TAUNTON'S

Fine WoodWorking

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Wax: the finisher's simple secret

How to peg any joint

Clever jig makes perfect mortises

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MAY/JUNE 2007 — ISSUE 191

60 TEA TABLE WITH CABRIOLE LEGS

features

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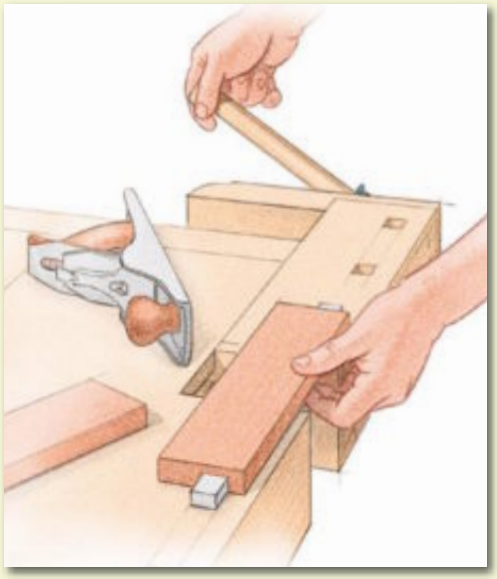

up front

in the back

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Drawbored Mortise and Tenon

Watch Matthew Teague ("The Pegged Joint, Exposed") assemble this tight-fitting joint.

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by Brian Nelson
Thornbury, Ont., Canada

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VIDEO

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APRIL 16: We travel to Vermont to watch furniture maker John Ogden put his portable bandsaw mill to use milling a tree from a local family plot.

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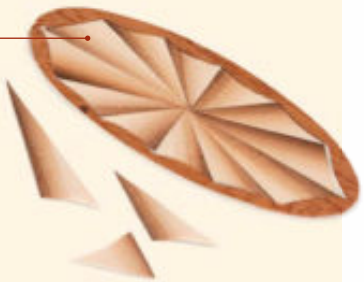

APRIL 23: John Gush demonstrates his techniques for shading and cutting veneers for a Federal-period oval fan inlay.

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Fine Woodworking
The Taunton Press, 63 S. Main St., PO Box 5506,
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contributors

Matthew Teague *("The Pegged Joint, Exposed")* has been woodworking since he was a child, when he learned the craft from his father. The author of *Projects for Your Shop* (The Taunton Press, 2005), Teague has spent the last year or so building and outfitting a new workshop; he describes the journey in his blog, *The Smart Shop*, on FineWoodworking.com. When not building furniture or writing about woodworking, Teague is busy learning the ropes of fatherhood—his daughter, Ava Jean, was born last fall.

Andy Barnum *("Tool Test: Heavy-Duty Lathes")* **calls himself a lathe guy. A professional wood turner, he teaches turning at Purchase College of the State University of New York. The last time he wrote for us, he enlisted his students and fellow instructors to help give five midi-lathes a workout for an article in *FWW* #158; this time, he did all the testing himself.**

Dan Faia *("Porringer-Top Tea Table")* **is a custom furniture maker and a longtime instructor at Boston's North Bennet Street School. When he's not building 18th-century reproductions, he likes to get outdoors to hike, fish, or paddle a canoe. He and his wife share their home with two large dogs—a Newfoundland and a German shepherd—and a small snowshoe cat.**

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

When you visit Peter Gedrys *("All About Wax")*, **he loves to toss you a board of tiger maple or crotch mahogany and then cry "Gotcha!" when you praise its beauty. Only when you turn over the board do you realize the front is faux-grained. Gedrys also specializes in making new wood look old.**

Rob Brown *(Master Class)* **founded Equinox Interiors six years ago to make nature-inspired custom furniture. Over the years he has incorporated rock slabs, small stones, and copper into his work, but it was his use of handmade Japanese paper that drew our attention. From traditional shoji screens to cabinet doors ornamented with what he calls "paper on paper," Brown's designs are simple, strong, and stylish. He lives and works in Peterborough, Ontario, and is a regular contributor to *Canadian Woodworking*. This is his first article for *Fine Woodworking*.**

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letters

From the Editor

TWO NEW FEATURES

We continue to improve *Fine Woodworking*, both in print and online. Our goal is to provide everything you need to be a better woodworker, from a massive, searchable library of past articles and videos to a steady supply of new techniques, projects, and inspiration.

In this issue, we add two short but highly useful departments. The first is What's the Difference. It follows the Tools & Materials department, but has a slightly different goal: Instead of helping you choose the right brand or model of something, it helps you find the right type. Future installments will contrast different kinds of brushes, bits, blades, chisels, and plane irons. Others will look at pro vs. DIY tools, and exactly what you get for the extra money (spoiler alert: the more expensive tool doesn't always win out). This month we clarify the debate over left- and right-tilting tablesaws (p. 30).

The other new department, How They Did It, is an extension of our back cover. As you know, we put woodworking on our back page, not advertising. We save that prime real estate for the finest recent work we have seen. But there's only so much you can say on one page about a tour-de-force piece. How They Did It will go behind these mind-bending feats of skill and engineering to reveal a simple series of steps. Of course, solutions often seem simple in hindsight, when you bypass the years of trial and error. That's the luxury of this new department. We could tell you about the next six—they are as fantastic as the joint wizardry on p. 110—but that would ruin the surprise.

—Asa Christiana

Fine Woodworking induces labor

I received my *Fine Woodworking* in the mail December 18 just about the time my wife started to have regular contractions. The same thing happened in 2004 when my first daughter was born. It works out nicely, because I have something to read when mother and baby are sleeping.

—JON SHAKESPEAR, Sandy, Utah

Rare-earth magnets and pacemakers

I recently read a reader's suggestion to put a rare-earth magnet inside a shirt pocket to hold a handful of screws on the outside (Methods of Work, *FWW* #189, p. 18).

Then I read that Swiss researchers tested "jewel-sized" pieces of neodymium-boron (rare-earth) magnets—in 70 volunteers with a pacemaker or ICD (implanted cardioverter/defibrillator). According to "Fatal Attraction" (Harvard Heart Letter, March 2007, Harvard Medical School), "All four pieces interfered with the heart device at a distance of an inch or so. They made the pacemaker generate 'beat now' signals at a fixed rate regardless of the heart's activity. More worrisome, they turned off the ICDs' ability to detect and stop a potentially deadly heart rhythm."

—DUSTIN DAVIS, Cumberland, Md.

Casters in tight spaces

In "Choosing and Using Casters" (*FWW* #190), author John White states: "In 99% of shop applications, you should use two fixed and two swivel casters, the same arrangement used on shopping carts."

In a larger shop environment, I would completely agree. However, in a modest space like mine (11x20), the "shopping cart" arrangement leads to a lot of frustrating back-and-forth zigzagging as you try to maneuver in tight spaces. Instead, I find four (locking) swivel wheels the best approach. This lets me move a cart sideways as well as back and forth, and it also lets me spin a cart in place.

—ART MULDER, London, Ont., Canada

More tips for wiring a workshop

With regard to "Wiring a Workshop" (*FWW* #188), here are a few other tips. Install two duplex receptacles instead of one in each outlet box. The extra material cost is minimal, and the electrician is already there. Install a switched set of receptacles around the shop with the switch next to the light switch(es). Use these for a radio or anything you want to turn on when you enter the shop and off when you leave. These also are good for task lighting and an electric glue pot.

Last, replace the receptacle ends of extension cords with a box that contains a switch and a duplex receptacle. It's easier to turn off the switch than unplug the tool to change blades or make adjustments.

—BILL BRACKETT, Northboro, Mass.

New and improved featherboard

Thank you for putting a picture of our Grip-Tite magnetic featherboard in your article about the shopmade wood types ("A User's Guide to Featherboards," *FWW* #187). The product was identified only generically as a "magnetic featherboard." For more information, readers can go to www.grip-tite.com. By the way, with the Grip-Tite system, all of the clamped

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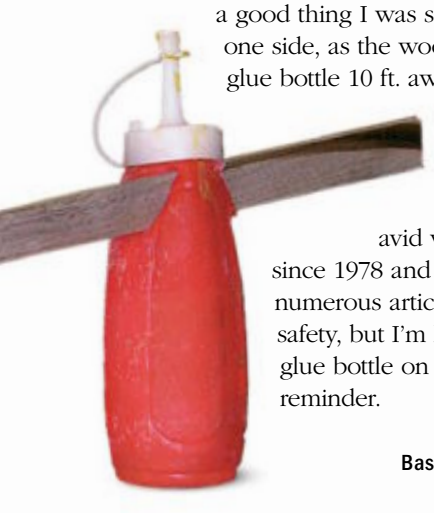
featherboard setups in the article could have been made in 1/10 of the time.

—JERRY JAKSHA, Mesa Vista Design, Rio Rancho, N.M.

Thin strips can kick back

A few weeks ago, I was ripping some thin strips to be used in segmented bowls, using a zero-clearance table insert for safety. A strip of walnut (⅛ in. by ¾ in. by 8 in.) wedged between the fence and blade and was shot back toward me. It is a good thing I was standing to one side, as the wood pierced a glue bottle 10 ft. away without knocking it over. I have been an avid woodworker since 1978 and have read numerous articles on shop safety, but I'm keeping the glue bottle on a shelf as a reminder.



—JEFF FETTE, Basking Ridge, N.J.

Editor replies: Many of us have stories like this (my offcut dented a water-heater tank!). You probably already know this stuff, but for the record: When making thin rips, double-check the alignment of the rip fence with the sawblade, and use both a splitter and a push stick if possible. Thin plywood is great for thin push sticks, because it retains its strength.

Woodjoy takes spokeshave advice

Thanks for the recent review of my newest tool, the No. 85 Spokeshave (Tools & Materials, *FWW* #190). Curtis Buchanan is highly regarded in the chairmaking and woodworking communities, and I respect his comments about the trickiness of adjusting our shave. Part of the reasoning behind the countersunk slots was to be able to use my blade as a replacement blade for the old Stanley No. 85.

My original prototype actually used a thicker, 3/16-in. blade with a flat surface and a flat slotted sole, which solves the adjustment issue. I now feel, after reading the article and after consulting a design engineer, that there is more than enough evidence to change back to the prototype No. 85. The tools will be ready in a couple of months, with a slight price increase.

Feedback is a good thing, and continued improvement of existing and new tools is my goal.

—GLENN LIVINGSTON, Woodjoy Tools, Dighton, Mass.

Japanese saws cut slowly

I was shocked to read the Dozuki review in the Tools & Shops issue ("Tool Test: Japanese-Style Dovetail Saws," *FWW* #188). I found it difficult to believe the number of strokes required to rip ¾-in.-thick stock ¾ in. deep. Over 60 strokes seemed ridiculous, and even 20 or 30 was hard to believe. So I ran a test myself, using hard maple and cherry like your reviewer did. My results were similar. I couldn't believe it even as I was cutting. On the other hand, an old-piece-of-junk pushsaw that I resharpened myself took only 15 strokes.

Now I remember why I gave up on Japanese saws and went back to traditional high-quality Western-style saws a few years ago.

—NICK ANASTAS, Barrie, Ont., Canada

In-cannel gouges are available

I really enjoyed the Master Class on "Barley-Twist Candlesticks" (*FWW* #189), by Ernie Conover. He recommends in-cannel gouges for the project, and I agree: "Having the bevel on the inside of the flute gives greater control." However, he says, "You can find them at old tool sales or regrind an old gouge."

I buy in-cannel gouges from Frank Mittermeier (www.dastrausa.com; 800-360-3843), who has been importing fine German woodcarving tools for 70 years.

—CHARLES ROGERS, Brighton, Mich.

Writing an Article

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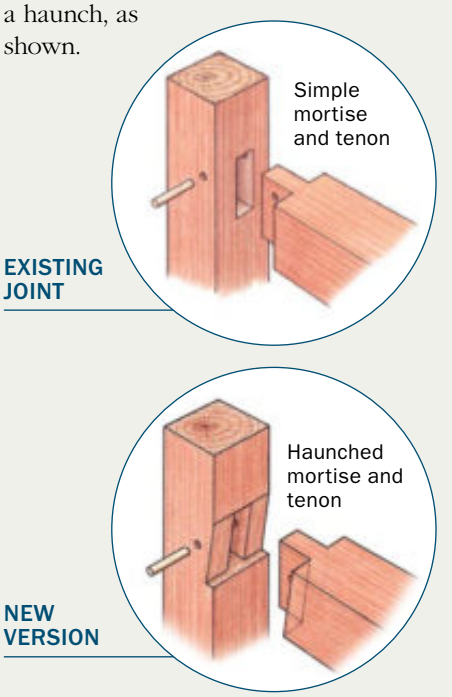
CORRECTION

In Shop Design: "A Timber-Frame Dream" (*FWW* #188), a joint was drawn incorrectly. The author reused an existing timber frame, but strengthened it by trimming the tenoned pieces to add a haunch, as shown.



Another benefit of jointer/planer combos

In your tool test, "Jointer/Planer Combo Machines" (*FWW* #190), you left out one important aspect. In 1993, I bought a combination machine that I'm still using. One of the main reasons I picked this tool is the optional horizontal mortiser attachment. This option is available for the jointer/planers in your review. The mortiser has been a great tool and a big time-saver.

—ROOSTER BARNHART, Delta, Colo.

Clarification

A number of readers were mystified by the description of a router jig on p. 45 of *FWW* #188 ("Quick-to-Make Tool Cabinet" by Jan Zoltowski). Some photos were cut for space, leaving the explanation as text only. The jig is used to cut slots in the sides of the drawers for hanging them in the cabinet.

For photos of the jig in use and a more extensive explanation, go to www.finewoodworking.com/corrections.

Photo: Courtesy of Jeff Fette; drawings: Vince Babak

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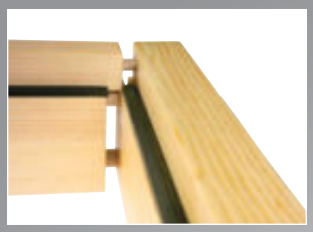

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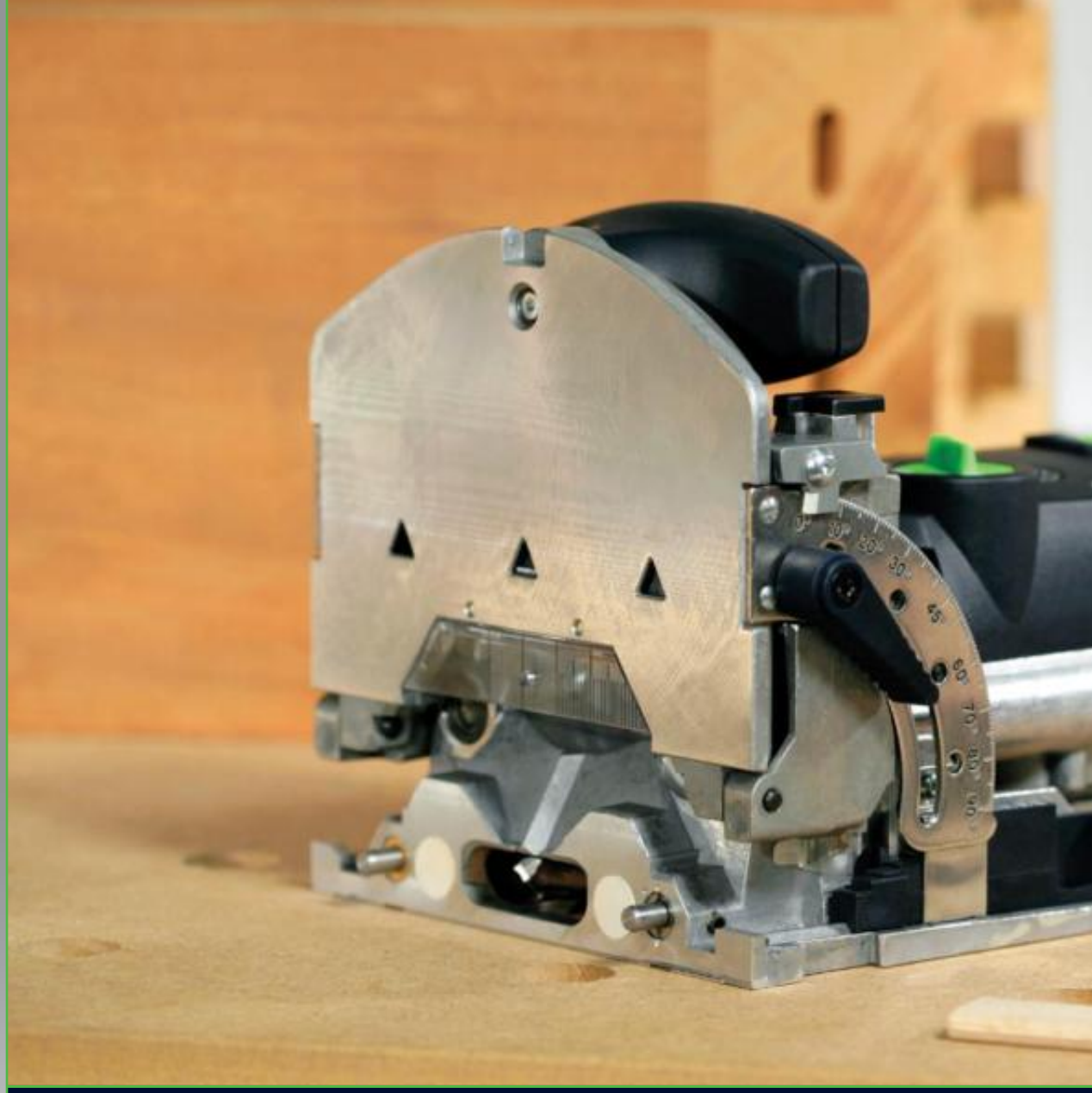

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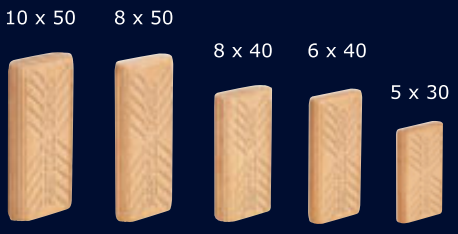

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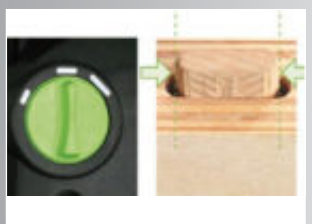
Prepare narrow wooden rails using the Trim stop accessory

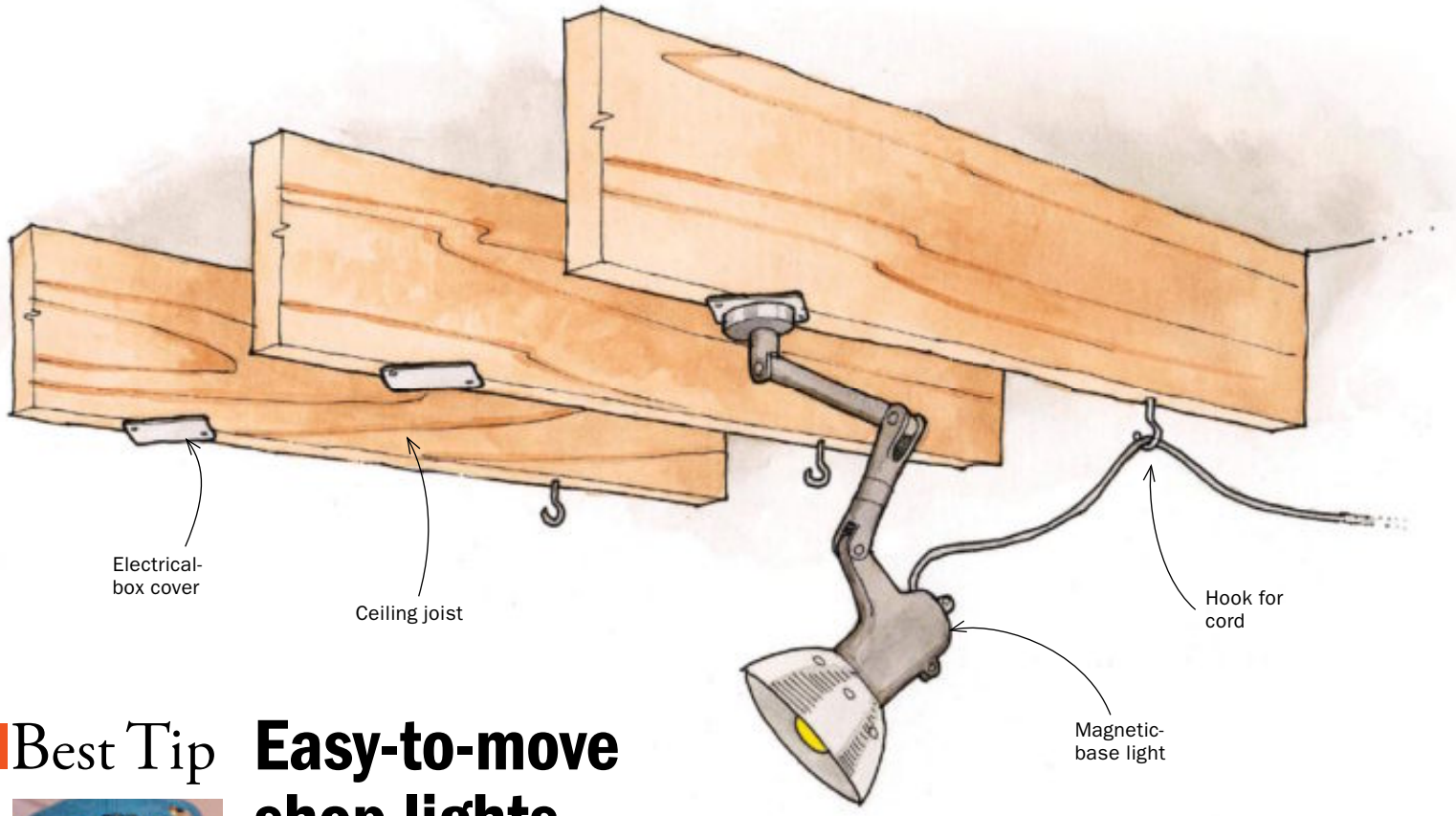
Simple and precise height adjustment



Instant mortise width adjustment provides a perfect joint every single time

methods of work

EDITED AND DRAWN BY JIM RICHEY



Best Tip

Easy-to-move shop lights

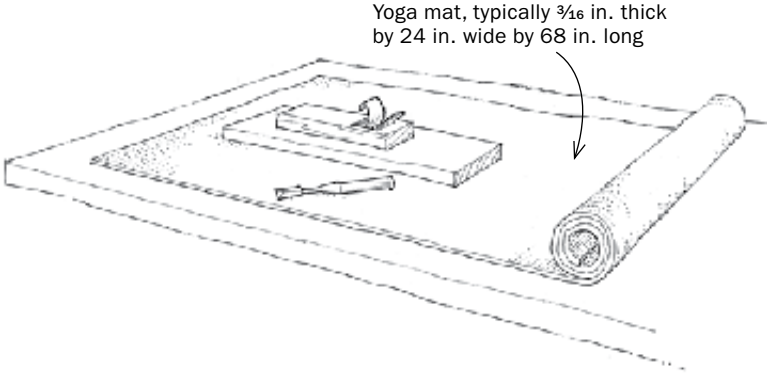
Regis McNicholas is a full-time furniture maker in Kennebunkport, Maine.

If, like me, you are sentenced to work in a dim basement shop, you know there's always a need for more light. I solved this problem with a few steel electrical-box covers and a light with a magnetic base. I screwed the metal plates to ceiling joists in convenient places (the screw holes are already in the corners of the plate). Now I simply move the light where I need it and stick it to the metal plate. If I need light in a new place, I attach a plate at that location. To keep the extension cord out of the way, I drape it over two or three hooks I have screwed here and there into the ceiling joists.

—REGIS McNICHOLAS, Kennebunkport, Maine

A Reward for the Best Tip

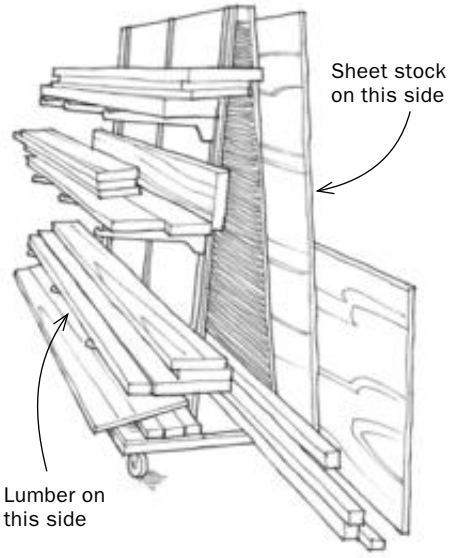
Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. If published, we pay $50 for an unillustrated tip; $100 for an illustrated one. The author of the best tip gets a pair of Brian Boggs spokeshaves (one flat, one curved) made by Lie-Nielsen Toolworks.



Yoga mat sits well in shop

A well-worn (or long unused) yoga mat doesn't have to go into the trash. Most of these mats have a high-tack, almost sticky surface. So a workpiece placed on the mat won't slide easily when you want to plane or sand a board without clamps. In addition, the mat will protect the workbench, preserve the sharp blades of hand tools, and provide a soft, nonscratch surface for a project. You can even take a nap on it. To order one, go to www.matsmatsmats.com, or wherever athletic equipment is sold. Plan to spend about $20.

—HIROSHI SHIINA, Sosa City, Japan



Rolling lumber storage

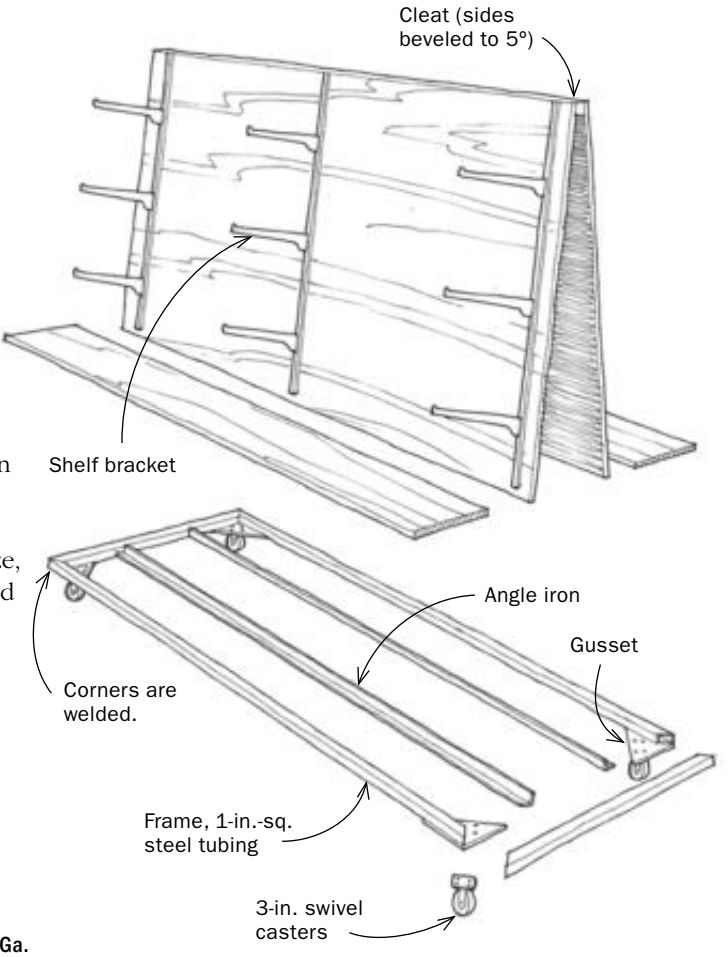
My shop is in a one-car garage and I have always stored my lumber in a spare bedroom. When I had to vacate the bedroom, the idea for this lumber rack was born.

Since my shop is so small, anything of size is on wheels to accommodate frequent rearrangement. So it followed that I needed a lumber rack on wheels, sized to fit through a doorway. To achieve all of my goals for strength, compact size, and mobility, I decided to build an A-frame on casters.

I started by welding a bottom frame of thin-wall 1-in.-sq. steel tubing with triangular gussets at the corners for strength and to provide an attachment location for the 3-in. swivel casters. Then I welded two pieces of 1-in. angle iron, each tilted about 5°, to receive a sheet of ½-in. plywood.

At the peak, the plywood sheets are screwed to a beveled 2x2 cleat. Finally, to support dimensional lumber, I attached three heavy-duty shelf standards and three sturdy shelf brackets to one side of the A-frame. The other side is open to accept sheet stock.

—JAMES BROKAW, Lilburn, Ga.



Quick Tip

A lot of woodworkers fill smallish dings, dents, and splits with homemade putty made from sanding dust and wood glue. To make the putty less visible, I go a half-step further and use dust from the same species of wood that's getting filled. To ensure a ready source of different types of sawdust, I store dust from several common wood species in individual containers. A sawdust source is never a problem; I just empty the dust-collection canister on my random-orbit sander after using it on a particular species of wood.

—MICHAEL WILSON, Tuscaloosa, Ala.

Multiuse measuring block

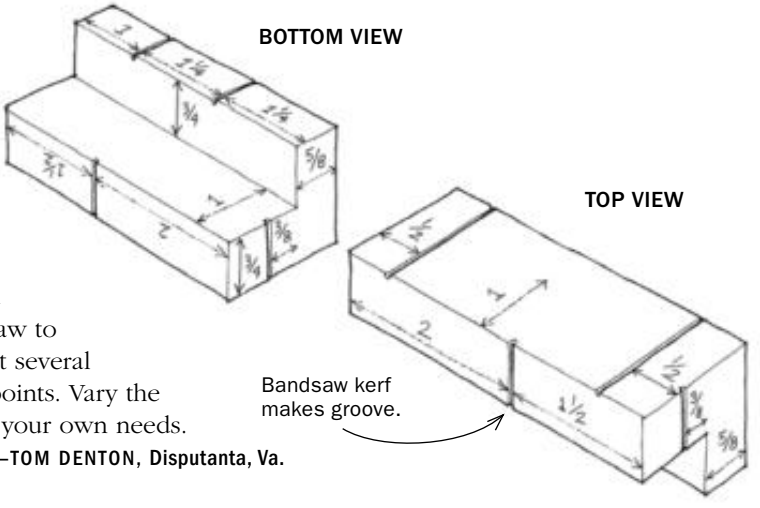
I often reach for this handy little shopmade measuring tool. It started as a single-use guide for marking holes ¾ in. from the edge of a panel. Since then it has evolved into a multiuse tool with several common dimensions built in.

A primary use for the tool is to mark reference lines parallel to an edge. For example, if I am screwing two ¾-in. pieces together at right angles, I use the block to mark a line at ⅜ in. to make sure the screws are centered.

When gluing one piece to another, I use the block to make a light pencil mark to show how far the glue should extend to minimize squeeze-out. I also use the tool like a miniature square to extend cut marks around a corner or from one face to another.

I made the block from hardwood scraps, using a bandsaw to cut shallow grooves at several common dimension points. Vary the measurements to suit your own needs.

—TOM DENTON, Disputanta, Va.



Rolling lift for the tablesaw

I often have to move my tablesaw around. So I made a rolling lift that raises the saw onto casters.

