Demo or Class: Small Vases & Hollow Forms

by Carl Ford (06/08/2011)

Turning small vases is a great low stress way to learn how to create hollow forms and to experiment with shapes and surface decorations.

Rattles and Christmas ornaments are another great use of small hollow forms that is fun to explore.

This demo focuses on turning and decorating a small hollow form vase from start to finish using Ellsworth style Small Hollowing Tools.

Topics will include:

- What makes a form easy or hard to hollow
- Wood selection
- Hollowing tools
- Procedure and tips for hollowing

Instructor

Carl Ford

To Schedule a Demo or Class:

Send email to **carl@carlford.info** with date, time, and type of group.

Chalk

Eraser

Demo Handouts:

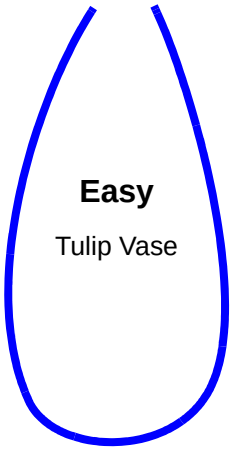
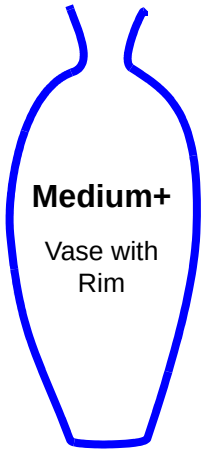
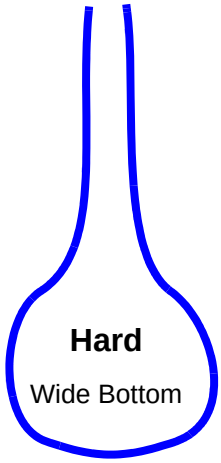
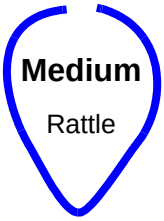
Easy verses Hard Hollow Forms: (Rules of Thumb)

What makes a form easy to hollow?

- Not to deep. 4” or less for 3/8” Ellsworth style tools
- Only requires the straight tool. Or just a little bit of bent tool at the **top**!
- Big entry hole. 5/8” or bigger.
- Soft wood. Turn green or use soft hardwoods like Popular or Ash.

What makes a form hard to hollow?

- To deep. 6” is really pushing the limit for 3/8” Ellsworth style stools. 8” is limit for 1/2” Ellsworth style tools.
- Wide bottoms. The use of straight or bent tool to create deep wide bottom is hard. Use of bent tool is really difficult. Hard to handle torque. Hard to figure out were you are.
- Any use of the bent tool over 2-3” into a hollow form gets hard.
- Low wide vase forms are very difficult. May not be possible with Ellsworth tools shown in this demo.
- Really hard exotic woods. Cocobola, African Blackwood, etc

 Straight tool only. **Start Here with a Wide Opening!**	 Straight tool and small amount of bent tool at top.	 Straight tool and small amount of bent tool at top. Not hard if rim flares out.	 Lots of bent tool deep inside of vase.
 Straight tool and small amount of bent took at top.	 Straight & bent tool. Not hard if small.	 Straight and bent tool if and ONLY if the rim is low and and top of the form flares out! Otherwise you need to start making your own tools from Allen Wrenches, etc.	

Carl Ford's Small Vase Turning Process

This process is used to create vases that are taller than they are wide by hollowing into end grain. It can be used on green or dry wood. It can also be used for side grain if you leave enough wood in step 2 to support the work while hollowing.

1. Mount the vase blank.

1a. Start with a blank 3” by 3” by 6” long.

Polar is good wood for practice. Ash and Cherry also work well. End grain hollowing in really hard woods like Cocobolo should be avoided.

1b. Mount the blank between centers and cut a tenon on one end that matches the jaws on your scroll chuck.

The work is between centers. The grain is running horizontal and the work is less than 4” in diameter so you are spindle turning. You can safely use Spindle Roughing Gouge, etc.

Make sure the tenon is really good and matches your chuck.

1c. Mount the blank in scroll chuck. The jaws on scroll chuck should be almost all the way closed for maximum grip.

