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Seal first for a perfect finish, p. 48



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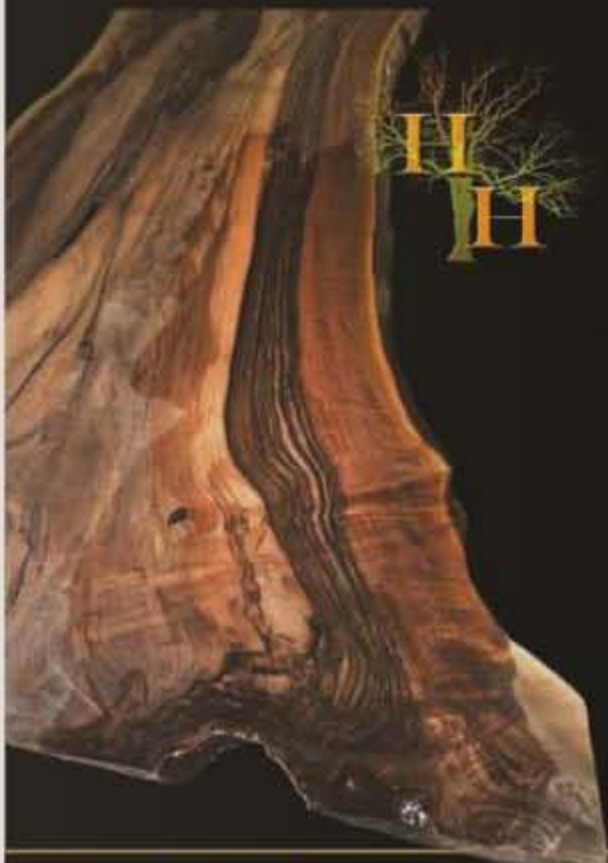
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on the web

THIS MONTH ON **FineWoodworking.com/extras**

Visit our website to access free web tie-ins, available May 31. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.



VIDEO: Simple Tricks for Shaker Legs

Christian Becksvoort (pp. 35-41) puts a bit of Yankee ingenuity to work, with a great series of tips and tricks for super-smooth, perfectly tapered Shaker legs.

VIDEO: Cure for Card-Scraper Ills

Learn how to avoid the top two mistakes most woodworkers make when sharpening a card scraper (pp. 22-25).



Fine Woodworking: Now with Video Built In

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VIDEO WORKSHOP

East Meets West

Build a graceful hall table chock-full of Asian flair. Timothy Rousseau takes you through every step, including:

- how to produce accurate patterns from drawings,
- pattern-cutting sled techniques for the router table, and
- how to create curved, tapered legs with a thickness planer.



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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 Mollers, Inc., 2835 Kew Drive, Windsor, ON N8T 3B7, or email to mnfa@taunton.com.

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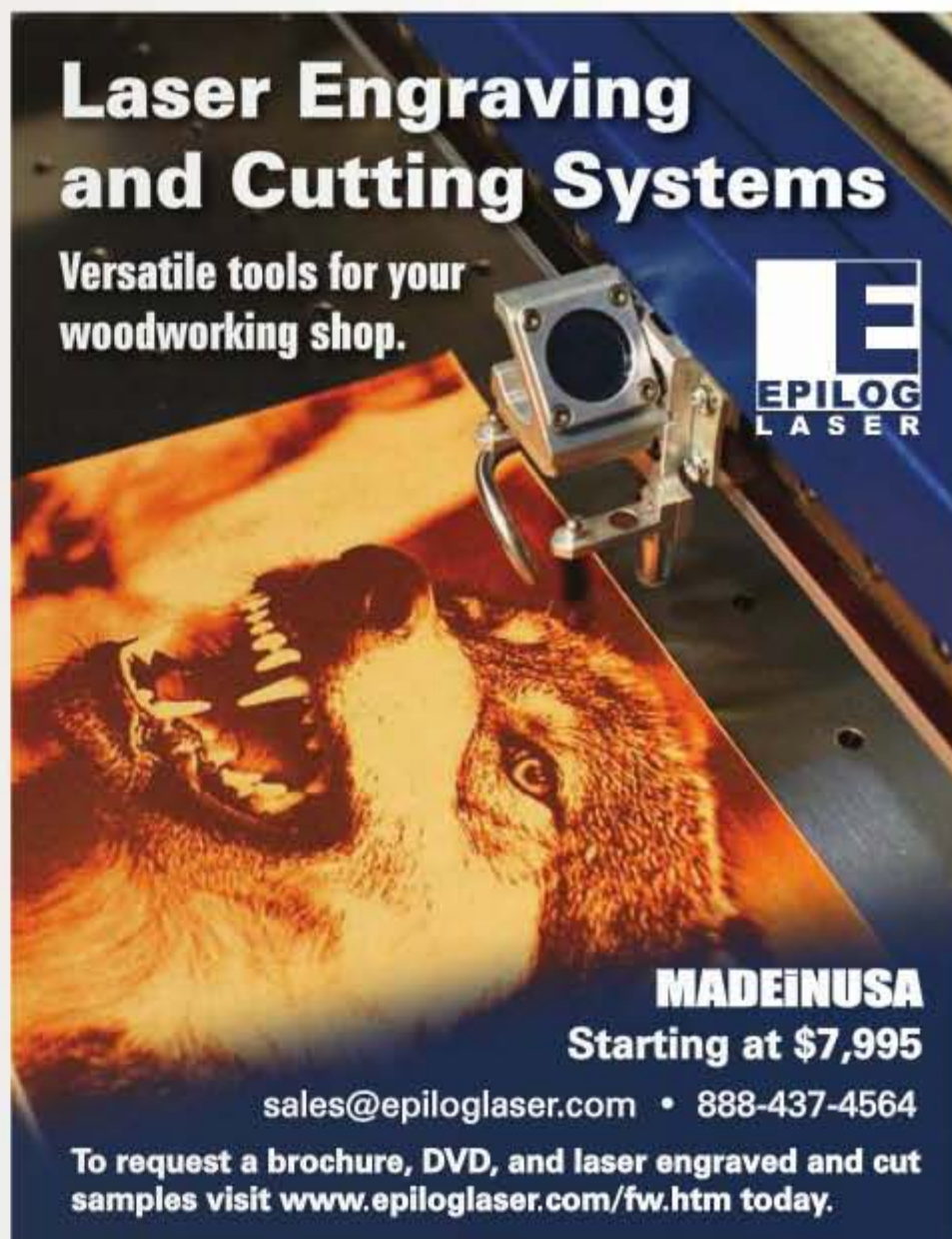


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contributors

One of the things **Andrew Hunter** (Master Class: "Super-Strong 3-Way Miter") appreciates most about making a living as a furniture maker is that it has allowed him to apply his fundamental values to a lifelong career, something not every job offers. In his Accord, N.Y., studio he builds custom furniture with a small but much-loved collection of Asian hand tools. Since he discovered traditional Chinese furniture making, Hunter has been eager to share what he has learned, and he says the three-way miter is just the tip of the iceberg. He and his wife, Kate, have taken most of the past year to refurbish an 1800s farmhouse. Hunter has approached this project in the same way he builds his furniture, with an emphasis on a well-thought-out and precise layout.

What do you like about your shop? "Its simplicity."

Tool you can't live without? "My Japanese smoothing plane."

Favorite style of furniture? "Currently, Shaker and early American country furniture."



W. Mickey Callahan ("Curved Moldings on the Router Table") has been a professional woodworker and furniture maker for more than 25 years. He received his formal training in furniture and cabinet making from North Bennet Street School in Boston. In addition to making furniture, he has taught at NBSS and at numerous other locations. He is also co-founder and past president of the Society of American Period Furniture Makers (SAPFM).

Favorite tool? "My Stanley-Bailey No. 7 jointer handplane. It's over 100 years old and just feels right. It has never let me down."



Peter Gedrys ("Seal First for a Better Finish") does most of his work in a converted barn next to his house. But he also finishes interiors, which gives him a chance to see how the other half lives. He has done restoration work on the Morgan Library and Museum in New York City; his last job was in a Park Avenue penthouse.

If I weren't a finisher, I'd be ... When we asked Peter this question, his wife Kathy quickly interjected "rich!"

Instead of the usual biography, we asked longtime contributing editor **Christian Becksvoort** ("Shaker-Inspired Hall Table") a few questions. Describe the view from your shop window: "A lawn with apple, ash, maple, and pine trees, a stone wall, and the woods."

What is the oldest tool in your shop? "I still have my father's old, handmade, wooden router plane."

Length of your commute? "Ten seconds."

Number of moose sightings in the family garden, annually? (Becksvoort lives in Maine.) "On average, about one a year. One year we had a young bull that came out of the woods every evening, all summer long."

Advice to an aspiring professional furniture maker? "Keep your day job."



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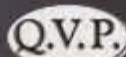
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From the Editor

GET INSPIRED AT FINE WOODWORKING LIVE!

Woodworking is a solitary pursuit. That's a good thing and a bad one. On one hand, it is deeply satisfying to carve out your own retreat, one that is always waiting for you just the way you left it, a place where you can be at peace and simply create.

On the other hand, we are social creatures. It is one of the important ways we make meaning of our lives. I feel great when I finish a piece of furniture and it looks the way I imagined it would, but I feel even better when someone else sees and appreciates it. Also, working by myself at home, I can run out of steam. Have you experienced the woodworking doldrums, where you just don't feel like making anything?

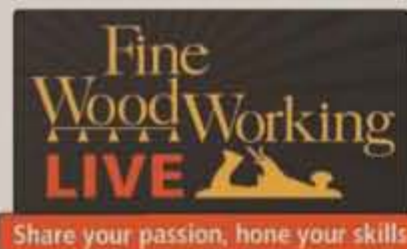


The cure is simple: Get together, and get inspired. I've seen this phenomenon work again and again. It has happened to me at furniture shows, or just about any exhibit of work made by my fellow artisans. And it happens at conferences, too. In each case, I encounter beautiful work, and experiencing it in person is so different from seeing it in a magazine. I can touch the finish, see the tool marks, and get a much better idea of how it was made. The technical demos are inspiring, too, letting me look over someone's

shoulder, ask questions, and interact with everyone around me.

So, to take you beyond the magazine and website, we created Fine Woodworking Live, our first-ever conference, this August in New York's beautiful Hudson Valley. It is long overdue and promises to be one of many, bringing together passionate readers like you and our most power-packed authors (and editors, too) for a weekend of skill-building demos and overall camaraderie. I guarantee you will leave inspired and itching to get back into the shop and create.

—Asa Christiana



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Goodwill table

Thank you to Garry Bennett for sharing your table with us ("Garry Bennett's Un-Trestle Table," *FWW* #219 and in video on FineWoodworking.com). A close friend wanted a table for her laundry room, but gave me only dimensions to work with. So I used your design. I used old-growth fir, as hard as oak, reclaimed from a foundation of a 50-year-old water tank here in Hawaii. After pulling all the nails out, the boards planed out nice. You made my friend happy. No sooner did we have that table assembled than she sat her grandchildren on it and fed them lunch. I don't think it's going to make it to the laundry room. Goodwill Table is an appropriate name for this piece. You are a gift to many of us who appreciate what can be done with one's hands and vision. Keep building pieces, Garry. And I thank you again for sharing.

—STEWART MIYAMOTO, Kailua Kona, Hawaii



Inspired by Bennett. This version of Garry Bennett's Un-Trestle Table was built for a laundry room, but it's proven too popular on the patio.

Power-tool safety

In the past 90 days, two very experienced woodworker friends have endured serious injuries to their fingers. Both are angry (and embarrassed) that they succumbed to what they describe

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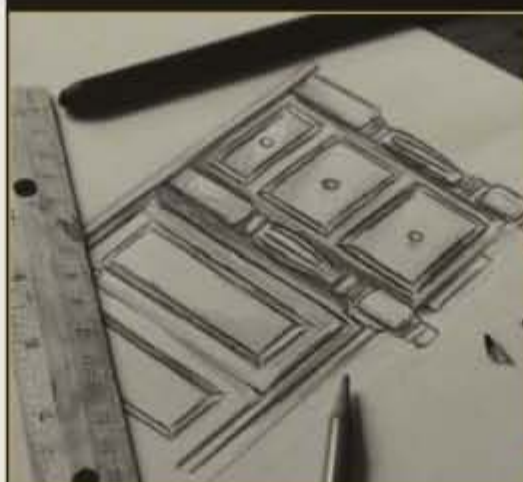
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as rookie mistakes. Both accidents were at the end of a long day against a real or imagined deadline.

When most of us make the first cut to create a product, we start out with all the proper precautions, using our guards and push sticks with respect and a little fear. But we get complacent as we succeed with our task. Then something doesn't fit just right, so we back up a step and trim it up in a hurry to get it right and move on. It is late. We are tired, and a little frustrated.

Stop and think! The most dangerous cut of the day is the last one. This is a letter to myself, and I hope it may help someone else, too.

—PETER ALLSOPP, Homewood, Ala.

Inspired by StartWoodworking.com

I was inspired to make these tables after watching the free series of videos on how to build a Shaker table. I changed up the all-walnut design, going with a

combination of maple and walnut. This is my first piece of furniture. In order to complete it, I also built a workbench so that I would have a surface to work on, and found many great deals on tools online through Craigslist and eBay.

—ROBERT FEREBAUER, Richland, Wash.



Sweet retirement!

Fine Woodworking has long been my husband's bible. He has been taking it for years, many times when we thought we could ill-afford it. He drove a semi for 32 years. He was gone a lot and always looked forward to his retirement years in his woodworking shop. After reclaiming his shop from the barn cats who had taken over, he began poring over those

Insulated glass in front doors

In a sidebar in Josh Finn's article "Build Your Own Front Door," *FWW* #226, there is a recommendation to bed insulated glass in clear silicone. My company builds custom doors, and our glass suppliers have warned against this practice because it can damage the rubber sealant used in insulated glass fabrication, possibly allowing fogging. So we use Infinity urethane caulk to bed door glass. It works great and has the extra advantage of accepting paint and varnish.

—DAN OLIVIER, Charleston, S.C.



Try urethane instead. Used to bed glass in a door, silicone may cause fogging.

issues he didn't have time to fully explore. His first project was the Windsor rocker you featured in April 2011 (*FWW* #218). He made himself a steam box to bend the wood, attached to a wallpaper steamer. When he carried the rocker into the house, just before Thanksgiving, I realized I was the one who really benefited from all his hours in the shop.

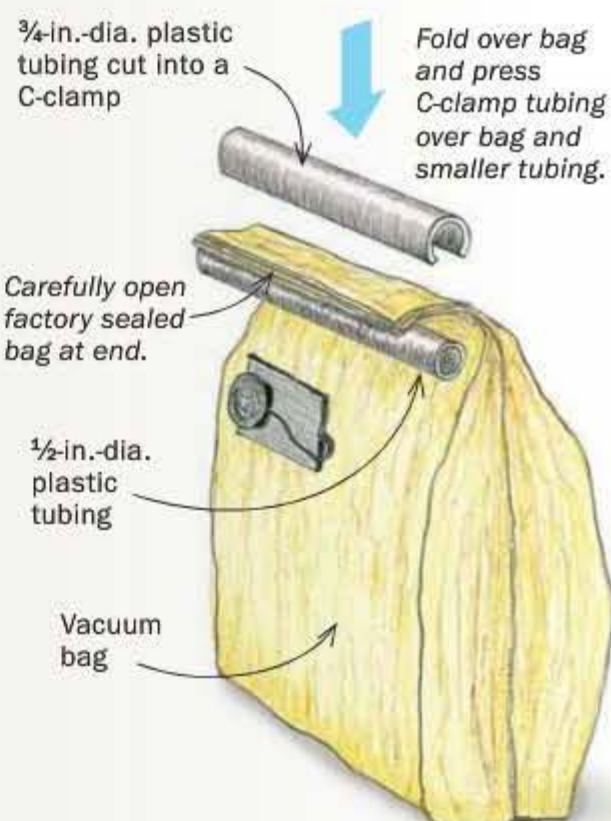
—KATHLEEN MILLER, Pleasant Hill, Ohio

How to make vac bags re-usable

I've got to weigh in on the editorial reply to the question of bag or no bag in issue #225. The question was why you downgraded vacuums with pre-filter bags that would keep their HEPA filters from clogging, preferring instead the vacs with a self-cleaning feature. In the response to the reader you explain that bags are not reusable. You know as well as I that woodworkers are resourceful. I've had a Festool CT33 for many years, and I'm still on my first bag. I figured out a simple way to make the bag re-closable. I got some plastic tubing of two sizes, 1/2 in. and 3/4 in. outside diameter, and I cut them to the width of the bag

end. Then I slotted the length of the larger tube, making it a "C." I carefully opened the factory-glued seal on the end of the bag; it's double-folded. Now I just fold the end of the bag over the smaller tube and snap the larger one over it! I've never had this fixture blow out, and it works like a champ!

—BRIAN WELCH, Burlington, N.J.



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.

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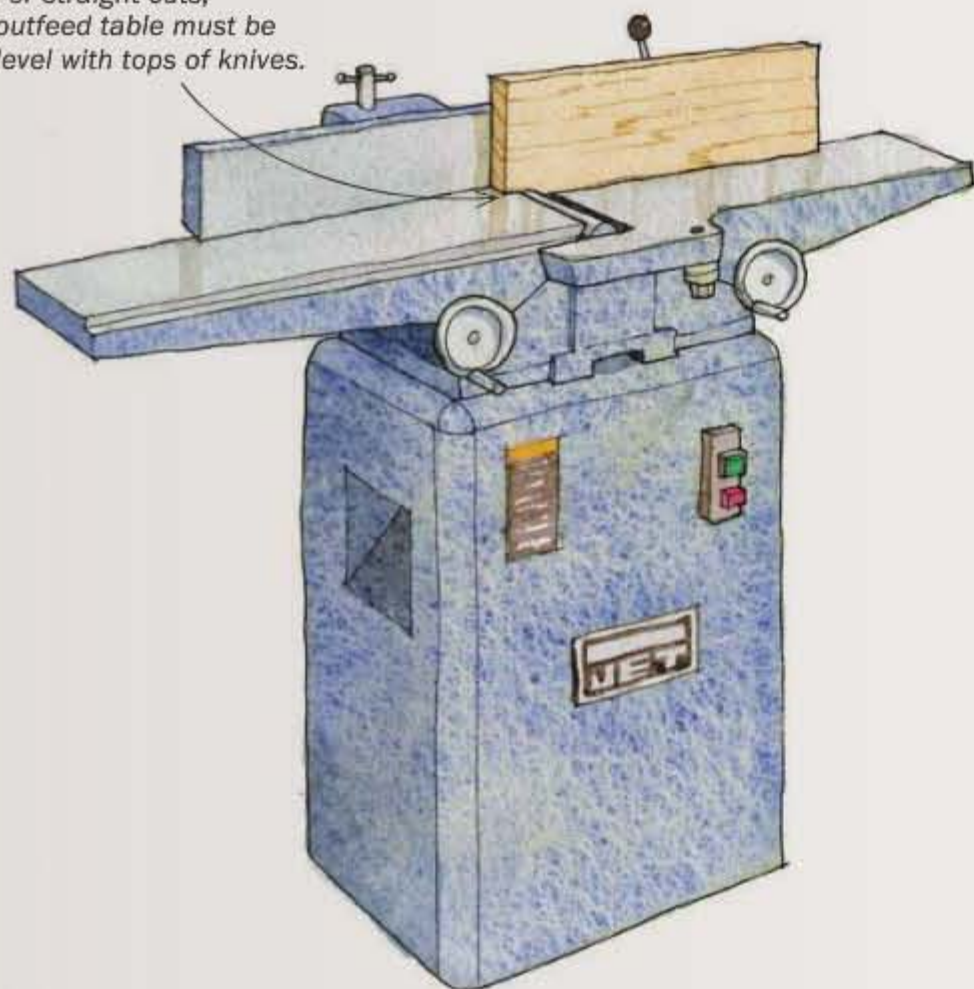


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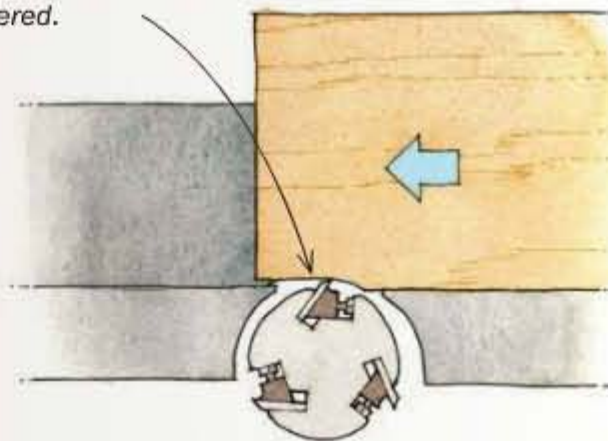
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For straight cuts, outfeed table must be level with tops of knives.



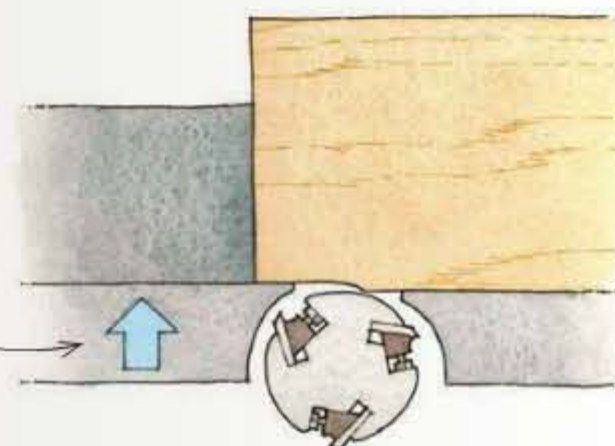
STEP 1: LOWER THE TABLE

Make short cut with outfeed table lowered.



STEP 2: RAISE IT

Raise table so it is level with workpiece.



Best Tip Adjust a jointer's outfeed table perfectly in seconds



Daniel Kay has always loved building things: using Lego and Meccano sets as a child, erecting a log cabin in his teens, and then designing and building a home with his wife. Over the years, that passion has refocused on building furniture and other household items.

Changing jointer knives is a tedious task made even more so by what often comes next: resetting your outfeed table to match the cut of the new blades.

If the table isn't perfectly level with the knives at their highest point of revolution, you'll wind up with cuts that are tapered, convex, or concave. Getting the adjustment right can be fussy and frustrating.

I came up with an accurate approach that also happens to be dirt simple. All it takes is a piece of solid-wood scrap with a straight, flat edge.

Before starting, make sure that the infeed and outfeed tables are parallel and the knives are properly adjusted in the cutterhead. Lower the infeed table for a cut of about $\frac{3}{16}$ in. and lower the outfeed table so it will be out of the way.

Start the jointer and, while firmly holding down the board on the infeed table, slowly feed the stock into the jointer. Stop the cut when the leading edge is about $\frac{1}{2}$ in. over the outfeed table. Stop and unplug the jointer, clamp the guard out of the way, and roll the cutterhead so the knives are out of the way.

Now push the board forward until the toe of the snipe is over the outfeed table. Adjusting the table to the right height is simply a matter of raising it until it is level with the bottom of the snipe. That's it!

After making this adjustment, I run a few pieces of wood over my jointer to be sure the faces are perfect.

—DANIEL KAY, Levack, Ont., Canada

A Reward for the Best Tip

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



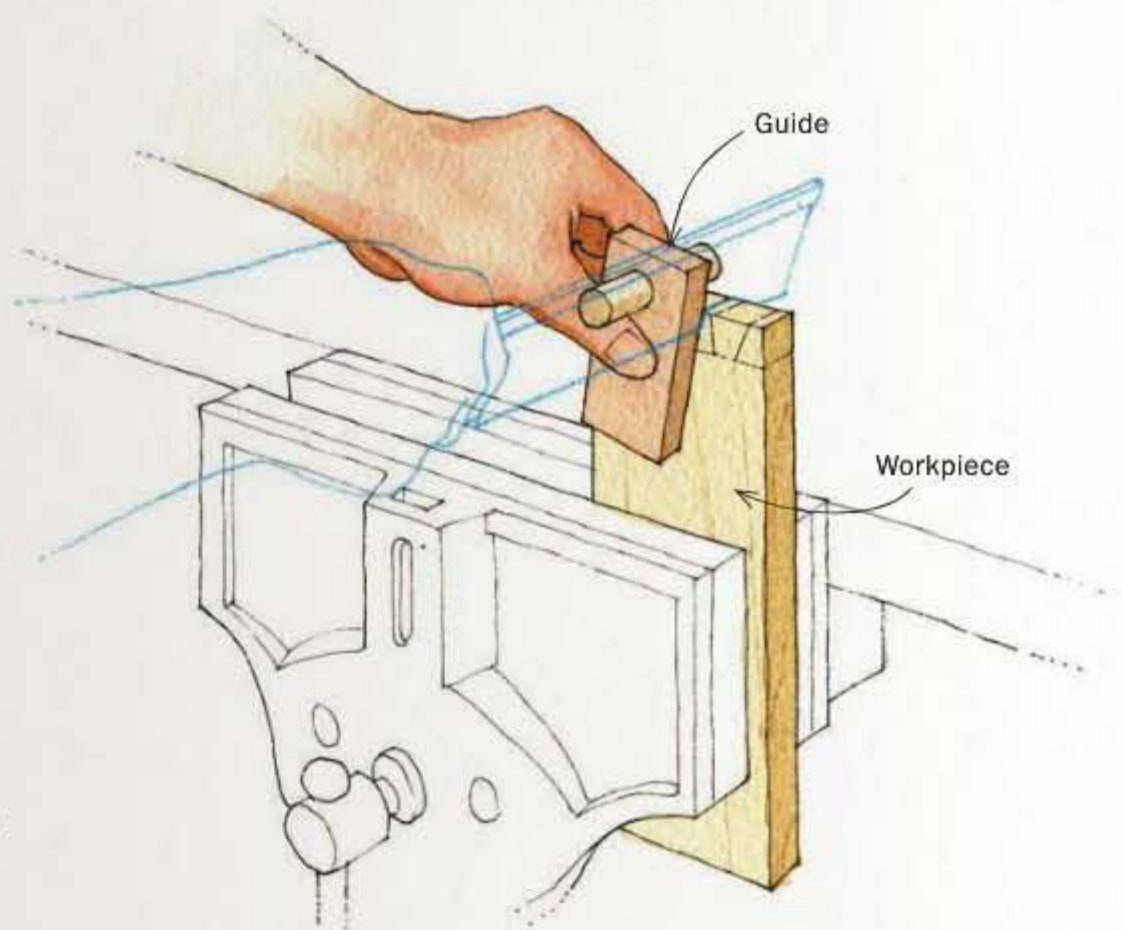
Simple saw guide for accurate dovetails

I cut my dovetails pins first and then scribe the tails from the pins. In this sequence, it's important to be accurate when cutting the tails, so they mate well with the pins.

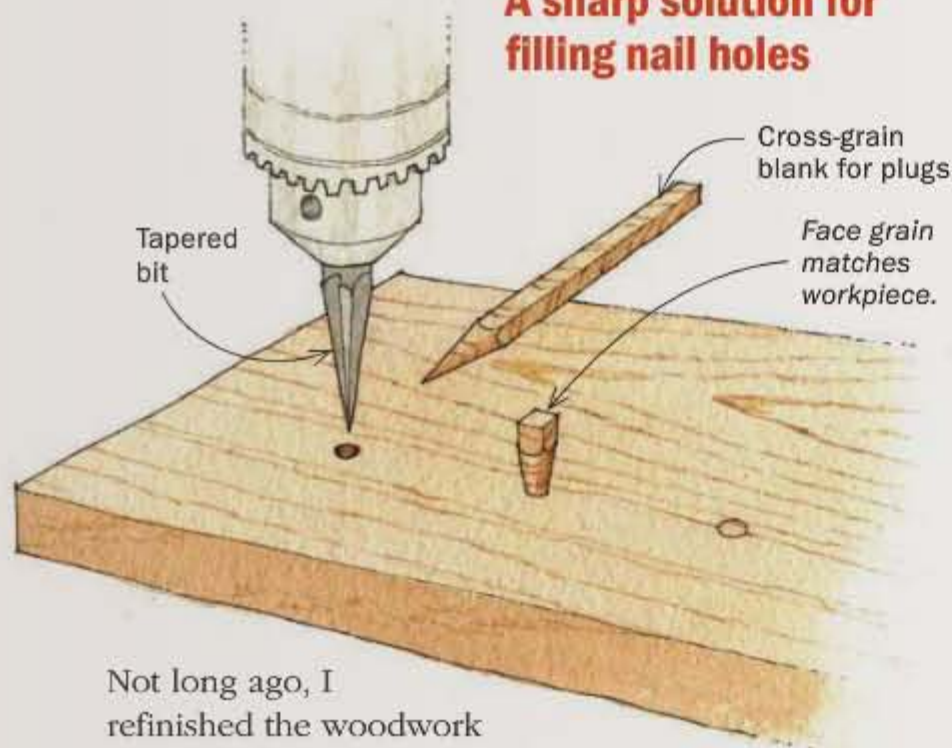
Following the scribe lines with the saw can be challenging, though, in part because the tail cuts aren't perpendicular to the end of the board. To avoid cutting at an awkward angle, you can tilt the board in the vise, but this is no guarantee of great results.

This simple little guide—a rectangular block with a dowel through it—is the solution. To use it, first make a shallow starting cut, then bring the guide close to the saw and align it with your planned cut. Rest the saw against the guide and proceed. After a few strokes, you can remove the guide and let the kerf guide the saw the rest of the way.

—ALEJANDRO BALBIS, Longueuil, Que., Canada



A sharp solution for filling nail holes



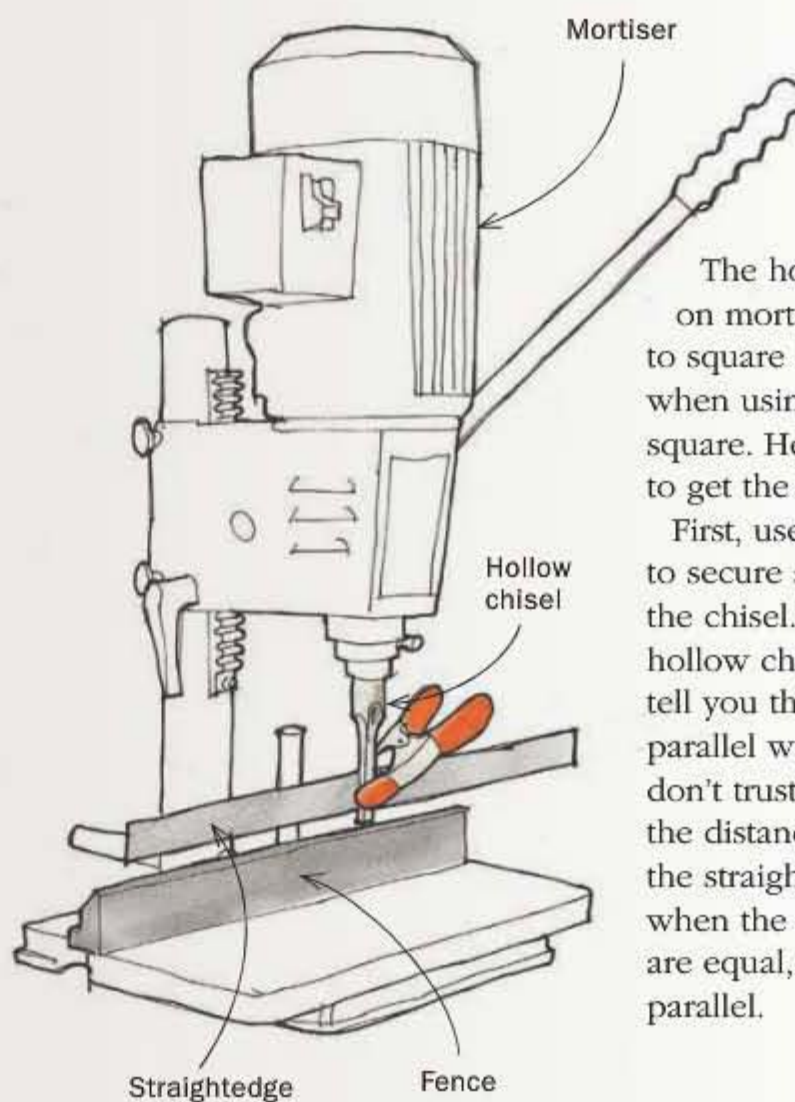
Not long ago, I refinished the woodwork in my living room, planing away old stain to reveal lovely tight-grained fir.

Because the new finish is clear, I wanted to fill the nail holes with something nicer than sawdust and glue. I have a Plugger drill bit (available at leevalley.com) that reams tapered holes for plugging with sharpened dowels. This worked, but the finish soaked into the end grain of the plugs and darkened them too much.

So I decided to try cutting cross-grain dowels with ends that matched the surrounding face grain. These can be fragile, but I found I could sharpen them in an old schoolroom-style pencil sharpener and tap them gently into place with a hammer. When the glue cured I planed the plugs level, sanded, and finished. The results look great.

—EDDIE FROTHINGHAM, Corvallis, Ore.

Square a hollow chisel by eye



The hollow chisels used on mortisers are difficult to square to the fence, even when using an engineer's square. Here's an easier way to get the job done.

First, use a spring clamp to secure a straightedge to the chisel. Second, rotate the hollow chisel until your eyes tell you the straightedge is parallel with the fence. If you don't trust your eyes, measure the distance from each end of the straightedge to the fence; when the two measurements are equal, the chisel is parallel.

—SERGE DUCLOS, Delson, Que., Canada

Quick Tip

A simple and relatively inexpensive way to get rid of the air and extend the shelf life of finishing products is to use one of those gadgets that remove air from an opened bottle of wine. Most wine shops sell them for about \$10 to \$20. Just pour finish into a clean, empty wine bottle, insert the rubber stopper that comes with the gadget, then pump out the air. I've had urethane in a wine bottle for over a year and it's fresh as new. Extra stoppers sell for \$1 or \$2 each.

—GEORGE COVEL, Shushan, N.Y.

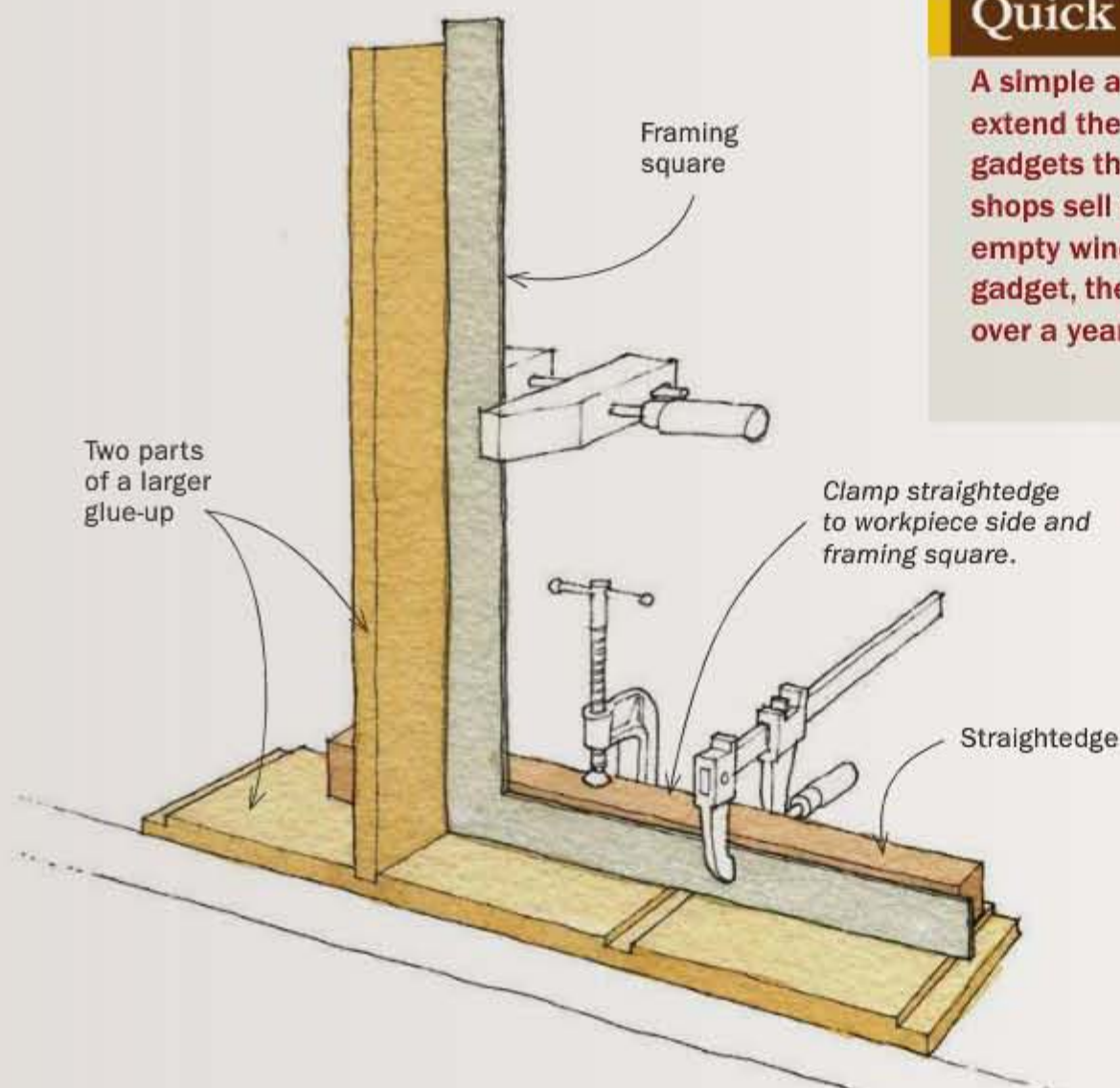
Glue up in stages for a square case

Gluing up a case piece of any kind can be a workout. You're racing to get glue applied to all of the joinery, to get the assembly under clamps, and then to check and adjust for square before the glue sets.

