Learn to Turn, Turn to Learn

Hollowing a Simple Form

by Walt Wager

Hollow forms are turnings where the opening is smaller than the diameter of the piece, so the wood inside the vessel is removed through a restricted hole. First, let me recognize the excellent article, "Turning Hollow Forms, We'll Start with Miniatures" written by Molly Winton in the *Women In Turning Newsletter,* available by using Explore! in the AAW website and by clicking the link below (next page). In this article I will amplify what Molly wrote with a bit more detail and information, illustrated by turning a small round pot (photo **1**) that you could use to make a holiday ornament.

1 Small round pot. Making this basic project will show you the fundamentals of hollowing.

Tools

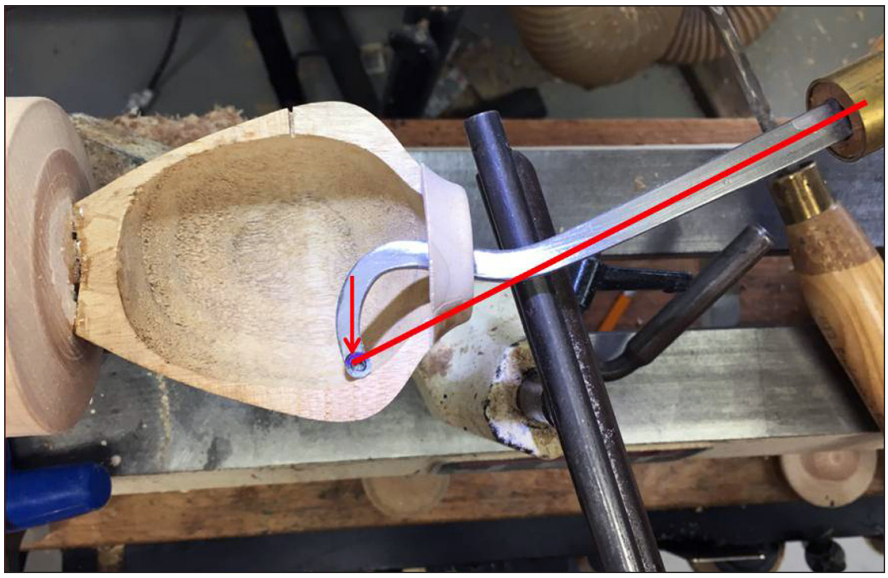
Let's start with tools. The majority of hollowing tools are scrapers. They may be High Speed Steel (HSS), like the ones shown in photo **2**, or carbide inserts, like those shown in photo **3**.

The shape of these scrapers is either straight or bent at different angles, as you can see in **2** and **3**, to reach into spaces inside the hollow form.

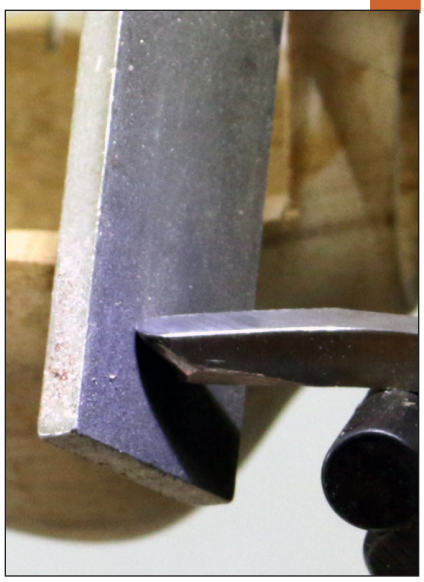
The width of the cutting tip is generally 1/4" (6mm) or smaller.

The shank of the hollowing tool is straight, with the cutting edge out at an angle, or on a curved section of the shank. The curved tool has the

2, 3 Tools. All hollowing tools are scrapers, with straight and bent shanks to reach everywhere inside a vessel. Steel tools, top, and carbide-tipped tools, right.



4 Downward force. The cutting tip is in line with the shank of the tool. To minimize torque, keep the straight part of the shank on the toolrest.



5 Hone steel. Touch up often using a small diamond hone.

cutting tip in line with the straight part of the shank, lessening the torque (twisting force) on the tool. There is still a downward force where the tip engages the wood, illustrated in photo **4**, as there would be on any tool.

