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Christopher Schwarz's Charleston Table

Popular Woodworking Magazine

APRIL 2012 ■ #196

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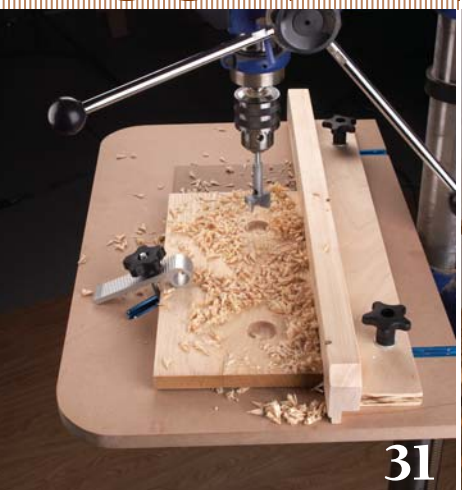
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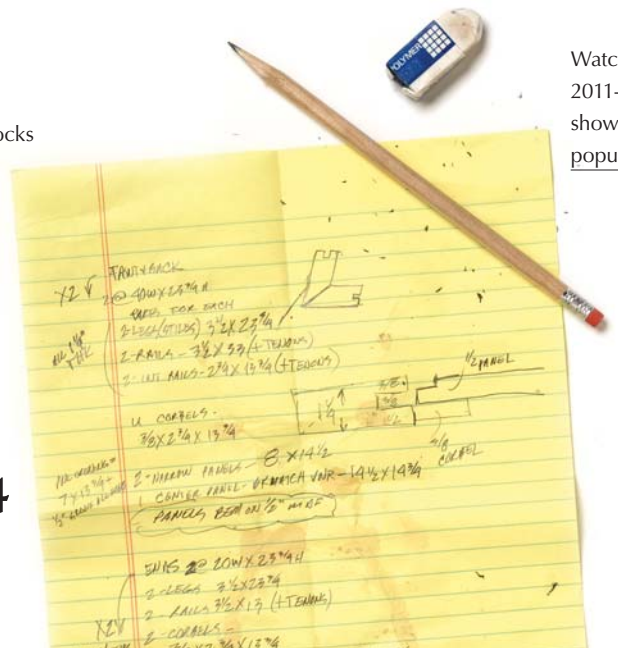
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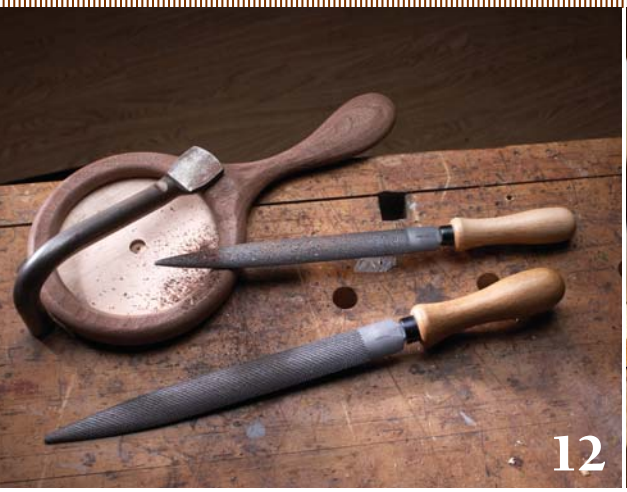

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Moving Forward

I've spent the last eight years building furniture and writing about the craft, so the process of moving into my new role as editor here at *Popular Woodworking Magazine* got me to asking a lot of questions.

As woodworkers, and perhaps makers of any kind, inspiration isn't always easy to find. Whether you reproduce period work, design contemporary furniture or fall somewhere in between, I'd argue that all of us would have quit trying to build well-designed and well-engineered pieces long ago if the process didn't fulfill, for each of us, certain inexplicable needs that even we can't fully understand.

For my own part, I got into woodworking when I was very young. Though my father never built furniture for a living (he spent nearly 50 years selling modern office furniture designs), his own father was a cabinetmaker who taught him the craft at a very young age. Then and now, building things has always been a critical part of my father's life. When I could still count my own age on two hands, I spent countless hours on the back deck with my father, working pine salvaged from construction sites through a small portable band saw, while my mother cringed from just inside the door, or sitting on the couch attempting to carve a chain out of a length of soft green maple clipped from a backyard tree.

My father didn't expect me to become a woodworker, just as his father never expected it of him, but something about the craft simply clicked for each of us.

Not long ago, after a half-hour of sketching out dozens of chairs and then closing the notebook and setting it aside, my wife asked from the other end of the couch, "What did you draw?" Because I knew none of the sketches were successful designs that had any chance of coming to life in my shop, I answered as honestly as I could. "Nothing, really," I said.

If my father can't sleep, he grabs a carving knife and starts cutting away. "What are you making?" I've asked him many times. "I don't know yet," he says more often than not.

Eventually my father figures out what he's making. Eventually one of my chair designs makes sense (to me, at least). We all have our own ways of finding the inspiration to spend time in the shop. Some of us try to conjure it, some simply wait for it to strike.

And while it may not occur every day – some days are simply filled with back-breaking tasks such as milling a stack of lumber, or the mind- and finger-numbing sanding of a set of chairs you're ready to get out the door – I am always anxious for it to happen: that hopeful rush that comes when a board exits the planer exposing an unsuspected but dramatic whirl of grain; sketching out an inspired edge detail on a cocktail napkin; or finally, magically, having that small breakthrough in your head – the one that compels you into the shop to finish up or get to work.

In the process of writing the article on the Krenovian display cabinet (page 24), I found myself asking questions about why we do what we do – not only in the shop but also here at the magazine. This magazine will continue its long tradition of not only explaining how to design and build successful furniture pieces, but also explore the history, evolution and inspiration that keep us returning to the craft again and again. We welcome your ideas, so let us know how we are doing. **PWM**

PHOTO BY AL PARRISH

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A Sharp Blade is Key to Successful Plowing

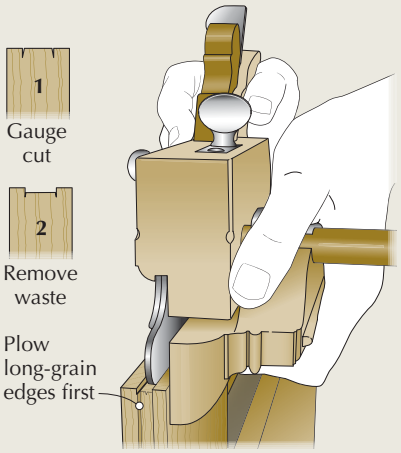
I enjoyed the article "12 Rules for Tool Chests" by Christopher Schwarz (December 2011, #194). I've admired old tool chests for years and have studied how the old-timers put them together. I always hoped to get the chance to build one for myself and the article finally spurred me on. I started preparing stock for my chest last night.

I love the simple, elegant strength of the framed lid with a grooved, full-thickness panel, but here's my question: How do you efficiently cut the groove in the end grain of the panel with hand tools? I have a shop full of power tools and could easily make that cut with the table saw or router in minutes, but I build all of my "recreational" projects using only hand tools. In my experience, a plow plane will not cut end grain well.

I could picture kerfing the grooves to width with a long, rip-filed backsaw and removing the waste with a low-angled chisel – but chopping out the end-grain waste on a 16"-wide panel would make for a rough, miserable job.

So how would period woodworkers have done it? Did you do yours with hand tools?

Nick Wemedge
via e-mail



Nick,
You can plow end grain.

Anything is possible with a sharp tool. So sharpen up your plow iron and give it a try. Use light passes and you'll be fine.

When you plow the ends of the panel, be sure to plow the long-grain edges first. That way the spelching/splintering will occur on the inside of your groove.

If you want to take things slow in this regard, try gauging the lines for the groove first with a sharp cutting gauge, then remove the waste between. You can continue this pattern with a stout marking knife and your plow plane all the way down if you like.

Christopher Schwarz, contributing editor

Without Splines, are Miters Strong Enough for Chest Legs?

I have begun building the Arts & Crafts Bridal Chest Robert W. Lang wrote about in the November 2005 issue (#151) of *Popular Woodworking Magazine*. I'm a bit concerned about the strength of the mitered edges of the legs. What do you think about adding a spline – or, do you think that would be overbuilding?

Jay Atherton
via e-mail

Jay,
Yes, to my mind, that would be overbuilding. You wouldn't do any harm, but I think it would be a waste of time.

The key is to get a good, tight fit along the length of the miters. This can be easily done on the table saw, provided that the pieces are truly straight.

Most likely to cause trouble is a slight bow along the length. If the wood rises up as it passes the blade, you will lose the 45° angle and you'll have a gap. A featherboard or other hold-down will take care of that. You also want to be sure the edge that rides along the fence is really straight.

A swipe or two with a block plane might be in order if the mitered edges are rough or there are any irregularities, but I usually glue these right off the saw. It's a long-grain-to-long-grain edge joint, and that glue joint is stronger than the wood. The thickness of the pieces helps, too; it's a wide glue surface.

Robert W. Lang, executive editor

Tool Chest Wood Selection

I enjoyed Christopher Schwarz's "12 Rules for Tool Chests" (December 2011, # 194) very much; however, I have one question/comment:

Christopher states that period tool chests were build out of a lightweight wood such as pine. I built a pie cabinet out of recycled first-growth pine similar to what would have been used to make old tool chests, and the old pine seemed to me to be about the same weight and hardness as our modern-day oak.

In order to reproduce period chests, wouldn't oak then be closer to the weight and strength of the wood used for those?

Mike Hood
Richmond, Virginia

Mike,
The bottom line is that pine is plenty strong for a tool chest, especially when dovetailed at the corners – and it is almost always less expensive than oak. Not all old pine is heavy; it really depends on the species and how quickly that particular tree grew. Yellow pines of any era can seem as heavy as oak. Megan Fitzpatrick has a vintage tool chest made from Eastern white pine and it is quite lightweight.

There are plenty of oak tool chests in the historical record, so if you want to make it using oak then go right ahead. Personally, I find pine easier to work (especially with saws and chisels) and I think it looks better. But those are personal choices.

Christopher Schwarz, contributing editor

CONTINUED ON PAGE 8

ILLUSTRATION BY MARY JANE FAVORITE

CONTINUED FROM PAGE 6

Nails Instead of Dovetails?

My question has to do with the tool chest featured in the December 2011 issue (#194). Do you think that the integrity of the tool box would be compromised by using rabbets on the front and back panel, then using 2" cut nails put in at slight angles?

Anonymous
via e-mail

I have seen many nailed tool chests that have survived just fine. So if you go that route, you are in good company.

But I think you would be surprised by how manageable the dovetails are for this chest. First off, they are all painted in the end. Paint covers a lot of sins.

Second, start at the back of the case – these won't show. By the time you get to the front you will be an expert.

But if you decide to go the nail route, don't feel like you have chickened out.

Christopher Schwarz, contributing editor

Period Steel Mistake

In the December 2011 issue (#194), in Adam Cherubini's article on chisels (in the sidebar "An Explanation of Period Steel"), Adam states that, "decarburization of steel takes place when steel is heated in a carbon-rich environment." I think what was meant is that decarburization of steel takes place when the steel is heated in an oxygen-rich environment. The oxygen reacts with the carbon to produce carbon monoxide (usually) and carbon dioxide.

If you heat iron or steel in a carbon-rich environment, the carbon will diffuse into the metal, rather than the other way around. For example, blister steel is produced by heating iron in a carbon-rich environment. If you wish to case-harden iron or steel, the metal is heated in a carbon-rich environment for some time to allow the carbon to diffuse into the outer layer of the metal.

There is a technique of producing steel from cast iron (high carbon content), and in that process the cast iron is heated in the presence of oxygen (air) to burn off some of the carbon. That is the way the original Bessemer process worked. Molten cast iron from the blast furnace was loaded into the Bessemer converter and air was blown through the molten metal. The reaction of the oxygen with the carbon is exothermic so no additional heat is required to keep the process going.

As a side note, there's nothing magical about early steel. In general, it was plain old carbon steel with impurities that were poorly controlled. The steel available today for making chisels and other woodworking tools is much more consistent and far superior to what was available to our ancestors. **PWM**

P. Michael Henderson
Villa Park, California

Serpentine Chest Correction

The stock for the drawer fronts on the Serpentine Chest from the February 2012 issue (#195) should be 2¾" in thickness in order to get the curve in the drawer as well as the actual drawer thickness (not 1¾" as was mentioned in the cutlist).

I know 12/4 stock is expensive and difficult to find, so there is a way you can make these drawer fronts using 8/4 stock. You need to lay out and cut the curves, then take the offcut and glue it into position on the back face of each front. Of course, then you need to complete the cutting operation. Or you could simply build up the inside curve before you cut.

Glen D. Huey, contributing editor

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PHOTO BY CHRISTOPHER SCHWARZ

Highly Recommended

While drill bits may seem a prosaic choice, lipped brad-point bits from Lee Valley are anything but dull. Thanks to the sharp lips that score the perimeter of the cut, these high-speed steel drill bits cut an astonishingly clean hole, even in woods prone to tear-out, such as the pine in the picture above.

Though they cost more than the brad-point bits you'll find at your local hardware store, they're worth every penny. In my six years of using them, they've remained as shiny and sharp as the day I opened the boxed set of 12 ($45 at leevalley.com).

— Megan Fitzpatrick

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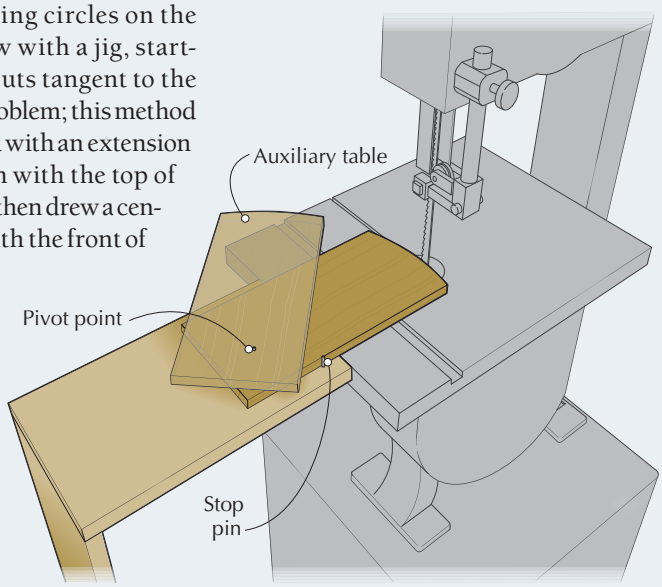
Safety Note

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

THE WINNER:

Band Saw Circle Guide

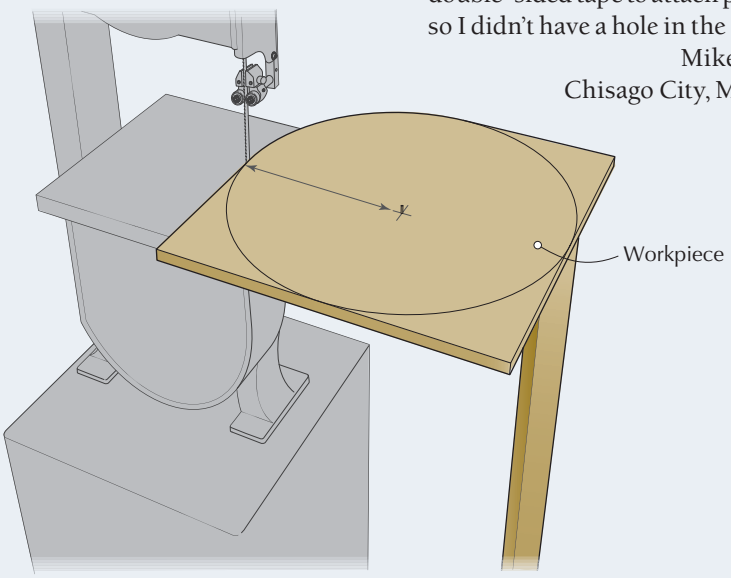
When cutting circles on the band saw with a jig, starting the cuts tangent to the right diameter is a problem; this method simplifies it. I started with an extension table mounted flush with the top of the band saw table. I then drew a centerline on it, even with the front of the blade. I nailed an auxiliary table to the extension table with a pivot point nailed on the centerline at the far end of the board. This piece also has a centerline drawn on it that runs from the front of the blade to the center of the circle. I used a cut nail for a stop pin to keep the auxiliary table from swinging past the point where the centerline reaches the blade.



I cut the head off a nail to use as a pivot. The pivot runs through the auxiliary table and into the bottom of the work. The two pieces are attached to the table and swung away from the blade. The cut is made by swinging the auxiliary table in to the stop, and rotating the blank 360°. After the cut is finished, the table is swung back away from the blade and the circle is ready for removal.

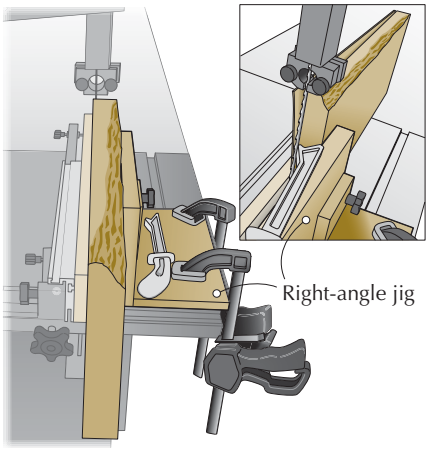
I have used this method on the shaper, router table and stationary sander as well. It is very handy if you are making multiple pieces. I have also cut out a waste circle and used double-sided tape to attach pieces to it so I didn't have a hole in the center.

Mike Siemsen
Chisago City, Minnesota



Band Saw Resaw Guide

A project I have underway requires a lot of quilted maple veneer. I decided to try clamping a right-angle jig to the band saw table to support the work on the opposite side of the fence. This creates a channel the work has to follow no matter what.



The result was the easiest and most predictable resaw session I have ever had. It takes only one hand holding a push stick to put the work through the saw – no need to risk "blow out" of a soft spot or cracked figure coming at you because it is contained in the jig setup. Hands also are not required to hold the work, so a slip won't risk them coming in contact with the blade.

All the veneers were smooth enough that I did not need to joint the faces between saw cuts. All the veneers were consistent in dimensions from end to end and top to bottom.

Don Henderson
Orleans, Ontario

Dry-erase Benchtop

I have started covering my benchtops and radial arm saw side extension tops with 1/8" dry-erase tempered hardboard. A sheet costs about $10 at big box stores. By topping my workbenches with these I can jot down notes and measurements or mark lines to cut all my pieces without having to measure each cut. When I'm done, I simply wipe it off and I have a clean top again.

Tyler Ceola
Fayetteville, Arkansas

ILLUSTRATIONS BY MARY JANE FAVORITE

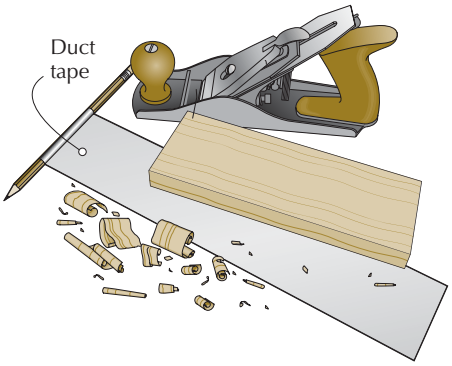
Annealing Cut Nails

Whenever *Popular Woodworking Magazine* mentions using masonry nails as cut nails, the fact that they can't be used for clinching is mentioned. I ran into this very problem last summer and I was trying to work out in my head what nails I wanted to buy from Tremont while starting my barbecue. This set off a light in my head.

I filled my big charcoal chimney starter halfway, tossed in a handful of masonry nails, then filled it to the top like I normally do to start a fire. I lit the starter, waited for it like normal and when I dumped it out, all of the nails were glowing red nicely. I left them in the bed of burning charcoal, cooked a steak-and-potato dinner, then let the nails cool overnight in a bed of coals. The next day they bent quite easily.

So if you need clinching nails, and don't mind cooking yourself dinner in the process, I recommend this method.

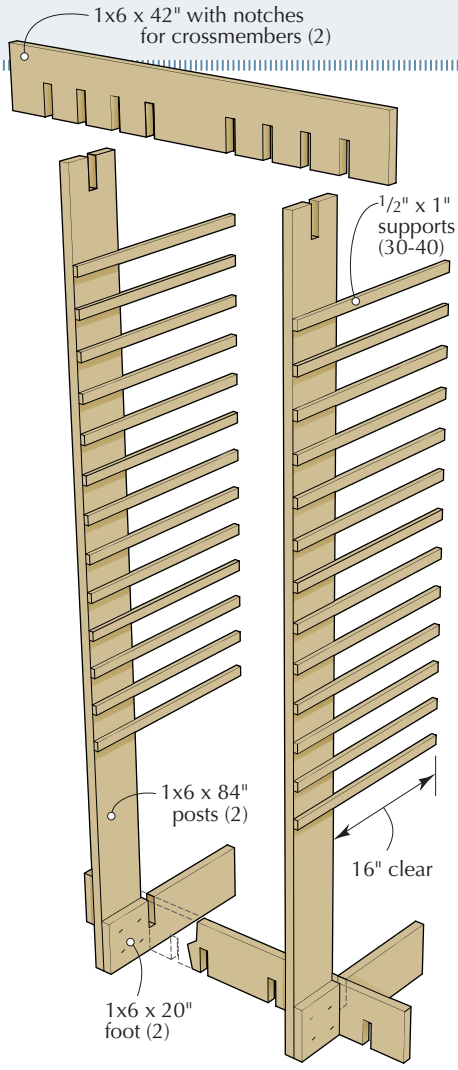
Bob Miller
Rochester, New York



Universal Planing Stop

Last week, I restored a couple old Millers Falls planes for a co-worker. I wanted to give him a quick lesson on how to operate his tools, but in the middle of a bunch of cubicles, workholding is at a premium. So we came up with this quick planing stop, using only a pencil and some duct tape. Wrap the pencil in the tape, then stick it down wherever you need a planing stop. This worked so well, I am sure I will use it on my workbench at home for thin stock.

