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Features

COMP WOOD, KEEPSAKE BOX & JACK PLANE PHOTOS BY AL PARRISH; INLAY PHOTOS BY FATHER JOHN ABRAHAM; COVER PHOTO BY AL PARRISH

CONTENTS

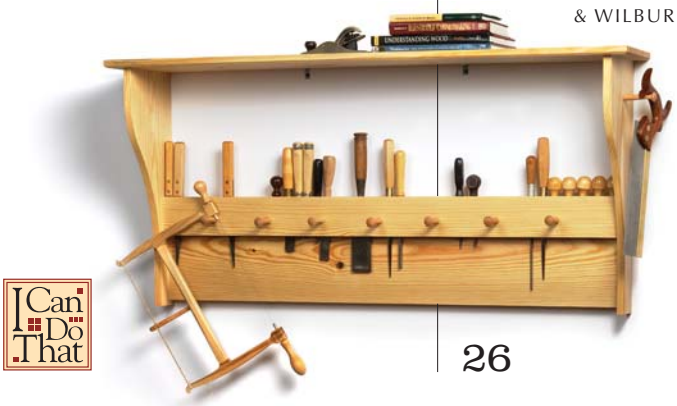
APRIL 2011

14


20


22

REGULARS



26

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Jameel Abraham

"Precision Inlay, Simple Tools," page 38.

Jameel Abraham first became interested in woodworking at a young age, thanks to his grandfathers who were both avid craftsmen.

Though he entered college to study the Russian language, Jameel dropped out after three months and began training in Byzantine art at a Greek Orthodox monastery. At about the same time, he started to approach woodworking seriously, and devoured every book on the subject he could find.

Now, Jameel divides his professional life between painting church murals, carving Byzantine-style church furniture and running Benchcrafted, a company he established along with his father and older brother in 2006. He also make ouds in his spare time.

To see Jameel's artwork, visit mscop.com; to see his ouds, visit khalafoud.com. Benchcrafted's site is benchcrafted.com.

John Wilson

"Variable-pitch Jack Plane," page 48.

Though John Wilson is perhaps best-known to our readers as the "Shaker box guy," he's also written several articles for us on shop-made tools, including "Make a Spokeshave" (October 2007, #164) and the "$5 Router Plane" (August 2005, #149). In this issue, he shows you how to make a jack plane using a three-piece body design to ensure accurate construction.

John is the founder of The Home Shop in Charlotte, Mich., where he and others teach classes in Shaker boxes and more. The Home Shop also offers supplies for Shaker oval boxes. In this picture, John is standing alongside a load of old-growth white pine logs, which represents his ongoing search for quality materials needed to supply the oval box trade.

You can read more about John, see examples of his work and read many of his articles at ShakerOvalBox.com.

Joe McMahon

"CSI: Tools," page 64.

A lifelong resident of Chicago, Joe McMahon got interested in woodworking by watching Norm Abram's "The New Yankee Workshop." He enjoys making furniture, clocks and small boxes, and these days, most of his work is done with hand tools.

Joe became a Chicago police officer in 1968 and served as a patrolman, robbery detective, homicide sergeant and tactical lieutenant before retiring in 2004 as captain watch commander. He met his wife at a murder scene, and they now have four daughters and one son.

While serving on the police force, Joe attended law school; he entered the bar in 1985. Joe now teaches law at a Chicago-area community college.

Joe is a regular contributor to the online woodworking forum at woodnet.net.

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BY CHRISTOPHER SCHWARZ, EDITOR

Why Furniture Stores Make Me Ill

In December I built a large traditional tool chest for my shop at home, and I couldn't stop staring at the end grain of the wide pine planks I'd selected for the walls of the chest.

Though I work with wood every day, the annular rings of these boards – some of them 18" wide – were mesmerizing. Before I cut the dovetails on one of the panels I stopped to count its annular rings, tracing the growth history of the tree for more than 20 years.

Before that board came into my hands, it had sat in a barn for at least 10 years. So when this tree was busy building the cells that would eventually become my tool chest, I was 12 years old and just learning to use a coping saw and hammer.

As I did this little bit of math, I put my dovetail saw down for a moment and tried to figure out what that meant.

What other objects do we have in our houses that take so long to create? When I visit tool-making factories, I am stunned by how rapidly things are manufactured. Once I watched an injection-moulding machine make the nylon shell of a random-orbit sander. I then watched a machine wind the motor. I watched a couple workers assemble all the pieces. And at the end of the factory tour my host presented the sander to me as a gift.

That tool is a small miracle – a testament to human ingenuity and industriousness. But it is also a symptom of a chronic sickness that we have lived with for so long that we don't even remember what life was like before we were infected and weak.

The ability to fulfill our desires in mere moments has cheapened our appreciation for the labor required to make anything. Because mass-manufacturing has made goods so inexpensive, we are willing to throw away once-permanent objects – such as furniture – when we grow tired of the way it looks.

So naturally manufacturers respond by making even cheaper goods that are designed to last only a short time. Why build a bookcase to last 50 years when it will be kicked to the curb in five?

Honestly, I can't live like that anymore. And I suspect that many woodworkers feel the same way, even if they don't express it in the same way.

By building things that are designed to outlast us, we make ourselves the last holdouts of a proud tradition of craft that stretches back to the beginning of civilization.

So when you pick up your saw and clamp up a board that is as old as you, try to make every stroke count. You owe it to yourself, the tree and the whole of human history. **PWM**

PHOTO BY THE AUTHOR

POPULAR WOODWORKING MAGAZINE

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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

If you make a lot of through-mortises, a "mortise float" should be on your wish list. This traditional-but-forgotten tool is like a cross between a saw and a rasp. Its teeth are designed to square the ends of a through-mortise with great accuracy. Unlike chisels, mortise floats don't deflect when cutting end grain – they simply beaver away at the wood, and produce accurate and crisp corners.

Finding a mortise float on the used market is folly. You are best off just buying a new one from Lie-Nielsen Toolworks for $60 (the $1/4$" is the most common size). Sharpen the teeth with a triangular file and prepare to be amazed. — *Christopher Schwarz*

PHOTO BY THE AUTHOR

Make a Lamination Last

In the video "Forgotten Handtools" Christopher Schwarz mentions that all glue fails eventually.

With that in mind, how does one preserve the integrity of something such as a laminated benchtop for future generations? I'm using 8/4 stock as this is what I can afford. In 70 years, I'll have long been dead but there would be joy (for now) in knowing that my son's son could possibly use the same bench.

I wonder if there is some other method that could be incorporated in the lamination process that would help ensure the glue joints remain strong.

Jim Tincher
Frankfort, Kentucky

Jim,
A good PVA joint will last at least 60 years without degradation. We don't know how much longer PVA will last because it hasn't been around longer than that.

If I were building a laminated top that I wanted to make sure was around in 200-plus years, I would do two things:

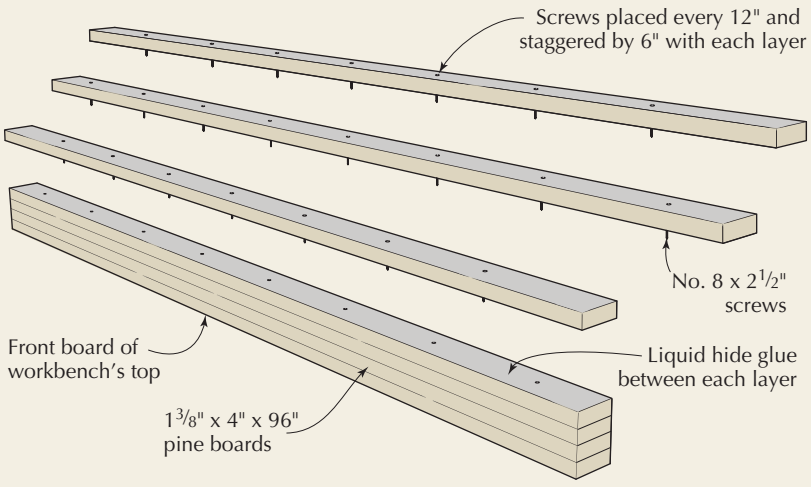
1. Use a reversible and repairable glue, such as liquid hide or hot hide.

2. Screw each lamination to its neighbor (which will also reduce your need for clamps to almost zero).

If the top delaminates, then it's a somewhat simple thing to disassemble the top, reapply hide glue and screw it back together.

My gut says that a well-cared for bench can last indefinitely. But few benches get that sort of cushy life.

Christopher Schwarz, editor



Plow Plane Help Please?

I've done my digging through your blogs and Christopher Schwarz's book "Handplane Essentials," but am left with some questions about plow planes. A vendor to whom I posed some questions asked me what I'm trying to do with the plow plane, and I didn't have a good answer aside from the fact that it shows up on Schwarz's list of "Nine Essential Handplanes." He retorted that, "Chris is very advanced" so "essential" for Chris may not necessarily be the case for everyone.

Regardless, he said if you try to do things mostly by hand and get away from the electric router and router table, then the plow plane is an essential. The question then becomes, what kind of plow? He suggested a Stanley No. 50 as a good starter plow. I'm curious as to why Veritas only makes a small one (similar to a No. 248?) and Lie-Nielsen makes what seems to be a very stripped-down version in its tongue-and-groove plane. More flexibility and adjustability inevitably equates to more difficulty in use and setup. So, does the balance land on the No. 50? What size covers the "essentials?"

Andrew Yang
via e-mail

Andrew,
If you are going to cut grooves by hand and you want to make moulding by hand, you can't skip the plow plane. It cuts all the grooves for frame-and-panel constructions. The plow also removes waste before you work it with moulding planes.

And there are other things you can do with plows, such as cutting small rabbets and making tongue-and-groove joints.

I can't imagine working without it, and most traditional woodworkers would probably agree.

As to which one you should get: The metal plows are fine and age more gracefully than the wooden ones. But they clog more because they throw the shavings onto the fence. So a Stanley No. 50 or a Record 043 or 044 would all be good choices.

I do hope that the modern toolmakers come out with full-sized plows in the future. But the good news is that there are perhaps millions of vintage ones out there for you to choose from.

Christopher Schwarz, editor

Ticking Sticks are Great!

I had a large inset drawer face to fit for a cabinet for my wife. Having read about ticking sticks in the November 2010 issue (#186) then watched your video on them, I decided to give it a try.

Wow! Holy Ticking Stick, Batman!

CONTINUED ON PAGE 10

ILLUSTRATIONS BY MARY JANE FAVORITE

CONTINUED FROM PAGE 8

It worked the first time. I mean, exact, piston-fit. No cursing. No sweating. No making the darn thing over again! I had a favorite aunt who, when a thing went uncommonly well would say, "Well, I swan!" And if the thing went just amazingly, uncommonly well, she would say, "Well! I never!"

So … Well! I never!

Mike Dyer
Louisville, Kentucky

"In my early years, my father was away as a soldier in the war. When he came back, work was very difficult to come by. Even though he was a highly skilled man, a maker of furniture, the payment for that work was very poor."

— Trevor Nunn (1940-)
English theater and film director

Shooting Board Woes

I made a ramped shooting board and a donkey's ear to attach to it and was using that to true up some miters on a small box I am making from reclaimed fir (the wood is about 40 years old, I think).

The plane lifted all of the end grain fibers (there were not any curls – just little pieces and dust) so the miters aren't smooth like they were right off the saw. So is this normal for such a soft wood? It has not been that long since I sharpened the plane blade (and I haven't used it that much) so I would not think it would need sharpening again so soon. Also, I verified that the donkey's ear is accurate using a Starrett combination square on the trial pieces I planed.

Terry Hennessy
via e-mail

Terry,

I hate to say it, but the first culprit is almost always the cutting edge. Shooting miters or end grain requires the sharpest edge. If the edge meets significant resistance in the cut, then the results are exactly as you describe – tearing, lifting, dust and grumbling.

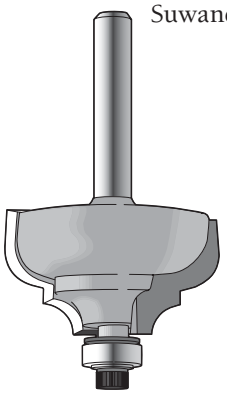
Take your iron back to the sharpening stones and give it your best edge.

Christopher Schwarz, editor

Chest Moulding Questions

I'm hoping you can help me out with a question about Glen Huey's blanket chest from the August 2009 issue (#177). Specifically, what moulding profiles were used to make the trim piece above the drawers and for the lid? I have a router bit I can use for the base moulding, but have not found the type that makes the middle piece.

Mike Maready
Suwanee, Georgia



Mike,

The waist moulding starts at 7/8" wide and I routed a cove-and-bead profile along both edges. Here's a drawing of the Eagle America bit #171-2515, which matches the one I used. The lid is routed with the same profile.

Glen D. Huey, senior editor

Four-sided Tapered Legs

Ever since the arrival of the February 2010 issue (#181), I've been admiring the side table Glen D. Huey designed for "I Can Do That." I bought the necessary wood in July, and after further procrastination, have taken the plans off the refrigerator door and am all set to begin.

But before I start, I'd appreciate your advice on two matters. First, would tapering all four faces of the legs do violence to the design, or are they best left as drawn? Second, might my using 1¾"-square stock for the legs make the table too clunky? If not, how would you suggest I adjust the taper?

Huston Horn
Pasadena, California

Huston,

Great to hear you're about to begin building that table. It is a fun piece to create.

Legs that are tapered on all four sides is something often found on period tables. That design is most often associated with Hepplewhite furniture; legs that taper on two sides are often thought of as Shaker. Either design goes great with this table. However, from a construction perspective, I believe you might find the four tapers to be additional work. In the article I use a jigsaw to cut the tapers. While doing so, I found it cumbersome to hold the saw on the leg surface as the cut was being made. If you have to remove a smaller amount of waste, it might add to the difficulty – as would making four cuts per leg instead of two.

If you are worried about the bulkiness of the table given the 1¾"-square legs, don't be. The added width makes the table look finer if you continue to keep the foot the same size as in the plan – you're tapering more so it lightens the overall appearance. **PWM**

Glen D. Huey, senior editor

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EDITED BY KARI HULTMAN

THE WINNER:

Benchtop Saw Upgrade

I recently improved the tabletop of my bottom-of-the-line table saw, and the saw's performance has gone through the roof. A piece of MDF, a few scraps and screws, and a couple hours work was all it took. It saved me hundreds of dollars because I didn't need to buy a bigger and better saw for my space-deprived shop.

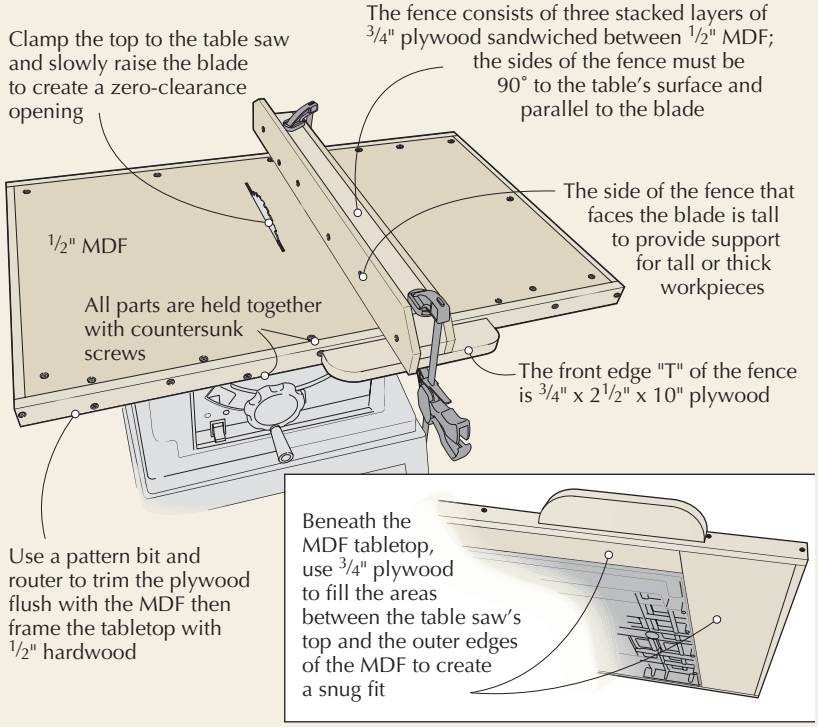
The tabletop is made from 1/2" MDF (you can use thicker material, but you will lose cutting height). It measures 36" wide x 22" deep, which provides an 18" rip capacity. Adjust these measurements to suit your needs.

Underneath and flush with the outer edges of the MDF, I fitted 3/4"plywood between the sides and back edges of the table saw's top to create a snug fit. I added a 1/4" (rather than 3/4") strip of plywood beneath the front edge due to a lip under the table saw. I secured the plywood to the MDF with screws and trimmed it flush with a pattern bit in my router.

Next, I framed the tabletop with 1/2" hardwood and attached it with screws. All screws need to be countersunk so they don't interfere with workpieces.

Also, the front edge of the tabletop must be flat and perpendicular to the blade; this is the edge along which the T-square fence rides.

To create the zero-clearance opening, I clamped the auxiliary top to the table saw's top, turned on the saw and slowly raised the blade. I lengthened the cut to allow for a splitter, a blade guard and anti-kickback pawls.



The fence is made from three pieces of 3/4" plywood that are stacked, glued and jointed to create a 90° surface to the tabletop. A 1/2" piece of MDF was attached to each side of the fence to ensure a smooth, flat surface.

The MDF piece that faces the saw blade is tall to provide support for thicker or taller workpieces. A piece of 3/4" x 2 1/2" x 10" plywood creates the "T" for the fence. This is the portion that rides along the front edge of the tabletop, so it must be flat, straight and perpendicular to the saw blade.

To add the "T," I placed the face of the fence against the raised blade and clamped it to the table. Then I screwed the "T" to the fence to lock it at a 90° angle.

I applied a couple coats of polyurethane to the entire assembly, let it dry for a day or two, then added two coats of wax to create a slick surface.

In use, I secure the fence with two clamps – one in front and one in back – after making sure the fence is parallel to the blade. For extra holding power, you can add adhesive-backed sandpaper to the bottom of the fence.

If your table saw's top is not perfectly flat, you can shim your new top as needed. The surface on either side of the blade must be 90° to the blade, otherwise accuracy is compromised.

To further enhance your new top, you can include miter tracks, adhesive measuring tape along the front edge and permanent hold-downs for the fence to eliminate the need for clamps.

Dan Chiappetta
Astoria, New York

ILLUSTRATIONS BY MARY JANE FAVORITE

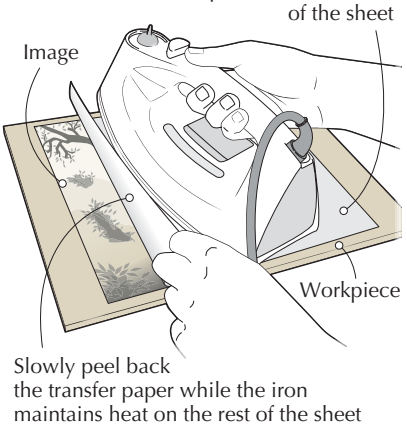
Transferring Images to Wood

This is a fun and inexpensive way to transfer any digital image to plywood, solid wood, veneer or unfinished furniture. It adds flair to coasters, mouse pads, lap desks, TV trays and more. And, if you're a carver, you can use this method to transfer your pattern directly onto the wood.

Start with a package of T-shirt transfer paper, available at office-supply stores. Print your image onto the paper using your inkjet printer. Use the "mirror image" setting on your printer so that the image won't transfer backward.

The ink prints onto the plastic film of the transfer paper. When you flip the transfer over and use heat to release the film, the ink adheres directly to the surface of the wood and the plastic seals it.

Cut your wood to size – if you're using plywood, I recommend Baltic birch – and sand the surface up to #220 grit. If the wood is rough, the transfer will look flaky like an antique, which might be your preference. Trim the white edges around your printed image and place the transfer paper image-side-down on the wood.



Next, heat a dry iron (no steam!) at a fairly high setting. Evenly heat the entire surface for about two minutes while maintaining steady pressure with the iron.

Test a corner of the heated transfer sheet to see if it lifts easily. If it doesn't, reheat the edge with slow, even pressure. Then, peel the backing away slowly, keeping the iron on the remaining paper to maintain heat. If some of the image lifts while peeling, don't sweat it. You can patch it later or leave it rustic.

I apply a clear, matte finish on the final piece. For mouse pads, I transfer images to veneer, then apply non-slip rubber or vinyl backing.

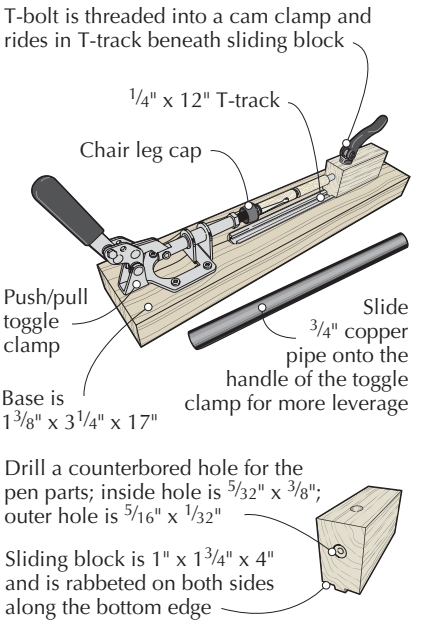
Mag Ruffman
Mansfield, Ontario
toolgirl.com

Shop-made Pen Press

I came up with a design for a shop-made, fully adjustable pen press. It consists of two pieces of hardwood and four pieces of hardware which include a push/pull toggle clamp, a 1/4" T-slot bolt, a 1/4" T-track and a cam clamp (Lee Valley #05J51.01). A standard knob would also work, but the cam clamp makes it fast and easy to adjust the stop block.

The base is 1 3/8" x 3 1/4" x 17", the sliding stop block is 1" x 1 3/4" x 4", and the T-track is 12" long. The T-track is dadoed into the base and the toggle clamp is aligned with the center of the T-track. Some push/pull toggle clamps do not have a protective tip on the end of the bolt. If that's the case, slip a chair leg cap onto the bolt to protect pen parts.

