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Pen Blank Rounding Jig for the Bandsaw Tutorial

Author: David Lange aka: egnLD Feb 2021

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If your pen blanks start out round this is not for you. However, if you are like most of us, your pen blanks do not start out round so this jig may be just what you need.

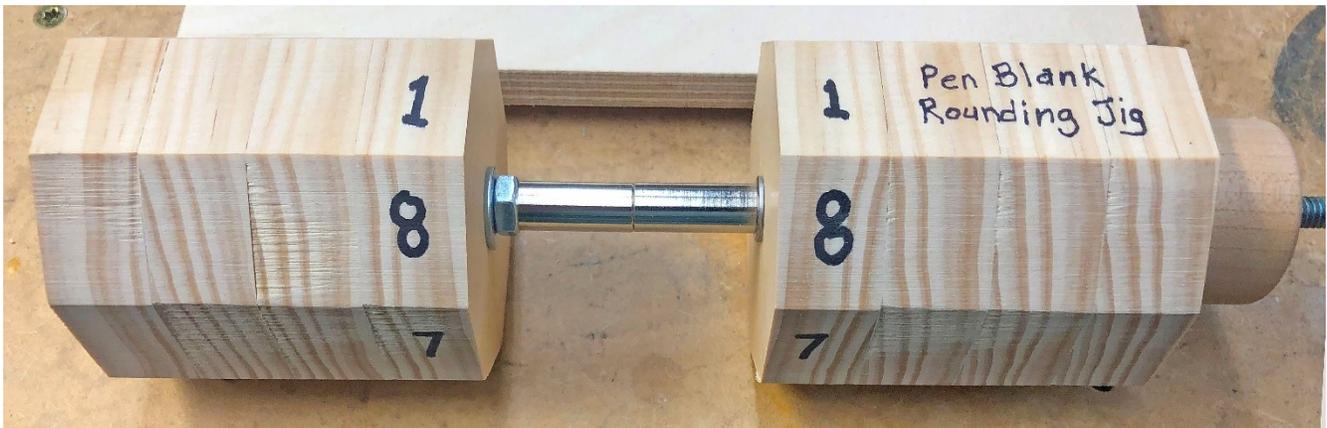
Most turning books and articles all indicate that it is a good idea to first “round” turning stock by cutting the corners off before turning. This is especially true for large or asymmetrical stock. Rounding turning stock provides a couple of benefits.

First, it reduces the weight of the stock and improves its balance which therefore reduces vibration. Second, it removes excess waste that you would normally have to turn off with a roughing gouge or other lathe chisel. Not only does this save time, but it also reduces wear and tear on the tools and reduces the chance of catches and chipping whenever the cutting edge of the tool transitions from cutting “air” to cutting the stock. This can be particularly useful when turning materials like very dense and very hard woods or very hard and brittle plastics.

Although simply “eyeballing it” and cutting the corners off of a blank using a bandsaw can be acceptable, this jig provides additional benefits. First, it provides a uniform “rounded” octagonal shape.

Secondly, the symmetry of the blanks after being rounded is centered on the center axis of the brass tubes so even if the blank is asymmetrical or was drilled crooked or offset from center, the tube will be right down the center of the rounded blank.

