Segmented Wood turning with Peter Schultheiss

As observed by Mike Josiah Spring 2008

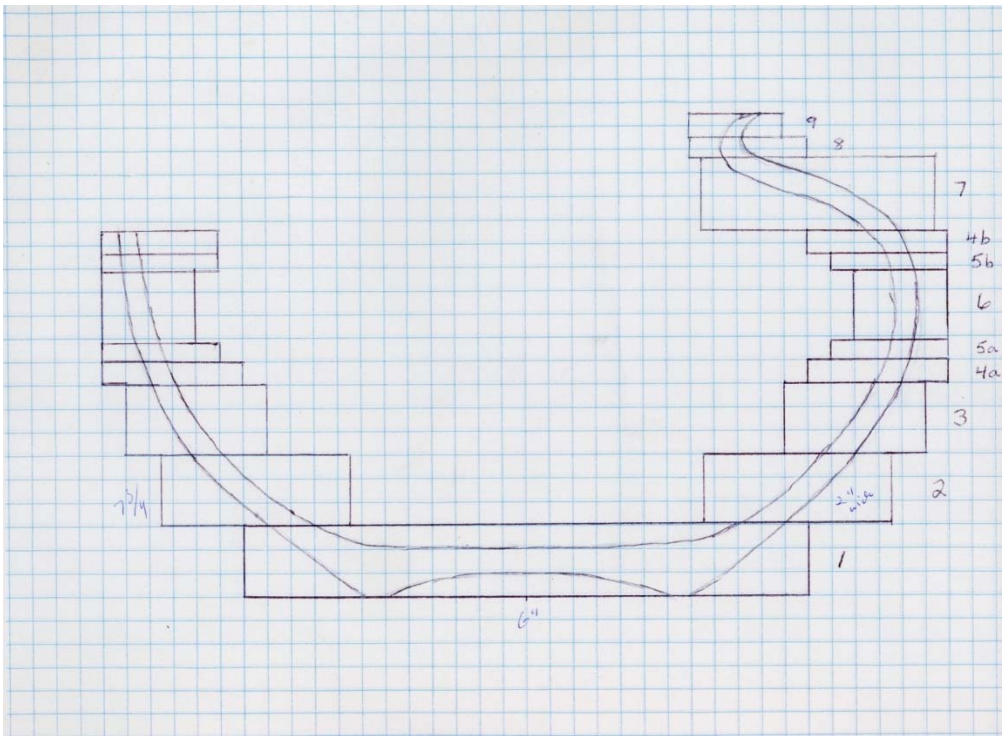
General notes:

Make sure the design incorporates the Golden triangle. 0.618-1 or basically 2-3. Use this for the segments as well as the entire piece.

Good advanced book:The Art of Segmented turning, by Malcom Tibits

To get the angle of the segments. Divide 180 degrees by the # segments. For 16 segments the angle is 11.250 degrees.

To get started, draw the outline of the shape you want to end up with on 1/4” graph paper. Use ¾ inch thick boards for most of the vessel. Always overlap each side of the wall by ¼”.



Stay away from oily woods like Teak, Walnut, Padouk, etc

Good woods:

Wenge: Dark

Bloodwood: Deep red

HARD Curly maple: Light figured wood. Make sure it’s HARD maple!

Bubinga: Medium color

Utilie: Med dark. (Like Mahogany)

Sapele: Med light color

Anigre: Light color

Bottom color: Use a dark wood

Filler: Use a light color like maple

Feature ring should incorporate Light + med+ color of bottom ring

Figure rings using tangent and cosine formula. (See formula page)

Use Elmers type white glue.

Segments should always be in multiples: 8-16-24-32; 12-24-36 etc

<<<Getting Started>>>

Start with a waste block 6” Home Depot maple works fine. (For 9” vessel) (Use hardwood!)

Glue it to the bottom ring, clamp it up.

After the bottom and waste block are dry, round them off the lathe. Use a scraper and come in from the front edge.

In the center of the base, cut a ¼” deep approximately 2’ wide round hole. This is easier to do now when nothing is attached.

Flatten the base. (THIS MUST BE PERFECT!!!) Align the tool rest with the block. Run the scraper across the block so it is flat.

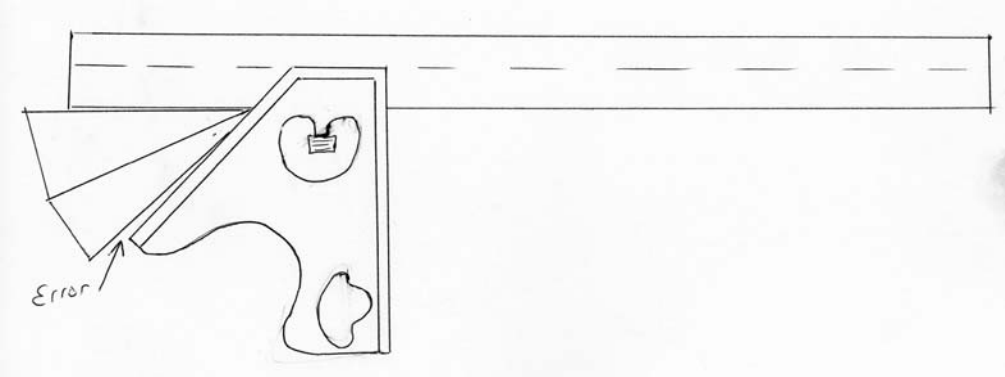
Take a perfectly flat 2” wide board and wrap it with a quality 50 grit sandpaper. Press this against the wood. Press hard until it is flat. Use 50 grit so you have a good glue surface.

<<<Set up the miter gauge>>>

Cut 2” long strips at 1 degree setting. Use these for shims.

Set the Miter gauge to 11.25 degrees. Use a stop block along the fence.

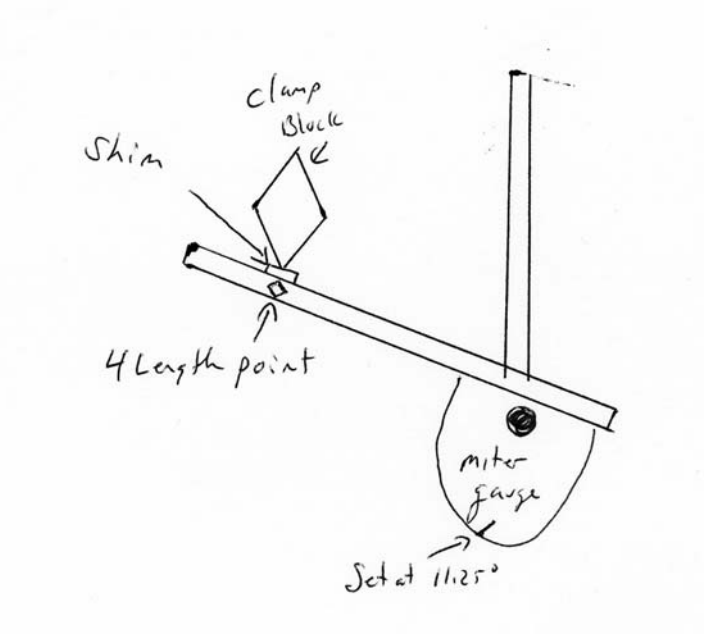
Use mdf for test cuts. Take 2” wide ½ thick MDF for test cuts. Cut one side, flip the board over, make the second cut. Cut 2 wedges this way. At 11.25 setting, 2 wedges = 45 degrees. Check with Starrett sguare. MUST BE EXACT! No Light can show between wood and square!



