A Countersink Gage, version 1.0

By R. G. Sparber

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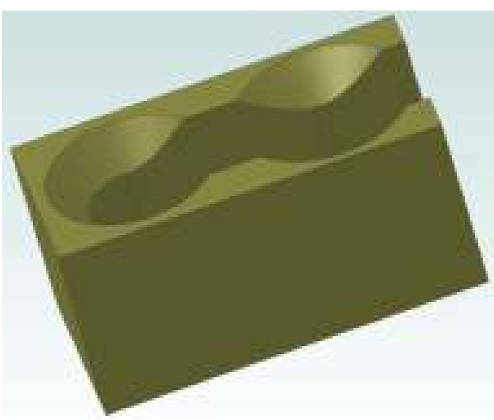
Marv Klotz recently presented a very nice design for a countersink gage on the Home Made Tools site:
http://www.homemadetools.net/forum/countersink-gage-56314

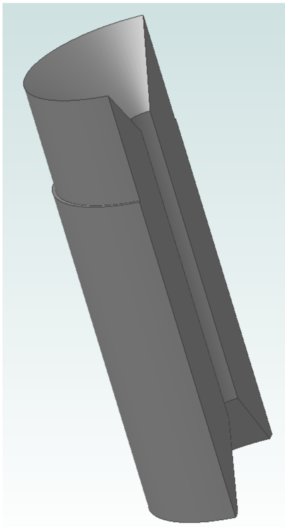
His simple and elegant approach made it easy for a user to sort 90° beveled screws from 82° screws. That is not so easy to do by eye.

His design inspired me. Was there a different, not necessarily better, way to accomplish this same task?



My first idea involved drilling and countersinking two holes in a block. Then I made a cut down the center to form a U.