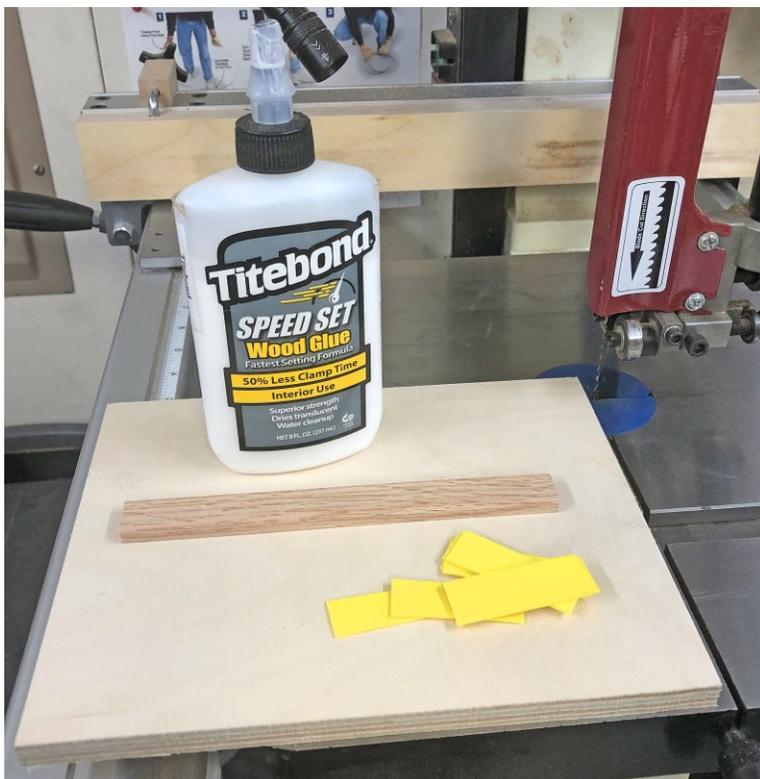
And finally, the jig can be adjusted to not only remove the corners, but to also remove material from all eight sides for situations when the blank is significantly bigger than the largest of the pen bushings.



Here are the tools and materials used to build the jig:

- Scrap of plywood worthy of becoming a 45-degree / Octagon sled to fit your saw. (Mine was about 7 x 9 inches – and was made to fit my bandsaw).
- Piece of wood to use for the runner for your sled. (Mine was made from a 7-inch piece of Oak $\frac{1}{4}$ x $\frac{3}{4}$ Screen Stock Molding).
- A length of $\frac{3}{4}$ inch thick wood that is at least 2- $\frac{1}{2}$ inches wide and 20+ inches long. (I used 2-foot piece of 1x4 clear pine dimensional lumber).
- A reliable marking compass and a straight edge. (A set of straight, flat spring calipers / dividers and a pencil should also work).
- A small 45-45-90-degree triangle. (A makeshift triangle can be made by cutting a paper square in half diagonally).
- Two small pieces of wood that will be glued to the sled as fences. (The same or similar to the $\frac{1}{4}$ x $\frac{3}{4}$ runner material can be used for these).
- A $\frac{1}{4}$ inch drill. (I used a Brad Point drill as the point helps position the bit in the exact center).
- A 14-inch piece of $\frac{1}{4}$ -20 threaded rod and a few washers and nuts. (This acts as the mandrel for the jig).
- Slimline bushings / spacers. (I used a couple of spare Barrel Trimming Sleeves instead of Slimline bushings).
- A small $\frac{1}{4}$ 20 female thread – through hole jig knob. (I modified a Rockler Quick-Release 5-Star Knob for the Quick-Release feature).

Step 1: Make a simple 45-degree Sled for your saw (if you don't have one already)



Place the strip of runner material in the miter slot on the saw. The runner needs to be spaced up so that it is just proud of the table on the saw. I used some small strips of closed cell foam to accomplish this.

Apply a small amount of glue to the runner. Titebond Speed Set Wood Glue works great, but any kind of appropriate glue should work just fine.



Position the plywood on top of the runner and apply some weight until the glue sets.



After the runner is securely attached, run the sled through the blade to establish the reference edge (the edge that will be cut by the blade). This reference edge will be parallel to the miter slot.

