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POPULAR Woodworking MAGAZINE

AUGUST 2010 ■ #184

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Watch our video on how to cut perfect wedges.
popularwoodworking.com/aug10

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A router, a straight bit and a piece of plywood scrap are all it takes to turn a puny miter into a strong half-lap joint with just minutes of work.

BY GLEN D. HUEY

ONLINE ► Square Platform Jig

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BY TOSHIO ODATE

ONLINE ► Odate Stones

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This handmade stool reflects the design sensibilities of the pre-industrial age.

BY JIM TOLPIN

ONLINE ► Design Matters

Read more about designing by whole-number ratios on George Walker's blog.
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This easy-to-build birdhouse is just plane perfect for woodworkers.

BY CHRISTOPHER SCHWARZ

ONLINE ► Birdhouse Plans

There are many birdhouse plans available in our online store.
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For a high-end traditional look, it's best to fill the pores on open-grained woods. Here are two methods for achieving a mirror-flat finish.

BY BOB FLEXNER

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Many of Bob's articles are available on the Finishing page of our web site.
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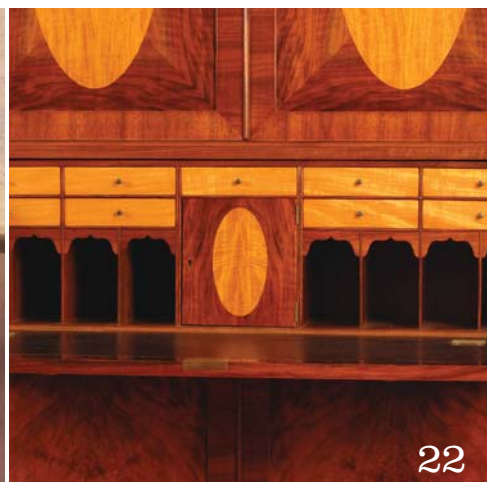
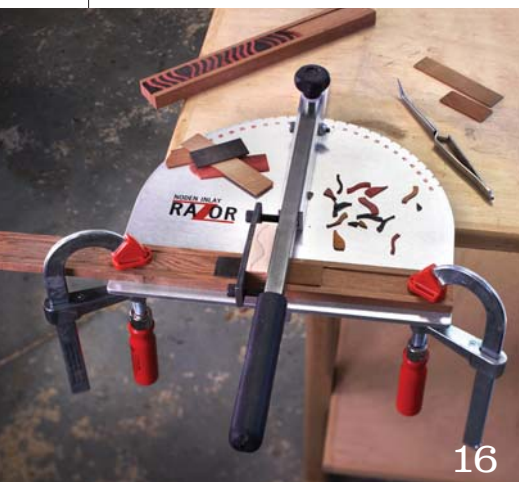
The keys to teaching your kids: Allow them free range of imaginations and lie to them.

BY DAVID ROSS PULS

ONLINE ► Shop Daughter

Editor Christopher Schwarz's youngest daughter may soon surpass all of us in woodworking skill. Read about her time in the shop with her dad.
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POPULAR Woodworking MAGAZINE

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NEW from *Popular Woodworking Magazine* –



SketchUp for Woodworkers

Part 1: Getting Started

Part 2: Advanced Techniques

BOTH BY **Robert W. Lang**

Executive Editor of *Popular Woodworking Magazine*

In these two Shop Classes, you'll learn how to use Google SketchUp – a FREE 3D-Computer Modeling Program ideal for woodworkers. With SketchUp, you can design projects on screen, work out joinery challenges, identify potential construction problems and see your project “completed” before ever cutting a stick of wood. Start out with a solid plan, and you'll save yourself hours of time and frustration in the shop.

In **Part 1: Getting Started (2 hours)**, you'll discover how to set up SketchUp to operate the way you work – with efficiency and accuracy. You'll get insider tricks to make working on screen as close to working with wood as possible, as you learn to navigate SketchUp and find and use the tools you need – including a virtual board stretcher (seriously!).

In **Part 2: Advanced Techniques (2 hours)**, you'll discover how to quickly make a conceptual model based on the size and shape of what you want to build. Then, you'll learn how to copy and pull “real” parts from that model to use in your design – the program tells you what size all your parts are; no calculating involved!

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POPULAR Woodworking MAGAZINE



Toshio Odate
“Magobei’s Dining Table,”
page 40.

Toshio Odate completed a traditional woodworking apprenticeship in Japan (where he also studied arc welding and sand casting) before moving to the United States in 1958.

As an author, lecturer and teacher he has been pivotal in spreading knowledge about Japanese tools and woodworking techniques throughout the Western world. He is a sculptor, woodworker, former professor at Pratt Institute in New York, and the author of “Japanese Woodworking Tools: Their Tradition, Spirit and Use” (Linden) and “Making Shoji” (Linden). His work has appeared in numerous woodworking magazines and other publications, and he’s been featured on “Martha Stewart Living” and “The Woodwright’s Shop,” among other television shows.

▶ *Toshio Odate’s books are available through online retailers, including Amazon.com.*



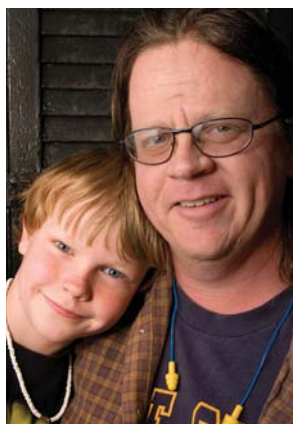
Roy Underhill
“Tallow Tales,” page 24.

Since 1979, Roy Underhill has explored every aspect of hand-tool woodworking as host of “The Woodwright’s Shop” on PBS. This year, the show celebrates its 30th season.

In this issue, Roy writes about greasy tools and old-school lubrication in “Tallow Tales.”

You can also catch up with Roy at Woodworking in America, Oct. 1-3 in Greater Cincinnati, where he’ll be teaching classes and leading hands-on sessions on the many forms of chisels, cutting tenons by hand, dovetailing drawers, filing rip saws and using bowsaws, as well as co-hosting a session on André Roubo and delivering the keynote address along with Frank Klausz. To find out more about the conference and to register, visit woodworkinginamerica.com.

▶ *To take a woodworking class at Roy’s new school in Pittsboro, N.C., visit woodwrightschool.com.*



David Ross Puls
“Woodworking with Wee Ones,” page 58.

Known by most around the Charleston, S.C., area as “Elvin’s Dad,” (Elvin’s the younger fellow at left) David Ross Puls is a full-time woodworker, designer and furniture artist. He has exhibited his work nationally for more than a decade, in numerous craft, museum and gallery settings. His furniture designs and interests remain focused around plywood and other “engineered” woods, and include many children’s items (which will come as no surprise after reading his article). David maintains a studio and plays there with his son amidst four acres of spreading live oaks on Johns Island, S.C.

David says he thanks the gang at *Popular Woodworking Magazine* for giving him the opportunity to add the title of “author” to the growing list of dubious endeavors he calls his resume.

▶ *When your kids are ready to work with simple plans, visit the “I Can Do That” archive: popularwoodworking.com/icandothat.*

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BY CHRISTOPHER SCHWARZ, EDITOR

The Unclear Future Of Table Saws

I have spent my life avoiding politics in all forms. In fact, when I was a kid, the most memorable political statement I heard was: "If voting could really change things, then it would be illegal."

I know that sounds like a defeatist attitude, but I've always been more interested in dealing with people based on what they create rather than what they believe.

But earlier this year, a ruling from a District Court in Massachusetts ripped away my blasé attitude toward all things political. By now, most woodworkers have heard about the lawsuit that pitted Carlos Osorio, a flooring installer, against One World Technologies Inc., which made a Ryobi-brand table saw that Osorio injured himself on. By his own testimony, Osorio was doing everything wrong.

The saw's guard was off. He'd removed the rip fence. He had the blade at its maximum height. And he was kneeling over the saw on the floor. His hand slid into the blade, nearly severing two fingers (later reattached) and lacerating two others.

Earlier this year, a jury ruled that the toolmaker should pay Osorio \$1.5 million for his injury for failing to include flesh-detecting safety technology on the saw, which would have greatly diminished the injury.

In other words, because Ryobi hadn't put SawStop technology on its saw, it was responsible for the injury.

SawStop, as we all know, is awesome new technology. I think it should be available on every table saw – and some other

machines as well. But should it be required equipment on every saw? No.

I think the current guarding on new table saws – a riving knife, pawls and a blade cover – is entirely effective. You can perform every major woodworking operation with safety equipment in place. If you want to injure yourself on a saw with this guard, you have to be reckless or careless.

It's true that the SawStop technology adds another layer of protection. It's also true that the technology costs less than the price of an emergency room visit. And if you want it, you can now get it on the high-quality machinery made by SawStop that we have tested



and praised in these pages.

But what rubs me the wrong way is that SawStop could become de facto required technology on every saw sold if this lawsuit survives appeal and dozens of other similar suits go the same way. If flesh-detecting technology becomes required equipment, then the price of entering the craft of woodworking will be too high.

As a result of this column, we might never see another dime of advertising from SawStop. So be it. I use all the guards on my machines, and I have all my fingers after a lifetime of woodworking. And I am here to tell you that our guards are safe. Let's just hope that our court system is smart enough to see things this way. **PWM**

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Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking Magazine*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand.

Highly Recommended

Good layout tools are just as essential to quality work as good design and good wood. And if you work with odd angles, then you probably have been frustrated by your sliding bevel. Most of these tools won't hold a setting and are just plumb awkward.

So do yourself a favor: Purchase a sliding bevel from Chris Vesper in Australia (vespertools.com.au). Yes, they cost more than the garden-variety stuff. But they are worth every penny. They lock tight. The blades are thick. The locking mechanisms never interfere with your efforts to transfer angles. They are the last sliding bevels you will ever buy.

— Christopher Schwarz



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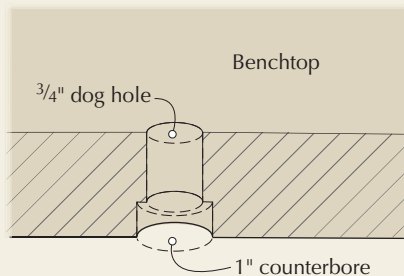
FROM OUR READERS

Counterbore for Holdfasts?

I'd like to use Gramercy holdfasts and a Veritas hold-down with my workbench. I'm getting ready to drill $\frac{3}{4}$ " dog-holes in the top of the workbench. In Jameel Abraham's blog (benchcrafted.blogspot.com), Jameel mentions that he enlarged the bottom half of his $\frac{3}{4}$ " dog-holes in order for the Gramercy holdfasts to work properly. Do you agree with this technique, and would there be any negatives in doing this?

Terry Liebel
Blackfoot, Idaho

Terry,
Many holdfasts need some tuning up to work in benchtops thicker than 3". You can try filing the shaft of the holdfast to make it stick better. Another option is to drill a



counterbore on the underside like Jameel suggests – though I'd drill that counterbore only $\frac{1}{4}$ " of your bench's thickness.

I'd probably try roughing up the shafts first. If that didn't make them hold tight, I'd drill a counterbore freehand with a big Forstner bit.

Christopher Schwarz, editor

and biscuits. It is attached to the apron with fasteners, just like you suggest.

So, is the table destined for self-destruction? Should I sneak into my friends' house and steal the table back? And if so, what can I do?

Rich Feldman
Washington, D.C.

Rich,

Because you have the top attached to the apron with fasteners that can move, the center wide section of cherry probably won't crack. My guess is that the miter joints will open up and the pieces attached to the very ends will come loose.

It's hard to guess because I don't know the moisture content of the wood when you made the table, or what the conditions inside the home are. In a worst-case scenario, the cherry could change in width $\frac{1}{8}$ " to $\frac{3}{16}$ " from a humid summer to a dry winter. At the ends, the grain of the walnut is at 90° to the grain direction of the cherry. The walnut won't change in length seasonally so something has to give.

If the humidity in your friends' home is close to being constant throughout the year, you might get away with it. You'll just have to wait to find out.

Robert W. Lang, executive editor

Layout Makes Sense of Angles

I'm interested in building the Chinese Stool from the Winter 2009 *Woodworking Magazine* (Issue 16).

The illustrations seem to be unclear; a close-up of each piece would have been useful. Please explain why the leg tenons are at an 8.7° angle (my take is you wedge from outside?). I have made several attempts and gone through a lot of scrap lumber – help!

Richard Rappa, Sr.
Canton, Georgia

Richard,

If you do a full-size layout, as shown in the photo on page 7, you'll have the answer. The main reference to find all the dimensions and angles is a vertical centerline through the seat. Because the stretchers form a triangle when they are assembled, the reference point for the stretchers is the center of this triangle. If you lay out the locations of the legs (120° apart from each other) you will see that the stretcher assembly needs to be rotated for the ends of all three stretchers to intersect all three legs.

After I had the three stretchers assembled and the seat and legs assembled, I placed the two subassemblies on the full-size pattern to find the intersections, as seen in the photographs at the bottom of page 10. I wouldn't try to figure out the angles or cut parts ahead of time, but would only work with the two subassemblies and the pattern. The mortises in the legs go straight through the legs from outside to inside. The tenons on the ends of the stretchers are at the angle to allow the center of the triangle between them to hit on the vertical centerline.

Robert Lang, executive editor

Tabletop Build Concerns

I recently built a cherry hall table, with tapered legs and two drawers, which I gave as wedding present. I just finished reading the April 2010 (issue #182) story on table design, and the "Beginner's Bad Luck" section has me worried. My tabletop is solid cherry, 8" wide x 30" long, with a mitered walnut frame around it. The frame, which is 1½" wide, is secured with yellow glue

'Roll Test' for Used Auger Bits

In your response to Ross Manning's question about selecting auger bits in the April 2010 issue of *Popular Woodworking Magazine* (#182), you left out one simple, essential test when looking at used bits: Roll the bit on a flat surface to see if it's bent. If it's bent in the fluted portion, it will hump up and down, like a kid's pull toy; if bent in the shank, you can see the square taper oscillate. On small bits, where the square taper is larger than the bit, you have to hang the end off the table, but the test still works.

I don't often find them bent – but I have tried, without success, to bore a hole with a bit that I hadn't realized was bent, so it's a worthwhile test.

Bill Houghton
Sebastopol, California

CONTINUED ON PAGE 12

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CONTINUED FROM PAGE 10

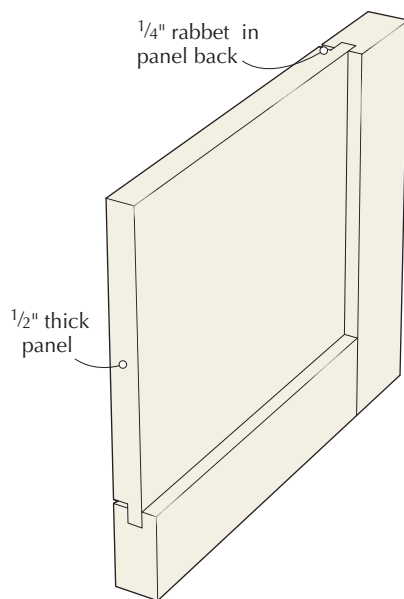
Advice on Raised Panel Build

I am in the process of making kitchen cabinets in the Arts & Crafts style. I'm using the first cabinet to work out the design details and have reached a stumbling point. The finished units will have the look of Robert Lang's Greene & Greene medicine cabinet in the April 2009 issue (#175).

The medicine cabinet has a 1/4"-thick panel. This makes the inside treatment of the panel simple. But in my research, most sources recommend that kitchen cabinets should have a thicker panel than this. If the stile and rail stock is 3/4", and the groove is 1/4", how do you treat the back of a thicker door panel?

I've experimented with different options and have yet to arrive at an aesthetically pleasing result. I'd hate to make all the cabinets and have all the doors and wide door fronts splitting over time. Your help would be appreciated.

Bob Callan
Michigan City, Indiana



Bob,
If you prefer a thicker panel, make them 1/2" thick and rabbet the back side. This will leave a 1/4"-thick tongue to go in the groove in the door, and preserve the flat-panel appearance on the front.

However, I think 1/4"-thick panels are OK – unless you make them really wide, or the wood is really wet. If these are solid-wood panels, don't glue them into the groove – that's what will make them split.

Robert W. Lang, executive editor

"I am glad that I paid so little attention to good advice; had I abided by it I might have been saved from some of my most valuable mistakes."

— Edna St. Vincent Millay (1892–1950)
American poet & playwright

Ideal Workbench Base Joints

I am building my bench, which will have a split top and a knockdown base, somewhat like the base for the LVL bench in the November 2009 issue (#179). My question is related to the attachment of the top to the base: Do you think that mortise-and-tenon joints are necessary?

On the LVL bench, I think you just used lag screws, correct? Because my bench is primarily ash, would it be better to through-bolt it to the base? And if through-bolted, should two of the four holes be enlarged to allow for movement?

Jesse Doughty
Poughkeepsie, New York

Jesse,
I prefer mortise-and-tenon joints. It's one of the few things I am steadfast in.

I have had lots of problems with all the other mechanical attachment methods. The tops jump off dowels, or something warps and the top shudders when you work (which was my problem at a class one recent weekend). Bolts are OK, but the clamping force of some face vises can push them around, deforming the hole for the bolt.

If I had to make a bench knockdown, I'd use mortise-and-tenon joints and drive lags through the tenon, much like you would pin a tenon in a door assembly.

Lots of people disagree with me, but I have only my experiences to draw on.

Christopher Schwarz, editor

'Lost Stickley Table' Snag

I'm building "The Lost Stickley Table" (November 2006, Issue #158), and I've hit a snag:

The drawer front is listed at 3 1/2", the drawer sides at 3 1/4". This is clearly to allow for the upper and lower bevels on the drawer front. That means the drawer itself will be 3 1/4" high when done. However, the space between the front rail and the top of the legs is 3 1/2". That 1/4" gap seems awfully large.

Do the drawer rails need to be raised (say, 1/8") above the front rail to equalize the space above and below the drawer? The detail photo of the dovetails on the drawer side show the drawer's top sitting almost flush with the top of the legs.

Ross Henton
via e-mail

Ross,

I make drawer sides shorter so the drawer will move in and out without dragging on the underside of the tabletop. If you bevel opposite corners of the drawer front, you won't change the overall dimension by much, so you can have as narrow a gap as you want. When I put a drawer like this together, the bottom edges of the sides are 1/32"-1/16" below the front's bottom edge to leave a gap at the bottom. Because the sides aren't in the way, you can plane the top edge of the front to create an equally spaced gap at the top. **PWM**

Robert W. Lang, executive editor

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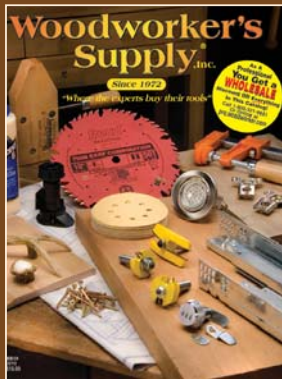
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EDITED BY KARI HULTMAN

THE WINNER:

Kerf Jigs for Perfect Cuts

Making long, perfectly straight cuts with handheld power saws, such as jigsaws and circular saws, can be a real challenge. They aren't difficult when a straightedge is used as a guide, but putting that straightedge in the right place can be. With kerf jigs, you can set up long cuts in seconds.

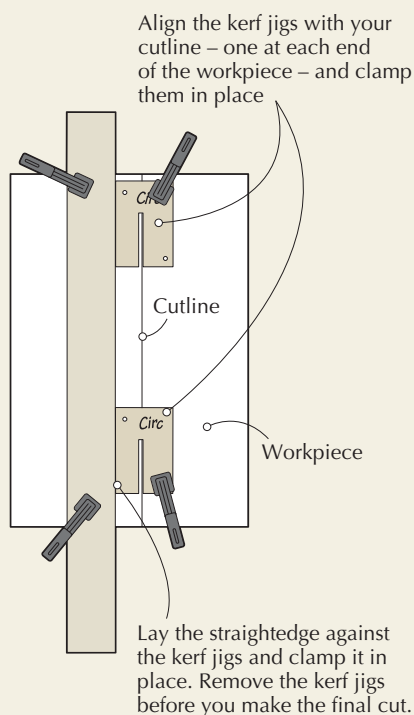
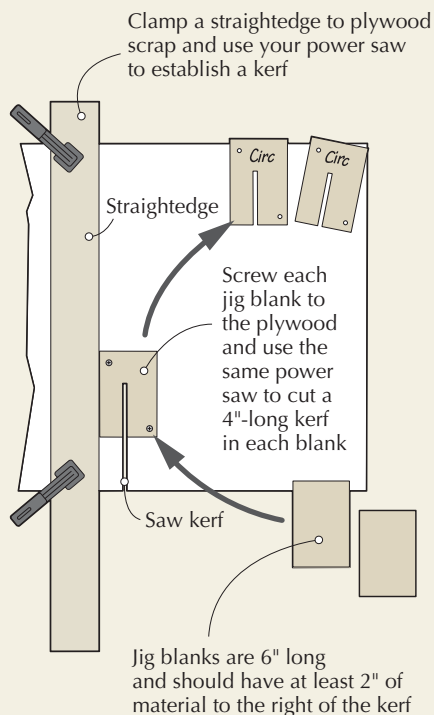
Here's how to make them. Clamp a straightedge to a sufficiently large piece of plywood. With your power saw pressed against the straightedge, make a short cut in the plywood to establish the path of the kerf. Next, cut two rectangular jig blanks out of $\frac{3}{8}$ " plywood or other stock. Each piece should be about 6" long and about 2" wider than the distance from the straightedge to the kerf. Kerf jigs are only accurate with the saw that created them, so mark each piece on the top side according to the saw you're using (e.g. "JIG" or "CIRC").

Position one jig blank flush against the straightedge, several inches from the near edge of the plywood, and secure it with two countersunk screws. Keep the screws well away from the path of the kerf. Use the same power saw to cut a 4"-long kerf in the blank. Unscrew the blank, attach the second blank, and make the same cut.

To use, align the kerf jigs with your cutline, and place them at opposite ends of your workpiece. The kerfs should either straddle or be positioned on the same side of the line. Clamp the jigs down firmly.

Next, lay a straightedge flush against the kerf jigs and clamp it in place. Remove the kerf jigs, and you're ready to make a perfect cut.

Sam Smith
Anthony, Florida



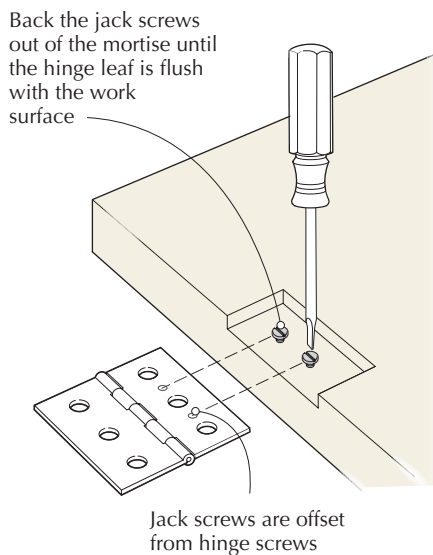
Jack Screws Tweak Hinges

When a mortise for a hinge leaf is too deep, the common solution is to shim the mortise so that the leaf is flush with the surface of your workpiece. The problem is, there is a lot of trial and error in getting the exact thickness for the shim. And planing small shims is a real pain.