For glue-ups like this, I've found it helps a great deal if two of the pieces are already set and firm at right angles. It's easier to get a single joint glued up squarely, using a framing square as shown, and afterward, this sub-assembly can act as a square reference for the rest of the piece. This makes the larger glue-up much more manageable.

The technique will work with most types of joinery, including dados, biscuits, and many others.

—KURT MEYERS, Flagstaff, Ariz.



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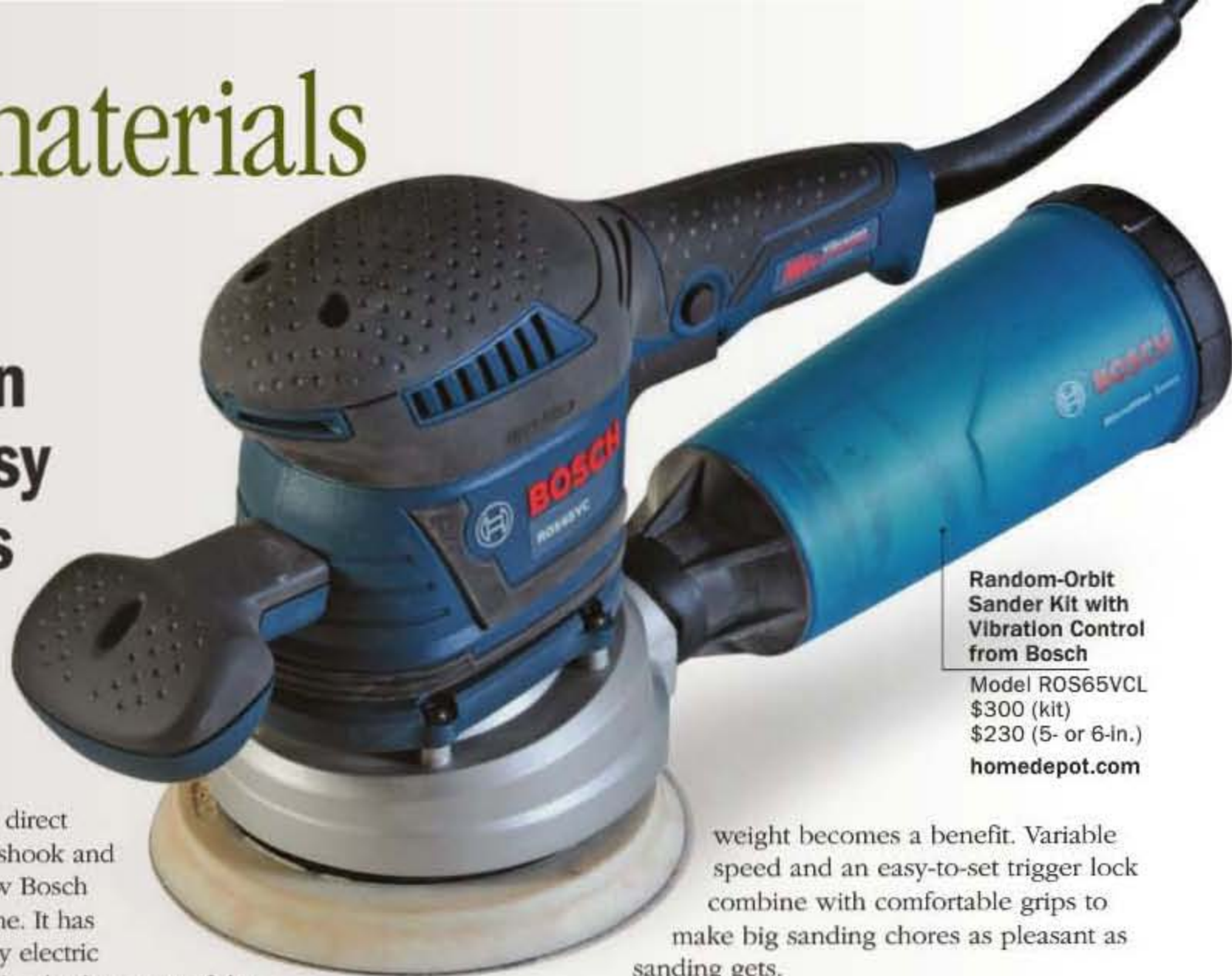
tools & materials

■ POWER TOOLS

Low-vibration sander is easy on the hands

THIS PAST NOVEMBER I HAD CARPAL-TUNNEL SURGERY on my left hand, after having the right one done several years ago. Doctors said my problems were a direct result of 36 years using tools that shook and vibrated. I wish I'd owned the new Bosch low-vibration sander all of that time. It has significantly less vibration than any electric sander I've used, taking much of the drudgery out of the job while maintaining peak performance.

The sander is heavy, coming in at a touch more than 6 lb. with the dust canister installed. That weight makes the tool awkward to use with one hand, but a removable handle on the front makes it a comfortable two-hand sander. It's great for sanding panels, tabletops, or any large surface where the added



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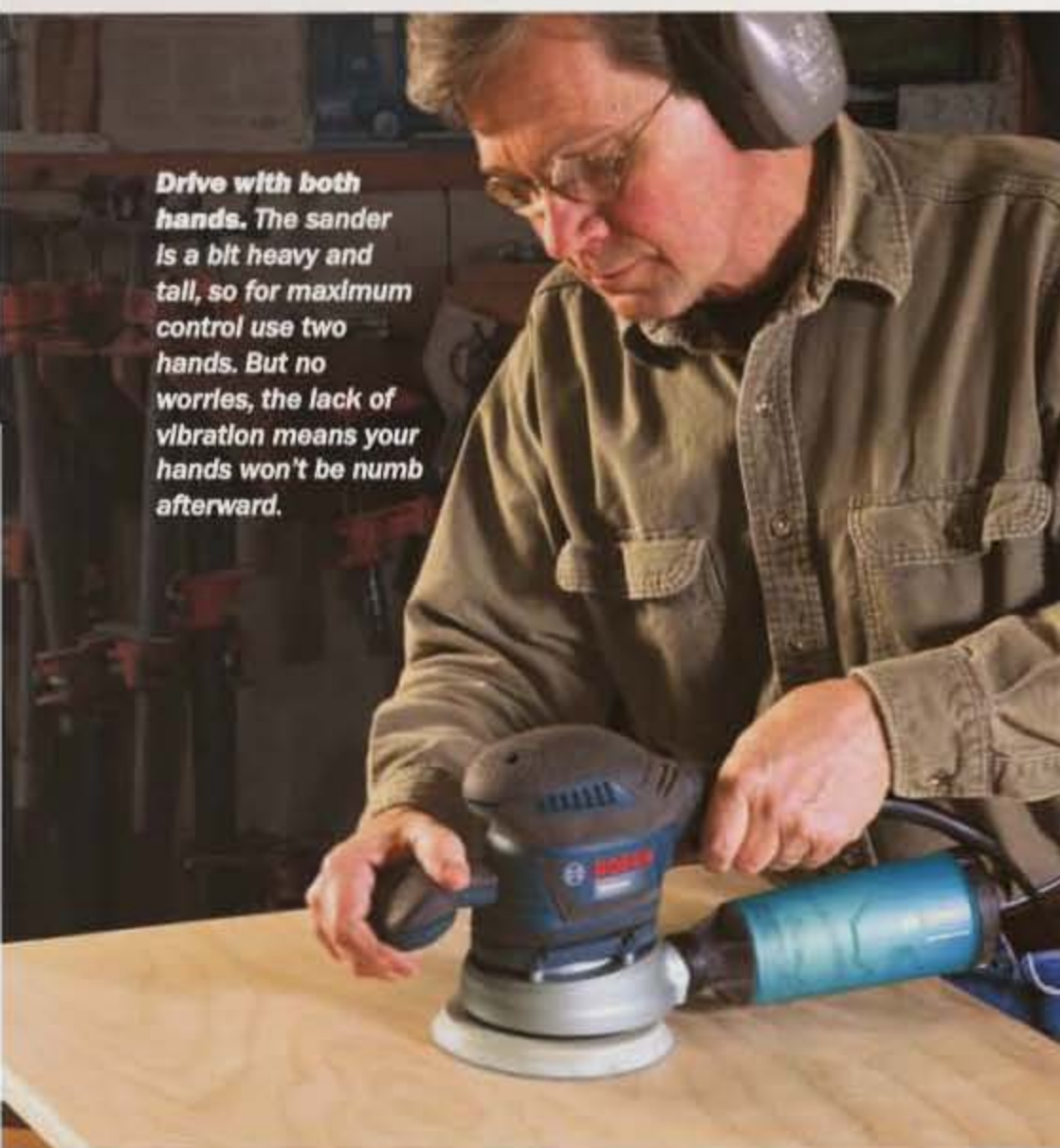
weight becomes a benefit. Variable speed and an easy-to-set trigger lock combine with comfortable grips to make big sanding chores as pleasant as sanding gets.

The sander is exemplary at containing dust. In fact, the built-in system proved as effective as having the sander hooked up to a shop vacuum. I ran the same test with this sander that we used in our *Tools & Shops* survey in 2009 (*FWW* #202), and the results were a 91% collection rate with the onboard system and a 92% rate with the vacuum attached ... impressive. The machine is reasonably quiet, too. At ear level I measured 91 decibels using P100-grit paper on a cherry board clamped tight to my workbench top. All in all, this sander is comparable in performance to the Best Overall in *FWW* #202 (Festool ETS 150/3 EQ).

You can buy the Bosch sander with either a 5- or 6-in. pad, or in a kit that has both sizes. If you're buying one, I'd recommend the larger pad (shown here) because it feels better balanced.

—Roland Johnson is a contributing editor.

Drive with both hands. The sander is a bit heavy and tall, so for maximum control use two hands. But no worries, the lack of vibration means your hands won't be numb afterward.



Dust eater. The Bosch sander has a filtered dust canister that works as well at collecting dust as a vacuum.

■ HAND TOOLS

New approach to handsaws

IN RECENT YEARS, SEVERAL SMALL COMPANIES have introduced high-end gent's or dovetail saws with designs gleaned from antique examples. That quality is also reflected in their price, with some costing as much as \$250. But by defying tradition, Veritas has managed to produce a pair of high-quality gent's saws at the very reasonable price of \$49 each.

The saws, produced as both a rip and a crosscut, have 20 and 22 tpi, respectively. They're small (8-in. blade, 13½ in. overall) and easy to control for delicate cuts.

The crosscut version is effective as a general cut-off saw for small parts. It cuts a clean, thin kerf and "drives" nicely, keeping to the line and leaving minimal tearout. I was equally impressed with the rip saw. Before putting the saw to wood, I followed Lee Valley's advice and lightly stoned the teeth on both sides to reduce the set slightly. Once tuned, it is a great dovetail saw. It's easy to control and cuts a clean, thin kerf.

This effort by Lee Valley is worth applauding: Great tools at a great price.

—Mario Rodríguez runs the Philadelphia Furniture Workshop, a woodworking school.

Gent's Saws
from Veritas

\$49 each
(\$89 for the pair)
leevalley.com



Low-cost saws are high on quality. In designing its new gent's saws, Veritas abandoned the traditional brass back for a polymer composite spine that is just as rigid and strong. The thin blades leave a clean, narrow kerf, making the saws ideal for cutting fine joinery.

■ ACCESSORIES

Best doweling jigs for the money

IF YOU'VE SEEN MY LATEST VIDEO PROJECT ("Getting Started in Woodworking, Season 3," free at StartWoodworking.com) or my recent article on doweling (Fundamentals, *FWW* #222), you know I'm a fan of the little \$14 doweling jig from Rockler. My only complaint was that it came in just one size: ¾ in.

Rockler fixed that by offering the same jig in ¼-in. and ½-in. sizes, meaning you can build a much wider range of furniture and furniture parts, from thin frames and boxes to big leg-to-apron joints. The ¼-in. jig will center a dowel in ½-in.-thick pieces, the ¾-in. model works perfectly in ¾-in. stock, and the ½-in. jig is designed for 1-in.-thick workpieces. Of course, as I demonstrated in the



Doweling Jigs from Rockler

\$14 each
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videos, you can easily add a shim to change that distance, offsetting a leg and apron, for example.

I love the simplicity of these jigs. You can either use the lines on the jig to align it with layout marks, as when lining up dowels for a panel glue-up, or line up the edge of the jig with the end of your stock. The jig only does two holes at once, but for a row of dowels you just drop a dowel into the last hole you drilled, which spaces the next one perfectly. These jigs are very solid and accurate, and you could build a houseful of furniture with just a couple of them and a cordless drill. I can't think of a cheaper, easier method.

—Asa Christiana is editor of *FWW*.

■ MACHINES

High-end hybrid saw

THE NEW HYBRID TABLESAW FROM SHOP FOX is an impressive saw for the money, with features rivaling those on some high-end cabinet saws.

The fence, for instance, is well designed. It has slick nylon faces, slides very easily, and locks down securely. The cast-iron top and wings are nicely ground and very flat. The extension table is a flat laminate-covered board that could easily support an undermounted router. Both blade height and angle adjustments are very smooth and easy. The riving knife and blade guard are both easy to remove and adjust. The dust collection works well.

Though the 2-hp motor won't keep pace with a 3-hp cabinet saw, it has plenty of power for most home shops. I was able to rip 5/4 hickory and cut 3/4-in.-wide by 3/4-in.-deep dados in spruce, though at a slow pace. The saw isn't without flaws. It had a bit more arbor runout than I'd like; fortunately, performance wasn't compromised. The included miter gauge is flimsy (just buy a better one), and it has a short power cord

(6 ft.). The insert plate, though stiff, is thin, making it difficult to make your own zero-clearance plates. However, you can buy blanks to fit this saw (grizzly.com, model No. T23279, \$25). But these shortcomings are small potatoes. If you're a hobbyist in the market for a serious tablesaw, this one packs in the value.

—Peter Breu, a woodworker in Manchester, N.H., is the unofficial tool reviewer for the Guild of New Hampshire Woodworkers.



Hybrid Tablesaw from Shop Fox

Model No. 1824

\$1,350

woodstockint.com

SPECS:

Motor: 2 hp, 8 amps at 220v (can be rewired for 110v)

Arbor runout: 0.002 in.

Table size: 27 in. deep by 55 in. wide

Table flatness: center and left extension were flat; right extension had a 0.016-in. warp.

Trunnion: cast iron, mounted to the underside of the table

Rip capacity: 30 in. to the right of the blade

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handwork

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BY MICHAEL PEKOVICH

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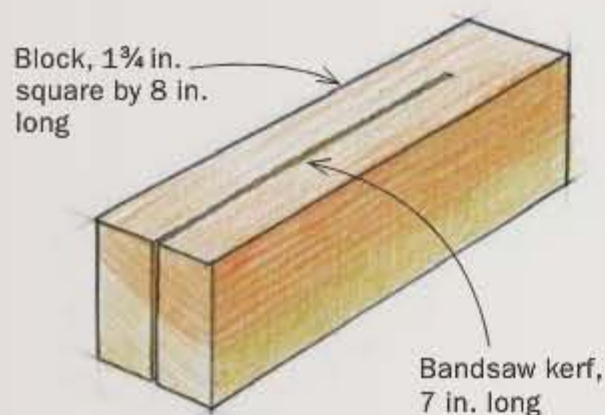
When you think of working with hand tools, the humble card scraper is probably not the first tool to come to mind.

But what it lacks in sex appeal it makes up for in ease of setup and use with no risk of tearout. Whether or not you use a handplane, the scraper is still a must-have for dealing with any tearout from the planer or jointer and for tricky grain that a handplane can't handle.

What transforms this piece of steel into a tool is the hook on its edge, often mistakenly referred to as a "burr." Creating the hook is the key to good performance. But a few common missteps

THE LITTLE BLOCK THAT DOES IT ALL

The invention of chairmaker Brian Boggs, this simple block makes it easy to file, polish, and hone the scraper for great results.



when burnishing the hook prevent most woodworkers from getting the best out of their scrapers. I'll show you the best way.

A great hook starts with a polished edge

Just like a plane blade and chisel, a scraper has a cutting edge. And just like the edges on those tools, it needs to be polished and scratch-free to work its best. So, before you burnish the scraper, you need to polish the faces and edges. I use a DMT fine/extrafine combination diamond plate (\$90, woodcraft.com), because it's more durable than waterstones and the polish it provides is good enough for a scraper. A less-expensive alternative is wet-or-dry sandpaper on glass. Start with 320 grit and work up through 600 grit.

A simple wood block helps with this task (and it comes in handy when you're burnishing, too). A bandsawn kerf runs most of its length and holds the scraper square for filing, polishing, and honing. For

Hone the surfaces first

You won't get a clean, sharp hook unless you start with perfectly flat, smooth, 90° angles on all four corners.



Polish the faces. Apply pressure with the honing block. Hold the scraper with your other hand (left). Force is distributed over the length of the scraper, polishing the edge evenly and completely (right).



File the edges. Put the scraper in the kerf (left). That makes it easier to clamp in a vise and because the edge barely sticks above the block, it's impossible to file it out of square to the faces (right). Take long, smooth strokes with a single-cut mill file to expose fresh steel.

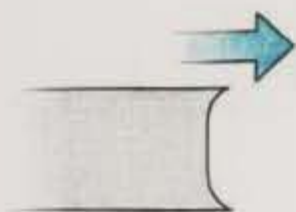


Polish the edges. The block supports the scraper and keeps it square to the diamond stone. Last, re-hone the faces to remove the slight burr there.

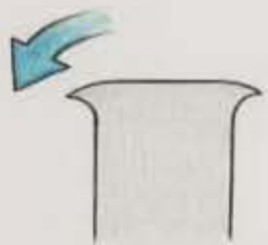


Turn the hook in two steps

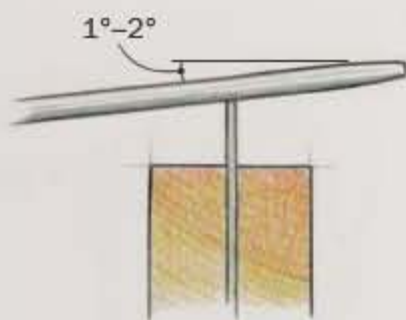
A light touch is better than a heavy hand. You don't want a big hook with a heavy angle—that makes the scraper harder to use.



1. Draw the edge. Keep the burnisher flat, so that the edge extends straight out from the scraper, making it easier to turn it into a hook. Take two light passes on each edge.



2. Turn the hook. The goal is a small hook with a shallow angle. So, keep the burnisher nearly perpendicular and take a couple of passes using moderate pressure.



now, we'll just lay the block on top of the scraper to polish the faces. This distributes the pressure evenly along the flexible scraper and ensures a nice polish along the entire edge. Using your fingers would leave shiny spots where your fingers were.

After the faces are scratch-free and polished, move on to the edges. The first step is to file them square. On a scraper that's been used, this is especially important. Turning the hook multiple times causes the steel to become brittle, much like bending a paper clip back and forth until it breaks. Filing cuts through

this work-hardened edge to softer steel, which makes turning a hook easier.

It's important to maintain a 90° angle when filing, so insert the scraper into the block with the edge just barely proud of the surface (no more than 1/64 in.) and clamp it in a vise. This will force you to keep the file square as you work. As long as you're not hitting wood, you should be within a fraction of a degree of square. On a work-hardened edge, the file skips and skates across the steel. Keep filing until you take a consistent cut. You'll feel the difference once you

hit the softer steel. Also, use a single long stroke to get from end to end. Short ones can create an uneven surface.

Filing leaves a burr along the corners. It's easy to mistake this burr for the hook you'll burnish later. Although the burr could take a shaving, it would leave a rough surface and the ragged steel would break down and dull quickly. So, it's important to remove the burr and polish the edge. To do this, leave the scraper in the block and place it on the diamond plate. Use a folded paper towel as a cushion for your hand and press down on the block and scraper together as you polish the edge. The block keeps the scraper square.

At this point, there probably is a slight burr along the corner. To remove it, alternate between polishing the face and edge on the extrafine diamond plate. The result should be a smooth, sharp corner, the foundation for a great-performing scraper. This sharp edge yields a single continuous hook—one that leaves a smooth surface and lasts a long time.

Keep the pressure and angle low

Burnishing properly is easy, but doing it wrong is easy, too. It's at this stage where common mistakes are made that limit the performance of the tool. The first mistake is using too much pressure. During demonstrations, people are always amazed at how little pressure I use when turning the hook. The area of contact between the burnisher and scraper edge is so small that just a little pressure equals a lot of psi. Using too much pressure creates an unnecessarily large hook, which is difficult to re-hone when dull. It can also crimp the steel, which ruins the edge and requires re-filing. To get an idea of the pressure necessary, extend your index fingers and run one along the other. Use moderate pressure, but not enough to deflect your finger, and you've got it.

Creating the hook involves first drawing the steel with a burnisher to create a razor-thin edge that extends out from the scraper, and then turning over that edge to create the hook.

To draw the steel, lay the scraper flat on the bench and rest the burnisher

Two ways to use it

Honing at a low angle allows you to remove stock quickly or tilt forward for a smooth finish.



For an aggressive cut, keep the scraper nearly vertical and don't flex it. Bending it just reduces how much of the hook engages the wood (right). Keeping your thumbs apart spreads the pressure over the entire edge and makes for a better shaving (above).



flat on the scraper. As you push the burnisher along the edge, keep it flat, but apply pressure to the edge. Also, angle the burnisher so that the tip is forward of the handle. Two light passes will yield a very slight hook along the edge.

Now it's finally time to turn the hook and here's where mistake number two comes in: using too much angle. The angle you burnish at is important because it determines how much you need to tilt the scraper forward before it starts cutting. If you burnish at 10°, you'll need to tilt it that far in use. If you burnish at 1° or 2°, it will dramatically alter the performance of the tool, allowing you to scrape at an almost vertical angle. With the scraper in this position your thumbs—the driving force—are behind the cutting edge. You can get your mass behind the tool and push for a really aggressive cut. On the other hand, scraping with more forward tilt puts your thumbs ahead of the cutting edge and the scraper wants to pivot back and out of the cut. More downward pressure and flexing is necessary to keep it engaged. You are pulling the tool through the cut instead of pushing it.

The great thing about honing at a shallow angle is that while you can take a really aggressive cut, you can also tilt the scraper farther forward when you



Go low for light shavings. The hook is less engaged and there's less force on it. Save this technique for final smoothing.

want a light, smoothing cut. Hone at a shallow angle and get two tools in one.

To turn the hook, place the scraper back in the block with $\frac{1}{8}$ in. protruding. Rest the burnisher flat on the edge and angle it just enough to be sure that you are in contact with the corner you are honing. You shouldn't come close to contacting the block. Again, angle the burnisher front to back so that you draw the steel out as you move forward. Two swipes on each corner are all you need. The resulting hook is small and can just be felt by running your finger up

TIP

DUST MEANS DULL



When the shavings stop coming, you can just repeat the drawing and turning steps for a fresh hook. But after you've done that a few times, you'll need to file the edge again.

from the edge. When I pass a burnished scraper around to an audience, I'm invariably met with "wow, that's all?" They're equally surprised when I take a big old shaving with it.

When the edge dulls, just draw the edge back up and turn the hook again. It lasts longer the second and third time you turn it, because the steel gets progressively harder. But eventually the steel becomes brittle and it's necessary to file off the edge and start again. □

Michael Pekovich is FWW's art director.

Make your cutlist a 'parts list' instead

LUMBER-BUYING STRATEGY WILL GIVE YOUR PROJECT A SMARTER START

BY ASA CHRISTIANA

Imagine for a moment that you had the run of a furniture factory: all the tools you needed at your disposal and a bottomless stack of roughsawn cherry, maple, and walnut to pick from.

It's a nice daydream, isn't it? Not exactly.

On a rushed assembly line, the worker doesn't get to choose boards individually or map out furniture parts for the best appearance of the grain. You, on the other hand, have a huge advantage: the time to choose just the right lumber—just like the time you'll spend making sure every joint comes together strong and true.

Choosing lumber is a process, maybe the most important one of all. Here's how to do it so you come home with the right boards to make your project come alive.

Start with a drawing

If you are not working from a detailed, dimensioned drawing like one of the exploded illustrations in *FWW*,

take the time to make one. It will help clarify your ideas about how the piece will go together and how it will look—the joinery you will use, the lumber species and thicknesses you need, the correct grain patterns for each part, and so forth.

Done thoroughly, the drawing is the most direct way to fully document your project, to literally have a clear picture of every part that goes into it. And you'll need that knowledge when you head to the lumberyard.

Make a woodworker's shopping list

Every new woodworker eventually hears about the advantages of buying lumber from a "cutlist," an organized inventory of all the wood needed to complete a project.

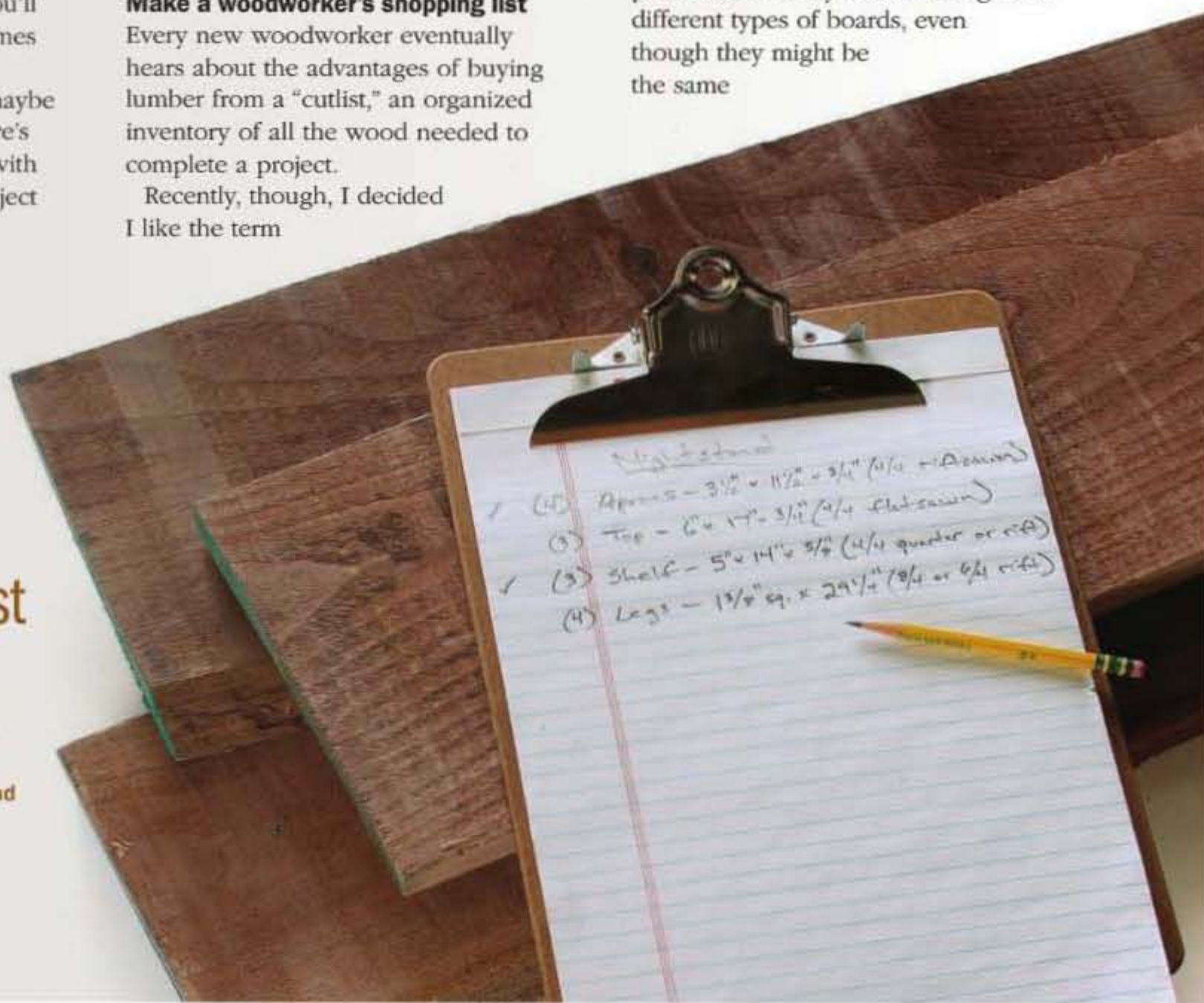
Recently, though, I decided I like the term

"parts list," much better than "cutlist." Where a cutlist might encourage you to think in simple terms of sizes and saw cuts, a "parts list" tells you to think of the components as distinct parts, each having a different role in the finished piece and in many cases coming from different types of boards, even though they might be the same



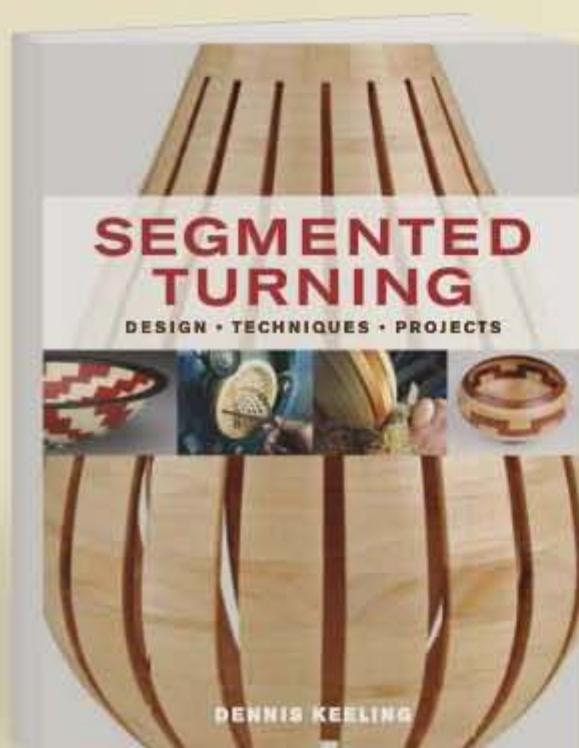
A smart buyer makes a smart list

The most basic parts list includes the type and number of each part, along with dimensions. Make your list more helpful by including notes about the type of grain you want in each part and the rough thickness.



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"Segmenters are only limited by their imagination, and when they get together to compare ideas, the atmosphere is electric," writes Dennis Keeling, award-winning turner, in *Segmented Turning*.

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Segmented Turning will capture the imagination of all woodworkers and with ten complete projects, it will inspire you to create your own original designs.

Segmented Turning

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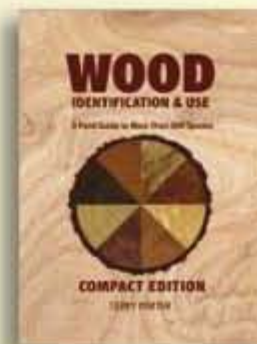
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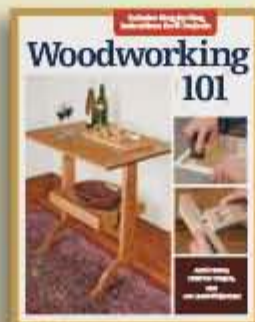
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At the lumberyard

Step one—bring the list.

Attach it to a clipboard (right) or leave it in the tablet so it's easier to make notes as you work. Also bring a tape measure, a block plane, and a lumber crayon (and a friend?). Lumberyards stack boards of each species by thickness, so it makes sense to choose all of your 4/4 boards at the same time, for instance. Sort by eye at first, looking for the grain and width you want. Use the tape measure to gauge the amount of clear stock between defects.



species. Regardless of what you decide to call your list, compile it this way: Spread the drawing out in front of you and refer to it as you make a list on a separate sheet. Write down the name of every part in the project—one to a line. On each line, note how many of that piece the project requires (“4 legs,” for instance), and the part’s finished thickness, width, and length, including joinery.

If you buy your lumber from a lumberyard that sells roughsawn stock, be sure to also list the thickness of the rough stock you want for each part. To get a 3/4-in. finished thickness, for example, you’ll want 4/4 roughsawn boards. For good measure, add roughly 1/2 in. to the width and an inch or two to the length of each piece.

Make note, too, of instances where you’ll want to take parts from the same board for good grain and color match. And, just to be safe, you might also want to mark down types of grain: flatsawn, riftsawn, quartersawn.

Because you’ll almost never find boards that fit your needs exactly, you’re likely to wind up with a bit more stock than you strictly need. That’s fine. You’ll want the extra for test cuts or repairs. In fact, if you think you may have cut it too close, throw in one nice extra board to be sure.

How to pull diamonds from the rough

All of this work leads to the lumberyard, where you will find those beautiful finished parts in the piles of rough lumber.

Remember: The decisions you make here are ones that you will live with for years to come. So take your parts list, and take your time. Start by spending a few minutes to make friends with your lumber guy. Explain that you are a furniture maker and need some extra time to pick through the piles.

For the two walnut end tables I made recently for our free video series, *Getting Started in Woodworking*, I needed a couple of 4/4 flatsawn boards for the tabletops, each with a very nice grain pattern, so I could cut it into three pieces, match the grain



Mark out parts. Once you’re home, it’s easy to get mixed up about which boards you intended for which part. To keep things straight, it can help to mark the parts directly on the stock with a lumber crayon before you leave the lumberyard.

One table from three boards

For this table, Christiana used a single board for each of the three major components, greatly enhancing the consistency of color and grain in each finished piece.

1. TOP AND SHELF

Christiana selected a single, 4/4 board. He chose flatsawn stock for its attractive cathedral grain pattern and found a board long enough to yield three equal segments of clear stock for the top and three for the shelf.

Continuous grain wraps around the apron.

Boards are edge-glued to make up top's width.

2. APRON

Still searching through the 4/4 stack, Christiana found a riftsawn board with straight grain lines for the apron.

3. LEGS

To get the straight grain lines in the legs, too, Christiana searched the stack of 8/4 stock for a riftsawn board with enough length and width to yield all four legs.

at the edges, and turn it into a beautiful panel.

I also needed some more 4/4 stock for the aprons and the shelves, nothing really special but still clear and close to final size. As I added boards to my take-home stack, I kept track by making a check mark next to the corresponding parts on my list. Then I headed over to the 8/4 walnut for the legs. Here I didn't want flatsawn grain anymore; I wanted riftsawn stock. That's where the growth rings are diagonal on the end grain, so you get relatively straight grain on all four faces of the leg. I found a nice clear, narrow piece with very straight grain,

one that I could take all of the legs from, going two across all the way down the board with very little waste.

Following this process, it's easy to make sure that you come home with the right boards for your project, and that you bring home enough material without buying too much.

You'll drive home worrying only about potholes and sharp curves, instead of your project. □

Asa Christiana is editor of Fine Woodworking.

TIP

Table legs work best visually when the grain runs straight up and down their length on all sides. So look for diagonal end grain, which signifies riftsawn stock.

Online Extra

For a step-by-step video series on this table project, go to FineWoodworking.com/extras.

TOOL TEST

Got Rust?

New protectants thrashed old favorites
in our tests

BY THOMAS McKENNA



If you live in a humid area of the country, you are more than likely familiar with the menacing presence of rust, especially if you work in an unheated basement or garage shop. Left untreated, rust will eat away iron and steel relentlessly, like a hoard of hungry termites on dead wood, causing extensive damage. To help protect your expensive woodworking tools, you need to take steps to prevent rust. One way is to coat iron and steel surfaces with a rust inhibitor. But which one?

Look on any woodworking forum or website, and you'll see a lot of "expert" recommendations about which products to use. To end the debate, *Fine Woodworking* put 20 of these commonly available preventers—from waxes to natural oils to petroleum-based products—through a torture test to see which ones really do work best.

The test results aren't the only answer to stopping rust. In the end we'll give you some sound strategies for fighting rust in your shop. Before you can go to battle, however, it's important to understand how rust forms.

Water is the instigator

Put simply, rust (iron oxide) is a form of corrosion that occurs when both iron and oxygen are exposed to moisture, whether in the air or on the surface. That moisture is the medium through which the players that chemically cause corro-

sion travel. Rust formation can be accelerated with the addition of a stronger oxide or acid—the salt in sea air, for instance, or the moisture from your fingertips (ever see prints on your hand tools?). The process also speeds up with temperature variations that cause condensation. In an unheated garage shop, as a cold night turns to a warm day, condensation settles on the tops of tablesaws, jointers, and bandsaws, as well as on hand tools left on a bench.

The corrosion starts on the surface and spreads like a rash. As corroded metal flakes away, fresh iron surfaces are exposed to the oxygen and water, and the process begins anew until the metal disintegrates. The key to stopping the degradation is to prevent water from mixing with iron and oxygen. And that's what these various coatings are meant to do.