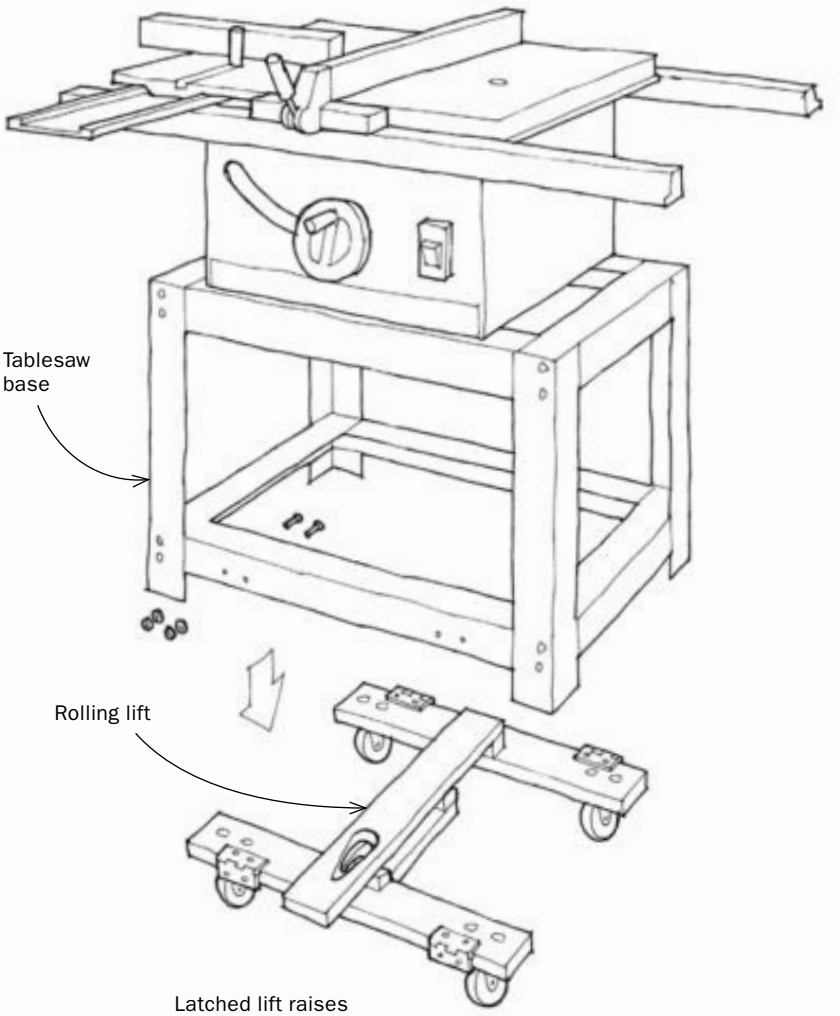
My design has a couple of advantages over the typical commercially made rolling platforms. Unlike those, it does not raise the height of the saw by 3 in. to 4 in. Also, when lowered, the base of the saw rests on the shop floor, so there's no intermediate platform to compromise sturdiness.

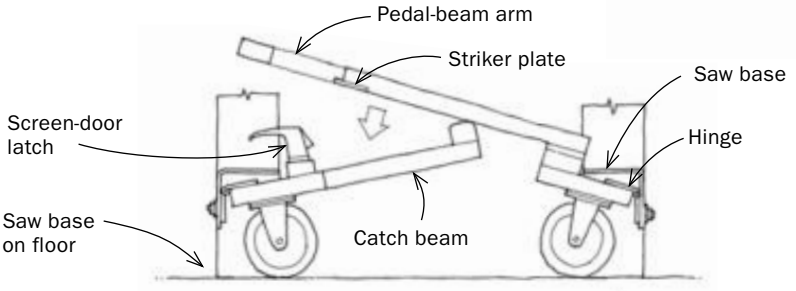
To build the lift, you need four swivel casters, four butt hinges, a screen-door latch, some scrap hardwood, and a few assorted nuts, bolts, and washers. Also, you need a small piece of metal (I used ⅛-in.-thick aluminum) for a striker plate.

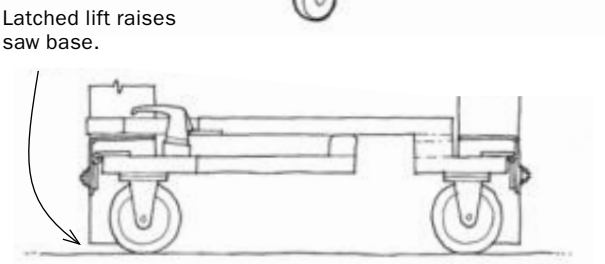
The lift has two main parts: a pedal beam and a catch beam. Attached to each beam are pairs of casters and butt hinges. The hinges mount to the base of the saw.

With the lift installed, you raise the saw simply by pushing down on the pedal-beam arm until the striker plate engages the screen-door latch. Once engaged, the two beams lock together to hold the saw up on the casters. The beams pivot up when the screen-door latch is released, lowering the saw base to the floor.

—TIM JANSSEN, Toronto, Ont., Canada







Using a carbide paint scraper as a scraper plane

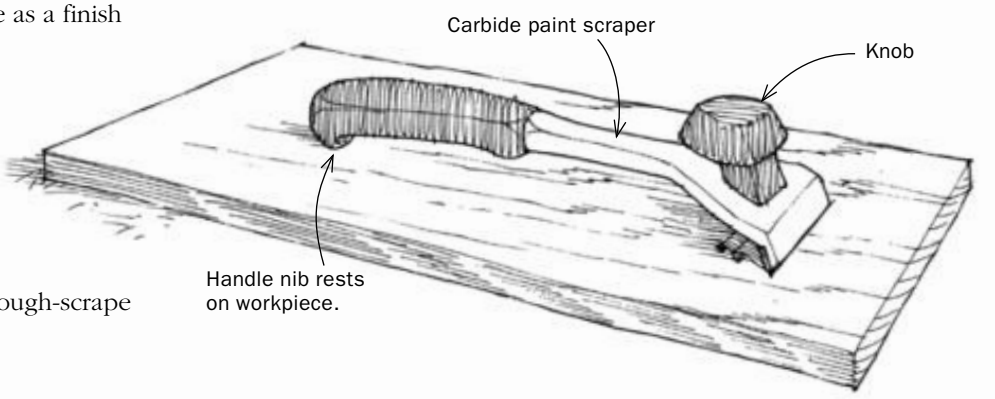
I recently edge-glued some hard, highly figured Georgia cherry for an armoire. Typically, on a project like this, I'd scrape the wood surface smooth with a card scraper. But the hard, figured wood quickly dulled the scraper, so I was sharpening frequently.

Earlier, when gluing the panels, I'd used a 2½-in.-wide carbide paint scraper (made by Bahco) to remove the excess glue. I wondered if this scraper might serve as a finish scraper.

I put in a new blade and experimented. With the nib of the scraper's handle resting on the wood surface (to lower the scraping angle) and with very light pressure applied to the knob, I produced beautiful, thin shavings. I could skew the cutting edge easily if needed. The tool enabled me to quickly rough-scrape the panels and then begin finish-sanding with P220-grit paper.

After several hours of use, the Bahco carbide blade started to dull. I flipped the reversible blade and went at it again. When the second side finally dulled, I restored the edge by lapping the back for 30 seconds or so on a diamond stone.

—TIM M. OTTO, Screven, Ga.



ROUTERS

Milwaukee muscles into combo-kit market

It's no surprise that router combination kits have become popular. Purchase one of these kits, which come with a fixed base, a plunge base, and a single motor that fits both, and you end up with two routers for not much more than the price of one.

Joining the pack of combo-kit makers (see *FWW* #173, pp. 50-55), Milwaukee has introduced model 5616-24. With its 2¼-hp, 13-amp, variable-speed motor (adjustable from 10,000 to 24,000 rpm), the Milwaukee is a powerful, versatile tool that can handle just about any cutting challenge. The motor has a soft-start feature that helps reduce startup kickback, and a constant-speed feature that maintains rpm, even when the bit has to work extrahard, such as when it hits a knot or gets fed a little too fast.

To get a sense of the router's power, I installed a ½-in.-dia. straight bit set for a ½-in.-deep cut. Using a long fence to guide the tool, I made several long plow cuts in hard maple. The motor showed no inclination to bog down. Some plunge routers have the annoying tendency to stick a bit when plunged, especially when one handle gets more downward pressure than the other. The Milwaukee was a smooth plunger, even when I applied downward pressure unevenly.

The Milwaukee is comfortable for use in a table. The bit height can be adjusted from above, but you have to lock the setting from under the table. However, doing so does not shift the bit height—as it does on some routers.

With its smart, comfortable design, I'd recommend the Milwaukee 5616-24 to anyone looking to buy a router combo kit. For retailer information, visit www.milwaukeetool.com.

—Tom Begnal is an associate editor.

MODEL: 5616-24

www.milwaukeetool.com
Listed price: $250
Motor: 2¼ hp, 13 amps
Vibration: Excellent
Quality of cut: Very good
Noise level: 94 db.
Runout: 0.001 in.
Ease of base changes: Very good
Router-table suitability: Very good
D-handle: $65
Edge guide: $40

Ready for a router table. *The Milwaukee allows for height adjustment and bit changes from above using an included T-handle wrench.*

WEB RESOURCES

Replacement parts for old woodworking machinery

Jim Austin has been rebuilding, repairing, and servicing classic American-made woodworking machines for 15 years. Knowing that many manufacturers had stopped making replacement parts, Austin decided to make and sell the parts himself. So he founded Renovo Parts (www.renovoparts.com).

Renovo's current product line focuses on Delta machinery, including parts and accessories for Delta's popular belt and disk sanders; parts for the Unisaw, 14-in. bandsaw, and shaper; and a variety of items for Delta's classic wood lathe. Austin plans to add products based on customer feedback. He hopes eventually to offer parts for brands such as Walker Turner, Yates, and Powermatic.

—Tim Albers is a woodworker in California.

Photos, except where noted: Thomas McKenna; this page (top) Kelly J. Dunton

SANDING

Compact belt sander is a small wonder

Many new tools marketed as innovative or cutting-edge don't live up to the hype. But Porter-Cable's compact belt sander is an innovation in sanding, a lightweight belt-sanding beast that's easy to hold and reaches into tight spaces.

At only 5 lb., this thing felt more like a bench plane than a belt sander. Its 2½-in. belt is easy to control on narrow surfaces, and its short sanding bed makes it ideal for sanding curves—both convex and concave. When I used the sander to scribe a mantel to a tile wall, it rode the waves and contours like a sports car. And when hooked to a shop vacuum using the removable hose connect, sanding was nearly dust-free. One side of the sander is clear of knobs and protrusions, which allows for flush-sanding against perpendicular surfaces, such as when cleaning up a wide rabbet or tenon right up to the shoulder.

My only complaint is that the dust-sealed power switch was sometimes difficult to turn off when operating with one hand.

—Mark Edmundson is a woodworker and teacher in Sandpoint, Idaho.

PORTER-CABLE 371K

Street price: $120
Sources: Amazon.com; Woodcraft.com
Weight: 5 lb. 6 oz.
Motor: 5 amp, 120v
Belt speed: 1,100 sfpm
Belt size (grits available): 2½ in. by 14 in. (60, 80, 100, 120 grit)

Easy to hold. *The curved rubber grip on the Porter-Cable is easy to hold with one hand, especially when edge-sanding. The front handle allows for two-handed sanding when needed.*

HAND TOOLS

New medium shoulder plane will be a classic

I use shoulder planes for many jobs, from trimming tenons, to refining dadoes and rabbets, to cleaning up machine marks. Lie-Nielsen has introduced a midsize shoulder plane called the 042 that traces its roots back over a century to the classic shoulder plane design of Edward Preston, and more recently, Record. Though the lineage is clear, Lie-Nielsen has made some improvements.

The bronze cap, which also serves as a palm rest, is a bit higher, making the tool more comfortable to hold and giving more hand clearance. The foot of the cap extends closer to the blade's bevel, improving its dampening abilities. The premium A2 steel blade is thick (0.150 in.). And the mouth is more precise and easier to adjust.

The plane is 7¾ in. long, ¾ in. wide, and weighs 2.35 lb. At its highest point, it stands 3¾ in. tall. It fits the hand well and has heft, but is not so heavy that it's tiring to use.

The plane was perfect out of the box. After just a few minutes honing the blade, the tool's performance was first-rate. It sells for $175 at www.lie-nielsen.com.

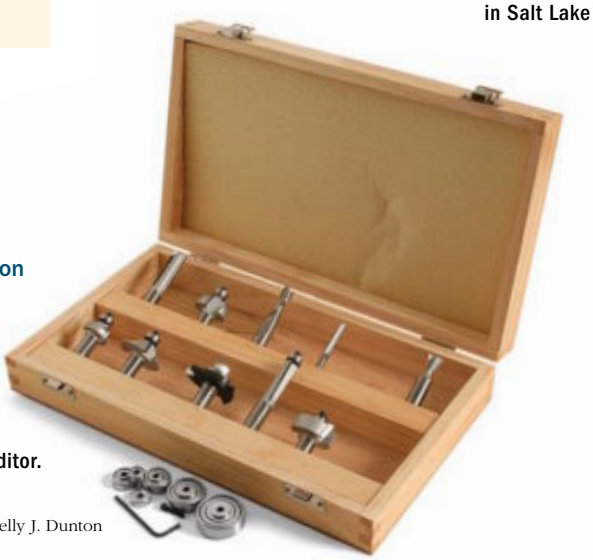
—Chris Gochnour is a woodworker and hand-tool aficionado in Salt Lake City.

ROUTER BITS

Bit set based on *FWW* article

Infinity Cutting Tools (www.infinitytools.com) is selling a set of router bits based on the "Ten Essential Router Bits" in *FWW* #186. All have ½-in. shanks, except for the ¼-in. straight bit. The $200 kit contains a rabbeting bit (seven bearings), a ½-in. flush-trimming bit, a ¼-in. solid-carbide straight bit, a ½-in. straight bit, a dovetail bit, a three-wing slot cutter, a chamfer bit, a ⅜-in. radius cove bit, a ¼-in. radius roundover bit, and a ⅜-in. solid-carbide spiral bit.

—Thomas McKenna is an associate editor.



Photos, this page (bottom two): Kelly J. Dunton

CLAMPING

Clamp set is loaded with handy accessories

THE NEW 70411 PARALLEL CLAMP SET from Jet comes with two 40-in. clamps, two 24-in. clamps, four Cross Doc Framing Blocks, and four benchdogs. At first I worried that the set was filled with throwaway items, but I soon discovered the system is hard to beat for gluing up small carcases, drawers, or cabinet doors.

On each clamp, the large handle is easy to grip, and the trigger-release clamp head slides smoothly. The clamp bars are marked out in inch increments. This struck me as unnecessary at first, but I used it often. For gluing up a 20-in.-wide panel, for instance, you can preset the clamp heads 20½ in. apart before sliding them onto the assembly. A movable rail stand/end stop can be adjusted to steady the clamp parallel to a surface.

The benchdogs can be screwed to the framing blocks to help keep an assembly square on a table or bench. They also can be attached to the fixed jaw to keep the clamps from tipping or shifting. And the clamp head can be removed and flipped around to convert the clamp to a spreader.

With their 4⅛-in. throat depth, 1,000 lb. of clamping pressure, minimal deflection, and smooth action, these are the best parallel-jaw clamps I've tried. The set sells for about $160; www.jettools.com.

—Matthew Teague is a woodworker and a writer in Nashville, Tenn.

Ergonomic design. *The large, faceted handle is easy to grip, and the trigger release on the head makes it easy to slide the head along the bar.*

Hard to beat for gluing up cabinet doors. *The framing blocks help lock the clamps perpendicular to each other to help keep the assembly square (you'll still want to check for square during glue-ups).*

Benchdogs add bite. *The benchdogs can be screwed to the framing blocks or the fixed jaw, allowing you to lock them in place on a bench or an assembly table.*

SAFETY

Eye protection works with earmuffs

New safety glasses from Fullpro attach to the outside of earmuffs, allowing you to protect your vision and hearing without compromising the acoustic seal of the muffs, as you would with standard safety glasses. The SoundVision Eye Protection Kit includes a set of ANSI Z87.1+ certified safety glasses outfitted with flexible straps that attach to a pair of adhesive patches on the muffs. It takes a bit of adjusting, but the result is a secure fit for glasses and muffs. The kit ($20; www.fullpro.com) should work with any earmuff that has room for the patches.

—Steve Scott is an associate editor.

Stretch and attach. *The elastic bands on the glasses attach to the muffs via hook-and-loop fasteners.*

Photos, this page (top three): Kelly J. Dunton

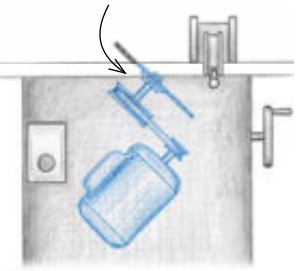
what's the difference?

Left-tilt vs. right-tilt tablesaws

BY HENDRIK VARJU

LEFT- VS. RIGHT-TILT

On a left-tilt saw, the arbor comes from the left.



On a right-tilt saw, the arbor comes from the right.

Although on most tablesaws sold in the United States today you tilt the blade to the left to cut a bevel, a lot of saws still are sold with right-tilting blades. You'll hear many viewpoints on this issue, and as with most debates, both sides have some valid points.

Measuring is easier on right-tilt saws

On a right-tilt saw, the arbor that holds the blade comes from the right side. This has several advantages. For one, the tape on the rip fence always reads the distance accurately between the fence and the right side of blade, whether it is a thin-kerf blade or a dado set.

For optimum safety, the right side of a blade guard's splitter should be set tight to the actual cut line. This assumes you are using the fence to the right of the blade. With a right-tilt saw, blade thickness changes don't alter this alignment, and the splitter remains in the safest possible position for all cuts.

The main disadvantage of a right-tilt saw is that beveled ripcuts can be more dangerous with the fence to the right of the blade. The offcut can ride up the blade's rear teeth, or the workpiece can get trapped under an angled blade, potentially causing a severe kickback. Also, the opposite bevel gets wedged under the rip fence. You can make beveled ripcuts with the fence to the left of the blade, but some people find the stance awkward and the table support inadequate.

RIGHT-TILT SAWS MAINTAIN FENCE-TAPE ACCURACY WHEN YOU CHANGE BLADES

Left-tilt dadoes. *On a left-tilt saw, because the arbor comes from the left, the fence tape is not accurate with blades of different thicknesses. If you want a dado to begin 7 in. from the fence, for example, use a tape measure.*

Bevel cuts are safer on left-tilt saws

In general, the pros and cons of a right-tilt saw are reversed for a left-tilt one. With a left-tilt saw, the arbor comes from the left, so changing blade thicknesses leads to a loss of fence-tape accuracy. Second, the right side of the splitter won't be at its ideal safety setting for varying blade thicknesses. If you set the splitter tight to the right side of a full-kerf cut line and then install a thin-kerf blade, the workpiece will hit the front of the splitter and get stuck. The best solution is to buy blades of the same thickness, especially for ripping.

The left-tilt saw wins out when making beveled ripcuts with the fence to the right of the blade. The workpiece is not trapped under the spinning blade and the offcut is free to slide off to the left.

When choosing a saw, consider your work habits. Above all, work safely and use a splitter whenever possible. □

LEFT-TILT SAWS MAKE SAFER BEVEL CUTS

Left-tilt miters. *A left-tilt saw, with the fence to the right of the blade, is the safest arrangement for cutting miters.*

Right-tilt miters. *To avoid trapping the workpiece under the blade on a right-tilt saw (above), move the fence to the left side of the blade (below).*

Photos: Mark Schofield; drawings: John Tetreault

Flat and square by hand

STUDENT TASK HONES HANDPLANE SKILLS

BY PHILIP C. LOWE

You often don't learn the value of stock that is flat, straight, and square until you've made furniture from material that isn't. You find out soon enough. A cupped drawer side fights back when you try dovetailing it to the front. A twisted apron can set a table's legs askew.

That's why the first task my students must complete is to mill by hand a piece of hardwood stock flat, straight, and square. This assignment trains the eye to recognize properly milled stock, and it builds basic skills in layout and handplaning.

Start by tuning your plane iron

Start with a No. 5 jack plane or a No. 4 smoothing plane. If the edge of the plane iron is perfectly straight, the corners of the iron will score the work as you plane. You can avoid this by sharpening the iron with a very slight convex edge. This "crown" is especially useful when planing edges.

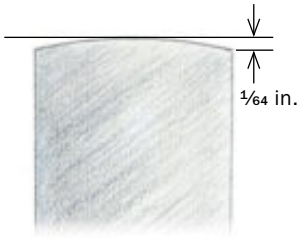
I get a convex edge by bringing the iron across a grinding wheel at a slight arc. You also can use a coarse stone and apply greater downward pressure at the corners of the iron. For a smoothing plane, aim for a difference of about 1/64 in. between the crown's peak and the edges of the iron. For a jack plane, aim for 1/32 in.

How a woodworker plays scales. *Like the practice that trains a musician's ear and strengthens dexterity, milling a board by hand teaches you to recognize flat and square while building basic skills that you will use throughout your woodworking.*

Flatten the first face

Start with a piece of stock roughly 1 in. thick, 8 in. wide, and 10 in. long. Lay a straightedge across one of the broad surfaces from end to end, edge to edge, and diagonally across the corners. Note the high and low spots. Begin taking strokes to bring the high spots in line with the lowest point on the surface. If

CROWN THE BLADE FOR GREATER CONTROL



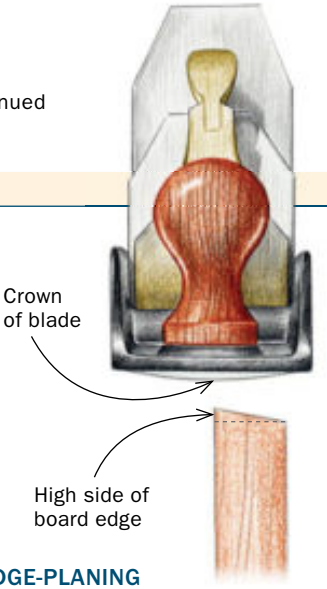
THE CURVE IS VERY SLIGHT
Grinding a slight curve into the cutting edge of a plane iron prevents the corners from scoring the wood's surface. It also allows better control when squaring edges.

First, flatten a face

1. *A diagonal stroke tackles twist. Work from one high corner to the other.*
2. *Finish with a series of straight strokes (the plane is skewed slightly). Overlap the strokes by half the blade's width to minimize undulations in the surface.*
3. *Check for flatness. Lay a straightedge across the board's face and look for light underneath it. Check the face diagonally, across its width, and along its length.*

Photos: Steve Scott; drawings: John Tetreault

Square an edge



EDGE-PLANING
To flatten a slightly angled edge, align the crown with the high side of the angle. The plane will make its deepest cut where the most material needs to be removed.

Use your index finger as a fence. *Keep the plane flat on the surface and use the blade's crown to control the angle of cut.*

Check for straightness and for square. *Use a straightedge along the length of the edge to make sure the surface is straight from end to end (above). Be sure the head of the square is registered against the reference surface that you have already planed flat (right).*

the board is slightly twisted, with one or two high corners, take diagonal passes from high corner to high corner, working enough of the surface to bring the high areas down to the low spots.

A board that is slightly cupped across its width can be worked with the convex face either up or down. With the convex side down, make straight cuts along both edges to lower the high corners, or make strokes across the board from edge to edge with the plane in a skewed position, working your way down the length to remove the high corners. Use the same technique if the board is tapered, removing thickness at one end. If the board is cupped and the convex side is up, plane straight down the middle until you have flattened the high center.

Check your progress frequently with the straightedge. When the board is nearly flat, finish with a series of straight smoothing cuts along the board's length and in the same direction as the grain. For the first pass, align the center of the blade—the peak of its crown—with the left- or right-hand edge of the board. The cut will be deepest at the board's edge. Overlap each stroke by about half the blade's width. This will put the blade's crown into the shallowest part of the previous cut, minimizing surface undulations. Check your work again. You'll know the surface is flat when no light can be seen under the straightedge in any direction. Mark the flattened surface for use as a reference face in laying out subsequent cuts.

Next, straighten and square an edge

The next step is to plane one long edge straight and flat so that it is square to the reference surface

Square the ends

Take care when planing end grain. *Work toward the center from both edges and stop short to avoid chipping off the corner (above). The edge should be square to the face of the board (right).*

Check the other direction. *The end should be straight, and square to the edge of the board.*

Plane the opposite edge

Make the other edge parallel. *Start by scribing a line with the square registered to the reference edge (above), then plane carefully to the scribe line, keeping the plane square.*

you just flattened. Beginners often want to correct an angled edge by tilting the plane's body to compensate. This would be required if the iron were ground and honed straight. With a crowned iron, it's unnecessary. Instead, set the sole in full contact with the edge, aligned so the blade's crown cuts on the high side of the angle. As you make cuts to remove the angle, shift the plane with each cut until the blade is centered on the edge, bringing the high side down and into square.

To remove a convex surface on an edge, simply make short strokes in the center of the edge and lengthen each consecutive cut until the edge is straight. For an edge that is twisted or high at opposite corners, move the plane laterally from one edge to the other, starting with the plane off to one side as though you were addressing an out-of-square edge. As the cut progresses, the plane will shift so that it is making a cut with the crown in the center, at the square point of the twist, and then gradually will shift to have the opposite side of the crown cutting to remove the opposite angle of the twist.

Use a straightedge to check that the edge is straight and flat. Use a square, with the head registered against the reference face, to check that the edge is square. Once the edge is straight and square, mark it, too, as a reference edge. You'll use it to check that the ends are square and that the opposite edge is parallel.

Next, use the edge-planing techniques to plane the ends of the board so that each is square to both reference surface and edge. With the iron adjusted to make a finer cut, use deliberate strokes, working in from both edges and stopping short of the corners to avoid chipping out.

Make the opposite edge and surface parallel

Set the head of the square against the reference edge and use the square's blade to scribe a reference line indicating the board's finished width. Plane the opposite edge to this width, checking with the square against the reference face for squareness, and using the head of the square and the blade to check for parallel.

Finally, plane the remaining surface to bring the stock to finished thickness. Use a cutting gauge to scribe a line indicating the final thickness. Working off the reference face, scribe the line all the way around the piece of stock. This line will be parallel to the original reference face.

Work to bring the high spots in line with the low point on the surface. As you approach the scribe line, you'll begin to create a feather edge just above it that falls away as you reach final thickness. This feather edge provides good visual evidence that you are getting the surface flat and parallel. If the feathering develops evenly on all four edges, you're on the right track.

If you've reached the scribe line and still don't have a parallel surface, strike another line and keep going. Don't get discouraged. By the time some of my students have completed this exercise, their original 1-in.-thick workpiece is no more than ½ in. or ⅝ in. thick. □

Flatten the opposite face

Create a uniform thickness. *Scribe a line on ends and edges, parallel to the reference face (left), then flatten the face and reduce the thickness until you reach the scribed line (below).*

The Pegged Joint, Exposed

Showcase and strengthen mortise-and-tenon joints

BY MATTHEW TEAGUE

I seldom cut mortises and tenons—whether in doors, leg-to-apron joints, or on breadboard ends—without pegging the joints. Driving a wood peg through a mortise and tenon not only strengthens the joint, but it also adds a decorative element that I've come to depend on in most of my designs. Because I lean toward joinery that is honest and exposed, using pegs makes the construction process transparent. If you see pegs, you can bet that they're more than ornamental, and you can tell at a glance how the piece is held together.

Reinforcing a joint in this manner involves driving a hardwood peg through the mortise and tenon (though I've seen the same technique used on other types of joinery, including box joints and dovetails). Structurally, the peg strengthens the mechanical connection between mortise and tenon—often to the extent that glue isn't necessary. Aesthetically, the peg can add a subtle or bold detail to your work.

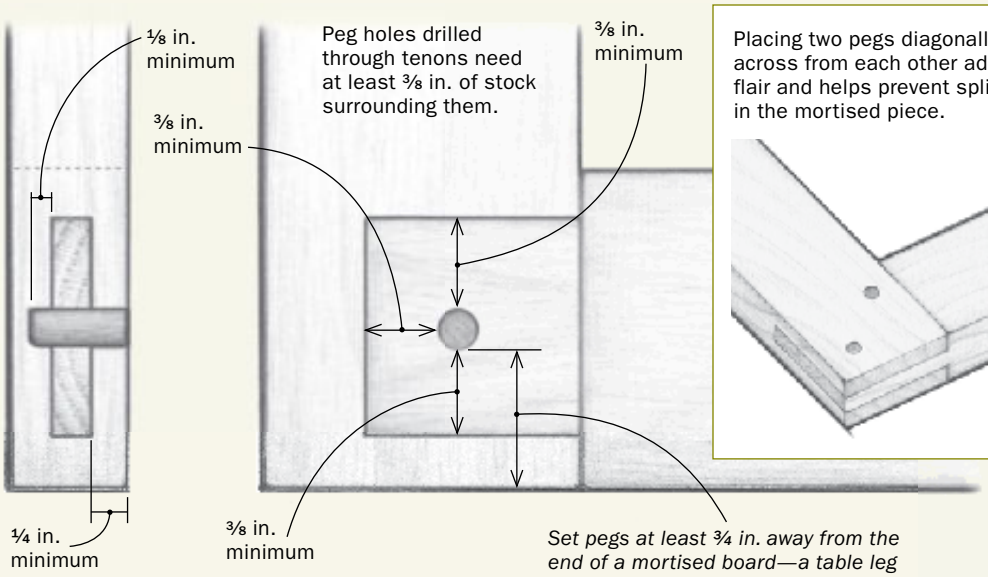
Most of the time, I drive pegs into a mortise-and-tenon joint that has already been assembled. But with proper planning, pegs also can be integral to the assembly process, exerting their own clamping pressure. This method, called drawbored pegging, calls for some

Layout and design

LOCATE PEGS SMARTLY

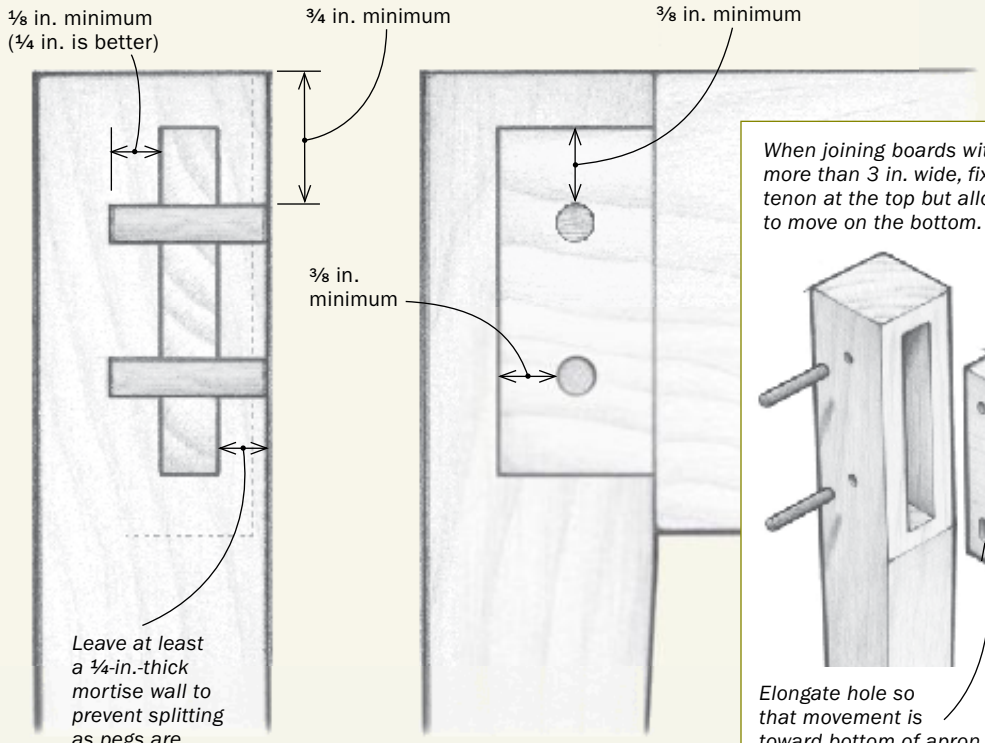
Wood pegs create tenacious mortise-and-tenon joints that will never pull apart. For maximum strength, be sure there's sufficient tenon stock above and below the peg as well as toward the front of the tenon. Leaving too little wood in these areas could result in splits as pegs are driven home.