Sharpening

The tools must be sharp! I use a diamond hone frequently when turning small hollow forms, as shown in **5.** Carbide tools stay sharp longer than HSS tools but even they get dull. They also can be sharpened with a diamond hone and a drop of honing oil or water. Hone across the flat surface of the insert, photo **6**.

6 Hone carbide. Hone across the flat surface with a drop of water or light oil.

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Women in Turning Newsletter
June 2017

Turning Hollow Forms: We'll Start With Miniatures
by Molly Winton

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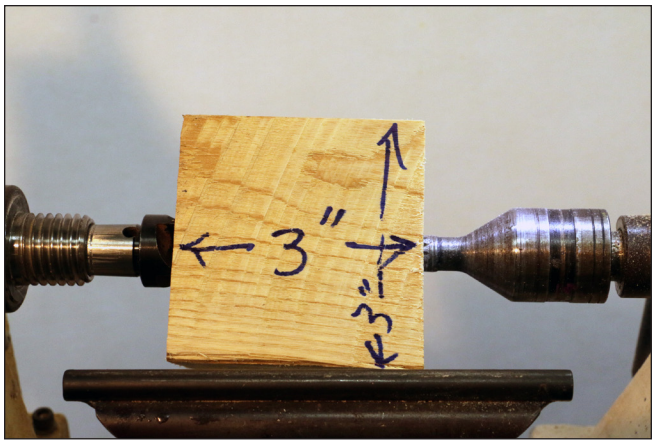
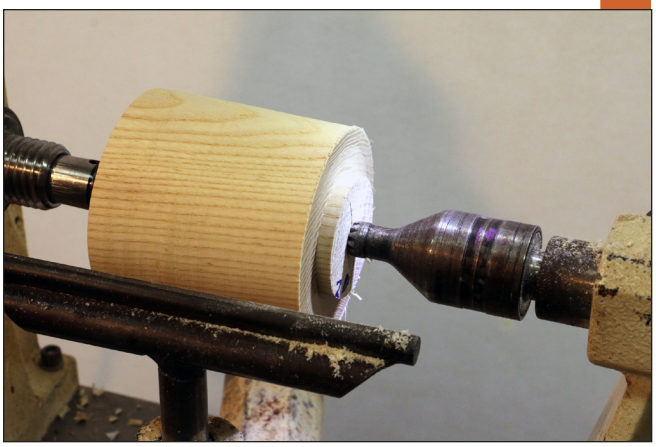
TURNING AND DECORATING AN
Heirloom Ornament
Pat and Karen Miller



7 The blank. Start with a 3" (7.5cm) cube of wood, mounted with long grain parallel to lathe axis.



8 Tenon. Rough-turn to a cylinder with a chucking tenon on one end.

Wood for hollow forms

Freshly cut and wet, air dried, or kiln dried? You can use any of the three for small hollow forms, realizing the fact that green and air-dried wood will shrink and move while drying. Green or air-dried wood is usually the easiest to hollow, but for these exercises it won't matter much what type of wood you use.

Cut an approximately 3" x 3" x 3" (7.5cm) blank of wood. Cut a couple of pieces, one for this practice exercise and one for a more closed hollow-form later. Mount it on the lathe between centers so that the grain runs parallel with the lathe bed, **7**. Rough the blank to round, then cut a tenon on one end, **8.**

Shape the outside

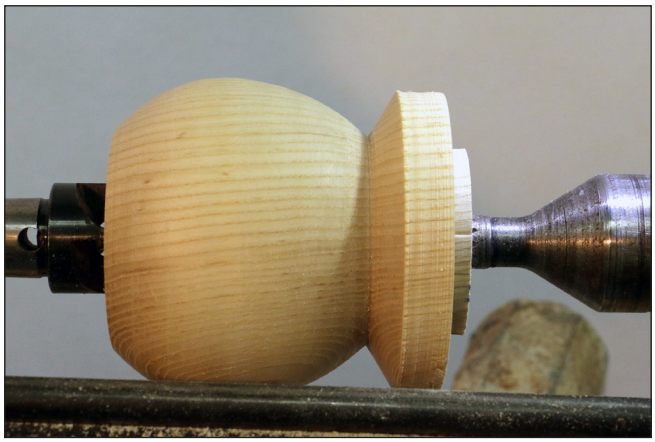
Hollow forms can take many shapes, and some shapes are more difficult to hollow than others. I suggest starting with a simple shape, like the one shown in photo **9**, to get the feel of the forces on the tools. Shapes that are almost spherical are easier than shapes that have wide shoulders, as shown in photos **10** and **11**.