10 days of hell

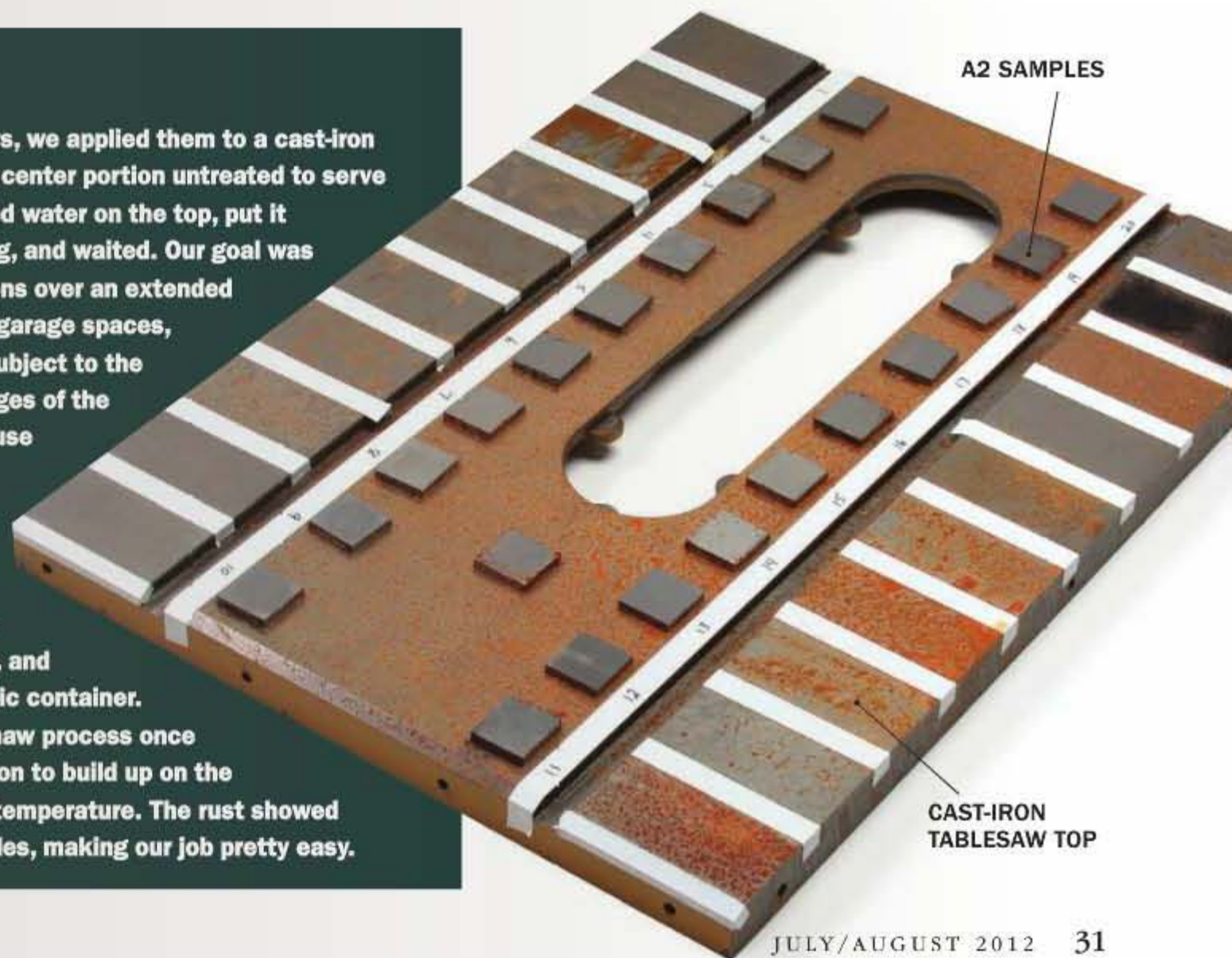
We tried the rust preventers on a cast-iron table-saw top and some samples of A2 tool steel (an iron alloy). All of the samples were subjected to extreme environments (see "A recipe for rust," below). The rust came on strong. We started seeing it on the table-saw top after only one night, and on the tool steel within 48 hours. After 10 days, it was clear which products were working and which were failing.

The top seven performers were CRC Industrial 3-36, LPS 3, Moovit, Rust Block, WD-40,

Tough test

To test the rust preventers, we applied them to a cast-iron table-saw top, leaving the center portion untreated to serve as the control. We spritzed water on the top, put it outside under an overhang, and waited. Our goal was to accelerate what happens over an extended period in some unheated garage spaces, where the top would be subject to the extreme temperature ranges of the outside air that would cause condensation.

We also applied the coatings to A2 steel samples. We placed the samples in a freezer for a few hours, removed them, and put them in a lidded plastic container. We repeated the freeze-thaw process once daily, to allow condensation to build up on the steel as it reached room temperature. The rust showed up quickly on some samples, making our job pretty easy.



Results don't lie

THE BEST OF THE BEST

We picked CRC Industrial 3-36 from the top seven performers as the Best Overall because it worked well on both cast iron and tool steel and did not leave an objectionable sticky or slick residue on the chisel. However, it does have a petroleum odor. Though the smell dissipates, some may find the spray offensive to use on hand tools. For those people, we recommend using the CRC for machines and Moovit for hand tools.



WD-40 Long-Term Corrosion Inhibitor, and 3M Rust Fighter 1. However, a rust preventer is useless if it interferes with your woodworking. So we did further tests to see if any of the top picks would discolor wood, or interfere with finishes or glue adhesion. We took the extreme path again, applying the products directly to wood samples, letting them dry, and then applying both a water-based urethane and an oil-based polyurethane. We also put a dab of yellow glue on the treated boards to see if the products affected adhesion. All of the products discolored wood when applied directly to it, but none of them interfered with the topcoats. The only product that resisted glue adhesion was LPS 3. On that sample the glue popped off pretty easily with a chisel.

Next, for a more realistic contamination test, we applied the top six products to A2 steel samples, rubbed them across some sample boards, and applied the oil- and water-based finishes on top of the boards. None of the samples showed



FAMILIAR PRODUCTS FADED FAST

Waxes and natural oil-based products have often been touted as rust preventers on machines and hand tools. But they didn't fare well in our testing.



WAXES WANED

Waxes work well as lubricants, especially on the bottoms of planes and on machine tops, but they don't offer much protection against rust.

OILS SLIPPED UP

Camellia and Jojoba oils are natural products (made from vegetable oil), so they have a pleasant odor. That quality is partially why they are used often by hand-tool aficionados as a protectant. But in our tests, the products were marginal performers.



CRC INDUSTRIAL 3-36

\$6 (11 oz.)
amazon.com



JOJOBA OIL

\$10 (8 oz.)
lie-nielsen.com



LPS 3

\$15 (11 oz.)
jdindustrialsupply.com



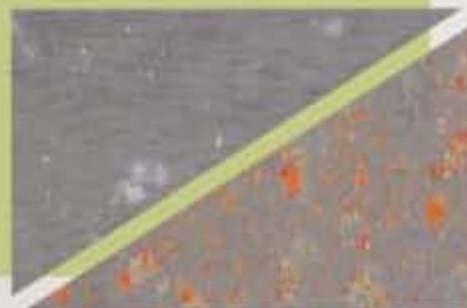
MOOVIT

\$10 (10 oz.)
leevalley.com



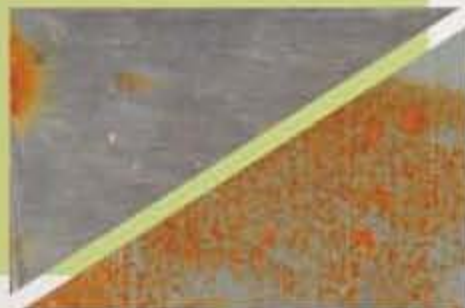
RUST BLOCK BY EVAPO-RUST

\$9 (16 oz.)
gemplers.com



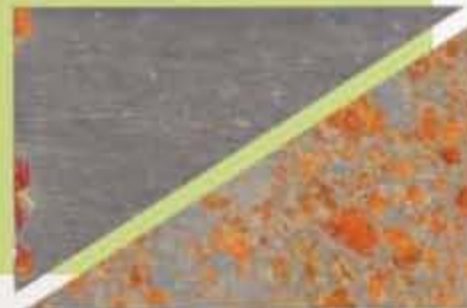
RUSTERIZER ARMOR

\$16 (32 oz.)
amazon.com



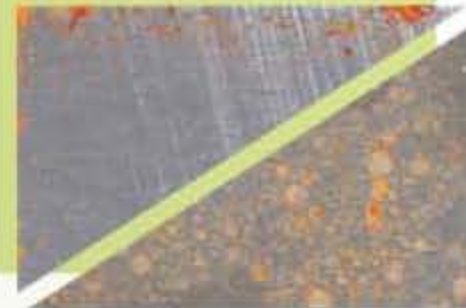
RUST-OLEUM STOPS RUST RUST INHIBITOR

\$11 (10.25 oz.)
amazon.com



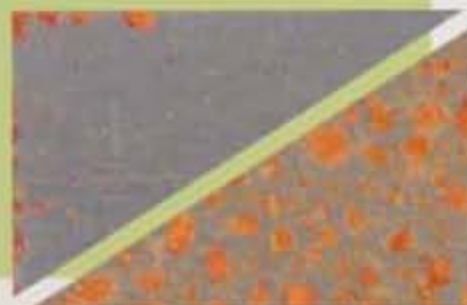
SC JOHNSON PASTE WAX

\$7 (16 oz.)
The Home Depot



WAXILIT

\$16 (7 oz.)
leevalley.com



WD-40

\$5.50
Most hardware stores



WD-40 LONG-TERM CORROSION INHIBITOR

\$16 (6.5 oz.)
amazon.com



3M RUST FIGHTER-1

\$17 (18 oz.)
amazon.com



any discoloration of the wood, and there were no problems with finish adhesion.

Last, to find out if any products left an objectionable residue on hand tools, we applied them to some chisels and then basically felt them, comparing an untreated chisel with the treated ones. The CRC Industrial 3-36 and Moovit were the favorites here. Each of these products were very close in feel to the untreated chisel.

We also applied the products to a jointer table and gave them a feel for any objectionable residue. Most of the products left a slick surface on the cast iron, a plus for machine tables. The only two that left a visible and tactile residue were 3M Rust Fighter 1 and LPS 3.

The best defense

Making a choice among the products was tough. 3M Rust Fighter 1 and LPS 3 performed perfectly in both torture tests, but we didn't like the sticky feel of the coating that both left on the tool steel and cast iron. Other products did well on one steel but showed kinks in the other. In the end we picked CRC Industrial 3-36 as Best Overall. If you prefer a non-petroleum product for your hand tools, we recommend Moovit.

But the best defense against rust has multiple prongs. Aside from weatherproofing and heating the shop, we also recommend using a dehumidifier to help control moisture. And because none of the products we tested can be applied to the inside of power tools (rust can degrade motor components), we recommend keeping desiccants or corrosion inhibitors in tool cases (above right). □

Thomas McKenna, senior editor, fights rust daily in his basement shop.



Solutions for enclosed spaces. Volatile corrosion inhibitors (VCIs) and desiccants help prevent rust in drawers, tool cases, and cabinets. VCIs form a protective coating on tools while desiccants draw moisture from the air.



VCIs

DESSICANTS



Dry the air. You also can curb moisture with a dehumidifier—just remember to empty it regularly. For basement shops, a masonry waterproofing paint keeps moisture from migrating through the porous concrete walls. Garage floors should be sealed as well.

Other ways to manage moisture

The wipe-on or spray products we tested aren't the only weapons available in the battle against rust. Aside from heating the shop or using a dehumidifier, two other options are desiccants and volatile corrosion inhibitors (VCIs). These products prevent corrosion of critical components in contained spaces, such as boxes, drawers, and cabinets. Each does the job differently.

Desiccants are made from a number of porous minerals, including calcium and silica, as well as manmade

compounds. They help prevent rust by removing moisture from the air via the process of *adsorption* (vs. absorption). When a substance is adsorbed, it remains separate from its host, which essentially works as a storage drum. And that storage area is limited. A desiccant compound can become saturated, or full. Some desiccants, such as silica and a few calcium-

based products, can be recharged, or reactivated, with heat to remove the stored moisture and used again.

VCIs emit molecules that settle on metal surfaces, forming a protective layer that repels moisture. VCIs are made by a number of manufacturers from proprietary chemicals and often are infused into a porous carrier material, such as foam. They are disposable and cannot be recharged—some last six months, others work for up to five years.

Desiccants and VCIs both are designed to work in enclosed spaces, and you purchase them based on the square footage of that space. To get the most protection from both products, the storage space needs to be as airtight as possible. If a drawer is left open, the protective tool coating emitted by a VCI will dissipate, while a desiccant will become saturated quickly.

Shaker-Inspired Hall Table

BY CHRISTIAN BECKSVOORT

Arched aprons and splayed legs
add balance and grace



This long, narrow table, which I designed years ago, is a kind of chameleon. You can use it in a variety of ways and in all sorts of places: as a hall table, a display table, behind a couch, or even as a sideboard-like serving table. No matter where you put this piece, it looks good and fits in. The design is sturdy but looks light and attractive, thanks in large part to the splay of the turned and tapered legs.

Unless I'm doing an exact Shaker reproduction, I splay all table legs that are turned and tapered. Otherwise, they tend to look pigeon-toed and slightly unstable. And for a long, narrow table like this, there's more than just appearance at stake. The splayed legs make the base wider at the floor than under the top, giving it a surer stance.

For the maker, part of the beauty is that this gently splayed stance is easy to create with just a few simple, angled cuts at the tablesaw. This project is perfect for getting acquainted with angled joinery, and for working with the lathe. The angles



LIGHT AND LIVELY

Becksvoort varies his table from straight Shaker by splaying the legs. Arched aprons add to the sense of lightness.

are all small and easy to cut, and the turning won't overwhelm you. I'll show you a no-nonsense way to get a nice straight taper on those legs, a deceptively difficult turning task.

A straight approach to round legs

These legs are square at the top where they join the aprons, with the turned portion beginning 4 in. from the top. The most difficult part of the turning is cleanly cut-

ting this transition from square to round.

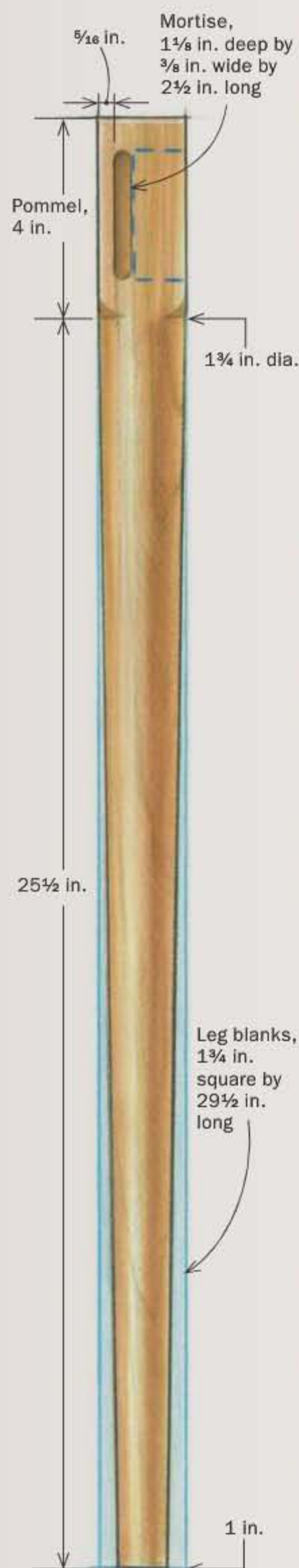
With the blank centered in the lathe and the transition point marked on the stock, set the lathe at approximately 2,200 rpm and use a $\frac{1}{2}$ -in. spindle gouge to turn away from the mark until you have a few inches of true round. Next, cut the transition using a diamond-point tool held on edge, carefully entering the cut at about a 45° angle. It takes a steady hand to make this cut without knocking off the square

corners; I suggest practicing on cheap stock until you master the technique.

Once this is done, use a roughing gouge to start cutting the taper at the bottom of the leg, checking your progress with a pair of calipers until you've reached the 1-in. bottom diameter. Then use the gouge to connect the top and bottom diameters. I'm a furniture maker, not a turner, so I don't bother trying to get a perfect taper and smooth finished surface with the gouge

TURNING FOR NON-TURNERS

You don't need to be a full-time turner to make perfect tapers. Becksvoort marks the high spots with one long block and sands them smooth and straight with another.



From square to round. After turning the first few inches of the round section with a spindle gouge, use a diamond-point tool (inset) to cut a clean bevel at the transition (above left). Lay out the beginning of the cut and then plunge in at 45°. A 45° mark on the tool rest is a good visual guide. Afterward, use a roughing gouge to rough in the taper (right).



Magic marker. To identify high spots on the turning, start by covering one edge of a hardwood block with pencil lead.



Pressed into action. Held against the spinning workpiece, the block leaves graphite on the high points. Use the spindle gouge to take down these areas, then repeat until the taper is as straight as possible.



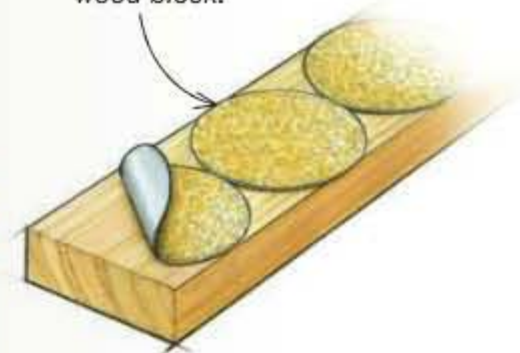
Online Extra

To see how easy this is, watch the free video at FineWoodworking.com/extras.

Super sanding block.

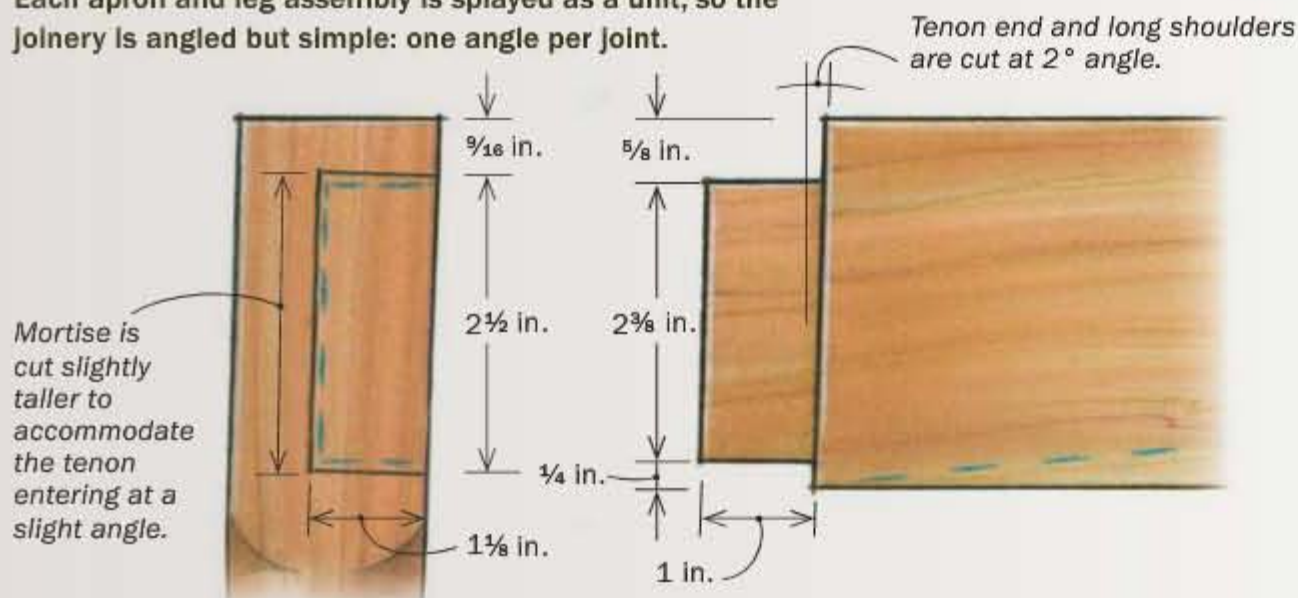
Use a straight piece of stock, one face covered with 80- to 100-grit sandpaper, to straighten the taper. Then hand-sand through 400-grit and burnish with 0000 steel wool.

Adhere the sandpaper to the wood block.



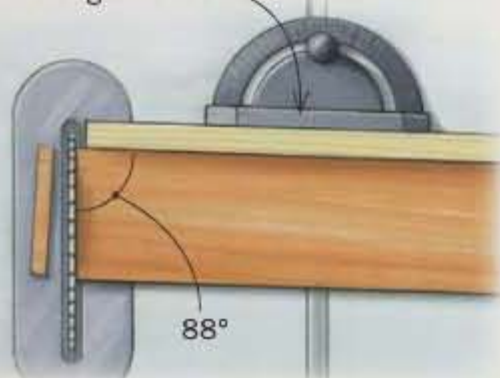
ANGLE THE SHOULDERS TO CREATE THE SPLAY

Each apron and leg assembly is splayed as a unit, so the joinery is angled but simple: one angle per joint.



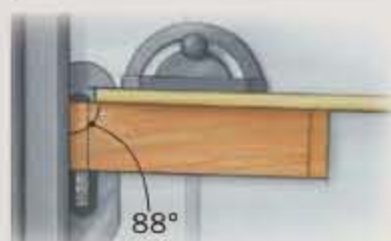
CUT THE TENON ENDS

Set the miter gauge to cut the angled ends.



Where the splay comes from. Angle the ends of the pieces, which become the reference for angling the shoulders (below).

CUT THE LONG SHOULDERS



1. Leave the gauge at 88° to cut the first shoulder and cheek. Flip the workpiece end for end to cut the second.

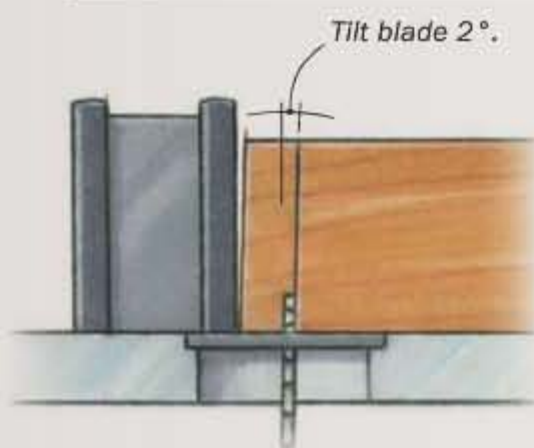


2. Set the gauge to 92° and cut the opposite shoulders and cheeks in the same way.



Why dado? A dado set cuts the cheeks and shoulders at the same time. Angle the miter gauge until the end of the workpiece rests flush against the fence.

ANGLE THE TOP AND BOTTOM SHOULDERS, TOO



Final cuts. Tilt the blade 2° to match the angle of the existing shoulder (above). You can cut two pieces at once. Then sever the waste at the bandsaw.

or a skew chisel. Instead, I get the results I'm looking for from a 2-ft.-long piece of hardwood. I color one edge with pencil graphite and hold it against the turning while it's spinning. The graphite marks the high points, which I then take down with a gouge or skew chisel. After three or four tries, the taper should be fairly straight, but not perfect.

The other side of the hardwood piece (or use a separate piece, if you prefer) is covered with 80- or 100-grit sandpaper. Holding that edge against the spinning taper assures flatness. I then hand-sand the spinning leg with 150-, 220- and 400-grit sandpaper, stopping the lathe between grits to sand with the grain. Last, I use 0000 steel wool for a smooth, glossy surface that is ready for a finish.

Before moving on to the aprons, go ahead and cut the mortises on two adjacent sides of the square sections of the legs. The mortises are cut at the usual 90°. Putting the splay in the table's legs is a matter of cutting some fairly simple angled joinery on the aprons. That's next.

Easy way to splay

The ends of the tenons, and the tenon shoulders, are cut at a 2° angle, making each apron longer at the bottom than it is at the top. When the resulting joints come together, the tops of the legs lean inward and the feet splay out. You might think you need compound-angled shoulders, but because the aprons tilt with the legs, you don't.

With the apron stock milled to final thickness and width, trim each workpiece to length with a 2° angled crosscut on the tablesaw. Pay attention to the orientation of the piece for each cut—make sure that each end is angled in the right direction.

When all the ends are cut, switch to a stacked dado set, which will let you cut the tenon cheeks and shoulders simultaneously. You'll once again guide the cuts with the angled miter gauge, this time using the tablesaw's fence to stop the cut at the tenon shoulder. Note: You'll only be able to cut one cheek and shoulder on each tenon with your initial miter-gauge setup. To cut the opposite sides at the correct angle, you'll need to reset the gauge to 2° in the other direction. I find it easier to make all of the cuts at one setting first, before resetting the gauge.

Last, I cut the top and bottom shoulders, standing the workpieces on edge against

the miter gauge and angling the blade to make the cut. I finish the work at the bandsaw, running the workpiece against the fence to sever the waste and complete the tenons. To make sure that this straight tenon has room to fit when the mortise is angled, I plan for a little top-to-bottom slop in the fit, and I use a knife to make wedge-shaped trims as needed for clearance.

Angled cuts create a flat surface

At this point, you can dry-fit the legs and aprons, holding the assembly together with a band clamp to see how the joints fit.

With the base together, you'll see that the top edges of the aprons—and the top inside corner of each leg—all tilt inward. So the next step is to make all of these surfaces flat and in the same plane to accommodate the top. To do this, disassemble the base and run the tops of the aprons over the jointer with the fence tilted 2°.

Mark the pieces carefully and make sure you orient them on the jointer so that the correct portion of the top edge (the outside corner) is removed.

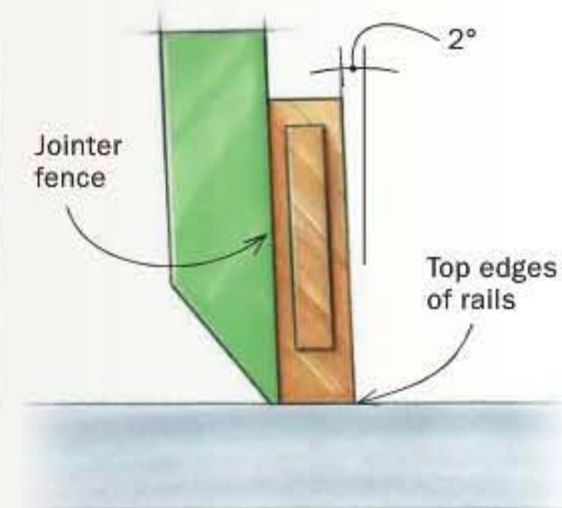
Trimming the tops of the legs at the proper angle requires a compound cut. The cut itself is easy to execute, but you'll need to pay attention to the layout and the setup on your tablesaw. To make it as foolproof as possible, I use a pencil or colored marker to darken the inside corner on the top of each leg. That corner should remain after the cut is made. Next, use a



Flatten the apron tops. With the jointer fence at a 2° angle, trim the apron tops so they'll be flush against the tabletop.

BEVEL THE TOP OF THE BASE TO MATCH

When the base is dry-fit, the top of each component will be canted inward. So it's necessary to trim the top edges level.



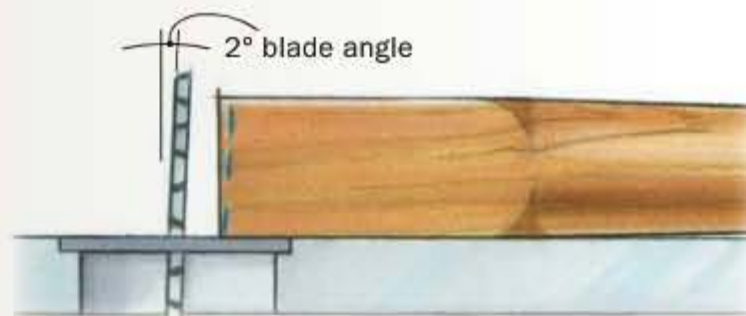
Same for the legs. To mark the top of the leg for trimming, start by marking the inside corner (red dot). Begin the layout at this corner. Use a bevel gauge set at a 2° angle to carry the lines around the corners.



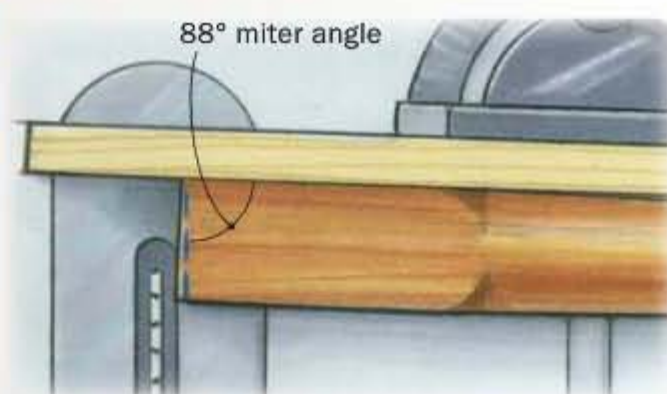
Two degrees of separation. With the highlighted corner at the bottom rear, a compound cut on the tablesaw removes a thin wedge of material.

TOPS OF LEGS GET A COMPOUND CUT

SET THE BLADE ANGLE



SET THE MITER ANGLE

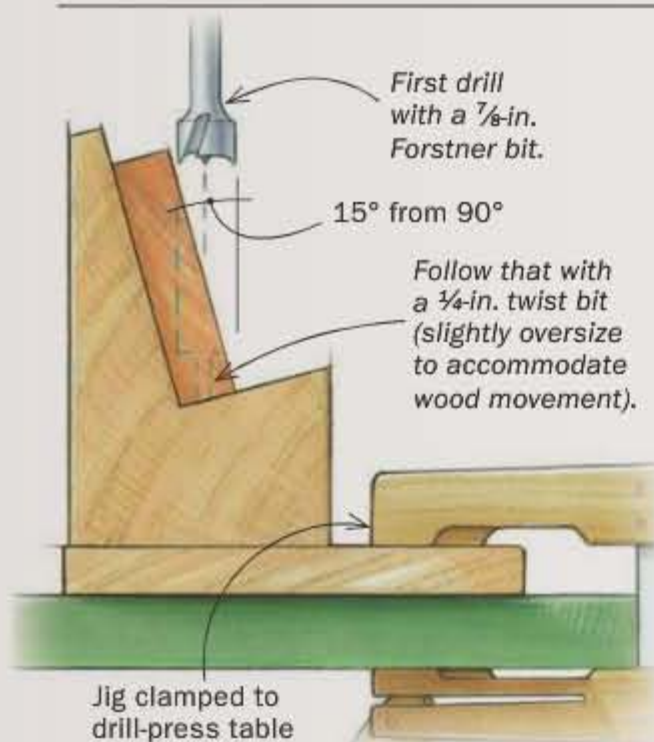


FINISH UP THE BASE

Lay out the apron arches. A flexible straightedge and a bar clamp create an easily varied, regular arc for tracing. Bandsaw the curves and sand them smooth.



DRILL POCKET HOLES IN THE APRONS



Pocket-hole jig for the drill press. A shop-built fence holds the inverted aprons at an angle to drill for the screws that will anchor the top to the base.

bevel gauge set at 2° to strike pencil lines marking the cuts on the two inside faces.

On a saw with a left-tilting blade, orient the workpiece with the marked corner riding the table at the rear of the cut. Tilt the blade 2° and angle the miter-gauge fence clockwise the same amount. Position the stock so the blade just removes the layout line on the leading edge of the workpiece.

A short length of 3/8-in. stock under the narrow end of the leg will give you greater control during the cut. You may also find it helpful to practice on a piece of 1 3/4-in.-square scrap first.

With these cuts made and the joinery fitted, the re-assembled base should now have a flat top with all eight parts flush and in the same plane. The table's feet will not sit flat on the floor at this point, but I don't flatten them until the top is attached, in case the slightest warp or stress in the top causes the base to skew.

Arches make the piece look light—Before glue-up, cut the arches into the lower edges of the aprons. To lay out the curves, I clamp a flexible straightedge between the jaws of a bar clamp, tightening until I reach the desired amount of bow.

For visual harmony, it's important to vary the amount of bow between the long side aprons and the short ends—a shallower bow will appear more pronounced on the shorter pieces. On the long aprons, I put the top of the bow at 2 3/8 in. from the top of the apron. On the ends, the apex should

PEG THE APRONS TO THE LEGS



Pin the tenons. After gluing up each joint, Becksvoort drills through the leg and through the tenon for a walnut peg (above). The pin adds interest and offers a bit more joint strength. With the side assemblies glued up, join them with the end aprons (right). Use bar clamps with rubber pads on the jaws to accommodate the angled legs.



FINISHING UP



Shape and attach the top. After cutting and smoothing a shallow arc in each end of the top, Becksvoort uses a block plane and sandpaper to shape a slight bullnose profile on all four edges. Do the end grain first (above). To attach the top, Becksvoort centers the base, then uses a scratch awl to transfer the hole locations, pre-drills the tabletop, and drives the screws (right).

be $2\frac{5}{8}$ in. from the top. Cut the arch on the bandsaw and smooth the curve with a spokeshave or sand by hand.

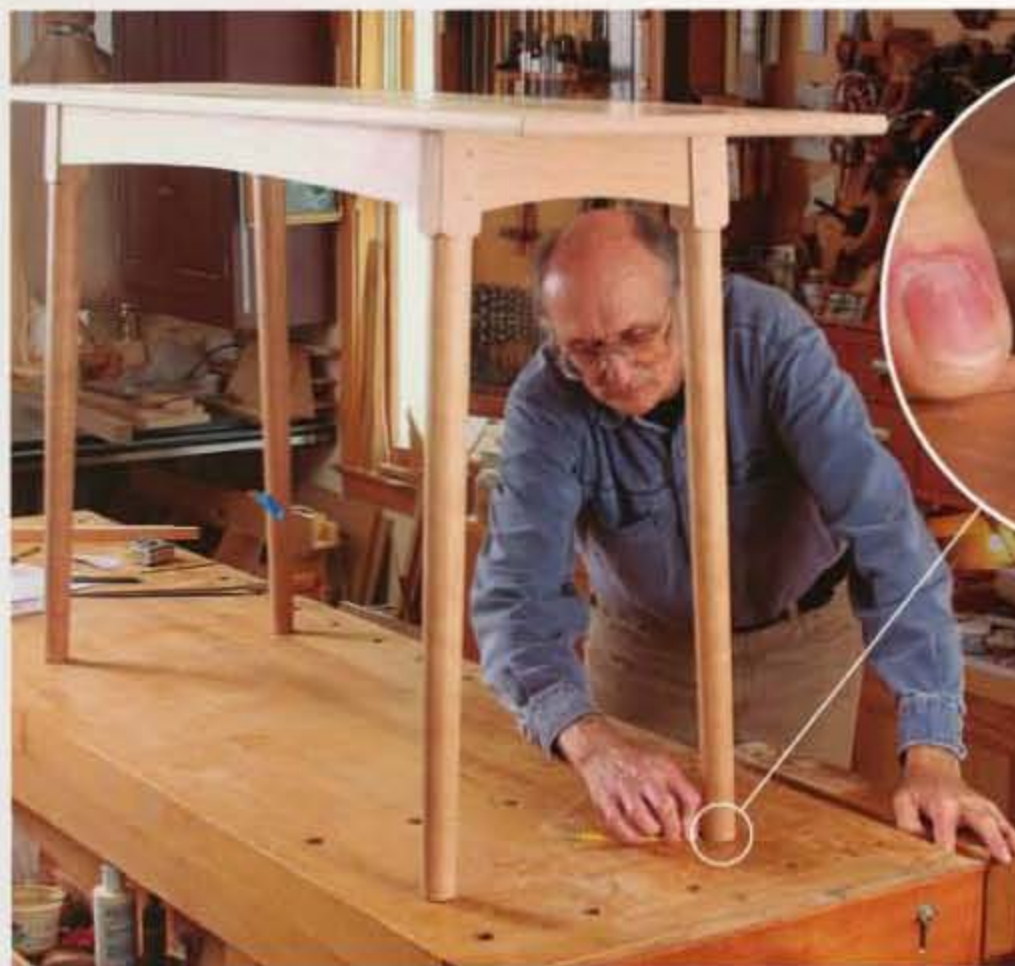
All four rails and the square portions of the legs should now be sanded to 400-grit, glued, and pinned. I usually glue up the two long sides first, pin them, and then glue in the short rails and pin them.

Subtle curves accent the top

The top of this table is 16 in. wide. Ideally a single board would look the most attractive, but stock that wide is not always available. So sometimes I use an 8-in. or 9-in. board, 9 ft. to 10 ft. long, cut in half, matched as well as possible, and glued side-to-side. After the glue is dry, I cut the top to exact width and length.

Bandsaw a convex $\frac{3}{4}$ -in. curve on the ends, again using a straightedge and clamp to lay out the curve. All four edges are then given a slight bullnose radius. This can be done either with a router or with a block plane and sandpaper. Finally, smooth the top with a handplane or by sanding to at least 400 grit and polishing with 0000 steel wool.

To attach the top, center the base upside down on the underside of the top. I anchor the two end holes with drill bits (or 16d nails) and use an awl to transfer the positions of the side holes to the underside of the top. I drill slightly oversize holes along the sides, to accommodate seasonal



Flatten the feet. Plane a pencil to flatten one side slightly and use it to mark the feet for trimming with a rasp. Afterward, chamfer the circumference with a file.

movement in the top. Now screw the base to the top.

Good trick for leveling legs

The last step before finishing is to flatten the bottoms of the legs. Turn the table right side up and set it on your tablesaw, benchtop, or another reliably flat surface.

