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Contents

APRIL 2020 | VOL. 40, NO. 2

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■ Build

28 Out of the Ashes

A look at Ken Richards' life in woodworking.

BY ASA CHRISTIANA

38 Single Oval Library Table

This classic reproduction of a Limbert Arts & Crafts design is simply a stunner.

BY WILLIE SANDRY

50 Crate Chair

Gerrit Rietveld's straightforward design for a lounge chair is a great platform for exploring ergonomics.

BY ANDREW ZOELLNER



28



38



50

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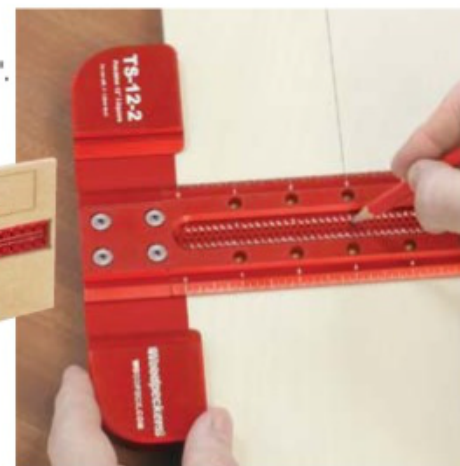
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- CSP Clamps add speed & convenience.



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- Perfect for pens & other small turnings.
- Square, round and detail tools available individually or as a set.



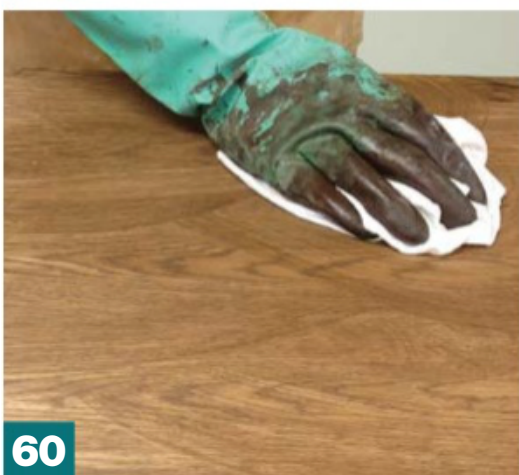
Pen-Size Woodturning Tool Set\$219.99

Contents

APRIL 2020 | VOL. 40, NO. 2

Popular
Woodworking

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■ Connect

06 From The Editor

A little bit every day.

BY ANDREW ZOELLNER

08 Workshop Tips

Dowels, corner clamps and more handy advice.

14 Tool Test

New machines from Harvey, the Dust Deputy bagger and a super handy square.

16 Turning

How to make a pepper mill.

BY ALAN LACER

21 Techniques

Butterfly keys made easy.

BY ASA CHRISTIANA

■ Craft

54 Jigs & Fixtures

Elliptical routing jig.

BY WILLIE SANDRY

60 Flexner on Finishing

Fixes for common finishing problems.

BY BOB FLEXNER

64 End Grain

Please take off your shoes

BY YOAV LIBERMAN

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New 15" 3 HP PLANER WITH SPIRAL CUTTERHEAD

- Motor: 3 HP, 240V, 15A, single-phase
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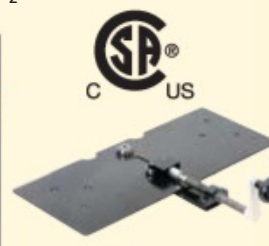


W1863 15" 3 HP Planer w/ Spiral Cutterhead

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- Cutterhead speed: 7000 RPM
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- Belt speed: 4500 FPM
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■ FROM THE EDITOR

Bit By Bit

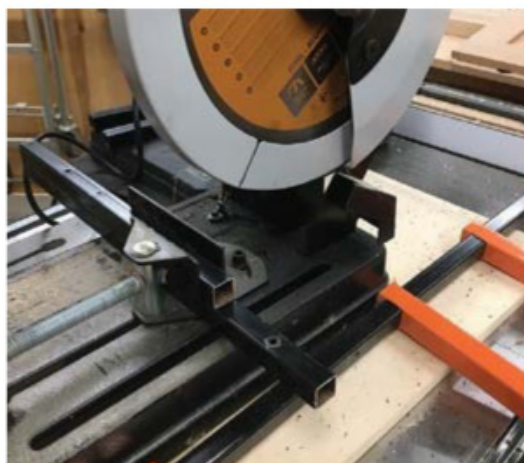
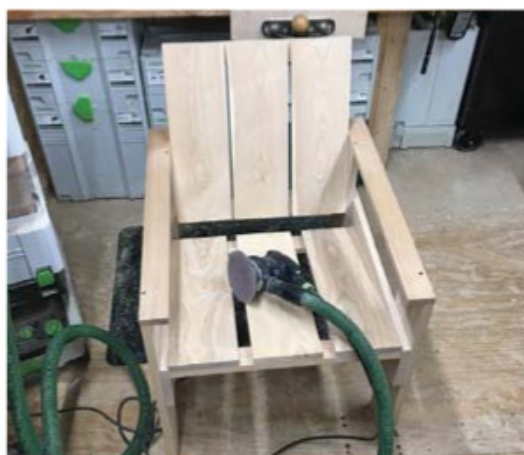
By Andrew Zoellner

If it were up to me, I'd be able to divide myself into two parts. One would focus on my family, health and career, and the other would focus on making great furniture. Unfortunately, that's impossible. So, I've done the next best thing: I've publicly declared that I'm going to woodwork every day this year, all those other things be damned (see issue #251). And it's actually working (so far).

So much about woodworking is learning new skills, trying things, failing, learning from failure, trying again and succeeding. Yes, reading and learning about woodworking is important. You really can learn a lot about how to approach projects and what to look out for when starting out. But it doesn't get real until it's you, in your shop (or back porch or spare room or driveway) with a pile of wood, some tools and an idea.

And that's where I've been spending at least some of my time every day since the beginning of the year. The first few days were surprisingly the hardest. A flurry of gift-making at the end of last year had left my shop in disarray. But simply cleaning and organizing didn't qualify as woodworking (at least in my mind). But making projects for the shop does, and that's where I started.

After a week, my shop was better organized, cleaner and I was able to try a few ideas I'd been thinking a lot about. After cleaning up a corner of the shop, I'd reward myself with turning a leg or spindle. After 10 days straight with shop time, I start-



Want to see what I'm up to in the shop each day? I'm keeping myself honest on Instagram. You can follow me @andrewzoellner and #365daysofwoodworking.

ed to have epiphanies about how to move things around and make it a nicer place to spend more time. Most days, I didn't even mind the January cold (made slightly better with some radiant heaters).

With the shop in better shape, it was time to start making stuff with no excuses. Thankfully I have a bunch of house-related projects that require some time building in the shop—a built-in pantry with a bunch of drawers, frame and panel sides stained to match an old oak buffet, even some precision trim work to make new windows appear part of the original construction.

I've also rediscovered that many projects have down time (waiting for glue and finish to dry, milling

and acclimating lumber to the shop, etc.). And there's no reason you can't have multiple projects going. In fact, forcing myself to be in the shop everyday has helped me chip away at projects that once seemed overwhelming. Having time in between steps to think through what happens next, or being able to simply walk away when things aren't going as planned is a bonus. It's all progress, working toward becoming a better woodworker every day, bit by bit.

P.S. Want to tell me something? Contact me here: azoellner@aimmedia.com

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WORKSHOP TIPS



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Good light is a must in every workshop, but sometimes I need a little extra light in just the right place. To make my light/magnifier more portable, I drilled a hole in a handscrew to fit the light's post. Now I can clamp the light to any of my benches, stationary tools, or shelves.—*Edward Hansen*



Clamping Dowels

I recently made a couple boxes with finger joints. I didn't have enough clamps to glue both boxes at once, so I decided to use band clamps. During my dry run, I discovered that the bands wouldn't allow the joints to close. To fix this, I put a dowel on each side of each joint to keep the band clamp clear of the corners. —*Mark Thiel*

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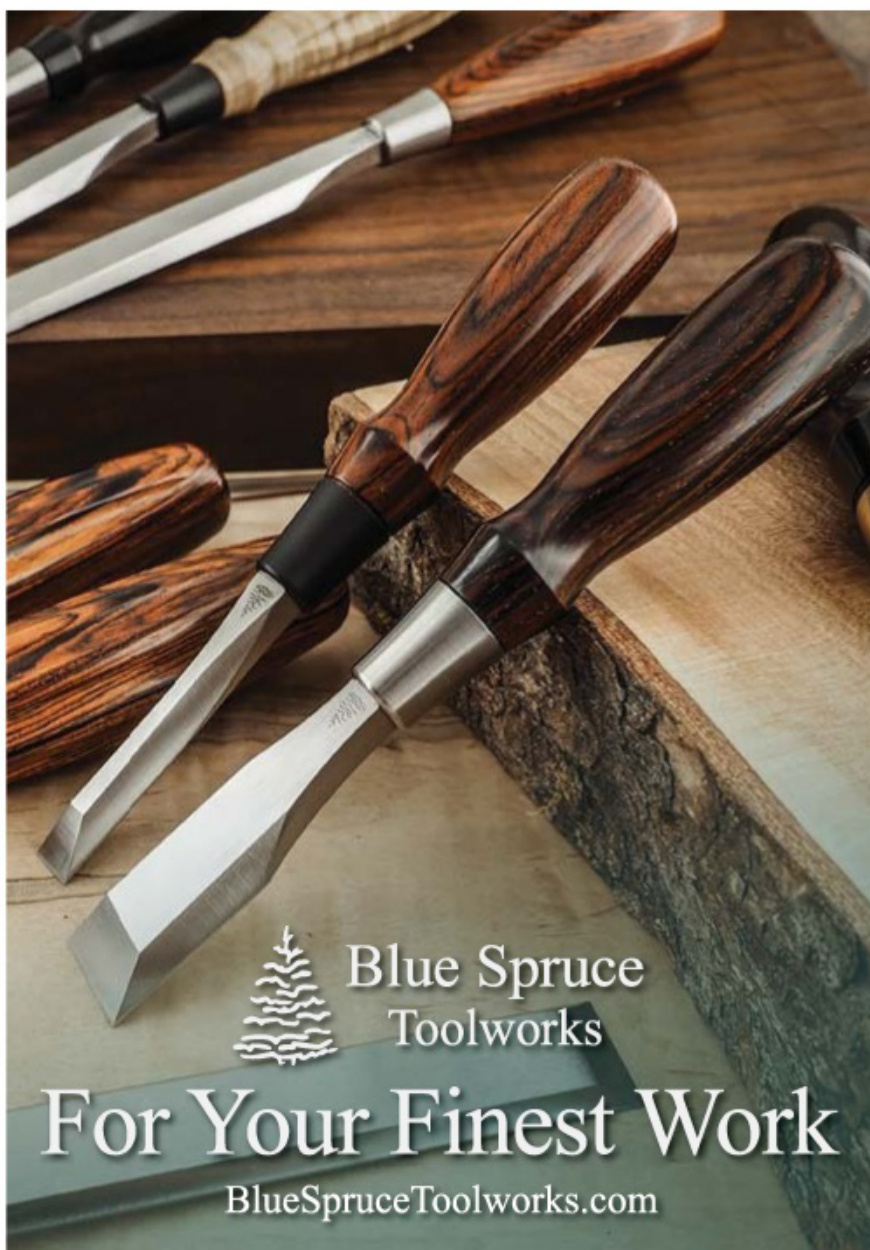
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Friction-Free Resaw Fence

Re-sawing a board is tricky. Most blades drift, so that you must angle the board to get a straight cut. Standard bandsaw fences can't be angled to compensate for drift, so many folks use a single-point fence instead, like this one. The point on my fence is a tall stack of machine bearings, which gives me effortless, resistance-free cutting.

To build the fence, you'll need a $\frac{5}{16}$ " steel rod, $\frac{5}{16}$ " i.d. bearings, $\frac{5}{16}$ " i.d. washers, a base 6" to 8" wide and as long as the depth of your saw's table, an upright (its height depends on your saw's capacity), and a hardwood cap to house the steel rod and hold the bearings in place. The steel rod and washers are available at any hardware store for a few bucks. (Try an auto parts or surplus store; the exact i.d. and o.d. of the bearings aren't particularly important.)

Drill a $\frac{5}{16}$ " hole at the base's point to house the steel rod's bottom end. Position the hole to allow the bearings to overhang the point by $\frac{1}{8}$ ". Glue and screw the upright to the base, $\frac{1}{8}$ " behind the bearings. Insert the rod in the base's hole and stack the bearings with a washer between each one. Insert the top end of the rod in the cap's hole, and then screw the cap to the upright, making sure it's positioned so that the bearing stack is square to the saw's table.—*John English*



Board-Stretching Joint

I bought a planer/molder so I could make my own moldings. My living room required one 28'-long molding, but all I had to make it were 12' boards. I didn't want to settle for separate 12' molding sections mitered during installation. I wanted this molding to be one continuous piece. Joining the boards with diagonal scarf joints before molding them was the solution.

To make a scarf joint, lay out the angles using at least a 4-to-1 ratio—4" of run for every 1" rise. Increasing the ratio strengthens the glue joint. The joint will be incon-

spicuous if you match the boards' grain direction and pattern. Use your handsaw or a circular saw to cut the angles. Then joint the edges by attaching a fence and routing with a flush-trim bit.

Glue the boards together on a flat surface. Install the clamps perpendicular to the joint to keep pieces from sliding. You may have to notch the edges of the boards to hold the clamps at the proper angle.—*Dave Olson*



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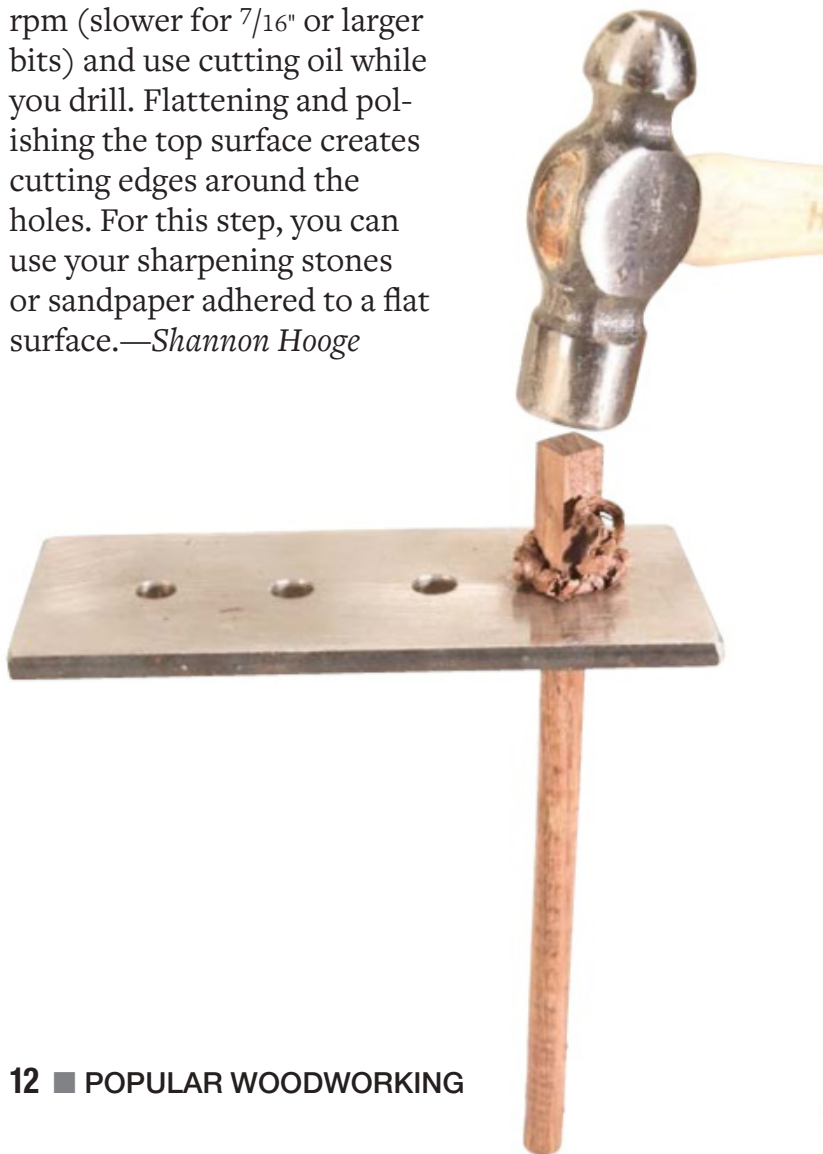
Make Your Own Dowels

I never seem to have the right dowel. If it's the correct diameter, it's the wrong kind of wood. Rather than stocking dowels of every size and species, I make my own, using a tool that's probably been around since the Iron Age.

My dowel maker is a $\frac{1}{4}$ " steel plate with holes that decrease in diameter by $\frac{1}{64}$ " increments. Driving a square blank through the series of holes produces a round dowel that matches the smallest diameter. The blank should be no larger than the largest hole; shaving one end to a point makes starting easier. The dowel is roughly shaped at first; successive passes refine it. Dowels made this way are perfectly sized, but they often show some tear-out. They also have to be made in short sections; hammering slender blanks that are longer than 12" causes too much deflection.

Each hole is drilled through from the top and then counterbored $\frac{1}{64}$ " oversize from the bottom. Stop the counterbore $\frac{1}{16}$ " short, so all that remains of the original hole is a $\frac{1}{16}$ "-wide lip at the top. This lip provides the cutting edge. The counterbore provides clearance for the dowel.

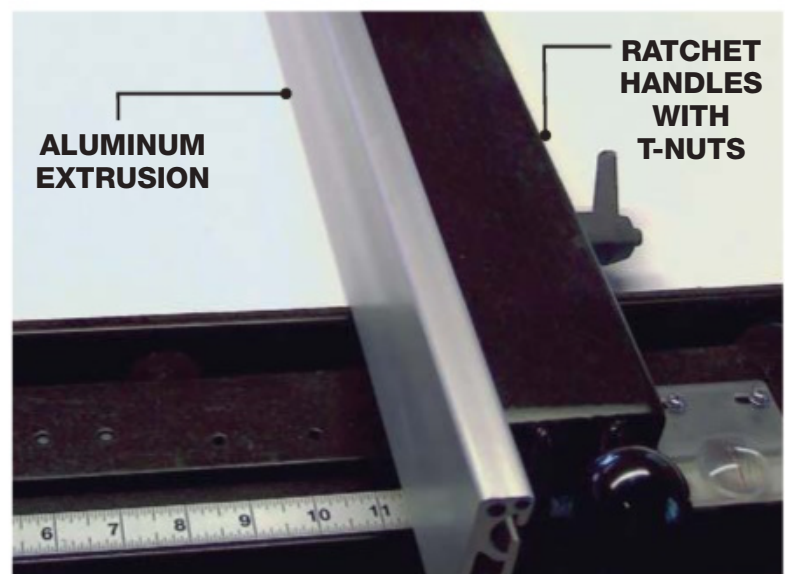
To drill accurately sized holes, you must firmly clamp the plate to your drill-press table and your drill bits have to be sharp. Use a centerpunch to locate each hole and keep the drill bit from wandering. Operate the press at 1,000 rpm (slower for $\frac{7}{16}$ " or larger bits) and use cutting oil while you drill. Flattening and polishing the top surface creates cutting edges around the holes. For this step, you can use your sharpening stones or sandpaper adhered to a flat surface.—*Shannon Hooge*



Fence Face Lift

I never really cared for the HDPE (high density polyethylene) sides on my tablesaw's fence. They built up a static charge and attracted sawdust and wood chips, but more importantly, they weren't straight. To solve these problems, I bought a 3" x $\frac{3}{4}$ " aluminum extrusion with T-slots on one side, three T-nuts, and three ratchet handles.

