TAUNTON'S

Fine WoodWorking

12 secrets for square glue-ups

Build a hayrake dining table

Ultimate dado jig

All-wood drawer slides

Make your own front door

A finer paint job for fine cabinets

TOOL TEST

Bench grinders

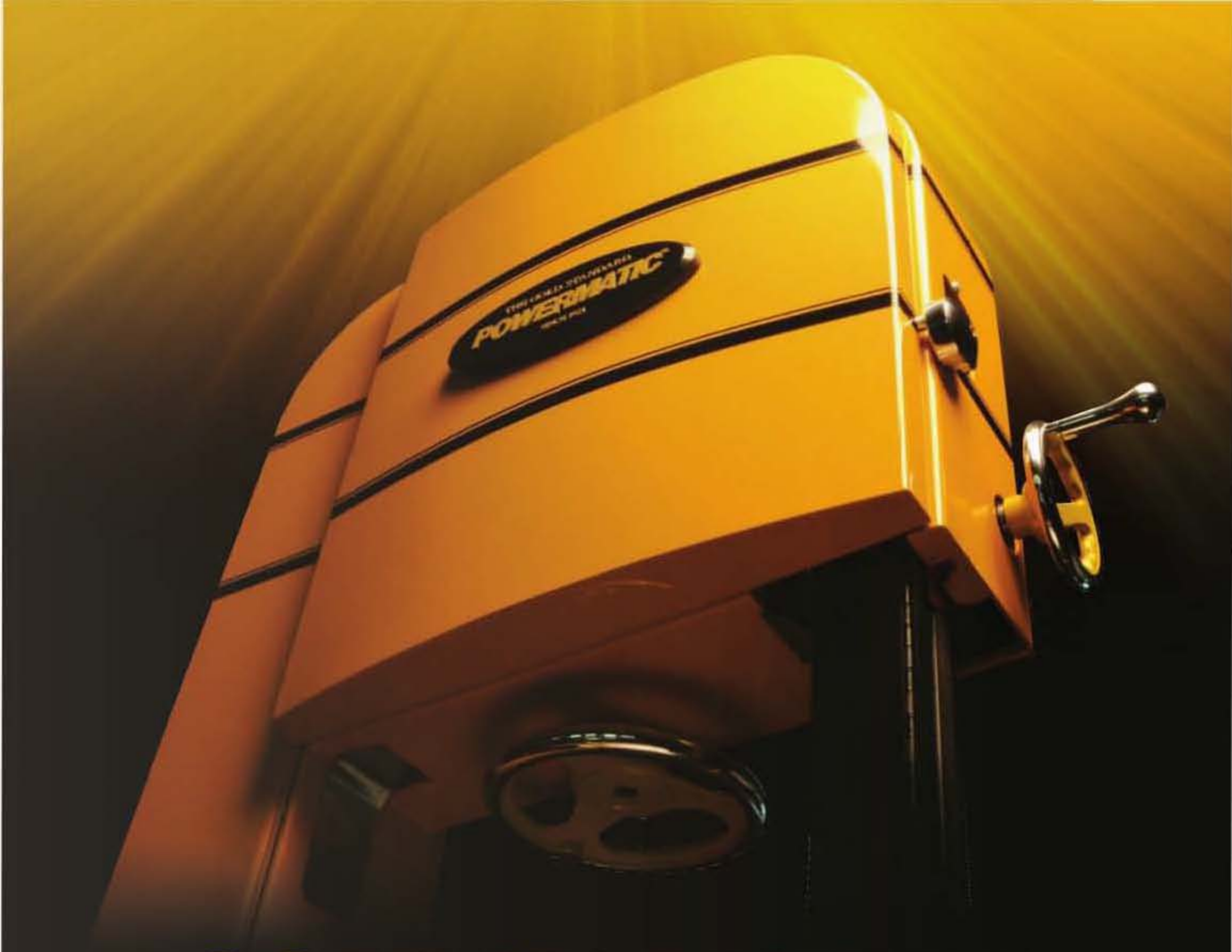
Master the shoulder plane

June 2012 No. 226

U.S. $7.99/Canada $8.99

www.finewoodworking.com

Arts and Crafts classic, p. 34



GOLD HAS NEVER BEEN STRONGER

Bring the Powermatic Dream to life in your shop today. Experience what woodworkers for generations have always known: The best tools make the best cuts, and the best cuts make the best projects. Upgrade to Powermatic today, and build with the best!

TO START UPGRADING YOUR SHOP,
VISIT POWERMATIC.COM TODAY

finewoodworking.com/marketplace | 800-719-6906 x3061

THE GOLD STANDARD
POWERMATIC
SINCE 1921

Fine Woodworking LIVE

Share your passion, hone your skills

AUGUST 2-5, 2012 | NEW PALTZ, NY

ATTENDANCE IS LIMITED

Join us at our first-ever event:

Fine Woodworking LIVE

See the pages of *Fine Woodworking* magazine brought to life before your eyes.

- **Meet the experts** behind the magazine.
- Enjoy **three days** of workshops with *Fine Woodworking's* expert craftsmen.
- Attend **live demonstrations** and workshops on a range of topics.
- Spend time with **fellow woodworkers** sharing experience and knowledge.
- **PLUS:** Nick Offerman, star of NBC's *Parks and Recreation* and a die-hard woodworker, is the featured guest speaker at our Saturday night banquet.

PRESENTERS:

Garrett Hack

Christian Becksvoort

Steve Latta

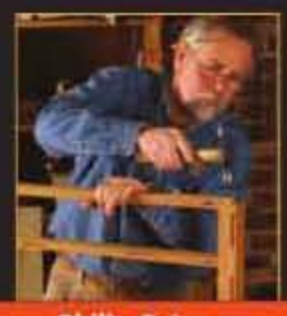
Michael C. Fortune

Matt Kenney

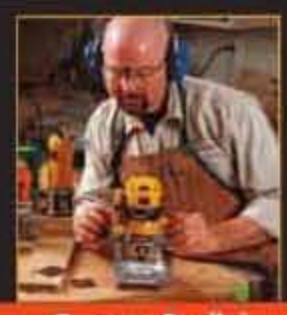
PRESENTERS:

Roland Johnson

Michael Pekovich



Philip C. Lowe



Gregory Paolini

SPECIAL GUEST APPEARANCE
Nick Offerman

ONLY 300 TICKETS AVAILABLE

Register now for this limited-attendance event

SAVE $50
with our early-bird discount.

Go to fwwlive.com/info
or call 877-787-5407

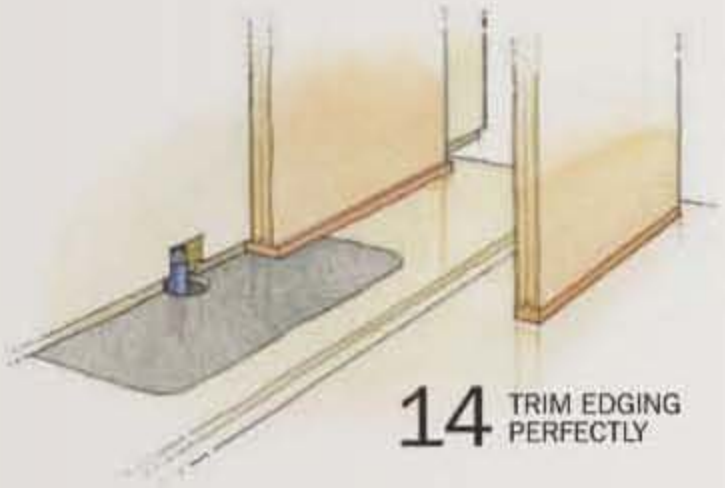
use code M1800175
International customers, call 203-304-3047

Sponsored in part by: Lie-Nielsen TOOLWORKS INC

Fine WoodWorking

MAY/JUNE 2012 ■ ISSUE 226

contents



14 TRIM EDGING PERFECTLY

up front

19 GREAT BENCHTOP ROUTER TABLE

features

Cover photo: Michael Pekovich

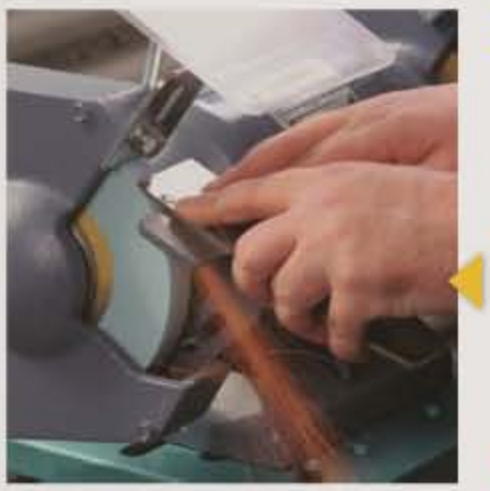
in the back

The Taunton Press
Inspiration for hands-on living®

on the web

THIS MONTH ON FineWoodworking.com/extras

Visit our website to access free web tie-ins, available April 5. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.



VIDEO: Not Your Dad's Dado Jig

Super-simple adjustments, zero-clearance rails, and the ability to work with just about any bit size make this dado jig (pp. 64-69) one for the long haul.

VIDEO: Bench-Grinder Basics

You don't need a high-priced, slow-speed, wet grinder for perfect bevels on your chisels and plane irons. Learn how to use a conventional bench grinder (pp. 42-45) to get the job done, without gouging your wallet.

Masters of the Craft

For over 30 years, John Reed Fox has been building furniture that blends Eastern and Western influences in a style that is distinctly his own. Go beyond the back cover of *Fine Woodworking* magazine in this audio slide show.

Free eLetter

Get free plans, videos, and articles by signing up for our FREE eLetter at FineWoodworking.com/newsletter.

Become an online member

Access nearly 1,000 exclusive project and technique videos by subscribing to FineWoodworking.com. You'll also get more than 35 years of magazine archives at your fingertips, including 1,400-plus articles and project plans.

VIDEO WORKSHOP

In the Arts and Crafts Style

Build a coffee table using techniques from legendary furniture maker Gustav Stickley. In our latest Video Workshop, Gregory Paolini demonstrates a variety of construction techniques, including:

- **laminated legs with figure on all four sides,**
- **straightforward router-cut joinery, and**
- **traditional breadboard ends accented with ebony.**

Fine WoodWorking

Editor	**Asa Christiana**
Art Director	**Michael Pekovich**
Managing Editor	**Mark Schofield**
Senior Editors	**Thomas McKenna** **Matthew Kenney** **Jonathan Binzen**
Associate Editors	**Steve Scott** **Ken St. Onge**
Senior Copy/ Production Editor	**Elizabeth Healy**
Associate Art Directors	**Kelly J. Dunton** **John Tetreault**
Administrative Assistant	**Betsy Engel**
Shop Manager	**William Peck**
Contributing Editors	**Christian Becksvoort** **Garrett Hack** **Roland Johnson** **Steve Latta** **Michael Fortune**
Methods of Work	**Jim Richey**

FineWoodworking.com

Senior Web Producer	**Ed Pirnik**
Web Producer	**Lisa Morgan**

Fine Woodworking: (ISSN: 0361-3453) is published bimonthly, with a special seventh issue in the winter, by The Taunton Press, Inc., Newtown, CT 06470-5506. Telephone 203-426-8171. Periodicals postage paid at Newtown, CT 06470 and at additional mailing offices. GST paid registration #123210981.

Subscription Rates: U.S., $34.95 for one year, $59.95 for two years, $83.95 for three years. Canada, $36.95 for one year, $63.95 for two years, $89.95 for three years (GST included, payable in U.S. funds). Outside the U.S./Canada: $41.95 for one year, $73.95 for two years, $104.95 for three years (payable in U.S. funds). Single copy U.S., $7.99. Single copy Canada, $8.99.

Postmaster: Send address changes to *Fine Woodworking*, The Taunton Press, Inc., 63 S. Main St., PO Box 5506, Newtown, CT 06470-5506.

Canada Post: Return undeliverable Canadian addresses to *Fine Woodworking*, c/o Worldwide Mailers, Inc., 2835 Kew Drive, Windsor, ON N8T 3B7, or email to mnfa@taunton.com.

Printed in the USA

Please Recycle This Magazine
Remove Inserts or Samples Before Recycling

PASSION. QUALITY. POWER.

14 SUV BANDSAW

- Worm Gear Rack & Pinion
- Leveling Feet, Bigger Footprint
- Foot Brake Design w/Micro Switch
- 3HP Leeson Motor 220 Volt 1 Phase

COMPACT SHAPER

- Precision Fence with Micro Adjust
- 4 Speeds with Quick Release
- Wheels Built In, Polygroove Belt
- 3HP 220 Volt 1 Phase

800.234.1976
CALL TODAY FOR A FREE DEMO

finewoodworking.com/marketplace | 800-719-8908 x3083

LAGUNA
WWW.LAGUNATOOLS.COM

contributors

Josh Finn (*"Build Your Own Front Door"*) caught the woodworking bug early from his father, a wood and stone sculptor, and he's been doing it professionally for 16 years now at his shop in High Falls, N.Y. He's still passionate about the craft because he keeps encountering new challenges and learning new skills. Finn also gets a charge out of designing and building things that will last and be enjoyed for generations. In addition to furniture and millwork, he enjoys building longbows and boats.
Something you love about your shop? "The possibilities, that it's a place to be creative."
Favorite tool? "My tape measure."

Kent Shepherd (*"Dado Jig Is a Cut Above"*) grew up working in his father's shutter company. After the company expanded into raised-panel cabinet doors, the two operations were eventually divided, and Kent took over the door shop, which he still owns. He later opened a woodworking tool and supply store in Lubbock, Texas. Shepherd also has built custom furniture, and even a few new homes, doing the trim and cabinets himself. His passion now is custom boxes, including jewelry and keepsake boxes, and humidors.
If you weren't a woodworker ... "I might make a living!"

Alan Turner (*"Speed Up Your Work with Spacer Blocks"*) learned woodworking from his father (he was the "take-off" man on the tablesaw at age 6). Now mostly retired as a lawyer, he teaches at the Philadelphia Furniture Workshop (philadelphiafurnitureworkshop.com), which he founded in 2006 to provide woodworking instruction to all skill levels. He finds time to write a bit and take on the occasional furniture commission.
Something you love about your shop? "There's plenty of room, but all my hand tools are within easy reach."

An interest in woodworking took a lucky turn when **Will Neptune** (*Master Class*) signed up for summer classes at Boston University's Program in Artisanry in the late 1970s and a shop assistant told him about North Bennet Street School. Attending the two-year program at that fabled furniture-making school was his start in full-time woodworking. It's the problem-solving that keeps custom work interesting, he says. "You never know what the next job will bring."
Strangest thing you've made recently? "A decoding device prop for the film, *The Albino Code*, which is a parody of *The DaVinci Code*."

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

We are a reader-written magazine. To learn how to propose an article, go to FineWoodworking.com/submissions.

Fine WoodWorking

Advertising Senior Vice President	Stephen Giannetti sgiannettI@taunton.com
Advertising Director	Peter Badeau 203-304-3572 pbadeau@taunton.com
Senior National Account Manager	Linda Abbett 203-304-3538 labbett@taunton.com
Associate Account Manager	Kali Lepak 203-304-3530 klepak@taunton.com
Advertising Sales Assistant	Diana Mackey
Director, Corporate Marketing	Kristen Lacey
Senior Advertising Marketing and Operations Manager	Karen Lutjen
Assistant Advertising Marketing Manager	Kandace Doyle
Advertising Marketing Associate	Jesse Rosenschein
Member Audit Bureau of Circulation	The Audit Bureau
Senior Consumer Marketing Director	Beth Reynolds, ProCirc
Digital Marketing Director	Sara Ezrin Larsen
Senior Consumer Marketing Manager	Melissa Robinson
Director, eCommerce	Michael Stoltz

The Taunton Press
Inspiration for hands-on living®
Independent publishers since 1975
Founders, Paul & Jan Roman

President	Suzanne Roman
EVP & CFO	Timothy Rahr
SVP, Creative	Susan Edelman
SVP, Advertising	Stephen Giannetti
SVP, Operations	Thomas Luxeder
SVP, Taunton Interactive	Jason Revzon
VP, Editorial Director	Anatole Burkin
VP, Editorial Director	Maria Taylor
VP, Single Copy Sales	Jay Annis
VP, Consumer Marketing	Nancy Hallberg
VP & Controller	Wayne Reynolds
VP, Finance	Kathy Worth
VP, Human Resources	Carol Marotti
VP, Fulfillment	Patricia Williamson

Publishers of magazines, books, videos, and online
Fine Woodworking · Fine Homebuilding
Threads · Fine Gardening · Fine Cooking
www.taunton.com

letters

From the Editor

HAND VS. POWER? NO CONTEST

Some see hand tools and power tools as two schools, or two religions, or as a pure thing and a polluted thing, and so on. I'm in the school that sees them all as tools. Not so many tiny idols, each with its own shrine dug into my shop wall. Just tools, each born to do a specific job well.

Like most woodworkers, my main motivation is to build things, as flawlessly and as efficiently as possible. As I get smarter and more skillful, I get more done, get better results, and enjoy this craft more and more. That's my definition of mastery, and I use every tool at my disposal, plugged in or not.

Perfect slices. *The bandsaw resaws quickly and smoothly, with very little waste.*

Other than noise, I don't see a meaningful difference between the physics of my No. 4 bench plane and my bandsaw. I've learned to tune the chipbreaker and sharpen the blade of the former, and tune the wheels and guides for amazing results on the latter. After that, both offer a similar symphony of reference surfaces and controlled cutting action.

Both also require finely tuned muscle knowledge and considerable finesse. With the bench plane, I've learned how to position my body, transition the pressure from the toe to the heel, and skew the plane's body on tough grain. With the bandsaw, I've learned to apply gentle side pressure for smoother curves, pivoting off the back of the blade to keep it on track. (Try it, you'll be amazed.)

Each tool has earned its place in my shop. There is simply no better or faster way to prep milled surfaces for finishing than my No. 4. Unlike a power sander, it creates a dead-flat surface that makes a finish seem world-class, and it works much more quickly. On the bandsaw, I rough out stock, cut curves, and resaw.

Technology has marched on since the 18th-century apogee of period work, but let's not forget that those guys were using the best tools available at the time. If the old masters had access to a jointer, do you think they would have surfaced rough lumber by hand? Or turned their backs on a mortiser? Am I not walking in their footsteps?

If you get your woodworking bliss from using exactly what Chippendale, Goddard, and Townsend used, go for it. I get the romance. But if you are in this game to build things, you'll do it faster and better by seeing tools as tools, each one as hallowed as the next.

—Asa Christiana

Surface prep. *My No. 4 removes milling marks instantly, leaving behind a dead-flat surface.*

New tablesaw rules for pro shops only?

One of the arguments against the government mandating SawStop blade-braking technology is its cost. A reasonable compromise would be that one-person production shops and hobbyists could continue to use whatever equipment they choose. But if we can afford to hire employees, we can also afford to give them the safest equipment. I think we should have to. Apparently that jury did, too [in the recent Massachusetts decision favoring a contractor seriously injured on a job-site tablesaw].

—ROBERT PIRMANTGEN, New Bloomfield, Mo.

Thomas McKenna's article on the tablesaw safety controversy (*FWW* #224) was a fine piece of journalism: thorough, informative, well-written, objective, and dispassionate. If McKenna has any personal opinions in the matter—and it is hard to imagine he has not—he kept them entirely to himself. As one who spent his working life as a reporter and editor on daily newspapers, I would give McKenna and his editors at *FWW* an A+.

Now, *my* personal opinion: It was a miscarriage of justice to punish Ryobi (or its corporate avatar) when clearly the tort was committed by [injured contractor] Carlos Osorio's employer for failing to instruct him adequately and impose strict rules on the use of a tablesaw. Enforcing workplace safety is not impossible. At every newspaper where I've worked, the urge to ride on the conveyor belt leading to the loading dock, though very tempting because it would save steps and looked like fun, was a firing offense. In 50 years in the newspaper game I never saw anyone riding the belt; they preferred to keep their jobs.

—E.F. PORTER, St. Louis, Mo.

Low-quality Chinese plywood

In "Plywood for Woodworkers" (Fundamentals, *FWW* #225), the most serious issue in obtaining plywood nowadays was not mentioned: the influx of Chinese product. Within a 100-mile radius of San Antonio, I am now unable to find any source of ¼-in. hardwood plywood that is not Chinese. While the product is less expensive, I have found

Fine WoodWorking

To contact us:
Fine Woodworking
The Taunton Press
63 South Main Street
PO Box 5506
Newtown, CT 06470-5506
Tel: 203-426-8171

Send an email:
fw@taunton.com

Visit:
www.finewoodworking.com

To submit an article proposal:
Write to *Fine Woodworking* at the address above or
Call: 800-309-8955
Fax: 203-270-6753
Email: fw@taunton.com

To subscribe or place an order:
Visit www.finewoodworking.com/fworder
or call: 800-888-8286
9am-9pm ET Mon-Fri;
9am-5pm ET Sat

To find out about *Fine Woodworking* products:
Visit www.finewoodworking.com/products

To get help with online member services:
Visit www.finewoodworking.com/customerservice

To find answers to frequently asked questions:
Visit www.finewoodworking.com/FAQs

To contact *Fine Woodworking* customer service:
Email us at support@customerservice.taunton.com

To speak directly to a customer service professional:
Call 800-477-8727 9am-5pm ET Mon-Fri

To sell *Fine Woodworking* in your store:
Call us toll-free at 866-452-5179, or
email us at tradecs@taunton.com

To advertise in *Fine Woodworking*:
Call 800-309-8954, or
email us at fwads@taunton.com

Mailing list:
We make a portion of our mailing list available to reputable firms. If you would prefer that we not include your name, please visit:
www.finewoodworking.com/privacy
or call: 800-477-8727 9am-5pm ET Mon-Fri

For employment information:
Visit careers.taunton.com

The Taunton guarantee:
If at any time you're not completely satisfied with *Fine Woodworking*, you can cancel your subscription and receive a full and immediate refund of the entire subscription price. No questions asked.

it to be of uniformly poor quality. The most recent example is some plywood I purchased that has a veneer layer about as thick as a sheet of paper and is oversanded along the edges, making it almost transparent there. The internal layers are full of voids, and even the "good" side has badly filled knots. Often the sheets warp so badly once out of the shipping stack that they are unusable. They must be using green wood for filler layers: I have seen ¾-in. birch sheets that look like lasagna noodles. Yet it is sold as "Baltic birch."

—JAMES CAMERON, Medina, Texas

Dangerous bevel cut in *FWW* #225?

In "Build a Curved-Front Desk" (*FWW* #225), a photo on p. 54 shows a bevel being ripped on a leg with the blade tilted inward toward the fence. This can be dangerous. If the workpiece lifts, it can jam between the blade and the fence and be shot backward with lots of force. Also, any lifting cuts into the workpiece, not the scrap, affecting the quality of cut.

Set the fence on the other side of the blade, leaving a wider opening at the top edge of the workpiece.

—JOHN BURRITT, Oriental, N.C.

Editor replies: *The author agrees. It takes a bit of extra work with his style of fence, but he says he often does place it to the left side of his right-tilting blade to make these types of cuts.*

Trapped workpiece. *With the blade tilted toward the fence, the workpiece can jam and shoot backward if allowed to lift slightly.*

Woodworking for mental health

I am 64 years old and started carving about 10 years ago as a form of anger management. Rather than employ a shrink, my husband thought it cheaper and wiser to provide me with an 8-ft. pole, an angle grinder, a Dremel with carbide bits, and a grinder. When a woman feels disempowered, a wise man provides her with power tools.

The pine poles I use (see photo at right) are smoke-damaged survivors of the Prescott "Indian Fire," which destroyed five homes and 1,365 acres of vegetation. I used them mostly to express my love of the cultures of the Southwest Indians and of Arizona in general. I've killed several Dremel tools in my quest, but it is still much cheaper than a psychiatrist. And it released my anger: My "Viking Pole" starts with Odin and dragons and transcends to feathers and the sea. I paint the poles with colors made from natural minerals and plants, and used by the Hopi on their Kachina dolls. I then seal them with several coats of Man-O-War clear varnish.

—JERI YOUNGREN, Prescott, Ariz.

Pull a honing jig?

I use the Veritas honing guide that Asa Christiana recommends (Handwork, *FWW* #225), however, I turn it around so the blade is held down with my thumbs. This makes it more stable so the blade doesn't accidentally gouge the honing surface.

—JANET YANG, Ridgewood, N.J.

Asa Christiana replies: *I don't think side-to-side stability is the main cause of gouging on waterstones. Bear in mind that some people prefer a cambered roller on the Veritas guide. Try moving the blade backward, no matter how you are holding it, for the first couple of strokes. This will safely establish the tiny flat at the tip (the beginning of the honed bevel), and should prevent the blade from digging in as you begin to roll the guide back and forth.*

Wood therapy. *Turning poles into art brought Jeri Youngren a healthier state of mind.*

Cyclone dust collectors

Do you plan to review cyclone/multi-stage dust collectors in the near future?

—KEVIN HEIN, Bellevue, Wash.

Editor replies: *We've considered it, but we haven't done so for one main reason. In our research for "A Revolution in Dust Collection" (*FWW *#223), we found that cyclone collectors were indeed superior to other types in terms of efficiency and airflow, but that the main difference between the various cyclones on the market is filtration. So if you're shopping for a cyclone, simply look for one that has a HEPA-level filter on it, certified by a third party. After that it is mostly power and convenience features that separate them.*

Clarification: Add-on riving knives

In a recent Q&A (*FWW* #223), machine expert John White noted that accessory riving-knife systems are not available for American-style tablesaws. That's not quite true. General (www.general.ca) sells riving-knife accessory kits for a couple of its older-model tablesaws made in Canada, the No. 350 saw, and the 650. A kit will run you around $600, and requires a pretty major rebuild of the machine. We also know of one other riving knife add-on, the Bork system. However, you'll need to sign a waiver before purchasing that item. That fact, and the overall design of the system, gives us pause.

About your safety

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

methods of work

EDITED AND DRAWN BY JIM RICHEY

Best Tip

Trim edging dead-flush every time

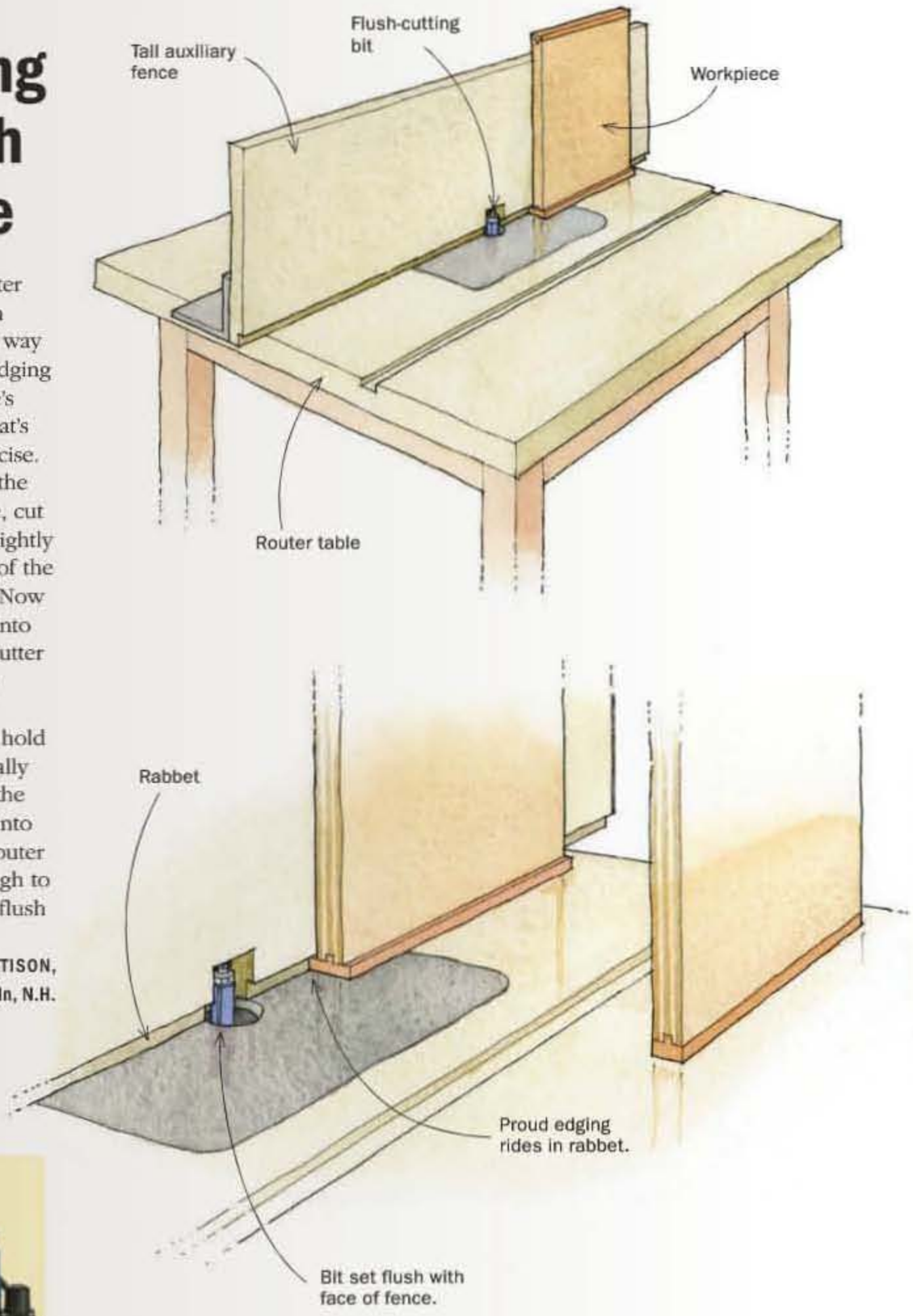
Roland Mattison began woodworking as a hobby while working as a developer of computer-aided engineering software. Now retired, he designs and builds furniture for family as well as commissioned pieces. He says that with a passion for woodworking, you always have a project to keep your hands and mind busy.

Balancing a handheld router on a workpiece edge is an awkward and error-prone way to flush-trim solid-wood edging on a plywood panel. Here's a router-table approach that's faster, safer, and more precise.

The setup is simple: At the base of an auxiliary fence, cut a shallow rabbet that is slightly wider than the thickness of the edging you want to trim. Now chuck a flush-cutting bit into the router and align the cutter flush with the face of the auxiliary fence.

To make the cut, firmly hold the plywood panel vertically against the fence so that the excess edging fits neatly into the rabbet. Turn on the router and push the panel through to trim the edging perfectly flush with the panel.

—ROLAND MATTISON,
Lincoln, N.H.



A Reward for the Best Tip

Send your original tips to fwmow@taunton.com or to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470. We pay $100 for a published tip with illustrations; $50 for one without. The prize for this issue's best tip is a Bosch combination router kit.

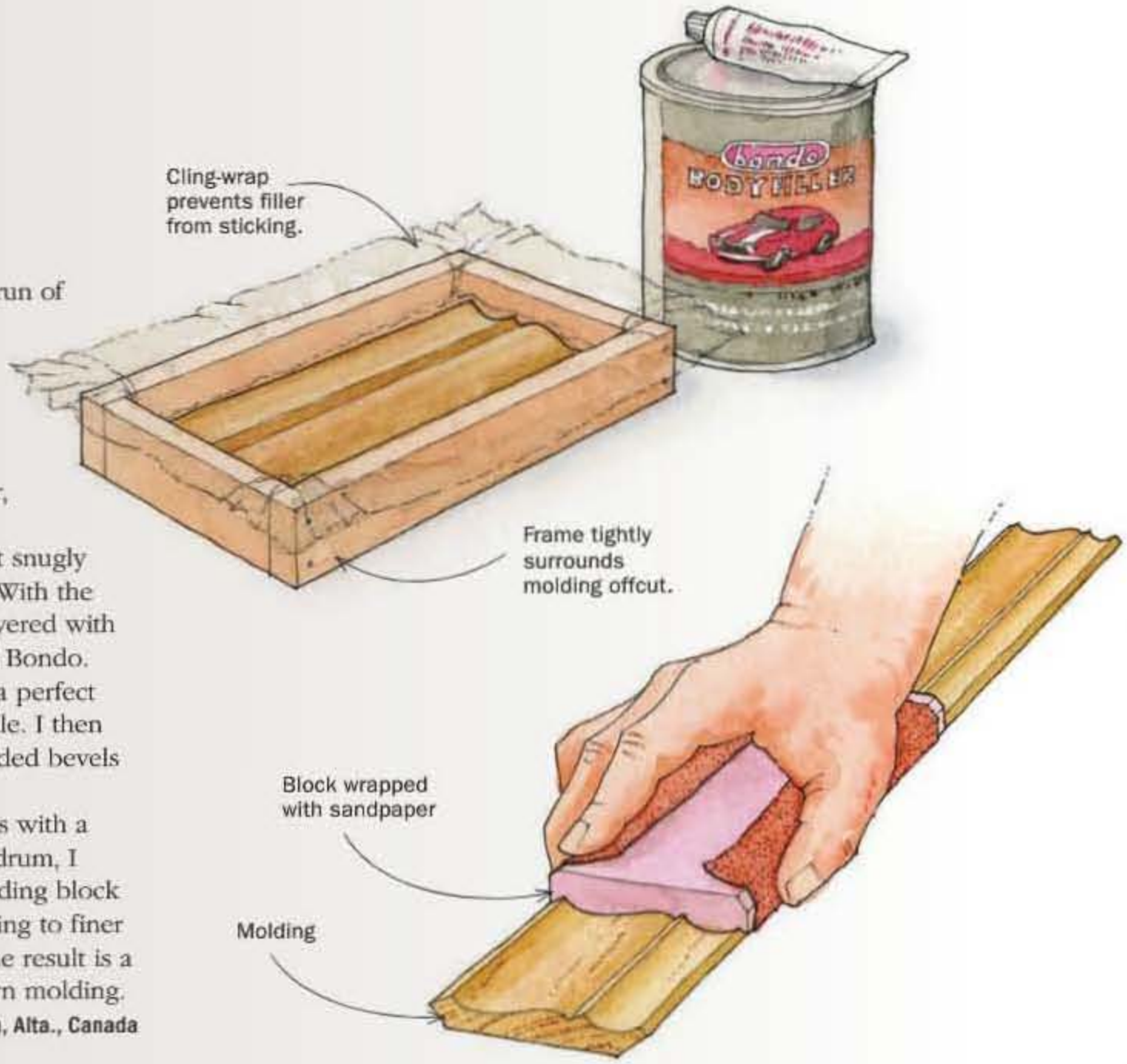
For a sanding block that fits perfectly, use auto-body filler

A recent job called for me to mill a short run of custom molding to match an existing profile. I roughed out the profile on the tablesaw, but needed a way to refine and smooth the shapes accurately. This sanding block with a mirror-image profile, made from Bondo auto-body filler, helped me do just that.

To make the block, I built a frame to fit snugly around a cutoff of the existing molding. With the cutoff at the bottom of the frame and covered with plastic cling-wrap, I filled the frame with Bondo. When the filler hardened, the cutoff left a perfect reverse impression of the molding's profile. I then sanded the back of the block flat and added bevels to help hold the sandpaper.

After working the larger molding curves with a handplane and a drill-mounted sanding drum, I began hand-sanding with my Bondo sanding block starting with 60-grit paper and then moving to finer grits. The process took some time, but the result is a perfect reproduction of the original crown molding.

—MYRON MYKIWKA, Edmonton, Alta., Canada



Quick Tip

I used to use plywood scraps to make patterns for my projects. But I couldn't see the grain through the plywood when I was ready to trace the pattern. To solve this problem, I now make a negative pattern by cutting out the pattern shape inside a plywood frame. This allows me to place the pattern on the work, move it until I'm happy with the grain, then trace the outline.

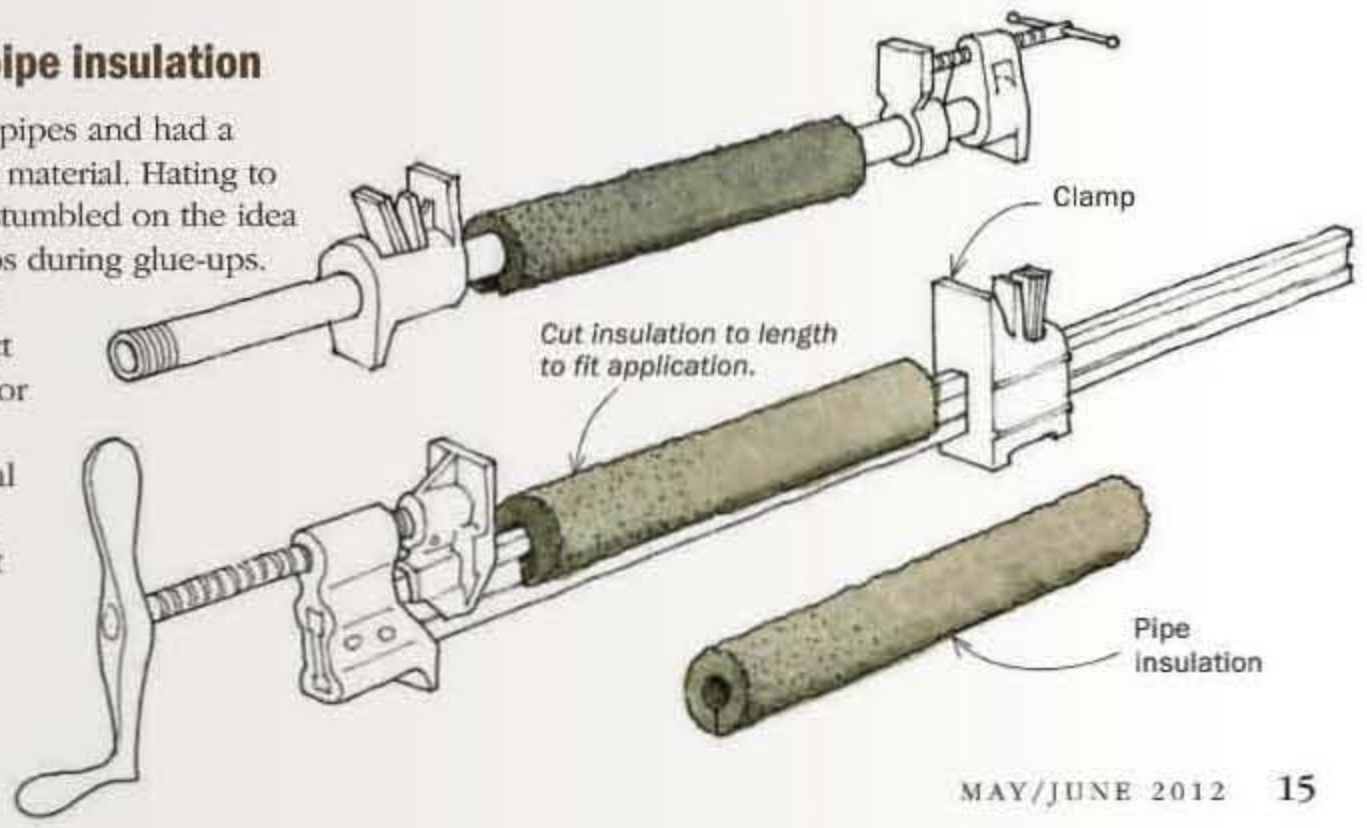
—SAEID KARIMZAD, Irvine, Calif.

Shield clamp pipes and bars with pipe insulation

I had just finished insulating some plumbing pipes and had a lot of leftovers of round foam pipe insulation material. Hating to throw anything away that might be useful, I stumbled on the idea of using them to wrap the pipes of my clamps during glue-ups.

Not only does the insulation keep glue off the pipes or bars, but it also prevents contact with the workpiece that might mar or discolor the wood (pipes and bars bow toward the work as the clamp is tightened). The material fits snugly on both types of clamps and can be cut to length easily with a utility knife. At about $1 for a 6-ft. length at the hardware store, it is very affordable.

—JOE CARRETTO, Friendswood, Texas



Where tenons meet, box-joint fingers add strength

Chair and stool joinery is tricky because the parts are narrow yet subjected to great racking forces. One problem area is where rails or stretchers intersect a leg at the same point. The mortise-and-tenon joints lose some strength because one or both tenons must be cut shorter to accommodate the other. You can miter the tenon ends, but on very narrow legs, a stronger solution is the inside box joint.