The bottom of the sliding stop block is rabbeted on both sides so that it fits into the T-track and won't spin under pressure. The end of the sliding block that faces the toggle clamp is counterbored to prevent pen parts from shifting under pressure. The inner hole is 5/32" x 3/8" and the outer hole is 5/16" x 1/32".



I slide a 3/4" copper pipe onto the toggle clamp's handle if more leverage is needed. PWM

Serge Duclos
Delson, Québec

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BY THE EDITORS

DeWalt's Compact Routers

One motor, two bases and a fistful of power.

Two for one. *DeWalt'sDW611PK is not just two bases in one kit – its 1¼-hp motor allows the tool to perform as a trim router while taking on many of the tasks tackled by a full-size router.*

Small size has become big news in routers. Compact routers, also known as trim routers, are easy to grip in one hand, which makes control and use easy, too. Fixed-base compact routers have become the workhorse in many shops, but what's been missing is a plunge-base compact router. DeWalt rectified this with its compact-fixed and plunge-base combo router kit, the DW611PK.

The motor with the two-base kit is 1¼ horsepower (more power than similar routers), and has a soft start and variable speeds. DeWalt's router accepts ¼"-shank router bits, as do other compact routers.

Mounted in the base of the motor are dual LEDs. One LED illuminates the work area; the second removes most of the shadows to improve visibility and accuracy as you work. The collet on this router is also a new design, with a longer length. That equates to more contact with your router bit, which translates into less vibration as you work.

To facilitate bit changes, DeWalt has improved the spindle-lock arrangement with 12 detents spaced around the motor shaft. It's quick to lock, and with a single wrench you can change bits in a flash.

The motor slips easily into either base. When used with a fixed base, the motor is attached via an adjustment ring. The ring threads onto the motor, snaps to the base and is used to adjust the depth of cut throughout the 1½" of travel in 1/64" increments. Once adjusted, a locking lever secures the setup.

The base plate on the fixed base is D-shaped for added stability, and allows for multiple routing techniques. A fixed base and motor are available separately (DWP611) or in the combination kit.

The plunge base has 2" of travel and is extremely smooth to operate while plunging into or lifting out of a cut. The plunge-lock lever is within easy reach of your thumb as your hand rests on the soft grippy handles. The grip of the lock is solid, with zero slippage even when excessive pressure is applied.

Coup de grâce. *Finally, a plunge base with a compact router – endless possibilities.*

The clear base plate accepts Porter-Cable template guides, and has both round and flat areas for multiple uses.

The turret stop has five settings (four fixed, one variable) and a fine-tune adjustment rod for precise settings.

If you're ready for a combo-router kit that functions as a trim router and performs as a full-size tool, this is it.

— Glen D. Huey

CONTINUED ON PAGE 16

PHOTOS BY AL PARRISH

DeWalt Compact Router

DeWalt ▪ dewalt.com or 800-433-9258

Street price ▪ DWP611 $139
▪ DW611PK $199

VIDEO: *Watch these routers in action at popularwoodworking.com/apr11.*

Prices correct at time of publication.

CONTINUED FROM PAGE 14

CEROS: Air-sander Size, Electric Heart

The compact electric random-orbit sander, or CEROS, from Mirka is the best sander to have in a woodshop. The tool is electric powered, but has the look and feel of an air-powered sander.

I'm not going to lie – this tool isn't cheap. But I think it's worth every nickel. How this tool works, and its weight, balance and control, is far different from the run-of-the-mill random-orbit sanders most woodworkers use.

The sander, available in both 5" and 6" models, plugs into a DC power supply that's plugged into a standard 110-volt outlet. There is a 12' cord attached to the sander to distance the power box safely away from the action.

The sander is light when compared to typical random-orbit sanders (1.9 pounds vs. 3.5 pounds average for the sanders we tested in 2008) and the low profile gets your hands closer to the work, which makes for easy control and balance, especially when sanding vertical surfaces such as case sides.

CEROS is a variable-speed sander capable of 4,000 to 10,000 rpm. Adjustments are made on the back of the tool (buttons change the speed by 1,000 rpm). From there, the on/off switch is the top-mounted paddle. If you prefer to have speed variability at the paddle, it's possible to set up the tool that way.

CEROS comes vacuum-ready (for a $1\frac{1}{4}$" hose) using a standard $\frac{5}{16}$" threaded, multi-hole backing pad for hook and loop – which is easily switched if you're a "sticky-back" disc user.

CEROS is packaged in a systainer, includes a sample pack of Mirka's Abranet (the best sanding product) and has a top-notch three-year warranty.

— GH

CEROS

Mirka ▪ mirka-usa.com or 800-843-3904

Street price ▪ $495

VIDEO: *Hear the sound of CEROS at popularwoodworking.com/apr11.*

Price correct at time of publication.

Is Bosch's Axial-glide Tool the Future of Miter Saws?

We have to hand it to Bosch. The axial-glide system found on the Bosch GCM12SD is the most innovative design idea to hit miter saws – ever. Hinged arms replace slide tubes.

The standout feature of the 12" dual-bevel miter saw is the two arms that fold and extend – one vertically and one horizontally – to move the saw back and forth throughout a 14" cutting length. The movement is smooth and any deflection when fully extended is on par with other saws. Because the saw's backward travel is fixed, you can position the tool tight to a wall. At 12" from wall to fence, it's a real space-saver.

The 3-horsepower motor on the GCM12SD is hefty, however, we experienced a bit of slowdown when cutting thick stock. The 15-amp motor has a kick on startup, so it's best to leave the saw fully up as you squeeze the ambidextrous trigger handle.

As with other Bosch miter saws, the tool's controls are up front. While access is easy, we found tilting the saw along its 47° maximum right or left tilt to be a challenge. You twist a bevel selector knob as you position the weighty saw head. The action gets easier with experience. The maximum cut angles are 60° to the right and 52° to the left with detents at all the typical positions. A split fence attaches to the back of the table for an exact 90° angle while extension wings open to a 42" span. PWM

— GH

GCM12SD Miter Saw

Bosch ▪ boschtools.com or 877-267-2499

Street price ▪ $798

VIDEO: *Check out the miter saw features at popularwoodworking.com/apr11.*

Price correct at time of publication.

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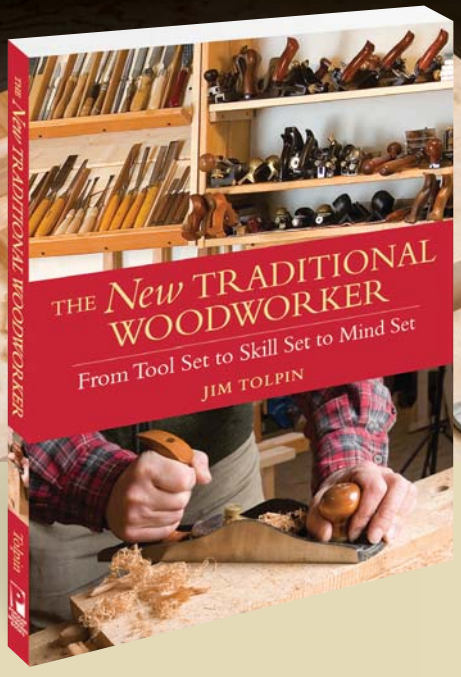

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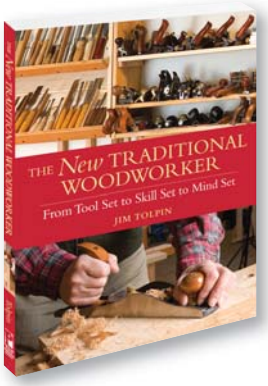

'The New Traditional Woodworker'

Jim Tolpin is well-known for his book "Table Saw Magic." Now, however, most of his work is done with hand tools – and in this new book, he shows you how to set up a hand-tool shop, use the tools effectively and efficiently and adopt a non-powered mindset.

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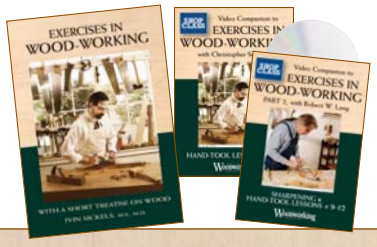

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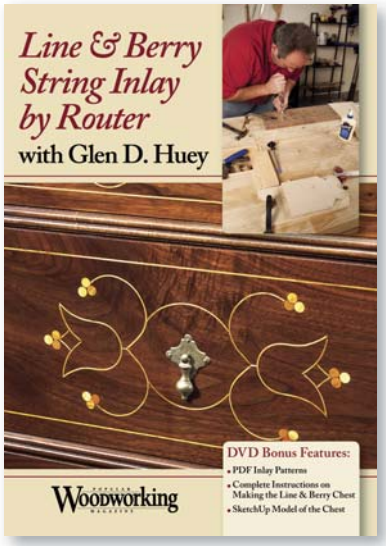
Editor's TOP PICK



'Line & Berry Inlay by Router'

I read Glen D. Huey's article on the "Line & Berry Chest" from the December 2010 issue of the magazine, and I must confess that I thought the inlay work was beyond my capabilities. But I watched this DVD during the video-editing process, and the techniques became immediately clear to me. The line and berry inlay pictured on the DVD cover looks complicated and time-consuming – but in reality, it's neither. Glen breaks down the process into easy-to-follow steps, and he uses tools that are common in most shops. And of course, using a router rather than scratching in the design speeds up the work considerably. Plus, the way Glen develops patterns from photos can be adapted to just about any inlay need. Watching this video was a revelation.

Megan Fitzpatrick

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BY GEORGE R. WALKER

Double-duty Dovetails

What's more important: Strength or aesthetics?

Strong and good-looking. *Joinery can add both strength and beauty to a design.*

One of the high points of the October 2010 Woodworking in America conference was the dueling dovetail session between Roy Underhill and Frank Klausz. The two squared off with saw and chisel in hand tackling the "pins first vs. tails first" debate. Friendly banter peppered the dialogue as these two masters cut dovetails with an ease and deliberateness that spoke volumes. Both represented a woodworking tradition, with Frank "Pins First" Klausz demonstrating skills learned in an Eastern European woodshop, while Roy "Tails First" Underhill shared his wisdom of historical American craft. But one part of the discussion in particular caught my attention.

Dueling dovetail masters. *Frank and Roy duked it out at Woodworking in America 2010.*

Frank pointed out that, "Grandpa taught him to make the joint strong by sizing the pins and tails equally." He even had a photo of Pope John Paul II's funeral casket, a simple pine box knitted together with bold, equally sized pins and tails.

It begs a question: Why would American and English cabinetmakers choose a different path and intentionally break up the sizing and spacing on dovetails? They typically make the tails large and the pins small, sometimes delicate. This can sacrifice strength in certain applications and can make the joint more difficult to execute. It's hard to say for certain, but my gut tells me they did this for aesthetic reasons. This was a craft tradition so familiar with proportions that even half-blind dovetails hidden away in a drawer should give a nod to beauty.

This also leads to questions about joinery and design. Aside from the obvious structural role that joints play, can we use them to enhance a design aesthetically? Should joinery be hidden or left in plain sight? If we choose the latter, how can we make sure it complements our design?

Joinery as Structure

Any time we join materials together, whether building a house or a cabinet, we are creating structure. A question facing a designer is whether to leave structure exposed or hide it from view. There is no right or wrong answer. Cabinet makers during the Federal era (circa 1790-1810) took great pains to hide any traces of joinery. A century later, Arts & Crafts furniture makers took an oppo-

Large and small. *This chest of drawers exhibits typical dovetails from American work with large tails and small pins.*

LEAD PHOTO BY FATHER JOHN ABRAHAM; FRANK & ROY PHOTO BY NARAYAN NAYAR

site tack and purposely exposed much of the joinery. Makers in both eras made sturdy, beautiful furniture with very different ideas about whether joinery should be hidden or in plain sight. So, when does it make sense to hide joinery or leave it in the open? It might help to look at architecture for some answers.

Designers from antiquity often covered structural elements such as brickwork, yet took great pains to include stylized representations of ancient joinery. Much of the familiar ornament on classical work shadows the original joinery on ancient structures built with wood. The triglyphs that adorn the Doric entryway below represent the carved wooden beams that would have supported a building. Dentil mouldings are another example of a stylized depiction of structure hinting at ancient joinery supporting a roof. Although the triglyphs are purely ornamental on this doorway, they succeed in highlighting the opening. They proclaim, "Here's the front door; welcome!"

Joinery Highlights a Form

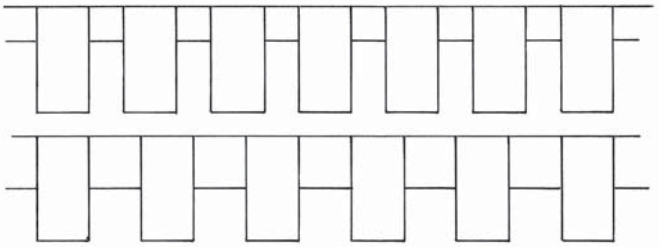
The subhead above is an important point. By its very nature, joinery holds together major elements. As is often the case, those elements also define the boundaries of the form. A form is a combination of simple shapes that anchors a design, often made up of rectangles, circles or ovals.

Designers often use mouldings, carvings or inlay to highlight a form and give the eye something to grasp from a distance. Joinery such as dovetails can also be used as a border element to highlight a form or a sub-element within a form. Tenons or pegs can also be left exposed at the corners or borders to gently emphasize a form. The key is to use them as a highlighter.

When we highlight a text with a yellow marker in a book, we make the words stand out. If the highlight is too bold it might obscure the letters, defeating our purpose. If we make the joinery (or mouldings for that matter) too bold, they compete with rather than emphasize the form. Joinery should do more than just show off some fancy chisel work. Rather, exposed pegs or joints can subtly complement the underlying bones of a form.

Bold. *Triglyphs over this doorway make a bold visual statement.*

Contrast. *Dentil moulding creates a contrasting light and shadow line, outlining the form from a distance.*



Preference. *The dentil sequence on top alternates major and minor spacing 3:2:3:2:3 …, the bottom sequence repeats 1:1:1:1 … Which does your eye prefer?*

Arresting. *Which dovetail sequence catches your eye?*

Dovetail Debate

Confession time: I cut dovetails "tails first." It took quite a bit of practice to master the technique and achieve tight joints that I'm pleased with. But, after watching Frank, I may have to give "pins first" a whirl. He made it look almost effortless, and with stunning results. I also agree with Frank that pins and tails sized equally produce a strong joint. Yet like Roy, I'll sacrifice a little strength for aesthetics. Sizing the opposing pins and tails into major and minor spacing gives it some visual flavor.

Look at the dovetail patterns shown above right; which appeals to your eye? Note the dovetail pattern on the far right is made livelier by adding another layer of major and minor spacing. Take another look at the proportional sizing and spacing on a simple dentil moulding at the top of this page. The face of a dentil block is twice as high as the width. The spacing between blocks is two-thirds the width of the block. This puts the blocks in a major-minor sequence. Compare that with a series of blocks sized and spaced equally.

Pins vs. Tails? One thing's certain; in 200 years a well-executed dovetail will still show the skill of the artisan's hand. PWM

George is the author of the DVDs "Unlocking the Secrets of Traditional Design" and "Unlocking the Secrets of Design: Moldings" both from Lie-Nielsen Toolworks (lie-nielsen.com).

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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.

REMAINDER OF PHOTOS & ILLUSTRATIONS BY THE AUTHOR

BY BOB ROZAIESKI & WILBUR PAN

Separated At Birth?

Western and Eastern tools might not be as different as you think.

East meets West. *While the differences between Western and Japanese planes are fairly obvious, their initially hidden similarities might intrigue you.*

At first glance, Japanese woodworking tools and techniques seem like the platypus of the woodworking world. Beginning in the Edo period in the early 1600s, Japan isolated itself from the rest of the world, especially the West. A policy of *Sakoku* meant that no foreigner could enter Japan and no Japanese could leave the country – under penalty of death in either case. This policy continued for more than 200 years until the mid 1800s, when Commodore Matthew Perry forced the opening of Japan to the West.

As a result, almost all the development of Western woodworking techniques and styles from the Jacobean through the early Victorian periods were unknown to Japanese woodworkers. And like the platypus, Japanese woodworking techniques evolved in isolation, resulting in a method of work that was different than in the Western world. One of the most well-known differences between Japanese and Western woodworking techniques is in the approach to planing wood.

Go West, Young Man

Most of us are familiar with the setup and use of Western handplanes. There's a stock or body made of wood or metal, a bed or frog to support the iron, also made of wood or metal, a lever cap or wedge to hold the iron in place, and possibly a tote and knob (though some Western planes lack these). The planes are pushed away from the body in use, and the power comes from the legs and the transfer of weight from the back foot to the front foot.

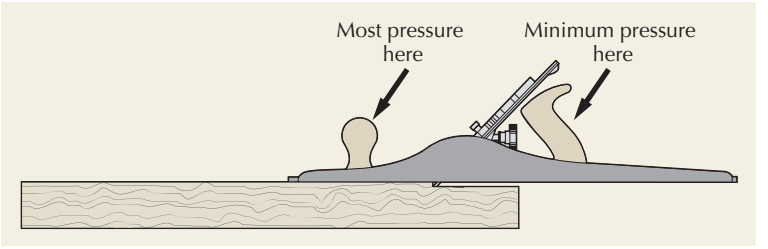
The sole of a Western plane is one flat surface from toe to heel. The iron projects below the plane of the sole and establishes the depth of cut. Western planes also vary in length depending on their intended purpose. The sole of the plane acts as a reference surface. As a result, the longer and flatter the plane's sole, the flatter the resulting board will be.

Roughing planes such as the fore or jack plane are of a middling length (15"-18") in order to be light enough to rapidly remove material by taking thick shavings, but also long enough to begin flattening the board. Surface-refining planes such as the try or jointer plane are longer (22"-24") in order to ride the remaining high spots in the board and bring it to final flatness. Finishing planes such as the smooth plane, on the other hand, are short so that they can easily tackle localized areas of tough or reversing grain that remain after using the try plane.

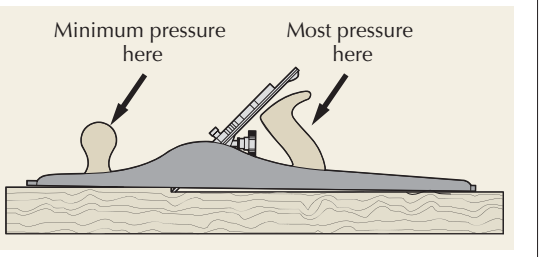
In use, one puts weight over only the toe of the plane at the start of the stroke. As the area of the sole behind the mouth begins to make full contact with the board being planed, the weight is gradually transferred to the back hand. Once the plane is entirely on the board, the majority of the weight is on the rear of the plane. At this point, the front hand serves only to help steer the toe and keep the iron in the cut. Most of the planing force comes from behind the iron once the entire sole is in contact with the wood.

This transfer of weight makes the length of the plane behind the iron an important factor when using a plane for flattening and straightening faces and edges. As the plane begins to cut at the start of the stroke, the iron removes wood, making the area of the board behind the iron lower than the area in

PHOTOS BY THE AUTHORS; ILLUSTRATIONS BY MARY JANE FAVORITE



Down in front. *Pressure is over the toe of the plane at the beginning of the cut. The area of the sole behind the mouth is not in contact with the board.*



Going up. *Pressure transfers to the rear of the plane once enough of the sole behind the mouth is over the board. The toe then tips up off the work.*

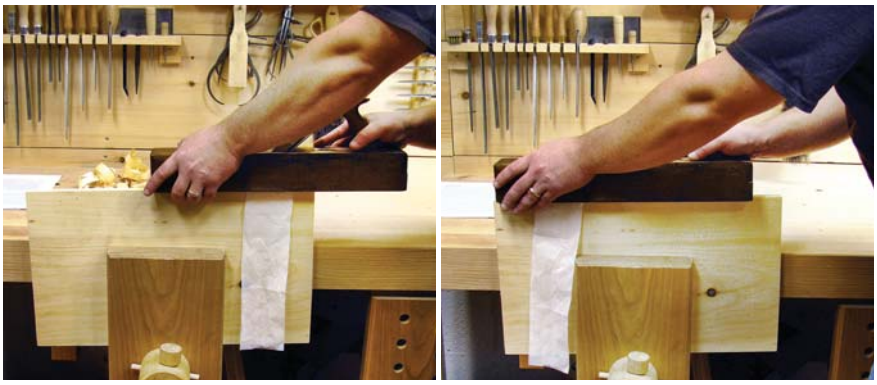
front of the iron. At this point, the back of the plane is not in contact with the board at all. After the transfer of weight, the heel of the plane becomes the plane's reference surface and the toe rides above the board at a very slight angle.

In a Western plane, the area of the sole behind the iron provides the reference for the majority of the cut. So it makes sense that Western planes designed for flattening and straightening, i.e. try planes and long jointer planes, are longer behind the mouth of the plane. The longer and flatter the sole is behind the iron, the flatter and straighter the resulting surface will be, because the longer surface will span the high spots in the board.

Enter the Dragon

As mentioned before, Japanese woodworking techniques developed in isolation from the Western world, and one result of that is a much different approach in the types of planes used to mill and flatten stock. Unlike the Western woodworking plane arsenal, where a somewhat long fore plane is used to initially flatten a board, followed by a longer try plane for flattening, then finished with a short smoothing plane to clean up the surface, the lengths of Japanese planes for these tasks are all nearly the same length – about $10^{1}/_{2}$" or so. What allows these planes to accomplish the same tasks – despite this obvious difference – are variations in the setup of the blade and mouth of the plane, and a variation in the sole configuration of a Japanese plane.

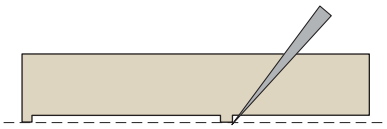
The sole of a Japanese plane is different from a Western plane. On a Japanese plane, the sole contacts the board at only two points, and there are two different setups with this method, depending on the task at hand. These days, most Japanese planes are used as smoothers, and if a Japanese plane is being used as such, the sole of the plane contacts the workpiece only at a narrow area at the front of the plane, and at another narrow area immediately in front of the mouth. The sole is relieved with a very shallow hollow between these two points, as is the area behind the mouth.