Slide one of the shims down the “error” opening of the blocks while on the square. Where it stops, that’s the error. Mark that point

If the test cuts are off, use the marked point of the shim roughly 4 lengths of the wedge out from center to offset the gauge. With a clamped block on the table saw, use the shim with the wedge to push the miter gauge against the clamp block. (At the 4 length point) Hold the miter gauge, loosen the knob, remove the shim and press the block against the clamped point to take up the shim or stick size.

Take 2 more sample cuts on the mdf.

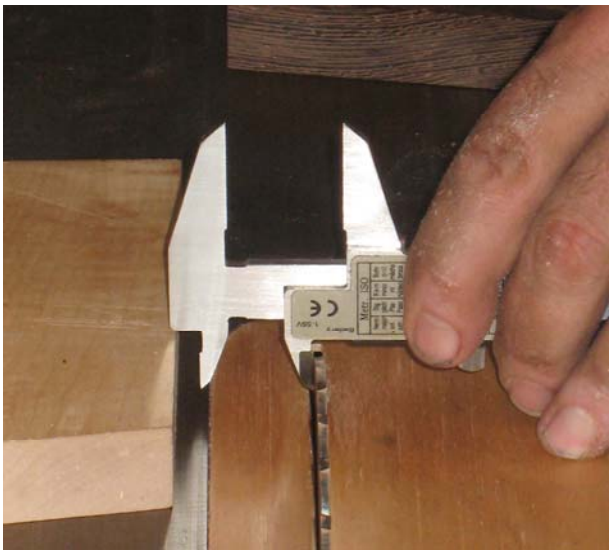


Always keep clockwise pressure on the miter gauge so keep the cuts consistent.

To figure the wedge size, Calculate the diameter from the outline drawing. For a 9” vessel, the 1st ring is 7.75”. Multiply 7.75 x tangent 11.25. This equals 1.541

This is the angles cut each wedge has to be. To make it easier, multiply 1.541 by cosine 11.25. this equals 1.5119 or 1.512.

Measure from the edge of the blade to the edge of the stop block straight across. Set it to 1.512.



<<<Make the first ring>>>

Cut 16 wedges, with 120grit sandpaper, sand off the “fuzzies” on each edge. (Lay the paper flat and make 2-3 long passes on each side.

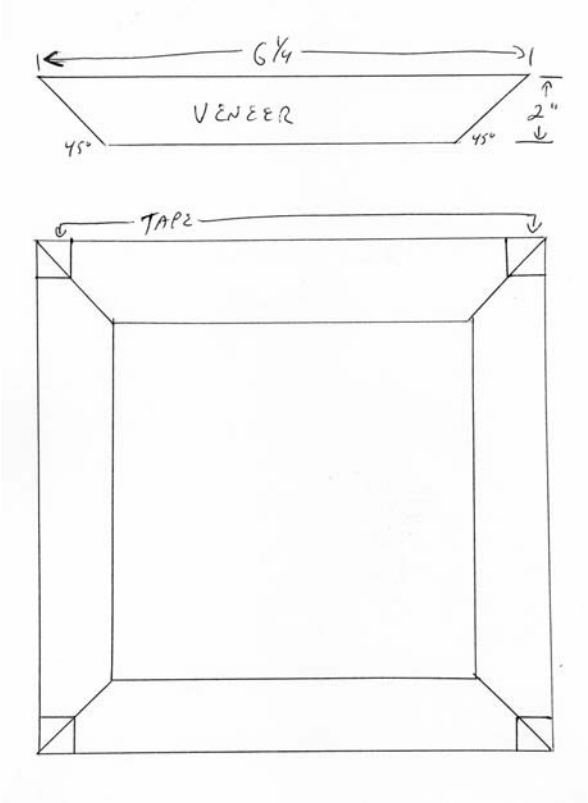
Using masking tape on the outside edge create a circle and clamp with a band clamp. Make sure there is NO light whatsoever showing through. If all is good, glue them up (Quickly) and clamp with the band clamp.

If any light shows through the segments, you will need to make an adjusted cut on a new segment. Place a popsicle stick between the wood and miter gauge about 4 lengths out. Mark the piece cut.*** If more than one adjusted cut is needed, make sure they are placed in the ring opposite from each other.

<<<Using veneer>>>

When using two darker woods together, you need a light colored veneer in between them. One piece is no good because the end grain of the veneer gets lost while the side grain stands out. You need to have 4 pieces of veneer.

For this ring use 2” wide x 6 ¼” long pieces. Use strapping tape on the inside and outside corners to hold it. Join 2 pieces together first then use a good square to trim the edges so both halves fir perfectly.



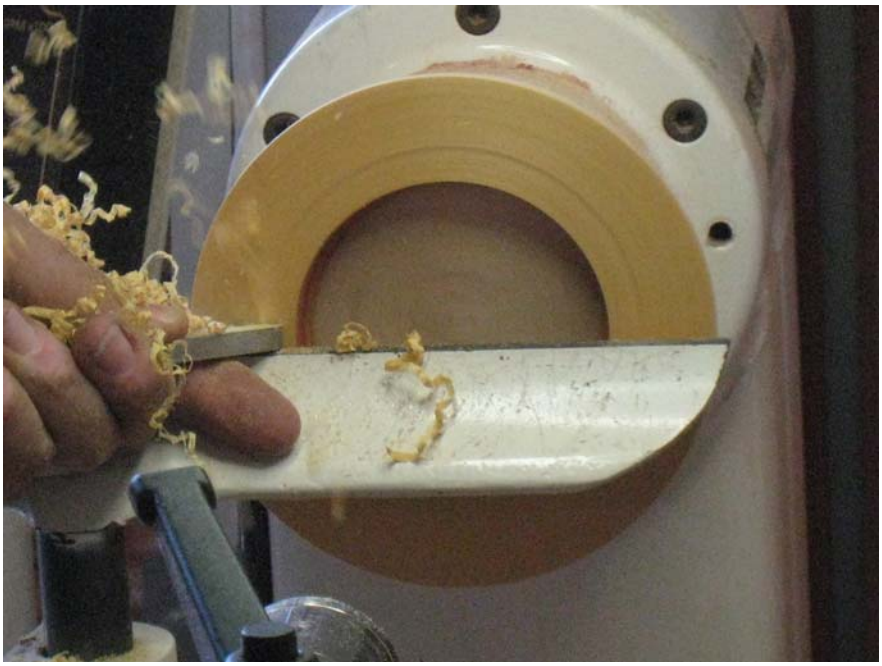
Use a press to glue the veneer on. This press is also used to glue the different rings together.