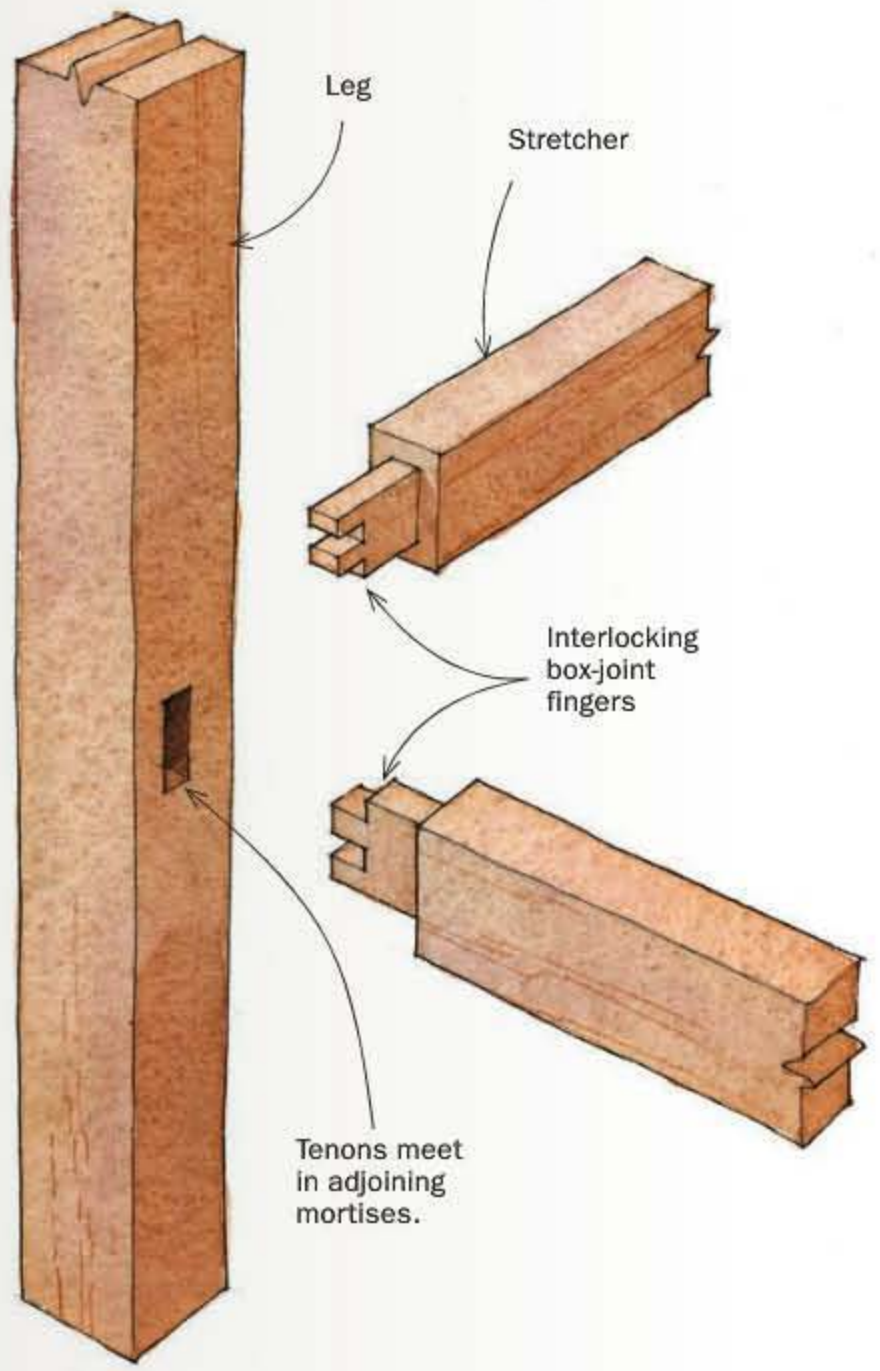
This is done by making both tenons full length and then cutting box-joint fingers on their ends.

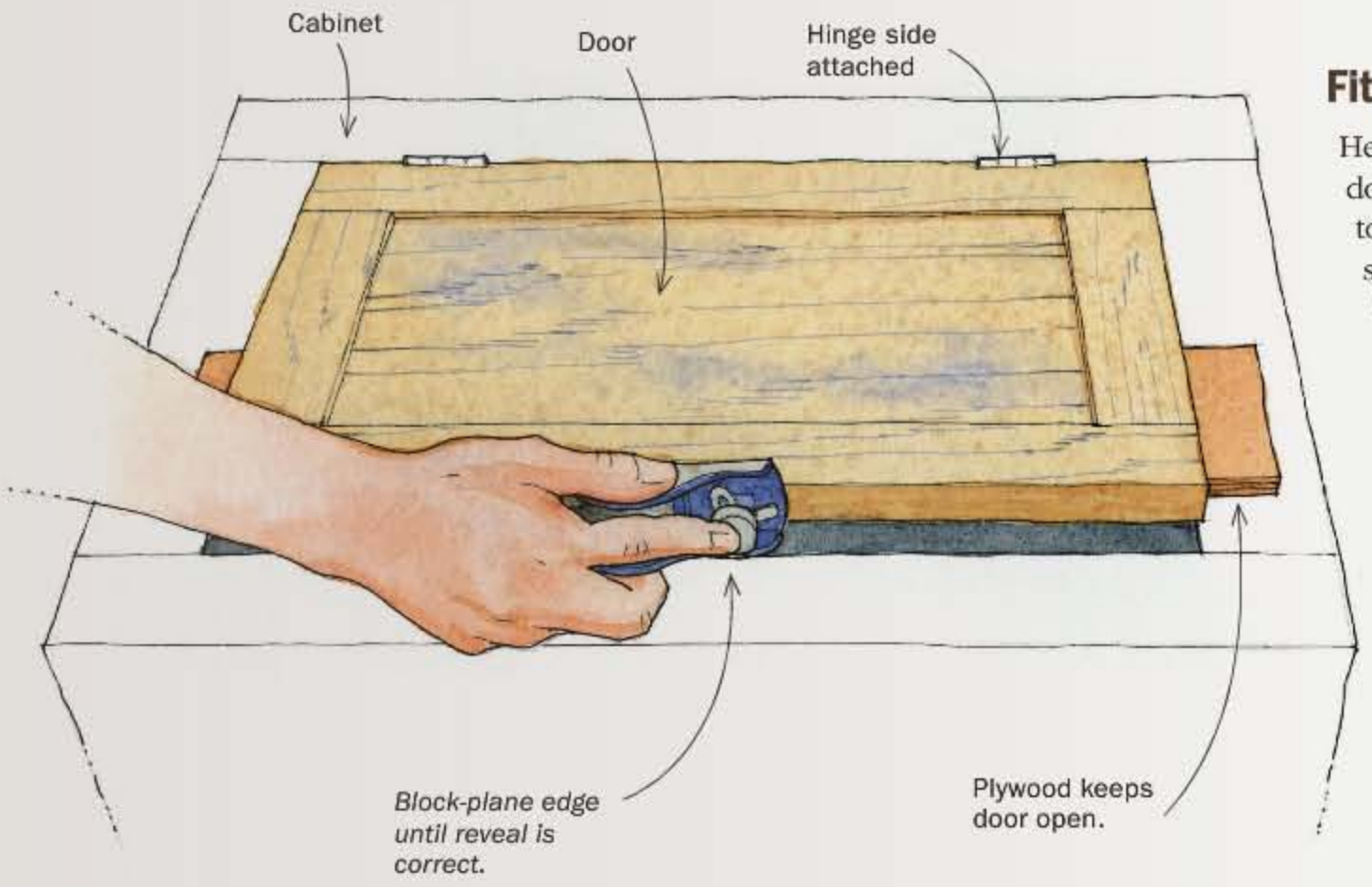
To make the joint, first cut the mortises and the tenons to fit the full depth of the mortise. Now mark the depth of the box joint by inserting each tenon in the mortise and marking it from the open mortise.

Remove the tenons from the leg, butt them together, and then mark alternate fingers for the box joint. Finally, cut the fingers and remove the waste with a mortising bit or tablesaw box-joint jig.

When gluing up, it's best to do all four legs at the same time, so you need to work quickly or use slow-setting glue. The fingers add extra long-grain glue joints and significant strength. Now you won't need to worry that the joint will crack, even when your heaviest friend rocks back on the chair.

—DAVID EKLUND, Lethbridge, Alta., Canada





Fit an inset door in place

Here how I make fitting a newly made inset door a bit less stressful. After fitting the door to the opening on the top, bottom, and hinge sides, I find it best to sneak up on the final fit at the latch side after hanging the door. Here's how.

With the door attached to the face frame by its hinges, I slide a scrap of thin plywood between the door and the face frame and use a block plane to carefully remove what is needed. This approach eliminates the back and forth between the saw and the cabinet to make minor final adjustments. As a plus, doing it this way lets you put a shallow back-bevel on the door, which helps it open and close more easily.

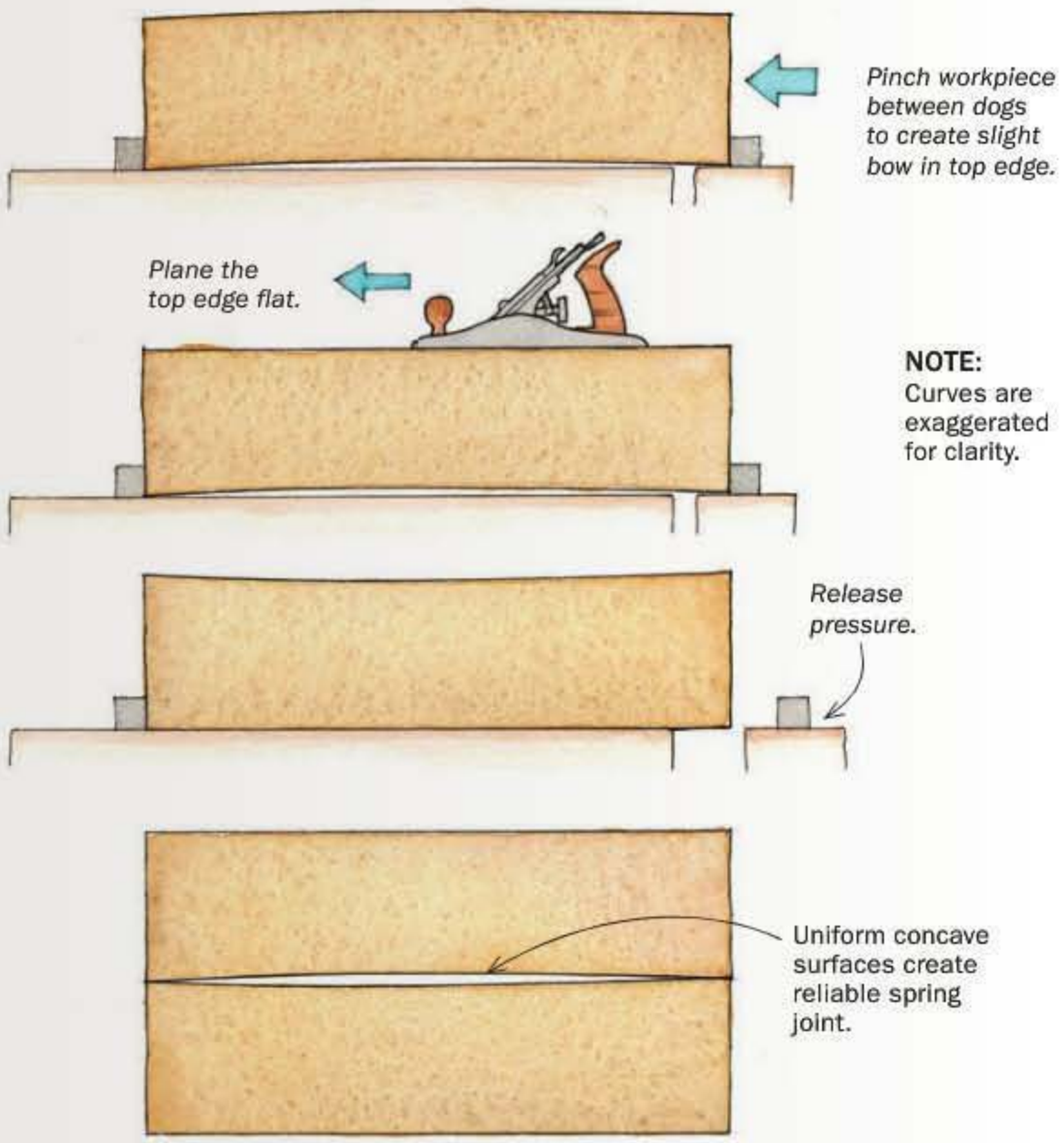
—PAUL COMI, San Gabriel, Calif.

Spring joints consistently

When handplaning the edge of a board for the purpose of edge-gluing, a time-honored technique is to plane a slight concave curve into the edge over its length. If done properly, the curve assures the whole edge will be tight when glued. It also reduces the number of clamps needed. The problem is how to plane a predictable curve that closes uniformly under clamping pressure.

Here is a simple solution: Stand the board on edge between a benchdog and the dog in your woodworking vise. Now put pressure on the board until the top edge curves upward. The curve should be quite slight, no more than 1/32 in. or so for a 2-ft.-long board. Plane the edge straight and square. When the pressure is released, you will have a uniform concave curve that will work perfectly for edge-joining the board. The curve should be slight so that you don't build unwanted stress into the glued joint.

–CARL SWENSSON, Timonium, Md.



tools & materials

Tabletop joinery. *Unlike many other dovetail jigs, the R9 can be used with a router table.*

■ ACCESSORIES

New dovetail jig is fast and affordable

LEIGH'S R9 PLUS JOINERY JIG is a dream to use, whether with a handheld router or on a table. It makes it easy to cut through-dovetails and box joints in material up to 13⁄16 in. thick, in any width. On top of that, it is significantly less expensive than past versions.

One reason the unit is so affordable, however, is that you'll have to do some woodworking to get it up and running. Unlike other Leigh jigs, such as the D4R and Super Jigs, which come ready to go out of the box, you have to mount the included aluminum template to a shopmade wooden beam and backer board. Workpieces are clamped to the beam, and the replaceable backer helps eliminate tearout. The task is straightforward, thanks to detailed instructions, and all hardware is included. By making the beam extra long, you can cut dovetails in virtually any width of board, an advantage over other Leigh jigs that limit board width. This feature could come in handy on larger cases and chests.

Out of the box, the jig cuts ½-in.-wide dovetails. But you can purchase accessory bits to cut ⅜-in. and 7⁄16-in. dovetails.

It takes a couple of test setups to get the jig dialed in for perfect-fitting joints, but you only have to do this once, and once done, I was able to knock out a through-dovetailed drawer in less than 10 minutes. The R9 can also make box joints, but you'll need to purchase the appropriately sized spiral bit (sold separately).

For more information about the jig, go to leighjigs.com.

—Gregory Paolini is a pro woodworker near Asheville, N.C.

R9 Plus Joinery System from Leigh Industries
$150
woodcraft.com

■ HAND TOOLS

The ultimate bit kit

No. 5575 Master Kit from Chapman Manufacturing Co.
$90
chapmanmfg.com

I ASSEMBLE A LOT OF STUFF IN MY SHOP, from tools for *Fine Woodworking* articles to electrical panels for my motor home, and I often find myself scrambling to find bits for non-typical fasteners.

Chapman Manufacturing's Master Kit No. 5575 solves those frustrations. The kit includes an impressive array of driver bits—Phillips, Allen, straight, square-drive, and star—as well as an assortment of metric socket-head drivers and Torx bits. The 53-piece kit also includes a ¼-in. socket adapter, a screwdriver handle, a 3-in. extension, and a midget low-profile ratchet handle for those hard-to-reach fasteners inside tool cabinets.

The set is ideal for assembling and fine-tuning woodworking equipment, and it will come in handy around the house and garage, too. It comes neatly packed in a durable plastic case with removable bit trays.

—Roland Johnson is a contributing editor.

Smart design. *The bits seat securely in both the screwdriver and ratchet handles. A knurled knob on the end lets you turn a bit when the fastener's too loose for the ratchet to work.*

Photos, except where noted: John Tetreault

■ FINISHING

Enliven your furniture with a new kind of paint

Annie Sloan Chalk Paint
Around $35/quart
Soft wax, around $25/500ml
For retailers, visit
anniesloanunfolded.com

ANNIE SLOAN, A WELL-KNOWN DECORATIVE PAINTER in England, has been selling her "chalk" paint since the early 1990s. This water-based paint is mixed with calcium carbonate (chalk) and is similar to milk paint, in that it is low-VOC and fast-drying, offers great coverage, and lets you layer colors for unique effects. Unfortunately, the paint was not available in the United States until recently. Being a fan of milk paint (see my Finish Line, "Accentuate carving with color," *FWW* #221), I was eager to try the product—and was hooked as soon as I did.

The paint is easy to apply, and one coat gives sufficient coverage in almost every case. It's also easy to layer different colors and then sand areas to reveal underlying coats. I was even able to paint over an oil stain, without a primer. Chalk paint must be sealed with wax, and Annie Sloan sells both a dark version, which gives an aged patina, and a clear wax, which can be buffed up for a high shine or left matte.

Though it has characteristics similar to milk paint, chalk paint is less quirky, with no problems of short pot life, no issues of matching a surface that has already dried, and better coverage, which offsets the high cost per quart. There are 28 colors available. I tried Emperor's Silk, a red that was so deep and saturated that I was instantly smitten and wanted to paint everything in the workshop.

—Michael Cullen builds studio furniture near Petaluma, Calif.

■ ACCESSORIES

A better benchtop router table

A BENCHTOP ROUTER TABLE IS HANDY for small shops, because it can be stowed out of the way when not in use. But these units are notorious for poor quality and inaccuracy.

JessEm's new benchtop router table gets it right, however, with quality where it matters most: up top. The high-density MDF top is 1 in. thick by 15¾ in. deep by 23⅝ in. wide, with a miter track in front. The beefy top is flat, and should remain that way. The insert plate is adjusted flush to the top from underneath. The adjustment is a bit cumbersome, but not a deal-breaker because it's something you should have to do only once.

The extruded aluminum fence is nicely made and designed. Besides the usual T-tracks for mounting the sliding melamine faces, it also sports two extra T-tracks—one on the front, and one on the top providing ample room for jigs and/or featherboards. The fence is square to the table and the faces stay perfectly aligned, which is critical for smooth routing. The dust collection is also excellent. Besides the fence-mounted 2¼-in.-dia. vacuum port, the JessEm features a canvas bag underneath the table that has its own dust port. The bag has zippers in front for access to the router.

The tubular frame is sturdy and lightweight, but I wish it were easier to clamp the table in place. One solution is to clamp boards on either side to keep it from walking as you rout.

All in all, though, the key parts of the table are high quality, making it a good value. For more information, go to jessem.com.

—Matt Stern is president of the Long Island Cabinet and Furniture Makers.

Heavy Duty Benchtop Router Table by JessEm
$200
amazon.com

Top left photo courtesy of CICO Books
(from "Creating the French Look" by Annie Sloan; cicobooks.com)

Combo Shelf Pin Template from Woodpeckers
$50; $25 for self-centering bit
amazon.com

***Router-ready.** The Woodpeckers jig can be used with a plunge router equipped with a ⅜-in.-dia. guide bushing and a ¼-in. or 5mm bit. The setup makes clean holes but takes longer than drilling because the router obstructs your view of the template.*

■ ACCESSORIES

HEAD TO HEAD: Shelf-pin shootout

WHEN DRILLING SHELF-PIN HOLES, you need an accurate jig to ensure precision. If the holes are off, you'll end up with wobbly shelves.

I compared two new commercial jigs: the Woodpeckers Combo Shelf Pin Template and the Rockler Pro Shelf Drilling Jig. Both help make precise holes, but they do it in very different ways.

The Woodpeckers Combo Shelf Pin Template is a one-piece phenolic jig. You need to buy the self-centering bits separately ($25), in sizes 5mm or ¼ in. dia. However, the jig can also be used with a plunge router fitted with a ⅜-in.-dia. guide bushing and a ¼-in. or 5mm upcutting bit. The router method makes marginally cleaner holes, but it takes longer.

The Woodpeckers jig is very accurate and allows you to inset the holes 1½ in., 2 in., or

2½ in. from the edge of the workpiece. It's a simple design that relies on locating pins for alignment, but the system works fine. Unfortunately, the jig is time-consuming to use because you can only drill one column of pin holes at a time.

The Rockler jig has the advantage of drilling both columns of holes with one setup, a big time-saver. The clamping mechanism on the extension tracks tightens and loosens easily, and when used with the locator pins, locks the jig securely in place on the workpiece. The jig can be adjusted to handle cabinet sides from 8¼ in. to 25¼ in. wide.

The clear acrylic templates make it easy to align the jig with marks on the workpiece below. For drilling, the jig uses spring-loaded, self-centering bits—also sold separately ($22), in 5mm, ¼-in., 7/32-in., and 9/32-in.-dia. sizes. The spacing between rows is 1¼ in., and they are located 1 7/16 in. on center from the edge of the workpiece.

Comparing the two systems, it's hard to beat the Rockler jig for its speed and convenience.

—Mark Edmundson is a woodworker in Sandpoint, Idaho.

Two for one. *The Rockler jig can drill both columns of holes with one setup, speeding the job significantly.*

Pro Shelf Drilling Jig from Rockler
$80; $22 for self-centering bit
rockler.com

Tips for square glue-ups

BY STEVE LATTA

The absolute worst time to try to solve a problem is when the glue is starting to tack. I watch my students scurry like mice in a maze, tracking down extra clamps to pull together a joint that just won't budge. In desperation, out comes the claw hammer and then things really start a downward slide.

Frantic glue-ups create open joints and out-of-square assemblies, which in turn means that doors and drawers don't fit. Sad to say, these wounds are usually self-inflicted. However, if you follow a few basic steps before and during the glue-up, you can approach this stressful time calmly and confidently.

Laying the foundation

First and foremost, gluing up a project needs to be viewed as the end of a process, not an isolated event. Proper alignment doesn't just magically happen, but rather is the outcome of a well-executed plan.

Let's start with design. For example, if I'm building a free-standing, open-front bookcase with fixed

Get a good start

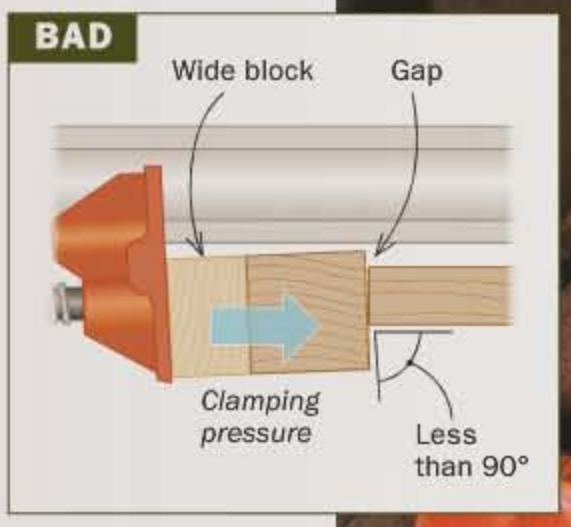
You can't get square glue-ups if the components don't match and the assembly surface is twisted.

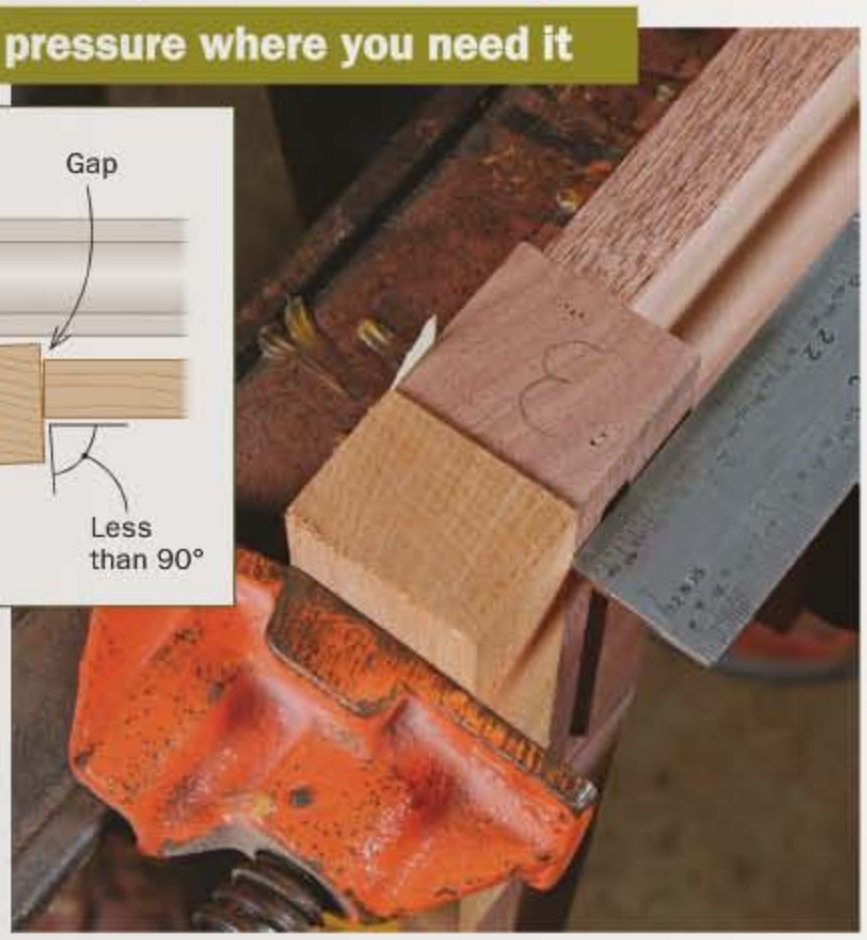
A FLAT SURFACE *Use a 4-ft. level to see if your bench or outfeed table (above) is flat. If it isn't, clamp a piece of ¾-in.-thick MDF or plywood to a pair of sawhorses and use shims to bring that surface flat (right).*

EQUAL PARTS *Parts on opposite sides of a piece must be the same length between shoulders to ensure square corners.*

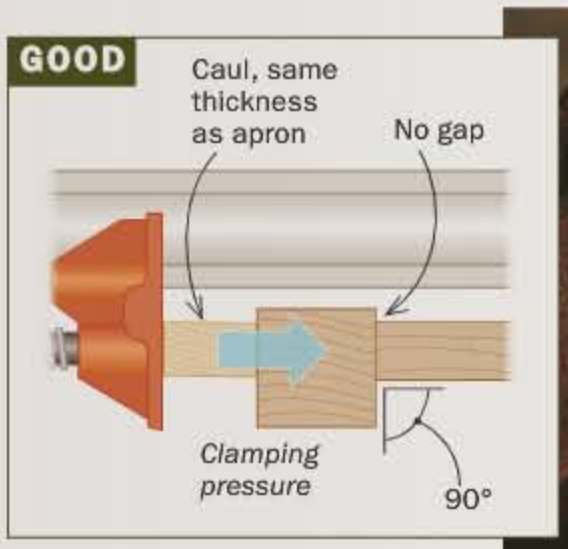
Make the right clamping block

Direct the pressure where you need it





Too wide. *Using a wide caul directs the force of the clamp to the front of this leg, twisting it out of parallel with the rear apron.*



Direct the force. *A clamping block the same thickness as the apron and placed in line with it (left) keeps the leg straight (above). Tape the cauls in place to leave your hands free for clamping.*

shelves, I'd feel comfortable using slats for the back. The glued shelves make up for the slats' lack of rigidity. However, if inset doors are part of the design, and if the shelves are adjustable, I'd go with a frame-and-panel back, especially one with glued-in panels. It will help make the main box square, which makes fitting the doors much easier. It also will keep it rigid, preventing the doors from binding.

You can't perform the impossible

It sounds obvious, but the piece you're gluing up should have the potential to be square! For example, if making a small table with a single drawer opening, the shoulder-to-shoulder distance on the rear apron better match the shoulder-to-shoulder distance on the drawer rails in the front. If not, the table will be a trapezoid and the joints may show gaps. Likewise, the shoulder-to-shoulder distance of the upper and lower drawer rails better be the same or the opening, no matter how much tweaking is involved, won't be square.

Have good-fitting joints and use the right cauls

Joints that fit properly need minimal clamping pressure. If an assembly can only come square by overtightening the clamps, the object will not remain square when the clamps come off but will eventually creep back into distortion.

You should prepare properly sized clamping blocks and cauls to direct the pressure accurately. Grabbing random-size blocks misdirects the pressure and just doesn't get the job done. For larger cases, corner braces with clamp holes along the edge ensure 90° corners.

Tools to check for squareness

A combination square is useful for checking to see if corners are 90°. For larger pieces, plastic 30°-60°-90° corner drafting triangles come in a variety of sizes. However, even if a corner is 90°, the piece as a whole can be out of square. Measuring the diagonal distances is a foolproof way to check. A tape measure works great for exterior corner-to-corner dimensions. However, if clamps are obscuring the exterior corners, you can measure the interior diagonals using two sliding sticks with ends cut to a point.

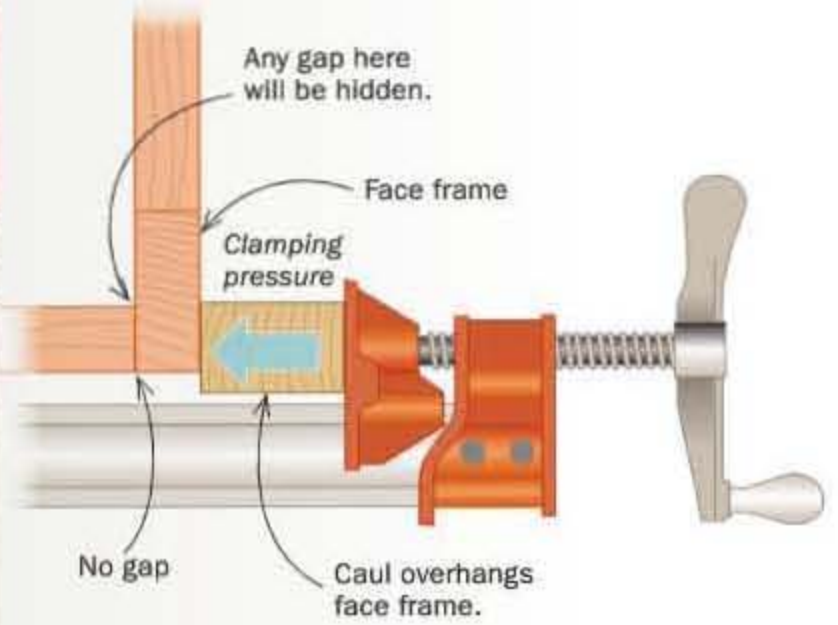
Practice makes perfect

The number one rule that should never, ever be ignored: Always do a complete

Photos: Mark Schofield; drawings: John Tetreault

Direct the pressure cont'd.

Gap-free face frame. *The visible outside of the face frame must join seamlessly with the carcase; the hidden inner side of the joint is less critical. To direct the clamping force to the outside, place the caul so that it overhangs the exterior of the cabinet.*



Spread the pressure where clamps can't reach

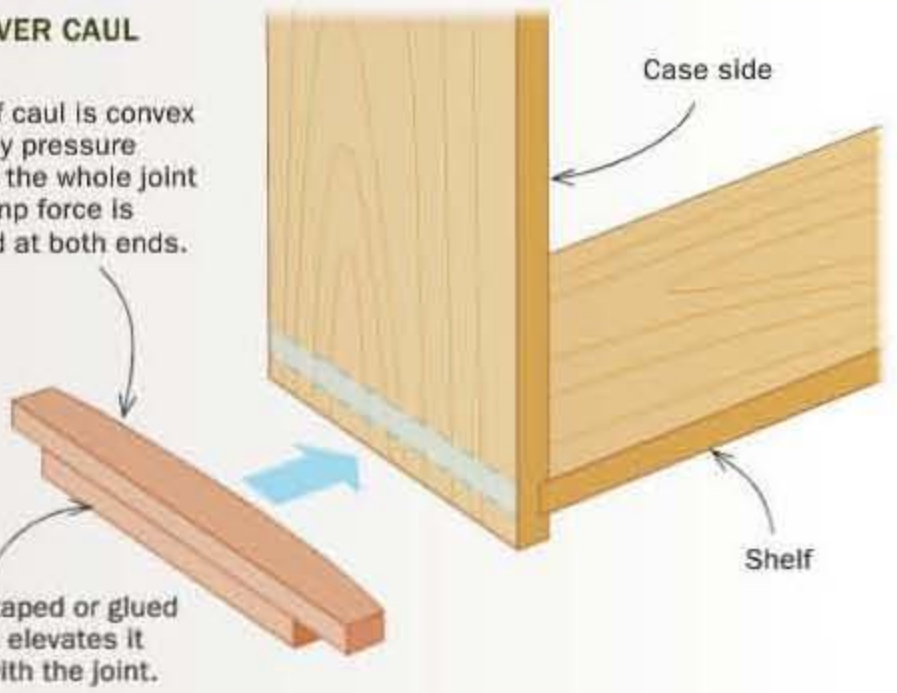
Two clamps, two cauls, two hands. *Put a convex curve on the face of a caul to get even pressure across a wide joint. Elevating the caul on a block of wood brings it even with the joint, leaving your hands free to work the clamps.*

dry-fit with all clamps, blocks, and corner supports. If you can't get the piece square during a dry-fit, you'll never get it square with the actual glue.

After a bad rehearsal, actors may comment, "It'll be all right on the night," but for woodworkers, all the lines must be perfect before the glue is applied.

Contributing editor Steve Latta teaches furniture making at Thaddeus Stevens College in Lancaster, Pa.

A CLEVER CAUL



Four ways to check for square

Combo square. *A combination square is a great tool to check that corners are square in small openings.*

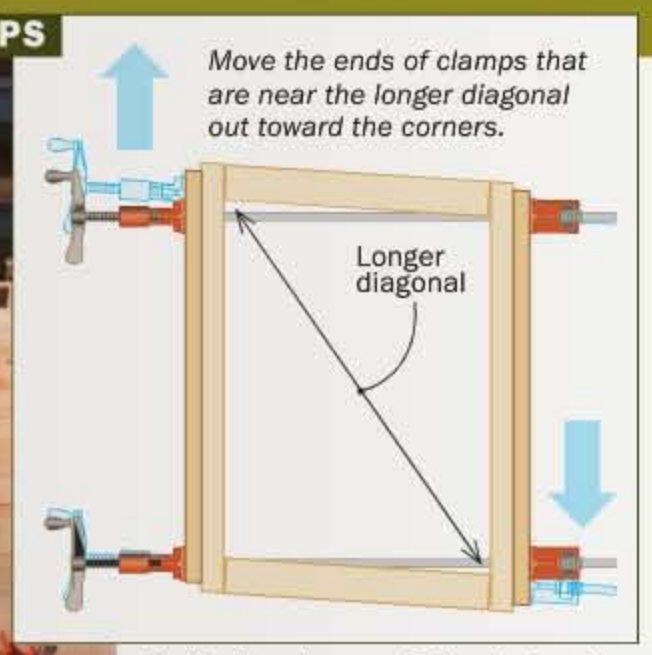
Flexible choice. *A raised panel may interfere with a rigid square but a plastic triangle can be bent downward to contact the frame.*

Check diagonals. *Make your clamping cauls shorter than the sides so that you can hook a tape measure over the corner (inset) and measure each diagonal. They should be within ⅛ in. of each other.*

Check inside. *If clamps are blocking the outside corners, you can check the interior diagonals using two sliding sticks with pointed ends (inset). Measure the first diagonal and draw a line across both sticks. Then measure the opposite diagonal.*

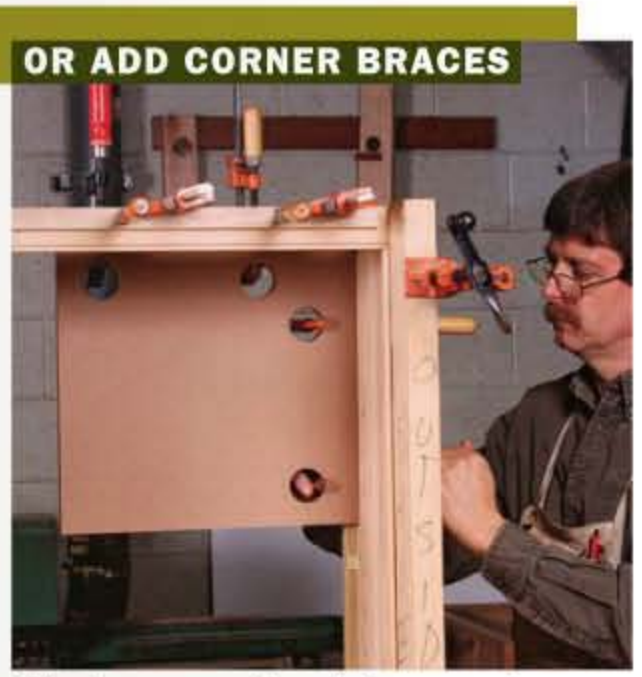
Two ways to adjust

REALIGN THE CLAMPS



Angle the clamps. *If the diagonals are different lengths, shift the clamps to pull the frame into alignment.*

OR ADD CORNER BRACES

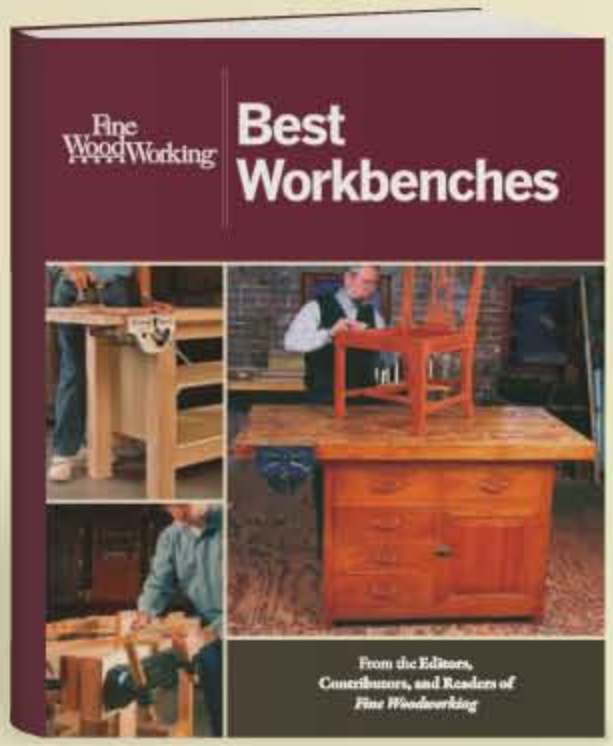


Attack a corner. *Clamping a square brace into one of the corners can bring an entire assembly back to square.*

Fine WoodWorking®

Shop Our Online Store

BOOKS, DVDs, PLANS & MORE



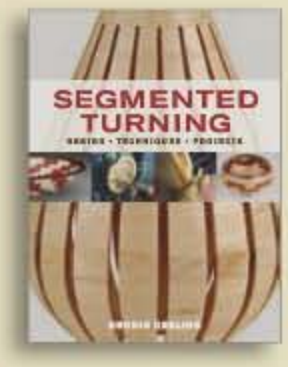
Find the bench that's right for you

The right bench is vitally important because it's the heart of your shop. Yet, what's right today may change with your needs, your budget, and shop space.

To learn your options for now and the future, turn to *Fine Woodworking Best Workbenches* – a diverse collection of 32 of the best workbench articles ever published in *Fine Woodworking*.

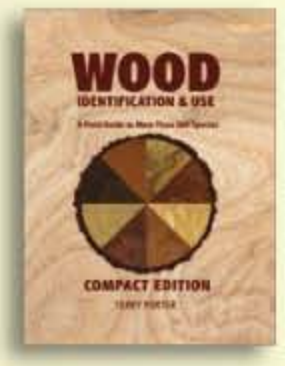
You'll be inspired by the possibilities, from a no-frills workhorse to a wired workbench. Plus you'll also learn invaluable tips, useful jigs, and techniques for reconditioning an old bench.

Fine Woodworking: Best Workbenches
Paperback
Product #071344
$21.95



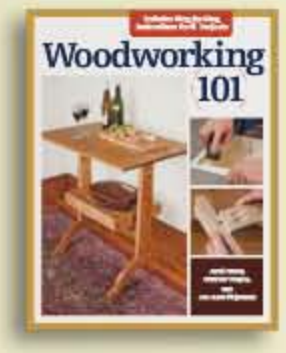
Segmented Turning
Paperback
Product #071374
$24.95

Dust Control Made Simple
Paperback with DVD
Product #071293
$24.95



Wood Identification & Use
Flexibound
Product #071373
$24.95

2011 Fine Woodworking Magazine Archive
DVD
Product #011328
$99.95



Woodworking 101
Paperback
Product #071347
$24.95

Southern-style Huntboard
SketchUp
Project Plan
Product #065110
$12.95

FineWoodworking.com/ShopNow

Your destination for trusted woodworking resources

Simply search by product number or call 800-888-8286, use code M1800155

Call Monday-Friday 9AM - 9PM EST and Saturday 9AM - 5PM EST • International customers, call 203-702-2204

Prices are subject to change.

handwork

Turn your shoulder plane into a star performer

A BIT OF WORK ON THE BLADE MAKES A BIG DIFFERENCE

BY PHILIP C. LOWE

In my shop, the shoulder plane is the go-to tool for trimming tenon cheeks. The low-angle, bevel-up blade works great across the grain. And because the blade is as wide as the plane body, it can cut all the way into the corner where the cheek meets the shoulder. This ability is also essential when I use my plane on rabbets.

However, despite its name, I typically don't use a shoulder plane on tenon shoulders. That's because most tenon shoulders are shorter than the plane is long—not to mention narrow. It's hard to balance the plane on the shoulder and get a good cut. Instead, I use a chisel. To see how I do it, take a look at "4 Chisel Tricks" (Handwork, *FWW* #221).

For best results on tenon cheeks, a shoulder plane needs a flat sole and sides that are square to it. Also, the width of the blade should match the width of the body. You might think they come that way from the manufacturer, but it's actually common for the blade to be a bit wider. So, I'll show you how adjust the blade's width, and give you some tips for setting it up for square cuts.

If you don't already own a shoulder plane, get one that's at least 1 in. wide. Most tenons are between 1 in. and 1½ in. long, and a narrower plane is more likely to taper the tenon.

