TAUNTON'S

Fine WoodWorking

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Build a classic picture frame in a weekend

The secret to sweet-fitting drawers

Work safer with featherboards

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Sharpen jointer knives in place

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Fine WoodWorking

JANUARY/FEBRUARY 2012 ■ ISSUE 224

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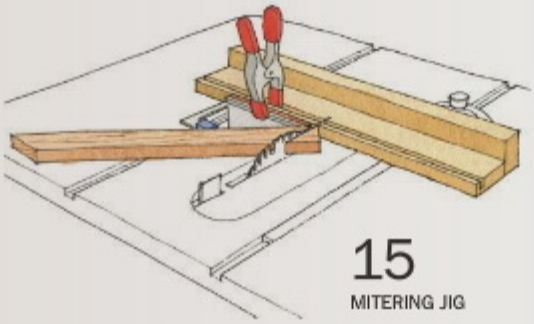

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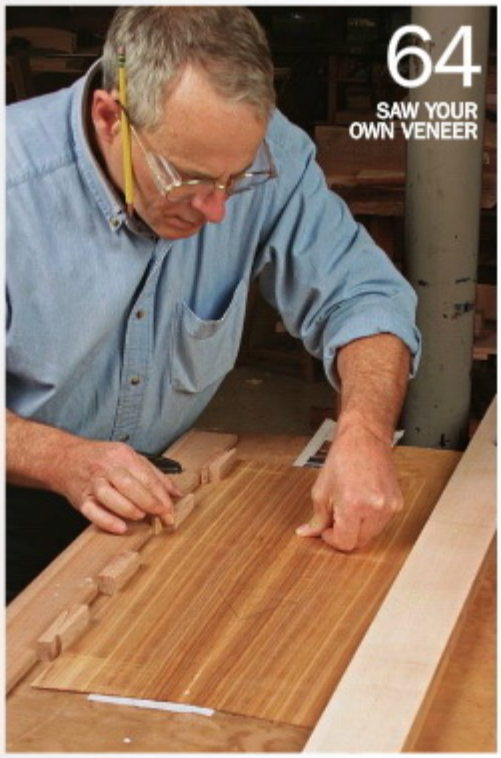

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on the web

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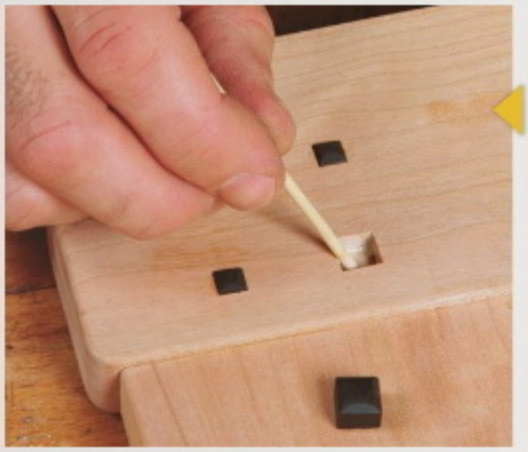

VIDEO:
Pillow-Top Plugs

We've discovered the simple secret behind the quintessential Arts and Crafts ebony plug. Learn how to hide your screws and dowels with style in a step-by-step video.

VIDEO:
Sharpen Jointer Knives

Hesitating to change them out, most of us leave our jointer knives in place long after they are dull. See how to hone them in place, in minutes.

The Future of the Tablesaw

The government wants tighter regulation of tablesaw technology and we've been covering the discussion since day one. Learn the who, what, when, where, and why of a growing controversy.

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Coming December 30: Build a traditional Shaker chimney cupboard that boasts lots of storage in a small footprint. In our latest Video Workshop, Michael Pekovich will have you building doors and drawers like a pro. This project includes:

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- Straightforward frame-and-panel joinery
- Simplified face-frame techniques

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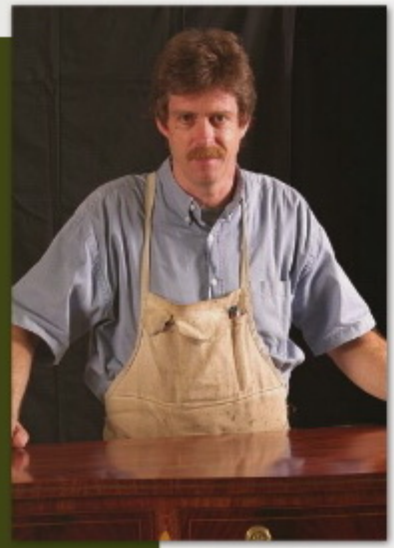

Steve Latta (*"Build a Serpentine Sideboard, Part 2"*) first appeared in *FWW* nearly 17 years ago, and since then he has written dozens of articles. Now a contributing editor, he builds period reproduction and contemporary furniture on commission, teaches furniture making at Thaddeus Stevens College of Technology in Lancaster, Pa., and recently completed his master's in American Studies at Penn State. In addition, he lectures and teaches workshops across the country. He has appeared several times on PBS's "The Woodwright's Shop" and has lectured on the topic of inlay at Colonial Williamsburg, the Milwaukee Art Museum, Winterthur Museum and Gardens, and other schools and guilds.

Steve Brown (*Handwork: "Use a pencil for accurate layout"*) has been an instructor in the Cabinet and Furniture Making Department at North Bennet Street School for 13 years, serving as the program's head for nine. He also is the technical adviser and a frequent guest on the WGBH television show *Rough Cut: Woodworking with Tommy Mac.*

Most interesting commission? "Restoring the woodwork in Ralph Lauren's 1938 Bugatti Atlantic Coupe."

More than 30 years of woodworking haven't dampened **Rob Porcaro's** enthusiasm for new techniques. Porcaro (*"4 Steps to a Sweet-Fitting Drawer"*) admires the furniture and work ethic of James Krenov and is happy when his pieces bring the "quiet joy" that Krenov described. When not in his shop, Porcaro enjoys working out at the gym, running, and swinging Russian kettlebells (a form of weight training, not music-making).

Favorite wood? "Gotta be Claro walnut, but there's so many I love." **Least favorite wood?** "Huh?"

Born and raised on an Iowa dairy farm, **David Welter** (*"Shop-Sawn Veneers Make Better Furniture"*) came to the College of the Redwoods after a progression of finish carpentry and architectural millwork jobs. He attended the school in 1982-1984, the second and third years of James Krenov's program. In 1986, he took his current position as woodworking specialist and instructor at the college.

First woodworking job? "I got my first regular paycheck and first cabinetmaking experience in the Winnebago motor home assembly line."

For more information on our contributors, go to FineWoodworking.com/authors.

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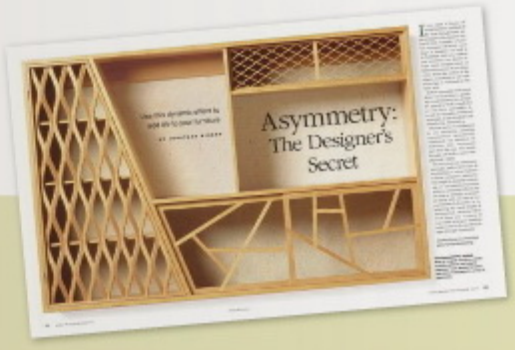
Spotlight



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A DIFFERENT KIND OF ASYMMETRY

Jonathan Binzen's article on asymmetry was interesting, but it missed one of the finer points. While totally asymmetric pieces are just fine, as is the case with many of the pieces in the article, they sometimes look like two different pieces stuck together. "Broken symmetry," a concept better known in architecture and the sciences, often looks better. These types of pieces start symmetrical but are shifted off their axis somehow to make them more dynamic. For example, the piece by Seth Janofsky has obvious symmetric structure and even without its asymmetric decoration would be a fine high-end piece, but the veneer work takes it to a higher level without disturbing the wholeness of the piece. Similarly, my shelf set (right) could have been assembled with the bow in the center and would have been OK, but pushing the bow and smaller shelves to one side made it a better piece.

—BRUCE WINTERBON, Deep River, Ont., Canada

Total asymmetry. *This cabinet by Peter Shepard is more radically asymmetrical, though there are a number of design elements linking the left and right sides.*

Broken symmetry. *This small chest by Seth Janofsky started symmetrical, but the veneer work shifts it off center.*

Another example. *Everything could have been centered on this piece, but the shift makes it more dynamic.*

Fans of dowel joinery

The article on using dowels (Fundamentals, *FWW* #222) brought back fond memories of my early days as a woodworker, when *Fine Woodworking* was a black-and-white, oversize publication, and dowel centers, brad-point drill bits, and doweling jigs were obscure and hard to find. I've learned a lot about working with dowels over the years. Here are some additional tips. You can use nipper pliers to create lengthwise slits on a plain dowel rod. A syringe of some kind will help you put glue in holes with better control and less mess, an ice pick works well to spread the glue in the hole, and a little open assembly time creates a better bond.

—SHELDON SMITH, Gurdon, Ark.

After seeing the dowel joint repeatedly dissed in various woodworking articles ("Not enough long-grain to long-grain mating surface! Harrumph."), I found Asa Christiana's article refreshing. A question, though: The author states flatly that "hardware store dowels won't do," but doesn't expound on what makes a great dowel great. Are spiral-grooved dowels better than the more common linear-grooved ones? Should craftsmen favor certain woods for dowels and avoid others? Thank you for illuminating this subject.

—TOM JOHNSTON, Franklin, Tenn.

Asa Christiana replies: *Those long dowels you find at hardware stores and home centers are inconsistently sized, in my experience, and a good dowel joint depends on a snug fit. So I buy mine from woodworking outlets, already cut to various lengths and including at least one lengthwise slit to let air and excess glue escape when the dowel is driven home. Without it, you can actually blow out the side of your workpiece. I've done it. By the way, if it happens to you, just put a tight clamp over the busted-out area while the glue is still wet. As for crosswise or spiral grooves, I don't find them necessary but they probably don't hurt either.*

Easy way to remove sanding disks

In Roland Johnson's article, "Why You Need a Benchtop Sander" (*FWW* #221), he

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noted the difficulty of removing old PSA disks from disk sanders. Pick up a cheap heat gun. If you heat the disk up a bit, it will peel off in one piece in a few seconds.

—MATT MYERS, via e-mail

Use butt joints on glass stops

While the mitered glass stops used in Chris Gochnour's recent tool-cabinet project ("House Your Tools in High Style," *FWW* #223) may look more professional, butt joints are actually more practical. Since the nails are driven in parallel to the glass, the stops have to be pried out parallel to the glass. That is next to impossible with mitered corners. From years of restoration of broken glass cabinet doors, I know that the humble butt joint is the simplest to replace. For the easiest removal, the best bet is to install the opposites in pairs.

—CHRISTIAN BECKSVOORT, New Gloucester, Maine

The trouble with miters. *Mitered glass stops look great and go in just fine, but they are difficult to pull out later.*

Don't hire out your finishing

"When to Outsource Your Finishing" (*FWW* #222) was a disappointing article to see in the magazine. I have been reading *FWW* for years, and the articles on how to dye and finish have inspired me to take chances and learn. I was one of those woodworkers who, as the article states, "don't like finishing" and struggled at it. But finishing is now the most rewarding part of my work. It takes the rough product and brings it alive. As an amateur I learned by doing, not by buying the solution.

—ED BROWN, Jacksonville, Fla.

Better then the original? *At left is Josef Hoffmann's 1903 original. At right is Kevin Rodel's take, from* FWW *#221, with its distinctive pinwheel top.*

Rodel table a great twist on the original

Please pass along my compliments to Kevin Rodel "A Study in Squares" (*FWW* #221) on the fine variation he has made on the original Josef Hoffmann table. I like the clever twist he made on the top: the whirling square pattern. I went to the Minneapolis Institute of Arts recently to look at the original. The mitered top of white oak with ebonized grain is quite beautiful and delicate. But I still like Rodel's variation better. Nice article on how to make it.

—PETER CARLSEN, Saint Paul, Minn.

Tip for segmented cutterheads

I have used these cutterheads in planers, jointers, and shapers for years and they do have many advantages, as your recent article explains ("Segmented Cutterheads Change the Game," *FWW* #223). I highly recommend them. One important tip that wasn't mentioned: When turning or replacing the cutters, it is very important to clean the backside of each one and the mating surface of the cutterhead. A bit of sawdust or a tiny wood chip trapped under the cutter can cause it to fracture when tightened and can also affect alignment and cut quality. An old toothbrush works well, and a brush with brass bristles (say that quickly) is even better.

—STEVE CHILDERS, Wyoming, Del.

Shop vacuum winner is too loud

I find it hard to believe that you consider the Bosch Airsweep's 91 db. noise level "a small drawback" ("Tool Test: Shop Vacuums," *FWW* #223). That is more than 50 times the noise energy level of the Fein, Festool, or smaller DeWalt vacuum in your test, and easily enough to damage your hearing. (Every 10 db. is a tenfold increase in noise energy, on a logarithmic scale.) I don't want to have to don earmuffs (as the article recommends) to do a little vacuuming around the shop, or work with a random-orbit sander, most of which do not require ear protection on their own.

—JOLYON JESTY, Mount Sinai, N.Y.

Kit guitar struck a sour note

I enjoyed the article about building a guitar from a kit ("Your First Guitar," *FWW* #221). I look forward to future articles on assembling furniture from IKEA.

—FRED THOMPSON, Highland Park, Ill.

Clarification

After we reviewed the Rockwell 3Rill 12-volt drill/driver/impact driver (Tools & Materials, *FWW* #222), a number of readers had trouble finding the accessory three-jaw chuck we mentioned (as an impact driver, the "3Rill" comes standard with a hex-type chuck). You can find the accessory chuck at Amazon.com for $18 by searching "Rockwell RW9275 Chuck."

Correction

In "Segmented Cutterheads Change the Game" (*FWW* #223), we neglected to test the segmented heads from Woodmaster Tools, available as option for their line of planer/molders. There is an average of 7 carbide teeth per inch on Woodmaster's heads, tied for the most in the cutterheads we looked at, and the teeth are shear-cutting, the type that performed best. Go to Woodmastertools.com for more info.

EDITED AND DRAWN BY JIM RICHEY

Best Tip

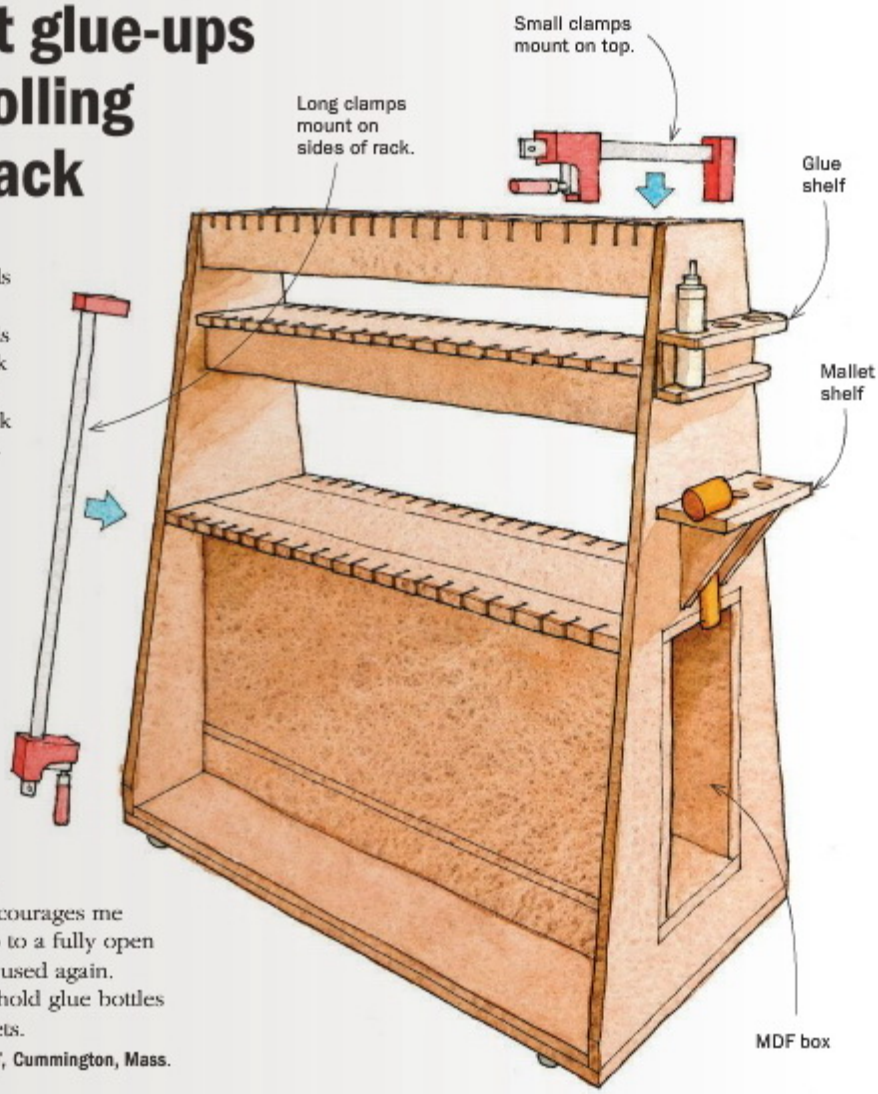
Efficient glue-ups with a rolling clamp rack

John Barrett got an early start in woodworking, making soap box racers as a kid. The bug apparently bit hard as, he says, "I've been making things ever since."

This rolling rack holds my most commonly used clamps and tools for glue-ups. The rack is built around a box made from ¾-in.-thick MDF, which provides great strength and extra storage space.

The rack is sized to hold shorter clamps across the top and longer clamps down the sides. The clamps lean toward the center and the rack never feels tippy, even when fully loaded. The spacing between the upper and lower slots on the sides encourages me to return each clamp to a fully open position ready to be used again. Shelves on one end hold glue bottles and dead-blow mallets.

—JOHN BARRETT, Cummington, Mass.



Quick Tip

When using paste wax to lubricate the surface on my tablesaw, jointer, and other tools, I often needed to stop and reapply the wax in the middle of a project. Now I keep a container of baby powder handy and sprinkle it on the tool's work surface when lubrication is needed. This simple solution works very well. As a bonus, my wife says I smell good when I come in from the shop.

—GREG SILKENSON, Elgin, Texas

A Reward for the Best Tip

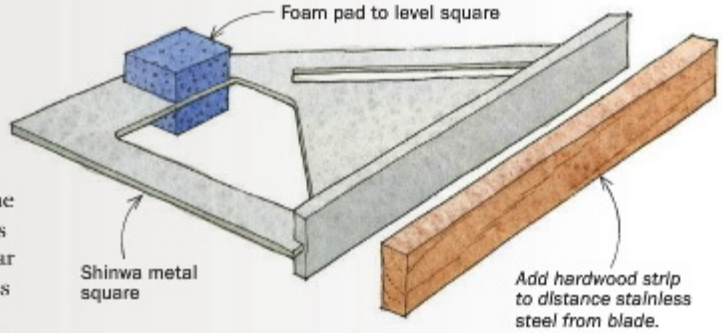
Send your original tips to fwmow@taunton.com or to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470. We pay $100 for a published tip with illustrations; $50 for one without. The prize for this issue's best tip is a Brian Boggs spokeshave from Lie-Nielsen Toolworks.

Turn a miter square into a mitering jig

I struggled to cut mitered frames with my standard tablesaw miter gauge, getting ugly gaps in the joints no matter how carefully I tried to set the miter gauge to exactly 45°.

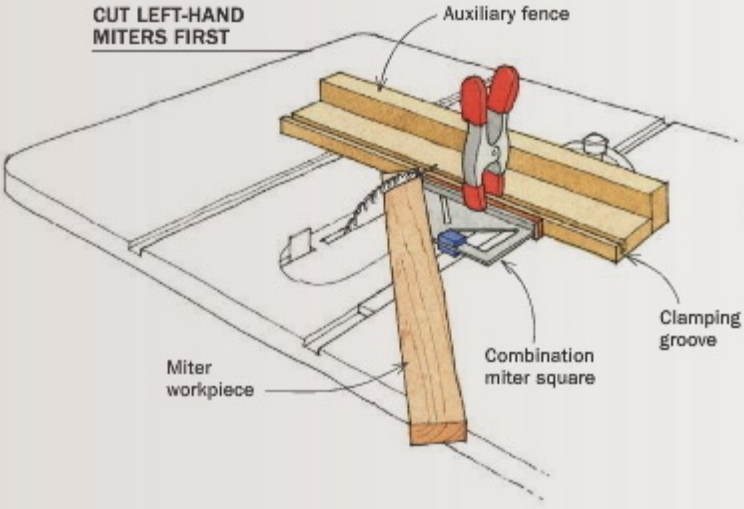
Finally it occurred to me that, if all the cuts in a mitered frame are made in the same way on the same miter gauge, any errors are incremental. An error of 0.5° on eight cuts (for a rectangular frame) adds up to a 4° gap. You could see that gap from across the room. The solution, I realized, was to cut the joinery in a way that instead caused the errors to cancel each other out. If I made a small error on one cut, it could be corrected by making an opposite error when cutting the mating face.

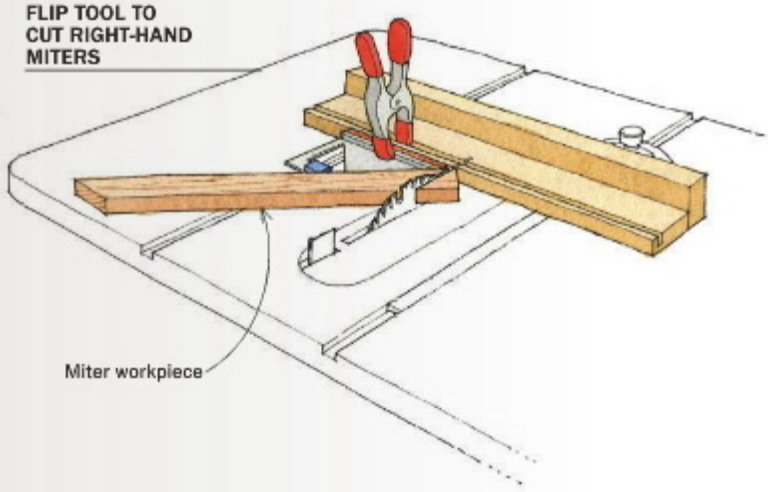
To do this, I made a miter tool using a Shinwa combination miter square. These stainless-steel tools are very accurate, and are available at Amazon and at woodworking outlets for around $27. I attached foam pads at the top on both sides, so the tool will lie horizontally on a saw table. I also glued a hardwood strip to the square's flanged base to distance the metal square from the blade and added an auxiliary fence to my miter gauge.



To use the miter tool, I set the miter gauge to zero, clamp the miter tool to the left side of the fence, and cut one side of the miter joint. Then I flip the miter tool over to the right side of the blade and cut the miter on the mating piece. Done this way, the second angle will be the complement of the first. When joined, the two cuts will be a perfect 90°.

—BILL WELLS, Olympia, Wash.

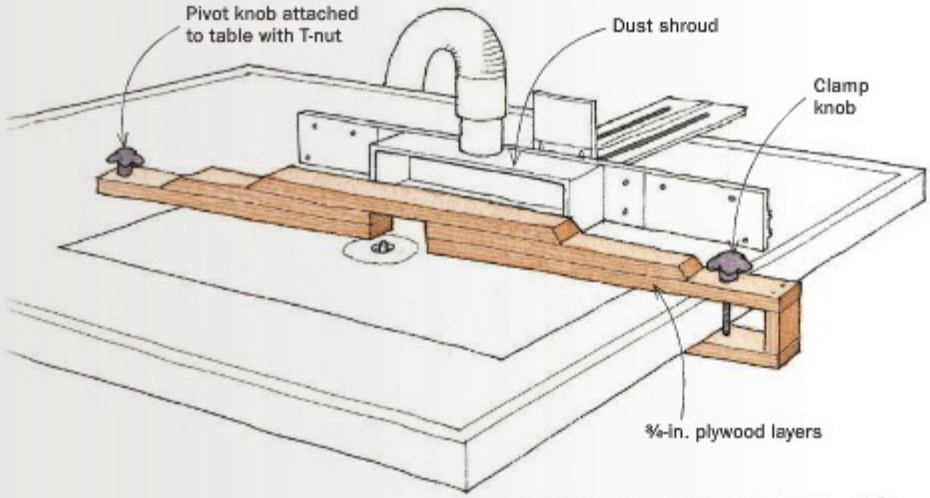




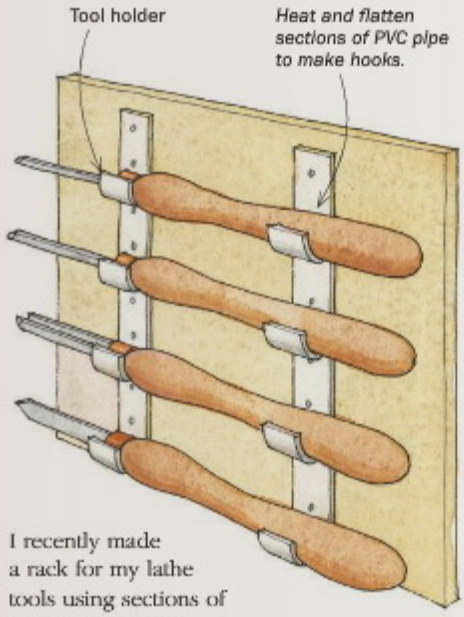
Pivoting router-table fence is simple and effective

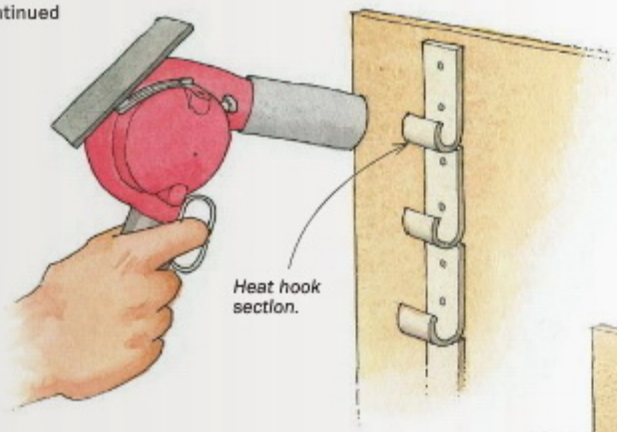
Although I have an ultra-precise Incra fence system on my router table, a simple plywood fence gets the most use. It's easy to make and pivots on one end, which makes the adjustments easy as pie. The pivoting end is attached with a knob that goes through the fence and table and threads into a T-nut on the bottom of the table. At the other end, the fence clamps to the edge of the table with a simple knob and bolt arrangement. When I'm using this fence, I attach a shopmade sheet-metal dust catcher to the Incra fence and attach a hose from my shop vacuum.

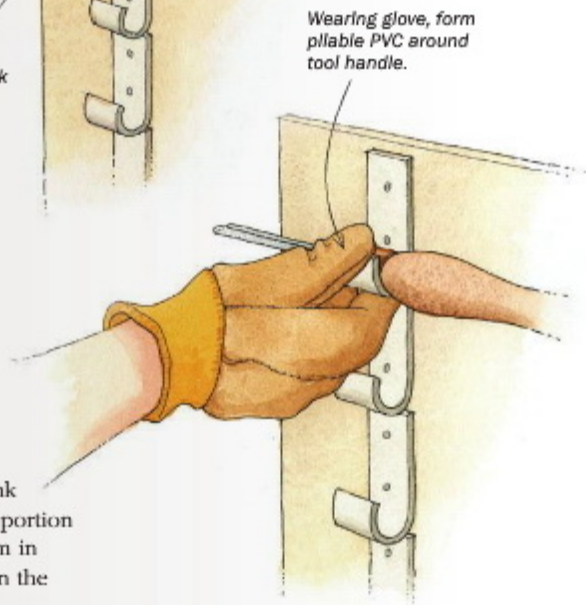
—ED MULLIKIN, Roanoke, Va.



Make PVC tool holders







I recently made a rack for my lathe tools using sections of PVC pipe.

To form the holders, I first used a chopsaw to cut several rings from 1¾-in.-dia. pipe. Then I cut through one side of each ring on the bandsaw. With a heat gun, I heated half of the PVC ring until it became soft and pliable, clamping the pliable half in my bench vise to straighten the back and make a J-shaped hook. I then drilled countersunk mounting holes in the straight portion of the hooks and fastened them in pairs to a board that mounts on the wall behind my lathe.

Next, one hook at a time, I heated the hook part of the PVC until it was soft and pliable. I then placed a lathe tool into the holder and, while wearing a leather glove, shaped the holder to fit the tool handle, holding the shape against the tool until the plastic cooled and set.

