Curved Metal Segmenting

A Tutorial by:

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Introduction

As I continue to learn about pen turning, I have really been excited about all the creativity in curved segmenting with different metals. In late July 2009, I posted a new design that I created and the responses the design received were absolutely fantastic. Everything that I learned about segmenting came from reading different posts online and from a whole bunch of trial and error. So, I wanted to share with all of you what I have learned about segmenting by writing this tutorial. I will specifically be discussing segmenting metals, but you can segment with plastic, veneer, etc.

Please read through this entire tutorial before starting. I will not provide basic instructions for turning, sanding, finishing, etc. of a pen, but there are some important key points that I will be discussing throughout the whole process. I hope this tutorial will provide clear details and allow you to follow the process through to completion of your own work of art. If you have any questions just send me a PM and I will do what I can to answer them. I am fairly new to segmenting and always learning, so I always welcome any experts' comments or suggestions on this tutorial!

Items required

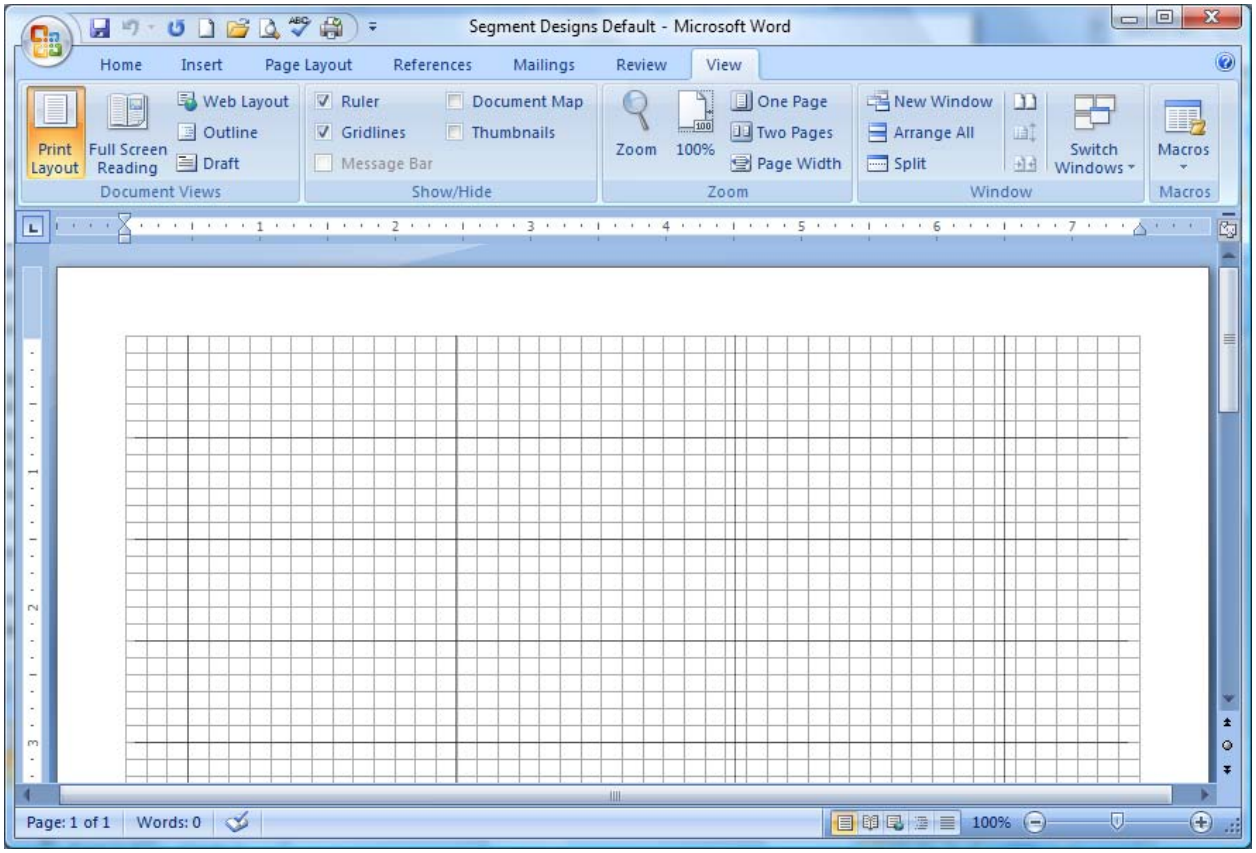
- Normal pen making items - Wood Blank, pen kit, drill bits, etc.
- Design template
- Scroll saw
- Metal product – aluminum, brass, pewter, etc
- Coarse sand paper
- Scissors (or something to cut the metal product)
- Thick Super Glue (CA)
- Wax paper
- Vise
- Belt Sander