I consulted with Marv and learned that he had already gone down this path. This design is limited. Screws with too large a threaded section can't fit in the slot. Aligning the screw with the countersink area can also be a problem. Marv solved this problem by having V grooves.



I slept on the problem and in the morning came up with another idea. This time I would use a cylinder. The two countersunk holes would be in the ends. A hole drilled through the part before sawing it in half axially would be the equivalent of Marv's V grooves.

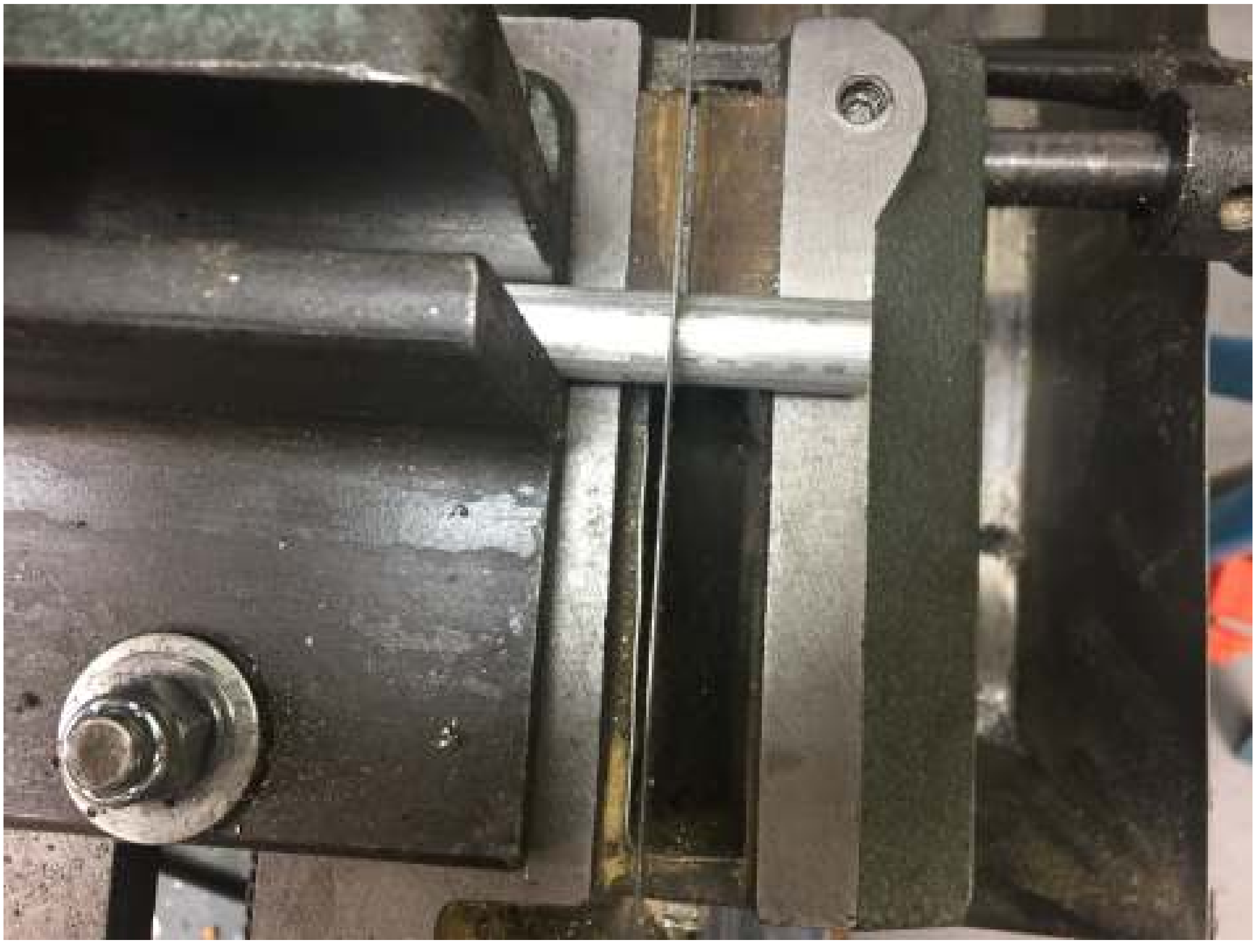
Further discussion with Marv convinced me it was worth making a proof of concept.

