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April 2017 ■ #231

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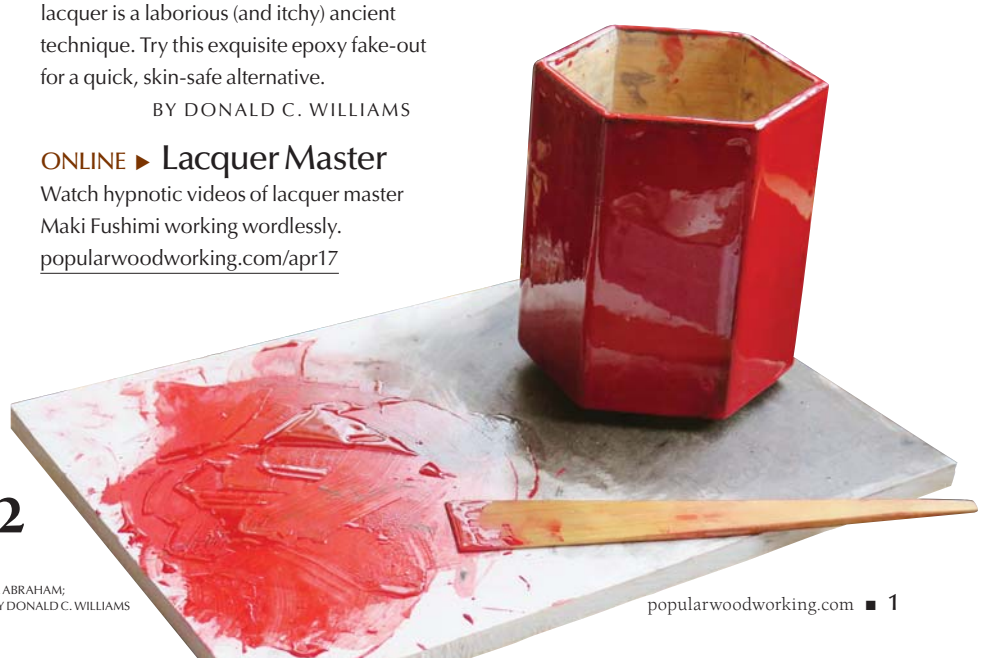

COVER & SIDE TABLE PHOTOS BY AL PARRISH; PLYWOOD PHOTO BY JAMEEL ABRAHAM; CUTTING BOARD PHOTO BY DANIELLE ATKINS; LACQUERED BOX PHOTO BY DONALD C. WILLIAMS

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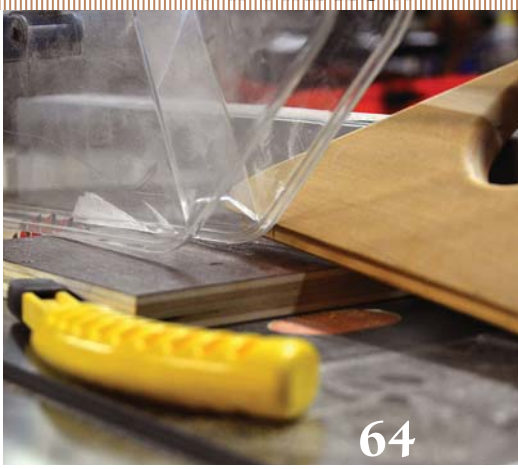

REGULARS

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POPULAR WOODWORKING MAGAZINE

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HOLLOW & ROUND PLANES PHOTO BY AL PARRISH;
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Dig out the best pictures of your work – or get started now on a new piece – and enter the fifth annual PWM Excellence Awards for a chance at the $1,000 grand prize. Submissions will be accepted in five categories from April 1-June 16 at popularwoodworking.com/2017readerexcellence.

There's no fee to enter – the only "string" attached is that we'll print the work of the grand-prize winner, the winners in each of the five categories and the Readers' Choice winners in the November 2017 issue.

You can enter up to five pieces total in the five following categories:

- Casework, Cabinets & Bookcases
- Seating
- Tables
- Boxes & Smalls (a "small," for example, might be a mantel clock or a beautiful shop-made wooden tool)
- Turnings, Carvings & Objets d'Art ("objets" encompass wall-hung art pieces, sculpture, wooden jewelry, etc.).

The editors and contributing editors to *Popular Woodworking Magazine* will select the grand-prize winner, plus the winner in each of the five categories. Your online voting determines the Readers' Choice winners (voting opens June 20).

The category winners and the overall Readers' Choice winner get $100 gift certificates to ShopWoodworking.com.

Last year's competition was fierce, with several stellar pieces vying for the $1,000 prize – but it was Alex Sutula's circular bench (shown here) that nosed out the competition in the end. We were impressed by not only the fair curves of the 10'-diameter bench, but by the execution of the many Maloof-style joints in the base.

I'm hopeful the 2017 competition will yield a similar battle – it's fun to discuss the finer points of joinery, wood selection, form and style.

And that's why it's of utmost importance that the photos you enter allow us to appreciate your work; if we can't clearly see your piece overall and the crisp details of the work that went into it, you hurt your chance of winning.

First and foremost, make sure your pictures are in focus. An uncluttered background is best so as not to pull the eye away from the work, and diffused natural light (say, sunlight through a sheer curtain) helps to avoid harsh shadows. (And if your work is chosen as a winner, you'll need to supply high-resolution digital images for print.) You'll upload up to three images for each entry – one that gets seen by every visitor to the site, and two additional shots for the judges.

Find all the contest details, as well as directions on how to enter, on our website at popularwoodworking.com/2017readerexcellence beginning on April 1.

I and the other editors – and I'm sure all of you – look forward to seeing this year's entries! **PWM**

PHOTO BY ALEX SUTULA

POPULAR WOODWORKING MAGAZINE

APRIL 2017, VOL. 37, NO. 2
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Shaker Candle Stand Grain Orientation

The Shaker candle stand is a fine piece, and a good exercise in handwork. But I have two complaints.

1) The grain orientation shown in the legs has the thin parts with grain at right angles – a great possibility for a break!

2) The proposed dovetail layout jig is way too complicated, and would be warranted only if one were planning a production run. The time would be better spent with saw and chisel.

Tom Higby,
Fowlerville, Michigan

Tom,

The grain orientation of the leg I wrote about is precisely how the original Shaker pieces were made (see the photos below of the original). I was skeptical about the thin tapered toe as well, but it really does not affect the stability of the table at all. The short grain at the ends of the legs is in compression when weight is applied to the table. If it were in tension it would be very weak.

On this point you have to take into account the original tables' longevity as well. There are some that are more than 180 years old and completely intact. If there were a fault in the design, I think it would have made itself evident by now. While most of them have been museum pieces for the last 60 years, they survived 120 years of daily use beforehand.

Regarding the layout jig, I just finished reviewing my new video about this table, "Building the Hancock Shaker Candle Stand" (it's available now at shopwoodworking.com). The part where I show making the dovetail layout tool is just shy of 11 minutes (unedited) – so it really doesn't take much time. I think it is worth making; an accurate layout on both elements of the sliding dovetails saves time in the end.

Will Myers, contributor

PHOTO BY WILL MYERS

Clenching Nails on Saw Table: A Recipe for Damage?

I read with interest Christopher Schwarz's article "Fall in Love with Nails" in the December 2016 issue of *Popular Woodworking Magazine* (#229). I wasn't aware there was so much information about the lowly nail.

However, I have concerns regarding the use of the cast iron top of a table saw as a worksurface to hammer nail tips, bending them back into the work (as is illustrated in the photo and accompanying text on page 42).

The top of a table saw should never be used as a worksurface! Pounding on it as demonstrated could leave scars in the saw top's surface, and more important, jar the saw out of alignment.

I do use mine as "flat space," but only after I set a 1/4" hardboard cover on it.

Ros Barnes,
Belen, New Mexico

Ros,

I've been clenching nails on my table saw's top for a decade now and haven't scarred it or knocked it out of alignment.

Clenching a nail doesn't require a lot of force – it's not like blacksmithing – which is probably why I've never encountered a problem.

For those woodworkers who don't want to use a machine's cast iron top, I suggest using a flat scrap of steel or iron to back up the nail's head.

Christopher Schwarz,
contributing editor

There is No Single Archetype For a Shaker Candle Stand

I'm a fan of *Popular Woodworking Magazine* and a long-time student and collector of Shaker furniture. I was surprised by the article on the Shaker candle stand in the December issue. One might get the impression from it that there is one archetypal "Shaker candle stand," and that many people had made poor drawings and inaccurate copies until this article.

In fact, there were many variations in Shaker furniture both between and within the various communities.

CONTINUED ON PAGE 8

CONTINUED FROM PAGE 6

The round stand in the collection of the Metropolitan Museum of Art was probably made in New Lebanon and is definitely not the same size and shape as the stand in the collection at Hancock, although they appear similar.

The claims that this "is the first perfect copy of the original" and that it's the "Hancock candle stand done right" ignore the scholarship on Shaker stands and numbers of craftspersons who have made beautiful copies of the many different originals.

It is one of the artistic gifts of the Shakers' communities that they allowed many variations within the basic, simple forms that they adopted from "The World." A close study of their casepieces, stands or chairs is like a course on the visual power of small changes in design.

Doug Powers,
Lyndeborough, New Hampshire

Doug,

You are absolutely correct that the Shakers made many different forms of pedestal candle stands (and other pedestal tables). I was not trying to imply in any way that the candle stand I wrote about is the only true or correct Shaker candle stand.

The particular table from Hancock Shaker Village about which I wrote has been photographed and written about many times, as I am sure you are aware. There is also more than one table of this style, probably all made with the same patterns (which more than likely originated at Mt. Lebanon, N.Y.). There are slight differences in the tables I have observed, mostly in the turnings; the legs all look to be identical.

I do feel this particular table has been misrepresented in the past in publications, many of which include the statement: "Measured from original at Hancock Shaker Village" (and often accompanied by a photo of the table I measured).

I personally measured the original at Hancock, and what I provided are the correct dimensions for that table – not my interpretation of it, but the actual original table's dimensions. I have not found a previously published measured drawing (I know of 17 different books with this table included) that is the same as what I documented, or is really even close.

My main inspiration for writing this piece was to provide a precise plan of the actual table at Hancock so that if someone does wants to build an accurate copy, he or she can do so without having to travel to the museum and gain access to the piece. Making changes to the design is quite alright, but at the very least the builder will have an accurate starting point either way.

I in no way mean to denigrate any previous authors. I simply wish to state the facts I have documented from the candle stand at Hancock.

Will Myers, contributor

Giving Hide Glue a Try

I think "Best Glue for Furniture," by Christopher Schwarz, is a terrific article (in the February 2017 issue, #230).

I've been an amateur woodworker for nearly 20 years, but have never used hide glues. All this time, glue-up and assembly was the most stressful and least enjoyable part of my hobby. Now I know it's because of the short open time of the PVAs I've always used – hence project assembly became a timed event, and who needs that?

I can't wait to try some hide glue on my next project. Thanks Chris! **PWM**

Karl Zetmier,
Leavenworth, Kansas

ONLINE EXTRAS

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Highly Recommended

"Good Clean Fun" is going to bring a lot of new woodworkers into the craft. Like Nick Offerman's other books, it's hilarious. Non-woodworkers are going to read it and love it – and by the time they're done, most will be itching to set up a woodshop and start making things.

And if you already bleed sawdust, well, this book will make you laugh out loud and remind you of what (I hope!) got you into the shop in the first place – unmitigated fun! *— Megan Fitzpatrick*

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.

PHOTO BY AL PARRISH

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THE WINNER:

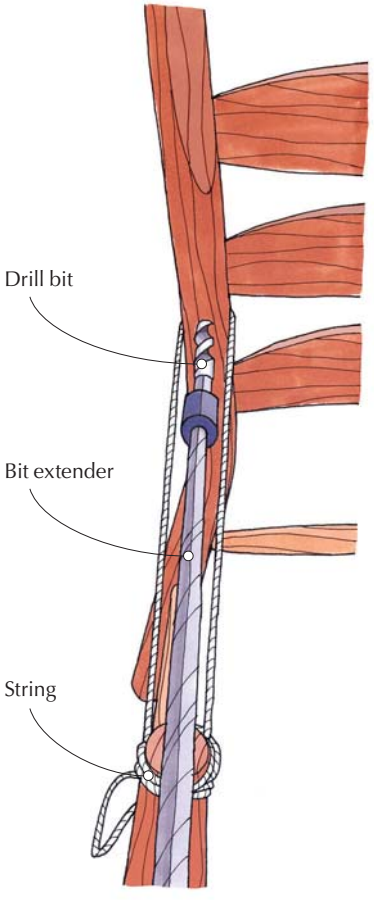
Centering Mortises For Angled Work

When drilling mortises for chair arms, such as those in a ladderback chair, it can be difficult to accurately center your bit.

But wrap a string around the rear post at the mortise location and then around the front post, and finding the center gets a lot easier.

By resting the bit extender on the front post and using the string to visually locate center while drilling, you ensure the mortise will also be angled correctly.

David Douyard,
Pine Meadow, Connecticut



Use a Wedge to Measure Gaps in Hard-to-reach Places

An easy way to measure a gap that is in a difficult place to reach with a ruler is to take a wedge and insert it into the gap, then mark a line on the top of the wedge at the intersection.

While you could then measure the distance from the wedge's bottom to your line, I simply turn the wedge on its side so I can see my line, and use that to set my table saw blade.

Tom Flader,
Fond du Lac, Wisconsin

Alternative to Pencil Erasers

Typically, any pencil marks I make on a workpiece are applied early in the process – cabinetmaker's marks to indicate the orientation of carcase sides, for example. Those marks get planed off after assembly as I prepare to apply a finish.

But occasionally, I have to make a pencil mark (always a light one so as not to scribe the line in the wood!) after the finish planing is done, and removing it with a pencil eraser can leave an ugly smear.

So instead, I reach for the alcohol. A good rub with an alcohol-soaked rag usually erases the mark.

Megan Fitzpatrick,
Cincinnati, Ohio

Easy-opening Finish Cans

I was tired of picking up cans of finish I had not used in a while, only to find that the caps were solidly attached to the can. Some of the liquid had found its way onto the cap threads, which then solidified and sealed the two together.

To alleviate the problem, I now cut a small piece of plastic bag (I use the ones from the hardware store) and put it over the opening and threads, then screw on the cap.

Now my cans of finish open easily, even after I've not used them for a while.

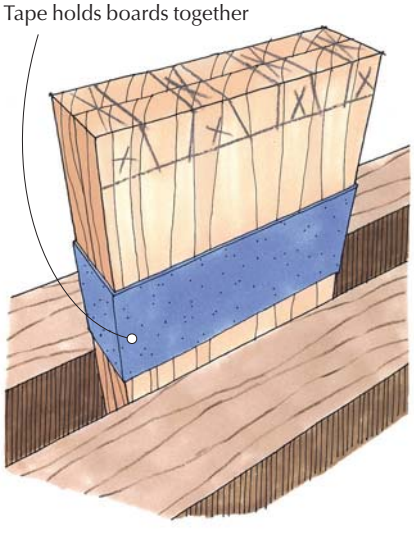
John Cole,
Murrieta, California

Keep it Together When Gang Cutting Dovetails

Aligning two drawer sides together to gang cut dovetails saves time and improves accuracy, but sometimes perfectly mating two pieces together and holding them while closing the vise can be a juggling act – especially when flipping the boards end for end.

I've solved my strife by aligning the boards flat on the bench, then binding them together with a wrap of blue painter's tape. Now the sides hold together through the whole process.

Derek Olson,
La Cross, Wisconsin



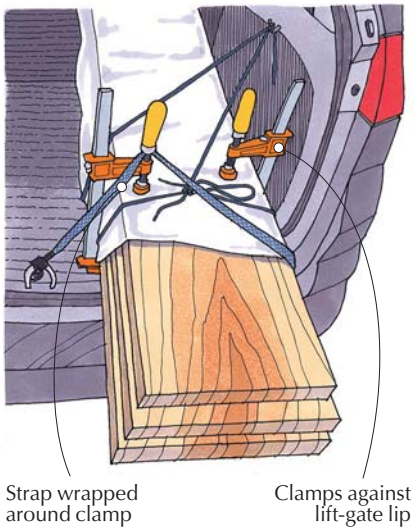
ILLUSTRATIONS BY MARTHA GARSTANG HILL

Safe Transport of Long Boards in a Short Vehicle

My vehicle isn't long enough to handle a lot of the material with which I work, so I have to let it hang out the back. To keep things from sliding around – and from falling out – as I drive, I clamp all the boards together, then wrap a strap around one of the clamps.

The clamps are positioned against the edge of the latch-gate opening to help prevent sliding back and forth.

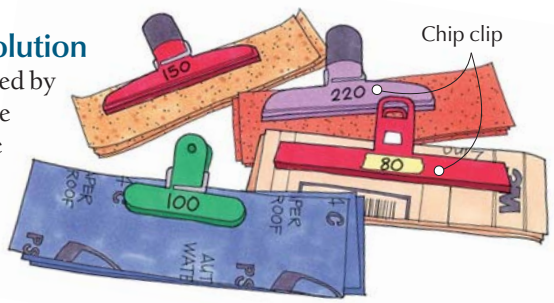
Andy Brownell,
Cincinnati, Ohio



Chip Clip Sandpaper Solution

I keep my sandpaper organized by using bag clips found at the grocery store, and mark the clips so I know the grit of the sandpaper at a glance.

Dan Martin,
Galena, Ohio



VINTAGE TRICKS:

Clean Mortise Bottoms with This Shop-made Tool

When mortising, I found it difficult to remove waste left over at the bottom of the mortise made by my hollow-chisel mortising bit. Prying it out with a bench chisel often damaged the shoulder of the mortise and was not kind to the chisel. I needed a tool with a right-angle cutting edge that would allow me to scrape the bottom of the mortise right up to the corners, then pull the chips out. I figured out how to make one from a 7/32" Allen wrench. Here's how:

With a hacksaw, cut off the short leg of the Allen wrench at a 45° angle, leaving about 3/4" of length on that leg, then grind the face of the cut flat. Next, grind the top of the short leg's flat to create a 30° cutting edge at the intersection with the first cut. The exact angle isn't critical; you just want it sharp enough to cut well, but sturdy enough to withstand the prying action. Go easy with the grinding, cooling the metal frequently in water. (If you overheat it while grinding, it will lose its temper and your tool will dull quickly in use.)

For a handle, drill a 3/16" hole at least 1" deep in a piece of 3/4"-diameter hardwood dowel, then tap the Allen wrench into the hole.

This tool works well for cleaning mortise slots 1/4" wide and up. For larger mortises, make one with a larger Allen wrench.

Mike Callihan,
Burnsville, North Carolina

Precise Hinge Placement

When installing butt hinges, it's hard to know exactly where to drill the holes. Here's the method I use: I attach one leaf of each hinge to the door then spread a 5-minute epoxy (or cyanoacrylate) on the other leaf. I tape a layer of plastic between the leaves to keep the epoxy from bonding it in a closed position, then slip the door into its frame and shim it into position within the opening. When the epoxy has cured, I open the door and install the wood screws. **PWM**

Devore O. Burch,
Fort Worth, Texas

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J. Wilding Hollow & Round Planes

Simple and functional, these moulding planes perform as they should.

Jeremiah Wilding is relatively new to the wooden planemaker brethren, but his planes perform as if he's been making them for decades – and he's offering them at a price that won't break the bank.

I tested a J. Wilding No. 6 (3/8" radius) hollow and round pair; they perform on par with M.S. Bickford and Old Street Tool planes – but there are some stylistic differences (more on that in a minute).

The mouths are right, ejecting shavings neatly and consistently, and the wedges hold tight with a perfect fit against the blind side. And they are comfortable in the hand.

Wilding offers his planes sharpened and unsharpened. So I got the hollow sharpened, and it worked perfectly, producing crisp shavings with an absolute minimum of fuss. The round came unsharpened, and had a significant scratch in the business end of the tapered iron – it took me about 20 minutes of flattening the back on a #1,000-grit waterstone before I could move on to honing and polishing the back, then sharpening with sandpaper wrapped around a dowel before finishing with a slipstone.

So unless you just love sharpening, for the $15 price differential per pair, I'd recommend having them delivered sharp. (Sure, you'll have to sharpen after using them, but you'll know better what you're aiming for.)

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Prices correct at time of publication.

No. 6 pair. *The details on J. Wilding's hollows and rounds are rooted in 19th-century British planes – simple and functional.*

So how do the J. Wilding planes differ from the M.S. Bickford and Old Street Tool planes? Well, they're a Toyota to the other makers' Mercedes. Both are reliable, comfortable in use and do the job they're meant to do, but the Toyota is much simpler in the detailing.