Years ago, I started using what I call jack screws. Here's how they work. In the mortise that is too deep, drive two flathead screws into the mortise, making sure the screw heads are flush with the bottom of the mortise.

Then, loosen the screws a tad and refit the hinge leaf. Continue to adjust the jack screws until the hinge leaf is the proper height. This trick enables you to micro-adjust the position of any hinge leaf.

Carl Bilderback
LaPorte, Indiana



Remember That Measurement

Too many times I take a measurement and, by the time I walk to my saw, I forget what it was.

So, I picked up a white laminate sample at the local home-remodeling store and glued it to the side of my tape measure. Now I can write on it with a pencil, wipe it off after I make the cut, and reuse it.

Chad Stanton
Toledo, Ohio

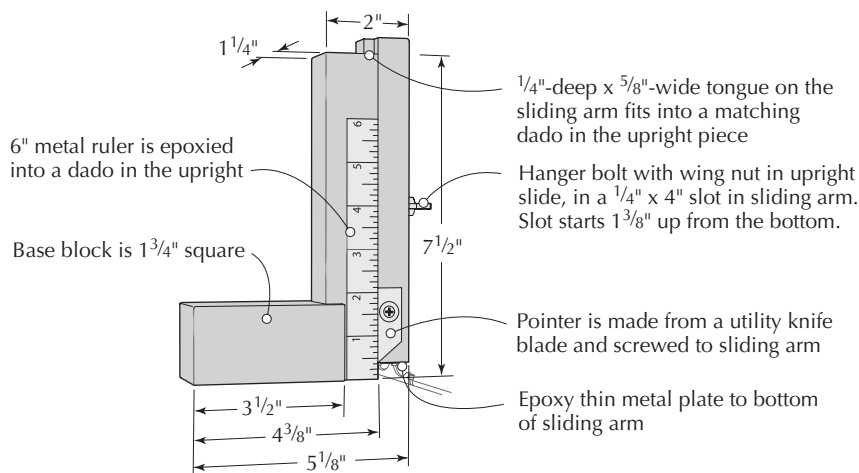
woodchoppintime.com

Handy Height Gauge

A few years ago, I needed a reliable height gauge and did not have the money to purchase one. A lot of ideas are born out of necessity, so I decided to make one. The frame is made from a piece of hardwood, the 6" ruler is graduated in $\frac{1}{64}$ " increments, and the pointer and metal plate are made from utility knife blades.

There is a $\frac{1}{4}$ " x 4" slot for a hanger bolt and wing nut, so you can lock it down at any height, up to $3\frac{1}{2}$ ". It works extremely well for checking the depths of rabbets, and setting the height for table saw blades and router bits.

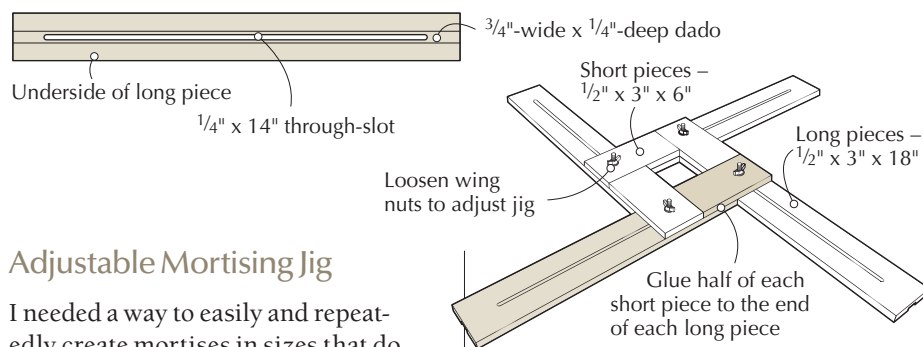
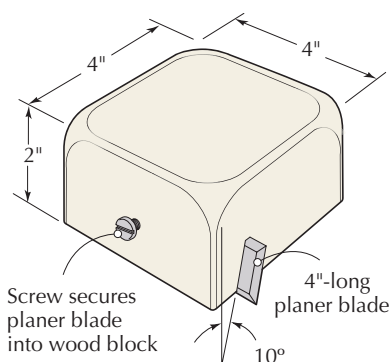
Lamar Gaines
Altamonte Springs, Florida



Glue Scraper From a Planer Blade

I was scraping some glue lines when I came up with this idea. Using my rotary tool and a standard abrasive disc, I cut a used planer blade into a 4"-long piece. Then, I sawed a 10° slot into scrap wood to house the blade and fastened it with a screw. The wood block is approximately 4" x 4" x 2" and the corners are rounded off to protect my hand.

Robert Knapp
Girard, Pennsylvania



Adjustable Mortising Jig

I needed a way to easily and repeatedly create mortises in sizes that do not correspond to standard size Forstner bits. So, I created this jig out of $\frac{1}{2}$ " MDF (but plywood or hardwood will work), and $\frac{1}{4}$ " carriage bolts and wing nuts.

Cut four pieces of MDF measuring 3" x 6" and four pieces measuring 3" x 18". Using a router table, cut a $\frac{3}{4}$ " dado, just shy of $\frac{1}{4}$ " deep, down the center of each 18" piece. Then, cut a $\frac{1}{4}$ " through-slot down the center of the dados, leaving about 2" unslotted at each end. Drill a $\frac{1}{4}$ " hole on the centerline and $1\frac{1}{2}$ " from one end of each 6" piece. Position each 6" piece so that the end with the hole overhangs the end of the non-dadoed side of the 18" pieces by 3". Then, glue them in place.

By using $\frac{1}{4}$ " carriage bolts and wing nuts, the four arms can be assembled as shown. The long arms of the jig allow for easy clamping without interfering with your router.

I use a palm router with a piece of $\frac{1}{4}$ " MDF attached to the base (so the adjustment knob clears the top of the jig), and a $\frac{1}{4}$ " upcut spiral bit. The router sits within the walls created by jig, not on top of the jig, which enables it to cut very small mortises and large recesses up to about 12" x 12". **PWM**

Brad Swaters
Platte City, Missouri

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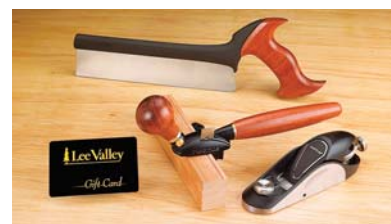
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BY THE EDITORS

A New Way To Inlay

One word describes this tool, its cutters and the twist on the materials used: innovative.

Seldom does a tool come along that changes how we look at a woodworking technique, but the Noden Inlay Razor does just that. The Inlay Razor, designed by Adjust-A-Bench inventor Geoffrey Noden, allows you to make an unlimited variety of inlay bandings as quickly as you can prepare the wood.

Although the process looks as if it might be slow, the work glides along easily. In fact, the process to create straight or curved banding is as addictive as it is creative.

While the tool itself is very simple, the idea and the design of the cutters used to slice the wood are outstanding and a bit mind-bending. The concept is light-years ahead of its time, but the cutting blades are decades old.

The cutters are wooden blocks that hold double-edged razor blades, the kind that your grandad shaved with years ago.

Inlay Razor

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► **BLOG:** Read more about this tool and watch a short video at popularwoodworking.com/aug10.

Price correct at time of publication.



Truly imaginative designs. The Noden Inlay Razor changed the way we look at inlay banding. The process is quick to complete (and addicting), and the only limitation is your imagination.

The blocks are bisected by kerfs that are straight, rounded, curved or whatever shape you can imagine, as long as you can bend the razor blade to fit the profile (sharp corners are difficult, but can be accomplished if you break the blade). The blades, slipped between the block halves, are glued in place with just a small edge protruding from the wood. That razor's edge slices the wood pieces to size.

The razor-embedded blocks are simple to switch in and out, but how and where you position the cutter influences the actual cut. To accurately repeat your designs, keep detailed records. Also, because the blades are delicate and wear out over time, you may need to duplicate the designs to create continuous runs.

The razor cutter should cut through thin veneer, but Noden has a completely different idea that again shows his inventive passion. He uses 1/16"-thick slices of end-grain wood as the inlay material. This mate-



That's money. The cutters make this tool. Cut a wooden block to nearly any profile, affix a razor blade in between and you're ready to work.

rial is easily sliced by the razor and affords the opportunity to use exotic woods and woods seldom used in furniture production without a huge outlay of cash.

To add to the already abundant design options, the Inlay Razor's cutting arm rotates on the tool's base. It's possible to swivel the arm to 60° left or right of center to further influence the design.

Included are four pre-made cutters (straight, arched, S-shaped and cornered—think mountain top), tweezers and a video tutorial. In the tutorial, Noden demonstrates how to use the tool, prepare materials and create your own shop-made cutters.

—Glen D. Huey

CONTINUED ON PAGE 18

PHOTOS BY AL PARRISH

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Bosch Solves Your Drilling and Driving Commitment Issues

If you've been slow to step up and spend your hard-earned money on an impact driver because you're not sure if you would use the tool enough to justify the cash outlay, Bosch has introduced a tool that should ease your commitment issues.

Bosch's 18v Lithium-ion Impact Drill/Driver (26618-01) offers an ideal combination of torque, speed and control, all within a single tool. It has three-modes: an impact mode, so you can put the tool to use when sinking long screws or when

ratcheting nuts and bolts, and two drill modes that satisfy all your standard drill-driver duties.

In impact mode, the tool delivers up to 3,200 beats per minute and produces 1,500 inch-pounds of torque – the highest in its category, according to the company.

Switch it into drill-driver mode and you choose either a high-torque setting (0 - 750 rpm) for larger diameter bits or a high-speed/low-torque setting that spins smaller-diameter bits from 0-2,800 rpm.

The 1/4" hex-drive design on this tool allows easy bit changes and keeps a strong grip on your drill bits, driver bits or whatever else you need to lock in and use.

Innovation is accomplished in small steps. To light work areas, most drill-drivers use LEDs below the chuck. These diodes seldom shine above the tips. Bosch has upped the ante with three LEDs that circle the nose of the driver to fully illuminate the work area.



The 26618-01 comes complete with two 18v Lithion Fatpack batteries (Bosch's 2.6 Ah Lithium-ion battery), and is compatible with the company's Slimpack batteries as well. A 30-minute charger also is part of the deal, as is a carrying case, double-ended Phillips bit tip and belt clip. —GH

18v Lithium-ion Impact Drill-driver

Bosch ■ boschtools.com or 877-267-2499

Street price ■ \$399

► **ARTICLE** Impact drivers made the "Best New Tools" list two years running. Read more at popularwoodworking.com/aug10.

Price correct at time of publication.

Makita's New Sander is Built for Comfort

If you're tired of sanding for extended periods with your palm stretched across the top of a random-orbit sander, and your fingers held spider-like to manipulate the switch, take a look at Makita's new BO5041 tool.

This new 5" random-orbit sander can be held with a top-mount grip, but the BO5041 also has a handle that gives you a chance to change your grip as you sand; that eases muscle tension and fatigue. And both grip areas have a rubberized cover to aid in comfort.

A large two-finger on/off switch, which can be locked in the "on" position, is located

on the underside of the handle, so it's easy to operate. And with your fingers wrapped around the handle, your thumb will easily adjust the speed – 4,000 to 12,000 orbits per minute (opm) – making it possible to fine-tune your sanding. The 1/8" orbit diameter makes this sander aggressive, so the option of a lower speed is beneficial for finish sanding – and 4,000 opm is slower than many other sanders.

The BO5041 has a powerful 3.0-amp motor, an increase from earlier models. Another improvement is the adjustable handle, included with the sander. The extra handle gives you a two-hand grip to increase your control. The handle ring has an adjustable hinge-pin so it can be freely positioned approximately 300° around the housing. And if the job requires, the handle can be removed.

The BO5041 uses 5" (eight hole) hook-and-loop sanding discs and is equipped with a removable dust collection system.



Or you can chuck the bag and hook directly to your vacuum via a 2 1/8" connection. **PWM** —GH

BO5041 Random-orbit Sander

Makita ■ makita.com or 800-462-5482

Street price ■ \$130

► **ARTICLE** Read our random-orbit sander review at popularwoodworking.com/aug10.

Price correct at time of publication.

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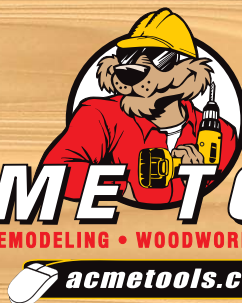
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Benchcrafted	Eccentric Toolworks	Manny's Woodworker's Place	Tools for Working Wood / Gramercy Tools
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BY GEORGE R. WALKER

Sublime Echoes

Repetition of proportion and shape can create design harmony.

Depending on your canoe route, Little Crooked Lake is about two days of paddling and portaging from the nearest highway. It's worth it. On a still morning, you can hear the smallest sound carry across the fog-shrouded water and echo off the steep rocky shoreline. A wood thrush pipes its flute-like song and the music folds back on itself to transform the solo into a chorus. I first hiked into Little Crooked intending to catch a fish dinner. The fish weren't hungry, but I took away memories of those haunting echoes that I still relish. I don't know why echoes can capture our imagination. They don't have to be loud; sometimes it's the small, subtle echoes that engage something deep within us.

Use Proportions to Create Echoes

Designers have long recognized that we pick up on echoes and are somehow drawn to them. At its simplest that's what using



Oval echo. The small oval in this desk gallery by William Evans echoes the larger shapes that grace the cabinet doors above.

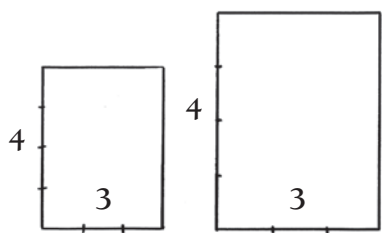
proportions often comes down to—repeating or echoing a ratio at different scales to create a pleasing, harmonious effect.

A proportion is a relationship between one part and another, often signified by a ratio. Two different-sized rectangles are in proportion when their sides are defined by the same ratio. Additionally, groupings of elements are in proportion when the ratios governing their parts are identical—even if the scale is different. In fact, it's desirable to arrange elements into major and minor pairings to avoid monotony. Visually we pick up on this and respond to it though,

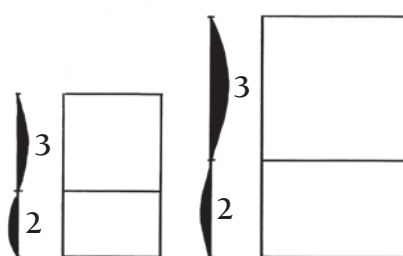
more often than not, subconsciously.

One of the most powerful uses of proportions is to assemble a design that repeats a ratio or echoes it on different levels. This drawing for a sideboard (above right) is organized around a simple ratio of 2:3. The overall form is a large rectangle that is two parts high by three parts long (in this case it's 32" high x 48" long). The overall height is divided in a ratio of 2:3 to define the case above and open space below. The drawers horizontally are proportioned across their widths forming a little sequence of 2:3:2. The drawer heights are—you guessed it—a ratio of 2:3.

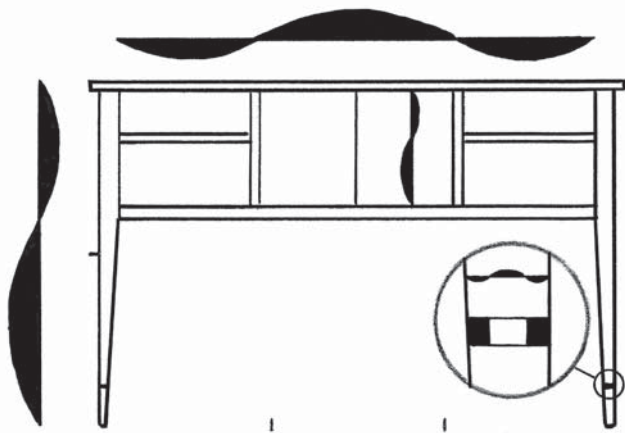
Don't take this wrong; you are not limited to just one ratio when assembling a design. This does illustrate, however, what can be achieved by repeating just one simple ratio. You can even have fun with this and weave this concept of echoing proportions from the macro level encompassing the overall form, all the way down to the micro level and repeat it in the design of mouldings or an inlay detail like the small banding that cuffs a leg.



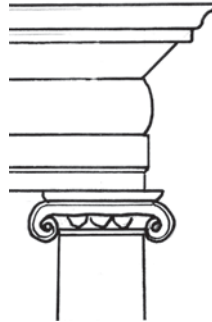
Proportion repeats. These rectangles are in proportion because the ratios that govern the sides are identical.



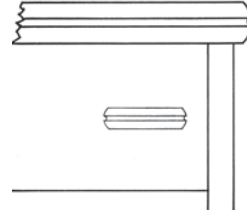
Ratios. Pairings of elements are in proportion, because the ratios echo in both.



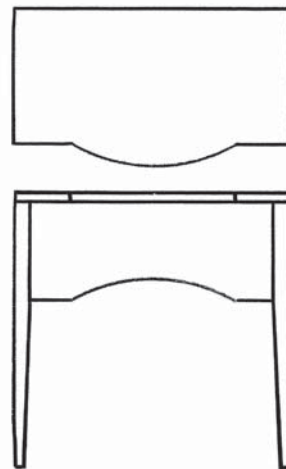
Layers of ratios. This design for a sideboard repeats the same simple ratio of 2:3 in multiple layers.



Complementary curves. The bulging curve in the frieze above the capital emphasizes the curved volutes below.



Multiple echoes. Have fun working echoes into small details like this small end table's top edge and the drawer pull below it.



Negative echo. The curves in the top are echoed in the open space below the case.

Use Shapes to Create Echoes

Another way to create visual echoes is through the play of shapes. The frieze on this Ionic order is bulged out in a convex curve (above right). A frieze is a horizontal band above the capital that is often decorated with carving or painting. In this case the designers left it plain but used a gentle curve to echo the elegant form below it in the volutes that crown the capital.

Often, shapes can echo and create further interest by switching up and contrasting the mirror images. Note how the convex curve on the top of the small dressing table (far right) is echoed in the concave shape of the open space below the case. This also presents the opportunity to

add another layer by using proportions to govern those shapes then echoing them in other parts of a design at different scales.

There are infinite possibilities to employ this and again, as with proportions, a shape can start with something at a macro level encompassing the overall form and work its way down the micro level in the shapes of small details. Note how the tombstone-arch shape in the clock case hood door below is echoed in the small brass lock escutcheon. That small piece of hardware is just a faint echo, but is a wonderful detail that can bring delight when discovered.

Application

If you'd like to begin working some echoes into your designs, experiment by weaving them into some of the small details. A nice example is to create a profile on a table edge that repeats itself in another detail such as a small drawer pull below it.

Some things to remember about echoes: An echo always has some separation between the original and the sound wave that bounces back. Also, the echo grows softer each time it reaches your ear.

You want to be wary of repeating identical cloned shapes right next to each other. It's best to separate a visual echo with some space as well as making it a different scale, which allows it to reach the eye with a softer voice. Avoid just stacking identical shapes or identical proportions right next to each other like pancakes. This creates monotony. You don't want the echoes to be overpowering like a gang of rowdy teenagers in a carnival funhouse. An echo can have its most profound effect when it slips into view as a gentle surprise.



Listen closely. Note how a small echo can be repeated in a detail. The arch in this brass escutcheon echoes the larger hood door on this clock.

Finally, have some fun with this. Echoes are a playful way to give life and harmony to a design. Don't be afraid to leave an echo only you can see. Who knows—generations from now, someone may be delighted to discover the gentle song of a wood thrush you created at your workbench. **PWM**

George is the author of two design DVDs from Lie-Nielsen Toolworks (lie-nielsen.com).

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BLOG: George R. Walker writes three times a week on the Design Matters blog.

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About This Column

If you have a thirst to hone your creative skills, Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.



BY ROY UNDERHILL

Tallow Tales & the Black Handplanes Of Britain

Puzzling lubrication.

I ran out of mutton tallow this morning! I searched my tool chests, under the benches and in the drawers hoping to find just enough white magic to ease the passage of the big jointer plane up and down the long shooting board. But all the grease boxes were licked clean – the cupboard was bare. Must ... find ... tallow!

It was a set of smelly black British planes that started me down the slippery slope of the tallow trail. Unlike American planes, British planes are often black from ceaseless soaking in linseed oil and relentless rubbing with tallow – a practice that was perhaps not so good in the long run. Aside from linseed oil turning planes black with age and dirt, the royal armorers at the Tower of London have recently discovered that the walnut stocks of the Brown Bess muskets that they have been rubbing with linseed oil since the time of King George are getting a bit soft. They now recommend that you switch over to wax after 250 years or so.

*"Tallowe your shyppes er you go,
it shall further you muche on
your waye."*

John Palsgrave, 1530



Three black planes on a dead man's chest. Even the iron plane is thick with decades of tallow and oil.

Easin' the Squeezin'

So we all know linseed oil, but mutton tallow was a mystery to me. In the old tool chest with the black British planes I found a tin of the slightly rancid white grease with the same smell that I had noticed on the planes. I tried it on the bottoms of the planes and was an instant convert. What a difference! All my effort was now going into cutting instead of overcoming friction. Tallow was the ingredient I had been missing.

Yes, there were other lubricants available in the pre-petroleum days, but olive oil, whale oil and beeswax were expensive and had better uses.

Besides, in the days before the cotton gin, your cloth was either linen or wool. Linen is made from flax, and pressed flax seed gives linseed oil. Wool comes from the outside of a sheep, and mutton from the inside. As meat, mutton was far cheaper than pork and beef in Europe, and the poor flavor of lamb fat made it unwelcome in the kitchens of France, and even in Britain.

So tallow was the joiner's grease, and it was everywhere easing the labor of hand woodworking. George Sturt, in his memoir of life in a 19th-century wheelwright's shop, described one of the workmen as having "a grease-box – that (also) handmade – hanging amongst the row of chisels over his bench. But, come to think of it, every bench had this. A big auger-hole in a shaped-out block of tough beech served the purpose admirably. You could thrust your finger ... into the grease-pot close at hand and easily take out grease for anointing both sides of your saw or the face of your plane."

Aside from speeding your saws and planes, tallow-grease makes your spindles fly on the dead center of your lathe, it cuts the friction between the pad and the crank of your bit-brace, and it lets the wooden screws of your clamps and bench vises exert their maximum force. It keeps coping saw blades from grabbing and mortising chisels from snagging. Tallow makes metal screws turn effortlessly into

the wood and lets grindstone axles roll freely in their bearing blocks. All of this saves endless elbow grease, but if that isn't enough, the old blackened tallow-grease gathered from the trunnions of church bells was reckoned to have special curative powers when rubbed into the parts that ailed you. This may not be so, but you can quickly cure a chronically choking plane by a good rub in its throat with soft, slippery mutton tallow.

Oil & Water

Tallow is animal fat, and it's slippery because the fat molecules, the triglycerides, are short, soft and round. When coated on steel, these molecules make a good protection against rust because they repel water. This quality becomes a problem, however, when it comes to gluing, for it is water that softens the long collagen molecules of animal glue and carries them into the wood. If enough tallow remains on the wood to prevent the water from penetrating, then the glue cannot hold. Still, it takes a lot of tallow to make a waterproof barrier on wood—you would almost have to do it deliberately.