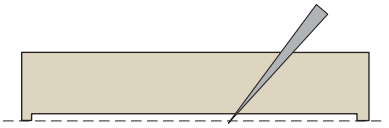
Balancing act. *The iron acts as a fulcrum or pivot point because the sole is flat. At the start of the cut, the toe is down and the heel is up (left). Once the weight transfer is complete, the heel is down and the toe is up, as shown by the tissue paper slipped under the toe (right).*

In use, the Japanese plane is placed at the end of the board away from the woodworker, with arms extended. Downward pressure is placed on the front of the plane. As the plane is pulled, the downward pressure does not transition from the front of the plane to the rear as it would for a Western plane. Instead, the downward pressure stays constant from the beginning to the end of the stroke, so there is no shift in reference during the planing stroke, unlike the shift from front to back when using a Western plane.

If a Japanese plane is being used to true a surface or an edge, however, the sole is set up differently. Instead of having areas at the front of the plane and the area in front of the mouth touching the board, a Japanese plane set up for truing a surface has two areas on the front and back of the plane touching the surface, with the sole relieved between these two points, and the blade set so



Two points of contact. *In the most common configuration of a Japanese plane, the sole is slightly relieved so that there are only two points where the sole of the plane contacts the wood: at the front of the plane and immediately in front of the mouth. The relief is on the order of $^{1}/_{64}$" or so, and is exaggerated in the drawing for clarity.*



Two points of contact, take two. *Japanese planes set up for truing a board are set up so that only the very front and back of the sole contacts the wood, and the blade is set so that it is in line with those points of contact. Again, the relief is just about $^{1}/_{64}$", and is exaggerated in the drawing for clarity.*

that the cutting edge is in line with those two touch areas.

This plane is pulled in the same way as other Japanese planes, with downward pressure throughout the stroke, but because of the geometry of the setup, the entire length of the plane can be used as a reference to flatten the board.

The Japanese equivalent of a scrub plane, called an *ara-shiko kanna*, shares many features with its Western equivalent. Its primary job is to quickly and efficiently remove wood to take a rough-sawn board to a flatter state, so it has a blade with a fairly pronounced camber, and a wide mouth and throat to allow thick shavings to pass through. Like a Japanese smoother, the sole of this plane is set up to touch the board at only two points at the front of the plane and immediately in front of the mouth.

The next step in milling a board is to true the surface. Here a Japanese woodworker would use a *chū-shiko kanna*, which would be the equivalent of a Western fore plane. This plane has less of a camber and a tighter mouth than the *ara-shiko kanna*, so it takes thinner shavings, and ultimately will flatten the face of the board being milled. A *chū-shiko kanna* is typically the same length as the *ara-shiko kanna*, but because this plane is used to true up a surface, the sole of this plane is set up so that the front and back of the soles touch, with the cutting edge of the blade set in line with those two surfaces.

The long and the short of it. *Most Japanese planes are about 10½" long (left). The* naga-dai kanna*, the Japanese equivalent of a try plane, is the exception to this rule, being about 15"-16" long (right).*

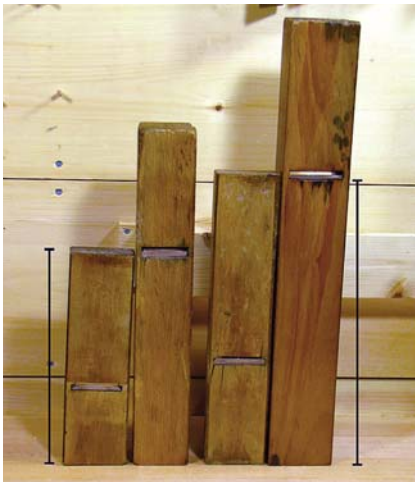
Of course, the longer the plane, the easier it would be to flatten an edge, and there are longer Japanese planes than the usual 10½"-long Japanese planes mentioned so far. These planes are called *naga-dai kanna*, and are usually about 15"-16" long, and serve the same purpose as a Western try plane. Like the *chū-shiko kanna*, these planes are set up with the front and back ends of the plane touching the workpiece and the cutting edge in line with these areas. Again, the entire length of the plane is used as a reference for planing. The added length certainly would help with truing and flattening longer boards.

Coincidence or Fate?

While the setup (flat sole vs. hollowed sole) and use (push vs. pull) of Western and Japanese planes differ considerably, it's interesting to note that the lengths of the reference area of each plane are almost identical. The length of the sole behind the mouth on a Western fore plane, for example, is very similar to the length of a Japanese *chū-shiko kanna* set up for flattening. Similarly, the length of the sole behind the mouth on a Western try plane is very similar to the length of a Japanese *naga-dai kanna* set up for flattening.

This is intriguing. How is it that two completely isolated methods of woodworking evolved to come up with nearly identical lengths of reference for flattening boards? Does this mean anything? Is this part of the Zen of working wood by hand? Did the hand-tool gods have some kind of divine intervention during the design of these tools? Maybe.

On the other hand, perhaps it's nothing more than a confirmation that physics works. The mechanics of flattening a board or edge should be the same regardless of where in the world you are, and maybe it's us woodworkers, perhaps misguidedly, who are often on the lookout for the differences in the way we work, when we should be looking for similarities and common ground, instead. PWM



Separated at birth? *When the reference lengths of the* chū-shiko kanna *and a fore plane are compared side by side, they are nearly identical in length. The same is true for a* naga-dai kanna *and a try plane.*

Bob hosts the popular hand-tool podcast at the Logan Cabinet Shoppe (logancabinetshoppe.com). Wilbur lives in New Jersey and writes about Japanese woodworking tools on his blog "giant Cypress" at giantcypress.net.

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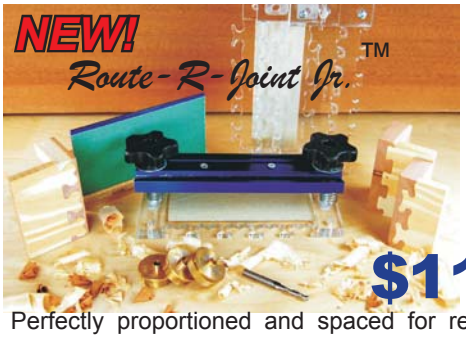

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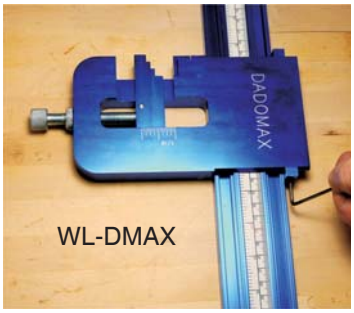

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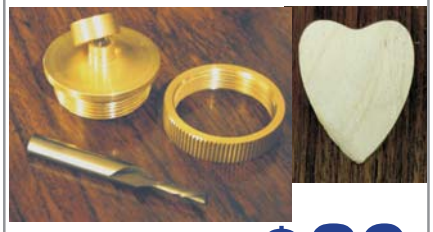

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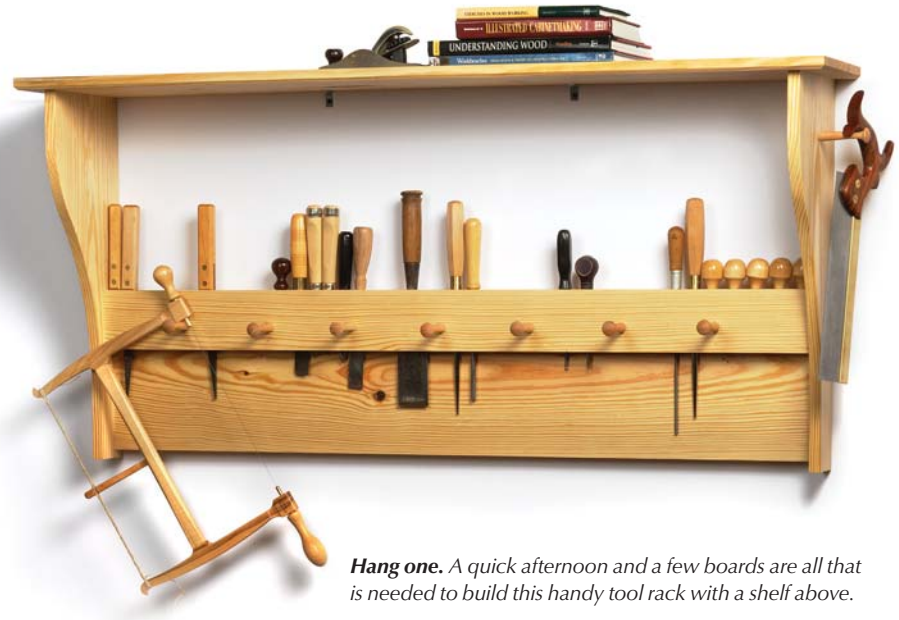
BY CHRISTOPHER SCHWARZ

Tool Rack

Swiped from a French engraving, this rack works in the shop or even in your kitchen.



Hang one. *A quick afternoon and a few boards are all that is needed to build this handy tool rack with a shelf above.*

It's good to keep your tools protected (think: tool chest). But it's also good to heep them handy (think: at arm's reach). My favorite way to accomplish both goals is a stout tool rack.

I've made many tool racks since I became a woodworker, most of them crude affairs that were cobbled together in a few minutes. I've always wanted a rack that both looks good and is easy to build. Then, while browsing a French book on vintage handplanes, I saw it.

In a 19th-century engraving of a French workshop, the back wall was covered with a rack very much like this one. Finding it and drawing it to scale were the hard parts. Building it took just a few hours.

You Know the Drill

The project is assembled using pocket screws, dimensional pine and some Shaker pegs I found at our home center (will wonders never cease?).

You are going to need at least 12' of 1x12 and 4' of 1x4 pine to build this rack. Once you have the wood in hand, the first step is to cut all the parts to length. Then rip the back and top pieces to width. Use a circular saw with an edge guide to make the rips, or use a jigsaw to make the rips then remove the saw blade marks with your block plane.

Next work on the ends with their ogee shape. I used the SketchUp drawing (available for free on our web site) to create a full-size paper template. I stuck the paper to one of the end pieces using 3M spray adhesive. Then I cut the ogee shape using a jigsaw and cleaned up my curves with a rasp and sandpaper.

Then I used the finished end piece as a pattern to make the second end.

Everything is in Pocket

All the joinery for this rack is screws. Bore three pocket holes on each end of the 1x4, which is the front of the tool rack. Then drill five pocket holes on each end of the back piece of the rack.

You are just about ready to assemble the bulk of the rack, but first clean off all the tool marks using a block plane or sandpaper.

You have to assemble the rack's parts in a certain way for everything to go together. The first job is to screw the front 1x4 to the end pieces.

The position of this part is critical because it will determine how much of a gap you will have between the front and the back of your rack. And this gap is what holds your tools. After much experimentation, I have found that a $\frac{1}{2}$" gap is ideal for handling about 99 percent of my tools. However, you should take a close look at the tools you are going to store on your rack before you imitate me.

Use my drawing (or your own modified drawing) to mark a line where this front piece will join the ends. Clamp the front piece in position and screw

Screw this. *The entire project is assembled with pocket screws. Here I'm boring five pocket holes on one end of the back piece.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG

it down. Screw the other end in place using the same procedure.

Now you can screw the back piece in place. You should be able to squeeze it between the two ends, tap it gently in place, then screw it tightly to the ends.

Now you can turn your attention to the top piece. I cut a 1/4" x 1/4" chamfer on the underside of the top using a block plane. This is easy to do freehand – just use your combination square to lay out the pencil lines for the chamfer and plane the corner down to them. A little irregularity is OK.

The top of the rack is screwed to the ends. It's not done with pocket holes – just six simple countersunk No. 8 x 1 1/4" wood screws.

I've Got You Pegged

The Shaker pegs on the front of the rack give you more places to hang your tools. The seven pegs are spaced every 5 3/4" across the front of the rack. The center of each hole is 2 1/4" down from the top edge of the front of the rack.

The pegs I bought needed 1/2"-diameter and 1/2"-deep holes. Drill the holes, dab in some glue and knock them home. I had an extra peg left over from the package from the home center and put it on one of the ends to hold my shop apron (our photographer hung a backsaw on it for the photo at left).

Finishing & Hanging

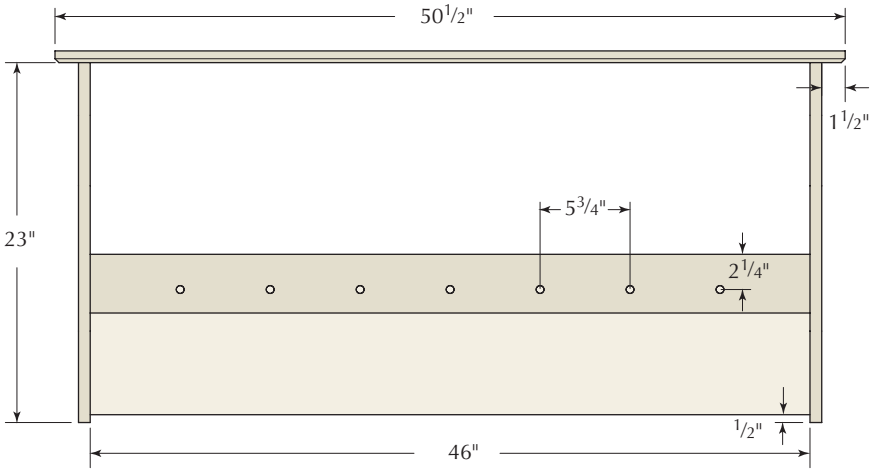
My first instinct was to paint this rack, but the pine I found was clear enough to use without paint. So the finish for this rack is the same I use for all my shop furniture. I thin down satin spar varnish with paint thinner at 3:1. I wipe on three coats, sanding between each coat with a #320-grit sanding sponge.

Hanging the rack is simple. Find the studs in your shop wall. Drive No. 8 x 3" screws through the back of the rack and into your studs. Then purchase two simple L-brackets. Screw them to the underside of the top and into your studs. That should do the trick.

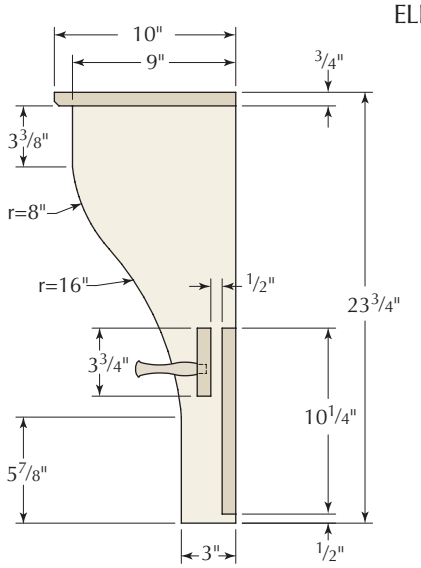
Though this rack is intended for the shop, several people who have seen it insist they are going to build one for the kitchen and put their knives in the rack, hang pots on the pegs and put cookbooks on the top shelf. As the French are both expert craftsmen and chefs, this is entirely appropriate. PWM

Chris is the editor of this magazine and doesn't have a drop of French blood in him, despite his love of French benches, tool racks, wine and food.

Stops sagging. *Don't forget the little L-brackets under the top. These prevent the top piece from sagging.*



ELEVATION



PROFILE

Tool Rack

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 2	Ends	3/4	9	23	Pine
❑ 1	Back	3/4	10 1/4	46	Pine
❑ 1	Front	3/4	3 3/4	46	Pine
❑ 1	Top	3/4	10	50 1/2	Pine

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Gustav Stickley Morris Chair

BY ROBERT W. LANG

Reproduce an Arts & Crafts classic and reward yourself with the ultimate easy chair.

Sit up straight. *Or lean back and relax. This Gustav Stickley Morris chair is an icon of American furniture design with exposed joinery and solid quartersawn white oak.*

In Gustav Stickley's book *Craftsman Homes,* there is a picture of this chair with the following caption: "A big deep chair that means comfort to a tired man when he comes home after the day's work." First produced around 1906, this chair is an icon of Stickley's furniture and his philosophy.

Visually, this chair invites you to sit down and relax – a result of the sloping arms and side rails, the warmth and color of the quartersawn white oak and the upholstered seat and back. Few people who see this chair can resist the desire to sit in it. And few who sit in it can rise without regret.

Other manufacturers who knocked off Stickley's work cut corners and simplified his designs, and many woodworkers look for a way to make a chair like this with simpler joinery. Without the joinery it isn't a chair like this; it's something less. There is a reward for doing it right; in this case, the reward for the effort is the chair itself.

Fools Rush In

As I prepare to build, I like to break a project down into its component parts. Each side of the base of this chair is a subassembly of two legs connected with rails. These are joined with rails front and back and are capped with the distinctive bent arms. The back of the chair is a separate unit that pivots and adjusts with a simple mechanism.

One obvious challenge is making the arm, but that is simpler than it seems. The rails and slats below the arms seem simple, but the slope that makes the chair appealing complicates these parts.

The first step in making this chair is to draw a full-size layout of the side assembly. It's a good exercise in understanding how it all goes together, and it's an indispensable reference for the actual sizes and angles of the component parts.

The top edge of the top side rail is angled, rising from a height of $15/16$" at the back leg to the full width of $3\frac{1}{2}$" at a point $3/4$" behind the front leg. The bottom edge of this rail is parallel to the

LEAD PHOTO BY AL PARRISH; STEP PHOTOS & ILLUSTRATIONS BY THE AUTHOR

floor, and perpendicular to the legs. The bottom rail is a constant width, but it meets the legs at a slight angle; the back is 3/4" lower than the front.

That slope makes the through-tenons on each end of the lower rail a little trickier, but the real complication is that each of the vertical slats is a different length. After drawing the full-size view, I switched gears and made the legs, which gave me something useful to do as I pondered the implications of the angled ends of the slats.

Trees Don't Grow Like That

Quartersawn figure on all four sides of the legs was a feature of original versions of this chair, and I used the same method used in Stickley's Craftsman Workshops. Three pieces of 13/16"-thick material were laminated into a stack. After letting the glue cure overnight, I dressed the surfaces on the jointer.

Then I glued a 1/8"-thick piece of quartersawn wood to the side edges of the leg laminations. These thick veneers were sliced on the band saw and cover the unattractive side grain (as well as the joint lines) on the legs. After an overnight wait for the glue to cure, the legs were dressed down to 2 3/8" square.

The edges of the legs are beveled, with the bevel ending at the glue line between the solid and veneered edges. I placed the finished legs on the full-size layout to locate the tenons at the tops, and the mortises, marking the locations directly on the legs from the drawing.

I made the 5/8"-wide through-mortises with a hollow-chisel mortiser, working from both sides with a 1/2" chisel and bit. That size bit takes less effort to plunge into the work, and I centered the mortises by cutting one side of the joint, then flipped the workpiece so the opposite side was against the machine's fence.

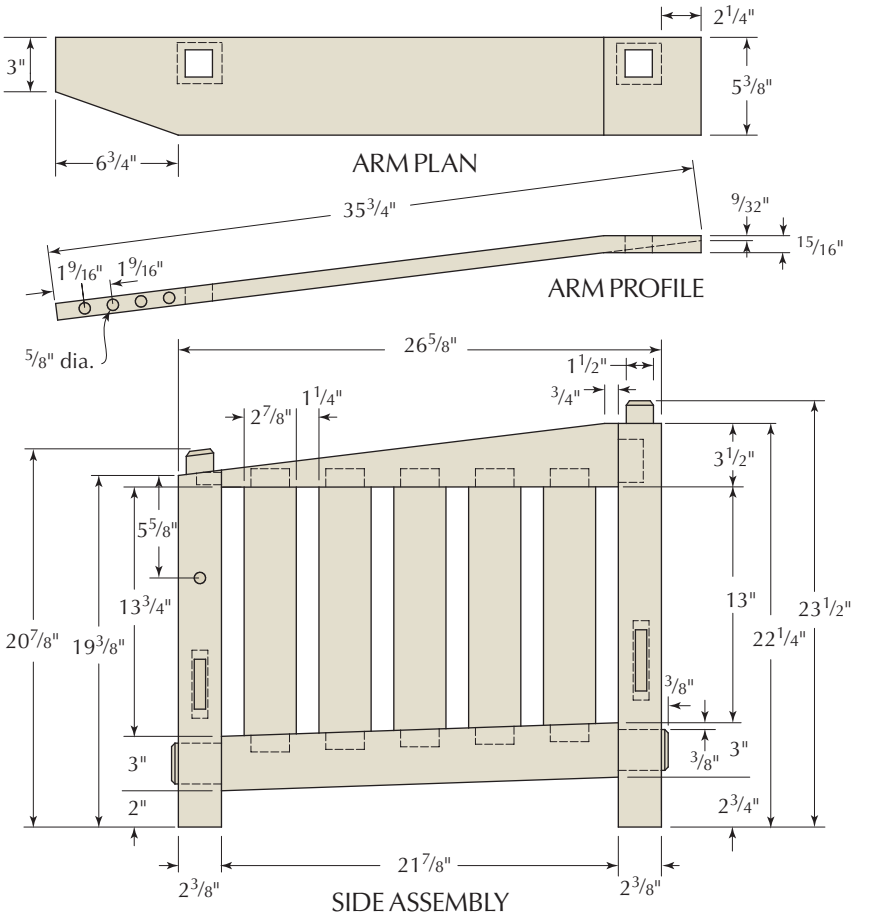
I also cut the angle on the back legs, and the 1 1/2" square tenons on the tops of all the legs before proceeding. The tenons on the ends of the side rails were cut, and I dry-fit test assemblies of the sides. I located the taper for the top rail from the test assembly and after cutting it on the band saw, I put each side assembly on top of my drawing.

Measure once. *A full-scale drawing provides a reference for most parts of the project. It saves time, and prevents measurement and layout errors.*

Use This to Measure That

I marked the locations of the vertical slats on the top and bottom rails, along with the mortises for the slats. Then, with a lumber crayon I marked each mortise with a number. I put each slat in position, numbered each with the crayon and marked the shoulder locations directly from the rails.

Each vertical slat is a bit longer than its neighbor, and if the slats move sideways along the rail the length will



"... As we grow older and begin to stand on our own feet and to cherish our own standards of life and of work and therefore of art, we show an unmistakable tendency to get away from shams and to demand the real thing."