I position a pencil flat on this surface to trace around each leg, turn the table upside down, and use a rasp and file to trim

to the lines. I rasp each foot flat, so there is no wobble, then use a file to add a small chamfer all the way around.

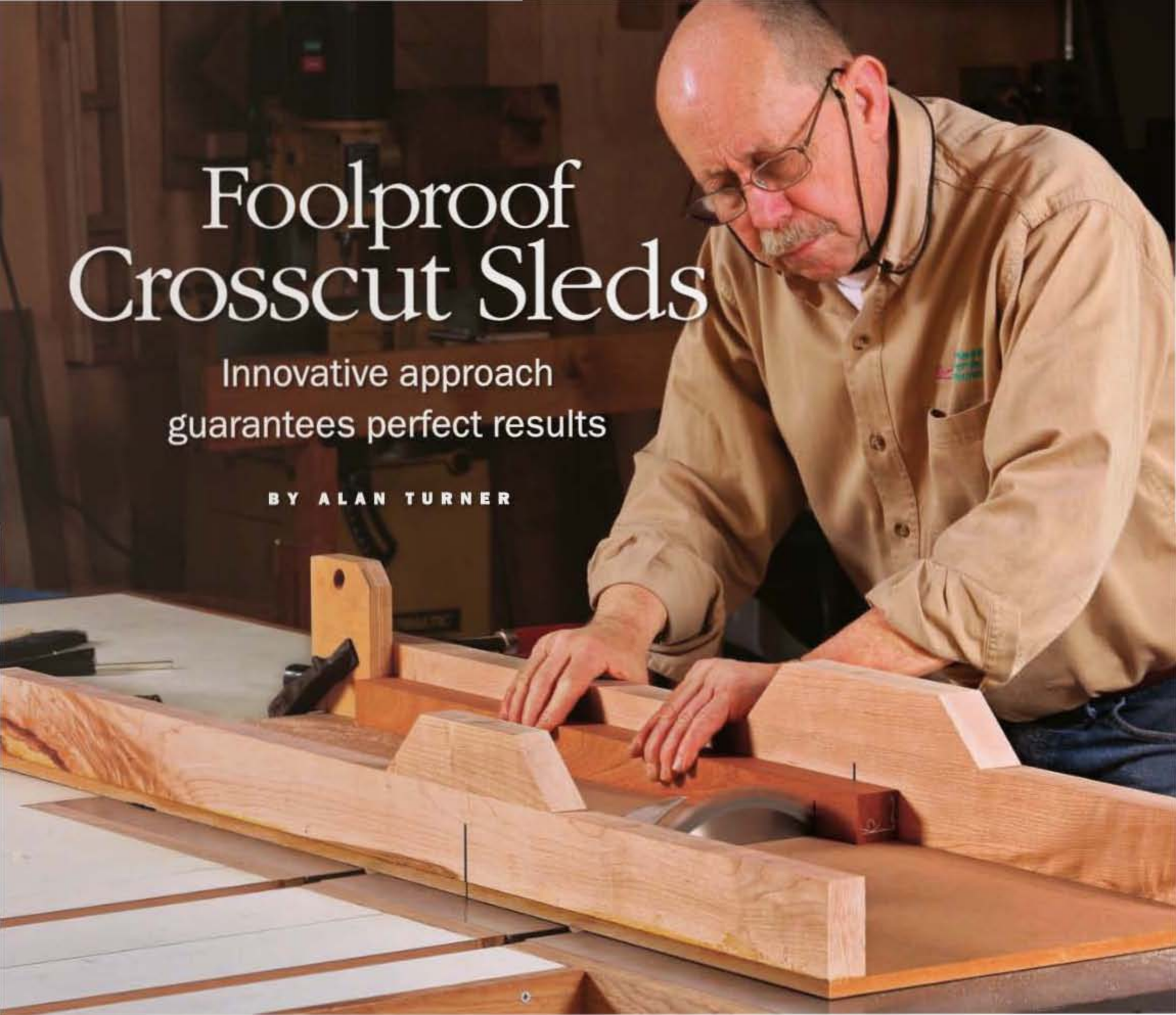
To finish the table, I remove the top and oil the table with a 50/50 mix of Tried & True Varnish Oil and spar varnish. After letting it dry for 24 hours, I rub everything down with 0000 steel wool, then add two or three more coats. □

Christian Becksvoort is a contributing editor.

Foolproof Crosscut Sleds

Innovative approach guarantees perfect results

BY ALAN TURNER



The tablesaw may be your shop's most valuable cutting tool, but for precise, repeatable crosscuts it needs a little help from a sled. The sled holds the work securely with its long edge at a precise right angle to the blade, so you get perfectly square ends when cutting pieces to length, the key to gap-free joinery. With a zero-clearance slot cut through it, the sled even prevents chipout at the edges.

The trick to building an accurate sled has always been to get the runners to fit the miter slots snugly without any wiggle room, and to attach the rear fence perfectly square to the blade—neither is easy to pull off. The technique I use at the Philadelphia Furniture Workshop simplifies both tasks and ensures dead-accurate results.

For starters, I assemble the base in two pieces, first attaching the

runners at the bench. Then, with the runner in the miter slot, I trim each individual base piece with a sawcut that creates a zero-clearance edge that is perfectly parallel to the blade.

To help ensure that the runners don't wiggle in the miter slots and yield inaccurate cuts, I lightly clamp them snug against the inside edge of the slots when gluing on the front fence.

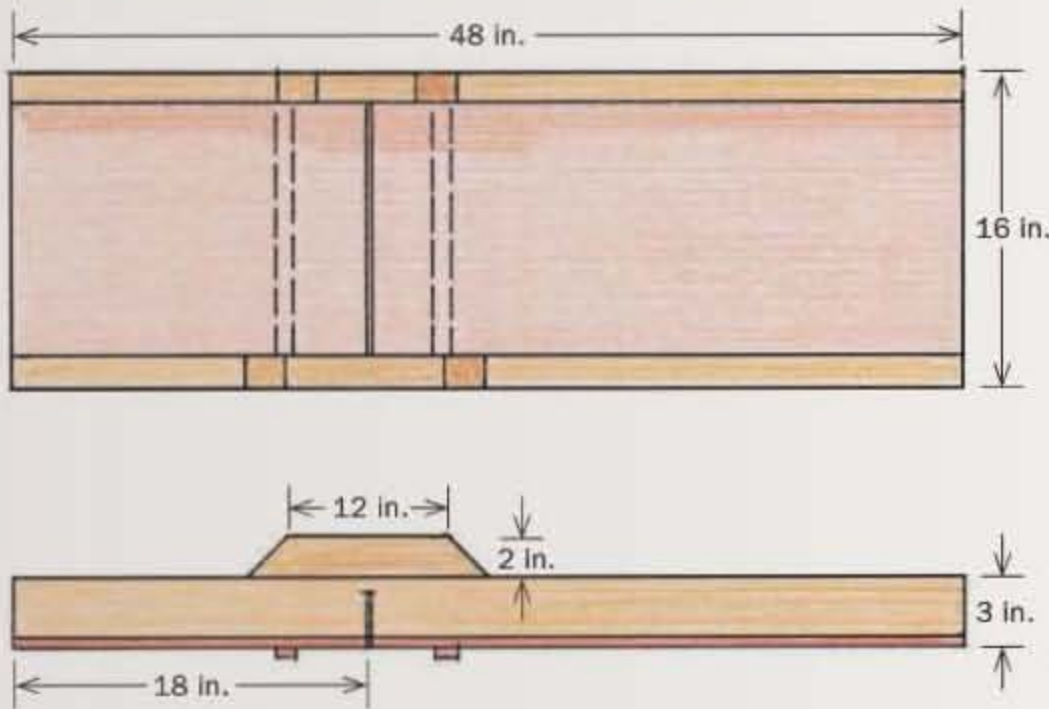
And, at the critical step of attaching the rear fence, I found a way to easily fine-tune the angle during glue-up so that it is perfectly square to the blade and stays that way. Armed with these simple techniques, you can crank out a number of sleds suited to specific tasks, instead of struggling to make just one. Instead of the typical medium-size sled, which is undersized for plywood cuts but too bulky for narrow crosscuts in solid stock, you really want the

So simple, you'll want to make two

The truth is you really need at least two different tablesaw sleds, and this method is so straightforward that now you can have them.

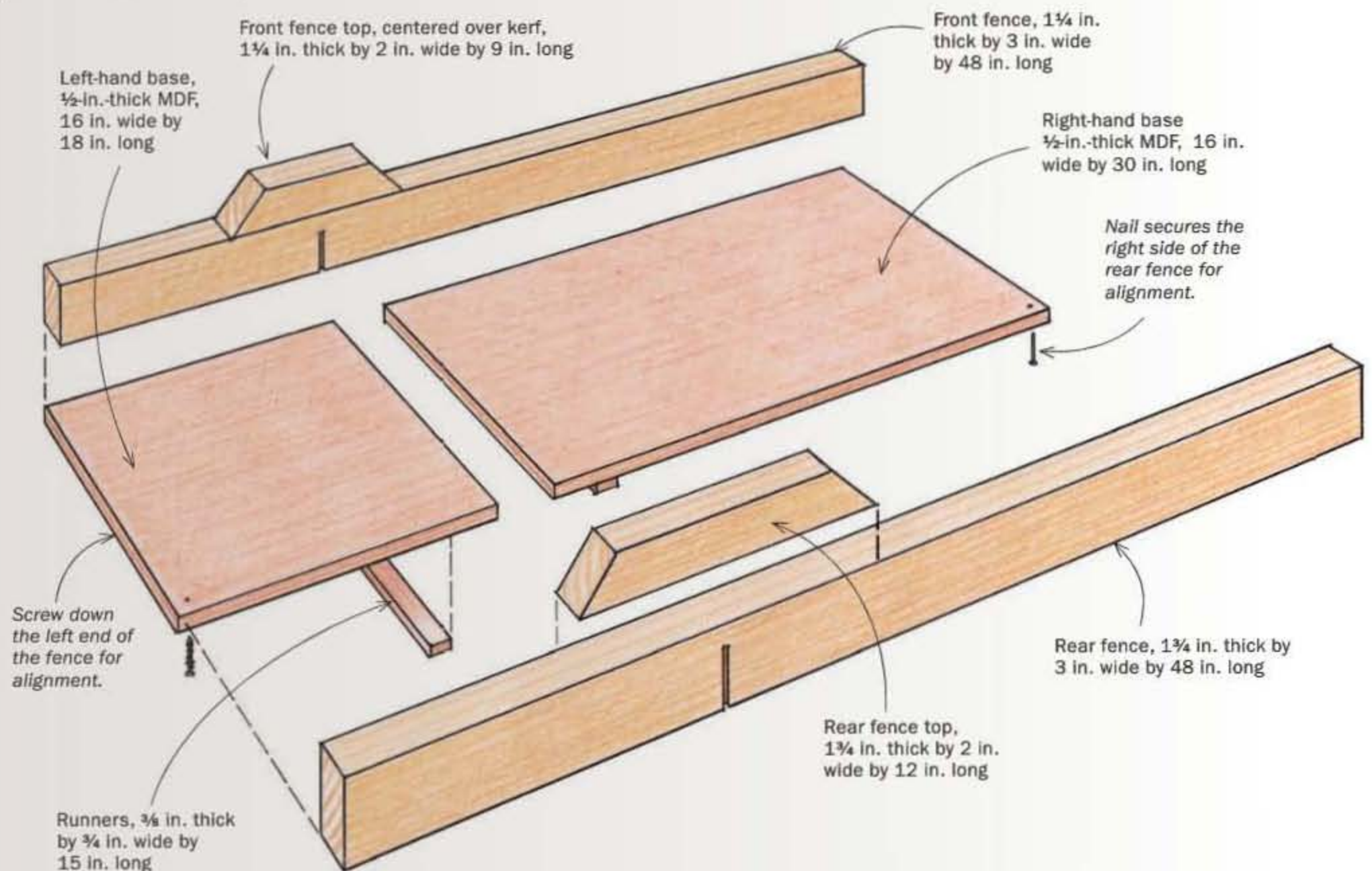
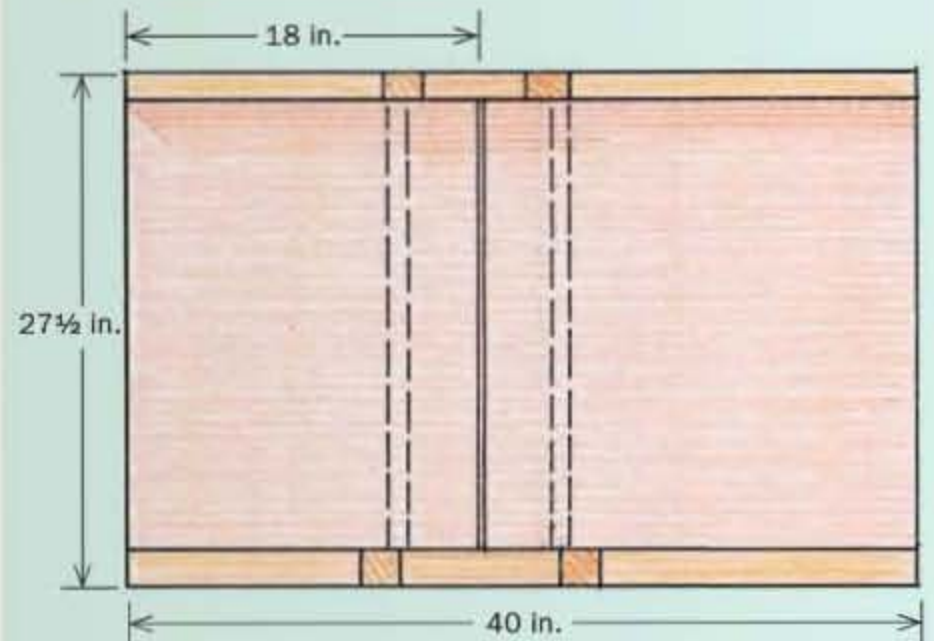
NARROW SLED HANDLES MOST TASKS

The advantage of this sled is its compact size. At 13 in. between the front and rear fences and 48 in. wide, it is light and convenient for everyday use. The space between the fences is narrow to minimize bulk and weight while still offering enough room for most solid stock. There is extra length on the right to support longer pieces like table legs and shelves.

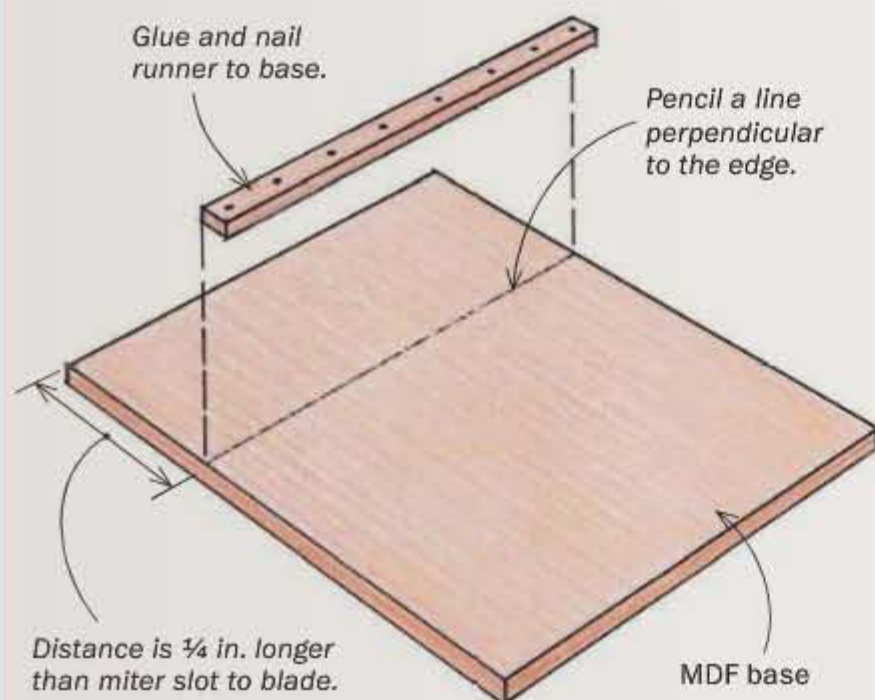


FOR SHEET GOODS, A DEEPER VERSION

To handle sheet goods for cabinet projects, you need a sled that will handle a 24-in.-wide piece of plywood. Most home woodworkers will use this sled far less than the one shown at right, but they'll need one eventually.



Make the base in halves



Mill the runners. Start by cutting the pieces oversize to relieve internal stresses that might cause the wood to move. Then trim them to final dimension. Orient the grain as shown so that most of the swelling or shrinking will be vertical and will not affect the runner's fit in the slot.



Glue the runner in place. Turner uses an MDF template clamped to the sled's base (above) to help locate the runner and ensure it is straight. While pulling the runner against the MDF template, Turner secures it with 18-gauge nails (right).



Trim each base for a perfect fit. With the runner in the miter slot, cut away the excess MDF. The resulting edge is a perfect zero-clearance fit against the saw's blade.

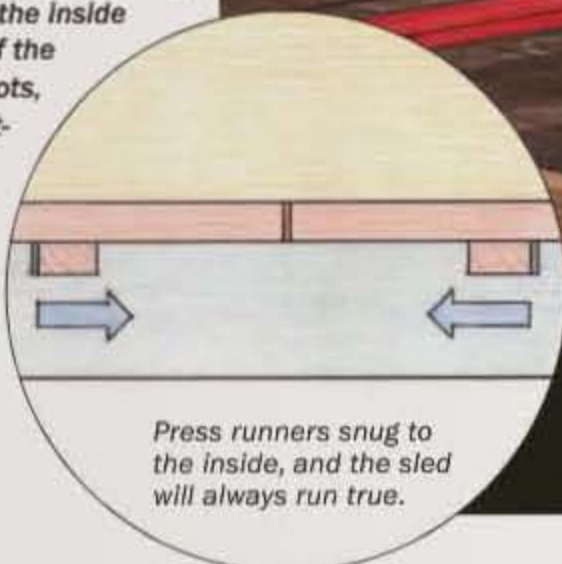
TIP

If you want to save the time spent on milling hardwood runners for a precise fit, you can buy a set of longer-lasting aluminum ones from Kreg. They are pre-drilled and come with nylon adjustment screws for a perfect fit in the miter slots. A 30-in. bar that can be halved to make the smaller sled is \$24 at amazon.com. Attach the bars using the procedure for the hardwood runners, but substitute cyanoacrylate glue with accelerator for the yellow glue, and use screws with a centering bit instead of nails.



Add the front fence

Lightly clamp the base together. When gluing the front fence in place, a long bar clamp keeps the halves aligned. It also holds the runners snug against the inside edges of the miter slots, eliminating any slop.



two shown on p. 43. You might even add one with a wider slot for dados and bevel cuts. I'll build the smaller sled here, the one you'll use 90% of the time. Let's get started.

Build the base from two pieces

For the sled's two-part base, I favor 1/2-in. MDF for its flat surfaces and consistent thickness. MDF also takes a finish well, which lets wax work effectively as a lubricant on the sled's bottom.

For the runners, I suggest either maple or white oak, milled with the end grain running vertically to minimize the effect of seasonal swelling and shrinking. Mill the pieces slightly oversize, wait 24 hours, and then trim them to final dimension. Their final thickness should be less than the depth of the miter slots to leave room for debris in the bottom of the slots. Trim each runner to precise width for its slot and then mark them for right and left—the slots may vary slightly in width.

Attach the runners—With the runners prepared, it is easy to attach and align them.

Measure the distance from the slot to the blade on each side of the blade, and then mount each runner with yellow glue so that each half of the base overhangs the sawblade path by at least 1/4 in. I use a piece of MDF as a template to help locate the runner and to brace against to keep the runner straight. While the glue is still wet, secure the runners with a nail gun, or clamps.

When the glue dries, it's time to trim each sled half for a precise fit around the blade. For each piece, place the runner in the slot and use the saw to cut away the excess 1/4 in. The inside edge of each panel now



Screws hold the fence. With the front fence glued down, Turner drives a series of screws into pre-drilled holes to lock it in place. Its squareness is not critical.

How to align the rear fence perfectly

The sled's rear fence must be perfectly perpendicular to the blade to ensure square crosscuts. A glued-down fence provides lasting accuracy, but you must get it right before the glue sets. Here's how:

1 GET IT CLOSE
Position the fence as square as possible to the blade and mark its location.

2 GLUE, SCREW, AND NAIL
Apply glue and set the fence back in place. Drive a screw from under the left end to act as a pivot, then add one nail at the other end.

3 TEST AND ADJUST
Make test cuts in wide stock and move the fence accordingly with a tap or two.

matches the exact path of the sawblade, one on the right and one on the left.

Attach the front fence and square the rear one

Use an accurate combination square to mark lines perpendicular to the sawcut edge for the front fence. Some 8/4 hard maple, carefully milled, is a good choice for the front and rear fences because it is hard and stable, and its light color reflects light well, making knife lines and other marks easier to see. To reduce weight but add stiffness, add a piece about 8 in. long to the center of the front fence where the blade comes through. The main section of the fence is about 3 in. tall; the added piece is 2 in. tall. To attach the fence, apply glue, pop in some nails to hold it in place, and then add screws for a better glue joint. It's only there to hold the halves together, so it doesn't matter if it is not exactly square to the blade.

Carefully prepare the stock for the rear fence. It has a built-up section similar to the front fence, but its surfaces must be flat, square, and parallel to one another. Milling in stages will relieve any internal stresses, so glue on the extra piece and then mill the fence oversize, letting it rest a few days before taking it down to final dimension. The front and rear fences don't have to be the same thickness; I used what I had on hand. Just be sure the front fence is at least 1 in. thick and the rear fence at least 1½ in. thick.

With the partially assembled sled on the saw, place the head of a combination square against the sawblade and use the rule to mark a line square to the blade where you will position the rear fence. Place the fence on this mark and pencil a line along the fence's entire length.

Now comes the most important part: attaching the rear fence dead-square to the sawblade path so that

1 ALIGN AND MARK



Square it. Hold the combination square against a front and rear tooth and align the fence with the square's blade (above). Pencil a line on the base along the edge of the fence so you can keep track of its location (right).



2 SECURE THE FENCE



Apply glue and one screw. The fence will pivot on this screw while you adjust it to its final position.



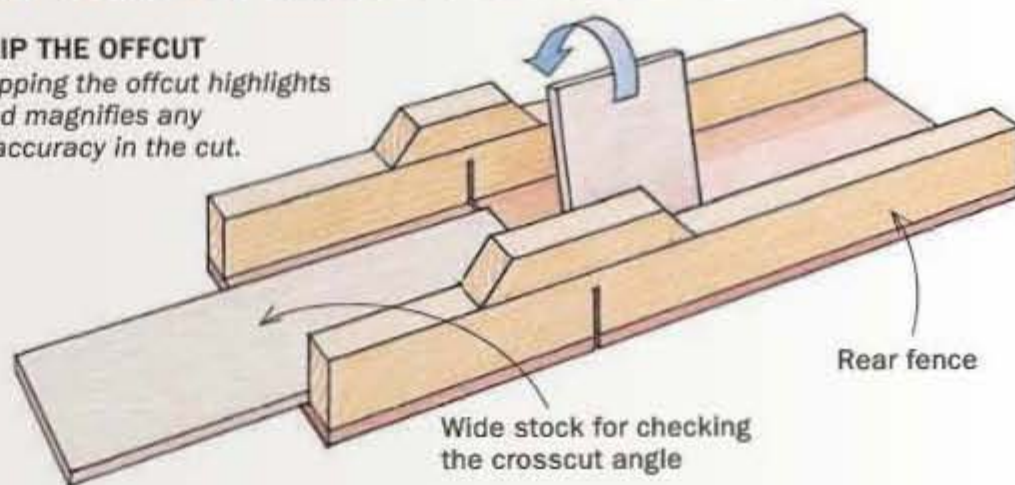
Nail the other end. The nail will flex just enough to allow subtle adjustments to the fence's position, but will otherwise hold the fence in place.

3

FINE-TUNE IT WHILE THE GLUE IS WET

FLIP THE OFFCUT

Flipping the offcut highlights and magnifies any inaccuracy in the cut.

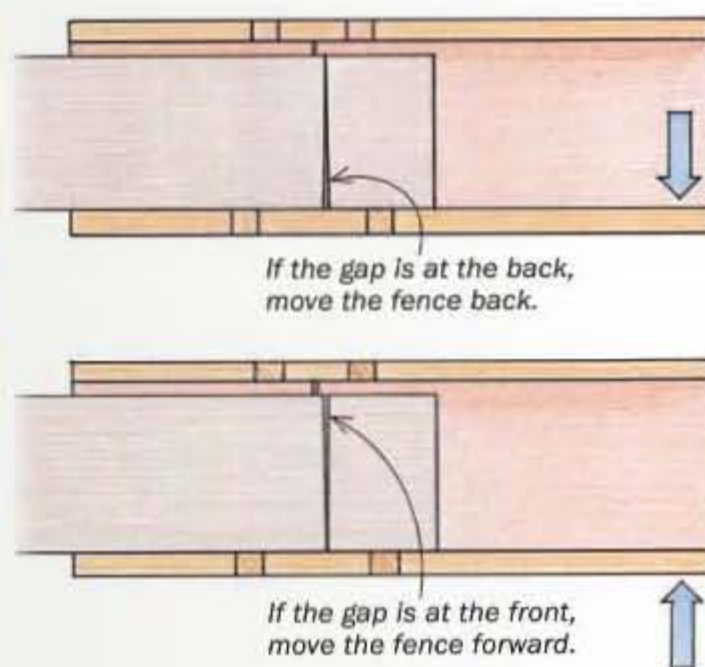


THE GAP DIRECTS THE ADJUSTMENT

Work quickly before the glue tacks up and tap the fence to adjust for square.



Butt the pieces together. A gap indicates that the fence is slightly out of square.



A tap closes the gap. First mark the base with a pencil line to help show the fence's movement. A new test cut shows no space between the workpiece and offcut (right).



Put the glue-up in clamps. Then, after the glue dries, drive a series of screws from underneath to complete the assembly.

Make a test cut. Right away, make a crosscut in wide stock to test whether the rear fence is square.

you will be able to crosscut at exactly 90° for years to come. Here's how you do it.

Get everything ready. Rip a piece of MDF about 12 in. wide and 3 ft. long with straight, parallel edges. This will be used to test the accuracy of the rear fence. Now drill from the bottom for a screw on one end of the sled base, and be ready to shoot a single 18-ga. nail from the bottom on the opposite end. Apply the glue, set the fence on the line carefully, then drive the screw and nail. Now crosscut the MDF test piece.

Pull the sled back and slide the two freshly cut edges together, keeping them snug against the fence. If the rear fence is straight, the edges should meet tightly, with no gap. Now, flip over one of the test pieces, keeping the same just-cut edges together, and put the two halves together against the rear fence. If there still is no gap, the cut is perfectly square. If there is a gap, this gap is double the amount the fence is out of square. With a steel hammer, tap the nailed end of the fence to correct, and test cut again, using the same procedure. Assuming that you've screwed down the left side of the fence and nailed the right, if the gap is at the fence, tap the right-hand end of the fence back. If the gap is away from the fence, tap the right side forward. With ordinary yellow woodworking glue, you should have about 3 to 5 minutes of open time to test and adjust, so work quickly.

When you have it dialed in just right, put clamps on to secure the rear fence to the sled base until the glue dries. Then go back and install screws from the bottom to be sure. You now have a sled that will cut dead square, every time, for many years to come. □

Alan Turner is an attorney, woodworker, and owner of Philadelphia Furniture Workshop, a woodworking school.

Seal First for a Better

Choose wisely for best results

BY PETER GEDRYS

One aspect of finishing that causes great confusion is sealers and their use. Part of the problem stems from thinking that sealers are to clear coats what primer is to paint and that all bare wood should be sealed first. In fact, the first coat of *any* finish acts as a sealer.

But using the first coat as a sealer isn't always the best choice—if that were the case, this would be a very short article! Clear finishes vary greatly in how effective they are

as sealers, and there are many times when you should go with something else. However, a product sold as a “sanding sealer” may or may not be the solution. Now that I've got you confused, let's delve into the world of sealers. I'll make the choice for your next project easy, and your final finish will be better than ever.

When to seal bare wood

The first coat of any finish on any wood penetrates the fibers and leaves the surface feeling rough and uneven after it dries.

Shellac is the wonder-product

There are many types of sealer, but if you could use only one it would be dewaxed shellac, either from a can (left) or flakes. It is readily available, cheap, has no strong fumes, goes on easily, and sands well. It is compatible with any finish and wood. Use it on all interior projects except those that will be subject to substantial heat or humidity.

Finish



This coat needs to be sanded smooth, to provide a good foundation for subsequent coats to build on.

Varnish doesn't sand well, so seal first—Not all types of finish sand easily, especially when applied to bare wood. Varnish tends to gum up the sandpaper and takes a long time to dry. You can overcome these problems by sealing with a coat of dewaxed shellac.

However, I never use shellac with exterior varnishes. Because of shellac's brittle nature, temperature fluctuations can weaken its bond to the substrate and cause the finish to fail. In this case you have a couple of options. You can thin the varnish by 50% with mineral spirits and apply it to the bare wood. It takes longer to dry and is harder to sand than shellac, but you get a durable exterior finish. A more expensive option is a marine-grade sealer that is stearate-free, such as Interlux's Interprime Wood Sealer (jamestowndistributors.com), suitable for interior or exterior work. (For more on stearates, see "Why to avoid some sealers," p. 51.)

For oil-based finishes, seal to avoid blotching—With oil or oil-and-varnish finishes, the problem is not poor sanding, but rather excessive or uneven penetration. Porous woods such as butternut seem to drink this type of finish and never create an even sheen. Others such as pine and cherry can end up blotchy. And on almost all woods, the end grain turns darker than the other surfaces. Thinning the first coat

What can a sealer do for you?

A sealer can save you time and money, help you avoid disasters, and result in a better-looking finish.



SAVE TIME AND FINISH ON POROUS WOODS

After three coats of wipe-on poly, the side of this butternut board sealed with a 2-lb. cut of dewaxed shellac has good build and an even sheen. The unsealed side absorbed the poly unevenly.



CONTROL BLOTCHING

Many cherry boards will absorb an oil-based finish unevenly, leaving a blotchy appearance. A 1-lb. cut of dewaxed shellac limits absorption in the more porous areas for an even look.



SMOOTH SANDING

The advantage to applying a 2-lb. cut of shellac rather than a thin coat of varnish as a sealer coat is that shellac powders when sanded (left) but varnish gums up the sandpaper (right).



TAME OILY WOODS

The oils in some tropical woods can delay or even prevent an oil-based finish from curing, leaving it sticky. The right side of the board was sealed with shellac, which prevents this problem.



Why seal? (continued)



ADD WARMTH

Waterborne finishes can leave some woods, such as cherry, looking gray. The right-hand side of the sample was sealed with dewaxed garnet shellac for a warmer look.



SEAL BETWEEN OIL AND WATER

Applying a waterborne topcoat over an oil-based pigment stain is asking for trouble. Dewaxed shellac seals in the stain and gives a good base for the topcoat.



PROTECT DYE

After the board was colored with a water-based dye, the near side was sealed with dewaxed shellac. When a waterborne topcoat was brushed on, it removed some of the dye on the far side, but not in the sealed area.

Special products for special situations



Vinyl sealer for kitchens and bathrooms

The pros spray this for most of their sealing. It has all the advantages of shellac but also stands up to high heat and humidity, making it a good choice for kitchen cabinets, tabletops, and bathrooms. You can apply it by hand but only to small areas because it dries very fast.



Pad on small surfaces or spray like a pro. Although vinyl sealer is designed to be sprayed (left), you can pad it on if you work quickly and in small areas (above). Vinyl sealer is ideal under solvent lacquer and two-part catalyzed finishes. The main drawback is the fumes, so wear a respirator when spraying or working with poor ventilation.

only makes these problems worse. Again, shellac comes to the rescue. Instead of sealing, the aim is to let absorbent areas of the wood soak up the washcoat while the rest of the surface is minimally changed. To do this, apply only a thin, 1-lb. cut of dewaxed shellac and when dry, lightly sand it with 220-grit paper. You will see slightly less shimmer from figured woods but the overall tone will be more even.

Sealers minimize raised grain—Some waterborne finishes are quite alkaline, which promotes grain raising when they are applied to bare wood. Manufacturers sell neutral-pH sealers, labeled sanding sealers, but you sacrifice some durability (see opposite page), so the better choice is once again shellac. As well as providing a smooth

base for the waterborne finish, shellac can enhance and warm the overall tone of a finish, particularly if you use darker grades such as dewaxed garnet. This is beneficial with waterborne finishes, which can have a cold and somewhat lifeless appearance.

Use vinyl sealer in hot or moist areas—Vinyl-based sealer may be considered the modern shellac. It dries quickly, forms an excellent barrier, and bonds so well that vinyl resin is the base for many adhesives. Like shellac, it will also lock in contaminants and seal oily woods. Use it for interior projects only. However, it has far better heat and moisture resistance than shellac, so it is a good sealer for kitchens and bathrooms. Although sold to be used under solvent lacquers or two-part coat-



Marine-grade sealer for the great outdoors

Only the toughest finishes survive the sun, salt, and water experienced on a boat. You can either thin a high-quality marine varnish and use that as a sealer coat, or look for a marine sealer that doesn't contain stearates.



Avoid shellac. Shellac is too brittle to use as an exterior sealer and will fall with severe wood movement, so you can either thin the varnish topcoat by 50% with mineral spirits, or use a marine-grade sealer that doesn't contain stearates.

ings to which it is chemically related, it can be used under any type of finish.

The downside is that vinyl sealer is formulated to be sprayed, and is not the friendliest stuff. But you can pad it on after thinning it (with lacquer thinner), and protect yourself with gloves, a respirator, and good ventilation. If applying it by hand, it works best on small projects because it dries rapidly. It doesn't sand as well as shellac, so some sealers include stearates, but better ones use a modified nitrocellulose resin to help with sanding. Examples include Sherwin-Williams' High Solid Vinyl Sealer No. T67F5 and M.L. Campbell's C100 25. Both come in a minimum size of 1 gal., but Behlen's Vinyl Sealer comes in quarts (woodcraft.com).

Seal in the oils in problem woods—The oils in some tropical woods such as rosewood and cocobolo can prevent oil-based finishes from curing, leaving them sticky. The same is true of the chemicals in aromatic red cedar and the resin in pine. In all cases, applying a coat of dewaxed shellac to the bare wood isolates the oil-based finish and allows it to cure normally.

Finally, if you are refinishing an old piece of furniture, surface contamination, particularly silicone oil from furniture polish, can

cause fisheye, where contamination repels the finish and leaves little craters. Again, an initial coat of shellac is the answer.

Sealers between finishes

When doing a multi-step finish, product compatibility is a big issue. We all know that oil and water don't mix, so it is good practice to apply shellac or a vinyl sealer between an oil-based stain, grain filler or glaze, and a waterborne clear coat. Otherwise you run the risk of poor adhesion.

Sometimes two similar products must be kept apart to avoid a fatal attraction. A water-based dye can bleed into a waterborne topcoat and leave a muddy, blurry appearance. A thin coat of sealer will lock in the dye or stain and allow you to topcoat with ease. If you plan to use an alcohol-based non-grain-raising dye, brushing shellac as a topcoat can be problematic because the alcohol in the shellac will reactivate the dye. Overcome this by spraying a very thin first coat of shellac. Trust me: Making the right choices will save headaches down the road. Guess how I know that! □

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

Why to avoid some sealers



Ingredients

Copolymer resin...
Petroleum distillates...
Stoddard solvent...
Vinyl toluene...
VM&P naphtha...
Zinc stearate...