Trevor Angell
Andover, Kansas



Knock-down Drying Rack

One of the most vexing problems when finishing is where to put all the project parts while they dry. After encumbering every inch of benchtop and countertop space with a recent project, I found that, as usual, I was still coming up short on space. So, I set about designing a drying rack. I wanted it to be as versatile as possible for handling different-sized pieces, collapsible when not in use and cheap to build.

The resulting rack fits the bill nicely. It consists of a series of 1/2" x 1" supports glued and nailed to a pair of 1x6 posts that are connected by two crossmembers. The crossmember notches mate with notches in the post tops and feet, and allow variable spacing of the posts to suit the length of material being finished. The crossmembers detach easily for stacking the post assemblies against a wall when not in use.

Tony O'Malley
Emmaus, Pennsylvania

Gluing Hard-to-reach Areas

When bending wood to make Windsor chairs, I often find that a sliver of wood will pull away from the workpiece and need repair. In order to reattach the sliver, glue needs to be applied along its entire length.

I manage to do this by putting glue where possible, then blasting it into the split with compressed air. The air blast pushes the glue deep into the crack where a toothpick or piece of paper can't reach. Wipe off the excess glue and clamp the sliver in place. PWM

Jack McAllister
Stephenson, Virginia

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Liogier Hand-cut Rasps

First-class shaping tools from France.

In 2004, *Popular Woodworking* introduced hand-cut French rasps to American woodworkers. Those tools from Auriou were definitely a cut above what was previously available, and we happily added them to our tool kits.

A few months ago, we learned about another French maker, Liogier – a company similar to Auriou Toolworks at Forge de Saint Juery (Auriou's current name). Both are family owned and have been making these tools for generations. I ordered a couple of cabinetmaker's rasps and have been using them for the last few months. As with the Auriou rasps, these tools are a delight to use, and well worth the price.

I tested a 250mm No. 9 grain and a 200mm No. 11 grain. These are middle of the road in size and grain, and either would be a good introduction. The handles are comfortable, the teeth are sharp and consistent and the tools simply felt like part of my hand. They remove material quickly, but with an amazing amount of control. The finish left on the wood is nice; a quick follow-up with a card scraper removes the fine tooth marks.

Liogier does not have an American distributor at present, but online ordering is simple, with shipping to the U.S. for about $15. The variety of sizes, shapes and grains (coarseness of cut) of available tools is staggering, and left- and right-handed versions are available. Start with one, use it for a while and you'll soon be ordering more. — *Robert W. Lang*

Liogier Hand-cut Rasps

Liogier ▪ *liogier-france.fr*

Street price ▪ *$61.35-$136.63*

▪ **VIDEO:** *See a video of how these tools are made: popularwoodworking.com/apr12.*

Prices correct at time of publication.

Bessey Auto-adjust Toggle Clamps

Toggle clamps are an indispensable workholding device for jigs, but they are a bit fussy to adjust to the desired height and clamp pressure. Leave it to Bessey to come up with clever innovations that give the traditional toggle clamp a big leap forward.

With these new versions, variation in thickness of the work is a non-issue. You can clamp a wide range of thicknesses, from a thin veneer to 2¾" stock, without a single adjustment. Just lift the lever handle, change material and lower the lever. Done. A simple screw adjustment provides a clamping pressure range from 50-550 pounds per square inch, and the selected pressure does not change when the material's thickness changes.

The horizontal clamp (right) is available in two models with different thickness capacities. Bessey also offers an in-line or "push/pull" version.

— *Steve Shanesy*

CONTINUED ON PAGE 14

Auto-adjust Toggle Clamp

Bessey ▪ *besseytools.com or 800-828-1004*

Street price ▪ *$20*

▪ **VIDEO:** *See this toggle clamp in action at popularwoodworking.com/apr12.*

Price correct at time of publication.

PHOTOS BY AL PARRISH

CONTINUED FROM PAGE 12

Philadelphia Furniture Workshop Moxon Vise

While Moxon-style twin-screw vises seem to be breeding like rabbits these days (see our November 2011 issue, #193 and our December 2010 issue, #187), this version, developed by Alan Turner and Mario Rodriguez at Philadelphia Furniture Workshop (and available through Tools for Working Wood) has some interesting features.

Perhaps most useful (for those who prefer to build furniture rather than shop fixtures) is that for just $30 more than the cost of the Benchcrafted twin-screw vise hardware alone, this vise arrives ready to use.

The screw handles on this version are also worth noting; they're ajustable. After you've tightened the front jaw, the handles are easily moved out of your way.

One significant difference between this vise, the Benchcrafted version and the one we featured in the December 2010 issue, is the thickness of the moveable front jaw (though of course if you make your own, you can make it any thickness you wish). Turner says this thinner front jaw allows you to get closer to your work for better control, and, because it's cambered along its length, it grips the work tightly with less effort than a flat chop (and less risk of marring your work).

One last difference is the shelf behind the fixed rear jaw, which allows tails-first dovetailers to clamp the tail board in position when transferring the layout to the pin board. — *Megan Fitzpatrick*

Moxon Vise

Tools for Working Wood

- *toolsforworkingwood.com or 800-426-4613*

Street price ▪ *$169.95*

▪ **VIDEO:** *See this vise in action at popularwoodworking.com/apr12.*

Price correct at time of publication.

Kreg Shelf-pin Jig

If your idea of a jig for drilling shelf-pin holes is a piece of pegboard, there's an affordable alternative from Kreg Tool that allows you to step up your game. And even if you have moved beyond pegboard, this new jig will cut down on the possibility of drilling sets of holes in wrong locations. You know the problem – misaligning the jig when you switch from cutting one row of holes to another. Opportunities to mess up are endless.

This shelf-pin jig, although compact, offers a number of features. It provides two options for setting the pin-hole locations from the cabinet edge. It has a fence to consistently repeat that setting and requires no tools to switch from the 1" setting to the 2" option.

And, after drilling your first six shelf-pin holes, an indexing pin slides into the last hole drilled for foolproof repeatability. Hole spacings are based on the 32mm (about 1¼") cabinetmaking standard.

Although the jig is plastic, the holes for drilling have hardened steel bushings for long wear. Standard hole size for the jig is ¼"; it comes with a brad-point bit. A 5mm bit is available separately and is designed to work with the ¼" steel bushings.

And to help prevent that other opportunity to mess up (drilling a hole too deep and through the work), the jig also comes with an adjustable stop-collar. The double-ended indexing pin can be used for either hole size, ¼" or 5mm. There's built-in storage on the bottom of the jig for the drill bit, stop collar and indexing pin.

Want a longer jig? Mulitiple jigs can be easily connected with the provided jig extender. PWM — *SS*

Shelf-pin Jig

Kreg Tool ▪ *kregtool.com or 800-447-8638*

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Over the Top

'Superadded Ornaments' won't save a poor design – but can enhance a good one.

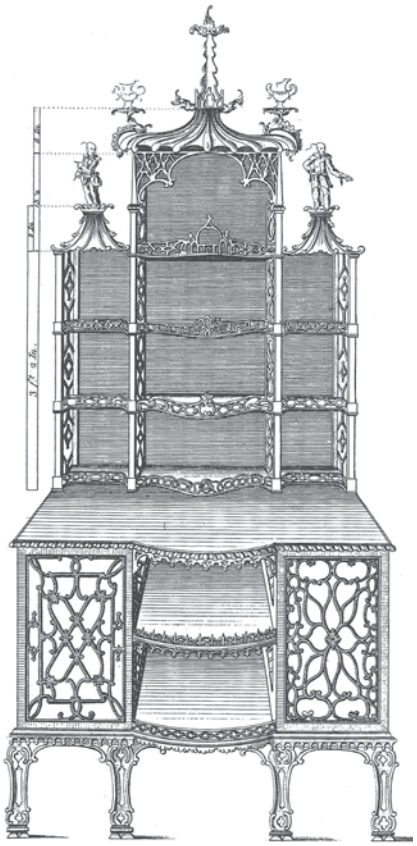
My 10-year-old son, Josh, tugged at my elbow and said, "Dad, check it out, is that cool or what?"

Parked a few yards away was a minivan encrusted with hundreds – no, make that thousands – of plastic toys glued to every square inch of sheet metal. What looked like grass sprouting from the roof was actually several battalions of green army men, along with tanks, bazookas, Pez dispensers, dinosaurs, guitar picks, Happy Meal toys and, on the hood, Wonder Woman in a pitched battle with Godzilla. I asked myself if this was part of a divorce settlement gone bad, or a desperate cry for help. Whatever the inspiration, it made us smile.

The Pendulum

Embellishment on furniture is a debate that's raged for centuries. It's a pendulum that's swung from one extreme to the other, time after time. Examples of how far it swings can be found in the Chinese Chippendale-inspired work from the mid-18th century that drips from every nook and cranny. It gets old, scares the grandchildren, and eventually the pendulum swings so designers strip back and simplify.

Shaker is a good example of the pendulum swinging in the opposite direction. This can also be seen in much contemporary work that emphasizes unbroken, sleek surfaces. Some builders take



Too much? *If a little carving is good, a whole bunch of carving must be better, right?*

SMALL BEADS

A simple bead moulding can add a touch of life to an otherwise static surface. Although mouldings are not considered ornaments in the strict sense, they are a good example of how breaking up a plain surface can introduce subtle change. Beads create a shadow line that highlights the border, in this case a set of drawer fronts. Beads are fun to experiment with. You can create them with a variety of tools, both hand and power. Antique dedicated moulding planes, sometimes called beaders, are plentiful and come in a range of sizes with the smaller profiles of 1/8", 3/16" and 1/4" most useful for furniture building. These simple yet effective tools are forgiving for a novice, somewhat addictive and produce a smooth profile that requires no sanding. You can also create beads with a scratch stock or with router bits. When applied around the perimeter of a drawer front this detail is called cockbeading. The narrow strips of applied moulding are usually set into a shallow rabbet on the edge of the drawer front. I use a shooting board to create tight miters, as shown in the photo at right. A shooting board also allows me to creep up on the perfect fit one shaving at a time. And it's much safer than trying to hold tiny parts near a rotating saw blade. — GW

Simple work; great details. *Small parts such as bead mouldings are a cinch to trim to perfection with a shooting board and sharp plane.*

PHOTOS BY THE AUTHOR; ILLUSTRATION IN PUBLIC DOMAIN

Bead variety. *These handy little bead planes are easy to use but quite addictive.*

it to such extremes that they even shy away from using wood containing any noticeable figure.

I'm not drawn to the overly ornate but I also find that the bare-bones approach can come across as cold, more manufactured than crafted. Admittedly, this is an area that's entirely subjective. I covered some of the basic theory on ornament in an earlier Design Matters column (November 2010, #186), but I also want to extend the discussion to mouldings or other design flourishes that often tempt us. Here are some thoughts that may help you make informed design judgments in this area.

Craft Tradition Wisdom

You might view period furniture (circa 1680-1820) as the poster child for excessive embellishment, but a deeper look into the original design approach might surprise you. Ornament wasn't considered a design flourish or an afterthought; rather, it was thought of as something that completes a design.

Think about the foliage on a tree. Does it take away from the form if leaves are absent, or do they complete it? Look at the curves worked into the saw handle in the photo below. Would it feel like something was missing if the graceful curved horns were eliminated? In this case the design gives the impression that this tool is an extension of the hand and it begs to be picked up and used.

Necessary curves? *Mentally block out the curves on this saw grip. Would it look and feel better or worse?*

A second thought often repeated is that no amount of embellishment or ornament can enhance a poor design. Abraham Swan, in the preface to his circa 1757 stylebook, "A Collection of Designs in Architecture," stated, "For if the original Design be bad, superadded Ornaments will make the whole to appear rather aukward than graceful, like a Clown in a laced Waistcoat."

The underlying form of the design must be solid and no application of mouldings, carving, inlay or LED lights will make up for bad bones. Perhaps that's at the root of why so many shy away from ornament of any kind. Much of the mass-produced furniture I grew up with were poor imitations of popular styles, made worse by slapping on mushy steam-pressed imitation carving. It may sound like a contradiction, but ornament is most effective when it completes a design, yet only works when a design is strong enough to stand on its own without it.

Finally, elements like ornament or moulding were always considered to have a function. Today we think of function in an engineering sense, focusing on the structure and joinery. The craft tradition had a wider definition. A design element could have a visual function. Carving was used functionally to highlight an underlying form; it could also function as an additional layer of visual interest when the piece was viewed close at hand. Mouldings serve as visual transitions linking one part to another. Something as simple as a bead moulding acts as a separator, telling the eye one part is about to end and another begin. Once you begin to understand this functional aspect, it may free you up to expand your horizons and begin to experiment.

Simple ornament. *Even in the raw wood, the beading on these drawer fronts adds a pleasing detail.*

Sometimes a small detail like a bead can add just the spark a design needs to make it blossom. PWM

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

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About This Column

Design Matters

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

Boarded Furniture Essentials

You needn't be a dovetail master to build handsome 18th-century furniture.

Skills to grow on. *A basic dovetailed carcase can easily feature 100 pins and tails. But you don't have to know how to cut cut dovetails – or mortise-and-tenon joints – to build handsome period furniture. Most of the furniture put together in the 18th and 19th centuries probably wasn't dovetailed. This boarded carcase may not look like much, but you can use the same techniques to build a wide variety of items.*

In my last article, I discussed the history of boarded (nailed) furniture and tried to get you as excited about it as I am. In this article, I'll explore one sort of boarded carcase. Though the finished project won't look like a country hutch or cupboard, the construction will be close or identical. This sort of furniture is fun to build and can be easily completed in a weekend with nothing but a few hand tools. The skills you hone building this sort of furniture will directly translate to building finer pieces.

Choosing Material

I'm using Eastern white pine, purchased from my local home center, for this project. I know this material isn't available everywhere. Feel free to substitute whatever is most readily available to you.

When selecting stock, look first for clear boards. I prefer to use the second-grade material. It's cheaper and often times the knotty sections can be sawn off and scrapped. Search through the racks to find good pieces. Once you find boards with clear sections, check the end grain on each. Read the rings to determine where the heart of the tree was. I want boards sawn as close to the heart as possible. On them, the rings will be almost perpendicular to the face of the board. These boards won't cup and won't shrink too much. Generally, the widest boards will be the closest to the heart. I also seek boards whose rings are close together. I believe these boards are of higher quality.

Lastly, check the secondary grain direction by examining the long edges. You should see straight lines there. If the grain curves and runs into the face, you'll have exposed end grain and a board that will forever want to warp. I think grain orientation is almost more important in this style of furniture because nails aren't always strong enough to resist the boards' tendency to cup or twist (dovetails are pretty fantastic at that). Once purchased, carefully sticker and stack your boards in your shop for at least a month. Cross-grain joinery is common when building in this style, so choose the best, most stable wood you can get.

PHOTOS BY THE AUTHOR

Stock Preparation

I prepare stock for nailed projects much as I would for any other. I cut the boards for the carcase first. Then I smooth their faces, clamp the sides face to face and joint their front edges.

Leave the clamps on and plane the end grain so that the boards match each other. Don't worry too much if the ends aren't perfectly square to the long edge. They should, however, be square to their faces and evenly matched. Plane both ends. I just use my wooden smoother.

Joinery

The joinery for boarded furniture should be characterized with a single word: Nails! And while nails are a big part of this style of construction, all of the pieces I've seen rely heavily on rabbets and tongue-and-groove joints as well as nails. A few well-placed dovetails or mortise-and-tenon joints might improve the quality of these pieces. But let's agree to skip them to maintain the authenticity of these working-class pieces.

Dados

Once the side pieces are sized and planed, it's time to cut the dados, which I cut using an antique dado plane. This is by far the easiest and fastest way to cut dados. The problem is, most antique dado planes cut 7/8" or 5/8" dados. If you choose a 5/8" plane, you will have to plane down your 3/4" boards to fit them (or at least plane their edges). And 7/8" planes will leave the joint sloppy. I happen to have a 3/4" dado plane. These are a bit rare and can be expensive, but they are very helpful for this sort of work.

Dado planes are designed to work with an applied fence. I cut both sides of my project at once by clamping them to my benchtop. Position the boards front edge to front edge. Any straight piece of scrap wood can be used as a fence. Nail it in place using fine finish nails.

Alternatively, you can cut dados with a backsaw and a chisel. Deeply scribe the sides of the dado with a sharp knife. Holding the top of the handle and the spine, use your backsaw to deepen the knife lines. If the saw is filed crosscut, its sharp teeth will find the knife line for you. Carefully pare away the material between the saw cuts with a chisel.

Fine furniture dados are often no more than 3/16" deep. Many woodworkers I know use a router plane in lieu of a chisel. If this is convenient for you, go for it. But an accurate depth isn't important for a dado. Typically, its bottom is not a mating surface for a glue joint. So if you are going the chisel and backsaw route, don't sweat not having a fancy router plane.

Rabbet the Back

Once the dados are cut, rabbet the back edges of the sides. I use a crusty old rabbet plane for this. If you think of the volume of wood you need to remove for a rabbet, you know you'll want a plane that functions more like a jack plane than a smoother. Its blade needs to be sharp but beyond that, just about any plane will do. You can cut rabbets with a chisel, too.

Tongue & Groove

I attach the front pieces with a tongue-and-groove joint (cut this joint as shown in the pictures at right). A glue joint and

Period planes. *Specialty dado planes were used to cut dados years ago. These tools are not like simple rabbet or shoulder planes. They feature two cutters. The front cutter scores the sides of the dado. The main cutter runs behind and removes the material between the lines. They typically feature depth stops as well. I simply nail a stick onto the inside surface of the case to serve as a makeshift fence. In this picture, I'm cutting dados on both sides at once. Keep an eye out for a 3/4" dado plane.*

Rabbets. *Cutting a rabbet is a simple matter with a rabbet plane. Every woodworker should have and master one. Though this one is very old and very worn, it still functions admirably. Use the fingertips of your left hand to set the width of the cut. After the first few passes the plane will track on its own.*

WHO NEEDS **PLANS?**

The sides are 1x12s. The door is a 1x12. The stiles in front are about 2" wide. Here, I've taped veneer scraps to the board that will become the door of this project. The sides were then clamped to the door so I could accurately measure the length I needed for each shelf. Having just sawn the shelves, I'm doing a fit check, holding the whole thing together with an 18th-century cabinetmaker's clamp. Next step: Measure and cut the backer boards. Almost done!

— AC

nails would also work. The advantage I see to the tongue-and-groove is that it aligns the parts nicely, and is secure enough to allow me to continue building without waiting for the glue to dry.

Assembly

Assembling these is a little different than assembling a dovetailed carcase. Dovetails do a lot more than simply hold boards together. When used in conjunction with hide glue, they offer a Lego-like construction process. You rarely, if ever, need clamps. The parts align themselves and stay together. Nailed joints don't do that. Tongue-and-groove and rabbet joints help, but my experience is that nailing boarded furniture together is like nailing a house of cards together. The obvious solution is the use of clamps – and many of them. But I wonder if some of the workmanship issues I see on boarded furniture are related to the lack of clamps available to the original builders. So I challenge myself by trying to keep my clamping to a minimum.

I typically glue the tongue-and-groove joints first. When I'm ready to nail, I start by nailing the backers on. I place the cabinet face down on the bench, slide in the shelves, then clamp the sides firmly to the shelves. Bar clamps are ideal. I've tried rope. See what you come up with. Fit and nail the backers checking to ensure the piece is square by measuring the diagonals corner to corner. Then flip the piece over. I cut the shelf boards a tiny bit narrow front to back to allow for expansion. I want the gap in the back of the piece, so before nailing the face frame to the shelves, shim the shelves to force them against the back.

I used Tremont's 3*d* (1¼") fine finish nails to fasten all the pieces of this carcase. These look almost identical to 18th-century finish nails, which were generally rectangular in cross section and tapered on all sides. Modern (early 19th-century on) finish nails such as the Tremont nails are cut from sheet metal and as such taper only on two of their four sides. Cut nails are a little easier to work with, tend to split projects less and look similar to hand-forged nails when they are in place.

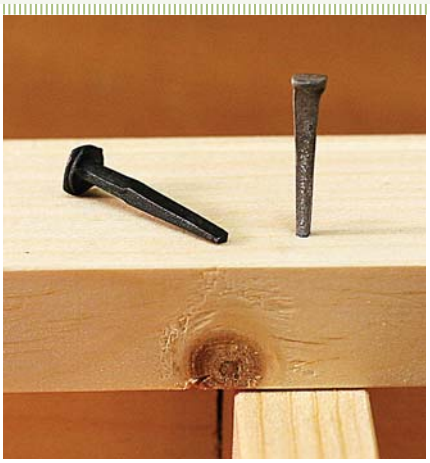
Tips for Nailing

I'm not the best nailer. You would think every woodworker should be good at

Tongue-and-groove. *"Match" planes cut perfectly matching tongue-and-groove joints. Though they may have been designed to produce wide panels, you can apply the groove to a face instead of an edge to make a right-angle joint. This is of great use to the boarded furniture maker.*

Common problems, different solutions. *Dovetailed carcases have structural tops and bottoms. When large, the sides are further supported by drawer dividers or shelves that feature sliding dovetails to hold the sides together. This piece has no structural top or bottom. A clever scheme of tongue and groove joints and well placed nails are all that are needed to hold the sides of this boarded carcase together.*

Tighten up. *Shims force the shelves tight against the face pieces for nailing.*



Align right. *Period nails are rectangular in cross section and tapered. They must be aligned carefully so that the taper crushes end grain fibers. If you align the taper across the grain, you risk splitting the wood.*

hammering nails. I suspect the reality is very few modern woodworkers do much with their hammers. I always use nails in my furniture, but the number I use are few and the applications so individualized, I guess I don't feel I have much experience swinging a hammer. I really have to concentrate to do a good job. Here are a few tips that have helped me:

- Align the wide side of the nail correctly with the grain.
- Avoid placing a nail in swirly grain. If you must nail through difficult grain, drill pilot holes.
- When you are worried about splitting, use light taps, easing the nail in.
- When light taps are required, use a light hammer. A carpenter's hammer is really too heavy and the head is too big for furniture making.
- Bent nails are straightened by scraping the hammer head across the top of the nail at the moment of impact. Tapping the nail sideways should be a last resort.
- I hammer from my elbow, keeping my wrist locked and my grip on the hammer light.
- I prefer to remove nails with Farriers' pliers. These are readily available secondhand and generally do a better job than a hammer's claw.