— Gustav Stickley (1858-1942)
furniture manufacturer

change. A slat that is slightly long or short can be moved for appearance sake, but more than a slight adjustment will show as inconsistent gaps between the slats. Moving one slat laterally will also affect the fit of an adjacent slat.

Many Mortises

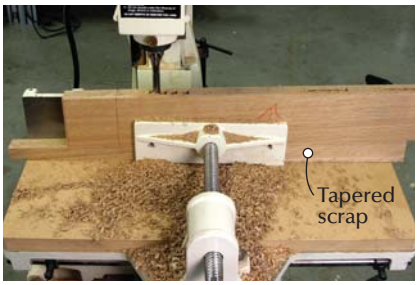
The mortises in the rails are centered and I made them with a 3/8"-wide chisel in the mortising machine. I saved the offcuts from the top rails and temporarily reattached them with tape to keep the mortises vertical. I cut a long wedge to hold the bottom rail at the correct angle to keep those mortises vertical.

I cut all of the tenon shoulders by hand. That gave me more control over the angles and a better cut edge than cutting them by machine. I cut the tenon cheeks on the band saw, and adjusted the fit with a shoulder plane and a float. When the slats were fit to the two rails I made a trial run of that subassembly with the legs.

I made a few minor adjustments to get a good fit everywhere. Before gluing the slats in position, I smoothed all the edges of the rails and slats with my plane and rounded all the edges slightly.

Through & Through

The through-tenons on the bottom rails give the chair frame strength – if they fit well. They also need to look good from the outside. Good looks are a given if the joints fit, and the key to it all is planning and patience.

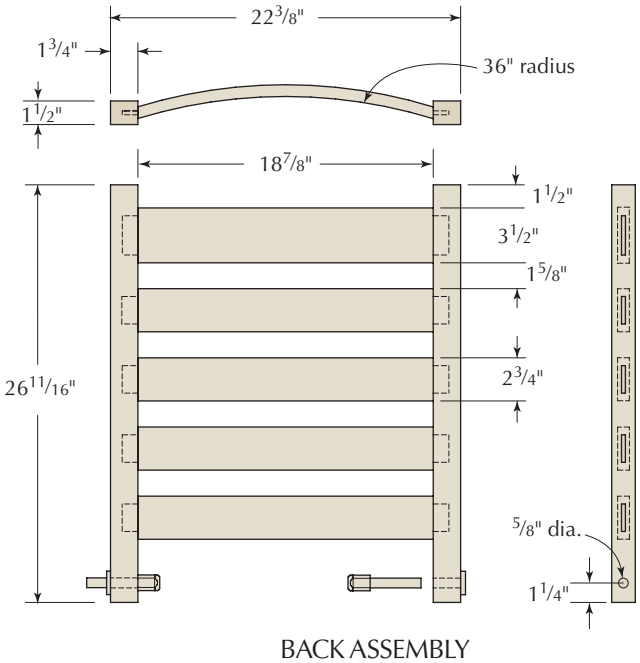


Keep your head straight. *A tapered piece of scrap below the workpiece keeps the mortises oriented vertically.*

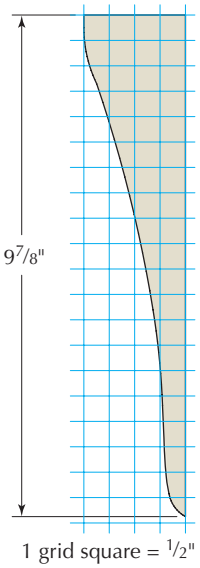
The mortise walls need to be straight and consistent, so I spent some time with a float to even out rough areas left from the hollow chisel. I also made sure that the ends were square and the walls of the mortises were perpendicular to the faces of the legs. With a chisel, I cut a small bevel on the inside edge of each mortise to ease starting the tenons.

To determine the exact tenon width, I held the end of a rail against the long edge of a mortise, and made a pencil mark to transfer the width of the mortise. I then took my marking gauge and set it halfway between the pencil mark and the opposite face of the rail. I made a test mark from each side and held the end of the rail to the mortise to check that the widths matched.

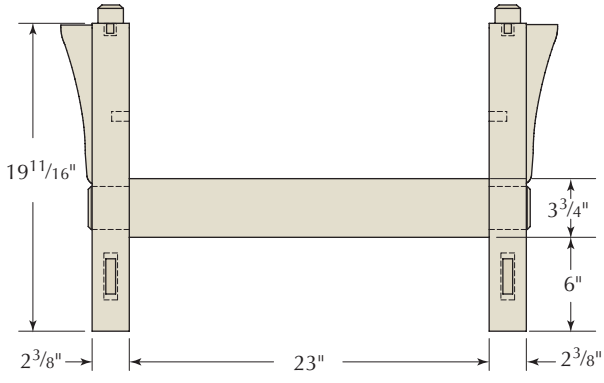
When I was satisfied that I had the correct size for the tenons, I marked the edges and ends of the rails with my gauge. I clamped both rails together



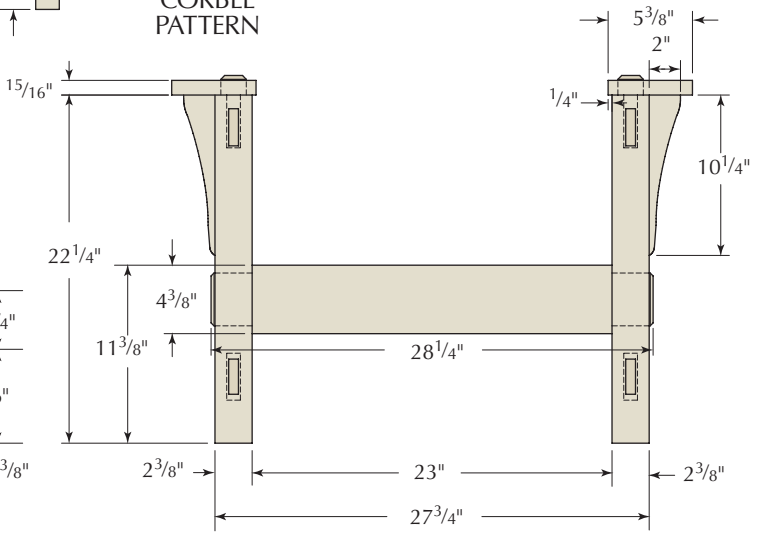
BACK ASSEMBLY



CORBEL PATTERN



BACK LEG ASSEMBLY



FRONT LEG ASSEMBLY

and marked the shoulder locations at the same time to be sure they matched. The shoulder cuts are only 1/8" deep, and I cut these by hand at a bench hook using my backsaw.

At the band saw, I set the fence so that a tooth angled toward the fence was just outside the marked line. I held the rails against the fence and cut the wide cheeks back to almost the shoulder line. I measured the tenon and the mortise with dial calipers to compare the sizes. My goal was a fence setting that left the tenon barely thicker than the mortise. This prevents a sloppy tenon, but it means that some tweaking must be done to get a good fit.

Before fitting, I cut a chamfer on the end of each tenon. This makes it easy to insert the tenon for a test fit, and it keeps the end of the tenon from doing any damage to the outer edges of the mortise when it comes through.

Fitting is a matter of removing a small amount of material at a time and seeing how far the tenon will go into the mortise. I generally start with a shoulder plane, being careful not to introduce a taper in the tenon. As I get closer, I switch to a float. The float is easier to control and leaves a nicer surface.

Hatch marks made with a pencil on the tenon indicate high spots that keep the joint from going home. The graphite smears at the sticking points, and I used the float to take off the smeared spots. I don't use a mallet to try to drive the tenon in; if that much force is necessary, something is likely to break.

Hand pressure is enough, and when the tenon can be inserted about two-thirds of the way, I can look from the outside to see if there are any problem areas. The first assembly is the hardest. I usually take joints apart and put them back together several times as I'm working to tune the fit at the shoulder and to make trial runs before making a final assembly with glue and clamps.

When I was happy with the fit, I marked with a pencil where the outside of the leg lands on the exposed tenon. I cut the tenon 1/4" beyond that line, then chamfered the end of the tenon back to the line with a block plane, rasp and finally sandpaper. Leaving the line ensures that the visible intersection of the tenon and the leg looks tight.

Bring on the Glue

Assembly of the base of the chair is done in stages; first the vertical slats are glued between the top and bottom rails for each side. I used liquid hide glue to gain some extra open time, and held the angled offcut from the top rail in place with painter's tape to keep the clamps from sliding. I used a block of soft wood and a mallet to fine-tune the lateral position of the slats.

I let that dry in the clamps overnight, and glued the legs to each end of the rail assemblies the following morning. To keep glue from going everywhere around the through-mortises, I started the tenons in the holes, then brushed glue on the cheeks before assembling and clamping the joints.

After letting the rail-to-leg joints dry overnight, I marked and drilled a 5/8"-diameter hole 1 3/8" deep on the inside of

Don't throw that away. *The offcuts from tapering the upper rails are taped back in place to keep the clamps from sliding during assembly.*

Only if you have to. *Because the lower end of the vertical slats are angled, they only fit in one place. They can be adjusted with a tap or two.*

Control the glue goo. *Start the through-tenon in the mortise before brushing on the glue to keep the end of the tenon clean.*

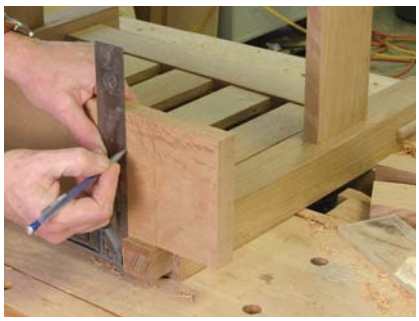
Stress management. *With the sides glued into units, the last stage of the base assembly is a simple matter.*

A little off the top. *An angled wedge sliced off the end of the arm forms the bend.*

Get to the bottom. *The wedge is glued to the underside of the arm, smooth face to smooth face.*

Smooth it over. *Planing out the band saw marks leaves a smooth surface on the top and bottom of the arm.*

Nothing to see here. *The glue line should disappear because the grain and color are the same in both pieces.*



Can't miss. *Balance the arm on the base assembly and mark the location of both the front and back tenons without moving the arm.*

Follow around. *An adjustable bevel transfers the layout lines for the angled mortise from the top of the arm to the bottom.*

each of the back legs. I then connected the two side assemblies with the front and back rails. This assembly was also left in the clamps overnight.

The arms complete the side assemblies, and are cut from a piece of $1\frac{5}{16}$" x $5\frac{3}{8}$" stock. I started with a piece several inches longer than the finished length to get the angle of the bend and the tenon locations right first. Before making the arm, I made sure that the top edges of the top rails were in line with the shoulders on the tops of the legs.

I placed the stock of an adjustable bevel on the shoulder of the front leg, and set the blade to the slope of the rail. I transferred this angle to the edge of the arm. The bend is actually a tapered slice cut from the top of the leg, then glued to the bottom edge.

After making the cut on the band saw, I glued the wedge to the bottom of the arm. This leaves the sawn edges exposed on the top and bottom surfaces of the arm, and the previously surfaced faces glued together. I removed the saw marks with my plane.

Location, Location, Location

The through-mortises on the arms are the most visible joints in the chair, and there aren't any magic tricks or shortcuts to the process. The mortises need to be just right, and in just the right place. I flipped the assembled base of the chair on its side so I could locate the joints in each arm directly from the tenons.

I placed the arm on top of the tenons in the legs, lining up the angle in the arm with the angle in the top rail behind the front leg. With a square I carried the edges of the tenon around both the top and bottom face of the arm. The procedure was roughly the same for the back tenon, except that I used an adjustable bevel to carry the lines over the edges.

When the chair is finished, the arm extends $\frac{1}{4}$" past the leg on the inside. I measured from the side of the leg to the cheek of the tenon, added the $\frac{1}{4}$" and marked the side of the mortise on the upper and lower faces of the arm. I then measured the tenon width and marked that distance on the face of the arm for the second edge of the mortise.

An accurate layout is half the battle so I stepped back and double-checked my lines before cutting. I removed most of the waste inside the lines with a $\frac{3}{4}$" Forstner bit at the drill press. For the front mortises, I placed a block of wood below the arm to support the horizontal end level while drilling.

At the back of the arm, I cut a wedge from a scrap of 8/4 material to support the arm while drilling to keep the front and back edges of the mortises plumb. I used this same wedge to support the arm on the bench as I pared the mortise walls back to the layout lines.

Supplies

Tools for Working Wood
toolsforworkingwood.com or
800-426-4613

Aniline dye, Fumed Oak (#94)
1 oz., $7.49

Price correct at time of publication.

On the up and up. *A wedge below the arm provides the proper tilt to keep the holes vertical.*

Pare to plumb. *The same wedge is clamped between the arm and the bench to pare down the walls of the through-mortise.*

Careful comparison. *Check the size frequently with calipers as you work on the mortise, and compare it to the tenon.*

I worked carefully and checked frequently to avoid over-cutting the mortises. It isn't possible to check the fit of the tenons one at a time. As with the through-tenons connecting the rails and legs, I beveled the ends of the tenons and hidden edges of the mortises before fitting, and used pencil marks on the tenons to locate any high spots.

When I had a good fit, I marked the top edge of the arms on the leg tenons, then removed the arms and rounded over the exposed ends of the tenons with a block plane and rasp. Before permanently attaching the arms, I drilled a series of 5/8"-diameter holes on the inside back edges for the support pins.

Back in a Week

While waiting for the glue to dry on the base assemblies, I made the curved back slats. I built a form from four layers of 3/4"-thick particle board cut to a 36" radius. I cut the curve on the first layer at the band saw, then smoothed the edge. The remaining edges were cut oversize, and each layer was added to the stack, then trimmed to the previous layer with a flush-cutting router bit.

Each slat consists of six 1/8"-thick layers. I marked a triangle on the edge of the slat blanks to keep the pieces in order, and made the cuts on the band saw. With a decent saw cut, the laminations can be glued without any further smoothing. I used a 3" paint roller to apply yellow glue, put the stacked pieces against the form and started clamping from the middle out to each end.

I used a piece of 1/4"-thick Plexiglas between the wood and the clamps to spread the pressure and prevent clamp marks on the wood, and left each stack on the form overnight. When all five slats were finished, I scraped the excess glue from the edges, ran one edge over the jointer, then trimmed the slats to width on the table saw.

To lay out the tenons on the ends of the curved pieces, I prepared a straight stick with a tenon on each end. By placing this stick on the top edge of the slats, I was able to mark the tenons on the curved parts by tracing. I then carried the lines around the slats with a square and an adjustable bevel.

I made the shoulder cuts by hand after going over the layout lines with a knife. The slats stayed put on the bench hook with the convex side of the curve on top. To cut the other side, with the curve up, I put a wedge of scrap below the slat and held the slats to the bench with a clamp while I made the cuts. I cut the cheeks at the band saw.

After the fit. *Mark the intersection of the arm and the tenon with a pencil line and round the end of the tenon down to the edge. Stop just outside the line to maintain the fit between the two parts.*

The 1/4"-wide, 1"-deep mortises in the back stiles are centered in the thickness of the rails, and were cut with the hollow-chisel mortiser. Before assembly, I

Work fast. *Use a roller to spread glue on one side only of the laminations for the back. Keep the pieces in order and the edges will match.*

Stick with it. *Make a pattern on scrap to lay out the tenon locations on the curved back rails. Hold the stick in place and mark both ends without moving the stick.*

Around the bend. *Mark the tenons all the way around the slat with a square and an adjustable bevel. Go over the lines with a knife before cutting the shoulders with a backsaw.*

Quick cheeks. *A band saw is an efficient way to cut the tenon cheeks, or you can cut them by hand. Either way, cut a little wide and make the tenons fit with a shoulder plane or a float.*

Gustav Stickley Morris Chair

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Front legs	2 3/8	2 3/8	23 1/2	QSWO*	1 1/4 TOE**
❑	2	Back legs	2 3/8	2 3/8	20 7/8	QSWO	1 1/4 TOE
❑	12	Leg laminations	13/16	2 3/8	25	QSWO	
❑	8	Leg veneers	1/8	3	25	QSWO	
❑	2	Top side rail	7/8	3 1/2	24 5/8	QSWO	TBE†
❑	2	Bottom side rails	7/8	3	27 3/8	QSWO	TBE
❑	10	Side slats	5/8	2 7/8	16	QSWO	TBE
❑	1	Low front rail	7/8	4 3/8	28 1/4	QSWO	TBE
❑	1	Low back rail	7/8	3 3/4	28 1/4	QSWO	TBE
❑	2	Arms	15/16	5 3/8	35 3/4	QSWO	
❑	4	Corbels	1 1/8	2	9 7/8	QSWO	
❑	2	Doughnuts	5/16	2 dia.	9 3/4	QSWO	
❑	2	Pivot pins	1	1	5 3/4	QSWO	
❑	2	Stop pins	1	1	3 3/4	QSWO	
❑	2	Back stiles	1 1/2	1 3/4	26 11/16	QSWO	
❑	1	Top back slat	3/4	3 1/2	21 3/8	QSWO	TBE bent lamination
❑	4	Back slats	3/4	2 3/4	21 3/8	QSWO	TBE bent lamination
❑	2	Seat cleats	3/4	1	22 7/8	QSWO	

*QSWO = quartersawn white oak; **TOE = tenon one end, †TBE = tenon both ends

sanded all the parts for the back, chamferred the edges of the stiles and drilled the holes at the bottom of the stiles.

When assembled, the width of the back should be about 1/8" less than the distance between the arms to allow the back to adjust without interference.

What the Holes Are For

Wooden pins serve as pivots for the back, and as stops to adjust the back to any of four positions. I started with four 1"-square blocks about 8" long and turned a 5/8"-diameter shaft on one half. These could also be made by gluing a dowel into a hole drilled in the end of a square block. I sanded the shafts to reduce the diameter slightly. These should go easily in and out of the holes in the arms and back legs.

After fitting the pins, I trimmed them to length. The bottom pins pass through the stiles of the back, and the round shafts are about 2" longer than the depth of the holes in the back legs. The upper set of pins are the same depth as the holes, and the square section should be about 2" long.

I used a block plane to chamfer the edges of the square end of the pins to an octagon shape and to round off the ends. Round wooden washers hold the back assembly away from the legs. These are 2" in diameter, and I waited until the arms were glued to the base, and the back was assembled, to make them.

I used a piece of scrap 2" wide and 12" long, and aimed for a thickness half the difference between the back and the back legs. Then I took another 1/32" off the thickness before drilling the holes and cutting the outside to a circular shape. These doughnuts keep the back from rubbing on the arms, but they must be thin enough to allow the back to swing without binding.

The last pieces to be fabricated are the four corbels that support the outer halves of the arms at each leg. All four corbels are cut to the pattern from 1 1/8"-thick stock. The back corbels should be about 1/2" shorter in the straight section than the front. The top of the back corbels also must be angled to match the slope at the top of the back legs below the arms.

The corbels are centered on the legs and are held to the leg with glue and a

Turn then whittle. *After turning one end of the pin, trim it to length then shave the sides to an octagon. The last step is to round the end to a hand-friendly dome shape.*

Take it for a spin. *The back of the chair pivots on the lower set of pins, and the large wooden washers keep the back centered without rubbing on the arms. The upper pins support the back in one of four positions, from upright to do not disturb.*

Suspenders and a belt. *Dowels cover screws that hold the corbels to the legs. The through mortises on the legs are also pegged with dowels made from scraps. Trim them flush before finishing.*

screw in a plugged hole. The screw isn't necessary as the glue alone would be strong enough, but it makes it easier to hold the corbel in position. Without the screw, the corbels slide around as the clamps are tightened.

When the glue holding the corbels dried, the screw holes were filled with dowels. The through-tenons on the base assembly were also pinned with dowels, as well as the tenons in the top and bottom slats of the back assembly.

I make dowels from straight-grained scrap. I start with a piece about 3" long and split blanks from the scrap with a chisel or a stout knife. I then drive the dowels through holes in a 1/4"-thick steel dowel plate. I whittle the ends to get them started, and knock off the corners with a chisel so there is less material to remove.

The dowels are coated with glue and driven into place. After the glue has dried, the pegs are trimmed flush with a saw. The saw can leave a fraction of the plug proud of the surface, so a bit of paring with a chisel was needed in a couple places.

Hard Surfaces, Soft Surfaces

As I worked, I smoothed exposed faces and edges with my planes before assembling. I also chamfered the long edges with my block plane, and I used a rasp and sandpaper to round the exposed tenons. In a few places I had some tearout to deal with where the grain direction reversed, and I used a card scraper to smooth these troublemakers.

Each of these tools leaves a smooth surface, but with a slightly different texture. To get an even texture before finishing, I sanded the entire chair, first with #120-grit Abranet, then #180 grit. Sanding white oak to too fine a grit can polish the surface to a point where it won't absorb color evenly. If scratches from sanding aren't visible, the wood is smooth enough to dye.

I used Lockwood's Fumed Oak (#94) aniline dye dissolved in alcohol. This dries quickly as it is brushed on and doesn't raise the grain. I aimed for a consistent coat on all surfaces without running the dye. The color is close to that of white oak fumed with ammonia, and there is another similarity between the dye and fuming; the surface looks like you ruined it when it dries.

I rubbed the entire chair with an abrasive pad after letting the dye dry for a few hours, then brushed on a 50-50 mixture of clear and amber shellac. I diluted this about a third with alcohol. The following morning I went over the chair again with the abrasive pad, then brushed on a second coat of shellac. After letting the shellac cure for a week, I gave the chair a coat of Dark Watco Satin wax, applied with an abrasive pad then buffed with a cotton cloth.

I had a local upholstery shop make the cushions. The bottom cushion rests on 3/4" x 1" cleats screwed to the inside of the front and back rails, 1 1/4" down from the top edge. The cushion consists of a solid-wood frame made of 2x4 material, ripped to 2" wide.

The corners are mitered and held together with glue and screws, with 45° corner blocks for additional strength. Rubber webbing was stapled to the top edge of the frame. The webbing covers the entire opening, running in both directions in a basketweave.

A 1"-thick, 12"-square piece of high density foam was glued to the center of the webbing to give the cushion a crown. On top of this is a 4"-thick piece of high-density foam wrapped in Dacron. The fabric wraps over the foam and is stapled to the bottom of the wood frame.

