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Make a Shaker  
Swing-handle  
Carrier



# POPULAR Woodworking

Learn How. Discover Why. Build Better.

NOVEMBER 2009 #179

## NEW MATERIAL FOR AN OLD-SCHOOL WORKBENCH

Knockdown Design  
Is a True Knockout

Why *Real*  
18th-century  
Finishes Look  
*Really* Wrong

How to Make  
(And Hide)  
Secret Drawers

Make Knobs &  
Totes for Your  
Handplanes



Check out  
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Megan Fitzpatrick's  
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on page 32







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& MEGAN FITZPATRICK

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Laminated veneer lumber makes this knockdown workbench decidedly modern – but it's based on André Roubo's 18th-century drawings. Page 32.

COVER PHOTO BY AL PARRISH



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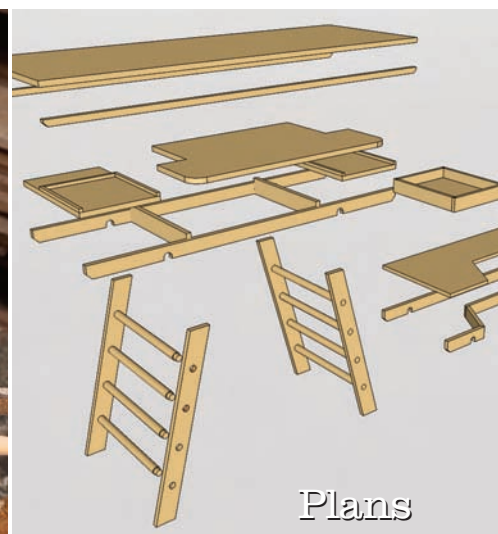




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## On the Web Site

### The Workbench Page

Read about Editor Christopher Schwarz's "Workbenches: From Design & Theory to Construction & Use" and download free SketchUp plans for three classic benches: the Holtzapffel Cabinetmaker's Workbench, the English Nicholson Workbench and the French Roubo Workbench (on which we've based our new model in this issue).  
[popularwoodworking.com/workbenches](http://popularwoodworking.com/workbenches)

## Video Gallery

### Turn a Chisel Handle

Watch Kevin Glen Drake turn a custom chisel handle in just minutes in this free video. (And read his story on the benefits of owning a lathe in this issue on page 42.)  
[popularwoodworking.com/video](http://popularwoodworking.com/video)

### Take a Tour of our New LVL Workbench

Watch how easily and quickly our new LVL workbench breaks down (and goes back together) and take a close look at the various workholding accessories and how they work. Plus, check out Senior Editor Glen D. Huey's video on how to drill dog holes using a 3/4" upcut spiral router bit, plunge router and simple (and cheap!) plywood jig.  
[popularwoodworking.com/video](http://popularwoodworking.com/video)

## Plans

### Computer Desk

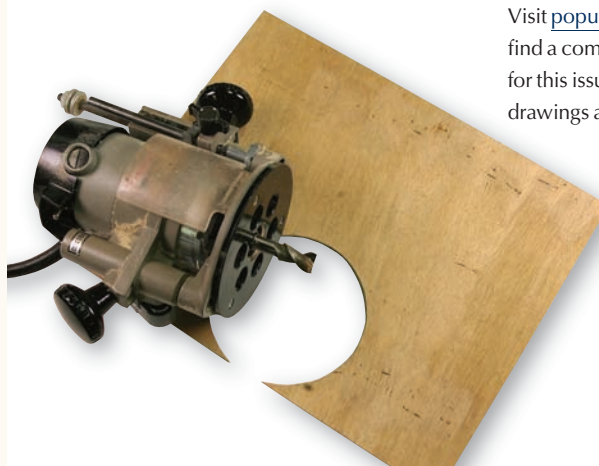
This computer desk (featured on page 58 in this issue) is a streamlined design that easily knocks down for moving – perfect for dorm rooms. You can find a free SketchUp model here:  
[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)

### LVL Workbench

Download a free SketchUp model of this new bench to make it easier to build your own version. In SketchUp, you can take the bench apart to see how the joinery works and make custom modifications to the plans – before ever putting blade to wood.  
[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)

## And More!

Visit [popularwoodworking.com/nov09](http://popularwoodworking.com/nov09) to find a complete list of all the online resources for this issue – including videos, additional drawings and photos.



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**Kevin Glen Drake** After graduating from the College of the Redwoods fine woodworking program, Kevin founded Glen-Drake Toolworks in Fort Bragg, Calif., where he combines woodworking, tool making and education. His innovative tools include the Tite-Mark marking gauge, which was named in 2003 as one of the 12 best tool values ever by *Popular Woodworking* editors.

Kevin thinks that woodturning skills are essential for woodworkers, and in this issue he writes about the tools required to get started, along with some of the benefits of having a lathe in your shop (page 42).



**Charles Murray** can usually be found in his shop up to his ankles in shavings. He enjoys collecting and using old hand tools, especially planes, which dovetails into his work of making period furniture as well as unusual kitchen cabinets. He works mostly in the William & Mary through Shaker styles and has a particular interest in furniture from 1680-1770.

In addition to working wood for a living, he's a member of the Society of American Period Furniture Makers (SAPFM), past president of Woodworkers of Central Ohio (WOCO) and a member of Ohio Tool Collectors.



In his first story for *Popular Woodworking*, Charles writes about making new knobs and totes for handplanes (page 45).

**Megan Fitzpatrick** After passing her exams for a Ph.D. in early modern drama, Megan took a break from writing her dissertation to build her workbench for *Popular Woodworking*'s shop. Like all the furniture she enjoys building, Megan demanded that her bench be massive – as big as any of the other benches in the shop. Also, she insisted that its benchtop be low enough for her to use with handplanes. The side benefit of this custom touch is that her bench is simply too low for any of the other woodwork-



ers in our shop to use. To build your own version of this bench (at the correct height for you), turn to the story that begins on page 32.

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EDITORIAL OFFICES 513-531-2690

**PUBLISHER & GROUP EDITORIAL DIRECTOR**

Steve Shanesy

**EDITOR** Christopher Schwarz

x11407 ■ [chris.schwarz@fwmedia.com](mailto:chris.schwarz@fwmedia.com)

**ART DIRECTOR** Linda Watts

x11396 ■ [linda.watts@fwmedia.com](mailto:linda.watts@fwmedia.com)

**SENIOR EDITOR** Robert W. Lang

x11327 ■ [robert.lang@fwmedia.com](mailto:robert.lang@fwmedia.com)

**SENIOR EDITOR** Glen D. Huey

x11293 ■ [glen.huey@fwmedia.com](mailto:glen.huey@fwmedia.com)

**MANAGING EDITOR** Megan Fitzpatrick

x11348 ■ [megan.fitzpatrick@fwmedia.com](mailto:megan.fitzpatrick@fwmedia.com)

**ASSOCIATE EDITOR FOR THE WEB** Drew DePenning

x11008 ■ [drew.depenning@fwmedia.com](mailto:drew.depenning@fwmedia.com)

**PHOTOGRAPHER** Al Parrish

**CONTRIBUTING EDITORS**

Adam Cherubini, Bob Flexner, Troy Sexton

**F+W MEDIA, INC.**

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**NEWSSTAND DIRECTOR** Susan Rose

**PRODUCTION COORDINATOR** Vicki Whitford

**ADVERTISING**

**ADVERTISING DIRECTOR**

Don Schroder

331 N. Arch St., Allentown, PA 18104

TEL. 610-821-4425; FAX 610-821-7884

[d.schroder@verizon.net](mailto:d.schroder@verizon.net)

**DISPLAY & CLASSIFIED ADVERTISING**

**SALES COORDINATOR**

Krista Morel

TEL. 513-531-2690 x11311

[krista.morel@fwmedia.com](mailto:krista.morel@fwmedia.com)

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# Getting Worked By the Wood

The garbage disposal was clogged with a chicken bone. And after three unsuccessful attempts to grind up the bone (and a little profanity for good measure), I reached my hand into the slimy hole.

What I pulled out was my beloved Sinn 656 wristwatch, which had gotten knocked into the sink while I was rinsing the dinner dishes.

The watch's crown was battered, its waterproof seal was broken and within a couple weeks the watch stopped ticking.

Normally, this would be a \$30 fix. Go buy a Timex at Target and be done with it. But a lifetime of woodworking has made that strategy impossible.

We woodworkers normally view the craft as an activity where humans perform brutal acts on dead trees to shape their dried carcasses to our liking.

However, what we rarely take note of is how working with this raw material changes us.

My love of handmade furniture changed the type of car I drive. When I was shopping for a used car last year, my research went way beyond brand names and dove deeply into the type of engine, plus which factory it was assembled in. Some factories take more care in bolting down your water pump than others. Care counts.

Woodworking has changed the beer I drink. I found a local brewery that sells its beer in half-gallon glass growlers. The beer is fresher, cheaper (\$5.99) and there's no wasted cardboard, bottle caps or bottles to

recycle. Plus, I know the name of the guy who developed the recipe.

Woodworking has changed what I hang on our walls at home. I've found a network of self-taught artists, many with disabilities, who produce work of astounding beauty that is made with care and detail. Like woodworkers, they produce these works despite an industry of mass-produced Matisse posters.

But most of all, woodworking has taught me to reject things that are disposable and wasteful and embrace things that are well-made, even if they are less sophisticated or sometimes more expensive.

To some, this might sound like a political column. I assure you it's not. My personal politics don't fit any party's platform. I frustrate both my liberal and conservative friends at every dinner party.

Instead, this column is an acknowledgement that working with wood has changed me more than any institution or individual has ever managed to.

And I need no more evidence of that than what I did after I fished my watch from the sink. I sent it out to be fixed, even though I could buy 10 watches for the price of the repair. My Sinn isn't flashy, but it's so well made that I could never pitch it.

And that is exactly what I want future generations to think of my furniture. It is simply too good to ever throw away. **PW**



*Christopher Schwarz*

PHOTO BY THE AUTHOR

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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*, 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.



# Why Don't You Ever Show Table Saw Jigs for a Unifence?

**W**hy is it that all the jigs and accessories you show for table saws are always for Biesemeyer-type fences, and you never show jigs constructed for the Unifence—there are a lot of Unifences out there.

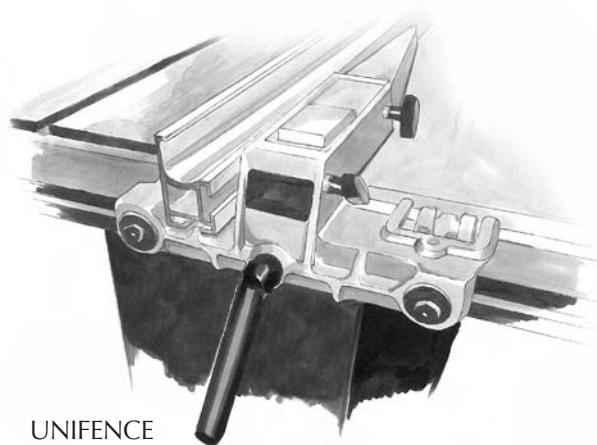
Dan Freitas  
Anchorage, Alaska

*It's a good question.*

*We prefer the Biesemeyer-style T-square fence system over all others. I had a Unifence for many years and it does have its advantages. But when it comes to pure simplicity and robust accuracy, there is nothing better than a Biesemeyer-style fence in my opinion.*

*So our jigs are built to fit the fence system we prefer. That's the honest answer. I also think it's fair to say that it would be easy to adapt any of these fence-riding jigs to accommodate any brand of rip fence.*

— Christopher Schwarz, editor



UNIFENCE



BIESEMEYER

## Dog Hole Drilling Dilemma

I'm wondering if you might know of a source for a 1" upcut spiral router bit to drill holes in the workbench I have (almost) completed.

The usual 3/4" dog holes look too small—the top is 3" x 30" x 8' maple. I successfully bored four 1" holes through the Veritas twin-screw end vice (with 6" jaws), but I'm hoping to use a router to make the rest. Or maybe you have a different suggestion?

Don Bowen  
via e-mail

*The reason most people choose 3/4" dog holes is that they hold a wide variety of bench accessories, including holdfasts, bench anchors and the like. I'm a big proponent of 3/4" holes because they are easy to add with a drill.*

*However, if I were going to rout out 1"-diameter dog holes, I would make a template and use a template guide that was paired with a smaller-diameter (less expensive) upcut spiral bit, such as a 1/2". That would allow you to make whatever size hole you wanted.*

*Another option would be to bore them out using a 1"-diameter Forstner bit and a shop-built jig. The jig could be as simple as a block of wood with a 1"-diameter hole drilled in it to guide you. With just a little practice, you'll be drilling holes that are straight enough for a benchtop.*

— Christopher Schwarz, editor

## Bevel-down Planes are Neither Antiquated or Outdated

In the August 2009 issue of *Popular Wood-*

*working* (#177), Lonnie Bird had an article about bevel-up planes.

Although his coverage of the subject was quite well done, and at the usual level of excellence we've grown accustomed to and expect from Mr. Bird, I take exception to his reference to bevel-down planes as, in his words, "antiquated" and of "outdated design."

The currently manufactured bevel-down planes from Stanley, Lie-Nielsen, Clifton, Wood River and Veritas (to name only a few), and a whole lot of other manufacturers both past and present, have been serving us quite well for many years and will continue to do so for many more.

There is plenty of room for all the various designs of the many planes available to

CONTINUED ON PAGE 12

us. They each excel in their own respective intended purposes.

Thus, the bevel-down design is as far from being outdated as our many other “ageless” and still quite useful tools.

James Clarke  
Hilton, New York

## Child-safe Finishing Advice

My daughter has just had her first baby, and I’ve been tasked with making a crib. I’ve settled on a design that converts into a double bed. This will be my first real woodworking project, and while I feel up to the woodworking side, I am unsure of how to finish it.

I have decided that trying to get a consistent finish between all of the slats would be virtually impossible, so I’m planning to finish the parts individually then assemble the crib. But as to what finish to use, I don’t have a clue. It will have to be something safe (as it’ll start off as a crib) and durable because my daughter lives in another part country and I won’t be able to touch it up.

Is there a relatively simple finish that you can recommend?

Matthew Riehl  
via e-mail

*All finishes are safe after a couple weeks once the solvents have evaporated. I think the easiest finish to apply is a wiping varnish. Just thin any varnish with paint thinner (mineral spirits). I use three parts varnish to one part paint thinner.*

*Rag on a thin coat, let it dry then sand with a fine sanding sponge to level the finish and remove any dust nibs. Repeat this process. Add coats until you get the look you want. Usually, five or six coats does the trick.*

*Most beginning finishers have great luck with this finish, and I still use it myself.*

*Varnish is quite durable, so it should do the trick.*

— Christopher Schwarz, editor

## Riding the Fence While Ripping

On occasion when ripping stock on my table saw, I notice the stock pulling away from or not riding tight to the rear of the fence. Sometimes when this happens, if the board is excessively long, the ripped edge becomes slightly concave, then it needs to be fixed on the jointer (basically negating the reason for ripping the board in the first place). The

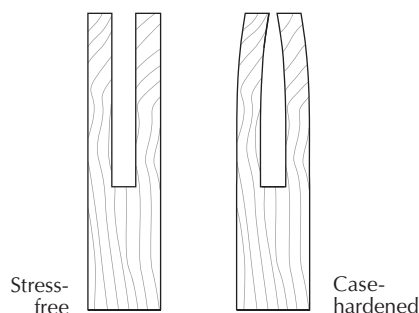
problem also seems to be unpredictable, and once it starts, I’m not able to get the board back tight to the fence.

For example, I recently ripped one board with no trouble. Then on the very next board, it did not ride tight to the fence (I’d made no adjustments to the blade or fence).

I don’t have a really expensive saw – but it’s not a cheap one, either. I’ve always faithfully followed all the tuning and setup recommendations. I’m using a high-quality blade, with the blade raised to where the gullets are just above the stock, and I feed the stock slowly. Everything is parallel. The fence is parallel to the blade; the blade is parallel to the miter slot (though that’s not pertinent to ripping).

Any help you could offer would be greatly appreciated.

John E. Brady  
East Berlin, Pennsylvania



*The issue is with your wood, not your saw. What you are experiencing is due to either case hardening or reaction wood.*

*Case hardening is caused by improper drying that leaves uneven moisture content within the board. Reaction wood is from a part of the tree that was under stress while the tree was alive, such as a tree growing on a hillside or part of the tree near a branch or crotch.*

*Although these boards may appear stable, they are under stress internally. When you cut into them you cut across cells that are under tension. It’s a lot like cutting a stretched rubber band; when you make the cut the tension is released and the wood moves.*

*One thing you can do is use a riving knife or splitter behind the blade. This will keep the wood from pinching the blade as you cut. You can also rip your wood wider than you need, then remove the extra width with your jointer or a handplane. This will also remove saw marks and get you closer to finishing.*

— Robert W. Lang, senior editor

## What Plane Should One Have for Finish-planing End Grain?

Having just finished a Stickley No. 516 encyclopedia table, and cutting the 27" square top, it became apparent to me that finish-planing the end-grain edges of the top might be a bit easier using a plane other than an adjustable-mouth block plane. I would appreciate your ideas on which plane to use.

Your descriptions in “Handplane Essentials” (Woodworking Magazine Books) of the low-angle jack plane, the low-angle smoothing plane and the low-angle jointer plane say that the planes are “technically block planes,” so I think I’m on the right track. If I’m going to use the plane on tabletop end grain from 18"-20", to as wide as 30", which of these planes would you use?

Greg Humphrey  
Fort Madison, Iowa

*It’s true that low-angle planes can be good for end grain. But when dealing with tabletops I just use a low-angle block plane. It’s more maneuverable. And you are going for looks, not for perfect squareness.*

*If I were going for perfect squareness on a shooting board, I’d get the low-angle jack because it’s the most versatile size. PW*

Christopher Schwarz, editor

## Question? Comment? We want to hear from you.

*Popular Woodworking welcomes comments from readers about the magazine or woodworking in general, as well as questions on all areas of woodworking. We are more than happy to share our woodworking experience with you by answering your questions or adding some clarity to whatever aspect of the craft you are unsure about, and if you have a complaint, we want to address it whenever possible.*

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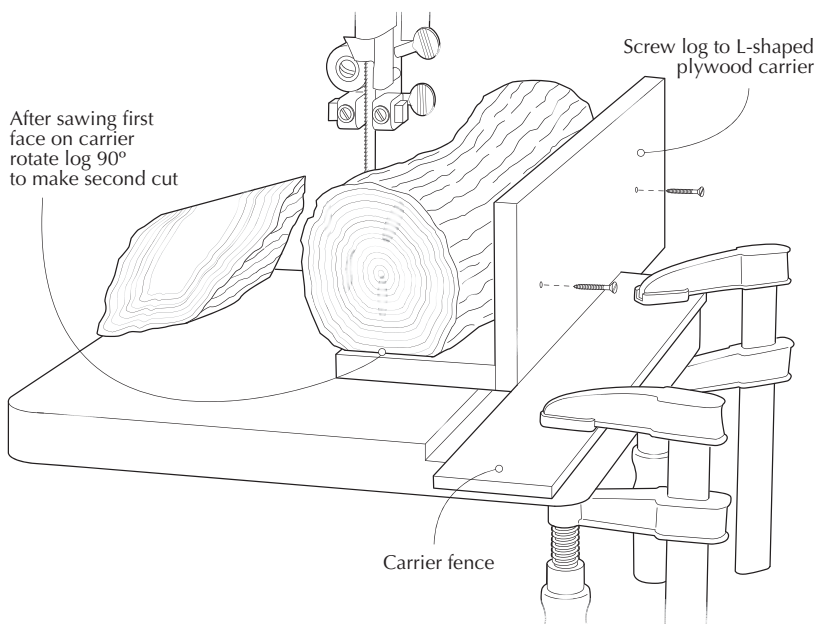
## THE WINNER:

# Band Saw Lumber from Logs

**S**mall logs from a local downed tree are a great windfall of free lumber for small projects. They're easy to saw into boards on the band saw once you have established a couple flat reference surfaces for safe feeding. I use a simple L-shaped carrier jig screwed together from scrap plywood to make the initial cuts.

Screw the log to the carrier using screws just long enough to provide the necessary purchase. Set up a fence on the band saw to guide the carrier while making an initial cut from one edge of the log. Then reattach the log to make a cut on an adjacent face. At that point, you can remove the log and rip it into boards using just a regular fence.

— Ric Hanisch, Quakertown, Pennsylvania



## Cash and prizes for your tricks and tips!

Each issue we publish useful woodworking tips from our readers. Next issue's winner receives a \$250 gift certificate from Lee Valley Tools, good for any item in the catalog or on the web site ([leevalley.com](http://leevalley.com)). (The tools pictured below are for illustration only, and are not part of the prize.)

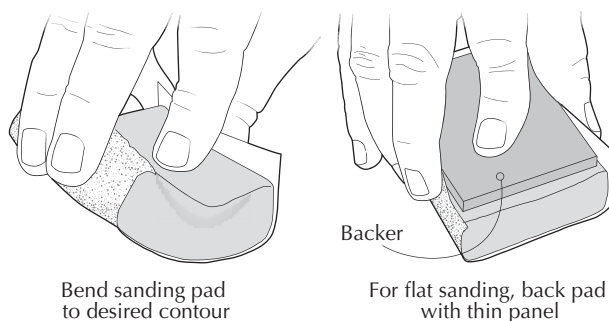
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## Sanding Help from the Garden

In my work as a luthier, I sand a lot of curved surfaces. I've found that I can make perfect sandpaper backing pads from "kneeling cushions" sold for garden work. Available at home-supply stores for about \$6, these 1" x 7" x 16" foam cushions can be cut up to make any size sanding pad you want, and you can get a lot of them from one cushion. One of the best things about this stuff is that it can easily be bent in use to suit all kinds of contours, including curved edges and mouldings. Or, if you want to keep a pad flat, simply hold or epoxy a flat backer on top of the piece as you work. The foam also resists water and mineral spirits, so it's great for wet-sanding finished surfaces.

— Bil Mitchell, Riegelsville, Pennsylvania



CONTINUED ON PAGE 16

## Laying Rubber on Clamps

While clamping up an assembly, I found my hands slipping on the wooden clamp handles. I was reminded of my teenage years playing foosball, when I had the same problem with the wooden game-table handles. I realized that the grip-improving trick I used then would also work now.

I cut up a 1 $\frac{1}{8}$ "-diameter 10-speed bicycle inner tube (just \$3) into sleeves a bit longer than the clamp handle. I wiped away any internal powder, then stretched the tube over the handle, with the clamp secured to the benchtop. Once the tube was in place, I stretched it outward to create a tight fit, then cut it to length.

If a handle is a bit too fat to stretch the rubber onto, I simply install it on a smaller handle first, then backroll it to

Keeping inner tube centered, stretch it down onto clamp handle ...

... then pull home

If necessary back-roll tube into ring that will roll onto larger handle

to remove it. In its ringed form, it will then easily roll onto a somewhat larger-diameter handle. For smaller-diameter handles, use a slightly narrower tube. You can often get old tubes for free from your local bike shop.