Drilling

Tiny drill bits weren't readily available to 18th-century carpenters. Tiny holes were made with a tool called a bradawl (pronounced "braddell") by English and Early Americans. Though they appear crude, they do a great job quickly.

The blade is placed cross grain and the tool is pushed into the wood while you twist it back and forth. Bradawls were available in a range of sizes.

You could probably make one easily enough. You could mount a wire nail in a handle and sharpen its end on your grinder. It would be better were it hardened, but don't let that stop you from making one and trying it.

For larger nails and screws, gimlets would have been used. These too are quick-acting practical tools. Antiques can be sharpened and work well.

I am not a fan of the newly made wire gimlets. The lead screw seems to do most of the work.

My advice is to practice all of this before you attempt this project. But if it happens that you bend over a nail or split a board, you haven't ruined your project or done something never done before.

Conclusion

White pine isn't the most stable wood species. Combined with the cross-grain joinery typical of boarded furniture, stock selection and grain orientation become much more important.

The basic stock preparation steps required to build boarded furniture are essentially identical to those required for finer pieces. Because a boarded project can be completed more quickly than a dovetailed piece, this is a perfect training exercise: cheap wood, quick turnaround, and relevant practice.

For the past 20 years, we have focused on "Joinery" as defined by the Guild court 400 years ago. For us, woodworking is exotic wood, dovetails and mortise-and-tenon joinery. We've arrogantly disregarded what was probably the most common form of case furniture. We've turned our heads away from the work, furniture and lives of our ancestors. And in the process we've done ourselves no favors. Our preoccupation with dovetails has brought us no closer to actually being able to build furniture by hand.

Here's my suggestion: Let's put dovetails aside for a while and focus on our basic hand-tool skills. Let's get good at putting things together by hand. These boarded pieces offer quick, fun build processes and furniture you can be proud of. There's plenty to learn and plenty of new skills to master.

In an upcoming issue, I'll build a raised-panel door without a plow plane or mortise-and-tenon joint, and a drawer without cutting a single dovetail. I'm just getting started and there are no books, videos or web forums on this subject. **PWM**

Visit Adam's blog at artsandmysteries.com for more discussion of traditional tools and techniques.

WORKING WITH PINE

I believe the boards I buy are run through a planer that planes all four sides at once. I find these boards to be generally very flat with straight, square edges. But all power planers I've ever seen leave marks. And I think the marks are worse on soft woods like pine. They aren't immediately obvious. But my guess is the machine compresses the wood slightly. And as these boards age, the compressed wood swells back to its original state and the planer marks telegraph through the finish. These marks offend my delicate aesthetic sensibilities so I smooth plane home center pine as a matter of course.

Contrary to what one may initially think, planing pine isn't easy. To successfully plane pine you need super sharp tools. Here's my theory: Because pine is so soft and weak, the wood will bend or break instead of cutting cleanly if your blade isn't razor sharp. The result is a nasty fuzzy finish that people blame the wood for. And indeed I find stiffer woods like walnut or cherry easier to work. When working pine, I often hone my smooth plane iron after every few boards. — AC

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Get a period look with big box materials.

Rustic display. *These hanging shelves, based on a period English piece, are perfect for displaying your small treasures.*

The inspiration for this small hanging set of shelves is a late 18th- to early 19th-century (circa 1775-1825) English dovetailed version in oak with a dark finish. I wanted to replicate the look as much as possible using the I Can Do That tool set and big-box stock, so I adjusted the dimensions to fit dimensional lumber, and, after the construction was done, sanded the edges heavily to impart a well-worn look. I then applied a somewhat distressed finish (more on that later).

Lumber Choices

The inspiration project is 8" wide and appears to be made of stock slightly thicker than 1/4". But at the big box store, the thickness choices are 1/4" and 1/2", and I dithered between 4"-wide and 6"-wide stock.

Perfect circles. *If you can't find a compass, dividers work just fine for marking out circles – and the resulting tool marks add an air of period flair.*

Because I knew I'd be using nails rather than dovetails for the box's joints, I opted for 1/2" stock to allow for a bit of forgiveness for slightly off-kilter drilling. And, I decided on the 4"-wide nominal lumber (which, as you know, is actually 3 1/2" wide) because 5 1/2" wide (the 6" nominal stock) simply looked too bucky. So, after crosscutting and gluing up two 19"-long pieces, the overall width of my back piece ended up 7" wide.

Add Curves

After the glue on the back dries, use the glue line as your centerline, and set your dividers (basically, a compass without a pencil) to a 7/8" radius, then scribe a circle at the center top of the back.

Then, measure down 4 1/2" from the top edge and mark a pencil line across the width. At either edge, that line locates the terminus of the arcs.

Now measure down 1 1/2" from that line, and at 7/8" to either side of the centerline, make a pencil mark.

Reset your compass or dividers to a 4 1/2" radius, set the point on one of those marks, then strike the arc from the bottom of the small circle to the edge of your back; repeat on the other side of the centerline. (This is not exact; please your eye.)

Use your jigsaw to cut the curves. Typically, we recommend the Bosch X-tra Clean for Wood blades, and I used that blade to cut the large arcs on either side. But when it came time to cut the tight circle at the top, I switched to the narrowest blade I could find, with lots of fine teeth, and cut slowly to overcome blade deflection. Once all the curves are cut, smooth them as needed with sandpaper.

Five Easy Pieces

The box is simply five pieces of 4" nominal lumber, nailed together. The two sides are each 14 1/2" in length; the three shelves are 5 1/2" in length. Make all the cuts at the miter saw, and set a stop so the two side pieces are exactly the same length. Set the stop again so all three shelves will match one another perfectly. While you can measure and mark each cut individually, why would you? That simply opens the door to error.

It doesn't matter if the sides are dead-on 19"; it does matter that they match – and the same is true for the shelves. If everything matches and is cut square, clamping up a square box is a breeze. But before assembly, sand all the pieces to #120 grit.

After you've clamped the five pieces in position, drill three pilot holes at each joint location, then hammer in 1" finish nails to hold the pieces together. (I rec-

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

ommend checking twice to make sure your clamps are tight before you start to hammer.)

Attach the Back

On the back face of the back piece, center your shelf assembly side to side and flush with the bottom, and trace around the shelf assembly inside and out. (You'll drill your pilot holes centered between those lines.)

Now flip the back face up, and again center the shelf assembly side to side and flush to the bottom, then clamp the two workpieces together with a clamp or two – make sure to locate the clamps to leave access to drill your pilot holes. Now drill pilot holes through the back and into the shelf assembly. As always, drill pilot holes that are slightly smaller in diameter than the shaft of your nails, and be cognizant that the shelf assembly is only 1/2" thick; there's little room to wander off course with your drill bit.

To attach the back, I used roofing nails to add a little mechanical strength to the joints. Unlike finish nails, roofing nails have wide, flat heads that aren't easily pulled through – though it's unlikely anything small enough to fit on these shelves will impart enough weight to cause that problem.

Clamp for success. *While you could try to hold adjacent pieces in place while you drill pilot holes, it's much better to clamp everything together first – just be sure to keep the clamp pads clear of where you need to drill!*

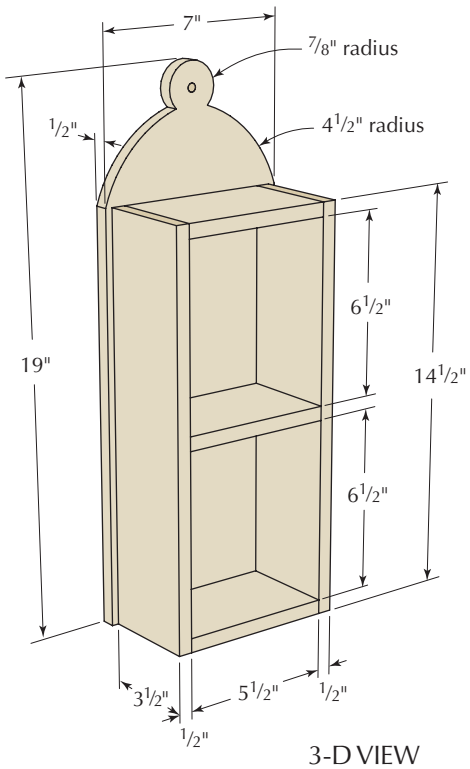
Roofing nails. *Typically, we use finish nails in our projects, but in this case, I chose roofing nails because their wide, flat heads will help keep the shelves firmly attached to the back for years to come (copper roofing nails are also available – and those would look great on a nice wood with a clear finish).*

A Fun Finish

To give this piece a well-worn look, I attacked the edges with #80-grit sandpaper, creating a few divots to emulate a century or so of wear and tear, and I softened the crisp 90° angles of the shelves' butt joints the same way. I also hit the project a few times with the claw end of a hammer, and threw my keys at it repeatedly for a couple minutes.

After slaking my appetite for destruction, I went over the surface with #120-grit sandpaper, and painted on two coats of Benjamin Moore "Bittersweet Chocolate" latex. After the paint was completely dry, I sanded it almost all the way through in a few places. Then, I rubbed on a coat of ebony Briwax, making sure to fill the nail holes and purposeful imperfections I'd created (and perhaps some not-so-purposeful ones, too). **PWM**

Megan is managing editor of Popular Woodworking Magazine. *She can be reached at megan.fitzpatrick@fwmedia.com.*



3-D VIEW

Hanging Shelves

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Back	1/2	7	19	Poplar
❑	2	Sides	1/2	3 1/2	14 1/2	Poplar
❑	3	Shelves	1/2	3 1/2	5 1/2	Poplar

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I Can Do That

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Cherry Wall Cabinet

BY MATTHEW TEAGUE

An angular front and glass doors lend visual interest to this classic Krenov design.

Through the early stages of my woodworking, when I was sweating away evenings in a Mississippi basement trying to learn the craft using a $99 table saw and an $18 block plane, I devoured the books of James Krenov. They represented an artistic, if idealized, approach to a hands-on craft that appealed to an angst-filled editor and writer in his 20s. Even if I wasn't up to the tasks, I knew my aim. Then life took over. After editing, writing and running a furniture business for a number of years, I still looked at the Krenov books from time to time, but my tastes and styles slowly became my own. When I started this job, however, I was inspired to revisit Krenov and the designs that kept me wide-eyed in earlier days. I'm glad I did.

I can't tell you how many Sam Maloof-style rockers or knockoffs of Brian Boggs Appalachian ladderbacks I've seen over the years, only to have their makers look me straight in the face and tell me how they came up with their "original" design. With that in mind, I can't claim that any significant design decision in this piece belongs to anyone other than Krenov.

I've only built a few actual reproduction pieces in my life, and while this can't be called a

strict reproduction, it's about as close as I get. Most times I either come up with something from my head or look through designs from numerous makers and periods until some amalgamation thereof seems to stick. This piece, however, evolved slightly differently.

As I set out to design a small, two-door wall cabinet, I looked through various woodworking and furniture books – Krenov's and otherwise. As usual, I studied numerous designs, then put them aside and started scribbling away at a sketch pad.

Once you've been exposed to good ideas, however, they're a little hard to shake. While it wasn't my original intention, time and time again, I found myself returning to design touches I'd seen on a particular Krenov display cabinet. Though at times unconventional, a few of Krenov's design solutions seemed so obvious after I saw them that I was unable to return to something more traditional.

This striking but seemingly straightforward display cabinet is a design that Krenov built a few times over the years. The first iteration was made of Swedish ash and appeared in his first book, "A Cabinetmaker's Notebook" (Van Nostrand Reinhold), and a later version made of Andaman padauk appeared in "Worker in Wood" (Sterling). Krenov built these cabinets in slightly different sizes, but all shared a few essential features: the angled case and doors; center stiles that are recessed and visible only between the rails (rather than the traditional arrangement); and backs made up of bookmatched boards that create an interesting but not overpowering pattern.

In Krenov's spirit of working with what the wood gives you, my own cabinet is slightly larger in all dimensions and more squat in proportions. And while I never put a scale to Krenov's door parts, I let my eye steal what it could. The doors are built using bridle joints and hung on straight knife hinges, both of which are common in Krenov's work.

As for the case, the edge profiles on the top and bottom are more angular and hard-edged on my piece than the originals, and the case joinery is a little different. I can only assume that Krenov assembled the cases using dowel joints, his go-to joint for case construction. I opted for tapered sliding dovetails instead. And though they have the reputation of being fussy, the knife hinges used to hang the doors are actually straightforward and easily installed – you just have to make sure you plan for them before you assemble the case.

A Case for Tapered Sliding Dovetails

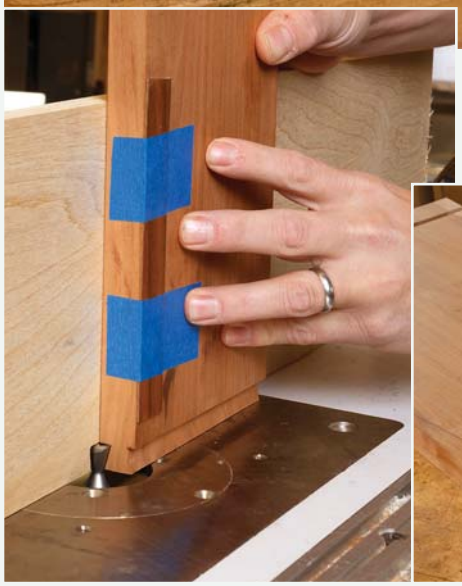
Many techniques would work for building this case; it could be biscuited, screwed and plugged, or, Krenov's choice, assembled using dowel joints. Because it's a more familiar route, I chose tapered sliding dovetails, a strong mechanical joint that works well in cases like this

TAPERED **SLIDING DOVETAILS**

Because the case will be dry-fit and reassembled multiple times, tapered sliding dovetails are a good choice because they don't bind or even close up until the very end of the joint. Once closed, however, tapered sliding dovetails are strong mechanical joints that need only a few drops of glue to secure them in place. They're also an ideal joint for bookcases and other instances where long joints are needed. To cut them, all you need is a router, dovetail bit, right-angle guide, a loose length of plywood to use as a fence and a shim.

— MT

1 ***Take two passes.*** *Cut a tapered dovetail slot by shimming out the leading edge of the guide fence and recutting the dovetail slot.*



2 ***Cut a tapered tail.*** *With the same dovetail bit partially buried in the fence, cut a tapered tail by attaching the same shim material to the rear outer edge of the side stock.*

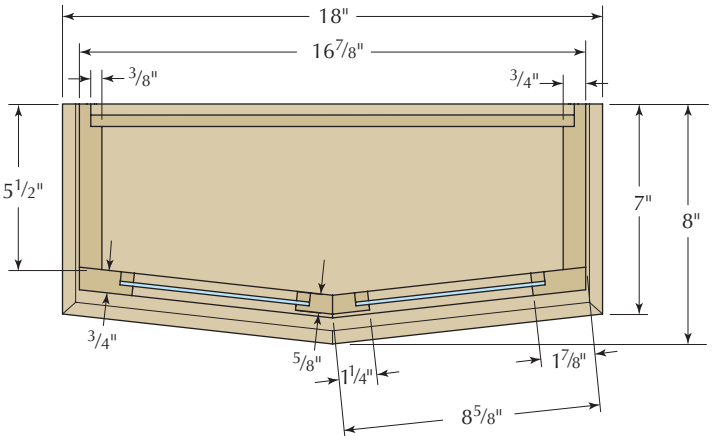
3 ***Test the fit.*** *Remove stock from the tail stock gradually, testing the fit until it slides snugly into the slot.*

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

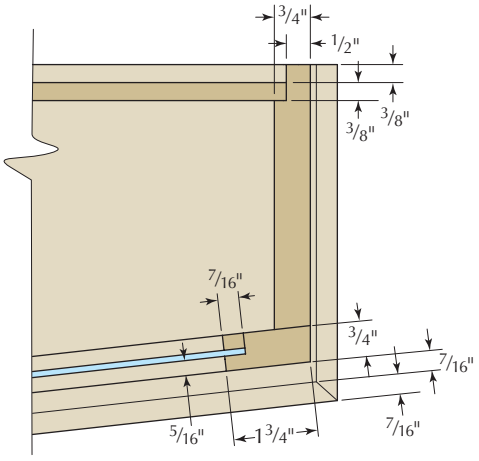
where the top and bottom overhang the sides. While a cabinet of this depth could be assembled using traditional sliding dovetails, the tapered version allows you to easily assemble and disassemble the case numerous times as you test the fit of the hinges.

To rout tapered sliding dovetails you need only a simple right-angle guide, a piece of scrap to work as an adjustable fence and a shim roughly 1/16" thick. Create the right-angle guide out of plywood scrap by screwing a short, straight length of plywood (about 2" wide x 10" long) square to the edge of a larger scrap – about 4" x 10". To cut the dovetail slot use a 1/2"-wide by 1/2"-long dovetail bit (mine is 14°) set to full depth in your router.

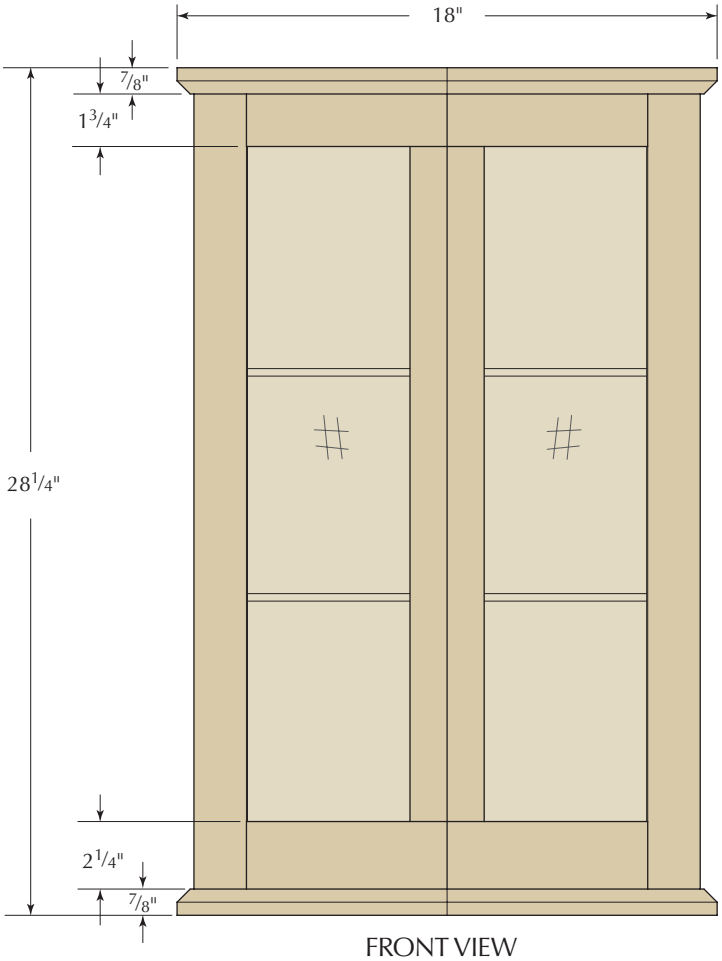
After jointing and planing the stock to thickness, leave the top and bottom an extra 2" long so that your router has more support as you cut the tapered sliding dovetails. Align the router bit with the centerline for the slot on the top and bottom. Clamp both the right-angle guide and the adjustable fence in place. You can make the cut in a single pass but



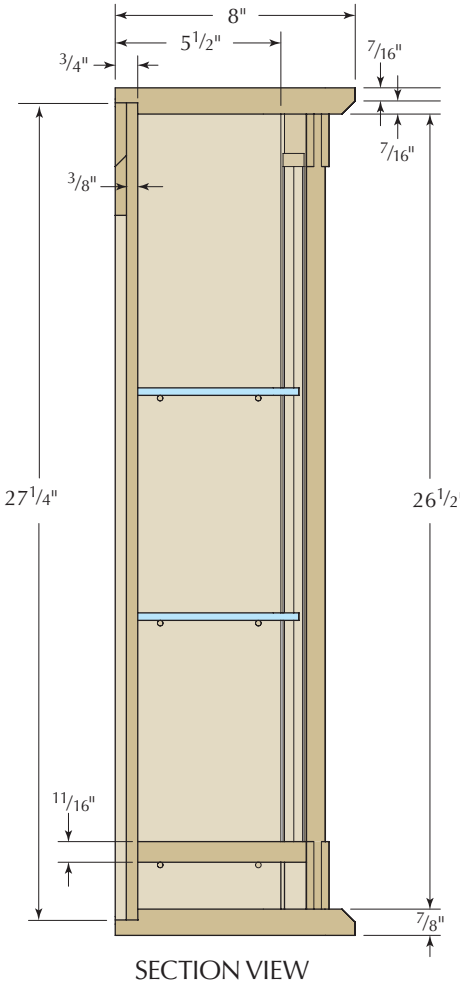
TOP VIEW



CORNER DETAIL



FRONT VIEW



SECTION VIEW

it causes less strain on the bit and less trepidation for the user if you hog out the bulk of the waste using a 3/16" straight bit before routing the dovetail slot. Mark out and stop the slot about 1/2" shy of the finished depth of the side. Make this same hogging cut for all of the dovetail slots. Then switch to the dovetail bit and repeat the cut. To make sure you position the fence in the same location for both the hogging and dovetailing passes, align the guides using a combination square registered off the end.

