Woodturning a
Three Sided
Lidded Box

Presented by

Paul Newton
INTRODUCTION

Your Presenter:
Paul Newton has been woodturning for approximately six years. He is a member of the American Association of Woodturners, and is currently President of the Thames Valley Woodturner's Guild in London, Ontario. He has demonstrated turning techniques at Guild meetings, Lee Valley Tool workshops and wood shows. His turnings include bowls, vessels, lidded boxes, pens, wine-stoppers, and art pieces.

History
Woodturning is a craft that has been passed down through generations, with the earliest known examples being over 4000 years old. Before the metal age, and the industrial revolution, vessels for eating and drinking were mostly made of wood or ceramics. The earliest of these were carved bowls and cups. Later artisans learned to "turn" wood on early pole lathes, creating more uniform shapes. With advent of the industrial revolution, turned wood items declined in use in favour of those in metal and ceramic.

Woodturning enjoyed a resurgence beginning in the mid twentieth century, and is presently enjoying immense popularity worldwide as both a professional art form and a popular hobby. The American Association of Woodturners was formed in 1986, by a small group of American (and Canadian) woodturning artists. Today the AAW boasts over 15,000 members, and a network of over 350 local chapters worldwide.
Intent of this Demonstration
In this demonstration we will learn the process for turning a three-sided lidded box. Subjects will include:

- Lathe safety
- Required tools
- Box design
- Preparing and mounting the wood
- Truing the wood
- Three-sided off-centre turning (layout of three off-centres)
- Forming tenons
- Hollowing
- Finish the lid and base
- Finishing

Tools and Materials Required:
- Wood – cut and dried Maple 3½" x 3½" x 6". Use any tight-grained wood.
- Sharp Turning tools
  - Spindle Roughing Gouge
  - 3/8" or ½" Spindle Gouge
  - Skew
  - Small Round-Nose Scraper or Easy Wood Tools Finisher.
  - Parting Tool
- Spur Drive / Safety Drive for mounting the wood.
- Live Centre for the tailstock.
- Measuring calipers or Vernier calipers.
- 4-Jaw Scroll Chuck with appropriately sized jaw sets (#2 or larger).
- Sandpaper (120 / 240 / 320 / 400 grits).
- Finish

SAFETY GUIDELINES

Wear Proper Attire!
- Always wear eye protection. A face shield is the best method of eye protection.
- Loose clothing and hair are dangerous because it can get caught in the spinning lathe. Tie back long hair, and wear clothing with short sleeves or roll up long sleeves. Remove jewelry and watches and rings as they can get caught up in moving parts.
- Be aware of the dangers of breathing wood dust. Wood dust is dangerous when inhaled in quantity. Prolonged exposure to wood dust can cause respiratory ailments. Wear a dust mask or respirator when sanding wood.
- Most finishes are not safe to breathe and precautions should be taken to avoid inhaling their fumes. A good respirator rated for finish-type chemicals would be a good investment in your health and future mental capacity. Be aware that chemical respirators have a limited functional shelf life so the filters should be changed frequently as recommended by the manufacturer.

Keep your fingers and body parts out of harm’s way.
- The toolrest on the lathe should be as close to the work as possible so that your fingers will not get caught between the toolrest and your work (¼" to ¼" would be safe).
• Get in the habit of blowing the dust and shavings off the toolrest instead of wiping it off with your fingers. Using your fingers to clean off the toolrest might cause your fingers to get caught between the work and the toolrest.

• **Always turn the lathe off before moving the toolrest.** This prevents harm not only to your work but also to your body parts.

• Do not wrap sandpaper or buffing/polishing rags around your fingers or hand. If the cloth gets caught in the spinning parts of the lathe, your fingers will be pulled into the lathe.

• Use paper towels for applying finishes. Paper will tear off if caught in the lathe.

• Check to see if pieces are securely held in the lathe. **Check again!**

• Rotate piece by hand and check to see that it rotates freely and does not contact the tool rest.

• Pay attention to, and use the proper lathe speed.

• When in doubt, start lathe on slow speed and increase after you are sure all is OK.

• Before turning on the lathe, always double check the speed setting. Also be sure to check that the drive belt is on the proper pulley for what you are turning.

• Turn at a speed that is comfortable for you and is appropriate for the work. A good rule of thumb for proper lathe speed, (Craft Supplies Woodturning Catalogue), is that the product of the diameter of the piece times the lathe speed in rpm's should fall somewhere between 6,000 and 9,000. For example, a 10" diameter turning times a lathe speed of 800 rpm's equals 8,000, which would be a safe speed as 8,000 falls between 6,000 and 9,000.

• Larger, or more off-balanced items should be turned at slower speeds.

• Stand clear when starting up lathe.

  *Listen to your inner voice – if it doesn't feel right; don't do it!*

**LET'S GET STARTED**

**Lathe Tools & Usage:**

• Use only those tools meant for the appropriate task.

• For Lidded Boxes, use the Spindle Roughing Gouge, Spindle Gouges, Skew, Parting Tool and Scrapers.