Note the veneer on the bottom ring, the tape at the corners, and glued popsicle pieces to keep the alignment of the two pieces. Good pressure is important to prevent the veneer from wrinkling.

Trim the outside edges of the veneer with a parting tool.

<<<Adding Rings>>>

As each ring is added, it needs to be rounded, flattened and checked with the Starrett Square



To flatten a ring, center it on a round piece of melamine attached to a face plate. Mark ½ the diameter of the ring, and draw a centered circle on the melamine. It is best to make the circle 1/16” larger than the ring. Using a good carpet double sided tape, attaché the ring. (Put the flattest side down. If both sides rock, flatten on a disk sander first.

Flatten the ring, sand with the flat board and 50 grit sandpaper. Check flatness with the Starrett Square.

Carefully remove from the jig using chisel, and MINIMAL force! Too much force can crack the ring…

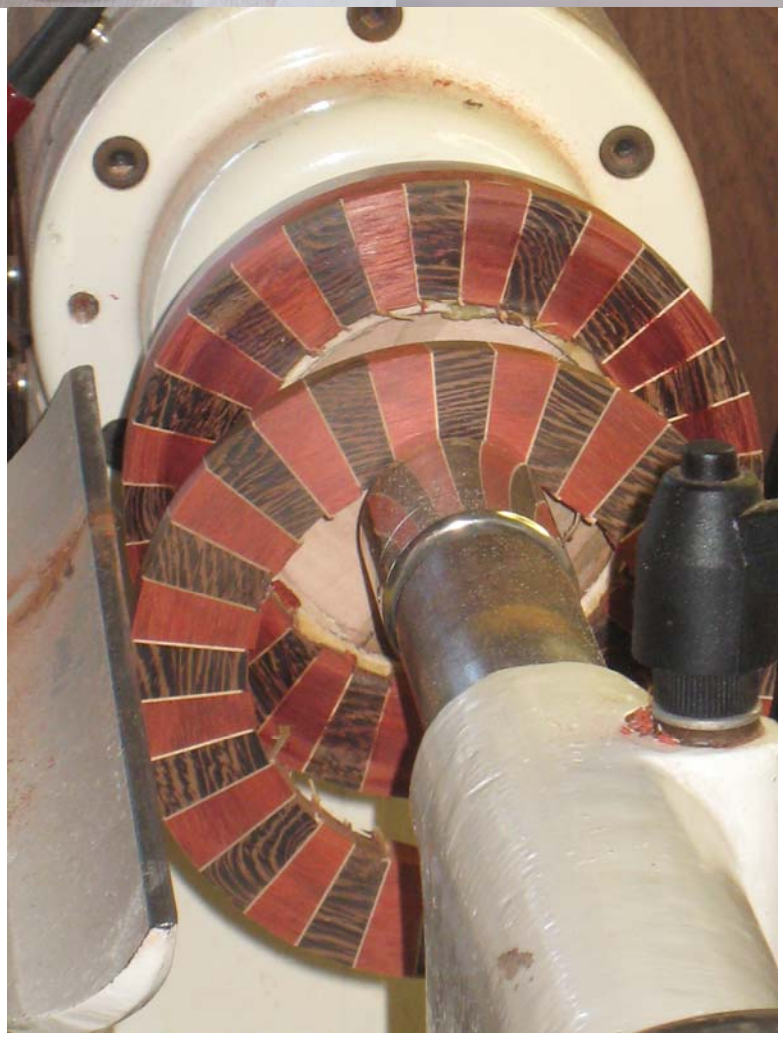
Carefully center the next ring on to the existing ring. (no glue yet). Use the hot glue gun and cut up popsicle sticks to hold the ring centered. Make sure you do not get the hot glue onto the new ring!

Glue the flattened side to the vessel in progress. Place it in the press for ½ hour.

Build up the bottom half of the vessel ring by ring. Glue up the ring, flatten on the melamine jig.

<<<Start building the top half>>>

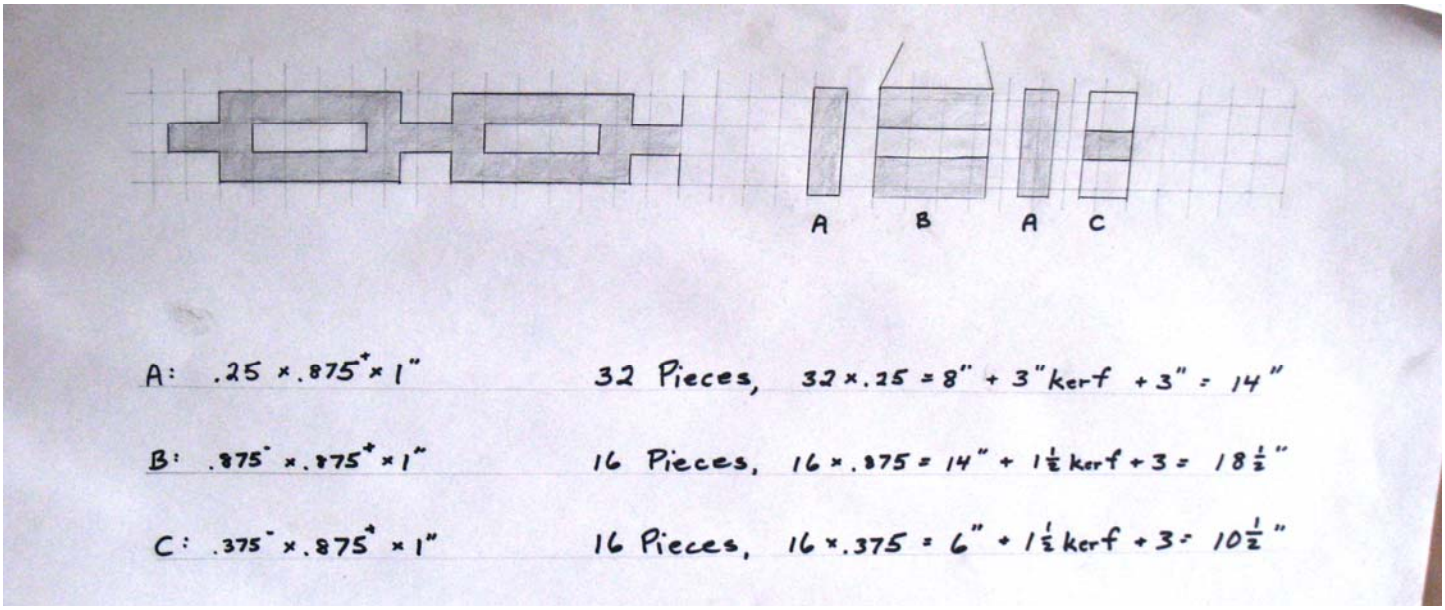
Once the bottom half is built up, place aside and start the top half. Same as with the bottom, start with a maple waste block. Flatten, sand and check with the square. Glue on the top ring. If you are going to use an accent ring, cut the segments and glue up according to your design. Typically these rings finished are ¼" in height. A one inch ring can be carefully parted off to have 2 or possibly 3 rings for future use. Flatten on the jig, center onto the vessel, glue and keep in the press for ½ hour. Flatten the outside and part off. Flatten the remaining piece. (The outside is first flattened to make it easier to use on another piece).