Usually, in woodworking, your best choice is a tool or product specifically

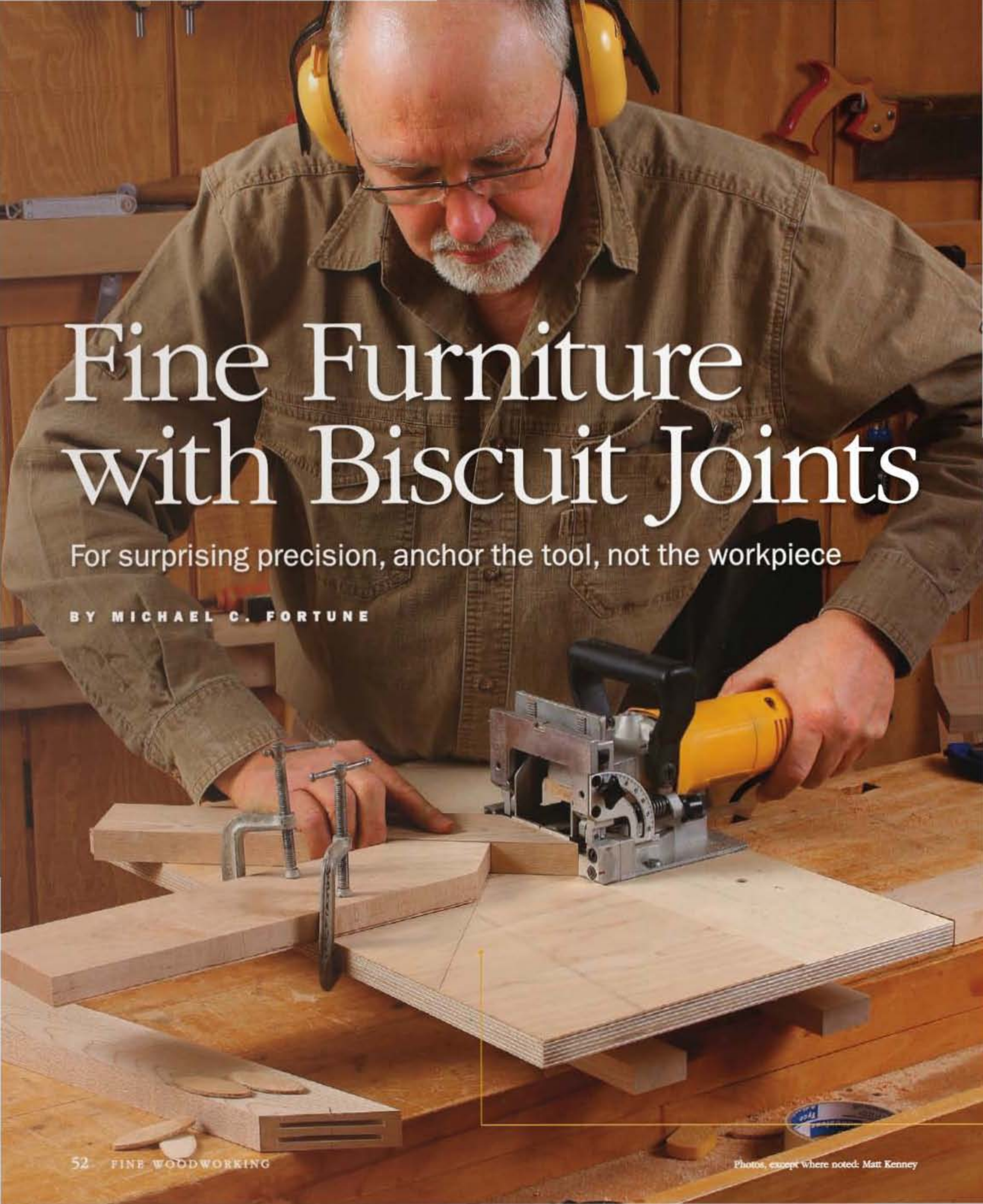
designed for the job. That's not the case with many products sold as "sanding sealers," whether waterborne or oil-based. The latter consist of a vinyl-alkyd resin that seals, a fast-drying solvent such as toluene that allows you to recoat in under an hour, and zinc stearates or metallic soaps to make sanding easier. These last components are the sealers' Achilles heel. They make the sealer soft and tend to produce a weak bond with the substrate and subsequent coatings.

Closely examine the description of the can's contents: Like the example shown above, if you see either stearates or soaps mentioned, then go with another type of sealer.

—P.G.



A flaky finish. On this window seat, a waterborne topcoat was applied over a stearated sealer. The weak bond between the two types of finish caused the topcoat to delaminate after it was scratched.

A man with a beard and glasses, wearing yellow earplugs and a tan work shirt, is focused on his work in a wood shop. He is using a yellow and black biscuit joiner to create joints in a piece of light-colored wood. The wood is held in place by several metal clamps on a workbench. The background shows a workshop environment with various tools and wood pieces.

Fine Furniture with Biscuit Joints

For surprising precision, anchor the tool, not the workpiece

BY MICHAEL C. FORTUNE

If you ask a furniture maker about joinery for fine furniture, you're sure to hear about dovetails, mortises, tenons, dadoes, and even rabbets. But I'd be surprised if biscuits were mentioned, unless only to explain how they have no place in high-end work. That's a shame, because there are some joints where a biscuit is the best solution. They're great for joining the rails and stiles of a face frame, attach-

ing a solid-wood frame around a veneered panel, tabletop, or door, or joining a leg to a veneered panel. Biscuits also let me build more adventurous furniture that would be difficult with traditional joinery.

Perhaps the biggest reason why biscuits have been dismissed by many furniture makers is that biscuit joiners seem incapable of accuracy. The cutter's rotation has a tendency

to jerk the machine sideways when you start the cut. Also, biscuit joiners can be difficult to hold and they have small fences, so they jump around and lift off the work. However, I've found a great solution to all of these problems: Turn your biscuit joiner into a stationary tool by attaching it to a shopmade table.

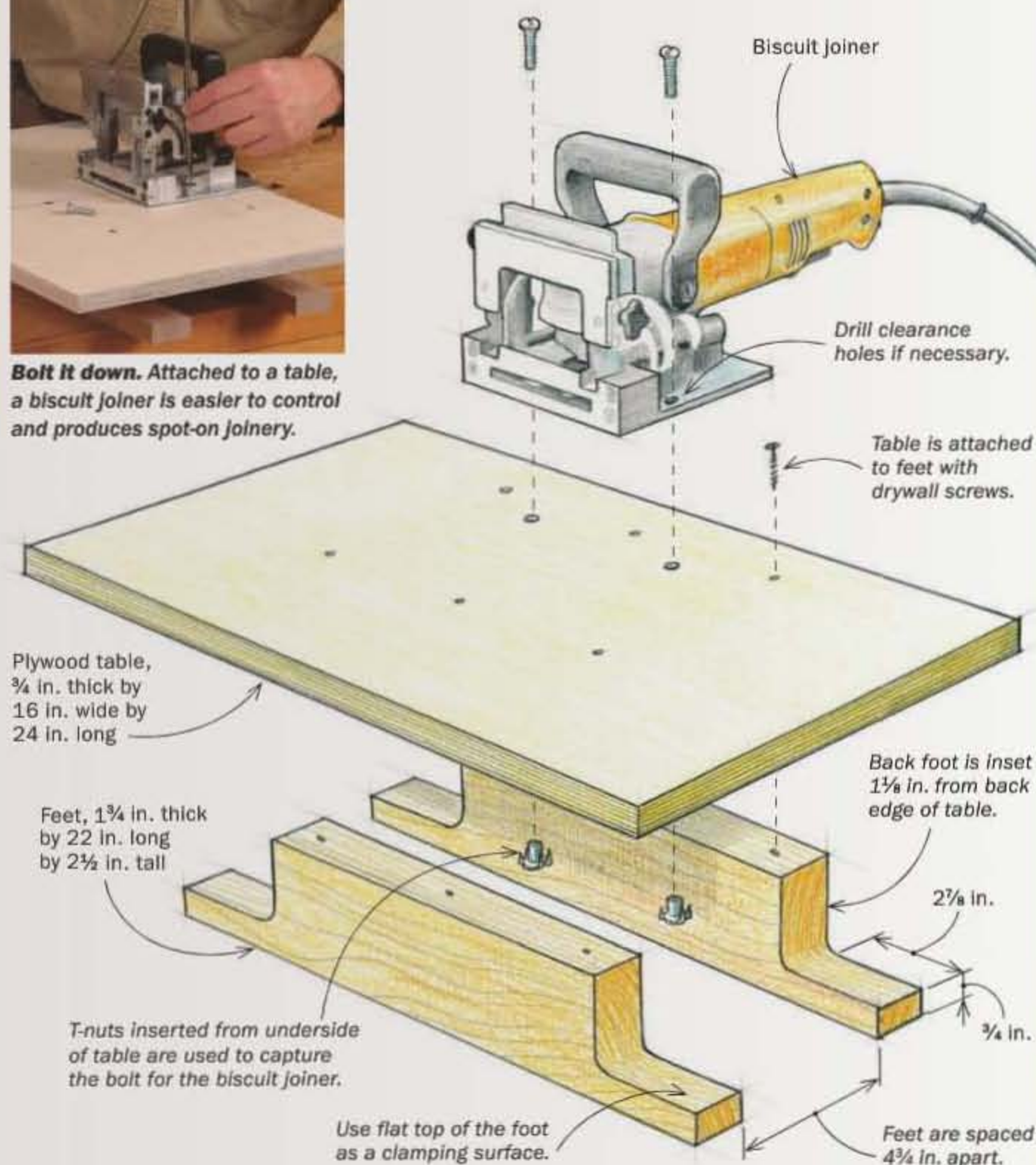
Attached to the table, the biscuit joiner really does have a place in fine furniture. I'll show



Bolt it down. Attached to a table, a biscuit joiner is easier to control and produces spot-on joinery.

JIG CURES THE JITTERS

The biggest problem with a biscuit joiner is how much it wants to move around when you use it handheld. To stop it cold, bolt it to this table.



Break through to new designs

When designing, Fortune doesn't worry about construction. He figures it out later. Keeping his mind open, he's found the biscuit joint to be reliable and, more importantly, versatile, allowing him to build furniture that would be impossible with traditional joints like the mortise-and-tenon.



Make a pyramid. Biscuits join four triangles to make this plywood door and the drawer fronts.



Join a side to legs. Biscuits make a solid connection between wide veneered panels and solid wood.



Wrap a veneered top in solid wood. Biscuits join the wood to the panel and reinforce the miter joints.



A smarter way to make face frames

Mortise-and-tenon joinery is overkill for a face frame, because after it's attached, the cabinet gives the frame more than enough strength to stay together over the long haul. Replace the mortises and tenons with biscuits, a far easier joint to make. But don't try this with doors and table aprons: They need the strength of a full mortise and tenon.



Stop block does double duty. It aligns the rail and stile with the cutter. And because the cutter's rotation forces them into the stop, it prevents them from shifting during the cut.



Slot the stile. Because of the table and the stop block, you need worry about only two things: holding the stile firmly against the joiner and pushing the cutter into the stile.

Repeat for the rail. The stop block hasn't moved, so just put down the rail and cut the slot. You'll need to flip the parts to do the joint at the opposite end of the rail, so you won't be referencing off the same face. But don't worry: The biscuits will still line up.



you where it's smart to use one and how to get the best results.

When and where to use biscuits

Biscuits can be used to join two solid-wood parts, two veneered panels, and solid wood to a veneered panel. But they can't be used everywhere. Don't use them for heavily stressed joints, like those in a chair, or for joints that hold a lot of weight, like those attaching shelves to a bookcase.

OK, that covers where to use them, but not how. A strong biscuit joint is a balancing act. You need enough biscuits to create adequate glue surface,

but not so many that their slots significantly weaken the two parts you're joining. I follow these guidelines to determine how many biscuits a joint can handle and where to put them: First, biscuits should be at least $\frac{3}{16}$ in. from the top surface and $\frac{1}{8}$ in. above the bottom one. Second, slots should be at least $\frac{1}{4}$ in. away from any edge—any closer and the remaining material is too weak. Likewise, the minimum spacing between slots is $\frac{1}{4}$ in., but I typically space them 2 in. to 3 in. apart.

Finally, go easy on the glue and apply it only to the slots (spreading it around) and, of course, the mating edges of the parts. Then wait at least 24 hours after glue-up before you sand or plane the parts. Biscuits are compressed during manufacture, and water in the glue causes them to expand and push out on the material surrounding the slot. That creates a slight bump on the surface. If you sand or plane too soon, that bump becomes



Wrap a veneered tabletop with solid wood

Tabletops made from veneered panels can be quite attractive. They also are more stable than a solid-wood panel and so, less likely to cup. But their edges are unattractive and prone to chipping. The best approach is to glue a broad, solid-wood frame around the panel, reinforcing the joints with biscuits.

START WITH THE MITER JOINT

Use a pointed stop block for this joint. Be sure the point forms a perfect 90° angle.



Locate the stop block. Align the joint's centerline with the joiner and trace the part's edge on the table. Repeat for the second part.



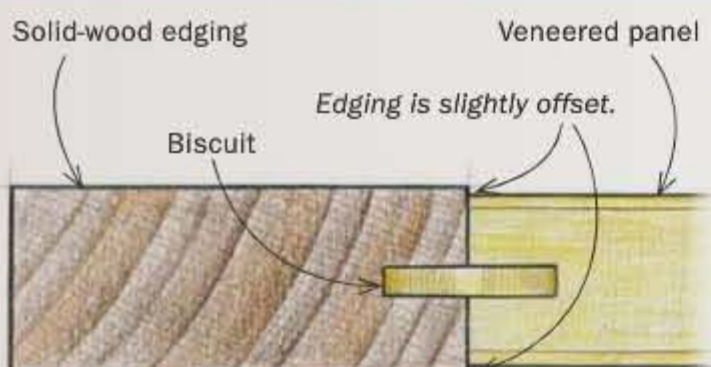
Clamp the stop in place. Its point is at the intersection of the two lines, located so that the parts fit snugly between it and the joiner.



Two jobs again. The stop both aligns the parts and provides some resistance against the cutter. Still, hold the part firmly against it.

SLOT THE EDGE-JOINTS NEXT

Continuous splines remove too much wood and weaken the joint. Biscuits are a better choice.



OFFSET THE FRAME, AND PLANE IT FLUSH

Tape under the panel centers it on the thicker edging. Plane the offset flush after assembly.



Cut slots for the frame's edge. A fence clamped to the table keeps the workpiece firmly against the joiner, but lets you quickly slide it from one slot to the next.



Raise the panel with a strip of tape. This creates the offset between the frame and panel. Make sure to slot the panel with the face down. Lean into the panel to keep it against the joiner during the cut. A short support stand (bottom right) comes in handy.



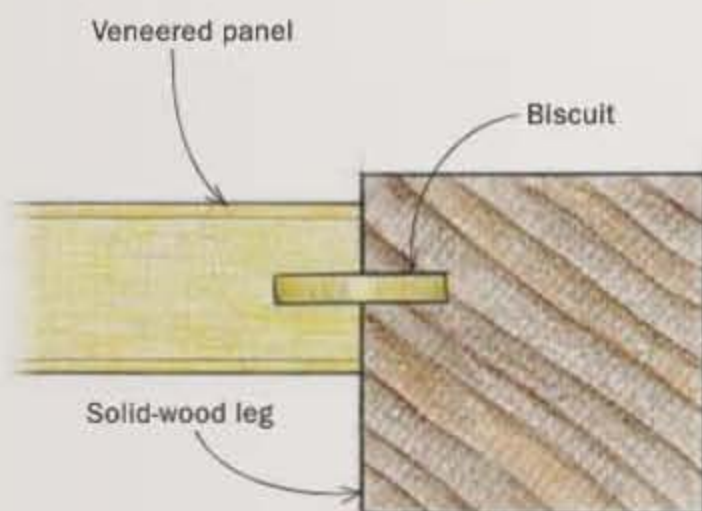


Join a side panel to a leg

Splines, dowels, and tenons are more hassle than they're worth here. A biscuit joint can be cut much more quickly and provides plenty of strength.

SHIM THE JOINER

Panels are typically set back from the edge of a leg. To create that offset, put a shim under the joiner. The thickness of the shim determines the amount of offset.



Put a spacer under the joiner. The spacer raises the cutter to offset the slots in the leg. Vary its thickness to vary the offset and remove it for slotting the panel.

Hold the leg with a clamp. Fortune's Da-Sta-Co-style plunge clamp lives on a square of plywood so that he can put it wherever it's needed on a variety of biscuiting setups.



an indentation after the biscuit dries out and shrinks.

Lock it down

After a lot of frustration and sloppy joints, and just as I was ready to give up on the biscuit joiner for furniture, I decided to try something new. I designed a benchtop table and bolted my joiner to it (see p. 53). Attached to the table, it can't jump because of the cutter's rotation or lift off the workpiece. Now it lives on the table and I almost never need to take it off.

The table is nothing more than a plywood base attached to two sled feet. The feet have flats that allow me to clamp the table to my workbench, putting the biscuit joiner at a comfortable height. The joiner is bolted to one edge of the plywood, leaving a large open workspace where I can temporarily attach stop blocks and toggle clamps as needed.

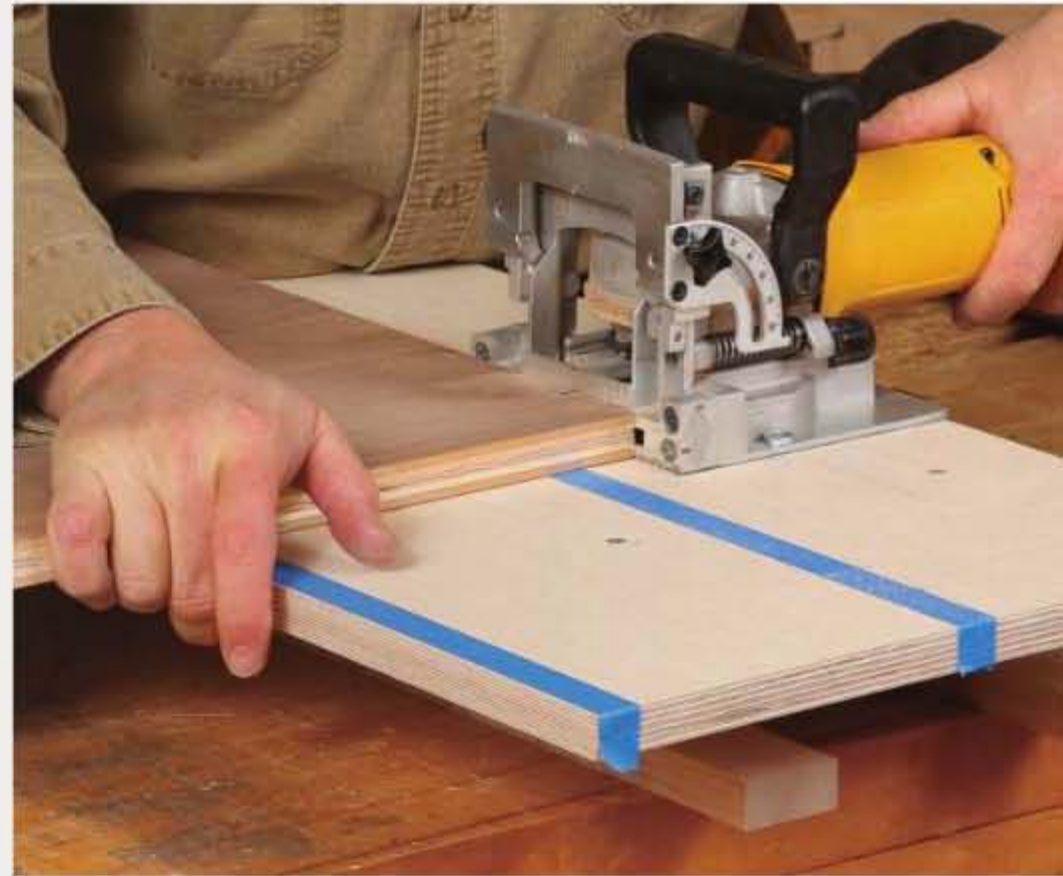
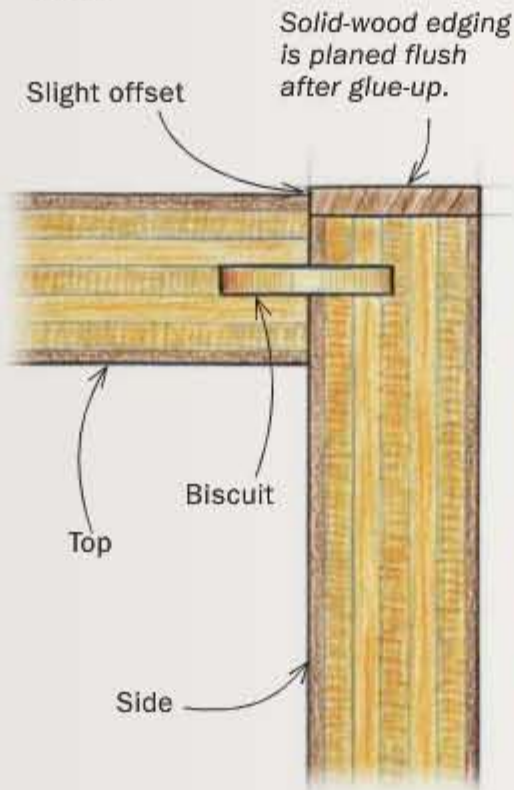
The stop blocks (and an occasional fence) do two jobs. First, I set them up so that they align workpieces to the cutter. Second, when possible I locate them so that they help the workpiece resist the force of the cutter, and that makes for

Perfect case joints every time

In theory it's no problem to join two case panels with biscuits, but in practice it can be difficult. Murphy's Law always seems to kick in and the top ends up proud of the side. Here's how to head off the problem.

CONTROL THE OFFSET

Adding tape to the table ensures that the panels align the way you want.



Tape creates an offset. The top is raised slightly and, after assembly, it ends up just beneath the top end of the side.

a cleaner and more accurate slot. As for the toggle clamps, I put them on their own bases, which are then clamped down, making my work much more efficient because it's quicker to clamp down a block and unclamp it when you're done using it than it is to screw down a clamp and unscrew it when you're done. Also, it keeps the table free of screw holes.

I glue 100-grit sandpaper to the faces of all of my stop blocks so they grip better. I also rabbet the bottom edge, because biscuit joiners eject dust from the front of the machine. Without the rabbet, dust builds up on the front of the stop block, pushing the workpiece out of alignment. □

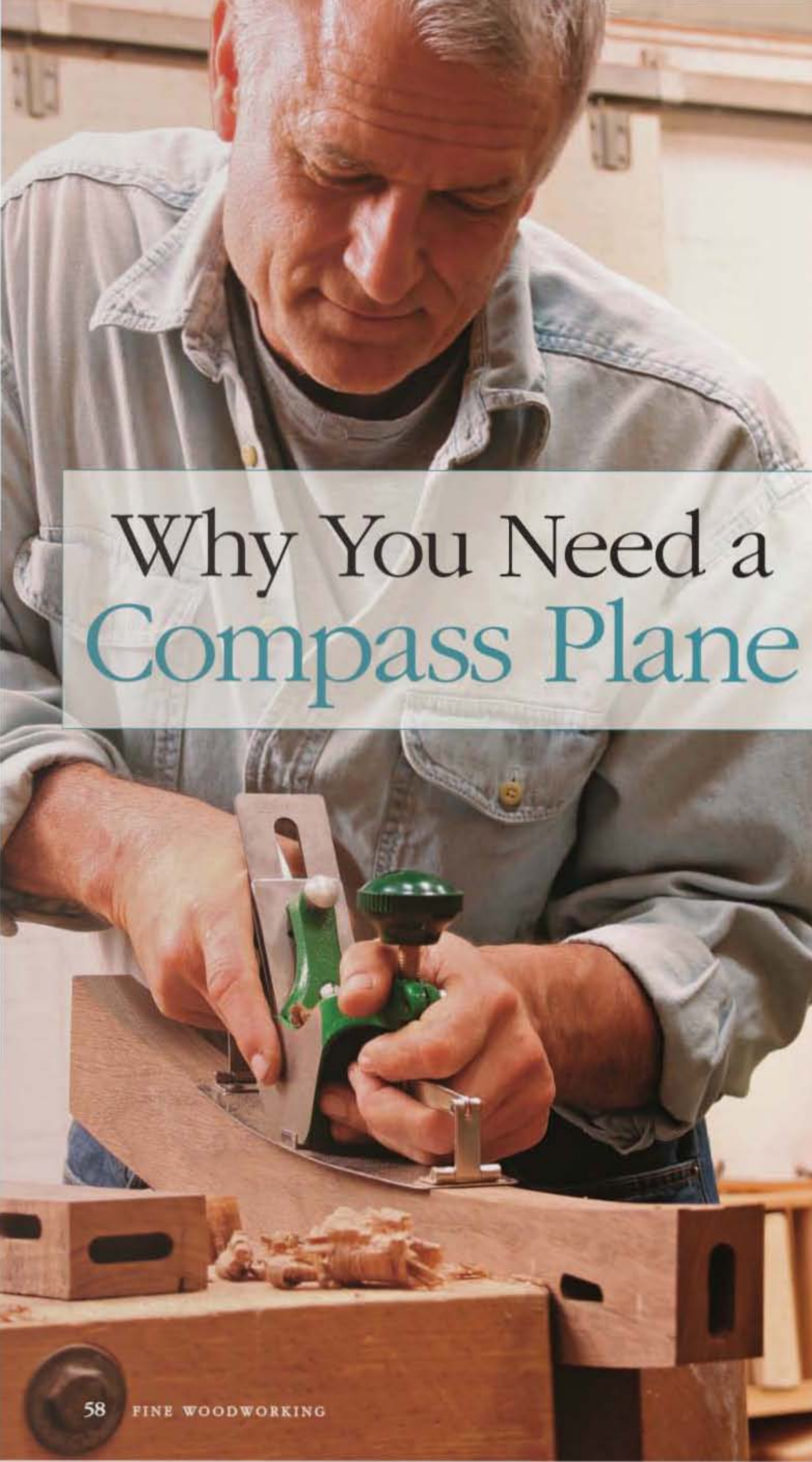
Michael C. Fortune is a contributing editor.

www.finewoodworking.com



Add a clamp for the side. Attach it to a square of plywood that can be clamped to the table. That way, it's quicker to switch between using the clamp and not. Be sure the side isn't resting on the tape.





Why You Need a Compass Plane

Create smooth
curves that are
fair to the eye
and hand

BY PAUL
SCHÜRCH

than the contoured and flexible sanding blocks that I've used in the past. I use this plane for all sorts of furniture parts, as well as for router templates.

I grab my old Stanley compass plane for both regular curves with a uniform arc and organic curves with an ever-changing radius, called "fair curves," using the adjustment knob to alter the curve of the sole on the fly. Since almost all of my furniture has curved components, almost every project is touched by a compass plane.

I use the tool on solid wood, plywood, and MDF. I use it to smooth the bandsawn curves on router templates, and then I use it again on actual workpieces, to remove the machine

Good options new and used

No one makes a new compass plane that's as good as the classic Stanley No. 113, but Kunz comes close.

VINTAGE PLANES

STANLEY IS STILL KING

You can find good Stanley No. 113 "circular" planes on the used tool market for \$50 to \$200. They are nicely made and comfortable to use, with very little slop between the moving parts.



RECORD HAS ISSUES

Record No. 20 compass planes are also available used, but they are uncomfortable to hold.



Pain in the knuckle. To get good results with a compass plane, you need to push harder on the front. Unfortunately, the Record has a little locking knob near the front that digs into your hand.



marks. Although the tool handles concave and convex curves with equal aplomb, there is a limit to how tight a curve it can handle. However, my favorite curves are long and graceful, and the compass plane handles them beautifully. For tips on designing and using fair, organic curves, see my

article, "Drawing Big Curves," in *FWW* #175.

Where to get one, and which one to get

The first adjustable-sole compass plane was designed by Leonard Bailey in 1871. This Stanley No. 13 was a crude affair and went through many

NEW MODELS

KUNZ: GOOD AFTER A TUNE-UP

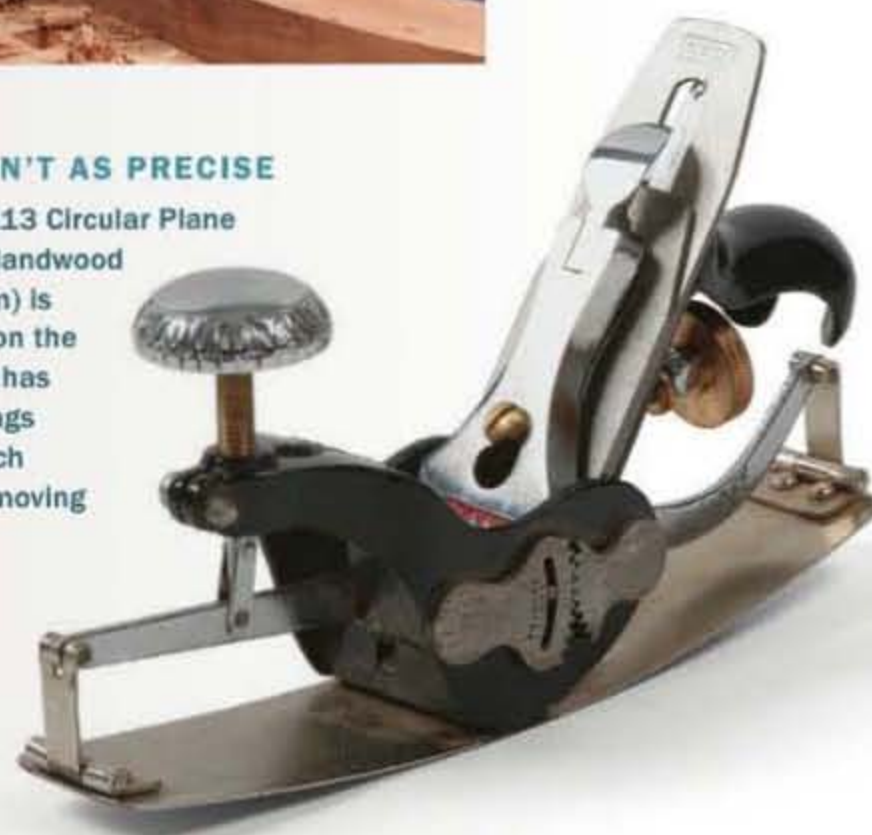
With some elbow grease, you can get the Kunz 113 Circular Plane (\$300; highlandwoodworking.com) working well. It is based on the Stanley No. 113, and is a close second in quality.



Comfy enough. You can get a good grip on Stanley-style compass planes, and the adjustment knob is easy to reach on the fly.

ANANT ISN'T AS PRECISE

The Anant 113 Circular Plane (\$240, highlandwoodworking.com) is also based on the Stanley, but has rough castings and too much slop in the moving parts.



design changes, reaching its pinnacle as the Stanley No. 113 Circular Plane. The adjustment of the front and rear sole occurs in unison with a single adjustment knob, bending the spring-steel sole into a convex or concave curve. I find myself constantly micro-adjusting the curve when using a compass

plane, and the front-knob adjustment on the No. 113 style works better for me than other systems.

Although Stanley stopped making the No. 113 in 1942, there are plenty on the used-tool market. You can get a good one on eBay for between \$50 and \$200. If you buy an older

All compass planes need a tune-up

To cut precisely and adjust easily, all of these planes, both old and new, need a flat sole and a bit of TLC.

Comfort first. Start by taking the plane apart, especially if it's a new one, and using a file to knock off the burrs and sharp edges that would dig into your hands.



plane, make sure that both sole plates are riveted cleanly and securely to the plane body, and that neither is bent or twisted from the plane being dropped. Also, there should be little-to-no play in the adjustment gears or the arms that connect the sole to the plane body, and no missing or cracked parts.

Your other main compass-plane option on the vintage-tool market is the Record No. 20. But I find these uncomfortable to hold, with a small locking knob that digs into the back of my front hand.

As for new tools, there are two circular planes being manufactured today, both based on the Stanley No. 113: the German-made Kunz, and the Anant, which is made in India.

HOW TO FLATTEN THE SOLE



Seal the mouth. First, put painter's caulk into the mouth to keep water and abrasive grit from getting under the riveted sole, where it will be hard to remove.



Stone the bottom. Adjust the sole flat, lock down the plane using a vise and blocks as shown, and sand the area around the mouth flat, finishing with honing stones.



Flat where it matters. You might not be able to reach the shallow depressions just ahead of and behind the mouth, but the narrow areas on each side are critical reference surfaces.



Lube job. Use a light oil like camellia to lubricate the moving parts, and to protect all of the exposed steel in general.



Hock #BK113
chipbreaker
\$30
hocktools.com

Thicker chipbreaker is a good upgrade. An aftermarket chipbreaker will stabilize the stock blade for smoother cuts.

Compass planing 101

The setup is slightly different for inside and outside curves, and the planing direction is, too.

CONCAVE CURVES



Leave a gap. Pressing the plane forward, adjust the sole for a $\frac{1}{32}$ -in. gap between the back of the sole and the work.

CONVEX CURVES



No gap. On outside curves, set the gap close to zero, but always feel free to adjust on the fly to improve the action.



Outside in. With all curves, always plane from high to low to work with the grain and avoid tearout. On concave curves, this means planing from the ends toward the center.



Inside out. Work from the center outward, and whether concave or convex, try reversing direction if you are getting tearout.

I took a very close look at both planes and found that the Kunz is fairly well-machined, and works well after a tune-up. The Anant has rougher castings and a sloppier fit between critical parts.

I was happy to discover that Lie-Nielsen Toolworks is also working on a compass plane, and is planning a late-2012 release.

Start with a tune-up

All of the available planes, new or old, need a tune-up to do their best work. Some require more and some less.

Start by taking the plane completely apart and filing all the sharp edges down to make handling more comfortable. Next, you might need to level the sole. But first, squirt some caulk down into the throat to

keep the water and wet grit from getting under the riveted sole, where it will be difficult to impossible to remove. Then flip the plane over, adjust the sole as flat as possible, and clamp it in a vise as shown on the opposite page. If the sole is especially bumpy, start flattening it with 220-grit wet-or-dry sandpaper on a block. I've even used a belt sander,

clamped upside down on my bench, moving the plane lightly over the belt to do the initial flattening. A diamond plate makes a good intermediate step, but I always finish by polishing the sole with my waterstones.

In the end, there might be a depressed area in front of or behind the blade opening that you can't quite remove, but as

Compass planing 101 continued

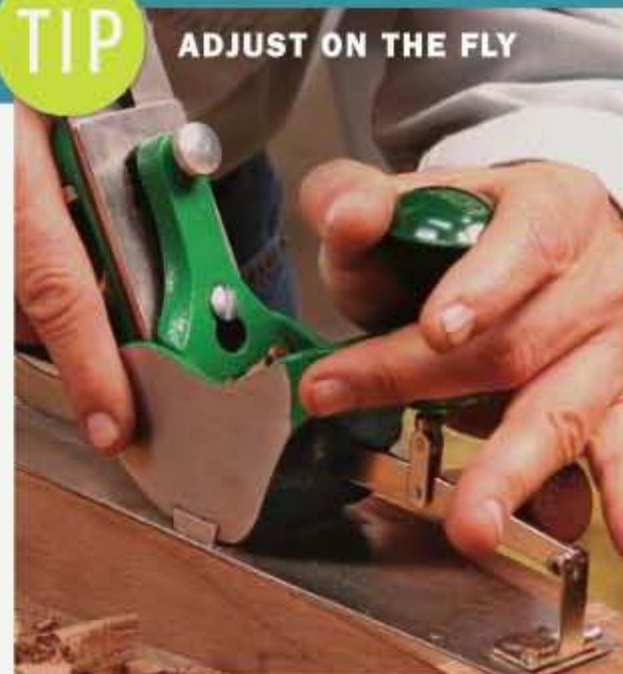


Quicker, shorter strokes. Plane more quickly than you would with a normal bench plane, with shorter strokes of 6 in. to 12 in. And focus the pressure on the front of the sole (above). On the return stroke, tip the plane upward (right) to avoid dulling the exposed blade.



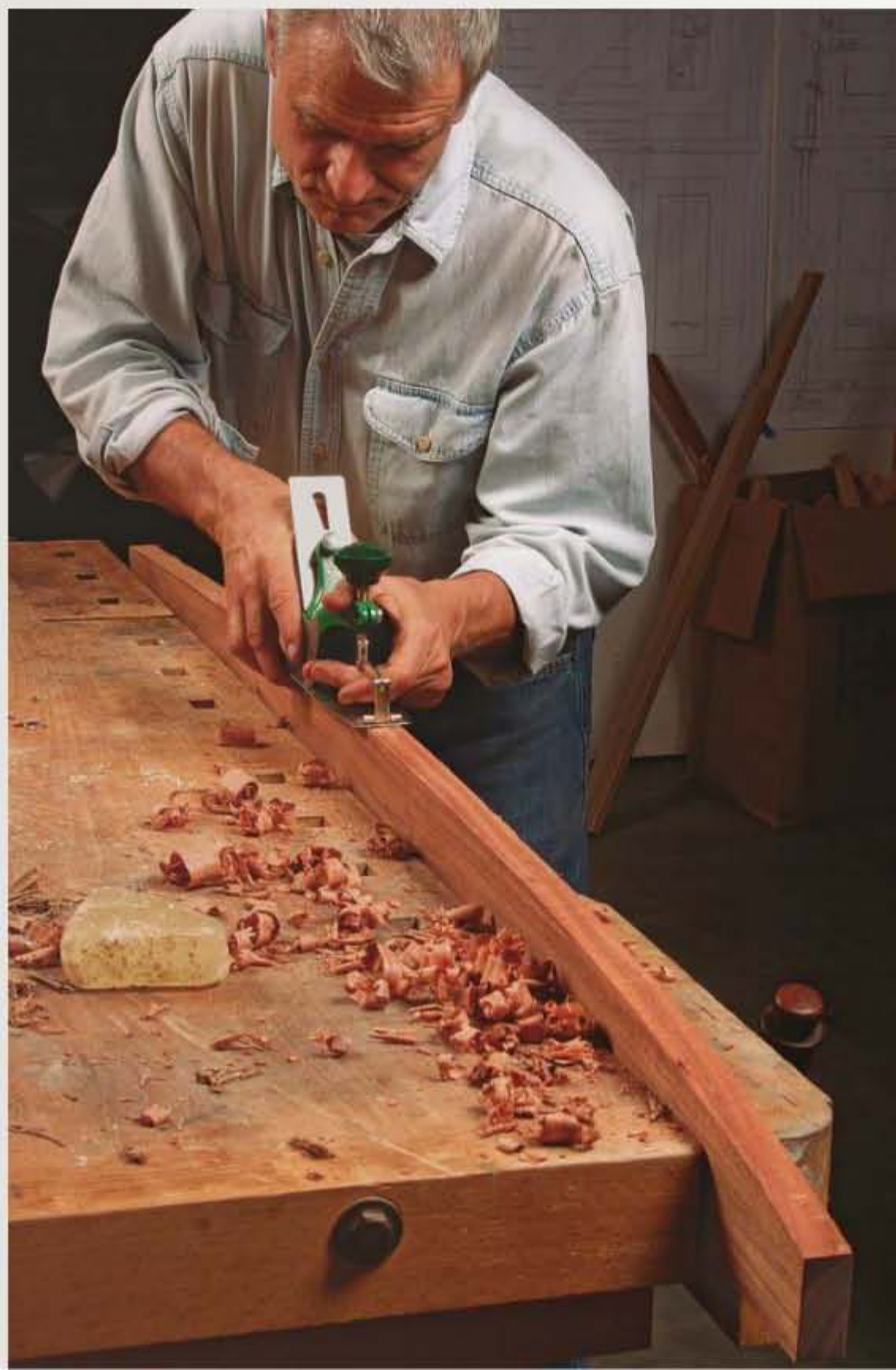
TIP

ADJUST ON THE FLY



As the curve changes and the plane stops making shavings, the Stanley design makes it easy to fine-tune the sole between strokes.