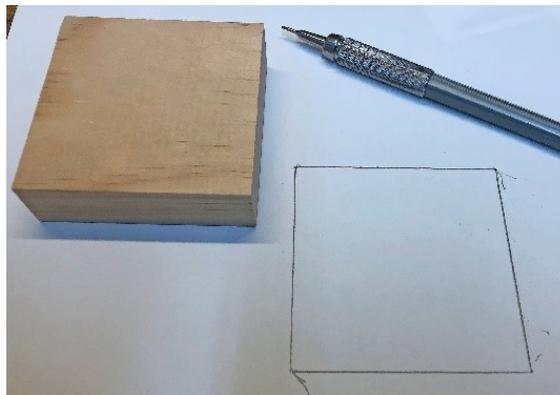


Step 2: Make an Octagon Template used to Complete the Jig.

Cut 8 squares from the piece of $\frac{3}{4}$ inch thick wood. Rip the board to $2\frac{1}{2}$ inches wide first, then crosscut the board into $2\frac{1}{2}$ inch squares. It is more important that they be precisely square than that they be exactly $2\frac{1}{2}$ inches. These will become part of the blank rounding jig.

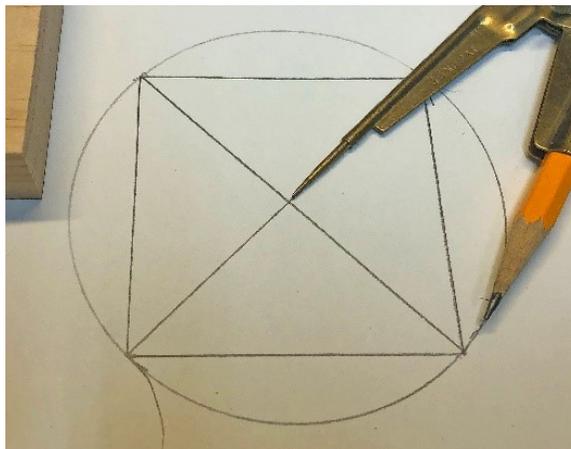


Using a very sharp pencil, transfer the outline of one of the squares to a piece of paper. (It is easier to make the template from a flat piece of paper than it is to try to make it from one of the squares).

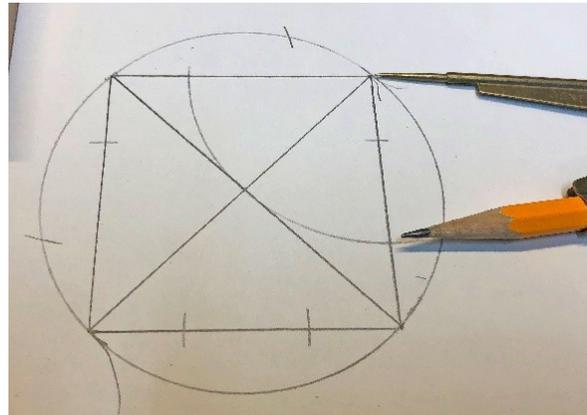


Draw lines that connect opposite corners of the square to find the center point of the square.

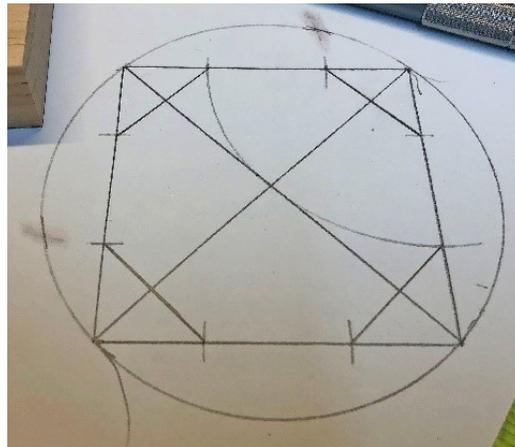
Set a compass to the distance between the center point and one of the corners of the square. Using the compass, check the accuracy of your center mark by verifying that the distance from the center point is the same for all 4 of the corners. (Or you can just put the pivot point of the compass in the center and draw a circle around the outside of the square. It should touch all four corners).



