

TAUNTON'S

February 2017 No. 259

Fine Woodworking

Tips for stronger tenons • Do more with your combo square
Test your hand-tool skills • Shoulder your dovetails for square glue-ups



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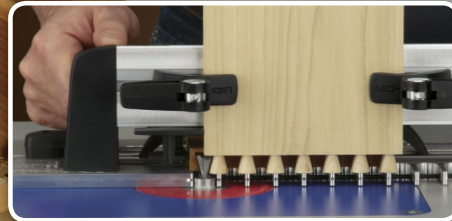
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Visit FineWoodworking.com/259 for online extras, available Nov. 30. And don't miss the collection of free content on our new website, including tool reviews, an extensive project gallery, and must-read blogs.



VIDEO

Tried and True

If your combo square (p. 44) isn't as accurate as you'd like, don't buy a new one. It's relatively simple to square up a combination square. In this video, web producer Ben Strano shows you how to dial it in to perfection.



VIDEO

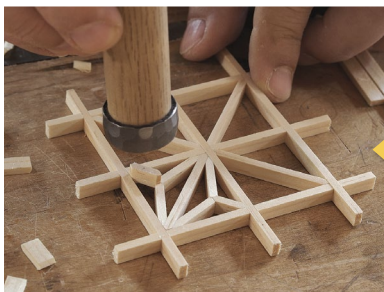
Two for the Money

Both barbed hinges and barrel hinges (p. 54-55) are easy to install and very economical. We'll show you the types that are available and the best methods of installing them.

VIDEO

Winning Workshop Tip

Fine Woodworking editor Tom McKenna brings this issue's winning workshop tip (p. 14) to life. All it takes is a V-bit and a router table to quickly make a strong drawer box.



VIDEO

The Quiet Art of Kumiko

Sometimes we need a break from the noise and dust of machine work. Take a quiet moment and watch as executive art director Michael Pekovich assembles a beautiful kumiko panel (p. 82) for his cabinet-on-stand.

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VIDEO WORKSHOP

Fundamentals of Handplanes

Nothing exemplifies an accomplished and experienced woodworker better than the full command of handplanes. In this video, Michael Pekovich leads you on the journey toward a mastery of this vital hand tool. You'll learn:

- How to read grain direction to avoid tearout
- How to assemble the essential plane kit
- A fast and reliable method for getting sharp
- How to do better work with handplanes



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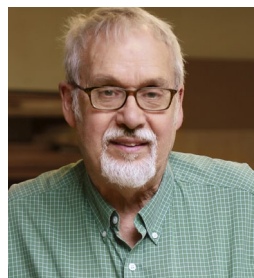
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contributors

After considering a career building traditional stringed instruments, **Michael Hurwitz** (Designer's Notebook) studied furniture making under Jere Osgood and Alphonse Mattia at Boston University's Program in Artisanry. Since the mid-1980s he's been building custom furniture in Philadelphia, where he was head of the wood program at the University of the Arts. Hurwitz has explored a broad range of materials in his furniture, some ancient, others innovative. An affection for Japanese craft has also profoundly affected Hurwitz's work, and he has collaborated with a number of traditional Japanese craftsmen, including experts in urushi lacquer, bamboo weaving, and metalwork.



Doug Stowe ("Pick the Perfect Hinges for Your Boxes") began his woodworking career in 1976 in Eureka Springs, Ark. The following year, he founded the Eureka Springs Guild of Artists and Craftspeople. He's written dozens of articles and numerous books, the most recent of which is *Tiny Boxes* (2016, The Taunton Press). He's also spent his career teaching boxmaking to adults and directing a pre-kindergarten through 12th-grade woodworking program called "Wisdom of the Hands."



Dan Bollock ("Tips for Stronger Tenons") has been an engineer at a semi-trailer manufacturer, a furniture maker in a one-man shop, and finally an educator in Sustainable Biomaterials at Purdue University. His stint as designer/maker ended abruptly after an accident left him incapacitated for six months. That stroke of bad luck turned fortuitous when the Purdue job, teaching college students about the properties of wood, became available. Now, Bollock purposely breaks most of the joints he makes.

You can buy a bowl made by **Mike Mahoney** ("Turn a Lidded Canister") and keep it safely on display in your home, but that was not his goal when he made it. Mahoney, a renowned wood turner who's been doing it professionally all of his adult life, wants his work to be used as well as admired. His bowls are designed to serve food—salad, popcorn, pasta, and fruit. The vessel featured in this issue was made to hold coffee.



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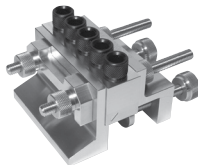
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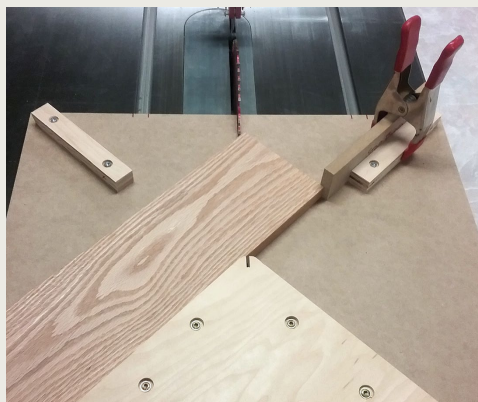
November/December 2016
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IMPROVEMENT TO MITER SLED

Craig Thibodeau's article, "Tablesaw Sled for Miters," was pleasantly timed. My wife and I have an assortment of pictures that need framing. So, my immediate future involves creating lots of mitered cuts, which Craig's sled will make a breeze.

However, I would like to offer an alternative to Craig's stop-block system. I prefer a system that doesn't involve unscrewing and tightening fasteners and is easily adaptable to mitering boards of varying widths. On my sled, I screwed down two 3/4-in.-thick by 1-in.-wide mini-fences that are parallel to the main fence on both sides. The mini-fences are far enough away from the main fence that the sled can accommodate up to 6-in.-wide boards on either side. I then clamp a stop block to the fence using a spring clamp.

I decided to forgo the stiffening block at the front of the sled because it would



interfere with my blade guard and integrated dust collection. However, this system would also work with a stiffening block.

—ADAM WAGNER, Plymouth, Mich.

Reader solution. Wagner expanded the usefulness of Craig Thibodeau's miter sled by incorporating a clamped-on stop block that can be adjusted to accommodate stock of different widths.

Comments on clamp choices

Your article, "Essential Clamp Kit" (*FWW* #257, pp. 38–43), gives only a single-sentence description to parallel clamps. Woodworkers' preferences vary, but I'm surprised that Jeff Miller finds them difficult to adjust. I have six kinds of parallel clamps from four



different manufacturers, and I have no problem adjusting any of them. On some, the adjustment speed and ease is identical to the F-clamp. On others, it might take a second or two longer, but there is no difficulty. The tiny increase in time is more than compensated for by the parallel clamp's virtues. I use parallel clamps for at least 90% of my glue-ups.

The larger area of the clamp pad, the mar-free surface, the excellent clamping pressure, and, of course, the more nearly parallel clamping surfaces, are pluses that new woodworkers should be made aware of.

—DEREK ROFF, Santa Fe, N.M.

I enjoyed "Essential Clamp Kit," but it missed my favorite and most-used clamp, the Vise Grip Model 18SP. It has a 10-in. throat and will clamp material up to 8 in. thick. It has many uses, is easy to adjust, has good clamping pressure, and can be operated using one hand. It is especially useful as a hold-down clamp (my work table overhangs about 10 in., making for a good clamping surface). I also use the 11SP, which has a 3-in. throat and can clamp material up to 4 in. thick.

—ANDY WESTERHAUS, Burnsville, Minn.

Jeff Miller overlooked Irwin's big brother to their Quick-Grip clamp (XP600). I was a little skeptical when I bought my first pair, but I have become a convert. Their ease of use and adequate strength make them a go-to clamp for 95% of my routine shop requirements. Also, the static head can be swapped to the other end to provide a spreader function—a real life-saver on the rare occasions when it is required. I have 18 of these clamps in a range of sizes up to 50 in. My poor Bessey F-clamps surely feel overlooked, only being put to use when their superior strength capability is required.

—BILL ANDERSON, Townsville, Queensland, Australia

It's what's inside that counts

It's nice that so many readers really liked your 40th anniversary issue cover. Personally I think all of your magazine covers have been done well.

But it's what's inside that really counts and keeps people subscribing year after year. On the whole, I think you have done a pretty good job there also.

—PAT FARMER, Montgomery, Vt.

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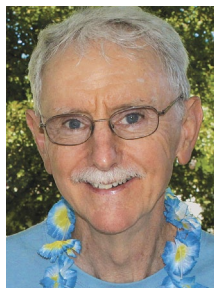
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Best Tip **Easy-to-make plywood drawers and trays**



John Burke started woodworking in 1978, when he built a bar in the basement of his first house. In 2014 he was diagnosed with Parkinson's disease. "Woodworking may seem like a bad choice for someone with a movement disorder," Burke says. "But it is great therapy, and it's safe as long as all necessary precautions are taken."

I needed a dozen small trays to hold hardware. I wanted them strong, but quick and easy to make. Then I remembered a technique Roy Underhill used on *The Woodwright's Shop* years ago. He cut V-shaped grooves in a wood panel by hand, just short of breaking through the opposite side, and folded up the edges of the panel to form a box. I used a router fitted with a V-groove bit and traded the solid wood for plywood.

To size the initial panel, start with the length and width of the finished tray and add the height of the sides to all four edges. Then put the V-groove bit in the router and set the fence so that the distance to the point of the bit is the height of the box sides. Simply run all four panel edges against the fence. Do the first box in multiple passes, creeping up to the perfect depth of cut for easy folding without breaking. You can make multiple boxes with the same setup, as long as you use plywood from the same panel.

Use a sharp knife to remove the squares at the corners. Then spread glue in the grooves and fold the sides up to meet each other. I use blue tape to hold the sides together while I put a band clamp around them and tighten it.

To avoid getting breakage at the folds, cover the back of the V-grooves with blue tape before folding them.

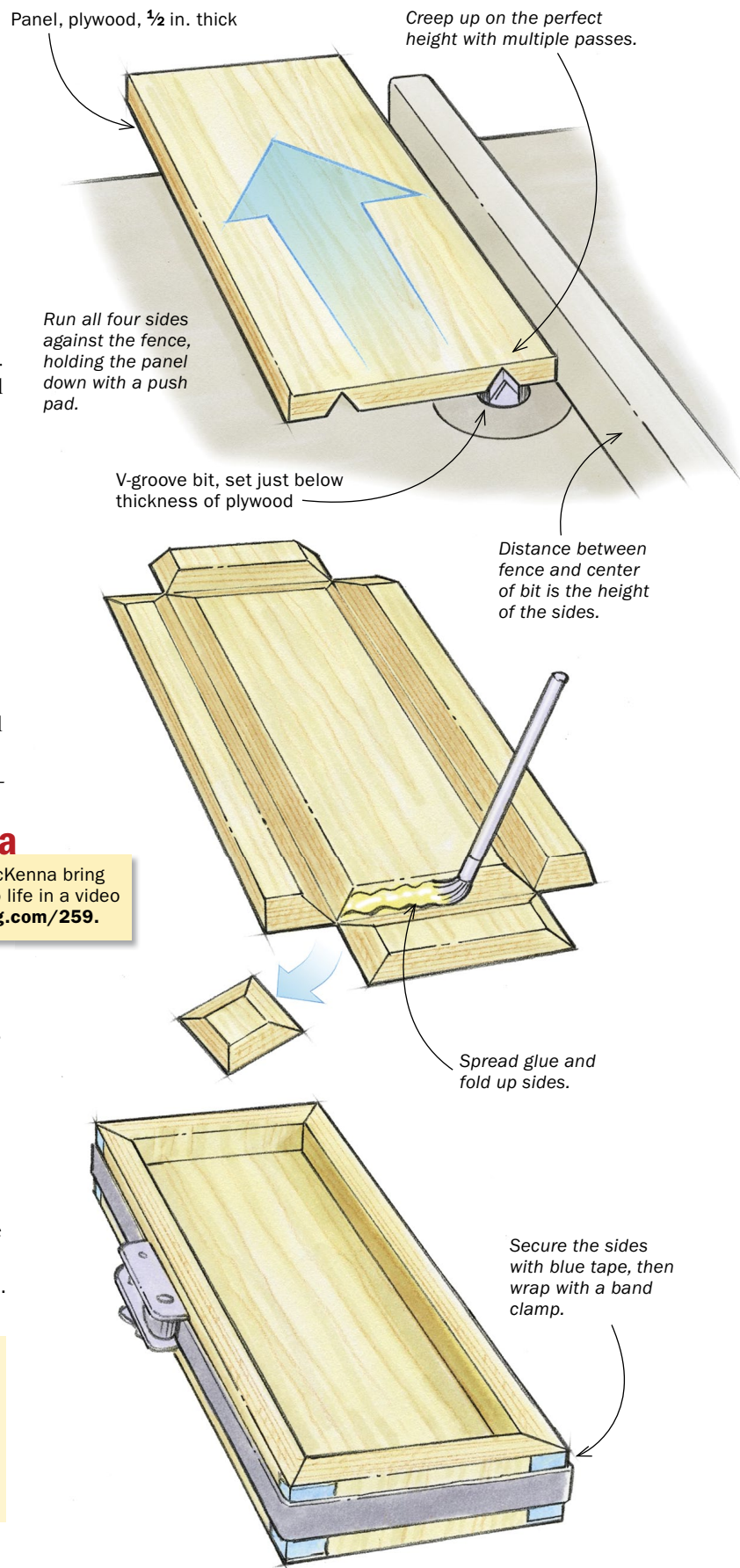
—JOHN BURKE, Northfield, N.J.

Online Extra

Watch editor Tom McKenna bring this Workshop Tip to life in a video at FineWoodworking.com/259.

A Reward for the Best Tip

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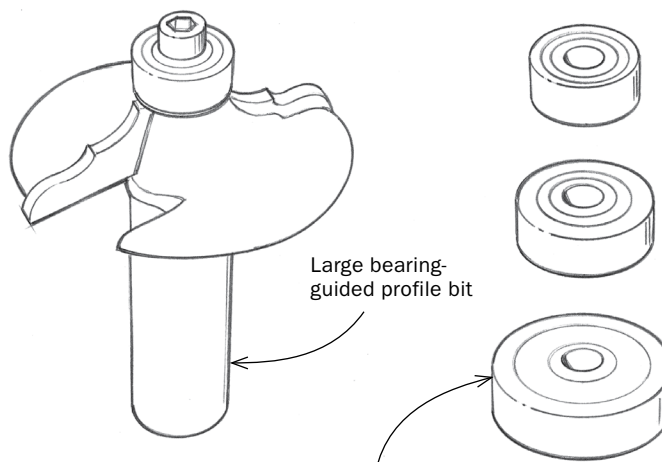
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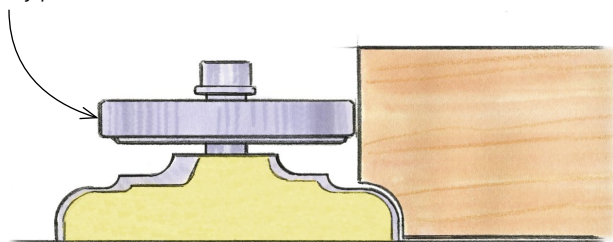
Use multiple bearings on a big router bit

When I was making a 2-in.-thick oval lamp base and routing a profile on the edge with a big bearing-guided bit, I needed to make multiple shallow passes for a clean cut, free of burn marks and splintering. The easiest way to control those passes turned out to be a small collection of extra bearings. These are often sold as bearing conversion kits, with bearings in a range of sizes. I worked through the bearings from large to small, using the bit's original bearing for the final pass.

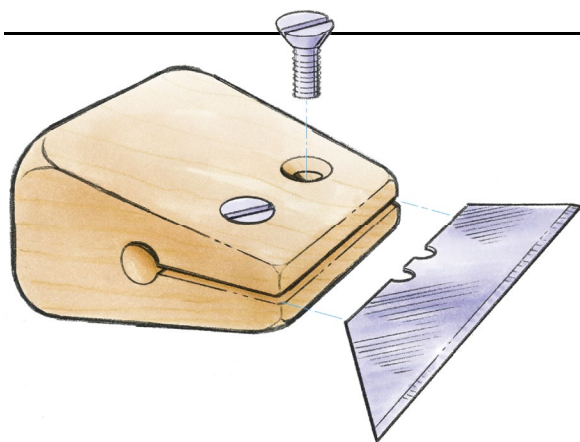
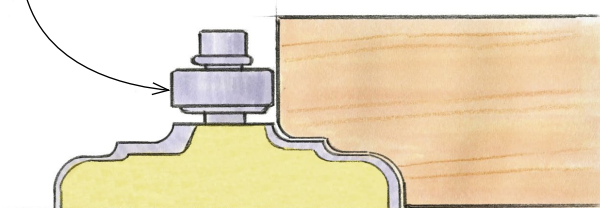
—WARREN JONES, Birmingham, Ala.



Use larger bearings for early passes.



Work down to the original bearing for the final pass.



Utility-knife blade makes a nimble scraper

By turning a burr on a standard disposable knife blade and adding a simple maple handle, you get an amazing detail scraper. The pointed ends let you get into corners easily, and the hardened steel holds a burr for a very long time. When it wears out, I just grab a new blade and turn a new burr. I use a hardened burnisher with oil to turn the burr, holding the blade in a vise.

The handle has a simple slot cut through it, with two $\frac{1}{4}$ -20 screws that clamp it shut around the blade. The screws pass through clearance holes in the front half, and then thread into the back half. I cut threads in the wood with a bottoming tap, but you could also use threaded inserts or T-nuts.

—PETER BREU, Manchester, N.H.



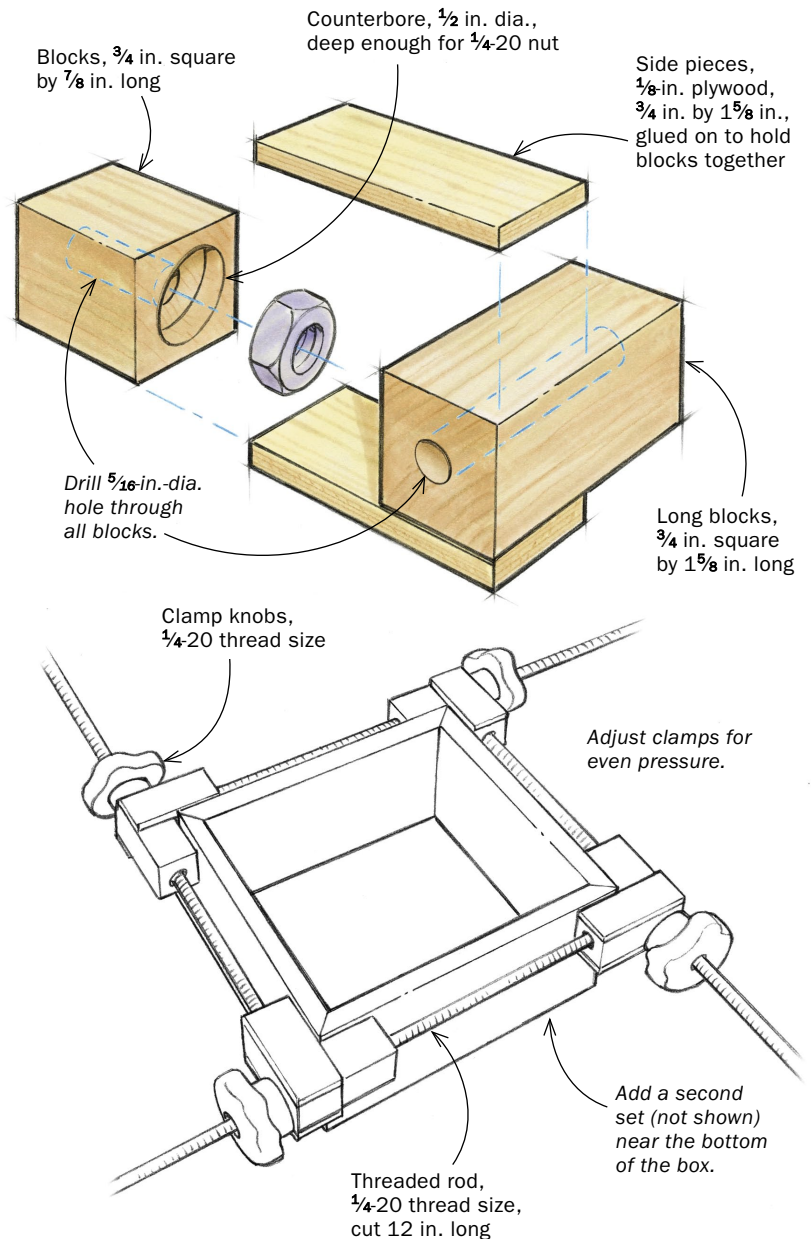
Shopmade corner clamps for boxes

Under most circumstances a mitered box can be successfully glued and clamped using rubber bands or plastic packaging tape to pull the corners tight. But there are times when extra clamping pressure is required. Two sets of these clamps is the perfect solution. You can buy more expensive miter clamps from a variety of sources, but these are less expensive and more satisfying, because you made them yourself.

