TAUNTON'S

# Fine WoodWorking

Amazing cure for squeeze-out, p. 34

## Build a Shaker chimney cupboard

## Make doors that stay flat

## Know the shelf life of your finishes

## Flatten the back of any blade

## Soup up your dust collector

## Easy way to inlay stringing

April 2013 No. 232

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Fine Woodworking

MARCH/APRIL 2013 ■ ISSUE 232

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## up front



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## features



The Taunton Press
Inspiration for hands-on living®

Cover photo: Michael Pekovich

## in the back

# on the web

## THIS MONTH ON FineWoodworking.com/extras

**Visit our website to access free web tie-ins, available February 7. While you're there, don't miss our collection of free content, including tool reviews, an extensive project gallery, and must-read blogs.**

VIDEO:

### Nailing Knife Hinges

After reading our article on installing straight knife hinges (p. 70), learn a hassle-free technique for the offset variety.

VIDEO:

### Choose the Right Finish for Any Project

Most woodworkers spend tons of time learning how to cut precise joinery, but stop short when faced with the variety of finishes on the market. Our video guide cuts through the clutter and offers simple tips for selecting the right one.

VIDEO:

### Great Glue-Ups in Five Minutes

Get back to basics with our *Five-Minute Guide to Great Glue-Ups*, and learn the best way to dry-fit, clamp, and tackle squeeze-out.

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**VIDEO WORKSHOP**

### Chimney Cupboard Fit for a Shaker

**Build the traditional Shaker chimney cupboard featured on p. 38, with step-by-step video instruction. *FWW* art director Michael Pekovich highlights a variety of construction techniques, including:**

- **A simplified face-frame method**
- **Traditional dovetailed drawers**
- **Straightforward frame-and-panel joinery**



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

**Printed in the USA**

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# contributors

**When Michael Fortune (*"Never Struggle with Squeeze-Out Again"* and *"String Inlay Made Easy"*) built a 4,200-sq.-ft workshop on his homestead outside Toronto, he left a small hand-hewn barn standing just a few feet away. Built in 1831, the structure was all but obscured by a tangle of vines and trees. The roof had collapsed, and with no foundation, the cedar logs sat right on the earth. Seeing potential in the building, Fortune lifted it and put in a foundation. Later, he added a well-insulated roof, built traditional windows, re-chinked the logs, replaced rotten floor beams, and sandblasted the interior. Recently, after 32 years, he finished the project. The ground floor holds a furniture gallery and Fortune's design office. The second floor is a studio apartment.**

**Ray Finan** (*"Triangle Table"*) makes furniture full time in his workshop in Arlington, Vt. After more than 20 years working for a large corporation, a brief fundamentals course at Boston's North Bennet Street School lit the fuse, and then a three-month stint at the Center for Furniture Craftsmanship in Camden, Maine, confirmed his decision to launch his own woodworking business. When not in the shop, you're ... "hiking up Mt. Snow for the Forest Service, recording the weather conditions." (In September, the Forest Service sent him to Montana to fight wildfires.) PHOTO: JOHN CONTE

**Doug Stowe** (*"Knife Hinges on the Router Table"*) is a professional furniture maker in Eureka Springs, Ark., with seven woodworking books to his credit, including his latest, *Building Small Cabinets* (The Taunton Press, 2011). In 2009 he was named an "Arkansas Living Treasure" by the state's Department of Heritage and Arts Council for his contributions to traditional crafts and craft education. He also teaches woodworking to grades 1 through 12 in his home town. How did you get started making boxes? "I live in a tourist town, and boxes were something tourists could carry home in a suitcase."

**Steve Latta** (*"Doors that Stay Flat"*) has been a furniture maker for nearly 30 years and has taught woodworking full-time for the past 15 at Thaddeus Stevens College of Technology in Lancaster, Pa. He lectures regularly at museums such as Winterthur and Colonial Williamsburg, and at guilds across the country. Most common mistake beginning woodworkers make? "Taking it all too seriously. No matter how intense the work, in the grand scheme of things, a piece of woodwork is just a piece of woodwork. The sun will rise whether there's a gap in those dovetails or not."

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

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


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# letters

## Spotlight

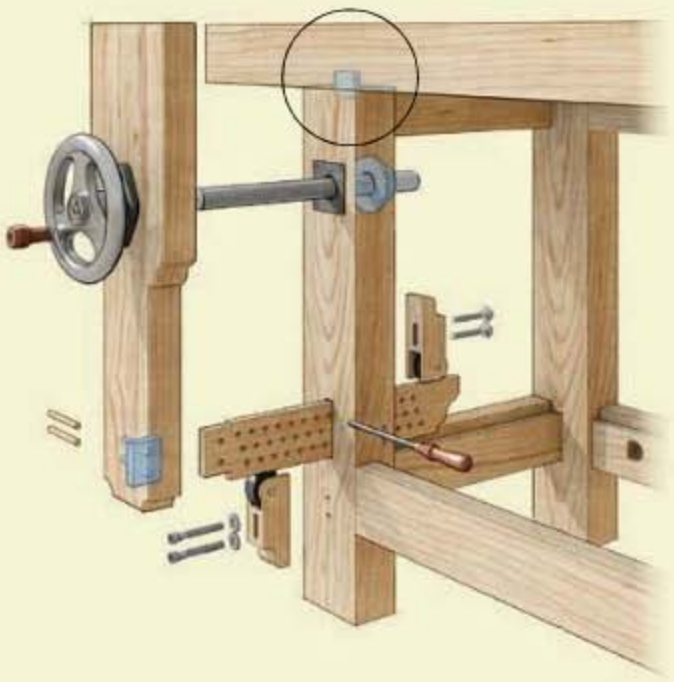

Modified Roubo Is the Ultimate Workbench

**ISSUE NO. 230**
**Tools & Shops, Winter 2012**
**p. 46**

### IMPROVING THE ULTIMATE

**One element of Jeff Miller's "Ultimate Workbench" puzzles me. At the critical point behind the leg vise, it appears that the top is attached to the leg with a single ½-in.-thick by 2-in.-wide by 2-in.-long tenon. That means the entire force of the vise is resisted only by that small tenon. Given the tremendous power that vise is capable of, I suspect that the tenon might fail. Am I missing something?**

**—GREG DICK, Johnstown, Pa.**



**Jeff Miller replies:** You are right that the tenon will take all of the force, and maybe it should be beefed up. Having said that, I've been clamping the heck out of stuff for a year and a half without any real problem. That might be because it is ash, which is extremely resistant to shear forces.

**I was pleased to see Jeff Miller's article about Roubo-style benches. He mentions that a drawback of these two specific vises is the inability to clamp large and thick workpieces in a vertical position. I overcame this by adding a sliding leg vise. It is nearly identical to the fixed leg vise, but can slide along the front of the bench, making it incredibly useful. I use the sliding and fixed vises in tandem to clamp large pieces vertically, and long pieces horizontally. Chris Schwarz described this sliding vise a few years ago on his blog at PopularWoodworking .com, finding it in the original Roubo volumes, and other blogs such as oudluthier.blogspot.com followed with more how-to.**

**—MICAH WOOLACE, Commerce Township, Mich.**

### Hide glue holds up to water-based dyes

As the manufacturer of Old Brown Glue, a liquid hide glue, and with many years of experience using it for veneering, I have a slightly different answer to the question about the potential for water-based dyes to weaken water-based, protein glues like hide glue (Q&A, *FWW* #231). Fully cured protein glues need a very prolonged exposure to water and heat to liquify. In my experience, just wiping the surface of the veneer with a water-based stain or dye is not sufficient to liquify the glue under the veneer, whether on a curved surface or a flat one. The stain would need to be flooded on the surface, left for a fairly long time, and then heat would need to be added for the veneer to lift. And even if the veneer lifted in spots, the protein glue would allow an immediate repair, by just pressing a hot iron on the blister and then clamping.

**—W. PATRICK EDWARDS, San Diego, Calif. (oldbrownglue.com)**

### Bevel-down plane shown bevel up

In Chris Gochnour's tool test of shoulder planes ("Best Way to Fit Tenons," *FWW* #231), I noticed that the Gordon Gidgee shoulder plane is pictured with the bevel up. The blade is bedded at 60° and used bevel down in normal circumstances.

**—ROB PORCARO, Medfield, Mass.**

**Editor replies:** *Good eye, Rob! We installed the blade incorrectly when setting up the "beauty shot" of the tool, but Gochnour used it the way it was intended.*

### Becksvoort's Shaker stool

Hooray for Christian Becksvoort's excellent Shaker stool article in the last issue. I am a woodworker who derives satisfaction from cutting my joinery by hand, so having an article that does not use a tablesaw, bandsaw, or router to machine "easier, better, and faster" joints is a welcome sight. I hope *FWW* will feature more articles like this on a regular basis.

**—SCOTT VANZO, Los Angeles**

### Correction

Our apologies for misspelling Wes Sunderland's name in the Letters section of *FWW* #231.

Bottom photo: Micah Woolace

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# methods of work

EDITED AND DRAWN BY JIM RICHEY

## Best Tip

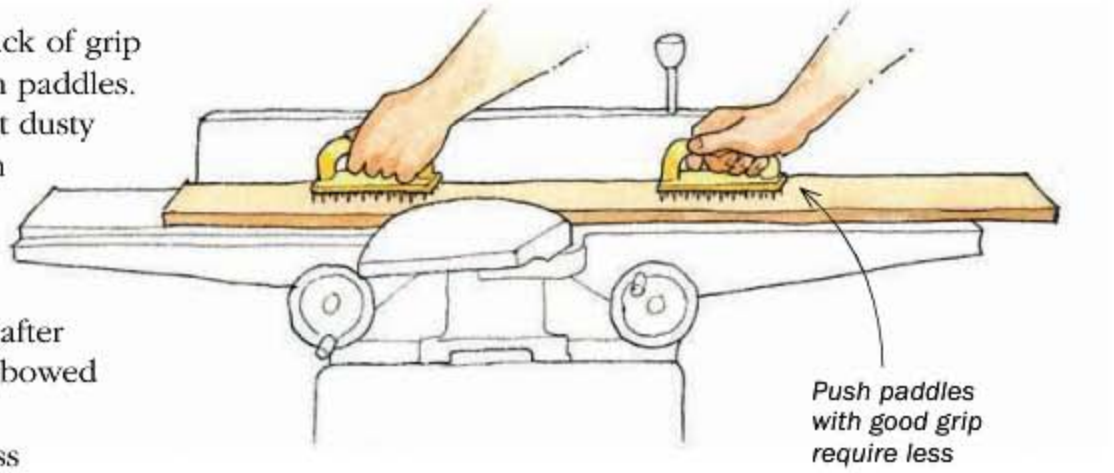
## Jointer push pads that don't slip

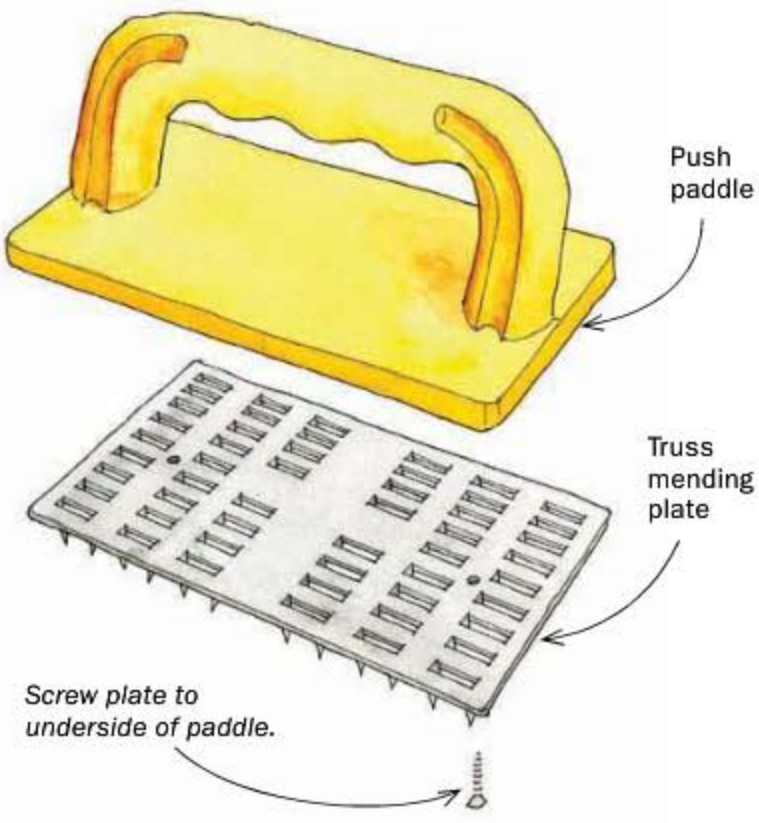
**Willie Sandry started woodworking 11 years ago while building a home for his family in Camas, Wash. He favors Arts and Crafts style furniture, drawing inspiration from originators like Gustav Stickley and Roycrofter Elbert Hubbard, as well as from modern makers.**

I have long been frustrated with the lack of grip from my rubber-bottomed jointer push paddles. They work well at first, but quickly get dusty and lose the friction necessary to push the workpiece across the jointer. When face-jointing, you wind up pushing down so hard you flatten a bowed workpiece as it is jointed and, after the cut, the board springs back into a bowed shape again.

To solve this problem, I screwed truss mending plates to my jointer paddle handles. These spiked plates easily grip rough lumber for quick, precise milling. Since you don't have to push down so hard on the workpiece, even bowed boards come out straight and true. The truss plates are available at building centers everywhere, and cost only about a dollar each. The small dimples left behind are easily removed when the stock is planed to final thickness.

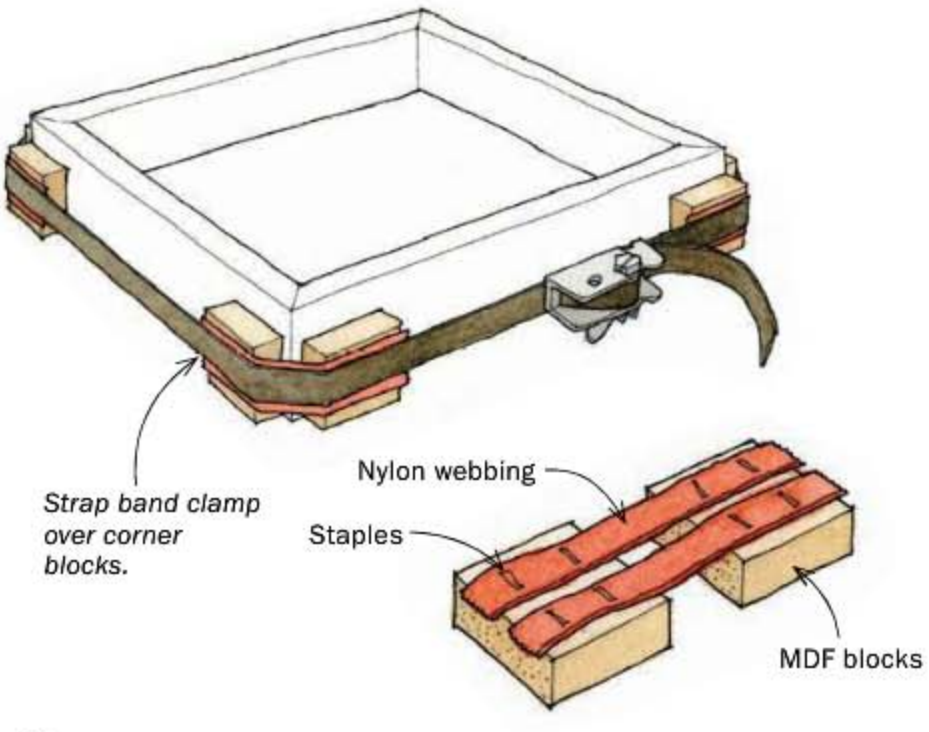
—WILLIE SANDRY, Camas, Wash.




### 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 illustration; $50 for one without. The prize for this issue's best tip is a Veritas block plane.




## Protective corner blocks for a band clamp

Recently my son and I were gluing up a mitered base for a hope chest using a band clamp. I needed some blocks to avoid damaging the miters under the clamping pressure. I came up with this simple, effective solution using stuff around my shop.

Start with four pairs of ¾-in. MDF blocks, about 2 in. square. Join each pair with two pieces of nylon webbing (from an old ratchet tie-down or backpack). Staple the webbing to the blocks, leaving about 1½ in. between them. Knock the sharp corners off the bottom of the blocks with a plane or sandpaper. The MDF blocks provide a broad clamping surface, and the band clamp slides easily over the webbing and stays in place nicely.

—MARK DRIEDGER, Dallas, Texas

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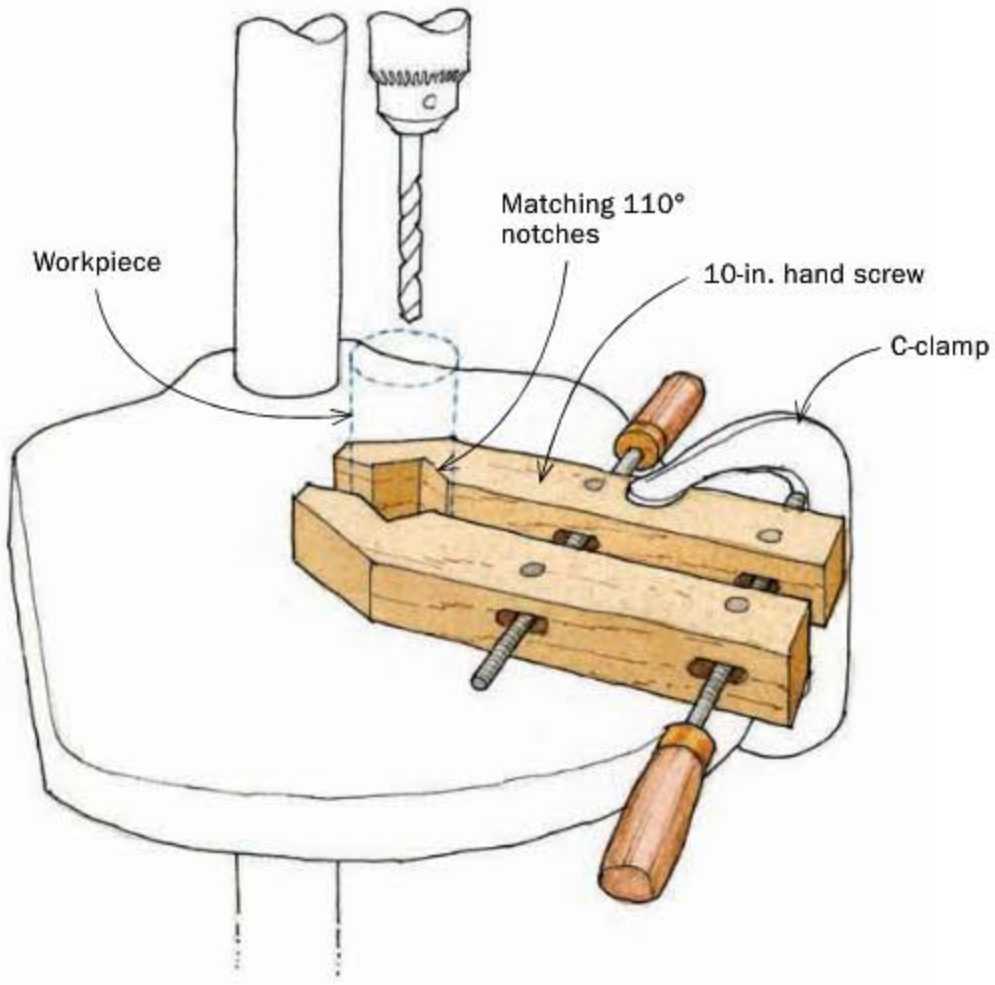
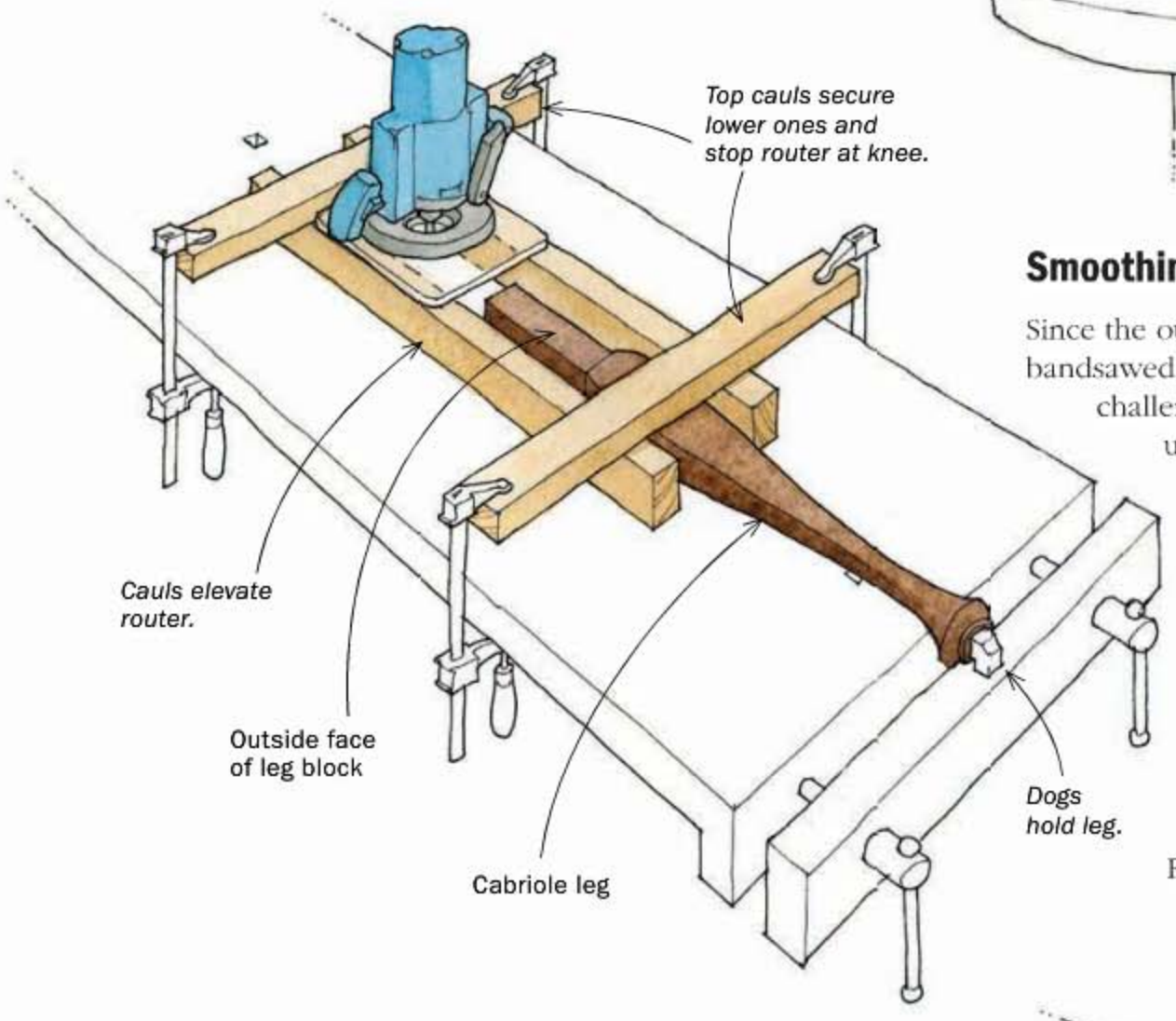
## Hand-screw vise holds odd pieces on drill press

To make a versatile drill-press vise for round or irregular workpieces, start with an inexpensive 10-in. wood hand screw. Cut a 110° notch out of each jaw with a bandsaw. Clamp the hand screw to the drill-press table and you now have a vise that can securely hold a piece up to 8 in. in. diameter.

—BILL PECK, Stow, Ohio




## Smoothing the top blocks on cabriole legs

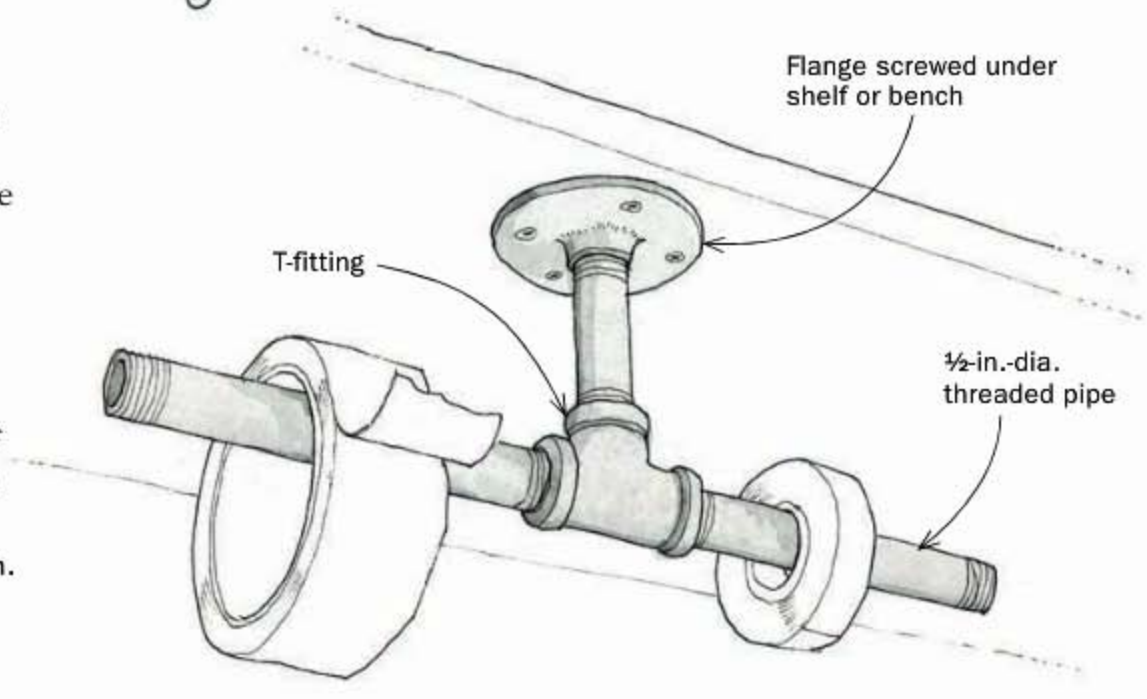
Since the out-facing top blocks of cabriole legs are typically bandsawed to shape, they require some smoothing. This is a challenge, because the knee section sticks up. You can use a rasp or rabbeting plane and sandpaper, but I have an easier method. Clamp the leg between dogs on your bench. Be sure the block section is parallel with the benchtop. Place two cauls parallel with the leg, one on each side. These cauls need to be taller than the top of the knee. Clamp two more cauls on top of and at right angles to the first two, positioning one so that it will stop the travel of your router base at the junction of the knee and the block. Rout the leg flat with a straight bit, then sand lightly to smooth. Rotate the leg 90° and smooth the other outside face.

—LARRY HAYWOOD, Cle Elum, Wash.

## Under-shelf storage for rolls of tape

One of the biggest problems with rolls of tape is that they roll around and often end up in out-of-the-way places. Here's a solution that keeps tape rolls close at hand, using often-wasted space under shelves or workbenches. Just attach three short lengths of pipe to a T-fitting, then screw the assembly to the shelf with a flange. You can use either PVC or iron fittings; ½ in. dia. is sufficient.

—DENNIS THEISEN, Grand Rapids, Mich.



# tools & materials

## POWER TOOLS

## High-performance vac is worth the money

**DEWALT'S NEW 10-GAL. SHOP VACUUM** has some fantastic features, such as HEPA filters, automatic filter cleaning, and a higher power rating than the company's previous models. To test it, I repeated the tests used for a shop-vacuum review we did last year (*FWW* #223).

After removing the optional paper dust-collection bags and seasoning the filter, I measured the working airflow at the end of the 14-ft., 1¼-in. inside-diameter hose. The DeWalt maintained 65 cfm, second only to the Bosch Airsweep 3931A, the Best Overall in the review.

With HEPA filters but without the paper bags in place, the automatic filter-cleaning feature is essential, and it works well. The two HEPA filters are third-party rated to remove dust particles as small as 0.3 micron with 99.97% efficiency.

The DeWalt has a power-tool actuation outlet (left). Also, a variable power control feature allows you to dial down the power draw to accommodate the amperage of the tool you're using. Multiple lift points make the vac easy to empty, and a retractable handle makes wheeling it around the shop a dream. Also, the hose connector can swivel, making it easier to use for general shop cleanup, including wet pickup.

When compared with the models in last year's test, the DWV012 is a Best Value choice.

*—Bill Peck is the shop manager at* Fine Woodworking.


**Shop vacuum by DeWalt**
Model DWV012
$500
amazon.com

***Plug and go.*** *The power-tool actuation outlet turns on the vacuum when the plugged-in tool starts. To clear the hose, the vacuum runs for 15 seconds after the power tool is turned off.*

## ACCESSORIES

## Better blades for the budget conscious

**GUHDO, A GERMAN TOOL MAKER,** recently entered the U.S. tool market with a new sawblade line called the Gmaxx series that boasts high quality with a high-value price.

The 10-in. general-purpose blade (No. 2400.100A50), which has 50 teeth with a combination grind and 15° hook, is a great combo blade. I used it to rip a bunch of hickory boards—a job I do weekly—without any signs of bogging down, and the quality of the cut was superior. I also used it to cut Baltic-birch plywood and again I was very impressed with the tearout-free cuts.

Then I used the Gmaxx crosscut blade (No. 2400.100A40), which has 40 teeth and an ATB grind with an 18° hook, to cut a variety of wood, from pine to koa, goncalo alves to rock maple. Like the combo blade, this one did a superb job.