The back cushion is a 2"-thick piece of soft foam wrapped twice in Dacron. The buttons in the back of this cushion help it to conform to the curve of the back, and loops of fabric hold the cushion in place on the back frame. PWM

Bob is executive editor of Popular Woodworking Magazine *and the author of the "Shop Drawing" series of books about the American Arts & Crafts movement of the early 20th century.*

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Bend the Laws of Lignum

BY CHRISTOPHER SCHWARZ

A recent innovation lets you bend wood without steam or adhesives.

I can bend that. *With Compwood, you can bend wood in ways that are surprising. When the wood dries, it holds its shape and can be worked with standard woodworking tools.*

The package of wood looked everything like a mummy when it arrived in our shop. The wood was wrapped in clear plastic, bound by plastic straps and wrapped by more plastic and cardboard.

We peeled away each layer to reveal a stick of unassuming 8/4 ash that was about 6" wide and 54" long. Aside from the fact that the wood was cool to the touch, it looked like regular ash.

I took it to the jointer and planer and machined it flat. I ripped off a 1"-wide slice and machined that to 1 3/8" thick, just like any other piece of wood.

But then I put that stick into a bending form, and the wood gave up its secret identity. Working alone, I bent the piece of ash along its 1 3/8" dimension and pulled it around a C-shaped bending form with a 9" radius. In 10 minutes, the wood was bent and clamped up. No steam or heat. No adhesives.

This is Compwood, a 1988 European invention that allows you to bend room-temperature wood around a form in multiple dimensions. The lumber comes to your shop wrapped in plastic because it is fairly wet – my piece of ash measured 20 percent moisture content.

"The New Age? It's just the old age stuck in a microwave oven for 15 seconds."

— James Randi (1928-)
magician, skeptic

While it's wet, you can bend the wood in almost any direction. When it's dry, it holds its shape and can be worked just like any other piece of wood.

Why Try It?

I became interested in Compwood when I saw it in use at Jeffrey Miller's woodworking shop in Chicago. He's been experimenting with the material to use in some of his chair designs and he showed me how it works. Intrigued, I purchased some for my own chairs, and I first cut into this batch to make some arm bows for some Welsh stick chairs.

The Compwood appealed to me for several reasons. While expensive, the Compwood allows me to make my arm bows without investing in a steam box, which I don't have room for. Also, the material allows me to bend wood to a tight radius without a bending strap and without the risk of compression ruptures on the inside curves or delaminations on the outside curves.

How tight? There's a formula for each species. For ash, the smallest bending radius without a strap is six times the thickness of the work being bent. So my 1 3/8" arm bow could be bent to an 8 1/4" radius or larger. So a 9" radius could be bent without a strap.

The Compwood is also less labor- and machine-intensive than a typical cold-lamination job. When I make cold laminations, I typically have to sand all the pieces down to 1/8" thick or less for tight bends – that's a lot of machine work. And I prefer to use plastic resin

Flexible terms. *Compwood can be bent without steam or – in many cases – a bending strap. It also can be bent in three dimensions.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR

glue for these parts, and it is nasty and messy stuff.

While I probably wouldn't consider the Compwood if I made hundreds of chairs for a living (I'd probably invest in a steam box), it did make sense for me for a short run of chairs.

How to Dry it

So how did the material fare? I found that it worked as advertised. After clamping up my arm bows, I let the wood air-dry in the form for a day, and its moisture content dropped to about 12 percent. Then I placed the form in a box that was heated with a lightbulb to 85° F and the work quickly dropped to 7 percent, according to our pinless moisture meter. That's when I first removed it from the form.

The piece sprang out a little at the ends (though it was nothing unacceptable). The reason for the springback was that the wood likely wasn't completely dry.

My makeshift "kiln" wasn't ideal. Miller makes his kilns out of 2"-thick pink foam insulation boards then heats the kiln with a ceramic heater with a fan. His kilns are leaky, which is good because it allows the moisture to escape. He leaves parts in his kiln for about a week. The results were impressive.

"It was pretty much flawless from a springback perspective," Miller says. "It didn't move a bit."

Relax(ed). *One of my arm bows sprung out a little after being released from the form before the arm bow was completely dry. Back onto the form for you.*

Chris Mroz, who makes and sells Compwood to woodworkers and industry through his company, Fluted Beams, says that I probably removed the wood from the form too soon. For a piece like mine, he would dry it at 110° F for about six days. If he were to air-dry it, he would leave the piece in the form for two or three weeks. So I clamped my arm bows back into the form and let them sit.

How the Stuff is Made

The way Compwood is made is just as interesting as using it. Compwood is made by first steaming the wood at 212° F until it becomes plasticized. Then it is placed in a press that compresses the wood in length. A 3-meter-long piece of wood will end up about 2.4 meters long when in the press. When the press is released the board will expand again, but it will have lost about 5 percent of its length.

This time in the press bends the cells of the wood like an accordion. The structural change in the cells is what allows the Compwood to bend when it is in a cold but wet state.

Not all species work with this process, but the range is expanding all the time. Fluted Beams, which has the only Compwood press in the Americas, sells 14 different species, from beech, white oak and walnut to cherry, elm and even osage orange.

Softwood species and exotics don't seem to respond well to the Compwood process, though experiments with exotics are ongoing.

As far as pricing goes, expect to spend $30 to $40 a linear foot for 8/4 material that is about 6" wide. Thinner stock is considerably less ($18.75 a linear foot). And Fluted Beams (fluted beams.com or 253-988-2046) also offers small bundles of Compwood for as little as $20 that will allow you to experiment with the wood without buying large planks.

Mroz quickly acknowledges that because Compwood is expensive it's not for every job. If the project can be done with steam-bending, that definitely is a cheaper way to go.

"I tend to focus on using this product for things that haven't been done before – when the wood needs to bend in multiple dimensions," he says. "It's whenever the shape gets more sculptural that this product becomes useful."

The golden arches. *I was well pleased with the way the Compwood behaved for these arm bows. Now I just have to get on with saddling the seats of the chairs.*

And while I can see that side of the equation, I also am a fan of it for my simple bends because it's easy to use in a small shop with limited equipment. Plus it doesn't fail spectacularly like some of my steam-bending adventures. **PWM**

Christopher is the editor of this magazine and secretly wishes at times to be a starving chairmaker, instead of a starving writer.

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WEB SITE: *Read details of how Compwood is made at the factory.*

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Precision Inlay, Simple Tools

BY JAMEEL ABRAHAM

A few shop-made appliances allow you to add stunning face-grain inlay to your work.

Plentiful patterns. *Make hundreds of designs using micro lumber and only two or three miter angles.*

Geometric bandings and inlay patterns, or parquetry, are widely used, from Japan to Egypt to Spain. I developed a method of creating parquetry while learning to build ouds, a musical instrument that is the ancestor of the European lute and modern guitar.

The method can be employed to make bandings and inlays from as little as two species of wood, one at a time, to more detailed patterns using multiple layers to produce several copies of the same pattern. The designs I most frequently use create the illusion of dimension, as if the pattern were a flexible ribbon, folding, twisting and turning along its length. These patterns are fun to design and make, and can richly embellish any project.

"One minute of patience, 10 years of peace."

— Greek proverb

This geometric parquetry differs from typical mosaic-wood techniques (think classical guitar rosettes made primarily of dyed strips and sliced into end-grain segments) in that the exposed face is entirely face grain. No end grain is visible, so the chatoyance and color of the wood is vibrant. I like to use figured woods such as curly or bird's-eye maple. Even at this small scale the wood's figure creates a shimmer and sparkle.

To my eye, these designs look best when the joints are near perfect, so simply cutting the pieces with machines usually doesn't cut it, although some of the cuts could be accomplished with precise machine setups. Plus, machines remove large amounts of wood, and many of the designs I use are cut from books of exotic and costly veneers, which take time to mill and assemble. Power machinery would waste more of the carefully prepared material. I also enjoy the process using hand tools – I can listen to music or the birds outside my shop. The fragility of the individual pieces calls for the use of gentler techniques.

Stock Preparation

The process starts with precisely dimensioned stock. My furniture-maker friend Tom Monahan stopped by my shop during this project, spotted my prepped stocked and quipped "nice micro-lumber."

But you can't buy this material from tiny sawmills; you have to make it yourself. I use a small wide-belt sander to mill stock down to about .075" (just over 1/16"), but this can also be accomplished by hand with a planing board and jointer plane. For the thinner elements in a design I use commerical sliced veneer.

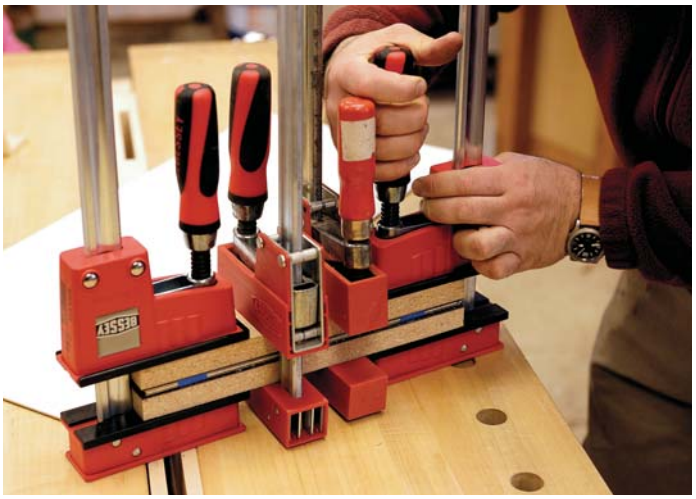
For this book (a veneer packet) I'll use three thick layers and four veneer layers. I usually make the two outer layers with thicker pieces. This makes the assembly and inlay process a little more forgiving because the extra thickness allows you to flush misaligned pieces after glue-up without compromising the design. If I want a very thin line of contrasting veneer around the perimeter of the piece, I'll glue this on later, after the assembly process is complete.

PHOTOS BY FATHER JOHN ABRAHAM

Planing board. *A planing board allows you to plane stock down to crazy thinness with insane accuracy.*

Micro from macro. *Use your largest bench plane (here, a No. 7) to keep the thin board held flat while planing the wood to precise thickness.*

Packet blanks. *Feel free to rearrange the blanks within the packet for a different look.*



I want you to squeeze. *Make the packet into a book in a quick-and-dirty veneer press made from kitchen countertop offcuts. Blue tape prevents slipping. Exert a lot of pressure on the packet. You want to make sure it's well-adhered and flat.*

Resawing & the Planing Board

I resaw these pieces off a jointed face of a thicker board then thickness them from the sawn face on the planing board.

To make the planing board, glue some thin offcuts of a mild wood onto a flat substrate. A short stop at the end and a long strip along the side are all you need. You don't want to clamp the wood in position; you just need to restrain its movement. This works best with short pieces because a longer piece will tend to buckle at the front of the planing board. I also try to keep my workpieces about 2" wide, no more. This allows me to take a full-width shaving with my No. 7 bench plane. The long toe section of the No. 7 also helps hold down the piece.

You'll also want to make sure the long strip running along the planing board is thinner than your final thickness. If it is thicker, you'll plane just the far edge of the blank as the plane's edge rides high on the strip. If you find areas of the blank getting thinner than you want, raise up that section with a layer or two of blue painter's tape. With a finely set plane and a sharp iron, you can easily get within three or four thousandths of your target. Once you get all your blanks to the right thickness, cut some veneer to complete the packet. With all the layers in the packet complete, clamp the entire packet in the face vise and plane one edge to see how it looks.

Glue-up

You don't need a veneer press or fancy setup to glue up your packet. This packet contains some rosewood so I'm using epoxy. Yellow glue is fine for five layers or fewer using domestic hardwoods. White glue or liquid hide are good if you like to take your time. Apply glue to the inside face of the first layer, then flip the next layer onto it and repeat. Once the packet is glued, apply a strip of masking tape around both ends to keep the layers from sliding. The "press" consists of two pieces of laminate-covered particleboard cut a bit larger than the packet.

Clamp the packet and look for squeeze-out along the edge. Make sure the layers haven't shifted significantly.

After the packet has cured into a "book," remove it from the clamps, and clean up the edges and ends of excess glue. Then refine it until its edges are parallel and square.

Miter Box & Miter Jack

For this article I'm making a design using only one 30° cut. A dazzling array of designs can be made by assembling individual 30° elements of different lengths and configurations.

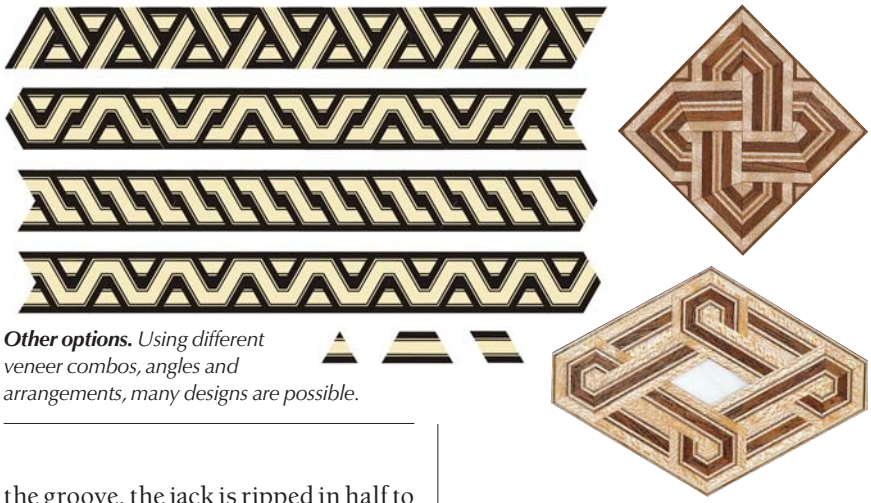
Can you believe how many designs one cut can produce? The bandings at right are all made from only the three different pieces illustrated at the bottom, all cut with 30° miters.

The key to this process is building a simple miter box and miter jack.

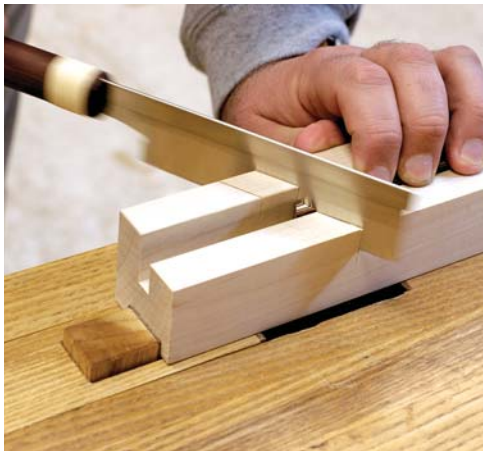
The miter box is made from mild hardwood with a groove just a little wider than the thickness of the book. A 30° kerf is cut into the walls of the box to guide the saw. A small, fine-tooth Japanese saw is perfect. I make the front wall of the miter box taller to guide the saw, and the rear wall lower to make it easier for my free hand to hold the work.

The miter jack consists of two jaws and a clamping knob to hold the workpiece. I cut a groove along a board as wide as the slice from the book – 5/8" to 3/4" wide is about as wide as I go. Any wider and the workpiece becomes difficult to align in the jack. After plowing the groove, the jack is ripped in half to allow the jaws to grip the workpiece, and holes are drilled for the clamping knob and screw.

The inner jaw is fitted with T-nuts while the outer jaw is fitted with a clamp handle and a machine screw. The outer jaw is then ripped a bit narrower so the inner jaw can be clamped in a face vise, allowing the outer jaw to move freely. Once the jack is assembled and clamped together, cut the 30° ramp on one end. You can also make the jack longer and cut a second ramp, at a different angle, on the other end for other designs.



Other options. *Using different veneer combos, angles and arrangements, many designs are possible.*

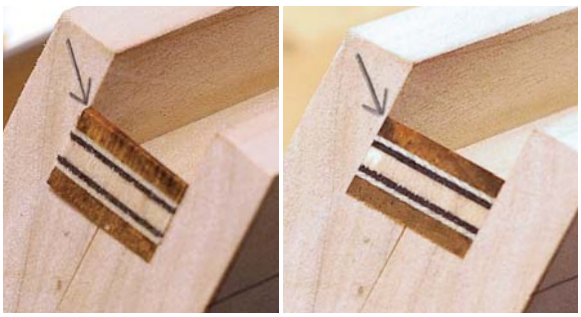


Miter box. *A scrap of wood and a cheap Japanese saw cut the rough miters quickly and easily.*

Miter jack. *This fixture allows you to perfect the miters with precise control.*

Shoot the stick. *Plane the mitered end of the stick in the miter jack.*

Trim the flat. *The narrow band at the top edge represents the amount to be planed off the sawn face to end up with a perfect piece.*



Jack be nimble. *Align the inside edge of the flat with the face of the jack. You'll plane wood off the sawn face until you reach this edge. The result is a sharp arris along the top edge of the piece.*

I use a shooting board to tweak the angle to exactly 30°. This needs to be right on the money because even a small discrepancy can multiply with each piece.

Before committing your prepared material to the saw, cut some samples from a piece of cherry or maple (light colors help precision) to check your miter jack's angle and your planing technique. The miter box gets the triangles close, but they are planed to perfection in the miter jack.

Here's the process: Prepare a stick the same width as the groove in the jack and clean up the edges with a plane so they are straight and square; then cut one end of the stick in the miter box. Toss the waste.

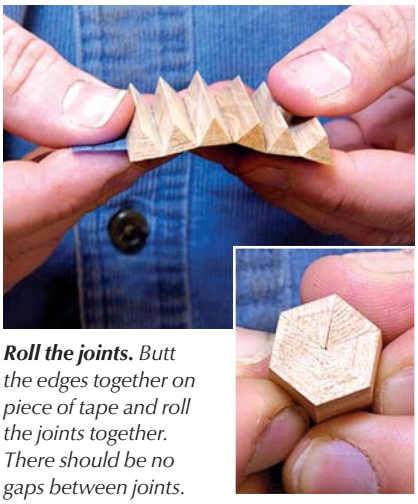
Move the stick to the miter jack and clamp it so the end is proud of the ramp by a few thousandths.

Use a low-angle plane to shoot the stick's end grain. If you've never used a miter jack, practice on scrap first. After a few trials you'll get the feel of the last stroke before you start planing away the jack. You can get precise results, within a thousandth of an inch, with this fixture and a sharp, finely set plane.

Now step back to the miter box and cut the triangle away from the end of the stick. You still need to shoot the other edge of the piece, so leave it about 1/32" long. You can use the kerf in the miter box to line up the cut. If you can see a flat area at the top corner of the piece, you've done well. This represents the exact amount of material you need to plane off at the jack.

Clamp this piece in the jack, aligning the inside edge of that tiny flat with the face of the ramp.

Jack be quick. *Repeat the process between the miter box and jack to make additional pieces. You'll want to place your miter box right next to the miter jack on the bench for maximum efficiency.*



Roll the joints. *Butt the edges together on piece of tape and roll the joints together. There should be no gaps between joints.*

Bundled up. *Nail the angle and you're ready to cut and glue the pieces.*

You want to end up with a perfect, sharp arris here without going past. I wear a magnifying visor – it makes everything look huge. Press down on the piece to make sure it's bottomed out in the jack. Once you've planed it to perfection, repeat the process to make additional pieces.

Test the Cut & Join the Pieces

Line up the pieces in a row on a piece of tape, butting the edges tightly. Now roll them up to see how they join up. There should be no gaps. If there is a gap widening toward the outer edge it means your angle is greater than 30°. If the outer edges all join up, but the gap widens toward the center, the angle is less than 30°. You can tweak small discrepancies by clamping the triangle at a slight tilt for individual pieces, but it's best to adjust the angle of the jack's ramp so the pieces roll up tight. Once you've nailed it, you can start cutting the real deal.

To assemble the pieces, butt the edges together as before on a piece of tape and apply glue. Roll up the pieces and shift them around until they align. Wrap a few more pieces of tape around the bundle and set it aside until the glue cures. You can also use rubber bands (I like to use an old bicycle tire innertube) to apply pressure. On smaller pieces such as these, blue painter's tape has enough stretch to keep things tight.

Making Inlays

After you unwrap the bundle, clean up any squeeze-out (there shouldn't be much) by carefully lap sanding on a flat surface. Use a light touch – you don't want to change the shape of the bundle. Start cutting slices by first truing up one end of the bundle on a shooting board. Next, trace around the perimeter onto a flat piece of scrap and rout a shallow mortise, about 1/16" deep. Try to make the mortise fit the bundle; you don't want it to move around while sawing. Place the bundle into the mortise and using a flush-cutting saw, work around the bundle lightly at first to establish a kerf all around the piece.

Save the offcuts. *A flush-cut saw consistently slices inlays from the bundle at a fixed thickness.*

Work toward the center. As you approach the last few strokes, lighten up on the downward pressure (the saw plate is doing most of the holding as you saw) until you gently finish the cut. Pop out the inlay piece, re-shoot the end of the bundle and repeat. One side of each inlay will have the planed surface, and one will have the fuzzy surface left by the saw. You don't need to clean up the fuzzy side – it will get planed flush after you inlay it.

Shooting-board Method

To make smaller quantities of inlays you can use a shooting board to true the miters of thin pieces. This technique is useful for rapidly producing test pieces or samples. I prefer this method to the miter jack for designs containing fewer elements, as it's quicker to make them one at a time than to saw the pieces from a thicker bundle using the miter jack method. The process is also more forgiving. Rip a 1/8"-thick stick from the book and use a miter box with a shallower groove to make your cuts.

Then plane the edge on the shooting board. Notice that the fence on the shooting board is set to the appropriate angle, but that the opposite edge of the fence is different by 90°. On this shooting board that means one edge is 30° and the other is 60°. This allows me to use the back edge of the fence to shoot the return miters without using a separate tool.