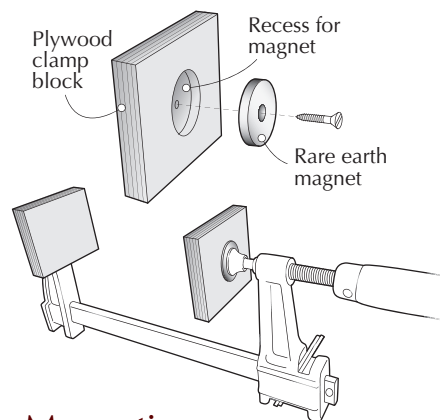
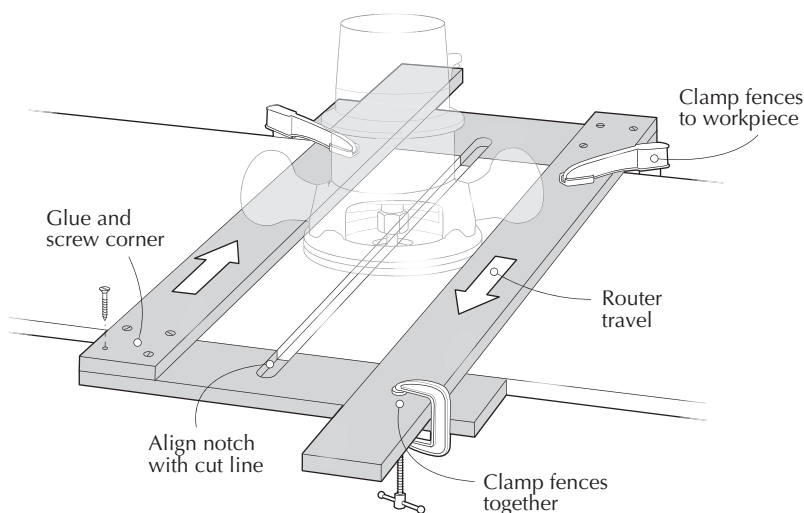
— Ed Armelino, Redding, California

## Adjustable Dado-routing Jig

I wanted to rout some shelf dados, but I didn't have the correct-size bit for the job. Fortunately, my dad stopped by and, as usual, had the answer to my problem. We cobbled up a couple L-shaped wooden fences from 3"-wide straight scraps, squaring each of the units carefully before gluing and screwing them together at the corners. After laying out the dado on the stock, I clamped the two fences together against the workpiece as shown, with the two router-bearing fences spaced at the appropriate distance from each other.

Pushing the router forward against the left-hand fence, then pulling it back against the right-hand fence, yields the exact width of cut in two passes, as long as you're using a bit that's at least half the width of the desired cut. The sweet thing about this setup is that you can make multiple dados of the same size by simply shifting the clamped assembly down the board for each subsequent cut. Once you've made your first dado, the notches in the end pieces serve as a reference for aligning the next cuts.

— Doug Corman, Missoula, Montana



## Magnetic Clamping Blocks

Difficult glue-ups are troublesome enough without having to position clamp pads as part of the process. I've tried using hot-melt glue, double-sided tape and various other methods to hold pads onto clamp jaws, but they always seemed to fall off at just the wrong moment. I recently tried using rare earth magnets, and they work very well. One of the best things about magnetically attached clamp pads is that they can be removed in an instant for use on whatever particular metal clamps you need for the job at hand.

The easiest magnets to use are those with a countersunk hole through the center (available from Lee Valley, [leevalley.com](http://leevalley.com)). The 1"-diameter magnets are large enough that you can just screw them directly to a plywood pad. However, if you want to use the more economical smaller sizes, it's best to flush-mount them into a recess drilled with a Forstner bit.

— Craig Bentzley, Chalfont, Pennsylvania

## A Blade-cleaning Tray

While removing pitch from my table saw blades is not a difficult task, I couldn't find a cleaning container that worked well for the job. I've tried aluminum foil and plastic containers that were either too large or tapered at the bottom, making them impractical to use. Then I accidentally dropped a blade into an empty five-gallon bucket and discovered that it fit the bottom of the bucket just right. I cut off the bottom at 1 $\frac{1}{2}$ " and found it to be ideal for the task, allowing easy access to wipe the blades while they rested in the cleaning solution. When not in use, the "tray" hangs on the wall with the blades, with its lower lip resting on a nail.

— Dennis Gagnon, Villa Park, Illinois



## Snipe-free Planing

Like most planers, mine snipes, overcutting a bit at both ends of a board. Sometimes I'll simply cut off the sniped areas if I can afford the extra board length. However, with precious woods, that can mean trashing a few bucks. Another technique is to closely precede and follow the board with a scrap of the same thickness. But that requires the right scrap and I find the process clumsy, especially when making several passes. Here's a better approach that only takes a few minutes to set up:

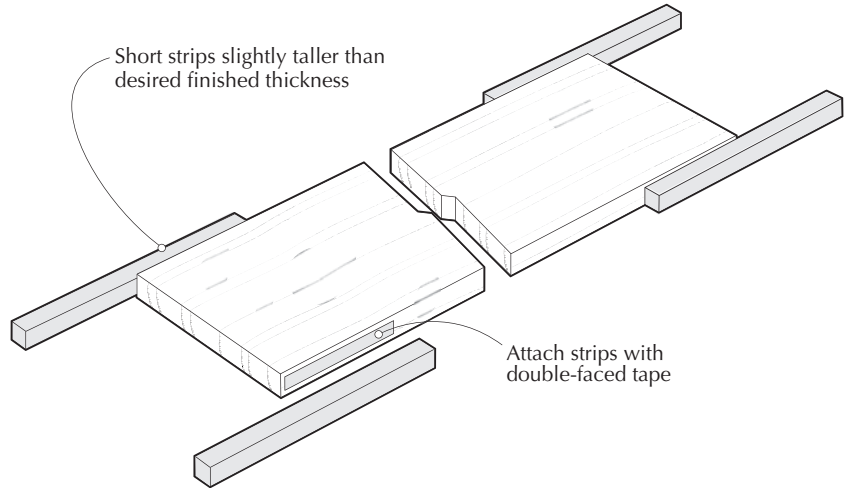
First, joint one face of your board and both its edges. Rip some lengths of straight scrap about 10" long and just a bit taller than the desired finished thickness of the board. Working on a flat surface, attach the strips to the edges of the board at both ends using double-faced tape. Extend the scraps beyond the ends of the board about 4", then clamp the strips to the board for a few moments to ensure a good tape bond. Now when you feed

the board through the planer, the scrap will take the snipe instead of your stock.

The same principle allows safe feeding of short workpieces. Simply tape the workpiece to long scrap "runners" in the same fashion.

But in this case, make sure that the runners start off at least as thick as the stock so the whole assembly will be pulled safely through the planer. **PW**

— Paul Anthony, PW contributor



# A Period Finish

‘Authentic’ look is, at best, a guess.

As period woodworkers, we strive to produce the most accurate furniture possible. We delight in the use of period tools, for they impart authenticity impossible to achieve by other (modern) means. But when it comes to finishing our projects ... well ... er ... most of us don't use authentic period finishes. And I think I understand why. In this article, I'm going to discuss what I know and don't know about period finishes. After reading this article, you may decide to try an authentic period finish on your project ... or not.

## Period Finishes

Period craftsmen had a wide variety of finishes at their disposal. Oil-based paints were used and probably more frequently than surviving pieces would suggest. The Charles Plumley inventory of 1708 included two quarts of “varnish” and two “varnish” brushes. The two quarts were valued at nearly a week's wage for a journeyman. It may have been some sort of concentrate.

Varnish is an imprecise term now and was likely even less precise 200 years ago. It's impossible to say whether Plumley had two quarts of oil-based, wood rosin “varnish,” or two quarts of shellac flakes dissolved in alcohol (possibly called a “spirit varnish” then) or some combination of a half-dozen different ingredients including, but not limited



**No fooling.** I'm not trying to fool anyone with this finish. Obviously this is not an antique chair. But the original finish used 250 years ago probably wouldn't look right to you.

to, lacquer, plant-derived resins, or shellac in various forms. These could have been dissolved in “spirits” – some sort of volatile that could include wood-based turpentine,

alcohol or even linseed oil.

Linseed oil is found in account books for cabinetmaker's shops (such as John Head, who purchased gallons at a time). Linseed oil may have been used as either a simple shop finish by itself or as an ingredient in other finishes. Ditto, beeswax can be found in period documents. Again, it could have been used as a finish by itself, was an ingredient in other finishes, or simply to lubricate plane soles.

Period craftsmen had various colorants they could add to make stains or tinting varnishes (there's that word again). I've not come across these in association with cabinetmakers' shops and I'd be surprised to. Legend has it that brick dust was used universally as both a colorant and an abrasive powder. I've tried this (both ways) and it works, though commercially available dry earth pigments are easier to obtain.

Eighteenth-century bricks were different from modern bricks. I used 18th-century bricks from Philadelphia. I can imagine how a single brick may not appear as either a purchased item or an item of sufficient value to warrant its inclusion in any period document. Marking gauges likewise don't typically appear in probate inventories, but I think it's safe to assume they were present.

To those of you who find this fascinating, I apologize. In the world of period furniture making there are apparently several very slippery slopes. Here is another one: Check out Appendix V of Jeff Greene's must-have book “American



Furniture of the 18th Century” (Taunton) for a list and description of period finishes. The Internet is replete with web sites detailing the process for brewing your own versions of all of these. Most that I found were associated with luthier work, so you might want to start there.

So we know period furniture makers had access to a wide range of finishes. What did they actually use? And how do we know? Well, the quick answer is: We don't know.

Extant period furniture has all manner of “stuff” on it, some of it intentionally applied, some of it, let's call it “patina,” was unintentionally applied. Theoretically, we should be able to analytically determine what the “original” finish was. But of course that's a difficult proposition. The bottom layer might be linseed oil, for example. Then a varnish may have been applied over that. Was the varnish the original finish? Or was it applied after delivery? Famed New York antique dealer Israel Sack popularized “patina” and the value for “original” finishes. Before his time, “patina” was “dirt” and furniture restorers removed it. He wrote in the forward of his son Albert's book, “Fine Points of Furniture: Early American,” about his time in the trade:

“The finest pieces had to be taken apart, scraped and finished inside and out before they could be sold (to most customers). Innumerable choice pieces were absolutely ruined by poor restoration. There is nothing which hurts (the value of) an early oak piece so much as planing, scraping, and finishing.”

Here, Israel Sack discussed his value for original finishes and his disdain for refinished furniture. Keep in mind that he was a furniture restorer before becoming an antiques dealer, so he knew more than a bit about the subject. But Sack, who established the value for original finishes, also included this gem:

“Mahogany and walnut, when properly restored, are not necessarily spoiled.”

I suspect that just about everything we see has been refinished. And just because the finish looks old now, it doesn't mean it was original then.

## Original Finish

So what was the original finish? Using state-of-the-art equipment, and leveraging a variety of historical resources including paintings of period interiors, the museum

*“There's no such thing as an original finish.”*

■ David DeMuzio  
Head Conservator of Wood  
Philadelphia Museum of Art

conservators I know suggest original finishes were spartan. Linseed oil and a bit of beeswax probably comprised the original finish on carved chairs like mine, for example. A film finishes couldn't practically be rubbed out when laid over intricately carved surfaces. It would also fill up the nooks and crannies, dulling the detail.

The baroque sensibility (some believe rococo is a form of baroque both aesthetically and linguistically) of light and dark, near and far, would also be harmed by a film finish. Philadelphia furniture makers seemed to intentionally use surface texture to enhance the contrast between carved areas and “bright” smooth areas made reflective with wax. Oil and wax offered period craftsmen the artistic control that a film finish over a carving would not.

I hasten to add that not all fine pieces were finished as simply. They had varnishes and we can assume they used them. There were



*“Original” finish. Note the color and texture on this chair from the 1760s. Despite its age and wear, the beauty of this work still shines through.*

people in the 18th century who could do this sort of work. Musical instrument makers applied film finishes to their products to affect tonal quality. And I believe there were specialty finishers in London and Colonial Philadelphia at the least.

What I'd like to leave you with on the subject of original finishes is doubt. I'm skeptical, and I think you should be too. I mean, there's still significant debate about the restoration of the Sistine Chapel's ceiling. Did the Vatican do the right thing? They removed varnish that Michelangelo may or may not have applied.

## What about Patina?

Perhaps the biggest problem I have with original finishes is that they very well may not have been the finishes that people of the period recognized. They certainly aren't the finishes that people who love antiques fell in love with. And this issue goes to the very heart of what reproduction furniture making is all about. Is the goal to represent how furniture looked when new? I don't know the answer.

Whatever the condition when new, period furniture almost certainly changed rapidly once it was delivered. Homes were heated with smoky fireplaces then. Folks cooked meals in their living rooms, and they lit their homes with candles made of animal fat or lamps filled with whale oil. There were no screens on their windows to filter any of the dust from a bustling street or a farmer's plow.

In very short order, furniture would have been coated with dirt and grime. The cleaning process pushed filth into recesses (and pores) where it would collect (often further punctuating the design). And dirt in Philadelphia is made of the same sort of stuff that's on your sandpaper. So just the process of weekly wipe-downs would have changed surfaces fairly quickly.

## A Sympathetic Finish

My goal is to create a finish that is sympathetic to the originals. The end product won't look like it's 200 years old. But it shouldn't look perfect and new either. The goal is to produce an item that fits people's expectations of Chippendale furniture.

Period furniture exhibits identifiable surface characteristics that we can approximate. The key is understanding the goal.



**Liberal oiling.** I began creating my finish with a liberal dose of boiled linseed oil. The resulting dull surfaces probably best approximate a true original finish.

Setting aside wear, old furniture takes on a certain color, generally has filled grain and has a texture associated with a build-up of grunge.

### Color

Wood changes color with age. Dark woods lighten. Light woods darken. In an August 2009 *Popular Woodworking* article (issue #177), Senior Editor Glen D. Huey finished his walnut chest over drawers with amber shellac and added a touch of red to create the lighter color of aged walnut. New mahogany can be tan or pinkish in color. It becomes darker and redder with age.

Due to the sculptural nature of my chair project, there's an additional concern. Areas of exposed end grain, especially when oiled, get much darker than other areas. So the knees of chairs are often very dark – sometimes almost black.

### Filled Grain

Old furniture typically has filled grain. Woods such as mahogany have open pores that fill up with dirt, grime and finish. You can fill the pores of new wood with any number of substances, from drywall joint compound to dry earth pigment to specially designed pore fillers (which seem to be joint compound with dry earth pigments added). Grain fillers change the color of wood, so that's a consideration. Some may be designed



**Wipe on, wipe off.** I mixed burnt umber dry earth pigment with linseed oil and applied it with an acid brush. I wiped off the excess to highlight the high spots. The goal was to darken the knee and foot, where the exposed end grain was most pronounced. What I have here essentially is slow-curing oil-based paint.

to be stainable while others are not, so that, too, is a consideration. Whatever you choose, know that in areas of exposed end grain and areas of high wear, old furniture takes on an almost plastic-like smoothness.

### Grunge

On carved furniture especially, built-up dirt and grime can significantly affect the look of a piece. Grunge alone has certain identifiable traits. It's generally black and has a range of textures from fairly smooth to fairly gritty. Grunge collects in nooks and crannies that can't be easily cleaned. It also collects on broad smooth or flat surfaces where end grain provides it a foot hold.

### A Period Finish

Creating a finish that looks like an authentic "original" finish requires a lot of faux finishing materials and techniques. I'm not sure I'm willing to invest the time that would take. So I've chosen to add 10-20 years to my chair. And I've done it with materials you have or should have: boiled linseed oil, Butcher's wax, shellac flakes and dry earth pigments (I used Liberon pigments available at [toolsforworkingwood.com](http://toolsforworkingwood.com)).

So what is an original finish and how do we apply it to our work? Heck if I know. What I do know is that the finish referred to



**Grunge.** I mixed lamp black with linseed oil and applied that in a similar fashion to create the color of grunge. Most of the dry earth pigments you buy are very finely ground. But Bitumen black is the exception. It makes an excellent gritty texture. It can be applied with wax, oil or shellac.



**Sealed.** The dry pigments can be removed pretty effectively by adding more oil and wiping. So I applied a light coat of buttonlac shellac to seal in the color. Much more needs to be done to this knee and obviously the foot. From here I can add more tinted oils (with less of a chance of disturbing what is under the shellac) or just tint the shellac.

as the "original" finish is not what furniture left the builders' shops with. Chances are, you wouldn't like that finish, and it may leave your period reproduction furniture looking, er ... inauthentic. **PW**

Visit Adam's blog at [artsandmysteries.com](http://artsandmysteries.com) for more discussion of traditional woodworking techniques.



# To Build or Buy?

Cost, time and a spouse's patience help determine the course of action.

It's a dilemma nearly every woodworker must face. Whether you are a weekend warrior or a woodworking pro, eventually you will ask yourself, "Should I build or buy?" I know for many, the thought of building their own furniture was the reason for getting into woodworking in the first place, and buying furniture is borderline sacrilegious. But we need to be realistic. We simply cannot build everything. For the pros, time is money and working on a personal project means one less commission for a client. And for you hobbyists, well, you barely get enough shop time as it is. But building things for our own homes is really at the heart of what we do. The need to surround ourselves with our own creations is natural, instinctive and very important to us. But things such as immediate gratification and cost are always there to confuse the decision-making process. There has to be a better way!

That's the thought that ran through my head as my wife and I pondered the furniture (or lack thereof) in our new house. Here's a small sampling of some of the things we need: a kitchen table and chairs, entertainment centers for both the family room and bedroom, office furniture, a coffee table, a closet organizer and a new bedroom set.

So how do I decide what to build and what to buy? Considering I won't have a shop right away, things that are needed urgently are not good candidates for my project list—for example, the kitchen table and chairs.



**Analysis.** Sure, as a woodworker, you could build all the furniture you need—but that may not be the most practical approach.

As much as I would love to build these items, we can't go very long without a place to eat. So let's break it down. A kitchen table is a simple project that would take a week or two, at the most. But how about those chairs? Well, that's a different story. You either need to do a bunch of mock-ups or you need to find a set of plans that are close to what you want, and modify them accordingly. Assuming I find an appropriate plan, I still have the challenge of making the entire thing look nicer than the table and chairs my wife just fell in love with at the store. All things considered, this is one project I am not going to tackle. If I had a fully functioning shop, I might consider making the table and buying the chairs. That's an easier pill to swallow than giving up on the entire grouping.

Now although I eventually arrived at a decision concerning the table and chairs, I may have saved myself some time and frustration if I had some simple way of addressing the build-or-buy question. So after some serious thought over a cup of coffee at my new kitchen table, I've come up with a quick, decision-helping worksheet that may in fact do just that. All you need to do is answer the following nine questions as honestly as possible then add up your score. The final result tells you whether you should build or buy. As it is, the worksheet will give you a very generalized objective answer.

## The Wood Whisperer's Score

So just for fun, let's test the quiz with a real-life scenario. Our kitchen features a small

## Online EXTRAS

To download a PDF of the Wood Whisperer's Build-or-Buy Worksheet, go to:

[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)

## Wood Whisperer's Build-or-Buy Worksheet

### Difficulty of the Project

- 1 - Very difficult. Will require research, mock-ups, new tools or new skills.
- 2 - Moderately difficult. Will be a good test of your skills but nothing you can't handle.
- 3 - Easy. Should be a slam dunk!

### Urgency of Project

- 1 - We needed it yesterday.
- 2 - Can live without it for a couple months.
- 3 - It doesn't matter when it's completed

### Likelihood of You Actually Finishing the Project

- 1 - I am not much of a completer, but I love starting new projects!
- 2 - Most of my projects are completed but I occasionally lose interest and abandon one here or there.
- 3 - I finish every project that comes through the shop.

### Recipient Patience Level

- 1 - If it's not done on schedule, you are in trouble!
- 2 - It would be nice if it was completed on schedule, but if it takes a little longer it's OK.
- 3 - As long as it's made by you, your recipient has the patience of a saint.

### Cost Savings

- 1 - It will actually cost more to build it yourself.
- 2 - It's about the same price.
- 3 - Building it yourself saves you money.

*If your score falls between 8 and 17, you should buy it. If your score falls between 19 and 27, you should build it. If your score is right in the middle at 18, see below for suggestions on how to break the tie.*

### Your Stubborn Pride

- 1 - You are easygoing. One less thing on your to-do list!
- 2 - You prefer to build it yourself, but the purchased piece is welcome in the house.
- 3 - You never let him/her live it down if they actually purchased a piece of furniture.

### Quality Level of Store-bought Product

- 1 - Much better than you could build in your shop.
- 2 - About the same quality construction and materials.
- 3 - They can't even come close to your level of craftsmanship.

### Visibility the Item Will Get in the Home

- 1 - No one will ever really even see it.
- 2 - Some people might notice it when they visit.
- 3 - It's in plain view and would get a lot of attention from guests.

### Need for Customization

- 1 - No specific size/color/species requirements (anything will do).
- 2 - It doesn't have to be perfect, but there is some consideration given to size/color/species.
- 3 - Very specific size/color/species requirements.



**Store-bought.** These two stools were bought rather than made. The low cost, compared with the time and money it would take to make them, wasn't worth an argument.

my estimation, building these stools would have cost me roughly \$20-\$30 more in wood alone. This doesn't even take into account the finish materials and the shop time. Giving the cost more weight in the quiz would definitely push me deeper into the "buy it" recommendation. So feel free to alter the values of the quiz as you see fit, especially if your score is 18.

If you folks are anything like me, you have this vision in your head that eventually everything in your house will be built by you. But I have to be realistic. In order to keep my wife happy, I need to operate on a certain timetable and occasionally swallow my pride. A quiz like this is helpful to me because it serves as an "impartial third party," giving me a gentle nudge one way or the other. Now you and I both know that you will probably just do what you want to do anyway. But at least if the quiz results come out in your favor, you can use it as part of your argument. **PW**

*Marc is a professional woodworker as well as the creator and host of The Wood Whisperer ([thewoodwhisperer.com](http://thewoodwhisperer.com)). The Wood Whisperer (an instructional Internet woodworking show) represents Marc's three passions: woodworking, technology and education.*

island that would look great with a pair of bar stools. Unfortunately, given the close proximity of the kitchen table, we decided against it. As luck would have it, we recently came across a unique pair of stools. Instead of having a full round seat, these stools feature one straight side. The low profile design was a little strange to the eye at first but would fit our kitchen perfectly. I pulled out my phone and began taking pictures from all angles. Although these stools looked pretty sturdy, I just knew I could improve on the design. My mind began to race with all the possibilities but before I could get too carried away, I received a little tap on my shoulder. Apparently, my wife was having a different reaction to the stools. She pointed to the price tag: \$90 for two stools. She indicated that the finish would match perfectly. Then she executed the death blow by reminding me that I don't even have a shop right now. I had no choice but to raise the white flag and surrender. With as much dignity as I could muster, I

picked up the box and placed it in our cart next to my Honey Nut Cheerios. Later that evening, I un-boxed the stools and found that they were completely assembled! And to add insult to injury, they had the audacity to be sturdy and well-built. At this point, there was absolutely no way I could deny that purchasing these stools was the right thing to do. Sigh ... so let's see what the quiz would have told us. Here are my answers in order: 2, 2, 3, 2, 1, 1, 2, 2, 2 = 17

My total score was 17, just barely squeaking into the "buy it" recommendation. That does seem a little odd because at the time of purchase, the decision seemed so clear-cut. So when taking this quiz it's important to remember that it doesn't take into account the fact that some questions carry more weight than others. Perhaps you have a very impatient recipient. Maybe the need for customization is paramount. For me, cost was a major factor. After our recent move, things are pretty tight financially. And from

## About This Column

Our "Wood Whisperer" column features woodworking thoughts and ideas, along with shop techniques from Marc Spagnuolo. Most columns have a corresponding video related to the techniques or views expressed in the column available at [popularwoodworking.com/video](http://popularwoodworking.com/video).





# American 'Bad Axe' Saws

A sawmaker builds tools inspired by the classic American forms of the 19th century.

The recent bumper crop of new handsaw makers has produced a lot of beautiful tools that cut brilliantly. And while almost all these new makers are in North America, the saws they build look decidedly British with their brass backs and handle designs.

Now there's a new sawmaker in Wisconsin who is making backsaws that are decidedly American and hearken back to the golden age of sawmaking kicked off by Disston & Sons.