Start by cutting the blocks to length, and then use a Forstner bit to counterbore the shorter blocks for the hex nuts. Now drill through all the blocks for the long threaded rods. Use epoxy to fix the hex nuts in the counterbores and let the glue dry before gluing the short blocks to the long ones with $\frac{1}{8}$ -in. birch plywood as shown.

The $\frac{1}{4}$ -in. threaded rod is available at most hardware stores. Use a hacksaw to cut it to length, and gently grind or file a chamfer on the ends so they thread easily into the nuts and knobs. I cut the rods roughly 12 in. long, and use threaded coupler nuts to join rods for extra length. The plastic knobs are available online for about \$1 apiece. Get the kind that lets bolts pass all the way through.

—DOUG STOWE, Eureka Springs, Ark.



Quick Tip Protect a blade with tape

After I hone the blade for my shoulder plane, it can be difficult to maneuver the blade into the narrow opening of the plane body without bumping the edge. A piece of painter's tape solves the problem. It protects the finely honed edge and comes off easily afterward.

—GEORGE WALDNER, Sun River, Mont.



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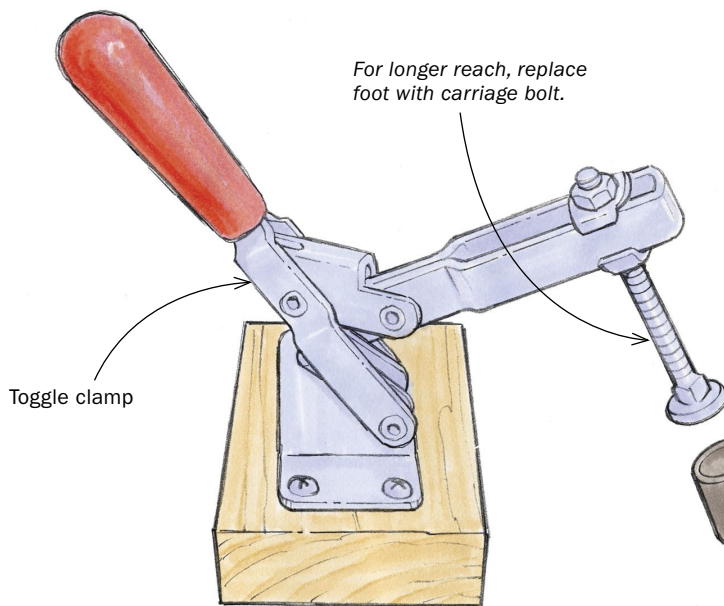
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workshop tips continued



New foot for a toggle clamp

When I needed a longer foot for one of my toggle clamps, I came upon this simple solution. The threaded shank is a standard $\frac{3}{8}$ in., so I removed the shorter foot and replaced it with a longer $\frac{3}{8}$ -in. carriage bolt. The head of that bolt is slightly over $\frac{3}{4}$ in. dia., so a $\frac{3}{4}$ -in. rubber chair foot fits it perfectly. Both items are available at hardware stores and home centers. This trick will work on larger toggle clamps with the $\frac{3}{8}$ -in. shank. If your toggle clamp is smaller than that, try a different bolt size and get creative with the rubber foot.

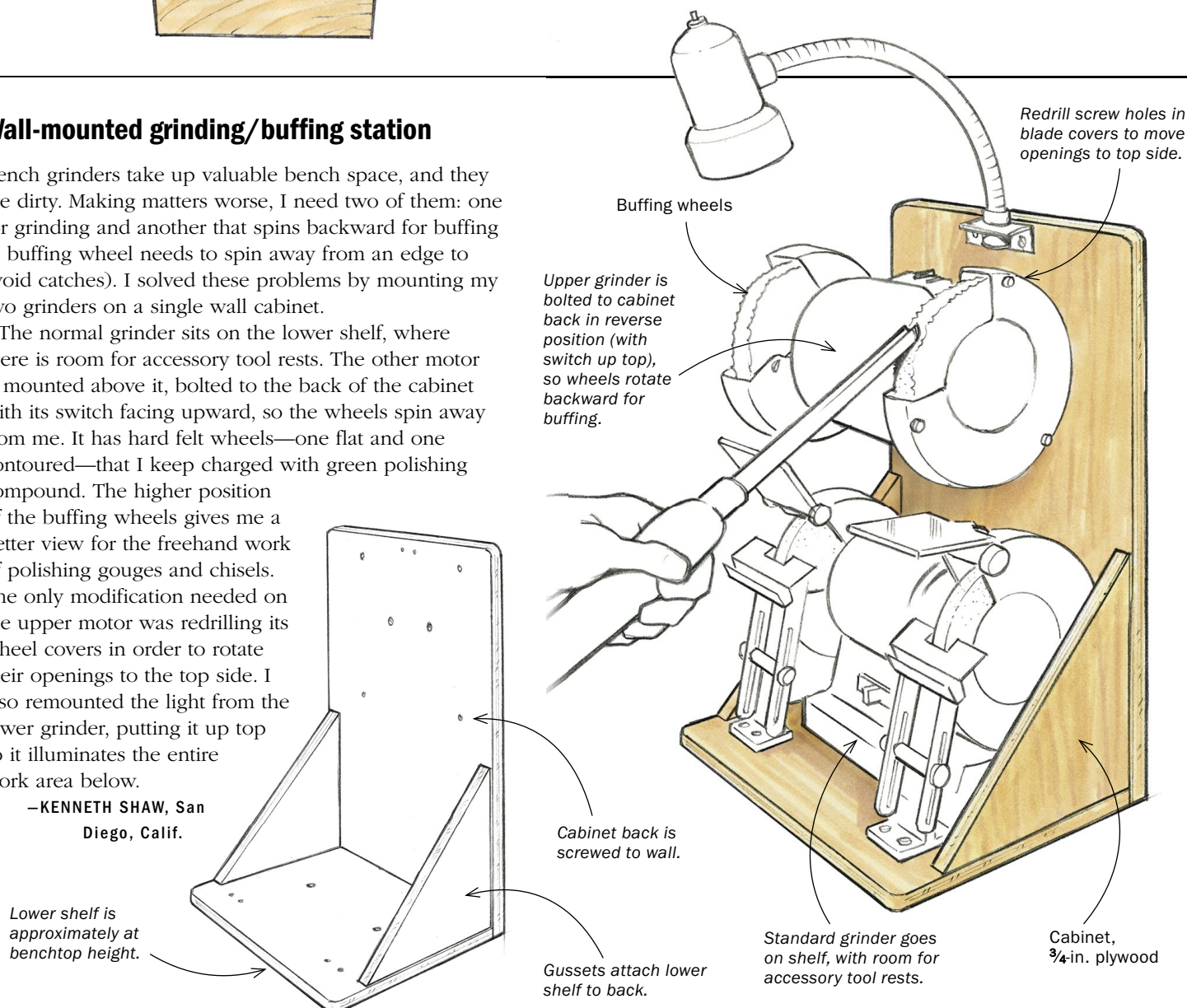
—BILL SELDON, Lake Bluff, Ill.

Wall-mounted grinding/buffing station

Bench grinders take up valuable bench space, and they are dirty. Making matters worse, I need two of them: one for grinding and another that spins backward for buffing (a buffing wheel needs to spin away from an edge to avoid catches). I solved these problems by mounting my two grinders on a single wall cabinet.

The normal grinder sits on the lower shelf, where there is room for accessory tool rests. The other motor is mounted above it, bolted to the back of the cabinet with its switch facing upward, so the wheels spin away from me. It has hard felt wheels—one flat and one contoured—that I keep charged with green polishing compound. The higher position of the buffing wheels gives me a better view for the freehand work of polishing gouges and chisels. The only modification needed on the upper motor was redrilling its wheel covers in order to rotate their openings to the top side. I also remounted the light from the lower grinder, putting it up top so it illuminates the entire work area below.

—KENNETH SHAW, San Diego, Calif.



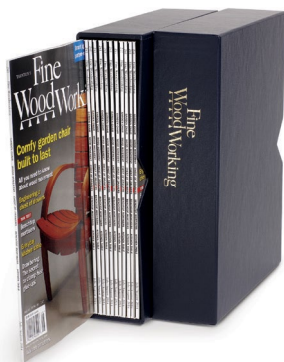
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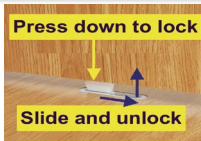
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■ AIR TOOLS

Senco's new compressor and flexible hose are a perfect pair

IN MY FURNITURE MAKING, I use pneumatic nailers to make jigs and attach the occasional piece of trim or drawer stop. I have an 18-gauge nailer to help with the jigs, and a 23-gauge nailer for moldings and stops. For these tools, I don't need a big compressor. Senco's PC1010N finish and trim compressor is the perfect fit. It has a ½-hp induction motor and a 1-gal. tank, and easily handled all the work I've thrown its way.

The worst machine sound I can think of is the punishing roar of a compressor. The Senco PC1010N, thankfully, creates little more than a moderate hum that did not disturb me in the shop.

The compressor also is very small and light. It weighs just 21 lb. and fits perfectly under my bench. The knob to adjust the hose pressure is on the front of the compressor, as is the hose connector. When the compressor was under my bench, I had no trouble hooking up the hose and changing its pressure to accommodate my two nailers.

I also have been using Senco's new hybrid air hose, which combines the benefits of rubber and PVC hoses. Like rubber, it's flexible and has no memory, so it's easy to lay out and coil, and it doesn't want to pull back into a coil like PVC hoses can. Like a PVC hose, the Senco hose is very light for its 50-ft. length. It's a great hose, and will definitely replace my 50-ft. rubber and 25-ft. PVC hoses. Hook it up to the Senco 1010N compressor, and you have a wonderful combination for a furniture shop.

—Matt Kenney is the special projects editor.



Air hose by Senco
Model: PC1319
\$30

Compressor by Senco
Model: PC1010N
\$150



A compressor for furniture makers. Assembling jigs and tacking on molding doesn't require a big, loud compressor. The Senco PC1010N has a big enough tank to power 18-gauge and 23-gauge nailers, and is quiet enough that it doesn't drown out conversation or your favorite shop tunes.



Compact and light. The PC1010N is small enough to fit under a bench, and can be carried with one hand.



Up-front control. The hose connector and hose pressure adjuster are on the front of the compressor, so changes are quick and convenient.



Hose is supple and lightweight. Big loops or small, Senco's hybrid hose easily curls into them. And it feels surprisingly lightweight for a 50-ft. hose.

■ SHARPENING

A diamond stone for router bits

M-POWER TOOLS HAS INTRODUCED a diamond stone designed for sharpening carbide router bits. It's small—the stone itself is just 1 in. wide by 3 in. long—and maneuverable. The elliptical handle, located close to the cutting action, allows you to apply cutting pressure more evenly and with great control. One side of the stone is 300-grit and the other is 600-grit, and both grits cut carbide quickly.

I sharpened several bits with the stone, and it did a good job. When sharpening a router bit by hand, remember to take the same number of strokes over each cutter so that the bit remains balanced. If you manage this, the M-Power router-bit stone is the perfect tool.

—Roland Johnson is a contributing editor.



Perfect size. Held with just a few fingers, the M-Power router bit sharpener is sleek enough to fit into a bit's cutters and to give you precise control over each stroke.

Router-bit sharpener by M-Power
\$20



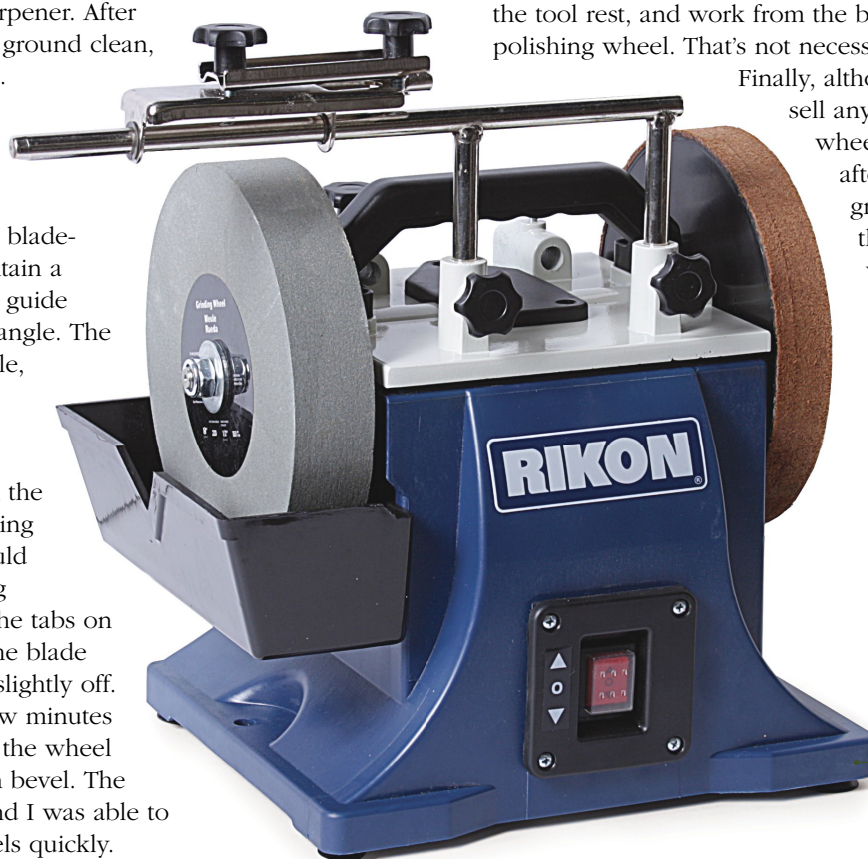
■ SHARPENING

Wet sharpener is a great value

MY FAVORITE METHOD TO GRIND a primary bevel into a plane blade or chisel is a slow-speed wet grinder, or sharpener, which excels at creating a square, smooth, even hollow grind without the risk of overheating the blade. The grind is so good that honing the cutting edge with my waterstones goes very quickly. For the last few months I've been using Rikon's new wet sharpener. After some small adjustments, it ground clean, smooth, and square bevels.

The Rikon sharpener comes with an 8-in. 220-grit grinding wheel and an 8-in. leather strop wheel. Also included are a blade-holding jig that helps maintain a square cutting edge, and a guide that sets the correct bevel angle. The water reservoir is removable, which makes filling and emptying it no trouble.

After setting up the sharpener, I put a chisel in the jig and set to work regrounding the bevel. Right away I could see that it was not grinding square. It turned out that the tabs on the holding jig that align the blade square to the wheel were slightly off. I filed those, and after a few minutes was back in business with the wheel creating a square and even bevel. The wheel spins at 115 rpm, and I was able to work through several chisels quickly.



Another feature that I liked is the reversible motor. This allows you to spin the leather wheel toward the back for polishing. What's the big deal? A leather wheel should spin away from you so that the blade doesn't cut into the leather. On other slow-speed wet sharpeners, the motor doesn't reverse, which means that you must rotate the machine 180°, move the tool rest, and work from the back side when using the polishing wheel. That's not necessary with the Rikon.

Finally, although Rikon does not sell any means to dress the wheel, there are a number of aftermarket tools for dressing grinding wheels. All in all, this is a good slow-speed wet sharpener, and it's a good value, too.

—Kelly Dunton is a furniture maker in Terryville, Conn.

8-in. wet sharpener by Rikon
Model: 82-100
\$295

■ ACCESSORIES

Forstner bits don't clog or overheat

AT FIRST GLANCE, THE COLT MAXI-CUT Forstner bits might appear to be no different from typical Forstner bits, but on closer inspection there are some unique features that make them stand out. The bits cut cleanly and aggressively. You can sustain a very high feed rate and cut a deep hole in a single stroke because there's no need to raise the bit to clear chips.

Notches machined into the cutting lip break the shavings into thin ribbons rather than the typical flat curly-fries that fill the hole and make it necessary to raise the bit repeatedly. Then there is the bit's rim. Instead of a continuous rim, it has relieved sides, leaving a scoring spur that makes a very clean cut. With a minimal rim, drag and heat are greatly reduced. The one slight drawback is that overlapping holes and angle boring are a bit more difficult without the continuous rim, which helps stabilize the bit when you begin cutting.



MaxiCut Forstner bits by Colt
\$20-\$52 for individual bits
\$109 for a set of 5 bits (½, ⅝, ¾, ⅞, and 1 in.)

Finally, the bit's shank has been machined to form three slight lobes that effectively lock the bit into a drill chuck and eliminate any shank-scoring slippage. The bits also lock into the bit extensions (\$19-\$27) with a simple twist—no Allen screws to deal with. It worked well, and there was almost no runout.

—R.J.

■ ACCESSORIES

Router bits cut better miters

MITER JOINTS ARE ATTRACTIVE, but they're not the strongest case joint. Infinity Cutting Tools has introduced a set of router bits that cut a lapped miter joint, which looks just as good as a standard miter but is easier to clamp and align and increases the amount of glue surface in the joint. Also, unlike standard miter joints, which can slide under clamping pressure, lapped miters stay square and aligned.

The bits run and cut smoothly, and work with material between ½ in. and ¾ in. thick. The bit set includes a setup block for ¾-in.-thick parts, and you can buy a setup block for ½-in.-thick parts (SET-509, \$10). These jigs speed up the process of dialing in the bits' height, but you'll still need to cut some test joints. Overall, the bits and setup jigs cut a nice joint.

—Peter Breu is a furniture maker in New Hampshire.

Lapped miter bits by Infinity
Model: 55-505
\$109



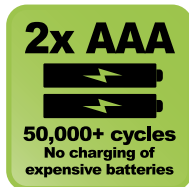
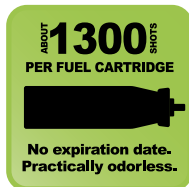
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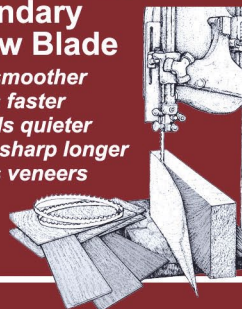


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New tools from IWF Atlanta

Alongside the colossal industrial machinery at the 2016 International Woodworking Fair (IWF) were some great new tools designed for furniture makers who work on a more human scale. Here are some that we're looking forward to reviewing this year.



BEEFY MORTISE CHISELS AND A BETTER BENCHDOG

Veritas unveiled an improved version of its low-profile bench clamp, the Wonder Dog. The new Wonder Dog has a cam lever that applies and releases pressure in an instant. The Quick-Release Wonder Dog is available now for \$60. In addition to the Wonder Dog, Veritas also introduced a series of mortise chisels ($\frac{1}{8}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, and $\frac{1}{2}$ in.) in both PM-V11 and A2 steels. Sold individually or as a set of five, they're available now. The price for one chisel ranges from \$65 to \$105. It's \$299 for the set in A2, and \$399 for the PM-V11 set.



IMPROVED SLOW-SPEED WET SHARPENER

Tormek's water-cooled, slow-speed sharpening system has long been a favorite with woodworkers. The latest iteration, called the T-8, improves on earlier models with a main body and frame cast in zinc. The sleeves used to attach the support arm are now integrated in the frame, which makes them stronger and minimizes play in the support. The water tray rises and lowers on a screw lift, making it easier to install after filling and remove for emptying. It's currently available for \$699.

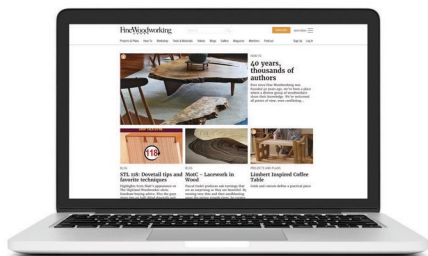


8-IN. JOINTER WITH SEGMENTED CUTTERHEAD

Rikon introduced several new machines, including updated versions of their bandsaws (for a review of the 14-in. model, see *FWW* #258, p. 18). Our interest also was piqued by Rikon's new jointer. It has an 8-in. segmented cutterhead, parallelogram beds, which makes them easier to adjust coplanar, and a rack-and-pinion fence. The 20-108H is expected to have a street price around \$2,000.