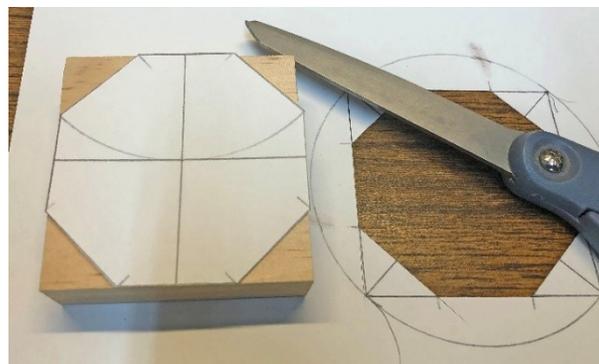
Set the pivot point of the compass on one of the corners and draw an arc that intersects the two adjacent sides. Repeat this for all 4 corners.



Use a straight edge to connect the points across each corner to form the octagon. The octagon can be verified by setting the compass to the length of one of the sides and then using it to verify that all 8 sides are the same length.



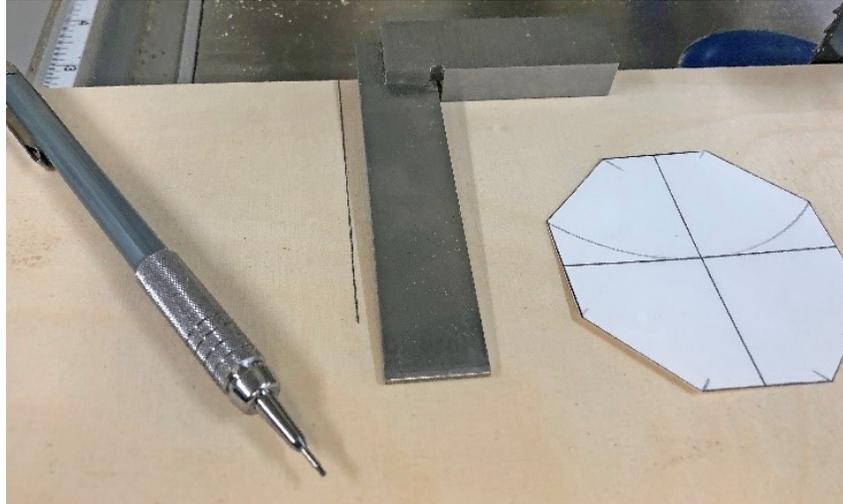
Carefully cut on the established lines to free the template from the paper. It will be used to finish building the 45-degree sled.



Note: There is a mathematical shortcut that can be used to calculate the lengths of each side of an octagon based on the length of one of the sides of a square. The formula is to multiply the length of one side of the square by 0.41421. So, starting with a 2-½ inch square, the sides of the resulting octagon will be 1.036 inches long.

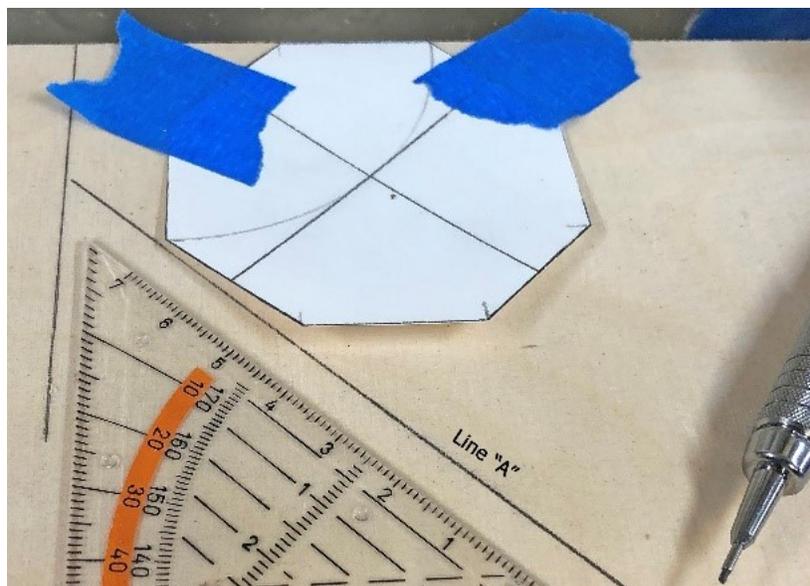
Step 3: Finish making the 45-degree sled for your saw:

