WOODTURNING FUNDAMENTALS

American Association of Woodturners
May 2019 • Vol 8 Issue 2

Skill-building projects

Crossgrain box
Coasters
Fitting tool
Seated lathe stand

Tools & Techniques

Bandsaw setup
Finishing with oil
Jam chucking
Friction drive

Bottle stoppers

...great gifts that use up scraps!

AAW AMERICAN ASSOCIATION OF WOODTURNERS
WE ARE TEACHING THE WORLD TO TURN

WOODTURNING FUNdamentals

May 2019 Vol. 8 No. 2

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The AAW strives to cultivate an organization built on mentorship, encouragement, tolerance, and mutual respect, thereby engendering a welcoming environment for all. For more, tiny.cc/AAWDiversity.

Let's get together... Raleigh NC in July, regionals everywhere


My First Symposium

JIM KELLER

As I drove home fr
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tiny.cc/myfirstsymp

Explore!

Click the blue box or scan the QR code to follow the link .... but it only works when you are also logged into the AAW website, woodturner.org

A national or regional woodturning symposium offers a terrific learning and social opportunity for turners of every skill level. These weekend events generally include:

— demonstrations and lectures, typically 90 minutes long, in rotational smorgasbord format, so you can choose your menu;

— a trade show featuring vendors and experts exclusively devoted to woodturning equipment, tools, and materials;

— an Instant Gallery where every attendee is invited to display a few recent projects;

— a host hotel and convention center in a city with restaurants and bars, where you can greet old friends and enjoy getting to know a ton of new ones.

Alongside the AAW's enormous annual symposium, turners over the years have organized a growing list of state, regional, and special-interest events, listed below.

Although most do have vendors these are not commercial events, and none could happen without enthusiastic participation by local turning clubs. These folks lend their time, muscle, and even their very lathes, to the success of the gatherings.

Josh Friend, editor of *American Woodturner*, and I will both be attending the 2019 AAW symposium, July 11-14 in Raleigh, NC. We'll be looking for story ideas and authors, and we'd enjoy a chat with any of y'all in attendance.

—John Kelsey

Symposium	Venue	Web	Upcoming dates
American Association of Woodturners	Raleigh, NC	woodturner.org	July 11-14, 2019
Southwest Association of Turners	Waco, TX	swaturners.org	August 23-25, 2019
Rocky Mountain Woodturning	Loveland, CO	rmwoodturningsymposium.com	September 13-15, 2019
Turning Southern Style	Dalton, GA	gawoodturning.org	September 19-22, 2019
Midatlantic Woodturning Symposium	Lancaster, PA	mawts.com	October 4-6, 2019
Tennessee Woodturning	Franklin, TN	tnwoodturners.org	January 24-25, 2020
Florida Woodturning	Leesburg, FL	floridawoodturningsymposium.com	February 7-9, 2020
Totally Turning	Saratoga Springs, NY	totallyturning.com	March 2020
Midwest Penturners	Chicago, IL	midwestpenturnersgathering.com	April 2020
Utah Woodturning	Orem, UT	utahwoodturning.com	May 2020
American Association of Woodturners	Louisville, KY	woodturner.org	June 4-7, 2020
Turn On! Chicago	Chicago, IL	turnonchicago.com	July 24-26, 2020
Ornamental Turners International	Seattle, WA	ornamentalturners.com	September 2020
Segmented Woodturners	St. Louis, MO	segmentedwoodturners.org	October 2020
Virginia Woodturning	Fishersville, VA	virginiawoodturners.org	November 2020
American Association of Woodturners	Omaha, NE	woodturner.org	July 15-18, 2021
Oregon Woodturning	Albany, OR	oregonwoodturningsymposium.com	March 19-21, 2021
Triennial New England Woodturning	Derry, NH	gnhw.org	May 2021

Lathe stand for seated turners

Design by Tony Kopchinski

Here's a sturdy lathe stand suitable for seated and wheelchair turners. It can be made of softwood or hardwood lumber, and it will accommodate a mini- or midi-lathe. The stand is stable, yet folds up for easy storage.

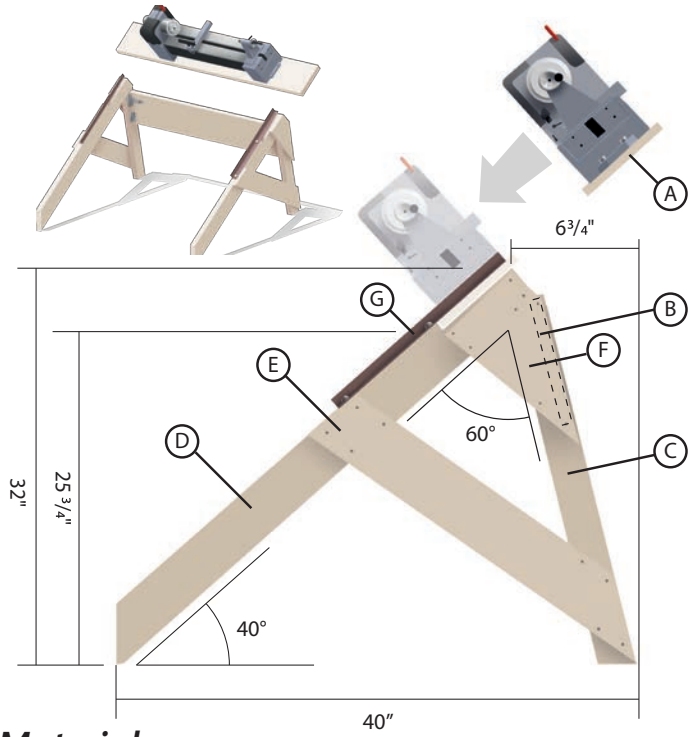
The forward slant of the legs safely positions the lathe over the lap of the seated turner while the lag-bolted angle iron holds it in place. The tilt of the lathe bed could be changed by lengthening or shortening either the front or back legs. The height of the lathe axis could be tailored by adjusting all four legs.

With all items on the materials list cut and gathered, form a 1⅛"- wide × 10"- long (2.9 x 25cm) rebate in the upper legs to accept the lathe board. Attach the back legs to the back crosspiece with the hinges. Dry-fit the upper braces to the front and back legs. Adjust the leg positions until all four contact a level floor, then bore pilot holes and attach the upper braces with glue and screws. Finally, attach the lower leg braces, and use the lag screws to mount the angle iron.

Folds up — Heavy hinges enable the stand to fold flat for storage.

Tony Kopchinski belongs to the Wisconsin Valley Woodturners. A version of this article appears in American Woodturner *v32n4, August 2017.*

Lathe base board has holes for turning tools.



Materials

A — base board 1" × 8" × 53" (2.5 × 20 × 135cm) on which to bolt midi-lathe.

B — horizontal back crosspiece, 1½" × 9" × 40" (3.8 × 23 × 102cm).

C — two back legs 1½" × 3" × 30" (3.8 × 8 × 76cm).

D — two front legs 1½" × 4" × 46" (3.8 × 10 × 117cm).

E — two lower leg braces ¾" × 5" × 29" (1.9 × 13 × 74cm).

F — two trim-to-fit upper leg braces from 7"- wide × ¾"- thick (18 x 1.9cm-) plywood.

G — two angle iron pieces 1½" × 1½" × 22" (3.8 × 3.8 × 56cm) with corners ground smooth.

- Screws for assembly.
- four lag screws 5/16" × 3" (8mm × 8cm) for attaching angle iron.
- four heavy hinges, strap- or door-type, plus screws. ❐

Bottle stoppers

by Ted Rasmussen

Stoppers for opened wine bottles make great turning projects. They provide an opportunity to use colorful and figured scraps of wood and a chance to practice spindle turning skills. They also make great host or hostess gifts.

The ideal block of wood is 1-1/4” to 1-1/2” (3 to 3.5cm) square, and about 3” (7.5cm) long, with the grain running in the long direction.

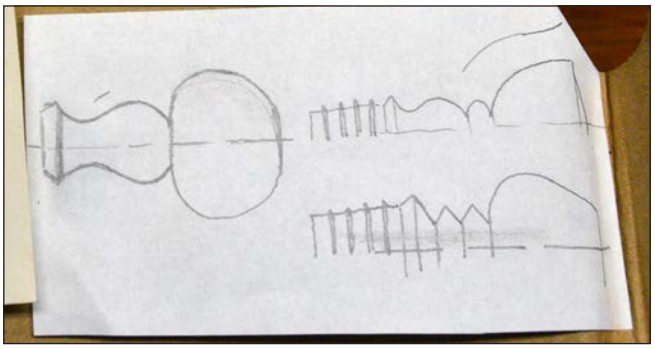
A stopper can be shaped to suit yourself, and it can be a way to display outrageous scraps of figured wood. When your investment in time and materials is as small as this, you can afford to try new skills and expand your repertoire of shapes. But it’s not a place for extravagantly tall stoppers. They won’t fit into the refrigerator, and they might not fit on a counter beneath upper cabinets.

You can turn bottle stoppers on any size lathe, with almost any style of turning tool. Here’s how:

2. Elements — Small stepped dowels simplify the stopper-making process. The small end is glued into the workpiece; the large end slides into a silicone rubber boot. You can also find old-style corks, and elaborate metal hardware (left) — this example has a corkscrew hidden inside.

3. Preparation — Mark center on the workpiece, bore to fit the stepped dowel, glue it.

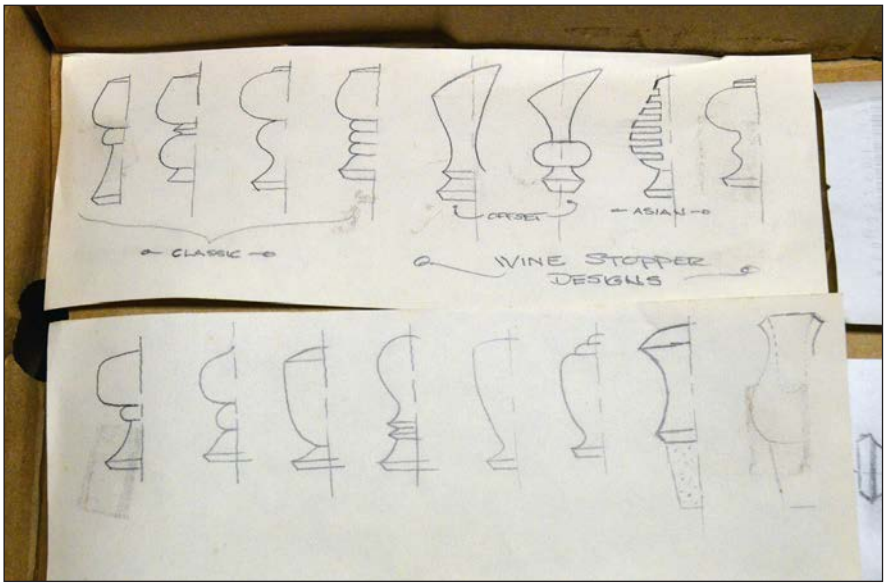
1. Scrap blocks — Most hardwoods make good blocks for stoppers. It’s a great way to use up colorful and highly figured wood scraps.



4. Basic design — In this project, Ted demonstrates making a simple stopper. This drawing will guide the sequence.

Designing stoppers

5. Sturdy knobs — A good stopper should have a substantial knob you can push into the bottle, with a neck section leading into the cork or silicone boot.



6. Repertoire — Ted gives stoppers as gifts, and also sells them at the Pennsylvania Guild of Craftsmen retail shop in Lancaster, PA. He keeps this sheet of sketches of his proven designs taped inside the lid of a box full of stopper blocks.

