled steel with rounded edges that I found next to the road about 30 years ago. Yup, another example of “feed the disease”. I pick up a lot of cast off metal and almost never throw any of it away.

I wanted the mounting holes to be a close fit but really didn't care exactly where they were located. This is a perfect application of “match drilling”.

I started by drilling the two holes in the clamping block using a #4 drill. Then I placed the clamping block on the mandrel and aligned the two by eye. After clamping the assembly down, I ran my #4 drill through one of the holes in the clamping block and through the mandrel. After tapping that hole 1/4-20 in the mandrel,

I opened out the hole in the clamping block with an “F” drill. Then I fit a 1/4-20 bolt, checked block to mandrel alignment, and tighten the bolt. And finally, I repeated the steps on the second hole.

³ Bob Sanders suggested placing a strip of paper between the blocks. It will help the drill find center plus cause the resulting channel to grab the wire better.

This cumbersome procedure guarantees that the holes in the clamping block are aligned with the tapped holes in the mandrel.



I bought a large coil of 0.144 inches in diameter galvanized steel wire from Home Depot a few years ago.

One of my custom tools associated with the mandrel is an 8-inch long piece of the wire. I marked the centerline with a black marker. It lets me easily locate where to place my bolt cutter and also where to mark the centerline.

I can't imagine a less impressive custom tool yet it speeds up the work and ensures repeatable results.



I place the center of the wire into my clamping block and



give the wire a tap with my dead blow hammer.

I can then handle the clamping block while the wire is secure.



The clamping block with wire is secured to the mandrel with the two bolts.

Notice that I have beveled the corner of the clamping block and mandrel. This ensures that I have the correct orientation of the clamping block on the mandrel.

I'm ready to form the hook.



rectangular part of the

I clamp the mandrel into my bench vise. You might be able to see how the edge of the mandrel is rounded.



The wire is bent over as much as possible using my dead blow hammer.



The mandrel is flipped over in preparation for bending the other end of the wire.



Again using my dead blow hammer, I bend the wire over as much as possible. Notice that the wire is angled so it bends past the first wire end.



The clamping block is now secured by the vise jaws.



A few taps with my hammer and the wire has fully encircled the mandrel and is a snug fit.

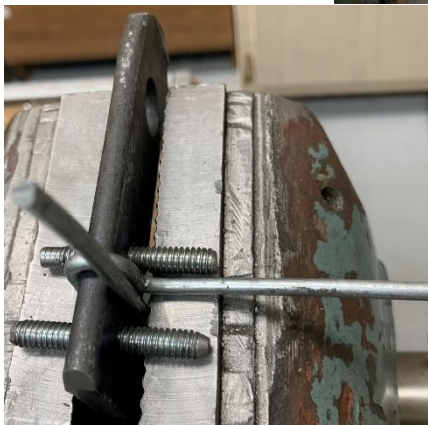


I then remove the clamping block and its bolts. Two lengths of threaded rod screw into the bolt holes.

Then the mandrel slides between the vise jaws until it rests on the threaded rods.



After tightening the vise, I'm ready for my next bend. I use the hammer to start the bend but then move on to tapping my steel bar to insure 90°.



The mandrel is flipped over in preparation for bending the other end of the wire. Note that the horizontal wire is above the vise jaw. Those threaded rods are in contact with the top of the movable jaw.



I again use the hammer to start the bend and the steel bar to finish it.



At this time, it looks like I have ruined the part. Steady on...



The ends of the wire go into my vise and I use the mandrel to twist the square loop.



A gentle twist brings the wire ends into alignment.



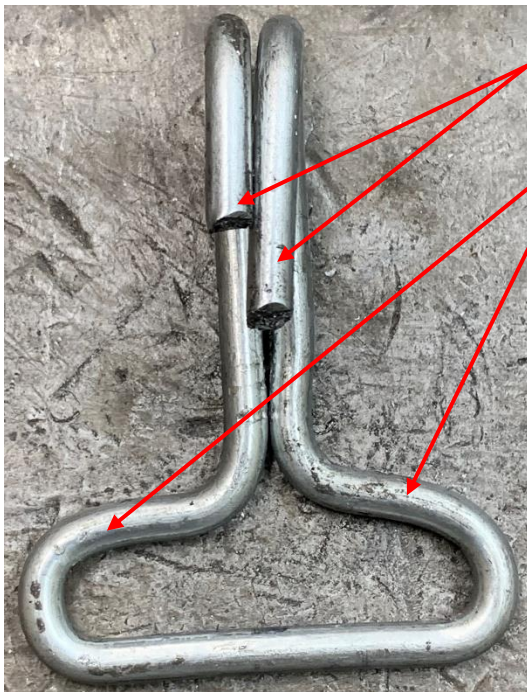
That is more like it.



The formed wire goes back into the vise with the mandrel in preparation for making the hook.



With judicious application of my dead blow hammer, the hook is done.



It is obvious that the wire ends do not line up. Less obvious is the reason. As I look at the rectangular loop, I see that the left bend is nice a crisp compared to the right bend. The gentler bend means less wire is used so I end up with excess. Good enough.



It just takes a moment to saw the ends of the hook square and deburr.

Next time, I will try placing a 0.01 inch shim under the threaded rods. This will give me 0.02 inches of extra room where the wire becomes parallel. That should permit the right 90° bend stay tight.



The final step is to add some braze so the hook does not open up too easily.



As you can see, this wasn't my first hook. A bit of fine tuning has yet to be done. However, I don't want the perfect to be the enemy of the good. Holding out for perfect would mean this article would never be written and I would never receive useful comments from my readers.

Please do understand that after each "failure", I do my best to understand what went wrong and make a change. Eventually, I will get repeatable and nice results.

Acknowledgments

Thanks to Nelson Collar for both encouragement and guidance. Thanks to Bob Sanders for suggesting the use of a strip of paper between the blocks.

I welcome your comments and questions.

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