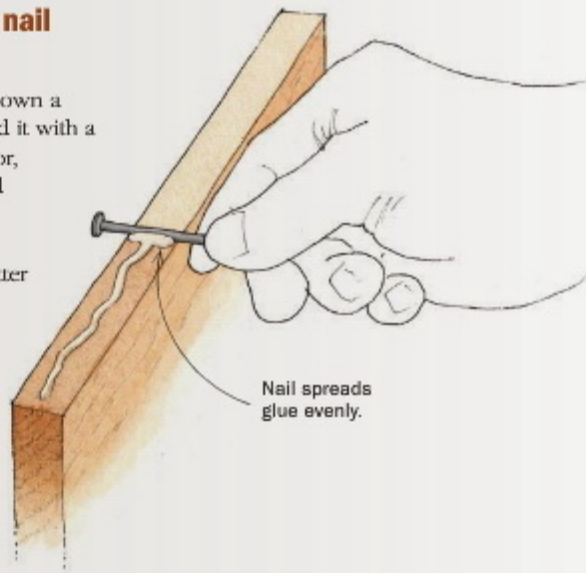
It takes about 30 seconds of playing the heat gun around the target area to soften the PVC. Work in a well-ventilated area and be careful not to overheat the plastic or you'll get scorching, smoke, and longer cooling/setting times.

—BARRY SHACKLEFORD, Portola Valley, Calif.

Spread glue with a nail or screw

Most woodworkers lay down a bead of glue, then spread it with a brush, a tongue depressor, or their finger. I've found that spreading the glue with a large nail or long drywall screw does a better job. The nail acts like a grader, spreading the glue evenly across the surface, while a screw combs the glue into rows.

—CHARLIE TOSI, Westerville, Ohio



Quick Tip

The common trick for keeping an aerosol nozzle clear of dried paint or finish after spraying is to turn the can upside down and spray for a few seconds. Trouble is, each time you do this you lose aerosol pressure and—as I've found many times—you end up with a can still containing material and no way to get it out. To avoid this, I keep a small, lidded glass jar half filled with a suitable solvent. When I'm done spraying, I pop off the nozzle and drop it in the jar until I need to spray again.

—JOE SARCHIOTO, Fair Play, S.C.

tools & materials

■ ACCESSORIES

Best toggle clamp ever

Bessey Auto-Adjust Toggle Clamp
$21.25 (low profile; 1¾ in. capacity)
$22.50 (high profile; 2¾ in. capacity)
woodcraft.com

TOGGLE CLAMPS ARE A MUST FOR JIGS AND FIXTURES. They're fast, strong, and add an element of control and safety to all sorts of holding and shaping operations. But traditional toggle clamps have their quirks. Any time the thickness of your workpiece or pattern changes, you have to adjust the clamping head with a couple of wrenches. It's a time-consuming procedure, while you try to nail down the right height and the proper amount of pressure.

Bessey's new auto-adjusting toggle clamps solve all of these problems. The clamps adjust automatically to accommodate a wide range of thicknesses, while clamping pressure stays the same (adjusted with a screw on the front of the mechanism). The swiveling clamp head helps distribute that pressure without marring the workpiece. So swapping various parts and patterns doesn't require any additional effort or time.

I think the low-profile versions will be fine for most shops. But if you work with thicker material often, you may want the added capacity of the high-profile clamps, though they're taller and may be awkward to hold for some folks. The clamps work very well, making it easy to get set up for pattern routing. They have nicely contoured handles, and exhibit the smoothest lever action of any toggle clamp I've used.

—Gregory Paolini builds furniture and teaches woodworking near Asheville, N.C.

One size fits all. *Bessey toggle clamps can hold workpieces of any thickness within their capacity without fussy adjustments of the clamp head.*

Small Bevel-Up Smooth Plane
by Veritas
$179
Leevalley.com

It shoots, too. *Used upright with two hands or on its side with one (shown with a shooting board at right), the small Veritas plane leaves a baby-smooth surface on any end grain.*

■ HAND TOOLS

Small plane is an end-grain champ

SOME PEOPLE MIGHT ACCUSE ME OF HAVING MORE HANDPLANES than I know what to do with, but remarkably there is still one hole in my arsenal: a plane for cutting end grain. So I was happy to give the new Veritas small bevel-up smooth plane a road test.

With its blade bedded at 12° and the bevel sharpened at 25°, it offers an effective low cutting angle of 37° that's perfect for slicing through end grain on shelf and tabletop ends. Used on its side, it's great for shooting small parts such as box sides and dividers. It has even inspired me to make a new shooting board. The plane is large enough for a two-handed approach, but it can be handled easily with one hand as well. This comes in handy when chamfering corners, where maintaining a consistent angle is easier to accomplish with a one-handed grip.

Overall fit and finish is flawless. The plane features the same adjustable mouth as its big brothers. Simply loosen the front handle and swing a lever to adjust the opening. It's about the same size as a No. 3 Stanley plane, which I find too small for everyday smoothing tasks. But for end-grain work typically done on narrow edges, the size is ideal.

—Michael Pekovich is FWW's art director and most prolific furniture maker.

Photos, except where noted: staff

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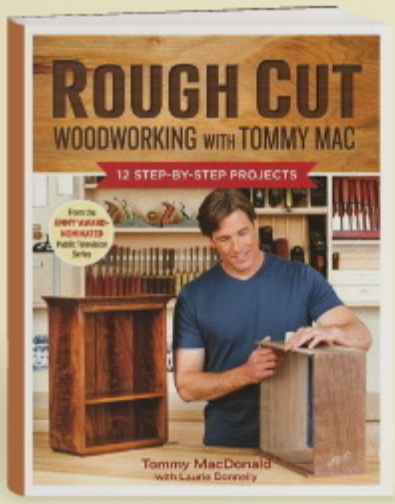

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■ SANDING

A finish sander with bite

THE SAND-FLEE IS A BENCHTOP DRUM SANDER that's been around for a few years, but there's a new model—the SF-925—which I was able to preview. This model has a thicker top, which at ¼ in. thick by 13 in. wide by 23 in. long, provides ample infeed and outfeed support. The table on the machine I tested was dead flat. The new model also includes a fence, which helps keep edges square to the face and can be moved to reach fresh grit on the drum. The SF-925 features a 9-in.-wide sanding drum. Belts (sold separately in grits from 100 to 320) are spirally wound on the drum and held in place by hook-and-loop fasteners, and changing them is a snap.

A 2½-in. dust port below the drum is very effective, and a number of accessories can be mounted to the drum shaft outside the cabinet to increase the tool's versatility.

The sander is easy to use. Adjust the drum just high enough to contact the workpiece, and push the stock across the table, maintaining a steady feed rate to avoid hollows. The Sand-Flee works much faster than a random-orbit sander but the drum leaves imperceptible snipe on the end (I noticed it only by laying a straightedge on the surface), which is easily removed with a sanding block. It's great for removing mill marks and works well for flush-trimming joinery on boxes and drawers. It will also work well at flush-sanding inlay.

—Roland Johnson is a contributing editor.

Sand-Flee Drum Sander
(model No. SF-925; available early 2012)
$600
rjrstudios.com

Marching to a different drum. *The Sand-Flee drum sander is great for smoothing flat parts. The large table offers ample infeed and outfeed support.*

■ ROUTING

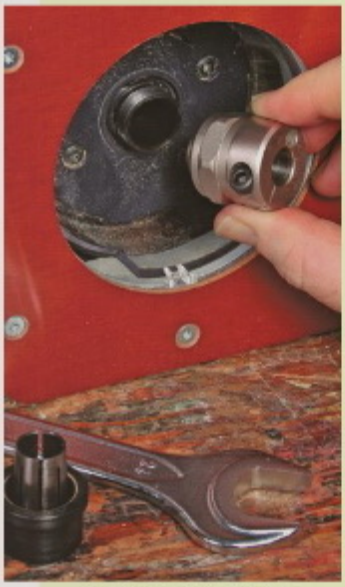
Replacement chuck makes bit changes a breeze

FOLKS OFTEN ASK ME WHY I HAVE TWO DOZEN ROUTERS in my shop, and I jokingly reply, "Because I'm too lazy to change bits." But there's some truth to that. Sometimes it's easier to grab another router that's set up with a different bit, rather than fumble around with a couple of collet wrenches, hoping I grabbed the right sizes. That's why I was excited to try the Musclechuck, an aftermarket replacement collet that clamps and releases bits quickly when you tighten or loosen a single socket screw, with sizes available to fit most popular routers.

I put the Musclechuck through a little torture test by cutting a half-dozen mortises in hard maple table legs. Each mortise measured exactly 1½ in. deep, meaning the collet held the bit firmly, and the width remained accurate, meaning the bit didn't wobble. I also used a dial indicator to check runout on a straight bit installed in both the existing chuck and the Musclechuck. The difference was less than 0.001 in.

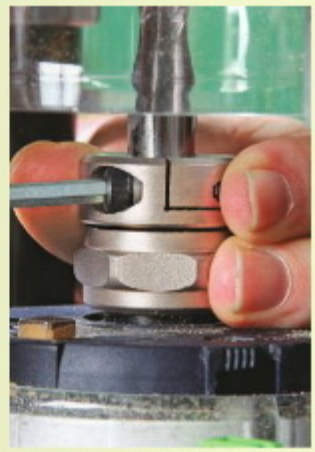
The Musclechuck works well with handheld routers, and it excels in table-mounted routers, where bit access can be more restrictive.

—G.P.



Easy replacement. *The Musclechuck threads right into the router's existing chuck.*

Musclechuck replacement collet
$82 (includes adapter sleeve for ¼-in. shank bits)
woodrat.com



Quick-change bits. *Paolini was able to install and remove bits in 7 seconds with an Allen wrench.*

Photo, this page (top): Roland Johnson

■ STORAGE

Soft landing pad for tools

IF YOU WANT AN EASY WAY to organize your tools and keep them safe, check out Kaizen Foam, a new product from FastCap that allows you to make custom holders for almost any tool. Available in 2-ft. by 4-ft. sheets, in thicknesses of ⅞ in., 1⅛ in., and 2¼ in., the foam is easy to use.

The foam is made of thin layers, so you just excavate a bit at a time as needed. Trace the tools and then cut through one layer using a utility knife, remove the waste, and check the fit. Keep cutting until the recess is deep enough to hold the tool securely but shallow enough to grab easily.

I used the foam to hold router bits and to organize planes in a workbench drawer, but it would also be perfect for holding sawblades and chisels and other hand tools—no matter the shape. The foam allows you to angle tools in varying ways to use space most efficiently. Doing that with wood dividers would take a lot more time and skill.

The custom-cut recesses keep things firmly in place—no more tools rattling around as a drawer is opened and closed. Available in white or dark gray, Kaizen Foam is one of the most innovative storage ideas I've seen.

—Tom McKenna is a senior editor.

Trace and cut. *Arrange the tools on the foam, then trace around each one. Cut along the lines with a knife and pull out the waste with your fingers.*

Snug as a bug. *With the Kaizen foam you can create custom recesses that hold tools snug and secure. It works for router bits, too. Use a drill press to cut holes in the foam to match the bit shank.*

Rolling Ladder Hardware (42285)

Step up in style with our custom Rolling Ladder System

Our new Rolling Ladder System combines clever design and a classic look to give you a custom ladder that is both sturdy and elegant. Simply provide the wood to match your fixtures and get building!

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Materials code: 354

Work more safely with featherboards

THEY KEEP WORKPIECES ON TRACK AND YOUR HANDS OUT OF HARM'S WAY

BY BOB VAN DYKE

Three types

Store-bought and shopmade featherboards abound. The best choice for a particular machine setup depends on a number of factors.

MAGNETIC FEATHERBOARDS

Rare earth magnets make these a go-to choice for metal tables.

A woodworker's third hand is often a featherboard—an accessory that guides workpieces through woodworking machinery. Featherboards are made of plastic or wood with thin fingers cut into an angled end. Mounted to a fence, they push a workpiece snug against the table. Mounted to a tabletop, they keep a workpiece tight against the fence. Like a hand moving over a bird's feather, a workpiece fed past a correctly positioned featherboard will only move easily toward a blade or bit, and is prevented from kicking back.

Featherboards add accuracy and consistency to many types of cuts made on a tablesaw, router table, or bandsaw. They also allow woodworkers to keep their hands away from the blade or bit—and that makes for safer and cleaner cuts.

There's a variety of featherboards, some store-bought and others shopmade. If you have none, start by using the shopmade featherboard—it will handle any situation. Adding the other two styles to your collection makes some operations even easier, making you more likely to reach for a featherboard when you need one.

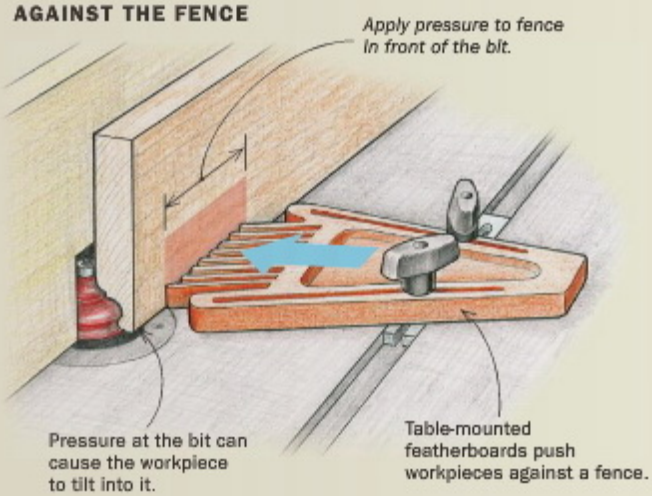
At the tablesaw

I frequently use a tablesaw and dado blade to cut grooves and rabbets. Adding a featherboard makes those cuts more accurate

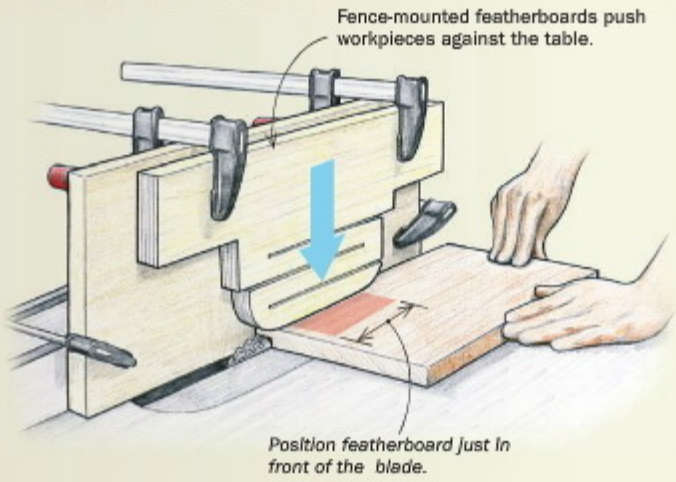
Featherboard basics

In general, place most or all of the featherboard ahead of or above a cutting edge, rather than right over it or past it. This is critical on cuts like rabbets or molding. When no material is left against a fence or table to resist the featherboard's pressure, a workpiece can dive into the bit. When ripping, make sure that *all* of the pressure is ahead of the blade. Otherwise, it will jam the offcut against the blade, possibly causing the piece to kick back violently.

AGAINST THE FENCE



AGAINST THE TABLE



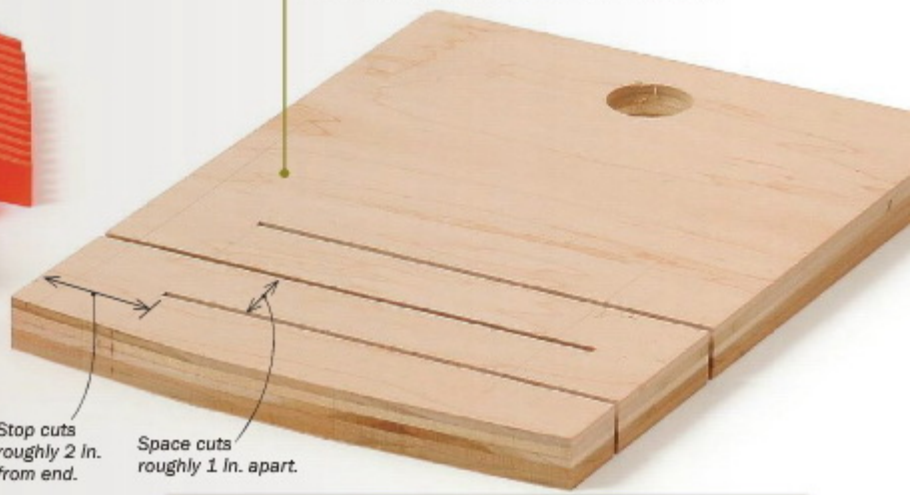
Photos: Ken St. Onge; drawings: John Tetreault

SLOT-MOUNTED

A good option for tables and fences with miter slots or T-tracks.

SHOPMADE

You have to make these yourself, but this three-cut type is quick and easy, and works for any situation.



and consistent. To cut a groove in the edge of a rail or stile, a single featherboard attached to the tabletop will ensure a workpiece stays flat against the rip fence. To position it, hold the workpiece against the fence and set the featherboard's fingers against the workpiece, just in front of the blade.

For cutting grooves in a longer workpiece, such as a drawer side, add a second featherboard to the outfeed side. It will prevent the workpiece from skewing away from the rip fence as it exits the blade. With both of these cuts, a store-bought, magnetic featherboard is easiest to set, but it won't work on an aluminum- or granite-topped tablesaw. In those cases, slot-mounted or shopmade featherboards will work.

The third cut's a charm. *Van Dyke prefers three-cut featherboards to the traditional type with many "feathers." Make one by cutting two kerfs at one edge, stopping just shy of the end. Then cut a third kerf starting from the opposite edge, between the other two. Then cut a slight curve along the edge.*

At the tablesaw

RIP ACCURATE GROOVES

Set the workpiece against the rip fence and butt the featherboard against it. Use medium pressure: The workpiece should be snug against the fence but shouldn't stick or bind.

CUT CONSISTENT RABBETS

Lower the blade and clamp this type of featherboard to the outfeed side of the rip fence first, then adjust the pressure when clamping the infeed side.

At the tablesaw continued

ADD SUPPORT FOR LONG PARTS

For long pieces like drawer parts, a second featherboard prevents the workpiece from drifting off the rip fence.

When cutting rabbets—where the depth of cut must be consistent—clamp a shopmade featherboard to the rip fence to keep the workpiece snug against the table as it moves. In this case, I prefer a featherboard made with just three cuts—a technique I learned from renowned teacher Will Neptune. Set the featherboard just in front of the lowered blade and place the first clamp on the outfeed side of the fence. Then pivot the featherboard into the workpiece using medium pressure. Use a second clamp on the infeed side. Position the featherboard over the blade and the infeed side of the fence, with the bulk of the pressure just before the leading edge of the blade. This assures an even cut and prevents the workpiece from pivoting.

To cut rabbets on narrower pieces, start with a wider workpiece. Rabbet the edge and then rip the piece to width.

For some cuts, use blocking to raise a featherboard off the table slightly—a technique that helps in making vertical cuts, like the bevels on raised panels. This prevents the workpiece from tipping, and moves the pressure away from the blade so that cutoff pieces won't be forced into the blade, which could kick them back. For blocking, screw a shopmade featherboard to an L-shaped base and clamp the base to the table.

Beginning woodworkers tend to overuse featherboards when ripping on the tablesaw. I use them only for cumbersome or repetitive cuts, such as ripping 30 pieces of 6-in.-wide stock down to 4 in. wide. In those cases, a featherboard will prevent your hand from accidentally touching the blade if your attention wanders. Remember to set the featherboard directly in front of the blade to avoid kickback.

At the router table

Featherboards are also a frequent companion at the router table. I often use them mounted to a fence to keep workpieces flat against the table. Many commercial router tables and fences come equipped with T-tracks, miter slots, or both, making

RAISE THE FEATHERBOARD FOR PANELS

For raised panels and tall workpieces, move the featherboard above the blade and use a tall auxiliary fence.

Start with a base. *Two pieces of plywood make a solid foundation for a featherboard.*

Watch the length. *Make the base long enough to be clamped to the tablesaw's edge.*

Keep it vertical. *The featherboard keeps the panel pressed snugly against the fence.*

At the router table

HAPPY RABBETS

Neglecting a featherboard when rabbeting a panel can leave inconsistent cuts. Stepped surfaces are a telltale sign of cuts made with uneven pressure.

slot-mounted featherboards a good option. But if your router table lacks slots, shopmade featherboards clamped to the table or fence also work well—I use them on my own shopmade router tables.

When routing rabbets, I use a single featherboard attached to the fence. Position it as just as you would with a tablesaw, with the bulk of the pressure from the featherboard focused on the infeed side of the table, just in front of the leading edge of the bit. Use the same technique for other operations where the depth of cut is critical.

Attach a featherboard to the router table when cutting molding profiles. The featherboard will keep the workpiece tight against the fence and leave a more consistent, chatter-free cut. For taller pieces, use the blocking technique to raise the featherboard over the bit.

Lock it down. *Slotted featherboards attach to the T-tracks on some router-table fences, but you can use shopmade featherboards if your fence has no grooves.*

Vanishing act. *The step disappears when a featherboard is used.*

CHATTER-FREE MOLDINGS

For making moldings on the router table, add a featherboard for burn-free, consistent cuts.

ACCURATE PROFILES

Thin stock, like the parts of a cope-and-stick frame, needs multiple featherboards. A push stick helps, too.

Some operations at the router table require featherboards attached both to the fence and table. The inside molding—called sticking—for a cope-and-stick door frame is a typical example. The double-featherboard setup will make more consistent cuts, reduce chatter, and stabilize the workpiece as it exits the bit. The same setup also helps in routing very thin stock, but leave enough room to use a push stick.

Resawing help

Featherboards will help when resawing stock on the bandsaw. Place the stock against a resaw fence, and butt a featherboard against it, just in front of the blade. A magnetic featherboard works best for metal tables, but shopmade and slot-mounted featherboards should also do the trick.

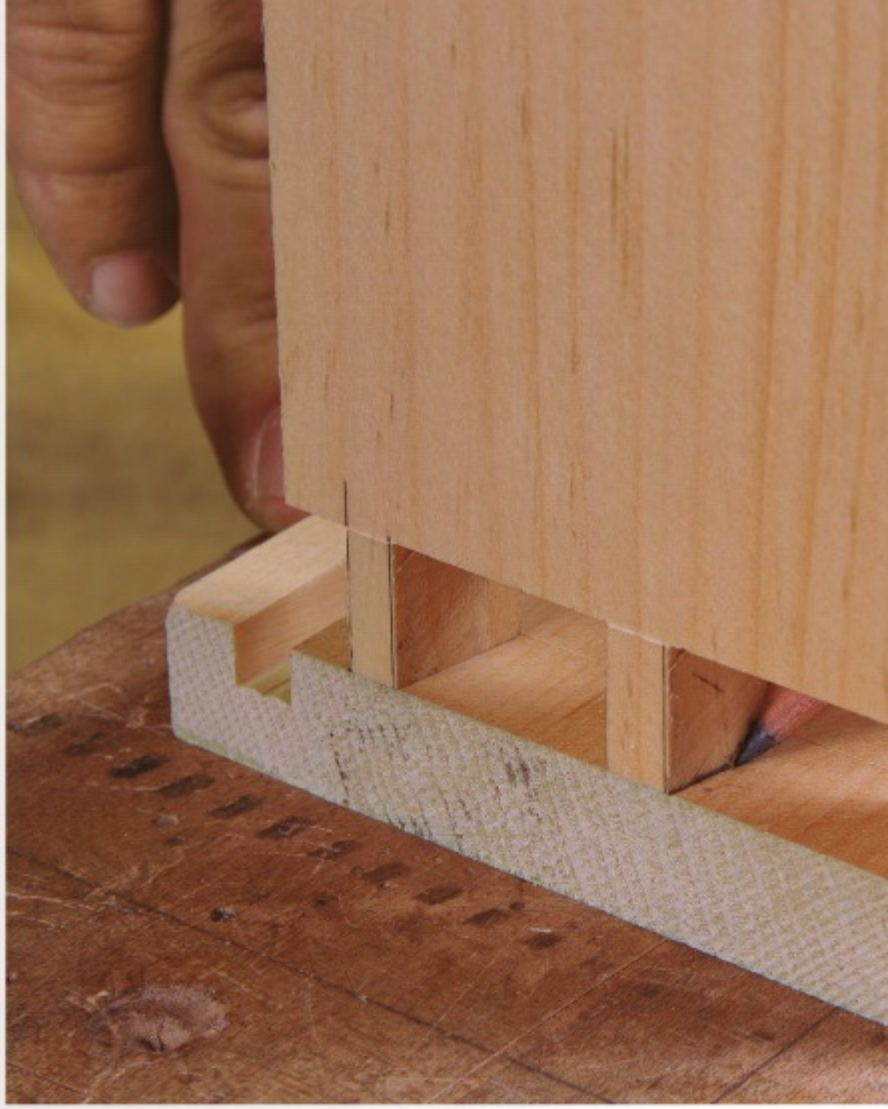
Regardless of which style of featherboard you use, these accessories will add accuracy and safety to your woodworking. □

Bob Van Dyke is director of the Connecticut Valley School of Woodworking.

Layout: When pencil beats knife

FOR ACCURATE DOVETAILS AND HINGE MORTISES, YOU'RE BETTER OFF WITH THE HUMBLE PENCIL

BY STEVE BROWN



Starting point. *The point created by a pencil sharpener can be too blunt for precise layout. Refine it by twirling the pencil between your fingers as you pull the lead over a piece of P220-grit sandpaper.*

Good joinery begins with accurate layout, and for many woodworkers that means using marking knives and gauges to cut layout lines. Pencils typically don't enter into the discussion, because a drawn line is supposedly less accurate. But a pencil line can be just as accurate as a scribed one and there are times when a pencil is a better choice for layout than a marking knife.

At North Bennet Street School, where I teach cabinet and furniture making, students learn to use a pencil instead of a knife when laying out dovetails and hinge mortises. In those cases, the knife cuts into the wood you want to keep, resulting in a loose or gappy fit. A sharp pencil marks a line that's just as accurate, but doesn't damage the wood. It also is easier to see. I'll show you how to do it.

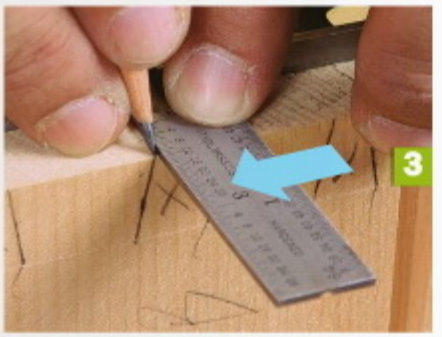
Pencils don't damage wood

No matter how you cut dovetails (I do them pins first), you're going to trace one half of the joint onto the board for the other half. I stand the pin board on the face grain of the tail board. All of the wood between the pins will become the tails, so it

Photos: Matt Kenney

Tight joints, guaranteed

Marking knives are accurate, but they also cut into wood that's part of the finished joint, so you end up with one that's either gapped or loose. A pencil is just as accurate but doesn't damage the wood.



Crisp dovetails. *A sharp pencil point reaches all the way into the corner and traces the pin where it touches the tail board (1), marking its location precisely. When transferring the line around the corner, the trick is to set the pencil in place first (2), placing the point exactly where the line on the face of the board meets the edge. Next, slide the square up to it (3), and draw a line across the end grain (4). Pare to the line (5), working across the grain. This makes it easier to control the depth of cut.*

is wood that I want to keep. If you trace the pins with a knife, pressing it firmly against the pins, you cut into wood that will be part of the tails. If you later remove that scribe line when paring the tails, the joint may be too loose. If you leave it, then there will be a small gap visible, created by the beveled edge of the knife. (The same is true for a hinge mortise. As you scribe around the leaf, the knife cuts into a part of the stile that needs to be kept.)

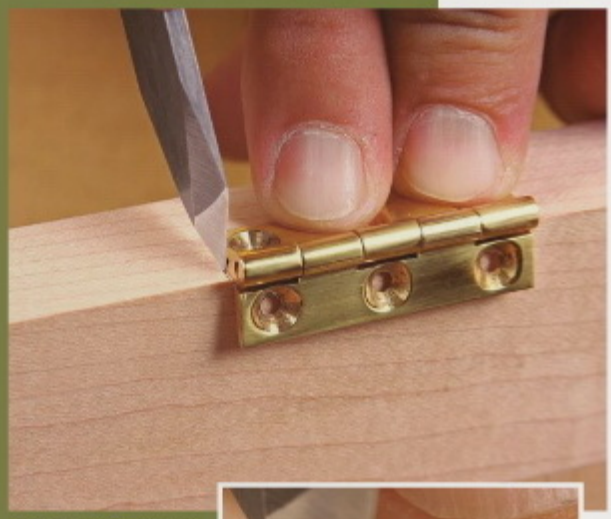
A sharp pencil avoids those problems. It draws a line along the pin and the entire line is on wood that needs to be kept. So, when it comes time to cut and pare the tails, you work up to the line, but not into it (this also is true for a hinge mortise).