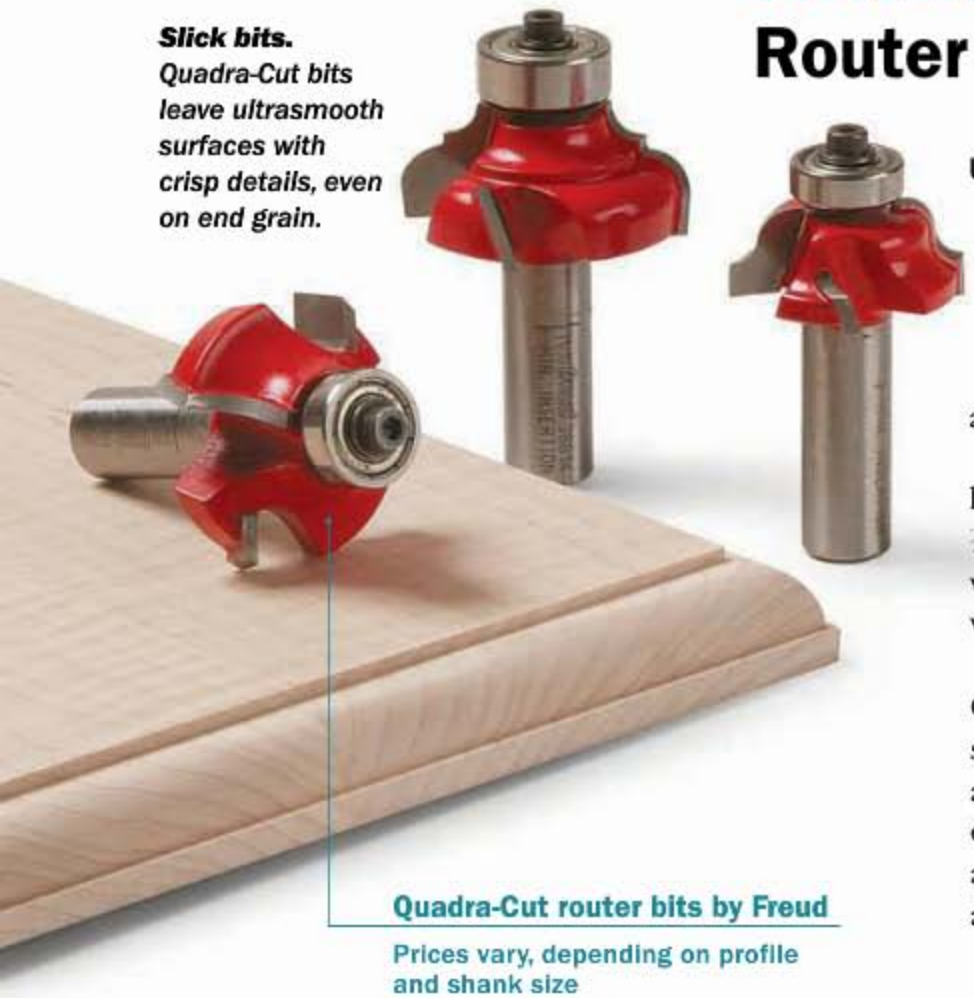
Overall, these blades seem at least as good as the high-end, expensive American blades I have been using. And the carbide tips are beefy, which means they can be resharpened a number of times. The blades are certainly a great value for the money.

*—Peter Breu is a professional woodworker in Manchester, N.H.*

**GMaxx Series sawblades by Guhdo**
$58 each for the general-purpose blade and the crosscut blade
amazon.com

■ ACCESSORIES

## Router bits leave glass-smooth surfaces



***Slick bits.*** *Quadra-Cut bits leave ultrasmooth surfaces with crisp details, even on end grain.*

**Quadra-Cut router bits by Freud**

Prices vary, depending on profile and shank size

freudtools.com

**USING A ROUTER IS THE MOST EFFICIENT** way to profile an edge. Unfortunately, the speed comes with a tradeoff. The cut surface is left with milling marks that need to be sanded out. Often that distorts the profile, eliminating the crisp, detailed edges most woodworkers seek.

Freud solves that problem with its Quadra-Cut router bits. These bits have four cutting edges, with two of them angled backward to create a negative shearing cut designed to slice cleanly through wood fibers.

These bits first appeared in 2008 but were limited to just 10 or 12 profiles, and only in ½-in. shanks. Now the line is expanding, with dozens of profiles available and bits with ¼-in. shanks.

I chucked over a half-dozen various Quadra-Cut bits into full-size and trim routers in my shop, and used them with woods that ranged from soft pine and alder to dense white oak and hickory. The Quadra-Cut bits were exemplary performers in each case, especially when routing tearout- and burn-prone end grain. None of the edges I routed needed any additional work or sanding.

In my opinion, Freud's Quadra-Cut router bits definitely make the cut.

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

■ PNEUMATIC TOOLS

## Bosch builds a better pin nailer


**23-gauge pin nailer by Bosch Tools**

Model FNS138-23
$140
amazon.com

**ABOUT A DECADE AGO I BOUGHT MY FIRST PIN NAILER,** and it's become a go-to tool in my shop. The tiny pins pop into place without splitting delicate wood or leaving much of a trace. I often use these as a replacement for clamps when I glue molding to a piece, say a crown molding that would be difficult to clamp in place accurately. It also works well to attach tiny molding where clamps can't reach, such as stops in glass doors, and it's a handy helper for assembling shop jigs.

Bosch has made all those jobs easier with a new nailer that's packed with useful features. First, it has a dry-fire lockout mechanism that prevents you from firing when you're out of pins. This is key for a pin nailer, as they leave almost invisible holes, so it's easy to go along for a while without realizing that you're shooting blanks.

The Bosch has an auto-length-setting device in the pin carriage, which makes it easy to use different-length pins without the need for manual adjustments. The carriage also has an indicator on the side that tells you when you're running low on nails, and it has a stepped shape to make it easier to angle the tool in tight places.

Some might grumble about the 1⅜-in. maximum pin length, but it's plenty long for attaching stock up to ¾ in. thick, and longer 23-gauge pins are hard to work with anyway. The nailer will fire any brand of pin, and it had no problem shooting 1⅜-in. pins through hard maple, white oak, and jatoba—without any jams.

This new nailer is a winner.

*—When not doing tool reviews for us, Roland Johnson has a regular gig at The Woodworking Shows (thewoodworkingshows.com).*



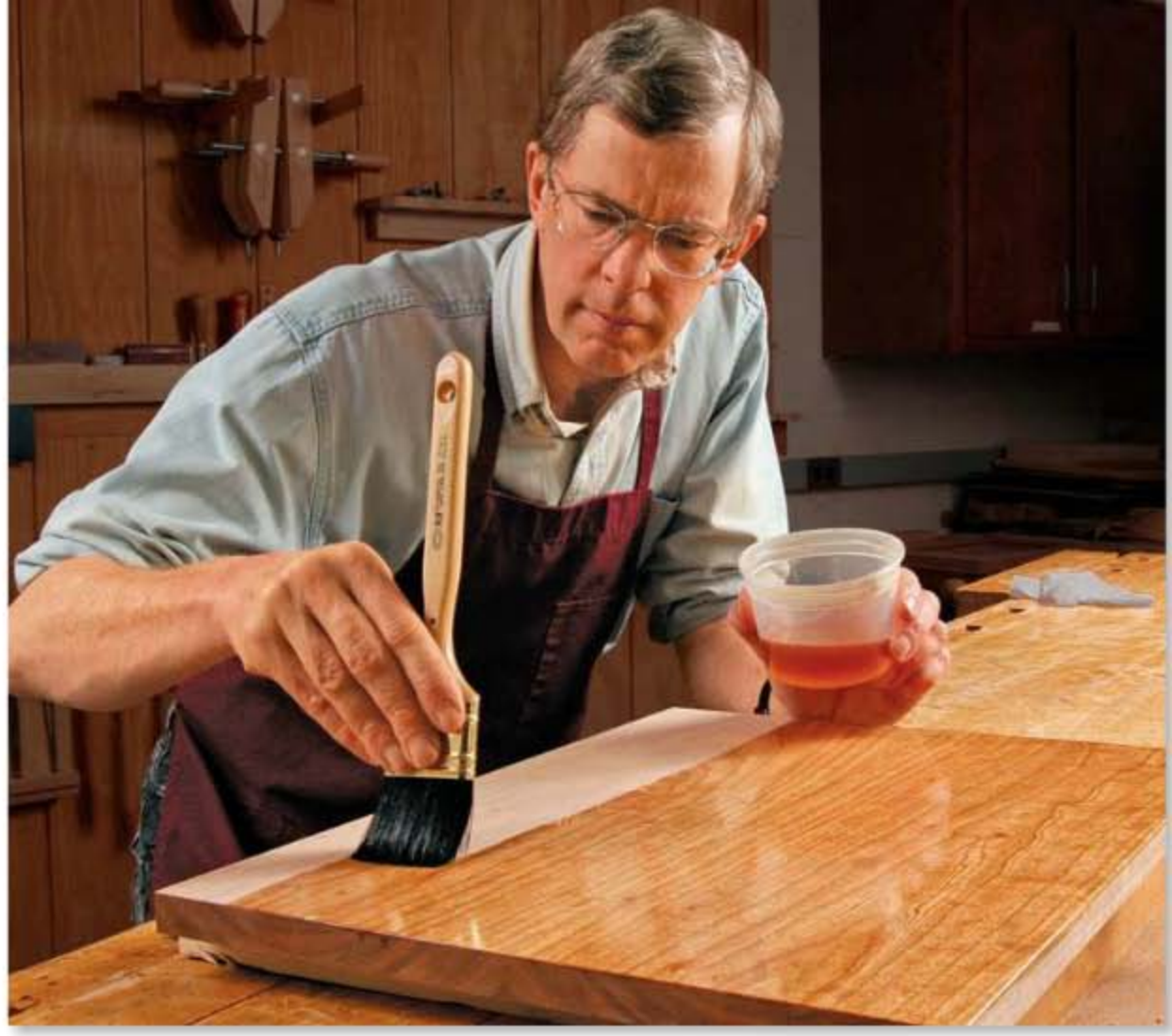
Photos, except where noted: John Tetreault; this page (bottom): Roland Johnson

fundamentals

# The language of finishing

## PART 2: APPLYING AND POLISHING

BY MARK SCHOFIELD



## Wiping

Rubber

French polish

In *FWW* #229, I wrote about the often bewildering terms that woodworkers and finishers use to describe the task of preparing a surface for finishing, and for the finishes they use. As it happens, there are more linguistic land mines when describing how to apply a finish and how to give the surface a final polish. Understanding these terms will make you a better finisher, helping you understand your problems—and the solutions given by experts, too.

### The right rag for a wipe-on finish

Wiping on a finish is a relatively simple process, but it's not without pitfalls. I wish I had a dollar for every finishing article I've read that suggests using a lint-free cotton cloth. Many cotton items from socks to underwear contain **lint**—residual flecks of fiber that gradually come loose and disappear after multiple washings. That's why an old, much-washed T-shirt makes a great application tool.

To check a cloth for lint, use it to dry a wine glass or clean a mirror with glass cleaner. Any lint will show up on the glass and will mar your project if you use a linty cloth to apply a finish.

Aside from lint marring a wiped-on finish, you may also encounter a problem known as **bleeding**. This occurs with oil finishes on open-pored woods such as oak when excess oil oozes from the pores long after you've wiped the surface dry. If you don't repeatedly wipe the surface, these droplets will dry into small, shiny dots that you'll have to sand off.

Bleeding finish

One important wipe-on finishing technique is known as **French polishing,** in which a **rubber** (a pad made from several layers of cotton cloth) is used to apply the multiple thin layers of shellac that make up this classic finish.

Photos: staff

## Brushing


**Brush up your language skills**

All brushes have **filaments**—the individual strands, natural or synthetic, that make up the body of the brush. Only a few, though, have **bristles,** a type of natural filament made from animal fiber. These are typically made from hog bristle, also known as China bristle because that is where the material comes from. Other fibers used in **natural-filament** brushes include ox hair and badger hair. All work well for oil-based finishes, shellac, or lacquer. The natural resilience of the fibers allows them to hold a lot of finish and distribute it evenly. Avoid using natural-filament brushes for waterborne finishes, however, because the filaments will absorb water and lose their resilience.

To apply waterborne finishes, use a brush with manmade filaments or **synthetic bristles**. These are mostly made from nylon or polyester. A particularly fine-strand filament is called **Taklon;** these types of brushes are great for applying a thin topcoat that leaves almost no brush marks. Synthetic-bristle brushes can also be used for other finishes and many consider them almost as good as top-of-the-line natural-filament brushes.

Natural or synthetic, look for filaments that are split and frayed at the ends. A brush with this characteristic, known as **flagging**, leaves fewer brush marks. For the same reason, look for a **chisel-ended** brush, where the filaments form a V at the end rather than being flat.

The metal that encloses the base of the filaments is known as the **ferrule.** On any brush you intend to keep, the ferrule should be made of brass or stainless steel to avoid rust that eventually can contaminate the finish.

## Spraying



**Learn what to say before you spray**

Spraying may leave a great finish, but learning all the terms makes it hard to get started. There are three areas you need to know about. The first is the source of compressed air for the spray gun, either a **turbine** (a self-contained unit with a built-in blower) or an air compressor. Both systems are defined as **HVLP** (high volume, low pressure). They use low air pressure to **atomize** the finish (turn it into tiny particles), so more of the finish stays on the workpiece instead of bouncing off and ending up as **overspray**.

Scuff-sanding

Wet-sanding

Steel wool

Auto polish

The last group of spraying terms has to do with the quality of the finish. Spraying is meant to speed up the finishing process, so you are aiming for an **off-the-gun** finish, one that needs no further work. Before you reach that nirvana, you will probably experience some problems. One of the most common is known as **orange peel**, a bumpy surface caused by too heavy a film or poor atomization of the finish. To fix it, you can cut back the supply of fluid and either increase the air pressure to the spray gun or reduce the viscosity of the finish.

Another problem when spraying fast-drying finishes such as lacquer or shellac on very humid days is **blushing**. This happens when water vapor gets trapped in the film of finish and creates a whitish haze. The solution is to add a blend of solvents known as a retarder to the finish to lengthen the drying time. A less-common problem is **fisheye**, small craters often caused by silicone contamination from old furniture polish or shop lubricants on the wood's surface.

### Finishing the finish

Unless you are an expert sprayer, with any kind of built-up film finish you will probably need to work on the last coat after it has fully cured. There may well be small bits of dust known as **nibs** stuck in the finish; the surface may be marred by brush marks or perhaps small sags and runs on vertical surfaces. Or, you may not want a glossy appearance. The solution to all these problems is to rub out the finish using a variety of methods and fine abrasives.

The shine on the surface is referred to as **sheen,** and is a measure of the amount of light it reflects. A **high-gloss** sheen, sometimes called a **piano finish**, requires careful leveling and polishing of the topcoat. A less formal **low-luster** finish is easier to achieve.

Any high-gloss finish must be perfectly flat, so the first step is to level it by **wet-sanding** with wet-or-dry sandpaper lubricated with water and a tiny amount of dish soap. With some finishes, you'll want to lightly "**scuff sand**" between coats to level the surface. If you sand through the topcoat of a finish like varnish where each coat doesn't melt into the previous one, you will create a **witness line**. The only way to cover up this ragged edge of finish is to apply another coat or two and start leveling again.

High gloss

Low luster

Final polishing of a high-gloss finish used to be done with **pumice**, a finely ground lava, lubricated with mineral oil, followed by **rottenstone**, a kind of limestone. These days it is much easier to use polishing compounds and liquids formulated for polishing car bodies.

For a lower-sheen satin finish, rub the surface with 0000 (pronounced "4 ought") **steel wool** or a 4,000-grit **Abralon** pad. This foam-backed abrasive disk works well on flat and curved surfaces. After that you can apply some furniture polish or paste wax and rub or buff it out with a lint-free cloth, which gets us back to where we started. □

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*Mark Schofield, a former managing editor, edited FWW's finishing articles for more than a decade.*

# Plane blades and chisels need a flat and polished back

## DO THE HEAVY WORK WITH SANDPAPER GLUED TO GRANITE

BY CHRIS GOCHNOUR

***Clear as a mirror, sharp as a razor.*** *The high polish means that the back—and the cutting edge—is truly flat and without blemishes. When it meets a bevel that's just as polished, the blade will be truly sharp.*

You surely have heard it before: A sharp cutting edge is the meeting of two flat, polished surfaces. That's why you need to give as much attention to the back of a plane blade or chisel as you do to its bevel. You must first flatten and smooth it, and then polish it to remove all the scratches. When you're done, it should be as clear and reflective as a mirror.

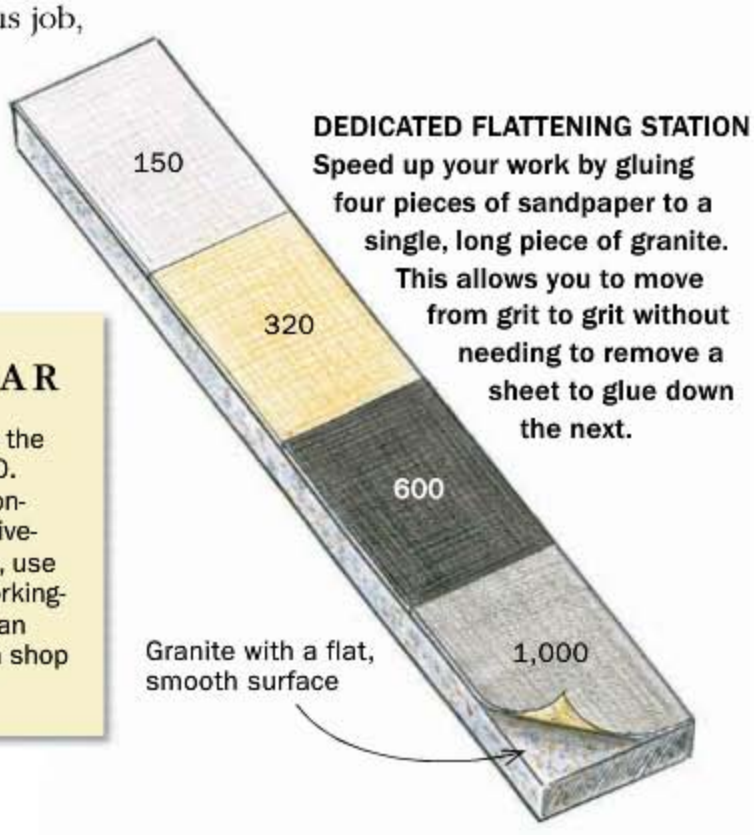
I wouldn't be surprised if the prospect of flattening and polishing a blade or chisel's back kept you out of the shop for a while. It can be a boring and tedious job, but it doesn't have to be. My technique is fast and gives perfect results. I use sandpaper for the heavy

## Get ready

**You need coarse grits to flatten a blade back efficiently, but coarse waterstones are soft and go out of flat very quickly. A better way is to use sandpaper, which cuts quickly, is cheap and easy to find, and when glued to a flat piece of granite, never goes out of flat.**


***Easy on.*** *Use spray glue, which is easy to apply and can be removed easily when it's time to replace the paper.*


***Easy off.*** *To pull off the sandpaper cleanly, use a heat gun or hair dryer to soften the adhesive. Mineral spirits cleans up the leftover glue on the granite.*




**DEDICATED FLATTENING STATION**
**Speed up your work by gluing four pieces of sandpaper to a single, long piece of granite. This allows you to move from grit to grit without needing to remove a sheet to glue down the next.**

### THE RIGHT GEAR

Use aluminum oxide paper for the coarsest grits, P150 and P320. Then switch to wet-or-dry silicon-carbide paper (check automotive-supply stores). For the granite, use a surface plate (many woodworking-supply retailers sell them), or an offcut from a stone fabrication shop (check the yellow pages).



Photos: Thomas McKenna; drawings: John Tetreault

# Flatten and smooth the back

**This stage is a lot like preparing a wood surface for finish. You want to get the surface flat first and then smooth it with progressively finer grits until it's ready to be polished.**


***Start with P150 grit.*** *Apply pressure with fingers from both hands within about ½ in. of the cutting edge (left) to ensure that the blade is flat on the sandpaper. Move the blade from side to side along the length of the paper, not in and out. Stay at this grit until there is a consistent scratch pattern extended back an inch or two from the cutting edge (above).*

work, gluing a progression of grits to a piece of granite. Sandpaper is inexpensive and easy to find, and because the granite never goes out of flat, the sandpaper doesn't either.

### How far to flatten

I flatten the first 1 in. to 2 in. of the blade behind the cutting edge. That's essential on a chisel, but some say that it's unnecessary on a plane blade, that only the cutting edge needs to be flat and polished. But for a plane to cut well, you need more than just a sharp edge. On bench planes, for example, the chipbreaker must mate perfectly with the back of the blade. Any small gaps between them are opportunities for shavings to get stuck and eventually clog the throat. By flattening a larger area of the back, I create a perfectly flat mating surface for the chipbreaker. Also, working a bigger area makes it easier to hold the blade flat on the sandpaper.

### Flatten, smooth, then polish

Preparing the back is really a three-step process. But before you start, polish the back a bit on your highest-grit stone or sandpaper. This will give you an idea of how flat the back is. Blades and chisels from high-end makers might already be flat and just need polishing.

The first step is to flatten it (on some blades and chisels you might also be removing machine marks at this point). This is work for the coarsest sandpaper (150 grit).


***Work up through the grits.*** *On the second grit, move the blade in and out until the side-to-side pattern from the previous grit is gone. Then you can move up to the next grit. Continue to alternate between side-to-side and in-and-out movement as you change grits.*

## Two ways to polish

**Now that the hard work is done, all that remains is to polish the back to a mirror shine. Here's how to do it without ruining the flatness.**

Don't move up in grits until you've created a consistent scratch pattern and an even sheen. After the back is flat, use the grits from P320 to P1000 to create ever-smaller scratches. This stage of the process is like sanding a flat surface in preparation for a finish.

Then, after the back is smooth, you can literally polish off the last of the scratches with your 4000- and 8000-grit waterstones or P1500- and P2000-grit sandpaper, moving the blade side to side on both grits. □

*Chris Gochnour is a woodworker and hand-tool expert near Salt Lake City.*

***Use sharpening stones.*** *Start with a medium grit, like 4000, and finish up with a polishing stone (8000-grit or higher). Make sure the stones are flat before you begin.*

***Or stick with the sandpaper.*** *Extrafine grits of sandpaper can produce a polish just as well as sharpening stones. A second granite surface plate for polishing is nice, but not necessary.*

***The payoff.*** *The back is now ready for work, and you won't need to flatten it again. Removing the burr on the polishing stone (or P2000-grit paper) when you hone the blade is all the maintenance the back needs.*

# Doors that Stay Flat

## How to ensure that your frame-and-panel doors come out flat—and stay that way

BY STEVE LATTA

For doors to hang easily and swing true, they need to be flat. It sounds obvious, but making doors that stay flat is easier said than done. No matter how much I emphasize proper techniques with my students, there are always doors that end up with a twist. In almost every case, the problem could have been avoided.

Flatness is the result of a painstaking process that starts with choosing the right stock, followed by patient milling and careful joinery and assembly. While building a basic frame-and-panel door, I'll share the techniques I use to make sure my doors come together flat and stay that way.

### Pick straight stock and mill it gradually

If you want your door to stay flat, the rails and stiles have to be resistant to twist. The best way

### BIG DOORS GET A BIG BANG

***Drop relieves stress.*** *For larger doors, like those on armoires, Latta actually drops rough parts on the floor! The impact releases internal tensions and lets the parts finish warping before final dimensioning, he says.*

## Milling: Start with the right stock

**Straight-grained, dimensionally stable stock—as in rift- or quartersawn lumber—is the right choice for door frames. Structurally, it moves more predictably and is less likely to develop twist than flatsawn stock. And its subdued grain pattern is less jarring visually.**


***Straighten the grain.*** *If the grain runs at an angle to the edge, mark a line parallel to the grain (top), then bandsaw to the line (bottom). Clean up the cut at the jointer.*


Photos: Henry P. Belanger

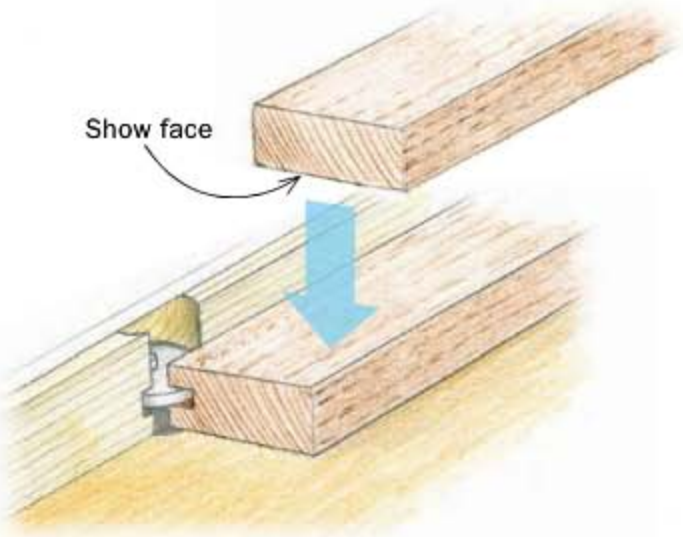
# Joinery: Know your show face

**When cutting the joinery, use the show face (usually the front) to guide the workpieces. Referencing off the show face ensures that the joinery will line up and the pieces will be flush on the front of the door where it is most obvious.**

## GROOVES AND MORTISES FIRST

### FRONT FACE DOWN

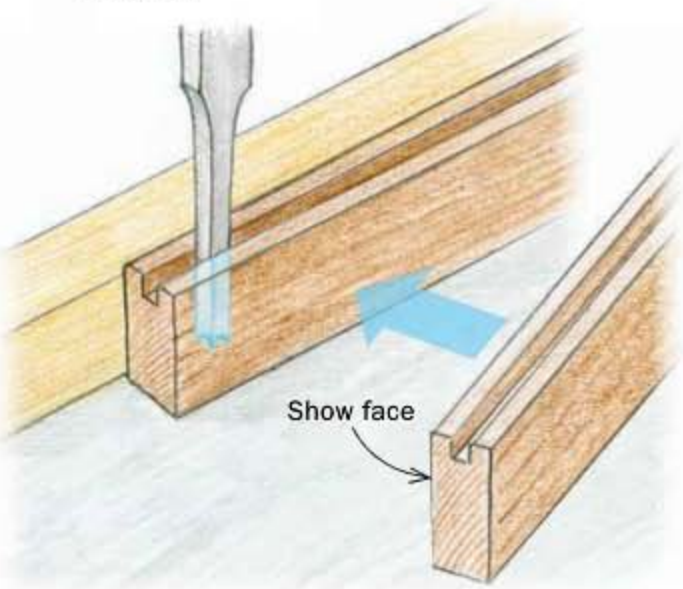
**By referencing the front faces against the router table, any surface or thickness variations will end up on the back of the door.**




***Start with the panel grooves.*** *Latta uses a slot-cutting bit in the router table. To prevent the workpiece from lifting, which will make a wavy cut, use push blocks to keep it tight to the table. It also helps to brush off the table between passes so that dust and chips don't interfere.*

### FRONT FACE AGAINST FENCE

**Place the front faces against the fence of the mortiser.**





***Use the grooves to guide the mortising.*** *Latta cuts the groove to the exact width of one of his hollow chisels. The groove helps him set up the mortiser. The same would work if you were routing the mortises.*

to avoid problems is to use dimensionally stable, straight-grained stock for the frame. As you mill any board, you release internal stresses that can cause wood to move out of flat. But figured grain is more prone to unpredictable movement—so save figured stock for the panel or elsewhere.

While milling the frame parts, remove material slowly and equally from both sides to minimize and balance wood movement. Throughout the process, keep stock neatly stickered on a flat surface to further discourage bows, cups, and twist.

Start with stock that is ¼ in. to ⅜ in. thicker than the final dimension and rough-rip the stiles and rails about ¼ in. to ½ in. heavier than final width if the stock allows. Larger doors need more buffer than smaller doors, so size parts accordingly. Rip a few extra pieces in case parts need to be replaced. The extras also can be used to set up joinery cuts.

Take stiles and rails to final thickness gradually. Take light passes on the jointer or planer. The dimensioning process might take a week for large doors, or overnight for small doors. After each milling session,



Drawings: John Tetreault

***Cut the shoulders.*** *Latta uses a miter gauge that's adjusted perfectly square to the blade. The rip fence serves as the stop.*

it's important to sticker the parts and let them sit overnight. Letting the parts sit allows the newly exposed grain to acclimate to the shop and lets the wood move. If a piece keeps warping severely, replace it with one of your extras. If it won't stay flat during rough-in, assume it won't later on.

Approach solid-wood panels just like the frame parts: Size them down slowly over time, and check often for twist, bow, or crook. Distorted panels can pull the frame out of flat during glue-up.

## Consistent machining ensures flush joints

Straight stock and incremental milling yield flat parts, but it takes solid, well-executed joinery to make a dead-flat, rack-free door. I use real tenons—not the flimsy stub tenons formed by a basic cope-and-stick router set—and make them as long as the frame design allows. Full tenons provide superior protection against racking, buckling, and distortion.

For speed and simplicity, I size and locate the mortises and tenons to correspond to the panel groove, which I cut first. I use a ¼-in. groove for small doors and a 5/16-in. groove for larger doors.