Designing a template

You will need a template to use for cutting the wood blank. You can use any method to design a template, but the design will ultimately need to be on paper that can be glued to the wood blank. I do not use an expense drawing program or Computer Aided Design (CAD) package. I simply use Microsoft Word to create my designs. With Word, you can turn on what is called "gridlines". Gridlines provide a reference to go by when laying out your design. The gridlines are spaced approximately 1/8" apart. You can insert all kinds of shapes to come up with a design. The first thing I do is draw some dotted lines that represent the size of the blank. In this tutorial I will be making an Aero pen, which uses a single barrel that is just under 2 inches in length. This length of design will allow printing of three designs across and thirteen designs down the page of normal size paper (see last page of this tutorial).

If you want to turn a two barrel pen, don't draw any vertical dotted lines and draw your design all the way across the page. This will allow adjustment of the design on the blank because there may be an area of grain that you want the design to be placed a certain way.

This screen shot below shows Word with gridlines turned on and the dotted lines, really those are dotted lines!



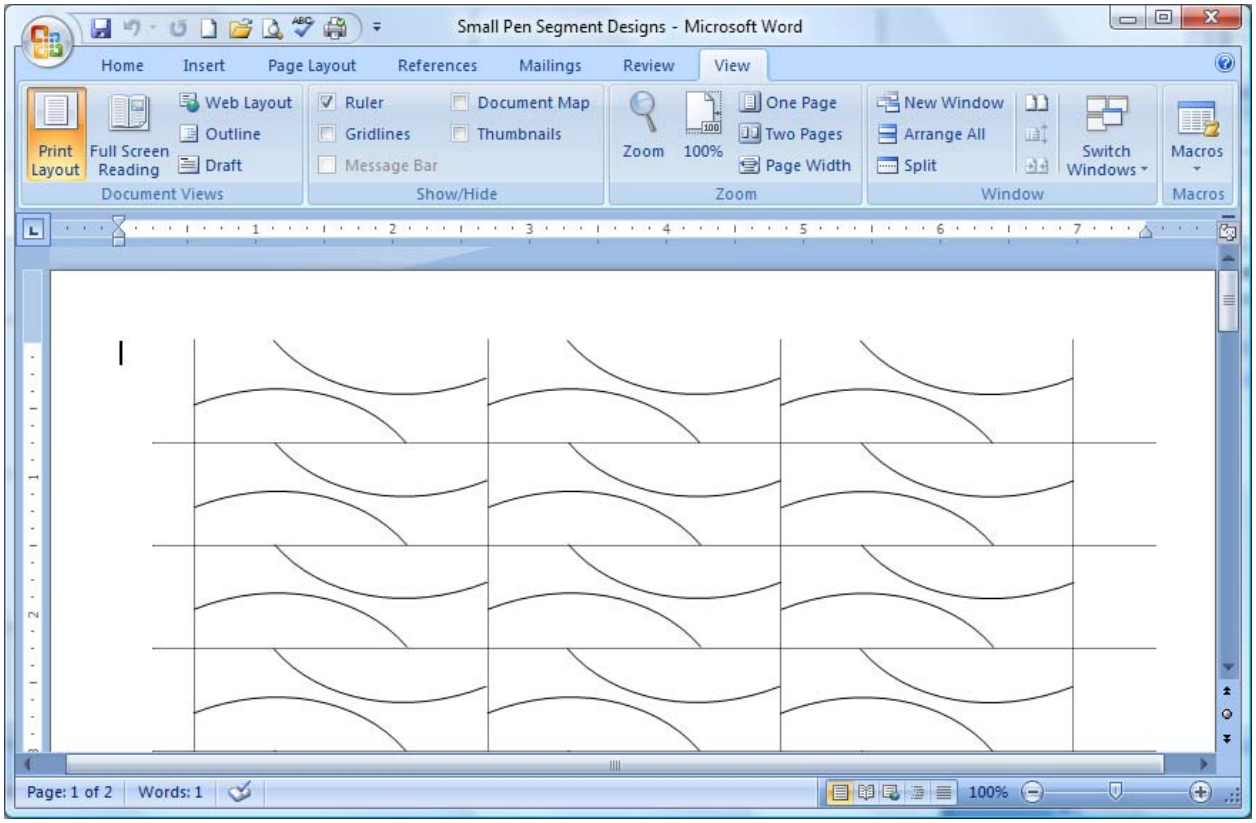
Now comes the part that will be hard to explain and I hope I can do this well enough to not confuse anyone! This will certainly make more sense when you complete one of these and see the finished barrel.