2. Turn the outside vase shape.

- The work is less than 4” in diameter and the grain is running horizontal so you can use spindle or bowl tools.

  A bowl gouge with straight grind (no wings) works well in dry wood. (See John Jordan segment on AAW “Fundamentals of Sharpening” video).

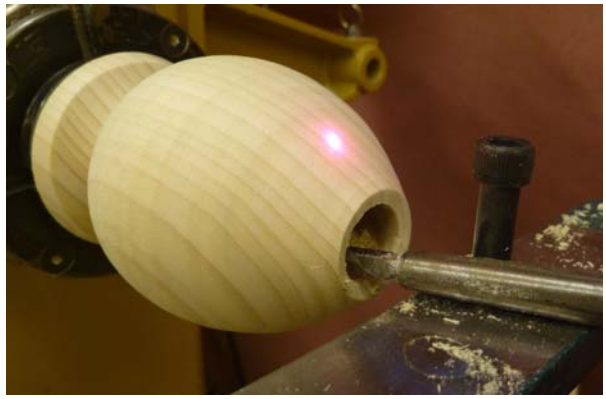
- It is best to start with a nice easy shape. No rim and a big hole.
- You **do not** need to leave a lot of wood at the bottom of the vase to prevent it from breaking off while hollowing because horizontal grain is strong. You can cut almost to the finished shape of your vase. The important thing is the wood should smoothly flow back into the chuck. No sharp transition point that can become a break point.

- Wait to see if the vase survives the hollowing process, before sanding, etc.

3. Drill center hole.

Real men don’t drill center holes. But smart people do! The hole makes it a lot easier to hollow. No nib to deal with.

A 5/8” Morris Taper shank drill works well.



4. Hollow the vase.

Use small Ellsworth Style hollowing tools to hollow out the vase. See “Turning the Interior of a Hollow Form” chapter in “Ellsworth on Woodturing” book. Follow the method in the “Organizing the Interior” section.

You can use the tools freehand or with a captured tool rest. A captured tool rest with a laser thickness gauge makes the job easy.

5. Finish the vase.

5a. Sand and decorate the outside of the vase. Seal with Shellac before finish if Poplar wood.

5b. Remove vase from chuck. Then jam and/or vacuum chuck the vase to finish the bottom. Use 5” wide Strech Wrap from office supply store to help hold the piece on jam/vacuum chuck.

Eraser

Chalk

Hollowing Tools

Small Ellsworth Style Hollowing Tools

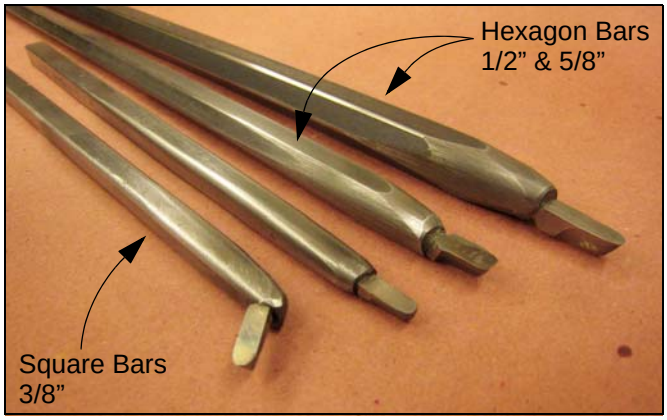
I **strongly recommend** purchasing a pair of small Ellsworth style Hollowing Tools rather than making your own. Over the last 25+ years David has refined the shape of his cutting tips so they really cut. Tools that don't cut or don't cut well due to poorly shaped tips are frustrating and dangerous.

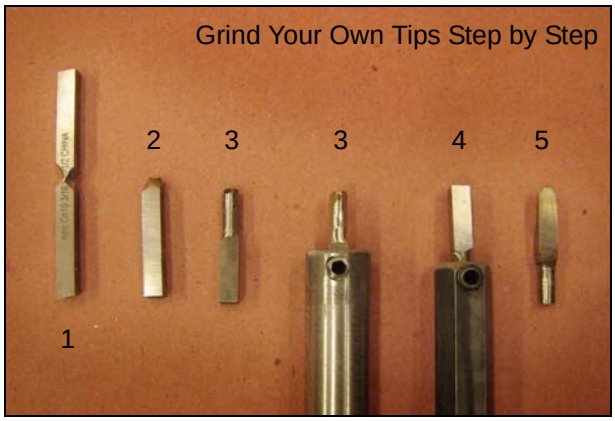
David sells large and small tools. **You want the small tools. 3/8" by 6" shaft with 3/16" square cutter with 10% cobalt.** Good for hollow forms up to 4" deep. Available from Packard Woodworks at www.packardwoodworks.com for $50 + shipping, item # 106209.