Before cutting the joinery, I mark all my front faces with crayon to keep track of their orientation. Consistently referencing off the "show" faces at the machines ensures flush joints later on. Any slight variations in thickness from piece to piece will end up on the back of the door, not the front. This marking procedure is especially critical when you are making a door with an offset (off center) panel groove.

I use a hollow-chisel mortiser to cut the mortises, matching the chisel to the width of the groove. The panel grooves and the mortises should be referenced off the same face, so here, reference the front sides against the fence. Mortises should be 1/16 in. deeper than the length of the tenons. This leaves room for excess glue or debris at the bottom, which otherwise might prevent the tenon shoulders from mating squarely with the stile during glue-up.

I cut tenons at the tablesaw, starting with the shoulders. To ensure consistent results,

***Then the cheeks.*** *Latta uses a shopmade tenoning jig to cut the cheeks. Before cutting the real tenon cheeks, however, he makes test cuts on an extra workpiece.*




***Set up square.*** *Square up both the jig fence and the blade; otherwise, you'll end up with tapered tenons.*

***Too tight is just right.*** *When machining the tenon, you want it to barely fit the mortise. Let it acclimate overnight, then fine-tune the fit with a rabbet or shoulder plane.*

# **Fine-tuning:** Get precision with hand tools

**If you've taken care setting up your machine cuts, any fine-tuning of the fit should be minimal. The job is best done with a rabbet block plane, which is wide enough to plane the entire tenon in most cases, but a shoulder plane works, too.**

***Take light passes.*** *Remove material equally from both sides to ensure that the joint is flush. Check the fit frequently as you go.*

***Check the cheeks.*** *Use a combination square to make sure that the cheeks are parallel and square to the rail faces.*

***Now check the corners.*** *Lay a 6-in. ruler across each joint to confirm that it's flat and flush in front.*

use a well-tuned miter gauge that's perfectly square to the blade.

I make the cheek cuts with a tenoning jig, sizing them a hair too thick so that the tip of the tenon just fits in the mortise. Then, I let the pieces sit overnight and acclimate. The newly exposed cheek fibers are likely to shrink; a too-tight fit in the afternoon often becomes a perfect fit the next morning. For that reason, I tend to schedule my work so I'm cutting tenons at the end of the day. If the tenons are still too tight, size them down with a rabbet block plane, which removes material uniformly across the whole tenon. Be sure to remove material equally from both cheeks, so you don't create misalignment problems later. Use a combination square to verify that the cheeks are parallel to the face of the rail. Assemble the joint on a flat surface and use a straightedge to see whether the joint is flat.

Because grooves run the length of the stiles, for this door, the tenons need to be haunched before you can dry-fit the rails and stiles. Establish the height of the haunch at the tablesaw, with a miter gauge, then rip to fit at the bandsaw.

Finally, size the panel. You want it to be about ⅛ in. shy of the available space in the frame (more in winter, less in summer); this provides the necessary room for seasonal movement across the grain. Keep the fit tight at the top and bottom.

## Keep things flat for a final dry-run

Before you break out the glue, do a dry run with the assembled door, clamps, and cauls. Start with a flat surface. Use two identical clamps (one for each rail) that are free from tape or dried glue, and make sure they're parallel—to each other and the table. Cauls should be sized about ⅛ in. thinner than the stiles, so clamping pressure is directed in line with the joints. Make the cauls ¼ in. shorter than the door, so you can make corner-to-corner measurements to check the door for square.

Dry-fit the door, lay it on the clamps, and position the cauls. Center the clamp heads on the rails and tighten them just enough to bring the joint together. Excess pressure is counterproductive.

Once you've confirmed that the door is square and flat during the dry-fit, take it all apart—you're ready to glue it up the same way. Glue should be a formality; by

# Assembly:
## The right cauls are key

**Dry-fitting and clamping the entire door gives you one more chance to check the alignment of parts. It also gives you a chance to see that the clamps and cauls you're using won't wreck your glue-up.**



***Thin cauls are more direct.*** *Cauls (or clamp jaws on their own) that project above the frame (left), will apply pressure unevenly, causing the door to bow. Cauls that are a bit thinner than the frame help direct the clamping pressure more precisely (above). Use a straightedge to make sure that parts are flush after you've tightened the clamps.*

the time the adhesive hits the joints, all the work of making a flat door is done.

### Store doors carefully

Don't forget to store your doors properly after you glue them up. Taking the doors out of the clamps and leaning them against the wall can cause them to warp. If they're not hanging on the finished piece, doors should be stickered on a level, flat surface. The stickers should be of equal size, not random scraps from the cutoff bin. □

*Steve Latta teaches woodworking at Thaddeus Stevens College of Technology in Lancaster, Pa.*

***Cut cauls a bit short, too.*** *To check for square, measure the door's diagonals. If they match, the door is square. Latta makes his cauls about ¼ in. shorter than the rails so the tape can hook securely over the corners.*

## EXTRA STEP FOR BIG DOORS

**An assembly surface that isn't level could cause the clamps to pull a large door out of flat as the glue dries. Check your benchtop or assembly table for flat and level, then do a dry run. The table, clamps, and door should be on the same plane.**

# Never Struggle with Squeeze-Out Again

## Wonder product prevents glue from sticking but doesn't affect finishes

BY MICHAEL C. FORTUNE

### WAXILIT IS TRIED AND TRUE, BUT OTHER WAXES WORK TOO

I discovered Waxilit in a catalog of German machinery a few decades ago and have been using it since to guard against glue squeeze-out. In that time, it has never let me down. But as I was writing this article, I discovered that my longtime source was no longer going to sell it. Fortunately, I eventually found a second source, Johnson's Workbench, that sells shoe-polish-sized cans. That's more than enough Waxilit to last for several years. As I was scrambling to find a new source, I also began to test other paste waxes extensively. I discovered (not surprisingly) that any wax would prevent glue from sticking. However, not every wax plays friendly with finishes. Some waxes have silicone in them, which causes problems. But waxes that are silicone-free work great, even with waterborne finishes. So, if you don't want to order Waxilit over the phone, look for a silicone-free paste wax.

**WAXILIT 22-30 P**
$10, Johnson's Workbench
By phone only: 800-292-5937

# Apply wax to assembled joints

**The wax goes on the joint before you spread any glue. Put it wherever glue will squeeze out, and wherever it's likely to drip.**



***How to get an even coat.*** *Pick up a small amount on a tissue (above), and then smear it in (right).*

***Dry-fit first.*** *Then clamp the joint together as tight as it will be after glue-up. A tight joint ensures that you'll get wax where you want it (around the joint) but not where you don't (on glue surfaces).*

***Tissue is the right tool.*** *Thicker materials don't reach into the tight corner where parts meet. Apply a thin coat, which should dry clear. If there's a white residue, you've applied too much.*

When I glue up a joint, I want to see a small, consistently sized bead of glue squeeze-out along the joint line. It's a good indication that the joint isn't starved for glue. It's also a pain in the neck. If you remove squeeze-out while the glue is wet, you run the risk of leaving behind residue that you invariably discover only after applying a finish. But try to remove the hard glue with a chisel or scraper and you can damage the wood.

I reached my limit of frustration 20 years ago while making 14 chairs that each had over 60 joints. I spent a full week removing the squeeze-out from the first chair I glued up. So, before I glued up the next one, I desperately searched for a solution.

I found a great one: Waxilit. I'm surprised more people don't know about it. It was originally designed to minimize friction on the surfaces of production woodworking machinery, but I also discovered that glue does not stick to wood that has been coated with it. After the glue has dried for about an hour, it pops off cleanly from the coated surface! Just as importantly, Waxilit doesn't affect finish. It's easy to wash it off with denatured alcohol, and I've put a lot of finishes over it—everything from penetrating oils to sprayed lacquers—without any problems. I've done some

TIP

**USE A BRUSH ON POROUS WOODS**

**Tissue would push the wax deeply into the pores. Brush it on gently instead.**

Photos: staff

## Let the squeeze-out stand

**This is a great change of pace for glue-ups. Typically, your stress levels are peaking at this point, because you're not sure if you should wipe away the glue with a wet rag or chisel it off later. Now, you can just relax.**

***Glue freely.*** *Since it won't stick to the wax, you can put glue in places where it's sure to cause squeeze-out, like the face grain around a mortise.*

***Don't wipe.*** *You want a small, tight bead that is easy to lift off after the glue has partly dried. Leave it to firm up. By then you should be able to remove the clamps for easier access.*

testing with waterborne finishes (which I don't use) and they seem to work fine with the waxes, too. It really is a cure-all for squeeze-out. And the time you spend applying and removing Waxilit is nothing compared to the hassle of removing squeeze-out and then repairing the damage you caused.

I apply Waxilit around joints before I spread any glue, and it's an important part of my inlay technique, too. It's easy to apply and simple to remove. I'll show you how.

### A little does a lot

After you've bought your first can of Waxilit, there is one thing you need to do before you use it: Let it sit with the top off until it becomes about as firm as a stick of Crisco. Otherwise, it's too soft and can bleed into the wood, making it difficult to clean up.

I sand all of my parts up to P220-grit before applying the wax. Also, I dry-fit the joints and clamp them. With the joint tightly together, you can spread the wax with no fear that it will get on any of the glue surfaces. I use a facial tissue or toilet paper to apply the wax, smearing it into the tissue with my finger so that it goes on in a smooth, even coat. Wipe it wherever squeeze-out and drips are likely to occur.

From there, glue up the joint, clamp it, and let it stand. Don't touch the squeeze-out for an hour. At that point, you should be able to get a chisel or fingernail under the bead of glue and peel or pop it off. It's like magic. Whenever I demonstrate this to students, they're amazed at how easily the glue comes off—often in a single, continuous piece that runs around the joint!

Finally, before you apply your finish, do a bit of cleanup. Use denatured alcohol and a toothbrush to scrub the wax from the surface, using a tissue to soak up the alcohol—and the dissolved wax—before it evaporates. You might wonder why that step is necessary if Waxilit doesn't affect finishes. Honestly, I do it to be safe and recommend that you do the same.

You might also ask whether you need to use Waxilit or if any paste wax will do. The short answer is no, you don't have to use Waxilit, but you need to be careful when picking another one. Waxilit is silicone-free and that's why it doesn't affect finishes. So, if you use another wax, make certain that it's silicone-free, too. □

*Michael C. Fortune is a contributing editor.*

**TIP**

### GREAT FOR INLAY, TOO!

The technique for inlaying into solid wood and veneered surfaces begins the same (right), but the cleanup for the two surfaces is different. In solid wood, trim the inlay flush before cleaning. Reverse that order for inlay set into veneer, where sanding the inlay flush might push the wax too far into the pores.


***Spread the wax before routing the grooves.*** *If you cut the recess first, you're sure to get wax into it and the glue won't bind to the floor and walls of the slot.*

***Then glue in the inlay.*** *Use plenty of glue to create a strong bond, and let any squeeze-out dry in a bead, just as you would with a joint.*

# Cleanup is a breeze

**This is where the magic happens. The glue bead comes off with no resistance and no residue. Fortune routinely gets entire beads to come off in a single piece, even turning corners around a joint.**

## TWO WAYS TO REMOVE THE GLUE

***Peel it up.*** *This works especially well for drips and runs, as long as you do it about an hour after glue-up, when the glue is firm but still flexible.*

***Use a chisel in corners.*** *Come at the bead from both directions. It should just fall away. If not, give it a little pull with your fingers.*

## WASH AWAY THE RESIDUE

***Clean with denatured alcohol.*** *The soft bristles of a toothbrush do a good job of pulling the wax off the surface. Then soak up the alcohol and wax right away with a tissue. If you let the alcohol evaporate, some wax remains.*

***Sand lightly.*** *Use P220-grit paper to knock down any grain raised by the denatured alcohol.*

***Finish with no worries.*** *Use whatever you want. There won't be any evidence that the wax (or glue) was ever there.*

# Shaker Chimney Cupboard

## An original piece with classic looks and easy joinery

BY MICHAEL PEKOVICH

One of the great things about Shaker furniture is that no two pieces are exactly alike. Aside from chairs, the Shakers didn't make furniture for commercial production. Each piece was essentially a one-off design, made for a specific purpose or even an individual user, so the variations are endless. And in spite of the restrained design sense, there is a playful, subtle originality to each piece. It's what inspires me to make furniture in the style, and to make it my own.

I'd wanted to make a chimney cupboard for a while because I like the tall, slender proportions of the form. Every original example I've seen, though, has just a pair of doors, one stacked on the other. Wider cupboards, on the other hand, typically have an arrangement of drawers at waist height that add interest and utility. I like that look so I figured, "Why not sneak a few drawers into my chimney cupboard?" The result, in keeping with the Shaker spirit, is an original design in the classic vernacular.

### Construction is simple yet solid

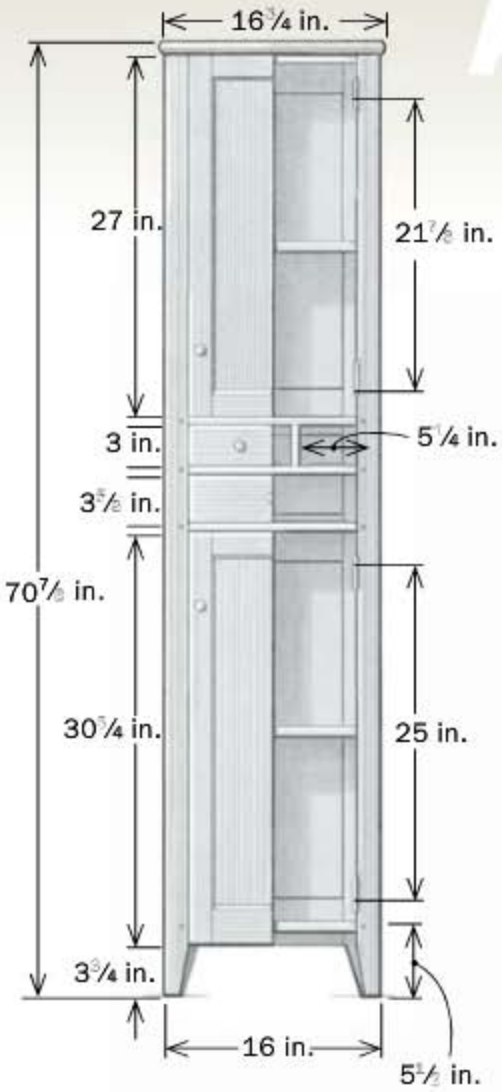
I looked to the Shakers for the anatomy too, but chose elements that are as straightforward as possible. Most of the joints are rabbets and dadoes. There are just a few half-blind dovetails at the top where the subtop rails connect to the case, but they're hidden, so there's no need to stress there either. Dressing up the front is a partial face frame, really just a pair of stiles glued to the sides. The stiles hide the shelf dadoes, but they also allow an opportunity to peg the case to the shelves for added strength. The primary wood is cherry, but I used pine for the frame-and-panel back. The back

**VIDEO WORKSHOP**

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

# ANATOMY

## LOTS OF STORAGE IN A SMALL FOOTPRINT




Top, ⅞ in. thick by 12½ in. wide by 16¾ in. long

Subtop rails, ¾ in. thick by 3½ in. wide by 15½ in. long

Back rails, ¾ in. thick. Top rail, 3 in. wide; all others, 3½ in. wide.

Tenons, ¼ in. thick by 1¼ in. long

Back panels, ⅜ in. thick, rabbeted to fit ¼-in. groove

*Inset magnetic catch contacts flat-head screw in door.*

Groove, ¼ in. wide by ⅝ in. deep

Dadoes, ¼ in. wide by 5/16 in. deep

Face frame stile, ⅞ in. thick by 1¾ in. wide by 70 in. long

Vertical divider, ⅝ in. thick

Fixed shelf, ⅝ in. thick by 11⅜ in. wide by 15 in. long

Rabbet, ¼ in. wide by ¼ in. deep

Bottom, 5/16 in. thick, rabbeted to fit ¼-in. groove

Pin, ¼ in. dia. by 1½ in. long

Front, ¾ in. thick

Drawer stop, ½ in. thick

Drawer guide, 1 in. wide

Sides and back, ½ in. thick

Stiles and rails, ⅞ in. thick by 2 in. wide*

Panel, ⅜ in. thick, rabbeted on back to fit groove

Adjustable shelf, ¾ in. thick

Glue block, ¾ in. square by 4 in. long

Groove, ¼ in. wide by ¼ in. deep, inset 5/16 in. from front face

Bottom, ¾ in. thick by 10½ in. wide by 15 in. long

Rabbet, ½ in. wide by ¾ in. deep

Thumbnail profile, ¼-in. radius, mitered at corners

*Bottom rail on lower door, 3 in. wide

Tenons, ¼ in. thick by 1 in. long

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

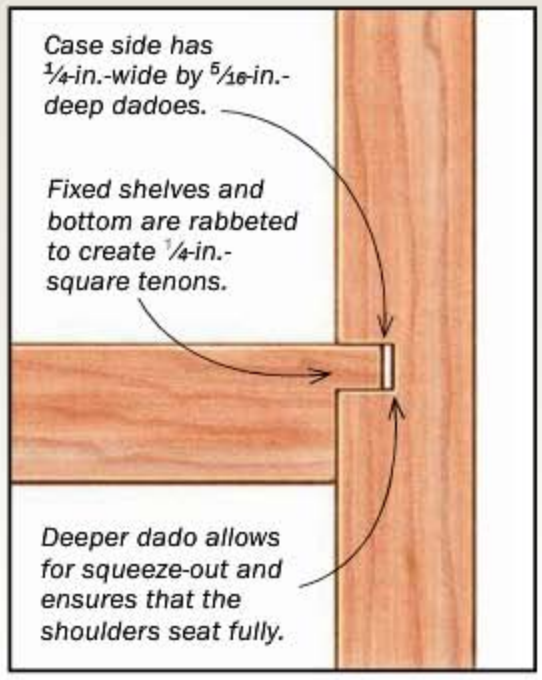
3¾ in.

1⅛ in.

Side, ¾ in. thick by 11½ in. wide by 70 in. long

Photo (opposite page): Michael Pekovich; drawings: John Hartman

## SIMPLE DADOES AND RABBETS




***Accurate dadoes at the tablesaw.*** *Clamp a long hook-stop to your crosscut sled to position the case sides (above). Dado both sides before moving the stop for the next pair of dadoes. The extra plywood on the sled base creates zero clearance around the dado blades.*

***Add an end stop for the bottom dado.*** *Screw the stop to the sled (above). Hold-down clamps secure the case side and prevent it from lifting or pivoting during the cut (right).*

***Rabbet the shelves to fit.*** *Widen the dado set to ⅝ in. and bury a portion of the blade in a sacrificial fence to dial in the width of the rabbet. Use a featherboard to ensure a consistent depth. Aim for a snug fit and fine-tune the joint with a shoulder plane.*

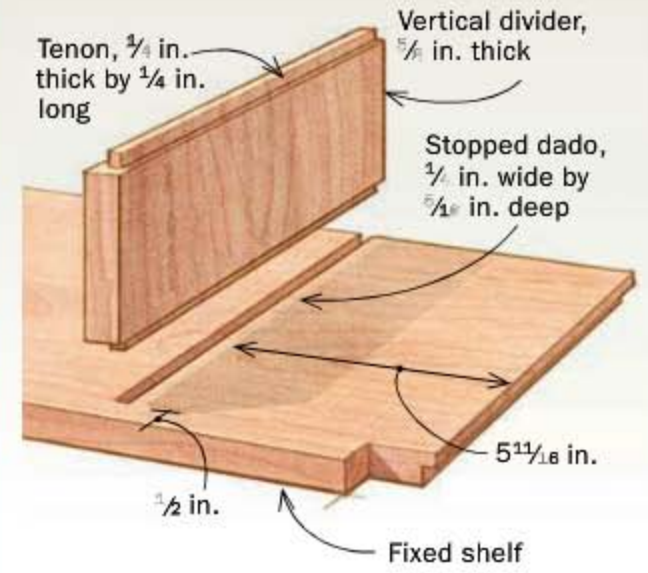
adds rigidity and the pine lightens up the look of the interior. Finishing things off is a top with a subtle bullnose profile. It overhangs the front and sides and is attached to a pair of subtop rails. The rails add rigidity to the top and also act as a doorstop. I simply glued and screwed on the top because the grain of all the parts runs in the same direction and seasonal movement isn't an issue.

Glue blocks under the bottom shelf and drawer blocks at the center shelves lend additional support. Added up, this is a very fast and strong way to build a cabinet.

This project is also a good one for working entirely by hand, but for that I'd probably do the whole thing in pine.



Photos, except where noted: Ken St. Onge




***Stopped dadoes for the vertical divider.*** *Clamp both shelves together with the back edges adjacent. Rout the dadoes using a straightedge to guide the router base. Stop short of the ends and square up the dadoes with a chisel.*

### How to work efficiently

Though most of the joinery is simple dadoes, there are a lot of them, so I came up with ways to make the process as efficient as possible. First I cut the dadoes narrower than the shelves, dividers, and bottom, and rabbeted those parts to fit.

This approach has some big benefits. First, rabbeting a part to fit a dado is much easier than milling a part to a precise thickness to fit a full-width dado. Second, the rabbet creates a shoulder on the shelf that registers against the inside face of the case side. This makes for much more accurate glue-ups because it doesn't rely on the bottom of the dado being perfectly even (that is difficult to pull off on a wide case side). And because the joint registers off the shoulder, you can cut the dado a little deep, which allows room for excess glue to gather and prevents squeeze-out. The face frame and back panel hide any gap at the bottom of the joint.

To cut the dadoes for the shelves, dividers, and case bottom, I used a crosscut sled and a ¼-in.-wide dado blade on the tablesaw. To cut the three dadoes for the shelf and drawer dividers, I registered the work against a long hook stop (opposite page). The dado for the case bottom is a little trickier because the long side can pivot during the cut. For that dado, I made a stop block with hold-down clamps and attached it to the sled.

While I had the ¼-in.-wide blade in the saw, I grooved the back of the face-frame stiles. The trick here is to locate the groove so that the face frame will be about 1/32 in. proud of the case side when glued up, so

## DOVETAILS STRENGTHEN THE TOP

***Scribe the case sides.*** *A shallow rabbet on the inside face of the rails (above) makes it easier to align the parts for scribing (right).*

***Rout and chop the waste.*** *A router makes quick work of removing most of the stock. Pekovich reground a pair of chisels at an angle to work into the corners as he chops the end grain. Afterward, he pares to the scribe line with a wide chisel as shown.*

Photo (top): Rachel Barclay

## 1. START WITH THE FACE FRAME

***Shape the feet first.*** *Pekovich jigsaws the profile on the case sides, and then smooths it with a block plane as shown, using a file to work into the corners. He tapers the bottom of the face frame on the bandsaw, smoothing the cuts with a bench plane.*

***Glue the face frame to the case sides.*** *A narrow caul directs pressure over the joint and distributes it along the length. Check for square during clamping. When the glue is dry, plane the face frame flush to the case sides.*

you can plane the face frame flush to the case. If you're really organized, you can cut the panel grooves in the door and back frame parts now as well. I hate changing out my dado blade more than I have to. One more thing: You can use cutoffs from the grooved parts to dial in a perfect fit on the rabbets later.

Next, I widened the dado set and rabbeted the case sides, dividers, and shelves. The case sides get a rabbet along the back and front edges. The rabbet in the back houses the case back. The one at the front creates a tongue that fits the groove in the back of the face frame stiles. It's a little more work than simply butting the parts together, but the tongue-and-groove joint makes it easier to register the parts during glue-up and can help correct any slight bow in the long case sides.

The two horizontal dividers require a stopped dado to accommodate the vertical drawer divider. I handled this with a router. Clamp both shelves to the workbench. With a T-square fence clamped in place, you can rout both shelves at once, saving time and ensuring perfect alignment.

### Dovetails lock the top of the case

The subtop rails are joined to the case sides with half-blind dovetails. Start by cutting the tails on the subtop rails, and then transfer their layout to the case sides. I normally stand the pins board in a vise for scribing, but these sides were too long for that. Instead, I placed the side flat on the benchtop and held the rail vertically while scribing, and then I kept them right there to rout, chop, and pare away the waste.

The last task before assembly is to cut out the feet on the case sides and the bottom of the face-frame stiles.

### Face frame anchors everything else

Normally the face frame is the last thing I add when building a case, but it's the first thing I tackled on this project. Gluing the stiles to the sides first eases construction in a couple of ways. First, it allowed me to plane the stiles flush while the side assemblies were easy to deal with; doing it when the whole cabinet is together is awkward. It also was easier to mark and notch the shelves to fit around the stiles at this stage. And that let me assemble the

## 2. NOTCH THE SHELVES

***Scribe and cut.*** *The fixed shelf and dividers end up flush with the case front, so they need to be notched to fit around the face frame. Butt them against the face frame and be sure they are vertical when scribing. Cut outside the line and pare to fit with a chisel.*



Photos, this page: Rachel Barclay

## 3. GLUE UP THE CASE

***Recipe for success.*** *Elevate the piece on rails to make room for clamps. Insert the shelf, dividers, and bottom flush against the face frame and drop the second side into place (left). Last, tap in the dovetailed rails (below).*

rest of the case all at once, without having to slide in the shelves afterward.

The case bottom and the front subtop rail butt against the back of the face frame and act as door stops. The fixed shelf and dividers, on the other hand, end up flush with the front of the face frame, so you need to notch them to fit around it. With the stiles already glued to the case side, it's easy to scribe the notches. Mark them a little high, so the shelves end up protruding a bit from the front of the case. That will let you plane them perfectly flush later. Cut just outside the line with a handsaw or on the bandsaw, and pare the remaining waste with a chisel.

Assembly continues with gluing up the sides, shelves, and bottom and top rails. Dry-fit and clamp the parts together and check for square. This is also a good time to check that all the shelf notches are sized properly. A notch that's too narrow will look fine from the front of the case, but won't allow the shelf to seat fully. Also the notch should be deep enough so that when slid forward, the shelf or divider is just proud of the face frame. When everything looks good, go ahead and glue up the case. Once all the clamps are on, add the glue blocks under the bottom shelf. Apply a thin coat of glue on two faces and rub the block back and forth until it grabs. The vacuum will hold it in

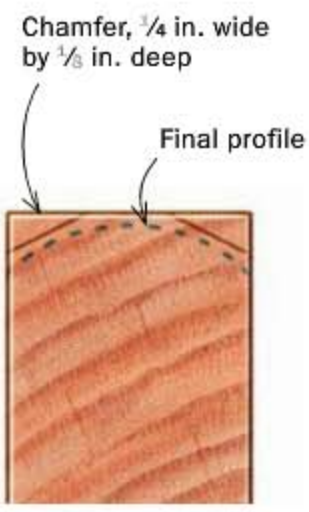
## 4. ADD THE VERTICAL DIVIDER




***Plane its neighbors, then slide it in.*** *Go slowly when planing (1) to avoid gouging the face frame. Then slide the vertical divider most of the way in (2), apply glue, and tap it home. Plane the divider flush when the glue is dry (3).*

## THE TOP GETS A BULLNOSE

***Profile is plane easy.*** *Lay out pencil lines as a guide and plane a wide, shallow chamfer along each edge (right). Then plane off the peaks for a smooth curve. Keep the corners crisp (bottom right) for a nice shadow line.*




***Attach the top and back.*** *The top can be glued and screwed directly to the subtop rails because the grain on the parts is running in the same direction (above). Trim the frame-and-panel back to a snug fit and screw it in place (left).*

place without clamps. To allow for seasonal movement, apply multiple short blocks along the joint rather than one long one. The drawer guides are glued in the same way, but because the guides are long, glue the front half only. Afterward, drill through the face frame at the shelf, divider, and bottom locations and pin the joints. This really locks the assembly and adds a little visual interest.

After the case has dried, flush up the shelf and dividers with the face frame. Then slide the vertical divider in place, and plane it flush. All that's left of the casework is to glue the top in place and add the frame-and-panel back. The back has two center rails aligned with the fixed shelf and lower divider, allowing you to screw the back to them as well as the sides, further strengthening the case joinery.

### Doors and drawers are straightforward

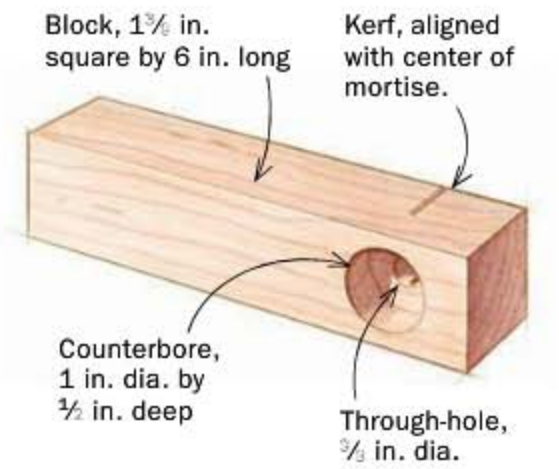
The doors are classic Shaker: simple flat panels surrounded by a thumbnail profile. I like to rout the profile into the door frame, and miter it where the parts meet. But Christian Becksvoort offers a simpler alternative ("Frame-and-Panel Doors Made Easier," *FWW* #218). He makes a standard frame-and-panel door and adds a quarter-round molding to the inside edge of the frame after assembly.

