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Fine Woodworking

Unlock your router's potential, p. 56

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Fine Woodworking

NOVEMBER/DECEMBER 2012 ■ ISSUE 229

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THIS MONTH ON FineWoodworking.com/extras

Visit our website to access free web tie-ins, available September 27. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.

VIDEO:

New Take on Tapering

Period furniture pro Steve Latta has rewritten the book on the traditional leg-tapering jig. Find out what sets his jig apart from the pack in this video tour.

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Inside the Shaker Workshop

Think the sliding tablesaw was a European invention? Think again. Step inside a Shaker shop and find out why these "traditionalists" were actually technology mavericks.

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VIDEO WORKSHOP

Build a Home for Your Hand Tools

This beautiful wall-hung cabinet houses your finest hand tools in style. Michael Pekovich takes you through every step of the process, including:

- **tips on tool layout and cabinet design**
- **how to cut proud dovetail joinery that's easy on the eyes and inviting to the touch**
- **custom tool-storage solutions for everything from chisels and handplanes to squares and spokeshaves**

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contributors

Twelve short years ago, Mark Schofield (Fundamentals: *"The Language of Finishing"*) arrived for an interview with *FWW* holding a half-built corner chair as proof of his interest in the craft. With his business background, we joked that he was applying to be chairman. Instead it was his office chair that mattered most, as Mark displayed an incredible level of productivity and became managing editor. Mark still has that Chippendale corner chair, and many other pieces he made after being inspired by the best furniture makers in the country. "It's been a great run but now it's time for a new adventure," he said. "By the time you read this I'll be in Puerto Rico with my wife, who was transferred there." Born in England, and an avid rower, Mark was convinced to make the move when he discovered a small but passionate rowing club on a lagoon in San Juan. We'll hire another editor, but we won't replace Mark.

At age 13, **Brian Roy** (Master Class: *"Perfect dovetails on a curve"*) got a Sears tablesaw from his dad. Thirty-two years later, this South Carolina woodworker can still hear his father's voice saying "watch your fingers!" and counts himself lucky he still has all 10. Inspired by James Krenov's book *A Cabinetmaker's Notebook* in high school, he cut his first dovetails with a hacksaw. Later, he studied under Krenov himself at College of the Redwoods in Fort Bragg, Calif.
Your favorite tool? "All my wooden handmade planes. There's something about handplaning that gives me energy."

Here at *FWW*, it's common to see lumber piled in editors' cubicles and furniture in various stages of assembly. But when **John Tetreault** (*"Fine Furniture from Reclaimed Wood"*) joined the staff as associate art director, things took a definite turn toward the funky. Tetreault loves using reclaimed lumber and oversize timbers in his work, and often throws in a joint or two of his own design. On a recent vacation in Greece, he studied with a stone sculptor.
If you weren't a woodworker ... "I might just get a huge chunk of marble delivered to my backyard and chip away."

Tim Rousseau (*"Float the Top"*) divides his time between teaching at the Center for Furniture Craftsmanship in Camden, Maine, and making furniture in the shop he built beside his house in rural Appleton, Maine. He often shares the shop with his two older sons, who are 8 and 5. The youngest, not yet 1, is the only one without a workbench of his own. The brood of boys is joined outside the shop by a band of chickens, whose eggs supply the neighborhood.
If you weren't a woodworker ... "Maybe [I'd] be some kind of farmer. I'd like to grow food for people."

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

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Top photo: Kevin Hall

letters

Spotlight

ISSUE NO. 227
July/August 2012
p. 30

RUST PREVENTERS

Did WD-40 get a bad rap in the rust test? The samples shown in "Got Rust?" showed essentially zero rust when WD-40 was used, yet there is no further mention of WD-40, which also happens to be the cheapest and most widely available option. What happened?

—SAMUEL R. WARD, La Jolla, Calif.

Editor replies: *We received a number of similar questions about WD-40. Sorry for the confusion. WD-40 certainly performed well, but it left a slick residue on hand tools. As mentioned on p. 34, Tom McKenna picked CRC Industrial 3-36 as Best Overall and recommended Moovit as a non-petroleum alternative because they both prevented rust just as well as WD-40 but without the residue. By the way, if you buy online, you can find CRC for the same price as WD-40.*


ALUMINUM FOIL

Your recent test of rust preventers could have included another method, the sacrificial anode. I live in a maritime climate, where the salt air does steel no favors. I work both in wood and metal, so I have a lot of tools to take care of. One of my tricks, certainly for my files, is to wrap them in aluminum foil to form a sleeve. The aluminum protects the steel by corroding preferentially, and it also prevents the tools from damaging each other in storage. When the sleeve gets a bit shabby, it costs little to raid the kitchen for more foil.

—CHRIS PATTISON, Auckland, New Zealand


DESSICANTS

Living in western Washington, known as the "Wet Side," we are very conscious of the effect moisture can have on our tools. The article mentioned using dessicants, which I have found to work well. I particularly like the high quality, convenient, and practical units produced in our area, which can be found at H2Out.com.

—LARRY HOLDREN, Bellevue, Wash.

Twisted doors? Consider the case

Regarding your tips on avoiding twisted doors (Q&A, *FWW* #228), here is some advice from another angle. The problem might not be the door at all. If the cabinet was fastened to a wall, was the wall plumb? If it is a freestanding cabinet, was the floor level and flat? In both cases, the answer probably is no. For a wall-hung piece, you often can alleviate a twisted door by loosening the fasteners and shimming the back of the cabinet. Experiment to see which corner needs adjustment. For a cabinet that sits on the floor, you can shim up one of the feet to get the whole thing level and correct a seemingly twisted door. Better yet, build yourself a dedicated, ultra-level, low bench for assembly. It ensures that your cabinets will go together square to start with, and keeps you from wearing out your back and knees. Hang the doors while the cabinet is on that low bench so you will know immediately if the floor is not level or the wall is not plumb when you install the piece.

—CURT ANDERSON, Green Bay, Wis.

Another reason low-angle block planes are better

Thanks to Mario Rodriguez for the great review of block planes (*FWW* #228), and to Tom McKenna for the short video tutorial provided as a free online

Fine WoodWorking

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extra. While Rodriguez explained the different bed angles for low-angle and standard planes, I don't think the point was made that because the blade is bevel-up, it is easy to get the low angle to have the same effective 45° cutting angle of a standard block plane simply by adding a microbevel to a standard blade. So you can always get a low-angle plane to do what a standard will do, but the reverse is not true.

Also, while Veritas and others offer optional higher-angle blades for this exact purpose, I suggest buying the standard 25° blade and adding that microbevel to get the final 33°, 38°, whatever. There isn't much metal to remove, and sharpening goes quickly.

—CHRIS HUDSON, via email

Better way to ebonize wood?

I have used water-soluble black aniline dye to ebonize wood in the past, as Garrett Hack recommends in "Ebony, the Dark Knight of Details" (*FWW* #228). But as he warns, it raises the grain. I have also tried Constantine's methanol-based "non-grain-raising" dye, and it too raises the grain, though only slightly. My most recent and successful find is Fiebing's Professional Oil Dye in black, which is used for dying leather. It does not raise the grain at all. It goes on like a regular oil stain and dries in just a few minutes, and it comes out jet black on all woods I've tried it on. It can be found at various online sites, such as Amazon.com, or at your local tack shop. Be aware, however, that it's not available in California.

—GERALD C. LAUCHLE, State College, Pa.

Beware false positives when testing old finishes

Jeff Jewitt's article, "Revive a Finish" (*FWW* #228), contains a basic error often repeated in woodworking publications. Lacquer thinner is the other solvent for shellac. So if you try it first to see whether a finish is lacquer or shellac, you still won't know. Use alcohol first. If the finish comes off, it's shellac. If not, try lacquer thinner.

—MICHAEL ARNDT, Severn, Md.

Jeff Jewitt replies: *Lacquer thinner will not dissolve shellac (try it with flakes.) Lacquer thinner is typically around 50% toluene, 25% MEK or another ketone, and 25% alcohol (isopropyl). There is some validity, however, in what Mr. Arndt says and it goes both ways. A really aged and degraded lacquer finish will be softened by a high-methanol-content denatured alcohol. Also, certain lacquer thinners may soften an old shellac finish enough to give a false positive. Don't be fooled by a softened finish. Make sure it gets obviously sticky or tacky. Try to actually remove finish from an inconspicuous place (like under a drawer-pull backing plate).*

'PopArch' table. *We missed this mixed-media table by Paul Sirofchuck when we reviewed the 'Poplar Culture' exhibit at the Wharton Esherick Museum.*

More 'Poplar Culture'

I was delighted to see the exhibition "Poplar Culture: A Celebration of a Tree," featured in your Readers Gallery (*FWW* #228). My wife and I were fortunate enough to see this wonderful exhibit in person at the Wharton Esherick Museum in Paoli, Pa. We were disappointed, however, to see that our own favorite work, a piece by Paul Sirofchuck, was not included in your story about the museum show. Paul is an architect by trade who was inspired by Esherick to build studio furniture (sirofchuckstudios.com). He captured the design and building process for this table in a blog that is archived at http://sirofchuckstudios.blogspot.com.

—GRIFF HOLMES, Greensburg, Pa.

Don't be fooled. *Certain lacquer thinners may soften an old shellac finish, but they won't dissolve it. For that, you need denatured alcohol.*

About your safety

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.

methods of work

Best Tip

Quick-change dust-collection manifold

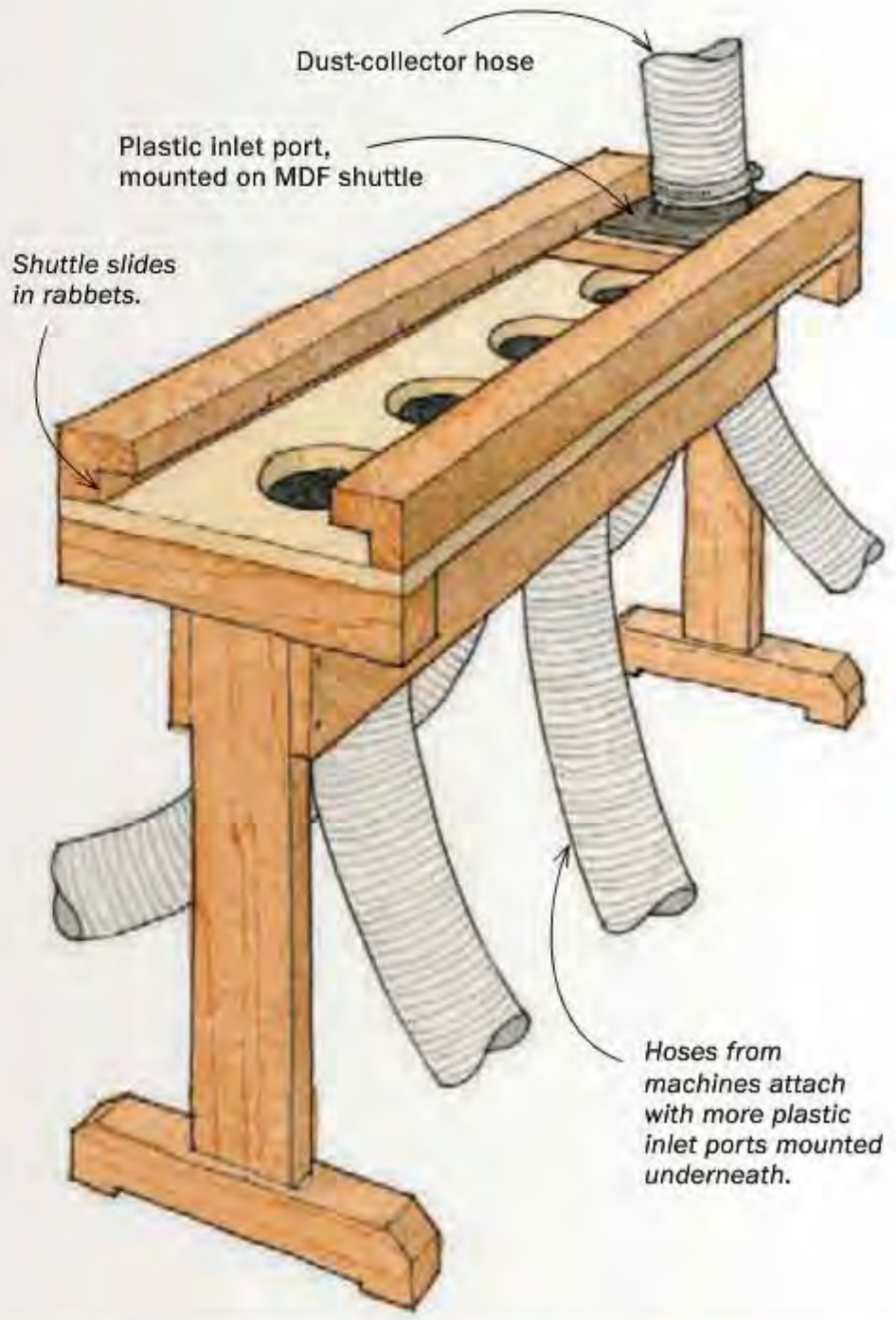
Chuck Lambert is a self-taught woodworker who has been practicing the craft for 14 years. He says he really enjoys the problem-solving aspects of the hobby, designing and building his own furniture plus special projects like a windmill and Venetian gondola, to name two.

For years, I tried to equip my shop with a convenient dust-collection system for multiple machines. First, I engineered a system with seven machines permanently connected. But each time I went to a new machine I had to close and open blast gates. Often I'd leave a gate open by mistake, sapping the performance of the system. I also dreaded the time spent disassembling and cleaning the frequently clogged gates. In my next shop, I hooked up individual machines as needed—no blast gates involved. This was simpler but still took longer than I wanted.

Finally, I built this manifold. It holds—in one place—the open ends of the outlet hoses from five machines. The intake hose from the collector rides a shuttle that lets it connect with any of the outlet hoses. The system is convenient and has the efficiency of a direct connection from machine to collector.

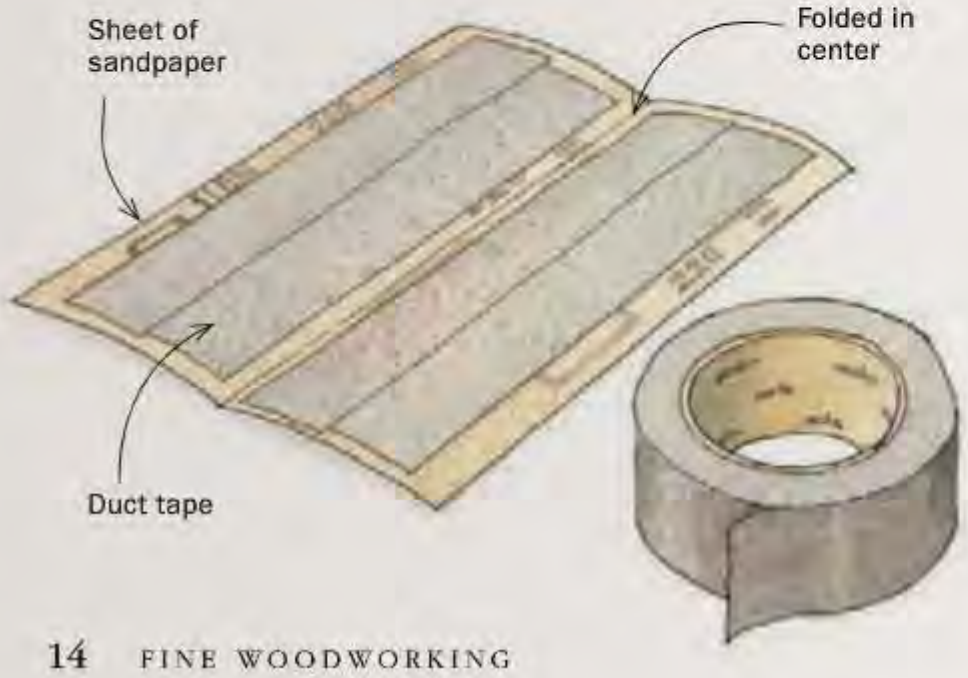
The only moving part is the shuttle, which slides in rabbets. I used a fly cutter to cut the 3¾-in.-dia. holes for the hoses, but a standard 4-in. hole saw would work as well.

—CHUCK LAMBERT, Ballston Spa, N.Y.



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 *Fine Woodworking* DVD archive.



Duct tape strengthens sandpaper

I do a lot of finish-sanding freehand, without a block or support, so I can smooth over curves and edges and get into nooks and crannies. But the finer abrasives are usually bonded to thinner paper and, at least for me, the paper is too thin and ends up tearing long before the abrasive is consumed.

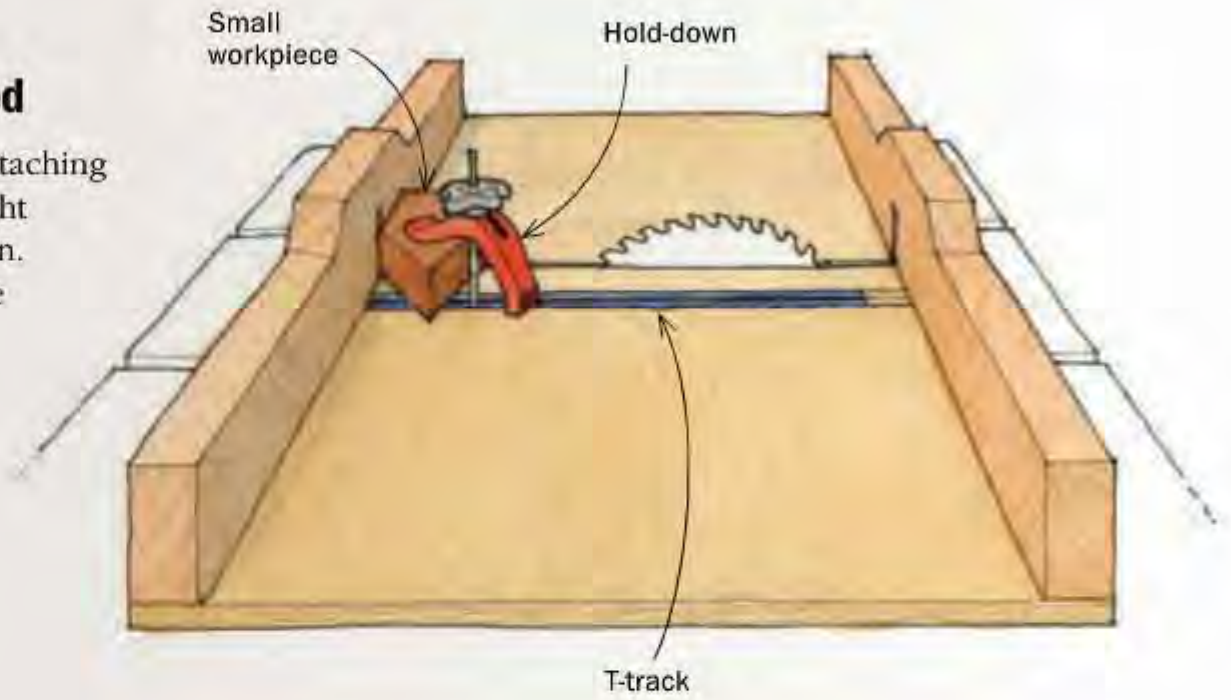
My solution is to back pieces of sandpaper with good old duct tape. It might be stiff at first, but it softens up quickly. The resulting sandpaper can handle a lot of stress and it's a cheap alternative to more expensive papers. I like to fold a piece of sandpaper in half, put a strip of tape on each side of the fold, and then use the paper like a shoeshine rag.

—BRAD ERICKSON, Lake Maggiore, Italy

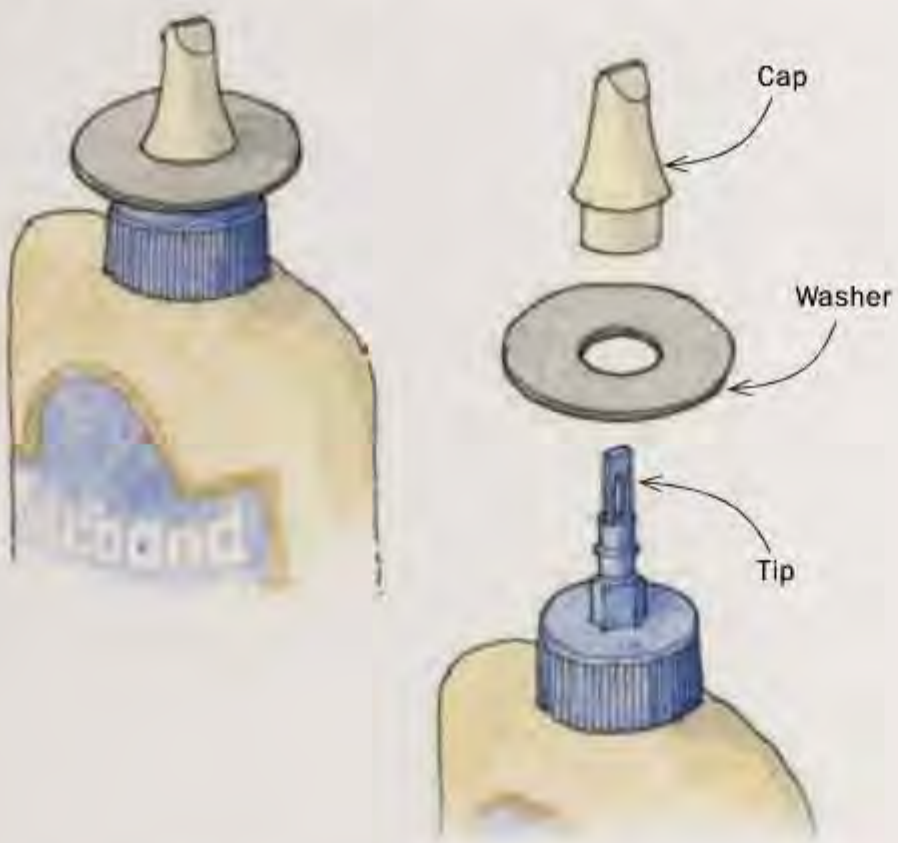
Hold small pieces safely in a crosscut sled

Here's a handy addition to a crosscut sled. Before attaching the fences, rout a dado a couple of inches to the right or left of the blade and add a T-track and hold-down. With this addition, you can firmly hold a small piece of wood for cutting at an odd angle or safely secure a larger workpiece for crosscutting. The hold-down keeps your fingers a safe distance from the blade. When you install the T-track, make sure to leave a gap at the back of the dado so you have clearance to insert the bolt into the track.

—BRUCE BARNETT, Troy, N.Y.



