

**58 TIPS
INSIDE!**

Sawtooth Desk *page 67*

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**Turn a Bowl
on a
Tablesaw?**

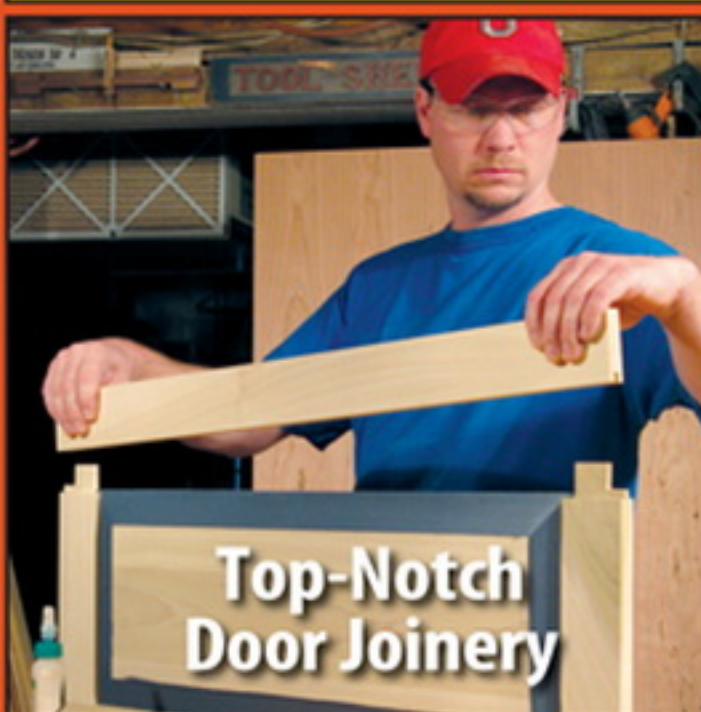
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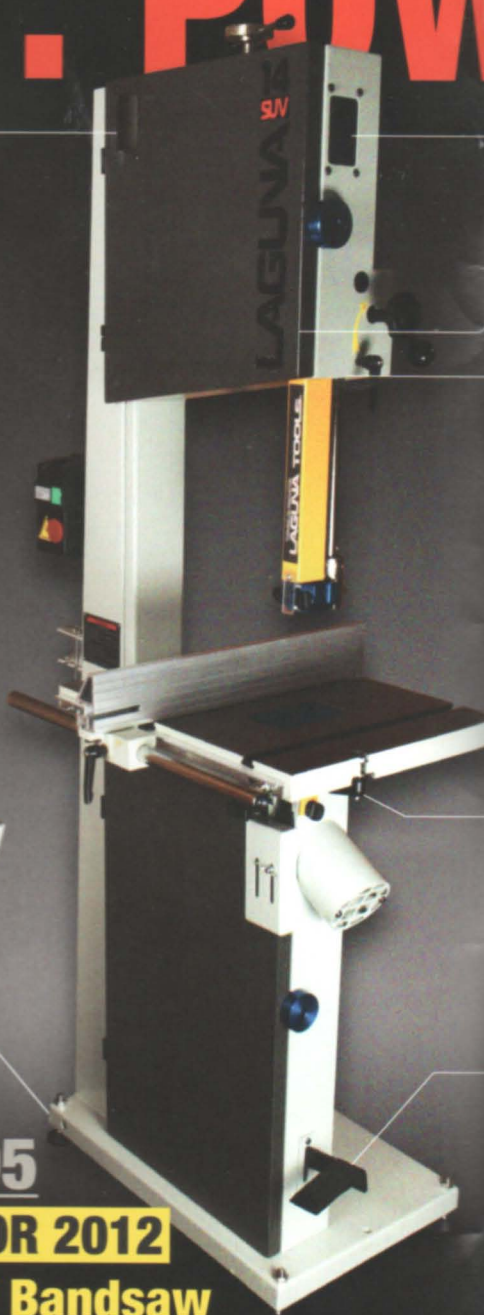
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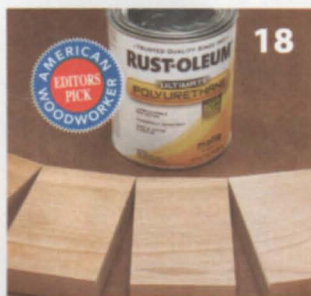
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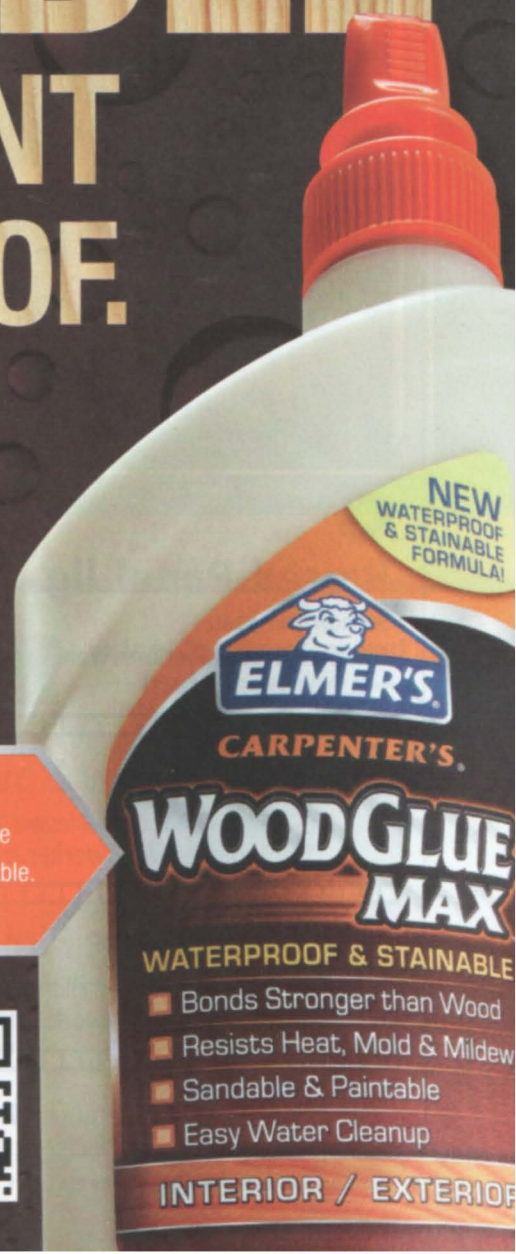


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Tablesaw Bowl

A bowl made on a tablesaw? (See page 58.) Watch the magic at AmericanWoodworker.com/WebExtras



Finish the Finish

Make a brushed-on finish feel smooth as silk. See how at AmericanWoodworker.com/WebExtras

American Woodworker

#159, April/May 2012

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ADVERTISING SALES

1285 Corporate Center Drive, Suite 180, Eagan, MN 55121

Brian Ziff, bziff@AmericanWoodworker.com
office (860) 417-2275, cell (203) 509-0125

Susan Tauster, stauster@AmericanWoodworker.com
office (630) 858-1558, cell (630) 336-0916, fax (866) 643-9662

Tim Henning, thenning@AmericanWoodworker.com
office (708) 606-3358, fax (866) 496-2376

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Contact the editors

Email: aweditor@AmericanWoodworker.com
Phone: (952) 948-5890, Fax (952) 948-5895
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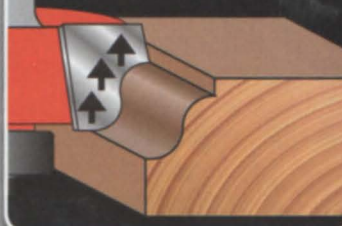


Other
Router Bit
2 Cutter
Design

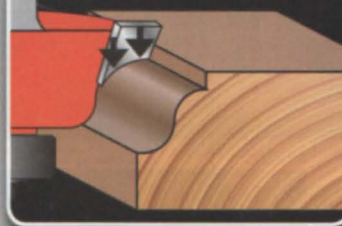


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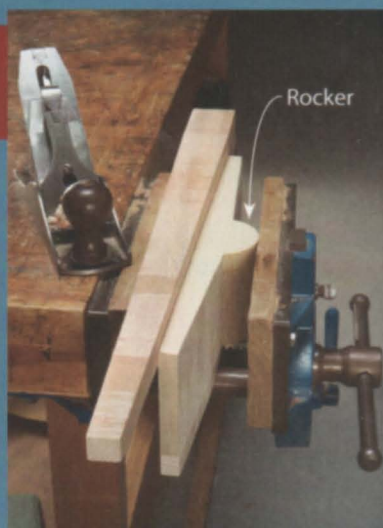
Terrific Tip!

Shop-Made Rocker Jaw

ONE SIMPLE BOARD, cut into the shape of a seesaw, can make a huge improvement to your vise. It allows you to firmly hold tapered work and long, upright boards off to the side of the vise.

For a tapered piece, such as the leg shown here, place the rocker in the middle of the vise. The rocker will automatically rotate to match the leg's taper as you tighten the vise.

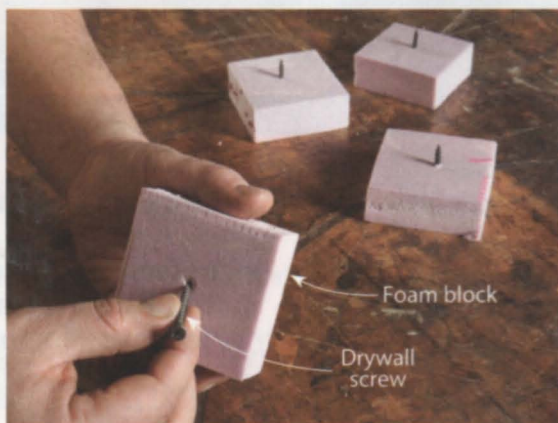
For a long board, move the rocker to the end of the vise. As you tighten the vise, the front jaw will twist a bit—an unavoidable condition known as “racking.” The rocker compensates for racking and applies even pressure across the front face of the board. Without the rocker, you know what happens: As the vise racks, it only pinches the left edge of the board, and the board is free to rotate. Not good. The



rocker neatly solves this age-old problem.

To make the rocker, you'll need a board that's about 1-3/4" thick, as wide as your vise is deep and a little longer than your vise's jaws. I made the curved portion 2-3/4" dia., but there are no critical dimensions. Just draw the shape on the board's edge and cut it out on a bandsaw.

Yoav Lieberman



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 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



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Besides the obvious cost savings, there are other benefits to making your own handles. First, you can customize their length and diameter—no longer do you have to settle for "one-size-fits-all" tools. Second, although a matched set of tools might seem like a good idea, giving each tool a unique handle is an easy way to tell them apart when they're stored edge-down in a tool rack.

John English



For more information on turning handles, go to AmericanWoodworker.com/WebExtras



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Tailstock Parking Spot

WHEN I TURN hollow vessels, I have to remove my lathe's tailstock to install a support for the hollowing tool. When I'm done hollowing, I have to re-mount the tailstock to finish the turning. It's a pain—literally. My tailstock is quite heavy; removing it is hard on my back, and getting it re-aligned on the ways is worse yet.

To solve the problem, I made a "parking spot" for the tailstock and bolted it to the end of my lathe. This addition is just for storage—it's not a bed extender. It's aligned with the lathe's ways, so I can slide the tailstock into the parking spot instead of lifting it.

I made most of the parking spot from dimensional lumber and common hardware, and used hard maple for the ways.

Lloyd Ackerman

Cork It!

TO PROTECT THE EDGES of small carving tools, stick a wine bottle cork on them. Synthetic corks work best because they don't break apart as easily as natural cork.

Allow the cork to dry for a couple weeks before using it. If the cork is still damp inside, it can rust the tool.

To make a cork cap, stand the cork on your bench and let go of it—or clamp it upright in a handscrew, placed on the bench. Then carefully push the tool into the cork. However you do it, keep both hands behind the cutting edge of the tool. If the tool slips, you don't want to spend the rest of the day in the ER.

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Workshop Tips

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Bullet-Catch Bench Dogs

WHEN I BUILT my workbench, I drilled round bench-dog holes in the top so I didn't have to cut square mortises. Being a thrifty sort, I didn't want to shell out for store-bought dogs, so I made my own.

At first, I thought all I'd need was a couple 3/4" dowels with flat faces cut into them at a slight angle. They worked, but I couldn't leave the dogs in the holes when they weren't in use—they fell right through!

I had some leftover bullet catches from another job, so I installed a pair in each dog. They're spring-loaded, providing just enough pressure to keep the dogs in place.

The catches have a lip, so I supported the dogs in a V-block and drilled shallow counterbores to sink the lips below the surface.

Serge Duclos



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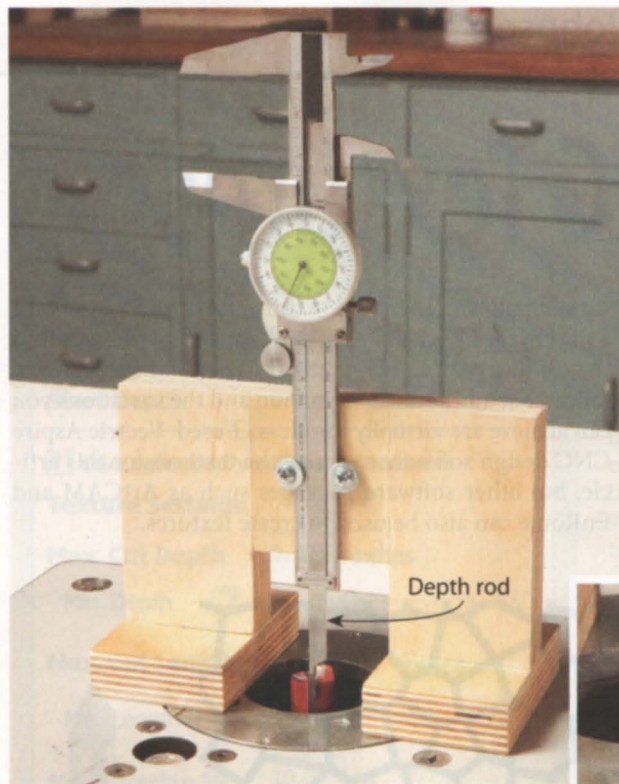
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Precision Height Gauge

TO SET THE HEIGHT of a router bit—within .001", if necessary—I made this simple stand for my caliper. It works on a router table or a hand-held router.

Two screws with washers secure the caliper. When I need the caliper without the stand, it's easy to remove. The exact position of the caliper on the stand isn't important; it just has to be plumb.

To use the gauge, set the bit at roughly the height you want. Place the caliper over the bit. Extend the caliper's depth rod until it touches the top of the bit's cutting edge, then turn the caliper's dial face so the zero is right on the needle.

Slide the gauge away from the bit and push the depth rod down to the table's surface. The reading you get is the bit's height. If the bit's height is not quite right, adjust the bit and repeat the procedure.

Fred Adams



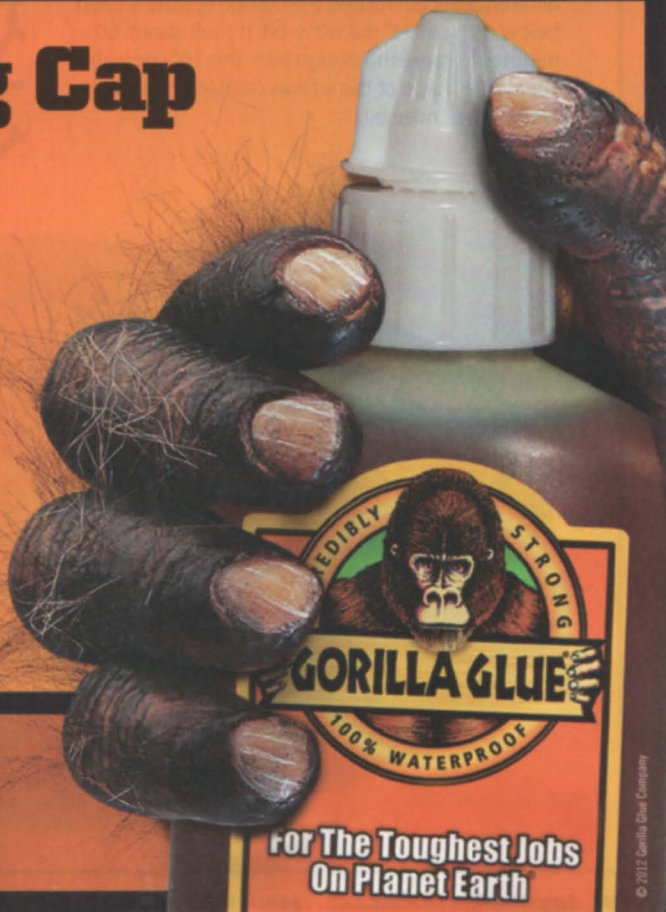
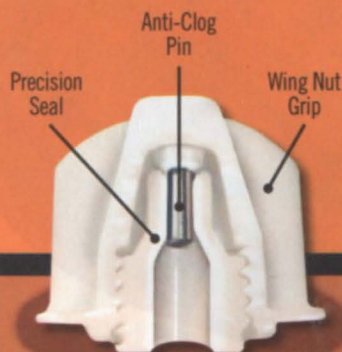
SOURCE

Highland Woodworking, highlandwoodworking.com, 800-241-6748, Woodworker's 6" Dial Caliper (reads in fractions and thousandths), #465008, \$30.

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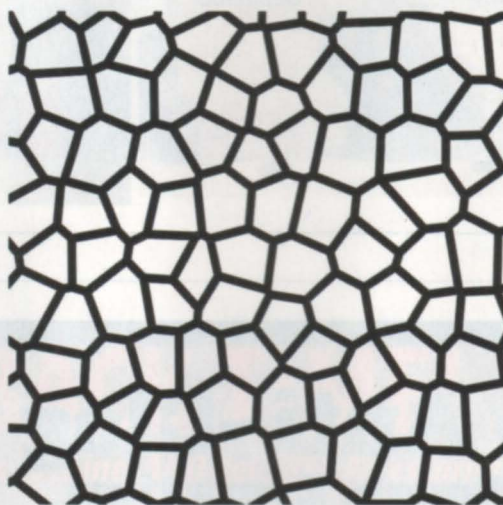
Creating CNC Textures

CNC ROUTERS are opening up lots of new ways to create textures in wood. Here are my three favorite ways of creating textures using a CNC. The first method uses the repetition of shapes to create a design that is routed using one or more bits. If you enjoy doodling patterns, this is a technique that you will enjoy. The second method uses programming built in to the design software to generate a texture design that simulates a hand-

carved pattern. The third texturing method starts with a photograph and converts the light and dark areas into the routing paths. Each method has a few basic rules to follow, but add some imagination and the variations you can achieve are virtually limitless. I used Vectric Aspire CNC design software to create the textures for this article, but other software packages such as ArtCAM and EnRoute can also be used to create textures.

Shape-Based Textures

Shape-based textures are created by repeating a pattern of either asymmetrical or symmetrical shapes. Patterns can be hand-drawn or drafted with a CAD program such as Google SketchUp. Hand drawn designs need to be scanned or digitally photographed so they can be imported into the CNC design program. CNC design programs are also capable of creating shape-based patterns. One creative aspect of this type of texturing is that you can rout on the lines or between them to achieve different effects. I routed the crackle texture shown below using a 1/4" dia. 60° v-bit. It took about 60 minutes to carve the design into this 10" cherry lid. The dome shape of the lid was created first using a 1/4" dia. ball nose bit.



Software-Based Textures

Using the built-in texturing program that comes with most CNC design software packages is an easy way to create a simulated hand-carved texture. As shown in the program window to the left, there are several options to choose from when designing this type of texture. Adjusting these variables enables you to create a wide variety of simulated hand-carved textures, ranging from those with long, closely spaced cuts, to those with short, widely spaced cuts—and anything in between. Once the options are selected, the program creates a semi-random pattern of lines (see middle image below) for the router bit to follow. I used the settings shown here to create texture on the walnut lid shown below. I used a 1/4" ball nose bit to create the texture, but other profiles such as straight bits or v-bits can also be used, expanding your options even further. It took about 60 minutes to carve the texture shown below.

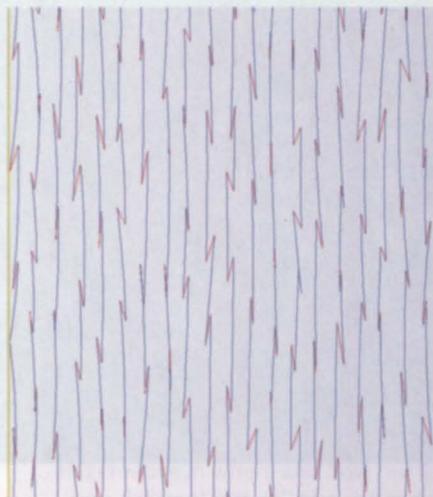
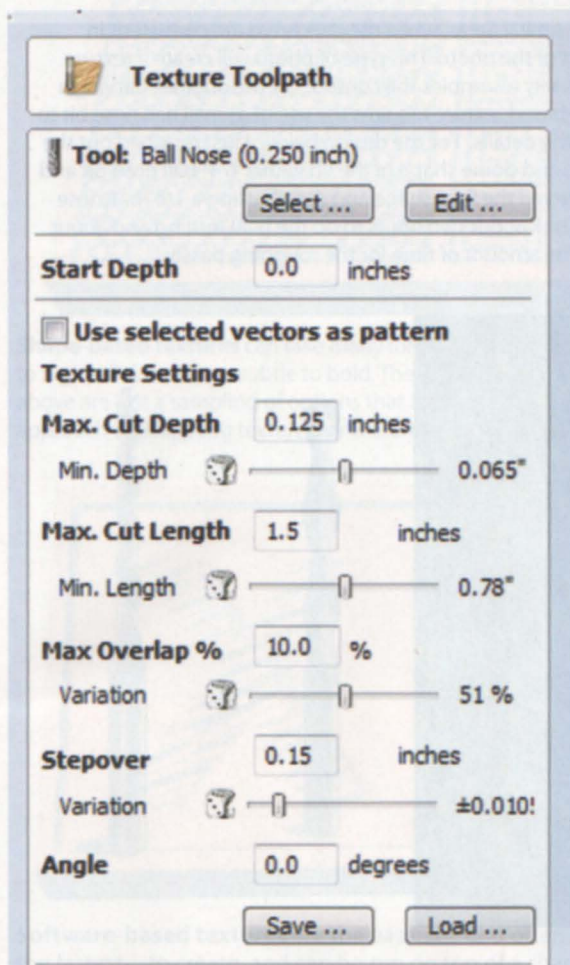


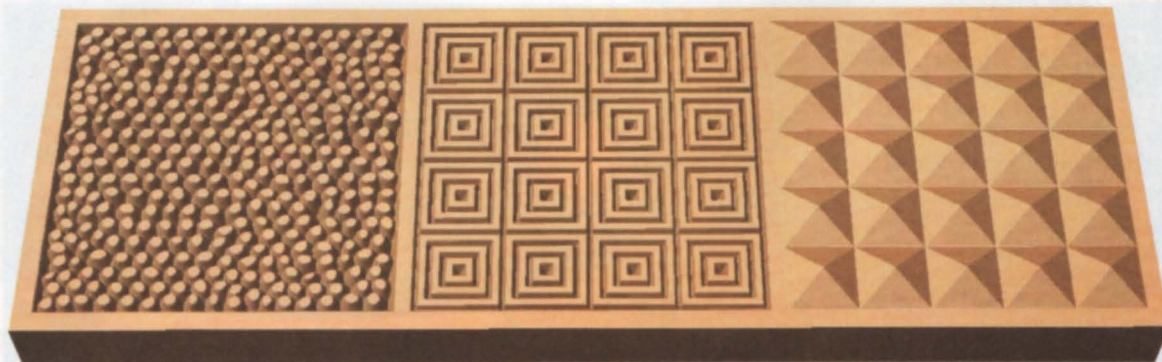
Photo-Based Textures

Another way to create a CNC texture is to start with a photo. Not all photos work equally well, however. That's because the CNC design software reads the light areas as high points and the dark areas as low points and tells the CNC router to carve accordingly. A good photo image is one that is evenly lit without long shadows, but yet has good contrast. As you can see in the alligator skin photograph below, the highlights

accent similar areas, while the dark areas are consistent in the rest of the photo. This type of photo will create a texture that closely resembles the contours of the original. Carving a photo-based texture requires the use of a small ball nose bit to attain the details. For the design below, I first roughed out the texture and dome shape of the lid with a 1/4" ball nose bit and then carved the final shape and details using a 1/8" ball nose bit. It took about two hours to do the final routing and about the same amount of time for the roughing passes.



Texture Variations



Shape-based textures can take many forms, from low relief to high relief, and from subtle to bold. The three textures above are just a sampling of options that are possible with this approach to designing textures for the CNC. The one on the left

was created using a collection of small circles that were then routed around with a 60° v-bit. The middle design is simply an array of concentric squares, while the one on the right uses a grid pattern made with a 120° v-bit.