I removed the HDPE sides of my fence and drilled three holes through the fence's steel tube core slightly higher than $\frac{3}{4}$ " above the tablesaw's surface, so the extrusion wouldn't rub on the table. The T-nuts allow me to slide the fence face back and forth as needed. Besides not attracting sawdust, my upgraded fence is longer, taller and straighter than the original, and a little wax made it slicker than the HDPE. When I need to use the right side of the fence, I just detach the extrusion and put it on the other side.—*John Lutz*



Permanent Clamp Pads

I lost the rubber pads that came with my clamps. I liked the way the pads protected the wood, so I decided to make my own. After a couple dips in liquid plastic (\$9 at a hardware store), my clamps have cushy pads that don't slip off. They work great!—*Randy Barker*





Foam Finishing Stand-Offs

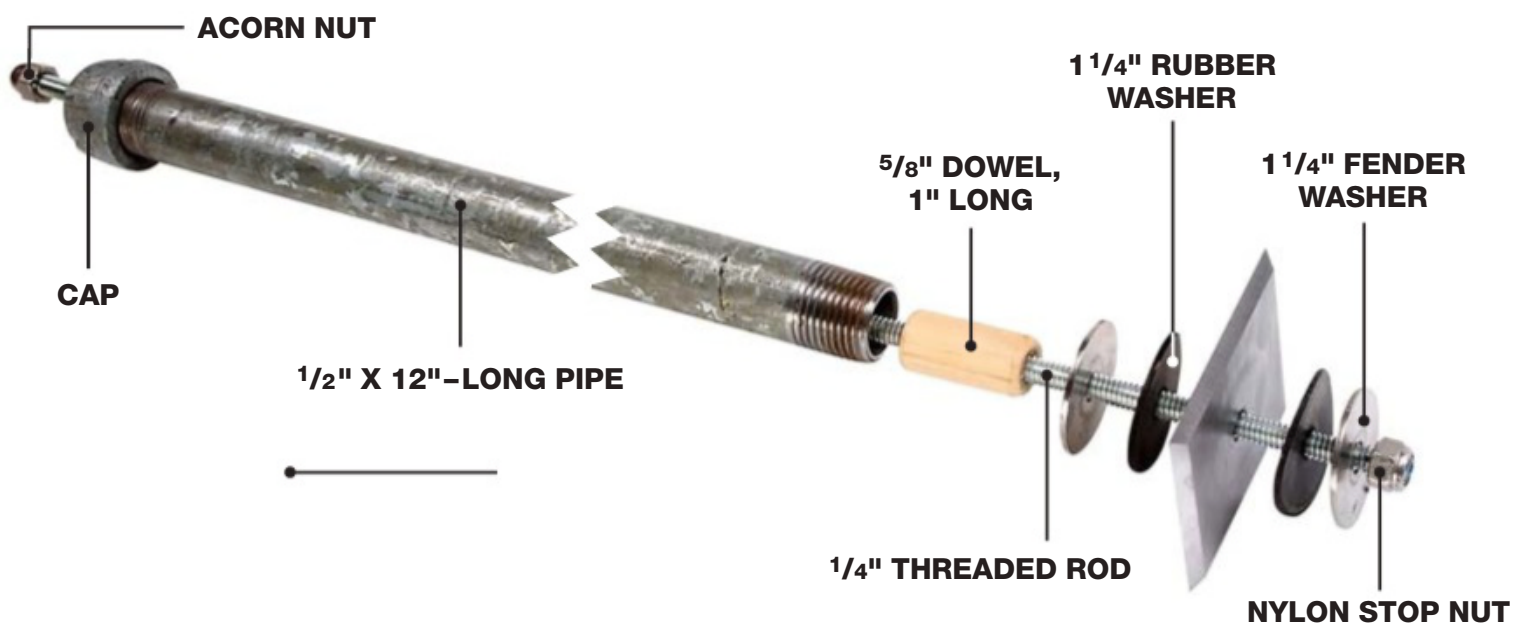
To make a quick and easy drying rack, or to raise a project off your bench while applying a finish, use blocks of rigid foam insulation and drywall screws. For stability, the screws should be no more than $\frac{1}{2}$ " longer than the foam's thickness.

If you simply push the screws through, they'll punch out a chunk of foam on the back side. The answer: Turn them through with a screwdriver. —*John Cusimano*

Heavy-Duty Glue Scraper

It's best to remove glue before it hardens, but sometimes that's not possible. When I face cement-hard glue, I pull out this robust scraper to bull my way through it. The blade is $\frac{1}{8}$ "-thick tempered steel, as tough as a chisel. There's no chatter, because the tool's long body is made from heavy iron pipe. Extra weight and leverage really count!

I ordered the blade through a catalog for about \$8 and bought the rest of the parts from the hardware store for about \$10. The pipe is a pre-threaded nipple. The blade comes with a predrilled $\frac{1}{4}$ " hole, but I had to drill holes through a dowel and the end cap for the threaded rod. The rubber washers dampen vibration. To remove old, dried glue from the blade, I scrape it with a chisel or soak it in hot water. —*Tom Caspar*



TOOLS

New Saws from Harvey

Harvey Tools recently released a new line of shop tools aimed at the hobbyist under the Ambassador name. We got a chance to put both the 14" bandsaw and the C200-30 table saw to work in the shop, and overall, we were quite impressed — especially factoring in the bang for the buck factor.

C-14 Bandsaw

This floor-standing bandsaw has everything most woodworkers want, including a lot of features found on higher-priced saws. It's a steel frame bandsaw with dynamically-balanced cast iron wheels and weighs in at about 350 lbs. The saw has a 13" throat and a 14" resaw capacity. Coupled with a 3HP 230-volt motor (larger than I've seen on most saws this size) and the included $\frac{3}{4}$ " blade, it did a great job resawing wide boards. The resawn surface wasn't as pristine as I've experienced on other higher-end bandsaws, but that isn't a huge deal. When most people are resawing boards, they plane or sand them to final thickness anyway. Under load, the saw was surprisingly quiet with very little vibration at the table.

■ **C-14 BANDSAW, C200-30 TABLE SAW**
Harvey Tools
www.harveywoodworking.com
Price: \$1399 (bandsaw)
\$969 (table saw).

The cast iron table is $19\frac{3}{4}$ " x $15\frac{3}{4}$ ", and sits at about 35" from the floor. The table includes a gas piston to assist in when you're tilting the table, and the rack and pinion tilting mechanism lets you dial in cutting angles from 45° to -15° . The ball bearing guides can be adjusted without tools (both above and below the table), making switching between blade sizes much less of a chore than it is on some other saws. The two-position fence is another nice touch. Two 4" dust collection ports (one below the table and another at the base of saw) keep dust at bay. With a foot brake, quick-release tension lever and even a convenient holder for the Allen wrenches you need to assemble the saw, Harvey has really nailed all of the details on this one. At \$1399, it's priced in the upper range of most 14" bandsaws, but unless you need more capacity, it's likely the only bandsaw you'll need in your shop.

C200-30 Cabinet Table Saw

Upon first look, the C200-30 appears to be a pretty standard entry-level cabinet saw. It has a 2HP 115/230-volt dual voltage motor, a 30" rip capacity, cabinet-mounted



trunnions and a 40" x 27" cast iron table—all the standard stuff you look for. But there are a few key points that really make this saw stand out.

The blade guard is one of the most interesting designs we've seen. To switch from the full guard to the riving knife (for a non-through cut, for example), you don't need to remove the throat plate. There's a little quick-release tab toward the back of the throat that releases the guard or riving knife. Once you get the hang of it, you can switch between the two in just a few seconds. It's convenient and leaves you without excuses for not having the guard on your saw.

The T-square fence is faced with a two-position aluminum extrusion. Upright, the fence functions just like any other table saw fence. In the low position, you can get the fence close to the blade for thin rips without having to remove the guard. Plus, with the built-in cam lock system for attaching the fence, you can easily attach auxiliary fences for specialized tasks without having to use external clamps.

Dust collection points on the saw are also well thought out, with both above and below the blade collection. The enclosed guard connects via a hose to the 4" below the table dust collection point. The dust collection port is located on the right side of the saw (not the back)—that means you can butt the saw right up to a cabinet or out-feed table without worry about dust hose clearance.

Here's the kicker: the saw retails for \$969. With the features this saw includes, that price is hard to beat. Much like Harvey's bandsaw, it's an excellent tool for the price. And, if you need more power or capacity, there are two other table saws in the Ambassador line.—Andrew Zoellner

Dust Deputy Bagger

Oneida's Dust Deputy separators are an excellent upgrade for shop vacuums, especially in the shop. The cyclonic action separates out the majority of the dust

■ Dusty Deputy Bagger

Oneida Air Systems

oneida-air.com

Price: \$129.95

and chips into an auxiliary container, so you're emptying your vacuum much less and its filter stays cleaner longer. The newest offering from Oneida takes the Dust Deputy design a step further, with a wall-mounted separator that separates dust and chips into a disposable plastic bag.

When the vac is running, dust and chips are separated out via the cyclone into the bin below. The bag is sucked up against the bin (and no dust or chips are going into the bag). But when you turn the vac off, the accumulated debris falls into the bag. And, because the suction action of the vac effectively seals the bag, none of that accumulated debris is sucked back into the vacuum on subsequent uses. The first time we turned it on, we thought something was wrong (because we hadn't read the directions), but it worked just like it was supposed to.

The package includes five clear 3 mil thick bags, and they recommend you replace the bag when it's about two-thirds full. It's much more convenient and easier on the lungs than trying to empty a full shop vac, and the wall-mounted system makes it great for general clean-up and dust extraction duty in the shop.—AZ



A Square for Woodworkers

This gem of square has become a go-to for use around the shop. Taking its design cues from the common rafter square, the compact size is a much better fit for wood-working than its larger cousins.

■ 4 1/2" Trim Square

Milwaukee Tool

milwaukeetool.com

Price: \$10.97

The aluminum square is laser etched (light colored readings on red) for high visibility. The heel is 1/4" on one side and 3/8" on the other. The scribe notches are in 1/8" increments (useful for scribing trim and cabinetry on an install). The square fits easily into a back pocket or tool apron, and it's made in the USA. It's the best \$11 I've spent on a tool in a long time.—AZ

Pepper Mills

Turn a useful and beautiful object.

By Alan Lacer

When it comes to pleasing the senses, a well-turned pepper mill has a lot going for it. It pleases the eye, is comfortable to hold and feels smooth to the touch. Of course, there's always that wonderful taste and smell that only fresh ground pepper can deliver. Keep these things in mind as you follow me in creating your own pepper mill.

Your first consideration is the mill mechanism. Mills come in lengths from 3 inches to 24 inches with 8" and 10" being the most popular. For this story I used a 10" mechanism with a nut on top.

You can also get mechanisms with crank handles, mechanisms that adjust from the bottom (no nut on top), or mechanisms that crush rather than grind. My rule of thumb; buy the best quality mill mechanism available. In other words, don't try and save money here. The time and effort you invest are the major costs involved and a poor quality mill will only make your creation frustrating to use.

Your next step is to select the wood. Domestic woods such as walnut, cherry, and maple are a good choice for pepper mills. Tropical woods are another choice. I used Hawaiian Koa for the mill in this story. The wood blank should be 2 1/2" to 3" diameter and 1 1/2" to 2" longer than the mill hardware to allow for waste.

The way I turn pepper mills often varies from the instructions that come with the mill hardware. The instructions are useful for some critical dimension and assembly guidelines. Don't get frustrated if the first couple of mills you turn aren't perfect. I think you have to turn five to ten mills before you can develop your own system and refine your shapes.

Prep the Blank

1 Cut the wood blank 1 1/2" to 2" longer than the hardware, to allow for waste and a tenon between the cap and the body.

2 Cut the block of wood to separate the cap piece and the mill body (*Image 1*). I like to place the tenon on the mill body, because it makes the cap a little lighter. I usually cut about 1 3/4" off the blank for the cap and allow for a 3/8" to 1/2" long tenon on the body.

3 Turn all three pieces to cylinders. Then cut tenons on the top of each one to fit your scroll chuck (*Image 2*).

4 Mount the base tenon into the scroll chuck. Face off the end of the body with a parting tool, to make it square to the sides and flat.

Drill the Body

5 Place a Jacobs-style chuck in the tailstock. Remove the tool rest and slide the base toward the headstock. Wear a full faceshield for all drilling operations.

6 Drill a 1 5/8" diameter hole to a depth of 1/2" (*Image 3*). You can also cut this hole with a parting tool or a skew chisel held flat on the rest in a scraping mode.

7 Place a 1 1/16" bit in the Jacobs-style chuck and drill about three-quarters of the way through the body (*Image 4*). Work slowly and back the bit out frequently to remove chips or the bit may overheat. Excessive heat can ruin your bit and possibly crack the wood.

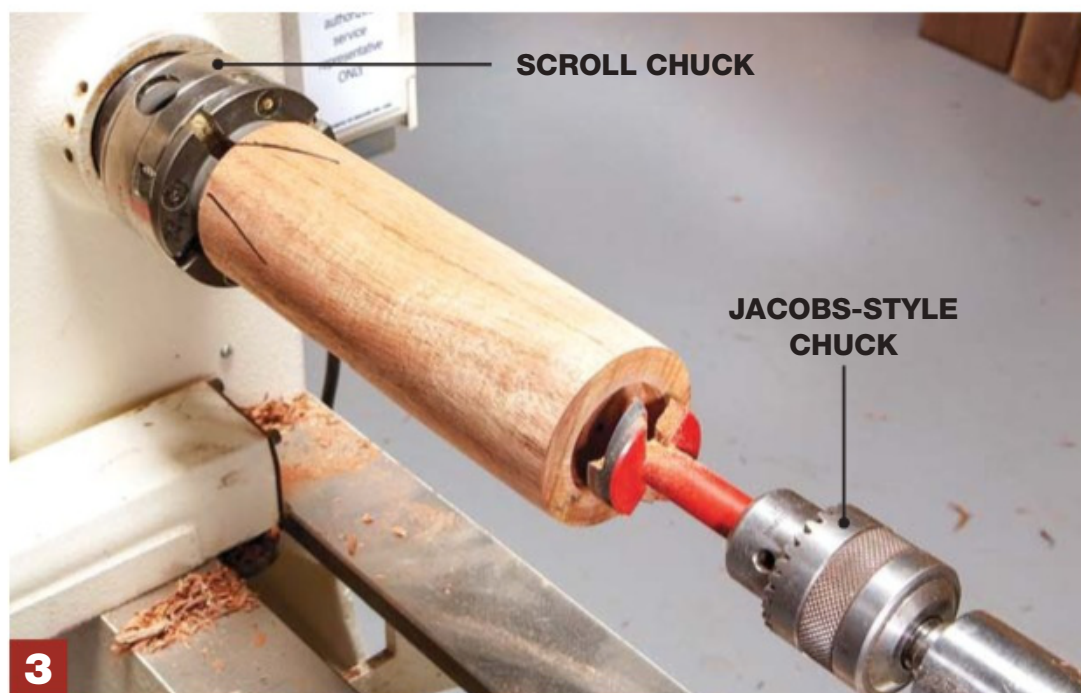
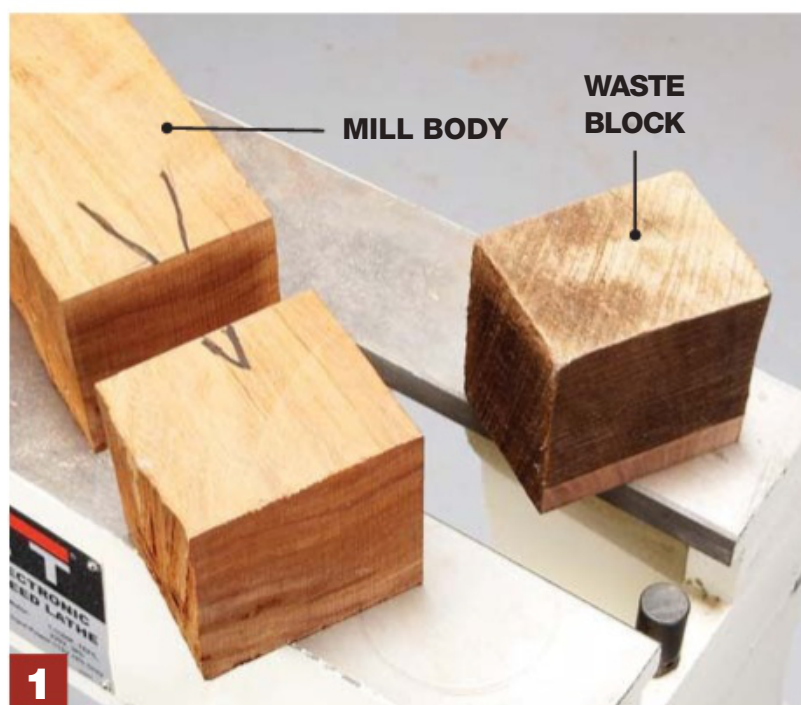
Alternate Method: The 1 1/16" hole is required only for the first 1" above the 1 5/8" hole. You can drill the body using a more common 1" bit and then widen the hole for that lower 1" section with a round nose scraper.

8 Clean up the bottom of the mill body using a skew chisel held flat on the rest to lightly scrape the end grain (*Image 5*). The base should be flat.

9 Mount the waste block into the scroll chuck. Create a tenon for a jam fit with the large hole on the mill body (*Image 6*). The length of the tenon is slightly less than the hole's depth. The fit is critical. It



PHOTOS BY THE AUTHOR



1 Cut the pepper mill blank to separate the cap from the body. Place a large “V” over the cut area to help keep the parts correctly oriented. Cut a 1 1/2" long waste block for chucking and drilling.

2 Cut tenons on the tops of all three pieces. Make another orientation mark after the cylinder is formed.

3 Mount the mill body in the scroll chuck by its tenon. Drill the 1/2" deep hole at the bottom of the mill body with a 1 5/8" bit in Jacobs-style chuck.