A better bottle cap

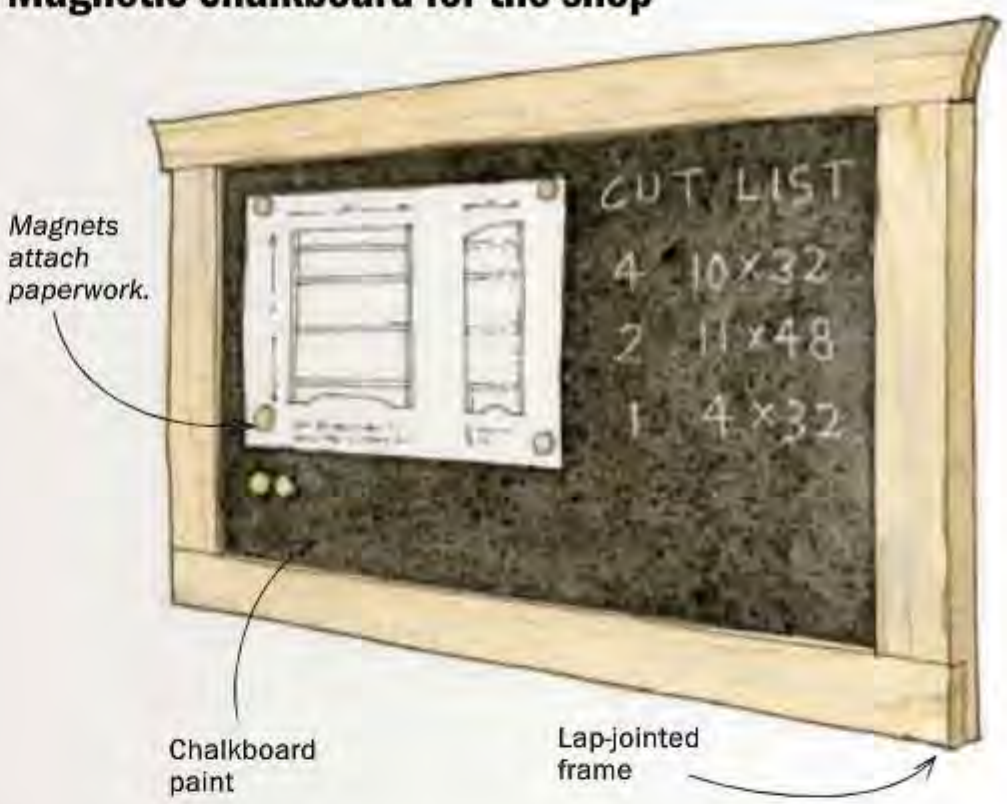


Often, the sliding cap on my glue bottle gets stuck or is hard to open and there is very little gripping area on the cap to get it unstuck. I fix this problem by first pulling the cap completely off the bottle. I then drop an appropriately sized washer over the tip of the bottle.

The large diameter of the washer makes opening the bottle cap easy even when it is stuck, yet still allows the cap to close air-tight. An unintended bonus is that the washer also catches a lot of dripping glue before it runs under the cap.

—BOB HARTIG, Sheboygan, Wis.

Magnetic chalkboard for the shop



I use chalk to mark boards when roughing out a project, and I recently decided that I also wanted an old-fashioned chalkboard for writing cutlists and sketching ideas. When I built it, I added magnetic primer behind the chalkboard paint to give the board a second purpose—a place to attach papers and plans using rare-earth magnets.

I made the chalkboard from a piece of ½-in.-thick MDF with three thin coats of magnetic primer and three coats of chalkboard paint (both available from Rust-oleum). I built the frame using half-lap joints and then ran a rabbet around the inside to set the MDF blackboard flush with the back. I trimmed the ends of each rail and stile to get the look I wanted before glue-up.

I love being able to hang my plans and keep notes in one place that is out of the way, yet accessible and visible from anywhere in the shop.

—CHRIS ADKINS, Duluth, Ga.

■ MACHINES

Top-notch sliding tablesaw for less

Hammer K3 Winner 31x48
$3,250
hammerusa.com

A slider for home shops. *The K3 Winner series comes in four sizes. We tested the 31x48 model, which is a good fit with a home shop. It has a 31-in. stroke and 48-in. rip capacity.*

BEING AN ADMIRER OF EUROPEAN AUTOMOBILES, I appreciate well-engineered machines like the new Hammer K3 Winner tablesaw (I tested the 31x48-in. model).

The right-tilting saw is a smooth operator with a 3-kilowatt motor (a bit more than 4 hp) that delivers serious cutting power, an adjustable riving knife for enhanced safety, an electronic motor brake for safety and convenience, and a European-style rip fence that can be used in a high or low profile, all for less than most other sliding saws on the market.

Of course, the sliding table is the big selling point. Seldom seen on American saws, it provides super-accurate cuts with support close to the blade, replacing your shopmade crosscut sled and making miter cuts, trimming doors to fit, and a host of other fussy operations easy and safe, not to mention how excellent a sliding table is with sheet goods. This slider is silky-smooth in operation and has a locking pin that secures the table for ripcuts. The long crosscut fence is accurate and easily adjusted for miter cuts, and it features a stout flip-up stop for repeat crosscuts.

The 12-in. blade has a unique double 9mm pin arbor mount with a central 30mm bore. It's available from Hammer, and dado blades are available from forrestblades.com (item No. DK06244; $337, with custom bore).

Dust collection is OK with a 50mm port on the blade guard and a 120mm port on the tablesaw base, both sizes a bit off from readily available fittings.

One thing to note: The cabinet interior is cavernous with a very small access door. If you drop the arbor flange, nut, or wrench in there, it will be hard to retrieve, so keep a long-reach magnet handy.

—Roland Johnson is a machine aficionado and a contributing editor.

Micro-adjust rip fence. *The Euro-style fence lets you dial in the cut with precision.*

Best tools from IWF Atlanta

Citing an uptick in show attendance, manufacturers were upbeat at this year's International Woodworking Fair, rolling out a number of innovative new tools. Here are a few we can't wait to test out. For the rest, check out our blogs at FineWoodworking.com/extras.

A BANDSAW LIKE NO OTHER

Powermatic's new 15-in. bandsaw is a different animal for American **tool makers. The PM1500 features a 3-hp motor** and a huge **14-in. resaw capacity. It includes a tall resaw fence,** and as a **safety measure, the saw won't start unless the blade** has been **tensioned. The PM1500 will be available at the** end of **the year, with a street price of around $2,900.**

NO-TEAROUT FLUSH-TRIMMING BITS

Whiteside's Ultimate Trim Bits feature high shear-**cutting angles with a double-compression** action **that the company says eliminates tearout on the top and bottom edges as you pattern-rout. The ⅞-in.-dia. solid-carbide bits are offered in three configurations** (Woodcraft.com): **our favorite, with a bearing on the shank and end ($150); with** a **bearing on the end ($150, not shown); and** with **a bearing on the shank ($140).**

Photos, except where noted: John Tetreault; IWF: Asa Christiana

■ HAND TOOLS

Tempered blanks for scratch stocks

SCRATCH STOCKS ARE GREAT FOR ADDING delicate details to your furniture. I often make my own by filing an old bandsaw blade and then mounting it in a simple wooden holder. But finding the right steel—both durable and easy to shape—is a problem for many hobbyists. Now Hock Tools has introduced its own take on this age-old tool, offering spring-steel blanks at an affordable price.

The material is significantly thicker than my normal bandsaw blade stock, which means that the Hock steel can be shaped into finer details and still be robust enough to handle the stress of use. The bluing on the steel works great for layout when scratched with an awl. To shape the profile, I used a series of fine chainsaw files, and was pleasantly surprised by the ease with which the files cut.

You can also purchase a bamboo holder for $30, which includes a blade blank and one blade with a bead profile. The bamboo body has an excellent fit and finish, but I found it hard to control along curves and was unable to keep the cutter perpendicular to the surface, which is necessary to make a consistent-size bead.

I still prefer to make my own blade-holders, but I'll be using Hock's scratch-stock blanks in the future.

—David Moore is the author of "The Power of the Simple Scratch Stock" (FWW #220).

Scratch stock blades by Hock Tools

$6 for a pack of four blanks ($30 for holder and two blades)

hocktools.com

Plunge Base for Bosch Colt

PR011

$100

boschtools.com

■ POWER TOOLS

Better base for Bosch trim router

THE BOSCH COLT IS A GREAT LITTLE ROUTER—tough, simple, and affordable. Now it's even more versatile, with the introduction of a plunge base that turns the Colt into an accurate, easy-to-use plunge router.

The base has seven turret stops with two that are microadjustable, an easy-to-read depth scale, and a microadjust extension on the plunge stop rod. All of that adds up to the ability to quickly set accurate plunge depth for any length or style of router bit. The well-placed plunge release lever is large and comfortable to use, and provides smooth action. The base handles are nicely sized with a soft-grip textured surface, and they're angled forward in a comfortable position. The base also accommodates a router edge guide.

The view under the router is good, way better than with the stock square base, with a great sightline to make inlay work or any fussy bit placement a walk in the park. And it's super easy to insert and remove the router from the base.

I've used the router base for a couple of weeks now and can't find a drawback. It's simple and accurate and makes the Colt easier to use for inlay work, hinge mortises, and edge-profiling.

Bosch representatives say the base will be available in October. A combination kit (model PR20EVSPK), which includes the motor, fixed and plunge bases, an edge guide, and case, also will be sold for about $200.

—R.J.

ROUTER TABLES YOUR WAY

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COMBINATION HANDPLANE

The Veritas bevel-up jack rabbet plane is a large rabbet plane and low-angle jack in one body. The plane, which features a Norris-style adjuster and an adjustable mouth, will sell for about $300, and we're told it will be available in September.

Photo, top right: Roland Johnson

■ POWER TOOLS

Updated Dremel great for carving and detail work

Dremel 3000 2/28 Rotary Tool Kit
$65
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I'VE OWNED A DREMEL ROTARY TOOL FOR YEARS and I've found about 102 uses for it in my woodworking shop, from drilling and sculpting wood to cutting screws and hardware to engraving salvaged copper name tags for my furniture. I even use it to hold tiny drill bits that are too small to fit in the chuck of my cordless drill.

Like my old Dremel Multipro 395, the new model is loaded with great accessories. The biggest improvement is that they've replaced the tiny, easy-to-lose chuck wrench with a toolless chuck that holds bits securely and makes changing them a breeze.

The variable-speed motor is small but packs a punch—or at least a good slap. The shape of the nose cap provides a comfortable grip when you're choked up on the tool for controlled work. The tool comes with a simple router-type base that works well for small, freehand inlays. It doesn't plunge, but it's easy to adjust and holds its settings, allowing you to ease the cutter into the work. It's plastic, though, so don't overtighten the bolts.

The kit also comes with a handful of accessories for sanding, polishing, grinding, and cutting—a few of each to get you going. And it will accept all manner of Dremel bits. If you do a lot of detail work, such as sculpting small parts or texturing, the Dremel 3000 will be an excellent shop mate. It comes with a four-year warranty, but I've been using my old one for about 12, without a problem.

—John Tetreault, associate art director, is a wood sculptor extraordinaire.

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The language of finishing

FROM ANILINE TO WITNESS LINE, GRASP THE LINGO AND YOU'LL SOON BE A FLUENT FINISHER

BY MARK SCHOFIELD

Hook-and-loop

One reason many woodworkers find finishing difficult may be because the language is so confusing. If your finish is bleeding, does it need time to cure? If it is blushing, should you be distressed (or perhaps you should be fuming)? Do you call the mob if you need a finish rubbed out?

What follows is the first in a two-part guide to the language of finishing. Each installment will explain some of the more common but cryptic words and phrases. We'll start by covering surface preparation and the range of finishes available. In Part 2, we'll discuss different methods of applying and polishing a finish.

Pigtail

Surface prep: the foundation of finishing

Surface preparation is the process of using handplanes, scrapers, and sandpaper (powered by machine or hand) to remove surface blemishes left by machines. A handplane and card scraper is the fastest method; sandpaper is typically the last step. Almost all sandpaper now uses the European **FEPA scale** (a metric system for measuring the coarseness of the abrasive granules), denoted by a P before the number. The older **CAMI scale** is now mostly confined to grits higher than 600 in wet-or-dry paper used for sanding finishes.

Most random-orbit sanding disks (and some rolls of abrasive) come with a **hook-and-loop** backing (aka Velcro) that can be pricey but lets you remove and reuse the disks. **Sanding swirls** and **pigtails** are visible scratches caused by pressing down too hard on a random-orbit sander. The sander's weight alone is enough to

Surface preparation

Raking light

Breaking edges

Photos: staff

Tack cloth

Pure oil finish

Chatoyance

let the disk do its job and yet spin randomly, leaving an evenly distributed scratch pattern.

For a penetrating oil finish (see below), you should sand up to P220-grit on most hardwoods, but on cherry or other woods that tend to absorb oil unevenly, I would go to P320- or even P400-grit to burnish the surface. For a thicker film finish, you can stop at P180-grit, but make sure the surface is flat and smooth. Check your progress with a spotlight or desk light just above the surface of the wood, shining across it. This is known as a **raking light.**

Finish sanding using a **sanding block**. This can be either solid cork, or wood faced with ⅛-in.-thick cork or rubber sheet (a cork floor tile works well). If you are applying a water-based dye or a waterborne clear finish to the bare wood, wet the wood with a damp cloth to **raise the grain**, causing the surface fibers to swell. Let the surface dry, and then hand-sand. This prevents the dye or clear finish from raising the grain and leaving a rough surface.

While you are hand-sanding, you'll want to **break the edges** of the piece. This involves very slightly rounding or chamfering the sharp corners. This makes the edge feel better to the touch, helps resist dents, and is more forgiving under a film finish. Breaking the edge lets the finish flow around the corner, giving the whole surface an even coat.

When you've finished sanding, remove the dust with a vacuum cleaner, blow out any remaining dust in the wood's pores with compressed air, and then wipe the surface with a cloth dampened with denatured alcohol or with a **tack cloth**. This is a cheesecloth impregnated with a kind of sticky varnish to pick up any fine dust remaining on the surface. Unfold the cloth, then lightly bundle it and wipe the surface, applying minimal pressure. Pressing down hard can leave sticky residue on the surface that may interfere with waterborne finishes.

Oil-based finishes

Oil and oil-based clear finishes are the finishes that most *FWW* readers use, but their complexity and range of variations also make them the most complicated to understand.

The simplest are **pure oil finishes**, which contain no resins or solvents. These are applied thinly and rubbed into the wood, eventually revealing any luster or **chatoyance** deep in the wood. Over time, pure oil finishes start to look dull but are easily cleaned and renewed.

The most common pure oil finish is **boiled linseed oil,** which is derived from the seeds of the flax plant. It is not actually boiled but has chemicals known as **metallic driers** added

Gel finish

to speed up the absorption of oxygen, which is how an oil finish cures. **Raw linseed oil** contains no driers, will take far longer to dry, and will not cure as hard as boiled linseed oil.

Like boiled linseed oil, **pure tung oil** is another **drying oil**, meaning that it will dry to a hard finish and will not remain greasy or sticky.

The range of **oil-based finishes** is immense, but they all share three components. The first is a **binder,** also known as a resin, which when dry forms a film attached to the wood's surface. Binders in oil-based finishes include **acrylic, phenolic, alkyd,** and **urethane**. The second component is a **carrier** to help the binder flow out. The most common are linseed, tung, and soybean oils. Finally, you need a **thinner** (a solvent) to achieve a workable viscosity. Commercial finishes use mostly **mineral spirits,** but shopmade oil-based finishes can be made with some **naphtha** for faster drying, or **turpentine** for slower drying (and a nicer smell).

Varying the ratio of these three components creates different finishes. You'll sometimes hear a finish described as **short oil** or **long oil** as if it were a commodities trader. A short-oil finish will have a higher percentage of binder and will

Wiping varnish

Shellac

Buttonlac

Blond

Orange

Garnet

form highly protective indoor finishes such as varnish or polyurethane. Thinned with solvent, it becomes a **wiping varnish**, meaning it can be applied with a clean cotton cloth. A long-oil varnish, also known as **spar varnish**, has more oil to give it a more elastic consistency that can cope with the increased wood movement outdoors. A higher-quality spar varnish is a **marine-grade varnish,** which should contain **ultra-violet absorbers** or **inhibitors** to slow damage to the finish from sunlight. A diluted long-oil finish is known as **Danish oil**. It is poured on the surface and allowed to penetrate the wood, and then the surplus is wiped off.

Gel varnish, gel polyurethane, or simply **gel finish** are all oil-based finishes with a thickening agent. This makes them much less messy to wipe on and off.

The many types of shellac

Derived from the protective casing of a type of insect larvae in southern Asia, this ancient finish has been refined into various grades and sold in flake or granule form. Among the least refined is **seedlac,** a reddish-orange granule mostly used in matching antique finishes.

Buttonlac comes in small coin-sized disks. Like seedlac, it contains about 5% wax, giving it a cloudy appearance. This makes it good for an antique look but less durable than grades of shellac that have been dewaxed. **Dewaxed** grades of shellac come in flakes and are described by their color, from a dark **garnet** through **ruby, orange,** and **lemon** to a very pale **blond**.

Shellac is an evaporative finish, where one coat melts into the prior one. Its viscosity is measured by its **cut.** When you dissolve 3 lb. of dry shellac in 1 gal. of **denatured alcohol** (ethanol with some methanol added to make it non-drinkable), you get a 3-lb. cut. To thin this to a more easily brushed 2-lb. cut, add one part alcohol to two parts liquid shellac by volume.

Solvent-based lacquer

Lacquer is another evaporative finish. **Lacquer thinner** is made from several solvents blended in different combinations. Faster-evaporating thinner is used when spraying lacquer, but slower blends allow you to brush this finish.

The most commonly sprayed lacquer outside commercial operations is **nitrocellulose lacquer,** made from cotton cellulose, nitric acid, and other acids. It dries fast and offers great

Lacquer

clarity and depth, but its high solvent content is highly air polluting. It also has a strong yellow color, which increases as the finish ages. For a non-yellowing lacquer, go with **CAB-acrylic lacquer**, which is made with clear acrylic resin.

Waterborne finishes

Often incorrectly called water-based finishes (a true water-based finish would dissolve in water), **waterborne finishes** consist of acrylic and polyurethane resins mixed with glycol ether solvent and water. As the water evaporates, the solvent makes the resins sticky so that they come together in a continuous film, the definition of a **coalescing finish**.

Waterborne finishes have names like lacquer, polyurethane, and varnish, but are nothing like their solvent-based namesakes. Instead they all have a white, milky appearance in the can, they dry almost colorless, and they clean up with water. □

Mark Schofield is Fine Woodworking's *managing editor and resident finishing expert.*

Waterborne finish

handwork

Why you need a router plane

UNDERAPPRECIATED TOOL WILL MAKE YOU A BETTER WOODWORKER

BY DAN FAIA

JUST A FEW OF ITS USES

A router plane does one thing well: It trims the bottom of a cavity flat and level. But that one thing makes it perfect for fine-tuning a hinge mortise (above), cleaning up a dado, even one with a stopped end (right), and fitting half-lap joints (far right), just to name a few tasks.

HINGE MORTISES

DADOES

HALF-LAPS

Photos: Matt Kenney

The router is one of the most common tools in the modern shop. You probably have one (or three). So you might wonder why anyone would need a router plane. After all, isn't a router plane just an obsolete, less-versatile ancestor of the router? In short, no. Router planes were never meant to perform those tasks where routers excel: cutting joinery and profiling edges. They are more like shoulder planes than routers, because their specialty is cleaning up and trimming the work of other tools.

The unique appeal of the router plane is that it planes one surface parallel to another and that its depth of cut can be controlled with precision. So, it's a great way to trim tenon cheeks, with the sole of the plane resting on the rail's face.

And if you've routed a hinge mortise just a hair too shallow, you can grab your router plane and remove that last bit of material. I also use mine to create mortises for inlaid panels (like those on Federal-style legs), to trim half-lap joints, and to correct the depth of dadoes cut into slightly cupped boards (dado sets and routers might not cut the dado to a consistent depth across the board).

There's no other tool that can do those jobs as well, so I find one indispensable. Actually, I find two indispensable: a large one for joinery work and a small one for inlay and hinge mortises.

Flatten the sole

To do its best work, a router plane must be properly tuned. Because the plane's primary function is cutting a surface parallel to its sole, the cutting edge itself must be parallel to the sole. It often isn't, so I prep the plane as soon as I get it.

Start by flattening the sole. Use sandpaper attached to a flat surface with spray adhesive. Start with 80-grit paper and work up through the grits to 220-grit, switching grits when the scratch pattern is consistent.

Prepare the blade for parallel planing

Now that the sole is flat, you need to ensure that the cutting edge is parallel to it. If it's not, you won't get flat-bottomed dadoes, mortises, and so on. Surprisingly, not all blades are flat across the bottom, but truing the edge isn't hard. Here's the key: If the bottom of the blade is out of parallel, a trued-up cutting edge might actually look crooked from the top. In

Models new and old

You'll have no trouble finding a high-quality router plane, whether it's a used Stanley or Record, or a new Lie-Nielsen or Veritas. Faia prefers closed-throat models, which work better on narrow stock.

VINTAGE MODELS
Most used large models have an open throat. Stanley and Record overcame this difficulty with a shoe that bridges the gap. If you buy used, make sure it's included.

How to sharpen the blade

For a router plane to do its job properly, the bottom of the blade, or at least its leading edge, must be parallel to the sole. Don't assume that it is—many aren't. Fortunately, it's easy to correct a crooked edge with a shopmade jig and a sharpening stone.

Start by polishing the back. *It might seem like a good idea to do it after correcting the cutting edge, but Fala has found that polishing can easily undo all the work you've done. Hone to 8,000-grit.*

fact, it will not be 90° to the sides of the tool. But before you correct the angle of the cutting edge, flatten and polish the back of the blade, just like you do for chisels and plane irons.

Now here's how to find that "true" angle that creates a level cutting edge. Using the sole as your reference, hone a small flat on the bottom of the blade. Here's the cool thing: The line at the back of that flat is your true angle—and your reference for all the sharpening steps that follow. Turn the blade over and grind the bevel, maintaining that true, level angle as you go. Grind until the last of the flat disappears. Then hone the bevel freehand. Finally, remove the burr. You now have a sharp edge, perfectly parallel to the sole.

To hone that level flat on the underside, I use a jig with a plywood base and a cleat that goes in the bench vise. Attach hardwood runners to the base, spaced just far enough apart for your sharpening stone to fit between them. The runners should be taller than your stone, with top and bottom edges parallel to one another. Place the sharpening stone (I use a fine India oilstone, but a 1,000-grit waterstone works, too) between the runners. Adjust the blade's depth until it just touches the stone and begin honing. Continue until the flat reaches all the way across.

Make it ride on rails. *On a plywood base, attach hardwood rails that are about ½ in. taller than your sharpening stone. Put a stop block at the far end to hold the stone in place as you push the blade over it.*

The blade just touches the stone. *Don't worry if the blade's entire width isn't in contact; grind what does touch, lower the blade, and repeat until the entire width is level.*

Grinding creates a flat. *But the flat isn't important. You'll grind it away to get to the angled back line, which is parallel to the plane's sole and serves as a baseline for the blade's new cutting edge.*

Regrind the bevel. *Use the front wheel of a belt or stationary sander to create a hollow bevel (right). Grind until the flat just disappears, while maintaining the angle at the back of the flat. Hone the bevel on the edge of a stone (far right).*

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Two routers are better than one

Just like the versatility you get from pairing a trim router with a standard one, you'll be able to do more and with greater ease by pairing a small router plane with a large one.

Set blade depth from a scribed line. *Lower the blade until the cutting edge is aligned with the cut line left by a marking gauge.*

Lock in the setting with the depth collar. *They're standard in big planes and let you raise the blade to take lighter shavings but still get back to the final depth.*

A belt sander is the right tool for regrinding the bevel. That might shock many of you, but it really works. Clamp the sander upside down and use the front wheel like a bench grinder. This creates the perfectly sized hollow.