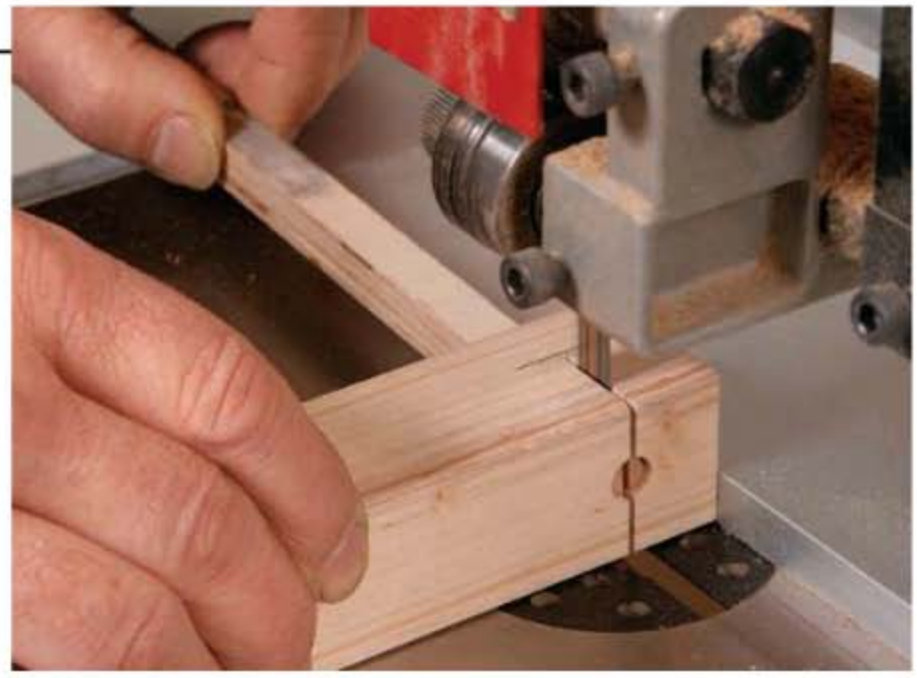
The drawers are traditional dovetail construction. The important thing is to cut all the fronts from a single board for a continuous grain match. I turned my own pulls, but if you don't have a lathe, you're not out of luck. Hardwood knobs are readily available. They're typically a little clunky, but it's easy to refine the profile on the drill press ("2 Classic Pulls," *FWW* #222).

The pulls on the doors and drawers are secured with wedges. For the drawers, I simply drilled a hole through the drawer front and wedged the pull from the inside. On the door, I got a little fancier. I didn't want the tenon exposed on the inside of the door, but I still wanted to wedge it. So I used a really cool joint called a fox-wedged tenon (opposite page). You start by drilling a stopped mortise. Then you insert a wedge into the kerf in the tenon and insert the pull into the mortise. If everything is sized correctly, the wedge contacts the bottom of the mortise, forcing it into the kerf as you drive in the pull, creating a self-wedging joint. The only trick is to cut the wedge to the right length so that the pull seats before

## WEDGES SECURE THE PULLS

***Safe slotting on the bandsaw.*** *A simple block holds the pull. Insert the pull into the stepped hole (below) and slide the block along the rip fence into the cut (right). Stop 1/16 in. short of the pull's shoulder.*

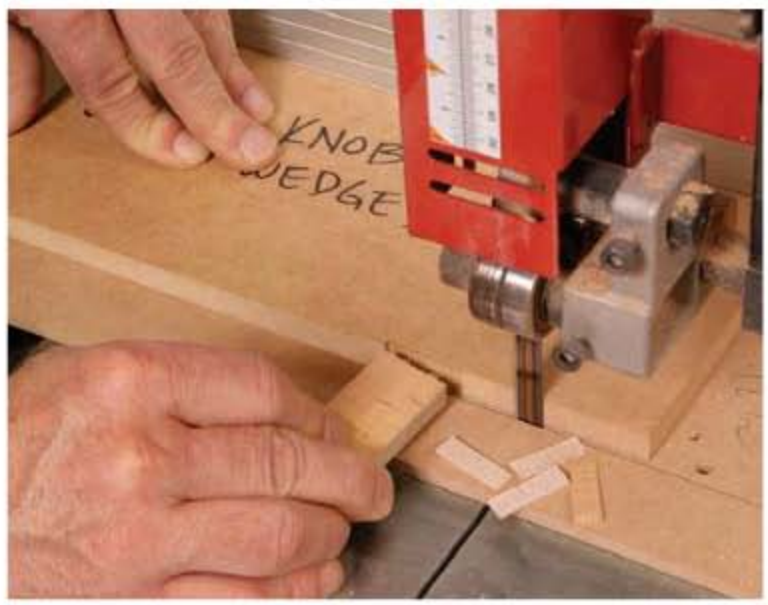


the wedge bottoms out in the kerf. Wedging is simple in concept, but tricky in practice. The toughest part is kerfing the tenons of the pulls. Cutting kerfs in such small, odd-shaped parts can be difficult, but a simple block makes it easy on the bandsaw. You can use the same block to cut the tenons to length.

I finished the case and knobs before installing them. It makes for less nooks and crannies to work around when finishing. I used a wiping varnish, building it up for a deep luster and good protection, as I demonstrated in *FWW* #218 ("Wiping Varnish: The Only Finish You'll Ever Need"), followed by steel wool and wax. □

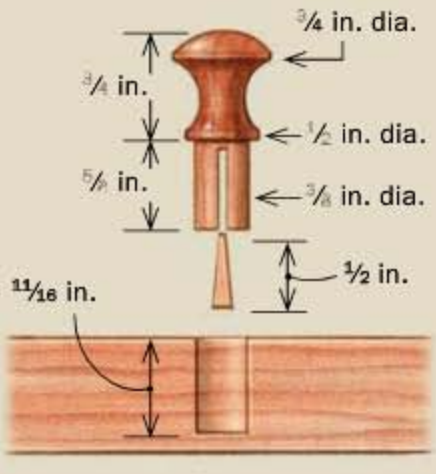
*Michael Pekovich is FWW's art director, and a prolific furniture maker.*




***A jig for wedges, too.*** *A scrap of MDF with an angled notch makes quick work of wedges (above). To install the drawer pulls, add glue to the mortise and insert the pull. Press in the wedge (right), tap it home, and trim flush.*

## A hidden wedge for doors

**For a clean look on the inside of the doors, Pekovich hides the wedge in a stopped mortise. The wedge is placed into the slot prior to installing the pull.**




***Self-setting.*** *Insert the wedge into the slot (left), and then install the pull. Use a pine block as a pad when driving in the pull (above). As the wedge contacts the bottom of the mortise, it is forced into the slot, expanding the tenon for a tight fit.*

Photos, this page: Rachel Barclay

# Soup Up

## Get finer filtration and more power from any single-stage collector

BY ASA CHRISTIANA AND BILL PECK

### ADD A FINE FILTER

**Grizzly, Oneida, and Wynn Environmental sell state-of-the-art aftermarket filters that will keep your airways cleaner. But without a separator stage or baffle (opposite), these filters clog quickly, killing the power and performance of your dust collector.**



Photos, except where noted: Michael Pekovich

# Your Dust Collector

The dangers of wood dust have been well-chronicled in this magazine. Most people now realize that it is the tiniest, hardest-to-capture particles that are the worst, lodging deepest in the lungs and staying there the longest.

Everyone agrees on the problem, but a lot of people can't afford the best solution: a cyclone dust collector, with state-of-the-art filtration, hooked up permanently to every dust and chip producer in the shop. A good-sized stationary cyclone costs upwards of $1,000, and you'll spend a lot more for the ducting and blast gates required to put the suction everywhere you need it. Of course, you can save money by buying a smaller, portable cyclone and connecting it to one or two tools at a time, but you'll still be in for a grand or more.

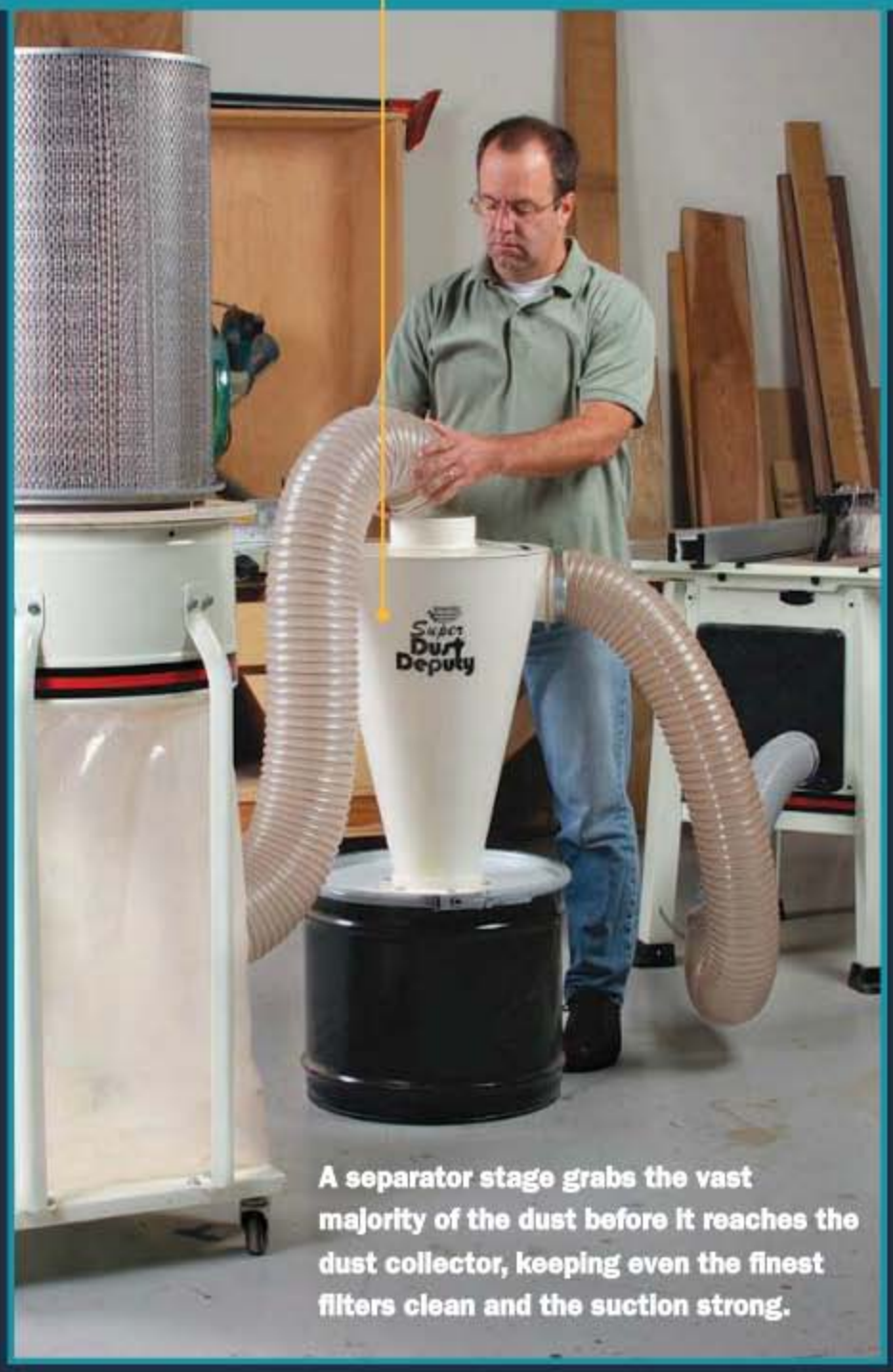
The good news is that there are ways to boost the performance of a less-expensive single-stage dust collector, whether you own one already or are starting from scratch. The key is conquering the shortcomings of these portable machines: subpar filters that clog quickly.

## The trouble with single-stage collectors

As we pointed out last year in "A Revolution in Dust Collection" (*FWW* #223), even the best single-stage dust collectors come with compromised filters that won't grab the smallest particles, those under 1 or 2 microns in size. Fortunately, three companies, Grizzly, Oneida, and Wynn Environmental, now sell much better aftermarket pleated filters that grab the most dangerous dust particles. But a better filter alone isn't enough.

The trouble—and the reason manufacturers don't put better filters on their

## AND A SEPARATOR OR AN INTERNAL BAFFLE



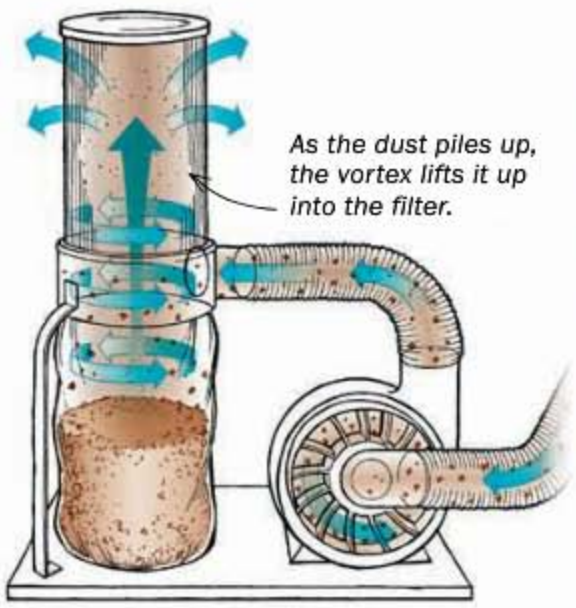

A separator stage grabs the vast majority of the dust before it reaches the dust collector, keeping even the finest filters clean and the suction strong.

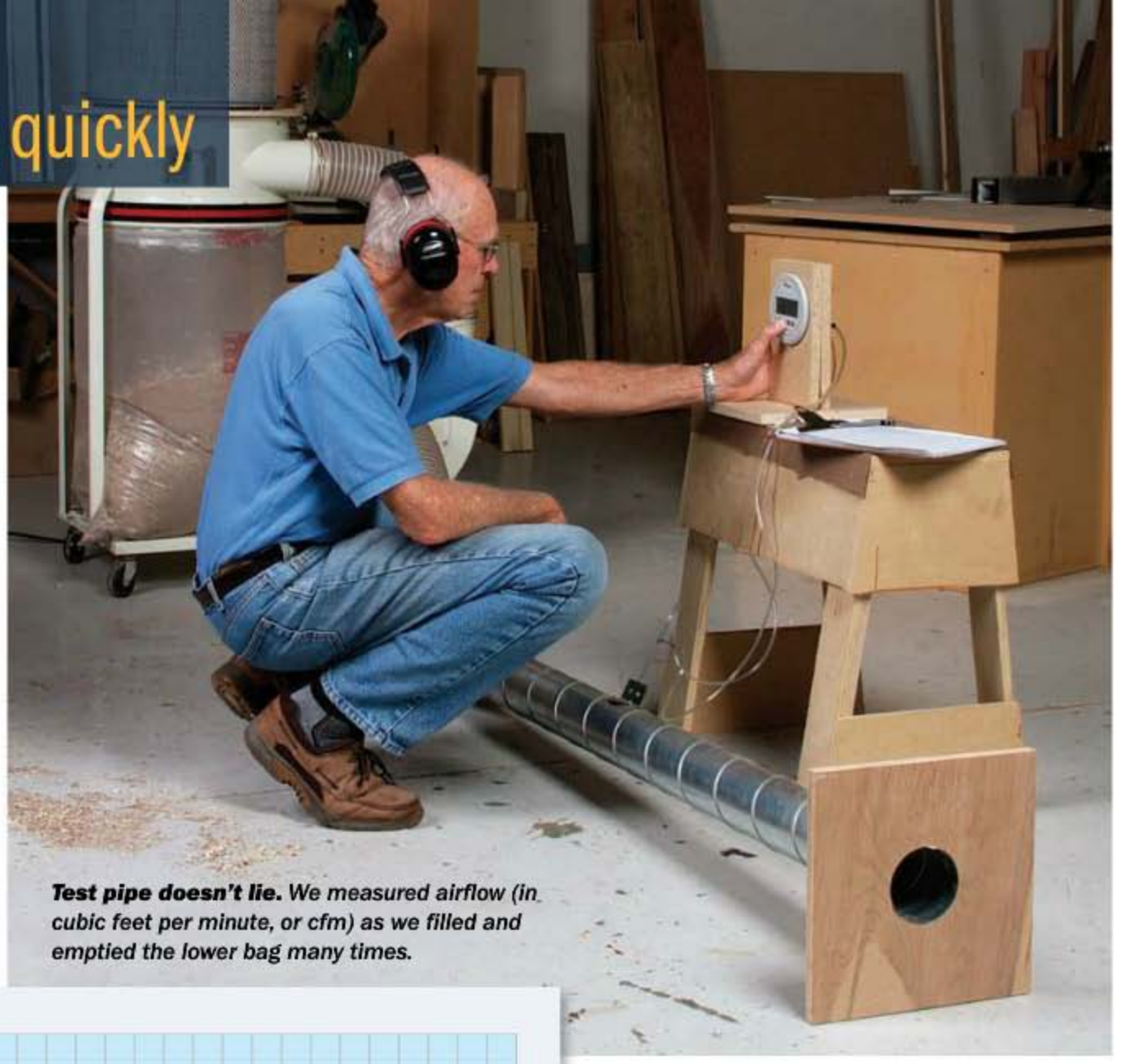
A shopmade disk works as a baffle to keep the dust in the lower bag from swirling up into the filter and clogging it.

# Finer filters clog quickly

**With a single-stage system, as the lower bag fills with dust and chips, the swirling air begins to grab it, carrying it up into the filter. If that filter is too fine, it clogs quickly.**

### SINGLE-STAGE SYSTEM



***Test pipe doesn't lie.*** *We measured airflow (in cubic feet per minute, or cfm) as we filled and emptied the lower bag many times.*

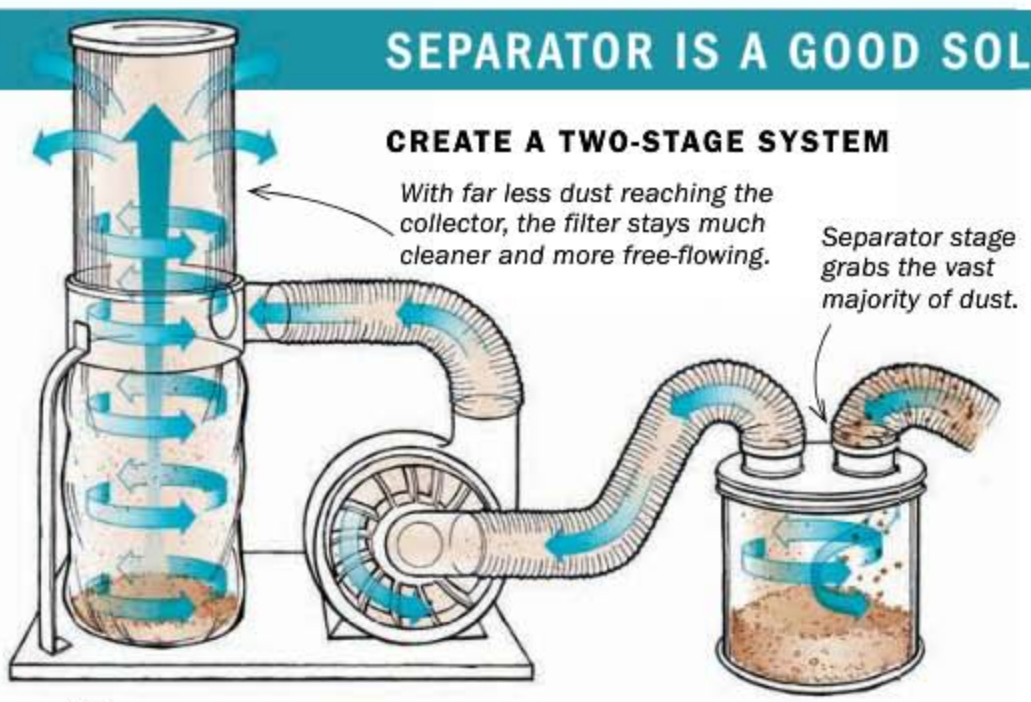
### ONE BAGFUL IS ENOUGH

**We ran the dust collector with an aftermarket filter in place but no separator, until the bag filled. We repeated the test, cleaning the filter each time we emptied the bag. The filter clogged every time.**


single-stage collectors in the first place—is that this type of collector doesn't have a separation stage that catches most of the dust before it reaches the filter, like a cyclone does. That means that all of the dust and chips reach the lower bag of the dust collector, and though we can't see exactly what happens, the following is our best guess based on our testing numbers.

When the lower bag gets to about half full, the vortex, or swirl, begins to pull dust up into the filter area, clogging it

## SEPARATOR IS A GOOD SOLUTION




### CREATE A TWO-STAGE SYSTEM

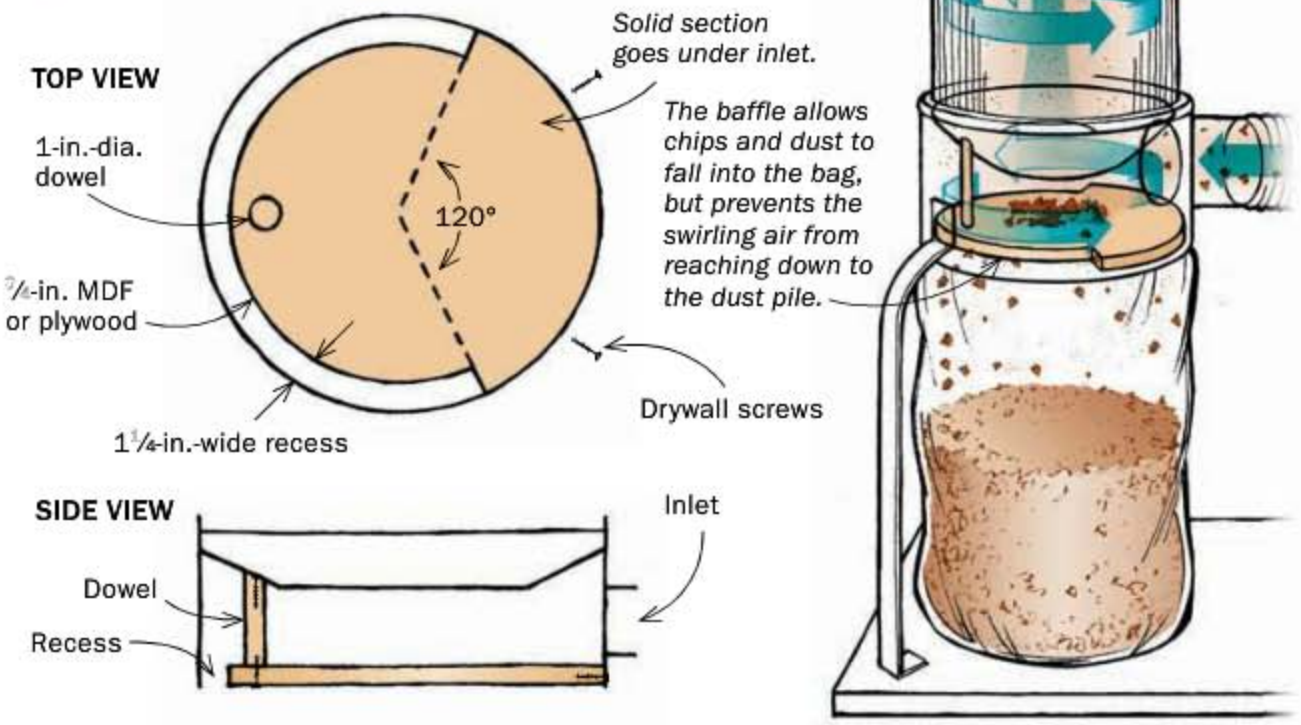
### TWO CHOICES

**SUPER DUST DEPUTY**
$200 ($290 with steel drum)
Oneida-Air.com

**TRASH CAN CYCLONE LID**
$33
Woodcraft.com

## THIEN BAFFLE IS A SHOPMADE OPTION

**J. Phil Thien's internal baffle, described on his website (jpthien.com), was easy to install on our Jet DC1100 1½-hp single-stage collector, which is similar to many others. To make it, you cut a circle to fit in the central metal drum of your collector, mark a second circle on it with a smaller radius, and then cut away part of the perimeter. You mount it just below the flow inlet.**





***Insert from the bottom.*** *The baffle goes in from below, with a dowel acting to support and position it. Drive a screw through the internal cone into the dowel, and then two screws through the side of the collector drum into the edges of the baffle.*

and killing airflow. Of course, when the flow slows, too much dust escapes at the source, and you are back to square one: a faceful of the fine stuff.

### Two good solutions

It's easy to add a separator to a single-stage collector. Last year we illustrated the benefits and showed you which ones work best. The Best Value option was a simple lid by Woodcraft that leads your dust hose to and from a trash can. The Best Overall was Oneida's full-on cyclone-style separator, the Super Dust Deputy, which is pricier but works amazingly well.

However, another solution has been kicking around the Web for some time: a simple shopmade disk that goes inside your single-stage collector, keeping the dust vortex from rising into the filter area. This gizmo was conceived by J. Phil Thien a few years back, and is pretty well described on his website (jpthien.com). Recently, Jet started building a similar

***Occasional cleanup.*** *When you blow out the filter, dust settles on the baffle and will get sucked up into the filter later. To prevent this, remove the filter and brush off the baffle.*

### TWO SEPARATORS VS. BAFFLE

(WITH TYPICAL AFTERMARKET FILTER)

**We teamed one of the aftermarket filters with each of the separators and also the Thien baffle, and loaded in 180 lb. of dust and chips to test each setup. We emptied the separators every 20 lb. With the baffle, the chips and dust do end up in the collector bag, and we emptied that every 30 lb. All three solutions kept the filter much cleaner than using nothing at all (opposite page, top), but there were differences. The separators stole more initial airflow than the baffle, but they keep the filter clean longer. On the other hand, you can get the highest airflow with the baffle, but it allows the filter to clog gradually, meaning you'll need to clean it every few times you fill the bag in order to maintain that high airflow rate.**


*tested with 1½-hp dust collector; airflow rate will be higher with more horsepower

Drawings: Stephen Hutchings

# Filter face-off

**There are three aftermarket filters that will catch the finest particles, each one a big improvement over the stock filters on today's single-stage dust collectors.**

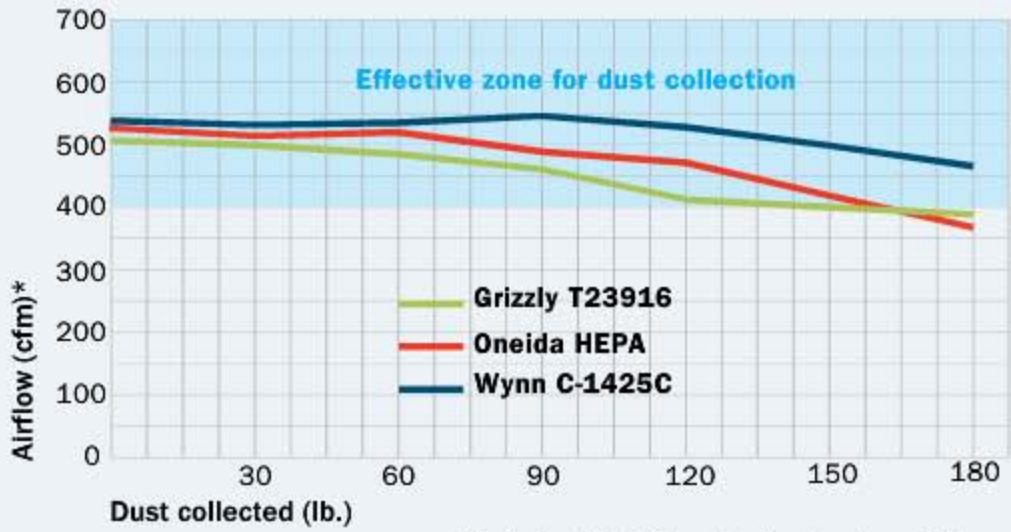

**GRIZZLY T23916 CARTRIDGE FILTER**
$300
Grizzly.com

**ONEIDA HEPA MEDIA FILTER CONVERSION KIT**
$268
Oneida-Air.com

**WYNN C-1425C**
$165
Wynnenv.com

## SLIGHT DIFFERENCES

**We tried all of the filters with the Thien baffle, which allows some dust to reach the filter. The Wynn was the least prone to clogging. On the other hand, the others can be easier to attach.**




*tested with 1½-hp dust collector; airflow rate will be higher with more horsepower

baffle into its Vortex line of single-stage collectors.

We decided to pair up all three separator options with the new aftermarket filters to see which setup is the best, most cost-effective way to collect dust with a single-stage machine. We wanted to know which combination keeps airflow the strongest and the longest before the filter requires cleaning.

So once again our indefatigable shop manager, Bill Peck, dragged our test equipment out of storage, lined up a typical 1½-hp single-stage collector, brought in dozens more bags of wood dust from a local millwork shop, and

## WYNN REQUIRES SOME DIY

**There are a number of ways to attach the narrow Wynn filter to various dust collectors. The method that works on any model, and makes the filter easiest to take off and put back on when needed, is two shopmade plywood rings.**

***Lower ring.*** *Make a plywood ring that fits the inside of your dust collector with a ⅛-in. or smaller gap. Mount the ring about ⅛ in. down from the rim, and use contact cement to glue ½-in.-square foam insulation along the top edge.*

***Upper ring.*** *The filter attaches to another, wider plywood ring. When you screw the upper ring to the lower one, the foam insulation gets compressed, creating a good seal against both the plywood and the wall of the dust collector.*

started pouring it into the hose and taking readings. Take a close look at the charts and conclusions, and you'll learn how to get the cleanest air for the least money.

### The bottom line

All three of our aftermarket filters are third-party certified to be MERV 15 or higher (meaning they collect 85% or more of particles 0.3–0.5 microns in size). We are not equipped to test filtration, so we took their word for it. What we *were* able to evaluate was how much additional airflow they steal, how quickly they clog, and how easily they attach to various dust collectors.