Software-based textures are the easiest—and often the fastest—to create, and can be run on top of a shape (left), around a shape (middle), or overlapping in different directions (right). These options allow you to be selective

and creative in where and how the texture is applied. Using different bits will also expand the variations you can create with this method of texturing.



Photo-based textures are an easy way to simulate existing textures—as seen in these three examples. The weathered end grain (left) shows a surprising amount of detail, as does the cloth texture (right). The stones (middle) create an interesting pattern, although they are rendered quite

flat. Additional depth can be added to the stones through the use of other modeling tools, if so desired. The thing to remember about creating textures from photos is to always start with a photo that has even contrast.

No-Finish Look, Poly Protection

SO YOU WANT THE LOOK of raw wood and excellent protection against spills and scratches? Until now, that request might have provoked a few chuckles.

Rust-Oleum's brand new water-based Ultimate Matte Finish Polyurethane will get you pretty close. When dry, this finish has the minimal look of a wax finish—the wood is hardly darkened at all, even with multiple coats. Soft to the touch, it feels a bit like wax, too. But unlike a wax finish, it offers the superior protection of a polyurethane, and it doesn't have to be regularly renewed.

Ultimate Matte Finish is very easy to use. It dries in two hours, so you can apply the recommended three coats in one day. Cleaning up your brush or paint pad only requires soap and water. This finish is not recommended for floors or outdoor projects.



whereweshare.com

SOURCE

Rust-Oleum, rustoleum.com, 877-385-8155, Ultimate Polyurethane with Soft Touch, #260165, 8 oz., \$7; Quart, \$12.

Thrifty Dovetail Jig

THROUGH DOVETAILS—for woodworkers, this is batting in the big leagues, isn't it? Cutting them by hand certainly requires skill and practice, but if you use a well-designed router jig, almost anybody can play ball. Many of these jigs are quite expensive, but Leigh Industries, the maker of one of the best-known jigs, has just introduced a money-saving option: the R9 Plus Joinery System.

The heart of the R9 is a very precise, double-sided aluminum template. You mount the template to a wooden

beam, which you make yourself. The template allows you to make through dovetails up to 9" wide—and box joints, too. You can vary the size of the dovetails somewhat, but not their spacing. Using two different bits, you rout pins on one side of the jig and tails on the other side.

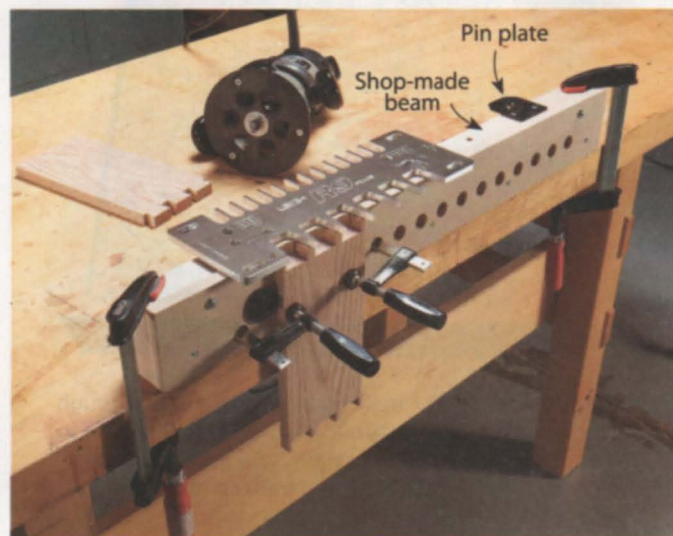
You're not limited to 9" boards, though: By moving the R9 template down the beam (which can be any length), you can dovetail boards of any width. The template is indexed by a series of "pin plates," which you screw to the beam. After you move the template to dovetail a wide piece, the pin plates enable you to return the template to the same positions for the next board. The R9 comes with three pin plates, enough to dovetail an 18" wide piece; more plates are available as accessories.

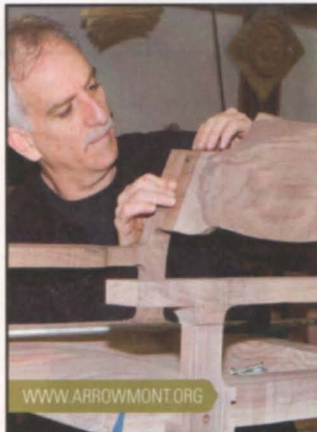
A cam-shaped guide bushing installed on your router's base controls the joint's fit. You just turn the bushing one way or the other to tighten or loosen the fit.

With the R9, you'll be able to make five different sizes of through dovetails on boards of any thickness up to 13/16". You can choose from three different pin widths and two joint pitches. For box joints, you can use stock of any thickness up to 7/8", with three different finger sizes. The R9 Plus works with either a hand-held router or on your router table.

SOURCE

Leigh Industries, leighjigs.com, 800-663-8932, R9 Plus Joinery System, #R9 Plus, \$169; R9 Pin Plates-2 pack, #2010PR, \$10.





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Work Sharp Upgrade

SHARPENING ON SANDPAPER is sure easy when the sandpaper rotates on a disc—you just hold the tool. That's the idea behind the Work Sharp 3000, a machine that's given me excellent results. As originally designed, the 3000 was equipped with a built-in ramp for holding chisels and plane blades at the correct angle, but you had to hold carving tools freehand. No longer.

For carving tools, the new Tool Bar Attachment changes everything. Mounted on the back of the 3000, it holds all those nifty jigs designed by Tormek for their legendary wet grinder. You get accurate and repeatable results every time. Tormek also makes jigs for turning tools, knives, scissors and many other types of blades. Tormek jigs range in price from about \$35 to \$100.

The Work Sharp tool bar swivels on a post, allowing use of the entire sharpening surface, so you won't wear out just one spot on the sandpaper. The post adjusts up and down to create the bevel angle you need and has a micro-adjust wheel for fine adjustments.



SOURCE

Work Sharp, worksharptools.com, 800-597-6170, Tool Bar Attachment, #WSSA0002601, \$60; Work Sharp 3000 Wood Tool Sharpener, #WS3000, \$250.

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A **CROSSCUT SLED** is one of the handiest jigs you can build for your tablesaw, but making the runners is fussy work. They have to fit tight in the miter slots, yet still be loose enough to slide. This requires a tolerance of only a few thousandths of an inch over the length of the runner. The folks at Micro-jig have made this task much easier for you.

Their ZeroPlay guide bars come in two parts: a top and a bottom. The mating surfaces of the bars have a series of opposing wedges molded into them. To size each bar, you place the bottom part in the miter slot up against a stop, which is provided. Then you push the top bar along the bottom bar, and the whole unit expands. When the guide bar fits the miter slot just right, you tighten the parts together with three setscrews and you're good to go. The bars have threaded inserts for machine screws, which you'll use to mount the sled to the bars. Lining up holes in the sled with the inserts will require some precise drilling.

ZeroPlay bars are made from Noryl, a reinforced plastic nylon. Unlike solid wood bars, which can fit tight in summer and become loose in winter, these bars will always give your sled smooth, wiggle-free action.

ZeroPlay bars are designed for 3/4" wide miter slots.



Included with the bars are plans for a small-parts cutoff sled with an off-cut deflector and a small-parts jointing jig for your router table.

SOURCE

Micro Jig, microjig.com, 855-747-7233, ZeroPlay Guide Bar System (includes two bars and two stops), #ZP9-B2S2, \$27.

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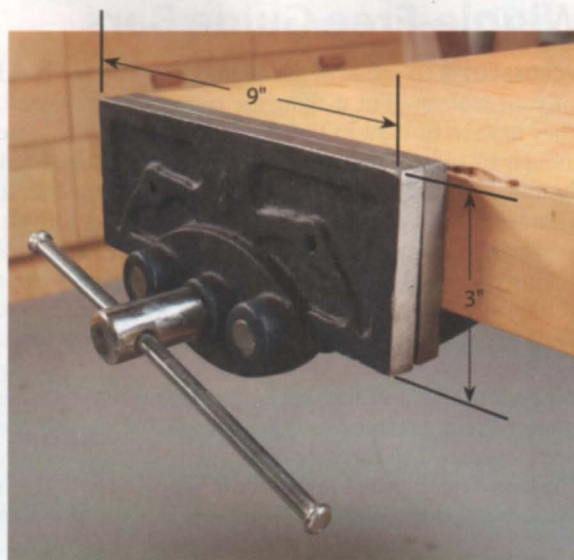
Bargain Vise

WHAT GOOD is a bench without a decent vise? You really need one—the bigger, the better. I've found that large vises hold work much better than small ones because their jaws have more surface area. Northern Tool now offers a large generic vise that costs only \$35—about \$100 less than a comparable name-brand model.

Inexpensive tools always make me suspicious, so I've given this one a good hard look. Right off the bat, I noticed that it doesn't have a quick release or a dog. A quick release allows you to slide the front jaw in and out without turning the screw—nice, but not a necessity. And I don't miss the dog; if I wanted one, I'd just add a thick face to the vise, drill a hole in it and add my own dog.

The Northern Tool vise does have more side-to-side play in it than a more expensive model, however. When you open or close it, the front jaw wiggles around. But does that matter, really? Nope. When you've got a board clamped up, the front jaw doesn't move at all, and that's what really counts.

The vise is 9" wide and has a depth capacity of 3". It opens a total of 8". The front jaw is canted forward, so it's vertical when fully tightened. All in all, a pretty good deal!



SOURCE

Northern Tool + Equipment, northerntool.com, 800-221-0516, Northern Industrial Woodworker's Vise – 9 in., #62895, \$35.



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Entry deadline is July 31, 2012.

Refined Gentlemen

"GENT'S SAW" is a marketing term that dates back to Victorian times. It was used to sell small, professional-quality saws for joinery to "gentleman" woodworkers—the hobbyists of the day. Those saws have been in production ever since; today, Lee Valley has a new take on them. They've issued both rip and crosscut versions.

A gent's saw has a straight, turned handle, as opposed to a pistol-grip handle. The handle on the Veritas saws is quite comfortable, but it's also replaceable. You can make a new one that's any shape you wish.

The real story is in the blade. Although these saws cut on



the push stroke, in the Western tradition, their blades are just about as thin as a Japanese dozuki saw, which cuts on the pull stroke. A thin blade removes less wood, which makes a saw easier to push (or pull) and easier to control.

Both saws have very fine teeth: 20 tpi for the rip saw and 22 tpi for the crosscut. Fine-toothed saws are excellent for beginners; they don't require the steady, confident strokes essential to cutting with a coarser blade. Unlike a dozuki saw, these teeth aren't hardened; when they get dull, you must re-sharpen them yourself. (With a dozuki saw, you replace the blade.) Sharpening teeth this small takes a steady hand and a good eye.

These saws are very similar to two pistol-grip saws also offered by Lee Valley. The gent's saws are a bit shorter, but are considerably less expensive. If you're considering buying a gent's saw for dovetailing, go for the rip version, since dovetail cuts are essentially rip cuts. My ad-hoc test for a dovetail saw is to make a cut, then make another cut right next to the first, leaving as little material as possible—1/64" or less—between the two cuts. The Veritas gent's saws passed with flying colors.

SOURCE

Lee Valley & Veritas, leevalley.com, 800-267-8735, Rip Gent's Saw, #05T10.01, \$49; Crosscut Gent's Saw, #05T10.05, \$49; Pair of saws, #05T10.08, \$89.

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Fast-Track to Flat Stones

FLAT STONES ARE ESSENTIAL to good sharpening. The new Dia-Flat from Diamond Machining Technology (DMT) is certified flat to within .0005" and makes quick work of flattening waterstones or oilstones.

I tried it out on a well-used Shapton ceramic stone, and was finished in about two minutes! (That's pretty impressive, as Shapton stones are so hard that flattening them with sandpaper is impractical.) In fact, I had so much fun that I flattened every stone in my shop.

According to DMT, their Diamond Hardcoat Technology—utilizing precisely-sized micron mono-crystalline diamond—outlasts any other diamond-coated lapping plate. It's 120 micron (roughly equivalent to 120 grit sandpaper) and can be used on any stone, from coarse to fine. The Dia-Flat's generous size is another plus. The plate is 4-1/2" wide by 10" long, which is plenty large to flatten any stone. For the quickest results, use it under running water or in a tub of water. If you're flattening oilstones, use oil instead of water.



SOURCE

Diamond Machining Technology, dmtsharp.com, 800-666-4368, Dia-Flat, \$200.

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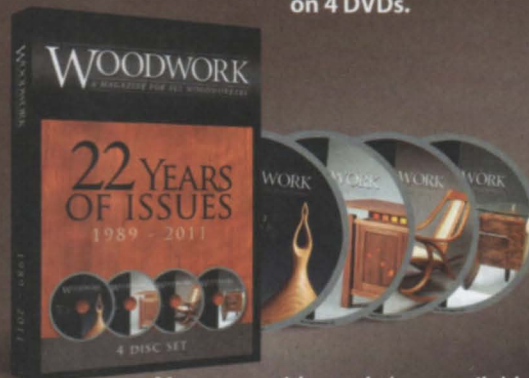
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continued

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"LONGER SHELF LIFE!" That's what the folks at Gorilla Glue heard from customers about their flagship product, which is a polyurethane glue. As you know, poly glues react with moisture in the wood or in the air to cure. If the bottle cap doesn't form a complete seal, poly glue can harden in the bottle before you reach for it again. The answer: a better cap.

Gorilla's new anti-clog cap has a stainless steel pin attached to the inside. The cap is threaded; as you tighten it down, the inner walls compress the bottle's opening to create an airtight seal around the pin. The cap has integrated "wings" so it's easy to turn.

The anti-clog cap is only available on the 2 oz. versions of both the original Gorilla Glue and the new "Dries White Two Times Faster" formula. These glues will last for months after you open the bottle—just don't lose that cap!

SOURCE

Gorilla Glue, gorillatough.com, 800-966-3458, Gorilla Glue 2 oz. products, \$5.



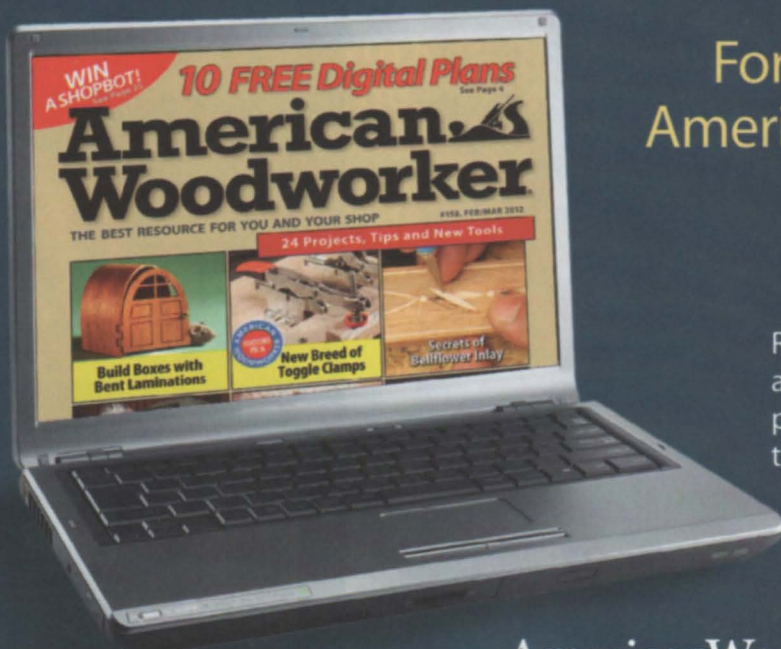
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PHOTO BY KATHY HUBEL

Brian Hubel

Amazing woods and curvaceous curves.

by Spike Carlsen

BRIAN HUBEL'S WORK is a seamless blend of amazing woods and fabulous craftsmanship, of cutting edge design and ancient Asian influences, and of graceful curves and chunky slabs. What woodworking school teaches this amazing range of skills and techniques? None other than SHK—the infamous Skool of Hard Knocks.

Brian is completely self-taught. "I've never taken a class or a course," he explains. "Though there are lots of times I wish I had. It would have

made the learning curve *way* less expensive."

Not a straight line

When asked how he got into woodworking, Brian says, "It sure wasn't a straight line." He started at the age of nine, making plaques on his grandfather's scroll saw. "I was one of those kids that would rip stuff apart, just to see if I could put it back together again," he recalls.

Brian's woodworking path took a major detour while he earned

degrees in criminal justice, chemistry and biology. Shortly after graduating he was hired to build railings and trampoline decks for the gymnastics school in Denver where his wife taught. Payment came in the form of a Powermatic 66 tablesaw. This tool, along with the acquisition of even more heavy-duty equipment, produced enough momentum to launch him into woodworking full time. He moved to Colorado Springs, where he now lives with his wife and two kids, and paid his dues

remodeling kitchens, building cabinets and taking any business that walked through the door.

Today he builds an average of 20 pieces a year. Many have a distinct, Asian look and feel. "I've never studied Asian culture or design," Brian explains. "A lot of my work just winds up that way." He loves the design aspects of woodworking. On the commissioned pieces he builds, he warns his clients ahead of time that the drawings will be rough, often letting the wood's figure and the joinery dictate the details. When asked how his clients feel about this, he says that no client has ever been dissatisfied. "At least none that have told me," he smiles. And he loves the little things; Brian takes great care in carving, turning and shaping the intricate ebony and



Bakers Table
20" H x 36" dia.

Big leaf maple burl, ebonized ash



burled pulls showcased on much of his casework.

Some years the bulk of Brian's work is based on commissions through professional designers and private individuals; other years his work is built primarily on speculation and sold through galleries and, increasingly, high-end art shows.

When asked about memorable mistakes, the conversation turns to business, not sawdust. "The biggest blunders I've made are in pricing. I don't know how many times I've undercut myself and wound up working for \$2 or \$3 an hour."

Brian's commute to his 1000 sq. ft. shop, a stone's throw from his back door, is ideal. His 1920s Oliver lathe, his 60 year old Tannewitz bandsaw (with 19" resaw capacity!), and his aged Craftsman drill press inherited from his grandfather

attest to his love of old, heavy-duty tools. He works primarily alone. "My 36" wide belt sander keeps me from having to hire somebody." But the workbench he built for his kids, who love tinkering in the shop with scraps, attest to his love of carrying on the woodworking tradition.

Wonderful woods

Brian has learned to acquire fabulous woods whenever he runs across them. "Since Colorado isn't exactly a hotbed for hardwoods," Brian explains, "I hoard wood like there's no tomorrow. It's a very bad habit. I have a 500 sq. ft. storage area packed with unique boards, wide boards, you name it. I'll stumble across something that's fabulous and I have to buy it, even though I have no idea what I'll do with it. I can't help it."

He's stumbled across some amazing woods in unexpected places. The big leaf maple burl top that graces *Bakers Table* (see **Photo**, above) came from a stump discovered when Baker Lake in Washington state was drained.

Forward in Time
70" H x 16" W x 11" D
Sapele, ebony

A Great American Woodworker

continued

The base for another table was crafted from purpleheart salvaged from the beds of old trailers found at Fort Carson military base. The wood for one of Brian's case pieces began life as a Russian olive tree on his grandfather's farm. The drawer fronts of that same piece are from Claro Walnut trees cleared from an orchard in northern California. Another unique piece of wood from this same orchard serves as the top of another distinctive table. It's a slab of Claro walnut displaying a dramatic change in grain and color where English walnut was grafted to the tree decades ago. Regarding his passion for wood, Brian reflects, "Luckily my wife is very understanding."

More than one way to skin a curve

Brian loves a good curve and employs a variety of methods to create them. Curved seats, such as those in *Flare* (see **Photo**, page 31, bottom left), are roughed out on a bandsaw, refined with a spokeshave and finished off with "a whole lot of sanding," he says.

Other pieces, such as *Forward in Time* (see **Photo**, page 29, at bottom), employ torsion box construction which involves building an internal curved frame or skeleton from ash, then applying a 5/16" thick skin veneer for the finished surface.

But Brian's favorite method for creating curves involves using his mammoth vacuum press; a tool he equates to a gigantic Ziplock bag. Initially he used a homemade press, but he now owns a commercial version that can accommodate pieces up to 5' x 10'. He starts by creating a bending form and then resaws boards into strips for laminating. His rule of thumb is to cut the laminations thin enough so he can bend them around the form by hand. He applies resin or

formaldehyde glue to the strips, uses heavy-duty tape to secure the strips to the form and then puts the vacuum press to work. "The pressure it exerts is phenomenal," Brian

explains. Since springback is negligible, the form he creates produces the shape he needs. He makes pieces slightly longer and wider than needed so he has extra material for



Room Divider
African mahogany, ebonized ash



Show Tyme
30" H x 64" W x 18" D
Cherry, Claro walnut, khaya



Solide
30" H x 96" W x 40" D
Figured Bubinga, cherry, ebony



Up-Lifted
46" H x 70" W x 16" D
Quartersawn mahogany, ebony



Flare
19" H x 50" W x 14" D (17" seat height)
Cherry, bubinga

final shaping and sanding. Brian is currently building steam-bending equipment so he can experiment with yet another type of curve.

His advice for those getting into curvaceous woodworking is to simply experiment and not worry about the end results. "Even if it's a complete failure, you'll learn something from it." 

See more of Brian's work at hubelhi.com.



Sterling
48" H x 14" W x 11" D
Claro walnut, ebonized ash, ebony

Spike Carlsen's upcoming book, *Woodworking FAQ: The Workshop Companion* (Storey Publishing) will be available April 10th. His other books include *A Splintered History of Wood* and *Ridiculously Simple Furniture Projects*.

The Woodturning Scraper

An essential part of your turning tool arsenal.

THERE'S A THEORY in woodturning—popularized by some British turners—that wood “prefers” to be cut rather than scraped. While I agree with this notion, I’ve also found that scraping tools play an essential role in woodturning.

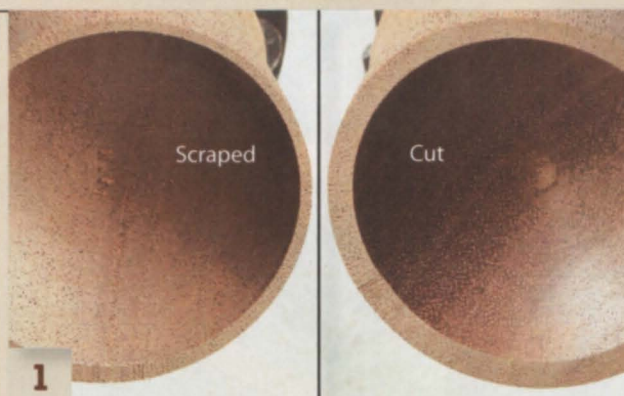
Scraping tools are used primarily for bowl turning, vessels and end-grain hollowing. They’re rarely used for spindle work, because cutting tools are better suited to the task. Scraping tools excel at roughing out shapes when the quality of the cut isn’t critical, and in situations where a cutting tool can’t be presented to the wood practically or safely—a situation that commonly occurs while hollow turning.

Surprisingly, a scraper can also be used as a fine finishing tool (**Photo 1**). Elevating the humble scraper to such a high level of performance may seem like creating a silk purse from a sow’s ear. But as I’ll show, it actually depends on how the tool is refined, how its edge is prepared and how the tool is presented to the wood.

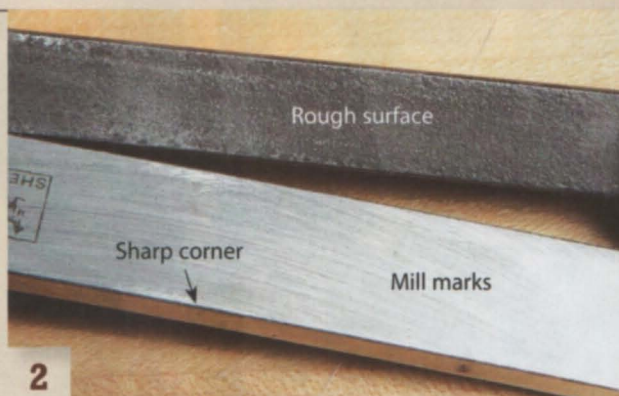
Cutting vs. scraping

In this story, I’ll focus on the traditional notion of scrapers and scraping; that is, using only the edge, with no bevel support on the wood. Most turning tools (including gouges, skews and parting tools) are cutting tools, designed to work with support from the bevel—the tool is presented at an angle, so the bevel bears against the wood as the edge cuts. Scraping tools, on the other hand, are presented nearly straight on, so the edge receives no support from the bevel. Of course, cutting tools are sometimes





1 Used the traditional way, a scraper leaves torn and crushed fibers (left). But after refining its surface and edge and using a technique called “shear scraping,” the same tool leaves a near-perfect surface (right).



2 Two flaws commonly appear on the top surfaces of new scrapers: rough surfaces from little (or no) milling, or deep marks left from milling, along with very sharp corners.



3 Smooth the scraper's top surface by rubbing it on a large, flat diamond hone to remove the pits and coarse mill marks. Concentrate on the last inch or two.



4 Soften the four long, sharp corners using a medium-grit wheel. Remove the tool rest and then freehand each corner from the leading edge to the ferrule.

used this way. And scrapers are sometimes used as cutting tools, by riding the bevel. Hence, the angle at which you present the tool really determines whether you cut or scrape.