To hone the bevel, stand your stones on edge and hone the blade on the narrow side. Go freehand, balancing the hollow-grind on the stone.

Many router planes have a second, pointed blade. I don't use it, but if you do, the blade doesn't need to be trued like the square one. Prepare it like you would a bench- or block-plane blade. □

Dan Faia is a furniture maker in East Wakefield, N.H., and head of the cabinet and furniture-making program at North Bennet Street School.

TRIM TWO TENONS AT ONCE

Tapered tenons result in doors and frames that aren't flat. Here's a fast, accurate way to trim and true them in one shot.

Get support on both sides of the blade. *Set two rails end-to-end so that you can trim two tenons at once. With a large model, the sole is wide enough to bridge both tenons and rest on both rails (right).*

GO SMALL FOR INLAY

The little brother to the standard size has a narrower blade that fits into tighter spaces, and its diminutive body won't obscure your view of the workpiece.

Use inlay to set depth. *Set the blade just shy of the inlay's thickness. This leaves the inlay proud of the surface, so you can scrape and sand it flush.*

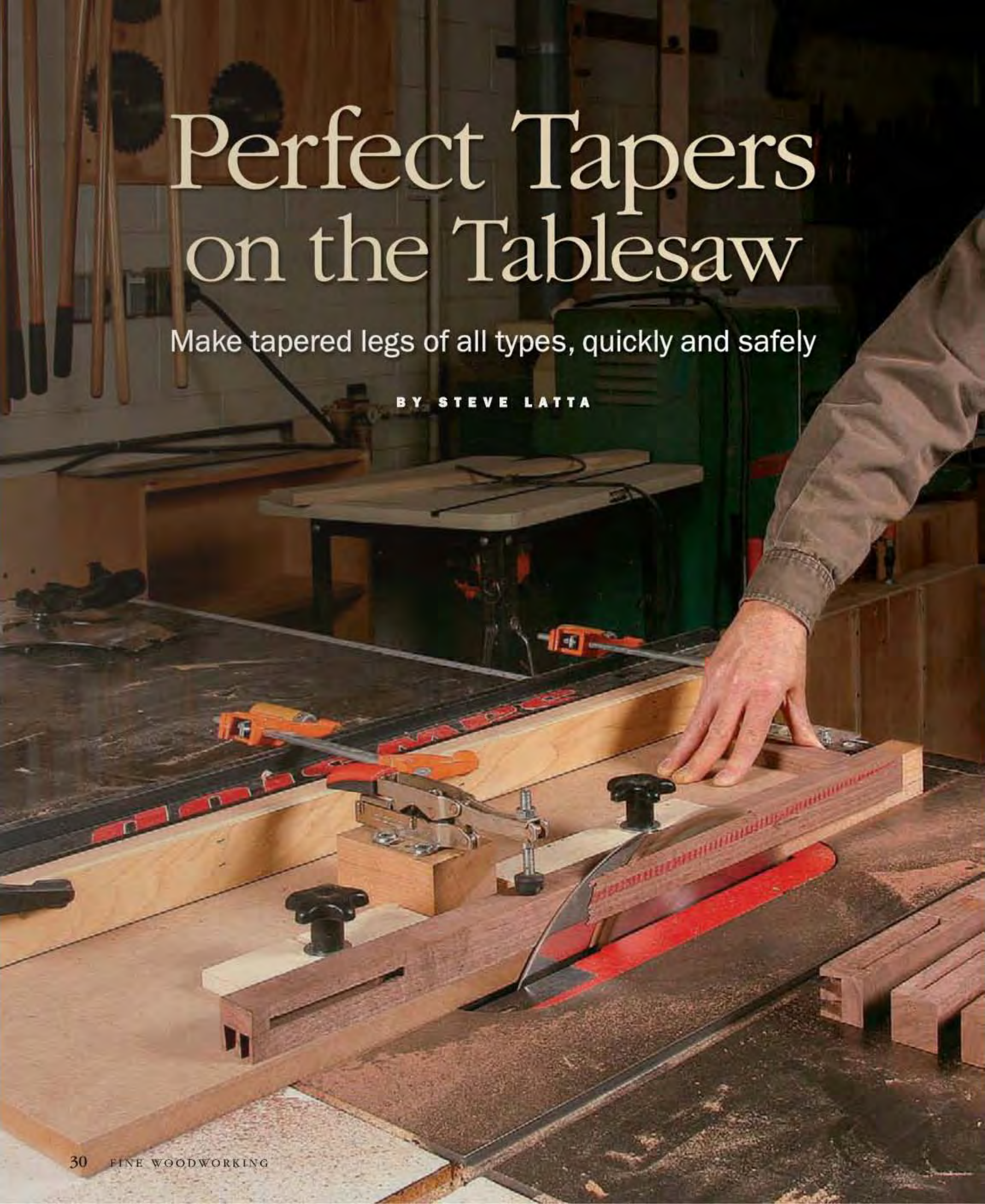
Lock in the depth. *Because small planes don't come with collars, use a drill-bit stop collar to do the job. Now you can work down to the final depth.*

Support is important. *The sole on both sides of the blade needs a surface to rest on, ensuring that it doesn't tip and plane an uneven bottom.*

Perfect Tapers on the Tablesaw

Make tapered legs of all types, quickly and safely

BY STEVE LATTA



It's no secret why woodworkers taper the legs of tables and chairs: It improves the appearance of the entire piece. Tapering breaks up that boxy square look, lightens the visual weight, and helps direct the eye toward the center.

Tapered legs are found across the range of furniture styles. The majority have tapers on two adjacent faces that begin just below the apron or rail, keeping the joinery square. But you can also find tapers that extend to the top of the leg, and tapers on all four sides. What they all demand is a way to cut them accurately and safely.

While you can cut tapers on the bandsaw or the jointer, tablesaw cuts are cleaner and more accurate. However, the standard commercial tapering jig (two aluminum sections hinged on the end) has always scared me—strike that—terrified me. Because the workpiece isn't clamped to the jig, your fingers have to come dangerously close to the blade.

Why I favor foolproof

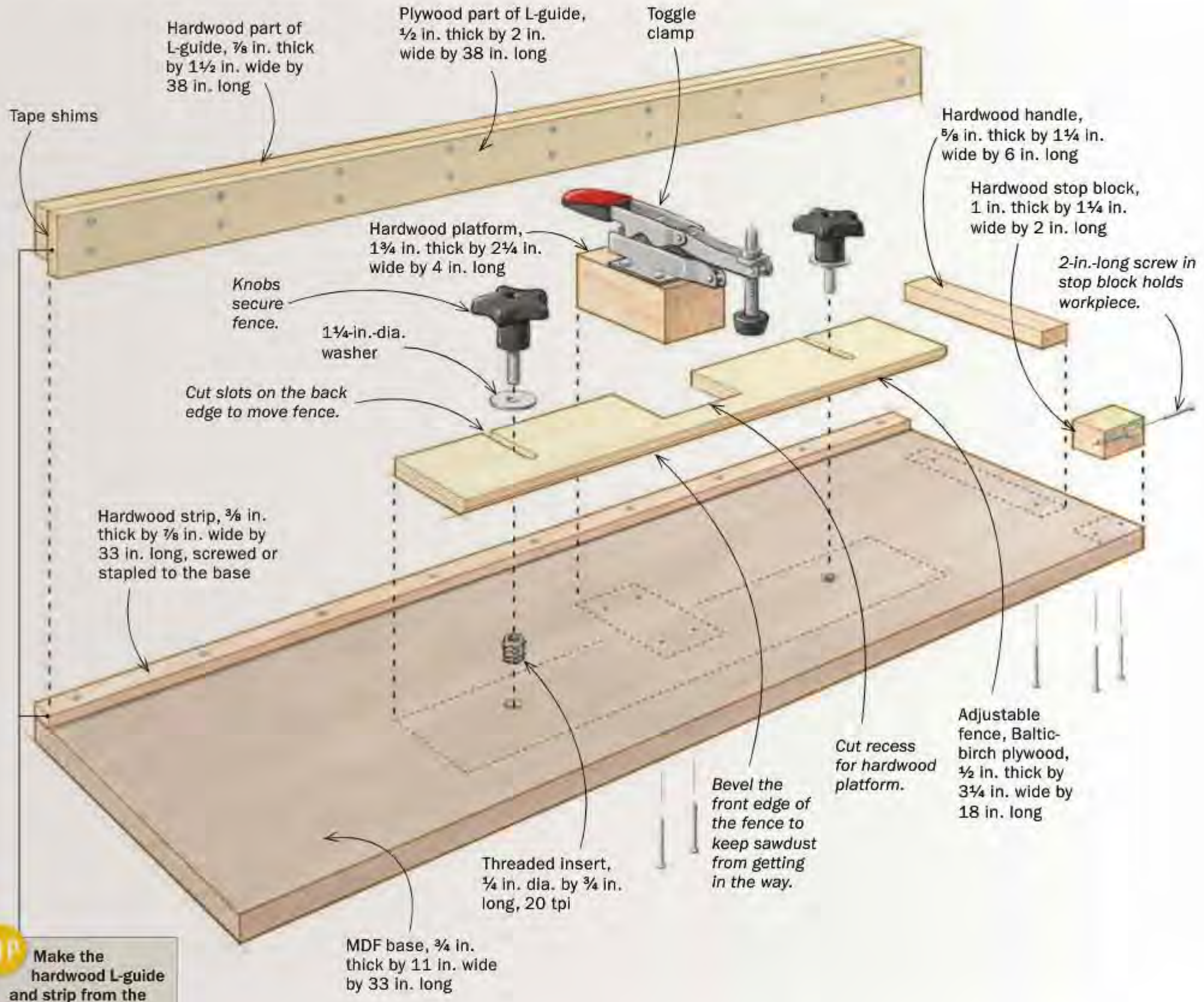
At the college where I work, many of my students are new to woodworking, so any jig has to be simple and safe to use. The jig we use to taper legs ticks both these boxes. It falls under the broader category of what I call carriage jigs, in that the work is carried on some sort of sled. Because one edge of the sled lines up with the path of the blade, setting the location of the workpiece is very easy, and with a built-in clamp to secure the workpiece, your hands remain well clear of the blade.

Instead of the sled being guided by the miter slot, as in most cases, I have it hooked to the fence. If the sled only rides in the

Tapered legs on fine furniture. *You need a jig that can make dead-accurate tapers on two, three, or four sides.*

A SMARTER SLED

The sled is guided simply and safely by an L-shaped guide that clamps to the rip fence, and a little hardwood strip that is nailed to the sled.



TIP Make the hardwood L-guide and strip from the same piece.

miter slot, it wants to dip and come out of the slot before and after the cut. Some people try to use one knee to support the sled while doing an odd little one-legged dance in front of the spinning saw. Not with this sled. It is tied to the fence with an interlocking strip that keeps it flat on the table at all times.

What's more, one edge of the jig is near-zero-clearance, so it tells you where the blade will cut. That means you can simply align the layout marks on a leg with the edge of the jig, and cut with confidence.

Construction is straightforward

To make the jig, start with a piece of hardwood, roughly ⅞ in. thick by 2 in. wide by 38 in. long, rip off a ⅜-in.-wide strip, and cut it to 33 in. long. This strip will ride against the rip fence, so you want it just proud of the edge of the sled. To achieve this, place a piece of masking tape along the edge of the sled, place the strip and the sled base against the rip fence, and then glue and either screw or staple the strip to the sled. Peel off the tape, and you're all set.

The two long sides of the sled must be parallel, so with the sled riding against the rip fence, trim the opposite side. But before you do that, attach the stop block, so it gets trimmed flush, too. Afterward, attach the sled's adjustable fence, push handle, and toggle clamp.

An L-guide locks the jig parallel to the fence yet allows it to glide smoothly with no slop. To make the

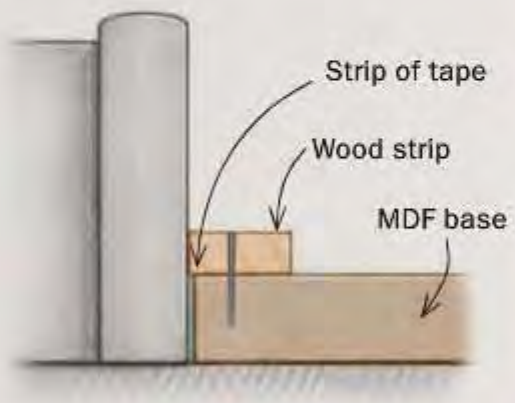
Photos: Mark Schofield; drawings: John Hartman

MAKE IT IN ONE HOUR

The guide strip and fence are easy to attach and fine-tune. The other parts go on quickly.

ATTACH THE GUIDE STRIP

To keep the wood strip just proud of the MDF, temporarily attach a strip of masking tape to a long edge of the base. Push both pieces against the fence as you screw or nail them together.



Trim the other edge. *After attaching the stop block, trim the edge of the sled and the block at the same time. Those surfaces will tell you exactly where tapers will be cut.*

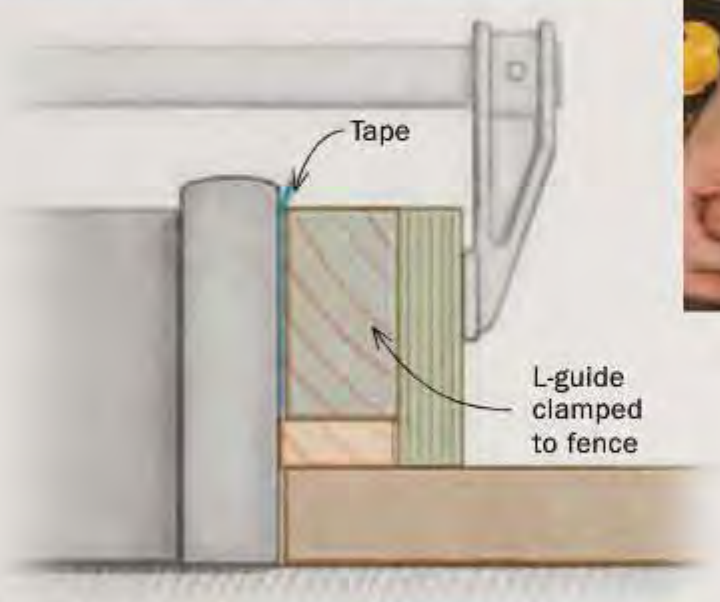
guide, glue and nail or staple a 2-in.-wide by 38-in.-long strip of ½-in.-thick plywood to the remaining piece of hardwood that you ripped earlier. Place the side of the base with the maple strip adjacent to the saw's fence and clamp the guide to the fence. Check to see if the sled slides back and forth. If it is too tight, simply add a strip or two of blue painter's tape to the hardwood side of the guide before reclamping it and testing the movement again.

Two-sided tapers are the most common

On traditional furniture across a range of styles, there is a basic rule for which faces of a leg to taper: If it falls under the aprons, it gets tapered. A tapered leg lends a piece the lightness and grace mentioned earlier, plus gives it a stable-looking stance without making it look splay-legged. On a typical four-legged table with a rectangular top, or

Add the adjustable fence. *Screw threaded inserts into the base of the sled. These will receive the knobs that secure the sled's adjustable fence. File the inserts flush with the underside of the sled to avoid scratching your saw.*

MAKE AND FIT THE L-SHAPED GUIDE



Smooth sledding. *Attach the sled to the fence via the L-guide and see how easy it is to push (right). You may need to add a strip or two of masking tape to the L-guide to allow the sled to slide smoothly but without slop.*

TWO-SIDED TAPERS IN MINUTES

You need to set up the sled only once to cut tapers on two adjacent sides, but lay out each leg to keep track of your cuts.

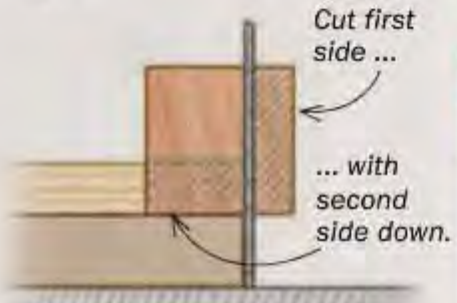
Align the foot. *Line up the layout mark with the edge of the sled and stop block, and push the leg gently against the screw in the block.*

Align the top. *You need only a small tick mark at the start of the taper. Line it up with the edge of the sled, then slide the adjustable fence against the back of the leg blank.*

Adjust the rip fence. *You want the edge of the sled to be about 1/32 in. away from the blade. In this way the taper is cut slightly proud to leave room for handplaning and sanding.*

MAKE THE FIRST CUT

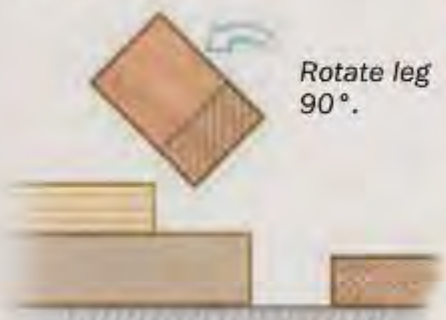
Adjust the jig and cut the first taper.



SEE IT IN MOTION

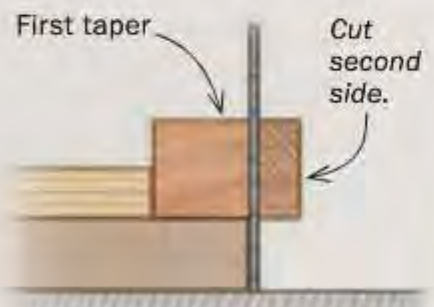
ROTATE FOR NEXT CUT

There is no need to adjust any setting; just reposition the leg while the blade is spinning and clamp it down.



CUT THE SECOND TAPER

With the first taper facing up, make the second tapering cut.



even variations such as a bow or serpentine front, the two inside faces of the legs are tapered. To show how the jig works, I'll cut one of these legs.

First, cut any joinery on the leg. It is much easier while the blank has straight sides. Layout, or more accurately the lack of it, is another advantage to this jig. A line marking the start of the taper and another on the bottom of the foot are all you need. The taper usually starts where the bottom of the apron or rail intersects the leg. I use a combination square to set the lines on the top, being careful to mark only the sides to be cut. Too many lines leads to mistakes! If the taper has a finished dimension of, say 5/8 in. at the bottom, I cut a piece of stock that thick, line up the blanks, and mark the bottoms with one swipe of the pencil. I rotate each leg 90° and make a second mark. Finally, I use a wax crayon to highlight the faces to be tapered.

When using the sled, the thin end of the tapered leg should always be closest to the operator. This way not only are you cutting "downhill" with the grain, but the action of the blade helps push the blank onto the sled. You also want to rotate the leg clockwise after the first cut, so the leg is resting flat on a non-tapered face during the second cut (see photos, left).

To position the leg in the sled, align the mark on the bottom of the foot with the edge of the sled and push the foot into the tip of the screw protruding from the stop block. Now align the start of the taper with the edge of the sled and set the adjustable fence against the leg. Finally, deploy the toggle clamp. Leave a little extra material to handplane and sand by setting the saw fence so that the side of the sled is about 1/32 in. from the blade. Make the cut, using the handle to push

FOUR-SIDED TAPERS? JUST ONE EXTRA STEP

Set up for tapers three and four. *After cutting the second taper, rotate the piece clockwise and align the marks with the sled as before (left). This time, because the opposite side of the leg has already been tapered, you'll need to move the adjustable fence (right).*

Cut tapers three and four. *There is no need to adjust the fence after the third cut, but you might need to adjust the toggle clamp or place a shim under it to maintain pressure on the thinner leg.*

the sled so that your fingers come nowhere near the blade. Pull the jig back to the front of the saw, loosen the clamp, rotate the leg 90° clockwise, and secure it again. Cut the second taper. When cleaning up the saw marks, don't remove any wood above the taper because this will leave a gap between the leg and the apron. To sneak up on the line, I mark the area below the line with a crayon, and then plane up the marked area, stopping just before the line. A final light sanding completes the job.

Three or four-sided tapers are no problem

On a round or oval period table with corresponding shaped aprons, the legs can be tapered on three or four faces. Further, on contemporary furniture, it is common to find legs tapered on four sides, often extending all the way to the top, or even inverted with the wider part at the base of the leg. Never fear, this jig can handle all of these tapers and then some.

For example, with four-sided tapers, cut the first two adjacent sides as above. To cut the last two sides, first adjust the sled's fence to take into account the tapered side of the leg that will now be against it. After cutting the third taper, you may need to place an offcut under the blank to support it during the fourth cut. □

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

CLEAN UP THE CUTS CAREFULLY

Precise planing. *To avoid extending the taper too far, mark the surface of the leg a few inches below the layout mark with a wax crayon (right). This makes it easier to measure your progress and to stop before you reach the line (far right).*

Float the Top

Add lightness and distinction to any table

BY TIMOTHY ROUSSEAU

When you float the top of a table—lifting it up to create a gap between it and the aprons—you're contradicting centuries of sensible furniture making (traditional tops attach easily, and serve to stiffen the base). So why do it? For me, it's partly for the kick of doing something different. And partly for the visual interest and refinement it can bring to a piece.

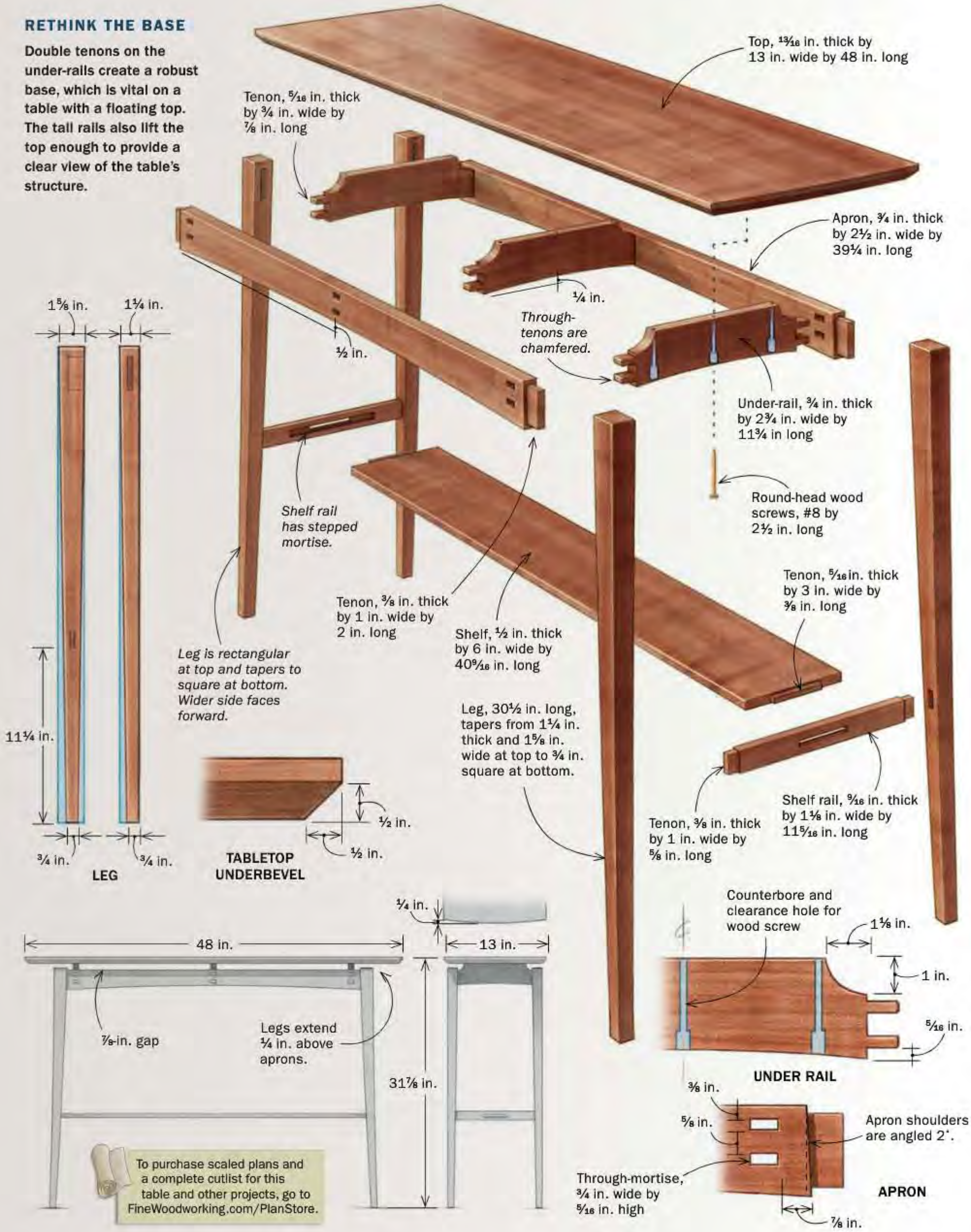
Some makers float their tabletops ½ in. or less, creating a dark shadowline, or reveal, below the top, which gives the table an air of mystery and makes you wonder what's holding up the top. I prefer to float my tops higher, so you can see right through to the structure underneath, almost as if the table were an exploded-view drawing. Either way, a floating top will add flair to your table.