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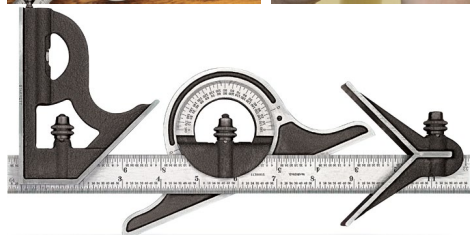


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Enter the octagon

OLD-WORLD EXERCISE HONES HAND-TOOL SKILLS

BY MICHAEL CULLEN

Making the octagon was the final exercise of the first segment of the year at Leeds Design Workshops in Massachusetts, where I trained to be a furniture maker. Up to that point, the class had focused solely on tool preparation, sharpening, and hand-tool skills through a series of core exercises. It was the culmination of everything we had learned to that point: a test to see if one could cut straight and plane true without hesitation or flaw.



We had all seen the octagon in the Barnsley book—that black-and-white photo of Edward Barnsley and several students standing by the bench as lead craftsman George Taylor deftly defined the facets of the octagon. Our teacher, David Powell, had worked in Edward Barnsley's



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FLATTEN THE FACES



First face. A jointer plane used along the grain, then at 45° to it, flattens the face (above). Cullen frequently uses the plane as a straightedge to check his progress toward flatness (right).



Erase the roughness. Without worrying about squareness, Cullen quickly planes the edges clean to prepare for the pencil lines.



Preliminary pencil work. With the first face flat, Cullen marks the edges with a pencil gauge, placing the line $\frac{3}{8}$ in. over final thickness.



Tune it with a smoother. After flattening the second face and waiting a day to let the blank move, take it to final thickness and flatness with a smoothing plane, working to a cutting-gauge line.



Be a tough critic. Cullen tests final flatness with a straightedge, checking along the grain, across it, and diagonally.

workshop in England in the early 1950s, and we were at Leeds to learn the same set of skills. The successful execution of that simple-looking octagon provided the confidence to begin making entire pieces of furniture by hand.

I use the same octagon exercise as the culmination of hand-tool training for my apprentices and students. Making the octagon tests everything from material selection and careful layout to tool preparation, blade sharpening, and sawing and planing skills.

Start with a square

The first step toward the octagon is to make a perfect square. Begin by choosing a roughsawn blank of 4/4 lumber big enough to yield a 12 $\frac{3}{4}$ -in. square. Select a flat board without a lot of figure. Specify all the dimensions you'll aim for in the octagon before you pick up your tools, and stick to them at

SQUARE THE BLANK

each stage. Start by planing one face flat, using a combination of jointer and smoothing planes. Then plane the second face flat and parallel with the first.

It's best to thickness the blank in two stages: First bring it to within $\frac{1}{8}$ in. of the final thickness, and then sticker it and leave it overnight to reach equilibrium. The following day, reflatten the first face, scribe a line around the perimeter, and plane to the line, bringing the blank to final thickness.

Choose a long-grain edge and use a jointer plane to make it flat along its length and square to the faces. Follow this by laying out a line parallel to this edge on the far side of the blank. Saw close to the line to minimize planing—and to practice sawing straight and square. Clean and square up the sawn surface with a plane, and then lay out, saw, and plane the last two edges. At this point you should have a perfectly square blank. Check it with a square and ruler thoroughly to be sure that you do.

On to the octagon

Now lay out the octagon with a compass, making sure each edge is of equal length and corresponding angles measure the same. Once the layout is done, saw off the four corners to create the outline of the octagon. Using a smoother, plane downhill to finalize the four freshly sawn edges. Check your work with a large square, and measure to see that all eight edges are equal.

To lay out the chamfers, use a marking gauge to scribe a line around the perimeter of the blank, defining the bottom edge of the chamfers. Then scribe a line on the top face of the octagon to define the upper edge of the chamfers.

Create the chamfers entirely with a plane, beginning with a smoother and finishing with a block plane. To reduce the risk



The vital reference. With the faces flat and parallel, square up one long-grain edge. This is the reference edge, used to lay out the other edges.



The second side. Using a combination square or a panel gauge, mark a line parallel to the reference edge.



Find the line. Cullen counsels sawing close to the line to develop confidence and to save time in planing. He uses a crosscut saw for this rip because it cuts so cleanly.



Refine the sawn surfaces. With the edges sawn, plane them smooth and square to the faces (above), and check for flatness with a straightedge (right).



CLIP THE CORNERS



Compass drives the layout. Find the square's centerpoint by drawing diagonals corner to corner. Then set a compass to span the distance from one corner to the centerpoint.



Two ticks. Using that compass setting, make two marks from each corner to define the octagon's facets.



Define the facets. Connect the compass tick marks with a straightedge.



Saw the facets. Saw the four facets, being sure to cut downhill to limit tearout.



Plane them perfect. Fine-tune the corner facets with a smoother (top), checking squareness to the face (above left) and squareness to each other (above right). Also, measure the facets to be sure they are all equal in length.

CREATE THE CHAMFERS



Scribed layout. After scribing a baseline for the chamfer around the perimeter of the octagon, establish the chamfer's upper limit with a marking gauge.



Start skinny. Cut the chamfer with a smoothing plane, broadening out from a narrow band. Propping one edge of the workpiece on a scrap presents a less angled surface for planing.

of tearout, it's best to plane the end-grain chamfers first. If your handplaning skills are particularly good, you might plane the surface flat and to the line entirely with a smoother.

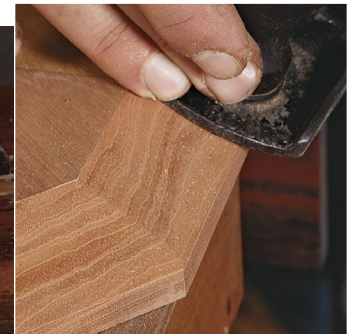
The completed octagon should appear as nearly perfect as possible, without flaws from planing or sawing. There should be no tearout or ridges left from incorrect setting of the iron. All dimensions should be checked for exact measurement, and all the angles should be equal. Most important, every plane on the piece should be dead-flat in all directions.

When you've finished your octagon, you might keep it in the shop as a symbol of hand-skill accomplishment—or do as the Barnsleys did and put it to use as a bread board. □

Michael Cullen studied at Leeds Design Workshops in 1986-88.



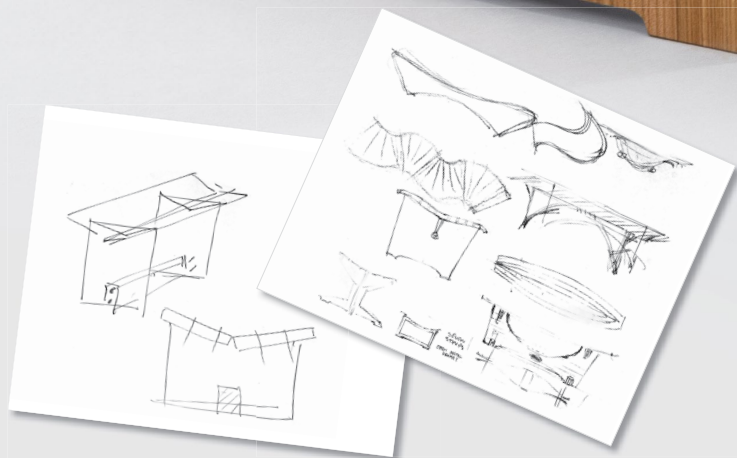
No crowning. Check with a straightedge to see that the chamfer is dead-flat in all directions.



Tune the arris. With your last plane passes, be sure to bring the line between neighboring chamfers into alignment with the line between the edge facets below.

Museum bench

BY MICHAEL HURWITZ



Quick concept. Hurwitz's early sketches (left) laid out the basic idea of the bench—two tilted planes for the seat and wide legs. The shaping and detailing came into focus in an end view (right) while other ideas percolated on the page.

I designed this bench as public seating for a contemporary art museum. I was aiming for something comfortable and visually interesting but quiet enough not to compete with the artwork. Simple was the goal—but not boring. As it turned out, the museum chose not to have me build the benches, but I decided to ask my assistant, Zack Deluca, to make a couple anyway.

My sketching began with the expression of a rudimentary idea: two planks to form a seat, two monolithic legs, maybe a stretcher. While playing with other concepts on paper—including a bench with an S-shaped seat and a bench with a bridge-like arch underneath—I arrived at an end view I liked for the original bench: the seat's two tilted planes shaped to curves top and bottom, and the wide, solid leg pierced with a keyhole slot at the center.

After working out the cross-section of the leg and the tenon joinery to the top in another sketch, I moved on to scale models and then a mockup. For the mockup, we used poplar for the legs and 2x stock for the seat. We made it long enough for one person, which let us test it for comfort and work out the construction without making it full length. I liked the way the seat came out in the mockup—it was comfortable, and I was happy with the look. But I was disappointed that you couldn't easily read the shape of the leg. I wanted to see a shadow line where the two angled planes of the leg met, and we had to



Scale models preview the look. Once he had the design clearly in mind, Hurwitz made scale models to see how it looked in three dimensions.



Small comfort. A one-seat mockup in poplar and 2x stock (above) let Hurwitz work out the construction and test the seat for comfort. He used red elm in the finished bench (below).

keep beefing up the thickness of the mockup's leg to get the visual effect I wanted. The mockup made it clear that the keyhole slots did what I had hoped, breaking up the broad width of the leg and giving an indication of its cross section.

Then it was on to building the real thing out of red elm. I had a big pile of elm that I'd been tripping over for years, avoiding it because there's so much tension in elm that it requires double or triple milling, and its rowed grain tears out easily and requires a lot of sanding after milling. We couldn't avoid the extra milling, but I had recently purchased a thickness sander, which took the dread out of all that sanding.

Zack shaped the convex curves at the edge of the seat with a combination of chamfer cuts on the tablesaw and fairing cuts with a handplane. And he created the concave curves on the underside of the seat by cove-cutting with the tablesaw. I like using cove cuts to create hollow curves because the shape of the parabola is infinitely variable, and you don't have to order expensive tooling.

Rather than use wide, thick, flatsawn planks for the seat, I asked Zack to cut the stock into narrow strips and glue them up, creating a quartersawn surface. This endowed the relatively simple form of the bench with the lively iridescence of quartered elm. □

Michael Hurwitz makes furniture in the Fishtown section of Philadelphia.



Display

Eye-catching details and contrasting woods make this a case to remember

BY MICHAEL PEKOVICH

I first came across the writings and work of James Krenov while in college, and they have influenced my approach to the craft ever since. His signature piece was the cabinet-on-stand, and he made many throughout his career. Each one was an exploration of joinery, grain, and form. While this cabinet is definitely an ode to Krenov, my aim wasn't to create an exact reproduction. Instead, I wanted to tackle the design challenges the form presents. I hope this article prompts you to try a case of your own, whether based on this project or by following your own muse.

Straight grain adds to quiet beauty

I had a few goals in mind when working out the design. Like a lot of my work, my aim was a quietly interesting piece, rather than something that shouted too loudly. On a quiet piece, small details make a big difference. To that end, I made the joinery the star of the show. I also added some contrast by building the case and base in different woods. I chose ash and white oak because while they differ in color, each has very strong grain that complements the other. To further unify the different woods, I used riftsawn stock for each species. Its tight, straight grain kept the two woods from clashing, and helped to reinforce the lines of the cabinet.

Getting riftsawn stock required a different strategy for each wood. For the base, I started with an 8/4 flatsawn white oak board. I looked for a board with tight rings that dove at a diagonal at the edges. The base parts were taken from those edges, where the rings ran corner to corner and yielded tight straight grain on each face. For the ash case, I started with the widest flatsawn 4/4 boards I could find and ripped off the outer riftsawn sections to glue up for the case sides. I usually try to minimize glue-ups in case parts, but the straight grain of the riftsawn stock made for almost seamless joints, and the quiet grain was worth the effort.

A light, sturdy base

The base needs to support a lot of weight and look good doing it. To make it strong but keep a light look, I used a pair of aprons on the front and back of the case. The narrower doubled aprons offer the same resistance to racking that a single, wide apron would, but without the visual weight. I lightened the look of the lower apron

Cabinet on a Stand



STRAIGHT GRAIN FROM FLATSAWN BOARDS

The subtle lines of the cabinet are enhanced by tight, straight grain on the base and cabinet parts. Pekovich used two different strategies to get the riftsawn, or diagonal, grain he wanted from flat-sawn boards.



For the cabinet. Pekovich started with the widest ash boards he could find. He ripped off the outer edges, where the straight grain is, and used those pieces to glue up the case parts. The straight grain made it easy to hide the glue lines.

even further by giving it a subtle arch. On the sides I used single aprons, set down low. Between the side aprons I used a pair of rails that connect the front and back aprons. These two rails add strength to the base and also support and elevate the case, making it appear to float. The construction results in a delicate-looking base that still offers a solid foundation for the case.

Through-tenons add strength and beauty

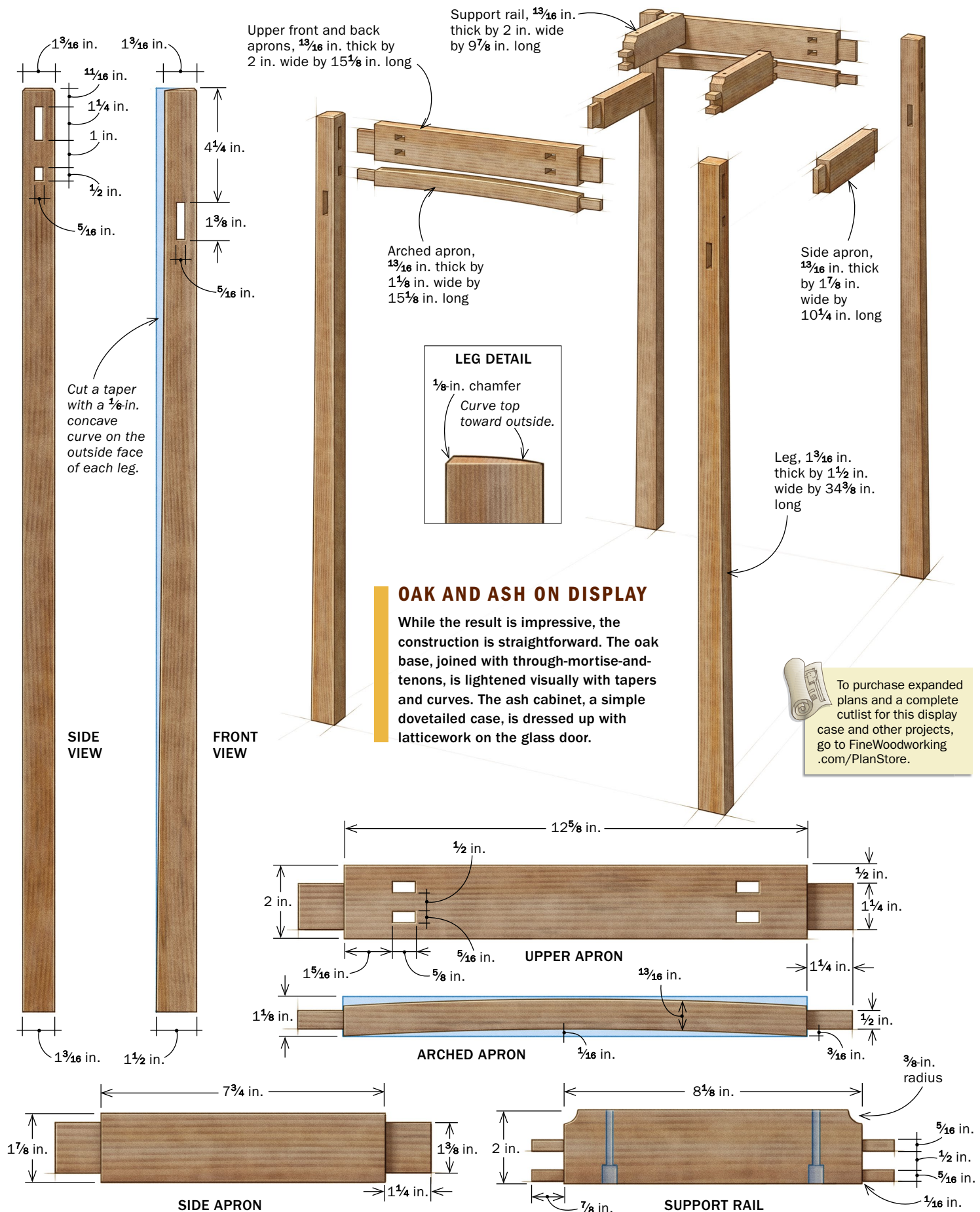
The base is joined with through-tenons to add a little pop and a lot of strength. While they're not much more difficult to cut than regular tenons, care must be taken when cutting to prevent tearout on the through-mortises and chipped corners on the tenons.

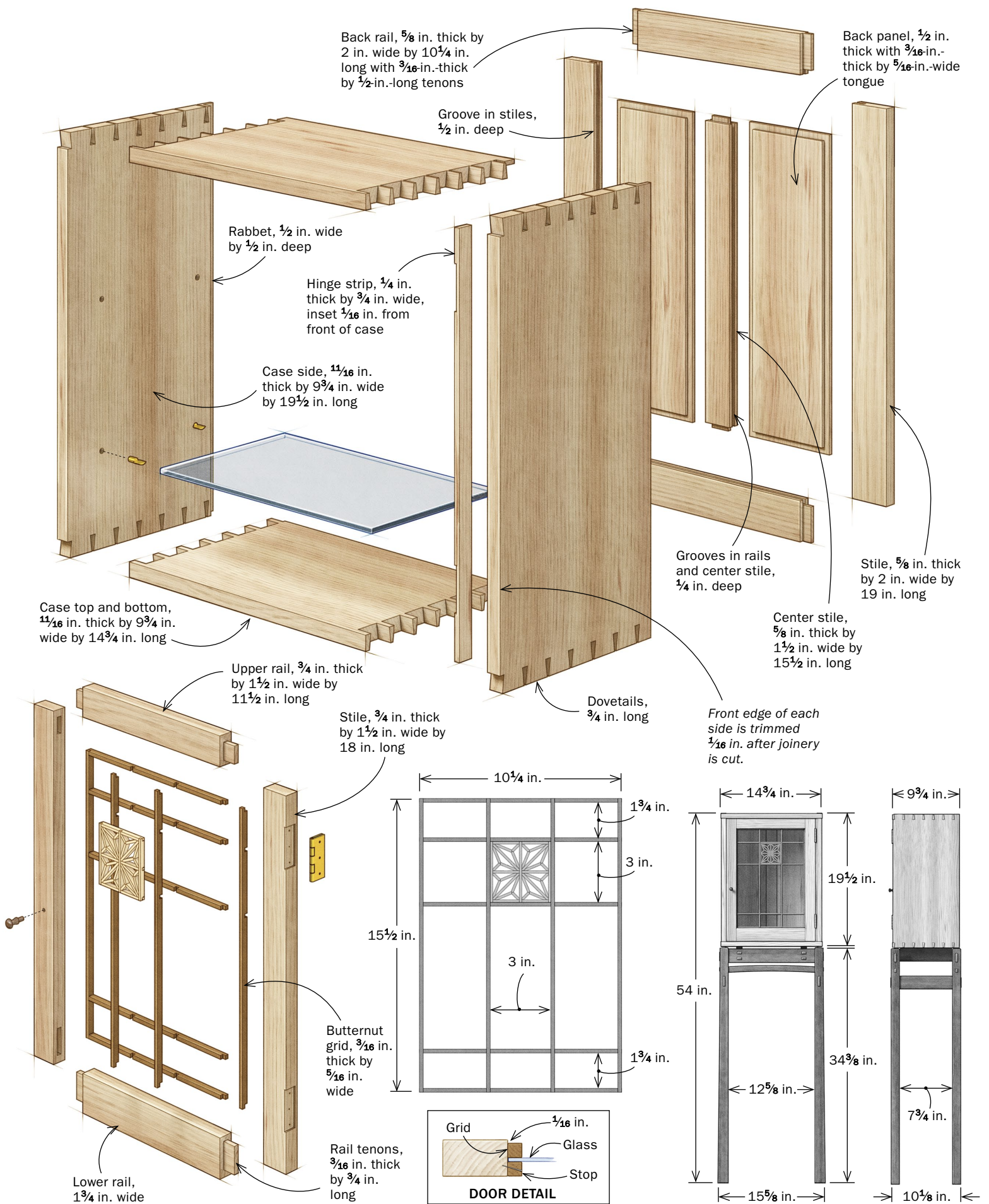
I handle the mortises quickly on a hollow-chisel mortiser, but you can use any method you want. No matter how you do it, the important thing is to work in from each face. This will prevent tearout along the edges of the mortise. For this method to work, you must scribe the mortise accurately on each face to avoid off-setting the mortise walls. This can make fitting difficult and lead to gaps in the joints.

I usually use a dado blade to cut tenons, but it can chip the corners at the ends of the tenon. This is not a big deal with normal



For the base. Again, cutting away the outer portions of a white oak board yielded the riftsawn stock for the legs and the aprons.