• Make sure your tools are properly ground and sharp.

• Observe the ABCs of Woodturning (Anchor – Bevel – Cut)

• Learn and understand the attack angle and the cutting angle for each tool.

• Take small cuts to start with – don't be too aggressive.

• Cut downhill – always have fibers supported by the bevel.

**Design – Shape is Important to a Successful Turning**

• Design can follow classic forms (study ancient pottery design).

• Shapes found in nature (Catenary Curve).

• For the purposes of this demonstration we will be turning a small three-sided lidded box.
The most important factors in turning a successful lidded box are:
  - Good proportions (1/3 – 2/3)
  - Good transition between the bottom and the lid
  - Good fit of the lid (suction or "pop" fit is preferred)

Step One – Prepare and Mount the Blank
  - Examine the blank first; check for cracks, bark inclusions and other faults. If the wood is "punky", or contains one or more of these faults, discard it.
  - Identify which will be the top, and which will be the bottom of the box on the blank.
  - Mark the centre point at each end of the blank.
  - Orient the blank with the bottom closest to the headstock.
• Mount the blank between centres using a spur drive & live centre.
• Bring up the tailstock for support, and lock into place.
• Start lathe on slow speed and increase after you are sure all is secure. Increase speed to a level appropriate for the work and your skill level.
• Stand clear when starting up lathe.
• Set on slower speed when first starting to shape the blank. Speed can be increased as the wood is shaped to run balanced and true.

Step Two – True up the Blank & Turn the Three Off-Centre Sides
• True up the blank and turn into a cylinder using the Spindle Roughing Gouge.

• Take cuts that work "downhill" towards the ends of the blank; with each successive cut working your way towards the centre. Work in both directions until the blank is a cylinder with all flat spots removed.
• Either use the index head on your lathe, or using protractor and pencil, mark the piece at both ends at every 120 degrees (3 marks). Make sure your marks align at both ends. Draw a pencil line along the length between marks (good for later reference). Connect each mark at the edge to the centre at both ends.
• Use a compass to draw a circle 10mm in from the edge. The intersection of the circle and the three lines will be your three centres.
• Use an awl or punch to mark the three centres at each end. Number the centres 1, 2 and 3 at both ends. Make sure numbers align 1-1, 2-2, 3-3.
• Re-mount the wood between centres using the centres marked number 1.
• Make sure the tool rest is clear of the wood when rotating. Check rotation by hand before turning on the lathe.
• Using the Spindle Roughing Gouge, begin turning along the length working towards the circle drawn on the ends. Stop frequently and check your progress. When you get close to the lines, make smooth final cuts to avoid any tear-out along the transitions, and to achieve straight lines.
• Sand with the lathe turned off using a foam sanding pad. Work through several grits.
• Re-mount the wood between centres using the centres marked number 2. Repeat the previous three steps.
• Repeat the process for the third centre.
• Mark where you will part off the lid and where you will turn a tenon on each end.
• Measure the size of the tenon you will need using the calipers; sized from the scroll chuck (approx. 2 1/8” in diameter).
• Mark the tenon depth (approx. ¼”) on each end of the blank using a pencil.
• Using a Parting Tool, shape a tenon on each end of the blank. Cut using an arc towards the centre point. Cut slowly, a bit at a time until the desired diameter is reached. Stop frequently and check the diameter with the calipers.
• Make sure you have a flat shoulder for the chuck to nestle against, and slightly dovetailed tenon cheeks to fit in the jaws of the chuck.
Step Three – Part off the Top of the Box
- Divide the blank into thirds and make a pencil mark on the third closest to the tailstock. The side of the line closest to the tailstock will become the top of the box.
- Using the Parting tool, part off the top. Cut down towards the centre of the blank, stopping within roughly 1/8" to ¼" of the centre.
- Stop the Lathe and cut through the remainder with a fine saw (coping saw or hack saw works fine).
- Remove the two pieces from the lathe.
- Remove the spur centre.

Step Four – Turn the inside of the Top
- Mount the scroll chuck in the lathe and secure the top of the box in the chuck using the tenon.
- Make sure the tenon shoulder is firmly seated against the jaws of the chuck and tighten securely.
- Set Lathe at lowest speed again and stand clear when turning on. Turn on the lathe and observe the piece to make sure it is running true. Adjust if necessary.
- Using a Skew or a Spindle Gouge, true up the bottom face of the lid.
- Using the Parting tool, cut the "female" side of the tenon in the lid. Leave at least 1/8" at the rim. The tenon should be approximately 1/8" deep x 1/8" wide. Make tenon square to the piece (not tapered).
- Now using a spindle gouge, shape the inside of the lid. Work the spindle gouge using a pull cut, from the centre out to the rim. Final shaping may be done using a round nose scraper.
- Sand and apply finish to the inside surface. (Note: do this now, as you will not get another chance). Sand the tenon lightly using the folded sharp edge of a sandpaper piece, so as not to deform the shape of the tenon. Apply minimal finish to the tenon.
Step Five – Turn the inside of the Bottom

- Remove the lid from the lathe and mount the bottom section of the lid in the 4-jaw scroll chuck.