IN FRAME JOINERY



Placing two pegs diagonally across from each other adds flair and helps prevent splits in the mortised piece.

IN APRON-TO-LEG JOINERY

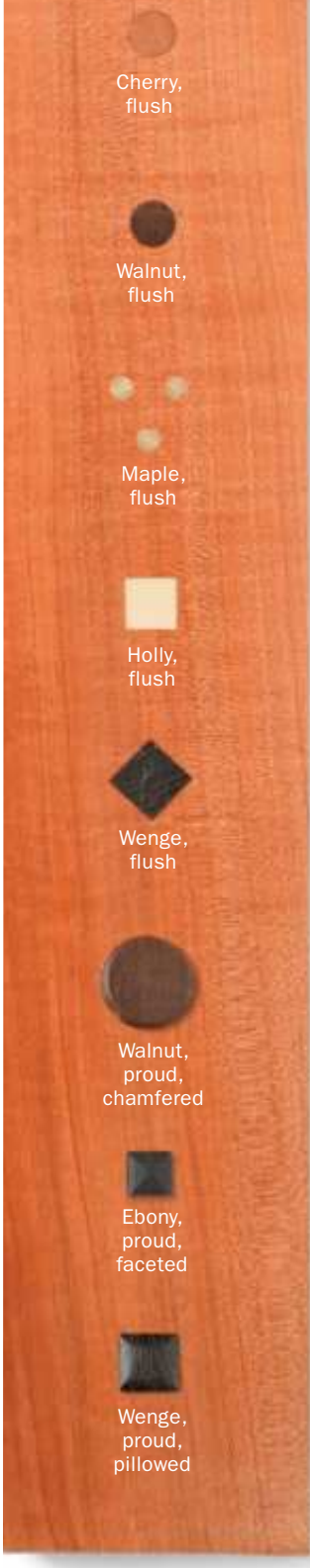


When joining boards with tenons more than 3 in. wide, fix the tenon at the top but allow it to move on the bottom.

Elongate hole so that movement is toward bottom of apron.

A PALETTE OF PEGS

Against a cherry backdrop, you can see the stunning effects you can achieve by varying the wood, shape, and size of the pegs.



Photos, except where noted: Thomas McKenna; this page: John Tetreault; drawings: Christopher Mills

Pegged-joint basics

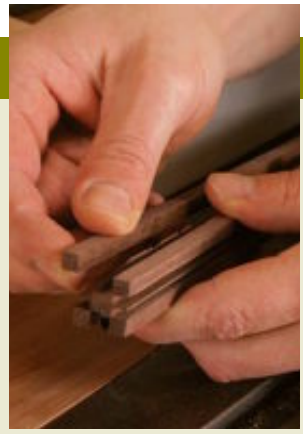
Driving wood pegs into mortise-and-tenon joints adds strength and visual appeal to furniture. Typically, the joint is glued up before pegs are installed, but you don't have to wait for the glue to dry before adding pegs.

Mark out the peg locations. *Draw the outline of the tenon on the mortised stock. Locate the pegs' center points, then define them with an awl so that the drill bit won't wander.*

Drill peg holes. *Attach a tape "flag" to the drill bit, and stop drilling when the flag knocks the chips away. Drill perpendicular to the workpiece to avoid tearout.*

Buy pegs or make your own

You can buy dowel stock for pegs, but you'll have more design options if you make your own from hardwood scraps in your shop or from purchased pen blanks, which come in a variety of exotic species (see Sources, below). Start with a ¾-in.-sq. blank. Set the tablesaw fence and the blade height based on the size of the pegs you're cutting. If you're making 3⁄16-in. pegs, set the fence to 3⁄16 in. but leave the blade height just shy of 3⁄16 in. Using a push stick at the end of each cut, rip along each corner of the blank, adjusting the blade height until only a sliver holds each corner together (top photos, right). Eventually, you'll be able to peel away the strips. To make round pegs, place the square strip in a V-grooved trough and plane away equal amounts of stock at the corners (bottom photo).



Square pegs on the tablesaw. *Set the fence to match the peg width and set the blade height to just under that measurement. Use a push stick at the end of each cut, and raise the blade until only a sliver of material holds the peg stock to the blank. Then peel away the strips.*

Make 'em round if you want. *With the blank set in a V-grooved trough, use a block plane to remove the corners at the end, rotating the blank as you go.*

SOURCES OF SUPPLY

Hardwood dowels and pen blanks

www.rockler.com
www.woodworker.com
www.woodcraft.com

Photos, this page (bottom left): John Tetreault

Drive pegs home. *The pegs will go in easier if you round over the bottom edges (inset). Use a metal hammer to drive in the pegs. Stop when the hammer tone deepens; it means the peg has bottomed out.*

drilling and layout work before assembly (for details, see pp. 44-45). Both methods make for bombproof joints, and the techniques are relatively simple.

Let the furniture dictate the peg form

Pegs can be designed to suit most furniture styles. For starters, you can make them round, square, flush, or even proud and faceted (for an assortment of peg styles, see the photo on p. 39). Then there is the species of wood. Because the end grain of the pegs is exposed and will darken with an applied finish, they will offer contrast in some form. For a more subtle appearance, cut the pegs from the same primary wood you're using on the project. To pump up the contrast, choose pegs of a darker or lighter species. I often use walnut to add a darker accent to cherry designs. Ebony is dense and strong, and the near-black color offsets mahogany or walnut well. On occasion, especially if I want a more contemporary look, I'll use pegs of a lighter color: holly pegs in a mahogany door, for instance.

Regardless of your design, choose a dense and strong hardwood peg that is as strong as, or stronger than, the material you are pegging. On a few occasions, I have pegged joints with a softer

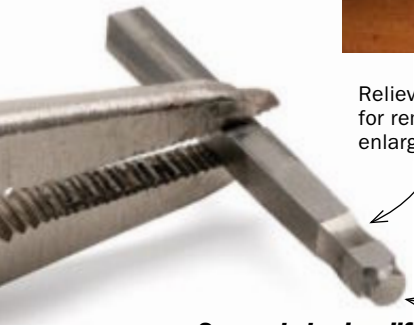
TRIMMING PEGS FLUSH

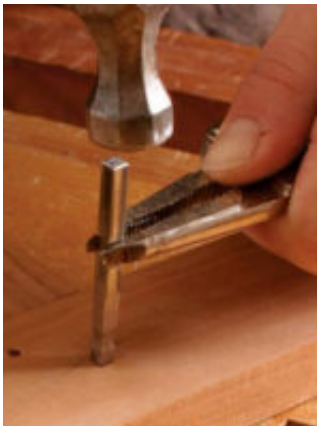
1. *Use a handsaw to trim the peg almost flush. Place a shim under the saw to protect the workpiece.*
2. *Dampen the peg with water, then mash it a few times with a hammer, causing the head to mushroom slightly. The water softens the fibers and mashing helps spread the peg to fill any gaps.*
3. *Pare the peg flush using a chisel. Rest the chisel flat on the worksurface. Slowly work your way around the outside of the peg and toward the middle to avoid tearout as you finish the cut.*

Square pegs stand out

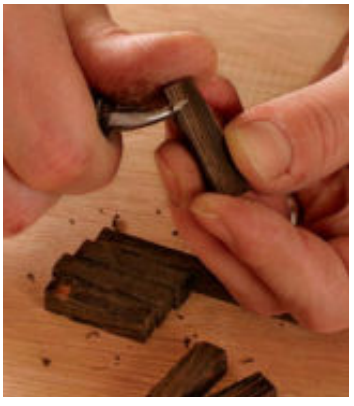
Square pegs can add visual interest and are often appropriate stylistically, as in Arts and Crafts furniture. After drilling the peg holes (see p. 40), square up the top third of each hole.

Use a chisel that matches the peg width. *Create a square opening at the top of the hole that tapers down about half the depth. A combination square will help guide the chisel at the start of the cut.*





Square holes in a jiffy. *A punch made from key stock available at hardware stores can be used to square up holes. Match the stock to the width of the pegs, and grind it as shown. Tap the tip into the hole (right) until you reach the relieved section, using pliers to keep the punch steady.*



Whittle the bottom of the pegs and drive them home. *Round over the bottom two-thirds of the peg using a small knife or chisel (above). Use an adjustable wrench to help guide the peg and keep it aligned square when driving it in (right).*

wood, but in these cases the pegs are simply a design element—not a means of strengthening the joinery.

Maximize strength without sacrificing appearance

There's more to pegging a joint than the appearance. It's also important to get as strong a mechanical connection as possible. A few factors come into play here: the size, placement, and number of the pegs.

Without calling in the engineers, you can determine the size of the peg by considering the joint you're reinforcing and the desired effect. In general, I use pegs between 3⁄16 in. and 3⁄8 in. dia. That said, even smaller decorative pegs of 1⁄8 in. dia. would not be out of place on a delicate box, and 1⁄2-in. pegs might work better on a beefy trestle base.

Position pegs so that neither the mortised nor the tenoned stock splits as the peg is driven home (see drawing, p. 39). You also may use multiple pegs to secure wide mortises and tenons, such as those on table apron-to-leg joints. In these cases, double pegs help strengthen the joint and lend the design a more balanced appearance.

Drill peg holes first

Whether you're installing round or square pegs, start by choosing a bit that closely matches the peg size. Just make sure the bit isn't much larger than the peg stock. If you're drilling into softer stock, you can make the hole about 1⁄32 in. smaller than the peg stock because the primary wood will offer a little give. But you may need to whittle the bottom two-thirds of the peg to get it to fit the hole. Shoot for a snug fit, but not so tight that the peg could split either the mortised or tenoned stock. Different woods react differently, so test the fit on scrap pieces.

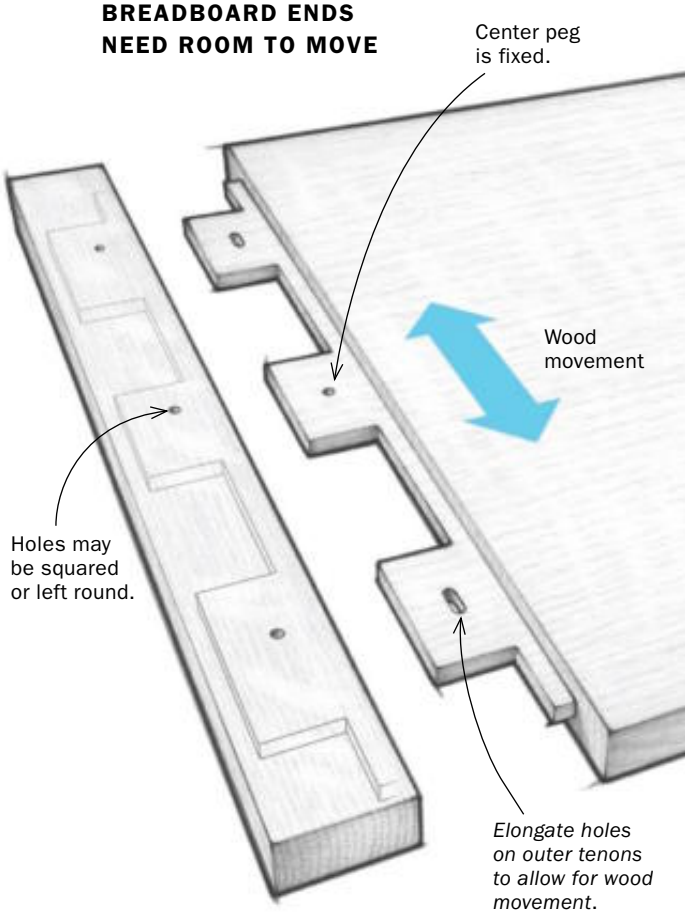
Before gluing the mortise-and-tenon joint, transfer the mortise/tenon location around to the face of the stock

FACETING PEGS

How pyramids are made. *With the chisel bevel side down and resting on a thin shim, lever the blade upward. For clean results, try to facet each side in one pass.*

Pegged breadboard ends never loosen

Pegging the breadboard ends of a tabletop is a great way to reinforce that joint. But you must allow for wood movement by elongating the outermost peg holes.



Clamp and drill, then widen the outermost tenon holes. *With the breadboard ends clamped to the tabletop, drill the holes for the pegs at their marked locations. Again, flag the bit to gauge the drilling depth (left). Remove the breadboard end, use the drill to elongate the holes in the outer tenon, then clean up the holes with a chisel (right).*

Drive the pegs. *Glue the breadboard ends to the tabletop, being sure the holes in the breadboards align with the holes in the tenons. Clamp them in place, and tap the pegs home.*

and then mark out the center point of the peg locations. If you are pegging an exposed mortise and tenon, such as a bridle joint, you can mark the locations after glue-up.

Simply drill at the center points all the way through the tenon and about ⅛ in. to ¼ in. beyond. On thinner stock, common on door frames, ¼ in. is not always possible. In these cases, simply drill about a third or half of the way into the opposite wall of the mortise—just make sure the back wall of the door stock isn't thinner than about ⅛ in. Use a piece of tape attached to the bit to control the depth, and keep the drill perpendicular to the workpiece. On smaller workpieces, using a drill press guarantees perpendicular holes. If your design calls for square pegs, you'll need to square up the top third of the hole using a chisel (see photos, facing page).

Metal hammer will sing as you tap in pegs

Both round and square pegs need a little prep work before you drive them home. After cutting the pegs to length—

they should be about ⅜ in. longer than the depth of the hole—ease the edges on the bottom of the pegs using sandpaper, a chisel, or a small knife. Doing so allows you to drive the peg into the hole without splitting or damaging any parts, and gives excess glue a place to go when you drive the pegs home.

Once both hole and peg are prepped, place a small drop of glue in the hole and apply a thin layer to the lower third of the peg. To drive the peg home, use a small metal finishing hammer. Its light weight won't stress the stock you're pounding, and the tone of the metal hammer will deepen as the peg bottoms out in the hole. Once the peg bottoms out, stop hammering or you'll risk cracking the stock.

Trim pegs flush or leave them proud

You can trim pegs flush (see p. 41), but leaving them proud of the surface they're driven into is a good way to accentuate the joinery even more. I often leave small pegs about 1⁄16 in. proud of the surface, larger ones a little more. After installation, the exposed end of the peg can be softened with sandpaper, chamfered with a chisel or plane, or, my favorite, faceted.

The first few times I tried to use faceted pegs, I made it a lot more difficult than necessary. Brian Boggs, a chairmaker in Kentucky, taught me a better way. Simply drive the peg into place as usual, then wait for the glue to dry. To cut the pegs to a consistent size, use a shim whose thickness matches the desired projection of the peg, and register the saw against it as you trim the pegs to length.

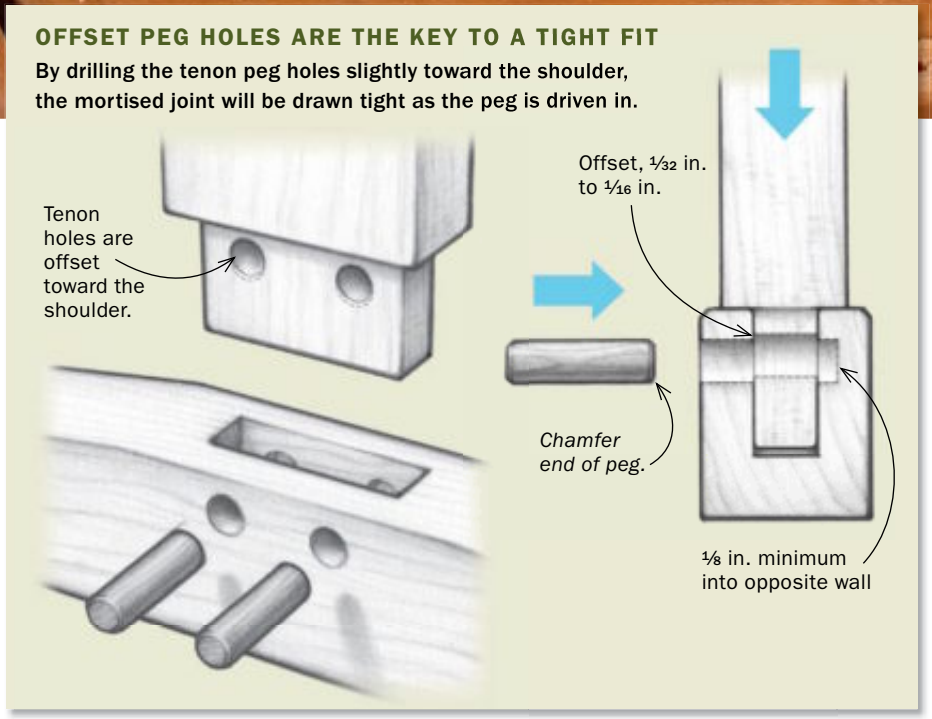
To cut the facets, use a chisel that's wider than the peg, and hold it bevel-side down against the surface adjacent to the peg. Working in from one side at a time, use the bevel as a lever to angle the blade upward as you cut toward the center. To prevent denting or scarring the surface you're bearing against, place a thin shim between the chisel's bevel and the surface of the wood. You'll have the best luck if you cut each facet in a single sweep of the chisel—every time you stop to realign the chisel, you're left with a small ridge on the peg's pyramid top that will have to be cleaned up. Before working on a project, practice the technique on a scrap peg and joint. □

Matthew Teague is a writer and a woodworker in Nashville, Tenn.

Drawbored pegs pull joints tight

OFFSET PEG HOLES ARE THE KEY TO A TIGHT FIT

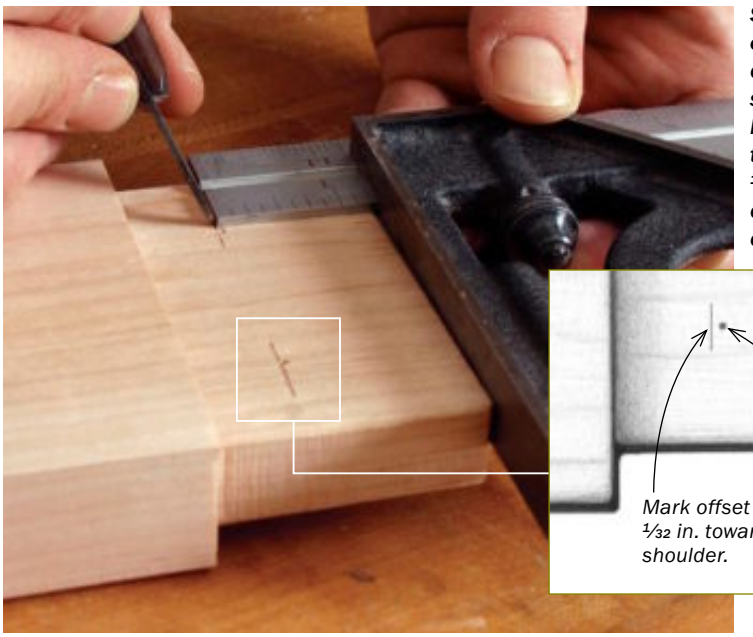
By drilling the tenon peg holes slightly toward the shoulder, the mortised joint will be drawn tight as the peg is driven in.



Drill the mortised piece. *Go through one side and partway into the other. Use a Forstner bit for a clean cut.*

Mark the tenon. *With the joint re-assembled and clamped together, mark the center point of the hole. An easy way to do this is to insert a Forstner bit into the hole and tap lightly.*

No matter what kind of peg you use or how you adorn the top, drawboring adds significant strength to the joint and helps to pull the pieces tight as the pegs are driven home. It even will allow you to forgo clamps and glue at assembly, which is especially handy when you don't have clamps long enough to handle large assemblies like the stretchers on a long dining table. Drawbored pegs are drilled in two steps. After dry-fitting the tenon into the mortise, take apart the joint and drill through the mortised stock. Clamp the joint together again, then mark the hole's center point on the tenon. Disassemble the joint and scribe a line slightly inset from the center point toward the shoulder of the tenon (middle photo, right). For softer hardwoods like cherry or walnut, offset the holes about 1/16 in.; for harder woods like oak or hard maple, make the offset about 1/32 in. Now drill through the tenons at the inset marks. Chamfer one side of the peg or round over the end dramatically so that the peg seats itself in the offset hole without butting against the tenon face (see drawing, facing page). As the peg is driven home, the mortised stock will pull snug against the tenon shoulders.



Scribe the offset. *Use a combination square and a knife to offset the hole 1/32 in. to 1/16 in., depending on the hardness of the materials.*

Drill through the tenon. *Align the tip of the Forstner bit so that it engages the crosshairs marked previously. If you need to drill multiple holes, using a fence helps ensure consistency.*

FineWoodworking.com

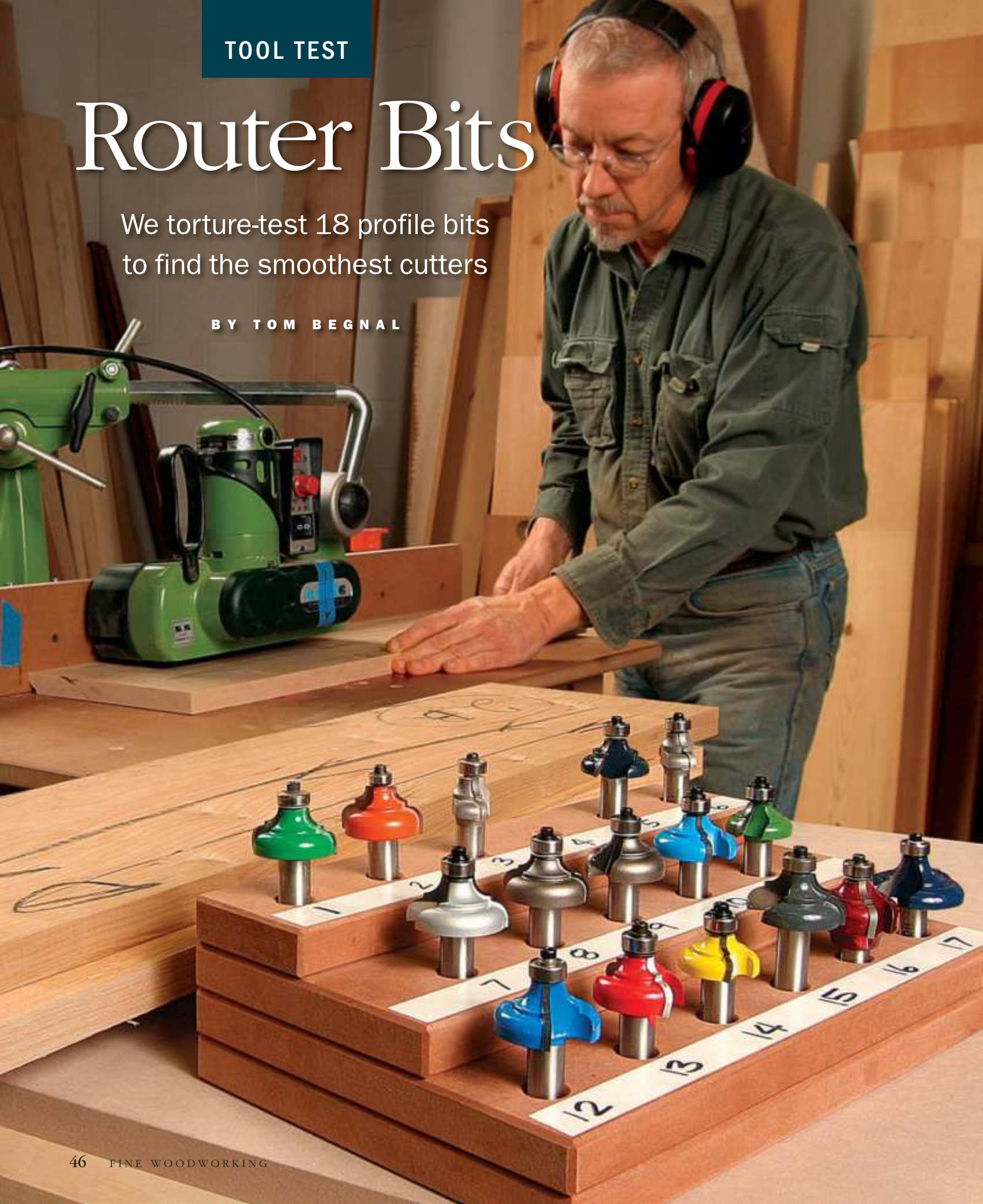
Watch Matthew Teague assemble a drawbored mortise and tenon.

TOOL TEST

Router Bits

We torture-test 18 profile bits to find the smoothest cutters

BY TOM BEGNAL



Woodworkers want a router bit to do just two things: cut cleanly and stay sharp a long time. But with a long list of companies selling bits, it's hard to identify the top-of-the-line performers. So to find out how bits measure up when it comes to smoothness and longevity, we purchased the same-style bit from 18 companies and tested the lot.

The bit goes by several names. Commonly called a cove-and-bead bit, it also can be labeled a bead-and-cove bit, a rounding-over cove bit, or a classical bit. We chose that bit because it cuts two profiles, a cove and a bead, with a shallow step in between. As a result, we could evaluate the bit's ability to make a concave cut, a convex cut, and two sharp corners.

Our goal was to use carbide-tipped bits with a ¼-in. radius on both the cove and the bead. However, we soon learned that some are available only with a radius of 3⁄16 in., or a combination of 3⁄16 in. and ¼ in. So, with one exception, all the bits we tested have cove and bead radii that range from ¼ in. to 3⁄16 in. The Holbren bit is the exception, as it creates a ¼-in. cove and a ⅜-in. bead. However, we did not see a significant correlation between size of bit and test results. Also, we tested only bits with ½-in.-dia. shanks.

How we tested the bits

The tests were done on a rock-solid router table with a massive fence made specifically for the test. A sturdy 3¼-hp fixed-base router provided the get-up-and-go. A power-feeder ensured that the test stock was fed through each bit at a constant rate of 5 ft. per minute (fpm), a speed that mimicked our typical hand-feed rate. Each bit was tested with the fence in line with the bearing, so the bit would make a full cut.

The test was designed to include a number of materials, feed rates, and grain orientations, as well as performance after a few hundred feet of wear. First, we made edge-grain cuts on 30-in. lengths of knot-free sugar maple, black cherry, red oak, and eastern white pine, four woods that offer a mix of hardness and cutting characteristics. We also made end-grain cuts on 6-in.-wide sections of the same woods. Finally, we made edge-grain cuts on 30-in. lengths of Premium MDF (medium-density fiberboard) a product that, unlike regular MDF, has the same density across the entire thickness, allowing us to better evaluate the cut quality of each bit.

Then, to accelerate wear on each bit, we cut through 100 ft. of standard MDF, which, according to a number of experts and manufacturers, would equal at least 200 ft. of hardwood. After that, we repeated the edge-grain, end-grain, and Premium MDF tests. Not surprisingly, all the bits lost sharpness after cutting the 100 ft. of MDF. When the tests were completed, our cuts on all the bits totaled nearly a half mile.

Before the test started, to level the playing field, we planed all the boards to ¾-in. thickness. Also, because wood can vary from one board to another, we made sure each type of test cut was always made on the same board.

At the end of the test, we had 216 carefully labeled sample strips. Then, in a blind test, four editors independently

BITS WERE TESTED ON A VARIETY OF WOODS

Longevity, too. *Each bit made test cuts on edge grain (facing page), end grain (above), and then Premium MDF (right). Then, to accelerate wear, the testers ran 100 ft. of standard MDF past each bit. After that, they ran the edge grain, end grain, and Premium MDF cuts again.*

Two bits stood out

At the end of the day, the Whiteside (left) and the Eagle (right) bits had risen to the top of the mix, tying for the highest score. Lee Valley had the second-highest score, followed by Southeast and Woodtek in a tie for third. By the way, Whiteside also had the best bit when we reviewed straight bits in our August 1999 issue (*FWW* #137).

We named the Eagle and Whiteside bits best overall. And, since the Whiteside had one of the lowest prices of the top bits, we also named it best value.

Photos, except where noted: Michael Pekovich; this page (top two): Tom Begnal

ROUTER-BIT SCORES

SUPPLIER	STREET PRICE	MAPLE	CHERRY	OAK	PINE	END GRAIN	MDF	OVERALL AVERAGE	OVERALL RATING
AMANA 54134 www.amanatool.com	$52	3.38	6.5	4	7.87	5.88	6.75	5.73	Good
BC SAW 43272 www.bcsaw.com	$70	4.75	5.75	6.13	7.13	5.5	7.25	6.09	Very good
BOSCH 85605M www.boschtools.com	$40	4.88	6.25	6	6.88	5.13	5.75	5.82	Good
CMT 845.850.11 www.cmtusa.com	$40	4.25	4.63	3.63	8	5.63	7.38	5.59	Good
AUTHOR'S BEST OVERALL CHOICE EAGLE 171-2605 www.eagleamerica.com	$36	6	7.38	7.63	8.13	6.63	6.88	7.11	Excellent
FREUD 38-614 www.freudtools.com	$40	4.5	4	3.5	7.25	6	6.88	5.36	Good
GRIZZLY C1755 www.grizzly.com	$28	2.75	6.88	5.25	7.38	5.63	5.5	5.57	Good
HOLBREN 24229 www.holbren.com	$17	6.63	4.25	4.25	6.38	4.5	7.63	5.61	Good
INFINITY 44-850 www.infinitytools.com	$35	5.13	6.75	6.25	7.75	6.75	7.63	6.71	Excellent
LEE VALLEY 16J34.52 www.leevalley.com	$30	5.5	7.88	7.25	6.75	7.13	7.38	6.98	Excellent
MLCS 8788 www.mlcswoodworking.com	$25	3.38	3.88	4.25	6.5	4	5.63	4.61	Fair
PORTER-CABLE 43179PC www.porter-cable.com	$27	4.13	4.75	4	7.13	4.5	6.63	5.19	Fair
RIDGE 23-515 www.ridgecarbidetool.com	$47	5.63	5.88	4.88	7	4.75	6	5.69	Good
ROCKLER 91680 www.rockler.com	$33	5.38	7.88	5	7.63	6.13	6.5	6.42	Very good
SOUTHEAST SE3212 www.southeasttool.com	$32	6.63	6.75	6.63	8.25	5.88	6.75	6.82	Excellent
AUTHOR'S BEST OVERALL CHOICE AUTHOR'S BEST VALUE CHOICE WHITESIDE 3212 www.whitesiderouterbits.com	$31	6.63	7.5	7.13	7.63	6.38	7.38	7.11	Excellent
WOODLINE WL-1253 www.woodline.com	$22	4.25	4	3.5	6.5	4.75	5.38	4.73	Fair
WOODTEK 820-228 www.woodworker.com	$30	5.63	7.75	6.88	6.88	6.63	7.13	6.82	Excellent

Fair to excellent. *We rated the lowest-scoring bits "fair," as they showed significant but still sandable amounts of bumpiness, tear-out, and burning (top). "Excellent" results (bottom) required little to no sanding.*

examined each strip and rated them for cut quality using a scale of 1 to 10. Then we averaged the scores for each bit.

How we ranked the bits

Each bit was rated fair, good, very good, or excellent based on its overall average. A "poor" category wasn't included because none of the bits met our definition of poor—a bit that cut so badly that the molding was unusable. To determine the range of each rating, we calculated the difference between the highest and lowest averages, and then divided that number by four. □

Tom Begnal is an associate editor. Shop manager John White contributed to this article.