Flatten, glue the accent ring onto the top section. The same parting technique is used typically for all the thinner rings.

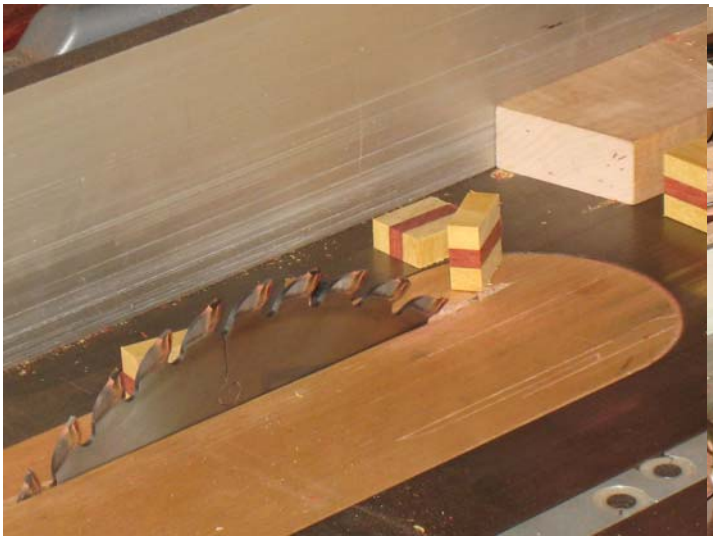
<<<Create the feature Ring>>>

When you get the the feature ring, multiple designs are available. For this vessel, a chain feature ring is used.



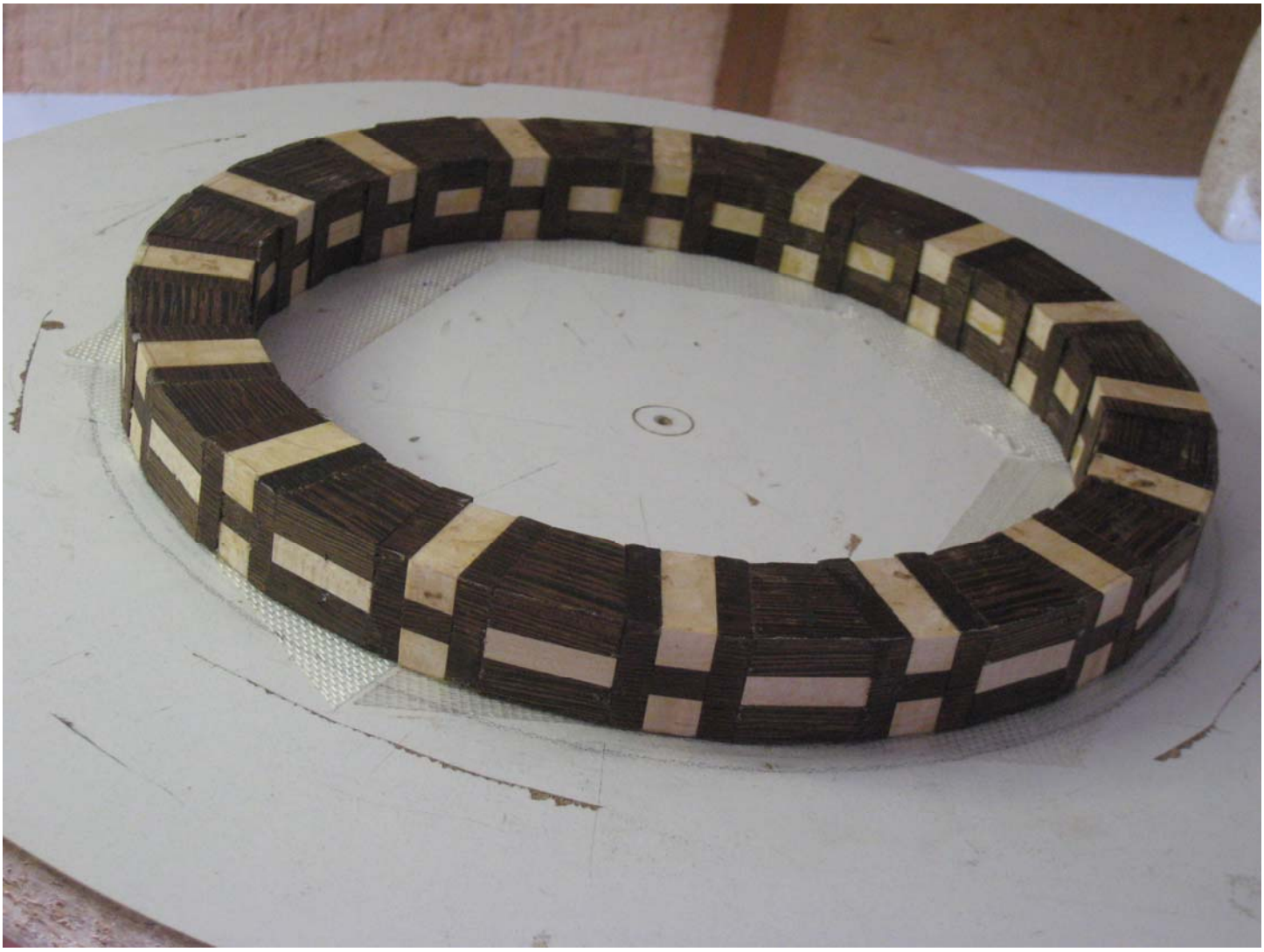
Start off by cutting the strips of wood to be used in the segments. Rip a 1" wide strip from the board. Rip them to ½". The center pieces on B and C plus the A pieces must be planned down to exactly ¼". The outer pieces are planned down to 5/16" to allow for flattening. Make sure that the A pieces are slightly less in height than the B pieces so that there are no alignment issues. (The center must match perfectly! Match up the correct pieces for each part of the segment and glue them up. Make sure you use wax paper in between the different sections. Make sure the paper stays out of the clued up parts.

Use a 90 degree miter gauge to cut the “A” and “C” pieces to ¼ inch. Cut the “B” pieces to 1.542” wide wedges



Glue up the “A”-“C”-”A” pieces together.