After your first pass with the dovetail bit, position your shim along the edge of the workpiece between the guide and the adjustable fence. Make sure the end of the fence is positioned at the point on the bottom or top where the cabinet side ends. To open up one side of the dovetail slot and create a tapered dovetail slot, run the router against the shimmed fence. Then square up the end of the dovetail slot using a chisel.

Cut the dovetails on the ends of the case sides by chucking the same bit in the router table and setting the depth to match the depth of the dovetail slot in the top and bottom. (This is where it pays to make test cuts in scrap stock milled to the thickness of the case parts.) Use masking tape to attach the same shim used to cut the dovetail slot to the outside face of the side stock so that it is flush to the back edge. Alternate taking passes on each side of the stock, slowly adjusting the fence toward the bit until the tail fits snugly in the dovetail slot. Because both the dovetail and its mating slot are tapered, the fit will be loose until it seats itself to full depth. (The fat end of the dovetail should match the opening in the dovetail slot.)

Once you're happy with the fit, crosscut the top and bottom to length and then cut the angled front edges at the band saw. Clamp the two parts together and clean up the cut with a handplane. Use a 45° chamfer bit at the router table to profile the edges of the top and bottom. Just make sure you don't chamfer past the point where the cabinet sides meet the faces of the top and bottom.

Streamlined Doormaking

Bridle joints are a handsome exposed joint that puts the maker's work on display. Bridle joints, often called slip joints, are a little easier to cut than traditional mortise-and-tenon joints because all the door parts get cut to full length, which you can check directly against the case. The joinery is also exposed, which lends a handcrafted look to the piece. — MT

EXPOSED JOINERY **FOR THE DOORS**

1 ***Cut the mortises.*** *Using a tall fence and a right-angle guide, center the mortise by taking two passes – one with either face against the fence – using a single blade.*

2 ***Cut tenon shoulders.*** *Set the blade to match the thickness of the mortise walls. Then use a stop-block on a table saw sled to cut the tenon shoulder.*

3 ***Cut the tenon cheeks.*** *Trim away both sides of the tenon, testing the fit and making slight adjustments after each pass.*

4 ***A snug fit.*** *Aim for a tenon that slides into the mortise with a little resistance using only hand pressure.*

play. Using them to join the doors makes the fitting process almost foolproof. Start with stock that fits the opening and then cut your joinery. As long as you glue up the door square, it's essentially pre-fit to the case. Bridle joints are also straightforward: All you need is a tall auxiliary fence for your table saw and a right-angle guide to help hold the workpieces safely.

The rail and stile arrangement for these doors is simple, but certainly not traditional. The outer stiles run full length, as is traditional, but the inner stiles are inset and visible only between the upper and lower rails. To make the process easy, cut all the joinery on stock that is milled to the same thickness. After the joinery has been cut, the front face of the center stiles are run through the planer again so that their faces are set back 1/8" from the rail faces.

This arrangement allows the top and bottom rails to come to a point at center, highlighting the angled front of the case. It also creates an almost visually seamless frame around the cabinet, which helps draw your eyes to the inside of the case and creates an interesting shadow line reminiscent of Greene & Greene. I like it, but if the doors don't fit your tastes, feel free to build the doors with the more traditional arrangement.

Start by cutting all your stock to finished length, aiming for about 1/32" of play top-to-bottom. Remember that angles will be trimmed on the stiles after the door is assembled – so cut the stock about 3/16" wider than finished width. It helps guide your milling to draw out the door parts to size on the bottom of the dry-fit case. You can always trim down doors that are too large, but there's no saving doors that are too small.

> "Most of my work comes not from drawings but from an idea I have. Something that is both a guess and a hope."
>
> *— James Krenov (1920-2009) furniture designer and maker*

Start by cutting the open mortises on the outer stiles and on the inner ends of the rails. For each joint, set the height of the blade to match the width of the mating piece. It makes sense to cut them in batches based on the depth of cut. Position the workpiece upright in a right-angle sled held against the tall fence. Adjust the blade so that it cuts about 1/4" in from the edge and make the cut. To prevent burning, make these cuts in two passes. You'll want to make this cut on all four joints before raising the blade to final height. Flip the stock so that the opposite face is against the fence and repeat the cut. Taking two passes with a single blade rather than one pass with a dado stack ensures that the mortise is centered on the stock. Depending on your saw blade, you may need to clean up the end of the mortise with a chisel.

Before cutting the tenon cheeks, cut their shoulders with the stock held flat on the table saw and registered against a miter gauge or a crosscut sled outfitted with a stop block set to the tenon length. Cut the tenon cheeks using a setup similar to the one you used for mortising, but with the blade adjusted to remove the faces of the stock. Sneak up on the fit slowly by taking passes on each side. Test the fit against the mortise and aim for a joint that is snug but can be assembled with only hand pressure.

After all the joinery is cut, run the center stiles through the planer, trimming their front faces down by about 1/8". Assemble the doors on a flat surface and make sure the assembly goes together square by measuring the diagonals. The two measurements should match.

Knife Hinges Lend a Clean Look

Many woodworkers steer clear of knife hinges, assuming that they're too difficult to fit correctly. But they're needlessly daunted. Knife hinges are nearly impossible to install if you attempt to do so on a case that has already been assembled, but if you plan for them prior to assembly they're pretty straightforward. They also add minimal visual distraction to the case, putting the design, the joinery and the wood itself on display.

Start by drawing out the location of the hinges on the top and bottom of the case. Dry-fit the case and position a scrap of the door stock against the front edge of the cabinet side; to give it a little breathing room, shim it out by the thickness of a business card. Then find the centerline of the door stock and transfer the location of the hinge.

Center one hinge leaf on the line and hold or tape it in place. Set a combination square so that when it's positioned

Cherry Wall Cabinet

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Top*	7/8	8	18	Cherry
❑	1	Bottom*	7/8	8	18	Cherry
❑	2	Sides**	3/4	5 5/8	27 1/2	Cherry
❑	2	Upper door rails†	3/4	1 3/4	8 5/8	Cherry
❑	2	Lower door rails†	3/4	2 1/4	8 5/8	Cherry
❑	2	Outer door stiles	3/4	1 7/8	26 1/2	Cherry
❑	2	Inner door stiles	5/8	1 1/4	26 1/2	Cherry
❑	1	Cabinet back††	3/8	15 7/8	27 1/4	Cherry
❑	2	French cleats	3/8	2 1/2	7 1/2	Cherry
❑	1	Lower shelf	11/16	5 3/8	15 3/8	Cherry
❑	2	Upper shelves	1/4	5 3/8	15 3/8	Glass
❑	2	Door panels	3/16	6 5/16	23 3/8	Glass
❑	2	Pulls	5/8	5/8	1	Walnut

* Leave 2" long until after routing the sliding dovetail. ** Left slightly wide at this point – trim to final angle after dry-fitting. † Leave 1/8" longer, to be trimmed to finished size after. †† Glue up boards as necessary to span width.

SUPPLY SOURCES

Brusso
brusso.com or 212-337-8510

2 ■ center pivot hinges (aka knife hinges) #ST-18, $24/pair

Price correct at time of publication.

INSTALLING **KNIFE HINGES**

Knife hinges work well in cases where you want minimal intrusion from the hardware. Straight knife hinges, like those seen here, are used on cabinets where the top and bottom of the case overhangs the door but the door overlays the case sides. The key to installing them without incident is to do all your mortising and test-fitting before gluing up the case. — MT

1 ***Positioning the hinge.*** *Draw out the position of the door stock to help center the hinge. Then use a marking gauge to establish the front and rear edges of the hinge mortise.*

2 ***Score around the hinge.*** *Use double-sided tape to hold the hinge in place and then scribe its location with a marking knife.*

3 ***Rout it out.*** *Hog out the waste in the mortise using a small straight bit. Position the edge guide so it makes a clean cut along the rear edge of the mortise.*

4 ***Set the hinge in place.*** *The hinge leaf should be flush to the surface of the workpiece. Drill pilot holes before attaching it with screws.*

5 ***Rout the door mortise.*** *Scrap stock clamped flush to the top of the door allows you to rout the door mortises in the same fashion as those on the case.*

6 ***Hang the door.*** *Attach the hinge leaves to the cabinet and one side of the door. Set the leaf attached to the door in place on the hinge. Set the other leaf in place on its hinge and slide the door into place. Double-check the position of the door on the case and then mark out the screw holes. Finish the doors and install the glass before you attach the doors permanently.*

against the front of the bottom it abuts the front edge of the hinge. Butt the hinge against the square and position it so that the inside edge of the pivot is flush to the outside edge of the case. (It's worth noting that on cases without angled fronts, the pivot of the knife hinge is centered on the outer edge of the case.) Once you're happy with the position of the hinge leaf, use double-sided tape to help hold the hinge in place and scribe a line around its perimeter. Disassemble the case and duplicate these markings for the remaining three hinges.

Use a 1/8" straight router bit that is set to the thickness of one leaf of the knife hinge (the same set up used to mortise the top and bottom). Clamp or use double-sided tape to secure an edge guide to the bottom of your router so that the bit aligns with the rear edge of the hinge mortise. You could use a plunge router to cut the mortise, but I find I get more consistent results using a fixed-base version and dropping carefully into the cut. Work the router in small circles, freehand, to hog off the bulk of the waste. Then take a final pass with the guide fence flush to the front of the workpiece to establish the rear edge of the mortise. Remove as much waste as you're comfortable removing freehand, and then clean up the edges of the mortise with a chisel.

Screw the leaves of the hinges (make sure it's the side of the hinge that has a pin and washer on it) into their mortises and reassemble the case. Make sure you drill the pilot holes and use steel screws.

Install the glass. *A bead of silicone and wood strips secure the glass in place. Use cardboard to protect the glass as you tap the brads home.*

You can install the brass screws later but they tend to break unless you first thread the holes with steel ones.

Finish up the Doors & Case

At the table saw, cut the angles on the edges of the assembled doors so that they fit snug between the hinge washers on the top and bottom of the case. Determine the length of the mortise so that the bit matches the distance mortised on the case (from the outside edge moving in toward the center). Then hold or tape the hinge in place and mark the end of the cut with a knife.

Set a combination square or marking gauge and scribe lines on the sides of the hinge so that it is perfectly centered. Clamp the door upright to the side of your bench or in a vise and clamp a guide block flush to the edge of the door. Attach a guide fence to the router base so that it aligns with the far edge of the mortise. Flip the door horizontally and cut the other edge of the mortise. Routing from both sides of the door guarantees that the mortise is perfectly centered on the door. Repeat this for the remaining mortises.

Set the mating hinge leaf on the hinges at the top and bottom of the case and then slide the door into place so that the hinge leaves slide into the door mortises. If the door needs to set farther in, you can open up the ends of the mortises on the doors. Once you're happy with the position of the doors on the hinges, drill the screw holes. You can install the leaf in one end of the door (either the top or the bottom), but leave the other loose so that you can slide it onto the hinge in the case.

Before attaching the doors permanently you need to glue up the case then apply your favorite finish (I used Waterlox). Route a 7/16"-wide by 3/8"-deep rabbet on the inside edges of the door then square up the corners. Use a small bead of silicone and install wood strips to secure the glass in place.

To finish up the case, drill for shelf pins. You can position them wherever you like or to fit the contents you plan to keep in the case. In my own cabinet I installed a lower wooden shelf that sits flush with the top of the lower door rail. This prevents the contents of the cabinet from being hidden behind the door rail. The upper shelves are 1/4" glass.

A comfortable pull. *A departure from Krenov's original, the gently curved walnut pulls emphasize the vertical lines of the doors.*

The back of the cabinet is a good spot to highlight a few bookmatched or especially figured boards you've been holding on to for awhile. Rabbet the back of the case about 3/4" deep and 3/8" wide and then install the 3/8"-thick back. You can shiplap the boards or glue them up as one solid panel, as I did.

To hang the cabinet, attach a French cleat to the back – simply a 5"-wide board ripped down the center at 45°. The upper length attaches to the back of the case and the lower section mounts to the wall.

My pulls differ from Krenov's. I band sawed them to shape and then refined them with a carving knife.

Throughout building this cabinet I was reminded of a story Hunter S. Thompson told: He claims to have once typed out the entirety of F. Scott Fitzgerald's "The Great Gatsby" simply to know how it felt to type those words. After completing essentially the same task with Krenov's display cabinet I'm convinced that Thompson's pursuit wasn't as crazy as it sounds. At least this one. **PWM**

Matthew is editor of this magazine; he can be reached at matthew.teague@fwmedia.com.

ONLINE EXTRAS

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Drill Press Table

BY STEVE SHANESY

It's accurate, easy to use and built to last.

There are all manner of drill press tables and fences, from a simple 2x4 clamped to the machine's cast iron table to ones with gadgets and gizmos galore. The latter is not my style, so when the time came to replace my drill press table the list of requirements was short:

- ***Accuracy.*** The table must be flat and stay flat, and the fence must be square to the table.
- ***Ease of use.*** My prior table had a fence fixed to the table itself, so every fence adjustment required loosening and tightening F-style clamps to the irregular bottom of the cast iron table.
- ***Longevity.*** Though I tried not to, I eventually fouled my old table by drilling into it too many times.
- ***Workholding.*** There are times when I need to clamp down my work but normal clamps won't reach.

With these issues in mind, I developed the drill press table seen here.

LEAD PHOTO BY AL PARRISH

Choose Your Materials

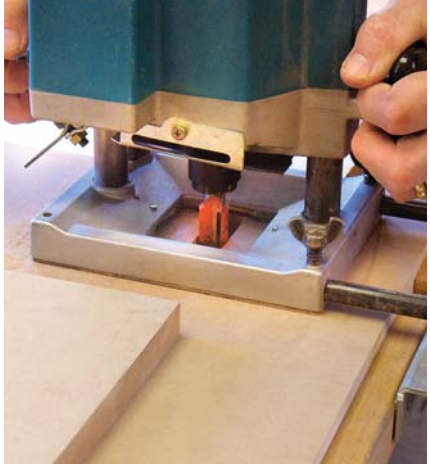
I decided to use MDF for the table because it is flat and stable. Plywood is another option so long as it's flat (which is typically the case only in the highest grades). I dismissed a melamine-clad particleboard because the surface is too slippery. The fence is cut from a clear section of a 2x4 that I jointed straight and square. A piece of plywood is screwed to the bottom of the fence. The plywood itself is clamped to the MDF table. T-track and T-bolts are used for fence adjustment and securing it to the table. An additional piece of T-track is set closer to the front of the table for workholding when the need arises.

> "All things are difficult before they are easy."
>
> — *Thomas Fuller (1606-1661) English clergyman*

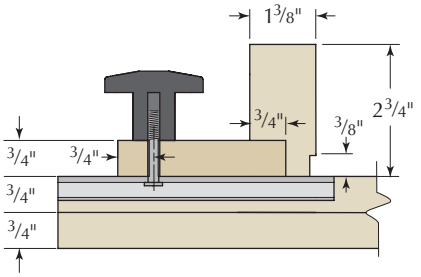
Make the Table

My table is 18" x 28" – a generous size for most work. If you are challenged for space in your shop you may want to scale it down. I should also note that my drill press has an 18" swing. If your drill press is smaller, you'll need to shorten the amount of travel for the fence.

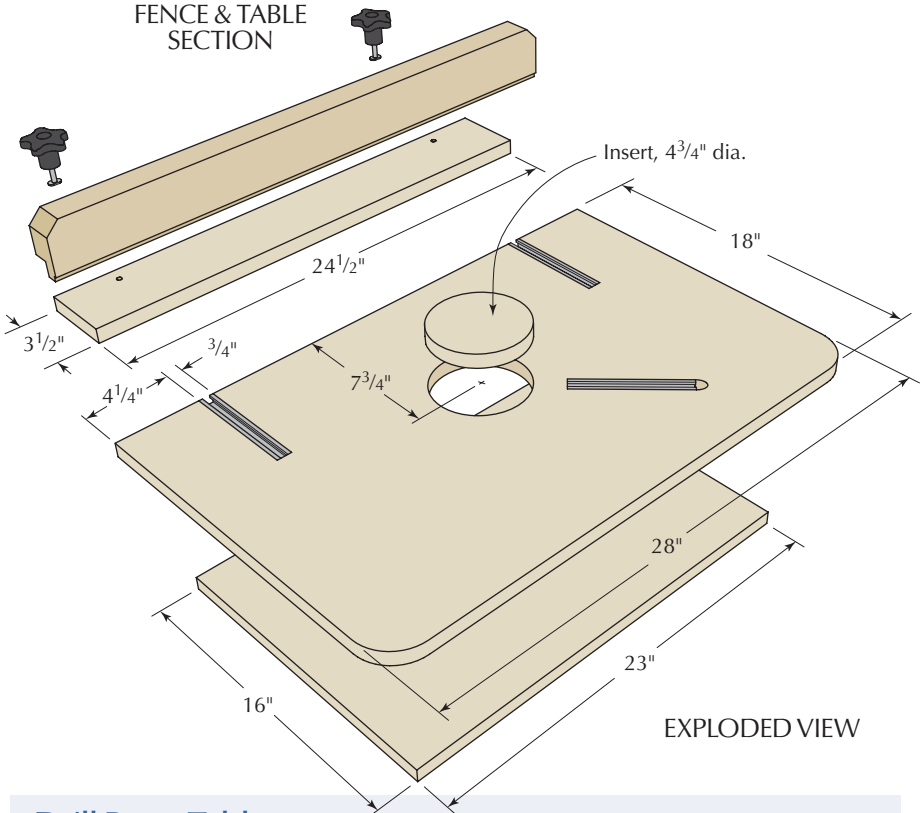
Below the table surface is a second piece of MDF that is 16" x 23", which I'll call a sub-table. The sub-table gets screwed on later but its main purpose is to provide more thickness to the table in order to securely screw down the T-track. Set the sub-table aside for now.



Take the plunge. *I used a plunge router with a fence to cut the 3/4"-wide by 1/2"-deep grooves for the T-track. I also clamped a piece of stock to the table to act as a stop for the router cut.*



FENCE & TABLE SECTION



EXPLODED VIEW

First up on the table was routing the grooves for the T-track. My T-track is 3/4" wide x 1/2" thick. When routing these grooves, make them a hair deeper than the T-track's thickness. I routed the two grooves for the fence about 4 1/4" in from each side and made them 5 3/4" long, as measured from the back edge. To cut the grooves I used a plunge router with a fence attached.

The groove for the workholding piece of T-track is routed at about a 45° angle. Its placement is somewhat arbitrary, but you can use the drawing to see where I positioned mine. Again, this piece is about 5 3/4" long, but make your groove slightly longer so you can insert a T-bolt in the track.

Next, I made a 4 3/4"-diameter hole using a fly cutter. It is centered side to side on the table, and 7 3/4" from the back edge. In this hole I drop in a like-sized insert that can easily be replaced as needed – that remedies the problem of ruining the table from repeatedly drill-

Drill Press Table

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
❑	1	Table	3/4	18	28	MDF
❑	1	Sub-table	3/4	16	23	MDF
❑	1	Table insert	3/4	4 3/4 dia.		MDF
❑	1	Fence	1 3/8	2 3/4	27 1/2	Pine
❑	1	Fence base	3/4	3 1/2	24 1/2	Plywood

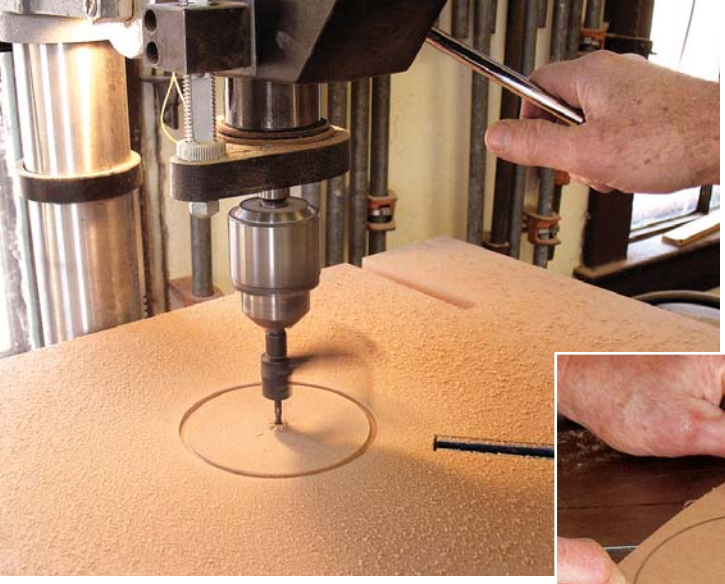
SUPPLY SOURCES

Rockler Woodworking and Hardware
Rockler.com or 800-279-4441

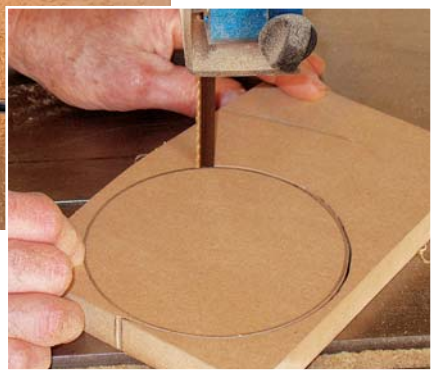
- 1 ■ Universal T-track, 2' length #22104, $13.99
- 3 ■ T-bolts, 1 1/2" #83311, $1.29
- 3 ■ T-bolt knobs #23812, $1.99

Prices correct at time of publication.

STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG



Let 'er fly. *The large hole in the table is made using a fly cutter. Keep your hands well away from the spinning cutter and be careful using this tool.*



Round up your insert. *To make the round insert for the table, simply draw the circle with a compass, then carefully cut it out at the band saw.*

ing into it. To make the insert I simply drew the circle using a compass and carefully cut out the circle on the band saw. A few minutes of sanding the outside edge and the fit was good.