Use a square to draw a line at 90-degrees from the reference edge of the sled. (This can be done with a small square as shown in the pictures or with the 90-degree side of the 45-45-90-degree triangle used in the following steps).

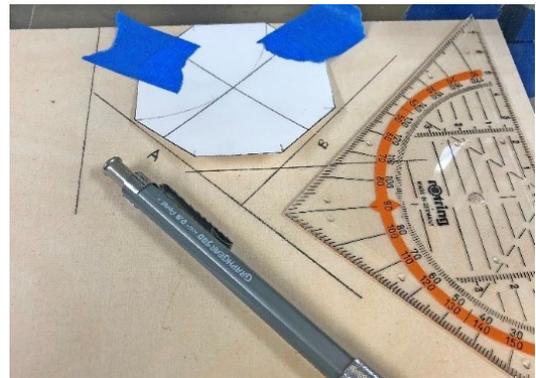
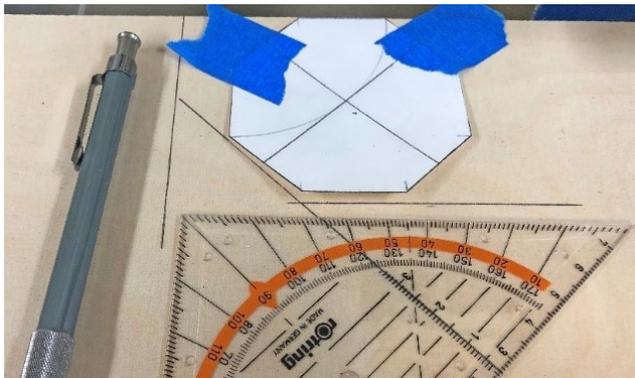


Place the octagon template that was made in the previous step on the sled with one side aligned with the reference edge of the sled and another side on the line that was drawn at 90-degrees. Use a couple of small pieces of blue painters tape to stick it down to the sled so that it doesn't move while more lines are drawn.

Align a 45-45-90-degree triangle with the reference line drawn in the previous step and an edge of the template. Draw a line at 45-degrees from the previous line. (This will become line "A").