Work in sections. On long pieces with changing curves, work one section at a time, adjusting the sole as you go.



long as the narrow sides of the opening are polished, you'll have a good continuous surface to plane on.

Last, blow out all the moisture, and lubricate all the metal parts with camellia oil or another silicon-free lubricant to keep them running smoothly.

The full monte—Although I'd never tried these upgrades before, I also tested both a better aftermarket blade and thicker chipbreaker to see if I could improve the performance even further.

The chipbreaker had a significant effect, stabilizing the standard blade for less chatter and a smoother cut. Be aware that the chipbreaker for a compass plane must have a slightly different hole pattern than one for a bench plane. Ron Hock made a custom model for my testing, and has agreed to make more for \$30 each (No. BK113; HockTools.com). As for the thicker blade, I wouldn't bother unless you buy a vintage plane that has a rusted or pitted one. In that case, most 1¾-in.-wide bench-plane blades will work, with

thicker ones requiring you to file the mouth a bit.

Successful planing

The plane is easy to use, but a few tips will help a lot. For a start, always press down harder on the front of a compass plane. That keeps the blade engaged in the wood, and also happens to create a slight gap between the back of the sole and the surface. For good planing action, the size of that gap should be different for inner and outer curves. For inside (concave) curves, set the curve of the sole a hair ($\frac{1}{32}$ in. or so) short of the desired shape. For outside curves, the back of the sole should be close to zero, barely touching the wood as you set the curve. If you are having a difficult time getting a good shaving, make slight adjustments to the sole and blade as you plane. You'll get there.

The other key is to take quick 6- to 12-in. strokes, shorter and faster than you would with a bench plane. Also, since the blade is exposed, lift up the back slightly on the return stroke to avoid dulling it without breaking your rhythm.

For long, changing curves, tackle the job in sections, turning the screw-adjustment knob to dial in the proper arc as you work the plane along the length of the curve. If the grain begins tearing in the direction of travel, change your direction, the same way you would with a regular bench plane.

This plane has strongly influenced my design work and furniture making, giving each piece an organic feel and grace unobtainable in any other way. Try it. It might become one of the most cherished hand tools in your collection, too. □

Paul Schürch builds furniture in Santa Barbara, Calif., and teaches widely. Go to Schurchwoodwork.com for info.

From perfect pattern to finished piece



Schürch uses his compass plane to create smooth, fair curves on templates and then to quickly smooth and fair the workpieces themselves.

Making templates. After laying out his curves on paper, he glues that to template stock and planes to the line. Where a sander would leave a bumpy surface, the compass plane creates smooth, flowing curves.



Roughing out. Template routing doesn't work well on thicker workpieces, so Schürch lays these out with the template (left) and then bandsaws close to the line (right).



Perfect curves. Schürch then uses his compass plane to quickly remove the bandsaw marks and leave a smooth surface for final sanding and finishing.

A photograph of an older man with glasses and a beard, wearing a blue denim shirt and a brown leather apron, working on a wooden chair in a workshop. He is holding a wooden seat board and fitting it into the frame of a chair that has a curved backrest. The workshop is filled with various wooden planks and tools, creating a warm, rustic atmosphere.

A Revolution in Chairmaking

When you separate the seat and back from the structure, it gets easier

BY MICHAEL C. FORTUNE

I have designed dozens of chairs during my career, and made several hundred. Whenever I design one, I strive to make it beautiful, comfortable, and strong. Meeting those goals often means the chairs are difficult to build, with parts meeting at compound angles. And then all those parts must be hand-shaped so they join seamlessly.

So, I began looking for a less complex way to make chairs, while remaining true to my design goals of beauty, comfort, and strength. In traditional chairmaking the legs, rails, seat, and back are part of a single unit, which complicates construction quickly. With this design, I borrowed from techniques developed in Scandinavia during the mid-20th century. By separating the seat and back from the legs and rails, you build the chair's base first and then

add the seat and back to it. As a result, the legs and rails can be square to one another, which simplifies the joinery. But the seat and back can be highly contoured for comfort, and then attached to the base with screws (I have a great technique for the shaping).

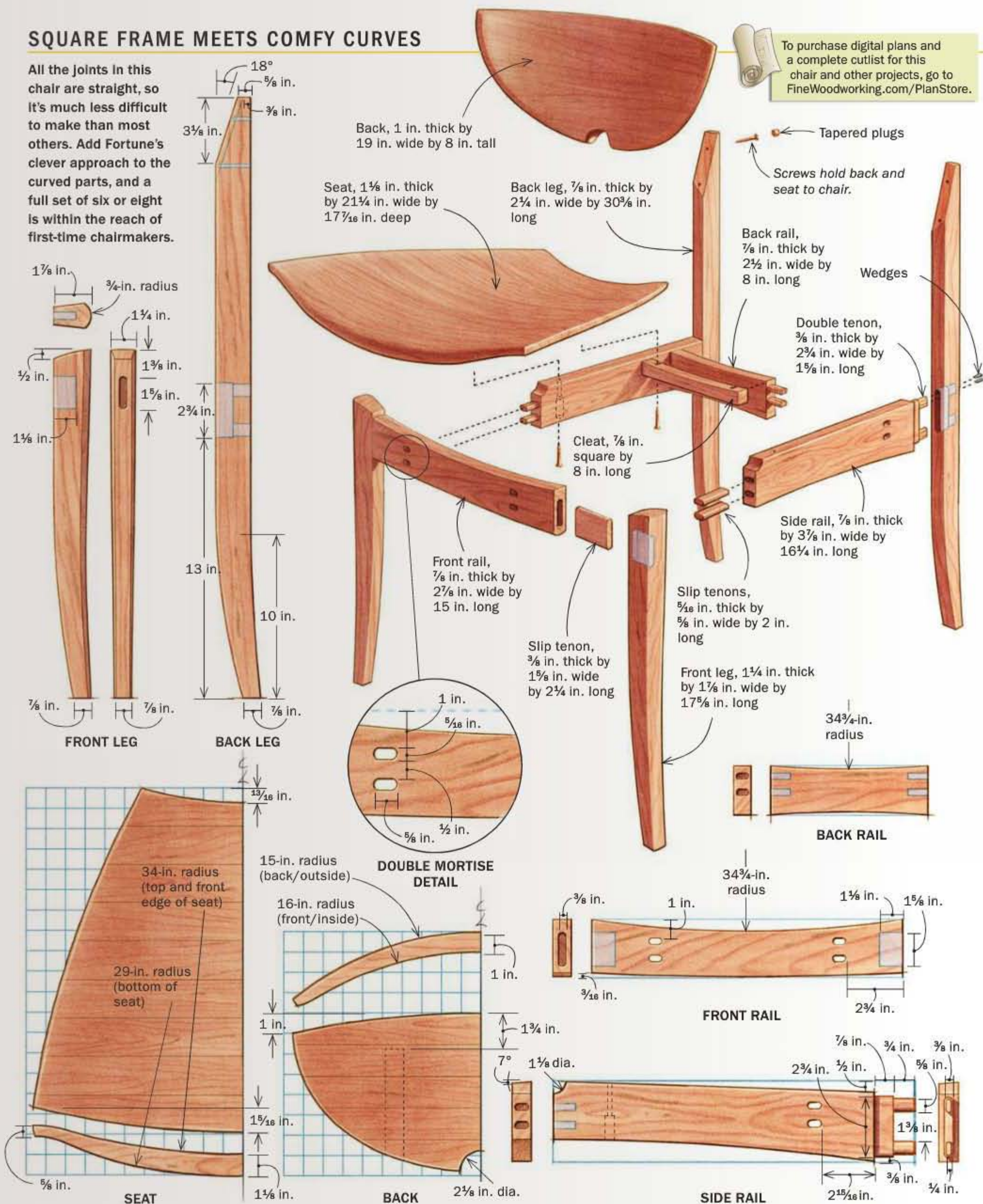
A chair like this is for a dining table, so you'll be planning to make at least four, but more likely six or eight. Since you're basically taking your woodworking into production mode, I'll show you some nifty jigs that will make the process go more smoothly and quickly.

I've now made a lot of chairs this way, and I couldn't be happier with the results. The basic structure and technique is flexible enough to accommodate a variety of designs. Best of all, even a

SQUARE FRAME MEETS COMFY CURVES

All the joints in this chair are straight, so it's much less difficult to make than most others. Add Fortune's clever approach to the curved parts, and a full set of six or eight is within the reach of first-time chairmakers.

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



Ultimate jig for slip tenons

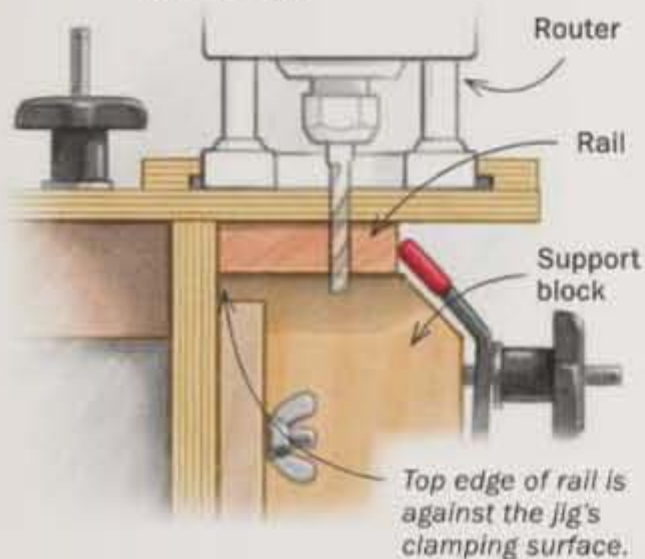
This jig's usefulness goes far beyond this article. We first presented it in *FWW* #197, but we've included it here for those of you without access to that issue.



ROUT THE DOUBLE MORTISES

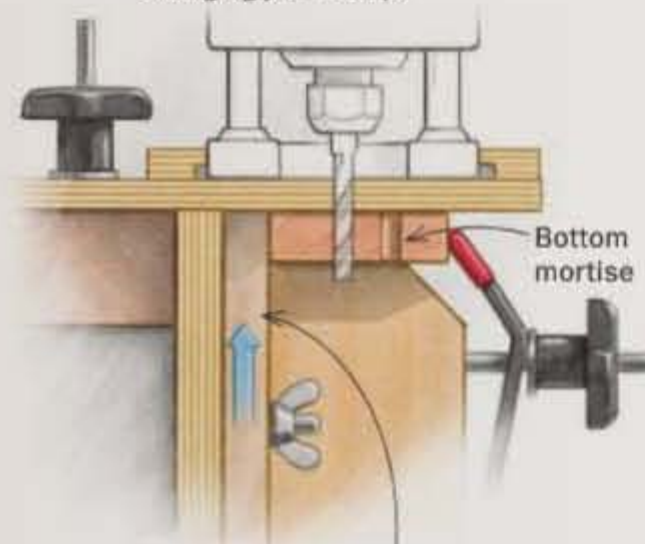
BOTTOM ONE FIRST

Set the jig for the mortise farthest from the top edge.



NOW ADD A SPACER

This lets you cut the top mortise without changing your setup.



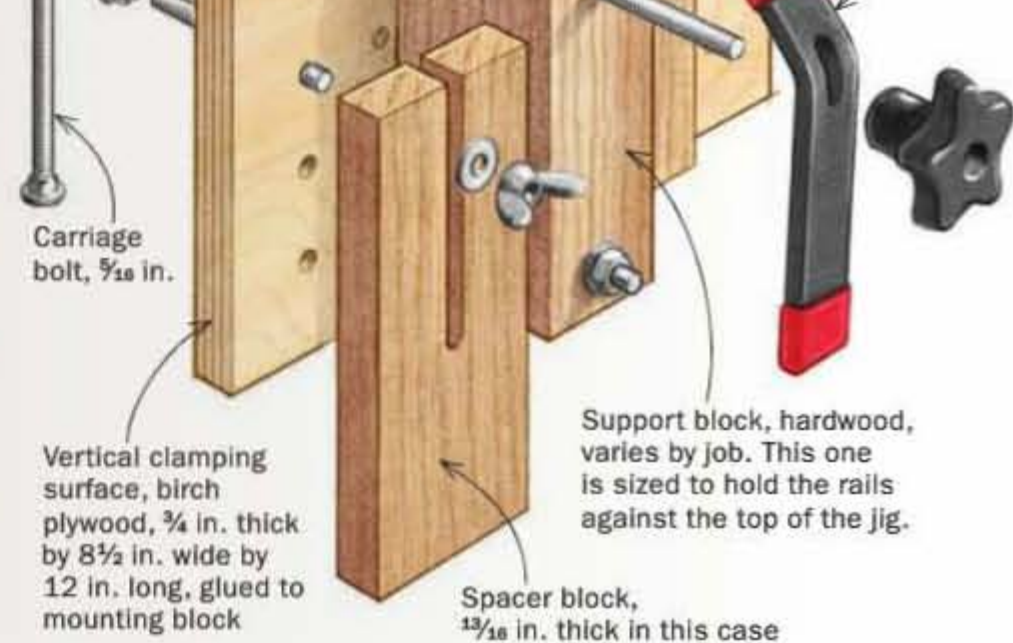
Add a 1 3/16-in.-thick spacer between the jig and top edge of the rail.



Lock the top of the jig. Then clamp the workpiece in place and rout the bottom mortise.



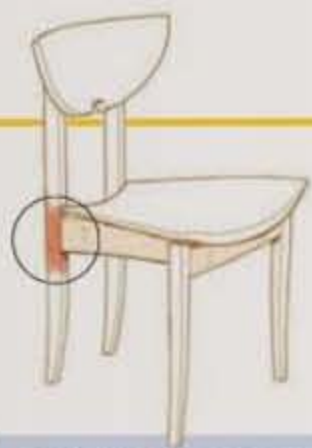
Space out for the second mortise. The spacer lets you keep the overall setup locked in and ready for the next workpiece.



END GRAIN MORTISES MOUNT VERTICALLY

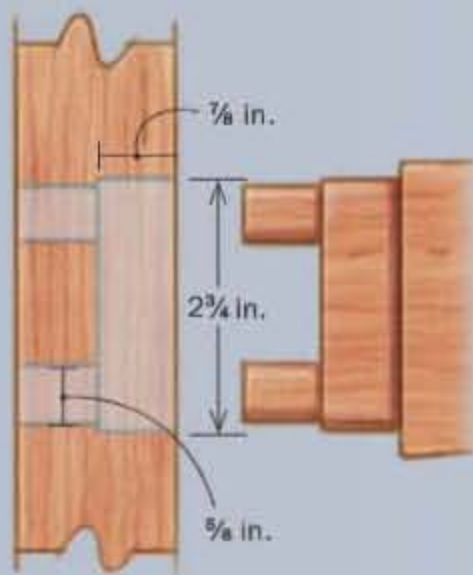
Rout the ends of the rails with the workpiece clamped against the support block, which stays exactly where it was when you were routing the face-grain mortises.





CUT THE STEPPED MORTISE AND TENON

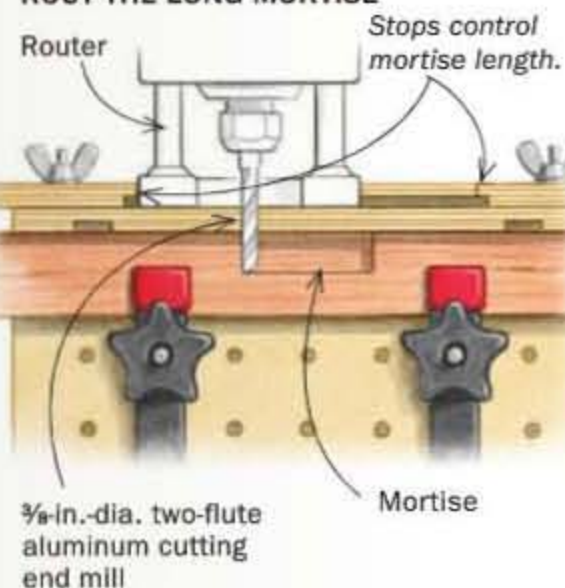
Had Fortune used a slip tenon here, the mortise in the end grain of the rail would be too close to the double mortises for the back rail, weakening the side rail.



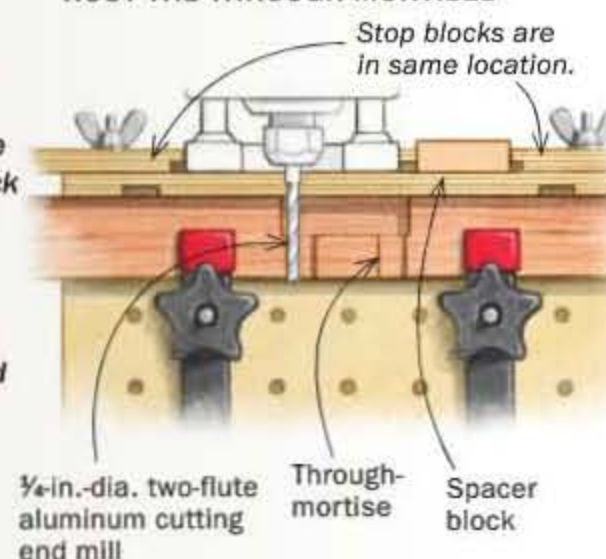
Mortise the back legs. Fortune adds a long piece of plywood behind the vertical clamping surface and notched to fit around the jig's mounting block, so he can use a stop block to quickly locate all of the legs (and that's a lot when you're making six or eight chairs).

Another spacer to the rescue. When routing the two through-mortises in the back leg, Fortune puts a small block in the jig to lock in their length. Switch it to the other end of the jig for the second mortise.

STEP 1: ROUT THE LONG MORTISE



STEP 2: ROUT THE THROUGH-MORTISES



novice chairmaker can use the technique and make great chairs right away.

One jig handles many mortises

The curved legs give the chair an air of complexity. But that's an illusion. The rails and legs meet at right angles and slip tenons hold them together, except for an integral tenon where the side rail joins the back leg. Making the joinery comes down to routing a bunch of straight mortises. The slip tenons are basically straight sticks planed to fit. As for the curves in the legs, don't sweat them. Use the drawings to get you close and trust your eyes when making templates.

While the legs and rails are still straight and square, but before routing the mortises, drill holes in the back legs and side rails for attaching the back and seat.

I rout all the mortises with the help of one shopmade jig, starting with the double mortises that join the side rails to the front rail. These are oriented horizontally, because vertical mortises cut across too much grain and weaken the rails. The double



CUT THE STEPPED TENON

Two-part cheeks. After cutting thinner cheeks at the end of the board, lower the dado set, adjust the rip fence, and cut the thicker base section of the tenon.

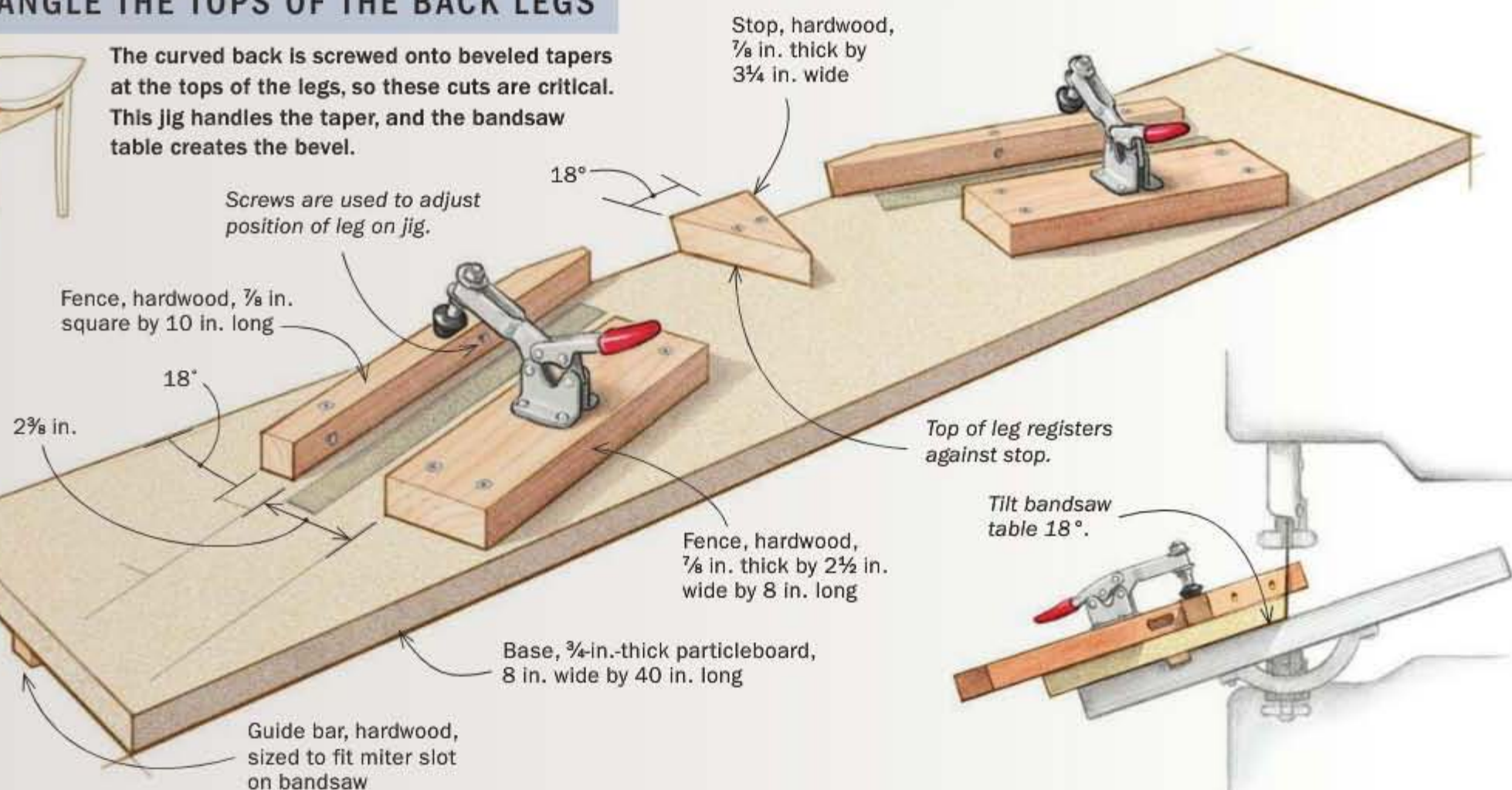
Form the double tenon. Fortune makes all of the cuts at the bandsaw, using diagonal cuts to clean out the waste between the tenons.

Jigs dial in the leg shapes, too

When you're making a set of chairs, it pays to make jigs for the repetitive tasks, especially shaping. Your parts are guaranteed to be exactly the same and you'll get them done much quicker.

ANGLE THE TOPS OF THE BACK LEGS

The curved back is screwed onto beveled tapers at the tops of the legs, so these cuts are critical. This jig handles the taper, and the bandsaw table creates the bevel.



One jig, two legs, two angles. The angled table (18°) and jig combine to cut a compound angle on both legs in one shot. A wooden guide bar on the bottom rides in the table's miter slot.

mortises are laid out so that the ones in the face grain and the ones in the end grain can be routed with a single setup on the jig (and a $\frac{5}{16}$ -in.-dia., two-flute aluminum-cutting end mill). The secret is a spacer.

Route the bottom mortises on the front rail. Then put the spacer between the rail and vertical clamping surface on the jig. This moves the rail out so you can rout the top mortises. I rout the entire through-mortise from one side of the rail, taking shallow cuts (about $\frac{1}{8}$ in.). I don't use a backer block, because I've never experienced tearout with this type of end mill (it is an upcutting bit). Just don't take too big of a cut.

Now rout the mortises in the side rail's end grain, adjust the jig's stop block, and rout the double mortises that join the back rail to the side rails. Then set up to rout the vertical mortises in the front legs. Put a $\frac{3}{8}$ -in.-dia., two-flute aluminum-cutting end mill in the router and adjust the jig to center the mortises on $1\frac{1}{4}$ -in.-thick material. Once that's done, adjust the jig to center the bit on $\frac{7}{8}$ -in.-thick material and rout the matching



CURVE THE FRONT LEGS

Fortune bandsaws all the curves on these chairs, cleaning up with hand tools where possible. For concave surfaces, he uses router templates.

Clean up with a router. A flush-trimming bit leaves a clean, fair surface.



Roundovers on the router table, too. Fortune uses part of a $\frac{3}{4}$ -in. radius roundover bit to put a softer edge on these front legs. The pin at rear helps him enter the cut safely.

mortises in the end grain of the front rail.

Finally, rout the mortise in the back leg for the integral tenon on the side rail. The tenon is stepped, with a large base section that carries the weight, and a pair of smaller wedged through-tenons that lock the joint. Rout the mortise for the tenon's base first and then the two through-mortises.

Time for tenons

To make the slip tenons, start with two blanks milled to the final thickness and width. Rip a groove down both faces of one blank. The grooves give the glue a place to go. Next, round over the edges of both blanks to match the ends of the mortises. Finally, cut individual slip tenons

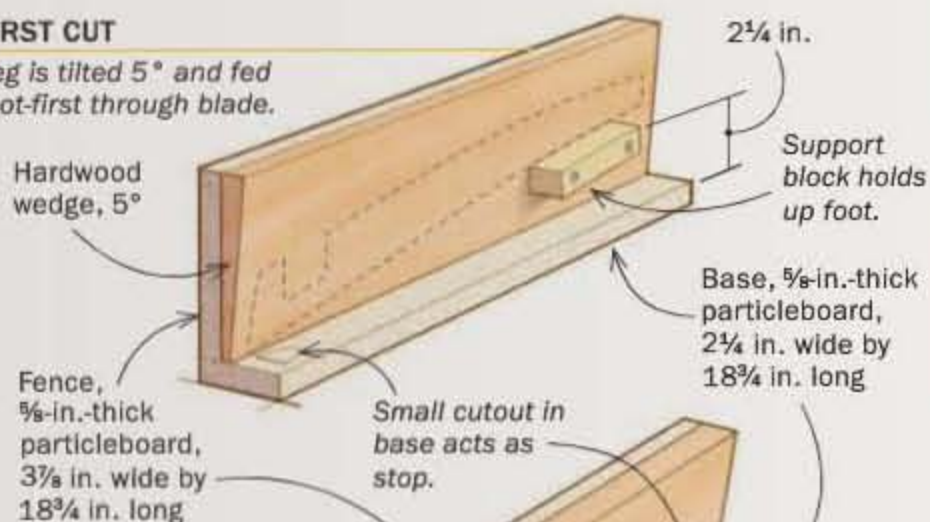
from the blanks. For the tenons that fit a stopped mortise on one end only, use a handsaw to cut a small kerf (with the grain) on that end. Now cut the integral tenon into the side rail. Start at the table-saw, cutting the cheeks with a dado set. Then head to the bandsaw and cut the two small through-tenons. Finally, cut slots

NOW TAPER THEM

With their curves cut, Fortune bevels and tapers the legs with sleds. He holds them in place by hand, reaching past the blade when necessary.

FIRST CUT

Leg is tilted 5° and fed foot-first through blade.



SECOND CUT

Leg is tilted 10° and fed top-first through blade.



Wedge-shaped fence is the key. Tilting the leg into the blade creates an angle on the side and raising the foot (pushing it farther out than the leg's top) cuts a taper along the leg's length.



Second jig for the second side. The wedge's angle is double that on the first jig, and the leg is fed through the blade top-first, so it's raised on the trailing end.



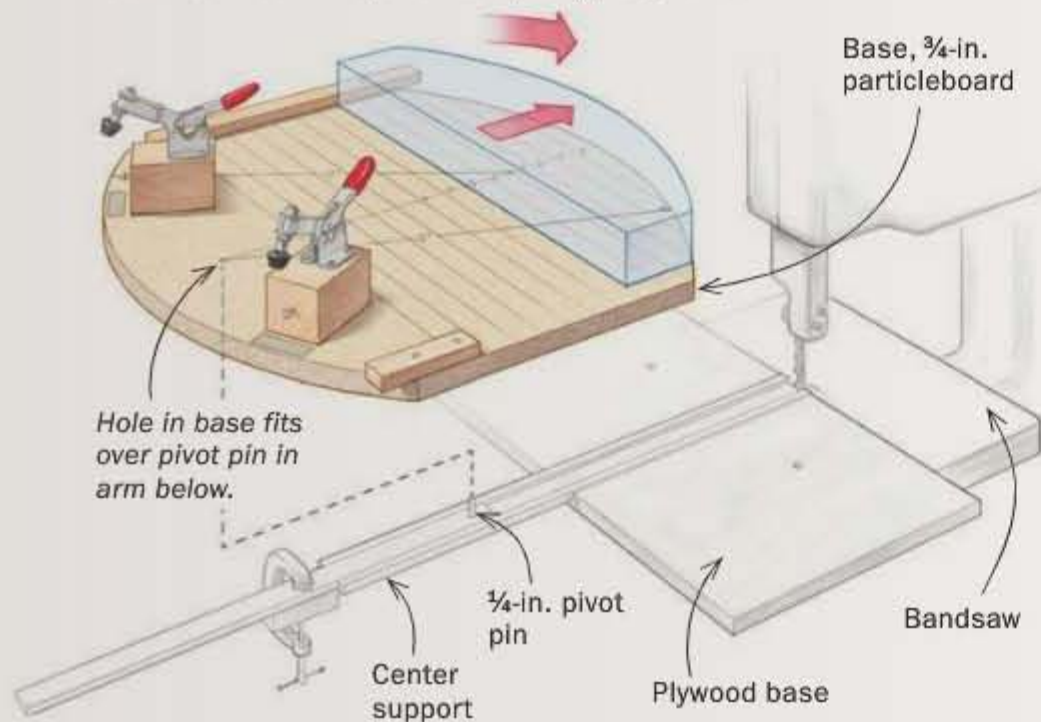
Curved seat and back: Stack and conquer

Rather than cooper the curved seat and back or sculpt them from solid slabs, both tedious techniques, Fortune cuts curved sections on the bandsaw and then simply stacks them. Little cleanup is required.

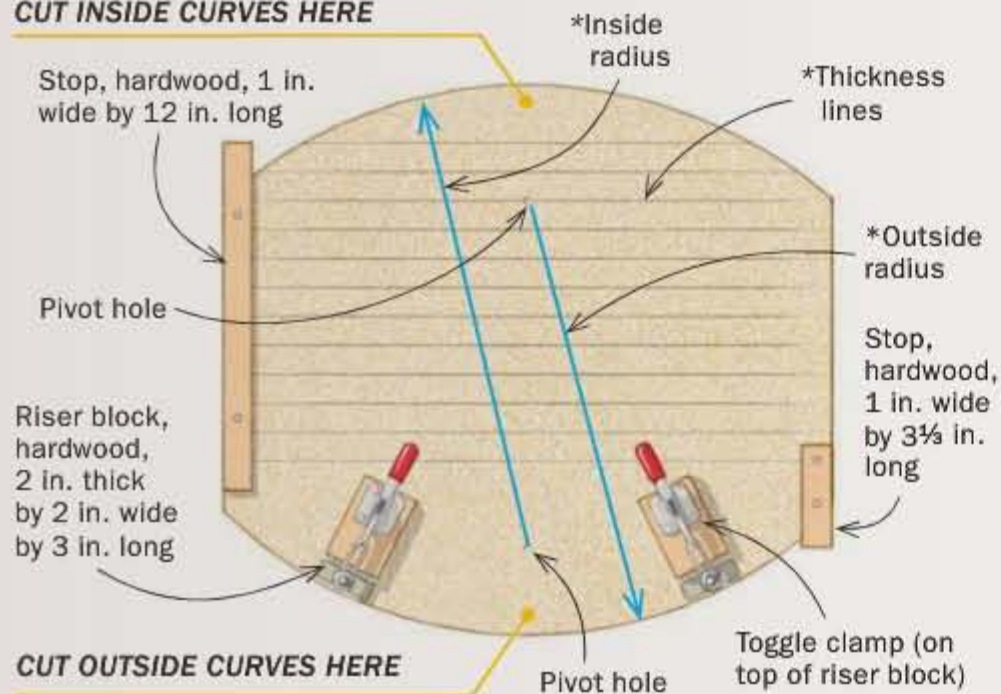
CUT THE SECTIONS

ANOTHER INGENUOUS JIG

You'll need two of these, one to form the curved sections for the seat, and the other to handle the slightly different curve of the back. Both jigs work the same. The seat jig is 24 in. wide by 36 in. deep with reference lines $1\frac{1}{8}$ in. apart. The one for the back is 21 in. wide by 19 in. deep, with reference lines 1 in. apart. *See plan (p. 65) for radii.



CUT INSIDE CURVES HERE



in the tenons for the wedges and make the wedges.

Shape the parts and assemble the base

Now shape the legs and rails. Start with the side rails, which have a beveled taper on their top edges to accommodate the curved seat. (The beveled edge sits higher than the front legs and rail so that the seat clears

them.) Then cut the compound taper at the top of the back legs to fit the curved back. Clean it up with a block plane.

Next, cut the curves on the legs. Trace the profile from a full-size template, rough out the shape at the bandsaw, and then clean up the curves. Convex curves are easily smoothed with a handplane, but concave curves are trickier. For those, I

use a template and rout the parts flush to it at the router table—making sure to always rout down the curve and with the grain.

The front legs are also tapered along their length and across their width. Both tapers can be done at once at the bandsaw. I use an L-shaped jig that has a tapered shim added to its vertical side.

The rails are much easier to shape. Just



SEE IT IN MOTION



Cut the inside curve first. No clamps are needed, because the force of the cut pushes the blank against the stop. But as the blank gets narrower, use a bit of hot-melt glue on the leading end.



Other side now. The other side of the jig has a smaller radius, so the blank ends up thinner at the edges than in the center, eliminating the need to taper it by hand.

GLUE AND SHAPE THE BLANKS



Clamp it up in sections. Fortune starts by gluing up pairs of ribs and then glues those together into a single blank. Cauls across the blank's width keep the ribs aligned, which makes it much easier to smooth it.



Cut it out at the bandsaw. Use hot-melt glue to hold the blank in place. Fortune puts the blank in the cradle first and then adds a few drops of glue along the seams.

USE A CRADLE FOR CONTROLLED CUTS

Again, you need one for the seat and one for the back.

Support, ½-in. particleboard, 4 in. wide by 19 in. long, curve on top edge matches outside radius of back

Base, ½-in. particleboard, 9 in. wide by 19 in. long

5 in.

1½ in.

trace the curve onto the bottom edge, cut it out at the bandsaw, and rout it flush to a template at the router table.

After shaping the legs and rails, assemble the base. Glue the front rail to the front legs. Next, glue the side rails to the back legs. Wedge the tenons. Then glue the back rail between the two side rails and wedge those tenons. This creates an assembly made up of the back legs, back rail, and side rails. Let the glue dry. Finally, glue and wedge the side rails into the front rail. After the glue has dried, trim all of the wedges and tenons, cutting them close with a handsaw and handplaning them flush.

The secret to a comfortable seat

A chair is either made or broken by how comfortable it is. With traditional methods,



Soften the edges. Fortune hogs off most of the waste with a Shinto saw rasp and then follows up with files (left) and sandpaper. To smooth the curves, use a sanding block that's been shaped to match the radius (right). Wrap the sandpaper around the ends of the block and staple it in place.



Assemble in stages

To avoid making an unintentional rocking chair, glue up a single joint or subassembly at a time. Then add subassemblies together for a square, solid chair.

Slope the walls. Use a rat-tail file with a diameter that matches the bit used to rout the mortise— $\frac{5}{16}$ in. for all but those mortises on the back legs (use a $\frac{3}{4}$ -in.-dia. file there). An angled guide block ensures that the shape is correct.



Put glue in the mortises. Spread some on the area around the joint, too, but not on the tenons. They'll swell and the joint will be much harder to get together. Assemble the front legs first. Fortune elevates the parts and uses shaped cauls to create a flat surface for clamping and protect the legs from the clamp heads.



Then glue the side rails to the back legs. Don't use a caul over the through-tenons. They need to stick out a bit for the joint to be pulled tight. Hammer in the wedges right away. After the glue is dry, the tenon won't spread for them. Also, sink them all the same amount so that after being flushed to the leg they are same thickness (looks better than wedges that vary in thickness).

shaping the seat and back for comfort is difficult, but the technique I use on this chair makes it easy.

Both the back and seat are made by cutting curved ribs from large blanks and then stacking them on edge and gluing them together to create a curved blank. The concave side becomes the scoop that your back and backside rest against.

Because both the back and seat are made in the same way, I'll show you how to make only the back. Start with a flatsawn board. The grain exposed by the bandsaw cuts will complement the curve. Also, the board should be wide enough to

make all of the ribs (use a second board for the seat).