Woodturning scrapers have two basic attributes, flat steel and a bevel ground on only one side. The shape of the edge is almost endlessly variable—straight across, skewed, half-rounded, full-rounded, side-cutting with a relief behind the edge, even profiled to fit the shape you wish to create—virtually any shape the turner desires.

Refine the tool

New scrapers often show problems right from the start. The top surface of the steel can be quite rough, or even pitted, which means it has had little or no milling. Or, it can show deep milling marks or very sharp corners along its entire length (Photo 2).

Smoothing the scraper's top surface gives the tool a more consistent edge. This step is especially important for fine finishing applications, because it dramatically improves the quality of the cutting burr that sharpening creates. To remove pits or mill marks, rub the top surface on a medium or fine flat diamond hone (Photo 3 and Sources, page 35).

Softening or fully rounding the scraper's corners from behind the cutting edge all the way to the ferrule makes the tool much friendlier to grip and helps it glide smoothly across the tool rest (Photo 4). I often follow the grinding by running the diamond hone along those edges to smooth them a bit more.

Shape the profile

The good news about scrapers is that their profiles can be quickly and eas-

ily changed, whether for a particular application or personal preference. Install a coarse (46 grit) wheel in your grinder and set the rest horizontal to the wheel. Then move the tool quickly and continuously to shape the edge (Photo 5).

The next step is to reduce the bevel angle. Unlike the bevel on a cutting tool that supports the cut, the bevel on the scraper is more for clearance (although it will also be used for support). Scrapers often come with steeply angled bevels (80° to 85°). But if the bevel inadvertently touches the wood while scraping, it can cause problems. Therefore, it's better to reduce the angle to between 60° and 70° (Photo 6). Change the angle on the grinder's tool rest and follow the shape of the edge as you grind. Keep the tool moving constantly, to avoid overheating.



5

Shape the leading edge of the scraper, using a coarse wheel and the tool rest set in a horizontal position. You can grind the edge to almost any profile.



6

Reduce the bevel angle to provide better clearance. The factory bevel is often too steep. Tilt the tool rest to 60° and then regrind the bevel by following the profile.



7

When tiny sparks appear at the top edge, the new bevel is fully ground and a burr is being formed.



8

Test for the presence of a burr by running your thumb off the end of the top edge. This ground burr serves as the cutting edge for most scraping tasks.



9

Sharpening for finish work requires a finer edge. The first step is to remove the ground burr by polishing the scraper's top edge with a diamond hone/slipstone.



10

Create a new, finer burr by burnishing the edge. Tilt the burnisher about 5° toward the top of the scraper and pull it *once* across the entire edge.

Create the edge

The final step in producing the bevel angle also produces an edge. Sparks consistently traveling over the top of the tool indicate that a heavy burr—a curl of steel along the edge—is being formed (**Photo 7**). This burr must be consistently formed across the scraper's entire profile for the tool to work properly. You can test for a consistent burr by feel (**Photo 8**). Your thumb is sensitive enough to detect even the faintest burr.

For subsequent sharpenings, you'll need to periodically regrind the edge—usually with a finer wheel, 60 or 80 grit. Simply match the rest to the bevel angle, follow the shape as you grind, and watch for the sparks.

A ground burr is a suitable cutting edge for at least 90% of scraping jobs, such as rough shaping and other coarse applications. However, to use a

scraper for finish work, a finer, even more consistent burr is necessary. Start by removing all traces of the ground burr (**Photo 9**). A few passes with a diamond slipstone does the trick (see Sources). Then replace the ground burr with a burnished burr (**Photo 10**).

Use a burnisher to raise (or pull) the burr. Any material harder than the steel will work for burnishing, whether a carbide rod mounted in a handle or a cabinetmaker's burnisher used to sharpen card scrapers. With a single pass, pull the burnisher across the edge while holding it at a slight angle towards the top. The amount of pressure you apply dictates the size of the burr. For finishing work, the burr should be very light—almost undetectable to the touch, but certainly there.

This tiny burr wears down fairly quickly during use, but it can be easily renewed by re-burnishing. How-

ever, each time you burnish, the edge is slightly rounded. After using and pulling a burr five to 10 times, you'll need to return to the grinder to create a new "sharp edge" and then repeat the process of removing the ground burr and pulling a burnished burr. Always remove the previous burr before pulling a new one, whether ground or burnished.

Tip ▶ Renew the burr when the surface it cuts on the wood begins to degrade or when the shavings become short or turn to dust. Both results indicate the tool is dull.

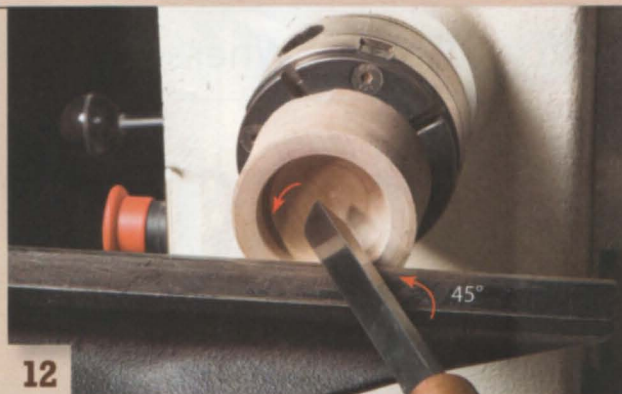
Using scrapers

The most common scraping method is to place the tool flat on the rest and slightly tip up the handle at the back, to keep the bevel away from the wood (**Photo 11**). As the bevel



11

Traditional scraping technique tips the tool's cutting edge slightly downward by raising the handle in back, while keeping the tool flat on the lathe's rest. This method leaves torn and crushed fibers, as shown in Photo 1.



12

Create a smooth surface during end-grain hollowing by shear scraping. Tilt the tool up onto its corner (45° degrees or higher) and angle it towards the work. Then move from the center to the left in order to follow the grain.



13

Shear scraping works well on the outside of a face-grain bowl because it's cutting across end grain. Lift the tool 45° in the direction of the cut and work from smaller to larger diameter.



14

The shavings tell the tale when the scraper is tilted at the correct angle for shear scraping, because they'll change from ribbons (left) to fine, twisted curls of wood (right).

doesn't ride against the wood for extra support, the tool rest must be positioned as close as possible to the work—this is a fundamental rule for using scrapers.

This method is great for rough hollowing in face-grain bowl work or for end-grain hollowing of goblets and lidded boxes. (You can use a gouge for these tasks, but using a scraper is often easier.) However, scraping often tears the grain—especially end grain—and it's harsher on softer woods than harder woods (see Photo 1).

Creating a smooth surface with a scraper requires a technique called "shear scraping." This method, which can produce a surface that requires very little sanding, works well on the inside of end-grain hollowed items (boxes, vessels, bowls, goblets, etc.) and on the outside of face-grain shapes.

Tip ▶ A bowl gouge can be used to work most of the inside of a face-grain bowl, but the scraper, held flat on the rest and close to the work, is great for blending from the lower sides to the center.

Start by lightly burnishing the edge to create a fresh burr. Next, rather than holding the tool flat on the rest, twist it in the direction of the cut to 45° or higher. When hollowing end-grain vessels, work from the center to the edge (**Photo 12**). When shear scraping the outside of face-grain objects, work from small to large diameters (**Photo 13**). When shear scraping is executed correctly, a fine, twisted fiber of wood rolls off the edge (**Photo 14**). Slowly elevate the scraper onto its corner while making a cut. When you see the shavings change, you've reached the correct angle for shear scraping. 



Alan Lacer is a turner, writer and teacher living in western Wisconsin.

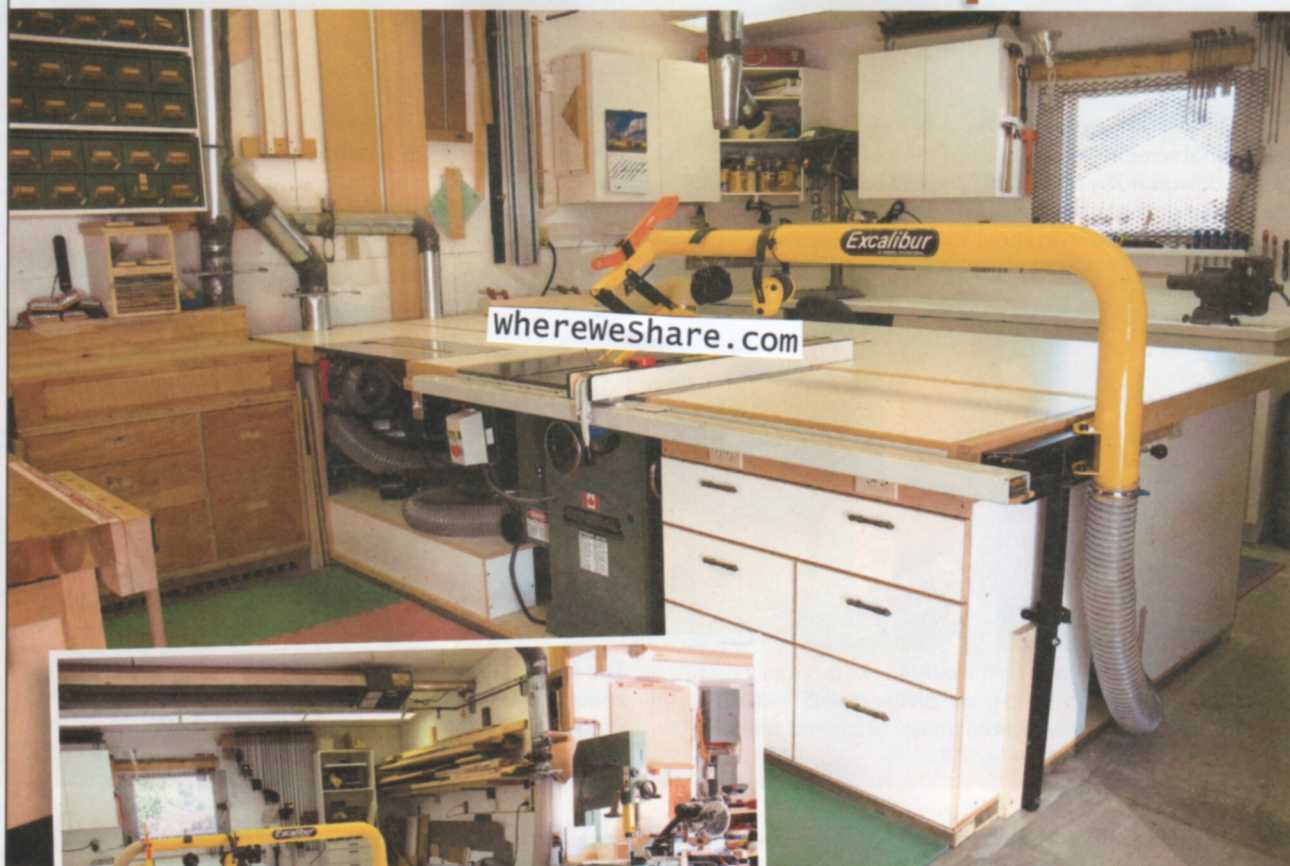
SOURCES

- MSC, mscdirect.com, 800-645-7270, Flat Diamond Hone, 325 (medium) grit, #051266438, \$128; Combination Flat Diamond Hone, 325/600 grit, #40109456, \$160; Carbide Rod (to be mounted in a handle with ferrule), 3/8" dia. x 2-1/2", #04114310, \$23.20.
- Alan Lacer Woodturning, alanlacer.com, 715-426-9451, Diamond Slipstone, 600 grit, \$95.



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Accidental Shop



Shirking leads to woodworking.

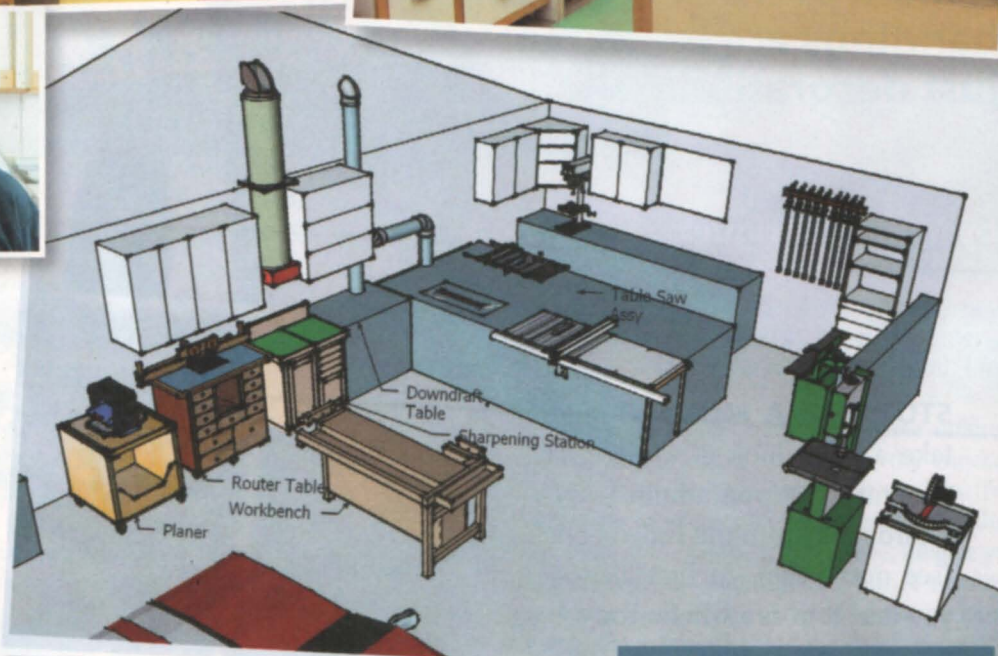
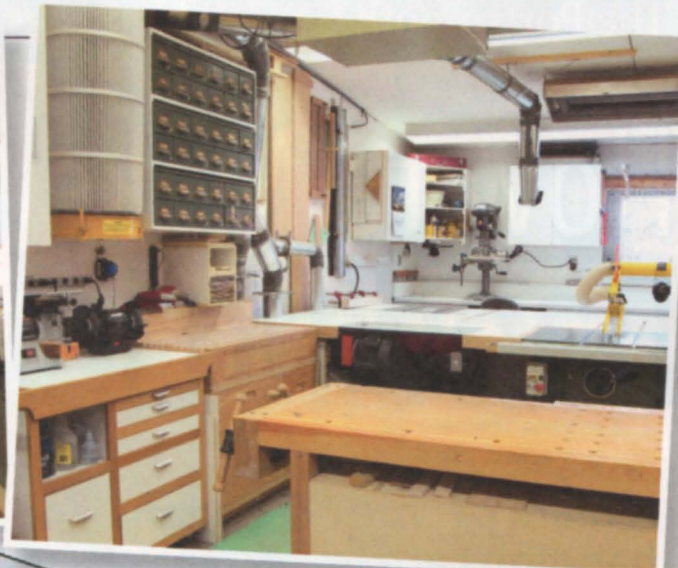
I GOT INTO WOODWORKING quite by accident. About ten years ago my wife and I removed our old kitchen countertop so the installer could replace it the following Monday. As soon as the top was removed, my wife noticed that the corner cabinets contained a lot of unused space and asked if I could install shelving before the new top arrived. Hoping to shirk the task, I said it would be impossible without a tablesaw. This

strategy didn't work, so it was off to the local home center for sheet goods—and a tablesaw. The project went well and I discovered that using a tablesaw rather than my circular saw was pure euphoria. I was hooked.

My shop is located in a 24' x 26' garage with a 180 sq. ft. addition off to the side and scissor truss ceilings for added headroom. As I live in Canada, the space is insulated and

heated. The dust collector and air compressor are housed in a lean-to structure outside the shop. I have to share the space with the family cars, so most of the major tools are on mobile tool bases.

The heart of my shop is a 6' x 12' workstation with two built-in table-saws (one permanently fitted with a dado blade), a flat bed sander, a wing-mounted router, and handy storage drawers.



The top consists of three torsion box sections that provide outfeed and side support for sawing, sanding and routing. Each section is surface-drilled like an air-hockey game table and can be attached to a heavy-duty shop vacuum that resides under the flat bed sander. Used as a blower, the vacuum makes it easy to slide large panels across the drilled surface. Used as a vacuum, it holds panels down for sanding or routing. Collected dust is routed to a central system stationed in the attached shed via ducts down the center of the assembly. Each branch is fitted with blast gates to insure proper airflow. Users of Google SketchUp 8 can find a basic drawing of this workstation by searching for "outfeed table" and then "saw assy with air table" by Frank.

In addition to building my own shop fixtures such as the miter saw stand, router table, workbench,

downdraft sanding table, sharpening station and the main workstation, I've also built several items for our home, including a Murphy bed and a room-size computer center. I've also built many projects for friends and family—the most unusual was a cremation urn.

Some future shop improvements I'm considering include a new insulated overhead door and some ceiling drop cords. I'd also like a more powerful shop vacuum, so all three air table sections can be operated simultaneously. 

*Frank Martin
Regina, SK*

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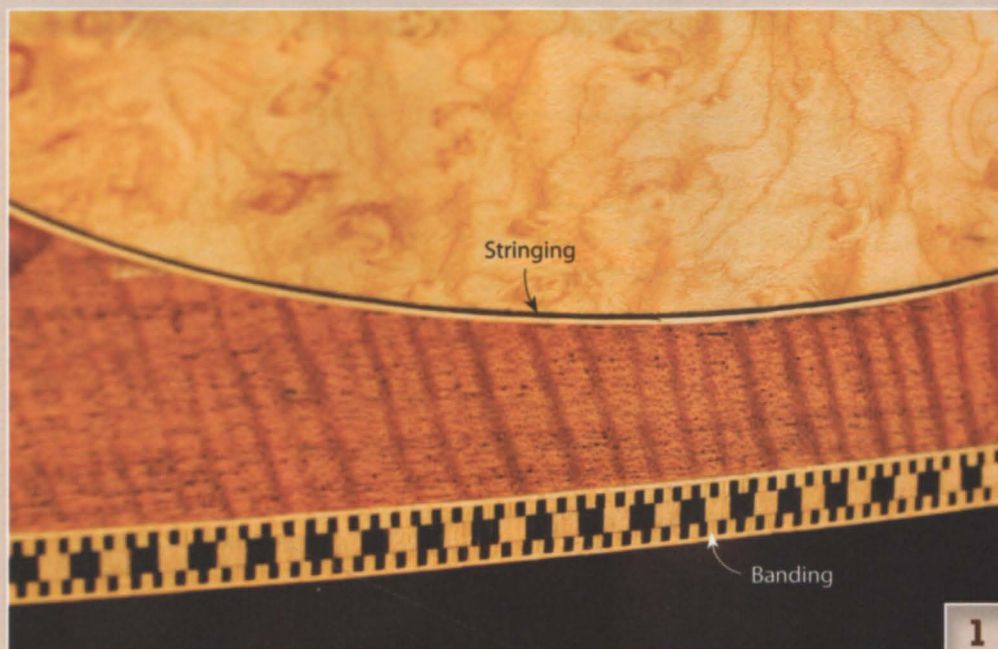
How to Make Banding Inlay

A mark of true craftsmanship, bandings are much more than just decoration.

by Mario Rodriguez

STOP FOR A MOMENT and take a good look at a piece of furniture that you admire—say, a card table from the Federal era (see next page). At first glance, you take it in as a whole: You see a curved top supported by thin, tapered legs. Then you take a closer look, and things start to get interesting.

Your eye starts to move around the table—across the apron, down a leg and back up again. Sometimes this visual path is smooth and continuous; other times, you halt at various places of interest. How about that checkerboard inlay under the apron? Did you stop there? That's the power of banding.



Banding and stringing serve different purposes. Stringing is linear; it moves your eye smoothly around a piece of furniture. A banding consists of geometric patterns; it forces you to pause.

Banding vs. stringing

Inlay that consists of repetitive patterns is called banding (**Photo 1**). Inlay that's just a simple line is called stringing. Banding and stringing are integral to the design of Federal furniture, but in different ways.

Stringing facilitates the movement of the eye from one area to another—it leads you on. Banding does just the opposite—it arrests your eye, forcing you to pause momentarily. Banding gives you time to appraise the piece and consider what you've seen before moving on.

Banding can also serve as a border that separates areas of a piece, much like molding. But unlike molding,

banding doesn't project from the surface. It often has the illusion of three dimensions (**Photo 2**), but all bandings are flat, lying on a single plane, embedded in the wood. I find that fascinating!

The card table I mentioned before has three different types of banding. The principal banding is the checkerboard pattern, which divides the apron from the legs. Two narrower and simpler bandings play a smaller role, dividing less prominent areas of the table. In this article, I'll give you some general principles for making any kind of banding, show you how to put together one of the table's simple bandings, then unwrap the mystery behind the checkerboard.



The Portsmouth Card Table

This article is the third in a series on making a card table in the Federal style (1790-1830). While there are many regional variations in Federal furniture, my design was inspired by the work of cabinetmakers in Portsmouth, New Hampshire. In this series, I'll show you how to make stringing, shade veneer with hot sand, make bellflowers, cut and lay veneered patterns on a curved rail, and make a knuckle joint. (See "Stringing Inlay," #157, December/January 2012, and "Bellflower Inlay," #158, February/March 2012.)

I'll give you the plans for the entire table at the end of the series. I also teach a Master Class on making the table at Philadelphia Furniture Workshop (PhiladelphiaFurnitureWorkshop.com). Please join me!

—Mario Rodriguez



Bandings rely on their size, color and pattern to make an impact. While you can buy commercially made banding, it's really not that hard to make yourself, once you understand the basic steps.

Basic rules

Bandings are usually composed of “strips” of veneer (**Photo 3**) and “chips” of thicker wood or layers of veneer (**Photo 4**). Making a banding doesn't require any specialized tools; you just have to be methodical and follow four important rules:

- **Rule 1.** All bandings are cut to show long grain, not end grain. End grain is weak and won't hold together. And it won't maintain the strong contrast necessary for an attractive end result.
- **Rule 2.** Material should be carefully selected. The wood should be free of knots and flaws, straight-grained, uniform in color, and have tight (not porous) grain.
- **Rule 3.** Banding materials must be uniform in dimension. This requires careful preparation when re-sawing, thickness planing or sanding, and crosscutting.
- **Rule 4.** Cuts must be clean. Any voids, tearout, burning or variation in dimension will adversely affect the appearance of your bandings.

Materials

The Portsmouth card table's bandings are stark, relying on the contrast between black and white for effect. The materials I chose are typical for many styles of banding.

Historically, ebony and holly would have been used for black and white elements. These woods are available today, but at a premium price. In my experience, cutting high-quality strips from these woods generates enormous waste, so I use less expensive substitutes: dyed hawthorn veneer and tight-

grained maple veneer and solid maple. (Dyed veneers are available in many different colors.) These woods are relatively easy to acquire and work. Once the veneers are cut into strips, they stay true and don't warp, twist or split. Maple and black-dyed veneer are available in 1/32" and 1/16" thicknesses; other colors are only available in 1/32" sheets (see Source, page 43).

Cutting strips

I use a tablesaw for cutting veneer into strips. To perform this operation safely, you'll need two things:

- **A zero-clearance throat plate.** There can't be a gap around the blade, where offcuts can get stuck.
- **A good push stick.** I make a new one each time. A push stick is essential to keep your hands at a safe distance from the blade and to guide the material past the blade.

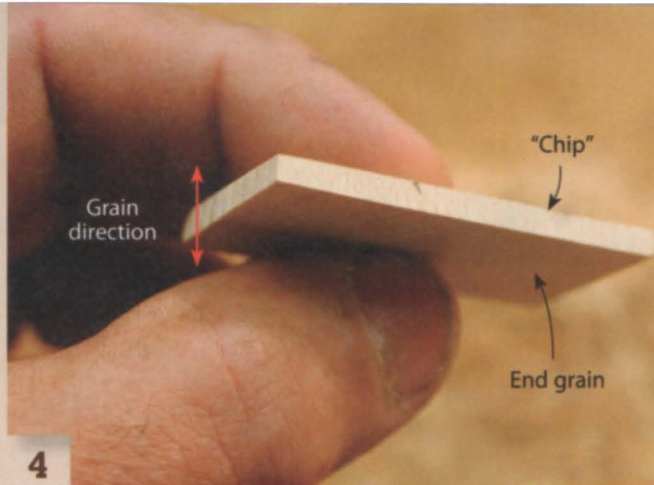
Laminating strips

Strips can be laminated into “bricks” to make stock of almost any thickness that a design requires. You can also alternate different colors of veneer, as I did to make the checkerboard section of the card table's principal banding.