Check the plane body, then tweak the blade

A shoulder plane won't cut a square corner unless it has a dead-flat sole and sides that are exactly 90° to it. So, the first time you pick up the plane, check the sole with a straightedge and use a combination square to check that the sides are square to the sole. If the sole isn't flat or the sides aren't square to it, return the plane. Correcting those problems is not worth the hassle.

After checking the body of the plane, turn your focus to the blade. Take it out of the plane, then lay the plane on its side on

Photos: Matt Kenney

Three step tune-up

Intended to cut into square corners, a shoulder plane needs a flat sole, square sides, and a blade as wide as the plane.

1 CHECK THE BODY

Straight and square. *Hold the plane up toward a light source. Light sneaking between the plane and a rule means it's not flat. Replace the rule with a combination square to determine if the sides are 90° to the sole.*

2 TWEAK THE BLADE'S WIDTH

Ink along one edge. *It's much easier to see the scribe line you'll create against a dark background than against the steel of the blade.*

Mark the sole's width. *Lowe uses the scribe from his combination square, holding its tip slightly above the plane body as a precaution against grinding the blade too narrow.*

Grind to the line. *Set the tool rest at 90° to the wheel. Grind away most of the excess, then smooth the rough edge on your sharpening stones.*

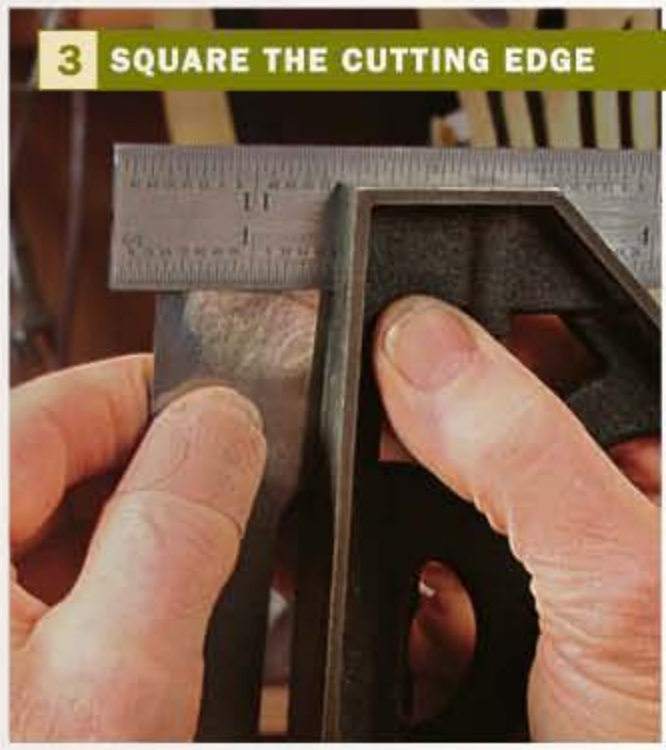
a flat surface. Hold the flat side of the blade against the plane's sole and look to make sure the blade is wider than the body. If it's not, send the plane back. If the blade is too narrow, one side won't cut into the corner, creating a wider step and pushing the plane farther away from the shoulder with each pass.

However, a blade that's too wide is also a problem, because it can dig into the shoulder. Ideally, the blade should be the same width as the body, but if it's 0.001 in. to 0.002 in. wider, that's OK.

Mark one edge of the flat side of the blade with a permanent marker. Then, with the plane on its side and the blade pressed against the sole, scribe the body's width on the blade.

Grind it down with a bench grinder (or on your sharpening stones). It's critical that the two sides of the blade are parallel to one another, so use calipers to check them as you grind. Next, check whether the cutting edge is square to the factory edge. If not, grind it square. Finally, sharpen the blade. I recommend

3 SQUARE THE CUTTING EDGE



Look into the light. *Register the square on the factory edge of the blade (the one you didn't grind). If the cutting edge is out of square, regrind it.*

Set up for a square cut

A shoulder plane's primary use is to trim joinery, so it's critical that it take a shaving the full width of the blade and of a consistent depth. Here's how to set the blade to get that job done.

Set the blade in the body. *Pinch the blade between your fingers to center it, and tighten the hold-down to keep it in place (left). Then adjust the mouth, if that's possible on your plane (above).*

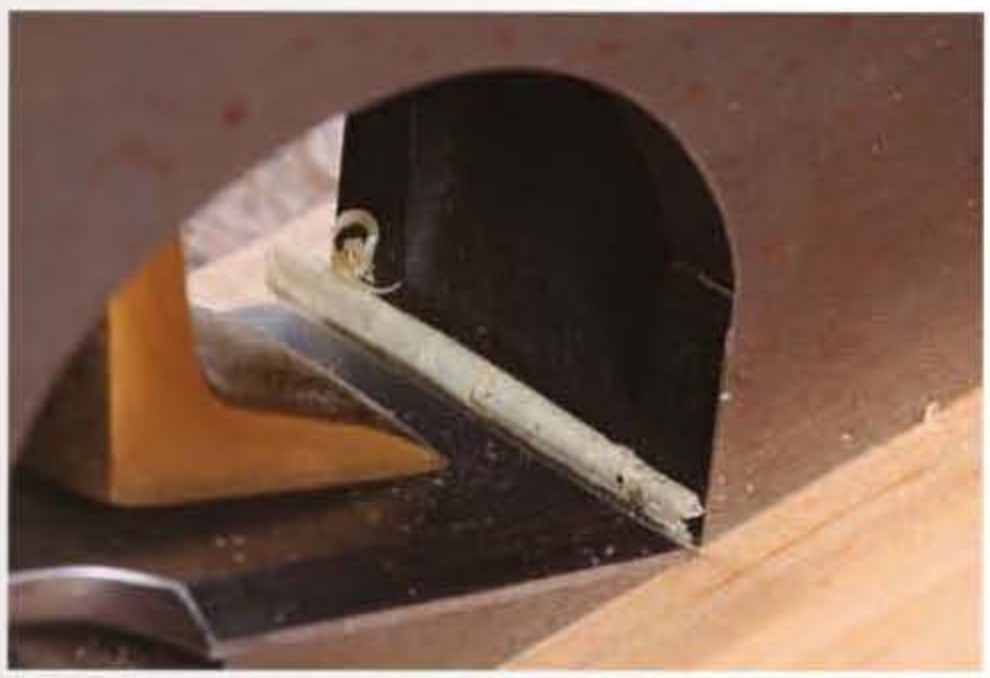
Narrow shavings are bad. *A blade that's cutting square takes a shaving across its width. This blade is cutting too deep on the right.*

a hollow grind for the bevel. Because of the blade's shape, it doesn't fit well in honing guides. The two high points created by the hollow grind make it easier to hone the blade freehand.

Set up for a square shaving

Now that the blade is sharp, put it back in the plane. When sliding it into the throat, take care not to nick the edge, and be certain that the adjuster mates solidly with the blade. Visually check that it's centered in the throat.

Next, square the cutting edge in the mouth. First, get it roughly set by turning the plane sole up with the blade projecting beyond the sole. Sight down the sole of the plane

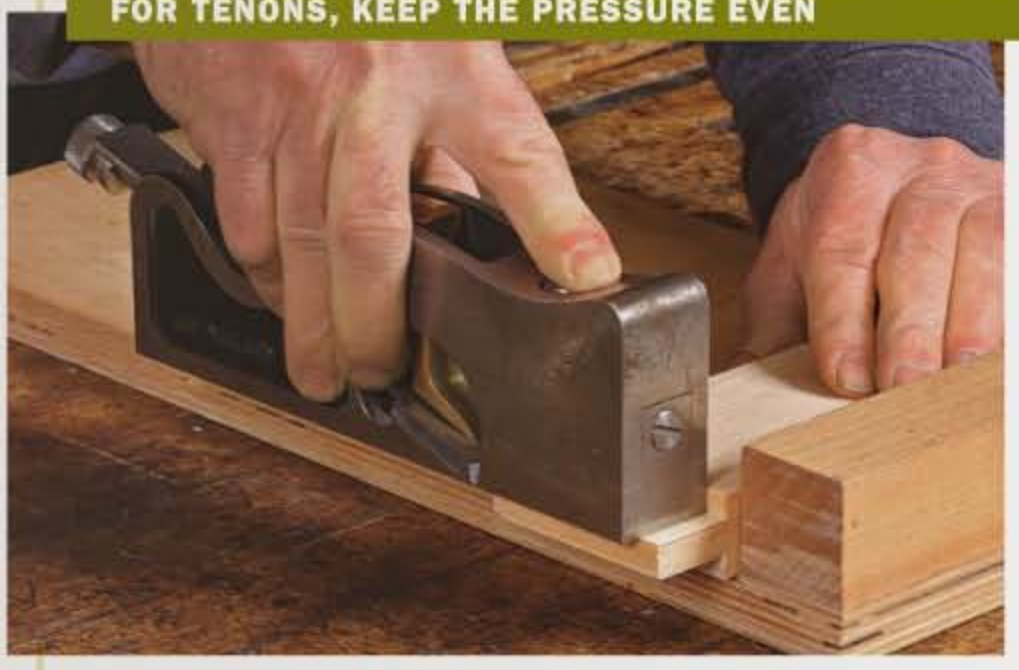


Here's how to fix the problem. *Loosen the hold-down just enough to allow you to shift the blade's tang. Move it toward the side of the blade that wasn't cutting (left). When the blade is cutting square, it cuts a full-width shaving that has a uniform thickness (above).*

Keep the plane vertical in use

A simple bench hook holds workpieces on their side so you can hold the plane upright, where it is easier to control.

FOR TENONS, KEEP THE PRESSURE EVEN



Two steps for straight cheeks. *First, place the toe of the plane on the tenon and slide it forward until the blade just touches. Then take a shaving, keeping even pressure on the plane throughout the cut.*

Start at the shoulder. *And don't overlap cuts. Otherwise, you'll get cheeks that aren't parallel.*

from the front. Make lateral adjustments to the blade until it projects equally across its entire width.

Now retract the blade so that it doesn't cut. Then begin pushing the plane across a piece of scrap and increase the depth of cut as you go. When you start to get a shaving, notice where the blade is cutting. If it's making a square cut, the shaving will be the full width of the blade. If not, adjust the tang of the blade in the direction of the corner that isn't cutting. Pinch your fingers around the plane and blade near the cutting edge to keep that end still. Loosen the hold-down and nudge the tang over. Tighten the hold-down. Test and adjust the blade until it's right. Finally, set the mouth—if that's possible on your plane—narrow for figured and hard woods and wider for soft woods. □

Philip C. Lowe is a furniture maker and teacher in Beverly, Mass.

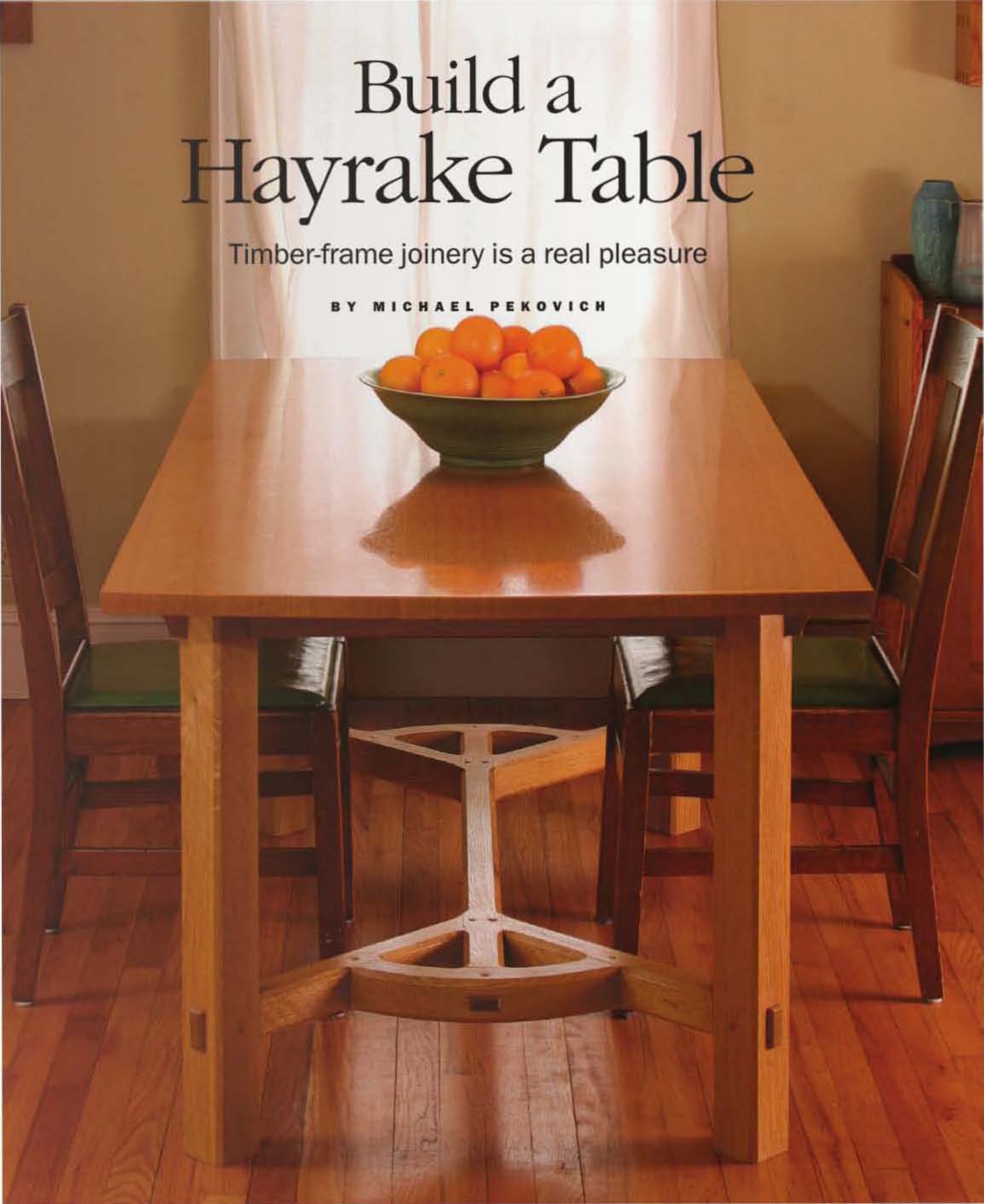
FOR RABBETS, ROTATE THE BOARD (NOT THE PLANE)

Keep it upright. *For the wall parallel to the board's face (left), clamp the board between benchdogs and use your off hand to keep the plane tight against the rabbet's vertical wall. Use a vise for the other wall (above). With the board on edge, there's no need to lay the plane on its side.*

Build a Hayrake Table

Timber-frame joinery is a real pleasure

BY MICHAEL PEKOVICH



When it came time to make a new dining table, I knew I wanted it in the Arts and Crafts style, but I was also looking for a twist. For inspiration, I looked to the English countryside, the birthplace of the Arts and Crafts movement. What I found was a hayrake library table by Sidney Barnsley, one of the pioneers of English Arts and Crafts design. The table gets its name from the unique lower stretcher system, which splays out at the ends like a hayrake. I really like the table's massive timber-frame look, with its obvious through-tenons and heavy chamfers, and building it is a refreshing break from typical woodworking projects.

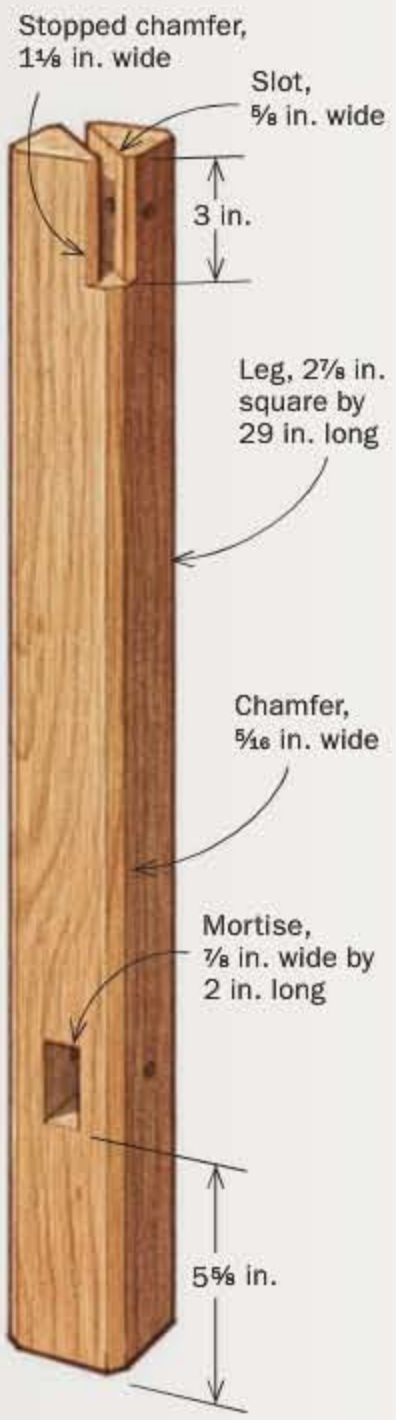
Another distinctive feature of the table, though it may not be apparent at first, is the orientation of the legs. They're at 45° instead of parallel to the edges of the tabletop. This makes the joinery to the hayrake stretcher simple—just a single through-mortise. Things get a little more interesting at the top. Each pair of legs is connected with end aprons that slot into their tops. This requires a slot cut diagonally across the top of the leg as well as a wider stopped chamfer. It looks like a tricky joint, but a bandsaw simplifies the task (see photos, this page).

How to get thick stock

The base of this white-oak table requires 12/4 stock. If you can find it, buy riftsawn stock for straight grain lines on all the faces. If you can't find these massive planks,

Start with the legs

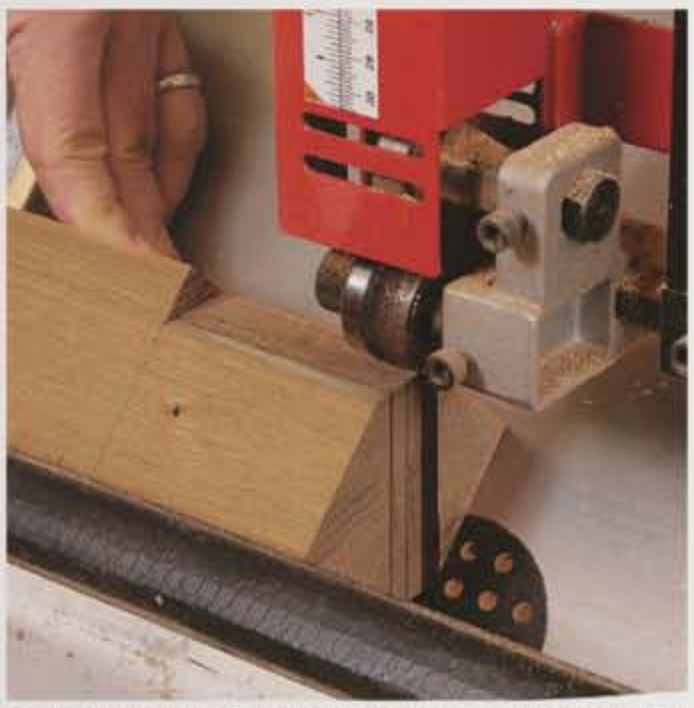
The through-mortise at the bottom is standard, so we'll focus on the diagonal joinery at the top.



CUT THE STOPPED CHAMFER

Bandsaw then handsaw. *Tilt the bandsaw table to 45° and cut the flats (top). Clamp the leg in a vise and use a handsaw to cut the shoulders. Then clean up the sawn surfaces with a shoulder plane and chisel.*

THEN THE SLOT



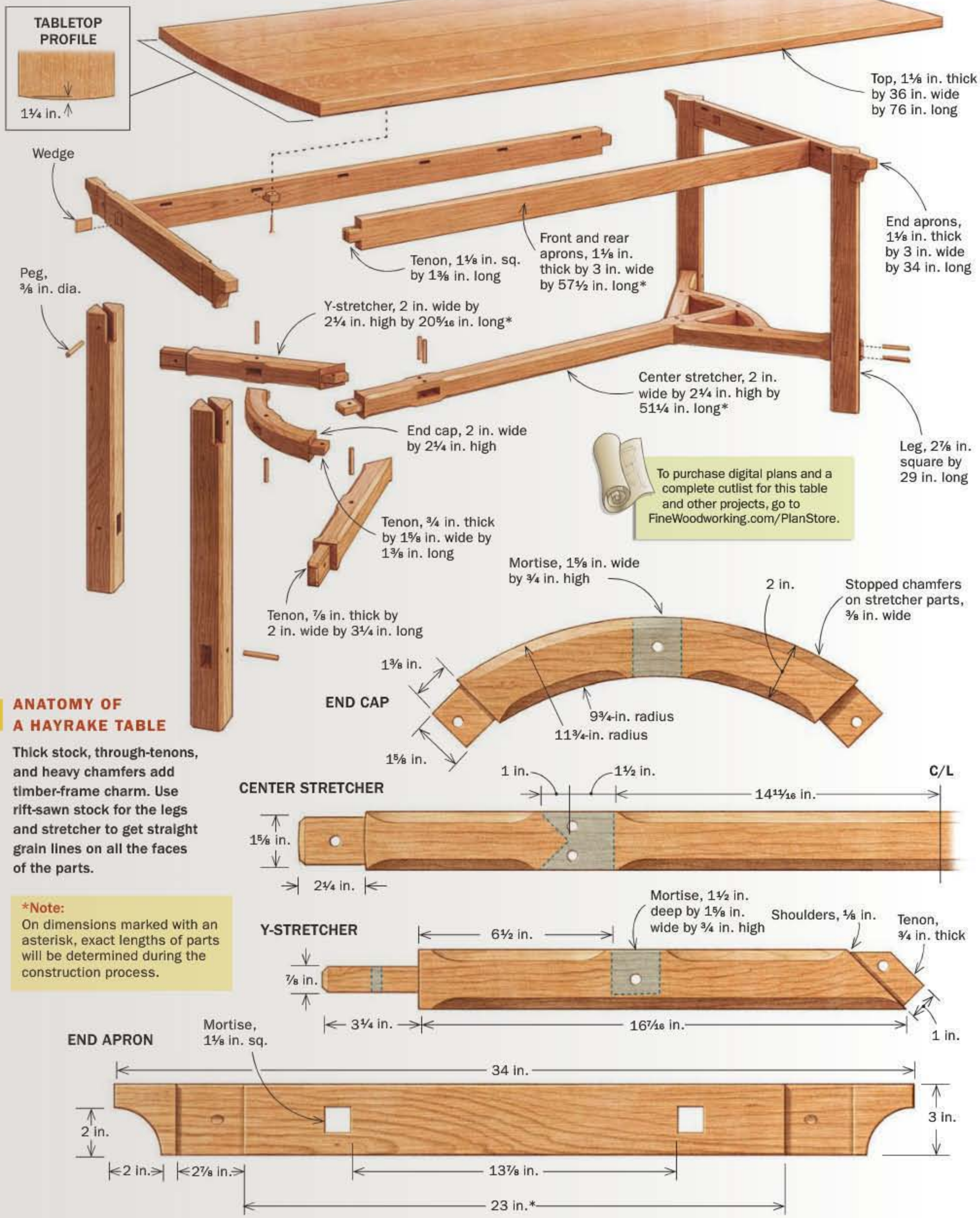
Saw, drill, chisel. *With the bandsaw table still tilted to 45°, cut one side of the slot, rotate the leg, and cut the other side (left). This ensures a perfectly centered slot. Now make a 45° cradle to hold the leg, and drill a hole at the bottom of the saw cuts (center) to remove the waste. Finish up with a chisel (right).*

Photos, this page: Mark Schofield; facing page: Michael Pekovich

ANATOMY OF A HAYRAKE TABLE

Thick stock, through-tenons, and heavy chamfers add timber-frame charm. Use rift-sawn stock for the legs and stretcher to get straight grain lines on all the faces of the parts.

*Note:
On dimensions marked with an asterisk, exact lengths of parts will be determined during the construction process.

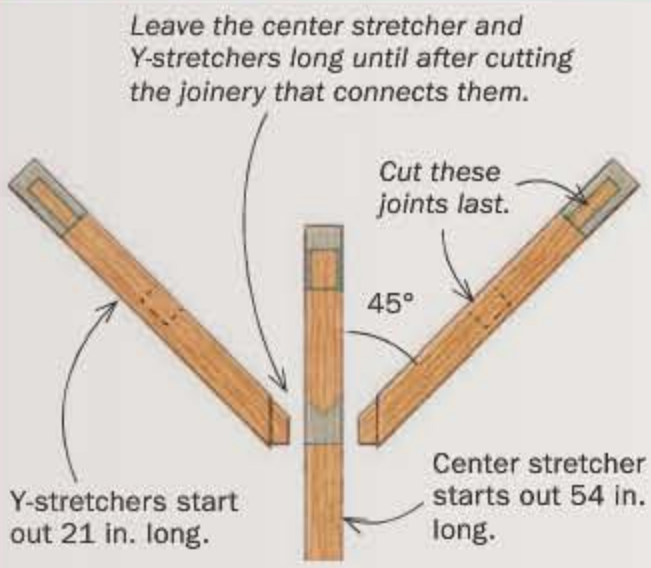


Drawings: John Hartman

Tackle the hayrake stretcher

The stretcher array gives the table its farmhouse flair, but the angled stretchers and curved cap on each end also present the biggest joinery challenge of the project. Breaking down the construction into simple steps is the key to success.

1. JOIN THE Y



MAKE THE ANGLED MORTISES

Start by cutting a through-mortise in the center stretcher. To create the 45° angled shoulders, clamp a 45° block in place (above) to use as a guide. Chop out a bit at a time until the chisel is resting on the block (right).

NOW THE ANGLED TENONS

Leave the stretchers long and miter one end using an angle guide on a tablesaw sled (above). Install a dado blade and adjust your miter gauge so the end of the piece is flush with the rip fence, and cut the tenon (right). You'll have to readjust the gauge for the opposite face, but the rip fence can stay put. Last, trim a triangle off the end, to fit the angled mortise (far right). Once the angled end is done, cut the stretcher to length, tenon the opposite end, and finally cut the mortise for the end cap.

you can get by with 8/4. Here's how. Reduce the thickness of the hayrake stretcher parts just ⅛ in., to 1⅞ in., and glue up the 2⅞-in.-thick leg stock from two 1½-in.-thick layers. Make sure the layers are flat-sawn so the glueline will be hidden in the straight grain lines on the edges. Mill all the parts to final width and thickness but leave all the stretcher pieces about 1 in. extralong at this point.

Now you can launch into the stocky joinery, walking in the footsteps of timber-framers past. The legs are the place to start. Cut out the stopped chamfer at the top of the leg, and then create the slot. When the lower mortise on the leg is complete, chamfer the corners on the tablesaw.

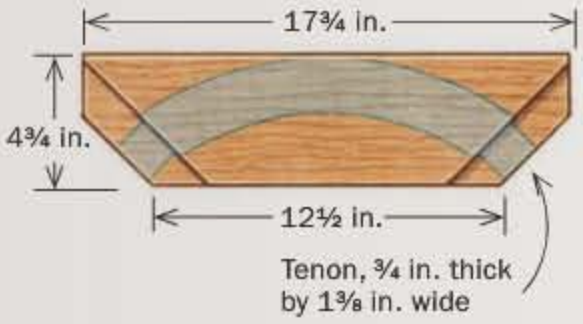
Rake section is easier than it looks

The lower stretcher system is where the fun begins. The curved and angled parts look daunting, but if you tackle the joinery one step at a time, it's really not that tough. The curved end cap actually simplifies the join-

Photos, except where noted: Rachel Barclay

2. END CAP: CUT THE TENONS BEFORE THE CURVES

The end cap starts as a block with mitered ends. All of the joinery is cut at 45° angles, which the tablesaw and bandsaw handle easily.



More angled shoulders. *Start by mitering the ends of the end cap on the tablesaw using the same sled that you used for the Y-stretcher ends. This will ensure an exact angle match between all of the joints. Then cut the tenon cheeks with a dado blade as before (right).*

ery. It allows you to cut mortises in the angled Y-stretchers at 90° instead of 45°.

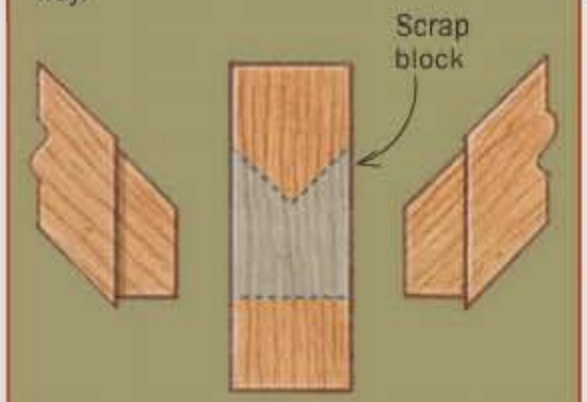
The first task is to join the Y-stretchers to the center stretcher. The ends eventually will be tenoned to fit the end caps, but leave the stretcher long for now, taking all measurements from its midpoint. Start by cutting the through-mortises, noting that one shoulder on each side is cut at 45° to receive the diagonal stretchers. Cut a simple through-mortise, then chop the angled shoulder with a chisel as shown on p. 37.

With the mortises done, tenon the Y-stretchers as shown on p. 37. Finally, use a backsaw to cut the tenon ends and clean them up with a block plane.

With the angled tenons done, it's quick work to cut the stretchers to length and

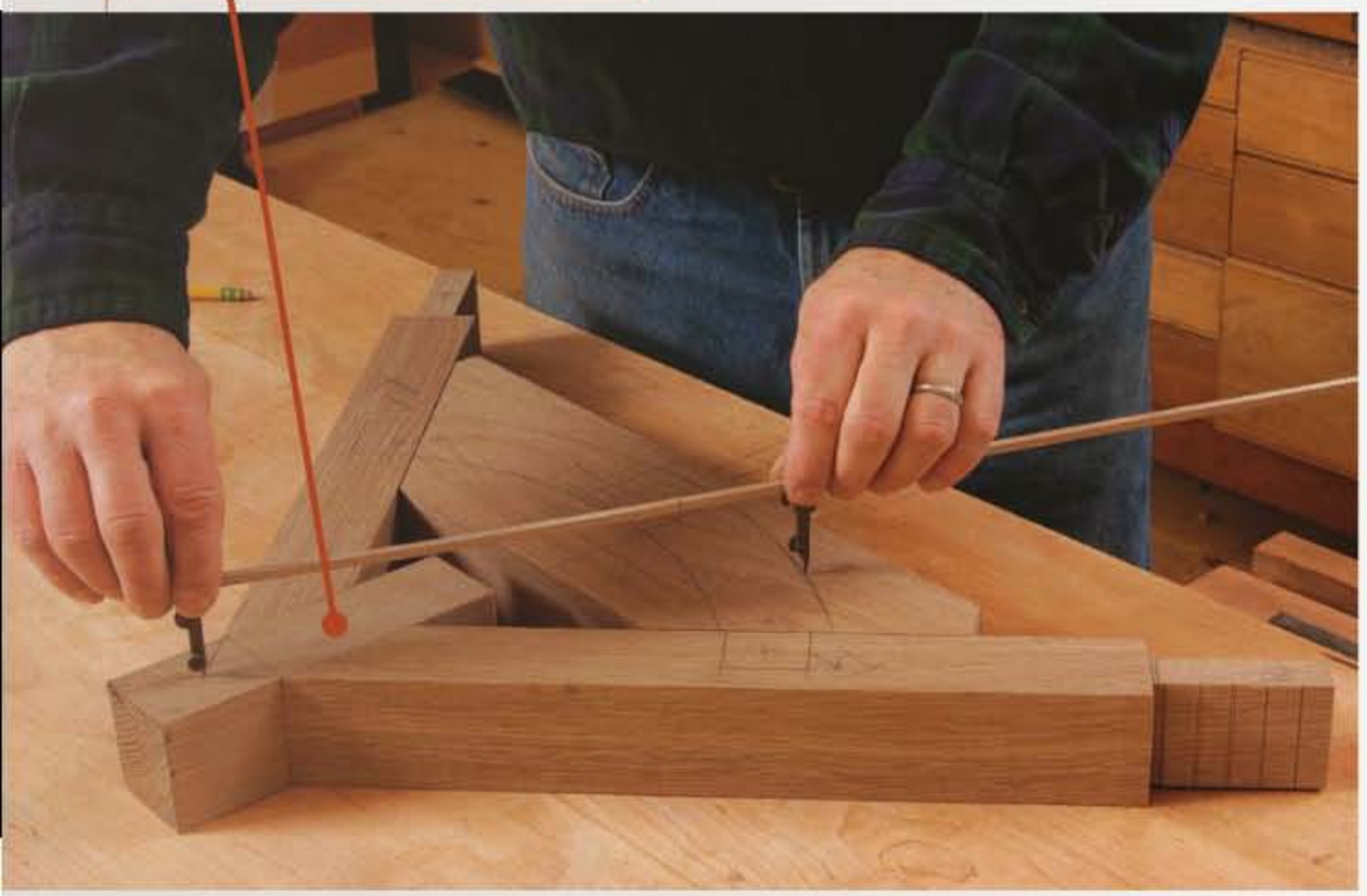
SCRAP BLOCK IS THE SECRET

A mortised block allows you to assemble the Y-stretchers and mark the end-cap tenons and curve without the long center stretcher getting in the way.



Lay out the tenons. *Dry-fit the Y-stretchers to a mortised scrap block. Then place the end cap over the stretchers, sliding it forward until its shoulders are snug. Use a square to mark the mortise locations on the ends of the tenons.*

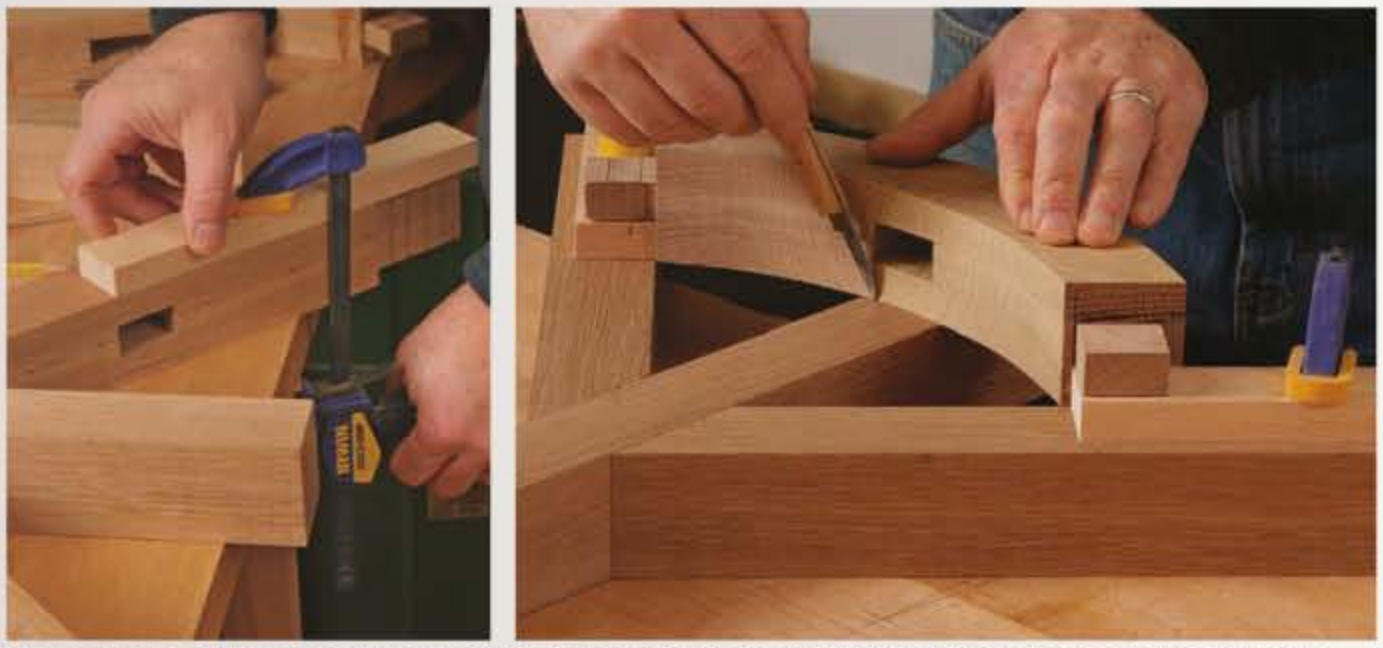
Cut the tenon ends on the bandsaw. *Use a miter gauge to guide the workpiece, flipping it backward in its slot.*



Now cut the curve. *Dry-fit the end cap to the assembly and lay out its curves (left). After sawing out the center of the end cap so you can mortise for the center stretcher tenon, cut the curves on the bandsaw (above).*

3. CENTER STRETCHER IS THE FINAL PIECE

With the end cap complete, you can use it to scribe the shoulders on the center rail and cut it to its final length. Leaving the center rail long until now is the key to a gap-free assembly.



Transfer the curve. *To scribe the curved tenon shoulders, dry-fit the stretchers and clamp on blocks even with the end-cap mortises (left). This elevates the end cap and lets you align it with the mortises so you can scribe the shoulder accurately on the center rail (right). To mark the bottom, extend the scribe marks down the rail sides, flip the rail and align the end cap to the marks, and scribe.*

Cut a square shoulder, then pare to fit. *Cut the tenon with a dado blade, stopping short of the curved shoulder. Then use a chisel to pare to the scribe line.*

tenon the ends to fit the leg mortises. While you're at it, bandsaw kerfs in the tenons for wedges. The last task is to cut the mortises that the end cap goes into.

How to handle the curved end cap

The final component of the hayrake stretcher is the end cap itself. Its construction is pretty simple because the joinery is cut while the stock is square.

Miter the ends of the end cap on the tablesaw, then tenon the ends. Set the end cap against a miter gauge and adjust the angle until the mitered end is flush with the rip fence, then cut the cheeks with a dado blade. Now locate the tenon ends using a scrap block as shown on the opposite page.

Next, you'll mortise for the center stretcher and cut the end cap to shape. Lay out the curves as shown, but bandsaw out some of the waste on the inside face to make mortising easier. Cut the curved profile on the bandsaw and clean up with a block plane and spokeshave. A spindle sander or sanding drum mounted in a drill press also works well for the inside face. With the end cap shaped, tenon the center stretcher and cut it to length (see photos above).

Drawbore pins replace clamps

It would be difficult to get clamps on this odd-shaped stretcher assembly for gluing. So, I created a self-clamping joint using drawbore pegs. It looks like a simple pegged joint, but the holes in the parts

All together now. *All of the pieces come together at once, bit by bit. When fine-tuning the fit, keep in mind that the top face of the stretcher is most critical. Feel free to flip it to put the best side up.*

are slightly offset so that when the peg is driven in, it pulls the joint together tightly. I also added wedges in most of the through-tenons. They add extra strength, and also close any visible gaps. I don't angle the mortises, but just kerf the tenons, drive in thin wedges, and trim them flush.

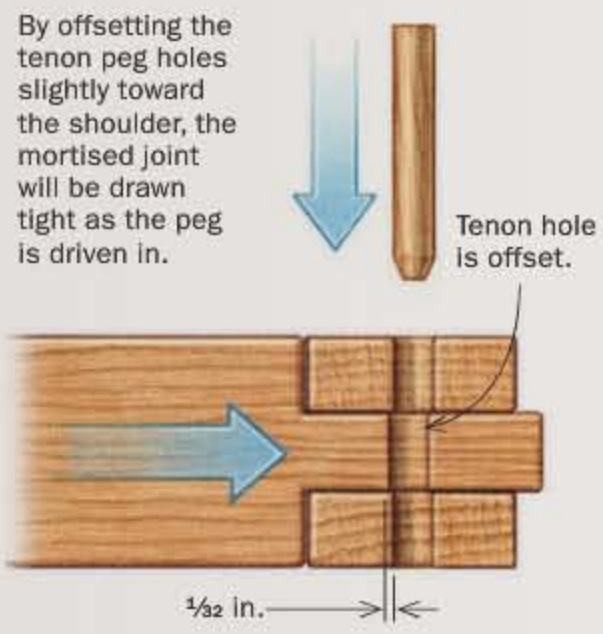
Smart methods for thick chamfers

The last task before assembly is to chamfer the parts. These chamfers were originally made by hand with a drawknife. I wanted to keep the handmade look, but I sped things up a bit by using a router for most of the work. The trick is to rout the chamfer, stop short of the end lines, and then use a chisel to finish it. This way, the chamfer flows smoothly from part to part.

I find it easiest to dry-fit the parts and rout the chamfers as a unit. I use a light touch and rout in the climb-cut direction to avoid tearout. As long as you don't take too heavy

Offset pins take the place of clamps

The angled and curved parts of the hayrake stretcher are nearly impossible to clamp for glue-up. Instead, drawbore pegs driven into intentionally misaligned holes pull the joints together tightly. It's a time-tested method for both assembling and reinforcing joinery.



Drill through the mortised parts. *Insert a scrap into the mortise to prevent blowout inside.*

VIDEO WORKSHOP

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

Mark and drill the tenon. *With the holes drilled, dry-fit the parts again and insert the drill bit into each peg hole, giving it a twist to mark the center point (1). Disassemble the parts and mark a new center point 1/32 in. toward the shoulder of the tenon from the drill-bit mark (2). Insert a piece of scrap below the tenon to prevent blowout when drilling (3).*

a pass, the router won't get away from you. Stay well away from intersections.