Most tables can be made with a floating top, but if you want to expose the structure, it helps to do so on a tall table; on a coffee table, even a wide gap will rarely be

Photos: Jonathan Binzen

RETHINK THE BASE

Double tenons on the under-rails create a robust base, which is vital on a table with a floating top. The tall rails also lift the top enough to provide a clear view of the table's structure.



To purchase scaled plans and a complete cutlist for this table and other projects, go to FineWoodworking.com/PlanStore.

Drawings: John Hartman

Double mortise-and-tenons made easy: Spacers are the key

ROUT THE MORTISES

Take the plunge. *Rousseau starts by cutting the top mortise. After setting the router's guide fence (silver), he snugs up a second fence (black) so the bit won't wander. A sacrificial board prevents blowout underneath.*

Quick stops. *Using double-stick tape, Rousseau affixes two pieces of scrap to the workpiece to limit the router's travel. He places the aprons side-by-side to provide a wider surface for the router to ride on.*

visible. I made a series of decisions in the design process to help expose the structure and create the floating feeling from every vantage point. First, I dispensed with end aprons and supported the top with under-rails inset from the ends. I designed the under-rails so they would lift the top ⅞ in. above the front and back aprons, providing a clear view underneath. To increase the sense of airiness under the top, I cut away the shoulders of the under-rails in deep curves and cut a shallow curve along their bottom edge. I also pushed the proportions of all the table's parts to the thin side, and made the top appear even thinner by giving it an underbeveled edge. The 6-in. overhang at the ends also helps.

I'll cover the parts of this table that support the floating top, giving you the fundamentals you need to build any table like it. For my complete video series on building this specific design from start to finish, go to FineWoodworking.com.

Double tenons beef up the base

Without the top adding strength to the table, you want to be sure the joinery in the base is rock-solid. I decided to join the under-rails to the aprons with double through-tenons. Multiple horizontal tenons provide the best joinery in this situation, since they maximize the long-grain-to-long-grain glue surface. Using

ADD A SPACER FOR THE SECOND MORTISE

Automatic spacing. *A spacer block enables Rousseau to cut the second mortise without readjusting the primary guide fence, though the second fence does need to move. Double-stick tape holds the spacer to the router fence.*

TWO SPACERS FOR TWIN TENONS

To cut the tenons at the bandsaw, Rousseau uses the gap spacer—which he used for routing the mortises—in conjunction with a tenon spacer.

DIAL IN THE TENON SPACER WITH A TEST PIECE

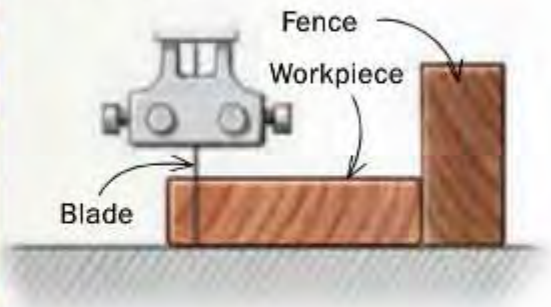
The tenon spacer's thickness equals the width of the mortise plus one bandsaw kerf. Once within range, Rousseau dials in the exact thickness of the tenon spacer by cutting a test tenon.

Any scrap will do for a test tenon. *Rousseau cuts the first cheek with the scrap against the bandsaw fence.*

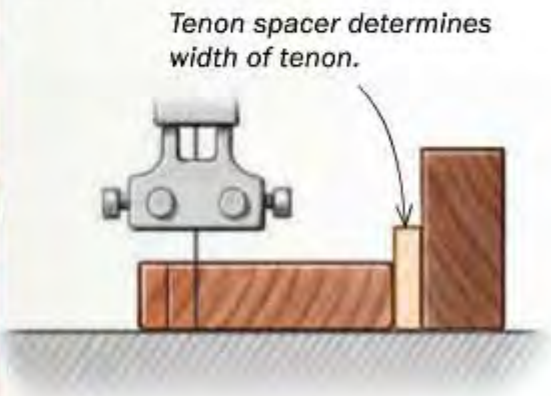
Drop in the tenon spacer to cut the second cheek. *Then crosscut freehand to chop out the waste.*

A snug fit means the spacer is finished. *If the tenon is too tight, Rousseau puts the spacer through the planer again. If the tenon is just a bit loose, he thickens the spacer with a piece or two of tape.*

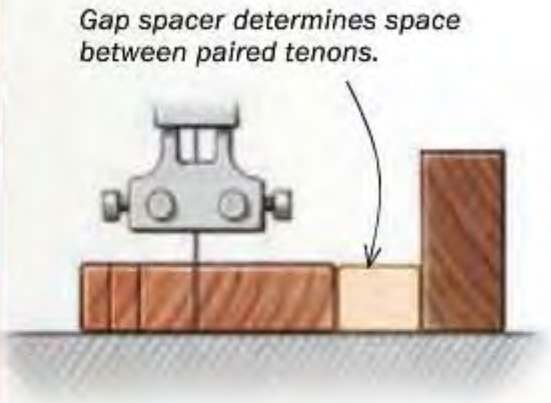
No spacer. *With the top edge of the rail riding against the fence, Rousseau cuts the bottom cheek of the lower tenon, stopping at his pencil line.*



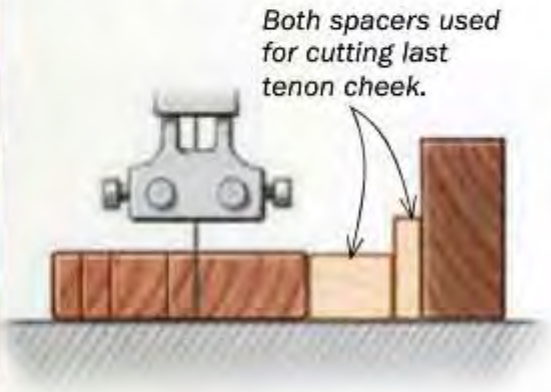
Tenon spacer. *Dropping the tenon spacer between the fence and the workpiece, Rousseau cuts the top cheek of the lower tenon.*



Gap spacer. *The gap spacer—the same one used with the router—rides between the fence and the workpiece to cut the lower cheek of the upper tenon.*



Both spacers. *The last cheek is cut with both the gap spacer and the tenon spacer riding between the fence and the workpiece.*



Curves lighten the look

Stacked for sawing. *After chiseling the mortises square, Rousseau joins the two aprons with double-stick tape and saws the long curves on the bottom edge (right). After fairing the curve with a spokeshave, Rousseau leaves the aprons paired and does final smoothing with a scraper (below).*

one large vertical tenon would have given me much less glue surface and weakened the apron considerably. I used through-tenons—and left them proud—because I wanted to emphasize the unusual structure of the table. Someone wanting to keep the support structure hidden could use stopped tenons instead.

Double tenons might seem like a challenge. But I use a simple system of spacers to help cut perfectly sized and spaced mortises and tenons. The process is surprisingly quick. I use the same spacer with the plunge router and the bandsaw, so the gap between mortises is always identical to the gap between tenons. A second spacer determines the width of the tenons.

I also have a few tricks for laying out the joinery. When possible, I size furniture parts to match my measuring tools. In this case, the thickness of the rails—¾ in.—is the same as the width of my combination square's blade. So when I'm laying out the location of one of the under-rails on the apron, for instance, I just mark along both sides of the blade without moving the square.

To plunge-rout the mortises, I use two fences, making it nearly impossible for the bit to wander during the cut. I used to improvise a second router fence using a block of wood, but recently I bought a second guide fence and some metal rod to make extra-long rails so I can fit guide fences from either side of the router onto the one set of rails.

Tip for the tight curves. *To use his lathe like a spindle sander, Rousseau turned a hardwood cylinder and cut a slot along its length with a handsaw. He tucks the ends of the paper into the slot. Strips of double-stick tape on either side of the slot hold the sandpaper in place. Rousseau wraps three sheets of sandpaper side-by-side on the spindle, so he can progress from coarser to finer grit without changing the paper.*

Assembly starts with the apron

Clever clamping blocks. *Rousseau makes custom clamping blocks that accommodate the proud through-tenons. He faces them with packing tape to keep glue from sticking.*

When I bandsaw the tenon cheeks using my spacers, I can cut all 12 through-tenons with one fence setting. Since these will be proud tenons, I make them ⅛-in. longer than the thickness of the aprons. I bandsaw to just shy of the shoulder line. To remove the waste between the tenons I use a fretsaw, and then I chisel the shoulders clean. I handplane the faces of the under-rails slightly until the fit is perfect, then chamfer the tenon ends with a block plane.

Beveled top really floats

Because the tabletop is thin and only supported across half its width, it's important to select dimensionally stable lumber—quartersawn if possible.

Before ripping the top to final width, I bandsaw the two curving ends and clean them up with a block plane. I do the ends first so that when I later cut and plane the sides, I'll remove any end-grain blowout.

Finally, with a 45° bit in the router table, I cut a bevel around the underside. I clean up the surface with a block plane and finish by scraping and sanding. I put special effort into this, because when people come up to a table like this they run their hands over the edges and reach underneath, and I want it to feel as good as it looks. □

Timothy Rousseau builds furniture in Appleton, Maine, and teaches at the Center for Furniture Craftsmanship.

video workshop

Watch Rousseau build this table from start to finish in a members-only video at FineWoodworking.com/extras.

Inverted at the end. *After gluing the legs to the aprons and preparing all the parts for finish, Rousseau attaches the top with three screws through each under-rail.*

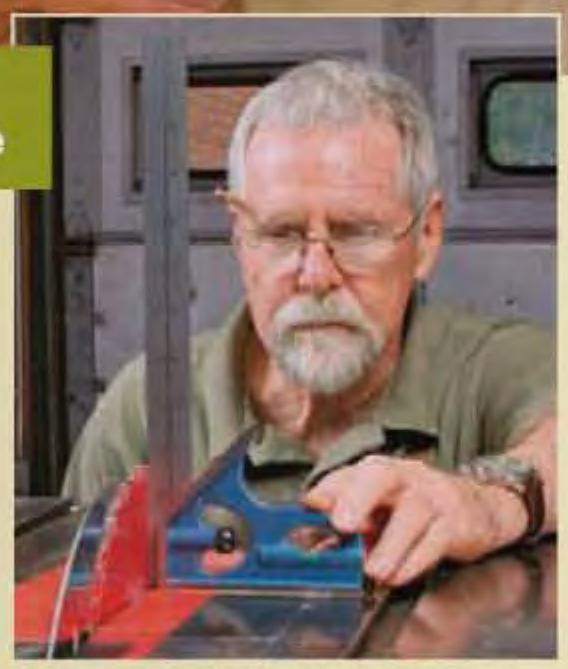
Tool Test: Squares

Why you need two and which two to buy

BY PHILIP C. LOWE

12-in. square is a workhorse

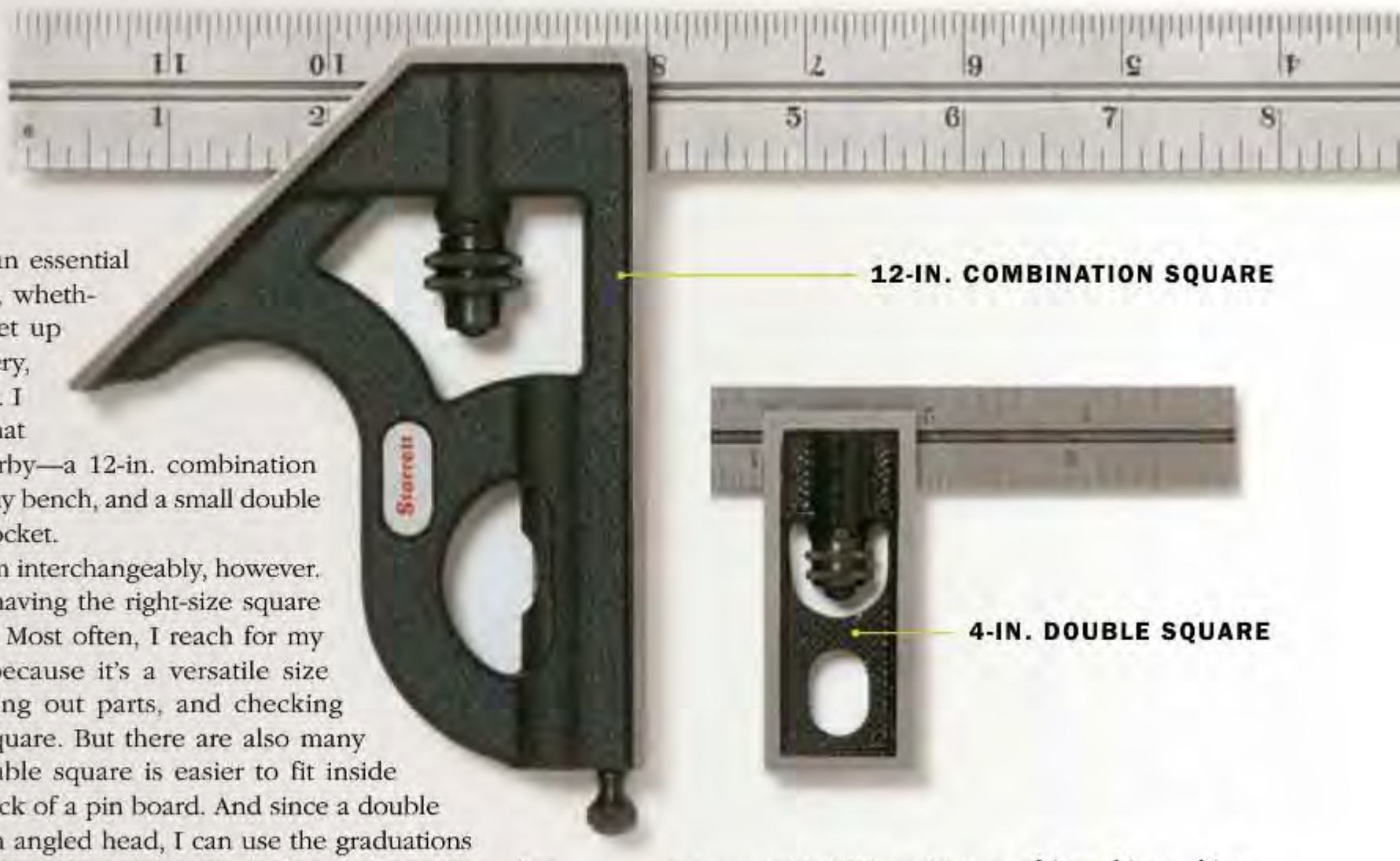
It's a good size for measuring and layout, and the blade length exaggerates any errors in squareness, which helps when adjusting machinery or checking workpieces. Plus, the removable rule makes a great tool for use on flat surfaces.



Set a sawblade. *Use the longer head of the 12-in. combo square to clear the tablesaw's throat plate when setting the blade square.*

Check joinery. *The wider blade of a 12-in. combo square helps when checking that tenon cheeks are parallel to a board's face.*

Mark centers. *Use the angled end of a combo square head to mark center points on wood-turning blanks.*



A good square is an essential tool in my shop, whether it's used to set up machinery, lay out joinery, or check for squareness. I reach for one so often that I always keep two nearby—a 12-in. combination square that hangs near my bench, and a small double square that fits in my pocket.

I don't always use them interchangeably, however. There are times when having the right-size square makes a big difference. Most often, I reach for my 12-in. combo square because it's a versatile size for measuring and laying out parts, and checking if surfaces are flat or square. But there are also many times when a 4-in. double square is easier to fit inside small spaces, like the back of a pin board. And since a double square does not have an angled head, I can use the graduations that run in both directions without removing and reattaching the blade. Having both types of squares will make your woodworking quicker, easier, and more enjoyable. But figuring out which brands to buy is trickier.

What to look for

I've had my two favorite squares for many years, but if I were in the market for one today, the choices would overwhelm me. When *Fine Woodworking* asked me to do a head-to-head test of both types of squares, I found at least 50 combination squares and 11 double squares on the market. So I narrowed my choices to those that would be best for woodworkers in the United States. I opted for squares with "4R" graduations (⅛ in., 1⁄16 in., 1⁄32 in., and 1⁄64 in.) because we use those fractions almost exclusively. I also stuck with models that had etched rules, which are easier to read than stamped-steel rules. I didn't look at models that come with more than just a rule and a head, because centering and protractor heads aren't that useful for most woodworkers, and buying them can increase the cost. And where both hardened steel and cast-iron heads were available, I opted for iron, which is strong enough for woodworking, and less expensive. For the doubles, I tested all 11 models.

I then gave all the squares a couple of simple tests. I used knife-line tests to verify whether each model was set perfectly

4-in. size is handy

A 4-in. double square is more comfortable to use. It's big enough to handle most of the tasks its bigger cousin can, and is even more useful when checking for squareness inside cramped areas—like joinery and small boxes. And it fits in a pocket.

Set heights. *Place the blade of the square on end to set router-bit heights.*

Find depths. *Check the depth of a mortise by extending the rule all the way to the bottom.*

Work in small spaces. *Use the rule to check inside half-blind dovetails.*

Photos, except where noted: Ken St. Onge

A SQUARE MUST BE SQUARE

Accuracy matters most. *On a straight board, Lowe scored a line along the edge of the rule, rotated the square, scored another line, and checked that this line was parallel to the first. Then he flipped and reattached the blade to check again. All the squares listed on p. 47 were, in fact, square.*

Consistent width? *Lowe used a dial caliper to measure a few spots along the rule to confirm that the width was even, and the edges parallel.*

square at the factory. I then removed and reattached the blades to evaluate each square's locking mechanism, known as a lockbolt. I finished by using a dial caliper to check the width of the rules in a few spots to test whether the edges are parallel, which affects squareness. That gave me some hard data.

Next, my students at the Furniture Institute of Massachusetts helped me put each square through a day of regular use in the shop—which includes layout, machine work, and handwork. We graded each square for fit, feel, finish, and the intangibles of how it performed in a shop setting. Together, we eliminated models that didn't stand up during our routines.

Best bets

The L.S. Starrett 12-in. model with a satin chrome blade ($100) was the clear Best Overall pick. The difference-maker between the Starrett and every other combo square is the unique lockbolt, which uses metal tabs to keep it perfectly positioned to enter the slot in the rule. The design makes removing and inserting the blade quick and easy. It may sound trivial, but the blade must be reversed for some measurements and I also use it on

READABILITY RULES

The finish is important. *Compared with satin chrome (right), the high polish of a hardened steel rule (left) is harder to read beneath the glow of shop lights.*

Avoid confusing markings. *The graduations on the Swiss Precision Instruments rule (left) are numbered by eighths and are almost of equal length, which can be confusing compared to traditional graduations (right).*

WHERE PARTS MEET

LOCKBOLTS

Some are finicky. *Combo-square blades are removed and flipped frequently, and some lockbolt designs are more troublesome than others.*

The trouble with alignment. *It's difficult to keep lockbolts aligned when attaching the rules on most squares (top). But the tabbed lockbolt on the Starrett (bottom) stays aligned for smooth changeovers.*

its own sometimes. Having to toy with the finicky lockbolts found on other squares is an annoyance. The fit, finish, and machining on this Starrett model were just as excellent. I also tested a Starrett with a shinier, hardened-steel rule ($77), but my students and I found that the glare on the blade made the markings harder to read. Its superior lockbolt would still make that model a solid choice, but not the best.

You can find decent 12-in. squares from other makers, too. Among those I tested, the combination square from Products Engineering Corp. (PEC Tools) stood out. It performed well, had a lockbolt that was relatively easy to use, and came with a satin chrome blade. At $44, it cost half as much as the Starrett, and was my pick for Best Value.

For double squares, the Starrett ($53) was Best Overall again. Once more, the well-designed lockbolt makes it a standout, but the blade is equally important. At ⅝ in. wide, the Starrett blade is narrower than the others. That makes it slightly better for fitting into tight spaces, an important consideration for small squares. It was the only double square I tested that didn't have a satin chrome blade. And the hardened steel did make it a little tougher to see at some angles, but not enough to be truly troublesome.

KNOBS

Get a grip. *The two rows of knurling on the Starrett knob (left) were easy to grip, but the shallow knurling on the Mitutoyo (right) was tougher to get a handle on.*

As with the combo squares, The PEC Tools double square is my pick for Best Value. It has an easy-to-read satin chrome blade, it performed well and stayed square, and it costs much less ($23) than a Starrett. Interestingly, the double squares branded by several other companies—Mitutoyo, Brown & Sharpe, Lee Valley, Pinnacle, and McMaster-Carr—appear to be identical to the PEC, with slight cosmetic differences, such as the color of enamel on the head (see "Will the real Best Value please stand?" p. 46). So if you can find one of those at a lesser price than the PEC, it's a good buy. □

Philip C. Lowe is founder of the Furniture Institute of Massachusetts and a frequent contributor to Fine Woodworking.

HEAD TO HEAD

Since all the squares are accurate, ergonomic details make the difference.