Transfer dovetails accurately

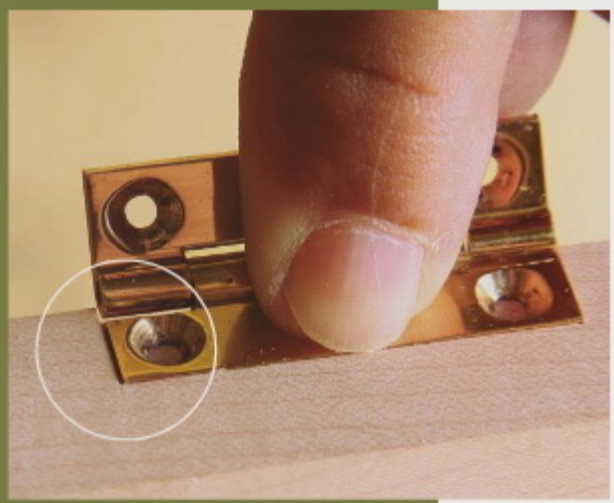
You don't need a fancy pencil. A good, old-fashioned No. 2 works great. But the point does need to be as sharp as possible. After sharpening it in a pencil sharpener, use P220-grit sandpaper to sharpen it to a finer point, twirling it in your fingers as you do so.

As I mentioned, I cut pins first. However, this

THE PROBLEM WITH MARKING KNIVES



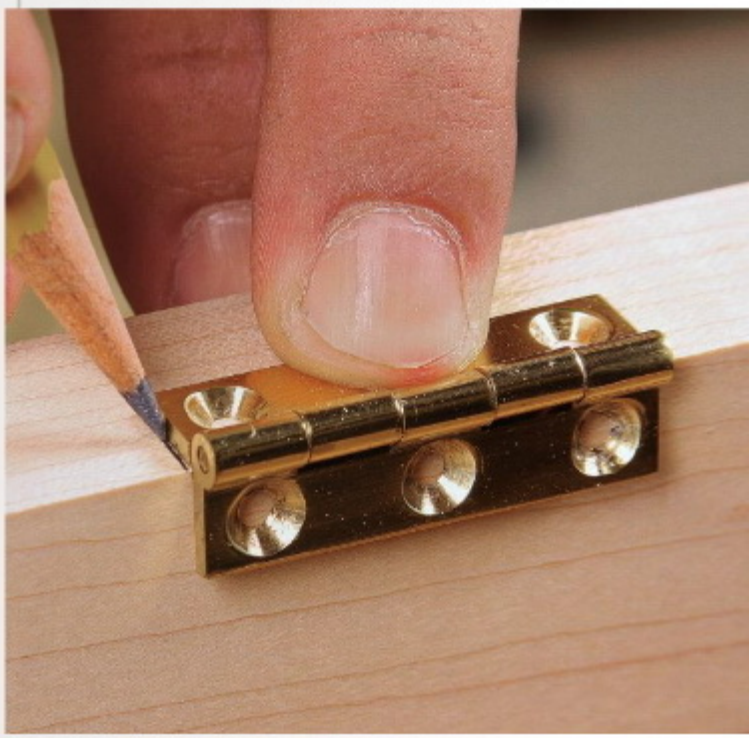
They cut the wrong wood. *For accuracy, the flat back of the knife must go against the hinge. That means the bevel faces out, slicing wood fibers that aren't part of the mortise.*



That leads to a sloppy fit. *It's natural to pare the mortise wall back until the cut line is gone, but that creates a mortise that's too long and has an unsightly gap.*

No-slop hinge mortise

Here's how to do it with a pencil, and get a great fit every time.



Use a pencil on both ends. *No matter how thick the line, it's only marking the wood outside the mortise, so you know exactly where to stop paring—before you cut into the mark.*

technique works if you cut tails first, too, as long the space between them is large enough for a pencil to fit.

Clamp the pin board on top of the tail board and transfer the pins by putting the point of the lead into the corner and taking a single stroke. It's that sharp point that provides the accuracy, because it gets right into the corner between the pin and tail boards (the thickness of the line doesn't matter). To preserve that accuracy, sharpen the pencil frequently.

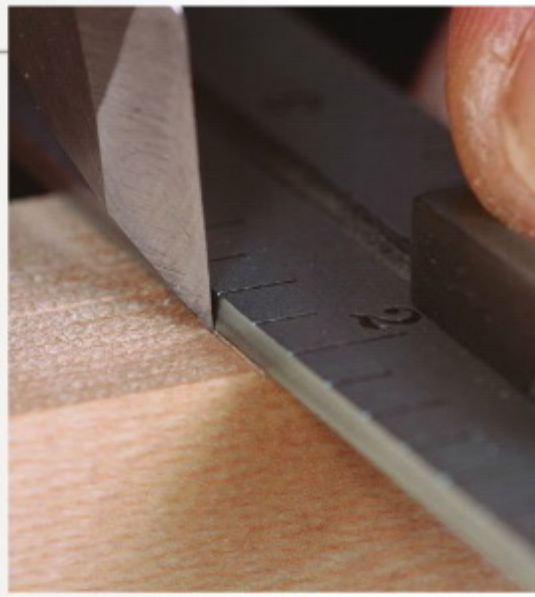
After tracing all of the pins, use a square and a sharp pencil to transfer the lines across the end grain of the tail board. Then cut out the waste between the tails, cutting as close to the line as you can. Ideally, you cut right on the line, but if there's a bit of paring left to do, work up to the layout line, but not into it. From here, it's just a matter of testing the fit and paring until the joint comes together.

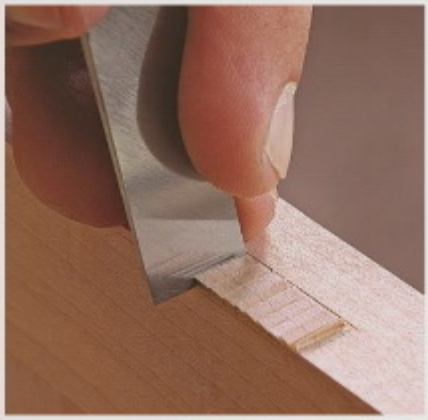
Cut a hinge mortise that always fits

To trace around a hinge, sharpen your pencil the same way as for dovetails. Then hold the hinge in place on the stile and trace around it, holding the point of the lead in the corner where the hinge and stile meet. Take away the hinge and scribe along the inside of the line with a marking knife. To do that accurately,

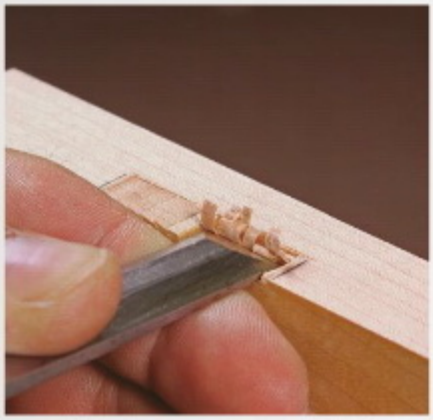
But it's OK to scribe for the side. *The bevel on a marking gauge's cutter faces the waste wood, so paring away the entire cut line creates a mortise of the perfect width.*

Add a knife line for easier paring. *Put the knife on the inside of the line (above), push the square against it, and then scribe the line (right).*

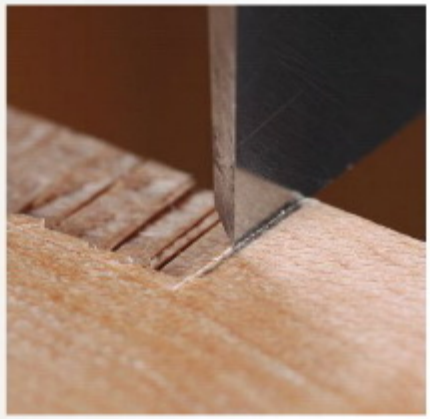




Chop across the grain. *It's easier to control the cut depth this way.*



Work inward to remove the waste. *Start above the scribe line marking the depth and get rid of the waste quickly. Then pare to the line.*

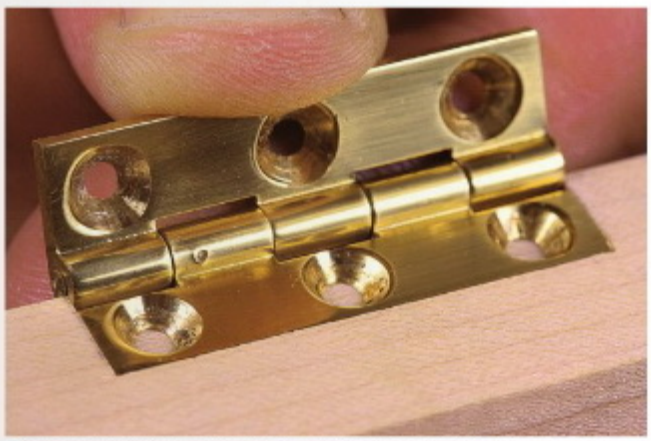


Put the chisel in the scribe line. *This aligns it with the inside of the pencil line, so you pare only wood that should be removed.*

put the bevel of the knife on the line first, with the bevel facing into the mortise. Then move a square up to the flat of the knife. Scribe the line. With this technique, the knife does not damage the wood outside of the mortise, and you get the benefit of having a scribed line to put your chisel into when paring.

After marking the hinge's length, use a marking gauge (the kind with a cutting knife, not a pin) to mark its width and depth. It can be used for those lines because the bevel cuts into the waste. Next, chop out the waste, staying about 1/16 in. inside the layout lines, including the one that marks the mortise's depth. Then, carefully pare back to the lines, by placing the chisel edge into the scribed line and pushing. □

Steve Brown is an instructor at North Bennet Street School in Boston, and is technical adviser to the WGBH television show Rough Cut: Woodworking with Tommy Mac.



No gaps. *This is how a hinge should fit its mortise, and it's proof that pencils can be accurate layout tools.*

Upgrade Your Router with Shop-Built Bases

Four custom bases unlock the tool's versatility

BY JEFF MILLER

A router is a very simple woodworking machine; at its most basic, it's a device that spins a cutting tool. This simplicity is a virtue, however, and is the reason the router is so incredibly versatile.

But the router needs some help to unleash its full power. One way is with custom bases. Once you realize you can attach your own sub-base to a router, you open up many possibilities.

The simple bases in this article help with a variety of tasks: They stabilize the router for otherwise risky cuts, they quickly and cleanly trim furniture components flush, and they make mortising a snap. The cost for this added versatility is a few scraps from your wood bin, and the few minutes it takes to put each base together.

An oversize base for edge profiles

One common routing problem involves cutting edge profiles, an operation that puts more than half the router off the edge of your workpiece. This is manageable when the edge profile is small, but can be quite unstable with a larger router bit.

You gain a great deal of control over the operation with an oversize base, which helps prevent the router from tipping off the edge. This is important because even a small wobble can cause the bit to dig in and dent your perfect profile.

Start with a piece of plywood roughly 9 in. by 12 in. and drill or rout a 3½-in.-dia. hole about 2¼ in. from one end. Drill and countersink holes in the plywood so you can attach it to the router, with the collet centered over the base's opening. If you remove the router's existing plastic sub-base, you can use the holes in it as a template for drilling

Photos: Steve Scott

1 Wide base for edge-profiling

For better balance, a bigger footprint. *An oversize base gives you greater control when routing an edge with large profile bits. Use the router's plastic sub-base as a template for drilling the mounting holes.*

2&3 Two bases for flush-trimming

TRIM EDGE-BANDING

Elevate the base. *Adding a partial bottom layer (above) prevents the base from bumping into the projections you want to trim flush, like the solid edging on the veneered panel at right.*

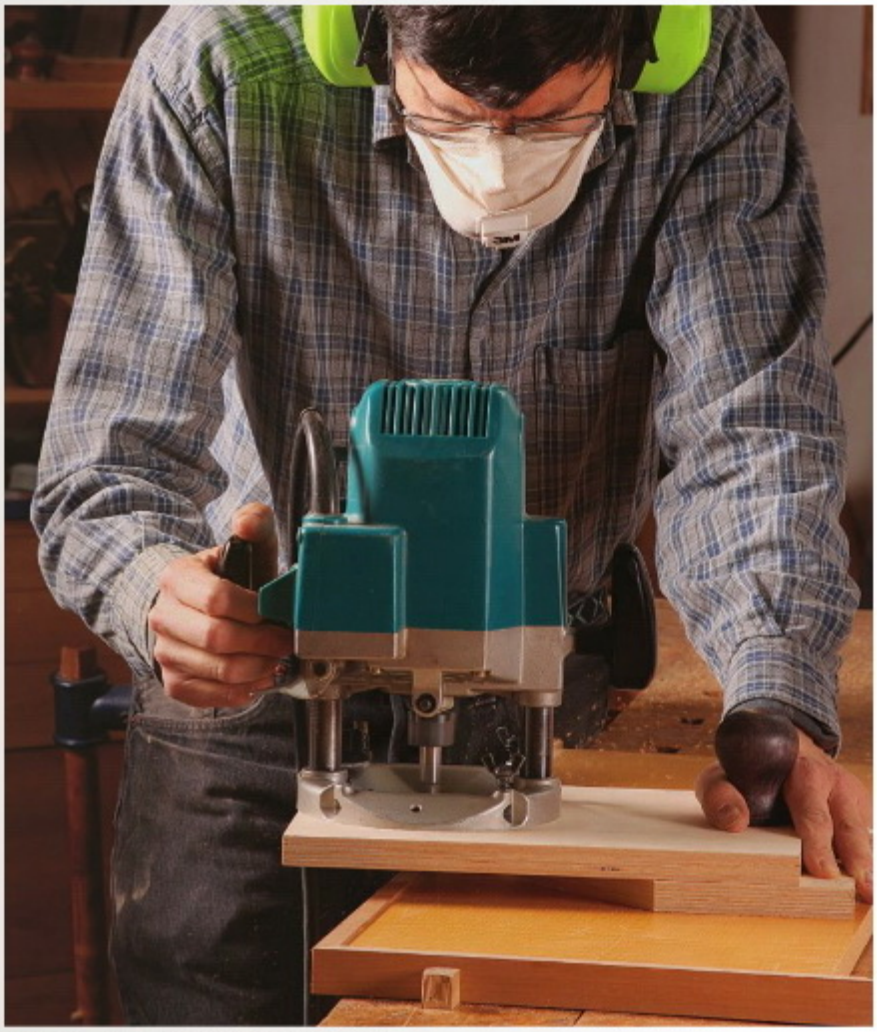
holes in the plywood. You'll need some longer screws that match the thread size on the ones that attach the existing sub-base; bring one with you to the hardware store to be sure you get the right size.

Once you've attached the plywood to the router, add a handle to the top side of the plywood, roughly 2 in. from the end opposite the router. I bolted on a knob from an old router, but a knob from a handplane or the like is perfect, too. Smooth and then wax the bottom of the jig, or use melamine board, or even a scrap of solid-surface countertop material (such as Corian) so the base will move easily on a surface. Rounding over the edges a bit helps, too.

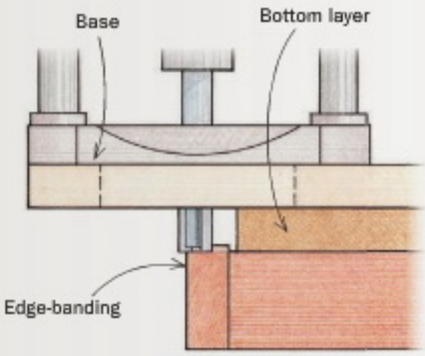
Now you have a base that will give you the leverage to keep the router upright while cutting those edge profiles.

Two bases that simplify flush-trimming

The oversize base can be modified for trimming a row of projecting dovetails or



Trim solid edging. *The angled front on the bottom layer lets Miller work all the way into the corners on this veneered top. He starts with a climb cut on the outermost edge to reduce tearout. The bit is set to leave just a bit of edging to be scraped and sanded flush.*



TIP **A CLEAN CUT FOR DOVETAILS**

A bottom layer with a straight front edge is great for flush-trimming dovetails.

Drawings: Vince Babak

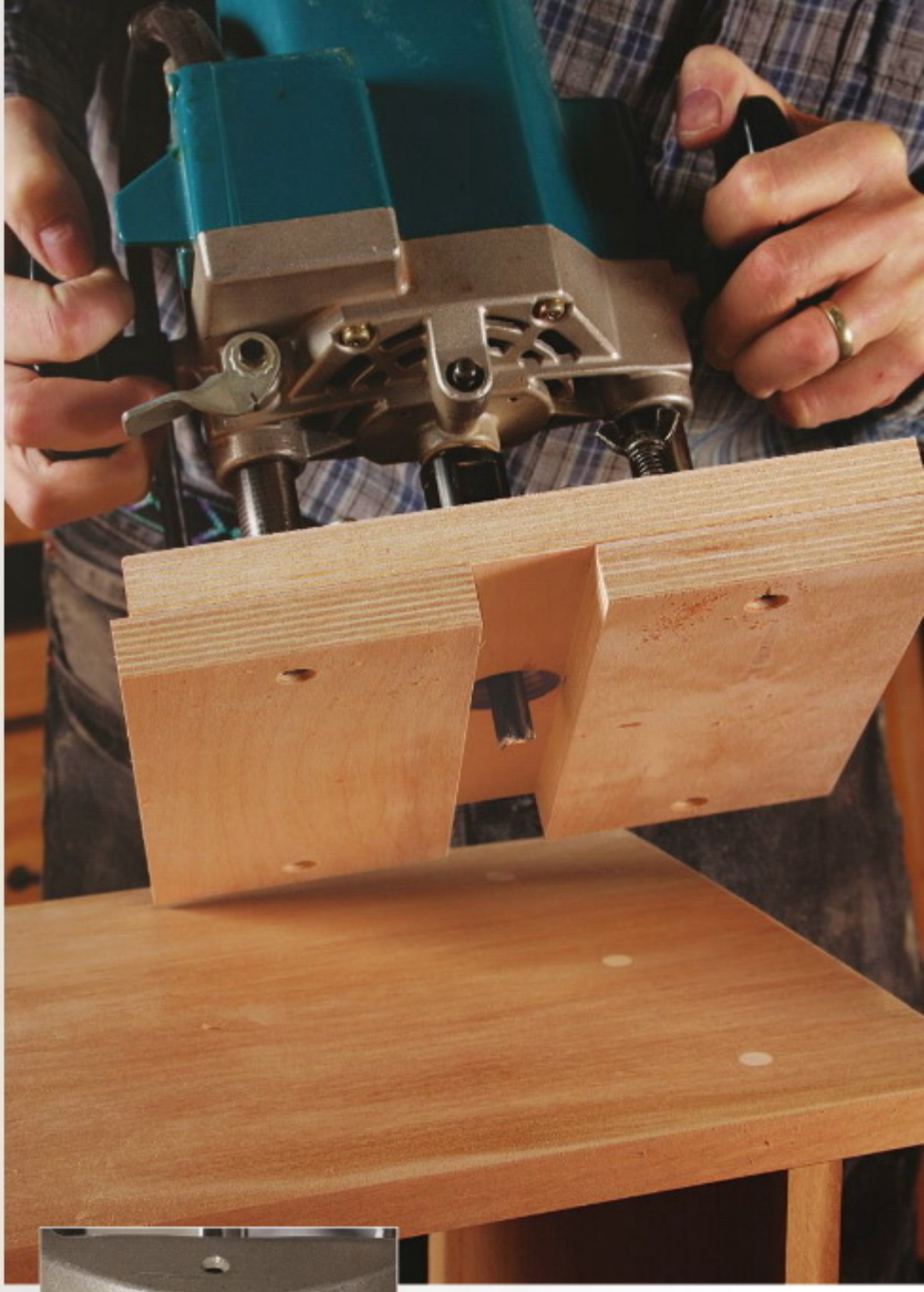
TRIM PLUGS AND TENONS

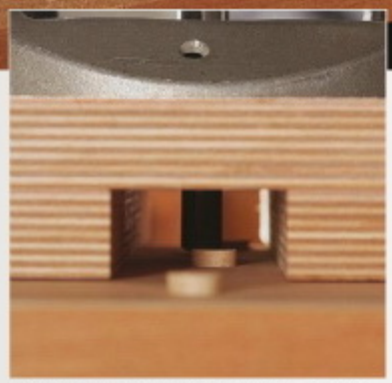
Smaller flush-trimming base. *This square base is great for flush-trimming tenons and pegs. It offers support for the router on both sides of the bit.*

through-tenons on the face of a board. Just add another layer to the bottom of the jig that extends all the way from the side where the handle is to about an inch shy of where the router bit will be. You'll have to press down securely on the handle, but this will give you access to rout off projections, where a standard router base would just bump up against them.

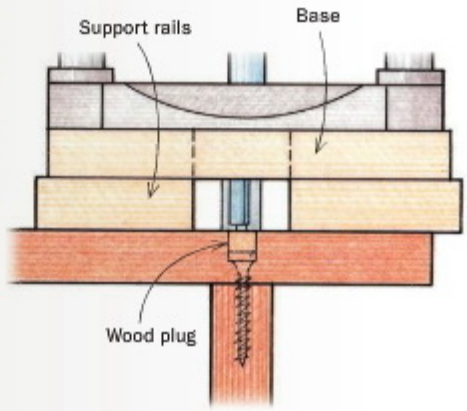
When you need to flush-trim in the middle of a workpiece, make a thicker sub-base that is square and just a little bigger than the base of your router. I made mine out of ¾-in. plywood, first attaching a square layer and then screwing blocks on either side of the bit to create a channel about ¾ in. wide (these dimensions will vary based on the specifics of the task). Set the router bit so it is just above the surface you're trimming down to.

This sub-base will support the router on both sides and prevent any tipping down onto the surface while you level wood



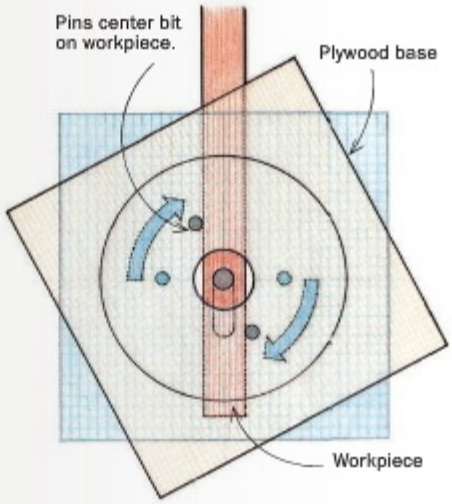


Sure-footed. *The base straddles a series of screw-hole plugs, for example, with the twin support rails preventing the bit from tipping into the work surface.*



4 Make a mortising base

A SELF-CENTERING MORTISING BASE
In use, rotate the router until each pin touches the workpiece for a perfectly centered cut. For mortises near the end of a workpiece, you might need to leave some extra length at first to *support the pins.*



Rotate the router. *When the pins touch the sides of the workpiece, the router bit is centered.*

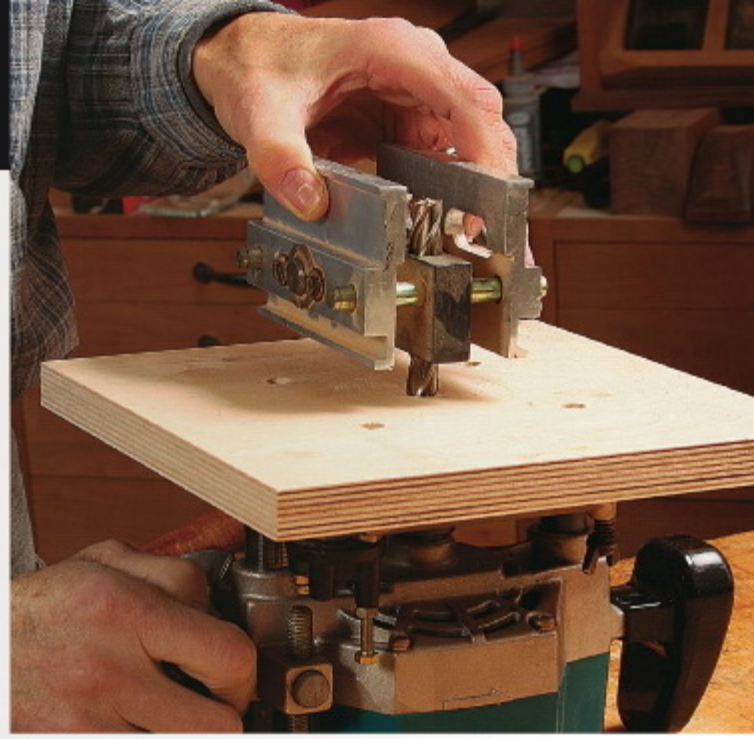
plugs, for example. This base is also handy for pegs or other projections on a narrower surface like a table leg.

Centering base makes mortising quick

Another base, used with a plunge router, makes it easy to center a mortise on a leg or post. The base has two downward projecting pins at equal distances from the bit on opposite sides. The concept is elegantly simple: When you rotate the router so that the pins are touching the sides of the workpiece, the router bit is centered.

SIMPLE METHOD FOR ACCURATE PINS

First, plunge through a square base. *Put a ½-in., plunge-cutting bit in the collet, and plunge down through the base.*



An unlikely layout tool. *With a ½-in. drill bit chucked in the router, Miller uses a doweling jig to locate and drill the pin holes directly opposite one another and equidistant from the bit.*

When building the base, it's crucial to locate the pins accurately. Do this after the base is attached to the router and a hole for the router bit has been plunged through. The distance between the pins should exceed the widest part you're likely to use it for. With the locations marked, remove the base and drill the holes on a drill press. Finally, insert smooth dowels—not the kind with ridges—or metal pins into the holes.

A better way to locate the holes is with a self-centering dowel jig, used in an unconventional way. With the base attached and the center hole plunged, chuck a ½-in. drill bit in your router (you won't be running the router with this, it's just a reference), then place the ½-in. bushing of the doweling jig over the bit. Align the ⅜-in. bushing hole so that it is either across or in line with the axis of the router handles, then position a straightedge against the jig and clamp the straightedge to the base. Drill through the ⅜-in. bushing into the base. Then swing the dowel jig around to the opposite side, use the straightedge to align it, and drill the other hole. You can then enlarge the hole for the router bit to whatever you need. □

Register the jig on a straight strip. *Clamp the strip in place and align the jig with it before marking and drilling the first hole.*

Rotate the jig. *After drilling the first hole, spin the jig 180° to locate the opposite hole.*

Pins center the router. *Add some glue, drive in two ⅜-in. dowels or metal pins, and the jig is done.*

Jeff Miller builds furniture and teaches woodworking in Chicago.

Build a Greene-and-Greene Picture Frame

Shallow carving adds a twist to classic cloud-lift curves

BY KELLY J. DUNTON

A picture frame is an ideal project for a woodworker, regardless of skill level. It requires very little material, so it's inexpensive to build. Plus, it can be built quickly, offering a nice change of pace from complicated furniture projects that can take weeks or even months to complete.

With its rounded edges, stepped sides, square pegs, and distinctive cloud-lift patterns, this Greene-and-Greene-inspired frame resembles a piece of heirloom furniture. But I added a twist to the design by carving around the edges of the cloud lifts, and by using cherry instead of mahogany, which the Greenes favored.

Sturdy mortise-and-tenon joints hold the frame together, while the framed materials sit inside a rabbet. The profiles are cut with a jigsaw or bandsaw and cleaned up with a router and a simple half-template. And the carving, done with a marking knife and chisel, is a good introduction to some basic carving techniques.

Joinery first

The frame fits a standard mat that is 18 in. tall by 24 in. wide. The dimensions can be adjusted for different frame sizes, but check that the framed materials will fit the rabbet. If possible, build the frame from a single board—it will be easier to match the grain patterns and tones of the wood.

Cut the joinery before the curves—it's easier to work on square pieces. I used a hollow-chisel mortiser to cut the mortises on the rails first. Then I cut the tenons on the stiles at the tablesaw using a dado blade, and used a shoulder plane to fine-tune the fit of the tenons. The rabbet runs

Photo, this page: John Tetreault

FAST MORTISE-AND-TENONS

Beefy tenons make this frame stronger than the mitered joints of a typical frame.