After routing the top and bottom faces of the stretcher assembly, mark the joint intersections and disassemble the parts. Use a chisel to complete the chamfer. Small irregularities are a good thing, but avoid chiseling deeper than the routed chamfer.

Get ready for glue-up

I make my own pegs, ripping stock to 3/8-in. square and then pounding it through a dowel plate (lie-nielsen.com). I cut the pegs long and taper the leading end with a pencil sharpener so that it can clear the offset holes. I lightly chamfer the top of the pegs because they are left slightly proud of the surface. To ensure a consistent peg height, I drill a shallow hole in the end grain of a scrap block and position it over the peg when driving it in.

Assembly begins by gluing up the hayrake stretcher (see photos, opposite). When both ends are assembled, flip the stretcher over and trim the bottoms of the pegs flush. With the stretcher glued up, dry-fit the legs and measure for the upper stretcher frame. Because of all the odd an-

Assemble from the stretcher up

Glue up the hayrake stretcher. *Wipe a thin coat of shellac on the end grain of the through-tenons to prevent glue from soaking in. Let it dry, then glue and assemble the parts one end at a time. Start the pegs in the hole and gradually drive them in until the joints are fully seated. Then drive them all the way home.*

Assemble the rest of the base. *Start by gluing the legs to the hayrake stretcher, but don't drive in the wedges just yet. Before you do that, it's important to install the upper aprons to help square up the entire assembly. Then drive wedges into the through-tenons in the legs, and peg the upper frame joints.*

gles, it's better to take dimensions from the workpiece rather than a set of plans. Start by measuring between the legs to locate the bridle joints on the end aprons. Cut the bridle on the tablesaw with a dado blade. Then cut the corbel profiles on the ends and mortise for the front and rear aprons. Fit the end aprons in place and measure between them to determine the shoulder-to-shoulder length of the long aprons.

Tenon the long aprons, then rout slots for the wooden buttons that secure the top. Finally, glue up the apron frame and drive wedges into its through-tenons. Assemble the rest of the base as shown.

Keep the color light

English Arts and Crafts furniture tends to be lighter in color than Stickley-style furniture. So, even though I fumed the white oak with ammonia, I didn't fume it as long as I normally do, just a couple of hours. I also used the weaker janitorial-strength ammonia instead of the industrial-strength. The result was a nice golden tone. I warmed it up further by wiping on a thin coat of garnet shellac before finishing with Waterlox, a tung-oil-based wiping varnish. □

Michael Pekovich is the art director and a professional woodworker on weekends.

The top is attached with buttons. *The tabletop won't be attached to the base until after finishing, but Pekovich pre-drills for the buttons now.*

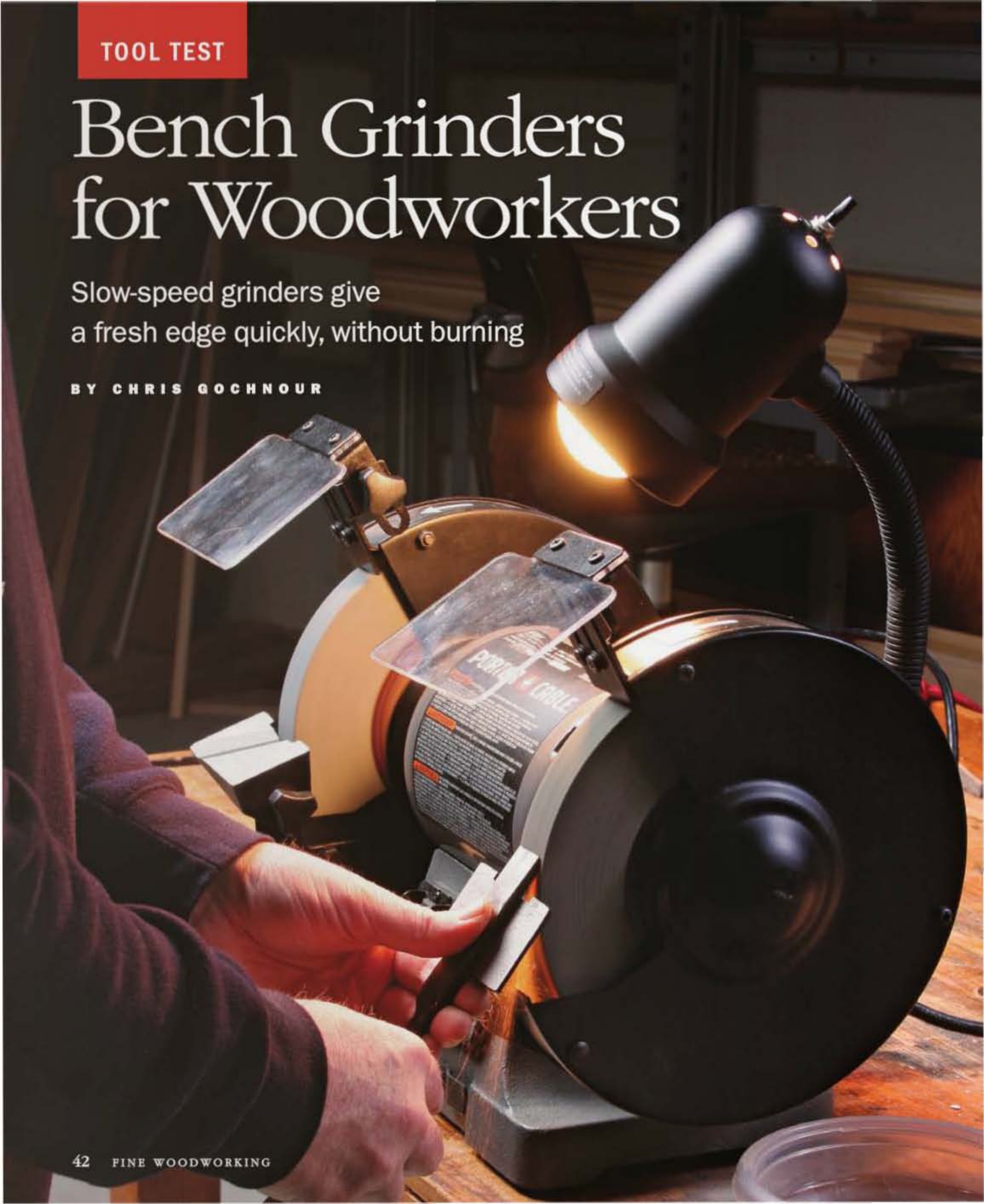
Photos, this page: Gina Eide (top left); Steve Scott (top and bottom right)

TOOL TEST

Bench Grinders for Woodworkers

Slow-speed grinders give a fresh edge quickly, without burning

BY CHRIS GOCHNOUR



Over the years I have reviewed many wonderful hand tools for *Fine Woodworking*, from handplanes to chisels to spokeshaves to backsaws. So when they asked me to take a look at electric grinders, I was a bit befuddled and hesitant.

It didn't take long to reconsider. After all, grinders are a vital tool in the woodshop, for shaping plane irons, chisels, gouges, and knives before they are honed to a polished edge. They also excel at reshaping tools, such as scratch stocks and scrapers, and creating skew chisels for dovetailing.

For this review, we narrowed the field to 8-in. variable- or slow-speed machines. I prefer 8-in. models. The shallow hollow leaves more material behind the bevel. We capped the price at $200, a point we thought made sense for such a one-dimensional tool. That left us with five grinders, from Craftsman, General International, Penn State Industries, Porter-Cable, and Woodcraft.

To evaluate the machines, I first considered the usefulness of the stock tool rest, the most important feature. Then I judged the overall quality of the wheels, checking them for roundness and for runout. Finally, I evaluated other features and accessories, and then judged the machines on how well they performed the basic tasks of shaping plane irons and bench chisels.

Are the tool rests good enough?

A tool rest should be sized to accommodate wide plane blades as well as chisels, and should move in and out to ensure that the platform stays within ⅛ in. of the wheel for safety. The platform needs to be flat so that tools slide easily on it. It also needs to be adjustable to handle different sharpening angles, and the angle should remain fixed as you grind. Unfortunately, woodworkers are not the primary market for these machines, so most of the tool rests fall short.

The deal with wheels

Years ago, when you purchased a grinder you did so knowing that you would immediately replace the hard, hot-running silicon-carbide wheels on it with softer wheels. Not anymore. Each grinder I reviewed is equipped with soft but long-wearing aluminum-oxide

Tool rests fall short

USABLE

Big and adjustable. *The Craftsman (shown here) has the biggest tool-rest platforms. Both it and the Porter-Cable are easily adjusted. Unfortunately, each one has detents in the adjustment mechanism that limit the angle settings. A simple fix is to place a washer spacer over the detents (above).*

NOT USABLE

Made for metalworkers? *Most of the tool rests were subpar, including one on the Porter-Cable (left), which has a trough for drill bits raking across the platform that won't let you grind chisels accurately. Platforms on the Penn State (right) and General International can't be angled at all.*

BEST FIX

Easy upgrades. *The best solution to a faulty tool rest is to invest in an aftermarket model, such as the Veritas (left, $50), which took Best Overall and Best Value in a head-to-head comparison (FWW #174). Another option is the Wolverine jig (above, $88), which comes with both a flat rest and a clever arm for turning tools.*

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

8-in. bench grinders, head to head

While their wheels are state-of-the-art, all of the grinders in this group have problems with the other critical part of the machine: the tool rests. Because of that, we decided to award only a Best Value, to the Porter-Cable.

AUTHOR'S BEST VALUE CHOICE

PORTER-CABLE PCB575BG

Street price: $119

Source: Lowes, lowes.com

Speed: Variable, from 2,000 to 3,400 rpm

Wheels: 1 in. wide; 120 grit, 36 grit,

Runout: 0.005 in. (after flange adjustment)

Tool rest: 2¾ in. by 1¾ in.

The Porter-Cable has one usable tool rest that's ground flat; the other has a drill trough cast into the platform, making it useless for narrow chisels. That's too bad because the rests are the easiest of the group to adjust via thumbscrews. The only inhibiting factor in the angle adjustments is the detents in the mechanism that limit the settings; I had to override them with a washer spacer (top right photo, p. 43). Once set, the platforms held their settings. The grinder ran with very little vibration, after adjusting the flanges to correct wheel wobble. The Porter-Cable comes with a diamond wheel dresser and a handy work light. At $120, you'll have some money left over to replace one of the tool rests with an excellent aftermarket version (see p. 43).

CRAFTSMAN 21162

Street price: $170

Source: craftsman.com

Speed: Variable, from 1,745 to 3,450 rpm

Wheels: 1 in. wide; 60-grit, brass wire

Runout: 0.005 in.

Tool rest: 4¼ in. by 1⅞ in.

This grinder has the biggest tool-rest platforms of all the grinders, and they were flat. Angle adjustments were easy to make via a thumbscrew, but detents in the mechanism had to be overridden by a washer spacer (see p. 43). Once set, the platforms held their settings. But depth adjustments, which are needed whenever the angle is changed, require a wrench, which is a hassle. The grinder was the only one in the group that did not experience severe runout, so no flange adjustment (opposite page) was needed. But the machine's brass wire wheel is essentially useless for woodworkers and caused a lot of vibration. The work light comes in handy.

wheels. The wheels run cooler and are friable, meaning they break down in use, exposing new sharp edges. Overall, the quality of the wheels was good, though each machine required some wheel work (see opposite page). Most grinders in this review come with a coarse wheel (34 or 36 grit) and either a medium (60 grit) or fine (120 grit) wheel. For grinding tool steel, you are better off with a coarse or medium-grit wheel.

Speed changes are rare, but it's nice to have the option

When spinning at the same rpm, 8-in. wheels generate higher surface speeds than 6-in. wheels. That's an advantage and a curse. The bigger wheel removes metal quickly, but the by-product of that increased speed is increased heat. With the high-carbon tool steel in plane irons and chisel blades, excessive heat can ruin the temper and hardness of the cutting edge. That's why you want slow speed with 8-in. machines, which I use for most sharpening jobs. But having a higher speed option comes in handy for rapid stock removal, say if I were blunting the tip of a chisel to make a skew. High speed is also preferable for dressing the wheels.

Best of the bunch

While testing the machines, I discovered that none is perfect. Each has major flaws with its tool rests, and in all cases I'd recommend replacing at least one of the stock rests with an aftermarket one. Because of that fatal flaw, we decided to choose only a Best Value, the Porter-Cable. One of its tool rests was usable, and it comes with a dresser and work light. It also was the least expensive, making the cost of an aftermarket tool rest easier to swallow. □

Chris Gochnour is a professional furniture maker in Salt Lake City.

GENERAL INT'L 15-825 M1

Street price: $190

Source: toolking.com

Speed: 1,725 rpm

Wheels: ¾ in. wide; 60 grit, 34 grit

Runout: 0.014 in. (after flange adjustment)

Tool rest: 2⅝ in. by 1¼ in.

The General International grinder is the only machine with a ¾-in.-wide wheel. The tool rests can move in or out by loosening and tightening two bolts with a wrench, but they are cast roughly and can't be angled in any way, making them almost useless. On the other hand, the General is a very smooth-running grinder, with very little vibration (after adjusting the flange).

PENN STATE INDUSTRIES GRIND2X

Street price: $160

Source: pennstateind.com

Speed: 1,720 or 3,450 rpm

Wheels: 1 in. wide; 120 grit, 60 grit

Runout: 0.007 in.

Tool rest: 2⅜ in. by 1¼ in.

Like those on the General International, the tool rests on the Grind2X are not a bright spot. Each is a one-piece casting that can move in and out, but lacks an adjustable platform (one platform also has a drill bit trough cast into it). The platforms are relatively flat, but because they can't be angled, grinding a chisel or plane iron evenly is a big challenge. The plastic shields had a hard time staying put while the machine was running.

WOODCRAFT 150780

Street price: $125

Source: woodcraft.com

Speed: 1,725 rpm

Wheels: 1 in. wide; 120 grit, 60 grit

Runout: 0.006 in. (after flange adjustment)

Tool rest: 2⅜ in. by 1¼ in.

The Woodcraft grinder has two-piece tool rests with relatively flat but small platforms. The rests and platforms can be adjusted, but the job requires a wrench, which is a hassle. But once dialed in, the tool rests held their settings well. The biggest problem with the Woodcraft in this review is that it vibrated a lot, even after I corrected the wheels for runout and dressed them.

Before you grind

A grinder will give you fits if it's vibrating excessively. Sometimes the vibration is caused by the grinder not being mounted securely. But often vibration can be traced to the wheels. A common cause is runout, a situation in which a wheel wobbles from side to side. Runout often is caused by the pressed steel flanges, which hold the wheel on the shaft, not allowing the wheel to run true. Vibration also can be caused by an out-of-round wheel. Fortunately, both problems have simple solutions. If neither fix works, the shafts of the machine could be bent and you should return it.

WIPE OUT THE WOBBLE

The flange fix. *Mark a reference line on the inside flange (top), in a spot you can see while the wheel is on. Then mark the outer flange and place it on the shaft (bottom). Spin the wheel by hand, checking for runout by eye or with a dial indicator. If you find it, rotate the outer flange about an eighth of a turn, and re-check. Repeat until the runout has been minimized.*

TRUE THE WHEEL

Get dressed. *A diamond wheel dresser not only trues the wheel, but it also exposes fresh abrasives, making the wheel run cooler and more efficiently.*

Online Extra

For a free video on how to grind perfect bevels with no burning, go to **FineWoodworking.com/extras.**

Speed Up Your Work with Spacer Blocks

Little blocks simplify all kinds of joinery

BY ALAN TURNER

The old saying "measure twice, cut once" is certainly sound advice, but if you need 10 parts of identical length for a project, your accuracy—and your speed—will go out the door. To make these repeat cuts quickly and accurately, most woodworkers rely on fences and stop blocks. But what if you could change the position of a stop block for other cuts on the same piece, without having to unclamp, remeasure, and reclamp? Enter spacer blocks. Used with fences and stop blocks, spacer blocks provide a quick way to move the workpiece exact distances for cutting, boring, mortising, and other tasks. You can use them to move your work closer to, or farther away from, the blade or bit. So you can lock in a final setting on the fence and then take multiple passes as you remove spacer blocks, rather than readjusting the fence.

I've developed lots of ways to use spacers to speed up my machine setups. Once you try a few, you'll find even more great uses for these righteous rectangles.

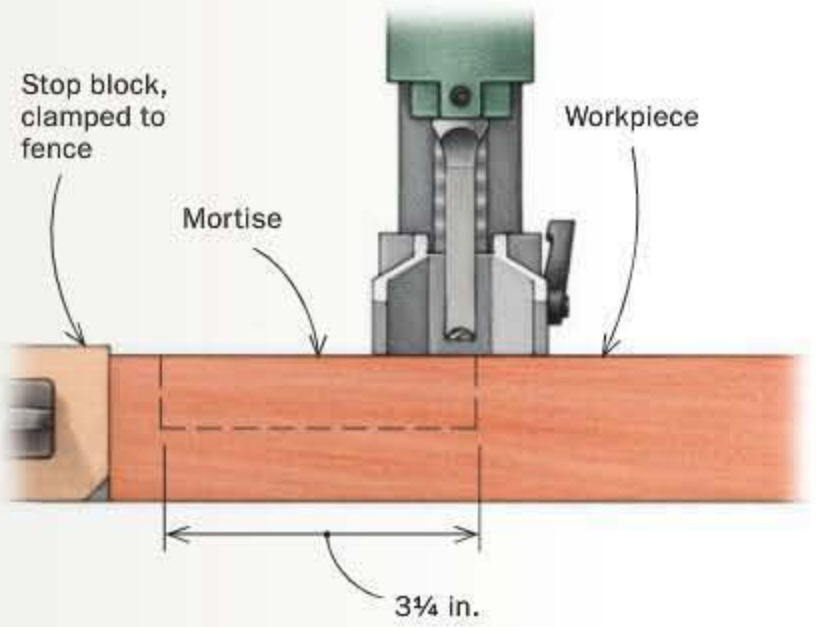
Alan Turner teaches at Philadelphia Furniture Workshop.

Photos: staff; drawings: Christopher Mills

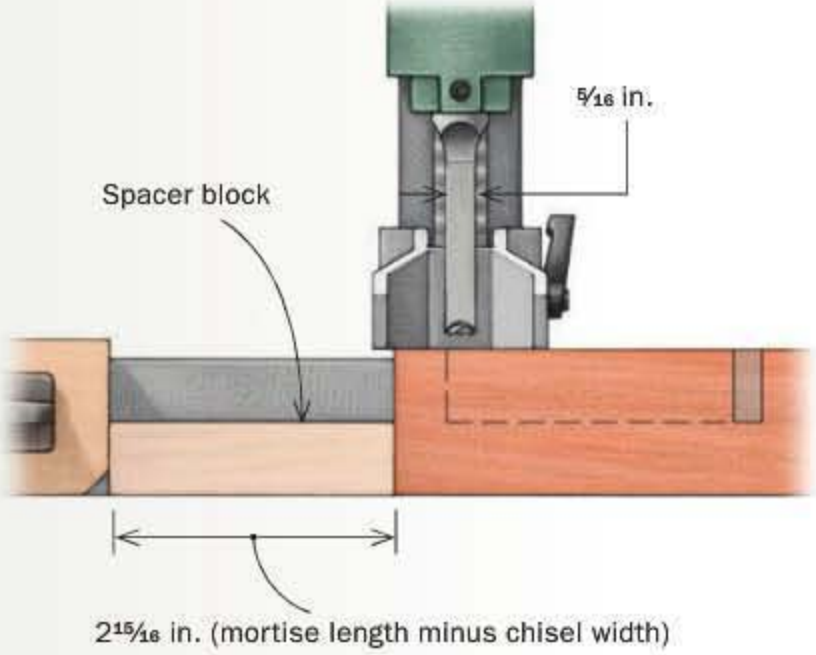
ONE-STOP ACCURACY FOR MORTISES

Most woodworkers who own a hollow-chisel mortiser will lay out every mortise in pencil and cut to the line. This is not only tedious but also increases the chances for inaccuracy, especially at the ends of the mortise. However, it is easy to cut identical mortises using a spacer block and a stop block—and you'll only have to lay out the joint once. Clamp a stop block to the fence to position the chisel at one end of the mortise. Then cut a spacer block equal to the full length of the mortise, less the size of the mortise chisel. Now you can quickly make the end holes and then nibble out the middle. You will not have to cut to a pencil line again, and all of your mortises will be identical in length and position.

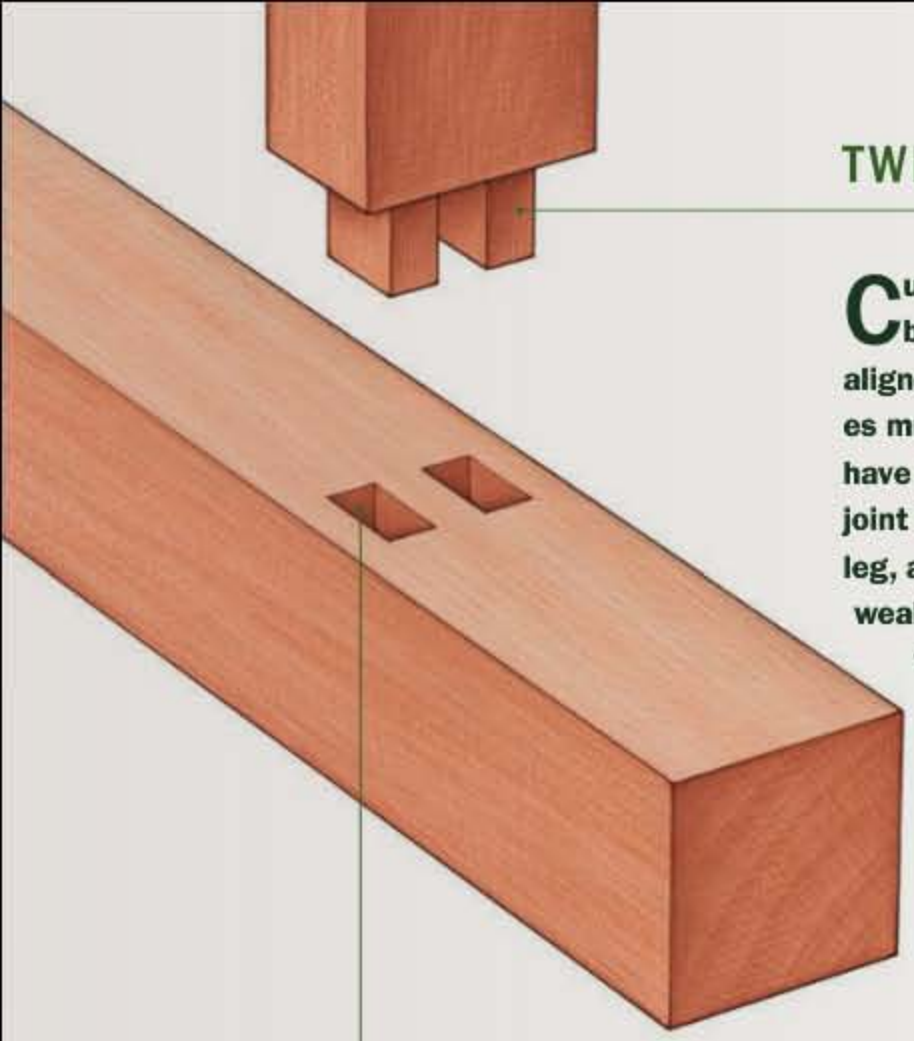
Stop block sets the first end. *Set the stop block to cut the bottom of the mortise.*



Spacer lines up the other end. *Next, insert a spacer block that is the length of the mortise minus the width of the chisel.*



Quick and easy. *After you've cut the top of the mortise (right), remove the spacer block and nibble out the rest freehand. Make a series of cuts leaving small webs of wood between them (the chisel cuts straighter that way), and then clean out the webs (far right).*



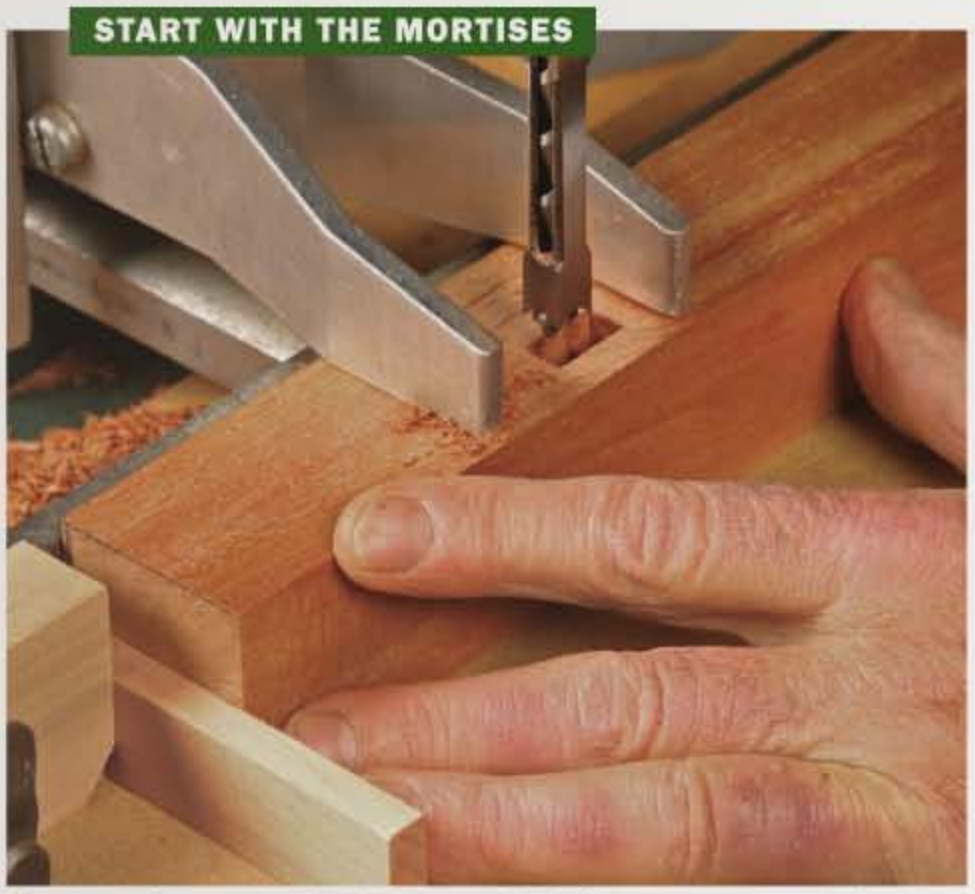
TWIN MORTISE-AND-TENONS THAT FIT PERFECTLY

Cutting a twin mortise-and-tenon can be a tricky affair. The joint has to be aligned in different directions, the mortises must be spaced evenly, and the tenons have to fit them perfectly. When using this joint to join a drawer rail to a case side or leg, any slop in the fit will translate to a weak joint or a crooked rail. Laying out the mortises in pencil, as most woodworkers would, invites error. But a couple of spacers add speed, accuracy, and repeatability.

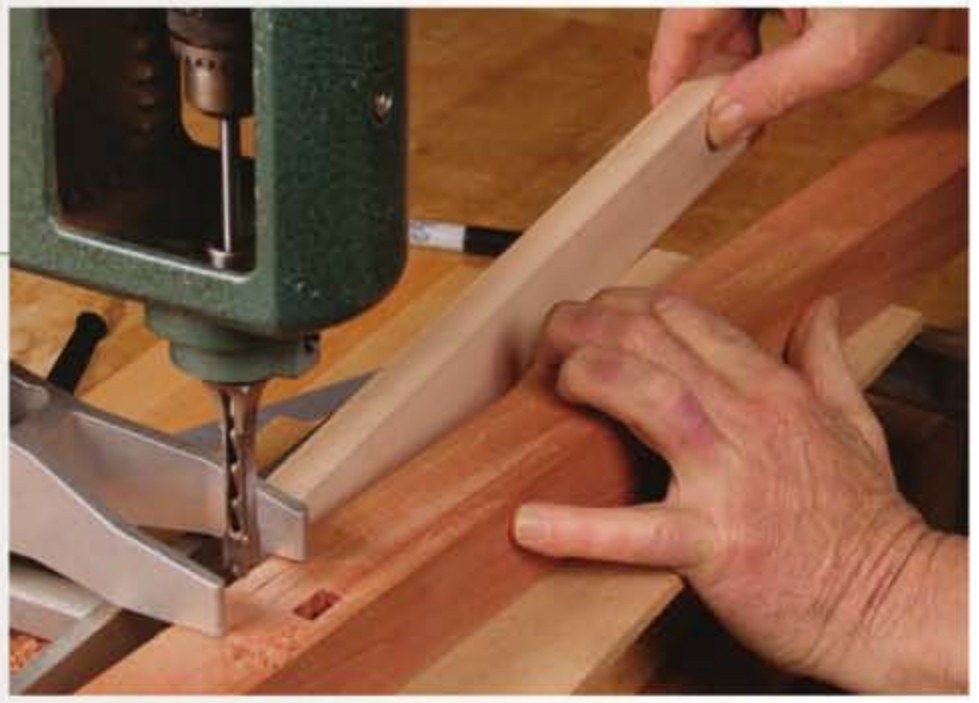
Cut the mortises before the tenons. As in the earlier mortising example, set a stop block to cut one end of the mortises, and then make a spacer that is equal to length of the mortise, minus the size of the square chisel.

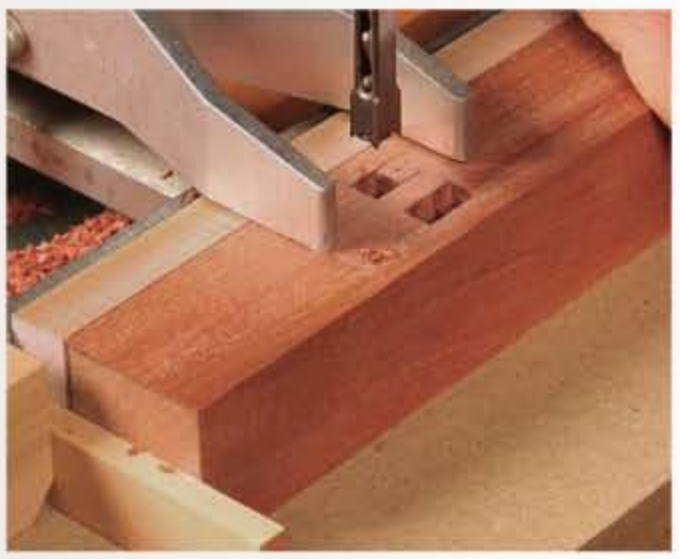
That takes care of the length of the mortises; now space them out. Set the

START WITH THE MORTISES

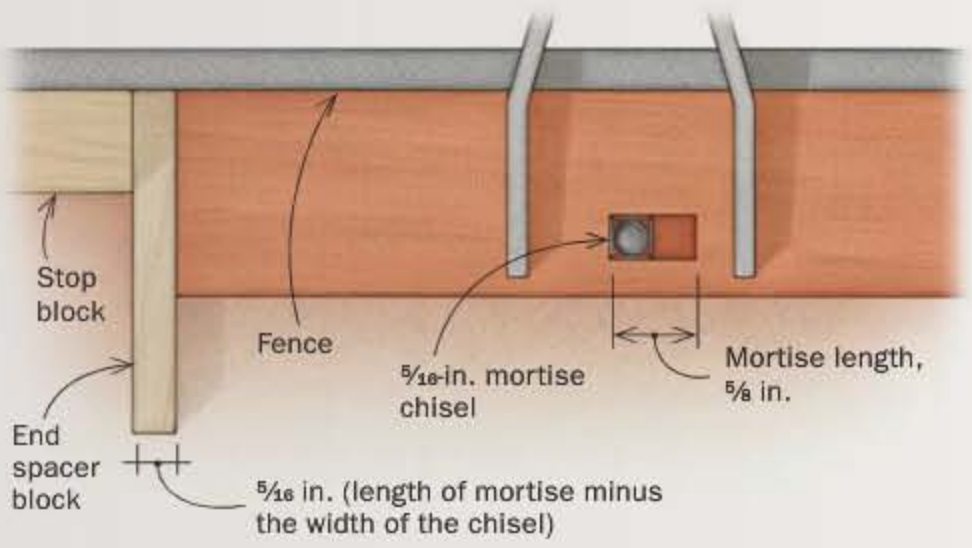


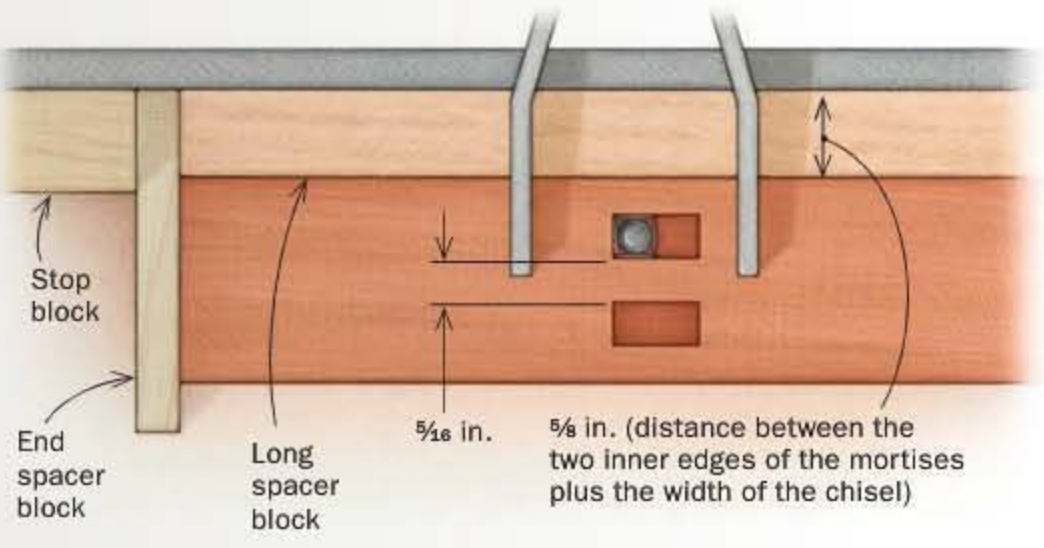
First mortise gets a single spacer. *As before, use a spacer and a stop block to determine the length of this first mortise.*



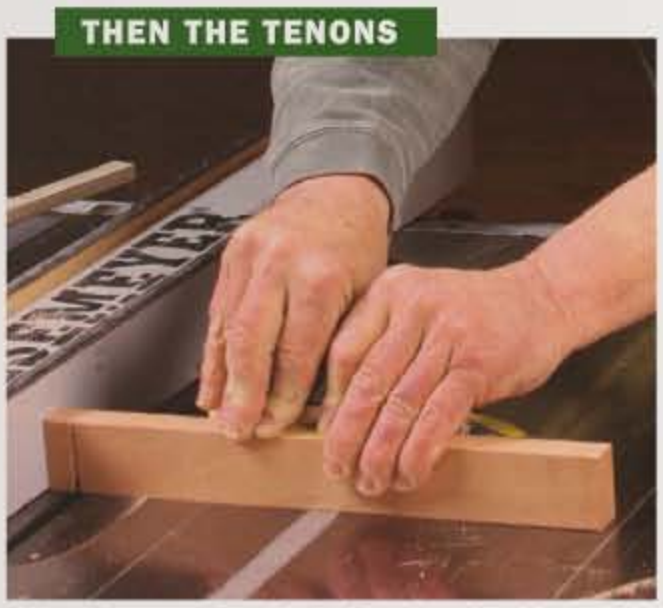


Add a second spacer and repeat. *This spacer sets the distance between the mortises and is cut long to fully support the workpiece. Note that if the mortises are not precisely centered on the leg, you'll have to reverse the setup for the opposite leg.*





THEN THE TENONS



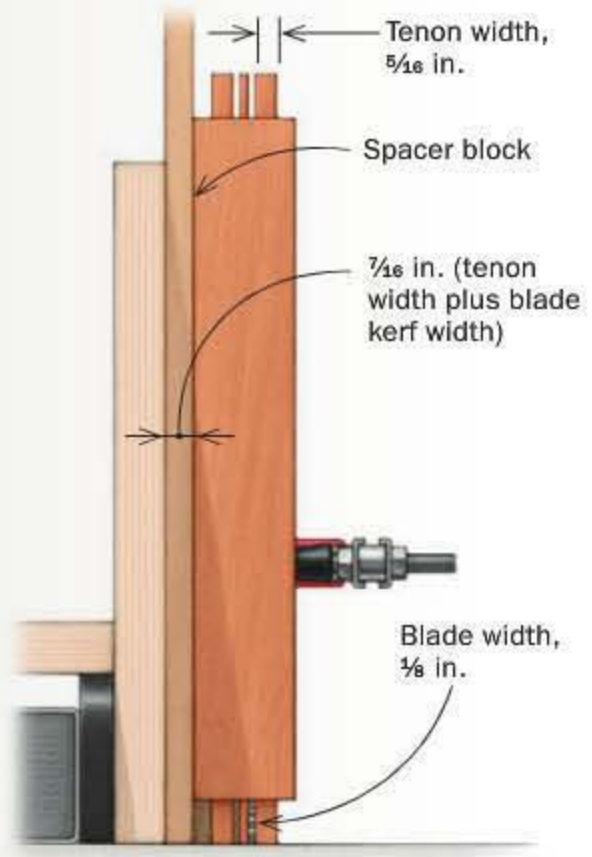
Shoulders and ends. *Define the shoulders with the miter gauge (left). Now you can load the workpiece in your tenoning jig and make the cuts that will form the ends of these twin tenons (right), checking the fit by inserting the workpiece partway into one of the mortises.*

Cut the outer cheeks. *Use a single setting on your jig and just flip the workpiece. Tip: You can keep the toggle clamp at the same setting throughout if you use a caul the width of your future spacer (see below).*

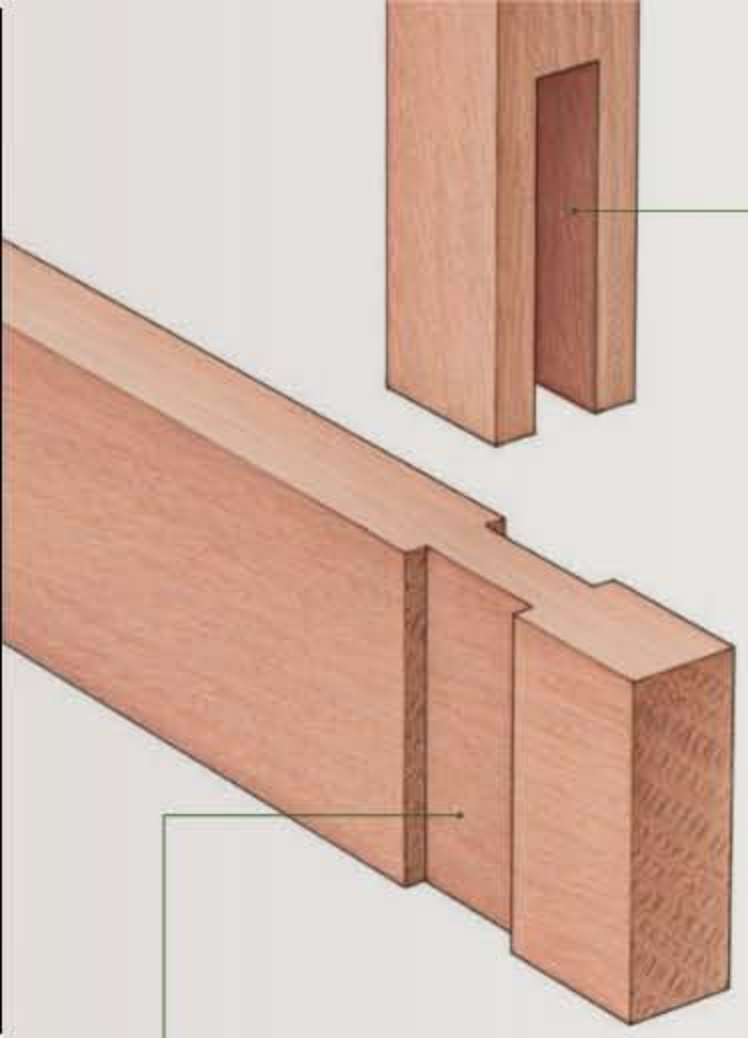
fence to cut the mortise farthest from it, and rip a second, long spacer equal to the distance between the two inner edges of the mortises plus the width of the chisel. Cut the outer mortise, and insert the long spacer against the fence to perfectly position the leg for the second mortise.

With the double mortises complete, another spacer setup ensures perfect-fitting double tenons. After cutting the shoulders at the tablesaw using the miter gauge, you normally might set your tenoning jig to cut the outer cheeks of the tenons, flipping the workpiece over in the process, and then readjusting the fence to cut the two internal cheeks. But the additional fence adjustment adds the risk of making your tenons too thick or too thin. Instead, you can simply set the jig once to cut the outside and inside cheeks.

After making the cuts that form the ends of the tenons, set your tenoning jig to cut the outside cheeks the normal way, and check to be sure they line up with the outsides of the double mortise. Then, without readjusting the jig, insert a spacer equal to the thickness of the tenon plus the blade's kerf, and cut the inner cheeks of the tenons, again just flipping the work over between cuts. You should end up with perfectly mating mortises and tenons.