Before assembling all the table parts I rounded the front corners, cutting a 2" radius using the band saw.

To complete the table, screw the subtable to the table from below. Keep the screw locations away from the center area and the T-track grooves. Then screw the T-track in place and pop the round insert into the table. At this stage, you can go ahead and bolt the table assembly to the cast iron table of the drill press.

Make the Fence

Before you start, make sure the fence material is dead flat and square all around. As mentioned earlier, I used a clear piece of 2x4 that I milled flat and square using a jointer and planer . Next, cut a piece of plywood 3½" wide and about as long as the fence. Designate what will be the face of the fence and the back. On the bottom back edge, cut a rabbet about ¾" wide and as deep as the plywood is thick. Try to get everything nice and square – both the plywood edge and the rabbet. Now, on the bottom front face, cut a small rabbet about ⅛" deep and ⅜" wide. Before you screw the plywood into the rabbet on the fence, clip the upper corners of the ends of the fence. It's more user-friendly and looks nice.

Once the fence is screwed together, set it on the drill press table and carefully compare the fence face to the table to determine if it is indeed square. If it's out even slightly, here's the fix: Go to your jointer (make sure the jointer fence is dead square to the table) and, with the plywood base of the fence against the jointer fence, take a light jointer pass over the face of the drill press's fence face. This should correct any irregularity and true it up. Go back to the drill press table and check it again. If square, it's done.

Then, set the fence above the T-track so it's centered side to side. Mark the centers of the track slots on the plywood base of the fence. Then drill clearance holes for the T-bolts through the plywood in locations away from the fence that will allow the knobs to turn freely.

There are a few additional features on this fence. That shallow rabbet you made on the lower front will allow a ¼"-thick sacrificial board to slide in and still allow space for wood chips so the stock stays tight against the fence. Also, you can turn the fence around so that the plywood edge faces the front. This low fence is perfect for drilling small holes close to the edge of a board. This low fence also prevents the drill press chuck from hitting the fence before the bit can be sufficiently lowered into the work. **PWM**

Steve Shanesy is senior editor of Popular Woodworking Magazine. *He can be reached at steve.shanesy@fwmedia.com.*

Square is a must. *Your fence and table must be square so check it carefully.*

The fix is in. *You can always square up the drill press fence by taking a pass over your jointer after making sure the jointer fence is square.*

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The How & Why of CUTLISTS

BY ROBERT W. LANG

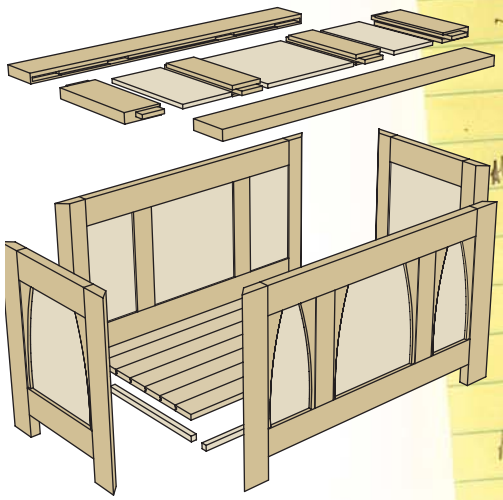
Why you're better off to look this gift horse in the mouth.

There is a trap lurking within the pages of this magazine. It is also in most woodworking magazines, and many books. It is called the cutlist, and while it poses as your helpful friend, you're better off to ignore it and make your own. A published cutlist can keep you from learning some of the most important skills in woodworking – and if you're convinced that you can't make your own, you can and you should.

Making a cutlist may not be the most enjoyable part of building, but it is a critical step and a fundamental skill. The good news is, it isn't difficult. The bad news is, it can be tedious and it involves arithmetic.

In theory, a cutlist speeds the building process. You cut all the parts for your project to size in one step and put them together in the next. What could be more straightforward than that? For that theory to work, you must cut all the parts exactly. That means right on the money for every dimension, each piece perfectly straight and absolutely square.

Unless your project contains only one piece of wood, any deviation in one part affects some, if not all, the other parts. If your logic tells you that a bunch of small errors will cancel each other out, you don't have much experience in building. Small



It's just a box. *No matter how complex a project may appear at first glance, think of it as a simple box. List the major components, then the parts that make them up.*

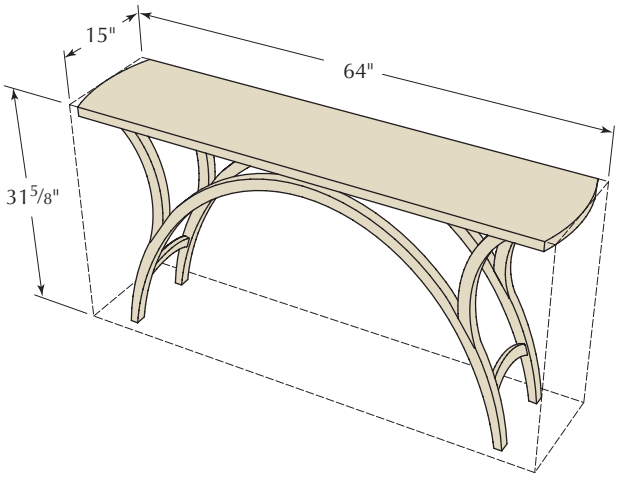
errors accumulate and seem to gather at the most visible point possible.

The most important item missing from the typical cutlist is something it can't possibly have if made by someone other than yourself. That is a knowledge of how you work, the tolerances that are important to you and the tolerances you are capable of reaching.

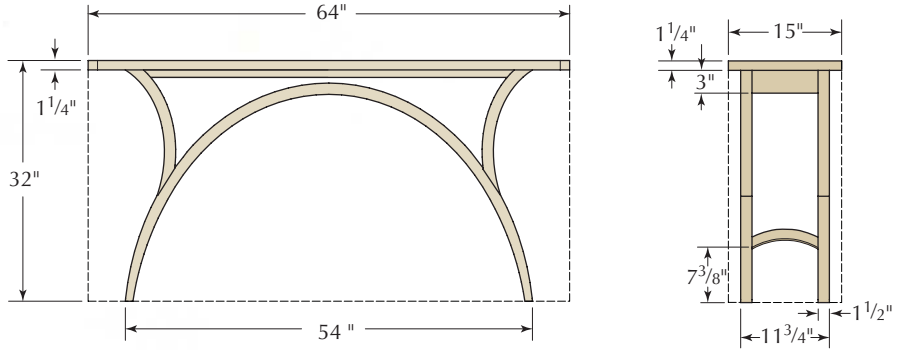
Some woodworkers operate by thinking, "Hey it's wood; close is close enough" while others measure everything they can with a precision straightedge and a .001" feeler gauge. Yet the thinking rarely matches the skill level. A lot of woodworkers in the "close is close enough" camp cut airtight joints and piston-fit drawers. At the same time there are über-engineers who can't make a square cut, or who are never really sure if something is square or not. Most of us are in between, and if you want to be successful at making things from wood, it pays to be aware of where you are on the spectrum.

It's easy to think that someone else's cutlist will enable you to avoid the difficult parts of building. But to get from a pile of wood to a finished piece of furniture is a complex process, and when you build you must go through the entire process, whether you want to or not. It's like a game of chess. If you don't have a strategy, don't have a way to defend against the unexpected, or don't think beyond the next simple step, your opponent will win.

In chess you lose your queen and then the game, and in woodworking you have to remake an important part and toss hours of work into the kindling pile. Or worse yet, you'll spend the rest of your life looking at something you made that isn't quite right, knowing you could have done better. Thinking through the process before you start to build ensures success. And the best way to do that is to make your own cutlist, or at least closely scrutinize a published one.



This is a box, too. *Even if the parts aren't box-like (as here in Jeff Miller's Arch Table), imagine a box that contains them to organize the way you think of planning and building.*



Better than reality. *Dimensioned drawings aren't realistic because they don't show perspective. But they do allow you to lay out complex parts precisely if you study them. Each view gives specific information about the objects in the drawing. Look at all the views to understand what goes where.*

Think Inside the Box

One of the planning strategies that I use is to think of everything as a simple box. Building a box is easy: There will be two sides, a front and a back, and a top and a bottom. Even the most complex pieces fit this idea, and it's helpful in many ways. First, it organizes the parts. The side of a case piece may be a simple slab of wood or it may be a complicated assembly of stiles, rails, panels and legs. Define the size of the assembly, then determine the size of the parts.

This also helps to plan a building strategy. Connecting two assembled sides with a front and a back is easier than trying to assemble an entire case in one shot.

Most of the work of planning is a series of if/then questions, working backward from assemblies to the parts that make up those assemblies. When I look at a measured drawing, I list the major parts, along with their overall sizes, leaving room to list the component parts below each major entry. A good drawing doesn't necessarily give you the exact size of every part; it gives you the information you need to figure out the size of each part when you understand the relationship of the parts to each other.

Section drawings take some study to understand, but they are the best source of information about a project. A section is an imaginary slice that lets you see the inside of an object, and the relationships between the parts and the openings they fit into. If a section doesn't seem to make sense at first, compare it to the elevations that show the outside.

A good drawing leaves out some numbers so that the person working from the drawing will have to do some math and look at all the given views. This serves as a safeguard in a couple of ways. If there is an error in the listed dimensions it will be found before parts are cut. It also ensures that the person doing the building spends time looking through the drawings to understand them.

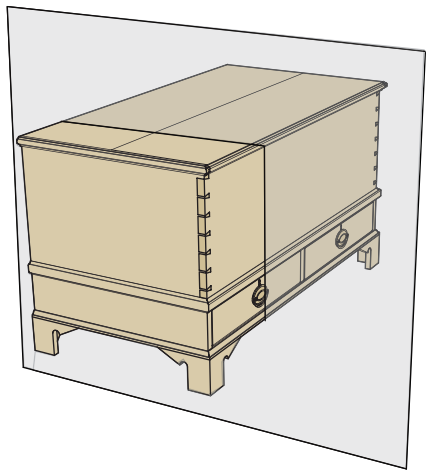
Build it in Your Head

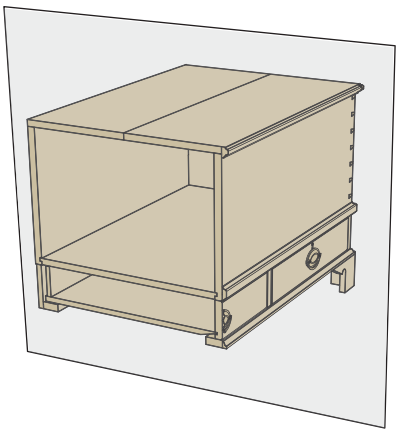
When I make a drawing, whether I use a three-dimensional computer modeling program or a pencil on paper, the under-

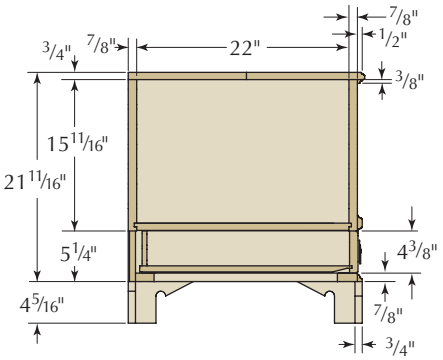
LEAD PHOTO BY AL PARRISH; STEP PHOTOS & ILLUSTRATIONS BY THE AUTHOR;
BRIDAL CHEST FROM NOVEMBER 2005, #151; ARCH TABLE FROM DECEMBER 2011, #194

lying process is the same. I'm working through the steps of the build mentally before cutting any wood.

When I look at someone else's drawings and make a cutlist, I'm doing the same thing – pretending to build it so that the real building will be easier. If I'm planning to build a project that already contains a cutlist, I don't do anything different, except that I check the math instead of work the math.







Slice of life. *Section views are generated by making an imaginary cut through an object, revealing the secrets of what is contained inside, and how all the parts fit together.*

When I'm satisfied that the numbers are good on the cutlist, I can go ahead and cut everything, can't I? The answer to that depends on a number of things: More if/then questions based on how I work, how well I know my work habits and capabilities, and how much of a risk I'm willing to take.

To minimize the risks, I need a sense of which numbers on the list are critical, and which are likely to vary. My strategy is to mill pieces to thickness and width, but to leave extra length until the last possible moment. If the project includes tenons, for example, it will be nice to have extra material the exact size of the real parts to make test cuts. Leaving parts too long initially provides exactly what I need during the build.

What Could go Wrong?

Lengths are also the most likely things to change during the project, followed by widths. When I rip material to width, I keep in mind that the size on the drawing (which I copied to my list) is a finished dimension after all the parts are assembled. If the piece I'm building has a 2"-wide face frame, I cut those parts 1/32"-1/16" wider than the finished dimension. I do that so that I can remove the saw marks with a handplane, a pass over the jointer or by ganging the parts together and running them through the planer.

At some point in the project, I have to decide which method to use and how much material to remove. I also need to be prepared for the consequences if I remove a bit too much. I gain control over the process by choosing when to make my choices. Every time I make a cut, the number of available options decreases.

I, for one, make better design and procedural decisions when I'm away from the shop. If I wait until I'm in the shop with a pile of wood, a list and a table saw, I'm likely to go ahead and cut. If I cut everything first, then remember I have to take the saw marks out, my decisions are now limited to how to deal with parts that are smaller than planned.

A good cutlist also helps when choosing what piece of available lumber goes where in the project, provided that both the cutlist and the lumber are available. I work my way through the stack of lumber and make rough marks with chalk or a crayon on the boards to indicate the cuts I'll need to make.

I work through the lumber stack looking for the largest, most attractive pieces first, while noting what smaller, less visible parts can come from the remainder. This process is part art, part science and a large part luck. The more lumber at hand when I do this, the luckier I will be. This is another part of the process that I can't avoid, but I can control when and where to do it.

I can do this as I buy the lumber, and maybe save some money, or I can buy more lumber than I need and perhaps save both time and money. The only thing certain is that I will have to buy more lumber than the actual board-foot measure of the finished parts. How much it costs depends on what random sizes of lumber are available at the time, if I'm buying it in bulk and how picky I am about the appearance of the finished piece.

> "Good judgment comes from experience, and a lot of that comes from bad judgment."
>
> *— Will Rogers (1879-1935)*
> *American humorist*

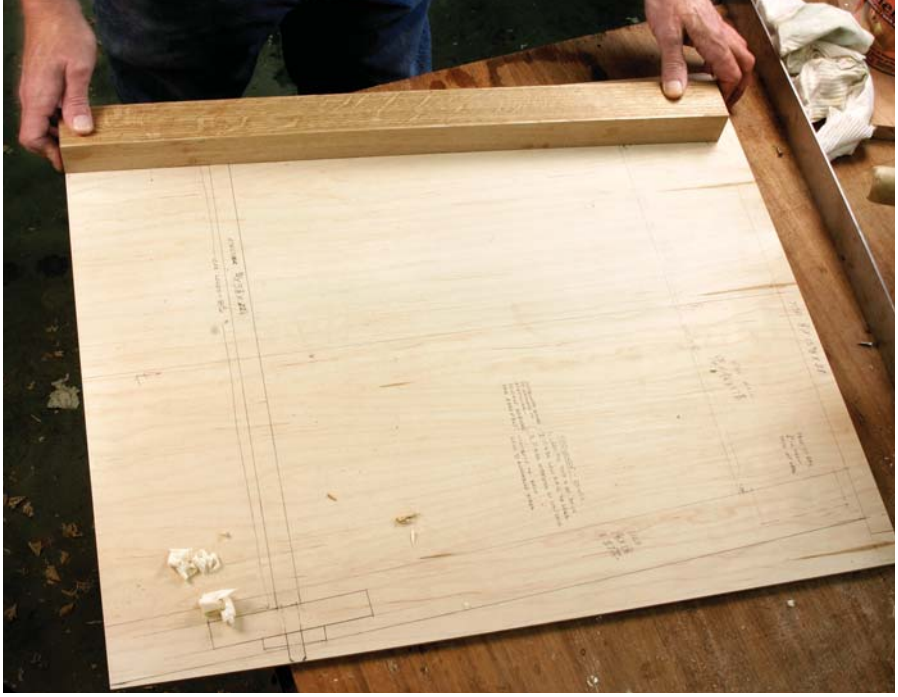
When Guessing is Good

You can use the numbers from a cutlist to figure how much lumber you need in board feet (bf). For each individual part, round the thickness up to the next quarter-inch, multiply the thickness by the width by the length of the part (all in inches) and divide the result by 144, the cubic inches in a board foot.

So far, so good, but the result is the volume of the finished part, not the volume of the piece of wood you need to make the part. You may get lucky and find rough lumber just slightly bigger than what you need, but the chances of that are slim.

Calculating the exact board feet in each and every piece takes time, and the result isn't very useful. You need some factor to account for the inevitable waste. If you're frugal, and your lumber dealer doesn't mind, you can pick through his stack and likely come within 20 percent or so of your original estimate.

BLANKET CHEST FROM "FURNITURE IN THE SOUTHERN STYLE"



The big picture. *A full-size layout when you need it is a great resource that minimizes the risks of building. Use it for a reference throughout the project, and as a place to record your plans.*

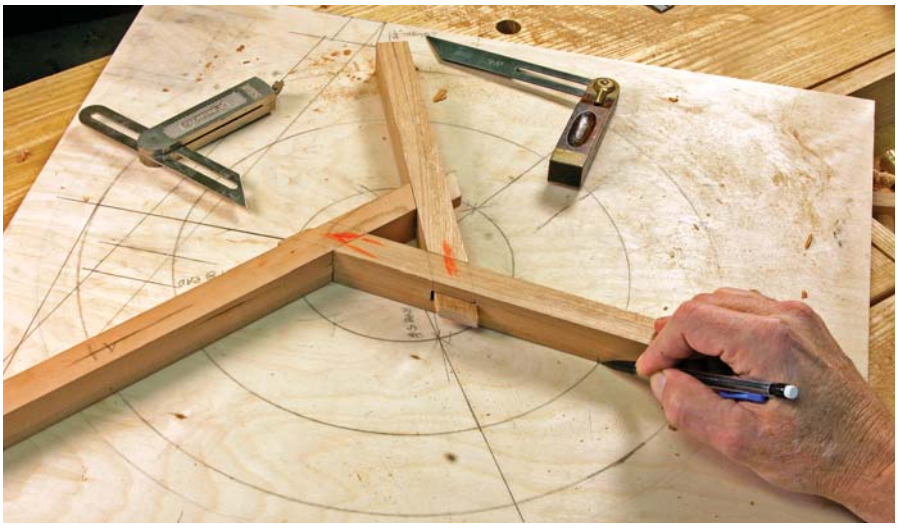
If you're trying to get an estimate of what the lumber will cost, and how much to buy, quick and dirty is just as good and only takes a fraction of the time.

Go back to the earlier discussion of thinking of a piece of furniture as a box. Take a cabinet or chest of drawers, for example. Look at each side of the box, round the dimensions up to the nearest foot and multiply. A chest of drawers 21" deep x 42" wide x 46" high would have sides that are about 8 square feet each, a top and bottom of about 8 square feet each, and a front and back of about 20 square feet each. Add those together and you get about 72 square feet.

If the material is all from 4/4 rough stock, 72 board feet is a good starting point. I add a waste factor of 50 percent to that, meaning I want to buy about 108 bf for the carcase.

Calculating the individual parts might get me to a more precise number, say 62.75 bf. I still need to add a healthy waste factor; using 50 percent would get me to 94.125. That might save some money, but it might leave me short. In either case, the amount I need is close to 100 bf, and at most places that quantity merits a discount.

If wood were a liquid, like concrete, we could just order the volume we need and be done with it. Wood being the way it is, making a guess and guessing high is faster, better and often cheaper. The most expensive piece of wood is the one you need to go get in the middle of a project.



Try it for size. *Odd sizes and shapes (such as the stretchers for a stool) are tricky to measure, but easy to compare to a full-size layout. The time spent making a layout speeds the entire building process.*

When Guessing is Bad

A published drawing and cutlist is similar to a road map. Unfortunately, the scale used to fit the printed page isn't always the best. Making a story stick or full-size layout of the important parts of a project is an excellent way to better understand how all the bits and pieces fit together, and most important it provides a physical reference to lay out the real parts and check your work as you go.

When a piece contains odd angles or unusual shapes, this is far better than trying to rely on numbers or calculations. Every time I make or transfer a measurement is an opportunity to make a costly mistake. Preparing the full-size layout is one more chance to build mentally, and it vastly reduces the chances of making an error, or repeating an error that found its way in to print.

Numbers in cutlists and dimensions in drawings are part of the language of building. As with any use of language, things can get lost in translation. If I want to guarantee that the building process is enjoyable instead of frustrating, the best thing I can do is to make sure I understand things before I start to cut and assemble. It's a lot more fun to say "OK, this is the next step" than it is to say, "Ouch, wish I had thought of that."

PWM

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

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Charleston Table

BY CHRISTOPHER SCHWARZ

A versatile and durable form from the early South.

Sturdy yet delicate. *This American table has the robust early joinery of the Jacobean period yet its overall form is lighter than those heavy oak pieces, giving it a bit of unexpected grace.*

Early tables such as this one were hardworking. Finished on all sides, they could be placed anywhere in a room in the late 17th and early 18th centuries. They could be used for writing, getting dressed or for any other task required of the household.

This particular table, which is in the collection of the Museum of Early Southern Decorative Arts (commonly called MESDA), straddles the 17th and 18th centuries in its form and its joinery. It looks somewhat like a "joint stool," a typical form of heavy joined furniture in the 16th- and 17th-century household. Yet it has thinner vase-like turnings that are more delicate than an early joint stool, and its drawer has features of both early and later dovetailed drawers.