The initial airflow didn't turn out to be a big deal. None steal more than 5%. And when we teamed all of these filters with the Super Dust Deputy, they stayed clean indefinitely. The Thien baffle lets a bit more dust through, however, and that's where we saw a difference in filter performance.

The Wynn was the slowest to clog and dampen the flow. On the other hand, the Wynn requires the most work to fit most dust collectors. The Oneida filter comes with an adapter kit that works with many collectors, and Grizzly's aftermarket filter drops right onto Grizzly dust collectors.

Also, you can always unclog any filter and restore the airflow with compressed air, blowing from the outside in. But there is a hiccup here with the Thien device. When you blow out the filter, some of the fine dust drops onto the baffle, where it is simply sucked back into the filter when you turn the collector back on. So if you go with this shopmade solution, we recommend blowing out the filter about every third time you empty the lower bag, and taking off the filter each time so you can brush the dust off the baffle into the lower bag.

And finally, to collect dust efficiently from the biggest chip-producers in your shop, you need airflow of at least 400 cfm, and preferably 500. With our 1½-hp collector and our best filter/separator combos, we were able to keep flow levels in this critical zone, but only just. So we do not recommend these upgrades on dust collectors below 1½ hp, but we recommend them highly for dust collectors above that power level. □

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*Asa Christiana is editor of* Fine Woodworking*; Bill Peck is* FWW*'s shop manager.*

## Upgrading your collector

**If you already own a single-stage collector, here are two great ways to improve its filtration and flow.**


### WYNN C-1425C/ THIEN BAFFLE

**$168**

**You'll save a lot with this pairing, and have no separator to drag around. The downside is that you will need to blow out the filter occasionally, and remove the filter each time to brush off the baffle.**


### WYNN C-1425C/ ONEIDA SUPER DUST DEPUTY

**$368**

**This combination will give you top-notch filtration with almost no clogging, meaning you will empty the separator dozens of times before you need to blow out the filter with compressed air.**

### Starting from scratch?

**If you don't already own a dust collector, and you don't have the budget for a cyclone, buy the most powerful single-stage collector you can afford, with the most basic filter. Grizzly's 2-hp G1029Z2 is only $275 at Grizzly.com. Then pick one of the upgrade combos mentioned above.**

***Go big, and bag the bag.*** *Buy a 2-hp or larger dust collector with a low-grade filter on it. Then just replace the filter and add a separator or baffle.*

Product photos, pp. 50-51: John Tetreault

# Triangle Table

## Jigs and tips for innovative joinery

BY RAY FINAN

After 25 years of hopscotching from state to state working for a large company that makes paper for magazines like *Fine Woodworking*, I recently settled in Vermont and turned my woodworking hobby into a second career. To help launch my business, I decided to produce some pieces of furniture inspired by the Art Deco and mid-century modern styles. This little table was one of those pieces. I was eager to make a successful start, so of course I wanted my table to be distinctive in its design, but I also wanted it to be straightforward to make.

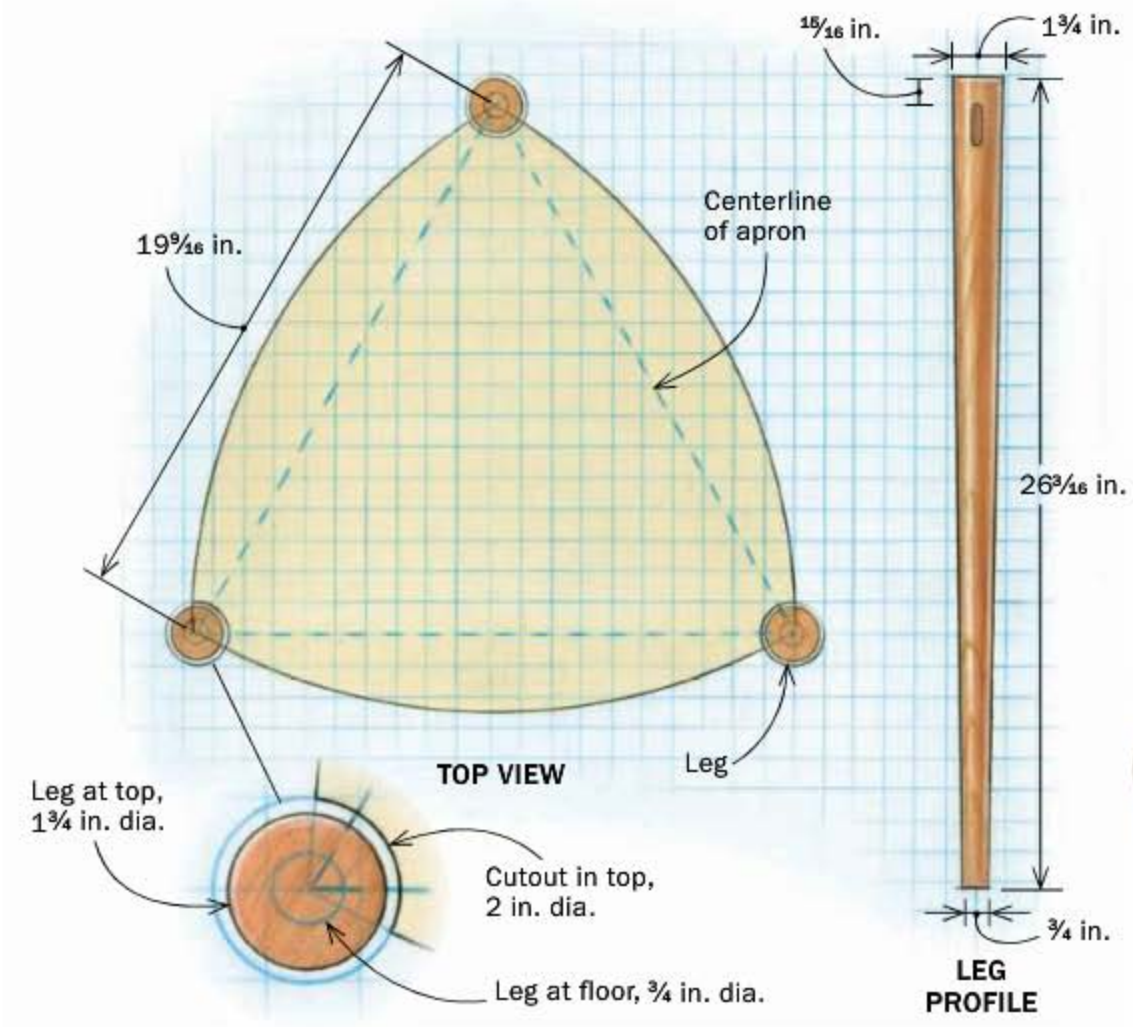
A few key decisions helped streamline the building process. When I hit on the idea of a curved-sided triangular shape for the tabletop, I found a simple way to generate the shape full size, first on paper and then on

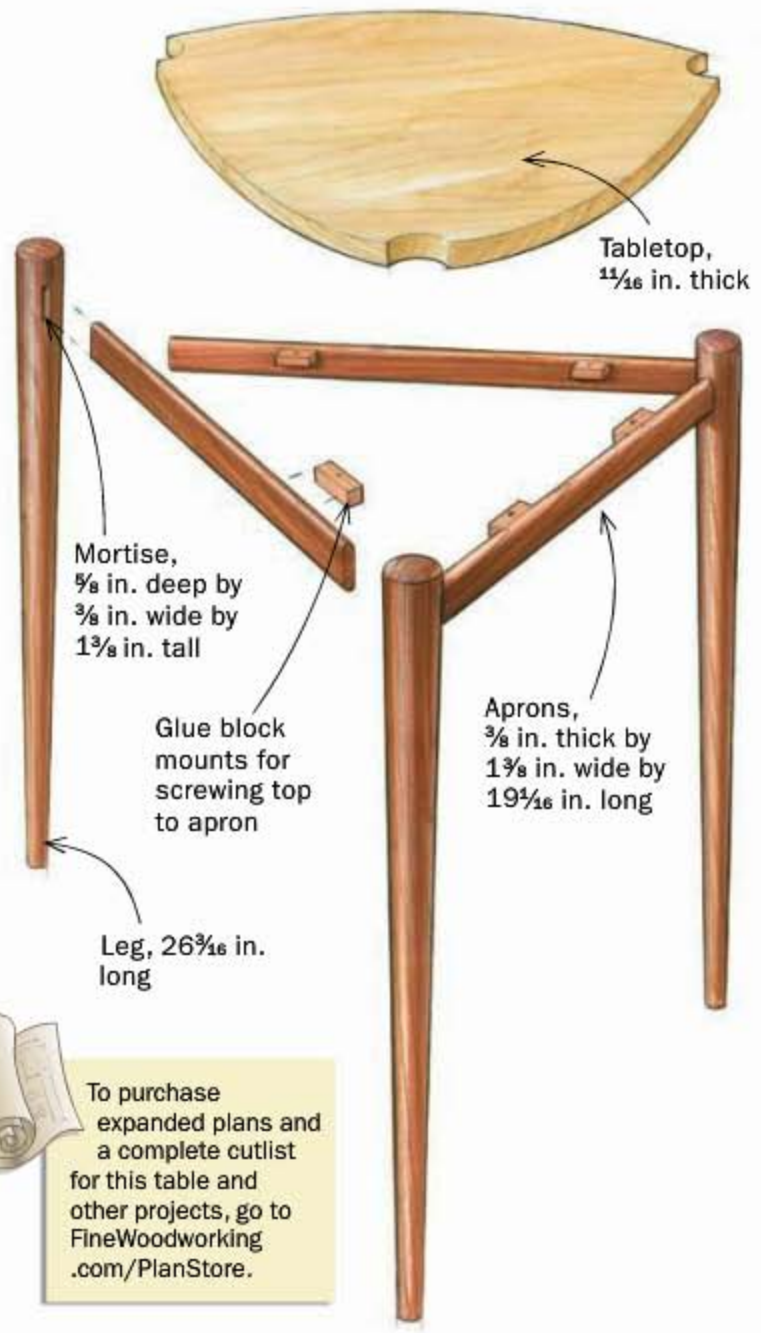


Photos: Jonathan Binzen

## FULL-SCALE LAYOUT IS KEY TO SUCCESS

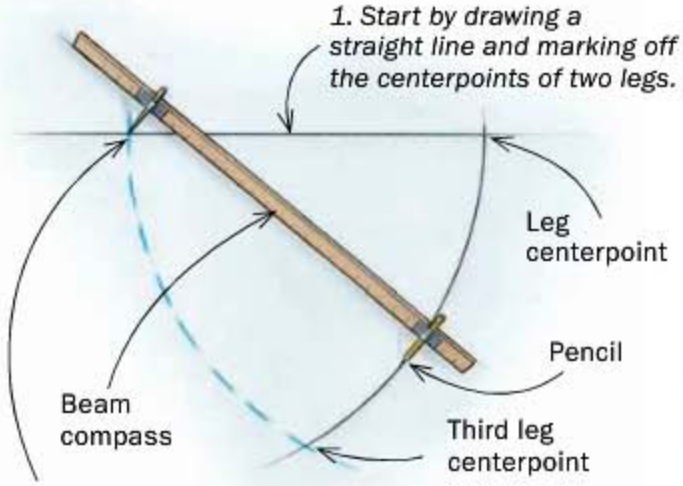
**Finan draws a top view of the table full-scale on paper and uses the drawing at several critical points as he builds. A full-scale front view of the leg, drawn on a thin piece of MDF, guides him on the lathe.**



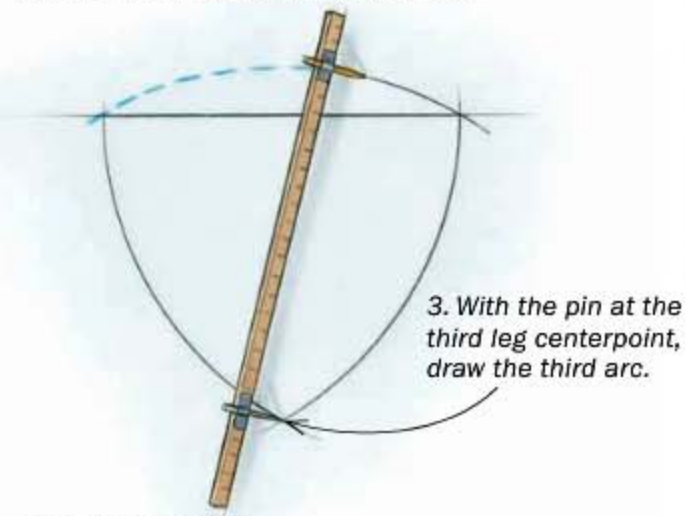




To purchase expanded plans and a complete cutlist for this table and other projects, go to FineWoodworking.com/PlanStore.

### EXERCISE IN GEOMETRY




*2. Place the pin of a beam compass on the first two leg centerpoints and draw crossing arcs to find the third leg centerpoint (above).*





***Two compasses create the plan.*** *Finan uses a beam compass (left)—in this case simply a yardstick fitted with a movable pin and pencil—to lay out the curve-sided triangle of the top. He uses a regular compass (above) to establish the circumferences of the legs and the corner cutout of the tabletop.*

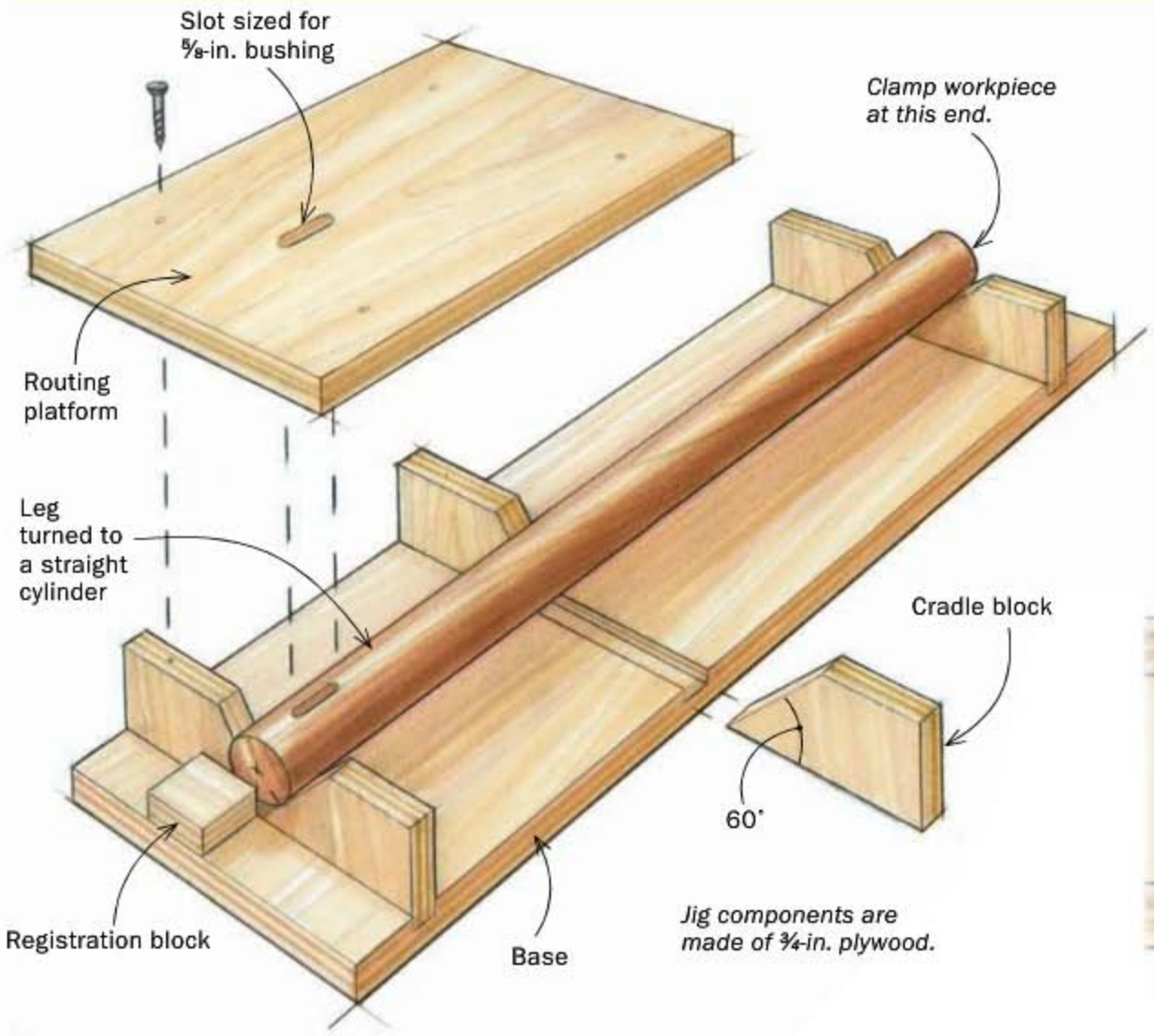
Drawings: Bob La Pointe

# Do the leg work

## 1. TURN A CYLINDER

***And mark the mortises.*** *After turning the leg blank to a 1¾-in.-dia. cylinder (not tapered yet), Finan puts it in place on the drawing and transfers the apron centerlines (far right). These will register the leg in the mortising jig.*

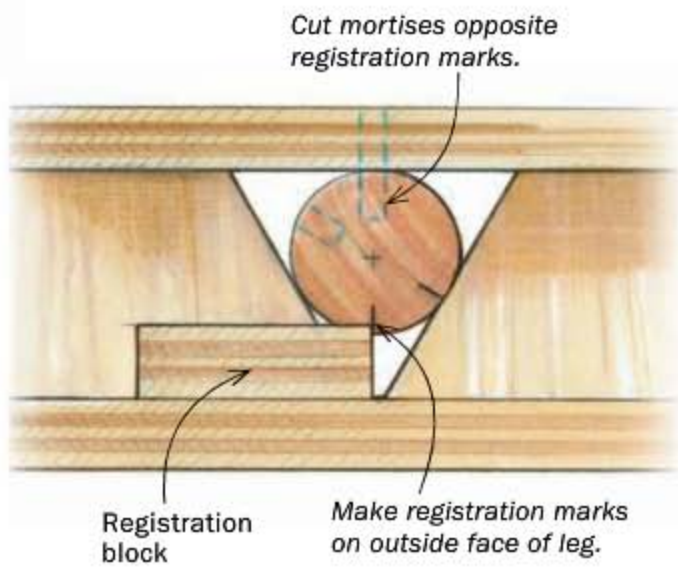
## 2. ROUT THE MORTISES




*Jig components are made of ¾-in. plywood.*

***Snug in the jig.*** *A clamp at the far end is critical, but the mortise jig is sized so the leg is also held firmly between the routing platform and the cradle blocks. If necessary, Finan unscrews the platform to insert the leg.*

**ALIGNMENT IS EASY**




***Plunge with a bushing.*** *Using a ⅝-in. guide bushing and a ⅜-in. spiral upcut bit in his plunge router, Finan cuts the mortises in a series of progressively deeper passes.*

## 3. NOW TURN THE TAPER

***Tapering tricks.*** *To achieve a consistent taper, Finan starts by cutting a series of grooves with a parting tool, using his full-scale leg drawing to set his calipers. He uses a roughing gouge (above) to remove the waste between the grooves, then smooths the taper (right) with a long, straight sanding block.*

the workpiece. When it came to the legs, I thought turning and tapering them would nicely complement the shape of the top. But wouldn't that make for challenging leg-to-apron joinery? I greatly simplified the matter by dispensing with shouldered tenons and mortising the aprons full-size right into the legs. On a small, light table like this, that would give me plenty of joint strength. To cut the mortises, I built a router jig that took the guesswork out of what might have been a tricky process.

It takes very little wood to make the table, so this could be an opportunity to use some favorite scraps kicking around your shop. I made the top of mine from a beautiful small board of curly ash I'd been saving.

***Round the top.*** *After shaping the top of the leg with the parting tool, he sands it smooth.*

### Lay it out full scale

Although this is a fairly simple table, I found it beneficial to build it from full-size drawings. They made it a snap to lay out precise mortise locations, helped ensure that the legs didn't splay during assembly, and provided a controlled method for tapering the legs, even for a novice turner like me. Two drawings are needed: a plan view and a leg profile. The good news is that the drawings are very quick to make and you'll soon be building furniture.

I drew the plan view on drafting paper. I used a beam compass to draw the curved outlines of the top and a straightedge to draw the equilateral triangle that represents the centerlines of the aprons. Next, with a regular compass, I drew three concentric circles at each point of the triangle. The small circle is the circumference of the leg where it meets the floor; the middle circle is the circumference of the leg at the top; and the large circle represents the edge of the table where it is cut away to allow the leg to penetrate the top.

I drew the full-scale leg profile on a scrap of ¼-in. hardboard so that I could use it as a frequent reference when turning the legs to a taper. After drawing the tapered elevation, I added a series of lateral lines across the leg. While turning, I took caliper measurements at these points and transferred them to the leg.

### Three legs, three stages

Cutting mortises in the legs after they had been tapered would have been a challenge. I simplified matters by making the legs in three steps. First, I turned the square blanks to 1¾-in. cylinders. Then I mortised the cylinders in the router jig. And last, I remounted the cylinders and turned them to a taper.

Since I had the full-scale plan-view drawing, marking the mortise locations was easy. I simply stood the cylinders in place on the drawing and transferred the apron centerlines to the leg. I carried those marks around to the top of the leg and used them to register the leg in the router jig. One important thing to note is that the mortises will be cut on the face opposite these marks—so be sure to make the registration marks on what you want to be the outside face of the leg.

## Add the aprons

***The apron is a tenon.*** *Finan shapes the aprons with a roundover bit on the router table, preparing them to be inserted fully into the leg mortises. This means he won't have any shoulders to fit to the round, tapered leg.*

After cutting all the mortises, I put the leg cylinders back between centers on the lathe and shaped the tapered profile. I don't do much turning, so I tried to make things as foolproof as possible. I started by using a parting tool to cut a series of evenly spaced, progressively deeper grooves along the leg. I used calipers to transfer measurements from the leg profile drawing to the appropriate grooves. Then, using a ¾-in. roughing gouge, I removed the waste wood between the grooves. I faired the leg with a long block of wood with 100-grit self-stick sandpaper adhered to it. Then I finish-sanded the legs to 400-grit while they were still on the lathe. With the sanding finished, I used the parting tool to form a slight crown at the top of the leg, paring back at a slight angle until the leg separated from the drive center.

### The base comes together

After thicknessing and ripping the apron stock to size, I rounded over all four long edges with a quarter-round bit on the router table. I used a test piece of apron stock and a test mortise to sneak up on a snug fit. After applying glue and getting the pieces knocked together, I stood the base up on the drawing and tweaked the stance until the tips of the legs stood precisely in the small circles. Then I cinched the band clamp, rechecked the stance, and let the glue cure.

***Perfect placement.*** *Because there are no shoulders on the aprons, the legs can be adjusted vertically. With the joints just glued, Finan tweaks the legs until they stand within the ¾-in. circles on the drawing.*

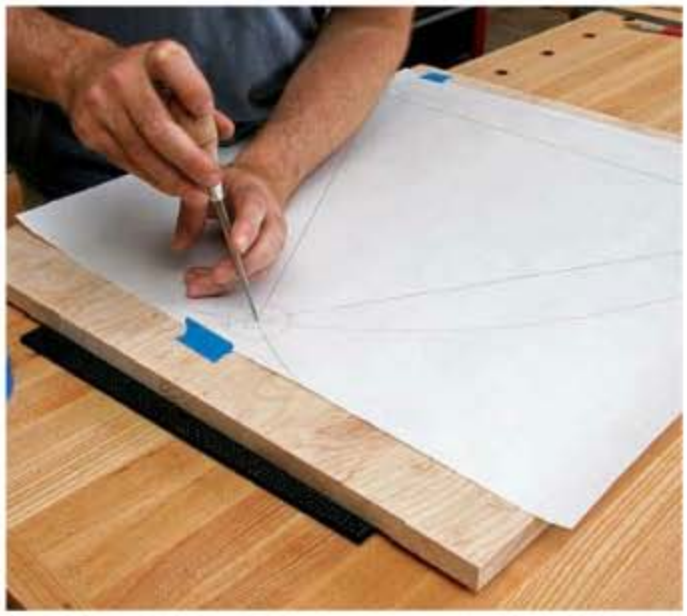
***A little belt tightening.*** *After adjusting the stance of the table, Finan cinches up a band clamp. He checks the stance once more and then leaves the table on a flat surface to cure. He will remove the blue tape (which makes glue cleanup easy) before the glue dries.*

***Screw blocks.*** *Preparing to attach the top, Finan rubs on screw blocks, holding them in place with finger pressure for a minute or two until the glue stiffens.*

### Top it off

The full-scale drawing came in handy again when it was time to lay out the tabletop. I taped the drawing to the tabletop blank and used an awl to mark the centerpoints of the three legs. Then I removed the drawing and used the beam compass—with its pin in the holes made by the awl—to draw the curved sides of

# Curves complete the top



***Good point.*** *Finan tapes the full-scale drawing to the tabletop blank and uses an awl to transfer the center-points of the legs (above). The awl holes allow him to quickly lay out the outlines of the tabletop (right).*

***Drill first, saw later.*** *Using a Forstner bit, Finan drills the cutouts for the legs at the corners of the top (above). Then it's on to the bandsaw (right) to cut the curved sides of the tabletop.*

the top. I used the regular compass, its pin in the same awl holes, to draw a 2-in.-dia. circle at each point.

I bandsawed out the long arcs of the top, but before I did so I used a Forstner bit at the drill press to create the tightly curved cutouts for the legs. To get a clean cut, it's a good idea, especially in wood with difficult grain, to make the blank large enough to allow full contact of the Forstner bit. I cleaned up the bandsawn arcs with rasps and files.

## Different finishes for top and base

To showcase the spectacular grain pattern of the curly ash, I applied multiple coats of Waterlox Original, wet-sanding it in with 600-grit wet-or-dry paper. I wanted a sharp contrast between the light-colored top and the white-oak base, so I darkened the base with a recipe from Teri Masaschi that produces a look reminiscent of lightly fumed white oak—without the ammonia fumes. I let the finish cure for a week, then lightly wet-sanded the top and base with a 2,000-grit Abralon pad and a 50/50 blend of mineral spirits and paraffin oil, and gave it a light coat of paste wax. □

*Ray Finan makes furniture in Arlington, Vt.*

# All Finishes Have a Shelf Life

## How to make them last longer and how to tell when they've gone bad

BY JEFF JEWITT

**TIP**

### ALWAYS DATE YOUR FINISH

On the container, write the date that you dissolved the shellac, or mixed your own wiping varnish. After six months, test the finish before use, even if it looks fine. Also, label brand-new finish with the purchase date, or the date provided by the manufacturer.

Few things are more annoying than opening a $30 quart of varnish you bought last year, only to find the remaining two-thirds has solidified into a gel. It's an expensive reminder that tools may last a lifetime, but finishes don't.

All finishes have a shelf life, which is the amount of time that a product remains usable. I'll show you how to maximize the shelf life of finishing materials, and more importantly, how to tell when they've gone to the dark side.

### Buy it fresh and date it

I'm as cheap as anybody, but when it comes to finishes, "buy more, save more" isn't a good strategy. Try to anticipate how much finish you'll use over the next year and don't buy more than that. Some manufacturers publish shelf-life figures and date products clearly, but many don't.

Never buy cans with rusty lids, the ones you often see "on

Photos, this page: John Tetreault

# Keeping oxygen out

**Oil-based finishes start to harden when exposed to oxygen, so keep them in an airtight container. To maintain a good seal, remove any dried finish from the lid and rim, and wipe down the rim after each use.**

## CLEAN THE RIM

***Dig it out.*** *To create a good seal with the lid, dig out any dried finish that has collected in the rim.*

## KEEP THE LID TIGHT


***Clean it.*** *If the inside of a lid has become encrusted with finish and won't fully screw on, soak it in lacquer thinner and then scrub it with steel wool.*


***The self-draining trick.*** *Use a nail to punch four or five holes in the rim of a standard container. When finish gets into the rim, it will drip back into the can.*

***Non-stick finish.*** *Wrap a screw top with Teflon plumber's tape. Finish won't stick to it, you'll get a much better seal, and the lid will screw on and off more easily.*

sale"—the condition of the can indicates poor storage or old age. Try to buy finishes like you buy milk: Look for a manufacturing date. If you don't understand the dating code, ask a clerk for help. If there is no date, write the date of purchase on the can. Label all your finishes, including those you've mixed yourself.

Store finish in a cool place, between 55°F and 70°F. Chemical reactions accelerate as the temperature rises, and almost all processes that cause finish to go bad involve chemical reactions. A cool basement is better than a hot garage. Most finishes are OK if stored below 55°, with the exception of waterborne. If you work in a cold shop, store your waterborne finishes in the house, and never let them freeze. Bring all finishes up to 55° to 70° before you use them. Also, keep the lid tight. If necessary, transfer the product to a container with a tighter lid.

### Keep oxygen out of oil-based finishes

Any finish based on a drying oil will harden when exposed to oxygen. These include tung and linseed oils, so-called Danish oils, and oil-based varnishes and polyurethanes. If you're not careful when storing these products, oxygen will cause them to harden prematurely.

When a can is full, there's no room for oxygen. But as you use the finish, you create "head space" as the can fills with air. Exposed to oxygen, the finish will gradually skin over, or the whole liquid may start to gel.