A pair of tools includes the "small straight tool" and "small bent tool". You really only need these two tools. David also sells a third "small high shoulder tool" that is best left to the pros. You only need it to do very difficult low and wide hollow forms.

Make Your Own Square or Hexagon Hollowing Tools

Square or Hexagon Hollowing Tools for use with Carl Ford's Adjustable Captured Tool Rest.





Making Your Own Boring Bars in a Nutshell:

1. After cutting the square or hexagonal bars to length round over the square edges with a belt sander, otherwise they act like scrapers!
2. Bore 3/16" holes in the ends for tool bits.
3. Cut a 2.5" long tool bit in half by scoring it with a grinder. Then hold it in a vise and hit it with a hammer. It will snap in half. See "Grind Your Own Tips Step by Step" photo above.
4. Drill a hole in the end of a 1/2" wooden dowel and use it to hold the tool bits while you grind one end round to fit hole in bars. *Note: Above photo shows a steel bar. A wooden dowel is an easier solution.*
5. Grind Ellsworth style cutting tip on the other end. Compare yours to the one you purchased.
6. Use thick super glue to hold the bits in the holes. *Note: The tool bits can be removed at a latter date by heating them with a torch.*

Materials for 3/8" Square Bars (For use with Carl Ford's Adjustable Captured Rest)

Note: Ellsworth style ROUND boring bars are normally made out of "O1" grade steel. "O1" grade SQUARE steel stock cost 3 times more than SQUARE "4140" grade steel. 4140 is a better grade of steel than O1. Thus 4140 is a better and cheaper alternative.

2 of 3/8" square x 9" long steel bars (straight and 45 degree boring bars)	1 of www.mcmaster.com #6552K153, 4140 Alloy Steel Square Bar 3/8" Square, 3' Length ($16 on 6/8/2011)

Chalk

Eraser

2 of 3/16” square tool bits	1 of www.mcmaster.com #3363A8 ($8) M-42 Cobalt HSS Square Tool Bit Blank 3/16" Square X 2-1/2" Overall Length ($6 on 6/8/2011) or Better Yet get a perfectly ground bit by an expert (David Ellsworth) from www.packardwoodworks.com #106215 ($8 on 6/8/2011)

Materials for 1/2” Hexagon Bars

For use with Carl Ford’s Adjustable Captured Tool Rest and Don Derry’s Torque Arresting Tool Rest

2 of 1/2” hexagon x 12” long steel bars	1 of www.mcmaster.com #6607K43, 4140 Alloy Steel Hardened Hexagonal Bar 1/2" Hex Size, 6' Length ($33 on 6/8/2011) Beware of shipping charge, ONLY 6’ length is available!
2 of 3/16” square tool bits	See Materials for 3/8” Square Bars

Materials for 5/8” Hexagon Bars (For use with Carl Ford’s Adjustable Captured Rest)

2 of 5/8 hexagon x 18” long steel bars	1 of www.mcmaster.com #6607K453, 4140 Alloy Steel Hardened Hexagonal Bar 5/8" Hex Size, 3' Length ($26 on 6/8/2011)
2 of 3/16” square tool bits	See Materials for 3/8” Square Bars

Note: I like to use 3/16” rather than 1/4” cutters in both my 1/2” and 5/8” bars. 3/16” cutters cut faster and are easier to use and control.

Tools

Morris Taper Shank Drills

I like to drill a depth hole in center of hollow form before hollowing. The hole makes it a lot easier to hollow. No nib to deal with.

I like to use Morris Taper Shank drills that mount directly into the tail stock of lathe without a Jacobs chuck. The drills I like have a raised edge on each flute that minimizes binding in deep holes. Always use short drill to start hole. Switch to smaller diameter long drill if needed. Taper shank drills at reasonable prices are available from MSC Direct at www.mscdirect.com.