The original table was painted, yet the surviving example has lost almost all of its paint to time. When I decided to build this piece (approximately 3.2 seconds after seeing it at MESDA), I decided to build it like it was when originally constructed and not distress the wood or the finish. The crisp and new look is a bit arresting to modern eyes, but I think it's like getting a glimpse of the past that few ever get to experience.

Cypress or a Local Softwood

Furniture historians think this table was from Charleston because it's made of cypress and has turnings that resemble another Charleston joint table in cypress. While I chose to make this version from cypress in the interest of historical accuracy, you might want to consider another softwood.

Cypress, while inexpensive, also seems to have a death wish. It splinters easily when sawn, planed or (especially) turned. I destroyed three legs on the lathe before getting the hang of turning this species. If you can get Eastern white pine or another softer wood that can take crisp details, I recommend that route.

To Turn or Burrow?

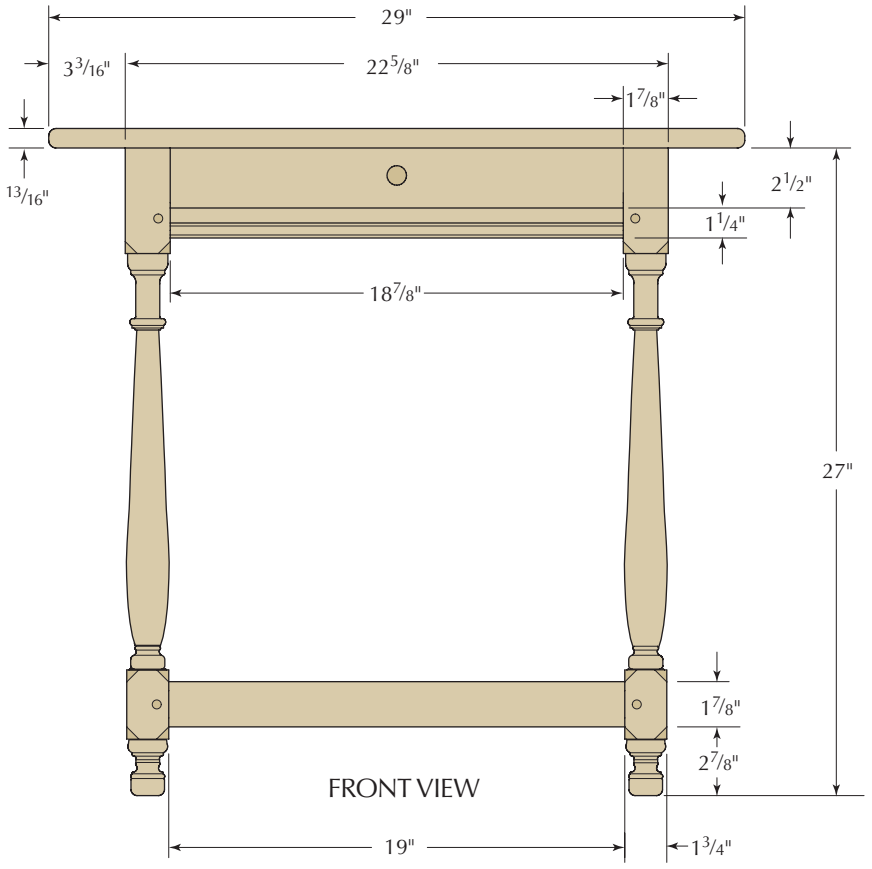
Once you select your wood you are faced with the choice to either first turn the legs or to make the mortises for the aprons and stretchers. I chose to cut the mortises first thinking it would be harder to do that after the legs were turned.

If I were using pine or poplar, that would have been the right choice. However, because of cypress's tendency to fly apart on the lathe, I ended up mortising two of the legs after turning them. Still, I recommend mortising first.

Mortises all around. *Even when I cut my mortises with a hollow-chisel mortise machine, I mark out one wall of the mortise using a marking gauge. This distinct and deep mark helps me avoid mistakes.*

Mortises all Around

Each leg has four mortises – two for the stretchers near the floor and two for upper aprons or the rail beneath the drawer. If you use thicker stock like on the original table, use 7/16"-wide mortises. My stock ended up a little skinnier than 7/8", so I used 1/4" mortises. (Note that in the illustrations the blocks at the tops and bottoms of the legs are different thicknesses; this adds complications in materials and construction; if you want to be faithful to the original, pull all your measurements from the drawings, which match the cutlist.)

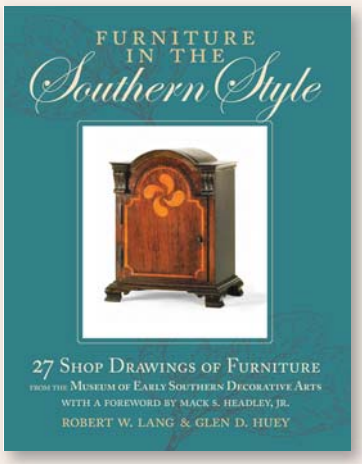


LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY ROBERT W. LANG

THE SOUTHERN **STYLE**

This project is taken from the book "Furniture in the Southern Style" by Robert W. Lang and Glen D. Huey, a long-overdue look at furniture from the Southern region of the United States. The book features shop drawings of 27 pieces from 1710 to 1860 and are based on records housed at MESDA plus measurements of the actual pieces.

As a born-and-bred Southerner, I consider this title to be one of the most important woodworking books of the last decade. It's available at ShopWoodworking.com and bookstores for $29.99 (retail). — CS



The mortises are 1" deep and just about touch in the middle of the legs. After truing up all the legs, mark the locations of the mortises for the aprons, stretchers and the drawer rail between the front legs. Then cut the mortises.

Turn the Legs

If you're not using cypress, the legs are quite easy to turn using a roughing gouge, parting tool, spindle gouge and skew. The first thing to do is to isolate the round sections of the leg from the square.

The best way to do this (especially if you are using cypress) is to saw into the corners at the points in the leg where they change from square to round. These saw cuts protect the square sections of the leg from splintering when you go at it with the roughing gouge and parting tool.

Turn the areas between the aprons and stretchers – plus the area between the stretchers and the floor – using a roughing gouge. Then refer to the leg illustration to define the round areas of the leg using a parting tool.

Use a spindle gouge to shape the astragal up near the aprons and all the small coves at the transition points of the leg. Most of the work on the feet is done with a spindle gouge. The vase-like turning on the legs is the last part to tackle. Turn the vase to its rough shape using a parting tool and roughing gouge. Then finish the job with a skew.

Complex moulders are simple. *I use a square ovolo a lot, so I have a plane (called a complex moulder) dedicated to making that profile. The other hand-tool option is to use hollows and rounds to make the ogee found on the original.*

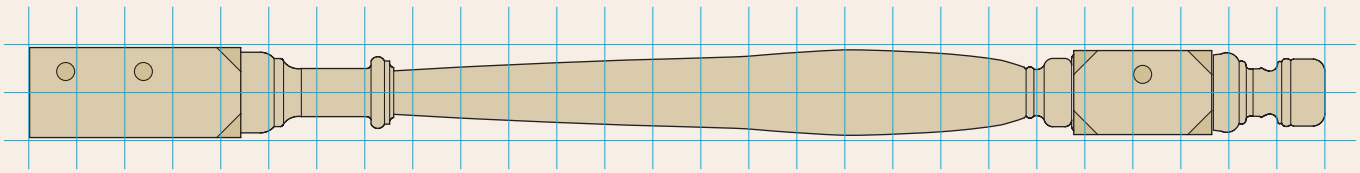
Tenons all Around

Now cut the tenons on the aprons, stretchers and the drawer rail that runs between the two front legs. All these tenons should be 1" long and match the mortises you've already cut. Any tenoning technique will work, from the table saw to the tenon saw.

TURNED **LEGS**

Kerfs make it easier. *By sawing the corners of the legs at the transition points between square and round, you greatly reduce the tendency of your turning tools to splinter the square sections. Even a shallow kerf all the way around will help.*

Crisp for now. *The original table had turnings that looked (to my eye) like they had been worn down a bit, either from handling or from unfortunate refinishing. When I turned my legs, I went for crisp details. If you want to age your table, you can mute the transitions with sandpaper.*



LEG PATTERN

1 grid square = 1"

After cutting the tenons, you need to cut details on all the pieces. Cut a moulding profile on the bottom edge of the aprons and the drawer rail. Cut a torus (a doughnut shape) on the top edge of the stretchers. I chose to do these by hand with moulding planes to make them both crisp and slightly irregular – just like the original. If you use a router table, the details will look symmetrical all around. And if you sand the details after routing them, there's the risk of muting the sharp corners. So take care.

On the aprons and the drawer rail, I cut a 1/2" square ovolo using a moulding plane. The original had an ogee and fillet (technically a "cyma recta"), but I don't own that plane. No matter what profile you choose, try to use one that has fillets (square corners) at the top and bottom – those are the details that create the dominant shadow lines.

To make the torus on the stretchers I drew out the profile on the end grain of both ends of the stretcher. Then I used a jack plane to waste away most of the waste and finished the profile with a No. 10 hollow plane set for a fine shaving.

Trim & Assemble

Like on many early pieces, the aprons and stretchers are flush to the outside edges of the legs. The best strategy to get everything flushed up is to do as much of the work as you can before final assembly. So dry-fit the parts and trim the proud parts as flush as you can. A little extra work now will save a lot of fussing around later.

In keeping with the spirit of this piece, I decided to drawbore all the mortise-and-tenon joints. We've written quite a lot about this technique and have posted a free article at popularwoodworking.com/apr12. While traditional drawboring doesn't require glue, I almost always use adhesive unless I intend to take the piece apart someday.

For this piece, I used 1/4"-diameter oak pins, and I offset the two holes – the one in the tenon from the one through the mortise – by about 3/32". The cypress didn't complain too much. Assemble the table base (with or without glue – it's your choice) then drive the oak pins home.

The Modern Interior

Drawers in 17th-century casework were frequently "side hung"; the drawer sides had a groove in them that nested with a wooden runner affixed to the side of the case. The original table has a more modern arrangement: The drawer slides on top of two drawer runners and is restrained on its sides by two drawer guides.

The corners of the drawer runners need to be notched to fit around the legs. The easy way to do this is to lay the runners on top of the assembled table base and trace around the legs with a pencil. Saw along those marks and that should give you a good fit.

Glue the runners and guides to the inside of the aprons. The original was also nailed in through the rear apron.

> "Without craftsmanship, inspiration is but a mere reed shaken in the wind."
>
> — *Johannes Brahms (1833-1897) German composer*

Peg the Top in Place

The top of the table has a simple torus on all four edges. I made this profile in the same way I made it on the stretchers: Draw out the shape on the ends, remove most of the material by chamfering the corner with a jack plane, then finish the profile with a No. 10 hollow plane.

Cut the profile on the ends of the top first, then on the long grain. This will reduce spelching – where you splinter the end grain at the corners.

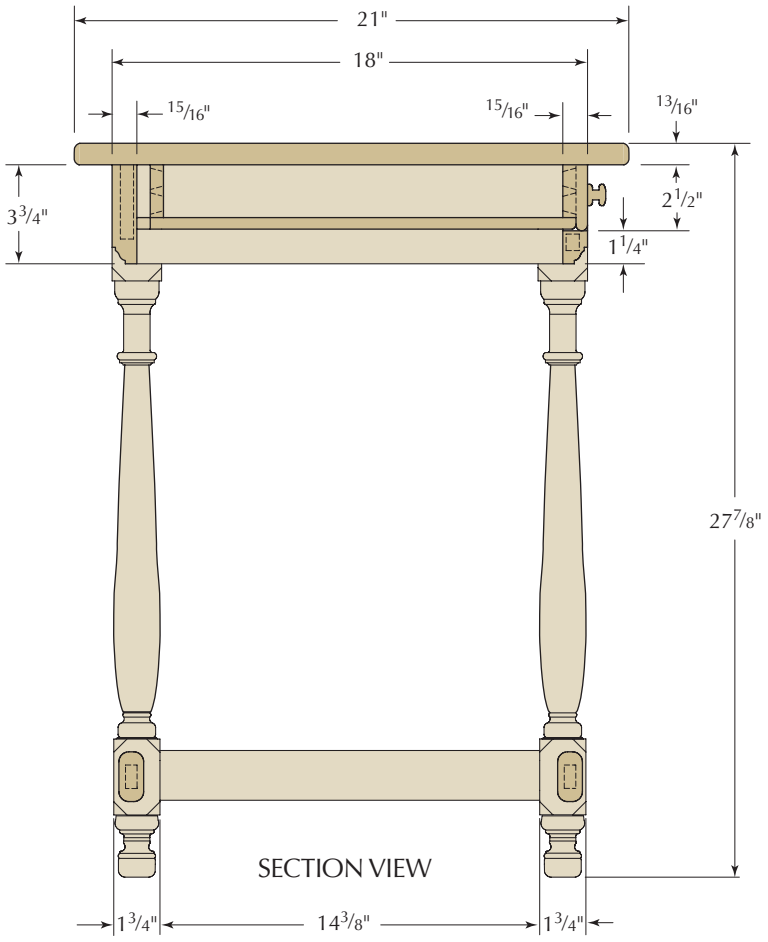
As was done on the original table, I

Marking the bore. *With the table dry-fit, use a 1/4" brad-point bit to mark the centerpoint of the hole on the tenon cheek.*

Shift the hole. *Then bore the hole about 3/32" closer to the shoulder. This offset will pull the joint together when the peg is driven through the two holes of the joint.*

Watch your lip. *When you glue the runners in place make sure they are flush – perfectly flush – to the drawer rail at the front of the case. Otherwise your drawer won't run smoothly.*

Guide from the side. *Glue the drawer guides to the runners and take care to make sure that they, too, are flush to the inside surfaces of the legs. A little attention here saves a lot of headaches later.*



attached the top to the base using oak pegs driven through the top and into the legs and aprons. And, just like on the original, this is likely to split the top as the top moves and the base does not. Use a modern attachment method if you like.

The pegs are slightly larger than 3/8" square and about 3" long. Using a chisel, I shaved them octagonal along most of their length and then roughly round at the tip. To bore the holes for the pegs, I first traced the shape of the base on the

Square, then round. *First cut a chamfer with a jack plane that gets as close as possible to your layout lines. Then use a No. 10 hollow plane to finish the profile. The hollow will ride on the arrises. When the plane makes one shaving instead of two, the profile is complete.*

First trace. *With the whole table upside down, and the base centered on the top, trace out its shape – both the outside of the base and the inside.*

Bore from below. *Now bore the holes through the top. Note that the bit is angled. The exact angle isn't important – just add a little lean to it.*

underside of the top. Using a 3/8"-diameter auger, I then bored the holes through the underside of the top.

Then I clamped the top in place on the base and finished the holes from above. Note that I angled all the holes a bit – this helps keep the top in place if the table is ever picked up by its top.

To affix the top, drive the pegs home. Glue is optional if your pegs are a snug fit. After driving the pegs in, you can trim them flush with a saw and a plane.

Drawer Details

Unless you build a lot of early furniture, the drawer may seem odd. It's dovetailed at the four corners and the bottom is simply nailed to the assembled drawer frame. The drawer front also has a rabbet on its inside face for the drawer bottom.

Another interesting detail is the rounded-over bottom edge of the drawer front – a decorative touch.

Cut all your dovetails – through-dovetails at the rear corners, half-blinds at the front. Then cut the rabbet on the inside face of the drawer front and the profile on the front face. Assemble the dovetail joints then nail the bottom in place; I used 4*d* cut headless brads.

The last touch on the drawer is to turn the knob and glue it into the drawer front.

After you fit the drawer into the table, you'll notice that its front is not flush to the front of the legs. To make it so, you'll need to glue two blocks to the inside of the rear apron that act as drawer stops. These blocks are scraps that I planed down until the drawer front fit flush.

Finishing Options

On the original table, little of the original paint remains – so I was tempted to finish this version with just an oil/varnish blend. But I wanted to see what it might have looked like in the early 1700s. So I painted it.

I chose a green milk paint (Cypress Green from General Finishes), though the original paint was likely something lead-based. So the milk paint isn't for historical accuracy as much as for the fact that I like the color, sheen and durability of that brand.

And then comes the decision about what to do with the table. I just happen to know someone in Charleston (my father), so I think this table will be returning – in a sense – to its homeland. **PWM**

Christopher Schwarz is the editor of Lost Art Press, the author of "The Anarchist's Tool Chest" and a huge fan of shrimp and grits – a Charleston specialty.

Charleston Table

	NO.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL	COMMENTS
❑	4	Legs	1 7/8	1 7/8	27	Cypress	
❑	2	Side aprons	15/16	3 3/4	16	Cypress	7/8" TBE*
❑	1	Rear apron	15/16	3 3/4	20 5/8	Cypress	7/8" TBE
❑	1	Front rail	15/16	1 1/4	20 5/8	Cypress	7/8" TBE
❑	2	Side stretchers	15/16	1 7/8	16	Cypress	7/8" TBE
❑	2	Front & rear stretchers	15/16	1 7/8	20 3/4	Cypress	7/8" TBE
❑	1	Top	13/16	21	29	Cypress	Pegged to base
❑	1	Drawer front	15/16	2 1/2	18 7/8	Cypress	
❑	2	Drawer sides	1/2	2	16 1/4	Cypress	
❑	1	Drawer back	1/2	2	18 7/8	Cypress	
❑	1	Drawer bottom	7/16	16 1/4	18 7/8	Cypress	
❑	2	Drawer stops	1/2	2	1 1/2	Cypress	

* Tenon both ends.

Finish the holes. *Clamp the top to the base and finish the holes. The final depth is about 3".*

Chamfer then round. *As on the rest of the table, make a chamfer on the bottom corner of the drawer front, then finish the job with a No. 8 or No. 10 hollow plane.*

ONLINE EXTRAS

For links to all these online extras, go to:

■ **popularwoodworking.com/apr12**

VIDEO: *See the author peg the top to the base.*

BLOG: *Visit the Chris Schwarz blog at popularwoodworking.com.*

IN OUR STORE: *"Furniture in the Southern Style" by Robert W. Lang and Glen D. Huey.*

TO BUY: *"The Essential Woodworker" by Robert Wearing.*

WEB SITE: *Learn about drawboring, an oft-overlooked technique.*

MUSEUM: *Visit the web site of the Museum of Early Southern Decorative Arts at Old Salem village in Winston-Salem, N.C.*

Our products are available online at:

■ **ShopWoodworking.com**

It's a Mystery

BY ROY UNDERHILL

This puzzle mallet is seemingly made by magic.

A pounding puzzler. *The mystery mallet looks impossible to make; the secret is rising dovetails.*

It can't come apart, but, problem is, it can't go together!

Legend has it that Abraham Lincoln invented this mysterious mallet. The trouble with ordinary mallets, in his time as now, was that they kept "flying off the handle." President Lincoln, having the same problem with his fractious Congress, created this presentation mallet with a head that could never come loose. The handle joins to the head with a central tenon and two shallow dovetails passing up the sides. The taper of the dovetails makes it clear that they can't be retracted. Obviously then, they must have been sprung in from the sides – yet a quick look at their ends shows them dovetailed against that possibility as well! Not only can the head never come off – far worse, it can never go on! So proud of it was Lincoln, that he mentioned it in his second inaugural address, uttering his famous phrase: "With mallets towards none."

The True Story

In truth, this weird wooden whacker did perhaps first come to be a century ago in a Victorian-era woodworking magazine. The original article has been lost to time, but the mallets have hung around long enough to mystify many generations since. I first encountered the mystery mallet decades ago in a scholarly journal article. The author had X-rayed the head and speculated on possible explanations of its seemingly impossible

PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY THE AUTHOR

1 Start with the handle. *Offset, oval turning for the handle takes three steps. The first brings it to a concentric taper – a fat, round handle. The head end of the handle is toward the drive center end of the lathe.*

2 Oval turn! *Now, keeping the drive center end where it is, offset the point for the tail center by 3/8" and turn again. This forms one side of the oval. A second 3/8" offset to the opposite side of the original center lets you take off the remainder, and turn it into a true oval. Work at low speeds, lest the wobbling wood take forceful flight into mortal flesh.*

3 Draw the intersections. *Choose and mark the face sides of both pieces. Make sure that the mallet head and the handle are precisely the same thickness, because you'll be gauging in from both faces and relying on this to be correct. Superimpose the two pieces and outline their intersections as if they were magically pushed into one another. Notice that the upper line on the handle (henceforth, the "waterline") is set back from the end about 1/2".*

4 Gauge the mortise & tenon. *Use a mortising gauge to lay out the central tenon around the broad sides of the handle and its corresponding mortise through the head. Be sure to run the fence of the gauge against the face side of both pieces, making lines 3/8" apart and centered.*

5 Finish the mortise. *Chop both ends of the mortise just 1/4" deep. These shallow mortises will keep your auger aligned as you bore a series of four holes halfway through the head from both sides to meet in the middle. Clean out the waste with paring chisels and rasps.*

construction. The perverse eye, however, one shamefully well-versed in the more questionable expressions of joinery, will see the solution immediately – back-to-back rising dovetails.

I taught you how to cut the basic rising dovetail in the November issue (#193) (the story is now available online), and this mallet is essentially two of these devilish joints placed back to back. A bit of practice cutting that basic joint is a good warm-up for making this doubly complex version. Still, because our brains are so accustomed to thinking at right angles, even after you've finished making this thing, you still won't be quite sure what you have done!

Grade-school Science

Here's one way to visualize the joint: Hop in the bathtub with one of those spectrum-making prisms used in grade-school science class. Now partially submerge the prism with one end sitting quite deep and the other end barely submerged. This oblique slice of the triangular solid will reveal a tapering dovetail-shaped section. That's what we see on the side of the mallet head – an oblique slice of a prism that looks like a regular dovetail. If you imagine the prism coming to the surface like a submarine, still at that angle while moving forward, you'll see how the joint is assembled and how it gets its name – the rising dovetail.