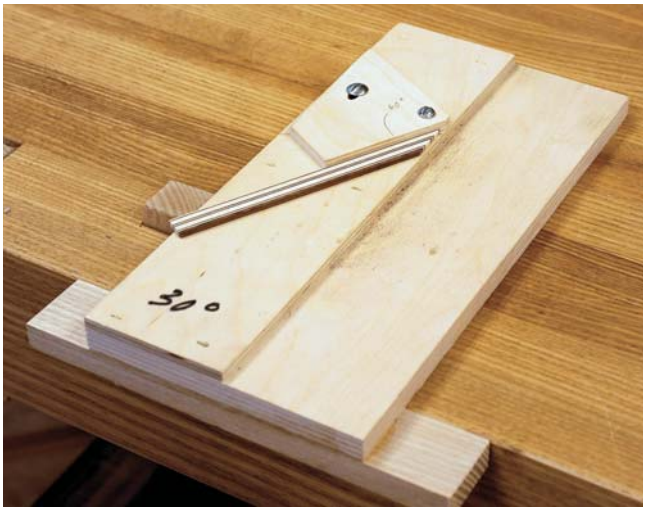
Getting small pieces aligned and glued together is easy. I use gap-filling cyanoacrylate (the thin stuff is too runny) on the edges of one piece and press its mate in place. The thick cyanoacrylate allows a couple seconds of movement.

Inlaying the Pieces

This particular pattern I'm using is quite busy-looking, so keep that in mind when designing how you incorporate inlays into a project. Designs like this can overwhelm a project if overused. I've chosen six pieces to create a central rosette for the backgammon board shown in the opening photo. You can see the designs automatically fit together to create new designs. This is the fun part of creating these decorative elements.

To make the rosette, just glue the pieces together with cyanoacrylate on a piece of paper. Draw some layout lines on the background so positioning the inlay for scribing is quick and easy. Place a single, tiny drop of cyanoacrylate on the back of the inlay and place it in position. Use as little glue as possible.

Once the pieces are tacked in place, scribe around the perimeter of the inlay. I use a new X-Acto No. 11. The blade is double-beveled, so tilt the knife to guarantee the knife is riding the edge of the inlay. I take two to three passes. On the first pass I hold the knife tight

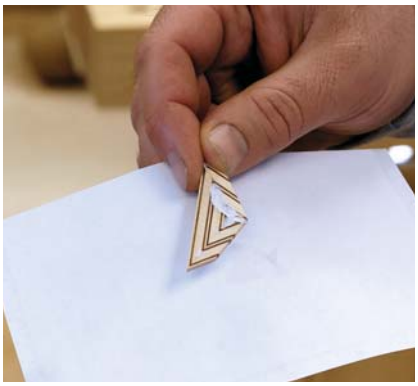


Shoot me now. *Shooting boards are another option for truing miters of varying angles.*

Just a couple. *When you need just a couple pieces of a design, the shooting board method is quicker.*

Private plane. *I commissioned a small miter plane from Daed Toolworks just for use with this technique. Its boxy sides and long toe section make for efficient shooting. But any block plane with parallel and square sides will work.*

Return the miters. *The back edge of the fence is 90° to the leading edge, meaning I can plane the areas where certain elements meet.*



Can you spare a square? *Glue the pieces' edges together on a flat surface separated by a small square of paper. Peel the paper off after the glue dries and lap off the residue.*

Scribe. *A #11 X-Acto is the best tool for creating an ultra-thin scribe line. Try to scribe so the grain of the background wood forces the knife toward the inlay.*

Side slide. *A feeler gauge removes the tacked inlay without damaging it. Use side-to-side motion here; don't pry.*

Gentle taps. *Set the chisel in the scribe line and tap gently. A short chisel with fine side grinds is paramount to precision and control.*

to the inlay, but I use little downward pressure. You want the knife to follow the inlay, not the grain. This cut establishes the line. On the next pass I use a tad more downward pressure. Now look at the line (I wear a magnifying visor for scribing). If you can see it, stop. The more passes you take, the wider your scribe line, and the worse the inlay will fit. This line needs to be crisp.

After scribing, I remove the inlay with a thin blade. If you try to pry up the piece, it will break. But it's not the end of the world if this happens. Chances are it will break on a glue line and you can reassemble it when you glue it in place. But if you have a lot of pieces it's better to keep them intact. I've found that a long set of feeler gauges (I got mine from Lee Valley Tools) does the trick. The .006" blade slips under the edge and I can work the blade side to side to pop the glue joint. I use no upward force.

Don't forget to mark your inlay and background so you can reorient the pieces later. You can rout the mortise with a number of tools. I use an old rotary-tool handpiece with a 1/16" upcut-spiral bit in a small shop-made router base. Set the depth a little shallower than the thickness of your inlay piece. A magnifying visor and strong light are a must.

Rout close to the scribe line but don't touch it. To remove the remaining waste drop a chisel into the scribe line and tap down lightly. A couple years ago I commissioned Czeck Edge Hand Tool to create a custom chisel for this type of work (which the company now offers as a regular item). It has a short blade and handle for a low center of gravity, and finely ground side bevels for preserving the mortise corners. All the butt chisels on the market are too beefy for this fine work, and the fine chisels that are available are all too long and heavy.

Once you tap in the scribe lines, use the same chisel, bevel down, to free the sliver of waste. When you press the blade in, don't lift up (you could split out the edge of the mortise). Instead retract the blade and try to blow the chip away. If the mortise is large enough, I use a small router plane to work the perimeter. I grind the cutter to a 1/32" width to sneak into corners.

Test-fit the inlay. It should be snug and there should be no gaps around the edge.

Satisfying. *After the inlays are glued in and planed flush, you get to see the final results of your effort.*

Removing the piece can be tricky. Here's the best way: Take a sharp chisel and touch it to the protruding edge of the inlay that's proud of the surface (you didn't rout too deeply, did you?). Without pushing in (you don't want to slice the inlay flush) gently tilt the chisel up. The sharp edge will grab the inlay and lift it out. Once you're satisfied with the fit, glue the inlays in and plane them flush after the glue dries. **PWM**

Jameel's interest in woodworking began in both of his grandfathers' shops. He's also a painter, oud maker and carver, and co-founder (with his brother and father) of Benchcrafted.

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Dovetailed Keepsake Box

BY GLEN D. HUEY

Shortcuts learned as you build this classic box help you become a better joiner.

Skill builder box. *There's more to dovetails than basic techniques. Learn the tricks and uncover the secrets to improve your dovetail joinery skills whether you're building for strength or for show.*

This box is chock-full, but don't look on the inside. Check out the outside. It's loaded with dovetail joinery – through dovetails on the front and half-blind dovetails on the back. It's an ideal practice project for the finer points of the dovetail joint and when you're finished you'll have a great-looking keepsake box that can be built on the cheap using offcuts.

Prep the Parts, Layout & Pins

Mill the material for the top and bottom panels, and prepare the box front and sides. Mill the back, but don't cut it to length at this time.

The pin boards are the sides while the tail boards are the box's front and back. From a pins-first perspective, set your marking or cutting gauge to the thickness of the front, then scribe a baseline onto both faces of one end of each side piece. To mark the layout for two half pins and two full pins, equally space the tail sockets and use a square to pull the lines from the edge to the baseline on the inside (non-show) face. Then grab your dovetail saw and cut on the waste side of the lines, as shown in the photo at right.

To chisel out the waste, it's best to begin with the face of the pin board up so you remove the wider portion of the tail socket first. Work halfway through the thickness before flipping the board to complete the pins.

One area that creates problems with the pin-to-tail fit is the back of the tail sockets. Woodworkers often leave end grain protruding into the socket.

Waste side. *The trick to accurate saw cuts is to follow both lines as you cut. Once you reach the scribeline, move the saw to perpendicular and it will follow the already-cut kerf.*

Make sure to undercut the bottom of the socket. The bottom of the socket has a V-shape to it when it's complete. Fine-tune your pins; they become the pattern for your tail board.

Tail Match

Next, set your marking gauge to the thickness of the side pieces to scribe a line onto both ends of the box front. Align a side with the scribe line, and the top and bottom edges, then transfer the pin layout onto the tail board. To confirm that your parts are oriented correctly, check that the tails are widest at the end of the box front.

Saw on the waste side of your lines. For this, you can turn to power tools such as a band saw without sacrificing the hand-cut look.

How close should you cut to your lines? A good rule of thumb is: The harder your material and the more pins and tails in your layout, the closer you

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG

cut to your lines. If you're working with pine, stay a skosh farther from your lines than if cherry or another hardwood is your material of choice.

Remove the waste of the pin sockets just as you did for the tail sockets. Keep the back wall of the pin sockets V-shaped. Test-fit the joints.

Half-blinds are More Work

Half-blind dovetails require many of the same techniques as through-dovetails, but there is a major difference in layout and execution. Again, the side pieces are your pin boards and that's where to begin.

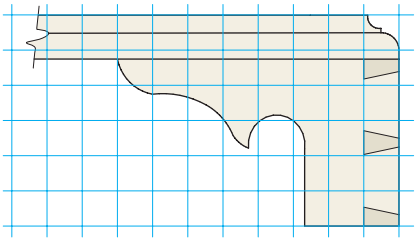
Take a look at the layout photo above center; your layout should be similar. Notice that the lines are sawn well past the scribeline – working beyond the scribeline allows for easier waste removal due to the material being cut as opposed to spending more time on chisel work (and it's appropriate for period reproductions).

Care needs to be taken as you remove the waste to create the tail sockets. Because you bring waste up through the narrow part of the tail socket, the corners of the pins are easily broken off as you excavate the waste. To prevent that, remove a small amount of waste from each corner before hogging out the center. Set your chisel, bevel side up, across a corner of the tail area then lightly tap the chisel moving in an upward motion. As you work, the small corner rides up the bevel of the pin side. Repeat these steps a couple times to make sure the pin corners stay put.

There's extra work removing the waste deep in the corners, and it's especially important to keep not only the back of the socket beveled (pare any protruding end grain), but to also slope the bottom of the socket, too. If the bot-

It's OK to miss this line. *With the stock lying flat, make the cuts to define the pins for half-blind dovetails. Over-cutting the lines beyond the scribeline leads to easier waste removal.*

Up and at 'em. *Remove small corners of waste to keep the pin corners from being fractured as you clean out the dovetail sockets.*



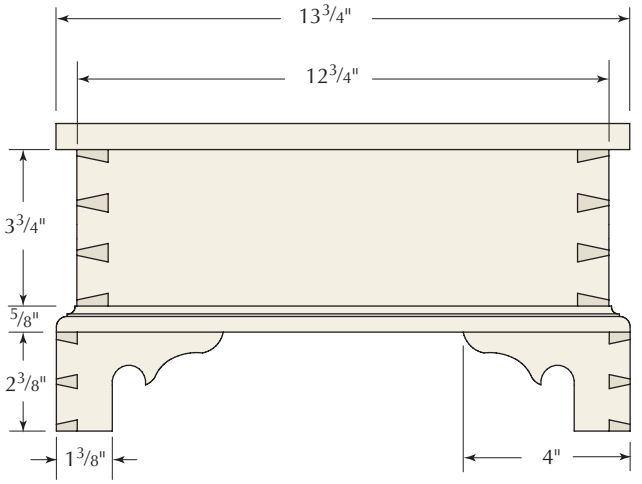
1 grid square = 1/2"

BRACKET FOOT PATTERN

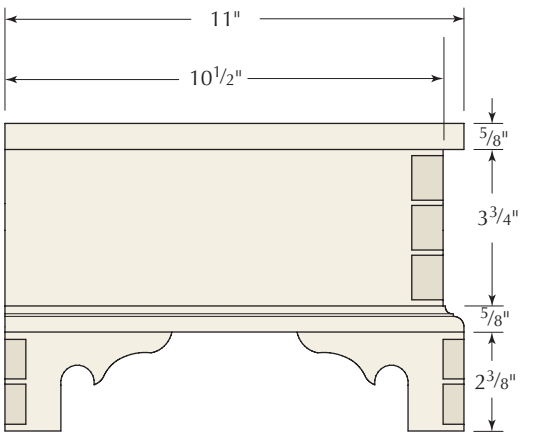
Dovetailed Keepsake Box

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	2	Top/bottom	5/8	11	13 3/4	Cherry	
❑	1	Front	3/4	3 3/4	12 3/4	Cherry	
❑	1	Back	3/4	3 3/4	12 1/4*	Cherry	
❑	2	Side	3/4	3 3/4	10 1/2	Cherry	
❑	4	Foot frame	1/2	2 3/8	11	Cherry	2 feet/pc.

* Take actual length from partially assembled box.



ELEVATION



PROFILE

Just a cat's whisker. *To accurately set your cutting gauge, allow the edge of the cutting wheel to just lip the bottom of the tail socket. Too much on the wood and your tails will be too long.*

tom angles upward away from the end any amount at all, a gap appears as the mating piece slides up the angle and your fit will be too tight. A sloping bottom accounts for most of the problems in half-blind dovetail work.

Sizing Up the Back

To acquire the back's length, measure the box front from scribeline to scribeline then add twice the depth of your half-blind tail socket, as measured from the inside face.

Set your marking gauge so the tip of the pin or wheel just rests on the bottom of the dovetail socket, then scribe both ends of the back. Position the side at the scribe line – a portion of the side hangs off the back's edge – and transfer the layout with a pencil.

"Speaking from considerable experience, failing stinks. Just don't be undone by it. Failure is no more a permanent condition than is success."

— Sen. John McCain (1936 -)
2010 commencement address at
Ohio Wesleyan University

Saw and remove the waste making sure the back of the pin socket is V-shaped. Test the fit. If all is good, glue the tails and pins to form the box. If you worked to the scribe lines and removed any protruding end grain, your box should be square. Check it, then set it aside as the glue dries.

Dovetail Saw Selection: Don't Get Bogged Down by Minutiae

If you're about to hand cut your first set of dovetails, you're going to need a saw. Which should you select? It's my opinion that we get mired in details. The saying is "Paralysis through analysis." This seems to be the flavor of the month in anything woodworking, especially when choosing saws.

Any dovetail saw will do the job. If you have one, use it. As you gain experience you'll be in a better position to understand and evaluate available saws. That's the time to change or upgrade your tool. However, if you need to purchase a saw, here are some basics.

I began hand cutting dovetails using a Japanese saw. I felt comfortable using it and continued to do so for many years. The problem I discovered was that the teeth often broke. (I had saws that looked like Jack-o-Lantern teeth carved by 6-year-olds.) While brittleness is a characteristic of Japanese saws, my breakage was most likely due to the fact that I used that saw for everything in the shop. It was the only saw I owned. I changed the blades a couple times – replaceable blades are nice when considering Japanese saws – and I switched saws along the way. Eventually I purchased and dedicated one saw to dovetails while my older saw handled everything else.

As I became better at pins and tails, I purchased a new Western saw, but was unhappy with the way it cut (I didn't try it before I bought it). What eventually got me to adopt an Western saw for dovetailing was when I was handed a saw that felt great in my hand and cut as I expected a good saw to cut – maybe experience helped, too.

This was about the time that the explosion in new dovetail saws began. In what was seemingly overnight, we have way too many from which to choose. Beyond the simple Japanese or Western choice, we now need to decide between thin and thick

blades, the points per inch (PPI) and even the weight of the back of the saw. Experience will best answer these questions.

If I were looking to purchase my first dovetail saw, I would shy away from thin saw plates. It's true these saws take less effort to use and may be a bit quicker as you cut, but without experience it's very easy to kink the blade, possibly ruining the saw. It's true that Japanese saws are thin, but it's more difficult to kink the Dozuki because you cut on the pull stroke as opposed to the push stroke as with American saws.

Points per inch on a dovetail saw is where your workpiece best dictates a choice. If you're cutting into thick wood such as when dovetailing case pieces, a saw with fewer points per inch is better. The larger gullets between the teeth carry waste from the cut making the work easier.

If, on the other hand, you find yourself dovetailing drawer boxes, then a higher PPI would work better. Carrying large amounts of waste from the cut is not important because the teeth are not in the cut as long. Also, a saw with more PPI is easier to start in the cut.

Given this information, do you need two dovetail saws? No – a middle-of-the-road PPI will cut just fine.

To me, all this information is great to understand and will become useful with experience and as your woodworking budget grows, but as a beginner the selection of a dovetail saw should come down to just two questions. 1) Is the saw comfortable in your hand? (Try the saw prior to purchase if at all possible.) 2) Can I make a clean cut using this saw?

Don't worry about purchasing your *last* dovetail saw. It may be that your first saw is the saw you use throughout your woodworking career, maybe one of the high-end saws is the answer to your dreams, or you might not take kindly to pins and tails only to revert back to nails or routers. You'll be better off to purchase a quality saw and get busy dovetailing. Gain experience, then step up to a new saw (if you feel the need). — GH

Mill and size the material for the feet. Form another box before separating the individual feet. This keeps you from working with pieces too small to handle easily and it assures that you have four sets of feet that match the dovetails on the box. Cut through-dovetail pins and tails (pins on the sides and tails at the front and back).

Transfer the foot design onto each piece and label the feet to easily match up the pairs later. A 3/4" bit at a drill press forms the spur, then cut and sand the profiles. Pair each set according to your labels, add a spring clamp to the foot's pin board as you slip the dovetail together – it's easy to split the foot as the joint is joined – then glue and assemble the feet.

Shapely Bottom

Mill the top and bottom panels to size (1" longer than your box and 1/2" wider). Attach the feet to the bottom with glue and a couple spring clamps. As the glue dries, sand your box to #180 grit then sand the box bottom and flush the feet even with the bottom's edges.

To add interest and shadow lines, profile the edge of the bottom's front and two sides. (Don't shape the back edge.) Limit your profile to 7/16" wide.

Position and center your box on the base then draw a light pencil line around the inside and outside edges of the box. With the box set aside, drill pilot holes centered between the two lines. Use two screws at the front of the box, and cut nails at the sides and back.

Position the box to the base, add a clamp to hold things secure then flip the unit over to attach the two.

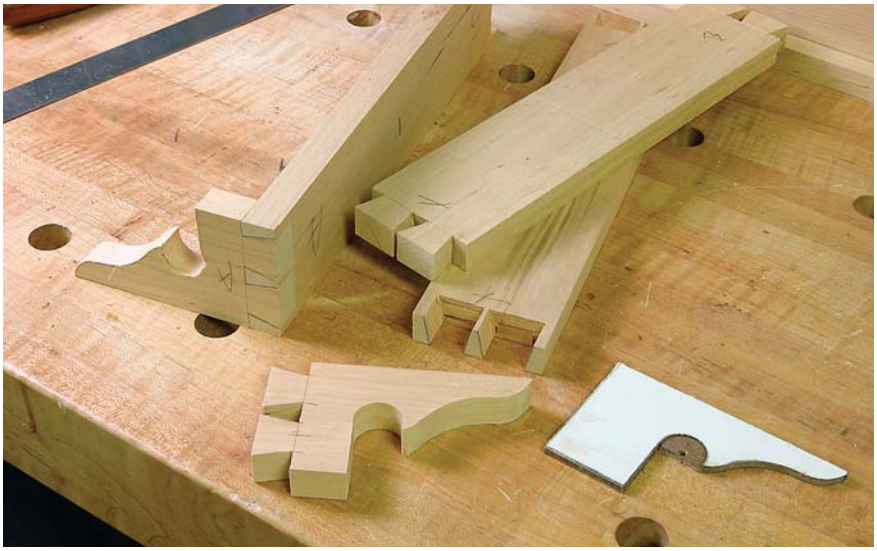
The Finishing Touch

Ease the sharp corners of the top, then attach it to the box with inexpensive hinges from a hardware store that are mortised into the box and top.

To dress up the finished box, add a nice escutcheon. If you drill out behind the keyhole and paint the area black, the look is more authentic.

After a few coats of amber shellac to warm the cherry's appearance, all that's left is to load the inside with special items you wish to keep – *Popular Woodworking Magazine* fits perfectly into the keepsake box. PWM

Glen is senior editor of this magazine. Contact him at 513-531-2690 x11293 or glen.huey@fwmedia.com.



They're better paired. *While scraps the length of the feet may be prevalent in your shop, working with longer pieces is easier. It also keeps the feet pins and tails matching those on the box.*

Planning ahead. *Choose your edge profile carefully so your box continues to fit the base after the edges are moulded and make sure the pilot holes fit centered in the box frame.*

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Variable-pitch Jack Plane

BY JOHN WILSON

This jack plane can be easily set to work at 45° for rough work or 52° for smoothing chores.

Jack of all trades. *Jack planes can be used for both roughing and smoothing chores. This shop-made example allows you to change the pitch of the iron. Low for rough work. High for fine.*

The story of this plane goes back 20 years to a chance encounter I had with a Cecil Pierce jack plane. Pierce was a planemaker in Maine who made beautiful planes for more than 50 years. Just a one-man operation, an avocation really, for the love of the craft. I saw the plane while on the road in a shop where I was teaching and its shape captivated me. I drew its plan. I was to the point of asking if I might buy it. I was smitten.

That experience surfaced recently when a group of friends with whom I conduct a tool-making session asked for something different. How about a jack plane? I thought of Pierce's plane.

The Design

There are three basic parts to this plane: the wood body, the cutter and the adjustment mechanism. The Pierce plane body was what started the venture, and was easiest for a woodworker to make. The design copies his work which is gratefully acknowledged ("Fifty Years a Plane Maker and User," by Cecil E. Pierce (Monmouth)). What is different is the method of construction and the blade-holding cap. Instead of starting with a single wood block, I start with three: one core and two side boards.

The blade is made from O1 tool steel available from mill supply catalogs in an 18" length, which is enough for three blades, for about $20. Two reasons exist for making your own blade. One is being able to make exactly the kind of blade needed for the plane. The second is finding out how blades are made. I incorporate blade making in all my tool workshops. You might be interested in reading about this in "Making a Spokeshave," *Popular Woodworking*, October 2007 (#164). I have heard from students that the blade forming and hardening is an epiphany.

The third element is the blade-adjustment mechanism. For hundreds of years, shop-made planes had a wedge holding the blade. Then in the period from 1875-1900, a series of developments occurred resulting in the modern plane. The ability to advance and retract the blade by a screw mechanism rather than by tapping a wedge won over the market.

What follows is a description of the three parts of the plane: the blade, the body and the adjustable pressure cap.

Makeup. *The elements of a jack plane with double-screw adjustment: Razee plane body, cap with holding and adjustment screws, blade with rest button, and 52° wedge for optional smoothing plane pitch.*

Parts. *Parts of the jack plane: Handle with 3/4" holes prior to cutting, blade, cap parts, core block and sides, angle pattern, lead screw and thumb nut.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY MARY JANE FAVORITE FROM THE AUTHOR'S DRAWINGS

See for yourself if a shop-made plane that looks good, adjusts easily and cuts well is something you can make.