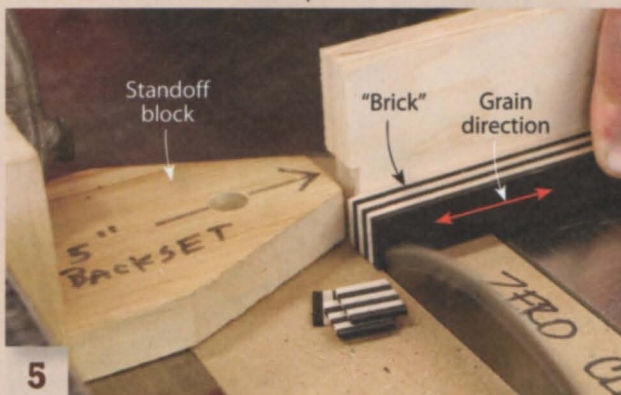
Always use stout cauls when gluing up banding. Cauls ensure that the resulting piece will be straight and flat. Apply cellophane or tape to the working surfaces of the cauls so the strips won't adhere to them. Cauls also allow you to evenly spread clamping pressure. I usually place my clamps about 3" apart. Using plenty of clamps ensures adequate and even pressure without requiring excessive force, which can result in an uneven thickness.



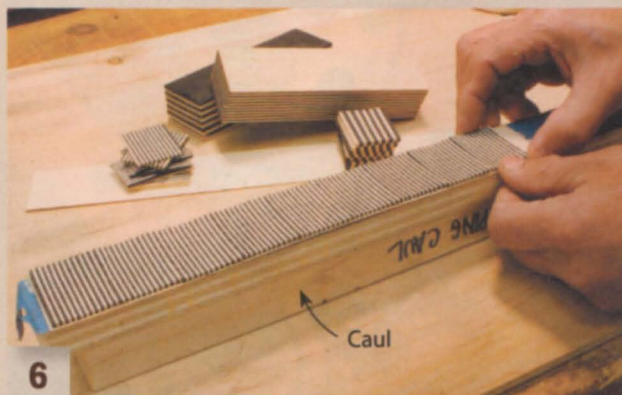
Bandings are made from layers of veneer and solid wood. Veneers that are dyed all the way through, such as this black hawthorn, allow you to work with a large palette of colors. Veneers are cut into narrow "strips" on the tablesaw.



Solid wood layers are usually composed of "chips." The grain of a chip runs the short way. Sometimes, chips are composed of multiple layers of veneer, called a "brick," as you'll see next.



Chips are made by repeatedly slicing the end of a longer piece, such as this laminated brick. This operation requires a safe and accurate setup. You'll need a zero-clearance throat plate and a standoff block clamped to the saw's fence.



Veneer and chips are glued in layers between two cauls, creating a "loaf." The loaf is then sawn into thin strips of banding. I'll show you how to make two kinds of banding on the next pages.

Slicing chips

Bricks are next cut into chips (Photo 5). (Sometimes you make chips from solid wood, too.) Each chip must be exactly the same thickness, a process that requires careful preparation and due regard for safety.

To cut chips, I use a simple device called a standoff block. It's 5" long and 2" wide; I clamp it to the tablesaw's fence 2" in front of the blade. I also use an aftermarket miter gauge that fits tight in the miter slot—so there's no wiggle—and support the brick with a zero-clearance fence.

Here's how the standoff block works: You butt the brick up to the block, then push the miter gauge forward and slice off the chip. The chip falls away from the blade and joins other chips in the area behind the standoff block. After cutting a small number of chips, turn off the saw and retrieve them. It's a good idea to cut about 25% extra chips and discard those

that aren't perfect. Chips are placed side-to-side in a banding (Photo 6). When you do this, you can see why they must be precisely uniform in thickness.

A simple banding

Let's combine all these steps and make a simple banding (Photo 7 and Fig. A, page 42). On the Portsmouth card table, this banding goes around the legs, down near the floor. I call it an "ankle" banding.

Begin by ripping 1/32" maple veneer and 1/16" black veneer into strips that are 1-3/4" wide and 9" long. You'll need two strips of each color. Laminate the strips, one maple strip glued onto one black strip, between cauls.

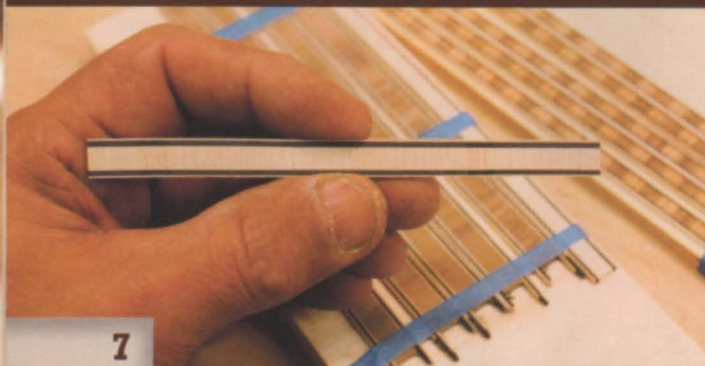
Maple chips will go between the layers of veneer. Make the chips from stock that is 3/4" thick, 1-1/4" wide and about 12" long. Clamp the standoff block to your fence, then adjust the fence to saw chips that are exactly 1/4" thick.

Place one of the veneer laminations on a caul, black side up, and spread a thin layer of glue down its length (Photo 8). Place the chips side-by-side on the veneer (it's not necessary to put glue between the chips). Spread glue on the black side of the other piece of laminated veneer and place it on the chips. Put a second caul on top and clamp. You've made a "loaf."



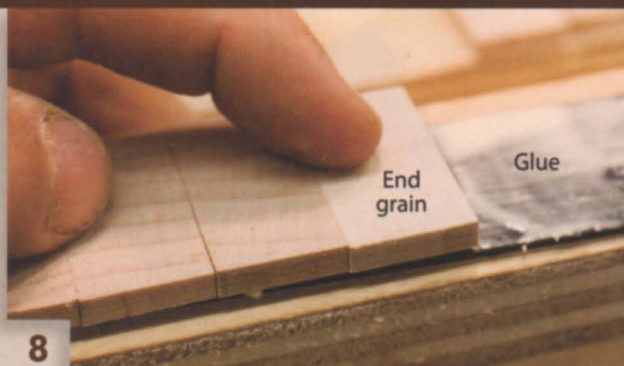
For instructions on how to make your own inexpensive zero-clearance throat plates, go to AmericanWoodworker.com/WebExtras

The Portsmouth Card Table Series



7

This banding is composed of solid maple chips and layers of maple veneer and black hawthorn veneer. It goes around the legs of the Portsmouth table, near the floor.



8

Maple chips are butted up to each other to make the core of the loaf. These chips sit on top of two strips of veneer, which were glued together beforehand.



9

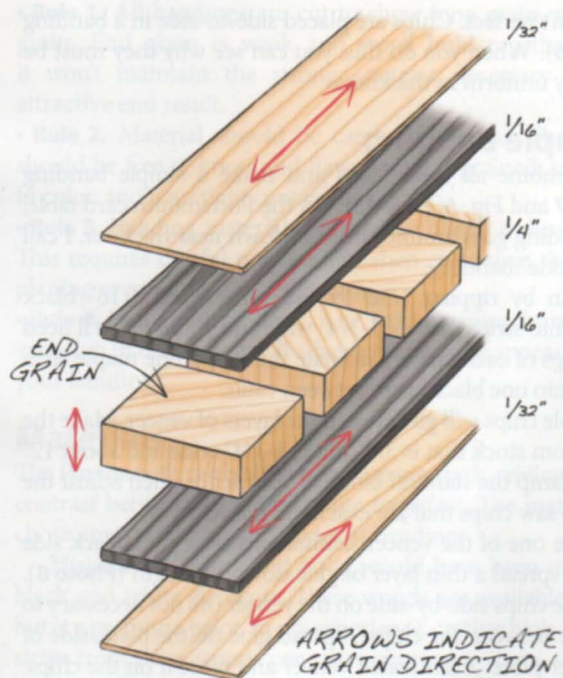
Plane the sides of the loaf to even up all the layers.



10

Bandsaw the loaf into 1/16" thick strips of banding. A fine blade leaves the surface quite smooth.

Fig. A Portsmouth Ankle Banding



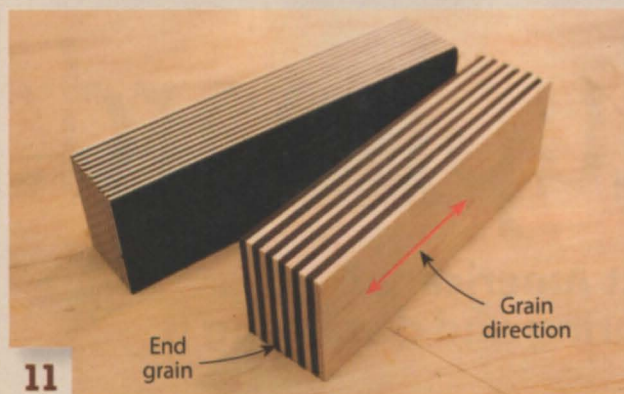
The next day, after the glue is good and dry, plane the edges of the loaf square and straight (**Photo 9**). Now it's ready to be sawn into 1/16" thick strips (**Photo 10**). Use a zero-clearance table and a 1/4" 6 tpi blade. After a few cuts, plane the surface of the blank again. Tape the banding pieces to a 1/4" board for safekeeping.

A complex banding

Now let's make the banding that runs under the apron of the Portsmouth card table. Its staggered checkerboard pattern looks quite complicated, but when you deconstruct it, the parts are very simple (**Fig. B**).

The core of this loaf is made from 1/16" and 1/8" thick chips, which are cut from similar types of bricks (**Photo 11**). The bricks for the 1/16" thick chips are made from 1/16" thick laminations—that's what produces the square pattern you see on the ends of the chips. The bricks for the 1/8" thick chips, of course, are made from 1/8" thick laminations. (I made these by gluing together two layers of 1/16" veneer.)

To make the bricks, saw a number of strips that are 1-3/4" wide by 9" long. Make at least 24 strips from the 1/16" veneer and at least 12 strips from the 1/8" material. Prepare one stack of 1/16" strips and another of 1/8" strips, each 1-1/2" high. Make sure the stacks start with a light



11 A complex banding can be made from bricks composed of glued-up layers of veneer. The brick in the foreground has 1/8" thick layers; the other brick has 1/16" thick layers.



12 The bricks are then cut into chips. The 1/16" brick is sawn into 1/16" thick chips, the 1/8" brick into 1/8" chips. This produces a square, checkerboard pattern on the ends of the chips.



13 Glue the 1/16" chips on a strip of maple veneer and clamp the assembly between cauls. Make two of these.



14 Glue the 1/8" chips in between these two pieces to complete the banding.

layer and end with a dark one. Glue the stacks between cauls. After the glue is dry, rip both sides to make bricks that are 1-1/2" wide. Cut the bricks into chips (Photo 12).

The chips are sandwiched between layers of 1/16" maple veneer. Cut the veneer into strips that are 1-1/2" wide and about 20" long.

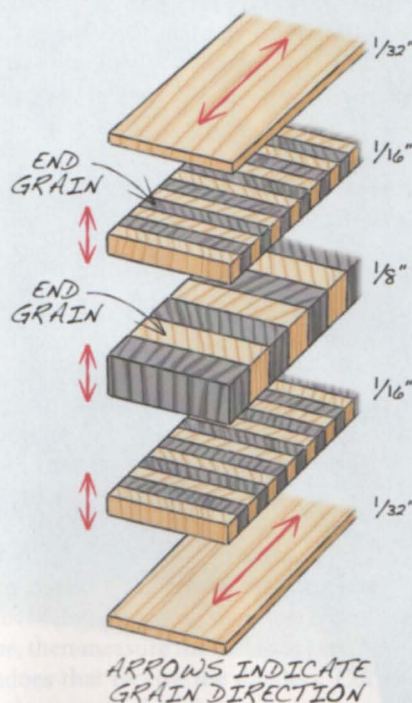
Now that you have all the ingredients prepared, it's time to glue up the loaf. There are too many pieces involved to glue the loaf all at once, so we'll break it down into two stages, starting from the outside and working in. First, glue the 1/16" chips to each piece of veneer (Photo 13). Place the chips carefully, black edge against white edge. Clamp these sandwiches between cauls and let the glue dry overnight.

For the second stage, glue the 1/8" chips between these two pieces (Photo 14). Plane the edges of the loaf and bandsaw it into individual pieces of banding.

SOURCE

Constantine's Wood Center, constantines.com, 800-443-9667, maple and dyed veneers, prices vary.

Fig. B Portsmouth Apron Banding



Country Cupboard

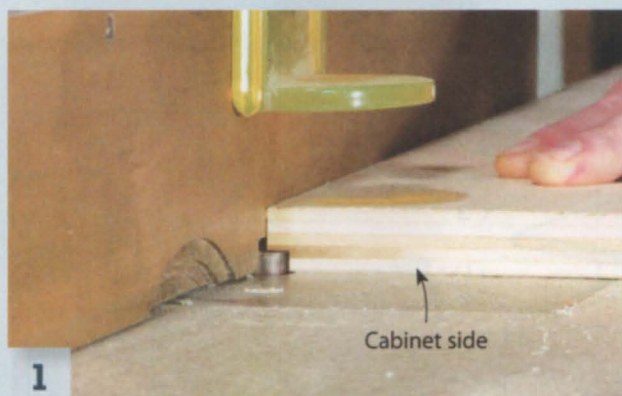
Do you collect Americana?
Here's a cabinet for storing and displaying it.

by Jeff Corns

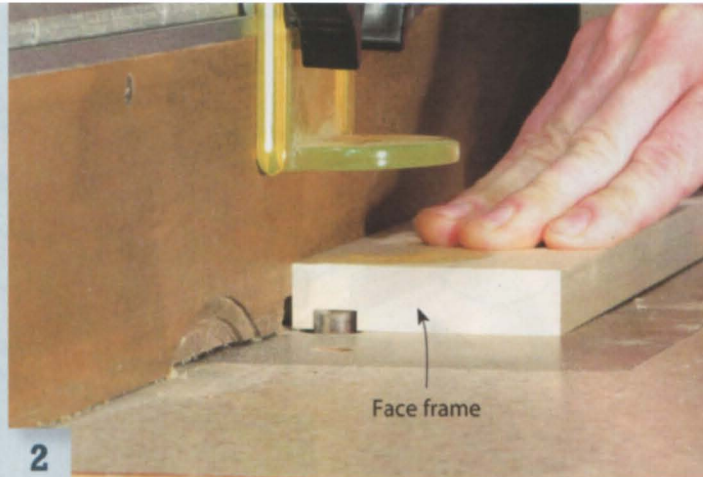


PAINTED furniture fetches a fortune in antique stores, but I'd rather build it myself. I can size it to fit my house, pick the color to match our walls and build it to last.

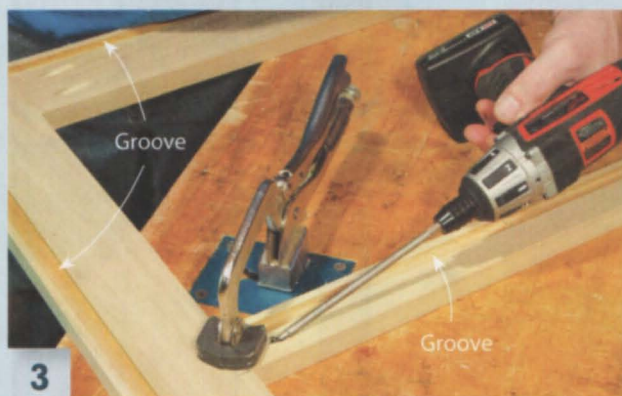
This design is new, but it's inspired by farmhouse jelly cupboards from 150 years ago. I've made this case taller than a jelly cupboard in order to add a display area above the doors. The top shelf is just the right height for showing the painted objects that my wife and I collect, while the storage area below is perfect for hiding the overflow. We rotate the pieces now and then for variety.



1 Join the sides and horizontal dividers to the face frame with a rabbeted tongue and groove. To make this joint, rout a rabbet on the front edges of the sides and dividers.



2 Rout a matching groove on each part of the face frame.



3 Assemble the face frame with pocket screws and glue. I use a bench-mounted hold-down clamp to make sure the pieces are flush (see Sources, p. 50).



4 Place each side of the cabinet in the face frame. You'll be cutting rabbets and dados in the sides to receive the dividers; use a framing square to mark the locations of these joints.

Start with the face frame

This cabinet is composed of two major parts: the face frame and the case. Some folks build a case first, then make a slightly oversized face frame, glue the face frame to the cabinet and trim off the excess. I follow a different method: The face frame and the case fit together with a rabbeted tongue-and-groove joint (Fig. C). I'll point out how this method makes the building process easier as we go along, but it does require you to cut and fit pieces in a particular order.

Begin by cutting all the parts of the face frame (A1—A4) to exact size. Next, cut the plywood sides of the cabinet (B1) to exact size (Fig. H). Cut the horizontal dividers (B2) and subtop (B3) 1/4" extra-wide and 1" extra-long.

Rout a rabbet along the front edges of the sides and dividers, using a 1/2" bit in a router table (Photo 1). The precise height of the bit will depend on the thickness of your plywood, which is usually 1/32" or so less than 3/4". Adjust the router bit's height until the lip just above the rabbet measures exactly 1/2" thick (Fig. C). You may want to cut a 1/2" wide groove with this router bit in a scrap piece of wood first, to test the thickness of the lip. Don't make the fit too tight; you shouldn't have to force the plywood in the groove.

Next, cut grooves in each part of the face frame (Photo 2 and Fig. D). Leave the router bit at the same height as the pre-

vious cut, then adjust the fence so that the distance between the outer edge of the bit and the fence is equal to the thickness of your plywood. When you assemble the joint, the face frame will automatically be flush with the plywood—a key benefit to this method.

Drill pocket holes in the ends of all three face-frame rails. Mark the positions of the middle rail and bottom rail on the face-frame stiles (Fig. D), then assemble the face frame with screws and glue (Photo 3).

Fit the dividers

The two horizontal dividers fit into dados that you'll be cutting into the sides (Fig. B). The subtop fits into a rabbet. Mark the location of these joints by standing each side in the face frame (Photo 4). Using shims, adjust the width of a tablesaw dado set to cut a test groove that exactly fits your plywood. Cut the dados and rabbets (Photo 5). In addition, cut a rabbet along the back edge of each side piece to receive the backboards.

Back to the dividers and subtop. Remember, they're extra-long; the next step is to figure out how long they must be to fit between the sides. Stand both of the sides in the face frame, then measure the distance between the bottoms of the dados that receive the dividers. Cut both dividers and the subtop to this length.

Fig. A Exploded View

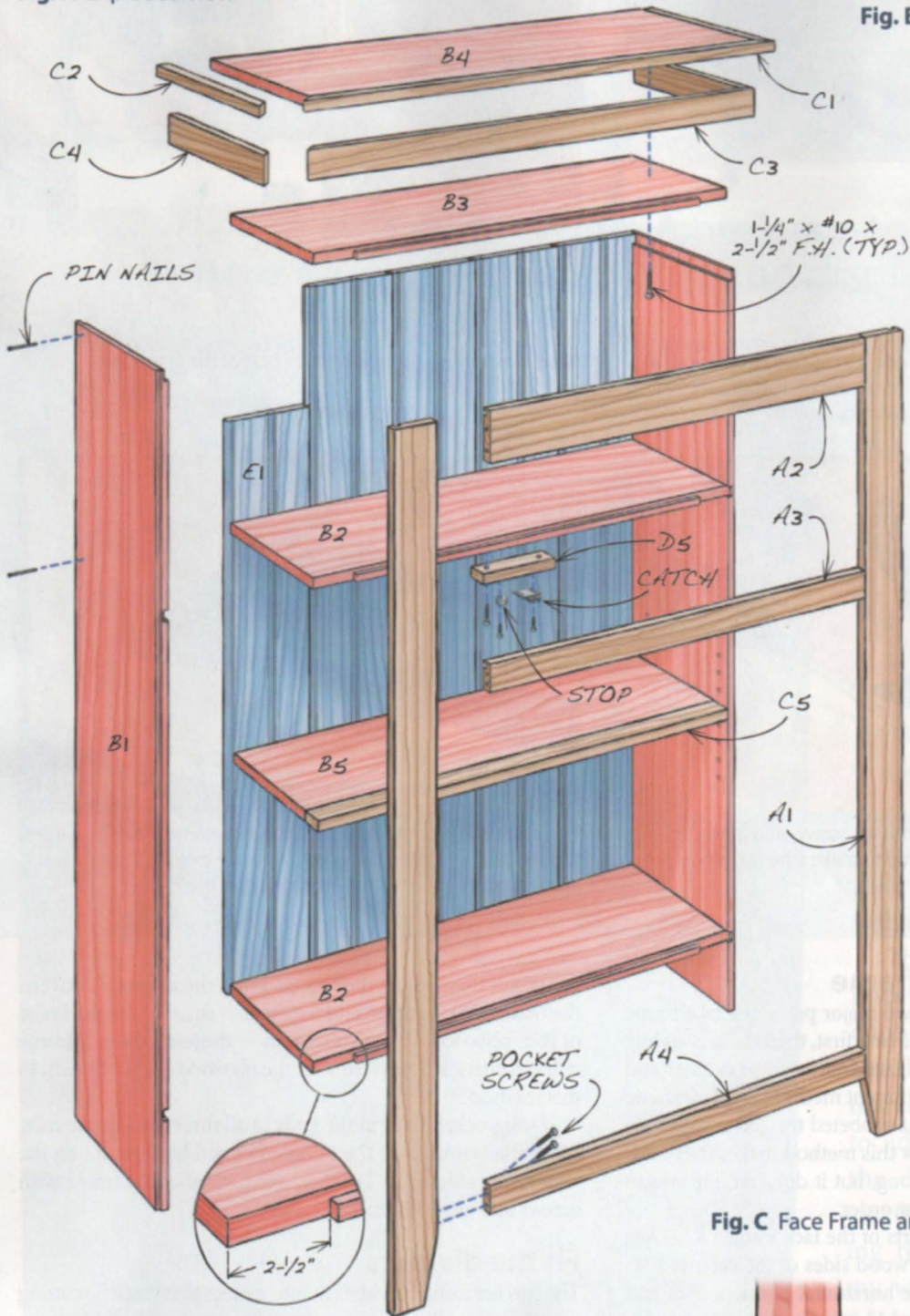
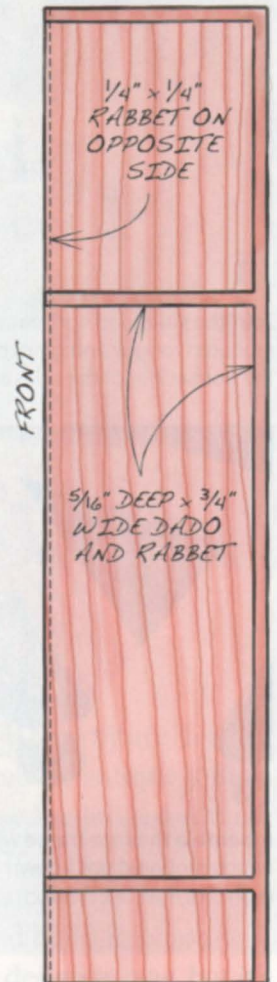
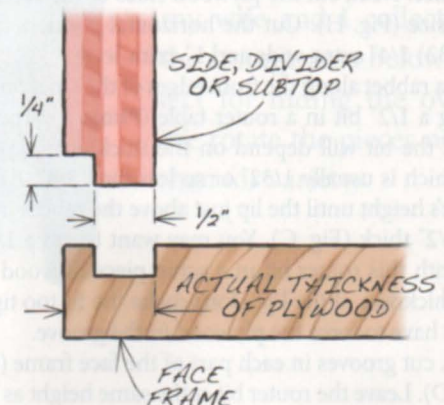


Fig. B Plan View of Cabinet Side



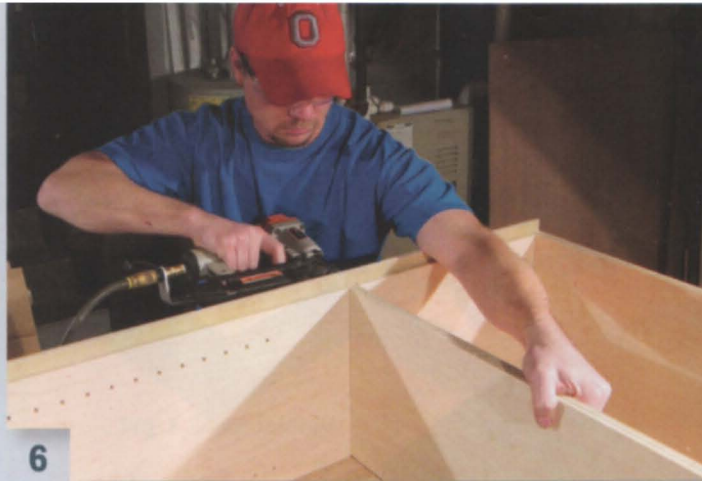
Tongue and groove joints ensure that the sides and shelves are flush with the face frame.

Fig. C Face Frame and Side Joint





5 Cut the dados and rabbets on the tablesaw, using a dado set. Use a miter gauge with a long fence to help push the plywood, so it doesn't twist and kick back.