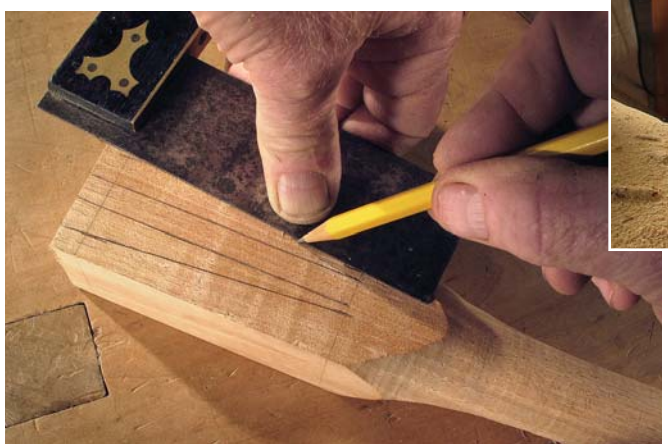
An Irritation – Excellent!

The original mystery mallets have a handle that splays out allowing for a wide, heavy head. The version I show here looks more like a conventional bench mallet, but loses some of the strength of the original. I made the handle of hickory and the head out of walnut (going for the color contrast) but any stout but not-too-brittle wood should do. The

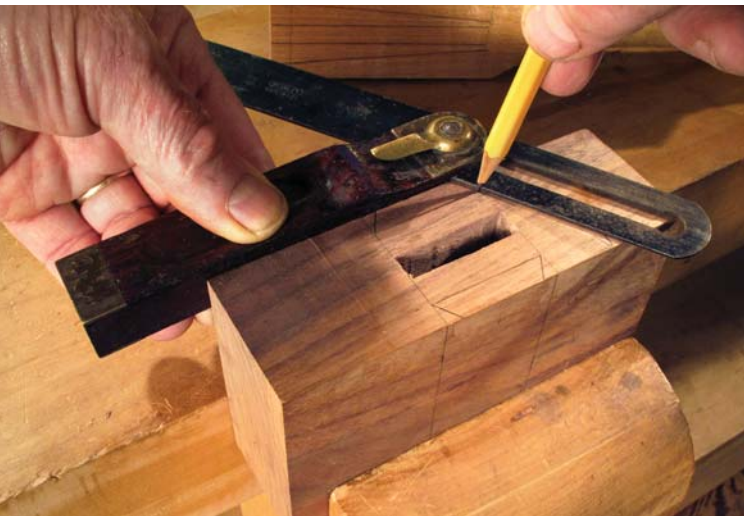
6 ***Find the tops of the back slopes.*** *Gauge in 5/16" from both the face and back side of the handle, marking on the waterline of the broad face. Run the same lines on the top of the head.*

7 ***Find the bottoms of the slopes.*** *Now set the gauge to come within 1/16" of the mortise on the underside of the head. Mark these lines on the underside of the head parallel to the mortise, and then on the broad sides of the handle where they intersect the lower line.*

8 ***Connect the dots.*** *Be sure to continue the lines all the way to the top end. This extra tapering length will help feed the dovetails into the sockets in the head.*



9 ***Saw the tenon.*** *Cut the cheeks of the central tenon all the way to the bottom line on the handle, but saw the back slopes of the dovetails only 1/2" past the waterline. You'll finish these cuts with the bowsaw later on. Strive to split the pencil lines with the edge of the saw kerf.*

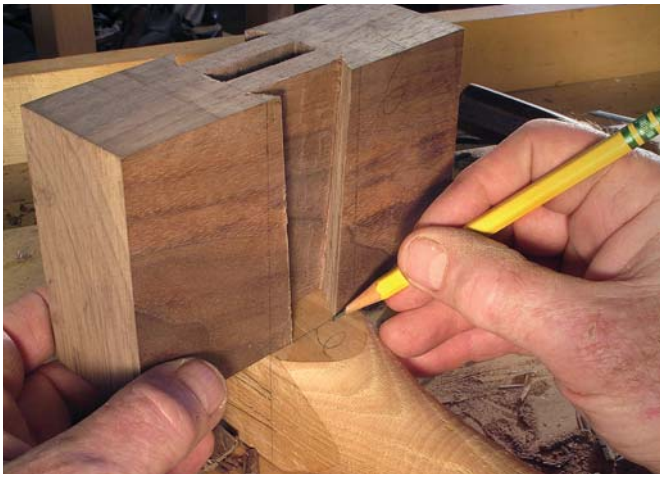


10 ***Start the dovetails.*** *Set your bevel in the range of 120° to 130° and draw the angled cheeks of the dovetail sockets on the top of the head. Then draw the same angles on the underside of the head. This creates shallow truncated triangles on the top and deep truncated triangles on the underside.*

11 ***Connect across the faces.*** *Find the slope of the dovetail shapes on the faces by connecting the shallow truncated triangles on the top with the deeper ones on the underside. Set your bevel to that angle to provide a stable guide for drawing the lines.*

12 ***Cut the cheeks.*** *Knife in these lines, making a V-shaped channel to give your saw a clean start. Then saw down both sides and once down the center to give your chisel a precise depth stop.*

13 ***Chisel out the waste.*** *Protect the sharp corners of the dovetail opening as you work.*



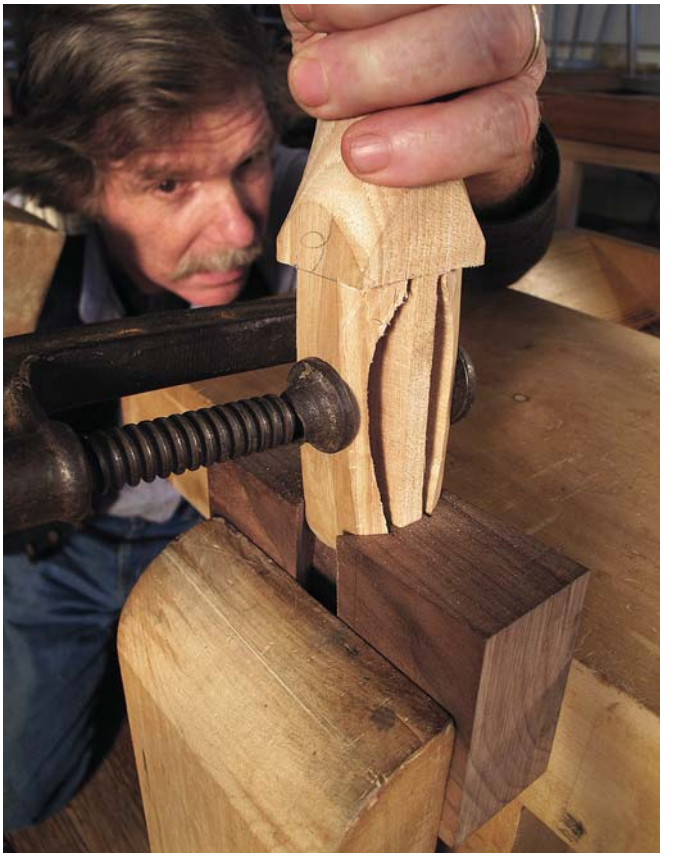
14 ***Transfer the tails.*** *Mark the actual openings of the top and bottom of the dovetail sockets onto the handle. Mark the wider end of the opening on the waterline of the handle and the narrow end on the bottom line as shown. Maintain the left-right and face-back orientation of the two pieces as you work.*

15 ***Kerf the cheeks.*** *Connect these points on the face and back of the handle with pencil lines. Rather than trying to rip the length of the long dovetail, carefully saw stopped cuts into the corners so that they just barely touch the two lines.*

16 ***Pare to the lines.*** *Split off these chunks then chisel down to the pencil lines (if you're feeling frisky, try to split your pencil lines!).*

17 ***Saw to a spring.*** *Begin at the ends of the abbreviated saw kerfs of the back slopes and draw a smooth curve down to the lower line. Follow this curve with your narrow-bladed saw, never thinning the dovetail to more than 1/4" at this stage. Avoid creating nicks that will be hard to rasp out, as the bending stress will concentrate there and the wood will snap. Fair the sawn curves with a rasp, constantly squeezing the two leaves to test for even bending. The object is to distribute the bending stresses evenly over as long a length as possible.*

18 ***Point the ends.*** *Pare the ends of the dovetails to help them feed into the sockets, but leave the end of the tenon sharp and square so it will push any waste ahead of it during assembly. Take care not to remove any wood at the waterline with a saw, rasp or chisel.*



19 ***Squeeze & drive.*** *Be sure that the face sides of head and handle are aligned. Set a C-clamp about a third of the way up the springy leaves and slowly bring the ends together as you start them into the underside of the head. Keep the head compressed in the vise to prevent its sides from splitting out. The handle should drive in at a rate of at least 1/16" or so with each moderate blow of a mallet. Listen for trouble and don't be afraid to back off to trim away a problem area.*

20 ***Trim up.*** *Saw off the protruding ends and plane the faces flush. Bevel around the hitting ends and smooth all over as you wish. Paste wax makes a good finish for the mallet – assuming the mallet doesn't finish you first!*

dovetails on the handle undergo considerable bending stress during assembly, so do look for wood with flawless, straight grain. I have had success with oak, ash, hickory, beech and even birdseye maple. I always find air-dried stock brings better fortune.

You might enhance your bending luck by heating the handle with steam or boiling water. But, if the dovetails absorb too much moisture, they may swell too fat for assembly, then shrink too much on drying to stay tight. Dry heat will work as well but, particularly on kiln-dried wood, you may make an already brittle wood even more prone to snap.

Instead of using heat, wet or dry, I have taken to carefully thinning the back sides of the rising dovetails so that they bend more easily at the start of assembly, and then push outward to fill the dovetail sides as the handle is driven home. This works well, but leaves voids between the head and the handle, making a weaker mallet than I would prefer. Hard pounding would certainly cause the head to break.

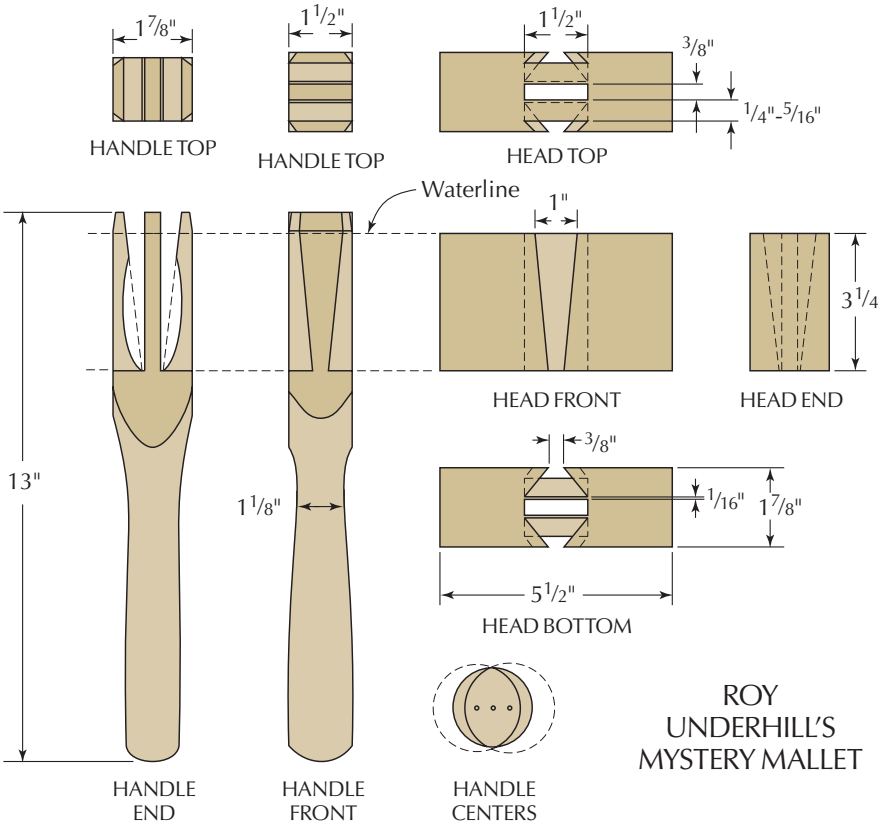
Heartbreak is never far away during this enigmatic endeavor. You must lay out and cut the joints precisely right. Too tight and the head can burst open during assembly. Too loose and it looks lame – and looks are much of the point of this undertaking. The beholders will study your mallet closely, squinting for glue lines. If anything looks like a glue line, they will be sure that they have found the answer. You can be nicer to yourself (and others) if you first make an easy-fitting mallet. This will give you some practice, and also give you a mallet that you can knock halfway apart to show others the trick – or not.

I suspect at this point you're thinking, "Well, this thing is frustrating to make, not much use when it's done and serves mainly to irritate people."

I agree with you completely – it is the perfect project! PWM

Roy is the host of "The Woodwright's Shop," the longest-running woodworking show on television.

> "Losing an illusion makes you wiser than finding a truth."
>
> *— Ludwig Borne (1786-1837) German writer*



ROY UNDERHILL'S MYSTERY MALLET

THE OLD **ORIGINAL**

The vintage mystery mallets all take the same form, but seem to be made by different hands, leading me to think they were the spawn of published plans. A period mallet, found in Alaska, shows the typical splayed handle, narrow dovetails and heavy head of the old breed. Noted historian of woodcraft Stephen Shepherd independently discovered the secret of this mallet and showed how to recreate the original form. Go to the Online Extras page for a path to his article. — RU

ONLINE **EXTRAS**

For links to all these online extras, go to:
■ **popularwoodworking.com/apr12**

ARTICLE: *Read Roy Underhill's article on cutting a single rising dovetail.*

WEB SITE: *Take a class with Roy Underhill at The Woodwright's School.*

ARTICLE: *Read woodworking historian Stephen Shepherd's 2001 article on making a puzzle mallet.*

VIDEO: *The 2011-2012 season of "The Woodwright's Shop" is now available for viewing online.*

IN OUR STORE: *"The Woodwright's Guide: Working Wood with Wedge and Edge."*

Our products are available online at:
■ **ShopWoodworking.com**

Tossing Out Tradition

Konrad Sauer improves a 150-year-old handplane design.

Let's say you were good at building Chippendale highboys. Really good. Phil-Lowe-kind-of-good at it. Customers came to you regularly and you had plenty of work to keep you busy.

Then why – oh why – would you try to reinvent that highboy?

That's the kind of question that many traditionalists are asking about planemaker Konrad Sauer, who has successfully made a living for more than 10 years as a custom toolmaker. Since Sauer opened his doors for business on Jan. 2, 2001, his bread and butter has been building infill jointer, panel and smoothing planes (plus other traditional forms) that are firmly rooted in the British infill tradition.

While experts would be hard-pressed to say that Sauer's planes look exactly like a Norris, a Spiers or a Mathison, they also could not deny that Sauer has always drawn his inspiration from these classic makers.

So it is with bemusement, amusement and consternation that many traditionalists have watched Sauer build his K13 plane, a tool that owes its design cues more to a turbocharged car than to the Scottish planemaker Spiers of Ayr.

The K13 is low-slung, lightweight and easy to hold. In other words, it is nothing like the upright, dried-out (but beautiful) English-governess style of panel plane that Sauer has been building for more than a decade.

So the question on everyone's lips is: Where did this new K13 plane come from?

"A customer commissioned it," Sauer says over a plate of jerk chicken in his kitchen. "He said he liked the size of panel planes, but that was about it. He said he wanted more wood and less metal. That was it. That's all he asked for."

The idea bounced around inside Sauer's head for some time. Trained as an artist and graphic designer, Sauer always was looking for the thing that would trigger a creative tidal wave. So he kept

Smooth curves & angles. *Like a sleek car, the K13 is difficult to photograph well. There are so many angles and curves that no single shot can capture it.*

PHOTOS BY THE AUTHOR

thinking about the idea, mulling it over as he built other customers' planes (he builds about 35 to 42 planes a year).

"I wanted the plane to look fast," Sauer says. "I wanted it to be modern, but not alien-looking. I wanted it firmly rooted in the infill tradition."

The project was all-consuming, he says. When his wife and two sons decided to go camping during the summer, Sauer intentionally left his sketchbook behind.

"I wanted to take a mental break," he says. But the plane was never far from his mind.

"I started drawing sidewalls on the paper from the kids' apple juice box wrappers," he said. "I was making sketches on cedar shingles. I couldn't stop it."

So the design for the K13 came flooding out of Sauer's fingers on his shop's chalkboard (the initial drawing is still there, next to notes of shop supplies he needs and some phone numbers). He built a prototype out of wood with an aluminum blade to see how it felt in his hands. It felt good. He decided to build one out of rosewood.

That sounds like an easy decision to make. But when a plane design can take weeks or months to build, it took a bit of courage.

I've always disliked traditional English infill panel planes. I built one years ago, which I sold, and I've owned and used many others during my career in the craft. To my American eyes, British panel planes are too heavy and long to be a smoothing plane, too short to be a good jointer plane and too difficult to hold to even make it worth the effort.

The K13 is a remarkable plane. It is much lighter than an English panel plane. It's a little shorter. Its sidewalls are curved like a smoothing plane. The front bun is low and easy to grip. And yet it has the earmarks of a traditional infill: beautiful wood, beveled sidewalls and solid bedding.

"The tool was a massive challenge," Sauer says. "And my naieveté about the situation really helped. I just jumped in, and the designs came flooding out. I couldn't draw fast enough to keep up with my brain."

Rough and ready. *These beautiful exotic blanks have been roughed out on the band saw and are waiting for customers.*

Almost ready. *These planes are almost ready to go out the door, including the jewel in the front with a black-and-white ebony infill.*

In the Backyard

In any case, the K13 is the culmination of more than a decade of hard labor for Sauer, who started out as a hobbyist furniture maker who got swept into a strange vortex that spawned two important Canadian tool-making companies: Shepherd Tool Co. and Sauer & Steiner. These toolmakers started from the same "Big Bang" – they wanted to reverse-engineer a Spiers infill smoothing plane and make it available to the modern woodworker.

Shepherd Tool made a huge splash with its infill plane kits, yet it collapsed

Rough but sleek. *Here you can see Sauer's next K13 plane. Even in the rough, it looks fast.*

in 2006 under its own weight. The company grew incredibly fast but was unable to keep up with customer service and ultimately lost the trust of many woodworkers.

Sauer & Steiner was different. Konrad Sauer and his partner, Joe Steiner, decided to make finished infill planes to the highest standards possible. No kits. They started small and grew slowly. Eventually Steiner left the formal part of the business (though he still does some shows and is a good friend of Sauer's). And while other planemakers emerged and then disappeared, Sauer kept on building planes, raising his standards and raising his prices.

What is his business secret? After observing lots of cottage toolmakers, it's obvious that Sauer knows how to work with customers. He delivers a beautiful plane at a fair price. But if you had to point to one thing that pushes his business ahead of his competitors, it is the wood he uses.

From the very beginning, Sauer has been obsessed with gathering gorgeous exotic woods through sources he's cultivated through both luck and persistence. The two-story shop in his backyard is stuffed with slabs and trunks of species that few woodworkers ever hear of, much less get to use. Yes, there is blackwood, but there is also black-and-white ebony, a crazy species that features swooping grain lines of the deepest black and a pale white. It is so mesmerizing that you forget that it is wood.

Stacked & ready. *Sauer restored this patternmaker's bench and reserves it for woodworking on the ground floor. The planemaking occurs upstairs.*

Wood everywhere. *Sauer's ground-floor machine room is stuffed full of wood on the walls, above the doors and even under the jointer's table.*

In fact, most of the ground floor of his shop is devoted to wood. It is stacked everywhere – against the walls, under the stairs, on top of the table saw. And Sauer knows it all – even the stuff that could never be used for planes. He has, for example, hundreds of 2x2 sticks of rosewood stacked under the stairs to the second floor of his shop.

"There are two things I love the most," Sauer says. "I love grabbing a chunk of wood, and I love figuring out how to make the best use of it in a plane, getting the right color and grain. I am really in this for the wood."

In fact, Sauer loves the wood so much that he refers to the metal in his work as "a weird wood with unusual working properties."

His passion for the material and working with it has taken him to some unusual places outside the toolmaking world lately. He did a project with Japanese calligrapher Norika Maeda, building six lamps for an exhibit at the Warms Spring Gallery in Charlottesville, Va. Sauer made the wooden bases and Maeda made the shades.

"When those opportunities open like a door, I will walk through it," he says.

Sauer says this while standing at a low bench set up for his two young boys. On the bench are a series of unusual wooden laminations – all handplaned. Sauer is making these with his boys as samples for a high-end sushi restaurant. They will be small presentation plates.

And when he has extra time, Sauer improves his old house and makes furniture for it. The front room of his house – a living room and dining room – has a white oak parquet floor that Sauer constructed himself. It's surrounded by banding in contrasting woods and rings the room. Next to the fireplace, he signed the work in the stringing by using dots of Morse code that spell out

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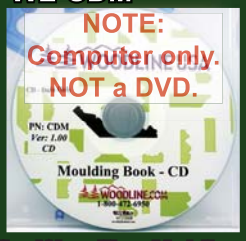

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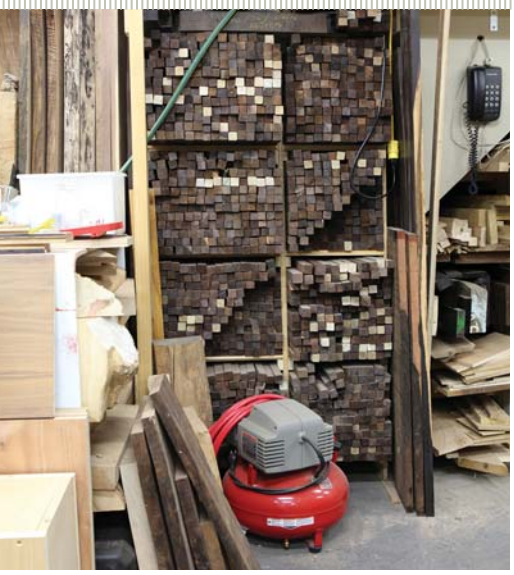

Stacked and waiting. *Sauer has hundreds of these 2x2 sticks of rosewood. What are they good for? He has yet to decide.*

For metalwork. *This small bench is where most of the metalworking occurs. Sauer files dovetails for the shells of his planes and bends the curved sidewalls on the anvil behind.*

the family name and the date. All this work in metal and wood happens in the purpose-built two-story shop behind his house.