Bad Axe Tool Works currently makes two joinery saws that are different in every way from the other premium makers' wares. We borrowed the saws for a month and took them for a test drive. Here are some of our impressions.

The saws are available in two lengths – 16" and 18". You can get them with either a folded stainless steel back or a folded steel back that has been blued by a gunsmith (which is almost too sexy to write about in a woodworking publication).



**A fine line.** The logo on the Bad Axe saws looks more like a perfect engraving. The rest of the saw is at the same level of quality.



## Bad Axe Backsaws

**Technoprimitives LLC** ■ 715-586-0233  
or [technoprimitives.com](http://technoprimitives.com)

**Street price** ■ \$215 to \$235

For more information, go to [pwfreeinfo.com](http://pwfreeinfo.com).

If you are a saw geek (hands up, people!) the sawmaker, Mark Harrell, will file the saws to almost any configuration you desire. However, he uses two standard filings that are a great place to start. Harrell has run a saw sharpening business for many years and has refined his hand-filing practices to a high art.

Both saws use a .025"-thick sawplate. The rip tooth has a progressively relaxed rake at the toe and heel. This makes the saw easy to start, aggressive in the cut and resistant to sticking at the heel. He also files a little fleam on the teeth, which makes the ripping smoother.

His crosscut tooth also has a progressive rake to make the saw easier to start. And it has more fleam than the rip-tooth version. This tooth works remarkably well for both rips and crosscuts and might just be the first commercial all-purpose saw I've ever been happy with.

The 16" saw I used had 11 points per inch, a stainless steel back and was filed for

crosscut. It is remarkably smooth and swift. The 18" saw had 10 points per inch and a rip tooth. It also was quick, which is a good thing with a tenon saw.

These saws aren't just about the teeth. The cherry handle has no hard edges and is quite comfortable. The logo on the blade is astonishingly crisp – I've never seen one this fine. And the medallion and nuts in the handle are just right. All in all, the saws are A-plus work, from the teeth to the tote.

The 16" saw is \$215. The 18" tool is \$235. If you are not sure what sort of configuration is right for you, contact Harrell through his web site at [Technoprimitives.com](http://Technoprimitives.com) and tell him what sort of species you typically cut and what sort of projects you build. He'll start you down the road to becoming a saw geek.

—Christopher Schwarz

## Makita Delivers a Compact Impact Driver

The newest members of the handheld power-tool party are impact tools. Everywhere you turn you see impact drivers and wrenches being pushed as the best tool for anyone's shop. But we've often wondered just what woodworkers need with an impact driver—there's an occasional use, just not a huge need for this tool.

But Makita has just introduced an impact driver that makes it an easy addition to a woodshop. The Makita BTD144 is not your ordinary impact tool. This impact driver has three settings that allow you to dial in the amount of speed (0-1,300/0-2,000/0-2,600 rpm) and torque (0-1,300/0-2,800/0-3,400 impacts per minute) you need. If you select the lowest setting, you have a small amount of torque and could use the tool as you would a standard drill/driver. But when the need for big-time drivability arises, switch settings with a button on the tool's base, and you have ramped-up torque to drive long screws.

The BTD144 motor is brushless. Just what does that mean to you? No more brushes to wear and change out after a couple years. But more than that, brushless motors are

highly efficient (20 percent more, according to the company) and very reliable. They run more quietly and are cooled by conduction, which means there is no need for air to flow around the motor. So, the motor can be encased to keep dirt and dust out.

The only disadvantage of a brushless motor is its higher initial cost, but you can recover that cost through the greater efficiency over the life of the motor. And if you have any other Makita 18-volt tools and batteries, the BTD144 fits right in. You can purchase this impact driver with or without a new battery and charger.

Makita's newest impact driver is compact in size (only 5½" long) and weighs in at just more than 3 pounds, but the BTD144 delivers 1,420 inch pounds of torque. The ¼" hex chuck is easy to use and simple to change; just snap a drill bit or driver tip into the tool and you're ready to roll.



**Makita Impact Driver**

**Makita** ■ 800-462-5482 or [makita.com](http://makita.com)

**Street price**

- BTD144 (no battery or charger), \$183
- BTS (w/battery & charger), \$345

For more information, go to [pwfreeinfo.com](http://pwfreeinfo.com).

Here's the opportunity and the rationalization to bring a workhorse into the stable. This impact driver can handle your everyday jobs and is set up to take on the toughest task you have.

—Glen D. Huey

## New Joint Tweakers Will Float Your Boat

Floats are interesting tools; they're similar to a file and a rasp, but with grooves across the working surface that act like a gang of scrapers. They excel at tweaking tenons and modifying mortises to achieve a perfect fit. With a good float, you can remove wood in miniscule, controlled amounts and leave a nice-looking surface behind.

Sawmaker Mike Wenzloff recently alerted us to these Iwasaki Japanese floats and after giving his a try, I ordered some in for testing. What sparked my interest was the quality of the tools, and when I learned the price I was even more curious.

Instead of the continuous straight grooves found on traditional floats, the cutting edges on these are curved with a slight radius. The edge also has small, staggered breaks along each edge. These features combine to reduce resistance and clogging, and they leave a nice smooth surface.

The floats cut only on the bottom edge so you don't get one tool with both a curved and flat face as you do with a premium hand-cut

rasp. The safe edge on the side is a real advantage when working on mortises and tenons; you can't inadvertently dig into a tenon shoulder as you work the cheek or deform one side of a mortise while fixing an adjacent one.

Iwasaki floats are very sharp when new, and they can be a bit grabby during their break-in and the user finds the right touch for using them. That's not a complaint, as the edges last a long time and the tools are quite effective. Available in several sizes with flat or curved surfaces and medium and fine cuts, these are a welcome addition to any toolbox.

My favorite was the smallest one—the IW-8CPFEF is 10mm wide with an extreme-fine cut and an integral rubber grip. It fits



**Iwasaki Floats**

**The Best Things** ■ 800-884-1373 or [thebestthings.com](http://thebestthings.com)

**Street price** ■ \$29.95 to \$34.95

For more information, go to [pwfreeinfo.com](http://pwfreeinfo.com).

easily inside through-mortises, but it's also long enough and wide enough to adjust tenons as well. If you're curious about using floats, it is a good place to start.

—Robert W. Lang



## Crosscut Sled for Benchtop Table Saws

A simple fact is that most table saws, straight from the manufacturer, have inadequate miter gauges. Woodworkers often make shop-made sleds of some kind, but if you're new to the craft or don't get a huge amount of time in the shop, building a sled is time-consuming and can be expensive.

Rockler has a new portable crosscut sled that's designed for benchtop table saws with the miter slot between  $5\frac{3}{16}$ " and  $6\frac{7}{8}$ " from the edge of the saw blade. The sled rides in the left-hand miter slot and is designed for easy use in common table saw crosscutting tasks. (But you can't make compound angle cuts because left-tilting blades, as are most benchtop saws, cut into the jig.)

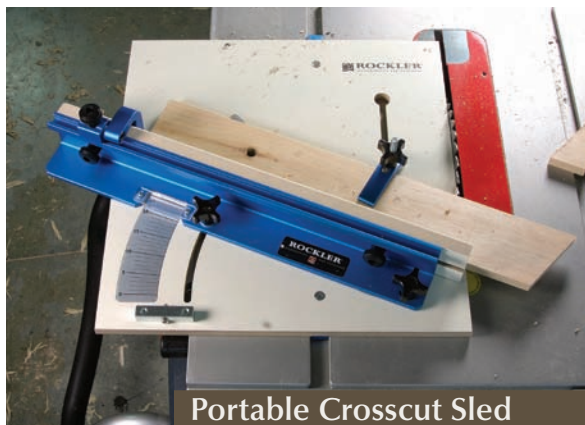
The sled adds a measure of precision to smaller table saws and is a scaled-down version of the company's original sled, complete with a Rockler hold-down clamp. The base of the sled is melamine-coated MDF that's 16" square and  $\frac{3}{4}$ " thick. With low-friction strips added to the bottom of the jig and fence, the sled breezes over your saw top.

The sled runs in a standard  $\frac{3}{4}$ " miter

slot ( $\frac{3}{8}$ " deep) and Rockler has added four setscrews to fine-tune the fit of the miter bar. Because the sled extends just past the blade, the first cut at your saw sizes the sled and that edge perfectly according to the company, and provides the same function as a zero-clearance insert—little to no splintered edges on your workpiece. (An optional drop-off platform is available for those who want for added safety and support.)

The fence is the real value of the sled. An aluminum-extruded fence (with a sliding flip-down stop) is faced with a replaceable MDF sacrificial fence.

The fence setup is adjustable in  $\frac{1}{2}^\circ$  graduations from zero to  $50^\circ$  on an easily read protractor scale. It's simple to position the settings using the hairline indicator; slide the fence into place then with a turn of a four-star knob (set a little too close to the fence



**Portable Crosscut Sled**

**Rockler**

■ 800-279-4441 or [rockler.com](http://rockler.com)

**Street price ■ \$120**

For more information, go to [pwfreeinfo.com](http://pwfreeinfo.com).

for your hand to grab easily), everything is locked. There is a micro-adjustable stop to quickly return to zero, but as on many sleds, the threaded, pointed-end stop used to dial in the settings can sometimes vibrate out of position over time.

—GH

## Drill To Depth Without Masking Tape

Quite possibly the first trick discovered by fledgling woodworkers is the old tape-on-drill-bit trick (wrap a piece of masking tape around your drill bit at the appropriate spot to act as a depth indicator while you drill a hole). The problem with this oft-used trick is that as you use the setup for a prolonged time, the masking tape begins to creep up the bit's shaft and your hole becomes deeper and deeper without your knowledge. It's conceivable that your last hole may be considerably deeper than your first—possibly to the point of ruining the opposing face of your workpiece.

Milwaukee recognized this problem and has developed a series of brad-point drill bits that eliminate the tape-on-drill-bit setup. These bits have laser-etched markings to indicate precise depth settings. I'll bet you'll say "D'oh!" when you see these drill bits for the first time. I know I sure did.

These drill bits have other features that also make them stand out. First, as with all brad-point bits, the point is superb for accurate bit placement. Second, the spur edges are precision-ground to maintain a sharp cut-

ting edge and to produce a clean-cut hole with reduced splintering. And third, each bit is clearly marked for easy visual reference and the markings are spaced at  $\frac{1}{4}$ " intervals for exacting depth-stop information. In fact, as you hold the bits, the markings are simple to see, and when spinning in your hand-held drill or in a drill press, the etchings become much more visible.

Milwaukee has introduced its new brad-point drill bits in seven of the most oft-needed sizes. The bits are available in diameters from  $\frac{1}{8}$ " to  $\frac{1}{2}$ ", stepped in  $\frac{1}{16}$ " increments. Each bit is packaged in Milwaukee red and the diameter (in both inches and millimeters) is clearly identified on the package front.

The brad-point drill bits are approxi-



**Milwaukee Brad Point**

**Milwaukee**

■ 800-729-3878 or  
[milwaukeetool.com](http://milwaukeetool.com)

**Street price ■ \$2.50-\$7**

For more information, go to [pwfreeinfo.com](http://pwfreeinfo.com).

mately \$2.50 to \$7 depending on the diameter, and are available wherever Milwaukee tools and accessories are sold. **PW**

—GH

# Simplified Stickley Bookcase

Great design and hidden screws make this a must-build project.

If you've perused the pages of our sister publication, *Woodworking Magazine*, you might have seen this piece in the Spring 2005 issue. We dug through the archives to find a fine bookcase, then did a bit of construction modification to allow the design to better fit the "I Can Do That" column. And that's something you should be on the lookout for as you read woodworking articles or skim the pages of your favorite catalogs. Find a piece you like and see what changes can be made to match the construction to your skill set and tools.

For this piece, we eliminated the complicated shelf joinery, and we adjusted a few sizes to better accommodate the lumber dimensions found at home centers. But by and large, this bookcase is close to our original project and a great piece to build.

For material, you'll need an 8' piece of 1 x 10 for the sides and one shelf, and a 1 x 10 x 4' for two shelves, the braces and one toe kick. Crosscut the material to the required length, then rip the braces and toe kick.

## Add Design to the Sides

The bookcase sides require the most work, so begin at the handle area. Measure down from the top 1 1/4", then square a line across the grain. Also, find the top center of the sides then square a line off the top edge that extends just across the first line.

The next layout step is to grab a compass that's set for a 2 1/2" radius, position the point of the tool at the intersection of the two lines and mark a half-circle with the flat side parallel with the top edge of the sides. To soften the look, round the sharp corners of the handle area. I used a pair of nickels placed at the corners to establish the radius.

To create the handle opening, use a 13/16" bit to drill holes at each corner (the bit closely



*Look at projects with a different eye. Find a piece with great design, such as a Stickley No. 79 bookcase, then make adjustments to the construction to better match your skill set.*

matches the diameter of the nickels). With the two difficult-to-cut areas done, use a jigsaw to remove the balance of the waste. Insert the blade through one of the holes then cut on the line from hole to hole. After that's complete, pivot the saw to cut the half-circle line. Stay close to the line, take your time as you cut and slow the blade speed if possible

— a slower blade increases your control as you cut. Then clean up your cuts with a file and sandpaper.

Next, make the cutout at the base. This, too, is a half-circle with a 2 1/2" radius. Because you can start the cut from the bottom edge of the sides, there's no need to drill a hole. Use your jigsaw to cut the area, then smooth the cut as you did before.

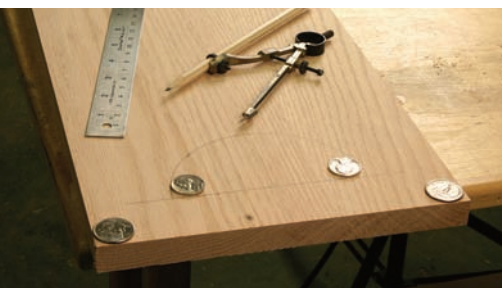
The last shaping step is to round the top corners. This step is a bit more expensive; use quarters as a template. Draw the profile on your sides, then remove the material with your jigsaw, or use a file and sandpaper.

The only other shaping work required is on the toe kick. Make a mark 1" in from both ends along the bottom edge of the piece. At the top edge, find the center of the piece then add a vertical pencil line across the toe kick. Move down that line 1 1/4" and mark the location.

Next, instead of finding the appropriate radius with a trammel, bend a ruler or thin stick to create the curve. Hold the ruler at the two points at the bottom edge as you bend the piece to reach the center point of the curve. With the bend set as you like, have a friend mark a line following the bend in the ruler. Cut on the waste side of your line with your jigsaw, then smooth the curve with your file and sandpaper.

## No Complex Joinery

Pocket screws make the joinery for this project a snap. Each shelf is drilled for four pocket screws, two at each end, spaced 1 1/2" from the edges. The toe kick is drilled for two screws at both ends as well. And the support braces have one hole per end (with the braces held tight to the bottom of the shelves, you need only the two screws for a secure connection).



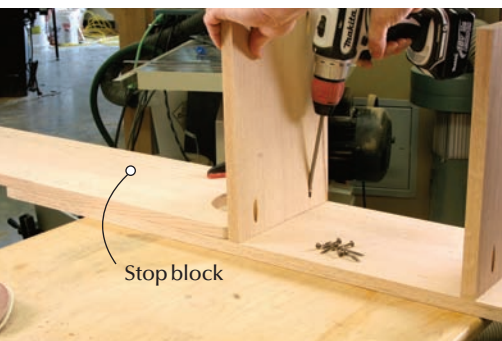
**It's just pocket change.** Quarters and nickels make great templates for rounding off corners. The larger the coin, the bigger the radius.

Set up your pocket-screw jig as directed and drill the pockets. Use  $1\frac{1}{4}$ " screws for this project; fine threads are better because you're working with hardwood. Note: As you drill in your toe kick, stay toward the top edge of the workpiece. If you bore near the curved portion, it's possible to have a pocket extend into the curve and be visible in the finished bookcase.

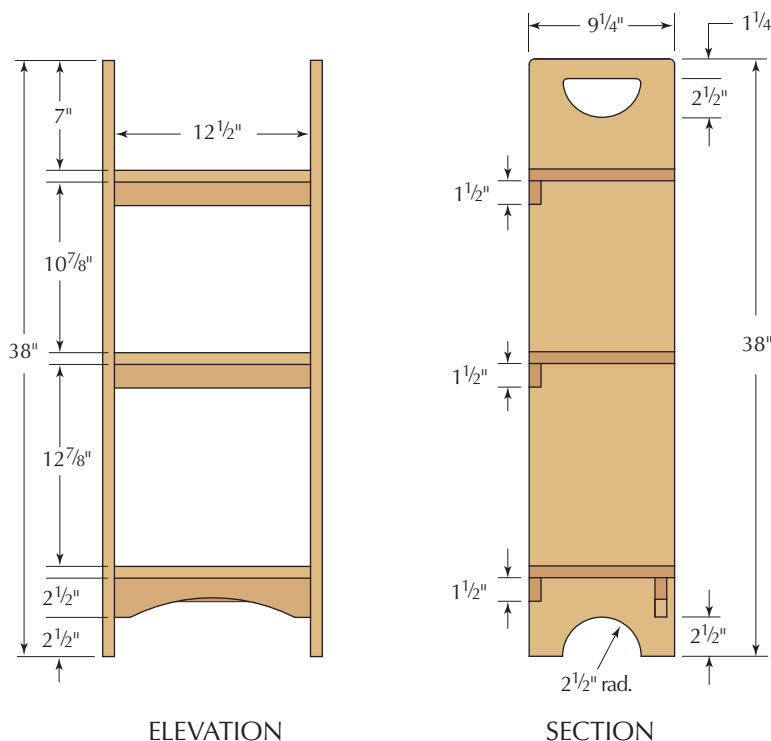
## Curtail Creepy Movement

As you install pocket screws, it's possible for your pieces to creep slightly. To reduce that possibility, use a stop block and a clamp to keep things in place. To begin, do a simple layout of the shelf locations on the inside face of your sides (a couple short lines set in from the edges is all that's needed).

Next, clamp a wide cutoff at a layout line that is the top edge of a shelf's location. As shown in the photo below, with the shelf pressed against that clamped-in stop block there is no problem with creeping pieces. Install the screws to affix all the shelves to one side of the bookcase, then align the second side and add the screws to complete the installation of the shelves.



**Stop the creep.** Use a clamp and stop block, or in this case one of the bookcase sides, to keep your shelves from inching forward as screws are driven.



## Simplified Stickley Bookcase

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
2	Sides	$\frac{3}{4}$	$9\frac{1}{4}$	38	Red oak	
3	Shelves	$\frac{3}{4}$	$9\frac{1}{4}$	$12\frac{1}{2}$	Red oak	
3	Support braces	$\frac{3}{4}$	$1\frac{1}{2}$	$12\frac{1}{2}$	Red oak	
1	Toe kick	$\frac{3}{4}$	$2\frac{1}{2}$	$12\frac{1}{2}$	Red oak	Curved lower edge

One support brace fits tight to the bottom edge of each shelf and flush with the back edge of the bookcase. Align the pieces, then drive the screws to lock the braces in place. The toe kick also sits under the bottom shelf but is held back  $\frac{1}{2}$ " from the front edge. A clamp added after the toe kick is positioned holds the piece secure and tight to the shelf as the screws are installed.

## A One-Two-One Finish

With the construction complete, take the time to knock off any sharp edges (especially around the handle area) and sand the piece to #120 grit. The finish is a coat of "Dark Walnut" Watco Danish Oil followed, when the oil is dry, by two coats of amber shellac. To complete the bookcase, lightly sand the piece with #320-grit sandpaper then apply one layer of paste wax for protection. All that's left is to put books, family photos or other knickknacks on display. **PW**

Glen is a senior editor of this magazine, the author of several woodworking books and the host of several woodworking DVDs. Contact him at 531-513-2690 x11293 or [glen.huey@fwmedia.com](mailto:glen.huey@fwmedia.com).

## About This Column

Our "I Can Do That" column features projects that can be completed by any woodworker with a modest (but decent) kit of tools in less than two days of shop time, and using raw materials that are available at any home center. We offer a free online manual in PDF format that explains all the tools and shows you how to perform the basic operations in a step-by-step format. You'll learn to rip with a jigsaw, crosscut with a miter saw and drill straight with the help of our manual.

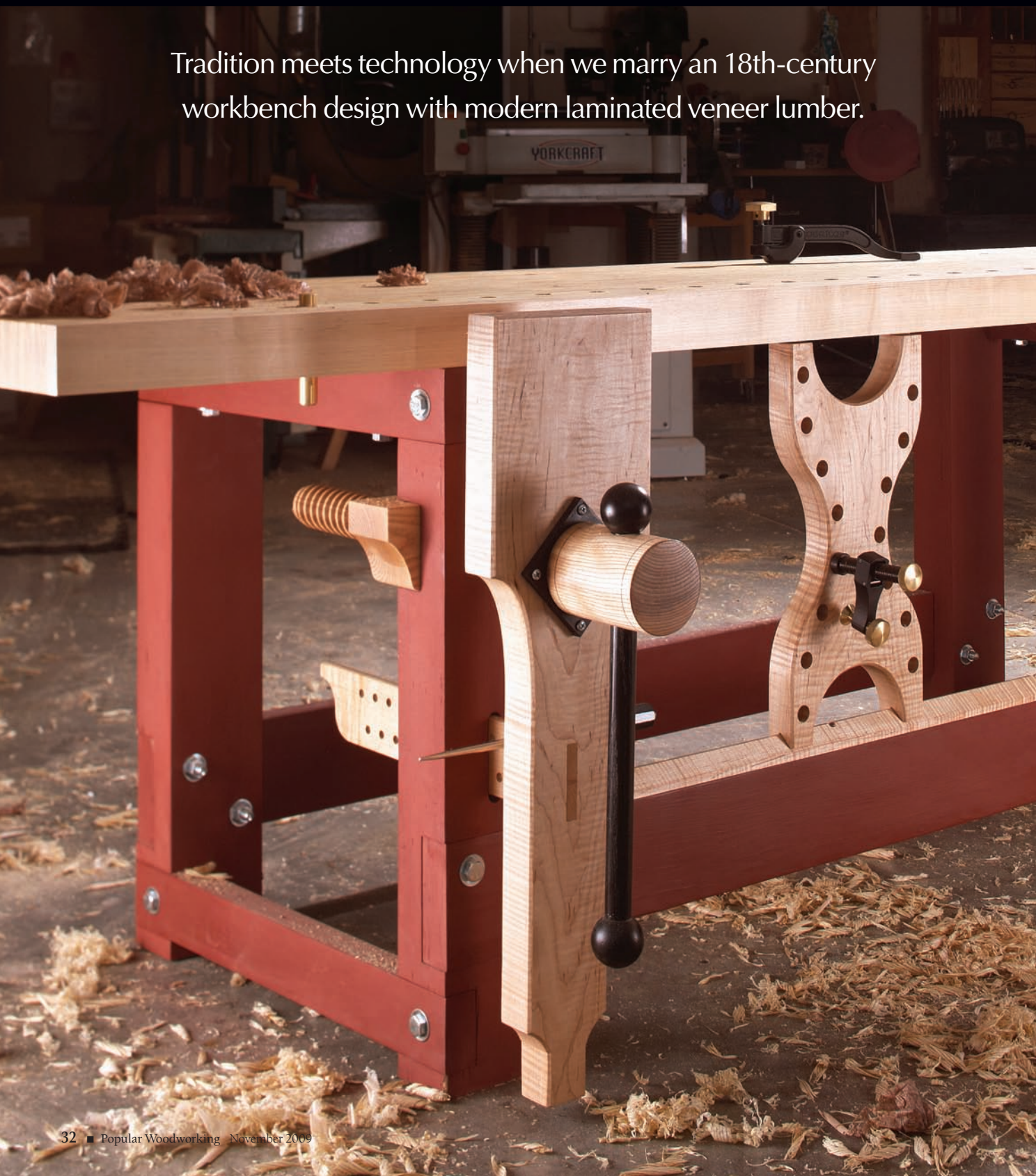


Visit [ICanDoThatExtras.com](http://ICanDoThatExtras.com) to download the free manual.