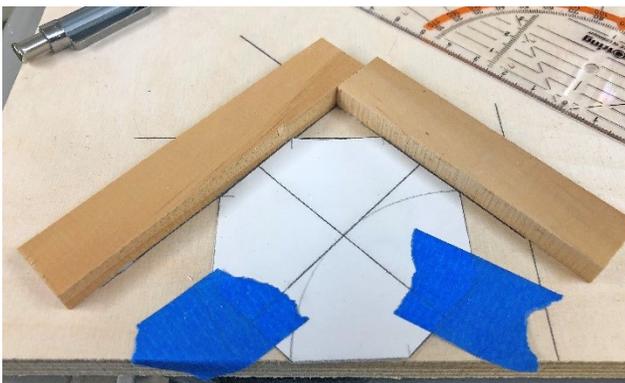
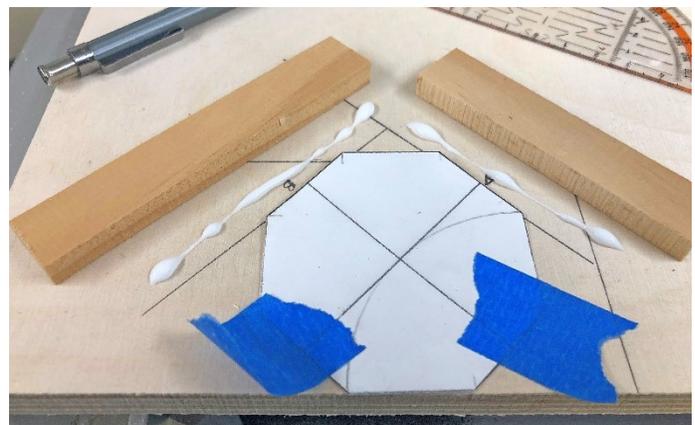
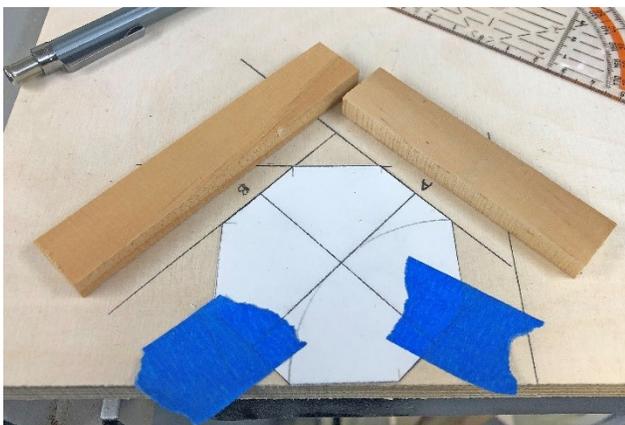


Align the triangle with the 45-degree line just drawn and an edge of the template to draw a third line at 90-degrees from it. Label the line "B" and the previous line "A". These will be the reference lines for attaching the two pieces that will become the fences.



Use a small amount of glue to glue the fence pieces to the sled on the outside of the reference lines marked "A" and "B". (The 45-45-90 triangle or a regular square can be used to insure that the fence pieces form a 90-degree angle.

Note: The sled was rotated 180-degrees in the following pictures to make it easier to see where the fences are glued into place.

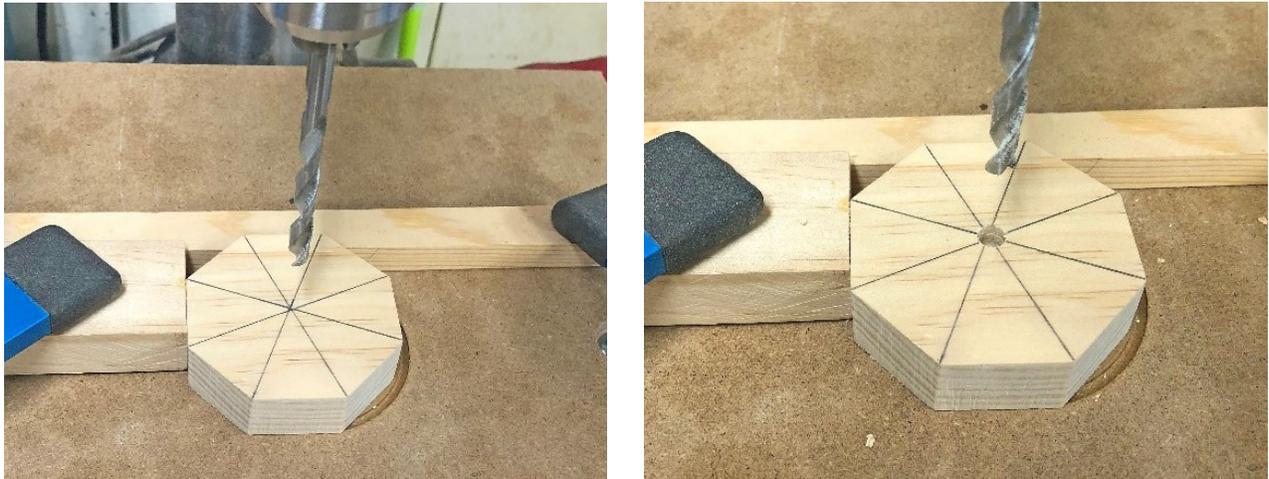


Step 4: Turn the 2-½ squares into Octagons with a ¼ inch hole in the center:

Use the jig to cut the corners off of the 8 squares that were made from the piece of ¾ inch thick wood. Align the squares with the two fences. Make 4 passes through the saw cutting one corner off on each pass as shown below.