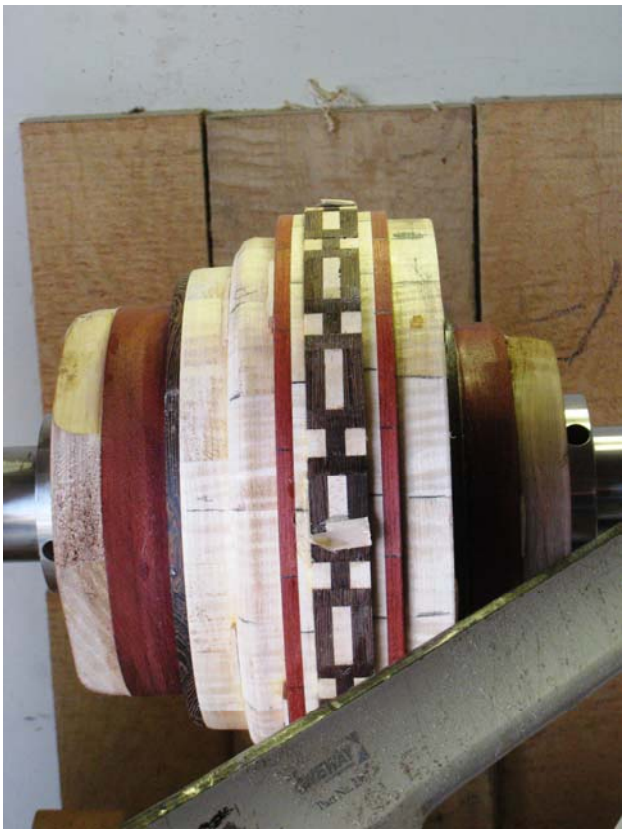
Create the feature ring by alternating the A-C-A and the B segments.



Flatten, sand, check, glue and press as usual.

<<<Finishing the Outside>>>

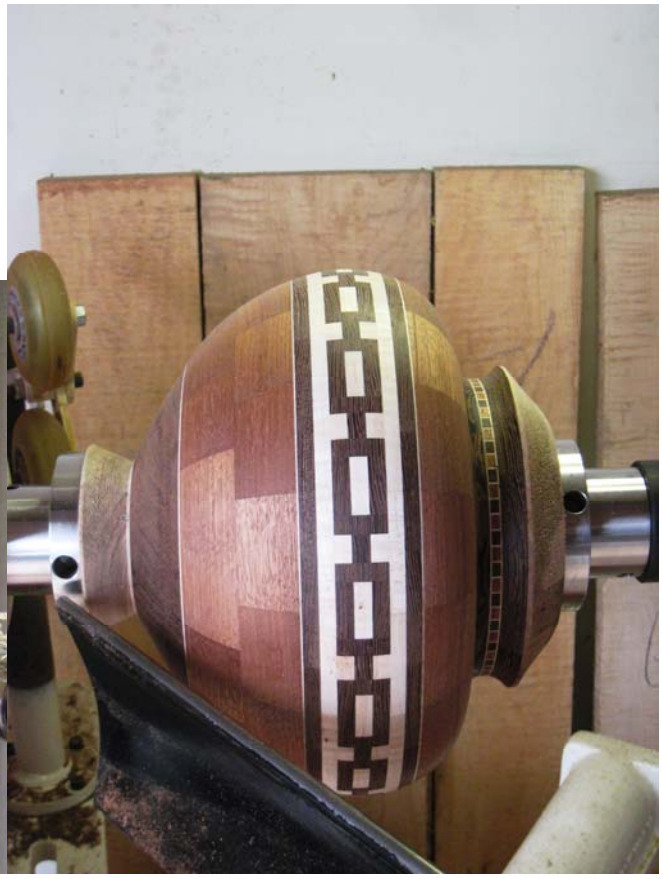
Press the two halves of the vessel together on the lathe. (You will need a live center like the OneWay that allows a faceplate adaptor to be attached.)



Start to shape the outside of the vessel.

TIPS: Take very light cuts along the outer edge. Too aggressive in and the shape will be angular not round. On the top, the center of the accent ring should be the center of the deepest cut. The top of the next section should be relatively flat.

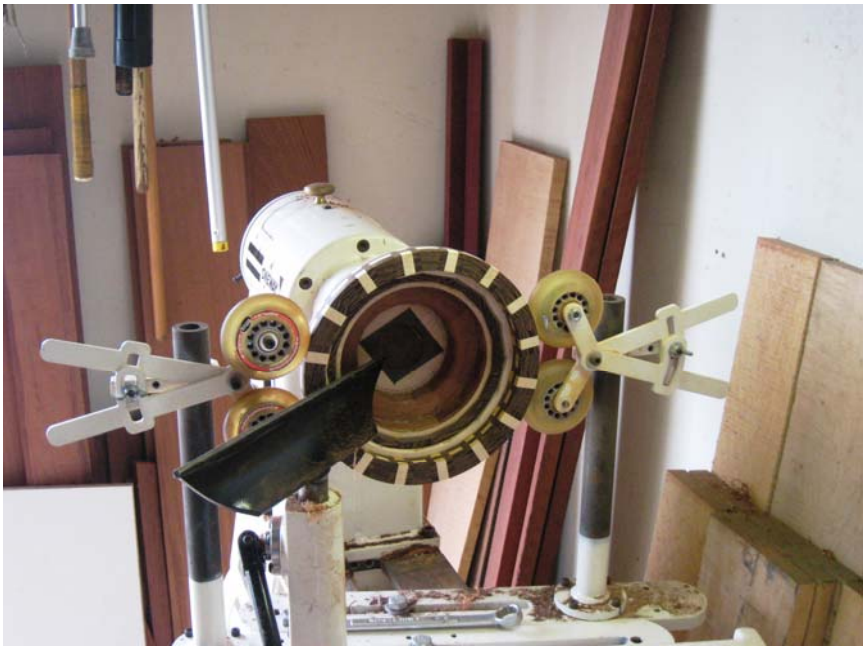
After the top has been shaped correctly. Turn the outside to the final shape. Once the rough shape has been turned, switch to a flat nosed scraper for the final shape cuts. Note how the shape has been started along the entire vessel, not just one ring or area at a time. This is important to enable you to achieve the desired shape.



<<<Finishing the Inside>>>

Separate the two halves, remove one half from the lathe, place aside. Start to turn the inside off the other half. For best results, use steady rests on both side of the half. Make sure the wheels at on the widest part of the half.

Use light cuts with the scraper. IMPORTANT! Leave the edge thicker to make mating the 2 halves together easier. This thick edge will be turned away later.