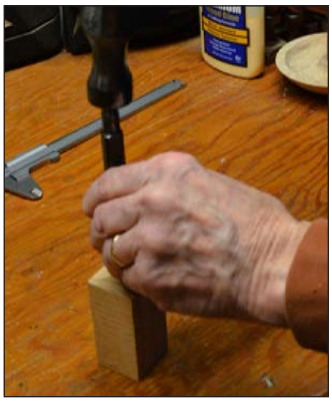
7. Different wood — Different species, similar design, different look and feel in the hand.

8. Proportions — These stoppers both have a tapered knob and a narrow neck. What's different is the proportion of neck to head.

9. Figure — This stopper displays outrageous wood figure.

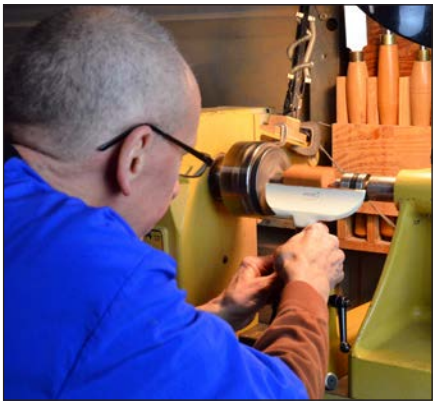
Boring for stepped dowels

10. Mark center — Draw diagonals to find center on one end of the workpiece.

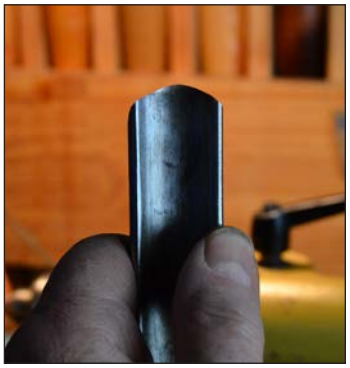


11. Bore for plug — Punch center to help start the bit, and bore the exact diameter and length of the stepped dowel. Whether on the drill press or with a portable drill, always clamp the workpiece.

12. Pin jaws — Glue the stepped dowel into the workpiece, mount it in a scroll chuck with pin jaws, and bring up the tailstock.



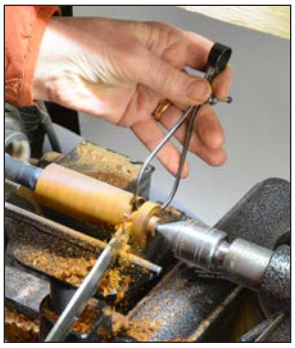
13. Toolrest height — Ted sights the toolrest against the lathe axis, setting it just below.



14. Roughing gouge — This version of the spindle roughing gouge has a curved nose, so its corners don't dig in.

Alternative: Turn your own dowel

15. Mark plug length — No scroll chuck? Mount the workpiece between centers. No stepped dowels? Start with a 4" (10cm) workpiece, measure and mark a turned plug to fit the cork or silicone boot. Complete the stopper between centers.

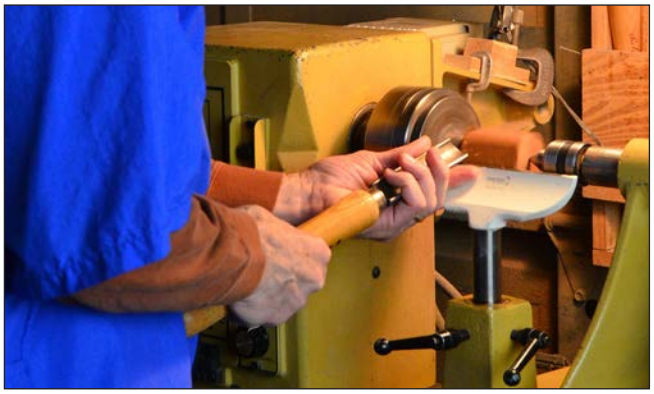


16. Plug — Parting tool with caliper — nails the diameter.

17. Pare flat — The skew chisel straightens out the turned plug.

Shaping the stopper

18. Stance — Ted stands easy at his large lathe; you can make a stopper on any size lathe. He grips the handle of the spindle roughing gouge in his right hand for power, while his left hand holds and guides the blade on the toolrest, for control.



19. Lift handle to cut — Lifting the handle of the gouge engages the cutting edge in the wood.

20. Rotate flute — Rotate the tool handle and aim the gouge in the direction you intend to travel. At 1000 RPM, the chips will fly!

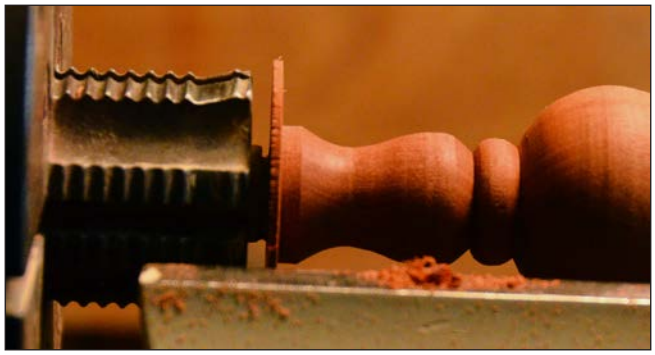
21. Spindle gouge — The spindle gouge shapes the stopper knob by cutting from large diameter to small.

22. Parting tool — Parting tool cuts the waste plug at the tail end, and can be used as a small skew to help detail the stopper.

Detailing the stopper

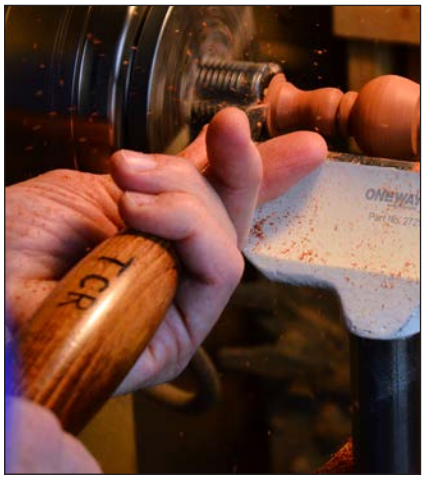
23. Skew cleans up — The skew chisel clears splinters out of tight grooves.

24. Shape, with flange — The gouge and parting tool shape the stopper neck, leaving a thin flange at the chuck jaws.



25. Clearance — To make a bit of clearance, loosen the chuck and tailstock, shift the workpiece 1/8" (3mm) or less, and retighten.

26. Waste — The parting tool makes short work of the flange nearest the chuck. This is where the stopper meets its cork, so cut a cleanly sloped shoulder.



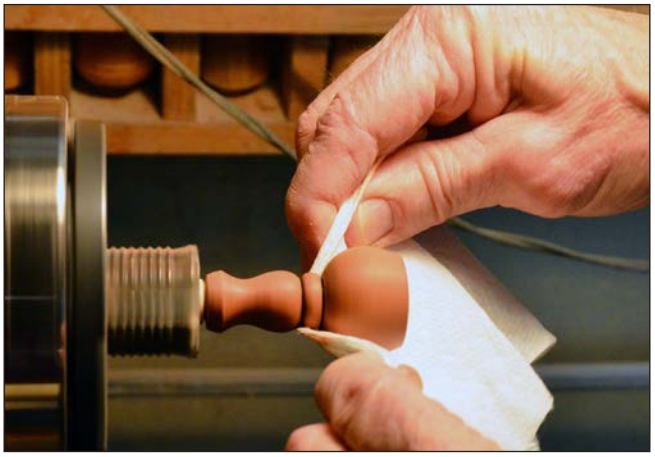
Cleaning up

27. Skew cuts it free — The long point of the skew chisel pares the endgrain and slices through the mounting stub at the tailstock.

28. Wire burns grooves — A fine steel wire chars the wood in the grooves for emphasis. Press the wire into the groove, don't ever wrap it.

Sand and finish

29. Sand it — The cleaner you can turn, the less you will need to sand. After sanding, use a paper towel to wipe dust and grit off the spinning wood.



30. Friction polish — A shellac-and-wax friction polish like this can be applied right on the lathe.

31. Rub it in — Use a small scrap of soft cloth to work the polish into the wood grain. Let it dry a few minutes, then buff off.

32. Silicone boot — Press the silicone boot onto the wood plug. It's a friction fit that won't need any glue. ❐

Turned coasters introduce friction drives, jam chuck

by Jerry Hubschman

Here's a great way to put those "can't part with" hardwood scraps to good use. Or if you're a wood collector, start using your treasured samples: Turn them into coasters for all to admire and use.

Small disks of wood aren't always easy to mount on the lathe. For complete access to the top surface and edge, you'll glue bandsawn coaster stock to a smaller turned disk, called a tenon, that you can grip in the scroll chuck. Then you'll turn the tenon away to complete the bottom of the coaster. Along the way, you'll need to assemble two simple friction drives and a jam chuck.

Your goal is to produce a set of small platters with reasonably uniform thickness and diameter. As in most repetitive turning, they need to be similar, but they need not be identical. Keep the sizing as consistent as possible, but don't fret if your coasters don't look like they came off a duplicating machine.

Tools and materials

For turning tools you will need a 3/8" (9mm) bowl gouge with traditional grind; a narrow parting tool; a friction-fit tool (some turners call this a side-ground tool), page **20**, and a standard four-jaw scroll chuck.

You can make 3/8"-thick (9mm) coasters from almost any closed-grained hardwood. The ones shown here were turned from butternut, maple, poplar, and walnut.

Your choice of tenon size and jam-chuck mount will depend on the external and internal grip ranges of your scroll chuck. The photos show using a compass to lay out 3-1/2" (9cm) disks for coasters and 1-1/4" (3cm) disks for tenons (**1**).

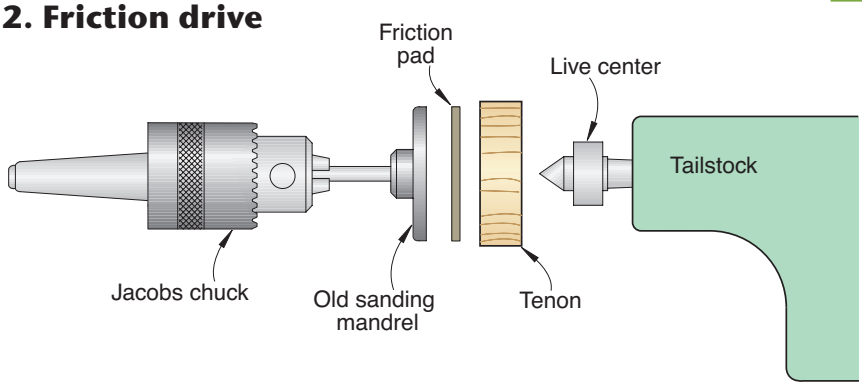
Pressing the compass point into the wood will help you center the tailstock. Bandsaw the tenon and coaster stock at the same time.

1. Bandsaw blanks — Lay out circles for chucking tenons while marking the coaster disks. Cut both tenons and coasters all at once.

Friction drive

A small friction drive, **2**, is used to true up the small tenons after bandsawing them. It's just a worn-out sanding-disk mandrel mounted in a drill chuck, with a glued-on drive surface. If you don't have such a mandrel, face off a piece of 1" (2.5cm) dowel in your scroll chuck and glue on the drive surface. A discarded bicycle inner tube makes an ideal drive surface. Pressure-sensitive adhesive (PSA) patches also work well.

2. Friction drive



Tenon disks

The first step in turning is simple and repetitive. Mount each rough tenon with a friction drive between centers. Turn each tenon to balance, and square off the edges, **3**. Then glue the disks to the flat face of your coaster blanks, **4**.

3. Tenon disk — Use the friction drive to mount and square up the tenon disks.

4. Glue tenons — Choose the flattest mating surfaces for this subassembly.

Coaster face

Grip the tenon in the scroll chuck to mount the coaster on the lathe. Turn the edge round; use calipers to establish your intended diameter. With a bowl gouge, make an entry cut just inside the outer edge and move from large to small diameter (**5**).