Kept in tightly sealed containers with minimal head space, raw or boiled linseed oil and tung oil can last five or more years. It might thicken with age, but if it isn't cloudy and gummy, it should be usable. Danish

Photos, except where noted: Mark Schofield

# Oil-based basics

**Oil-based finishes can last indefinitely, but only if you keep oxygen away.**

## TEST

***Good under the skin.*** *If the finish only has a thin skin on it, the liquid underneath should still be usable. Pour it through a strainer into a new container.*

***Too far gone.*** *If the finish has started to gel, or if you create lots of small flakes trying to break through the skin, it is probably not worth using.*

| PRODUCT |
| --- |
| Linseed oil (boiled and raw) |
| Tung oil |
| Danish oil, oil and varnish blends |
| Tung-oil-based varnish |
| Alkyd varnishes |
| Oil-based polyurethane |

## PREVENT

***Fill to the brim.*** *Fill a smaller jar with finish from a partially used can. This will prolong the life of the left-over finish by minimizing its contact with oxygen.*

***Or replace the air.*** *After using some of the contents, spray inert gas into the container to replace the air and prevent the remaining finish from hardening.*

MYTH

### STORING UPSIDE DOWN PROLONGS SHELF LIFE


**Storing a half-empty can upside down does nothing to displace the air and will not prolong the life of the contents.**

oil-type products are mostly oil and solvent. They may thicken, but are usable as long as they are clear and liquid.

On the other hand, when air gets into cans of oil-based varnish and polyurethane, one of two things will happen. In some products, a skin will form. If you can break the skin and get at the liquid, it's generally usable. But, in tung-oil-based varnishes like Waterlox, air can gel the entire contents, rendering them unusable.

To minimize exposure to oxygen, transfer finish to smaller containers as you use it (I use glass Mason and baby food jars). Or, use a product like Bloxygen, which replaces the air with a heavier gas. To test the finish, pour it through a medium mesh strainer (the cone-shaped type available at hardware and paint stores). If it strains, it's good.

### Even flakes have a shelf life

When you dissolve dry shellac flakes in alcohol, the shelf-life

| SHELF LIFE BEFORE OPENING | SHELF LIFE AFTER OPENING | BRAND NAMES | COMMENTS | UNUSABLE WHEN |
|---|---|---|---|---|
| Indefinite | Indefinite | Kleen Strip, Crown, Sunnyside | Can be thinned with mineral spirits if necessary. | Will not strain, is thick and jelly-like |
| Indefinite | Indefinite | Hopes, Master Blend, Rockler, Woodcraft | Can be thinned with mineral spirits if necessary. | Will not strain, is thick and jelly-like |
| Indefinite | Indefinite if properly stored | Watco, Deft, General Finishes | Pour into smaller containers or use Bloxygen. | Hardened or jelly-like |
| Indefinite | Indefinite in ideal conditions; typically 3–4 years | Waterlox and some spar varnishes | Shortest shelf life once opened. Pour into smaller containers or use Bloxygen. | Jelly-like consistency |
| Indefinite | Indefinite if properly stored | Pratt & Lambert, 38 Clear Varnish, Old Masters Super Varnish | Forms skin after prolonged oxygen exposure, but liquid underneath is generally usable. | Hardened or jelly-like |
| Indefinite | Indefinite if properly stored | Minwax, Deft, Varathane, Cabot, Behlen | Forms skin after prolonged oxygen exposure, but liquid underneath is generally usable. | Hardened or jelly-like |

clock starts ticking faster. This is due to esterification, a gradual chemical reaction between alcohols and organic acids (shellac is made up of organic acids). The reaction produces chemicals called esters, which are softer and tackier than the normally hard shellac resin. They are also more prone to water-spotting.

Less-refined shellac grades like button, seedlac, and waxy grades will esterify at a much slower rate and may last over a year once dissolved. Dewaxed, bleached grades such as super blond should be used within six months to a year, depending on the "cut," or the ratio of flakes to alcohol. That goes for all mixed shellac: the more alcohol, the shorter the shelf life.

To test whether dissolved shellac is still viable, pour a drop onto an impermeable surface such as glass or laminate. If it's good, it will dry enough to be tack-free (your finger won't stick to it) within an hour.

Dry flakes also have a shelf life. Bleached and dewaxed flakes are the most prone to going bad, while unrefined

## Waterborne

**Use waterborne finishes within a year or two of purchase and store them at between 55° and 70°F. If they freeze, throw them out.**

| PRODUCT | SHELF LIFE BEFORE OPENING | SHELF LIFE AFTER OPENING | BRAND NAMES | COMMENTS | UNUSABLE WHEN |
|---|---|---|---|---|---|
| **Waterborne finishes** | 1–2 years | 1–2 years if properly stored | General Finishes, Varathane, Behlen, Target, Minwax, Deft | Don't use waterborne finishes older than 2 years. | Discolored, lumpy, or rubbery when strained; test with strainer |


***Waterborne gone bad.*** *When a waterborne finish gets too old, it can curdle and get lumpy, like sour milk.*

Photo, this page: Jeff Jewitt

## Shellac

**Shellac has a shelf life both as flakes and when dissolved. Old shellac will take longer to dry and won't create a durable finish.**

### TEST

***Flakes won't dissolve.*** *If flakes don't dissolve, they're no good.*

***Liquid won't harden.*** *To test the viability of old shellac, pour a small puddle onto an impermeable surface. If it's tacky after an hour, dispose of it.*

### PREVENT

***Keep it cool.*** *Refrigerating shellac flakes slows their deterioration.*

waxy grades can last for years. In general, try to use flakes within a year after purchase.

There are a couple of myths about prolonging the shelf life of shellac. Some folks say that old shellac can be forced to dissolve by grinding it. Not true. Bad shellac is bad regardless of the size of the flakes.

The second myth is that vacuum-sealing shellac flakes makes them last longer. In fact, dry shellac reacts with itself over time, slowly becoming insoluble in alcohol. Heat accelerates the reaction, but oxygen has no effect. Probably, this myth persists because most folks vacuum-seal flakes and then refrigerate them, which *will* prolong their shelf life.

### MYTH

**VACUUM PACKING OR GRINDING EXTENDS SHELF LIFE**

**Vacuum sealing a bag of flakes doesn't extend its shelf life. The chemical breakdown isn't affected by oxygen.**


**Turning old shellac flakes into powder may make them dissolve in alcohol, but it will still produce an inferior finish.**

### Waterborne finishes have different problems

It's hard to generalize shelf life and storage needs for waterborne finishes because there are so many types. In general, I try to use them within a year, two at the most. Keep cans tightly sealed in a cool, dry place, and don't let them freeze. Bad waterborne finish has a cheesy, curdled consistency, or it separates like oil and water, even

| PRODUCT | SHELF LIFE BEFORE OPENING | SHELF LIFE AFTER OPENING | BRAND NAMES | COMMENTS | UNUSABLE WHEN |
|---|---|---|---|---|---|
| Shellac flakes, waxy Includes seedlac and buttonlac, waxy orange and lemon | 5 or more years in cool, dry conditions | (After mixing) 1–2 years in cool, dry conditions | Woodcraft and various online retailers | When mixed, thinner cuts have shorter shelf life. Refrigerate unused flakes. | Mixed with alcohol, a jelly forms |
| Shellac flakes, dewaxed Includes super blond, blond, pale, etc. | 1–2 years in cool, dry conditions | (After mixing) 6–12 months in cool, dry conditions | Woodcraft and various online retailers | When mixed, thinner cuts have shorter shelf life. Refrigerate unused flakes. | Mixed with alcohol, a jelly forms |
| Shellac, premixed | 3 years | 3 years if properly stored | Zinsser Bulls-eye, Sealcoat | Zinsser dates all its products. Buy the freshest date. | Won't dry quickly or stays tacky |

# Lacquer

**Furniture lacquer is among the longest-lasting clear finishes. It can stay usable for many years when stored correctly.**

| PRODUCT | SHELF LIFE BEFORE OPENING | SHELF LIFE AFTER OPENING | BRAND NAMES | COMMENTS | UNUSABLE WHEN |
|---|---|---|---|---|---|
| Nitrocellulose lacquer | Indefinite | Indefinite | Deft Clear Wood Finish, Minwax, Deft | Store in original container with tight seal. | Severely discolored, cloudy, or rubbery sediment |

after shaking. The additives in waterborne finishes can deactivate over time, causing them to "fisheye" or become foamy after they're applied. If a product is more than a year old, run it through a mesh filter and test it on a sample board before you use it. (If in doubt, throw it out.)

Head space doesn't cause problems with most waterborne finishes, but dried finish around the lid seal does. Again, transfer unused finish to a smaller container (glass or plastic) with a tight-fitting lid.

### Long live lacquer

One of the few products with a long shelf life is plain old solvent-based furniture lacquer, also known as nitrocellulose lacquer. Because there are no reactive components in the resin, it should store for many years if you keep it close to the 55° to 70°F range.

Oxygen has no effect on lacquer. It may thicken if the solvent evaporates, but just add lacquer thinner and keep the lid tight. I've seen lacquers yellow in the can over time, but this generally doesn't affect appearance.


***Old lacquer can be thinned.*** *Solvent-based lacquer may thicken with age, but a dash of thinner can bring it back to life.*

### Stains and dyes last long

Pigment stains are forgiving when it comes to shelf life and storage. They should store just fine for years. (Oil-based gel stains are an exception; treat them like other oil-based finishes.) One caution: Don't let waterborne stains freeze, or they'll become "cheesy" or curdled.

Concentrated liquid or powdered dyes have a virtually infinite shelf life. Try to use mixed dyes within a year, but as long as you store them in a metal-free container to avoid rust, they can last much longer. Always test older pigments and dyes on a scrap, to confirm the color hasn't changed. □

*Jeff Jewitt writes frequently about finishing for* FWW.

***Dye another day.*** *Water-based dyes, once dissolved, will last a year or more if kept in a non-metallic container.*

# Dyes and stains

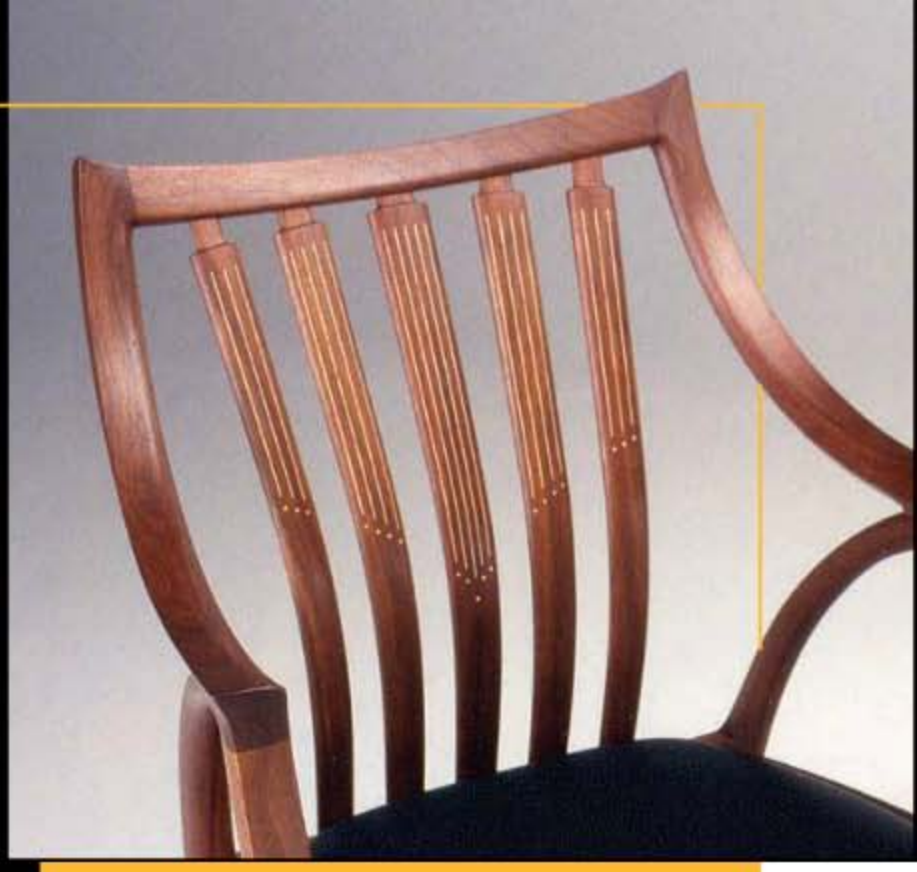
**Concentrated dyes, whether liquid or powder, and pigment stains can last for decades in their pre-mixed form.**

| PRODUCT | SHELF LIFE BEFORE OPENING | SHELF LIFE AFTER OPENING | BRAND NAMES | COMMENTS | UNUSABLE WHEN |
|---|---|---|---|---|---|
| Oil-based pigment wiping stains | Indefinite | Indefinite if stored in an airtight container | Minwax, General Finishes | If skin develops, product underneath should be usable | Hardened |
| Dye powders and concentrates unmixed | Indefinite | Indefinite | JE Moser, Lockwood, Homestead, Arti | Can last 20 years or more | Doesn't dissolve in solvent |
| Dyes, premixed with water or solvents | Indefinite | Indefinite | Behlen Solar-Lux, General Finishes | Never store dyes in metal containers. Use plastic or glass. | Severe color change from original; doesn't dissolve in solvent |

# String Inlay Made Easy

## Two simple, shopmade tools make the slits and the stringing

BY MICHAEL C. FORTUNE



I love my power tools, but sometimes in woodworking the most effective way of doing something does not involve plugging in a tool. That's certainly the case with string inlay. This decorative technique can light up a chair back, a tabletop, or a jewelry box, instantly increasing its appeal—and its value, by the way.

I create the slits for string inlay with a simple, shopmade cutter. It takes me an hour or so to modify a standard card scraper into a custom tool that flawlessly cuts straight or curved slits in flat stock and just as easily handles slits on convex or concave surfaces. You could use a router to cut some of these slits, but the process is far more laborious, requiring jigs and offset fences and many light passes to cut a narrow slit without snapping the fragile bit. And that's not to mention the ever-present peril: Routers are not known for small, easily repaired mistakes. Using a shopmade inlay tool allows you to work

***Stunning stripes in any direction.*** *Contrasting string inlay gives furniture an infusion of elegance. Fortune uses it on tables, curved chair parts, and jewelry boxes. The inlay slits—both straight and curved—are cut using a modified card scraper.*

Photos, this page: Michael Fortune (top two); Kelly J. Dunton (bottom two)

# SHOPMADE SLITTING TOOL

## 1. CREATE THE CUTTING TEETH

***Trace the profile.*** *Fortune marks the metal that he will grind away to create the tool's cutting teeth.*

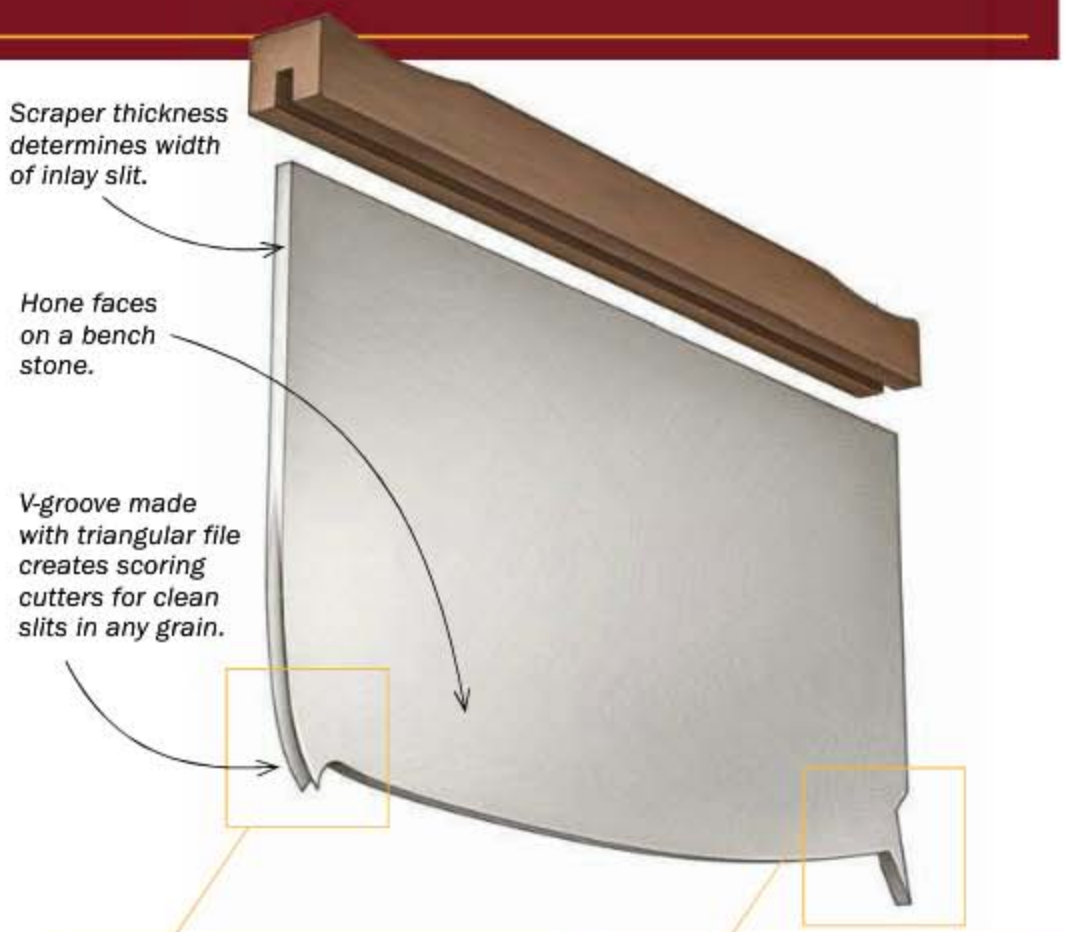
***Grind your teeth.*** *Making short, light passes against a grinding wheel to avoid heat buildup, Fortune removes the marked section of the scraper.*

Triangular jeweler's file

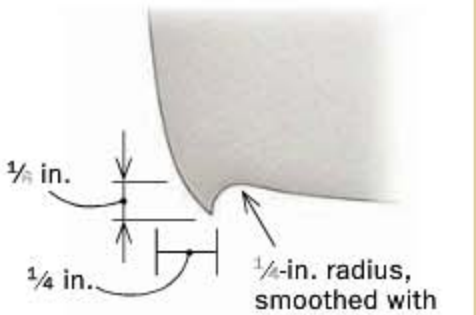




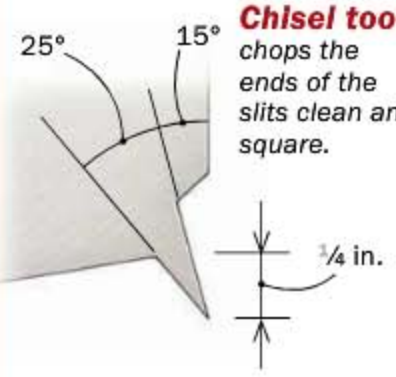
***File a groove.*** *A small V-groove filed in the curved tooth creates a pair of scoring cutters that permit the tool to slice cleanly through any grain. The last step is to smooth the inside curve with a round file, and then hone the edges and faces with abrasive stones.*




**Curved tooth** *does 95% of the cutting.*




**Chisel tooth** *chops the ends of the slits clean and square.*




## 2. ADD A HANDLE

***Making a slit for itself.*** *Using the just-finished curved tooth and a straight fence, Fortune cuts a groove in a piece of hardwood to make a handle for the tool.*

***Knock it home.*** *After ripping the handle stock to width, Fortune epoxies the scraper into the slit. Before doing so, he roughs up the gluing surfaces on the scraper with sandpaper. When the epoxy cures, he cuts the handle to length.*

briskly with confidence and to position your fence right along the line where you want the inlay—there's no need to follow the edge of the workpiece as with other string-inlay techniques. It also puts you, not the router-bit manufacturer, in control of the width of the inlay.

I generally make my string inlay about 1/16 in. wide. This gives it enough presence to be noticeable without being overpowering. On a small, delicate box I might go thinner, and on a large table wider. Whatever the width I want, I start by finding a piece of metal that matches it. Scrapers are available in various thicknesses, giving you some options for the width of your

Photos except where noted: Jonathan Binzen; drawings: Christopher Mills

## CUTTING STRAIGHT LINES

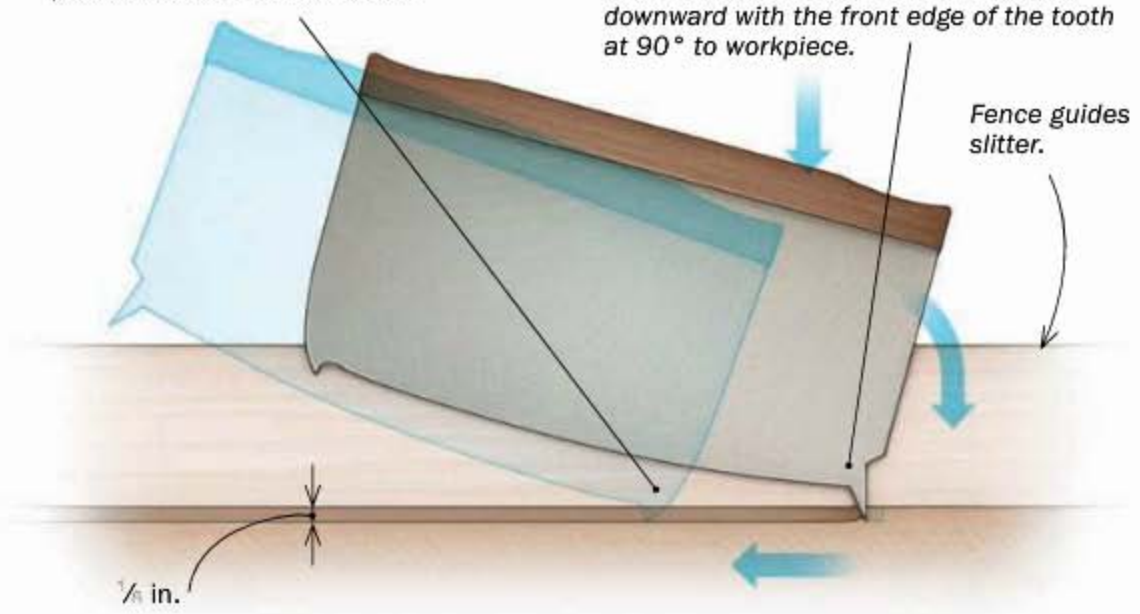
***Score, then go deep.*** *Several light passes with the curved tooth along the length of the layout line (left) score the edges. Fortune starts and stops just shy of the ends. A few heavier passes (above) get him to full depth. Before cutting the grooves, he lightly coats the wood with silicone-free wax so it will resist the glue.*

### TWO TOOLS IN ONE

**CURVED TOOTH CUTS THE GROOVE**
*Most of the groove is cut in long passes with the curved tooth.*

**CHISEL TOOTH SQUARES THE ENDS**
*You insert the belly of the tool in the slit, and then roll the tool forward and chop downward with the front edge of the tooth at 90° to workpiece.*

*Fence guides slitter.*




***Nibble up to the ends.*** *Fortune makes three or four plunging cuts with the chisel tooth to clean up the ends of the inlay slit.*

slits. After making the inlay tool and cutting the slits, I make inlay strips to fit. I bring the strips to final thickness with another shopmade tool—a wooden jig that turns another card scraper into a thicknessing device.

String inlay works equally well in solid wood or veneered panels (and plywood, though you need to go lightly to avoid lifting the thin veneer). When string inlay runs across the grain in a solid-wood workpiece, however, the design must account for wood movement. I limit lines of cross-grain inlay to 3½ in. or so in length, adding small accent details between the short sections of inlay.

### Making the slitting tool and cutting slits

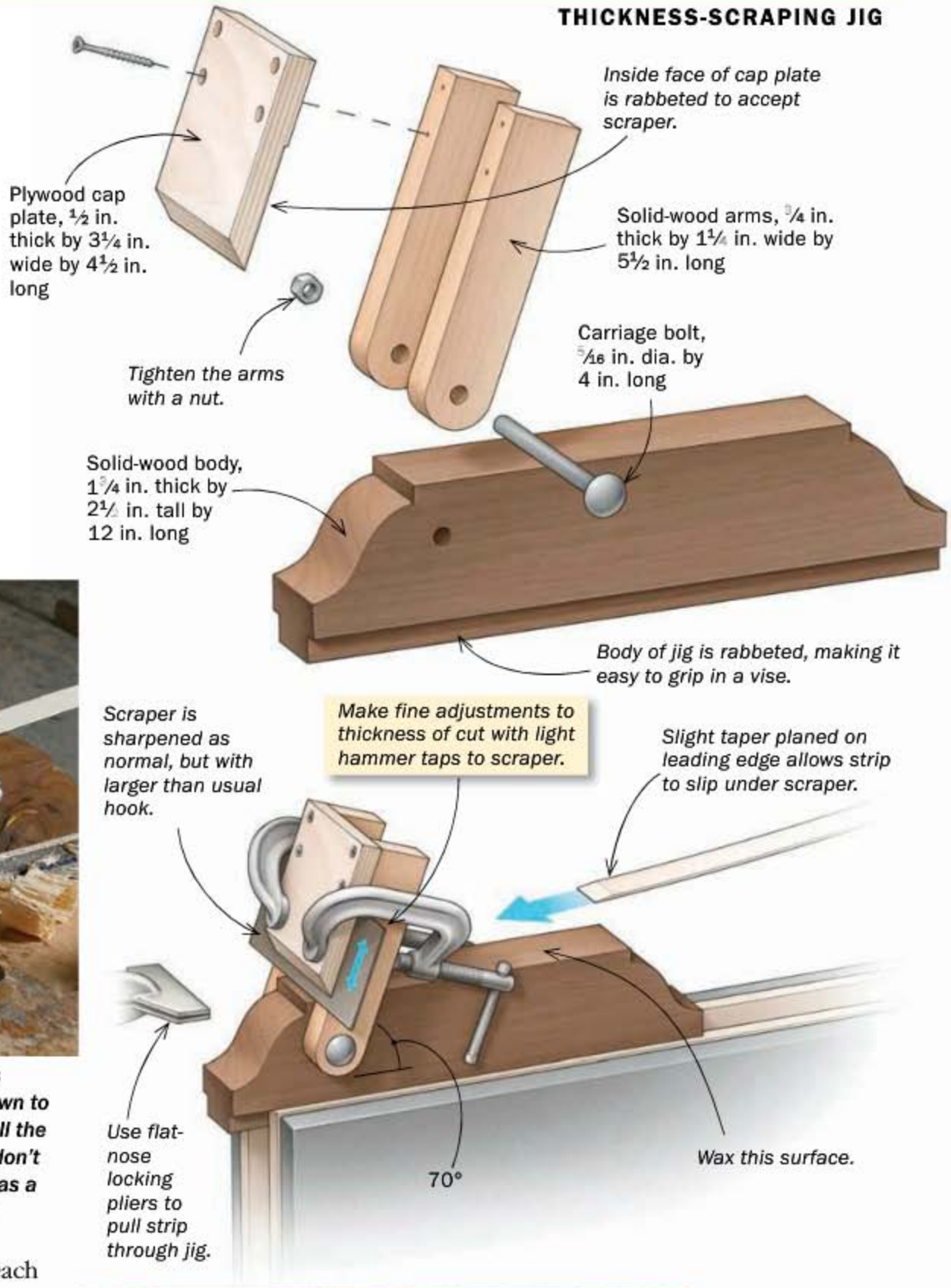
To make the slitting tool, I shape one long edge of a card scraper on a grinding wheel, creating a cutting tooth at both ends. One tooth is curved to a slight hook and has a V-groove filed into its outside edge. The V-groove creates a pair of scoring cutters that make for clean cuts either along or across the grain. This curved tooth is the workhorse, doing 95% of the slitting. I use a jeweler's file to produce the V-groove and a round file to clean up the adjacent inside curve of the tooth. I shape the other tooth to a chisel point and use it with a chopping action to work the last 1/16 in. or so of the slits, giving them crisp, square ends.

On both the curved tooth and the chisel tooth I hone the edges with slipstones, and then I hone the faces of the tool on a bench stone. When the teeth need resharpening, I return to the sharpening stones. After five or six honings, I'll refile the edges and hone again.

The slitting tool must be guided with a fence. I use tight-grained hardwoods like maple and make the fence about 1¼ in. high—tall enough to provide good support for the slitting tool but not so tall that it interferes with the tool's handle. To provide support at the begin-

***Slice mine a little thick.*** *Fortune bandsaws strips for the inlay from 1-in.-thick stock. He rips the strips just slightly over final thickness and joints the edge of the stock between rips.*

***Self-powered planer.*** *A few passes through Fortune's shopmade thickness scraper brings the wide strips down to final thickness—and cleans up the bandsawn face. Pull the strip through at a slight angle, so the bandsaw ridges don't catch. After taking a shaving, use the bandsaw marks as a guide to be sure the scraper is parallel to the jig body.*




***The fit is critical.*** *The inlay strip should press into the slit snugly with thumb pressure. After thicknessing and fitting the wide strips (left), Fortune bandsaws them to about ¼ in. wide for inlaying.*

ning and end of the cut, the fence extends past each end of the slit by 4 or 5 in. I glue 150-grit sandpaper to the bottom of the fence to keep it from shifting in use.