Making Sense of Vises

A user's guide to the heart of the workbench

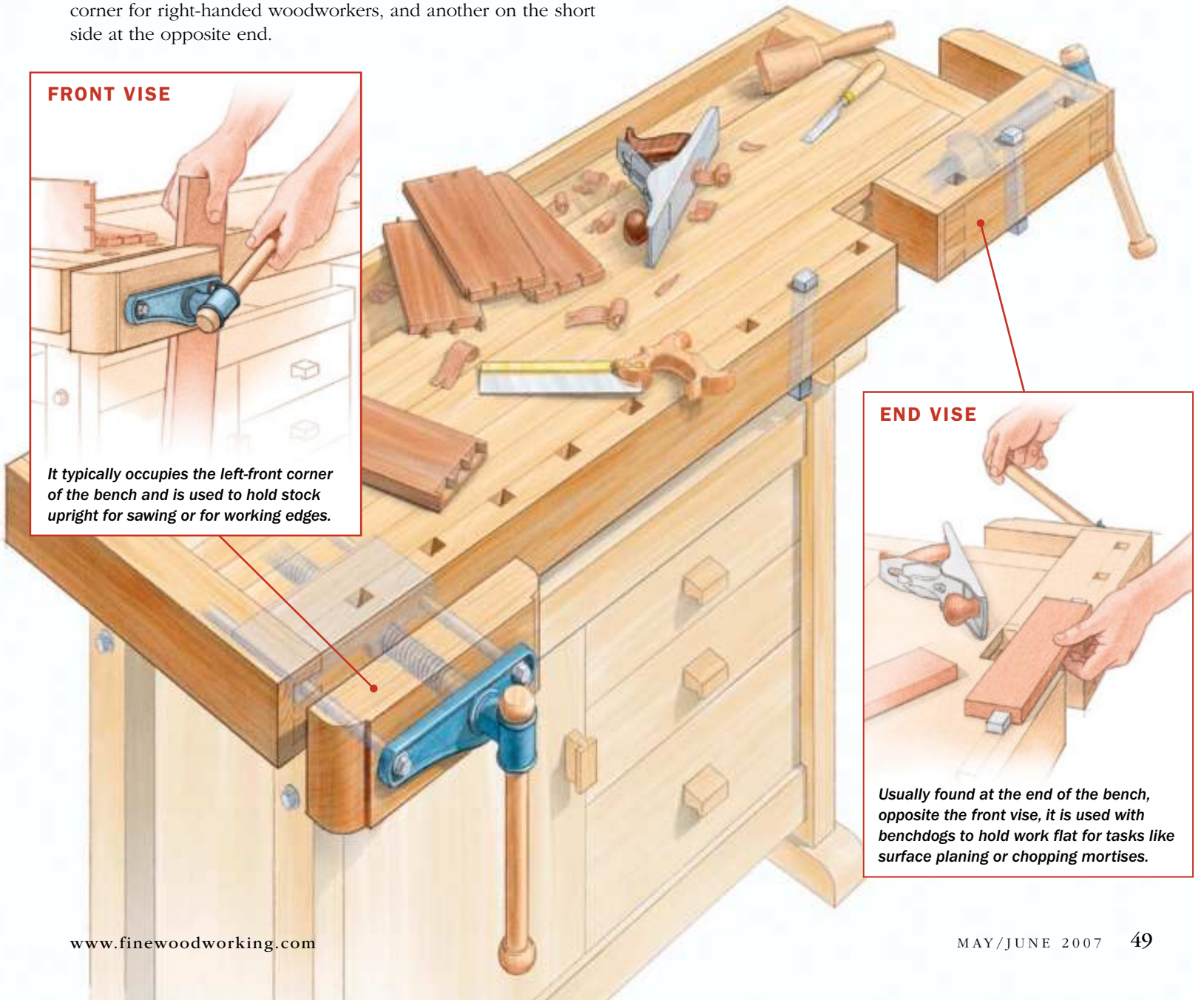
BY GARRETT HACK

A good bench vise is nearly as useful as a shop apprentice. On my bench I have a front vise and a large tail vise—I call them my right- and left-hand men. It's hard to imagine woodworking without them; they hold my work firmly so that I can concentrate fully on powering and controlling the tool I'm using.

In general, you'll find vises at two locations on a woodworker's bench: one on the long side of the bench, typically at the left-hand corner for right-handed woodworkers, and another on the short side at the opposite end.

The first, known variously as a side vise or front vise, matches the mental picture that most people have of a vise, with a movable jaw capturing work between it and the edge of the bench.

The second, called an end vise or tail vise, can clamp work like a front vise, but is more often used to hold boards flat on the bench, pinched between a pin or dog in the vise and another in one of the many holes along the benchtop. Together, these two vises can



FRONT VISE

It typically occupies the left-front corner of the bench and is used to hold stock upright for sawing or for working edges.

END VISE

Usually found at the end of the bench, opposite the front vise, it is used with benchdogs to hold work flat for tasks like surface planing or chopping mortises.

Hold work vertically for sawing dovetails or planing end grain. *A scrap piece of similar thickness, clamped in the opposite side of the vise, prevents the vise from racking.*

Hold wide workpieces on edge. *The vise screw prevents a wide piece from going all the way through the vise (right). A clamp seated in a dog hole provides extra support (above).*

Front vises

meet all of a woodworker's basic needs when it comes to holding work firmly and within reach.

Up front: a vise to clamp work vertically or on edge

A front vise, typically found on the bench's left-front corner, is ideal when you need to clamp a board to plane an edge, hold a chair leg while shaping it, or hold a board upright for sawing dovetails. The most common design is quite simple: a jaw of wood, or cast iron lined with wood, that moves with a single screw and a T-handle. The rest of the vise is mortised into the front edge of the bench. Mine opens about 10 in. and has about 4 in. of depth.

Many of the front vises on the market are fairly easy to fit to a benchtop. Look for one that has a large screw with well-cut Acme threads. These are the same square threads found on good clamps; they can smoothly deliver lots of force over a long life.

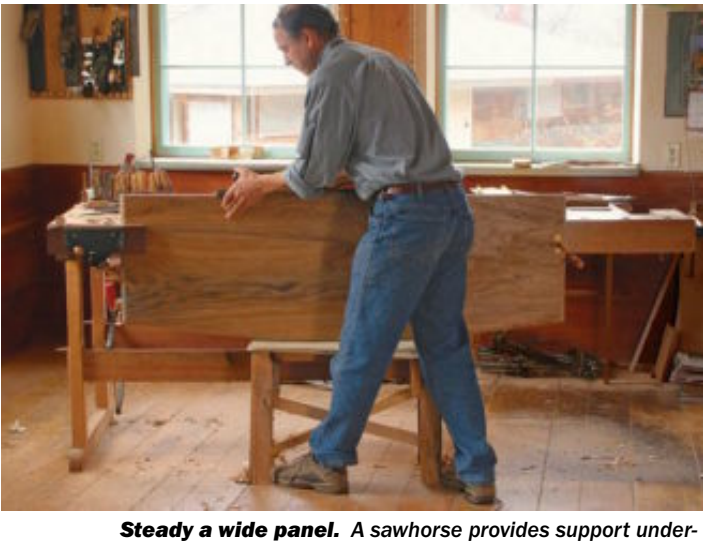
To hold long boards, wide panels, or doors securely on edge in a front vise, you need the added support of the deep front apron of the bench. Properly installed, the fixed half of the vise should be mortised into the bench so that the movable jaw clamps against the apron. This creates a great deal of stability, making it possible to

Credit Here

clamp most boards on edge with no other support. For very long boards, just put one end in the front vise and rest the other on a short board clamped in the tail or end vise, much like a board jack on traditional benches. You can clamp a large tabletop vertically against the front edge of a bench, one end held in the front vise and the other held by a bar clamp across the bench.

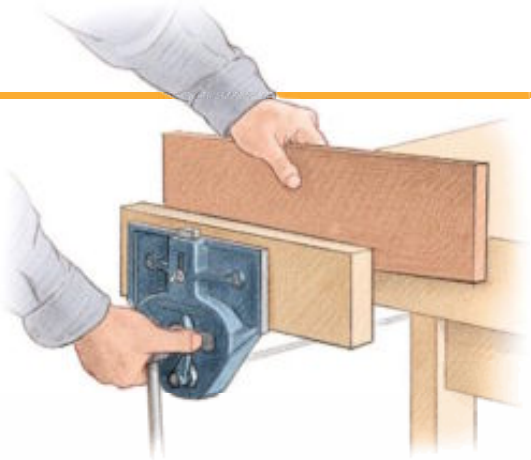
A problem can arise, though, when clamping on just one side of the vise, such as when holding just the end of a much larger piece, clamping pieces vertically for laying out or sawing dovetails, or holding tapered or oddly shaped pieces. When one side of the jaw is applying all the pressure—or trying to—it is very hard on the screw and any alignment rods, and can even distort them. One solution is to slip a block as thick as the workpiece into the other side

Secure long boards on edge. *A block clamped in the tail vise supports the opposite end.*



Steady a wide panel. *A sawhorse provides support underneath, with the opposite end clamped to the bench apron.*

TYPES OF FRONT VISE

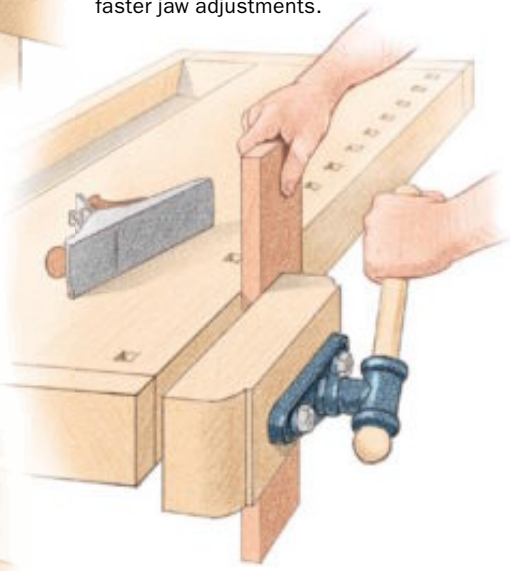


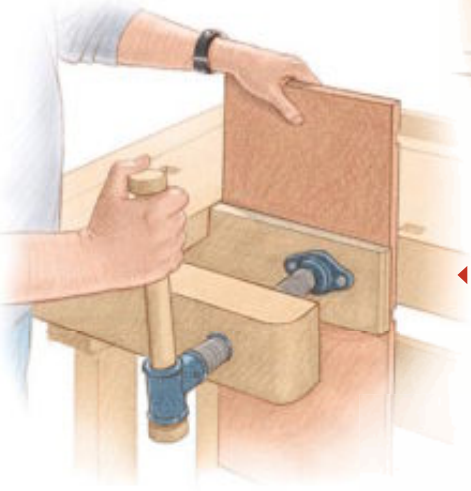
CAST IRON

The most popular front vise is cast iron. A steel rod or two keep the jaw aligned. Some also have a quick-action release for faster jaw adjustments.

WOODEN-JAWED

A wooden-jawed vise operates like its cast-iron cousin. The movable jaw is typically made from the same material as the bench. Some models offer quick-release.

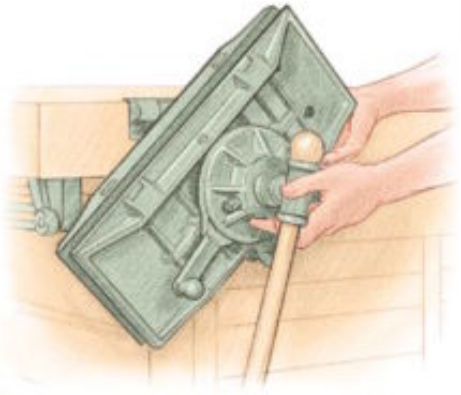


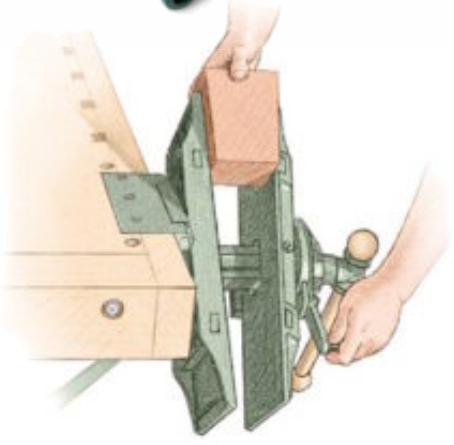


ARM VISE

An arm vise works well on wide boards. There are no screws or rods in the way. But the right-angled arm limits clamping force, which reduces the ability to clamp long boards horizontally.

Build it yourself. *Many companies sell the hardware for these vises. Look for a large screw with square-cut threads.*





PATTERNMAKER'S VISE

A patternmaker's vise excels at holding oddly shaped work. The vise body can pivot up and over the bench until the jaws are parallel to the benchtop. The jaws also can rotate 360° and angle toward one another for holding tapered work.

End vises

An end vise holds work flat. *Aligned with a row of dog holes, this vise has a wide capacity. It can hold smaller work and pieces nearly as large as the benchtop. It's ideal for smoothing a tabletop.*

A secure grip for cross-grain work. *The end vise allows you to clamp a panel across its width for tasks such as planing a bevel on the end.*

For chopping, a spacer keeps the work off the vise jaw. *The pounding could damage the vise. The best support is on the benchtop itself, right over a leg.*

An end vise also handles awkward shapes. *Pieces like this curved table apron can be held securely for scraping or other tasks.*

Photos: Steve Scott; drawings: John Hartman

of the jaw (use a wedge for odd shapes). This keeps the jaws parallel so you can apply all the pressure you need. Some bench manufacturers equip their front vises with a threaded stop that does the same job.

At the end: a vise to hold work flat

At the other end of the bench, you typically will find one of two distinct types of vises, known as end vises or tail vises. Their main purpose is to hold work flat on the surface of the bench.

A traditional tail vise, with one row of dog holes along the front edge of the bench and several more in the movable jaw, allows you to hold work flat over nearly the entire length of the bench. This is ideal for holding long boards to smooth a face, bead one edge, or hold a leg while chopping a mortise. You can also clamp across the grain to bevel a panel end or shape the skirt of a chest side. Be careful to apply only modest pressure to hold the work, or you will bow it up.

The tail vise is also great for holding long or odd pieces at any angle—there are no screws in the way and the hefty construction tends to prevent racking on odd shapes. Also, it can hold a workpiece at right angles to the bench edge, ideal for planing an end-grain edge, shooting a miter on a molding, or paring a tenon shoulder.

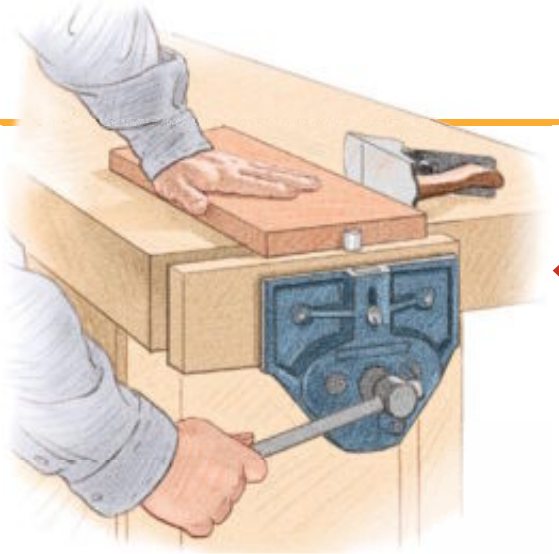
One drawback with this vise is that the large movable jaw can sag. A misaligned jaw makes it difficult to hold work flat on the benchtop. Avoid chopping or pounding over the movable jaw; it isn't as solid as the benchtop itself. Support the work as much as possible over the bench, with the least amount of jaw open. I keep small, square blocks handy to shim my work toward the bench or protect it from the dogs. I shouldn't have to say this, but never sit on your tail vise.

Another type of end vise—The other popular type of end vise looks and works like a front vise, except that the movable jaw is mounted to, and set parallel with, the end of the bench. If I had to outfit a bench with just one vise, it would be this type (see drawing, top right). My small traveling bench has an old front vise mounted on one end in line with a row of dog holes.

Some end vises of this type have a jaw that spans the entire width of the bench. Equipped with a dog on each end of the jaw, and paired with a double row of dog holes down the front and back of the bench, this is a great system for holding wide parts flat on the benchtop. Several ready-made benches are built this way. Lee Valley also sells the necessary hardware for making the vise yourself. □

Garrett Hack, a professional furniture maker and woodworking instructor, is a contributing editor.

TYPES OF END VISE

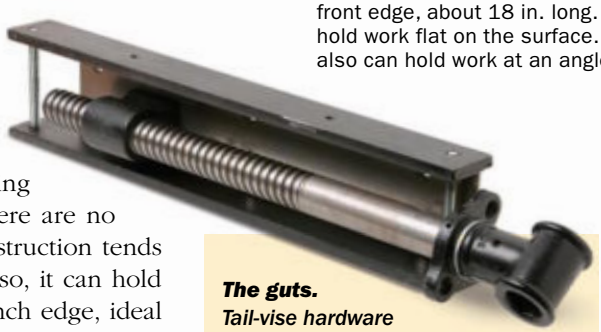


CAST IRON

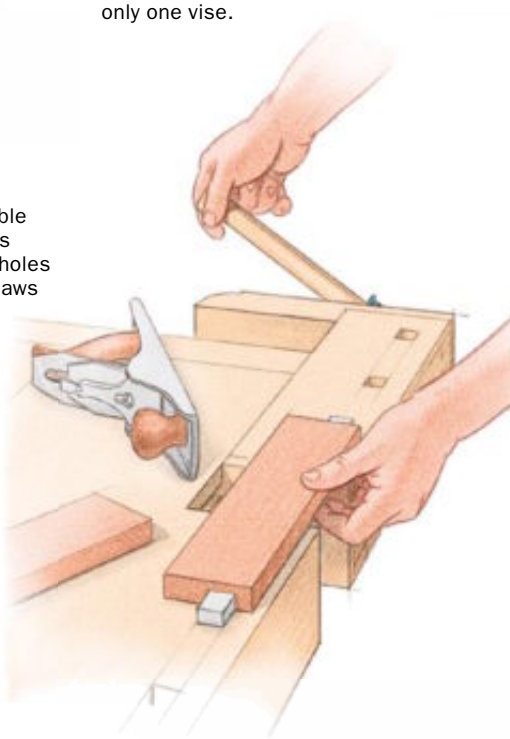
Same vise, different location. The cast-iron front vise also works well as an end vise—a smart solution if you have room or money for only one vise.

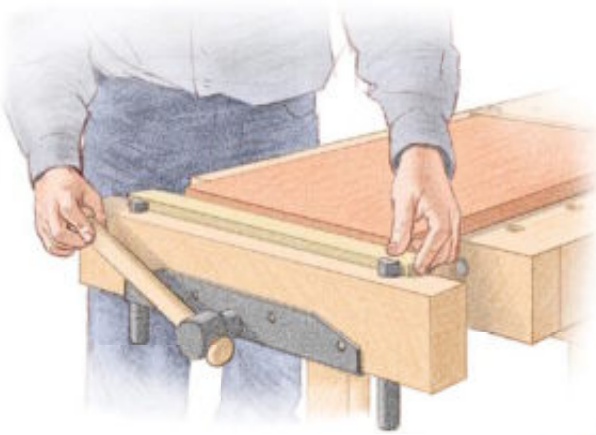
TAIL VISE

The traditional end vise. The movable jaw is a thick section of the bench's front edge, about 18 in. long. Dog holes hold work flat on the surface. The jaws also can hold work at an angle.



The guts. *Tail-vise hardware comes with instructions for making the wood components.*



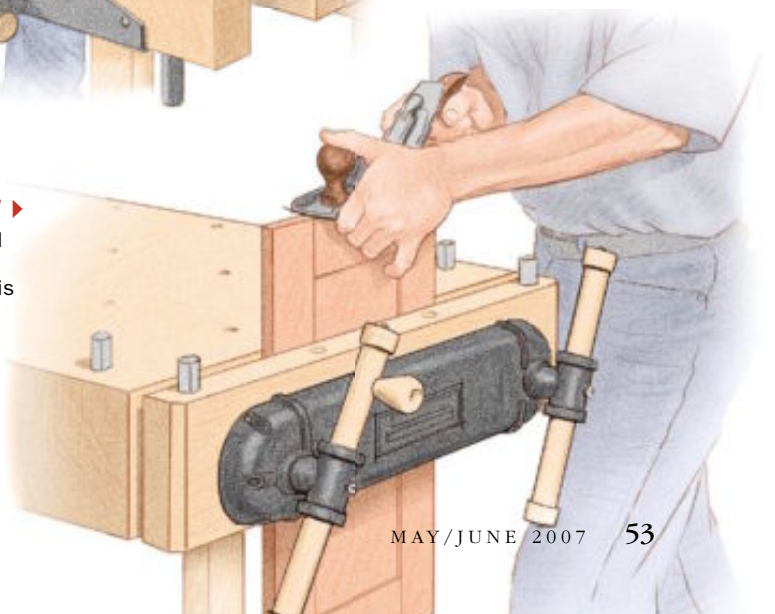


FULL WIDTH

A modern variation spans the width of the bench. With two rows of dog holes, the wide jaw of this vise is ideal for holding wider panels.

TWIN-SCREW

A twin-screw model can clamp wide stock vertically. This type connects the two screws with a chain to prevent racking.



All About Wax

Use it to perfect a finish or create special effects

BY PETER GEDRYS

There is a quality to a wax topcoat that can't be matched by more durable, modern finishes. The soft sheen and tactile quality of a waxed surface just begs to be touched. Not only does a waxed surface look good and feel good, but it also helps protect the finish underneath.

Besides being a final coat on finished wood, wax has a number of other uses. It can serve as a minimal finish to maintain a wood's natural beauty, or it can give a just-made piece an antique look. Colored waxes can create special effects. Best of all, the tools are simple and the techniques are easy. Whatever your furniture-making ability, your projects will look and feel better after a proper waxing.

Wax polish finishes a finish

The most common use for wax is to apply it as the final layer of finish. It can go on top of any type of finish, from an in-the-wood couple of coats of oil to high-gloss,

CHOOSE ONE MADE FOR FURNITURE

In general, if the first use mentioned on the can is polishing wood floors, don't use the wax on furniture. It is likely to contain a high percentage of carnauba wax and is designed to be buffed with a mechanical floor buffer. You'll have a hard time buffing it by hand. Butcher's Bowling Alley Wax and Minwax finishing wax fall into this category. However, these hard paste waxes can be used as a clear base for custom-coloring. In general, waxes designed for furniture are easier to use. They usually are softer in consistency (what I call a semi-paste wax) due to their higher percentage of solvent, which makes them easier to apply. I've had good results with Antiquax; Fiddes dries fast and has a low odor; Liberon's Black Bison goes on very smoothly but has a strong odor; Goddard's has a pleasant lemon verbena scent.

Photos, except where noted: Mark Schofield; this page: Michael Pekovich (top); John Tetreault (bottom) and facing page, top left and right

Step one is understanding the ingredients

CLEAR-WAX BASICS

Although brands of wax vary greatly in price, they all draw from the same limited number of raw waxes and solvents.

The best-known wax is beeswax. After the honeycomb has been melted and refined, it can be left dark or placed in the sun and bleached. Medium-soft, beeswax produces a medium-gloss finish.

The cheapest component is paraffin wax, derived from refining crude oil. Relatively soft and colorless, it serves as the base for many wax blends. Also obtained from petroleum is microcrystalline wax, a highly refined and expensive wax that has excellent resistance to water. It is favored by museums because of its neutral pH.

To offset paraffin wax's softness, manufacturers add harder waxes: Carnauba, obtained from scraping the leaves of a Brazilian palm tree, produces a very high shine but is also very hard to buff out when used alone; candelilla, obtained from the leaves of a Mexican plant, is much like carnauba, but somewhat softer.

Raw waxes. *Shown from left are beeswax, paraffin, and carnauba flakes.*

The speed at which a solvent evaporates will determine how long you have to wait before you can buff the wax. Traditionally, turpentine was used to dissolve beeswax, but its relative expense means this medium-paced solvent is rarely used in commercial waxes.

Mineral spirits is the most common solvent and can be formulated for slow or medium-paced evaporation. Faster-evaporating solvents include naphtha and toluene. I avoid toluene waxes such as Briwax (below) for a number of reasons. First, I dislike their strong odor; second, toluene is most likely to damage a finish that is not fully cured; third, I find they harden very fast, making them somewhat difficult to work with.

COLORED WAX

If you do one thing after reading this article, I hope you'll try using a dark wax. As this piece of walnut shows, a clear wax on a dark, open-pored wood can leave white residue in the pores. Even if the pores are filled, the clear wax can leave a slight haze on a dark surface.

Conversely, wax the same color or darker than the wood can enhance the appearance. See p. 59 for more detail and to learn how dark wax can be used to give an aged look.

You can buy wax in a range of wood tones, or you can take clear paste wax and color it yourself. You must first melt the wax, but because wax is flammable, never heat it over an open flame. Instead, place it in a container over heated water, a device known as a double boiler. Add artist's oils or universal colorants and mix them in thoroughly. Let the wax solidify before use.

Buy the right color. *Find one that matches the wood and it won't show in pores and recesses.*

Or color your own. *If you need only a small amount of colored wax or you want an unusual color, melt some clear paste wax in a container over hot water, and then mix in artist's oil colors.*

Finish a finish with wax

GLOSS LOOK

Create a wax applicator. *Place some wax in the center of a double thickness of cheesecloth, gather the edges of the cloth together, and twist them closed.*

rubbed-out shellac. The wax helps to even out the sheen and adds a measure of protection that can be renewed easily. However, don't be in a rush to apply it: Almost all waxes contain solvents, which can damage a film finish that isn't fully cured. For most finishes, this means waiting a week; but wait at least a month before applying a paste wax to solvent-based lacquer.

For best results, use an applicator—Using widely available but hard paste waxes, beginners tend to put on too much, then wonder why the surface smears when they try to buff it. The answer is to make a wax applicator.

Take some good, dense cheesecloth and fold it over. Place a small amount of wax on the middle of this pad. Gather up the edges and twist them to form a small knob that encloses the wax. As soon as you rub the surface, the wax will start coming through the cloth evenly and thinly. Although you can use softer semi-paste wax this way, you gain the most benefit when using harder paste waxes. For closed-pore, light-colored woods such as maple, I use a clear wax, but for open-pore woods such as oak or mahogany and darker closed-pore woods like cherry, I use a colored wax.

When you rub the surface, you will apply a very thin film of wax. The applicator prevents you from applying too much. I begin by applying the wax in circles, forcing it into any open pores, and then I give it a once-over with the grain to straighten everything out. If you run out of wax, don't apply more to the outside of the applicator; just unwrap it and replenish the inside. When

A thin coat is critical. *The cheesecloth applicator allows an even amount of wax to reach the wood. Apply the wax in a circular motion (1). Follow up by giving some light strokes with the grain (2). Before buffing, wipe the surface with a white non-abrasive pad; the open weave picks up any residue (3). Don't use a colored pad; many contain abrasives. To raise the shine (4), you can do the final buffing with a cotton cloth or a paper towel. Turn it frequently to keep removing surplus wax.*

finished, you can store the applicator inside the can of wax.

To get the best results, you must wait for the solvent to evaporate before you remove the excess wax and buff the surface. If you do this too soon, you'll either remove the wax or just move it around. If you wait too long, it becomes progressively harder to remove the surplus. Although the wax won't get hazy like car polish, it will change from glossy to dull. The time this takes varies by brand and atmospheric conditions, but 20 minutes is average.

Although using the applicator should prevent excess wax, I still rub the dried wax with a white nylon nonabrasive pad (www.woodworker.com). The open weave picks up any thicker patches or small lumps of wax. The final step is to buff the surface with a soft cloth like terrycloth, an old T-shirt, or even a paper towel. Rub the surface vigorously and turn the cloth frequently so that you burnish the wax rather than just redistribute it.

At this stage, if you find you simply can't get the surface to shine, you probably put on too much wax or let it harden for too long. Rub the surface with a cloth dampened with mineral spirits to remove most of the wax. Wait an hour for the solvent to evaporate, and then reapply the wax more carefully.

Rub out the surface with wax—If you prefer a medium luster, an option when waxing a cured finish such as shellac, varnish, or lacquer is to apply the wax with 0000 steel wool or a gray abrasive pad. This will reduce the sheen and soften the look. To better lubricate the steel wool, I use a softer semi-paste wax. To avoid cross-grain scratches, apply the wax with the grain only. It is easy to apply too much wax with this method, so you'll probably need to go over the wax once it has dried with clean steel wool or a white abrasive pad. When the wax has cured, buff the surface in the same way as previously described.

Waxing intricate shapes and carvings—By highlighting areas that are proud and leaving recesses dull, wax can give carvings and moldings a more three-dimensional appearance. The softer the wax, the easier it is to work into the corners using either a cloth or a small stiff brush. When dry, a vigorous buffing with a dry and moderately stiff-bristle brush will yield good results.

Renewing a waxed surface—When a waxed surface begins to look dull, try buffing to renew the sheen. If this doesn't do the trick, simply apply and buff another layer of wax in the same way as described earlier. When done correctly, the layers of wax are so thin you need have no concern about wax buildup.

If the surface becomes worn or dirty, wax can be removed with mineral spirits or one of the proprietary wax washes. If it is very

FineWoodworking.com

Peter Gedrys mixes up a batch of wax and finishes a piece.

SATIN SHEEN

Steel wool and wax. *You can combine rubbing out the finish and waxing it by using steel wool to apply the wax. Liberon's 0000 steel wool gives the most even scratch pattern (right). To avoid cross-grain scratches, rub the steel wool with the wax in the direction of the grain only (below).*

Not just for shoes. *You can buff wax with a brush. This works well in carved areas and produces a slightly lower shine than a cloth.*

As a minimal finish

Simple steps. *For objects rarely touched and that don't need a protective finish, wipe on a single coat of shellac, sand when dry, and then wax and buff.*

grimy, use either 0000 steel wool or a gray abrasive pad with solvent to loosen the wax. Wipe well with paper towels, and then rewax the surface.

Wax bare wood for a natural look

Wax also can be used on its own as a finish. It has the advantage of barely changing the natural color of the wood, just giving the surface a slightly higher sheen. The downside is that it gives minimal protection, but this is not a problem for objects such as picture frames that are subject to infrequent handling. As with waxing a finish, you need to match the wax color to the wood.

A variation on this is one of my favorite finishes. I seal the bare wood with a coat or two of a 1- to 2-lb. cut of shellac, lightly sand it when dry, and then apply the wax. I've used it with great success on lightly used furniture and on architectural components such as paneling. The thin barrier of shellac barely changes the wood's appearance yet makes it smoother and less porous, allowing a more even luster. It also allows me to easily remove the wax at a later date, if required.

Colored wax gives a range of looks

Wax comes in a range of colors, from wood tones to specialty colors such as black and white. These colored waxes can be used either for decorative finishing or for replicating antiques.

A limed finish on white oak is the most famous decorative wax finish. First, open up the pores with a brass brush or a slightly stiffer bronze brush, then vacuum and blow out the pores thoroughly. Seal the surface with a thin coat of shellac, and then rub white wax well into the pores. Wipe off the excess and apply

Pop the pores with colored wax

Prepare the wood. *Open the pores by brushing the wood with a bronze or brass brush. After removing the dust with a vacuum or compressed air, apply a single coat of shellac.*

A limed finish. *Fill the pores with white liming wax, and then remove the surplus. Later add a coat of clear wax, or for a higher gloss, a coat of shellac.*

Color wax with powders. *You can color clear wax by adding dry pigments or mica powders. Afterward, topcoat with either clear wax or shellac.*

Wax can give an aged appearance

CREATE INSTANT DUST

Dirt in the crevices. *Apply softened paste wax into the nooks and crannies of carvings. Then tap in some rottenstone with a stiff-bristled brush (top). When the wax has dried, rub the area with crumpled newspaper to remove the bulk of the rottenstone, and then burnish the high points with a cloth (right). This leaves a line of gray similar to that found on antiques.*

ADD YEARS OF POLISH

Simulate wax buildup. *To replicate the dark recesses found on antiques, use dark wax in these areas (above), or apply dry pigments to freshly applied clear wax (center). When the wax is dry, burnish the high points with a cloth or a brush (below).*

either a couple of coats of paste wax or, for a higher sheen, a coat of shellac. Other applications include adding colored pigments or mica powders to clear wax to color the pores.