Sometimes it is deliberate. Tallow rubbed on the corners of your door panels will keep any frame-joint glue that seeps in from getting a grip and causing your panels to shrink-split. Perhaps that was what young British apprentice Robert Simms was doing before he ducked out of the shop one day in 1922 to go buy a new saw.

As the salesman watched from across the counter, Simms examined the saw

then gave it the standard test for quality. He bent the tip of the saw fully around to see if it would poke through the handle then spring back straight. His hands were still slippery, though, from his work in the shop and he lost his grip and the end of the blade sprung straight and slapped right into the salesman's face. Being stiff-upper-lip British (and needing to make the sale) the toolmonger never let out a whimper. Bob Simms paid and ran.

So, where do you get tallow? It's just melted fat and you can make it yourself. Ask the butcher to save some mutton fat for you—a lot easier around Easter time. Grind the fat and heat it, either directly in a pot or in boiling water. If you render it in boiling water the fat will rise to the surface and upon cooling you can lift it off in a cake. Reheat this and pour it through a sieve or cheesecloth. The resulting tallow will be much softer and may go rancid sooner than that melted out directly in a pot.

If you put the grease in a pot to melt without water, be careful of overheating and keep the lid handy to smother any flame.

Grease Box

You'll need a grease box too, because unlike beeswax, tallow can't just sit around in a solid block. In "L'Art du Menuisier," A.J. Roubo shows his workbench with a swing-out grease cup under the top, and this was common in most European benches. I use a little puzzle box with two lids. After the upper lid swings aside, you're faced with a second lid that seems immovable. The upper lid conceals the fact that the screw hole through the lower lid is actually a slot that allows the lower lid to slide back free of the dovetail on the end and swing aside.

Yes, the tallow makes the tools work easier, but it was also a vital ingredient of a way of working that was visceral, muscular and organic. There may be synthetic substitutes, but I do like working in a shop where there's nothing that would kill my dog if she ate it. So add mutton tallow to your tool chest and you will not only work like a classic joiner, you will smell like one too. **PWM**

Roy Underhill is a former master craftsman at Colonial Williamsburg, the author of the Woodwright series of books and host of his PBS series "The Woodwright's Shop," now in its 30th season.



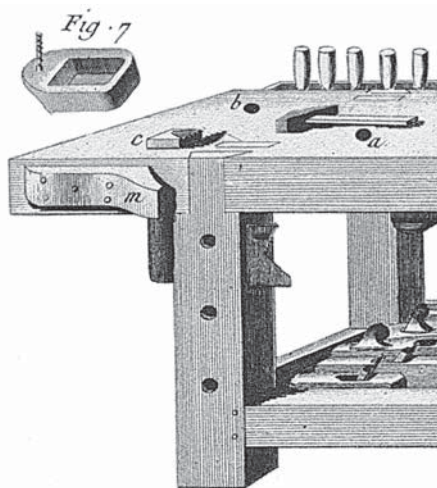
A puzzle. The dovetail puzzle grease box.



Lid 1. The first lid swings aside, but the inner lid seems trapped by the dovetail ...



Lid 2. ... until you slide the inner lid back toward the screw. (The pivot hole is elongated.)



Roubo's grease. André Roubo's bench with the swing-out grease cup.

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VIDEO: "The Woodwright's Shop" episode in which Roy makes his dovetailed puzzle grease box is available free online.

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BY GLEN D. HUEY

Step Stool

Whether stepping or sitting, this multi-purpose stool is sure to give your youngster a boost.

You may not remember when you looked up at the sink, or when you climbed up to the potty – but if you'd had a few extra inches on your legs, things would have been so much easier. This stool can do that for youngsters – and help you clean out your scrap bin, too.

This column generally begins with a trip to buy lumber, but you probably have the needed material – scraps – floating around your shop. This especially holds true if you paint this piece instead of go all wack-nutty with figured maple like I did. But if you need wood, simply head off to the store with your cut sheet in hand.

On this project, you can cut the pieces to size at the beginning of the build (most times it's better to cut to length and width as you need the parts in case things change). Once the parts are cut, the majority of the work is on the sides; they get laid out, drilled and shaped.

Find and mark the locations for the holes prior to any shaping work and make sure you have mirrored layout images. Keeping the drill square to the workpiece, bore the two $\frac{3}{4}$ "-diameter holes and one $\frac{1}{4}$ "-diameter hole in both sides.

Next, align the bottom edges of the two sides then lay out the centered arched cut-out. To do that, set your compass at $2\frac{1}{2}$ " then find the location where the compass hits the marks along the bottom edge ($3\frac{3}{4}$ " from the outside edges) and $1\frac{1}{4}$ " of height at the center – the compass point rests on



For tails, it's up. This stool transforms from a step stool into a chair with a simple flip of the step. As it increases the reach of your children, it reduces the materials in your scrap bin.



the opposing workpiece when drawing the arch.

The photo below shows how to lay out the side's curved shape. Clamp a workpiece to your bench, clamp a thin strip of wood to the bench just in front of the workpiece then bend that strip to the $2\frac{7}{8}$ " layout mark along the top edge to get a pleasing shape. The radius of the line should be around $9\frac{3}{4}$ ".

With the strip bent to position, transfer the line to your side with a pencil. Use your jigsaw to cut close to the line and finish smoothing the curve with a rasp and sandpaper. This is the only time that you'll need to use this setup. The remaining layouts are transferred from this one curve.



Fairing a curve. A thin strip of wood makes the perfect tool for designing a curve.

A Choice of Power Tools

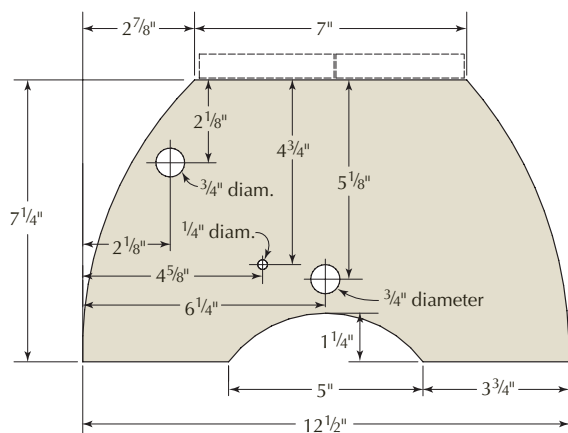
Align the sides to transfer the layout from the first side workpiece to the second side, then flip the shaped side and repeat to add the second curve to second side. There's one curve yet to add, but that comes after you shape the second side.

You could use a jigsaw to cut the curve to the final dimension, but a router with a pattern bit installed does the job in a flash – then, rasp cleanup isn't necessary and final sanding is minimal. (For more information on using a router, refer to the updated "ICDT" manual.)

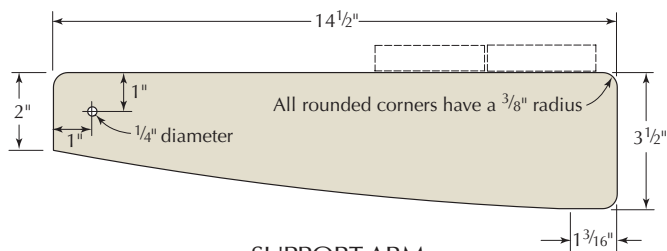
Use a jigsaw to rough-cut and stay about $\frac{1}{8}$ " from the layout line. (This allows the bit to cut exactly to the line.) Fit the sanded curve to the rough-sawn curve, clamp the pieces to your bench so the clamps are out of the path of the router's base as the cut is made, and you're ready.

Adjust the router bit so the bearing rides along the sanded curve while the bit's cutting length is aligned to remove waste material. Make the cut moving the router from left to right, or with the direction the router bit is spinning. After routing the curve, flip the top board and repeat the steps to complete the work on that side.

Switch the sides then lay out, rough-cut and rout the remaining curved edge. The sides are complete after a bit of sanding.



SIDE ELEVATION



SUPPORT ARM

If you want to bypass the router work, jigsaw, rasp and sand those three curved profiles.

There's a bit of layout and shaping work done to the step supports. Make sure to locate the 1/4" holes prior to any shaping. The bottom edges of the supports have gentle curves and the corners are softened, or rounded. Make the cuts with your jigsaw, then use a rasp and sandpaper to finish the shaping. Or use the router setup to complete this work, like you did on the sides.

On to Assembly

The seat boards, with the edges rounded with a block plane, are taken from standard-width stock, but the steps need to be ripped to width. Use your jigsaw to make the cuts and clean the sawn edges with a block plane. Sand all the parts, including the dowels, to clean up the surfaces and you're ready to assemble.

Position the dowels: The short dowel fits toward the bottom center of the sides with the ends flush with the exterior face

of the sides. The longer dowel acts as a stop when the step is flipped up and the stool is in seat mode. This dowel extends 3/4" beyond the exterior faces of the sides. After the dowels are positioned, drill 1/8" cross holes through the edge of the sides and into the dowels. Glue in a dowel pin to secure everything.

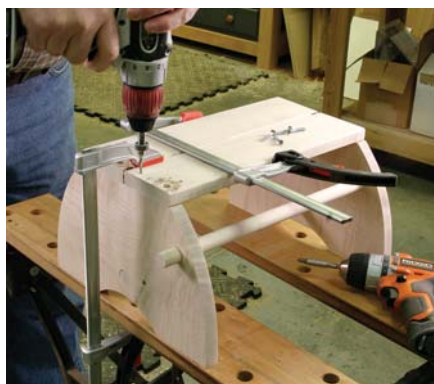
The seat boards and the steps are attached with countersunk and piloted screws. Plug the screw holes then sand the areas smooth and it's time for finish, be it paint, or stain and topcoats.

With the finish complete, attach the step support assembly to the main stool assembly using lag bolts, washers and nuts (slip an extra washer between the support and side to keep the parts separated) then take the stool into the house and watch your youngsters reach new heights. **PWM**

Glen is senior editor of this magazine, a published author, teaches woodworking classes and seminars and has no children, so he plans to use this stool himself. Contact him at 513-531-2690 x11293 or glen.huey@fwmedia.com.



Exact replication. A flush-cut router bit with a top-mount bearing makes shaping the curves quick work, but the profile is only as good as the one copied.



Arrange and attach. The seat boards, as are the steps, are spaced with pennies, clamped together and clamped to the frame prior to drilling for screws.

Step Stool

NO.	ITEM	DIMENSIONS (INCHES)		
		T	W	L
2	Sides	3/4	7 1/4	12 1/2
2	Seatboards	3/4	3 1/2	16 1/2
1	Long dowel	3/4 dia.		18
1	Short dowel	3/4 dia.		16 1/2
2	Step supports	3/4	3 1/2	14 1/2
4	Dowel pins	1/8 dia.		2
2	Steps	3/4	2 1/4	18 1/8

HARDWARE

- 2 Carriage bolts, 1/4" x 2"
- 2 Nuts, 1/4"
- 4 Washers, 1/4"

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SLIDE SHOW: We took extra step photos while building this piece – though you can build it with what's printed here. See the extra shots online.

PLAN: Download the free SketchUp plan for the step stool.

ARTICLES: All our "I Can Do That" articles are free online.

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shows you how to perform the basic operations in a step-by-step format. Visit ICanDoThatExtras.com to download the free manual.

The Return of Roubo

BY CHRISTOPHER SCHWARZ

An 18th-century French workbench is quite possibly the most perfect design ever put to paper.

In the 18th century it was common for the workrooms and living areas of a home to share the same space. A workbench, for example, would not be out of place in the front room of the house.

This small historical fact has me concocting a plan, which I haven't yet shared with my family.

My workshop at home is in a walkout basement. I've done what I can to make it pleasant, but it's isolated from the rest of the house. This is on purpose: My planer and jointer sound like air-raid sirens.

During the brutal stock-preparation phase of a project, my shop is perfect. I can run machinery all day and bother no one. But when I get into the joinery of a project, I long for a shop with beams of natural light, wooden floors and a close connection to the day-to-day of my household.

In other words, I want to claim some space upstairs as a bench room.

Hold tight: This story isn't just about me. It's about you, too. A furniture-grade workbench is a great idea for apartment dwellers, or people who need to set up a shop in a spare bedroom of their house. It's also a fine idea for people like me who plan (read: plan to grovel for permission) to do some woodworking in a living area of their home.

Lucky for all of us, one of the best-looking workbench designs is also the simplest to build and most useful, no matter if you have a love affair with your plunge router or your router plane.



And here's to you Monsieur Roubo. Few workbench designs are as bullet-proof or as simple as those of A.J. Roubo, an 18th-century cabinetmaker who also was a fine writer.

Thank You, Monsieur Roubo

During the last five years I've built (or helped build) more than a dozen workbenches based on the 18th-century designs of André J. Roubo, a French cabinetmaker and writer. And after five years of working on Roubo's bench I think it is an ideal bench with almost none of the

downsides or limitations I've found on other forms.

Its advantages are numerous. Here are a few.

1. Its simple design makes it easy and quick to build, even for beginners.

2. The thick slab top has no aprons around it, making it easy to clamp any-

thing anywhere on it (this feature cannot be overstated).

3. The front legs and stretchers are flush to the front edge of the benchtop, making it easy to work on the edges of long boards or assemblies, such as doors.

4. Its massive parts make it heavy and stout. This bench will not rack or move as you work.

But what about its looks? The first Roubo-style workbench I built was out of Southern yellow pine. I think it looks great, but an 8'-long pine behemoth might be best suited to the workbench underworld. And it is probably too big for most living areas.

So I decided to go back to the original text for inspiration. You see, the original bench published in plate 11 of “L’Art du Menuisier” shows a bench that has beautiful exposed joinery – through-dovetails and through-tenons in the top. And it has a single piece of wood for its top – something that George Nakashima would love (if it had a bit of bark on it).

In other words, the original Roubo bench has a lot in common with furniture of the Arts & Crafts movement (thanks to its exposed joints), Shaker (with its lack of ornamentation) and even contemporary styles (thanks to the clean lines and use of a single-board top). This bench looks like a lot of furniture that contemporary woodworkers enjoy building and will look at home in the home (if you’re lucky) or in the shop.

About the Raw Materials

The biggest challenge with this bench is finding the right raw materials, particularly for the top. I was looking for a single slab that was 5" thick, 20" wide and at least 6' long. That's a tall order. Here are some leads if you'd like to follow suit: Haunt the “building materials” sec-

“I will not give away my hard-earned skills to a machine. It's a bit like robbery with violence, for (machines are) not only intended to diminish my bank balance, but also to steal my power.”

— John Brown (1932–2008)
Welsh stick chairmaker



Face your edge. If you are edge jointing two massive slabs into one benchtop, you need to treat the edge of each board more like it is a face. That means checking the surface to ensure it's flat across its width and length. Take your time.



One out of one editors agree. This is a bad idea. Even with my coarsest rip saw, this slab was too much. After 20 minutes of sweating, I ripped the edge on my band saw. The correct tools for this job are a pitsaw, a pit and a good strong friend.

tion of [Craigslist.com](#). Old construction beams seem to come up for sale there on a regular basis. These can be cheap, but you are going to have to scrounge a bit.

You can find a local sawyer (we use a network maintained by [Wood-mizer.com](#)). Of course, drying a wet slab that size will take time or some serious work in a kiln. The third option is to find a specialty lumber source, such as Bark House in Spruce Pine, N.C., ([barkhouse.com](#)), which specializes in selling big slabs of kiln-dried lumber and shipping them all over the country.

Almost any species will do for a workbench. Maple or ash would be my first choices, but almost every species is stiff enough and heavy enough to serve as a benchtop when you are dealing with 4"- to 5"-thick boards. I ended up with two slabs of cherry that were donated by housewright Ron Herman of Columbus, Ohio. They had some punky areas and some checks, but I was convinced I could make them into a good-looking top.

For the undercarriage, almost anything will do, as long as it will look nice with the top. I used construction-grade 2x6 white pine for the stretchers and 6x6 mys-

tery wood for the legs. I built the project almost entirely with hand tools (except for a couple long rips). This was for fun. Your definition of fun may vary. All of the techniques here easily translate to a power-tool shop, so don't be put off by the joinery; just fire up your band saw.

One other thing to note: You don't need a workbench to build a bench. This entire bench was built on sawhorses without the assistance of any of the benches or vises in our shop.

I began the project by dressing the two rough cherry slabs so I could join their edges to make my benchtop. That's where we'll pick up the story.

Take the Tool to the Work

The length and the width of your top will determine the rest of the design of the bench. Here are a couple pointers: Make your benchtop as long as feasible, but it doesn't have to be wide (in fact, wide workbenches are a liability in many cases). A 20"-wide bench is plenty big and stable in my experience.

My benchtop required one seam down its middle. To dress the edges I removed the sawmill marks with a jack plane, then

dressed each edge with a jointer plane. Running these edges over the powered jointer would be a two-man job. You can do this by hand by yourself.

Once you get the two edges flat, rest them on top of each other. Look for gaps at the seam and use a straightedge to ensure



Straight up. You can save a ton of work for yourself by checking the slab to ensure it will be flat when it's glued up. A wooden straightedge is ideal for this operation.

they create a flat slab. Glue up the top and let it sit overnight no matter what brand of glue you use. You want the glue to reach maximum strength and you want most of the water in the glue to evaporate (if you use a water-based glue).

With the slab joined, dress its outside edges – again handplanes are less effort here than humping this slab over your machines by yourself. After you dress the first edge, make the second one nearly parallel. Then cut the benchtop to length. I used a 7-point crosscut handsaw. It was work, but was fairly quick work.

With the top cut to finished size, dress the benchtop and underside so they are reasonably flat and parallel. Do a good job here because this will be the working surface you'll be using to make the remainder of your bench. Flatness now will prevent struggles later.

Begin flattening the top using traversing strokes across the grain with your jack plane. Follow that up with diagonal strokes with a jointer plane. Or, for the super-lucky, run the slab through your wide-belt sander. No matter how you do it, don't forget to check the top for twist.

Before you get into the legs, it's best to first install your end vise on your top. That way you can use that vise to cut all the joints on the legs. I installed a vintage



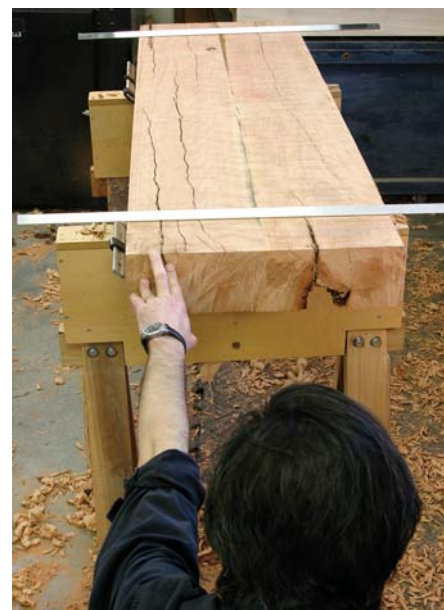
Small and simple. I used a 7" vintage quick-release vise as my end vise. You can use almost anything, perhaps even a vise you now have.

quick-release vise and added to it a big wooden chop, which will support wide panels on the benchtop.

In addition to the vise, you also should drill the dog holes in the top that line up with the end vise. Place the holes close to the front edge if you use joinery planes with fences (such as rabbet or plow planes). I placed the center of the holes 1³/₄" from the front edge. Space them closely and evenly – and don't forget to note where the through-dovetails and through-tenons will be. You don't want to put a hole where the joint will go. I spaced my holes on 4" centers. If you can get yours a little closer (say 3") then you'll be golden.



More than one way to cut a board. Handsaws are designed to be held in a variety of positions, including this one. This position uses different muscles than when you are cutting with the teeth facing the floor. Trying different positions will prevent you from tiring out as quickly.



Accuracy on the cheap. I use aluminum angle as winding sticks. These parts are cheap, super-accurate and don't lose their truth unless you abuse them. Paint the ends of one of them black to make the twist easier to see.



For looks alone. I added a square ovolo shape to the end of my vise chop. It doesn't have a purpose, except to make the bench look more like a piece of furniture. Cut the shoulders of the ovolo with a backsaw. Use a bowsaw to cut the curve and clean it up with rasps and files.

The Magical Mystery Legs

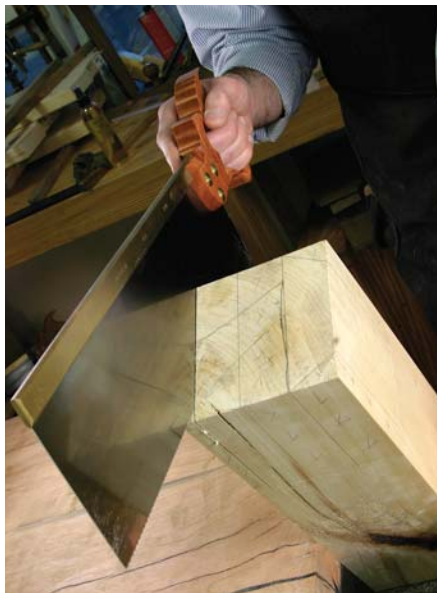
I have no idea what species of wood these legs are. I found them in the back of my home center labeled as 6x6 timbers. They were a bit wet and had a few green streaks like poplar. But they were stringy, tough and difficult to plane. In any case, they were cheap and look pretty good – plus I didn't have to glue up any stock to make the thick legs, which is a nice bonus.

Cut them to rough length (about 1" over-long) with your crosscut handsaw. The length of your legs determines the height of your workbench. There are many ways to determine your ideal workbench height. My favorite technique is to measure from the floor up to where your pinky joint meets your hand. For me, that measurement is about 34".

If you use hand tools, I would err on the side of a bench that's a little too low rather than too high. Low benches are ideal for handplaning and let you use your leg muscles as much as your arm muscles. Dress the legs with your jack and jointer planes. Then prepare to lay out the joinery.

The joints in the legs and top are unusual – each leg has a sliding dovetail and a tenon. Why did Roubo use a sliding dovetail and not a twin-tenon? I don't know. But based on building the bench, my guess is that the sliding dovetail is easier to cut and prevents that part of the joint from twisting because of the sloped walls.

I spent a couple days (yes, you read that right), poring over Roubo's drawings and the translated French text to lay out the joints so they were balanced and looked like the joints shown in the 18th-century



Big, but not big enough. Use a tenon saw to define as much of the cheek as possible by using diagonal cuts. (Or just do it on a well-tuned band saw.) When you cannot go any deeper with your tenon saw, it's time to break out the big boy.



I like backless things. Because there is no back on this rip saw, I can go as deep as I like. Stop sawing when you touch your baseline on both edges.



Connect two. After sawing cheeks across the entire width of the legs, this is easy work. Take your time. Fixing a wandering dovetail slope is no fun.

text. I won't bore you with the details (like I bored my spouse), so here's what you need to know:

The sliding dovetail and tenon are each 1 1/4" thick, with 1" between them. The remainder of the joint is a shoulder on the inside face of the leg. The dovetail is sloped at 1 3/4" to 1" (about 30°). That's steep, but it looks right compared to Roubo's drawings and other early French benches I've examined.