I use the Alibre PE Computer Aided Design program to precisely visualize most projects before I cut metal. Saves a lot of time, makes it easy to show to others, and generates nice shop drawings too.

Here is the prototype gage holding a ¼-20 screw and a 6-32 screw.

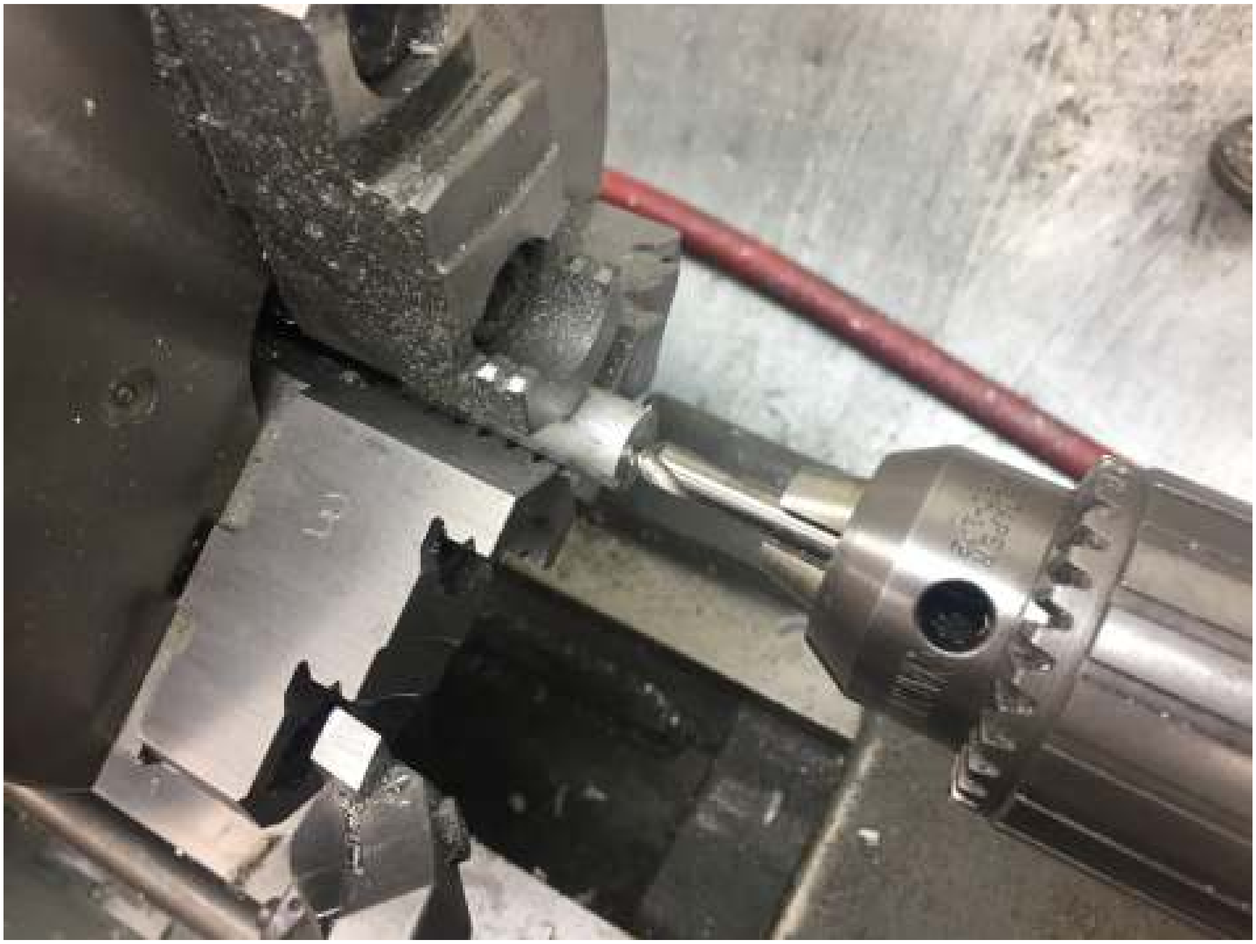
The intent was to use a 90° countersink on one end and an 82° countersink on the other. I don't own an 82° so, for the sake of proof of concept, just used 90° on both ends.

Experienced hobby machinists can look at these pictures and figure out how to make it. But if you are new to this hobby, this is an excuse to "make a few chips".