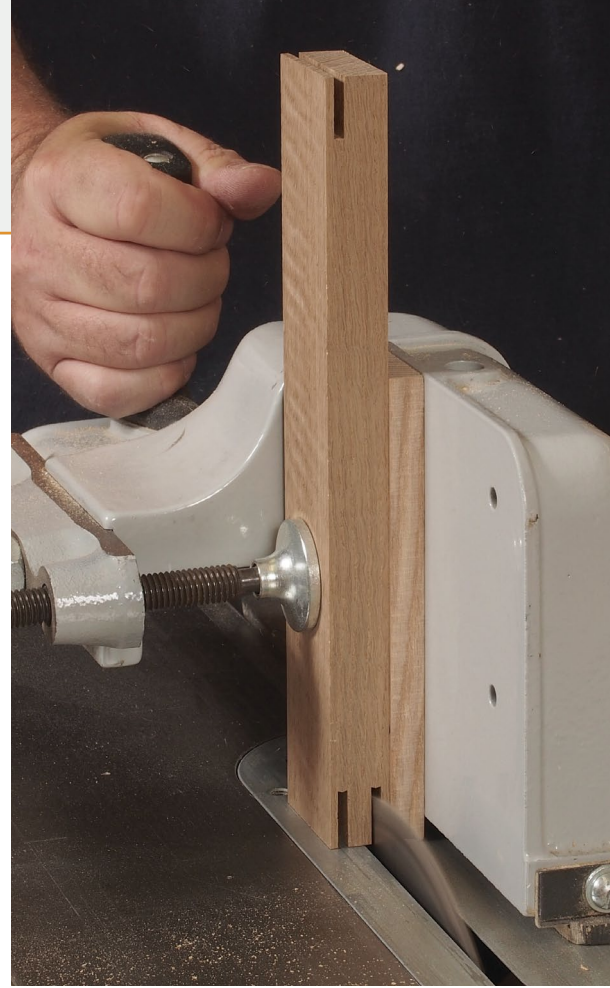


SPACER MAKES PERFECT TENONS

Pekovich uses a tenoning jig and spacer to cut the through-tenons of the base. The spacer ensures tenons of consistent thickness regardless of variations in stock thickness.



Fast and accurate. Position the tenoning jig to cut the outside cheek, and raise the blade just below the shoulder. Cut the outside cheek (left), then slip a spacer between the stock and the fence (above) to cut the inside cheek (right).

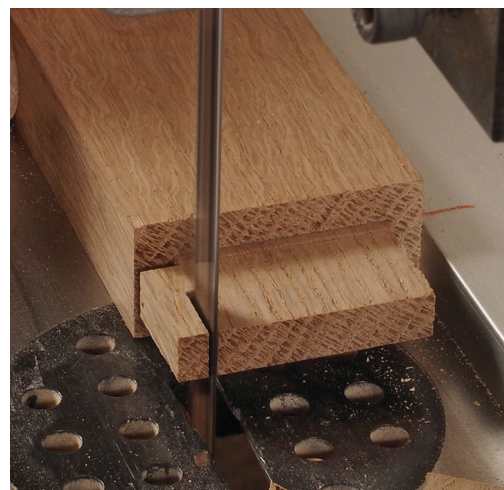


hidden tenons, but it's a problem for through-tenons. So instead I used a combo blade and tablesaw tenoning jig. Rather than cutting one cheek and rotating the stock to cut the remaining face, I cut one cheek and added a spacer between the jig and workpiece for the second cut. This results in consistent tenons regardless of variations in stock thickness. The spacer's thickness equals the width of the tenon plus the width of the blade's kerf. To make it, start with a long board slightly thicker than you need and cut off one end to use as a spacer for a test cut. Take light passes through the planer, cutting off sections for testing until you get the fit you want.

A pair of spacers for the double mortise-and-tenons—The double tenons of the support rails are tricky to fit, but a pair of spacer blocks makes the process easy. You've already made the first spacer that determines the thickness of the tenons, but you'll need a second spacer to set the gap between the tenons. The thickness of the gap spacer is equal to the distance between the tenons plus the width of the tenon. Its exact thickness isn't critical because you'll use it to cut both the mortises and the tenons.

Set up the mortiser fence to cut the outside mortise, then add the gap spacer to cut the inside mortise. To cut the tenons, set up for the outside face of the outer tenon. Make a cut and slip in the tenon spacer to cut the second cheek. Now remove the tenon spacer and add the gap spacer to cut the next tenon cheek. Finally, add the tenon spacer to the gap spacer to make the final cut.

With the tenon cheeks cut, saw off most of the waste with a backsaw or coping saw to prevent it from getting caught between



Finish them off. Remove most of the waste with a backsaw before trimming the shoulders at the tablesaw (above). Finally trim the ends of the tenons at the bandsaw to avoid chipping the corners (left).

ADD A SECOND SPACER FOR DOUBLE TENONS

Pekovich adds another spacer to cut the double mortise-and-tenons. His method guarantees perfect alignment.



Cut the mortises first. Start by cutting the mortise farthest from the fence, plunging halfway down from each face to avoid tearout. Then insert the gap spacer between the stock and fence (above) to cut the inside mortise (right).



Combine spacers to cut the double tenons. The stock was too wide for his tenoning jig, so Pekovich clamped a stop block with a hold-down to his crosscut sled to make the cuts. Set the stop to cut the outermost tenon cheek, then insert the tenon spacer to cut the next cheek (1). Next, use just the gap spacer to cut the outer cheek of the inside tenon (2). Finally, use both spacers to cut the innermost cheek (3).



GIVE THE LEGS A LITTLE SHAPE

The legs widen at the bottom to give the base a solid stance, while subtle curves lighten the look just a bit.



Taper the outside face of each leg. After cutting the joinery, Pekovich bandsaws the legs to their final shape. The taper has a slight concave curve, which is planed smooth after cutting.

the blade and the fence, and then cut the shoulders at the tablesaw. Finally cut the tenons to width at the bandsaw.

Quiet curves enliven the base

With the joinery complete, turn your attention to giving the base some shape. The lower aprons are arched to add a little lift to the base, and the legs widen at the bottom for a solid stance. In addition to the taper, the legs also have a little curve to them.

At the bandsaw, cut a taper with a slight hollow on the outside faces of the legs and smooth the surface with a block plane or sandpaper. To enhance the curve of the leg, plane a tapered chamfer on the outside corners. Start about 10 in. below the top of the leg, and make successively longer passes with a block plane until you reach the top and bottom corners of the leg. This tapered chamfer exaggerates the curve of the legs and results in a leg with a slightly narrowed waist that appears to flare out just a bit as it reaches the floor and the case.

The top of each leg gets a slight curve as well. Start by planing a heavy chamfer along the four edges of the top. Then plane a curve onto the top starting at the base of the outside chamfer and ending at the top of the inside chamfer.

Bring the base together

Gluing up the base is a bit of a challenge. Start by gluing the case rails to the front and rear aprons. It's important that this frame assembly sits flat, so clamp it to a flat surface while it dries if necessary. The next step is to glue the legs to the side aprons. To maintain the vertical alignment of the legs, dry-fit the leg assemblies to the frame while clamping. Finally bring all the parts together into a single unit with the last glue-up.

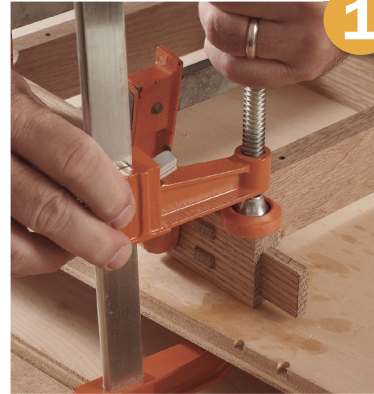
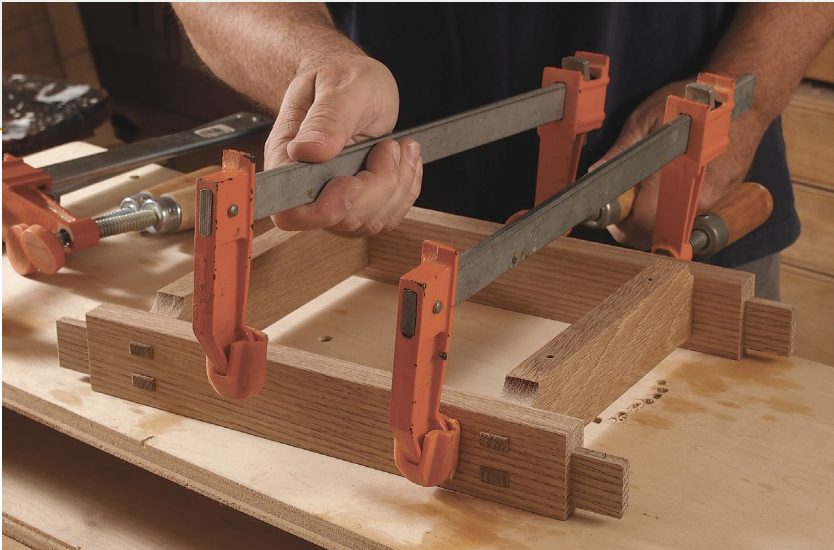


Chamfers enhance the curves. By starting at the upper third of the leg and taking successively longer passes with a block plane, you create a tapered chamfer that exaggerates the curve of the leg (above). To shape the top of the legs, start with a heavy chamfer (left), then plane a curve starting at the top of the inside chamfer and ending at the bottom of the outside chamfer (below).



ORDER OF ASSEMBLY

Don't try to glue up the base at once. Follow these three steps, and you'll avoid headaches.



1

Start with the base frame. Prefinish the parts and apply glue to the tenons only to avoid squeeze-out as much as possible. If necessary, clamp the assembly to a flat surface while the glue dries.

Glue the legs and side aprons. To ensure that the leg assemblies are glued square, dry-fit them to the base frame while clamping (below). This will guarantee that parts come together easily during the final glue-up.



2



3

Finally, bring everything together. Remove the leg assemblies from the frame, then add the arched aprons before gluing everything together. Make sure all four legs hit the floor when clamping, and shift the clamps as necessary for a stable stance.

A SIMPLE CABINET

Proud dovetails add a little interest, and a frame-and-panel back creates a rigid case.



Dovetails with a built-in rabbet. The back panel is glued into a rabbet in the case. Cut the rabbet before dovetailing the case parts. A half-tail at the back of the case accommodates the rabbet.



Dovetailed case is straightforward

The case is just a dovetailed box with its rear edge rabbeted for a frame-and-panel back. Hinge mortises are cut into a $\frac{1}{4}$ -in. strip and attached to the case side. This allows the door to be inset slightly from the case front. For more visual interest, the case sides are planed so that they are inset from the top and bottom. The dovetails are left proud as well. All of these add subtle interest to the case, but the real star of the show is the door front.

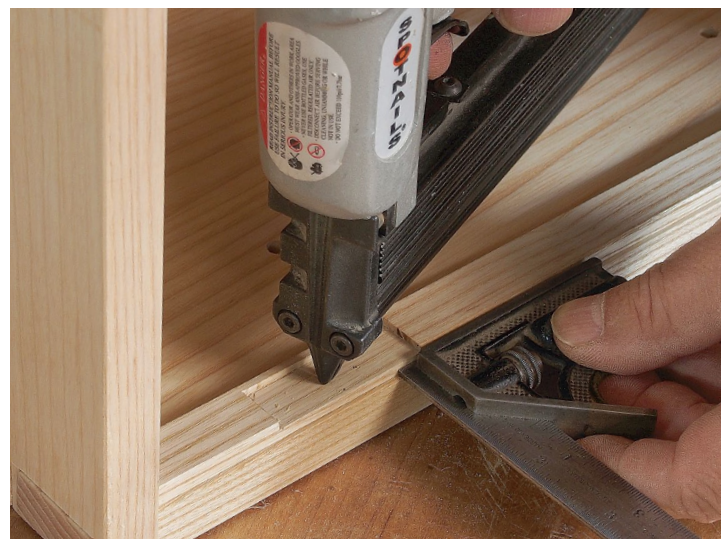
Dressing up a glass door

A thin butternut gridwork adds interest to the glass panel without obscuring the contents of the case. The grid is assembled with half-lap joints, and its border also creates a stop for the glass. Start by planing a board to $\frac{5}{16}$ in., the thickness of the grid. Then crosscut the board into two lengths, one equal to the height of the door opening, the other to the width. Make this a snug fit to avoid gaps between the grid and door frame.

Before ripping the stock into individual strips, rabbet the ends and cut dadoes at the grid intersections. For this, I use a simple finger jig clamped to a crosscut sled. The width of the blade kerf will determine the width of the grid parts. For a $\frac{3}{16}$ -in. grid, I use a single blade from a box-joint blade set, which is available from a number of manufacturers.

Start by cutting a rabbet on the ends of the stock the width of the blade. Then clamp the jig in place to cut the dadoes. Register the rabbet against the indexing pin to cut the outermost dadoes. Then seat the dadoed stock onto the indexing pin to cut the remaining dadoes. Finally rip the stock into strips that match the width of the dadoes.

Assemble the frame in the door opening, adding a drop of glue at each joint, but don't glue the grid to the door at this point. When it's dry, slip the grid out of the door and reinstall it once the case has been finished. To set its height in the opening, drop



Add the hinge strip. Mortise the strip for the hinges, and use a combination square to inset it from the front edge of the case. Drive a pin through the hinge locations to hold the strip in place while the glue dries.

a $\frac{3}{8}$ -in.-thick piece of plywood into the opening and slide the grid down onto it. Glue or pin it in place with a 23-gauge pin nailer. You can fill out the center of the grid with a square of kumiko, a Japanese decorative lattice technique. For more on that, see *Master Class*, pp. 82–86.

I finished the cabinet by wiping on a few coats of blond de-waxed shellac followed by steel wool and wax for a friendly feel. I drilled shelf-pin holes at the grid locations. The bottom shelf may look a little low, but it raises the items above the lower door rail so they are not obscured. □

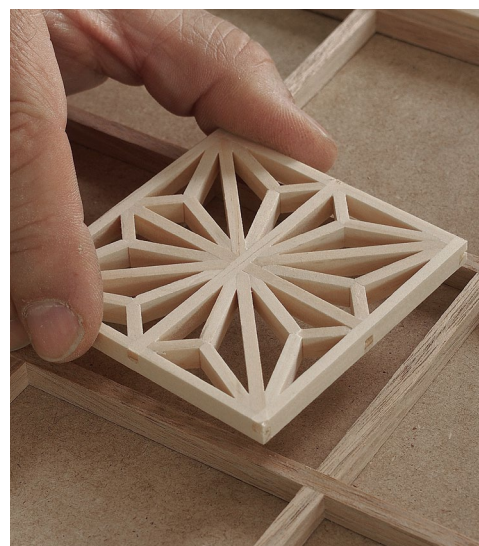
Michael Pekovich is a furniture maker, instructor, and FWW's executive art director.

A HALF-LAP GRID FOR THE DOOR

A butternut lattice dresses up the door front and acts as a stop for the glass panel. Half-lap joinery makes assembly fast and accurate.



Finger-joint jig for the lattice. To make the jig, cut a notch in a piece of MDF and glue in a strip of wood (index pin) to register the workpiece (top). Cut the lattice stock to length, and rabbet the ends (above left). Then register the rabbet against the index pin to cut the dados (above right). Then fit the dado over the pin to cut the remaining dados. Finally, rip the strips to final width (right).



Install the lattice. Wait until the door is trimmed and finished before gluing the grid in place. The parts can be left bare or finished with a light coat of shellac or oil before assembly. Glue the outer strips to the door frame and add a drop of glue at each intersection. Pekovich finishes off the lattice with a square of kumiko (above); see pp. 82–86 to learn how to make it.

Combo Squares: The Basics and Beyond

Tips and tricks for getting better joinery from these must-have layout tools

BY TIMOTHY ROUSSEAU

Every fall, a new group of students begins the 12-week furniture-making program at the Center for Furniture Craftsmanship in Maine, where I teach. They spend the first few weeks learning to tune and use essential hand tools like chisels, planes, and saws. They also learn about layout tools, and it doesn't take them long to understand why one layout tool, the combination square, is perhaps the most useful of all. I know I couldn't work without at least one close to hand.

Checking for square

Because 90° cuts are so common and critical in furniture making, you'll use the combination square most often to verify the accuracy of corners and joinery.



Across the end grain. The 12-in. square works best here. Hold the square's body in your dominant hand and press the head against the board's edge. Slide the blade down until it touches the end grain. If you see light coming through, the cut is not square.



On the edge. The technique used for end grain works here, too, but a 4-in. square is better because it's easier to balance on the narrow edge.



Joints need checking, too. For inside corners, you'll need to push the blade into the body and lock it in place. This setup can be used to check dry-assembled cases and miter joints to determine if they're square.



Make jigs accurate. To square up a shooting board's fence, register the head against the runway and the blade against the jig's fence.

Precise layout

Joints that come together without gaps start with accurate layout. The combination square can be used for laying out square shoulders, as well as case and frame miters.

How to hold the square. When marking across a narrow edge, pinch the square's head against the board, using three fingers on the head and your thumb on the board. Use your index finger to hold down the blade (left). The grasp is nearly the same when marking across the face of a board. However, as your thumb can't reach the far edge, use it to help hold down the blade (right).



Two heads are better. Rousseau puts two heads on a 24-in. blade to lay out joinery on wide panels. With this setup, it's a snap to lay out identical joinery at different locations, such as dados for shelves in case sides.



Working with one head. This is more accurate than using a ruler to locate a joint, because the head gives you positive registration off the end grain and is repeatable from one board to the next.



MITER JOINTS

On edge. The angled fence on a small 4-in. or 6-in. combination square is easier to manage when laying out a miter on the edge of a board, say, for a mitered dovetail. The grip is the same as it is for square layout.



On the face. Use the angled fence of a larger 12-in. square to mark wide miters like those for a picture frame. Use your thumb and index finger to offset the head's weight.



Accurate mortise-and-tenons

The combination square can be used to dial in the fit of a test joint, or as a diagnostic tool to discover why a joint doesn't go together the way it should.

Measure the mortise depth.

Loosen the blade, place the head on the stile, and slide the blade down until it bottoms out in the mortise. Lock the blade.

Compare it to tenon's cheeks.

If the head sits on the end grain while the blade hits the shoulder, the tenon is just right.

Keep it centered.

Set the blade against one cheek (below), then check from the other side.



Online Extra

Combo square not true?
Learn how to dial it in at
FineWoodworking.com/259.

Many woodworkers understand the fundamental uses for combination squares, such as laying out joinery or checking to see if the corner of a case is square. But they're good for so much more. I find them invaluable for diagnosing why a joint won't come together or close up without gaps, and for checking the joint's accuracy after it is assembled. Here, I'll help you master this fundamental tool. Once you do, the combination square will help you do better work.

Start with a 6-in. square

Combination squares come in a variety of sizes, but the most useful sizes for furniture making are the 4-, 6-, and 12-in. models. Of the three, I use my 6-in. square the most. It's small enough to fit into joints like mortises and between dovetails, but it's big enough for machinery setup. It's also easy to control when laying out joints. However, I do use the 12-in. square often, and I keep a 4-in. square in my apron pocket to help fit dovetails and to quickly check edges for square. If you're just starting out, get the 6-in. combination square first, and then the 12-in. model. The 4-in. square can wait.

The rule etched into the blade of a combination square is available in a dizzying array of scales, but almost all of them are meant for machinists and other metalworkers. As a woodworker, you should get the "4R Grad" rule, which has $\frac{1}{8}$ -in. and $\frac{1}{16}$ -in.

Dialing in dovetails

The combination square is a handy aid from beginning to end. You can use it to help with layout, to check for high spots on shoulders, and for cheeks that bulge.

ACCURATE ANGLES



Slick trick for dovetails. The 1-in.-wide blade of a 12-in. combo square can be used to set a bevel gauge to common dovetail angles such as 1:6 and 1:8. Extend the blade so that its length matches the slope number (6 in. for 1:6). Then mark on both sides of the ruler at the board's edge, along the sides, and the top edge (1). Use the square's blade to draw a line from the bottom corner on one side to the top corner on the other side (2). Place the bevel gauge's body against the board's edge and angle the blade to match the sloping line (3). Now you're ready to lay out some dovetails.



increments on one side and $\frac{1}{32}$ -in. and $\frac{1}{64}$ -in. increments on the other.

If you're in the mood to lavish yourself with a specialized tool, get a combination square with a 24-in. blade. With a second head attached, it becomes a great layout tool for case joinery.

As for what brand to buy, I've had good luck with Starrett combination squares, and I recommend them to my students.



FINE-TUNING THE FIT

Keep the shoulders square. Press the head against the tail board's surface and lower the blade. Run it back and forth to find high spots.



How flat is the webbing? Extend the blade to match the length of the tails. With the head on the pin board, slide it through the socket to determine where to pare.



Check the cheeks, too. With the head on the end grain, you can check them for plumb. You also can check the shoulder this way.