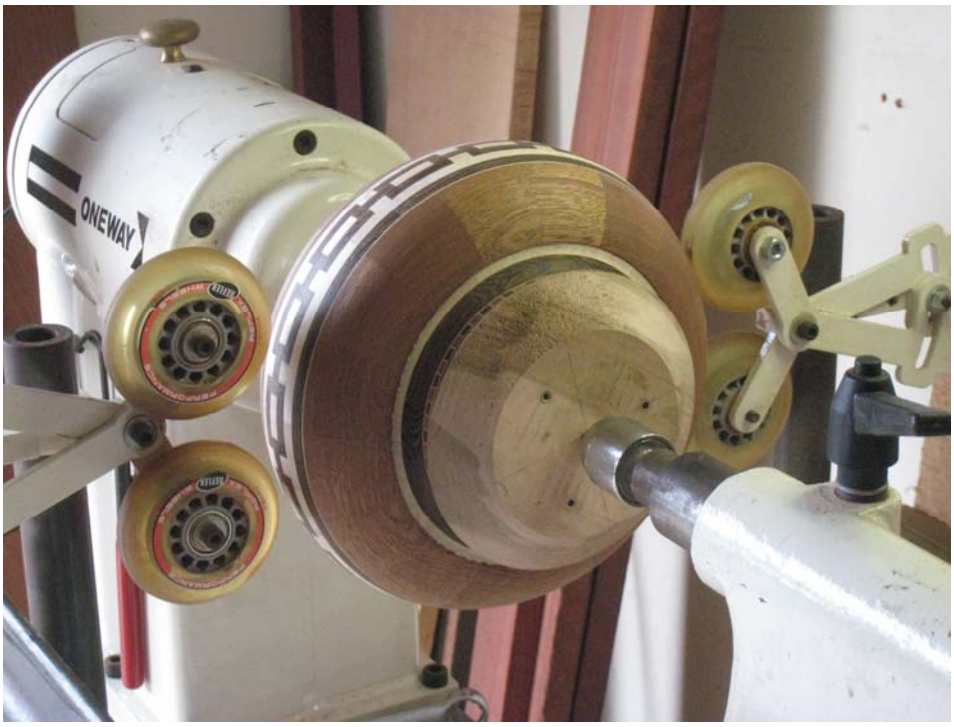


Periodically check the thickness with a gauge to make sure the walls are even.

With the lathe set to a low speed, power sand the inside using 60 grit paper on a soft bowl sanding disk. Make sure the drill is turning clockwise.

<<<Glue the 2 halves together>>>

After the 2 insides have been turned and sanded, blow off any remaining dust, and glue the two halves together on the lathe.

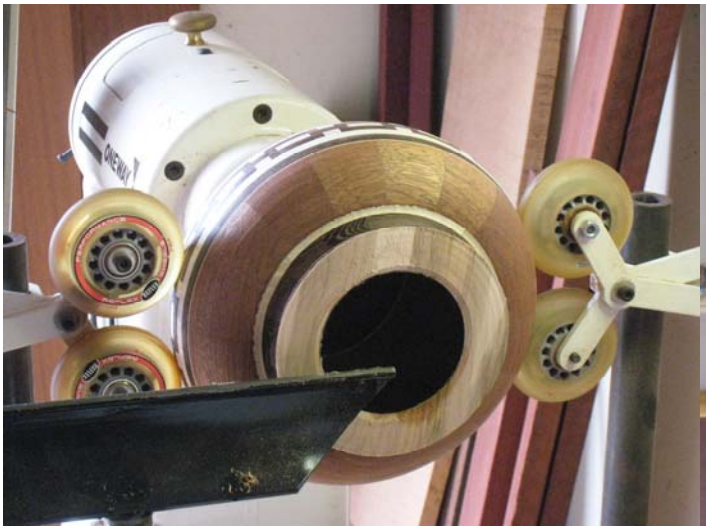


After the glued had dried for at least an hour, remove the face plate from the top of the vessel.

<<<Forming up the top>>>

Turn away the top waste/glue block.

Once the waste/glue block has been turned away, carefully turn the upper lip to shape.