Instead of wide chamfers and eyes on the ends, and elegant coves and fillets on the steps (the side of a wooden moulding plane where it juts out to the width of the sole), J. Wilding planes have simple, narrow chamfers and a flat at the step, which reduces the amount of detail work that goes into each. The top of the wedge is also less ornamental. And the planes are 1/2" shorter (9 1/2" rather than 10") – all of which makes them look more like 19th-century British planes than the more elaborate high-end 18th-century look of the other two makers' tools.

Plus, Wilding's planes are quartersawn maple rather than the traditional beech, which he says is easier and less expensive to dry properly for planemaking.

Wilding started out as a period furniture maker, and his attention to detail shows in his planes – the differences are in aesthetics, not in function.

The hollows and rounds are available in 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 1 1/4" and 1 1/2". Nos. 2-10 (1/8"-5/8") are $260 per pair unsharpened/$285 sharpened; Nos. 12-18 (3/4"-1 1/2") are $285 per pair unsharpened/$300 sharpened. Wilding also offers quarter and half sets of hollows and rounds, as well as other wooden moulding and joinery planes.

— Megan Fitzpatrick

CONTINUED ON PAGE 14

PLANE & BEADLOCK PRO PHOTOS BY AL PARRISH; CHISEL PHOTO BY THE AUTHOR

CONTINUED FROM PAGE 12

Beadlock Pro Joinery Kit

I looked to the Beadlock Pro recently when I found myself needing four loose-tenon joints for a project – I wanted an economic but quick solution, and didn't want to make a router jig.

The Beadlock system, which cuts mortises up to 3½" wide, uses a standard drill bit with a stop collar to first guide your drilling of a series of three holes. Then the guide block is shifted slightly to drill two overlapping holes evenly spaced within the first three. Together, these create an undulating mortise into which the Beadlock tenons fit perfectly. It's quick, simple and at the right price for this quick job.

Initial setup of the Beadlock is important – it isn't self-centering, but this allows for more variety in tenon location. Just make sure to mill a few pieces of test material on which to confirm your setup and you'll be in good shape.

While a traditional loose tenon has smooth sides, the wavy shape of the Beadlock tenons makes the joint very precise – but it also makes it somewhat unforgiving. There's no left-to-right slop to adjust things. So again, accurate setup is key.

The Beadlock Pro kit is solidly made of steel and anodized aluminum, and it comes standard with a high-speed steel ⅜" bit, stop collar, a paring block (to guide your chisel if you wish to flatten the ridges for a traditional mortise) and a molded storage case. Guide blocks and bits for ¼" and ½" tenons are available as accessories.

The tenons are available precut at 1½", 2" and 2½" lengths, or in 12" lengths you cut yourself. (There are also router bits available to make your own tenon stock.)

Is the Festool Domino faster? Absolutely. But the Beadlock is a decent budget alternative. — *David Thiel*

Beadlock Pro Joinery Kit

Rockler ■ rockler.com or 800-279-4441

Street price ■ $140

■ **ARTICLE** *Read about other loose-tenon joinery methods.*

Price correct at time of publication.

Veritas Mortise Chisels from Lee Valley Tools

The Veritas (Lee Valley) mortise chisels are awesome in every sense of the word. They're big, heavy and can plow through a mortise in just a few good passes. The size, shape and substantial thickness of the blades bring English "dagger"-style mortise chisels to mind, while the overall shape and length give them the feel of elegant Japanese or sash mortise chisels in the hand.

The chisels are available in ⅛", ¼", 5/16", ⅜" and ½" (and as a set of five). I tested the ¼" size in both A2 and PM-V11 steel and found little practical difference between the two in terms of edge retention or overall performance. (Their paths diverged at the sharpening stones, however, where PM-V11 was the clear winner, taking a finer edge with fewer strokes.) The rounded heel of the blade might seem like a small detail, but it provides a smoother fulcrum and changed how I used the tool to clear waste. I found myself almost shearing with the edge as I levered, leaving a cleaner and more uniform mortise, especially in the corners.

But it's easy to start judging a mortise chisel from the wrong end and get hung up on the pointy part when the real question is, can this thing take a beating? Years of mallet strikes are the only sure answer to that question, but all signs point to yes. Both test chisels exhibited dead-straight grain oriented exactly 90° to the ferrule to exploit the wood's natural strength, and the hybrid tang-and-socket design resists splitting and tightens with every mallet blow. These chisels are slightly more expensive than others currently on the market, but they're built for the long haul and to my mind, that makes them a bargain. **PWM**

— *James McConnell*

Veritas Mortise Chisels

Lee Valley ■ leevalley.com or 800-871-8158

Street price ■ from $85/each to $399/set

■ **VIDEO** *Watch what mortising looks like from the inside out.*

Prices correct at time of publication.

Mouldings Got a Start in the Gutter

Woodwork and architecture share some surprising DNA.

I am a country mouse who likes to visit the city. It's a habit that doesn't make much sense, because I've always preferred walking in the woods to dodging traffic.

But when my design quest led me into the world of architecture, I came to value the urban landscape. As a woodworker I had a vague idea of the overlap between buildings and furniture, but I was stunned, then delighted, to learn just how much.

Throughout history, our furniture echoed and reflected the best creative ideas from buildings. It turns out that many of the things that make us feel good about a home also resonate in our favorite chair. That's the shared thread that runs through our furniture-making craft and is key to understanding the hidden gems of good design.

I'm not saying that you must school yourself on classic architecture (oh, yes I am – it will rock your world). But just taking the time to pause and look with purpose at that old courthouse or library building can unlock a treasure trove of ideas. If you think about it, this connection makes sense. Much of our architecture began as wood structures, and both carpenters and cabinetmakers shared many tools and techniques. But this goes much deeper than a common material and tool set. Furniture and architecture also share a common design language.

One way to see this clearly is in something as everyday as a crown moulding. The house carpenter and the furniture builder have long used a crown or cornice to cap off their designs, and the feature is not limited to historic forms. A graceful crown moulding continues to find a place in contemporary work, and with good reason. But before we go there, let's step back in time and find out how this all got started.

Close relatives. *Cornices and crown mouldings on furniture come from the same wellspring – architecture.*

Function First

We find a cornice or crown moulding on the top of tall buildings, tall case clocks, bookcases, entertainment centers, even the top rims of clay flower pots. We join interior walls to ceilings with a crown moulding or use it to cap off our kitchen cabinets. Decorators even sell sections of crown as shelves to add some architectural flair to a wall.

Crowning touch. *A crown moulding can transform a humble shelf into something extraordinary.*

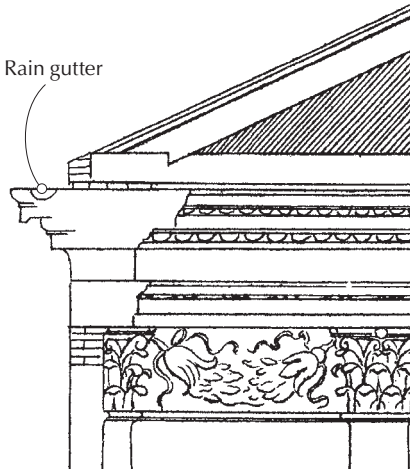
Where did this all come from? Rain gutters. Early crown mouldings were used on the tops of exterior walls where a pitched roof connected with the structure below. Builders realized that water streaming down a wall and seeping into the foundation was a recipe for failure, so they used the outward extension of the angled crown moulding as an overhang to protect the structure below it. More than just a decorative crown, this moulding also hid a rain gutter carved into the top side, which controlled the flow of rainwater off the roof.

So, yes, this thing we call crown moulding began as a practical solution to a water problem. Yet our ancestors weren't the kind of builders that would just hang some gutter and leave it at

CONTINUED ON PAGE 18

PHOTOS BY THE AUTHOR EXCEPT "GENTLY CROWNED" BY LIE-NIELSEN TOOLWORKS; "GUTTER TALK" ILLUSTRATION BY ANDREA PALLADIO, FROM "THE FOUR BOOKS OF ARCHITECTURE"

CONTINUED FROM PAGE 16



Gutter talk. *In the cross section of this cornice, you can see a small semi-circle that was the rain gutter carved into this stone temple.*

that (industrial chic hadn't been invented yet). Even though the solution had a structural purpose, builders also thought about how our eye took in a building. In this case a cornice terminates a tall vertical plane – a wall.

Our eye prefers a transition, a visual signal that tells us something is about to end. Ancient builders observed the way nature deals with transitions and took inspiration from how tree branches curve up gently to carry the eye toward the sky, and they mimicked this in the curved profiles of crown mouldings. The lines of light and shadow resulting from the profile give our eye that transition we look for.

Builders also thought about what shapes the crown profile should take to convey the effect they were after. They wanted to get a sense of lightness or lift. That's why crown mouldings usually have compositions featuring concave curves rather than a series of convex shapes.

In contrast, we use convex-shaped mouldings in the bottom of structures where they reflect the sense of heavy loads pressing down from above and causing them to bulge out.

Gently crowned. *The gently curved concave profile on this crown gives it a lightness and sends the eye upward.*

Application

Whether you want to add a crown to the family room walls or design a cornice for a bookcase, here are a few tips to guide your decisions.

We've all seen remodeling jobs where someone slapped up a thin strip of moulding to hide the seam where the wall meets the ceiling. Though a crown can cover some drywall sins, its true purpose is to transition the eye, and scale is important to achieve this. In the case of a wall, the height of the crown is related to the height of the wall. Take notes next time you are in a space with tall ceilings, such as a church sanctuary. The crown mouldings will be quite large, in keeping with the room height.

An ancient rule of thumb is that a cornice should be one-eighteenth the overall height of the wall. That means a crown for an 8'-high ceiling would be a little over 5" in height. That's not written in stone, but it's a good jumping-off reference.

However, when it comes to furniture, you may wish to deviate from this rule. A tall, narrow grandfather clock would look top-heavy if you applied that same one-eighteenth logic. In that case, you might think about the cornice just in relation to the height of the top portion of the case, called the hood.

These kinds of decisions are subjective, but thinking in terms of the crown verses the structure below it will help guide your eye.

Finally, the profile of the mouldings must be considered. History offers a wide range of ideas, from a plain and simple flowing arch to a complex combination of curves. Aside from your own observations of buildings, search through furniture books and note how artisans used different profiles and scales. I reference a link in the Online Extras where you can download several classic cornice profiles that you can study and use in your own designs. Who knows? You may have a city mouse inside of you longing to go look at some great architecture. **PWM**

George is the co-author of two design books and writer of the By Hand & Eye blog with Jim Tolpin.

Pop the hood. *If we scaled this crown to the overall height of this tall clock, it would be twice as tall and broad. Instead this is proportioned to complement the upper hood section of this clock.*

ONLINE EXTRAS

For links to all these online extras, go to:

- **popularwoodworking.com/apr17**

BLOG: *Read more from George R. Walker on his By Hand & Eye blog with Jim Tolpin.*

PLAN: *Download PDFs of historic crown moulding profiles from the author's site.*

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About This Column

Design Matters

Design Matters dives into the basics of proportions, forms, contrast and composition to give you the skill to tackle furniture design challenges with confidence.

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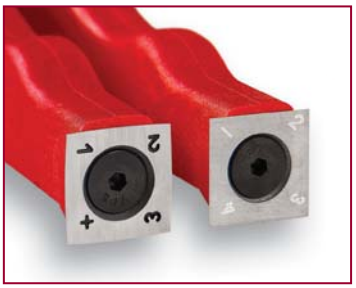

Our standard blade *(left)* has cambered edges to prevent gouging the work. An optional square blade *(right)* gets into square corners.

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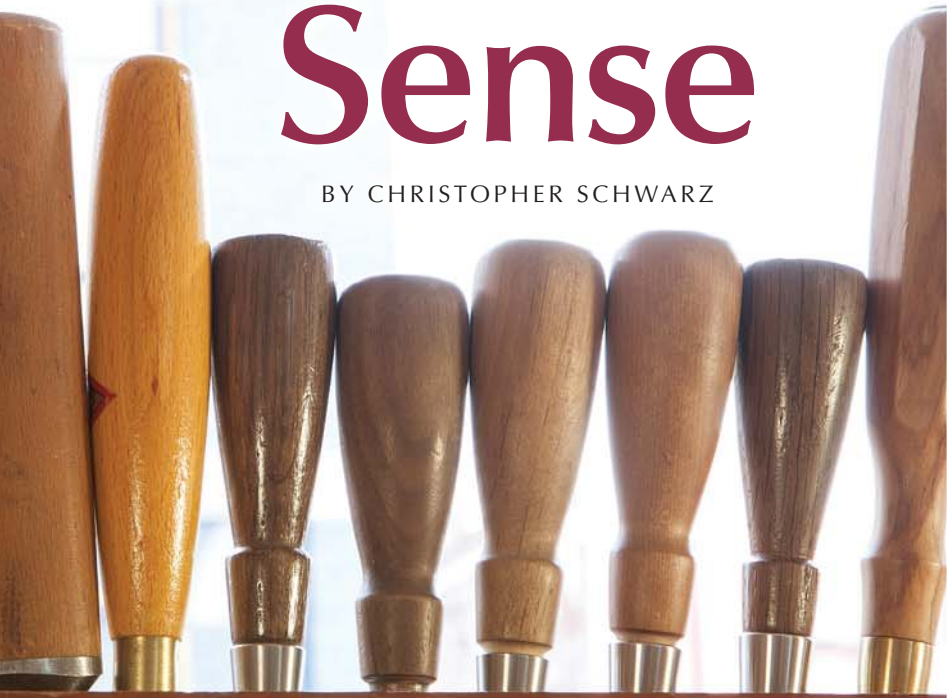
Good Chisel Sense

BY CHRISTOPHER SCHWARZ



The simplest tool in your chest is also the most sensitive and versatile; here's how to set up a chisel to a high level and wield it like a maestro.

It's almost impossible to build furniture without a chisel, yet most woodworkers I've met (even professionals) have chisels that are unbalanced, the wrong shape and poorly sharpened.

Before you despair, this article is not a commercial to convince you to buy an expensive set of boutique chisels. You cannot just throw money at this problem. Instead, my hope is that after reading this article you will fetch the 1/2" chisel you have in your set – no matter the brand or the vintage – and set it up for a high level of work.

Once you see what a proper and perfect chisel is capable of – and how to wield it – you'll quickly discover that the chisel you have is (most likely) perfectly adequate, or that it could be better. Either way, you'll know exactly why that is the case.

Warning: If you are a tool collector or have beliefs that tools should not be radically altered, you definitely want to stop reading now.

Types of Chisels & What You Need

Most woodworkers have far more chisels than necessary. Years ago I sure did. The downside to being chisel-rich is the downside to having a dozen children: You have to take care of them all. I'd much rather have a small set of perfect and sharp tools than a menagerie of misfits that I'm always poring over to find a decent one.

Likewise, I don't think you need a bunch of styles of chisels to do good work. I've explored the world of firmer chisels, slicks, registered, butt, paring, patternmaker and crank-neck tools. Yes, they all have their uses for certain trades and times in history. But I always come back to the basic bevel-edge chisel as the most handy pattern for making furniture. A good bevel-edge chisel (and we'll discuss what makes a good one) can handle almost any task imaginable.

What sizes? A set of five (1/4", 3/8", 1/2", 3/4" and 1") is more than enough. If I had my druthers, I'd skip the 1" chisel and get a 1 1/4" or 1 1/2" chisel instead. These wider tools come in handy for paring and defining tenon shoulders.

PHOTOS & ILLUSTRATIONS BY THE AUTHOR

It's better with a bevel. *The narrow flats on the long edges of these chisels let you sneak into acute corners, yet they are strong enough for fairly heavy work.*

Mortising needs mass. *Hand-mortising can be brutal on the wood and the maker. Mortise chisels are built to withstand heavy blows and levering out boulders of waste.*

When students ask me how to start buying chisels, I recommend they buy a 1/2" tool (the most-used size), then expand cautiously from there. You might end up with a 1/8" bevel-edge chisel because you make London-pattern dovetails. You might never pick up a 3/8".

The only exception to this blanket of love for bevel-edge chisels is when it comes to mortising. If you cut your mortises by hand, you'll be best served by a couple dedicated mortise chisels. I've snapped bevel-edge chisels in a deep mortise (heck, I've seen students snap mortise chisels in a deep mortise).

But what style of mortise chisel? Japanese? English? Continental? All of the patterns work just fine – I've used them all in my shop for many years. My favorite is the English pattern because it has an oval-shaped handle that helps you line up the tool with the joint's walls. Also, the English pattern is the most beefy and seems to take abuse the best.

You don't need a lot of sizes of mortise chisels (please don't buy a whole set). Start with a 1/4" chisel if you work with mostly 3/4"-thick material or a 5/16" if you work mostly with 7/8" to 1". Let your work dictate the next size you purchase. If you plunge into bench-building, you'll find a 1/2" to be indispensable. If you make delicate frames, a 3/16" will come in handy.

Fancy Specialty Chisels

There are lots of specialty chisels out there – some are helpful; others are not. Here are the patterns that I find most helpful for furniture making.

Fishtail chisel: If you cut half-blind dovetails, these chisels are invaluable for cleaning out the sockets on the pinboard. Note that you can make your own fishtail chisel with a hardware-store chisel and a grinder if you want to try out the pattern first. In any case you need only one chisel that reflects the type of dovetails you cut.

Second-string chiselers. *The fishtail chisel (top, right) is a huge help when cleaning up half-blind dovetails. The swan-neck chisel (top, left) scours the bottom of mortises. And the drawer-lock chisel (sorry, no cute animal name) lets you work in tight quarters.*

Swan-neck chisel: If you cut a bunch of mortises, this chisel is a life-saver when it comes to cleaning out the trash at the bottom of the mortise, which can be vexing at times. I have only one (a 1/4") that matches the size of my mortising chisel.

Chop, hone, repeat. *When dovetailing a carcase, I hone my chisel after each corner. When dovetailing a large drawer, I might do two corners before honing. With small drawers, I hone after finishing each drawer. These little rules keep me sharp.*

Drawer-lock chisel: This odd-looking bird gets you into tight places when installing locks in small drawers. You can get around owning one of these with this simple trick: Install the lock before assembling the drawer.

What's Important & Not

While it seems logical to focus on the steel of the chisel – the tool is a piece of steel stuck to a stick – it's one of my smallest concerns. I think there's basically good steel and bad steel. Bad steel won't hold an edge for more than a few minutes of work. It needs to be annealed, re-hardened and tempered (which will make it good steel). Good steel covers a wide range of tools from the well-made hardware-store tool up to premium products. Yes, there are differences in the edge-holding properties between the inexpensive and expensive stuff, but if you keep your chisels sharp with regular honing, you won't really notice the difference.

Chisels should be honed regularly during work. When I chop out dovetails in a chest or case, I'll rehone the chisel after every corner. This gives me a break from bending over the work

About this long. *For general use, the handle should be the width of your palm – like here.*

Necks are for pushing. *The small hollow area in the handle makes the tool easier to push.*

and ensures the chisel is keen when I start at it again.

You are welcome to obsess over all the different steel formulations and read all the torture tests that get published (confession: I've been involved in some of these), or you can quit worrying and get to work at the bench.

Bottom line: If your chisel won't hold an edge for more than a few chops, send it back to the maker or learn to heat treat steel. Otherwise, focus your energies on what is far more important than steel: the handle.

The Handle & the Balance

The comfort of the handle and the balance of the tool are, in my opinion, the most important factors in selecting a good chisel. Here's what I look for when I pick up any chisel.

You should be able to wrap your fingers entirely around the handle. But the tool shouldn't get lost in your palm. Handles that are too big or small reduce your control and increase your fatigue.

Unless it's a paring chisel, the length of the handle should be about the width of your palm. Anything more increases the weight and can affect the balance.

My favorite handles, no matter who makes them, have some sort of "neck" near the transition between the handle and the steel. This narrow area is an ideal place for your thumb and index finger to push the tool forward while paring. Having this neck allows you to use a more relaxed grip when paring.

Farewell heavy plastic. *Use a hacksaw to remove the plastic handle. Then turn a wooden one. It's time well spent.*

I'm not a fan of plastic handles for a couple reasons:

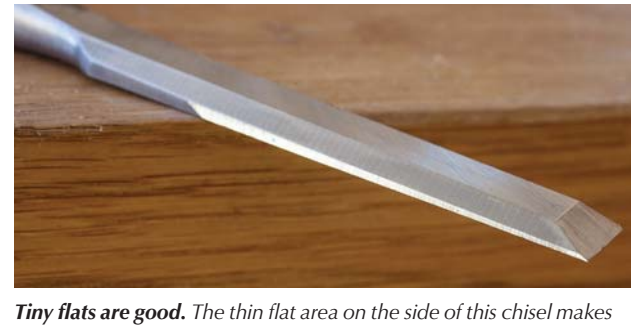
- They are much heavier than wooden handles and throw off the balance of the chisel. The extra weight makes them quite fatiguing to use when chopping dovetails especially. You have all that weight swinging up in the air that you have to control. You quickly feel this as soreness in the meat between your thumb and palm.
- I don't like the feel of plastic. Though I've held many quality handle shapes made with plastic, I got into making furniture because I love wood.