To cut the curves, I use my bandsaw and a modified circle-cutting jig. It has a large base that pivots on a center point. The blank sits on top of the base as I feed it through the blade. I then advance the blank 1 in. closer to the blade and make a second cut to free another rib. Repeat until you've cut out all of the ribs. The outside curve is cut from the other end of the base, so rotate it, adjust the centerpoint, and cut the curve on all of the ribs.

Next, edge-glue the ribs together to make the curved back blank. I do this in steps, first gluing up the ribs in pairs. Then glue all



Finish the base and attach the back. When gluing the back rail between the side rails, Fortune dry-fits the front leg assembly to keep things square (left). Then, when gluing on the front legs, he clamps a board to the back rail (center), providing a large, flat clamping surface so that he can get a clamp on both sides of the two joints. Finally, the back gets pilot holes for the screws, making it easier to get the screw in (right) and preventing splits along the grain.

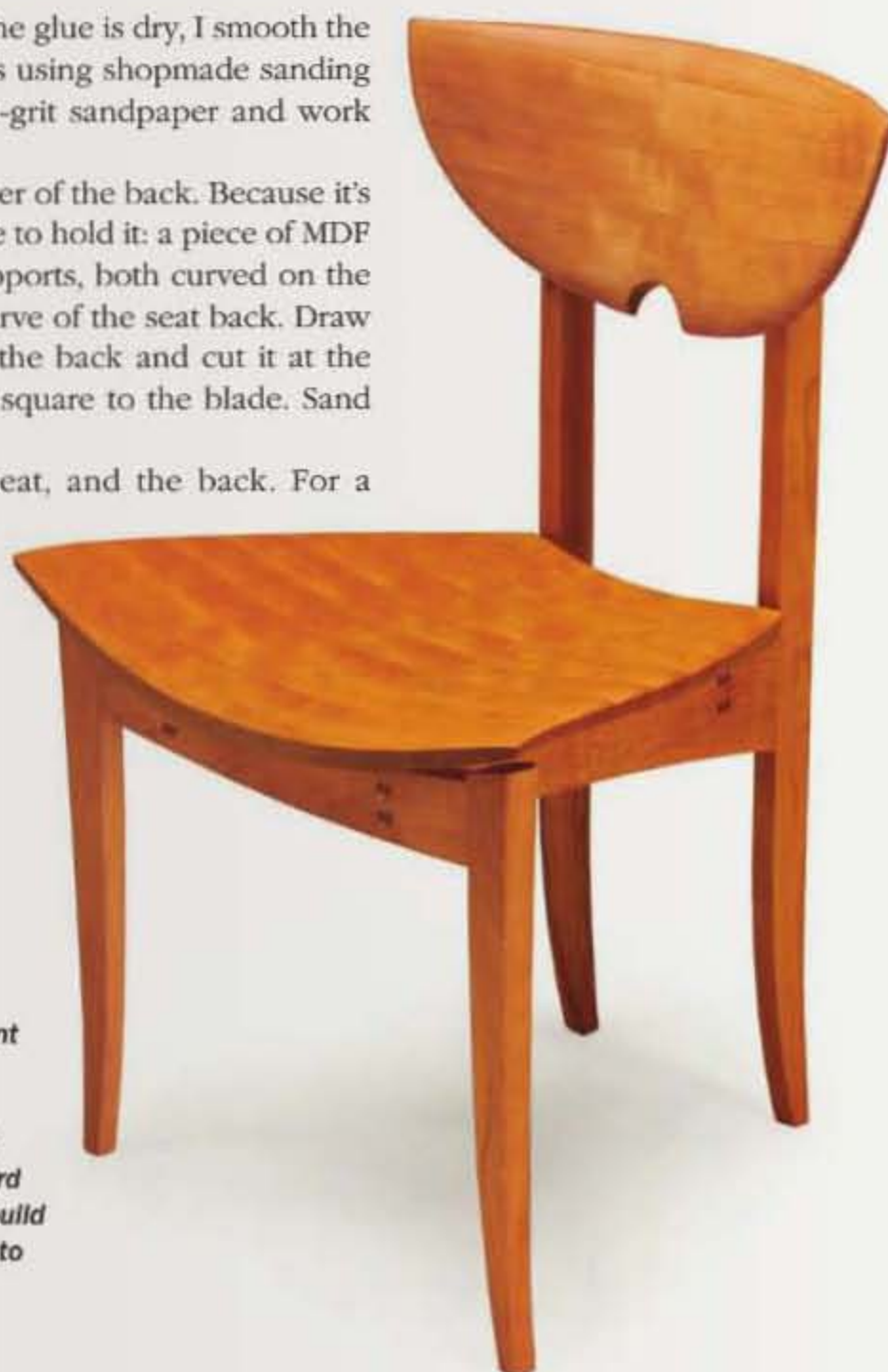
the pairs together. After the glue is dry, I smooth the inside and outside curves using shopmade sanding blocks. I start with P120-grit sandpaper and work up to P220-grit.

Now shape the perimeter of the back. Because it's curved, you need a cradle to hold it: a piece of MDF for the base and two supports, both curved on the top edge to match the curve of the seat back. Draw the perimeter shape on the back and cut it at the bandsaw, with the table square to the blade. Sand the cuts smooth.

Finish the base, the seat, and the back. For a chair like this, I use Watco Danish Oil. Then screw the seat and back in place. □

Michael C. Fortune is a contributing editor.

Smart comfort. Reminiscent of the classic chairs found at cafés, Fortune's design combines a welcoming seat and back with straightforward joinery. It's a chair you can build and that everyone will want to sit in.



EASY TO CHANGE THE LOOK

A café-style chair isn't right for every dining table, but by adding 1½ in. to the height of the back legs and adjusting the back's dimensions, you get a more traditional dining chair.



Curved Moldings on the Router Table

Over-arm jig lets you form complex profiles with standard bits



BY W. MICKEY CALLAHAN

Whether it's a gooseneck molding for the top of a tall clock or handsome trim for an arched opening between two rooms, curved molding has long been a challenge to cabinet makers and trim carpenters alike.

If time is no constraint, you can make molding the traditional way: by hand with carving gouges. If money is no object, you can have shaper bits custom-ground to your desired profile. For everyone else, a simple over-arm guide on the router table is the way to go. A small tube acts as an adjustable bearing surface suspended

over the cutter. In turn, you guide a template, which you attach to the workpiece, against the tube. It's basically an upside-down, shopmade version of a commercial pin router. Using off-the-shelf router bits with this jig, you can create almost any curved molding profile.

Decide on the design, then make a template

Your first task is to create the molding's profile or cross section. If you're making an exact replica, look for router bits that match each section of the profile as closely as possible to



PERIOD DETAILS

One jig, many uses

Gooseneck molding is but one use for this over-arm router jig. You can add style to a room with arched doorways and entrances outlined with elaborate molding. Subtle curved profiles also work well on some contemporary pieces. Whether you are starting from scratch or replacing missing moldings, you can use this jig.



CLASSIC ARCHITECTURAL ELEMENTS



CONTEMPORARY FURNITURE

To see how to make a master template with parallel curved edges, go to FineWoodworking.com/extras.

ACCURATE TEMPLATES ARE THE KEY

One master template can lay out many pieces with the same front profile, but you need to make a separate router template for each piece of curved molding. That said, the back edge of the template can be used to rout straight return moldings.

MAKE THE ROUTING TEMPLATE



One template creates two others. Use the completed master template to create the pair of templates that actually guide the blanks that will form the left- and right-side moldings.

ATTACH THE MOLDINGS



Rough out the curved stock. Before attaching the templates to the blanks, use them to draw the outline of the curved molding (left), and then bandsaw just outside the line (right).

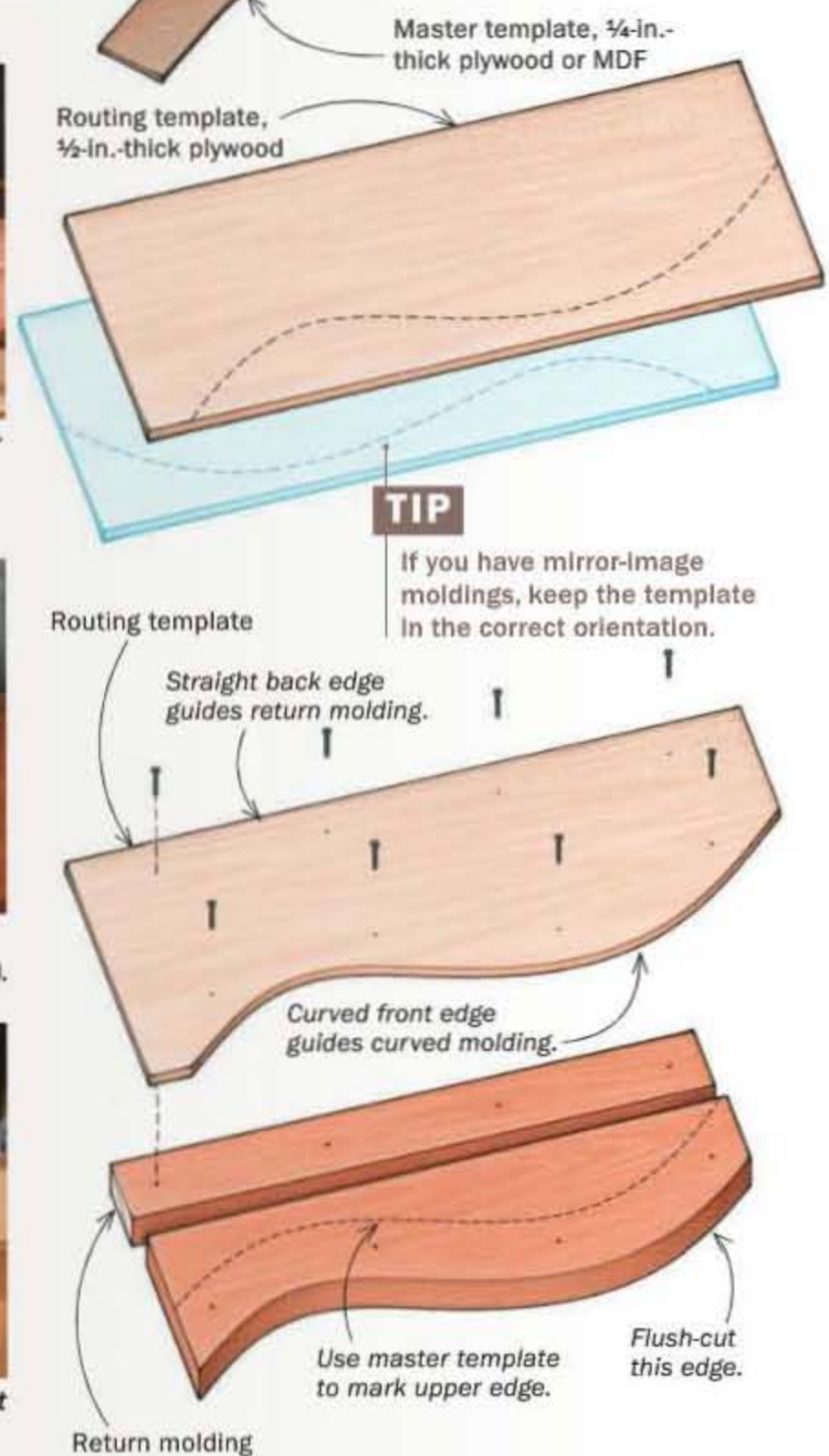


Flush-cut the curve. Screw the template to the blanks (left), then use a flush-trimming bit to bring the blank even with the template (right). The over-arm jig won't work accurately unless this is done.

minimize cleanup scraping. If you create your own design, feel free to adjust it closer to bits you already own. For the gooseneck molding on my Philadelphia-style secretary, I chose a commonly used crown profile: a large cove flanked by an ogee at the top and a thumbnail at the base.

With the cross-section profile drawn, you need to determine the molding's front profile—its length and the radii of its curves. Create a full-size master template out of 1/4-in.-thick plywood or MDF. Extend the template a few inches at each end and ensure that the edges are smooth, square, and parallel over its entire length.

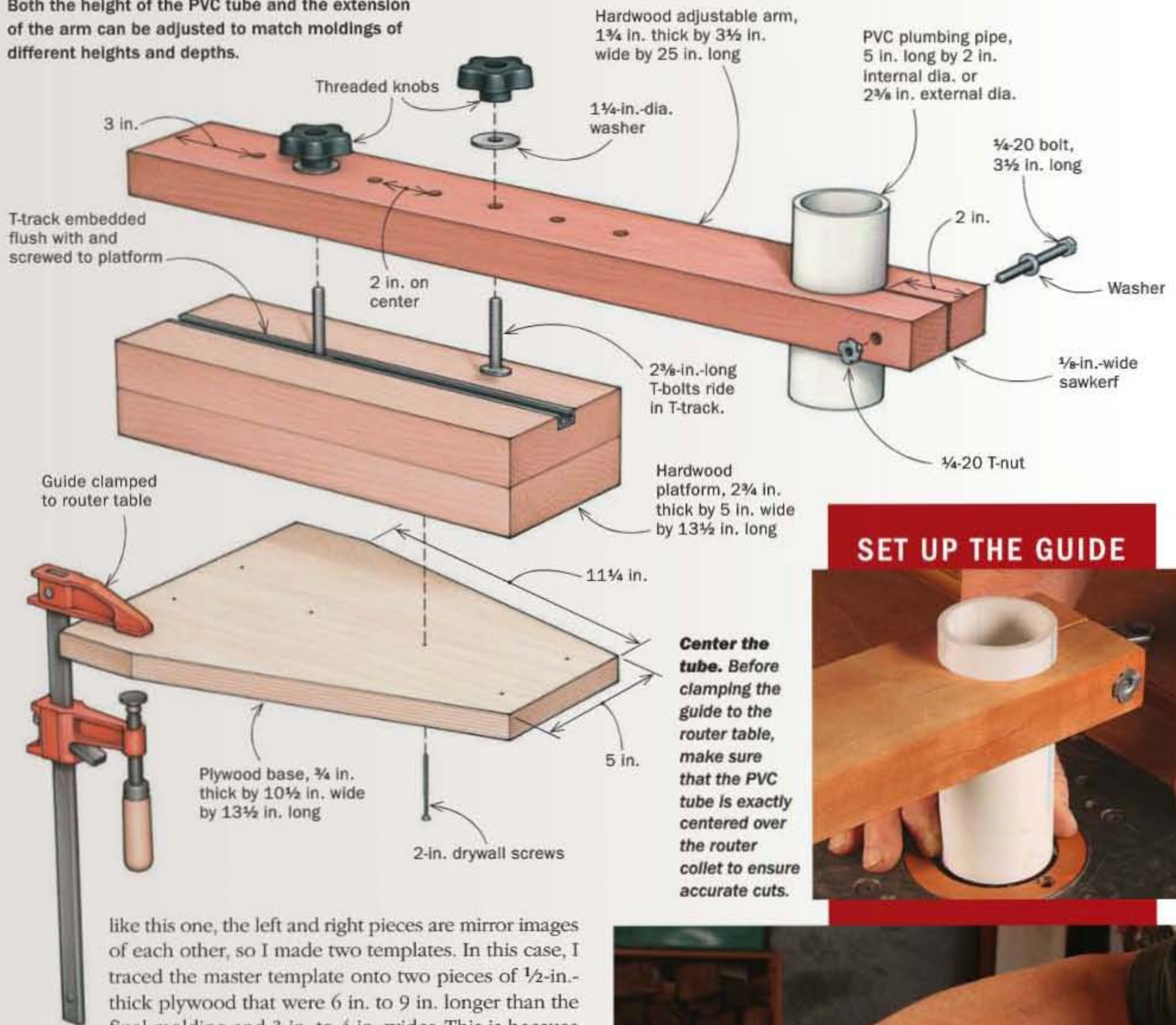
You now need to create the routing templates that will attach to the workpieces and guide them. For a gooseneck



Mark the upper edge. But don't cut along this line yet. A wide blank will be more stable on the router table.

ADJUSTABLE OVER-ARM ROUTER GUIDE

Both the height of the PVC tube and the extension of the arm can be adjusted to match moldings of different heights and depths.



SET UP THE GUIDE

Center the tube. Before clamping the guide to the router table, make sure that the PVC tube is exactly centered over the router collet to ensure accurate cuts.



like this one, the left and right pieces are mirror images of each other, so I made two templates. In this case, I traced the master template onto two pieces of 1/2-in.-thick plywood that were 6 in. to 9 in. longer than the final molding and 3 in. to 4 in. wider. This is because the routing template was also used to create the return molding that attaches to the lower end of the gooseneck molding.

Bandsaw 1/32 in. outside the traced line. Now mount the master template on the plywood with either brads or double-sided tape, being careful to line up the template on the traced line. Use a pattern or flush-cutting bit with the bearing riding along the master template's edge to cleanly flush-cut the routing template's edges.

Prepare the stock and attach it to the templates

The stock needs to be wide enough to accommodate the curve, thick enough to accommodate the profile, a few inches over in length, and with the grain running parallel to the central section of the curve. In this case, I also needed stock for the return moldings.

For long architectural molding, you will need to join pieces of wood together end-to-end. You can do this before the shaping using splines or bricklaying the piece, or you can simply shape



Bite-size cuts. Adjust the height of the tube until the bottom is just above the lower edge of the template. Then slide in the adjustable arm as shown to set up a manageable cut.

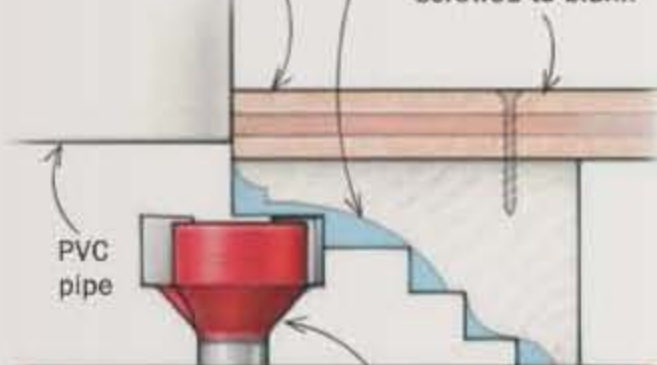
SNEAK UP ON THE PROFILE WITH A VARIETY OF BITS

1 ROUGH IT IN

The blanks should be extra-long, giving you a place to start and stop.

Draw the desired profile on the end grain.

Routing template screwed to blank



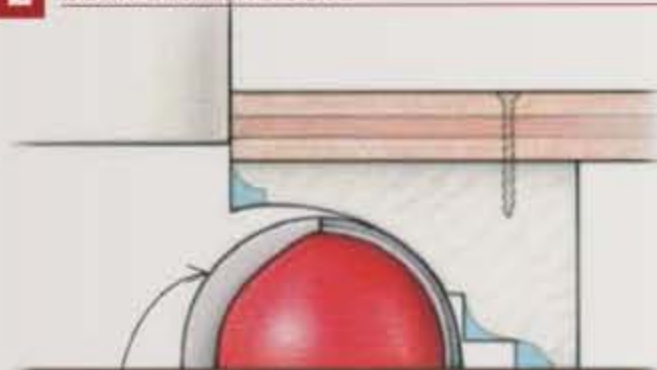
1 1/4-in.-dia. mortising bit; Freud No. 16-108

Whether you are reproducing an existing profile or designing a profile to match your router bits, you'll need to draw the profile on the end grain and sneak up on it by moving the arm and changing router bits.



Rough out the waste in steps. Don't try to remove too much at once. Make a series of passes to rough in the profile.

2 COMPLETE THE COVE

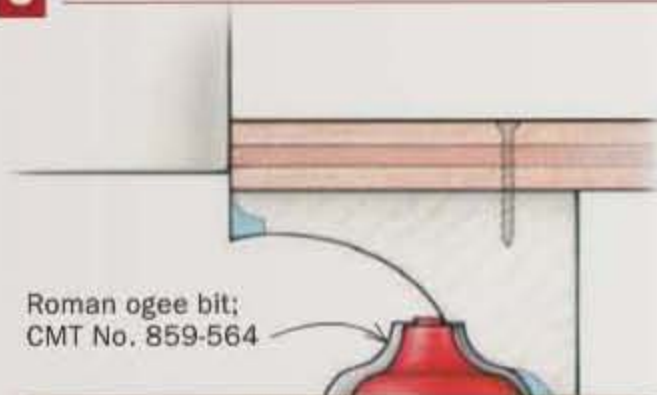


2-in.-dia. core-box bit; Freud No. 18-138



Big and fast. A large core-box bit is fast and clean. A small bit will take more passes and leave more irregularities to be scraped.

3 NEXT SECTION

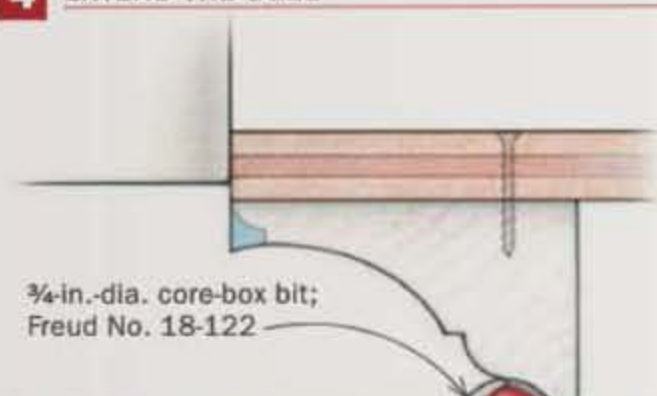


Roman ogee bit;
CMT No. 859-564



Modify the bit. Callahan used a Roman ogee bit with the bearing and stem removed.

4 EXTEND THE OGEE



3/4-in.-dia. core-box bit;
Freud No. 18-122



Refine the shape. You can use a 3/4-in.-dia. core-box bit to extend the ogee profile.



5 FINAL FEATURE

Complete the profile. Callahan flipped the workpiece over so that the template was riding the bearing of the bit when cutting the thumbnail profile.

Thumbnail with bearing bit;
Freud No. 85-344



CREATE THE PROFILE CONTINUED



Blend and smooth with a scraper. A gooseneck scraper is ideal for cleaning up the different parts of the profile.



Period details. This traditional gooseneck molding gets a few more touches. Use the master template and a nail (above) to mark the location of the rosette at the top, and bore the hole using a Forstner bit whose diameter matches the rosette (right).



smaller, more manageable pieces and splice them together later. Curved stair railings are a good example. Either way, avoid any short-grain or cross-grain stock that can weaken the structure.

Keeping in mind that there would be right and left moldings, I traced the curved outline of each routing template onto the stock, making sure to label the templates and stock accordingly. Once you've done this, bandsaw the stock to within $\frac{1}{32}$ in. of the traced lines, and screw them to the routing templates with their bandsawn edges slightly overhanging the templates' edges. Make sure the screws are placed to avoid being hit later by a router bit.

Before you screw on the return stock, paint the end that will enter the router bit white, and when dry, trace the outline of the molding's profile onto it. This outline allows you to position the guide arm and the router bit very accurately for each cut.

The return pieces stabilize the template on the router table. If you don't need return pieces, attach support blocks the same height as the curved stock.

With a flush-trimming bit, trim the curved edges of the stock flush. On the back side of the gooseneck pieces, align and trace the outside or upper edge of the master template. This determines the finished width of the molding.

Set up the guide and cut

Clamp the over-arm guide jig to the router table, and extend the arm until the PVC tube is centered over the collet. The face of the tube acts as a bearing surface for the template. It is imperative that you keep the same contact spot on the tube throughout the cut and not pivot the jig around that



Cut out the molding. Bandsaw just outside the line that you drew before cutting the profile (see p. 75).



Trim the top edge. Attach the master template to the top edge of the molding and use it to guide a flush-trimming bit to clean up the top edge. Raise the bit to finish the job.

spot. Ideally, this spot should be at the point of the tube farthest from the back of the router table.

Using a 1-in.-dia. mortising or straight bit, I removed stock inside the molding's cove profile, as shown on p. 77. You can create a series of step-cuts by adjusting the height of the bit and the in/out position of the arm guide. Make sure all four blanks are cut before changing the height of the bit or the arm guide's position. You can also establish the fillet between the cove and ogee using this bit. Next, I installed a cove or core-box bit. Ideally the bit should have a cutting radius close to the curvature of the cove, but you can use a smaller bit and make several overlapping cuts. You can come back later and fine-tune the coved surface with a curved cabinet scraper or sandpaper.

I created the ogee profile in the same manner. Again, you can use smaller radius bits if you can't locate a single bit that matches the desired shape.

Final shaping and assembly

With the pieces still attached to the templates for stability, use a gooseneck scraper to refine the curves. If you use sandpaper, be careful not to round over the profile.

Remove all the sections from the templates, and set aside the return pieces. If your gooseneck molding terminates in a rosette, (see Master Class: "Carve a rosette," *FWW* #194), cut away the tip of the molding on the drill press with a bit whose diameter matches that of the rosette.

To create the top edge of the molding, bandsaw close to the traced line you drew earlier, and then attach the master template and use it to guide a flush-trimming bit. By making the moldings overlong as recommended, you now have plenty of excess stock on which to practice cutting the miters. While the bottom miter is usually close to 45°, the upper miter (if there is no rosette) is usually a compound angle that requires some trial and error.

Now that curved moldings hold no fear, go ahead with that highboy, build that classical entryway, and trim that arched built-in. □

W. Mickey Callahan is a period-furniture maker in Massachusetts.

Mitering a curved molding



Mark the corner. With the curved part of the molding clamped in place, mark a 45° line from the cabinet corner.

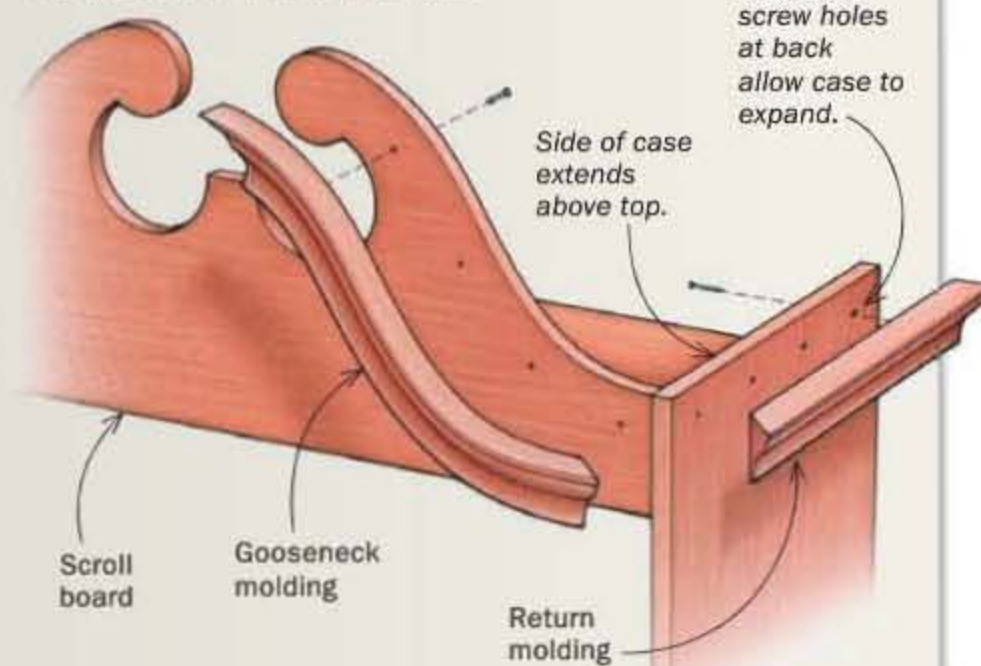


Cut the miter. Clamp both ends of the molding to the chop-saw's fence and then cut the miter. The left clamp is behind the author's hand.



A fussy fit. Sometimes the miter joint fits right the first time. If not, you may need to trim the cuts or modify the profile until the corner comes together.

ATTACHING THE MOLDING



readers gallery

LARRY GREWE AND JOSEPH CORSON

Meeting, Pa.

Neighbors Grewe and Corson talked about making this Pennsylvania secretary together for about four years before Corson, 90, convinced Grewe, in his early 70s, to go for it. Being the less-experienced furniture maker, Grewe was a bit reluctant to take on the challenge. "Then I realized that to work on it with a friend and neighbor would be a true learning experience and stretch my abilities," he said. They chose cherry, because it is a bit less formal than the walnut used in the Lonnie Bird piece that inspired it (*FWW* #154, 155, 156). The piece is 21 in. deep by 38½ in. wide by 85 in. tall; it is finished with tung oil.

PHOTO: AARON AND MATTHEW GREWE



KYLEE SEBREE

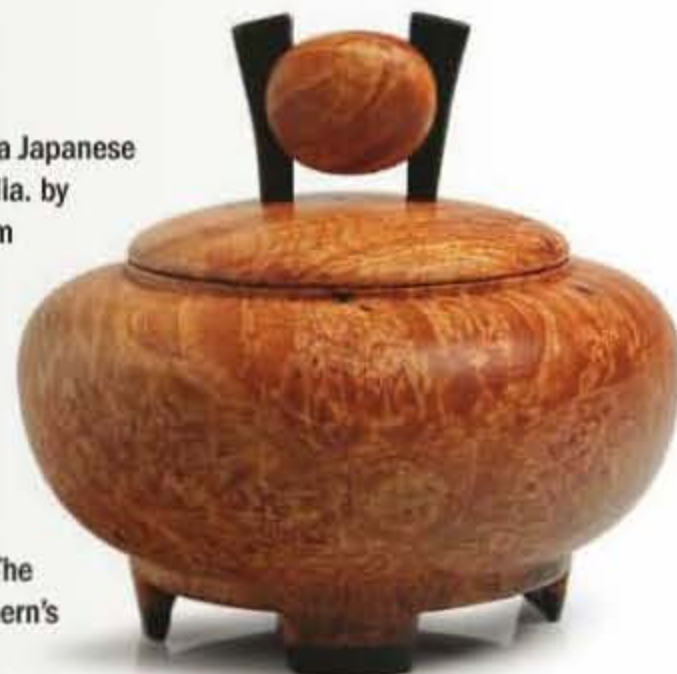
Escondido, Calif.

This Krenov-inspired cabinet on stand (10¼ in. deep by 23 in. wide by 45¼ in. tall) was Sebree's final project at the Inside Passage School of Fine Woodworking in British Columbia. Sebree says he enjoyed making the veneered carcass appear as one piece. "I looked at that plank of European cherry for months, noticing the slight inward bend in the grain, so when I finally decided on the wood I knew it was going to be a curved piece," he says. The outside of the cabinet and the doors are cherry; other woods are Port Orford cedar, Afromosia, Italian olive, and sycamore. The finish is shellac and wax. PHOTO: INGEBORG SUZANNE

DAN SOUTHERN

Huntington Beach, Calif.

A stone lantern encountered on a trip to a Japanese garden inspired this turned box (5½ in. dia. by 7½ in. tall). But the handle was born from another source: a photo of a pendant in a jewelry-making book. This is typical of Southern, who often blends contemporary lines with primitive art styles in his pieces, which include intricate carved insect sculptures, tikis, masks, and other sculptures. This box is made of big-leaf maple burl and ebony. The finish is linseed oil. To see more of Southern's work, go to woodenaddictions.com.



PETER MARCUCCI

Woodbridge, Ont., Canada

A Charles Rohlf's 1898 desk chair inspired Marcucci to make these mahogany chairs. As he made each one, he changed the design of the back and other details. The first (center) shares the same back shape and cut-out design as the original Rohlf's, although it is not as elaborate. The second (left) has a simpler back, with a walnut center and trim. The third is based on a flatware pattern Marcucci admired. The chairs are 16 in. deep by 15½ in. wide by 47 to 51 in. tall; they are finished with oil-based stain and urethane.



GEREMY COY

Washington, D.C.

Modeled after a Shaker sewing chest, this cabinet was made to hold a Japanese teapot and cups. The top is a cherry slab, sliced from the log where two branches flowed together; the dark crack along the center shows that meeting place. The structure of the carcase is cherry, the drawer fronts and side and back panels are fir, and the drawer pulls are wenge. Coy made the piece by hand—including the milling and resawing. He allows that the lumberyard used electricity on the wood before he got it, but "once it entered my studio, I only touched it with hand tools." The cabinet is 18 in. deep by 37 in. wide by 36 in. tall; the finish is an oil/varnish blend and wax.

GREG BROWN

Deerfield, N.H.

This carved urn stand (11½ in. dia. by 30 in. tall) was built to sit beside a Samuel McIntire parlor chair that Brown made a few years ago with a simple function: to hold a drink, and it, too, is based on a McIntire piece. The stand has a number of challenging turned and carved elements. The column and base feature five different types of foliage, with a grape-leaf motif descending the shaft. The base was coopered to avoid end-grain carving and, Brown says, "to provide an efficient use of my precious mahogany." The finish is shellac and wax. PHOTO: MARK SCHOFIELD



JOEL SHEPARD

Seattle, Wash.

This tansu entertainment cabinet (26 in. deep by 72 in. wide by 96 in. tall) offered Seattle designer and builder Shepard the perfect way to indulge his “fascination with all-things Japanese and explore my curiosities even further.” The piece conceals a wide-screen television and stereo components, with plenty of room for storage.



The wood is elm, the traditional hardware was imported from Japan, and the finish is aniline dye, walnut stain, and lacquer. The piece was commissioned by a longtime—and very patient!—Shepard adds—client. It took him approximately 1,200 hours to build! PHOTO:

RAIN GRIMES



NICK BOYNTON

Missoula, Mont.

Boynton has made several variations of this hall table (16 in. deep by 30 in. wide by 29 in. tall), including dining tables and coffee tables, based on a Japanese Torii arch. This one is curly walnut veneer and solid wood, finished with oil and lacquer. Boynton says people often ask how he mortised the curved stretchers through the curved legs. He bandsawed the parts, laid the stretcher over the legs, and recorded the mortise angle with a bevel gauge. Then he marked how far the leg needed to slide onto the stretcher, and tapered the stretcher slightly so it would slide in tightly with no glue needed. The top is attached with a dowel at each leg.

Submissions

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

RAYMOND FINAN

Arlington, Vt.

When Finan set out to design a triangular table (19¾ in. deep by 21¼ in. wide by 26¼ in. tall), his first thought was to give it straight sides and square, tapered legs. Then he decided to soften the triangle with slightly bowed sides. The quick sketch reminded Finn of something



Inspiring engine. The curve-sided triangle on Finan's table is also at the heart of the Wankel rotary engine.

In his car-racing background: the rotor in a Wankel rotary engine. Searching online, Finan discovered that the sweet shape he'd stumbled upon for his tabletop was a Reuleaux triangle, a form well known among mathematicians and gearheads if not among woodworkers (you can see some of its unusual properties demonstrated at: <http://whistleralley.com/reuleaux/reuleaux.htm>). In addition to

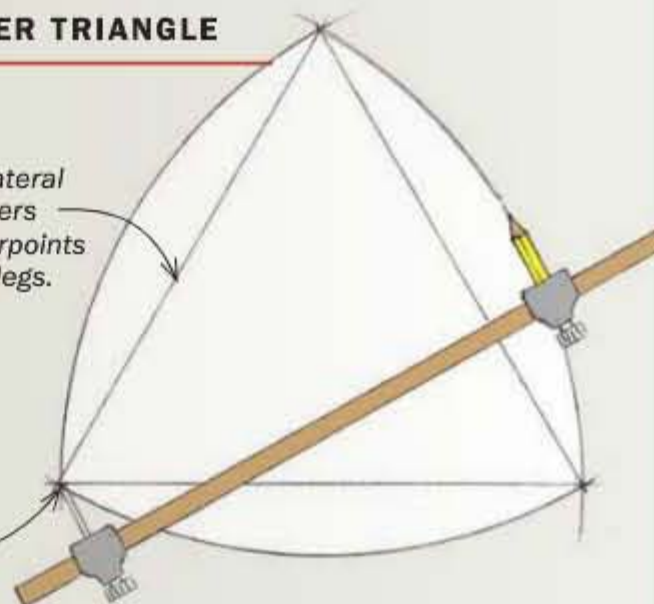
making Finan's table more distinctive, the Reuleaux shape made it more functional by adding to its surface area. The shape is easy to lay out using trammel points (right). To make the legs more compatible with the curves of the tabletop, he decided to turn and taper them. Finan made the tabletop from an old board of curly ash and the legs from white oak stained to simulate the look of fumed oak.



A SOFTER TRIANGLE

First, draw an equilateral triangle whose corners represent the centerpoints of the table's three legs.

Then, using a compass or trammel points, place the pin on each corner of the equilateral triangle in turn, sweeping arcs that connect the other two corners.



ZACH MALCOLM

Portland, Ore.

Malcolm says this mahogany sideboard (24 in. deep by 72 in. wide by 36 in. tall) was the most involved furniture project he has tackled. He set out to use simple curves in the top, rails, and stiles, and balance them with the symmetrical drawer array. It took him about 300 hours to make the piece, which is finished with oil and shellac. The drawer pulls are ebony.

PHOTO: GARY ROGOWSKI

Designing dovetails for strength and style

Q: Do I really need to use higher angles when I'm cutting dovetails in softwoods like pine? Does the dovetail angle affect the strength of the joint?

—BILL FONTANA, Worcester, Mass.

A: NO. ALTHOUGH SOFTWOODS ARE MORE compressible than hardwoods, you needn't change the dovetail angle to add strength to the joint. Any angle between 7° and 15° will work, regardless of the wood. But stay within that range. If you go below 7°, you'll start to lose the mechanical strength of the dovetail. Go above 15°, and you'll leave too much short grain at the tips of the tails, which weakens the joinery.