Although the coaster is a shallow dish, this is a downhill entry. Continue to make gouge passes from large diameter to small until you reach the depth you want. Ride the bevel to control the depth (**6**).

5. Entry cut — The bowl gouge starts the cut and forms the rim on the coaster face.

6. Coaster face — The coaster face is a shallow dish. Ride the gouge bevel from large diameter to small.

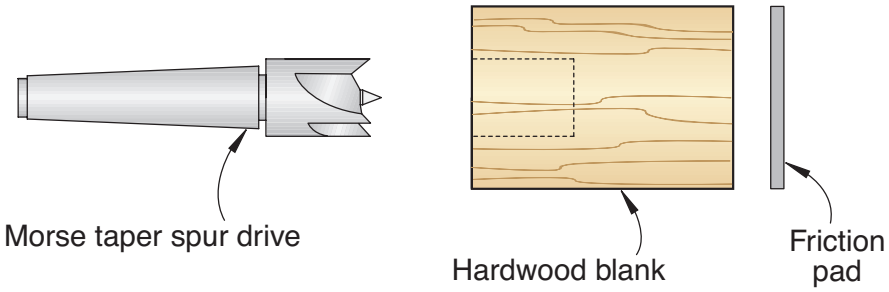
Use a straightedge to test for flatness (**7**). When you are satisfied with the profile, sand smooth with progressively finer grits; I usually sand to 240 grit. Before removing the coaster from the chuck, apply a coat of quick-drying lacquer or sanding sealer (**8**) to toughen the wood fibers.

7. Is it flat? — A small straightedge checks the coaster top for flatness.

8. Sealer — Sand the coaster top and apply a coat of quick-dry sanding sealer.

Coaster drive

A second friction drive allows you to turn the bottom of the coasters. It's a shopmade drive block mounted on a Morse taper 1/2" (12mm) spur drive (**9**). Bore a hole the diameter of your spur center in the hardwood block. With the spur center in the hole, a light tap will seat the spurs. Mount the assembly in your lathe and turn the block to a cylinder. Face off the end and glue on a friction surface.



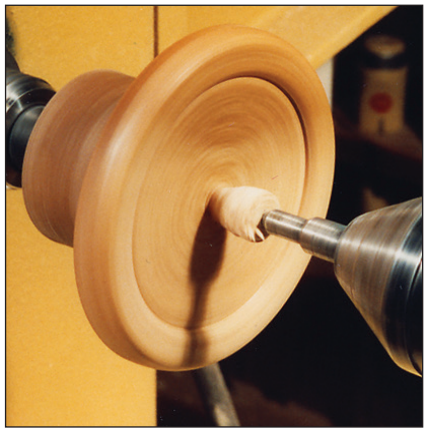
9. Coaster drive

Coaster bottom

Turn all of the top faces before shaping the coaster bottoms. Mount the coaster between the shopmade friction drive and your tailstock live center. Turn from large diameter to small, developing the profile up to the tenon itself (**10**). I usually turn a small rim on the outer edge of the bottom, as I would in bowl turning.

When you are satisfied with the profile, reduce the tenon to a small cone (**11**). Sand and seal the bottom the same as the top.

10. Coaster bottom — Mount the coaster between tail center and friction pad to shape it up to the tenon.



11. Reduce tenon — Turn a shallow rim, then reduce the mounting tenon to a small cone.

12. Jam chuck – Saw the softwood disk larger than the coasters. Bore a shallow hole for mounting on the chuck.

13. Mount the coaster – Cut a shallow depression to fit the smallest coaster. Press the coaster into the chuck.

14. Clean up – With the coaster nestled in the jam chuck, turn away the last of the chucking tenon.

Jam chuck

A shopmade jam chuck mounts the almost-completed coaster so you can part off the remaining tenon and sand the bottom.

Bandsaw a disk of softwood about 1" larger than your coasters. In what will be the backside, bore a hole 1/2" (12mm) deep with a Forstner bit to match the grip range of the chuck jaws (**12**); 2" (5cm) is typical.

Mount the block on your chuck and turn it to balance. Bore a 1/2" (12mm) hole through the block, **13** — later, you'll be able to use it to push out a snug coaster. Face off the front and pencil in a guideline slightly smaller than the diameter of your coasters.

Select the coaster with the smallest diameter for the first fit. Turn a shallow depression to provide a snug fit for the first coaster. Later you can enlarge the gap incrementally for the rest of the coaster set.

Fit the top face of the first coaster into the jam chuck. With support from a live center, reduce the spindle speed and part off the remaining tenon (**14**). Back off the supporting tailstock and gently turn away the center button, sand and seal.

Finish

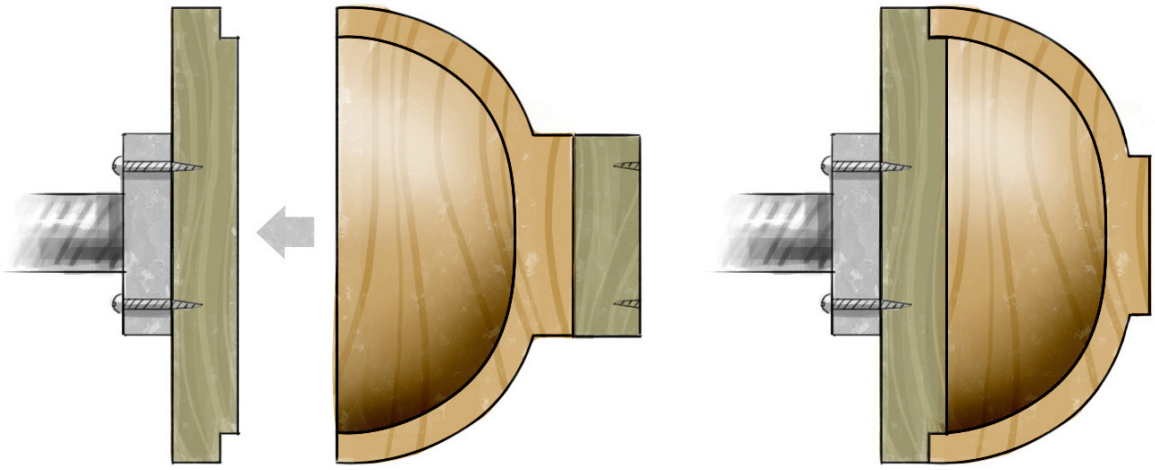
Because beverage coasters are going to be in contact with water, fruit juice, alcohol, and other liquids, a simple wax finish will not offer enough protection. Two coats of oil-based polyurethane varnish, each thinned about 50% with mineral spirits, will do the job.

Ring-porous woods such as oak, walnut, and sassafras may require more coats than tight-grain species; some turners prefer also to fill the pores of open-grain woods. After your varnish has cured, rub off dust bumps with an abrasive pad, then apply furniture wax.

15. Sand and seal – Complete the coaster bottom same as the top.

Jerry Hubschman is a member of the Central Ohio Woodturners. A version of this article appears in American Woodturner *v22n2.*

Jam chucks remount work



This bowl was mounted on the lathe by way of a glue block on its foot. The jam chuck, with tailstock support, permits remounting the project for final cleanup.

Many projects, toward the end of the turning process, need to be reversed and remounted for final cleanup. The old way, with the help of a wooden jam chuck screwed onto a faceplate, remains a very solid technique. It's quick, infinitely adjustable, inexpensive compared to scroll chucks, and, when supported by the tailstock, highly reliable.

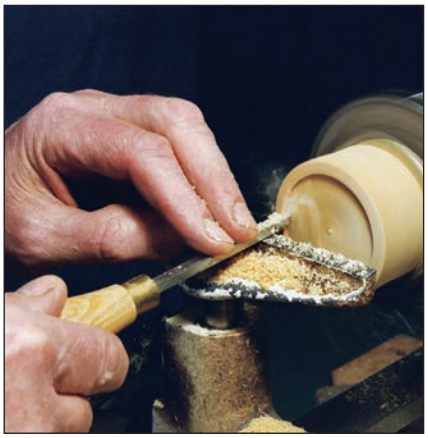
A jam chuck is sometimes called a waste block, but that doesn't mean it's scrap wood. It's called that because it wastes away as you repeatedly reshape the disk to fit each new project. Softwood, or a mild turning wood like cherry, is best. Mount the bandsawn jam chuck on a faceplate with stout steel screws, not brittle drywall screws.

Bowls can be fit over a rebate cut into the rim of the chuck, for access to the entire outside surface. Some box and vessel projects will be centered in a groove turned into the face of the chuck, and some will be nestled into a hollow. Always leave the tail center in place as long as possible, which may leave you with a small nub to pare and sand by hand.

Jam chuck — To make a jam chuck, bandsaw a softwood disk and screw it onto a metal faceplate. Center, the jam chuck can be reshaped and reused many times. Right, the chuck wastes away.

Fit the jam chuck, use tailstock support

Rim shot — The bowl will fit onto a rebate turned in the rim of the jam chuck.

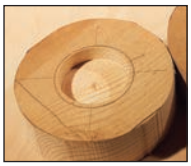


Shallow recess — Small jam chuck wil be used to remount boxes and lids for cleanup.

Reusable — The recess in the jam chuck is tailored to each piece in a matching set.

Tailstock — Tailstock live center supports bowl on the jam chuck. Leave the tailstock in place as long as possible. Detail the project, then pare the glue block or tenon to a tiny nub.

Jam chucks and scroll chucks



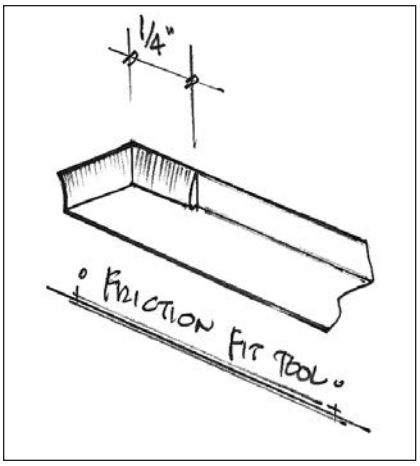
To mount a jam chuck on the regular scroll chuck, turn a recess to fit the almost-closed jaws. Then expand the jaws into the recess.

Most scroll chucks can be fitted with jumbo jaws that have rubber bumpers for remounting. The eight bumpers can be threaded into a series of holes to grip a wide range of projects.

No marks — Rubber bumpers on jumbo jaws won't mark the work. Whenever possible, bring up the tailstock for support; avoid dings by pressing the live center against a smooth disk.

❐

Shopmade friction-fit tool cuts perfect recess in jam chuck



1. Friction-fit tool — Grind a short side-bevel on a small square-end scraper.

2. Grind — Both the side-bevel and the end-bevel have an included angle of 70°.

by Bob Rosand

The friction-fit tool is simply a small square-nose scraper with a second bevel ground on its left side. It can remove tiny amounts of wood for jam-chucking bowls to finish the foot, and when friction-fitting coasters or the lids of boxes, or any other jam-chucking situation. With this tool, you can sneak up on that perfect friction-fit.

Grind the profile

To make the friction-fit tool, you need nothing more than a small square-end scraper, or a discarded scrap of 1/8”-thick (3mm) HSS planer blade about 6” (15cm) long and 1/4” to 1/2” (6mm to 12mm) wide that you’ll mount in a handle. Grind the nose of the tool just as you would a regular scraper; an included angle of 70° is typical. Then, turn the tool 90° degrees and sharpen about a 1/4” (6mm) along the left-hand side, **1** and **2**. Resist the temptation to sharpen all the way down the side of the tool. If you over-sharpen, you will waste a lot of steel and shorten the life of the tool.

Turn a handle of your choice, or fit your blade into a standard universal handle. If your handle needs a tang, you can grind that too.