6 Place the sides back in the face frame, without glue, then nail the sides to the dividers.

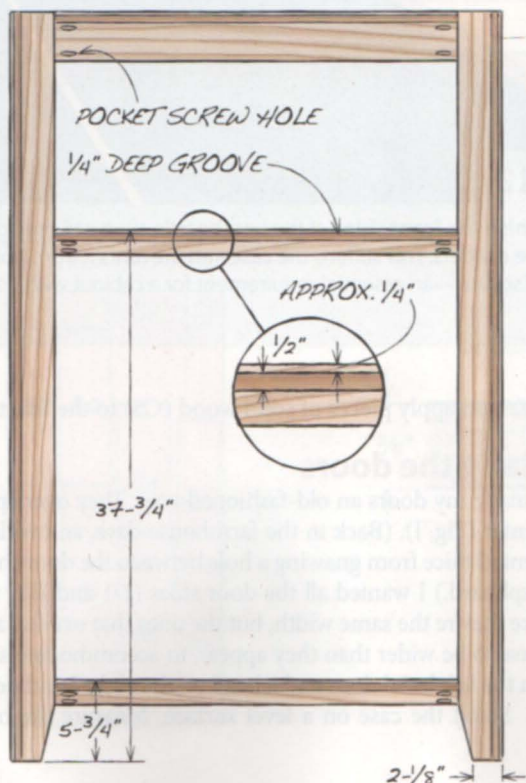


7 Glue the face frame to the case. The tongue-and-groove joints lock the face frame in place, ensuring that all joints will be flush.



8 Fasten the cabinet's top to the upper divider.

Fig. D Plan View of Face Frame



Tip ▶ Clamp a speed square to the face frame and sides of the case to make sure the parts are perpendicular.

Next, cut off the ends of the rabbeted lips on the dividers and subtop (Fig. A, Detail in circle). (This notch enables these pieces to butt up against the face-frame styles.) The easiest way to cut the rabbets is on the tablesaw. Make short rip cuts first, then crosscut the rabbets with a handsaw. Use a chisel to clean out the corners.

The last task is to cut the dividers to exact width. Again, the easiest way to figure out this dimension is by measuring directly from the partially assembled cabinet. Here's your goal: The back edge of all three dividers should be flush with the rabbets in the sides that receive the backboards. Slide the middle divider down inside the cabinet until it's tight against the face frame. Make a mark on the divider just opposite the lower edge of the backboard rabbet. Remove the divider and rip all three dividers to this width.

One last item, before assembly: Lay out and drill holes in the sides for shelf pins.

Assemble the cabinet

Place the face frame, face down, on a surface that you know is level. This is important: If your worktable isn't level, your cabinet will probably come out twisted. Hanging doors on a twisted cabinet is a nightmare you'll want to avoid at all costs.



9

Paint the panels before assembling the doors. Pre-finishing the edges prevents bare wood from showing when the panels shrink in winter, when humidity is low.



10

Glue the doors after the paint dries. These doors are fairly large, so I use mortise and tenon joints for extra strength.



11

Shim the doors with 1/16" spacers, then mount the hinges. When you're sure that both doors hang properly, remove the hinges and paint the whole cabinet, inside and out.



12

Finish the front sides of the backboards, then nail the boards to the dividers. This stiffens the case and prevents it from going out of square—an essential requirement for a cabinet with doors.

Tip ▶ Make an assembly table by placing a hollow-core door on sawhorses. It's guaranteed to be flat.

Stand the sides of the cabinet in the face frame—without glue. Fasten the dividers to the sides, with glue (**Photo 6**). Turn the cabinet over and remove the face frame. Apply glue to the rabbets on the case, then place the face frame back on the case (**Photo 7**). Clamp it all around.

Cut the top (B4) to final size and applying edging (C1 and C2) to its front and sides. Fasten the top to the cabinet (**Photo 8**). Cut the band that goes under the top (C3 and C4) and nail it to the cabinet. Cut one or two shelves (B5) to

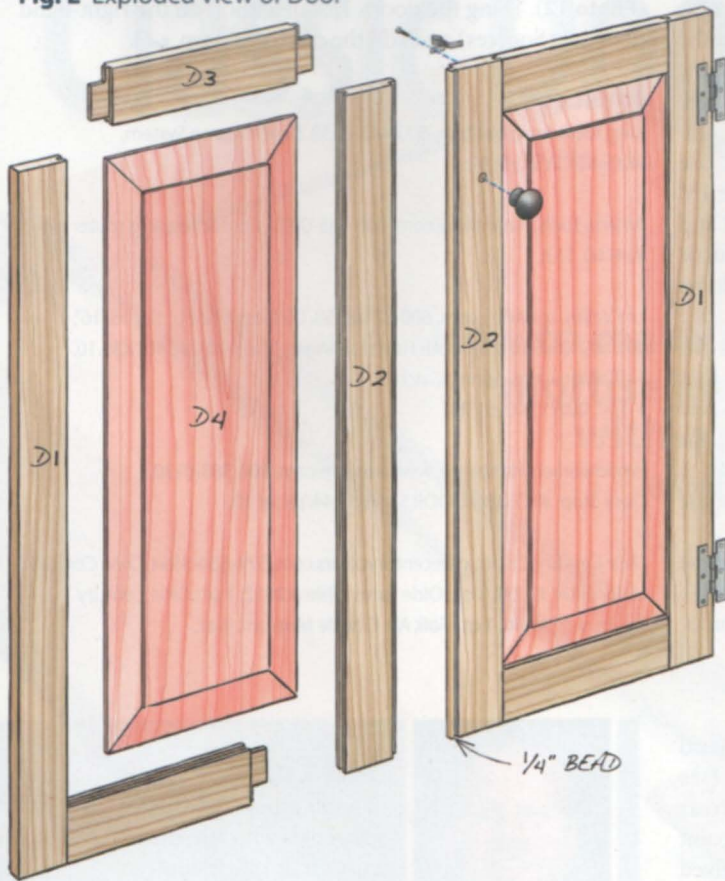
size and apply pieces of solid wood (C5) to the front edges.

Hang the doors

I made my doors an old-fashioned way: They overlap in the center (Fig. J). (Back in the farmhouse days, an overlap prevented mice from gnawing a hole between the doors of a jelly cupboard.) I wanted all the door stiles (D1 and D2) to look like they're the same width, but the ones that overlap actually have to be wider than they appear, to accommodate a rabbet on the left-hand door and a bead on the right-hand door.

Stand the case on a level surface. Measure the opening

Fig. E Exploded View of Door



Learn how to build a jig for cutting raised panels on the tablesaw at AmericanWoodworker.com/WebExtras

Fig. F Door Joinery

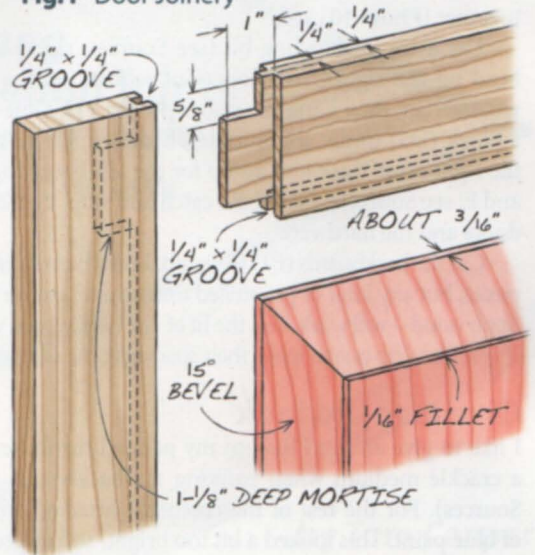


Fig. G Cross Section of Cabinet Front

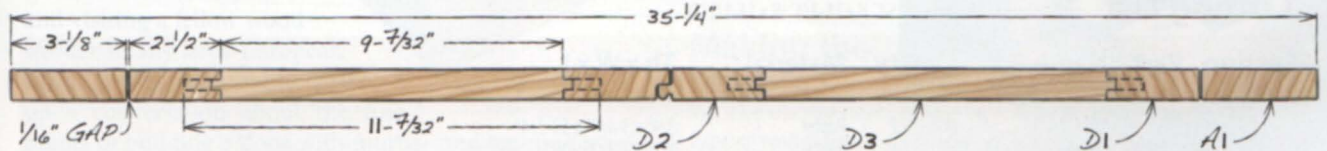


Fig. H Plywood Cutting Diagram

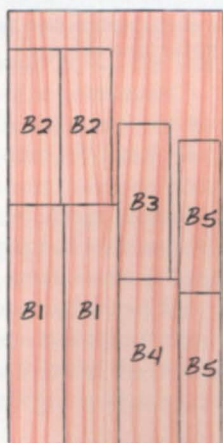
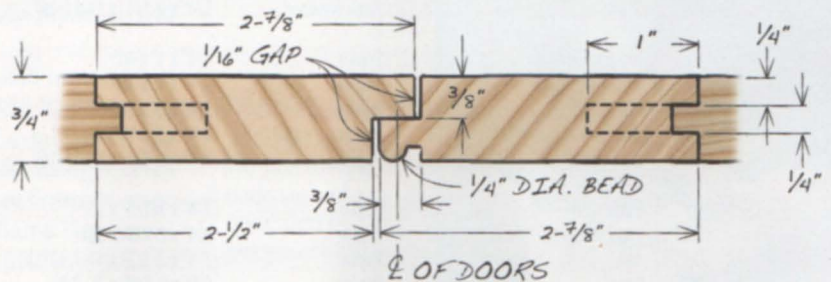


Fig. J Cross Section of Door Overlap



for the doors and refer to Fig. G. If your opening is a different width than indicated, adjust the length of the door rails (D3) as needed. Measure the height of the opening and cut the door stiles 1/8" shorter, for a 1/16" clearance above and below the doors. For more information on making the doors, see "Classic Door Joinery," page 51.

Glue the door panels (D4) from two pieces of wood. Use your tablesaw to bevel the panels (Fig. F). Tilt the blade 15° and stand the panels on edge. Use a zero-clearance insert and an auxiliary tall fence to support the panels as you cut. Paint or finish both sides of the bevels (Photo 9), then glue the doors together (Photo 10).

Use a corner-beading bit (see Sources, right) to rout the bead on the right-hand door. Cut rabbets on the stiles that will overlap, then hang the doors (Photo 11). Glue and screw a block (D5) under the middle divider to mount a catch for the right-hand door and a stop for the left-hand door (Figs. A and E; see Sources). Install the catch and stop, then remove the doors and the hardware.

Cut the backboards (E1) to length. I used barn siding for these pieces, but any kind of pre-milled tongue-and-groove material—or plywood—will work. Test the fit of the back pieces; you'll probably have to rip one to make their spacing come out right.

Give it an old look

I like to give an aged look to my painted furniture, so I used a crackle medium when painting the backboards white (see Sources). For the rest of the cabinet, I brushed on two coats of blue paint. This looked a bit too bright, so I sealed the paint with two coats of wipe-on poly, then wiped on a pre-mixed brown glaze, which helped darken the paint (see Sources). The secret in glazing is to wipe most of it off, but leave some in crevices and corners to imitate the look of old painted furniture.

After the finish dries, nail the backboards onto the cabinet (Photo 12). Hang the doors. Install a knob on the right-hand door (see Sources) and add the catch and stop. 

SOURCES

Kreg Tools, kregtool.com, 800-447-8638, Bench Klamp System, #KKS-KBKSYS, \$41.99.

Amana Tools, amanatool.com, 800-445-0077, Corner beading router bit, #54160, \$33.

Lee Valley, leevalley.com, 800-871-8158, CS Classic Knob, 1" x 13/16", #01W47.05, \$3.50; Smooth Flush H-Hinges, 3" x 1-13/16", #01X35.10, \$10.20/pr; Large Spring Catch, 1-1/4", 00W11.02, \$1.20.

Woodworkers Hardware, wwhardware.com, 800-383-0130, Door Stop, #FCEURO DOOR STOP, \$1.44/pk. of 10.

Olde Century Colors, oldecenturycolors.com, 574-654-8894, Olde Century Union Blue #2009, 1 qt.; Olde Farm White #2012, 1 pt.; Olde Century Antiquing Liquid, 1 qt.; Folk Art Crackle Medium, 4 oz.



Jeff Corns

is a self-employed finish carpenter who also makes custom furniture and cabinets. Jeff lives in Ohio.

Cutting List

Overall Dimensions: 54" H x 38-3/4" W x 14-1/2" D

Section	Part	Name	Qty.	Material	Th x W x L
Face Frame	A1	Stile	2	Poplar	3/4" x 3-1/8" x 53-1/4"
	A2	Top rail	1	Poplar	3/4" x 3-1/2" x 29"
	A3	Middle rail	1	Poplar	3/4" x 1-3/4" x 29"
	A4	Bottom rail	1	Poplar	3/4" x 1-3/4" x 29"
Case	B1	Side	2	Birch plywood	3/4" x 12-1/4" x 53-1/4" (a)
	B2	Divider	2	Birch plywood	3/4" x 11-1/2" x 34-1/4" (a)
	B3	Subtop	1	Birch plywood	3/4" x 11-1/2" x 34-1/4" (a)
	B4	Top	1	Birch plywood	3/4" x 13-1/2" x 36-3/4"
	B5	Shelf	2	Birch plywood	3/4" x 9-1/4" x 33-11/16"
Molding	C1	Top front edge	1	Poplar	3/4" x 1" x 40"
	C2	Top end edge	2	Poplar	3/4" x 1" x 16"
	C3	Front band	1	Poplar	3/4" x 2" x 40"
	C4	Side band	2	Poplar	3/4" x 2" x 15"
	C5	Shelf edging	2	Poplar	3/4" x 1-3/4" x 33-11/16"
Doors	D1	Outer stile	2	Poplar	3/4" x 2-1/2" x 30"
	D2	Inner stile	2	Poplar	3/4" x 2-7/8" x 30"
	D3	Rail	4	Poplar	3/4" x 2-1/2" x 11-7/32" (b)
	D4	Panel	2	Poplar	5/8" x 9-5/8" x 25-7/8"
	D5	Catch block	1	Poplar	1" x 2" x 6"
Back	E1	Backboard	5	Pine	3/4" x 7-1/4" x 53-1/4" (c)

Notes:

- a) Rough cut these pieces 1/4" extra-wide and 1" extra-long.
- b) Rails are 9-1/4" long between shoulders and have 1" long tenons.
- c) Backboards are made from tongue-and-groove barn siding; a bead runs down the middle on the face side of each piece.

Classic Door Joinery

How to make *strong* mortise and tenon joints with a plunge router and a tablesaw.

by Tom Caspar

IMAGINE turning the clock back 500 years and visiting a fellow woodworker in any large European town. You could instantly strike up a conversation about the fine points of building a door with mortise and tenon joints—he'd know exactly what you're talking about. Woodworkers figured out this joinery a long time ago, and we use the same design today.

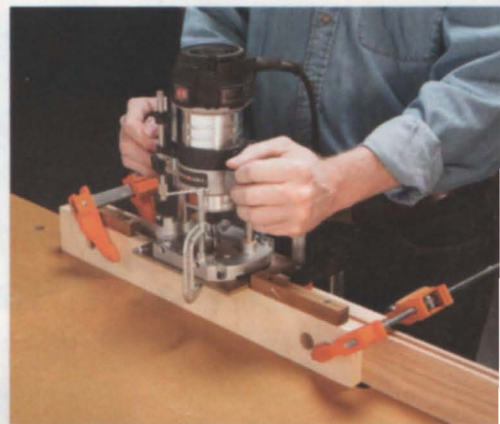
Of course, we also have modern methods of building doors, such as cope-and-stick joinery, but when it comes to making a large door with a loose panel, the mortise and tenon joint is still the way to go. Properly made, it will never sag or come apart.

There are many ways to make a door with mortise and tenon joints. I'd like to show you how to do it using very basic power tools—a plunge router and a tablesaw. Just about any plunge router will do, but I prefer using a small one, equipped with an upcut spiral bit (see Sources, page 55). (A small router is easier to balance than a large one.) You'll need a dado set for your tablesaw.

When making mortise and tenon joints, it's standard practice to make the mortises first, then cut the tenons to fit. Let's begin by looking at a new style of mortising jig I've devised.

Making the Mortises

We'll be using a new type of router jig that automatically centers the mortises in the grooves.



Making the Tenons

We'll be using a dado set and a dedicated sled to get a precise fit.



Making the Mortising Jig

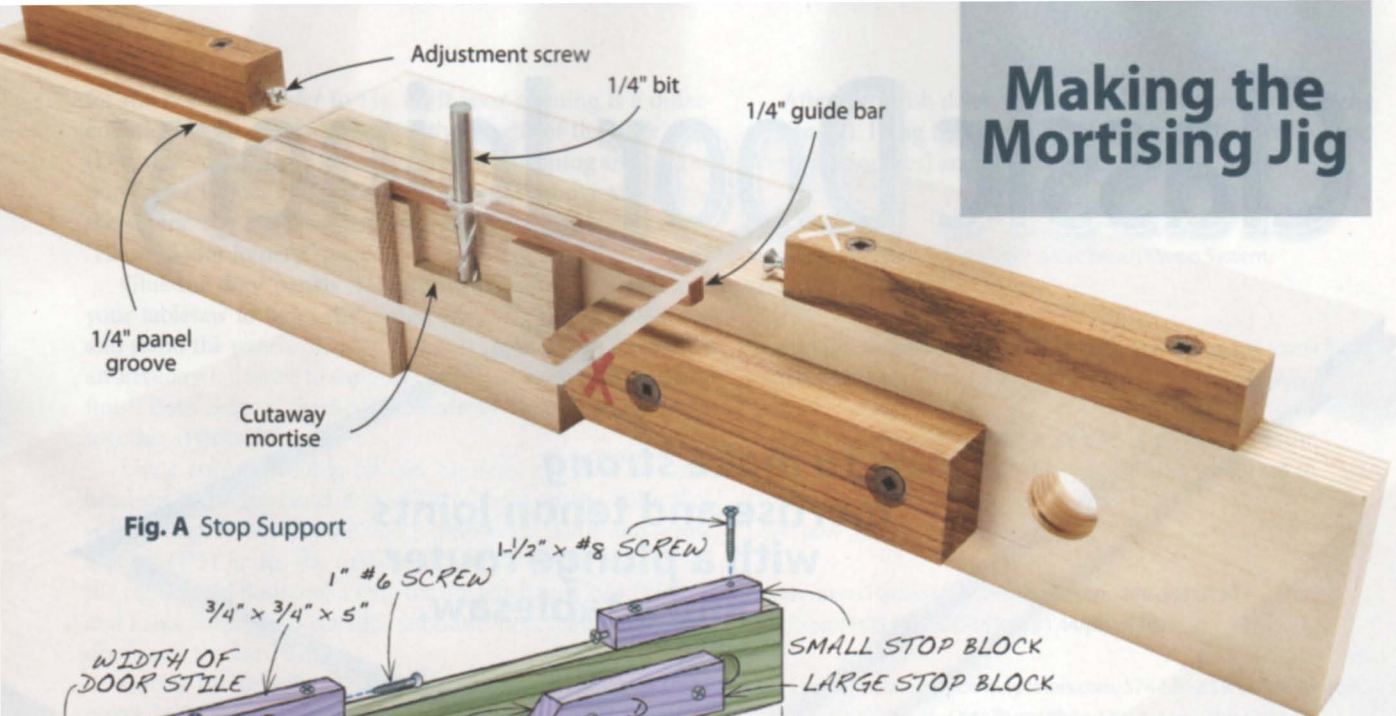


Fig. A Stop Support

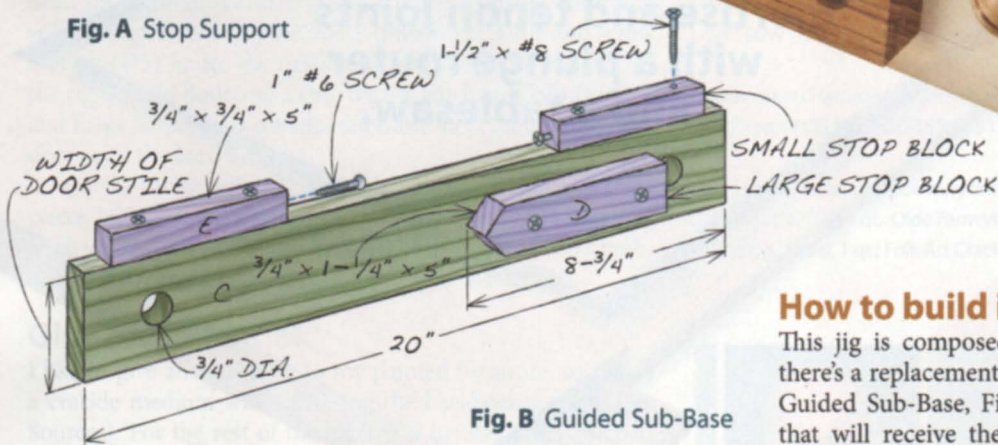
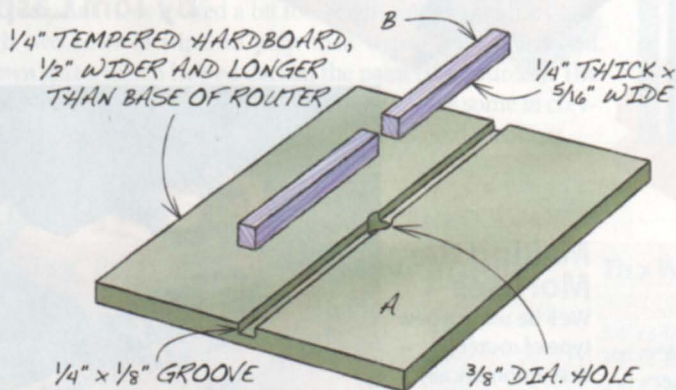


Fig. B Guided Sub-Base



How to build it

This jig is composed of two simple parts. First, there's a replacement sub-base for your router (the Guided Sub-Base, Fig. B). It slides in the groove that will receive the door panel. Second, there's a board that supports the router as you cut the mortise (the Stop Support, Fig. A). This block has stops that limit the router's travel, controlling the length of the mortise.

To make the Guided Sub-Base, start by cutting a piece of 1/4" tempered hardboard or MDF (A) about 1/2" wider and 1/2" longer than the base of your router. Drill a 3/8" hole in the center of the piece. Next, cut a 1/4" groove down the approximate middle of the piece, using a dado set. Make the groove 1/8" deep.

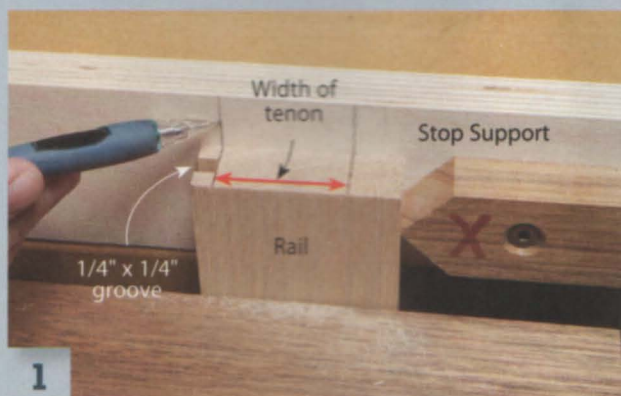
Make two guide strips (B), from one longer piece, to fit snugly into the groove. Glue them in place. Using the dado set, cut a 1/4" x 1/4" groove in a scrap piece and test fit the Sub-Base in the groove. It should slide easily, but should not wiggle. You may have to sand the sides of the guide strips to get the right fit. Rub a little paraffin wax on the Sub-Base to keep it sliding smoothly. Clamp the Sub-Base to your router (see photo, left).

To make the Stop Support, cut two pieces of 3/4" plywood or solid wood the exact same width as your door stiles and about 20" long (C). Set one piece aside, for use later. Drill two 3/4" dia. holes near the ends of the other piece. Make a large stop block with a pointed end (D), and fasten it to this piece. Lastly, make two smaller stop blocks (E). Drill pilot holes in the ends of these blocks, then run in two small screws most of the way. Drill pilot holes for fastening the blocks to the Stop Support—you'll attach them later.

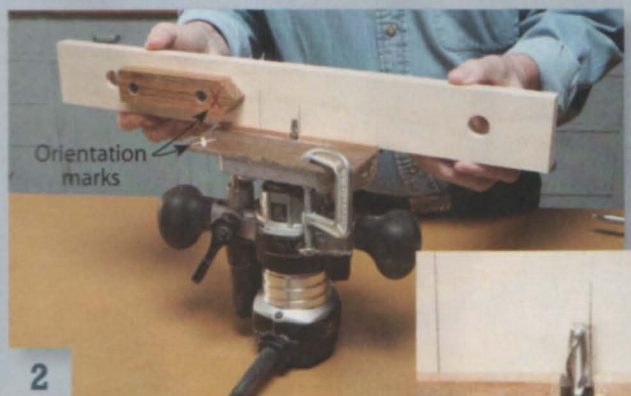


Clamp or screw the Guided Sub-Base to your router. Using a ruler as a straightedge, position the Sub-Base so the 1/4" wide guide strips are exactly in line with a 1/4" bit.