Spacer block sets up the inside cuts. *The blade will next cut the inside cheeks, so the spacer should be the width of the tenon plus the blade kerf width (left). As with the tenon cheeks, you just flip the workpiece to make the second cut (right).*



A COMPLETE BRIDLE JOINT WITH SPACERS

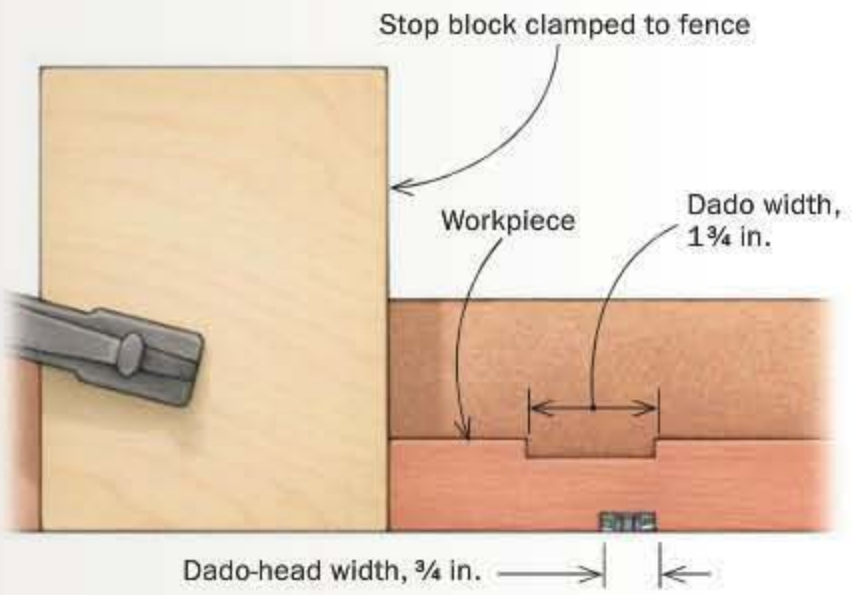
For bridle joints, many woodworkers use a stacked dado head and careful layout to make a series of cuts in the rail, forming a tenon of sorts, and then moving to the bandsaw to cut the matching slot in the post. Getting a perfect fit this way is not only difficult, but tedious.

Again, a spacer block is the answer and by now, you probably can guess at the process. For the rail dadoes, set a single stop block just once so that the cut farthest from the end is defined by that distance. Then use a spacer block as wide as the dado you want (here the width of the post), minus the width of the stacked dado head. Make the inside cut, insert the spacer and cut the outside, and nibble the remaining middle waste, if any. Flip the workpiece over and do the same on the other side to form a centered tenon.

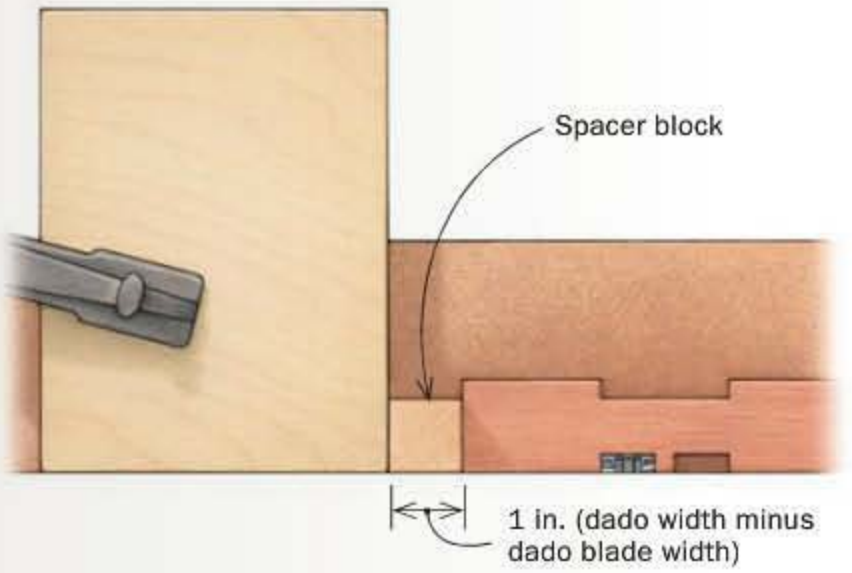
Spacer blocks simplify the deep slot in the post, too. First, make a test cut on the bandsaw and measure the width of the kerf. Set the bandsaw fence to cut one side of the slot, and then make a spacer the width of the tenon you already cut, minus the kerf thickness. Place the spacer between the work and the bandsaw fence, and make the second cut. With just two quick cuts, you have outlined a slot that will fit the tenon perfectly. All that's left is removing the waste.

START WITH THE TENON

Stop block for one side. *Cutting against the stop block defines the first wall of the two opposite dadoes.*

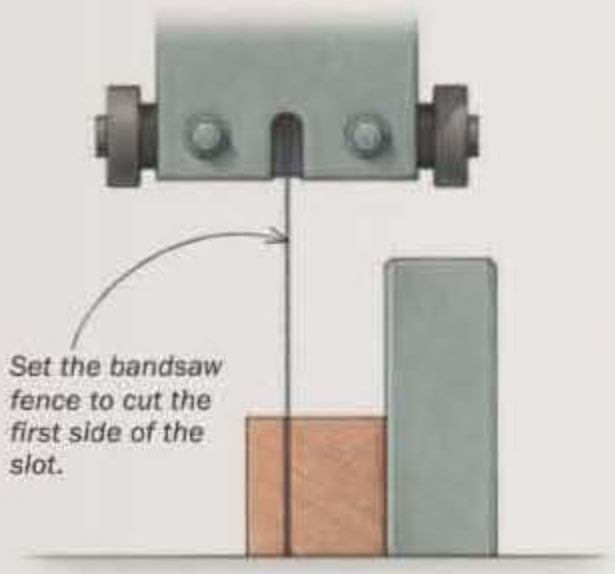


Spacer block for the other side. *After you've made the first cuts on both sides of the rail, add the spacer to make the cuts at the other end of the dadoes. Then just nibble away the wood between them.*



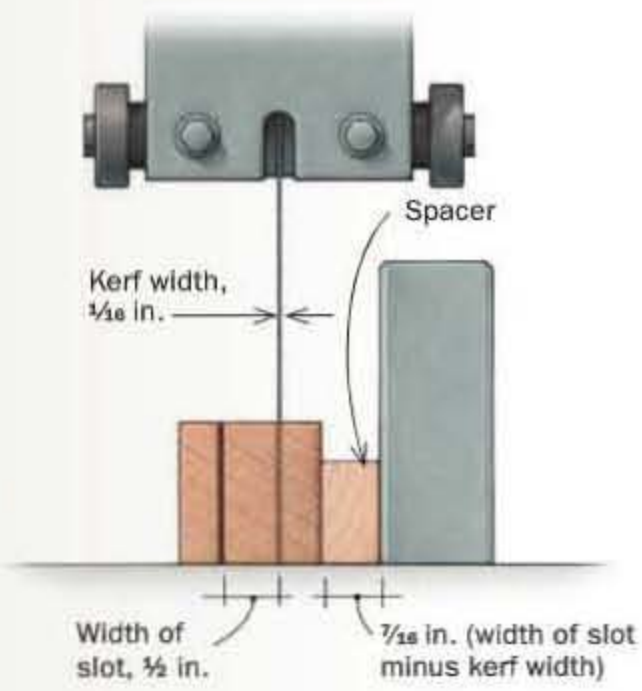
MAKE A MATCHING SLOT

Cut the first side. *At the bandsaw, the stop block sets the depth. The fence setting determines the location of the slot.*



Measure the kerf carefully. *Measure the kerf width of your bandsaw blade and use that measurement to calculate the spacer width.*

Add the spacer for the second cut. *Sized correctly, it guarantees a perfect fit between tenon and slot.*



Keep going until you hit the block. *Make sure your stop block is thicker than your spacer, or it won't stop the workpiece during this second cut.*

All-Wood Drawer Slides

Full-extension slides that are as pretty as the rest of your piece

BY ROB HARE

Early in my career as a furniture maker, a client asked me to design and build an entry table. The client wanted an elegant piece *and* the practicality of drawers that would open all the way, giving full access to the contents. If I didn't come up with a unique solution, I would be stuck with those convenient but ugly commercial metal slides.

With some forethought and trial-and-error, I developed a system that supports a drawer when pulled completely out of the case using attractive hardwood slides that harmonize with the piece.

I built my first set of these slides 25 years ago. That set is still going strong, and I am still building and installing these drawer slides the same way. The process isn't hard. Beyond a couple of special tapping bits and a full-size plan, all it really calls for is a little extra care and patience. In the example I built for this article, I used thick, solid case sides, but the technique can also be adapted for use with a frame-and-panel case or a traditionally framed opening

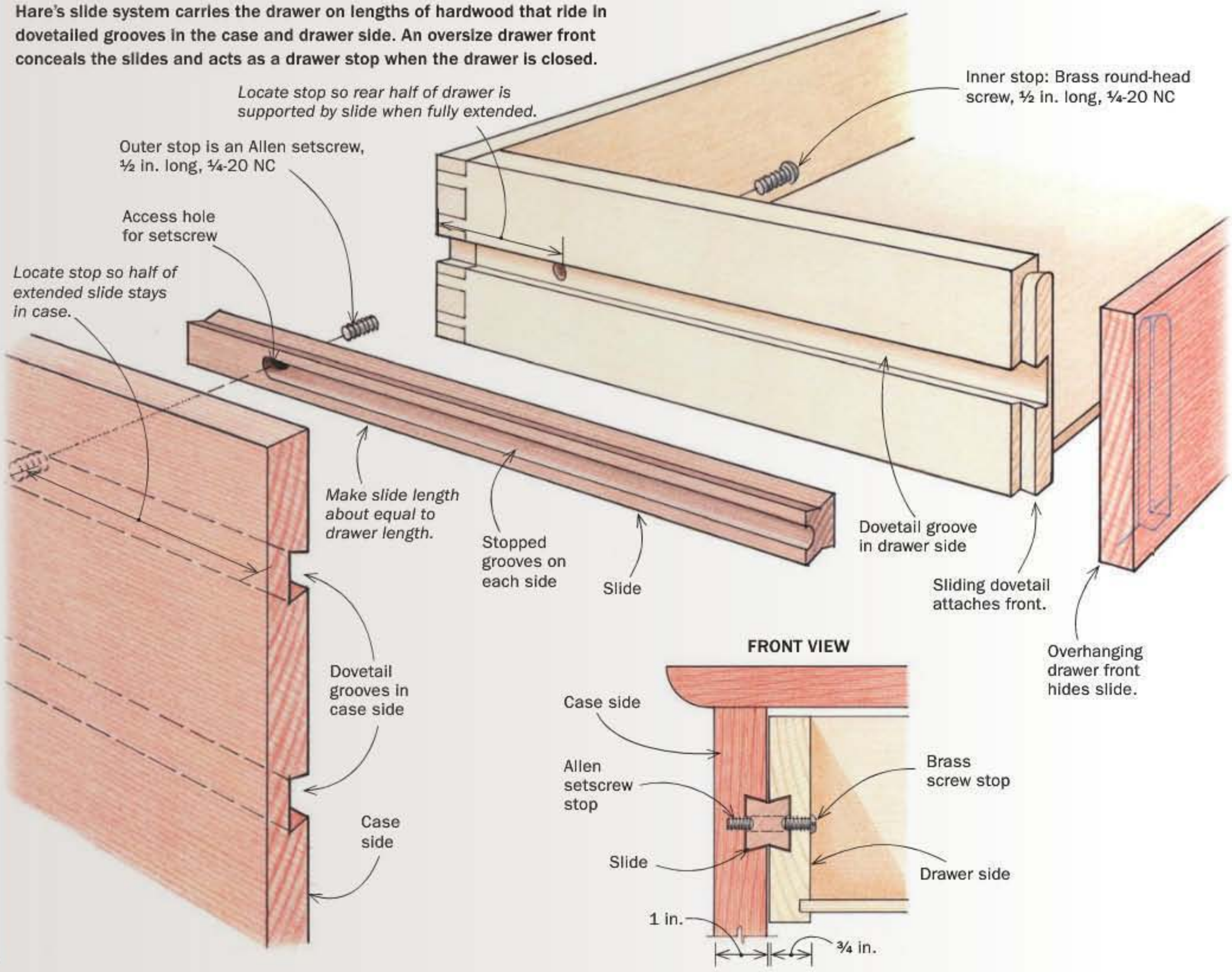
TIP

WORK FROM A FULL-SIZE PLAN

Pick up measurements from the drawing to guide machine setups. Then compare cuts in test pieces directly with the plan to make any needed adjustments.

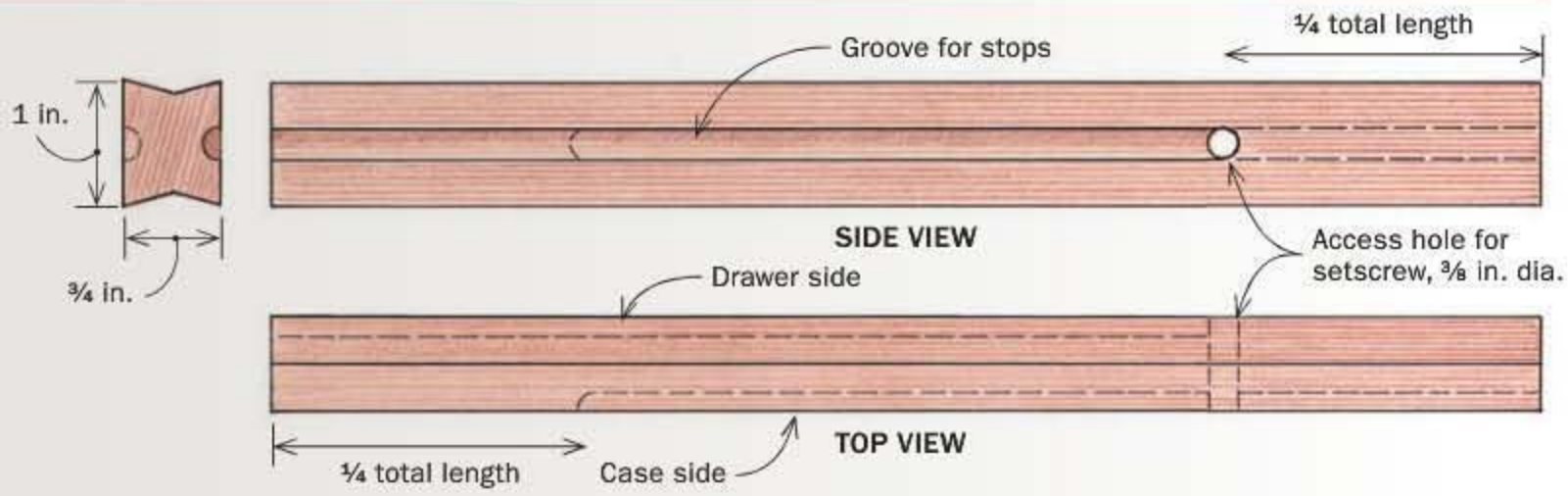
SLIDE RIDES IN MATCHING GROOVES

Hare's slide system carries the drawer on lengths of hardwood that ride in dovetailed grooves in the case and drawer side. An oversize drawer front conceals the slides and acts as a drawer stop when the drawer is closed.

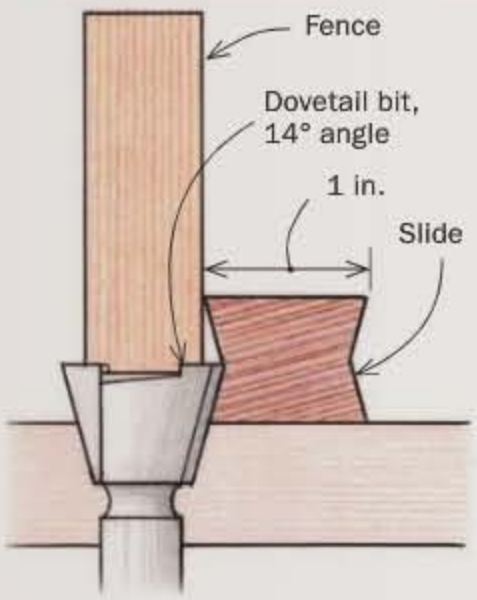


One slide per side

A single hardwood slide mates with dovetailed grooves in both the drawer and case sides to create full-extension action. Stopped grooves and screws limit the travel.

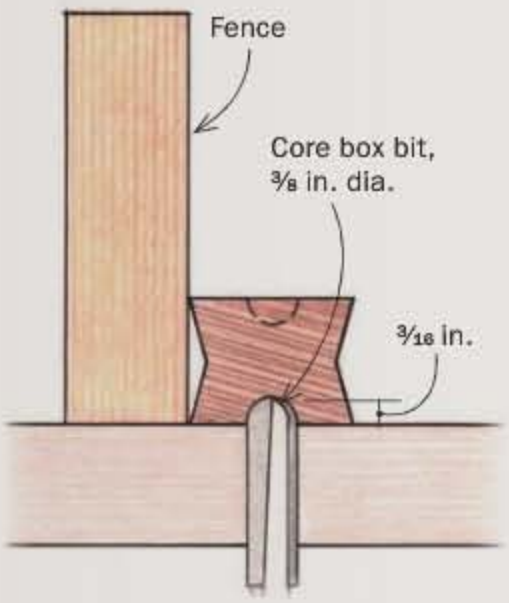


ROUT THE BEVELS



Rout the V. *Mark the midpoint of the stock and set the bit height so that the cut doesn't touch the top half. With the top and bottom of the dovetail cut, you may be left with a thin line down the center that can be snapped off by hand.*

ROUT THE GROOVES



Cut the stopped grooves. *Use a stop on the router table fence and pivot the workpiece up when you reach it. Remember that the grooves are on opposing faces and start at opposite ends of the slide.*

Drill access holes. *In each slide, drill a through-hole centered in the stopped end of one groove. This hole provides access to the inside of the case side during installation of the drawer stops.*

for a table drawer. In any case, the results, as you'll see, are beautiful enough for a finely made piece of furniture.

A blueprint for success

When building the piece, it's important to locate the dovetailed grooves that hold the slides accurately so that the drawer hangs properly in its opening. A full-scale drawing helps with this by showing exactly where to cut each groove. It also lets you check each machine setup by cutting a test piece and laying it directly on the plan for comparison. Finally, a drawing helps you plan the layout for the dovetails at the drawer's back corners. The center pin, on the drawer's side, should be wide enough to let you cut the groove for the slide without cutting into the joinery.

A sliding dovetail that really slides

I begin building by cutting the dovetailed slides, because I can use them to check and adjust the fit of the dovetailed grooves that will house them. For the slides, use a hardwood with straight grain. Maple works well, but I favor wenge because it lasts forever and the dark color contrasts attractively with a variety of other woods. To extend a drawer fully, the slides must be as long as the drawer is deep, excluding the front. I make most slides ¾ in. thick by 1 in. high. Keep the grain straight when milling; any runout can eventually cause the slides to bind. Be sure to mill up a couple of test blanks.

I profile the slides at the router table, using a 14° dovetail bit to rout a V-shape into the top and bottom of each slide. Precise setup is crucial. Set the bit height at ⅜ in. and position the fence for a test cut just deep enough to angle the entire bottom half of the ¾-in. face, without touching the outside corner. Now flip the test piece and make another pass to create the V. Its

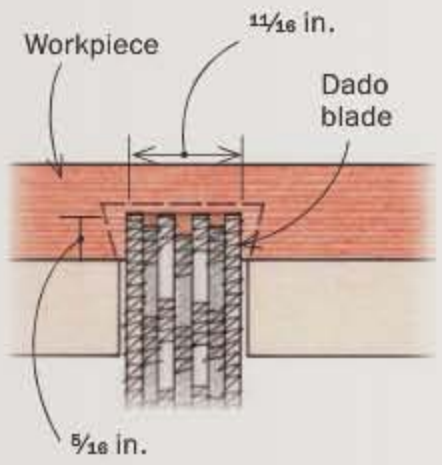
Photos: Anissa Kapsales; drawings: Vince Babak

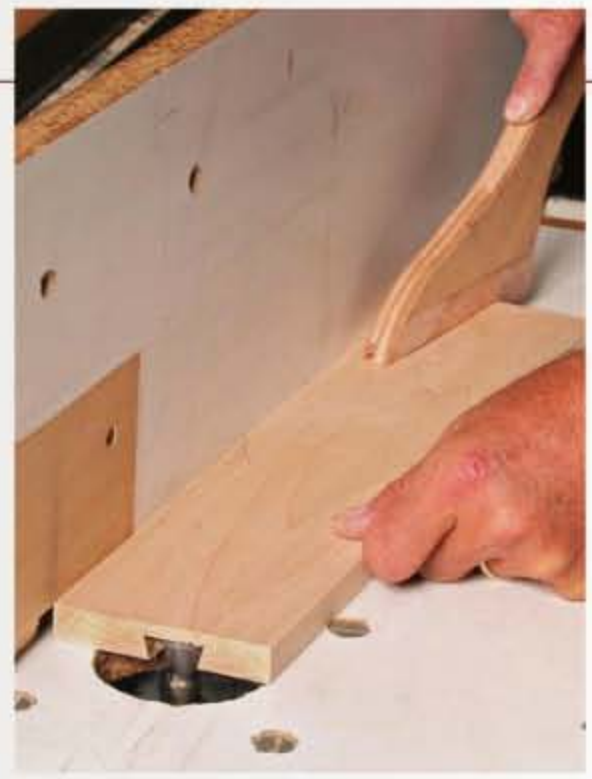
Slot the case sides and drawer sides

Work from your full-size plans to determine exactly where these grooves should go.

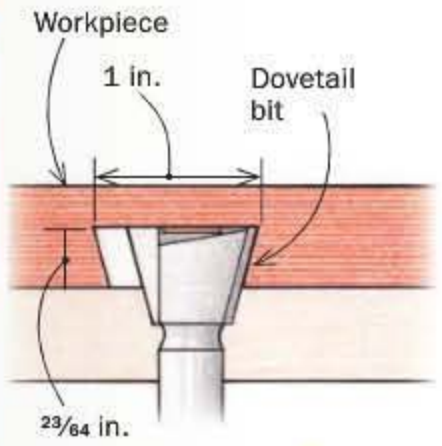
TWO STEPS TO A DOVETAILED GROOVE

1. Starting with the drawer sides, use a dado set on the tablesaw to waste away the center of the dovetail groove.





2. Finish at the router table with a dovetail bit. Use measurements from the full-scale drawing to locate the fence.

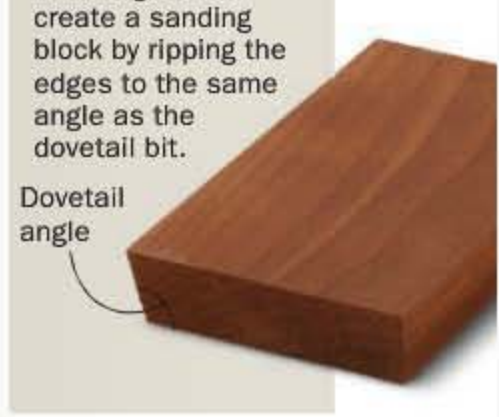


Build in some play. *A slightly oversize groove will help prevent the slide from jamming due to humidity changes. Set the bit about 1/64 in. lower than you did for cutting the slides. Sand the grooves with an angled block for smooth travel.*

TIP

CUSTOMIZE A SANDING BLOCK

For the grooves, create a sanding block by ripping the edges to the same angle as the dovetail bit.



bottom should be perfectly centered and show no lapping of the cuts. Use a machinist's square to check that the outside corners remain square after cutting a complete tail. Once the setup is right, profile all the slides at one time for consistency.

The last step is to cut a stopped groove in each side of the slide to house the stops. Use a 3/8-in. core-box bit in the router table. Adjust the bit height to 3/16 in., and set the fence to center the bit on the slide. For each slide, rout a three-quarter-length groove on one side, then flip the piece and rout a matching groove on the opposite side and from the opposite end. Afterward, drill a 3/8-in.-dia. hole at the stopped end of one groove on each slide.

The slide is only as true as its groove

Your carefully machined slides now need a carefully matched set of dovetailed grooves

Case sides follow suit. *Use your full-size plans again to carefully locate the grooves in the case sides, and use the same tablesaw and router-table techniques to cut them.*

Assembly, step by step

There are stops in the case that keep the slide from coming all the way out, and similar ones in the drawer sides.

1. LOCK THE RUNNER INTO THE CASE FIRST

Drill for the first stop. *Mark the case side at the point where the access hole falls when the slide is inserted a little more than a quarter of the way into the case. Use a guide block as shown to keep the drill straight; a piece of tape marks the bit depth. A 3/16-in. brad-point bit centers easily and cuts cleanly.*

This hole needs threads. *The setscrew that serves as the stop in the case side can't cut its own threads, so you'll need to cut them using a standard ¼-20 NC tap, available at Amazon.com and online hardware dealers. Follow up with a ¼-20 bottoming tap to thread the hole all the way to the bottom.*

to carry them. The grooves must be cut to the right size for the slides to move smoothly, and located accurately for the drawers to hang properly with even gaps between them. Fortunately, the task is straightforward and essentially the same for both drawer sides and case sides. It involves taking measurements from the full-scale drawing for machine setups that are then fine-tuned with cuts on full-size test pieces.

Start at the tablesaw, using a dado set that is ⅛ in. narrower than the neck of the finished groove. Set the height 1/16 in. lower than the finished depth of the groove. On the drawing, measure from the top of the drawer side to the groove opening. Add 1/16 in. to account for the narrower dado stack, and use this measurement to set the fence. After plowing a groove in a test piece, check the groove's location by setting the workpiece directly on the drawing for comparison. When the fence is located correctly, cut the grooves in all of the drawer sides. Now repeat the entire process for the grooves in the case sides, using the top of the case side as the starting point for your measurement on the drawing.

(By the way, if you are making your case from open-pored wood or veneered plywood, it's a good idea to inlay a strip of maple in each groove location before cutting the grooves so that the slide has a smoother bearing surface to ride against. Cut the inlay mortise with the dado head, making it ¼ in. wider and ⅛ in. deeper than the finished groove will be.)

Install the set screw. *With the slide in the groove, insert the screw through the access hole and into the threaded hole in the case. Continue turning the screw until the slide moves freely in its slot but is halted by the stop.*

With all of the square grooves cut, move to the router table to finish the dovetail. Measure on the drawing from the top of the drawer side or case to the dovetailed corner at the bottom of the groove. Use these measurements to set the fence for each angled wall in turn, using the tip of the router bit as a reference. Set the bit about 3/64 in. higher than you set the dado cutter at the tablesaw, to deepen the entire groove as you are cutting the angled walls. After cutting the angled walls in a test piece, check the fit of the slide and adjust if needed. The fit should be snug, not tight. A light sanding will create a little

2. INSTALL THE DRAWER

Locate the second stop. *To locate the stops in the drawer sides, extend the hardwood slides completely and place the drawer on them in the position where you want its travel to stop. Make sure the top of the slide is marked to show where the inner groove ends.*

extra space. You want about 1/32 in. of breathing room all around.

Fit each slide with a pair of stops

Each slide gets two stops. One keeps the drawer attached to the slide and the other keeps the slide from coming out of the case. Each stop consists of a screw that bottoms out in one of the grooves on each side of the slide. To keep the slide in the case, I use an Allen setscrew driven into the case side through the access hole in the slide. First drill and tap the hole in the case. Install the setscrew, then check the clearance by moving the slide back and forth while holding it tight against the groove. If you feel any friction from the screw, set it in a little deeper and check that the slide doesn't skip past the stop. If it feels loose, back out the screw a little bit.

To keep the drawer on the slide, I use a brass round-head screw driven from inside the drawer. Where you locate this stop determines how far the drawer will open. Start by mounting the drawer on the slides in the case and then pulling the slides and drawer out until you reach the desired opening—it should come out far enough that you can see its entire contents. With the drawer fully extended, the slide should be roughly halfway out of the casework.

Install the stop. *Transfer the mark from the top of the slide to mark the drawer side for drilling (left). Drill with a 3/16-in. Fuller taper bit, cut the threads with your standard tapered tap, and then insert the stop (right) from inside the drawer while the drawer is resting on the slides.*

Mark the drawer sides at the spot where the stopped grooves end, then remove the drawer, drill and tap through the side for the stop (see photo, above). Then put the drawer back on the slides and install the stop. To remove the drawer from the slide, unscrew the stop.

Sand all surfaces of the grooves and slides to P220-grit and lightly bevel all corners at the ends of the slides. Don't apply finish: It can get sticky from the friction. Instead, lightly rub the surfaces with bar soap. The small amount of oil and wax it contains works perfectly. □

Rob Hare builds custom furniture in Ulster Park, N.Y.

Better than Paint

Pigmented lacquer is smoother, brighter, and more durable for fine cabinetry

BY SEAN CLARKE

Right at home. *You should design a built-in or entertainment center to match the design of the room, and a paint company can tint your lacquer to match, too.*

Whether in modern or traditional interiors, bookcases, built-ins, and cabinets sparkle when finished in a crisp, classic white. For maximum impact, this finish requires a very even application and a smooth finish, so it is typically sprayed on. But don't despair if you aren't set up to spray: I will show you how to get an off-the-gun-looking finish just by brushing and wiping. It will take longer than spraying, but the quality of this finish is well worth the wait.

While I could reach for oil-based or latex paint, I find that pigmented lacquer provides a superior look in terms of evenness and lack of residual brush marks. I prefer acrylic lacquers over nitrocellulose

ones because they are non-yellowing and retain brilliance better. I'm going to use a pre-catalyzed version here, which has better durability than a non-catalyzed lacquer and is easier to apply than a post-catalyzed lacquer. You can buy this type of lacquer from Sherwin Williams or M.L. Campbell paint stores and, if you like, they can tint it to match an existing color in your house.

A flawless finish needs perfect prep work

The best woods for painting are close-pored, such as poplar, maple, pine, or birch plywood. The high-solids primer that I'll use can fill medium-pore woods, but if you find yourself having to paint an open-pored wood such as oak it would be best to apply an oil-based grain filler first.

I begin to prep the surfaces by filling any imperfections with water- or solvent-based, natural-colored wood filler. Using a utility blade or flat spatula, I lay the wood filler into any indentations, leaving the filler slightly proud of the surface. For minor indentations (less than 1/16 in. deep and 3/16 in. wide), let the filler dry for one or two hours. Larger fills will require more drying time. Next, I sand the whole surface up to P180- or P220-grit. Wrap the sandpaper around a sanding block for a smooth, even surface. The block also ensures that the filled areas end up even with their surroundings.

Since this project is made from pine, I next apply a 2-lb. cut of shellac as a sealer on any knots or sap pockets. Without it, these areas can emit resin that eventually leaches through the finish. I apply a generous coat of dewaxed shellac to any knots, spreading it away from the center of each knot to blend into the unsealed surfaces. Let the shellac dry for about four hours, or until it is not tacky to the touch, then light-

PREP THE SURFACE

A painted finish is far less forgiving of any surface defects than a clear finish is, so deal with these first.

Fill dents and holes. *Clarke uses a knife blade to press wood filler into a knothole.*

TIP

WHY IS THIS CAN UPSIDE-DOWN?

The manufacturer of Plastic Wood intentionally inverts the label to encourage people to store the can lid-side-down. This old finisher's trick keeps air from leaking in, and works well for any finish that tends to gel or harden in the can.

Sand it flush. *Use P150-grit paper wrapped around a cork-faced block or a sanding sponge to level the filled area.*

Seal with shellac. *To prevent resin from staining the finish in the future, seal all knots and sap pockets in pine with dewaxed shellac.*

SOURCES OF SUPPLY

MOP BRUSHES
Davis International Group
mylands.com

PRIME FIRST

A primer formulated for lacquer creates a flat, uniform-colored surface for the topcoat.

PRIMER RECIPE

60% Primer, 40% Thinner

Thinned for brushing. *To make it easier to brush, Clarke thins the primer with a lacquer thinner.*

ly dull the shellac with a purple abrasive pad, being careful not to cut through it.

Primer creates a smooth foundation

White lacquer primer is one of the big secrets. It builds a film that overcomes any imperfections too small to fill and it sands easily, leaving a flat, seamless surface devoid of grain texture, critical for a flawless finish. I work in a large, well-ventilated area; otherwise, I'd use a respirator.

I reduce the primer approximately 40% with the manufacturer's recommended solvent. This is slightly thinner than for spraying but it makes the primer more workable and forgiving for a hand application. I prefer a large lacquer mop brush (see sources of supply, p. 59) because of the amount of finish that it can carry, but a quality 2-in. natural-bristle flat brush is also a good choice. If possible, work on a horizontal surface, as this greatly reduces the chance of runs. Tip cabinets onto their sides and let one side dry before turning it over.

Best technique for flat areas: Unload, then spread. *Load the brush and then lay down a thick strip of finish away from the edges (left). Then come back and spread the finish out on both sides of the strip (center). After reloading the brush, land it an inch or two from the wet area (right). Now it, too, can be spread out on both sides and will not create a ridge of excess finish.*

Next coat. *After the first coat is dry, apply the second coat of primer with the same technique, but perpendicular to the first to reduce the buildup of brush marks.*

Brushing tips for primer and lacquer—Both the primer and topcoat are applied in the same way. I apply the first coat with the grain, starting a few inches from an edge and applying the finish about half the length of a normal brush stroke. Then I go back and forth to spread it out on each side of the initial brush stroke. After recharging the brush, I land it about an inch or two away from the wet area, ensuring even coverage without a ridge of surplus finish.

On narrow moldings or details, I use a smaller #6 or #8 lacquer mop or a 1-in.

Photos: Mark Schofield

natural-bristle flat brush. I let this whole first coat dry at least one to two hours, depending on temperature and humidity, and then evaluate the surface. Fill any imperfections that may have been missed in the initial filling; let the filler dry one to two hours (or longer for larger areas), and then block-sand the filled spots.

If the surface is fairly smooth (and didn't need more filling), you can skip sanding as long as you apply the next coat within 60 to 90 minutes. If you wait longer, or the surface is rough, sand it with P220-grit paper to smooth the surface and to create a mechanical bond with the next coat.

To apply the second primer coat, I work perpendicular to the grain, using the same technique. By applying coats alternately with and across the grain, you minimize a buildup of brush lines. If you are brushing a confined area, apply all the coats in the longer of the two directions. I allow this coat to dry for a minimum of two to four hours, depending on temperature and humidity, but overnight is fine too.

I repeat the horizontal application for the third primer coat, let that dry for two to four hours, and then block-sand all the primed surfaces with P220-grit sandpaper. I use a vacuum with a brush attachment to carefully remove all the sanding dust. Wipe your hand across the surface. If it comes up white, gently use a tack cloth to remove any remaining dust.

Apply topcoats until you get the desired look

It's time to apply the tinted lacquer topcoats. Start by thinning the lacquer by approximately 30% with the manufacturer's recommended solvent and then add a further 10% in retarder. This gives the lacquer time to flow out before drying, minimizing brush marks. I apply the first coat across the grain, as described above, and let it dry for a minimum of two to four hours. Using P220-grit sandpaper and a block, I lightly sand this coat to remove any surface debris and brush marks, and then vacuum away the dust. I apply a second coat of lacquer with the grain, and then allow the workpiece to dry overnight.

Stop here? The next day I assess the workpiece. As long as there is no streaking, and if you like a little grain pattern showing, then you can stop here. If desired, you can rub the surface with 0000 steel wool wrapped around a cork block

REMOVE ANY FLAWS

Sand the surface and deal with any remaining problems before applying a third coat of primer.

Sand each coat. *Lacquer primer is designed to be easily sanded. Wrap P220-grit paper around a block for flat areas, and hold it in your fingers for moldings.*

Remove all dust. *After vacuuming the surface, lightly wipe it with a tack cloth to remove any remaining residue.*

More flaws show up. *The uniform appearance of the primer will probably reveal surface defects that were camouflaged by the natural wood. Fill and smooth them.*

Deal with drips. *If you can't catch a drip or run immediately, don't wipe the sticky surface. Let it dry, then shave it flush with a sharp knife. Clarke uses a utility blade.*

BRUSH ON THE TOP COATS

Like the primer, the lacquer topcoat is thinned and applied in multiple coats.

BRUSHING RECIPE

60% lacquer, 30% thinner, 10% retarder

Doctor it for brushing. *Thin the topcoat to make it easier to apply and add retarder to leave fewer brush marks.*

Brush in sequence. *When finishing complicated surfaces, do the large surfaces first with a big brush, then cover molding and trim with a smaller one.*

Sand between coats. *Sanding not only removes dust nibs and brush marks, but it also creates a mechanical bond between layers of finish.*

Work horizontally. *On large and small pieces, when possible, work on a horizontal surface to reduce the risk of runs.*

and then apply wax, to both level the surface and then even out the sheen.

Brush two more coats and then pad on a topcoat for a flawless finish

Even if you aren't set up to spray, you can still achieve the formal look of a factory finish; it just takes a little longer. Lightly block-sand all the surfaces with P220-grit sandpaper to remove dust nibs and brush marks. Then rub all the surfaces with a maroon abrasive pad, dulling down the finish to make really sure that a mechanical bond can be achieved with the next coat. Follow up by wiping all surfaces with a tack rag to remove any fine sanding debris.

I apply two more coats in the same manner as the first two, sanding after each and allowing for an overnight drying period.

To approach the smoothness achieved by spraying, pad on a final application of lacquer. To form the pad, I cut a cotton bed sheet roughly 8 in. square, removing any hems. I then cut a piece of cotton wadding (available at fabric stores) about 6 in. square and fold it into a wad roughly 2 in. wide and 3 in. long, with a point at one end.

I further thin the topcoat by 10%, and then add it directly to the core of the pad. After squeezing out the excess, I place it in the center of the sheet, bring each corner of the sheet in to the center, twist the corners into a grip for the pad, and make sure that the polishing side of the pad is tight and free of creases or wrinkles.

I start the process perpendicular to the grain, beginning at the far edge, working the pad left to right and slowly moving toward me. When you begin to feel some resistance, it's time to charge the pad with more lacquer. Open the pad and add lacquer to the inner face of the wadding, let it absorb, re-wrap the pad tightly, and gently squeeze the pad to remove any excess material.

When working in an area where the light source is fluorescent tubes, place the workpiece in a position so that your strokes are perpendicular to the light source for a better surface reading.

Working a small area such as the side of a cabinet, I cover the whole surface two or three times, let it dry for about 10 minutes, and then repeat the process with the grain. I pad in alternating directions up to four times, with a 10-minute drying break after each application, until I am satisfied with the build and evenness of the surface.

CHOOSE YOUR FINAL SHEEN

As with clear coats, you have a choice of final sheen. You can use steel wool and wax for a low-luster look, or pad on the last coat for a high gloss.

LOW LUSTER

Steel wool and wax. *Unwrap a pad of 0000 steel wool and fold it around a sanding block. Rub the surface in one direction to smooth and dull the surface (right). Wipe on and buff off a coat of paste wax (far right) for an even sheen and a pleasing feel.*

HIGH GLOSS

Pad on a final coat. *Make a pad with cotton cloth and cotton wadding. To get an even flow of finish, always add the finish directly to the core (right) and not to the outside of the pad. Pad on a last coat (far right), wiping lightly to keep the coat very thin.*

PADDING RECIPE

50% lacquer, 40% thinner, 10% retarder

In tight corners, moldings, and narrow surface areas, you can try using a smaller pad. Or you can allow the larger surface areas to cure overnight, and then tape them off with low-tack blue tape before padding the adjoining smaller areas.

Let the finish cure for two or three days before moving it into the house. This will allow it to off-gas in the workshop and avoid the risk of heavy object imprinting into the finish while it is still soft. □

Sean Clarke is the owner of Clarke Restoration and Refinishing in Columbus, Ohio.

Isolate the trim. *If you can't pad the whole surface at once cleanly, let the large areas dry overnight, then mask off areas adjacent to the trim, and work on it with a smaller pad.*

Dado Jig Is a Cut Above

Clever guide guarantees a perfect fit for shelves of any thickness

BY KENT SHEPHERD

I got my first job in woodworking when I was 9 years old, cleaning up the shop at my father's shutter business in Lubbock, Texas. When I was 12, Dad let me start using the tools. Early on, I learned a lesson that I carry with me today in my own cabinet-door business—the value of jigs for both speed and safety.

At work and in my home shop, I use dadoes often in a variety of ways, from housing fixed shelves and vertical case partitions to drawer construction. Traditional router jigs involve wrestling with C-clamps to hold them in place and require calculating offsets to align the jig, and in turn the bit, with the location of the dado.