Once the fence is clamped in place, I examine the grain of the workpiece to determine which direction to pull the tool; I want the grain to draw the tool naturally toward the fence. I begin cutting the slit by taking very light passes with the curved tooth, just scoring the surface of the wood. I start and stop the cuts 1/16 in. or so from the end marks. With the slit established, it usually takes just four or five harder passes to reach the final depth of about ⅛ in. For these later cuts, grain direction is not critical, and I make passes in both directions to obtain a consistent depth of cut. The curved tooth is about ⅛ in. long, and I can use it as a rough depth gauge. Next, I use the chisel tooth to nibble up to the

## HOW TO INSTALL IT

***Fit the square end, mark the miter.*** *Fortune fits one strip in place and marks the miter with a knife. He uses this strip to set the stop block for his miter setup (see below).*

***Many miters.*** *A simple bench hook serves as a miniature miter box as Fortune cuts the inlay strips to length.*

***Gang gluing.*** *Having checked the fit of all the inlay strips, Fortune keeps them in order on pieces of double-stick tape. He dispenses glue with a syringe, being careful not to overdo it.*

***Miters first.*** *Fortune inserts the mitered end of the strip first, then toes in the far end and finishes by pressing down in the middle (left). He uses the end of a small stick of soft pine as a push stick to be sure all the strips are well seated (above).*

ends of the slit. I insert the belly of the tool in the groove, rock the chisel tooth down to take a bite, and pull it back to remove the waste. Repeating this two or three times gets me to the end of the slit.

### Produce the inlay strips

I cut the slits first and then make inlay strips to fit. In choosing wood for the inlay, I aim for as much contrast as possible, and I keep in mind that dark woods lighten over time and light woods darken. If the workpiece is cherry, walnut inlay will not produce a strong contrast after the two woods have oxidized. Inlaying ebony would be much better. For a light inlay into a dark wood, English holly is more effective than maple.

I create the inlay strips in three main steps. First, I mill the inlay wood into a billet about 1 in. thick. Then I bandsaw it into thin strips, cutting them just slightly thicker than my target thickness, and I joint

***Scrape, don't sand.*** *Sanding dust from contrasting inlay can discolor the surrounding wood. Instead, start the flushing with a block plane and finish up with a scraper.*

## WORKING WITH CURVED INLAY

***Curve the fence for serpentine stringing.*** *The same slitting tool can follow a curved fence, but the fence must be convex to work with the slitting tool. To make an S-curved inlay slit, move the fence from one side of the line to the other.*

***Careful going cross-grain.*** *To avoid problems with wood movement, break up lines of inlay that run across the grain. Fortune limits cross-grain lines to 3½ in. long, and he adds accent details between them.*

the billet between rips. I bring the strips to final thickness by pulling them through my shopmade thickness scraper. The fixture holds a standard scraper blade with a larger-than-normal hook. I use a block plane to create a slight ramp on one end of each strip so it will pass under the scraper and I can grip it with a pair of flat-nose pliers. Then, back at the bandsaw, I rip these pieces into a batch of ¼-in.-wide inlay strips.

### The string goes in

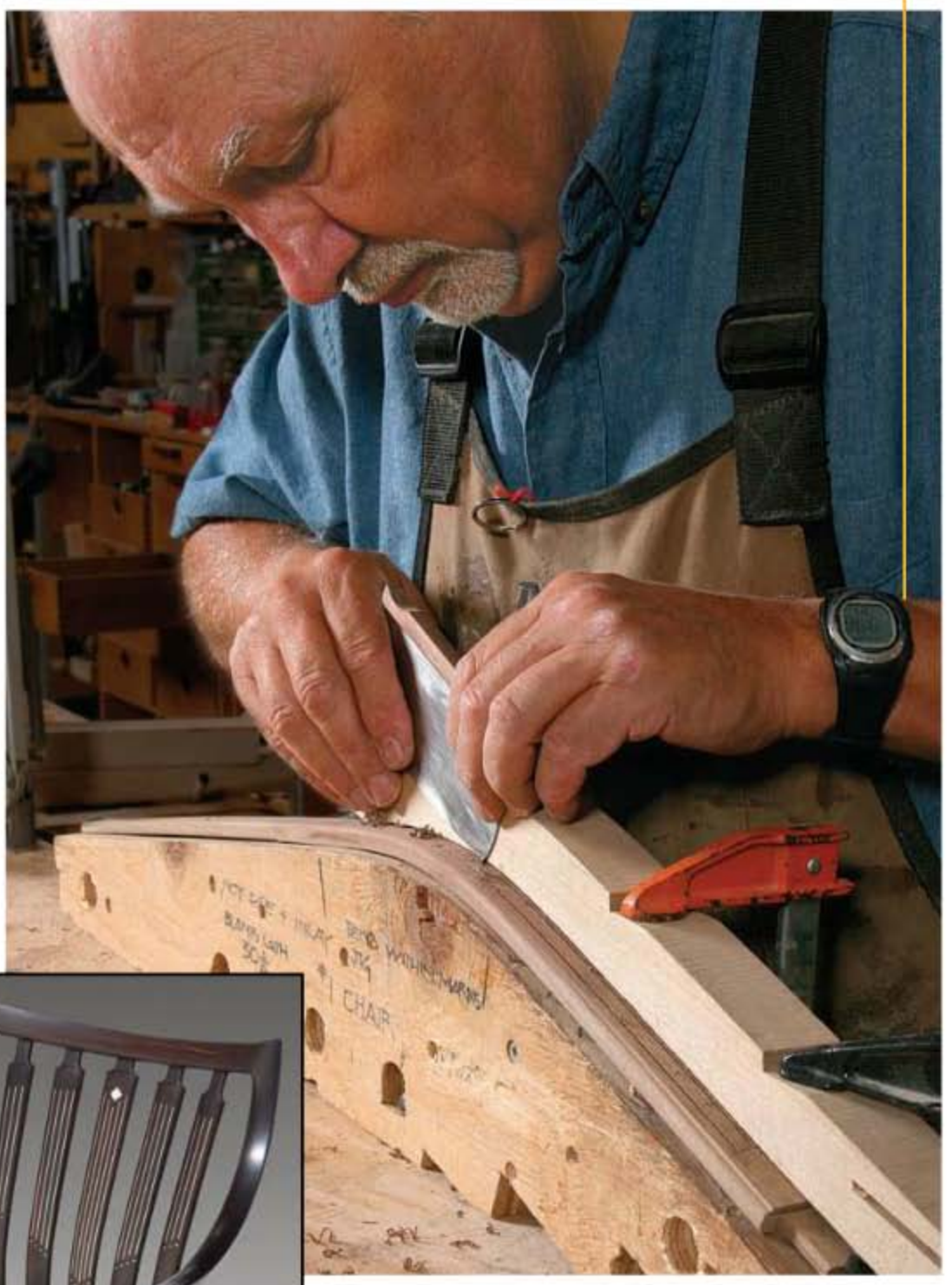
When I'm ready to inlay the stringing, I cut the strips to length with a razor saw and a shopmade bench hook that functions as a miter box. I use PVA (polyvinyl acetate) glue for most woods, but epoxy for the oily exotics. I apply the glue with a syringe (leevalley.com), taking care not to overfill the slits—I don't want hydraulic pressure fighting me as I press the inlay into place.

### How about curved inlay?

Curved inlay is not much more difficult than straight work. You follow the same steps. but use a fence with a convex curve. If a design calls for an S-curved inlay, you'll need to move the fence from one side of the line to the other as you proceed, because the slitting tool will not work properly with a concave fence. Direction of cut is especially important with curved cuts, as the grain direction changes as the line curves. Before I cut a curved design, I assess the grain and draw arrows on the workpiece to guide me.

You also can inlay a concave or convex surface, as I often do with the steam-bent back slats on dining chairs. The slitting technique is the same as for flat work, you just need a support block and a fence that conform to the curved workpiece. I also use these tools to inlay metals and other materials. I'll cover those advanced techniques in a future article. □

*Michael C. Fortune is a contributing editor.*





***Curves in the other direction.*** *To cut inlay slits in a bending chair slat, Fortune uses a fence cut to the same curve. His slitting tool works well with wood inlay, but also allows him to inlay silver—as in this chair—and many other materials.*

Inset photo, bottom: Michael Fortune

# Knife Hinges on the Router Table

## Clever template ensures matching mortises

BY DOUG STOWE

I like knife hinges for cabinet doors because they're practically invisible, so they don't detract from the beauty of the piece. They also work smoothly and wear well over time. But there's a downside. The cabinet mortises for the hinges must be cut before the cabinet is glued together, and knife hinges require precise installation. The mortises must be sized perfectly and located exactly to prevent binding.

Traditionally, mortises for knife hinges have been cut with a chisel or plunge router. The chisel is a tedious choice; a plunge router is tough to balance on the edge of a door. I have a better way, using a simple template and a router table.

My method works only for straight knife hinges, which are used with overlay doors. Offset knife hinges are for inset doors, and this technique doesn't work with them because of their L-shape. But you can make a wide variety of beautiful cabinets with overlay doors. I'll

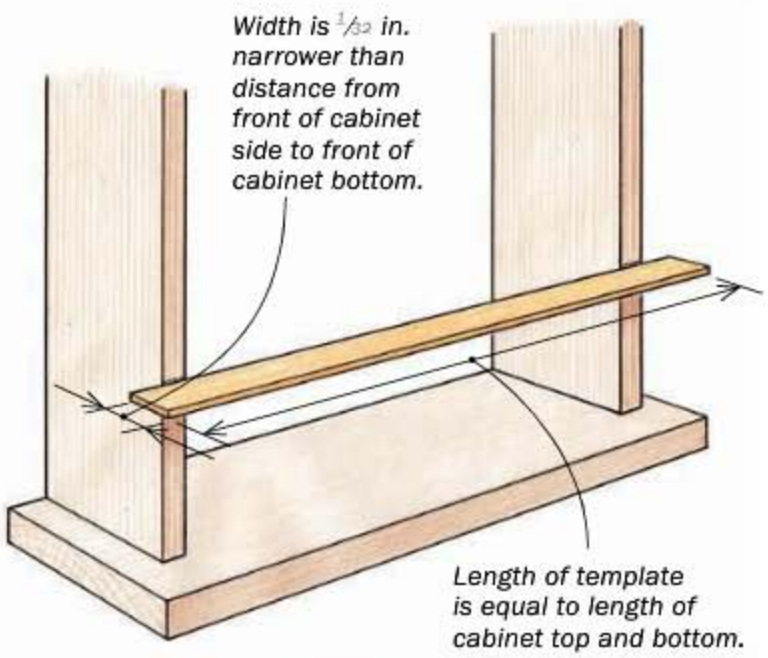
Photos: Matt Kenney

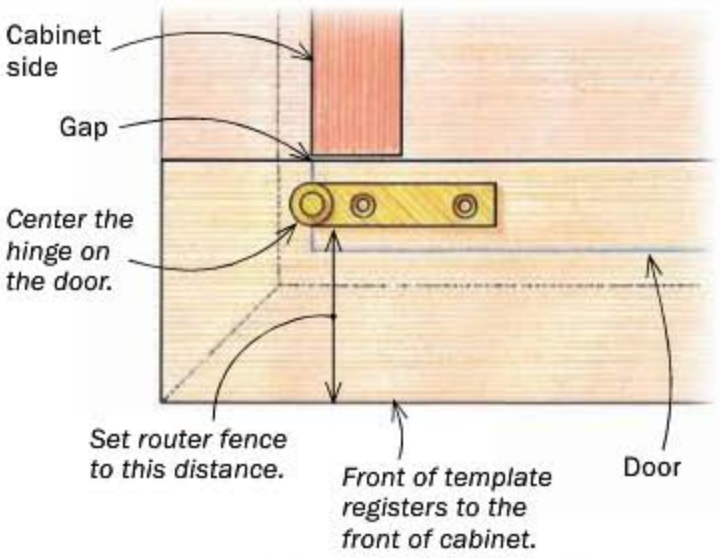
# A template is the key to fast, accurate mortises

**The template is used to set up the router table for all of the hinge mortises—in both case and doors.**

## SIZE THE TEMPLATE FROM THE CASE

**Cut the template stock to the same length as the case bottom. Then, to create the necessary gap between the door and case sides, rip it slightly narrower than the setback of the sides.**



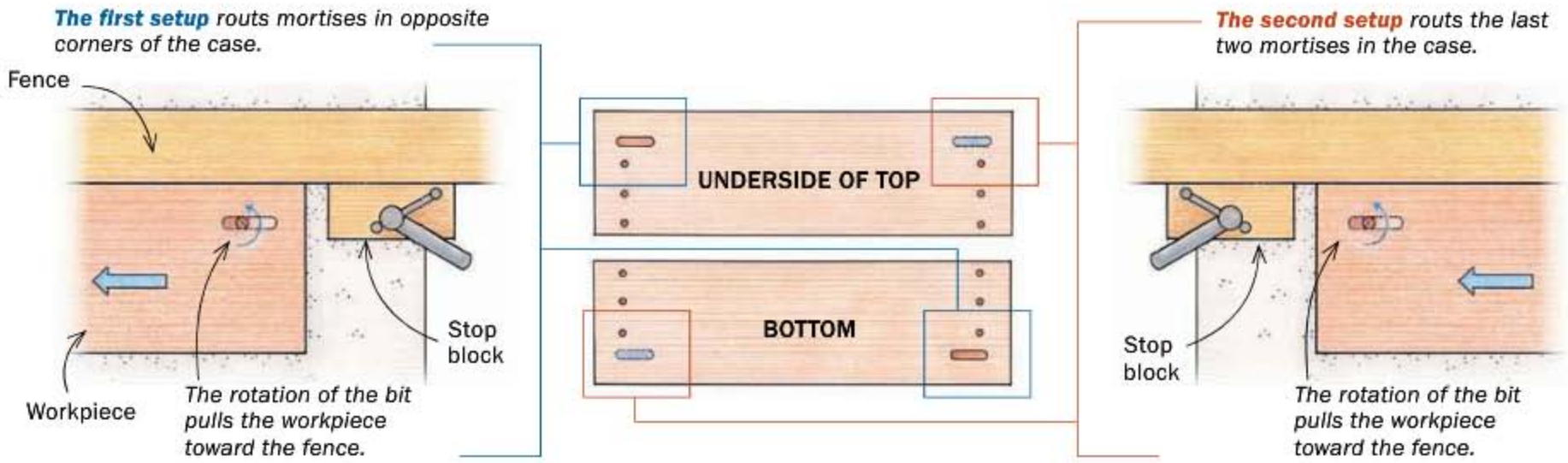

***Locate the hinge on the template.*** *Place the template flush with the front edge and ends of the cabinet. Then set the door in place, with the 3/32-in. gap behind it. Center the hinge on the thickness of the door and measure the distance to the front edge of the template (above). Then slide the hinge sideways into its true position, and mark the ends of the slot needed in the template (right).*

***Set up the router table.*** *Use the measurement you made earlier to set the distance between the fence and the bit (the front of the template will ride the fence). Then line up the left end of the slot with the left side of the bit and clamp a stop block at the end of the template. Set the bit slightly higher than the thickness of the template.*

***Rout the slot in the template.*** *With the template against the stop block, lower it onto the spinning bit and then push it until you reach the right end of the slot. Turn off the router and hold the template in place until the bit stops.*

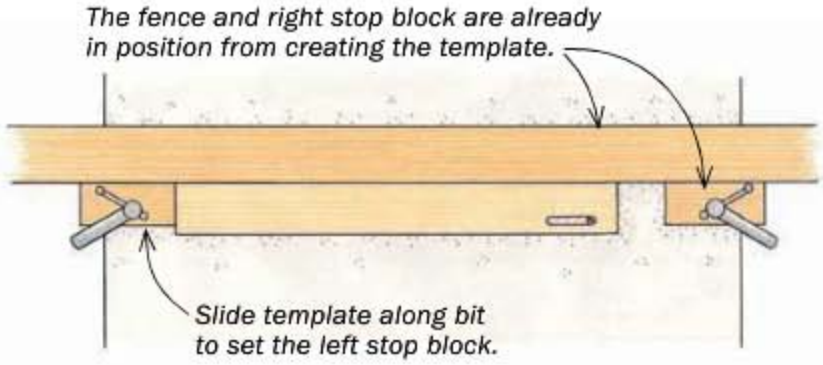
# Rout the cabinet in two steps

**Rout all of the mortises from right to left so that the bit's rotation keeps the workpiece against the fence. To accomplish this, you'll need two different setups on the router table.**



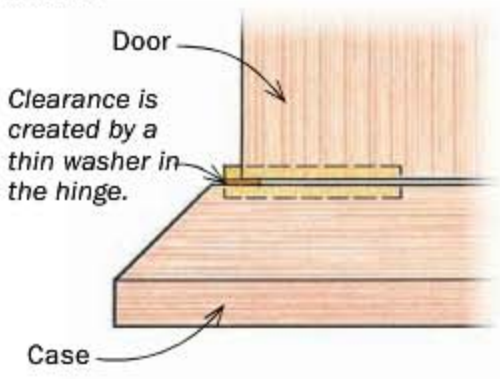

## 1. ROUT THE FIRST PAIR OF MORTISES

**Use the template to set the remaining stop block, and then mortise the case parts.**




***Clamp on the second block.*** *With the router off and the bit against the right end of the template mortise, clamp a stop block on the left end of the template.*

***Reset the bit height.*** *It should match the thickness of the hinge leaf exactly, so the leaf ends up flush with the surface.*



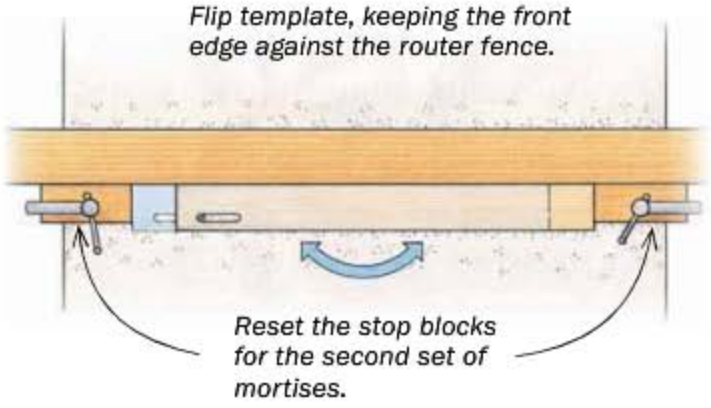

***Rout the top and bottom.*** *Start with the right end of the workpiece against the stop block. Then lower it onto the spinning bit—being careful to keep it against the fence—and slide it to the other stop block.*



Drawings: Vince Babak

## 2. ROUT THE SECOND PAIR

**Simply flip the template end for end and reset the stop blocks to complete the mortises in the top and bottom.**




***Reset the stops.*** *The critical step here is to make sure the bit's cutter is touching the very end of the mortise when you set the stops; otherwise, the mortises in the cabinet won't match each other.*

***Square up one end.*** *Match the chisel's width to the mortise's width (left). Remember that only one end of the hinge leaf is square, so leave the other end of the mortise round (above). Do all four mortises in the case.*

demonstrate on a cabinet with an overhanging top and bottom—a basic design that's flexible enough for many furniture styles. Give knife hinges and this technique a try on your next cabinet. You'll get perfect results.

### Make the template

As I mentioned, the mortises in the cabinet top and bottom must be routed before the cabinet is glued together. After you glue up the cabinet, you'll fit the doors to the opening and rout the hinge mortises in them.

That said, you use the template to set up the router table to rout the hinge mortises in both the cabinet and doors. It's a simple affair. One end has a slot routed into it that represents the hinge mortise. This template handles all the router-table setups. The front edge sets the fence for the cabinet; the back edge sets the fence for the door. And since it is the full length of the top and bottom of the cabinet, it also sets up the stop blocks for the mortise length.

After cutting the template to size, locate the hinge mortise on one end (see p. 71). Next, set up the router table. Use a spiral-cut straight bit with a diameter that matches the leaf's width. Set the bit height just above the template's thickness. Put the front edge of the template against the fence and adjust the fence so that the bit and mortise are aligned.

You'll need to lower the template onto the spinning bit, but first put a stop block on the right side of the bit to control the workpiece. Align the left end of the mortise (as laid out on the template) with the left side of the bit. Clamp the stop against the right end of the template. Turn on the router, put the trailing end of the template against the stop, and lower the template onto the bit. Push it through until the bit reaches the mortise's other end. Hold the template in place as you turn off the router and the bit stops. Clamp a second stop block against the left end of the template. Reset the bit's height to match the hinge leaf's thickness. You are now set up to rout the first two mortises (one in the top of the cabinet and the one in the bottom).

### Rout the top and bottom

Rout the cabinet mortises the same way you routed the slot in the template, placing the trailing end of the workpiece against the right-hand stop block and lowering it onto the bit. Push the workpiece through from right to left until it hits the other stop. Turn off the router and wait for the bit to stop before you remove the workpiece.

To rout the other two mortises, keep the fence in the same position, but relocate the stop blocks. Flip the template end for end so that the mortise is on the right end, and put it over the bit. Use the template to set the stop blocks. After they're clamped in place, rout the mortises.

Where necessary, square up the ends of the mortises with a chisel. Drill pilot holes for the screws, and then glue the cabinet together. Make and fit the doors to the opening. The gap at the top and bottom of

# Trim the template for the doors

**The mortises on the doors are shorter than the ones in the cabinet, because the round end of the hinge sticks out from the door's edge. Also, you'll be referencing off the back edge of the template now.**

***Mark the door's edge on the template.*** *Work directly from the assembled cabinet, using the side, which will be flush with the door's edge, as a reference. Then crosscut the template at that mark.*

***Set the fence and add a stop.*** *Use the back edge of the template to reset the fence. You'll be feeding the end of the door directly into the bit, so you need only one stop. This setup routs one mortise in each door.*

***Rout the mortise.*** *Stowe uses a featherboard to keep the door tight against the fence.*

the door is critical. It must be equal to the thickness of the washer on the hinge pin.

## Mortising the doors is just as easy

Before you can rout the mortises in the doors, you need to adjust the template. Put it in place on the assembled cabinet and mark where the outside face of the side hits the template. That's where the door will end, too. Cut the template at that mark. The mortise is now open on one end, just like it will be on the door.

When setting up the router-table fence for the top and bottom, you used the front edge of the template, which accounted for their overhang. For the door, you'll use the back edge of the template to set the fence, so the hinge ends up centered on the door with the correct gap between the door and the cabinet sides. Put the mortise over the bit, with the back edge of the template facing the fence. Move the fence up to the template and clamp it in place.

Because the doors' hinge mortises are open on one side, you need only one stop block to rout each one. Start with the stop block on the left side of the bit. Set it by putting the closed end of the template's mortise against the right side of the bit. Clamp the stop against the open end. Rout the first two mortises (one in each door). To rout the second two mortises, set the stop block on the right side of the bit.

Square up one end of the mortise and drill pilot holes for the screws. □

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*Doug Stowe is a furniture maker in Eureka Springs, Ark.*

***Move the stop for the next set of mortises.*** *The stop goes on the right side. The door is dropped onto the bit, then pushed through it.*

**Online Extra**

To see a video on installing offset knife hinges for inset doors, go to **FineWoodworking.com/extras.**

# Hang the doors

**Because the hinges are above and below the door, installing a door with knife hinges is a bit different from doing it with butt hinges: The door must be slid onto its hinge leaves.**

***Install the cabinet leaf first.*** *To keep from damaging the brass screws, drill pilot holes, wax the screws, and use a screwdriver, not a cordless tool.*

***Slide the door onto the hinges.*** *The hinge leaves are put onto the hinge pin before they're attached to the door. If you attached them to the door first, you couldn't get them both on the pins.*

## If everything is flush, it's even simpler

**Not everyone wants the top and bottom of a cabinet to overhang the sides and door. If you'd rather have them flush all around, the template technique is even easier. The template's width doesn't matter, because your setups are all referenced off the front edge and the fence never moves. Its length doesn't matter, either, because you'll only use one end of it to set up a single stop block.**

**After laying out the hinge's location on the template, set up the router table to cut the mortises. Once again you want to always be routing right to left, so the cutting force pulls the workpiece against the fence. That means you'll still need two setups. With the stop block on the left, you start with the door or cabinet part on the table, and simply slide it over to the stop block. With the stop block on the right, you'll start with the workpiece against the block, drop it carefully onto the spinning bit, and then rout.**

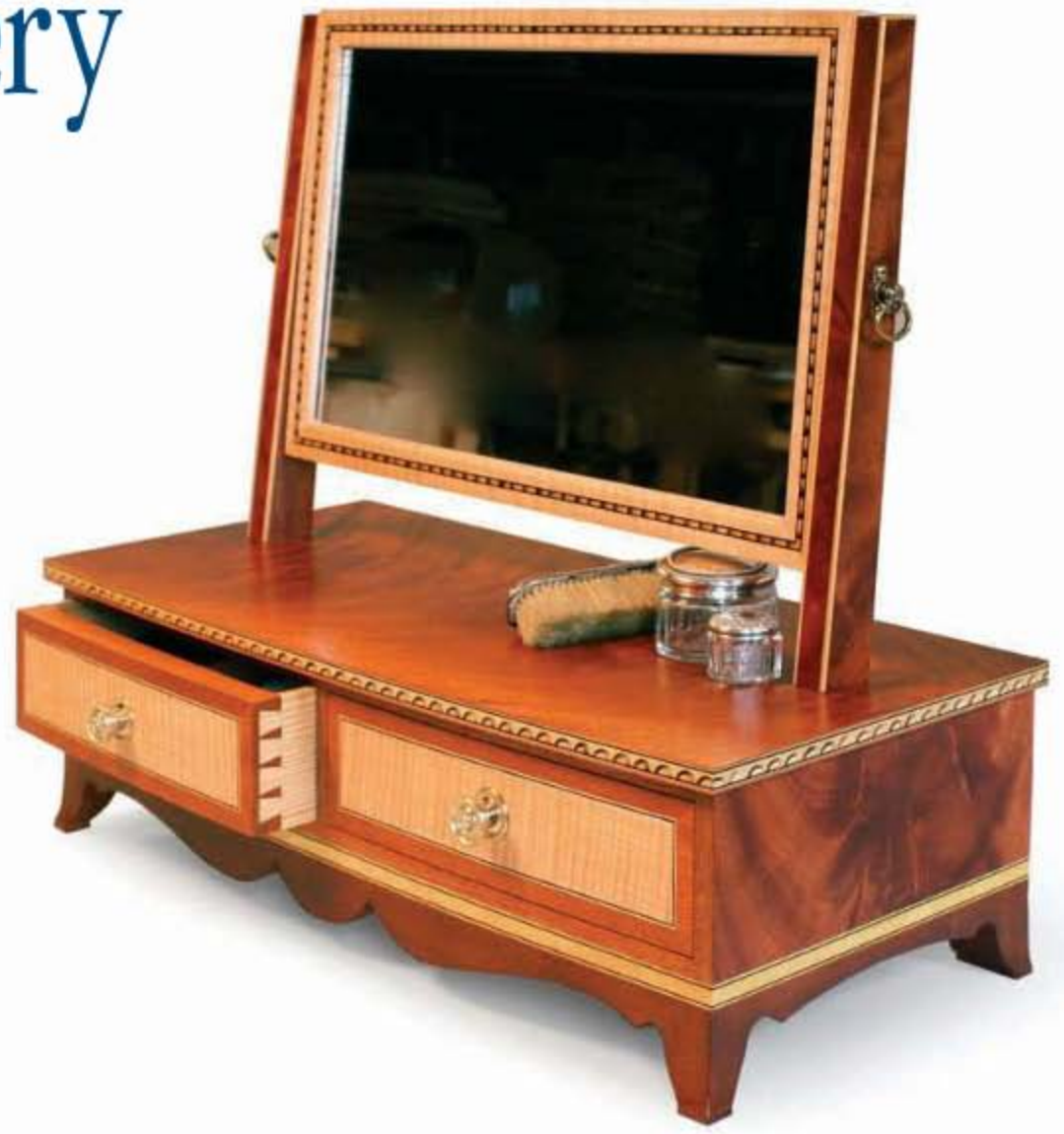
**Also like before, you should mortise the top and bottom first, then glue up the case and fit the door (or doors) before routing its mortises.**

***One stop block is all you need.*** *But you'll need to set it up on both sides of the bit to cut all of the mortises.*

***Head for the block.*** *For half of the mortises, you'll be able to simply rout into the open end of the mortise until you hit the block.*

***Drop and go.*** *In order to rout the other mortises in the same direction, you'll need to start against the block, and then drop and go.*

# readers gallery



## MARIO RODRIGUEZ
Cherry Hill, N.J.

Several times a year at Philadelphia Furniture Workshop, Rodriguez teaches a Master Class in which students attend classes one weekend a month. Because students take their project home between classes to work on it, Rodriguez picks a piece for the class that is relatively portable. But he also wants the project to stretch the students' skill set—and sometimes his own, too. This dresser mirror in mahogany and curly maple, based on one by the Federal-era masters John and Thomas Seymour, was just the ticket. Rodriguez made the sand-shaded lunette banding above the drawers in yellowheart with ebony stringing, using a technique he learned from fellow period furniture maker Freddy Roman. The drawer sides are pine and the brass hardware is from Whitechapel. The piece is 10 in. deep by 23 in. wide by 14 in. tall.

## QUENTIN KELLEY
Milton, Mass.

Kelley based the design of this chair on one his client liked. The original, made by an Italian manufacturer, was badly proportioned, so Kelley resized his version. He also thought he could improve on the details of the arms, crest rail, back splat, and seat apron. So he designed a chair of soft maple, adding dark stain and upholstery according to the client's wishes. Then he made this version (21 in. deep by 21 in. wide by 39 in. tall) for himself, leaving it unfinished and upholstering the seat with simple muslin fabric. It took about 100 hours to complete. PHOTO: CHRISTIAN PHILLIPS

## 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.

## DAVID HURWITZ
Randolph, Vt.

The walnut carving on this chest of drawers (19 in. deep by 26½ in. wide by 42 in. tall) wraps around from the front to the sides, and fades off toward the back of the piece. On the drawer fronts, the carvings do double-duty as integral pulls. The drawer boxes are ash with hand-cut dovetails in the back corners and sliding dovetails into the drawer fronts. The base is a cylinder of stack-laminated walnut, set back 2 in. from the front edge of the chest. To test his concept and ensure the chest wouldn't be tippy as a drawer is opened, Hurwitz built a scale model. This chest won first place for Custom Studio Furniture in the 2012 Vermont Fine Furniture and Wood Products Design Competition. To see more of Hurwitz's work, go to davidhurwitzoriginals.com.