The Plane Iron

The 1/8" x 2" x 5 1/2" plane iron is cut from O1 tool steel. It makes a fine blade that has parameters for hardening and tempering well-suited for woodworking.

Tool steel comes in an annealed state softer than it will be later after heat treating. You can saw, drill and file it as it has a Rockwell 45C hardness. Above Rockwell 55C such tools cannot cut steel. However, it is not as soft as mild steel, so get a new blade for your hacksaw before attempting it.

The main screw is a 3/8" threaded post with a brass knurled nut. You need to make a slot in your blade by drilling two 25/64" holes, not quite touching, joined by filing to complete the slot. Another tool for enlarging a hole is called a rotary file (Reid Supply #GAR-60020; $6.12), which is a 1/4" bit with carbide burrs along its side to enlarge a hole. The hole for the stud, called a rest button, is drilled into the blade at this time using a 3/16" drill.

The tombstone shape of the top end is filed after grinding to smooth and ease its edges. The cutting end is ground to 25°. Do not be alarmed by producing some blueing, which is indicative of overheating the steel in ordinary sharpening activities. The whole cutting end will be heat treated.

One of my favorite tools for sharpening blades is a 4" x 36" belt sander. I save my belts after working wood to use them for steel. A new belt works best, but you can get one blade sharpened on a used belt. Use the belt sander after using a grinding wheel as it will give a perfectly flat surface. The belt is much less likely to blue the blade than grinding. Safety point: Clean out any wood dust before doing this to avoid sparks causing a fire.

Heat treating a tool steel blade is a mysterious venture for the uninitiated, so take this opportunity to lift the veil. First, it is helpful to know some hardness/brittleness characteristics of the O1 steel. Soft and workable is what the annealed state is at Rockwell 45C. The crystalline structure of the steel is changed by heating above 1,450° Fahrenheit (F) followed by an oil quench. The heating is done by either a welder's torch or a handy propane torch on which the flame is large enough to heat a 2"-wide blade. (BenzOmatic torches series JT, BT and TS all have a brass regulator valve with a side-mounted burner tube that delivers enough flame to do the job.

Blade beginnings. *Making the blade begins with a 3/8" slot and hole for the rest button. The 25° angle is ground and the top rounded.*

"(T)he rule in the trade being that all which the plane passes over is joiners' work."

— Henry Mayhew (1812-1887)
The Morning Chronicle, July 11, 1850

A "pencil point" torch does not deliver enough heat. MAPP gas delivers a hotter flame than propane.)

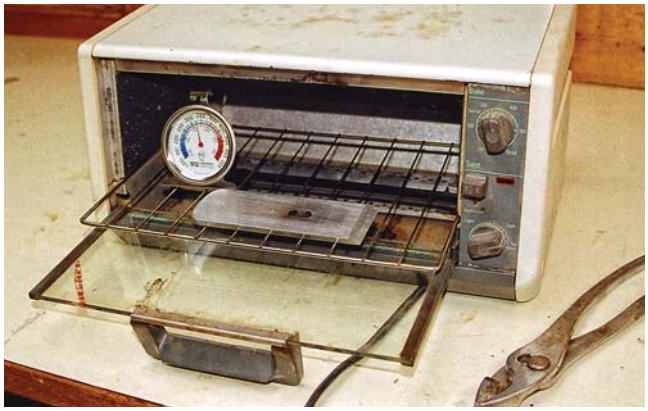
How do you know you have heated the steel to the right temperature? The end should glow medium red when viewed in shaded light, not full sunlight. The quench is a full immersion, rapidly dipped to avoid warping the steel. The oil can be motor oil, new or used. However, soy oil is better, as it does not smoke.

The blade has a gray appearance where it is heated, and the steel is hard to Rockwell 75C. If you have any concern about whether or not you have the heat and quench right, run a file lightly along the edge. Where it is still annealed, the file will bite into the steel. Where it is hard, it will glide over it.

Along with hardness goes brittleness. Rockwell 75C steel will actually shatter when struck by a hammer. Tempering a blade reduces hardness and restores the necessary toughness. The proper hardness range is around Rockwell 62C. A second operation, called tempering, to moderately heat and slowly cool the steel, will accomplish this.

When you purchase tool steel, the wrapper often gives you information on tempering temperature with resulting

Homemade furnace. *Harden the cutter using a torch and furnace made of nested tin cans. Quench when red hot. A 2" x 2" piece of sheet metal with a hole (slid over the end of the torch) protects the plastic from heat.*



Toast. *Temper in toaster oven for one hour at 350° F. This restores necessary toughness to the tool steel while resulting in Rockwell 62C hardness.*

hardness. The Starrett brand O1 steel indicates heating it to 300-350° F for one hour will result in 62C-64C hardness; 400-450° F for one hour results in 58C-60C hardness. Anything over that will be too soft to hold an edge. A kitchen toaster oven or household oven works. If you have any doubt on the accuracy of the oven's thermostat, purchase an oven thermometer (less than $5) to be sure. Set the blade in the oven for one hour then allow it to air cool.

Now that the blade is heat treated you can finish sharpening the bevel and lapping the back. The rest button, which engages the blade adjustor, is now ground at a 15° angle to provide a landing for the adjustment rod. It is ground flush with the back of the blade. A drop of cyanoacrylate (CA) glue will set it permanently in place.

The Wooden Plane Body

The wood for this plane can be selected from a range of hardwoods. Beech was traditionally used in Europe, but hard maple is my first choice.

The challenge for any planemaker is accurately forming the throat. The two elements are the angle of the iron, and the opening in the sole, called the mouth. Achieving accurate angles within the throat, and doing so without going beyond any of the respective surfaces, is the challenge. Besides cutting into a single block of wood, two-piece and three-piece plane body methods are possible.

A two-piece or three-piece plane body eliminates many difficulties in making the throat. Making a two-piece plane is described by Bud McIntosh (*WoodenBoat*, March 1986). The three-piece plane is described by James Krenov in "The Fine Art of Cabinet Making" (Sterling). In both cases, the plane throat is cut and the body is reassembled with glue.

The drawing on page 52 shows you the basics. The bedding angle is 45°, the foreward face is 60°. The width of the pocket is the blade width plus a small amount for lateral adjustment. Accurate dimensioning of the core block provides the 1/32" used by Pierce.

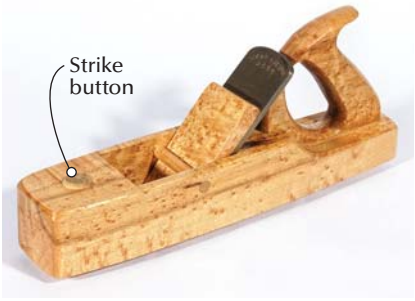
Assemble the Three-piece Body

Starting with a core block that's 2 1/32" x 2 1/32" x 12 1/2", draw a line 3 5/8" from the end. Ahead of this line mark and cut a 60° angle, and after it a 45° sloped block. These surfaces must be square and flat. A small flat is made on the 60° block 3/16" back from the sharp edge. The two side pieces are 5/16" x 2 1/32" x 12 1/2".

An alignment board will aid in glue-up. A scrap of 1/4" x 2 1/2" x 12 1/2" plywood is waxed. Mark on this a line square across at 3 3/4" from one end. A second line 5/16" away from the first defines the opening of the throat. Prepare for glue-up by clamping the two core blocks to the alignment board. Spread glue on all surfaces avoiding the throat opening on each side board. The alignment board allows you to keep the right throat opening, and the even alignment of the core and sides.

Two 3/16" x 1/2"-long dowels are driven

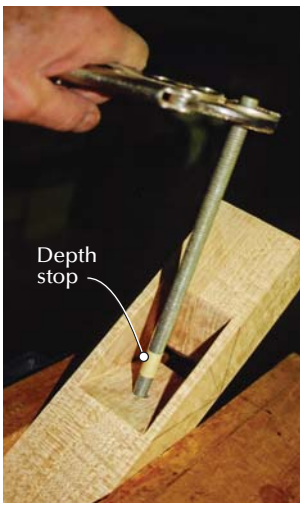
Three-piece body. *By dividing the plane box into three pieces, the angles of the blade pocket can be easily and accurately made: a 45° bedding angle, a 60° front angle and one small 90° cut in the front block.*



Jack plane with wedge and retainer dowel pin. *This is a simple yet effective jack plane mechanism. Note also the wood strike button in the fore block.*

Dowel both sides. *Two 3/16" pins on both sides will prevent movement under pressure. While two clamps hold the core blocks to the alignment board, drill 1/2"-deep holes for the pins, which are then cut off flush. Final clamping can be done in the bench vise like the 12"-wide one in the background here, or with clamps.*

Drill for 3/8" threaded rod. *Use of a jig helps hold the plane body at 45°. A pre-drilled 3/16" hole keeps the 21/64" drill on line.*



Self-tap. *Advance the 3/8" threaded rod to tap the wood into an undersized hole. Tape indicates how far to go.*

in each side, and driven into the plane. Cut them off flush. Squeeze the plane in a bench vise or use clamps. Check that all the parts touch the alignment board, and that all the glue lines are tight.

When the glue is dry, sand the top and bottom of the plane body. Keep this sanding minimal to avoid making the box thinner or out of square. Remove any glue beads from the throat. File the front edge of the 45° blade bed slightly to remove the sharp edge. Check the fitting of the blade in the throat opening and correct any irregularities now.

Blade Adjustment Methods

You can choose one of two ways to hold the blade. The time-honored wedge is effective and simple. A wedge 4¼" long, cut on a 10° angle, engages a ⅜" dowel pin. This pin has a flat one-third of its thickness where it touches the wedge, and is free to rotate because no glue is used. The photo on page 50 also shows a strike button placed on the fore block. This is 1" of ¾" hardwood dowel. Glue this piece in a hole to prevent marking the plane when tapping the blade free.

The alternative to a wedge for setting the blade is the double-screw mechanism. The main screw is a ⅜" threaded post and brass knurled thumb nut. The second screw is set into the cap and bears on a rest button set in the blade. This secondary screw is both for adjustment and for holding the blade in use to prevent it from slipping out of adjustment. Using flat-milled blade stock has replaced the traditional forged blades of more than a century ago. Those old blades were wedge-shaped themselves, being thicker at the cutting end. The opposition of two wedges gives positive blade holding, which is now missing from single-piece blades. The rest button and screw rod provide this holding.

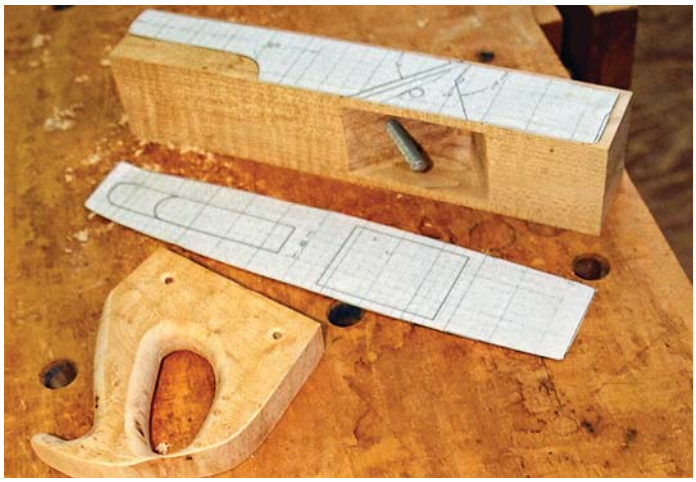
Set up some way to hold your plane body at a 45° angle for drilling the screw post. Mark the location of the hole 1⅞" up from the sole in the center of the blade block. Drill a 3/16" pilot hole to guide the larger 21/64" bit; both are drilled to ¾" deep. File the end of your rod slightly to help it in entering the hole. Spot a mark ¾" from the end. The rod is held by vise grips while turning. You will feel the rod hit the bottom the hole. Cut it off leaving 1½" of threaded post – or 1⅞" if using the 52° pitch adapter. If the post is not square to the block, make it so using a wood block and hammer. If you need to remove the post, use a hacksaw to make a slot for a screwdriver to withdraw it.

There are two shapes in this plane body that are different from a typical plane body. The coffin shape and the step, or razee section, where the handle is bedded defines the Pierce plane. Draw out the shapes, and cut them on your band saw starting with the razee. The upswept end of this cut fits the radius of the 4" x 36" belt sander nicely. The coffin sides are also cut on the band saw followed by sanding a fair curve to the whole body. The edges are chamfered all around for hand comfort. The amount of chamfer along the bottom edge is small, while the top edge has a ⅛" flat to the chamfer increasing where it turns around the nose of the plane.

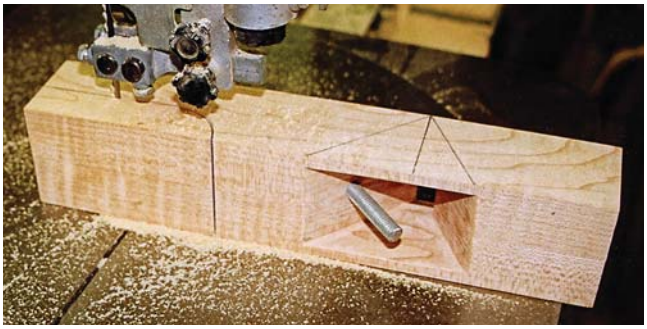
Blade Cap

Next make the adjustable pressure cap. A production company would have this made as a special casting. What is made here is in keeping with a shop-resourceful project. A piece of hard maple, ¾" x 2 1/32" x 4", is cut to the profile shown in the drawing. The long bottom bevel, the 15° top angle and the side scallops give it a touch of grace . This cap will be sanded for side-to-side clearance later, the side sanding is determined by how it fits best on the threaded post.

The pressure screw lands on a ⅝" copper washer set into the cap. This is a brake gasket available from an auto store (at NAPA, it's part #26442). A ⅝" recess holds it in place. Start your

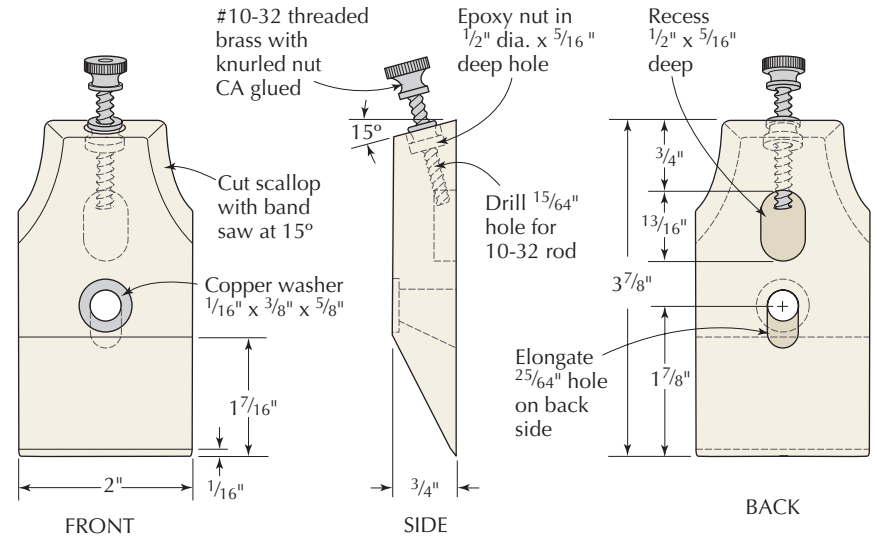


Shapes and curves. *The profiles are copied from the plans. The coffin shape and handle step define the Pierce plane.*

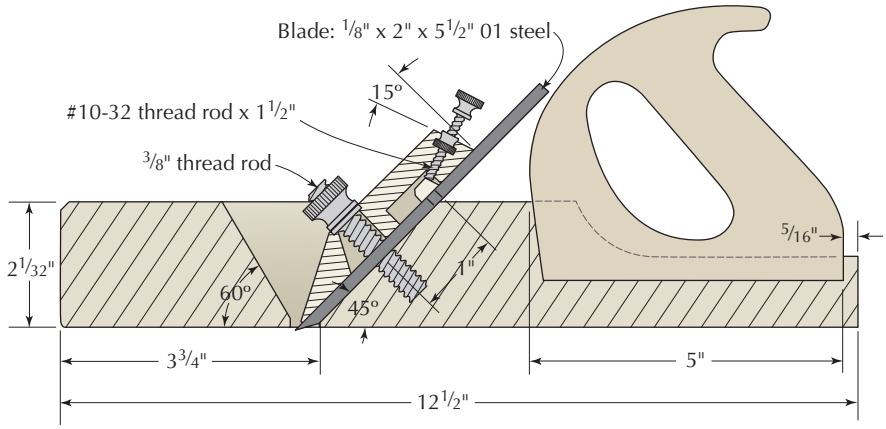


Shape the plane. *Cut the razee step and coffin sides on the band saw.*

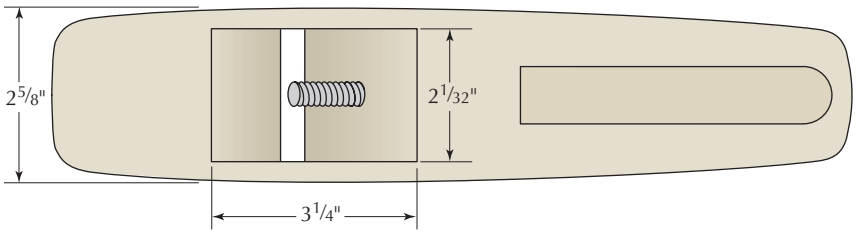
Smooth. *Sand both sides and chamfer the edges.*



ADJUSTMENT CAP



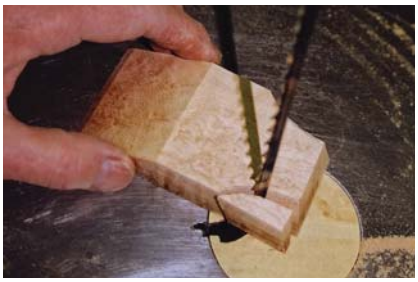
SECTION



PLAN

Variable-pitch Jack Plane

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Body	2 1/32	2 1/32	12 1/2	Hardwood
❑	2	Side pieces	5/16	2 1/32	12 1/2	Hardwood
❑	1	Cap	3/4	2 1/32	4	Hardwood
❑	1	Handle	15/16	5	5	Hardwood
OPTIONAL PARTS						
❑	1	Wedge	9/16	2	4 1/4	Hardwood
❑	1	Wedge 52° pitch	3/8	2	3	Hardwood



Screw. *Cap is sawn and drilled for screw assembly.*

drilling with a Forstner bit of this size going only 1/16" deep. Next, drill the hole slightly oversized at 25/64". In order to slip on or off the threaded post, this hole must be enlarged. Angle the first hole 30° for post clearance. Follow this with a hole straight into the cap. Finish filing out the hole before setting the copper washer as the last step in setting up your plane.

In the back of the cap, drill a recess for the stud on the blade using a 1/2" Forstner bit going 5/16" deep. Check the drawing for the location.

The adjustment screw is made from #10–32 steel or brass threaded rod and two knurled brass nuts. One nut is glued to the end of the threaded rod with thread locker or CA glue. The other nut is set into the cap to act as threads

Supplies

Reid Supply
reidsupply.com or 800-253-0421

- 1 ▸ O1 tool steel 1/8" x 2" x 18" #SFS-54006, $17.66
- 1 ▸ stainless steel rest button, 1/2" x 3/8" #PF-105, $2.79
- 1 ▸ threaded rod, 3/8" x 16" x 36" #TR-90, $4.16
- 1 ▸ threaded rod, 10-32, 36" x 36" #TR-57, $8.39
- 1* ▸ brass thumb nut, 3/8" x 16 #AJ-727, $3.12
- 2 ▸ brass thumb nuts, 10-32 #AJ-718, $1.68 ea.

*2 needed for making beveled washer

Any AutomotiveSupply Store

- 1 ▸ brake gasket copper washer 5/8" dia.; must accept 3/16" rod

Prices correct at time of publication.

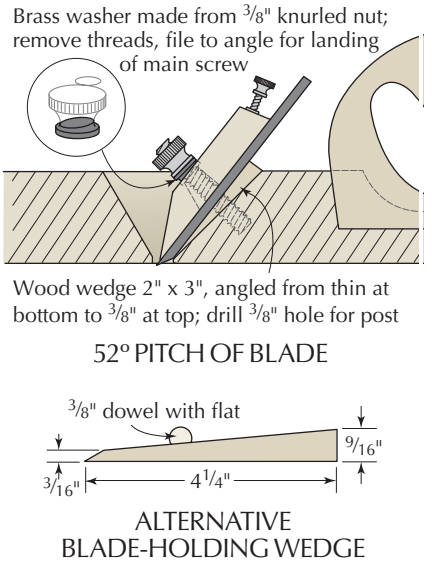
Two-screw mechanism. *Drilling the top screw at 15° will hold the inverted thumb nut. The back of the cap has space for the rest button and a 3/8" lead screw hole. The front of the cap has wear washer and adjustment rod.*

in the hole. Hold the cap at a 15° angle to the bit in your drill press. Start with a 1/2" Forstner bit and drill 5/16" deep. Drill the remainder of the hole with a 15/64" bit. Press a nut, knurled side first, into the hole. To ensure that you have things lined up properly, thread the rod into the nut before gluing. Use a small amount of epoxy or thick CA glue to fill the recess around the nut.

The Handle

The handle completes the razee and coffin-shaped body. The shape of the handle is personal, and relates to your hand size and how you grip the plane.

The razee stepped-down handle improves the feel and control of the plane over the style where the handle



Handle. *The handle is cut out and routed for curves. The two screws holding the handle for this operation are in the bottom edge that will be cut off.*

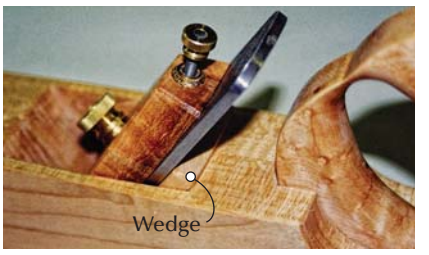
is mounted higher on a square plane body. The handle itself is cut from 7/8" or 15/16" maple. The latter dimension is what hardwood boards are dimensioned when milled "hit or miss" for furniture work. It is sold this way as a more uniform dimension than 4/4 rough stock. Whatever you have, cut the profile and hole (see the photo above). The top faces are left flat, while the hand-grip surfaces need to be rounded over.