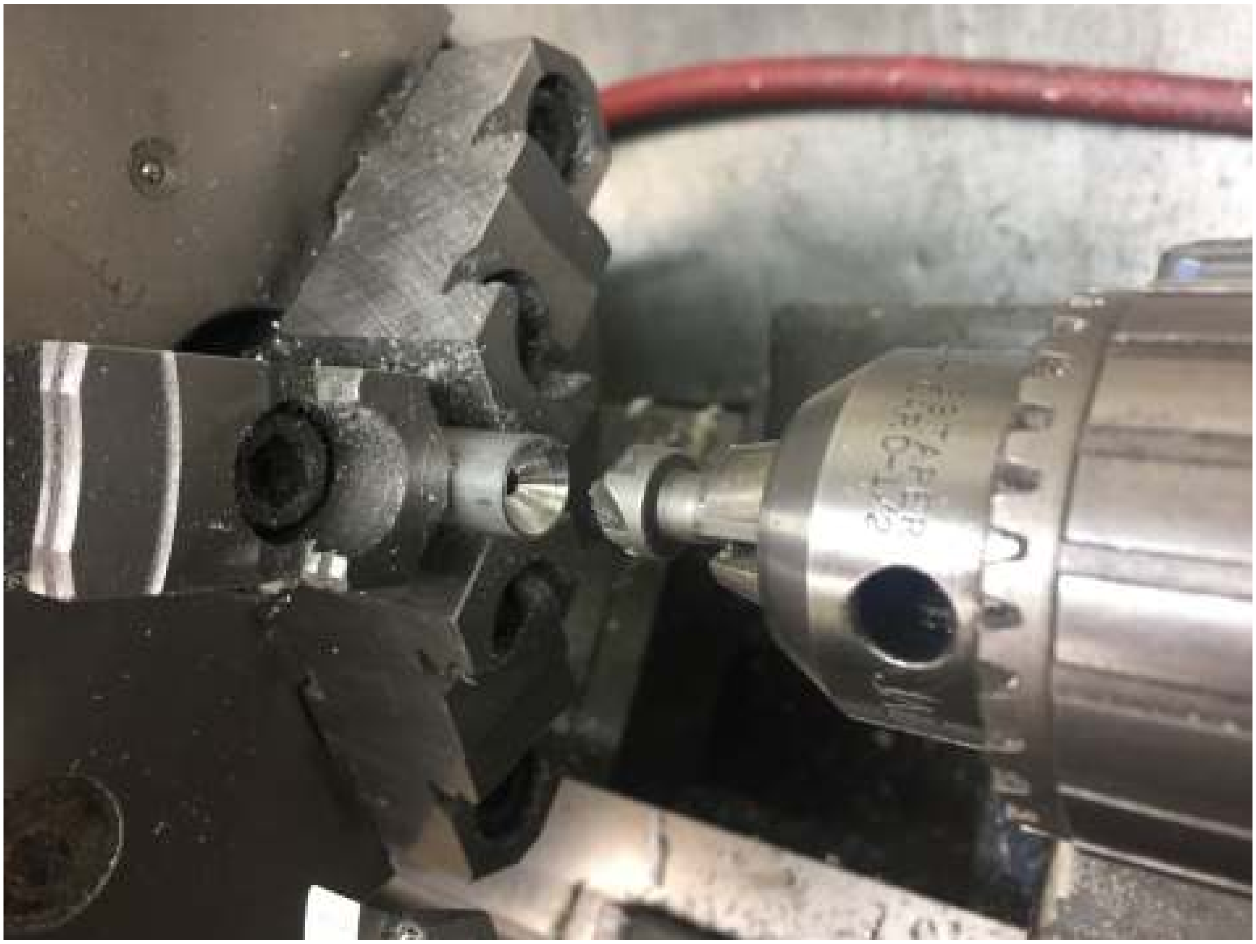
The first step is to find some aluminum round stock. I chose ½" diameter 6061. Sawed off about 1" of it. You could use hard plastic, brass, or even steel.

Next I put the stock in my 3 jaw chuck with about ¼" sticking out. Using my left hand cutter, I faced the end. Then, using a file while the lathe was turning, I deburred the end. Care must be taken to keep the file away from the spinning jaws.



Spot drilled next. This provided my 1/8" drill bit with a solid place to start cutting that was on center.

I drilled through using my 1/8" drill bit. Feed in about a half inch and then retract. Remove all swarf caught in the flutes of the drill bit. Repeat. The goal was to prevent chips from binding up in the hole. A bit of cutting fluid helps too.



Next I ran my 90° countersink. Note that I left about 0.02" of lip. I didn't want a sharp edge here plus did want a bit of wall thickness for strength.

Removed the part and turned it end for end. Then I put it back into the chuck with ½" sticking out.

Using the left hand cutter, I faced the second end.

After running the 82° countersink[2] , I reduced the outside diameter of the part by about 0.01" for about ¼". The smaller diameter indicates the smaller angle of the countersink.

Note that I did not go as deep with the countersink on this end. I wanted to leave material for the outside diameter cut.

[2] OK, make believe it is an 82° countersink.

I then turned the part over and held the reduced diameter section gently in the chuck in preparation for final polishing.