Find the center of one of the octagons by drawing lines to connect all of the opposing corners. The center will be where all of the lines cross each other.



Drill a $\frac{1}{4}$ inch hole through the center of each of the octagons. Being perfectly centered and drilling square to the face is important so it is advantageous to use a drill press with some makeshift locating guides to position the subsequent parts accurately and repeatability. If they must be drilled by hand some kind of drilling guide block should be used to make sure the holes are straight. (With the appropriate chucks, one to hold the piece and a Jacobs chuck to hold the $\frac{1}{4}$ inch drill bit, these could also be drilled using the lathe).

Note that any variations between the lengths of the individual sides of the octagons and variations between each side and the center of the hole that was drilled will directly translate into variations of the rounded blank after it is cut. Unless the variations are severe the jig may still perform adequately; however, the symmetry of the rounded blank will not be as good.

Step 5: Glue sets of Octagons together. Use threaded rod for alignment & clamping:

Slide the Octagons onto the piece of $\frac{1}{4}$ "20 threaded rod and rotate them to provide the best fit. Carefully remove them in order and lay them out in 2 sets of 4.



Apply glue to each set of 4 and re-align them on the threaded rod. Be sure to only apply glue to the inner surfaces of each set of 4 as you don't want to accidentally glue the two sets to each other. Also be sure to avoid using too much glue especially near the holes to prevent any squeeze out from blocking the holes. After gluing, use ¼-20 knobs (or nuts and washers) to clamp them together until the glue dries.

After the glue dries and while they are still clamped together would be a good time to optionally and carefully sand the surfaces to take care of any slight mismatches between the segments in each set. Do this very carefully though as it is important to keep the dimensions of all of the sides as equal as possible.



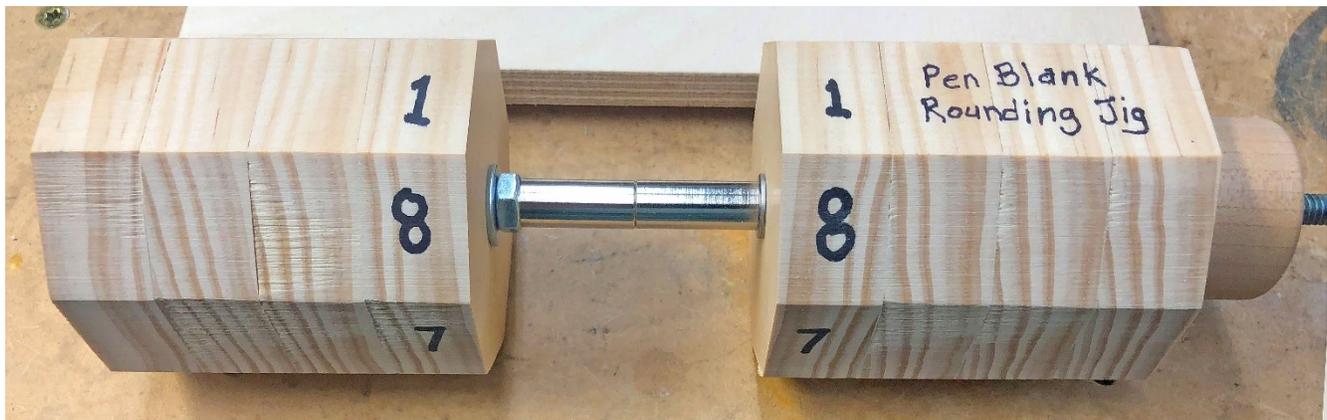
This is also an ideal time to label/number the sides of the jig. The two sections of the jig, each made out of a set of 4 octagons should both be labeled so that orientation between the two ends of the jig can be maintained when it is in use.