When designing, you will need to understand how the placement of the metal will ultimately appear when the barrel is turned to the final size. The metal will look like a line when it stays within the finished barrel width. If the metal curves out of the finished barrel width, it will appear as a loop on the perpendicular side from the side the cut was made on the wood blank.

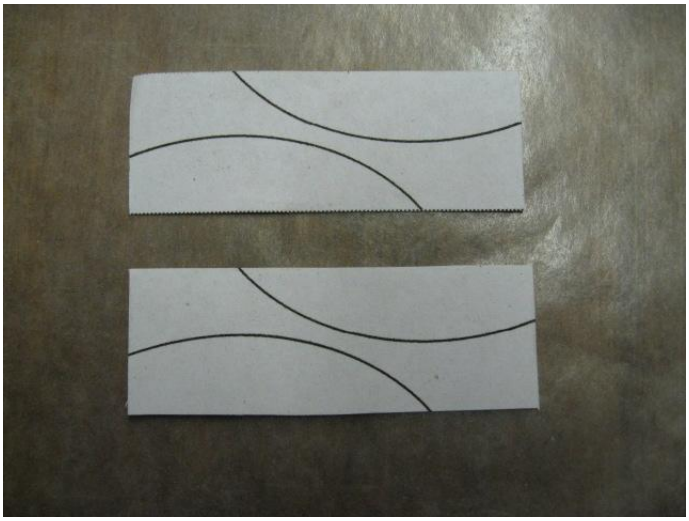
A design can be placed on just one side of a blank, while putting designs on perpendicular sides dramatically increases the end result. You can place designs on one or two sides, make one cut or several cuts on a side, draw different kinds of lines and draw lines for one or both barrels of a pen giving an unlimited amount of design options! Once you make a design and finish the pen, there will be another idea for a design that is spawned, then another and so on. Some designs you think will look

great will come out not looking so good, while other designs you just throw together will amaze you when finished. Just start designing, turning and having a blast!

For this tutorial I will be using a simple design that consists of two arcs. This simple design will be placed on two perpendicular sides. The screen shot below shows several of these templates with the gridlines removed to make it easier to see.



Print the page of designs and cut out each of the designs using the dotted lines as a guide.