## TIMOTHY JAMES PETERS
Burlington, Vt.

Peters, a student at the Vermont Woodworking School (VWS), won second place for his Gaming Box in the 18-plus student-apprentice category at the 2012 Vermont Fine Furniture and Wood Products Design Competition. But Peters had begun work on the box long before he became a student at the school. He started it in his garage shop after work and on weekends, completing the frame and adding the shopsawn maple burl veneers and inlaid ebony details, and finished it during his first semester at VWS. At 9 in. deep by 7 in wide by 6 in. tall, it is sized perfectly to hold a set of dominos and a deck of cards. In all, it took Peters about 50 hours to complete. The finish is shellac. PHOTO: AMANDA LASS

## PETER TURNER
South Portland, Maine

Bored during a quiet moment at a craft show, Turner sketched out the design that would eventually become this queen-size bed (70½ in. wide by 85 in. long by 43½ in. tall). But before making the bed itself, he used the leg design on a bench, a rocking chair, a side table, and even a pair of doll beds for his daughter. Turner says he calls the bed "Shiner" because the clusters and patterns of the small rays on the surface of the beech remind him of schools of minnows. The finish is tung oil and citrus solvent. PHOTO: DENNIS GRIGGS

## STEPHEN NEUMON
Albuquerque, N.M.

Neumon built this Ming Dynasty wardrobe cabinet in cherry (23 in. deep by 40 in. wide by 84 in. tall) over the course of 11 months, working in tandem with his friend Charles Palmer, who built an identical cabinet in walnut. They worked together three Saturdays a month and separately on days between. Since the parts for the two cabinets were interchangeable, they divided up the work and made parts in batches. The project amounted to a rigorous apprenticeship in Chinese joinery—the wardrobe contains 12 three-way miters and 32 two-way miters, which incorporate a total of 112 mortise-and-tenon joints. Overwhelming? Apparently not; the two friends will be making a different pair of Chinese pieces this year. PHOTOS: CHARLES PALMER

***Ming remodeled.*** *Neumon had silversmith Walt Doran design and execute pierced patterns in the traditional escutcheons and hinges, purchased from chinesebrasshardware.com.*

***Tricky joints.*** *The cabinet is replete with complex Chinese joinery. To see how the three-way miter joints are made, see* FWW #227.

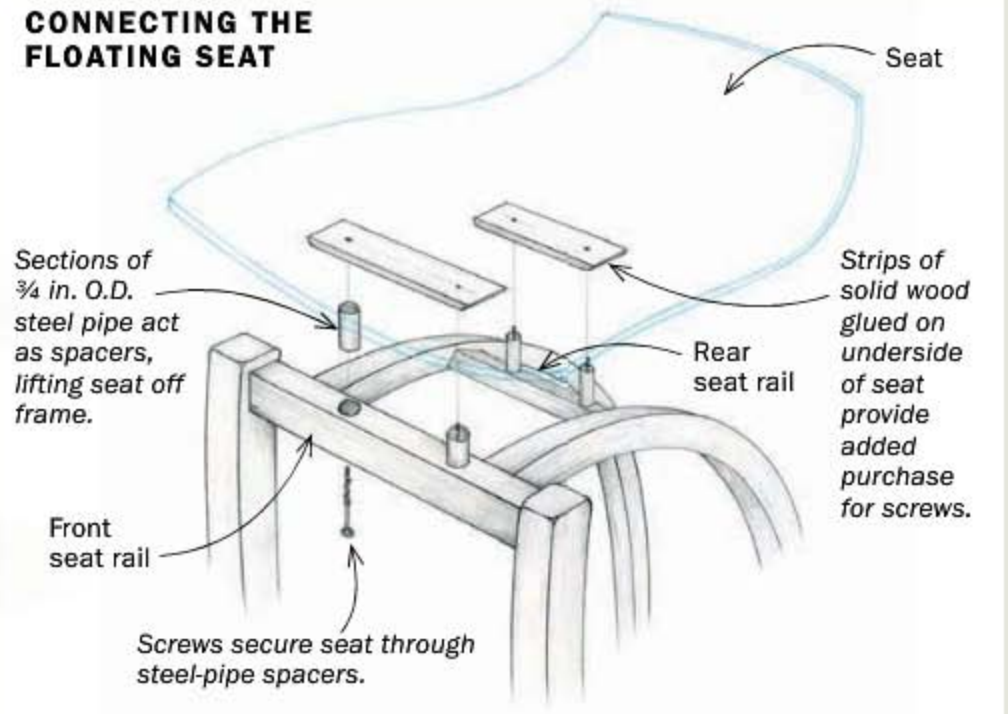
## MATTHEW OSBORN
Indianapolis, Ind.

"My wife and I were used to living in tiny apartments with our daughter and having to move our furniture around to do anything that required any amount of floor space," Osborn says. "This table design was my solution to that situation." He calls these white oak and walnut tables "Mother and Her Cub." With the smaller one (20 in. dia. by 16 in. tall) nestled inside the larger coffee table (42 in. dia. by 14 in. tall), there is plenty of surface area to play games or eat. Or, you can take out the smaller table to use as a side table. The tables are finished with Danish oil and took about 40 hours to complete. For more of Osborn's work, go to osbornandstillman.com. PHOTO: PHIL TENNANT

## REED HANSULD
Toronto, Ont., Canada

Hansuld wanted to create "something that would play on the eye" and challenge expectations of what makes a sturdy bar stool. For efficiency's sake, he also wanted to limit the number of parts required to make the stool. With its upswept seat cantilevered out over back legs that bend 90° to meet the front seat rail, his design is striking and simple. To make it structurally sound, Hansuld used tapered bent-laminations to make the back legs, joining them to the front seat rail with double slip tenons. He added a curving H-stretcher system to connect the back and front legs. And to make the leg structure even stronger, he fitted a rear seat rail between the back legs. The seat is a bent lamination—three layers of ⅛-in. Baltic-birch plywood stained around the edge with water-based dye and veneered top and bottom with wenge. To allow the seat to "float" yet still be supported solidly, Hansuld used lengths of pipe as spacers in the four spots where he attached the seat to the frame. The stool is 19 in. deep by 18 in. wide by 28½ in. tall. PHOTO: JANELLE FALCONER

### CONNECTING THE FLOATING SEAT




## THOMAS STARBUCK STOCKTON
Montgomery Creek, Calif.

The overall design of this men's valet was inspired by the work of Charles and Henry Greene, although it is not a copy of any particular Greene and Greene piece. The size (16½ in. deep by 28 in. wide by 36 in. tall) was dictated by a client, who "at the end of the day wanted to have a place to put essentials [where] they wouldn't clutter his bedroom," Stockton says. The piece is made of cherry and ebony, with mother-of-pearl details in the drawer pulls. The finish is oil and polyurethane.

Q&A

# Add bandings to a plywood tabletop

**Q: I don't have a vacuum press, but I'd like to try my hand at some of the designs in Craig Thibodeau's recent Master Class on tabletops (*FWW* #228). If I use nice hardwood plywood as the center panel and add solid-wood edging all around, can I still add a decorative banding?**

—NICK JOHNSON, Wells, Maine

**A: DEFINITELY, BUT THE PROCESS** is a little different. Rather than taping a shopmade banding to the central field of veneer, your best option is to use premade banding, and install it after applying the edging. Premade banding is thicker than veneer, which makes the banding easier to install and level afterward without fear of sanding through the veneer on the plywood top.

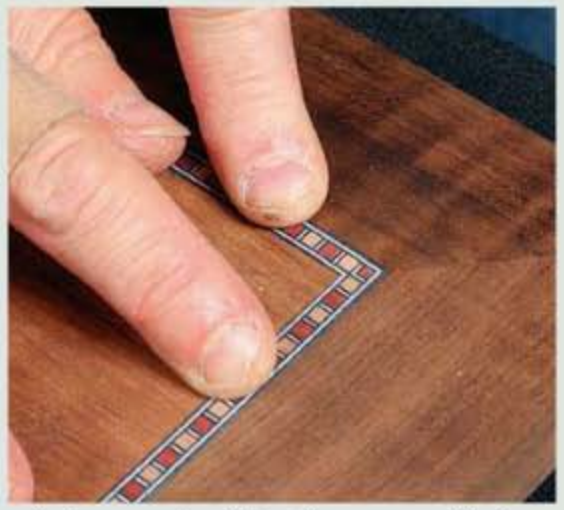
Cut the recess with a router and an edge guide, and square up the corners with a chisel. You'll need to fit and miter the banding pieces before gluing them in. Start at the corners to make sure the pattern meets seamlessly there. Trim the pieces to length near the middle. The eye is drawn to the corners, so people won't notice if some squares near the middle are a bit narrower than others. After you glue in the pieces, flush the bandings close to the surface with a block plane, scrape them flush, and finish-sand them. By the way, I use a vacuum while sanding to keep the colored dust from migrating into areas where I don't want it.

*—Craig Thibodeau is a furniture maker in San Diego.*

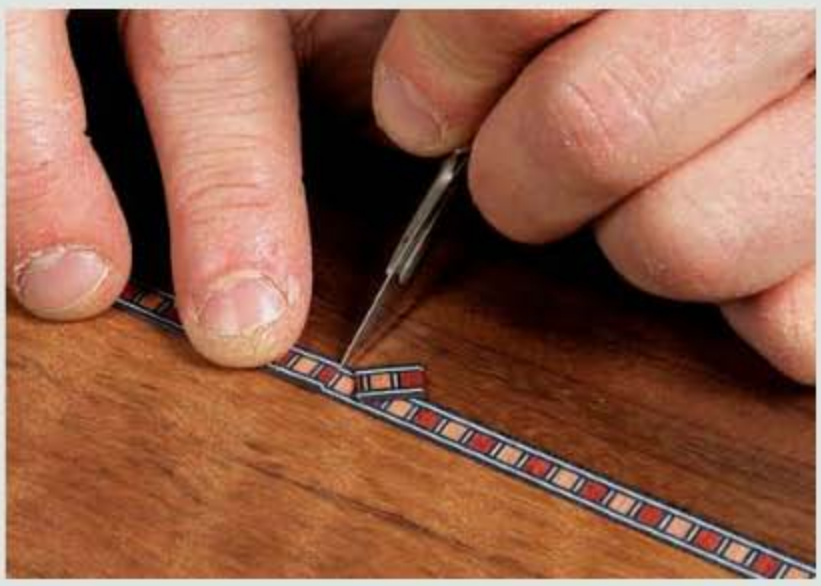
## Ask a question

**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.**

***Rout the groove.*** *Set the bit depth just shy of the banding's thickness, and adjust the edge guide so the cut straddles the glue joint. Stop a bit short of the corners, and chisel those square by hand.*



***Fit and miter the pieces.*** *Because the eye is drawn naturally to the corners, it's important to cut clean miters that match. Use a drafting triangle to guide the knife (left) and then check the joint (right).*



***Adjust at the middle.*** *No one will notice a slightly narrower square near the center where you trimmed a butt joint in the banding. Just overlap the pieces, and trim through the top one with a razor or scalpel.*



Photos: Kelly J. Dunton

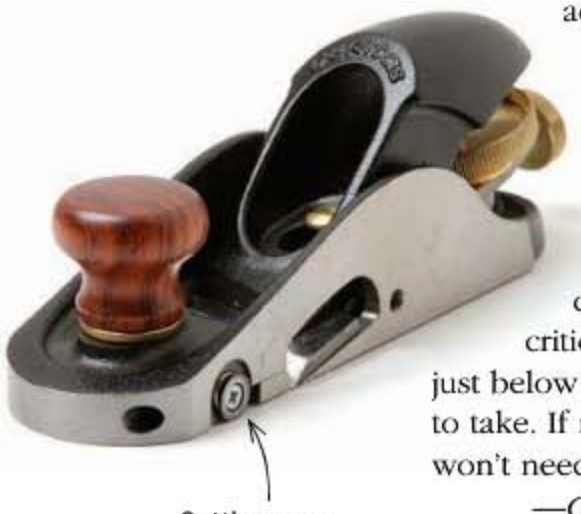
# Aligning rabbet plane nickers

**Q: When do I use a nicker on my rabbet plane, and how do I set it up?**

—RYAN MATTHEWS,
Parma, Ohio

**A:** THE NICKER, OR CUTTING SPUR, is designed to sever the fibers ahead of the blade, making for clean cuts across the grain. It is especially important when cutting joinery by hand, such as rabbets or even raising panels. For the spur to do its job properly, it needs to line up perfectly with the side of the blade; otherwise, you'll get some tearout across the grain or a sliver of wood left between the blade and spur. To check and adjust the alignment, lay a steel rule across both surfaces and move the blade sideways as needed. The cutting depth of the spur is less critical. If yours is adjustable, set it just below the deepest cut you are likely to take. If not, it's probably fine and you won't need to worry about it.

*—Chris Gochnour is one of* FWW*'s hand-tool experts.*



Cutting spur, or nicker

***Line it up.*** *The leading edge of the blade should be parallel to the cutting spur.*

***Deep, clean cuts.*** *The spur severs the fibers along the inside edge of the cut, making for clean cuts across the grain, no matter how deep you go.*

master class

# Customize your carving tools

## MODIFY THE GRIND AND REAP BIG REWARDS

BY ALLAN BREED

Economy of cuts. That was the only advice on carving that I ever got from my first boss, an Italian-trained cabinetmaker. I took it to mean that a rose carved with 15 cuts was better than one made with 35. After my boss died, I bought his carving tools, and I found some that were obviously ground for specific purposes—what purposes, I didn't know. But one by one they revealed themselves over the years. I discovered that a tool customized for a particular task is much better than a factory-ground tool, replacing many inefficient cuts with a single clean cut and producing a far better result. I now rely heavily on modified grinds in my carving. Some are extremely versatile, while others are specific to particular jobs and may see use for just a few cuts per project.

One of the most versatile and powerful of my custom-ground tools is the V-tool. Switching

***Revved up V-tool.*** *Breed custom-grinds many of his carving tools to improve their performance. His modified V-tool cuts cleanly across the grain with minimal pressure.*

**V-TOOL WITH FORWARD-RAKING WINGS**


***Lower is better.*** *On his V-tool—and many others—Breed grinds down the steep factory bevels to create a long, curving underside that allows him to use the tool at a lower angle, thus increasing control.*



Photos: Jonathan Binzen; drawings: John Tetreault

# Transforming a V-tool

**To customize this tool, I start by changing the angle at the tip so that the wings rake slightly forward. Then I grind back the steep factory-ground bevels. The grinding techniques I use on the V-tool also apply to many of the other custom grinds. I do the grinding on a fine grinding wheel. I take off quite a lot of steel with many of these grinds, so I always proceed slowly and with a light touch to avoid overheating the metal. It typically takes me between 30 and 45 minutes to modify a tool.**

**—A.B.**

1 ***Tip first.*** *Holding the tool upside down against the side of the wheel and using a very light touch, Breed regrinds the angle at the tip of the tool from 90° to about 100°. He uses a slipstone to deburr the inside faces so he'll see the exact thickness of the wings as he grinds their bevels.*

2 ***A bit off the bottom.*** *Start flattening the bevel angles by removing metal along the keel of the tool. Replacing the steep angle there with a shallow curve produces an elongated diamond shape on the bottom (above).*

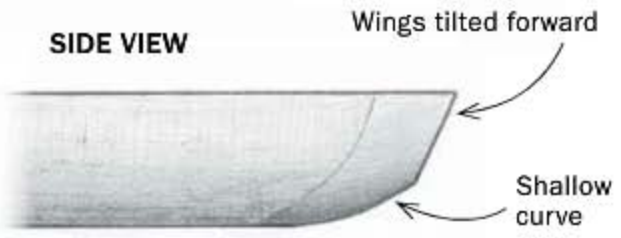
3 ***Lengthen the bevels.*** *Using a very light touch and a rocking motion against the side of the wheel, Breeds regrinds the side bevels, removing a lot of metal on the way to creating long, sweeping surfaces.*

4 ***Finishing up.*** *Breed uses the edge of the wheel to bring the two elongated bevels to a sharp ridge along the keel. On a 1,000-grit bench stone, he hones the cutting edges, and, rocking the tool gently, smooths away a tiny triangle of metal left at the very tip of the keel after the grinding process.*

# Custom-ground gouges


## WINGS FORWARD

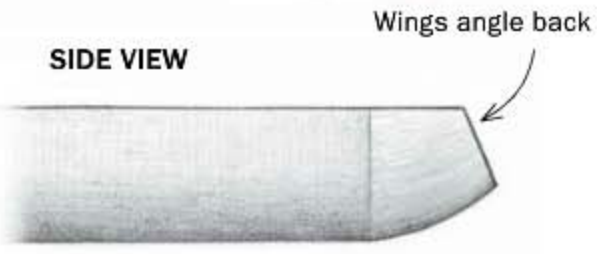
**With the wings of the gouge tilted forward and the steep factory bevel ground to a shallow curve, this grind—like the one on the V-tool—creates a very versatile gouge that cuts smoothly and easily across the grain.**


***A go-to gouge.*** *Like the wings-forward V-tool, this gouge can be used at a low angle, making it easier to control.*

## WINGS BACK

**Breed grinds the wings on another gouge so that they angle back, creating a tool useful for cutting flutes that stop against an adjacent element. He also lengthens the factory bevel, as in the V-tool, for better control.**


***Best for stopped cuts.*** *With its raked-back wings, this gouge can make clean stopped cuts, plus lozenge-shaped hollows with two quick cuts from opposite directions.*

***Another specialist.*** *Breed uses a modified straight chisel to clean up the end of a stopped cut. He grinds this flat chisel to a curve at the tip and bevels it front and back.*

from a factory grind to this custom grind is like going from a VW Bug to a Ferrari. An off-the-shelf V-tool has bevels that are short and steep. To slice the wood with as little resistance as possible, I regrind them to a long, shallow bevel. This also allows me to hold the tool at a lower angle and rest my hand on the workpiece as I carve. I also regrind the tip so that the wings of the V angle forward. This way, the wings shear the grain in advance of the bottom of the V, giving me clean cuts both along and across the grain, and even in diagonal grain, where one wing of the tool is cutting with the grain and the other is cutting against it. I use this same "wings forward" grind on gouges and get the same revved-up performance.

I use a related "wings back" grind on other gouges. This is useful for stopped cuts. With the bottom of the tool cutting first and the wings following, I can cut right up to another element in the carving without damaging it.

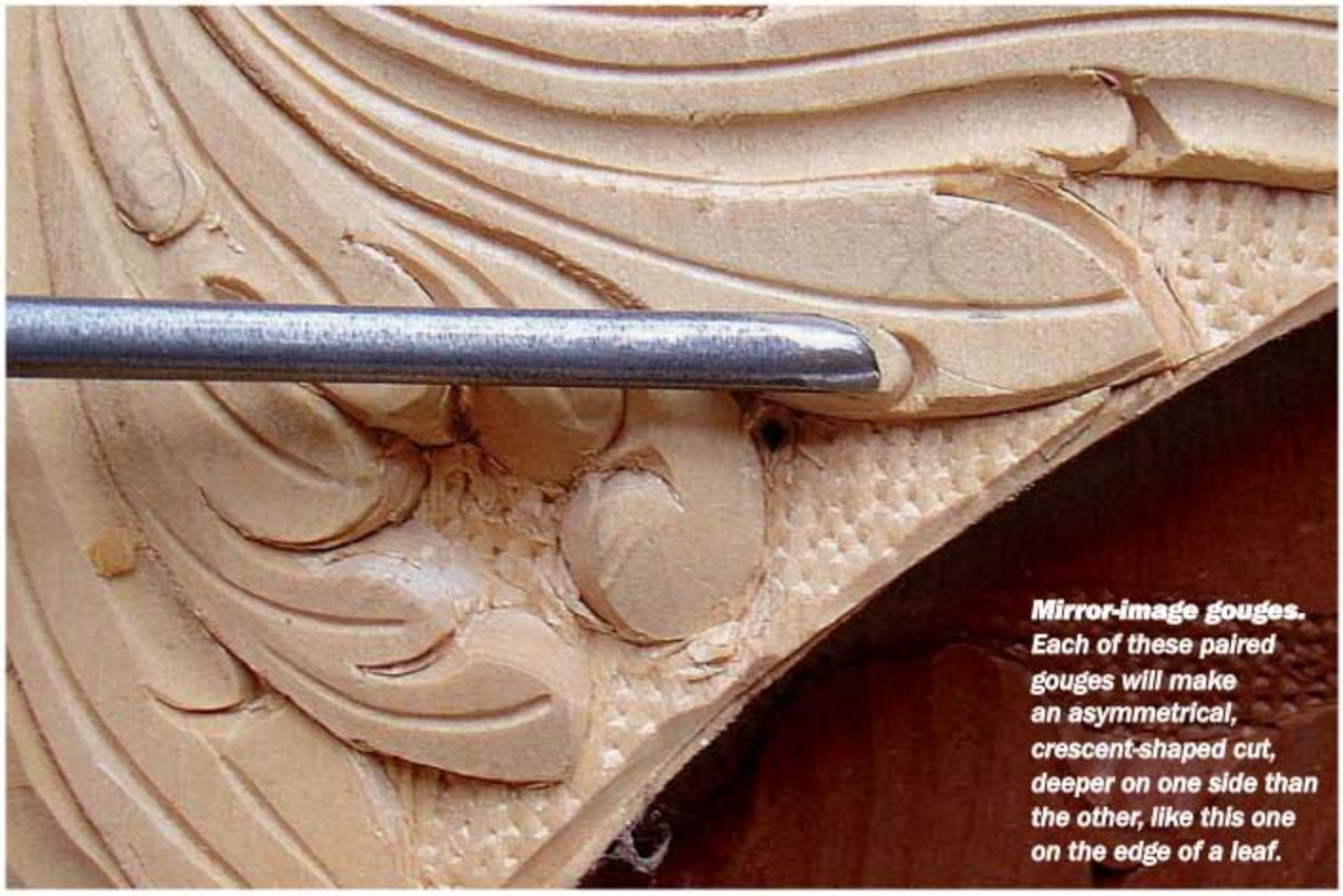
When to modify a tool? For me it's strictly a matter of necessity. I use plenty of tools with their original grinds, and I don't modify tools until I need them. After you try a few of my grinds, you may invent some of your own. □

---

*Allan Breed builds 18th-century furniture and teaches at the Breed School in Rollinsford, N.H.*

## LEFT AND RIGHT FLARED GOUGES WORK AS A PAIR

**Breed made these gouges, used for left and right flaring cuts, by grinding the tip and then the bevel. He made one from a standard gouge and the other from a fishtail gouge. Both work well.**



***Mirror-image gouges.*** *Each of these paired gouges will make an asymmetrical, crescent-shaped cut, deeper on one side than the other, like this one on the edge of a leaf.*


## BACK BEVEL BETTER FOR CONVEX DETAILS

**Breed grinds a very small bevel on the concave side of a shallow-sweep, standard-ground gouge. This grind permits him to quickly convert a standard gouge of any sweep for use as an in-cannel gouge. He uses the edge of a Tormek grinding wheel to do the grinding and then hones the mini bevel on the rounded-over edge of a bench stone.**


***Big help from a small bevel.*** *You can cut shallow convex shapes, as in the ribs of this shell, with the gouge hollow-side down, riding on the tiny inside bevel.*

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The Wood Working Shows

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# A peek under the hood

BY JONATHAN BINZEN

Aled Lewis designed radically different joinery for the two pairs of legs on his "Wish Desk" (see the back cover). The outside legs, which function like breadboard ends, are attached to the desk with eight floating tenons. He glued the tenons at the edge of the desk to both the desktop and the leg; he left the inner tenons unglued in the oversize mortises in the desktop so the top could move with the seasons. To attach the inner pair of legs to the underside of the desktop, Lewis combined a segmented sliding dovetail with a pair of slip tenons. The slip tenons lock the legs in place, while the sliding dovetail—which is glued to the leg but not the desktop—supports the top and keeps it flat without restricting its movement. To assemble the table, Lewis started with the inner legs, gluing them to their rail and then gluing in the slip tenons and sliding dovetails. The outer legs came next, and Lewis glued the legs to the desktop and the rail in one operation.

## INNOVATIVE JOINERY KEEPS DESKTOP FLAT AND STABLE

**Lewis's novel but simple-looking desk required an unorthodox combination of joints.**

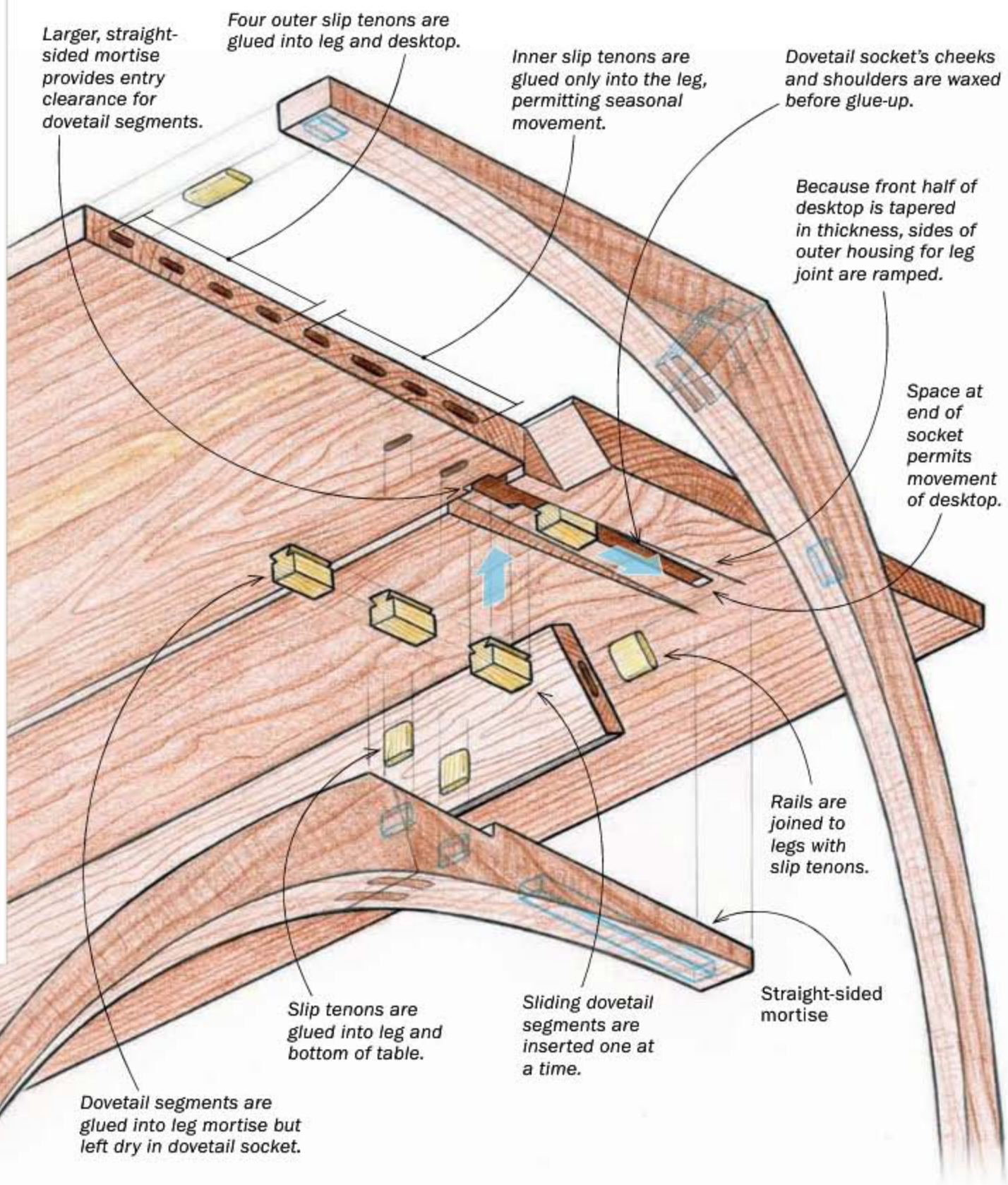




Photo: Jim Dugan; drawing: John Tetreault

# Wishbone Desk

When Aled Lewis hatched the idea for his innovative "Wish Desk" in solid walnut—with legs that become part of the desktop and keep it flat as well as support it—the difficult part of the design process was still ahead. To make the novel concept functional in solid wood, he had to devise a joinery system that combined splines, slip tenons, and a segmented sliding dovetail (see p. 90 for details). But working out the conundrums of one-of-a-kind woodworking is what he relishes these days. Lewis, who is the lead instructor for the Nine-Month Program at the Center for Furniture Craftsmanship in Rockport, Maine, was raised on a sheep farm in Wales and spent many years in high-end commercial cabinet shops in England, "laying acres and acres of veneer" while cranking out hundreds of pieces for universities, banks, and corporations. Since opening his own small shop a decade ago, he's been building pieces one at a time, focusing solely on designs from his own sketchbook, having as little as possible to do with flakeboard and veneer.

*—Jonathan Binzen*

Photos: Jim Dugan

**How They Did It** Turn to p. 90 for a closer look at the unorthodox combination of joints Lewis used in this desk.

**Pro Portfolio** To see more of Lewis's work and hear him discuss it, go to FineWoodworking.com/extras.