If your taste runs more toward period than contemporary, wax can give furniture an aged appearance. Using wax a shade or two darker than the wood will add accent lines around moldings and carvings. There are brown and black waxes sold as patinating waxes, but you can make your own or use dry pigment powders on top of a clear wax.

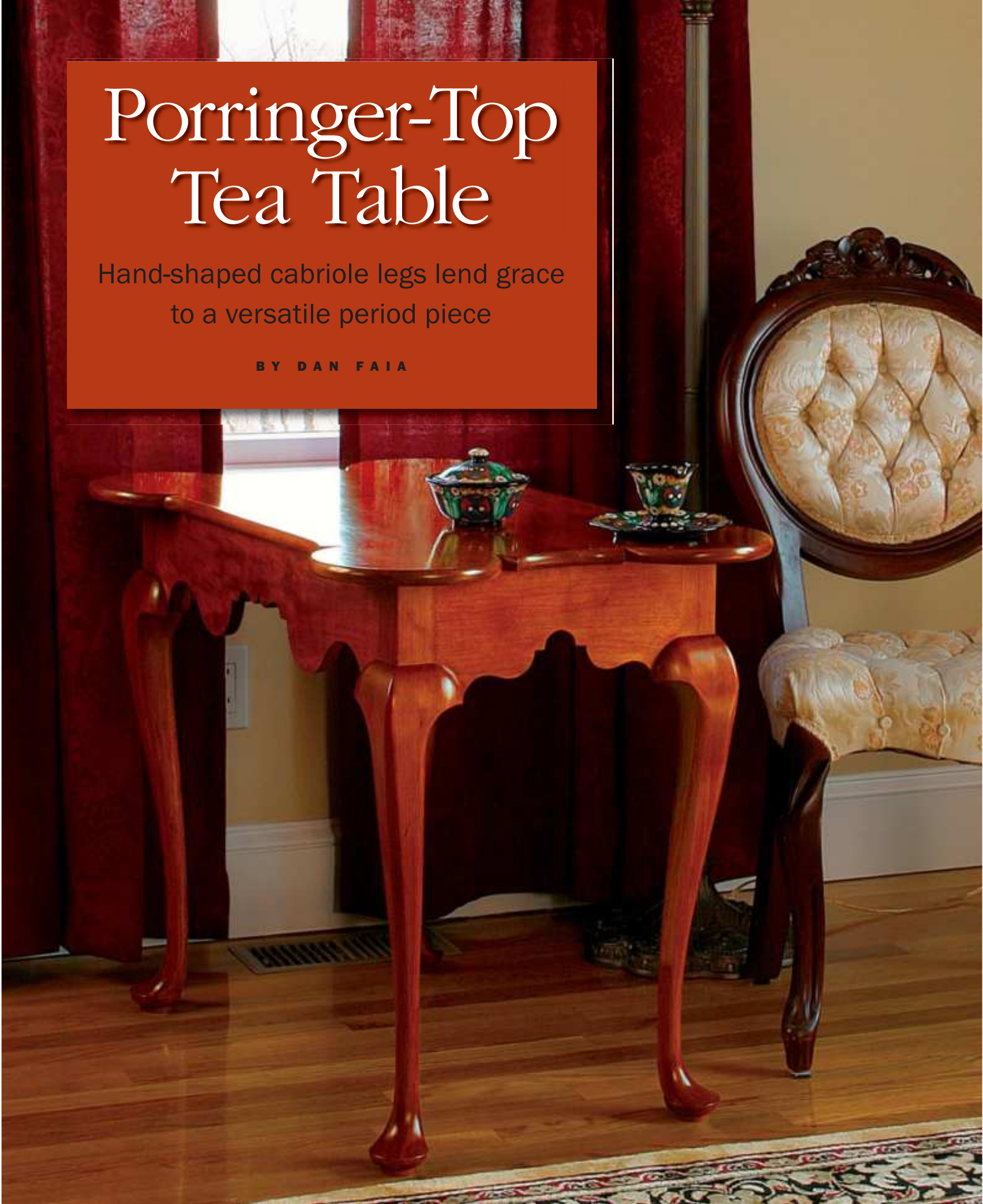
Don't use shoe polish. Many include silicone, which will play havoc with any film finish that you apply afterward. □

Peter Gedrys is a professional finisher and restorer in East Haddam, Conn.

Porringer-Top Tea Table

Hand-shaped cabriole legs lend grace to a versatile period piece

BY DAN FAIA



When a client asked for a tea table recently, I built this one in the Queen Anne porringer style, named for the top's rounded, soup-bowl-shaped corners. I found the design in an antiques catalog. The original was built in Wethersfield, Conn., sometime between 1740 and 1760.

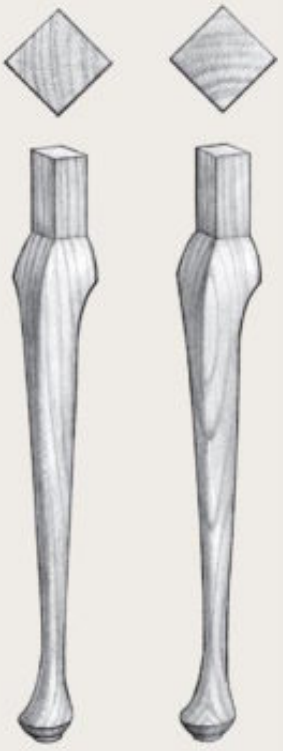
Tea tables were most popular from the William and Mary period in the early 1700s through the Empire period in the mid-1800s. Today, even though earlier dinnertimes have put an end to daily afternoon "teas," these tables still are useful as end tables or occasional tables.

This piece is also a great way to get started in building period reproductions. The design is simple, but there are challenging details in matching the grain, shaping the cabriole legs and transition blocks, and creating the uniquely shaped top. The project requires careful machine work and a delicate touch with hand tools. When you're done, you'll have a handsome, highly functional piece of furniture.

Seek consistent grain for a coherent look

Lumber selection and grain orientation are critical details for any furniture project. Using the

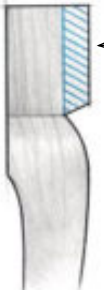
Bandsaw the legs



TWO WAYS TO ORIENT THE GRAIN

There are two options for the look of the legs: flow lines and bull's-eyes. Flow lines, used on this piece, keep a parallel vertical pattern that follows the leg's contours. Bull's-eyes are the sunburst patterns seen at the peak of the knee. You can get either pattern from the same blank, depending on how you orient the leg. End grain that runs from inside corner to outside corner will create flow lines (left). Side-to-side grain will produce bull's-eyes (right).

Rough-cut the profile on the bandsaw. *After turning the pad foot, trace the layout onto two faces of the blank and cut one face (above). Leave the waste area above the knee intact for now. Then tape the cutoffs back in place and cut the second face (left). The cutoffs support the work for safe and accurate cutting of the adjacent sides.*



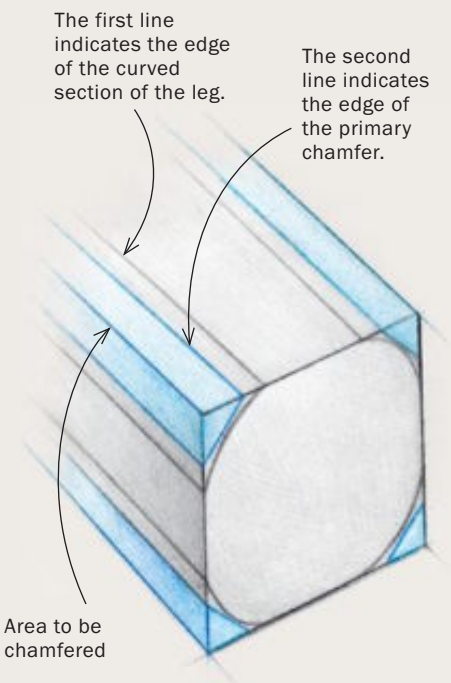
Do not remove the waste until after dry-fitting the legs to the aprons.

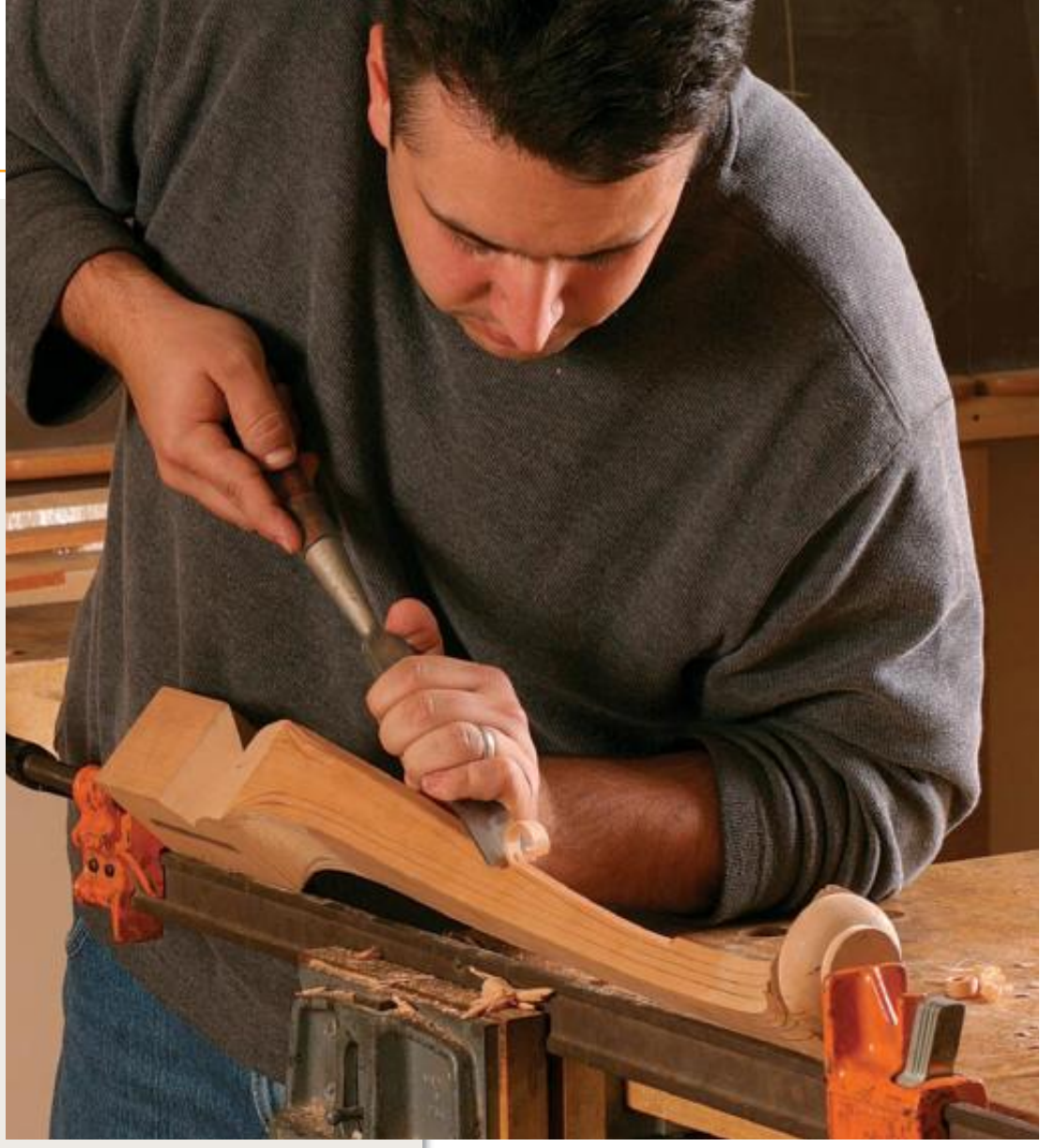
Shape the legs

LAY OUT THE PRIMARY CHAMFERS

Mark the edges of the curves. *Begin the layout for shaping the leg by drawing a pair of reference lines on each side, at equal distances from the corners. These are called centerlines because the two meet at the center of the leg's narrowest point.*

Mark the edge of the first chamfer. *Faia visualizes a "5/7" ratio to draw a new set of lines a little less than halfway from the reference lines to the corner on each side. He chisels to these lines in creating the first chamfers.*





Cut the first chamfer. *Use a chisel to remove the wood between the second layout lines (above). Stop the cut at the narrowest part of the leg, where the grain direction changes, and then work from the opposite direction. The sharply curved area just above the foot is hard to negotiate with the chisel. Follow up with a rasp to smooth the transition (below).*

Photos: Steve Scott; drawings: Bob La Pointe

right grain for individual parts can make the difference between a good piece and a great one. For grain consistency, I made the aprons and the slip-matched top from a single board. It might seem shameful to rip wide lumber into narrow pieces, but it pays off in the finished appearance.

Grain selection for the cabriole legs is even more important. Look for a 12/4 board with a rift-sawn end section, but be prepared to spend some time picking through the lumber to find it. Most pieces that will fit the bill will be rift for only half or three-quarters of the width. You'll rarely find a board that will yield any more than two legs side by side in the rift.

Turn the feet before shaping the legs

Start by rough-cutting the leg blanks longer than the finished leg. This leaves matching stock for two transition blocks, which you should trim off after the leg is turned and before it is shaped.

Begin by turning the pad foot on the center of the blank. Layout is done using plywood patterns derived from full-scale drawings. On the lathe, use a parting tool and a pair of calipers to set the pad's maximum diameter and to cut the fillet on which the foot will rest. Then make a rolling cut with a spindle gouge to establish the curve between the foot's widest point and the fillet. The last step on the lathe is to use the corner of the skew to make a shallow scribing cut that just begins the top of the foot. This will help you locate the toe later in the leg-shaping process.

While the blanks are square, cut or chop the mortises for the aprons, making sure to choose the proper inside corner for the grain selection. Label and trim off the transition blocks, and cut the legs to length.

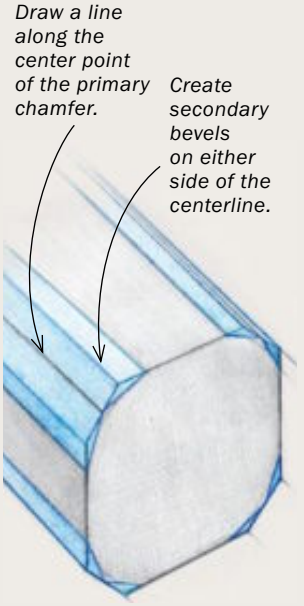
Time-honored cabriole layout method

Lay out the leg pattern on the two inside faces and bandsaw the profile. Do not bandsaw the top of the post, and stay proud of the pattern line by 1/16 in. or more above the knee. It is important to leave plenty of wood here for shaping later. Clean up the cuts with a spokeshave and a rasp, making each surface a fair curve.

I shaped the legs primarily with wide, flat chisels, removing wood in a series of chamfers until I arrived at a rounded profile. For consistency, I laid out the chamfers using a technique called the 5/7 rule.

At this small scale, the 5/7 rule isn't a precise measuring technique. It's a way of eyeballing the layout with consistent results (consistent enough, anyway, to please the eye). Start at the ankle by marking the center point of each side of the leg. From these marks, draw centerlines

LAY OUT THE SECONDARY CHAMFERS



Lay out the next chamfers. *Mark centerlines on the newly created faces. These lines will be used in cutting a second set of chamfers.*

Cut the new facets. *Chisel away a triangular section of waste between the two centerlines. This cut is only about halfway to the line on either side of the corner (above). The remaining ridges are small enough to remove with a spokeshave (below left). Use rasps, files, and sandpaper to shape the leg to its finished contour (below right).*

Assemble the base

Profile the aprons. *Use chisels, rasps, and files to create a smooth surface after bandsawing the apron shape.*

Mark and trim the posts. *Dry-fit the aprons into the mortised leg posts and trace cut lines on the front of each post (top). The finished posts will be flush with the aprons. Cut on the waste side of the line (above) and plane the posts flush with the apron after glue-up.*

up and down the blank, maintaining the same dimension and following the curves created by the saw.

Your next marks should be a little less than halfway from these centerlines to each adjacent corner. To estimate this distance consistently, imagine that the space between each center point and each adjacent corner is divided into 12 equal parts. From each center, count five units toward the corners and make your marks at those locations. Draw additional layout lines from these marks up and down the blank.

Use a chisel and rasp to remove the material between these second layout lines, creating a broad chamfer. Now mark the centerlines of the chamfers. Refine the profile by paring about halfway in from these centerlines and the original ones to remove the newly created corners. This will create a set of narrower, secondary chamfers. Last, remove the ridges along these faces with a spokeshave. The corners should now be so close to round that no other division is needed. Use a rasp, file, and scraper to achieve the final shape.

Blocks transition from apron to knee

Cut the apron stock to the appropriate lengths and rip the aprons slightly wider than the finished width. I used a dado head on the tablesaw to cut the tenons. Remove milling marks from the aprons with a handplane. Locate the center of each apron, measuring from the shoulders. Trace the apron patterns and bandsaw to shape. Clean up the bandsaw marks with a spokeshave, chisels, and files.

With the base dry-fitted together, trace the outside face of the aprons onto the leg posts, which were left fat earlier. Bandsaw the posts just proud of these lines, leaving wood that can be planed flush to the aprons after assembly. Glue up the base, checking for square and using moderate clamp pressure. Finish the assembly

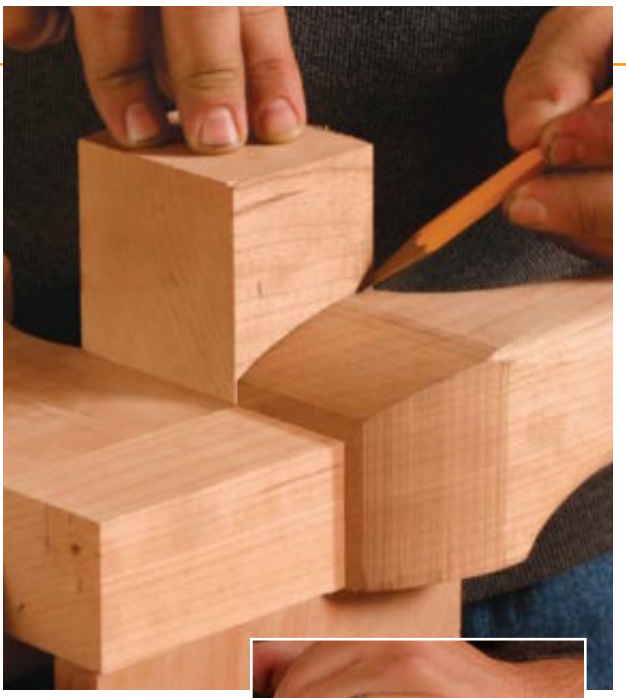
Glue up the base. *Use moderate clamping pressure and be sure to check the assembly for square.*

Add transition blocks

PREP THE LEG FOR CORNER BLOCKS

Plane the post flush. *Use a shoulder plane, referencing off the surface of the apron.*

Locate the transition block. *Clamp the rough stock in place, aligned roughly with the bottom of the apron. Plane the top of the leg to match the block's height.*



Mark and cut the corner block. *Mark the block at the knee's apex to determine its thickness (above). Cut the block to shape and glue it in place before shaping it with a chisel (right).*

Shape the transition block. *Pare across the top of the block, using the leg as a reference surface. As you near the apron, round over the ledge made by the shoulder plane.*

Change directions. *Next, work toward the top of the leg, rounding the transition block until it meets the apron.*

by trimming the posts flush to the apron fronts with a shoulder plane.

To begin fitting the transition blocks, first handplane their mating surfaces so that they fit tightly to the legs and aprons. Now clamp the transition block temporarily into place, aligning it roughly with the flat bottom of the apron, and use it as a reference surface for the shoulder plane. You want to plane the top of the leg where it meets the post, bringing its height flush with the top of the transition block.

Remove the blocks and use a bandsaw to cut the curved side profiles on each one. Use chisels and sandpaper to smooth the outer profiles to a fair shape, and then glue the blocks onto the legs and aprons. Chisel the leg profile to shape with the transition blocks. Curve the transitions across their width from the leg to the apron. Continue shaping diagonally over the blocks to a final rounding.

Shape and attach the top

I like to spring-joint the top boards. To "spring" the joint, plane away a minimal amount of wood from the middle section

Fair the curves underneath. *Use a rasp to smooth the underside of the transition block where it meets the bottom of the apron.*

SHAPING THE TABLETOP'S EDGE

Using chisels, rasps, and files, work between a centerline drawn on the edge and layout lines on the faces.

of each edge, so clamping pressure is moderate. Then the joint requires only one center clamp for glue-up. After planing and/or sanding the top flat, lay out and bandsaw the top pattern slightly proud of the lines. A jigsaw is a good alternative for cutting these shapes, especially the large-radius corners. Fairing these shapes by hand will require the use of many tools—spokeshave, chisel, file, and scraper.

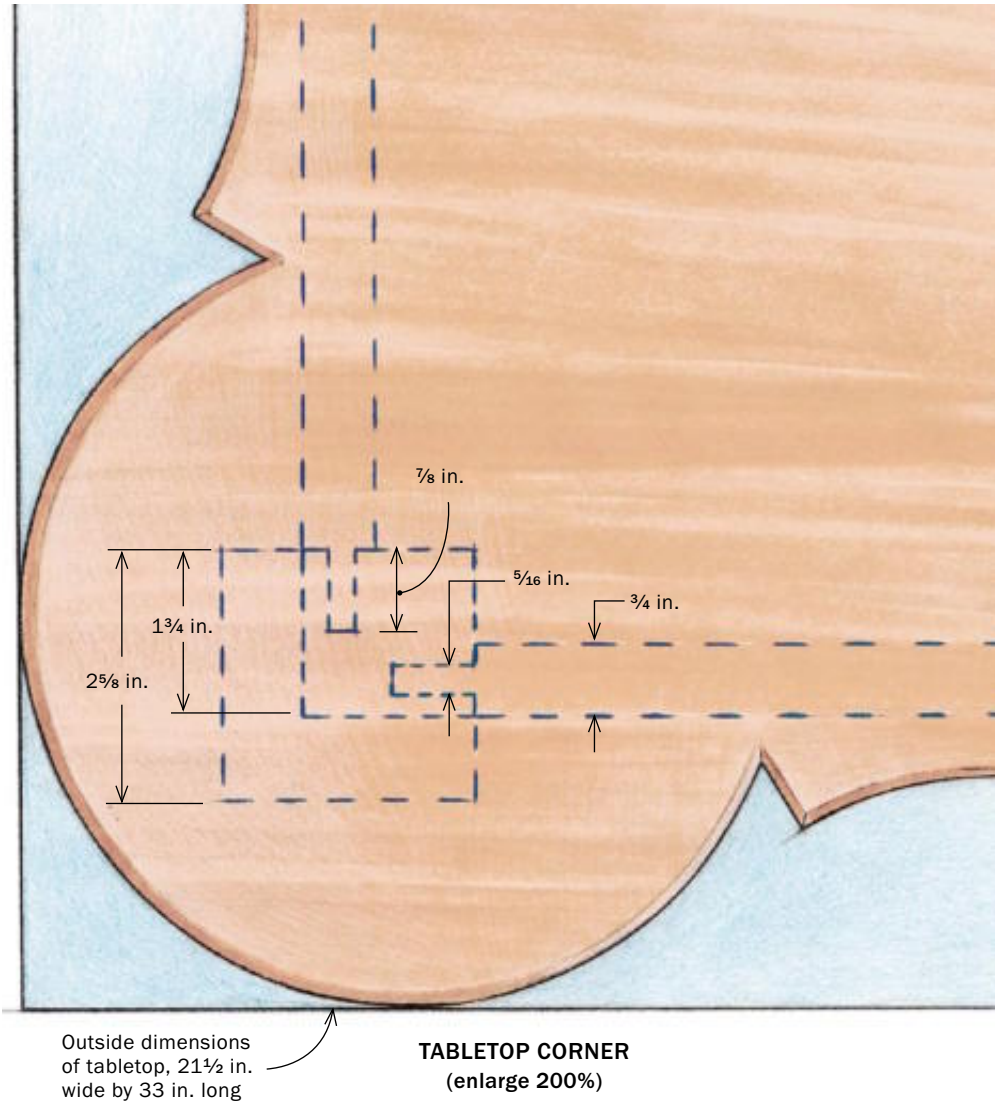
The edge profile is not a half-round shape. It's a section of a larger radius, which is a common profile used in 18th-century furniture. Layout is simple. Draw a single centerline on the edge, and a pair of lines (one on each face) marking the top and bottom of the curve.

The makers of many original pieces used glue blocks to attach their tabletops; however, I don't recommend this because it restricts seasonal movement. Six wood screws, driven through pocket holes in the aprons, hold this top down. Mount the two end screws tightly and widen the slots for the four side screws to allow wood movement. □

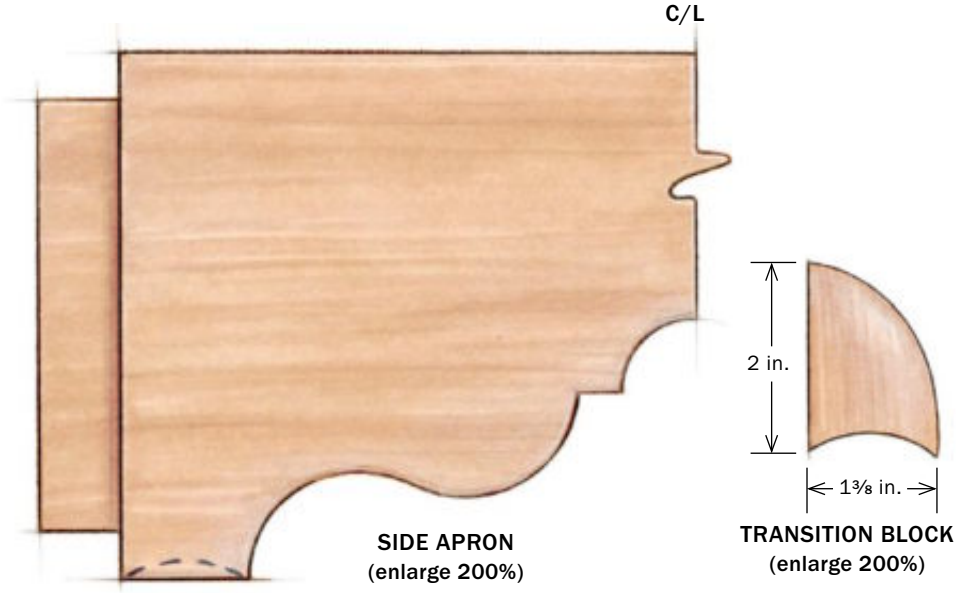
Dan Faia is a custom furniture maker in New Hampshire.

BASIC JOINERY SUPPORTS A GRACEFUL DESIGN

Simple mortise-and-tenon joinery brings the leg posts and aprons together, while the details lend distinction to the piece. The aprons are flush with the leg posts, and the curves in the cabriole legs are echoed by the rounded corners and edge details of the tabletop.

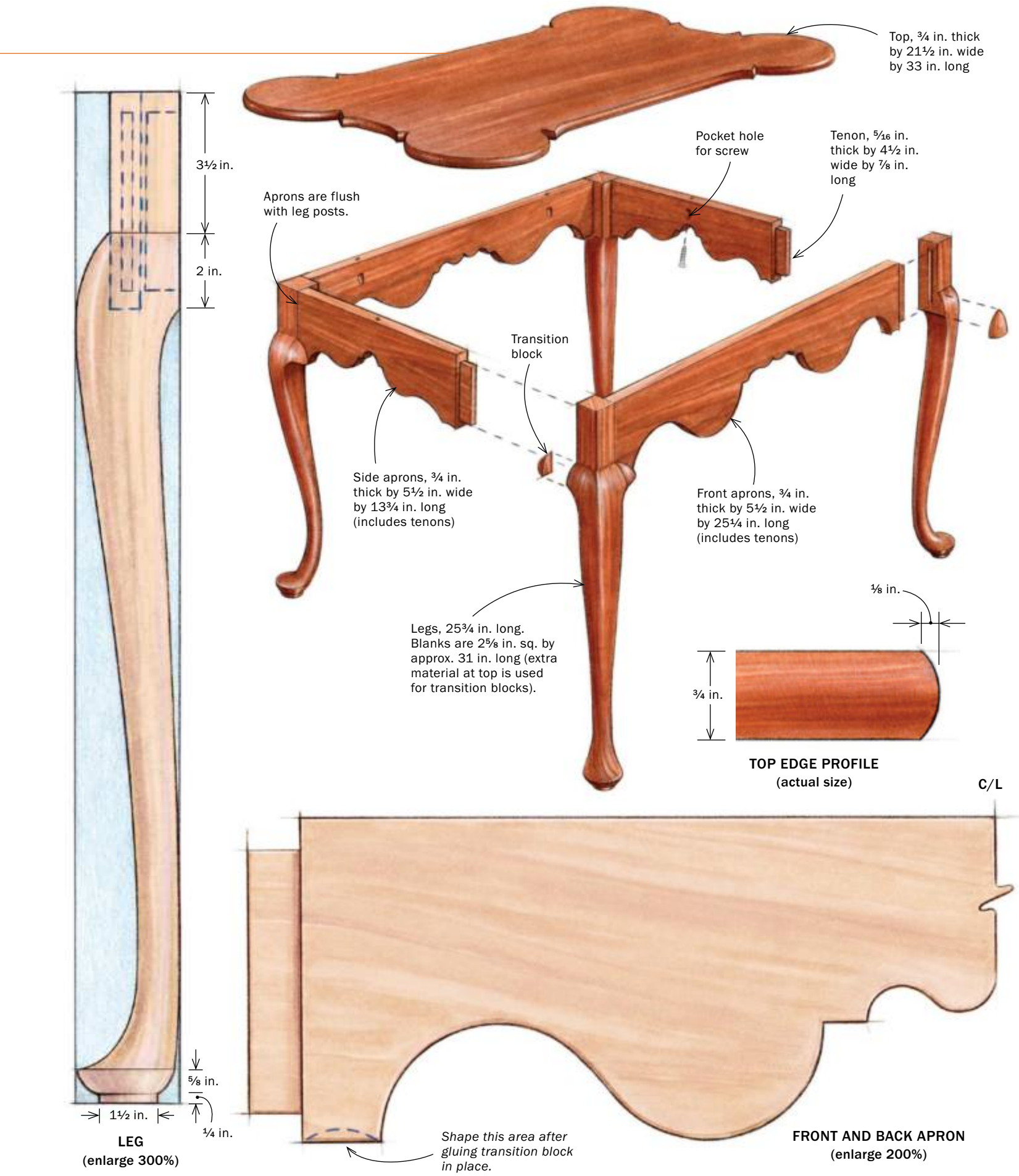


TABLETOP CORNER (enlarge 200%)



SIDE APRON (enlarge 200%)

TRANSITION BLOCK (enlarge 200%)


Top, ¾ in. thick by 21½ in. wide by 33 in. long
Pocket hole for screw
Tenon, 5⁄16 in. thick by 4½ in. wide by ⅞ in. long
Aprons are flush with leg posts.
Transition block
Side aprons, ¾ in. thick by 5½ in. wide by 13¾ in. long (includes tenons)
Front aprons, ¾ in. thick by 5½ in. wide by 25¼ in. long (includes tenons)
Legs, 25¾ in. long. Blanks are 2⅝ in. sq. by approx. 31 in. long (extra material at top is used for transition blocks).
3½ in.
2 in.
⅝ in.
1½ in.
¼ in.
LEG
(enlarge 300%)
⅛ in.
¾ in.
TOP EDGE PROFILE
(actual size)
C/L
Shape this area after gluing transition block in place.
FRONT AND BACK APRON
(enlarge 200%)

Self-Centering Mortising Jig

Rotating circles make on-the-mark mortises every time

BY DAVID LEHMAN

Recently, as I considered a set of bedroom furniture I was designing, I counted more than 50 mortise-and-tenon joints. I needed a way to make them as simply, precisely, and consistently as possible. To me, that meant using loose tenons; it's much easier than with standard tenons. There are no shoulders to cut (and then fine-tune) for a perfect fit. There's no need to add tenon length to rail length; just cut to exact shoulder-to-shoulder dimensions. And it's easier to cut tenons separately than at the ends of rails.