4 Drill the smaller 1 1/16" hole approximately three-quarters of the way through the body. Tall pepper mills like this one, may require a bit extension. A piece of tape indicates the stop point.

5 Scrape the end grain on the bottom of the mill body. Use a light touch and keep the skew chisel flat and horizontal on the rest.



must be tight enough to hold the mill secure for turning, but loose enough to remove the body without undo force. Approach the diameter sizing carefully — as every cut is double. In other words, if you push in $\frac{1}{32}$ " you remove $\frac{1}{16}$ " of diameter. The shoulder of the waste block tenon should be flat or slightly concave.

10 Mount the mill body on the waste block and finish drilling the $1\frac{1}{16}$ " hole from the top (*Image 7*).

Shape the Body

11 With the interior work complete, it is time to turn the outside of the body. First, turn a small cork-shaped block of wood to fit the hole in the mill body (*Image 8*). This will allow you to use the tailstock to support the body. On some lathes, there may be a tapered cone area on the tailstock's center that will fit the $1\frac{1}{16}$ " hole. There are also large after market cones available that function much like my wooden cork.

12 With the plug in place, bring the tailstock up and turn the body to the desired shape. I like to make the diameter of the body larger at the base than at the top, with a nice inward curve in the middle for the hand. This general shaping is done with a spindle-roughing gouge (*Image 9*).

13 Use a detail-spindle gouge or a skew chisel to do the detail work. I often turn one to three beads at the



6 Mount the waste block in the scroll chuck and cut a tenon to fit the hole in the mill body. The fit must be tight enough to hold the mill body for drilling and turning.

7 Mount the mill body on the waste block tenon — a technique known as “jam chucking.” Complete the drilling from the top of the mill body.

8 Plug the hole with a turned wooden “cork.” With the hole plugged, the tailstock can be used to support the mill body while turning the exterior.

9 Use the spindle-roughing gouge to shape the mill body. Switch to a detail spindle-gouge or a skew for detail work like beads.

10 Sand the completed mill. If the turning went well, you should be able to start with 120 or 150-grit. Continue sanding with finer paper up to 220 or 320-grit or until all scratches are removed.

11 Turn the mill body tenon approximately $\frac{1}{2}$ " larger than the hole in the body. Cut the top and shoulder of the tenon clean and square by scraping with a skew.

12 Mount the mill cap in the scroll chuck. Drill a flat-bottomed hole approximately $\frac{1}{4}$ " deeper than the length of the tenon on the mill body.

13 Drill a $\frac{1}{4}$ " hole through the cap and into, but not through, the tenon. Work slowly, removing the bit and chips frequently to avoid binding and overheating.

14 Determine the final height of the cap by measuring the distance from the tenon shoulder to the bottom of the cap nut. Before you measure, screw the cap nut down all the way then back it off a full turn.

base of the body, and something a bead at the top, where the cap and body will meet—but these are design questions for you, the maker.

14 With the detailing complete, remove the tool rest, put on a dust mask and sand until there are no visible scratches (*Image 10*).

15 Before you remove the body from the lathe, finish the tenon area (*Image 11*). The length is $\frac{3}{8}$ " to $\frac{1}{2}$ ". The shoulder should be flat or slightly concave.

16 Remove the mill body and the waste block from the lathe.

Shape the Cap

17 Place the cap tenon into the scroll chuck. Use the Forstner bit to drill the cap about $\frac{1}{4}$ " deeper than the length of the tenon on the body (*Image 12*).

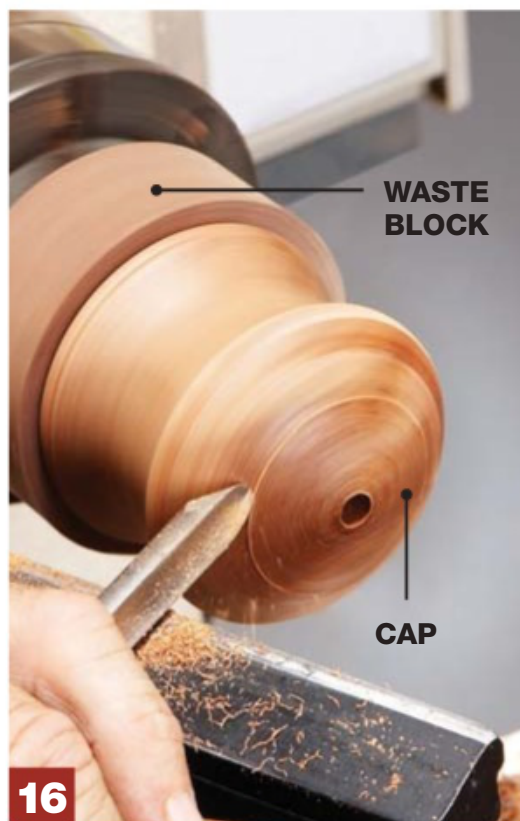
18 Install the $\frac{1}{4}$ " bit in the Jacobs-style chuck and drill through the cap (*Image 13*).

19 Now it's time to compare the hardware dimensions with the mill you have created thus far. Place the mechanism into the body. Screw the cap nut all the way down then, back it off one full turn.

20 Measure to determine the cap's length (*Image 14*).

21 Widen the hole in the cap to fit the tenon on the body. This





Materials List

Wood

- A wood block 2 1/2" to 3" diameter and 1 1/2" to 2" longer than the mechanism
- 3" diameter waste block (grain length wise as the mill) that's 2" to 3" in length

Mill Mechanism

- Suggested size: 10" mill mechanism

Hardware

- Scroll chuck
- Jacobs-style chuck
- 1 1/16" Forstner style drill bit (a 1" bit can be used and the hole slightly enlarged by turning)
- 1 5/8" drill bit (this too can be turned)
- 1/4" drill bit extension
- 1/16" bit for drilling pilot holes for mill mechanism screws (Bit sizes may vary depending on the mechanism used)
- Spindle roughing gouge—any size
- Detail/spindle gouge—3/8" suggested
- Skew chisel—1/2" or larger
- Parting tool—3/16" or 1/4"

15 Shape the outside of the cap with the detail/spindle gouge. The goal is to have something that feels wonderful in the hand and looks pleasant to the eye.

16 Jam-chuck the cap onto a new, larger tenon cut on the waste block. Turn the cap to its final shape and length.

17 Assemble the parts with the supplied screws. These screws are small and break easily so be sure to pre-drill.

fit should be a little loose for easy pepper grinding. I widen the hole for either a parting tool or a skew held flat and horizontal on the rest.

22 Establish the length of the cap by cutting in with the parting tool, about one-fourth of the way down.

23 Use the detail/spindle gouge to shape the outside of the cap (*Image 15*). To check the overall look of the mill I often turn the lathe off and put the body on the cap.

24 Remove the cap from the scroll chuck. Mount the waste block back in the scroll chuck and create a new tenon or jam chuck for the cap.

25 Turn away the remaining waste material on the cap to achieve the final length (*Image 16*). When you're satisfied with the shape and quality of your turning, go ahead and sand the cap.

26 The mechanism I've chosen uses four small screws to secure the mill

in the base. Pre-drill each of the holes with the 1/16" bit. Screw the mill hardware in place. Add the cap and nut and see how it performs.

The Finish

There are several considerations when choosing a pepper mill finish. A pepper mill is a hand-operated tool that holds a food items and is frequently exposed to moisture from boiling pots of gourmet goo. Hands are abrasive and acidic—even when they're clean. Most film-type finishes, including wax, lacquer, shellac and varnish don't wear well on a pepper mill. I lean towards oil or an oil/varnish blend, such as pure tung oil, walnut oil and Danish-oil finishes. **PW**

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Alan Lacer is a turner, author and instructor who calls Wisconsin home. See more at alanlacer.com.

Butterfly Keys Made Easy

Tips and techniques for beautiful bowties.

By Asa Christiana

Furniture made from thick wood slabs, with gorgeous grain and natural edges, at once rustic and refined, has remained popular ever since George Nakashima first introduced it to U.S. woodworkers in the 1950s. Better yet, woodworkers of almost all skill levels can build something with a natural-edged slab.

If you can get your hands on a beautiful slab and find a way to smooth its faces—buying time on an industrial sander or using one of many homeshop methods—you can find a way to showcase your unique find.

While I prefer the thick furniture bases Nakashima favored, which root these tree sections to the earth, others place slabs on welded steel bases, reclaimed industrial equipment, or stylish hairpin legs that simply bolt on.

Enter the Butterfly Key

The main calling card of these beautiful log sections is their close connection to the tree, and natural defects are embraced. Large splits, however, can make big slabs unstable. Nakashima had the perfect answer here too—butterfly-shaped inlays that bridge gaps and splits—a soulful, handmade touch that is both decorative and structural.

Because the inlay is shaped and traced onto the wood, which is then excavated to house it, butterfly keys can be almost any shape or size, and vary from key to key. That means you can, and should, design them to suit the job at hand—as Nakashima did—long and thin for wide gaps, short and fat for long cracks, and so on. Vary the angles and elements beyond the classic profile, and you



Both structural and decorative, butterfly keys add a soulful touch to natural slabs.

Note the curved neck on these graceful keys.

can make an already unique slab completely yours.

While the inlay process is simple in concept, it can be tricky in practice. And the stakes are high: Mess it up, and you get obvious gaps.

Side Taper is the Secret

Stealing a page from the master, I add a slight bevel to the sides of

my keys—roughly 1 degree or so, depending on the hardness of the woods—which makes the inlay process more forgiving. Stray a little with your knife or chisel, and the key fills the gaps as you drive it into place. The wood in the slab compresses a little to accommodate the slightly over-sized key.

The question is how to add that

Butterfly Keys

bevel in a consistent way. If you bandsaw your keys, as most do, you can impart the slight bevel as you smooth the edges on a hard sanding block. That works OK, but I've worked out a more consistent approach.

If you've got a benchtop sander something like mine—an oscillating edge/belt spindle sander, one of the best values in woodworking, in my humble opinion—you can create a new twist on the butterfly key and get perfectly beveled edges in the process.

What makes this sander great for this task is the access it allows to the round drums at both ends of the belt, and also its tilting table. By tilting the table a smidge—or shimming a piece of thin MDF or plywood on

a table that doesn't tilt—and using both ends of the belt to smooth the keys, you get perfectly tapered edges and a gently rounded neck, which I find more graceful than the sharp junction on the classic key. As for the rest of the process, I've got some helpful advice there as well.

Beautiful Butterflies, Step by Step

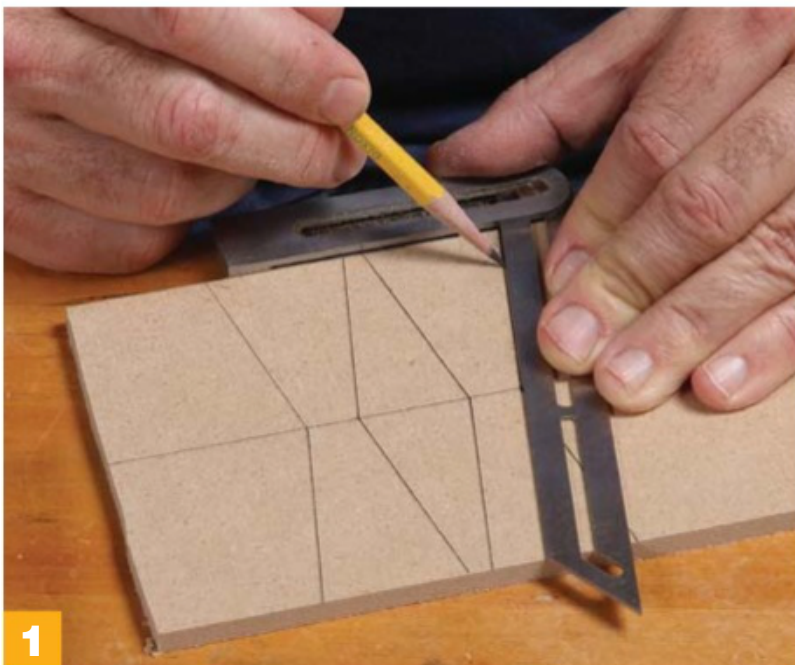
For a start, here are some key dimensions and angles that work well. To create the mechanical strength you need, keys should be at least $\frac{1}{4}$ " thick, or $\frac{3}{8}$ " for big splits in big slabs. Some woodworkers inlay much thicker keys, but I find that to be overkill, and not worth the increased difficulty. If the split goes

1 To lay out key templates in $\frac{1}{4}$ " MDF, use a protractor or bevel gauge to carry 10° lines to a center line.

2 Bandsaw just outside the lines, creating a gentle curve at the middle of each key.

3 Smooth the edges on both ends of a stationary belt sander like the Ridgid's benchtop model. Use a light touch and gently ease up to the neck from both directions, to create a smooth curve there.

4 No sander? In that case, bandsaw your key templates to a sharp junction at the center—the traditional style—and smooth their edges on a hard sanding block. When sanding the actual keys, angle them slightly to bevel the edges roughly 1° .



through the entire slab, I just add a similar key on the back side. As for the dovetail-shaped angles, I find that anything between 8 and 10° looks and works great.

For the side bevels along the edges, 1° is a good target. For very hard woods like maple, or less-forgiving are-as of a slab with knots or wild figure, I ease up on the bevel angles a little, maybe closer to 0.5°. In those cases, I place a flat block over the key as I bang it into place, to help keep it from cracking or splintering upward. In softer slabs like fir or pine, a 2° bevel works well, and hides even more of your subtle mistakes.

As for which woods to use, I like the simple elegance of keys made from the same species as the table-top, but contrast can be lovely too. If you're mixing woods, choose a harder wood for the key, so the slab gives way as you drive it in, not the key itself.

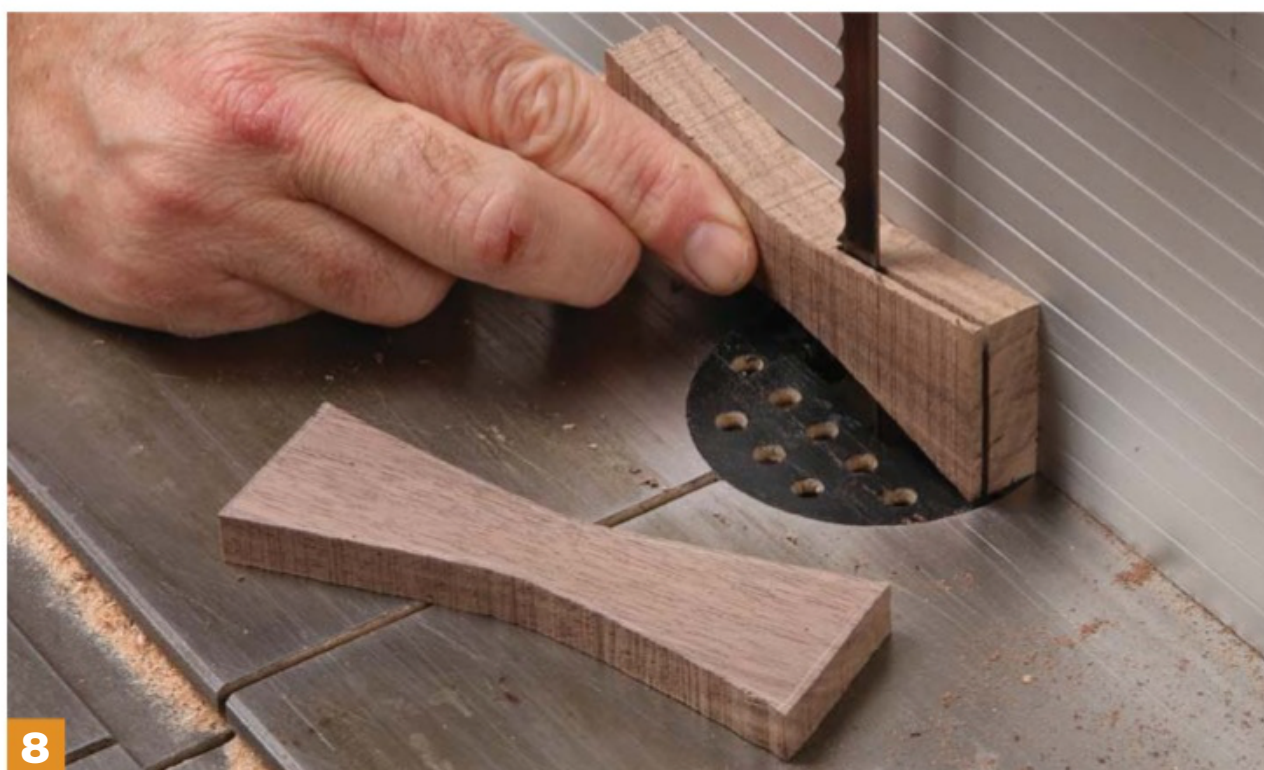
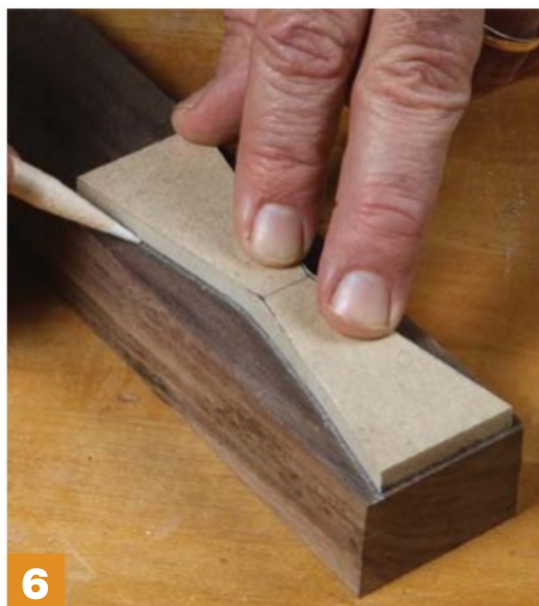
I always use a marking knife to trace my keys. It's a little harder to control than the sharp pencil that some prefer, but the knife hugs the inlay much more closely and leaves a line I can drop my chisel into for the final paring cuts.

Where some simply hold down the inlay while tracing it, I don't trust my shaky hands to keep it stable, and gaps in my furniture keep me up at night. So I use a few blobs of hot glue to lock down each key for tracing.

5 Make templates of various sizes and styles and lay them on the slab to preview the look and placement.

6 Trace templates onto key stock. Use the same species as the slab, or a harder wood if you want contrast. I'm using a soft white pencil here for maximum visibility on this dark walnut.

7-8 Bandsaw close to the lines and rip to thickness. I make my keys 3/8" thick in most cases—plenty strong yet not too difficult to inlay cleanly.





9



10



11



12

9 Head back to the belt sander and tilt the table a hair. 1° works well for most woods. Go a little less for harder species and up to 2° for soft woods like pine and fir.