Jam chuck

The photos show how to use the tool to friction-fit a 4”-diameter (10cm) bowl in a jam chuck to finish the bowl bottom. Yes, a vacuum chuck would work well here, but if you don’t own this accessory, this tool gets the job done — inexpensively and perhaps with less setup effort.

A jam chuck is nothing more than a waste disk, typically pine or another softwood, into which you can cut a recess that will snugly fit the rim of a bowl or the lid of a box.

To mount the jam chuck on your lathe, glue it to a hardwood block held in a scroll chuck; this is more secure than expanding the jaws into a recess. If you don’t have a scroll chuck, you can screw the disk onto a standard faceplate, but be careful not to turn into the screws.

True up the jam chuck (Photo **3**), then set vernier calipers to the bowl diameter. While the lathe is running, scratch the diameter onto the soft pine disk, **4**. Use the vernier calipers as you would use a scraper, with the points angled down toward the floor. Touch the work only with the near point. If the outboard point makes

contact, you risk damage to the calipers and to yourself.

Using the tool

With a spindle gouge, remove some of the material between the scratch lines. Now, switch to the friction-fit tool to scrape a flat area to accept the rim of the bowl. Only use the 1/4" side-grind and keep the toolrest close to the work; gently slide the tool along it, removing small amounts of wood (**5**).

As you get close to the scratch (reference) lines, check the fit of the bowl. When you get close to a snug friction fit, swing the tool to the left just enough to make the cut exactly square to the surface, **6**. This cut will remove a scant amount of wood, just enough for that perfect fit.

If you're not happy with the fit, remove the bowl, true up the face of the jam chuck, and start again.

If you've done it just right, you will feel that the bowl is snug and running true. You'll be able to use a small spindle gouge to clean up the bottom, as shown in Photo **7**.

Bob Rosand (RRosand.com) lives in Bloomsburg, Pennsylvania. A version of this article appears in American Woodturner *v21n4, Winter 2006.*

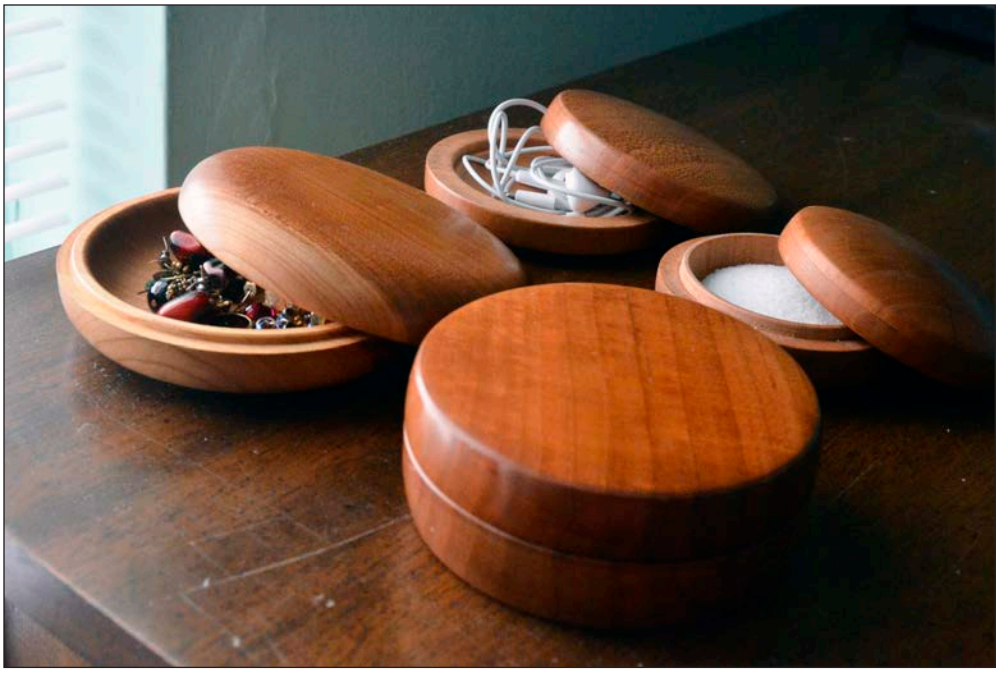
3. Jam chuck — The goal is to complete the foot on this small bowl. To make the jam chuck, mount a pine disk and flatten its surface.

4. Layout — With calipers, transfer the bowl diameter to the pine disk. Be sure to angle the caliper points downward.

5. Cut recess — Slide the friction-fit tool along the rest to cut the recess to the marked circle.

6. Final fit — To finesse the fit, swing the tool handle to the left by a very small amount.

7. Mount the bowl — Press the bowl into the recess in the jam chuck, then clean up its bottom with a small gouge.



Hockey pucks — People use flat crossgrain boxes to keep track of earrings, earbuds, and sea salt: anything small and precious. Making one box is fun, while making more than a few of them will deepen your understanding of wood and turning techniques. Plus they are great gifts.

Crossgrain flat boxes expand skills and techniques

by John Kelsey

Here is a woodturning magic trick: Make and finish a crossgrain lidded box using just one chuck and a few tools, in about an hour and with no apparent chucking scars. One secret: turn the inside first. Another secret: you can turn almost anything with a 3/8" (9mm) bowl gouge, and making boxes like these builds skill with this most important tool. And another: a light touch with sharp gouge and sharp scraper allows you to sand less (page **37**).

This past year, in a mad drive to improve my skills, I turned several large planks of 8/4 cherry into more than 40 lidded boxes. By the end of the game I'd learned how to do it mostly with that 3/8" gouge, plus a parting tool for separating the lid, a square-end box scraper for lid-fitting, and a couple of thick curved scrapers for scratch-free finish cuts.

This is crossgrain turning, so the wood fibers run at right-angles to the lathe axis. The wood figure on the box lid is the face grain of the plank. My wood had air-dried a few years, but I still expected, and got, some distortion due to wood movement.

The adventure's challenges included:

- an investigation of grain and how to see the finished box in the raw plank;
- learning a logical chucking and turning sequence that ends with no visible signs of how the work was held;
- an exploration of the design details available in this limited format;
- a lot of tool-control practice in turning thin walls, lid-fitting, and minimizing sanding.

John Kelsey is editor of Woodturning FUNdamentals.

Learning to see wood figure in the raw plank

A gift falls on me — The tree man cut this fat 6' (2m) cherry log into four 8/4 planks, which dried all checked and twisted. I swapped a turning for the lot.

Needs work — After too much of this, I needed practice. How about a cherry box? Hah, in the next year I turned more than 40.

Cosmic alignment — It's both satisfying and mysterious when the wood figure runs continuously through box body and lid; 8/4 plank nets 1-1/2" (4cm) thick box.

Marking out — Template disks span the range of scroll chuck jaws. Bandsawing batches of blanks around checks and rot, I begin to see the relationship between wood figure and the tree's fibrous structure.

Wood figure — How it's sawn determines visible wood figure. Rift-sawn cherry, center, shows calm parallel bands of color. Left, quartersawn displays shimmery chatoyance next to light sapwood edge. Right, flatsawn blank with bark side up displays characteristic cathedral, or hyperbolic, figure.

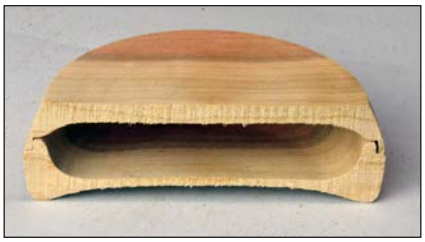
Chatoyance

Trees have structural cells called rays that radiate from the heart. Because the rays intersect the growth rings at 90°, they are exposed on quartersawn surfaces. Ray cells appear as a broad splash in white oak, but a subtle band of shimmery squares, called chatoyance, in maple, cherry, and many other hardwoods. Planks aren't perfect, so a domed box lid increases the chances of slicing through the rays at just the right angle to reveal this subtle and beautiful feature.

Design limitations — The basic hockey-puck shape offers several avenues for design exploration, sampled around the tower of blanks. These include, from left, heartood-sapwood play, chatoyant lid, knot feature, and two rounded examples.

Logical sequence— Flat boxes surround a sequential tower of blanks. The sequence shown is:

- bandsaw the blank;
- square it up;
- tenon both ends;
- part off the box body;
- turn and finish lid inside;
- fit box body to lid;
- hollow box inside, finish;
- jam-chuck lid on box;
- turn box and lid side;
- turn, finish top of lid;
- turn, finish foot of box.



Saw into your mistakes, see how you're doing.

An efficient chucking/turning sequence, while exploring design on a limited format

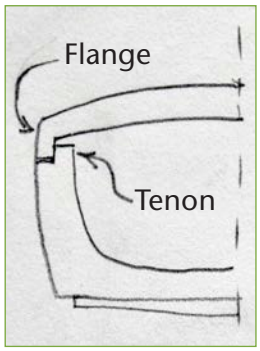
As with most box-turning, the blank is first mounted on the lathe by its outside, in order to hollow the inside and fit the lid. Then shape the outside, then remove whatever tenons and chucking scars held it on the lathe.

These crossgrain boxes have overset lids that fit over a tenon on the box body (page **25**). While there are other sequences, I've come to prefer preparing the blank by carefully squaring it up and tenoning both ends, making the lid then fitting the box body to it, whilst sanding and finishing each surface as it emerges on the lathe.

- Bandsaw the hockey puck and seat it fully in a scroll chuck;
- Turn a clean and uniform cylinder with short chucking tenons on both ends;
- Rechuck by lid end and part off box body, about 2/3 of wood thickness;
- Turn, sand, and finish inside of lid, leaving flange a bit thick;
- Mount box body, turn tenon to fit lid;
- Hollow, sand, and finish inside of box;
- Fit lid onto box body, retain with tailstock; turn lid and box side together;
- Turn top of lid up to tailstock, then:
  a) remove tailstock to complete lid, relying on friction fit, or
  b) expand scroll chuck into lid flange to complete lid. Sand and finish.
- Chuck box bottom by foot tenon, trim lid tenon to achieve final fit;
- Remount box by gripping lid tenon or on a jam chuck (page **17**), trim box base and foot, sand and finish.

And done.

Fitting the lid



Overset lid flange fits over box tenon.

Box tools — Shopmade box tool (top), catalog version (below). Both are just less than square at the leading corner.

Lid flange — Align the box tool with the lathe bed to cut the lid flange. The goal is a straight, smooth flange parallel to the axis of the lathe.

Key tip — Press a steel ruler tight into lid corner and sight the lathe ways to verify parallel.

Box tenon — To sneak up on the lid fit, box tool makes a tapered tenon on the box body.

Jam it on — Use the box body as a jam chuck for finishing the join and lid.

Tailstock — Bring up the live center to hold the lid on the box.

People use these boxes for salt, for jewelry, for earbuds, for paper clips ... and in most applications, they want to just lift off the lid without picking up the box body. So it should be a nice but loose fit. Too loose is sloppy; too tight and it takes two hands to open, maybe spilling the contents (page **25**).

With the lid blank mounted by its chucking tenon, excavate the center to about 1/4" (6mm) deep. Then use a square-end scraper or perhaps your shop-made recess tool (page **20**), to start the rebate that will form the lid flange.

Hold the scraper flat on the toolrest at center height and squint to align it with the lathe bed. Cut the flange of the rebate to about 1/8" (3mm) deep, but leave its outside wall a bit thick so there's enough wood for shaping the box body and lid together.

With the flange established, hold a small ruler tight against its inside wall and again, sight against the lathe ways for parallel. Adjust until it's right; this is worth some fussing. Then cut the rebate and flange to full depth and complete the inside of the lid, sanding and finishing as you go.