Short Drill. 21/32” (just over 5/8”) x 5-1/8” flute (9-3/4” overall length)	www.mscdirect.com, 2MT is item #01520428, 3MT is item #01530427
Long Drill. 5/8” x 10” flute (15” overall)	www.mscdirect.com, 2MT only item #01663400
2MT to 3MT Adapter (sleeve)	www.mscdirect.com, item #00070235

Bench Grinder Wheel

Bench Grinder Wheel (My favorit wheel, for sharpening tool bits and turning gouges)	www.mscdirect.com #75941443 ($34) Norton, Gemini, Fine 100/120, 8” x 1” x 1”, Gray, Aluminum Oxide ($35)

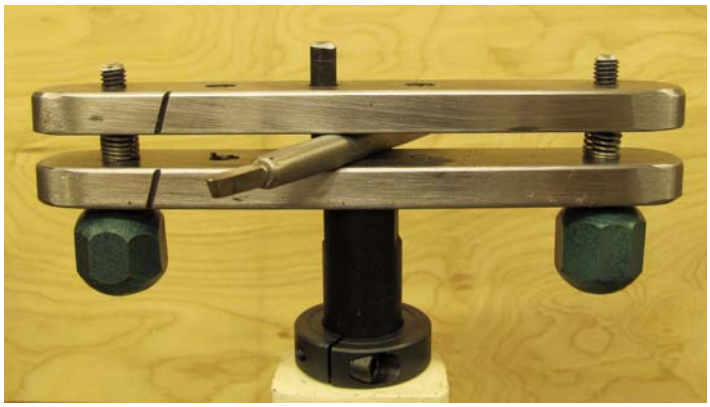
Eraser

Chalk

Carl Ford's Adjustable Captured Tool Rest (Make your Own Directions)

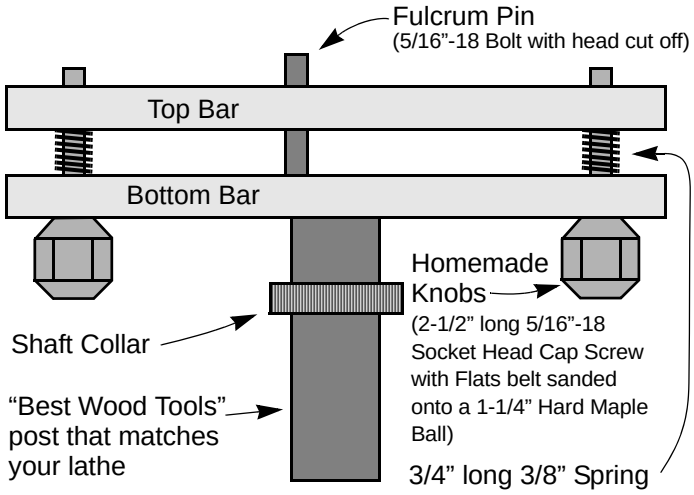
This captured tool rest can be EASILY adjusted to use any size square or hexagon bar from 3/8" to 3/4".

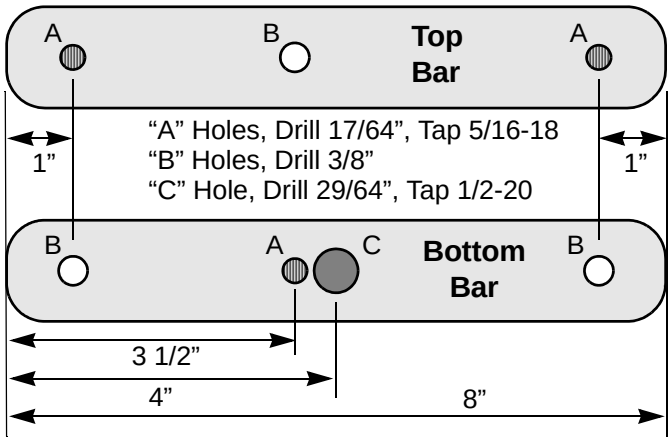
The Fulcrum Pin makes hollowing require less effort and may save the rim of your hollow form if small catch.