If you have a heavy plastic handle, here are my two recommendations: 1) Replace it with a wooden one. It's not difficult (we have an article by Roger Holmes on this process on the website). 2) If you refuse to take this route (which is weird because you are a woodworker), then hacksaw off the end of the handle and shape it with a rasp to reduce the weight and shorten the handle. This is what woodworker Lonnie Bird does when students bring plastic-handle chisels to his school. The tools look pretty bad after the operation, but they are much easier to wield.

When it comes to the balance of the tool, you want the steel part to be heavier than the handle. The tool should be balanced 50/50 at a point somewhere along the steel part. A handle-heavy chisel is misery.

One of the other important details of a bevel-edge chisel is the size of the side bevels. The bevels of a good chisel will almost touch the flat back of the tool – leaving a very fine flat. A chisel like this will plunge nicely into a tail-

Handle-heavy hurts. *If the balancing point for the tool is in the handle, I think it's too heavy for light chopping. Cut the handle down or replace it with a wooden one.*



Tiny flats are good. *The thin flat area on the side of this chisel makes it ideal for dovetailing. Poorly designed bevel-edge tools have flats as wide as 1/4".*

Most woodworkers have flirted with Japanese chisels. I had a set of beautiful blue-steel blacksmith-made chisels in the late 1990s. They are the most gorgeous form of chisel made, and the best Japanese chisels seem to stay sharp much longer.

In use, Japanese chisels aren't really all that different than Western chisels. There are small differences in how to set them up. But before you dive headfirst into that world, I recommend a good deal of research, because there is a huge gap between the low-end chisels and the pricey handmade ones. — CS

That's not flat. *One of the nice features of Japanese chisels are the hollows ground in the back. These hollows make the chisel easy to set up – there's less steel to flatten.*

board without bruising the tail. It also can get into other acute corners, such as butterfly-shaped mortises and sliding dovetail sockets, with ease.

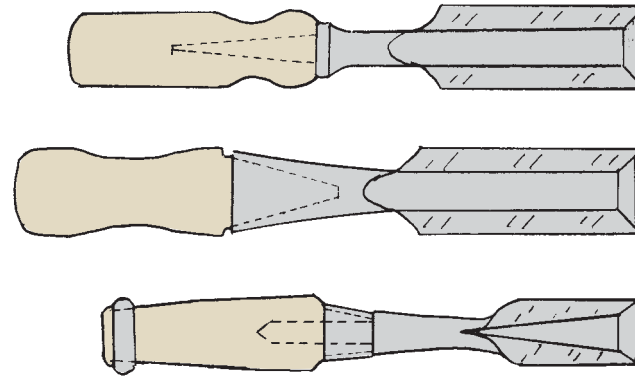
Note that if your chisel has a chunky flat on the side, you can fix that easily on the grinder (see the photo at right for details).

While I like this small flat on the edges of the steel, I don't like the bevel and the back to come to a point for the simple reason that these tools shred my fingers while chopping or paring.

Oh, and what about the different ways of attaching the handle to the blade? Manufacturers try to make a lot of hay about the differences between a socket chisel, a tang chisel and the combined socket/tang construction of Japanese chisels. Don't get too wrapped up in it.

Socket chisels are heavier but it's easier to replace the handle (turn a new one and knock it into the socket). Tang chisels are lighter, but the handle is more difficult to replace and might require a ferrule, which is a sleeve of metal that keeps the wood from splitting at the intersection of the metal and wood. And the Japanese hybrid construction is probably the best of both worlds, but it is available on only certain tools.

It's not scary. *If you have a flat platform around your grinding wheel, then grinding down the side bevels is easy work, even for a beginner.*



Three ways to attach the handle. *Here are the most common three ways to attach the handle to the blade: a tang (top), a socket (center) or a combination of socket and tang.*

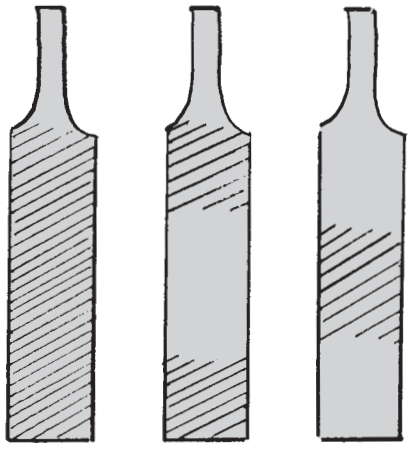
Set Up a Chisel

One of the best reasons to buy premium chisels is they are a cinch to set up. The back is flat, the handle is perfect out of the box and the bevel is square and nicely ground. All you have to do is polish the back, hone the bevel and get to work.

Less expensive, vintage or abused chisels generally need work. You might not have to perform all the steps below, so take stock of each chisel first.

The first thing I do is to flatten and polish the back of the chisel. This can take a moment or a day. To asses the state of the back, I first rub it on a #1,000-grit waterstone (or the equivalent) to see how wonky it is. As I work the back of a chisel, I always plunge it on and off the stone. Working the back side-to-side can result in the back becoming convex, especially with narrow tools.

After about 30 seconds on the #1,000-grit stone, I look at the back. You'll see one of three patterns: 1) The scratches cover the entire back, mean-



Great, good & bad. *When the scratches cover the entire back (left), it is flat. When the scratches are at the tip and near the handle (center), it is hollow. When the scratches are in the center of the blade only, it is bellied. Bellied blades can be hard to set up.*

In & out. *To flatten the back (especially with narrow chisels), it's best to plunge the tool onto and off of the stone rather than working side to side.*

Remove metal & tedium. *Grinding out a bellied back can save hours of work. Once again, a flat platform around the wheel makes this operation a cinch.*

ing your back is flat. 2) The scratches will be at the tip and up near the handle only, meaning your back is hollow. 3) The scratches are in the middle of the length of the blade, meaning your chisel is bellied. (See the illustration above.)

If the back is flat or hollow, polish it. I use #4,000 grit and finish with #8,000. And then you are done with the back.

If the chisel is bellied, I'll put a straightedge on it to see how bad the situation is. If the straightedge makes close contact, I'll try to fix the situation with some coarse belt-sander paper stuck to a flat surface, such as my table saw's wing or a piece of granite flooring. I use the same plunging strokes on the coarse paper and hope for the best. If I manage to get it flat enough so the scratches reach the tip of the tool, I'll then move to the #1,000-grit stone and polish it up.

If it seems hopeless, I take the chisel to the grinder and attempt to grind out the belly. This is pretty easy (see the photo above, right for details), but the results are generally not pretty unless you are a maestro at the grinder.

> "It is well with me only when I have a chisel in my hand."
>
> —*Michelangelo Buonarroti (1475-1564), Sculptor, painter, architect & poet*

Other Modifications

If your chisel has chunky flats on its long edges and you plan to cut dovetails, you'll want to grind these bevels to make the flats thinner along the blade. You can do this operation with a file, but it's tedious. Set up a grinder and you'll find it's fast work.

After grinding the bevels (or just inspecting them), take some fine sandpaper or a burnisher and break any sharp edges along the shaft of the blade. Sharp edges will shred your hand while chopping dovetails.

Now turn your attention to the handle. If it's uncomfortable or plastic, I recommend you turn a new handle or at least modify the existing one. Most plastic handles are too heavy, so cutting off $\frac{1}{2}$" to 1" from its end will greatly improve the balance.

Many inexpensive wooden-handled chisels are covered with a thick skin of goopy lacquer. Remove this with solvents, scraping or sanding. Many people leave their handles bare, but if you want a finish, I recommend a couple coats of oil. Slick film finishes aren't my favorite thing in the world, and I think they make the handle a tad more difficult to grip.

If you have a Japanese chisel, you might need to set its metal hoop on the end of the handle. There are lots of detailed tutorials on the internet, but here's the quick-and dirty: Remove the hoop, then hammer the handle in the hoop area to compress the wood to receive the hoop. Tap the hoop on the handle so it's about $\frac{1}{8}$" or $\frac{3}{16}$" from the end. Soak the end in water for about 20 or 30 minutes to make the wood swell. Use the chisel, which will mushroom the end of the wooden handle over the hoop.

Farewell plastic. *I've turned a new wooden handle for this chisel that is the same shape as the old plastic one.*

Sharpen the Bevel

Check to make sure the bevel is relatively square to the sides of the tool. If it's out by more than a couple degrees, regrind the bevel square. Note that, with some homemade chisels, the long edges of the tool might not be parallel, so you'll just have to split the difference.

Most chisels are ground with a bevel of 25°, then honed. You can hone the entire bevel (a Japanese practice), or just hone the tip, which is called a secondary bevel. Honing just the tip speeds sharpening and increases the angle of the edge in relation to the back.

Most people hone their chisels somewhere between 30° and 35°. Some woodworkers tune up their chisels for specific jobs. Wide paring chisels get ground at 20° and honed at 25° (or less). The middle sizes are ground at 25° and honed at 30°. The small sizes for chopping get ground at 25° and honed at 35°.

Lower angles are easier to push and higher angles retain their edge longer.

I don't mess with this. I find that sharpness is more important than the cutting angle. So I grind all my tools at 25° and hone at 35°. It keeps things simple and I can pare and chop without any problems.

When I hone, I start with #1,000 grit, then proceed to #4,000 and finish with #8,000. Many woodworkers skip the #4,000 and go straight to the #8,000. Others stop at #4,000. Experiment.

Chisel Safety

The most serious workshop accidents I've seen were caused by chisels. Preventing accidents is simple: Never put your flesh in the path of the blade. When paring, both hands should always be on the tool. Never hold the work with one hand and chisel with the other.

With the serious lecture out of the way, we can learn how to use the versatile chisel.

Use a Chisel

Most chisel applications can be divided into three operations: paring, light chopping and heavy chopping – usually mortising. Each operation has different rules and tricks to ensure the chisel does what you want it to.

The first rule applies to all three operations: Chisels want to travel through the wood at an angle that bisects the bevel. So if you have the tip sharpened at 30°, and you drive the chisel straight down into a board, it will try to travel at an angle of 15° to the back of the tool. (See the illustration below if you are scratching your head.)

You can overcome this tendency by removing wood in front of the bevel. If the wood offers minimal resistance, then the chisel will travel straight down.

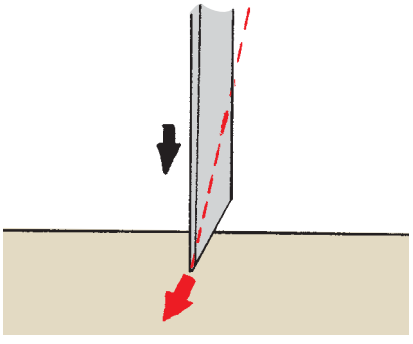
So when paring, the trick is to remove as much material as possible before making the final paring cut. Think of a drawbored peg that you need to flush up to the surface of the leg. First you should saw away as much of the peg as possible. Then take light paring cuts with a chisel to reduce the peg so it's just a whisker proud. Then you place the back of the tool flat on the leg and pare away the last bit.

The other trick when paring is to use a slicing cut. This reduces tearing. A slicing cut is where you move the chisel both forward and sideways in the cut. It takes a little practice to master, but it's the best way to tame tricky grain and will up your carving game as well.

When paring, put your off hand on the blade to steer it in a slicing cut. Use your dominant hand to push the tool forward.

Light Chopping

The most common light-chopping operation is removing waste between your tails and pins when dovetailing. Your



A little geometry. *When wood presses against both the bevel and the back, the tool will plunge into the wood at an angle that bisects the bevel. The black arrow indicates the desired direction of travel. The red arrow indicates the direction the tool wants to go.*

Slice while paring. *It's usually best to use a slicing cut while paring. Move the chisel both forward and laterally to do this. My left hand is moving the chisel to my left.*

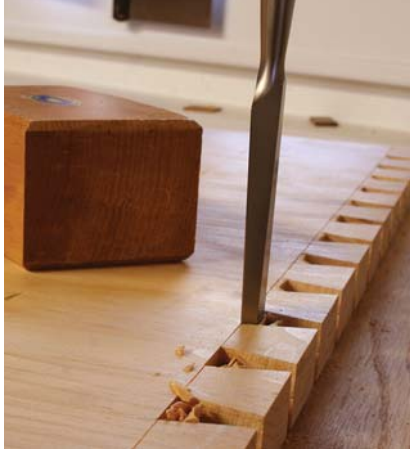
MAKE YOUR OWN BUTT CHISELS

Butt chisels can get in tight places that bench chisels cannot. But I don't own butt chisels (nor do I want to). That's because I can transform my socket bench chisels into butt chisels by removing the handle with a few taps. When I'm done, I can then tap the handle back into the socket.

This is why I don't recommend gluing your handles into your sockets. If you find a handle comes loose too easily, spray the handle's tenon with hairspray. Let it dry and knock it into the socket. That will improve the grip.

— CS

Instant butt chisel. *Removing the handle of your socket chisel gets you into most tight spaces.*



See the 90°. *If you cannot see the relationship of the back to the work, you are likely to undercut or overcut. Sit or stand so you can see this important angle when chopping.*

The rule of halves. *To avoid crossing the baseline, remove half the waste (left). Then remove half of the remaining waste. Continue this cycle until you cannot remove any waste. That's when you drop your chisel tip into your baseline (right).*

A low-angle chisel. *This low-angle chisel is great for the final chop when dovetailing. It's fussy. But some customers pay for fussy.*

off hand holds the chisel like a pencil. Your dominant hand drives the tool with a mallet.

Because you are driving straight down into the wood, the chisel will want to travel in a direction that bisects your bevel's angle. That is why many beginners cross the joint's baseline when chopping out their dovetails – they leave too much wood on the bevel side of the tool and the tool moves across the baseline, ruining the cut.

Just like with paring, the way to avoid this problem is to remove as much waste in front of the bevel as possible before you put your chisel in the baseline. One way to do this is by sawing away the majority of the waste with a fret saw or coping saw. Another method is to chisel away the waste before placing the chisel in the baseline.

When I teach students to cut dovetails, here's the scheme we follow to ensure they don't cross the baseline. When you chisel away the waste, first chop half of the waste away. If there's 1/4" of waste left, chop away 1/8". Then repeat the operation. Chop away half of the 1/8" of the waste (1/16"). Then chop away half of the 1/16". Keep going until you cannot remove half of the waste. And that's when you drop your chisel's tip into the baseline.

The other trick involves where you sit or stand when chopping (I prefer to sit). It's best to sit to the side of the chisel so you can see that the back of the chisel is 90° to the work. If you sit in any other orientation, you cannot tell if the chisel is dead vertical and you are unlikely to cut straight down.

One more thing about light chopping. Sometimes the wood will come out in chunks that are below the baseline. Usually this isn't much of a problem because it's inside the joint. In some softwoods the chunking can be so bad that it might show when the finished piece is planed up.

The solution is to use a chisel with a really low angle (usually between 20° and 25°) for the last couple chops. It's kind of a pain and requires another chisel to maintain, but that's the best way I know to avoid the problem.

Mortising

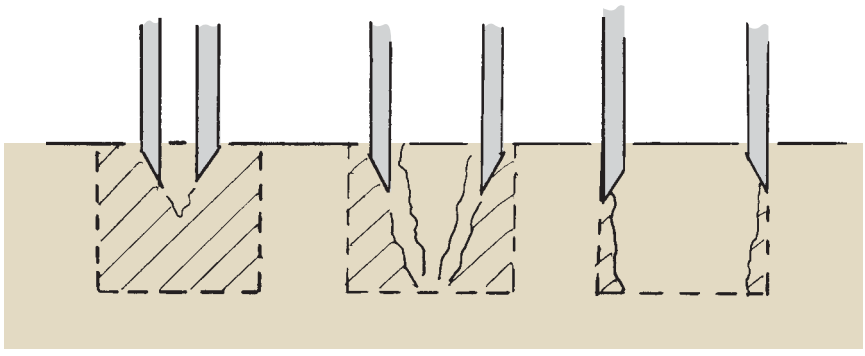
There are lots of ways to cut mortises by hand; this is my favorite method. Just like with light chopping, it's important to stand in the right place. When mortising, you don't want to stand to the side of the tool. Instead you want to stand facing the bevel of the tool. That will ensure your chisel doesn't wander left or right, making your mortise wider than intended.

Another important note: I don't recommend mortising in your vise. It's better to work on the benchtop over a leg. See the photo at right for a simple setup for mortising that works well.

I first learned to mortise using the "central V" method, which is where you drive down hard in the center of the mortise with the bevel facing you. Then turn the chisel so the bevel faces the far end of the mortise and drive down about 1/8" away from the first strike. Turn the chisel around and drive down about 1/8" from the first strike, but this time on the edge of the strike that is closest to you. The bevel of the tool should always face the ends of the mortise at this stage.

When you get to your finished depth, turn the chisel so the bevel faces the

A solid mortising setup. *This is a fairly common English way to cut mortises. Note that the side pressure from the cramp, I mean clamp, helps prevent the work from splitting during mortising.*



'Central V' is a friend to me. *Here you can see how the cut progresses with the "central V" mortising method. At left the V is first made. The cut progresses at center. Then you turn the bevel around to clean up the ends of the mortise at right.*

Chop, chop. *As with any light chopping, sneak up on your layout lines so you don't cross them. Remove all the waste in the middle before paring or chopping on the knife lines.*

mortise, and chop down gradually to get to the knife lines at the ends of the mortise.

At the end, you might have a lot of debris at the bottom of the mortise that is difficult to lever out without damaging the ends of the mortise. This is where the swan-neck chisel saves the day. Another option is to just keep chopping until the mortise is deeper and the debris is not in the way of the tenon.

Hinge Mortise

The other common type of mortising is actually light chopping: making a hinge mortise. The trick to accuracy is to remove as much waste as possible in front of the bevel before chopping out the layout lines that define the extant of the hinge leaf. First break up the surface of the mortise with light chops. Remove that layer of waste with a router plane.

Then sneak up on the layout lines using the same method as for dovetailing (take half the waste until you cannot take half of the waste). Be careful when you are chiseling parallel to the grain. Chopping here might split the work. I'll usually use hand pressure to pare away the section of the mortise that is parallel to the grain.

The Most Important Trick

Whenever you are having trouble with your chisels, stop and sharpen them. That fixes about 90 percent of problems. It also gives you a few minutes to clear your head and perhaps think of a better solution to the trouble you are having.

I never allow my chisels to come anywhere near dull. And this strategy ensures my problems will only be with my chiseling technique. It also allows me to forget about my tools' edge retention properties. They never see dull, and I never want for a chisel that costs as much as a table saw. **PWM**

Christopher is the editor at Lost Art Press and the author of the forthcoming book "Roman Workbenches."

MALLETS: ROUND, SQUARE & METAL

Mallets are objects as personal as your knife. And working with someone else's mallet feels like wearing their underwear: very weird.

The three most common choices are wooden mallets (both round- and square-headed) and metal ones. Square-head wooden mallets come in two common sizes: about 11 ounce or 16 ounce. They are inexpensive and easy to make, but (in my opinion) a bit bulky.

My favorite chisel mallet is a 16-ounce round mallet that is infused with resin so it's tough and compact. The only downside to these resin-infused mallets is they are expensive.

Japanese and some English joiners use metal mallets; I use one for mortising that is about 2 1/2 pounds. The weight of the head does the work and it doesn't destroy the handle (promise).

My best advice on mallets is not to take anyone's advice. Try some out for yourself at a woodworking store or show. The answer is in your fingers.