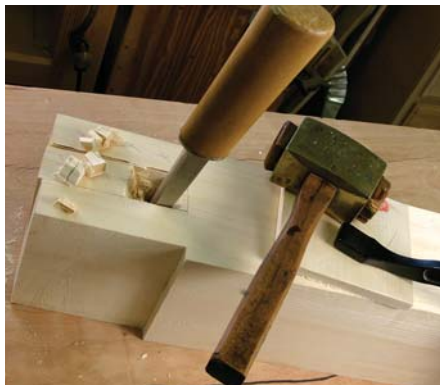
Lay out the joints. Be sure to make them about 1/8" overlong so you can cut them flush with the benchtop after assembly. Then fetch your biggest tenon saw and a large rip saw.

Begin by cutting the inside cheek to get warmed up – it's easiest to fix this joint if you go off line. Begin with your tenon

saw (mine is a 16" model with about 10 points). First kerf in the top of the joint in the end grain about 1/8" deep. Then cut the cheek diagonally on one side. Turn the leg around and cut diagonally again. Then remove the "V"-shaped waste between.

When the top of your joint hits the saw's back, switch to a rip-filed handsaw to finish the job. Now do the other cheek of the tenon the same way. Then follow up with the inside cheek of the dovetail.

Now cut the dovetail slopes on the outside corners of each leg. Begin with the tenon saw and finish up with the rip saw. The technique for cutting the dovetail is similar to cutting the tenon. Kerf in the end grain a bit. Then work diagonally down both edges and remove the stuff between the diagonal cuts.



Heavy metal. A heavy mallet (this one is 2 lbs.) will make the work go faster. Here I'm almost halfway through the second side and the waste is starting to come loose. Pry it out as soon as it's feasible.

I tried a variety of ways to remove the waste between the dovetail and tenon. The fastest way was to use a mortising chisel. Sawing it out with a bowsaw—even a coarse one—was slower. To bash out the waste, treat it like you are removing waste between dovetails. Chisel straight down near your baseline. Then chisel in diagonally about $1\frac{1}{2}$ " away from that first cut to meet your first cut. Pop out this "V"-shaped piece of waste. Continue until you are halfway through. Flip the leg over and repeat the process on the second side.

Clean up the bottom of the canyon between the tenon and dovetail. A paring chisel makes short work of flattening the bottom.

Then cut the shoulders of the legs. You have three shoulders to cut: Two are up front at the base of the dovetail and

the third is at the inside of the leg. I used a crosscut sash saw to make this cut. A smaller carcass saw also would do, but it is slower.

The Difficult Females

The through-mortises are some work. Because you are unlikely to have (or want) a $1\frac{1}{4}$ "-wide mortising chisel, you should take a page from our friends the timber framers. Bore out the majority of the waste to excavate the mortise. Then clean up the walls with a mortising chisel (at the ends) then chisel along the walls.

This job is a good excuse to buy a big brace. While most cabinetmakers will choose a brace with an 8" or 10" sweep, I would recommend a 12" or 14" sweep. You will gain more mechanical advantage. Sadly, my 12" brace went missing, so I gained a workout.

Sharpen the biggest auger you have and mark the flutes so you'll bore about halfway through the top. Clear the holes of waste, then use a mortising chisel to bash out the ends of the mortise (this is the hard and exacting part). Then use a wide paring chisel to split the remainder of the waste from the walls. This is easy stuff.

Flip the bench over and bore through the other side. Then clean up the mortise on the underside and ensure the two cavities meet and have flat walls that are coplanar. (Humps in your mortise walls are common and troubling. Check your work with a combination square.)

Luckily, the dovetail socket is easy work compared to the mortise. Define the walls of the socket using a backsaw (I used



The diagonal drill. Think of this like a big angled tenon cheek. Kerf in the top of the joint about $\frac{1}{8}$ " deep. Then saw diagonally down until you hit your baseline and the far corner of the benchtop. Then go to the other side of the benchtop and work down the other side.

a sash saw). Then take your crosscut hand-saw and make several kerfs in the waste. Pop the waste out with a stout chisel and clean the floor of the socket with a router plane and a wide paring chisel.

A Cheat – But Not What You Think

I made my stretchers using 2x6 material from the home center. After I dressed the stock (it was twisty) it ended up at $1\frac{1}{4}$ " thick. To make life easier I decided to make the tenons on the stretchers by laminating two 2x6s face-to-face. The long one would be the tenons. The short one would be the shoulders between the legs.

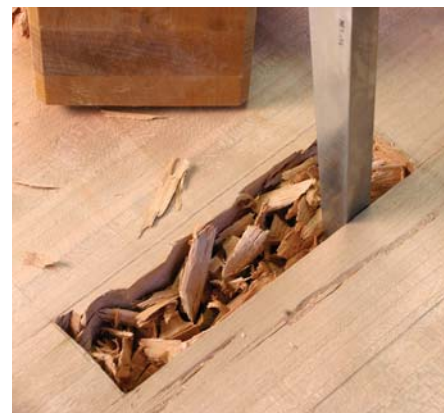
A bit of truth here: It's unlikely my legs are perfectly square or their faces are parallel to one another. But if you discard your measuring systems, you'll be OK.



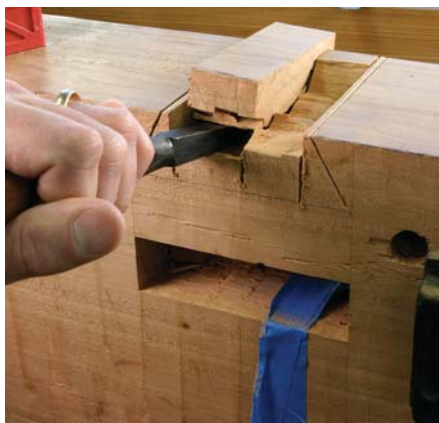
Trace, don't measure. Every leg will be a bit different. So trace the joint layout onto the top to get a real idea of the waste you need to remove.



Boring work. Usually I use "boring" as a pun here. This is seriously boring work. A drill press would have been a welcome machine here—though how I would have put this benchtop on the drill press's table is beyond me. I'd probably move the drill press over to the benchtop and swing the table out of the way.



Side-splitting fun. Remove as much of the waste as possible by splitting it off the sides. The wood splits easily along the grain. Knowing the wood's weakness is always a big advantage.



Don't be shy. Make a few kerfs in the waste then split the bulk of the waste out of the dovetail. Stay about $\frac{1}{8}$ " away from the baseline to avoid splitting away wood you want to keep.



Router plane reverie. If I could write a love poem to my router plane, I would. It makes tough jobs such as this quite easy. Note you might have to remove the depth adjuster wheel on your tool to reach this depth.



Something for the corners. Your router plane won't reach into the tight inside corners. So use a paring chisel. Use the flat floor established by your router plane and pare out the junk.

What's critical here is that each stretcher fit perfectly between its legs and end up 3" from the floor. That 3" is the perfect gap for your foot, which you'll find handy (footy, actually) when planing across the grain.

So I figured out where the stretchers should intersect the legs and cut two battens to length ($21\frac{1}{8}$ " long in this case). I clamped these battens to my legs and rested the stretcher on the battens and

marked my stretchers' finished length directly from the legs. These shoulder lines were not square, but that's no big deal if you cut them with a handsaw.

After I cut these pieces to length with a handsaw I confirmed that they fit between their legs. Then I laminated them each to a longer section of 2x6. As a result the stretchers won't have a shoulder at the back (this is called a bare-faced tenon), but that is no big deal in a bench.

Mortises That Meet

When you make mortises that meet inside a leg, there is a tendency to have the inside corner of the joint split when you make the second mortise intersect the first. Does it matter? Probably not much. But I want every bit of wood in there that I can have.

So I use an old English trick for intersecting mortises. Make your first mortise shallow so it will just kiss the second



How high? Who cares. I've clamped two battens to my legs and rested the stretcher on them. Now I'm marking the shape of the shoulders directly on the stretcher.



From the inside. Here's what this looks like on my side of the bench. Use a knife for accuracy. Then cut your stretcher to length with a handsaw.



Almost an instant tenon. Leave the tenons way overlong. They'll be mitered to size after you excavate your mortises.



Mortise without the mess. Here I'm boring out the intersecting mortise, which is deeper than the first mortise. The result is cleaner mortise walls and more surface area for gluing.



Again, please don't measure. Hand-cut mortises and tenons are best done by direct comparison. Show the tenon to the mortise (or the mortise to the tenon) and mark what you need.

(deeper) mortise. This prevents the inside corner from breaking off.

The mortises in the legs are smaller than those in the top, but the procedure is the same. Bore out most of the waste. Bash out the ends. Pare the long-grain walls. You should be pretty good at this by now.

Now miter the ends of your tenons. The tenons don't have to touch—you won't get any points if they do. Then show the mitered tenon to the mortise to mark out the location of the edge cheeks. Saw out the edge cheeks and shoulders. Then fit each tenon.

Mallet Time

Do a dry fit of all your parts to ensure that not only will the individual joints go together, but that all the joints will go together at the same time. While you could assemble the base and then (if you got lucky) bang the benchtop in place, I think it's better to assemble the whole thing at once.



Mortise holes first. The $\frac{3}{8}$ " holes pass entirely through the legs and mortises. Be sure to stagger the holes if you are going to peg all four stretchers. Otherwise the pegs will collide.

To hold the joints together I used draw-bored pegs (to pull the shoulders tight to the legs) and a slow-setting, flexible epoxy as insurance. You probably could get away without glue. But if you can afford the glue, I see no disadvantage to it.

With the bench pieces fit, mark where your $\frac{3}{8}$ "-diameter pegs will go on the legs. I placed them about 1" from the shoulder of the tenon.



High and dry. When the bench parts finally go together, the result is remarkably stout, even without glue.



Mark the tenon. Use the same $\frac{3}{8}$ " bit for boring the holes to mark their center points on the tenons. Then disassemble the joint.

Drawboring is simple: You drill a $\frac{3}{8}$ " hole through the mortise, assemble the joint, then mark where that hole intersects the tenon. Disassemble the joint, move the centerpoint of the hole about $\frac{1}{16}$ " or $\frac{3}{32}$ " closer to the shoulder and drill the $\frac{3}{8}$ " hole through the tenon.

When you drive the peg in, the offset holes will pull the shoulder tight against the leg. If you have drawbore pins, these metal pins will deform the holes a bit. And they let you test-fit the joint before glue or a peg gets involved in the equation.

A Pause Before Assembly

If you are going to install a leg vise, now is the time to bore the hole for the vise screw and the mortise for the parallel guide. This is no different than any of the other mortises in the project, so details here would be redundant.

There are a couple design considerations: Make the center of your vise screw about 10" or so from the top of your workbench. This will allow you to clamp 12"-wide stock in the leg vise with ease. Also, you have a lot of flexibility as to where you put the parallel guide. I've put it at the floor (for maximum leverage) and above the stretchers (for minimum stooping). There isn't a noticeable difference in leverage when you move the parallel guide up, so I'd put it above the stretcher. It's easier to reach that way.



Move the bore. Shift the centerpoint toward the shoulder of the tenon. When building benches in softwood this can be about $\frac{3}{32}$ " without (much) danger.

Another design detail: Keep your mortise for your parallel guide fairly close in size to the guide without rubbing or binding (yes, this takes fiddling). A close fit reduces the amount of racking that the vise's chop will do left and right. Trust me on this.

Big Finish

When I assemble something, I don't take chances. If I can clamp it, I will. And if I can glue it, I will (unless it will cause wood-

movement problems). So I used some slow-setting epoxy, which has a practical open time of several hours. I applied glue to all the joints, knocked everything together then applied the clamps to get things as tight as possible.

Then I drove in the $\frac{3}{8}$ " white oak pegs. A couple details of these pegs: The best way to get them is to make them yourself. Rive them and drive them through a dowel plate. Whittle one end so it looks like a pencil. Apply some paraffin to lubricate the pin and knock it home. The paraffin is another timber-frame trick that works well. Since I started using it I've had far fewer exploding pegs.

After driving your pegs, wedge the through-tenons through the top. I used wedges that have a 4° point. For directions on how to make these wedges using a handsaw or band saw, visit popularwoodworking.com/aug10. Once the glue sets up, remove the clamps and saw the wedges and tops of the tenons flush to the benchtop.

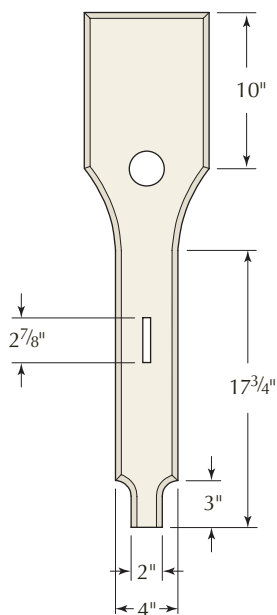
True up the top again, just like you did at the beginning of the project. Then you can turn your attention to the face vise.



Clamps and drawbores. This might seem like wearing both a belt and suspenders, but it will reduce the number of splintered pegs.



And wedges, too. Roubo specifies that you should wedge the tenons that protrude through the top. I declare this joint bomb-proof.



LEG VISE DETAIL

Roubo Workbench

NO.	ITEM	DIMENSIONS (INCHES)			COMMENTS
		T	W	L	
1	Top	4 7/8	20	72	
4	Legs	5 1/2	4	34	
2	Long stretchers	2 1/2	5	45 1/2	2 3/4" TBE
2	Short stretchers	2 1/2	5	17 1/2	4 1/4" TBE
1	End vise chop	3	4 7/8	14	
2	Long cleats	1	1	37	
2	Short cleats	1	1	12	
	Shelf pieces	1	15	43	
1	Leg vise chop	1 7/8	8	33	
1	Parallel guide	1 1/2	2 7/8	15	

* TBE = Tenon both ends

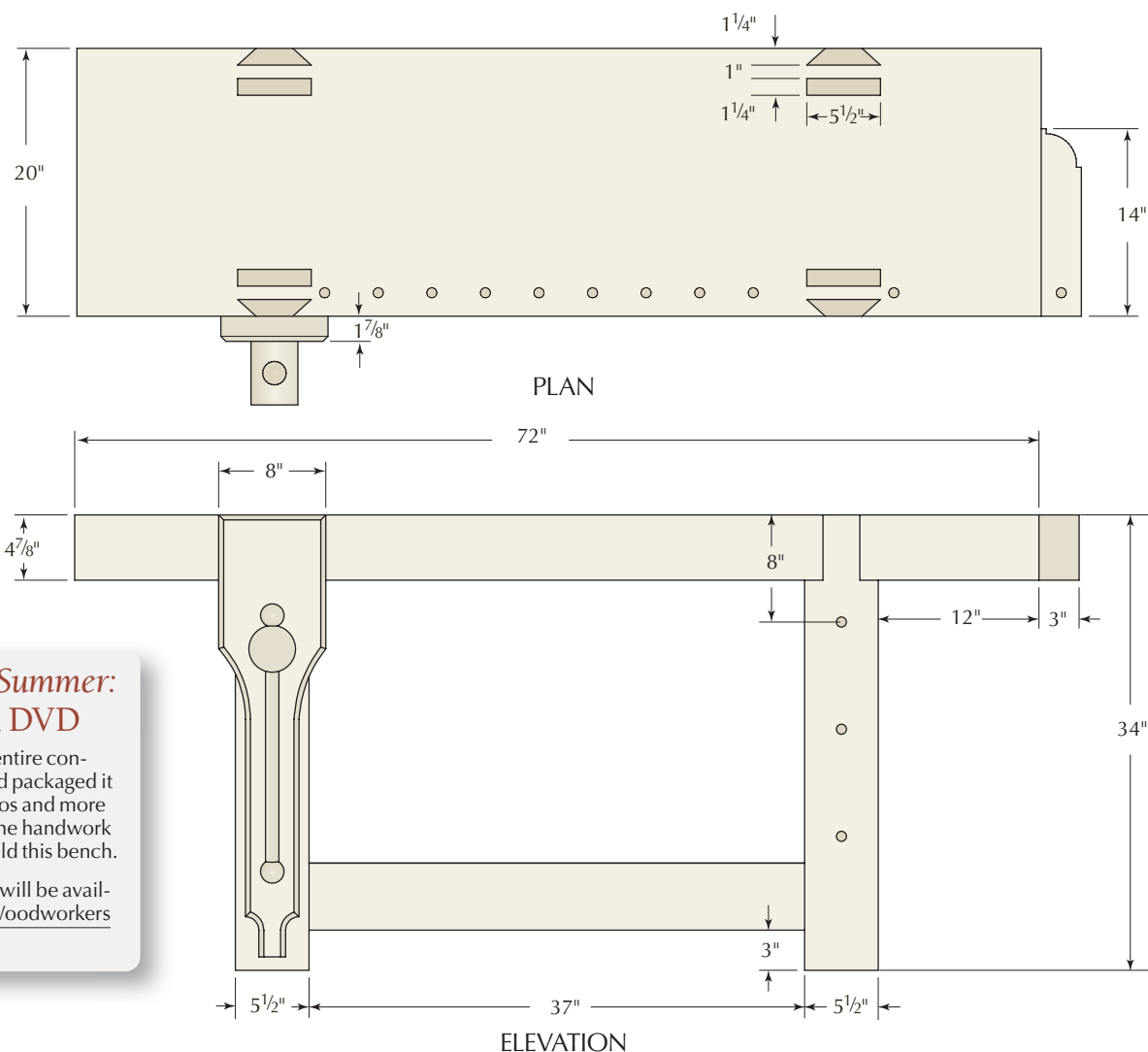
I'm a Leg Man

Leg vises are awesome. You can customize them for your work. You can build them in a day. They have tremendous holding power. And they don't have the parallel bars that iron vises use. So you have more clamping real estate.

Why have they almost vanished? Beats me. Most people who try them love them.

The vises have three parts: The chop, which you make and which grips the work; the vise screw (usually a purchased item), which moves the chop in and out; and the parallel guide, which you make that pivots the chop against your work.

The parallel guide is the thing that trips up most people who are new to leg vises. The parallel guide is attached to the chop and moves in and out of a mortise in the leg. A pin pierces the parallel guide in one of its many holes. When the pin contacts



Coming this Summer: Roubo on DVD

We videotaped the entire construction process and packaged it with additional photos and more in-depth details on the handwork skill necessary to build this bench.

The enhanced DVD will be available in our store at WoodworkersBookShop.com.

the leg, the chop pivots toward the bench-top and clamps your work.

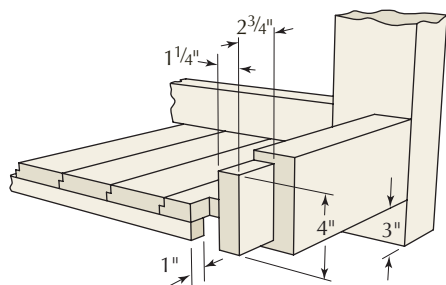
Once you make your chop, you'll need to make an orifice for the vise screw and a mortise for the parallel guide. The parallel guide is wedged into the chop and is pierced by two rows of $\frac{3}{8}$ " holes that are on 1" centers. And the two rows are offset by $\frac{1}{2}$ ".

I know, all this sounds complicated. It's not. I built my first leg vise years ago without ever having used one. Within 30 seconds I had mastered it. You will, too.

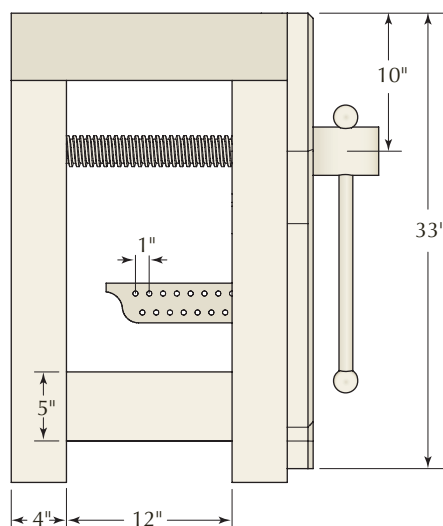
A Place for Planes

You need a shelf. Let me repeat that: You really need a shelf. You'll put your bench planes there, plus parts and tools that you need later on in a project. Build the shelf; you'll be glad you did.

The shelf takes just a couple hours to build by hand (less if you slay electrons in your shop). Begin by fastening a 1x1 cleat to the bottom inside edge of the four stretchers. I used glue and cut nails.



LOWER LEG DETAIL



PROFILE



Here's the setup. Here you can see the parallel guide right before I'm about to install it in the chop. And you can see the hole I chopped out for the vise screw. It's simpler than it sounds.

Then you'll nail shiplapped shelf boards to these cleats to create the nesting place for your bench planes.

To make the shiplapped boards, use a plow plane to make the rabbets on the long edges. This is easy work in pine. I went the extra step and beaded one long edge to dress up the boards. The two boards on the end will need to be notched at the corners to fit around the legs. You know what to do.

Nail the shelf boards in place with about $\frac{1}{16}$ " gap between each. A single nail in the middle of the width of each board is best. This will prevent your good work from splitting.

A Simpler Finish

Finishes on workbenches should be functional, not flashy. You need a finish that is easy to renew, resists glue and stains and doesn't make the bench too slick. Slick benches stink.

The answer is so easy. Mix equal parts boiled linseed oil (to resist glue), varnish (to resist spills) and paint thinner (to make it easy to apply). Shake up the amber liquid and rag it on. Three coats is all you need. When it is dry, you can get to work.

What is work? Well, one of the inspirations for this bench came from the Pottery Barn catalog. I am a bit cowed to admit this. The catalog featured a fake workbench sold to be used as a wet bar. I thought: What if a real workbench were



One setup for the shelf. My shelf boards are 1" thick. I set my plow plane to make a $\frac{1}{2}$ "-wide x $\frac{3}{8}$ "-deep rabbet. A minute of work on each edge made the perfect joint.

used as a wet bar, a sideboard or a table behind a couch?

You see, some people allow their workshop furniture to be made of ugly plywood, screws and crude joints. Me, I just cannot build that way. When I invest my time in something, I want it to be both beautiful and functional (thank you Gustav Stickley for that line).

So whether this bench goes in the dank-est dungeon or in your living room, I think you should do your best to ensure that all your work is ready for the front room of your house. **PWM**

Christopher is the editor of this magazine and is a bit worried that his spouse will actually read this article before he's ready to take over the sunroom with this workbench.

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Mitered Half-lap Joinery

BY GLEN D. HUEY

With a router, straight bit and plywood scrap, turn a weak joint into a superhero of strength.