The Shop Layout

Above his woodworking bench on the first floor, he has woods that you only read about, including perfectly quartersawn rare English brown oak. Thick. In the rough. Desert ironwood. Slabs of curly apple – and this is the stuff he is using for projects outside of planemaking.

This shop area downstairs is where Sauer roughs out the blanks for his planes and his other woodworking projects. Upstairs is where he assembles his planes. The upstairs shop is flooded with natural light from three walls of his shop, including the small deck area where he shoots all the finished handplane photos for his blog.

There are four workbenches up there. One is low for his two young boys. One is compact for traveling to woodworking shows. The third is in a corner and surrounded by moulding planes and chisels – this is where Sauer focuses on woodworking. And the fourth bench is where the metalwork happens. There is a machinist's vise secured to the top and a large anvil directly behind.

The rest of the shop is lined with small machines that Sauer uses for his planes: a couple grinders, a disc sander and a small wood lathe that he rarely uses. While some planemakers will use a metal lathe to turn all the screws and pins for their projects, Sauer prefers to subcontract that work to a machinist and focus on the parts he enjoys the most and does best.

So his lever cap screws are turned by a machinist, his irons come from blademaker Ron Hock and the rough metal parts for the shells for his planes are shaped by an outfit that uses a waterjet cutter. Sauer files the dovetails in the metal, peens them together, fits the wood infill (the biggest part of the job) and makes all the components sing together.

At the end of the process, he also takes every tool for a test drive.

Though he has built more than 300 planes during the last decade, he always has an anxious moment as he sharpens up the iron, drops it onto the plane's bed and secures it.

"It's always, 'I hope this works,'" Sauer says.

Performance in Perspective

Sauer & Steiner planes always perform at the top of the charts. In fact, some observers are beginning to compare Sauer to Karl Holtey, the perfectionist planemaker in Scotland who goes to incredible lengths to make perfect tools.

While Sauer's planes may not have the deliberate attention to detail that is found in Holtey's work, there is a perfect individuality in Sauer's work that is obvious when you see a group of his planes. They have family traits and all look like they came from the same hand – even the K13.

For Sauer, he is still amazed that he is able to continue to build tools for a living. Even after 10 years, he is waiting for the the other shoe to drop.

"It's either like I retired 10 years ago, or I took a job where I am always working 24 hours a day," Sauer says, standing at a bench with the K13 in hand. "But most days, it's like I retired." **PWM**

Christopher Schwarz is the editor of Lost Art Press (lostartpress.com) and can be reached at chris@lostartpress.com.

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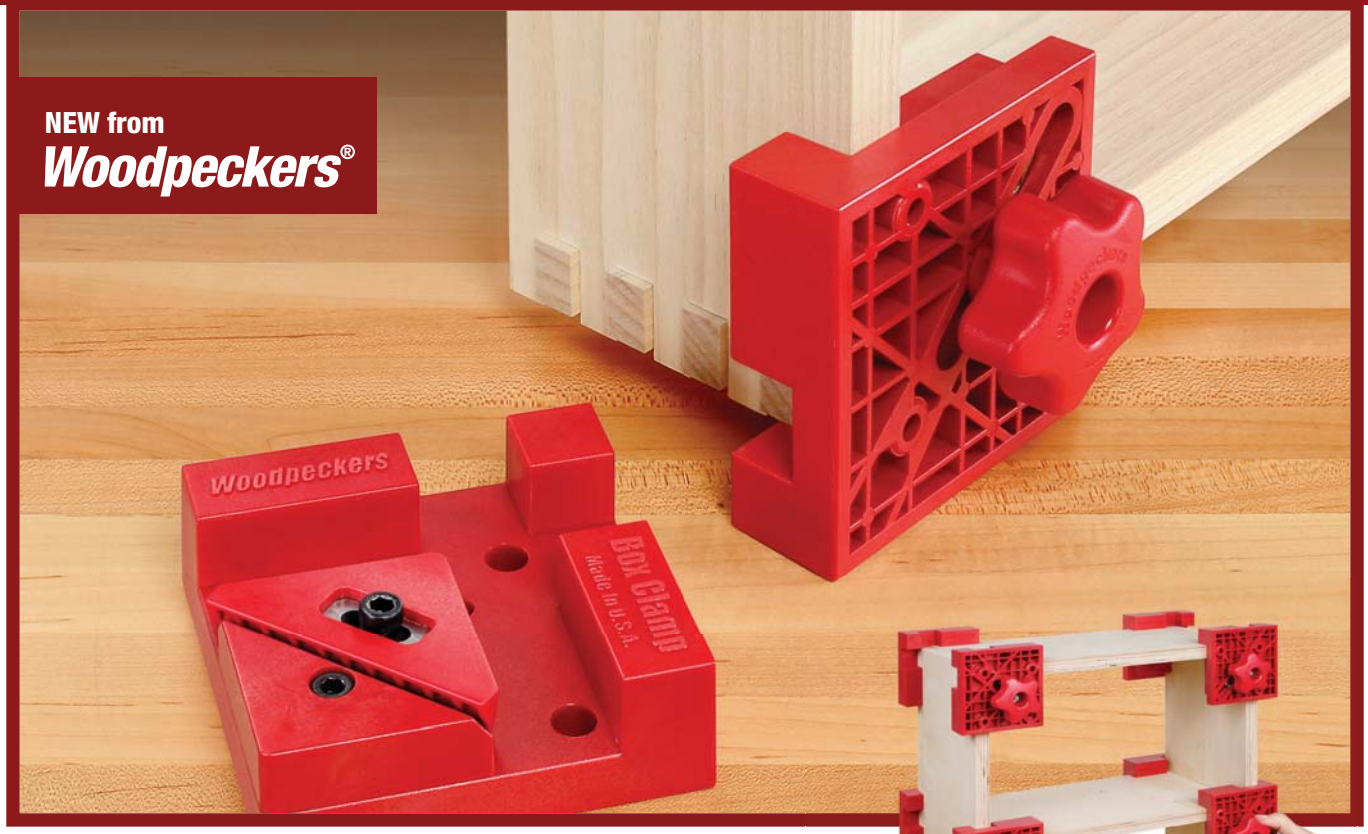

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Alternative Paint Strippers

Safer strippers are having a 'green' revival.

Green strippers. *The failed attempt to introduce alternatives to methylene-chloride strippers in the early 1990s is having a revival as "green." (Notice the green coloring on the labels.) The strippers pictured here all work great, but they do so considerably more slowly than traditional methylene-chloride and combined-solvent strippers. If you have the time, however, these alternative strippers are actually easier to use because they can remove many coats of paint or finish in one application.*

Methods for removing old paint and finish from furniture have gone through at least four distinct periods.

Before solvents became widely available, coatings were removed by scraping, often with glass used like we use scrapers, and sometimes by sanding, after sandpaper became available.

(Heat and caustics such as lye have never been a good idea for furniture because they can lift veneer and separate joints. Also, lye will turn most hardwoods black.)

The first active solvent widely used for stripping was benzene. It was cheap and fairly effective, and it was sometimes combined with other solvents to make commercial strippers.

By the early 1970s, however, benzene was shown to be carcinogenic. It was taken off the market and replaced as a stripping solvent by methylene chloride, which is more expensive but also more effective – that is, stronger and faster acting.

Other solvents were also used in combinations to make less expensive (and less effective) strippers. These include acetone, MEK, toluene, xylene and methanol. Sometimes, these solvents were combined with methylene chloride to reduce its cost. All of these solvents are flammable while methylene chloride is not.

Each of these strippers is still widely available and easily recognized by the packaging – in metal containers rather than plastic. High-percentage methylene-chloride strippers are noticeably heavier than the combined-solvent strippers and are labeled "non-flammable," so they are easy to recognize.

In the mid-1980s, methylene chloride came under scrutiny as a possible human carcinogen. The evidence for this was weak and is still in dispute. But the doubt created, plus the flammability and toxicity of the other solvents used in strippers, was enough to create a market for an entirely new line of paint and finish removers with reduced toxicity.

It isn't that these solvents are much less toxic; it's that they evaporate so much more slowly (remaining wet on the wood for up to a day or two). There's plenty of time for the air in a room to turn over several times before it reaches toxic levels.

Alternatives

The pioneers in this new category were Safest Stripper and Wood Finisher's Pride. You may remember them from the early 1990s. Their introduction was accompanied by a great deal of advertising, focused primarily on replacing methylene chloride, which was prominently branded a carcinogen.

Safest Stripper was based on di-basic esters (DBE): dimethyl adipate, dimethyl glutarate and dimethyl succinate. These solvents are often used in so-called "safe" or "green" cleaners, including graffiti and paint-spatter removers. When used alone, DBE is often combined with water.

DO 'GREEN' STRIPPERS MAKE SENSE?

Pros

- They are considerably less irritating to breathe.
- They are generally less damaging to the environment.
- They are very easy to use if you give them time to work. This can amount to overnight or longer depending on the coating being stripped and how thick it is or how many coats there are.

Cons

- One of the biggest problems with alternative strippers is that some of them contain water (and may even be promoted for it). Water raises the grain of wood and causes steel wool to leave rust marks on the wood (so use a synthetic pad instead). Much worse, water can lift veneer if left in contact for an extended period.
- The slow working advantage is a disadvantage if you are in a hurry. You have to allow more time (sometimes much more time) than you may be used to with strippers in metal cans.

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PHOTOS BY THE AUTHOR

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Wood Finisher's Pride was based on n-methyl-pyrrolidone (NMP). This solvent is stronger (meaning it works faster) and more expensive than DBE.

The flurry of advertising created enough interest for many additional companies to enter the market with their own versions of alternative strippers, some combining NMP with DBE. It got to the point that every paint store and home center stocked several brands.

Then, fairly suddenly, this entire category of strippers almost disappeared from the shelves. What happened?

In my opinion, alternative strippers disappeared because of a major marketing mistake. Every brand exaggerated the time it took for their stripper to work. That is, they claimed much less time than it actually took for them to work.

Manufacturers chose to compete with the speed of methylene chloride, which they couldn't legitimately do, instead of promoting ease of use. Instead of having to fight the rapid evaporation rate of the traditional strippers, you could relax, be patient, and eventually remove all coats with a single application of stripper.

The exaggerated claims got strippers packaged in plastic the reputation of "not working." Customers complained to store clerks, and store clerks warned potential customers. Then the market dried up.

The 'Green' Revolution

This situation continued until recently when "green" entered the marketing vocabulary. Terms such as "biodegradable," "non-toxic," "water-based," "earth friendly," "no harsh fumes," "soy-based" and "citrus" took on strong marketing clout. (Soy and citrus are misleading because they don't refer to the active ingredient, which is NMP.)

Alternative strippers fit many of these terms well, so makers reentered the market, often with newly labeled products.

Exaggerated working times and hyperbole didn't disappear, but the bet is that consumers are now so desirous of avoiding bad-smelling solvents that they will try these strippers anyway.

Do They Work?

The question is: Do they work adequately enough to be legitimate replacements for methylene chloride and flammable-solvent combinations? The answer, in my opinion, is that they do. They just take longer on most coatings.

Swell and blister. *Most paints and some clear finishes swell and blister, no matter which stripper you use. You can scrape them off flat surfaces or scrub them off complex surfaces using abrasive pads.*

Test first. *Alternative strippers work slowly, but they stay wet for days. They will remove multiple layers of paint if you give them time. This is their great advantage. You don't have to fight the rapid evaporation as you do with traditional strippers. In this case, after 24 hours, a little more time was needed before five layers of paint came off easily.*

It's important to note a second problem with manufacturers' speed claims. No matter which stripper you use, whether in a metal or plastic container, different coatings react differently.

For example, shellac and lacquer dissolve fairly quickly and become a "gunk" that is easy to wipe off (though not so quickly with DBE). Varnish, oil paint and usually latex paint swell and blister. Oil-based polyurethane and two-part, high-performance (catalyzed) finishes have their bonds to the substrate broken so you can scrape them off.

If you want to avoid the irritating solvents in traditional strippers, give an alternative stripper a try. Just allow more time than the label says. Unless I'm in a hurry, I always go to one of the alternative strippers. PWM

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

Dissolve. *Shellac and lacquer, the finishes used on almost all furniture made since the 1820s, usually dissolve and are easy to wipe off with rags or durable paper towels.*

Release bond to wood. *Some coatings, notably modern high-performance paints and finishes show no evidence that the stripper has had any effect, but, in fact, their bond to the wood has been broken so they are easy to scrape off.*

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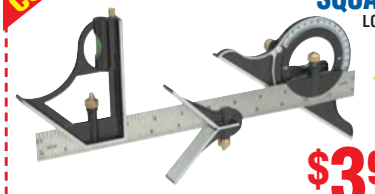

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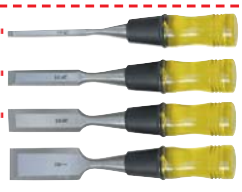

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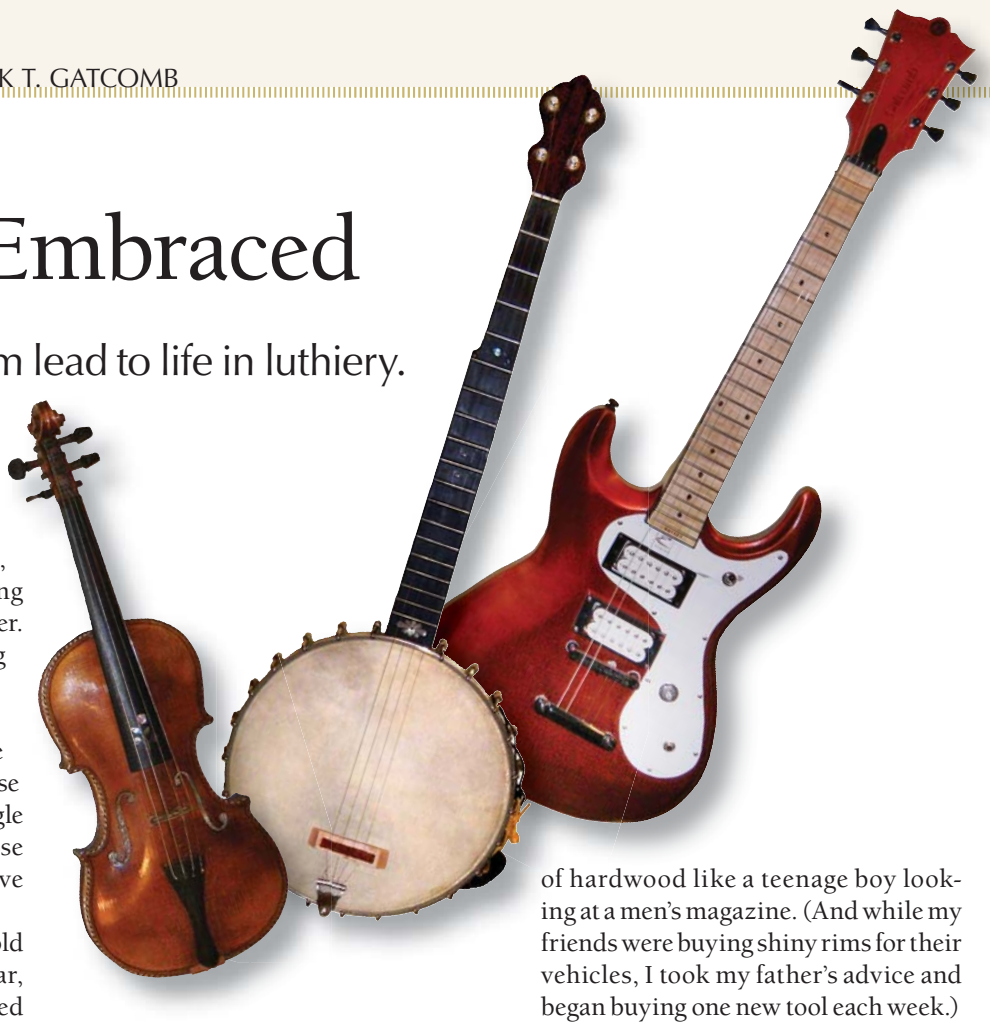
Tradition Embraced

Dreams of rock stardom lead to life in luthiery.



The allure of woodworking is a hell of a thing. As a teenager determined to break the family cycle – everyone, male or female, was/is a carpenter – I loathed hearing about 2x4s and pressure-treated lumber. The thought of spending a life pounding nails was comparable to a life in purgatory, which never seems very promising, particularly to an adolescent. The old man would tell me, "One day all these tools will be yours." And I would struggle to stifle a groan. After all, what purpose would those woodworking tools serve to a world-famous rock star?

But the woodworking bug took hold soon after I got my first electric guitar, an entry-level instrument that needed more than a few upgrades, at least aesthetically, to find favor with me. Taking it apart and examining it, I realized that the instrument wasn't nearly as remarkable or mysterious as I had imagined. In fact, it was nothing more than a couple pieces of wood screwed together and a set of steel strings running from one end to the other.

It occurred to me that anyone should be able to design and craft a guitar in the comfort of his or her own workshop, and I soon set about designing my very own custom creation, which the old man agreed to help me build.

(Though my sudden interest in woodworking came as a surprise to me, it almost seems to have been predestined. My ancestor, Lincoln B. Gatcomb, left our hometown in the late 19th century and found fame and fortune in Boston as one of the premier luthiers of the day.)

At school I looked forward to racing home and spending the evening in the garage where my father would teach me to use his beloved band saw and perilously sharp chisels. We forged ahead, blindly and without direction, on a project in which neither of us had any expertise.

The end result, though seemingly impressive at the time, was in retrospect a laughably amateurish attempt. But by the same token, it was an inspiring and life-changing event.

There's power in woodworking – the potential to craft, with your own hands, just about anything your heart desires. On top of that, there's a sense of accomplishment that comes with building anything – even something as simple as a bookshelf, which can often be built for less money than it would cost to buy an identical mass-produced product from a chain store. For me it was a chance to begin building all those coveted guitars that a 15-year-old from a working-class family could only dream of owning, whether because of the scarcity of the models or because of the astronomical price tags.

And build I did. Embarking on a journey I could have never foreseen, I spent years gathering knowledge and honing my woodworking skills. So in a strange twist of fate, I found myself ogling billets of hardwood like a teenage boy looking at a men's magazine. (And while my friends were buying shiny rims for their vehicles, I took my father's advice and began buying one new tool each week.)

Now, almost 15 years later, I look back on those late nights in the garage as lessons – however rudimentary – that prepared me for a modest career as a small-town luthier. Whether I'm spending my nights using a spokeshave to shape a flamed maple banjo neck, or standing in the sun using my trusty No. 5 jack plane on a solid mahogany guitar body, I congratulate myself on abandoning my dreams of rock stardom and embracing the family tradition of woodworking – a fulfilling and wholesome career that still keeps me grounded in music.

And even now I find myself driving to the old man's house to borrow hand tools, all of which will one day be mine – and now, our family woodworking tradition is one I gladly embrace. PWM

Erick is a life-long resident of coastal Maine, and the owner of Gatcomb Co., a family-owned luthiery shop.

ONLINE EXTRAS

For links to all online extras, go to:
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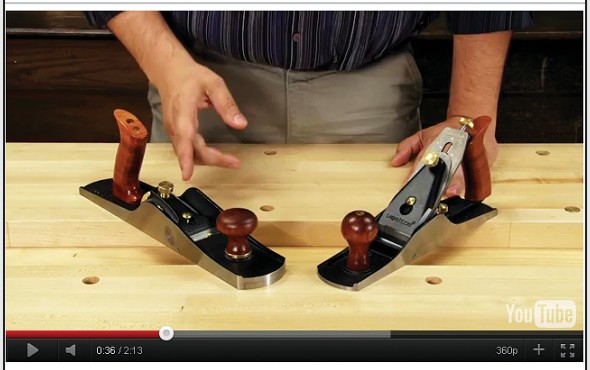

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Explaining the difference between bevel-up and bevel-down planes

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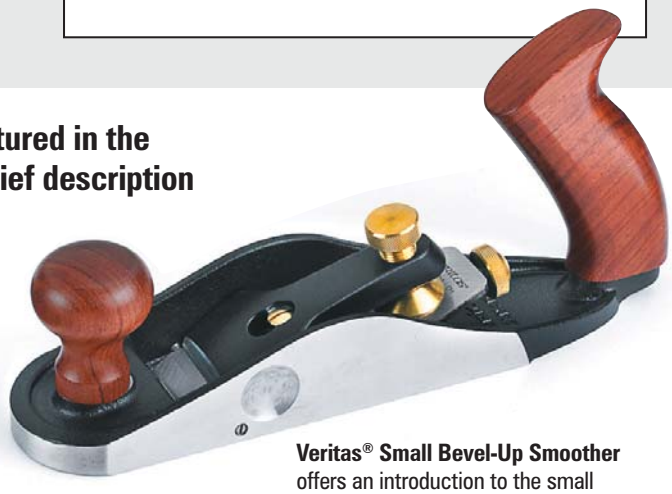

Veritas® Small Bevel-Up Smoother offers an introduction to the small bevel-up smoothing plane. 05P39.01

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Veritas® Dual Marking Gauge shows you how to mark out mortises, tenons and dovetail baselines with the dual marking gauge. 05N70.01

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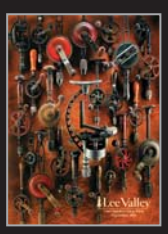

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