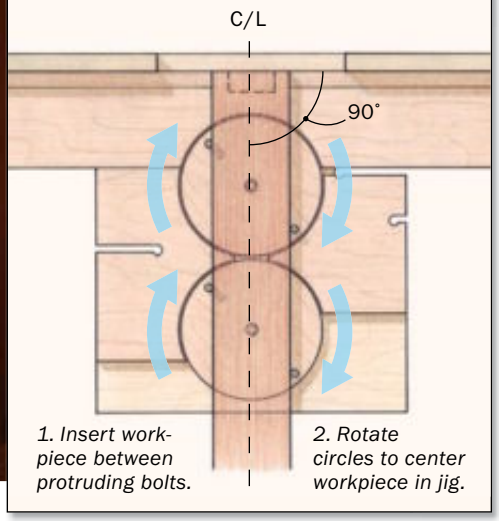
All it takes is two perfectly matching mortises in mating pieces. And I decided a shopmade jig would do that job best.

My jig uses two vertically aligned, rotating circles with protruding metal bolts to center the rails automatically for end mortising. The

FineWoodworking.com

Watch us take this jig for a test drive in the *Fine Woodworking* shop.

HOW THE JIG WORKS



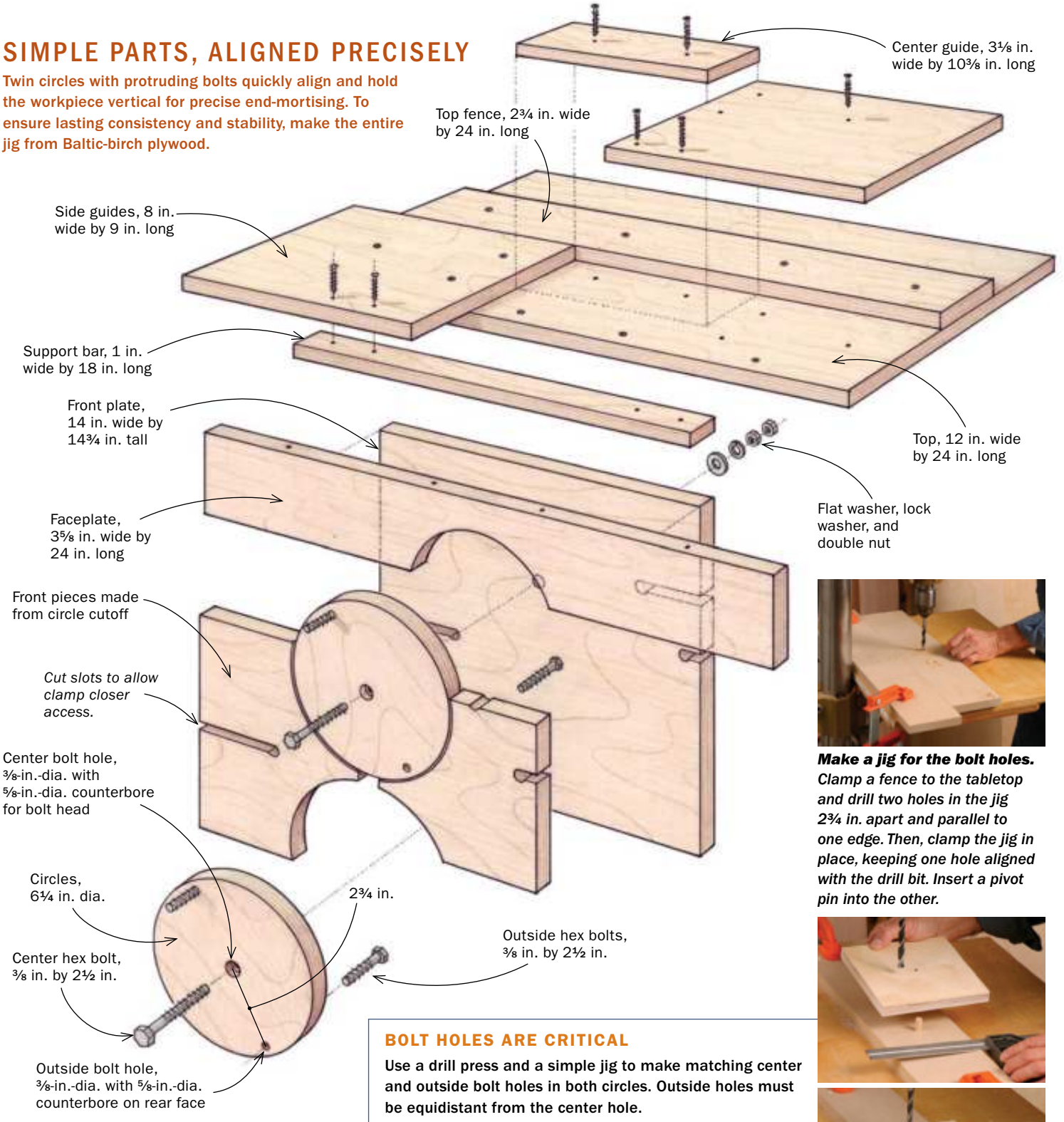
1. Insert workpiece between protruding bolts.

2. Rotate circles to center workpiece in jig.

Photos: Michael Pekovich; drawings: Vince Babak

SIMPLE PARTS, ALIGNED PRECISELY

Twin circles with protruding bolts quickly align and hold the workpiece vertical for precise end-mortising. To ensure lasting consistency and stability, make the entire jig from Baltic-birch plywood.



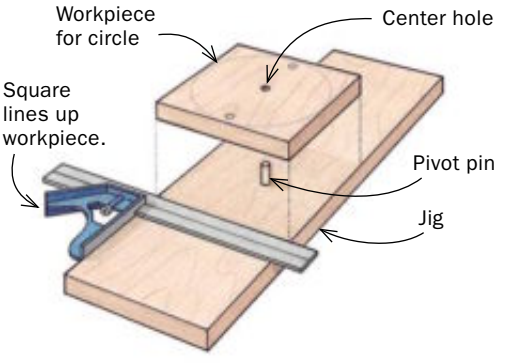
jig, made of Baltic-birch plywood, also aligns the stiles horizontally for matching mortises using a simple stop-block setup. And it's semi-dedicated—made to cut the widest mortise I'd need while allowing me to make narrower, and even offset, cuts.

Start with the circles

The jig is centered on the circles, so begin by making them. They must be large

BOLT HOLES ARE CRITICAL

Use a drill press and a simple jig to make matching center and outside bolt holes in both circles. Outside holes must be equidistant from the center hole.



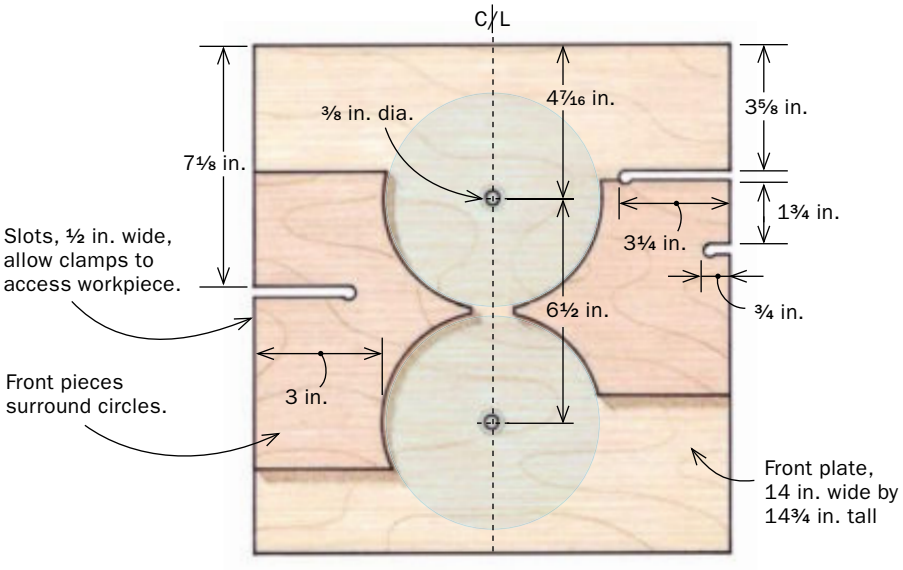
Make a jig for the bolt holes. *Clamp a fence to the tabletop and drill two holes in the jig 2¾ in. apart and parallel to one edge. Then, clamp the jig in place, keeping one hole aligned with the drill bit. Insert a pivot pin into the other.*

Drill the holes. *Place the blank's center hole over the pivot pin, using a square to align the edge. Drill the first hole, then rotate the blank 180°.*

Building the jig

ASSEMBLE THE FRONT

The jig front is critical. The center holes of the circles must be aligned precisely on a centerline perpendicular to the top edge of the front plate. Use a drill press to make sure the holes are true. Slots are machined from the sides to hold the clamps.



Locate the circles on the front plate. *Drill two ⅜-in. holes on the centerline for the circles' center holes. Use a fence to ensure that the holes are aligned.*

Attach the circles. *With outside bolts in place, secure the circles to the front plate with ⅜-in. bolts through the center holes. Hand-tighten double nuts over the washers and lock the washers.*

Attach the top faceplate. *Align its top edge with that of the front plate. Clamp it in place, and attach with screws from the rear.*

Test for vertical alignment. *Square the end of a test piece and place it between the outside bolts, rotating the circles for a snug fit. The top edge of the test piece should align perfectly with the top edge of the jig. If it doesn't, you can mark and trim the top edge.*

enough to accept the widest piece to be end-mortised between the bolts that protrude from them. My circles are a bit over 6 in. dia. and can accommodate a board up to 5 in. wide between the bolts.

To make each circle, start by cutting a perfectly square blank slightly larger than the circle it will become.

Mark the center point of the square. Install a ⅝-in.-dia. Forstner bit in your drill-press chuck and make a counterbore as deep as the bolt head it will receive. Then switch to a ⅜-in. brad-point bit (or a spiral bit if your brad-points cut with their outside edges first) and drill a through-hole. Put the blank aside.

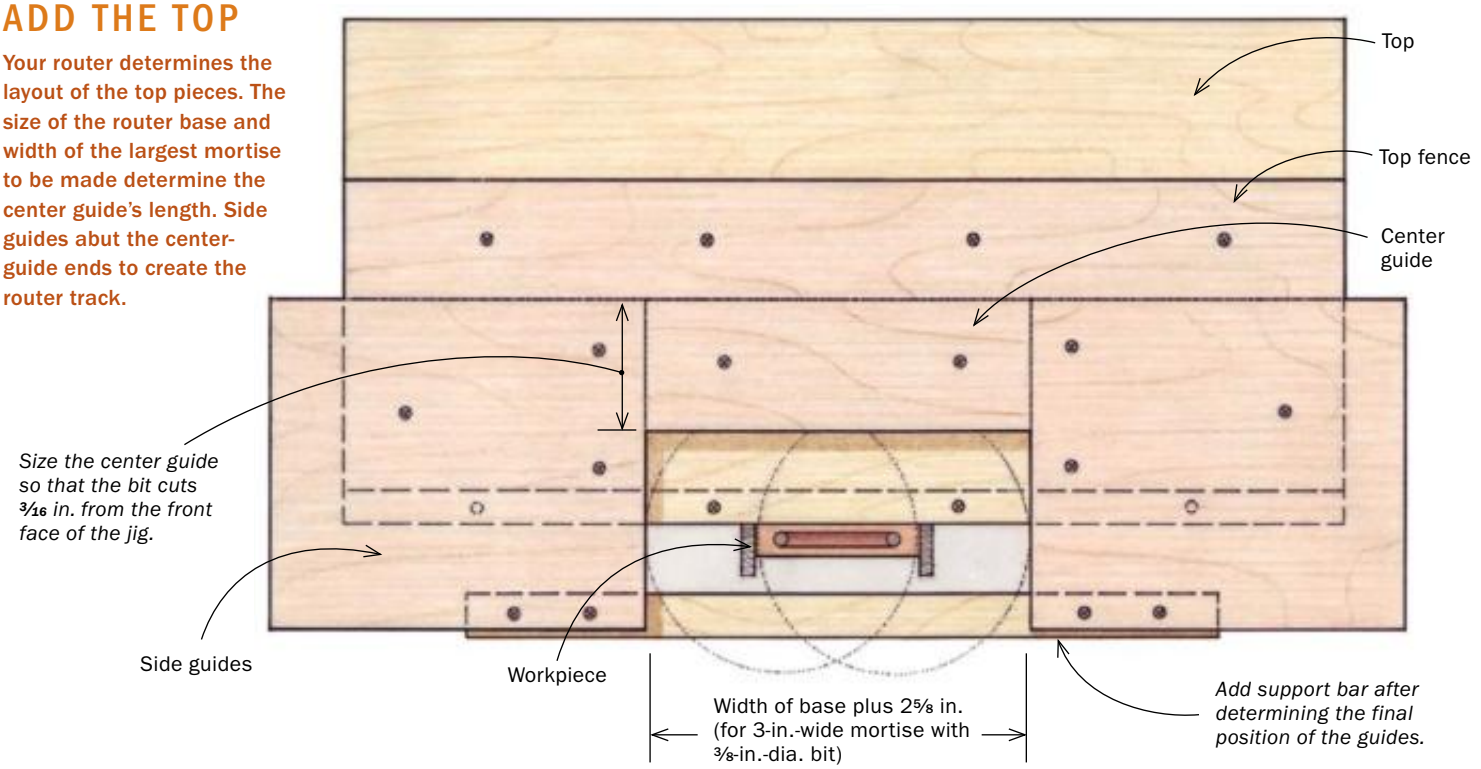
Cut a simple drilling jig from ¾-in. wood or medium-density fiberboard (MDF) long enough to span the drill-press table from left to right. On the jig face, draw two parallel lines perpendicular to the front, separated by the distance between the circle blank's center and an outside bolt hole.

Clamp a fence to the table and place the drilling jig against it, lining up the left-hand line with the drill bit. Drill a ⅜-in. through-hole on the line. Slide the drilling jig to the left and drill a second through-hole on the right-hand line. With the drill bit still in the hole, clamp the drilling jig to the table. Then, raise the bit out of the hole.

Insert a ⅜-in. pivot pin into the left-hand hole, and place the circle blank face-

ADD THE TOP

Your router determines the layout of the top pieces. The size of the router base and width of the largest mortise to be made determine the center guide's length. Side guides abut the center-guide ends to create the router track.



Attach the top. *After cutting the top to size, align its front edge with the front of the faceplate and screw it in place (above). Then attach the top fence parallel to the front edge of the top, leaving room for the center guide.*

Clamp the side guides in place and make a test cut. *With a test rail in place, make a cut to determine if the mortise is centered on the workpiece.*

Adjust the side guides until the mortise is centered. *Slide the parts along the top fence to make small adjustments. When the mortise is centered on the rail, screw the parts in place.*

down on the drilling jig with the pivot pin protruding up through the center hole.

Using an accurate combination square, adjust the blank so that its sides are perpendicular to the front edge of the platform and drill a ⅜-in. hole for one outside bolt. Then rotate the blank 180° and line it up again with the square. Drill the other bolt hole. The two holes will be equidistant from the center.

Without moving the table or the jig, switch back to the ⅝-in. Forstner bit. Turn the blank over and make the outside bolt counterbores on the back of the blank, squaring up for both. The bit's outside edges will come down centered over the ⅜-in. holes.

Finally, using the center hole as a pivot point, cut a circle out of the blank with a bandsaw or router. Repeat the entire process for the second circle.

Attach the circles to the front plate

Next, make the front plate and draw a vertical line, perpendicular to the top edge, down its center. On that line, mark and drill ⅜-in. holes to receive the center bolts of the circles, allowing the circles to be about 1½ in. from the top and centered vertically with their edges ⅛ in. to ¼ in. apart. Make the clamp-access slots on both sides of the front plate (see drawing, facing page). Insert

the ⅜-in. outer bolts through the circles so that they protrude out the front, their heads nestled fully into the back-side counterbores. Then attach the circles to the front plate with ⅜-in. bolts through their center holes. Use flat washers, lock washers, and hand-tightened double nuts to make the circles turn with some resistance. This will enable them to stay tight against the sides of the workpiece and hold it in place for clamping.

To add stability to the jig, I attached front pieces on both sides of the circles. I made them from the circle cutouts so they could be attached to loosely "hug" the diameters.

Test for vertical alignment

Next, make the top faceplate with the half-circle cutout, and screw it in place on the front plate, with both top edges aligned. Square up the end of a 4-in.-wide to 5-in.-wide test rail and place it on the circles with the bolts tight against the sides. Adjust the test rail vertically so its top edge is even with the top of the faceplate and front plate. If they don't align evenly along the entire top edge of the rail, mark and trim the top edge of the faceplate/front plate until they do. Make sure this edge is square in the front-to-back plane as well.

Test the centering

Make the top and use 1½-in. drywall screws to attach it flush with the front. Make the top fence and clamp it to the top, parallel to the front edge. Next, make the center guide against which the plunge router will track. It should be precisely as long as needed to rout the longest mortise you intend to make. And it should be precisely as wide as needed to align the router bit over the center of the thinnest rail to be mortised. My jig is set to cut a centered ⅜-in. mortise in a ¾-in. board.

Place the center guide against the front of the top fence. Center it left-to-right over the circles' vertical axis, parallel to the top's front edge.

Next, make the side guides and clamp them to the top, abutting the center guide on both sides.

Reinsert and clamp the test rail in the closed circles flush with the top. Cut shallow test mortises and keep adjusting the center and side guides until both shoulders are exactly equal. Then screw the guides in place.

Using the jig

1 MORTISE THE END PIECE FIRST

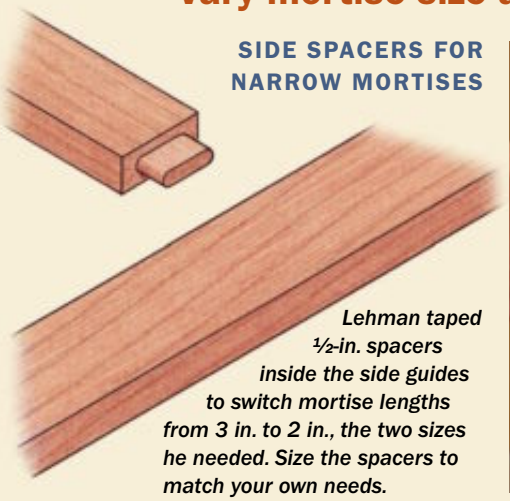
Start by aligning the workpiece securely inside the bolts and clamping it in place. Then with the router firmly against the center guide, start the first cut by plunging approximately ¼ in. as you move the router left to right. Repeat the process in increments until the desired mortise depth is reached.

2 ATTACH A STOP BLOCK AND MORTISE THE MATING PIECE

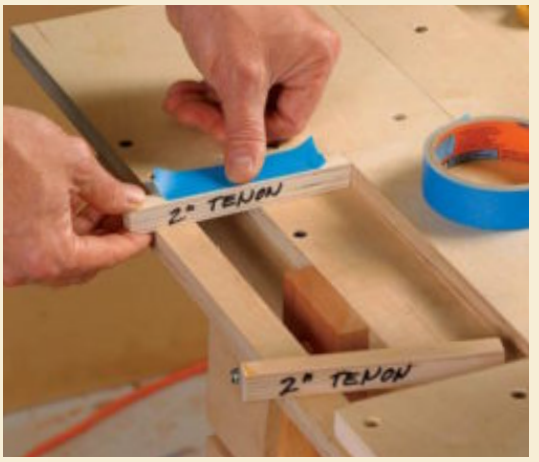
For the matching side mortise, leave the first workpiece in place and clamp a stop block firmly against one of its sides (above). Then align the mating piece by butting it against the stop block (right). Clamp it in place. Now rout the mating mortise.

Vary mortise size and location with spacers

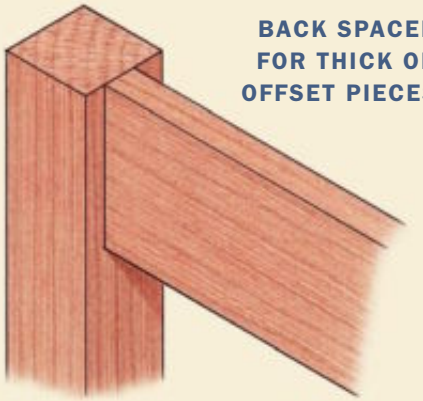
SIDE SPACERS FOR NARROW MORTISES



Lehman taped ½-in. spacers inside the side guides to switch mortise lengths from 3 in. to 2 in., the two sizes he needed. Size the spacers to match your own needs.

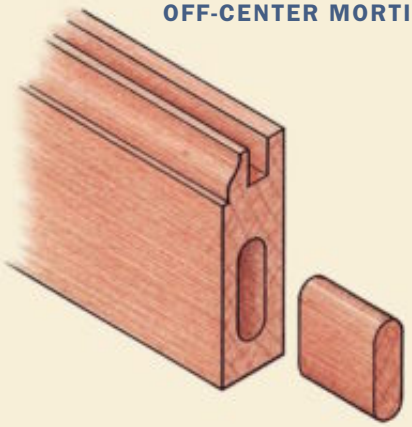


BACK SPACER FOR THICK OR OFFSET PIECES



A thin spacer taped to the front of the center guide gives you several options. You can center a mortise in a thicker workpiece, or make an off-center mortise (for example, as needed for a table apron-to-leg joint.)

WORKPIECE SPACER FOR OFF-CENTER MORTISES



Attaching spacers to one side of a workpiece sets up for an off-center mortise.

Finally, install a support bar under the front edges of the guides, spanning the gap between them. This will provide a front base to keep your router from tipping.

Use the right router and bit

This jig is designed for a plunge router. I use a 3-hp DeWalt with a flat edge on its base that I run along the back fence. If you use a router with a fully circular base, keep the same point against the fence throughout the cut (circular bases aren't always circular or concentric with the bit).

You can use either a straight bit or an up-spiral bit, which will pull the chips out of the mortise. I hook up my router's dust collector for extra chip-clearing.

Do the bulk of the cutting from left to right, so the cutting force keeps the router pressed against the fence. Most router bits won't cut at their very center, so plunge down in ¼-in. increments on each left-to-right stroke, returning to the left without plunging.

Mortises can be centered or off-center

Centered mortises are made by clamping the rail in the circle guides and plunge routing to the desired depth. Make sure to mount matching workpieces consistently, front and back.

For a face frame, rout the mortise in the rail end first. With the rail still in the jig, clamp an end stop in place on either side of the rail. Remove the rail from the jig, and clamp the stile against the stop and flush to the bottom of the wings. Then mortise the stile.

To make off-center rail-end mortises, or to change their length, place appropriately sized shims inside either or both side guides. The same shims are inserted alongside the stop blocks when mortising the matching stiles. A shim inside the center guide sets up for thicker or offset workpieces. I use masking tape to hold the shims in place.

Once the mortises are made, you've come to the final step—making the loose tenons. Cut long pieces of wood slightly thicker than your mortises will accept. Round over their edges, and plane them down to fit snugly into the mortises. Finally, cut them to length. □

David Lehman is an orthodontist and part-time woodworker in Elkhart, Ind.

TOOL TEST

Heavy-Duty Lathes

There are two clear winners in this group of smooth operators

BY ANDY BARNUM

WELL-ROUNDED MACHINES

These full-size lathes let you turn spindles up to 42 in. long and bowls up to 16 in. or 20 in. dia. Hefty headstocks and beefy components control vibration, and variable speed makes them more versatile than older or less-expensive lathes.

FineWoodworking.com

Watch as Andy Barnum puts his two top picks to work.

Interest in wood turning has exploded in the last decade, with artisans producing bowls, vases, and sculpture in every shape and size imaginable. Manufacturers have steadily upgraded their lathes to meet the demands of contemporary turners.

The latest crop of heavy-duty lathes typically comes with electronic speed control, a 16-in. or 20-in. swing (the largest bowl blank the machine can accommodate), a bed measuring 42 in. between centers, plus beefier spindles and the torque needed to turn large workpieces. Prices range from $1,200 to $3,200.

These machines hit the bull's-eye in the world of lathes. Above this class, you get machines sized and priced strictly for the pros; below, you get much less lathe—one with less horsepower, a smaller spindle, or a smaller swing.

These lathes have enough power and capacity to satisfy the bowl-turning enthusiast. At the same time, they probably aren't too beefy or expensive for the woodworker who uses a lathe to make legs, stretchers, and balusters. These lathes are good choices if you're a first-time buyer or are looking to upgrade.

I tested seven lathes, including new models from Nova and Rikon (we outfitted the Nova models and the Powermatic with bed extensions to give them the same capacity as the others). Oneway wasn't represented because it doesn't make a lathe comparable in size and price with the others I tested. Delta wasn't able to provide its 46-755X lathe for testing. All seven models tested served well for spindle turning, but some performed better than others when it came to turning large bowls, platters, and hollow vessels.

Measuring performance

The lathe is a unique woodworking machine. You don't push the workpiece into the path of a spinning bit or blade. Instead, you manipulate a handheld cutting tool as the wood spins, so your skill largely determines the final quality of the work.

However, a lathe that's prone to vibration or that has other drawbacks will frustrate even the most skilled user. For my main trials, I tried to isolate the lathe's performance with the wood turner out

CHANGING SPEED

Dialing it in. *Most of these lathes have an electronic speed control that lets you adjust the speed while the lathe is running. It also permits very low speeds, especially convenient for large turnings.*

Stepping it up. *The Nova 1624-44 has eight speeds, set by shifting the drive belt between pairs of pulleys with the lathe stopped. But for many turners, this is all the speed control they will need.*

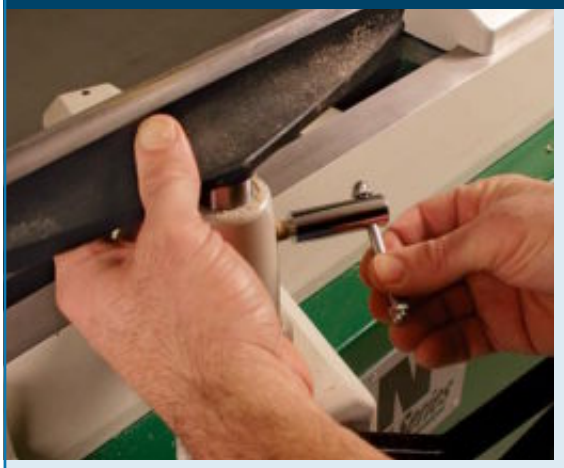
POWERMATIC 3520B

Built like a tank, with the stoutest tailstock and the beefiest tool-rest base, this lathe also has plenty of power. The headstock slides to the far right for outboard turning, where it's used with an optional bed and tool-rest extensions ($400). It comes with a high-quality live center.

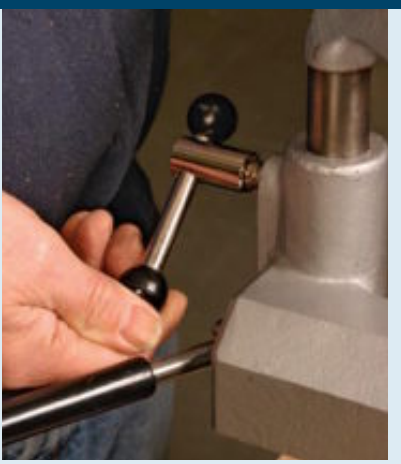
NOVA 1624-44 (AND NOVA DVR-XP)

These two are identical except for the headstock and drive mechanism. The 1624-44 is an excellent basic lathe and the author's choice for best value. The DVR (inset) has an excellent electronic speed control. Both lathes are light and will benefit from having a base with plenty of ballast.

TOOL-REST DIFFERENCES



Skimpy. *The Rikon's tool rest is nicely designed, but it is held in place with a small locking lever that's uncomfortable to hold.*



Comfy. *The two Nova lathes have a substantial locking lever for the tool rest that's easy on the hands.*

Versatile. *The locking lever on the Powermatic and the Jet fits in one of three holes. You can move it to keep it clear of the tools.*

of the picture, using objective tests devised with the help of John White, *Fine Woodworking's* shop manager. Those tests assessed stability, torque, and tool-rest rigidity. I then put myself back in the picture, using each lathe to turn large bowl blanks.

All the lathes are well-machined, with perfectly concentric Morse tapers and headstocks that could be aligned precisely with the tailstocks. And all are quiet. That's important because turners need to listen to the cutting tool to know if it's behaving properly.

Making the lathes walk—I put a large, out-of-balance bowl blank on each lathe, gradually increasing the speed until the machine began rocking. A dial indicator mounted on a separate stand let me measure exact amounts of movement.

The Powermatic and the Rikon moved no more than 0.005 in. until I raised the speed past 500 rpm. That's impressive. It means the lathes won't move when you begin turning a large bowl and take a series of interrupted cuts to make the blank round. As delivered, none of the other lathes could match that. Weighting the less-stable lathes with 200 to 250 lb. of sand helped. The Nova 1624-44, for example, became nearly as stable as the Powermatic.

Most lathes have a shelf on the base to hold sand, or lugs cast into the legs for a ballast shelf. The four-legged Nova base can't accept ballast, but Nova provides plans for a bench that does.

Trying to make them stall—A simple brake-and-lever setup let me measure each lathe's power at 100, 200, and 300 rpm. Ample low-speed power is important when roughing out large bowls or spindles. The Nova DVR, the Powermatic, and the Rikon had no significant speed loss even with the maximum 40 lb. of weight on the brake lever. At the other extreme, the Grizzly could handle only 22 lb. before stopping.

Hammering the tool rest—A well-designed tool rest will stay locked in position, allowing you to make heavy cuts safely when

GENERAL 25-650

This lathe has less real power than others this size. The narrow base hampers stability. The headstock slides and swivels for outboard turning. Although the headstock spindle has 1¼-in. threads, the shaft itself is thinner and prone to flex under heavy loads.

GRIZZLY G0456

Big on the outside, this lathe lacks the guts of other lathes with a 20-in. swing. It has a skinny drive belt and an automatic shutoff that stopped the lathe frequently and annoyingly when turning large bowls. The tool-rest base is too short for large turnings.

Photos: David Heim

turning a bowl. In extreme cases, a shifting tool rest could cause you to lose control of the tool.

I locked the rest tightly, then let a length of ipé on an MDF stand swing freely to strike one end of the rest. The rests on the Nova models and the Grizzly showed no measurable movement; the Jet, Powermatic, and General rests moved ⅛ in. or less. The Rikon's moved ¼ in. It needs a beefier locking lever.

A close look at the headstock

Most lathes have electronic speed control that allows a range of speeds not available with the older stepped-pulley designs.

All but one lathe could run at about 200 rpm and still deliver adequate power to handle a large bowl blank. The Grizzly was the exception. It stalled whenever I took a heavy cut. It has a ½-in.-wide drive belt—more appropriate for a mini-lathe than for one with a 20-in. swing. The others use a ¾-in. or 1-in.-wide belt.