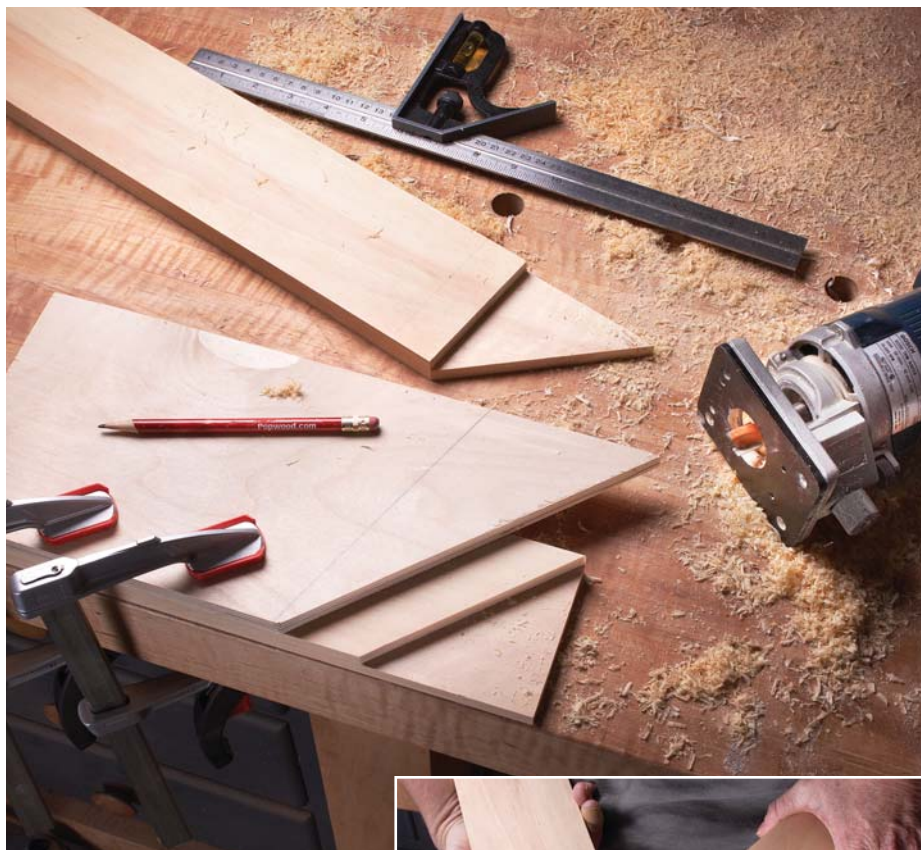
One of the strongest joints in woodworking is a properly fit mortise-and-tenon and the opposite in strength is a simple butt joint. For years I built base frames with mortise-and-tenon joints at the rear and mitered corners at the front. The miters were joined with biscuits. The rear joints were much stronger, so I wanted to add strength to those mitered front corners, but how?

Not with mechanical fasteners; screws were out. I needed something quick to create and when assembled, I wanted the joint to retain a mitered look. The answer was a mitered half-lap joint. With a half-lap, there is plenty of flat-grain glue surface, and that increases the holding power, big time.

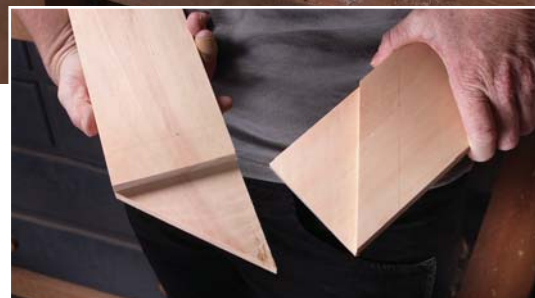
Tools for the Task

Quick means simple in my book, so if a bunch of tools are needed, forget it. Good-bye, handtools. The process I came up with works with a router, a straight bit and a piece of plywood that's a couple inches wider than your workpiece and long enough so it's easy to add clamps. Trim one end of the plywood to a 45° angle to make things easier.

With this technique, the router sits on top of the workpiece and kisses the fence on the final pass. It's best to have a straight edge on your router's base plate, or make sure you have accurately adjusted a round base plate so the bit is centered. An off-center base plate, depending on how you hold the router each time it's picked up,



Not often considered. Mitered joints are a common woodworking joint. Most are splined or joined with biscuits and lack real strength. With a quick setup that uses your router, you can master the mitered half-lap. When assembled, this joint rivals a tightly fit mortise-and-tenon.



allows the possibility that you'll miss the layout line as you plow out the waste.

The straight bit can be any straight bit that you have in your arsenal. You're only going to use the end of the bit, so even a top-mount bearing-guided bit works. A smaller-diameter bit is a bit easier to use, but because the cut is most often $\frac{3}{8}$ " in

depth (half the thickness), a larger diameter bit is no problem.

Keep the Players Straight

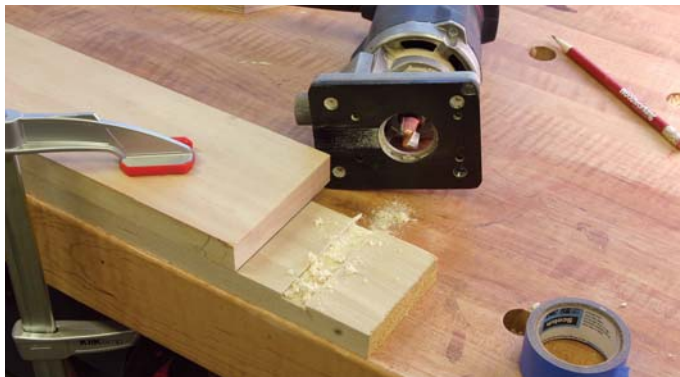
To begin, cut your pieces to their finished length. For a base frame, miter the ends of the front rail at 45° – the adjoining returns are left square.

Chuck a straight bit into the router and set the depth of cut very shallow.

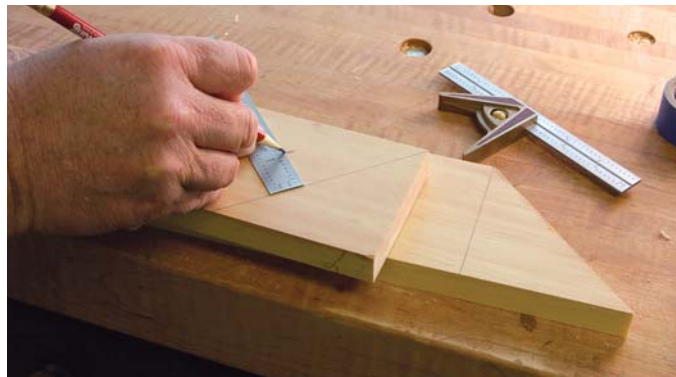
Grab a couple pieces of scrap and position one on top of the other leaving a few inches to the right of the top piece, as shown above right. This makeshift fence allows you to find the exact offset from the edge of your base plate to the edge of the

"The successful man will profit from his mistakes and try again in a different way."

— Dale Carnegie (1888 - 1955)
American writer and lecturer



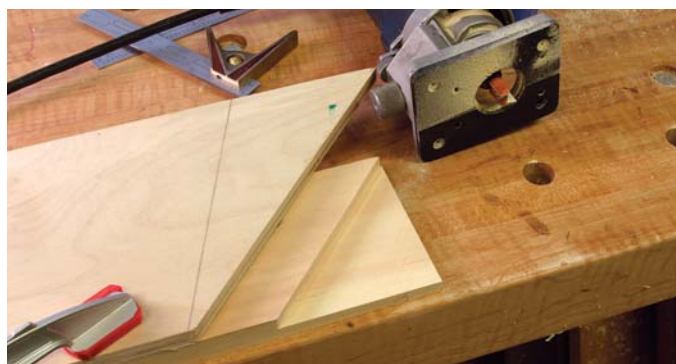
Get it exact. The key to this technique is accuracy. Find the precise offset measurement through a sample cut to ensure you'll have a perfect fit.



Offset and go. Whether it's an angled line on a square end or a square line on an angled end, the offset line is king. Plus it's where to position your fence.



Nibble away. If you're comfortable with your router abilities, remove waste using a climb-cut, as well as in the traditional left-to-right manner.



It's a keeper. With accurate layout and routing, the completed portion is perfectly cut to accept its half-lap mate.



Oh the pressure. It's easy to allow the router to tip into the cut portion as you work. Keep downward pressure on the base plate with one hand while steering the router with other.

a line across the mitered ends beginning at the edge of the cut. Draw a second line, offset by the earlier measurement (the one I told you to remember), that's parallel to the first lines.

Position your plywood fence at the second layout line with the angled end toward the mitered end of your workpiece. Hold the fence flush with the bottom edge of the workpiece then clamp the fence in place.

After you adjust the bit to remove half the thickness of your workpiece, nibble away the waste beginning at the end of the workpiece and working toward the plywood fence.

On your last pass, hold the router base tight to the plywood. At the end of the cut, the router base plate hangs mostly off the edge of the workpiece, so maintain pressure to keep the plate tight on the workpiece.

To clean the bottom waste from the miter-cut piece, align your fence with the square offset line, hold the bottom edge flush with the workpiece then nibble away the waste. Work slowly from the point to the fence.

straight bit. Make one pass with the base riding along the fence then measure the distance from the fence to the dado. This is the offset measurement. Remember it.

Layout is key. Form the half-lap on the wrong face of the pieces and you'll lose the mitered look, so mark the faces to remove the bottom half of the miter-cut end and the upper half of the square-cut ends.

Draw an angled line (45°) on the squared ends beginning at the corner then square

With the waste material removed from both workpieces, your joint will slip together with both shoulders tight. The increased glue surface adds strength to the joint and when viewed from the top, the joint appears to be mitered. This is a great technique for base frames, picture frames or anywhere else your woodworking calls for a mitered corner. **PWM**

Glen is senior editor of this magazine, a published author, and teaches woodworking classes and seminars. These days, his biscuit joiner sees little action. Contact him at 513-531-2690 x11293 or glen.huey@fwmedia.com.

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Magobei's Dining Table: Part 1

BY TOSHIO ODATE

A table built for a 'rags to riches' patron becomes the perfect project for an accomplished protégé.

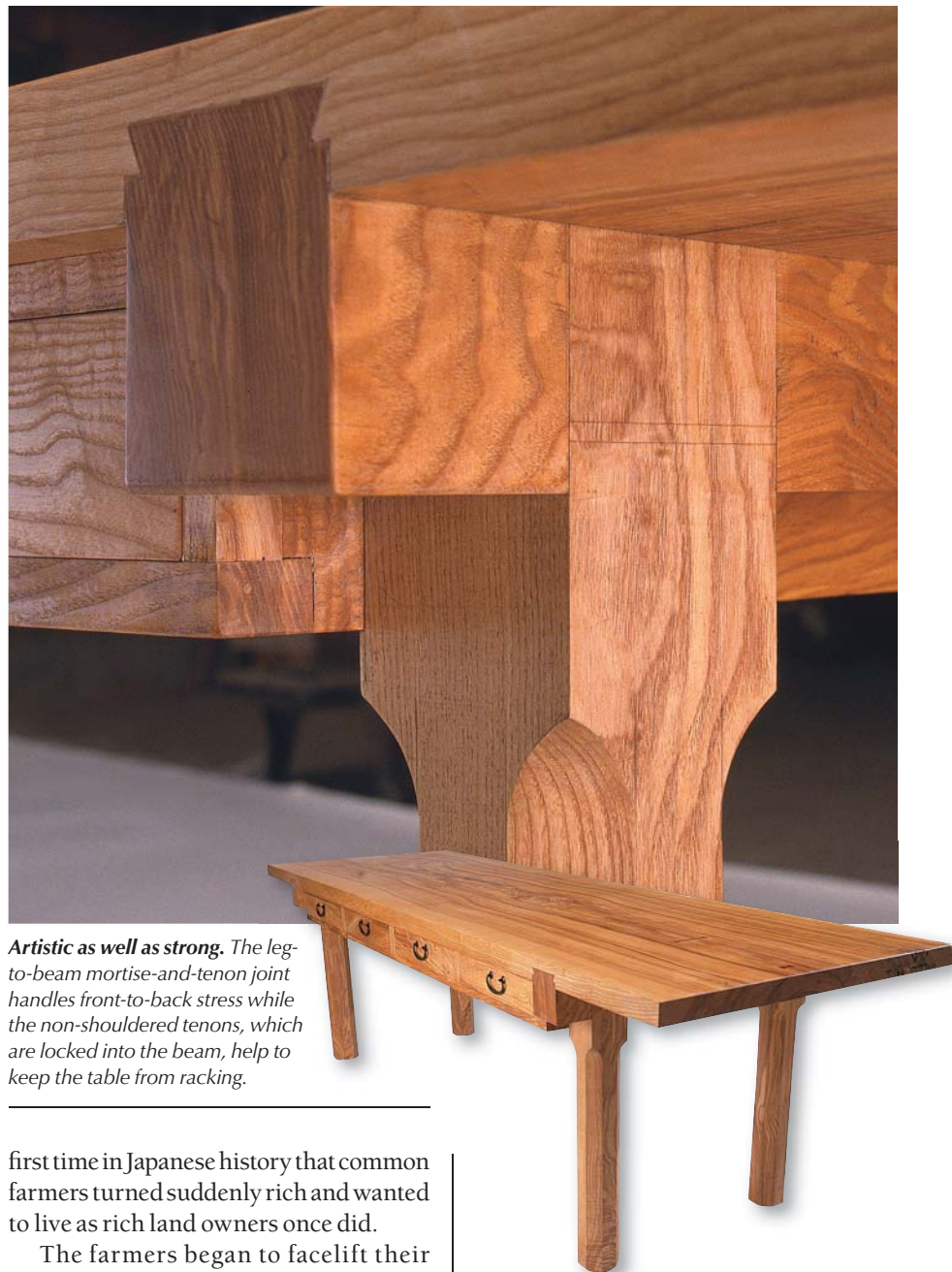
All these years, my assistant, Laure Olender, has not only been working with me doing woodworking, she also takes photographs (including those in this article), edits my articles and assists me at lectures and demonstrations. I thought she was ready to do her own large project from beginning to end. I brought up several traditional Japanese woodworking projects, but every one of them had some small, complicated, technical detail that did not fit well for her first large project.

I came up with the dining table idea and thought this to be the perfect project for her, so we made a plan. I explained all the necessary concepts to her before she started on the project, as I have many wishes, thoughts, traditions and ideologies about this dining table.

Origins Born on a Farm

In a small village in Japan, my woodworking Master and I first made this table for the Magobei household. That table was constructed in a traditional Japanese way; however, unlike Japanese dining tables, its legs were long and Western in style.

During World War II, Japan was struck by a dreadful food shortage. City people would take their belongings and other assets to exchange them for rice, potatoes and other foods. With time, farmers became extremely rich. Finally, the war ended and soon thereafter the new government freed farmers from the feudal-like system by agrarian reform—it was the



Artistic as well as strong. The leg-to-beam mortise-and-tenon joint handles front-to-back stress while the non-shouldered tenons, which are locked into the beam, help to keep the table from racking.

first time in Japanese history that common farmers turned suddenly rich and wanted to live as rich land owners once did.

The farmers began to facelift their houses, the entrance door and the houses' exterior shoji. Magobei was the first in his village to apply these changes, then many other farmers followed. It was also Magobei's idea to have a Western-style table.

Most farmers I knew in this village were barefoot for most of their farming day. The Magobei house had a large dirt floor by the entrance and a wood-burning cooking stove dug in the floor's corner.

From this dirt floor there was a small

wooden veranda-like step that led to the tatami floor. In most Japanese houses, people remove their shoes while on the dirt floor then go up to the tatami floor. Each one in the family had a hakozen, a square wooden tray that held the individual's eating utensils. After serving food on the hakozen, each would take it to the small veranda at the edge of the tatami floor.

There they sat, with the tray in front of them, to eat their meals. Even during the winter months they would eat in this way, but with straw sandals on.

As you may know, Japan did not have a chair culture in its history. A large dining table on the dirt floor with two sitting benches somehow felt exotic, Westernized and contemporary. It brought Magobei pride and happiness. Thus I call the table Magobei's dining table. It became so popular that neighbor villagers followed his footsteps.

The Object of Magobei's Pride

Two beams are secured to the tabletop with sliding dovetails. The legs are positioned and locked into that beam with mortise-and-tenon joints. There is no apron, no brace between legs and no leg-to-tabletop connection. I want no distraction with the tabletop. Here is my working procedure for this table: Begin with the tabletop, work the sliding dovetail beam and finish with the legs. Under my supervision, Laure will physically execute this table from beginning to end. Ash is the wood we chose.

Since I acquired the ash logs used for this dining table, many years have passed by. My original plan for this wood has progressed slowly, but well. I have made two small boxes for my friend's young daughters, a part of my sculpture and produced a traditional Japanese geta-bako, or shoe cabinet. I also have a traditional Japanese kitchen cabinet, a mizuya, in progress.

This ash is quite old and even though it looked solid, many parts had lost its strength as lumber. We did not know how thick or wide it could be until it had been planed. The wood was dried for many years in a shaded and well-ventilated area; the wood had the chance to move as much as it wanted to move. By now, it was bone dry. However, once planed, the wood would still move slightly.

Truing the Slab for the Tabletop

Laure started by flattening both sides of the tabletop with a portable 6" power planer – removing warp and twist carefully while trying to keep the top at maximum thickness. The blades were sharpened by hand and had a crown to avoid planer marks.

She used a wide brush soaked with water and brushed the convex side of the plank first, then started planing across the grain while constantly wetting the wood.



A quick trip to flat. A power planer is used to flatten the tabletop, the first pass is run across the grain.

I suggested she use the power planer to shape the slab. When using a power planer for rough shaping, I plane squarely across the grain using the full width of the cambered blade. For the medium work, pull the blade into the tool leaving about 4" exposed then use the plane at a 30°- 45° angle to the grain. And for fine flattening adjust the blade further into the planer (expose about 2½" of the blade), then follow the grain straight. (Another method would be to have three sets of blades to switch during use, each blade with less camber.) She followed my advice, taking down the high points while correcting the slab's warp and twist on both sides.

It was about 90 percent done when we carefully checked both sides of the slab to decide which surface would face up. This decision was a quite difficult one. Commonly, one large board has straight grain (quartersawn) close to both edges and flat grain (cathedral grain) in the center of the board – Japanese woodworkers say the face with the older growth rings (the heart side of the board) is "kiura." The face with the younger growth rings (the bark side of the board) is called "kiomote." Most boards cup toward kiomote.

Commonly, you should use the kiura



It takes two. To trim the end of the top, the circular saw blade was too small to cut through the entire thickness. The cut was completed with a kataba Anahiki-Nokogiri, a Japanese saw.

facing the top of the table, especially when you employ the through-sliding-dovetail beam to secure the top, as the joint is very visible. If kiura is facing up, the edges of the board will press down into the joint. However, if you use kiomote on top, then the board's edges will try to move away from the beam's dovetail edges – there is then a tendency for the joint to open.

After she finished planing, we saw so many defects on the kiura side that we had no choice but to use the kiomote side as the top surface.

In addition, I also had to give up my original idea of keeping the natural edges, as some parts were rotten or lacking in strength. Both edges had to be trimmed quite a lot, and one end was worse than the other. I marked the worst end's maximum width then checked the other end. If I marked the same width on both ends, which is commonly done, then I would have to trim much more of the wood's healthy portion. I did not have the heart

"I am always doing what I cannot do yet, in order to learn how to do it."

— Vincent Van Gogh (1853 - 1890)
Dutch post-impressionist painter

to do that, so I explained to her that I would keep the maximum width on both ends. One end became 32½" and the other measured 34". The table length is about 108". The 1½" difference in width did not bother my eye or beliefs. I'd rather not take any healthy portions from the tabletop. I marked the maximum size of the tabletop then Laure trimmed its edges with the circular saw. As she was cutting the edges, she went through a ⅜"-diameter lead bullet. It was very soft; happily nothing happened to the blade.

Develop the Dovetail Beam

Now we have to think about the dovetail beam. The tabletop is about 2" thick and 9' long. I decided that the legs and beam

be about 4" x 4" x 36" with consideration for the part of the beam that goes into the tabletop with a tail. Laure used the jointer and band saw to produce all the pieces then she marked the position of the sliding-dovetail beams by looking at the movement of the grain and color. The four legs were chosen in the same manner – the left and right, then the front and backside.

On the bottom side of the tabletop we marked the centerline from end to end with a "sumitsubo," an ink line. From this centerline, Laure marked the table ends squarely on both sides. From the end lines are marked the positions of the sliding dovetail beams.

Around this time of the process, I gave great consideration to the table's weight.

The table design had no brace for its legs and no apron under the table, so I could not depend on just the tail to steady the legs. I decided to sink part of the beam, with the tail, into the tabletop. That provides greater strength in the connection.

We decided on the tail's angle, and the size and depth of the tail support, before she marked out the lines. Laure used a circular saw, chisels and a narrow Japanese plane to remove the waste. She checked flatness with a straightedge to produce the tapered sliding-dovetail groove.

Next, she marked the beam's tapered sliding dovetail with a marking gauge and knife, and used the table saw to roughly notch out the tail.

Using a "hifukura" plane and a chisel,



It's not all handwork. A jointer squares the sides of the beams and legs before sizing them with the band saw with a 2"-wide blade.



No secret here. Cuts with a circular saw ease wood removal at the center of the tail socket. Create sharp corners using a dovetail chisel.



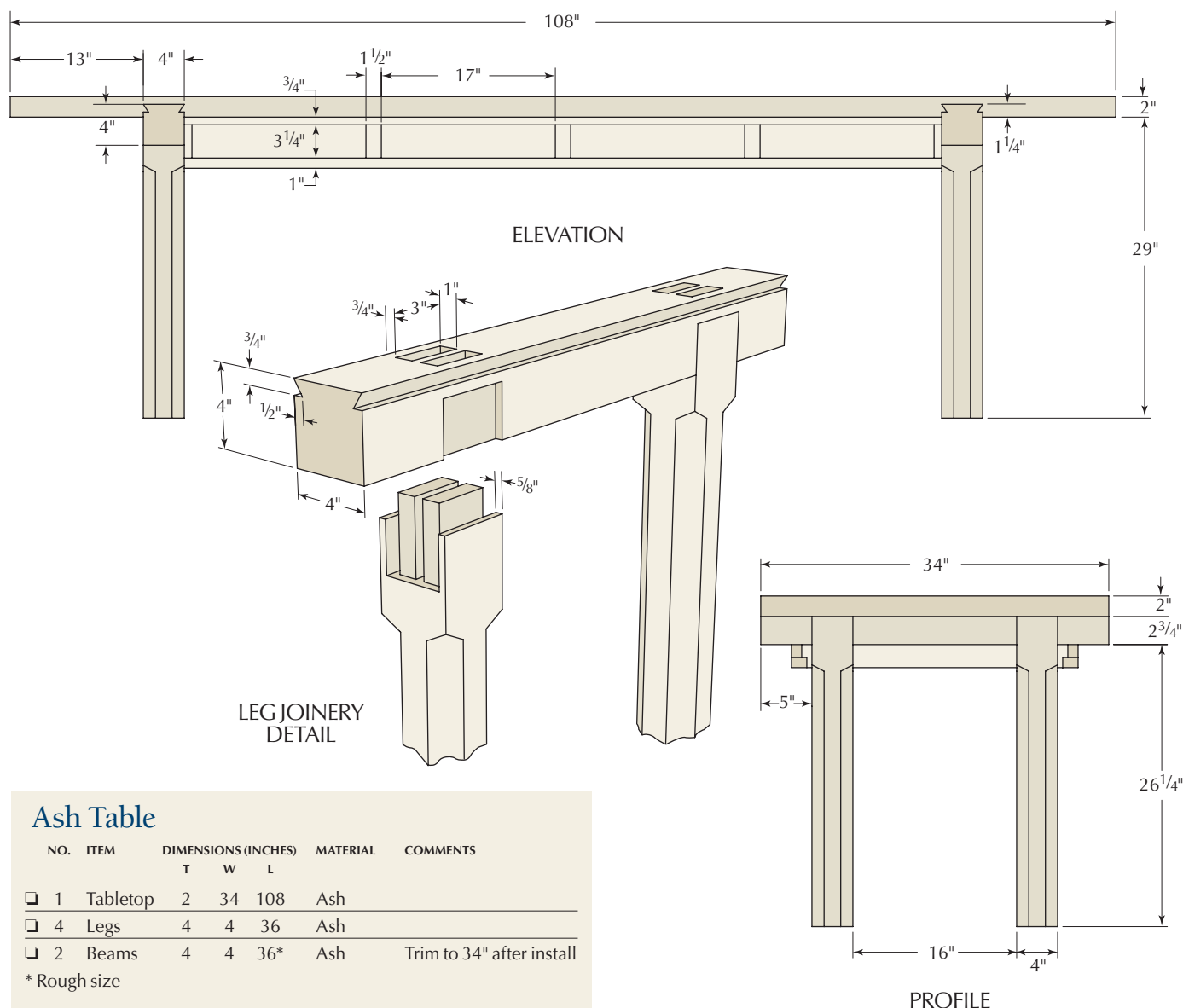
Smooth slides best. The bottom of the tapered pin groove is best flattened with a handplane.