Method

1. Cut 2 steel bars to length. The bottom one must be at least 1/2" thick so it will be sturdy when threaded onto a tool post.
2. Drill 29/64" hole in of center Bottom Bar ONLY for tool post.
3. Clamp the 2 steel bars together and drill a 17/64" hole all the way thru both bars 1" in from end of bars. ***Note: Drilling thru 1" of steel is easier with a good short machinist drill bit. Drilling and tapping is easier if you use cutting oil. I like "Tap Magic" in spray can. See "Tools" below.***
4. Drill a 17/64" hole for Fulcrum Pin thru both bars 3-1/2" in from one end. See diagram. *Note: The Fulcrum Pin needs to be in center for hollow forms with small openings because the banjo on most lathes can not be moved beyond center.*
5. Enlarge the OUTER holes ONLY in the Bottom Bar ONLY with a 3/8" drill bit. The 5/16" bolts should fit loosely in these holes. See diagram!
6. Enlarge the 3-1/2" in hole in Top Bar ONLY with a 3/8" drill bit. See diagram!
7. Tap all 3 of the 17/64" holes with a 5/16"-18 hand tap. Use a homemade tapping block to get the tap started straight.See "Homemade Tapping Block" on page 7
8. Tap the tool post hole with a 1/2"-20 hand tap. *Note: 20 TPI is a FINE thread tap! This will match the thread on top of "Best Wood Tools" post.*
9. Temporarily bolt the 2 bars together with 3/4" long 5/16"-18 bolt. Grind and belt sand the ends round for safety. Separate the bars and round over all edges with belt sander.
10. See "Homemade Knobs" on page 7 or purchase Knobs from www.mcmaster.com #6079K19
11. Assemble the rest. The "Best Wood Tools" tool post needs a 1/2" washer under the bottom bar to get a tight fit. Carefully! Grind and file off the top of the post to be flush with top of bottom bar.





Materials (From Local Hardware Store or Steel Supplier)

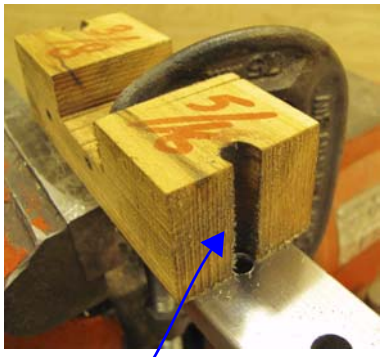
Steel Bars	2 of 1/2" x 1-1/4" x 8" Cold Rolled Steel
Fulcrum Pin	1 of 5/16"-18 x 2" Bolt (cut head off)
Knob Bolts	3 of 5/16"-18 x 2-1/2" Socket Head Cap Screw
Knob Ball	2 of 1-1/4" Hard Maple Ball (Crafts Store)
Springs	2 of 3/8" x 3/4" Compression Spring
Tool Post	1 of "Best Wood Tools" that matches your lathe
Shaft Collar	1 that matches your lathe (Mcmaster 6436K18)

Tools (All part # are for www.mcmaster.com on 6/8/11)

2521A572	5/16"-18 Hand Tap
2521A665	1/2"-20 Hand Tap (Fine Thread!)
2896A26	17/64" Short Machinist Drill, Split Point 135
2896A39	29/64" Short Machinist Drill, Split Point 135
2896A34	3/8" Short Machinist Drill, Split Point 135
1413K39	"Tap Magic" Cutting & Tapping Fluid (oil)

Chalk

Homemade Tapping Block



This homemade tapping block will allow you to tap nice straight holes.

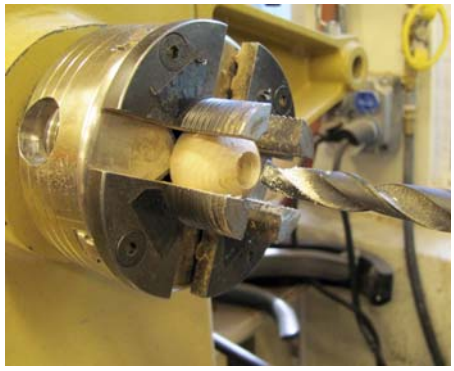
HOW TO MAKE A TAPPING BLOCK

1. Start with a scrap of hardwood, maple, etc. Around 1" x 1-1/2" x 4"
2. Use a drill press to drill a perpendicular hole all the way thru block. Same size hole as tap. For example drill a 5/16" hole for a 5/16"-18 tap.
3. Cut off the block so only 3/4s of the hole remains. This creates a slot for the metal shavings to exit and a place to squirt in tapping oil. See photo.