For the first exercise, the hollow form will be a spherical shape with a rather large 2" (5cm) opening on top. Using a bowl or spindle gouge, shape the outside so that the top (opposite the tenon) comes slightly back toward the center, as shown in photo **12.**

9 Simple shape.

10 More difficult shape.

11 Most difficult shape.



12 Outside shape. Shape the outside of the pot, leaving wood for a foot on the tenon side.

13 Remount. Grip the tenon in a scroll chuck, face off the end, and make a drill-centering divot.

Bore the center

After shaping the outside, **12**, remount the blank in a scroll chuck. Back off the tailstock and face off the tailstock end of the form. Cut a small drill-centering divot, photo **13.**

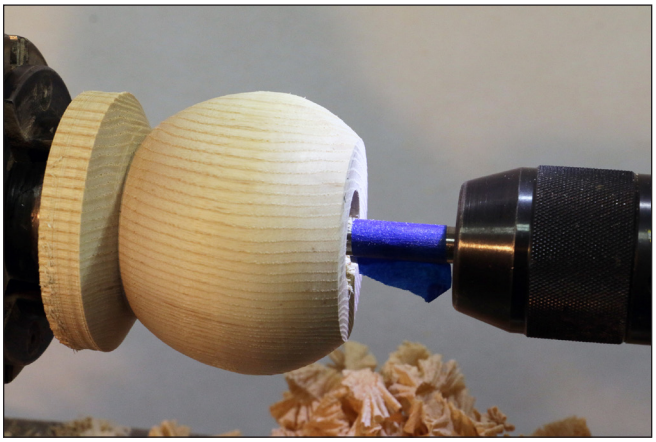
To hollow the form you are going to be cutting into endgrain. It is far easier to cut into side grain, so bore a hole in the center of the form to the depth that you are going to hollow. I generally use a 3/4" (2cm) Forstner bit but a 1/2" (12mm) twist drill would be sufficient.

Mark the bit with tape to the depth you want to bore, **14**. Remember that the tip of the drill bit has a point on it – consider the point to be the bottom of the inside of the hollow form.

For this exercise drill a hole 2-1/4 " (5.4cm) deep, **15**. This is the bottom of the inside of the vessel. You need a drill chuck with a Morse taper that fits into the tailstock quill. As an alternative, you could bore with a spindle gouge, pushing it straight in at the center.

For the drilling operation set the lathe speed to between 300 and 400 rpm. Bore in about 3/4" (2cm), back the drill out to clear the waste, then drill in another 3/4", back the drill out to clear, and then drill the final 3/4". From my experience the larger the center hole, the easier it will be to hollow. OK, you are now ready to try out your hollowing tools.

14 Depth gauge. Mark the depth with tape so the point of the bit indicates the pot's bottom inside.



15 Bore. Mount the drill bit in a tailstock chuck and bore in stages to the exact bottom depth.

16 Scraper setup. Set the toolrest so the straight hollowing tool cuts on center with its handle horizontal and parallel to the lathe axis.