10 Sand the edges as before, using both ends of the belt to create a smoothly rounded neck in the middle. Hold down the key on the tilted table to be sure the edges are beveled evenly.

11 The ends get beveled too. For safety and accuracy, work against a stop.

12 Apply a few dabs of hot glue, flip the key, and press it down firmly. It will hold tight for tracing and pop off easily afterward. Be sure to number your keys (and mortises), as each one is slightly unique.



13

13 Use the flat side of your marking knife to trace the straight edges of the key, starting with light passes to establish the line without wandering. Then flip the knife and use the bevel side to hug the curved areas closely.



14

14 Visibility trick. In dark woods like this walnut, I trace my knife lines with a white gel pen, which surrounds and highlights the thin scored line.



15



16

15 For fixed-base routers, drill a big flat-bottom starter hole with a Forstner bit, slightly less than your router-bit depth.

16 Set the bit depth to roughly $\frac{1}{16}$ " less than the thickness of the key and use the starter hole to tilt the spinning bit to full depth. Rout in easy overlapping passes in a counter-clockwise direction, bracing the base with your free hand to keep the router from jumping suddenly. Then switch to a climb cut to rout close to layout lines without going over.



17 Careful chisel work is the key. Using a 1/2" chisel for good control, you'll be able to set the tip directly in the scribe mark in most spots. The router will leave extra material in the corners, however, so nibble up the mark in those spots, placing the chisel in the line for only the last thin paring cuts.

18 An angled chisel is very helpful for removing the last bits of waste in the tight corners. Take a last look at all of the mortise walls and make sure they are square (or back-beveled slightly) so they allow the key to seat fully.

19 Glue goes in the mortise only. Spread it around onto all surfaces with a small brush. You can wet the key slightly with glue, but most of it will just squeegee off and become troublesome squeezeout.

20 Drive the key evenly. After chamfering the bottom edges with a sanding block, I use a rubber mallet for most woods, but when driving keys into harder woods, I sometimes place a hard block on top to prevent the key from splintering or splitting as it goes in.

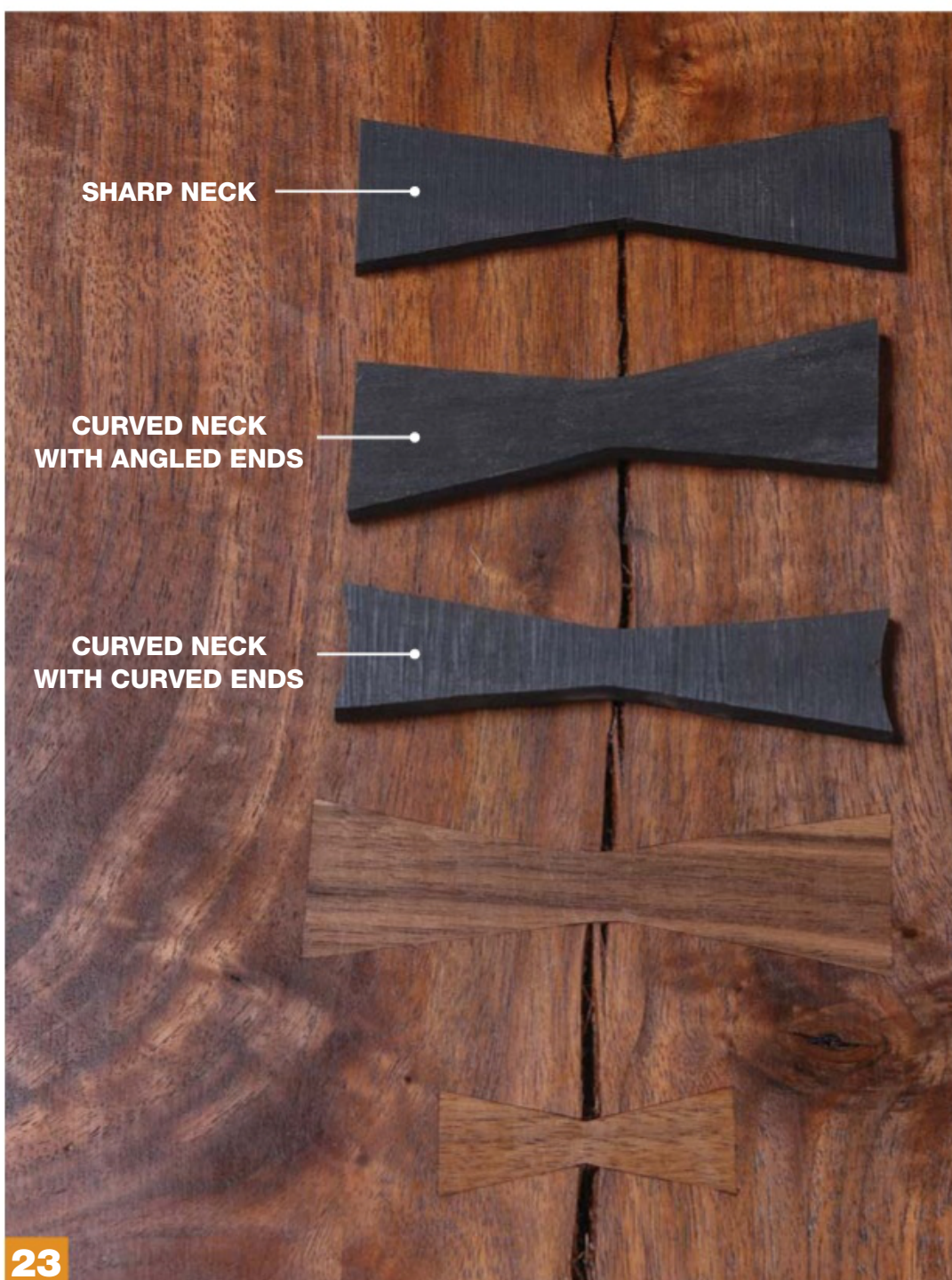




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21-22 Plane and sand keys flush. Switch planing directions to avoid tearout, and feel free to plane across the grain as needed. Stop when flush or almost so and finish the job with a random-orbit sander.

23 You'll be proud of the results, and your slab will be stable for decades to come. Don't be afraid to vary woods and designs. For example, these ebony keys would contrast nicely with most slabs.

The rest of the process is pretty typical for all types of inlay: you rout to establish the depth of the pocket, and chop to the line with chisels. It's all covered in the photos.

By the way, I don't like filling defects with epoxy—tinted or otherwise. Wood moves and will eventually pop out some of that hard plastic filler. I strip the bark off the edges too, for the same reason: It's bound to work itself loose over the years. **PW**

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Asa Christiana is the former editor of Fine Woodworking magazine, now living and working in Portland, Oregon. His 2017 book Build Stuff with Wood is a guide for true beginners. You can find him on Instagram @buildstuffwithasa



■ Out of the Ashes

A look at Ken Richards' life in woodworking.

By Asa Christians

After six years as a draftsman at Boeing—his first job out of high school—Ken Richards had enough money put aside to buy five acres and a barn in nearby Maple Valley, Wa., and he was ready for a career change. “Six years of sitting at a desk, in a room full of desks, in a giant building full of rooms full of desks—was enough to convince me the insecurity of unemployment beat the security of Boeing,” he recalls.

Drawn to woodworking, Richards got a contractors license to pay the bills and spent his free time building furniture in the barn, for family and friends. To keep his overhead low, he lived in an unfinished house on the property—essentially a basement with a roof on it, left behind by the previous owners.

Within five years, Richards was

woodworking full-time in the barn and had his first piece in the Northwest Fine Woodworking Gallery in Seattle, a thriving retail space for beautiful contemporary work. His padauk wine cabinet sold quickly to a visiting couple from Florida, who were interested in ordering other pieces.

A couple of months prior to that in the spring of 1991, Richards was wiping finish onto his largest piece to date, a ceiling-high, 8-ft.-long walnut buffet for a client's dining room.

The next morning, the barn, the buffet, and all of his tools and equipment were gone. “I missed some oil-soaked rags when cleaning up the night before and they spontaneously combusted,” he says. “Everything went up in flames.”

When the couple from Florida showed up, Richards was “covered with dirt, working in a ditch, and laying foundation forms for a new shop,” he says. His commitment to his woodworking career must have been obvious, because the couple commissioned a full dining set, plus two other pieces, and were willing to wait.

“There was never a thought about picking another path,” he recalls. “It was, ‘What do I need to do here?’ I started making ‘build’ and ‘burn’ piles, had the new building up in

1 When his original barn workshop burned down in 1991, Richards built one for the future. It's been a critical part of his success as a pro furnituremaker.

PHOTOS BY THE AUTHOR, EXCEPT WHERE NOTED



1

six months, and was back to work replacing the buffet.”

Rich Life, Modest Budget

What Richards has created in the 27 years since is astounding. His furniture is a tour de force of fine woods, ornate detail, deeply sculpted surfaces, and meticulous craftsmanship, with recent pieces taking up to a year to finish. On the idyllic property he never left, he built a huge two-story workshop and an extraordinary home, both almost entirely on his own, each as personal and pristine as his furniture. Every fir beam, every charming shed and fence, he crafted it all, while raising chickens, cows, and the occasional pig for food.

Ken Richards is an example of how talented, determined woodworkers can live far beyond their bottom line. His formula: Buy a nice piece of land, stay on it, buy materials as you can afford them, build everything yourself (you’ll figure it out, and friends will help), and refuse to compromise your vision. “There’s a connection you get when you built something, that you don’t get when you purchase it,” he says.

Dream Shop

The fire gave Richards the opportunity to design a workshop for the future, a two-story building that houses lumber drying and wood storage below and a spacious 1,000-sq.-ft. workshop above, with a wall of windows bringing in a wash of natural light and an elevated view of the pastoral landscape.

“The old barn had very limited space for tools and wood storage,” he says. “The new one let me take my work to another level, building multiples and big dining sets. Setting up and working in a space specifically designed as a wood shop—rather than working to try to make an existing structure work—is a big difference.”

As Richards’ work transitioned



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2 Upstairs is a 1,000-sq.-ft. workshop with a wash of natural light, beautiful views of the property, tons of storage, and plenty of room for outfeed, infeed, and big projects.

3 As Richards’ work became more focused on handwork, he added an audiophile stereo system to fill the silence, with world-class speakers and wall hung blankets making his CD collection sound like live music.

4 The dust collector and duct system is housed downstairs, keeping the shop quiet, with no hoses underfoot.



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5-6 At the other end of the shop is the bench area, with Richards' extensive hand-tool collection at the ready.

7 Richards' built a clamping ledge into the middle of his bench, to accept standard bar clamps. It's one of his favorite features.

8-9 The ground floor of the workshop houses two huge rooms for wood storage and a third lumber-drying, which have allowed Richards to take advantage of bargains and acquire world-class materials for his work.

10 Behind the bench area is his office, which doubles as a climbing gym. Rock climbing has been Richards' main pasttime for 20 years, providing exercise, relieving stress, and building friendships.

from machine work to hand work, the shop got quieter, making room for another of Richards' passions. To bring hi-fidelity music into the sunny workshop, he connected an audiophile stereo system to world-class speakers, which are suspended by chains from the ceiling and angled down toward his workbench. The tops of the high walls are draped with moving blankets to improve the acoustics. As a result, Richards' CD collection sounds shockingly like live music.

A House Built like Furniture

When the fire struck, Richards plans for a new house on the old foundation were put on hold, and he lived in the improvised basement house with his wife for another 12 years. Then he gutted the existing place down to the raw foundation, and built the house he had been dreaming about for years.

Richards extraordinary home sits comfortably among the trees, crafted from native woods, with wide eaves and a wraparound porch. Like the workshop, it's designed to fit his life, and sided with the same vertical cedar, finished with clear oil. Unlike the shop, the house feels almost like a museum, with gorgeous fir beams above, marble and maple floors below, exotic wood trim all around, and Richards' furniture and art collection spotlighted by careful lighting.

The main floor is open, with a big stand-alone cabinet separating the kitchen and living spaces, with art objects displayed on one side and kitchen cabinets on the other. The



11 Richards lived in the foundation of this house — essentially a basement with a roof on it — for 23 years before he was able to build a full house above it.

12-13 The wraparound porch, wide eaves, and natural siding settle nicely into their Pacific Northwest surroundings.



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14-15 The front door has curved panels and sand-shaded marquetry. The siding is cedar with a clear oil finish, just like the workshop.

16-18 Richards crafted the timber-framed trusses from clear, old-growth fir, and illuminated them with accent lighting and clerestory windows at the peak of the roof.

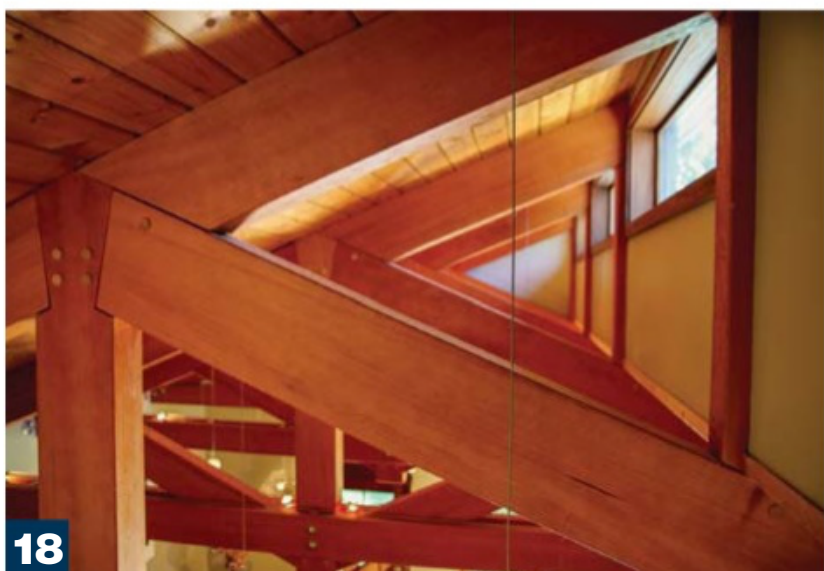
19 A large display cabinet divides the open floor plan. The floors are marble and maple, and the trim is a mix of afrosia, wenge, birdseye maple, quilted Western maple and imbuaya.



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20-21 Intentional lighting spotlight Richards' furniture and art collection, which is arrayed around the room. On the left is a bombé chest, one of his earliest challenges. On the right is a breakfront display cabinet in ceylon satinwood, characterized by exotic woods and delightful embellishments.

22-23 Richards built the sheds and fences for the chickens and livestock he raises for food. An old bathtub waters the cows.



23

second floor is a partial loft that houses the master bedroom, bathroom, a small library. The basement houses a lovely guest suite.

Exposed above both floors are timber-framed trusses Richards fashioned from clear, old growth fir, salvaged from submerged logs. The porch also has a timber-framed roof, this one from old-growth cedar, also salvaged.

By day, clerestory windows at the roof peak light the trusses and help the other windows bring in natural light. By night, the entire home—trusses, Richards' furniture and sculpture, the display cabinet, and both floors—is illuminated with an extensive system of low-voltage-lighting fixtures that he designed and installed.

After years of late nights and patient work, Richards is at ease on his five acres, feeding the chickens and ducks, grilling grass-fed steaks on the porch, and turning his wood-working career in a new direction.

Design Process

While his work has recently turned toward sculpture, Richards is one of the Pacific Northwest's most accomplished furniture makers and he has valuable lessons to share with pros and hobbyists alike.

The first is not rushing the design stage. Richards' brainstorming process begins with a series of rough sketches. "Once I think I'm on to something, I start working on proportions and detailing with scale drawings," he says. The third step is full-size drawings, which he tapes to MDF and props against the wall to get a better viewing perspective. A favorite trick for refining a design is "splitting a piece down the middle and trying different shapes, proportions or details—one version on one side, another on the other."

Drawings are just the beginning. "I make better decisions when a piece is sitting in front of me as a three-dimensional object, rather than a 2-D

drawing," he says. "So I find ways to mock up options with pieces of scrap, clamps, duct tape, whatever." He also notes that designs look different when you walk away for a few days or more, let your subconscious go to work, and come back with fresh eyes and new solutions. "Procrastination can be a good thing," he says.

Words of Wisdom for Would-be Pros

The main challenge for full-time woodworkers is finding clients who can pay for high-end work. In the beginning, Richards worked for friends and family. He was also lucky to have a wife with a good-paying job at an upscale restaurant. Many of his first pieces went to her customers.

After that, he had another lucky break. Nearby in Seattle was the country's oldest and largest wood-working cooperative, the Northwest Woodworker's Gallery, where Richards drew inspiration and connected with clients. It closed in 2016 but the website (<https://www.nwwoodgallery.com>) still promotes former members.

Once connected to clients, Richards tried to convey his passion and talent, telling them about the materials, process, and potential of an idea. "You have to become comfortable being around wealthy people," he says. "Go in with confidence—as an equal. I'm not a salesman. I walk them through my portfolio and tell stories. There's no hard sell."

Once they were committed, he treated clients well, welcoming them to visit the shop, sharing photos of the work in progress, and always over-delivering in the end. As a result, many of his clients became lifelong friends and patrons, purchasing multiple pieces through the years and sustaining him through the market meltdown of 2008.

A related key to success, he says, is shooting excellent images of his work and creating a powerful portfolio, both in print and online.



24-25 This collector's stand, made from Nicaraguan cocobolo, is designed to display a collection of small, precious objects. Richards detailed the back as nicely as the front, so the piece will work in the open, as a room divider of sorts. (Courtesy of Ken Richards)

For today's pros, he also acknowledges the importance of an active social-media feed.

Part of treating himself as an equal was estimating his time on a project, pricing it accordingly, and taking payment in a series of 25% deposits. The first gets a project on the schedule, the next is paid when drawings are approved, another comes when he's halfway done building, and the last 25% is payable upon delivery.

As for what to build and how, there are many paths, he says, each with its tradeoffs. "I'm at one end of the spectrum—making high end, one-of-a-kind art pieces. But I know folks who live very rewarding lives doing simpler designs they can produce efficiently on a limited-production basis. Some have developed specialties—shoji screens, for instance."

Regardless of their personal path, he sees common traits in successful pros, or "survivors," as he calls them. "They have a strong inner drive to create, they work hard, and they operate their businesses with a high level of integrity. If you are not strongly driven to do this work—strictly for the personal rewards that come from creating things and being your own boss—then it's probably not for you. If you do have that drive, it can be a very rewarding lifestyle."

He adds with a wry smile: "A supportive spouse with a regular paycheck helps a lot."

A New Direction

A couple of years ago, Richards stopped looking for furniture commissions and started making pure sculpture on spec. "I decide the price when I'm done and there's no time pressure," he says. "It's a reward for paying my dues, and developing a toolbox of hand skills."