PROCEDURE FOR USING TAPPING BLOCK

1. Loosely place the block over the hole to be tapped.
2. Insert the tap thru hole in block and use it to line the block up over the hole. See photo.
3. Secure the block with a C clamp.
4. Tap the hole with the block in place.

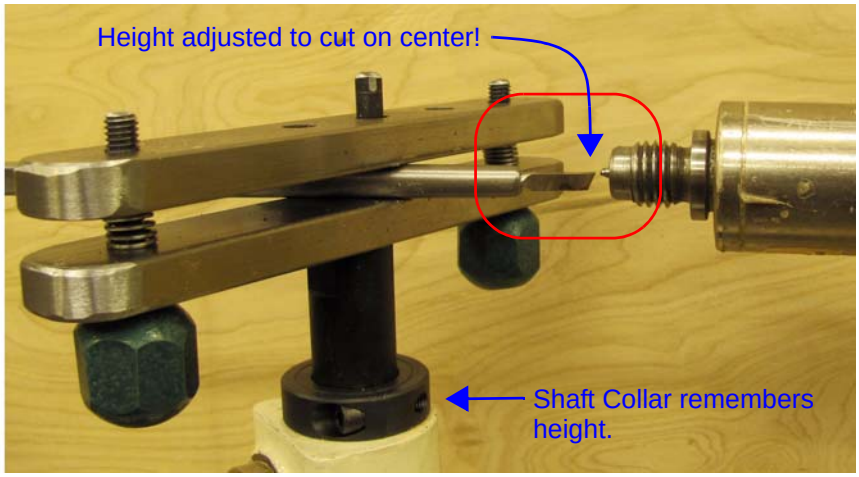
Homemade Knobs



It is hard to find knobs with a long shaft and a nice small head. Making your own is easy.

1. Start with a 1-1/4" Hard Maple Ball purchased from local craft store. Or turn your own.
2. Drill a hole the same size and DEPTH as the head on the cap screw in the ball. DO NOT drill all the way thru. You can do this at the drill press or in a 4 jaw chuck on lathe. See photo.
3. Drill a 9/32" hole all way thru ball. 9/32" is 1/32" smaller than 5/16".
4. With a hammer drive a 2-1/2" long 5/16"-18 Socket Head Cap Screw (bolt) thru the ball. Put a little super glue under the head before driving it home.
5. Use a belt sander to create 8 flats on the ball. See photo.

Adjusting Height of Tool Rest



If you want to avoid that ugly nib in the bottom of your hollow forms you need to adjust your tool rest so your hollowing tools cut right on center.

This is easily accomplished by lining up the TOP of the hollowing tool with live center. Then install a shaft collar on tool post to semi permanently set the height. See photo.