12-IN. COMBO SQUARES

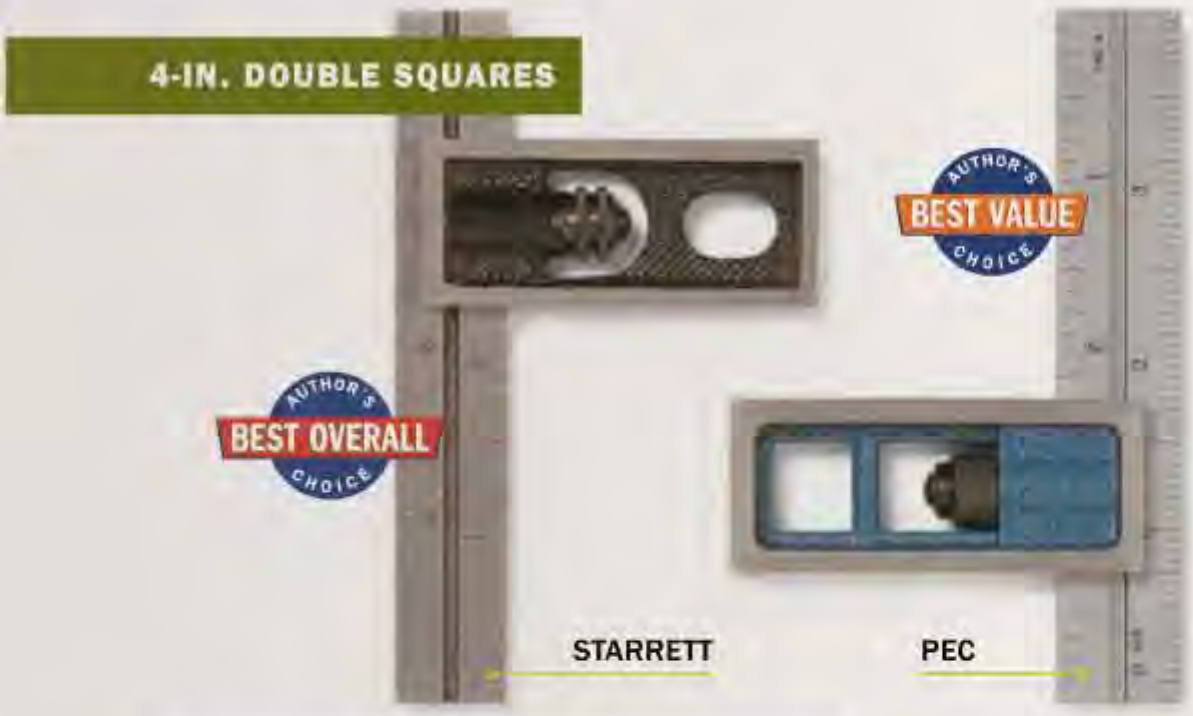
Will the real Best Value please stand?

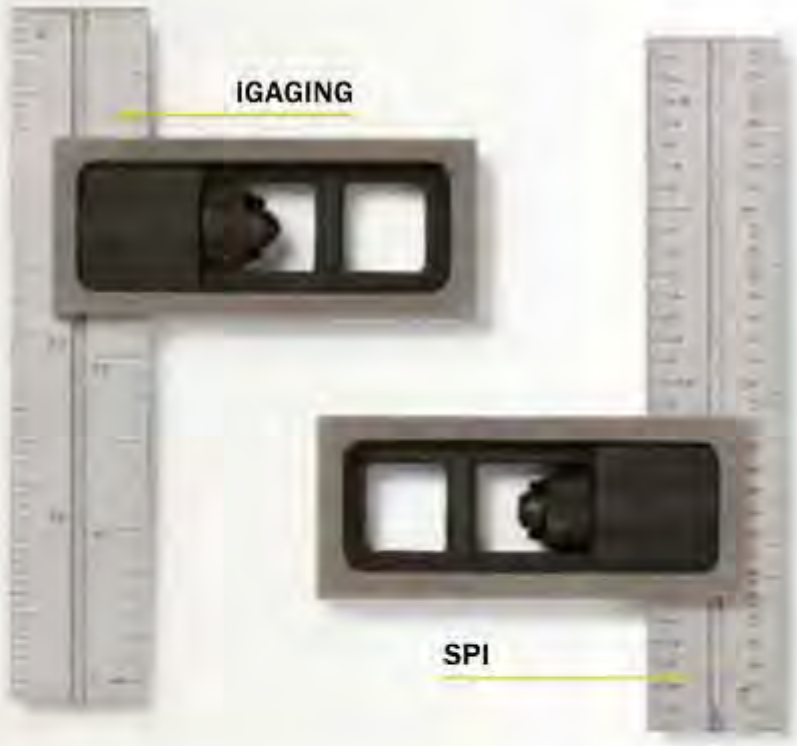
When testing squares for this review, we found many to be nearly identical, though prices varied. For instance, double square models sold under the brand names PEC, Lee Valley, Brown & Sharpe, Pinnacle, and Mitutoyo all appear to have been made by PEC. Four of them even came in the same blue-and-white box. Aside from a few cosmetic differences, they performed identically, but the prices ranged widely, from $23 for the PEC to about $55 for the Brown & Sharpe.

Rather than list these identical models in the chart, we chose the lowest-price model available at press time. That model, the PEC, was picked as Best Value. However, if you find any of these others for a lesser price, go for it.

Photos of squares: Kelly J. Dunton

4-IN. DOUBLE SQUARES





THE FIELD AT A GLANCE

MODEL/SOURCE	STREET PRICE	BLADE	EASE OF REPLACING RULER	EASE OF READING RULER	MACHINING AND FINISH	COMMENTS
12-IN. COMBINATION SQUARES						
General 812 amazon.com	$35	Stainless steel	Good	Good	Good	Good overall product; comfortable to use all around; looks like a PEC but without the satin-chrome-finish rule.
iGaging rockler.com	$30	Satin chrome	Fair	Excellent	Good	Performed well; accurate and legible; loose lockbolt made for difficult re-assembly; nearly identical to models from Westward and Highland Woodworking.
Johnson 440 amazon.com	$29	Hardened steel	Fair	Good	Good	Locknut a bit small in relation to the head; graduations are not clear, and only go down to 1/32 in.; lockbolt loose in hole; some sharp edges.
Mitutoyo grainger.com	$123	Satin chrome	Good	Excellent	Good	Excellent tool, but the knurling could be a little coarser; head and blade sold separately.
AUTHOR'S CHOICE BEST VALUE **Products Engineering Corp. (PEC)** amazon.com	$44	Satin chrome	Good	Excellent	Good	Very good product; nearly identical to models from McMaster-Carr and Brown & Sharpe.
AUTHOR'S CHOICE BEST OVERALL **Starrett** woodcraft.com	$100	Satin chrome	Excellent	Excellent	Excellent	Superior lockbolt design made head easy to remove, replace, and lock down; well machined, easy to read, and an excellent all-around performer.
Starrett leevalley.com	$77	Hardened steel	Excellent	Good	Excellent	Performed as well as the Starrett satin chrome model with the same basic design; however, the hardened steel rule was harder to read under lights.
Swiss Precision Instruments (SPI) mscdirect.com	$63	Satin chrome	Fair	Poor	Good	Good tool but the graduations were difficult to read because lines are nearly identical lengths.
4-IN. DOUBLE SQUARES						
iGaging grizzly.com	$10	Satin chrome	Fair	Excellent	Fair	Poor locknut action makes it difficult to replace the rule; nearly identical to models from Highland and Rockler.
AUTHOR'S CHOICE BEST VALUE **PEC** wttool.com	$23	Satin chrome	Good	Excellent	Good	Good fit and feel and comfortable to use; locknut occasionally needed extra tightening to keep blade in place; least expensive of the PEC-made models.
AUTHOR'S CHOICE BEST OVERALL **Starrett** leevalley.com	$53	Hardened steel	Excellent	Good	Excellent	Head is easy to remove, replace, and lock down; narrowest blade, at 5/8 in., made it easier to fit into tight places; hard to read under bright lights.
SPI mscdirect.com	$37	Satin chrome	Fair	Poor	Fair	Difficult to distinguish lines on ruler.

Fine Furniture from Reclaimed Wood

How to overcome the obstacles without losing the character

BY JOHN TETREAULT

To a budding woodworker interested in art and in building things, the old barn boards that my father salvaged from historic buildings in my native western Massachusetts held an allure that's hard to describe. They were damaged by weather, pockmarked by insects, scarred with leftover joinery cuts, and had countless other defects that lent each board a character and feel vastly different from new lumber. His unusual finds inspired me to try building with antique wood, and after the first few pieces, I was hooked.

Now as a woodworker, I look at furniture as usable art—a chance to make something beautiful with your hands that can be used in everyday life—and reclaimed wood is by far the best way I've found to guarantee each piece is one-of-a-kind. I've used it to build more than 50 pieces for myself and clients, and I keep coming back to it. Designing furniture from reclaimed wood

Photos, except where noted: Ken St. Onge

Where to find it

Over the last decade, growing environmental awareness has made reclaimed wood much easier to find, both locally and online. With a little creativity and vision, you can give this beautiful material another life.

Craigslist.com, eBay.com, and other websites can connect you with people selling salvaged lumber. There are also dealers who specialize in reclaimed lumber, and particularly rare or nearly extinct species like chestnut. I find most of my antique wood through word of mouth. I keep my eyes peeled for old barns and buildings, and have even helped homeowners clean up sites in exchange for wood. I've also used wood salvaged from house fires, just like the wood used in my coffee table (left). Owners are happy to see the material reused rather than going into a landfill. You can use anything from moldings and trim to structural beams and timbers.

A word of caution: Watch out for bugs. They are notorious for hiding in reclaimed materials. I avoid pieces that look infested, or at least cut out the sections that do. For this reason, I prefer to store reclaimed wood outside, covered, before bringing it into the shop. The damp pieces will still dry up, but it lets me keep an eye out for holes, sawdust, or other telltale signs of bugs.

– J. T.

TWO WAYS TO TREAT THE SURFACE

The easiest way to use reclaimed wood is to plane it lightly and treat it like any other boards (above). For even more fun, turn to p. 53 and read about how to leave it unsurfaced and still get square, solid furniture (right).

Reclaimed lumber 101

GET IT CLEAN BEFORE DIMENSIONING

Spare your planer by removing hidden hazards like old nails, hardware, dirt, and gravel. Then use a dedicated set of planer knives to take off the finish, if any.

Inspect closely. *A metal detector can help spot nails or other metal hidden in the wood (left). To protect the surface from dents, leverage pullers against a piece of scrap (center). Then use a wire brush and a vacuum to remove dirt and gravel that could damage a cutterhead (right).*

Plane first. *To get rid of the old finish, Tetreault ran all of the boards through his planer first (above). That dulls the knives, so you might need to change them (right), but this method is still faster and cheaper than chemical strippers.*

forces me to flex my art and design muscles because I have to work with what I have in front of me. It's hard to go back and get matching old boards, so I play it a little loose and let the wood guide the size and look of a piece. Plus, deciding where and how to highlight knots, tool marks, or other aspects of the wood's character is among the most rewarding parts of the process.

And as a frugal Yankee, I take a lot of pleasure in reusing materials to make furniture that hopefully will last several lifetimes more. Using reclaimed wood allows me to work with American chestnut or old-growth pine, beautiful species that are lost to us otherwise. And often, because of the extra labor involved, reclaimed wood is much less expensive than new hardwood from a lumberyard. But you may pay a premium for wide boards or extinct species.

To master using reclaimed wood, you'll have to learn a couple of new tricks. The basic technique is to lightly joint and plane the lumber flat, straight, and square, then go back after glue-up to repair some defects. That leaves most the wood's aged character intact, while simplifying layout and joinery. Once dimensioned, reclaimed wood will easily adapt to designs and plans you like. And it's easy to start using it because, aside from a few tweaks, the approach differs just slightly from what most woodworkers already do.

Another option is to skip milling altogether to show off the as-found, unsurfaced look of the boards. You won't have flat, straight or square boards to work with, but you can get around it by cutting or clamping on straightedges to guide layout and tools where needed. It's a bit more challenging, and won't adapt as easily to plans you already have, but using untouched reclaimed boards guarantees truly one-of-a-kind furniture.

Working with flat boards

Let's start with the more straightforward approach: milling the stock and using it the way you would use new wood, with a few modifications to the process.

I tend to use this approach for tables and other surfaces that frequently will be wiped down or spilled on. Light jointing and planing leaves a surface that's easier to clean, won't make containers tippy, and can be finished, so it resists damage from liquids. But to preserve the priceless character of the material, I approach milling carefully, using a few tricks to spare the surface, and fill holes and cracks.

Keep milling minimal—Dimensioning reclaimed wood is a balancing act: Remove too much and you strip away all the patina; remove too little and the boards aren't flat or straight. The key to reaching a happy medium is taking lots of very thin cuts, keeping a close eye on the surface with each pass.

To illustrate my basic approach to working with reclaimed wood, and touch on most of my favorite tips, I built a dovetailed coffee table from four old, chestnut floor boards. As always, when there is finish on the wood, I removed it with my planer. This step often dulls one edge of the knives. I then flattened (jointed) that side by taking extremely thin cuts with a handplane, although I would have used a jointer if I'd had one wide enough. Last, I used the planer to take equally thin cuts from the opposite side, using a fresh set of knives. I made only enough passes to get the wood flat, or comfortably close to it. I removed bumps, but left small depressions in the middle of boards that still allowed me to safely rip them on the tablesaw. Once I got the boards flat enough, without losing the telltale dark spots, patina, and surface defects common in reclaimed wood, I stopped.

Oversize joinery suits the surface—One way I keep from over-milling the surface of a board is to cut dovetails that stand proud of the corners they join. That way, I don't have to plane the dovetails flush to the surface, and remove more of the patina. For minimalist, simple designs, the oversize, handcut detail can really complement the overall look.

In my coffee table, I joined the top and shelf to the sides with oversize dovetails. I also used them to join the top to the sides of my bookcase (see photo, p. 53), although I needed to use a couple of extra tricks there. The procedure is just like normal dovetailing, except that I add an extra ¼ in. when I'm scribing the shoulder lines. I also generously chamfer the tails and

DESIGN TIP

Simpler pieces spotlight the unique character of reclaimed wood, and are also easier to adapt to your lumber and any surprises it gives you along the way.

MATCH THE JOINERY TO THE MATERIAL

Big, bold dovetails that stand proud of the surface fit nicely with the reclaimed material, and add to the handmade look.

Pencil the intersections. *Dry-fit the piece to mark the overhang (left) and then chamfer down to the lines on the tails with a chisel or block plane (center). Mark and chamfer each pin individually (right), cutting the longer sides first. Chisel in from both sides to avoid tearout.*

DECORATIVE DEFECTS

Here are some attractive ways to fill gaps and cracks.

Plug holes with scrap. *Chisel random-shaped pegs from offcuts and glue them into nail holes or worm holes (left). Then trim them flush (above).*

Use a contrasting crack-filler. *Darkened epoxy looks more natural than sawdust or clear epoxy once it's finished. Just mix quick-set epoxy with a few drops of India ink, then apply it quickly in any cracks (above). Let the mixture gel for a few minutes, and then scrape off the excess with a razor blade (right).*

pins, not only to prevent them from being damaged, but also to add to the rustic-yet-refined look.

Cracks, defects, and finishing touches—Before glue-up, I fill and repair holes, bumps, knots, and other defects, paying special attention to the top or any other surface where flatness is critical. For areas that aren't wiped down regularly, like a drawer front or the sides of a cabinet or coffee table, I leave the smaller holes and cracks. Defects highlight reclaimed wood's character, and leaving them in some areas adds to the look without affecting the design.

Next, I surface the boards with a handplane or sand up to P220-grit with a random-orbit sander. Satin polyurethane brings out the beauty of the wood without looking too glossy. I brushed on two coats, sanded with P400-grit, and wiped on a third. □

John Tetreault is associate art director and a professional furniture maker.

Skip the stain. *Low-luster finishes like satin polyurethane bring out the natural look of reclaimed wood.*

The next level: Learn to join lumber that hasn't been flattened

Weathered boards plucked from the side of an old house or barn are not hard to find, and they scream "rustic" like no other wood. But they won't keep that look if you joint or plane them. It's impossible to re-create that naturally acquired character with a finish, so when I want to highlight it, I just use the boards as I found them. Of course, that means having to join workpieces that are warped, deformed, or even roughsawn. But if you start with just one straight surface, preferably where no one sees it, you can add a variety of clamps, jigs, or fences to make square or parallel cuts. Here's how I do it.

Joint hidden faces–For cabinets like this bookcase, I start by jointing a perfectly straight edge along the back of the case. The back edge will be unseen, since it's against the wall, but it will let you line up a T-square jig or edge guide to rout grooves or dadoes.

I also joint the bottoms and edges of the shelves and the backsides of the rails so that I can lay them out squarely and glue their edges so they fit tightly. Like the back edge, those jointed faces aren't visible when the case goes together.

Rabbets simplify joinery–I use rabbets in a couple of different ways to build a piece. In the bookcase, I made a glue-tight fit where shelves slot into dadoes by rabbeting across the top ends of both shelves. I scribed the rabbets with a marking gauge and cut them with a handplane. I clamped a fence to the shelf to guide the cut straight.

I also use rabbets to line up and mark dovetails in unsurfaced wood. By planing shallow rabbets across the inside faces of the pin boards and tail boards, I can butt the boards together squarely, and mark the pins from the tails. When the joint goes together, the rabbets stay hidden and are never seen.

Clamp things straight–Wide boards often cup or warp, which causes problems when cutting joinery. I get around this by

JOINT ONLY WHERE NEEDED

Inconspicuous jointing lets you line up square cuts afterward.

Hide it in the back. *A jointed edge along the back of a case (left) can help line up a jig for routing dadoes and grooves. Paired with a tablesaw sled, the jointed edge also allows you to safely and squarely cut workpieces to length (above).*

Flat bottoms make joinery easier. *Since the bottoms of shelves aren't seen, joint them to help cut even rabbets.*

JIGS FOR RABBETS AND DADOES

A T-square for dadoes. *Square the jig from the back edge and then use a thick caul to clamp the whole board flat.*

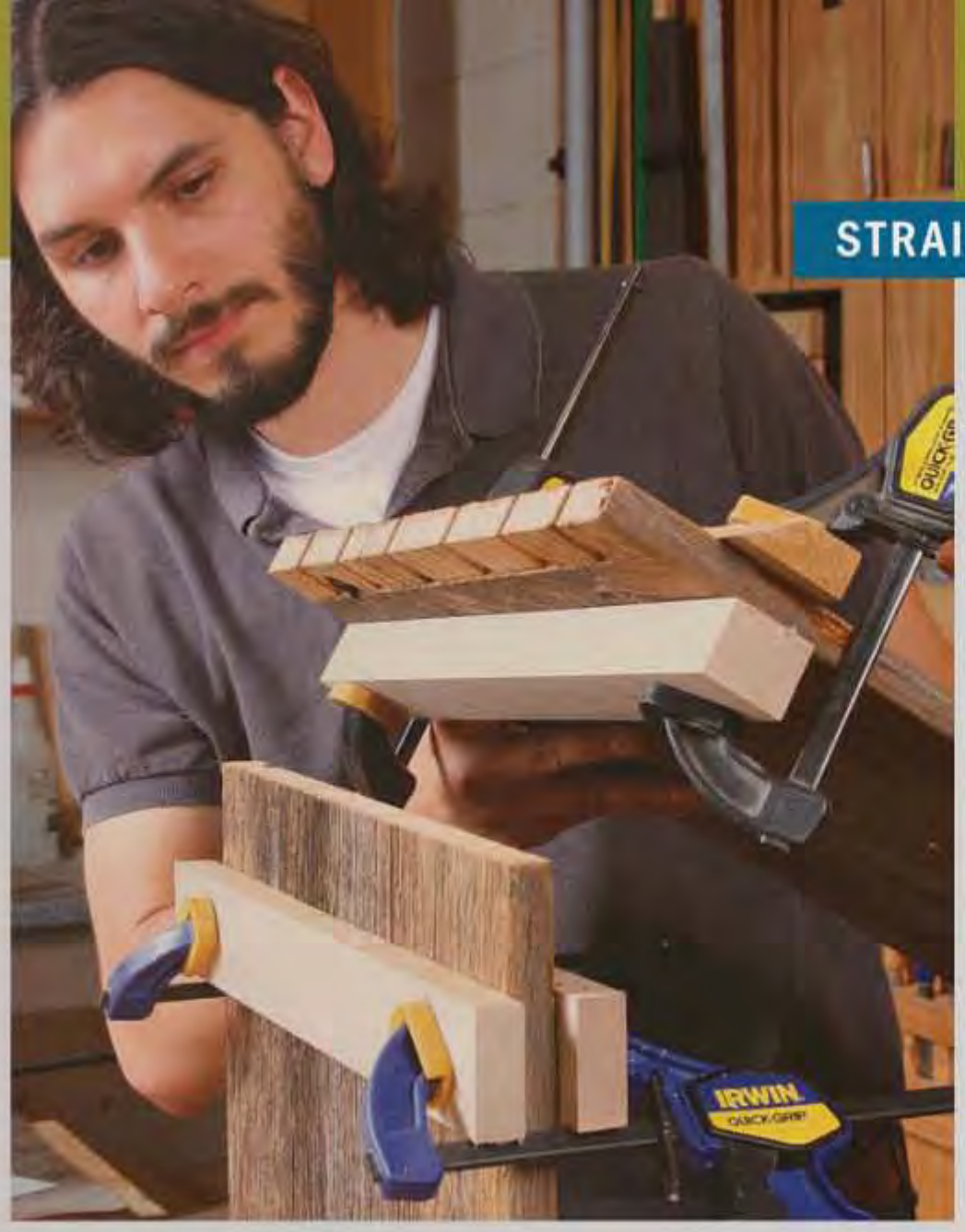
clamping the board between thick pieces of scrap, which pulls the board straight enough to join easily.

Two tricks for mortising–Cutting mortises in reclaimed wood can be tricky, because you don't want to mar or tear out the wood surface when marking and cutting the joint. Plus, the surface you're marking is not likely to be flat or straight, which means you could end up with crooked joinery. There are two easy ways to get around that problem.

For a blind mortise (one that isn't seen from the outside), I cut the tenons before the mortises. It's a backward approach from traditional joinery, where mortises are usually cut first. Once I cut the tenons on a piece, I put it in position against its mating pieces and

Rabbet the shelves to fit. *The jointed bottoms of the shelves create a reference face for scribing perfectly even rabbets (left). Tetreault rabbets the shelf using a thick piece of wood to guide a rabbeting block plane (right).*

Photos, these two pages and p. 53 (bottom 3): Michael Pekovich



STRAIGHTEN DOVETAILS IN WOBBLY WOOD

Clamp the workpieces flat. *Cut a shallow rabbet on the inside faces and once again squeeze the boards between thick pieces of scrap to help line them up evenly for marking the pins.*

simply trace around the tenons to mark the mortises.

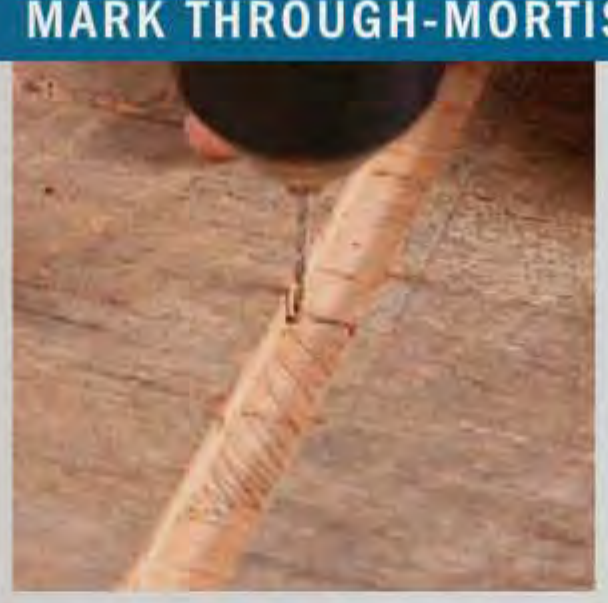
For through-mortises, which will be seen from the outside, it's easier to mark the mortise first, but you should do so in a way that your layout marks get covered up. Usually, that means marking from the inside out.