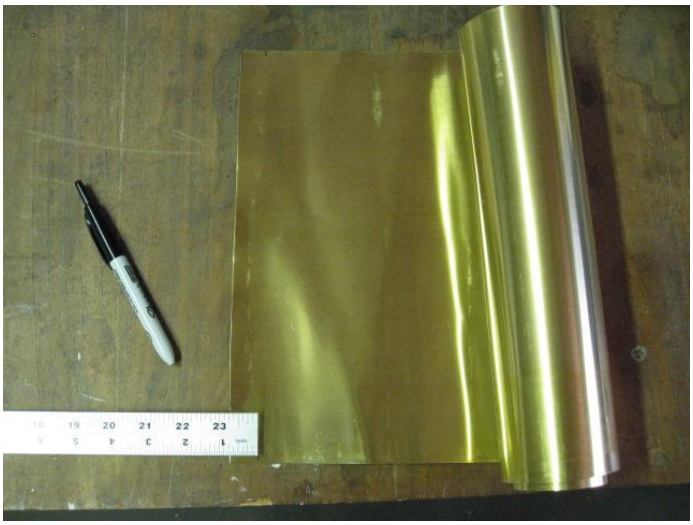


Metal discussion

The metal that is used must be very close in thickness to the size of the kerf. The bigger the difference between the metal thickness and the kerf will result in the finished barrel having lines that are skewed. This is compounded with the more lines a design contains. I like to use metal that is around .003"-.004" smaller than the kerf so there is a small amount of room for glue and I don't clamp tightly. I use a scroll saw to make the cuts with blades that have a width of .013"-.014". The metals that I use are .010", which is also 10mil or 30 gauge. Craft supply stores will have this same thickness of metals for embossing, which is referenced as a "medium" thickness.

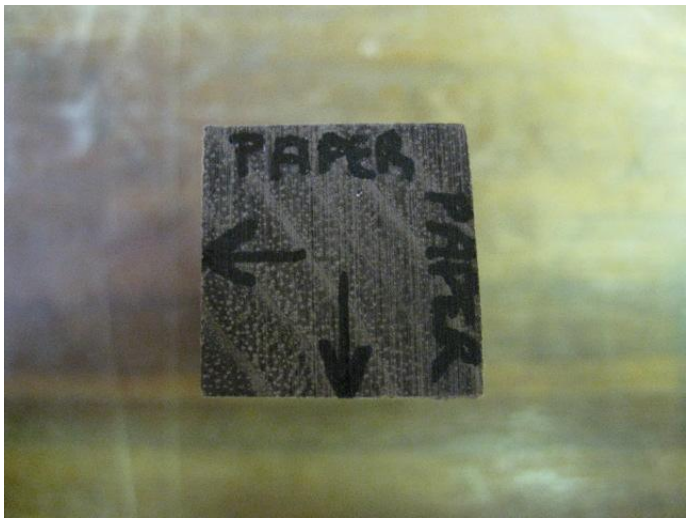
Different types of metals that I use are aluminum, pewter aluminum, yellow brass and jeweler's brass. Plain aluminum is the most economical and provides a shiny silver look and the pewter reminds me of black titanium. The yellow brass is a light bright gold, while the jeweler's brass is a deeper gold color. I will be using yellow brass in this tutorial.

Measure, mark and cut the metal to the width of the wood blank you will be using.