These lathes have a headstock spindle of at least 1¼ in. dia. (It's 1½ in. on the Grizzly.) The fatter spindle adds rigidity, so you can expect less vibration and chatter. That wasn't the case with the General. Although the threaded part of its spindle measures a full 1¼ in., the shaft is only 1 in. dia.

By contrast, the unique Nova DVR integrates the motor and headstock; it has no drive pulleys. This makes for an extremely rigid spindle and very smooth, quiet operation.

Some move for outboard turning—Years ago, nearly all lathes had a fixed headstock, which limited the type and size of work that could be turned. Some lathes could do outboard turning with the work threaded on a spindle at the outside end of the headstock. But that was an awkward arrangement at best.

Many of these lathes have a rotating or sliding headstock, a more practical design for outboard turning. Best in this regard are the two Nova models and the Powermatic. The Nova lathes and the Rikon offer a beefy bolt-on outrigger to hold the tool

OUTBOARD TURNING

A substantial outrigger. *The Nova models come with a hefty, well-made accessory to hold the tool rest for outboard turning.*

Slider. *The Powermatic headstock slides the length of the bed. A bed extension and an accessory for the tool rest give it very useful outboard-turning capability.*

A questionable outrigger. *An extension bar for the General tool rest is designed for outboard turning. But it flexes considerably and is a weak spot.*

JET JWL-1642-EVS-2

A solid performer, the Jet is similar in many ways to its beefier sibling, the Powermatic. It has plenty of power. The headstock slides for outboard turning. The spindle lock is spring-loaded, so it can't be left locked by accident. The Jet comes with a high-quality live center for the tailstock.

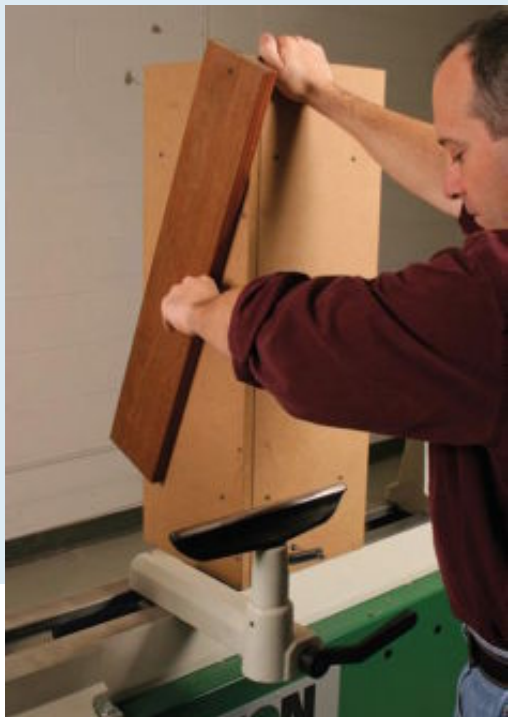
RIKON WOODFAST SERIES 70-500

A strong but expensive performer, it has 20-in. capacity, no shortage of power, and a very stable design. The five-step drive pulley and speed control gives a wide range of speeds. The Rikon has a nicely designed tool rest, but it's mated with an undersize locking lever.

Testing

How stable? *Barnum mounted a large out-of-round blank on each lathe, then stepped up the speed until the lathe began to "walk" across the floor. The best held steady up to 500 rpm; the worst, about 300 rpm.*

How powerful? *A lever pressing against a disk became a brake that let Barnum gauge torque at 100 to 300 rpm. The best hardly slowed even when he piled on 40 lb. The worst stalled under 22 lb.*



How rigid? *In this test, a length of hardwood was allowed to swing, striking one end of each tool rest. Some didn't budge, but the Rikon's tool rest shifted ¼ in.*

MODEL	SOURCE	STREET PRICE	SWING OVER BED
General 25-650	www.general.ca 514-326-1161	$1,770	16 in.
Grizzly G0456	www.grizzly.com 800-523-4777	$1,600	20 in.
Jet JWL-1642-EVS-2	www.jettools.com 800-274-6848	$2,100	16 in.
Nova DVR-XP	www.teknatool.com 866-748-3025	$2,100	16 in.
AUTHOR'S BEST VALUE CHOICE Nova 1624-44	www.teknatool.com 866-748-3025	$1,200	16 in.
AUTHOR'S BEST OVERALL CHOICE Powermatic 3520B	www.powermatic.com 800-274-6848	$3,200	20 in.
Rikon Woodfast Series 70-500	www.rikontools.com 877-884-5167	$3,000	20 in.

rest. To set up the Powermatic for outboard turning, you slide off the tailstock and tool rest, move the headstock down to the tail end of the main bed, and bolt on a bed extension. You reattach the tool rest on the bed extension, using an extension tube to bring the rest to the proper height. It works beautifully.

The General's headstock can be pivoted at an angle to turn bowls larger than 16 in. Trouble is, the extension needed for the tool rest is a very flexible casting. I was reluctant to use it because I was afraid that it would crack if I pushed down too hard.

Taking stock of tool rests

Of all the parts on a lathe, the tool rest probably gets the most rigorous workout. Any shortcomings in tool-rest design will quickly become major points of frustration.

On all these lathes, the tool-rest base slid easily along the bed and locked in place securely. However, the Grizzly's base is too short to use when turning a large-diameter bowl. Although the lathe has a 20-in. swing, the tool rest limits bowls to 14 in. dia.

I also found significant differences in the ergonomics of the locking levers that hold the tool rest in position. The Rikon has a

DISTANCE BETWEEN CENTERS	SPEED RANGE (RPM)	HP/ VOLTAGE	OUTBOARD TURNING	TORQUE	STABILITY	TOOL REST	COMMENTS
43 in.	Variable in three ranges: 0 to 1,100; 0 to 2,000; 0 to 3,750	1.5/220	Yes (headstock slides and swivels)	Good	Fair	Very good	Headstock spindle shaft only 1 in. dia.; flexed under heavy load. Tool-rest extension flexed under heavy load.
43 in.	Continuously variable: 300 to 3,000	2/220	No	Fair	Good	Fair	1½-in.-dia. spindle, but undersize drive belt. Auxiliary disk sander on headstock means you can't use a knockout bar to free drive center. Tool-rest base too short to allow large bowl turning.
42 in.	Variable in two ranges: 0 to 1,200; 0 to 3,200	2/220	Yes (headstock slides)	Excellent	Good	Very good	Tool rest slipped slightly in hammer test.
24 in.	Continuously variable: 100 to 3,500	1.75/120	Yes (headstock swivels)	Excellent	Fair	Excellent	Stability improves to very good when weighted with sand. 20-in. bed extension, $200; stand, $245; outboard tool-rest holder, $270. Street price includes bed extension.
24 in.	Eight-step pulley: 215 to 3,600	1.5/120	Yes (headstock swivels)	Very good	Fair	Excellent	Stability improves to very good when weighted with sand. 20-in. bed extension, $200; stand, $245; outboard tool-rest holder, $270. Street price includes bed extension.
34½ in.	Variable in two ranges: 50 to 1,200; 125 to 3,200	2/220	Yes (headstock slides)	Excellent	Excellent	Very good	Tool rest slipped slightly in hammer test. 18-in. bed extension and tool-rest extension for outboard turning, $400; Street price includes bed extension.
36 in.	Variable in five ranges: 50 to 510; 90 to 910; 170 to 1,740; 290 to 2,900; 390 to 3,890	2/220	Yes (headstock has outboard spindle)	Excellent	Excellent	Good	Tool rest moved more than most in hammer test, has undersize locking lever. Outboard tool-rest holder, $200.

short, skimpy lever with acorn nuts on the ends that dig into your palm. (The tool rest itself was my favorite; it has softened edges and a polished surface.) The Nova models use a thick rod capped with comfortable plastic balls; it was easy on my hands.

Checking the tailstocks

The Jet and the Powermatic have the best live centers—large, plated cones that turn smoothly and are similar to the best aftermarket live centers. The Rikon's live center is nearly as good. All the others have a small but serviceable basic live center.

Quill diameters range from 1 in. on the Grizzly to 1½ in. on the Nova models. As with headstock spindles, a larger tailstock quill means more rigidity and less vibration transmitted to the work. However, even the Grizzly's smaller quill seemed solid enough. Tailstock travel was adequate for all the lathes.

Most of these lathes have a handwheel on the tailstock and a self-ejecting center. As you turn the handwheel counterclockwise, the quill retracts into the tailstock and the center pops free. The Nova models and the Rikon have a hollow quill and use a knockout bar to free the center. Many turners prefer the self-ejecting center. However, the hollow-quill design lets you thread a long auger bit into a turning, for drilling lamp bases and the like.

Two lathes to consider

These lathes easily handle spindle turning and most faceplate work. Most have the size and power needed for large-scale pieces, and using them was a pleasure. However, the Grizzly stalled when turning heavy bowls, and the General needs a beefier spindle to be truly competitive.

The Powermatic 3520B is my choice for best overall. Originally designed with the help of a legendary wood turner, the late Rude Osolnik, the 3520A was a good lathe with a few faults. The 3520B, designed with the help of Ernie Conover, did everything right.

The Nova 1624-44 is the best value at $1,200, which includes a bed extension. Its simple step-pulley design should deliver years of trouble-free operation. The runners-up are the Jet JWL-1642-EVS-2, the Nova DVR, and the Rikon. Both Nova models need plenty of ballast. The Rikon needs a better tool-rest handle. □

Andy Barnum is a wood turner and wood-turning instructor in Carmel, N.Y.

The Art and Craft of Room Screens

The range of uses is exceeded only by the design possibilities

BY JONATHAN BINZEN

Chip-carved panel screen by Craig Vandall Stevens

Shoji door screen by Craig Vandall Stevens

Wenge and papyrus screen by Joe Tracy

Room screens stand in a category of their own. They're not quite furniture, since you don't actively use them and rarely touch them; and they're not quite millwork, since they're freestanding and movable. Their closest cousin is the door, with which they share hinges and a frame-and-panel structure. But you can't slam a folding screen or close one against cold or noise. Lightweight and a little lonely, they are designed simply to stand there and look pretty. With the right screen, though, that's enough to transform the whole flow and feeling of a room.

Screens are particularly useful for dividing space in the large, open-plan rooms of contemporary houses. A screen might be used to carve off an area for a home office, to screen off a passageway or an entry and make a sitting area cozier, or to make a meal more tranquil and intimate by hiding the mess in the kitchen.

With its frame-and-panel format, a screen is essentially a frame waiting to be filled—with striking veneers or solid wood; with light-filtering handmade paper; with works of art on cloth, canvas, or hardboard; or with anything else that you can adhere to a flat substrate. The screens that follow provide a sense of the wide range of materials and formats available to the imaginative screen maker.

I'll also describe the different ways to engineer a screen—single or multi-section, self-standing or with feet—and detail the range of specialist hinges for screens. Building a screen is as straightforward as making a lightweight door, but with lots more ways to display your creativity.

Jonathan Binzen is a freelance author and editor who lives in New Milford, Conn.

Multiple uses for room screens

Although screens traditionally have been used to section off parts of large rooms for dedicated spaces, their two-dimensional aspect makes them a natural for screening a bright window or a cluttered area.

In front of a window. *Translucent screens can block harsh sunlight or increase privacy while still admitting natural light.*

Hiding a work area. *A screen can create an informal home office, giving privacy and hiding computer clutter.*

Screening the kitchen. *This diminutive three-section screen goes in a pass-through window to hide the kitchen from the eating area.*

Photos, except where noted: Joe Tracy; this page (top right): Mark Schofield

Translucent screens

PRECISION-CUT DIVIDERS PROVIDE THE ARTWORK

Taking his cue from traditional Japanese shoji screens, Craig Vandall Stevens, a furniture maker in Sunbury, Ohio, uses softwoods such as cedar, cypress, and white pine for his screens (at left and below). These woods are light both in weight and in color; they also plane beautifully, making the exacting joinery easier to accomplish. To make these curved-gridwork doors, Stevens used one large plank of perfectly clear Eastern white pine, which yielded impeccable uniformity of color and grain throughout the piece.

The gridwork has its own thin frame, to which the interior pieces are joined with half-laps. When the gridwork is fully assembled within its frame, the whole is press-fit into the outer frame. All the joints in the gridwork are half-laps, including those that hold the slender curving vertical members. The curves were created simply by nesting a pair of slender pieces in the same notches at the top and bottom and then separating them at the center rail.

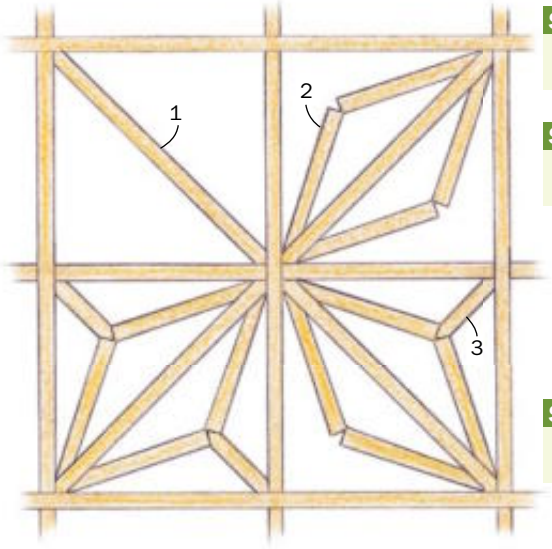
As on most traditional shoji screens, all the parts of the frame and the grid lie in the same plane on the back so that the paper can be applied directly over all of them. For more on making a screen backed with Japanese paper, see Master Class on pp. 96-100.

Translucent patterns. *With clear-paper screens, the design of the dividers provides the artwork. In this case, the thin strips of Eastern white pine are just press-fit together.*

Simple decoration, precise joinery. *The leaf pattern is composed of different sections cut and planed by hand for a precise fit.*

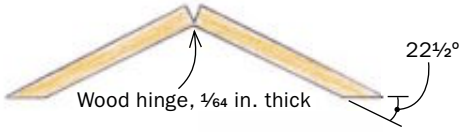
MAKING THE LEAF PATTERN PIECE BY PIECE

It is important that the squares surrounding the leaf pattern are perfectly symmetrical. The leaf parts are cut with a backsaw and the angles are refined with a handplane using shooting boards with different angles.



STEP 1 *Cut and fit the diagonal piece first, with both ends cut at 45°.*

STEP 2 *Cut the second piece at 22½° on both ends, and kerf at the center to within 1/64 in. using a miter box with a depth stop. Place a drop of water on the hinge and wait a few moments before flexing the cut and installing the piece.*



STEP 3 *Cut one end of the last piece at 45°. The angle on the other end will depend on the length of the piece cut in Step 2.*

Photos, this page: Stephen Webster; drawings: John Tetreault

SLIDING SCREENS CAN BE THIN AND LIGHT

Shut out the night. *The tracked screens, illuminated from behind, replace a cold expanse of dark window with a warm, gentle light.*

The south-facing wall of a client's house had an expanse of large windows to take advantage of the view. At the wrong time of day, however, the windows were a wall of glare, and at night they were a cold, black hole. Joe Tracy, a furniture maker in coastal Mount Desert, Maine, solved both problems with a pair of four-panel mahogany and paper screens. When the screens are pulled across the windows during the day, they diffuse the sunlight and present a calm, rippling pattern of slender middle rails. By night, the screens replace the blackness with a sense of enclosure and warmth. Tracy also made a pair of custom floor lamps to stand against the window wall and illuminate the screens from behind at night. Diffused through the rice paper, the lamplight creates a warm, soft glow across the whole row of screens.

To make the wavelike middle rails, Tracy glued up shop-sawn 1/16-in. mahogany veneers between bending forms made from medium-density fiberboard (MDF). He laminated wide pieces of veneer and then ripped them to the rail width after the glue had cured.

Tracy's screens can be pushed completely out of the way and folded up accordion-style. He didn't want them to look too imposing when they were folded, so he made them thinner than his typical standing screens. Each package of four panels is only 4 in. thick when folded.

Tracy could get away with light construction because the screens are suspended and do not have to support their own weight. He hung the screens using sliding-door hardware from Häfele, which included tracks in the ceiling and floor. The screens are suspended from rollers in the upper track and guided by Delrin pins that run in the lower track. The hardware works well, but it's essential to have a consistent ceiling height.

Papyrus screen. *When not in the kitchen pass-through, this screen can be displayed on a table. The panels are made from papyrus adhered to translucent styrene.*

PAPYRUS PROVIDES BOTH TEXTURE AND TRANSLUCENCE

Tracy's wenge and papyrus screen, made to stand on a counter pass-through between a kitchen and a dining room, is only 20 in. tall, but it employs a design that applies just as readily to full-size screens.

He selected papyrus, a paper made from hand-pounded plant fibers, for its color and texture. Used by itself, papyrus would have been difficult to work, so Tracy applied the papyrus to sheets of self-adhesive styrene (www.lampshop.com), a translucent lampshade material that is washable and flexible and can serve as a strengthening substrate for a range of fragile materials.

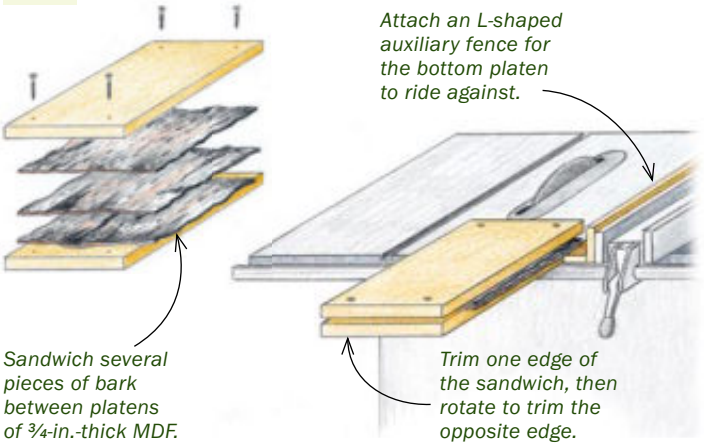
Solid panels display materials and artwork

A BIRCH-BARK SCREEN

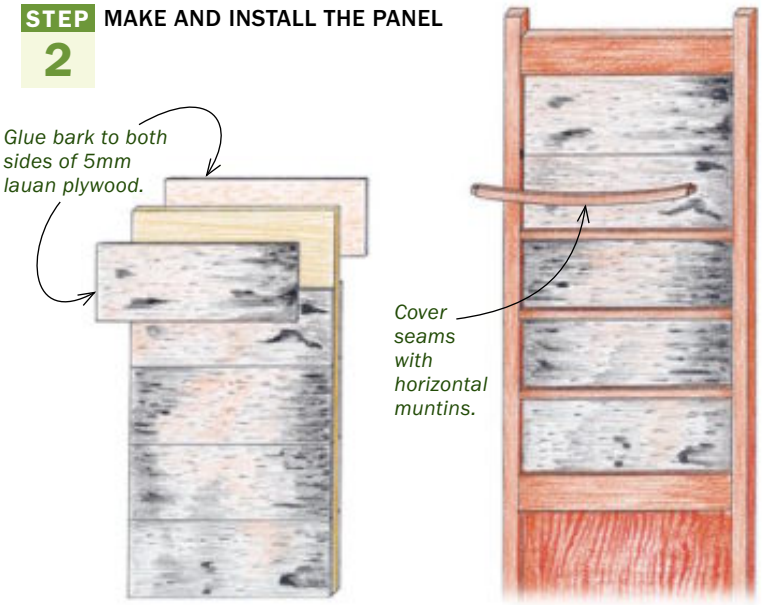
After discovering some stunning curly redwood in Oregon and buying some birch bark from a Native American canoe builder in Ottawa, Tracy found a way to display them both as panels in a mahogany-framed screen.

Working with birch bark is no more difficult than dealing with wavy veneer. If the bark tends to curl, it can be flattened by covering it with a wet cotton towel and pressing it with a hot steam iron. To make the panels, Tracy adhered the birch bark to 5mm lauan plywood using a vacuum press and urethane glue. He glued five pieces of bark to each side of a 5-ft.-long piece of plywood. To keep the pieces in position on the plywood during glue-up, he stapled the bark at the edges; after gluing, he removed the staples. In the veneer press, he glued one side of the panel at a time. When gluing the second side, he protected the downward-facing bark with a piece of foam carpet padding.

STEP 1 TRIM THE BARK TO SIZE



STEP 2 MAKE AND INSTALL THE PANEL



WHERE FURNITURE MEETS FINE ART

Screens offer inviting frames for any sort of artwork, and William Laberge, a Vermont cabinetmaker specializing in Arts and Crafts designs, capitalizes on that by collaborating with painter John Sherman. The canvases are mounted on pieces of ¼-in. Masonite and finished with several coats of polyurethane.

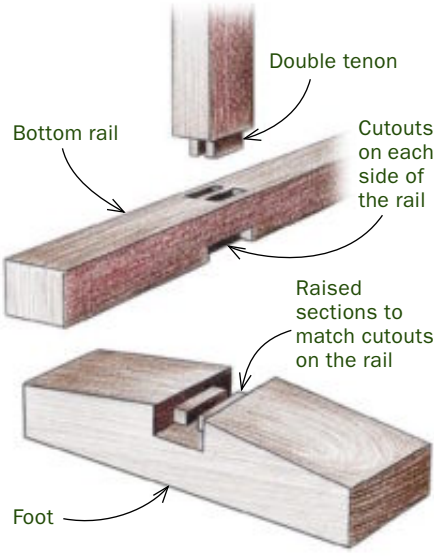
Laberge builds his screens from quartersawn oak and joins the stiles and rails with pinned mortise-and-tenon joints. The solid-oak panels at the base of the screen are captured in a groove, but the painting panels are set in a rabbet and secured with wood stops nailed in place.

Photos, this page (bottom): William Laberge; facing page (top): Stephen Webster

FOOTED SCREEN DISPLAYS CARVINGS

An excellent chip carver, Stevens has made a number of footed screens with solid panels that offer him a broad canvas for carving. Despite their solid appearance, these screens are very light, weighing only about 25 lb. Stevens keeps the weight down by making the solid-wood panels only ¼ in. thick. In this screen, the upper panel is made up of three separate boards that are held in register with splines but expand and contract independently.

Because there are so few elements to the design, sensitive proportioning is paramount. To zero in on the ideal dimensions, Stevens often will build a full-scale mock-up with a pencil sketch of the proposed carving on a large sheet of kraft paper, which is pinned into the frame.



A SPECIAL JOINT FOR A FOOTED SCREEN

Because the stile enters the bottom rail directly above the foot, a special double-purpose joint is required.

Hinges suited to screens

Screen hinges come in two primary types: single acting, which allow adjacent panels to be folded in only one direction; and double acting, which are essentially double-jointed so that adjacent panels can be folded together front to front or back to back.

The advantage of double-acting hinges is that they enable you to set up a screen in a variety of configurations without regard to hinge direction. If you don't need that flexibility, or if the screen will be hung from a track in the ceiling, you will find single-acting hinges perfectly suitable.

SOURCES OF SUPPLY

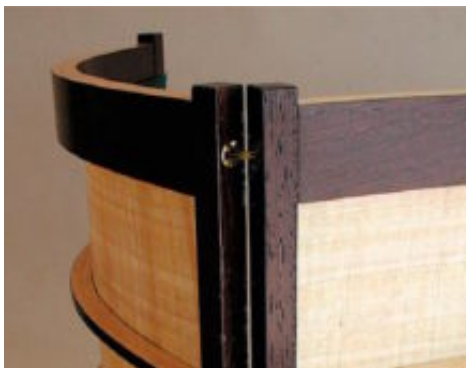
HardwareSource
877-944-6437
www.hardwaresource.com

Whitechapel Ltd.
800-468-5534
www.whitechapel-ltd.com

SINGLE-ACTING HINGES

Sized appropriately, butt hinges of nearly any type intended for doors will serve well on a screen.

Concealed hinges are mortised into the edge of the panels and disappear when adjacent panels are open fully. They range in size from the light-duty barrel type to the medium- and heavy-duty plate type. Soss makes a full line of them.



DOUBLE-ACTING HINGES

Four-screw double-acting hinges are the most common type of screen hinge. Typically made of steel, they come plated in a number of finishes and range in price from $1 to $4 per hinge. Three hinges at each joint should work fine for light screens or those not subject to frequent folding.

Six-screw and ten-screw double-acting hinges stand up to much heavier duty, but come at a big jump in price, typically ranging from $8 to $22 per hinge. William Laberge buys stainless-steel 10-screw hinges from Whitechapel at $19 each. His screens weigh about 120 lb., and he's had trouble with lighter-duty hinges deforming under load.

readers gallery

CHRIS BURTIS
Bath, Maine

While attending the North Bennet Street School in Boston, Burtis chose to make a project that incorporated techniques he wanted to learn—string inlaying, veneering, banding, and French polishing. This reproduction of a Hepplewhite sideboard table is the result. The table (21¼ in. deep by 53 in. wide by 38 in. tall) is made from mahogany, holly, pau ferro, pau amarillo, black-dyed castelo, and poplar.

DON GRAY
San Francisco, Calif.

Gray spent 250 hours designing and mocking up this laminated mahogany chair, and another 200 hours building it. He was inspired by the natural form of forked tree branches and wanted the angles and joints to subtly reflect that image. The chair, finished with Liberon Finishing Oil, is 32 in. deep by 27 in. wide by 47 in. tall.

ED KELLE
Glen Head, N.Y.

This bowl, made from spalted sugar maple, has 10 hours' worth of texturing on the outside and rim and is colored with thin washes of oil paint. Kelle wanted the inside of the bowl (7 in. dia. by 3 in. tall) to contrast with the outer coral appearance, so he left it smooth and finished it with clear lacquer.

Toolmakers wanted

Do you make your own woodworking tools? We want to showcase these shopmade wares in our annual Tools & Shops issue. We'd also like to include photos of restored vintage hand tools and machinery. Send entry forms (available at www.finewoodworking.com) and photos (unaltered digital images, prints with negatives, or slides) to Readers Gallery, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwgallery@taunton.com.

MARK LACKLEY
Woodstock, Vt.

Lackley designed this tiger-maple table (36 in. deep by 84 in. wide by 30 in. tall) and benches (14 in. deep by 84 in. wide by 17 in. tall) to accommodate a family with four children. The challenge was scaling the table and arched feet down to bench size. The finish is lacquer and wax.

PHOTO: LYNN BOHANNON

RICHARD KAUTTO
Lessebo, Sweden

Kautto, a student at Capellagården (the Swedish craft school founded by Carl Malmsten) made this box when he attended the College of the Redwoods as part of an exchange program between the two schools. Kautto felt it was important to make the box from local California woods and to convey the design philosophy of the College of the Redwoods. The claro walnut and madrone box (10 in. deep by 19 in. wide by 11½ in. tall) is finished with shellac.

DAVID BEACH
Leesburg, Va.

Beach reproduced this mahogany bed as a commission. The original was made by the client's grandfather, who trained as a cabinetmaker in Germany and then emigrated to the United States in the early 1900s. Working directly from the original, Beach copied the design and carvings while enlarging the bed from a single to a double. The bed (80 in. deep by 60 in. wide by 56 in. tall) is finished with aniline dye and shellac.

TONY KUBALAK
Eagan, Minn.

The quality, variety, and number of carved elements make this reproduction of a Chippendale side chair the most ambitious project Kubalak has done to date. The knee carving was particularly challenging. The chair (21 in. deep by 23 in. wide by 40½ in. tall) is made of mahogany and upholstered with cotton damask. The finish is aniline and walnut dye, shellac, oil stain, and wax.

CHARLIE GOEDEKE
Laurel, Md.

When designing this media center, Goedeke wanted to blend traditional Japanese design into a contemporary look. The piece (19 in. deep by 57 in. wide by 33 in. tall) is constructed of figured Swiss pear, wenge, and cedar. The panels are Japanese paper. The finish is tung oil and wax.

KEN NEWMAN
Cambridge, Idaho

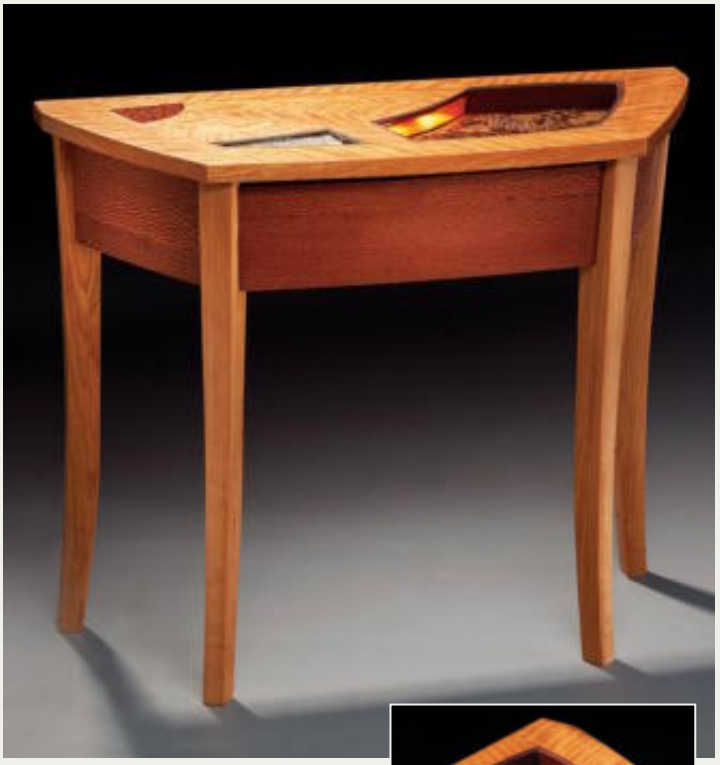
An avid outdoorsman, Newman tried to convey the essence and attitude of a pheasant in its natural environment while sculpting a weathered pine branch he found on a hiking trip in Wyoming. Capturing the bird in typical ground-scratching behavior made this possible. The sculpture (36 in. deep by 22 in. wide by 17 in. tall) sits on a metal base and is finished with tung oil. PHOTO: MEL SCHOCKNER

NEW HAMPSHIRE FURNITURE MASTERS ASSOCIATION

These are a few of the latest pieces from NHFMA, a group of skilled artisans dedicated to educating the public, nurturing emerging artists, and promoting the making of finely crafted furniture. For information, go to www.furnituremasters.org. PHOTOS: BILL TRUSLOW

TIMOTHY COLEMAN
Shelburne, Mass.

Inspired by the way a fall-front secretary works and how useful a simple arrangement of cubbies and drawers can be, Coleman made this secretary from curly English sycamore, walnut, and morado. It measures 15 in. deep by 26 in. wide by 57 in. tall and is finished with shellac.



JEFFREY COOPER
Portsmouth, N.H.

This table (14 in. deep by 35 in. wide by 30 in. tall) is made from lacewood and cherry and is finished with an oil/varnish mix. Cooper incorporated a relief carving and a poem by the 13th-century Chinese master Shen Chou (both set in glass) into the design. An internal light highlights the carving.

TED BLACHLY
Warner, N.H.

Blachly used the understated form of this low trestle table to emphasize the figure in the claro walnut top. He finished the top with varnish. The base is ebonized cherry with lacquer. The table measures 20 in. deep by 45 in. wide by 17¼ in. tall.

Q&A

Put a cyclone outside?

Q: I am building a new woodshop and want to keep the level of machine noise to a minimum. I plan to put my two-stage dust collector outside, but protected from the weather. To improve airflow, I want to run it without a filter, as the dust will not pose a problem in this backwoods environment. Is it OK to run a cyclone unit without a filter?

—MATT MATTICK, Menahga, Minn.

A: A CYCLONE WILL RUN FINE WITHOUT A FILTER, but there are some considerations you may have overlooked. Some woods contain toxins; walnut dust, for example, is highly toxic to horses. Wood dust is also a fire hazard, so you don't want it accumulating around the electrical components of the collector or other possible sources of ignition.