— CS

Common mallets. *Most woodworkers prefer round, square or metal mallets (which can be round or square). This is 100-percent personal preference.*

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/apr17**

BLOG: *Learn a different way to mortise by hand.*

BLOG: *Read about rehandling a mortise chisel.*

TO BUY: *"The Perfect Edge" video by Ron Hock.*

IN OUR STORE: *"Using the Versatile Chisel with Jeff Miller" video.*

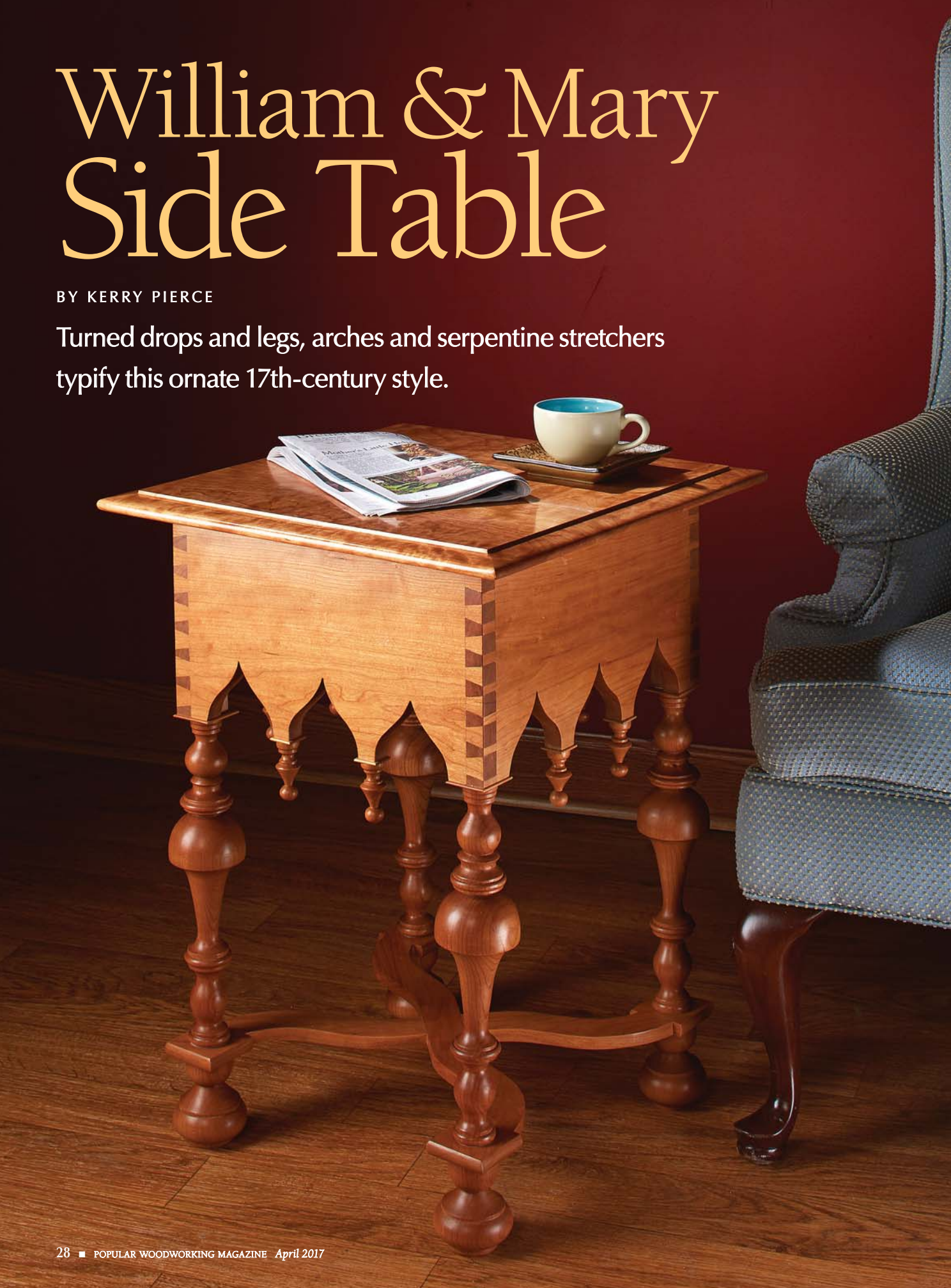
Our products are available online at:

- **ShopWoodworking.com**

William & Mary Side Table

BY KERRY PIERCE

Turned drops and legs, arches and serpentine stretchers typify this ornate 17th-century style.



When someone uses the term "period furniture," we think most often of the Queen Anne, Chippendale and Federal genres. Certainly these have been the most influential styles in Western furniture-making history. But there have been other periods worthy of our attention, among them the William & Mary period, named for the English monarchs of the late 17th century. This is a genre I've long admired. Unfortunately no one had ever before asked me to build in this style, so when my wife asked for a small table on which she could rest her coffee cup beside her bird-watching chair, I decided to indulge myself.

The design of my wife's table incorporates several William & Mary motifs: the serpentine X stretcher, the Gothic arches on the apron, the turned drops at the bases of the arches and, of course, the bold leg turnings, incorporating both the "cup and trumpet" and the bun foot features.

Drawings & Story Sticks

I begin the construction of any piece of furniture by creating measured drawings to guide me through the construction process (presented here in 1/4 scale). Then, based on those drawings, I make my patterns and story sticks. This particular table requires three story sticks: one for the legs, another for the feet, the last for the drops. It also requires a pattern for the Gothic arches of the aprons and a pattern for the X stretchers.

In addition, I made two simple measuring implements: one for the legs and one for the feet. These are necessary because it isn't possible to lay a story stick or a rule on a "bold" turning and produce accurate results – the peaks and valleys of the turning make it impossible to lay the story stick flat on the work. And, while the heights of intermediate turned elements can vary from leg to leg or foot to foot, it is critical that the overall length of these parts be absolutely consistent from one to another.

I don't keep pattern material in my shop. Instead, I use whatever odd pieces of wood that will serve, so for this table my story sticks are hardwood offcuts; my patterns, two pieces of 1/4" plywood; and my measuring gauges, are two pieces of 3/4" pine.

At the Lathe

The most eye-catching feature of William & Mary furniture is the use of bold turnings. The word "bold" doesn't refer to a quality the turner brings to the process (if it did, I would be disqualified). Instead it refers to turnings in which there is a considerable difference between the greatest and least diameters. For example, the upside-down "cup" above the "trumpet" has a diameter of 3", while other parts of the leg turnings have diameters as narrow as 3/4".

Begin the turning process by establishing an order for the steps you will take to produce these parts. In the case of the legs, I first turned my 3 1/8" square turning stock into a 3" cylinder with a roughing gouge.

I then marked the bottom of the cup (the point of greatest diameter). Next, I reduced the length below that mark to 1 3/4", the greatest diameter of any element in that section, and I reduced the diameter above the cup to 2", the greatest diameter in that section – keeping in mind, of course, the tapering shape of the cup above the mark.

After estimating the placement of the tenon shoulders with the story stick, I used my length gauge to nail down the overall distance between tenon shoulders. With a parting tool, I cut a trench on the outside of both marks to a diameter of 1". This is twice the diameter of the finished tenons, but it's enough to establish the limits of the visible parts of the leg, and leaves more meat to support the piece during the next steps.

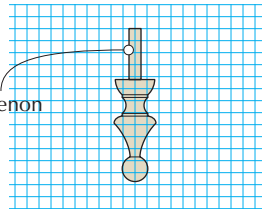
I then cut the various beads, coves, vases and fillets. I formed the beads with the tip of my 1/2" skew, the coves with my 1/4" gouge (its bevel snugged up against the work) and the fillets with an upside-down chisel. Before sanding each piece, I reduced the tenons to their

Story stick. *Locate the position of the leg's greatest diameter, leaving sufficient material north and south. Note the row of calipers on the wall, each set to one of my final turning dimensions; I leave them set until I'm done turning all like parts for a project so that I can quickly and easily check the diameters.*

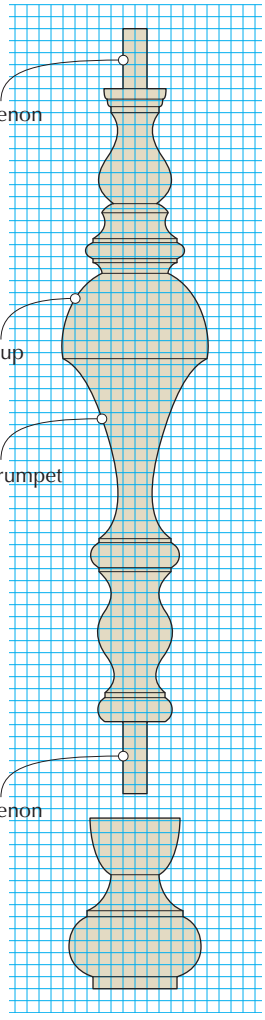
Location, location. *After you've reduced the diameter of the top and bottom of the leg blank, use the story stick to mark the shoulders at the top and bottom of the leg. Then nail down those locations with your length gauge. Note that I allowed a tiny bit of extra length between the shoulders to remove when the turning was done.*

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY DAN PESSELL FROM THE AUTHOR'S DRAWINGS

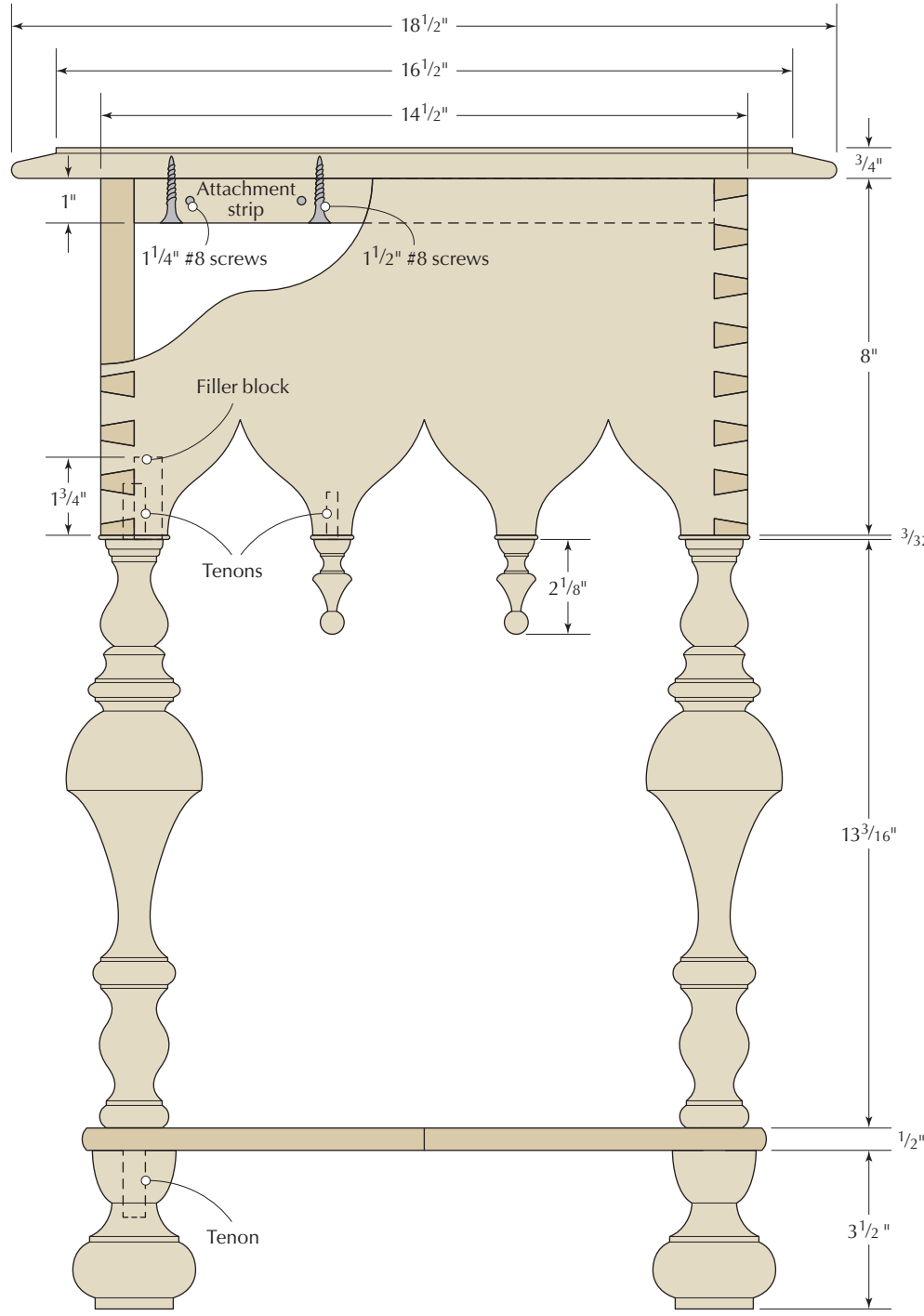
Turn, turn, turn. *I turn beads and any bead-like forms (the cup above the trumpet, in this case) by rolling the tip of a 1/2" skew over the side of the bead. (You can also use a gouge.) For cove-like shapes, such as at the top of the bottom vase here, I use a 1/4" gouge, keeping the bevel on the work.*



DROP PATTERN
One square = 1/4"



LEG & FOOT PATTERN
One square = 1/4"



ELEVATION

***Legs & drops**. Although to the naked eye the turnings on this table appear to be nearly identical, actual measurement would reveal considerable variation.*

William & Mary Side Table

NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Top	3/4	18 1/2	18 1/2	Cherry
❑ 4	Aprons	3/4	8*	14 1/2*	Cherry
❑ 4	Legs	3 dia.		15 7/8**	Cherry
❑ 4	Feet	2 3/4 dia.		3 1/2	Cherry
❑ 2	Stretchers	1/2	4 1/4	22 1/4	Cherry
❑ 8	Drops	1 dia.		3 1/4†	Cherry
❑ 4	Corner cock beads	3/32	1 3/4	1 3/4	Cherry
❑ 8	Drop cock beads	3/32	1	1	Cherry
❑ 4	Filler blocks	5/8	5/8	1 3/4	Hardwood
❑ 2	Attachment strips	1	1	12 3/4	Hardwood

*I cut dovetails proud & plane flush after assembly; add 1/32" on each end if you follow my approach; **Tenon both ends; †Tenon one end.

1/2"-diameter finished size.

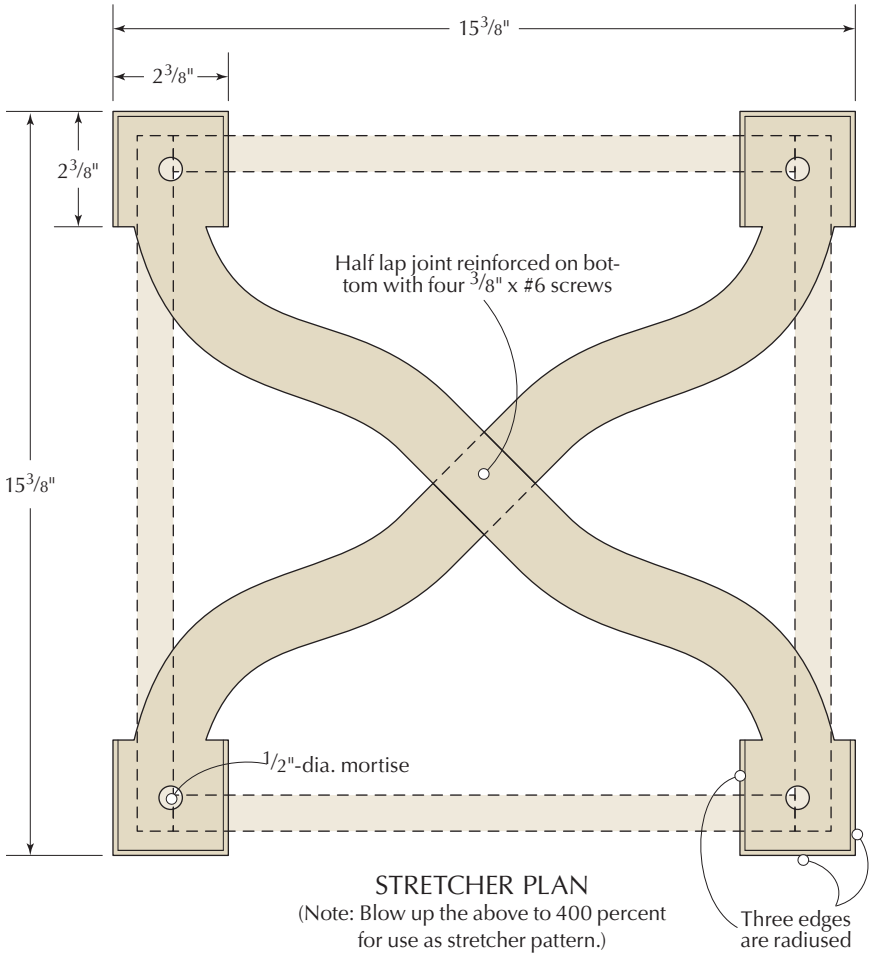
The feet and drops were created in the same way: I established the greatest diameters with my roughing gouge, then articulated the details with a skew, gouge and chisel.

Dovetailed Aprons

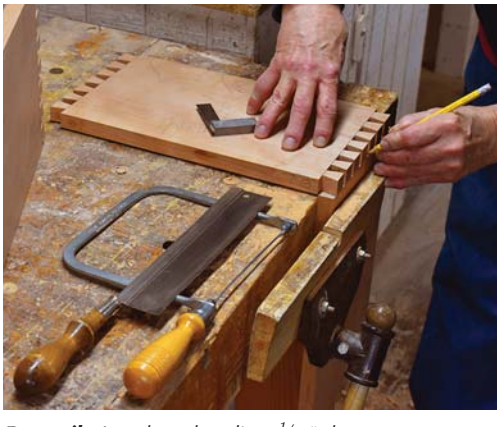
As much as possible, I've removed machine tools from the fussy work of cutting joints. I've done this because I've grown to love those quiet times at the bench when I'm cutting joinery by hand. For this reason (and because I'm not smart enough to figure out how to use a router dovetail jig), I cut the dovetails on the apron by hand.

Because of the fittings hand-cut dovetails require and the stress those fittings can impart to the components, it's important to cut the joinery before sawing out the arch shapes at the bottom of each apron section.

My dovetailing process is simple. I saw out the tails, which defines the sides of each one with a backsaw, remove the bulk of the waste with a coping saw and, finally, clean up the bottom of each pin space with a paring chisel powered by a mallet. I then clamp the pin stock in my vise, lay the dovetails on the edge of the pin stock and mark those pins with a pencil. After squaring vertical lines on the pin stock, I saw

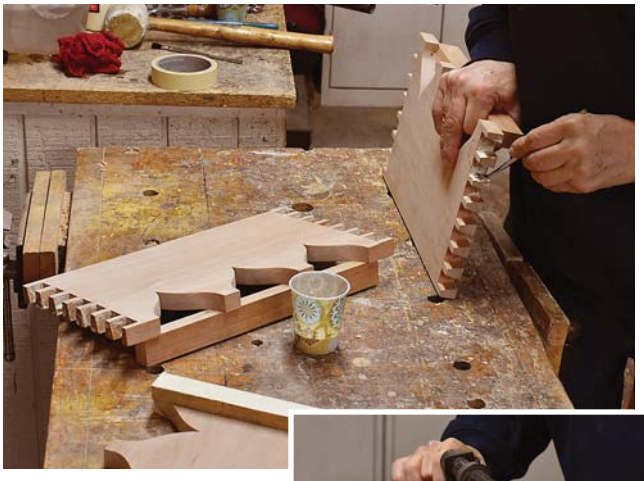


STRETCHER PLAN
(Note: Blow up the above to 400 percent for use as stretcher pattern.)

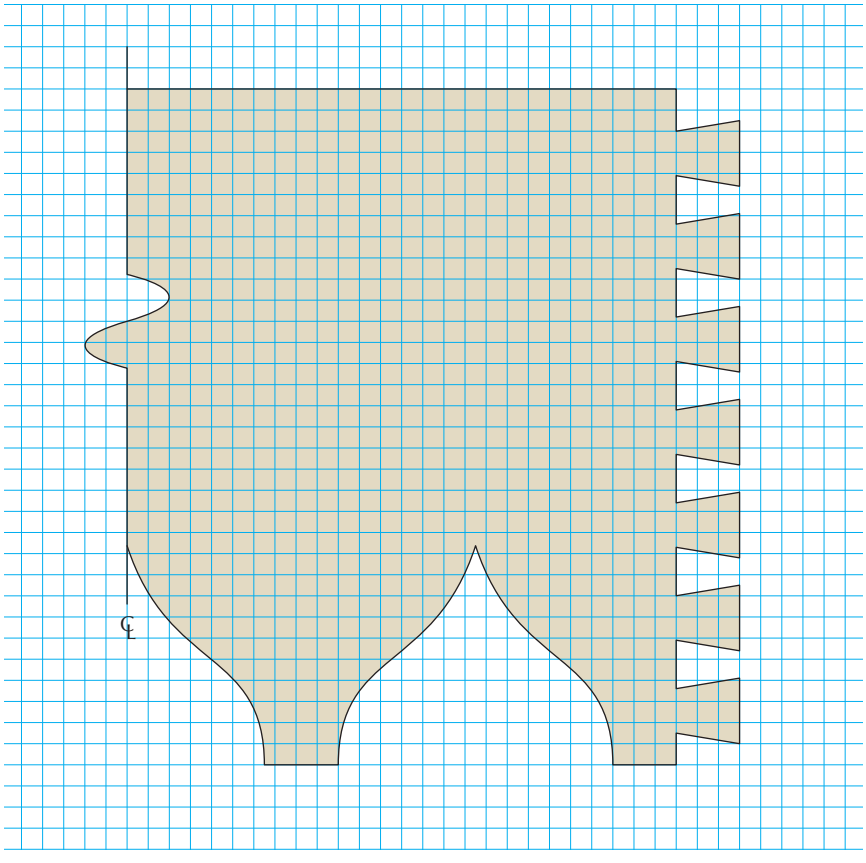


***Dovetails.** I mark my baselines 1/32" deeper than the stock thickness (and cut tails-first).*

Arch support. *Grain runout in the Gothic arches makes them susceptible to breaking under clamp pressure during glue-up. To reduce the risk, screw a caul to the inside faces of pin stock as shown here. (The screw holes won't be visible on the finished table.)*



On the case. *Glue is both cheap and incredibly strong; apply it to all mating surfaces. Gently tap the tails to start them in their positions, then seat them with slow pressure from a clamp over cauls.*



APRON ARCH PATTERN
One square = 1/4"

Flushed. *Level the surplus length of the pins (if, like me, you choose that approach), and clean up the case.*

them out just as I did the tails.