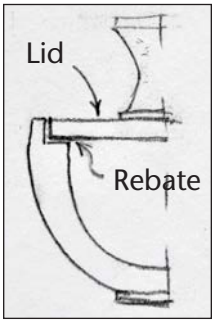
With the box body now chucked up, make the lid tenon about 1/8" long, with a steeply sloping wall. Test the lid to see if it starts onto the taper, or not, and when it almost does, straighten the taper and cut to its full length. Sight against the small ruler to be sure it's parallel to the lathe ways. Then you can sneak up on the fit you want: very tight, if you intend to use the tenon as a chuck for completing the lid, or a slightly looser final fit if you're going to mount the lid by expanding chuck jaws inside its rebate. Finally, as a last step, tune the fit (page **25**). ❐

Three ways the lid sits on the box

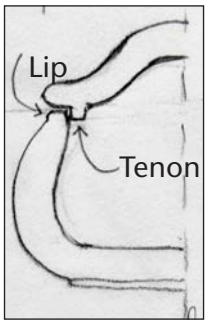
1. Inset lid

The inset lid sits on the floor of a rebate cut inside the box opening. Blackwood box lid is a snug-fit straight plug; opening the box takes two hands. Lid of mulberry box, right, has a tenon that centers it on the body; its loose fit can be opened one-handed, without picking up the box.

Blackwood box at left is by the noted English turner Ray Key, who died in 2018.



Inset lid sits on floor of rebate.



Onset lid sits on lip of box opening.

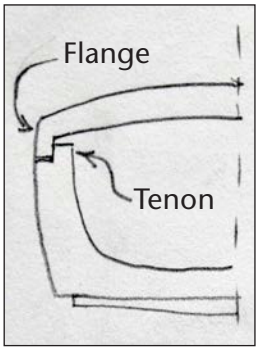
2. Onset lid

The onset lid sits directly on the box opening, in these cherry examples on a low tenon or lip. Both lids have a tenon that fits loosely inside the box opening; the lid on the left has a plug tenon that is flat on the bottom side; the one on the right has a rebate on the inside and has been hollowed to the same thickness as the box body.

3. Overset lid

A tenon defines the box opening. The lid has a flange that fits over the tenon. Rosewood box above left, by Del Stubbs of Wisconsin, has a smooth-fitting lid that settles gently onto the box. The inside of the lid is flat, the top is softly rounded.

Flea-market acorn box at right, of cherry, has a captive ring turned around its foot. The lid is a tight piston-fit that opens with a satisfying pop.



Overset lid flange fits over box tenon.

Loose fit, smooth fit, tight fit

All three of these lid fits can be made tight or loose, and anywhere in between. The practical difference is, a box with a loose lid can be opened one-handed without needing to be picked up. The contents aren't at risk of spilling.

The box with a tight lid has to be stabilized with two hands, and maybe picked up, pulled, twisted, or even wrestled open. Maybe it spills.

And the wood might move in response to seasonal humidity. Endgrain might move less than crossgrain, a film finish might slow it down. But when the tight fit becomes a clamshell to pry open with a knife, the piece needs to go back on the lathe. Maybe in a jam chuck (page **17**).

❐

Bandsaw: choosing, setting up, adjusting

by Kurt Hertzog

How big a bandsaw do I need? Is cast iron or welded steel construction better? How much horsepower? What's the best blade? How much blade tension, what about fences and guides? And on and on.

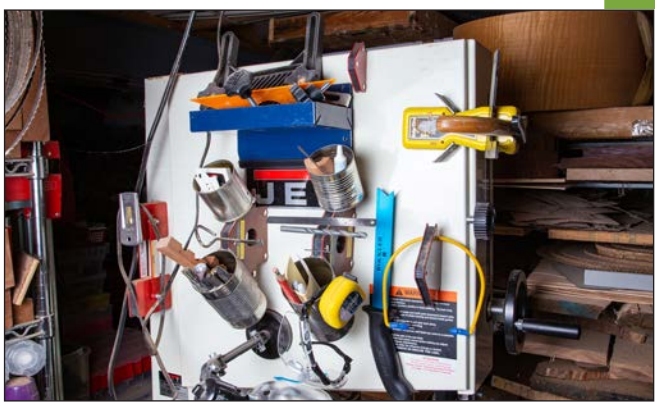
It's hard to imagine getting far in woodturning without a bandsaw. I'm going to share the basic setup I use along with information gleaned from experts I have faith in.

Safety

You should always wear safety glasses when bandsawing and also ear muffs or ear plugs for hearing protection. Keep safety gear hung on the saw, photo **1**, or immediately nearby. Being close at hand means it'll be used when needed.

Don't ever put your hands in the blade's path, just don't; instead, train yourself to steer and push from the sides, **2**. To keep your hands out of harm's way, buy or make push sticks, **3**. Keep the area around your saw open and free of trip hazards front and back. Often it is necessary to finish a cut by pulling the stock from the back of the saw. You need to be able to get there and have room to work.

Always unplug the bandsaw power cord when working on it.



1. Gear nearby – Unsightly but efficient. If your personal protective equipment is handy you'll use it. Notice the glasses, ear plugs, feather boards, and push stick, all stored on the saw housing and at hand.

2. Hands clear – Don't ever put your hands in the blade's path. Instead, train yourself to steer and push from the sides.

3. Push stick – Whether a homemade wooden one or a commercial aluminum one, get in the habit of using a push stick. To press work against the fence, use featherboards as well.

3. Wide throat — The throat specification is the largest cut possible from the blade to the frame. My 18" (45cm) saw really can cut an absolute maximum of 18-3/8"(46cm).

4. Tall throat — The depth of cut specification is the maximum thickness that can be cut with the blade guides fully open; on this saw, the blade tension adjustment wheel hangs low and would interfere with some cuts.

Bandsaw Specifications

In an ideal world, you'd buy the biggest and baddest saw that you could fit into your shop. As with lathes, new doesn't necessarily mean better. The bandsaws made 75 years ago can still be used and may have features no longer available. Focus on bandsaws intended for wood, you won't need multiple speeds or metal-sawing lubrication systems.

Underpowered saws can present problems so pick the more powerful motor; extra horsepower is rarely a problem. However, pay attention to the input voltage because more than two horsepower generally requires 220 volts.

These days larger saws (and cheaper lines) are typically made of welded steel rather than cast iron. This can make shipping easier and less costly, but maybe with some assembly required. Classic older machines are usually of cast iron.

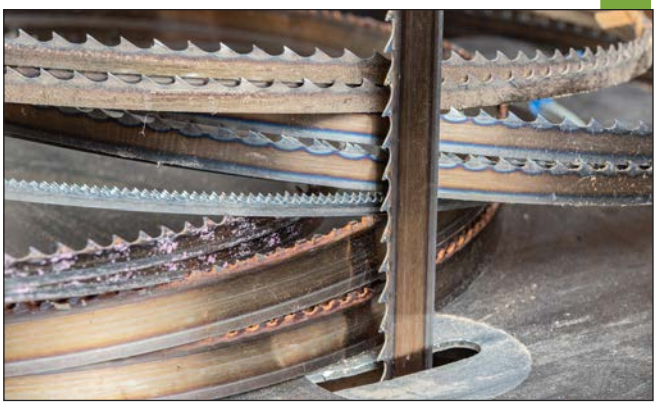
5. Benchtop — Small benchtop saws have smaller specs, but setup and adjustment advice is the same as for floor-standing machines.

6. Heavy — Older cast-iron machines are heavy and vibrate less than modern welded-steel constructions. Note the red quick-tension-release lever on this saw.

7. Steel — Large new saws tend to be fabricated from sheet steel. This makes it cheap to ship in pieces for on-site assembly.

New or old, the key specifications are depth of cut and throat size. Depth of cut is the maximum thickness you can cut. Risers and longer blades can add depth-of-cut capability to some saws. The throat dimension, the distance from the vertical column to the blade, is how wide you can cut **(3-7).**

8. Fave blade — The standard, general purpose blade on my 18" saw is a 3/4" (2cm), 3tpi, hook-tooth blade. It can't cut small circles but I'll change to a narrower blade as needed.



9. Blade collection — Most needs can be addressed with just a few blades. My collection includes 3/4" x 3tpi, 3/4" x 4tpi, 3/8" and 1/2" x 3 tpi, and 3/16" x 10 tpi. Most are hook-tooth.

Blade selection

There are more opinions about blade selection than there are blades. For most turners, standard carbon steel or Swedish steel blades will work nicely with no need for expensive carbide teeth. You can cut nearly all of the woods, most plastics, and a few of the softer metals, (aluminum, brass) with regular wood blades.

Generally speaking, use wider blades with fewer teeth per inch (tpi) blades for heavier work. Roughing bowl blanks from split logs would be suited for a 3/4" 3 tpi blade, **8**. The same blade could be used for cutting veneer, with good technique and fencing, but not for tight curves.

In general wide blades with few teeth make aggressive cuts while narrow blades with many teeth make smoother cuts. The wider the blade, the more difficult it is to turn a circle. A 1/4" (6mm) blade can cut a much smaller bowl blank than a 3/4" or 1" (2 or 2.5cm) blade. Depending on whether you make green salad bowls or doll house parts, you'll acquire a selection of blades that will cut with no more kerf than needed, and can be maneuvered in the materials you use (**9**).

I recommend buying a quality blade. It will have a better weld and grinding, allowing it to run smoother and provide longer service. The price difference between a bargain blade and a quality blade is minimal (**10**).

10. Coiled up — When not in use, store blades coiled and hung out of the way. Notice the factory spec labels left on new unused blades.

Explore!

Click the blue box or scan the QR code to follow the link and learn more about the turner's bandsaw.

tiny.cc/bandsaw

11. Teeth — When installing a blade, be certain the teeth are pointing down at the table top.

12. Gullets — The rearmost part of the gullets should ride on the peak of the tire crown. Here, the blade is too far forward on the tire.

13. Crowned — This blade is adjusted about right. The back edge of the gullets rides on the crown of the tire.

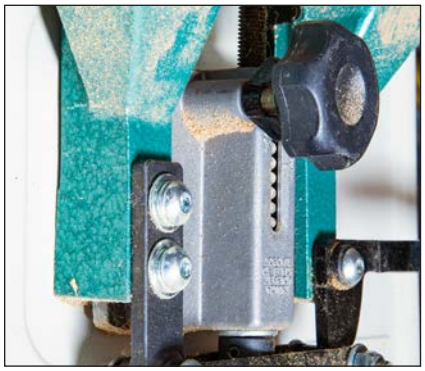
Blade alignment

If your saw has upper and lower guides for the blade, it is best to remove the tabletop to install the blade and to set up tracking and guides. If there are no lower guides, leave the tabletop in place.

With the saw clean of shipping protectants and other debris, loosen and retract the upper and lower guides so they will be clear of the blade. Open both wheel door covers, make sure the tires are clean and intact, and lower the tension adjustment to minimum.

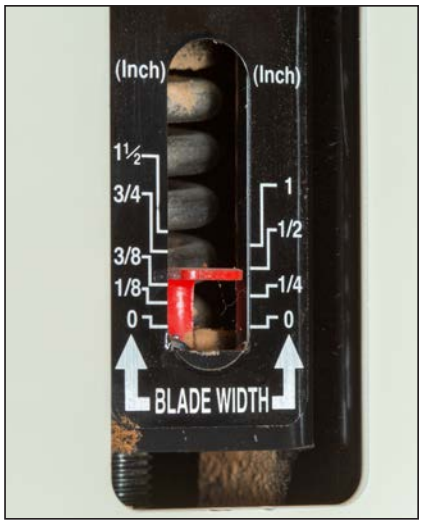
Install the blade by draping it around the lower wheel, through the slot in the table, and around the upper wheel. Be certain the teeth points are facing down at the tabletop, **11**. Increase the tension on the blade as indicated on the gauge, and slowly rotate the upper wheel by hand to let the blade find its natural position.