# LVL WORKBENCH

Tradition meets technology when we marry an 18th-century workbench design with modern laminated veneer lumber.





BY  
CHRISTOPHER  
SCHWARZ &  
MEGAN FITZPATRICK



When it comes to workbench designs, I think it is difficult to improve on the 18th-century designs developed in Europe, England and the United States.

These behemoths are far simpler to build than the contemporary and common Euro-style bench, yet the old benches also offer better workholding, superior mass and less maintenance. In fact, there is only one true advantage offered by the Euro-style benches, and that's portability.

Modern Euro-style benches are bolted together and can be knocked flat and shipped by truck or rail. The ancient benches are about as portable as a pregnant brontosaurus.

After building and working on more than a dozen different workbench designs, I resolved to fix this problem with the ancient benches, and I set my sights on turning one of my favorite French workbench designs from the 1700s into a bench that could be disassembled in less time than it takes to knead a baguette.

This design was first published in André Roubo's "The Art of the Woodworker," an 18th-century masterpiece that explained everything from carpentry to woodworking, marquetry, carriage-building and garden furniture. The workbenches in Roubo's volumes are monolithic and simple, yet they excel at making it easy for you to work on the faces, edges and ends of boards and assemblies. (See the sidebar on the "The Kitchen Test for Workbenches" on page 37.)

Since 2005 I've been working on a version of Roubo's bench and am impressed daily with its versatility. I also have a crick in my back from moving this bench in and out of trucks to demonstrate it at woodworking shows. It is one solid chunk of wood.

With a little design work, I easily transformed Roubo's bench into a version that was ready for the traveling Cirque du Soleil. But I wasn't satisfied that I had pushed the limits of the bench's design.

After writing the book "Workbenches: From Design & Theory to Construction &

**21st-century Roubo.** A bolted-together base makes this massive, classic design knock down quickly and easily.

Use" (Popular Woodworking Books), I was besieged by people who wondered if you could use engineered wood (such as plywood or MDF) to build a good workbench. I've used Baltic birch to make a number of workbench tops, but I've never been thrilled with cabinet plywood (it's unreliable these days), MDF or OSB (all of which sag like wet croissants). After doing some research I came across a material that you don't see much in woodworking shops: laminated veneer lumber (LVL).

### About LVL

This layered material is like plywood in some ways and like solid wood in others. It is typically made up of many thin layers of veneer (such as yellow pine or poplar) that are glued into pieces that are basically sized like dimensional softwoods (2x12s, 4x4s etc.).

Unlike plywood, all the plies in LVL have their grain running in one direction – the length of the board – just like solid wood. But unlike solid wood, LVL beams have a lot of stiff glue sandwiched between the wooden plies. They are typically used as joists to span long distances in residential and commercial construction.

LVL beams are stiff, relatively cheap and easy to find at commercial lumberyards. But for the woodworker, there are a lot of question marks when it comes to working with the stuff. How stable is it? How easy is it to joint, plane, saw and rout? Will the glue tear up the cutters of our tools?



**Ripped and ready.** We began by ripping down the LVL 2x12s we needed for the benchtop and were surprised by how easily the material cut on the table saw with a combination blade.

As luck would have it, Managing Editor Megan Fitzpatrick was ready to build a real woodworking bench after making do with the too-short spare workbench in the magazine's shop. And she was game to try out the LVL. So we bought enough material for an 8'-long version of Roubo's workbench and got to work.

A Top of Many Laminations

I think it's best to begin by building the benchtop. Then you can hump it onto sawhorses and use it as a work surface to build the base. You can indeed build a bench without having a bench – I've done it many times.

We ripped each LVL 2x12 into four 2 3/4"-wide strips. Then we jointed the solid-wood faces of each strip. The nice thing about LVL is that the faces are thick enough to withstand a couple passes on the jointer before you cut through the laminations – it's like thick, old-school veneer.



**Scraping glue.** After gluing up four strips into a chunk, we scraped off the excess yellow glue before dressing the lamination on the jointer. After all, the knives were already taking a beating from the glue between the plies so removing any glue we could was an act of kindness.

Online EXTRAS

For a free SketchUp drawing of this bench and a tutorial on how to flatten a workbench top with handplanes, visit our web site at:

[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)

After slicing into the LVL on the table saw we learned some of the finer points of this engineered material. Because of the laminations, there really aren't any stresses in the planks. It cuts easily, like nice plywood.

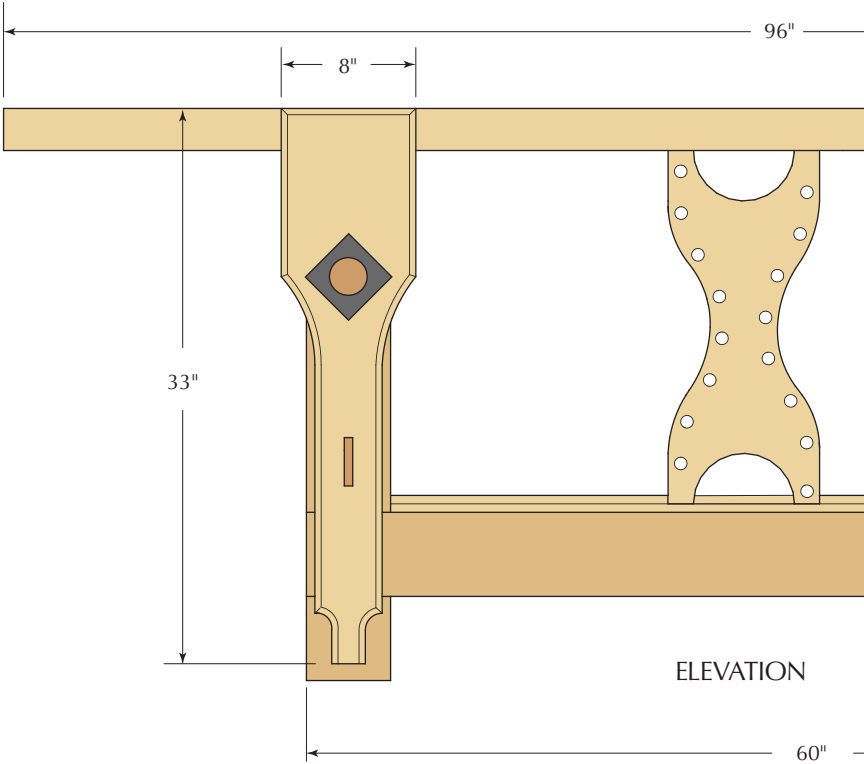
The bad thing about LVL is the seams. Every 6' or so there is a scarf joint where the laminations overlap one another. These seams determine the direction you should run the material over the jointer. We jointed one of them in the wrong direction and the reward was a big splintery bite at the seam.

The material is fairly consistent. The first plank was dimensionally perfect in thick-

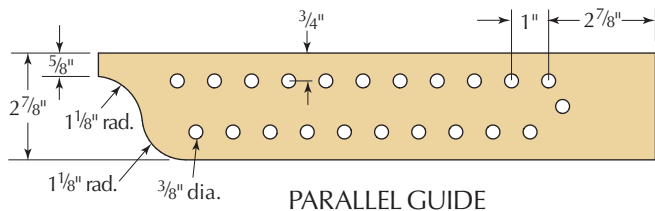
ness and width. The second one was not. One end was a little thicker than the other (about 1/16") and the plank had a pronounced crook – but only on one edge.

After ripping them, we turned all the strips 90° and prepared to glue them face-to-face. To keep the glue-ups manageable, we glued four strips into a chunk. Then we repeated this operation three more times. When the glue was dry in these laminations, we jointed and planed the four laminations and glued the four pieces into two large laminations. Then we carefully glued these two laminations into a benchtop that was about 24" wide.

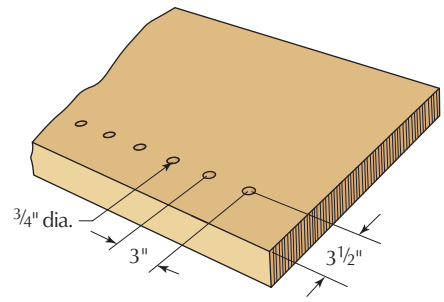
LVL Workbench						
NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 1	Top	2 1/2	24	96	LVL	With maple banding
❑ 4	Legs	3 1/4	5	31 1/2	LVL	Glued from 2 pieces
❑ 2	Long stretchers	1 5/8	5	60	LVL	Half-lapped into legs
❑ 4	Short stretchers	1 5/8	3	24	LVL	Half-lapped into legs
❑ 1	Leg vise chop	1 7/8	8	33	Maple	
❑ 1	End vise chop	1 7/8	3	17	Maple	Screwed to vise
❑ 1	Board jack	1 7/8	9	23	Maple	Long; trim to fit
❑ 1	Board jack track	1 5/8	1 1/4	50	Maple	Bevels on long edges
❑ 1	Garter	3/8	3 3/4	3 3/4	Maple	
❑ 1	Parallel guide	1/2	2 7/8	17 1/4	Maple	



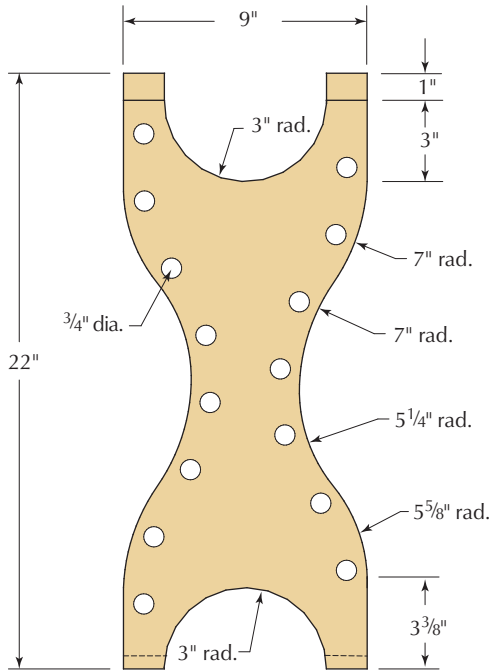




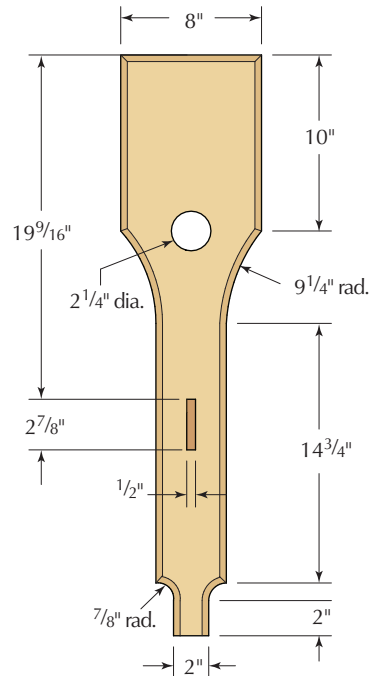
PARALLEL GUIDE



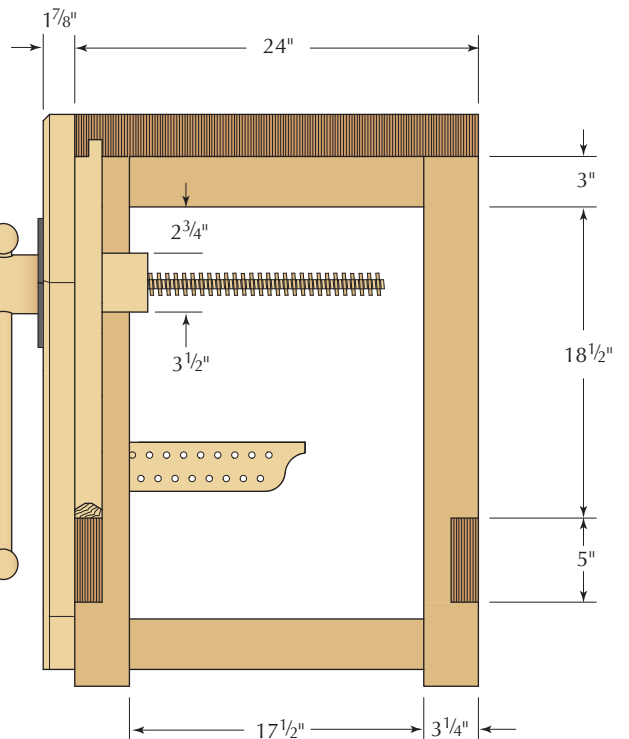
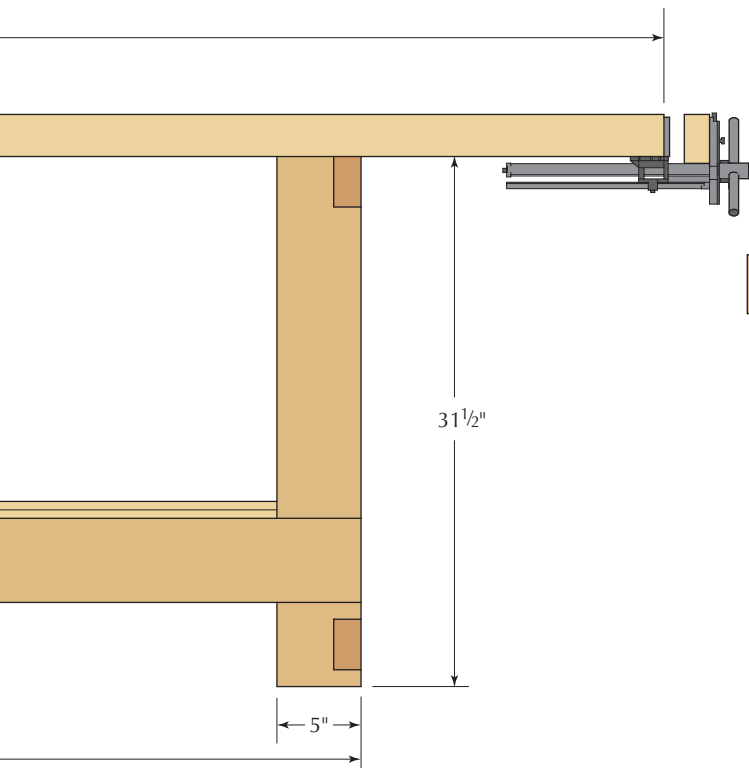
DOG HOLE PATTERN



DEADWOMAN



LEG VISE CHOP



SECTION

We used yellow glue through most of this project and didn't have any problems. When gluing LVL made using yellow pine, we recommend you keep it clamped at least five hours. Yellow pine has resin that resists glue penetration.

Of course, there are some other important details you should know about when working with this material. We didn't want to run the LVL through the machines any

more than we had to, so we took extra care to line up all the laminations as we clamped them. The extra care paid off, and when we glued the two final 12"-wide laminations together we jointed their mating edges and decided to take an extra precaution: some Dominos.

### The Base: Beef & Nuts

This is the simplest base I could design that is both robust and completely functional. Each leg is made from two lengths of 5"-wide LVL that are face-glued. Then you cut half-lap joints in the legs using a dado stack in your table saw and bolt everything together using 1/2" hex-head bolts, washers and nuts.

Once we got the legs glued up, building the base took less than six hours, and we stopped several times to take pictures (and we got coffee, which is as important as glue in our shop).

Begin by gluing up the legs using pieces that are slightly oversized. Let the adhesive cure, then joint and plane all four legs to a consistent final thickness. The length of your legs is, naturally, what will determine how tall your workbench is. The cutting list and drawings will produce a benchtop that is 34" from the floor – the same height as a typical table saw.

The way to determine the correct bench height is to measure from the floor to the joint



**Jointing with carbide.** Our jointer has a carbide-insert cutterhead, and it had no problems dealing with the glue in the LVL. I was more worried about the planer, which has high-speed steel knives.



**Planing is no problem.** We were surprised by how well the planer's knives fared after dressing all the laminations for this project. After dozens of passes through the machine, the knives didn't look any worse for the wear.



**Looking for bumps and hollows.** When dealing with an 8'-long edge, it can be difficult to find the source of the problem with an edge. We balanced a straightedge at several places along the edge, then pinched the ends of the straightedge. If the straightedge rotated easily, there was a hump under it. If the corners dragged and there was light under the straightedge, we had a hollow on that edge.



**Dominos will do 'ya.** You can use almost any method to align the two edges you are gluing up for the top: biscuits, splines or even dowels. We have a Festool Domino in the shop, and it's perfect for this sort of accurate work.



where your pinky finger joins your hand. That will be a good height for most hand- and power-tool operations. If you work only with power tools, you might consider raising things 2". If you work only with old-style wooden-bodied handplanes, you might consider lowering the benchtop about 2".

Once you determine the final length of your legs, crosscut them to length and lay out all the half-lap joints on the four legs. The leg that will get the leg vise will get a few extra cuts, but we'll get to that in a minute.

Put all the chippers from your dado stack on the arbor of your table saw. Raise the arbor until it is 1<sup>5</sup>/<sub>8</sub>" high – exactly the thickness of all the stretchers. Lock the saw's arbor

in place and make a test cut on a piece of scrap LVL.

If your saw breezes through the material, then you are good to go. If, however, it balks at the task by slowing down, you'll need to first remove most of the waste using a band saw.

Removing the waste using a dado stack is simple work. To determine the stopping and starting place for each cut, we used the stop on our table saw's miter fence. Then we lifted the stop and wasted the remainder between the start and stop points on the legs. It really is simple work. Just keep alert and watch that cabinetmaker's triangle for guidance.



**Joint and glue.** Joint the inside face of each of your leg pieces and glue them together. When the glue dries, joint and plane the legs to their final thickness and width. Planing the legs to width ensures they will all be consistent.



**Triangles and squares.** Note the "cabinet-maker's triangle" scrawled across the tops of the four legs. This helps you keep all the legs oriented as you mark out the half-lap joints for the stretchers.



**How high? This high.** The actual height of the dado stack isn't important. What's key is that the cutters be just as high as your stretchers are thick. Place a sawtooth at top dead center and compare it to a stretcher.



**The whole stack for half-laps.** This is a lot of meat for a table saw to remove, but our cabinet saw was up to the task. If your saw isn't, a band saw will remove most of the waste and the dado stack can clean up the cuts.

## The Kitchen Test For Workbenches

I wish there were a simple test to separate a good workbench from one that should live the rest of its life as a plant stand. You know, something simple like an instant pregnancy test, but without having to drag your bench into the lavatory.

I developed such a test for my book on workbenches. I call it "The Kitchen Test," but I need to come up with a better name for it. In a nutshell, here it is: Pretend you have three pieces of woodwork in your shop and you need to secure them on your workbench so you can work on their faces, edges and ends.

One piece is a kitchen cabinet door that measures 3/4" x 18" x 24". The second is a kitchen drawer that is 4" x 18" x 18". The third is a piece of baseboard for the kitchen that is 3/4" x 6" x 48".

Now pick two (or 10) workbench designs and pit them against one another. Which bench would grip these three pieces of work in each of the three positions (for working the faces, edges and ends) with the greatest ease?

Some benches require a lot of extra accessories (bench slaves, bench hooks etc.), and some don't. But it really is quite surprising how a lot of benches fare in this test. There are significant differences. Some bench designs can handle all nine operations. Some can easily accomplish only about half.

—CS





**Snug, square and traced.** Put the vise screw through the 2" hole and snug up the vise block on the backside of your leg. Square up the block then trace its outline on the leg.



**Right wasted.** Use your dado-stack set-up to remove the waste for the threaded nut block. Be careful to work right up to the lines and test the fit of the block into the dado.



**Holes to guide you.** The through-mortise in the leg allows the parallel guide to pass freely in and out. You don't need to square the ends of this mortise. Leave them round. The parallel guide is narrow enough to pass through.

## About that Leg Vise

This workbench uses a traditional leg vise in the face-vise position. The leg vise is a simple, robust and almost-forgotten form of vise. Other vises might be easier to install, but few can beat the leg vise when it comes to making it just what you need for your style of work.

The only thing you need to buy to make a leg vise is a vise screw. You can buy a quality metal one for less than \$40. We purchased a wooden one from [BigWoodVise.com](http://BigWoodVise.com). It cost more (\$165), but it looks nicer, moves faster and doesn't ever mark your work with grease. Both metal and wooden vise screws do a great job of holding your work. So go with your heart or your budget.

One quick word on where you should place this vise on your bench. If you are right-handed, put it on the left front leg. If you are left-handed, put it on the right leg. This traditional set-up will assist you when planing – you always want to plane into a vise's screw.

To install the wooden screw, you need to first drill a 2"-diameter hole in the leg for the screw. Then you'll have to waste away a chunk of the leg to hold the vise's threaded nut block. Here's the easy way to make everything line up.

Drill the hole and insert the wooden screw through it. Spin the nut block onto the screw and snug it up onto the backside of the leg. Square up that block with a try

square then trace its position on the leg.

Go back to the table saw and waste away the area between those marks. The nut block should fit great and the threaded hole will be lined up perfectly with the hole in the leg.

Before plunging headlong into assembly, you need to make one more critical cut for your leg vise. You need to make a  $\frac{5}{8}$ "-wide x 3"-long through-mortise to accommodate the vise's "parallel guide." The parallel guide is a length of  $\frac{1}{2}$ "-thick wood that is bored with holes and attached to the wooden front chop of your vise.

The parallel guide has a couple important jobs. One, it keeps the chop parallel to the leg. Without a parallel guide the chop can spin and sway. Two, it acts as a pivot point for the chop.

By putting a small rod of metal through one of the holes in the parallel guide it causes the vise's chop to pivot toward the benchtop when the metal bar hits the bench's leg.

To use the parallel guide, you just slide the metal bar into the hole that most closely matches the thickness of the work you want to hold in the chop. Then close the jaw. Yes, you do have to stoop on occasion to remove the metal bar, but it's really not a big deal. Plus, with the metal bar in the hole closest to the chop you can clamp anything between  $\frac{3}{8}$ " thick and  $\frac{7}{8}$ " thick. That covers a good deal of work.

To bore the through-mortise, set up a fence and a  $\frac{5}{8}$ "-diameter Forstner bit at your

drill press. Make repeated plunges through the leg until the mortise is clear.

## A Too-easy Assembly

Now comes the fun part: Assembling the base. First you want to bore  $\frac{5}{8}$ "-diameter holes through all the half-laps to accommodate the  $\frac{1}{2}$ "-diameter hex-head bolts. Use the drawings as a guide to mark all the holes in the stretchers. Bore these on the drill press. Then place the stretcher on its mate and use a  $\frac{5}{8}$ " Forstner bit to punch the location of the mating hole on the leg.

Then remove the stretcher and bore the mating hole in the leg using the same bit. You could take an extra step and counter-bore all the holes for the bolts, washers and nuts, but I decided against it. I didn't want to risk ripping apart the laminations inside the LVL when I tightened the hardware.

One more detail here: You need to bore two  $\frac{5}{8}$ "-diameter holes in each top stretcher to attach the base to the benchtop with lag bolts. Make these holes about 6" from each end of the top stretchers.

With those holes drilled, assemble the base.

## Getting on Top of Things

While the LVL top was stiff and the bench's top looked good, the front and back edges looked like they had a nasty skin disease because of the exposed glue and partial plies. So we decided to laminate strips of



**Ratchet to attach it.** Use  $\frac{1}{2}$ " lag bolts to secure the base to the top. The pilot hole for the lag bolt should be the diameter of the bolt minus its screw threads.