The design process is also more free. "I start with a fuzzy idea, start playing with the wood, and see where it goes," he says.



26-27 Some of Richards' pieces feature extensive marquetry. He built this dining set in narra for a home with a lakeside view, sculpting the chairs flawlessly, for beauty and comfort. (Courtesy of Ken Richards)



28 This sideboard, in quilted makore and holly, was Richards' most technically challenging project to date. He carved the curved parts by hand from thick lumber. (Courtesy of Ken Richards)

29 With sculpture Richards often lets the wood dictate the design. At the heart of this piece, called "Tranquility," is an extraordinary slab of maple, with spalting that stops in a distinct line.

30 Richards made "Glory" from 40 hard-carved pieces of ceylon satinwood. It includes a pedestal with built-in lighting.

31 Richards' work has turned lately to sculpture. This piece, called "Smoke," is made from an olive root burl that he pulled from a friend's free pile.



He's not sure if he will be successful as a sculptor, but Richards is giving himself three years to develop a portfolio and find out. Furniture tends to be seen as craft, not art, and the hope is that the new work will find different galleries and venues, and draw prices appropriate to fine art. "I'm still following my heart," Richards says. "In that way, it's not any different than the past." **PW**

See more at kenrichardsarts.com. Asa Christiana is the former editor of Fine Woodworking magazine, now living and working in Oregon. Follow him on Instagram @buildstuffwithasa.



PROJECT #2004

Skill Level:

Advanced

Time: 3 days

Cost: \$400

Single Oval Library Table

Recreate this classic design and push your skills to the next level. **By Willie Sandry**

PHOTOS BY THE AUTHOR

Of all the surviving Charles Limbert designs,

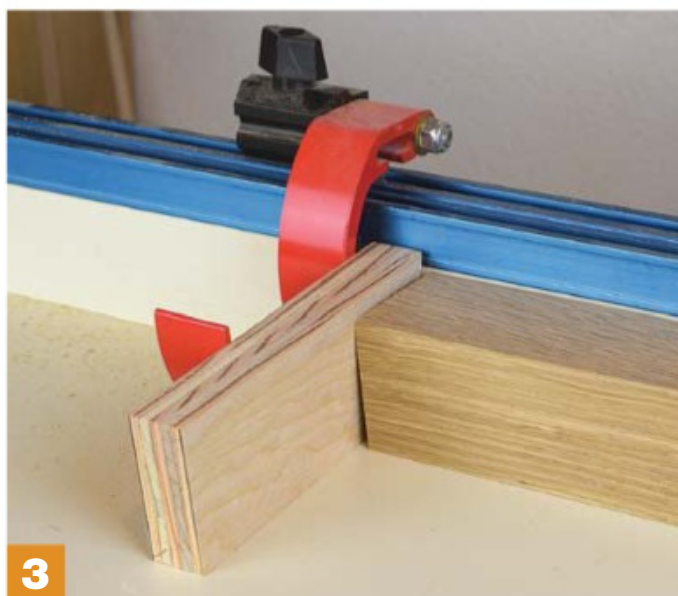
there are three that stand out above the rest in my mind. One is the #355 Cottage Bookcase, and the second is the #153 Turtle Top desk. The third is the #146 Single Oval Library Table. I've been fascinated with these pieces for years and inspired by the interesting use of shapes and angles in Limbert designs. With most Arts & Crafts style furniture, there is a deceiving level of complexity hidden in the design. With Limbert's #146, the complexity is plastered all over the face of it. You don't have to ponder long to see the compound angles, trapezoids, and elliptical forms in this interesting table.

The Single Oval table is a medium sized display table and would make an excellent perch for vases and collectibles. While most furniture from this era looks fantastic with heavy fleck Quartersawn oak lumber, I found myself reaching for rift sawn stock to build this one. There are so many dominant profile lines and shapes, that too much figure might actually distract from the piece. Likewise, sapwood and flatsawn grain draws the eye away from the intended focal theme of this piece: its interesting shapes and angles.

Compound Angle Legs

Find a plank of 8/4 rift sawn oak and make the four legs. They finish out at 1 3/4" square, and about 30" long. The legs are mitered and beveled, forming a compound angle. My father and I have another name for compound cut: we usually call them "About a quarter inch short."

Compound angles can be tricky, so whether you use a miter saw or a table saw, come up with a consistent way to cut them to length. I chose a miter saw, and set the miter angle to 5°, and the bevel angle to 5°. Start by cutting one end of the leg at this compound angle, and slide the leg down the table, being sure to keep it in the same orientation. Then use a stop block to trim the legs to identical length.



1 Cut, Slide, Cut. Set both the bevel and miter angles to 5° and trim one end of the leg.

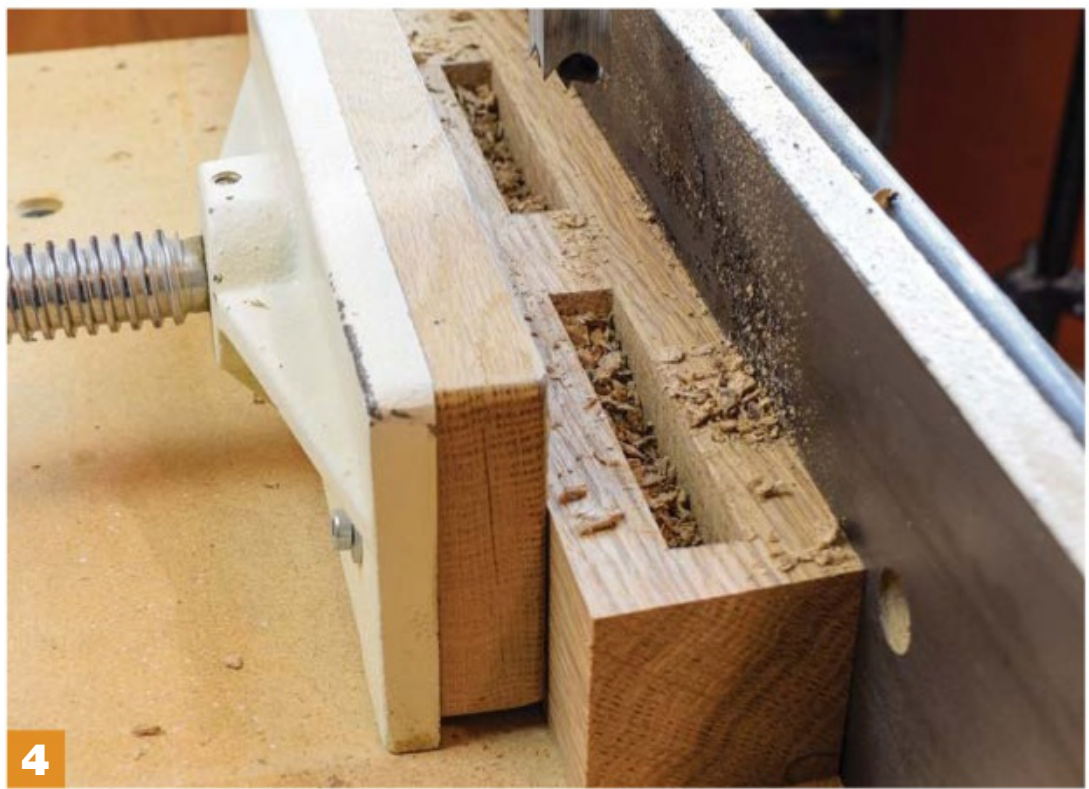
2 Slide the leg to the left until it contacts the stop block and trim the leg to final length.

3 Use a scrap block to make sure the point of the compound angle makes contact with the stop block.

Upper Leg Joinery

The upper third of each leg is where most of the joinery takes place. The arched rails join the legs with mortise and tenons, and the corbels feature stub tenons that sit in shallow grooves. Mark the extent of the $\frac{1}{2}$ " wide x $8\frac{1}{2}$ " long mortise on the leg and mill it $\frac{3}{4}$ " deep. Since the tenon will be divided, I left the center $1\frac{1}{2}$ " of the mortise a little shallow.

For cutting the grooves, I stumbled onto an interesting problem. Since the top of the legs are cut at a compound angle, my regular stop block wouldn't work. Instead, I came up with a single-point block for the router table that registers only the center of the leg. This allowed me to mill grooves on adjacent sides of the leg to the exact same length. Use a scrap offcut from the legs to make the



4 Each leg gets two mortises, cut $\frac{3}{4}$ " deep. The remaining material is cut last to a depth of $\frac{1}{4}$ ".

Make a Template for Panel Cutouts

Cut strips of scrap plywood and set them on your layout lines. Angle the ends of the short cross pieces approximately 7° . Using pocket hole screws, attach the strips to form a quick frame (Image A). Now clamp the frame to a piece of $\frac{1}{2}$ " MDF to make a permanent one-piece template. Use your router like a jigsaw to rough out the shapes with a $\frac{1}{4}$ " spiral bit and $\frac{3}{8}$ " guide bushing (Image B). Finish shaping the template with a $\frac{1}{2}$ " diameter top-bearing pattern routing bit, before removing the frame (Image C).



single-point stop. Drill a hole centered in the top of the offcut and tap in a short length of $\frac{1}{4}$ " dowel. Set the stop block to allow a 9" long groove and clamp it to the router table fence. Chuck a $\frac{3}{8}$ " diameter straight bit into the router, with bit height set to $\frac{1}{4}$ ". Set the fence for a centered cut and mill two grooves in each leg.

Trapezoid Templates

Glue up the panels required for the table including the top, side panels, arched rails, and lower shelf. Once the panels come out of clamps, cut the side panels to a rough size of $26\frac{1}{4}$ " long and 16" wide. Next, set out to make a template for the trapezoid cutouts that decorate each side panel.

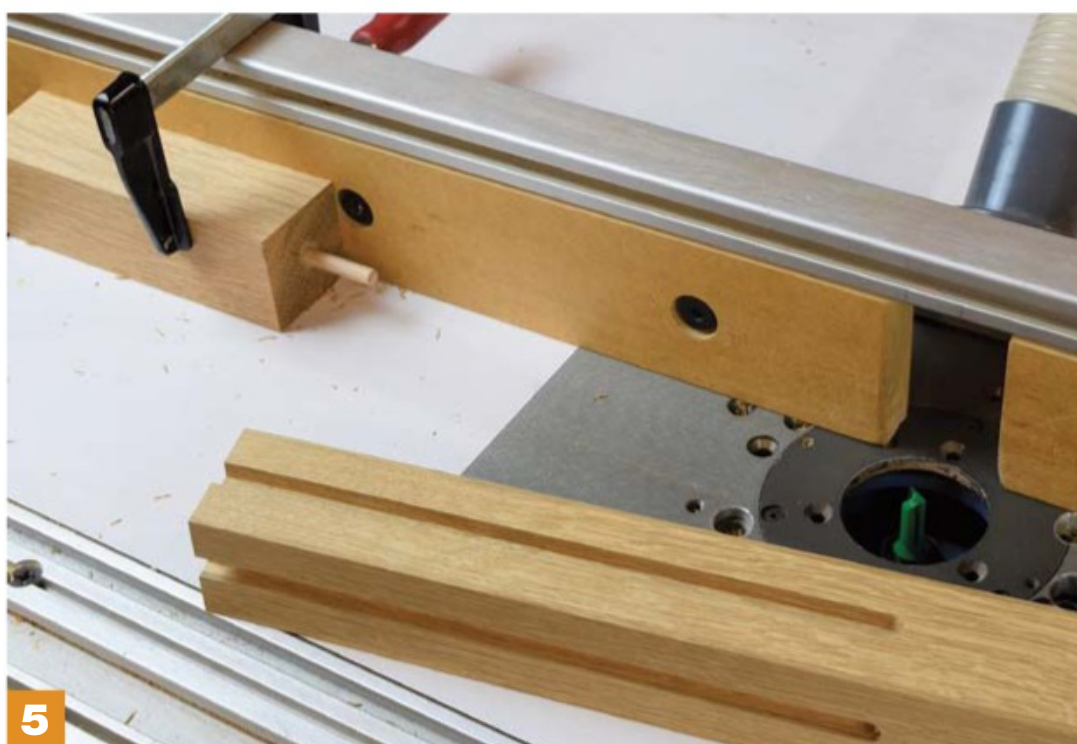
Start by drawing the trapezoid shapes on one side panel. Rip 4" wide strips of plywood and lay them on your pencil. Measure between the strips and cut short cross-pieces to fit. Assemble this somewhat crude five-piece template with pocket hole screws.

Now—you could use this alone as a routing template, or you can use it to pattern rout a one-piece template of $\frac{1}{2}$ " MDF. Either way, you'll need to remove most of the waste from the trapezoidal cutouts. I have a $\frac{1}{4}$ " spiral bit in my shop that I've dedicated to just such a task. Paired with a $\frac{3}{8}$ " guide bushing, it's the perfect bit to remove the bulk of the waste.

So long as you take your time, and cut in multiple passes, it works quite well. I find it quicker and more accurate than a jigsaw, and now you're one step away from nice finished cutouts. Switch to a bearing-guided flush trimming bit, and remove the sliver of waste in a single clockwise pass.

Taper and Spline

The legs are glued to the side panels with splines. But first, the side panels must be tapered at a 5° angle, which lets the legs lean



5 A single-point stop block, made from a leg offcut and dowel, helps make the two shallow grooves the same length.

6 Rough out the shapes with a router equipped with a $\frac{3}{8}$ " guide bushing and $\frac{1}{4}$ " spiral bit.

7 Flush trim the minimal waste that remains.



8 A tapering jig makes quick work of the angled side panel cuts. The jig is guided by a wooden runner underneath.

9 With a 1/4" wide dado stack, form stopped grooves in the side panels. A stop block clamped to the outfeed table limits the length of the cut.

10 With the 1/4" dado stack still installed on the saw, set the rip fence for a centered cut on the legs. Adjust the stop block and complete a stopped groove in each leg.



in towards each other. Taper the panels to your layout line with a tapering jig at the tablesaw. Now mill centered grooves in the side panels to accept the spline. The groove should stop about an inch from the bottom of the panel. This 1/4" deep groove is easily formed at the tablesaw with a 1/4" wide dado stack. Then reset the rip fence and make a centered groove in the legs as well. This groove should stop 3 3/8" from

the bottom of the leg.

Now angle the tablesaw blade to 5°, and make a bevel cut across the top of each side panel. Once that's taken care of, you're ready for the leg subassembly. Mill up some spline stock to fit the grooves and glue each panel to a pair of legs. Use the tapered offcuts as cauls to keep the clamps square. Focus on aligning their top edges as you clamp the parts together.

Arched Rails

Although the arched rails feature angled sides, the joinery for these parts is actually quite simple. Rip a pair of rails to 9 5/8" wide and cut them to a rough length of 24 1/2". Then set a miter gauge at the tablesaw to 5°, and angle both end of the rails. Now switch to a full dado stack and cut the tenons. This process is just like cutting traditional square tenons, except you'll reference the angled



11 Tilt a combination blade to 5° and bevel the top of the panel. With left tilting saw, orient the “show face” of the workpiece down toward the tablesaw. Use large push pads and firm pressure to complete this light skimming cut. A riving knife is another good safety measure for this operation.

12 Chisel the corners sharp, but only the lower corners of the larger trapezoid. This will let the lower shelf fit snugly, without visible gaps.

13 Glue the side assemblies together with 1/4" thick x 1/2" wide splines. Use the tapered offcuts as cauls to give the clamps a flat bearing surface as you tighten them home.



end of the rail against the rip fence. Luckily the rail is wide enough to make the cuts safely without a miter gauge. Once the tenon cheeks are established, raise the blade to a height of 1/2" to remove the waste between the divided tenons. For this operation you'll use a miter gauge, and reference the end grain of the tenon against the tablesaw. The remaining shoulder cuts can be completed with a dovetail saw.

While the dado blade is still on the saw, take care of the centered notch at the top of each arched rail. Position the rail against the miter gauge and use an angled block to support it at the required 5° angle. The notch is 2 1/8" deep and 7/8" wide. Then switch to a standard tablesaw blade and bevel the top edge of the arched rail to 5°, just as you did with the side panels. If you have a left-tilting saw, orient the “show face” downward as you complete these bevel cuts.

The final process for the arched rails is to cut the curved shape. Mark the Tudor style curve and cut close to your line at the bandsaw. Refine the shape with a spokeshave and sand it smooth. At this point it's advisable to test the rails, and check that all the angles come together as they should.



Cross Rail and Corbels

It may be tempting to alter the plans to make the notch for the cross rail a true half-lap. My advice is to notch only the arched rail, and not the cross rail. Otherwise you will have an impossible puzzle that only goes together one way and may be difficult to test fit. Make up the cross rail component and cut it to shape. Drop the cross rail into position and stand back to admire your handiwork. It's this stage of the project that you see indelible progress as the table starts to take shape.

Make the eight corbels, and form stub tenons to match the grooves in the legs. The corbels need to be trimmed at a compound angle to meet the underside of the tabletop. The lower end of the corbels are trimmed in a similar manner. Tilt the tablesaw blade to 5° and angle the miter gauge to 5° as well. Trim four corbels with the miter gauge angled to the left, and the remaining four corbels with the miter gauge angled to the right. Use a stop block on an auxiliary fence for corbels of uniform length.



14

14-15 Angle first, then tenon. After trimming both ends of the arched rail to 5°, raise the tenons with a dado stack. Finally, trim the tenon shoulders with a handsaw.

16 Dado notch for cross rail. Use a scrap block angled to 5° to pitch the arched rail forward toward the blade. Steadily pass the rail over the dado blade with a miter gauge.

17 Only after all the joinery for the arched rail is complete—including beveling the top edge—can you mark and trim the Tudor style arch. Cut close to your layout line at the bandsaw, and refine the shape with a spokeshave, file and sandpaper.



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18 Angle the cross rail leaving the end profile $\frac{7}{8}$ " square. Plane the angle smooth, and form elongated holes for mounting the top.

19-20 Corbel blanks. Raise stub tenons on the corbels, sized to fit the groove (Image 19). Then form compound angles at the top and bottom. With the blade tilted 5° , angle the miter gauge 5° (Image 20). Just like the legs "cut, slide, cut" is our mantra for the compound angles.