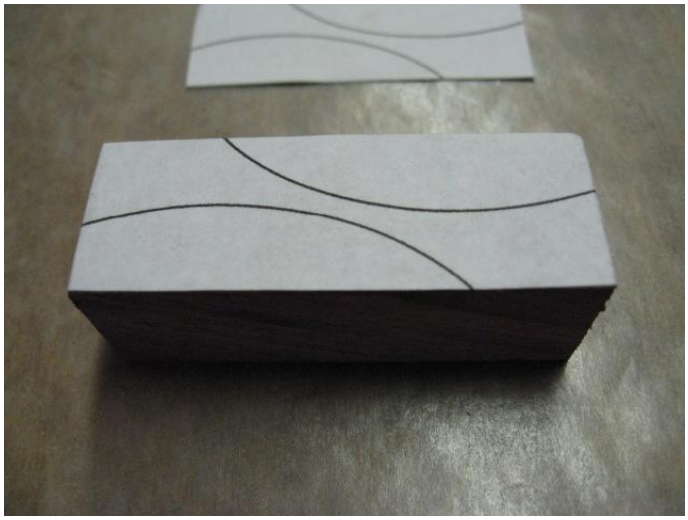


Preparing and cutting the wood blank

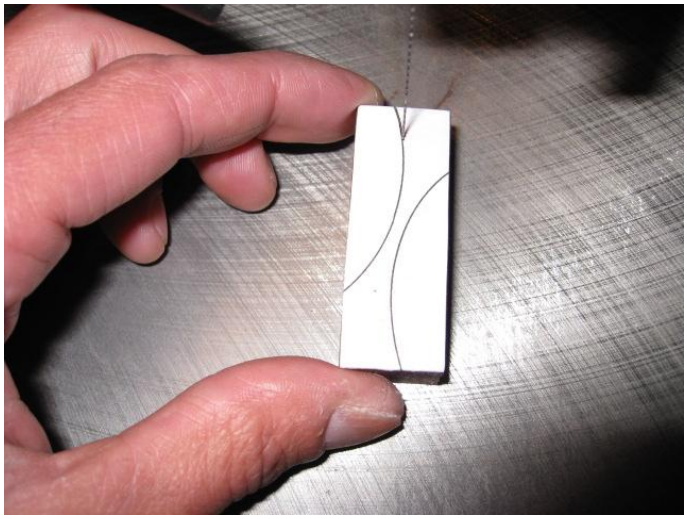
It is very important to start with a square pen blank or at least two sides that are squared. On the wood blank, pick perpendicular sides that are a perfect 90 degrees. Mark these sides (arrows used in picture) and these will be the sides that are down on the table when cutting out the design. The other two sides will have the paper design placed on them.



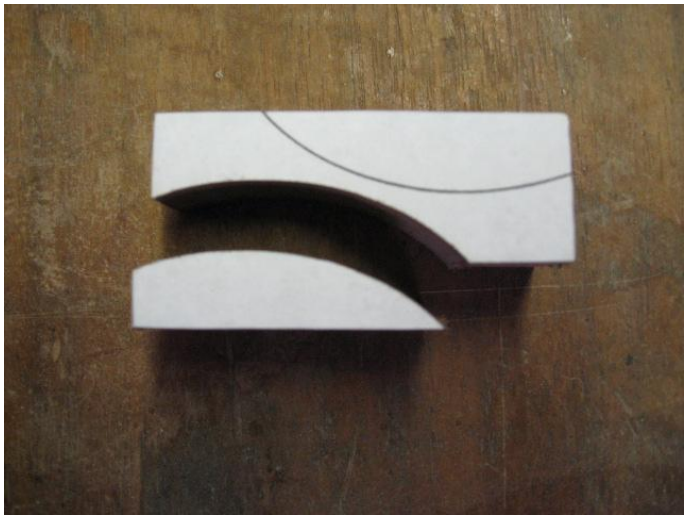
Use wood glue and apply a design template to only one side of the wood blank. Make sure the paper is placed squarely on the wood blank. Allow time for the glue to dry completely.



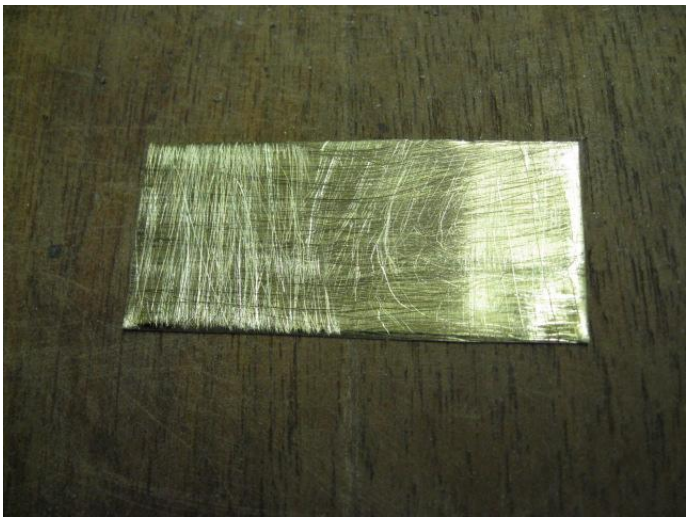
Cut only one of the design lines with a scroll saw, starting at the end grain.