17 Cutting. Take shallow cuts by sliding the tool along the rest from the center opoening toward the outside.

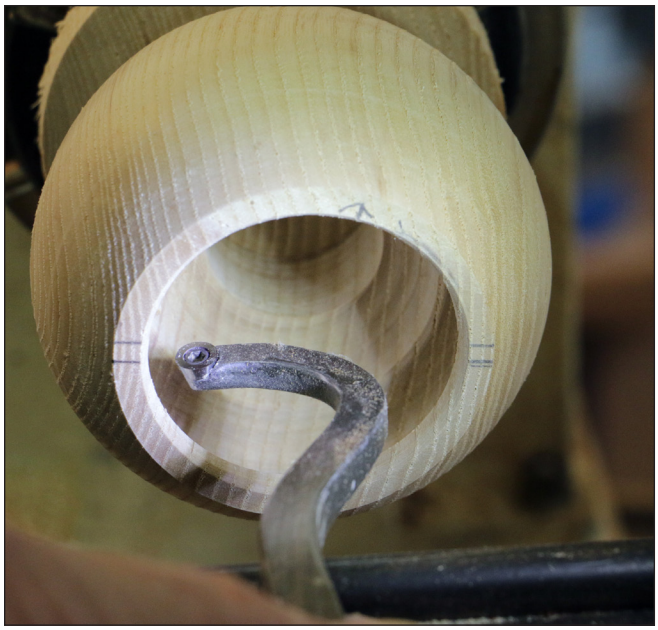
Cutting with scrapers

When the tool is inside a hollow form mounted in spindle orientation, you are mostly cutting side grain. Using the straight hollowing tool, start in the center opening you just bored and move the tool from the center toward the left outside edge. Take shallow cuts, no more than 1/16” to 1/8” (1.5 to 3mm) deep.

Unlike gouges, a scraper is used with the handle either parallel with the lathe bed or slightly elevated, as shown in photos **16** and **17**. Set the toolrest so that you are cutting at the center of rotation. The tool should be parallel to the bed of the lathe. Keep the toolrest as close to the cutting tip as possible, with one hand against the rest and the other on the end of the handle.

I like to work from the top down into the piece and establish the desired thickness of the walls at this stage, because I can see the rim and where the tool is cutting, **18**. It is desirable to get the thickness of the walls as even as possible so that as the wood dries, it shrinks evenly and

18 Walls. Establish uniform wall thickness near the opening before hollowing to full depth, using the bent tools.



19 Bent tools. To minimize unpredictable torque, keep the straight part of the shank on the toolrest.

doesn't crack. Also, the wood, especially green wood, will be drying as you turn, and the top walls might move as you get further into the piece, so you won't be able to come back and cut them later.

I use the straight hollowing tool as much as possible because I can get the toolrest close to the work and unlike the bent tools, it has no tendency to twist. However, if the shape of the piece requires the bent tool to follow the outside shape, then it must be used.

Using a bent tool

With any bent tool, it is important to keep the straight part of the shank on the toolrest, as shown in **18** and **19**.

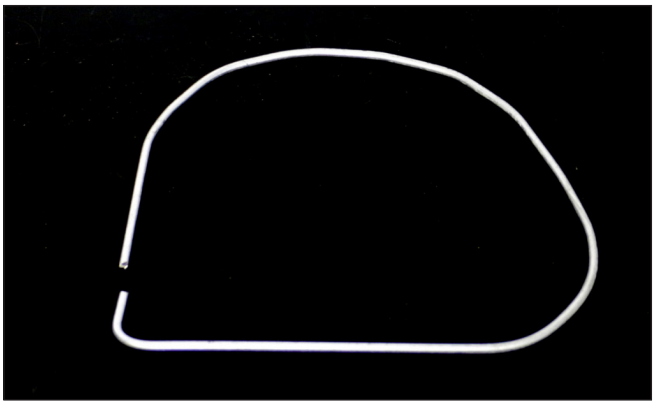
This may require backing the toolrest out from the workpiece. This means that you have less leverage holding the tool, so it will be more likely to grab as it contacts the wood. You simply must be aware of this and take light cuts. The further from center the tip of the tool is from the straight part of the shank, the more torque, so use as short a bent tip as possible.

20 Room to work. Because it's mostly side grain, the bent tool makes short work of the waste wood.

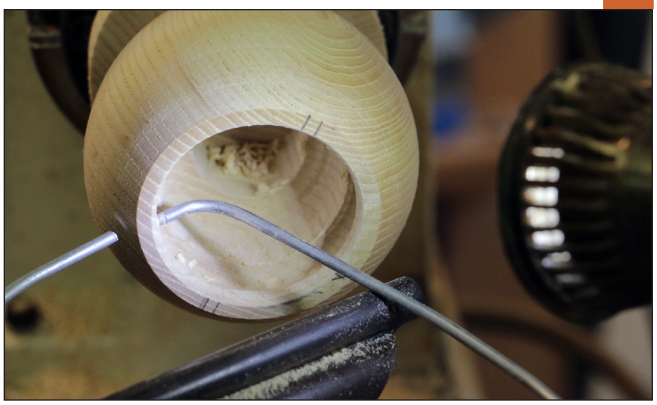
With curved hollowing tools, with the tip aligned with the handle, there is no twisting torque, but there is still the downward force from the spinning wood contacting the cutting tip. So, the closer the toolrest to the cutting tip the less the downward force, and the longer the tool handle, the easier it is to counter this force.