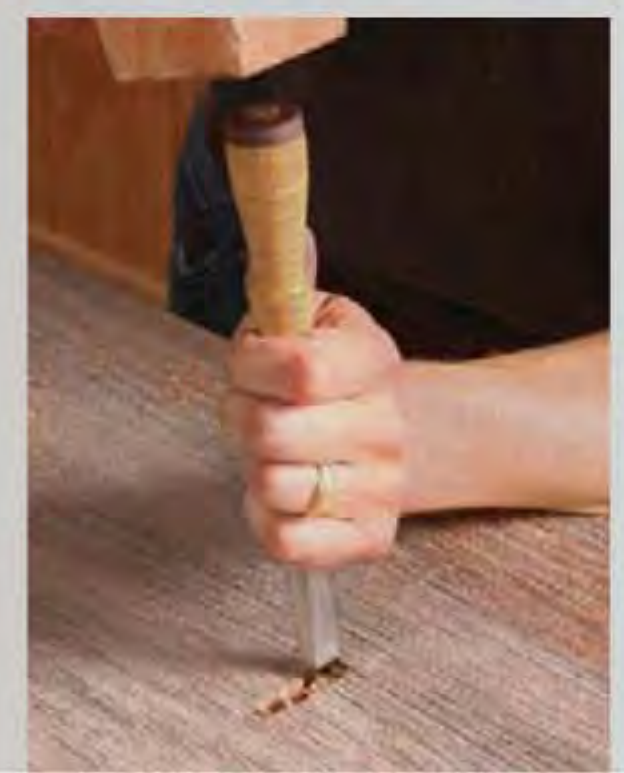
In the bookcase, for instance, I marked the through-mortises for the shelves on the inside of the dadoes. Then I drilled pilot holes through the corners of the mortise, and used them to mark and chop out the mortise from the other side. Then I marked the tenons directly from the mortises, like normal.

Skip the finish– I don't use any kind of finish when I've built a piece with an original patina. Oil tends to darken it too much and mute the color, and wax fills the nooks and crannies. I figure that the wood has been building its finish naturally for years, and nothing I can do would beat it.

–J.T.

MARK THROUGH-MORTISES INSIDE OUT





Drill the corners. *Mark the mortises on the inside, then drill tiny holes to transfer the marks for the corners to the outside (top left). Scribe a line between the pilot holes and chop the mortises from the outside in (left). Then mark the tenon from the mortise (above).*

Master the Plunge Router

Because they are versatile, easy to use, and affordable, routers are extremely popular tools. And while a router with a fixed base is great, one with a plunge base is even better. Plunge routers can do everything the fixed-base type does, plus they can plunge into and out of cuts, so you can also tackle mortises and stopped dadoes. They're better for template routing, too.

Unleash the full potential of this versatile tool

BY GREGORY PAOLINI

To take full advantage of the plunge router's versatility, you need to master a few basic concepts. I've used them for my entire career and I'll explain what you need to know. However, before diving into this article, you'll need to be familiar with some fundamental routing techniques that apply to fixed-based and plunge routers alike, such as routing standard edge profiles, grooves, and dadoes (for a refresher, read Gary Rogowski's "Handheld Routing" in *FWW* #194). This article will focus on plunge cuts, helping you master more advanced furniture-making tasks like routing mortises in table legs and stopped dadoes in cabinet sides for shelves and drawer dividers.

Get the most from the plunge system

A plunge router's motor assembly is connected to a base by

Photos: Matt Kenney

What to look for

For starters, a plunge router needs **enough power** to handle cutting mortises, dadoes, and grooves. That means you need one with at least an 11-amp motor, typically advertised as 1¾ hp (for a review, see "Heavy-Duty Plunge Routers," *FWW* #214).

The **plunge mechanism** is another critical feature. Look for one with at least 2 in. of travel. That's enough to rout deep mortises in furniture with longer bits (check the manufacturer's website for this information).

A **baseplate with a straight side** is more stable against a fence than a round one. And with the straight side always against the fence, you know exactly where the bit will cut (round plates usually aren't concentric with the bit).

Look for an **on/off switch** built into the handle.

The router should come with **¼-in.- and ½-in.-dia. collets**, so you have a larger choice of bits.

It's a good idea to have a **baseplate that accepts guide bushings**, preferably the widely available Porter-Cable style. But that isn't a deal-breaker, because there are aftermarket baseplates that work with bushings and many manufacturers sell proprietary bushings for their routers.

What doesn't matter as much

Here are a few features that aren't critical: spindle locks for bit-changing and bellows that protect the plunge mechanism. Variable speed is nice but not critical. Don't worry about dust-collection, either. Except for the Festool models, most routers do a pretty bad job of

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two spring-loaded, telescoping legs. You push the motor assembly (and the bit) down and the springs raise it back up. There is also a lock, so you can fix the depth of cut when routing. A depth rod allows you to preset the final cut depth and a rotating turret with stops allows you to quickly work through a series of successively deeper cuts without hitting the off switch. You simply plunge the router, lock it, and rout. Then unlock it, raise the router, rotate the turret to the next lower stop, plunge, lock, and rout.

That might not seem like a big deal, but it means you don't have to rout the full depth in one pass (which isn't

TIP Buy bits that plunge

Standard bits don't work for plunge cuts, because they are designed to cut a horizontal path. Plunge one and you'll rout a shallow circular channel with a raised and burned center. On a plunging bit, however, the cutters continue to the center.

Also, use solid-carbide spiral bits. Up-cut bits are for mortising, where they pull out chips and the tenon shoulders hide the tearout. Down-cut bits leave a cleaner cut, because their cutting force is directed toward the workpiece and the fibers are backed up by the wood beneath them. Use them for dadoes and grooves—where the edge of the cut is visible after the joint is assembled.

Two good ways to set the depth

Don't rely on the router's scale, which can be inaccurate and hard to read. Also, vibration can cause the indicator to loosen and move. Use one of these surefire methods instead.

1 ***Go low-tech.*** *Just mark the depth on the workpiece's side, hang the router over the edge, and plunge the bit to the mark. Lock the depth stop in that position.*

2 ***Spacer trick is super accurate.*** *Plunge the bit until it touches the bench or workpiece (above). Now find a drill bit that matches your desired depth. Put the shank of the bit between the depth rod and depth stop. Then lock the rod (below). Or, use a shopmade gauge block (right) .*

OR

even possible for something like a 1¼-in.-deep mortise) or turn off the router and make a height adjustment between each pass, like you would with a fixed-base router. Also, because the depth rod and turret can be locked into their settings, the plunge router is easy to set up for repetitive identical cuts, like a set of mortises in a table's legs.

The best way to set cut depth—The simplest way is from a mark on the edge of the part. But it can be tricky to balance the router over the edge, plunge the bit, and set the depth-adjustment rod.

Here's how I usually do it. With the router unplugged, zero out the bit by plunging it down until it touches the top of the bench or workpiece. Loosen the depth-adjustment rod and let it fall down (or turn it down, if yours has a rack-and-pinion system) into contact with the lowest stop on the router's turret. Now set the cut depth by placing a spacer between the depth rod and turret. Tighten the depth rod.

Use the turret to cut in steps—You don't want to take a single, deep pass because you'll get terrible results. Also, the motor might overheat, and the bit could snap. That's why there is a turret with several stops set to different heights. For most jobs, there are enough stops for the number of passes you need to take. After setting the cut depth, you make the first pass with the turret set to its highest stop. Then you raise the bit—there's no need to turn off the router—and rotate the turret to its next stop. Plunge the bit and take the second pass. Repeat for the third pass and so on. By the time you've reached the lowest stop, you've routed to full depth.

On many routers, these stops are adjustable, so you can vary how much you cut on each pass. That can come in handy if you are routing to a depth that isn't easily divisible by the number of stops on your turret. There are a few guidelines for how much you can rout per pass. Bits ¼-in. diameter and larger (most of the bits you use will be in this range) can overtax the motor, so don't rout deeper than ¼ in. on a single pass. Bits less than ¼-in. diameter can snap off easily, so I never rout deeper in one pass than the diameter of the bit.

Plunge, then make the cut

A plunge router moves vertically and horizontally. Do not attempt to do both at once. Be-

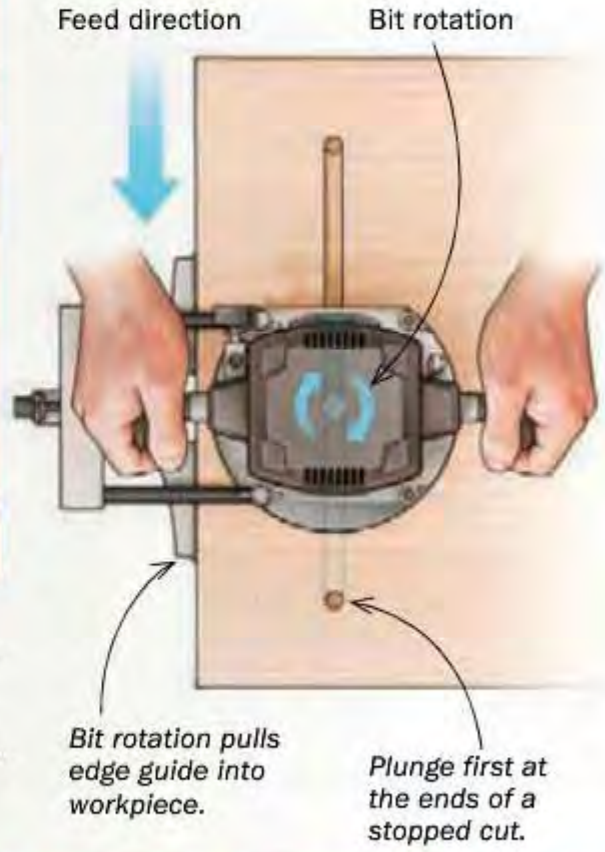
Near an edge? Use an edge guide

An edge guide is the simplest way to control a plunge router, because it goes on in seconds and adjusts easily. It's the right choice for many mortising jobs, and it works great for dadoes and grooves near the edge, too.

Mount the guide on the right. *Then start by making a plunge cut at both ends of the cut to create clean and accurate end walls. Rout between the holes by pushing the router away from you so that the bit's rotation pulls the router and edge guide against the workpiece (right). But don't rout into those first two plunge cuts, or you might accidently cut into the end walls.*

THE RIGHT DIRECTION

Use the rotation of the bit to your advantage by putting the edge guide on the right side of the router and pushing it away from you.



gin by plunging straight down (see "Buy bits that plunge," p. 57). Then, after locking the plunge mechanism, move the router across the workpiece. At the end of the cut, come to a complete stop. Release the plunge lock and raise the bit, but do not lift the base off the workpiece. Lifting the base exposes the spinning bit—a dangerous situation—and gets you off track. Instead, let the springs in the legs raise the router.

After the bit has cleared the cut, rotate the turret to its next lowest stop and slide the router back to the beginning of the cut. Plunge the router, lock the mechanism, and take the second pass. Repeat until you've routed to the final depth.

When you're done, raise the bit and turn off the motor. Do not turn off the motor with the bit still in the cut, because the router could shift and foul the

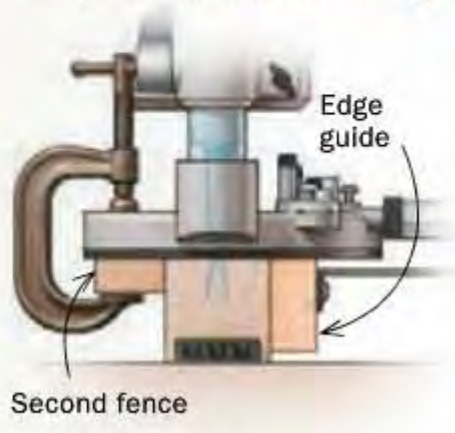
Adjust the depth between passes. *You can leave the power on, but for safety, move the turret as a separate operation, not while you're raising the bit or moving the router.*

Push after plunging. *Separate the two actions so you have greater control over them.*

TIP

DOUBLE UP FOR MORTISES

A second fence, clamped to the base, makes the router more stable on a leg, and keeps the bit from wandering.



T-square is another option for dadoes

Use this guide for dadoes and sliding dovetails that are too far from the ends to use the router's edge guide.

Two strips make a great guide. *Rout through the fence, and then just align that cut with your layout lines (right).*

cut. You might be tempted to rout back and forth through your cut rather than always in the same direction, but don't do it. As a bit spins, it forces the workpiece in one direction and the router in the opposite direction. When you push the router, the workpiece is forced to the right and the router to the left. When you pull the router, those forces are reversed. That change in the direction of the force can cause an inconsistent cut, even if the router is guided by a fence, straightedge, or bushing. In the best case, the cut will be off by only a few thousandths of an inch, but that is enough to turn a tight-fitting dado joint into a loose one. In the worse case, the bit wanders far off course and ruins the workpiece.

How to guide the router

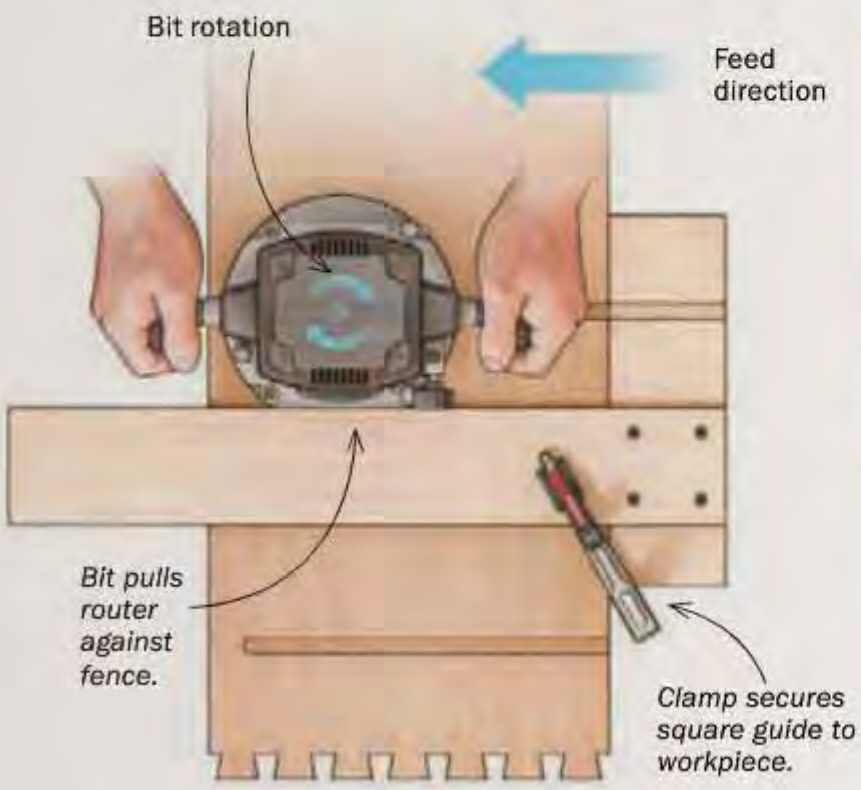
Router bits spin and want to follow the path of least resistance, so if you rout freehand—without the guidance of a fence, straightedge, bushing, or bearing-guided bit—there is no way you'll be able to rout in a straight line. Nor will you be safe. Bearing-guided bits are the usual solution, but they cannot be used for plunging cuts, so they're not an option here. Depending on the task at hand, you need to use an edge guide, a straightedge, or a guide bushing and template.

An edge guide attaches to the router's base, so it can be used only for cuts parallel and close to an edge. That makes it perfect for mortises in chair and table legs, and grooves and dadoes near the edge of a panel.

There are several types of straightedge, but they are all basically a straight guide clamped to the workpiece. The router's base rides along the straight edge, which keeps it on the straight and narrow.

The simplest straightedge is just a board with a face and edge jointed straight and square to one another. They can be clamped down at any angle

AGAIN, USE THE SPIN TO YOUR ADVANTAGE



Keep to the right of the fence and push. *The rotation of the bit will pull the router into the fence, so it won't wander in the cut.*

Drawings: Christopher Mills

A straightedge for angled cuts

Here's another shopmade guide that expands your router's versatility. It's the right choice for angled mortises and grooves.

Trim the base for zero-clearance. *Afterward, the edge of the base shows exactly where the bit will cut.*

Lay it on the line. *Because the base is zero-clearance, there's no need to account for an offset or make fussy measurements (left). Paolini uses an offcut from the base to support the other side of the router (below), so that he doesn't have to worry about it tipping and ruining the cut.*

Use a template for curves and multiple cuts

Here's how to improve your accuracy and efficiency when you need to rout mortises, grooves, or dadoes in several identical parts.

One template can do it all. *Slots, angled mortises, and even a handhold are no problem on these bookcase sides, and you can do them all with the same router setup.*

and work fine, but are sometimes a hassle to locate precisely. A shopmade T-square is a better option, because you can rout through the fence, which shows exactly where the bit will cut. However, you're then limited to cut perpendicular to an edge. A zero-clearance straightedge gives you the best of both worlds: the ability to rout at any angle and a visual indicator of where the bit will cut.

A template combined with a guide bushing is perfect for repetitive cuts. Just place it accurately on every workpiece for identical cuts. Here's a few tips for locating the template: Attach a fence to register against one side of the workpiece; pick one edge of the template to align with the same edge on every workpiece; and draw crosshairs on the workpiece to align with crosshairs on the template that extend down the sides of the slot. □

Gregory Paolini is a professional woodworker near Asheville, N.C.

Slots are sized for the bushing. *It should move easily but without any slop. To make the straight slots in the template, Paolini used his straightedge jig.*

ACCOUNT FOR THE OFFSET

The bushing's outside diameter determines the width of the slots that guide it.

Offset between template and bit

Built-ins that Fit Like a Glove

Tricks to fit a cabinet perfectly into any space

BY GREG ZALL

Installing a built-in cabinet is where woodworking meets carpentry, and where square meets not-quite-square. Walls that are out of plumb and corners that are not 90° are tricky to work around, especially when you're installing in a three-sided space. I face this challenge regularly when I build a wall-to-wall desk or design a cabinet to fit into the alcoves that are a common architectural detail in the San Francisco area, where my shop is. To make my built-ins fit like a glove, which I think fine furniture should, I pair a few old carpentry techniques with some cabinetmakers' tricks of my own.

I start with a cabinet narrower than the space, and a separate base shallower than the cabinet. That design lets me position the whole assembly away from the imperfect wall surfaces. I compensate for any undersizing with overwide face-frame stiles that I scribe and cut during installation. Then I cap it with an oversize, thick-edged wood top. These techniques ensure that any built-in will fit perfectly.

The case and the base are quick and simple

I assemble the cabinet and most of its parts before installation. The case and the base are equal width, but the base is ½-in. shorter, front to back. That keeps it away from the back wall, where a bumpy surface could prevent it from sitting flush with the face frame in the front.

I use ¾-in.-thick, veneer-core plywood for everything except the back, which is ½ in. thick. I use pre-finished plywood to save time. Join the case parts with biscuits, glue, and screws, and the base with glue and nails.

Big face frames fit better

The face frames are the heart of my technique for a perfect fit. The trick is to attach the rails before installation,

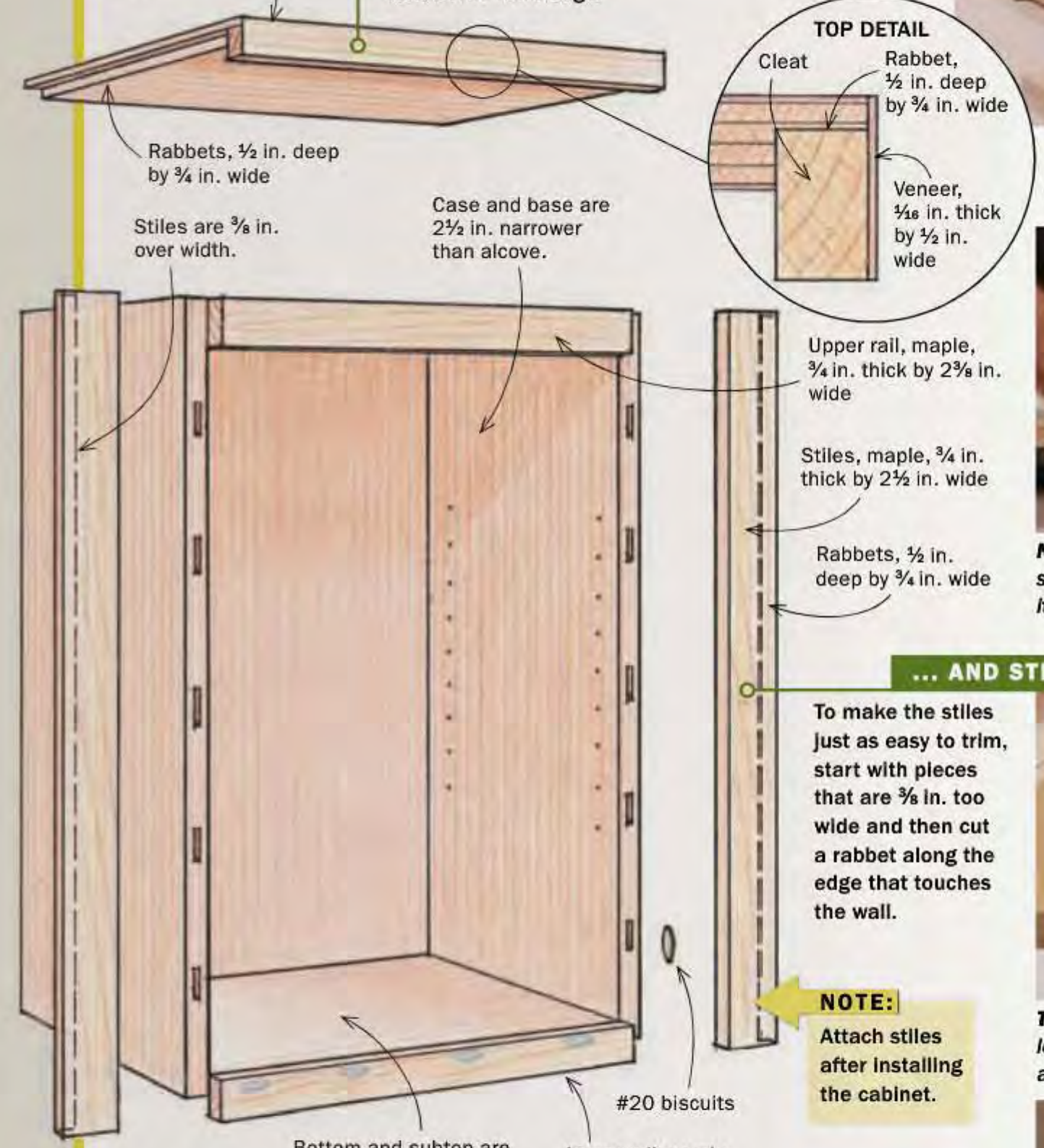
Photos: Ken St. Onge; drawings: Vince Babak

SMART CONSTRUCTION IS THE KEY

Build the top oversize, the stiles over-width, and rabbet any edges that will touch a wall. And leave those pieces unattached, so they can be cut to fit during installation. The rest of the case and base is assembled ahead of time.

SEAMLESS TOP...