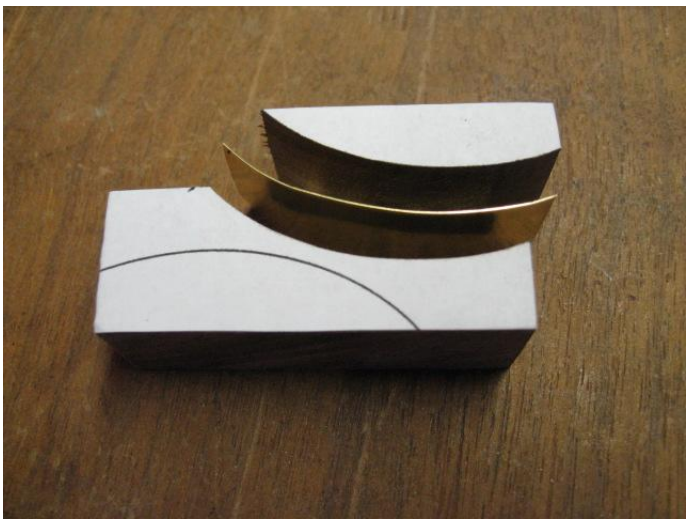
Make sure to clean the two pieces of wood to get rid of any dust particles.



Cut the metal to a length that equals or is a little bit longer than the saw cut. I take the long strip of metal, from earlier, and lay it between the two pieces of wood, squeeze the wood together bending the metal between the wood and mark the metal. Cut the metal squarely to that length. Sand the metal on both sides to allow the glue to bond better. The grit of sand paper depends on the type of metal you will be using. Some metals will be hard and will require course grit, while other metals will be really soft and a finer grit will do the job. You just want to score the metal to provide some nice grooves for the glue to grab and not decrease the thickness of the metal. I use 80 grit for harder brass and 120 grit for the soft pewter aluminum.



Next, form the metal to the design cut.



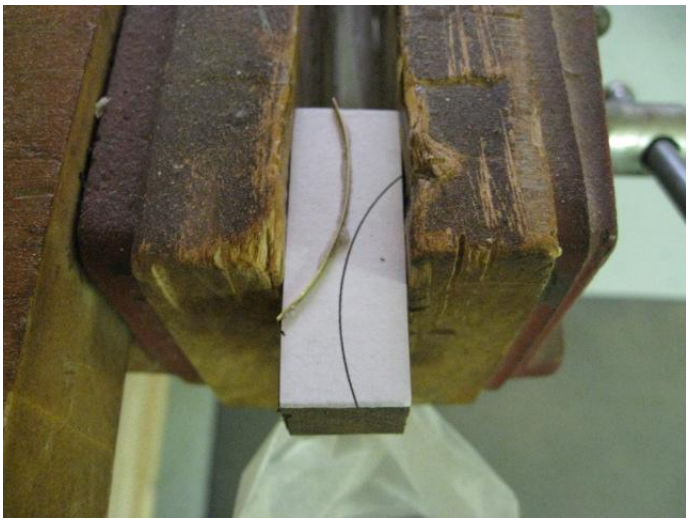
Gluing in the metal segments

Now is the time to apply glue. I use thick CA, but you can use epoxy if you want. I use CA because I don't want to wait for epoxy to setup! BEWARE, using CA adds difficulty since it sets so quickly! I'll describe more about this in a minute.

I put a piece of wax paper down on the table, since this part gets messy with the CA oozing all over the place! Apply thick CA to both sides of the metal piece. On the wax paper, stand the metal piece on edge between the two pieces of wood. This is the part that gets really difficult. Just remember to work quickly BUT efficiently since the CA glue can grab quickly and the pieces need to be in perfect alignment. Start pressing the wood pieces together. Make sure the wood and metal stay in alignment as they all come together. Sometimes I will put a thin pencil line on the paper across the cut, since this gives a

better point to focus on while bringing all pieces together. Once you squeeze the pieces together with your fingers, place the blank into a vise or clamp and apply more pressure.

Do not apply so much pressure that all of the glue squeezes out, just good and snug. Notice there’s also some wax paper under the blank in the vise to catch any glue that drips.



At this point I will take a paper towel and wipe any excess glue off of the blank.

After the glue has set, remove the blank from the vise. Sand the metal and any glue on the bottom side of the blank flat for the next cut to be made. I also sand the ends where the metal is extending out from the blank. I try to keep any sharp metal that is sticking out to a minimum. Don’t sand too much on the end that has the mark that tells which side to place the second design template. You can sand the metal down on the paper side if you want, just make sure you don’t sand away the design template!