After fitting the joints, cut the arches on the aprons, then fair and smooth the curves.

Glue up the case and check its squareness by measuring diagonals (adjust as necessary). Position filler blocks flush with the leg locations (you can see one in the "Clamping cauls" photo on page 35), then set the case aside to dry overnight.

Serpentine Stretchers

Plane your stretcher material to a thickness of 1/2", then square two lines across

"Det er de små unøjagtigheder der kendetegner det gode håndværk." ("It's the small inaccuracies that characterize the good trade.")

—*Danish saying*

that material 1½" apart. Place your stretcher pattern so the limits of its central square align with those squared lines in a position that allows the entire stretcher component to be drawn on that material.

Before you cut out that shape, excavate a dado between the squared lines that is a depth half the thickness of your material, in this case ¼".

Saw out the shape of the first stretcher component, then use it and the stretcher pattern to establish in your mind on which side of the second stretcher component you'll cut the matching dado for the lap joint.

Remember that the right and left sides of the finished stretcher assembly must be mirror images – the placement of this second dado determines whether or not you achieve that bilateral symmetry. Cut the dado on the wrong side and you'll end up with a strange-looking stretcher assembly – you know, like I did my first time out.

This next step is optional. I applied a gentle radius to the squared ends of the stretcher components simply because I liked the way it looked. If you choose this option, begin by establishing three lines on the edges at the end of each stretcher. You could create these lines by measuring, but I chose to eyeball their placement using my finger as a fence to locate the pencil point.

The first line should be drawn in the middle of the end's thickness, leaving ¼" of thickness above and below the lines. The two remaining lines are drawn on the top and bottom surfaces of the ends, approximately ⅛" from the edges.

Using a block plane or rasp, create rounded surfaces connecting the lines on the top and bottom with that line in the middle of the component's thickness.

The final step in preparing the stretcher components is to bore ½"

Stretcher layout. *Square two lines 1½" apart across your stretcher stock. Place the pattern on the stock in a position that aligns the limits of the lap joint with the two squared lines on the stock, then trace the pattern.*

Lap joint. *I use my radial arm saw to cut the waste from the lap joint to a depth of ¼" (half the thickness of the stretcher stock).*

Cut the curves. *I use a band saw to cut out the stretchers, then fair and smooth the curves by hand.*

Square or eased? *On some 17th-century pieces, the edges of X stretchers are simply squared. On others, the edges of the entire lengths of the stretcher components are radiused. The edges of my stretchers manifest a compromise; only the three sides of the square through which the legs pass are radiused. I like the look.*

Radii. *I drew lines freehand to guide my block plane and rasp as I shaped the ends of the stretchers.*

Ready to glue. *With the holes bored and the lap fit, apply a little glue to the joint and assemble. Then reinforce the joint from the underside with countersunk 3/8" screws.*

holes in the squared ends of both stretcher components, through which the feet are secured into the legs. The placement of these mortises is critical, so be sure that each is centered in the squared end. (The easiest way to find those centers is to draw a pair of diagonals across the squared ends. The center will be located where these diagonals intersect.)

Apply a bit of glue, assemble the lap joint, then reinforce the joint with a few countersunk 3/8" wood screws on the underside.

Add Some Cock Beading

There is a 3/32"-thick cock bead tile at the base of each of the Gothic arches. Those at the corners are 1 3/4" square; the intermediate tiles are 1" square.

Rip your stock to width, then plane it to thickness before cutting the tiles to final size.

Ease all four edges of each tile to a gentle radius and finish-sand before gluing each tile in place.

Then drill 1/2"-diameter holes for the leg tenons and 1/4"-diameter holes for the drop tenons using Forstner bits at the drill press. While the 1/2" bit is in your drill press, bore the leg mortises centered in the feet.

At this point, you're ready to put things together. I recommend a dry assembly to ensure that everything is just the way you want it. When you're satisfied with your work, apply glue to all the mortises and tenons and assemble the table's undercarriage.

I glued up the 3/4"-thick x 18 1/2"-square top from three pieces, then moulded the edge using a combination of rabbets cut at the table saw and handplanes.

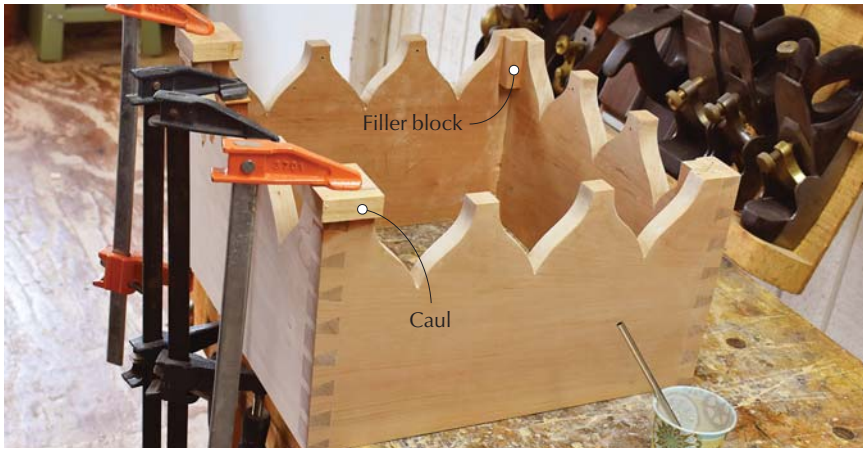
The same look can be achieved solely with handplanes, or with a router or shaper; use the approach that fits your tools and skills.

I screwed 1" x 1" strips of hardwood through clearance holes to the underside of the top to position and attach

Safe machining. *After you've ripped the cock bead stock to the finished width, attach the bead stock to thicker stock (a sled) with double-sided tape, then run that through your planer. (Or use a different method for thicknessing.)*

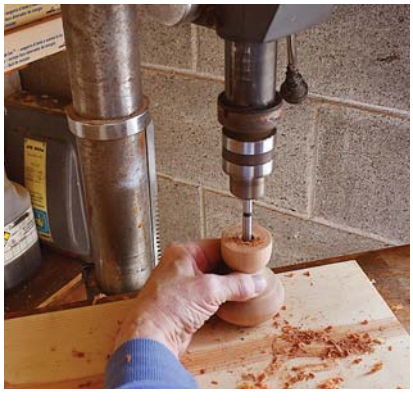
Leave it on the sled. *It would be unsafe to use a radial arm saw (or miter saw) to cut the thin cock bead tiles to length – but leave the 3/32" stock attached to the sacrificial planing sled and it's OK.*

Grit work. *I used spray adhesive to affix small pieces of sandpaper in grit progression to a piece of scrap, then eased the edges of each tile to a pleasing radius.*



Clamping cauls. *Add a drop of glue, then carefully position and clamp each cock bead tile centered on its leg or arch location. Because of the width of the corner tiles, it's necessary to apply pressure indirectly through the use of a caul slightly larger than the tile.*

Round mortises. *Use a 1/2" Forstner bit to drill mortises for the tenons atop the legs, and a 1/4" Forstner bit for the tenons atop the turned drops.*



Pierced buns. *The tenons on the bottom of each leg pass through the holes in the stretchers, and into 1/2" mortises in the feet. These can be drilled while holding the foot in your hand. A Forstner bit imparts very little torque to the part being drilled. (I would never do this with a twist drill.)*

Use the force. *Although it isn't necessary to leave the clamps on the legs while the glue dries (in fact, doing so can result in deformation of the table's undercarriage), it's better to pull parts together with a clamp than it is to bang it with a mallet because the force imparted by the mallet is explosive and therefore much more likely to result in cracked components.*

Sloped rabbets. *My moulding method is to cut a rabbet by first making four 3/32"-deep cuts 1" from the edges, then raise my table saw blade to 1" and adjusting the angle slightly to cut sloped rabbets. Notice that I'm standing not at the back of the table as you ordinarily would, but at the side of the table opposite the fence. This position not only keeps me out of the zone in which kicked-back strips can be rocketed toward the user, it also gives me better control of the panel during its passage along the blade.*

Fair the edges. *After cleaning up the sawn edges with a wide shoulder plane, I use the same three-line method from the stretcher ends to cut a roundover on the edge of the top.*

it to the table base (see the pictures below), but you could use wooden buttons or commercial tabletop fasteners if you prefer.

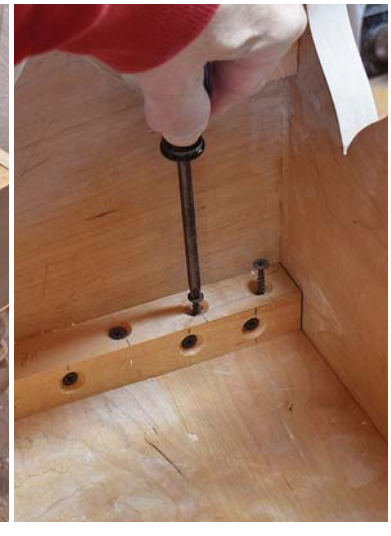
Finish as desired. (I used a matte polyurethane on the base and a gloss polyurethane on the top.)

Bedazzling Consistency

We live in an era of woodworking machinery capable of fabricating parts of incredible consistency – but that approach to woodworking is the antithesis of what takes place in my shop. Much of what I do is eyeballed rather than measured. This means there is variation in diameters between one leg and another, between the placement of coves and beads along the lengths of the leg, between the angles and widths of my dovetails, and in the widths of the two stretcher components.

I don't deliberately create these inconsistencies; they are simply the result of the way I choose to work. When someone looks at a piece of my furniture, I want them to know that a human hand and a human eye were deeply involved in the fabrication. **PWM**

Kerry has been a furniture maker and teacher for 50 years and is the author of many books, most focusing on Shaker furniture and hand-tool use.



Get attached. *I used 1 1/2" #8 screws to attach two strips of 1" x 1" hardwood on opposing sides at the top of the aprons. After centering the tabletop on the base, I screwed the strips to the bottom of the top through clearance holes to secure it in place while allowing for seasonal movement. Note that the grain direction of the top is perpendicular to the length of the attachment strips.*

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Make Your Own PLYWOOD

BY JAMEEL ABRAHAM

The title of this article may sound silly, or perhaps us woodworkers have just run out of things to write about? Now that is silly. But why on earth would anyone want to make plywood? It's almost as ridiculous as saying, "Honey, pick up a quart of aliphatic resins at the supermarket. I ran out of wood glue last night." You don't make plywood, you buy plywood, right? No one but a caveman would build anything out of BC plywood. Or would they?

Enjoy your sandwich. *Can you count the layers in the image above? From top to bottom: sunburst veneer of maple and beech, 1/16" cherry, quartered mahogany core, 1/16" cherry, 1/8" white pine. At left, see how shop-made ply creates unique project possibilities.*

PHOTOS BY THE AUTHOR

Stock prep. *These quartered boards of mahogany are a perfect material for your core. If you can get all your boards from one plank of wood, all the better.*

I want to squeeze. *Basic panel glue-up here. No rocket science involved.*

The Why

Plywood: What do you picture? A 4x8 piece of laminated who-knows-what filled with tan putty and football-shaped dutchmen that you would only use for cheap shop furniture or college bookshelves.

First off, forget about the 4x8 thing. You're not mass producing this stuff – you're making up pieces just slightly oversized. Say you need a cabinet door, 18" x 24". You make a piece of plywood that's 19"x 25". Done. You're basically making what you need, when you need it.

And here's why you want to make your own plywood. Not for a quick set of cabinets, not for edge-banded bookshelves for the guest room. You're making plywood for real, lasting furniture from wood that you select. That unique project that demands something special – and that special something is called veneer. Yes, you can veneer to solid wood, but don't expect it to stay stuck for very long. Wood movement will wreak havoc with it. The trick, ironically, is to actually use veneer to immobilize the wood.

Lumber Core

My favorite type of plywood is called "lumber core." You're probably picturing plywood as an odd number of equal-thickness layers of veneer. The vast majority of plywood falls into this category. But here's why it's not the greatest for most furniture making: When working with typical plywood, attaching hardware (especially to the edges of the panel) can be problematic. Because in typical plywood you have equal thicknesses of plys, you're presented with narrow bands of long grain in between rows of end grain, making the screw-holding properties of the plywood iffy. With a lumber-core panel, you can treat the entire panel as solid wood, attaching hardware in the same manner as you would with solid wood.

A lumber-core panel, like any plywood, is made from an odd number of layers. This serves the purpose of balancing the layers. Balancing means that the grain in the two outermost layers of a panel are always running parallel with each other, but perpendicular with the layer they are glued to. This keeps the panel flat. It doesn't matter if there are three layers or 301, each layer is glued at 90° to the layer beneath it, and opposing layers are always parallel. You can't screw this up as long as you orient each layer at 90° to the previous.

To maximize the solid-wood effect of lumber core plywood, it's important to make the central core thick. If your goal is a $^{3}/_{4}$"-thick panel (and that number is arbitrary – you can make whatever thickness you like), then your central core should not be less than $^{7}/_{16}$". This leaves you some room for varying thicknesses of the outer layers.

Core smoothing. *A light pass with a jointer plane makes the core nice and flat after coming out of the clamps. Don't get overeager here. You're just getting rid of slight misalignments. The final pass should be a light traversing. This leaves a toothy surface your glue will love.*

The core material is important. You'll want to select the best quality material you can find. I like to use mahogany, but any stable wood is acceptable. Mahogany has a fine texture, and it is stiff and light. These attributes make for a wonderfully lightweight but strong panel. Here's the other important thing: This central core should be made from the most quartersawn wood you can find. Riftsawn is OK, but try your best to get those growth rings dead perpendicular to the faces. I usually have to select narrower boards to get the most quarter across the full width of the board, then glue these up until I get the width I need. This is typical edge-joining work. Easy stuff.

Once the core is glued up, you'll need to surface the faces by hand (often the case due to the width) or run the panel lightly through either a surface planer or sander. You don't want any raised ridges on the joint lines or plane tracks that might telegraph through your veneer.

Remember, you're building this panel oversize, so don't get too finicky on dimensions just yet. Just make sure it's bigger than it needs to be.

Once the core is ready, you can begin preparing your next two outer layers. Orient the grain perpendicular to the grain in the core. I like to use thick-sliced commercial veneer, and 1/16" veneer is readily available in many species (I tend to buy from Certainly Wood). The thicker dimension makes it a bit easier to work with. Jointing veneer might seem like a tricky proposition, but it's actually quite easy. My favorite way is to use a couple offcuts of hardwood, about 3/4" thick, then place the veneer in between these boards, making sure the veneer is right at the edge of the board, then pass the whole sandwich over a jointer, or clamp the whole works in a face vise and have at it with a jointer plane. Because the thin veneer is held tightly between the sacrificial boards, it planes exactly like a thick piece of solid wood. You can get perfect edge joints in veneer with this method, and it's quick and easy.

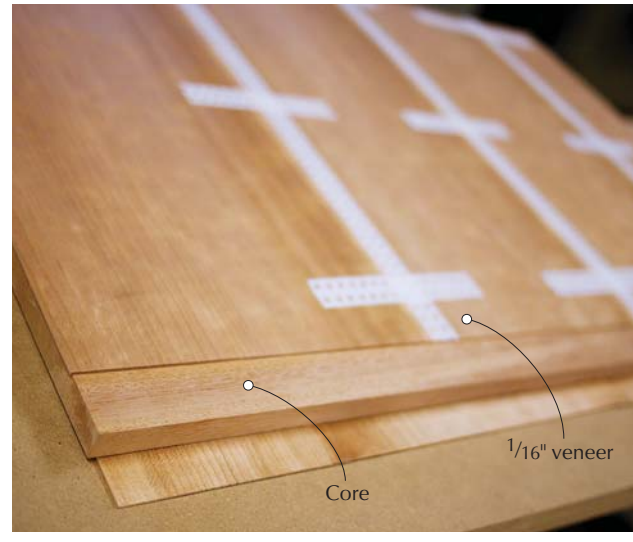
To join the veneer, first tape the pieces together on the backside with blue painter's tape, pulling the tape tight across the joint (the tape will stretch slightly before breaking) every 3" or so. Now flip the veneers over and repeat the process with water-activated veneer tape, adding a single strip of tape down the joint.

The water-activated veneer tape is important. It shrinks as it dries, drawing the joint tightly together. It also removes easily after coming out of the press with the wipe of a damp rag and a little scraping action. Blue tape is a real bear to remove after coming out of the press.

Once the veneer tape is on, flip the piece over and remove the blue tape. Make two pieces like this, one for each side of the core. These pieces should be just about the same size as the core, but never bigger. You don't want thin, overhanging edges to get damaged in the press.

The outer layers can now be glued to the core using your preferred method. I use a vacuum-bag system, but you can get excellent results with dirt-simple curved cauls and clamps. If you don't mind tying up your bench for a few hours, you could use several go-bars and a big caul (3/4" MDF is great) to

Thick & rich. *This is 1/16"-sliced veneer – awesome stuff for lumber-core panels. This happens to be cherry, but any wood will work.*



Layered up. *Here I've joined the edges of the 1/16" veneer with perforated veneer tape. Note that the grain direction in the core is perpendicular to the outer layers.*

"Reality is plywood and plastic, done up in mud brown and olive drab."

—George R.R. Martin (1948-), American author

Apply the glue. *I like to spread the Unibond with a disposable roller. Make sure it's a nice, wet coat with no dry areas.*

Make the sandwich. *With the core ingredients prepared and the dressing applied, you can set the outer layers in place.*

Press it real good. *Into the bag the panel goes, along with two MDF cauls to even the pressure. I let it sit overnight. If you use Unibond, smear some inside a Ziploc bag, seal it up and use that to determine when it's cured. It should crack like burnt cheese on the edge of pizza when it's cured. Mmm, pizza.*

Joining thick veneers. *Here I'm using ye olde technique of candling to check my joint.*

exert enormous pressure on the panel. But back to the vacuum-bag system. You don't need a high-dollar electric pump system to get the benefits of squishing wood under atmospheric pressure. Do an internet search for "skateboard veneer press" and you'll find a company called Roarockit that makes manual veneer presses. Here's the thing with using a vacuum to make plywood: Atmospheric pressure exerts a fixed amount of force (unless you go to the top of a mountain where the air is thin). That plastic sack is pushing on your veneer the same whether you suck out the air with a fancy electric pump or an inexpensive plastic pump that you operate by hand. Your bike tire doesn't know if it's holding 50 pounds of air from the gas-station compressor or from the foot pump you've had in the garage since 1986.

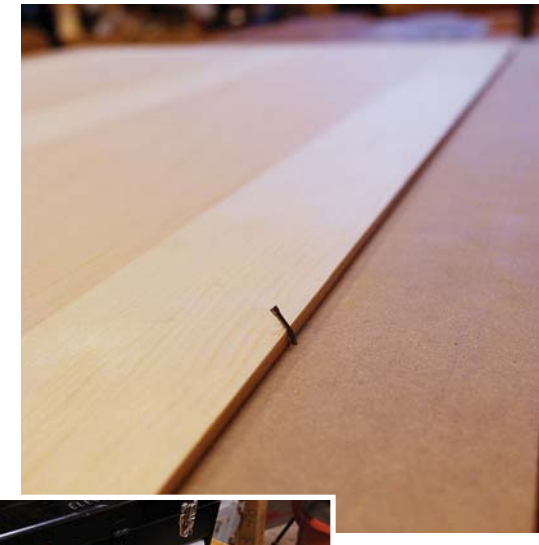
Glues

This subject is open to some debate. The traditional choice is hide glue, and if you're experienced with using hot hide in veneering applications, I don't see a reason you can't use it to make your own plywood. You don't need any fancy tools, and we all know the holding capability of hot hide glue. My favorite, however, is Unibond 800. It cures hard and is very much like hot hide in its cured state. It is, however, chemical-based, and you may not feel comfortable using it. To each his own. Epoxy is also an option, but it is quite messy and will likely ruin your bag or press if you're not careful about squeeze-out. The Unibond stays put and doesn't squeeze out like epoxy. Yellow glue can also be used. I don't recommend contact cement. It's good for Formica, but not so useful for fine furniture.