Hybrid woodworking. Use a table saw to roughly notch out the tail, then use a hifukura plane and a chisel to finish both tails, testing the fit as you work.



Aye, aye, commander. Dry-fitting a sliding dovetail into the table's tapered pin groove takes a big hammer – and a steady eye as you swing.



Ash Table

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
1	Tabletop	2	34	108	Ash	
4	Legs	4	4	36	Ash	
2	Beams	4	4	36*	Ash	Trim to 34" after install

* Rough size

Laure finished both tails, but struggled while manipulating this material. I did not have much knowledge or experience with ash, so I could not give her much advice. In spite of this, she accomplished the process after many adjustments.

She mainly worked manually; I thought that was very important for her. She finished very nicely the pins and tails of the joint then cut a large chamfer on both ends of the tail beam before she pounded the beam into the groove using a Japanese wooden commander, a really big mallet. If the beam fit is too tight, take it out and make an adjustment. Then another and another

I reminded Laure that we used the tabletop upside down (kiomote on top) so she

had to make both ends quite tight. It was not easy to pound with a commander. With great effort, both beams finally reached their final position and each extended beyond the table about 3" on both sides.

Not Just Regular Mortise-and-tenon Joints

We had to mark the position of the legs. First Laure marked the table edge all around the beams then she decided on the legs' positions. Like I said before, this table does not have an apron or leg brace, therefore all the stress comes to this point, so I designed this joint to be able to take the stress from all angles.

I utilized double mortise-and-tenon joints and placed a non-shouldered tenon



Eye-catching and strong. The mortise work for the leg-to-beam joinery is complex in design but uncomplicated to produce.

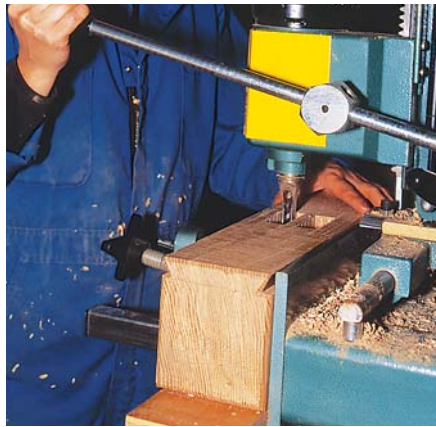
on both extremities to sandwich the tenon joints. The non-shouldered tenon is flush with the side of the beam. In this way, the table is secure in length and width.

Laure pounded the beams out and marked the mortise positions, then marked cosmetic shoulders. She roughly excavated the waste from both sides with a mortise machine and bit, then cleaned the mortises from both sides using a Japanese chisel.



Layout in spades. A few modifications to your marking gauge makes repetitive layout quick and easy.

She notched down about $\frac{5}{8}$ " for the non-shouldered tenons that give extra support to the legs, then removed the material to leave a smooth surface.



Machined breakthrough. Roughly drilling mortises into the beam, halfway through from both sides, opens the slots with ease. Use a chisel to accurately clean the mortise for final fitting.

Leg Tenons to Match

Laure cut the end of the legs cleanly and squarely, then marked for the tenons. Next, she ripped the legs' tenons with a Japanese hand-held rip saw and removed the material between using chisels.

She then marked the exact tenon widths on both sides of the tenon cheeks.



Quite a relief. The non-shouldered tenon fits flush with the beam's face. The mortise is easy to complete if you kerf the waste materials prior to the chisel work.



Test your skills. Sawing the tenons from the leg with a Japanese rip saw requires a sharp saw, a steady hand and a good eye.



Meet in the middle. Removing wood from between the tenons doesn't have to be pretty. Work in from both sides and work tight to your layout lines.



A workable road map. The octagon layout determines your chamfered corners, and the lines set with the marking gauge determine the final surface.



Quick, but not final. The table of a band saw is tilted to 45° to rough-cut the leg corners. Get close to the line, but complete the work with hand tools.



Finesse the final surface. A drawknife, chisels and a handplane are used to cleanly finish the octagonal shaped legs, including the lamb's tongue.



Dressed for driving. Chamfer the leg's bottom edges to receive the pounding commander. By not hitting the edge wood fibers, you will save the integrity of the legs.

She could not saw these lines, so she used chisels to remove the material, following the lines very carefully. Then she chamfered all the tenon ends.

She chose an octagon for the leg shape. Out of hard cardboard, Laure made an octagonal template then traced it onto the bottom end of the legs. She used a marking gauge to draw the line up the face of the leg until it was 2½" below the beam line. There she drew lamb's tongues to not disturb the tenons.

She tilted the band saw table to 45° and adjusted the fence to make the cuts up to the lamb's tongues.

That gave the legs a rough octagonal shape. With a drawknife, Japanese plane

and chisel, she cleanly finished the octagonal legs and lamb's tongues.

The end of the legs were chamfered to receive the pounding commander.

The mortise-and-tenon joints are assembled with glue and wedges. She needed to cut a little slit for wedges on the tenon; however the non-shouldered tenons are on both sides of the center tenons, so it is difficult to use a saw to rip the slits. However, these outside tenons terminate at the bottom of the tabletop, hence the center tenons will be longer than the outside ones. She cut the outside tenons to their exact length and then ripped the slits with a small Japanese rip saw. All the legs were fitted and the joints adjusted.

After she cut and planed every part, Laure used a palm sander to smooth all the legs, sliding-dovetail beams and the bottom surface of the table. She was ready to assemble, with glue, the legs to the sliding beams. She pounded in one leg at a time – the tenons, coming out of the beam, were tightly fit. She then hammered and glued



Table leg smackdown. To handle the stresses of use, the mortise-and-tenon joinery has to fit tight. Here the legs are persuaded using the pounding commander.



No turning back. This completed leg-to-beam joint is not going to work loose under stress. Once the wedges are glued in place and the extra tenon length is trimmed, the joint is pleasing to the eye and strong.

One more time.

The beams, with the legs attached, are again pounded into the tabletop. The beam's ends are then cut flush with the edge of the slab.



the wedges into the slits, then left the leg there to assemble the next one. She then returned to the first leg to cut and plane the tenons flush with the beams. The second leg is finished in the same manner.

Laure cleaned and sanded, with a palm sander, the non-shouldered tenons. Before the final assembly, I suggested that she plane the top of the leg's tenon a few more times so in the future the tenons will not touch the tabletop. Then she was ready to pound the beam into the top for the final time. I held the other side of the table.

She pounded the end of the beam while the legs gradually moved toward the center of the table. The dovetail was quite tight. Finally the beam mark came to the edge of the table. Everything went well.

She measured the length of the legs evenly and squarely, then marked and cut the legs with a Japanese saw. The octagon edges are chamfered then the end grain was planed. A larger chamfer was then cut all around the end of the legs. **PWM**

In Part 2 (which will be in the October issue) construction wraps up and finishing is complete – but a major design concern creeps into Toshio's thoughts; it's a near nightmare. He and Laure devise a plan to increase the strength of the table without giving in to aprons or thick braces. The solution involves hidden joinery and a masterfully built structure that serves multiple purposes.

As an author, lecturer and teacher, Toshio has been pivotal in spreading knowledge about Japanese tools and woodworking techniques throughout the Western world. He is a sculptor, woodworker, former professor at Pratt Institute, and the author of "Japanese Woodworking Tools: Their Tradition, Spirit and Use" (Linden) and "Making Shoji" (Linden).

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Designing by Foot, Hand & Eye

BY JIM TOLPIN

Empirical, not Imperial,
is the measure of the
pre-industrial maker.

In this article I'm going to show how I design a simple piece of furniture whilst immersed in the mindset of the pre-industrial, hand-tool artisan. Because I'm not going to use power tools to build the piece, I can shelve my usual, machine-oriented design process to develop it. This means I won't be bothering with drafting up (or SketchUp upping) numerically defined drawings in order to generate cut-lists because, as you will see, I simply don't need them. Machines need numbers—the hand-tool artisan doesn't.

I start by roughing out concept sketches that satisfy the essential parameters of function and aesthetics that are the “givens” of the project. When I come to an iteration that looks good enough to pursue, I draw a full-scale rendering of it – and from there construct a cardboard mock-up that allows me to view the piece not only in three dimensions, but placed so I can look at it in the way it will be viewed in use. (Often, real-world views elongate or foreshorten planes and details in ways that are not obvious in drawing elevations.) Once satisfied with the mock-up, I commit the design to the traditional, analog recording system of tick sticks and templates. No tape measures or rulers of any kind are harmed in the creation of this design!

“Everything is expressed through relationships.”

— Piet Mondrian (1872 - 1944)
Dutch painter



Personal design. This small stool, designed by eye and built by hand, satisfies my four criteria: Sized to fit my foot and step; stable for all potential foot positions; durable and strong enough to support more than my weight; and offering a non-slip step surface.

For Whom the Stool Toils

If I'm avoiding numbers, how am I going to derive and define the dimensions of this piece of furniture – in this case a simple step stool for my shop? Well, this is where it gets interesting.

Because this stool is to fit me in size and use, I can call on my body to provide all the primary dimensions. This is how it works: The human frame can be roughly proportioned in whole-number ratios of eight. We are eight of our hand-spans (with arms outstretched) wide and eight hand-spans high. Our head is one-eighth of our height. Our centerline to shoulder is one-eighth of our width, and our foot length comes out to be five-eighths of our shoulder span. (This latter relationship happens to make

the step board come out to be close to the infamous, and inherently attractive, golden rectangle.) So in designing this step stool I develop its basic dimensions, as well as the location of structural intersections, around ratios of eight. Not just any eighths though: I use my own hand-span to provide the starting point information – after all, this stool toils for me!

The Particulars of the Parameters

The need here is to build a durable and stable, single-step stool for my own use in the shop – it will give me just enough lift to reach the top rack of my lumber storage and a few high shelves. To prevent slipping off the stool, I want some kind of textured surface on the step board. For aesthetic

appeal I envision tapered angles and lines softened with curves. So here is the list of “givens” for this project:

- Optimized in dimensions to properly fit my body
- Stable no matter where I place my foot
- Durable and strong enough to support my full weight
- Non-slip step surface

Here’s how I intend to meet the givens: To provide stability, the step board should be about shoulder width in length (because the weight of our body, transferred through our feet, inherently falls under our shoulders.) To offer a safe and usable width, it should be a foot (that is, my foot!) wide. The height of the stool should be the rise of a comfortable step (again, my step). In the drawing below I show how I lay all this out precisely from the span of one of my hands.

For strength, most any hardwood is adequate to provide adequate bending resistance and to resist distortion in the joints. I avoid softwoods such as cedar and pine because side stress against their low-density grain would likely lead to loose joints and eventual catastrophic failure in the event someone jumped on the stool.

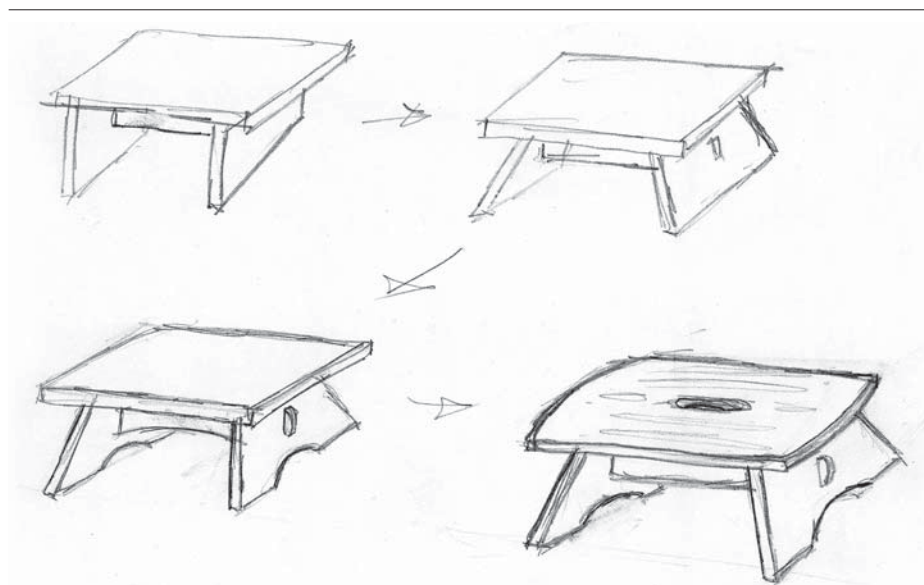
For long-lasting durability that depends on physics rather than chemistry, I’ll fasten the parts of the stool together with joinery that physically locks the boards to one another and does not rely on glue for strength. As you can see in the drawings, I’ll attach the stretcher to the end boards with through-wedged-tenons (which also

provide aesthetic appeal), then attach this assembly to the step board with a pair of sliding dovetails reinforced against side movement with pocket screws. To provide a non-slip surface on the step, I’ll add some texture to the surface by hand carv-

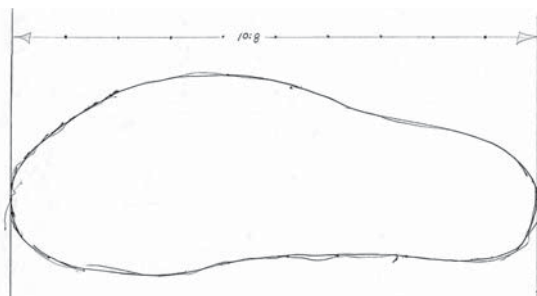
ing a series of grooves across the face of the step board.

Drawing by Eye and by Golly

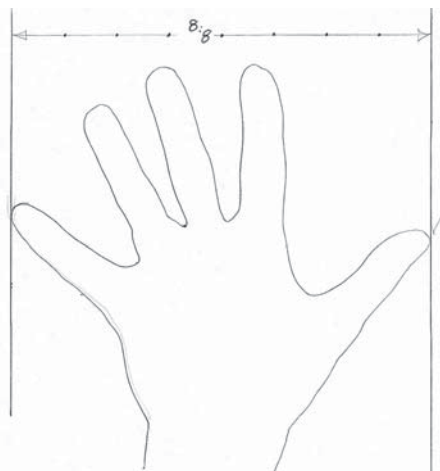
Operating in the pre-industrial artisan mindset I get to let myself go and draw on



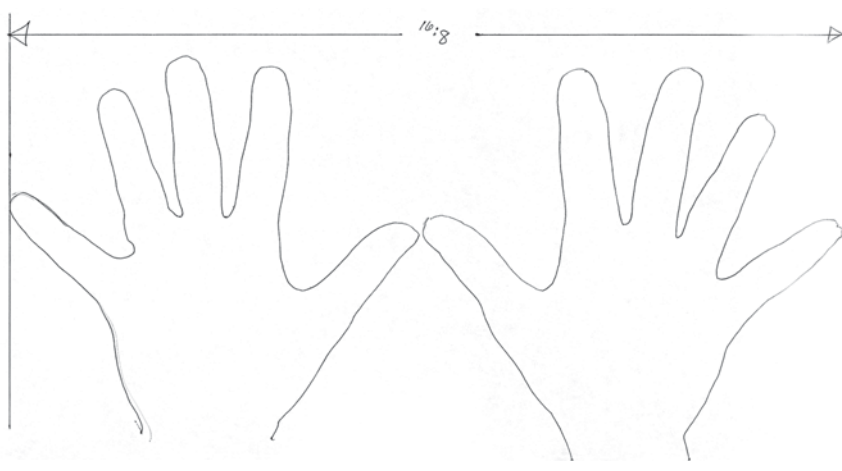
Rough sketch. A thick pencil and a piece of paper is all that’s needed in the initial progression of design concepts.



One foot. The width of my custom stool is one foot – my actual foot, rather than an Imperial foot.



Hand span. Step off the space of one hand with dividers into eighths; then use those eighths to derive every dimension on your stool.

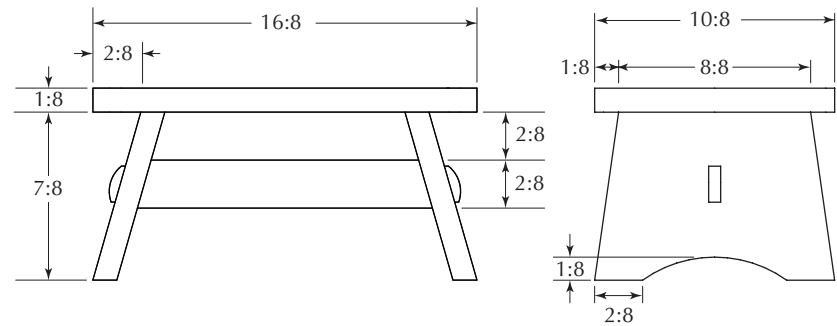


Two hands. The span of two of my hands is a ratio of 16:8. This dimension establishes the overall length of my custom-designed step stool.

the right (I sometimes think the bright) side of my brain – the half that isn't analytical and bound by a lot of rules and precedents. I grab a thick pencil (to forcibly keep myself from getting into the minutia of details) and rough out a perspective sketch that captures the basic functional requirements. I make a progression of sketches until I feel I've captured both the physical and aesthetic demands of the design. While I do strive for accurate perspective and pleasing proportions, I don't worry too much at this point with producing these concept sketches in perfect scale. The next step, drawing out a rendering in three views, brings the concept closer to reality by pinning down the exact sizes and relationships of all the parts in full, true-to-life scale.

Once I have a concept sketch that I can live with, I lay out a piece of vellum (or other see-through paper) over 1" square graph paper and prepare to draw the first full-scale view of the stool: the side elevation. (The graph paper eliminates the need for the cumbersome, slip-prone T-square.)

Now here comes the fun part: At the top of the paper I spread out my left hand and mark the extent of the span from the outside of the little finger to the outspread thumb. I then take the dividers and step out



Computer-rendered. The hand-drawn sketches were too large to reproduce well, so here's a computer-generated illustration detailing the "hand-generated" ratios.

eight portions between these two points. I record this $\frac{1}{8}$ hand-span by making a circle in a corner of the drawing; this trick gives me a way to quickly and accurately reset the divider.

Now note this: Every dimension and major structural intersection of this little piece of furniture will be based on so many eighths of my handbreadth! The result is three-fold: The stool will be easy to proportion using a set of dividers; it will fit my body perfectly; and, because the size of all its parts and portions relate in some whole-number ratio to one another, this piece of furniture is practically guaranteed to look pleasing and satisfying to the eye.

After drawing a base line I make a starting point then step out two handbreadths to establish the overall length of the stool. I draw out perpendicular lines to the base at this point by geometry or by simply eyeballing to the underlying graph paper. A safe and comfortable height of a step stool should be the rise of a natural step for the human frame, which is $\frac{1}{8}$ of its height (which also conveniently happens to be a handbreadth).

So to mark the height, I simply step up one handbreadth on each perpendicular line with the dividers and connect the marks with my drawing stick. Because the drawing stick is a sample of the stock

Tool List

For drawing:

- ☐ My hand (and foot!)
- ☐ Drawing surface and paper (vellum is ideal)
- ☐ 1"-square-gridded graph paper (available from EAI Education, Franklin Lakes, N.J. eaieducation.com/531109.html)
- ☐ Straight-edged drawing stick (a straight-edge piece of stock trued to the thickness of the stock from which the stool will be made)
- ☐ Square
- ☐ Dividers – at least two plus a compass (a divider with pencil)
- ☐ Trammel points
- ☐ Bevel gauge (the thin, Japanese-type recommended)
- ☐ Pencil (standard #2 or mechanical with .07 lead) and white plastic eraser

For making a mockup:

- ☐ Cardboard sheeting (no folds if possible)
- ☐ Packing tape (brown) and masking tape (blue or green)

For transferring layout to stock:

- ☐ Story stick material (light-colored wood $\frac{1}{4}$ " x $2\frac{1}{2}$ " x 24")
- ☐ Stock for template ($\frac{1}{8}$ " plywood or thick Mylar)



Simple needs. My drawing system is simple: a sheet of vellum spread over graph paper marked with 1" squares. By following the underlying crosshatch of lines I can easily create straight lines and right angles. Note that I'm using a tick stick to transfer the "hand-span" dimension to the drawing.

from which I'll make the stool I can draw the exact thickness of the top by tracing on each side of the stick.

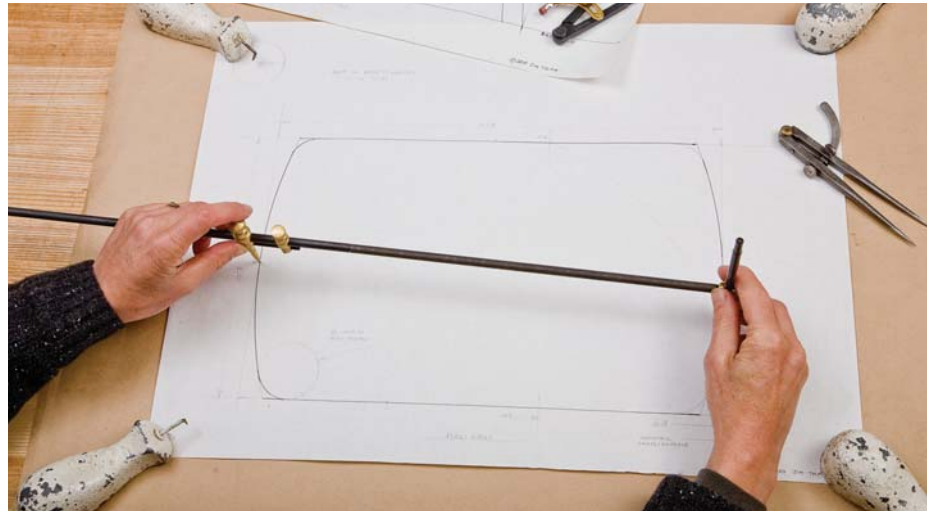
Next I draw in the end boards. The final concept sketch indicates that the ends are canted inward at the top—both for aesthetics and to increase stability and durability by triangulating the stresses that will be placed on the joints. I quickly see that I don't want the ends to extend past the top step board (I don't want to trip on them), but at the same time I want the base to be as wide as possible.

The obvious solution is to make the foot of the ends even with the ends of the step board. But how much should they cant in? Just by eyeballing I can see what's too much and too little. What happens to be just right to my eye is, conveniently enough, two-eighths of my hand span. I step this distance in with a divider, then use my drawing stick to outline the side view (and exact thickness) of the end boards.

Now what about the stretcher? My concept sketch indicates that it should be located about halfway between the floor and the top of the bench. But how wide should it be and how far should it sit below the step board? Again, two-eighths of my hand-span seems to fit the bill in both cases. I also go ahead at this point and draw in the through-wedged tenon and add a nice little detail: a curve to the end of its tenon.