Now do the same steps above for the next line on the design template. After you have finished with the second line, glue on the second design template to the proper adjacent side of the wood blank (see markings on end of blank). Make sure the side of the blank that will be on the saw table is flat and has no glue or metal sticking out. Continue preparing the wood blank with metal until all four lines are in place.

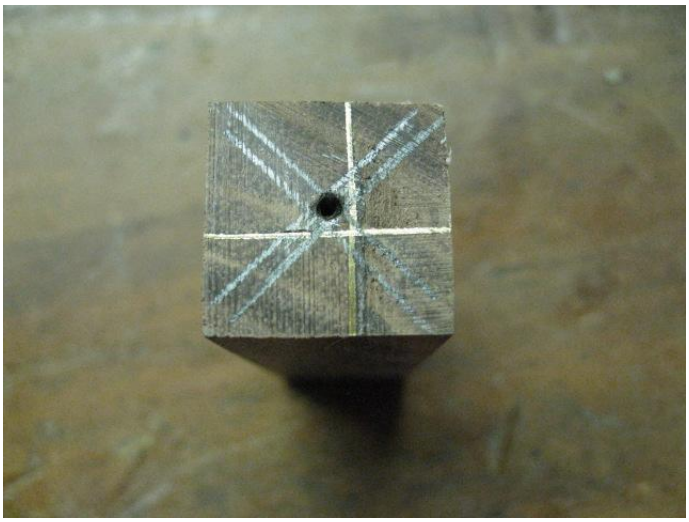
Sand protruding metal from all sides and you now have a wood blank with metal segmented inside.

Finishing the wood blank

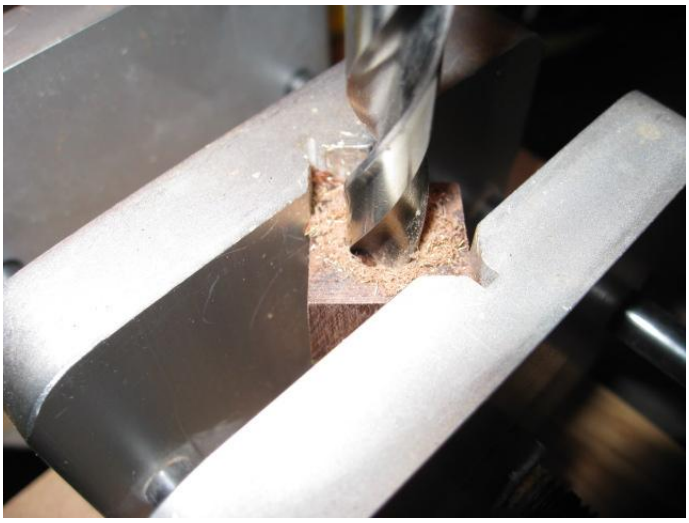
The rest is just regular steps of turning a wood blank. I'll point out a few key points to remember.

The blank must be drilled exactly in the center of the blank. This is very important so the design will be spaced evenly around the finished barrel. I use a center marking tool to find the center of the blank.

I mark from all four corners of the blank, holding the pencil at the same angle each time and end up with a square in the middle of the blank. I then take an awl and mark the center. The pencil marks and hole will help visually in making sure the tip of the drill bit is setup perfectly to drill the center of the blank. I use a drill vise and clamp the vise down securely on the drill press.



When drilling for the tubes, take it VERY VERY slow. Excess heat will soften/breakdown the glue and too much pressure will cause the drill bit to grab the metal, both resulting in the blank falling apart. Also, do not clamp the blank in the drill vise too tightly. You can take some small rope and wrap around the entire blank and pour on some thin CA. This will strengthen the whole blank, but after you are done, you have to remove all of the CA and rope.



After you insert the brass tube in the blank, mount it on your lathe and start turning. Take it slow and easy when turning the blank, take small bites with a roughing gouge. Notice the small wood chips!

Finish the barrel to your personal preference. If you use any type of polishing compound, watch out for oxidation to occur with the metal.

Put the pen together and you are done making a metal segmented pen!

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