Hardware List

No.	Item
2	#8 x $2\frac{1}{2}$ " screws for attaching the cross rail
14	Figure 8 fasteners
14	#6 x $\frac{5}{8}$ " screws for the figure 8 fasteners
3	#8 x $1\frac{1}{4}$ " pan head screws to attach the tabletop
-	18 gauge x $1\frac{1}{4}$ " brad nails for attaching the cleats to lower shelf
4	#8 x $1\frac{1}{4}$ " pocket hole screws used to attached the lower shelf

Lower Shelf

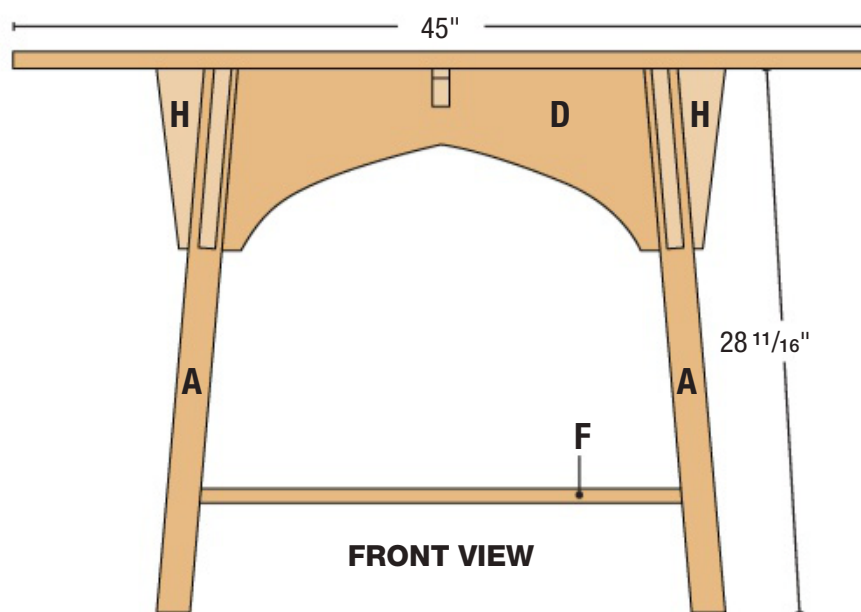
The shelf juts out through the lower trapezoid, giving the impression of a through tenon. To successfully mate the parts, the projection on the shelf is cut at a 7° angle. The shoulders of the shelf are cut at a 5° angle to fully seat against the side panels. The angled notch is readily handled at the bandsaw by tilting the table left or right. Start by measuring between the side panels of the dry assembled table. The inside-to-inside measurement at the bottom of the lower trapezoid is the shelf. A few swipes with a coping saw are required to complete the bandsawn

notch. Finally, drill four pocket holes on the underside of the shelf.

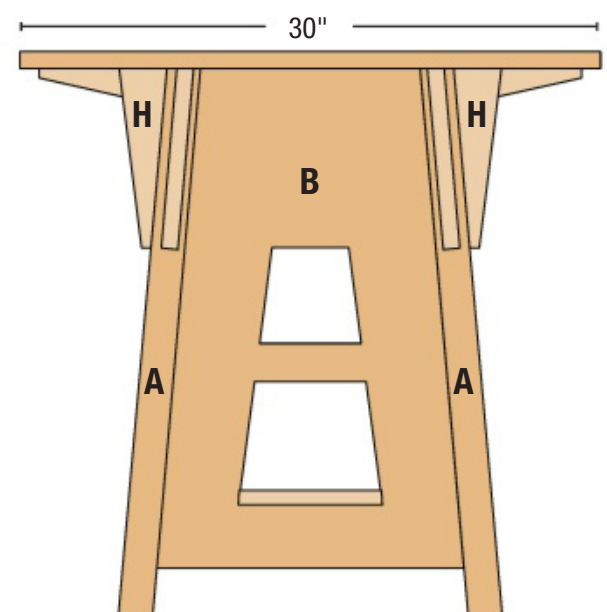
The Elusive Ellipse

Sand the parts you've made and glue the table together. As that dries, revisit the tabletop panel, and setup a router and jig to cut the ellipse. While there are commercial jigs available, I wasn't able to find one that could cut the $45" \times 30"$ size required. Instead, I built a simple jig that could handle the large difference between the major radius and minor radius. (See page 56 for detailed instructions on making your own ellipse-cutting jig.)

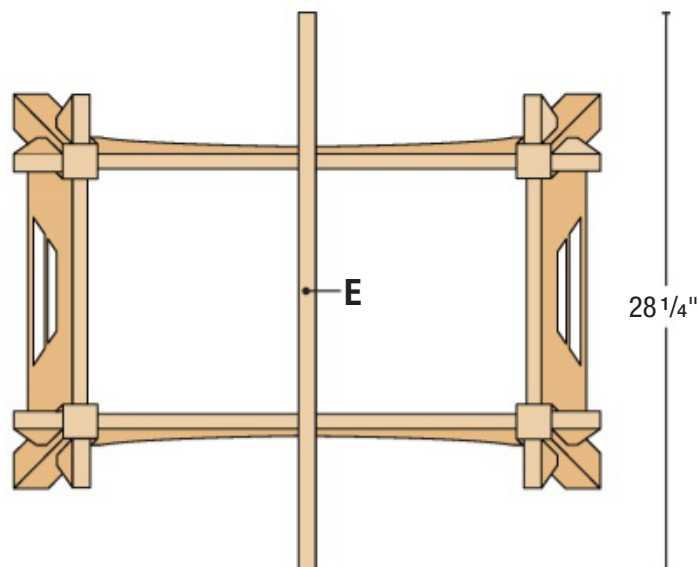
Single Oval Library Table



FRONT VIEW



SIDE VIEW



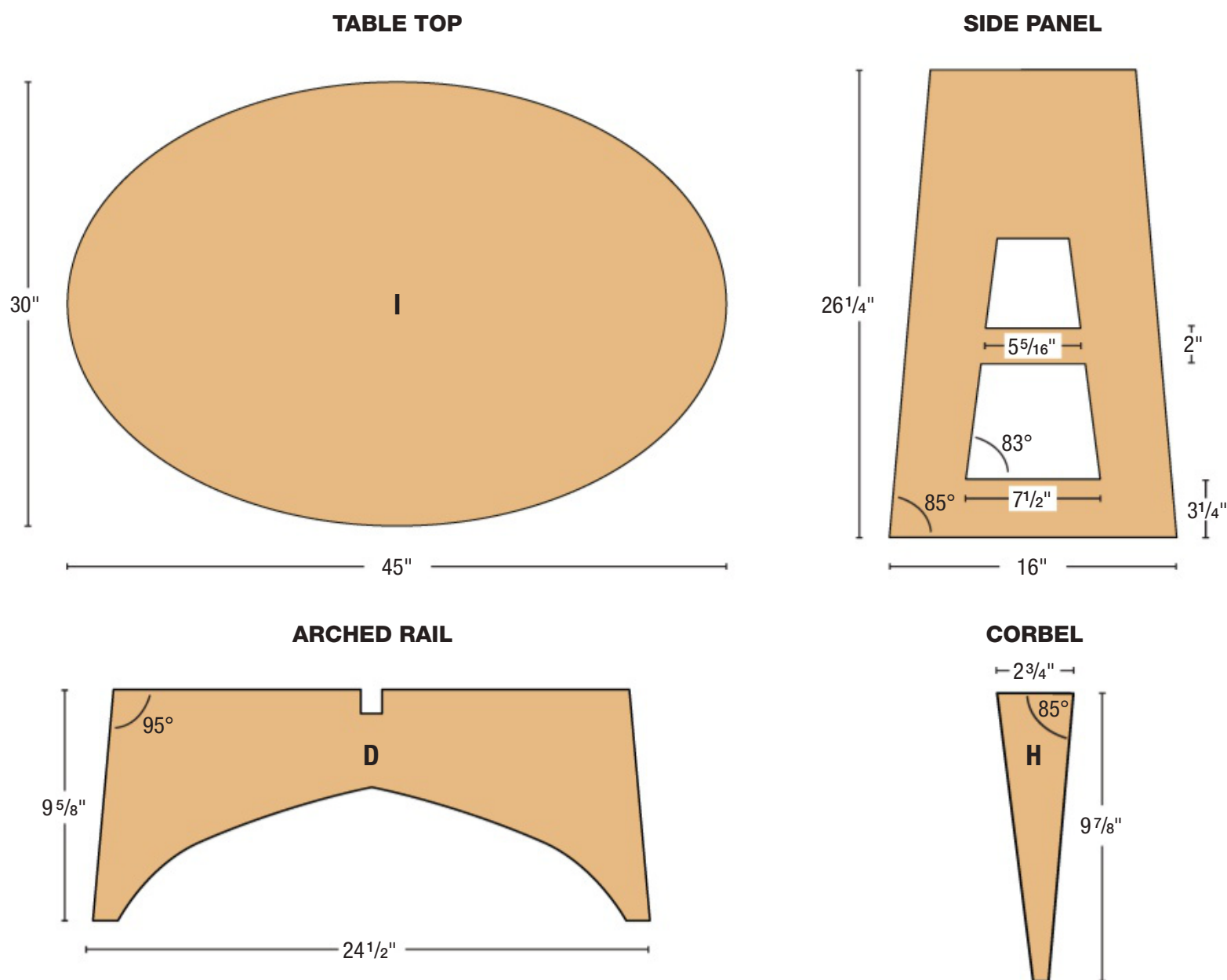
TOP VIEW (TABLE TOP REMOVED)



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21 Angle the bandsaw 5° upward to complete the first two shoulder cuts. Then reset the table to 5° downward and complete two more shoulder cuts.

22 Since two angles intersect at the corner of the notch, the bandsaw can't reach all the way. A few swipes with a handsaw releases the waste piece. Note the shelf offcut in the background, which served as a practice piece for testing these cuts.

Cut List

No.	Item	Dimensions (inches)			Comments
		T	W	L	
4	A Legs	1 3/4	1 3/4	30	*Finished length is 28 11/16
2	B Side Panels	7/8	16	26 1/4	
4	C Splines	1/4	1/2	25 1/4	Used to attach side panels to legs
2	D Arched Rails	7/8	9 5/8	24 1/2	
1	E Cross Rail	7/8	2	28 1/4	
1	F Lower Shelf	3/4	12	29	
2	G Cleats for Lower Shelf	1	1	8	
8	H Corbels	7/8	2 3/4	9 7/8	*Finished corbel length is 9 1/2
1	I Oval Table Top	7/8	30	45	

*Length is measured from long-to-short once angled.

**All material is white oak hardwood.

23 When gluing the table frame together, loosely insert the shelf (without glue), and focus on aligning the arched rails with the top of the legs as you tighten the clamps. The lower shelf will be attached in a separate step. Painter's tape holds the long angled cauls in place.

24 Glue two corbels to each leg, making sure the parts are flush at the top.

25 Just like the original, the lower shelf is attached with four pocket hole screws and a pair of glue blocks. Angle the blocks to fit, and glue them in place with 18 gauge brad nails. Note the blocks are cut from an end grain lamination, to avoid a wide cross-grain glue joint.





26

26 Insert the cross rail into the notches and secure it with a pair of screws. Check for a gap-free intersection between the cross rail and arched rails.

27 Cut out the elliptical shaped top in multiple counterclockwise passes. Reset the jig for a slightly smaller ellipse and complete a full-depth trimming pass to clean up the router bit marks.

Using a plunge router and $\frac{1}{4}$ " spiral upcut bit, cut the tabletop to shape in several passes. Then make a micro adjustment for a slightly smaller ellipse. You're looking for a small change here — just enough to clean up the bit marks from the initial passes. Sand the top and ease the edges with a roundover bit, and you're on the home stretch.

Final Details

Glue the corbels in place, making sure each one sits flush with the top of the leg. Counterbore holes in the underside of the cross rail to serve as screw holes for mounting the top. The outer holes will need to be elongated to allow wood movement. Secure the cross rail to the arched rails with $2\frac{1}{2}$ " long x #8 screws, driven in from the top. The world is your oyster when it comes to finishing, but I kept it simple with this project. An oil-based stain in a warm brown tone supplied the color, while two coats of lacquer will keep it protected for years to come. Wet sand the final coat with a 1500 grit soft sanding sponge and soapy water, for that velvety smooth finish. Add a few of your favorite collectibles, and this unique treasure is ready for display. **PW**

Willie Sandry specializes in Arts & Crafts reproductions when he's not at his day job.



27



PROJECT #2005

Skill Level:

Beginner

Time: 4 hours

Cost: \$50

Crate Chair

Gerrit Rietveld's simple design for a lounge chair is a great platform for exploring ergonomics. **By Andrew Zoellner**

PHOTOS BY THE AUTHOR

Gerrit Rietveld was a Dutch furniture designer and architect that worked in the first half of the 20th century. Part of the De Stijl art movement, Rietveld's furniture was often reduced to just the essentials to make a piece work. His 1917 Red and Blue Chair is an icon of modern design. After breaking away from De Stijl, he also designed the Zig-Zag Chair and the Crate Chair.

I was drawn to the form of the crate chair immediately after seeing a pair in an online auction. It looked pretty straightforward to build but still had a modern feel. Plus I had a pile of ash offcuts that I'd collected over the years, and they seemed perfect for a project like this.

The design itself is pretty ingenious. Most of the pieces are the same width, no pieces are longer than 30" and there are no panel glue-ups needed. Researching the design further, the chairs appeared with different seat angles, back angles and even different leg heights. The original design had the seat about a foot off the ground. I settled on a size that better handled my burly frame, with the seat and back angled for comfortable lounging. Now, let's get building.

Gather the Pieces

The bulk of the boards in this chair are 6" wide, save for the arm rests (2 1/4" wide) and the battens for the seat and back (2 1/4" or so—whatever offcuts you have available).

You can get the bulk of the pieces for one chair out of four 8' 1x8s if you're shopping at the home center. That's what I'll do when I build a pair of these for the front porch. (And I'll paint them blue and red in honor of their designer.)

Assemble the Sides

The chair is made up of four main parts: two mirrored sides, a seat and a back. Build the sides first.

I used glue and pin nails for most of the joints on the chair. They're almost all face grain to face grain,

so the glue is strong enough to hold everything together. The pin nails are just to keep things in place while the glue cures. Don't be afraid to use screws or other nails if you'd like, just try to keep things even and symmetrical.

The chair legs are 24" long. The top of the rail should be 6" below the top of the leg (leaving 12" of leg below the rail). I put a coat of glue on the first leg, then put a few pin nails in the joint to keep it in place. Flip the assembly over and glue and pin the second leg to the rail.

For the second side, you repeat the steps, but make sure you're creating a mirror of the first side. (Avoiding this mirrored assembly issue is one strength of the original design. Because the legs were 18" long, with the 6" rail, there is 6" of material above and below the rail, so both sides are assembled exactly the same.)

Seat and Back

The seat and back are another opportunity to adjust the sizing of the chair. The back of the original design was about 18" wide and the seat about 19 1/2" wide. I needed a little bit more room and wanted some space between the back slats, so I took the back to 18 1/2" wide and the seat to 20" wide.

I assembled the back first with glue and pin nails. I cut a pair of battens to 18 1/2". Then, I attached the two outside boards to the battens. After that, I eyeballed the spacing for the middle board and glued and pinned it in place.

With the back assembled, I used it along with two offcuts from the legs to get a precise length on the seat battens. My lumber was a hair under 3/4" thick after milling, so the seat battens came in just shy of 20". Put together the seat in the same manner as the back. This is when the fun really begins.

Depending on your plan for this chair, there's a lot of variability in how you can position the seat and



1 Make the leg assemblies first. Start by marking a line 6" from the top of the legs.

2 There's plenty of face grain to face grain surface for the glue to hold. The pin nails just keep the boards in place. Make sure to mirror the two leg assemblies.

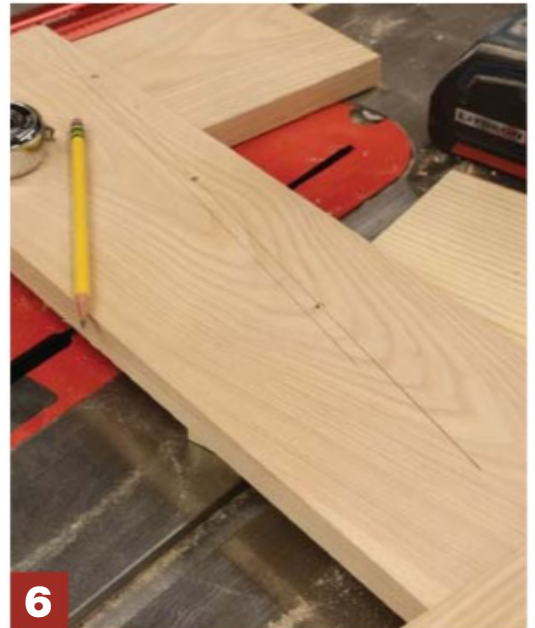
3 Repeat the assembly process for the back, equally spacing the boards on the battens.



4



5



6



7



8

Modifying the Original Design

Rietveld's design called for 18" legs, which would put the seat about 12" off the ground. I mocked this up in the shop and it was just too low for me to sit in comfortably. So, keeping in mind that most dimensions in the chair were based off 6", I added 6" to the legs, which brings the seat up to about 18" off the ground, which felt much better.



9

4 Use the back and two $\frac{3}{4}$ " offcuts to get a precise length for the seat battens, then attach the seat slats to the battens.

5 Dry assemble the chair and find seat and back angles you like and transfer layout lines. Mine were both at about 10°, give or take.

6 Then I attached the stretchers to the legs, paying close attention to make sure I made a pair of mirrored assemblies.

7 Pre-drill and countersink holes for your screws to attach the seat. Clamps and an extra pair of hands help a lot here.

8 Repeat to attach the back.

9 The last step is to cut the arms to length and attach them with screws.

back. I used a few clamps to try some different seating positions. I was aiming for something borderline lounge-y, but not too reclined.

With a comfortable seat and back angle established, I traced the positions of the seat and back onto one of the leg assemblies. Then I unclamped the chair and mirrored those layout lines to the other leg assembly.

Next, I marked out and predrilled a few holes for screws in the leg assemblies. I used three screws on each side of the seat and two screws on each side of the back. I then clamped the chair back together and used those holes to predrill into the seat and back.