Using the Mortising Jig



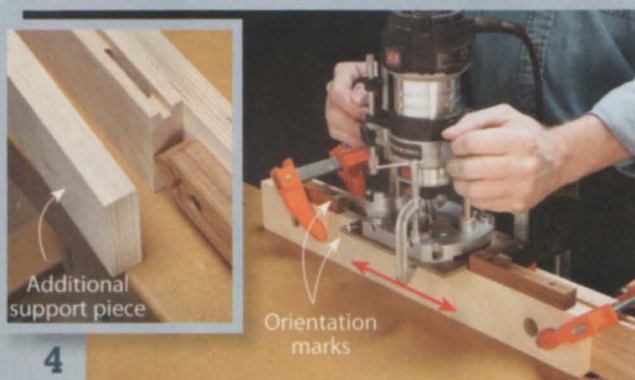
Draw layout lines on the mortising jig's Stop Support directly from one of the door's rails. Cut 1/4" x 1/4" grooves in all the stiles and rails first, then draw the width of the tenon on the end of one of the rails.



Place the Stop Support on top of the router. Line up the bit with the right-hand line on the Support. Note the Xs on both parts of the jig—these marks will help you orient the router the right way when you turn it over.



Clamp one of the stop blocks to the Support, so the adjusting screw in the end of the block butts against the Guided Sub-Base. Repeat this operation for the other stop block, then screw both blocks to the Support.



Set up the jig and rout a mortise in a stile. The stile is clamped between two support pieces to steady the router. Adjust the screws in the stop blocks, if necessary, to fine-tune the mortise's length. Once you're set, use the same setup to rout all the mortises.

Set up the jig's stops

Begin by milling all your stiles and rails to final width and length. (Make a few extra pieces for testing the setup operations ahead.) Mark the face sides of each piece. Using a dado set, cut a 1/4" x 1/4" groove for the door panel along the inside edges of all the stiles and rails, keeping their face sides against the tablesaw's fence. The groove doesn't have to be exactly centered; close is good enough. It can be offset, too.

Draw the width of your tenon on the end of one rail (Photo 1). Clamp the rail in a vise and butt the Stop Support against the rail. Make sure the large stop on the Support is tight against the rail. Transfer the lines from the rail to the Support.

Turn the router upside down and place the Support on the router (Photo 2). Draw a large X on the corner of the Guided Sub-Base nearest the large stop. Align the bit with the right-hand line on the Support (see inset). Clamp one of the small stop blocks to the Support (Photo 3). Slide the Support so the bit aligns with the left-hand pencil line and clamp the second small stop block in place. Draw an X on top of this stop. Remove the Support from the router, clamp the Support in a vise and screw the stops to the Support.

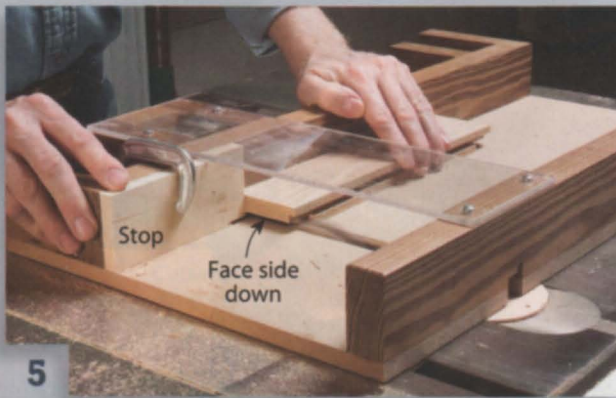
Cut the mortises

To assemble the jig, place the test piece against the Support. Butt the end of the piece up to the large stop (Photo 4; see inset). Place the second Support Piece (it's just a plain board) against the test piece, making a three-board sandwich. Clamp all the pieces together, and clamp the whole assembly down to the bench.

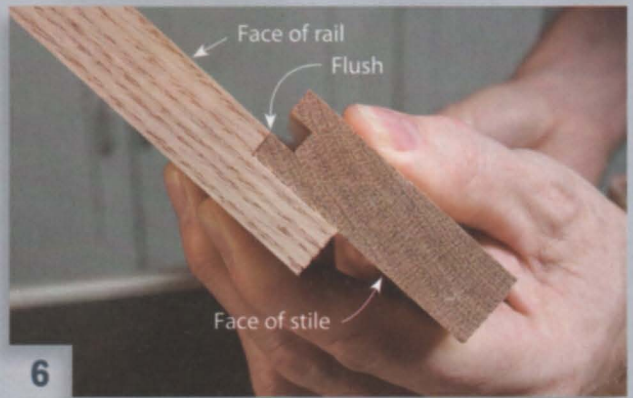
Place the router on top of the jig, with the X mark on the Sub-Base near the X on the Support. Plunge the bit about 1/4" into the wood, then move the router back and forth between the stop blocks. Plunge the bit another 1/4" and repeat the operation until you've reached the full depth of the mortise.

Remove the router and make sure the mortise is in line with the groove; if it isn't, adjust the position of the Sub-Base. Also, compare the length of the mortise with your original layout lines. Adjust the screws in the stop blocks as necessary. Be fussy about the end of the mortise farthest away from the end of the stile—it has to be spot on. Once the screws are set, rout both ends of all the stiles.

Making the Tenons



5 **Cut the tenons** with a dado set, using a sled or a miter gauge. Butt the rails against a stop, so all the cuts are equal in width. First, cut only one face of a test piece.



6 **Check the depth** of the cut. Place the rail against a stile, face to face; the rail's face should be flush with the groove in the stile. Adjust the height of the dado set, if necessary, then cut the face sides of the tenons on all of the rails.



7 **Cut the opposite sides** of the tenons, starting with a test piece. Lower the dado set a bit, so the tenon starts out a bit fat on the first try. Then raise the blade little by little, making more cuts, until the tenon is the right thickness.



8 **Test the fit** of the tenon in a rail. Once the dado set is at the correct height, and the test tenon slides in nicely, cut the back side of the tenons on all the rails.

Saw the tenons

Set up a $\frac{3}{4}$ " wide dado set in your saw. Door tenons are usually at least 1" long, so cutting them will require at least two overlapping passes. Clamp a stop block to your sled or miter gauge's fence to ensure that all the tenons are the same length (**Photo 5**).

Place a test piece on the sled, face side down, and raise the dado blade to cut about $\frac{1}{32}$ " lower than the panel groove. Cut both passes, then compare the depth of the cut to one of the door's stiles (**Photo 6**). Raise the blade in small increments, recutting the test piece, until the face of the test rail is perfectly flush with the groove. Once you're set, cut tenons on the face sides of all the rails.

Turn over the test rail and repeat the same procedure, starting with the blade $\frac{1}{32}$ " lower than the groove (**Photo 7**). Check the fit of the tenon in a mortise (**Photo 8**). At this point, the tenon should be too tight, or not fit at all. Raise the blade in small increments, making more test cuts, until the fit is correct.

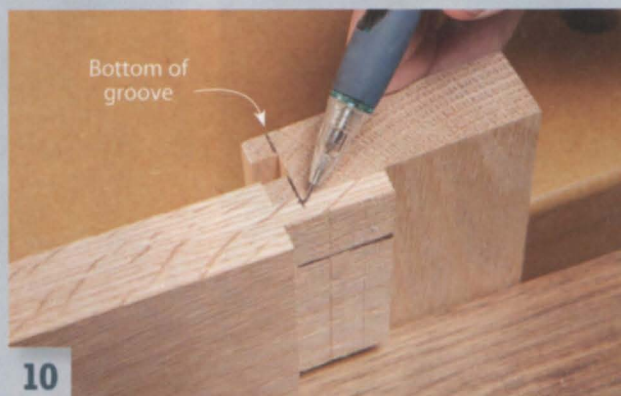
How tight should the joint be? If you have to pound

or push hard on the rail to get it in the mortise, it's too tight. If there's a gap between the tenon and mortise that's greater than the thickness of a piece of notebook paper, it's too loose.

Cut out the haunches

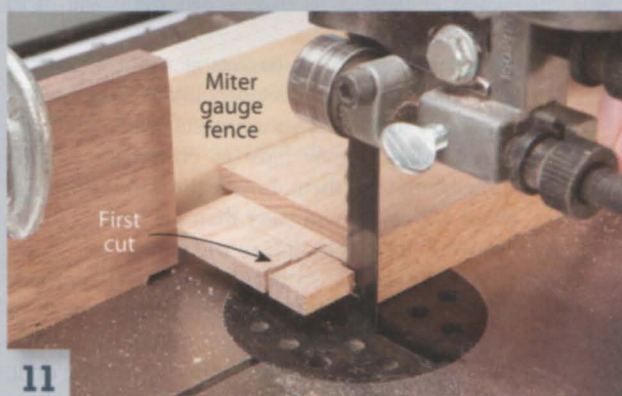
The last step in making the joint is to cut a notch just above each tenon, leaving a small stub to fit into the panel groove. This stub is called a "haunch," making this a "haunched mortise and tenon joint." The best way to lay out the haunch, which is identical on both ends of each rail, is by directly marking from a stile. First, mark the width of the tenon, so it's exactly as wide as the mortise (**Photo 9**). Second, mark the length of the haunch (**Photo 10**).

You can saw the haunches by hand, but it's faster to use a bandsaw. Set up a rip fence to cut on the first line you laid out. Clamp a stop to the fence to limit the length of the cut. Use a miter gauge equipped with a fence and stop block to make the second cut (**Photo 11**). Make this



9 Lay out the haunch—a notch above the tenon—directly from a mortise. Clamp a stile in your vise, level with the face of the tenon, to make this line easier to transfer.

10 Mark the length of the haunch directly from the same stile. This time, clamp the stile so it's even with the top edge of the rail.



11 Saw all of the haunches on the bandsaw. Set up a rip fence for the first cuts; use a miter gauge for the second cuts.

12 Round the tenons with a file, to match the rounded ends of the mortises.

cut about 1/32" off the line, so the haunch doesn't quite bottom out in the panel groove (this guarantees that the tenon's shoulders will draw up tight).

Finally, round all the tenons with a file (**Photo 12**). A 10" double-cut flat bastard gets the job done very quickly. Place a mortise nearby for reference; you'll be able to copy the round shape, by eye, quite easily. 

SOURCES

Hartville Tool, hartvilletool.com, 800-345-2396, 1/4" Upcut Spiral Bit, 1/4" shank, #RRU2100, \$16.85.

Porter-Cable, portercable.com, 888-848-5175, Model 450PK, Compact Combination Fixed Base/Plunge Base router, \$180.

Woodhaven, woodhaven.com, 800-344-6657, #4910 Deluxe Miter Gauge, \$139.99.



For plans to make a top-notch crosscut sled, see AmericanWoodworker.com/WebExtras

Why Use A Sled To Make Tenons?

To make tenons with a dado set, you must be able to make a perfect right-angle cut on your tablesaw. Sad to say, many stock miter gauges aren't capable of this level of precision because their bars have too much play in the saw's miter slots. If the head of the miter gauge wiggles just a little bit as you make a cut, the shoulders of your tenons won't be straight or square or in the same plane, front and back. And that leads to gaps or joints that are out of square.

Here are a few solutions to the wiggle problem: First, scrounge a second miter gauge and attach both gauges to a long wooden fence. The fence will prevent both gauges from wobbling. Second, use an aftermarket miter gauge whose bar can be adjusted to custom-fit your miter slots (see Sources, left). Third, build a sled with two runners. Normally, a sled is just used for crosscutting with a standard blade; if you use the same sled with a dado blade, you'll create a huge opening in its base and fence, which is not ideal. It's far better to build a dedicated sled for making tenons—it will pay off many times over.

3-Level Basket Stand

The “drawers” are ready-made—you just provide the stand.

by Spike Carlsen



EVERYBODY NEEDS more room for storage—for extra towels in the bathroom, for hats and gloves in the entryway, for workout clothes in the bedroom or for veggies or hand towels in the kitchen. But making the drawers for a storage unit can be complicated and frustrating. Here's a way to simplify the job: Use ready-made baskets. This “chest of baskets” is easy to build and will fit in nearly any room.

I purchased these baskets at a Michael's craft store, but many other retailers like Pier 1 and Ikea also carry them. Buy your baskets before you build the stand; you may have to change the stand's dimensions to fit them. I made the stand's openings about 1/2" wider and taller than the baskets so the “drawers” are easy to slide in and out.

Cut the legs (A), front and back rails (B) and side rails (C) to final length. Note that the lower three front rails lie flat, while the other rails stand on edge. This gets a bit tricky to lay out; here's how you do it. First, clamp all the legs together and draw centerlines for each set of rails. Draw an “X” on each of these lines. Next, draw two lines on either side of the centerlines (**Photo 1**). The inner two lines indicate the position of the three front rails (the horizontal ones); the outer lines indicate the position of all the other rails (the vertical ones).

Cut biscuit slots in all the legs and rails (**Photo 2**). Glue the sides of the stand together (**Photo 3**). The biscuits will be slightly wider than the slots; trim off the overhang after this glue-up. Add the front and back rails. Cut the runners (D) to length, then glue and nail them to the side rails (**Photo 4**).

Cut the top (E) to exactly fit the stand, with no overhang. Glue and nail it to the rails. Apply stock 3/4" cove molding (F and G) around the top with glue and nails. 

This and 40 more clever, easy-to-build woodworking projects are featured in Spike Carlsen's new book, *Ridiculously Simple Furniture Projects* (Linden Publishing). Available at awbookstore.com.





1

Clamp the legs together, then draw a centerline for each set of rails. Mark this line with an "X". Then draw pairs of lines to show the outer edges of the rails.



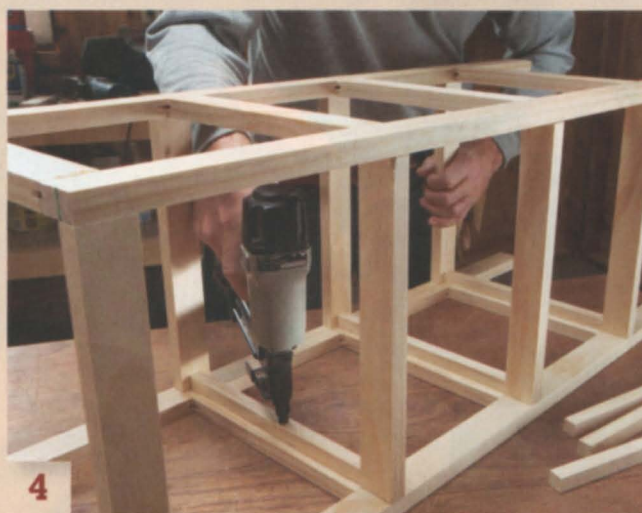
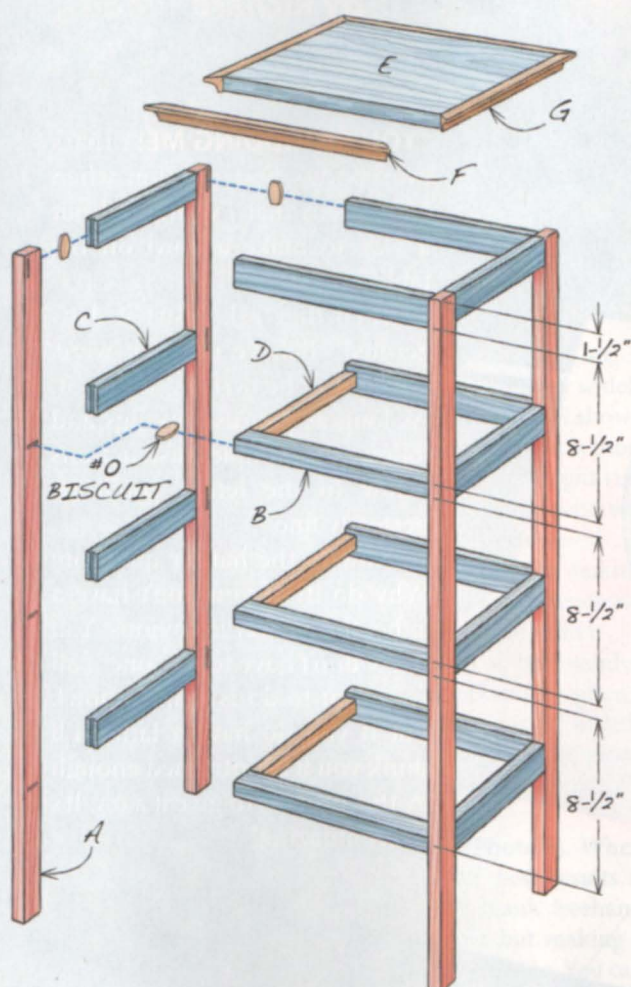
2

Cut biscuit slots in the legs and side rails. Center each slot on an "X."



3

Glue the sides together. Next, cut slots for the front and back rails. Note that the back rails are upright, like the side rails, but the lower three front rails lay flat.



4

Install runners for the baskets after gluing up the whole frame. These pieces are level with the front rails.

Cutting List

Overall Dimensions: 36-3/4" H x 15-1/4" W x 14-1/2" D

Part	Name	Qty.	Th x W x L
A	Leg	4	3/4" x 1-1/2" x 36"
B	Front & back rail	8	3/4" x 1-1/2" x 12-1/4"
C	Side rail	8	3/4" x 1-1/2" x 10"
D	Runner	6	3/4" x 3/4" x 10-3/4"
E	Top	1	3/4" x 13" x 13-3/4"
F	Molding, front and back	2	3/4" x 1-1/4" x 15-1/4"
G	Molding, side	2	3/4" x 1-1/4" x 14-1/2"



The Amazing Tablesaw Bowl

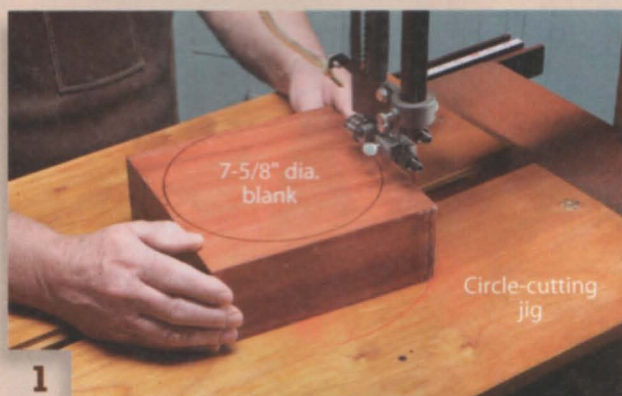
**It's just like sawing
a cove molding,
but now the
wood is round.**

by Richard Tendick

"YOU'RE KIDDING ME!" That's everybody's first reaction when I tell them that I've figured out a way to make a bowl on the tablesaw.

Then they ask, "Isn't it dangerous?" Believe me, if it were, I wouldn't be writing about it. As long as you use my jigs and follow the simple instructions below to the letter, you'll be perfectly fine.

Now to the harder question: Why do it? If you don't have a lathe, the answer is obvious. You really don't have to buy one if all you want to do is make a bowl. But if you do have a lathe, I'll think you'll be intrigued enough by this process to give it a try. It's really amazing!



1 Saw the bowl blank as round as possible. I use a circle-cutting jig, where the blank rotates on a pin like a record on a turntable. The result is a near-perfect circle.



2 Install a jig on your table saw for hollowing the interior of the bowl. Tighten two knobs to lock the jig in the miter slot, so it can't move. Raise the blade so it's even with the top of the saw table.



3 Place the blank in the jig and raise the blade 1/16". Rotate the blank one revolution. The result will be a dish-shaped, concave cut. Raise the blade another 1/16" and repeat the procedure.



4 Remove the blank after a few passes and check your progress. Keep raising the blade 1/16" at a time until the cut measures 6-1/2" across.

Make the blank

I designed these jigs for 8" x 8" turning blanks that are 3" thick (see Source, page 60). Blanks of this size are widely available and come in a variety of species. (The bowl shown here is made from padauk.) I prefer to use wood that is thoroughly dry—wet wood can clog up the jigs and might rust your saw. Many blanks aren't dry enough; I recommend setting them aside until they are as dry as kiln-dried wood.

Caution: Don't use cracked or knotty wood for making this bowl. It could break apart during the sawing operations. In any case, wear safety glasses, goggles or a face shield.

Flatten both sides of the blank with a belt sander, electric plane or hand plane, or by using a thickness planer. If you use a planer, temporarily fasten 3/4" x 3" x 16" boards to both sides of the blank, to effectively lengthen the piece. On most planers, it's not safe to mill pieces that are less than 12" long.

Cut the blank into a 7-5/8" dia. circle (Photo 1). When using the bowl-making jigs, you'll get the best results if the blank is perfectly round. Cutting the blank freehand will work OK if you're careful and go slow, but making a perfect circle is a cinch if you use a circle-cutting jig. You can

buy one or make one yourself (see Source and "Adjustable Circle-Cutting Jig," AW#158, February/March 2012).

Note that the blank is 1/8" smaller in diameter than the holes in the jigs you'll be using.

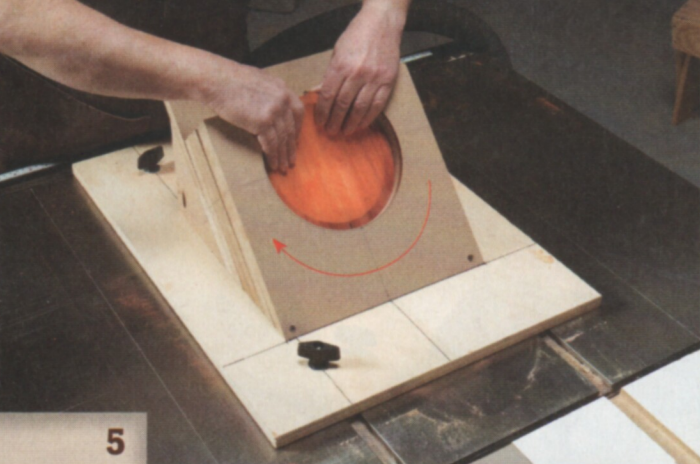
Using the hollowing jig

First, put an 8" dia. blade in your table saw. Any blade will do, but I've found that an outer blade from an 8" stacked dado set leaves the smoothest surface.

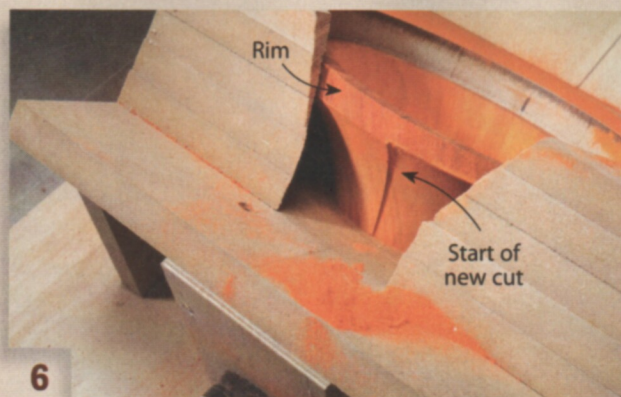
Install the hollowing jig (Photo 2 and Fig. A, page 61). Align the front of the jig with the front edge of your saw, then tighten the knobs of the locking miter bars. Adjust the height of the saw's blade so the top of the blade is just a bit below the surface of the table.

Place the blank in the jig. Press down lightly on the blank with one hand, turn on the saw and raise the blade 1/16" (on my saw, that's about 1/4 turn of the blade-elevation hand-wheel). Rotate the blank, clockwise, one complete revolution (Photo 3). (You might want to make a mark on the blank, so you can tell when you've turned the blank full circle.)

Keeping one hand on the blank, crank up the blade another 1/16" and repeat the procedure. Keep raising the



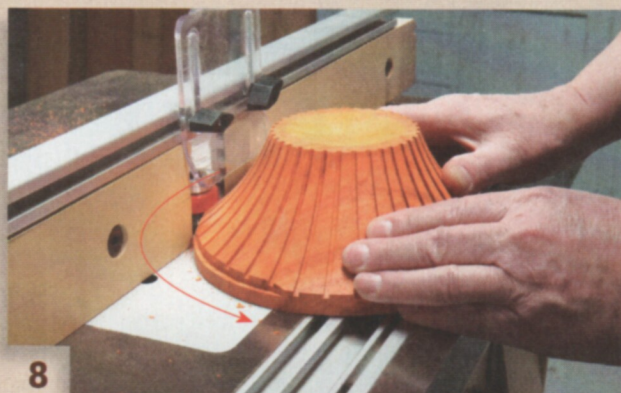
5 Switch to a second jig to shape the outside of the bowl. Like the previous jig, this one is fixed in place with bars that lock in the miter slots. Rotate the blank to cut the wood.



6 Here's what the outside of the bowl will look like as you cut it. Raise the blade $1/16"$ at a time until the rim is $1/2"$ thick.



7 Saw decorative kerfs. Here, you hold the bowl stationary and raise and lower the blade $1/8"$ to make each kerf. Equally-spaced lines on the rim show you where to position the bowl for each cut.