Eraser

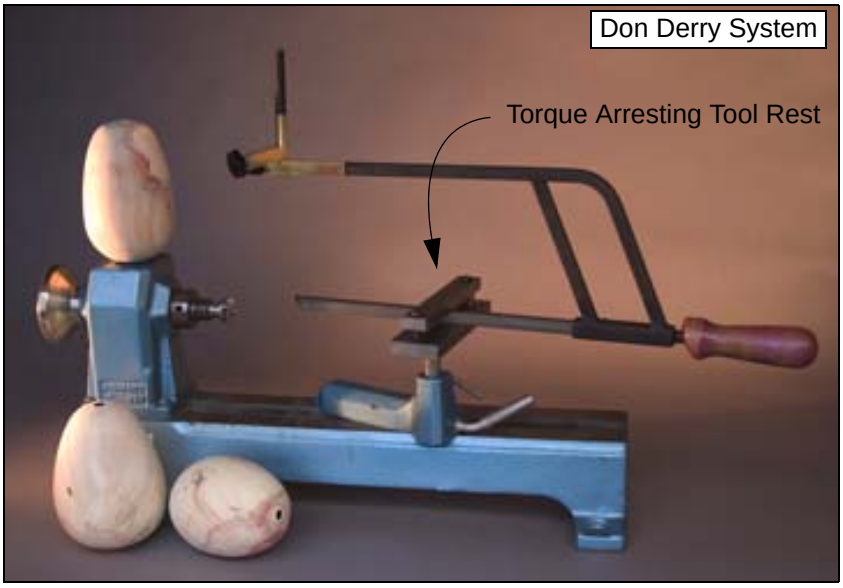
Chalk

Captured Tool Rests you can Purchase

I like my own homemade Captured Tool Rest better than the commercially available ones because mine has a Fulcrum pin. If you can't make your own or don't want to then consider the Don Derry system.

Don Derry Torque Arresting Tool Rest

I like the Don Derry "Lightning Hollower" system available from Don at www.derrytools.com because it features a torque arresting tool rest. The system includes a laser and straight boring bar in addition to the **Torque Arresting Tool Rest**.



I like my own laser system better because it can be used on any tool, not just tools with 1/2" square shafts. I also like my own Adjustable Captured Tool Rest better because it is easily adjustable and features a Fulcrum pin that makes hollowing easy. See "Carl Ford's Adjustable Captured Tool Rest (Make your Own Directions)" on page 6

You may be able to purchase just the **Torque Arresting Tool Rest** from Don. Phone or email Don. Then add your own Fulcrum pin.

I personally do not like the Jamieson, Kelton, etc. style deep hollowing systems that use a secondary captured back rest. I never can find a comfortable place to put my hands. I can't unlock my knees and use the movement of my whole body to create nice smooth curves like I do when using a bowl gouge.

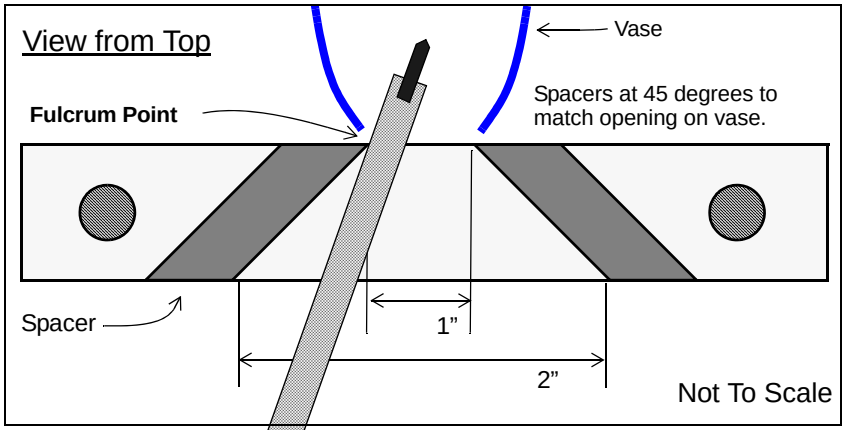
I like Don Derry's system because if I replace the short handle with a nice long handle, it feels like I am using a bowl gouge. It's like using the Ellsworth hollowing bars, except there are no torque problems!

The only disadvantage to the Derry system is you can ONLY use 1/2" square or hexagon boring bars. Only available from Don Derry or make your own. See "Make Your Own Square or Hexagon Hollowing Tools" on page 4

Setup of Torque Arresting Tool Rest

I like to arrange the spacers between the top and bottom bars in my torque arresting tool rest so they are at a 45 degree angle with a 1" wide opening at the front and 2" at the back.

The narrow front opening helps me avoid whacking the openings on my hollow forms. I position the tool rest so I can use one of the spacers as a fulcrum point. This really helps in the bottom of deep hollow forms!