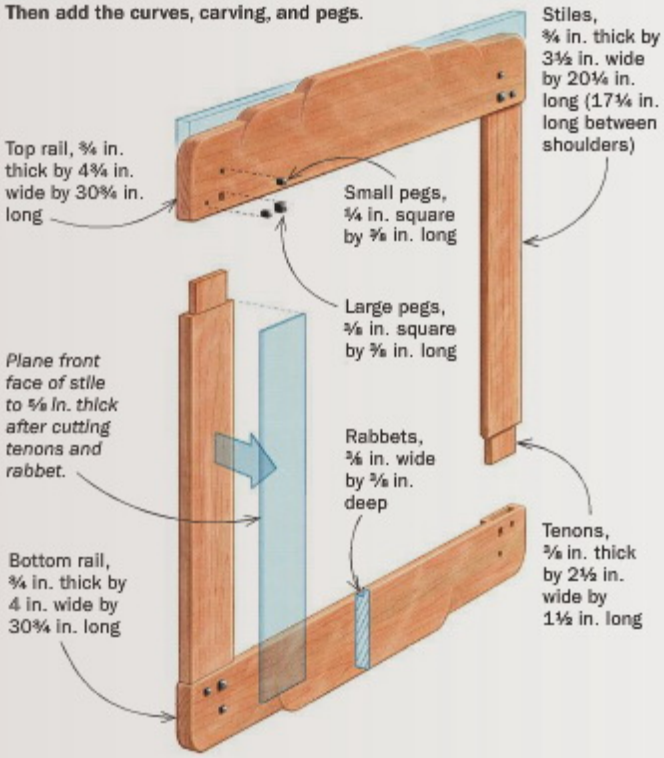
Mortises first. *A hollow-chisel mortiser makes quick work of the mortises, but you can also use a drill press and square the corners with a chisel.*

Dado the tenons. *A miter gauge and a stop block ensure equal shoulder-to-shoulder length.*

Rabbet the stiles. *At the router table, cut through-rabbets on the inside edges of the stiles.*

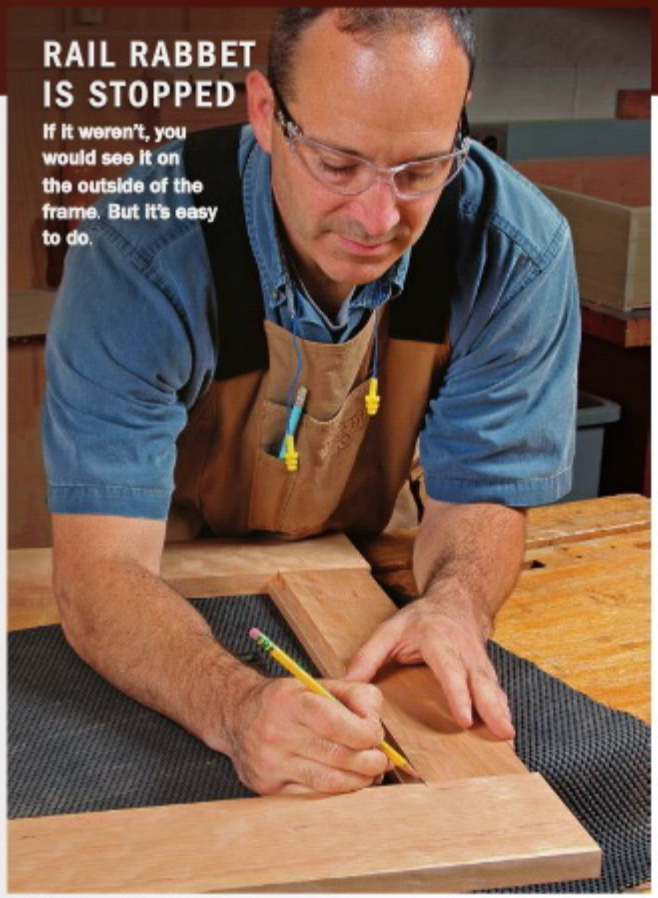
SIMPLE ANATOMY

Leave the pieces square while cutting the joints. Then add the curves, carving, and pegs.



RAIL RABBET IS STOPPED

If it weren't, you would see it on the outside of the frame. But it's easy to do.



Mark the ends. *Dry-fit the frame and use a pencil to transfer the stopped rabbet marks from the stiles to the rails. Carry the marks to the opposite face with a square.*

Line it up. *Mark the edges of the rabbeting bit on the router-table fence and align the marks with those on the workpiece. Pivot in to start the cut and pivot out to stop the rabbet.*

Square the edges. *Mark the ends of the rabbet with a knife and then square them with a chisel. Nibble away, working toward your scribe lines.*

Use a template to rout the profiles

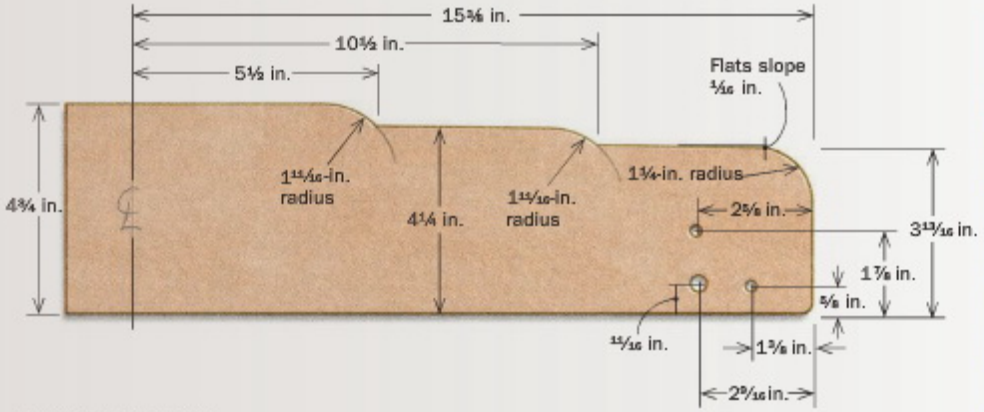
MAKE A PAIR OF HALF-TEMPLATES

The half-templates, made from ½-in. MDF, make it easy to cut symmetrical curves and align the pegs.

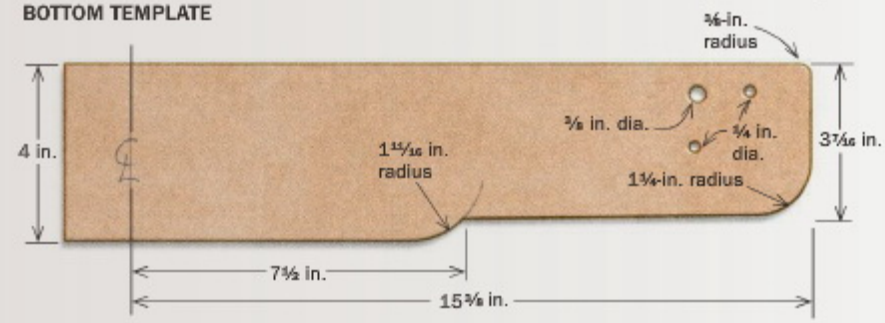
Uncanny curves. *After marking the guidelines on the template, use the bottom of a can to draw the curves.*

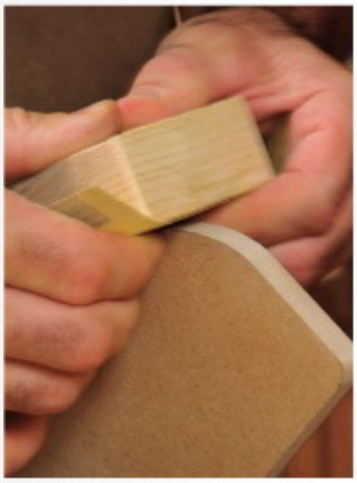
Bandsaw the profiles. *Stay close to the line.*

TOP TEMPLATE

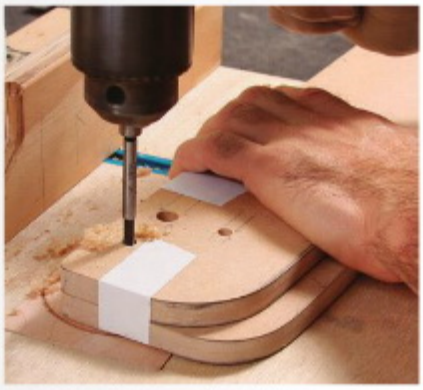


BOTTOM TEMPLATE





Final prep. *Use a sanding block to clean up the edges and shape the templates as perfectly as possible. Defects in the template will transfer to the workpieces during routing.*



Drill holes once. *Mark the peg holes on one template and tape it to the other to drill a matched set of holes.*

the entire length of the stiles, but stops short of the ends on the rails. It's easiest to cut the rabbets at a router table with a ⅜-in. rabbeting bit.

Rabbet the stiles first. Then dry-fit the frame to mark the stopped ends. Disassemble the frame, rabbet the rails, and use a chisel to square the rabbeted corners.

After rabbeting, plane ⅛ in. of material from the top faces of the stiles. The planing gives the frame a layered look—a key Greene and Greene design element.

Half-templates ease curves

The cloud-lift patterns on the rails are another design element of the Greenes. Cut them using half-templates for each rail. The templates ensure both sides of the profile will be symmetrical, and they also locate the holes for the peg mortises.

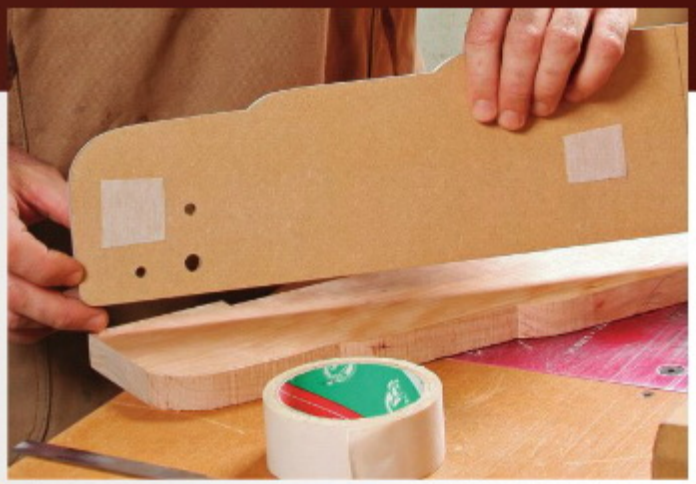
Make the templates from a piece of ½-in.-thick MDF that is the same width as the rail, and a few inches more than half the length. The extra length will help guide the router bit into the cut.

Photos, except where noted: Ken St. Onge; drawings: John Hartman

PERFECT PROFILES

Place the template on each side, aligning it with the centerline.

Lay out the curves. *Mark the profile on both sides of the rails, and bandsaw the curves. Stay about ⅛ in. to the waste side.*



Then stick it on. *Use double-sided tape to attach the template to the rail.*

You can use the scale drawing to lay out the curves on the template, but I just used cans with similar radii. The largest can will also help later when carving. Draw and cut the template with a jigsaw or bandsaw, and clean up the edges with a file or sandpaper. Then drill the holes in the corners.

Align the centerlines of the template and rail, and trace the template onto both halves. Cut away the waste and use double-sided tape to affix the template to the workpiece. Flush-trim the rails to the template with a bearing-guided bit on the router table (see photos, right).

While the templates are on the top faces, use drill bits—Forstner, if possible—as transfer punches to mark the centers of the peg mortises. Cut the holes at the drill press, using a piece of scrap in the frame mortises to prevent blowout.

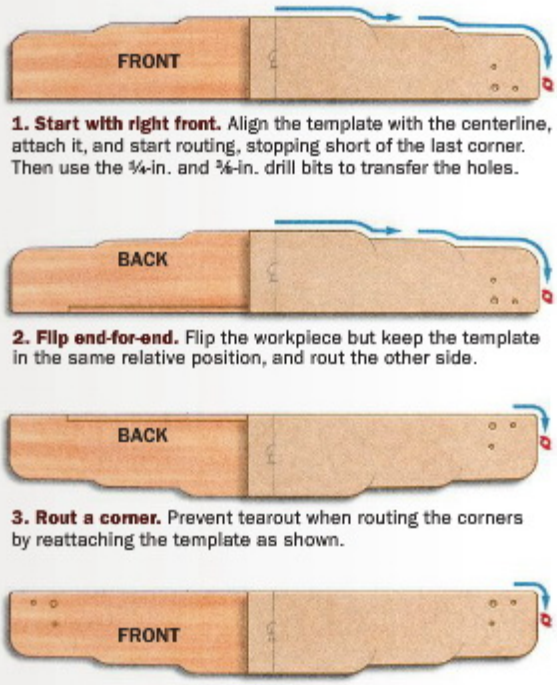
After drilling, use sandpaper or a handplane to surface the workpieces, and round over the edges of the rails and stiles with a handheld router.

Carving complements stepped look

The shallow carving around the cloud lifts extends the line of the curve into the rails, and adds a three-dimensional look to the surface. Start the carving by placing the largest can on one of the inside curves on the frame. Scribe around the can with a marking knife to sever the wood fibers.

Use a 1-in.-wide chisel to pare along the frame's face into the scribed line. Cut deepest at the edge of the frame, and taper toward the middle. You may need to deepen the scribe line with the marking knife. Clean up the carving with sandpaper and round over the edge to match the routed

Rout downhill. *A flush-trimming bit follows the template, but you must rout down the curves to prevent blowing out the grain.*



1. Start with right front. Align the template with the centerline, attach it, and start routing, stopping short of the last corner. Then use the ¾-in. and ⅜-in. drill bits to transfer the holes.

2. Flip end-for-end. Flip the workpiece but keep the template in the same relative position, and rout the other side.

3. Rout a corner. Prevent tearout when routing the corners by reattaching the template as shown.

4. Rout the other. Flip the workpiece end-for-end and reattach the template. Rout the corner and then transfer punch the remaining holes for the pegs.

Transfer punch. *With the template in place on the front of the rails, use drill bits to mark the peg locations.*

Round all the edges. *Round over all edges with a router and a ⅛-in. roundover bit. But avoid the shoulders of the stiles.*

Relief carving

The same can used to make the templates extends the curves onto the frame, and guides the carving.

Scribe the edge. *Line up the can on the profile and continue the curved line. The knife line gives the paring cuts (right) a place to stop cleanly.*

Ease into the line. *Use a 1-in. chisel to pare along the face, into the knife line. Recut the line as needed.*

Crisp curves. *Square up the inside corners left round by the router bit. Then pare along the edge to extend the roundover.*

Square the peg holes. *Drill out the peg holes, inserting a piece of scrapwood into the mortise to prevent blowout. Then square the holes with a hollow-chisel mortising bit or a square hole punch (see below).*

Glue and clamp. *After carving and drilling the peg mortises, brush glue in the mortises only (to avoid squeeze-out) and clamp the frame along the stiles.*

SOURCES OF SUPPLY

Hollow-chisel mortising bits
¼ in. and ⅜ in., $14.50 each

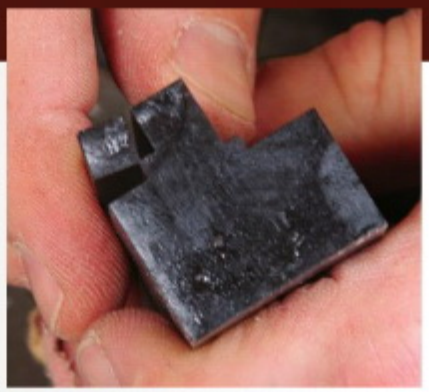
Square hole punches
¼ in. ($25.50), ⅜ in. ($27.50)

leevalley.com

Greene-and-Greene pegs made easy

Cut the pegs from an ebony pen blank and shape them before gluing them in place.

Cut the kerfs. *A thin-kerf blade will make straight cuts with minimal waste—a bonus with expensive, exotic woods like ebony. Dunton uses a scrap piece to hold the block against the fence.*



Not too deep. *Leave just enough material so the ebony strips stay safely attached to the blank on the tablesaw, but snap away cleanly by hand afterward.*

Online Extra

To see Dunton make these pegs, watch the video at **FineWoodworking.com/extras.**

Chamfer first. *Use a block plane and bench hook to chamfer the ends of the stock.*

Soften second. *Pillow the pegs by rounding the chamfered ends on a piece of 320-grit sandpaper on top of a folded napkin.*

Insert carefully. *To avoid squeeze-out, put glue in the mortise only. Then tap the peg down to just the right height.*

edge. After carving, glue up the frame and let it dry for a few hours.

Add pegs to corners

The solid-wood pegs in the frame's corners add a decorative detail to the frame, but they don't actually peg the tenon in place. It's OK; the mortise-and-tenon joints are plenty strong enough for a picture frame.

Greene-and-Greene pegs are gently pillowed, which can be tricky to shape. I've found that the pillowing looks much better if you start with a pyramid-like profile. Start with a square strip cut from a pen blank. Chamfer the ends with a block plane, then round the chamfers by rubbing the ends into a piece of sandpaper. Cut off the pillowed ends with a handsaw to get the pegs.

Apply a dab of glue to each peg and set it in place with hand pressure. The pegs should sit evenly, so when gluing be careful to avoid sinking them too deeply. I find it's easiest to set all three in place and then tap each one down a little at a time until they are about equal height from the surface—about 1/16 in. higher than the face.

Finish the frame with a washcoat of shellac, and two to three coats of Minwax Antique Oil finish. □

Kelly J. Dunton is an associate art director.

Photos of bits and ebony blank, this spread: John Tetreault

Sharpen Jointer Knives in Place

Get better cuts and spend less time fiddling with your machine

BY HENDRIK VARJU

Sending jointer knives out for sharpening is inconvenient enough, but I've also been unhappy with the results. I've tried half a dozen sharpening services over the years, and the edges were rarely very fine and often quite coarse. Also, re-setting the new knives to perfection is a time-consuming and tedious task—time I'd much rather spend woodworking. For years, I've been trying to devise a reliable way to get really sharp knives without having to remove them from the cutterhead. Any freehand method wasn't accurate enough. And then I came up with this jig. It is simple to make and can be adapted easily to your own machine's dimensions.

This DIY sharpening doesn't completely replace the need for a sharpening service. If your knives get large chips, it's best to have a sharpening service do the heavy grinding work. However, a hobbyist who uses his machines carefully should get years of use before having to remove the knives.

Hendrik Varju builds furniture and teaches woodworking near Toronto, Canada. His website is passionforwood.com.

Online Extra

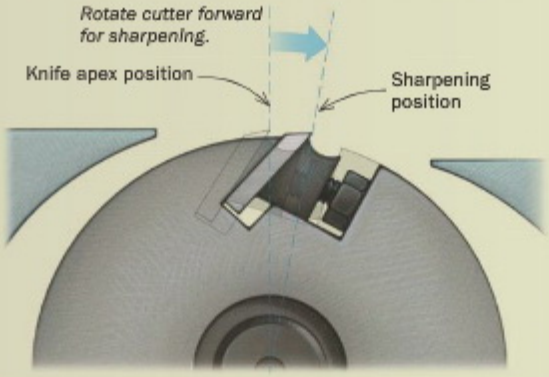
The concept works on planers, too! To see Varju's jig for planer knives, visit **FineWoodworking.com/extras.**

Photos: Mark Schofield; drawings: Christopher Mills

1. Lock the head in place

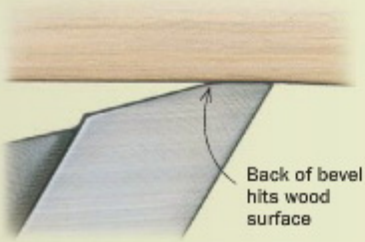
To ensure that each of the knives is sharpened at the same angle and left at the same height, it is critical that the cutterhead is locked in the same position when each knife is sharpened. The jig does that.

RELIEF ANGLE IS THE KEY



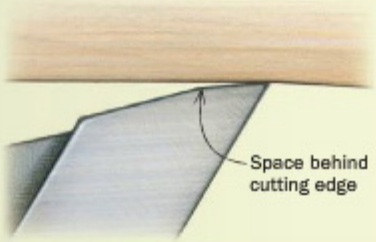
WRONG: BLADE SHARPENED AT APEX

If you sharpen the knife when it is at its apex, the microbevel will rub on the wood and the knife won't cut well.



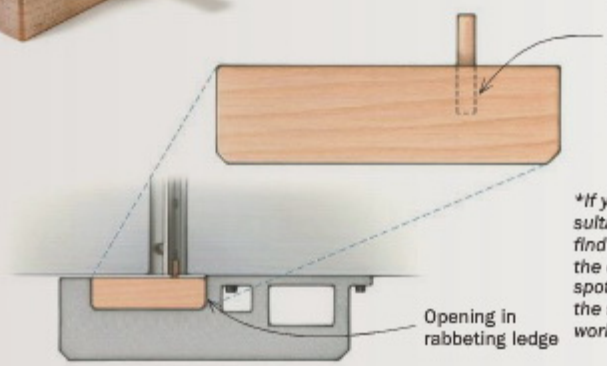
RIGHT: BLADE SHARPENED FORWARD OF APEX

If you rotate the knife forward, the microbevel is shallow enough to clear the workpiece but still provide a strong edge.



MAKE A JOINTER LOCKING JIG

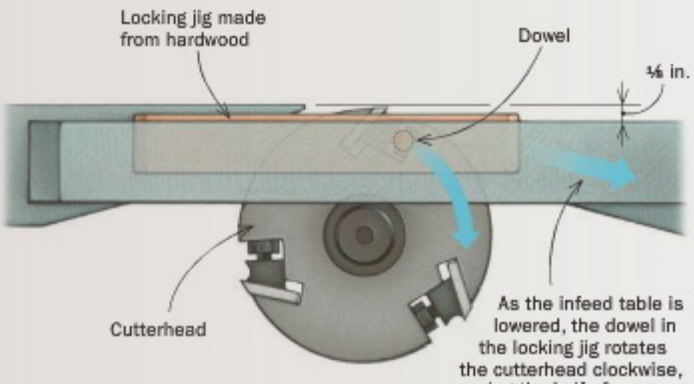
The hardwood body goes into the opening in the rabbeting ledge adjacent to the cutterhead. The fit should be snug enough to avoid any slop but still be easily removable.



**If your jointer doesn't have a suitable opening, you'll need to find another method of securing the cutterhead in the exact same spot for every knife rotation, but the sharpening technique will work equally well.*

Insert locking jig. *With the machine unplugged, the infeed table all the way up, and one of the knives at its apex of its arc, test-fit the jig.*

LOWER THE INFEED TABLE ⅛ IN.



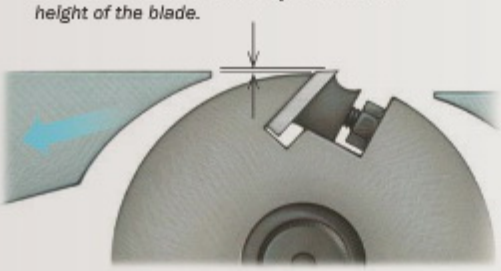
Move the table. *This will rotate the knife forward, so it ends up about ⅛ in. below a block of wood representing the sharpening stone. Now you can hone the bevel at an angle that won't rub on the workpiece.*

2. Hone a microbevel

Your aim is to remove only enough metal to get rid of any small nicks in the knife. This secondary bevel should be much smaller than the main bevel.

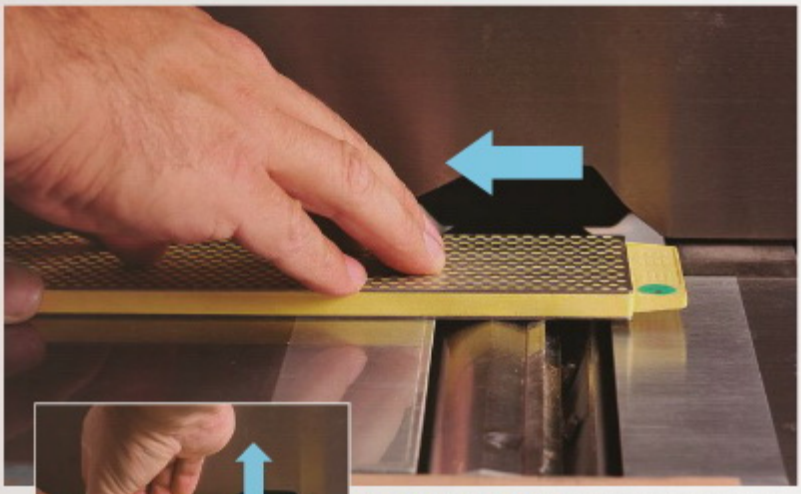
NOW LOWER THE OUTFEED TABLE

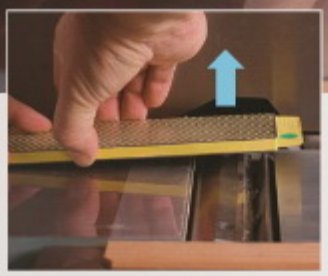
Position the outfeed table to just below the height of the blade.



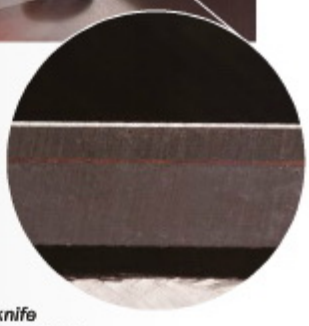
Protect the table. *Apply some self-adhesive, plastic laminate sheet (leevalley.com) to the start of the outfeed table. This will protect it from the sharpening stones. If you are just lightly honing the knives, clear packing tape works fine.*

Set the depth of cut. *Lower the outfeed table until a block of wood (representing the sharpening stone) just touches the knife. A strip of copier paper should just slip under the wood at the start of the outfeed table.*





Sharpen the knife. *Place the fine (600-grit) side of the diamond stone on the knife with about half its length on the outfeed table. You can also use water- or oilstones, or sandpaper on plywood. Draw the stone toward the outfeed table, to avoid creating a burr (below, left). Lift the stone back over the knife and repeat the step.*

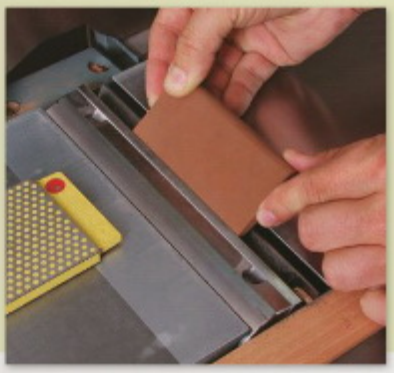


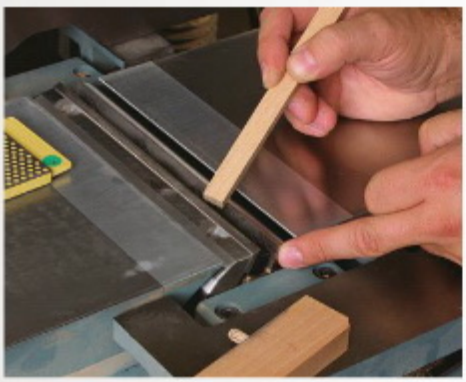
Check your progress. *Before switching to the 1,200-grit side of the stone, use a magnifying glass to check the microbevel. The width doesn't have to be uniform, but it must extend along the full length of the knife (inset). You will automatically stop cutting when the tip of the knife is no longer proud of the outfeed table.*

TIP

BURR BE GONE

If you only move the stone from right to left, you won't create a burr on the flat side of the knife. If you go from left to right and create a tiny burr, it is easily removed with a small slip stone.





Next knife. *Without adjusting the tables, remove the locking jig, rotate the cutterhead to the next slot, and reinsert the jig to lock the second knife in the same position. When all the knives are done, raise the infeed table, then the outfeed table until snipe disappears.*

Tablesaws Under Siege

U.S. government considers flesh-sensing technology for all tablesaws, but is that feasible?

BY THOMAS McKENNA

The tablesaw is a cornerstone tool in the majority of home and pro shops, and for good reason. Its versatility is unmatched—it rips and crosscuts, it cuts tapers and bevels, and it handles a number of essential joinery jobs, from dadoes to tenons. But the saw has a built-in risk: an exposed blade that spins at around 4,000 rpm.

There's no license required for using a tablesaw, but with a bit of know-how and attentiveness, and some kind of splitter behind the blade, the tool can be used safely. However, the number of tablesaw accidents is staggering, averaging 36,400 a year (from 2001 to 2008), according to statistics compiled by the Consumer Product Safety Commission (CPSC).

Those numbers, combined with the estimated cost of treatment for those injuries reaching into the billions per year, have compelled the CPSC to consider making radical changes to tablesaw safety rules. The most controversial is the possible mandatory inclusion of flesh-sensing technology—like that developed by SawStop—that will halt the blade upon or before contact.