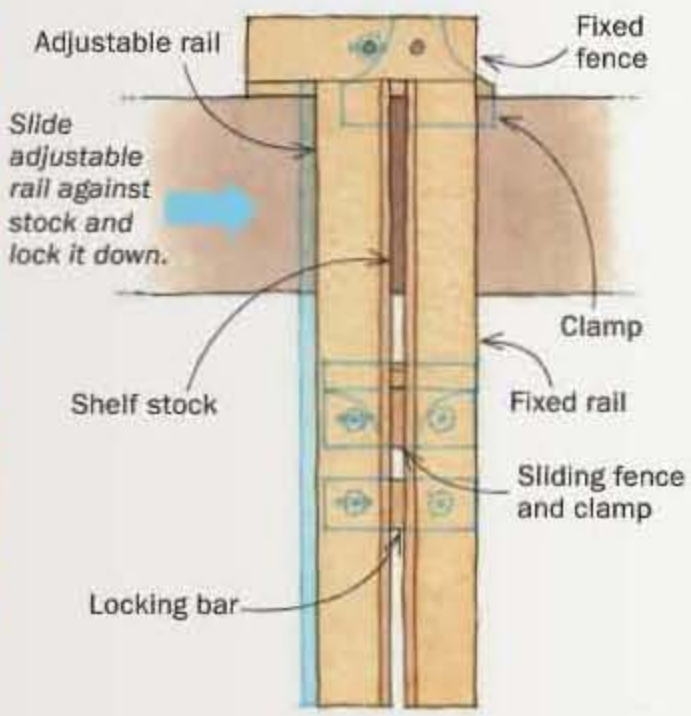
Neither of those requirements appealed to me,

The clamps are underneath, to stay out of the router's way, so you have to elevate the workpiece. But after that the jig is foolproof: You use one of your actual shelves to adjust it for a perfect-fitting dado.

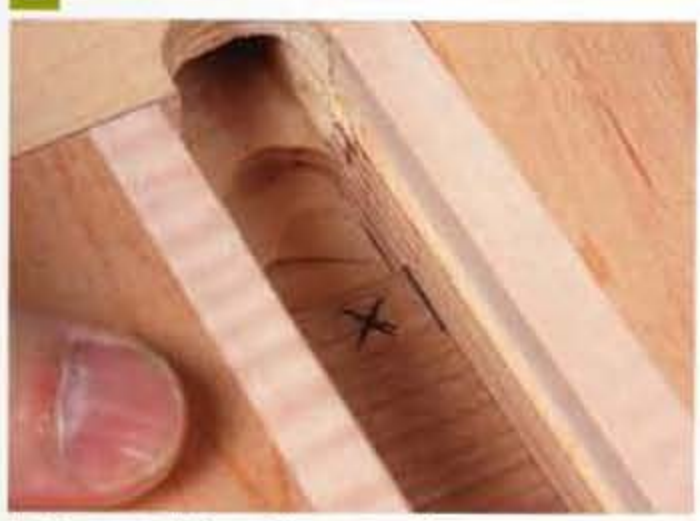
3 STEPS TO A DEAD-ON DADO

1 USE A SHELF TO SET IT UP

Set the guide rails. *The lower parts of the guide rails show exactly where the router will cut. For a perfect fit, snug the rails up to a shelf, then tighten the adjustable rail.*



2 ALIGNMENT IS SIMPLE



Just a pencil line. *All you need is a mark on one edge of the dado, with an "X" to show the waste side.*

Photos: Kelly J. Dunton; drawings: Jim Richey

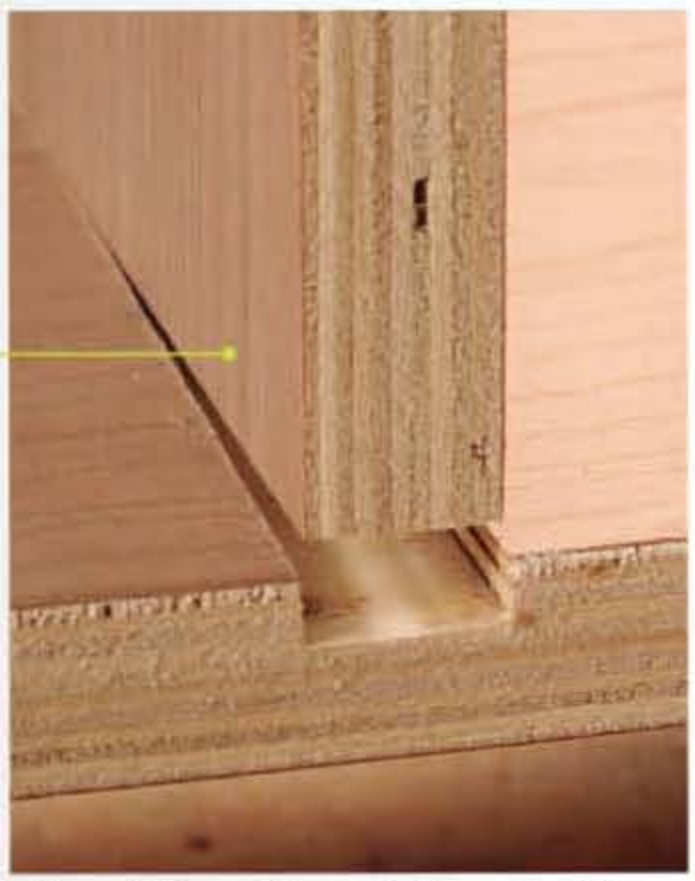
so I created this router jig instead. I started with an adjustable, twin-rail design that calls for using a guide bushing in the router. By custom-fitting the jig with the bit and bushing I planned to use for cutting the dadoes, it's easy to locate and set up the cuts by eye. The innermost edges of the rails show exactly where the bit will run, so you don't have to factor in the offset between the bit and bushing when setting up a cut. The twin rails—one fixed and one adjustable—make it easy to cut a dado to custom width, exactly matching the thickness of the part it will house.

To do away with C-clamps, I added an integral clamping system that makes it easy to secure the workpiece and lock the jig in place. These built-in clamps can handle stock from 3/8 in. to 1 in. thick, and they work from underneath, so they don't interfere with the router's travel. With them, I can quickly release and reposition the jig while keeping the setting for my dado's width. This makes speedy work of tasks like cutting multiple shelf dadoes in a case side.

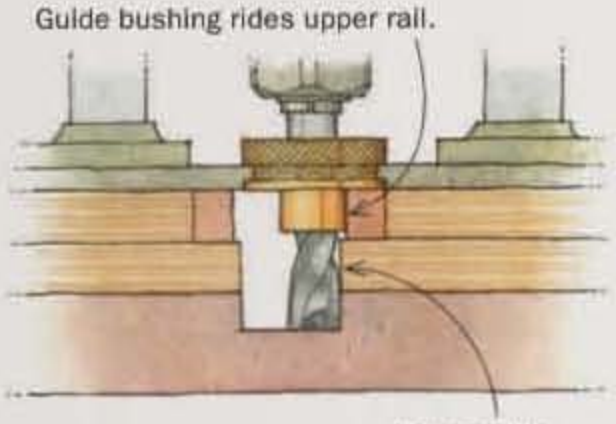
The adjustable rail lets you set the jig for a dado that will precisely match the thickness of the mating piece it will house. And one final benefit of the jig is that its inner edges act to prevent chipout along the edges of the cut. It's a bit of work to build, but the reward is having the world's most reliable dado jig.

Two rails make for straight cuts

The rails are made from two layers of 1/2-in.-thick plywood, face-glued together. The inside



The genius of the jig is the offset rails, which both guide the bushing and show exactly where the bit will cut.



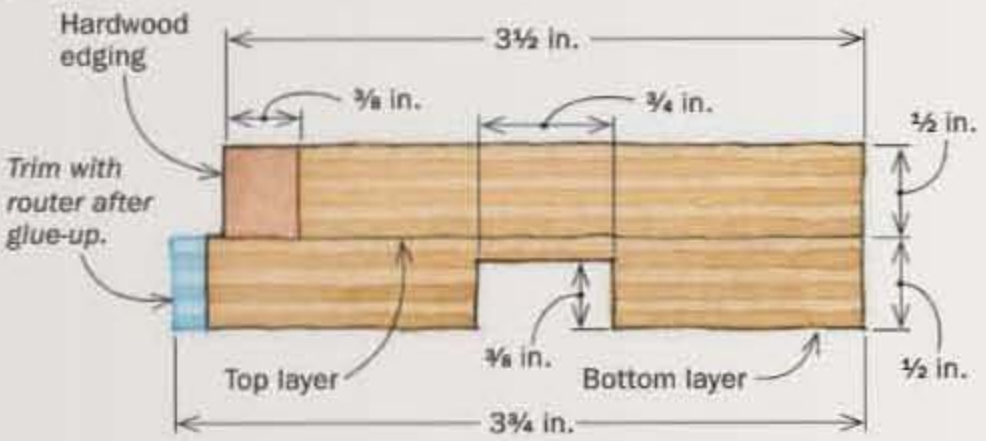
3 LOCK IT DOWN AND ROUT

Clamp and go. *The cam clamps lock the jig in place quickly, and it's easy to ride each rail for a perfect-fitting dado every time!*

Making the jig: Rails first

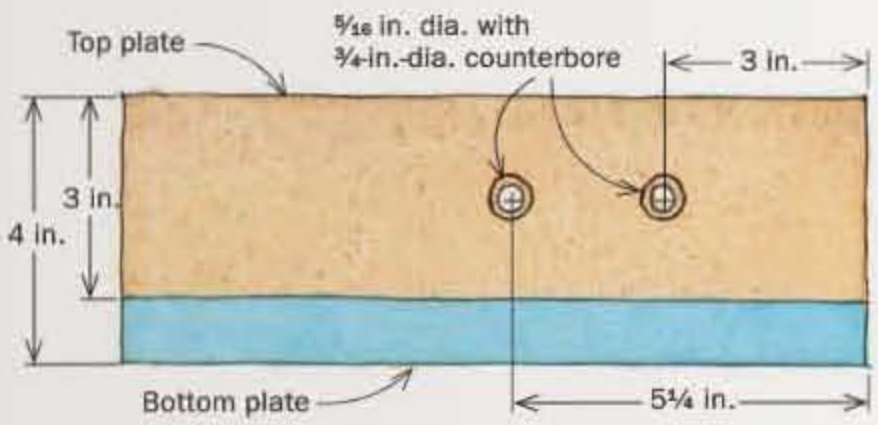
Built to last. *Hardwood edging gives the router's guide bushing a long-wearing surface to ride on. Edge-glue the strip in place and sand it flush.*

RAIL DETAIL

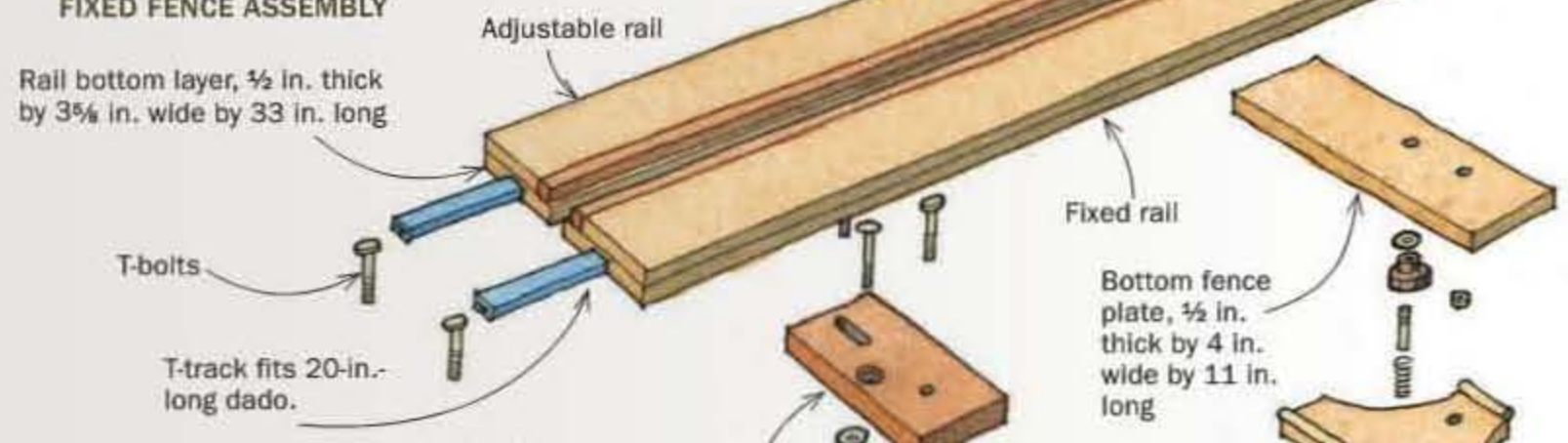


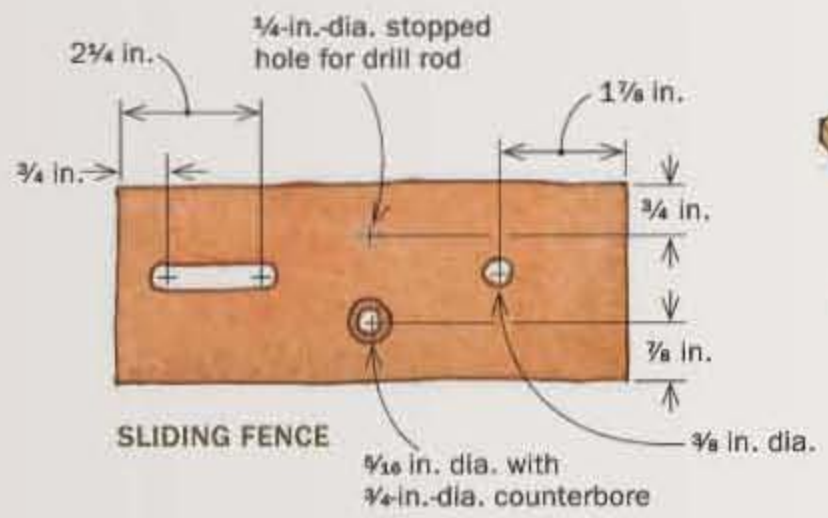
ULTIMATE DADO JIG

Shepherd's jig is built around a rigid square, with two rails that guide the router bushing, one fixed and one adjustable. Each rail has two layers, which are offset to account for the distance between the bit's cutting edge and the guide bushing. Built-in clamps are underneath, one on the fixed fence, and the other attached to a sliding fence. There is also a locking bar that keeps the far end of the guide rails in alignment.

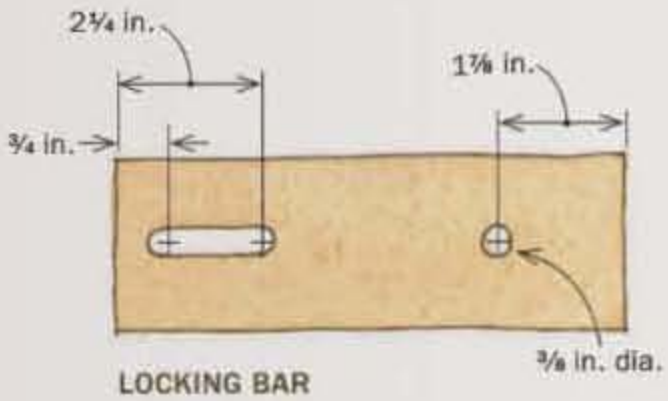


FIXED FENCE ASSEMBLY

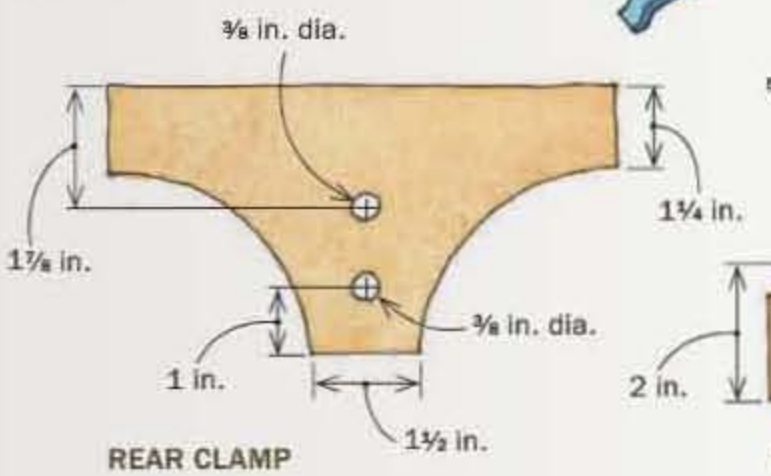




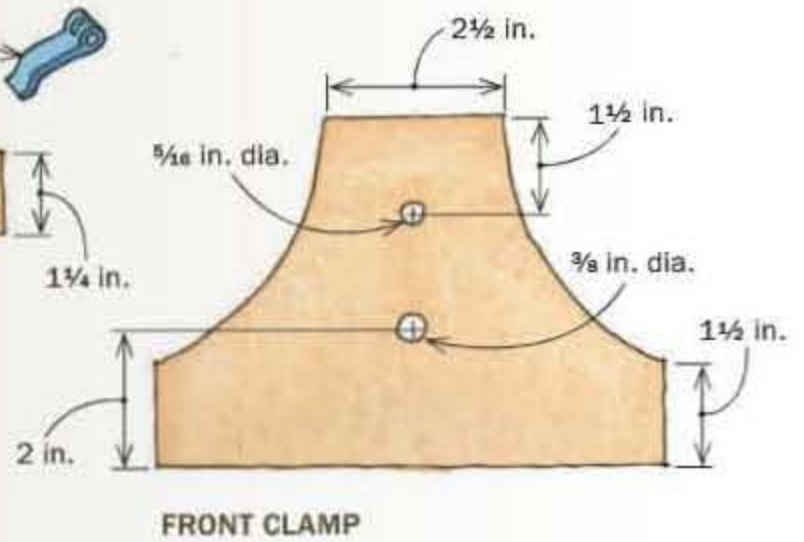
SLIDING FENCE



LOCKING BAR



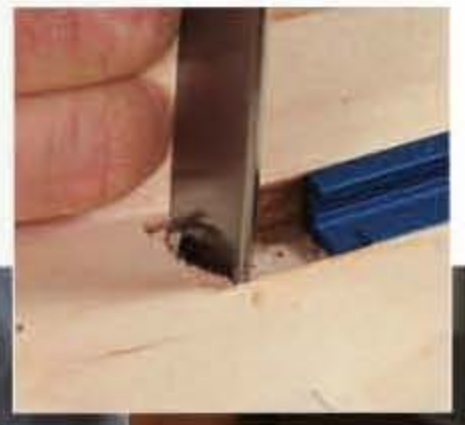
REAR CLAMP



FRONT CLAMP

Offset layers make up the rails. *Leave the bottom layer wide at this point. Alignment is not super-critical, as you will be trimming the bottom rail with the router afterward (see lower right photo).*

Put tracks under the rails. *Rout a ¾-in.-wide stopped groove on the underside of each rail (above), then square up the ends of the groove with a chisel (right). Mount a length of T-track (below) for securing the sliding clamp and locking bar.*



edge of the top layer has a strip of hardwood for the guide bushing to ride against. The bottom layer of each rail is longer, for attaching to the jig's right-angle fence, and wider to accommodate the offset between the router bit and the guide bushing. When the jig is assembled, one rail is fixed and the other adjusts to set the width of the dado. An elongated mounting hole drilled in the sliding rail lets it travel back and forth while the clamps are loose.

When face-gluing the top and bottom layers of each rail, pay close attention to how the layers are oriented. Viewed side-by-side, the two rails should mirror one another, with the extra length of the bottom layers at the same end and the extra width toward the center. After the glue dries, use a router to trim the inside edge of each lower rail, tailoring it to fit the bit and bushing that you'll use to make dadoes. I use a ⅝-in. bushing with a ½-in. upcut spiral router bit. Later, if you want to cut dadoes narrower than ⅝ in., be sure to use a bit-and-bushing combination with the same offset that you cut into the jig.

With the bit and bushing installed, make a pass against each rail, with the bushing riding tight against the upper rail. The trimmed lower rails will perfectly define the limits of the bit's travel and, therefore, can be used for perfectly aligning the jig for dado cuts.

Last, use the router table to cut a stopped groove in the bottom of each rail. Once this is done, you can install the lengths of T-track that will hold the sliding fence and locking bar.

A square glue-up is key—The next step is to glue the fixed fence to the fixed rail. The tongue end of the fixed rail fits between the top and bottom plates of the fence. The bottom plate of the fence assembly is the reference surface that ensures your dadoes will be square to the edge of the workpiece, so it must be perfectly 90° to the fixed rail.

To keep things square during glue-up, attach the top and bottom plates of the fence one at a time, letting the glue dry between

SOURCES OF SUPPLY

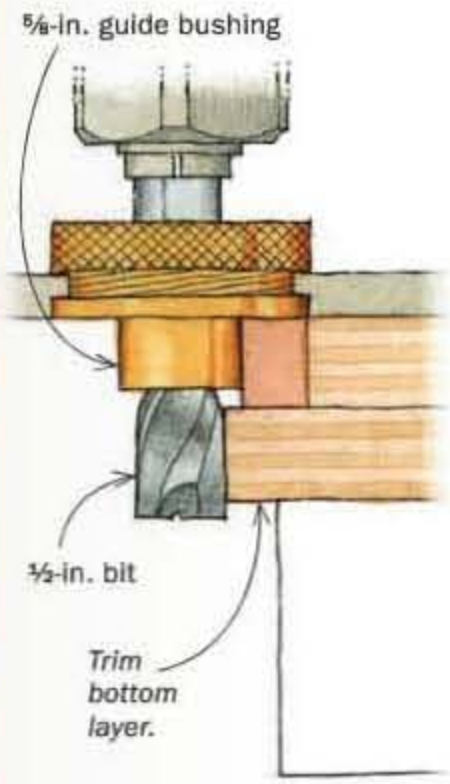
CARRIAGE BOLTS, NUTS, WASHERS, SPRINGS, AND DRILL ROD

Available at local hardware stores

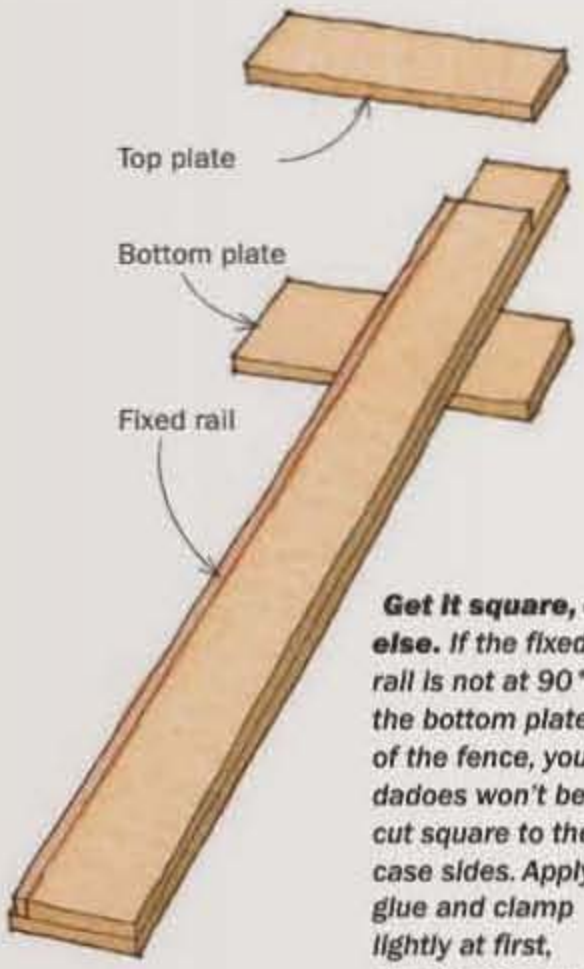
T-TRACKS, T-NUTS, FIXTURE KNOBS, AND CAM HOLD-DOWNS

rockler.com
woodcraft.com

Custom tailoring. *Trim the bottom layer of the rails with the same bit and bushing you'll use to cut dadoes. A smooth, straight cut is critical, so be careful not to tip the router.*



Add the fence



Get it square, or else. *If the fixed rail is not at 90° to the bottom plate of the fence, your dadoes won't be cut square to the case sides. Apply glue and clamp lightly at first, checking for square frequently as you add clamps.*

Attach the top of the fence. *The top plate of the fence is only there to support the router at the beginning of the cut.*

The top should be flush. *Use the same plywood for the top surfaces of both the fixed fence and fixed rail. This ensures smooth travel for the router and no unwanted variations in the cut.*

steps. Apply the glue and lightly clamp each fence plate in place with a single clamp. After checking for square, use more clamps to apply greater pressure.

Install the hardware

Underneath, a pair of clamps secures the work to the underside of the jig and against the fixed fence. One is bolted to the fixed fence and the other is attached to a sliding fence that rides in the twin T-tracks. Each clamp applies pressure via a piece of plywood. A dowel glued along the plywood's back edge lets the clamp pivot freely during adjustment; another attached along the front edge grips the workpiece. A spring keeps the clamp open before tightening, making it much easier to reposition the work between cuts.

Also underneath the jig are several fasteners used to lock down the sliding fence and the adjustable rail. To install this hardware, first drill two counterbored holes through the fixed fence. These holes will hold a pair of carriage bolts—one to secure the clamp underneath and the other for the adjustable rail. With the holes drilled, insert the slotted end of the adjustable rail between the open holes and epoxy the carriage bolts in place. Use a washer and 5/16-in. nut to temporarily tighten from the bottom to seat the bolts into the jig. After the epoxy sets up, remove the washer and nut.

Another carriage bolt mounts the second clamp to a sliding fence, which rides in the T-tracks on a pair of T-bolts. A second block also sits in the T-tracks and is used to lock down the "outboard" end of the adjustable rail.

The jig is simple to use

To use the jig, you'll need to elevate the workpiece off the bench to accommodate the clamps underneath. A pair of simple T-shaped risers works great. Mark your workpiece exactly where you want the dadoes, and set the jig on the workpiece. Don't fasten it in place just yet.

Start by setting the dado's width. Place in the jig a scrap of the stock that will need to fit into the dado. Bring the adjustable rail tight against this scrap and use the star knob and T-nuts underneath the fixed fence and the locking bar to secure both ends of the rail. For a dado that will still be snug but a little easier to assemble, use a piece of masking tape as a shim between the scrap and the adjustable rail.

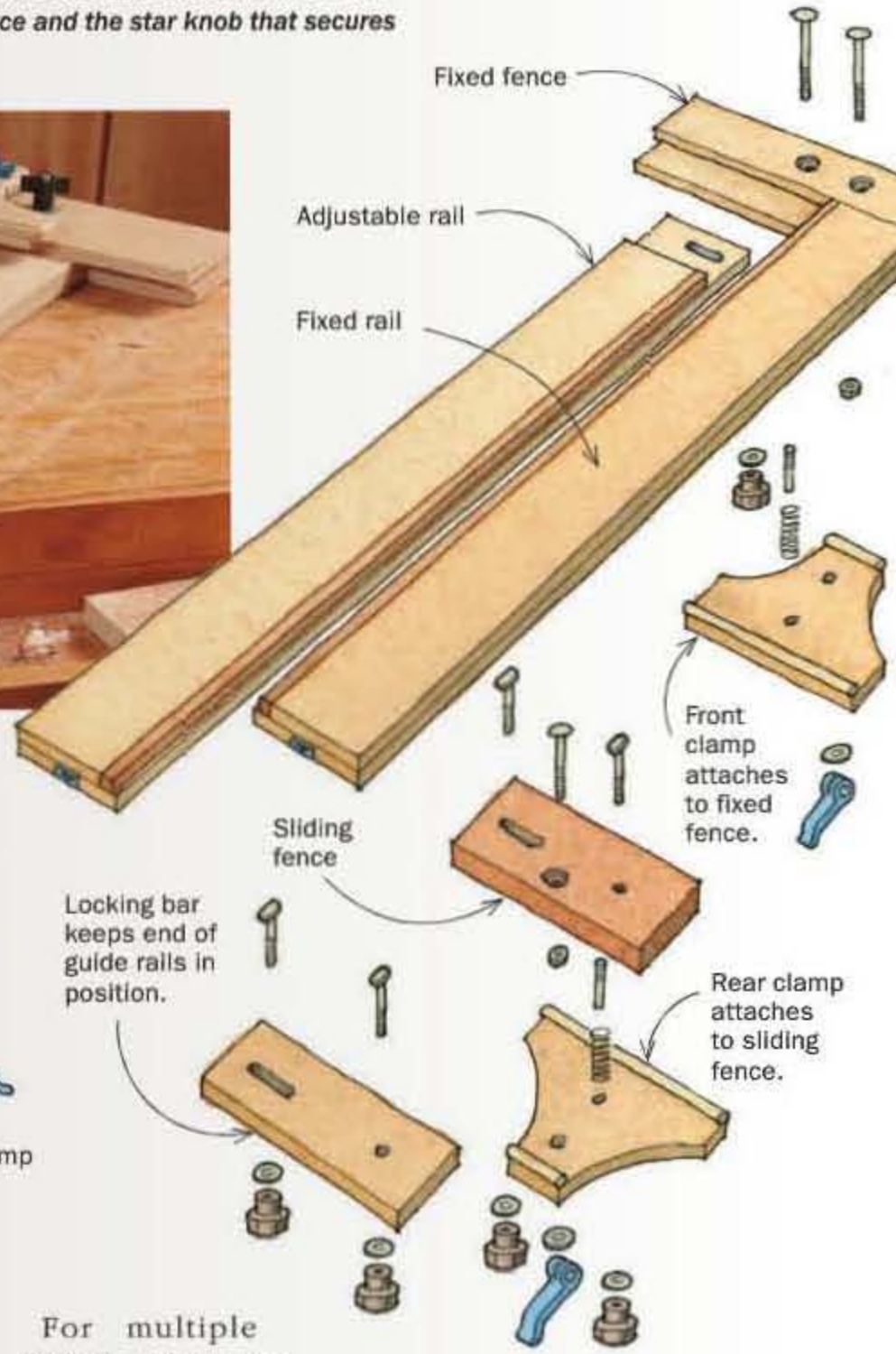
With the width set, go ahead and position the jig. Set the inside edge of the fixed rail on the appropriate layout line and bring both the fixed and sliding fences tight against the edges of the

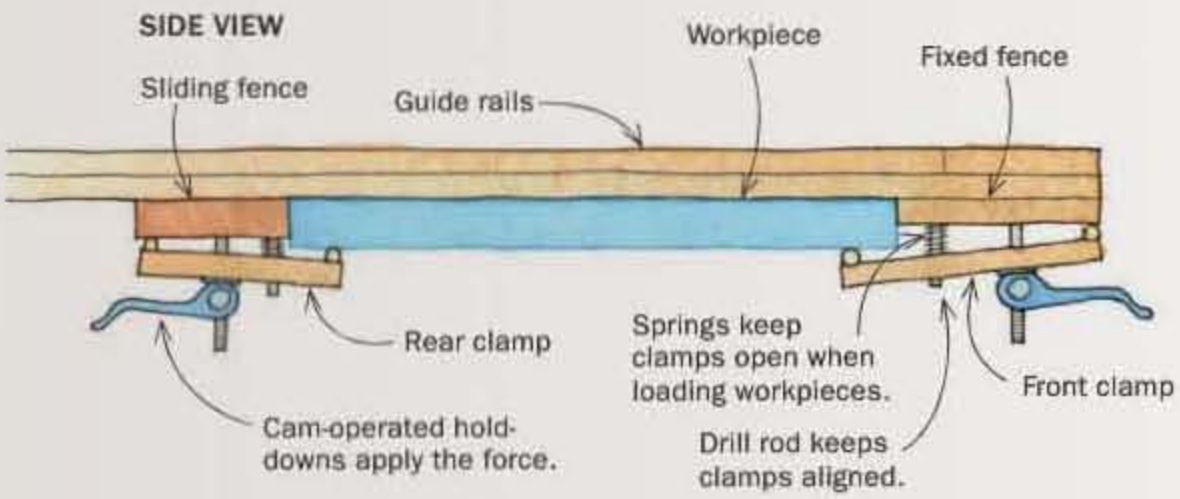
Install the hardware

Drill and counterbore. *Drill the larger holes in the fence first, to accommodate the heads of the carriage bolts, and then bore through-holes.*

Attach the hardware. *The bolts hold the cam hold-down for grasping the workpiece and the star knob that secures the adjustable rail.*

Assemble the clamps. *They are a smart assembly of cam clamps, pins, bolts, knobs, and springs.*





workpiece. Now use the cam clamps and the other fasteners on the fixed and sliding fences to lock the workpiece in place and hold it snug to the bottoms of the rails.

Now you are ready to cut. Start at the end closest to you, with the router on the jig; rout down the left side, and come back toward you on the right side. To avoid excess strain on the router, take repeated passes at incremental depths until you have the proper depth.

For multiple dadoes, the cam clamps make it easy to release the clamp pressure on the workpiece while keeping your dado-width settings. This means you can quickly reposition the jig and then retighten it for the next cut. □

Kent Shepherd operates Shepherd Woodworks in Lubbock, Texas.

Build Your Own

Easier than you think to make and install, a custom door stands out

The front door is the first contact anybody has with a house. My mother has a charming Arts and Crafts house from 1932, with a front door from the late 1950s. Aside from any aesthetic judgments, 50 years of people coming and going had taken its toll, and I decided to replace her door before another upstate New York winter took hold. I got lucky, because the existing jamb and sill were in great shape. This makes installing a new door easy. Just match the old hinge locations and existing dimensions and swap the new door for the old one. If your jamb and sill aren't in good shape, you'll have to tear them out and replace them.

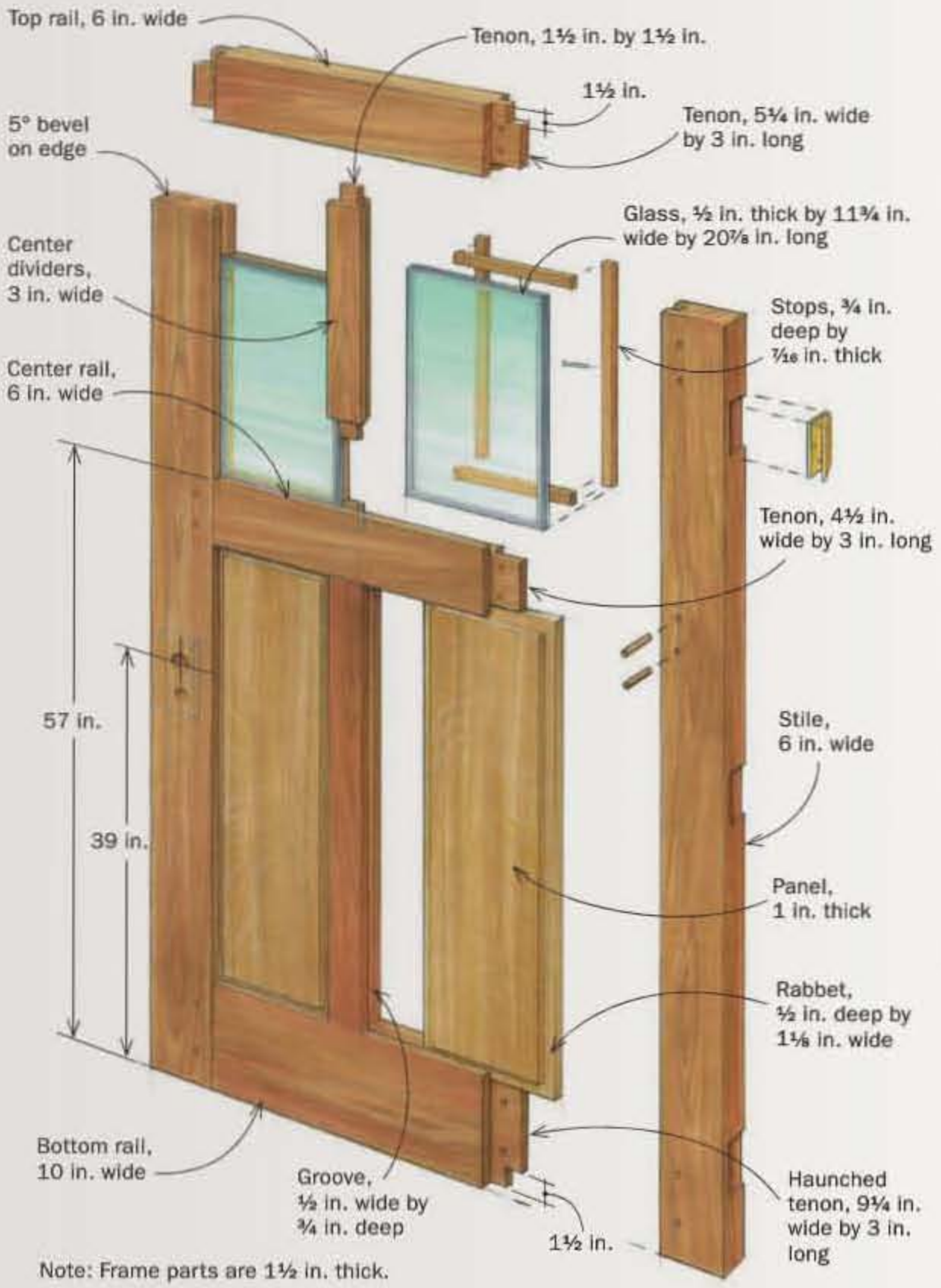
Three reasons to build your own

You may ask why you should spend the time and money to build your own entry

Photos, except where noted: Anissa Kapsales; this page (top): Steve Scott

Front Door

BY JOSH FINN



Note: Frame parts are 1½ in. thick.

GLASS MUST MEET CODE

In most areas, exterior doors must use insulated and tempered or laminated safety glass, but check the code in your area. Thermopane panels (shown) are a good choice, and widely available.

Easy install. *Apply a clear silicone bead around the rabbet, set the glass in place, and add the stops. Finn secures the long stops first, predrilling and setting the nails, and then finishes with the short stops.*

door when you could go to the home store and pick from a wide array of them. If you are a woodworker, you'll be disappointed with the style and quality you find there. The bottom line is you can afford to build a much better door than you can buy.

Cost—The nicer the door and the nicer the materials, the higher the price. In-stock, standard-size frame-and-panel doors in pine start at $400. If you want anything beyond that, you have to start looking in a higher price range. Once you've looked at the more expensive manufactured doors, it makes more sense to build the door yourself, especially because the joinery is basic and it doesn't take that long. I've made a lot of doors, and I have the process down pat. The last door I built took five hours, and that included milling the lumber. Not to mention that if it's an odd-size opening (I recently made a front door for an old house where the opening was 3 ft. wide by only 6 ft. 1 in. tall), the cost at the store goes up even more. If you can't get anything off the shelf, you're looking at a special order. Incidentally, this door is 82 in., which is 2 in. taller than standard.

Hardware adds to the overall cost, but it doesn't come with stock doors either. That extra cost is there regardless. It can be

Drawings: Bob La Pointe

Regular mortises and tenons, only bigger

Use easy, tried-and-true woodworking joinery to make an entry door. The only daunting thing about the construction is the overall size of the pieces.

MORTISES

One groove does it all. *With a dado blade in the tablesaw, Finn cuts the groove for the panels in the rails, stiles, and center dividers (above). Then, where the rails intersect the stiles, Finn uses a hollow-chisel bit in his drill press to extend the groove into mortises (right).*

TENONS

Haunched tenon fills the groove. *Cut the cheeks on the tablesaw, supporting the rails upright with a tall tenoning jig (left), and then establish the haunch shoulder using the miter gauge (above). Complete the haunch on the bandsaw (right).*

purchased economically at a home center, but I suggest buying hardware as distinctive and sound as the door you'll make. I get mine from Horton Brass, WhiteChapel, or Restoration Hardware. Unless you can reuse some of the old stuff, you will need hinges, a mortise lockset, and a handle (lever or knob).

Design—Building the door yourself gives you a blank slate to design an original. You may want to match the style of your house or create a really unique door that captures attention. I chose a flat-panel style for this door because I felt it suited the house. But you could choose to bevel the panels or add other details.

By the way, even though this is an exterior door, you aren't limited to outdoor woods. Most homes provide some sort of overhang to protect the door from the elements, but if yours doesn't, marine spar varnish (see "A Durable Exterior Finish," *FWW* #179) or paint provides adequate protection.

Quality—This is obvious, but when you build your own door you control the quality of the materials, adhesives, hardware, finish, and craftsmanship.

A note on R-value

The truth is that the R-value of a solid-wood door (R-1.8 to R-3.0) will never match that of a fiberglass insulated door (R-7 to R-9). But a new solid-wood door with a double-glazed light and beefed-up weatherstripping is much better than a leaky older door. Add a storm door for even more weather protection.

Familiar construction

There is nothing about making an exterior door (or an interior door for that matter) that isn't a common woodworking practice. It is just like making a cabinet door, only bigger.

While the door is still on the drawing board, choose the hardware so that a large mortise lock won't eat away most of your stiles or the joint of your center rail. When selecting boards, choose the very straightest for the stiles to reduce movement as much as possible. Mill all the frame pieces at the same time for consistency.

I start at the tablesaw by running a groove down the length of the stiles and rails. This not only receives the panels but also creates a haunched tenon, which is better for big doors because it eliminates wobble and adds glue surface. Then I extend the groove into mortises wherever the rails

Break assembly into steps

As with the construction, the door glue-up is straightforward when broken into manageable steps.

Insert the panels. *Prefinish them, or seasonal movement will expose sections of unfinished wood in the rabbets. Then epoxy and clamp the center dividers in place as shown, and slide in the panels.*

Add the stiles. *As a defense against the elements, Finn uses two-part marine epoxy when gluing exterior doors. Once the door is in clamps, you can peg the tenons.*

Turn a groove into a rabbet. *The glass sits in a rabbet, held with stops. Use a handheld router with a bearing-guided bit to cut away the top of the groove, creating the rabbet.*

Bevel the latch side. *A 5° bevel on the back edge of the latch side keeps that edge from scraping on the jamb while opening and closing. Rip the bevel on the tablesaw using a big outfeed table or a friend to help catch.*

Hinge placement is easy

If you don't have to replace the sill or jambs, it's easy to find the hinge placement. Just use the old door as a guide. If the old door fits the jamb well, you can also use it as a template for trimming the new one.

will meet the stiles. For strength, I like to have the mortises at least 3 in. deep, but the maximum throw on my drill press with the hollow-chisel mortising bit is only 2½ in., so I have to chisel the extra depth away. By the way, if there is going to be glass in the door, I turn the groove into a rabbet after assembly with a handheld router.