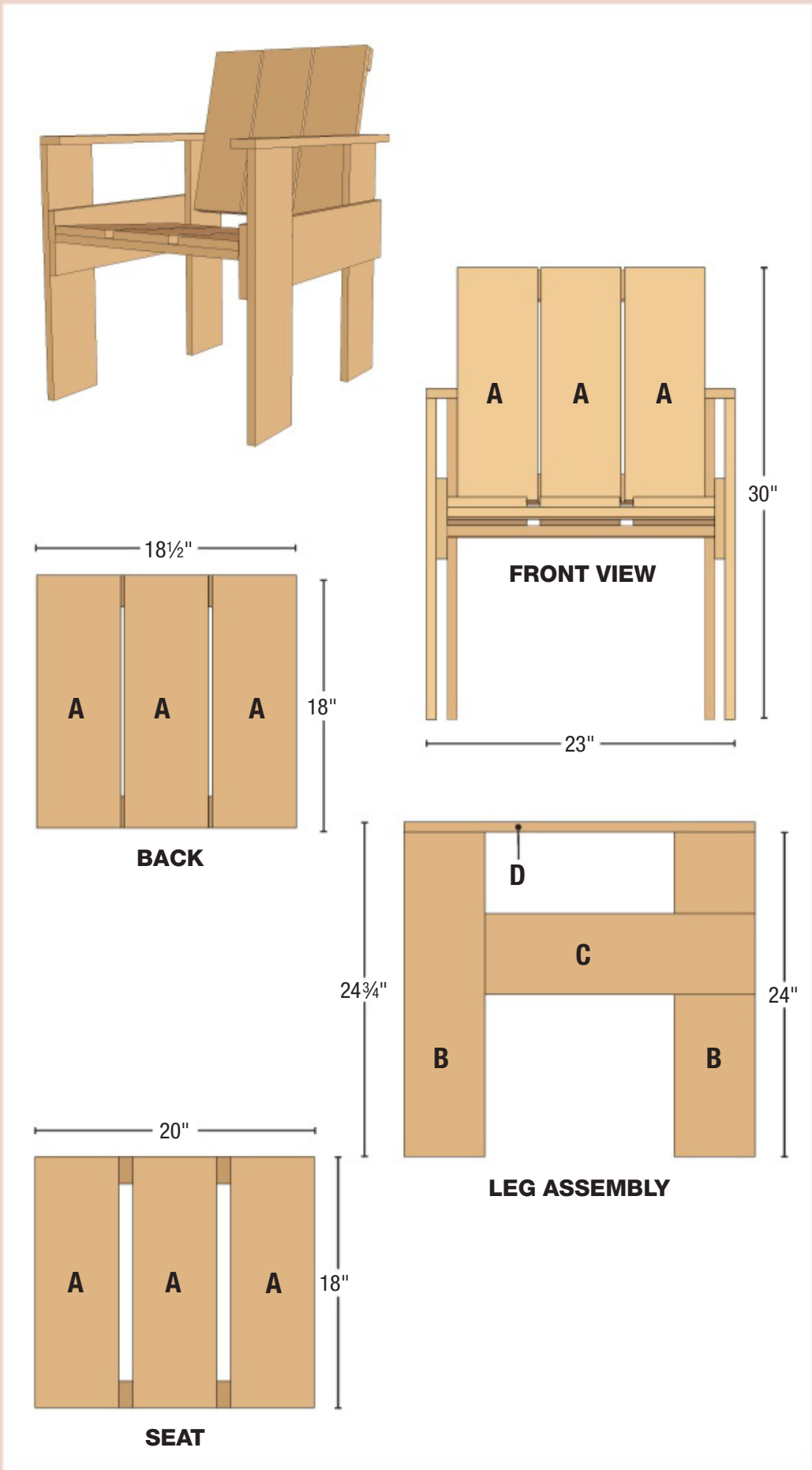
With the four pieces ready to go together, I countersunk the screw holes and did some sanding. With a name like crate chair, I'm not aiming for perfection here; I just did my best to make sure there were no stray glue marks and paid extra attention to where you're likely to touch the chair with your hands (arms, seat, back).

The last thing I did was add a couple coats of finish. Because the chair will likely end up on the porch at some point, I opted for a hard wax oil (this one made by Briwax). It brings out the grain in the ash and offers some protection. It's also easy to reapply as needed. But perhaps the best part, is that it's very low VOC, so I could apply the finish in the comfort of my dining room without stinking up the house.

As for the chair itself, I'm quite happy with how it sits. I also have grown quite fond of the form, which really emphasizes the core elements of a lounge chair. Plus, it's quick to build, making it a great project to introduce a budding woodworker to some of the basic tenets of furniture making. And I can definitely see building a pair or more to sit outside around the grill, comfortable enough to relax but still keep your wits about you. **PW**

.....
Andrew Zoellner is Popular Woodworking's editor in chief.

Crate Chair



Cut List

No.	Item	Dimensions (inches)			Material
		T	W	L	
6	A Slats	¾	6	18	Ash
4	B Legs	¾	6	24	Ash
2	C Stretchers	¾	6	26	Ash
2	D Arms	¾	2¼	26	Ash
2	E Seat Battens	¾	2¼	20	Ash
2	F Back Battens	¾	2¼	18½	Ash

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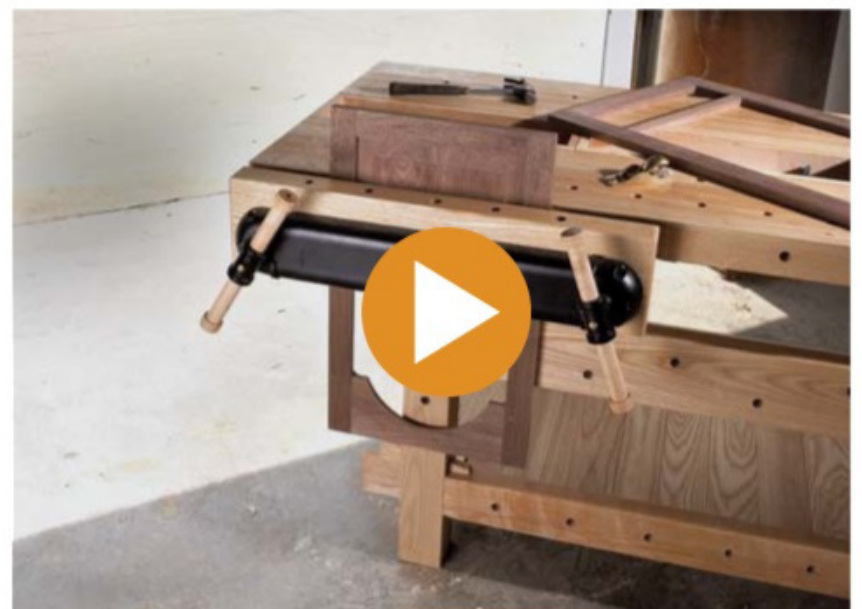
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Elliptical Routing Jig

One jig opens up a whole world of useful shapes.

By Willie Sandry

If you've ever wanted to venture beyond the world of squares and circles, consider incorporating elliptical shapes into your next design. Cutting an oval by hand can be tricky, and usually involves lots of sanding to smooth and fair the curve. Luckily there's an easier way.

Make the Base

A shop-made jig is pretty easy to make with a few scraps and a handful of jig hardware. You'll need a piece of $\frac{3}{4}$ " plywood that measures 18" square to get started. Set up a router table with a $\frac{1}{2}$ " straight bit, and mill two centered grooves in the plywood. The grooves intersect at a 90° angle so they look like a big "plus sign." I made these initial passes with the straight bit a little less than the finished depth of $\frac{1}{2}$ ". Then swap the straight bit for a dovetail bit and set the cutter depth to a full $\frac{1}{2}$ ". Widen the centered dovetail groove in multiple passes. The finished width of the dovetail channel is about one inch at the



I developed this jig to make the oval top for the Limbert library table (page 38) but its adjustability means it's useful for more than just that.

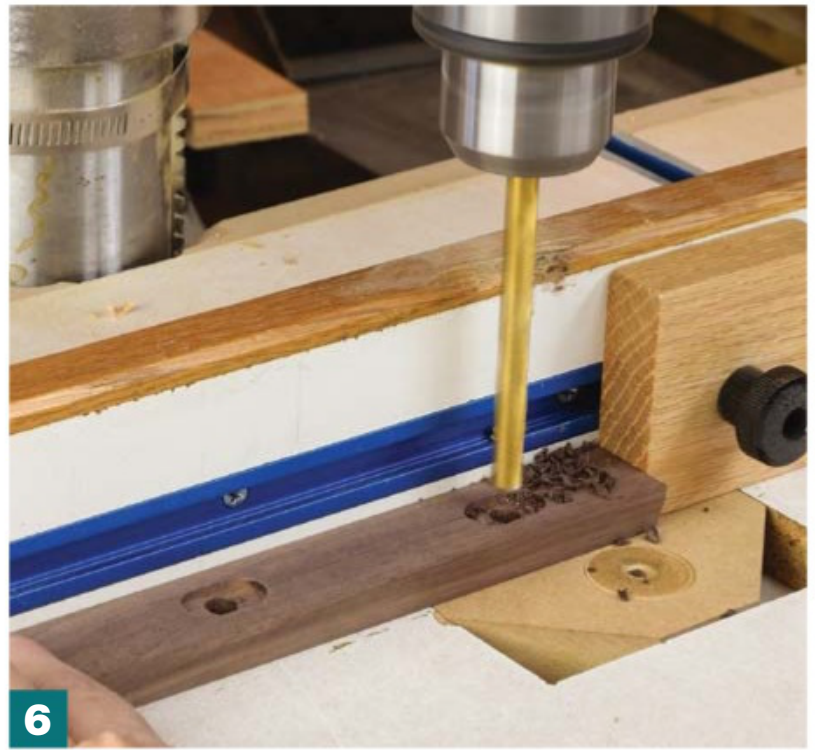
1 Mill centered grooves in the plywood base to remove most of the waste. Set the bit height to slightly less than $\frac{1}{2}$ ".

2 Take passes from both edges of the board for a centered groove. The result looks like a large "plus sign" on the plywood base.

3 Switch to a dovetail cutter and complete the centered channel. Take multiple passes, and adjust the router table fence until you achieve the desired width.

4 With the same dovetail bit still in the router table, bevel both sides of the dovetail sliders. Leave them extra-long for now.





widest part. The dovetail bit I used has a 14° slope, but the angle isn't critical. As long as the dovetail bit has a cutting length of $\frac{9}{16}$ " or better, it should work fine.

Dovetail Sliders

Now make the dovetail sliders to fit the grooves. The stock used to make the sliders should be $\frac{9}{16}$ " thick, and extra-long for safe milling. Make a few of these strips, and rip them to various widths. I made three, ranging in size from 1" to 1 $\frac{1}{8}$ " wide. This way, I can run them all past the dovetail bit at one time. Once the sliders are beveled, test the fit in your plywood base. Choose the slider with the best fit,

and sand the angled edges until it moves easily in the channel.

With the sliders still extra-long, mill slots and holes to accept T-bolts. A $\frac{1}{2}$ " straight bit at the router table forms a shallow slot for the head of the T-bolt. Form two or three of these shallow grooves along the dovetail slider blank. Then head to the drill press and drill $\frac{5}{16}$ " holes through the blank, centered in the shallow recess.

Once all the milling operations for the dovetail sliders are complete, they can be cut to final length. The dovetail sliders need to be about 3" long, with the T-bolt roughly centered. A dab of paste wax helps create a smooth sliding action.

5 Router and drill for T-bolts. With a $\frac{1}{2}$ " diameter bit at the router table, mill shallow slots in the dovetail sliders to accept T-bolts.

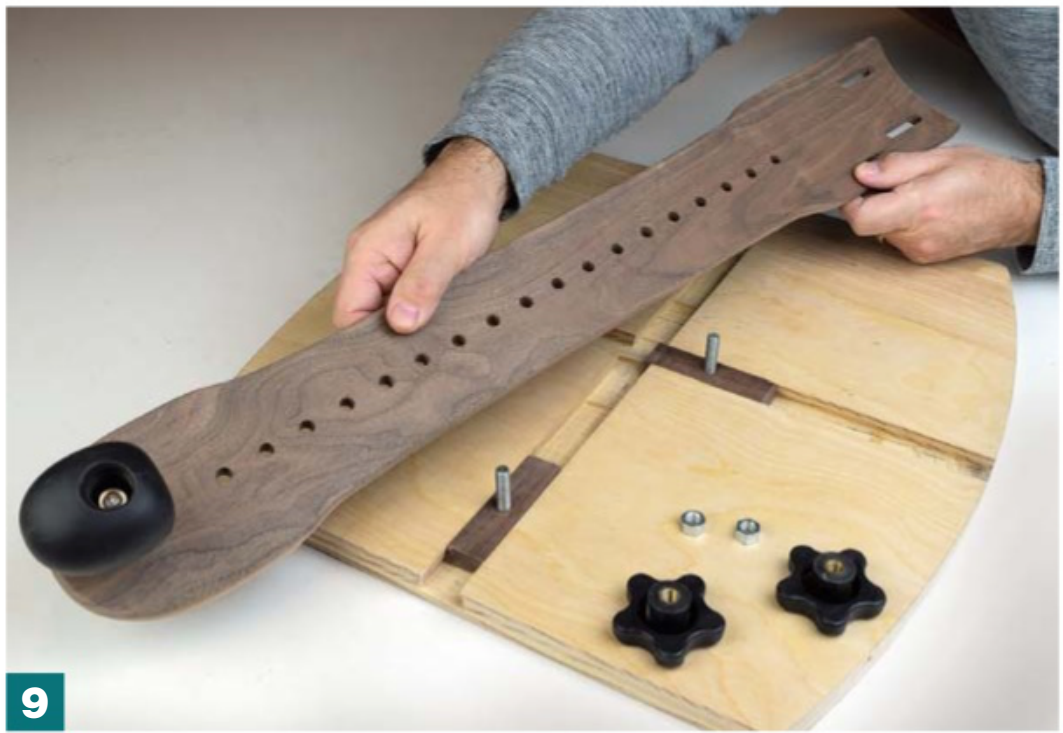
6 Then drill $\frac{5}{16}$ " diameter holes while the dovetail slider blanks are still extra-long.

7 Fit the dovetail sliders with T-bolt hardware. The heads of the T-bolts should be flush with the bottom of the sliders.

8 Rout slots in one end of the swing arm with a plunge router and edge guide. A scrap of MDF is clamped to the swing arm to act as a stop for the router.

Make the Swing Arm

Now that the base and sliders are complete, move on to building the swing arm component. The arm starts as a rectangular blank 27" long x 4" wide. While it's tempting to make this component from thick stock, I've found that a $\frac{3}{8}$ " thick hardwood blank is sufficient. Start by routing a pair of slots on one end of the swing arm. These slots will allow additional adjustment of the ellipse diameters, without removing the dovetail sliders. This feature is particularly helpful for setting a final trimming pass when cutting out the elliptical shape. Next, take the swing arm to the drill press and drill a series of $\frac{5}{16}$ " diameter holes with consistent spacing. I spaced the holes $\frac{7}{8}$ " apart center-to-center. For a greater range of size possibilities, you could space the holes even closer together. The last hole on the swing arm will mount an optional handle with a $\frac{5}{16}$ " T-bolt. Rout a $\frac{1}{2}$ " wide x $\frac{7}{8}$ " long slot to re-



9

9 Drill a row of $\frac{5}{16}$ " diameter holes in the swing arm, and shape it as desired. Mount a handle on the far end of the swing arm for extra control.

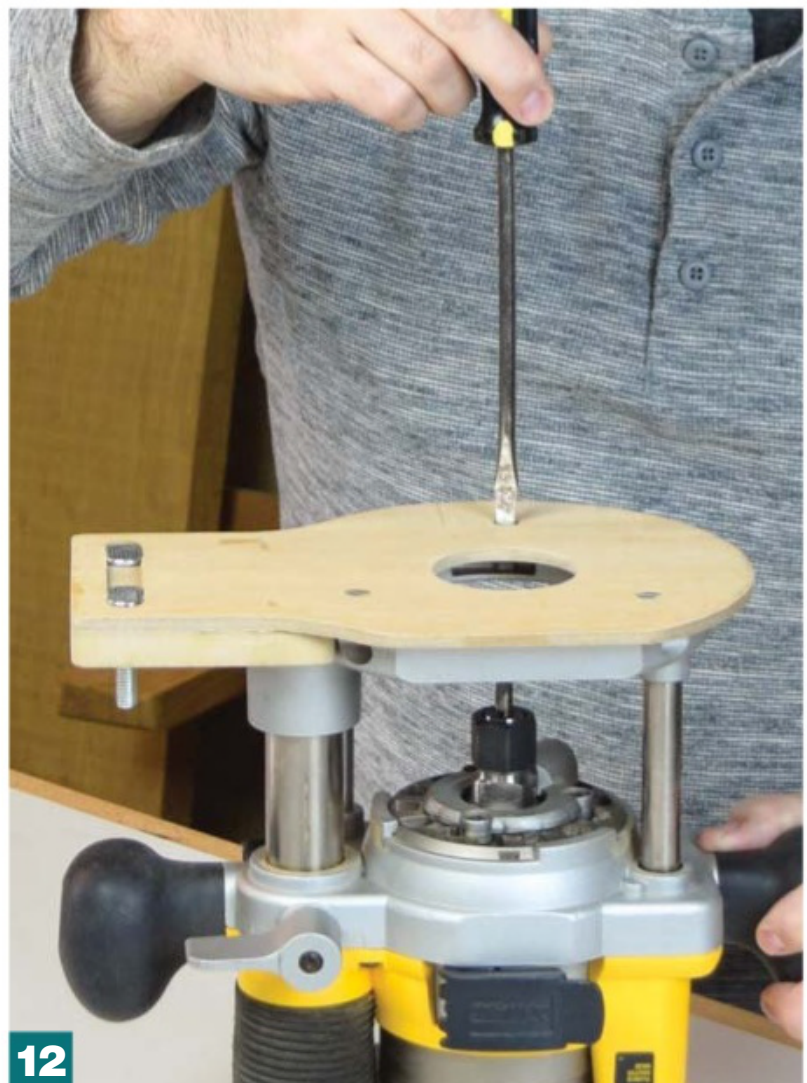
10-12 Glue the base plate to the step-down block (Image 10). Rout a slot to receive a pair of T-bolts, and countersink holes for the router mounting screws (Image 11). Finally, mount the jigs baseplate assembly to a plunge router with the original screws.



10



11



12

ceive the T-bolt head (just as you did with the dovetail sliders previously). I repurposed a handle off a spare router, which offers a comfortable and secure grip when using the jig. Finally, shape the swing arm as required for your particular router. I cut a concave shape on the router end of the swing arm, and rounded the corners.

Simple Router Base Plate

My goal was to make a base plate that sits low to the workpiece so I could use standard length router bits. This simple step-down router base accomplishes that goal, with the router sitting no higher than it normally would. Start with a piece of $\frac{1}{4}$ " plywood or MDF, and trace the shape of your router. Transfer the mounting hole locations using the router sub base as a template. Now add the

step-down block, which is a piece of $\frac{9}{16}$ " thick stock sized to fit your new base plate. A scrap of $\frac{1}{2}$ " MDF would also work for the step-down block. Glue the step-down block to the base plate, and sand the edges flush once the glue sets. Rout and drill the step-down block for a pair of T-bolts, and you're ready to assemble your new elliptical jig.

Assembly and Use of Jig

Place the swing arm onto the sliding T-bolts, setting both the major radius and minor radius to the desired dimensions. Install washers and nuts first, followed by star knobs to hold the swing arm in place. The $\frac{5}{16}$ " nuts and star knobs function as jam nuts to hold the parts securely together. Alternative you can use locknuts with built in nylon inserts. Attach the base-

plate to a plunge router, and secure it to the swing arm with a pair of $\frac{5}{16}$ " x $1\frac{1}{2}$ " long T-bolts. Test the arc of motion at the radii you intend to use. You may find it necessary to trim two sides of the jig's base to allow the router to pass by.