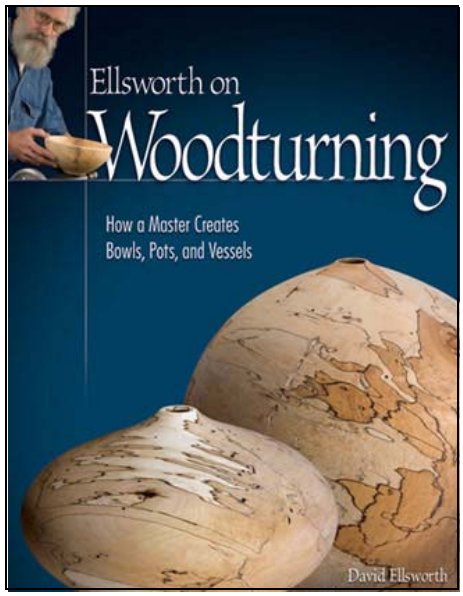
Chalk

Penn State's Captive Toolrest

If you have a mini lathe then Penn State's (www.pennstateind.com) Captive Toolrest is a good option. Just add your own Fulcrum Pin and knobs and you have a tool rest that is almost identical to "Carl Ford's Adjustable Captured Tool Rest (Make your Own Directions)" on page 6.

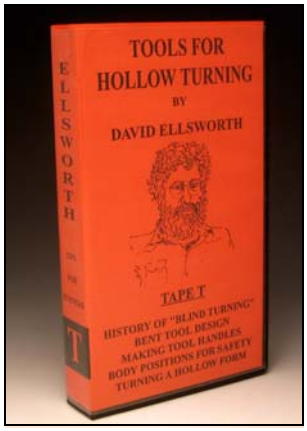
Penn State's rest only comes with 5/8" tool post. So it is only good for Mini Lathes. This tool post is to wimpy for use on larger lathes.

Books, Videos, Tapes and DVDs



Book: David Ellsworth just released a new book. "Ellsworth on Woodturning, How a Master Creates Bowls, Pots, and Vessels". The whole book is very good! It has two chapters on hollow forms with good photos of large and small tools and techniques. Available from David at www.ellsworth-studios.com, 247 pages, $30

Tapes and DVDs: The following video tapes show how to use Ellsworth style hollow tools. The best way to learn is to watch it, then try it. Repeat until you master it.



- David Ellsworth "Tape T", available from David at www.ellsworthstudios.com, 60 min, $30

  Very good because it shows David hollowing thru a cut away hollow form. Also covers sharpening. This video shows David's large tools. The same advice and procedures apply to his small tools.
- John Jordan "Hollow Turning", No longer available? Borrow from your local Wood turning Club.

  John shows his "steps" approach to finding his way around inside of a hollow form.
- AAW "Fundamentals of Shapening" video available at www.woodturner.org

Eraser

Chalk

Demo Outline

1. Introduction
    - 1.1. Show examples of vases and rattles
        - 1.1.1. Great way to experiment with forms
        - 1.1.2. Great way to experiment with surface decorations
    - 1.2. Show small verses large Ellsworth style tools
        - 1.2.1. Small tools are low stress
    - 1.3. Talk about what makes a form easy or hard to hollow
    - 1.4. Talk about wood selection
2. Turn Small Vase
    - 2.1. Mount between centers. Cut tenon for chuck. Mount in chuck
    - 2.2. Shape the outside in forward. Talk about good shape
    - 2.3. Drill depth hole. Talk about why we drill. To avoid nib problem
    - 2.4. Show procedure for hollowing on white board
    - 2.5. Hollow with straight tool in reverse
        - 2.5.1. Mount laser. Better for demo. Talk about feeler wires if no laser
3. Switch to bent tool
4. Switch to square boring bars with torque arresting tool rest

Eraser

Chalk

Class Outline (2 Days)

Day 1

1. Morning:
    1.1. Introduction
        1.1.1. Safety
        1.1.2. Lathes
    1.2. Demo: 3/8” Square Bars with Carl Ford’s Adjustable Tool Rest. See “Demo Outline” on page 10.
    1.3. Students start easy “Wide Mouth” vase.
2. Lunch
3. Afternoon:
    3.1. Students finish easy “Wide Mouth” vase.
    3.2. Students turn easy “Tulip Vase”.

Day 2

1. Morning:
    1.1. Demo: “Vase with Rim”.
    1.2. Students turn “Vase with Rim”.
2. Lunch
3. Afternoon:
    3.1. Demo: “Gouda Cheese” shaped small hollow form.
    3.2. Students turn “Gouda Cheese” shaped hollow form.
    3.3. Clean up

Chalk

Eraser