The clock is ticking. On Oct. 5, 2011, after years of research, the CPSC issued an advance notice of proposed rulemaking (ANPR), giving the public 60 days to comment about whether new safety standards are needed and whether they should be mandatory or voluntary. If made mandatory, such a ruling will have huge consequences on makers of tablesaws, especially those whose bread and butter are lightweight benchtop saws common on construction sites. The Power Tool Institute (PTI), a trade association of U.S. portable and stationary

Online Extra

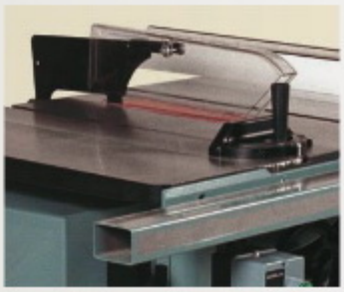
To join the debate and get breaking news on the tablesaw ruling, go to **FineWoodworking.com/extras.**

Tablesaw timeline

1939

Unisaw sets the standard for American saws. *Introduced in 1939, the Delta Unisaw features a blade guard and splitter by 1949, as shown in this catalog image.*

1971



U.S. safety mandate. *The UL issues a mandate (UL 987) on safety gear, adding anti-kickback pawls to the traditional gear—not much of an improvement.*

1996

Riving knives required in Europe. *Common on European saws for decades, this effective anti-kickback device was not adopted by U.S. manufacturers.*

power tool manufacturers whose members account for about 85% of all tablesaws sold in the United States, said the cost of compliance with that ruling could eliminate portable tablesaws from the market. A benchtop saw with flesh-sensing, blade-braking technology has not been proven in the marketplace, though SawStop has built a prototype and says that a production model will be ready by next summer.

The ruling would not just affect benchtop saws. It would require entire tablesaw lines, including contractor and cabinet models, to have the technology, raising prices on all saws. To avoid costly changes to the industry, and since SawStop saws already are available for people to choose, the PTI is urging the CPSC to make the standard voluntary.

So how did the CPSC and tablesaw manufacturers come to this crossroads? For the answers, we have to flip the calendar back more than 20 years.

Spotlight on tablesaw injuries

The CPSC had been looking at the incidents of tablesaw injuries since the early 1990s. Alarmed by the numbers, the agency presented injury data to tablesaw manufacturers and Underwriters Laboratory (UL) in 1998, hoping they would update the voluntary safety standards (UL 987) to reduce the number of injuries.

At the time, the voluntary standard stated that all tablesaws should have a guard that consists of a hood that encloses the blade, a spreader, and some type of anti-kickback device, typically pawls. That outdated equipment had been on saws since those standards were written in the early 1970s and clearly it wasn't working. You don't have to be a *Fine Woodworking* editor to know that many woodworkers discarded those old, inconvenient systems, or that European saws had superior safety guards for years that included riving knives.

To respond to the CPSC concerns, the PTI implemented a training program, utilizing primarily videos distributed to shop classes and woodworking seminars about how to use tablesaws safely.

Enter the inventor

In 1999, Stephen Gass, a patent attorney and amateur woodworker, had an idea that could make tablesaws dramatically safer. Putting his doctorate in physics to work, he designed the SawStop device, which uses sophisticated electronics to sense contact with human flesh and then trigger a brake system that stops and retracts the blade fast enough to prevent an amputation or other catastrophic injury.

In June 2000, at a meeting with the CPSC, UL representatives agreed to look more closely at ways to improve tablesaw safety, according to CPSC documents. Later that summer, Gass and his partners, David Fanning and David Fulmer, unveiled the SawStop technology at IWF in Atlanta, demonstrating it on a hotdog. SawStop won the IWF Challengers Award, which recognizes companies that make significant advances in woodworking technology.

In October, Gass demonstrated a SawStop prototype for Ryobi representatives in Anderson, S.C. He also gave Ryobi a prototype to test. Gass wasn't interested in selling the technology to just one company. Instead, he was looking for a larger sales opportunity and to change the industry for the better, he said. "We did not want to see it on just one brand of saws," he said, "and so we were unwilling to give an exclusive license to any one company. It was our feeling that this technology, like air bags, should be on every saw."

In 2001, Gass sent the CPSC a prototype of the SawStop. After testing it, the CPSC awarded SawStop the Chairman's Commendation for product safety.

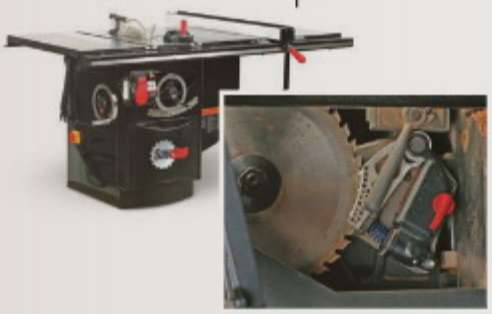
While negotiations with Ryobi went on, Gass said he pitched his product to other tablesaw manufacturers, asking for what he considered a low 3% royalty at first, to help offset the additional costs of incorporating the technology. That royalty would increase if more tablesaw makers adopted SawStop (when market share reached 25% the royalty would go to 5%; 75% share would increase the royalty to 8%).

To avoid litigation, manufacturers believed they would have to equip every saw in their lines with the new technology, a process that would require redesigning the saws and retooling the factories where they're made. And yet Gass's invention hadn't yet been proven to work in the real world. It was a tough decision.

In 2002, SawStop and Ryobi came close to a licensing agreement. However, the deal was never closed, and people involved in the negotiations differ as to why. According to witnesses who testified in a recent legal case (Osorio vs. One World Technologies, Inc.), Ryobi chose to work with other members of the PTI on a joint

Photos, except where noted: staff

2004 2005 2011



SawStop hits the market. *After failing to come to terms with the existing manufacturers, Gass rolls out his own line of saws with his innovative safety device inside.*

Riving knives become standard in the United States. *The rest of the tablesaw industry, working with the UL, updates UL standard 987 to include riving knives as part of all guard systems.*

Controversial verdict. *A Massachusetts jury awards $1.5 million in damages to a worker injured on a Ryobi tablesaw in 2005.*

venture to design a flesh-sensing alternative to SawStop, as well as a better guard system. David Peot, former director of advanced technology for Ryobi, testified that such cooperation among PTI members was unprecedented. "The people who belong to the Power Tool Institute are very fierce competitors. Never in my 30, 35 years of working with [them] had I ever been exposed to something where they said 'let's get together and develop something.' "

After the Ryobi deal fell through and with no responses from other tablesaw makers, Gass and his partners decided to develop their own brand. While they were working with designers on a saw, Gass and his partners petitioned the CPSC in 2003 to do something about the large number of tablesaw accidents that were occurring yearly, asking for a ruling that would require all tablesaws to have some sort of flesh-sensing technology and blade-stopping device.

In 2004, SawStop rolled out its first saw. Then, in the spring of 2005, an accident on a Lexington, Mass., job site cracked open the floodgates on the tablesaw safety debate and its legal fallout.

As this issue goes to press, there are 50 other tablesaw lawsuits pending

Osorio vs. One World Technologies

Carlos Osorio moved to Boston in 2003 from Colombia. Trained as a computer technician in his home country, he was unable to find similar work in the United States. On a recommendation from a friend, he took a job in April 2004 with P.T. Hardwood Flooring in Massachusetts, working as an installer and repairman. The 24-year-old had never been exposed to power tools until that job and was trained on the go.

A year later, on April 19, 2005, Osorio was using a Ryobi BTS 15 benchtop tablesaw to rip a piece of hardwood flooring to size. He testified that he was using the saw on the floor, that both the blade guard and fence were removed, and that he was making a tapered cut freehand. Clearly, he was using the tool improperly. Osorio also testified that he'd never seen a saw on the job that had the guard or fence in place.

As he fed the workpiece, it jammed and vibrated on the first try. He turned off the saw, cleaned sawdust and chips from the saw's throat and top, and tried again. Like before, the workpiece started chattering, but instead of turning off the saw, Osorio pushed harder. Before he knew it, the workpiece had kicked back and his left hand had plunged into the blade.

Osorio endured multiple operations to repair his mangled hand and in 2006 his insurers filed a lawsuit on his behalf against The Home Depot, the seller of the saw, and One World Technologies, the parent company of Ryobi, to recover damages. In cases like this, the victim, or plaintiff, gets whatever money is left over after the insurance company gets reimbursed and all legal fees are paid.

When the suit finally reached the courts in February of 2010, the jury ruled in favor of Osorio, awarding $1.5 million in damages from Ryobi—The Home Depot was found not to be liable. Ryobi appealed, but the decision was upheld Oct. 5, 2011, the same date the ANPR was issued.

The jury ruled that Osorio was 35% at fault but that the tool he was using was unsafe because it didn't have a flesh-sensing/blade-stopping device on it—technology that was available when the BTS 15 was made. As this issue goes to press, there are at least 50 other tablesaw lawsuits pending against various manufacturers. We've even seen an ad for a law firm saying, "Injured in a tablesaw accident? You may be entitled to compensation."

Manufacturers weigh in

So why didn't companies add SawStop in 2001/2002? The individual manufacturers I contacted were tight-lipped about it all, citing pending litigation. However, the PTI has a lot to say about the topic. Their first argument has to do with the injury statistics presented by the CPSC.

Do the numbers tell the whole story? The CPSC gets its data from its National Electronic Injury Surveillance System (NEISS), which collects patient information from NEISS-associated hospitals for each emergency visit from an injury related to consumer products. From this sample, the total number of product-related injuries is estimated.

According to NEISS data collected from 2001 to 2008, there were an average of 36,400 tablesaw injuries per year. In that same time period, the PTI claims, tablesaw sales had risen while the injury numbers

Tablesaw timeline

2012?

Benchtop SawStop. *Gass has long disputed claims that a durable, portable benchtop saw can't be made with the SawStop technology inside. Shown here is a prototype for a model he plans to have ready for production next summer.*

remained relatively stable, meaning the number of injuries is actually declining.

The PTI said 800,000 saws have been sold since 2007 that meet the updated voluntary standard (UL 987), which includes an improved blade-guard design and riving knife. They point out that there have been no studies of that group of saws to determine the impact of the new guard system and any injuries associated with those new saws.

Will SawStop work in a benchtop tool? During the Osorio trial, witnesses for the defense claimed that SawStop would not work on a small benchtop saw. They cited structural issues with the tool, namely that the saw is too light to withstand the force of stopping the blade and bringing it below the table. Peter Domeny, a defense witness and the former director of safety for Bosch, who also served as a chairman of the PTI's product liability committee, said adding SawStop would drastically change the size and engineering of a benchtop saw, making it heavier and less mobile.

Gass's own testing at the time, however, indicated to him that the technology was "perfectly viable" in a benchtop saw. He now has a prototype built, ready for evaluation in the field. He said the production model will be unveiled this summer and estimates the cost of the saw to be under $1,000. A benchtop saw without SawStop runs from about $100 on the low end to $600 for a high-end machine

At what price, safety? One of the key arguments during the Osorio trial was the cost of putting the SawStop technology on a tablesaw. Gass and Domeny both testified that SawStop would add about $150 to the wholesale price of a saw.

That increase may be less painful with a cabinet saw that already retails in the $1,000 to $3,500 range. But raising the price becomes more of an obstacle with less-expensive saws. With the retail price being two to two and a half times the wholesale price, said Domeny, the cost of a saw that used to be $179 (the price of Ryobi's BTS 15) would jump to more than $500. That's too much, said the PTI, for a tool that has a short life span (about six years, said the PTI) due to its exposure to the elements and transport from job site to job site.

The PTI claims that the cost of the replacement cartridge ($69) and blade ($50 to $100), which gets destroyed when the device fires, is prohibitive. They also say that Gass' royalty fee "demands" are excessive.

Gass dismissed the arguments about increased manufacturing costs in an online Q&A with *FWW* editor Asa Christiana. "If tablesaw manufacturers had to pay for the injuries occurring on their products," he said, "something like SawStop would have been incorporated on every saw long, long ago."

Is SawStop a monopoly? Domeny revealed during the Osorio trial that engineers from Bosch had started working on their own flesh-sensing technology and blade-braking system back in 2002. "We were interested in a technology that can prevent the accident using similar principles," he said, "but not to rely on a contact system, where you have to get injured in the first place before the system mitigates the degree of injury."

Their system used a "pyrotechnic propellent" to bring the sawblade below the table in a flash but didn't destroy the blade in the process. Domeny said the cost of a replacement propellent cartridge would be about $15. The project was handed over to the joint venture group of the PTI but was stopped because, the PTI said, "introducing this technology will result in costly patent infringement litigation (estimated to be at least $7–$10 million for each party) with uncertain outcomes."

The PTI also said Gass has a monopoly on the flesh-sensing patent arena, claiming he owns 70 patents relating to the SawStop technology and that many are too broadly written. Gass admitted owning 70 patents, but he said, "I would guess that a little more than half our patents relate to the SawStop technology on tablesaws."

The ball is in CPSC's court

Now that the CPSC has issued its ANPR, the public has 60 days to send the organization comments and opinions about whether the flesh-sensing standard should be voluntary (added to UL 987) or mandatory. The CPSC says it will consider the economic impact of the ruling on the industry, and will not recommend one technology over another, though it remains to be seen if manufacturers will be able to meet the standard without violating Gass's patents.

The PTI has made it clear how they will respond to the ANPR, encouraging the CPSC to "work with the power tool industry and others in the table saw community to promote safety through the voluntary standard process."

Gass prefers a mandatory standard. Because the voluntary standards are written by manufacturers, he said during the Osorio trial, "it's a completely perfect example of the fox guarding the henhouse. They write the standards and then they come to court and try to use them as a shield to protect themselves and say, 'we met the standards.'"

FWW will also send a response to the CPSC. There are too many unresolved questions for us to take sides, but our editors and experts can shed valuable light on the real-world implications of tablesaw safety gear, including the new riving-knife systems. Then, like everyone else, we'll wait for the ruling. We'll update this story on FineWoodworking.com as it develops. □

Thomas McKenna is a senior editor.

Photo, this page: courtesy of SawStop

TOOL TEST

Waterstones

They're the best choice for honing sharp edges

BY CHRIS GOCHNOUR

After many years of experimentation, there's no doubt in my mind that waterstones are the best choice for honing chisels and handplane blades. They produce a finer polish than both oil and diamond stones, and are more durable and less expensive (in the long run) than sandpaper.

Natural waterstones have been quarried for centuries and have always been highly prized, but the supply has diminished. Good ones are difficult to find and can be very expensive. However, synthetic waterstones are widely available and more affordable. There are so many for sale at woodworking stores, in catalogs, and online, that it's not easy to know which one to buy. In fact, that's why the editors at *Fine Woodworking* asked me to test them.

Bear in mind that waterstones are best used for honing a small, secondary bevel, not grinding the primary one. So, I looked at the three grits I use to hone: 1,000, 4,000, and 8,000. Some manufacturers don't make stones in those exact grits, so I used an equivalent grit in those cases. Also, one set had only two stones (1,200-grit and 8,000-grit) based on the recommendation of the retailer.

Synthetic waterstones have a reputation for dishing quickly, and you can't get a flat, straight cutting edge from a dished stone. So, the first thing I evaluated was how quickly they dished and how fast I could re-flatten them. I then tested how

The 4 things that matter most

You want a stone that is easy to keep flat, cuts quickly, and sharpens your tools well enough for woodworking. Our tests were designed to find the waterstones that fill that bill.

1 HOW FAST DOES IT DISH?

A dished stone won't sharpen edges consistently, so one that dishes quickly will need frequent flattening.

Gochnour started with a flat stone. *After setting up on a flat surface—a jointer outfeed table—he zeroed out the dial indicator, referencing off the stone's center point.*

He worked the center. *Gochnour took 300 strokes with a plane blade in a honing guide. He added a 4-lb. weight to the guide so that the pressure was consistent through all of the tests.*

And finished with a second reading. *After re-marking the center of the stone, Gochnour took another reading with the dial indicator to determine the amount of dishing.*

quickly they sharpened both O1 (standard high-carbon tool steel) and A2 (a tougher alloy) blades. Finally, I used them to sharpen plane and chisel blades, and used those tools to take shavings from end and edge grain, as the ultimate real-world test. Results from all of the tests are in the chart on pp. 56-57.

Durability and maintenance

To see how quickly the stones dish, I based my methods on the elegantly simple ways that Lee Valley tests the waterstones they are considering for sale. I started by flattening the stones with a diamond lapping plate. Then I measured their height with a dial indicator. Next, I took the stones over to my workbench, and dished them with a plane blade (see photos, above). After that, I measured the stones' height again, which told me how much material had been removed. All of the 1,000-grit stones dished. However, none of the 8,000-grit stones dished enough for me to measure, which means you won't need to flatten them as often.

After the stones were dished, I flattened them with the diamond lapping plate, counting the number of strokes it took to do it. Because the 8,000-grit stones showed no measurable dishing, I didn't do the flattening test on them.

2 IS IT EASY TO FLATTEN?

All waterstones do inevitably dish, so you want one that's quick to flatten.

The disappearing lines test. *Gochnour drew a crosshatch pattern over the stone and then rubbed a diamond flattening plate over it until the marks were gone, counting the strokes as he went.*

Honing speed

Next, I tested the stones to see how quickly they cut both A2 and O1 steel. The test for both the 1,000-grit and 8,000-grit stones was essentially the same. I put a blade in the honing guide, set to 25°, and honed it to get an even surface on the bevel. Next, I scratched the bevel, taking both back-and-forth strokes along its length and diagonal strokes, which stand out better. Then I counted the number of strokes it took to remove the scratches on each stone.

I tested the 8,000-grit stones the same way, except I scratched the blade with a 2,000-grit Shapton Glass stone. I evaluated the bevel after 100 strokes, noting the amount of scratching still present and the quality of the polish.

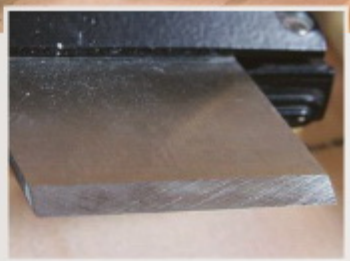
Performance

The next stage of testing looked at the performance of the edges produced by each set of stones. To sharpen each blade, I used the 1,000-grit stone until a burr formed on the back, I refined the edge with the 4,000-grit stone, and then I polished the edge and

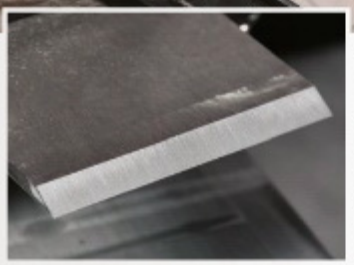
Photos: Matt Kenney

3 HOW QUICKLY DOES IT HONE?

The less time you spend honing, the more time you spend woodworking. Gochnour tested the 1,000 and 8,000-grit stones on both O1 and A2 blades.



Scratch test. *To test each stone, Gochnour first used it to polish the entire bevel, then scratched the bevel on a rougher stone. Last, he returned to the original stone to polish out those scratches.*



How many strokes? *Gochnour checked his progress regularly to see how long it took for the stone to get rid of the scratches. A consistent scratch pattern over the entire bevel was the telltale sign that the job was done.*

removed the burr with the 8,000-grit stone. I started with an end-grain paring test, using an O1 steel paring chisel to take a shaving across the end grain of a basswood board. First, I clamped the board in a wooden clamp so that its end stuck up 0.013 in. above the clamp. I rested the chisel on the clamp's jaws and pushed it across the entire width of the board. After removing the shaving, I graded the quality of the surface left behind.

I then did an end-grain planing test, using a Veritas low-angle jack plane with an A2 blade. I clamped a 1-in.-thick by 12-in.-wide piece of cherry in my bench vise and took a full-width shaving (0.003 in. thick) across the end grain. In addition to evaluating the surface quality left afterward, I also considered how much force was needed to push the plane across the board.

For the last test, I used a Lie-Nielsen No. 5 jack plane with an A2 blade to plane a 0.001-in.-thick shaving from the edge grain of a 1¼-in.-thick by 84-in.-long cherry board. I assessed how much effort it took to push the plane, how easy it was to get a continuous shaving, and the surface quality left by the blade.

The bottom line

Every set of stones I tested is capable of producing a cutting edge good enough for the finest woodworking. And after all of the testing, I couldn't pick just one set for best overall, because three stood out: Naniwa Chosera, Shapton GlassStone, and Sigma Power. The differences among these sets is very small. The Chosera stones performed extremely well, but the 1,000-grit stone dished

4 THE ULTIMATE TEST: PERFORMANCE

Gochnour used three real-world tests to see if blades sharpened with the stones left tearout, rough grain, or any other defects.

End-grain paring is a tough job. *It takes a very sharp edge to slice end-grain fibers cleanly, especially in softer woods like this basswood.*

It's not easy for a handplane, either. *Gochnour took a continuous shaving from the end of a wide cherry board.*

Long grain, too. *The goal was to get a thin edge-grain shaving the full width and length of a 6-ft.-long cherry board.*

THE FINAL CUT

All of the waterstones produced an edge suitable for fine woodworking, leaving smooth surfaces with no tearout. It's also clear that it takes longer to sharpen A2 blades than it does O1 blades, but the same stones that do well on the one tend to do well on the other. When it comes to maintenance, none of the 1,000-grit stones were a burden to flatten. Even the most dished ones can be done in less than a minute. And the polishing stones—the highest grit, which matter most—dished so little that we couldn't measure it. So, you'll hardly ever need to flatten those. All that being said, Gochnour's tests discovered significant differences between stones.

slightly more. The Shapton GlassStones didn't cut as quickly, but dished the least and performed great, too. Like the coarse Shapton, the Sigma Power 1,000-grit stone dished just one thousandth of an inch. The Sigma stones cut faster, but didn't perform quite as well as the Chosera and Shapton stones. Mind you, we are talking tiny degrees here.

My choice for best value is the set from Japan Woodworker, which has two stones: a Bester 1,200-grit and the Kitayama 8,000-grit. This set is proof that two stones can do the job of three. And they are a great deal at $153 for the two. On the downside, the coarse stone did dish the second most. If you already have a set of waterstones and want to replace only your polishing stone, or if you need to add an 8,000-grit stone to your arsenal, I recommend getting the Naniwa Chosera, Shapton, or Sigma Power. A fourth alternative is the Naniwa Superstone 8,000-grit. It performed very well as a polishing stone, and is a great value at $70. □

Chris Gochnour is a furniture maker in Salt Lake City, Utah.

NAME	STONES TESTED	STREET PRICE	DISHING
Bester/Imanishi leevalley.com	1,000, 5,000, 8,000	$47,$59, $74	0.006 in.
BEST VALUE **Bester/Kitayama** japanwoodworker.com	1,200, 8,000*	$59, $94*	0.002 in.
King leevalley.com	1,000, 4,000, 8,000	$27, $29, $63	0.002 in.
BEST OVERALL **Naniwa Chosera** toolsforworkingwood.com	1,000, 5,000, 10,000	$87, $140, $266	0.002 in.
Naniwa Superstone toolsforworkingwood.com	1,000, 5,000, 8,000	$36, $60, $70	**
Norton woodcraft.com	1,000, 4,000, 8,000	$44, $60, $92	0.002 in.
BEST OVERALL **Shapton** craftsmanstudio.com	1,000, 4,000, 10,000	$49, $62, $148	**0.001 in.**
BEST OVERALL **Sigma Power** toolsfromjapan.com	1,000, 6,000, 13,000	$50, $73, $144	**0.001 in.**
Sigma Power Select II leevalley.com	1,000, 3,000, 10,000	$68, $73, $94	0.007 in.

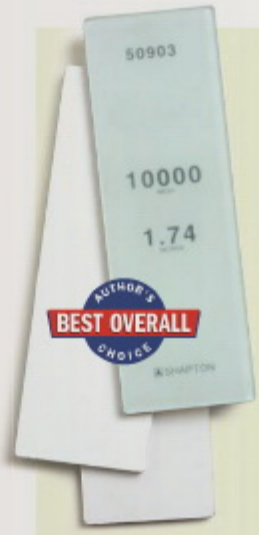
* Japan Woodworker recommended only a coarse and fine stone.

BESTER/IMANISHI | BESTER/KITAYAMA | KING | NANIWA CHOSERA | NANIWA SUPERSTONE

1,000-GRIT STONES			8,000-GRIT STONES					
FLATTENING (strokes needed)	HONING SPEED (rated 1-10)		HONING SPEED (rated 1-10)		PERFORMANCE (rated 1-10)			COMMENTS
	O1	A2	O1	A2	End-grain paring	End-grain planing	Edge-grain planing	
14	8	6	8	4	8	8	**9**	These moderately hard stones have a good feel during use.
15	**10**	**8**	**9**	3	7	8	8	Great results from just two stones, but remove the wooden base on the 8,000-grit stone—it warps after getting wet.
10	8	7	4	3	5	6	5	Grits are not marked on the stones. Use a Sharpie to tell them apart.
8	8	7	7	4	**9**	8	**9**	The Chosera have the smoothest cutting action of all the stones tested and create a nice slurry during use.
**	4	1	4	3	**9**	**9**	8	The 8,000-grit stone produced an excellent polish, but the stones are not well-mounted on their plastic bases.
15	9	**8**	7	**5**	6	7	6	Honed A2 steel the quickest.
9	9	6	6	4	**9**	8	**9**	These stones are very hard and blades occasionally chattered across the surface.
11	9	7	8	4	8	8	**9**	Excellent value at $317 for a full set that includes a 400-grit diamond plate for flattening.
27	9	7	7	3	6	6	7	1,000-grit stone dished so quickly that it created a cambered blade, which the finer stones were not able to correct easily.

** 1,000-grit Superstone tended to bow upward during our dishing test, making it impossible to measure wear.

NORTON



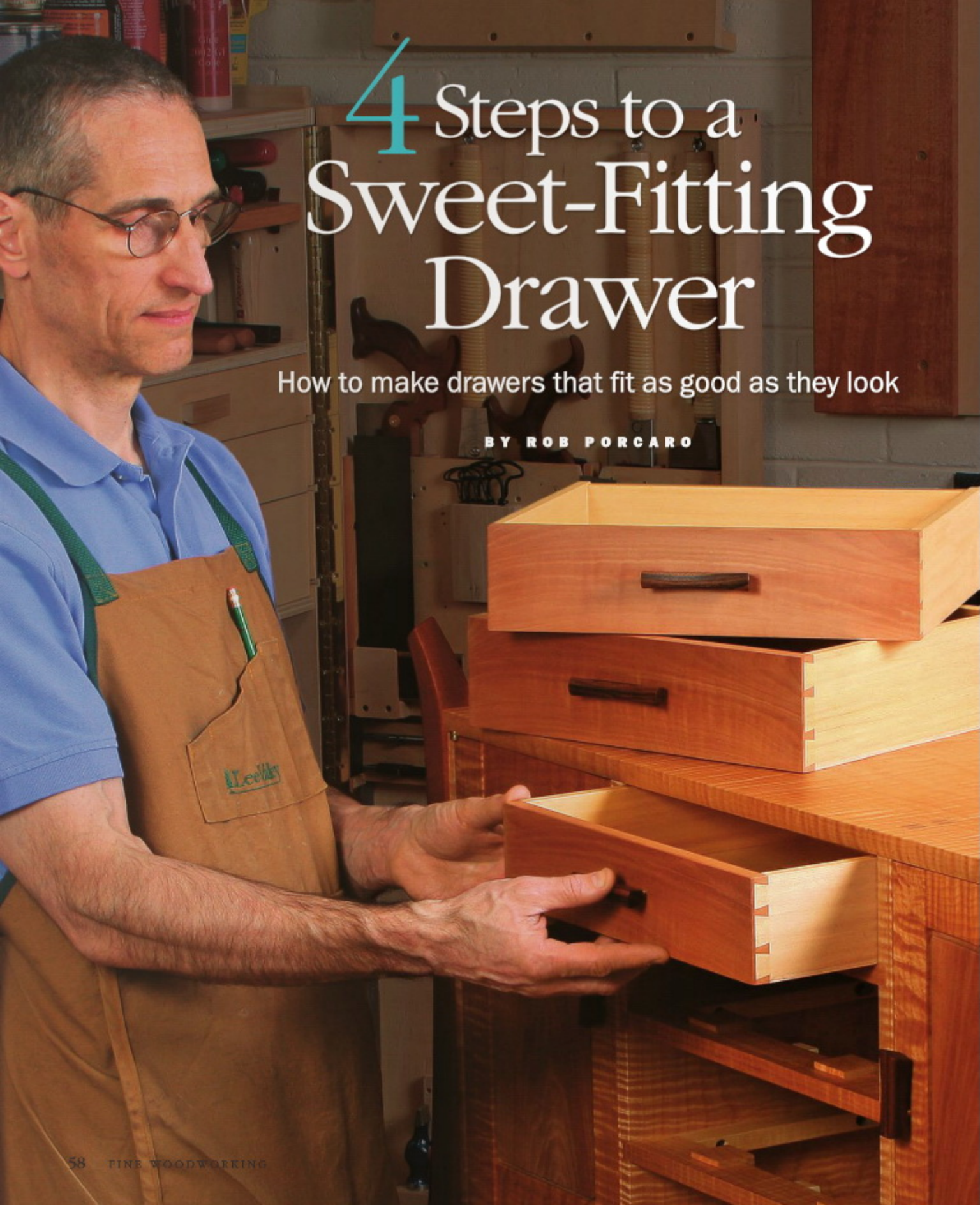
SHAPTON

HIGHER GRITS AREN'T ALWARS BETTER

Shapton also makes 16,000-grit and 30,000-grit GlassStones. To see if they would produce a better edge than the lower-grit polishing stones, I subjected them to the same performance tests. The 16,000-grit stone produced a polish comparable to the best standard polishing stones, and the 30,000-grit stone produced the highest polish of all. Yet, despite the polish, neither stone produced an edge that performed better. For woodworking, I don't think these stones are necessary. —*C.G.*

SIGMA POWER

SIGMA POWER SELECT II



4 Steps to a Sweet-Fitting Drawer

How to make drawers that fit as good as they look

BY ROB PORCARO

You don't need to know any mysterious art passed down from a master to fit a drawer successfully. All you need is a logical process. And that's what I'd like to share with you. I've distilled what I've learned through the years into a clear path that guarantees success. The key is that it eliminates—rather than compounds—errors as you move through the steps.