Cutting out the middle

After establishing the wall thickness and removing some of the wood from the top, you need to make room to work in the middle (photo **20**). In an enclosed form, because of centrifugal force, the chips will collect at the widest diameter. You need to stop periodically to remove the chips so they don't bind on the tool and cause a catch. Use compressed air or some sort of scoop (maybe an old iced tea spoon) to remove the chips.



21 Caliper. A loop of coat-hanger wire, or #14 iron wire, can be bent into a wall-thickness gauge.



22 Wall thickness. Move the caliper along the inside wall and eyeball the gap on the outside.

Wall thickness

Your goal in hollowing should be to make the walls of the vessel an even thickness.

If the hollow form has a wide enough opening, with the lathe stopped you can pinch the walls between your fingers. This won't be possible on forms with small openings, and you will have to use a caliper of some type. For small hollow forms you can make your own caliper out of coat-hanger wire, shaped as in photo **21**.

Set the gap in the wire to about 1/2" (12mm) and you can judge the difference in the gap as you move the caliper along the inside wall, **22**.

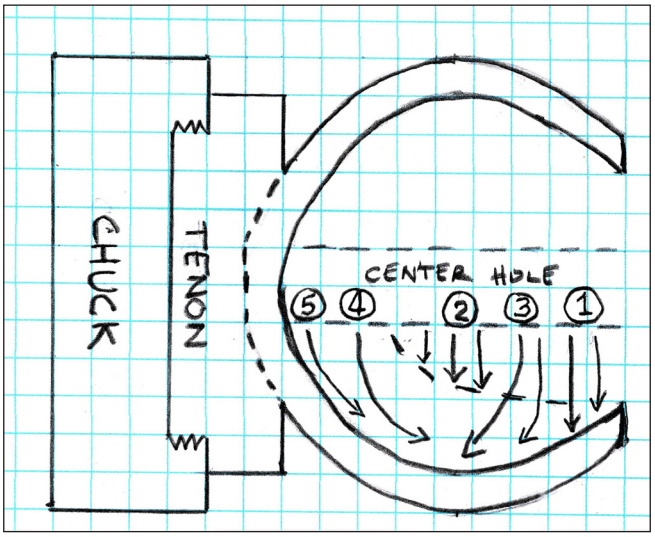
The hollowing sequence and directions of cuts are illustrated in **23**. The sequence I use is:

1. Establish the wall thickness at the top opening.
2. Use the straight hollowing tool to enlarge the drilled hole in the middle, working from the center to the outer wall.
3. Continue the cut from the top toward the center to finalize wall shape and thickness.
4. Remove wood from the bottom and middle of the form, working from the center toward the outer edge and the bottom toward the top.
5. Gently clean up the inside bottom wall of the form.

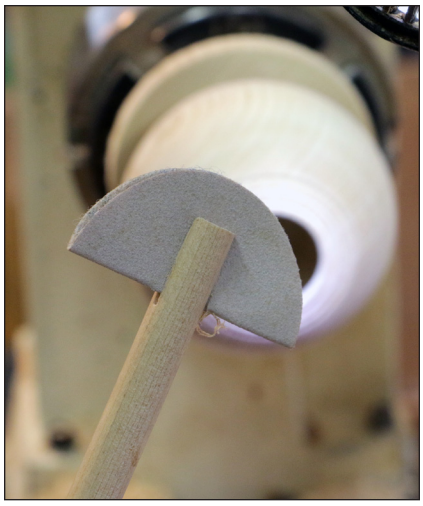
Tool capabilities

Don't exceed the capability of your tools. Most mini hollowing tools are only good for cutting about half their shank length into the hollow form. For example, a tool with a 6" (15cm) shank will be able to cut to a 3" (7.5cm) depth.