To create the end-view, I simply extend the base and height lines I established in the side view. Because I'm setting the width of the stool step to the length of my foot—which is about $\frac{1}{6}$ the height of the human frame—I step out ten eighths of my handbreadth. (I'm rounding off one-sixth when I step off 10 out of the 64 eighths that make up my full height.)

To ascertain the cant-in of the end boards, I try going in two-eighths of a handbreadth as I did on the side view, but on the end view it looks too steep. Instead, I use the same ratio, but I make it relative to the width of the top. Now the cant-ins are one-eighth of the length and one-eighth of the width. To me, the cant-in now looks just right. I then try two-eighths of the width to set the width of the feet on either side of the arch and I step out one-eighth on the centerline to determine the apex (height) of the arc. That also looks good. I then draw the arc using a compass and straightedge to find its focal point.



Big arc. To draw an arc with a larger radius than can be set on a compass, I use a set of commercial trammel points. This version from Lee Valley features a vernier adjustment for setting the focal point pin. The other end has a fixture for holding a pencil.



Centered approach. To transfer the length of the mortise along the centerline, I set the dividers to the drawing ...



... then move the divider to the centerline drawn on the template.

However, because the end board is angled inward, its true length isn't expressed in this face-on view – it's foreshortened. To draw the end board to its true dimension so I can make a layout template, I need to “expand” the drawing to show the angles on the ends of the end boards. I also redraw the arc on the expanded view.

Make up a Mock-up

At this point, rather than going any deeper into detailing the full-scale rendering, I find it best to create a full-scale, three-dimensional mock-up of the piece so I can view it more true-to-life and from all angles. I transfer the overall dimensions from the full-scale rendering to the sheets of cardboard via a tick stick and a square. Note that I use the expanded view of the end boards rather than the elevation. After cutting out all the parts, I make slits for the “tenons” of the stretcher and then assemble the mock-up using brown packing tape.

Now that I have a 3D form to play with, I set it on the floor (where it will live most of its life), observe it carefully and start asking questions: Do the proportions look right? (They do.) Does the through-tenon show fully, or does the overhang of the



Divide and conquer. I often create a thin plywood template to represent components with angles and/or curves. The end boards of this step stool have both. To avoid the tedious and error-prone measuring process, I transfer all the dimensions from the drawing to the template using a pair of dividers.

step board partially hide it? (It does show OK.) Would the step board look a little less severely rectilinear if I curved its ends a little? (Don't know, let's try it.) I add a strip of masking tape to quickly and effectively

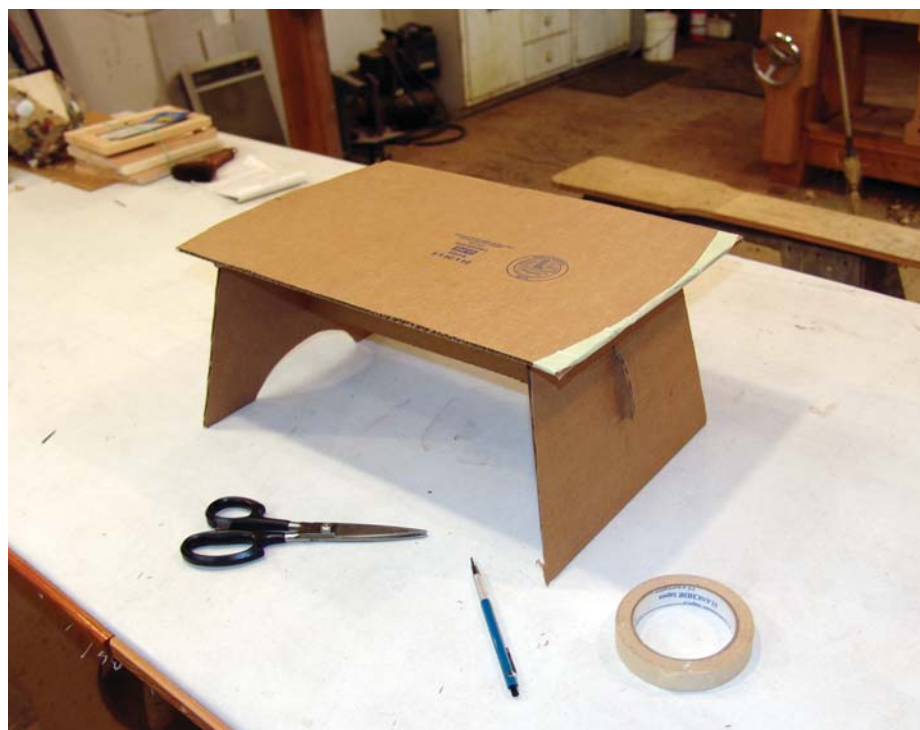
outline the curve without having to commit to cutting the cardboard.

As it turns out, the curve helps considerably, and I discover that the most graceful curve seems to be conveniently generated by making the curve a portion of a circle of which the focal point is at the centerline at the opposite end of the step board. I try the tape trick on the bottom of the stretcher but a curve there seems to be overkill and I overrule it. I'll probably just make a chamfer of variable width along its bottom edge that just hints at a curve.

When I'm satisfied with the mock-up, I transfer any new information and design resolutions back to the full-scale rendering. I also finalize the location and cross sections of the joints, including choosing a width for the tenon of the stretcher that is “tool slaved” – that is, of the same width – as one of my mortise chisels.

Let's Make a Record

To lay out the components of this piece of furniture on the stock efficiently and with near-infallible accuracy, I create an analog – that is, a physical rather than a numerical – recording of the sizes of the components, the locations of their intersections, and the size and angles of the joints. On the story stick – which is simply a clean, straight piece of wood about 1/4" thick by 2 1/2" wide by a couple feet long –



Mock-up. I nearly always mock up a furniture project so I can observe it from all angles in three dimensions. And because a step stool spends its life on the floor, I'll move the completed mock-up to the floor to observe it as I assess the design.

I mark and label the length and width of the step board and the stretcher. I also record the location and the angle of the cant of the stretcher tenon's shoulder line. To record the exact size and details of the end boards, I make a template out of 1/8" plywood "doorskin."

At this point I won't need the mock-up

anymore and I can throw away the rendering if I wish. I also don't have to worry about losing the cutlist because there isn't one. All the information I need to make this project – now and forevermore – is fully recorded on one little stick and a small slab of plywood. Creating a design immersed in the mindset of the pre-industrial artisan, I

revel in a place where I get to draw on the bright side of my brain where rulers no longer rule and I am free from the tyranny of numbers! **PWM**

Jim has been working wood for more than three decades and has written a dozen books on the subject. His next, "The New Traditional Woodworker," is due out in April.



Story stick. Once the drawing is done, I make up a story stick to transfer the component dimensions shown on the drawing to the stock. Again, there is no need to take numbered dimensions – I'll simply lay the stick right on the wood and mark the position of the cutlines (which I'll draw out with a square or straightedge).



Captured patterns. I lay the end board template on the stock, working around knots, and encapsulating interesting and appropriate grain patterns – in this case cathedral grain.



The beginning and the end. The completed stool in solid wood next to the cardboard mock-up.

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BLOG: Read more about whole-number ratios on George R. Walker's "Design Matters" blog.

TO BUY: Get all the dividers you need on eBay. Use our custom search to find them.

IN OUR STORE: Purchase Jim's "Measure Twice, Cut Once" from our store.

All of our products are available online at:

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Old Plane Birdhouse

BY CHRISTOPHER SCHWARZ

Every woodworker should spruce up the yard (or the shop) with this simple birdhouse.

I've never been a fan of birdhouses. Why welcome something to your yard that really wants to poo on your head?

Yet, inspiration works in weird ways. While visiting Maine in February I saw an enormous birdhouse that looked like a jointer plane hanging outside Liberty Tool, an ironmonger. I just had to have one to hang above my shop door.

"A boat is not a boat unless it's in the water."

— John Gardner (1905 - 1995)
founder of Mystic Seaport's boatbuilding program

Simple, Quick & Fun

This birdhouse is based on a Marples 14" razee jack plane I own. I scaled it up to 35" long so it would look good above a standard door. If you'd like to make yours bigger, you can scale our model by downloading the free SketchUp file through our web site.

You'll need about 10 to 12 board feet of a weather-resistant wood. I used cypress. And don't forget the waterproof glue and stainless (or galvanized) fasteners.

The whole project takes about three hours, so it also was great therapy for me after coming off of an intense three-month-long project.

Begin by gluing up the wood for the thick wedge and the tote. These pieces



For birds both plane and fancy. This birdhouse would look great in your yard, above the door to your shop or even in your shop.

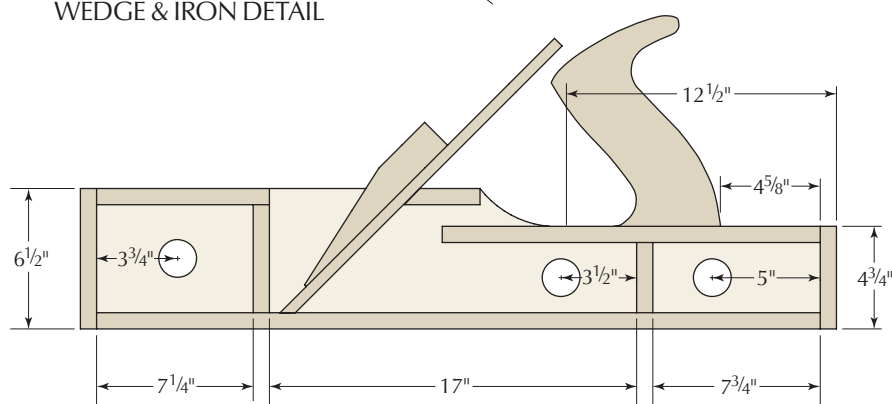
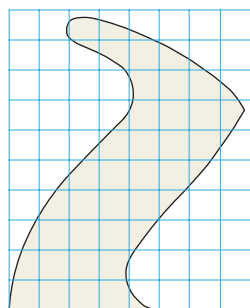
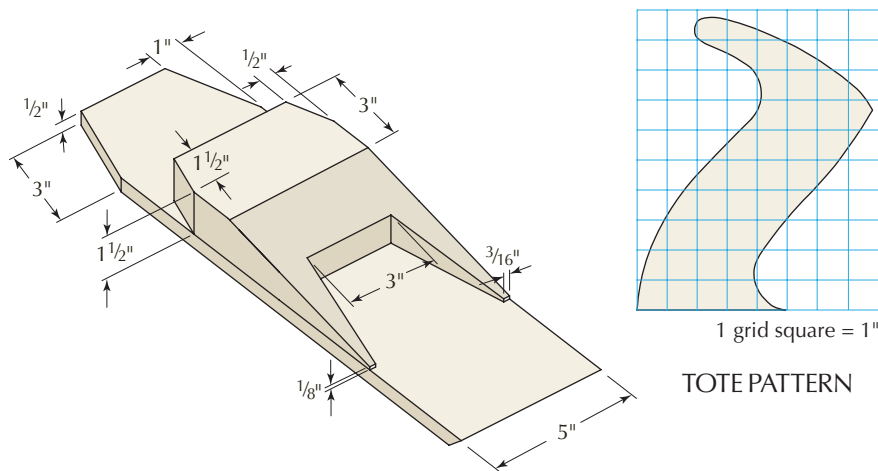
are made by gluing two pieces of stock face-to-face. Clamp them up and set them aside for the glue to dry.

Next Up: The Sidewalls

After ripping all your parts to width, begin by shaping the two sidewalls. Lay out the razee shape on one sidewall using the

drawing as a guide. Cut the shape on the band saw and clean it up with a spindle sander. Then use the first sidewall to lay out the pattern for the second.

Cut that one close, then tape the two sidewalls together and shape them simultaneously so they are identical. I used the spindle sander here as well.



Assembly. What, Already?

Cut the interior parts to size: the toe, heel, top, front of the mouth, frog, divider and sole. Sand or plane them smooth, then get your nails out.

Glue and nail these seven pieces to the sidewall that will eventually have the entrances for the birds (you'll bore those holes later).

Now shape the tote. Remove the thick piece that you glued up earlier from the clamps and cut it to size using the patterns and drawings provided above. Dress it smooth and then screw the tote to the plate for the tote. Glue and nail the finished assembly to the sidewall.

Shape the iron and the wedge using the drawings to guide you. Glue and nail them in place to the sidewall and the frog.

Be Bird-friendly

Drill some ventilation and drainage holes in the sole and in the top of the plane using a 1/4" bit. Then decide what sort of birds you want to attract and drill entrance holes that are based on the species (a quick search on

Old Plane Birdhouse

NO.	ITEM	DIMENSIONS (INCHES)		
		T	W	L
☐ 2	Sidewalls	3/4	6 1/2	35
☐ 1	Toe	3/4	5	6 1/2
☐ 1	Top	3/4	5	8
☐ 1	Front of mouth	3/4	5	5
☐ 1	Frog	3/4	5	3 1/2
☐ 1	Plate for tote	3/4	5	17 1/2
☐ 1	Divider	3/4	5	3 1/4
☐ 1	Heel	3/4	5	4 3/4
☐ 1	Sole	3/4	5	33 1/2
☐ 1	Tote	1 1/2	7 1/2	10
☐ 1	Wedge	1 1/2	5	9 1/4
☐ 1	Iron	1/2	5	18

the Internet will call up the hole sizes for a variety of birds). I want to attract Purple Martins, so I drilled my holes at 1⁷/₈" in diameter.

So that the birdhouse is easy to clean, attach the second sidewall to your birdhouse using No. 8 x 1¼" stainless screws.

To hang the birdhouse, I made a French cleat. One half gets screwed to the sidewall. Its mate gets screwed to the house, right above my shop door.

And what about having the birdhouse hanging over my shop door? That seems stupid. Maybe. But perhaps the threat of some loose-boweled birds will prevent my neighbors from pestering me when I'm working in the shop. **PWM**

Chris is editor of this magazine and married to a crazy cat lady, who just might like the idea of a birdhouse that attracts food (I mean birds) to the yard.

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WEB SITE: View many of the common hole sizes for different species of birds.

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Filling Pores for an Elegant Look

BY BOB FLEXNER

Two methods to create a mirror-flat surface.

Very few woodworkers or refinishers fill the pores of wood anymore. The process is not well understood and it's perceived to be difficult. So if the wood has large open pores, the pitting is usually allowed to show.

This open pored, “natural wood” look has even become quite popular and is often promoted in the woodworking literature.

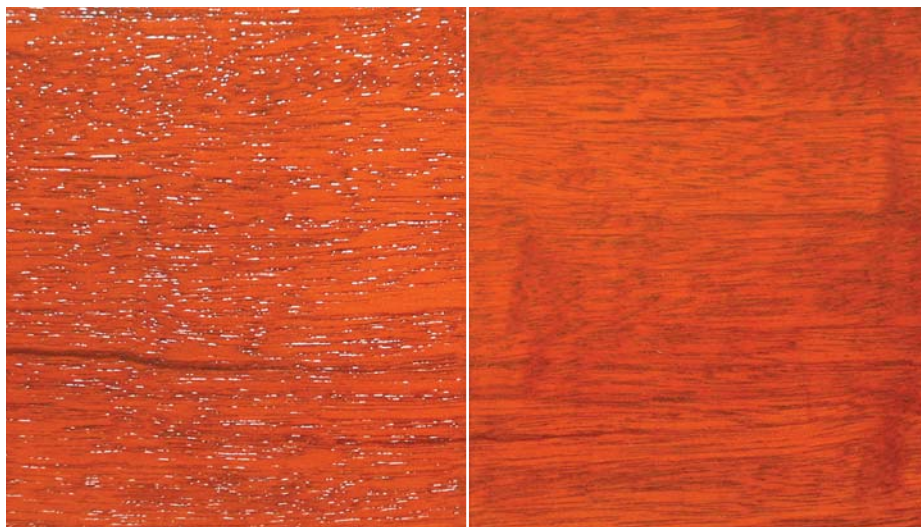
But for some, the natural-wood look creates a less-than-elegant appearance. This is surely the view of companies that mass-produce high-end furniture and most people who buy this furniture. For the last 150 years, in fact, most better-quality, factory-produced furniture has had its pores filled to create a “mirror-flat” appearance.

Better-quality furniture in the past was made largely from mahogany, walnut or quarter- or rift-sawn oak. It's these and other woods with similar pore structures that look better with their pores filled (in contrast to plain-sawn oak, for example, which is difficult to get flat because of the wide segments of deep grain).

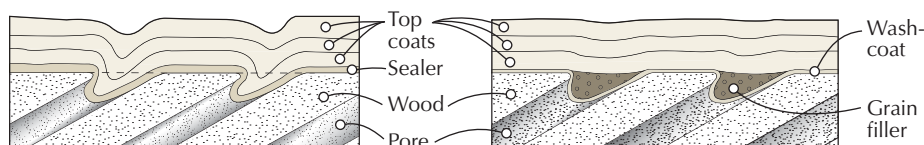
If you use these woods to make furniture or you restore old furniture and you want the wood to look its most elegant, you need to know how to fill pores.

Two Methods

There are two ways to fill pores in wood to produce a mirror-flat finish. One is to apply many coats of a film-building finish such as lacquer, shellac, varnish or water-based finish then sand them back (a little after each coat, or a lot after all the coats) until the pitting caused by the pores comes level. The other is to fill the pores almost level



Unfilled vs. filled. The difference on a wood such as this unfilled mahogany surface (left side) and a filled mahogany surface (right side) is striking. The pores on the unfilled side break up the light creating a raw look. The filled side looks richer, deeper and more elegant.



Unfilled pores. Topcoats follow the contours of this unfilled wood surface.

Filled pores. You can use grain filler to fill pores almost level. But to get the surface perfectly mirror-flat, you still have to sand a little.

with grain filler (also called “paste wood filler” or “pore filler”) then complete the filling by sanding the finish level.

The first method is fairly effective with alkyd and polyurethane varnish, and with water-based finish, because these finishes build rapidly. It's often less work to leave out the filling step with these finishes.

But with lacquer and shellac, it's definitely more work using only the finish to fill the pores. It is also wasteful of finish material and sandpaper, and the finish shrinks back into the pores more over time than if grain filler is used.

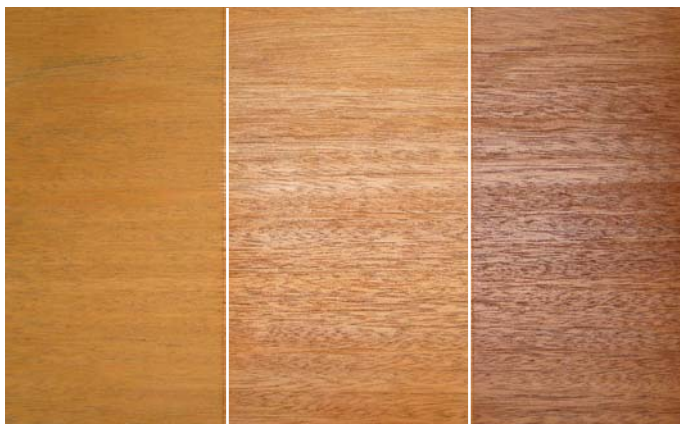
Keep in mind that until recently, with the introduction of water-based and high-performance two-part finishes, the furniture industry and most shops have always used either shellac (until the 1920s) or lacquer (since). So most discussion of filling pores has always been connected with these finishes.

If you use shellac or lacquer on a wood with a pore structure resembling mahogany, you should consider using grain filler. If you use varnish or water-based finish, you could experiment with both methods to see which you like best – or simply not mess with grain filler at all.

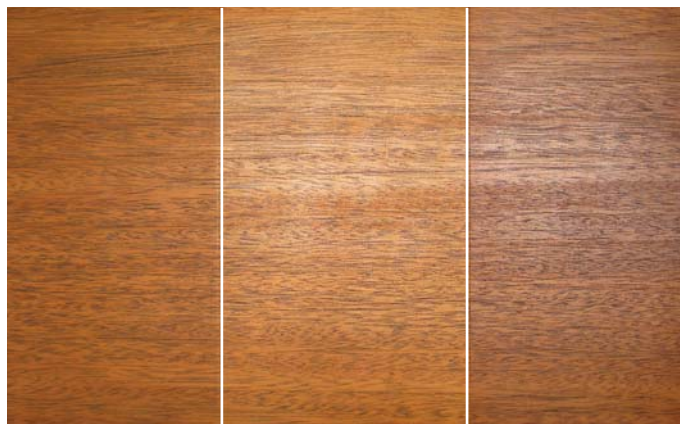
Filling With Finish

There's nothing complicated about filling pores with just the finish. It's simply a matter of applying enough coats so you don't sand through when sanding them level. You won't know how many coats is enough without trying first on scrap because woods vary and people vary in how thickly they apply each coat. Four to six coats of varnish or water-based finish should be enough, but more will be necessary with shellac and lacquer.

For instructions on sanding and rubbing a finish to the sheen you want, please



Before filler. The three situations for applying grain filler are (from left) over unstained and unsealed wood, over unstained and washcoated wood and over stained and washcoated wood.



With filler. A walnut-colored grain filler stains and fills the unsealed wood at left but fills and colors only the pores of the washcoated wood in the middle, and the stained and washcoated wood at right.

refer to “Rub to Create a Great Finish” in the August 2006 issue (#56) or online at popularwoodworking.com/finishing.

With both alkyd varnish and lacquer, dedicated sanding sealers are available that are much easier to sand than the finish itself. Sanding sealers contain a soap-like lubricant that causes the finish to powder rather than clog sandpaper, so it’s easier to bring the pore pitting level with sanding sealer than with varnish or lacquer.

But sanding sealer causes bonding problems if applied thick, so you shouldn’t apply more than one or two coats. A trick, if you decide you want to fill the pores with sanding sealer, is to apply a full coat of the varnish or lacquer first, then apply several coats of sanding sealer on top.



Finish as filler. To fill the pores of wood and keep it looking as natural as possible, without any color in the grain, use just the finish and sand it level after many coats. To speed the sanding of alkyd varnish and lacquer, apply a coat of the finish, then several coats of varnish or lacquer sanding sealer. Then sand off the sanding sealer, as I’m doing here, until you reach the resistance of the varnish or lacquer. You are filling the pores with the sanding sealer.

Sand the sealer using non-steared sandpaper until you reach a little resistance, which tells you that you have reached the varnish or lacquer. Then stop sanding so you don’t sand through. This technique will eliminate the build of sanding sealer that could cause problems.

Water-based finish and polyurethane varnish sand fairly easily, so no sanding sealer is necessary – or even available.

Grain Filler

I’ve heard of people using all sorts of products to fill grain, including wood putty, plaster-of-paris and joint compound. I can understand how these could be made to work, but they provide very little working time, especially in warm or hot temperatures. At least with shellac, lacquer and varnish, oil-based grain fillers are a lot easier to use.



Thinning filler. To thin oil-based grain filler to make it easy to brush or spray, use mineral spirits to add more time for large surfaces or naphtha to speed up the drying on small surfaces. You can also mix the two thinners to get something in between. Thin to a brushable consistency.



Brushing. The most efficient method of applying grain filler is to brush or spray it to get an even thickness that hazes uniformly over the surface as the thinner evaporates. A thinned grain filler soaks into the pores on its own. If you apply the filler thick with a cloth, you should press it into the pores as you wipe.