I start with an old cabinetmaker's trick: I taper the width of the drawer pocket slightly. Then I fit the drawer front to its opening. It's easy to take that one board and plane its ends and edges so that it fits perfectly into the opening, even if the opening itself is slightly out of square. I then make the sides and back to match the front. There's nothing new about these steps. But after them, I do one thing that will be new to some of you. Instead of marking and cutting my dovetails so that the pins are proud, I leave the drawer sides slightly proud. That makes gluing the drawer together much easier and takes all the hassle out of fitting it. All you need to do is plane the sides down to the pins and the drawer slides right in.

Function as fine as the form. *It's not enough to have a beautiful drawer front. The drawer must work well, too.*

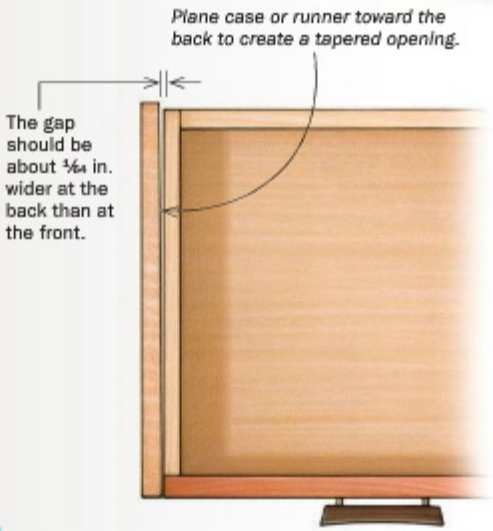
Taper the pocket

A drawer fits into a pocket. And you won't get a truly good fit for the drawer unless you take care when making the pocket. They can be made in variety of ways and from a variety of materials. No matter how you do it, I've got a tip that makes the pocket a perfect partner for the drawer.

The pocket should be slightly wider at the back than at the front—about 1/64 in. How that's accomplished depends upon how the case is made. For a cabinet with solid-wood sides dovetailed into a top and bottom, I assemble the piece dry, use a shopmade bar gauge to measure the front of the pocket, and then slide it to the back to see how wide it is in relation to the front. I then disassemble the case and use a handplane to remove a few shavings, typically from the back. For a plywood cabinet, you would simply make the back panel of the cabinet a hair longer/wider than the face frame. The exact process might vary,

Step 1. Taper the case...

A pocket that's slightly wider at the back helps prevent binding. Porcaro assembles the case dry, checks the width at the front and back, disassembles it, and then uses a plane to widen the pocket.

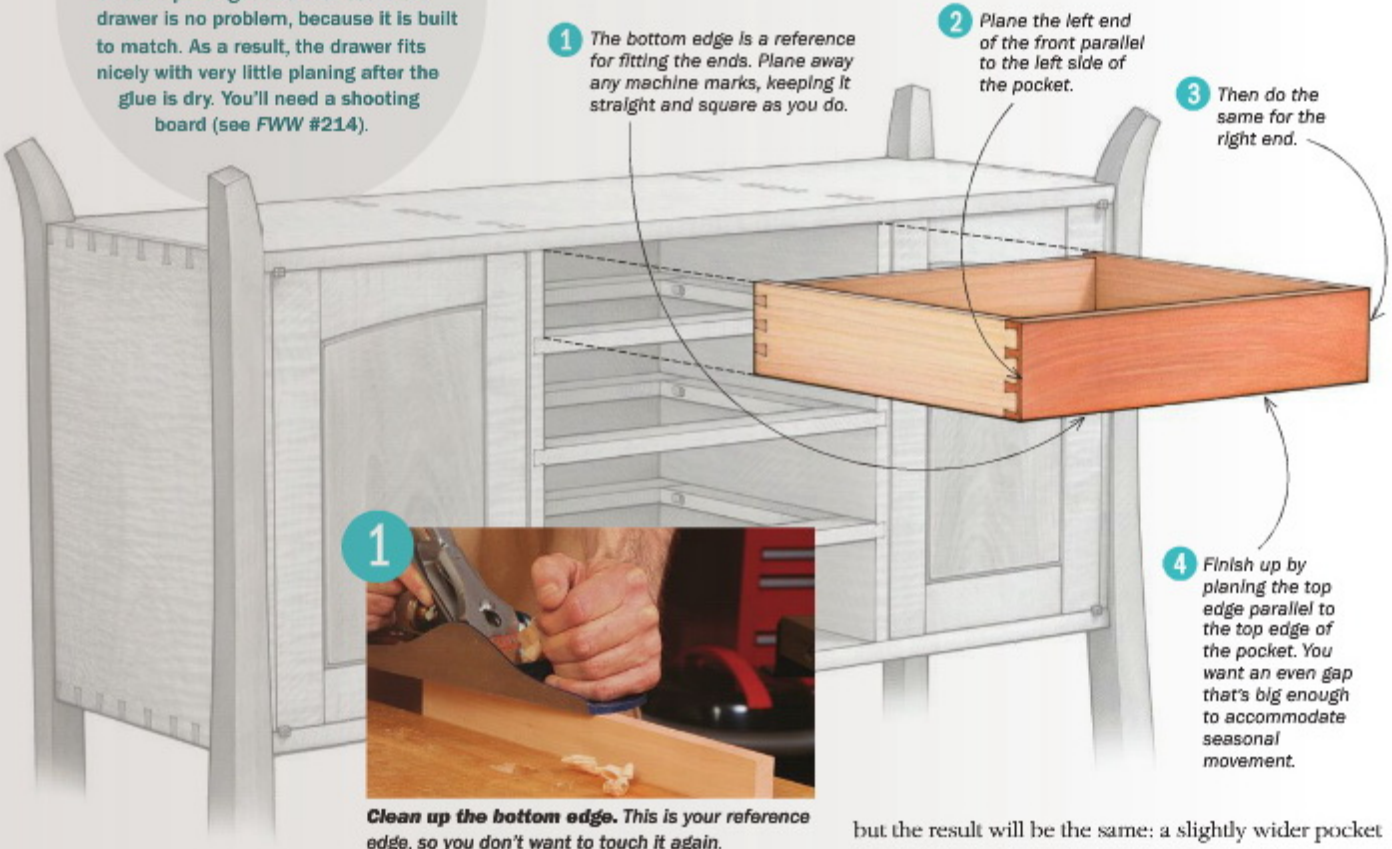


...or the drawer runners

They guide the drawers. *Tapering the runners has the same effect as tapering the case.*

Step 2. Fit the drawer front

Get this part right and the rest of the drawer is no problem, because it is built to match. As a result, the drawer fits nicely with very little planing after the glue is dry. You'll need a shooting board (see *FWW* #214).



Clean up the bottom edge. *This is your reference edge, so you don't want to touch it again.*

Shoot the left end. *Put the bottom edge of the drawer front against the shooting board's fence. Porcaro has shimmed it with a piece of tape because the opening isn't square (above). That brings the end of the drawer front parallel to the side of the pocket (right).*

but the result will be the same: a slightly wider pocket at the back.

Fit the drawer front to its opening

After you have the cabinet assembled, mill the drawer front to near final thickness and rip it to width. It should be just narrow enough to fit the height of the opening. Then crosscut it about 1/32 in. larger than the opening's width. Now turn off the machines and get out your shooting board and handplane. They offer a level of precision and control that let you easily sneak up on the perfect fit. That's important because this is incremental work. The way to get a perfect fit is to remove a shaving at a time. And a shooting board lets you angle the drawer front a bit so that you can plane the end to match a pocket that's slightly out of square.

Plane the bottom edge of the drawer front to remove milling marks and to ensure that it is straight and square. Next, register it against your shooting board's fence and plane the left end of the drawer front. It should be parallel to the left side of the drawer pocket. If the opening is out of square, place a shim between the shooting board's fence and the drawer front. Check your progress frequently.

After the left end has been fitted, it's time to get really careful. Fitting the right end is a critical step. If you take too much off or the end isn't parallel to the side of the opening, the fit will be sloppy and you'll need to start over. As you did with the left

Photos: Matt Kenney; drawings: Christopher Mills

end, shoot the right end until it's parallel to the right side of the pocket and the front barely makes it into the opening. The fit should be very snug at this point.

Now it's time to plane the top edge, keeping it parallel to the top of the opening. Don't worry if it's no longer parallel to the bottom edge. It doesn't need to be. As for the size of the gap at the top, it needs to be large enough to accommodate seasonal movement, but don't guess at how much movement to expect. Rather, consult something like the Lee Valley Wood Movement Reference Guide (leevalley.com, No. 50K24.01) or an online wood-movement calculator to determine it precisely.

Now fit for length. *Trim the right end just like the left, parallel to the opening. At this point, the fit should be tight.*

Prep the other parts and cut the dovetails

The drawer sides and back are next. I prefer straight-grained, quartersawn stock for the sides and back, because it is more stable than flatsawn. I typically make the sides slightly greater than half the thickness of the front, but I make the back just a bit thinner than the front for stronger joints and to help balance the drawer as you pull it out. It also is a good idea to orient the grain on the sides so that they can be planed cleanly from front to back after assembly. If you plane the sides from back to front, you might blow out the end grain on the drawer front.

Rip both sides so that they are as tall as their mating ends on the drawer front. Now crosscut them a bit longer than final length. Head back to the shooting board and square up both ends (bring them to their final length in the process), registering the bottom edge against the fence. Rip the back slightly wider than its final

Plane the top edge, too. *Porcaro uses his shooting board to ensure that the edge stays square.*

Mind the gap. *What's important is an even gap along the top, so don't worry if the top and bottom edges aren't parallel. The exact size of that gap depends on what time of year you're fitting the drawer. Make it smaller in summer than you would in winter.*

Step 3. Leave the sides proud when dovetailing

Leave the pins a little short. *Set your gauge about 1/64 in. shy of the side's thickness, and use it to mark the tails' depth on the drawer front.*

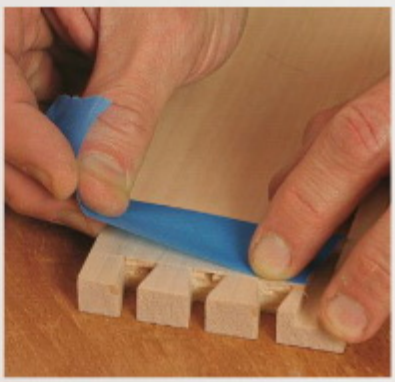
dimension, and then crosscut it a bit long. Shoot its ends to match those of the front, making it the same length or a hair longer, but never shorter.

I use dovetails to join the parts: half-blinds up front, and through in the back. This article isn't about cutting dovetails, so I'll spare you a detailed explanation. However, there is one step that is critical to my fitting process. When laying out the pins, set your marking gauge just a hair shallower than the thickness of the tails. The sides will be proud after assembly, but you'll plane them flush to ends of the drawer front.

Now, glue together the drawer. That couldn't be easier. Because the sides are proud of the front and back, no clamping cauls are needed if you're using parallel jaw clamps. If you're not using them, use a straight caul—no need to shape it to fit around the pins—to spread pressure across the entire joint.

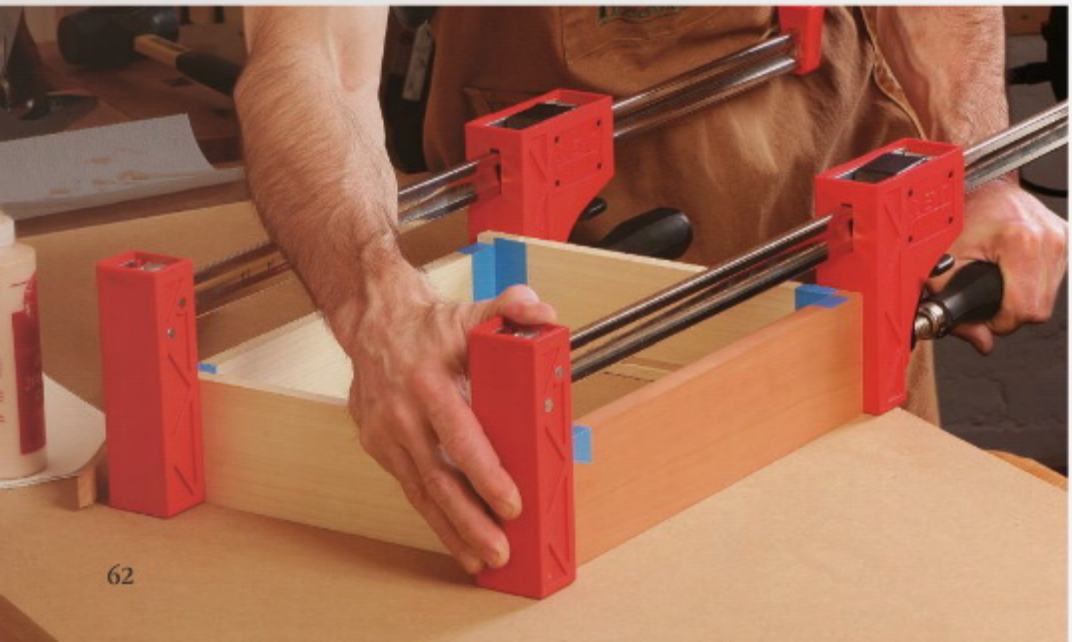
TIP **HOW TO BEAT SQUEEZE-OUT**

To catch the squeeze-out in the inside corner, put a piece of blue tape on both parts of the joint. As soon as the glue sets, pull up the tape, leaving a clean corner.

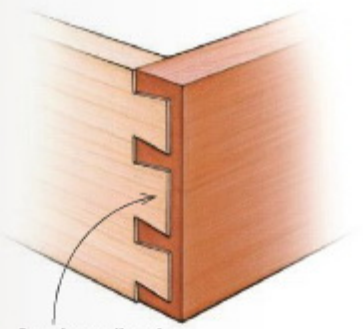


A few quick shavings and the drawer slides in like a piston

After the glue has dried, take off the clamps and get your handplane ready for action. Planing drawer sides can be tricky, because vises don't hold assembled drawers very well. So, I use a simple jig made from a piece of ¾-in.-thick MDF. It has notches cut deep enough to hold the widest drawer and spaced so that you can plane the sides and front. I clamp the jig between benchdogs and then slide the drawer into the notches. (If you don't have benchdogs, just use a piece of MDF wide enough to be clamped down at the back of the bench.) The side is supported by the MDF, so you have a good flat surface for planing. But the drawer isn't clamped in, so you can quickly move from one drawer side to the other, and from one drawer to the next.



Another benefit of proud sides. *Because the sides are proud of the pins, you don't need any special cauls, and that makes the glue-up less stressful.*



Step 4. Plane for a perfect fit

Here's when you see the big payoff for fitting the drawer front first. After planing the sides down to the pins, it takes just a few more shavings for the drawer to fit nicely into the pocket.

Do the sides first. *This simple jig holds the drawer box much better than a vise can for this job. It's a piece of ¾-in.-thick MDF clamped between the benchdogs. The slots are spaced so the sides and the front and back can be planed. And you don't need to clamp the drawer in place.*

Plane down the sides until they are level with the ends of the front. At this point, the drawer will barely fit inside the pocket, because the front was already fit snugly to it (and the back was made to match). You'll probably need to take another shaving or two to fine-tune the fit. Before doing that, put the drawer on a flat surface, such as your tablesaw, and check that it sits flat, without any twist. Plane any high spots until it does. Now you are ready to fine-tune the drawer's fit. Slide it into the pocket to get a sense of how tight it is. Pull it out and take a few conservative shavings from both sides. That should be enough for the drawer to gently swish back into its opening, but keep in mind the season in which you're working. If it's winter, which can be quite dry, you should take a few extra shavings from the sides. Experience has taught me that the sides can get slightly thicker in more humid weather, which is enough to bind the drawer.

Now it's on to the bottom. You might not think that making the bottom is part of fitting the drawer, but if you get it wrong it could fall out in the winter or push the drawer front out of the pocket in the summer. Quartersawn stock is best here, too, because it moves less and resists cupping better than flatsawn. Unless you are working on the driest day of the year, the bottom should extend beyond the back of the drawer to accommodate shrinkage. I lightly glue the front of the bottom into its groove, forcing all of the seasonal movement to the back. But I do use hide glue, so that I can reverse and remove the bottom should it need repair. At the back, I cut opened slots in the bottom. A screw goes through the slot and into the drawer back. I use washer-head screws, but you can cut a counter-sunk slot and use a flat-head screw, too. □

Rob Porcaro, an avid woodworker for more than 30 years, lives in Medfield, Mass.

Plane front to back. *Porcaro uses a jack plane (a smoother works, too), which is long enough to maintain a flat side. Because there is so little material to remove (inset), he sets it for a light shaving.*

Clean up the top edge. *After planing the sides, take a few shavings from the top edge of the drawer front. Then plane the sides to match.*

This is a must on a solid-wood drawer bottom, so when it expands, it doesn't push out the sides, locking the drawer into the pocket or worse, breaking the joints.

Shop-Sawn Veneers Make Better Furniture

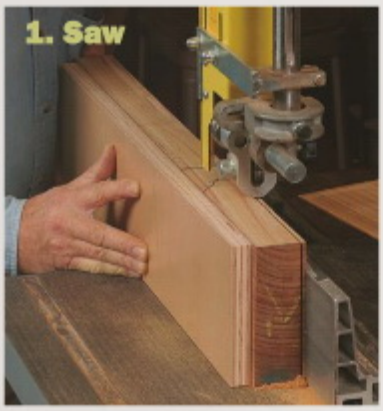
Wrap one beautiful board around an entire piece

BY DAVID WELTER

The main reason for using veneer is the same now as in Tutankhamun's time: Veneering makes it much easier to cover a large area with very attractive or rare wood. Used with man-made sheet goods as a substrate, veneer also minimizes the construction difficulties posed by solid wood, which moves with moisture changes. These days, there are veneer options that weren't available when the pharaohs reigned, commercially cut veneers as well as shop-sawn. However, I only work with veneers I resaw myself at the bandsaw. And that's what we teach at College of the Redwoods, in the cabinetmaking program founded by James Krenov.

Commercial veneers are available in thicknesses from 1/32 in. to 1/60 in., but the slightest misuse of furniture with these thin veneers can cause damage that requires a repair with the same vulnerable material. And it is rare that you'll be able to perfectly match commercial veneers to the solid wood you'll need for the other parts of a furniture project.

In stark contrast, shop-sawn veneer, described by Krenov as "real," with a finished thickness of 1/16 in. to 3/32 in., can better withstand everyday use. And if the



Photos, except where noted: Anissa Kapsales

veneer is damaged, it is thick enough to sand or even plane, restoring the surface. Also, you can cut veneer from the same boards you use for solid wood, providing harmony throughout a project. Furniture made this way stands out from the arranged marriages of commercial veneer and solid wood. And because shop-sawn veneer is thicker, it's easier to work with and doesn't bubble as much as commercial veneer during pressing.

Successfully sawing and using your own veneers isn't difficult. The keys are careful bandsaw setup, thoughtful layout, and a few edge-banding tips.

Choose the right blade

No method of ripping or resawing is better than a bandsaw. And a few minutes of careful setup will yield great resawing results without great risk.

The result is harmony

Photo: David Welter

A world of color in one board. *Jim Budlong found startling color variation in an unusual piece of birch, and arranged its veneers beautifully around the doors and sides of this wall cabinet. The interior is veneered with ash, which gives it its own personality.*

Combine solid wood with veneer. *Although all of the wood in this China cabinet is Douglas fir, Welter used shop-sawn veneers in the doors and sides, and solid fir for all of the frame parts.*

Photo: College of the Redwoods

Seamless display. *George C. Gaines spread Macassar ebony veneer over this buffet, with uninterrupted grain lines passing through the doors. The legs are Gabon ebony, which picks up the dark brown streaks in the veneer.*

Photo: Sean Sprague

The first thing to consider is the blade. A resaw blade needs deep gullets that can eject all of the sawdust that these tall cuts generate. I suggest a 3 tpi (teeth per inch) blade at least ½ in. wide. For dedicated resawing in widths greater than 6 in., a 1½ tpi, 1-in.-wide blade reduces the effort needed to feed the stock and has more room to clear waste from the kerf.

Even if you have the blade set up just right, you might have to negotiate for drift, the tendency for the stock to wander away from the fence or for the blade to cut a

Center the blade. *The upper wheel is crowned, and the blade needs to run on the center of it to cut straight. While spinning the upper wheel by hand, gradually turn the tilt adjustment screw. A small tweak may be all that is necessary. Spin the wheel a few turns to see that the blade has settled in the right position.*

wavy line. The solution is easy: Just angle the fence to match the blade's natural cutting angle (see photo, below).

Get ready to cut

In most cases, the veneered panels will need edge-banding of some kind, and you want that to blend in seamlessly. So before you cut your first sheet of veneer, you need to cut the edge-banding from your board.

Estimate that you'll be cutting five veneers from 1 in. of stock. Most likely, you will be able get at least six veneers, but the pessimist is rarely disappointed. Plan to cut the veneers slightly under ⅛ in. thick. If you are cutting a width greater than 8 in., favor a slightly heavier cut, but no thicker than ⅛ in.

Now you are ready to resaw. Start by surfacing one face of the board and then squaring an edge to it. After each cut, lightly joint the sawn surface. Each leaf then will have a jointed face and a sawn face. If the veneers will be thicknessed by machine, having one clean surface will give you a head start.

In your first outing, plan to cut veneers about 4 in. longer than the finished dimension. The extra length allows room for bobbles at the ends when cutting and for snipe at the planer. Additionally, it provides latitude for aligning grain. Also, give yourself ½ in. of extra width to accommodate jointing the edges before gluing the

Adjust the guides. *Back the guides and thrust bearings away from the blade on both the top and bottom guide assemblies, and then set them as close as possible to the blade without touching it. You should just barely be able to see light between the guides and the blade.*

Match the fence to the drift. *To find out if your blade wants to drift one way or the other as it cuts, draw a straight line on a scrap piece, parallel to its edge, and move the rip fence out of the way. Now try to cut along the line. The angle you need to hold the board at is the angle of drift. Hold the scrap at that angle and turn off the saw. If the saw's fence allows adjustment, set its angle parallel to the scrap. Otherwise, use that angle to set up a shopmade fence.*

Resawing, step by step

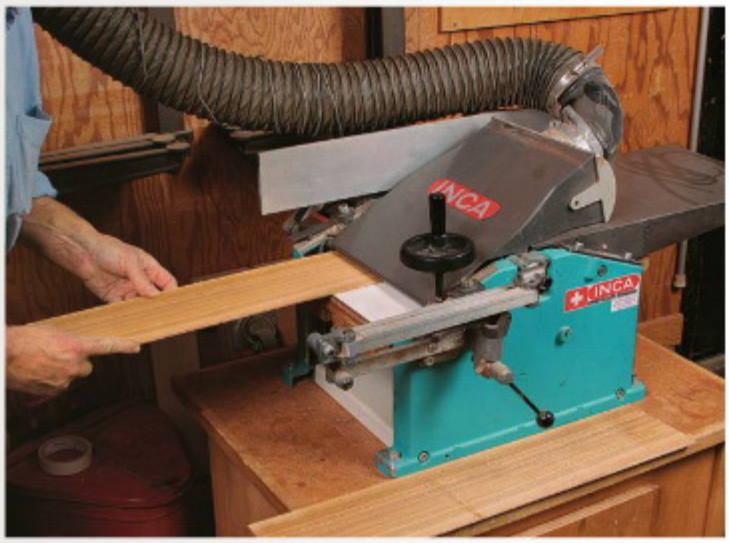
Remove edge-banding first. *Slice off solid banding now, and you'll be sure it will blend seamlessly into the veneered surfaces later. Mark the edges and ends of the board so you know which side the banding came from, and the order in which the veneers were cut.*

Start at the jointer. *Joint one face and one edge of the board. These will be your reference points against the table and fence. After each bandsaw cut, rejoint the same face of the board to maintain a solid reference and give you a jump on smoothing the veneer. Stack the veneers in order.*

A few tips from a pro. *If you are cutting through the entire board, the last ¾ in. can be tricky to handle. This problem can be solved by taping a ¾-in. backer board to the back face of the board (above). A steady feed yields the best cuts (right), so find a position from which you can feed the cut with little or no shifting. Use additional support such as rollers if the stock is long. Keep the stock in contact with the fence with the right hand, and use your left to feed the workpiece at a constant rate no faster than the blade will allow.*

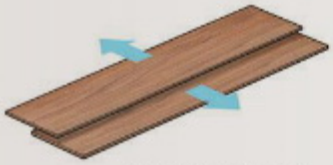
How to plane veneer safely

Make an auxiliary bed for your planer. *If your resawing skills are good, the unjointed face of the veneer may not need to be machine surfaced. But if you need to smooth it further, use a thickness planer with sharp blades and a simple melamine auxiliary bed to support the thin pieces.*



Arrange leaves thoughtfully

SLIP-MATCH



Slip-match regular grain. *If the veneers have a consistent pattern across the face, as is likely in a quartersawn board, consider slip-matching. Place the first leaf on the bench, lay the second next to it, and so on with no flipping.*

veneer leaves into a panel and squaring up the panels.

Remember, there's nothing like the security of having at least a couple more leaves of veneer than you need for a project. The extra leaves will allow more options for the arrangement of the grain pattern and serve as a backup in the event of a mishap.

Arranging leaves

After you have cut a stack of veneers, you have an opportunity to play with the grain pattern to create a pleasing effect. The leaves can be arranged in a number of ways: book-matched, slip-matched, end-for-end, or a combination.

Of course these are only starting points. When book-matching, notice the way that light reflects from the veneer surfaces. A phenomenon known as chatoyance often occurs. One leaf may seem brighter than another. The effect may be most apparent on vertical surfaces. The resulting

BOOK-MATCH

For eye-catching figure, book-match. *Pick any two leaves as they came from the board and open one leaf as you would open a book. Open the book on the left, and then the right. Now look at each of those options upside down. With just two leaves, you already have four choices.*

A trick for three leaves. *Book-matching can look awkward with three leaves (left). Consider turning the middle leaf end-for-end (below), so the grain lines flow from one piece to the other.*

Drawings: Christopher Mills

Joint the edges with a handplane. *With the veneer elevated on a strip of stock and sandwiched under another piece, use a plane on its side to take light passes and joint the veneer edges. If the side of the plane is not square to the sole, plane one leaf face up and its mate face down. The resulting angles will be complementary, giving a good joint.*

White glue is best. *A fine bead of ordinary white glue is all you need to keep the joint together. Quicker-tacking yellow glue can begin to set before you've made final adjustments.*

Wedges instead of clamps. *Before applying any glue, test-fit the joint and close any gaps with selective handplaning. Clamp two fences to a work table, and use pairs of opposing wedges to apply pressure (left). To keep the veneers flat, just weigh them down with lumber (above).*

impression of striping can either be unsettling or used to good effect.

Join the veneers like solid wood

When you are ready to glue the veneer leaves together to create a bigger panel, you must first joint the edges. Using the jointer isn't a good option because it will leave tiny scallops in the finished joint. But a handplane does a great job, as long as you sandwich the veneer between boards.