14. Adjuster — The wheel tracking adjustment knob, with locking wing nut, is located on the back side of the upper wheel cabinet.



15. Another — Make small adjustments under hand power, then check at power and lock the adjuster. Here's the tracking adjustment on another common saw.

Once the blade has become stable at some position on the tire, adjust the wheel tracking so the back edge of the blade gullets are riding on the center of the tire as you rotate the wheel by hand (**12-15**).



15. Inaccurate — The blade tension indicators on saws are notoriously inaccurate. I use them for initial setup and refine from there.

16. Unscientific — Not scientific but you'll be very close with 3/16" to 1/4" (4-6mm) deflection at mid-blade with guides out of the way and modest finger pressure.

17. Just right — "Modest" pressure is when the fingernail begins to show white.

Blade tension

Most saws have tension indicators for different blade widths. Regardless of the cost or quality of the bandsaw, its tension indicators are inaccurate (**15**). Use the gauge as a starting point.

The blade maker may have special setup instructions for their particular steel and blade. Without special requirements, use the following guidelines:

Once the blade has been tensioned per the gauge, and is tracking on the crown of the tires, the tension can be fine-tuned. Move the upper guides to their highest position, so they don't interfere.

With the power off, I use a simple push on the side of the blade to test the tension. At the table level, push on the side of the blade with one finger. It should flex about 1/4" (6mm) with modest pressure (**16**). Modest pressure is not too specific but I call "modest" as pushing only until the white begins to show on my fingernail, **17**. I tighten and loosen blade tension until I get 1/4" (6mm) of flex with white-fingernail pressure. Not very scientific but it works for me. I find this test more repeatable and functional than the spring-loaded gauge on the back of the saw. I use this method for all widths of blades, from 3/16" (4mm) to 1" (2.5cm).

While some recommend de-tensioning the blade when the saw is not in use, I only do this on machines that have a quick-tensioning lever (photo 6). On saws that don't have this feature, I have not noticed any detrimental effect by leaving the blades tensioned all of the time.

Blade guides

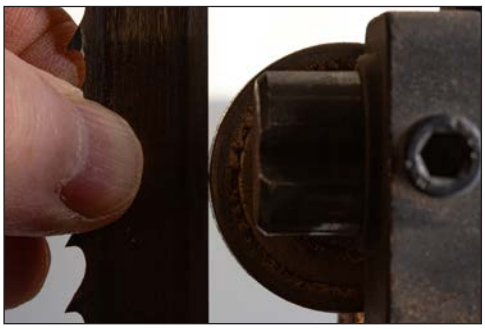
Bandsaws have many types of blade guides, but most follow the same setup. If your saw has both upper and lower guides, the lower guides will be adjusted exactly the same as the uppers.

To begin, adjust the guide block position forward so that the front edges of the guides are just behind the tooth gullets, **18**. Leave them spaced away from the blade for now.

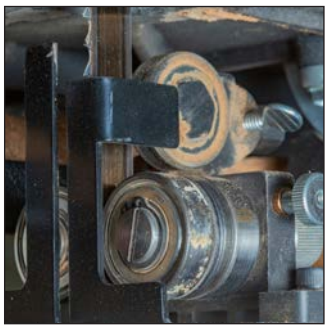
18. Guides — Position the guides so the front of the roller is just behind the tooth gullets.

19. Sides— Adjust the blade guide rollers until they almost touch the sides of the blade. They don't rotate with unloaded blade travel.

20. Clearance — The thrust bearing is adjusted to a small clearance at no power. Some use a dollar bill as a gauge, I just eyeball it.



21. Contact — The thrust bearing contacts the back of the blade with slight sawing pressure from the front.



22. Lowers — Lower guides are adjusted exactly the same as the upper guides.

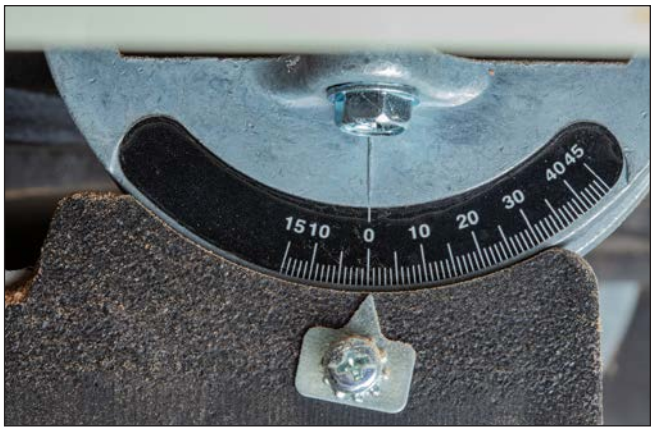
Blade guides continued...

Adjust the blade thrust bearing forward until it almost touches the back of the blade, **20**. Rotate the upper wheel by hand and observe to be sure the thrust bearing is extremely close to the back of the blade but doesn't contact it as the blade runs normally. Pressure from the workpiece will deflect the blade rearward, bringing the thrust bearing into operation, **21**. You will often hear of using a dollar bill thickness as a spacer, which is not needed but OK.

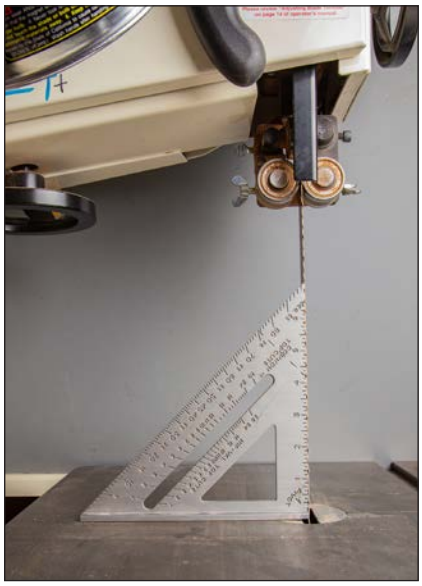
Next, adjust the side bearings inward towards the blade, one side at a time. They should be as close as you can get without touching while you hand-turn the upper wheel to move the blade (**19**). Adjust both side bearings so they will come into contact when the blade is deflected sideward in operation. Repeat the adjustment with the lower bearings if your saw has them, **22**. Replace the tabletop if you removed it.

Close the lower wheel cover door, reconnect the saw power, and turn the saw on. Keeping all body parts clear and safe, observe the blade tracking on the upper wheel tire. It should continue to run with the rear edge of the gullet tracking on the center of the tire. If for any reason it doesn't, adjust the tracking mechanism until it does.

As the blade runs unloaded, examine the thrust bearings and side bearings to be certain that all of them are stationary and not touching the blade. If any need readjustment, turn off and unplug the saw, then readjust as needed.



23. Angle guide — The tabletop angle guide located below the table is unreliable. Even when set, it shouldn't be relied upon for critical cuts without other checks.



24. Square — A speed square on as much of the blade as possible offers a quick and easy way to check the tabletop. Do both sides and watch out for a protruding table insert.

Squaring the tabletop

Regardless what the tabletop angle gauge says, **23**, it needs to be checked and aligned. With the blade and guides adjusted, bring the tabletop to the 0° setting on the gauge and lock in place. With the blade guard moved out of the way, use a speed square to check that the blade is square to the table. Use it just behind the gullets on both sides of the blade and use the tallest square you can fit, **24**.

Another and even better method of squaring the table (page **36**) is to make a partial cut into the face of a length of 2 x 4, as it faces the blade. Turn the saw off and leaving the board on the table, slide and rotate it around behind the blade. The back of the blade should slide perfectly into the cut. If it doesn't, the table is not square. Continue to adjust until a cut from the front will accept the blade from the back.

Many saws have an adjustable 90° stop built into the frame or bottom of the table. When you get the table square the first time, set the stop to it.

While you are attending to the tabletop, remove or minimize any current rust with naval jelly or an abrasive block. Clean the top with denatured alcohol and apply a quality paste wax.

Back of the blade

The back edge of the new bandsaw blade is usually razor sharp on the corners. Carefully break these sharp edges using a wooden block with 320 or 400 grit sandpaper wrapped around it. With the saw running, carefully sand the sharp corners away. It only takes a moment and a light contact at 45° on each side, with a slight rounding motion. It only needs to be done once and it will make a big improvement. This easing can also be done with a sharpening stone.

25. Fence — Check that the fence is parallel to the miter slot in the saw table.

26. Square — Check with a square at both ends of the fence to be sure it is perpendicular to the tabletop and not twisted. Adjust with shims under the mounting bolts.

Aligning the fence

The factory rip fence needs to be checked and adjusted to be parallel to the miter slot and perpendicular to the table. Slide the fence over to the miter slot and see if it lines up from front to back.

Saw fences vary but typically the mounting bolts for the fence-to-track mechanism can be loosened, allowing the fence to be accurately aligned to the miter slot, and retightened, **25**.

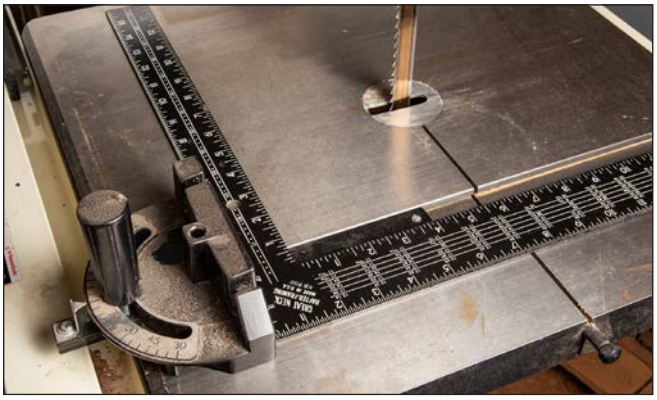
Move the fence to any open area of the table and use a square to check that it is perpendicular to the table. Check it at the front and the back of the fence, **26**. If the fence is out of square, you'll need to check its mounting fasteners to see if there is any adjustment possible. Make the necessary adjustments to bring the fence into square.

If your fence has no adjusting arrangements, you'll need to put shims under the mounting hardware. Thin metal, washers, tape, playing card material, folded aluminum foil, or other similar material works well enough.

If the fence is square in some locations but not over its entire length, there is a twist that may require a more complicated solution or perhaps fence replacement.

Miter gauge

You'll usually have a miter gauge that comes with the saw. Rarely are these actually 90° when they are set to their scale. Use a square against the miter gauge fence and check it against the miter slot itself. Loosen the lock on the miter fence and reposition until it is actually perpendicular to the slot, **27**. Tighten the lock at this position, then realign the pointer or scale on the fence to more accurately indicate 90°.



27. Miter gauge — Check the miter gauge against the miter slot in the saw table.

Kurt Hertzog, a long-time AAW member and past board president, lives in Rochester NY. A prolific woodturning author, he likes to turn ornaments and pens. For more, see kurthertzog.com.

Squaring the bandsaw tabletop

An accurate way to square the bandsaw table to its blade uses a length of 2x4 as a gauge. Stand the 2x4 on edge and make a cut part-way through. With the saw off, slide the 2x4 around behind the blade and see how it aligns with the cut.

If it slides in easily with the blade straight up and no flex, the table is perfectly perpendicular to the blade. If the blade doesn't slide easily into the cut without flex, make the necessary adjustments to the tabletop and repeat the process until the test succeeds.

A. With the table as square as you can get it, make a shallow cut in the tall face of the 2x4.

B. Turn off the saw and leave the wood standing on the surface of the table.

C. Leaving the saw turned off, slide the cut block around the back of the blade.

D. The back edge of the blade slides easily into the cut.

Negative-rake scraping: more turning, less sanding

by Tom Wirsing

I love turning platters and bowls from highly figured woods, and putting a hand-rubbed gallery finish on them. The process is challenging, but it offers a fundamental introduction to a very helpful finishing tool, the negative-rake scraper.