Once all the grooves and mortises are cut, I cut the tenons on the rails: shoulders first, then cheeks, then haunches. Then I make the panels, and I sand and finish them before assembly.

Assemble and add the hardware

After a dry-fit, it's time to glue up. For exterior doors, I use two-part marine epoxy. Once the glue is dry, I pin the tenons, trim the door to size, and add a 5° bevel on the latch side. For a finish, I recommend an exterior varnish that is UV-resistant.

If the door is going into an existing jamb, the hinge mortises already are in the jamb, so you need only mortise for the hinges in the door. I use the old door or a story stick to transfer the hinge locations to the new door. Then I place the lockset and knob and install the door. If there is a new jamb in place, put the hinges on the door first and then hold the door in the jamb to check reveals and mark hinge locations.

Now, assuming everything went well, you should have a quality start to every day and a welcome return. □

Josh Finn makes furniture in High Falls, N.Y.

From old to new. *To transfer the hinge locations, line up the old door with the new one and use a square and a knife to mark their locations (above). Finn routs freehand, close to the knife lines (left), and chisels the mortises clean. He uses a Vix bit, a self-centering hinge drill bit, to predrill perfectly centered screw holes (right).*

Don't settle for ordinary

Making your own entry door means you don't have to settle for typical factory fare. Your dimensions and design possibilities are unlimited. In these examples, Finn built doors well outside standard dimensions or with unique carved panels that can't be found on the rack.

Lockset is the final step

Most locksets are sold with precise manufacturer's instructions and a template you can follow. Although it's slightly more work to install, Finn prefers a mortise lockset over a cylinder lockset because it lasts longer, exudes quality, and is truer to original hardware you'd find in an older home.

Start with the knob location. *On the edge of the door, mark where the center of the old knob would fall. Set the new lock body so the knob hole is centered over that mark, and mark the outside edges of the lock body as shown.*

Manufacturer's template will guide you. *Line it up with the lock-body marks and mark where to drill the holes for the lock and knob.*

A deep mortise for the lock body. *Use a handheld drill with a spade or Forstner bit to waste away most of the mortise. Clean up the walls with a chisel.*

A shallow mortise for the faceplate. *With the depth set to the thickness of the faceplate, rout close to the line and finish the job with a chisel.*

Insert the lockset. *Once the holes for the knob and cylinder are drilled, you can screw the lock body in place and install the escutcheon plates and knob.*

Photos, this page (bottom three): Steve Scott

Pens Make Great Gifts

With a few specialty tools, you can turn your nicest scraps into keepsakes

BY BARRY GROSS

More furniture makers should try turning a pen. You already have most of the tools you need, you probably have the wood, and if you've done any wood turning at all, you have the skills. Not only is pen turning fun, but pens also make great gifts both for the recipient and for the maker. In the time you'd spend making a box—never mind a small piece of furniture—you can make half a dozen pens and get six heartfelt thank-yous instead of one.

Pen turning can be done on any lathe with a few specialized tools. I'll tell you which of these tools are essential and which ones can be duplicated by tools you probably already own. I'll tell you what pen hardware to buy, what woods work well, how to turn and finish the blanks, and last, how to assemble the pen.

Preparing the pen blank

Woodworkers often ask me what wood makes the best pen and I half-jokingly reply any wood they rejected for furniture making. Examples include gnarly or crotch sections of boards, isolated patches of figure or curl, or even pieces of firewood with spalting in it. Remember, you want a blank that is less than 1 in. square by 5 in. long. For this reason, burls are a good choice because their tight, swirly grain pattern is the right scale. If the scrap bin or the firewood pile is exhausted, one of the benefits of wood turning is the opportunity to try new and exotic species such as amboyna burl, lignum vitae, or red palm for $2 to $8 a blank. You can also buy eye-catching composite woods and acrylic blanks.

Once you've selected the pen kit and the material for the body, you can get started. Depending on whether your kit has a one-

Tools of the trade

THREE TURNING TOOLS

Full-size tools suitable for turning a table leg are too big for delicate pen turning. Medium-size or small tools are more responsive. The good news is that you only need three.

1 5/16-in. to ½-in. roughing gouge, $30
Used to turn the square blank down to a round.

2 ½-in. skew chisel, $30
Used to profile the blank, smooth the cylinder, and bring the ends almost flush with the bushings.

OR

½-in. Spindlemaster, $38
Designed to leave a smooth finish like the skew chisel without the risk of catching. Use instead of the skew.

3 ⅛-in. parting tool, $30
Used to remove finish from the bushings and to achieve a clean break with the blanks.

PEN-TURNING SUPPLIES

bgartforms.com
pennstateind.com
woodturnerscatalog.com
bereahardwoods.com

Photos, this spread: John Tetreault

Quick to make

PREPARE THE BLANKS

TURN AND POLISH THE BARRELS

ASSEMBLE

part or two-part body (or barrel), place the pen tube(s) on the pen blank and mark it for length, adding 1/16 in. to each end. Label the sections and then cut the parts to length.

What makes pens different from a typical spindle turning is the long hole through the center, and the metal tube(s) you glue into it. You can drill the pen blank on the drill press or on the lathe. For the former you'll need to clamp the blank and ensure it is in line with the drill bit. On the lathe, a dedicated pen-drilling chuck is the easiest way to center the blank to the drill bit, but you also can hold the workpiece in a four-jaw chuck.

Once the pen blanks have been drilled, glue the tubes into them. Roughen the outside of the pen tubes with 80-grit sandpaper. I also size natural or unstabilized wood by dripping some thin cyanoacrylate (CA) glue down the holes. Both actions give the glue for the tubes a better surface to bond to. When it is dry, place some medium-thick CA glue or 5-minute epoxy on a piece of glossy paper or plastic, roll a tube in it, and then use a specialized insertion tool or a nail punch to hold the pen tubes so you do not get glue all over your fingers. Push the tubes into the blanks until they are about 1/16 in. inside each end. You'll bring the ends flush to the tubes later when trimming them clean and square. You can do this before or after rough-turning the blank using either a barrel trimmer in a handheld drill or a squaring jig and a disk sander equipped with a miter gauge. Take off the excess slowly until you just reach the brass tube.

Turning and finishing the blanks

To secure the pen blank while

Buyer's guide to pen hardware

All pens require a kit of metal parts. Choices include ball point, roller ball, or fountain; a pen that twists or clicks open; or one with a single or a double barrel. The typical ball-point kit consists of one or two brass tubes that you place inside the drilled-out pen blanks, a top clip and cap assembly, a twist or click mechanism, a refill, and a bottom or nib section. I'd start with a "cigar-style" kit (shown above). It gives a good introduction to wood selection, turning, and finishing and only costs $6 to $10. Avoid 24-karat and 10-karat gold plating, which wears off quickly to expose the brass inside. Titanium nitride (TN) gold plating is better. Even more durable is chrome or black chrome, but I prefer rhodium (sometimes misnamed platinum). It lasts essentially forever.

BARREL TRIMMER

This tool ensures that the turned blanks will fit together seamlessly with the parts of the pen kit. Attached to a drill, the shaft removes any excess glue from inside the tube and also aligns the cutter as it trims the end of the blank flush with the end of the tube.

PEN MANDREL

A mandrel supports the blanks while you turn them on the lathe. Most come with a 7mm drill bit and a set of 7mm bushings that match the standard pen kit. The step bushings indicate the diameter to which the blanks must be turned.

GLUE AND ABRASIVE PADS

Super glue creates a very durable finish. Special sanding pads bring it to a high shine.

Prepare the pen blanks

Before you turn the blanks, you need to drill them and insert the brass tubes that come with the pen kit.

Lay out the blank. *Each section should be a little over ⅛ in. longer than its respective tube. Label the parts and mark their relationship for grain continuity.*

Drilling on the lathe is easiest. *Cut the parts to length, then secure each blank in a pen-drilling chuck or a conventional four-jaw chuck (shown).*

Stabilize the blanks. *In any natural wood (as opposed to impregnated or stabilized woods sold for pen turning), you should "size" the holes with thin cyanoacrylate (CA) glue.*

Rough up the tubes. *Rub the pen tubes on 80-grit sandpaper to give them better adhesion when you glue them into the blanks.*

Work fast. *Spread medium-viscosity CA glue on some glossy paper. Roll a tube in the glue and then use either a dedicated insertion tool or a nail punch to push it into the blank.*

Square up the ends. *To bring the ends of the blank flush with the ends of the tubes, you can use a barrel trimmer mounted in a handheld drill as shown, or a miter gauge on a disk sander.*

you turn and finish it, you use a mandrel, which goes into those tubes you inserted earlier. Hold the mandrel in the head stock of the lathe via a Morse taper or an attachment to a chuck, and place the step bushings and prepared pen blanks on the mandrel following the instructions in the pen kit. Do not overtighten the nut on the mandrel because this will cause the mandrel to bow slightly, and you'll turn the blanks out of round. I prefer to turn one pen blank at a time to reduce the chances of vibration.

With the lathe speed set at approximately 2,000 rpm, start with a roughing gouge to get the blank round. Next, use a skew

Photos, except where noted: Mark Schofield

Turn and sand

and turn the blank down to the step bushings, adding a little shape to the blank if desired. If you are skew "challenged," use a Spindlemaster. This tool is a beginner's best friend because it does not have the sharp points of a skew to catch and dig in, and it leaves almost as good a finish.

For the last pass, use the skew or the Spindlemaster as a scraper to lightly pass over the blank and bring the ends almost flush with the bushings. Start sanding with P180- or P220-grit sandpaper and work your way up to 800 grit. To remove the microscopic scratches that sandpaper will leave, I give the blanks a very brief touchup with 500, 1,000, 2,000, and 4,000-grit Abralon sanding pads.

Round it. *Insert the correct size bushing (above). Use a roughing gouge to turn the square blank round (left).*

Refine it. *Use a Spindlemaster (left), or if you are comfortable with it, a skew chisel to bring the blank to its final size and shape. To bring the ends of the blank flush with the bushings, use the skew (right) or Spindlemaster like a scraper.*

Super glue is the pen-turner's secret finish—A high-gloss finish best displays the wood's beauty, but because of the frequent handling that pens get, it needs to be durable. You can use solvent-based lacquer, but the most durable shine comes from CA glue, which is in fact a type of acrylic. With the lathe turning at around 150 rpm, and wearing disposable gloves, dribble some medium thick CA glue onto the blank while holding a paper towel against the underside. Thin glue wicks into the towel too fast and will not apply evenly.

Apply the glue by moving the towel back and forth as the pen blank is turning. Keep moving the towel so it does not stick to the pen blank, then spray on some accelerator to dry the glue quickly, and apply three more coats in the same way. Don't worry about getting glue on the bushings; you'll remove it later.

Once you've applied four coats, turn off the lathe and sand parallel to the lathe with 320-grit sandpaper to remove any ridges. Turn the lathe back on at 2,000 rpm and with a small parting tool, remove the glue on the bushings close to the pen blank. This will make it easier to remove the bushings from the pen blank later.

Wet-sanding and polishing—With the finish smooth, you can use acrylic sanding pads to polish it. The six grits range from 600 up to 12,000 and are color-coded

Sand it. *Smooth the wood with sandpaper to 800 grit, then switch to Abralon cushioned abrasive pads and go up to 4,000 grit. Each grit needs to be applied for a few seconds only.*

Finish and polish the blanks

A super finish. *Apply medium-thick CA glue to the turning blank as you spread it with a paper towel. Wear a disposable glove or wrap your finger in a plastic bag. Use an aerosol accelerator to instantly cure the CA finish (inset).*

by grit. Place a towel on the lathe bed to protect it and wet a 600-grit pad with water. Use a medium amount of pressure and wet-sand for about 10 seconds per pen blank. Wipe off the resulting white slurry, move on to the next grit, and repeat the process.

Remove the pen blanks from the mandrel. If a blank is stuck to the bushings, lightly tap it on the lathe to break the bond. Your blanks will almost certainly have a higher sheen than anything else you've made, but if tiny scratches are still visible, you can buff them off. Hold the pen blanks perpendicular to a buffing wheel treated with a compound (in this case a blue acrylic polish), and apply a bit of pressure. Then polish the blanks on a cotton flannel wheel to bring up the ultimate shine.

Smooth the finish. *After four coats of finish are applied, use 320-grit paper to remove any ridges.*

Unstick the blank. *Use a parting tool to scrape off any glue from the bushings.*

Polish the finish. *Use a series of increasingly fine abrasive pads designed for acrylic to polish the finish.*

Assemble the pen

Any vise works. *You can buy a pen press to assemble the pen, but as long as you protect the components, a metalworking (or woodworking) vise works almost as well.*

Line up the pen parts according to the instructions in the kit. Use a pen press, drill press, or bench vise to apply light pressure to press (not glue) the pieces into the pen blanks. Use scraps of wood to avoid any metal-to-metal contact that might damage the pen components. Congratulations, you've just finished what I'm sure will be the first of many pens. □

Barry Gross turns and sells pens, demonstrates pen turning at shows and clubs, and sells pen-turning supplies.

readers gallery

CRAIG THIBODEAU
San Diego, Calif.

Thibodeau designed this dining set for a client who wanted a slightly Asian/Arts and Crafts feel. The top incorporates a special four-way book-match of Carpathian elm burl that he had been saving. The base also has burl panels, as do the chairs. Other woods are cherry, Gabon ebony, and Macassar ebony. The table is 39 in. wide by 74 in. long by 30 in. tall, and the chairs are 17 in. deep by 17 in. wide by 37 in. tall. The finish is conversion varnish and lacquer. PHOTO: CRAIG CARLSON

MICKEY McCANN
Morristown, N.J.

This bedside cabinet (14 in. deep by 13 in. wide by 30 in. tall) was inspired by an old smoking stand McCann grew up with, which "made the perfect nightstand except for the fact it had a hole in the center of the top where an ashtray used to be." With that inspiration and the desire to do some curved veneer work, McCann created this cabinet during his second year at College of the Redwoods. The primary wood is African padauk, the interior is Tazmanian blue gum, and the door pull is manzanita. The shopmade hinges are brass and the finish is shellac and wax. Because of the color, McCann's been calling his piece "Percival the Red Knightstand." PHOTO: MICHAEL PEKOVICH

Submissions

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

RACHEL BRYDOLF-HORWITZ
Cambridge, Vt.

Brydolf-Horwitz calls this hanging wall cabinet her "calligraphy cabinet," because after all the design and construction was complete, she stepped back and realized it reminded her of Asian calligraphy characters. She designed the white-oak cabinet (9 in. deep by 40 in. wide by 30 in. tall) for a carcase construction class at the Vermont Woodworking School and used some of the techniques she had learned there in its construction: tapered bent lamination to produce the curved top, and sliding dovetails to join the top to the case sides. The drawer pull is walnut and the finish is shellac. PHOTO: JEFF CLARKE

KEN KATZ
Salt Spring Island, B.C., Canada

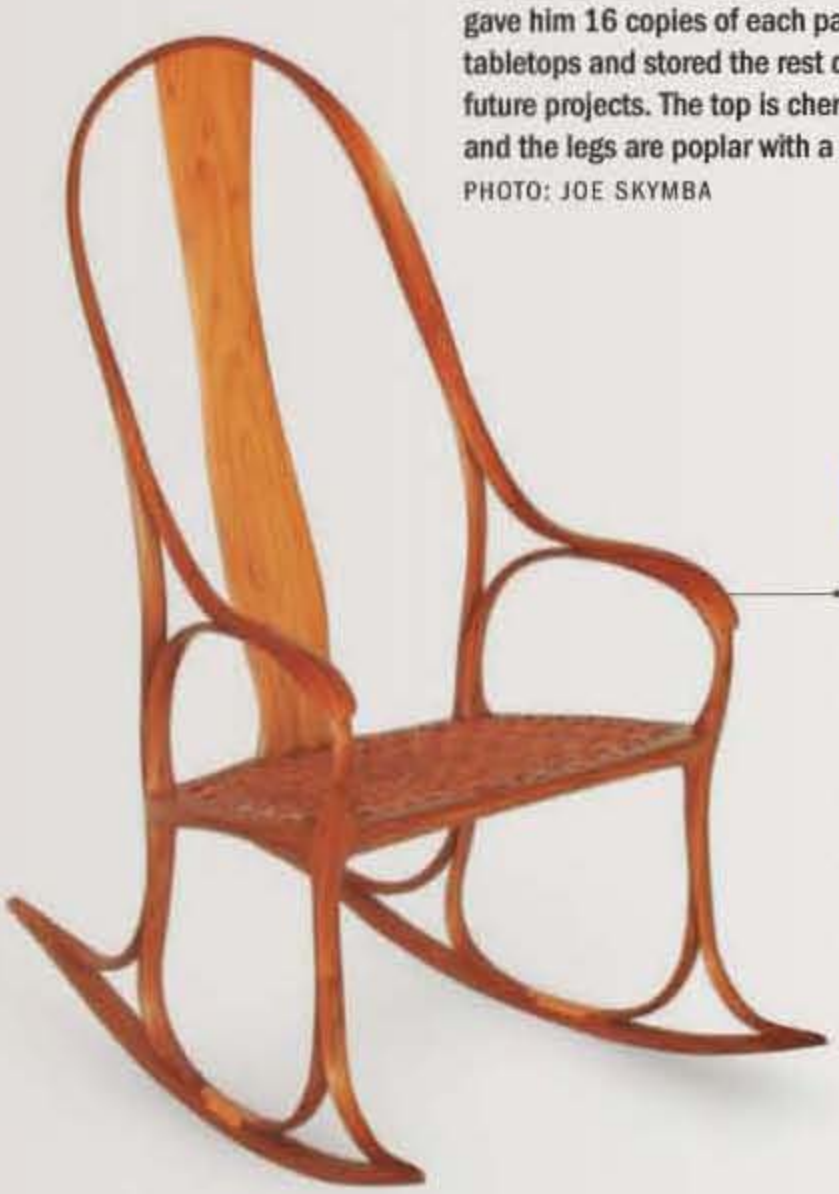
Inspired by the designs of Sam Maloof, Katz built this dining chair as part of a set of six chairs and a table. He made the chairs first, and says his goal was for diners to be comfortable sitting for long periods, while running their hands over the curves and angles. The crest rails are coopered, and the rear legs are swept back to prevent people from rocking backward. The chair measures 24 in. deep by 20 in. wide by 34½ in. tall; the wood is black walnut with ebony accents, and the finish is a Deft oil and polyurethane blend.

ALLEN JENSEN
Loveland, Colo.

These cottonwood vessels came from a tree that grew near Jensen's home. He's been turning local cottonwood for about 15 years, first wrapping the blanks in plastic until semi-dry, then turning them and letting them dry completely in their own chips to slow the process and prevent cracking. He says the vertical tiger-stripe figure is revealed when turning side-grain blocks, but if he had turned this wood in the end-grain orientation he'd have gotten a more horizontal figure. The walls are between 3/16 in. and ¼ in. thick. From left, these vessels are 4 in. dia by 5 in. tall, 6½ in. dia. by 8 in. tall, and 4 in. dia. by 3 in. tall. The finish is lacquer.

JEREMY GRUBB
Dickinson, Texas

This side table (20. in dia. by 25 in. tall) won the Judges Special Award, sponsored by *FWW*, at the Texas Furniture Makers Show in Kerrville, Texas, this past December. Grubb said he wanted to make the marquetry orchid as realistic as possible, and he used a packet-cutting technique to do so. That gave him 16 copies of each part, so he made two tabletops and stored the rest of the pieces away for future projects. The top is cherry and cherry veneer and the legs are poplar with a black lacquer finish.
PHOTO: JOE SKYMBA



ROBERT GALUSHA
Austin, Texas

This walnut and maple rocker, which won second place in the Texas Furniture Makers Show, is based on a dining chair that was a finalist in *FWW*'s maple build-off competition in 2008 (Readers Gallery, *FWW* #201). Galusha has built two other versions of the chair using different woods and slightly different designs, but this is the first rocker. Galusha used a long-grain lamination technique that he says adds strength that belies the chair's fragile appearance. The rocker is 42 in. deep by 26 in. wide by 50 in. tall; the webbing is leather belting used on treadle sewing machines; the finish is lacquer and wax.
PHOTO: JOE SKYMBA

GABRIEL SUTTON
Biddeford, Maine

Sutton's goal in building this cherry and bubinga liquor cabinet was to display a harlequin pattern in a subtle way. The curved panels and legs are meant to contrast with the hard lines of the diamond shape in the center panel veneer, maintaining a softness to the overall piece. The ebony door pulls are hand carved. The interior of the cabinet (14 in. deep by 34 in. wide by 32 in. tall) is quartersawn ash. The finish is shellac. PHOTO: TRENT BELL

Base has a supporting role. *The angular cantilevered base is designed to be the perfect foil for the beautiful book-matched walnut boards that make up the top.*

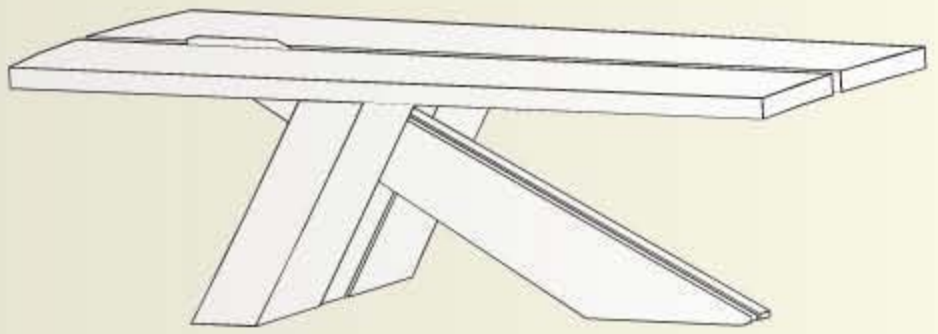
DAVE BOYKIN AND TOM PEARCE

Denver, Colo.

Furniture designers Boykin and Pearce (the latter now retired) knew the book-matched walnut boards used for this cantilevered coffee table were special when they first laid eyes on them. So they bought them, right away. That was more than 25 years ago. "Typically we buy materials for each project and don't stockpile lumber, but in this case I bought them immediately," Boykin said. "I thought about the boards off and on all those years but never felt the right project had come along." Finally, during a slow period for commissions, Boykin decided to build the table that he wanted—one that exists to display the boards, following the example of George Nakashima. This cantilevered table (25 in. deep by 62. in wide by 18 in. tall) is the result.

While some makers build scale or full-size mockups of their pieces, Boykin designed this table completely in CAD. "We rarely do mockups, preferring to work out design and engineering issues with a CAD program. Once the design and engineering are complete, shop drawings are printed and executed in the shop."

Employee Jim Price, a North Bennet Street School graduate, built the table. It is finished with oil. Boykin has designed a few other tables using the same cantilevered base construction, but he feels this table (the first) is still the best. For more information, go to boykinpearce.com. PHOTOS: JIM STAYTON

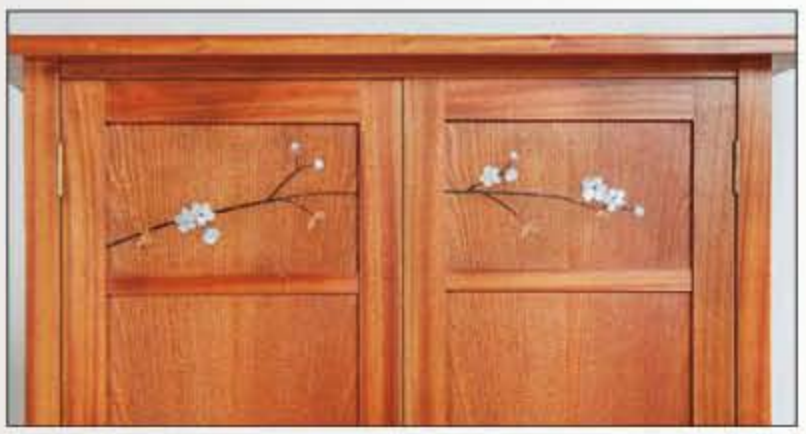


CAD design. *Boykin used the VectorWorks CAD program to work out the design and engineering issues in this table before even touching his prized walnut boards.*

THOMAS STARBUCK STOCKTON

Montgomery Creek, Calif.

Stockton worked with gallery owners Pat and Steve Kirkish of Healdsburg, Calif., to design this sapele, walnut, and white oak wardrobe for an attorney's office in Washington, D.C. For the marquetry and inlay design on the door panels, he used walnut for the branches, oak for the leaves, and abalone and mother-of-pearl for the flowers. The wardrobe, 20 in. deep by 38 in. wide by 71 in. tall, is finished with oil. Stockton says it took about 100 hours to complete. PHOTO: STEPHEN KIRKISH



Q&A

How to handle cross-grain veneer

Q: I'd like to use 1/16-in.-thick shopsawn veneer on a solid-wood drawer front. Will I have any problems if I lay the veneer perpendicular to the substrate?

—NICK BRYGIDYR, Montreal, Que., Canada

A: VERTICAL GRAIN ON DRAWER FRONTS can give a flattering effect to furniture, and it shouldn't create any problems as long as you keep the veneers between 1/16 in. and 3/32 in. thick. Anything thinner will be less durable and more difficult to work with hand tools. Anything thicker would react too strongly to seasonal changes in humidity.

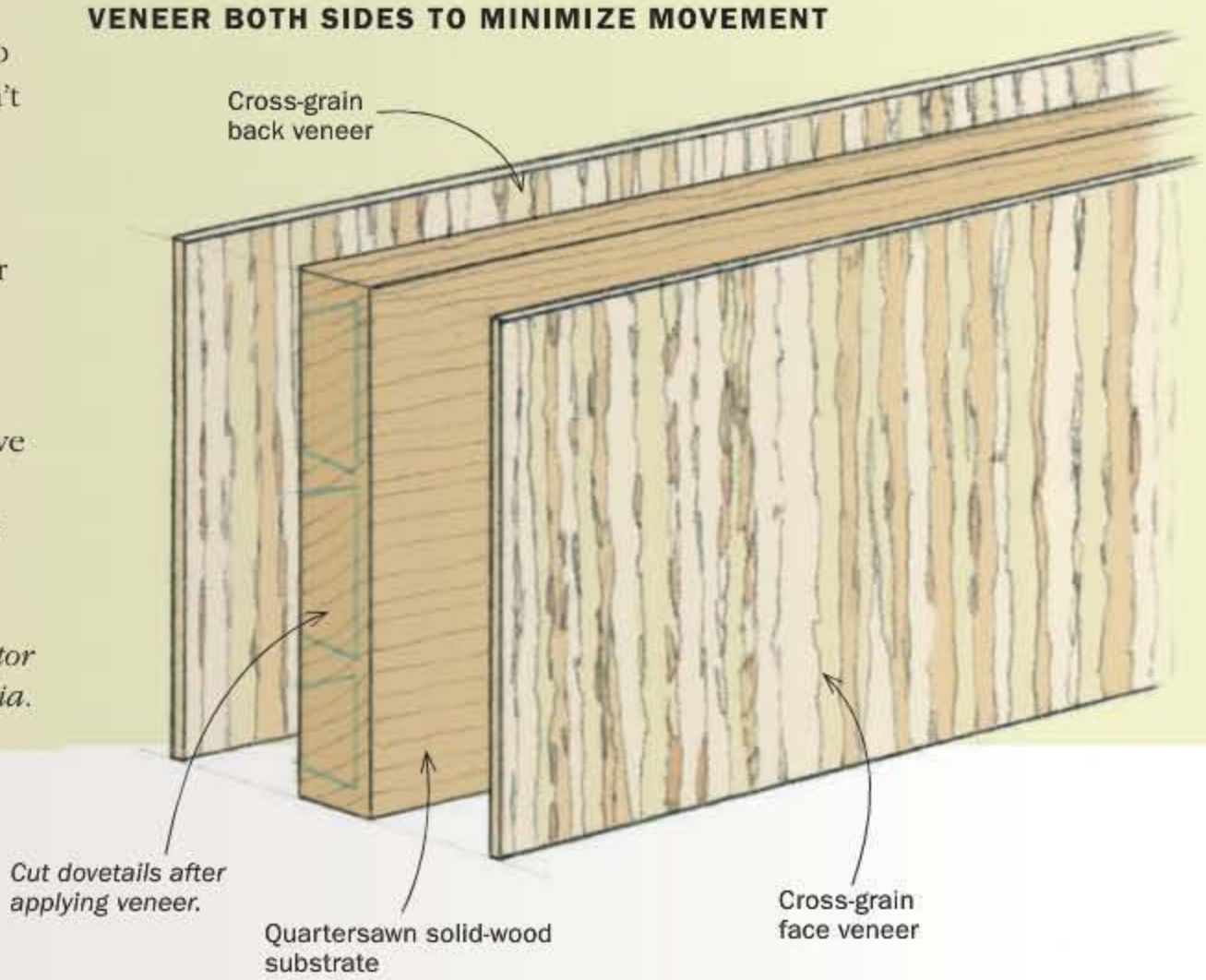
Remember to veneer both drawer faces with equal thicknesses of the same wood to balance any twisting or warping caused by the glue curing. If you can, use veneers with similar grain orientation. Using a flatsawn veneer on one face and a quartersawn veneer on the other, for instance, will create a panel that is more likely to distort. For a substrate, I'd pick a wood that won't react wildly to changes in humidity, preferably one with quartersawn grain and color similar to the veneers. You can attach the veneers with white or yellow PVA glue, but I prefer the longer setup time that white glue affords.

When making curved drawers that are laminated, first glue together the plies of the substrate before applying the veneers. If the curve is severe, the plies stiff, and the arc of the curve critical, use urea-formaldehyde glue for both the laminates and veneer. Its stiffness will minimize creep and springback.

—David Welter is an instructor at the College of the Redwoods in California.

Vertical appeal. *Grain lines that run north and south can give a dramatic look. This drawer, built from spalted maple veneer on mahogany, contrasts nicely with the case, which is made of kwila, an exotic hardwood.*

VENEER BOTH SIDES TO MINIMIZE MOVEMENT



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.

Photo, this page (top): David Welter; drawings: Kelly J. Dunton

Why a mallet beats a hammer

Q: Why are mallets better than hammers for woodworking? And should I get a square-headed mallet or a round one?

–DAN PEREZ, Anaheim, Calif.

A: THE HEFT OF A REGULAR HAMMER is great for driving nails, but its small head makes it easy to miss the butt end of a chisel or gouge when woodworking. The large head on a square mallet allows you to strike a chisel hard and accurately, which is especially useful for heavy-handed work like chopping mortises or dovetails. For an extra-hard strike, I often rotate the mallet 90° and use the widest side to be sure I'm on the mark.

A round mallet is lighter and allows for a more controlled cut. It's best for carving, where you're striking with light, short blows. It's not a good choice for mortising or chopping dovetails, however, since the round head can easily deflect, tilting the cutting edge of a chisel and creating miscut joinery.

—Phil Lowe is a frequent contributor to Fine Woodworking.

Bigger surface adds accuracy. *A square mallet's wide, thick head helps deliver hard hits without missing. A round mallet is best for lighter work, since hard strikes with its curved edge may misdirect a cutting tool.*

Bandsaw is better for rough ripping

Q: I've heard that using a half-fence, which extends to just the middle of a tablesaw blade, is a safer way to rip, especially with wide stock. Should I be using one?

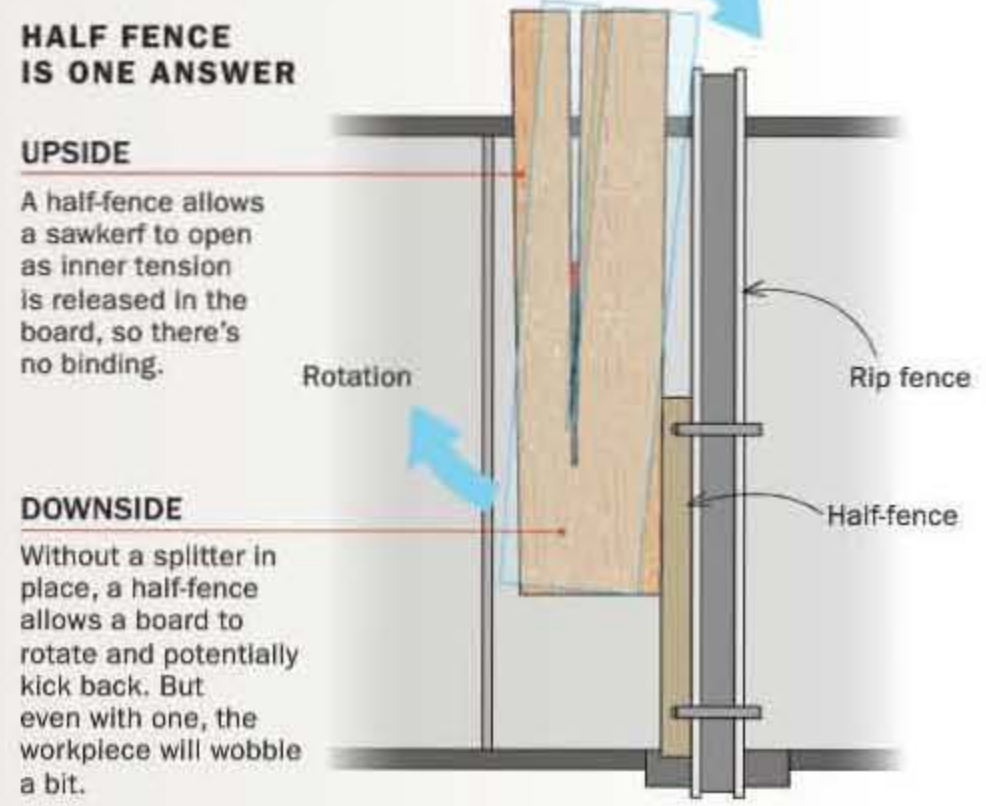
–JON DEMPSEY, Myrtle Beach, S.C.

A: NO, I DON'T RECOMMEND USING a half-fence to solve the problem, and definitely not without a riving knife or splitter in place. A half-fence stops supporting the board toward the end of the cut, leaving it free to rotate into the back of the blade and kick back catastrophically. And even with a riving knife sitting loosely in the kerf, the board will begin to wobble a bit toward the end, ruining the cut quality.

I understand why people use them, especially for rough ripping wide boards down the middle. Wide stock has a way of bowing this way or that as internal tension is released, causing binding against the blade or fence. But there is a better way.

Do your rough ripping on the bandsaw, where the blade is flexible and kickback is nonexistent. Then joint (or rejoint) the face that will go against the saw table and the edge that will go against the rip fence. Now you can trim that final edge on the tablesaw with no worries, using the full rip fence for a clean cut.

—Roland Johnson is a contributing editor.



Bandsaw is better. *Rough out your stock on the bandsaw, getting it to within ½ in. of final width before heading to the jointer and planer to remill it, and then to the tablesaw to trim the final edge.*

Photos, except where noted: staff

Upgrade a compressor drain valve

Q: The air compressor shown in *FWW* #225 (p. 88) appeared to have its drain valve replaced with a ball valve. How do I do that to my own compressor?

–NATHANIEL MYLES, Iowa City, Iowa

Undersize and tough to grasp. *The small drain valves found on most compressors are difficult to get to, and in some cases, hard to open.*

A: THE DRAIN VALVES on compressors can be difficult to reach and open, but you can build a replacement from three parts: a 90° street elbow, a short nipple, and a ball valve, all common items at a hardware store. The most common thread for compressor valves is ¼ in. NPT, but remove the valve and check your fitting at the store. Before threading the pieces together, wrap two layers of white PTFE tape, also called Teflon tape, around the threads. Wind the tape clockwise to prevent it from pulling up during threading.

Connect the nipple to the ball valve, and then connect the nipple to the elbow before threading the elbow into the tank. If small leaks develop, try yellow PTFE tape instead. It's made for gas pipes and is thicker than the white type.

—Matt Kenney is a senior editor.

Walk away empty. *As air is compressed, condensation forms inside the tank. To avoid rust, completely drain the tank after each use.*

INEXPENSIVE UPGRADE

For about $15 in parts at a home center or hardware store, you can replace the drain valve with a large, easy-to-reach ball valve.

Non-yellowing finishes

Q: I just built a table out of maple. What finish can I apply that won't turn it yellow?

–JIM DUNNE, Denver, Colo.

Two brush-on options. *Brushing on a coat of Zinsser's pre-mixed SealCoat or two coats of Minwax's Polycrylic will cause minimal yellowing.*

A: NO FINISH CAN PRESERVE the pure whiteness of just-milled wood, but there are several options that will get you very close while protecting a surface from spills and scratches.

The easiest option is to apply a clear, water-based finish such as Minwax's Polycrylic. Two brushed coats are enough for the table's base, but apply three to the top for added protection.

For more of an in-the-wood look, brush or wipe on a coat of blond shellac, such as Zinsser's pre-mixed SealCoat. Lightly sand the surface with 320-grit paper, and then apply a coat of paste wax after the single coat. This will allow the table to be wiped clean occasionally, but it won't protect the wood from prolonged contact with food or drink.

CAB-acrylic lacquer is non-yellowing but it is best sprayed. Brush-on lacquers, which are mostly nitrocellulose, will yellow with age.

—Mark Schofield is the managing editor.

CLOSE TO CLEAR

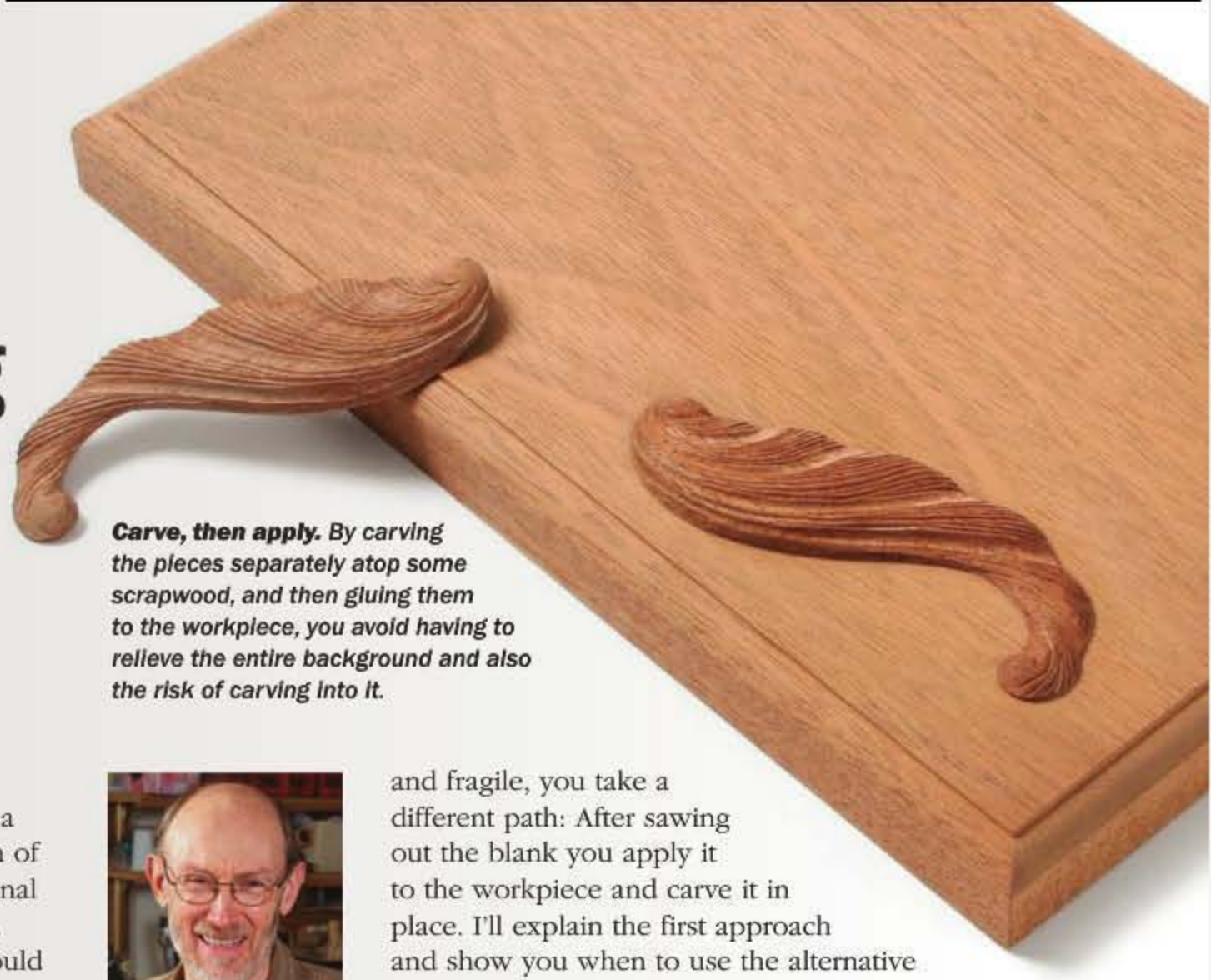
Non-yellowing finishes can keep woods looking close to their original hue.

master class

Applied carving

BEST WAY TO MAKE CARVINGS THAT STAND PROUD OF A SURFACE

BY WILL NEPTUNE



Carve, then apply. *By carving the pieces separately atop some scrapwood, and then gluing them to the workpiece, you avoid having to relieve the entire background and also the risk of carving into it.*

Woodworkers often react to applied carving as "cheating," a somewhat grudging admission of its effectiveness. It is a traditional but still very useful technique. Sure, every applied carving could be done "in the solid," with the carving outlined by vertical stop cuts, and then the background lowered with numerous relief cuts or perhaps with a router. But achieving the smooth background normally needed for furniture can be very time-consuming.