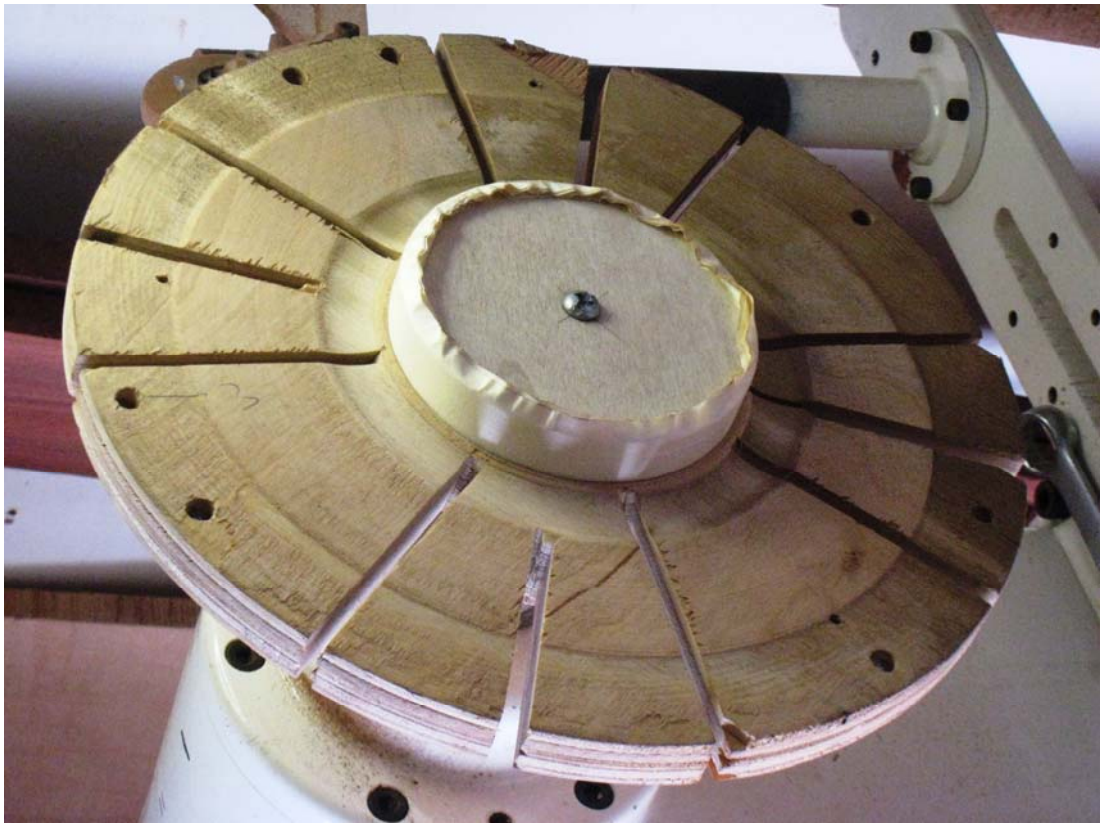


<<<Finish off the inside>>>

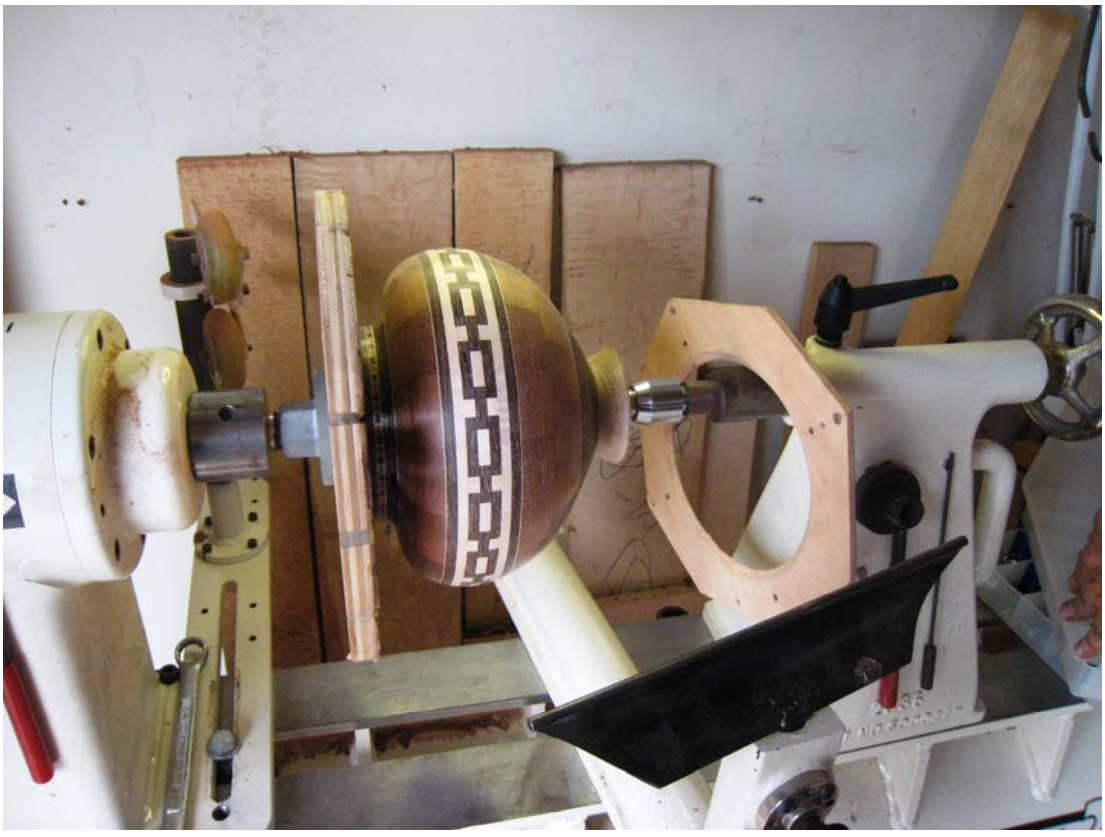
Once the top lip is finished, use a hollowing tool to smooth out the inside lip where the two halves were joined. Take careful light cuts until the lip has been removed. Hand sand the inside smooth. Make sure to keep the straight part of the hollowing on the tool rest!

<<<Reverse chuck and finish off the bottom>>>

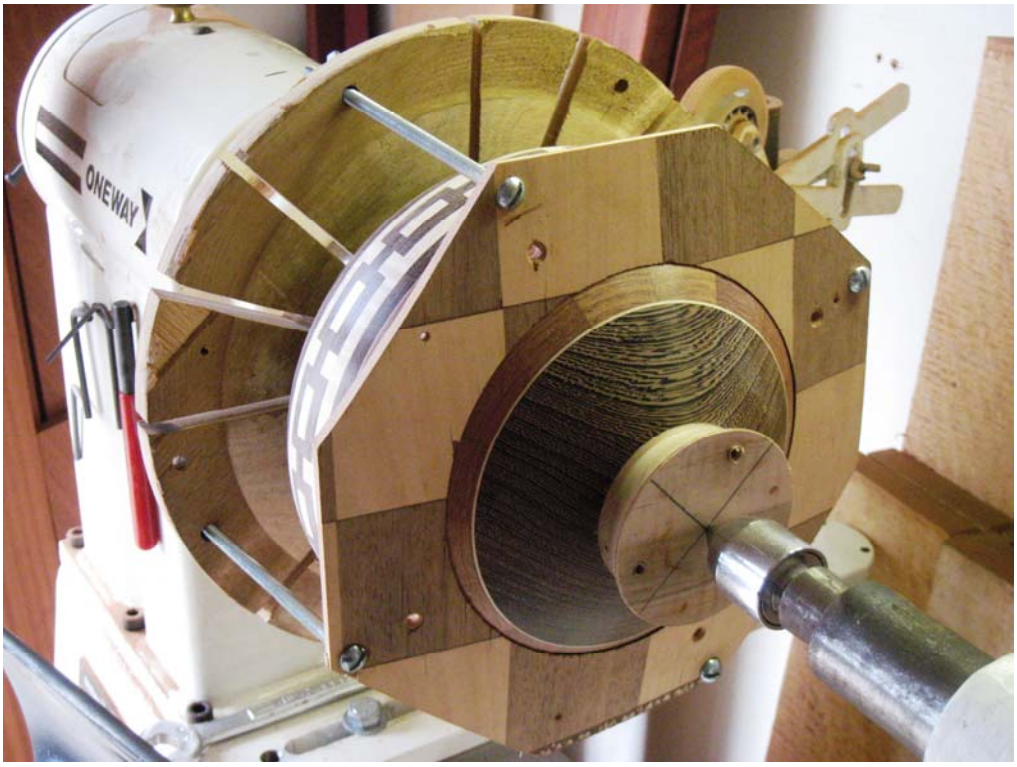
To reverse chuck a vessel like this you will need a home made jig to hold the vessel in place. The jig in the following pictures is easy to make. It consists of two round disks, one with a face plate and a jam chuck attached, and long enough screws to accommodate the vessel.



Vessel on the jam chuck.



All set to turn away the bottom waste block.



Turn the waste black off leaving a center nib.

With a fine toothed hand saw. Remove the nib.

Turn the bottom with a slight recess to it will sit flat on a table.

Power sand the bottom smooth.

<<<FINISHED VESSEL!>>>

<<<Applying the finish>>>

The finish used here is a Tung Oil finish. This is different from plain Tung oil as it also has varnish in it. This finish really brings out the color and grain of the wood.