- Set Lathe at lowest speed again and stand clear when turning on. Turn on the lathe and observe the piece to make sure it is running true. You may need to make a few skimming cuts with the Spindle Roughing gouge to true up the surface again.

- Flatten the end using a spindle gouge using a gentle pull cut. Using a skew, make a small dimple in the centre of the bottom.

- Using a Vernier caliper, measure the inside diameter of the female tenon you cut in the top.

- Using a Parting Tool and a Skew, begin to cut the "male" tenon in the bottom section. Cut a little at a time, and stop frequently to check the diameter with the Vernier. When the size is close to the required diameter, stop the lathe and use the lid to check for correct fit. Stop when the lid fits snuggly on the bottom section (tight but removable).

- Set the tool rest across the end of the piece and set the height for the Spindle gouge tip to be at the centre. Using the Spindle gouge as a drill resting on the tool rest, push the spindle gouge into the bottom to drill out the centre. Keep backing the tool out and clear the chips. Stop just short of the desired depth. (NOTE: this may also be done using a traditional twist drill mounted in a Jacobs chuck in the tailstock.)

- Now using a Spindle gouge, shape the inside of the bottom section. Work the spindle gouge using a pull cut, from the centre out to the rim. Final shaping may be done using a round nose Scraper. Try to make the inside parallel to the outside at the rim. (NOTE: this may also be done using a Forstner bit mounted in a Jacobs chuck in the tailstock. If using a Forstner bit, do not drill pilot hole mentioned in previous paragraph)

- Sand and apply finish to the inside surface. (Note: do this now, as you will not get another chance). DO NOT sand or apply finish to the tenon at this point.
Step Six – Finish Turn the Outside of the Box

- Fit the lid onto the bottom of the box and bring up the tailstock for support. DO NOT OVER-TIGHTEN!

- Finish turning the top of the lid using a spindle gouge. Shape the top of the lid as desired. Part off and remove the lid.

- At the bottom end, use the Parting tool to begin parting off the bottom. Part down approximately ¾ of the way through.

- Sand and apply finish to the outside surfaces of the box.

- Remove the lid, and lightly sand the "male" tenon. Apply finish. Be sure to check the fit with the top continuously. Don't sand too much or the lid will become loose.

Step Seven – Finish the Bottom of the Box (Jam Chuck or Chuck Mount)

- Mount a scrap wood block in the chuck. We will now create a "Jam Chuck" to hold the bottom.

- Using a Vernier caliper, measure the inside diameter of the bottom section of the box.

- Using a Parting Tool, cut a "male" tenon approximately 3/8" to ½" wide on the block. Cut a little at a time, and stop frequently to check the diameter with the Vernier. When the size is close to the required diameter, stop the lathe and use the bottom of the box to check for correct fit. Stop when the bottom fits tightly on the Jam Chuck.

- Alternatively – Use a scroll chuck with Pin Jaws and insert inside the box. Wrap the jaws with tape or use a paper towel to protect the inside of the box.

- Bring up the tailstock for support. (NOTE: you will need to remove it later.)

- Using the Spindle gouge, carefully remove the excess wood at the bottom.

- Remove the tailstock, and carefully remove the "nub" at the bottom.

- Sand and apply finish to the bottom of the box.

- Sign your work! Be proud of what you have created.

Alternative Design – Offset with a Twist!

- When beginning the offset turning phase, line up centre 1 with centre 2, centre 2 with centre 3, and centre 3 with centre 1. This will give a "twisted effect to your box.

A Few Pointers – Things to Remember

- Safety First!!!
- Be sure wood is always securely held in the lathe. Check again!
- Spin the wood by hand first to check securement and toolrest position.
- Start Slow!!!
- Remember the ABCs (Anchor - Bevel - Cut)
- Take small cuts – don’t be too aggressive.
- Cut downhill – cut with wood fibers supported. Bevel rubbing.
- And most important of all ……

Have Fun!
SUGGESTED RESOURCES

Associations
• AAW – American Association of Woodturners www.woodturner.org

Books
• Richard Raffan – Turning Boxes
• Richard Raffan – Turning Wood with Richard Raffan
• Richard Raffan – Complete Illustrated Guide to Turning

Videos
• Richard Raffan
• Ray Key

YouTube Channels
• Robbiethewoodturner
• Carl Jacobson
• As Wood Turns (Alan Stratton)
• Wyomingwoodturner (Sam Angelo)
• Woodturningwithtim (Tim Yoder)
• You Turn (Brendan Stemp)
• Mike Waldt

Local Clubs and Guilds
• Thames Valley Woodturners Guild (London) www.thamesvalleywoodturners.com
• Golden Horseshoe Woodturners Guild (Burlington) www.ghwg.ca
• Grey-Bruce Woodturners Guild (Kincardine) www.gbwg.ca