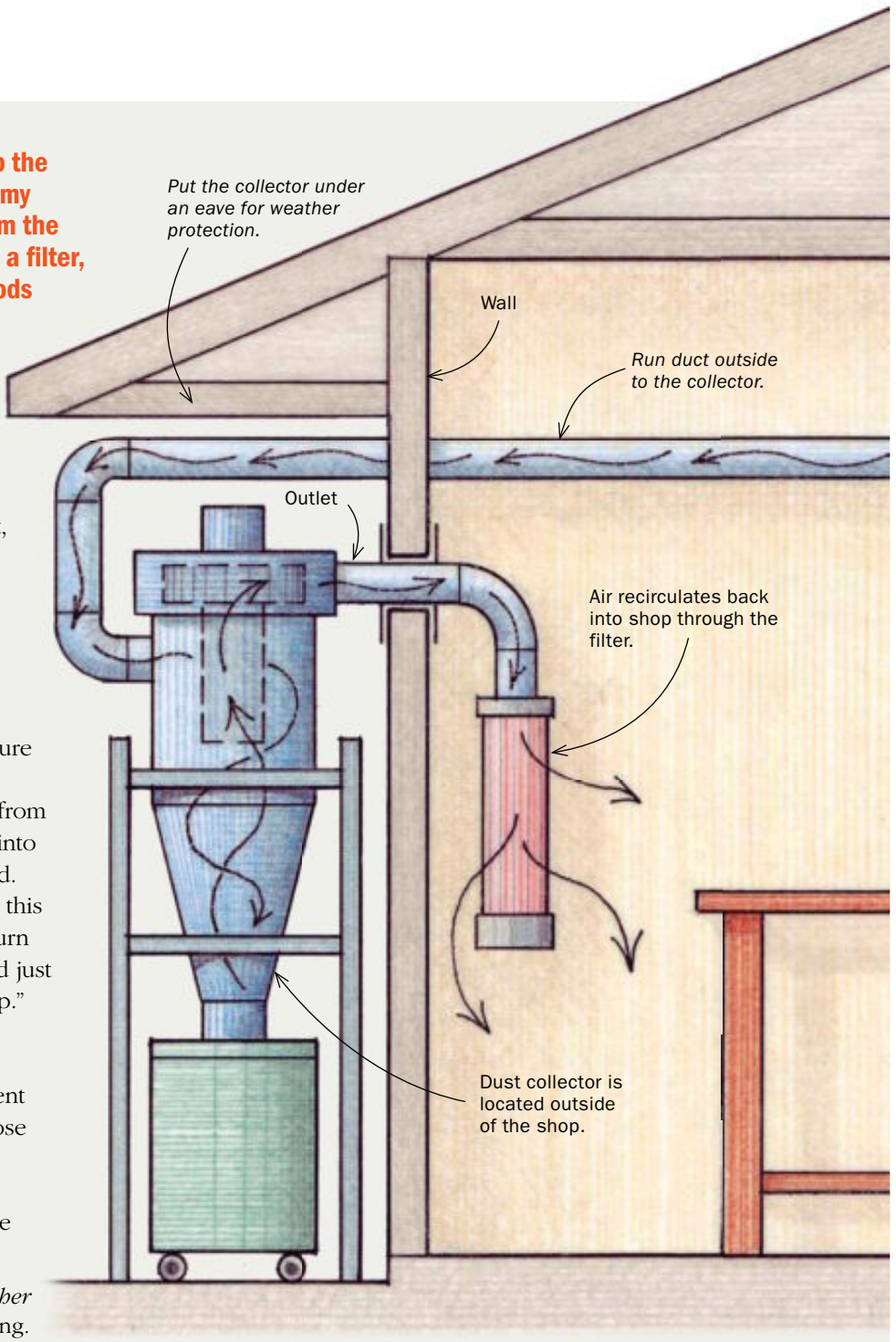
Robert Witter, president of Oneida Air Systems, offers some additional advice:

"The dust collector will draw a slight negative pressure on the building as the air is moved out. Under some circumstances in small or tight spaces, the flue gases from heaters, stoves, or water heaters may be drawn back into the building, creating a carbon monoxide (CO) hazard. Usually the building isn't sealed tight enough to pose this danger, but it is worth thinking about. Installing a return air vent or cracking a window eliminates the risk. And just to be safe, you could buy a CO detector for your shop."

In my view, however, the main consideration is the loss of heated or cooled air from the shop. Living in Minnesota, if it were me, I'd keep the filter on and vent the air back into the shop because I would hate to lose all that heat or air conditioning.

If you decide to forgo the filter, screen the cyclone outlet with wire mesh to keep small critters out of the turbine blades.

—Anatole Burkin is publisher of Fine Woodworking.



RECIRCULATE THE AIR

A cyclone dust collector can work without its filter and vent its exhaust outdoors. But for a heated or air-conditioned workspace, returning the warm or cool air (as shown) through a filter to the shop makes sense.

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.

Drawings: Vince Babak

Hanging a heavy tool cabinet

Will it stay on the wall? *When filled with tools, a wall cabinet can weigh several hundred pounds. The design of the cabinet impacts how well it will stay attached to the wall studs.*

Q: Jan Zoltowski's tool cabinet (*FWW* #188, pp. 40-45) is impressive, but its sheer size raises a question often overlooked in articles featuring wall-mounted cabinets. How do you properly secure something that must weigh over 300 lb. when filled with tools? The article shows the cabinet secured to the wall with French cleats, with at best four screws on each cleat that is mounted to the wall. What size are the screws, and why not use lag screws for something this heavy?

—SKIP KUNST, Cincinnati, Ohio

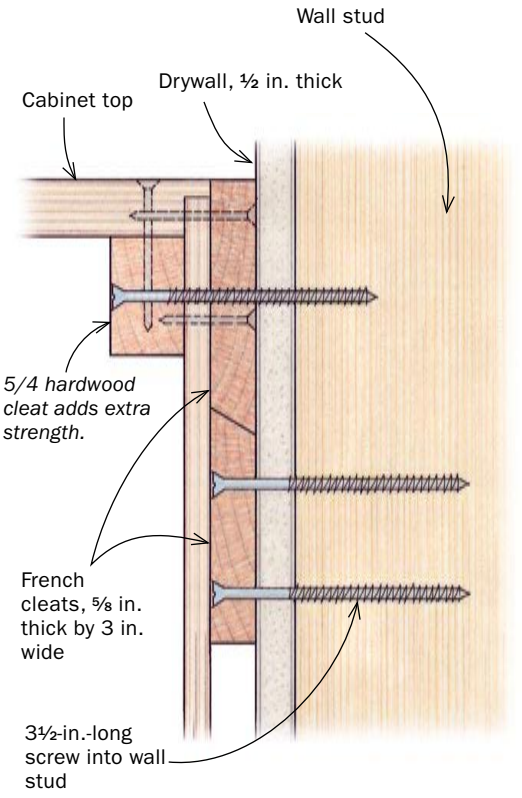
A: I'VE BEEN IN THE CABINET BUSINESS for 36 years and I've never heard of a cabinet falling off a wood stud wall as the result of screw failure.

But I have seen cabinets fall because of their own poor construction, leaving their backs still on the wall.

The screw size depends on the weight the cabinets will carry. Typically, kitchen cabinets are hung with 3½-in. drywall screws, but to be conservative I use 3½-in. #10s. Lag screws are overkill. Two-thirds of the screw should penetrate the stud.

In my opinion, Mr. Zoltowski's cabinet-mounting system is strong enough. But for extra strength, you might add an internal cleat, then screw through it into the wall studs.

—Joel Wheeler owns a cabinetmaking business in Albuquerque, N.M.



A STRONG CONNECTION

To secure a heavy cabinet to a wall, screw a hardwood cleat inside its top corner. Then drive 3½-in. #10 screws through the cleat into the wall studs.

Best glue for bent laminations

Q: I am interested in making bent laminations for furniture. What type of glue should I use?

—GARY HERBER, Langley, B.C., Canada

Which glue is best for laminating? *Michael Fortune uses a variety of glues for his laminations depending on the type of wood, the required open time, and the tolerance for springback.*

A: THERE ISN'T ONE ADHESIVE ideal for every application.

With domestic wood laminations, the simplest and least visible glue is PVA (polyvinyl acetate) yellow glue. Unfortunately, it is not particularly rigid and does not have much open time. Adding a maximum of 8% powdered cornstarch by volume makes the glue more rigid and controls springback. Using a PVA glue like Franklin's Titebond II Extend or Titebond III gives you a longer open time.

A two-part urea/formaldehyde adhesive like Unibond 800 has an open time of 20 minutes. However, you must use a good respirator when mixing it. Powdered formaldehyde glues have similar characteristics to Unibond but are mixed with water.

With oily exotic woods, go with slow-set epoxies. But don't rush. The laminate faces should be scuff-sanded to remove any oxidation immediately before gluing. Carefully measure and thoroughly mix the Industrial Formulators' G2 epoxy (www.leevalley.com), and let it sit for 10 minutes before liberally coating both laminate faces. After 30 minutes, recoat any dry spots, and do the same after 60 and 90 minutes when the epoxy has started to gently gel up. This avoids starved gluelines. Only then, begin assembly.

Epoxy leaves dark gluelines, so it's a poor choice for light-colored woods.

—Michael Fortune designs and builds furniture in Lakefield, Ont., Canada.

Photos, except where noted: Kelly J. Dunton; this page (top left): Mark Schofield

Are link belts a permanent solution?

Q: I've read a lot about the advantages of replacing regular V-belts with link belts, but when calling around to some local distributors, I was warned that using link belts on tools over an extended period could lead to premature failure of equipment. Is this true? Can a link belt be used as a permanent replacement for traditional V-belts?

—KEN KIMBERLEY, Vancouver, B.C., Canada

Two link belts for woodworking machinery. *The Fenner PowerTwist Plus V-Belt (red) is intended as a permanent replacement for a standard V-belt. The orange belt is a temporary belt.*

A: LINK BELTS ARE INTENDED as permanent replacements for V-belts. As a matter of fact, numerous manufacturers install link belts on new equipment. The machines in our shop have been running with link belts for years with no problems.

The distributors you contacted probably were referring to the temporary replacement belts (which also are called link belts) that are used in a pinch until you can find a suitable permanent replacement belt. To avoid confusion, ask for Fenner brand PowerTwist Plus V-belts (www.fennerindustrial.com).

—*John White is the* Fine Woodworking *shop manager.*

These belts are adjustable. *This type of belt can be adapted to a variety of machines by adding or subtracting links to get a proper fit.*

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Working with Japanese paper

BY ROB BROWN

Radically stronger than Western paper, traditional Japanese paper is much like a thin, easily worked piece of cloth made from 100% natural fibers. It has a long tradition in Asia of being used to give furniture texture, color, and individuality, in much the same way that a perfect piece of figured wood is used as part of Western design.

There are three basic ways to incorporate Japanese paper into a piece of furniture. First, it can take the place of a solid panel in frame-and-panel construction. The most common form is the traditional shoji screen, but panels in doors and cabinets of any size can be constructed this way.

Second, the paper can be placed in front of a light source to highlight its texture and color. Uses include lampshades and interior window shutters.

Third, it can be used as a form of marquetry, where different pieces of paper are cut out and adhered to an existing paper panel to create a landscape or geometric design.

The only tools needed are a sharp knife, a straightedge, and some glue.

Design for available paper sizes

There are some general rules when building a piece of furniture that incorporates this paper. Make sure you know the

The world of washi

Traditional Japanese paper has been made for over 1,500 years. Known as washi ("Wa" means Japanese and "shi" means paper), it is primarily made from the inner bark of three plants combined with a liquid to produce a paste-like substance. The paste is evenly spread on a bamboo screen to dry in the sun. This process gives unique characteristics to each square foot of paper. The range of color, texture, translucency, and design means that you can find the right type of paper for any project.

Paper usually used for shoji screens (white to creamy in color and high in strength)

Photos, except where noted: Mark Schofield; this page (left): John Tetreault

The frame should be strong yet delicate

size of the paper you'll be using before you start the project; handmade paper doesn't come in unlimited sizes. If you're covering a large area, wooden dividers must be added to the frame. Known as *kumikos*, they strengthen the frame, give some protection to the paper from errant elbows and chair backs, offer many design possibilities, and give joints in the paper a place to overlap.

Because paper doesn't offer as much support as a wood panel, the frame and its joints must be engineered to provide maximum strength. Also, all four sides of the frame and any dividers must be flush at the back because that is where the paper usually is applied.

Making a standard frame-and-paper panel

Machine the parts for the frame, but don't assemble it. At the same time, mill stock for the dividers. They should be ¾ in. longer than the internal dimensions of the frame, and machined about ⅛ in. narrower than the thickness of the frame to leave a reveal on the front after final assembly. Regarding width, I usually make mine ⅜ in. wide, but variations are fine—different-sized projects will require heavier or lighter-looking dividers.

Before ripping the blank to create individual dividers, go to a router table to cut dadoes for the half-lap joints where the dividers overlap each other. While at the router table, cut the notches in the frame to receive the ends of the dividers. Set the height of the bit to the exact height of the dividers and clamp a stop to produce a ⅜-in.-deep cut. You can either square off the notches to accept the square end of the divider, or machine a 3/16-in. radius onto the ends of the dividers.

Because a precise friction fit is necessary for the half-lap joints and where the dividers meet the frame, use a scrap piece to set the depth on the planer. Leave the thickness of the dividers slightly proud, as they will be sanded to fit before assembly.

Attach the dividers in two installments—Glue the frame, and when it's dry, test-fit the entire grid of dividers. Glue either the horizontal or the vertical dividers (it doesn't matter which), but make sure the half-lap joints are facing the back of the screen. With

Cut the joints first. *It is easier to cut the half-lap joints before ripping the blank into individual dividers.*

Round over the ends. *Use a 3/16-in. roundover bit to profile the ends of the dividers so that they match the notches in the frame.*

Notch the frame. *Set the router-bit height to match the thickness of the dividers and then notch the parts for the frame. A stop block limits the distance of the cut.*

Assemble the frame. *Apply glue sparingly when gluing the dividers together and into the frame.*

comes in rolls about 36 in. wide and between 7 ft. and 50 ft. long. For most other papers, the standard available size is about 2 ft. by 3 ft. Some papers are as small as 3 in. by 10 in., so be sure you have the paper before you design the project. Start looking at www.japanesepaperplace.com/retail/retail_products/shoji_papers. There you will find papers suitable for woodworking projects that have been selected for *Fine Woodworking* readers. If you prefer to see and feel the paper before you buy it, you can check this Web site for a retail outlet near you.

Cut, glue, and shrink the paper

Cut the paper to size. *A long rule and a sharp utility knife are all that is needed to cut the paper.*

Glue on the paper. *Apply a thin coat of rice paste to the back of the frame and dividers. You cover a larger area with small pieces of paper by overlapping joints at a divider.*

a small brush, carefully apply yellow glue to the ends of the dividers and the corresponding notches in the frames. Press the dividers in place and let them dry.

Follow suit with the rest of the dividers, but also add glue to the half-lap joints. Keep the amount of glue to a minimum; you don't need much on these small, accurately machined joints, and squeeze-out may stain the wood and take away from an otherwise fine job. If you do get squeeze-out, let it partially dry and remove it with a sharp chisel.

You don't want to get finish on the paper, so apply finish to the frame and dividers at this point. Alternatively, as with this screen, you can leave the wood in its natural state.

Applying handmade paper—When cutting the paper to size, make sure it extends at least ½ in. onto the frame and almost the whole width of the divider. To size the paper for curved applications, I use scrap paper (newsprint works great) to get the right dimensions, then trace or cut around the paper template.

Scuff any finish on the back of the frame where the paper will be attached to give the glue something to adhere to, but make sure that you damage only the portion that the paper will cover.

Rice paste is the traditional choice because it creates a strong bond between paper and wood and is easy to clean up. It is available from the same sources as the paper. Use a ¼-in.-wide artist's brush to apply a light, even layer—you don't want the paste squeezing out between the frame and the paper. Lay the precut paper on top of the paste and simply press the edges down to create a bond. Don't worry, rice paste acts more like yellow glue than contact cement—you will be able to reposition the paper. But don't try to get it really tight; we'll take care of this later.

The paste has an open time of about five minutes, but if it gets too dry, brush on a bit more to soften it up. With a small piece of paper, you can paste the entire wood contact area at once. With larger pieces, paste one area at a time, but make

Keep the paper parallel. *It is easy to misalign a long piece of paper, so line it up with the frame or a divider before pressing it down.*

No more wrinkles. *After the paste has dried, mist some water onto the front side of the paper. When it dries, it will be as tight as a drum.*

Designing with colored paper

Paper marquetry. *The silhouette of the willow tree was created by applying colored paper to a panel of white paper already stretched onto the frame. The limited amount of rice paste won't make the paper sag.*

sure that a longer piece of paper is aligned properly; you don't want to get to the other end of a long shoji panel and realize it was a couple of degrees off and doesn't line up.

The rice paste will be dry in about an hour, although waiting longer is never a bad idea. On larger panels, the paper will be a little bit baggy. Fill a spray bottle with water and lightly mist the entire surface of the paper from the front of the frame. The paper will immediately expand and wrinkle, but over the next 30–60 minutes in a warm place, it will dry as tight as a drum. Spraying the paper from the front of the frame keeps the moisture away from the paste and doesn't compromise any of its strength. The exception is on an unfinished frame where the water may discolor the wood and sanding away stains would be very difficult on the small pieces. In a case like this, try to get the paper as tight as possible when you paste it.

Repair and renewal are easy

Although the paper is tough, accidents can happen. There are two ways to make repairs. For larger repairs, cut out the damaged panel and replace it with the same type of paper. Obviously, it pays to get a little extra when you buy the paper.

If the damage is small, pull the edges of the tear together to hide the damage as best as possible. You can then cut a piece of complementary paper an inch or so larger than the damage and paste it right over the area. Or you can make a virtue out of necessity and cut a contrasting paper patch in the shape of a chrysanthemum flower or a leaf.

If your décor changes, you can transform the entire look of a piece by replacing all of the paper. Lay the frame on its face and spray water on the paper where it is pasted to the frame. After a few minutes, the paste will soften and the paper can be pulled off. Clean the frame, let it dry, and apply new paper. Try doing that with a wooden panel. □

When accidents happen

Replace major damage. *If the cat decides to sharpen its claws on the paper, cut out the damaged panel from the front.*

An invisible repair. *Apply a new section using the same paper, and the panel will look as good as new.*

Contrasting paper covers the damage. *You can patch a small hole with matching paper, or you can apply a different-colored paper cut into the shape of a leaf or a flower.*

Photo, this page (top right): Rob Brown

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Fine Woodworking 9-180. #72 missing. All excl. condition. $450 OBO plus shipping. Knoxville area. (865) 494-7574 or TennJoeS@aol.com

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Easy finish ages a classic cherry piece

BY DAN FAIA

Like many furniture projects, this porringer-top tea table in cherry (see pp. 60-67) won't be the first piece of furniture in its new home. There is a spot all picked out for it in the living room, between pieces of age-darkened cherry and stained pine.

So my first goal was to tone down the table's bright natural cherry a little to help the new piece blend in.

Cherry's tendency to blotch can make dyeing tricky, but this staining method helps to minimize the problem. For a topcoat afterward, I chose Waterlox Original Satin Finish because it allowed me to build a durable finish quickly, with a minimum of fuss.

Surface preparation is important to all finishes, but especially when dyeing and staining. Coloring wood highlights and magnifies minor imperfections like overlooked glue squeeze-out or small areas of tearout. Glue will absorb less dye and appear lighter than the surrounding wood. Sanding scratches and tearout will do just the opposite.

Begin the process by handplaning to level the surfaces and to remove mill marks. A thorough scraping will refine the surfaces, helping to clean up any tearout. How the wood is scraped will determine the sanding grit to begin with—P180-grit is most likely. To preserve the feeling of hand-worked surfaces on this period reproduction, I sanded only by hand, without using a sanding block.

Even though I seal the surface before applying the water-based dye, I still start by raising the grain. After sanding, slightly dampen the surface with distilled water. If you use tap water, be sure to test it on a piece of scrap first. Some tap water has a high iron content that can stain the wood, leaving black or yellow spots. Allow the wood to dry thoroughly and resand the wood lightly with P220-grit paper. □

1 The first coat is shellac

Sealing the piece with a washcoat of shellac will even out the wood's absorption properties, resulting in a more uniform color throughout the piece.

Whether you're using premixed shellac or flakes, adjust the heavy cut with denatured alcohol until you have roughly a 1-lb. cut.

Apply the shellac with a brush. It will dry quickly, so don't do much reworking as you go. Sand lightly with some used P220-grit paper or 0000 steel wool to level any fuzzy fibers.

Washcoat. *Brush on a thin coat of blond shellac (above). Try to avoid drips and puddling. Level any raised fibers with sandpaper or steel wool (below).*

Photos, except where noted: Tom Goffe; this page (left): John Tetreault

2 The key to applying dye: Keep moving

Water-based aniline dye is easy to mix. I used Homestead Finishing's TransFast dye powder in antique cherry red. Start with a capful (about ½ oz.) of dye powder in a pint of warm water and add small amounts of dye or water to adjust the color. Always test the color on a scrap piece of project lumber that also has been sanded and sealed.

To achieve a uniform color when applying the dye, it's best to be methodical. Brush dye on one element of the project at a time, then mop away the excess with a rag. If the dye puddles or sits too long, it could darken the piece unevenly. You can make the overall color darker by applying further coats. The dye shouldn't raise the grain enough to require any additional sanding, but you can smooth the surface with 0000 steel wool.

Brush on the dye, then mop it off. *Keep a rag handy to wipe away any excess quickly after applying the dye. Any puddling will result in darker areas.*

3 Full-strength varnish builds quickly

I apply Waterlox Original without thinning. It is heavy and flows slowly, but the advantage is that it is self-leveling and leaves very few brush marks. Be sure to use a high-quality brush for fewer stray bristles. Brush on three or four coats (maybe more for porous woods), rubbing out between coats with 0000 steel wool.

If you are nervous about brushing, you can apply the finish with a rag. Ragging requires the product to be thinned. The downside is that this means more coats—and more rubbing out—to achieve the same build of finish.

After the final rubout, apply a coat of paste wax for a uniform sheen and an extra layer of protection. Use a lint-free rag and work on a few sections at a time. If the wax hardens for a long period of time, it will become very labor-intensive to rub out.

Finally, use a clean rag to buff the piece to its final luster.

Unthinned varnish builds a finish quickly. *Apply the varnish with a high-quality brush and count on applying three or four coats. Rub out the surface with steel wool between coats. After a final rubbing out, apply paste wax and buff with a clean rag.*

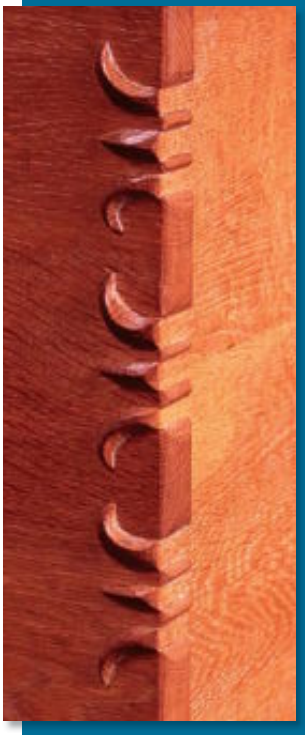
Photos, this page (bottom center and right): Steve Scott

The wizard's secrets

BY JONATHAN BINZEN

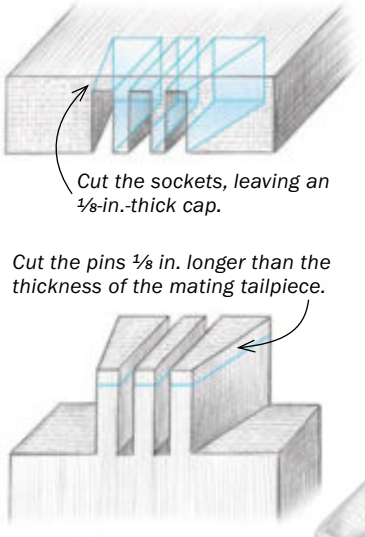
While Kintaro Yazawa often uses exposed joinery on his wide range of furniture and boxes, only occasionally does he invent joints like the ones on the back cover. When he does, they are one of a kind. If he thinks he can improve one of his joints he might make a new version, but replicating one exactly is just drudgery, he says. The Japanese joint that first piqued his interest in mysterious joinery—the double-twisted dovetail—was explained in *FWW* #61 by Alan Peters, who learned it from Yazawa. Now, for the first time, Yazawa himself shares the secrets of two of his perplexing joints. In both cases Yazawa's methods are surprisingly straightforward, and could be adapted to an array of other decorative joints.

HAWK'S NAIL JOINT

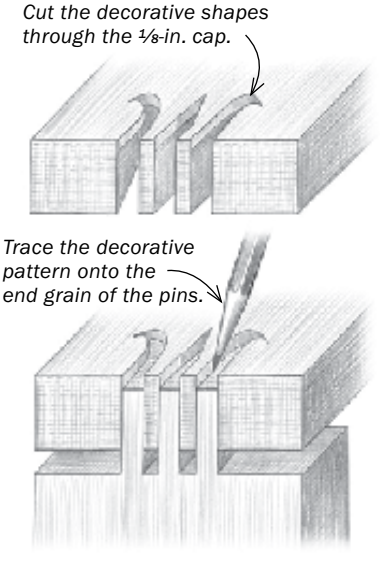


The hawk's-nail joint is a variation on the through-dovetail. The key to this joint as well as to Yazawa's decorative tenons is that he gives a decorative shape to only the last ¼ in. of the pins (or tenons). For most of their length, the pins (or tenons) are essentially traditional in shape.

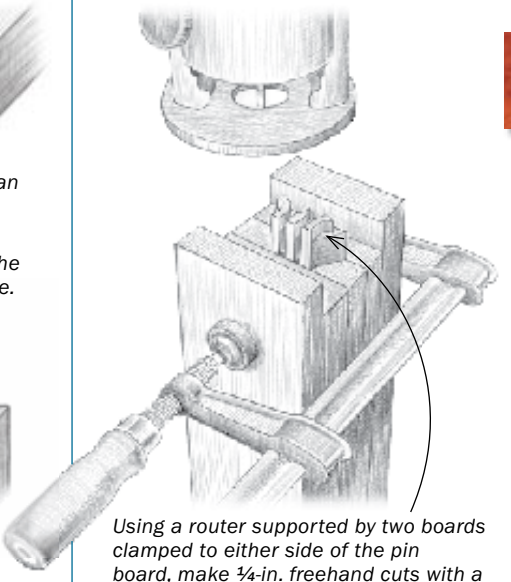
1 CUT THE PINS AND SOCKETS



2 CUT THE HAWK'S NAIL

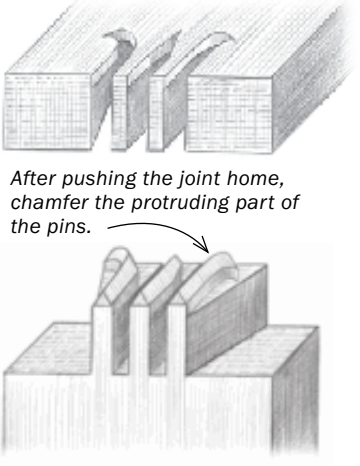


3 ROUT THE END GRAIN



Using a router supported by two boards clamped to either side of the pin board, make ¼-in. freehand cuts with a straight, flat-bottom bit, removing all but the penciled portion of the pins.

4 THE FINISHED JOINT



TALKING TENONS

Silent Listener

Yazawa's most astounding joint, his letter-shaped tenon, functions on the same principle as the hawk's-nail joint. He cuts a mortise, leaving a ⅛-in. cap. Using a router and very small chisels and rifflers, Yazawa cuts the letters through the mortise cap. Next, he inserts the tenon until it stops against the cap and traces the letters onto the end grain. He then removes the waste between the letters with a router.

Photos, top and left: courtesy of Kintaro Yazawa; bottom right and drawings: John Tetreault

Joint Wizardry

Kintaro Yazawa brings a mind-bending flourish to woodworking's most powerful joints. In his hands, dovetail pins morph into hawk's talons or sewing scissors. Finger-joints, sawn micro-thin, form diamond patterns. And the end of a through-tenon can take the shape of letters spelling out a phrase.

In his 20s, Yazawa left a sales career in Osaka and apprenticed to an organ builder in France. On returning to Japan in 1977, he set up shop as a furniture maker and began to teach himself traditional Japanese woodworking. Convinced that joinery was the heart of good furniture, he employed exposed joints on his pieces and called his business Yazawa Joinery Workshop.

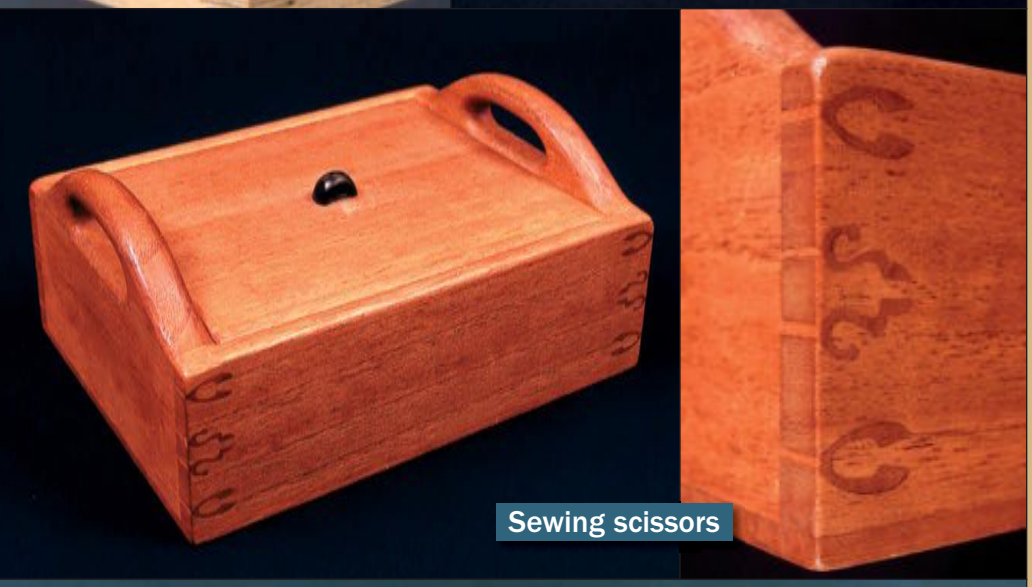
Soon after, an old man visited and said, "Your workshop has a very boastful name!" Showing Yazawa a double-twisted dovetail joint, or *nejiri arigata*, the man defied him to figure out how it was made. When Yazawa did figure it out, a seed was planted. Before long, he was inventing astonishing joints of his own.

See How They Did It, *p. 110, for an inside look at Yazawa's joinery.*

—Jonathan Binzen

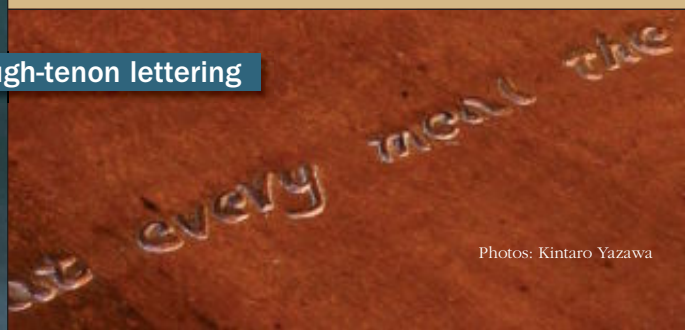
Hawk's nail

Diamond



Sewing scissors

Pro Portfolio: Visit FineWoodworking.com for a narrated slide show of work by Kintaro Yazawa.



Through-tenon lettering

Photos: Kintaro Yazawa