A good grip improves accuracy

The head of a combination square is much heavier than the blade. Because the head hangs off the side of the board during layout, it can be tricky to keep the square steady, especially since you hold it with your non-dominant hand. Not steadying the head can lead to bad layout.

The solution is to use your pinky and the two fingers next to it to press the head

against the edge of the board. If the board is narrow enough, reach across it with your thumb and pinch the board between your thumb and the square's head. Press down on the blade with your index finger. This grip keeps the square tight against the board with the blade flat on the workpiece, which allows you to use your other hand to get a precise mark with a pencil or knife. If the board is too wide to pinch,

then use your thumb and index finger to press down on the blade.

You're now ready to put the combination square to use for laying out joints and checking their accuracy. □

Timothy Rousseau, who lives in Appleton, Maine, is a professional furniture maker and instructor at the Center for Furniture Craftsmanship (woodschoo.org).



Pick the Perfect Hinges for Your Boxes

The right choice will help you design and build better boxes

BY DOUG STOWE

Selecting just the right hinges to fit each special box can be a daunting task. There are so many types that it's tough to make the right choice. And you don't want to make a box before choosing the hinges—that's like painting yourself into a corner. To help you wade through the options, here I'll give a brief look at the different hinge types and their applications.

There are three main criteria to consider when you're deciding which hinge will be right for your box. First is appearance. Do you want to see the whole hinge on the outside of the box, see a proud brass barrel at the back, or just glimpse a barely visible barrel tucked into the lid joint? Another key factor is the size of the box and the weight of the lid. Some hinges are more robust than others, but in certain cases you can use multiple pairs of less substantial hinges to bear the weight. One aspect of hinge choice that tends to be forgotten is the installation difficulty. Some hinges simply screw right to the surface, some require cutting a complex mortise, and some require a specialized cutter to make a slot for the hinge. Understanding each type's strengths and weaknesses will let you refine your box design and find that perfect hinge each time.

Doug Stowe is a professional furniture maker and boxmaker in Eureka Springs, Ark.



Surface-mount hinges

Visibility: Can be seen on exterior whether closed or open.

Strength: Available in sizes for almost all applications

Installation: Easy to moderate. Inexpensive hinges are simply screwed to the surface. Higher-quality hinges are recessed into the surface.

Cost: \$2 to \$30 per pair

Surface-mount hinges come in several forms and are generally available at hardware stores and big home-improvement stores. Depending on the type, they can be nailed or screwed in place.

Surface-mount hinges are visible when the box is closed or open. So if you want to accentuate the hinge and draw attention to the back of the box,

surface-mount hinges are a great choice. If you prefer a more subtle or hidden hinge, move along.

These hinges are available in a range of sizes capable of accommodating most boxes and lid weights. But you must check the screws' length against the thickness of the box body to make sure they won't pop through the inside. This can be overcome by using a different-size screw or filing down the screws that came with the hinge.

Many craftsmen are drawn to the use of surface-mount hinges by the simplicity of their installation. There are no mortises to cut or holes to drill other than the pilot holes for the screws. While they are one of the easier hinges to install, it's still important to make sure the hinge barrels are in line and that you leave some space between the top and body at the hinge to let the box close fully.



Line up the barrels. It's important to keep the hinge barrels aligned so the box works smoothly. Clamping a straightedge in place makes alignment easier.



HINGE SOURCES

leevalley.com

woodcraft.com

jewelleryboxhardware.com

smartboxmaker.com

craft-inc.myshopify.com

Leave space at the back. When marking the lid for the hinge pilot holes, use business cards at the back corners to space out the lid. This tiny gap will allow the lid to close fully and avoid any binding at the hinge side of the box.

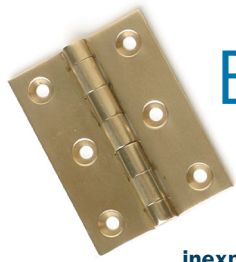
RECESSED HINGES: MORE WORK, BUT WORTH THE EFFORT

A few manufacturers make surface-mount hinges that require recessing into the box top and body. These take more work, but the hinges are still visible and this variety are typically more able to support heavy lids.



Hinges with built-in stops. Some surface-mount hinges—most commonly found on higher-quality versions—come with mechanical stops cast into the hinge, which keeps the lid from falling back when the box is opened.





Butt hinges

Butt hinges give boxes a clean, traditional look. They come in a range of sizes and quality, from inexpensive, stamped-steel versions to high-quality solid brass. Brass hinges are much more rigid in use, so they are more suited to heavier lidded pieces. In addition, some have built-in stops, which saves the effort and cost of having to buy or make a stop to keep the lid from falling backward.

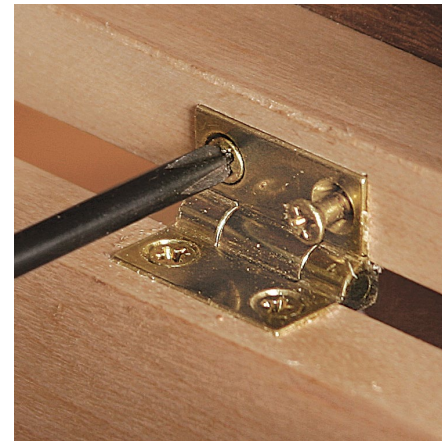
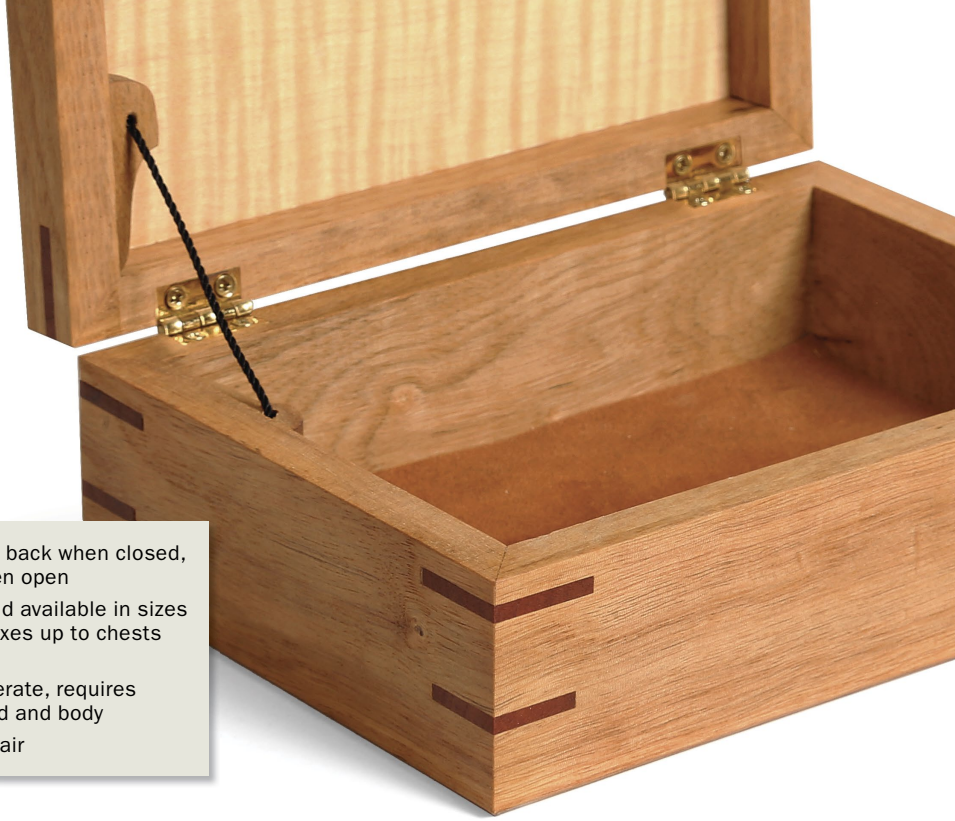
The mortises must be aligned and in plane, but when installed carefully the butt hinge is hardly visible at the back of the box and is quite good at aligning the front edge of the lid with the body of the box.

Visibility: Barrel visible at back when closed, hinge leaves exposed when open

Strength: Fairly strong, and available in sizes to accommodate small boxes up to chests and doors

Installation: Easy to moderate, requires aligned mortises on the lid and body

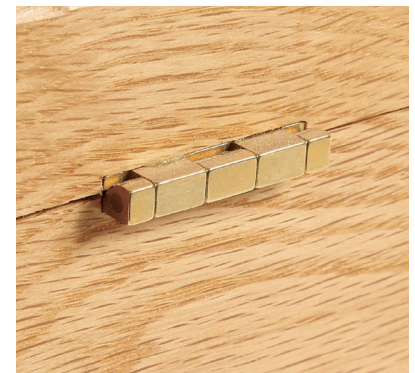
Price: \$1.50 to \$80 per pair



Mortises for butt hinges. The router table makes quick and accurate work of removing the majority of the waste. The corners can be squared up with a chisel before installing the hinge.

BUTT HINGES WITH BUILT-IN STOPS

To keep the lid from falling all the way back, hinges need a stop that holds the lid at roughly 95°. Some hinges have stops that are designed into the hinge mechanism (below), while others require an additional stop, such as a shopmade string stop (top photo) to keep the lid from falling back.



Blocky in the back. Most stopped butt hinges have a squared-off knuckle, as compared to the rounded knuckles of the non-stopped varieties.

Side-rail hinges

These finely crafted, premium hinges are available with or without stops, and they have a minimal profile at the back of the box for a clean look. Side-rail hinges are mortised into the box sides and lid. These hinges can support heavier or larger lids because they place the stress at the corner of the box where the body is strongest. One thing to consider when mounting side-rail hinges is the type of joinery used on the box. If you're using miter joints, the placement of the screw closest to the barrel has a tendency to fall directly along the joint line between the side and back, which can weaken the joint when the hinge is stressed. For that reason, I prefer to use side-rail hinges on boxes made with dovetails or finger joints.

Except for the location, installing side-rail hinges is similar to butt hinges. Routing out the mortise usually works exceptionally well, as many side-rail hinges have a round end to their leaves that matches a standard straight bit.

Visibility: Small knuckles at the back can be seen when closed, leaves are visible when box is open.

Strength: Strong, suited for heavy-lidded boxes

Installation: Moderate, requires aligned mortises along the narrow box sides and lid

Price: \$10 to \$60 per pair

A few ways to stop. Side-rail hinges come with or without stops, which can use either a captured arm or an internal stop engineered into the knuckle.



Quadrant hinges

Quadrant hinges feature a built-in stop and are placed at the corner of the box back and side with legs that get mortised into each side. When the box is open, the complexity and unique mechanism of the hinge is fully visible. These hinges offer excellent support for heavy-lidded boxes, but are one of the most challenging hinges to install, as they require routing shallow mortises into the sides and back of the box, and an additional deeper mortise in the sides for the stop arms. I've made templates for installing this hinge that ease the mortising operations, and a few companies sell routing templates specifically designed for their hinges which are invaluable at setting them up successfully. Because of the complexity of the install, I usually reserve quadrant hinges for special projects that require their strength and aesthetic.

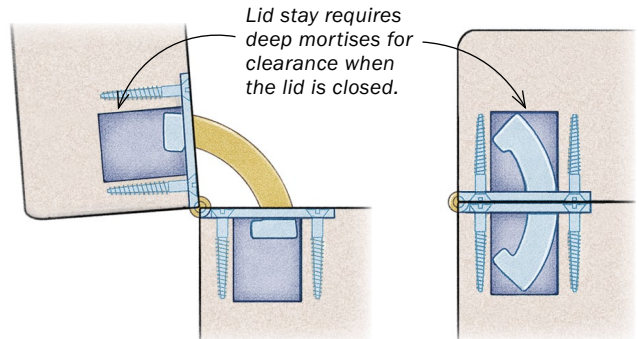


Visibility: Knuckles visible at back when closed, leaves and stop visible when open

Strength: Very strong, suitable for large boxes with heavy lids

Installation: Challenging, requires three separate mortises in both the lid and body

Price: \$10 to \$70 per pair





Barbed hinges

Barbed hinges are one type that my students always want to use in class, but may avoid in their own shops due to the special equipment required. The leaves of a barbed hinge have hooks and are pressed into a thin slot made in the box top and body.

Once pressed in, they stay put without screws or glue.

Barbed hinges are almost completely invisible whether the box is open or closed because the leaves are housed in the box sides. These hinges affect the look of a box because they require a chamfer that lets the lid open and acts as a stop.

These lighter-duty hinges are perfectly suited to small boxes up to 5 in. by 8 in., where the stress of a heavy lid isn't an issue. For larger boxes, you can use two pairs of barbed hinges in sequence to provide the necessary support. Manufacturers also offer barbed hinges that come with leaf springs built into them to help keep heavier lids closed tightly.

Barbed hinges require a special blade for cutting the thin slot in which they are installed. The cutter is mounted in a drill press and the piece is fed into the cutter using a fence and stops.

After that, a simple chamfer along the back allows the hinge to function. While the cutter is sold separately and requires special setup, the advantage of these hinges—which has caused me to use them for thousands of my boxes over the last 40 years—is that they simply press in place with no glue and no screws.



Slot cutter

Visibility: Only the thin hinge barrel is visible whether open or closed.

Strength: Weak, ideal for smaller boxes but multiple hinges can be used to add strength

Installation: Easy, but requires a special cutter to make the slot for the hinges

Price: 30 cents to \$1 per pair



Spring aids in closure. Some hinges are equipped with a leaf spring that helps keep the box closed, but extra clearance holes are required.



Slots cut at the drill press. The thin-kerf slotting tool is mounted into a standard drill press, and a fence with stops is positioned to set the depth and spacing of the slots.



Push into place. After chamfering the lid and the body, press one leaf into the slot until it reaches the barrel (left). The barbs grab securely and hold the hinge in place. Seat the opposite leaf into the slot in the box's other side, and squeeze the hinges into place (above).



Barrel hinges

Barrel hinges are very common on small boxes. They come in two varieties—5 mm mini and standard—both easily obtained through a handful of online woodworking supply companies. Once installed, the only visible parts of the mini barrel hinges are the small round knuckles, whether open or closed. Like barbed hinges, mini barrels require a chamfer at the back to allow them to open and to act as a stop. Standard barrel hinges, also called expanding link barrel hinges, use a complex armature to allow the hinge to open without the chamfer, and when the box is closed they are invisible. When open, the brass armature and the barrel are exposed.

Mini barrel hinges are perfect for boxes of small to modest size, no larger than about 3 in. by 5 in. Bigger sizes are doable, although I would consider using three or more hinges to carry additional weight. Full-size barrel hinges are intended for larger boxes or small cabinet doors, and come in a variety of sizes that can handle lids of almost any weight or size.

Both types are installed by drilling perfectly aligned holes in both the body and lid, and then pressing the knurled hinge bodies into the holes. The mini barrel version gets a drop or two of PVA glue before being inserted and aligned. The regular barrel hinges have an expanding collar that is engaged with a small flathead screw. Once they're inserted and aligned, it's just a matter of tightening the screws and locking in the hinges.

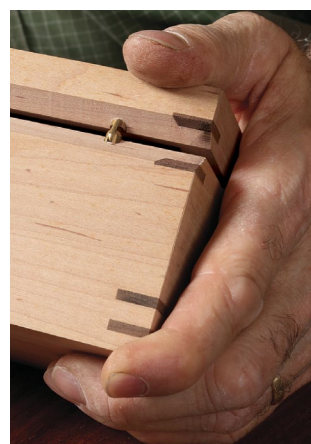


Visibility: Only the small round knuckle is visible on the mini-barrel when open or closed. The standard is invisible when closed and the linkage and barrels are visible from inside when open.

Strength: Mini barrel is weak, ideal for smaller boxes, but multiple hinges can be used to add strength. Standard hinges are fairly strong, and sizes are available to handle boxes all the way to cabinetry.

Installation: Easy, both only require an aligned, drilled hole. Mini barrel requires a chamfer at the back like the barbed hinges.

Price: \$2 to \$12 a pair.



Mini barrels get glued in place. To keep them from pulling out, a small amount of glue is placed in each hinge hole. After that, place the hinges in one side, align them to open in the right direction, and squeeze them into place.

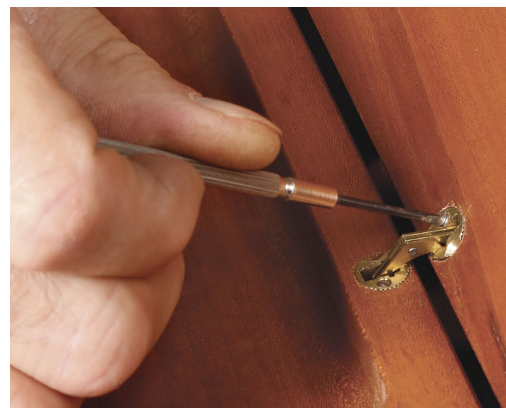


Online Extra

Learn more about barbed and barrel hinges in a video at FineWoodworking.com/259.



Alignment is critical on barrel hinges. Both barrel hinge types need to be aligned with extra care to make sure they don't bind. Use a small square on the fully expanded hinge. A small screw expands the barrel in the hole to lock it in place. This also means that the hinges are easy to remove, unlike the mini barrel type.



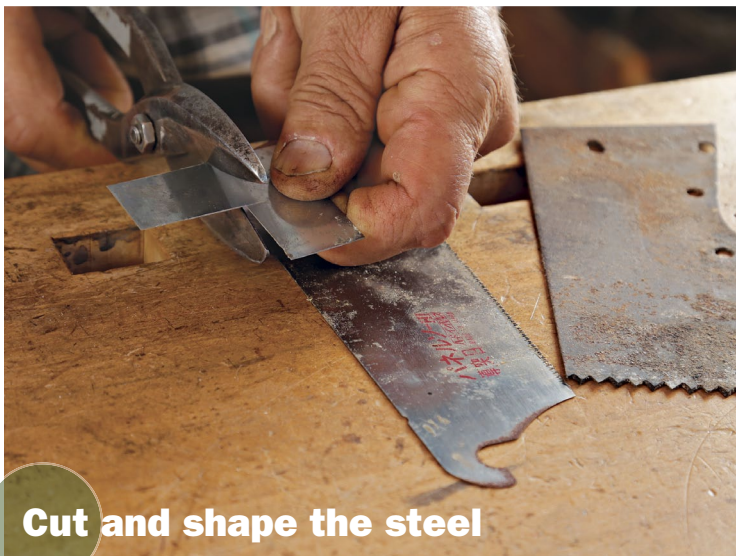
Custom Scrapers for Custom Work

Shopmade
scrapers smooth
tough-to-reach surfaces
without dulling sharp details

BY GARRETT HACK



Make them as you need them



Cut and shape the steel



Snip and file. Hack cuts small scrapers from an old Japanese handsaw blade (left). More robust scrapers are taken from thicker western saws. For a straight scraper, he snips it out of the blank, then cleans up the cuts with a file (above), holding the blank in a small vise.

Few tools are as simple as a card scraper, or as versatile and effective. It's just a rectangle of flexible steel with a fine burr for a cutting edge, but it can perfectly smooth the most ornery grain. I take that basic idea a bit further, making custom scrapers of all kinds. Typically these small tools, for working in tight places, have curved or angled edges, and most of the time no burr at all. These shopmade scrapers are some of my most useful tools.

Better than sandpaper

What makes a scraper so useful is its ability to cut a very fine shaving in any direction, against or with the grain, around curves as well as on flat parts, and to cut well at any angle to the surface. Scrapers can level flat surfaces and fair shaped ones. And a well-sharpened scraper cuts more quickly and cleanly than sandpaper, with more control.

My collection of custom scrapers can be divided into two categories: those with straight edges and those with curved edges. Straight edges generally work best on flat areas, such as when scraping squeeze-out from a joint or lightly leveling a surface after applying finish. Some of my straight scrapers have corners where the edges meet just shy of 90° to allow me to reach into tight corners easily.

My curved-edge scrapers can smooth any concave or convex surface, stepping in after a router or molding plane does its



Hone and polish. Hack hones the edges of the scraper on a fine diamond plate and a 2,000-grit waterstone. He polishes the faces first on a 2,000-grit waterstone and finishes with 5,000-grit. He polishes only the area near the cutting edge. For these cleanup tools, a burr is not necessary.



Adding curves



Trace the profile. After cutting the blank to size, use a fine Sharpie to trace the profile on it (left). Shape the profile with a file, then hone the edge and polish the faces in the same way you'd work a square-edge scraper (above). For hollows, you'll need a chainsaw file or jeweler's files to create the profile. Don't use a grinder with this thin steel, as it will ruin the temper.

Where small scrapers shine

Perfect a profile without losing detail

Small, intricate details are a signature of Hack's work. Trying to smooth rough spots with sandpaper would soften the crisp edges, so he turns to scrapers with custom profiles.

work. My most basic scrapers have simple round shapes for such tasks as fine-tuning a mitered corner in a cove molding. A few have a combination of shapes that fit a whole molding profile. They take longer to make, but they are especially useful for fairing and smoothing curved moldings. Oftentimes, though, I'll use a handful of different shaped scrapers on complex moldings instead of trying to file multiple shapes onto one tool.