Hazing. When the grain filler hazes, it's ready to be removed. Removing the filler before it hazes will result in more shrinkage in the pores as the remaining thinner evaporates.



Rag wiping. One method of removing the excess grain filler is to wipe with a cotton cloth across the grain so you pull less filler out of the pores. If you time it just right, the filler will still be soft and moist enough to remove easily with the cloth. Finish by wiping lightly with the grain to remove streaks.



Burlap wiping. If the grain filler has hardened too much to be removed easily with a cotton cloth, use burlap instead. Burlap is coarser but not so coarse that it scratches the wood. On turnings, carvings and inside corners, use a stiff brush or sharpened dowel to remove the excess filler.

These fillers are made thick with a high percentage of solid material (usually silica) added to some oil (which acts as the binder) and a little thinner.

A few brands offer grain filler in colors, but most fillers are available only in “natural” to which you have to add a colorant. Adding color is critical with oil-based fillers because they don’t “take” stain well after they have dried.

You can add any colorant to oil-based grain fillers, including Japan, oil and universal colorants. Use universal colorants with water-based fillers. These are the same colorants paint stores use to tint latex paint. Don’t use a dye colorant because it could fade and leave the filled pores lighter than the surrounding wood.

You can also add stain to the filler to get the color you want, but this is not usually the best practice because it locks you into the evaporation rate of the thinners in the stain, which may not be what you want.

Also, the stain may contain dye, which could fade.

Usually, a walnut color is best, but there are situations where you might want another color, such as white for a pickled effect.

In most cases it’s best to thin the grain filler to make it easier to spread or spray. Use mineral spirits or naphtha (for faster evaporation) with oil-based fillers and water with water-based fillers. You can apply grain filler successfully at any consistency. I like to thin it about half to an easily brushable consistency.

All commercial brands of grain filler I’ve tried, which is most, work well; the critical difference is drying time. It’s best to adjust your work rhythm to the drying time of the product you’re using, but you can also add a little boiled linseed oil (to slow the drying) or some Japan drier (to speed the drying).

It’s not easy to change the rapid drying

of water-based fillers. Temperature and humidity will be critical.

Sealing First

Instructions have created confusion about whether or not to seal the wood before applying the grain filler. Unquestionably, the best practice is to seal first. But before discussing why, I want to discuss “seal.”

A sealer coat is a first coat of finish. It can be any finish, but it’s usually the same as you’re using for the topcoats.

If this sealer coat is applied heavy, it will round over the pores and more of the filler will be pulled out when you wipe off the excess. So it’s best to thin this first coat to create what is called a “washcoat.” A washcoat is about 10 percent solids content, which translates to varnish thinned with about two parts mineral spirits (the same as “wood conditioner”), lacquer thinned with about 1½ parts lacquer thinner and shellac thinned to about a ¾-pound cut.



Scrape off. An efficient method of removing the excess grain filler is to scrape it off with a plastic spreader. Then follow with a cotton cloth or burlap. Whichever method you use, finish by wiping lightly with the grain to remove streaks.

Water-based finishes don't work well when thinned with a lot of water, so use a commercial water-based washcoat or wood conditioner instead of doing the thinning yourself. Or apply the water-based grain filler directly to the wood as I describe below.

A washcoat will leave enough film build to block the color in the filler from getting through to the wood while leaving the top edges of the pores sharp enough so more of the filler will remain in the pores. It's not necessary to sand this washcoat, and in fact you shouldn't because you might sand through.

The best practice, therefore, especially with oil-based grain filler, is to stain the wood, apply a washcoat, then apply the grain filler. Here are the reasons:

- You'll get better contrast between the pores and the wood, which will create more depth.
- The surface will be slicker so it will be easier to wipe off the excess filler.
- The washcoat will create a cushion so you're less likely to sand through stain if you have to sand off some streaks of filler later.
- A washcoat makes it possible to apply filler to small areas at a time without getting lap marks, which are darker-colored streaks caused by overlapping.

"There are two kinds of people, those who finish what they start and so on."

— Robert Byrne (1930 -)
American author and champion billiards player

■ If you don't get all the filler removed before it begins to harden, you can remove it with solvent (mineral spirits or naphtha for oil-based and water for water-based) without also removing some of the stain.

On the other hand, you can skip the stain and washcoat and use a colored grain filler to stain the wood and fill the grain in one step. There is nothing wrong with doing this.

With water-based grain filler a case can be made for applying the filler directly to unstained wood. Then scrape or wipe off as much of the excess as you can and sand off any remaining after it dries. Use colored grain filler as a combination stain and filler. Or use natural grain filler, then apply a stain after you have wiped and sanded off all the excess. Most brands of water-based grain filler take stain fairly well.

I've applied water-based grain filler both ways—over a washcoated surface and directly to the wood. I like the first method best, but I sometimes use the second with colored filler. The second doesn't produce the depth the first does, and neither method using water-based grain filler produces the depth the oil-based system does.

Other Considerations

Because you can't wait until all the thinner has evaporated from an oil-based grain filler (or it will be too hard to remove), there will always be some shrinkage. So you will always get a more level filling with two applications—the second after the first has dried overnight.

If you are spraying lacquer over an oil-based grain filler, spray the first coat or two very light, even to the point of just "dusting" the finish by holding the gun farther from the surface and moving it faster. Try to avoid wetting the surface excessively. A wet coat will cause the filler to swell and push up out of the pores. Sanding to level the surface then removes some of the filler and leaves the pores partially open.

You could also apply a coat of shellac between the filler and lacquer coats. The alcohol in the shellac won't cause swelling and the shellac will slow the penetration of the lacquer thinner that is causing the problem. Unlike the other finishes, the thinner in each fresh coat of lacquer opens up the pores a little even if you've sanded the surface perfectly level. If you want a perfectly mirror-flat surface, you'll



Sand off. It's nearly impossible to get all water-based grain filler wiped off of wood (such as this crotch mahogany) when no washcoat is applied. You'll have to sand it off, trying to avoid sanding so deep you open up some of the pores.

have to sand the last coat level and rub it to the sheen you want. Very little sanding will be necessary if you've done a good job of filling.

The biggest fear is usually that the filler will set up hard before you get it all wiped off. You need to get used to the drying rate of the product you're using, of course, and you can washcoat the wood first, then fill smaller areas at a time. But if the grain filler still gets too hard to wipe off even with burlap, remove all or most of the excess quickly by wiping with mineral spirits or naphtha for oil-based filler or water for water-based filler, then fill again—working faster or in smaller areas at a time. **PWM**

Bob's new book, "Flexner on Finishing" (Woodworking Magazine Books), will be available in mid-August.

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Woodworking with Wee Ones

BY DAVID ROSS PULS

Kids' imaginations are inversely proportional to their attention spans.

Want to take up woodworking with your kids, but find it difficult to keep them in the shop? I share this desire and dilemma. I sheepishly admit that the difficulties arise from my needs and notions, not those of my son. He is, of course, perfect in every way.

I believe that all of us old-fart woodworkers need to give up our foolish notions of design, technique, function and even completion if we are to encourage our kids to join us in our ligneous endeavors.

I learned quickly with my son that allowing him to follow his muse was utmost. It also took the pressure off me. He happily does as he pleases and I get to look brilliant with almost no effort. My son, Elvin, and I have clocked a gazillion hours (his count – it has only felt like a couple zillion to me) working on countless



Concentration. Elvin's earplugs are, according to his father, meant to block out the sound of the other children as he concentrates on producing the perfect paint job for his plane project.

projects in my shop. And, I can honestly say that I have absolutely no idea what many of our creations are. They are of the highest caliber, however, and are of maximum coolness, according to Elvin.

10 Things to Consider

1. **Safety!** My No. 1 rule for young visitors to the shop is: DON'T TOUCH ANYTHING!!! Everything is plugged in and everything is dangerous. I tell them, "Please ask; I'll show you how anything works." Often this means tearing down the machine a bit, so don't make this promise if you won't follow through.

2. **Safety equipment.** Kids are often interested in a machine until it makes a really "BIG" noise – then they are turned off. Even though the young ones will never touch a piece of equipment, the proper safety gear is essential. Get them their own goggles, hearing and dust protection – not the play stuff. They know the difference. Gearing up is half the fun. They feel cool and grown up. There is also nothing cuter than a little one in full safety regalia. Keep your camera handy. And set a good example by wearing your own safety equipment.

3. **Plane truth.** Make lots of long, curly, shavings – even if you don't really need to.

4. **Time.** A child's attention span is short (use a dial caliper to measure it, you'll see what I mean). At first, forget making anything that takes more than a few steps. I remember trying to get my boy to hurry up saying, "We've only got five more minutes!" He looked up with a smile and said, "Wow, Poppa! That's a really long time!"

Either have lots of ready-made parts on hand, or be prepared to work fast. You'll be amazed at what a 2x4 and some wooden wheels can accomplish. Their imaginations supply the details.

5. **Letting go.** If you think their attention span is short, wait until you see how long they can focus on one idea. (Keep a magnifying glass on hand to read the dial on those calipers.) If you want to keep them coming back, let them decide what to build. Let go of the need to know what it is you are making. The end result is not important. Keep the scrap bin full.

6. **Molecular bonding strips.** A "fastening" thing. After the cutting is done, let the child do as much of the assembly work as possible. Kids are naturals at putting things together, if not necessarily in the manner adults might choose. Leave cutting dovetails for another day. I once saw on the bulletin board in the hallway of my son's



Safety drill. Julia is wearing 3D glasses to protect her eyes as she learns how to drill press.

"Free the child's potential, and you will transform him into the world."

— Maria Montessori (1870 - 1952)
Italian physicist and educator

preschool, that the teachers had placed Thanksgiving lists of things the children were thankful for. Most of the responses were predictable: Mommy, daddy, grandma and grampa, my kitty, Jesus and the like. My favorite, however, was one from Adam. He was thankful for tape.

It's not permanent, but a bunch of scraps and a roll of tape can be immediately gratifying. Rubber bands, twist ties and dental floss are good, too. For the rest of the time use glue, nails or drywall screws.

7. *Suck up.* Never clean up before the kids arrive! They absolutely love the shop vacuum, and watching the sawdust magically disappear. Also small tools, nuts and bolts.

8. *Color.* The last and most important step in any project is the employment of an expert pigment/ finish application technician. Once again, kids are the obvious candidates for the job. Keep a small can of each of the primary colors, and black and white (latex, of course), a brush for each, and lots of soap and water and paper towels. Supply kids with a smock and stay the heck out of the way.

Whilst you may feel differently about the surface of your workbench, mine is a riot of colors, which brings back memories and a smile whenever I think about what was accomplished there. My plan is to one day make my son a coffee table or

something out of the masterpiece he has painted for me.

9. *Celebrate.* No project can be complete without a celebratory snack. Make sure there is room in the shop fridge for their favorite juice and cookies.

10. *Nap.* 'Nuff said. (Though I'm not sure who needs it more.)

A Teaching Moment

Right about now, some of you are saying: "But I want my kid to actually learn something." I agree. I have always felt that woodworking is best learned standing knee-deep in sawdust, pounding on the process with a rubber mallet, until it fits neatly under your hat. It is hands-on, and can't be learned through books alone. While my son would happily pound on anything with a rubber mallet, this particular metaphor is unlikely to evolve into a useful teaching philosophy, and would probably only guarantee an eventual visit from the local constable. How, then, do we get our children to share our suffering and learn something? You may have your own ideas, but mine is simple: lie.

Lies, trickery and deceit. The oldest implements in the parenting toolbox. Every parent who has flown a spoon and made the airplane noise to get a morsel of food into their child, knows the power of this. It is the moment at which we all don the big black hat, grow a handlebar mustache, and hunch over, wringing our hands and cackling with evil glee. Any parents in denial about this are simply not watching the same cartoons as me. Good parents, however, resist the urge to tie their children to the railroad tracks — even if they really deserve it.

Yes, I lie to my darling boy. I sit next to him and make my own projects. I stumble, I bumble. I get splinters and take them out with my teeth. I make things that fall apart on purpose. I sputter, get frustrated and exasperated. Method acting complete, I leave the solution to my problem in plain view on the table.

In disgust, my son will say, "Geez, Dad! It's not that bad!" I throw up my hands in defeat and walk away saying: "I need a drink! I could use a tall cold one. Can I get you one?"

By the time I return with our juice bags, he has solved my problem, completed my project and made the world safe for humanity. With astonishment, gratitude



A sticky friendship. Best friends Sophie (left) and Carly (right) practice perfect glue lines.

and pride, we toast his success with our juices. (Don't squeeze when you do this; it squirts out the straw.)

This scenario is also effective in fending off our own pesky perfectionist tendencies. This is a road best not taken. You learn to simply do your best and be happy.

You will undoubtedly have your own teaching methods, gentle reader, and I encourage you to share them. But please do so quietly. Kids hear everything. Once the secret is out, the tool is gone from the parenting toolbox, and is out in the yard somewhere, rusting. My son asked to read a draft of this article, and when he finished, he looked up at me with a wise and knowing smile and said nothing. I am in deep doo-doo. **PWM**

David is an artist and woodworker on Johns Island, S.C.



Little brother. Lucas looks on as his sister, Gabriela, shows him how it's done.

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GLOSSARY

Woodworking's lexicon can be overwhelming for beginners. The following is a list of terms used in this issue that may be unfamiliar to you.

auger (n)

A tool or device having a helical shaft that is used for boring holes. The tip is threaded to help pull the tool into the wood. As you work, waste material is excavated from the hole.

bare-face tenon (n)

A tenon – a projection on the end of a workpiece for insertion into a mortise – having only one face shoulder.

chop (n)

On a vise, the chop is a block of wood that acts as a jaw to clamp the work.

“The difference between genius and stupidity is that genius has its limits.”

— Albert Einstein (1879 – 1955)
scientist, mathematician, inventor

dowel plate (n)

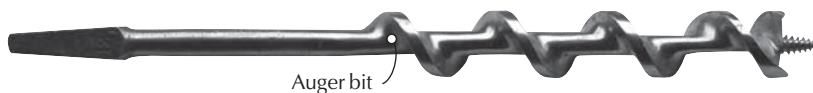
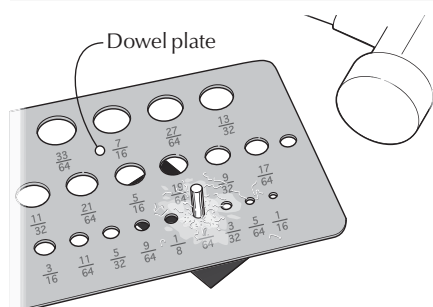
A steel plate with various sized holes. Small sections of squared wood are driven through the holes to form the pieces into accurately sized dowels.

echo (n)

In design work, the repetition of a ratio at different scales to create a pleasing, harmonious effect.

flute (n)

An architectural term used in woodworking and design. The flute is a hollowed out vertical groove milled or carved into columns to add a sleeker and more decorative look.



frieze (n)

A horizontal band above a column's capital between the architrave and the cornice of an entablature; it's often decorated with carving or painting.

hifukura plane (n)

A traditional Japanese pointed-side plane used to clean up the sides of wide grooves and sliding dovetail joints. The plane is operated by pulling it toward oneself.

ironmonger (n)

The traditional term for a person or store selling hardware, such as tools and household implements.

jack screw (n)

In woodworking, a screw that can be turned to micro-adjust the position of an object, such as jointer knives or even a hinge leaf.

kiomote (adj)

In Japanese woodworking, the side of a slab of wood on which the flat grain (the cathedral in the center) comes out from the board and faces the core.

kiura (adj)

In Japanese woodworking, the side of a slab of wood on which the flat grain (the cathedral in the center) goes into the board or faces the bark.

lamb's tongue (n)

A decorative hand-carved profile that is used to transition smoothly from a chamfered edge into a 90° corner.

parallel guide (n)

A piece attached to a workbench chop that moves in and out of a mortise in the leg. A pin pierces the guide which then contacts the leg so the chop pivots to clamp your work.

riven peg (n)

A peg that is split (instead of sawn) from a log or other larger piece of wood.

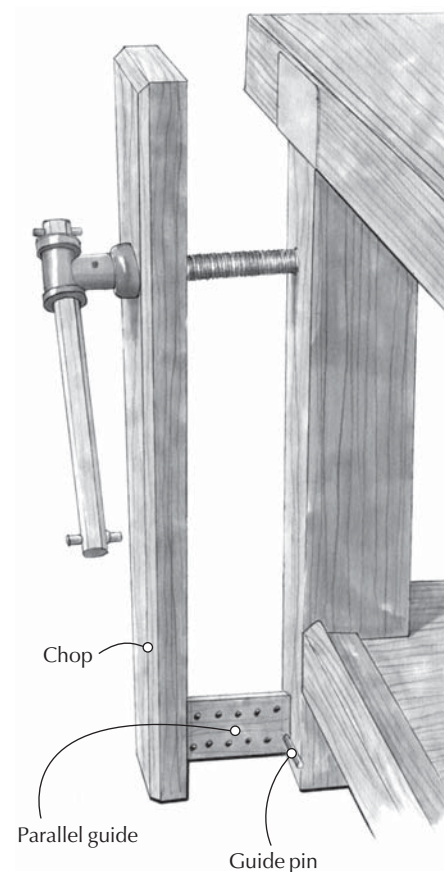
sumitsubo (n)

A Japanese black ink pot used for marking long straight lines onto various surfaces, similar to a Western chalk line. The sumitsubo is gener-

ally made of zelkova (a species of deciduous trees in the elm family).

tallow (n)

A natural product (animal fat) derived from mutton or sheep that's used as grease to ease the labor of hand woodworking. **PWM**



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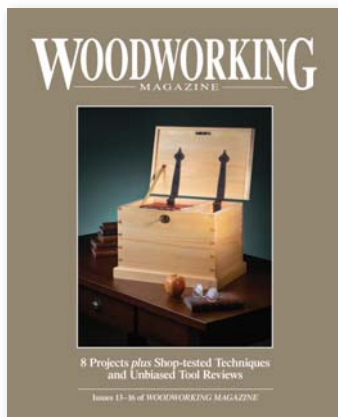
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Editor's TOP PICK



SketchUp for Woodworkers CDs

Part 1: Getting Started Part 2: Advanced Techniques

SketchUp is one of the most important tools a woodworker can use. It's a free program you use to build a project on your computer similar to how you would build it in the shop. I've used SketchUp a lot and thought I knew it well – but I was amazed by all the shortcuts I picked up from watching these two CD tutorials from Bob Lang. If SketchUp is new to you, learn the best techniques from the start with "Getting Started." If you're already comfortable with the basics, "Advanced Techniques" will help you design like a pro. I know these CDs have helped me improve my SketchUp skills – and they'll help you, too.

Robert W. Lang

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BY ROB PORCARO

New Names For Old Tools

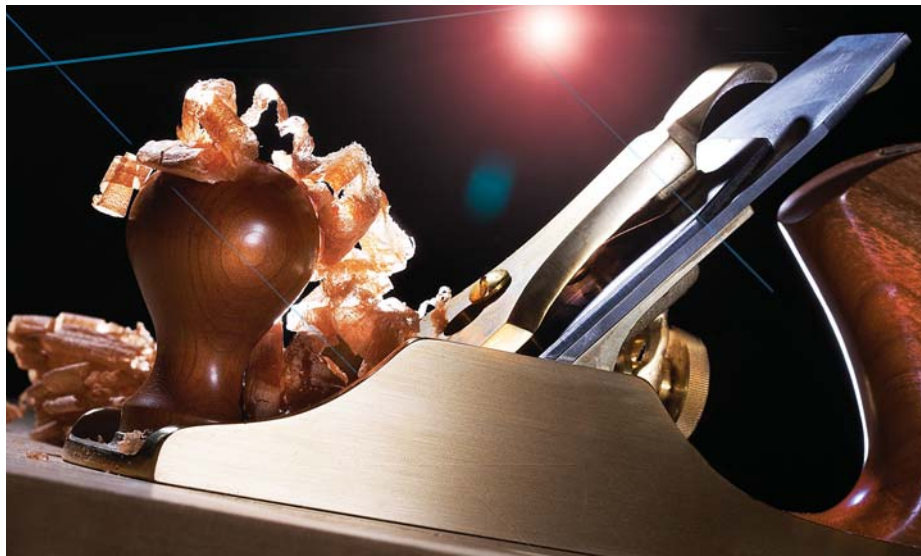
Just keep saying 'micron.'

Woodworkers who use hand tools to lay the quality touch on their work know what can be accomplished with these wonderful inventions. Along with skill, supplied of course by you, a good hand tool is an exquisite blend of simplicity and sophistication that is capable of sweetening your work well beyond what machines alone can produce.

Despite this, I don't think hand-tool woodworking gets enough respect in today's world. For the record, sure, I use machinery in my woodworking. Yes, the machines are high quality, well-tuned, take plenty of skill to use and I wouldn't be without them. Yet when I discuss the joys of our craft with folks not therein immersed, I am invariably asked which major power tools inhabit my shop. This is especially true of techies, but the same question comes from many woodworking beginners. I don't seem to earn credibility as a serious woodworker until I've cataloged my cabinet saw, 16" band saw, jointer and so forth. Otherwise, I sense I'm regarded as a dilettante who toys with the sort of quaint tools people used before there was indoor plumbing. Who could produce serious work with those things?

Perhaps this is just a matter of nomenclature and description. If we could tell, in modern tech-speak, of the remarkable qualities of our hand tools, I think respect and even awe would ensue.

Here we go. My No. 4 is actually a cordless micro-adjustable incremental wood-removal tool that leaves a micron-smooth finish. (Wow.) My Japanese chisels: High-



impact multi-alloy cleavers capable of putting at least 10,000 psi to the wood surface with extreme contact accuracy. (That must be one bad boy in the shop.) A handsaw is a linear bidirectional multi-point wood separator with a biologically integrated, light-based guidance system. (Really? They have that kind of stuff now?)

Similarly, our workbenches, layout tools, specialty planes, sharpening stones and so forth would perhaps inspire deserved esteem if described with weighty words, which still would be, technically speaking, accurate. Our hand tools, so common to us, represent the evolved synthesis of materials science, clever engineering, a profound understanding of human capacity and intimacy with that glorious product of nature, wood.

Now the conversation gets upgraded to something like this: "Cool, your shop must be huge. What were you saying about that micro-adjustable..."

"Well, it toasted my wallet but this thing can create great furniture, and faster than you can imagine. It's powered by a rechargeable battery system that never needs replacement and carries a lifetime warranty. The power unit is so quiet that you can listen to music while you work."

"Dude, something that high-tech must have a laser guidance system, right?"

"Ah, I don't understand all the intricacies, but somehow it works by means of light rays that guide you to intuitively move the tool; it just responds to your wishes. It's a weird feeling to use at first but after a while you'd be amazed at how natural and efficient the work becomes. I dial in the incremental removal adjustment to within about 10 or 20 microns of where I want it and then have at it." (The micron thing sounds so much better than inches.)

"Sweet. You know, I've seen antique furniture in museums and wondered how people made that stuff. I mean, they didn't even have machines then!"

"Imagine that."

"It's beautiful woodworking though. I suppose that with some strange know-how it's amazing what could be done with, I guess, hand tools."

"Yeah, amazing." **PWM**

Rob is a woodworker in Medfield, Mass.

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