After the Press

When your panel is cured and out of the press, you can treat it just like solid wood, except for planing the surface (more on that in a bit). If you wish to add more layers of veneer, it will add to the rigidity and stability of the panel. To

Batten up. *A 1/2"-thick batten raises up the pieces just enough to exert the perfect amount of pressure at the joint of these thin boards.*



Nail clamps of yore. *Another olde way of doing things. (Read the text for details – you didn't think I'd reveal all in the captions now, did you?)*

Sit on it. *A weight keeps it all from misbehaving while the glue cures.*

keep things manageable, I don't usually glue more than two layers on at a time.

If I want my outer veneers to be made of thicker material, to allow some extra meat for dressing the stock after glue up, here's what I do. On the chest lid shown on the first page, I wanted the show side to be made from the same material as the rest of the chest: white pine. This allowed me to treat the show surface just like the rest of the chest, meaning I could handplane the surface more aggressively, even to the point of inducing plane tracks if I so desired. This would be risky in thinner veneer and wouldn't allow for much error or prevent tear-out. By using a full 1/8"-thick veneer layer, I can handplane the surface without worry and reap the benefits of the cross-grain construction of lumber-core plywood. The thicker stuff also finishes like solid wood. See, I told you this stuff was great!

With the thicker veneers, I don't use veneer tape to join the edges. Because the wood is thicker, the edges themselves also need to be glued. I use an old luthier's technique to do this: I joint the edges on a shooting board, because the wood is so thin. I simply block up the veneers off my workbench surface so they are presented to the blade of my jointer plane, which I run on its side on the benchtop as I plane the edges of the veneers. To check the quality of the joint, I hold both pieces up to a strong light to check for leaks. This is called "candling."

To clamp these thin veneers, I slip a 1/2"-thick batten under the joint, then drive small nails right into my workbench (or a scrap of MDF if you're sensitive about your benchtop) at the edges of the veneers. Apply glue to the joint, remove the batten, then press the joint flat to the benchtop. A piece of wax paper under the joint keeps the assembly from getting glued to the bench. Press the joint flat and feel that the glue line is flush. Now place a heavy weight on the panel and let it cure. That's it. The nails keep enough pressure on the joint while the glue cures, and the heavy weight keeps it from popping up under the tension of the nails.

When you think about it, making a plywood panel is really only one more step beyond a panel of edge-glued boards. And the result is a dead-flat and stable board that you can work just like solid wood. Once you add this technique to your woodworking arsenal, you'll realize you can make shapes and forms that solid wood just can't handle. **PWM**

Jameel is a toolmaker, artist and woodworker, and co-owner of Benchcrafted (benchcrafted.com).

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Faux Urushi

BY DONALD C. WILLIAMS

Poison sumac for a perfect finish? A quick epoxy fake-out spares the itch.

Within the ongoing renaissance of fine furniture making, I find myself an enthusiastic evangelist and ardent agitator for the full appreciation of decorative surfaces in most iterations, especially finishing. To many skilled furniture makers, I'm that weird woodworker who sees finishing not as something to be endured or avoided, but rather to be anticipated and savored as a delightful opportunity for expressing skilled craftsmanship and artistry.

Yup, I'm the guy who thinks making things is mostly the necessary preamble to the more desirable task of making the surfaces sing in four-part harmony at the finishing bench.

For most artisans aware of the rich history of traditional finishing, that sublime space of "the perfect finish" is occupied by the exquisite hand-rubbed or pad-polished transparent spirit varnish known commonly as French polish.

In that assertion they would be one-third correct, as a padded spirit varnish is but one of the trinity in the pantheon of sublime historic decorative finishes.

And as it happens, the remaining two finishes are interconnected in that the penultimate decorative surface, "japanning," is in fact a Western derivative of the ultimate high-performance decorative finish representing the highest expression of the art – namely oriental lacquerwork or "urushi" (ur-OO-she).

The 'Perfect Finish'

The ancient art of urushi is perhaps the highest-performing coating known to man, and technical literature from the modern coatings industry is sprinkled with articles discussing the quest to synthesize a replicate of the natural material's remarkable characteristics.

Once again, nature holds the ace card with a coating material resulting from purifying and refining sap from the urushi tree, *Toxicodendron vernicifluum* (formerly *Rhus verniciflua*), a cultivar of the poison sumac tree. The resin in true lacquer, urushiol, is the same toxic chemical that makes poison ivy and poison oak, well, poison, and which also occupies the underside of a

PHOTOS BY THE AUTHOR

mango's skin. Who knew? (As one of my daughters learned recently, it is really important to peel a mango before eating; otherwise the unfortunate result is something probably akin to getting your lips sandblasted.)

But what a spectacular surface urushi is, with unparalleled beauty and a durability quite literally unknown in most modern artistic coatings. Short of degradation resulting from truly extreme exposure to ultraviolet light (sunlight), the only way I know to damage a healthy lacquered surface is to pour boiling nitric acid on it. Now that is what I call "high performance."

Like many furniture coatings in general use, urushi lacquer is used as both a transparent varnish and, with the addition of pigments, as a paint. However, unlike many of the coatings we use, urushi has a syrupy consistency and is applied with brushes designed and fabricated to work more like trowels than the artists' brushes we typically employ for much thinner spirit or oleoresinous materials such as shellac and oil varnish.

Urushi is a reactive coating, undergoing an enzymatic polymerization under the very specific conditions of a warm and moist environment. Most lacquer shops have specially constructed curing chambers in which the temperature and humidity can be modified, and where the varnished or painted objects are placed to harden. The full urushi cure takes a few days, during which time the pieces must be flipped or rotated occasionally to prevent sags and drips in the thick coating. A completed urushi surface takes many applications, sometimes dozens or even hundreds of layers, each painstakingly applied and polished by hand. It requires months or years to complete the entire process.

If this doesn't sound like "the perfect finish," I won't quarrel with you. Yet the beauty, craftsmanship and durability of the surface inherent in lacquerwork has been a siren song for me going back many decades.

Several years ago I embarked on a quest to find a suitable alternative to this art form. While I have not yet identified the perfect substitute and will continue my explorations, I am at a point where I can move forward, refining my skills and aesthetic sense by creating beautiful objects in the milieu of oriental lacquerwork with what I call "faux urushi." Epoxy may not be the perfect analog to urushi, but it was close enough for me to test my hypothesis about making faux urushi objects.

Simple & elegant. *As with many art forms, for urushi there is great elegance in simplicity. Even a simple box made on the table saw or a small box from a craft supplier make excellent substrates.*

There are notable examples of urushi lacquerwork being employed as a transparent finish, but the predominant use for it is as an opaque pigmented coating, sometimes applied in layers with different colorations for further artistic expression. This is my primary focus here, where I demonstrate a classic "rubbed through" lacquer surface. As I continue to explore new artistic expressions along this line, I will blog about them in detail on my website, donsbarn.com.

The Substrate

While most genuine urushi lacquerwork has a wood base, that need not be the exclusive case. Multitudes of remarkable lacquered objects feature fabric, paper or woven vegetable fiber as a base. Art Deco artists such as Jean Dunand and Eileen Grey have even applied polychrome urushi lacquer to metal creations.

For this project I used a simple hexagonal wooden box of balsa wood.

You can make your own simple boxes from pine, tulip poplar, paulownia or any other generally even-grained wood, cutting the pieces on the table saw and gluing them together with hide glue or PVA. As in many historical lacquered pieces, the joinery is perfunctory at best, relying on the encasing lacquer to serve as an exoskeleton to hold everything together. After the glue sets and a quick sand with #80-grit sandpaper to remove any bumps, the surface is ready for a seal coat of basic epoxy, thinned about 10 percent with acetone for deep penetration, using a disposable brush. Throughout this exercise, for all but the final clear coats, I used West System Epoxy, Resin 105 with 206 Slow Hardener (it's what I had on the shelf). After the seal coat hardened, I gave it another brisk sanding to remove any pebbles.

Cover the surface. *With slightly thinned epoxy, saturate the surface to get complete penetration of the seal coat. Come back in a half-hour or so to brush out any runs.*

Sealed & ready. *The box has been sealed and sanded, and is ready for me to begin laying the foundation.*

Cut the bias. *The first step is to cut the bias (the hypotenuse of the triangle). All further measurements and cuts are either parallel or perpendicular to that bias line.*

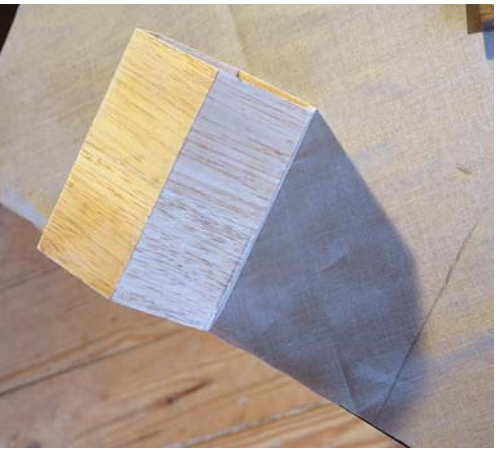
Building the Foundation

The system for constructing a urushi lacquerwork coating is a complex one, generally beginning with adhering fabric over the entire surface of the substrate. The initial base layer for urushi lacquer, and hence my faux urushi, is an extremely fine fabric. For my early trial runs, I selected a lightweight "portrait linen" from the fine art painter's suppliers, but I found that to be too heavy for the scale of my work. I then tried "handkerchief linen" and eventually ultra-fine hemp linen. These both worked exceedingly well and are what I use now.

The fabric serves as a robust interface between the wood and the layers built up later, and provides a homogenous base rendering the wood's grain direction irrelevant. In keeping with the traditions as I understand them, I cut the cloth on the bias (at 45° to the warp and weft of the fabric) so that it would "lay" better to the surface, especially as it encounters curved surfaces or corners.

Once the fabric was cut to rough size, I applied epoxy resin on the surface with a disposable brush or spatula, set the fabric in place and burnished it down with a spatula (not unlike the motions of hammer veneering), then applied another light application of the epoxy.

The application of the fabric underlayment often takes several steps, and that was the case here; normally



Box template. *Using the box itself as the measuring tool, I cut a slightly oversized piece of linen from the bias-cut fabric.*

Be generous. *A generous application of the epoxy makes certain there will be thorough saturation and laying-down of the fabric.*

Press in place. *Place the slightly oversized piece of linen in the correct location, pressing it down just enough to keep it there.*

Now burnish. *Starting in the center of the section, gently use the spatula as a squeegee to remove excess epoxy and burnish the fabric flat.*

Yet more epoxy. *Once the fabric is flat and firm on the surface, apply a light coating of epoxy over the entire surface and set it aside.*

I apply fabric first to the inside bottom, then immediately to the outside bottom, then set the piece aside. The next day, after two sections cured, I trimmed them and proceeded to apply the fabric to the hexagonal insides. I let the fabric sit until hard, then trimmed it and applied the same layer on the outside surfaces.

Once this fabric ground was finished, I sanded the surface lightly with #120-grit sandpaper to remove any large bumps. This sanding need not be fussy – all you want to do is knock down any obvious boulders.

Next comes the primer/filler coat, prepared by mixing another epoxy batch and bulking it up with diatomaceous earth. I use disposable paper plates for nearly all of my epoxy mixing. Using a spatula to mix the ground lacquer substitute, I add diatomaceous earth until the material is essentially too stiff to flow, similar to mayonnaise or frosting. Then comes the opportunity to test your cake-decorating skills when you slather the thickened material on the whole surface smoothly. Any lack of smoothness will need to be removed later, so it's better to work quickly and just get it smooth from the start.

Knead until stiff. *Sprinkle the filler on a fresh batch of epoxy and "knead" it with a spatula. Continue adding filler and mixing with the spatula gradually until it stiffens.*

Get it covered. *The initial application of the filler can almost be applied with a spatula and squeegeed off. The important thing is to cover the entire surface evenly.*

Once this heavily bulked primer has hardened and been sanded with #80-grit paper (again removing only the worst unevenness), mix a second epoxy/diatomaceous earth batch that is less stiff and can flow out a little. You want to get this layer as smooth as possible so that when it is sanded it is an excellent and flat surface for applying the pigmented epoxy layers for the finish coats. Once hardened, this layer should be sanded with #120-grit sandpaper and a firm block (sometimes I even scrape it with a Sloyd knife), mak-

THE LACQUERING SPATULA

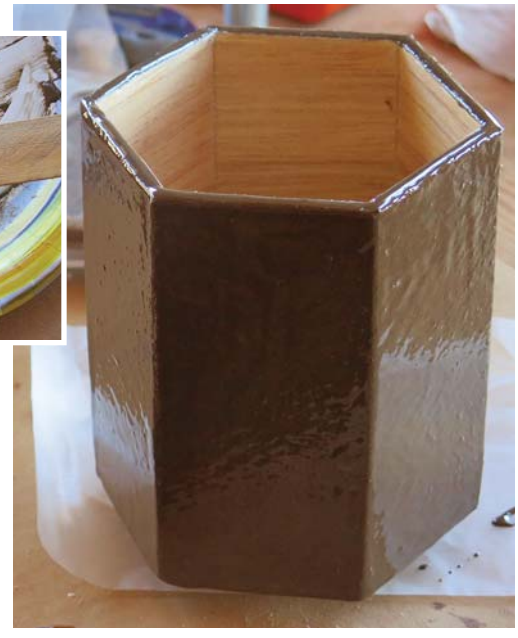
Much of lacquer prime-coat application is closer to spreading cake frosting than finishing, requiring a spatula rather than a brush. I make my own spatulas from flat-sawn lumber, usually white pine or bald cypress (primarily tangential grain orientation) because I have found that radial or quartersawn wood is more prone to splitting in use. I start with some flat-sawn lumber approximately 1/8" thick and cut to the size and shape desired. Then, with a well-sharpened block plane and a Japanese knife, I create a gentle taper to a near knife-edge profile for the working end. You want the tip of the spatula to be very flexible to conform perfectly to the substrate on which you are applying the lacquer. My final step is to very gently smooth the tip on both sides by placing some #400- or #600-grit sandpaper face-up on a flat board and gently passing the spatula along it. Then it goes into a bowl of molten wax to seal it completely from any epoxy penetration. When done properly, the spatula's tip is actually translucent when you hold it up to the light.

—DW

In the bend. *A well-made lacquering spatula will be flexible enough to conform to the surface perfectly, yet robust enough to not snap off when used with pressure.*

Ready & waiting. *This batch of spatulas is shaped and sealed with molten wax, ensuring the epoxy/lacquer can be wiped off once you are done with the process.*

Syrupy. *The second batch of primer/filler is less stiff than the first one, more like syrup than frosting.*



Coat your box. *At this step you learn whether or not you have good cake-decorating skills. Don't worry; you will get better at this.*

ing sure not to cut through to the fabric layer. (If you do cut through, another coating of primer is required.)

When this layer is sanded smooth to the point where the surface is uniform, you are ready to begin applying the pigmented paint layers by brush.

The Lacquering Brush

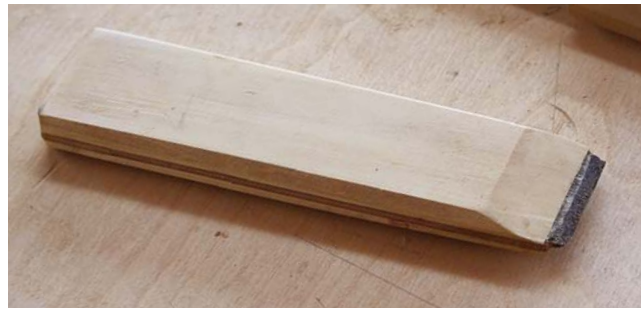
For most traditional finishing practices, a fine, soft-ish brush with elegantly long flagged bristles has been the tool of choice for generations. But lacquerwork requires a substantial paradigm shift because the finish being applied is not water-thin, such as spirit varnishes, or even the heavier viscosity of thinned honey, as in oil varnishes. Urushi lacquerwork requires applying something more akin to refrigerated pancake syrup, and the brushes needed must be appropriately robust. True lacquering brushes do not actually look much like brushes at all – they more closely resemble a block of wood with about 1/4" worth of bristles protruding from the end. While I have made some of my own traditional brushes, the simplest entrée for a newcomer is to modify a hake or hak-ie (pronounced "ha-KAY") brush available from art supply stores.

> "Art completes what nature cannot bring to a finish."
>
> —*Aristotle (384-322 BC), Greek philosopher*

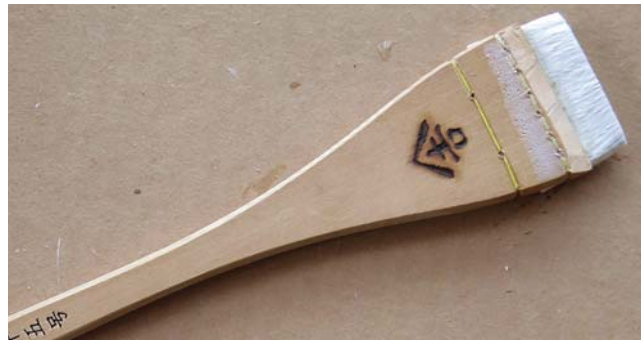
Take the new brush and dip it into a pot of hot hide glue until the fibers are saturated, then shape the tip with your fingers and set it aside until the glue is completely hard. Using a Japanese knife or similar tool, trim the bristles to about 1/2" in length and taper them to a knife-edge tip.

Once the shape of the tip is to your liking, soak the brush in hot water to remove all the glue; when it has fully dried, it is ready to use. For these brushes it is critical to clean them thoroughly after every use – my solvent of choice is acetone. I put a little bit in a glass jar and massage the bristles gently in the solvent, replacing the old solvent with new several times just to make sure the brush is cleaned.

Get your goat. *Here's one of my homemade lacquering brushes in the traditional form. Goat hair bristles are embedded into and run the whole length of the brush "handle."*

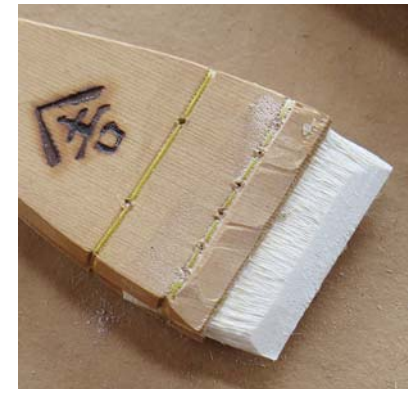


Glue stiffened. *The bristles of this hake brush were impregnated with hide glue, then trimmed to 1/2" length.*



Start Building

To build the faux urushi, prepare another batch of epoxy and mix in colored pigments with no other additive to render it into paint. My preference



Cut like a knife. *The tip is sculpted to a knife edge, extending the profile up to the handle. This can only be accomplished easily if the bristles are fully saturated with hard glue.*

Red epoxy. *This epoxy batch is mixed with red pigment powder and will be applied over the black base and the first red coating.*

Freshly done. *Here's the final pigmented faux urushi all freshly done. It will flow out a little in a half-hour or so.*

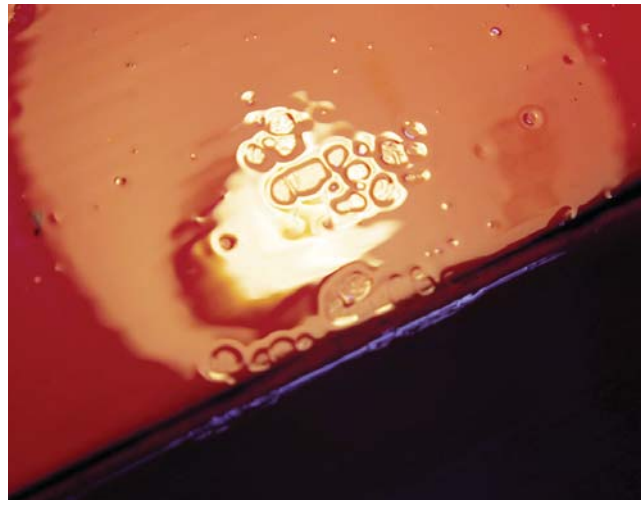
is to use artist's fine dry pigments – using a restricted palette of red, black and dark blue for the most part – and making sure the pigment is well mixed into the epoxy.