**Ready for wedging.** Here's the parallel guide right before we glued it in place and wedged it with a sliver of oak. We cut a kerf down the middle of the tenon to give the wedge a place to go.

solid  $\frac{5}{8}$ "-thick quartersawn maple to the front and rear.

We had to rip down the top a bit to end up at the target 24" width. Except for humping the top up onto the table saw, this was a surprisingly easy operation. We made the maple pieces a little wider and longer than necessary so we could trim them flush after gluing them in place.

Once the maple is glued in place and the

adhesive is dry, trim it flush with a plane. Then you can trim the ends of the benchtop to length. This operation was the most difficult machine operation when building the bench.

We trimmed the top using a circular saw and an edge guide. I've used a similar setup to trim about a dozen benchtops without incident, but the LVL was a bear to crosscut. It kept deflecting the blade of the circular saw. After four or five attempts we had to switch to a saw with a thicker sawplate to get an acceptable result. This is one place where a thin-kerf sawblade is not your friend.

## And Now to the Vises

The vises and sliding board jack are simple work if you do things in the right order. Here's the first rule: Don't cut the chop or the board jack to their final shapes until you have to. They are easier to work on when they have long straight edges.

To make the leg vise's chop, first bore a 2" hole through the chop then thread all the parts together on the assembled bench. Now you want to mark where the parallel guide will attach to the vise chop. Transfer the location of the mortise through the leg to the chop. Then use your drill press to make a  $\frac{1}{2}$ "-wide x  $2\frac{1}{2}$ "-long through-mortise.

Square up the corners of the mortise then fit the parallel guide into the mortise. The goal here is to shave the thickness of the guide so it fits tightly in its through-mortise. And to trim the width of the guide so it runs smoothly in the through-mortise in the leg. This takes a little massaging.

Once you get the tenon and mortise playing nice, you can bore the array of  $\frac{3}{8}$ " holes in the parallel guide. The holes are on 1"

centers and the two rows are offset by  $\frac{1}{2}$ ". The first hole in the middle of the parallel guide is  $\frac{5}{8}$ " from the tenon's shoulder. This is the hole you will use the most. Then cut the ogee shape on the back of the guide and cut your chop to its final shape.

Glue the parallel guide in place and wedge it. We used liquid hide glue here because it is reversible (just add heat and moisture). That's always a good idea when dealing with a part that might need to be replaced some day.

## A Garter for the Leg Vise

The job of a vise garter is to lock the vise screw and the vise chop together, allowing them to move in and out in tandem. Usually you need to add a garter if you are using a wooden vise screw – metal vise screws have this function built into their casting.

You can use a vise without a garter, but it's not as convenient because you'll sometimes have to manually pull the vise chop away from the workbench after you release the screw's tension on your work.

There are two basic kinds of garters: Interior garters and exterior garters. Both work the same way; the only difference is in their location. Exterior garters are mounted on the surface of the vise chop. Interior garters are driven into a mortise in the vise chop that intersects with the hole for the vise screw.

How do they work? Let's look at some photos. The photo below shows the ash wooden vise screw from BigWoodVise.com. See the two grooves on the shaft? One is right up against the hub, and the other is a little ways down the shaft. The groove next to the hub is for exterior garters. The other groove is for interior garters. So this vise screw will work either way.



**Two garter grooves.** This wooden vise screw has two garter grooves. One is by the hub (for exterior garters) and the other is a little bit down the shaft (for interior garters).

## Supplies

- 8 ■ hex-head bolts:  $\frac{1}{2}$ " x  $3\frac{1}{4}$ ", plus washers and nuts
- 8 ■ hex-head bolts:  $\frac{1}{2}$ " x 5", plus washers and nuts
- 4 ■ lag screws:  $\frac{1}{2}$ " x 5", plus washers
- 4 ■ hex-head bolts or lag screws to attach end vise,  $\frac{3}{8}$ " diameter

### Lee Valley Tools

800-871-8158 or [leevalley.com](http://leevalley.com)

- 1 ■ small quick-release vise #10G04.11, \$99
- 2 ■ bench dogs #05G04.02, \$28.50/pair
- 1 ■ Veritas Hold-down 05G14.01, \$72.50
- 1 ■ Veritas Surface Clamp 05G19.01, \$69.50

### BigWoodVise.com

[bigwoodvise.com](http://bigwoodvise.com)

- 1 ■ Classic-style vise screw, threaded nut block and handle, \$165

### Real Milk Paint Co.

[realmilkpaint.com](http://realmilkpaint.com)

- 1 ■ 1-quart bag, red \$16.50

Prices correct at time of publication.





**Can't-miss garter hole.** Clamp the two halves of your garter together and bore the hole right through them. Our garter hole needed to be 1<sup>5</sup>/<sub>8</sub>" in diameter to match the dimension of the shaft of the vise's screw.



**Garter, disassembled.** To assemble the leg vise, drop the vise screw through the hole in the chop and fit the garter in its groove. Screw the garter pieces down and you're ready to bust some walnuts with your vise.

We're using an exterior garter for this leg vise (I think they're easier to install), so the first step was to plane down some hard maple so it fit easily into the garter groove. These grooves are about 3/8" wide.

Then we cut the garter stock to width (3<sup>3</sup>/<sub>4</sub>" ), ripped it in half and bored a 1<sup>5</sup>/<sub>8</sub>" hole through the middle while the pieces were clamped together, then cut it to length.

Now assemble the leg vise. Put the garter around the groove and drop the screw into the vise chop. Then screw the garter to the vise chop. Don't use glue – you want to be able to remove the garter for repairs to the vise someday.

The photo above right shows how everything locks together. You can see the 2" hole through the vise chop, the two halves of the garter and the 1<sup>5</sup>/<sub>8</sub>" hole that is created when the garter is screwed down.

To complete the leg vise, screw the threaded nut block to the leg. We used deeply countersunk 3" screws.

The quick-release vise on the opposite end of the benchtop is easy to install. If you bought the vise listed in the Supplies box from Lee Valley, it should be a simple job with no shimmying. Place the vise at the end of the benchtop and install it with lag bolts (which is OK) or with hex-head bolts, washers and nuts that go through the benchtop (which is permanent).

## The Sliding Board Jack

Some people call the board jack a "deadman," but because this is Megan's bench we've been calling it the "deadwoman." The job of the deadwoman is to help you clamp things on edge, whether it's a single board or an assembled panel or door. You can place a

simple peg in one of the holes to support your work from below. Or you can use a clamp if you need things immobilized.

The deadwoman slides freely across the front of the bench. The bottom of the deadwoman perches on a piece of maple that has a triangular top. The top of the deadwoman has a tongue on it that fits into a groove in the underside of the benchtop.

Begin work by ripping two 45° bevels on the long edge of a wide piece of 8/4 maple. Then set the sawblade to 90° and rip the triangular part free. Screw it to the front stretcher of the bench.

Now cut the complementary triangular shape on the bottom of the deadwoman. We cut this shape using a miter gauge and the



**Resists dust.** Some sliding jacks run in grooves that are plowed in the lower stretcher. These grooves fill with dust. By making the track for the board jack triangular in section, sawdust won't interfere with the movement.

blade tipped to 45°. With those two pieces fitting, cut the groove in the underside of the top. This groove is 3/4" wide and about 1" deep. We routed it using a plunge router, a 3/4" spiral upcut bit and an edge guide. The LVL is tough stuff to rout, so take it easy.

With the groove complete, you can cut the matching tongue on the top of the deadwoman. The easiest way to do this is by using a dado stack in your table saw and a miter gauge.



**Wear a dust mask.** When you rout LVL, the misery begins. The stuff kicks up a lot of stinky, fine, super-nasty dust. Wear a good dust mask, even if you normally throw caution to the wind.





**Cutting curves.** These curves actually are more than eye appeal. They are convenient places to grab the board jack to slide it or to sneak a clamp into.

Then you can lay out and cut the curvy shape to the deadwoman. This ogee shape is based on historical forms I've seen, but you can choose any shape you like. Even just a straight (boring) board will do the job.

Lay out the  $\frac{3}{4}$ " holes in the deadwoman using a marking gauge and dividers. The two rows of holes are offset (like the holes in the parallel guide). The number of holes and their spacing depends on how tall you are making your bench. In our example, these holes are about  $2\frac{1}{4}$ " apart.

The last bit of boring work is to make the holes in the top for dogs and holdfasts. The row of dogs along the front edge is in line with the metal pop-up dog in the quick-release vise. The holes are on 3" centers. That's a lot of holes, but you'll be glad you have all those holes as you use the bench. Most people bore too few.

Holdfast holes, however, are another matter. You only need a few well-placed holes to work along the back of your workbench (which is where holdfasts do a lot of work). The reach of the holdfasts is about 9", so put the holes on 18" centers and line them up with the holes for the dogs.

We routed all these  $\frac{3}{4}$ " holes with a plunge router and a plywood template. It plunged almost deeply enough to make it through the top. So we had to finish off each hole with a little drilling.

## Flattening and Finishing

We flattened the benchtop using handplanes, which had no problems with the adhesive in the LVL. That was a pleasant surprise after all the nasty router dust. We've posted an online tutorial on how to flatten your benchtop with handplanes on our web



**A special marking gauge.** Because I do a lot of work with chairs, I have this marking gauge with a special fence that allows it to follow curves. If you don't have a gauge like this, it's easy to modify your standard gauge. Take some  $\frac{3}{4}$ " dowels, plane a flat on them and glue two short sections to the back of your fence. Turn your fence around and you'll have a gauge that does two operations.

site (you can link to it from [popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)). If you prepared your top with care, flattening it should take only about 30 minutes.

As far as finishing the workbench, there are a lot of recipes out there that we've tried. The goal is to protect the bench from glue and spills, but not to make it slick. A glossy film finish can make your work slide around too easily.

We prefer a simple boiled linseed oil and varnish blend (such as Watco or something we mix ourselves) for the top and vises. You can wipe on a couple coats and be done with it. The linseed oil helps resist water in glue and the varnish provides a little bit of a barrier against spills. And the finish won't be slick.

We painted the base using red milk paint. Milk paint is durable and easily covers the LVL. The first coat looked great. The second coat looked even better. And a couple coats of wax deepened the color.

All in all, we're pleased with the bench, both with the way it comes apart and the way it functions. The test ahead will be to see how the LVL holds up. How sensitive will it be to the seasonal changes in humidity? How easy will it splinter or dent when bashed?

After working with the material, I have high hopes. Perhaps next year Megan will weigh in on how well her bench is faring and we'll be working more with LVL. If, however, you spot her browsing the Sjöberg benches at the local Rockler . . . PW



**Walk it off.** Dividers are the absolute best way to space the holes in the deadwoman. To offset the holes, simply bore a hole at every other mark left by the dividers.



**More nasty dust.** The  $\frac{3}{4}$ " upcut spiral bit and template makes short work of this operation. Lay out all your holes on the benchtop, then position the template and make your plunge. The template is marked with crosshairs that align things with your layout marks.

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Chris is the editor of this magazine and one of the authors of the new book "The Joiner and Cabinet Maker," which is available from [LostArtPress.com](http://LostArtPress.com). Megan is the managing editor of this magazine, and likes to build large pieces of furniture – and now has her own bench on which to do so.





# TURNING

## FOR FURNITURE MAKERS

BY KEVIN GLEN DRAKE

Why almost every woodworker should own a lathe –  
and how to get started.

**W**oodworkers and woodturners tend to travel in their own circles, but a lathe is a very useful tool, even for the occasional turner, as most woodworkers tend to be. Turning takes some practice, but it's a little bit like riding a bicycle; once you get the hang of it, it stays with you forever.

Full-sized lathes can take up a lot of precious shop space though, and they can be expensive. But the new mini-lathes can be stored under a bench, and at about 10 percent of the cost of a full-sized lathe, they are far more affordable. The tooling and tools will cost about





**Lose the plastic handle.** Turn your generic tools into heirlooms with wood handles for an attractive custom fit and a comfortable grip.

**You need round things.** Chair spindles, knobs, pegs and pulls are typical turned objects that are better if you make them yourself.



the same regardless of lathe size, but some of them can be made, or purchased as part of a package deal.

It depends on your needs, but a mini-lathe can generally do what most woodworkers need to have done. Some of the things you can turn to support your woodworking activities include:

- Mallets and hammers
- Tool handles
- Pulls
- Legs and spindles
- Dowels, plugs and pegs

Plus you can turn gifts such as small bowls, lidded boxes and jewelry. With a little practice, you can turn a nice gift in less time than it would take to go shopping, and it will be unique as well as personal. You can even sign it.

A lathe is also a handy tool for restoration work, especially if you get called on to repair a chair with a broken spindle. And I

frequently use my lathe as an auxiliary tool holder for finishing and polishing tools such as wire brushes, Scotch-Brite pads and sponge sanders.

Some projects will clearly fall outside of the capacity of a mini-lathe. An extension will increase the length but not the diameter (throw) of the work you can do, but turning for woodworking projects rarely falls outside the throw of even the smallest wood lathes. We're not talking architectural turning here.

### Practice Makes Perfect

Like anything that's worth doing, you also have to invest some time to learn and practice turning. Woodturners are generally willing to share their time and knowledge with anyone who shows an interest in furthering their skills. Today's books, videos and guilds offer some very cost-effective instruction, but if you have access to one, a good teacher can significantly shorten your learning process.

A lathe is unique in that it is the only tool that rotates the wood instead of the blade. Woodworkers are used to just the opposite. A revolving blade can do serious damage if it is not given the respect it deserves.

The lathe, on the other hand, is one of the safest tools in the shop. Once the wood has been "rounded up," it is generally safe to touch. And you can even touch rotating "out-of-rounds" as long as you touch them as they rotate away from you and not toward you. In fact, turners often use one hand as a "steady rest" to reduce chatter on long and/or thin work. This is not to say that there cannot be nasty accidents, but most accidents occur while turning unsafe projects. Where safety is concerned, we have to know where to draw the line.

### Off to a Good Start

Here is what you will need to get started.

- **Lathe.** Used lathes abound, but if space



**Dead center holes.** The addition of a Jacob's chuck allows you to drill holes in the end of a spindle.



**Live center.** A live center with a ball bearing is one of the first accessories to get. It will reduce friction at the tail stock end.



is an issue then a new mini-lathe can be had for less than the price of a used full-sized lathe. Look for a deal that includes some tools and/or tooling. Avoid the “floor-stand-included” deal if space is a problem. You’ll likely be putting your lathe under a bench when it’s not in use.

One more thing that is very nice to have on a lathe is electronic speed control. That means you can dial the speed up and down while the lathe is running instead of having to stop it to move a drive belt to another pulley. Plus, you get all the speeds in between the pulley arrangements.

■ **Tooling.** Two fixtures you will want are a live center for the tailstock and a four-jaw chuck for the headstock. A live center will rotate with the wood, decreasing the turning friction at the tailstock. A new mini-lathe will most likely include a live center. Hold off on purchasing a four-jaw chuck if you must, but get a live center any way you can; a dead center (one that doesn’t turn) may cause smoking, and it’s noisier. A Jacobs chuck for your tailstock is also a great add-on. If you need a hole drilled in the center of something (such as a tool handle), doing that on the lathe is a piece of cake.

## Start With Basic Tools

A basic set of spindle tools is essential. If you acquire some by buying an older used lathe, compare them with the newer tool sets. Older tools tend to be undersized, so replace them if you need to. You will need:

- Roughing gouge (1" or larger)
- Shallow gouge (1/4" and 1/2")
- Skew chisel (1/2" and 3/4")
- Parting tool (3/16")

You can use these same tools to turn end-grain bowls and boxes, then add some bowl gouges and scrapers for face-plate work if you get hooked.

It’s the grain orientation of the work that determines the tool set you will eventually need. The wood grain is oriented along the lathe’s bed for spindle work and across the lathe for face-plate work.

## Sharpen Your Tools & Your Skills

Sharp for turning is not the same as sharp for flat work. You’ll need a grinder to keep your tools sharp. There are jigs available for sharpening turning tools, but freehand grinding has fewer limitations. I also prefer to use my spindle tools right off the grinder. The hollow grind registers the tool on the work and

## Resources

**Turning Basics for Furniture Makers by Steve Shanessy (DVD)**

[WoodworkersBookShop.com](http://WoodworkersBookShop.com)

**Wood Turning: A Foundation Course by Keith Rowley (Book)**

[Amazon.com](http://Amazon.com)

**Turning with Richard Raffan (3-DVD set)**

[WoodworkersBookShop.com](http://WoodworkersBookShop.com)

**The American Association of Woodturners**

[woodturner.org](http://woodturner.org)

provides the relief that the edge requires to cut with minimal force.

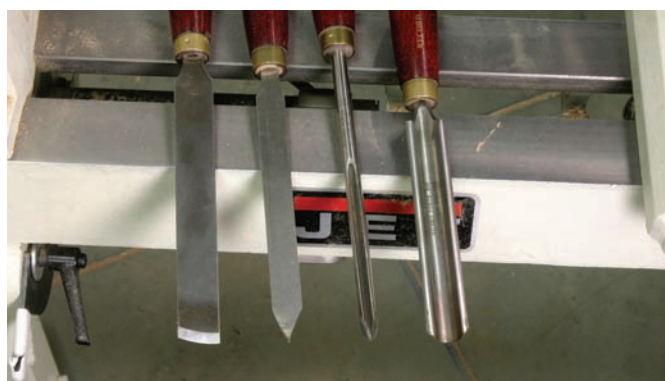
Get someone to show you the ropes if you can, invest in some educational DVDs, and join a turning guild if there’s one around. You’ll be glad you did. **PW**

*Stay tuned for Kevin’s upcoming article on turning tool handles.*

*Kevin Drake is a graduate of the College of the Redwoods Fine Woodworking program and the owner of Glen-Drake Toolworks. He lives and works in Fort Bragg, Calif.*



**Small is good.** Mini-lathes allow any shop to afford (and have room for) a lathe. Without the stand it can be stored below a bench.



**Start with the basics.** These tools, a skew, parting tool and gouges will cover your needs for most turning tasks.



### Versatile gripper.

A four-jaw chuck will hold nearly anything, round or square, securely for turning. It also makes mounting work quick and easy.

# MAKING Totes & Knobs

## FOR HANDPLANES

BY CHARLES MURRAY

Custom grips can make the difference between a usable plane and one that just gathers dust.

Over the years I've collected a few handplanes. I've found out (as many collectors before me) that although many handles look the same, there are subtle differences. Finding the correct type is getting increasingly difficult. But in this case, I wanted to change the wood used for the handle so I could spot this particular plane more easily (I have several planes that look alike, and I would rather be making shavings than spend my time looking for the correct plane). It was time to come up with a way to make my own handles, not only for this Lie-Nielsen No. 5½, but also for my antique planes whose handles have seen better days.

The first step is to remove the old handle and decide on the shape for the new one. If you're going for the same shape, the easiest thing to do is to trace it onto paper, stick the paper to the plywood, then cut it out and shape it with rasps and files.

I chose ebony. However, any dense fine-grain hardwood will work. Note that on the knob the grain runs from top to bottom, while on the tote the grain runs from front to back. Keep this in mind as you choose the wood for your handles.



**Custom grips.** With just a pattern and simple jig, it's easy to make custom knobs and totes for all your bench planes.



To make the rear tote, begin by making a template, drawing the lines at the angles that you will be boring for your bolt holes. This can be made easier if you have the original handle; you can insert a drill bit of the appropriate size to get an accurate reading on the angles required.

## A Jig for Routing the Tote

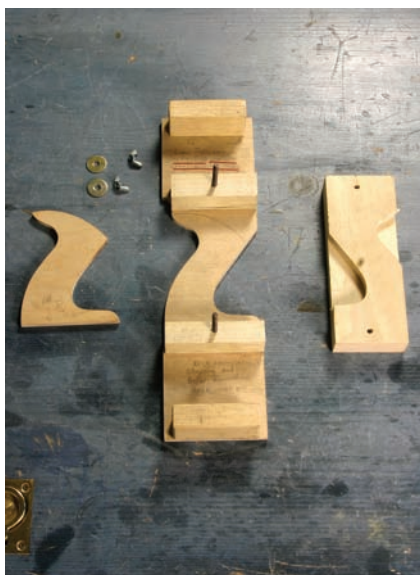
Next make the jig that will hold your blank for routing. I made mine from scrap  $\frac{3}{8}$ " birch plywood and some poplar and pine that I had lying around. Please note the width of your particular jig will be determined by how wide your tote is; make the length long enough to keep your fingers away from the router bits. In the center of your jig's base, trace around the template; afterward add  $\frac{3}{16}$ " to the top and  $\frac{3}{16}$ " to the bottom of your tracing for a total of  $\frac{3}{8}$ ". This allows for

tear-out, which will be removed later. Make sure you file and sand your jig smooth, as any imperfections in it will be transferred to your finished product. The tote I was reproducing was 1" thick, so I made my spacer blocks  $\frac{15}{16}$ " thick, allowing the top hold-down piece to apply firm pressure so my blank would not slip. After gluing your spacer blocks on, drill down through the top of the center of them. Next, temporarily clamp the hold-down piece in place, then flip the jig over and bore down through the two holes that you just made. Doing it this way will make sure both sets of holes are in alignment. You can then countersink the bottom of the jig for the flathead machine screws (make sure that they are deep enough so that they will not scratch the top of your router table). The holes I bored were slightly larger than the root diameter of the machine

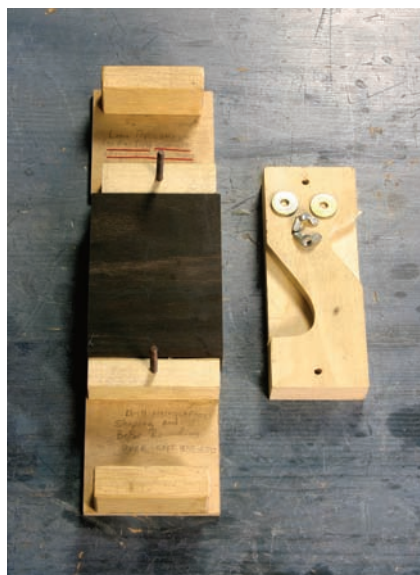
screws. This allows them to stay in place as you use your jig. After that, enlarge the holes on the top hold-down piece so that they will slide easily over the screws. Then glue on two small blocks of wood to act as handles.

## Jig in Use

Now it's time to use the jig. First, dress your tote wood to the proper thickness, keeping in mind the proper grain direction. Then cut your blank for a snug fit between the holding blocks. Place it in the jig, trace the outline of the handle around it, remove it then cut away the waste within  $\frac{1}{8}$ " of the line. Reinsert the blank, place the top hold-down on, and tighten up the wing-nuts. Using a  $\frac{3}{4}$ " router bit with a bearing guide (I use a CMT 812-690B), place the jig against the starting pin on your router table and carefully rout the blank to shape. Caution: At certain points,



**1 Routing jig.** This jig, which holds the tote blank for routing, is made from scrap  $\frac{3}{8}$ " birch plywood, poplar and pine.



**2 Snug fit.** Make sure your tote blank fits snug between the holding blocks in the jig before tracing the tote's shape onto the blank.



**3 Now rout.** After you've cut to  $\frac{1}{8}$ " outside your marked shape, reinsert the blank and rout to final rough shape.



**4 Rough but ready.** This photo shows the tote after pattern routing is complete.



**5 Round over.** Place the tote blank in a small parts holder and use a roundover bit to shape the edges, then sand smooth.



**6 Work from the original.** Use the original tote to locate the proper angles and holes for attachment.

you will be routing against the grain, so be careful and take it slowly.

Remove your blank from the jig and place it in a small parts holder (this is another reason why the blank ends are kept long and square). Using a roundover bit of the appropriate radius with bearing guide (mine is a CMT 835-850), round over these edges.