Step 6: Assemble the jig.

The jig is essentially made up of a fixed end and a removable end. For the fixed end, install a nut and washer on one end of the ¼ 20 threaded rod. Then install one of the blocks of 4 octagons. Secure it in place by using another washer and nut from the other end.

Slip the spacer bushings on the rod followed by the remaining blocks of 4 octagons. Optionally place a washer or fender washer between the last spacer and the removable end to protect the wood from being damaged by the spacer. And finally, clamp them together using the threaded knob.



Since the fixed end is held on with nuts and bolts, the length of the ¼-20 threaded rod can be adjusted by replacing it with a longer or shorter one as needed to accommodate the size of your particular bandsaw or to meet your specific needs.

How to Use the Jig:

To use the jig, the blanks should have already been drilled, have the brass tubes glued in, and have been squared (barrel trimmed).

Take off the removable end of the jig. Using the turning bushings load the blanks onto the jig. Put the removable end back on. Orient the blanks so that one of the flat surfaces is facing up on the jig – usually facing the side that is marked as number 1. Then install the knob and tighten everything up.



Lay the loaded jig on the bandsaw with one of the flat surfaces of the blank touching the outside surface of the bandsaw blade. Slide the fence on the bandsaw towards the blade until it just touches the jig and lock it into position.



Move the jig back and turn the bandsaw on. After the saw is up to speed, carefully position the jig against the fence with the blade between the end of one of the blanks and the jig. Saw the blanks by moving the jig along the fence until both of the blanks have been cut.

Back the jig off and rotate it to the next surface. Although very little may be cut off when the flat sides of the blank are facing the blade, making all 8 passes should provide the best results.





Note: when adjusting the bandsaw fence, it can be moved back slightly so that material will be removed even from the flat sides of the blank. This will simply reduce the overall diameter of the blanks before they are taken to the lathe. However, be very careful when doing this to make sure that the blade does not cut so close that it will hit any of the turning bushings.



Closing Notes:

A simpler to build version of the jig can be fabricated by using only 2 octagon blocks. One for the fixed end and one for the removable end. However, the extra length gained by gluing several together increases the surface area that makes contact with the bandsaw table and bandsaw fence. This additional surface contact adds stability. It also makes the jig easier to hold when the knob is being tightened down on the pen blanks and bushings and when it is being sawed.



A very simple version of the jig can be built by using square blocks. Although the jig will be square and not octagonal, it will still work for cutting the corners off of blanks. When the blanks are loaded onto the jig, they must be strategically positioned so that the corners of the blanks are pointing up and towards the blade. This makes setting the distance from the blade be a little more difficult, but it should work as long as the blade does not hit any of the bushings.

Although running the jig through the bandsaw rotating it $\frac{1}{4}$ turn between each pass will cut the corners off, it will not necessarily provide as precise of a symmetry after sawing as the octagonal versions of the jig are capable of.



As noted, in the parts list, I modified a Rockler Quick-Release 5-Star Knob for use with the jig so I could take advantage of its Quick-Release feature. The modification was primarily for aesthetics and involved somewhat rounding the knob by cutting the star protrusions off followed by threading the knob onto a $\frac{1}{4}$ -20 bolt and securing it with a washer and nut. It was then turned round and turned down to a 1-inch diameter using a collet chuck to hold the assembly. A sleeve was made by turning down a piece of wood to a little over 1- $\frac{1}{4}$ inches, drilling it out with a 1-inch Forstner bit, and gluing it over the rounded down knob as is illustrated below.