8 Rout the bowl's rim with a rabbeting bit. Rotate the bowl counterclockwise, against the rotation of the bit.

blade until the cut measures $6-1/2"$ across (**Photo 4** and Fig. B).

Repeat the same process on the opposite side of the bowl. Stop when the cut measures $2-1/2"$ across. This puts a finished look on the bottom of the bowl.

Using the coping jig

For this jig, put a 10" blade in your saw. Again, any blade will do. A rip blade will make the smoothest surface because its teeth have flat tops. Adjust the blade's height so the top of the blade is just below the table's surface.

Install the coping jig (Fig. C, p. 62). Be sure to hook it up to a vac—without suction, sawdust will clog up the jig. Align the jig with the front edge of your saw and tighten the knobs of the locking miter bars. Turn on the saw and raise the blade until it cuts all the way through the jig, then lower the blade so the top of the blade sits just below the base's platform (C).

Place the bowl in the jig. Press down on the bowl, lightly, with one hand. Turn on the saw and raise the blade $1/16"$. Sound familiar? Rotate the bowl one complete revolution (**Photo 5**). Keeping one hand on the bowl, raise the

blade another $1/16"$ and rotate the bowl again. Repeat the procedure until the bowl's rim is $1/2"$ thick (**Photo 6**). After the last cut, leave the blade at that exact height.

To saw the decorative kerfs around the bowl, remove the bowl and draw 36 equally-spaced lines around its rim. (The lines will be about $5/8"$ apart; step them off with a compass.) Draw an index mark on the jig, then position the bowl so one line is opposite the mark. Raise the blade $1/8"$, lower it to the same position from where you started, rotate the bowl to the next line and make another cut (**Photo 7**).

Refine the bowl's rim with a rabbet (**Photo 8**). Put a rabbeting bit in your router table and adjust its height to cut even with the bottom of the saw kerfs. You won't be able to use the bit's bearing as a guide; instead, ride the bowl on the two inside edges of the fence. Adjust the space between the fences to make a cut that's $1/8"$ deep. 

SOURCE

Rockler, rockler.com, 800-279-4441, 8" x 8" x 3" Turning Blanks, available in many species; Miter Slot Hardware Kit, #26993, \$7.39 ea.; AccuRight Circle Jig for Bandsaws, #33981, \$69.95.

Fig. A Hollowing Jig

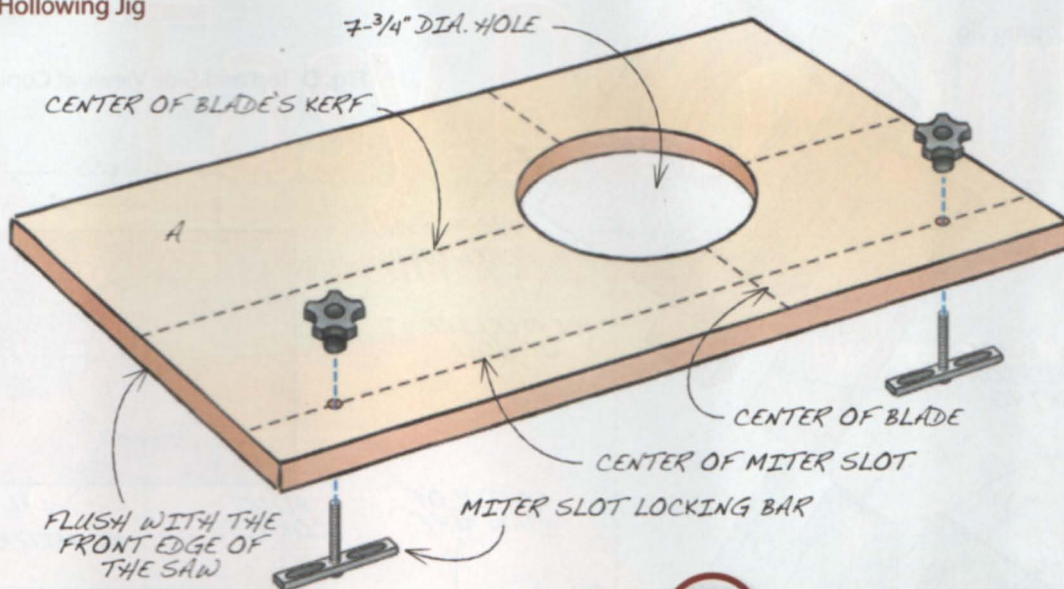
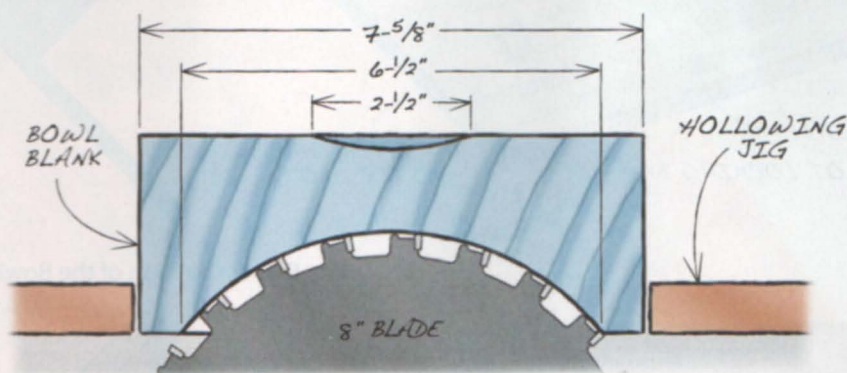


Fig. B Cross Section of the Bowl in the Hollowing Jig



Making the Hollowing Jig

Cut the base (A) from a flat piece of plywood or MDF. Draw a line down the middle of the base (Fig. A). Measure the distance from the center of your saw blade to the center of the right-hand miter slot. Draw a second line down the base. Measure the distance from the front edge of the saw's table to the center of the saw's arbor. Draw this line across the base.

Draw a 7-3/4" dia. circle from the intersection of the saw blade lines. Carefully cut out this circle with a jigsaw, then drill holes for the miter slot locking bars (see Source, page 60) and install the hardware. You're good to go.

Cutting List for Hollowing Jig

Part	Name	Qty.	Th x W x L
A	Base 1	1	3/4" x 16" x 27"



Fig. C Coping Jig

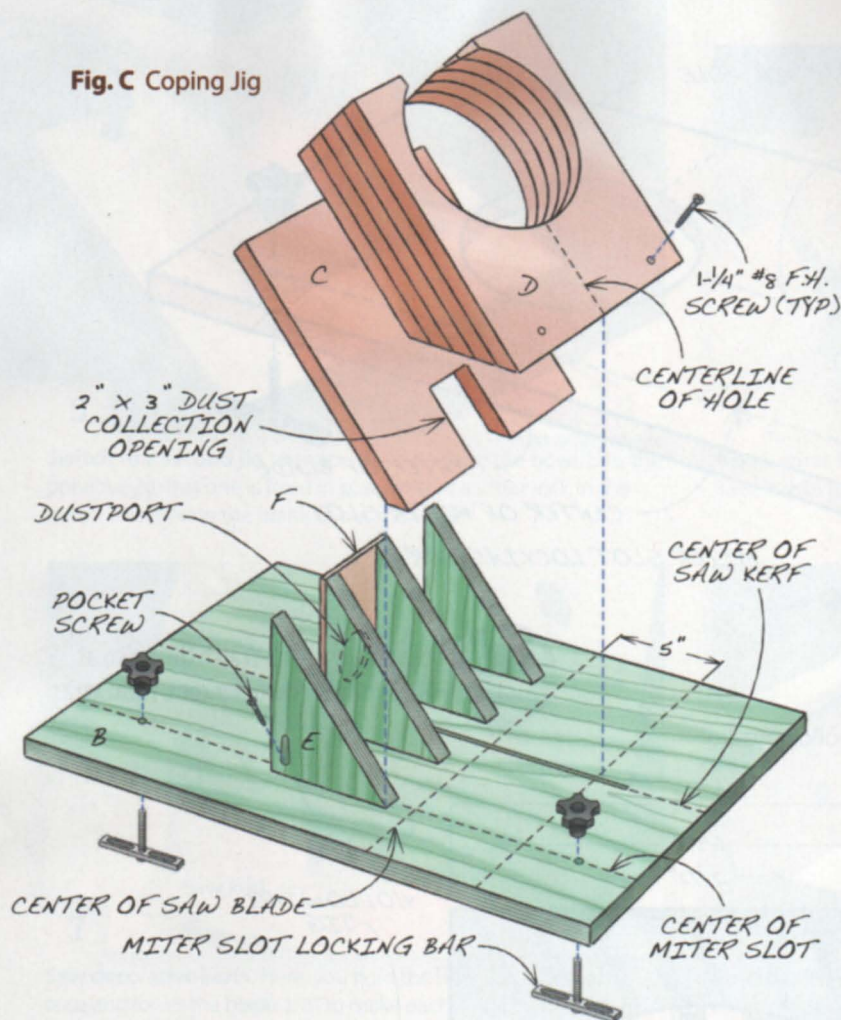


Fig. D Top and Side Views of Coping Jig

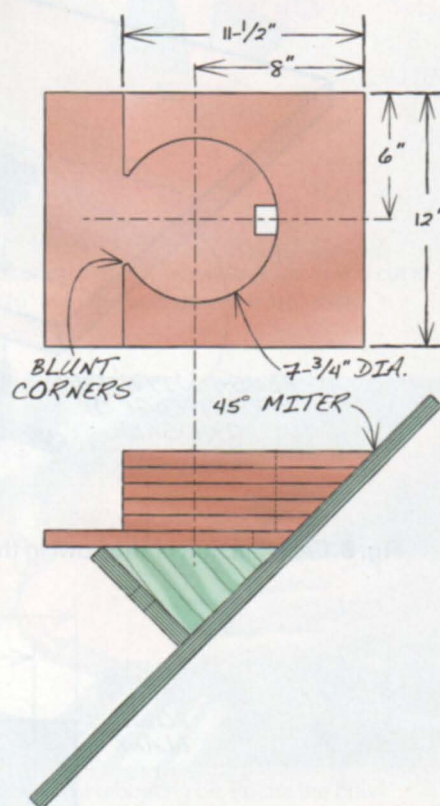
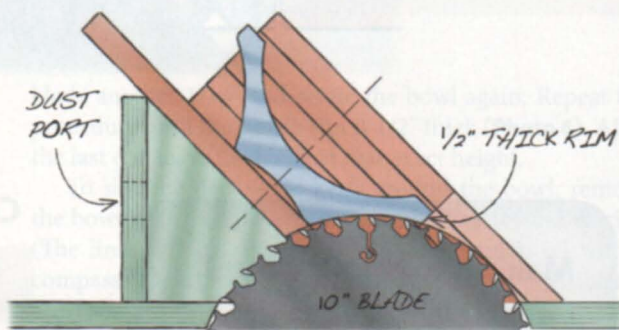


Fig. E Cross Section of the Bowl in the Coping Jig



Making the Coping Jig

Start with the base (B). Draw the same three lines as you did for the coping jig. In addition, draw one line 5" in front of the "center of saw blade" line (Fig. C).

To make the platform (C) and guide pieces (D), start by sawing six pieces 12" wide by 11-1/2" long. Saw a 45° bevel on one end of each piece (Fig. D). Set aside one of these pieces for the platform. Stack the rest, so the bevels line up, and crosscut each piece individually, so the square ends also line up. Glue the stack together. Mark the center of the hole that will hold the bowl blank. Saw the hole on the bandsaw, either freehand or using a circle-cutting jig. Saw off the sharp corners of the hole. Finally, cut out a 2" wide by 3" long slot in the end of the platform for dust extraction, then glue the stack to the platform. Glue and screw the platform and stack to the base.

Make the supports (E) and fasten them to the base. Make the dustport (F) and screw it to the supports.

Cutting List for Coping Jig

Part	Name	Qty.	Th x W x L
B	Base 2	1	3/4" x 18" x 27"
C	Platform	1	3/4" x 12" x 11-1/2" (a)
D	Guide	5	3/4" x 12" x 11-1/2" (b)
E	Support	4	3/4" x 6" x 6"
F	Dustport	1	1/4" x 4" x 6"

Notes:

a) Miter one end.

b) Miter the ends of all pieces, then crosscut to length as shown in Fig. D.

A large, close-up photograph of a wooden table top, showing the natural grain and a smooth finish. In the upper left corner, a portion of a lamp with a reddish-brown shade and a dark base is visible. The background is a solid light blue.

Easy Rub-Out

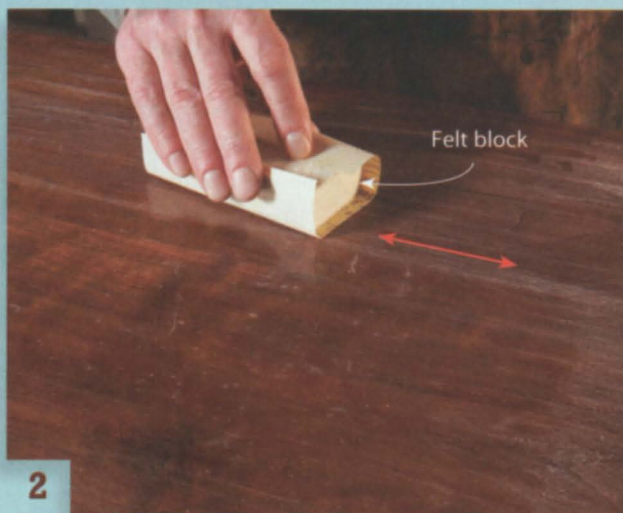
Three quick steps to a silky-smooth finish.

by Kevin Southwick

BRUSHED-ON FINISHES such as varnish provide superior protection, but they dry so slowly, airborne dust and renegade hairs are almost sure to settle on the damp surface. Fortunately, the process I use to remove these minor imperfections is both fast and simple—the table top shown here took less than 10 minutes to complete—and it leaves the finish looking and feeling like nobody's business. The trick is to apply a low-sheen finish, let it dry thoroughly and then use a gentle touch and the appropriate fine abrasives to rub it out.

1

Embedded hairs and dust nibs are almost impossible to avoid with film-forming finishes. Removing these imperfections and creating a smooth, lustrous finish is easier than you might think.



2

Start by sanding very gently with the grain using a felt block wrapped with 400 grit paper (or finer). Removing dust and hairs requires only a few strokes.



3

Consistently work the surface while carefully staying about 1/2" from the edges. Sanding gently leaves smaller scratches that are easier to remove.

Rubbed-out vs. hand-rubbed

While the terms are similar, a "rubbed-out" finish and a "hand-rubbed" finish are distinctly different. Abrasive rub-out methods are typically used on film-building finishes that are susceptible to debris getting stuck in the film as it dries. A hand-rubbed finish usually refers to a wipe on/rub off process that does not involve building a film above the surface of the wood.

Rubbing a film finish with fine abrasives allows you to subtly control how light is reflected, for a warmer, more inviting and refined appearance. Using fine abrasives to remove minor imperfections in the finish will also give your project an elegant feel that makes it hard for people to keep their hands off.

Most rub-out methods include difficult, labor intensive processes with a fairly high level of risk that problems will occur. For example, the first step in many of these methods is "leveling the finish" to remove all the wood texture. This step is risky because it's so aggressive. For anyone, even an experienced finisher, rubbing through the top layer of finish or even right down to the wood is a distinct possibility.

My rub-out method carries almost no risk, because leveling the surface isn't required. Leveling is only really necessary when the goal is a high-gloss sheen, as in a "piano finish." My method produces a satin sheen.

Start with satin varnish

It's important to start with a satin- or flat-sheen varnish, so that the pores and low spots in the texture of the wood don't appear shiny after the finish has been rubbed out. The table shown here is made of figured cherry that has been finished with General Finishes Arm-R-Seal satin polyurethane, applied with a foam brush (see Sources, page 66). This product flows out nicely due to its thinner viscosity, so there are no visible brush marks to remove.

Tip ▶ *If your satin varnish is thick enough to leave brush marks, try thinning it at least 25%.*

I've applied three coats everywhere but the top, which has a fourth coat because it will be subjected to more wear and tear. Unfortunately, my dog stopped by to check things out while the last coat was still wet (**Photo 1**).

Before rubbing out the finish, you must allow it to dry for at least three days in optimal conditions (above 60 F with relative humidity at 50%), but it's better to wait a week. Allow even more time when the relative humidity remains above 80%.

Silky-smooth in three steps

This rub-out technique has only three steps. There's no reason to worry about the confusing range of abrasive sheets, pads, powders and compounds used in more involved processes. All you need is satin Arm-R-Seal, 400 grit or finer sandpaper, a felt sanding block, good-quality steel wool (made by Liberon or Briwax), and a few drops of dish soap. These products are available online or at woodworking specialty stores (see Sources).

Step 1: Remove dust nibs, hairs and very small imperfections above the surface. Very fine sandpaper is the most effective tool for shearing off these buggers, because it's important not to remove any more of your carefully applied finish than necessary. Use 400 grit or finer sandpaper cut to one-quarter sheet size (not torn with rough, scratchy edges). For consistent cutting action, wrap the sandpaper around a soft, pliable sanding block. The best blocks for this job are made of felt or neoprene rubber. (Neoprene blocks of assorted density and pliability are available through automotive suppliers.)

Sand very lightly with the grain to shear off dust and hairs (**Photo 2**). This process requires very little pressure—maybe as much as the weight of your hand. It feels more like dusting or gentle cleaning than sanding. It doesn't take long, either. Two or three strokes will often do the trick.

Applying the minimum amount of sanding pressure keeps the sanding scratches as small as possible. Pushing down harder than necessary creates bigger, deeper scratches that require more work to remove in the steps that follow. Feel the surface as you go and stop sanding as soon as it feels smooth. Completing this step on an average-size dining room table should take between five and ten minutes.

In all three steps of this process, it's best to work carefully to within about 1/2" of the edges to avoid cutting through (**Photo 3**). Then finish the work around the edges separately and cautiously (**Photos 4 and 5**). Consistency is very important for an even sheen. Wipe the surface clean with a damp cloth. You should see a consistent visible scratch pattern that shows on the high spots in the texture of the wood.

Step 2: Remove the visible scratches from sanding and replace them with smaller scratches. For this step you must have good quality #0000 steel wool that's specially made for rubbing finishes (see "Types of Steel Wool," page 66). It's important to cut and fold the steel wool carefully to create a good, consistently-abrasive surface (**Photo 6**). An 18" to 20" length of wool folds into an effective four-layer pad. Use your felt or neoprene block to back up the steel wool. As with the sandpaper, this provides a much more even and gentle cutting surface. Work the surface carefully and consistently to create an even appearance (**Photo 7**). As with the first step, this step requires very little pressure. Once again, save the edges for last. Wipe clean with a damp cloth. This step should take 10 to 20 minutes.

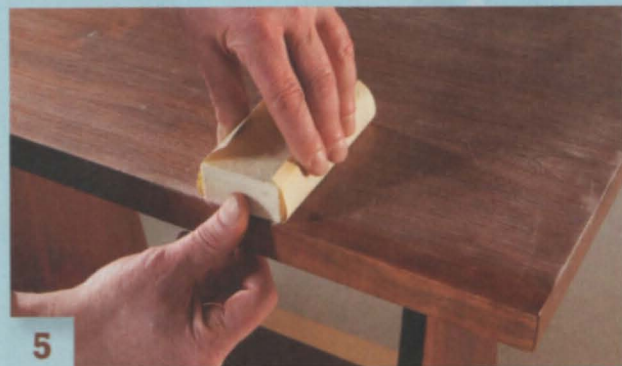
To rub turned legs or shaped moldings, use the sandpaper on only the straight portions. On the shaped portions, skip the sanding and go straight to the steel wool (**Photo 8**).

Step 3: Remove the scratches made by the dry steel wool and replace them with scratches that aren't visible to the human eye. Scratches that are easily visible create a hazy appearance. Moving from these scratches to scratches so small they're not detectable is what makes this step different from the first two.

Start with fresh steel wool prepared as in the previous



Sand to the ends using two or three short, light strokes, lifting at the end of each stroke so you don't cut through the edge.



Sand to the sides, working with the grain and using your thumb as a guide to keep the abrasive away from the vulnerable edge.



Carefully cut and fold good-quality #0000 steel wool to make a consistent abrasive pad. Folding the wool allows you to renew the cutting surface by unfolding fresh layers.



Remove the sandpaper scratches by working with the grain using the steel wool. Back the wool pad with the felt block to create a more consistent rubbing tool.



8

Go straight to the steel wool on the shaped portions of turned legs and moldings. Be careful to avoid cutting through delicate edges. It's OK to sand the flat portions, but stop short of any curves.



Finish the job with a fresh wool pad, soapy water and a circular rubbing pattern. The lubricated wool removes the scratches from the dry wool and leaves no visible marks behind.

step, with the soft felt block to back it up. Mix a couple drops of mild dish soap or hand soap in a small dish of water. Use just enough to get some suds going. Dip the steel wool in the soapy water or just sprinkle drops around on your surface. Work the wool in a circular pattern using the same gentle approach as in the first two steps (**Photo 9**). Add a drop of soap to the surface anytime you need more suds. Move across the surface in an overlapping pattern. After one complete pass over the entire surface, repeat the pattern two more times, then wipe dry with clean, soft paper towels. Let the water evaporate and then carefully assess your progress. Repeat this last step as needed to create a consistent satin sheen. This step should take 10 to 20 minutes. 

SOURCES

Woodcraft, woodcraft.com, 800-225-1153,
General Finishes Satin Arm-R-Seal, 1 qt., #56606, \$15.99; Norton 3X Sandpaper, 400 grit, 20 sheets, #29533, \$12.99; Felt Block, #58289, \$10.59; Liberon #0000 Steel Wool, 1/2 lb. roll, #58354, \$21.49.

Rockler Woodworking and Hardware, rockler.com, 800-279-4441,
General Finishes Satin Arm-R-Seal, 1 qt. #85F08, \$14.99; Norton 3X Sandpaper, 400 grit, 3 sheets, #145034, \$5.99; Felt Rubbing Pad, #38N41, \$14.50; Briwax 4/0 Steel Wool, 1 roll, #844337, \$11.50.



Kevin Southwick is a wood-finishing specialist and furniture restorer/conservator in Minneapolis, MN.



See how little time this rub-out process takes at AmericanWoodworker.com/WebExtras



Types of Steel Wool

The fibers in good-quality steel wool are long and very consistent. That makes it far better for rubbing finishes than ordinary steel wool, because it provides consistent cutting action and produces a consistent scratch pattern. It also lasts longer. Good-quality steel wool is more expensive than ordinary wool and harder to find (see Sources, above).

Ordinary steel wool has shorter fibers that are visibly inconsistent. It often feels greasy with residual oil from the manufacturing process and it has a tendency to crumble.

A quick look at the cutting surface of a nylon abrasive pad shows that it's significantly different from good-quality #0000 steel wool. Although it's a useful finishing tool, a nylon abrasive pad isn't appropriate for the process shown here, because it doesn't cut the same way that good-quality steel wool cuts.

Sawtooth Desk

by Lisa Clements

Create awesome patterns with a spindle sander.



WHEN MOST OF MY FRIENDS want something—like a new phone or a computer desk—they just ask their parents for it. I'm a little different, because I've been woodworking with my Dad for about eight years; when I want something, my dad and I make it. He's taught me how to use all of the machinery in his shop and we've built many projects together. When I told him that I wanted to build a computer desk, we sketched a few ideas to work out the dimensions and then headed to the shop.

We get design ideas by experimenting. That's how we came up with the desk's sculpted legs. We were using the

oscillating spindle sander to shape some rounded cutouts on a scrap-wood leg when we decided to see what happened if we tilted the sander's table. Wow! Pushing the leg directly into the spindle created a really cool cone shape. Before long we discovered how to combine multiple cone shapes to create an intricate overlapping pattern that looked like a serrated sawtooth. Next came the idea to face a pair of mirror-image patterns. Separating them with ginormous loose tenons in a contrasting wood was the last piece of the puzzle. Awesome! We'd developed a simple process that gave our desk a signature feature.

Fig. A Exploded View

1-1/2" x 1-1/2" NOTCH (TYP)

3"

1-1/2" x 1-1/2" RABBET (TYP)

2-1/2" x #4 F.Y. SCREW (TYP)

2-1/2" x #4 PAN/HEAD SCREW (TYP)

1-1/2"

Fig. B
Mortise Locations

1-1/2"

whereweshare.com

A vertical wooden board is shown with several horizontal sections of different widths and heights. The total height is labeled as 28". The height of the top section is 24 5/8". The height of the section below it is 21 11/16". The height of the next section is 18 3/4". The height of the section below that is 15 13/16". The height of the next section is 12 7/8". The height of the section below that is 9 15/16". The height of the bottom section is 3".