Thin stock is perhaps the one exception. If you're dovetailing stock less than 1/4 in. thick, go with at least a 10° angle. It increases the glue surface and strengthens the joint—but only slightly.

When it comes to making a strong dovetail joint, the spacing and size of the dovetails is far more important than the angle. The trick is to balance that strength with aesthetics, which means finding the sweet spot between two extremes.

At one extreme are skinny, widely spaced dovetails. They look hand-cut, but the joint is weak because most of the material has been removed from the pin board while nearly none has been removed from the tail board. The other extreme is removing roughly equal amounts from the pin and tail boards. Doing so produces a mechanically strong joint, but one that looks machine-cut, and to my eye, unappealing.

The art of dovetailing is to aim somewhere between those extremes. The ultimate goal is a strong joint that looks handmade.

—Christian Becksvoort is a contributing editor.

Ask a question

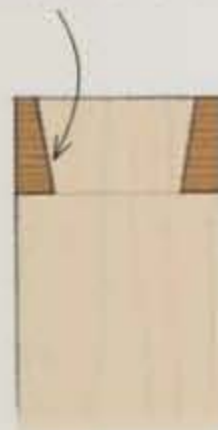
Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.



Keep the ratios right. For a strong, handsome dovetail joint, spacing is more important than the angles of the pins and tails.

A RANGE OF ANGLES WILL WORK

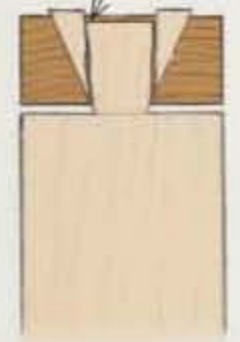
Anything between 7° and 15° is OK.



If there's not enough angle, the dovetail loses its mechanical strength.



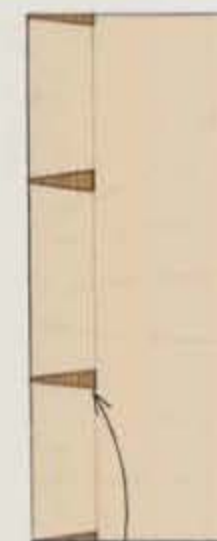
An angle that's too severe leaves unsupported grain at the tips, weakening the joint.



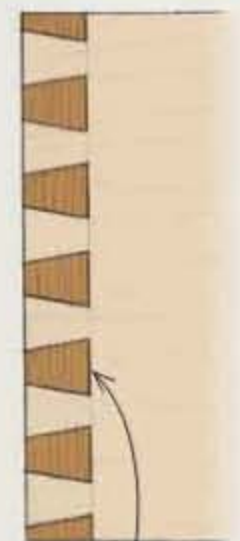
SPACING AFFECTS BOTH STRENGTH AND LOOKS



Removing about one-third of the material from the tail board is a good compromise between strength and aesthetics.



Cutting skinny, widely spaced dovetails removes too much material from the pin board, weakening the joint.



Cutting equal amounts from the pin board and tail board leaves a joint that is very strong, but looks machine-cut.

Advice for spraying finish outdoors

Q: I'd like to spray shellac for a finish, but I don't have an explosion-proof spray booth. Can I do it outside?

—ERNIE RUXTON,
Twin Falls,
Idaho



A: YOU CAN SPRAY SHELLAC or any flammable finish outside, but pick a day with moderate temperature (55° to 75° F) and humidity (under 70%), and find a shaded spot with no direct sunlight. You should avoid strong winds, but some air movement—whether from a light breeze or a box fan—will prevent overspray from landing on the piece.

Even if you do have a suitable environment for spraying, there are a few potential problems to guard against. When sprayed, shellac's solvent, denatured alcohol, dries so quickly that it can prevent the shellac from “flowing out” correctly. It also can lead to a rough or grainy finish because the shellac partially dries by the time it hits the surface. Avoid both problems by using denatured alcohol with a low methanol content, such as Behlen Behkol.

—Jeff Jewitt is a finishing expert and regular contributor to FWW.



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Clean routing: It's feed, not speed

Q: I get a lot of burn marks when I rout cherry. Will changing the router's motor speed stop it?

—KEITH MUNRO,
Carleton Place, Ont.,
Canada

A: CHANGING THE MOTOR SPEED WON'T stop burn marks, but you can minimize them by moving the router faster.

Burn marks come from the heat released by the friction of a spinning bit. The longer the bit stays in the wood, the more cuts it takes and the more heat it creates. Feeding the router over the wood faster means fewer cuts per inch, less heat, and less burning.

Reducing the router speed won't really help. A slower-spinning bit needs to remain in the wood longer, which leads to more heat, and more burning. Check your bit, too. A dull or dirty bit will struggle to cut wood, generate a lot of heat, and cause burn marks. Cleaning or replacing the bit should help.

—Gregory Paolini is a frequent contributor to FWW.



BURNED

Don't slow down. The longer the bit stays in the wood, the more burn marks you'll see. Move the bit faster to leave a burn-free edge.



CLEAN



Correct a wobbly chair

Q: I miscut the length of my chair's legs, and now it wobbles. What's the best way to fix it?

—JOHN WASSERMAN,
Austin, Texas

A: I RE-cut WOBBLY LEGS with a flush-cut saw and a guide that rests on a flat surface like a tablesaw. Balance the chair on the saw and add a blob of hot glue to a side of all four legs—even the one that is raised slightly—to freeze the chair in position. Then build a guide using a piece of scrap barely thicker than the largest gap under the legs and notch it to fit around the leg. Saw around each leg, then move the chair and finish the cuts. Chamfer the ends with a rasp when you're done.

—Michael Fortune is a contributing editor.



Start with a flat surface. Use a splotch of hot-melt glue to lock the chair in position on the tablesaw.



Use the guide. Cut lightly around all four legs with a flush-cut saw, and then clamp the chair elsewhere to finish the cuts.

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COMBINATION OF HAND AND POWER TOOLS MAKES IT SURPRISINGLY STRAIGHTFORWARD

BY ANDREW HUNTER

At first glance, this double-tenoned lapping miter joint might seem as complicated as its name. I am sure some of the Chinese craftsmen using the joint more than 500 years ago puzzled over it, too. But once you have taken the time to create an accurate layout, this intricate joint can be made quickly and precisely.

In China it is known as the rice dumpling joint, after the three-way mitered fold of a dumpling, and has been in use since the Ming dynasty (1368–1644). Since its early history, Chinese furniture has been constructed predominantly with miter joints. In addition to its strength, mitered joinery lets shaped profiles meet seamlessly. Curves can flow into curves without the need for a more difficult cope.

This oak cabinet has 16 separate corners all with this mitered joint. For this article,

I'm demonstrating one joint made from

FRONT RAIL

SIDE RAIL

STILE

start to finish. However, it's worth mentioning that because the three parts of each joint are so different, in an actual project I lay out all the like pieces, move on to the next set of like pieces, and then lay out the last set. I do the same with the construction. I cut all the stiles first, then I cut all the mortise-only rails (side rail, above), and then the rails with one tenon and one mortise (front rail, above).

Whether the tenons are through- or concealed is a matter of personal preference. I use through-tenons. Also, because there is so much mechanical strength to this joint, I am able to leave it unglued, which allows for any repairs in years to come. But feel free to lock your joints with glue.

The key to a successful three-way miter joint is an accurate layout. It is important to begin with straight, square stock and to really take the time to draw out every line accurately. Once you are confident your layout is perfect, you can breathe easy. Carefully excavating to these lines should leave you with little or no fitting.

Andrew Hunter designs and builds custom furniture in his studio in Accord, N.Y.

Strength and beauty. Hunter cut the three-way miter 16 times to create all of the corners in his oak dressing cabinet (right). The joint lends great rigidity to the piece, which consists of two stacked cases.



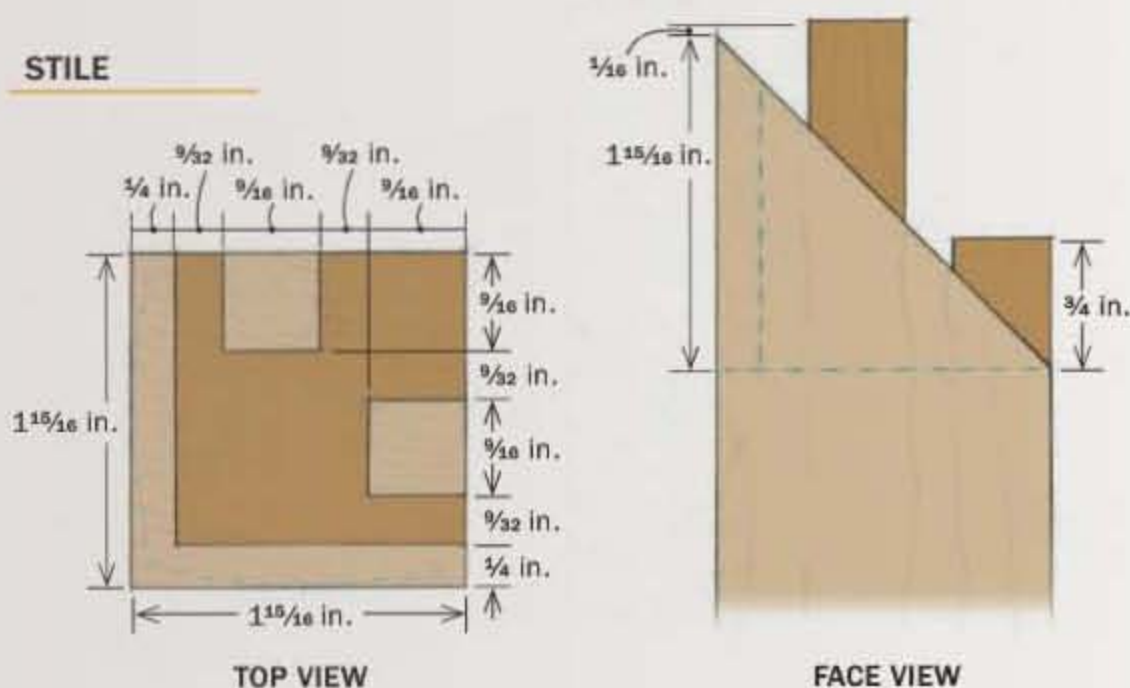
SEE IT IN MOTION



Precise layout is key

Begin by labeling the outside faces of each piece and using them exclusively as reference surfaces for locating the layout lines. Hunter lays out the stile first, then uses an adjustable square to transfer most of the layout lines to the two rails.

STILE

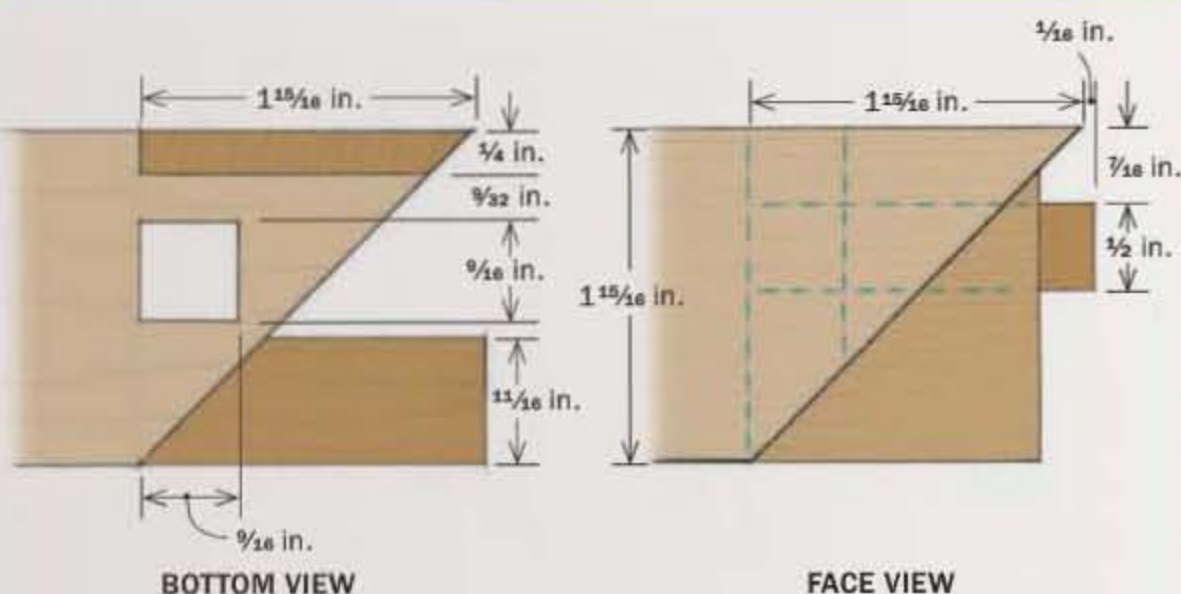


Mark the bottom shoulders and 45° miters first. Start the miters about $\frac{1}{16}$ in. from the end of the workpiece to let the tenons protrude.



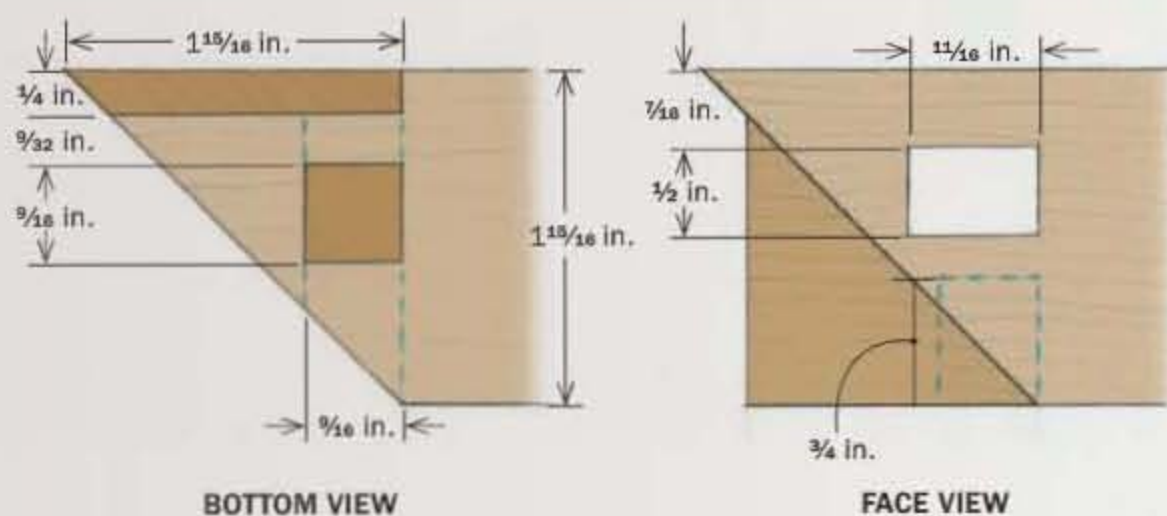
Two tenons top the stile. On the end, lay out four pairs of perpendicular lines at equal distances from each reference face. Two of the resulting squares will become tenons. Mark the waste tenons as shown and carry the lines down to the baseline on each inside face.

FRONT RAIL



Front rail is next. This piece has a vertical through-mortise that accepts the long tenon from the stile. A beefier horizontal tenon goes through the second rail. Transfer most of the layout from the stile using a square, but mark directly from the stile to locate the mortise wall opposite the baseline.

SIDE RAIL



Side rail gets mortises only. A stopped mortise underneath accepts the short tenon from the stile, while a rectangular through-mortise accommodates the long tenon from the front rail.



Make the stile

Some slick hand-tool and machine tips will get rid of the unwanted material and leave you with two perfect miters and two tenons.

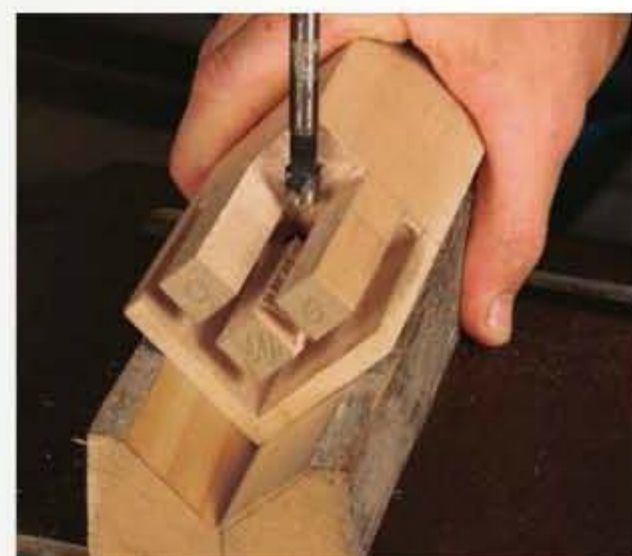
Magic at the router table. Using a 1/4-in. spiral bit, work slowly (about one-third-depth intervals) to clean out between the layout lines. Mark the bit's location on the fence so you can eyeball when to stop the cut before the bottom shoulder line. After an initial rough pass, go back and clean up right to the pencil line. This step will leave you with four perfect tenons, though you only need two of them.



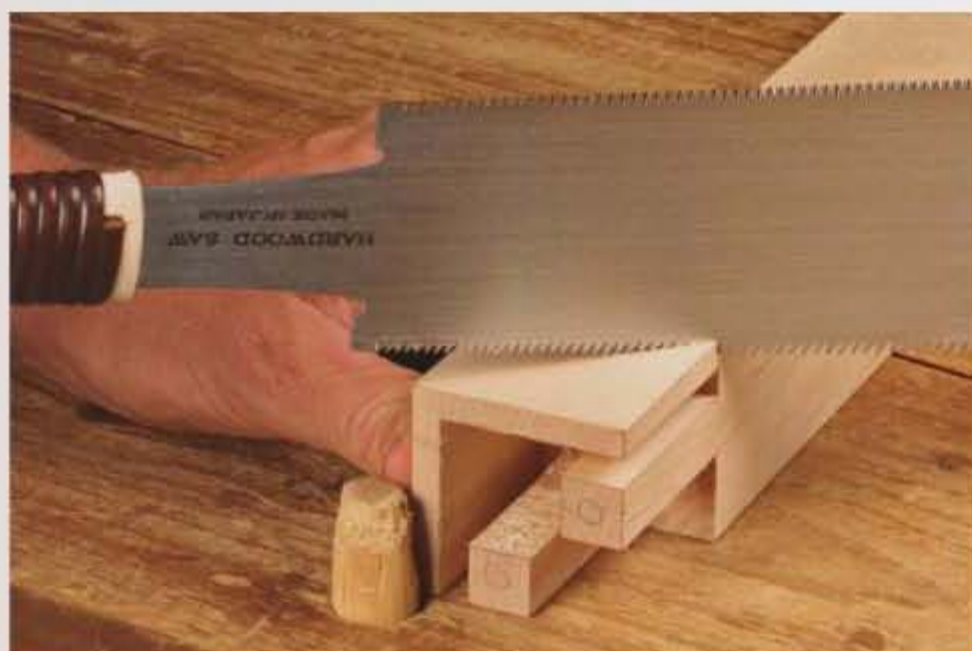
Remove the front tenon. Use a Forstner bit in the drill press to remove the section of the tenon that you wouldn't be able to reach with a handsaw.



Follow up with a handsaw. Carefully cut off what remains of the front tenon.



Get rid of the back tenon. With the front tenon gone, you have access to the back one. Drill between the two side tenons to remove it. Clean up the bottom of the joint with a chisel.



Outside miters are easy now. Cut the two mitered shoulders with a handsaw, then shave right to the line with a shoulder plane.



Cut one tenon short. Finish by cutting one of the tenons short to accommodate the tenon that will come in from the rail.

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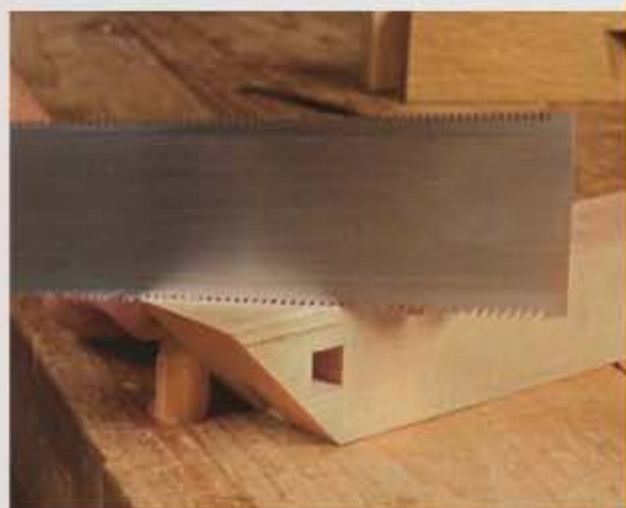
SPECIAL GUEST APPEARANCE
Nick Offerman

Tackle the rail without tenons

Of the two rails, the side one has no tenons, and Hunter likes to tackle that next. This piece is the most straightforward of the three.



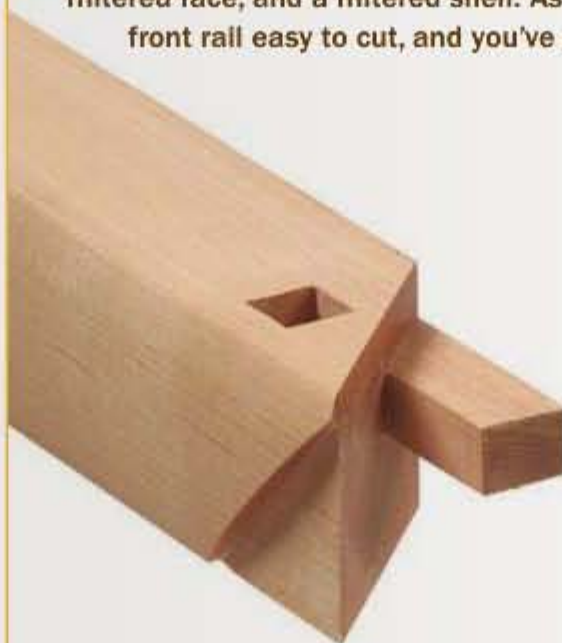
Two mortises and a miter. Use a drill press to remove the bulk of the mortises, and then chop to the lines with a chisel. Then use a chapsaw to cut the miter. Hunter cuts just outside the layout lines and then shaves right to the line with a handplane or chisel.



Cut the mitered shelf. Use a handsaw to cut the 1/4-in.-deep shelf that will accommodate the mitered laps of the stile. Clean it up with a shoulder plane.

Final rail combines all the elements

This piece combines elements of the other two. It has one long tenon, one through-mortise, a mitered face, and a mitered shelf. As with the other two parts of the joint, Hunter makes the front rail easy to cut, and you've already done all of these moves on the first two pieces.



Mortise first, then the tenon. Drill the mortise and square it with a chisel, then saw away the sides to reveal the tenon's cheeks. Use a shoulder plane to clean those faces to the line.



Finish up the tenon. Again with a handsaw followed by a chisel, cut away the remaining waste to leave the tenon.



Add the shelf. Like the other rail, this one gets a mitered shelf that holds the mitered laps of the stile.

SHAPING IS THE FINAL TOUCH

With the joinery complete, you can shape the outside faces of the joint. This is where the genius of this joint becomes so apparent. Superior strength aside, you can seamlessly transition any profiling you do from one face of this joint into the next.



Creating a profile. Cut the desired profile on a piece of scrap, then transfer the shape to the stile. Mitering the ends of the scrap makes the transfer easy.



Rough the shape at the tablesaw. Rip the facets first, then fine-tune the shape with a handplane. Reassemble the joint and trace the profile from the stile onto the rails.



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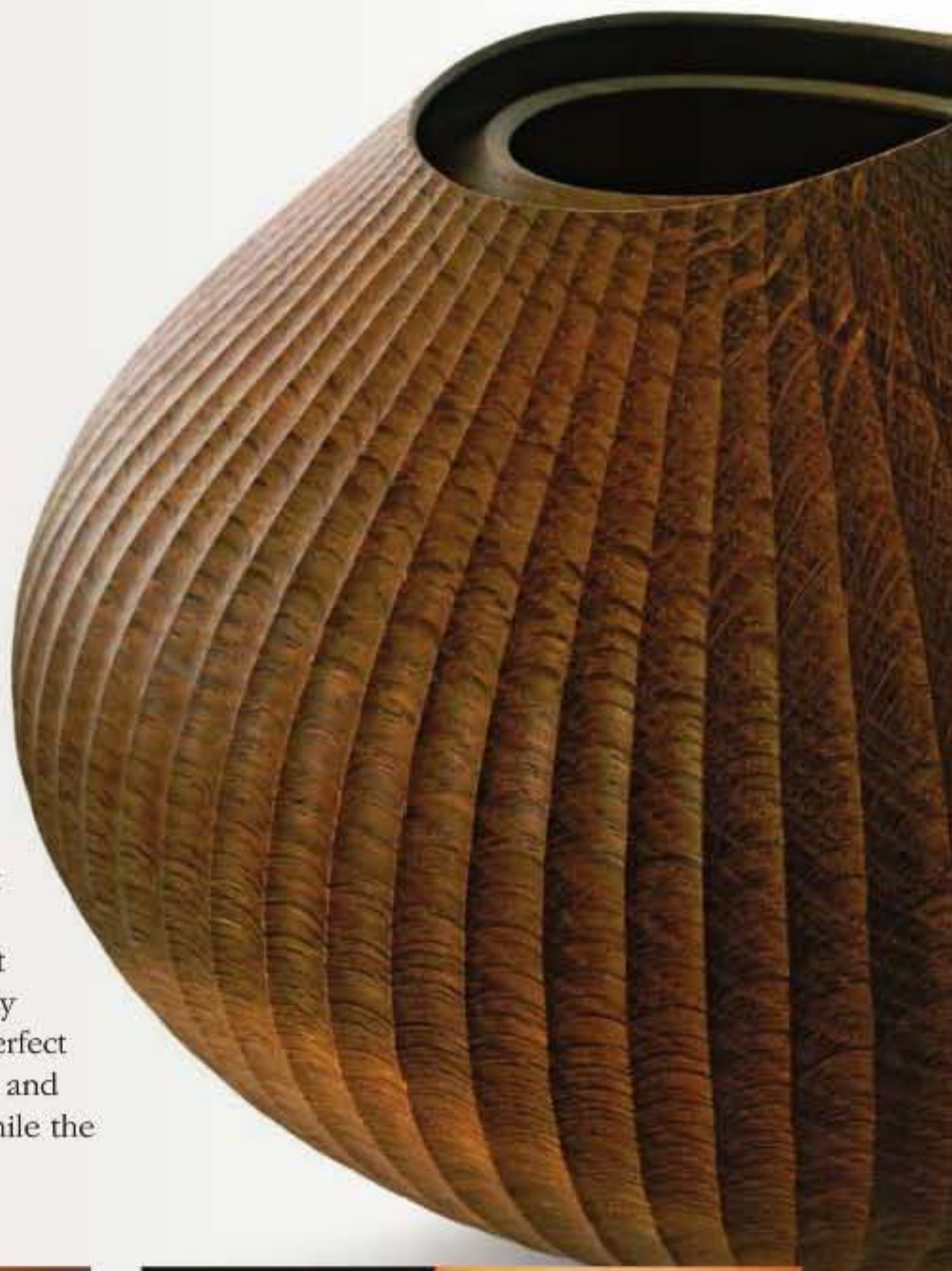
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how they did it

Go beyond the lathe for beautiful vessels

BY JONATHAN BINZEN

The beautiful overall shapes Liam Flynn creates on his lathe immediately draw the eye. Yet much of what makes his vessels so memorable happens afterward. The signature double lip found on many of his pieces is made on the lathe but modified at the workbench. And all the fluting is done with the vessel off the lathe. A lathe by nature generates perfectly symmetrical forms, but Flynn has found a way to produce turned vessels that are equal parts symmetry and asymmetry, perfection and imperfection. He may be aiming to find “the perfect line,” but while he’s pursuing it he lets the irregularities of work done by hand and by eye become part of the composition. Flynn turns and carves his pieces while the



THE DOUBLE LIP

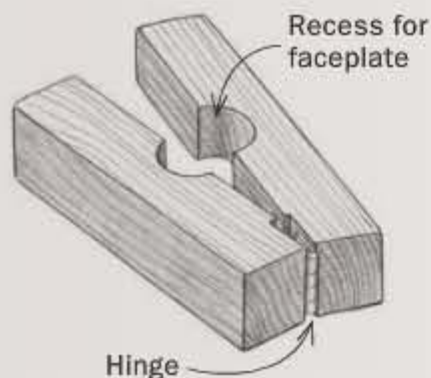
Many of Flynn’s vessels feature a distinctive double lip with an asymmetrical profile. He creates the lip partly on the lathe and partly at the bench.

Establishing the inner lip.

After hollowing the vessel with a bowl gouge, Flynn uses a hooked scraper to define the shoulder of the inner lip. He uses the same tool to smooth the inside walls.



Last lathe step. Using a round-nosed scraper that’s been ground back at an acute angle, Flynn shapes the recess between the inner and outer lips.



Faceplate leaves the lathe.

Flynn turns all but the bottom inch of the vessel, then takes it to the bench for carving. He uses a shopmade jig (above) to hold it solidly in the vise.



Slanting the lip. Flynn makes a sawkerf to provide a depth gauge as well as a relief cut (above left) before carving down the outer lip. Working toward the kerf, Flynn uses a shallow gouge to cut an incline (right). Having reached the bottom, he does the same thing from the opposite direction.



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FLUTE MUSIC

Flynn stays at the bench to carve the flutes. When most of the carving is done, he returns to the lathe to turn the foot, then completes the flutes.



Freehand fluting. Flynn cuts the flutes without layout lines (far left), preferring the slightly irregular effect it creates. When only a small space is left unfluted, dividers help him assess the width of the final flutes (above).

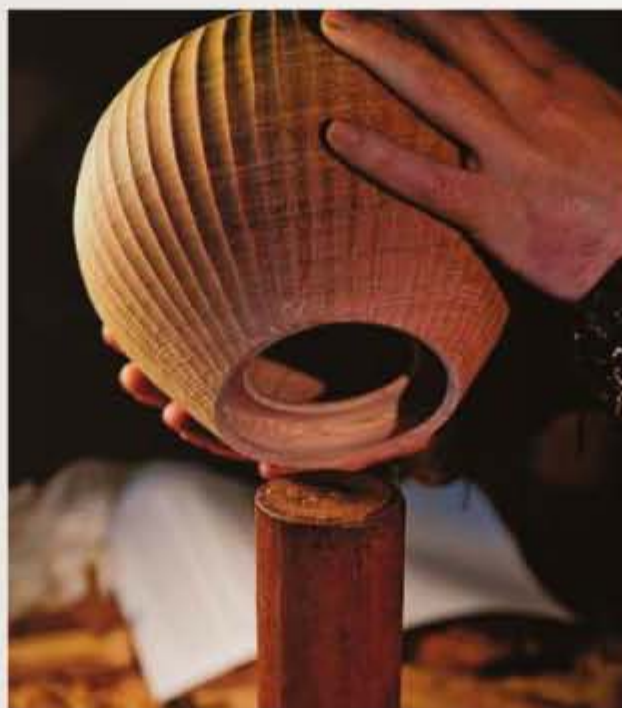
wood is still green—he chainsaws the blanks from sawlogs—so there is always some distortion of the overall shape as the piece dries. To minimize distortion, he cuts out the blank so that the vessel's height is oriented perpendicular to the length of the log. He often turns the vessels from English oak (American oaks would be suitable, too), and he uses the prominent medullary rays as a guide while he's roughing out the turning: If he has it oriented properly, the rays should form vertical lines on two sides of the vessel.

Flynn begins a piece by screwing his blank to a faceplate and turning the outside form down to within an inch or so of the foot. Then he hollows the inside and creates the double lip.

Now comes the carving. Flynn takes the vessel off the lathe but leaves it screwed to the faceplate—which he uses to help hold the vessel for carving. With most of the carving complete, Flynn removes the faceplate and mounts the vessel between centers to finish turning the foot. Then he completes the carving off the lathe. □

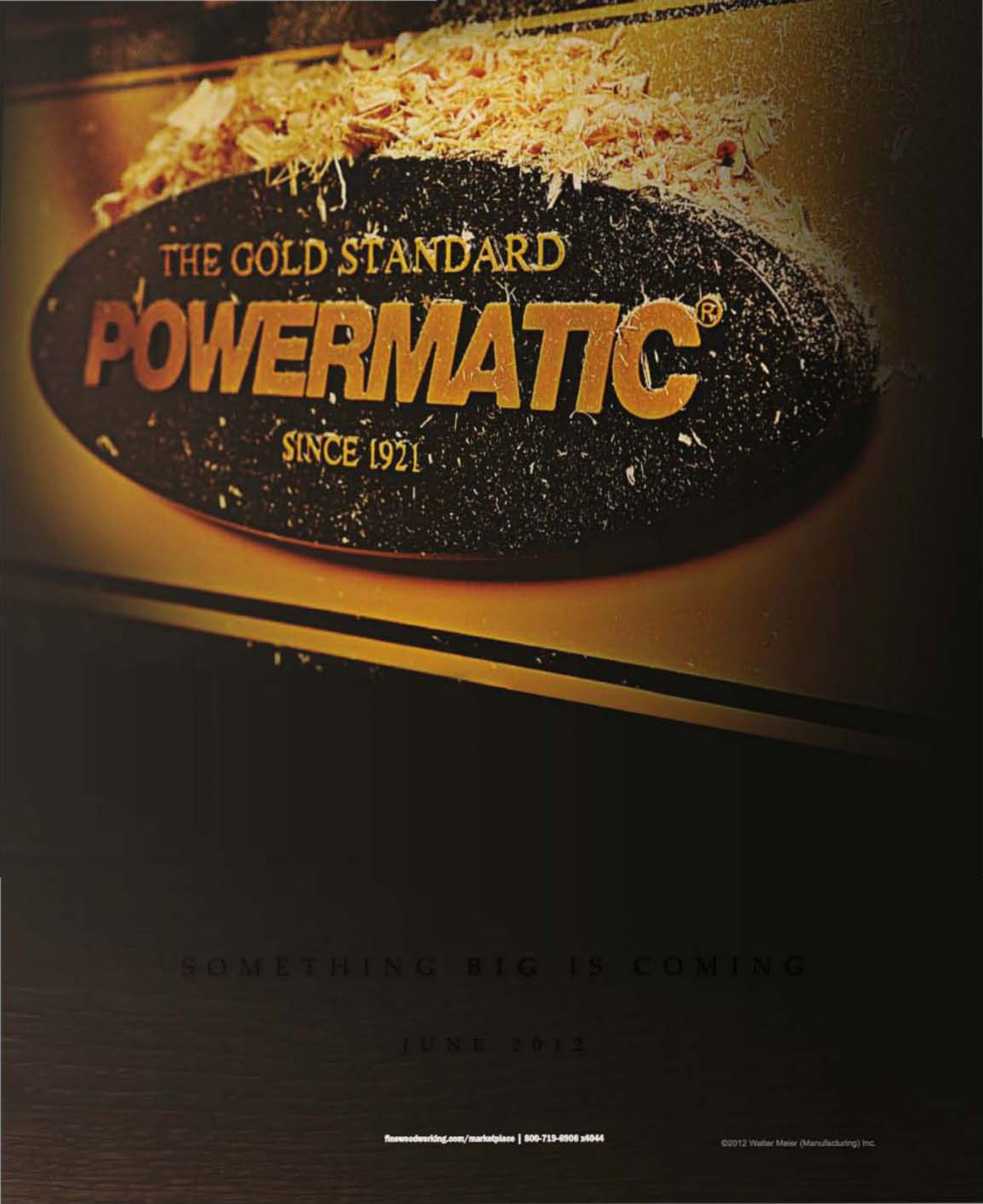


Back on the lathe. After unscrewing the faceplate, Flynn puts the vessel between centers on the lathe to turn the foot. The vessel is held between a cup center in the tail stock and a cylinder chucked into the headstock (left). He leaves a small spigot (right), which he removes later with a chisel.



Post production. To do the last bit of fluting, Flynn inverts the vessel on a cylindrical post clamped in a vise. Perfection is not his aim, Flynn says. "They're imperfect; that's the way it is. They're not machine-made." Certainly not.





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Liam Flynn, born into a family of woodworkers in the small town of Abbeyfeale, Ireland, was “banging around” in his father’s shop by the time he was 8. His father didn’t use a lathe, and it wasn’t until a few years later that Flynn tried turning at a friend’s house. “Straight after that,” he says, “I had to have my own machine.” And before long, “I decided I didn’t want to do anything but this.” With no access to a teacher, Flynn learned by turning and reading. Thirty years on, working in the same shop his father and grandfather used, Flynn makes his living by turning vessels. He chainsaws his blanks from straight-grained sawlogs and turns them green. As the vessels dry they distort slightly. Flynn carries that irregularity into the textured surfaces he carves, working without layout lines. Flynn says the overall shapes he turns haven’t changed radically over the years. Essentially, he says, “I’m still trying to do the same thing. I’m trying to find the perfect line, the perfect form.”

—Jonathan Binzen



Photos: Liam Flynn

◀ **How They Did It** Turn to p. 96 to see how Flynn produces these beautiful forms, both on and off the lathe.

| **Audio Slide Show** To see the chips fly in Flynn’s Irish workshop as he pursues the perfect form, go to FineWoodworking.com/extras.