As you get to the bottom of a hollow form you have two things working against you. First, the cutting tip is further off the toolrest, giving you less leverage advantage. Second, and more important, you are cutting more directly into endgrain, and there is more chance of a catch. Here's where drilling the hole to the desired depth becomes so helpful. When you reach the bottom of the hole, don't bore deeper. Use the straight tool to come across the bottom and up along the side toward the middle.

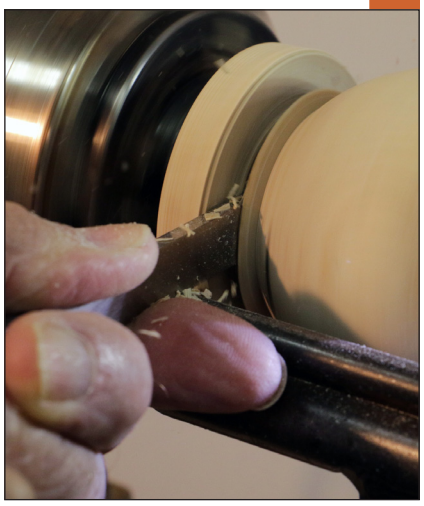


23 Hollowing Sequence.



24 Sanding aid. To sand the inside, fold a disk of sandpaper into the slot in a dowel.

25 Mark bottom. Measure and mark the inside bottom on the outside of the form.



26 Part off. Be sure to leave enough wood for a small foot.

Sanding

Sanding the outside is no problem. Sanding the inside can be a problem. Don't stick your fingers inside a spinning hollow form. Instead, cut a slot in a 3/8" (9-10mm) wood dowel and fold a disk of sandpaper into this slot, **24**. Use it to sand the inside of the hollow form.

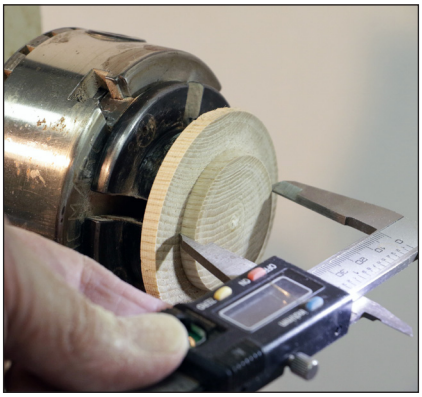
Parting Off

First, mark the bottom of the inside depth onto the outside of the hollow form, **25.** Now you can determine where to part the piece off to achieve the bottom thickness you want, **26**.

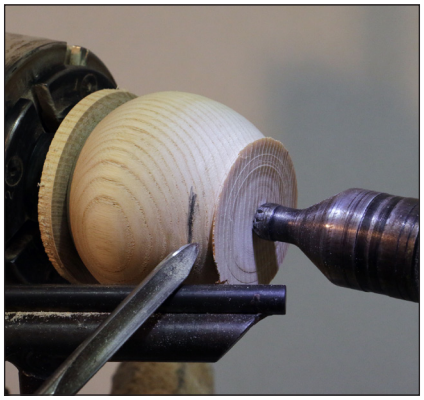
When you have finished parting off the hollow form, make a jam chuck out of the waste that is still in the chuck. Measure the inside diameter of the hollow form and cut a tenon on the waste block as shown in photos **27** and **28**.

Reinstall the tailstock onto the lathe and bring the live center up to the bottom of the form to support the form on the jam chuck, **29**.

27 Measure opening. Set a caliper to the inside diameter.



28 Jam chuck. Cut a tenon on the waste block, sized to fit the opening.



29 Remount. Plug the hollow form onto the jam chuck and bring up the tailstock live center.

30 Cut the foot. Undercut the bottom so the form has a foot that sits flat on the table.

31 Power sand. The rotating pad cleans up the center of the foot.

Cutting a foot

I use a spindle gouge to undercut the bottom slightly, to make a foot that will sit square on the table. I cut as close to the live center as I can without breaking off the wood, **30**. Finally, with the lathe stopped, I cut off the nub and sand the bottom with a 2" (5cm) rotary pad on an electric drill, **31**.

OK, you finished hollow form #1. Now, using what you learned, turn a second hollow form through a 1" (2.5cm) hole, as in photo **32**.

Happy hollowing!

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32 Challenge. After making a simple hollow form, try making another with a smaller opening. ❐