Simple to make

The steel I use to make my scrapers is the same spring-tempered steel of a card scraper. I use old handsaws for thicker, stiffer scrapers, and worn-out Japanese saws for thin and flexible ones. This steel is soft enough that it can be filed, yet hard enough to hold an edge. Strong snips work to cut the scraper to rough shape, and then files to get a final profile. Stay away from a grinder or you risk burning the thin steel and ruining its temper.

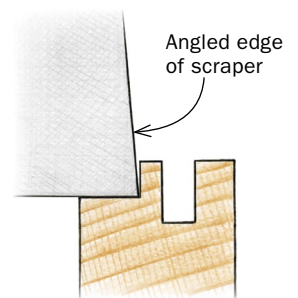
For the small shaped scrapers, I draw the profile I want on the blank with a Sharpie and file the steel to that line. If you are creating a scraper with a concave profile, you'll need some round files of different



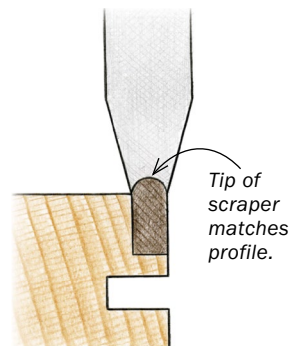
Coves and fillets. This curly maple molding had some tearout. To clean it up without losing detail, Hack uses a rounded scraper for the concave section (left), and a square scraper to finish the fillet (above).



Inside corners. To prepare for a glued-on bead, Hack uses a small scraper to refine the inside corner of a rabbet. One edge of the scraper is angled so the tip reaches into the corner without touching the wall.



Beadwork. This ebony bead is smoothed with a narrow scraper with a hollow nose that matches the bead profile. A light touch creates delicate shavings.





Make squeeze-out disappear without a trace

These small custom scrapers are easy to maneuver in tight spots, making them ideal for removing glue in areas that are tough to reach with chisels, planes, or bigger scrapers.

Clean up the cock bead. For this delicate job, Hack uses the straight-edge scraper to get the glue out. Again, the vertical edge of the scraper has a slight angle so it can reach into the corner without damaging the applied bead.

diameters. If you want a scraper to match a molding profile or part of it, trace the molding on the steel blank. As you file, make sure you maintain a square edge. When you're done, it should feel sharp even before you start to hone.

After filing the scrapers, I hone their edges using a fine diamond plate and a 2,000-grit waterstone. The most important part of the process is to keep the blank perfectly perpendicular as you hone, to ensure a square edge. At this point the tool already feels sharp and is able to make some shavings. I hone the faces of the scraper next, focusing my efforts near the cutting edge only. For this I use 2,000- and 5,000-grit waterstones.

I don't put a burr on these scrapers. They work very well without one. The scraper should produce delicate shavings, no matter whether you push or pull it across the surface. The only time I put a burr on my custom scrapers is if I need to take a more aggressive cut, say, if my goal is to alter the shape of a profile. A scraper's cutting edge never lasts that long, but honing it again to sharpen it is very quick.

Custom scrapers are a real asset to your tool collection. Try one, and before long you'll be making more of them and using sandpaper far less. □

Garrett Hack is a contributing editor.



Leg-to-apron joint. Squeeze-out on an inset apron is hard to reach, but a small, thin scraper is the solution. You can run it across the grain without damage (left), or scrape out the glue from the corner with the grain (right).



They work for finishes, too. Hack uses wider square-edge scrapers to remove dust nubs and other imperfections from tabletop finishes. A well-honed scraper will leave a glasslike surface.

Smooth finishes



Tips for Stronger Tenons

Make them bigger, reduce gaps, and don't spare the glue

BY DAN BOLLOCK

As part of my job as a technician in a wood research laboratory, I test joinery, materials, and glues to see how they withstand the rigors of use and abuse. But I'm also a woodworker and furniture maker, so I have a vested interest in my research. Recently, I spent time studying the strength of various mortise-and-tenon joints, an important study as the joint is typically used in high-stress and load-bearing situations in chairs, tables, and case pieces.

As part of the testing, we made and broke more than 150 mortise-and-tenons using a computerized hydraulic ram, called an Uniaxial Load Frame, by MTS Systems. We discovered not only that bigger is better, but also that the final joint fit and glue-up procedure affect the joint's strength.

Make them wide and long

Most of the testing was done to determine how the size of the tenon affects its overall strength. For all three dimensions—width, length, and thickness—bigger directly equated to a stronger joint. For the width and length tests, we used $\frac{3}{8}$ -in.-thick tenons, a fairly common size.

Increasing the width of the tenon had the biggest effect

Testing the joints

To find out how different variables affect the overall strength of a mortise-and-tenon joint, we ran more than 150 different variations on the same joint through a computerized hydraulic press designed specifically to bring all manner of joints to their breaking points. To ensure accurate results, all the tested joints were made from kiln-dried yellow poplar with a consistent moisture content between 6% and 8%. Slip tenons were used for consistent sizing and for ease of manufacture. The tenons were sized with a drum sander and the mortises cut using a horizontal mortising machine. Finally, every joint was glued using the same bottle of Titebond I PVA.



The variables. Bollock analyzed how tenon dimensions, fit, and glue-up procedures play a role in the strength of a joint.

Bigger is better

It isn't a surprise that the size of a tenon directly relates to its strength, but not every dimension plays an equal role.

WIDTH

When designing joinery that will see a lot of force, the widest possible tenon will give the best results. Jumping from a 1¼-in.-wide tenon to one that was 2¼ in. wide allowed the joint to take more than twice the force. Adding another inch to the width nearly doubled the force required to break the joint.

Tenon width	Failure load
1¼ in.	191 lb.
2¼ in.	464 lb.
3¼ in.	748 lb.

All tenons were ¾ in. thick by 1¼ in. long.



LENGTH

Every ¼ in. added to the length of the tenon added 130 to 180 lb. of load-bearing capacity to the joint. When laying out mortise-and-tenons, make the tenon as long as possible to take advantage of this gain in strength.

Tenon length	Failure load
¾ in.	251 lb.
1 in.	383 lb.
1¼ in.	464 lb.

All tenons were ¾ in. thick by 2¼ in. wide.



THICKNESS

While tenon thickness had the least effect on strength, it still can play a pivotal role in building a lasting joint. Where you don't have room for an extra wide or long tenon, increasing its thickness from ¼ in. to ¾ in., or ¾ in. to ½ in. will give you a joint that's about 40% stronger.

Tenon thickness	Failure load
¼ in.	341 lb.
¾ in.	464 lb.
½ in.	511 lb.

All tenons were 2¼ in. wide by 1¼ in. long.



on the strength of the joint. As the width went from 1¼ in. to 2¼ in., the strength increased by 140%, and a 3¼-in.-wide tenon tested as 291% stronger than a 1¼-in.-wide tenon.

We also discovered that increasing the tenon length added strength. Going from ¾ in. to 1 in. resulted in a 53% gain, and increasing the length to 1¼ in. gave us an 85% increase in strength over the ¾-in.-long tenon.

As for tenon thickness, thicker is stronger. A ¾-in.-thick tenon was 36% stronger and a ½-in.-thick tenon was 50% stronger than the ¼-in.-thick tenon. But increasing thickness has a smaller effect than increasing width and length.

Reduce gaps

Another crucial factor in the joint's strength was the fit of the tenon in the mortise. The tests proved that tight-fitting joinery is a must and that you can't rely on glue to bridge even small gaps. Ideally, the gap around the tenon should be no more than 0.005 in. When the gap is doubled in size, the strength of the joint decreases by 21%.

I know it's difficult to measure gaps precisely, so here's a tip to check the fit without math. A properly sized tenon can be inserted into the mortise with hand pressure to just short of the shoulder. A hammer or clamp should be needed only for the last fraction of an inch to fully seat the parts. The gap is too large if gravity is able to pull the parts apart when they are held vertically.

Don't skimp on the glue

Sizing the joint properly and fitting the tenon into the mortise are keys to a strong joint, but where you apply glue matters, too. We found that the best approach is to apply glue to both the mortise and the tenon. This method gave us a joint that was 103% stronger than the joint where glue was applied to the tenon only, and 34% stronger than when it was applied to the mortise only.

Designing the strongest tenon

All this testing gave me a description of a perfectly engineered, strong, durable mortise-and-tenon joint. Use

The fit counts

A loose fit can severely weaken a mortise-and-tenon joint. Using calipers to measure, keep the gap between the mortise and tenon to about 0.005 in. The joint should fit snugly by hand and hold itself together despite gravity.



Gap	Failure load
0.005 in.	464 lb.
0.010 in.	368 lb.



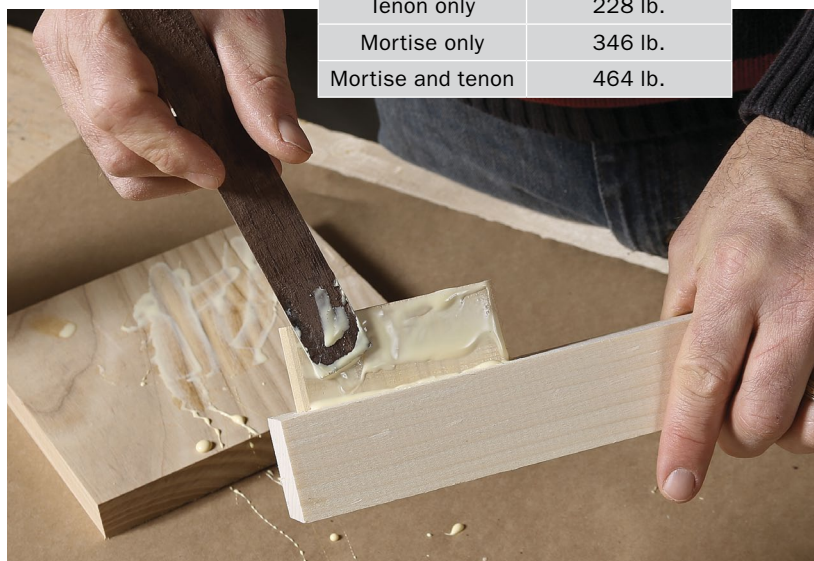
All tenons were $\frac{3}{8}$ in. thick by $2\frac{1}{4}$ in. wide by $1\frac{1}{4}$ in. long.

Proper glue-up

The joints with glue applied to both the mortise and the tenon were able to take twice the load of those with glue applied to the tenon only, and over 100 lb. more than those with glue applied solely to the mortise. Although it leads to more squeeze-out, gluing both parts of the joint will add strength.



Glue application	Failure load
Tenon only	228 lb.
Mortise only	346 lb.
Mortise and tenon	464 lb.



All tenons were $\frac{3}{8}$ in. thick by $2\frac{1}{4}$ in. wide by $1\frac{1}{4}$ in. long.

the widest, longest, and thickest tenons you're able to fit into your design, keeping in mind the hierarchy talked about earlier—width first, length second, and thickness third.

After that, make sure your tenons and mortises fit together accurately. Last, apply glue to both the mortise and the tenon for the strongest glue bond and worry about the cleanup afterward.

Follow these tenon guidelines, and you'll build stronger, longer lasting furniture. □

Dan Bollock, a furniture maker from Lafayette, Ind., is a laboratory technician in the Wood Research Laboratory in Sustainable Biomaterials at Purdue University.



Shoulder Your Dovetails

Make layout easier
and get cleaner results

BY STEVE LATTA

I can't remember when I started shouldering my dovetails, but it has been a regular practice for most of my years as a cabinetmaker. In my early days, I noticed the old-timers shouldered the dovetails on spice chests to avoid cutting half-blinds. They quickly cut through-dovetails and covered the joinery with a molding. This combined efficiency with cleanliness, and in my book that is always a winning combination. I've expanded the practice to just about all my dovetails. The lip allows for an easier, more positive registration and covers up any inaccuracies or slight chipping that may occur.

I'll walk you through this technique. It's my typical approach for drawer construction, the top stretcher of a table, and carcasses. The order of operations is almost the same for all. It is easy and saves time while adding to the overall clean look of the piece. Why wouldn't I use it?

Contributing editor Steve Latta teaches woodworking at Thaddeus Stevens College of Technology in Lancaster, Pa.

DRAWERS WITH NO TWIST



While creating the shoulder on a dovetailed drawer makes a huge difference to the stability and appearance of the finished product, shouldered dovetails aren't much more work to create.

After you fit the drawer front to the opening, lay out and cut the dovetails on the sides. I cut mine on the tablesaw using a customized blade for cutting dovetails. All the teeth are ground at 10° in one direction, and I tilt the sawblade 10° so its tip is parallel to the saw table (for more details on my method, see "Tablesawn Dovetails," *FWW* #152). I use a scrollsaw to remove the waste between tails.

I shoulder the tails on the tablesaw with a rip blade. Hold each drawer side on end against the fence to skim off about $\frac{1}{16}$ in. or so of material to create the shoulder. Now move on to the pins. Set a marking gauge to the thickness of the tails, and transfer them to the drawer front. Mark one side of the tails, wiggle the board to just cover those lines, and then mark the other side of the tails for a tight fit. With a handsaw, cut to the line on the sides, clear the sockets close to the line with a router, and pare to the lines with a chisel.



Cut the tails, create the shoulder, and mark the drawer front. Set a marking gauge to the thickness of the tails and score the drawer front. Then, registering on the shouldered tails, transfer them to the drawer front with a knife.



Flat and clean. The shoulders ensure square joinery and a drawer box that sits flat (left). They also conceal any gaps or sawcuts, leaving clean inside corners (above).



SQUARE DRAWER POCKETS IN TABLES

Combining the shoulder with a double dovetail on the top stretcher not only makes transferring the layout easier, but it also ensures that the drawer pocket is dead-square. If the shoulder-to-shoulder distance of the bottom stretcher with double tenons matches the shoulder-to-shoulder distance of the top stretcher with the double dovetails and the back stretcher, the drawer box is guaranteed to be square. I typically use a double tail as opposed to a single one, because adding the second tail doubles the face-to-face glue surface.

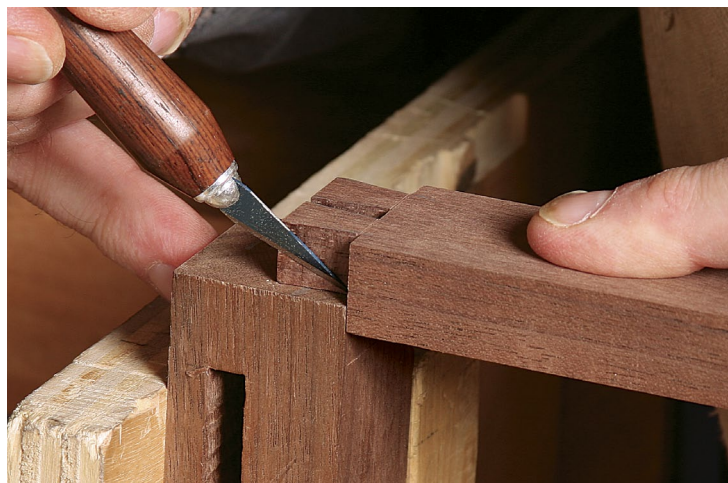
In this situation, I use the tablesaw with a miter gauge to make the shoulder cuts for the tails. Then, with a tenoning jig, I make the cheek cut on each end of the upper rail.



Creating the shoulder. Latta uses a miter gauge on the tablesaw to make the shoulder cuts on the faces and edges of the tail board. Using a test piece, creep up on the shoulder-to-shoulder distance until the shoulders exactly match those of the lower stretcher to ensure a square opening (above). Then, use a tenoning jig to make the cheek cut on each end of the upper rail (right).



Cut the tails. After establishing the shoulders, Latta cuts the tails on the scrollsaw, getting close to the layout lines, and then pares them clean with a chisel.

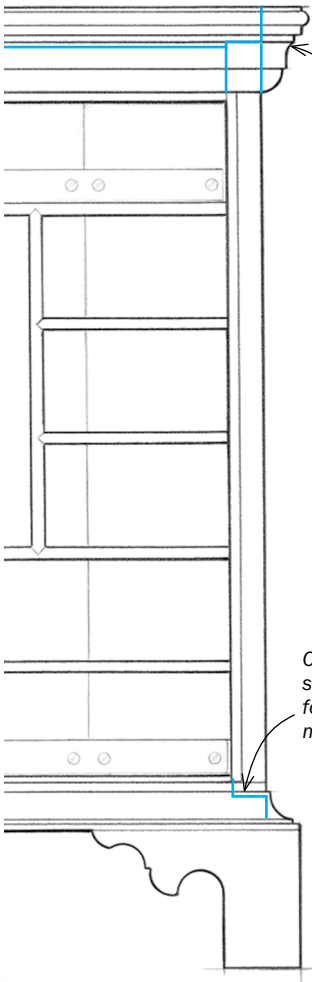


Transfer the tails to the top of the leg. Registering on the shoulder, score the ends of the tails on the top of the leg (above). For a tight fit, mark one side of the tails, move the board to just cover those lines, and then mark the other side. Rout the pin sockets, pare them with a chisel, and test the fit (left).



SQUARE GLUE-UPS AND HIDDEN JOINTS IN CASEWORK

Shouldering the dovetails on case pieces guarantees a square box, makes it easier to lay out the pins, and makes the tails easier to hide with molding. Latta cuts the tails on the tablesaw, cleans out the centers with a scrollsaw, and then pares them with a chisel. Then he uses a router with a wooden fence clamped to it to cut the shoulder. The fence also creates a zero-clearance cavity that eliminates tearout. Once the shoulders are cut, he transfers the tails to the pin boards.



Through-dovetails on the sides can be hidden behind moldings.

Cut a deeper shoulder for narrow moldings.

Rout the shoulder and transfer the layout. Latta cuts a deeper shoulder on the case bottom to make the tails thinner and easier to cover with the narrow molding. Clamping a wooden fence to the router makes it easy to cut the shoulders. Then, resting on the shoulders, transfer the tails to the pin board and cut the pins.



Turn a Lidded Canister

With a few basic turning tools, you can create beautiful storage for the kitchen

BY MIKE MAHONEY



Perhaps I'm biased, but I think every kitchen should have at least one wooden canister. In my own kitchen, there are wooden canisters that hold sugar, spices, flour, and even spaghetti. I prefer these canisters over store-bought ones because they have more character, and it's nice to have the kitchen counter decorated with beautiful and useful storage containers that I made.

Lidded canisters aren't difficult to make, and you don't need special turning tools. I'll show you how to make one with just a roughing gouge, bowl gouge, spindle gouge, skew, parting tool, and round-nose scraper. At my wife's request, this canister is sized for coffee grounds. It's made from highly figured cottonwood with a walnut pull. However, you can use any hardwood species you'd like.

Rough out the body and lid

You need a fairly large blank, 6 in. square by 9 in. long, for this canister. The best source for blanks this size is a log still in the round, but working with green wood requires that you allow the body and lid of the canister to dry for a while after roughing them out, so it doesn't warp out of shape.

To rough them out, mount the blank between centers (I use a 4-prong spur drive in the headstock), and turn the blank round with a 1-in. roughing gouge. Next, use a skew to turn a tenon on each end of the blank. After the tenons

Rough out, then wait

Green wood is the best source of blanks big enough for most canisters, but you'll have to turn it in two stages. Turn the lid and body rough and let them dry at least 30 days before completing the canister.



Turn two tenons. Do this with a skew after turning the blank round but oversize. The tenons are used to secure the body and lid in the chuck so that you can hollow and shape them.

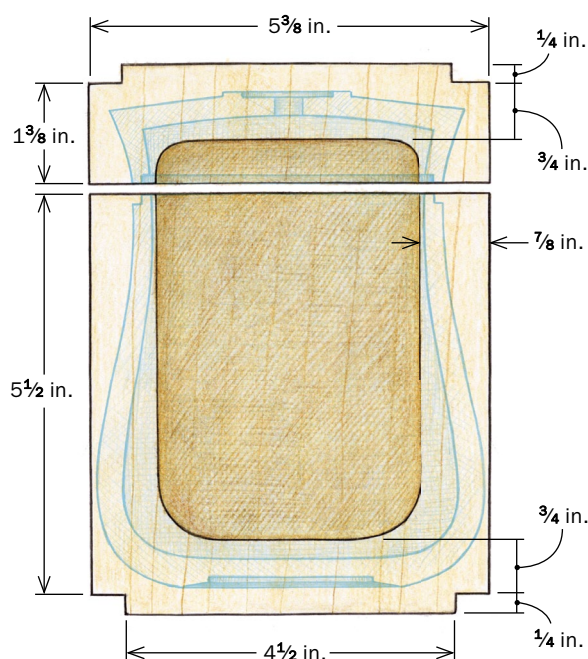


Separate the lid and body. Use a parting tool: The less material you remove at this step, the better the grain of the lid and body will match when the canister is completed.