Some woodworkers use painter's masking tape to pull the leaves together. Because it is a bit of a pain to remove the tape and it obscures the fit of the joint, I prefer a clamping method that uses small wedges to apply pressure. If you go with tape, do it on both sides, use more strips than you would clamps, and pay extra attention to keeping the veneer surfaces flush with each other.

After the leaves have been joined and the glue is dry, trim the veneer sheets to size. If you are applying an edge-banding after you veneer, you'll want to make the sheets the same size as the substrate, or slightly smaller. The exposed substrate edge makes it easier to trim the panel to finished dimensions. If the sheets are to be applied to a substrate with captured banding, remember to include the banding dimension when you size the veneer sheet. After the veneers are glued to the substrate, you can trim them down to the banding.

On the jointer, joint one long edge of the sheet straight, then use a tablesaw sled to crosscut the piece to length before ripping it to width. A quick word about the substrate: You are taking pains to create

Trim the sheets to fit the panels

First, rip to width. *Joint one side of the veneer sheet (a regular jointer works fine), and then rip it to size on the tablesaw. An auxiliary fence keeps the thin veneer from sliding under the rip fence.*

Now crosscut. *To prevent tearout on the lower edge, support the cut with an extra piece of plywood on the base of your crosscut sled, creating zero clearance around the blade.*

an item of quality, so glue the veneers to a good, void-free substrate. Use multi-ply birch or maple plywood. Fiberboard products may be flat, but they do not hold fasteners well and will swell if they get wet, to say nothing of the off-gassing and noxious dust. So I don't use products like MDF.

The shrinkage of glue exerts significant force on the substrate. To minimize the risk of cupping, be sure to veneer both sides of the substrate at once, and orient the plywood substrate so that its outer veneer is perpendicular to the direction of the veneer you are applying.

Edge-band before or after?

Unless your veneered panel is trapped in a frame-and-panel door and the edges won't be seen, you'll need to apply an edge-banding that covers the substrate, either before or after you veneer. This banding can be made wide enough to take on a shape, or at least to allow the edges to be softened. If you followed my advice and cut the banding from a board before it was sawn for veneers, your edging matches the faces of your panel, and the color or grain pattern continues from the top across the edge. This shows care and attention.

Captured bandings, about ⅛ in. thick, are glued to the substrate before the veneer is applied. They are most often used where the appearance of after-the-fact framing would be undesirable; for instance, if you want a pattern to flow uninterrupted from a door to a drawer above. Here, an applied edge-banding would be a visual disturbance and look like a production job on shop plywood.

Applied edge-banding is glued to the substrate after the veneers are in place and is rarely more than ½ in. wide. The thickness of an applied banding provides you with the opportunity to shape a profile on a tabletop or cabinet top.

Also, the two types of banding can be used on a single panel, such as a door. A panel can look like a solid board if the top and bottom are captured and the sides are applied. Applying banding at the sides of the door also allows for the shaping of overlapping rabbets where two doors meet. □

Woodworker David Welter is a woodworking specialist and instructor at the College of the Redwoods in California.

Two edging options

In general, use captured banding for end-grain edges and applied banding for long-grain edges.

1 Capture edge-banding before veneering

Tape does the trick. Because the veneer will cover this glue joint, tape is plenty strong for clamping. The edging should be proud of the substrate on each side and a little longer. Glue two opposite sides at a time, trim the banding to length, and then band the other two sides. Last, using a handplane, flush all the banding to the level of the substrate.

Veneer both sides at once. This will balance out the tension as the glue dries, and prevent cupping. You can use a different wood on each side, but the woods should be of a similar nature, such as quartersawn with quartersawn.

Pressing issues. Welter manages smaller work with hand clamps and cauls to distribute pressure. Larger panels go in a vacuum bag. For both, Welter goes through a dry run first, and uses blue tape to keep the veneers aligned.

2 Or apply edge-banding after veneering

Applied edge requires more pressure. The banding should be slightly wider than the panel is thick. Blue tape helps with alignment but isn't enough. Cauls and clamps must be used to keep this visible joint tight.

Plane banding flush after the glue dries. To keep the plane from tilting and overcutting near the edges, concentrate your pressure over the substrate. Welter uses one plane set for a thicker cut initially, and then switches to another plane to take thin cuts and flush the banding to the panel.

Build a Serpentine Sideboard

PART 2

Traditional interior is redesigned for longer life, smoother action, and an easier build

BY STEVE LATTA

Shape the dividers and rails

In Part 1, we built the front. Once the parts fit nicely, you can cut the sideboard's serpentine profile on them.

1 ***Where leg meets curve.*** *With the front of the sideboard dry-fit, lay a straightedge across the front of each leg and mark where it meets the rails and the dividers.*

2 ***Make room for veneer.*** *Make a half-template from the centerline over, and use it to extend the lines you just drew. Then pull back the template just enough to allow for the vertical-grain veneer that you'll apply.*

3 ***Shape the top rail.*** *Attach the template to the bandsawn top rail and trim it flush (above), stopping just over halfway to flip the workpiece and reattach the template to rout the rest of the profile. Then dry-fit the legs and check that the upper rail is set back just enough to leave the veneer slightly proud of the leg (left).*

Tall buildings seem to take forever to rise above ground level, and then shoot up to their finished height almost overnight. Likewise, the four legs, four rails, and two door blanks you've completed on this project (see "Build a Serpentine Sideboard, Part 1," in *PWW* #222) may not seem like much progress after all the hours you've invested, but believe me, you are well over halfway there. The finicky joints, painstaking inlay, and multi-step door construction are behind you. What lies ahead are the fun parts: finishing off the serpentine pieces, building the straightforward interior, and final assembly.

Antique sideboards had little allowance for wood movement; consequently sides cracked and drawers jammed. By building a kind of internal skeleton and making extensive use of frame-and-panel

4 ***The rail becomes the template.*** *Use the top rail to shape the lower rail and then the two drawer dividers to give all four pieces the same profile.*

Photos: Mark Schofield

Dress up the dividers and rails

With the profile cut, you can veneer the front of the rails and drawer dividers and edge-band the lower rail.

FIRST THE VENEER

Non-stick trick. *To avoid having veneer stick to the part of the lower rail that will receive the banding, apply clear tape to the whole rail. Set a slicing gauge to the width of the banding, run the gauge along the rail registering off the lower edge, and then peel away the top section of the tape.*

Apply the veneer. *For both rails and dividers, use a cutoff as a caul, but add a piece of thin foam to even out the pressure between the curves. Cover the foam side facing the veneer in clear tape to prevent it from sticking to any squeeze-out.*

Slice through the veneer. *After the glue has set on the lower rail, and with the gauge still set to the width of the banding, slice through the bottom part of the veneer.*

Then just peel away. *Lift up one end of the clear tape and peel it off the rail, taking the section of veneer with it and leaving a perfect recess for the banding.*

construction, I've done my best to ensure that my sideboard will age more gracefully.

Shape the front and then apply veneer and banding

In Part 1, we'd reached the point of dry-fitting the front of the sideboard, without sawing curves into the pieces yet. Before disassembling them, lay a straightedge across the face of each leg and mark where the rails and the dividers meet the leg.

Working from the full-size drawing that you've tweaked to fit the actual doors, make a template from ½-in.-thick MDF for half the front profile, allowing the ends to run a few inches long. Transfer the pattern to the top rail, flipping the template to cover both ends. Cut close to the line on the bandsaw and save the offcuts for later use as cauls.

Federal pieces often used face veneer on rails and drawer dividers, and I'm going to stick with tradition. Resaw a piece of mahogany to generate the vertically grained veneer about 1/16 in. thick, and then slice strips of the veneer about ⅛ in. wider than the thickness of the upper rail and the dividers.

Place the template back on the upper rail and attach it with double-sided tape. Place it on the pencil line if you are not

Glue up the front. *It's finally ready. Glue together the front of the sideboard and add the extra pieces of vertical-grain veneer where the rails and dividers meet the legs.*

ADD THE BANDING

Dry-fit the banding. *Place the banding in its groove and score the legs where it crosses them (above left). Make several cuts across the legs with a sharp knife and then remove the waste with a chisel (above right) or a router plane.*

using veneer, or back from the line by the thickness of the veneer if you are. Use a bearing-guided, spiral flush-cutting bit to bring the upper rail flush with the template. Once the upper rail is shaped, it becomes the template for the lower rail and the drawer dividers.

Using hide glue, hot or liquid, glue the veneer to the rails, overhanging each edge by about 1/16 in. I clamp the veneer using the bandsawn offcuts as cauls, with a thin piece of foam covered with packing tape taking up any irregularities. Stop the veneer about 1/2 in. short from each leg so you don't damage the veneer when attaching the legs, and patch in short pieces after gluing up the sideboard's face. Because the grain runs vertically, the patch is easy to do and quite invisible.

When the glue has dried, trim the overhang using a wide, sharp chisel or a plane iron. Slice with an inward motion to avoid breaking out any grain.

Because the bottom rail has a lower banding that is 5/16 in. wide, the approach is a little different. Run a piece of packing tape along the lower half of the front face, pressing firmly to make sure it adheres well. Set a slicing gauge to the width of the banding and run it along the tape, referencing off the lower edge of the rail. Peel

How to splice it. *There is no natural place along the front to hide a joint in the banding, so create a staggered splice (inset). Clear tape is sufficient to hold the banding in place until the hide glue dries.*

Complete the cabinet

An internal skeleton and frame-and-panel assemblies solve the problem of wood movement and make assembly quick and simple.

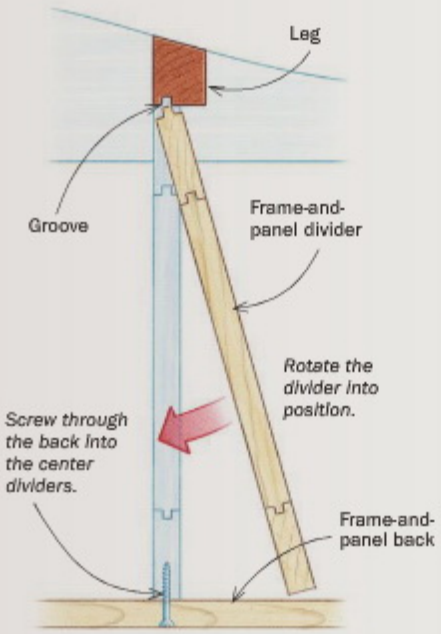
START WITH THE SIDES AND BACK

Let the sides move. *The outer mahogany side is joined to the legs with elongated mortises to allow for movement. Use white glue, which also allows for movement. The internal poplar side rails are tenoned into the legs for added strength.*

Add the back. *Assemble the back separately by gluing the rear legs to tenons in the upper and lower rails and to the outer edge of the end stiles. Then glue the back assembly to the rest of the piece as shown, fitting it onto the outer and inner side tenons.*

ADD THE CENTER DIVIDERS

In they go. *The frame-and-panel dividers have shallow dadoes in line with the drawer dividers (right). When gluing them, make a pair of custom cauls whose face matches the 15° front face of the center legs (below right).*



away the upper section of tape, leaving a 5/16-in.-wide strip. Size the veneer to about 1 in. wide and apply it so that it overhangs the top edge and laps over the tape. After the glue is dry, cut through the veneer with the slicing gauge still set at the same width, and remove the veneer and tape strip. Don't apply the banding until the front is glued together.

Before gluing the front, use a slot-cutter set up on a router table to cut a groove in the back of the center legs for the dividing panels. To locate that groove, center a groove on the stiles and rails of the poplar dividing panels. Using that offset on the leg guarantees the panel will be flush to the drawer opening. Repeat the process for the side compartment assemblies and then cut a slot in the inner edge of the bottom rail. Also, center a groove in the inner edge of the top rail to receive the cleat and kicker. Having the appropriate secondary materials ready to go when cutting all these grooves and slots saves a great deal of time and makes alignment far more accurate.

Assemble the piece from front to back

At this point, the front is ready to glue up and I do this in a very systematic manner

Drawings: John Hartman

after a few dry runs. Use slow-set glue such as white or liquid hide glue to gain more open time. First, glue the drawer dividers into the center legs and dry-fit both rails to ensure the legs are correctly spaced and the drawer openings square. After the adhesive has set, glue the upper and lower rails to the center legs with the outer legs dry-attached to once again help with alignment. When that is set, glue on the outer legs, making sure the various joints are square and tight.

Once the entire assembly is dry, complete the veneer where the rails and dividers meet the legs. Score and cut across the legs for the lower banding using a sharp knife, chisel, and a small router plane, if you own one. Because the sides have such a potential for movement, the banding wraps the outside corner but terminates at the back edge of the front leg. Because the rail sits flush with the legs, there is no natural place to split the banding. Consequently, I make one long strip by doing a staggered splice to minimize the appearance of the joint. Using hide glue and short strips of packing tape as clamps, apply the banding along the bottom edge.

In traditional sideboard construction, any guides, runners, and cleats were mounted directly to the sides and as the sides moved, so did the internals. This led to problems with drawers and doors and, in many cases, cracked sides. On this piece, I used an additional set of poplar side rails, fully tenoned to the front and rear legs, to eliminate this problem and give strength to the overall construction.

The mahogany sides are joined to the legs with a triple tenon; the top has a tight fit and the lower two are inserted into elongated mortises to allow for movement. All of the cleats, guides, and bottom supports are mounted to the poplar rails and are totally independent from the case sides.

To further avoid movement issues, I replaced the traditional solid back, bottom, and internal dividers with frame-and-panel sub-assemblies. The back is poplar and its upper and lower rails attach to the rear legs with full tenons. There are four vertically grained panels floating between five stiles. When the back is glued to the rear legs, the outer edges of the end stiles are

ADD THE PANELS AND SUPPORTS

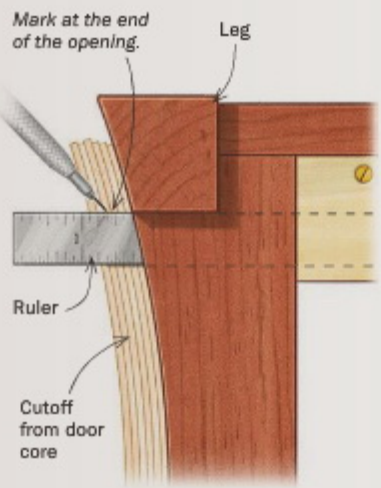
Add the bottom. *Use a spline to align a panel support with the groove in the back of the lower front rail (left). Then glue and screw the support to the lower internal side rail. Slide in the bottom panel and then repeat the process with the center support (below), which also serves as a drawer runner.*

Runners allow movement. *The runners are aligned by a spline that fits in a groove in the back of the dividers. The runners are glued to the frame of the divider but only screwed to the panel in one place to allow it to move seasonally.*

Add doors, drawers, and top, and finish your masterpiece

Once the cabinet is complete, cut the doors to fit the openings. Holly stringing outlines the doors and ties them in with the rest of the piece. Cock beading the doors and drawers is an optional step.

MARK FOR THE WIDTH OF THE DOORS



Measure the opening. *With the cabinet assembled, use a cutoff from the door's core to mark the door's width. Remember to allow room for cock beading if you decide to apply it.*

Cut the doors to width. *Transfer the marks on the template to the door, making sure the crotch is centered on the door (above). Cut the doors on a crosscut sled with a block of wood to lift one side so the other is flat on the sled (right). The blade must be angled slightly, too.*

glued to the leg as well. This adds about 10 sq. in. of face-to-face glue surface on each end, enhancing the overall strength of the piece.

The other components that constitute the bottom of the side compartments (outer panel supports, lower runners, and panels) and the upper cleat and drawer kickers are joined to the back edges of the cabinet face using a tongue and groove. You'll add them after the whole case is glued up and the interior dividers are sized and mounted.

Not only was it quick and efficient to mill all the internal frame-and-panels, tongue-and-grooves, rabbets, etc., at the same time, but the subassemblies quickly come together during final assembly.

The top can be either veneered or solid wood, but in either case you'll want to add radial grained veneer running along the edges in the same way as the rails and dividers. Even on the end grain of a solid-wood top, movement is not an issue because the two grains are sympathetic. To further harmonize the top with the rest of the front, add black-and-white banding to the center of the edge.

Fitting and finishing the doors

Cock beading is optional and not all Carolina pieces had it. Even if you're certain you'll add the beading I would still add a strip of mahogany to the hinge side of each door's core to give the screws a better grip. Before diving into the actual doors, hang one of the sample doors (see Part 1) and resolve any potential problems.

After crosscutting the door on the tablesaw to the proper height, take the offcut (or an offcut from the original core), hold it against the door opening, and mark the width, remembering to subtract ¼ in. for the two ⅛-in.-thick strips of cock beading. Cut the door to width using a crosscut sled with the blade tilted and the door supported by a strip of stock, in the same manner that you sized the core to receive the tongued side edging.

Now that you know the final dimensions of the doors, you can run a piece of stringing around the face, about ¾ in. from the edge. I used the Lie-Nielsen straight-line stringing tool to cut this groove. Because of the doors' curvature, the head

ADD THE STRINGING

Cut the grooves. *Latta uses Lie-Nielsen's straight-line stringing tool because the orientation of the head can be reversed for cutting concave surfaces. On flat surfaces, the L-shaped fence rides on and against the workpiece.*

Trim the stringing flush. *After the glue dries, use a bench chisel bevel-side down to remove the bulk of the stringing that is proud of the surface.*

needs to be reversed for the top and bottom recesses.

Cutting curved cock beading—With the stringing complete, you can add the cock beading. The first task is to make a template of the door's curve using ¼-in.-thick MDF, extending the curve about 1 in. on each end. The side of the template opposite the curve should be dead straight for the side pieces of cock beading. Attach the template to a ⅛-in.-thick piece of mahogany that has been bandsawn close to the desired line, and profile the cock beading with a bearing-guided beading bit.

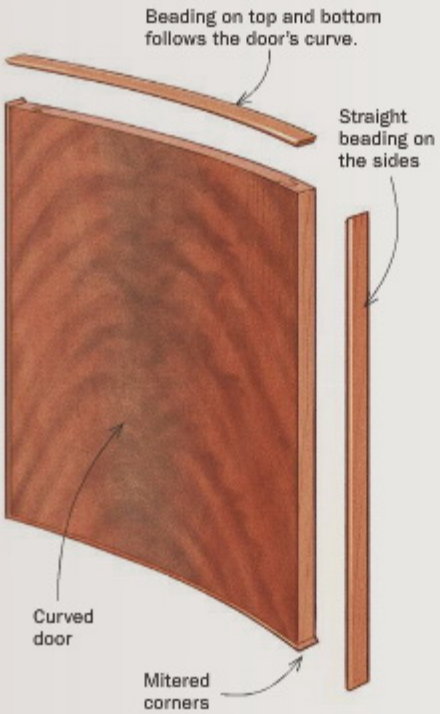
You can cut the miters on the ends of the cock beading using a fine-tooth saw, and pare them with a plane iron, but I've found the easiest method is to use a disk sander with the table angled at 45°.

Rout the hinge mortises in the legs and then transfer the hinge marks to the doors. Set the hinges and hang the doors.

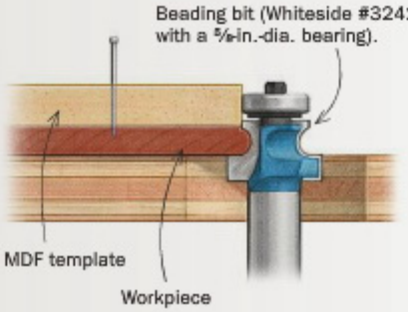
The bow-front drawers are made in the same way Jeff Headley showed in his article "How to Tackle a Serpentine Drawer" (*FWW* #199), and the accompanying Master Class shows how to add stringing to them. The finish shown in Peter Gedrys's article, "Antique Finish that Holds Nothing Back" (*FWW* #220), will work perfectly on this Federal piece. Add some Sheraton pulls (londonderry-brasses.com, item No. SK4) and you've completed one of the most beautiful pieces of the early 19th century. □

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

CUT, SHAPE, AND APPLY THE COCK BEADING



Shape the cock beading. *A template curved on one side and straight on the other profiles the beading for the doors' top and sides.*



Fit the beading. *A good way to secure the curved door without damaging it while you fit and then glue in the beading is to use a hand screw with cork-faced pads.*

readers gallery

First carving project! *Before this table, Cabe had mostly made musical instruments such as dulcimers and guitars.*

LEWIS CABE
Alexandria, Va.

This tilt-top tea table is Cabe's first attempt at period furniture. He started the piece (33 in. dia. by 30 in. tall with the top horizontal) in a class on carving period furniture. It is a replica of a table by Robert Walker, circa 1740-50, in the collection at Stratford Hall Plantation in Stratford, Va. Cabe traveled to Stratford to see the table before completing the piece, which is mahogany with three brushed and 14 padded-on coats of amber shellac. He says he decided not to fill the grain or the wormholes in the top, preferring to retain the character of the wood. PHOTO: DIANE COOPER CABE

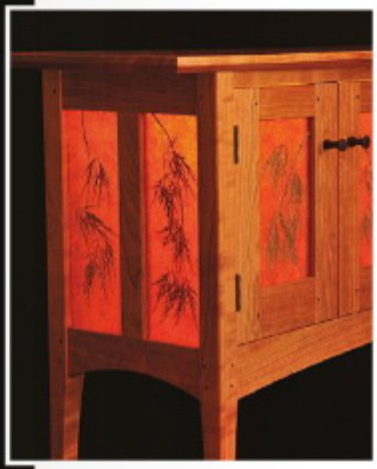
DESIGN SPOTLIGHT

JASON KLAGER
Prince George, B.C., Canada

This dressing table and treasure box work as a unit, with the box positioned and kept in place with eight rosewood dowels. The table (18 in. deep by 32 in. wide by 37 in. tall) is veneered with shop-sawn wenge; the drawer sides are hard Eastern maple and the bottoms are afromosia. The box (10 in. deep by 19 in. wide by 8½ in. tall) has 90 bubinga marquetry leaves outside and pearwood inside; the drawer sides are hard Eastern maple and the bottoms are lacewood. Klager says he added the pierced tree carving on both the table and box because it tied in nicely with the marquetry leaves. He played with the bubinga when designing the marquetry on the box, and says when you walk around it, the leaves appear to move. Klager's father bought the piece as a gift for his mom. PHOTOS: JAYSON L. HENCHEROFF

Hand carved. *Klager first curved the panel using a block plane and chair scraper. He started the carving by drilling holes and removing the waste using a scrollsaw. Then he sculpted the branches with gouges and files.*

DOUG CLARNER
East Burke, Vt.



Clarner collaborated with artist Trenny Robb of Sutton, Vt., when designing this Shaker-style sideboard, which won the 2010 Vermont Fine Furniture and Wood Products Design Competition. Dubbed the "Thread-Leaf Sideboard," the piece (15 in. deep by 50 in. wide by 34 in. tall) features mica panels designed by Robb, each containing a thread-leaf Japanese maple branch and back-lit to show off the details. The top is a single cherry board. The rest of the piece is cherry with walnut details. Poplar is used as a secondary wood. It is finished with an oil-varnish mixture and wax. PHOTO: STEVE LEGGE

MARK BELLONBY
Mason Neck, Va.

After four years learning the craft of Windsor-chair making, Bellonby took the traditional design and added his own touches when he built this chair for his daughter and son-in-law. He says the pierced back splat and monogrammed comb gave him a chance to express his own style in what is otherwise a somewhat restricted form. Except for the cypress seat and cherry back splat, the chair is made of red oak split and riven from trees on Bellonby's property in Virginia. The arm, spindles, and comb are steam-bent. The chair, which is 16 in. deep by 27 in. wide by 44 in. tall, is finished with gold leaf, black enamel, and varnish. It took about 70 hours to complete.

Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For submission instructions and an entry form, go to FineWoodworking.com.

NEXT GENERATION SHINES IN MAINE SHOW

The idea behind *Regeneration: Fine Woodworkers Under 30*, a juried exhibition co-produced by *FWW* and the Center for Furniture Craftsmanship in Rockport, was to encourage the next generation of woodworkers. Since conventional wisdom says the woodworking community is growing grayer by the day, we were pleased when more than 580 photos of work by 150 talented, passionate entrants rolled in. After a tough review by the jury, 22 outstanding pieces were chosen for the exhibition. Seven of our favorites are below. To see more, go to woodschool.org and click on Messler Gallery.

RUSSELL GALE
Asheville, N.C.
Jurors' Best in Show

Gale, 27, built this sideboard because he wanted to make a large, veneered case piece with doors and drawers, plus he wanted to work out the miter detail where the legs join the lower rails. He used black limba veneer because the vertical striping helps to make the piece (17 in. deep by 52 in. wide by 34 in. tall) appear less wide. Other materials are Japanese ash, sassafras, and plywood. The brass drop pulls were made by Bob Sanderson of Wood Joint Studios in Fort Bragg, Calif. The finish is shellac. To see more, go to russellgale.com. PHOTO: DAVID WELTER

VIRGINIA BLANCHARD
Pelham, N.Y.
1st place, Traditionally Inspired Furniture

A big fan of Art Nouveau, Blanchard, 24, thought a screen would make a good piece for her first attempt at something Nouveau-inspired. "A decorative object executed in a decorative style. Perfect," she says. This screen (80 in. wide by 75 in. tall) was also her first carving experiment. When carving the mahogany frame, she kept the look sinewy and slightly anatomical. The panels are primarily birch burl, with a patchwork of various other veneers used to create the wavy peacock-inspired pattern at the bottom. It is finished with shellac. PHOTO: JIM DUGAN

BRETT MacLEARNSBERRY
Poulsbo, Wash.
1st place, Boxes, Containers, and Lighting

This beech blossom wall lamp was MacLearnsberry's introduction to—among other things—bent lamination. The 22-year-old wanted the shape to suggest that it had grown out of the wall, and when the lights are on, he says the beech shades seem to come to life. Each shade consists of eight ribs, spanned by a piece of beech veneer backed with 1/16-in.-thick acrylic. Other woods are hickory and mahogany. The lamp is 16 in. deep by 24 in. wide by 36 in. tall. PHOTO: DAVID WELTER

ERIC ORANSKY
Freeport, Maine

Oransky based this reproduction of a Hepplewhite serpentine chest of drawers on a piece made in the late 1700s in New England. He created a scaled drawing of the piece (22¼ in. deep by 40½ in. wide by 38 in. tall) from a photo, then worked out the details and curves in full-scale drawings. He matched the veneers, inlay, and hardware as best he could. The woods are mahogany, avodire, and poplar, and the finish is shellac and wax. Oransky, 27, says the project took about 600 hours to complete.

BRYAN KLOTZ
New York. N.Y.
1st place, Turning/Sculpture

Because he finds end grain to be the most striking part of any wood, Klotz, 29, tried to pack as much of it as possible into this maple and walnut sculpted bowl. He experimented until he landed on the final brick pattern. And he was as innovative with his techniques as he was with the design. Not having a lathe, he shaped the piece entirely with a tablesaw. He used different coving setups to shape the outside, and a jig that spins to help carve out the inside. The sculpture is 13 in. deep by 15 in. wide by 6½ in. tall, and it took approximately 20 hours to complete. PHOTO: KIRSTEN KAY THOEN

NATE BLAISDELL
Somerville, Maine
Fine Woodworking
Craftsmanship Award

Good ideas come from unexpected places. The unrefined shape of corrugated roofing inspired the scalloped doors on this quartersawn white oak cabinet (9 in. deep by 13 in. wide by 32 in. tall). Blaisdell, 27, said when building the piece, he experimented with the interaction of the exterior and the interior, so that all the scalloped surfaces—interior shelves, inside of the doors, and outside of the doors—match exactly.

CHRISTOPHER ATWOOD
Clifton, Va.

Atwood, 21, says he "doodled lots of shapes" before coming up with the minimalist geometry of this segmented zebrawood veneer coffee table (28 in. dia. by 18 in. tall). His goal was to create a table that would be the centerpiece of the room, yet be functional and interactive by being able to easily change shape. The finish is shellac and waterborne lacquer. Atwood says the piece took about 100 hours to build.