Cut a rabbet along all four edges of the top, glue a solid cleat into the rabbet along the front, and then veneer the front edge.



Attach the cap. *Glue a solid-wood cleat in the rabbet along the front (shown) and then rip the overhang to make it flush with the plywood edge.*

Now veneer it. *Use yellow glue with a long caul to spread the pressure evenly along the veneer. When it dries, break the edge with sandpaper.*

... AND STILES, TOO

To make the stiles just as easy to trim, start with pieces that are ⅜ in. too wide and then cut a rabbet along the edge that touches the wall.

NOTE:
Attach stiles after installing the cabinet.

Thin the sides. *Rabbet the edges of the stiles to leave about ¼ in. of material, which makes it quick and easy to trim them to fit a wavy wall.*

Glue the rails beforehand. *Dry-fit the stiles to align and glue the rails in position during assembly. Then remove the stiles so they can be trimmed later.*

ANCHOR THE BASE

Level everything before securing the cabinet, so it too goes in level and plumb. Zall's scribing method depends on it.

Level it. *Check the base for level. Zall adjusts the fit with wedged shims if needed, but doesn't nail it down yet.*

Locate it, and nail it. *Test-fit the cabinet so it is against the back wall, and position the base flush at the front, using tape to mark its position on the floor. Then remove the case, re-level the base, and nail it to the floor.*

Lock it in place. *Install the cabinet equidistant from both side walls. Push it against the back wall again, shim any gaps at the back edge, and screw through the top of the back panel into a wall stud.*

SCRIBE THE STILES

Use over-width stiles to fill the gaps between the wall and the sides of the case, trimming them to fit after the cabinet is screwed to the wall.

Measure from the top. *Measure the distance from the end of the rail to the wall to determine the final width of the stiles. It should be the same on both sides of the cabinet.*

Transfer the distance. *Run a strip of masking tape along the edge of the stile to help mark and trim the edge without marring the piece. For now, just transfer that top distance.*

but leave the stiles overwide, unattached, and with the biscuit slots already cut. That way I can scribe the stiles to the wall and cut them while they're loose, which is easier. Then I use the friction from the wall, rails, and biscuits to help hold the stiles in place while the glue sets.

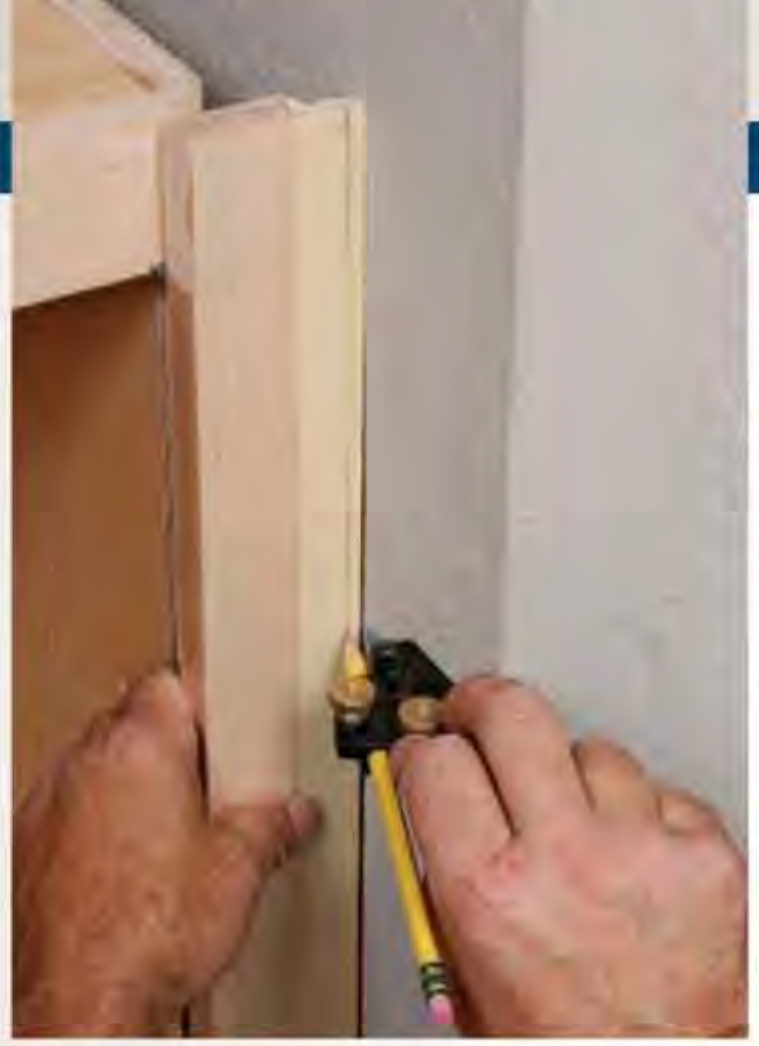
Leaving the stiles ⅜ in. too wide gives me more than enough scribing room, but it's a good idea to check the walls beforehand to see how flat they are. To make it easier to scribe and trim the stiles, I cut a ¾-in.-wide by ½-in.-deep rabbet along their back edge, where they touch the wall. The rabbet leaves ¼ in. of solid wood along the edges, which is strong enough to resist breakage but thin enough to trim easily with a jigsaw and block plane during installation.

Cap the top

Just like with the stiles, I build wood tops that are too big to fit in the space, and cut sizable rabbets along the wall-side edges to make them easier to trim in place. Rather than cutting stopped rabbets along the sides, I cut through-rabbets on all four edges and fill the front rabbet with a piece of solid wood.

Most cabinetmakers just glue ¾-in.-thick edging along the front edge of a plywood top, but I don't like that technique because it leaves an obvious grain change and a thin glueline visible on the top. Instead, I glue a hardwood cleat into a rabbet along the front, and then veneer over it. Then, when I break the edge with sandpaper, it hides the glueline.

Keep stiles plumb. *Lay the stile on top of the rail and butt the rabbeted edge tightly against the wall. Check it with a level and shim if needed.*



Scribe the edge. *Use the pencil mark at the top to set the scribe, and keep the tool butted against the wall as you run it along the stile.*

Once the cleat is glued and veneered, the top should be about ⅜ in. longer than the alcove and ¾ in. too wide. That should be more than enough space to scribe and trim for a tight fit.

Install from the bottom up

When scribing the stiles, I need to reference my marks off a solid, level cabinet that's firmly rooted in place, so setting the base properly is a key first step in the installation.

I start by positioning the base ½ in. from the back of the alcove, and roughly equidistant from both sides. Then I test-fit the case to make sure everything lines up properly and the bottom rail of the face frame sits flush with the front of the base. I mark the position of the base with tape, remove the case, and check the base with a level, shimming where needed. I nail the base to the floor through the cleats with 1½-in.-long nails. The nails keep the base tightly cinched against the floor when I'm positioning the case, but still have enough play that I can adjust the fit front to back with a hammer tap. Install the case, check that it's level and plumb, and then screw the case to the back wall studs. Screw near the top of the case to prevent the case from moving, adding shims between the wall and the top of the case as needed to stabilize the cabinet.

To trim and attach the stiles, measure from the end of the rail to the drywall and mark that distance on the stile. Push the stile against the wall, shim it plumb, and place the pencil of the scribe on the mark. Keep the stile tightly in place as you run a line along it.

Cut along that scribed line to match the stile to the wall. I do this by first cutting close to the line with a jigsaw. Then I use a block plane to smooth the saw marks and sneak up on a good fit. I secure the stiles with glue and biscuits when I get them snug.

Cut the top with a template

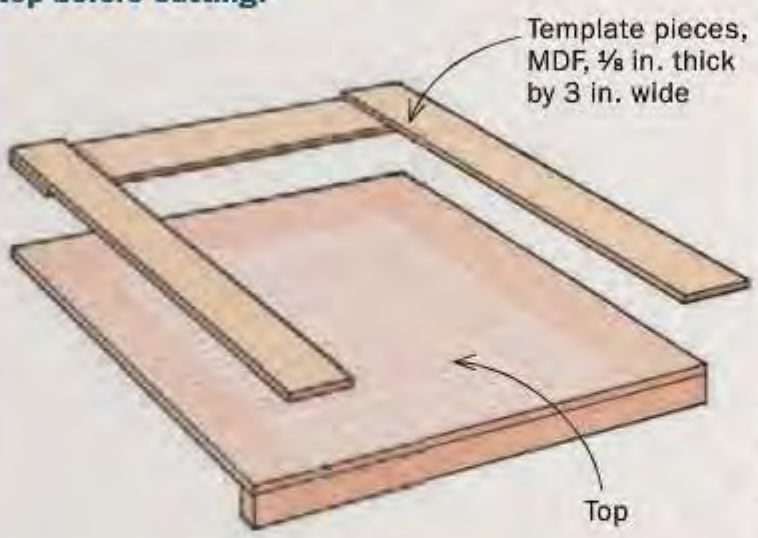
Three-sided spaces are almost never perfectly square, which makes fitting cabinet tops tricky. The easy, imperfect way to do so is to cut an undersize top and cover the gaps with clunky

Plane to the line. *Cut away the excess using a jigsaw and clean up the edge with a block plane.*

Friction does the clamping. *Pivot the stile onto its biscuits. The rails and the wall will keep it wedged in place while the glue sets, but give it a couple of taps first to get it flush.*

A TEMPLATE FOR THE TOP

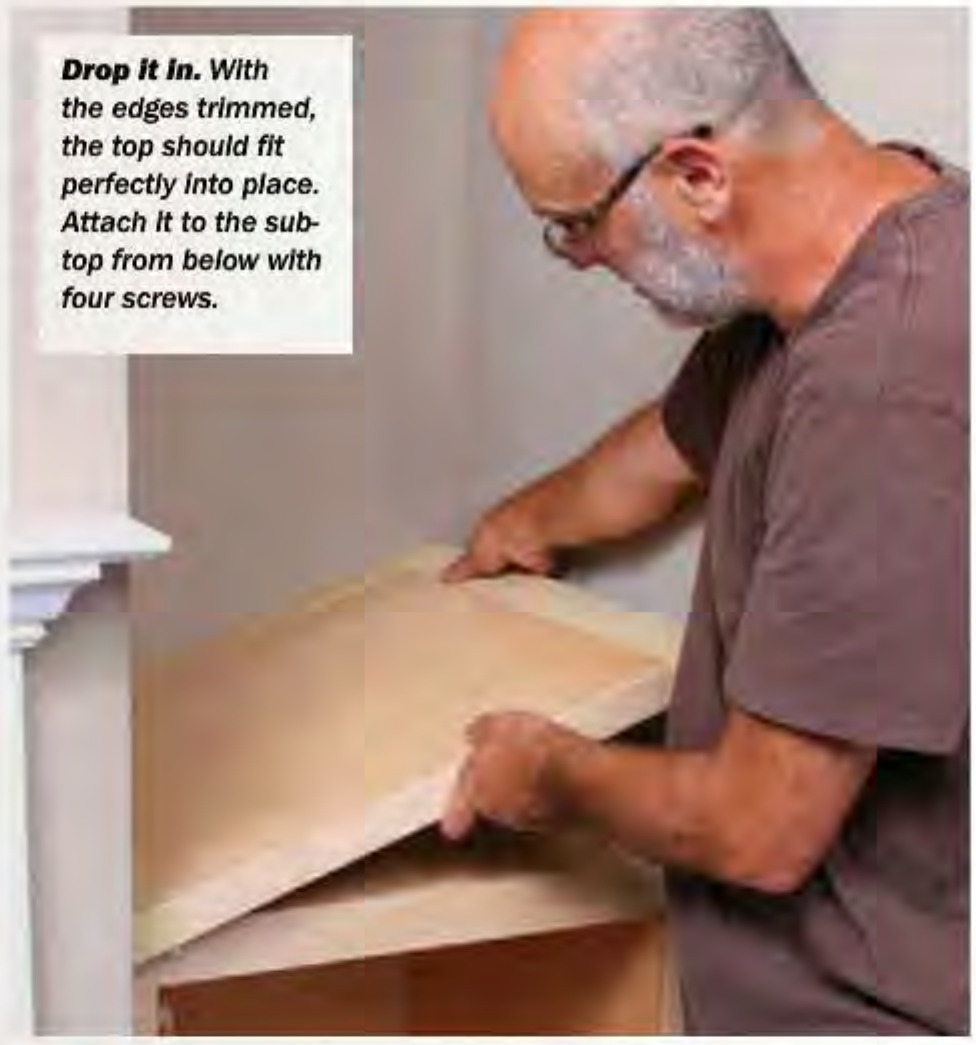
Use narrow strips of MDF to make a template the exact shape of the opening, and use it to mark the top before cutting.



Scribe each piece. *Butt the edges of the MDF pieces against the wall and use a pencil as a scribe. Then trim the edges down to the line using a block plane.*

Glue them together. *Zall uses hot-melt glue to attach the template sides to the back piece. Before removing the template, mark where it meets the cabinet's front edge.*

Line it up. *Use the marks at the front to align the template, adding an extra 1¼ in. to account for the overhanging top, and trace the template. Use a fine-tooth handsaw to cut through the maple cleat in the front but remove the rest of the waste with a jigsaw and trim the top to fit with a block plane.*



Drop it in. *With the edges trimmed, the top should fit perfectly into place. Attach it to the sub-top from below with four screws.*

moldings. Instead, I build a quick template from MDF and use it to mark the oversize top so it can be cut to shape perfectly.

I make three template pieces by butting a piece of MDF against each wall and then scribing the wall shape onto the MDF with a pencil. Then I use a block plane to trim the template to the scribe lines. Once the pieces are scribed and cut, butt the rear template into position and attach the sides to the back with hot-melt glue. Before removing the template, mark where it meets the front rail, then measure out another 1¼ in. to account for the overhanging top. Use that mark to line up the template on the wood top.

Align and trace the template with a pencil and use a square to transfer the template line down the front edge. Now you're ready to cut. Start at the front edge using a fine-toothed handsaw on the cleat and cut right to the pencil line. A spot-on cut is best, because you won't need to go back and handplane it later. I finish cutting the rest of the top with a jigsaw, staying as close to the line as possible, and then carefully clean up the saw marks with a block plane.

If the back of the alcove is the same size or smaller than the front, slide it straight in. If the back of the alcove is wider than the front, you'll need to angle the top on one side and drop it into place. Go slowly and don't force it or you could scratch the wall or damage the top. Attach the top with screws from inside the cabinet. Then attach the trim with a pin nailer.

Use these tricks and you will get cabinets in place fast with an exact fit. Your reward is a perfect line where the wood meets the wall. Or, as a client once said, "It looks like it grew there." □

Greg Zall builds cabinets and solid-wood furniture in Petaluma, Calif.

Classic Shaker

Discover the difference between the masterful and the near-miss

BY CHRISTIAN BECKSVOORT

Many furniture makers are inspired to build Shaker pieces. I can see why. After all, Shaker design embodies all you'd want in a piece of furniture. The style is defined by clean lines and excellent craftsmanship, and more importantly, the pieces are highly functional. But it can be hard to distinguish a piece that's truly Shaker from one that's diluted by non-Shaker influences.

Like any other seminal furniture style or movement, Shaker style experienced different periods. Initially, the Shakers were influenced by the furniture they found in New England. Then, around 1820, Shaker design came into its own. For the next 40 years, the Shakers produced their finest furniture. The worldly influences found in earlier furniture were gone and their work took on that classic and unique look the Shakers are famous for. After 1860, Shaker communities began to decline and outside influences, particularly Victorian, crept back into Shaker work.

Shaker pieces are abundant, and you can copy any that strike your fancy. But to build in the truly classic style, you need to know its forms and details. I've been around Shaker furniture since the 1970s, helping to restore and even build pieces for the Sabbathday Lake Shakers in Maine. That experience has given me insight into what makes a piece quintessentially Shaker. To help you understand the essential elements, I've put together this guide, drawn from two New England Shaker villages: Sabbathday Lake and Hancock. I'll show five types of furniture, pointing out details that arose from outside and those born in the movement that make the pieces classic.

Online Extra

See the water-powered machinery at Hancock Shaker Village at **FineWoodworking.com/extras.**

Christian Becksvoort is a contributing editor.

Candle stands

Candle stands are among the most diverse and creative designs of any Shaker furniture. But within all that diversity there is a uniquely Shaker spin on the form.

PRIMITIVE

Simple and unrefined. *Early stands like this one, built in 1820 at Sabbathday Lake Shaker Village in Maine, have the least ornate posts and legs. The post has a long swell-taper that ends in a small cove above a cylinder. The legs are really slightly tapered dowels fit into drilled mortises in the post. The rectangular and square-edge top is another indication of early design.*

QUEEN ANNE

Snake in the garden. *The most prominent features on this stand are the Queen Anne snakefoot legs, an obvious worldly influence. The post's shape has changed, becoming more ornate. The top has been dressed up as well, having an undercut ovolo edge profile.*

QUINTESSENTIAL

Reminiscent of a wine bottle, the post starts at the top with a tulip-shaped swell that flows downward through a stretched out S-curve and ends in a cylinder with a slightly reduced diameter. The beautiful "spider" legs taper in thickness from top to bottom and dovetail into the post, where their curve creates a seamless transition from leg to post. The round top has a slightly radiused edge profile.

Every detail counts. *Tapered in thickness and beveled on the edge, even the brace under the top (rarely, if ever, seen) is elegant. The post's tulip-shaped swell is another perfectly executed but mostly unseen detail.*

Photos: staff

Sewing desks

One of the hallmarks of classic Shaker design is purpose-built furniture, embodied beautifully in the highly utilitarian sewing desks used by the women, or Sisters, of the community.

Ad-hoc isn't classic. *This early sewing desk, built around 1815 at Sabbathday Lake in Maine, seems to have started life as a small bureau, with the top gallery added later. The legs, with their whale-tale shape, and faux panel sides were likely borrowed from furniture the Shakers found around them at the time.*

Mixed but not matched. *This desk probably started life as a side stand, with the six-drawer gallery added to repurpose it for sewing. Both parts show the excellent craftsmanship and design typical of Shaker work, but they don't work together to form a single, coherent design.*

IMPROVISED

PURPOSE-BUILT BEAUTY

Although built in 1890 by Elder Henry Green of Alfred, Maine, this matched set of sewing desks retains the classic features of crisp, unadorned lines, frame-and-panel construction, large drawers on the bottom, and stepped back gallery. And they were clearly built as sewing desks, with pull-out work surfaces. Almost every community had similar desks.

Trestle tables

The Shakers didn't invent the trestle table, but they refined its design and adapted it for communal life.

THE BEST SHAKER LEGS ARE TURNED

Although the foot design of this trestle table is similar to the one on its larger cousin (below left), the arch is not as high and there is a chamfer on the top edges rather than a roundover. But what really sets it apart is the turned leg with moldings, making this a more pleasing table and an excellent example of the Shakers' finest work.

TOO FLAT

A step behind. *At 20 feet in length, this communal dining table was definitely purpose-built. The high arched feet are attractive and the slight radius on the toes carries up the legs and onto the curved supports. But the legs are flat, making it a less-refined design.*

TOO FANCY

Worldly details. *The Victorian influence is clear in this trestle table built by Brother Delmer Wilson at Sabbathday Lake around 1920, notably in the molded edge of the top. It also lacks the breadboard ends of the classic table and has square feet and legs.*

Dressers

The best Shaker chests are strictly functional. Carvings, veneer, and ornamentation are absent and moldings are used only sparingly.

NEAR-MISS

Something missing. *This tall chest of drawers, built in 1806, is a near-perfect design, but it also is a great example of how one missing detail can throw off the entire design. It has a bracket base but no top molding, so it looks a just a bit bottom heavy and incomplete.*

NOTHING LEFT TO CHANCE

Topped with a small half-molding that counters the simple details below, this cupboard over a chest of drawers is a fully resolved design. The top molding ties into the quarter-round molding on the frame-and-panel doors, and the center stile in the cupboard is twice the width of the outside stiles.

Restraint at the floor. *The sides have elegant, understated feet cut into them, a detail carried around to the front by the addition of two small pieces of wood cut to match the shape on the sides. This style suits the overall design better than the bracket foot found on the earlier dresser.*

Don't forget the middle. *This half-round molding separates the top and bottom, and echoes the moldings on top and around the door panels.*

Built-ins

The Shakers were ever mindful of order and efficiency: "A place for everything and everything in its place" became their motto. So, virtually every building in a Shaker village had built-ins. They're found in attics and knee-walls, next to chimneys, in corners, and under stairs.

NOTHING NEW

Early built-in hasn't broken free. *This is one of the earliest examples of a Shaker built-in. Found next to a post in the Sabbathday Lake Meeting House (built in 1794), its construction is similar to techniques used in New England at that time. It has raised, beveled door panels and surface mounted H-hinges.*

VICTORIAN

Outside creeps back in. *When the Trustees Office at Hancock, Mass. was refurbished in 1895, its built-ins were also updated to a Victorian style. The door frames have stopped bevels on their inside edges and the doors are surrounded with a walnut bead, a detail picked up in the walnut cock beading on the drawers. The porcelain knobs are a Victorian touch, too.*

Shakers weren't shy with color

Most of us think of cherry's warm glow when we think of Shaker furniture. However, the Shakers often painted their pieces. The exteriors of these built-ins at Hancock Shaker Village show just how bold the original paint colors were. An analysis of the faded original paint (still present inside the cabinets) allowed conservators to remake it accurately and return the cabinets to their lost vitality.

UNDERSTATED BEAUTY

Located in the dwelling house at Hancock Shaker Village in Massachusetts, this built-in has door panels that appear flat, even though they have soft bevels. The rails and stiles have a quarter-round molding on their inside edges that echoes the quarter-round thumbnail profile on the lipped drawer fronts.

readers gallery

JASON KLAGER
Prince George, B.C., Canada

A lifetime love of Japanese cabinetry led Klager to build this tansu cabinet (17 in. deep by 39 in. wide by 32 in. tall) as a gift for the other love of his life. The woods are wenge, afromosia, Japanese walnut, and bocote. There is a secret box hidden behind the top-right drawer when the cabinet is closed. The lid and bottom of that box are made of wood from a Mayday tree that Klager's wife planted as a child. The cabinet is finished with a three-part mixture of Waterlox Original Satin Finish, tung oil, and mineral spirits.

RYAN MAILS
Greensboro, N.C.

The design for this black walnut and Danish cord bench (15½ in. wide by 48 in. long by 17½ in. tall) began with the gull-wing profile of the ends. Mails says the rest of the design flowed out of his desire to conform the cord seat to that shape. Because he has always liked the straightforward utility and exposed joinery of underhung drawers, he says he "played with that" on this bench as well. The finish is shellac. Ash is the secondary wood.