A technical drawing of a mechanical part, likely a bracket or support, showing its overall dimensions and features. The part has a rectangular base with a width of 8 inches and a total height of 27 inches. A central vertical slot is cut through the top, with a width of 1-1/2 inches and a depth of 2-1/16 inches. On the right side, there are three semi-circular cutouts, each with a radius of 2-1/2 inches. The distance between the centers of these cutouts is 2-1/2 inches. The bottom edge of the part is also semi-circular, with a radius of 2-1/2 inches. The overall height from the bottom of the semi-circle to the top of the slot is 21-5/8 inches. The drawing includes dimension lines and arrows indicating the measurements.

Overall Dimensions: 28-1/2" H x 40" W x 22" D

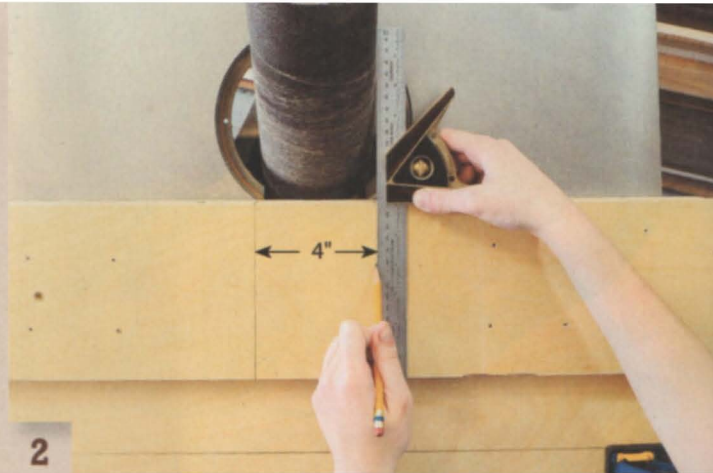
Part	Name	Qty.	Material	Th x W x L
A	Top	1	Spanish cedar	1-1/2" x 22" x 40"
B	Leg	4	Spanish cedar	1-1/2" x 8" x 27" (a, b, c)
C	Rail	2	Spanish cedar	1-1/2" x 3" x 36" (d)
D	Tenon	4	Wenge	1/2" x 5" x 7" (e)

- Finished length; start with 28" long blank.
- Cut centered $1\text{--}1/2" \times 1\text{--}1/2"$ notch in top.
- Cut two $1/2" \times 2\text{--}1/2"$ (as measured on the blank) $\times 5"$ mortises on one face.
- Cut $1\text{--}1/2" \times 1\text{--}1/2"$ notches in both ends.
- Round the top and bottom edges to fit the mortise.



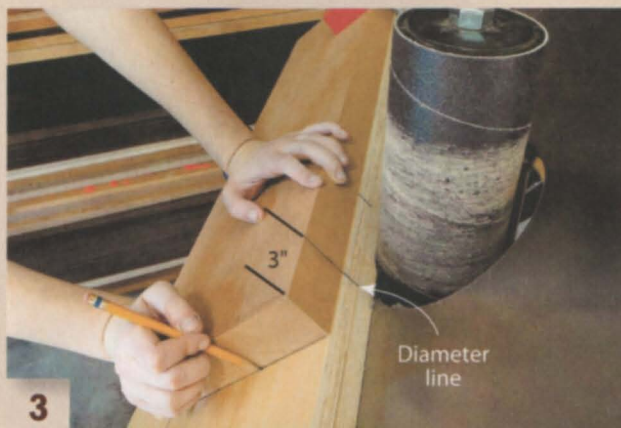
1

The legs are shaped using a simple fixture mounted on an oscillating spindle sander that's outfitted with a 4" drum. Square the fixture to the spindle and then tilt the table to 45°.



2

Mark the diameter of the spindle on the face and edge of the fixture.



3

Mark a third line on the fixture using a blank marked 3" from one end. Align the mark with the fixture's right diameter line. Make sure the edges are flush.



4

Fasten a 90° fence to the fixture at the line you've just marked.

Wood and big machines

The desk's legs, rails and top are made of 8/4 Spanish cedar boards that were left over from one of my Dad's projects. I like working with Spanish cedar because it doesn't weigh a ton! It also sands easily, smells good and looks pretty. We decided to use wenge for the exposed tenons because its dark color would accentuate the overlapping curves we'd be sanding into the legs. Wenge looks awesome, but it's no fun to work with because it's hard and super splintery.

We used two of my favorite tools to make this desk. In addition to the big oscillating spindle sander, we used our Multi-Router to cut the mortises (see Sources, page 72). Dad says it's unusual for a small shop like ours to have these tools. I say we're lucky!

We started by milling lumber for the top, legs (including a test leg) and rails (A, B and C, Fig. A, and Cutting List, page 68). We chose the best-looking boards to make the top and the "next-best" to make the legs. Dad said to use the ugliest board (or even offcuts from the top and legs) to make the rails, because they wouldn't show. I used ugly wood to make the test leg blank, too. We cut all the boards a couple of inches longer than the final dimensions and set

aside the ones we'd chosen for the top and the rails.

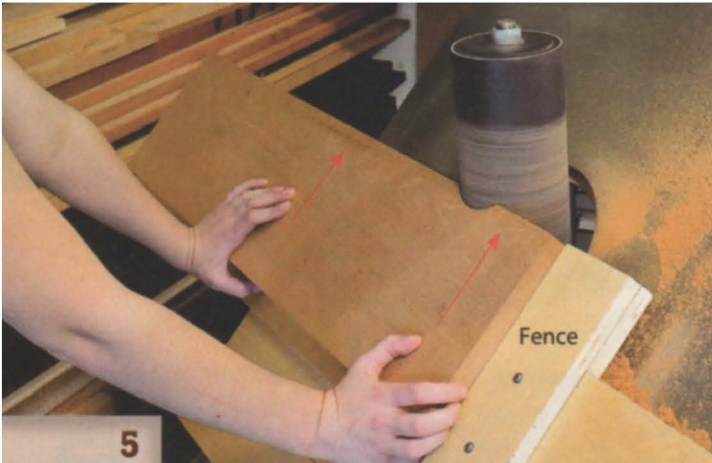
We were fortunate to have wide boards, so our leg blanks didn't have to be glued up. We squared the ends of the leg blanks at 28" and jointed their edges smooth while cutting them to their final 8" width.

Set up the sander

I installed a 4" spindle with a 60-grit sleeve in the oscillating spindle sander while Dad assembled the 3/4" plywood fixture that supports the leg blanks. Its 12" x 25" base and 6" x 60" support rail are fastened together to create one flush edge. Dad squared the fixture to the spindle and held it in position (butted against the spindle) while I clamped it to the table. Then I tilted the table to 45° (Photo 1).

I marked both sides of the spindle on the fixture's rail and extended the two marks onto the edge that faces the drum (Photo 2). Meanwhile, Dad marked a reference line on the edge of each leg blank, 3" from one end. I placed the test blank on the fixture, squared it and aligned its reference line with the right diameter mark. Then I drew a third line on the rail (Photo 3).

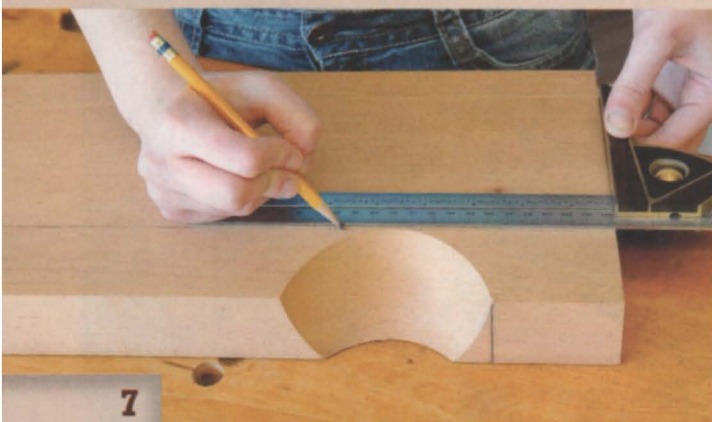
I completed the setup by fastening the fixture's 1-1/2"



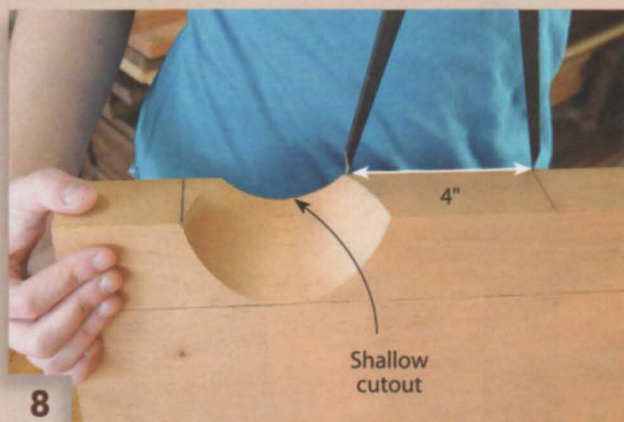
5 Sand the first profile by sliding the leg blank up and into the sanding drum while holding the end firmly against the fence.



6 Stop sanding when the profile meets the line on the blank. Sanding the edge at 45° creates a cone-shaped profile.



7 Mark a line tangent to the apex of the deep cutout on the blank's bottom face. Extend this line down the length of the blank, on both faces.



8 Mark the edge of the blank again, exactly 4" from the end of the shallow cutout on its top face.

x 3" x 11" fence at this line (**Photo 4**). A 3/4" x 3" square block fastened to one end of the fence automatically positions it.

Shape the first profile

Dad turned on the sander while I held the test leg blank on the fixture with its end against the fence. Then I slowly but firmly pushed the blank straight up into the spindle (**Photo 5**). The spindle's counter-clockwise rotation helped hold the blank against the fence. I kept pushing the blank until the sanded profile touched the mark (**Photo 6**). Then I removed the blank so we could check our setup by measuring the cone-shaped cutout on its edge, which we knew from earlier experiments should be 4" long at the bottom (the diameter of the drum) and 1-7/8" long at the top.

The cutout's length at the top edge is important because it determines the overall length of the overlapping pattern. (You'll learn why it's the determinant in the next step.) When Dad and I were experimenting earlier, we learned that every 1° variance from 45° in the table's tilt adds (or subtracts) about 1" to the pattern's overall length, and this can cause problems with centering the overall pattern when you cut the legs to final length.

Tip ▶ If the length at the top is greater than 1-7/8", it means the table is tilted less than 45° and needs to be adjusted.

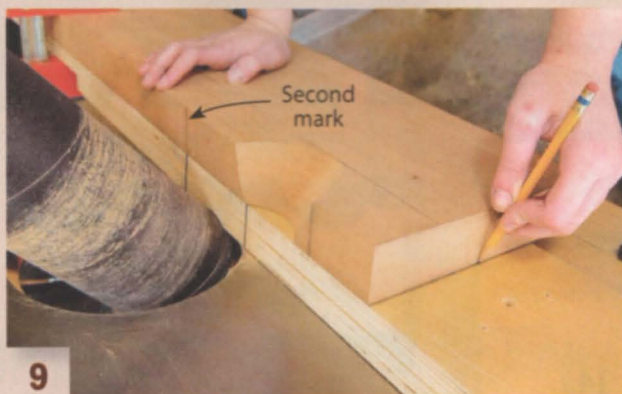
Our measurements showed our setup was good, and that meant I could shape the first profile on the four real legs. So I did.

Shape on!

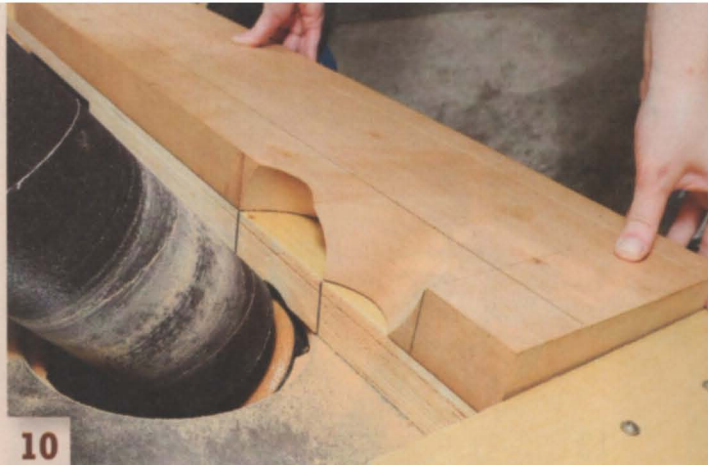
When the setup is correct, the large cutout on the blank's bottom face is a semi-circle with a 4" diameter. I used its apex to draw a pair of reference lines, one on the bottom face and another on the opposite face (**Photo 7**). I used these lines as depth gauges to check all the remaining cutouts.

Next, I marked another reference line on the edge of the board, exactly 4" from the end of the 1-7/8" long cutout on the top edge (**Photo 8**). My Dad removed the fence from the fixture. Then we flipped over the blank and used its new reference line to reposition the fence and install it (**Photo 9**).

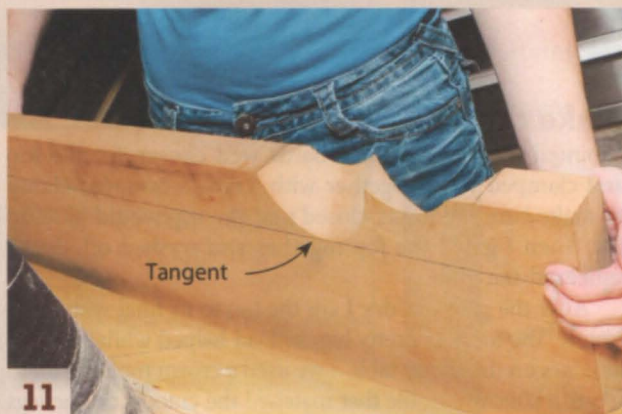
We were finally ready to shape the second profile—and create the first overlap. Dad turned on the sander after I'd positioned the test blank on the fixture with its large cutout facing up and its end planted against the fence. Then, like before, I slowly pushed it up into the spindle (**Photo 10**).



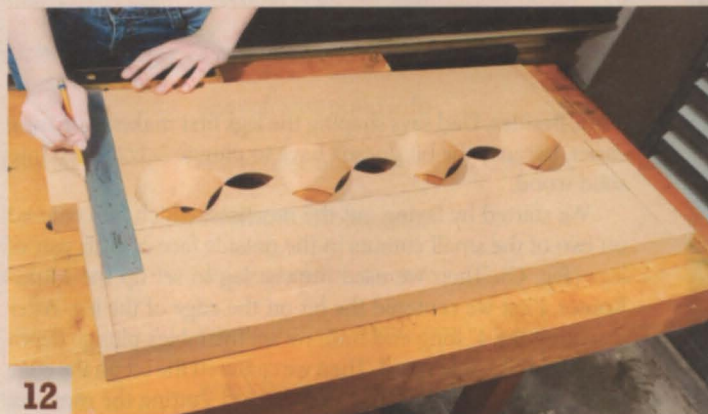
9 Draw another line on the fixture with the blank positioned so that the shallow cutout and your second mark align with the fixture's two diameter lines.



10 Install the fence at the line you've just drawn and then sand the second profile. As before, stop sanding when the profile reaches the mark on the leg.



11 The wide end of the second profile should be tangent to the line on the opposite face of the blank. Repeat the process shown in Photos 7 through 10 to complete each blank.



12 Mark the legs in pairs for cutting to final length. Butt the legs together and align their sanded profiles. Then measure from the center.

Keeping the blank against the fence was harder this time, because the spindle's rotation tried to pull it away. When the sanded profile reached the reference line on the edge, it also reached the depth gauge line on the opposite face (**Photo 11**). After verifying the profile's dimensions and depth, we marked and shaped the second profile on the four real legs.

From here on, we just repeated the process to complete the overall profile: I marked the test blank 4" from the most recent 1-7/8" cutout, used it to reposition the fence, and then shaped the next cutout. After verifying the profile, I shaped that profile on the real legs. There are seven overlapping profiles in all.

Tip ▶ If you just can't get the top cutout to measure 1-7/8", don't use it to locate the overlapping profiles. Instead, draw the seven reference marks dimensioned in Fig. B (page 68) on the edge of your blank and use them to position the leg on the fixture. Using this alternate method will keep the overall profile at its intended length.

Match the legs

The next step was to align the overall profiles on each pair of legs and mark their final lengths by measuring from the center

(**Photo 12**). I also marked each pair, so they'd stay together. Then I cut the legs to final length. After that, I cut a centered notch in the top of each leg using a bandsaw with a fence. I carefully fit the width of the centered notches so the rail blanks slid in snugly, without binding or wobbling. I started by cutting just inside my layout lines and removing most of the waste. Next, Dad squared the bottoms using a coping saw. Then I went back to the bandsaw and trimmed the shoulders by making tiny fence adjustments and testing the fit.

Rout the mortises

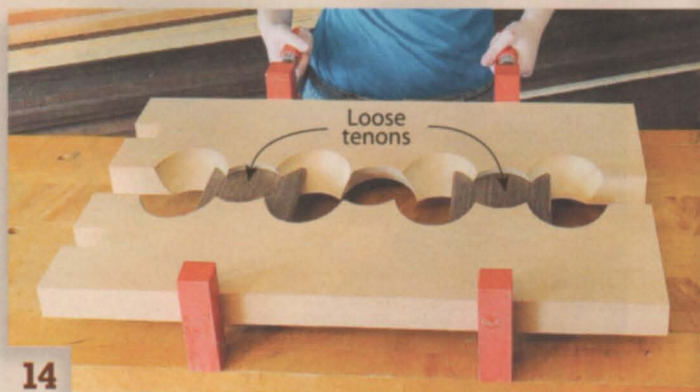
You may be thinking that we should have cut the mortises for the loose tenons before shaping the edges of the legs. That would have been necessary if we were planning to cut them with a plunge router or a Forstner bit mounted in a drill press. But as I said, Dad has this sweet tool called a Multi-Router, a joint-making machine that he uses constantly.

Unlike a plunge router, which would have to sit on the edge of the leg, the Multi-Router stations the leg on a table. And rather than plunging the bit into the wood, the Multi-Router moves the leg into the bit. So, by using the Multi-Router, it doesn't matter that the leg's straight edge has been sanded



13

Cut mortises in all the legs for the loose tenons. The Multi-Router's three-axis adjustability makes this easy.



14

Dry fit the legs and loose tenons to make sure the parts fit and the assembly is square.

away. Besides, Dad says shaping the legs first makes mortising easier, because the bit doesn't have to plunge 2-1/2" deep into solid wood.

We started by laying out the mortises, which we centered on two of the small cutouts in the outside face of each pair of legs (Fig. C). Then we used the test leg to set up the Multi-Router. First we centered the bit on the edge of the leg. After installing the 4" long end mill, we set the table's plunge depth and its side-to-side travel. Then we centered the bit on the edge of the leg. Once we'd dialed in the setup, cutting the mortises was easy (**Photo 13**).

Assemble the legs

Dad milled a wenge board to fit the 1/2" wide mortises and rounded the edges on the router table, using a bull-nose bit. Then I crosscut the board to make the four giant loose tenons (D).

I applied glue inside the mortises in each pair of legs, inserted the tenons and clamped together the assembly (**Photo 14**). After making sure the assembly was square I washed off all the squeezed-out glue.

Dad said the two leg assemblies should be identical, so when they were both dry, I unclamped them and put them together. They didn't quite match, so Dad trued them up with a hand plane. Then he had me finish-sand them. I *hate* sanding, but Dad says it's one of the most important parts of building a project.

Glue up the base

I cut notches in the rails to fit the ones I'd cut earlier in the legs. Then I drilled countersunk screw holes for mounting the top to the rails and the rails to the legs. I also drilled pilot holes in the legs, so the screws wouldn't split the end grain. Meanwhile, Dad widened the holes I'd drilled for mounting the top into slots to allow for seasonal movement.

We stood the legs on our super-flat assembly table to glue in the rails, so we could make sure everything was square. The only clamps we used for this glue-up were the screws we drove into the legs.

Make the top

I jointed the edges of the boards we'd chosen for the top and clamped them together with a single centered clamp to make sure the joints closed and the top would glue up flat. Then I glued the top together and washed off all the squeezed-out glue.

After the glue was dry I cut the top to its final width and length. The top was pretty big, so Dad helped while I routed its edges on the router table—we used a crown molding bit to create a concave profile that matched the cutouts on the legs (see Sources). This bit cuts a 2-1/4" long profile; we only used the top part of it, starting at the 45° chamfer. After that I was sentenced to finish-sand the top. At least it was flat—there weren't a million cone shapes to sand!

Back to school

The base needed a little touch-up sanding, especially where I washed off the glue. The next step was to apply the finish, a job I always leave to my Dad, because he's great with a spray gun. When the finish was dry, I attached the base to the top. Now to catch up on all that homework! 📖

SOURCES

Grizzly Industrial, grizzly.com, 800-523-4777, Oscillating Spindle Sander, #G1071, \$750. JDS Company, jdtools.com, 800-480-7269, Multi-Router, \$2695; 1/2" dia. x 4" end mill, #12856, \$48.95. Ace Tool Repair, Inc, acetoolonline.com, 877-783-8899, Freud Crown Molding Bit, #FRE-99-408, \$62.99.



Lisa Clements

has been woodworking in Friendswood, Texas for about eight years.

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Hammered Cat

THE HANDLE on my favorite hammer needed to be refinished, so I sanded it, sprayed on a coat of polyurethane and hung it over the edge of the picnic table to dry. A moment later I heard a blood-curdling wowl, and looked around to see my big fuzzy yellow cat sailing across the yard with the hammer stretched out behind, stuck in her big fuzzy yellow tail. I thought this was the last I would see of my beloved hammer, but the cat veered just before exiting the yard and ran around in circles instead. Eventually the hammer flew off. My cat quickly regained her dignity, but the hammer's handle, covered with gravel, leaves, sticks and big fuzzy yellow hair, required a complete makeover.

J. Louis Bledsoe



Short Cut

THE LAST TIME I drove home for a visit, my dad was in his shop building several stools for my niece. When my mom asked him to sit with us and have a Coke, Dad said he would come in as soon as the last stool was glued and clamped.

Well, after about 20 minutes Dad came in, mumbling under his breath, drank a glass of water, and left. He returned 20 minutes later and headed for another glass of water. I realized something wasn't quite right, so I handed him a Coke and suggested that he take a break. After he had taken a

few sips, I casually inquired as to what the issue was. His response went something like this:

"I just don't understand it. The last stool had a little bit of a rock in it because one of the legs was about 1/8" shorter than the others. That should be easy to fix, but I've cut 1/8" off of that dangled leg three times now and it's still too short." Suddenly, he got up and headed back towards the shop. On his way out the door, he turned to us and said, "Don't you say a thing—not a single word!"

Ralph D. Wilson II

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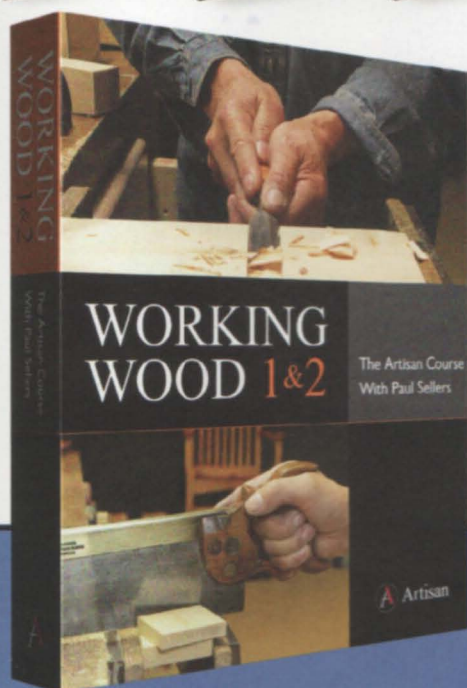
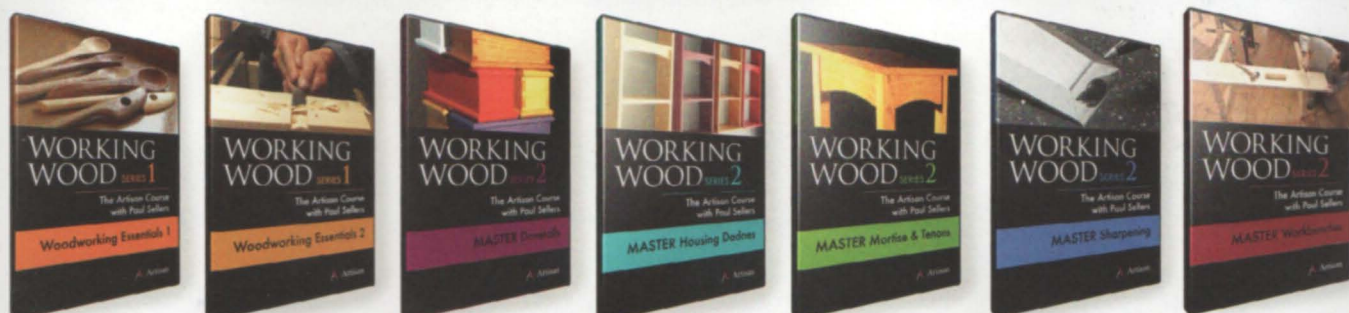
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