Q&A

Wedged tenons are stronger with sloped mortises

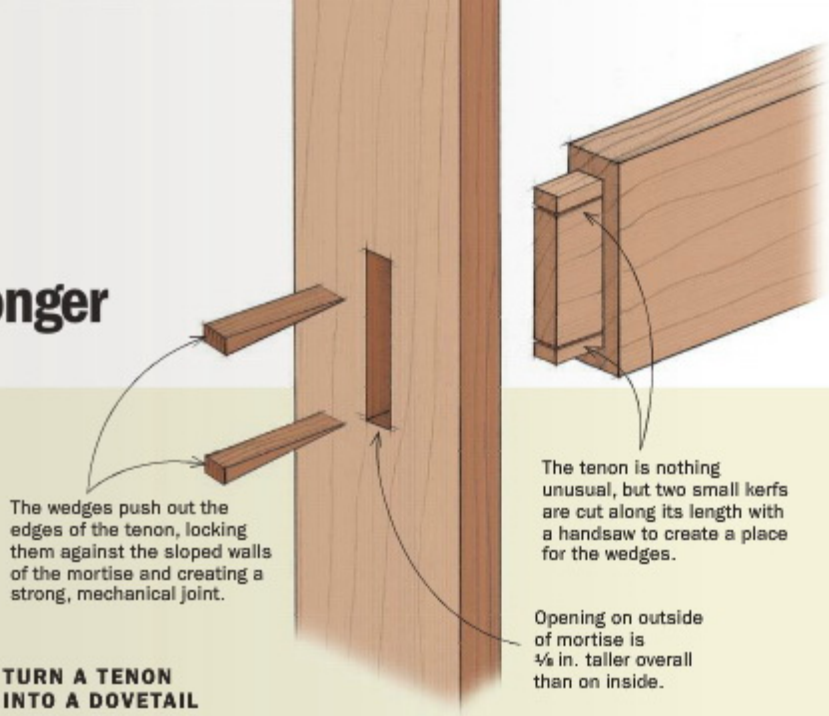
Q: I've seen mortises for wedged through-tenons that have straight walls and ones that have sloped walls. Is one method better than the other? And what are the correct angles?

—DUSTIN JACKSON, Pocatello, Idaho

A: USE A MORTISE WITH SLOPED WALLS, because the resulting joint has a mechanical advantage over one made with a straight-walled mortise. By wedging the tenon, pushing its sides out and against the sloped walls of the mortise, you essentially create a dovetail, which locks the tenon into the mortise. However, if the mortise walls are left straight, then the wedge simply creates an extremely tight-fighting tenon.

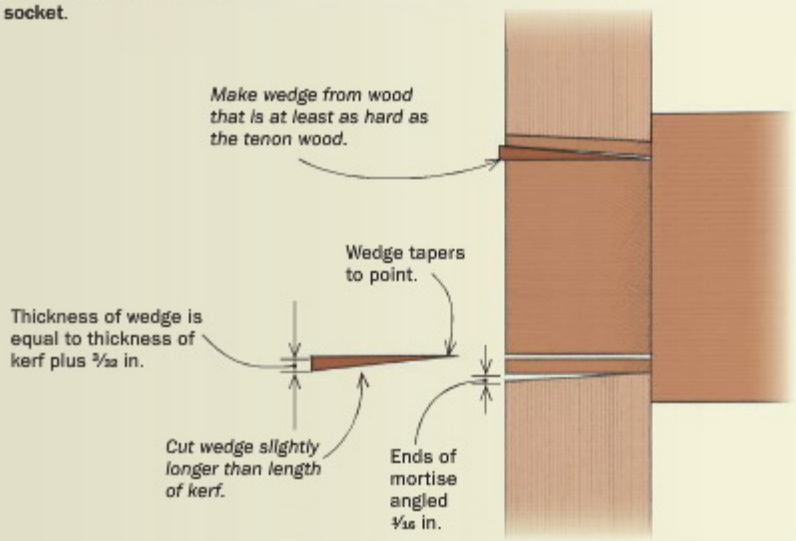
When it comes to sloping the walls and making the tenon, I don't fuss with angles in degrees. Rather, I make the outside opening of the mortise ⅛ in. longer than the inside opening. The walls on the inside just slope from the longer opening to the shorter one. I then use a handsaw to cut a kerf ⅛ in. from each edge of the tenon. The wedges should be as wide as the tenon and a hair longer than the kerf. At the fat end, their thickness is equal to the thickness of the kerf plus 3/32 in. (1/16 in. for the extra length at both ends of the mortise opening and 1/32 in. for fiber compression, which really locks in the joint).

—Christian Becksvoort is a contributing editor.



TURN A TENON INTO A DOVETAIL

The mortise's sloped walls create a dovetail-shaped socket.



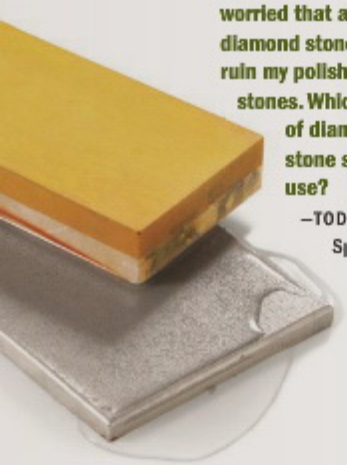
Put the squeeze on. *After applying glue, clamp the tenon in place so it doesn't move while you hammer in the wedges. Put glue in the sawkerfs too, to lock in the wedges.*

Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

Photos: staff; drawings: Kelly J. Dunton

Flatten waterstones with a coarse diamond stone



Q: I use waterstones to sharpen my tools and have heard that diamond stones are a great way to flatten them. I'd like to give it a try, but I'm worried that a coarse diamond stone will ruin my polishing stones. Which grit of diamond stone should I use?

—TODD COOK, Spring Hill, Fla.

A: WHEN CHOOSING A DIAMOND STONE FOR LAPPING, look for one that is flat, coarse, and larger than your stones. I use a 120-micron diamond stone that is roughly equivalent to P120-grit sandpaper. It flattens the waterstone quickly without any ill effects. You might see tiny scratches on your stone, but those won't diminish its performance.

You also want the diamond stone to last for a long time, and some wear quickly, coming out of flat and losing their grit much sooner than you would think (to read more on a diamond plate designed to flatten waterstones, see *FWW* #223, p. 20). That's why it's best to use the diamond stone only for lapping your sharpening stones, since that spreads the wear over a broad surface rather than focusing on smaller areas with a blade or chisel.

—Deneb Puchalski is a sharpening expert who works at Lie-Nielsen Toolworks.

Bigger is better. *A large diamond plate works the entire surface of the stone at once, so it's sure to be dead flat.*

Use diameter to determine turning speed

Q: I've just started turning spindles and vessels. What is the correct speed for turning them?

—MORT BELL, Athens, Ohio

A: YOU WANT TO GO FASTER than you might think, because in general your tools leave a better surface the faster you turn. I use the formula RPM = 7,500/dia. to determine maximum turning speeds. But I'm a professional turner. If you aren't comfortable turning at these speeds, feel free to slow down. Here's one other caveat: Long, thin spindles tend to flex and whip from tool pressure, so dial back the speed significantly to help control it.

—Mike Mahoney is a professional wood turner in Orem, Utah.

Just follow the formula. *It works for most faceplate turnings, except for irregularly shaped chunks of wood. Turn those at slower speeds.*

The same goes for spindles. *The formula works as long as they're less than 16 in. long. Slow down for anything longer, especially if it is less than 2 in. dia.*

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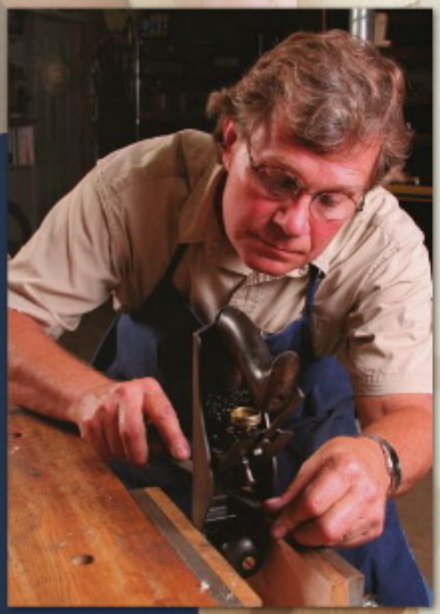

Stop by and meet Contributing Editor Roland Johnson as he shares everything you need to know to purchase, set up and use a jointer, planer and tablesaw.

He will also demonstrate essential workshop safety, good habits, and logical work progression.

We'll see you there!

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Fix a loose drill-press chuck

Q: I've had trouble with my chuck sometimes coming out of the morse taper of the drill press. I've cleaned the surfaces of both the arbor and the socket, but it still comes out. Is there something else I can do?

—MARK SCHOFIELD, Southbury, Conn.

A: FIRST CHECK TO SEE IF THERE ARE ANY burrs on the arbor shaft or in the socket. Even a tiny burr can thwart the locking action of the taper. To check, lightly spin the arbor in the socket. A burr in the socket leaves a shiny line on the shaft, and one on the shaft leaves a line in the socket. In either case, use a piece of fine-grit emery cloth to remove the burr. Clean the surface thoroughly to remove the filings.

Then re-seat the arbor into the socket by twisting and pushing it in one motion. This assures that the tapers align correctly. Next, retract the jaws on the chuck and press it onto a hardwood block with significantly more pressure than you would use to drill a hole.

—Roland Johnson is a contributing editor.

Remove burrs from the arbor. *Wrapping the emery cloth around the arbor reduces the chance that you'll sand a depression into it. For the socket, wrap the emery cloth around a dowel and reach into it. Again, take care to remove any burrs or bumps without damaging the rest of the machined surface.*

Twist in. *The tapered arbor won't seat properly in the matched socket unless you turn the chuck as you push it in (left). Some manuals recommend hitting the chuck with a mallet to seat it, but pressing it onto a wooden block (right) does a better job.*

Seal with shellac before using grain filler

Q: I used waxy shellac by mistake to washcoat my mahogany tabletop. Can I still apply grain filler or do I need a coat of dewaxed shellac first?

—RICK WELLS, Marysville, Mich.

A: YOU HAVEN'T MADE A MISTAKE. You should use a seal coat of shellac before filling the grain, and grain fillers work equally as well over both waxed and dewaxed shellac. Fillers typically have some color to them, and if you don't use a seal coat, it will affect the color of the wood beneath. After the filler is dry, I put down another coat of shellac—use dewaxed—and then continue with the finishing process.

—Peter Gedrys is the owner of Architectural Finishes in East Haddam, Conn.

The seal coat is important. *The thin coat of shellac isolates the pores so that the grain filler can do its job without altering the color or clarity of the wood.*

Curved door with flat glass panes

BY CLARK KELLOGG

A curved or bow-front feature gives a sophisticated look to any piece of furniture. The downside of adding glass is the high price of curved panes. I learned a good compromise at the College of the Redwoods, where founder James Krenov developed a straightforward technique for setting straight panes into curved rails. And I have continued to use it.

This technique isn't difficult. The curved door rails are laminated over a bending form. Then, a rabbet with three facets is routed into the back of the rails and the glass panes are set into them.

Make the door frame first

As with any curved door, it is far easier to fit the cabinet to the door than the other way around, so start with the curved rails. I make mine by laminating ⅛-in.-thick plies over a bending curve.

After the rails have been laminated, joint one edge and then rip them to width. Next, use one of the rails to make a full-size, top-view drawing of the door. Lay out the precise locations of the bridle joints, mullions, glass panes, and stops. Use the drawing to mark the final length of the rails and then cut them.

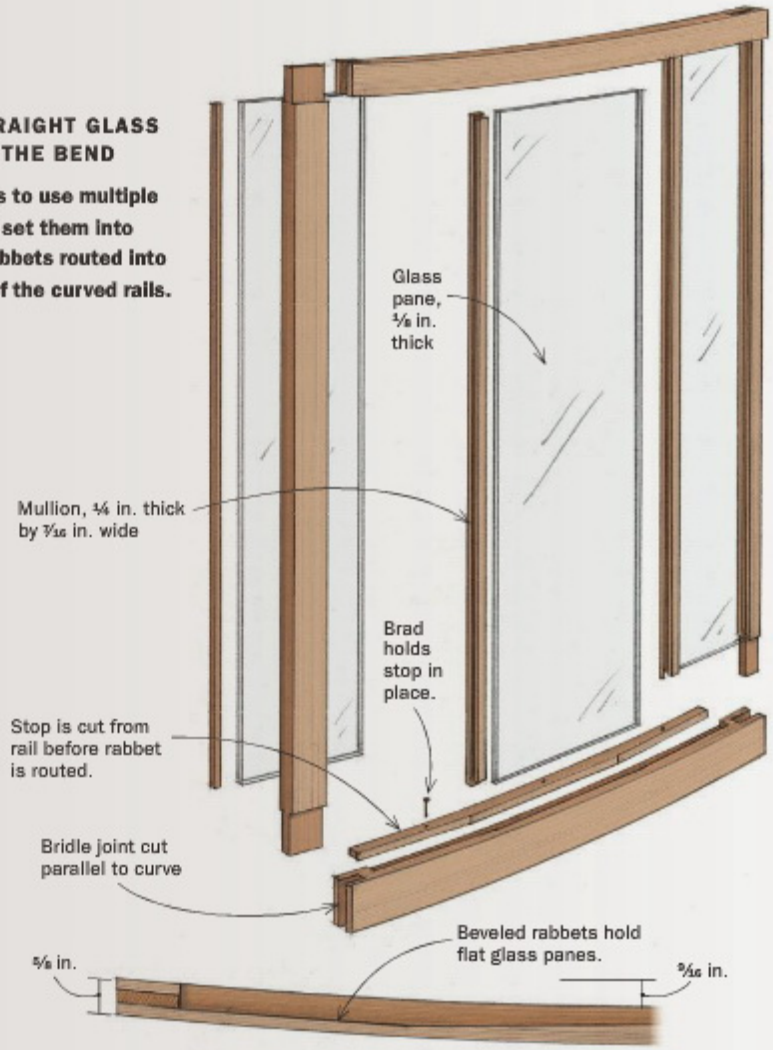
Now you can cut the slots for the bridle joints in the rails. I use a tenoning jig and my tablesaw. Because the rail is curved, I make a cradle for the jig to hold it so that the slot is cut parallel to its sides. Then I head over to the bandsaw and rip off a ⅛-in.-thick strip from the top edge of the bottom rail and from the bottom edge of the top rail. These strips are used later to make stops to hold the glass in the door.

The stiles are next. Make them slightly wider and thicker than their final

Photos: Matt Kenney; drawings: Kelly J. Dunton

TAKE STRAIGHT GLASS AROUND THE BEND

The trick is to use multiple panes and set them into straight rabbets routed into the back of the curved rails.



dimensions. The extra thickness lets you plane them to match the curve of the rails, and the extra width helps with the clamping when you're gluing the door together. After they are cut, dry-fit the frame and plane the stiles to match the rails' curve.

Rout the rabbets for the glass panes

The glass panes fit into the door using rabbets, but because the glass is flat, the rabbets must be faceted. I use a jig to rout them.

Start by making a template of the faceted rabbet. And then use that template to make the jig (see photos, p. 92).

After the jig is made, rout the rabbets and then hold the rails against one another to check that they are mirror images of one another. If there are any differences between the rabbets, shim one of the registration blocks with tape and rerout the rabbets.

Next, rout the rabbets in the stiles. In order for this rabbet to be square to the one in the rail, you need to use a simple jig. Glue a shim (I use a few pieces of veneer) along the length of a piece of MDF. Use double-stick tape to attach this jig to your router table (shim side down) and then rout the rabbets by running the

Laminate the curved rails

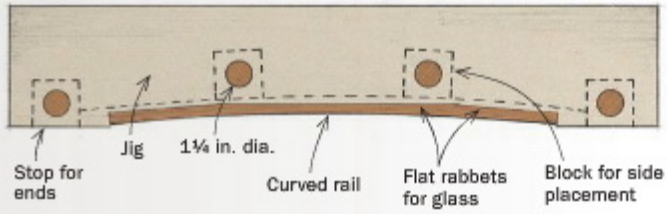
The grain of the plies follows the curve, so the rails are stronger than if they were cut from a solid blank. Also, the curve of the top and bottom rail is more likely to be the same. That's important, because deviations between them can result in cracked glass.

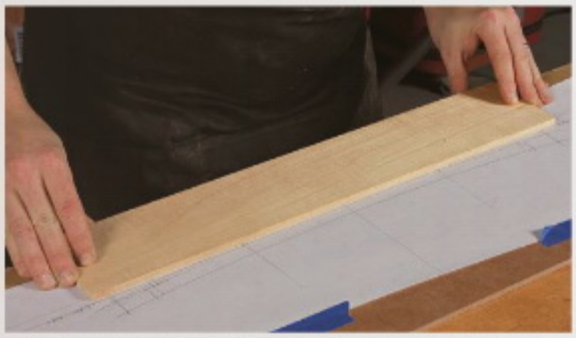
Spread the pressure evenly. *Kellogg uses blocks under the clamp head and three hardboard cauls to ensure that all of the glue joints are tight.*

Cut the slots at the tablesaw. *Add a cradle to your tenoning jig, curved to match the rail, to hold the rail at the correct angle.*

Jig creates straight rabbets on curved rails

The rails on this door are curved, but the three glass panes are straight. That means the rabbets they sit in must have three straight sides. This jig is the best way to rout them.

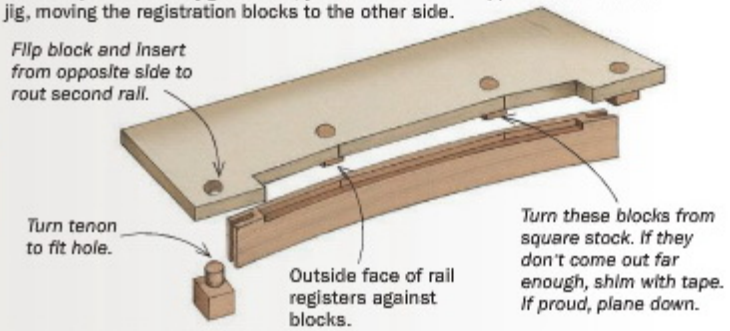




Build a template first. *It's used to make the jig. Do it over a full-size drawing so that it fits your rails perfectly. Align the first piece with the straight side of the rabbet for the middle pane.*

MAKE THE JIG REVERSIBLE

The rabbets in the top and bottom rails need to mirror each other perfectly. Since the template probably isn't perfectly symmetrical, you can't just flip the workpieces in the jig. Instead, you rout them from opposite sides of the jig, moving the registration blocks to the other side.



Shims create the other sides. *Use solid wood for these (left), so you can easily tune their shape with a handplane to match the drawing. Glue them in place with cyanoacrylate glue. Use stops to end the rabbets (right). If they ran through the rails, they'd be seen after the door is glued up.*

stile on top of the jig and taking several light passes.

Make the mullions and stops

Glue up the frame. After the glue has dried, square up the corners of the rabbets with a chisel. Then make the mullions. I cut them a hair too long and use a shooting board and plane to sneak up on a perfect fit. Notch the ends so that they just fit over the rabbets. I do that at the tablesaw with a crosscut sled.

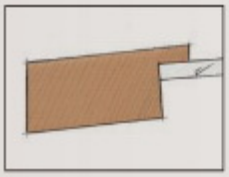
Next, rout ⅛-in.-thick slots in both sides of the mullions. Like the rabbets in

Use the template to make the jig. *Kellogg roughs out the shape on a piece of ¾-in.-thick MDF, screws the template to the MDF, and then routs it flush to the template.*

Rout the rabbet. *A guide-bushing rides on the jig. Kellogg uses a ½-in.-dia. spiral downcut bit to eliminate tearout on the top of the rabbet. He squares up the corners of the rabbets after the frame is glued up.*

WOODWORKERS MART

See advertiser index on page **97** for more information.

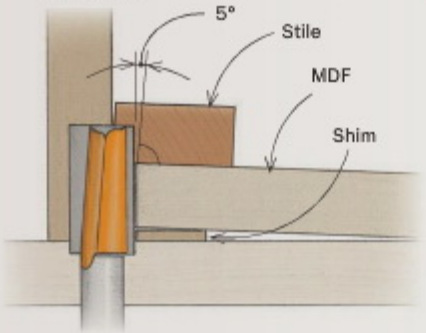


Rabbet the door stiles

Now that the big challenge—the rails—is out of the way, finish the door by rabbeting the stiles and then gluing together the door frame.

ANGLE THE RABBET IN THE STILES

That keeps it perpendicular to the curve of the door and allows the glass to sit flat on its bottom.



A shim does it. *A shim glued to the underside of a piece of MDF lets you rout the angled rabbets with a straight bit.*

Clamp bridle joints from three directions. *Go across the width and down the length and then add a clamp to press the sides of the slot tight against the tenon.*

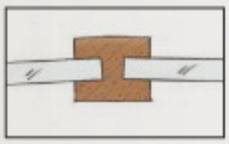
the stiles, these slots need to be slightly angled in order to be square to the rabbets in the rails. Use the same jig you used for the stiles (but with a thinner shim) and a slot-cutting bit. Leave at least ⅛ in. of material between the slots.

Dry-fit the mullions into the door and measure for the glass panes. Cut them about 1/16 in. undersize on all four sides.

Now take the thin offcuts from the rails (the ones you cut at the bandsaw before rabbeting the rails) and make the stops for the rails. Clean up any saw marks and notch them to fit around the mullions. Next, make straight stops for the stiles. The stops are held in place with small brass pins. Remove the glass from the frame, locate holes for the pins (four or five per stop), and drill them in the stops and frame.

Reassemble the door with glass, mullions, and stops. Gently press the pins into place with a small wood block. Tap the glass to make sure it doesn't rattle in place. Finally, disassemble the door and store the parts in a safe place while you make the rest of the cabinet. After the case is built, fit the door frame, mortise the hinges, and apply a finish. Reassemble the door and hang it. □

Clark Kellogg is a furniture maker in Houston, Texas.

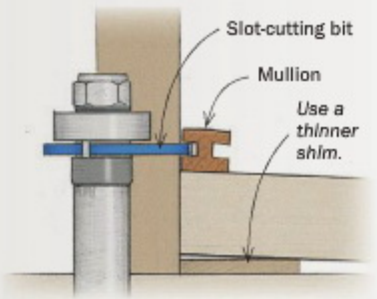


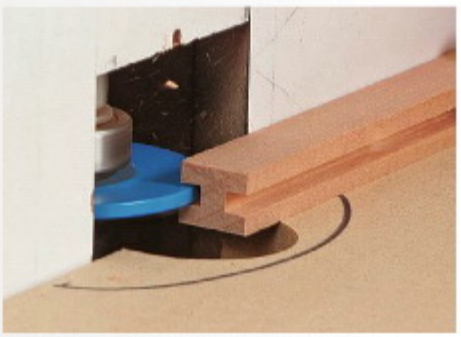
Make the mullions

Grooved mullions separate the panes from one another, and the glass stops hold them in the rabbets.

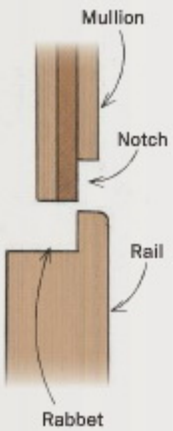
MULLION GROOVES ARE ANGLED, TOO

The angle is a bit smaller than the one in the stiles, so the shim needs to be thinner. Notch the mullion to fit the rails.





Make a new jig. *The angle is smaller on the mullions, so the shim needs to be thinner.*



Fine-tune the fit. *Dry-fit the mullions and mark for a notch that brings them flush with the front of the rails.*

Add the stops. *They were cut from the rails earlier. Drill clearance holes for the pins that hold them in place. Push them in with a wood block, protecting the glass with cardboard.*

WOODWORKERS MART

See advertiser index on page 97 for more information.

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Mix-and-match marquetry

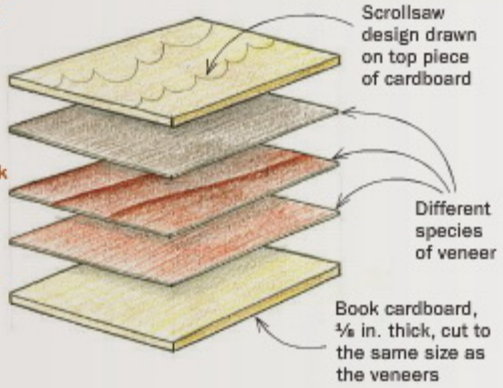
BY JONATHAN BINZEN

Unlike Scriba's sophisticated marquetry patterns are based on a simple technique: She cuts the same pattern in a stack of different veneers all at once, then separates the pieces and reassembles them like puzzles, putting contrasting species in the same composition. She often will re-stack those new patterns and repeat the process of cutting, separating, and reassembling. She says the technique requires patience and care and is not entirely predictable—like the glaze on a ceramic pot, the final pattern is always something of a surprise.

Negative into a positive. *Scriba deliberately leaves the gaps open and fills them with paste in a contrasting color. She sometimes uses commercial wood filler, and sometimes makes her own from glue, sawdust, and pigment.*

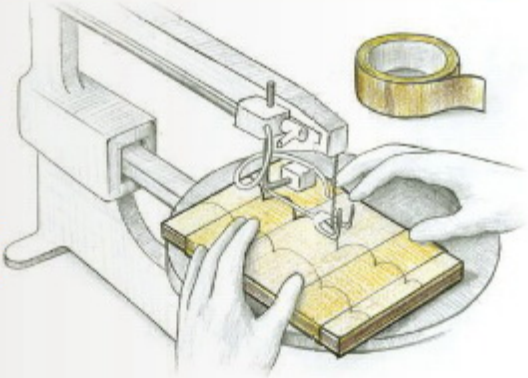
1. MAKE A VENEER SANDWICH

Scriba begins by stacking veneers of different species between pieces of book cardboard. She draws her cutting design on the top piece of cardboard.



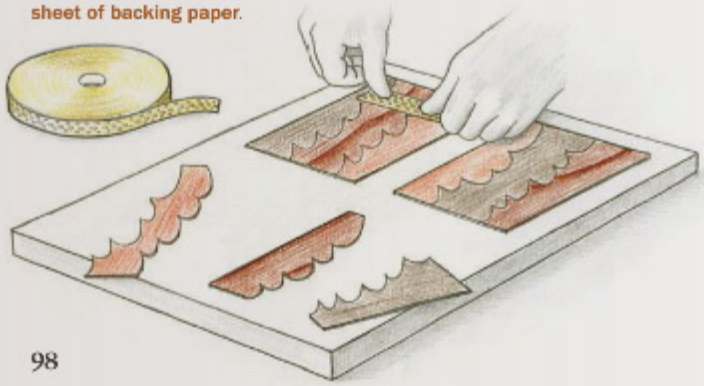
2. SAW THE SANDWICH

After tightly taping the sandwich together with packing tape, Scriba saws along the lines. Then she removes the tape and separates the pieces.



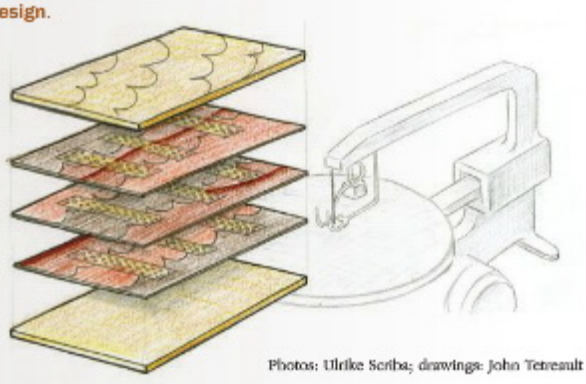
3. PUZZLE OUT THE PATTERN

Working on a clean, smooth surface, Scriba combines pieces from different species to compose new patterns. She uses veneer tape to hold the pieces in place and then adheres each new pattern to a sheet of backing paper.



4. RE-STACK AND SAW AGAIN

Scriba makes a second sandwich with the newly arranged patterns between two fresh pieces of cardboard. She draws a different set of lines, cuts out the parts, and then recombines them to achieve the final design.



Photos: Ulrike Scriba; drawings: John Tetreault

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Magical Marquetry

Ulrike Scriba has worked in marquetry for 30 years and has never stopped experimenting. She grew up surrounded by craft and design: Her father was a silversmith, and architects and cabinetmakers fill her family tree. She began making things from wood and metal in her father's workshop when she was 14, but learned marquetry completely on her own. "I learned by making mistakes," she says. "It was the mistakes that spurred me on." Scriba, who lives amid vineyards in a small town in southern Germany, cut veneers with a knife at first and used that method for years before switching to a scrollsaw. Her designs evolved along with her technique. She first explored repetitive geometric patterns, which shifted to the asymmetrical arrays and looping lines of her current pieces. Scriba reveres the great German marquetry of the 18th century and the Art Nouveau period, but has no interest in replicating those designs. Instead, she continues to innovate, saying recently, "May this old art be granted a future!"

—Jonathan Binzen

Photos: Paul Clemens (above), Ulrike Scriba (below, left)

Lidded boxes. *Scriba's decorative boxes, measuring about 10 in. square, feature ornate marquetry over a solid-wood body.*

How They Did It Turn to p. 98 to see Scriba's simple technique for creating complex marquetry patterns.

Pro Portfolio For an audio slide show featuring more of Scriba's creations, go to FineWoodworking.com/extras.