With applied carving, the outline of the carving is cut with a coping saw or scrollsaw. You then temporarily attach the blank to a backing board, carve it, and glue it to the workpiece.

If the carving is particularly large and complex or narrow and fragile, you take a different path: After sawing out the blank you apply it to the workpiece and carve it in place. I'll explain the first approach and show you when to use the alternative one. With a little practice, soon you'll be accused of cheating, too.

Wood selection is critical

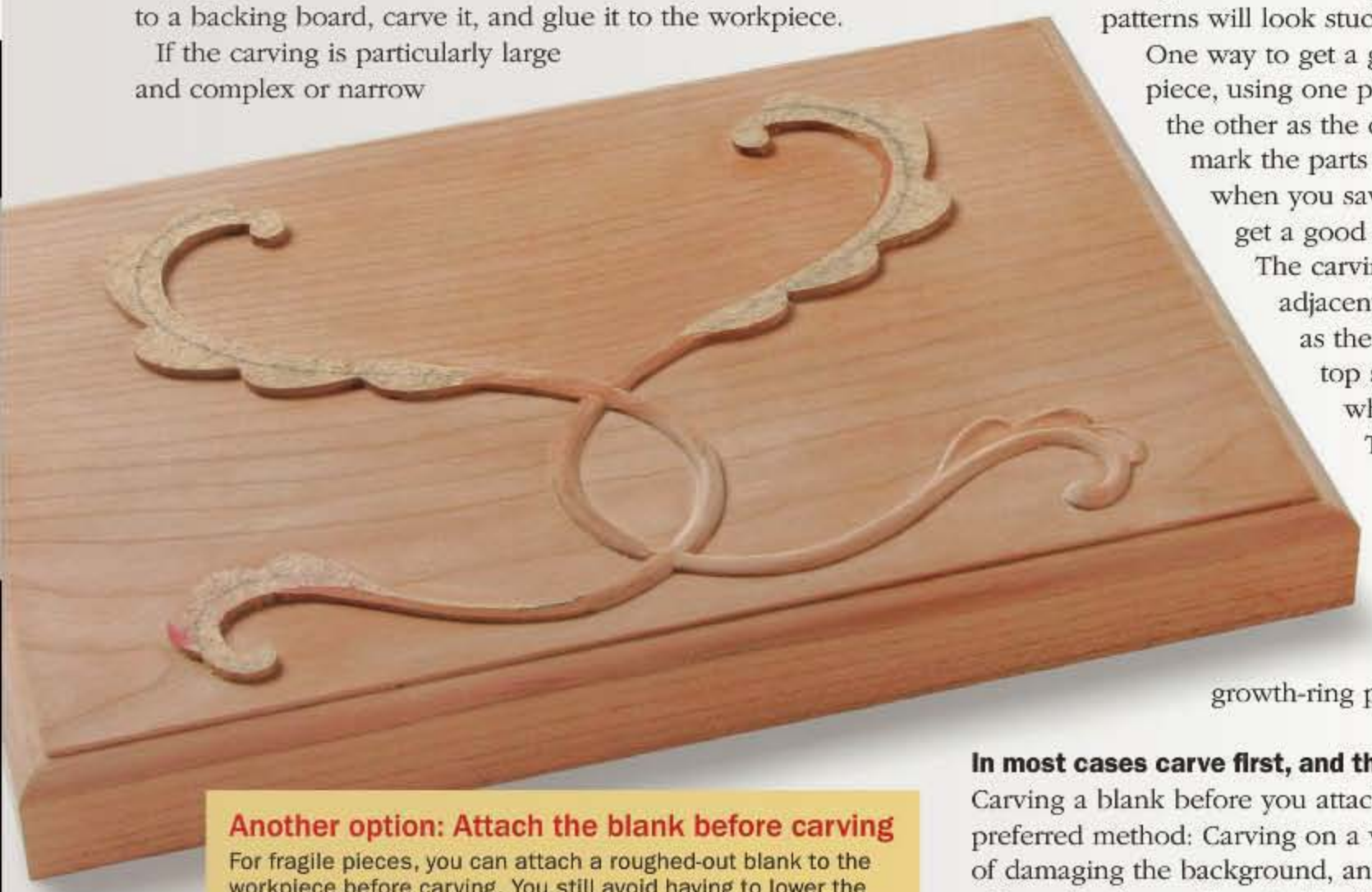
Grain that is straight and not pronounced generally gives better results than figured wood. In addition, the appliqué should match the background. A carving with clashing color or grain patterns will look stuck on.

One way to get a good match is to resaw a thick piece, using one piece for the background and the other as the carving blank. Remember to mark the parts and keep track of the match when you saw and carve. The other way to get a good appearance is to slip-match. The carving blank comes from an adjacent section of the same board as the background and slides on top so that the growth rings nest when you look at the end grain. This works best if the board has mild grain and a similar look along its length. Before I cut the carving blank to the pattern, I lay it on the background piece to see where it best matches the growth-ring pattern on the end grain.

In most cases carve first, and then apply

Carving a blank before you attach it to the workpiece is the preferred method: Carving on a waste block reduces the risk of damaging the background, and mistakes can be discarded.

Transfer the pattern to the blank—You have several choices for transferring the pattern to the carving blank. Stencils are



Another option: Attach the blank before carving

For fragile pieces, you can attach a roughed-out blank to the workpiece before carving. You still avoid having to lower the background around the carving. See p. 93.

Photos: Mark Schofield

worthwhile if the pattern is one you'll use often. I cut these from thick oak tag or matboard. You can leave small connecting tabs to secure thin, flexible areas. Soaking the edge with cyanoacrylate glue makes the stencil hold up better.

With identical parts, the sawing can be done in a stack to save time and parts can be flipped over to make lefts and rights. It's also easy to mount multiples in a row and carve them as a group.

For one-off carvings, you can photocopy a design and stick it down with low-tack spray adhesive. This method is great for dark woods where it is hard to see a pencil line. You will need to clean off the back of the carving with solvent before you try to glue it down.

For mirror-image carvings, I photocopy a drawing onto tracing paper from both sides to make matching patterns.

In all cases, put the pattern on what will be the underside of the carving. In this way, any tearout from sawing out the pattern will be on the top edges where it will most likely be carved away, instead of on the bottom where it would leave gaps against the background.

Saw out the pattern carefully—A jigsaw, a scrollsaw, or a coping saw with a bird's-mouth support are all good ways to cut out the parts. The more accurately you saw, the less cleaning up you'll need to do. There is always a tendency to saw a little wide of the line but this makes everything rather heavy.

Use files to clean up the edges. Don't sand or you risk carving into residual grit, blunting your tools. I usually hold the part in a hand screw clamped vertically in my vise, which makes it easy to see what I'm doing and quickly reposition the part. File away from the bottom to avoid chipping. Try to work right up to the lines while keeping the edges square.

Carve the blank on a backer board

I mount the carving blank on plywood using double-stick tape. Scraps of ½-in.-thick Baltic-birch or marine meranti are excellent backers and very strong. Lightweight, thin carpet tape is good. Most of the carving force is downward, so you don't need a killer grip. I trim away the excess so it won't collect chips while I carve.

From this point, the carving is the same as if you were working in the solid with the ground established. Start by establishing the main contours, then sketch in as much information as needed to guide the detail work. If necessary, you can clean up the surfaces

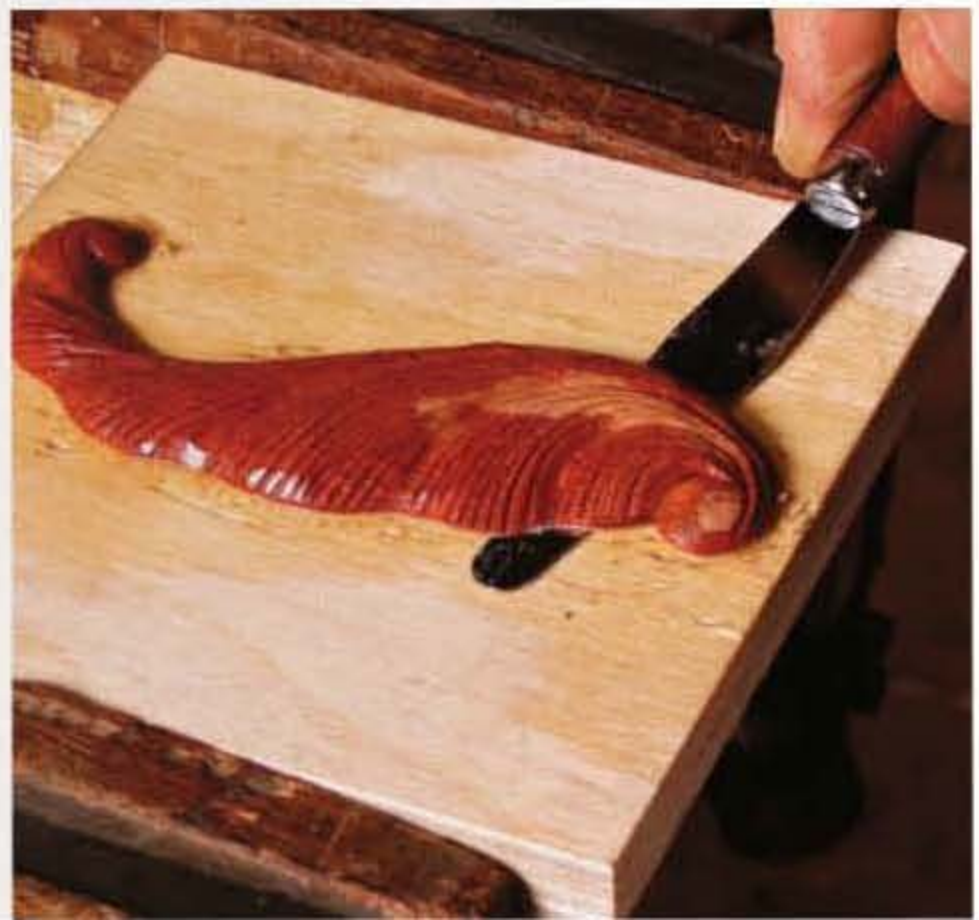
Tape to backer and carve

Attaching the carving blank to a plywood backer makes it easy to clamp the workpiece in any position and protects your benchtop from gouges.

Ready to work. *Use double-sided tape to attach bandsawn blanks to plywood backer boards. These should be square so that you can rotate them to carve from different sides with minimal adjustment of clamps.*

Carve at will. *After roughing out the shape, add the details. It doesn't matter if you damage the backer board.*

Break the bond and lift off the carving. *To loosen the grip of the tape, apply denatured alcohol to the edges of the carving (above). After the alcohol has had a few minutes to soak in, slide a putty knife under the carving and lift it off the backer board (right).*



OR

Attaching the carving

The challenge is to securely apply a delicate carving in an exact location with the minimum of squeeze-out.

Stop the squirm or corral the carving. *If your carving is thick enough, you can push it onto small brads clipped close to the surface (left). This will stop the carving from moving around when clamping pressure is applied. Another way is to attach thin wood tabs with double-sided tape in a few key spots (right).*

with fine files and/or sandpaper.

When you're done, a thin putty knife and some solvent make it easy to dismount the blank. Fanning the carving with a heat gun will also help to loosen the tape's grip.

Clever tricks for gluing and clamping

Attaching the carving securely and completely is very important. If you use too much glue, cleanup will be almost impossible without damaging the background. Too little glue or uneven clamping pressure and you risk parts lifting later on.

The first step is to prepare the background as you would before finishing. Be sure all mill marks and tearout are cleaned up. Position the carving dry and mark the location with tape or light pencil marks.

One of the problems when clamping small pieces is that if they slide while you're clamping them down, you may not notice with cauls and clamps in the way. I have a couple of ways to overcome this: If the carving is fairly sturdy, without narrow branching parts, I tap two or three fine brads into the background board and nip them off to leave short nibs. Then I press the carving into place, making dimples that hold it there.

If the carving is more fragile or flexible, I trap it with thin tabs of wood taped around its edges. These strips can be shaped as necessary to control every part of the carving.

The trick for gluing is to "ink" the back of the carving with an even coat of glue (see photo, below left). You should do tests to learn how heavy a coat is needed. Too light a coat and the

Molded caul. *To apply uniform pressure to complex carvings, make a custom caul. Place a piece of plastic food wrap over the carving, then build up a layer of non-hardening modeling clay (left). Remove the plastic and clay carefully (right) and refrigerate for at least 30 minutes to harden.*

The "inking" trick. *Roll glue onto an impervious surface and then lower the carving straight down onto the glue. This way, you get an even application of glue on the bottom of the carving and none on the sides. Use the point of a knife to lift up the edge of the carving before removing it.*

Even pressure for a good bond. *Place the carving on the workpiece in the marked location and apply the cold, stiff, molded caul followed by a plywood caul. Then apply the clamps. The clay will stay stiff long enough for the glue to set.*

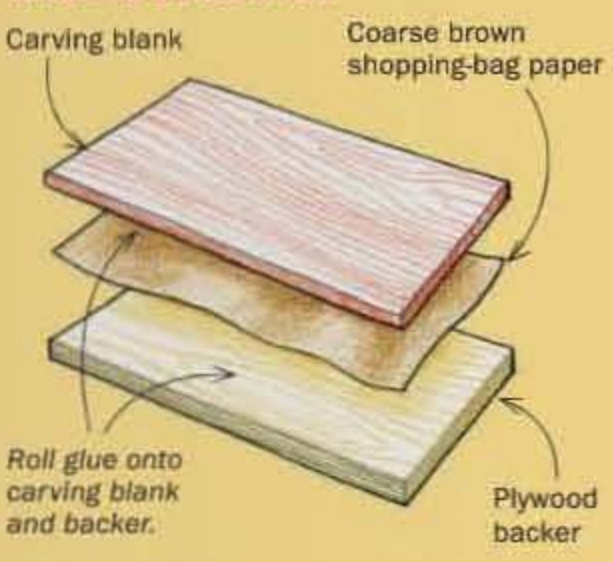
ALTERNATE METHOD

Apply, then carve

Complex or delicate carvings may need to be carved in place. It is more time-consuming, but still easier than working in the solid. As before, the blank is temporarily mounted on plywood.

Add a backer and plane to thickness. *Roll PVA or hide glue on the plywood and the carving blank, and then clamp them with a layer of coarse brown shopping-bag paper in between. The paper holds moisture, so these joints dry slowly. Once dry, you can thin the blank in a planer if necessary.*

MAKE A SANDWICH



Saw out the pattern. *Spray-mount the pattern to the blank and then cut it out on the bandsaw. The plywood keeps the carving blank intact.*

Locate the carving. *On delicate carvings, tabs of wood attached to the workpiece work better than snipped brads, which might split the workpiece.*

Plywood acts as clamping caul. *The plywood now distributes the clamping pressure. Once the glue is cured, split the paper joint with a wide chisel to remove the plywood, as shown.*

Start carving. *The carving is done as before but you have to work next to the finished background. The risk is no greater than when carving from the solid and you've avoided the labor of removing all the background waste.*

background will absorb it and starve the joint. Too much and you get messy squeeze-out.

A variety of clamping techniques

Clamping pressure is as important as using the right amount of glue. The goal is to get small dots of squeeze-out along all of the edges, without any areas having a continuous bead.

Simple shapes can be clamped with cork or Homasote pads. On complex carving, one easy way to get even pressure is to use a vacuum bag without a caul. If there are pointy areas, cover the carving with soft leather to protect the bag.

Whatever clamping method you choose, remove the clamps when the glue is dry but not fully cured, so it is easy to remove the squeeze-out. I use a Popsicle stick sharpened like a skew chisel. Don't try to wash off extra glue with water and a brush. This risks washing out glue from under the carving and weakening its bond, or getting glue in the background wood, which will show up under a finish. □

Will Neptune is a woodworker and woodworking teacher in Acton, Mass.

WOODWORKERS MART

See advertiser index on page **96** for more information.

CLASSIFIED

The Classified rate is $9.50 per word, 15 word min. Orders must be accompanied by payment, ads are non-commissionable. The WOOD & TOOL EXCHANGE is for private use by individuals only; the rate is $15/line, minimum 3 lines. Send to: *Fine Woodworking* Classified Ad Dept., PO Box 5506, Newtown, CT 06470-5506. FAX 203-426-3434, Ph. (866) 505-4687. For more information on advertising go to www.finewoodworking.com/classified Deadline for the July/August issue is April 12, 2012.

Hand Tools

DIEFENBACHER TOOLS- Fine imported and domestic hand tools for woodworkers. www.diefenbacher.com Free catalog 1-800-326-5316.

HIGHLANDWOODWORKING.COM, the world's largest selection of hand planes, plus thousands more fine hand tools.

PETE NIEDERBERGER- Used and Antique tools and parts. Special on vintage tuned Stanley planes. (415) 924-8403 or pniederber@aol.com Always buying!

BOB KAUNE-ANTIQUE & USED TOOLS. Since 1982. Hundreds of quality handtools. Stanley planes and parts. Visa/MC. www.antique-used-tools.com (360) 452-2292.

Instruction

SUMMER WOODWORKING CLASSES 2012. All levels. Beautiful NC foothills. Work featured in FWW, no. 59; Published author; *Pro Refinishing*, Vol. 6 #2, April '02; HGTV Magazine. www.garyreynoldsstudios.com

THE SCHOOL AT ANNAPOLIS WOODWORKS, Davidsonville, MD. Turning, Carving, Furniture Making, etc. Weeklong and weekend classes for all skill levels. www.annapoliswoodworks.com (301) 922-0649.

PENLAND SCHOOL OF CRAFTS, in the spectacular North Carolina mountains, offers one-, two-, and eight-week workshops in woodworking and other media. (828) 765-2359; www.penland.org

PRIVATE CLASSES with woodworking author in the Great Smoky Mountains. All skill levels. www.GregoryPaolini.com (828) 627-3948.

Miscellaneous / Accessories

WOODSLICER.COM, resawing blade rated best-performing 1/2-in. bandsaw blade by *Fine Woodworking*. 800-241-6748.

Plans & Kits

FULL SIZE FURNITURE LAYOUTS Drawn by: Philip C. Lowe. Catalog $3. (978) 922-0615. 116 Water Street, Beverly, MA 01915. www.furnituremakingclasses.com

Wood

LONGLEAF HEART PINE (antique). Flooring-lumber-millwork. Red cedar lumber & paneling. Lee Yelton: (706) 541-1039.

FIGURED CLARO WALNUT slabs and planks, in dimensions suitable for small to large projects. CWD: 800-660-0203. www.woodnut.com

QUALITY NORTHERN APPALACHIAN hardwood. Custom milling. Free delivery. Bundled, surfaced. Satisfaction guarantee. Niagara Lumber. 800-274-0397. www.niagaralumber.com

SAWMILL DIRECT 100 species of exotics, turning, lumber, logs, slabs, musical instruments TROPICAL EXOTIC HARDWOODS OF LATIN AMERICA, LLC: Toll Free (888) 434-3031. www.anexotichardwood.com

TIGER MAPLE, MAHOGANY, cherry, walnut, butternut, curly birch; plain and figured. Wide boards, matched sets, 4/4 to 24/4. 150-ft. minimum. (570) 724-1895. www.irionlumber.com

LARGE CLARO WALNUT book-matched slabs, turning stock, raw and paper-backed veneer of burl and crotches. www.walnutwoods.net online store. Newton Woods. (559) 277-8456. Fresno, CA.

EISENBRAND EXOTIC Hardwoods. Over 100 species. Highest quality. Volume discounts. Brochure. 800-258-2587. eisenbrandhardwoods.com

BIRD'S-EYE AND CURLY MAPLE, 4/4 to 12/4 lumber, flitches, turning squares and blocks. Black walnut, cherry/quartersawn, and curly oak lumber. Dunlap Woodcrafts, Chantilly, VA. (703) 631-5147.

VIRGINIA WOODWORKERS: Complete line of domestic hardwoods, specializing in curly maple and premium cherry. Superior quality, personalized service. (540) 825-1006. cpjlumber.com

INDEX TO ADVERTISERS

For quick access to advertisers, go to www.finewoodworking.com/marketplace or call 800-719-6906

ADVERTISER	Extension	page #
Adria Toolworks, Inc.	3025	p. 94
Airware America	3036	p. 94
Alderfer Lumber Co.		p. 95
Allred & Associates, Inc.	3004	p. 94
American Fabric Filter Co.	3040	p. 81
Arrowmont School of Arts and Crafts	3037	p. 17
Bamboo & Rattan Works	3069	p. 13
Banner Hill School of Fine Arts & Woodworking	3001	p. 95
Berkshire Products	3006	p. 94
C.R. Muterspaw Lumber	3066	p. 95
Cabinetparts.com	3026	p. 95
Center for Furniture Craftsmanship		p. 33
Certainly Wood	3024	p. 95
Clear Vue Cyclones	3012	p. 89
Connecticut Valley School of Woodworking	3005	p. 13
Contempo Living	3034	p. 95
Craftsman Studio	3028	p. 95
Davisson Rockers	3032	p. 95
Dowelmax	3048	p. 31
DR Power		p. 13
DR Power		p. 33
DR Power		p. 81
Epifanes	3072	p. 31
Felder USA	3049	p. 31
Fine Woodworking Live		p. 3
Fine Woodworking Online Store		p. 27
Forrest Manufacturing	3043	p. 23
The Furniture Institute of Massachusetts	3007	p. 95
Goby Walnut Products	3023	p. 95
Gorilla Wood Glue	3047	p. 17
Grex USA	3056	p. 9
Groff & Groff Lumber	3016	p. 94
Guhdo	3042	p. 81
Guillemot Kayaks	3022	p. 95
Hearne Hardwoods, Inc.	3038	p. 11
Highland Hardware	3050	p. 13
Infinity Cutting Tools		p. 11
Inside Passage School of Fine Woodworking	3018	p. 9
JDS Company	3031	p. 9
The Japan Woodworker	3003	p. 31
Kay Industries	3020	p. 13
Keller & Company	3035	p. 95
Kreg Tool	3057	p. 23
Laguna Tools	3063	p. 7
Lie-Nielsen Toolworks	3010	p. 13
Lignomat	3030	p. 31
Marc Adams School of Woodworking	3071	p. 11
Northwest Woodworking Studio	3033	p. 95
Oneida Air Systems	3054	p. 23
Oneida Air Systems	3044	p. 33
Osborne Wood Products	3058	p. 33
Peck Tool Company	3017	p. 95
Phase-A-Matic, Inc.	3013	p. 33
Philadelphia Furniture Workshops	3053	p. 94
Powermatic	3061	p. 2
Quality Vakuum Products		p. 31
RadarCarve.net	3009	p. 81
Rare Woods USA	3002	p. 94
Ringmaster	3027	p. 95
Rosewood Studio	3039	p. 81
Sawtooth Shelf System	3045	p. 89
Scherr's Cabinet & Doors, Inc.	3008	p. 13
Sorbothane	3070	p. 95
Stratton Creek Wood Works	3011	p. 94
Supermax Tools	3068	p. 9
Titebond	3065	p. 20
Trend Routing Technology, Inc.	3041	p. 89
Triton Precision Power Tools	3060	p. 89
Vacuum Laminating Technology	3059	p. 9
Woodcraft Supply	3046	p. 99
WoodRat	3064	p. 81
Woodworkers Source	3055	p. 95
Woodworker's Supply	3014	p. 11
Woodworker's Supply	3015	p. 17

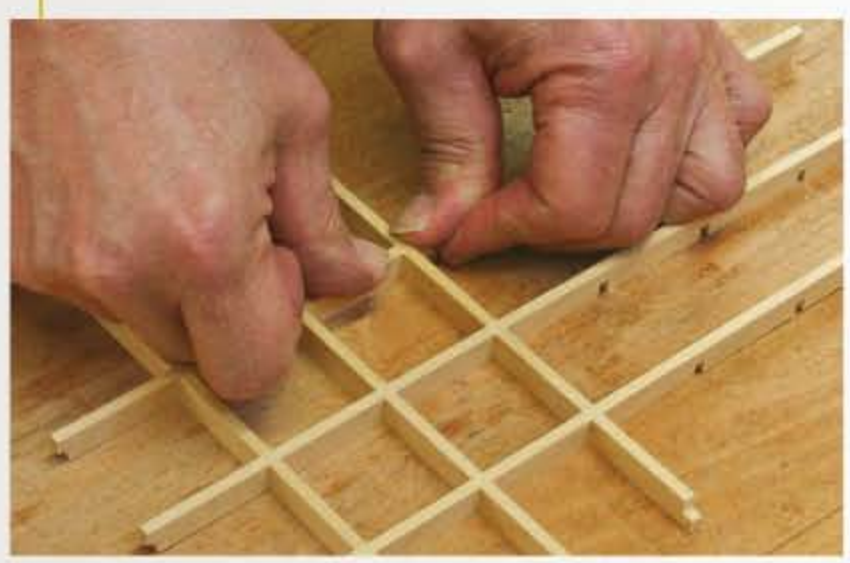
Japanese lattice

BY JONATHAN BINZEN

The decorative latticework in John Reed Fox's cabinet (back cover) is based on examples he has studied in Japanese shoji screens and transom frames. Like the originals, his latticework, or kumiko, is assembled largely without glue—almost all the parts are merely press-fit, putting a premium on perfect accuracy in the joinery. Made carefully, however, the latticework is extremely rigid. Fox's work begins with a known opening for the lattice panel and a very precise full-scale drawing. He generally builds with Port Orford cedar, which is straight-grained and relatively soft, but will hold a clean, sharp edge. To the back of the lattice, Fox glues a sheet of handmade paper, available in art-supply stores.

Gridwork

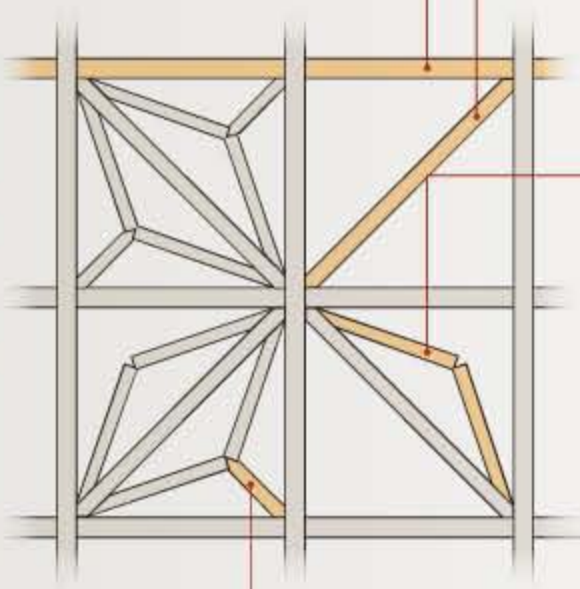
Accurate bars. *After milling his blanks, Fox cuts dadoes (left) for the half-lap joints that will create the grid. A registration pin in the miter fence establishes the spacing between the dadoes. Fox rips the dadoed blank (right) into strips slightly thicker than the final thickness of the grid bars.*

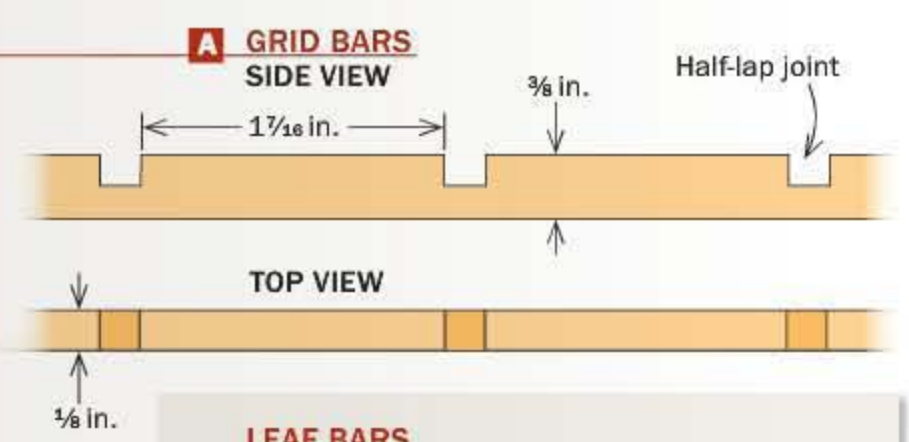


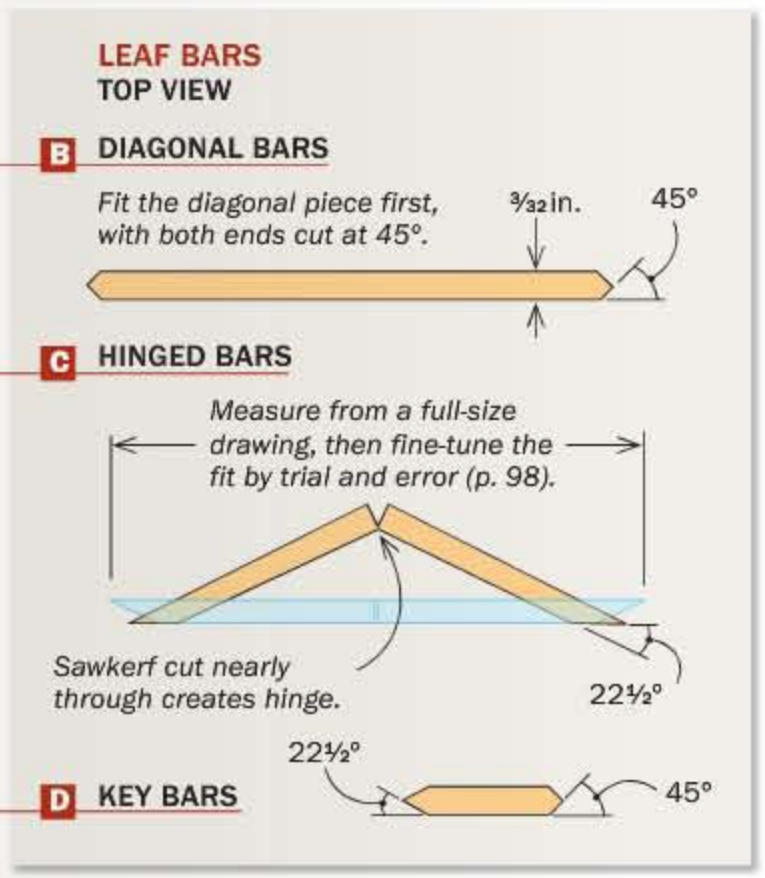
Gridlock. *After handplaning the grid bars to final thickness with just a few passes on each side (see p. 98), Fox assembles the frame. Only the joints around the perimeter are glued, yet with all the snug-fitting half-lap joints, the completed panel is very rigid.*

LATTICE ANATOMY

The size of the grid and the dimensions of all the bars vary from project to project. In this case, Fox made all the bars ⅜ in. wide. The grid bars are a bit thicker than the leaf bars. Dimensions are approximate.

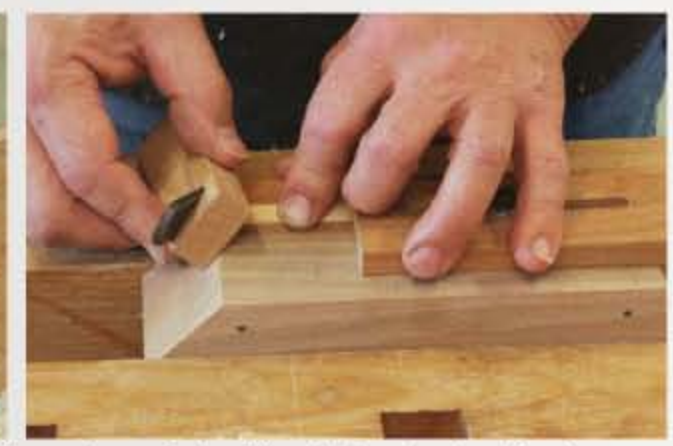






Producing the parts

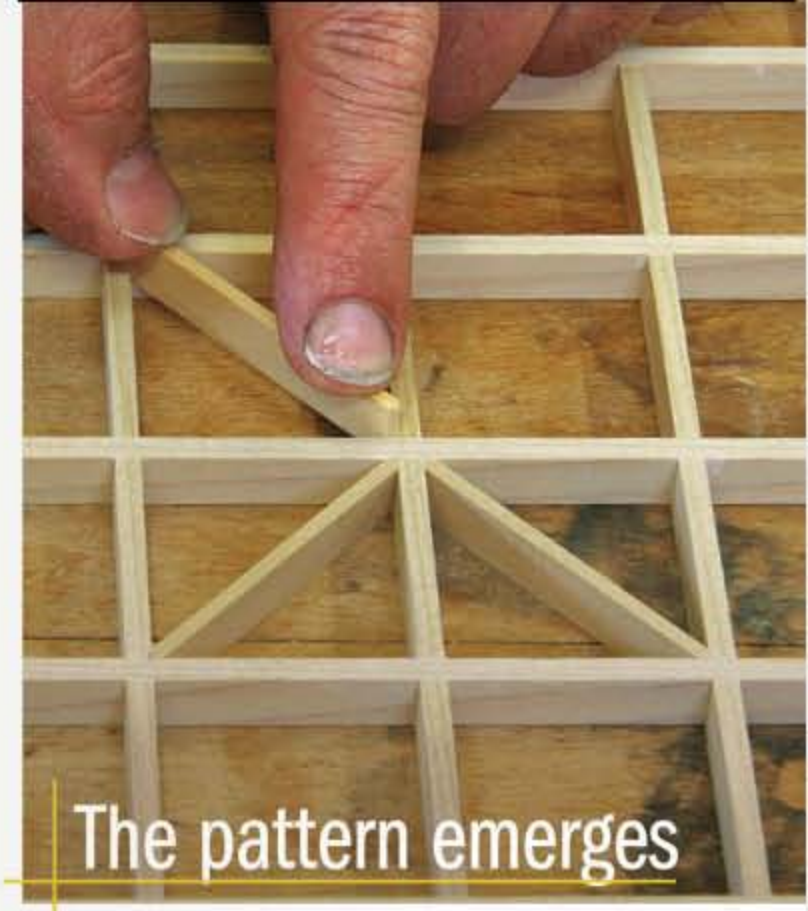
Precise thicknessing by hand. *To make stock for the small bars that create the leaf pattern, Fox tacks strips of the desired thickness to the bottom of a handplane as depth stops (left). Then, working on a dead-flat surface, he gangs several workpieces (above). Note that he is pulling an Asian-style plane, so the end stop is at the rear.*



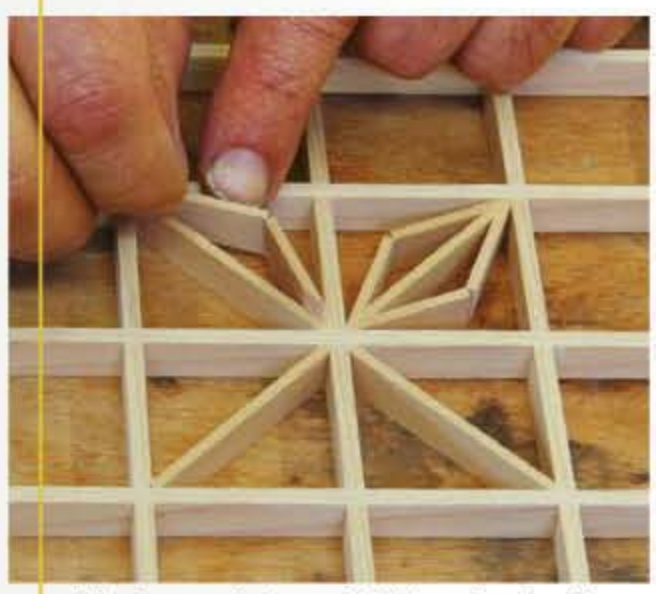
Little jigs for little bars. *Fox cuts the pattern pieces to length using a simple miter box—just a stepped piece of wood—clamped to his bench (left). He miters and fits the ends of the bars on a shopmade donkey's ear planing jig with an adjustable end stop (right). This jig is for 45° cuts; he made another for the 22½° cuts.*

Bend it with a kerf. *Fox cuts a kerf to within a whisper of a full through-cut to create a hinge in one of the bars (above). The strip of wood clamped to his saw acts as a depth stop. He can fine-tune the depth of cut by placing tape beneath the workpiece. After moistening the hinge points with water, Fox bends the hinges open (right) over a wooden block.*

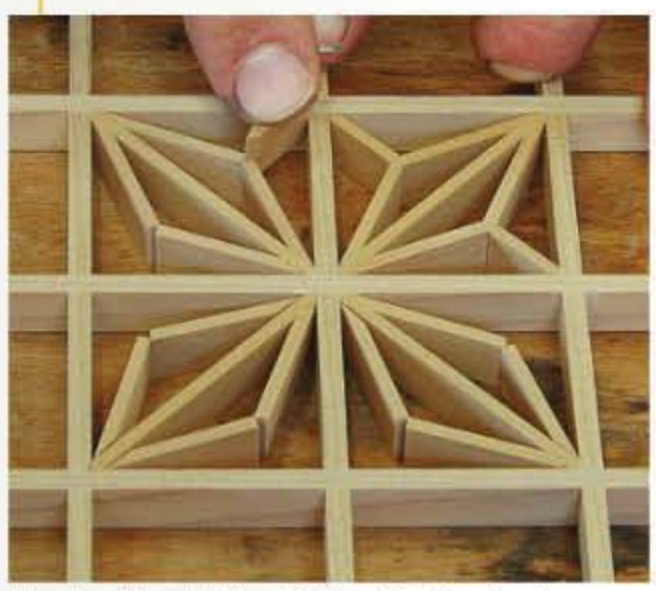
The pattern emerges



Begin with the diagonal bars. *The fit needs to be precise. If it is sized correctly, the cedar will compress slightly as it is slid home. But it shouldn't be so tight that you can't remove it if necessary.*



Hinges next. *Fox establishes the length of the hinged bars and the key bars at the same time, working with one pair by trial and error until they fit just right. Then he planes all the parts to final length and inserts them.*



The leaf is finished. *When the key bar is pushed home, all the small parts are locked in and the leaf pattern emerges.*

Photos, except where noted: Jonathan Binzen; finished piece (p. 97): Dean Powell; drawings: John Tetreault

WOODCRAFT®

For A Free Catalog Or To Find Your Local Woodcraft Store, Visit woodcraft.com Or Call 800-225-1153.

The Best Chefs' Tools begin with – ZHEN Premium Damascus Knife Kits

Knives are tools that create culinary masterpieces in the hands of master chefs – whether professionals or amateurs. Woodworkers, now you can craft custom knives for your favorite chef with Woodcraft's new ZHEN Premium Damascus Knife Kits and knife scale stock (sold separately at Woodcraft). Utilizing years of knife making skill and technology, the knife blades are crafted by forge welding 66 layers of steel around a core layer of VG–10 steel (HRC 60–62) to create a unique surface pattern and razor-sharp edge. Made of high carbon stainless steel (HRC 54 -56), the bread knife blade features a granton edge (non-stick scallops) for easy slicing.

	Blade Length Overall Length
153651	Cleaver, 6 9/16", 11 5/8"
153652	Nakiri, 6¼", 11½"
153653	Chef's Knife, 7 9/16", 12¾"
153654	Santoku, 4¾", 9 5/16"
153655	Parer, 3 5/16", 7 1/16"
153656	Bread Knife, 9½", 14 5/8"

WOODCRAFT®

1.855.923.7326

www.woodcraftfranchise.com

Watch the video and find out more about owning a Woodcraft Franchise. Download a QR app to scan this QR code with your Smartphone.

12WW06P

QUALITY WOODWORKING TOOLS • SUPPLIES • ADVICE®

finewoodworking.com/marketplace | 800-719-6906 x3046

Refined Over Time

A few years after dropping out of college, John Reed Fox was working as an auto mechanic in Boston and spending his lunch hours browsing in a bookstore. That's where he stumbled across James Krenov's *A Cabinetmaker's Notebook*, with its beautifully crafted furniture and its message about the deep pleasure of handwork in an industrial age. Krenov's book "lit the fuse," Fox says, and before long he had begun building furniture in his own distinctive style, with undertones of Krenov, Arts and Crafts furniture, and Japanese architecture. Fox, whose mother's family is from Japan, builds his pieces with Japanese hand tools and western machines. "I use machines to get me to the bench quicker," he says. Traveling in Japan, Fox was deeply impressed by the steadfastness of craftsmen who make the same thing again and again. Likewise, his own furniture style—distilled in this cabinet in cherry with Port Orford cedar latticework—has remained remarkably constant without losing its freshness. "I've been criticized for making the same thing for 30 years," Fox says. "I'm working with one aesthetic idea and trying to make it better and better. For me, a tiny little change is a huge thing." Here's to more of the same.

—Jonathan Binzen

Photo: Dean Powell

How They Did It Turn to p. 97 to see how Fox makes the latticework on this cabinet, with its traditional Japanese hemp-leaf pattern.

Audio Slide Show For more of Fox's furniture and a taste of the philosophy behind it, go to FineWoodworking.com/extras.