Using your lacquering brush, a modified hake brush or even a short-bristle oil-painting artist's brush, apply a thin but complete layer of the pigmented epoxy on the entire surface of the piece. If this is not possible to do all at once, select the portion of the surface to be coated (top, bottom, inside, outside etc.), then return to complete the task once the initial application has hardened.

As a practical matter, given the hardening time for the faux urushi, you might need a dust-free chamber to place the object inside while it is curing. This could be as simple as an overturned clean cardboard box.

Once the surface of each layer has fully hardened, I gently wash it with disposable cotton pads moistened with a mild detergent, followed by wiping with clean pads moistened with distilled water, followed by clean, dry pads. This removes any waxy compounds known as stearates that might form during the hardening reaction and cause beading or cissing down the line. I found that taking these precautions and switching to West's Special Clear Hardener 207 for the final clear coats did the trick.

Following each application of the epoxy faux urushi, the cured surface needs to be smoothed perfectly, scraping it with disposable razor blades and using progressively finer-grit sandpaper as you build the coats. When sanding the cured surface, make sure to be careful at the corners. For objects with flat surfaces like those illustrated



Fixing the cissing. *Cissing is the beading up of a coating when applied over a contaminated surface (in this case waxy contaminates formed during the previous coat's hardening). It is a head-scratching thing, and I solved it by changing my working process.*

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Razor smooth. *Disposable razor blades are the secret weapon for ultra-smooth finishing on flat surfaces.*

Rubbed through. *Here, the "rubbed through" effect is completed on the smoothed surface, making it ready for the final layers of transparent faux urushi.*

Go-to polishers. *Triangular blocks of hard felt cut from a polishing wheel are my go-to tools for polishing finishes and almost everything else in the studio.*

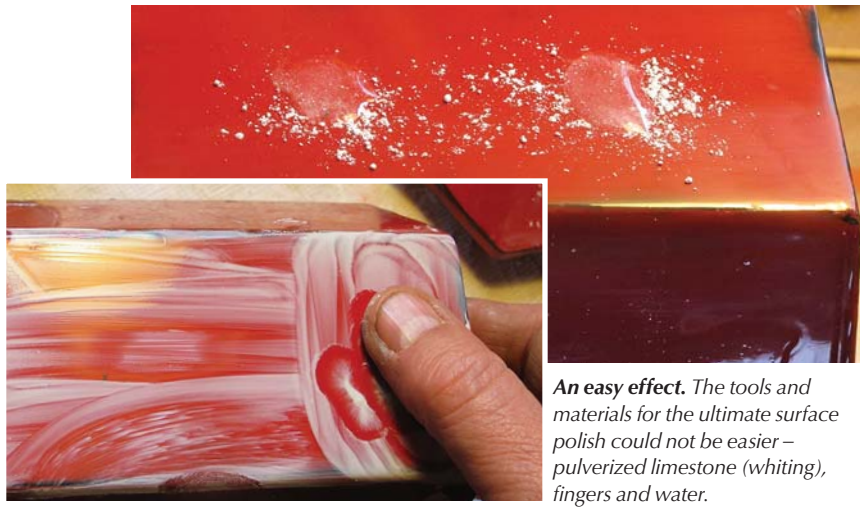
in this article, I find it useful to employ small sanding blocks. When the sanding has resulted in a uniform surface, you can apply the next coat of epoxy faux urushi.

I repeated this process until I built enough coating so that the surface was perfect. I worked my way up through the sandpaper grits for each successive layer of cured epoxy until I achieved that perfect surface after using #1,500-grit wet/dry sandpaper.

It usually takes several layers to arrive at this point, each taking only a few minutes to apply, but a day (at least) to cure.

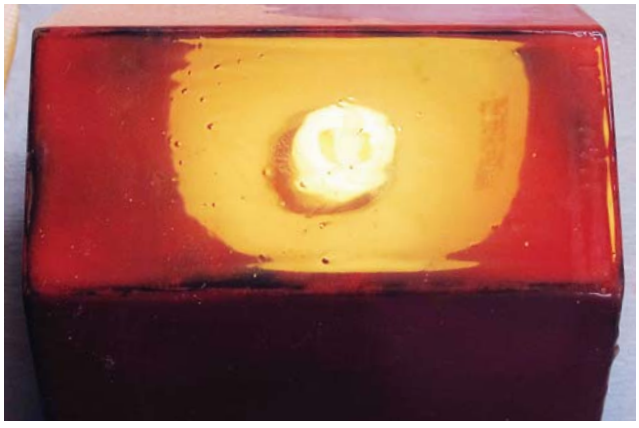
Once I had my two sets of pigmented epoxy finished – red over black – I strategically abraded the surface to bring out the visual texture I wanted, with the black showing at the corners and intermittently on the flat surfaces. Then I applied two coats of transparent epoxy.

With that perfectly applied and cured surface, it is time to polish it out. This is the process that separates urushi work from almost every other type of wood finishing – its importance cannot be overstated. For the final faux urushi polishing, I generally use a cut-up semi-hard felt buffing wheel as my rubbing blocks, which I charge with abrasive



An easy effect. *The tools and materials for the ultimate surface polish could not be easier – pulverized limestone (whiting), fingers and water.*

Reach the tricky bits. *A 1/4" dowel with felt affixed to an angled end polishes hard-to-reach areas.*



Prepped for polishing. *This surface is ready for final polishing.*

Scrape & sand. *Here's how it looks scraped with a razor blade and sanded with #1,500-grit wet/dry paper and a sanding block.*

Finely polished. *Next I polished with 4F pumice, then rottenstone (tripoli) and a felt block with water.*

And final polish. *Finally, I polished with multiple grades of agglomerated microalumina and a felt block, then applied whiting with my fingertips.*

polish. Sometimes my fingertips work just fine for the finest polishing.

As for the abrasive powders, I use those from the province of metallography or petrography, or for scanning electron microscopy: 1.0-micron, 0.3-micron and 0.05-micron microalumina. These high-performing abrasive polishes are unfortunately quite expensive, but a little goes a long way. I'm still working my way through the 4-ounce units I bought three decades ago, though I have had recent trouble finding suppliers for small quantities.

A less efficient, but more available and affordable approach would be to work with 4F pumice, followed by rottenstone/Tripoli and, finally, whiting (I prefer Gamblin brand).

Either approach, however, will result in a flawless, mirror-like surface.

I make a point of reserving a felt polishing block for each grit, and I mark them with permanent marker to help keep them straight. I use water or naphtha for the polishing slurry medium.

For any intricate surfaces or inside corners, I take a 1/4" dowel and cut the end at a shallow angle, then epoxy a small chunk of felt to the end to use as my polishing surface so I can reach these difficult or recessed locations.

Much like the sandpaper grits, I steadily work my way up to the finer and finer abrasive powders, making sure that the surface is uniform before moving on to the next one, and I always clean the surface completely before starting with the next, finer polish.

I use litho pads or hypo-allergenic cosmetics pads to clean the abrasive powder slurry. I use them only once and toss them in the trash.

For the final polish, I use whiting with a small piece of chamois lubricated with naphtha, or just plain whiting on clean, dry fingertips. When you finish with this process and clean off any residue, you are left with an epoxy faux urushi surface that is breathtakingly magnificent. **PWM**

Don retired as senior furniture conservator after almost three decades with the Smithsonian Institution. Follow his work at donsbarn.com.

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Breadboard End Cutting Board

BY DAVID PICCIUTO

Practice a centuries-old technique on this small contemporary piece.

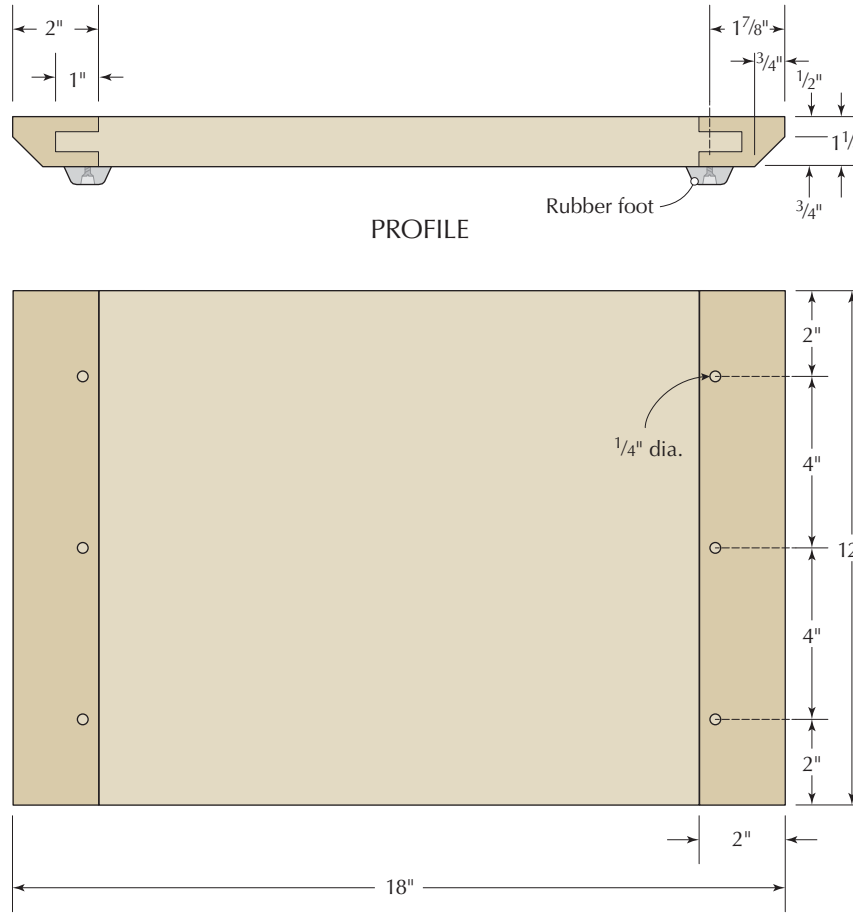
Found on everything from refined 18th-century highboys to muscled Arts & Crafts tables, breadboard ends are a handsome and time-tested way to prevent wooden panels from warping over time. Correctly made, breadboard ends not only keep panels flat, but also allow them to expand and contract with seasonal (or other) changes in humidity.

Key to successful breadboard ends are the pins that join the tongue of the panel to the groove on the end piece. For this application, the center pin is fixed in both the panel and end, but the outer pins are installed in elongated holes that allow the panel to move freely with shifts in humidity. But other breadboard ends, such as those found on a drop-front desk, for example, feature fixed pins on one end to force expansion and contraction to happen on the unhinged edge.

This small cutting board is a great project on which to get started with breadboard ends, and it features a modern look with its use of contrasting woods. **PWM**

David is the host of makesomething.tv and the author of "Make Your Own Cutting Boards: Smart Projects and Stylish Designs for a Hands-On Kitchen" (Spring House Press).

1 ***Rough cut the stock.*** *Begin by cutting lengths of 8/4 (2" thick) hickory stock to a length of 18". Cut enough pieces to create a cutting board 12" wide when glued up edge to edge.*



Cutting Board with Breadboard Ends

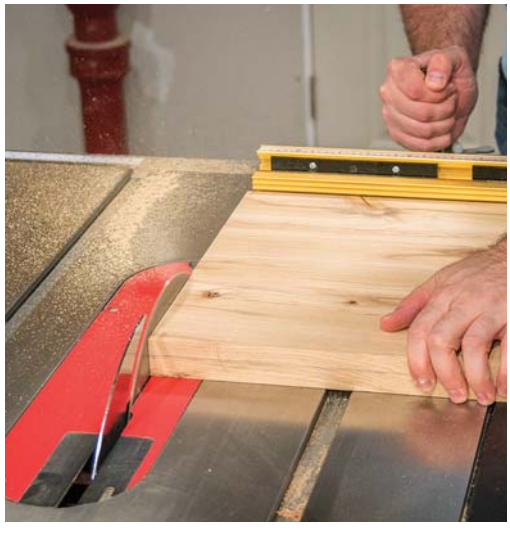
NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑ 1	Center panel	2	12	16	Hickory
❑ 2	Breadboard ends	2	2	12	Walnut
❑ 6	Pins	1/4 dia.		1 1/4	Hardwood dowel

2 ***Glue up the panel.*** *Spread a thin layer of glue (Titebond III or another waterproof glue is best) onto all mating edges and clamp them together to create a single panel at full width. Try to get at least one side flush to create a flat surface.*

LEAD PHOTO BY DANIELLE ATKINS; STEP PHOTOS BY THE AUTHOR & ERIC OBLANDER

3 ***Thickness the stock.*** *Run the panel through your thickness planer, flattest side down, until the top is flat. Then flip the board over and flatten the other side as well. The exact overall thickness is less important than making sure the entire panel is of uniform thickness.*

4 ***Prepare the breadboard ends.*** *Plane the stock you plan to use for breadboard ends down to the same thickness as the center panel.*



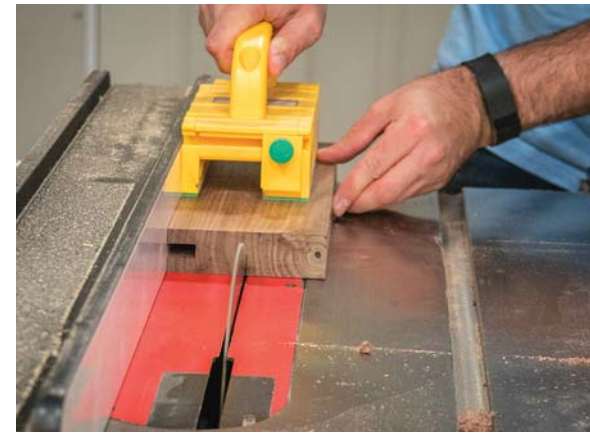
5 ***Square it up.*** *At the table saw, use a miter gauge to square up the two ends of the center panel.*

6 ***Cut the tongue.*** *Position the fence 1" from the blade (including the blade width) and raise the blade to 3/8". Take multiple passes with a single blade to hog away the waste on the ends of the stock, with your last pass guided by the miter gauge but flush against the fence. Because you're removing the same amount from each face of the panel, the tongue is perfectly centered.*

7 ***Raise the blade.*** *With the saw switched off, raise the blade until its height matches the length of the tongue.*

8 ***Cut the groove.*** *On the stock you're using for breadboard ends, take multiple passes to hog out the waste to accommodate the tongue. Be sure to flip the stock and take passes with each face against the fence so that the tongue will be centered. Aim for a fit that is snug but goes together with only hand pressure.*

9 ***Crosscut the breadboard ends.*** *Mark the width of the center panel directly onto the stock you're using for the breadboard ends. Use your table saw and miter gauge to crosscut it to length.*



10 ***Rip it to width.*** *Now that all of the joinery has been cut, remove any excess width on the breadboard ends by ripping them at the table saw.*

11 ***Prepare for pegs.*** *Set the breadboard ends into position on the panel and drill three 1/4" holes on each end. The holes should go through both sides of the breadboard end as well as the tongue on the panel.*

12 ***Allow wood to move.*** *The center holes on each tongue should be drilled straight and true. But use a hand drill to ream out (left to right) the four outer holes. These slightly wider holes will allow the pegs to stay in the same spot on the breadboard ends as the main panel expands and contracts.*

13 ***Glue it up.*** *To allow for inevitable wood movement, glue only the center 3" of the panel to the breadboard ends. The outer pegs will keep the ends flush against the shoulder on the panel even as the panel changes with humidity.*

14 ***Install the pegs.*** *Clamp the breadboard ends to the panel tightly in place. Use a mallet or hammer to drive short lengths of 1/4" dowel through the breadboard ends and tongue. Round over the leading edge of the pegs so they are easier to tap into place. On the center dowels only, add a drop of glue before you sink the pegs.*

15 ***Clean it up.*** *Use a flush-cut saw to trim away the ends of the pegs. If they're not quite flush with the breadboard ends, use a sharp chisel to clean up the cuts.*

"It's not just about making beautiful furniture. But how do you get rid of it?"

—Tage Frid (1915-2004), Woodworker, teacher & author

16 ***Cut the bevel.*** *Angle the blade on your table saw to about 45°. Then bevel the lower edges of the breadboard ends using a miter gauge to guide your cut.*

17 ***Seal any imperfections.*** *Use a pencil dipped in epoxy to drip epoxy into any knots so bacteria doesn't gather in the crevices.*

18 ***Make it shine.*** *Use a lint-free cotton rag to wipe on your finish of choice. This board was finished with mineral oil and wax.*

19 ***Give it a lift.*** *Screwing rubber feet onto the bottom of the cutting board at all four corners not only raises the cutting board up off your counter, it also lends a little grip so it is less likely to move when in use.*

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Wallington: The Unhappy Turner

Trade dangers revealed in 17th-century journals.

I thought of Nehemiah Wallington (1598-1658) when I set up my lathe in my nearly finished workshop. A few times a year he pops up in my mind. He was a turner in Puritan-era London, and as unhappy a soul as you might meet.

I know of him through Paul S. Seaver's book "Wallington's World: A Puritan Artisan in Seventeenth-Century London" (Stanford UP). Wallington kept journals and notebooks, more than 2,600 pages of which survive, that are the material upon which Seaver wrote his book. While Wallington (and Seaver) concentrated on larger issues of the day – religion and politics among them – I scoured the book for references to Wallington's trade.

Look Out!

Most of what we find in Seaver's book mentioning the turner's trade is about the workshop as a perilous place. Wallington recorded several brushes with near fatalities, and praised God after each close call.

One incident involved an apprentice, Theophilus Ward, who, while "showing chairs in the back room, dislodged a heavy one with his 'bustling' about, apparently one at the top of a stack, which crashed down into the shop through the doorway and demolished a powdering tub that Wallington was in the process of selling to another customer. 'It was God's great mercy that it hit none of us, for if it had, it would have maimed us, if not killed us.'"

Much of this quote is Seaver, not Wallington, so the chairs might not actually have been in a stack. Regardless, turned chairs of the period can be quite heavy, and I wouldn't want one to fall on me – from a stack or not.

In another incident Wallington mentioned, "'My sweet child Sarah was playing in the shop, and as I was shewing of bed staves' to a customer, a huge

CONTINUED ON PAGE 61

Unlike Wallington. *I enjoy time spent at my craft – but turning is just part of my livelihood.*

'Ware falling chairs. *A turned chair to the head would be painful.*

PHOTOS BY THE AUTHOR

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US★GENERAL — SUPER COUPON

26", 4 DRAWER TOOL CART

ITEM 95659 shown
61634/61952

- 580 lb. capacity

SAVE $269

★ WINNER ★ – Truckin' Magazine

SUPER COUPON $99.99

Customer Rating

~~$149.99~~ comp at $369.32

11035726

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CENTRALPNEUMATIC — SUPER COUPON

3 GALLON, 100 PSI OILLESS AIR COMPRESSORS

A. HOT DOG
ITEM 69269/97080 shown

B. PANCAKE
ITEM 95275 shown
60637/61615

SAVE 59%

Customer Rating

YOUR CHOICE $39.99

~~$59.99~~ comp at $98.62

11060514

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SUPER COUPON

900 PEAK/ 700 RUNNING WATTS 2 HP (63 CC) 2 CYCLE GAS RECREATIONAL GENERATOR

SAVE $37

SUPER COUPON $89.99

Customer Rating

ITEM 60338
69381 shown

~~$109.99~~ comp at $127.49

11032894

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CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

ITEM 69924 shown
62403/62862

6" VARIABLE SPEED DUAL ACTION POLISHER

SAVE $95

SUPER COUPON $54.99

Customer Rating

~~$69.99~~ comp at $149.99

11046666

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drillmaster — SUPER COUPON

Includes one 18V NiCd battery and charger.

18 VOLT CORDLESS 3/8" DRILL/DRIVER WITH KEYLESS CHUCK

Customer Rating

ITEM 69651/62868
62873/68239 shown

SAVE 65%

SUPER COUPON $16.99

~~$19.99~~ comp at $49

11062999

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SUPER COUPON

7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP

ITEM 69249/69115/69137
69129/69121/877 shown

SUPER COUPON $2.99

Customer Rating

~~$4.99~~ comp at $8.48

SAVE 64%

11033647

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CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

12" SLIDING COMPOUND DOUBLE-BEVEL MITER SAW WITH LASER GUIDE

Blade sold separately.