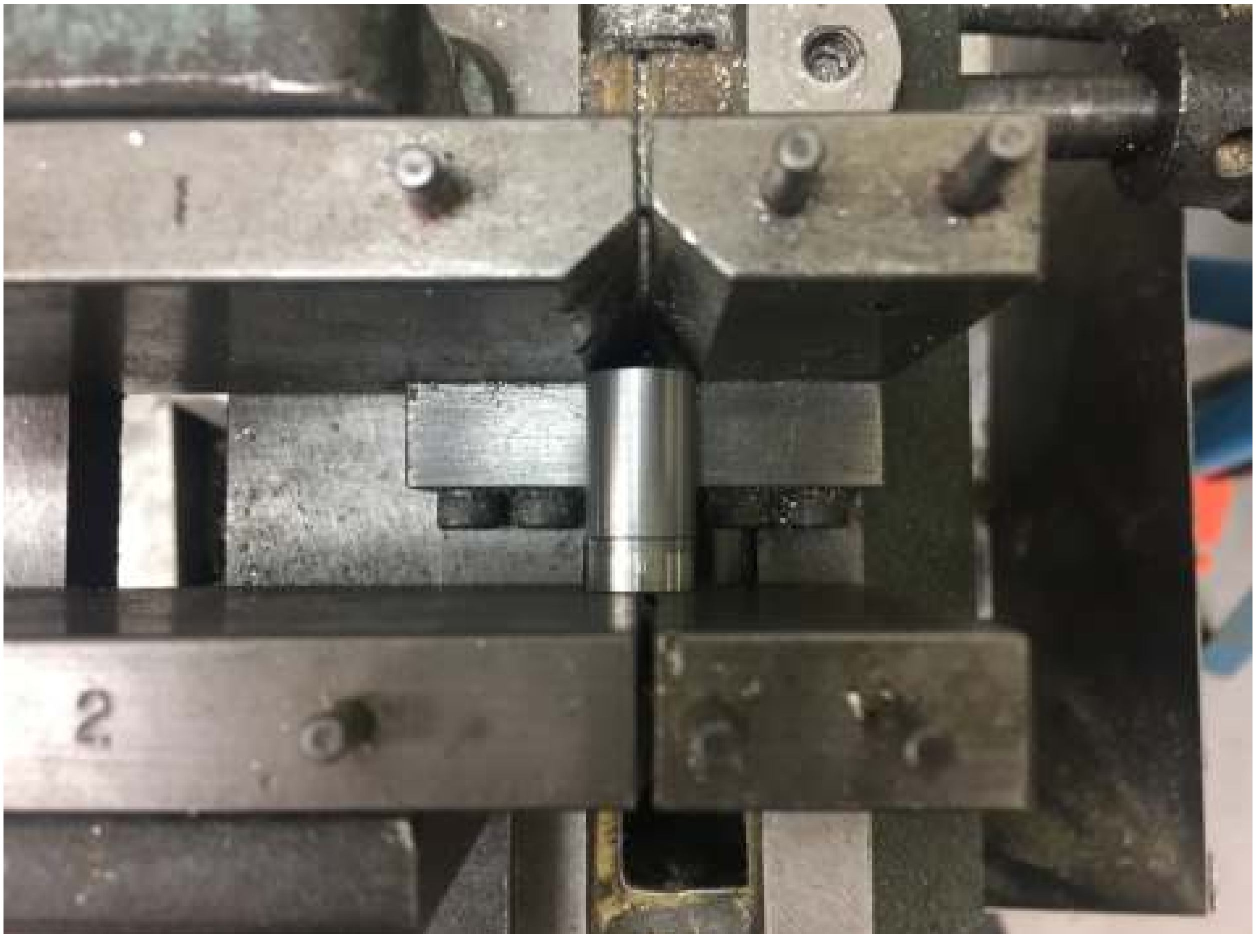
Being very careful not to contact the spinning chuck, I used a 3M pad to polish the surface of the part.

Here is the part before sawing.

The next step was to saw the part in half axially. This can be done with a hacksaw in a vise or with a bandsaw in a fancy custom fixture.

Well, since I happen to have a fancy custom fixture, why not use it?



This is my "Double V" vise jaw liner[3] for my horizontal/vertical bandsaw. It supports even very small round parts so they can be cut either axially or radially.

[3] See http://rick.sparber.org/vvj.pdf

Here is a side view of the saw blade axially cutting the part. With jaw support on both sides of the cut, the part remains securely clamped even after the sawing is complete.

With the part sitting horizontally, it was resting in the bottom V (red arrow).

The parts look identical which means the cut was about centered.

And finally, sand and/or file the rough cut faces. Then I had one gage for myself and another for a friend.

Acknowledgments

Thanks to Marv Klotz for the original idea and his encouragement in developing this alternate idea.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with just "Article Alias" in the subject line.

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