Finished Vessels at our Annual Show


SEGMENTED VESSEL

Formulas for Segmented Turning

Angle = 180 ÷ n

Examples: What is the angle needed to construct a ring consisting of

a) 16 segments? Answer: 11.25 degrees
b) 18 segments? Answer: 10 degrees
c) 24 segments? Answer: 7.5 degrees
d) 32 segments? Answer: 5.625 degrees

Length of a Segment = Diameter × Tan A

Examples: Calculate the length of a segment needed to construct a ring of

a) 32 segments and a diameter of 10.5 inches Answer: 1.034 inches
b) 24 segments and a diameter of 9¼ inches Answer: 1.218 inches

Saw setting for cutting a segment = Diameter × Tan A = × Cos A

Examples: Calculate the saw setting fo construct a ring of

a) 16 segments and a diameter of 6.5 inches Answer: 1.268
b) 24 segments and a diameter of 12 inches Answer: 1.566

Length of stock needed for a ring:

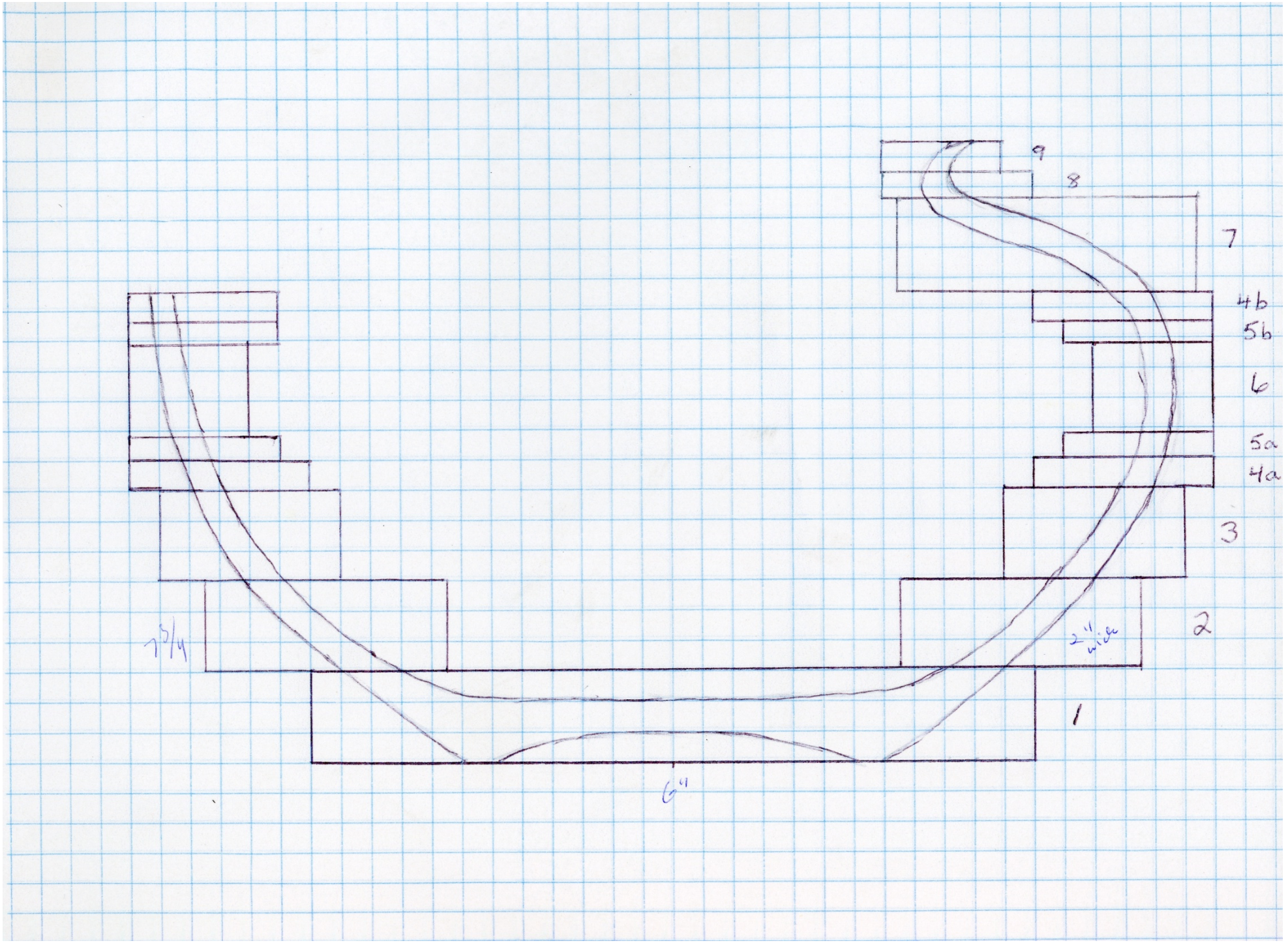
(D - W) × n × Tan A + n × K + 3.5

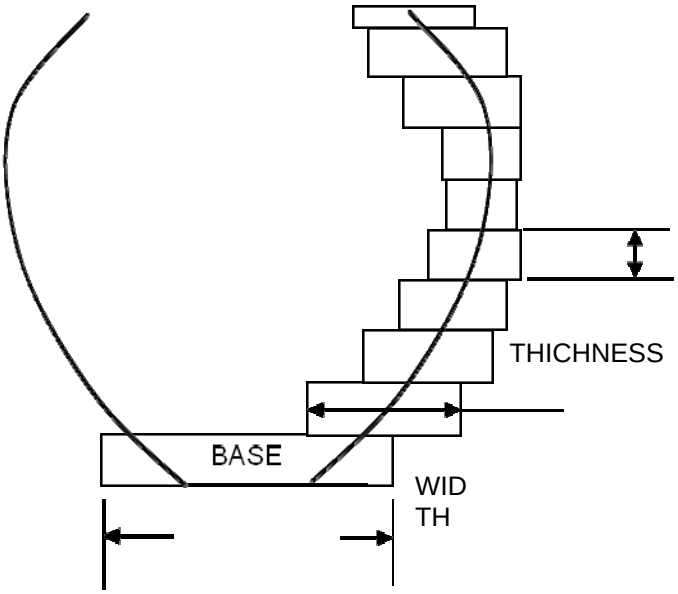
Examples: If the kerf of you saw blade is 3/32, how long must your stock be to cut the segments for a ring

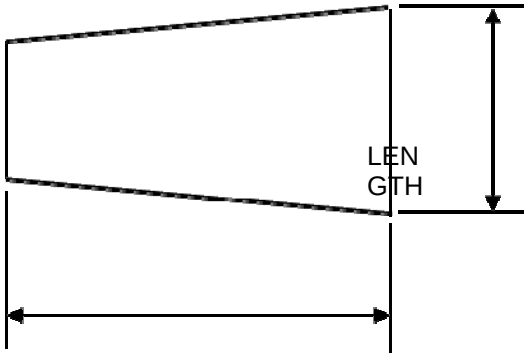
a) 2 inches wide, 11.5 inch diameter, having 16 segments? Answer: 35.2 inches
b) 1½ inches wide, 7¼ inch diameter, having 16 segments? Answer: 23.3 inches

Note: for the kerf, just enter 3 ÷ 32

Final note: the last two formulas are luxury, only the first two are essential.


9
8
7
4b
5b
6
5a
4a
3
2
2" wide
1
7 3/4
6"





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DIAMETER

ANGLE IS THE SETTING OF THE MITER GAUGE ON THE SAW

SETTING = LENGTH x COS(ANGLE)

IT IS THE DISTANCE FROM THE SAW BLADE TO THE FENCE STOP BLOCK WHEN CUTTING SEGMENTS