A $\frac{1}{4}$ " spiral upcut bit is an ideal choice for cutting out the oval workpiece. Lower the bit $\frac{1}{4}$ " at a time, and make multiple passes to complete the cut. Make sure the workpiece is supported on a scrap of sheet goods as you complete the cut. Use this setting to make a full-depth trimming pass in a counterclockwise direction. Make a micro adjustment for a slightly smaller ellipse. This will clean up any bit marks from the previous step. **PW**

Willie Sandry makes lots of Arts & Crafts furniture in his Washington shop.

13 Attach the swing arm to the dovetail sliders with $\frac{5}{16}$ " T-bolts, washers and nuts. The star knobs and nuts work together as jam nuts to prevent the swing arm from loosening as you work.

14 Rig the power cord and dust hose so they're out of the way. Select the appropriate holes in the swing arm to make the appropriate size ellipse. Make several counterclockwise passes with a $\frac{1}{4}$ " spiral bit to complete the cut. Make a micro adjustment, and make a full-depth trimming pass to clean things up.



Common Finishing Problems

How to avoid them and then fix them when they do occur.

By Bob Flexner

No matter how experienced or good you are at wood finishing, you'll still have problems now and then. Here are some of the most common and how to avoid and fix them.

Brush Marks and Orange Peel

Brush marks and orange peel are the problems that cause woodworkers to like the wipe-on/wipe-off finishes so much. Finishes such as oil, wiping varnish and wax are essentially fool-proof. The problem is that they are too thin to offer much protection against moisture.

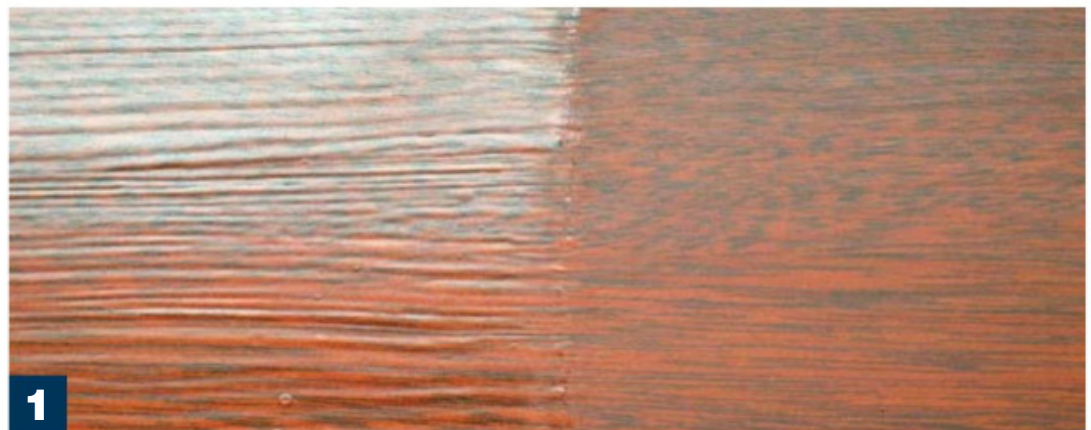
So how can you eliminate or, at least, reduce brush marks and orange peel to get the maximum protection? The easy solution is to thin the finish more. This is pretty logical, actually. If the finish were just the thinner, the problem would be solved. There wouldn't be any build, so no brush marks or orange peel. It follows that thinning to somewhere between the thickness that is causing the problem and just the thinner should produce minimal brush marking and orange peel while still producing adequate thickness.

If you are spraying and using a compressor rather than a turbine, you can also turn up the air pressure. Doing this will atomize thicker finishes better. I have not found that using a more expensive brush eliminates brush marks. They happen anyway.

Fixing brush marks or orange peel after they have occurred is also pretty logical. Sand the surface level and brush or spray another coat that is thinned more.

The Finish Won't Dry or Harden As It Should

The most common reason finishes



1 Brush marks occur when the finish is too thick (left). So thin the finish more to eliminate them. You may have to apply more coats to get an equivalent build.

2 Orange peel occurs when you spray a finish that is too thick (left). To eliminate orange peel, thin the finish or increase the air pressure to your spray gun.

dry slower and sometimes never reach the hardness you expect is working in cold conditions. So figure out a way to warm the area you're working in.

There are also some other things you can do depending on the finish you're using. You have more control of the drying with lacquer than other finishes, which is one of the reasons lacquer (including catalyzed lacquer) is popular with professionals. To speed the drying of lacquer thin it with acetone rather than lacquer thinner. Acetone evaporates much more rapidly than lacquer thinner, so the finish dries quicker.

With shellac you don't have a

choice of solvents you can use. The usual cause of slow drying, other than working in low temperatures, is using shellac that is too old. Unlike lacquer and varnish, shellac has a shelf life. It used to be that Zinsser Bulls Eye, the only remaining supplier of already-dissolved shellac put the date of manufacture on the can. They no longer do this. So your choices are to go to another store or catalogue that you think has a faster turnover so the shellac will be fresher, or dissolve your own shellac from shellac flakes and use it within a year or less.

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23848266

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72" x 80" MOVING BLANKET

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23848609

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LIMIT 2 - Coupon valid through 4/11/20*

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23855414

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drillmaster

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LIMIT 3 - Coupon valid through 4/11/20*

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18" WORKING PLATFORM STEP STOOL

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23872230

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4 PIECE ANTI-FATIGUE FOAM MAT SET

- Each pad measures 25" x 25"

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LIMIT 5 - Coupon valid through 4/11/20*

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3 Glue splotches can usually be disguised by painting in color. It's usually best to paint the grain first, then fill in the lighter surrounding area.

4 Blushing occurs in lacquer and shellac on warm humid days. It's a milky-white haze that develops in the film as it dries. You can usually remove it easily by rubbing the surface with steel wool or an abrasive pad.

5 Water-based stains dry much more rapidly than oil-based stains, so they can be difficult to wipe off. Divide your project into smaller sections or get a second person to help.

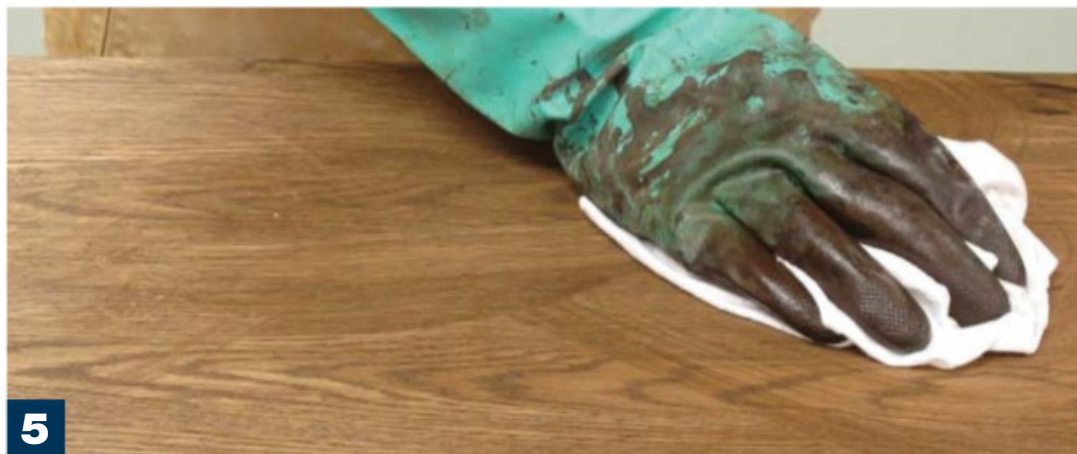
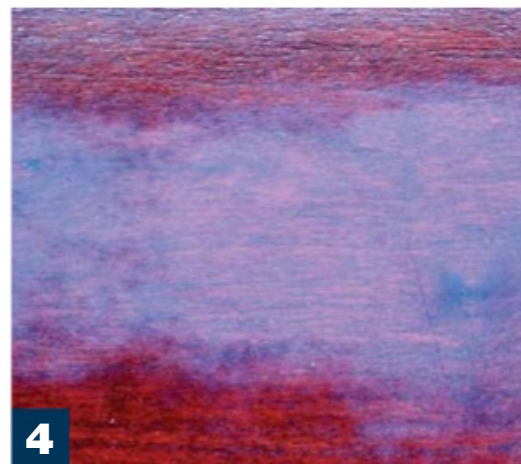
won't dry properly in warm conditions should be thrown out and replaced. With both of these finishes, and with shellac that is too old, you'll need to strip the tacky or gummy finish, sand the wood smooth again, and start over with a fresher product.

Glue Splotching

Glue splotching usually shows up as lighter areas caused by glue seepage around joints or from fingerprints, especially under a stain. So the obvious way to avoid the splotching is to put less glue in the joints and make sure your hands are clean when touching the wood. Also, pay close attention before applying a stain or finish to be sure there's no glue on the surface.

To remove any fresh glue you find, wash it off with a wet rag and re-sand to remove raised grain. If the glue has dried, lift it off with a chisel if it hasn't dried all the way through, or sand or scrape it off if it has. Then re-sand to remove raised grain and any remaining glue.

To fix the splotched lighter areas after staining, sand these areas with sandpaper wet with more stain. You may need to sand the entire part this way to get the color even. Sometimes it helps to use a coarser-grit sandpaper and sand the entire part wet with more stain.



To fix the splotching after finish has been applied, disguise the lighter area with markers or with an artist's brush and some colorants. Then apply another coat of finish to protect your repair from being rubbed off.

In the worst cases, if you can't make an adequate repair, you'll need to strip off the finish and sand to an even coloring. You don't need to sand off all the color, just make what is left fairly even so the stain you reapply comes out even.

Blushing

Blushing is a milky white haze that occurs on warm, humid days in fast-drying shellac and the various lacquers. Blushing doesn't occur in varnishes or water-based finishes. The cause of blushing is the rapid solvent evaporation causing the surface to cool so moisture in the air condenses into the finish and takes it out of solution.

To avoid blushing thin lacquer with slower-evaporating lacquer retarder, or wait for a drier day with both shellac and lacquer. You can also warm either finish in a pot of

hot water. This also helps the finish level better.

To remove the milky-white haze after it has occurred, spray the lacquer surface with lacquer retarder, or wait for a drier day and spray or brush the shellac surface with denatured alcohol. You can also abrade the surface of either finish with steel wool or an abrasive pad. The haze is right at the surface.

Stain Dries Too Fast To Wipe Off

This is seldom an issue with oil-based wiping stains, but with the increased use of water-based stains, it has become an issue, especially on large surfaces. So to help get the stain wiped off faster, divide large projects into smaller parts and apply and wipe off one at a time. Or get a second person to help – one applying and the other wiping off right behind. Just allow a few seconds for the stain to penetrate so it comes out even. **PW**

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Please Take Off Your Shoes

Learning from the footsteps of time.

By Yoav Liberman

Before I give my students their sandpaper for the first time, I ask them if they have noticed the depressions in the treads of our school's stone stairs. Most of them have not, so I continue to ask: what do you think created these eroded areas? Now I see some raised hands and I begin to hear answers flowing in the right direction. The consensus view is that our shoes ought to be blamed for the deed. But can it really be the leather soles of the 19th and early 20th century shoes, and then the rubber and molded plastic of the 20th and 21st centuries that inflicted all of this damage? After all, aren't leather and plastic much softer compared to granite or marble?

When I reveal to them that the real reason for the treads shapeshifting is the sand and grit that our shoes carry, they are in awe. I explain to them that over time, the tiny pieces of sand that temporarily embed themselves in our soles act like sandpaper on the surfaces that we walk upon. This, I say, is the main reason for the "please take off your shoes" rule

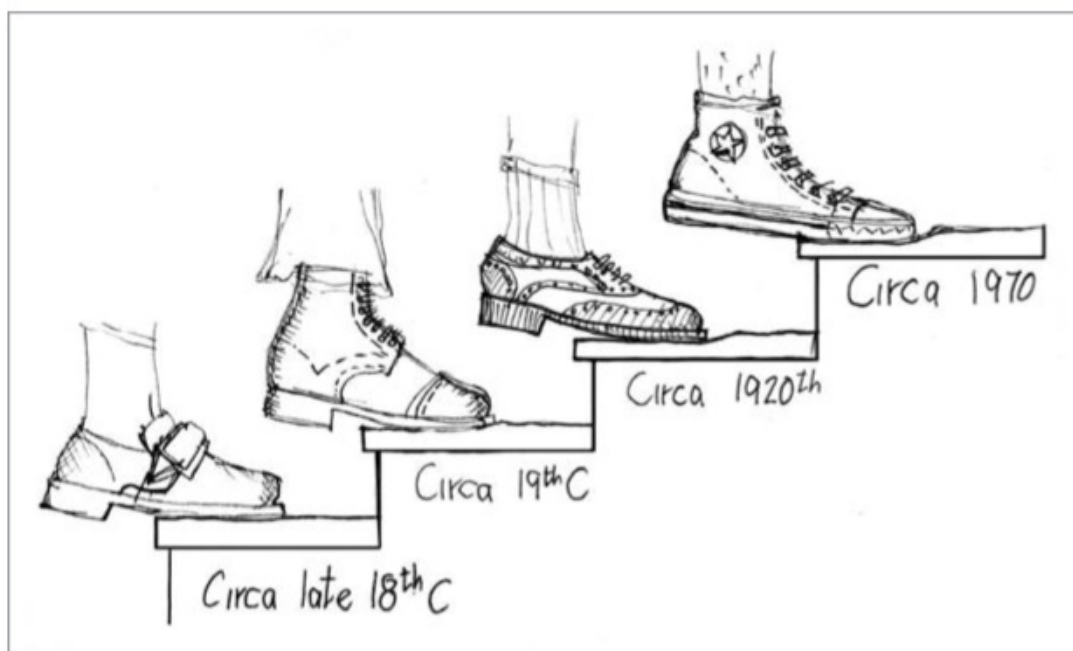
which exist in so many homes with wooden floors.

Late last year, I had a chance to visit the wonderful Hopper-Goetschius House Museum in Upper Saddle River, New Jersey. The original house was built in the 18th Century and has received a few additions and modifications over the years. It was owned and was inhabited by the same family since the early 19th century, and then was gifted to the Upper Saddle River Historical Society in 1985. Ever since then the house, its contents, and the historical structures around it are used as a living museum.

When I visited the house, I took a trip to the basement which is perhaps the oldest part of the structure. What overwhelmed me was the condition of the wooden treads and in particular the depth and span of the depressions. I have never seen such remarkable evidence of shoe-soles sandpapering effect on wood before. I was told by the Historical Society's volunteers that only a handful of visitors bother to descend to the cellar, as it is not part of the museum tour

plan, plus the house is open to the public only a few times a year. Therefore, these depressions are not due to recent "shoe-sanding" but rather evidence of almost three centuries of use. I thought that this was quite impressive—to literally walk in the footsteps of our predecessors, and add a tiny contribution of my own, as the museum rules do not include the "Please take off your shoes" rule. **PW**

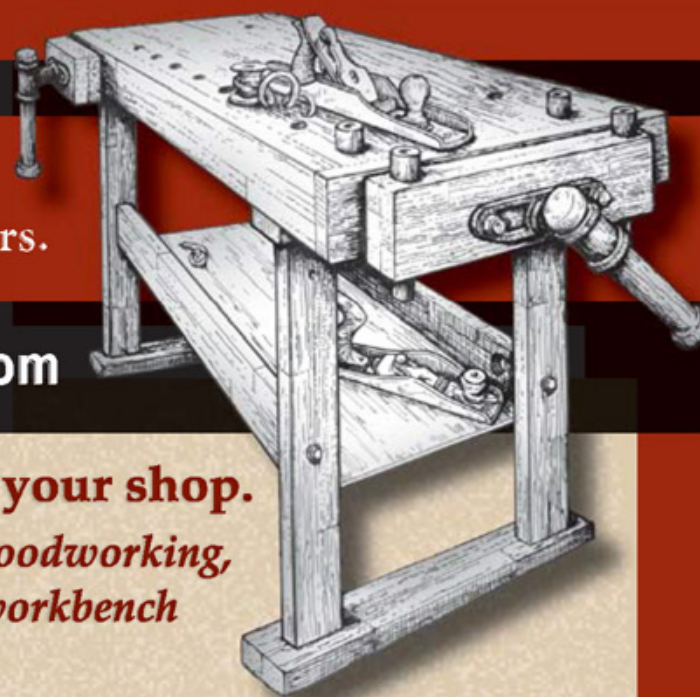
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Yoav Liberman is a woodworker, author and woodworking teacher at the Rudolf Steiner School in Manhattan.





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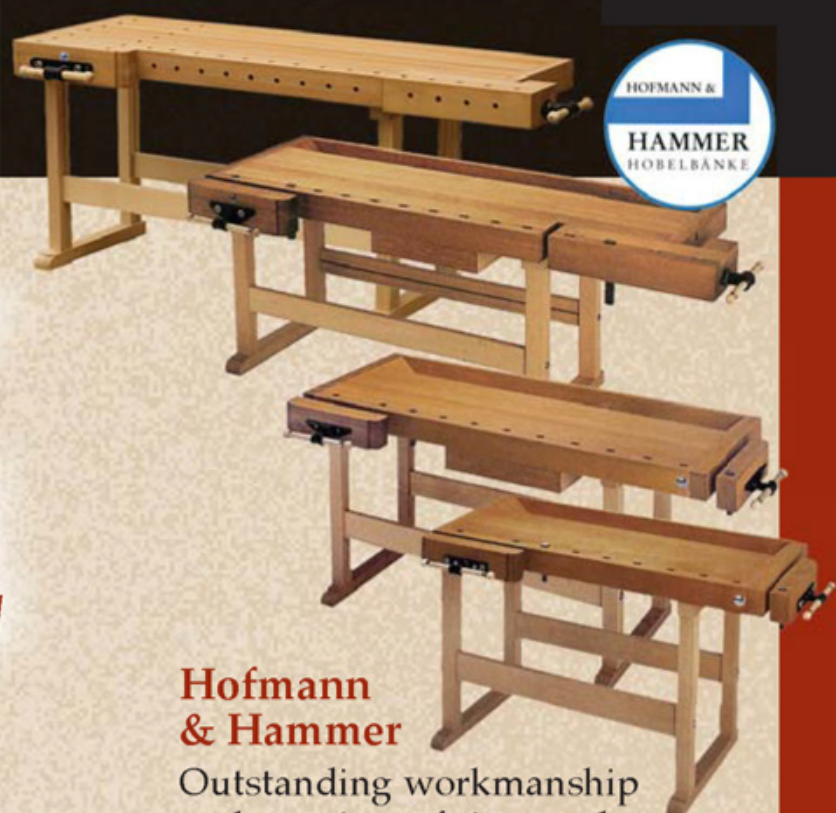
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