Torn grain takes a lot of sanding to remove, but too much sanding will ripple the wood, and with a hand-rubbed finish the imperfections stick out like a sore thumb. The negative-rake scraper can get highly figured workpieces so smooth right off the tool, with absolutely no tearout, that very little sanding is required.

It takes a two-step turning process:

1. **Cut and shape** with gouges, removing 99% of the wood;
2. **Scrape** the entire workpiece with negative-rake scrapers before sanding, removing any and all discontinuities and tearout, and fine-tuning all shapes and curves.

This sequence significantly reduces sanding. Note that negative-rake scrapers work best on hardwoods. If the wood is too soft, negative-rake scrapers may not work so well.

Some old-time woodturners think anyone who uses scrapers is a poor turner. But I believe anything we can do to reduce sanding is good. Excessive sanding may smooth the wood, but it will almost never improve the woodturning and is far more likely to harm it.

Tom Wirsing is a physicist and a past president of the AAW. For more, visit thomaswirsing.com.

Platter turned from figured maple was finished with a hand-rubbed blend of tung oil and polyurethane. The finish is smooth with no ripples and no tearout. This fine surface was achieved by negative-rake scraping before doing any sanding.

Two gouges

I use only two shapes of gouges. For rough-shaping the workpiece, the gouge has a V-shaped flute and swept-back wings, with the cutting edge ground at 40° (left in photo **1**). This tool cuts fast, to rough-shape the workpiece quickly. The left wing of the tool, which does most of the cutting, is kept very sharp by frequent regrinding.

1. Two sharp gouges — Left, for rough-shaping bowls, V-shaped flute with 40° bevel and swept-back wings. Right, for finish cuts, U-shaped flute ground at 55°.

The gouge on the right in photo **1** is for all finishing cuts. It has a U-shaped flute ground at 55°, which doesn't get under and lift the wood fibers, so it tears out less than if it were ground at 40°. The tool must be kept very sharp. A minimum of pressure against the wood facilitates smooth finishing cuts.

Excessive pressure on finishing cuts is your enemy. If the tool isn't kept very sharp, it takes too much pressure to pick up the cut. Light, precise cuts work best. Keeping the tool very sharp requires frequent regrinding, sometimes as often as every cut!

Negative-rake scrapers

The gouges remove 99% of the wood, but before sanding I scrape the entire turning with negative-rake scrapers. I scrape every square inch, including the edges and all concave, convex, and flat surfaces, using scrapers ground to closely mimic the curves in the wood (photo **2**).

Under a microscope the cutting edge of a freshly-sharpened negative-rake scraper looks like a line of fine sanding grit. It can abrade the wood almost like fine sandpaper. The advantage is accuracy and precision, particularly helpful on a delicate curve or transition, a fine detail, or highly figured woods and twisted grain.

The tool produces shavings like fine hair as it removes the smallest bit of tearout and the slightest discontinuity. If forward pressure is needed to get the scraper to cut, or if it produces sawdust, it is dull.

Scrapers float across the wood

A negative rake scraper is easy to control because the handle is held horizontally with the blade flat on the toolrest, and the cutting burr on center height. When kept very sharp, it can be floated across the surface with very light pressure on the wood and almost no downward pressure on the toolrest.

A negative-rake scraper is easier to use than a conventionally ground scraper because, with the handle horizontal at center height and blade flat on the toolrest, there are few variables. Since the top of the cutting edge of the scraper has a negative angle, there's not much risk of a catch. And because negative-rake scraping requires almost no forward pressure, the tool can safely extend an inch over the toolrest before becoming difficult to control.

2. Negative-rake scrapers — Variety of edge shapes closely follow turning contours. These tools have the same bevel on both sides, with the cutting burr on the top side.

A traditionally ground scraper is usually held nose-down to prevent it from catching, even though this angle tends to self-feed. The negative-rake scraper has no tendency to self-feed. Note that you must never hold any scraper nose-high, with the handle down, to avoid a dangerous catch.

Always scrape in the direction of the supported ends of wood fibers (**4, 5**). Near the center of the platter or bowl, where the wood fibers are flat, the tool may be moved in either direction, from center toward rim, or vice versa. However, closer to the rim scrape only downhill from rim toward center, to avoid tearing into the ends of unsupported fibers.

The technique is the same for bowls and platters, though for bowls much more of the

4. Negative-rake scraping — The handle is held horizontally and the tool blade is flat on the rest, with the burr on the upper side of the blade and at center height. The shavings look like fine hair, not dust. The scraper, which has a slight convex curve to follow the platter, will ensure there is no central dimple, ring, or nub.

5. Trouble zone — It's difficult to sand where the center of the platter rises to the rim because it's alternately sidegrain and endgrain, twice per revolution. Sidegrain abrades more rapidly than endgrain, plus it's almost impossible to sand through endgrain tearout. Negative-rake scraping can remove every speck of tearout.

scraping must be done downward from rim toward center. Move the toolrest inside the bowl, keeping the overhang under an inch.

Negative-rake sharpening

The burr on the negative-rake scraper is delicate and wears away quickly, but it can be reground in seconds. Particle metal tools stay sharp longer than high-speed steel (HSS) tools. The burr on HSS works well, it just won't last as long, needing more frequent grinding. Negative-rake carbide tools are available; I don't use them because they cannot be ground to the precise shapes I need, and they have no burr, therefore requiring excess pressure to get them to cut, producing more damage than good.

It's essential to keep the negative-rake scraper very sharp. If it needs any pressure to cut, it is dull and liable to damage the surface. I grind scrapers at the same angle top and bottom, so the cutting edge is symmetrical. With the grinding platform around 22° to 23°, the included angle is around 45°. I always grind both bevels so the cutting edge stays centered, and I always feel the cutting edge after grinding to make sure it's sharp with a good burr.

The burr, which is essential to good results, is on the upper side of the cutting edge when the tool comes off the grinder, and the tool is placed burr up on the toolrest. Between cuts, I'll frequently touch the cutting edge to be sure it's still sharp. And when the burr is gone, I regrind immediately. ❐

Explore!

Click the blue boxes, or scan the QR codes, to follow the links and read two related articles by Tom Wirsing...

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Negative-rake scrapers and that burr

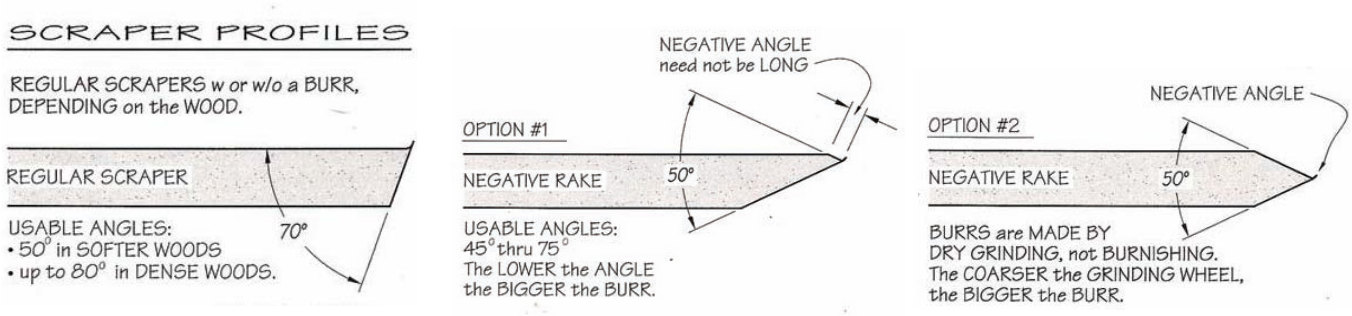

Illustration by Angelo Iafrate

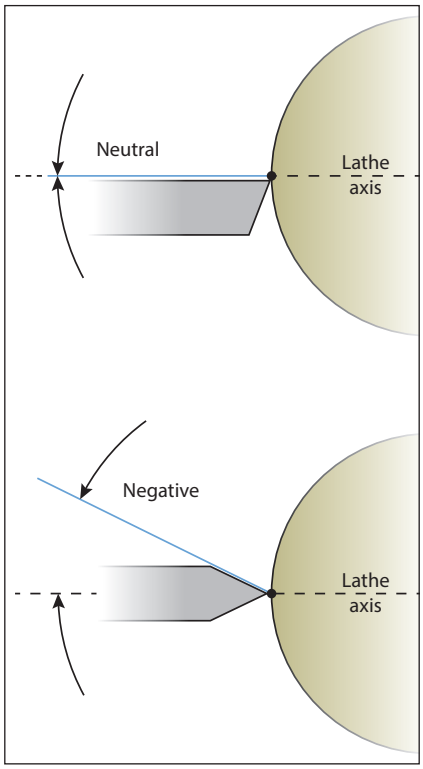

Illustration by Robin Krats

What is negative rake?
Rake angle is measured from the level lathe axis to the cutting surface.

Text by Stuart Batty, a third-generation woodturner. A version of this article appears in American Woodturner *v21n01.*

Negative-rake scraping is most suited for medium to extremely dense woods; it is ideal on oak, yew, cherry, ash, and most exotics. It is not suited for soft woods like redwood or some types of spalted maple. You can achieve better results in these woods with a regular scraper.

Negative-rake scraping relies on one essential element: the burr. When the blade is ground on the top at an angle and then ground from beneath to produce a burr on the upward edge, the burr does all the work. This is an excellent way to refine shape and remove small tool marks.

Negative-rake scraping is an easy technique to learn and a great way to get accurate shapes and thickness. Here are a few turning tasks that are ideally suited for negative-rake scraping:

- finishing the end grain on the inside of a bowl or goblet;
- finishing the end grain on the inside of a box;
- finishing the outside of a bowl with side and end grain;
- turning where space is restricted;
- turning square bowls.

Unlike a traditional scraper with a burr, negative-rake scraping is not an aggressive cut—even on dense endgrain. However, it is not a bulk removing technique, because the cutting life of the burr at the tool edge is short.

It is essential that there is a burr present on the cutting edge. Once the burr has been worn off, the scraper will not work well and will usually start tearing the grain. This is because you have to apply too much pressure to keep it cutting.

Unlike regular scraping, negative-rake scraping does not require the handle to be higher than the blade, nor tilted/trailing like shear scraping. However, do not drop the handle too low or it will catch. ❐

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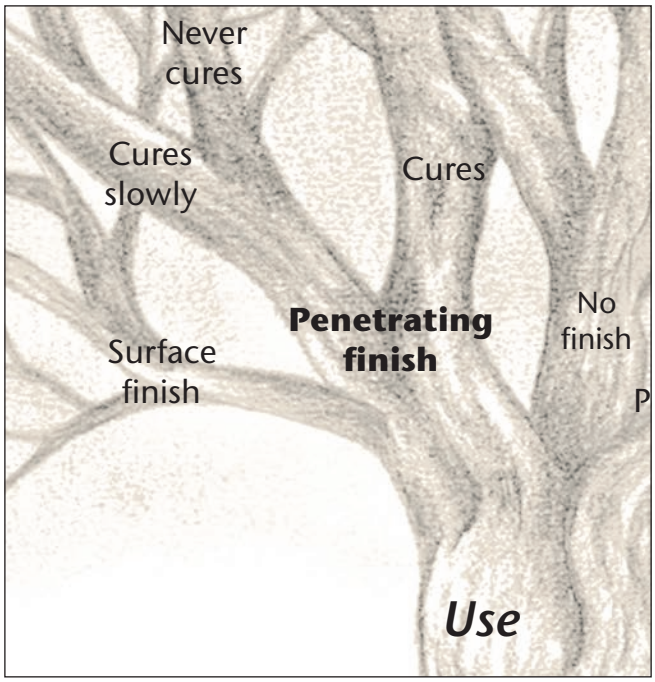

Finish decision tree — Mark Palma's finishing decision tree, featured in *FUNdamentals* V8n1 for February 2019, suggests that penetrating oil finishes are best for turnings that will be used.