Submissions

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

DIEGO MISCORIA
Trieste, Italy

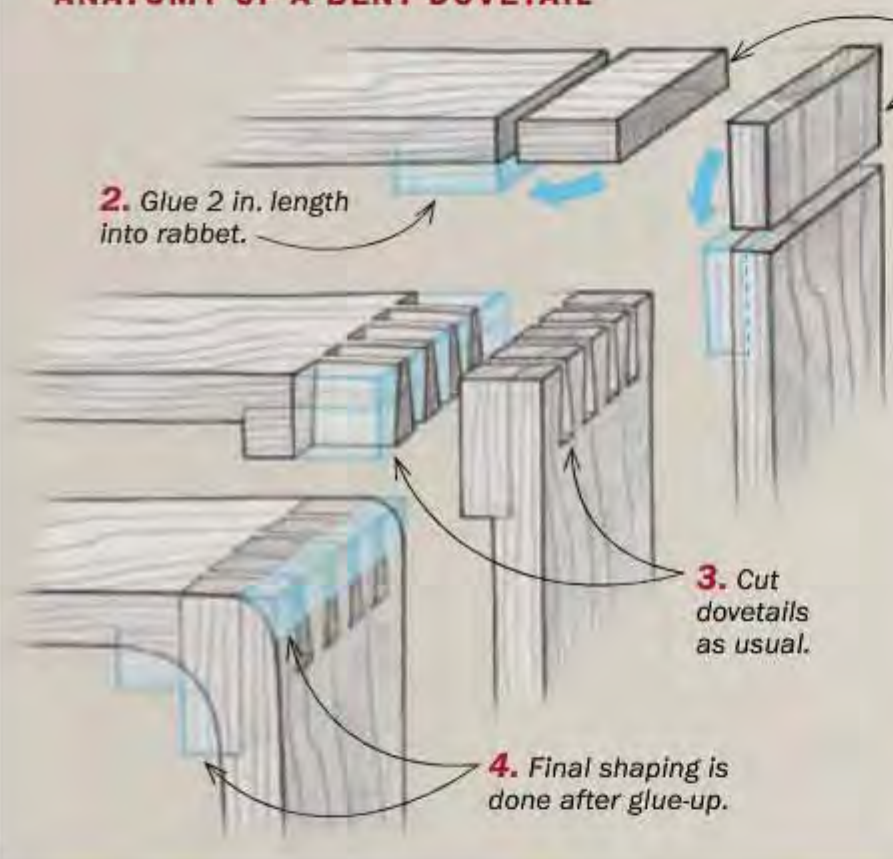
Hoping to design a comfortable and beautiful bar stool without upholstery, Miscoria spent a lot of time on the backrest of this steam-bent ash stool (22 in. deep by 22 in. wide by 41 in. tall). He added a small concave curve in the upper middle that keeps the sitter's backbone from leaning directly on the wood. He chose ash for its excellent bending qualities, and added a wenge detail on the back to make things interesting. He says next time he'll probably add wenge to the armrests, too. The finish is wax, except for the footrest, where he used varnish to protect the wood from shoes. For more of Miscoria's work, visit dimisco.com. PHOTO: JANKO FURLAN

DESIGN SPOTLIGHT

JOHN TETREAULT
Durham, Conn.

Tetreault, also the author of "Fine Furniture from Reclaimed Wood" on p. 48, has used his "bending dovetail" technique on a number of pieces, including this curvy wall cabinet (7¼ in. deep by 19 in. wide by 27½ in. tall). Not only does he like the way the curved joinery looks, but it's also a great way to get a thicker curved corner joint using thinner stock. The key is that during layout, he adds 4 in. to the length of each piece. Then, he cuts 2 in. off at each end to glue into a rabbet at the end of the board, making each end thicker with almost perfectly matched end grain. He cuts the dovetails as usual, dry-fits the piece, and shapes the curves using rasps and files. You could get a similar organic look starting with thick boards and wasting away a lot of that thickness afterward, but Tetreault's approach is more efficient.
PHOTOS: JOHN TETREAULT

ANATOMY OF A BENT DOVETAIL



MIKE FUCILE
Palm Harbor, Fla.

This glass-top table won Best in Show honors in the Fine Handcrafted Furniture Competition at the Florida State Fair. Fucile, who has been woodworking for 30 years, says the design was his first attempt at "thinking outside the rectilinear box." All the joints are floating tenons. Fucile ebonized the maple legs using black dye and ebony stain. The stretcher is quilted makore veneer over ash bent-laminations. Fucile says contributing editor Michael Fortune, with whom he has taken several classes, gave him advice on the final design details. The table is 21 in. wide by 52 in. long by 29 in. tall. PHOTO: HEATHER AND ZANE BOND

31 YEARS OF FINE FURNITURE IN FORT BRAGG

Every spring for the past three decades, a crop of remarkable furniture has appeared in a small, remote coastal town in northern California. James Krenov began teaching at the College of the Redwoods (CR) in Fort Bragg in 1981, drawing talented and passionate students from across the country and around the world. This year's student show, held at the Highlight Gallery in nearby Mendocino, marks the first year with the program under its new director, Laura Mays, an Irish furniture maker who entered the school as a student in 2001, in time to catch Krenov's last year of teaching. We've chosen a handful of pieces to represent the range of excellent furniture on display.

PHOTOS: DAVID WELTER

RAVE CLAY
Kiowa, Okla.

"I have always had a love for windmills, the lone artifact in the low plains of Oklahoma," Clay says, citing the inspiration for this box on stand. The piece, 12 in. deep by 18 in. wide by 48 in. tall, is made of kwila, Siberian elm, and eastern maple. The stand is joined with half-lap joints; the box, with dowels. The finish is shellac. "At CR, where sawing, chiseling, paring, and planing never seemed to stop, I was able to work with and learn from some of the West's finest woodworkers. What I gained from my time there was not limited to the world of fine woodworking, and will stay with me forever," Clay says.

MOLLIE FERGUSON
Fort Bragg, Calif.

Ferguson calls this chair "dulcius ex aspiris" (after difficulty, sweetness). She says the project (37 in. deep by 25 in. wide by 39½ in. tall), with its leather upholstery, hand-cut bevels, and bent-laminated seat back and legs, gave her a chance to try joinery that was not 90°, complex curves, and shaping wood with hand tools. The finish is Epifanes varnish.

CARLOS CUX
San Rafael, Calif.

Cux was in his second semester at CR when he built this bow-front display case (7½ in. deep by 19½ in. wide by 26 in. tall). He'd learned how to do curved work, fit drawers, and hang doors in an earlier cabinet, but this time he added glass. The case and doors are made from madrone, with spalted sapwood in the lower door panels. The finish is shellac. "I came here from Guatemala, and I want to be able to teach young people in my home country when I complete my studies," Cux said.

DAN WACKER
Chico, Calif.

This sideboard (17 in. deep by 47 in. wide by 32 in. tall) is Wacker's take on a classic serpentine-front cabinet. The left and right doors are concave on the bottom and convex on the top; the center door is concave on the top and convex on the bottom. The case is sapele, the base kwila, and the interior narra. The finish is shellac. Of the CR program, Wacker says: "Although I never had the privilege of meeting James Krenov, I feel as if his pulse still beats within the walls of the woodshop."

SARAH MARRIAGE
Fort Bragg, Calif.

The ocean waves that break a mile west of the school's woodshop, coupled with the grain of the madrone, gave Marriage the idea for this box (14 in. deep by 10 in. wide by 2¼ in. tall). The box has two lids, carved from solid stock, that overlap to provide a built-in pull. The finish is shellac. "CR is one of those places in the world where creativity, work ethic, and passion exist in strong concentrations," Marriage said.

JOHNNY WILLIAMS
Newtown, Conn.

"The instructor's rules said to keep it small, solid, simple, and sweet," Williams says, describing this wall cabinet (7⅛ in. deep by 26¼ in. wide by 7⅞ in. tall). "To those, I added my own requirements: to work only with native species and shape curves by hand." The cabinet is claro walnut, bay laurel, and maple, with a shellac finish. "The College of the Redwoods is such a welcome change of pace," Williams said. "We know fast won't last, so we slow down and build real, durable furniture."

JONATHAN PARRIS
Santa Cruz, Calif.

This oak table and chairs was modeled after a set designed by Carl Malmsten more than 50 years ago. Parris got interested in the Swedish furniture maker's work when he studied at his school, Capellagärden, in Sweden. The table is 43 in. dia. by 29 in. tall; the chairs are 18 in. deep by 16 in. wide by 32 in. tall; the stools are 11 in. deep by 17 in. wide by 18 in. tall. The finish is oil. "My two years at CR felt all too short," Parris says. "Not for my education—which was superb and life-changing—but for the community and friendship of my classmates, and the alumnae and teachers who continue to care about it so deeply."

Q&A

How to make dovetail keys

One bit, two cuts. *Ensure a perfect fit by using the same bit to cut the keys and the slots.*

Q: I've built a few boxes with mitered splines on the tablesaw, and now I want to try my hand at dovetail splines. I know I can use a jig to cut the slots in my box at the router table, but how do I make the splines?

—JOHN MIHALICK, Pensacola, Fla.

A: THE SECRET TO GETTING THE SPLINES TO FIT is to use the same dovetail bit you used to cut the slots.

Start by cutting the slots in the side of the box with a dovetail bit and a jig. Once all the slots have been cut, raise the dovetail bit about 1/16 in. The extra height makes the splines, also known as dovetail keys, slightly taller than the slot, and easier to trim to fit. Then bury the bit about halfway into a zero-clearance fence on your router table. Make the keys from a piece of stock that's slightly thicker than the widest part of the dovetail slot, and at least several inches too wide. The extra thickness lets you adjust the fit of the keys, and the extra width makes it easier to grip and to register the workpiece against the fence.

Make one pass with the face of the workpiece against the fence to cut half of the key. Then flip the workpiece and run it back through the bit to cut the other half. Test-fit the piece in one of the slots. If it's too tight, nudge the fence to take a slightly deeper cut from one side. It doesn't matter if the key is not centered on the board because you're going to cut it off anyway. Once you're close, use a block plane to take a swipe or two from the bottom, fatter part of the key to make it fit a little looser.

Cut the key stock from the board with a bandsaw, crosscut the keys to rough length, glue them in the slot, and then trim the keys flush with a block plane.

—Matt Kenney is a senior editor.

Use a sled for the slots. *A simple jig, registered against the fence, holds the box at 45° and makes it easy to cut the dovetail slots.*

Better keys in bigger pieces. *Rout the key on the bottom of a larger piece to stay safe and get a clean cut. Raise the bit a little from its earlier position. Also, bury it in a sacrificial fence if possible.*

Adjust the fit. *If the key is too thick, move the fence and recut one side. When it fits, rip away the key stock, and crosscut keys as needed.*

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: Kelly J. Dunton

Removing shellac entirely is best fix for spilled liquor

Q: Spilled Scotch ate away the shellac on my table. What's the best way to fix the finish?

—DON HAYES,
Ames, Iowa

A: FOR SMALL OR MINOR BLEMISHES WITH ALCOHOL, you can try blending in a new coat with a pad, but the best solution is simply to remove the shellac from the entire top and refinish it. Fortunately, shellac is easy to remove. Place doubled-up paper towels on a section of the top and saturate them with denatured alcohol. Smooth out any bubbles and then cover the paper towels with newspaper or plastic to slow the evaporation. After about 10 minutes, roll back the paper towels and wipe off the loosened shellac. Repeat until all of the shellac is gone, then refinish the piece.

Water rings are a different deal, involving moisture trapped in the finish. To release it, simply dampen a pad with alcohol, rub lightly, see if the ring disappears, and repeat as necessary.

—Peter Gedrys is a finishing expert in East Haddam, Conn.

Dissolve it all. *Doubled-up paper towels soaked in denatured alcohol will remove the old finish. Cover the soaked towels in plastic to prevent the alcohol from evaporating before the finish dissolves.*

Wipe it off. *Use the alcohol-soaked paper towels to rub the remaining shellac from the surface.*

When to sharpen tablesaw blades

Q: How do I know when a tablesaw blade needs sharpening? And is it really better to sharpen a tablesaw blade, or should I just buy a new one?

—FRANK DEL GRECO,
Novelty, Ohio

A: YOU CAN'T SPOT A DULL BLADE JUST by looking at it, but you'll feel it when you use one. A dull blade makes it tough to feed stock at a steady rate, and often bogs down the motor. Rely on feel, instead of visual cues like burnt stock or rough cuts, which could mean a dull blade, a dirty blade, damaged teeth, a poorly adjusted saw, or a feed speed that's too fast. And before declaring dullness, try scrubbing the blade with a pitch cleaner. A blade that is cleaned regularly will also last longer.

If you have a high-quality blade, it will have plenty of carbide for resharpening, and will be worth the $20 or $30 to do so. If the blade is cheap, just replace it.

—Roland Johnson is a contributing editor.

You can't spot dullness. *A dirty blade may not need sharpening. Try removing the pitch and built-up residue with blade and bit cleaner before cutting with it. Also check that the fence is parallel to the blade.*

master class

Perfect dovetails on a curve

NESTING BLOCKS EASE LAYOUT, CLAMPING, AND CUTTING

BY BRIAN ROY

Most woodworkers have cut dovetails to join two straight boards. Some have even used the joint to bring together a curved drawer front and a straight side. But confronted with two parts that are curved across their width—perhaps for the sides of a jewelry box—many would hesitate.

Because both parts are curved across their width, the ends are also curved. So, there are no straight edges for your square and bevel gauge to register against, which makes layout very difficult. There's also no obvious way to clamp the bowed parts securely when you saw and chop the dovetails. And how do you keep the shoulders properly curved while cleaning out waste?

The answer is a pair of hardwood blocks that sandwich the workpiece. Each block has a straight edge that lets you lay out the dovetails. Nested around the workpiece, they can be clamped in a vise, so you can saw the pins and tails. Also, they can be used as a chisel guide when you're cleaning out the waste. I'll show you how to make and use the blocks, including some tips on laying out and cutting dovetails on curved parts.

Make the blocks

The blocks are used in pairs. One goes on the inside curve of the workpiece and has a convex face and edge to match its curved face and end. The other goes on the outside and has one convex side and one concave side. To make the blocks, you need two templates (opposite page), made from ½-in.-thick

Curved blocks are the key

A pair of these blocks gives you a straight edge for layout and clamping, and a curved one that helps you chop perfect shoulders.

LAYOUT

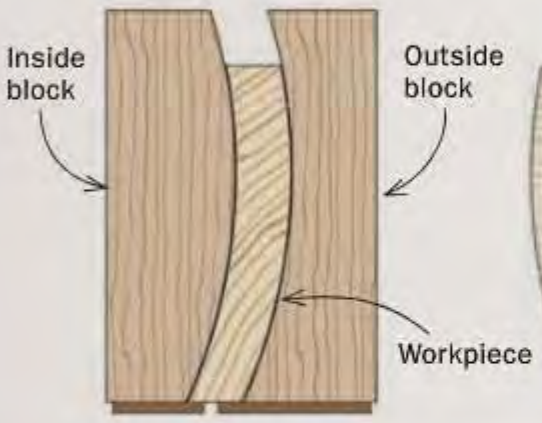
CLAMPING

CHOPPING

Photos, this page and top of opposite page: Kelly J. Dunton

Start by making the blocks

Because the sides of this box have an irregular curve, you can't just flip one pair of blocks over and use it at the other end. So, you'll need a second pair that is a mirror image of the first pair. For sides with a regular curve, one pair is all you need.



END VIEW

The mating faces of the blocks match the profile of the workpiece.

SIDE VIEW

The outside faces of the blocks match the ends of the workpiece.

Sandpaper (P220-grit) and fences help keep the workpiece properly aligned.

USE A PAIR OF TEMPLATES TO MAKE THE BLOCKS

Templates ensure that all of the convex curves—and the concave ones—are identical.

YOU NEED TWO TEMPLATES

Cut the curves at the bandsaw and then sand them fair, backing up the sandpaper with posterboard so that it skims over the low spots while knocking down the high ones. The curves need to nest together tightly.

One fence for both templates. *The fence sits in a number of grooves on both sides of the templates, to keep the blocks in the same orientation.*

Use the template to lay out the curve. *With the blank pressed against the fence, trace the curve onto it.*

Bandsaw the curve. *Leave about 1/32 in. of waste to remove at the router table. Before you do that, tape the offcut back on and then trace the second curve and cut it.*

Rout flush. *If your bit isn't long enough to trim the entire block, use a block plane to remove the remaining waste. Then flip the block onto the opposite template to rout the concave face.*

Photos, except where noted: Matt Kenney

Shape the workpiece

Shape the end grain first, when the blank is still straight and square. Then you can register the curved side of the block against the curved end grain, making it easier to lay out the side's shape.

Template for the end. *While the workpiece is still square, use the template's fence for alignment. It registers against the bottom edge, so the same section of curve is used for all eight ends. Lay out the curve and then cut it.*

Block for the curved faces. *A fence on the block aligns it with the bottom edge (left). The shim under the block is the same thickness as the workpiece's final thickness. Remove the shim to trace the inside face (right).*

Rough out the inside curve first. *Make a series of ripcuts. Keep the blade square to the table and adjust its height so that each cut is just shy of the layout line.*

Clean it up with plane. *You'll need one with a radiused bottom tighter than the tightest part of the curve. Roy made his, but you can buy new and used "round" molding planes from a variety of sources.*

MDF. For an asymmetrical curve like the one shown, I rough-cut the curve at the bandsaw. Then I clean up and fair the curve with sandpaper attached to a flexible caul made from a few pieces of stacked posterboard. For symmetrical curves, I cut the templates with a router and a circle-cutting jig.

After the templates are made, make the blocks. Trace the template's curve onto the hardwood blank and rough it out at the bandsaw. Then trace and cut out the curve on the adjoining face (you may need to tape on the offcut to do so). To clean up the bandsaw cuts, screw the blank to the template and rout it flush.

Lay out and cut the dovetails

After the blocks are made, you're ready to lay out the dovetails. Of course, first you need to make the sides. On a small box like this one, I start with thick sides and use the template and blocks to lay out the shaped ends and faces.

The dovetailing is no different from what you'd do to join two straight boards: Lay out the baseline and pins (or do tails first), cut the pins and chop out the waste, then transfer the pins to the tail board.

Of course, you do have to compensate for the curved parts. The blocks take care of that. One rests on the outside face and allows you to draw a baseline. Then sandwich the side between the pair and lay out the pins.

To cut the pins, cradle the side between the blocks and clamp it in a vise. The pins can be sawn like those on any other board. Chopping out the waste is a snap, too. Just align the block with the baseline and use it as a chisel guide. Finally, clamp the block to the baseline on the tail board, stand the pin board against it, and transfer the pins' location. Use the blocks to clamp the tail board for sawing and chopping out the waste.

Brian Roy builds furniture in Charlotte, N.C.

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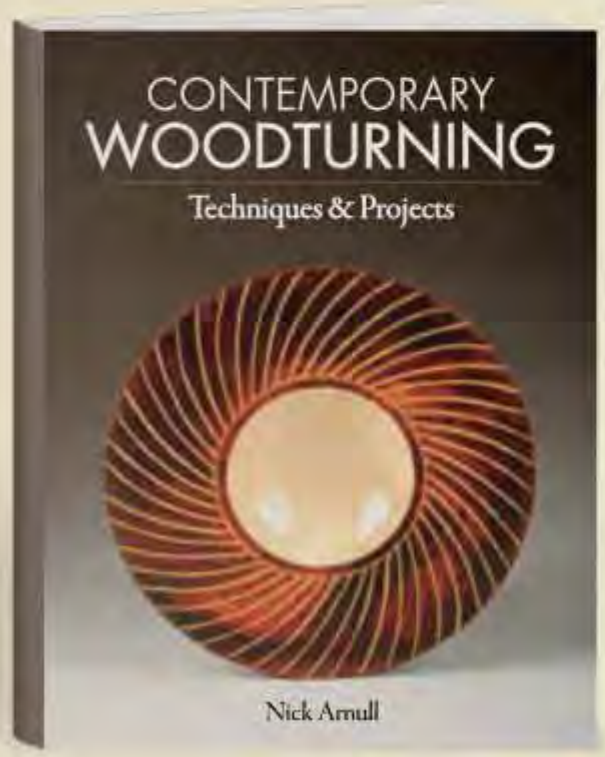

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Put the blocks to work for layout...

They provide a straight edge that's square to the finished box.

1 ***Mark the curved baseline.*** *The fence on the block is too small to keep the block square and steady, so make a long plywood square to do the job.*

2 ***Resting place for the bevel gauge.*** *The second pair of blocks holds up the other end of the workpiece.*

3 ***Extend the pin lines.*** *With the square against the block's straight side, extend the pin lines so they are parallel to the length of the sides.*

... and for cutting

Get a solid grip for sawing, paring, and transferring the pins.

Cradle for clamping. *Nestled between the two blocks, the workpiece won't flex under the vise's pressure, and you'll get a more secure grip.*

Curved chisel guide. *Aligned with the baseline, the block keeps your chisel perfectly plumb and prevents it from cutting beneath the baseline.*

Transfer the pins. *Align one block with the baseline and hold the pin board against it. The lower block cradles the bottom of the workpiece.*

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The secrets within

BY JONATHAN BINZEN

Fascinated by Abraham and David Roentgen, the renowned 18th-century father-and-son cabinetmakers who elevated their furniture with masterful marquetry and ingenious inner workings, Silas Kopf packed his cabinet with secret compartments. Kopf gave us a tour of the compartments—though not quite all of them; he's saving one or two to reveal only to the owner. If you're anywhere near New York City and you'd like to see the amazing original pieces that inspired Kopf—not to mention Catherine the Great, Marie Antoinette, and assorted other royals who bought Roentgen cabinets—you're in luck. New York's Metropolitan Museum of Art will present some 60 pieces in "Extravagant Inventions: The Princely Furniture of the Roentgens" from Oct. 30, 2012, until Jan. 27, 2013.

Storage behind the skirt. *Tug on the right half of what appears to be the cabinet's skirt and out slides a double compartment that's hinged and hooked together.*

Drawers within drawers. *With the hinged unit removed, Kopf can access two drawers that nest behind the left half of the skirt, one rectangular and one whose side is angled for easier removal.*

Why waste space? *Kopf fit a long, narrow drawer in the triangular space between the leg and the floor of the hinged unit's pocket.*

A roof on runners. *Inspired by Roentgen tables whose tops slide aside to reveal compartments, Kopf built the arched top of his cabinet on runners (left). Pushing a button causes a drawer to slide forward into the cavity (above).*

Cache for currency. *Tucked under the left end of the cabinet's lid is a compartment just big enough for a stack of bills. Release a hook and it swings down on a hinge; a little door with a fingerhole provides access.*

Top photo: David Ryan; all others: Jonathan Binzen

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Trickery and Tribute

When he started out as a woodworker in the mid-1970s, Silas Kopf didn't know any experts in marquetry, so he taught himself the craft from a book. But he never stopped looking for teachers. A trip to Italy in 1984 opened his eyes to the secrets of intarsia—a combination of marquetry and inlay perfected by Italian craftsmen during the Renaissance. Their work often featured eye-fooling tricks of perspective, and the seemingly half-opened door on Kopf's recent cabinet is a direct tribute to the golden age of intarsia. Several years after his trip to Italy, Kopf began studying the work of Abraham and David Roentgen, 18th-century German makers whose cabinets for kings and tsars were not only embellished with superb marquetry but bursting with inventive mechanisms and secret compartments. Kopf's cabinet is an elaborate homage to the Roentgens as well, but the evidence is well hidden. To unlock the secrets within, turn to How They Did It, p. 90.

—Jonathan Binzen

Aha moment. *The left door of Kopf's cabinet is trapezoidal, and angled rabbets top and bottom allow it to lie flush to the case.*

Photos: David Ryan (top), Jonathan Binzen (bottom)

How They Did It Turn to p. 90 for a tour of the secret compartments in Kopf's cabinet.

Audio Slide Show To see more of Kopf's dazzling marquetry and hear him talk about his work, go to FineWoodworking.com/extras.