Hollow the body. Mahoney uses a long bit held in a turning gauge (far left). He stops drilling about $\frac{1}{2}$ in. before he reaches final depth. Hollow the body in stages, starting with the top third (left), leaving the wall just thick enough to accommodate the final shape. Do the same for the middle third, then the bottom third.

ROUGH TURNING DIMENSIONS



Do the same for the lid. The goal here is to remove enough wood to speed up the drying process without getting too close to the final dimensions.

Shape and hollow the body

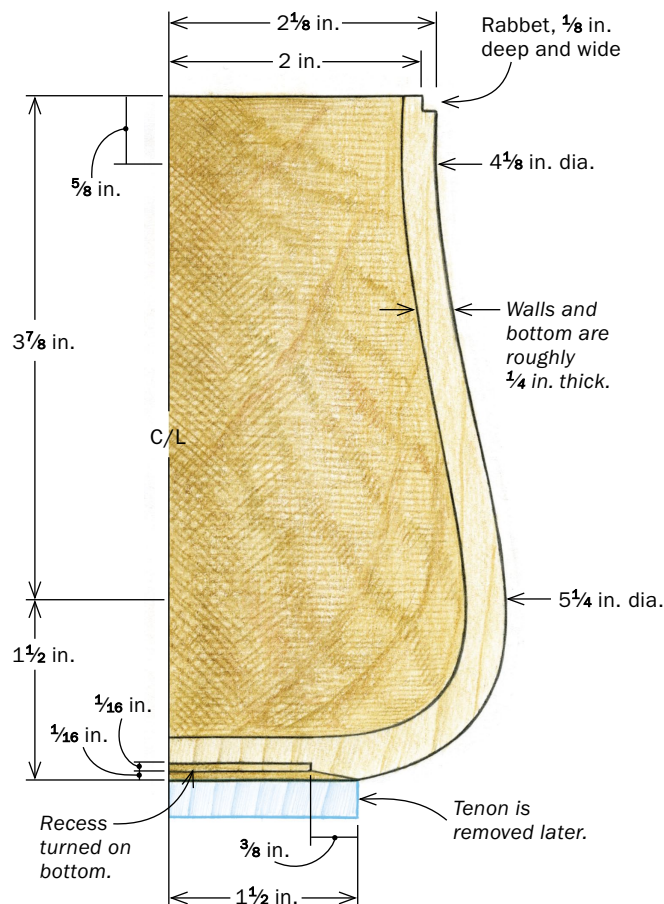


Shape the upper section. Using a $\frac{1}{2}$ -in. bowl gouge, refine the shape. With figured woods, Mahoney keeps the shape simple, allowing the figure to do its thing.



Rabbet the lip. Mahoney uses a skew to cut straight in and create a square corner.

BODY DIMENSIONS



are complete, use a narrow parting tool to separate the lid from the body. I make the lid's height one-fifth of the canister's overall length.

Now secure the lid in the chuck using the tenon you just turned, and slightly hollow the inside of the lid with a $\frac{1}{2}$ -in. bowl gouge. Take the lid out of the chuck and mount the canister's body. Drill a hole in the center of the blank, stopping $\frac{1}{2}$ in. above the final depth. Then, use the $\frac{1}{2}$ -in. bowl gouge to hollow the interior. When hollowing, work in stages. Hollow the top third, then the middle third, and finally the bottom third, stopping at the bottom of the drilled hole.

After taking the body from the chuck, tape the lid and body together with the open ends facing out. This helps speed up the drying. Write the date on the tape joining them and set the parts aside to dry. It takes between 30 and 120 days. The surest way to gauge



Complete the hollowing. Just as when roughing out, work down the interior in thirds, bringing the wall to its final $\frac{1}{4}$ -in. thickness.



Scrape the bottom. A round-nose scraper is the best tool to create a clean transition from the walls to the bottom, and to smooth the surface.

when the rough turnings are dry is to weigh them periodically. When they are no longer losing weight, they're dry.

Shape the lid and body after drying

After the body and lid have finished drying, you can safely turn them to their final shape and dimensions without worrying that they'll one day warp so badly that the lid gets stuck on.

Start with the body. Mount it in the chuck and use a $\frac{1}{2}$ -in. bowl gouge to refine the exterior shape. When using highly figured wood like this cottonwood, I keep the



Sand where you can. At this point, you can smooth the interior and top two-thirds of the outside. Start rough and work up to 400 grit.

Shape the bottom



Continue the body's curve into its lower section and then hollow the bottom to create a stable base.

Fit the body on a jam chuck. The lip of the chuck must fit snugly into the canister's body and the body should seat firmly on the chuck's shoulder.

Shape the bottom. A $\frac{1}{4}$ -in. spindle gouge works well to create an elegant transition from the sides to the bottom.



Remove the tenon. Take very light cuts with the $\frac{1}{4}$ -in. spindle gouge to completely remove the tenon.



Relieved bottom is more stable. A truly flat bottom can be tough to turn. Instead, hollow the middle slightly to create a narrow lip, which acts like a circular foot.

shape simple and let the figure shine. Because of the chuck, you can only turn the upper two-thirds of the body's exterior. The bottom third is turned after you've hollowed the inside and can flip the body to get access to the bottom.

When you're done shaping the upper body, use a skew to turn a rabbet into the top lip, then move on to the interior. The process is the same as when you roughed it out. Work down in thirds, turning the wall to its final thickness of about $\frac{1}{4}$ in., working on the top third before moving to the middle and then to the bottom third. The canister's bottom should be about $\frac{3}{8}$ in. thick. You can use a round-nose scraper to smooth the transition from wall to bottom. Now, sand both the inside and the outside of the body.

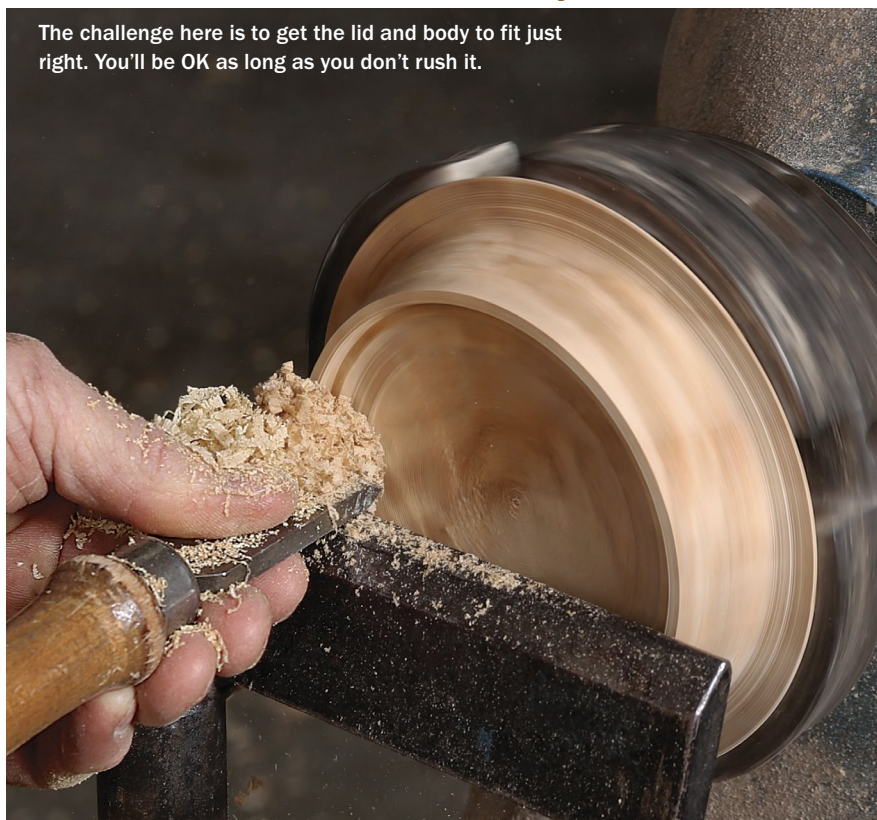
The next step is to take the body out of the chuck so you can turn the lower third of the exterior and the bottom. However, do not clamp the body in the chuck's jaws, which will mar the wood or even break it. Instead, mount a jam chuck in the jaws and pinch the body between it and the tailstock. The jam chuck should have a lip that fits snugly into the canister's body.

Fit the lid to the body

After you have the body in place, turn the lower third of the sides. Then remove the tenon from the bottom by taking very light cuts with a $\frac{1}{4}$ -in. spindle gouge. Pull the tailstock away and relieve the bottom so that there's just a narrow lip for the canister to rest on. This is far easier than attempting to create a truly flat bottom. Sand these newly turned areas to match the rest of the body.

Now that the body is done, it's time to finish turning the lid. The process is the same as it was for the body. Remount the lid in the chuck using the tenon. Refine the exterior, leaving the section down by the chuck for later. Next, drill a hole through the center of the lid for a wooden tenon that

The challenge here is to get the lid and body to fit just right. You'll be OK as long as you don't rush it.

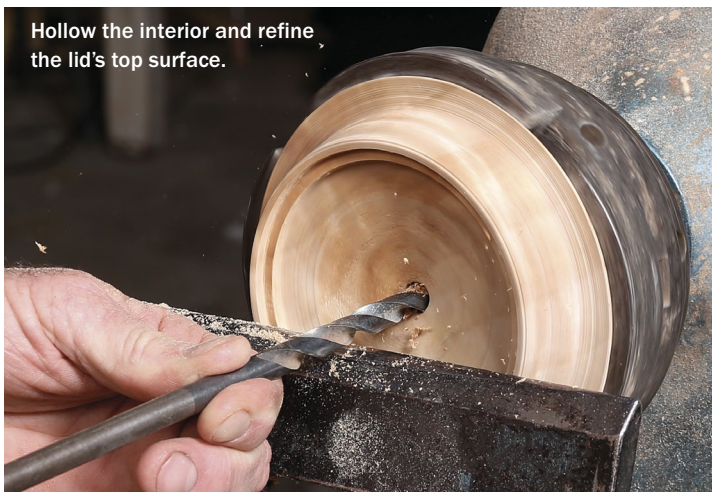


Cut a rabbet. After shaping the outside to match the body, use a skew to create a rabbet inside the lid (left). Move carefully and stop often to check the fit between the body and lid (below). You want it snug.



Turn the lid

Hollow the interior and refine the lid's top surface.



Drill for the pull. This $\frac{3}{8}$ -in.-dia. hole is for a tenon—it looks like a wooden bolt—that joins the pull to the lid.

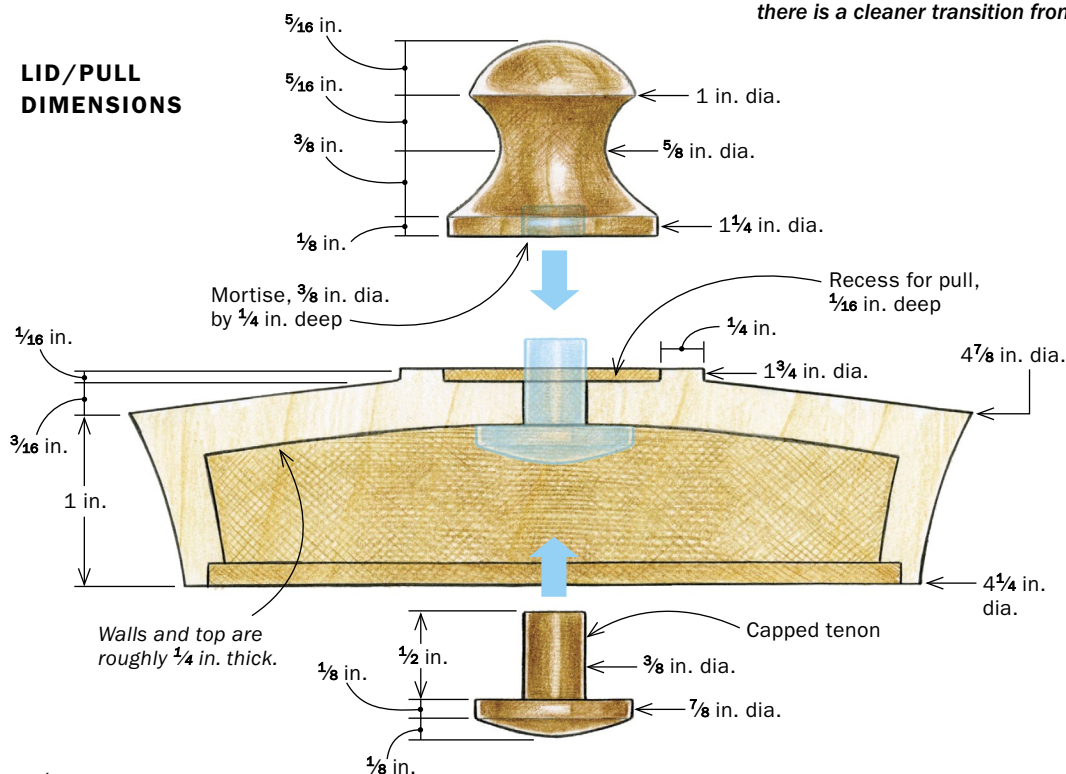


Clean up the inside. Work out from the center and get the lid to its final thickness before you go deeper.



Cut a shallow recess for the pull. With the pull sitting in this recess, there is a cleaner transition from lid to pull.

LID/PULL DIMENSIONS



will attach the pull to the lid. After the hole is drilled, turn the lip to fit over the body, then hollow out the interior. The sides should be $\frac{1}{4}$ in. thick and the top about $\frac{3}{8}$ in. thick. Sand the interior and as much of the exterior as you can.

Completing the exterior requires another jam chuck. After you've made it, mount the lid and finish it up. There is a shallow recess on the top that the pull fits into. After you're done with the recess, sand the exterior of the lid.

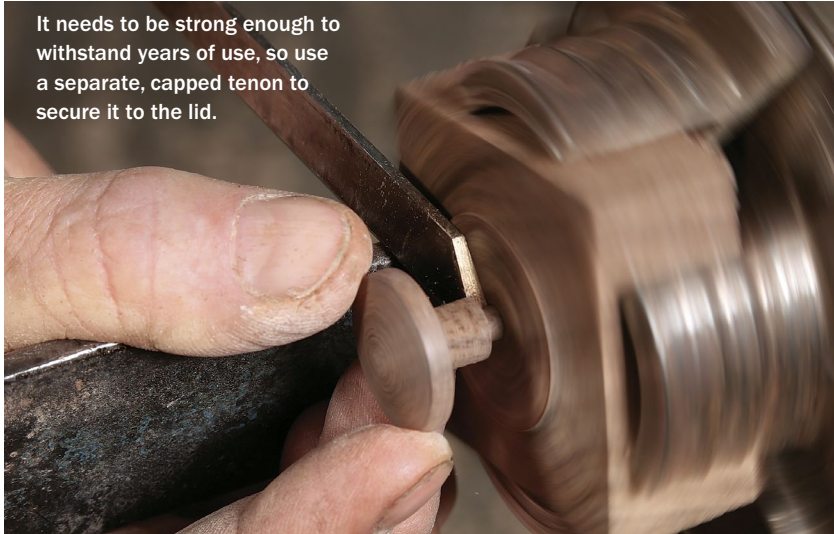
All that remains is to turn the pull. It's turned like a spindle, with the grain running the pull's length. Mount the blank in the chuck, turn it round, and clean up the exposed end. Drill a hole into the exposed

Add the pull

end for the tenon. Now shape the pull as far as you can while it is still mounted in the chuck. There will be a bit of the top that needs to be refined after you've parted the pull from the blank. To clean up this last bit, make a jam chuck that holds the bottom of the pull. Take very light cuts, as friction is the only thing holding the pull in the jam chuck.

A capped tenon joins the pull to the lid. It is shaped like a bolt with a thin, round head and slides in from below the lid and into the pull. The head registers against the

It needs to be strong enough to withstand years of use, so use a separate, capped tenon to secure it to the lid.



Start with the capped tenon. For strength, orient the grain like a spindle. After turning the round head and stud, part the tenon from the blank.



The pull needs a mortise. A tenon comes up through the lid and joins the two (far left). Use a narrow spindle gouge and do as much of the shaping as you can (left) before parting off the pull. Then mount it in a shallow mortise cut into a block of wood to finish off the top.

bottom of the lid. You can turn this between centers and part it off, or turn it as you did the pull, with one end of the blank in a chuck.

After it's turned and you've glued on the pull, apply finish to the canister, inside and out. I prefer a few coats of polyurethane that's been thinned with mineral spirits (three parts polyurethane to one part mineral spirits). When the last coat of finish has dried, put the canister to work in the kitchen and start making the next one. □

Mike Mahoney is a professional turner and teacher who lives outside Sacramento, Calif. For his members-only video workshop, Wood Turning Basics, go to FineWoodworking.com/259.



Glue it to the lid. Align the pull's grain with the lid's. Spread glue on the tenon, the pull's bottom, and the lid to create a strong long-grain glue joint.



MICHAEL SCHAD

Eminence, Mo.

This carved clock depicts the legend of St. George and the dragon, with St. George at the top left and the captive princess below the clock face. "The dragon's tongue flicks once on the half hour and multiple times on the hour with the gong to tell the time."

CHERRY, 11D X 17W X 32H

Photo: My Way Photography



MARK BELLONBY

Mason Neck, Va.

Bellonby designed the marquetrie on the doors of his cabinet-on-stand to show a river with mockingbirds and dogwoods reminiscent of the Virginia countryside where he lives. The case is joined with dowels and has Krenov-type friction catches and strike-plate buttons. The base is ebonized cherry.

CHERRY, 11D X 22W X 55H



FRED ROSSI

Manchester, Mass.

Rossi's goal in designing this table was to create a piece with clean lines that highlighted the wood: "No hardware, no countertop overhang, nothing extra." The top is wrapped in quilted quartersawn white ash veneer, and he added a bit of asymmetry in the layout of the three drawers.

WHITE ASH (SOLID AND VENEER), 18W X 74L X 34H

Photo: Marshall Dackert



CRAIG ALLISON

San Anselmo, Calif.

With its limestone veneered exterior, this pull-out coffee table was designed to be an attractive surface for serving guests. Allison donated it to an auction to benefit the City of Hope research hospital in Duarte, Calif. The stone veneer was installed by Venetian Natural Marble of San Francisco.

MAHOGANY AND LIMESTONE, 18D X 30W X 18H (CLOSED),
34D X 30W X 18H (OPEN)



STEVE OLIVIER

Mission Viejo, Calif.

Inspired by Tommy MacDonald's videos on building a bombé secretary, Olivier built this secretary desk as his son's college graduation gift. "Not meant to be an exact reproduction, the design incorporates all the 18th-century furniture styles my son likes."

MAHOGANY, 20½D X 38W X 89½H

ERIK ROISE

Menlo Park, Calif.

One of the goals in designing this coffee table was to hide as little of the rug beneath it as possible, says Roise, who is a senior at Menlo-Atherton High School. "The slatted, asymmetrical hourglass shape was roughly inspired by the benches in the Anderson Collection Museum at Stanford University. I made the end-grain coasters as well."

CHERRY AND WALNUT, 22½D X 40W X 18H



PHIL GAUTREAU

Brooklyn, N.Y.

The wood for these maple burl platters came from Columbia County, N.Y., about two hours north of Gautreau's studio. "The design inspiration was more of an accident than a plan. I'd intended to turn two saucer-shaped hollow forms but the wood blank thickness was better suited to the open platter form."

MAPLE, 13 DIA. X 2H (TOP),
11¼ DIA. X 1½H (BOTTOM)

Photo: Fiorenzo Borghi



KELLY PARKER

Parkville, Mo.

Parker made this table from a magnificent burl that was given to her, though she's not sure what the wood is. She was intrigued by the portion of live edge that is highlighted in the middle of the top, because it had lots of "great little protrusions" and chainsaw marks. The wood was dry and cracked and hard to work with, but she filled the cracks with black epoxy, which accentuated them and made the slab stronger. "I felt that these beauty marks told the story of this wood's previous life."

"MYSTERY" BURL AND EBONIZED MULBERRY, 16D X 37W X 29H

JASON BEDRE

Georgetown, Texas

This table gave new life to an elm tree that was dying in Bedre's front yard. After felling the tree and letting the boards air-dry for three years, he built this sofa table with its arched base, hand-cut dovetails inlaid with wenge, and cherry raised-panel drawer bottoms.

ELM, CHERRY, WALNUT, AND WENGE,
15D X 60W X 30H

Photo: Chris Kemler



JASON JENKINS

Portsmouth, N.H.

Inspired by Mark Edmundson's bench in *FWW* #194 ("A Modern Bench"), Jenkins modified his version to integrate Edmundson's double rails and stretchers into a single, deeper rail. The tenons interlock inside the legs for added rigidity. "My youngest son, Pierce (age 7), put in several hours' help with the weaving—small fingers were a plus!"