Soft shine — Oil finish on a dense hardwood can easily be buffed to a soft, touchable luster. Below, porous woods like red oak may not develop a sheen when finished with oil.

Penetrating oil finishes

by Mark Palma

Penetrating oil finishes offer woodturners a form of protection to turned work, while allowing the texture and natural feel of the wood to be enjoyed. For many turners they are the go-to finish for projects that will be handled and used.

Surface finishes form a film that sits on top of the work. Penetrating oils are absorbed at a cellular level, with the surface of the wood being what we see and touch. This article will explore what penetrating finishes are, some of their myriad products and characteristics, some application techniques, and living with work that has a penetrating finish applied to it. With some simple instructions, the finishes are applied in a straightforward manner and are repairable by the recipient of the turned work.

All oil finishes may not be the best choices for every turner. They can be considered in the following categories:

- non-hardening oils,
- slow curing oils,
- curing oil finishes,
- oil and wax blends.

Non-hardening oils
— These oils are not truly finishes, but temporary coatings that will need to be renewed often.

Non-hardening oils

Some penetrating oils do not harden and therefore I do not recommend them as finishes. These include:

- mineral oil,
- "butcher block" oils,
- fruit oils (lemon, orange),
- cooking oils (and untreated walnut oil).

These oils should be thought of as temporary coatings, but really they are not a finish. Cooking oils, with the exception of walnut oil, actually can harm turned work. All the non-hardening oils lack durability to survive in use, even when subjected to undemanding environmental conditions. If you apply a temporary coating as a finish, the constant care and renewal ritual will cause the user to finally give up and not maintain the turned work.

The Mystique of Oils

Some turners finish with mystery oils they hold as a closely guarded secret. And like the snake oil salesmen of the Old West, some oils claim unique properties. But here is the real secret of oil: Although they smell different, have some different application traits, come in different packaging, may be more or less stable once opened, have different viscosities, are easier or harder to use, or are more or less expensive, the user cannot tell which oil is on the turned work.

When properly applied, the natural beauty of the wood is enhanced and the figure pops. However, the unobtrusive nature of the oil finish makes it invisible to the user. Users do not realize how the wood appeared before the oil was applied. They only see the enhanced look of the turned work with no visible finish on the wood.

Slow curing oils

My grandmother always said "patience is a virtue," but surprisingly she lacked that patience when I did stupid things. Two types of oils are very slow curing. They are:

- raw linseed oil, and
- pure tung oil.

These products, if fresh, take up to 30 days to fully cure. If the finish is old or contaminated, it may never harden. So I do not recommend using these slow-curing oils for turned objects. With so many great finishes available, these two can be easily avoided.

Favorite oils – For many woodturners, oils and oil mixtures like these are the go-to finish for objects that will be handled and used.

Hardening Oil Finishes

This category of finishes is the real workhorse for turners wanting a penetrating oil finish. Hardening oil finishes have some trait (either natural or man-made) that causes them to transform, after application, from a liquid to a solid. Here is a list of hardening oils:

- tung oil
- boiled linseed oil
- treated walnut oil

However, due to the infinite ways that oils are described and marketed, you will find all types of names and descriptions in the marketplace. So the product may not use these words, or it may have a proprietary name yet contain one of these oils as a main ingredient. Every finish sold is required to have a "material safety data sheet," which may give some hints as to the oil, or at least the type of solvent, present in the preparation, and the percentage of the can that is product versus solvent.

Hardening oils are often said to "polymerize," which means to cure. Some oils (or hybrid blends) are created by heating the raw ingredients in an oxygen-starved environment. When you spread one of these products onto your work, you expose the oil to oxygen and it hardens. Other oils have hardening agents added to them. Prior to 1978 these hardening agents commonly were heavy metals that are hazardous to health. Since 1978 those toxic metals (primarily lead) have been banned and now all penetrating oil finishes are non-toxic once fully cured.

Since the oil penetrates into the work and hardens, it will not leave the work even with daily use in the home. Some penetrate more than others, but the premise is the same.

Traits of hardening oils

Hardening oils are easily maintained by the recipient, and the most user-friendly finish for items that will be used by the recipient. With any finish there are favorable traits and also some potential problems that must be considered. Traits favoring oil finishes include:

- "foolproof" application,
- can be applied either on or off the lathe,
- conveys protection from some environmental elements,
- enhances grain and wood figure,
- cures in a variety of temperature and humidity ranges,
- has an unobtrusive odor when curing,
- is very repairable.

Hardening oils continued...
Other traits of oil finishes that need consideration include:

- oils darken the wood and may change how it looks,
- if the turned work is heavily used it will eventually show wear,
- many oils are flammable and care must be taken in their application and storage,
- some react radically to oxygen and will spoil in the can,
- old or improperly stored finish may never cure, leaving a gummy mess on the work,
- oils will not hide mistakes in cutting or surface preparation,
- most oils do not protect from UV rays,
- oil finish may not leave the glossy surface some people expect.

Hybrid oil finishes — Oils mix well with varnish-type surface finishes, and also with waxes.

Hybrid oil finishes

Oils mix well with some other finishing materials and lend themselves to the creation of hybrid finishes. Marketing hype aside, these seem to go in one of two directions:

- oils mixed with a surface finish,
- oils mixed with wax and solvent.

Oils mixed with a surface finish include "varnish oils", "tung oil blends", "urethane oils", and a myriad of other names. These hybrids all combine some type of penetrating oil and some type of surface finish, mixed with a solvent.

Oils mixed with some type of wax and solvent are typically marketed with the words "oil" and "wax" plus a string of adjectives.

Hybrid finishes should bring the best of all worlds to the woodturner. Unfortunately, some work well and some work very poorly. Many seem to be the wrong viscosity for turned work – either too runny or too thick. Many are wasteful and so much cures in the can that your cost per usable ounce is double what you thought. Some seem way overpriced, particularly once you learn that more than half is just thinner, not finish at all. But, when you find that holy grail finish, you love what it can do for your work.

Many turners make their own hybrids as a cost-effective alternative to premixed hybrid finishes. Lots of recipes exist. Like hybrids themselves, some are great and some are gimmicks.

One note of caution in using an oil and wax blend — the finishes may be incompatible with other finishes (particularly any surface finish) because of the wax. So if you use an oil and wax finish, or apply wax on top of an oil finish, you have contaminated the work and cannot use a surface finish as a top coat. This happens when people use a buffing system with the last wheel carrying a carnauba-based wax.

Setup for oil finishing – Before you start, assemble tools including lint-free cloths, gloves, small disposable brushes, and a working container such as a yogurt cup. Note the opened date on new cans of finish.

Setup for oil finishing

With any finishing project, wear appropriate personal protection equipment. In my shop I wear safety glasses, a dedicated finishing apron to keep sawdust out of my finish, and disposable gloves. A large tempered-hardboard panel covers my workbench, with large sheets of clean cardboard as surface protectors.

Your surface preparation should be consistent with the ultimate use of the turned work. Daily wear turned objects work well with 320-400 grit as the final sanding. On the other hand, I have sanded some presentation pieces through 4000 grit before applying oil. So consider your goals early in the project.

Buy finishes in sensible quantities that can be consumed in 6 to 12 months in your shop. Only buy cans of finish that are fresh — look for dust on the cans or store shelves. Many finishes have a date code imprinted on the can, and calling the manufacturer will give you their date coding methodology. This matters — I have encountered finishes that were four years old sitting on a shelf.

Write the date you open the finish on the can with magic marker and keep your finish fresh. You can tell if oil finishes are bad either because they are solid in the can, or are gummy on the work and do not cure.

Always pour your finish out of its original can and into an application container so that you do not contaminate your supply. Yogurt cups work well. Wipe the can opening clean because spilled oil will cure on sealing surfaces and prevent proper closure. Teflon plumbing tape or petroleum jelly works on threads to keep them from sticking.

Use an application method that is right for the turning. For large, uninterrupted areas like the sides of bowls and platters, a 3” to 6” (7.5 to 15cm) lint-free cloth works well. Disposable flux brushes work well for detail areas and natural edges, because they allow the oil to flow into cracks, voids, and places where a cloth can’t reach. Avoid large applicators that absorb more finish than the work itself.

Applying the oil finish

Penetrating oil finishes often work best by saturating the work, letting it sit for 15 minutes, then wiping on a second coat. Wait another 10-15 minutes then wipe off any excess finish.

Open grain woods may bleed oil out of their pores for several days. In these circumstances, you will need to check the work every day. The goal is to not allow any oil to pool on the surface of the wood, but also not to have any areas that look dry or dull. With some woods, and in particular burls, this may take many applications and wiping cycles to get a uniform finish.

Oils take time to cure so have a plan to support

the work for maximum air circulation. Setting work on chopsticks or upside-down on a paper cup may allow the finish to cure better.

Do not rush the curing process. In my shop I apply the oil twice 15 minutes apart, then let it sit three days before the next application (if needed). Humidity and temperature will impact cure time; in normal conditions the first application cures on this timetable. I then wait a week after the second application to see if a third is necessary. When all done, I let the work sit a month on a pair of chopsticks to allow the finish to fully cure.

Finishing renewers — Most oil finishes can be renewed by the end-user, with the aid of products like these.

Any modern penetrating oil finish is food safe after 30 days, so plan ahead when making gifts. After 30 days carefully inspect the piece. If it is for display it may benefit from buffing. If it is for use in a home, it probably needs nothing, but I often put on a coat of wax. Wax is a nice complementary finish with oils. It provides some surface protection but is unobtrusive to the oil finish itself. Sign the work and be proud.

Wet sanding

Some work responds well to wet sanding the penetrating oil finish into the wood. First, coat the work with oil as you normally would. Then using one grit finer that your last sanding (for example if you sanded to 320, use 400) dip silicon carbide abrasive (black auto body paper) into your yogurt cup of oil and proceed to sand the oil into the work.

Keep the paper wet with the oil and hand-sand the work with the lathe off. Good music helps you have patience. Spend 10-15 minutes to do the entire piece. You will be surprised to see the yogurt container empty of oil and the wood seem to look dry, despite all the oil you sanded into it.

Consider all cloths and applicators for oil finishes as flammable and dispose of safely. A simple way is to spread them on the ground outdoors to dry for several days. Then you can toss the dried rags into the regular trash.

With each piece of oiled work I include a small bottle of walnut oil and use and care instructions. It is a small thing that adds another element of value to your work.

Oils in my shop

So, what oil finishes do you find in my shop? I have probably tried 50+ different finishes in my finishing journey. It helped that my family had a hardware store. I like one oil finish you can find almost anywhere, Watco Natural Danish Oil, in a quart can (no larger). I also order Mike Mahoney's Walnut Oil (it has been treated so it cures) and sometimes Odie's Oil.

A little Odie's goes a long way so a small jar takes a while to use up. It is susceptible to curing in the jar, so once you open it, have a plan to use it up soon. Odie's oil has a distinct odor that I like, but others might not agree.

Mahoney's Walnut Oil has been treated and it does crave oxygen, so much so the bottle sides tend to collapse in after you take some oil out. It is easy on your skin, cures, and gives a nice finish.

❐

Mark Palma lives in Cameron, WI.

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The Danger Zone

The Danger Zone is the space directly behind and in front of the workpiece. It is the firing line, where the workpiece would be most likely to travel if it were to fly off the lathe.

Don't be in the Danger Zone when you first turn the lathe on, and keep your hand on the switch while the motor revs up, in case you need to turn it off fast. When observing someone else turn, stay out of this zone. When turning irregular, unbalanced, or unsound wood, train yourself to keep your head out of the Danger Zone.

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