Now it's time to cut away any tear-out and make the top of your tote smooth and flowing. Using your template, mark the appropriate lines on your new tote then cut off the excess and sand smooth. A stationary disc sander will make this easier. Next, transfer the locations and angles of all the holes needed. Place the proper size bit for the large top hole in your drill press. Use a handscrew to hold your workpiece and sight down the bit to obtain the proper angle. Bore this hole the correct depth. The tote

I was making also had a secondary screw hole on the bottom; I drilled this next. After this the smaller hole was drilled all the way through, using the line drawn on the blank as a guide. Drill slowly and let the bit do the work (I had to drill through both the top and bottom because my bit was not long enough). Next drill and countersink any other holes needed. Finish up by sanding and blending everything together, getting it ready for finishing.

### Turn the Knob

Now it's time to make the front knob. Begin by preparing a blank approximately  $\frac{1}{2}$ " longer than needed and square up the ends. Although the hole in my knob needed to be  $\frac{9}{16}$ " in diameter, I first drilled it to a  $\frac{1}{2}$ " diameter; this fit my lathe's drive center snugly (I enlarged this hole after I was done turning). I also drilled this hole  $\frac{1}{8}$ " deeper than required to allow for clean-up. Next I

bored the bolt hole all the way through, using the center point left by the  $\frac{1}{8}$ " brad-point bit to center up the smaller bit.

Now over to the lathe. I placed the  $\frac{1}{2}$ " hole over my drive center and the small hole on the live center and proceeded to turn the knob, almost parting it as I cleaned up the ends. I finished cutting off the stubs with a fine dovetail saw. Then I countersunk the top of the knob for its screw. Next, find a longer flathead machine screw. Grind off most of the head and place this through your knob with a nut on the other side; chuck it up in your lathe to finish sanding.

Now the only thing left to do is to put on the finish of your choice, screw your new knob and tote in place, and you're ready to plane (assuming your blade is sharp). **PW**

*Charles Murray specializes in period furniture. If he's not at a meeting of the Society of American Period Furniture Makers, Woodworkers of Central Ohio or Ohio Tool Collectors, you'll find him in his shop.*



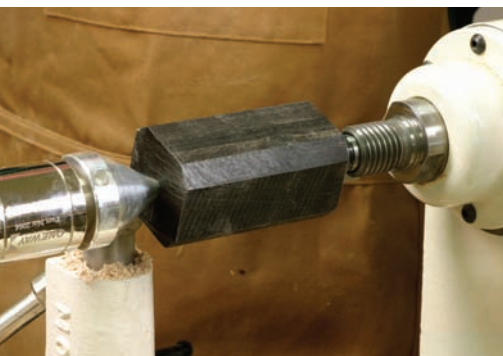
**7 Handscrew helper.** A handscrew can securely hold the workpiece at the required angle for drilling.



**8 Support.** Place a support block underneath as you drill the attachment hole in the back of the handle – otherwise, it could break off.



**9 Prep your knob blank.** Drill a hole that's a bit more narrow than needed – you'll enlarge the hole after turning the knob.



**10 Turn.** Place the hole at the top of the blank over the drive center, and the smaller hole on the live center; turn the knob.



**11 Almost done.** For a clean look and feel, turn as close as possible on the top without parting it off, then remove the stubs with a fine-toothed saw.



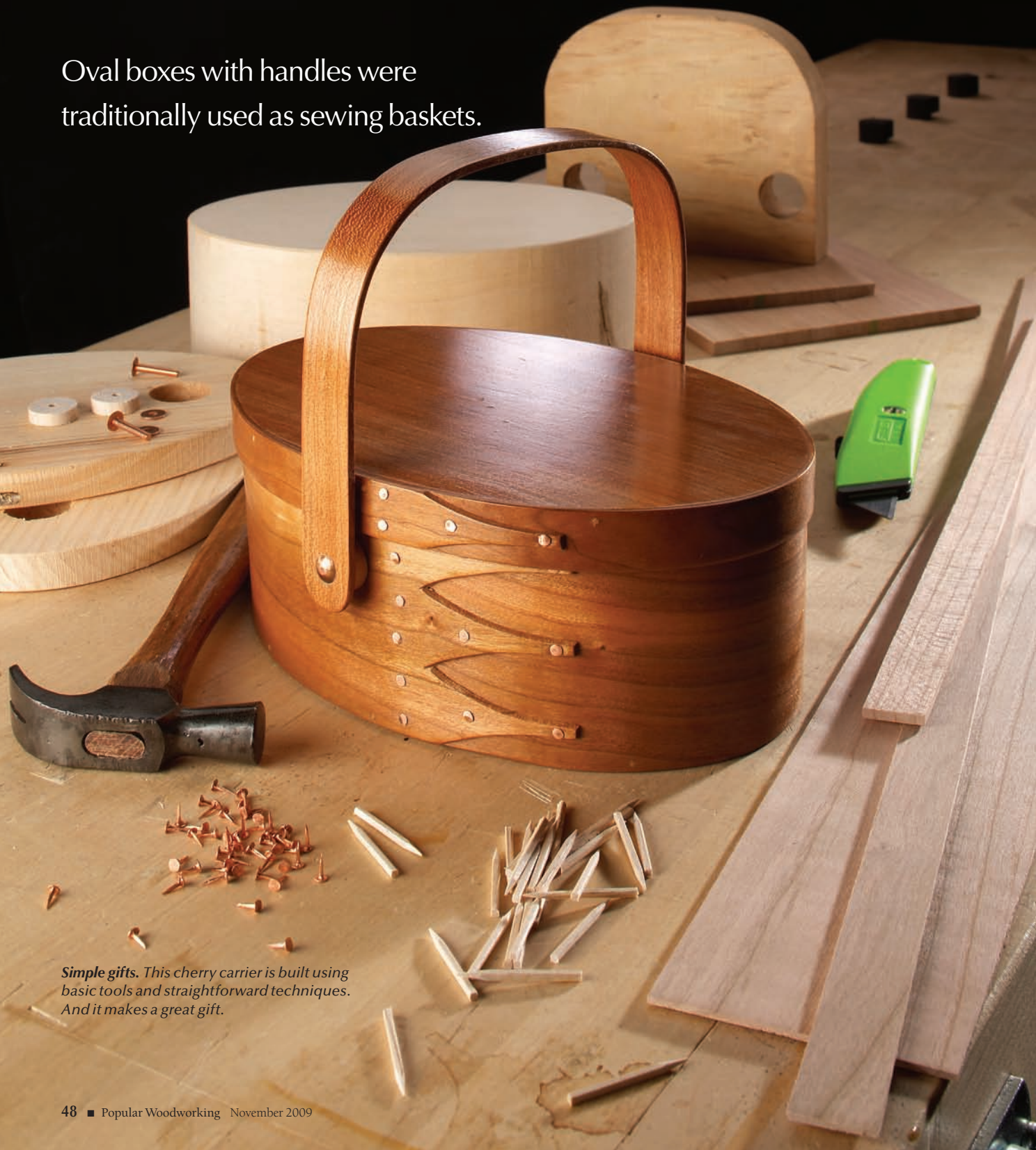
**12 Screwed on.** Use a ground-down flathead screw through the knob to secure it to the lathe for final sanding.



# Shaker Swing-handle Carrier

BY JOHN WILSON

Oval boxes with handles were traditionally used as sewing baskets.



*Simple gifts. This cherry carrier is built using basic tools and straightforward techniques. And it makes a great gift.*

The craftsmen of the Shaker community were known in their day for quality workmanship of utilitarian designs. This project represents one of their adaptations of the oval box in a size commonly referred to today as a #4. (See *Popular Woodworking* August 2003, #135; it's also available online at [ShakerOvalBox.com](http://ShakerOvalBox.com).)

During the period from the 1890s to the 1930s, large quantities of carriers were made and sold in the Shakers' "fancy goods trade," or what we would call a craft or gift store. Such carriers, which they called "work baskets," were lined with satin and fitted with sewing items including a pincushion, needle holder, beeswax for waxing button thread, and an emery ball for sharpening pins and needles. One famous photograph taken at Sabbathday Lake Shaker Village in 1923 shows Brother Delmer Wilson and his output of 1,083 carriers.

## Project Items

The swinghandle carrier requires the following (as shown in the opening photo):

### Wood

- Hardwood bending stock for the lid ( $\frac{1}{13}$ " x  $\frac{3}{4}$ " x 28") and bottom band ( $\frac{1}{13}$ " x  $3\frac{1}{16}$ " x 27")
- Top and bottom boards:  $\frac{1}{4}$ " thick
- Handle:  $\frac{1}{8}$ " x  $\frac{3}{4}$ " x 15", limber enough for bending

### Fasteners

- Small copper tacks  $\frac{1}{4}$ " long, the #2 size
- Wood pegs to hold the top and bottom boards
- Copper trunk rivets with washer and wood spacers made from  $\frac{3}{4}$ " dowel

### Forms

- A core the inside volume size of the box
- Two shapers for holding the wet wood until dry
- Handle bending form
- Patterns for cutting forms and bands

## Bending

The most exacting materials in a bent-wood box are the sides. They need to be strong yet limber, able to bend yet provide adequate strength for the project. Hardwoods such

**Work basket.** This reproduction of a Shaker work basket by Dave Coleman shows the attachment of needle holder, pin cushion, beeswax and emery, tied with matching ribbons through holes drilled in each quadrant of the oval. Some of these sewing baskets were made with lids like Dave's, others were left open to display the fine contents as in Brother Delmer's carriers.



as maple or cherry are commonly used. Be aware that any one piece of wood can exhibit a wide range of flexibility, and you may need to try different pieces to be successful.

Band stock is available from The Home Shop ([shakerovalbox.com](http://shakerovalbox.com)). For those wishing to dimension their own bands, the use of a table saw or band saw to resaw wood, followed by sanding to final thickness in a drum sander, is recommended. And attention to exact thickness is important. The thickness for this project is from .075" to .082". You may have been surprised to read the notation of  $\frac{1}{13}$ " in the Project Items list.

That is the traditional way of the American veneer trade to indicate thickness – a fraction whose numerator is always one. Use of a dial caliper will help you in achieving the desired thickness for your project.

## Tools

You will need a tray of some sort to soak the bands and handle. This can be a specially made tray, or something as simple as a length of eaves trough (a gutter) with end caps. Traditionally, hot water (above 180°F) soaking was used, and I follow that method, although a steam-bending apparatus can do



**Brother Delmer Wilson.** Carriers were an important part of the Shaker's Fancy Goods Trade. Here Brother Delmer Wilson stands next to his winter's output of carriers which would go from the woodshop to the sisters' shop where they were lined with colorful fabric and sewing aids.



the job if you have access to that. A longer soaking in cold water (12 hours or more) can work, but the thicker handle in this project would more reliably be bent after soaking in hot water.

Dimensioning bending stock requires a well-equipped workshop, as to a lesser extent does cutting  $\frac{1}{4}$ " stock for tops and bottoms. If you buy these two items, for the cutting and assembling you'll need relatively few tools. If you have access to a band saw, an electric drill, and a belt and disc sander (the small benchtop variety with a 4" x 36" belt and 6" disc is ideal), together with a utility knife and a small ball-peen hammer, then you have all that's needed.

There are, of course, alternative ways for those with limited shop access or a preference for hand tools such as the use of a coping saw for cutting ovals, and using the utility knife to do all the finger profiling. An alternative to wood cores and shapers (discussed next) is the use of 1"-thick rigid polystyrene foam board, a residential construction mate-

rial, which can be cut with only a utility knife and a sandpaper block. This foam board can be used for a core by gluing together several layers with foam construction tube glue or double-sided tape.

## Cores and Shapers

In addition to a soaking tray you need cores and a set of shapers. The core is a wood plug the size of the inside of a box. The hot, wet band is bent around it. Made from soft wood (foam board also can be used), they are created using the oval pattern at right.

The shapers are the key to the Shakers' box production. You will need a pair for each box made at one soaking. If you wish to make five of one sized box, then 10 shapers are needed. The alternative is to bend on five successive occasions, which is a lot more work than making a few extra shapers. They are made to the same oval pattern as the cores, only they have a 10°-beveled edge to act as corks in the oval opening. Cut them slightly oversized by cutting  $\frac{1}{16}$ " outside

your pattern line. Drill holes for ventilation and to allow you to grab them for removal after the band is dry. The wood for shapers can be solid or ply.

## Preparing Bands

The bands are prepared for soaking by cutting out the shape of the fingers and drilling the holes for copper tacks using a  $\frac{1}{16}$ " drill bit. The final edging to the fingers is done with a sharp knife. A slight 10° bevel is given to the curved edges and the ends of each finger.

The square end is feathered to make a smooth curve to the inside of the box. This feathering goes from full thickness about  $1\frac{1}{2}$ " back from the end to an almost sharp ending. A belt sander, and wood block that serves as a holder, is best for this work.



**1 Fingers.** Profile the finger design to rough dimensions before final trimming with a utility knife. The locations for copper tacks are drilled at this time, too.



**2 Trimming.** My preference for trimming is a utility knife with a fixed, not retractable, blade. This gives the necessary control. Use heavy-duty blades, not the lighter ones that come with a new knife.



**3 Feather.** The inside end of a band is feathered back  $1\frac{1}{2}$ ". This will provide a fair curve to the inside of the box.

**4 In hot water.** The band has been feathered on one end and the fingers are trimmed and drilled on the other. The hot water tray has an electric hot plate with wood blocks under each end for stability. While a full boil is not necessary, water more than 180° Fahrenheit will soften the lignin.



**5 Core.** The wet band is wrapped around a core the size of the inside of the box. Here the wrapped band is marked so that the core can be removed and the band returned to its proper size. Note that all the band's fingers are held to prevent them from splitting. The mismatch at the lapped edges of the band is common at this stage and will be made even when tacking.

Place the bands in hot, nearly boiling water for 10 to 20 minutes before attempting to bend around the core.

## Bending the Oval Band

Your soaked band will cool quickly once it is removed from the tray. When this operation goes in a smooth even motion, band breakage is minimized. Your core will need a pencil mark to show where to start the feathered end of the band in bending. Here is how you find that mark: The major tack line in the swing handle carrier is  $\frac{3}{4}$ " forward of the center of the box, which is also the point of attachment of the handle. The start point of the wrap is  $2\frac{1}{4}$ " to the left of the main tack line.

Copper tacks clinch the band. No glue is needed for this efficient fastening. The tacks are  $\frac{1}{16}$ " longer than two layers of veneer and clinch to hold the lap securely. Have your tacks, anvil, hammer, a pair of shapers and a core ready when the band is taken from the hot water.

The central operation of all box construction takes but a few seconds. In one smooth sweep, hold the feathered end at the start mark and bend it half way around. Change hands, hold and complete the wrap. Pencil a mark across the veneer lap to register the circumference. The photograph in step 5 shows this step completed. Hold the fingers securely at all times to avoid splitting the wood between them. Do not worry about having the edges exactly even or the main tack line exactly where you want it at this stage. Both of these steps come next.

Open the band slightly to remove the core. Bring the band together so the pencil marks meet. Now align the edges of the lap-ping band, then tack the lap.

The last step is to place a shaper in both sides of the oval band. These can be rotated if needed to bring the main tack line into position on the oval. The band is pliable while wet, so you can rotate the shaper. Match the second shaper with the position of the first to avoid a skewed band. Be gentle while inserting the shaper and do not push too hard because this will flare the edges of the band.

The lid band (soaked along with the bottom band) is next. The box itself acts as the core. Size, alignment and centering are observed for this band, too. When tacked, the lid band goes in place with the fingers pointing the same way as the bottom fingers.



**6 Tacks.** Small copper tacks  $\frac{1}{16}$ " longer than the two thicknesses of veneer are used to clinch the lap. No glue is used. The wood cradle secures the pipe anvil to the bench.

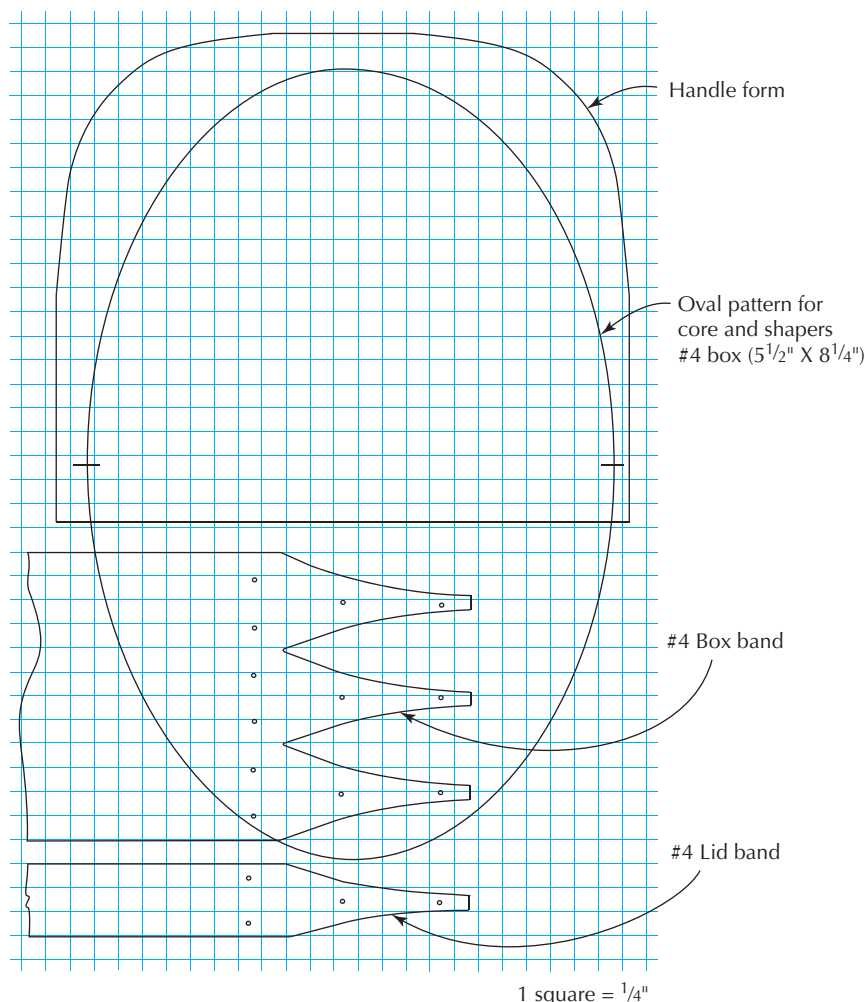


**7 Shapers.** Once tacked, wood corks called shapers are put in both sides to hold the box shape for one to two days of drying. The  $10^\circ$  edge bevel and the holes for ventilation are a hallmark of this piece of bench equipment that is key to the Shaker system of production. The top band is wrapped on the box itself. It will be tacked then returned to the box for drying. Note that the direction of the band finger matches that of the bottom band fingers.

## Online EXTRAS

For a full-size PDF of the patterns shown below, go to:

[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)



SHAKER SWING-HANDLE CARRIER PATTERNS





**8 Mechanical pencil.** Here I'm tracing the oval on the 1/4" boards used for tops and bottoms. A mechanical pencil will ensure accuracy of this line.

The first half of carrier construction will be complete when these two bands have dried in one to two days. Allow for normal air flow around the carrier. Avoid using extra heat, direct sun, or fan blowing. Drying too quickly can result in the veneer warping.

### Bending the Handle

The swing handle needs to be prepared before soaking by rounding the ends and drilling the 9/64" holes for the trunk rivets. The bending form made to the pattern provided on the drawing can use 3/4" plywood, solid wood or foam board. Cut it to shape, and drill 1" holes in the lower corners if you plan on using two small clamps to secure it to the form. Otherwise a 12" sliding-bar clamp can be used to span the whole width. Two small scraps of wood will be needed to protect the wet wood from the clamps as shown in photo 5.

The handle stock is thicker than what you have bent for the box so plan to be thorough in the hot water soaking—20 minutes in the hot water is the minimum. Work while the handle is hot, but ease the wood around the bends and avoid jerky motions. Always put a wood scrap under the metal clamps to avoid getting black mineral stain.

### Fitting Oval Boards

The oval tops and bottoms are 1/4" thick. Your boards need to be as dry as the interior of your home when making the carrier to avoid a shrinkage gap that would appear in the next few days (a bummer). To minimize seasonal expansion that might break the band (an even greater bummer), the Shakers used quartersawn eastern white pine. This is a great choice, but may not be available to you, or fit your décor. Select stable wood—



**9 Two-degree angle.** The disc sander finishes the edge up to the pattern line. The sander table is elevated to 2° to provide a slight cork effect to this ellipse for a tight fit. To make this adjustment, you may need to file out the slide slot so it no longer stops at 0°, or you can remove the thumb screw and use a small C-clamp.



**11 Drill for pegs.** After the oval board is in place and sanded flush, drill the perimeter every 2" to 3" for wood pegs. This drill jig locks a spare drill to a board with a front table the right height to center the hole on the 1/4" board inside.

softwoods are better than hardwoods, and all quartersawn boards have half the dynamic of flat-sawn stock of the same species. Plywood such as 5-ply, 6-mm birch used in furniture and cabinets also works well.

Use the dry carrier band as a pattern for the oval. Remove the shapers and give the inside a light sanding. Use a mechanical pencil for an accurate line around the inside of the oval band. Now determine the direction of the fingers. It's up to you. Historically, most boxes were pointing right, but significant numbers were lefties. In either case, both top and bottom bands should match.

Getting the top band finger direction to match that of the bottom band can be troublesome in the finished carrier. The reason is this: When the lid is lying on the bench to be traced out, it is in the opposite position from where it is in place on the carrier. Check to make sure that you have the right finger direction to match the bottom.

After band sawing the oval, sand the board up to the line on the disc sander. This is not a right angle, but has a slight bevel to



**10 Fit the bottom.** The oval board is fitted into the bottom by setting it against the front lap and then working the back into place. This will ensure that the feathered end will not be damaged in the process of pushing the oval.



**12 Alternate approach.** An alternative drilling method makes use of a drill press. The jig, which is shaped like a bookend, creates a vertical drilling station.

give it a cork effect. To get this, adjust the disc sander table up 2°. Most sanding machines aren't designed to do this out of the box, but you can easily file the slide that adjusts the table to allow it to tilt up. Or, you can tape a 1/8"-thick shim to the outside edge of your disc sander table to achieve this angle.

After sanding, insert the oval board against the front edge first, then press in the back. This avoids catching the feathered end of the band, which can be damaged. Press the board into the oval band until it is even or slightly below the band all the way around. Sand this joint line flush. Now repeat these steps for the lid section.

### Fixing Mistakes

You might find two kinds of repairs helpful in your work, each using their own kind of glue. Wet bands that split can be repaired



**13 Location.** Locating the center front and back from which the hole location is 1" down. Set your box on the floor and look down from a standing position.



**16 Peen.** Peen the rivet until the handle is secured and will stay put.



**14 Rivet sequence.** The rivet sequence is: copper trunk rivet, handle,  $\frac{3}{16}$ "-thick wood spacer, the box side in which has been drilled a  $\frac{5}{32}$ " hole, the copper washer for the inside end of the washer.



**17 The finished project.** Use a clear finish and the cherry wood will patina naturally with time.



**15 Trim excess.** Snip off the excess length of the rivet, or take it out and grind it to the proper length.

with cyanoacrylate (model maker's instant glue) two-part glue because it works on wet wood. The advantage of this is that any repair will hold the pliable wood before it dries. Minor gaps found around the edges of the oval board can be repaired with carpenter's glue. Wipe glue into the gap and sand immediately. The sander dust loads the wet glue, creating a matching glue line. Unlike cyanoacrylate, which remains clear under varnish, carpenter's glue must be removed from the surface before finishing.