WALNUT AND ASH, 16D X 43W X 18H

LES HASTINGS

Wichita, Kan.

This folding bench was inspired by Steve Latta's minibench (*FWW* #244). "I made another that is more like his, but somewhere along the way I started thinking of making one that is even more portable."

This folding version includes a vise that opens about 4 in. The bench weighs 26½ lb.

BEECH, WENGE, HOLLY,
RED RIVER GUM BURL,
11½W X 22¾L X 3½H (CLOSED),
11½W X 38¾L X 12H (OPEN)



NORTHERN WOODS EXHIBITION

The Minnesota Woodworkers Guild presents the best work of its members at the annual Northern Woods Exhibition, now in its 33rd year. Here are a few of our favorites from the 2016 show. For more information on the show, go to mnwwg.org.



ELISE WALKER

Amery, Wis.

This is Walker's version of a 1765 block and shell bureau by John Townsend. The top drawer front and shells were carved from one thick piece of mahogany instead of using applied shells. "This allowed the grain line to continue throughout the drawer front and all the shells."

MAHOGANY, 21 $\frac{1}{4}$ D X 37W X 35H



ED NEU

Buffalo, Minn.

Neu's chimney cupboard, inspired by a project in *FWW*, was designed to showcase classic Shaker elements—flat-panel doors, frame-and-panel back, Shaker pulls and door latches, and classic proportions. "The understated design of the crown molding at the top was used to give their pieces the feeling of reaching to the heavens."

CHERRY AND PINE,
12D X 16W X 73H



DALE JOHNSON

St. Francis, Minn.

Having discovered a rare log of American chestnut, which has largely disappeared from northern forests due to a blight, Johnson designed this small table to highlight the wood. "I may never work with chestnut again, but it is a unique and worthy material."

CHESTNUT AND OAK,
26D X 28W X 24H



TIMOTHY J. GORMAN

Minneapolis, Minn.

There are few flat surfaces in this cabinet, and that was one of Gorman's goals when designing it. His aim was to create a piece that used elements of classic architecture and appeared as if it were floating.

MAPLE AND BUBINGA, 26D X 42W X 48H



JOE MORGAN

Park Rapids, Minn.

Fascinated by how trees seem determined to sprout inside abandoned buildings, Morgan designed the marquetry on this cabinet so that spring blossoms appear to grow out of the piece. Inside there is a bird's nest and on the back, a pair of swallows.

MAHOGANY, JATOBA, AND WHITE ASH,
16D X 22W X 50H

STEVEN McLOON

Minneapolis, Minn.

McLoon designed this side table to accompany two Greene-and-Greene-style chairs he is making, so it includes elements from the chairs, which are based on originals designed by the Greenes for the Robert R. Blacker House in Pasadena, Calif.

SAPELE AND EBONY,
16W X 23L X 24H



Submissions

For submission instructions and an entry form, go to FineWoodworking.com/rg.

master class

Spice up your work with kumiko

BY MICHAEL PEKOVICH



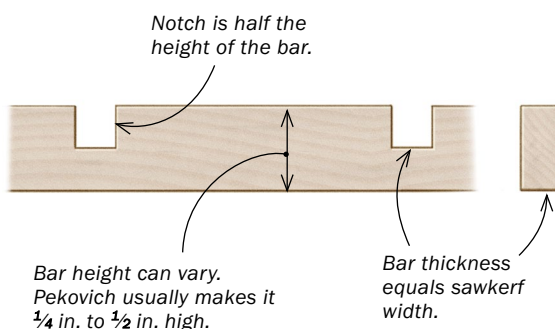


Jig makes quick work of the grid. Cut a notch in a piece of MDF, and glue in an indexing pin sized to match the dado blade. Clamp it to a cross-cut sled to dado the stock for the grid.



MAKE THE GRID

The first step is to build the grid of half-lapped pieces, called bars. The size of the grid is determined by the spacing of the notches. You can build the grid first and design around its size, or build the opening first and size the grid to fit.



The Japanese latticework technique of kumiko is traditionally found on shoji screens, but it is making its way into contemporary furniture as well. The furniture of John Reed Fox inspired me to incorporate kumiko into my own work, and I've used the technique in a number of pieces over the last two years, from boxes to cabinets to case pieces. My process has evolved over that time. I make the half-lap grid at the tablesaw and handle the rest of the work with a sharp chisel and a pair of beveled guide blocks.

Making kumiko requires precise work, but I don't find it tedious or boring. I actually look forward to the quiet bench time the process affords, and the result is always a nice addition to a project. I hope this article demystifies the process a little and encourages you to give it a try. For design inspiration and more information on shoji and kumiko, I recommend the excellent books *Making Shoji* by Toshio Odate and *Shoji and Kumiko Design* by Desmond King.

Start with a simple design

This article focuses on the *asa-no-ha*, or hemp leaf, pattern. It begins with a half-lap grid of pieces, or bars, that create four squares. Parts are then beveled to fit into the squares, creating the pattern. I make the bar grid using a finger-joint jig clamped to a tablesaw crosscut sled. The distance between the indexing pin on the jig and the sawblade determines the size of the grid.

I typically use 1/4-in.- or 1/2-in.-wide basswood or pine for the bars. Start by milling two pieces of stock to thickness. Then cut the notch for the half-lap joints in one blank before ripping both into individual bars. The bars should fit snugly into the dados. I've planed the bars to final thickness in the



Rip the bars. Pekovich uses a thin-kerf blade to maximize the yield (above). Re-joint the stock as necessary to maintain a straight edge for ripping. The bars should fit snugly in the notches. When you glue up the grid, leave the parts long to make alignment easier (left).

Online Extra

To watch Michael Pekovich cut and assemble a kumiko panel, go to FineWoodworking.com/259.

master class continued

Hold-down, $\frac{1}{2}$ in. thick by $\frac{1}{2}$ in. wide by $2\frac{1}{2}$ in. long

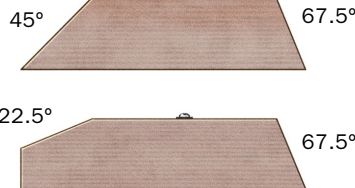
Sliding stop, $\frac{1}{4}$ in. thick by $\frac{1}{2}$ in. wide, with $\frac{3}{16}$ -in.-wide slot for screw

Groove, $\frac{1}{2}$ in. wide by $\frac{1}{4}$ in. deep

Block, $1\frac{3}{4}$ in. thick by 2 in. wide by 8 in. long

BEVEL BLOCKS ENSURE A PRECISE FIT

A pair of angled guide blocks equipped with adjustable stops are used to bevel the parts and cut them to length.



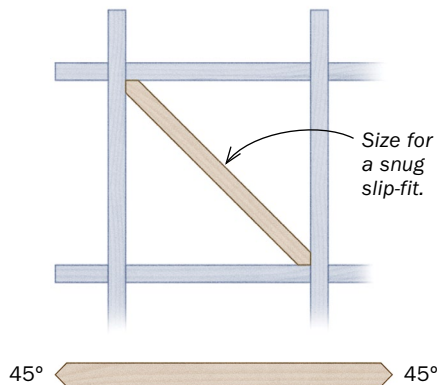
TIP



Chopsaw handles the bevels. For the 22.5° end, clamp a hold-down to the saw base to secure the block at 90° to the fence.

THE DIAGONALS FIRST

One per square is needed. Both ends are beveled at 45°.

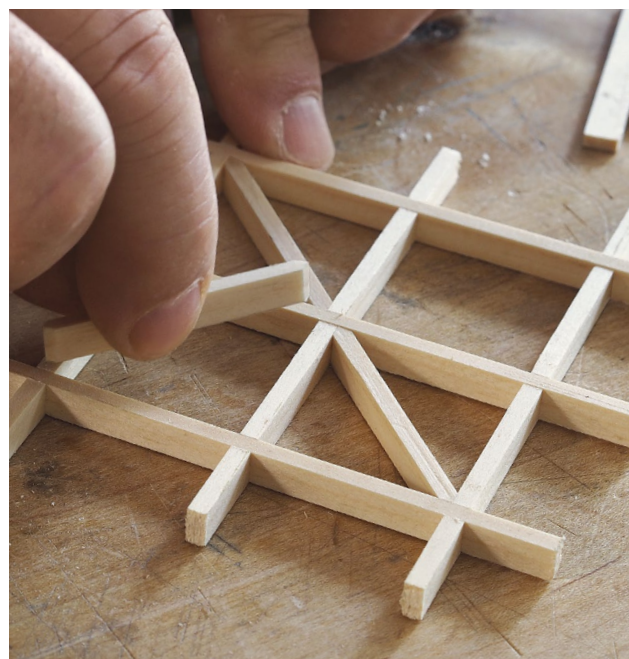


past, but I find that a sharp thin-kerf blade leaves a clean surface that doesn't require sanding or planing.

Guide blocks are the key to accurate chisel work

While the design looks complex, it consists of only three uniquely sized parts. The key is repeatability when making them. The ends of each part must be beveled at a specific angle, and the parts must be of consistent length. To tackle the job, I use a pair of beveled guide blocks with ends cut to various angles. A groove along the top holds the stock, and an adjustable stop sets the length of each part.

I start by making the long diagonal in each square using the 45° end of the bevel block. You'll need four plus a couple more for test-fitting. Cut the pieces slightly overlong, and set the stop block for a slightly longer piece than you think you need. Use a sharp chisel to make the first bevel, then turn over the stock and finish the end, creating a centered point. Then place the beveled end against the stop



Sneak up on the fit. Set the sliding stop to cut the diagonal a little longer than needed (above left). Place the stock against the stop and use a chisel to bevel one end (above). Flip the stock to create a center point. Rotate the stock and bevel the opposite end. Check the fit of the workpiece. It should fit snugly into the grid (left).

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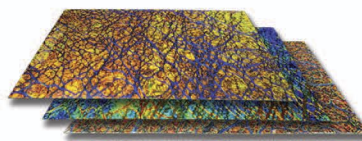
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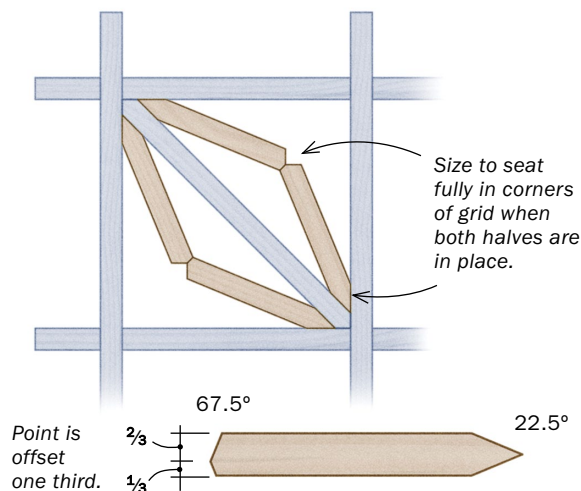
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ADD THE WINGS

You'll need four of these funky pieces per square. Each is beveled 22.5° on one end, and 67.5° on the other.

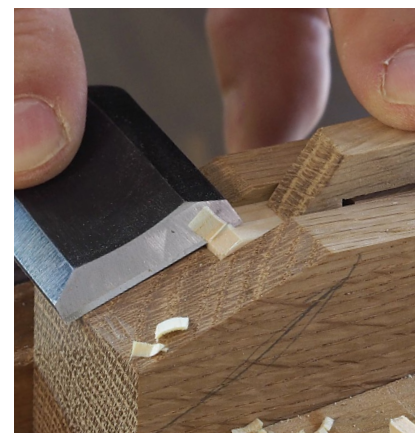


to bevel the opposite end. Check the fit in the grid, and adjust the stop as needed. You want a snug fit.

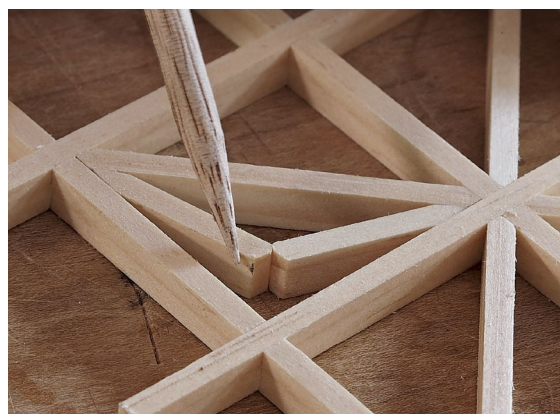
Next make the wings on either side of the diagonal. These parts are the most complex and numerous. You'll need a total of 16 to complete the design. Make at least four extra parts for test-fitting. The wings have a centered 22.5° bevel on the outer end, and an off-center 67.5° bevel where the parts meet. I start with the off-center bevel, using the 67.5° end of each block. Again, start with parts that are slightly oversize. Set one stop block to cut a bevel on one end. Then set the stop on the second block to cut a shorter bevel, creating a point that is roughly one-third the width of the stock. Bevel one end of all the pieces this way before using the 22.5° block to bevel the opposite end. To determine the correct length, make two pieces and fit them in place so their ends meet. Then look at how the outside ends are seated. They should fit snugly in the corner of the square. If there's a gap at the bottom of the joint, the pieces are too long. A gap at the top means they're too short.

Finally, complete the design with short diagonals that lock the wings in place. You can leave the parts dry-fitted, but for parts that see a lot of action like doors and box tops, I glue them in place. To do this, I slip the parts out one square at a time, maintaining their orientation. Then I reassemble them in the same order, using a sharpened stick to place a drop of glue at each intersection as I go. Once the glue is dry, trim off the tabs and level the assembly by rubbing it on a piece of 220-grit sandpaper on a flat surface. I leave the kumiko unfinished. □

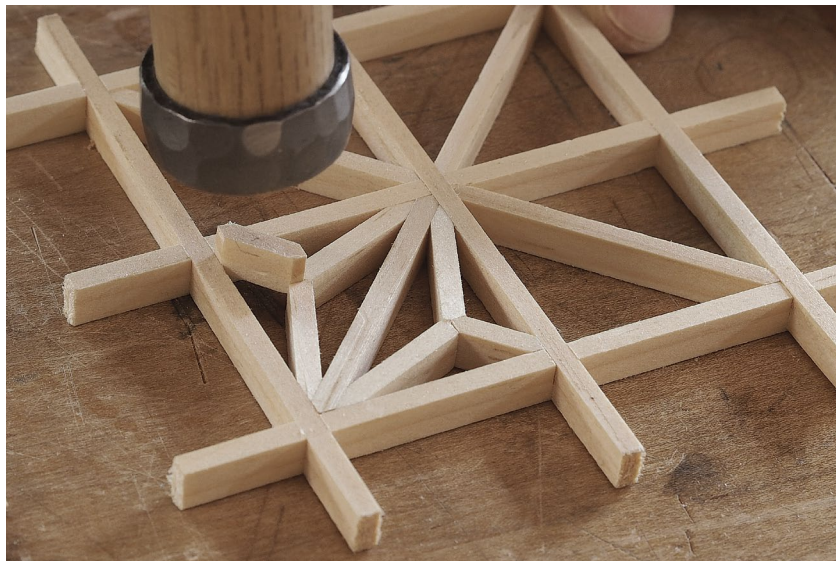
Michael Pekovich is FWW's executive art director.



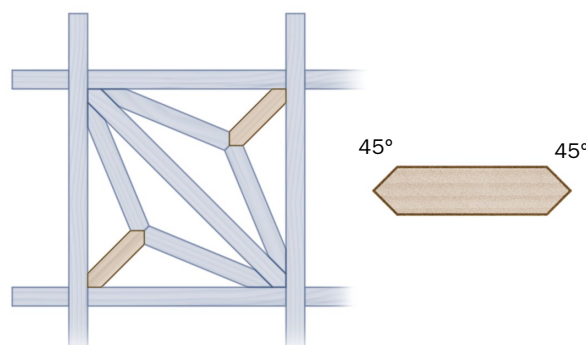
The wings get multiple angles. Use a pair of blocks with slightly different stop settings to cut the 67.5° off-center bevel on all of the parts (above). Then cut a 22.5° bevel on the opposite ends (above right). Adjust the stop so that the parts fully seat in the corners when the wings are butted together (right).



LAST PIECE LOCKS IT ALL IN PLACE



You'll need two short diagonal pieces per square. Each end is beveled at 45°. Size for a snug fit; this piece secures all the pieces in the square.



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how they did it

Creating compound curves

BY JONATHAN BINZEN

Designer Will Acland and maker Tim Smith realized that because their bent-laminated chair (see the back cover) was so full of subtle and complex curves, there would be no easy way to build a prototype to assess the design for looks and comfort. So they decided to create the seat and back first, bending fiberglass over MDF forms to make the compound-curved substrates for the leather upholstery. Next they made an MDF structure to cradle the seat and back so they could be tested for comfort (see p. 90). Then they moved on to building the chair's bent-laminated frame. Acland designed the frame joints to meet in curves, echoing the other rounded forms in the chair.



CURVED COMPONENTS FROM VENEER



A chair frame in the raw. Straight-grained, flitch-cut European ash veneer, 0.6 mm thick, was used for the frame (left). After ripping the sheets into strips and cutting them to length, Smith sorted and numbered them to keep them in the order they came from the tree (above).



Major bending. Smith built MDF forms to bend the chair parts. Applying epoxy to all 80 strips in the front leg-and-arms component and clamping it up took three hours.

SHAPING THE PARTS



Out of the bag. Once the epoxy cured, Smith used hash lines to indicate where wood should be removed during the initial shaping.



Square before circle. Smith cut the components to a square section before shaping them round. He made some cuts with a saber saw, others with an Arbortek angle grinder with a planer head.



Freehand shaping. Smith used an angle grinder for some of the shaping and rasps, files, and spokeshaves for the rest. A tent of plastic sheeting contained the dust.

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how they did it continued

SWELLING AT THE JOINTS

Joinery cradle.

Smith cut the joinery while the frame parts were still mostly square. The short veneers he added at the intersections let him shape the branch-like swells at the joints.



Ready for the router.

A curved template guides the router in cutting the male half of the back leg joint.



Powerful bevy of bolts. After routing and drilling, Smith epoxied in the lengths of threaded rod that secure the joint (left). With the joinery complete and much of the frame shaped (above), Smith finished up with hand tools.

FIBERGLASS SHELLS

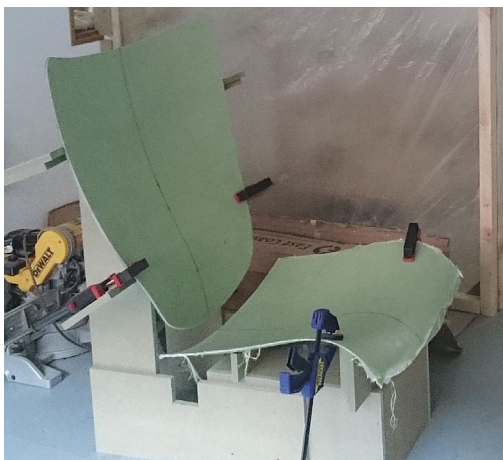
First the forms.

To make bending forms for the fiberglass substrates of the seat and back, Smith cut pieces of water-resistant MDF to shape and bolted them side by side.



Prepared for the test.

To assess comfort, Smith built an MDF cradle that supported the seat and back substrates in position. Then he invited dozens of people of all sizes to try the chair.



ATTACHING THE SEAT AND BACK



Two-part seat. The paired fiberglass substrates, fitted with threaded steel studs for attachment to the frame, were trimmed to size and then upholstered with leather.



Final fitting. Using the threaded studs, Smith epoxied the seat and back to the chair frame.

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Bending to Nature

When a client told Waters and Acland, a custom furniture-making shop in England's Lake District, that he wanted “a signature chair, something sculptural and amazing,” Will Acland immediately started sketching.

As he drew, Acland was blending inspiration from classic Scandinavian chairs with the arching joints of tree trunks and their branches. Although his design posed steep technical challenges, Acland was untroubled, since the company's lead maker, Tim Smith, would be building it. “Tim's invaluable,” Acland says. “I can design things I couldn't really make—and know that he can make them.” Smith, who called the months-long build “an epic task,” laminated some 700 strips of 0.6-mm.-thick European ash veneer to make the chair's frame. Gluing up just the component that includes the arms and front legs required three hours, 1 liter of epoxy, and a team of six. After Smith had the whole frame laminated, joined, and shaped, Acland was elated to see how the flitch-cut veneers had seemingly grown into a solid whole, “almost like we'd put the tree back together.”

—Jonathan Binzen



Photos courtesy of Waters and Acland



How They Did It Turn to p. 88 to see how Will Acland and Tim Smith created the curving frame, seat, and back of this chair.

Audio Slide Show To see more furniture by Waters and Acland and hear about the school they run, go to FineWoodworking.com/259.