The handle is bedded 3/8" deep into a rectangular slot.

Final Details

A cluster of chores remain to finish your plane. With the blade-adjustment mechanism done, check the throat opening. Sand the side of the cap to give the needed clearance. File the hole for the post likewise to allow taking it on or off. Press the copper washer into place. Now sharpen the blade. Seeing that everything works properly will take some fine-tuning.

The maker's mark goes on the top of the iron and the nose of the plane. I like to date it as well. The plane body is protected with a thin sealer of varnish. The brass adjustment screw may need to be



Smoothing plane option. *Here's a cap assembly with a 52° wedge that allows the standard 45° pitch to be changed to a smoothing plane.*

Fine-tuning. *Sharpen the blade, make the blade square to sole and adjust the cap.*

slightly stiffened with a swipe of candle wax or beeswax to prevent it from inadvertently moving, and not doing its job as a stop for holding the blade.

It is possible to adjust the angle of the blade to the 52° pitch of a smoothing plane. Cut a wedge 2" wide and 3" long with the thickness 3/8" at the top and tapered to a sharp edge where it meets the throat opening. A 3/8" hole corresponding to the position of the 3/8" threaded post will allow the wedge to go between the blade and the block. The length of the post needs to be longer by 3/8". Also, the knurled brass nut meets the cap at a new angle. A wedged brass washer is made from the small side of a 3/8" knurled nut. First file out the threads, then saw off the small milled section on an angle and file to proper size to make a landing for the nut.

Remember those other lengths of material – the O1 steel and threaded rod along with the extra knurled nuts and studs ordered at the beginning? Making planes could be catching. **PWM**

John founded and runs The Home Shop, where he teaches woodworking classes, and makes and sells Shaker box materials (ShakerOvalBox.com).

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VIDEO: *Watch a short video that shows this plane in use.*

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The Gottshall Block Challenge

BY ROBERT W. LANG

A piece of scrap and an afternoon will challenge and stretch your skills.

What's it for? *This small block of wood has no useful purpose, except as an exercise in layout and cutting joints by hand. As a practice piece, it contains a series of valuable lessons.*

Imagine yourself in a shop class of 40 or 50 years ago. The assignment for the day is to lay out and cut the block shown in the photo at right. That's the test; the lessons will come as you work. There is also one condition: All the cuts must be made with a backsaw or a coping saw, and the cleanup is done with a chisel.

Recently I posed a question on our magazine's blog about developing basic skills and sawmaker Mike Wenzloff reminded me of this block, developed by Franklin H. Gottshall. Gottshall began writing and teaching woodworking in the 1930s, and by the time of his death at age 89 in 1992, he had written 16 books and 150 magazine articles.

This exercise is from his book "Reproducing Antique Furniture." Many books of this type begin with a few chapters of basic woodworking, but this is one where the stuff at the front is actually valuable. If you can make all the cuts in this little block, you're well on your way to building good furniture.

Getting to the Point

I imagine Gottshall to be one of those teachers you hate during class, respect after the class is over and come to admire as years go by. I believe him when he says to make the block 3/4" x 3" x 7". "About," "nearly" or "just a little over" won't do. I bet he'd measure every part for grading. And as I begin the layout, I find that there were a few wrinkles up the old man's sleeve.

The center point for the concave curve is an example; you find it by drawing a line tangent to the arc, and a second line parallel to the end of the block. Go back up the second line by the given radius and there's the center. That point is outside the block so you need a piece of scrap to provide a place for the compass point.

The center point for the rounded corner isn't shown, and it isn't in line with the edge of the slot in the end as one might assume. The information to locate everything is in the drawing, but that's just a starting point; it takes some deduction to find the precise points.

I did the layout in pencil, then I went over the lines with a marking knife and gauge before doing any cutting. It's a good thing I did because I caught a couple mistakes when they could still be corrected by erasing. Lesson one is to double-check the layout on the wood with the drawing on paper before putting the saw and chisel to work.

"Just because something doesn't do what you planned it to do doesn't mean it's useless."

— Thomas Edison (1847-1931)
American inventor

The Value of Practice

Before I made any of the finish saw cuts, I made several cuts in the waste area of the slot in the end of the block. This would make removing the waste easier later on, but the big benefit was as a warm-up exercise. In a few minutes I had developed a feel for the saw, the wood and my coordination on that particular day.

Many variations of saw and chisel cuts are used to make the block. The rabbet is a wide crosscut. The dado, gain and notch on the end look similar, but the wood and the tools behave differently when cutting with or against the direction of the grain.

The versatility of the chisel also becomes apparent; it's almost a hatchet when removing the bulk of the waste from the rabbet, gain and mortise, but more like a scalpel when used to make the final paring cuts. These cuts also go with the grain in some places and across it in others.

When you know how the wood and the tool will likely behave, you can find an efficient sequence of cuts to leave

LEAD PHOTO BY AL PARRISH; STEP PHOTOS & ILLUSTRATIONS BY THE AUTHOR

All the same. *Setting the adjustable square to mark repeating dimensions saves time and makes for more accurate layout.*

Warm up. *Making cuts in the waste area is an excellent way to get the feel of the saw and the wood before cutting the real thing.*

Good grips. *Hold the saw gently and point your finger. This work calls for finesse, not brute force.*

crisp and clean finished edges without taking forever to remove the waste. The move from chopping to paring, or from one part of the block to another, is a good time to hone the chisel. You can catch your breath and think about your next move while preparing the tool.

Around the Corner

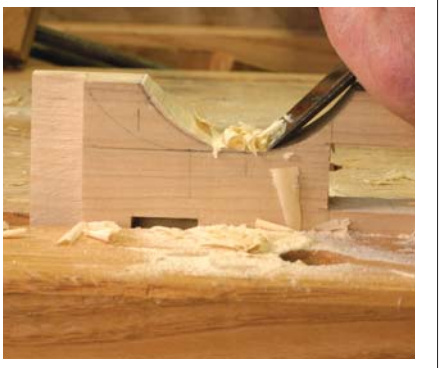
I cut the curves with a coping saw, staying close to, but just outside the layout lines. For the concave curve I flipped the chisel over and worked from each end toward the center. The chisel is easier to maneuver around the arc when the flat back is facing up.

I had seen this block several times over the years, but until now never took the time to try the exercise. If you want an introduction to making joints by hand, or a benchmark to see where your hand-tool skills are, this little hunk of wood is worth the effort. Hang on to it, and in a year or so make another. It's a lesson worth repeating. PWM

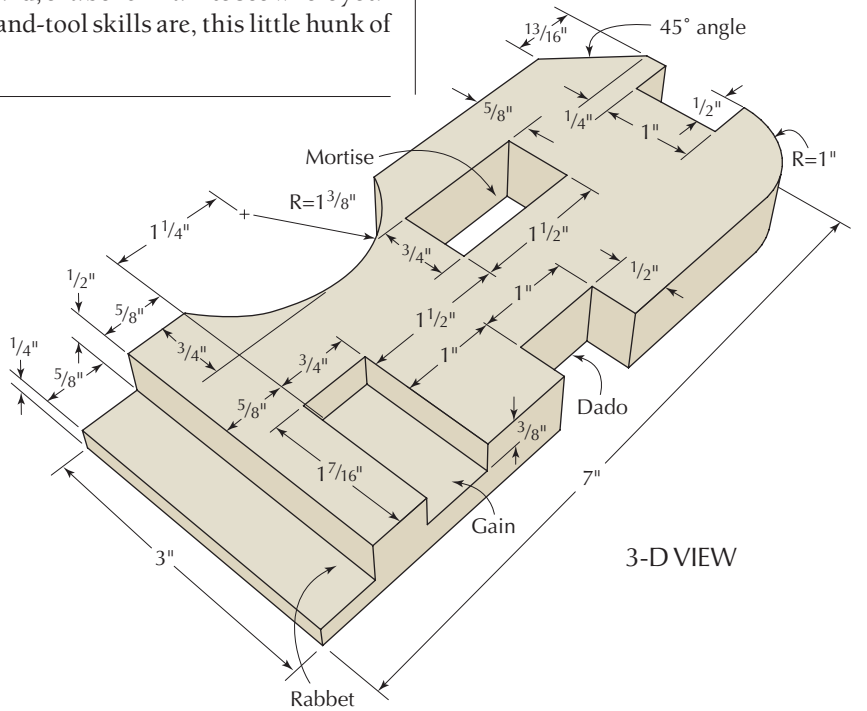
Bob is the executive editor of Popular Woodworking Magazine. *Contact him at robert.lang@fwmedia.com.*

Big bites. *To remove the waste, the chisel can be propelled with a mallet. Stay within the lines and chop.*

A close shave. *The final cuts are guided and controlled by hand. Same tool, different technique.*



Bevel down. *Paring around the circumference of the curve is easier if you use the primary bevel as a fulcrum to control the cut.*



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BY BOB FLEXNER

Shellac: A Challenging Finish

This traditional finish can be tricky to apply.

Many choices. *There are a lot of shellacs from which to choose. In liquid form there is (from left) clear shellac with the wax removed, clear with wax, and amber with wax. In flake form you can choose from (from left) superblonde, lemon yellow, orange, garnet and extra dark.*

If you have read much in the woodworking press, you've surely encountered many articles, including mine, in which the writer uses and recommends shellac as a finish. This may persuade you to try shellac.

I certainly don't want to discourage you because shellac is a great finish with a great history. But you need to be aware that shellac is a relatively difficult finish to use. The writers recommending shellac are usually advanced woodworkers who have learned to overcome the difficulties.

By pointing out some of the problems, I hope to increase your likelihood of success.

Name Confusion

Before you even get started, you have to overcome the confused naming of shellac and the large variety of shellacs available in flake form.

In liquid form, there are clear (actually pale yellow) and amber shellacs. Until about 20 years ago, when the sole remaining supplier, Zinsser, changed the names for marketing purposes, these were labeled "white" and "orange." "Who wants orange furniture?" was the explanation.

In solid flake form, which you dissolve yourself in denatured alcohol, the names include: blonde, superblonde, lemon yellow, orange, garnet, button, ruby, extra dark and more. These names all refer to the color, ranging from pale yellow to very dark orange.

Where to start? Usually clear or blonde on light woods and anything on dark or dark-stained woods. Whichever you choose, it's not as simple as buying a can of polyurethane at a home center.

Wax or No Wax

There's also the issue of wax. Shellac is a natural resin secreted from insects that feed off of plum trees in South Asia. This resin naturally contains 4 to 5 percent wax.

The wax can inhibit bonding with other finishes, so Zinsser introduced a dewaxed shellac called "SealCoat" and markets it as a sealer for polyurethane—even though polyurethane, like all finishes, seals perfectly well on its own. (As I've written many times, the need to use shellac as a sealer is way overblown except for some refinishing situations.)

Clear and amber liquid shellacs still contain the wax. Most varieties of flake shellac have the wax removed. There's no noticeable difference when you use the shellac for the entire finish.

Pound Cut

Unlike other finishes, in which all brands within a category have similar solids content (the ratio of the finish that hardens to the total liquid, including solvent), liquid shellac can vary from almost no solids to very high solids depending on the ratio of shellac flakes dissolved.

The system used to measure the relative solids content is called "pound cut," which is the ratio of the number of pounds of shellac flakes dissolved in one gallon of alcohol.

Clear and amber liquid shellacs are 3-pound cut (too thick for brushing without brush marks, so you need to add thinner). SealCoat is 2-pound cut (at the upper limit for easy brushing). When you dissolve your own shellac flakes, you determine the pound cut.

You don't have to deal with these variations using any other finish.

No Satin

Shellac is the only film-building finish not available in sheens ranging from gloss to flat. All shellacs are high gloss.

If you want a satin sheen, you have to rub the shellac with fine steel wool or other abrasive. This is more work, and it creates fine scratches that make the

CONTINUED ON PAGE 60

PHOTOS BY THE AUTHOR

CONTINUED FROM PAGE 58

surface very fragile. Any slight abrasion, even a light pass with the back of your fingernail, will level the ridges between the scratches and leave a mark.

To reduce marking, you can apply paste wax or a silicone furniture polish. Both raise the shine back to a soft gloss, but applying paste wax is a lot of work.

Blushing

Just like lacquer, shellac blushes (turns milky white) in warm, humid conditions. Unlike lacquer, there aren't widely available solvents for handling this problem.

With lacquer, you can add lacquer retarder to eliminate the blushing (though this slows the drying). You can add lacquer retarder to shellac also, and this is the best solution for the problem (other than waiting for a drier day). But try it on scrap wood first because lacquer retarders are formulated differently and the shellac may not dry properly.

Blushing. *Like lacquer, shellac blushes in humid conditions. You can see the blushing developing in the lower half of this panel that I just brushed. Sometimes the blushing disappears on its own. Otherwise, wait for a drier day or add lacquer retarder to the shellac.*

Ridging. *Unlike other finishes, shellac tends to ridge at the edges of brush strokes, as shown here on soft maple. This is the color produced by one brush stroke of 2-pound-cut garnet shellac.*

Finishes other than shellac and lacquer don't blush.

Ridging

Unlike other finishes, shellac tends to ridge at the edges of brush strokes. The way to reduce the ridging is to add more thinner, but then you have to apply more coats to get the same film thickness.

Shelf Life

The biggest problem with shellac is probably shelf life. Shellac is unique in that it deteriorates – especially in liquid form, but also in flake form.

In flake form, shellac usually stays good for many years unless it is stored in hot conditions or has been bleached to create a "blonde" color. When the flakes go bad, they usually (but not always) "block" into a solid lump, and they no longer dissolve well in alcohol.

In liquid form, the deterioration begins immediately upon dissolving. If the shellac is stored in cool conditions, you won't notice any difference for six months or so. But in time you'll notice that the shellac dries more slowly, takes much longer to harden and becomes susceptible to watermarking (freshly dissolved shellac doesn't watermark except in contact with very hot water).

Zinsser used to stamp the date of "dissolving" on their cans, which was helpful in letting you know the age of the shellac. Now the company just stamps a lot number, which is of no help.

Short shelf life is the reason advanced woodworkers usually dissolve their own shellac from flakes. Freshly dissolved shellac always performs better.

Blocking. *A good indicator, especially with bleached flake shellac, that the shellac won't dissolve is "blocking" – the flakes and powder lump into a solid. You can always try it, but this shellac is probably no good.*

Shelf life. *If flakes won't dissolve after a day or two, the shellac is no good and should be thrown out. Shellac is somewhat unpredictable because it is a natural material. The orange flakes I tried to dissolve here looked perfectly good; they weren't "blocked." But they still wouldn't dissolve.*

Dissolving Your Own

Even dissolving your own shellac can be problematic. It's extra work, of course, and you have to plan in advance so the shellac is ready when you are. You also have to weigh the flakes and figure the proportions to get the pound cut you want.

You should stir the dissolving flakes often. Merely shaking the container now and then will result in a hard lump of gummy shellac at the bottom that will be difficult to stir in.

No matter how you cut it, shellac is a relatively difficult finish. **PWM**

Bob's new book, "Flexner on Finishing," is now available at ShopWoodworking.com.

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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.

arm bow (n)
The curved piece of wood that makes up an arm, as in a Windsor chair. An arm bow can be made from one piece of bent wood (usually bent using steam) or from several pieces laminated together.

arris (n)
A sharp edge formed by the intersection of two surfaces.

book (n)
In terms of veneer, a packet of thin veneer pieces bound together.

chamfer (n or v)
A beveled edge connecting two surfaces. If one cuts a flat on an arris, a chamfer is the result.

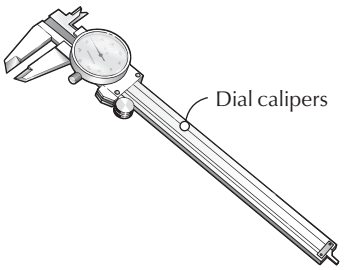
chatoyance (n)
Luminescence or changeable luster, as on a piece of tightly figured wood when viewed at various angles.

compression rupture (n)
When a piece of wood is bent, the inside curve can buckle and break when the wood fibers are squeezed together. Failure may also occur on the outside curve of a bend in the form of grain delamination. While these laminations can sometimes be glued back in place, compression ruptures on the inside of the curve are difficult to repair.

"A worker may be the hammer's master, but the hammer still prevails. A tool knows exactly how it is meant to be handled, while the user of the tool can only have an approximate idea."

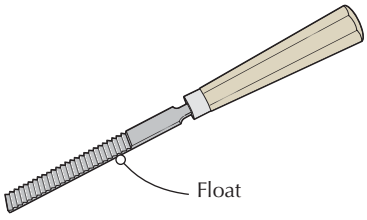
— Milan Kundera (1929-)
Czech novelist
(now a naturalized French citizen)

corbel (n)
A piece (often decorative) that juts out from the main structure and acts as a support. The term is thought to come from the French *corbeau*, or crow.



dial calipers (n)
A precision instrument used for measuring the exact distance between two inside or outside faces of an object, such as the thickness of a piece of wood or the width of a mortise.

dowel plate (n)
A (preferably) heavy piece of metal, usually steel, drilled with a series of precisely sized holes with sharp edges. A piece of stock of any type of wood can be driven through one of the holes to create pins and dowels of a needed size. While shop-made dowel plates will have perfectly cylindrical holes, some manufactured ones will have a slight taper to the hole to make it easier to release the peg from the plate.



float (n)
A traditional tool that is a cross between a rasp and a saw. The large teeth are designed to square the end of a through-mortise with great accuracy, and no end-grain deflection. Though floats were used by joiners, they were far more commonly found in the planemaking business, in which they were used for truing the mortises in a wooden-bodied plane.

gain (n)
A recess cut into a piece of wood, such as a hinge mortise.

lamination (n)
A solid piece of material created by the gluing together of two or more layers. A lamination may be useful in creating a bent-wood piece, or to effect a particular grain pattern on all sides.

liquid hide glue (n)
Like traditional hot hide glue, the "liquid" variety is made from the prolonged boiling of connective tissue of animals, and the adhesive is reversible with heat and moisture. Unlike traditional hide glue (which must be dissolved in water and kept hot), an additive keeps it liquid at room temperature. It also has a longer open time than a typical yellow glue.

oud (n)
A pear-shaped string instrument distinguished by its lack of frets and a small neck. It is a traditional instrument in North African and Middle Eastern music.

quartersawn figure (n)
Grain figure that results from milling a board so its annular rings are 60° to 90° to the face of the board. In some species, this produces shining "ray fleck" on the face when the board's medullary rays pass through the face of the board.

SWMBO (n)
An acronym for "she who must be obeyed," popularized on the Internet.

PWM

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POPULAR Woodworking MAGAZINE

BY JOE MCMAHON

CSI: Tools

It's hard to hide the loot when your wife has detective skills.

I am a toolaholic. There, I've said it. I've admitted my weakness. I am in need of a 12-step program. A 12-step program or a good surgeon. For you see, my bride has the sense of humor of a cat after it has been crazy glued to the left front hubcap of a '53 Buick that was driven 40 miles per hour over an Arkansas washboard back road. My wife is not mean. She is "focused." At least that is what she tells me that "look" means. You know the "look." That steely eyed glare that you feel searing your back when your significant other creeps up behind you just as the UPS truck is leaving your driveway and you are festooned with cardboard boxes.

The Warden and I have been honeymooning for 20 years now, having met at a triple homicide on the mean streets of Chicago. We were both police officers and just happened upon each other at a murder scene. Other than the blood and those dead guys, it was actually quite romantic. It was love at first sight. It wasn't long thereafter when I asked her for her hand. Idealistic fool that she was, she told me, "Sober up and ask me again in the morning." I apparently must not have sobered up enough, because I did ask her again.

Anyway, back to my problem. Well, actually I don't see it as a problem. It is really a friendship thing. I am on a first-name basis with toolmakers. I like to think that they all think of me as a friend because of my great skill in worrying their hand tools around a piece of gnarly wood, but it may also be because they recognize me as a bottom-line type of guy. I add to theirs. Frequently.

Therein is the rub with SWMBO. I don't think she likes my friends. Not because they're bad guys; she hasn't even met them. No, I think it is because they "write" to me so often. Actually they write me monthly. Their message is just a few numbers printed across my Visa statement.

Fortunately, I am now retired and the Warden isn't. That translates into me getting to the FedEx truck and the UPS man most days before the Straw Boss gets home. I grab the multiple packages, slit their little openings and bask in the glory of new tools 'n stuff! I can sometimes cavort with a Veritas object on the living room floor for an hour or so before I have to squirrel it out to the yard, kick it around a bit then throw copious amounts of dirt on it.

You see I have this theory: Dirty tools are old tools, therefore I can claim honestly that I've had them for eons. "No, that isn't new! Look at the scratches. Why I've had that Lie-Nielsen No. 49 for I don't know how long." My wife then takes out her CSI kit and dusts the living room for traces of mastic from packaging tape, or grabs her electron microscope looking for walnut abrasions on cutting surfaces just to disprove my defense. From there, she whips out her Sherlock Holmes spy glass and searches neighborhood garbage cans for tell-tale cardboard boxes from Mike Wenzloff, Ron Breese and Benchcrafted.

For 20 years now, SWMBO and I have done this tango. The dance of hide and seek. I hide the tools, boxes and bills, and she seeks my treasures. She also roots through my shop for the "swag," the ill-gotten gains, the loot. That 12-step program? I think I hear her loading it right now – only I think it is a six-step program recommended by Smith & Wesson. Perhaps I should look for that surgeon …. PWM

Joe is a lifelong resident of Chicago and served on the city's police force from 1968 until his retirement in 2004. He enjoys using primarily hand tools to make furniture, clocks and small boxes.

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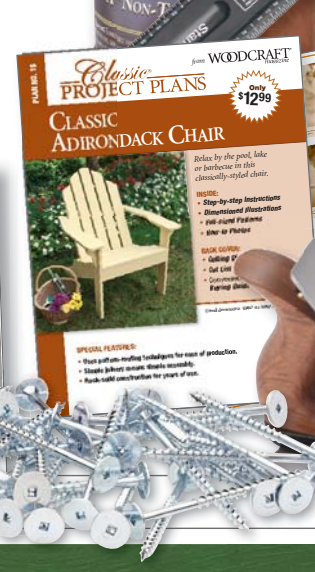

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