### Wood Pegs Hold the Boards

Once the oval boards are in place and the joints sanded flush, it is time to drill for wood pegs. These holes center on the  $\frac{1}{4}$ " top and bottom boards, and are placed 2" to 3" apart around the edge. It takes a  $\frac{5}{64}$ " hole drilled  $\frac{1}{2}$ " deep. Two jigs are shown for ensuring that you do not miss centering the edge of the boards.

Step 11 shows a small drill held down with a wood yoke to create a horizontal drilling jig. Step 12 shows an adaptation for a drill press using a shop-made fence clamped to the work surface. It drills in the vertical mode.

The wood pegs can be split off a thin cutting of wood. However, in my shop, hardwood toothpicks serve for pegs. Holding the

toothpick box firmly to avoid scattering the contents, cut the box in half on the band saw to double your count of pegs. Tap the pegs in securely (no glue needed), and snip off the excess with wire cutters. With the pegs in place, sand the surfaces of the box.

### Attaching the Swing Handle

Remove the handle from its drying form and give it a final sanding. The holes ( $\frac{9}{64}$ ") for the trunk rivets are centered front and back, spaced down 1" from the top edge of the box. This location, as far up the side as the lid will allow, will ensure stability when picking up the carrier.

The sequence for securing the handle is shown in photo 14. You will need a wood spacer  $\frac{3}{16}$ " thick,  $\frac{3}{4}$ " round, with a hole  $\frac{9}{64}$ " centered for the rivet. These are made by drilling in the end of a  $\frac{3}{4}$ " dowel, then cutting segments. This goes between the handle and the carrier. The rivet is fastened on the inside by inserting it through the handle, the spacer and the side of the carrier, then placing a copper washer over the end.

Cut the rivet to a length that leaves  $\frac{1}{16}$ " exposed for peening. An electrician's side cutters will do the job and leave this amount exposed, or you can remove the rivet and grind off the surplus. Place the head of the

rivet on an anvil while peening the inside end. The copper end should have a rounded-over appearance from tapping with the ball peen. This is accomplished by hitting in a pattern that peens the edges as well as the center of the rivet end. When you're done, the handle will swing past the ends of the lid, but not be able to pass under the carrier.

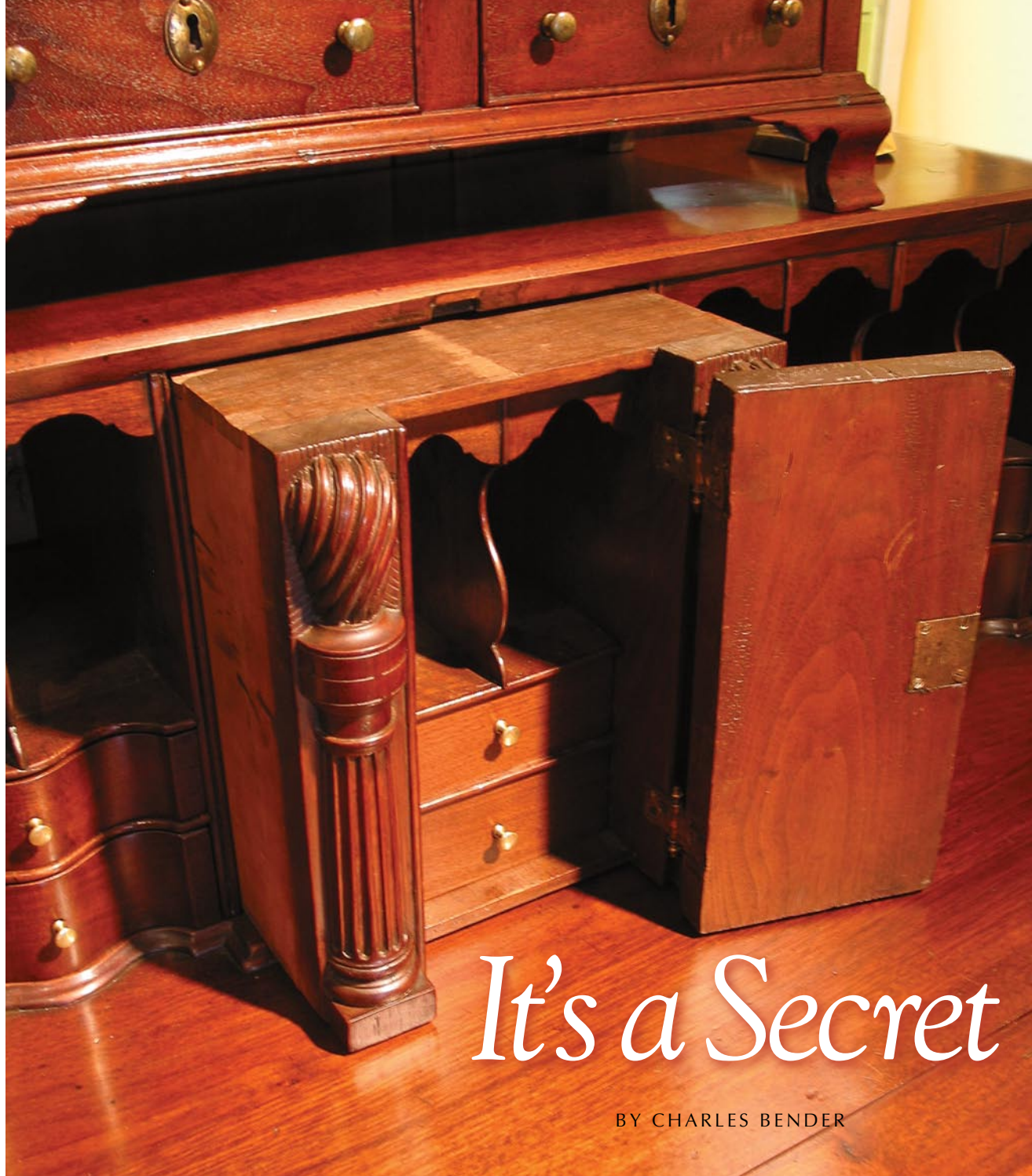
### Finishing Your Carrier: Paint vs. Varnish

Historically, boxes were painted before the mid-1800s and finished clear after that. This project dates from the latter period, and all examples I've seen have been varnished. Of course that doesn't mean that a painted carrier is wrong or unattractive—only that you may need to think ahead if you wish to use a traditional flat paint with dark wax to patina the surface. It will work better to do this before attaching the handle. Clear finishes can be applied either before or after handle attachment. In either case, leave the inside plain wood. Just like the inside of bureau drawers, you do not want the odors from oil or paint finishes to affect food or cloth.

Clear finishes come in a variety of forms such as shellac, varnish, lacquer, oil and blends of several of these. Some are brushed, some wipe on. Each has fans. All work. Your choice. What do I recommend? Polyurethane for durability, especially for projects used around the kitchen. So, pick a finish you like and are familiar with, leave the inside plain, get it done. Sign and date your lovely creation. **PW**

*John runs The Home Shop in Charlotte, Mich., which supplies wood, copper tacks and other critical supplies for the Shaker oval box maker. Contact him at [shakerovalbox.com](http://shakerovalbox.com) or 517-543-5325 (9 a.m.-5 p.m. Eastern).*





# It's a Secret

BY CHARLES BENDER

Secret drawers and hidden compartments are as much fun to create as they are to discover.

When I was a teenager, I met a cantankerous old lumber guy. You know the type—a little too disgruntled to actually have the term “customer service” apply, but with enough raw instinct to look deep within a log to find that special board. I had amateur and professional woodworkers alike tell me they just couldn’t deal with him, but I just kept going back. The wood was too good, and I liked the old guy.

Over the years I saw the quality and quantity of his lumber increase at a rate that far exceeded that at which my skills were developing. We became friends through our

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**Don't be surprised.** Behind the prospectus of a fall-front desk is a great secret area. Understand how the lock works and a world of secrets might be divulged—if, that is, the prospectus is made to remove.

mutual appreciation of wood, but he was still cantankerous. As my skills developed I began to make him a few pieces of furniture. He did, after all, appreciate wood and good craftsmanship. One day I showed him a picture of a Chester County spice chest on frame that I was going to build for a customer. He took the bait and signed on for one himself.

This was my chance to pay him back for all those years of being somewhat less than affable, in a good-natured way of course. Spice chests are known for their secret compartments. These wouldn't be the first secret drawers I'd ever made, but this was my chance to show off how far my skills had progressed. I planned the complex series of locking mechanisms that eventually led to an entire bank of hidden drawers. The best part of the scheme was that he didn't even know spice chests were well-known for their secret compartments.

### It's Not Wasted Space If You Use It

Most furniture forms will accommodate a hidden compartment or secret drawer somewhere. A few forms have had them with fair regularity such as spice chests, fall-front desks and blanket chests. Throughout the ages, craftsmen have tried to take advantage of the "wasted" space occupied by structural elements and mouldings by including a hidden compartment or secret drawer.

If you've ever actually opened a secret compartment on a period piece of furniture, you probably noticed they generally aren't meant to hold very large secrets. In fact, most secret drawers are so small as to seem fairly useless. So why, then, did all those period furniture makers invest so much time in creating them? Why do they still fascinate us today? The answer is simple: They're just plain fun.

As a cabinetmaker, they're fun to plan and execute. Having seen my clients poke and prod their furniture in search of the locking mechanism that would reveal the secret, I can tell you they're even more fun after they're complete.

### Historical Perspective

For thousands of years people have been making secret compartments. We've all seen the movie where the hero dusts off a decorative element then carefully twists that element to engage some sort of mechanical



**Payback is fun.** *Spice boxes and chests, especially those from Chester County, Pa., are renowned for secret drawers and compartments. This chest, a good-natured payback to a crotchety lumber dealer, is loaded with secrets.*

lock that allows the hidden compartment to spring open. The thing that fascinates us about hidden compartments is the ingenuity of the creator. It's the little bit of mystery, the puzzle to be solved to achieve the goal.

From the viewpoint of the maker there's the challenge of creating a compartment that's so carefully hidden, with a locking mechanism that is so creative, that the secrets contained within are secure from all but those who know how the lock works.

It's that cleverness that has kept the popularity of the secret compartment alive amongst the builders and users of furniture for all these years. When we look at secret compartments historically, we discover that they were never more popular than during the 18th century—the Age of Enlightenment. People then, as now, had a fascination with

the latest technology. For them, it wasn't electronics, it was things mechanical. This interest in mechanical, mathematical and scientific thought permeated many aspects of their lives. Tall case, or grandfather, clocks were an example of that interest. They were mechanical in that they were a machine and scientific in that they precisely kept the time.

### Know Where To Look

And people carried this mechanical interest into their furniture. When we examine period pieces we find hidden compartments in every imaginable type of furniture and in some of the most imaginative places in those pieces. There are examples of the decorative valances of the pigeonholes of a fall-front desk being made into small drawers.

You find panels on the front of tills in blanket chests that slide open to reveal hidden drawers; backboards that drop down or pivot out to reveal compartments; hollow dividers that create small spaces for drawers; table and chair aprons that hide drawers. Removable dividers and spring-loaded push buttons – these are just some of the different secrets that have been incorporated into furniture over the years.

When one looks at the locking mechanisms used in these early pieces you find that cabinetmakers primarily used their cleverness in combining simple locks rather than inventing new, complex systems for keeping their compartments closed. In an early 18th-century highboy I copied, the crown moulding conceals a hidden lace drawer. Part of the crown is actually the drawer front. This is a fairly typical place for a hidden drawer in an early highboy.

If this secret drawer design had a locking mechanism, it would have most likely been



**Inside the spice chest.** *Ingenuity positioned these secret compartments at the rear of a sliding divider. Not many would think to remove a portion of the interior to make such a discovery.*





**Put secrets where you can.** A drawer divider on a blanket chest is a great spot for a secret compartment. So-called “wasted” space becomes fun, useful and intriguing.



**You have to look closely.** Many early high chests have secret drawers behind the cornice moulding. Lace and other highly revered items were kept there.



**The secret's out.** One of the most common areas for secret drawers in antique desks, and an area that's often copied in reproductions, is the pigeonhole valances.

a simple spring lock, also called a Quaker lock. This mechanism can be used in combination with other spring locks to provide an infinitely variable series of locks that keep a compartment closed.

Another common locking mechanism was the sliding dovetailed key. This amounts to a small piece of wood set into a dovetailed groove that slides into a mortise, which locks the hidden drawer or secret compartment.

These two simple locking mechanisms account for the majority of locks on secret drawers in 18th-century furniture. They were popular because they could easily be made in the shop, and, more important, they were easy to use. Creatively applying them in combination allows the furniture maker to create a secret compartment that is not easily opened.

Both locks start out using the same basic dovetailed key. They were usually made from a hard, springy wood. I used white oak in my examples. The spring lock would usually be a bit thinner and longer than the sliding key. This allows the spring lock to be flexed enough to allow it to be unlocked. The sliding key was usually a bit thicker and shorter in length. It relied solely on its ability to be completely removed from a mortise, thereby allowing the compartment to be revealed.

## Lock Mechanisms Made Easy

Let's examine, step by step, how to make these two very common locks. First is the spring, or Quaker, lock. This lock has many applications but is particularly good to use in conjunction with hidden compartments. The photograph to the near right shows all of the tools necessary to make this lock. Although only hand tools are pictured, a router can also be used.

The most common place to find this lock is on the bottom of drawers in chests. In antique furniture, iron or brass drawer locks were expensive and took a lengthy period of time to acquire. A furniture maker might use a few metal locks for the lower drawers of a chest and a couple Quaker locks on the smaller, upper drawers. The spring mechanism is little more than a piece of hardwood attached to the bottom of the drawer using a sliding dovetail set at an angle. This allowed the front of the spring to catch a drawer blade (also known as a drawer divider) just below the drawer; that kept the drawer closed and locked. One would need to open the drawer below in order to access the spring on the upper drawer.

I usually start with a piece of oak about 1/8" thick (depending on the application) and a few inches long. Use a handplane to bevel the edges of the oak so it tapers toward the top. Make sure to keep the sides of the oak key parallel as you work. Check the angles to make sure they are planed to similar angles.



**Check your tool chest.** Eighteenth century furniture makers would have used tools such as these to create and install a Quaker lock or a sliding dovetail key.

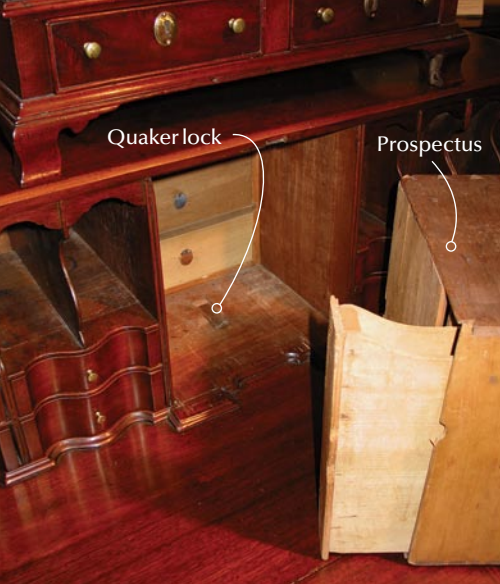
Once you have the oak key cut, it's time to transfer the dimensions of the key to the piece in which the key gets installed. Set a bevel square to the angles of your key, then saw into the drawer bottom. The idea is to create a dovetailed channel that slopes upward from its back and reaches a vanishing point about half the length of the key.

Once you have the channel sawn, use a chisel to remove the waste. If you find it difficult to saw the sides of the channel, chopping the side angles with a chisel is acceptable. Use your handplane to adjust the key; make the key fit into the channel snugly. As you can see in the picture at the top right of the next page, the oak key now protrudes from the surface of the drawer bottom.

If you want to use this Quaker lock with a secret compartment, say the prospectus of a fall-front desk, the spring is mounted in the desk interior with a corresponding catch in the prospectus bottom. To free the unit from the desk, remove the lower drawer of the prospectus to gain access, then through a small hole placed in the bottom panel, use a pin or



**No fastener is required.** The edges of the spring mechanism are planed to a dovetail shape to hold the spring in position as it's depressed. As pressure is applied to release the lock, the dovetailed sides push against the channel.



**Another secret revealed.** Quaker locks are perfect for use in fall-front desks. The prospectus is held secure, as are the secrets captured within the exposed compartment, until the owner depresses the spring to free the box from the interior.

paperclip to depress the spring and slide the prospectus from the desk interior.

The next type of lock is the sliding dovetail key. It is very similar to the Quaker lock except that the dovetailed key is positioned flush with the surface into which it is being set. Usually the dovetailed key slides inside a dovetailed channel and is captured in a mortise in an adjacent piece.

Start with the piece into which the dovetailed channel is to be cut. Install a dovetail bit into a router with the depth of cut set to the thickness of the key (in my case, a piece of  $\frac{3}{16}$ " oak), then set a fence to guide the router and run the channel into the piece, which is usually a case side or bottom. I seldom make my dovetailed keys longer than a couple inches, so be sure to plan the length of the key before you run the slot with the router.

After the channel is cut, use a chisel to square up the end. Now it's time to fit the dovetailed key. You can either shape the key with a router set in a table, set up a table saw with the appropriate angle or just use a handplane to cut the key to size, like I did on the Quaker lock. Remember that the key needs to taper toward the top along both edges just like the Quaker lock; this keeps the key from falling out. Fit the key into the slot using a handplane until you get a nice slip fit. Use a carving gouge and a bench chisel to add a finger grip to the key so the key is easy to slide.

This is one of the favorite locks of the spice chest builder. You'll commonly find



**It's a compound cut.** Use a bevel gauge, set to the angle planed on your key, to align your saw as you define the dovetailed channel. After the edges of the channel are sawn, use a chisel to waste out the material.



**Compact and flush.** The sliding dovetailed key, nestled into its slot, is sometimes missed during inspection due to the flush fit.

them holding up the back of the chest. One merely needs to remove the appropriate drawer from the chest, slide the lock forward and the backboard slides down to expose the secret compartment. For the lumber guy's spice chest, I used a series of both types of locks to keep the interior of the chest from being easily removed. One merely needed to remove the proper drawers, in the proper sequence, and release the lock within to eventually remove the entire interior of the chest. That accomplished, another complete bank of hidden drawers behind it was exposed.

The sliding dovetailed key can be used to stop a drawer or an entire interior case from moving. In the photograph at right you can see a sliding dovetailed key protruding from the side of a desk prospectus.

These two common locking mechanisms are very versatile. If you use a little imagination they can help you create secret compartments in nearly all your furniture projects, as long as you plan for it.

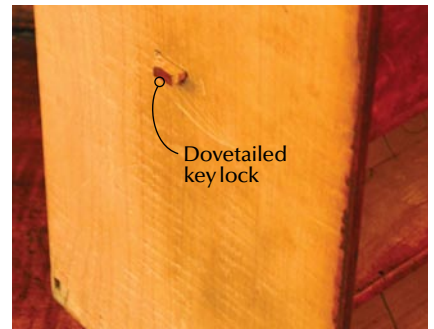
Secret drawers give you the chance to expand your skills and show how clever you can be. You'll have fun planning and making them. Your friends and family will have fun hunting for the locking mechanisms and discovering the secrets. You'll have even more



**A different application.** A spring lock is fit into a drawer bottom. From here, it's easy to fine-tune the fit so the lock catches the drawer blade and holds the drawer closed.



**Is power the choice?** The sliding key is flush, so you can use a router to make the dovetailed slot. Set the depth of cut equal to the sliding key thickness, set a straight fence to run against then cut the slot. Or cut the slot by hand.



**A tiny and mighty lock.** This small dovetailed key lock, slid through the side of a tiger maple fall front desk prospectus, has held the unit in place for hundreds of years with its secrets intact.

fun watching them in the pursuit. If you're like me, however, you'll find great pleasure in the secrets themselves. This is particularly true in the case of my lumber guy's spice chest. You see, I never told him there were any locks or hidden compartments in his spice chest. To this day, I don't know if he's discovered every secret. **PW**

*Charles is a nationally renowned period furniture maker near Philadelphia, Pa., and is the lead instructor of The Acanthus Workshop. To learn more about his furniture and the school, or to contact him, visit [acanthus.com](http://acanthus.com).*



# Knockdown Computer Desk

BY HUNTER LANG



Ladders form the base of this knockdown desk — simple steps to a higher education in woodworking.

I'm in the midst of preparing for college, so I need a desk that is functional but also portable, so that I can easily move it into my dorm room when the time comes. The desk that I've had since I was nine years old is too small and about to fall apart. It wouldn't be worth it to take it to school with me. So I decided to build a new one.

This new desk was designed with a large top to hold a computer monitor and still have enough space for book work. It was also designed to be easily taken apart and put back together. Slots in the rails of the shelves fit on top of the rungs of the ladders with a few screws for added stability. This design would be ideal for any college student, and meets my needs perfectly.

**Easy to build, easy to move.** This contemporary computer desk is built with simple joinery and is designed to be assembled or disassembled in minutes.



**Take it for a spin.** Tenons are formed on the ends of the rungs by rotating a dowel over the router bit.

I began building the desk by cutting  $1\frac{1}{4}$ "-diameter poplar dowels to  $20\frac{1}{4}$ " to be used as connectors for the ladders. Then I made tenons on each end at the router table, with a  $\frac{1}{2}$ "-diameter straight bit with  $\frac{1}{8}$ " of the cutter exposed above the table. To keep each dowel centered over the cutter, I clamped blocks on each side of the bit and set the fence on the router table back from the front edge of the cutter by  $\frac{7}{8}$ ".

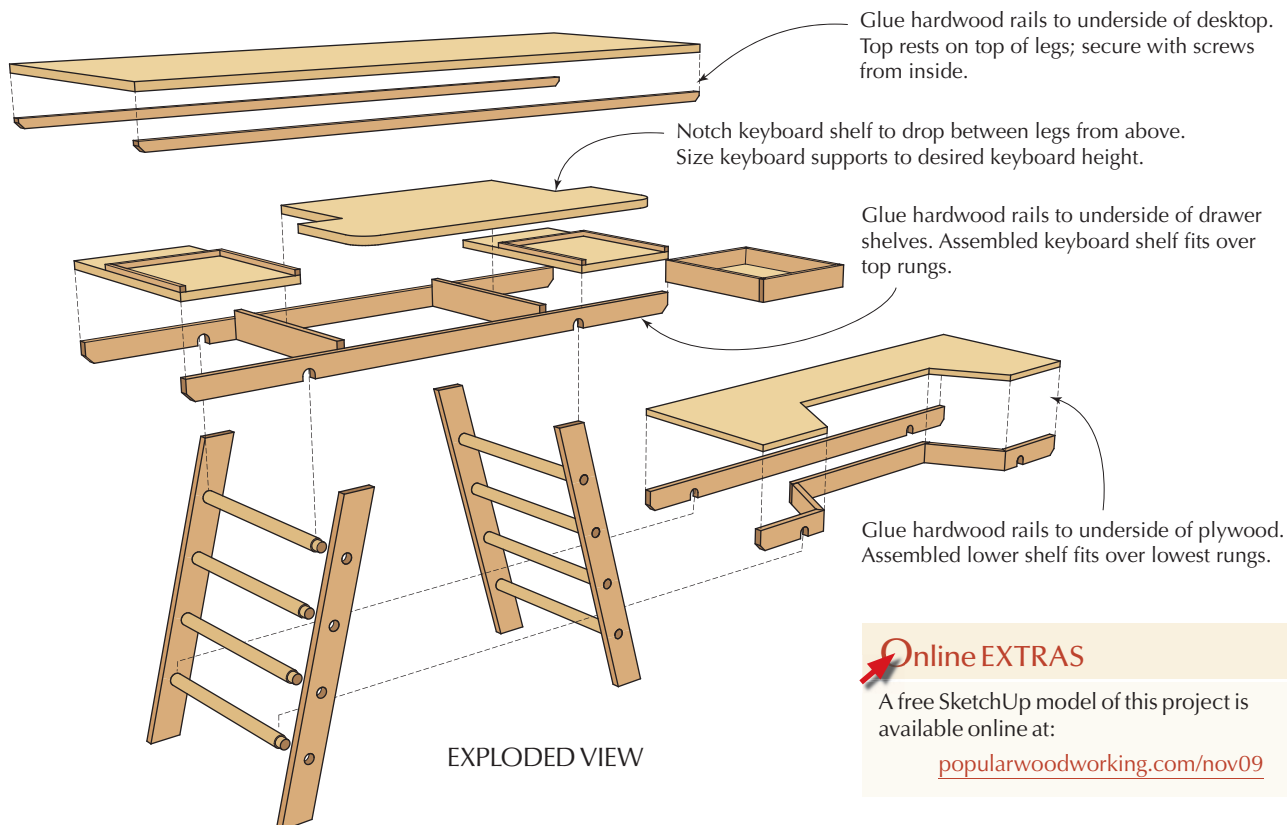
I moved each dowel into the cutter and rotated it with my right hand as I held it down with my left. As the cuts were made I moved the dowel toward the fence until I had made a complete rotation with the end



**Holes in a row.** Careful layout and setup of the holes in the legs makes for easy assembly and sturdy construction.

of the dowel against the fence. This gave me a tenon on the end with a 1" diameter – that's long enough to go through the legs of the ladders.