Customer Rating

ITEM 69684 shown
61969/61970

SAVE $204

SUPER COUPON $134.99

~~$199.99~~ comp at $339

11047030

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Haul-Master — SUPER COUPON

SAVE 37%

1500 LB. CAPACITY DUAL WHEEL SWING-BACK BOAT TRAILER JACK

Customer Rating

ITEM 69779
67500 shown

SUPER COUPON $27.99

~~$29.99~~ comp at $44.99

11029983

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CENTECH — SUPER COUPON

Customer Rating

12 VOLT, 10/2/50 AMP BATTERY CHARGER/ ENGINE STARTER

ITEM 60581/60653 shown

SAVE 57%

SUPER COUPON $29.99

~~$49.99~~ comp at $69.99

11052809

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CENTRALPNEUMATIC — SUPER COUPON

SAVE $138

RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE

Customer Rating

ITEM 93897 shown
69265/62344

SUPER COUPON $59.99

~~$89.99~~ comp at $198.45

11041140

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PITTSBURGH — SUPER COUPON

ITEM 46807/68975
69221/62123/63017
69222 shown

12" RATCHET BAR CLAMP/SPREADER

SAVE 85%

SUPER COUPON $2.99

~~$3.99~~ comp at $20.76

11061828

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CONTINUED FROM PAGE 58

ash log, propped against the wall, was dislodged and fell towards Sarah and 'had I not by God's providence caught hold of it – it would have knocked her down and killed her.'"

Furniture historians have often pondered what bed staves are, never having seen any surviving examples, but we all know what a "huge ash log" is, and that it would hurt if it fell on you.

One more. I include this so we don't feel so alone in our haste making tool handles. "Nehemiah Wallington's brother-in-law was chopping wood in the garret and the hatchet head had come off and fallen three stories down the stairwell to the shop, again missing everyone." So tool handles shrunk back then, too; it's not just a modern problem. Maybe they never did make them like they used to, after all.

Know Your Tools

My lathe is a simple machine, framed in oak and fastened with wooden wedges and iron nuts and bolts. I've had it since 1994 and am quite accustomed to its idiosyncratic traits. It's a pole lathe, with one upright extended above the bed to form one "poppet" and the other moveable and secured with a wooden wedge. The workpiece is fastened between the centers of the lathe, which are mounted in these poppets.

In 1643, Thomas Baynley died en route to New England. His goods were inventoried in Boston, and among his tools were "one skrew & a pin to turne."

This refers to the points of a pole lathe, as described by Joseph Moxon some years later in his book "Mechanick Exercises." A treadle or great wheel lathe needs a drive center at one end to transfer the action to the workpiece.

Baynley also had "two gouges & two hooke tooles" and "3 turning chesils."

More typically, period inventories are less specific, like the "dishturners tooles" owned by John Frizby of New Haven in 1694.

I mostly use my lathe for joined furniture parts: legs (or "stiles") of joined stools and chairs, applied turnings for casework and other small bits. I do make turned chairs on it, but not enough to be efficient at it. The same holds true for woodenware.

For me, the most compelling quote in Seaver's book is in Wallington's own words: "At night after examination how I have spent the day, after a chapter read I went to prayer with my family; then I went into my shop to my employment more out of conscience to God's commands than of any love I had unto it."

This quote leaves me thinking two things. One is that it figures that the only period artisan who wrote anything I have ever seen about his trade is a poor, unhappy craftsman with no real interest in his work. The second is how lucky I am today to be able to spend my time making things in wood with simple tools, and both provide for my family and enjoy it at the same time. **PWM**

Applied work. *Not all turnings stay in the round. Here's a pair of split turnings glued and nailed to a joined chest.*

A hook. *Here, I'm using one of the "dishturners' tools," specifically a hook, to hollow the inside of this bowl. The lathe's power cord is wrapped around a mandrel fitted into the bowl.*

Peter has been involved in traditional craft since 1980. Read more from him on spoon carving, period tools and more at pfollansbee.wordpress.com.

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/apr17**

BLOG: *Read Peter Follansbee's blog.*

ARTICLE: *"The Best Oak Money Can't Buy."*

About this Column

ARTS & Mysteries

"Arts & Mysteries" refers to the contract between an apprentice and master – the 18th-century master was contractually obligated to teach apprentices trade secrets of a given craft (and the apprentice was expected to preserve those "mysteries").

Brands of Dye Stain Differ

Make sense of different dye types to understand what works for you.

In the last issue (#230), I mentioned that I liked to use W.D. Lockwood or J.E. Moser water-soluble powder dyes (they are the same) for staining, and non-grain-raising (NGR) or TransTint liquid dyes (they are also the same, just different concentrates) for tinting coats of finish to make a toner.

I've written about these dyes previously in *Popular Woodworking* – for example, in the November 2006 issue (#158). That article is reproduced in my book "Flexner on Finishing." Though the article covers the broader subject of dyes well, I think I could do a better job of distinguishing between types. There are differences that may affect which you choose.

I would separate the dyes commonly available to woodworkers into two contrasting types: liquid or powder, and metal complex or acid. And I would create a new, slightly different, category for General Finishes dye.

Dye types. *The dyes discussed in this article are, from the left: liquid concentrated and acetone-thinned metal complex; powder metal complex; powder acid (partly reversible); and liquid metal complex with an acrylic binder.*

Liquid or Powder

Dyes sold in liquid form include TransTint and non-grain-raising (NGR). TransTint is concentrated NGR. NGR is TransTint thinned a lot with acetone. Lots of companies, including Behlen, sell NGR dyes, which are commonly used by professionals.

Dyes sold in powder form include TransFast and Lockwood/Moser. (In the 1980s John Moser started a finish company, Wood Finishing Supply, repackaging Lockwood dyes under his name; later he sold his company to Woodworker's Supply.)

The liquid dyes contain a glycol-ether solvent, which makes them compatible with water, alcohol and lacquer thinner. So these dyes can be used to make water-based, shellac-based and lacquer-based toners. (Notice that they are not compatible with oils and varnishes.)

These dyes can also be used as a stain directly on wood, and they often are, especially to create a background color. But they aren't as effective or versatile as powder dyes, in my opinion, for use as the total stain (rather than building the color in steps).

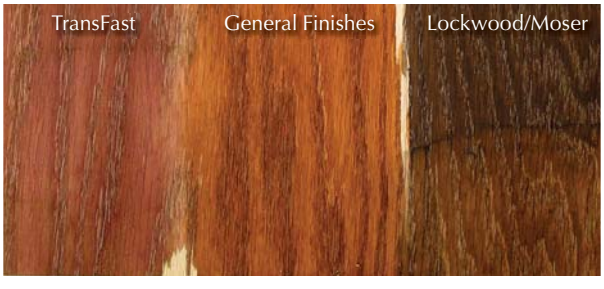
The most common powder dyes are dissolved in water. By adding higher ratios of dye powder, you can make very dark colors; lower ratios create lighter colors.

Metal Complex or Acid

Dyes were first synthesized in the mid-19th century. There were a number of different types, one being acid dyes. There's no reason to go into dye chemistry. That discussion gets very complex very fast. It's simpler to learn the characteristics of the different brands and choose the brand for the characteristics you want.

W.D. Lockwood and J.E. Moser brands are acid dyes. They have the useful color-matching characteristic of being able to be lightened significantly after they have dried by wiping over them with a wet cloth. Rewetting these dyes redissolves them so some of the color can be removed. Each time the dried dye is rewetted, more of the color can be removed.

So if you get the color too dark, you can lighten it. If you get the color wrong, you can, of course, tweak it by applying another color on top. But this may make the combination too dark. So



Reversibility. *Metal-complex dyes (left) are only minimally reversible by wiping over with water. Dyes that contain a binder (middle) are not reversible at all. Acid dyes (right) can be lightened a lot by wiping over with a wet rag each time the dye has dried.*

PHOTOS BY THE AUTHOR

DYE CHART

BRANDS	LIQUID OR POWDER	METAL COMPLEX OR ACID	WHERE SOLD
TransTint	Liquid (concentrated)	Metal complex	Woodcraft, Rockler and Klingspor stores and catalogs
Non-Grain-Raising (NGR)	Liquid (thinned)	Metal complex	Paint stores that cater to the professional trade and many woodworking stores and catalogs
TransFast	Powder	Metal complex	Woodcraft, Rockler and Klingspor stores and catalogs
Arti	Powder	Metal complex	Highland Woodworking
Lockwood and Moser	Powder	Acid (reversible)	wdlockwood.com, Woodworker's Supply and Lee Valley stores and catalogs
General Finishes	Liquid with acrylic binder	Metal complex	Woodcraft, Rockler and Klingspor stores and catalogs

you can lighten the wrong color first, then tweak it.

The biggest problem with acid dyes is that they fade fairly rapidly in sunlight, even through a window. In the early 20th century, chemists figured out how to add a metal molecule to dyes to make them more fade resistant. These dyes are called metal-complex or metalized dyes. I believe TransTint, TransFast, Arti and all the NGR dyes are this type. Lockwood also makes a metal complex powder dye.

But the added molecule also causes the dye to bond fairly well to the wood, so you can't lighten the color much by wiping over it with a wet cloth. Bonding can be a positive characteristic by limiting the amount of color that can be lifted when brushing a finish. It can be negative because you are fairly locked into the initial color you get, unless you want to make it darker.

Another difference between metal-complex and acid dyes is that acid dyes produce richer and deeper colors, though the difference can be subtle unless you do a lot of comparing.

Fade Resistance

The marketing angle for metal-complex dyes is that they are more fade resistant than acid dyes. This is true, but it's only relative because both dyes fade in UV light much faster than pigment.

My thinking on this is that fade resistance is a non-issue for most woodworkers because we hope that the objects we make will survive for decades or longer. If these objects are placed in sunlight, even through a window, they will fade significantly within a few years no matter which type of dye is used.

All dyes fade. *I covered the bottom half of this panel and placed it in a west-facing window for six months. All the dyes faded (top half), some less than others, but they all faded. Use pigment to avoid fading in sunlight.*

It might help a little to apply a UV-resistant boat finish (from a marina, not a home center) over the dye, but the best solution is to keep the object out of sunlight or use pigment for the coloring.

General Finishes Dye

The newest dye player in the woodworking market is General Finishes. Its dye is like TransTint and NGR in that it is both liquid and metal complex. But in addition, the dye includes a binder, listed as acrylic.

At first, I was confused by this. Why the binder? Then I read the data sheet, which recommends using one of General Finishes' water-based finishes over the dye. So I'm assuming the company wants to better lock in the color so it can't be lightened or smeared by brushing.

The downside, of course, is that the color can't be lightened at all short of stripping, which is not very effective, or sanding, which is difficult to do without losing control.

Pigment. *General Finishes dye appears to contain pigment, which settles to the bottom of the can. Pigment requires a binder to glue it to the wood and, indeed, General Finishes contains an acrylic binder.*

Bottom Line

So what do you do with this information? If you're getting satisfactory results with whatever dye you are using, stick with it. There will always be a learning curve if you switch to another brand.

But if you see a characteristic you want with another brand, then make the switch. Or begin with that brand if you're just starting out. **PWM**

Bob is author of "Flexner on Finishing," "Wood Finishing 101" and "Understanding Wood Finishing."

ONLINE EXTRAS

For links to all online extras, go to:

- **popularwoodworking.com/apr17**

ARTICLE: *"Making Sense of Dyes," by Bob Flexner.*

IN OUR STORE: *"Flexner on Finishing" – 12 years of columns illustrated with beautiful full-color images and updated, and "Wood Finishing 101."*

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'You Own a Table Saw?!'

This hand surgeon likes meeting fellow woodworkers – but not at work.

I long ago lost track of how many people, upon learning of my interest in woodworking, have puzzled aloud over my table saw. They follow up with, "Do you know how important your hands are?" or, "Do you know how dangerous that thing can be?" The answers are, "Yes," and "Absolutely."

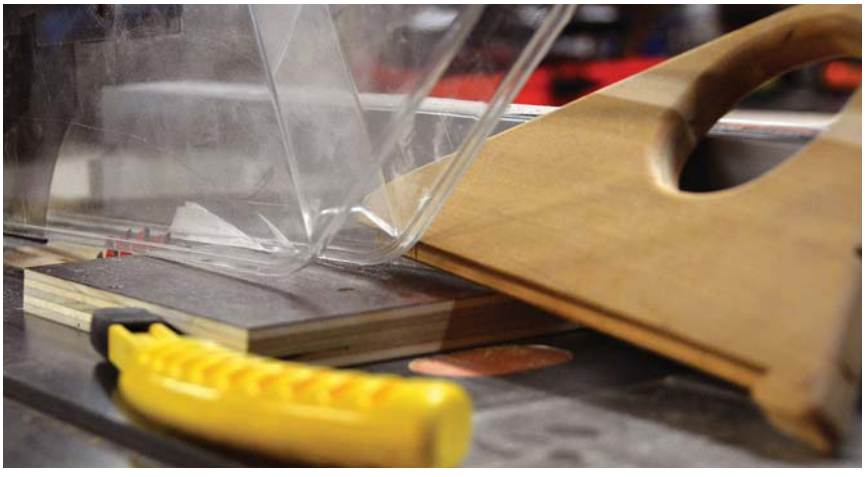
I've spent my entire professional career as a hand surgeon and have seen more woodworking injuries than probably anyone else (except for my hand-surgeon colleagues – many of whom are woodworkers). I've grown to respect the power of the machines we use, their ability to wreak havoc in an instant and our own inability to turn back time. I've seen injuries ranging from hyperaggressive manicures ("warning shots") to life-changing amputations. This hasn't at all diminished my enthusiasm for woodworking, but has given me insight into what causes injuries and how we can stay safe.

Many woodworking risks can be minimized by good practices such as keeping an uncluttered workshop, wearing masks, eye and ear protection, using dust collection and disposing of rags and chemicals correctly. And injuries happen with hand tools too – I've treated tendon and nerve injuries caused by errant paring chisels.

I've noticed that woodworking injuries tend to fall into a few categories.

Inattention: Repetition, fatigue, deadlines and complacency with a tool or technique are all setups for disaster. Tool work is no way to cool down from a bad day – if you can't get a problem out of your head, stay away from the sharp stuff. I use that time to draw, clean the shop, read or search the internet for more tools, plans and tips.

Inadequate protection: In the hundreds of table saw injuries I've seen, I've yet to see an amputation from a table saw with an appropriate blade guard and splitter. There have never been many good reasons to remove the guard; now with better-designed saws, guards and riving knives, there are even fewer. I've seen woodworkers injured on the "backstroke" as they bring a hand back over an unprotected blade after a cut, those who didn't see the teeth as the blade slowed and some who just pushed their hands into the blade as the work lifted, fluttered or started to kick. It is gruesome – use your guard.



Improper tool or setup: Nipping a little bit off a small piece on a table saw without a fence or guard? Ripping an 8' board without adequate outfeed support? Holding a metal trim piece on the drill press with your hand? Sometimes the setup takes longer than the cut – featherboards, push sticks, guards and outfeed support all take time to position. That is time well spent.

Inexperience (or too much experience): Carefully consider all information you encounter on the internet – if an idea or technique doesn't look safe, it probably isn't. Read comments on videos, and note the source's experience. Novice errors such as wrong-way feeding (inadvertently climb-cutting on the router table, for example) or jointing a too-short or too-thin piece are not uncommon. And those with "too much experience" often tout the acceptability of unsafe procedures. "I know it doesn't look safe, but I've done it this way for years," is a line heard too frequently in the emergency room.

Impairment: This should go without saying, but don't drink and cut.

My hand-surgeon hands are valuable, but no more than anyone else's. We all need hands to do our jobs and hobbies, write our names and hug our families. Protect yours and be safe. **PWM**

David is a hand surgeon at the Cleveland Clinic in Cleveland, Ohio.

ONLINE EXTRAS

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ARTICLE: *"Woodworking Essentials: Table Saws," by Marc Adams.*

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- Motor: 120V, 1.1kW, 5500 RPM, 9A
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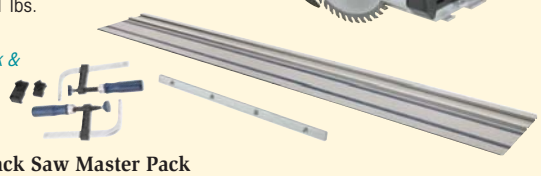
- Max. cutting depth at 45° without rail 1 5/8", w/ rail 1 7/16"
- Max. cutting depth at 90° without rail 2 5/32", w/ rail 1 31/32"
- Included saw blade: 160mm x 20mm x 48T
  Dust port dia.: 1½"
  Saw weight: 11 lbs.

W1835 Track Saw

Includes:
Accessory Pack & 55" Guide Rail



W1832 Track Saw Master Pack

7" 2 HP PLANER MOULDER W/ STAND

- Motor: 2HP, 240V, single-phase, 10.8A
- Cutterhead speed: 7000 RPM • CPM: 14,000 • CPI: 64-300
- Feed rate: 0-18 FPM • Max. profile: 6 3/4"W x 3/4"D
- Planing width: 7" • Min. stock length: 9"
- Min. stock thickness: 1/4" • Max. stock thickness: 7 1/2"
- Overall dimensions: 36 1/4"L x 22"W x 34 1/2"H
- Approx. shipping weight: 324 lbs.

PATENT OWNED BY WOODSTOCK INTERNATIONAL INC.

W1812 7" 2 HP Planer Moulder w/ Stand
D3393 Elliptical Jig for W1812

10" 2 HP OPEN-STAND HYBRID TABLE SAW

- 2 HP, 120V/240V, single-phase (prewired for 120V)
- Motor Amps: 15A at 120V, 7.5A at 240V
- Enclosed cabinet bottom w/ 4" dust port
- Precision-ground cast-iron table w/ steel wings measures 40 1/4" x 27"
- Rip capacity: 30" to right, 15" to left
- Quick removal/replacement system for blade guard and riving knife
- Weight: 243 lbs.

Includes a 10" x 40-tooth carbide-tipped blade, standard and dado table inserts, miter gauge, push stick, and arbor wrenches

W1837 10" 2 HP Open-Stand Hybrid Table Saw

13" 3/4 HP, BENCH-TOP OSCILLATING DRILL PRESS

- Motor: 3/4 HP, 110V, 1725 RPM
- Overall height: 38"
- Spindle travel: 3 1/4"
- Swing: 13 1/4"
- Drill chuck: 5/8"
- Speeds: 12, 250–3050 RPM
- Table: 12 3/8" dia.
- Table swing: 360°
- Table tilt: 45° left & 45° right
- Approx. shipping weight: 123 lbs.

PATENT OWNED BY WOODSTOCK INTERNATIONAL INC.

W1668
13" 3/4 HP, Bench-Top Drill Press

12" X 15" VARIABLE SPEED BENCH-TOP WOOD LATHE

- Motor: 3/4 HP, 110V, single-phase, universal motor
- 12" swing over bed • 15" between centers
- Two spindle speed ranges: 500-1800 RPM & 1000-3800 RPM
- 1" x 8 TPI RH thread spindle size
- Spindle indexing in 15° increments
- Heavy-duty cast-iron construction
- Approx. shipping weight: 87 lbs.

New

W1836
Bench-Top Wood Lathe

POCKET HOLE MACHINE

- Motor: 1/2 HP, 120V, single-phase, 3A, 17,500 RPM
- Two flip stops for drilling consistency
- Auto start/stop motor actuation w/ pull of handle
- Auto adjust clamping foot mechanism for workpiece thicknesses between 1/2" to 1 1/2"
- Cuts both dia. holes for pocket screws at the same time
- Ideal for face framing

Fast & super easy pocket holes!

PATENTED!

W1833 Pocket Hole Machine

6" PARALLELOGRAM JOINTER W/ SPIRAL CUTTERHEAD

- Motor: 1½ HP, 110V/ 220V, pre-wired 110V, single-phase, TEFC, 3450 RPM, 15A/7.5A
- Precision-ground cast-iron table size: 55½"L x 6"W
- Floor to table height: 32½"
- Max. cut (per pass): 6"W x 1/8"D
- Rabbeting capacity: ½" Spiral cutterhead dia.: 3"
- Cutterhead speed: 4,850 RPM
- CPM (effective): 19,400
- Fence system: positive stops @ ±45° & 90°
- Approx. shipping weight: 429 lbs.

Built-in mobile base!

W1755S
6" Parallelogram Jointer w/ Spiral Cutterhead

WALL DUST COLLECTOR

- Motor: 1 HP, 120V/240V, single-phase, prewired 110V, 7A/3.5A
- Air suction capacity: 537 CFM
- Static pressure: 7.2"
- Intake hole size: 4"
- Impeller: 10" balanced cast-aluminum
- Bag size (dia. x depth): 13 1/2" x 24"
- Bag filtration: 2.5 micron
- Dust level viewing window
- Height with bag inflated: 44"
- Approx. shipping weight: 55 lbs.

W1826 Wall Dust Collector

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