After preparing the tenons, I cut the angled leg pieces to length and laid out centers for holes according to the drawing on page 60. I grouped the legs in pairs and marked off the locations for the holes and the angles on the ends of the legs. Then I



## Online EXTRAS

A free SketchUp model of this project is available online at:

[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)



drilled the holes with a Forstner bit at the drill press, using the fence to center the holes in the legs.

### Little Things Mean a Lot

The next step was to make a kerf across the grain in each tenon with the band saw. I set the fence to keep them centered, and I stopped cutting just before reaching the shoulders of the tenons.

Next, I made wedges to put into the tenon kerfs. These wedges strengthen the bond between the dowels and the legs after the joints are put together. To do this, I angled the miter gauge to 3° and sliced wedges from a wide, 1"-long cutoff of scrap. I flipped the piece after every cut to form the wedges. To



**Across the grain.** A band sawn kerf is cut in the center of each tenon.



**Flipping for wedges.** The miter gauge is set at a slight angle, and the wedge stock is flipped over after each cut.

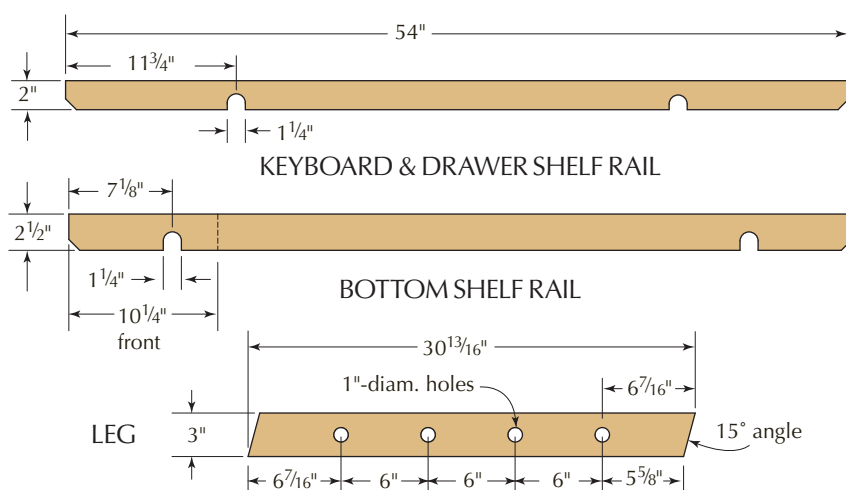
keep the pieces of wood from falling through the insert in the band saw table, I put packing tape over it.

Now I was ready to put the tenons into the holes of the leg pieces. I started by brushing glue around the inside of the holes. Then I inserted the tenons and clamped the legs and rungs together. I put glue on the wedges and drove them into the slots in the tenons to hold the pieces together. I let the glue dry overnight then trimmed the protruding tenons and wedges with a flush-cut saw, and cleaned up the wedges with a block plane.

### One Piece of Plywood

With the leg units assembled, it was time to start building the shelves. All the plywood in the shelves came from one 5' x 5' piece of 3/4"-thick Baltic birch plywood. I ripped the plywood at the table saw. I made two rips at 18 1/2" for the bottom shelf and keyboard shelf, and I made the last rip at 22" wide for the top shelf.

I cut the bottom shelf to 54" long, cut the two end pieces for the drawer shelves to 11 5/16" long, and set the leftover pieces aside for the keyboard shelf. I laid out the



**A reason to hide.** I used liquid hide glue to allow more time to assemble the rungs and legs.

notches in the solid-wood rails that support the shelves and drilled 1 $\frac{1}{4}$ "-diameter holes at these locations, with the top edges centered in the width of rails.

I used an adjustable square to draw lines tangent to the edges of the holes from the bottom edge of the rails. I used the band saw to cut from the edge of the rails to the holes to make notches, but you could easily use a jigsaw instead. Then I used a rasp to remove the saw marks at the notches and tested that they fit well enough to just slide over the rungs of the ladders.

The angled cutout area in the lower shelf provides legroom. To make it, I set my bevel gauge to 15° for the angle and went back from the front 9". With a jigsaw, I carefully cut

outside the lines that I had marked. Then I cut the rails to match the bottom front and back edges of the shelf.

I mitered the ends of the rails at the front corner of the cutout in the bottom shelf. The last piece below the bottom shelf, the foot rail, is just butted against the ends of the angled pieces.

### Starting at the Bottom

I started assembly with the bottom shelf, and worked my way upward. No fasteners were necessary. I just used glue, lots of clamps and a strip of clear packing tape across the mitered corners. After the glue dried overnight, I used a trim router with a flush-cutting bit to trim the roughly cut plywood to

the straight edge of the solid wood rails.

I put the shelves onto the ladders and clamped them into place. I then attached the shelves to the ladders with #8 x 1 $\frac{1}{4}$ " screws from the inside of the rails into the legs of the ladder units. These screws don't show when the desk is assembled, and they keep the shelves from pivoting on the rungs.

I wasn't sure how tall the keyboard tray should be. My original design had the keyboard tray on top of the rails of the first shelf below the top. I thought that this made the tray too low, so I decided to make it a little taller. So I cut two solid pieces of wood 2 $\frac{3}{4}$ " wide to support the keyboard tray, cut them to length and attached them between the front and back rails of the top shelf with



**A short drive home.** The wedges spread the ends of the tenons, making them tight in the mortises in the legs.



**A little off the top.** I made the tenons a little long, then trimmed them after assembly.



**New block for the kid.** A few passes with a block plane levels the ends of the tenons and wedges to the surface of the legs.



**Notches are the key.** The semi-circular openings in the bottom of the shelf rails line up all the parts and make assembly a snap.



**Glue is enough.** The connection between the plywood and solid wood is long-grain to long-grain, so a glue-only joint will be solid.



pocket screws. I didn't use glue in case I decide to change the height later on.

You may also need to adjust the shelf heights to accommodate your computer case, if you want to put it on the bottom shelf. Check the clearance you will need before building. You can also leave the drawer off one side if you need the space. Replace the plywood shelf with solid wood rails between the two long rails, and that will give you a few more inches.

I used a square to locate the notches on the keyboard tray, and made sure to leave clearance so I could drop the tray straight down between the ends of the ladders. These notches allow for easy disassembly; just pull the tray straight up to take the desk apart.

After I cut the notches in the keyboard tray with a jigsaw and smoothed the edges with a rasp, I screwed it down to the rails. The space behind the tray leaves room for wires and cables. The top was simple; two straight pieces of solid wood were glued beneath the front and back edges of the plywood. The top rests on the top of the legs, and is secured with a screw from the inside of each leg into the desk's top supports.

## Cutting Corners

I used the jigsaw to round off the sharp corners of the keyboard tray, then smoothed them with a rasp. Next, I used a  $\frac{1}{8}$ " radius roundover bit in a trim router to ease the sharp edges on all the parts of the desk. Now it was time to sand everything. I used #120-grit with a random-orbit sander.

The drawers are simple boxes with rabbet-in-groove joints at the corners and a  $\frac{1}{4}$ "-thick plywood bottom that slides into grooves in the drawer fronts and sides. To guide the drawers, I cut strips of solid wood  $\frac{1}{2}$ " square. After the drawers were made, I set them on the shelf and nailed a strip on each side of the drawer to act as guides, plus one at the back of each as a stop.

After everything was assembled and sanded, I applied two coats of brushed-on satin water-based polyurethane. After the first coat, I sanded with #180-grit sandpaper to smooth out the finish.

The building process wasn't as difficult as I had expected. I had to work with many tools that I had never used before, but I took to the new challenges readily. The design of the desk is very functional, so all of the construction steps made sense.

After finishing the desk, I was very satis-

fied with my final product. I put hard work into building my desk, but it is going to meet all my needs for college. I have already taken it apart and put it back together a few times. It was a stress-free process each time, and I'm not apprehensive in the least bit about having to disassemble it and take it with me to college. I know that it will be a simple process, and it will probably be the easiest part of moving. **PW**

*Hunter is a high school senior from Maineville, Ohio. In addition to woodworking, he runs cross-country, pole vaults and plays guitar. This is his second article for Popular Woodworking.*



**Quick assembly.** A few screws in concealed locations hold the pieces securely together.



**Cutting corners.** The angled cutout in the bottom shelf provides some legroom as well as out-of-the-way storage.

## Knockdown Computer Desk

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
❑ 8	Rungs	1 $\frac{1}{4}$ dia.		20 $\frac{1}{4}$	Poplar	18 $\frac{1}{2}$ " between tenons
❑ 4	Legs	1 $\frac{3}{16}$	3	30 $\frac{13}{16}$	Oak	
❑ 2	Desk top supports	1 $\frac{3}{16}$	7 $\frac{7}{8}$	60	Oak	
❑ 2	Keyboard shelf rails	1 $\frac{3}{16}$	2	54	Oak	
❑ 2	Keyboard tray rails	1 $\frac{3}{16}$	2 $\frac{3}{4}$	18 $\frac{1}{2}$	Oak	
❑ 1	Bot. shelf back rail	1 $\frac{3}{16}$	2 $\frac{1}{2}$	54	Oak	
❑ 2	Bot. shelf front rails	1 $\frac{3}{16}$	2 $\frac{1}{2}$	10 $\frac{1}{4}$	Oak	
❑ 2	Bot. shelf angle rail	1 $\frac{3}{16}$	2 $\frac{1}{2}$	10	Oak	
❑ 1	Bot. shelf foot rail	1 $\frac{3}{16}$	2 $\frac{1}{2}$	25 $\frac{5}{16}$	Oak	
❑ 2	Drawer fronts	1 $\frac{1}{2}$	2	10 $\frac{5}{16}$	Oak	
❑ 2	Drawer backs	1 $\frac{1}{2}$	1 $\frac{1}{2}$	9 $\frac{13}{16}$	Oak	
❑ 4	Drawer sides	1 $\frac{1}{2}$	2	12 $\frac{3}{16}$	Oak	
❑ 4	Drawer guides	1 $\frac{1}{2}$	1 $\frac{1}{2}$	12 $\frac{11}{16}$	Oak	
❑ 2	Drawer stops	1 $\frac{1}{2}$	1 $\frac{1}{2}$	10 $\frac{5}{16}$	Oak	
❑ 1	Desk top	3 $\frac{3}{4}$	20 $\frac{1}{8}$	60	Birch ply	
❑ 1	Bottom shelf	3 $\frac{3}{4}$	18 $\frac{1}{2}$	54	Birch ply	
❑ 2	Drawer shelves	3 $\frac{3}{4}$	18 $\frac{1}{2}$	11 $\frac{5}{16}$	Birch ply	
❑ 1	Keyboard shelf	3 $\frac{3}{4}$	18 $\frac{1}{2}$	32 $\frac{5}{16}$	Birch ply	

# Dovetail Markers

These simple shop-made helpers will make marking less of a chore.

**M**arking out dovetails for hand cutting goes much easier with these helpers. Held in place while hooked over the end of a board, these markers allow you, with one placement, to pencil a squared line across the end grain and a tail-slope line down the face grain.

To cover a range of dovetail angles, it is easy to produce several markers, each with a unique slope. This helps reduce errors.

## Select a Durable Wood

Use a dense, stable, fine-grained hardwood that will produce smooth, durable end-grain surfaces, such as the bubinga used here. Outside dimensions of the markers are 1½" tall, 1⅜" deep and about 1¼" wide. The rabbet extends 1" from the inside corner in each direction, allowing use on boards up to 1" thick. For most woodworkers, this will cover the vast majority of dovetailing.

On the edge of a dry four-squared board without internal stresses, 1⅜" thick, at least 12" long and about 4" wide, make a 1" x 1" rabbet on the router table with a 1" straight bit. Proceed in many small increments because this rabbet is far too large to make in one pass. For accuracy, make a final pass to remove just a sliver from each wall of the



**Dovetail marker.** I've made dovetail markers in a range of ratios to suit the work I do most often.

rabbet. At the table saw, rip away a 1½" strip containing the rabbet.

Use the table saw to create the angled edges. Make sure the blade is square to the table. The chart below converts commonly used slope ratios to degrees.

There is no need for extreme accuracy in setting the miter gauge, but the angles on each side of the marker must be consistent. Please do not risk your fingers by holding a short piece against the miter fence and crosscutting it. Work by cutting short pieces off the original long piece.

Here's the best method I've found:

Use the miter gauge to square the short edge of an approximately 10" x 12" piece of ¾" MDF. Rotate the miter gauge clockwise and lock it at the desired dovetail angle. Holding the same edge as before against the miter fence, crosscut away a narrow wedge, about 2" wide, tapering to about ½". Glue sandpaper on the angled edge.

This wedge now serves as an auxiliary miter fence. Reset the miter gauge to 90° and place the wedge against the fence (mine has sandpaper on it) with the angled edge away from you, wide end to the left. Place the thick wall of the workpiece against the wedge with the rabbet up. Crosscut the first slope. Now simply flip the wedge end for end to set up the second angled crosscut, which converges toward the first, to produce a marker about 1¼" wide.

Note: These markers can be made more directly with a single miter gauge angle setting by rotating the workpiece after the first cut so the rabbet faces toward you. But this makes the workpiece less stable and it is difficult to avoid tear-out on the inside edges of the marker against which the pencil will bear in use. I do not recommend this method.

Check the accuracy of your markers with a square and sliding bevel. Chamfer the outside edges that do not contact the work. Be sure to mark the slope on each gauge prominently – it looks nice to carve the number with a "V" tool. Apply an oil finish. **PW**

**Table saw setup.** With the miter gauge locked at 90°, the wedge serves as an auxiliary miter fence to create the desired angle on the bubinga.



## Common Slope Ratios

5:1 = 11.3°	7:1 = 8.1°
6:1 = 9.5°	8:1 = 7.1°

Rob has been a woodworker for more than 25 years; his shop is in Medfield, Mass. You can see more of Rob's woodworking ideas at [rpwoodwork.com/blog](http://rpwoodwork.com/blog).

## Online EXTRAS

For additional step photos, visit:

[popularwoodworking.com/nov09](http://popularwoodworking.com/nov09)



# The Thick & Thin of Veneer Repair

Veneer is just thin wood – so don't be afraid of it.

I love repairing old furniture – the older the better. I find repairing more challenging and satisfying than making new because someone else, or time and age, has set the parameters within which I have to work.

I've written several articles in *Popular Woodworking* on furniture repair, including "Regluing Doweled Chairs" in April 2007 (#161) and "Animal Hide Glue" in August

2007 (#163). Both articles are available free at [popularwoodworking.com/finishing](http://popularwoodworking.com/finishing).

But I haven't written on veneer, and lots of things can go wrong with veneer. For some reason many woodworkers, and even professional furniture restorers, have a fear of working with veneer (some shops even refuse to do it). I find this fear difficult to understand because veneer is just thin wood,

subject to the same rules as thick wood.

Recently, I had the opportunity (joy, really) of replacing some missing veneer on one of the oldest pieces of furniture I've ever worked on – an early 18th-century George II bachelor's chest with a hinged top that opens to a desk. The challenges were a little greater than usual, so I thought I'd show you how I dealt with them.

One aside before starting. After you've worked on a lot of old furniture, you become adept at spotting anomalies that indicate fakery or a "marriage" of two or more pieces of furniture. On this card table I saw nothing to make me question its authenticity.

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*Bob Flexner is the author of "Understanding Wood Finishing" and a contributing editor to Popular Woodworking.*

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**Top closed.** With the hinged top folded closed, the piece serves as a chest of drawers. Notice my veneer repair in the lower left-hand corner of the top.

**Top open.** With the top opened to rest on pull-out lid supports, the chest becomes a writing desk. Notice that the veneer on the back half may have been at some point replaced. The two halves should be bookmatched – but they're not.



**The damage.** Here's the damage the owner wanted me to repair.



**1 Straight edges.** It's far easier to shape a patch when you're dealing with straight rather than curved edges. So, if possible, I always try to straighten the edges before fitting my patch.



**2 Removing excess.** It's often possible to pop off the waste veneer as I'm doing here. When I meet resistance, I can usually overcome it if the glue is hide glue by using a syringe to insert a little denatured alcohol under the veneer. The alcohol crystallizes the glue, making it easier to separate.



**3 Cleaning up.** Though it's possible to reglue right over old hide glue using hot hide glue, it's best to clean off the old crumbly glue (and whatever contaminants, such as wax, that might be on the surface) before gluing the patch. Here I'm washing off the old glue with hot water. All contaminants come off with the glue.



**4 The challenge.** Above the hinge you can see damage to the substrate that must be repaired so the veneer has something to bond to. Also, you can see that the veneer is considerably thicker than modern  $\frac{1}{32}$ "-thick veneer. Thick veneer is common on furniture made before the machine age. Veneer seems to get thicker the older the furniture.



**5 Straight edges.** Again, it's always easiest to work with straight edges. So I'm cutting one using a chisel.



**6 Rub joint.** One of the reasons I love hot hide glue is that I can create a strong bond simply by rubbing two pieces of wood together with the glue in between. Work proceeds very rapidly using rub joints. Arranging a clamping setup for this patch would clearly be difficult.



**7 Shaping the patch.** After leveling the repair to the substrate using a chisel, I cut the veneer patch and trim it to fit snugly. The veneer is European walnut, which is considerably lighter in color (closer to tan) than American black walnut. If I didn't have any solid European walnut, I could use American walnut, but I would have to bleach the color out of the wood, then stain it to match, which could be difficult. I could also glue several layers of thinner European walnut veneer on top of one another to create the thickness, but cutting the veneer from solid, as I'm doing here, is always best.



**8 Rub joint.** Because of its thickness, I can glue the veneer patch, which I cut thicker than needed (called "leaving proud"), quickly and simply using a rub joint. But clamps wouldn't be difficult to arrange here.



**9 Leveling.** I use a block plane, scraper and sandpaper to level the veneer patch to the surrounding wood. It's important to avoid cutting into the surrounding old veneer. If you cut off some of the aged surface wood, you may expose wood that is lighter or darker and create difficult color-matching problems. Applying masking tape around the patch can be helpful. Working slowly and carefully is essential.



**10 Trimming.** With the top surface of the patch leveled, I trim the end using a chisel because of the difficulty of getting a hand plane into the narrow area above the hinge. Notice the missing veneer to the left of the hinge. I popped it off (by inserting denatured alcohol) to make the shaping and trimming of the patch easier. With the patch trimmed flush I will reattach the veneer so it covers the edge as it originally did.

**11 Finished.** Here's the completed repair with a wax finish applied. Wax was the common finish used in the early 18th century and it continues to be the finish on this piece. The repair stands out a little in this close-up, but it disappears in the larger shot shown at the beginning of this article. Only someone who knows it's there would find it, which is all that you can ask for in a repair. **PW**



# Regulae Stultis Sunt

Rules are for fools.

My junior high math teacher, Mr. Gayda, was fond of saying, “Rules are for fools.”

Although this little maxim sounds like a rallying cry for anarchists, Mr. Gayda was a man of many rules and by no means a member of some radical organization. I took his meaning to be more along the lines of: “Society has many rules and they are there for a good reason – but it’s foolish to follow them blindly.”

There are rules for every aspect of life. Art and furniture design are no different in that respect. Back in the days of T-squares, I had many of the rules prominently displayed on my drawing board. My designs were infused with Fibonacci numbers; golden rectangles were abundant. I thought I was doing everything right and I admit I had a few “acceptable” designs, but nothing that had any real fire in its soul. I had the rules in an iron grip, but they were not taking me where I ultimately wanted to go.

In the year following 9/11 my orders dropped off (as most everyone’s did). There came a point when I ran completely dry of work. Previous to this my comfort level was about a six-month backlog. I was now in panic mode. If nothing came in soon, I might have to get a real job! I had spent years getting to where I was, and I was not prepared to let it slip away without a serious fight.

At this point, an old Star Trek episode came to mind. Spock is in a dire situation and facing certain death. He has done all the possible logical things to save himself.

Faced with a seemingly impossible dilemma, Spock concludes that the only logical thing to do is the illogical. He must rely upon his intuition, which he does, thus saving himself with only nano-seconds to spare.

So given the fact that desperation was setting in, the Spock episode was on a continuous loop, and Mr. Gayda’s maxim was

when I am designing. There is only one rule in creative endeavors that is eternal: “No rule is so sacred that it cannot be broken.”

Inspiration and intuition are the major players in artistic pursuits. Without them, art is lifeless and sterile. The rules play a part but must be subordinate to intuition.

Louis Sullivan, the father of the skyscraper and mentor to Frank Lloyd Wright, wrote: “Formulas are dangerous things. They are apt to prove the undoing of a genuine art, how-

ever helpful they may be in the beginning to the individual. The formula of an art remains and becomes more and more rigid with time, while the spirit of that art escapes and vanishes forever. It cannot live in text-books, in formulas or in definitions.”

“Regulae Stultis Sunt,” or “Rules are for Fools,” is a gross simplification of my views, and on a literal level it is a bit too black and white for me. But it serves as a symbol and represents much more than those few simple words can convey.

I have recently put the finishing touches on a new shop building. As you enter, there are brass letters embedded in the concrete floor that read: “Regulae Stultis Sunt.” So now, the maxim is firmly embedded in my mind and under my feet, where it serves as a stepping off point every time I enter the shop to start on a new project. **PW**

still making the mental rounds, I decided on a course of action.

I had a file cabinet stuffed full of never-built designs – all lacking fire. It was time to re-visit these designs and this time forget the rules. I would rely on intuition, my only constraint being the function of the piece. I spent several weeks reworking the designs. I posted the results on my web site. To encourage commissions, I offered a discount on the first commission for each of the designs (just a note here – I no longer offer the discounts). I was overwhelmed by the response. Not only had I clicked into the right groove artistically, but I was backing up orders in a decidedly down market! And for the first time, I could feel real fire in my work. An act of desperation had rejuvenated my portfolio and in so doing had re-launched my woodworking career in the right direction.

I still believe that rules of design are valid. I refer to them when giving design advice, but they no longer rule me. After many years, the rules have been fused into my consciousness. They have become a part of what I “feel”



*Darrell Peart specializes in furniture in the style of Charles and Henry Greene, and is the author of “Greene & Greene Design Elements for the Workshops” (Linden). A photo gallery of his work and the book are available on his web site: [furnituremaker.com](http://furnituremaker.com).*